












VOLUME

1

REPORT

Okanagan Ecoregional Assessment

October 2006

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The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH
Washington Department of Fish and Wildlife

Okanagan Ecoregional Assessment

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Volume 1 – Report

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Okanagan Ecoregional Assessment Core Team

Leadership for the assessment process was shared between the Nature Conservancy Canada (NCC) and The Nature Conservancy (TNC). The Core Team members and their roles are listed below.

Kristy Ciruna, Director of Conservation Programs, NCC, British Columbia

Rex Crawford, Vegetation Ecologist - Eastern Washington, Washington Natural Heritage Program, Washington Department of Natural Resources, Washington

Robin Dye, Conservation Planner, TNC, Washington

Matt Fairbarns, Conservation Botanist, Aruncus Consulting, British Columbia

Steve Farone, Northwest Ecoregional Applications Manager, TNC, Washington

John Floberg, Manager of Ecoregional Planning, TNC, Washington

Shane Ford, Botanist, Conservation Data Centre, Ministry of Environment, British Columbia

Mark Goering, GIS Manager, TNC, Washington

Mike Heiner, TNC, Washington

Pierre Iachetti, Director of Conservation Planning, NCC, British Columbia

Gwen Kittel, Vegetation Ecologist, NatureServe, Colorado

Jeff Lewis, Wildlife Biologist, Wildlife Program, Washington Department of Fish and Wildlife (WDFW), Washington

Dave Nicolson, Conservation Planner / GIS Analyst, NCC, British Columbia

Barbara Pryce, Core Team Lead, Okanagan Program Manager, NCC, British Columbia

Sairah Tyler, Conservation Planning Consultant, NCC, British Columbia

Nancy Warner, North Central Washington Program Director, TNC, Washington

George Wilhere, Conservation Biologist, Wildlife Program, WDFW, Washington

Appendix 2 lists the many people who supported the Core Team through the assessment process

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EXECUTIVE SUMMARY

Ecoregional assessments provide a regional scale, biodiversity-based context for implementing conservation efforts. The intent of the assessments is to create a shared vision for agencies and other organizations at the provincial or state, regional, and local levels to form partnerships and ensure efficient allocation of conservation resources. The assessments identify a portfolio of sites for conservation action with a goal of protecting representative biodiversity and ecologically significant populations. These assessments are the result of rigorous scientific analyses, which incorporate expert review, and are the most comprehensive and current efforts to set conservation priorities at an ecoregional scale. Biodiversity conservation in an ecoregion will attain its fullest potential if all conservation organizations coordinate their strategies to protect and restore biodiversity according to the priorities identified in this process.

The Okanagan Ecoregional Assessment resulted in the selection of 430 conservation targets, including 220 terrestrial species targets, 48 freshwater species targets, 66 rare plant community types and 96 system targets. These system targets are the major ecological systems that make up the terrestrial and freshwater environments.

Conservation goals were set for each target. They defined the abundance and spatial distribution needed to adequately conserve each target in an ecoregion and provided an estimate of how much effort will be needed to sustain the targets well into the future. A suitability index was used to determine the areas of the ecoregion that had the highest likelihood of successful conservation. The suitability index incorporated five biological and non-biological factors: converted land (agriculture, urban, mining); level of protection (GAP status); urban proximity; road density; and fire condition. The conservation goals and the suitability index were used to develop a portfolio of priority conservation areas (PCAs) that represent characteristic landscape settings which support all of the ecoregion's biodiversity.

The terrestrial portfolio (Map 22) includes 137 PCAs with an area of 3,093,000 ha (7,642,969 ac), which represents 32% of the total area of the ecoregion. The freshwater portfolio, including 135 PCAs, (Map 24) extends beyond the ecoregion boundary to capture whole watersheds. The portion of the portfolio falling within the ecoregion boundary, 113 PCAs, totals 3,301,359 ha (8,157,835 ac) and represents 34% of the ecoregion. The area of overlap between the terrestrial and freshwater portfolios represents 14% of the ecoregion (Map 26). These portfolios include the last places where many of the ecoregion's most imperiled species occur, and the last, large expanses of relatively intact natural habitat. The sites included in these portfolios are regarded as having the highest likelihood of successful conservation according to the suitability factors used in the assessment. While integration of the Okanagan's terrestrial and freshwater portfolios was not achieved, future iterations of this assessment will strive to produce a fully integrated portfolio.

Threats to biodiversity in the ecoregion were determined based on a literature review and on assessment team members' experience and on-the-ground knowledge of the ecoregion, and interviews with experts who were knowledgeable about the area. The major threats to biodiversity in the Okanagan Ecoregion include:

- urban growth
- agricultural practices
- water management
- invasive species, pests, and pathogens
- roads
- transportation and utility corridors

- forest practices
- altered fire regimes
- climate change
- point/non-point source pollution
- recreational development and use

Approximately 23% of the terrestrial portfolio is currently in designated protected areas (Table 6.2, Map 23). In order to conserve the entire terrestrial portfolio, conservation strategies over the remaining portion of the portfolio, or 25% of the ecoregion, would need to be applied. Approximately 14% of the freshwater portfolio within the ecoregion is currently in designated protected areas (Table 6.4, Map 25). In order to conserve the entire freshwater portfolio within the ecoregion, conservation strategies over 30% of the ecoregion would need to be applied. These areas are not mutually exclusive.

This assessment resulted in a series of products that will be useful to those involved in biodiversity conservation in the Okanagan Ecoregion. These products can be used alone, in conjunction with one another, or with other information to enhance communication about on-the-ground conservation of biodiversity values in the ecoregion. The main products developed were

- terrestrial and freshwater ecological system classifications

- terrestrial and freshwater conservation portfolios showing the most important and suitable areas for conservation of ecoregional terrestrial and freshwater biodiversity, respectively. A summary of known target occurrences, land cover, land use, etc., is provided for each PCA along with an illustration of relative priority based on biodiversity value and suitability for conservation.

- irreplaceability maps showing the relative conservation value of all places in the ecoregion

- utility maps showing the relative conservation value and suitability for conservation of all places in the ecoregion

- overlaid terrestrial and freshwater portfolios showing the area of overlap between the two portfolios

- three scenarios for biodiversity conservation representing different levels of risk

Conservation projects within portfolio sites and high value assessment units (AUs) should receive special consideration. The conservation portfolios and irreplaceability and utility maps are useful for a full range of biodiversity conservation strategies; therefore, we encourage government agencies, non governmental conservation organizations and other conservation practitioners to consider these products in their work. To date, the Washington Department of Fish and Wildlife has committed to using the conservation utility maps in developing their State Comprehensive Wildlife Conservation Strategy (SCWCS) along with other governmental and non-governmental organizations. The Nature Conservancy uses portfolio sites to focus all of their on-the-ground conservation and policy work. Similar ecoregional assessments are being prepared for other ecoregions in support of Washington's and Oregon's SCWCS. In British Columbia, provincial government agencies will use the assessment to inform their decision-making. The Nature Conservancy of Canada will use the assessment products to develop a conservation program in the ecoregion. The ultimate vision of the ecoregional assessment process is to facilitate the thoughtful coordination of current and future conservation efforts by the growing number of federal, state, local, private and non-governmental organizations engaged in this field.

Chapter 1 – Introduction

The Okanagan Ecoregion is a biologically rich area consisting of numerous convergent ecological habitat types. The climate and abundant natural resources of the ecoregion have supported a rapidly expanding human population and agricultural industry; however, intensive land use threatens the region's biodiversity. Conservation organizations and government agencies are increasing their protection and restoration efforts in the region, but their limited resources make careful coordination of conservation efforts a necessity. To address the growing need for cooperation among these groups, the Nature Conservancy of Canada (NCC), The Nature Conservancy (TNC), and the Washington Department of Fish and Wildlife (WDFW), worked with various partners to complete an ecoregional assessment intended so that government agencies, non-governmental conservation organizations, and other decision makers and planners could direct their resources towards the most important places for conserving the ecoregion's biodiversity.

The purpose of the project was to use the best available information about the ecology of the region to identify lands and waters needed to maintain the biodiversity of the ecoregion. Assessment products that were developed include (1) a terrestrial portfolio and a freshwater portfolio of priority conservation areas (PCAs) that are of exceptional biological value and/or are the most likely places for conservation to succeed based on their current condition or status; (2) maps depicting the relative irreplaceability of all sites across the entire ecoregion; and (3) lower and higher risk portfolios depicting a wide range of options for the conservation of biodiversity. Numerous scientists and other experts from federal, state, provincial and local agencies, academia and conservation organizations contributed to this ecoregional assessment.

Assessment Methods

This assessment uses an approach developed by TNC (Groves et al. 2000; Groves et al. 2002) and scientists in other organizations to establish conservation priorities within ecoregions whose boundaries are defined by distinct climate, geology, landforms, and native species (Bailey et al. 1994). Similar assessments have been completed for 9 of the 14 ecoregions in southern Canada, 45 of the 81 ecoregions in the U.S., and several other ecoregions outside North America. The objective is to complete assessments throughout the U.S. and in many parts of Canada and other countries by 2008.

The Okanagan Ecoregion Core Team, comprised of six expert technical sub-teams, collaborated on a series of analyses. Three teams selected species, communities and ecological systems that served as terrestrial conservation targets; a fourth team selected animals and ecological systems that served as freshwater conservation targets. Conservation targets are those elements that were considered to represent optimal concentration of biodiversity. A fifth team developed an index of the threats to the conservation targets; the sixth team conducted the analysis and data management aspects of the project.

A computer program, MARXAN, was used to select the optimal portfolio of sites—i.e., that set of sites which met the goal of the most targets at the lowest cost, or the suite of factors thought to influence the likelihood of conservation success. Cost was minimized by selecting the most compact set of sites in areas rated as most suitable for long-term conservation. Site suitability was described by an index of existing land use and impacts. The MARXAN program then compared each part of the ecoregion against all others and analyzed millions of possible portfolios to select the most efficient alternative. Separate portfolios were created for terrestrial and freshwater biodiversity. The MARXAN tool was also used to generate maps depicting the relative irreplaceability of all sites across the ecoregion.

The technical teams then worked with MARXAN outputs to refine the terrestrial and freshwater portfolios based on expert review. Sites in both portfolios were prioritized for action based on the irreplaceability (biodiversity value) and suitability (biodiversity value and suitability for conservation) values encompassed by each site. These portfolios highlight areas of high conservation value for terrestrial and freshwater species and systems. The terrestrial and freshwater portfolios were then overlaid in order to identify areas of overlap between the two portfolios.

Using the Assessment

The Okanagan Ecoregional Assessment is a resource for planners, decision makers and others interested in the status or conservation of biodiversity in the region. This assessment has no regulatory authority; it is simply a guide for prioritizing conservation of habitats that support the extraordinary biological diversity of the ecoregion. The results of the assessment can be used to set conservation priorities, raise funds for conservation, measure progress, and influence how people think about the future of their ecoregion. The assessment should be used in conjunction with other biological information, particularly at more local scales, and with information about social and economic priorities to guide biodiversity conservation actions in the region.

The Report

The Okanagan Ecoregional Assessment consists of four separate documents. This document, the main report, contains an overview of the assessment process, methods and results. More detail on the methods, a glossary of terms, lists of participants, and references has been placed in separate appendices. Maps of the ecoregion, the terrestrial and freshwater ecological system classifications, and the various portfolios are in a separate volume. Summary reports for the terrestrial and freshwater priority conservation areas identified in the portfolios can be found in the site summary document.

The assessment report and the final product data are available to all interested parties. The Nature Conservancy of Canada, The Nature Conservancy, and the Washington Department of Fish and Wildlife will use the assessment results and those of similar assessments for other northwest ecoregions to prioritize projects and funding. Governments, land trusts, and others are encouraged to use the assessment as a supplementary resource to other planning information. It is our intent that the rich ecological landscape of the Okanagan region persist so that future generations of all species will prosper within it.

1.1 Okanagan Ecoregion Overview

General Description

The Okanagan Ecoregion occupies portions of south-central British Columbia (BC) and north-central Washington State (Map 1), and is 9,605,000 ha (23,724,350 ac) in area. About 69% of the ecoregion is in British Columbia; 31% is in Washington. Approximately 14% of Washington and 6% of British Columbia is within this ecoregion. The ecoregion supports one of the largest assemblages of nationally rare plant species in Canada and the greatest diversity of breeding bird species in British Columbia and Washington. Endemic species found within this ecoregion include the night snake (*Hypsiglena torquata*) and pygmy short-horned lizard (*Phrynosoma douglasii*). The ecoregion contains most of the remaining grasslands, shrub-steppe, and low-elevation dry forests in British Columbia. The low elevations of the Okanogan and Similkameen River valleys, where dry climate and desert-like habitats are northern extensions of the Great Basin, are particularly important for shrub-steppe species. This area is a critically important movement corridor into the mountainous areas of the western United States for wide-ranging carnivores such as grizzly bears (*Ursus arctos*), grey wolves (*Canis lupus*), lynx (*Lynx canadensis*) and wolverines (*Gulo gulo*). This biologically rich landscape is of international importance.

The Okanagan Ecoregion lies east of the crest of the Coast and Cascade Mountain ranges and west of the Columbia and Selkirk Mountains. The ecoregion is characterized by long, rounded ridges, rolling plateaus, wide valleys, and large lakes with the Thompson-Okanagan Plateau in the northeast and the Okanagan Highlands in the southeast. In the northwest and southwest portions of the ecoregion, the Chilcotin, Interior Transition, and Okanagan Ranges are characterized by rugged mountains and deep valleys. To the east, the mountains are more rounded, particularly the Kettle Range and Huckleberry Mountains in Washington (WDNR 2003). The south-central portion of the ecoregion contains the northern extent of Palouse grasslands—an area characterized by rolling, highly fertile loess hills, and scattered wetlands. The Sawtooth Ridge northeast of Lake Chelan marks the southwestern border of the ecoregion. In Washington, the ecoregion includes the Methow and Okanogan valleys and the Okanogan Highlands east to the Colville and Spokane valleys.

Elevations within the ecoregion range from below 300 m (1,000 ft) to peaks in the Interior Transition Ranges that are over 3,000 m (10,000 ft). Glaciation has left its imprint in the form of hummocky moraines, drumlinoid features, terraces, esker complexes, and glacial lake deposits.

Major water bodies in the western and northern portions of the ecoregion in British Columbia include the Thompson River and its lakes and tributaries which join the Fraser River at Lytton. To the east and south lie Okanagan Lake and the Similkameen River, which flows south into Washington State.

Development is concentrated in the Okanagan and Thompson valleys in British Columbia and in the Spokane, Colville, Methow and Okanogan valleys in Washington. In British Columbia, the ecoregion encompasses the Central-Okanagan and Okanagan-Similkameen, and part of the Squamish-Lillooet, Thompson-Nicola, North Okanagan, and Kootenay-Boundary, Columbia Shuswap and Fraser Valley Regional Districts. In Washington State, the ecoregion includes Okanogan, Ferry, Stevens counties, parts of Pend Oreille and Spokane counties, and the Colville Indian and Spokane Indian Reservations. Approximately 24% of historical grasslands in the British Columbia portion of the ecoregion have been lost to agriculture, urban and industrial development (Grasslands Conservation Council of British Columbia 2004). Ten percent of the Washington portion had been converted to agricultural or urban use as of 1991 (Washington GAP 1997).

1.1.1 Biogeographical Setting

Geologic and Glacial History

Continental and alpine glaciers played a major role in shaping the landforms of the Okanagan Ecoregion. The entire area was glaciated during the Pleistocene epoch. Extensive surficial moraines were deposited as the glaciers retreated, and lakes, such as Kamloops and Okanagan Lake, formed in the ice-carved depressions. Streams and rivers cut through the surficial moraines and created steeply incised gullies with exposed bedrock in transition areas between the headwaters and the lower-lying valleys. With the exception of the Cascades, bedrock is composed mainly of lava flows that extend southward from central interior British Columbia. The Cascades are composed of sedimentary rocks with some volcanics mixed with granites (Perrin and Blyth 1998).

Climate

The ecoregion has both the coldest climate in Washington and some of the hottest and driest weather recorded in British Columbia. The ecoregion is influenced by the extremes of hot, dry air from the Columbia Basin in the summer and cold, dense arctic air in the winter. The western part of the ecoregion is dry because it is within the rain shadow of the Coast and Cascade Mountains; however, precipitation increases to the east as air masses rise, cool, and drop moisture over the Rocky Mountains. Annual precipitation varies from less than 31 cm (12 in) in the greater Okanogan valley of Washington and British Columbia to 127–229 cm (50–90 in) in the Cascades. Most of the ecoregion lies within a 36–61 cm (14 to 24 in) precipitation zone. Throughout the region, fairly steep temperature and precipitation gradients occur from the mountains to the valleys (WDNR 2003; Scudder and Smith 1998; Environment Canada 2006).

Biotic Communities

The Okanagan Ecoregion can be described as transitional, with portions having characteristics of adjacent ecoregions; however, in British Columbia, the climate has created ecosystems that are not found elsewhere in Canada. Vegetation is dominated by three zones: the Bunchgrass Zone in the lower slopes of the large basins, the Interior Douglas-fir Zone on the lower elevations of the plateaus, and the Montane Spruce Zone on the higher elevations of the plateaus. Also present are the Engelmann Spruce - Subalpine Fir Zone on the higher elevations of the plateaus and highlands; the Alpine Tundra Zone on the highest slopes of the Okanagan and Clear Ranges; the Ponderosa Pine Zone sporadically on middle slopes of the large, dry basins; and the Interior Cedar - Hemlock Zone on the upper slopes in the northeastern area of the ecoregion.

Conifer forests dominate mountain ridges and low hills in the ecoregion, while valleys and lowlands are often non-forested. The conifer forests are more open and less continuous, consisting of smaller stands, than are forests west of the Cascade crest and in the Canadian Rocky Mountains. Douglas-fir–ponderosa pine (*Pseudotsuga menziesii–Pinus ponderosa*) forests characterize the ecoregion and grade to shrub-steppe in the low broad valleys in the eastern part of the ecoregion and to grasslands in the western part. Whitebark pine (*Pinus albicaulis*), lodgepole pine (*Pinus contorta* var. *latifolia*), and subalpine larch (*Larix lyallii*) form parklands in the highest elevations of the ecoregion and are often associated with dry alpine or subalpine meadows. Moister forests are dominated by Douglas-fir, with western larch (*Larix occidentalis*), western white pine (*Pinus monticola*) or trembling aspen (*Populus tremuloides*) as common components.

Historically, stand replacement fires occurred at irregular intervals from 10 years in the lowland foothills to 150 years or more at high elevations. Decades of fire suppression have resulted in a landscape composed of dense, fire-prone forests (WDNR 2003).

1.1.2 Socio-economic Environment

Approximately 925,000 people live in the Okanagan Ecoregion. Population levels have increased dramatically over the past 30 years, a trend that is particularly notable within the Thompson and Okanagan valleys of British Columbia and the Okanogan and Colville valleys of Washington. In the British Columbia portion of the ecoregion, there are more than 45 communities, and the five largest cities and towns had a total population of 266,560 in 2001 (Statistics Canada 2005). The northwestern portion of the ecoregion is less populated than the central and southern portions. The Okanagan-Similkameen Regional District, which encompasses Penticton, Princeton and Osoyoos, is predicted to undergo a 46% increase in population, growing from 78,100 in 1996 to an estimated 114,000 in 2026 (RDOS 2003). The Central Okanagan Regional District has the second highest rate of population growth in British Columbia (Statistics Canada 2005).

British Columbia's economy in 2006 is expanding at unprecedented rates. Residential and commercial development is flourishing, and the rate of job growth in British Columbia is Canada's highest at 8.3% (Government of British Columbia 2006).

In Washington, rural areas have generally been growing as fast as or faster than urban areas over the past 30 years, especially those which have access to major highways and airports. Population growth in the Ferry, Stevens and Pend Oreille County region grew from 27,085 to 59,058, or 118%, from 1970 to 2000. Most of this growth occurred in Stevens County due to people moving into the region, but Ferry and Pend Oreille counties also grew by 99 and 95%, respectively, due to immigration. During this same time period, Spokane County's population more than doubled from 1969 to 2002. Okanogan County grew from 24,701 in 1969 to 39,236 by 2002. The population on the Colville Indian Reservation in 2006 is approximately 7587; Tribal memberships on and off the reservation increased from 1970 in 1960 to 9082 in 2006 (U.S. Census Bureau 2000; Colville Confederated Tribes 2006).

The boom in urban and industrial development throughout the ecoregion is attributed to increasing population growth. Many communities are working to diversify their economies, particularly by expanding the small business sector and the accompanying infrastructure, training and partnerships needed to support that growth. Increasing development of nature heritage tourism, recreation, and other value-added natural resource businesses is also motivating communities to assess how they can balance rural values with dependency on economic change (Tri-County Economic Development District 2004; Children First 2004). High-tech and manufacturing sectors also continue to expand in communities in British Columbia (Statistics Canada 2005). Employment in farm and agricultural services dropped more than 9% across the region between 1970 and 2000 reflecting a general decline in livestock business, whereas the number of small businesses, particularly in retail and construction, increased mainly in Okanogan and Stevens counties (Sonoran Institute 2004).

Unemployment levels and long-term poverty rates are high across rural counties in the Washington portion of the ecoregion;,three counties are listed among the top ten stressed (a measure of socio-economic performance) counties in the Inland Northwest (Alexander et al. 2005). Conversely, unemployment and poverty rates in the British Columbia portion of the ecoregion are comparable to those in the rest of the province (Statistics Canada 2005).

People moving into the ecoregion generally have larger incomes than those moving out. Much of that income is in the form of investments, retirement income, and other non-labor sources (U.S. Census Bureau 2000; Statistics Canada 2005).

1.1.3 Land Ownership and Management

Approximately 44% of the Washington portion of the ecoregion is in federal or state ownership (Map 2, Table 1.1). The largest federal landowner is the U.S. Forest Service whose holdings include almost 947,000 ha (2,338,791 ac) or 32% of the Washington portion of the ecoregion. The holdings of the Washington Department of Natural Resources total 198,000 ha (489,700 ac) or 8% of the Washington portion of the ecoregion.

The Colville and Spokane Indian Reservations comprise approximately 19% of the Washington portion of the ecoregion. The Colville Indian Reservation is located in southern Okanogan and Ferry counties and consists of approximately 550,600 ha (1.36 million ac).

The 61,100 ha (151,100 ac) Spokane Indian Reservation lies in the southern part of Stevens County. The interests of these tribes extend well beyond their reservations; the Colville Tribes and the Spokane Tribe are sometimes actively involved in natural resource management and conservation issues on their historic tribal lands outside the reservations.

Approximately 95% of land in British Columbia is owned by the Crown, meaning that the provincial government retains ownership on behalf of its citizens. Similarly, within the British Columbia portion of the Okanagan Ecoregion, approximately 87% or 4.3 million ha (10.6 million ac) is Crown land (Table 1.1, derived from this Ecoregional Assessment). This includes provincial parks and protected areas which total about 6.5% of the ecoregion in British Columbia. This provincial land base is heavily encumbered by various tenured and untenured land and resource uses. Forest, range, guide-outfitting and trapping tenures cover most of the Crown land within the ecoregion. Recreation tenures apply to specific areas, whereas mineral claims are prevalent throughout the ecoregion.

Because most of the land in British Columbia is owned by the Crown, the provincial government is the major decision maker on how land and resources are allocated and managed. Several provincial government agencies have legislated mandates to ensure that Crown lands are used for the benefit of all British Columbians.

Approximately 11% of British Columbia portion of the ecoregion is privately owned. This represents a significant portion of valley bottom wetlands, grasslands and lower elevation slopes which have been converted to residential, urban and agricultural uses.

Table 1.1. Okanagan Ecoregion Land Ownership

Managed Land, Washington	% of the Washington Portion of the Ecoregion	% of the Okanagan Ecoregion
Federal Lands		
Forest Service: National Forest	23.6%	7.3%
Forest Service: Wilderness	8.3%	2.6%
Bureau of Land Management	1.4%	0.4%
National Park Service	1.6%	0.5%
Fish and Wildlife Service	0.6%	0.2%
Other Federal	1.4%	0.4%
State Lands		
Department of Natural Resources: Trust Lands	6.3%	1.9%
Department of Fish and Wildlife	1.0%	0.3%
Department of Natural Resources: NRCA and NAP	0.4%	0.1%
Parks and Recreation	0.2%	0.1%
Other State	< 0.1%	

Managed Land, British Columbia	% of the BC Portion of the Ecoregion	% of the Okanagan Ecoregion
Provincial Crown Land*	77.2%	53.3%
Private Land	10.8%	7.4%
Provincial Park or Protected Area	9.4%	6.5%
Indian Reserve	2.5%	1.7%
Federal Land	<0.1%	<0.1%
Conservation Trust Land	<0.1%	<0.1%

* includes land managed under a Tree Farm License

Managed Land, Washington	% of the Washington Portion of the Ecoregion	% of the Okanagan Ecoregion
Other Lands		
Private Land	36.1%	11.2%
Tribal Land	19.1%	5.9%
County or Municipal	< 0.1%	< 0.1%
Conservation Land	< 0.1%	< 0.1%

1.1.4 Land Use History of the Okanagan Ecoregion

Historically, native peoples moved between the valleys and mountains in the ecoregion and traded with other tribes to meet their seasonal and year-round needs. The traditional economy of these peoples consisted of seasonal hunting, fishing and gathering, and trading with other families and tribes. Resources from roots and game to fish and berries were geographically scattered; therefore, the native peoples lived a generally nomadic lifestyle based on gathering these resources, but they did establish more permanent winter settlements that were used as storage and field camps and were located near important gathering and processing areas (Wilson 1990; Thomson 1994).

The acquisition of horses from native peoples to the south and later contact with Europeans vastly changed the traditional way of life of aboriginal people in the region (Mather, no date). In 1811, explorer David Thompson of the Northwest Fur Company traveled down the Columbia River through Kettle Falls and initiated the fur trade era in the region (Wilson 1990). Fur traders established posts on the Spokane River and at the confluence of the Columbia and Okanogan Rivers, which accelerated cultural changes among native people by introducing them to fur trapping and European agricultural practices. The establishment of Fort Okanagan at the confluence of the Columbia and Okanogan Rivers in 1811 supported the northward expansion of the fur trade through the Okanagan valley to the present city of Kamloops (Mather, no date). As the Hudson's Bay Company established forts to supply goods to trappers who collected beaver pelts for the fur trade (Mather, no date), the native peoples developed more sedentary ways of life.

In the 1830s, missionaries arrived and began teaching English and agriculture as part of a broader strategy for converting the semi-nomadic native people into sedentary farmers. Prospectors and homesteaders anxious to claim new lives and lands in the West arrived soon thereafter. This expansion created the need for recognized boundaries. In 1848, the Oregon Treaty was established and the 49th parallel was designated as the boundary between British and American continental territories west of the Rocky Mountains. The British and American Joint Boundary commission began to survey and mark the 49th parallel in 1856. It was also during this time that native people began to struggle with the emerging governments about their rights to land. In British Columbia, native people believed their 1858 agreement with the new Colonial Government would be followed by full negotiations. Further negotiations did not occur, and the Imperial Agreement was used to establish Crown lands, ensure greater access to land throughout the Okanagan for settlers, and restrict native people to reserves.

The discovery of gold in the Lower Fraser River in 1858 sparked a gold rush that attracted prospectors across the border. In 1860, the Land Ordinance was developed to provide for the acquisition of 160-acre parcels of land by British citizens for a low price with the conditions that they must continuously occupy the land and make improvements. By the 1870s, the economy of the Okanagan in British Columbia was diversifying as ranchers, miners, and other settlers began to develop timber and other natural resources on their lands (Mather, no date).

While the Gold Rush brought thousands of people through the Okanagan to the Cariboo region of British Columbia, some stopped short in present day Washington State and began prospecting the lands and waters around the Pend Oreille, Columbia and Kettle Rivers. As in Canada, tension and conflicts grew as these miners and other homesteaders began to encroach onto the lands of the native peoples. In an attempt to reduce these conflicts, the Colville Reservation was created by presidential order in 1872. Changes to the boundaries of this initial reservation began only three months after being established when the Spokane and Kalispel Reservations were split off to accommodate the expanding populations of European settlers east of the Columbia River. Then, in 1892, the U.S. government declared the North Half of the reservation public domain, and it was opened for mining, timber cutting, and homesteading. By 1900, the native people had been allotted about one third of the lands, and the South Half of the reservation was opened for homesteading (Colville Confederated Tribes 2004; Kirk and Alexander 1990).

Work on the National Railway in British Columbia began in 1880, which stimulated growth in the beef and lumber industries. This lead to an increase in the number and size of settlements across the land. Over time, as agricultural and timber operations expanded and farmers and loggers were better able to transport their products to markets, agriculture and forestry grew into important industries (Kirk and Alexander 1990; Wilson 1990).

Around 1867, fruit growing added to the economic base of the Okanagan region (Fisher 1978). Orchardists used water from nearby rivers and lakes for irrigation, and advances in irrigation and pest control technology stimulated a shift from cattle ranching to crop farming on both sides of the border in the 1920s.

Lumber, livestock, apple growing and other related industries such as packing warehouses and shipping businesses created many new jobs throughout the 20th century. In Washington, the construction of the Grand Coulee Dam in 1938 and the filling of Lake Roosevelt flooded sacred Indian burial grounds, destroyed salmon spawning areas and inundated some productive agricultural lands. It also expanded the types of jobs available and opportunities for further development as electricity and irrigation were extended to additional parts of the region (Colville Confederated Tribes 2004; Kirk and Alexander 1990).

In British Columbia, 26% of farmland in the Okanagan valley was converted to non-agricultural uses between 1971 and 1986. New technologies supported a shift from the small timber operations in the lowlands to large-scale harvest of trees at high elevations. Forestry dominated the economy of the South Okanagan and Similkameen areas of British Columbia and portions of the Okanagan Ecoregion in Washington during this time. However, in recent years, prices as well as restructuring of the industry have made it less economically viable. In British Columbia, forest industry facilities and operations continue to support local economies throughout the ecoregion. In Washington, sawmills at Oroville, Omak and Colville continue to play a role in supporting the forest industry.

1.2 Biodiversity Status of the Okanagan Ecoregion

The Okanagan Ecoregion is considered unique because it is an ecosystem that contains elements of a number of biomes within British Columbia and Washington, which has resulted in unusually high species richness. The rain shadow effect of the Cascade Mountains on the southern interior of British Columbia and the Columbia Basin of Washington creates dry conditions that result in a number of rare habitats (e.g., grasslands, shrub-steppe and lowland dry forests) and unique assemblages of these habitats with wetland, riparian, mesic forest, cliff and talus habitats. Not surprisingly, these habitat characteristics result in rare and unique communities of flora and fauna.

The ecoregion has one of the largest assemblages of nationally rare plant species in Canada, probably surpassed only by the Carolinian forests of southwest Ontario and the Garry oak (*Quercus garryana*) and associated ecosystems of southeast Vancouver Island. This may be attributed to the hot, dry summer climate of the region, which provides suitable growing conditions for many species that are typically restricted to the arid intermontane regions of the United States. Many of these species are restricted to valley bottom environments and have probably declined significantly as lowland ecosystems have been depleted by agricultural and urban development. The Okanagan Ecoregion is less unique in the United States. Its flora is largely typical of other intermontane areas of Washington, Idaho and Oregon.

The Okanagan Ecoregion supports some of the greatest diversity and largest number of breeding bird species in British Columbia. It is home to 74% of all bird species known to occur and 70% of all species known to breed in the province. The greater sage-grouse (*Centrocercus urophasianus*) and the burrowing owl (*Athene cunicularia*) have been extirpated from the BC portion of the ecoregion. Burrowing owl reintroduction and recovery efforts in British Columbia are ongoing, and success will be monitored over time (John Surgenor, 2006, pers. comm.). There have been no recent greater sage-grouse reintroduction efforts in British Columbia. Fifteen other red-listed bird species occur within the British Columbia portion of the ecoregion, and more than four species are listed as threatened or endangered within the Washington portion. The Similkameen River Slough, which includes part of Washington's Palmer Lake, has the highest breeding bird diversity recorded in the Washington Gap Analysis (Cassidy et al. 1997). Conservation of grassland, wetland and riparian habitats is critical for protecting many of the bird species that occur within the ecoregion.

Mammal occurrences also reflect the wide variety of habitats available within the ecoregion. It supports a wide variety of bats, with 14 of the 20 species that occur in British Columbia occurring in the South Okanagan (Harper et al. 1993). The ecoregion also supports many ungulate species including mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), elk (*Cervus canadensis*), moose (*Alces alces*), bighorn sheep (*Ovis canadensis*), and mountain goats (*Oreamnos americanus*). Three of the four red-listed mammal species of the ecoregion are associated with grassland habitats; they include the pallid bat (*Antrozous pallidus*), white-tailed jackrabbit (*Lepus townsendii*) (now extirpated), badger (*Taxidea taxus*) and western red bat (*Lasiurus blossevillii*), the latter of which is associated with diminishing riparian habitats (BC Ministry of Environment 1998). Wide-ranging carnivores occurred throughout much of the ecoregion, but some are now thought to be extirpated and those that remain have greatly declined in abundance. While grizzly bears and fishers (*Martes pennanti*) still occur in the northernmost portions of the ecoregion, they once occurred in larger numbers in Washington where they are now listed as endangered. Wolverines, grey wolves, and lynx still occur in the ecoregion, but wolves may only occasionally travel south into the Cascades of Washington.

The ecoregion is the only place in British Columbia where the red-listed tiger salamander (*Ambystoma tigrinum*) (Hallock 2005a) and night snake (St. John 2002) and the blue-listed Great Basin spadefoot (*Spea intermontana*) (Hallock 2005b) can be found. The northern leopard frog (*Rana pipiens*) (red-listed) historically occurred within the ecoregion but is now extirpated (BC Ministry of Environment 1998; McAllister 2005). The pygmy short-horned lizard is also red-listed and is presumed to be extirpated from the ecoregion (St. John 2002).

The mormon metalmark (*Apodemia mormo*) and Behr's hairstreak (*Satyrium behrii*) are two red-listed butterflies that are associated with grassland habitats in the southern Okanagan area of British Columbia. Extensive surveys have been conducted to identify locations where they and other rare invertebrates occur within this portion of the ecoregion. While a great number of invertebrate species are likely to be at risk within the ecoregion, attention to the conservation status of invertebrates has focused on butterflies, dragonflies and mollusks.

A number of anadromous and freshwater fish species occur within the ecoregion. Anadromous species include the Pacific lamprey (*Lampetra tridentata*), steelhead (*Oncorhynchus mykiss*), chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*Oncorhynchus nerka*), and white sturgeon (*Acipenser transmontanus*). Freshwater fish species include native and transplanted populations of rainbow trout (*Oncorhynchus mykiss*), introduced brook trout (*Salvelinus fontinalis*), and native populations of Dolly Varden (*Salvelinus malma*), mountain whitefish (*Prosopium williamsoni*), lake chub (*Couesius plumbeus*), redside shiner (*Richardsonius balteatus*), and pikeminnow (*Ptychocheilus oregonensis*) (Demarchi 1996).

The southern portion of the Okanagan valley in British Columbia has become a focal point within the ecoregion because it supports most of the remaining grasslands, shrub-steppe, and low-elevation dry forests in British Columbia. The continuing loss of these habitats has placed many species at risk of extirpation or extinction in British Columbia and Canada. For example, the South Okanagan provides habitat for 30% of the vertebrate species that are red-listed in British Columbia, including 15 bird, 4 mammal, 2 reptile, and 2 amphibian species. Many more species would be added to this list if invertebrate and plant species at risk were included. The lowland habitats these species require are being threatened by housing and commercial development, road building, golf course development, agricultural development (especially orchards and vineyards), livestock grazing, logging and other silviculture activities, human recreation, and other human activities (Lea and Douglas 1991; Harper et al. 1993; BC Ministry of Environment 1998). Sixty percent of the original grassland and shrub-steppe habitat in this portion of the ecoregion has been altered by development; only 9% has not been disturbed in some way (BC Ministry of Environment 1998). Additionally, 85% of the wetland and stream-side habitats have been lost (BC Ministry of Environment 1998). Urban and industrial development in the British Columbia portion of the Okanagan Ecoregion has led to the disappearance of approximately 25,000 ha (61,750 ac) of the region's grasslands, with most of this loss having occurred around towns and cities in the Okanagan and Thompson Pavilion Grassland Regions. Towns such as Armstrong, Keremeos and Oliver have lost over 95% of their historic grasslands. In total, over 69,000 ha (170,430 ac) of native grasslands have been converted to agriculture in these Grasslands Regions (Grasslands Conservation Council of British Columbia 2004).

Ecoregional assessments are used to develop conservation strategies for species and habitats without regard to jurisdictions; however, they do take into account the fact that management activities within political borders can affect the status of species, habitats and ecological communities.

The international border has divided the landscape so that only a small area of British Columbia and Canada supports grasslands, shrub-steppe, and low-elevation dry forest habitats. Consequently, species associated with these habitats are likely to be listed as vulnerable to extirpation or extinction in the province and country. However, because some of these habitats and species are more abundant in Washington, they cannot officially be considered in species evaluation risks in British Columbia. While the larger habitat reserves in Washington are valuable to species and help ameliorate losses of species at the periphery of their range (i.e., in the South Okanagan), there is great value in conserving the broadest extent of species and habitats to protect against random and catastrophic population and environmental events (e.g., disease epidemics, genetic drift, climate change, fire, deforestation) that can decimate populations. The unique array of rare habitats and species that make up British Columbia's South Okanagan is an important part of the Okanagan Ecoregion and is an important link between the larger Columbia Basin in Washington and the grassland habitats of the Thompson and Nicola drainages in the northern and northwestern portions of the ecoregion.

The international border presents another consequence to biodiversity conservation within the ecoregion. Washington has historically supported populations of wide-ranging carnivores, including grizzly bears, grey wolves, wolverines, fishers, and lynx. However, only a small population of lynx (<40 individuals) and an even smaller population of wolverines (<10) are thought to exist in the state. Populations of wide-ranging carnivores in Washington depend on demographic support from larger populations in British Columbia to sustain them. All of these species are protected in Washington; however, only grizzly bears are protected in some areas of British Columbia. Whereas British Columbia may benefit from demographic support from Washington for species that use grasslands, shrub-steppe, and lowland dry forests, Washington depends on British Columbia to retain habitat connectivity within high-elevation forests and mountain ranges so that populations of wide-ranging carnivores can be sustained.

1.3 Ecoregion Boundary

The study area boundary for this Okanagan Ecoregional Assessment corresponds very closely with the British Columbia Ecoregion Classification system delineation of the Southern Interior Ecoprovince (SIR) (Demarchi 1996). The boundary for the SIR was extended into Washington State as part of the Shining Mountains Project, which was developed in the 1990s by the provincial government with numerous federal, provincial and state government, academic, and First Nations/Tribal partners in British Columbia, Alberta, Yukon, Alaska, Washington, Idaho and Montana. The purpose of the Shining Mountains Project was to determine the extent and distribution of regional and zonal ecosystems that British Columbia shared with its neighbouring jurisdictions (BC Ministry of Sustainable Resource Management 2005). In Washington, the boundary also corresponds with an ecoregion framework that was based on Bailey's ecoregion map for the United States (Bailey et al. 1994) and was further refined by agencies and other organizations in Washington and Oregon (Pater et al. 1998).

The British Columbia Ecoregion Classification system and its extension into Washington through the Shining Mountains Project, stratifies terrestrial ecosystem complexity into discrete geographical units at five levels. At the two broadest levels (ecodomain and ecodivision), British Columbia's ecosystems are placed in a global context. The three lower levels (ecoprovince, ecoregion and ecosection) become progressively more detailed and relate ecosystems to each other on a provincial and state scale. The three lowest levels describe areas of similar climate, physiography, hydrology, and vegetation (Demarchi 1996). Map 3 shows the Okanagan ecosections, and their descriptions are found in Appendix 7.

For the purposes of this ecoregional assessment, the Okanagan Ecoregion boundary was modified to reflect the improved terrestrial ecosystems mapping in the ecoregion. The southwestern boundary was moved west to include all of the Hozameen Range and Leeward Pacific Ranges; the boundary was modified in the north/northeast to include the Tranquille Upland and Northern Okanagan Highland and to exclude the Selkirk Foothills in the east.

The southern boundary of the Okanagan Ecoregion, which is shared with the Columbia Plateau Ecoregion, was modified to follow the boundary delineated by the British Columbia Ecoregion Classification except for the segment from the Little Spokane/Spokane Rivers confluence to the Canadian Rocky Mountains Ecoregion boundary. By excluding the southerly aspects of the Columbia River Canyon from the Okanagan, the SIR boundary better depicts the floristic/vegetation/ecological system affinities between the Okanagan and Columbia Plateau Ecoregions. The Little Spokane/Spokane Rivers confluence to the Canadian Rocky Mountains ecoregion segment (Bailey ecoregion delineation) was retained because it includes a vegetation pattern that is more similar to the Okanagan than the Columbia Plateau.

The boundary between the Okanagan and the neighbouring East Cascades ecoregion follows a watershed boundary, which is consistent with the rationale used by TNC in delineating the East Cascades and West Cascades Ecoregions. The boundary shared by the Okanagan and North Cascades ecoregions in Washington follows watershed boundaries, which is consistent with the rationale used in delineating the Cascades ecoregions. The northwestern-most segment of the Okanagan follows the southern-most boundary of an ecoregion section located primarily in British Columbia.

The SIR boundary generally corresponds to vegetation zones with the exception of the Ponderosa Pine Zone south of Spokane. This zone does not extend as far south as is depicted in the Shining Mountains Project. The final ecoregion boundary incorporates both the original ecoregion boundary and the SIR boundary. Figure 1.1 provides a graphical representation of the ecoregion boundaries and subsequent modifications.

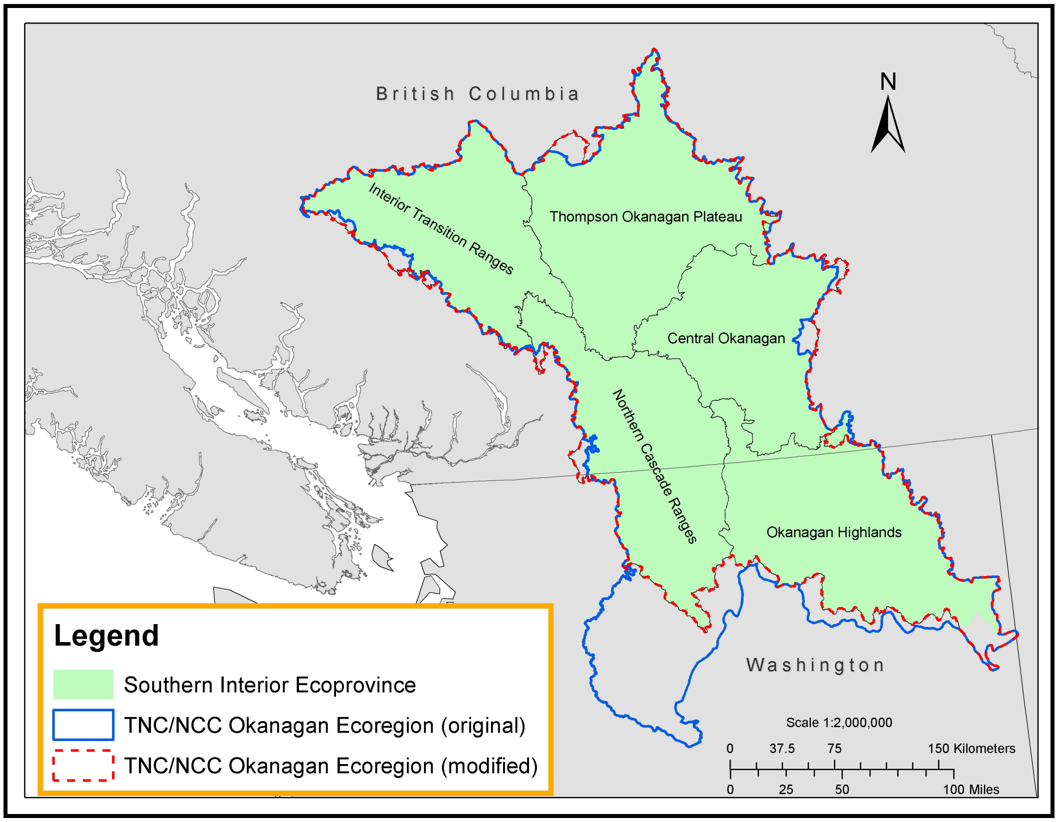

Figure 1.1. Okanagan Ecoregion Boundary Modifications

1.3.1 Terrestrial Ecosections

The Okanagan Ecoregion is divided into five ecosections that generally correspond to the British Columbia ecoregion delineation described in the Shining Mountains Project (except for the Thompson Okanagan Plateau, which was split into two sections as shown in Map 3). The ecosections are

- Interior Transition Ranges—entirely in British Columbia and covers the north-western portion of the ecoregion in the Lytton and Lillooet areas
- Thompson Okanagan Plateau—entirely in British Columbia and covers the northern portion of the ecoregion in the Merritt, Kamloops and Salmon Arm areas
- Central Okanagan—entirely in British Columbia and covers the eastern portion of the ecoregion in the Okanagan Lake, Penticton, Kelowna, and Vernon areas
- Okanagan Highlands—mostly in Washington and covers the south-eastern portion of the ecoregion from Skaha Lake and Osoyoos, British Columbia and into the Oroville, Tonasket, Omak areas of Washington, then east to the Inchelium, Colville, and Spokane areas
- North Cascades Ranges—shared by British Columbia and Washington in the south-western portion of the ecoregion and covers the Princeton area in British Columbia and the Winthrop and Twisp areas in Washington

Ecosections are an essential element of the assessment as they are used to stratify the ecoregion along ecological lines. Stratification ensures that the distribution of priority conservation areas reflects the distribution of biodiversity attributes that characterize the ecoregion and thus captures the genetic diversity of species and the varied composition of habitats in the ecoregion. The resulting conservation portfolio will be highly representative of biodiversity across the ecoregion. Appendix 7 provides detailed descriptions of terrestrial ecosections in the Okanagan Ecoregion.

1.3.2 Freshwater Ecological Drainage Units

Ecological Drainage Units (EDUs) are groups of watersheds that share a common zoogeographic history and physiographic and climatic characteristics (Map 4). We expect that each EDU will contain sets of freshwater systems with similar patterns of drainage density, gradient, hydrologic characteristics, and connectivity. This assumption is based on a large body of research that indicates that drainage basin and physiography strongly influence freshwater biodiversity patterns (Pflieger 1989; Maxwell et al. 1995; Angermeier and Winston 1999; Angermeier et al. 2000; Oswood et al. 2000; Rabeni and Doisy 2000). EDUs can be equated to terrestrial ecoregions largely because their biogeographic patterns and spatial extent are comparable. For our ecoregional assessment purposes, EDUs provide a means of stratifying freshwater systems and species in order to set appropriate goals for freshwater biodiversity conservation. The EDUs that intersect the Okanagan Ecoregion are the Middle Fraser, Thompson, and Okanagan (Map 5). The Upper Fraser EDU does not intersect the ecoregion, but it is part of the whole Fraser system, so it was included in the analysis. The Lower Fraser and Fraser Canyon and Puget Sound EDUs were assessed as part of the North Cascades and Pacific Ranges Ecoregional Assessment (Iachetti et al. 2006). The description of ecosections in Appendix 7 summarizes the physiography and climate of these EDUs. Appendix 7 also summarizes the zoogeographic history of these units.

1.3.3 *Assessment Units*

In order to address the complexity and large amount of data used in the analyses, the assessment team chose to use the optimal reserve selection algorithm MARXAN (Ball and Possingham 2000; Possingham, et al. 2000), which has been used in a variety of terrestrial and aquatic conservation assessments around the world. It uses an optimization algorithm to select a system of spatially cohesive reserves that meet a suite of ecological and site suitability criteria.

Assessment units (AUs) are used in MARXAN. They provide the framework for compiling data on the distribution of biodiversity features within the ecoregion (Warman et al. 2004). Assessment units are attributed with the target data located within their boundaries (Appendix 12). They are also attributed with data used in the Suitability Index (Chapter 4.0). Determining the type and size of assessment unit involves making a number of tradeoffs such as consistency in size, spatial resolution, natural versus geometric shapes and others. The size of the assessment unit will determine the spatial resolution of the analysis (Floberg et al. 2004). A more complete discussion of the rationale for selecting assessment units in the Okanagan Ecoregional Assessment is given in Appendix 8.

Our assessment used two types of assessment units. For the terrestrial analysis, we used 500-ha (1,236 ac) hexagons as assessment units (Map 6). For the freshwater analysis, we used third-order watersheds in British Columbia and watershed units from the Interior Columbia Basin Ecosystem Management Project[1] for the Washington portion of the ecoregion.

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[1] URL: http://www.icbemp.gov/

Chapter 2 – The Assessment Process

This section provides a brief overview of the main steps used to develop this ecoregional assessment. More detail on methods can be found in later chapters and appendices.

Six technical teams followed a methodological framework developed by Groves et al. (2000, 2002). The teams were as follows: terrestrial plant associations and ecological systems; freshwater ecological systems; plant species; animal species; assessment of impacts on biodiversity; and GIS/data management. Each technical team contributed to the steps described below and adopted innovations where necessary to address specific data limitations and other challenges.

In addition to the technical teams, a field team was assembled to conduct outreach to Okanagan communities, organizations, and individuals that were needed to effectively link the ecoregional assessment process to conservation program development in British Columbia and Washington. The efforts of all subteams were coordinated by the Core Team. Appendices 2 and 3 list assessment team members.

2.1 Identifying Conservation Targets

Conservation targets are those elements of biodiversity—plants, animals, plant communities and habitat types—that are represented in the analysis. Targets were selected to represent the full range of biodiversity in the ecoregion and to include any elements of special concern.

Robert Jenkins, who worked for The Nature Conservancy in the 1970s, developed the concept of coarse-filter and fine-filter conservation targets for use in conservation planning (Jenkins 1996; Noss 1987). The coarse-filter approach hypothesizes that conservation of multiple examples of all communities and ecological systems will also conserve the majority of species that inhabit them. This approach is a way to compensate for the lack of information on poorly studied species and species that are still unknown to science.

Fine-filter targets are species that cannot be assumed to be captured by coarse-filter targets. Fine-filter targets warrant special effort to ensure they are represented in the conservation assessment. They are typically rare or imperiled species but can include wide-ranging species that require special representation or species that occur in other ecoregions but have genetically important disjunct populations. The plant and animal species teams each developed criteria to guide their selection of fine-filter targets.

Before coarse-filter targets (e.g., ecological systems, plant associations, habitat types) can be selected, they must first be defined. There are many different classifications for ecological systems and plant associations. The communities and systems teams had to develop classifications that could be used throughout the ecoregion before they could decide which systems and associations should be targets. The list of targets is provided in Appendix 5.

2.2 Assembling Information on Target Locations

Data for target "occurrences" (e.g., location, spatial extent of a separate population, or example of a species or community) were assembled from a variety of sources. Although existing agency databases comprised most of this dataset, the teams filled in data gaps by gathering all available information and consulting specialists for specific target groups.

One of the challenges of conducting an ecoregional assessment is to find data that cover the whole ecoregion. This is typically done by combining datasets from different jurisdictions to create a complete coverage.

The assembled target data for plants and animals were screened by examining the dates and locations of each record. Records that were considered out of date or spatially inaccurate were not used in the analysis.

Decisions were made about the best way to describe and map occurrences of each target. Targets may be represented as points for specific locations, such as rare plant population locations, or polygons to show the spatial extent of fine- or coarse-filter targets. The data were stored in a geographical information system (GIS). Appendix 4 lists data used in this assessment. Appendix 12 discusses how occurrence data was added to terrestrial assessment units.

2.3 Setting Target Goals

Conservation goals define the abundance and spatial distribution of viable target occurrences needed to adequately conserve the targets in the ecoregion. The goals also provide an estimate of how much effort will be needed to sustain those targets well into the future. For assessment purposes, “goal” is defined as a numerical value associated with a species or system that describes how many populations, nest sites, or breeding sites (for species targets) or how much area (for systems targets) the portfolio should include to represent each target. The goal also describes how those target occurrences should be distributed across the ecoregion to represent environmental variation and hedge against local extirpations. Further discussion on setting goals can be found in Appendix 6.

In setting goals for species targets, the Okanagan teams used goals developed by NatureServe (Comer 2003a; Appendix 19). Targets were grouped according to geographic range relative to the ecoregion. Goals decrease as endemism decreases, in rough proportion to the ecoregion’s share of the global distribution.

We had no scientifically established method for setting goals for coarse-filter targets. Hence, we relied on the best professional judgment of ecologists from the technical teams and Natural Heritage Programs. These scientists have settled on a generic goal for matrix-forming, large-patch, and linear terrestrial ecological systems: 30% of the historical extent of the system (Neely et al. 2001, Rumsey et al. 2003). Historical was defined as circa 1850. In cases where there was significant change from historical extent, either an increase or decrease in the area of the system, the default goal was adjusted. Appendix 5 lists the goals set for all targets.

The terrestrial systems team conducted a literature review to determine the minimum dynamic area (MDA) terrestrial systems historically required to ensure survival or re-colonization of the ecological system following a natural disturbance that removes most or all individuals. This is determined by the ability of some number of individuals or patches to survive, and the size and severity of stochastic events (Pickett and Thompson 1978). MDAs were used to determine the minimum patch size of each terrestrial system to be captured by the MARXAN site selection algorithm. These goals were later adjusted by the team based on how the algorithm performed in meeting the goals when capturing terrestrial systems. Goals for freshwater ecological systems were set at 30% of current extent.

2.4 Rating Conservation Suitability of Different Portions of the Ecoregion

The ecoregion was divided into thousands of assessment units (AUs). These are described in Section 1.3.3 and shown in Map 6. Assessment units consisted of 19,210 500-ha hexagons for the terrestrial analysis and 4,307 watershed units for the freshwater analysis. Watershed units ranged in size from 302 ha (747 ac) to combined watershed areas of 469,163 ha (1,159,326 ac). AUs were compared to each other using a set of factors the team and other experts selected to determine the suitability of each AU for conservation. These include factors that are likely to impact native species habitat quality, such as the extent of roads or developed areas or the presence of dams. They also include factors that are likely to impact the cost of managing the area for conservation, such as proximity to urban areas, percent of public versus private lands, or existence of established conservation areas. The A suitability index intended to indicate the relative likelihood of conservation success across the ecoregion was developed.

2.5 Assembling Terrestrial and Freshwater Portfolios

An ecoregional assessment incorporates hundreds of different targets at thousands of locations. The relative biodiversity value and conservation suitability of thousands of potential conservation areas must be evaluated in order to identify a network of sites (i.e., the portfolio) that best represents viable occurrences of coarse- and fine-filter biodiversity targets that meet our goals. The complexity of such analysis precludes experts from selecting the most efficient and complementary set of conservation areas through simple inspection alone.

MARXAN is designed to meet conservation target goals in the smallest area possible while maximizing AU suitability. It begins by selecting a random set of assessment units—i.e., a random conservation portfolio. It then explores improvements to this first portfolio by randomly adding or removing hexagons. At each iteration, the new portfolio is compared with the previous portfolio and the better one is accepted. The algorithm uses a method called simulated annealing (Kirkpatrick et al. 1983) to reject sub-optimal portfolios, and thus greatly increases the chances of converging on the most efficient portfolio. Typically, one run of the algorithm consists of 2 million iterations, and each output scenario (portfolio) is the result of 10 runs.

2.6 Creating the Portfolios

Results of MARXAN analyses for freshwater and terrestrial conservation portfolios were then reviewed and refined by the Core Team and other experts who are familiar with the ecoregion. This compensates for gaps in the input data or other limitations of automated portfolio development.

The terrestrial and freshwater portfolios were then overlaid so we could readily see where selected units overlap. The combined portfolio is rather extensive; hence, all sites within the portfolio were prioritized based on their relative conservation value and vulnerability. Overlap between terrestrial and freshwater portfolio sites may confer greater importance to individual priority conservation areas.

2.7 Expert Review

Throughout the planning process, each of the six subteams solicited expert input at workshops and through personal interviews (see list of experts in Appendix 3). Experts were asked to (1) review draft target selection criteria, target lists and data on target distributions, and provide recommendations for additions and deletions to the lists; (2) provide spatially-explicit additions and deletions to the freshwater and terrestrial portfolios regarding occurrence of species, communities or ecological systems; and (3) provide available datasets for species, communities or ecological systems. Members of the Core Team then reviewed expert comments and made final changes to the portfolios.

Expert input addressed the need to (1) verify the results of our MARXAN model, (2) improve results of the portfolios with knowledge of the ecoregion, and (3) reveal shortcomings in the modeling approach due to data errors and gaps (Data gaps are discussed in Chapter 8.0). The net benefits of finding and fixing errors in the modeling process exceeded potential drawbacks of expert bias (Cleaves 1994; Coughlin and Armour 1992; Saaty 1980; Tversky and Kahneman 1974).

2.8 Prioritization of Portfolios

The conservation portfolios are intended to serve as the conservation blueprint for protection of the ecoregion's native biodiversity. Prioritizing conservation areas within the portfolios informs decision makers about their options for conservation.

To facilitate prioritization, we used MARXAN to generate two indices that reflect the relative importance of every assessment unit: irreplaceability and conservation utility. The irreplaceability index was also incorporated into an irreplaceability versus vulnerability scatterplot that was used to establish priorities within the portfolio. Prioritization methodology is detailed in Chapter 7.0.

Chapter 3 – Targets

The ecoregional assessment process identifies all native species and communities as the elements to be represented in an ecoregional portfolio of sites (Groves et al. 2000; Groves 2003). As previously noted, this represents the coarse-filter/fine-filter approach to biodiversity conservation developed by The Nature Conservancy and partners and refined through experience and planning. Both terrestrial and freshwater coarse-filter targets were used to design the portfolio of conservation sites for the Okanagan Ecoregion. The planning team's strategy with coarse-filter conservation was to develop a landscape portfolio of sites that captured the size and extent of natural communities and terrestrial habitats so that natural processes such as fires and floods could continue to function across the ecoregion.

All teams incorporated expert review into the target selection process. The experts solicited are listed in Appendix 3. Appendix 5 lists all targets selected and goals summaries.

3.1 Terrestrial Ecological Systems and Species

Four types of conservation targets were selected for the terrestrial analysis. Two scales of coarse-filter targets were used to describe the ecoregion's biodiversity: plant associations—typically the finest scale defined in a classification system, and ecological systems—a more general categorization of communities based on plant associations and environmental substrates. Certain animal and plant species were selected as fine-filter targets.

This section briefly describes how the targets for each target type were selected and the principal data sources used during the selection process. Summary tables are also included.

3.1.1 Terrestrial Plant Associations

The terrestrial plant associations and ecosystems team included the following people:

- Carmen Cadrin—Ecologist, British Columbia Conservation Data Centre, Ministry of Environment
- Rex C. Crawford—Natural Heritage Ecologist, Washington State Department of Natural Resources, Subteam Lead
- Mike Heiner—GIS Analyst/Ecologist, The Nature Conservancy of Washington
- Gwen Kittel—Vegetation Ecologist, NatureServe

Definition

A plant association is a recurring plant community with a characteristic range in species composition, specific diagnostic species, and a defined range in habitat conditions and physiognomy or structure (Jennings et al. 2002). Plant associations are the basic coarse filter tracked by NatureServe programs (http://www.natureserve.org/). These plant communities are typically less than 1,000 ha (2,471 ac). An example is "Ponderosa pine / bluebunch wheatgrass".

Selecting Plant Association Targets

There are several plant classifications in use, but there is no single, agreed-upon list of plant association targets. In order to develop one classification for the whole ecoregion, the team compared and resolved differences among (cross-walked) published plant association classifications from across Washington and British Columbia.

The International Vegetation Classification (IVC) (Grossman et al. 1998) provides a relatively comprehensive classification of plant associations across the ecoregion. This was used as the basis for the ecoregional list used in this assessment. Plant associations from the British Columbia Conservation Data Centre's and Washington Natural Heritage Program's databases, which have not yet been included in the IVC, were cross-walked. The resulting list contained 531 plant associations for the Okanagan Ecoregion. From this list, 66 globally imperiled or critically imperiled associations were selected to serve as conservation targets for the assessment. Globally imperiled plant associations tend to occur either in extremely specific geographical or ecological settings (i.e., they are naturally rare due to restricted habitat), or they consist of relatively few or small occurrences in a particular landscape due to habitat loss. Therefore, they need specific attention to ensure inclusion in the portfolio. More common plant associations can be assumed to be captured by the broader ecological systems.

Data Sources

Data for plant associations were obtained from the British Columbia Conservation Data Centre and the Washington Natural Heritage Program. There were 25 records in total for 12 of the 66 selected associations..

Okanagan Plant Association Targets

Due to the lack of data for plant associations, occurrence information was not used in developing the automated portfolio. It was, however, used to evaluate the automated portfolio retrospectively and is included in the Site Summary Reports for mid-risk portfolio sites. Table 3.1 lists all plant associations (plant communities) used in the retrospective analysis. Section 6.6 documents how this analysis was completed.

Table 3.1. Okanagan Plant Association Targets

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**
	Abies grandis / *Taxus brevifolia* Forest	CEGL000283	G2	S2
	Alnus incana / *Carex scopulorum* var. *prionophylla* Shrubland	CEGL000122	G1	
	Artemisia tridentata (ssp. *tridentata*, ssp. *xericensis*) / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation	CEGL001018	G2G4	S1
	Artemisia tridentata ssp. *tridentata* / *Leymus cinereus* Shrubland	CEGL001016	G2	S1
Bitterbrush / needle-and-thread Shrub Herbaceous Vegetation	*Purshia tridentata* / *Hesperostipa comata* Shrub Herbaceous Vegetation	CEGL001498	G2	S1
Black cottonwood / common snowberry - red-osier dogwood Forest	*Populus balsamifera* ssp. *trichocarpa* / *Symphoricarpos albus* Forest	CEGL000677	G2	S2
Bluebunch wheatgrass - balsamroot	*Pseudoroegneria spicata* - *Balsamorhiza sagittata*	C5B2CASBS1	G2	

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	CEBC000001	G2	
	Calamagrostis purpurascens Herbaceous Vegetation	CEGL001850	G2	
	Carex aperta Herbaceous Vegetation	CEGL001801	G1	
	Carex lanuginosa – Juncus arcticus	CEBC001014	G2	
	Carex limosa Herbaceous Vegetation	CEGL001811	G2	S1
Drummond's willow / Holm's Rocky Mountain Sedge Shrubland	*Salix drummondiana / Carex scopulorum* var. *prionophylla* Shrubland	CEGL001584	G2	S2
Drummond's Willow / Holm's Rocky Mountain sedge Shrubland	*Salix drummondiana / Carex scopulorum* var. *prionophylla* Shrubland	CWWA000024	G2	
	Festuca viridula - Festuca idahoensis Herbaceous Vegetation	CEGL001633	G2?Q	
Giant wildrye Bottomland Herbaceous Vegetation	*Leymus cinereus* Bottomland Herbaceous Vegetation	CEGL001480	G1	S1
	Glyceria grandis Herbaceous Vegetation	CEGL003429	G2	S1?
Idaho fescue - bluebunch wheatgrass	*Festuca idahoensis - Pseudoroegneria spicata*	CEBC000268	G2	
Idaho fescue - parsnip-flower buckwheat Herbaceous Vegetation	*Festuca idahoensis - Eriogonum heracleoides* Herbaceous Vegetation	CEGL001616	G2	
	Larix lyallii / Vaccinium scoparium / Luzula glabrata var. *hitchcockii* Woodland	CEGL000951	G2G3	
	Leymus cinereus Herbaceous Vegetation	CEGL001479	G2	S2S3
	Marsilea vestita – Schoenoplectus americanus	C7C1CMVSA1	G1	
	Philadelphus lewisii Intermittently Flooded Shrubland	CEGL001170	G2	S2
	Picea engelmannii x *glauca – Betula occidentalis / Ribes oxyacanthoides*	C2A2BSXBO1	G2	
	Picea engelmannii x *glauca / Ribes lacustre - Oplopanax horridus*	CEBC000313	G2G3	

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**
	Picea engelmannii x *glauca* / *Rosa acicularis* / *Petasites frigidus* var. *palmatus*	C2A2BSXPP1	G2	
	Pinus albicaulis / *Calamagrostis rubescens* Woodland	CEGL000753	G2	
	Pinus contorta / *Vaccinium caespitosum* / Sphagnum spp.	CEBC000221	G1	
	Pinus ponderosa – Populus balsamifera ssp. *trichocarpa* / *Rhus radicans*	C2B2CPPPB1	G1	
	Pinus ponderosa - Pseudotsuga menziesii / *Penstemon fruticosus* Woodland	CEGL000212	G2G3	
	Pinus ponderosa / *Crataegus douglasii* Woodland	CEGL000855	G1	S1
	Pinus ponderosa / *Hesperostipa comata* Woodland	CEGL000879	G1	S1
	Pinus ponderosa / *Symphoricarpos albus* Temporarily Flooded Woodland	CEGL000866	G2	S2
Ponderosa pine / common snowberry / Kentucky bluegrass	*Pinus ponderosa* / *Symphoricarpos albus* / *Poa pratensis*	CEBC000416	G2	
Ponderosa pine / mallow-leaf Ninebark Forest	*Pinus ponderosa* / *Physocarpus malvaceus* Forest	CEGL000189	G2	S1S2
Ponderosa pine / pinegrass Forest	*Pinus ponderosa* / *Calamagrostis rubescens* Forest	CEGL000181	G2	
Ponderosa pine / rough fescue Woodland	*Pinus ponderosa / Festuca campestris* Woodland	CEGL000185	G4	S1
	Populus balsamifera ssp. *trichocarpa* / *Salix sitchensis – Rubus parviflorus*	C3B4CPBSS2	G2	
	Populus balsamifera ssp. *trichocarpa – Psuedotsuga menziesii* / *Symphoricarpos albus – Cornus stolonifera*	CEBC001052	G1	
	Populus balsamifera ssp. *trichocarpa / Betula occidentalis*	C1B3DPBBO1	G1	
	Populus balsamifera ssp. *trichocarpa* / *Oplopanax horridus - Acer glabrum* Forest	CEGL000482	G2	

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**
	Populus balsamifera ssp. *trichocarpa / Salix exigua* Forest	CEGL000676	G1	
	Populus balsamifera ssp. *trichocarpa / Salix* spp. Dry Submaritime	C2A2BPTSS1	G2	
	Populus tremuloides – Populus balsamifera ssp. *trichocarpa / Symphoricarpos albus / Equisetum arvense*	CEBC000417	G1	
	Populus tremuloides / Achnatherum richardsonii – Geum triflorum	CEBC000878	G2	
	Populus tremuloides / Carex pellita Forest	CEGL000577	G2	
	Populus tremuloides / Philadelphus lewisii	CEBC001051	G1	
	Pseudoroegneria spicata – Anemone occidentalis	C5B2CASPO1	G1	
	Pseudoroegneria spicata - Eriogonum heracleoides Herbaceous Vegetation	CEGL001668	G2	S1
	Pseudotsuga menziesii – Thuja plicata / Corylus cornuta	C1A9BPMCC1	G2	
	Pseudotsuga menziesii / Acer glabrum / Prosartes hookeri	C1A9CPMDH1	G2	
	Purshia tridentata / Achnatherum hymenoides Shrubland	CEGL001058	G1	S1
	Cornus stolonifera / Carex spp.	CEBC001018	G2	
	Rhus glabra / Aristida purpurea var. *longiseta* Shrub Herbaceous Vegetation	CEGL001507	G1	
	Salix farriae / Eleocharis quinqueflora Saturated Shrubland	CEGL000229	G2	
Smooth sumac / bluebunch wheatgrass Shrub Herbaceous Vegetation	*Rhus glabra / Pseudoroegneria spicata* Shrub Herbaceous Vegetation	CEGL001122	G2	S2
Threetip sagebrush / bluebunch wheatgrass – balsamroot Shrub Herbaceous Vegetation	*Artemisia tripartita* ssp. *tripartita / Pseudoroegneria spicata* Shrub Herbaceous Vegetation	CEGL001538	G2	S2S3
Threetip sagebrush / needle-and-thread Shrub Herbaceous Vegetation	*Artemisia tripartita ssp. tripartita / Hesperostipa comata* Shrub Herbaceous Vegetation	CEGL001539	G1	

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**
Timber oatgrass Herbaceous Vegetation	*Danthonia intermedia* Herbaceous Vegetation	CEGL001794	G2	
Trembling aspen / common snowberry / mountain sweet-cicely	*Populus tremuloides / Symphoricarpos albus / Osmorhiza berteroi*	CEBC001050	G3	
Trembling aspen / snowberry / Kentucky bluegrass	*Populus tremuloides / Symphoricarpos albus / Poa pratensis*	CEBC000882	G3	
Western hemlock - Douglas-fir / electrified cat's-tail moss Dry Submaritime 1	*Tsuga heterophylla - Pseudotsuga menziesii / Rhytidiadelphus triquetrus* Dry Submaritime 1	C1A9CTHRT2	G2	
Western hemlock / queen's cup	*Tsuga heterophylla / Clintonia uniflora*	C1A9CTHCU1	G2	
Western hemlock / vine maple - falsebox	*Tsuga heterophylla / Acer circinatum - Paxistima myrsinites*	CEBC000866	G2	
Western redcedar / wild sarsparilla Forest	*Thuja plicata / Aralia nudicaulis* Forest	CEGL000471	G2	
Wyoming big sagebrush / needle-and-thread Shrubland	*Artemisia tridentata* ssp. *wyomingensis / Hesperostipa comata* Shrubland	CEGL001051	G2	S2

3.1.2 Terrestrial Ecological Systems

Definition

A terrestrial ecological system is defined as a group of plant associations that tend to co-occur within landscapes that have similar ecological processes, substrates, and/or environmental gradients (Comer et al. 2003). This emphasis on both the biotic component and the physical setting provides cohesive, enduring units that represent processes important to the persistence of natural communities and that are readily mapped across broad regions using available GIS data.

A given terrestrial ecological system will typically occur on a landscape at intermediate geographic scales of tens to thousands of hectares and will persist for 50 or more years. Ecological systems are intended to provide “meso-scale” classification units for resource management and conservation applications. They may serve as practical units on their own or in combination with classification units defined at different conceptual and spatial scales (Comer et al. 2003). An example would be “Rocky Mountain Ponderosa Pine Woodland”.

Selecting Ecological System Targets

As with the plant associations, the first task was to create a list of ecological systems that occur in the ecoregion. The team began with the list compiled and developed by NatureServe (Comer et al. 2003). Modifications were made to these ecological systems and their definitions using experience and information gained from other projects and ongoing ecoregional assessments. This was the basis for an initial list of 325 ecological systems that occur or possibly occur in the Okanagan Ecoregion.

This list was then reviewed and pared down to 41 ecological systems that are most likely to occur in the ecoregion. In cases where there were groups of plant associations that were outside the variation of existing ecological systems, especially in British Columbia, new systems were recognized. This resulted in 52 terrestrial ecological systems defined for the Okanagan Ecoregion. Full descriptions of the terrestrial ecological systems are provided in Appendix 10.

Many of these systems could not be mapped either due to inconsistencies in data across the border or because the small size of the system meant it was not well represented and had limited data. This required merging the 52 defined systems into 24 ecological system targets that could be represented spatially (Map 7). Appendix 10 shows the relationship between defined terrestrial ecological systems and system targets used in mapping and in the MARXAN analysis. Ecological system clusters were created through an iterative approach between efforts to spatially represent defined systems and on the ground knowledge of ecological and distribution relationships among defined systems. In general, riparian types were clustered into broader units, similar yet spatially indistinguishable systems are clustered (for example, Inter-Mountain Basins Montane Grassland and Sagebrush Steppe in Appendix 10),small patch types are grouped into their surrounding matrix types (for example, Inter-Mountain Basins Big Sagebrush Steppe), and peripheral types are grouped (for example, North Pacific Western Hemlock-Silver Fir Forest).

For terrestrial systems, MDAs were set for four ecological system targets. Two of these were aggregates of multiple system targets. The first aggregate target for MDA included five Interior and Rocky Mountain Subalpine and Montane Forests targets; the second included the Ponderosa Pine and Sagebrush Steppe targets. If the mapped area of a system was smaller than this MDA, then it would not be selected to be part of the portfolio. We assume that the MDA size and the landform selection in MARXAN capture enough variation to capture all the systems.

Riparian systems are difficult to map at the ecoregional level. Since they provide important habitat, have been widely converted, and are typically highly threatened, an alternate method was used to define and map them. Appendix 9, Section 2.2 provides details on the riparian delineation methods. Four riparian systems were defined for the Okanagan Ecoregion resulting in a total of 24 ecological systems used as targets in the assessment (Table 3.2).

Data Sources

The Okanagan is a highly transitional ecoregion, climatically and biogeographically, and available datasets vary widely across the international border in terms of spatial and thematic resolution. This presents a familiar challenge to conservation planning and to mapping the ecoregion's characteristic ecosystems. Four datasets were chosen to define and depict the ecological systems. For the British Columbia portion of the ecoregion, the Biogeoclimatic Ecosystem Classification (BEC) and the Broad Ecosystem Inventory and Mapping (BEU) datasets were used. The BEC system delineates terrestrial ecosystems based on dominant vegetation species, climax zones, and site characteristics (local vegetation, soils, history, successional status). At the broadest scale, units are classified according to their zone, then subzone, down in scale to variant and then site series. This system was first developed by Dr. V.J. Krajina, Department of Botany at the University of British Columbia, and is used by the BC Ministry of Forests and Range to classify and manage sites. For the Washington portion of the ecoregion, the Shining Mountains mapping and Vegetation Mapping of the Okanogan and Colville National Forests datasets were utilized. The Shining Mountains mapping was developed by the British Columbia government for the purpose of determining the distribution and extent of regional and zonal ecosystems the province shares with surrounding jurisdictions. It is based on two ecosystem classifications used in the province: the British Columbia Ecoregion Classification and the BEC zonation.

Appendix 4 provides a list of datasets used to map terrestrial systems. These datasets were intersected, and the resulting combinations of attributes were examined by the team to determine which ecological system definitions matched most closely. The systems were mapped as individual combinations of climate zone, physiography, and vegetation structure.

The riparian systems were mapped using a Digital Elevation Model (DEM)-derived GIS model. This model enables mapping of riparian areas consistently and quickly across large areas using GIS data that are widely available. The model identifies areas that are (1) influenced by fluvial processes (transport and deposition of alluvial materials and soils), (2) periodically inundated during floods, and (3) likely to exhibit hydrologic conditions that are the principal controls of spatial pattern of riparian vegetation. Appendix 4 provides a list of the datasets used to delineate riparian systems.

Of the 24 ecological systems mapped, the 8 matrix-forming systems cover the largest total area, spanning broad physical gradients and thereby encompassing significant ecological and genetic variability. To represent this variability, the team conducted a cluster analysis to classify the landscape using four topographic indices known to correspond to vegetation patterns and that are readily mapped from a digital elevation model. The four topographic indices were topographic position measured by a moving window of 300-m radius, topographic position measured by a moving window of 2,000-m radius, an index of annual clear-sky insolation (SolarFlux, Rich et al. 1995) and slope. The resulting clusters, or ecological land units (ELUs), provide map units that function to stratify the matrix-forming systems and thereby influence the automated selection of potential conservation areas. Appendix 9 provides details on the riparian model and ecological land unit classification. Full descriptions of the terrestrial ecological systems are provided in Appendix 10.

Okanagan Terrestrial Ecological System Targets

Table 3.2. Okanagan Terrestrial Ecological System Targets

Ecological Grouping	Coarse-filter Terrestrial System Target *	ScientificName	GELCODE
ALPINE	North American Alpine Ice Field	• North American Alpine Ice Field	CES300.728
	Rocky Mountain Alpine Composite	• North Pacific Alpine and Subalpine Bedrock and Scree	CES204.853
		• North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow	CES204.862
		• Rocky Mountain Alpine Bedrock and Scree	CES306.809
		• Rocky Mountain Alpine Dwarf-Shrubland	CES306.810
		• Rocky Mountain Alpine Fell-Field	CES306.811
		• Rocky Mountain Dry Tundra	CES306.816

Ecological Grouping	Coarse-filter Terrestrial System Target *	ScientificName	GELCODE
SUBALPINE PARKLAND	North Pacific Maritime Mesic Parkland	• North Pacific Maritime Mesic Subalpine Parkland	CES204.837
	Northern Rocky Mountain Subalpine Dry Parkland	• North Pacific Alpine and Subalpine Dry Grassland	CES204.099
		• Northern Rocky Mountain Subalpine-Upper Montane Grassland	CES306.806
		• Northern Rocky Mountain Subalpine Woodland and Parkland	CES306.807
		• Northern Rocky Mountain Subalpine Larch Woodland	CES306.808
SUBALPINE FORESTS	Northern Interior Lodgepole Pine-Douglas- fir Woodland and Forest	• Northern Interior Lodgepole Pine-Douglas-fir Woodland and Forest	CES306.New3
	Northern Interior Spruce-Fir Woodland and Forest	• Northern Interior Spruce-Fir Woodland and Forest	CES306.New1
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	• Rocky Mountain Lodgepole Pine Forest	CES306.820
		• Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	CES306.828
	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	• North Pacific Mountain Hemlock Forest	CES204.838
		• Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	CES306.830
MID-MONTANE FORESTS and SHRUBLANDS	East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	• East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	CES204.086

Ecological Grouping	Coarse-filter Terrestrial System Target *	ScientificName	GELCODE
	Inter-Mountain Basins Montane Grassland and Sagebrush Steppe	• Inter-Mountain Basins Montane Sagebrush Steppe	CES304.785
		• Northern Rocky Mountain Montane Grassland	CES306.836
	North Pacific Western Hemlock-Silver Fir Forest	• North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest	CES204.098
		• North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	CES204.001
		• North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	CES204.002
	Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland	• Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland	CES306.New2
	Northern Rocky Mountain Montane Mixed Conifer Forest	• North Pacific Montane Shrubland	CES204.087
		• Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	CES306.805
		• Northern Rocky Mountain Lower Montane-Foothill Deciduous Shrubland	CES306.994
		• Northern Rocky Mountain Western Larch Savanna	CES306.837
		• Rocky Mountain Aspen Forest and Woodland	CES306.813
	Northern Rocky Mountain Western Redcedar-Hemlock Forest	• Northern Rocky Mountain Western Hemlock-Western Redcedar Forest	CES306.802
	Rocky Mountain Cliff, Canyon and Massive Bedrock	• North Pacific Montane Massive Bedrock, Cliff and Talus	CES204.093
		• Rocky Mountain Cliff, Canyon and Massive Bedrock	CES306.815

Ecological Grouping	Coarse-filter Terrestrial System Target *	ScientificName	GELCODE
	Not mapped individually, modeled as steep slopes in several Forested Systems	• North Pacific Avalanche Chute Shrubland	CES204.854
		• Northern Rocky Mountain Avalanche Chute Shrubland	CES306.801
LOWER TREELINE FORESTS	Rocky Mountain Ponderosa Pine Woodland and Savanna	Northern Rocky Mountain Ponderosa Pine Savanna	CES306.030
STEPPE and SHRUB STEPPE	Inter-Mountain Basins Big Sagebrush Steppe	• Columbia Plateau Scabland Shrubland	CES304.770
		• Inter-Mountain Basins Big Sagebrush Steppe	CES304.778
	Inter-Mountain Basins Cliff and Canyon	• Inter-Mountain Basins Cliff and Canyon	CES304.779
	Northern Interior Plateau Grassland	• Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	CES306.040
WETLAND and RIPARIAN	Columbia Basin Foothill Riparian Woodland and Shrubland	• Columbia Basin Foothill Riparian Woodland and Shrubland	CES304.768
		• Inter-Mountain Basins Greasewood Flat • Inter-Mountain Basins Playa • North American Arid West Emergent Marsh	CES304.780 CES304.786 CES300.729
	North Pacific Montane Riparian Woodland and Shrubland	• North Pacific Montane Riparian Woodland and Shrubland	CES204.866
	Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	• Northern Rocky Mountain Conifer Swamp	CES306.803
		• Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	CES306.804

Ecological Grouping	Coarse-filter Terrestrial System Target *	ScientificName	GELCODE
	Rocky Mountain Alpine-Subalpine Wetlands	• Rocky Mountain Alpine-Montane Wet Meadow	CES306.812
		• Rocky Mountain Subalpine-Montane Mesic Meadow	CES306.829
		• Rocky Mountain Subalpine-Montane Fen	CES306.831
	Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland	• Rocky Mountain Subalpine-Montane Riparian Shrubland	CES306.832
		• Rocky Mountain Subalpine-Montane Riparian Woodland	CES306.833

* All coarse-filter terrestrial ecological systems were MARXAN targets.

3.1.3 Terrestrial Plant Species

The team that developed the plant species data for the assessment included

- Florence Caplow—Rare Plant Botanist, Washington Natural Heritage Program
- Robin Dye—Conservation Planner, The Nature Conservancy
- Matt Fairbarns—Ecologist, British Columbia Conservation Data Centre (now Aruncus Consulting), Subteam Lead

Selecting Plant Species Targets

Two groups of targets were identified: primary targets—those species of top conservation concern whose data would be used to develop the automated portfolio; and secondary targets—those species considered to be of lower conservation concern whose data would be used to evaluate and refine the portfolio.

Criteria for selecting vascular plant species as primary conservation targets were developed by the team based on the guidelines provided in Groves et al. (2000). Lists of tracked vascular plant species that occur in the ecoregion were obtained from the Washington Natural Heritage Program and the British Columbia Conservation Data Centre. Species from those lists were selected as primary targets if they met one of more of the following criteria:

- listed by NatureServe as G1–G2 for species or T1–T2 for intraspecific taxa
- listed by the U.S. Endangered Species Act and/or the Canadian Species at Risk Act
- strong candidates for listing by the Canadian Species at Risk Act (Fairbarns 2003) and/or the U.S. Endangered Species Act

- endemic to the Okanagan Ecoregion (using definition in Groves et al. 2000) and tracked by the British Columbia Conservation Data Centre and/or the Washington Natural Heritage Program

Other species were selected as secondary targets if they were listed as S1 to S3 in British Columbia and/or Washington.

These criteria and a draft target list were sent to experts to review and provide recommendations for additions and deletions. Additional species were added to the secondary target list if expert reviewers determined that they exhibit significant, long-term declines in habitat/and or numbers, are subject to a high degree of threat, or may have unique habitat requirements that expose them to great risk. Expert reviewers also added species to the secondary target list if they occur as disjuncts in the ecoregion (i.e., are absent from all adjacent ecoregions).

The British Columbia Conservation Data Centre and the Washington Natural Heritage Program rank and track all vascular plant taxa within their respective jurisdictions. However, at present, neither of these organizations comprehensively rank or track non-vascular taxa. Expert lichenologists and bryologists familiar with the region were asked to provide candidate lists of non-vascular plants that appeared to meet one or more of the primary target criteria.

Comments from expert review of the vascular list were evaluated by the team and incorporated, and the lichens and bryophytes nominated by experts were added to produce a final targets list.

In total, 332 vascular plant species were identified as potential targets for the ecoregion. Of these, 106 were primary targets, including 16 species in Washington and 88 in British Columbia (2 species were primary targets in both). The large number of primary targets from British Columbia is an indication of how unique the Okanagan valley is within a Canadian context. In contrast, the Washington portion of the ecoregion is more closely allied to other ecoregions across the northern portion of the state. Twenty-two species of lichens were identified as potential targets for the ecoregion; 11 of these were identified as primary targets. Primary plant targets are listed in Table 3.3. The entire list including secondary plant targets can be found in Appendix 5.

Data Sources

The team collected data on vascular plants from the British Columbia Conservation Data Centre and the Washington Natural Heritage Program. These data are gathered and managed systematically and are already in a format that is usable in the ecoregional assessment process. Map 8 represents terrestrial fine-filter target locations.

Since the heritage programs do not yet systematically track non-vascular plants, Dr. Katherine Glew, University of Washington herbarium, was contracted to visit a limited number of herbariums and contact expert lichenologists familiar with the ecoregion to gather lichen occurrence information. Dr. Glew recorded herbaria label information, and the team created records for these occurrences. Dr. Glew’s report on lichens is provided in Appendix 11. The team did not have the resources or time to search for records of bryophytes.

To prepare the data for use in the assessment process, the team decided that only records more recent than 1977 and those with enough locational certainty (generally the location known within one mile) would be used.

Okanagan Plant Targets

Table 3.3. Okanagan Plant Targets

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**	**S Rank (WA)**
Vascular Plants					
Andean Evening-primrose	*Camissonia andina*	PDONA03010	G4	S1	SR
Annual Paintbrush	*Castilleja minor ssp. minor*	PDSCR0D221	G5T5	S1	S?
Beaked Sedge	*Carex rostrata*	PMCYP03BP0	G5	S2S3	S1
Blue-eyed Grass	*Sisyrinchium septentrionale*	PMIRI0D180	G3G4	S3S4	S2S3
Branched Phacelia	*Phacelia ramosissima*	PDHYD0C410	G4	S1	SR
Bristly Mousetail	*Myosurus apetalus var. borealis*	PDRAN0H051	G5TNR	S2	S?
Cliff Paintbrush	*Castilleja rupicola*	PDSCR0D2U0	G2G3	S2	SR
Cockscomb Cryptantha	*Cryptantha celosioides*	PDBOR0A0F0	G5	S1	SR
Columbian Goldenweed	*Pyrrocoma carthamoides var. carthamoides*	PDASTDT021	G4G5T4	S2	SR
Cup Clover	*Trifolium cyathiferum*	PDFAB400N0	G4	S1	SR
Dwarf Woolly-heads	*Psilocarphus brevissimus var. brevissimus*	PDAST7R011	G4T4	S1	SR
Engelmann's Knotweed	*Polygonum douglasii ssp. engelmannii*	PDPGN0L0X5	G5T3T5	S2S3	XX
Flat-topped Broomrape	*Orobanche corymbosa ssp. mutabilis*	PDORO04042	G4T3?	S2	SR
Freckled Milk-vetch	*Astragalus lentiginosus*	PDFAB0FB90	G5	S2	SR
Giant Helleborine	*Epipactis gigantea*	PMORC11010	G3	S2S3	S3
Grand Coulee Owl-clover	*Orthocarpus barbatus*	PDSCR1H020	G2G4	S1	S?
Gray Stickseed	*Hackelia cinerea*	PDBOR0G070	G4?	XX	S1
Hairgrass Dropseed	*Sporobolus airoides*	PMPOA5V020	G5	S1	SR
Hairy Water-clover	*Marsilea vestita*	PPMAR01080	G5	S1	SR
Howellia	*Howellia aquatilis*	PDCAM0A010	G3	XX	S2S3
Hutchinsia	*Hutchinsia procumbens*	PDBRA2Z010	G5	S1	SR
Lance-leaved Draba	*Draba cana*	PDBRA110M0	G5	S4	S1S2
Leiberg's Fleabane	*Erigeron leibergii*	PDAST3M280	G3?	S1	S?
Lemmon's Holly Fern	*Polystichum lemmonii*	PPDRY0R0E0	G4	S1	SR
Low Hawksbeard	*Crepis modocensis ssp. modocensis*	PDAST2R0A2	G4G5T4	S1	SR
Lyall's Mariposa Lily	*Calochortus lyallii*	PMLIL0D0T0	G3	S2	S?
Mexican Mosquito Fern	*Azolla mexicana*	PPAZO01030	G5	S2	SR
Moss Grass	*Coleanthus subtilis*	PMPOA1L010	GNR	S1	SR
Mountain Holly Fern	*Polystichum scopulinum*	PPDRY0R0N0	G5	S1	SR

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**	**S Rank (WA)**
Mutton Grass	*Poa fendleriana ssp. fendleriana*	PMPOA4Z0V1	G5T5	S1	XX
Narrowleaf Skullcap	*Scutellaria angustifolia ssp. micrantha*	PDLAM1U042	G5T3T5	XX	S2S3
Narrow-leaved Brickellia	*Brickellia oblongifolia ssp. oblongifolia*	PDAST1H0Z2	G5T5	S2	SR
Needle-leaved Navarretia	*Navarretia intertexta*	PDPLM0C0C0	G5?	S2	SR
Obscure Cryptantha	*Cryptantha ambigua*	PDBOR0A040	G4	S2	SR
Okanogan Stickseed	*Hackelia ciliata*	PDBOR0G060	G3?	S1	S?
Oniongrass	*Melica bulbosa var. bulbosa*	PMPOA3X030	G5T5	S2	SR
Oregon Checker-mallow	*Sidalcea oregana var. procera*	PDMAL110K8	G5T4	S1	SR
Pale Alpine-forget-me-not	*Eritrichium nanum var. elongatum*	PDBOR0F033	G5T4	XX	S1
Pulsifer's Monkey-flower	*Mimulus pulsiferae*	PDSCR1B290	G4?	XX	S2
Rigid Fiddleneck	*Amsinckia retrorsa*	PDBOR010A0	G5	S1	S4
Rocky Mountain Clubrush	*Schoenoplectus saximontanus*	PMCYP0Q1D0	G5	S1	XX
Rough Dropseed	*Sporobolus compositus var. compositus*	PMPOA5V161	G5T5	S1	SR
Salish fleabane	*Erigeron salishii*	PDAST3M4U0	G2	S1	S2S3
Scalepod	*Idahoa scapigera*	PDBRA1G010	G5	S2	SR
Scarlet Ammannia	*Ammannia robusta*	PDLYT01050	G5	S1	S?
Short-rayed Aster	*Aster frondosus*	PDASTD8020	G4	S1	SR
Showy Phlox	*Phlox speciosa ssp. occidentalis*	PDPLM0D1Q4	G5TNR	S1	SR
Silvercrown	*Cacaliopsis nardosmia*	PDAST1L010	G4G5	S1	SR
Skinny Moonwort	*Botrychium lineare*	PPOPH01120	G1	XX	S1
Slender Collomia	*Collomia tenella*	PDPLM02090	G4?	S1	SR
Slender Crazyweed	*Oxytropis campestris var. gracilis*	PDFAB2X0X0	G5?		S2
Slender Gilia	*Gilia tenerrima*	PDPLM041N0	G5	S1	XX
Slender Hawksbeard	*Crepis atribarba ssp. atribarba*	PDAST2R021	G5T5	S1	SR
Small-flowered Ipomopsis	*Ipomopsis minutiflora*	PDPLM060A0	G2G3	S2	SR
Small-flowered Lipocarpha	*Lipocarpha micrantha*	PMCYP0H040	G4	S1	S4
Spalding's Milk-vetch	*Astragalus spaldingii var. spaldingii*	PDFAB0F8D0	G3?T3?	S1	SR
Stoloniferous Pussytoes	*Antennaria flagellaris*	PDAST0H0W0	G5?	S1	SR
Strict Buckwheat	*Eriogonum strictum var. proliferum*	PDPGN085L9	G5TNR	S1	SR
The Dalles Milk-vetch	*Astragalus sclerocarpus*	PDFAB0F7X0	G5	S2	SR
Toothcup Meadow-foam	*Rotala ramosior*	PDLYT0B030	G5	S1	S1

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**	**S Rank (WA)**
Tweedy's Lewisia	*Lewisia tweedyi*	PDPOR090A0	G2G3	S1	S?
Tweedy's Willow	*Salix tweedyi*	PDSAL022Z0	G3G4	S2S3	S3
Two-spiked Moonwort	*Botrychium paradoxum*	PPOPH010J0	G2	S1	S2
Ute Ladies' Tresses	*Spiranthes diluvialis*	PMORC2B100	G2	XX	S1
Velvet-leaf Blueberry	*Vaccinium myrtilloides*	PDERI180M0	G5	S4	S1
Watson's Cryptantha	*Cryptantha watsonii*	PDBOR0A3C0	G5	S1	SR
Western Centaury	*Centaurium exaltatum*	PDGEN02060	G5	S1	SR
Western Low Hawksbeard	*Crepis modocensis ssp. rostrata*	PDAST2R0A3	G4G5T3T4	S1	SR
Western Stickseed	*Lappula occidentalis var. cupulata*	PDBOR0K061	G5T5	S1	SR
Whited's Halimolobos	*Halimolobos whitedii*	PDBRA1A050	G3?	S2	SR
Winged Combseed	*Pectocarya penicillata*	PDBOR0T030	G5	S1	S?
Wyeth's Lupine	*Lupinus wyethii*	PDFAB2B470	G5	S1	SR
Lichens					
Beard Lichen	*Usnea sphacelata*	NLLEC5P780	G4G5		S1
	Agrestia hispida	NLLEC04010	G3		S1
	Dactylina arctica	NLLEC48010	G4G5		S1
	Dactylina ramulosa	NLT0009730	G4G5		
	Dermatocarpon atrogranulosum		G1		
	Hypogymnia austerodes	NLTEST7550	G5		
	Massalongia microphylliza		G1?		
	Nephroma arcticum	NLT0019510	G5		
	Ophioparma ventosa		G2		
	Peltigera lepidophora	NLTEST5110	G4		S1
	Physcia dimidiata	NLTES11590	G5?	SNR	SNR
	Physcia tribacia	NLTES11750	G4?		
	Sclerophora amabilis		GNR		
	Stereocaulon nivale		G1		
	Umbilicaria hirsuta	NLT0030260	G2G4		
	Umbilicaria lambii	NLLEC5N110	G2G4		S1
	Umbilicaria nylanderiana	NLT0030300	G4		
	Vestergrenopsis isidiata	NLLEC5S010	G3G4		S1
	Vulpicida tilesii	NLLEC6K010	G4G5		S1
	Xanthoparmelia angustiphylla	NLTES10110	G5		
Scholander's navel lichen	*Umbilicaria scholanderi*	NLLEC5N230	G1	SNR	S1
Vitt tube Lichen	*Hypogymnia vittata*	NLLEC84160	G4G5		SNR

3.1.4 Terrestrial Animal Species

The team that developed the animal species target list and data for the assessment included

- Dick Cannings—Consulting Biologist, Cannings Holm Consulting
- Orville Dyer—Senior Wildlife Biologist, British Columbia Ministry of Environment
- Scott Fitkin—District Wildlife Biologist, Washington Department of Fish and Wildlife
- John Fleckenstein—Zoologist, Washington Natural Heritage Program
- Lisa Hallock—Herpetologist, Washington Natural Heritage Program
- Neal Hedges—Wildlife Biologist, USDI Bureau of Land Management
- Jeff Heinlen—Wildlife Biologist, Washington Department of Fish and Wildlife
- Pamela Krannitz—Research Scientist, Environment Canada, Canadian Wildlife Service
- Jeff Lewis—Wildlife Biologist, Washington Department of Fish and Wildlife, Subteam Lead
- Jim Priest—Wildlife Biologist, Colville Confederated Tribes
- John Rohrer—Supervisory Wildlife Biologist, Okanogan National Forest
- Geoff Scudder—Professor Emeritus, University of British Columbia
- Andy Stewart—Zoologist, British Columbia Conservation Data Centre
- Kent Woodruff—District Wildlife Biologist, Okanogan National Forest
- Steve Zender—District Wildlife Biologist, Washington Department of Fish and Wildlife

Selecting Animal Species Targets

Animal species were selected as fine-filter targets if they met one or more of the following selection criteria which were developed by the team based on the guidelines provided in Groves et al. (2000):

- globally imperiled species (G1–G3 ranked species)
- federally listed threatened or endangered species
- IUCN red list species
- species of special concern (declining, endemic, disjunct, vulnerable, keystone, indicator, or wide-ranging species)
- species aggregations

- biodiversity hotspots
- sub-nationally imperiled species (S1–S3 ranked species)
- bird species having a Partners In Flight (PIF) conservation status score of >23 (Mehlman and Hanners 1999)
- species with PIF conservation scores of 19–22 were also considered as targets if they had a PIF score of 5 for either the breeding area importance factor or the population decline factor.

While some criteria clearly indicated that a species should be selected as a target (e.g., federally listed as endangered), other criteria were more subjective (e.g., vulnerable or declining), so the team and other experts evaluated each species to determine whether to incorporate it or exclude it.

Using the above criteria, the team developed a draft target list which was sent to regional biologists and experts in British Columbia and Washington. Their comments were evaluated and incorporated by the team to create a final target list that included 103 target species—3 amphibians, 5 mollusks, 7 reptiles, 38 birds, 22 mammals, 16 butterflies, and 12 dragonflies (Table 3.4 lists the targets).

The occurrence data for a number of species were used to evaluate rather than define the portfolio. We refer to these species as retro species because we use data for these species to retrospectively review completed conservation portfolios. There were 11 retro species designated among the animal targets: grizzly bear, fisher, grey wolf, olive-sided flycatcher (*Contopus cooperi*), sandhill crane (*Grus canadensis*), barn owl (*Tyto alba*), American dipper (*Cinclus mexicanus*), ferruginous hawk (*Buteo regalis*), burrowing owl, western grebe (*Aechmophorus occidentalis*) and coastal tailed frog (*Ascaphus truei*). The grizzly bear and fisher were included as retro species because the amount of data used to represent them was so great that it overwhelmed the site selection process and reduced its sensitivity to other targets. The other targets were included as retro species because they are species of concern but their status is considered more secure than other targets. We could then evaluate how well the portfolio captured hexagons where retro species occur and determine if the goals of a retro species were met incidentally, as was done for non-retro targets.

Data Sources

Occurrence data for target species were collected from throughout the ecoregion. Primary sources were:

- British Columbia Conservation Data Centre
- Washington Department of Fish and Wildlife
- British Columbia Ministry of Environment
- Okanogan, Colville, and Wenatchee National Forests
- Royal British Columbia Museum
- Washington Natural Heritage Program
- Dr. Dennis Paulson, University of Puget Sound
- Bella Vista-Goose Lake Range Sensitive Ecosystem Inventory
- Artemis Wildlife Consultants
- Ophiuchus Consulting Ltd

Occurrence data were screened to eliminate data that were more than 20 years old, spatially inaccurate, and incomplete. Data for several species were screened to include only occurrences that documented observations of reproduction (e.g., great gray owl [*Strix nebulosa*] nests) or larger nest colonies (e.g., great blue heron [*Ardea herodias*] rookeries with more than ten nests).

Okanagan Animal Targets

Table 3.4. Okanagan Animal Targets

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**	**S Rank (WA)**
Amphibians					
Great Basin spadefoot toad	*Spea intermontana*	AAABF02030	G5	S3	S5
Tiger salamander	*Ambystoma tigrinum*	AAAAA01140	G5	S2	S3
Western toad	*Bufo boreas*	AAABB01030	G4		S3S4
Birds					
American avocet	*Recurvirostra americana*	ABNND02010	G5	S2B,SZN	S4B,SZN
American bittern	*Botaurus lentiginosis*	ABNGA01020	G4	S3B,SZN	S4B,S4N
Bald eagle	*Haliaeetus leucocephalus*	ABNKC10010	G4	S4	S3S4B,S4N
Black-backed woodpecker	*Picoides arcticus*	ABNYF07090	G5		S3
Blue grouse	*Dendragapus obscurus*	ABNLC09020	G5	S4	S5
Bobolink	*Dolichonyx oryzivorus*	ABPBXA9010	G5	S3B,SZN	S3B,SZN
Brewer's sparrow (breweri ssp)	*Spizella breweri breweri*	ABPBX94941	G5T4	S2B	S4B,SZN
Calliope hummingbird	*Stellula calliope*	ABNUC48010	G5	S4S5B,SZN	S4S5B,SZN
Canyon wren	*Catherpes mexicanus*	ABPBG04010	G5	S3	S4
Common Loon	*Gavia immer*	ABNBA01030	G5	S4S5B,SZN	S2B,S5N
Flammulated owl	*Otus flammeolus*	ABNSB01020	G4	S3S4B,SZN	S3B,SZN
Golden eagle	*Aquila chrysaetos*	ABNKC22010	G5	S4B,SZN	S3B,S3N
Grasshopper sparrow	*Ammodramus savannarum*	ABPBXA0020	G5	S2B	S3B,SZN
Great blue heron	*Ardia herodius*	ABNGA04010	G5	S3B,S4N	S4S5
Great gray owl	*Strix nebulosa*	ABNSB12040	G5	S4B,SZN	S2B,SZN
Lark sparrow	*Chondestes grammacus*	ABPBX96010	G5	S2B,SZN	S4B,SZN
Lewis' woodpecker	*Melanerpes lewis*	ABNYF04010	G4	S3B,SZN	S3B,SZN
Long-billed curlew	*Numenius americanus*	ABNNF07070	G5	S3B,SZN	S2B,S2N
Northern goshawk	*Accipiter gentilis*	ABNKC12061	G5	S4B,S4N	S3B,S3N
Northern spotted owl	*Strix occidentalis caurina*	ABNSB12011	G3	S1	S3
Peregrine falcon	*Falco peregrinus anatum*	ABNKD06071	G4T3	S2B,SZN	S2B,S3N

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**	**S Rank (WA)**
Prairie falcon	*Falco mexicanus*	ABNKD06090	G5	S2B,SZN	S3B,S3N
Rufus hummingbird	*Selasphorus rufus*	ABNUC51020	G5	S4S5B,SZN	S5B,SZN
Sage thrasher	*Oreoscoptes montanus*	ABPBK04010	G5	S1B	S3B,SZN
Sharp-tailed grouse (columbianus ssp)	*Tymphanuchus phasianellus columbianus*	ABNLC13030	G4T3	S2S3	S2
Short-eared owl	*Asio flammeus*	ABNSB13040	G5	S3B,S2N	S4B,S4N
Swainson's hawk	*Buteo swainsoni*	ABNKC19070	G5	S2B,SZN	S3B,SZN
Trumpeter swan (S. Thompson R.)	*Cygnus buccinator*	ABNJB02030	G4	S4B,S4N	S3N
Vaux's swift	*Chaetura vauxi*	ABNUA03020	G5	S4B,SZN	S3S4B,SZN
Western screech owl	*Otus kennicotii macfarlanei*	ABNSB01041	G5T4	S1	S5
Western yellow-breasted chat	*Icteria virens auricollis*	ABPBX24010	G5	S1B	S4B,SZN
White-headed woodpecker	*Picoides albolarvatus*	ABNYF07070	G4	S1	S3
Williamson's sapsucker	*Sphyrapicus thyroideus thyroideus*	ABNYF05032	G5	S3B,SZN	S4B,SZN
Wilson's phalarope	*Phalaropus tricolor*	ABNNF20010	G5	S4S5B,SZN	S4B,SZN
Dragonflies					
Black-tipped darner	*Aeshna tuberculifera*	IIODO14180	G4	S3	S4
Boreal whiteface	*Leucorrhinia borealis*	IIODO44010	G5	S5	S1
Lance-tailed darner	*Aechna constricta*	IIODO14040	G5	S2S3	S4
Nez Perce dancer	*Argia emma*	IIODO68160	G5	S3S4	S5
Olive clubtail	*Stylurus olivaceus*	IIODO80060	G4	S2	S4
Pronghorn clubtail	*Gomphus graslinellus*	IIODO08310	G5	S2S3	S3
River jewelwing	*Calopteryx aequabilis*	IIODO65010	G5	S1	S4
Subarctic (muskeg) darner	*Aeshna subarctica*	IIODO14170	G5	S5	S2
Subarctic bluet	*Coenagrion interrogatum*	IIODO70020	G5	S4	S2
Twelve-spotted skimmer	*Libellula pulchella*	IIODO45140	G5	S3	S5
Western pondhawk	*Erythemis collocata*	IIODO39020	G5	S3	S5
Western river cruiser	*Macromia magnifica*	IIODO26060	G4	S3	S3
Lepidopterans					
Astarte fritillary	*Boloria astarte*	IILEPJ7120	G5	S5	S3
Behr's (Columbia) hairstreak	*Satyrium behrii columbia*	IILEPD4010	G5	S2	S5
California hairstreak	*Satyrium californicum*	IILEPD4040	G5	S3	S5

Common Name (where applicable)	**Scientific Name**	**GEL Code**	**Global Rank**	**S Rank (BC)**	**S Rank (WA)**
Eastern tailed blue	*Everes comyntas*	IILEPF9010	G5	S3	S2
Freija fritillary	*Boloria freija*	IILEPJ7100	G5	S5	S2
Juniper hairstreak	*Callophrys gryneus*	IILEPE2130	G5	S4	S3
Meadow fritillary	*Boloria bellona toddi*	IILEPJ7040	G5	S3	S2?
Melissa arctic	*Oeneis melissa*	IILEPP1100	G5	S5	S2
Mormon metalmark	*Apodemia mormo*	IILEPH7010	G5	S1	S4
Silver-bordered fritillary	*Boloria selene*	IILEPJ7030	G5	S5	S3
Sonora skipper	*Polites sonora*	IILEP66090	G4	S1	S4
Sooty hairstreak	*Satyrium fuliginosum*	IILEPD4020	G4	S1	S4
Mammals					
Badger	*Taxidea taxus jeffersoni*	AMAJF04010	G5	S1	S5
Bighorn sheep	*Ovis canadensis*	AMALE04010	G4	S2S3	S3S4
Bighorn sheep-WA	*Ovis canadensis*	AMALE04010	G4	S2S3	S3S4
Fringed myotis	*Myotis thysanodes*	AMACC01090	G4G5	S2S3	S3?
Great Basin pocket mouse	*Perognathus parvus*	AMAFD01070	G5	S2S3	S5
Long-legged myotis	*Myotis volans*	AMACC01110	G5	S4S5	S3
Lynx	*Lynx canadensis*	AMAJH03010	G5	S4	S1S2
Mountain beaver	*Aplodontia rufa rainieri*	AMAFA01014	G5T4	S3	S5
Mountain goat	*Oreamos americanus*	AMALE02010	G5	S4	S4S5
Mountain goat-WA	*Oreamos americanus*	AMALE02010	G5	S4	S4S5
Nuttall's cottontail	*Sylvilagus nutalli*	AMAEB01060	G5	S3	S5
Pallid bat	*Antrozous pallidus*	AMACC10010	G5	S1	S3
Preble's shrew	*Sorex preblei*	AMABA01030	G4	S1S2	SR
Spotted bat	*Euderma maculatum*	AMACC07010	G4	S3S4	S3
Townsend's big-eared bat	*Coryhorhinus townsendii*	AMACC08010	G4	S2S3	S2
Western gray squirrel	*Sciurus griseus*	AMAFB07020	G5		S2
Western harvest mouse	*Rheithrodontomys megalotis*	AMAFF02030	G5	S2S3	S5
Western red bat	*Lasiurus blossevillii*	AMACC05060	G5	S1	
Western small-footed myotis	*Myotis ciliolabrum*	AMACC01140	G5	S2S3	S4
Wolverine	*Gulo gulo*	AMAJF03012	G4	S3	S1

3.2 Freshwater Ecological Systems and Species

Freshwater ecological systems support an exceptional concentration of biodiversity and almost all terrestrial animal species since they depend on freshwater systems for water, food, and various aspects of their life cycles. As with the terrestrial analysis, the freshwater component of this project used two types of conservation targets. Ecological systems were used as coarse-filter targets; animal species were selected as fine-filter targets. Plant species were not used because there were insufficient standardized data available for freshwater plants.

The freshwater assessment was based on ecological drainage unit boundaries instead of the ecoregion boundary. Map 5 shows EDUs in and intersecting with the Okanagan Ecoregion.

Four ecological drainage units were used in this assessment:

- Middle Fraser EDU
- Upper Fraser EDU
- Thompson EDU
- Okanagan EDU

In the interests of preserving the ecological integrity of freshwater systems, the Upper Fraser EDU, which does not intersect the ecoregion, was included in the analysis because of its connectivity to the Middle Fraser EDU, which does intersect the ecoregion.

3.2.1 Freshwater Ecological Systems

The team that developed the freshwater ecological systems target list and data for the assessment included

- Bart Butterfield—Spatial Analyst/GIS Expert
- Kristy Ciruna—Director of Conservation Programs, Nature Conservancy of Canada, Subteam Lead
- Ted Down—Manager of Aquatic Ecosystem Science, BC Ministry of Environment
- Tracy Horsman—Spatial Analyst, The Nature Conservancy
- Craig Mount—Aquatic Geomorphologist, BC Ministry of Environment
- Peter Skidmore—Aquatic Ecologist, The Nature Conservancy
- Art Tautz—Science Advisor, BC Ministry of the Environment
- Dave Tredger—Manager of Ecosystem Information, BC Ministry of Environment

Definition

For classification purposes, freshwater ecological systems are defined as networks of streams, lakes, and wetlands that are distinct in geomorphological patterns, connected by similar environmental processes and gradients, occur in the same part of the drainage network, and form a distinguishable drainage unit on a hydrography map. Freshwater ecological systems are spatially nested within major river drainages and are defined at a spatial scale that is practical for regional planning.

Ecological systems provide a means of generalizing about large-scale patterns in networks of streams and lakes, and the ecological processes that link them together, whereas finer-scale freshwater systems capture a detailed picture of physical diversity at the stream reach level.

Selecting Freshwater Ecological System Targets

The team's first step was to create a freshwater ecosystem classification for EDUs that intersect the Okanagan Ecoregion or were used in the assessment. The classification of freshwater systems is a relatively new pursuit. Unlike terrestrial systems classification, it is virtually impossible to build a hierarchical freshwater classification founded on biological data because freshwater communities have not been identified in most places, and there is generally a lack of adequate survey data for freshwater species. Therefore, abiotic factors that have been shown to influence the distribution of species and communities are used to delineate freshwater ecological system types. Nine abiotic variables were used to develop the classification for the Okanagan EDUs: drainage area, underlying biogeoclimatic zone and geology, stream gradient, accumulative precipitation yield, lake and wetland influence, glacial connectivity, and Melton's R (watershed ruggedness). Different combinations of these variables will likely result in different freshwater communities.

The four EDUs analyzed in the assessment collectively consist of 4,307 watershed units. These were grouped into 44 freshwater ecological systems using the following statistical methods. The freshwater ecological systems are listed in Table 3.5 and Appendix 5. They are shown on Map 9.

Descriptive statistics (mean, standard deviation, skewness, and variance) were calculated for each variable. Variables that were highly skewed (skewness values ≥ 2) were log 10 transformed to help meet the assumptions of normality for parametric statistics. Variability in categorical variables such as gradient classes, biogeoclimatic zones, and geology classes was reduced into two continuous axes using nonmetric multidimensional scaling.

All variables were normalized for proportional comparisons between variables. Cluster analysis was performed on all normalized variables (agglomerative hierarchical clustering [Sorensen distance measure using a flexible beta value of -0.25]), and 44 freshwater system types were selected.

Data Sources

The following summarizes data sources used to develop the freshwater ecological systems:

- drainage area—BC Watershed Atlas; Interior Columbia Basin Ecosystem Management Project watersheds
- accumulative precipitation yield—ClimateSource
- percent of lake area to watershed polygon area—BC Watershed Atlas; USGS NHD data
- percent of wetland area to watershed polygon area—BC Watershed Atlas; USGS NHD data
- percent glacial influence—BC Watershed Atlas; USGS NHD data
- biogeoclimatic zones / ecozones—BC Ministry of Forests Biogeoclimatic Ecosystem Classification; BC Mnistry of Sustainable Resource Management Regional and Zonal Ecosystems of the Shining Mountains
- geology—BC Ministry of Energy and Mines; Washington Department of Natural Resources http://www.dnr.wa.gov/geology/dig100k.htm

- mainstem and tributary stream gradient—BC Watershed Atlas, BC TRIM/TRIMII 25 m DEM; USGS NHD data

Okanagan Freshwater Ecological System Targets

Table 3.5. Okanagan Freshwater Ecological System Targets

Freshwater Ecological Systems
intermediate, intrusives, alluvium, elevation 820, shallow
intermediate, intrusives, elevation 1032, shallow, glacial
intermediate, intrusives, elevation 722, shallow, lakes
intermediate, volcanics, alluvium, elevation 1080, shallow, lakes/wetlands
intermediate, volcanics, elevation 1001, shallow, lakes/wetlands
large volcanics, intrusives/alluvium, elevation 658, shallow
large, intrusives, alluvium, elevation 621, shallow
large, intrusives, elevation 546, shallow
small, alluvium, elevation 1098, shallow
small, alluvium, elevation 1098, shallow, wetlands
small, alluvium, elevations 1118, shallow
small, alluvium, intrusives, elevation 919, shallow
small, alluvium, volcanics, 765, shallow
small, intrusives, alluvium, elevation 1058, shallow
small, intrusives, elevation 1035, shallow, lakes
small, intrusives, elevation 1141, shallow
small, intrusives, elevation 1151, shallow
small, intrusives, elevation 1164, shallow
small, intrusives, elevation 1417, shallow
small, intrusives, elevation 1450, shallow
small, intrusives, elevation 1522, shallow
small, intrusives, elevation 1597, shallow
small, intrusives, elevation 1648, shallow
small, intrusives, elevation 1758, shallow, glacial
small, intrusives, elevation 1907, shallow, glacial
small, intrusives, sediments, 1965, shallow/steep, glacial
small, intrusives, sediments, elevation 1279, shallow
small, intrusives, volcanics, elevation 1019, shallow, lakes/wetlands
small, intrusives, volcanics, elevation 1032, shallow, lakes/wetlands
small, sediments, alluvium, elevation 972, shallow, lakes/wetlands
small, sediments, elevation 1683, shallow

Freshwater Ecological Systems
small, sediments, elevation 1799, steep
small, sediments, elevation 791, shallow
small, volcanics, alluvium, elevation 1038, shallow, wetlands
small, volcanics, alluvium, elevation 1137, shallow, lakes/wetlands
small, volcanics, alluvium, elevation 1156, shallow, wetlands
small, volcanics, alluvium, elevation 1442, shallow, lakes
small, volcanics, elevation 1002, shallow, lakes/wetlands
small, volcanics, elevation 1303, intermediate/steep
small, volcanics, elevation 950, shallow, wetlands
small, volcanics, intrusives, elevation 1418, shallow, lakes/glacial
small, volcanics, sediments, elevation 1017, shallow, lakes/wetlands
small, volcanics, sediments, elevation 1155, shallow
small, volcanics, sediments, elevation 907, shallow

3.2.2 Freshwater Species

The team listed above for the terrestrial animal species also developed an initial list of freshwater species. In addition to those team members, others reviewed and expanded the list:

- Kristy Ciruna—Director of Conservation Programs, Nature Conservancy of Canada
- Jeff Lewis—Wildlife Biologist, Washington Department of Fish and Wildlife
- Geoff Scudder—Professor Emeritus, University of British Columbia
- Peter Skidmore—Aquatic Ecologist, The Nature Conservancy
- Sairah M. Tyler—Conservation Planning Consultant, Nature Conservancy of Canada, Subteam Lead

Selecting Freshwater Species Targets

The target list developed by the terrestrial team included some semi-aquatic and riparian species that were also included in the freshwater species list. That list was expanded to include obligate aquatic species and to cover the expanded geographic area of the freshwater analysis. Map 10 represents freshwater fine-filter data.

A total of 48 freshwater fine-filter targets were identified, 35 of which had spatial data. An additional 28 secondary or retro, species were identified, 18 of which had spatial data. Species spanned the range of vascular plants, mollusks, insects, fish, amphibians, reptiles, birds, and mammals. All 6 species of salmon and 4 separate populations of white sturgeon were included in the target list. Only 2 plant species were included in the list due to a lack of available data. Table 3.6 lists freshwater species targets.

Data Sources

In addition to the data sources listed above for the terrestrial animal species, spatial data to map occurrences of additional freshwater species were collected from

- BC Fisheries / Canadian Department of Fisheries and Oceans; Fisheries Information Summary System
- American Fisheries Society, Fish Occurrence Data
- Pacific States Marine Fisheries Commission, StreamNet Project (Anadromous Fish)
- Washington Department of Fish and Wildlife, Salmonid Stock Inventory and Ecosystem Diagnosis and Treatment (EDT)

Records that were older than 20 years, locationally inaccurate, or incomplete were removed from the datasets.

Okanagan Freshwater Species Targets

Table 3.6. Okanagan Freshwater Species Targets

Common Name	Scientific Name	GEL Code	Global Rank	S Rank BC	S Rank WA
Amphibians					
Columbia Spotted Frog (EDU)	*Rana luteiventris*	AAABH01290	G4		S4
Great Basin Spadefoot (EDU)	*Spea intermontana*	AAABF02030	G5	S3	S5
Tiger Salamander (EDU)	*Ambystoma tigrinum*	AAAAA01140	G5	S2	S3
Western toad (EDU)	*Bufo boreas*	AAABB01030	G4		S3S4
Birds					
American avocet (EDU)	*Recurvirostra americana*	ABNND02010	G5	S2B,SZN	S4B,SZN
American bittern (EDU)	*Botaurus lentiginosus*	ABNGA01020	G4	S3B,SZN	S4B,S4N
American dipper (EDU)	*Cinclus mexicanus*	ABPBH01010	G5	S5B, S4N	S5
American White Pelican	*Pelecanus erythrorhynchos*	ABNFC01010	G3	S1B,SZN	
Common Loon (EDU)	*Gavia immer*	ABNBA01030	G5	S4S5B, SZN	S2B,S5N
Harlequin duck (EDU)	*Histrionicus histrionicus*	ABNJB15010			
Long-billed curlew (EDU)	*Numenius americanus*	ABNNF07070	G5	S3B,SZN	S2B,S2N
Sandhill Crane (EDU)	*Grus canadensis*	ABNMK01010	G5	S3S4B,SZN	
Trumpeter swan (S. Thompson R.) (EDU)	*Cygnus buccinator*	ABNJB02030	G4	S4B, S4N	S3N
Upland Sandpiper	*Bartramia longicauda*	ABNNF06010	G5	S1S2B,SZN	
Western grebe (EDU)	*Aechmophorus occidentalis*	ABNCA04010	G5	S1B,S3N	S3B,S5N

Common Name	Scientific Name	GEL Code	Global Rank	S Rank BC	S Rank WA
Wilson's phalarope (EDU)	*Phalaropus tricolor*	ABNNF20010	G5	S4S5B, SZN	S4B,SZN
Fishes					
Bull trout	*Salvelinus confluentus*	AFCHA05020	G3	S3	S3
Chinook Salmon	*Oncorhynchus tshawytscha*	AFCHA02050			
Chiselmouth	*Acrocheilus alutaceus*	AFCJB01010	G5	S3?	S4
Chum Salmon	*Oncorhynchus keta*	AFCHA02020			
Coho Salmon	*Oncorhynchus kisutch*	AFCHA02030		S3	
Columbia Mottled Sculpin, Hubbsi Subspecies	*Cottus bairdi hubbsi*	AFC4E02053	G5	S3	S3?
Lake chub	*Cousius plumbeus*	AFCJB06010	G5	S5	SU
Leopard dace	*Rhinichthys falcatus*	AFCJB37040	G4	S4	S2S3
Mountain sucker	*Catostomus platyrhynchus*	AFCJC02160	G5	S3?	S3
Mountain sucker - N. Thompson	*Catostomus platyrhynchus*	AFCJC02160	G5	S3?	S3
Pacific Lamprey	*Lampetra tridentata*	AFBAA02100	G5	S4	
Pink Salmon	*Oncorhynchus gorbuscha*	AFCHA02010			
Pygmy whitefish	*Prosopium coulteri*	AFCHA03020	G5	S4S5	S2
Pygmy whitefish - Okanagan Lake	*Prosopium coulteri*	AFCHA03020	G5	S4S5	S2
Shorthead sculpin	*Cottus confusus*	AFC4E02090	G5	S2S3	S3S4
Sockeye Salmon	*Oncorhynchus nerka*	AFCHA02040			
Speckled dace	*Rhinichthys osculus*	AFCJB37050	G5	S2	S4
Steelhead Salmon	*Oncorhynchus mykiss*	AFCHA02090			
Umatilla dace	*Rhinichthys umatilla*	AFCJB37120	G4	S1S2	SU
Westslope cutthroat trout	*Onchorynchus clarki lewisi*	AFCHA02088	G4T3	S3SE	SU
White Sturgeon (Columbia River Population)	*Acipenser transmontanus pop. 2*	AFCAA01052	G4T3T4Q	S1	
White Sturgeon (Lower Fraser River Population)	*Acipenser transmontanus pop. 4*	AFCAA01054	G4T2Q	S2	
White Sturgeon (Nechako River Population)	*Acipenser transmontanus pop. 3*	AFCAA01053	G4T1Q	S1	
White Sturgeon (Upper Fraser River Population)	*Acipenser transmontanus pop. 5*	AFCAA01055	G4T1Q	S1	

Common Name	Scientific Name	GEL Code	Global Rank	S Rank BC	S Rank WA
Insects					
Black-tipped darner (EDU)	*Aeshna tuberculifera*	IIODO14180	G4	S3	S4
Lance-tipped darner	*Aechna constricta*	IIODO14040	G5	S2S3	S4
nez Perce dancer (EDU)	*Argia emma*	IIODO68150	G5	S3S4	S5
Olive clubtail (EDU)	*Stylurus olivaceus*	IIODO80060	G4	S2	S4
Pronghorn clubtail (EDU)	*Gomphus graslinellus*	IIODO08310	G5	S2S3	S3
River jewelwing (EDU)	*Calopteryx aequabilis*	IIODO65010	G5	S1	S4
Twelve-spotted skimmer (EDU)	*Libellula pulchella*	IIODO45130	G5	S3	S5
Western pondhawk (EDU)	*Erythemis collocata*	IIODO39020	G5	S3	S5
Western river cruiser (EDU)	*Macromia magnifica*	IIODO26060	G4	S3	S3
Mammals					
Mountain Beaver, Rainieri Subspecies	*Aplodontia rufa rainieri*	AMAFA01014	G5T4	S3	SA
Mollusks (Ecoregion targets)					
California floater	*Anodonta californiensis*	IMBIV04020	G3		S1S2
Western pearlshell	*Margaritifera falcata*	IMBIV27020	G4		S3
Mollusks (EDU targets)					
California floater (EDU)	*Anodonta californiensis*	IMBIV04020	G3	na	S1S2
Western pearlshell (EDU)	*Margaritifera falcata*	IMBIV27020	G4	na	S3
Western ridgemussel (EDU)	*Gonidea angulata*	IMBIV19010	G3	na	S2
Reptiles					
Painted Turtle	*Chrysemys picta*	ARAAD01010	G5	S3S4	
Vascular Plants					
Leafy Pondweed	*Potamogeton foliosus*	PMPOT030B0	G5	S4	SNR
Nuttall's waterweed (EDU)	*Elodea nuttalli*	PMHYD03080	G5	S2S3	SNR

3.2.3 Ecosystem Diagnosis and Treatment

For those salmon species that had available data, an index that reflected both the quality and quantity of habitat was the fine-filter target input to MARXAN. We used an EDT model output to represent the habitat for these species. EDT is a system for rating the quality, quantity, and diversity of habitat along a stream, relative to the needs of a focal species such as chinook salmon (Mobrand et al. 1997; Lestelle 2004). EDT has been used by government agencies and tribes/First Nations to analyze salmon habitat value throughout the Pacific Northwest. EDT produces two metrics of relative habitat value: restoration potential and protection potential.

The EDT process begins by segmenting a stream network into reaches. EDT characterizes the condition of 46 habitat attributes for each reach to provide evaluations of current and historical conditions. EDT then uses habitat-dependent survival rules to simulate three population performance measures—intrinsic productivity, equilibrium abundance, and life-history diversity—for both current and historical habitat conditions. Based on the simulated population performance, EDT estimates the restoration and protection potentials for each reach. To calculate protection potential, EDT simulates the relative decrease in population performance that would be expected if habitat conditions for a given reach become fully degraded beyond current habitat conditions. The result is a set of reach-specific protection values expressed as percent change in population performance parameters from current conditions. We used the protection potential as explained below.

Calculating the habitat quality index for a given EDT reach was a four-step process. First, we combined EDT assessments for a given salmonid target from all basins within a given Evolutionary Significant Unit (ESU). A table was created that contained every EDT reach in a given ESU and values of the three performance measures for each reach. Second, a single protection potential estimate for each reach was calculated by summing percent change in productivity, abundance, and life history diversity for each reach. Third, all reaches were sorted by the new single protection potential estimate. Finally, the resulting reach-specific values were normalized such that the maximum value equaled 1000:

$$\text{Habitat Quality Index of reach } i = (pi / pmax) * 1000$$

where pi is the protection potential estimate for a given reach and pmax the protection potential estimate for the reach ranked as having the greatest protection potential in the ESU. We obtained the results of EDT analyses that had been done for salmon recovery efforts in the Columbia River Basin. In the Okanogan EDU, EDT analyses had been done for chinook and steelhead salmon.

Where EDT had not been completed but reaches had been identified, we obtained qualitative protection rankings (i.e., high, medium, low) that had been done in lieu of EDT modeling (Casey Baldwin, WDFW, pers. comm.). We translated these qualitative rankings into habitat quality scores as follows. We plotted the distribution of normalized habitat quality scores for all Okanogan EDU reaches where EDT output was available and then identified two break points that were used to stratify these reaches into high, medium, and low habitat quality. We then calculated the mean habitat quality score for these three strata and assigned these mean values to the corresponding qualitative rankings for reaches that lacked EDT (e.g., Wenatchee reaches).

Most assessment units (i.e., a class 1 watershed) encompassed more than one EDT reach. Hence, the conservation value of an assessment unit was the sum of habitat quality index values for all reaches in the assessment unit. This is the value that was used in MARXAN. This cumulative value was calculated separately for chinook and steelhead targets.

Chapter 4 – Suitability Indices

4.1 Introduction

MARXAN searches for the lowest cost set of assessment units that will meet representation levels for all conservation targets. This set of assessment units is defined as an efficient or "optimal" solution. "Cost" corresponds to economic, socio-political, and environmental factors operating on the landscape that either support or impede management regimes that emphasize biodiversity conservation (Comer 2003) and is represented in MARXAN by the suitability index. Used in this context, cost refers not only to financial considerations but also to likelihood of success, especially in terms of species viability or persistence. In other words, our conservation investment (whether financial or effort-based) has a higher return if it sustains biodiversity for the long term.

The actual cost of conservation encompasses many complicated factors including acquisition or easement costs, management costs, restoration costs and costs of failing to maintain a species at a given site. Determining monetary costs of conservation for all available targets for each assessment unit would be prohibitive; therefore, the suitability index serves as a surrogate measure for cost. Cost, as defined here, is an inverse function of suitability; the higher the cost, the less suitable an assessment unit is for conservation.

Land use suitability is a well established concept among planners (Hopkins 1977; Collins et al. 2001), and there are many different methods for constructing an index (Banai-Kashini 1989; Carver 1991; Miller et al. 1998; Stoms et al. 2002). Suitability indices have been used to locate the best places for a wide range of land uses from farms to nuclear waste sites. We applied a suitability index in an optimization algorithm in order to identify the best places for biodiversity conservation.

MARXAN requires that all suitability factors be represented by a single cost value. This single value must represent the combination of all factors, whether biological or non-biological, and their relative importance. The algorithm favours analysis units with lower cost values.

It is important to note that MARXAN will still select areas of high cost / low suitability if they are required to meet representation goals. For example, rare species or those with limited range will have fewer places for MARXAN to choose from and may force the selection of high cost areas. The suitability index simply ensures that if there is a high suitability / low cost alternative, it will be preferentially selected.

A summary of threats to biodiversity in the Okanagan Ecoregion can be found in Appendix 14. The team did not have the resources or time to include these factors in the suitability index..

4.2 Assumptions

We developed the suitability index based on three assumptions:

1) Existing public land is more suitable for conservation than private land.

2) Rural areas are more suitable for conservation than urban areas.

3) Areas with low habitat fragmentation are more suitable for conservation than areas with high fragmentation.

The first assumption is based on the work of the Gap Analysis Program (Cassidy et al. 1997; Kagan et al. 1999). The Oregon and Washington GAP projects rated nearly all public lands as better managed for biodiversity than most private lands. Furthermore, conservation biologists have noted that existing public lands are the logical starting point for habitat protection programs (Dwyer et al. 1995). The team also reasoned that by focusing conservation on lands already set aside for public purposes, the impact on private or tribal/First Nations lands and the overall cost of conservation would be less than if public and private lands were treated equally. Therefore, existing public lands could form the core of large, multiple-use landscapes where biodiversity conservation is a major management goal.

The second assumption is based on the definition of urban area. In general, urban areas make intensive use of land for the location of buildings, structures, and impermeable surfaces to such a degree as to be incompatible with large-scale conservation of native biodiversity. However, it is worth noting that this definition of urban does not preclude a need for natural areas or habitat restoration within the urban environment.

The third assumption is based on the work of Diamond (1975) and Forman (1995), among others, and is a well-accepted principle of conservation biology.

The validity of the first two assumptions is debatable. That is, other organizations or stakeholders may contend that biodiversity conservation on private lands is just as feasible as conservation on public lands, or that no distinction should be made between urban areas and rural areas with respect to biodiversity conservation. Certainly, there are situations where both these contentions are true. However, for this assessment, we assumed that public lands are the most sensible starting point for biodiversity conservation and that urban areas are a land use designation that is mostly incompatible with maintaining a full suite of existing biodiversity.

Although the simple index used in this assessment cannot account for the many complex local situations that influence successful conservation, we believe that some reasonable generalities are still quite useful for assessing conservation opportunities across an entire ecoregion. For a more detailed account of the suitability index, refer to Appendix 13.

4.3 Methods

The suitability index used in this project was based on the analytic hierarchy process (AHP) (Saaty 1980; Banai-Kashini 1989). AHP generates an equation that is a linear combination of factors thought to affect suitability. Each factor is represented by a separate term in the equation, and each term is multiplied by a weighting factor. AHP is unique because the weighting factors are obtained through a technique known as pair-wise comparisons (Saaty 1977) where expert opinion is solicited regarding the relative importance of each term in the equation. To simplify the elicitation process, we used the “abbreviated pair-wise comparisons” technique. That is, we assumed perfect internal consistency for each expert, which allowed us to reduce the number of comparisons. AHP has been used in other conservation assessments where expert judgments are needed in lieu of empirical data (Store and Kangas 2001; Clevenger et al. 2002; Bojorquez-Tapia 2003).

We asked several experts with knowledge of the ecoregion to give their opinion on the ranks and relative importance values for factors used in the suitability index. They were asked to do the same for sub-terms from management status, land use and fire condition. Weights for each factor were calculated using a pairwise comparisons matrix as described by Saaty (1977).

We built two similar cost suitability indices—one for terrestrial areas, and one for freshwater areas—by compiling spatial data relating to the human use footprint (e.g., road density, urban growth, conversion of natural landscapes), current management, divergence from the historic fire regime and presence of dams. We incorporated these data into the AHP equation and generated a single suitability value or cost for each assessment unit (see Appendix 8 for more details on assessment units).

The use of suitability indices for assessing the likelihood of successful conservation has some potential drawbacks. For example, our index is built upon expert opinions about which factors to include and the relative importance of each factor. Also, few if any of these GIS data are ever ground-truthed for accuracy, which would greatly improve the quality of those data (Groves 2003). To address these concerns, we performed a sensitivity analysis on the suitability index (Chapter 5.0).

4.3.1 Terrestrial Suitability Index

Terrestrial suitability is expressed quantitatively as

$$\mathit{Terrestrial\ Suitability} = A * \mathit{management\_status} + B * \mathit{land\_use} + C * \mathit{road\_density} + D * \mathit{future\_urban\_potential} + E * \mathit{fire\_condition}$$

A, B, C, D and E are weighting factors calculated from expert input and pairwise comparison, which collectively sum to 100%. The individual index factors are shown in Map 11. Map 12 shows the combined terrestrial suitability index factors.

Weights, summing to 100% of the category, were also applied to sub-factors within management status, land use and fire condition class. For example,

$$\mathit{Land\_use} = q * \%\ \mathit{urban} + r * \%\ \mathit{agriculture} + s * \%\ \mathit{mine}$$

Values for each factor (or sub-factor) are based on the percent area of that factor in the assessment unit. Values for each factor are normalized prior to applying the weights according to the following equation:

$$\mathit{Normalized\ score} = (\mathit{score\ for\ that\ AU} / \mathit{highest\ score\ for\ all\ AUs}) * 100$$

Weights were obtained from input provided by 18 people—9 members of the technical team and 9 outside experts. Ten of the respondents were from British Columbia; 8 were from Washington.

Appendix 13 provides details on how each of the factors were developed, including rationale for inclusion in the index, processing methods, factor weights and sub-weight values and data sources. The appendix also provides details on other factors that were considered for inclusion, including rationale for not including the factors in the index.

4.3.2 Freshwater Suitability Index

Freshwater suitability is expressed quantitatively as

$$\mathit{Freshwater\ Suitability} = A * \mathit{management\_status} + B * \mathit{land\_use} + C * \mathit{road\_density} + D * \mathit{dams}$$

A, B, C, and D are weighting factors calculated from expert input and pairwise comparison, which collectively sum to 100%. Map 13 shows the combined freshwater suitability index factors.

Weights, summing to 100% of the category, were also applied to sub-categories within management status and land use. For example,

$$Land\_use = q * \%\_urban + r * \%\ agriculture + s * \%\ mine$$

Values for each factor (or sub-factor) are based on the percent area of that factor in the assessment unit. Values for each factor are normalized prior to applying the weights according to the following equation:

$$Normalized\ score = (score\ for\ that\ AU\ /\ highest\ score\ for\ all\ AUs) * 100$$

Weights were obtained from input provided by13 people—6 members of the technical team and 7 outside experts. Six of the respondents were from British Columbia; 7 were from Washington.

Appendix 13 provides details on how each of the factors were developed, including rationale for inclusion in the index, processing methods, factor weights and sub-weight values and data sources. The appendix also provides details on other factors that were considered for inclusion, including rationale for not including the factors in the index. An overview Threats Assessment was compiled as a companion to the suitability index; it can be found in Appendix 14.

Chapter 5 – Prioritization of Assessment Units

5.1 Introduction

A conservation portfolio could serve as a conservation plan to be implemented over time by non-governmental organizations, government agencies and private landowners. In reality, however, an entire portfolio cannot be protected immediately, and some conservation areas in the portfolio may never be protected (Meir et al. 2004). Limited resources and other social or economic considerations may make protection of the entire portfolio impractical. This situation can be addressed two ways. First, we should narrow our immediate attention to the most important conservation areas within the portfolio. We prioritized conservation areas to facilitate this (Chapter 7.0, Maps 27 and 28). Second, we should provide organizations, agencies and landowners with the flexibility to pursue other options when portions of the portfolio are too difficult to protect. We assigned a relative priority to all AUs in the ecoregion, which will help planners explore options for conservation.

5.1.1 Sensitivity Analysis

A sensitivity analysis is necessary whenever there is considerable uncertainty regarding modeling assumptions or parameter values. A sensitivity analysis determines what happens to model outputs in response to a systematic change of model inputs (Jorgensen and Bendoricchio 2001). Sensitivity analysis serves two main purposes: (1) to measure how much influence each parameter has on the model output, and (2) to evaluate the potential effects of poor parameter estimates or weak assumptions (Caswell1989). Through a sensitivity analysis, we can ascertain the robustness of our results and judge how much confidence we should have in our conclusions.

The inputs to the reserve selection algorithm are explained in Appendices 9 and 10. The input with the greatest uncertainty is the suitability index. The suitability index was not a statistical model—variable selection and parameter estimates for the index were based on professional judgment. For this reason, the sensitivity analysis focused on the index. The methods for the sensitivity analysis are thoroughly explained in Appendix 18.

5.2 Methods

5.2.1 Irreplaceability

Irreplaceability is an index that indicates the relative conservation value of a place. Irreplaceability has been defined a number of different ways (Pressey et al. 1994; Ferrier et al. 2000; Noss et al. 2002; Leslie et al. 2003; Stewart et al. 2003); however, the original operational definition was given by Pressey et al. (1994) who defined it as the percentage of alternative reserve systems in which a site occurs. Following this definition, Andelman and Willig (2002) and Leslie et al. (2003) each exploited the stochastic nature of the simulated annealing algorithm to calculate an irreplaceability index. The index of Andelman and Willig (2002) was

$$I_j = (1/n) \sum_{i=1}^{n} s_i \qquad (1)$$

where *I* is relative irreplaceability, n is the number of solutions, and si is a binary variable that equals 1 when AU_j is selected but 0 otherwise. I_j have values between 0 and 1, and are obtained from running the simulated annealing algorithm n times at a single representation level.

Irreplaceability is a function of the desired representation level (Pressey et al. 1994; Warman et al. 2004). Changing the representation level for target species often changes the number of AUs needed for the solution. For instance, low representation levels typically yield a small number of AUs with high irreplaceability and many AUs with zero irreplaceability, but as the representation level increases, some AUs attain higher irreplaceability values. The fact that some AUs go from zero irreplaceability to a positive irreplaceability demonstrates that Willig and Andelman's index is somewhat misleading; at low representation levels, some AUs are shown to have no value for biodiversity conservation when they actually do. We created an index for relative irreplaceability that addresses this shortcoming. Our global irreplaceability index for AUj was defined as

$$G_j = (1/m) \sum_{k=1}^{m} I_{jk} \qquad (2)$$

where I_{jk} are relative irreplaceability values as defined in equation (2), and m is the number of representation levels used in the site selection algorithm. G_j have values between 0 and 1. Each I_{jk} is relative irreplaceability at a particular representation level. We ran MARXAN at 10 representation levels for coarse- and fine-filter targets. At the highest representation level, nearly all AUs attained a positive irreplaceability.

5.2.2 Conservation Utility

We extended upon the concept of irreplaceability with conservation utility, a term coined by Rumsey et al. (2004). Conservation utility is defined by equation (2), but the optimization algorithm is run with the AU costs incorporating a suitability index. To generate irreplaceability, AU "cost" equals the AU area. To create a map of conservation utility values, AU "cost" reflects practical aspects of conservation—current land uses, current management practices, habitat condition, etc. (see Chapter 4.0). In effect, conservation utility is a function of both biodiversity value and the likelihood of successful conservation.

5.2.3 Representation Levels

Each representation level corresponds to a different degree of risk for species extinction. Although we cannot estimate the actual degree of risk, we do know that risk is not a linear function of representation. It is roughly logarithmic.

Coarse-filter

We based the assumption that there is a logarithmic relationship between the risk of species extinction and the amount of habitat on the species-area curve. The species-area curve is arguably the most thoroughly established quantitative relationship in all of ecology (Conner and McCoy 1979; Rosenzweig 1995). The curve is defined by the equation $S = cA^z$, where S is the number of species in a particular area, A is the given area, and c and z are constants. The equation says that the number of species (S) found in a particular area increases as the habitat area (A) increases. The parameter z takes on a wide range of values depending on the taxa, region of the earth, and landscape setting of the study. Most values lie between 0.15 and 0.35 (Wilson 1992). An oft cited rule-of-thumb for the z's value is called Darlington's Rule (MacArthur and Wilson 1967; Morrison et al. 1998). The rule states that a doubling of species occurs for every 10-fold increase in area, hence z = log(2) or 0.301. We used this relationship to derive representation levels that roughly correspond to equal increments of biodiversity—i.e., each increase in coarse-filter area captured an additional 10% of species.

Fine-filter

Fine-filter representation levels specify the number of species occurrences to be captured within a set of conservation areas. The relationship between species survival and number of isolated populations is also a power function:

$$\text{Species Persistence Probability} = \quad 1 - [1 - pr(P)]^n$$

where pr(P) is the persistence probability of each isolated population, and n is the number of populations. This equation says, in effect, that the first population (i.e., occurrence) is more important than the second population and much more important than the tenth population. According to this relationship, if we want representation levels to correspond to equal degrees of risk, then fine-filter representation levels should not increase linearly but logarithmically. However, the above equation will not work for our purposes. We do not know pr(P), and it is not equal across all populations.

Luckily, other relationships were available to us. The Natural Heritage Programs use many criteria to determine G and S ranks. These criteria indicate the degree of imperilment—i.e., the risk of extinction. One such criterion relates the number of occurrences to degree of imperilment (Table A16.2, Appendix 16; Master et al. 2003)[2]. This system expresses the idea that the first 5 occurrences make about the same contribution toward species rank as the next 21–80 occurrences. If we assume equal imperilment intervals and equate A, B, C (a nominal scale) with 1, 2, 3 (an ordinal scale), then the relationship in Table A16.2 can be modeled as a power function. We used the function to interpolate between 1, 2, and 3 to yield multiple regularly spaced steps for the fine-filter levels. We did this to give 10 representation levels—the same number as for the coarse-filter.

5.2.4 Sensitivity Analysis

We explored sensitivity to the suitability index by altering the index's parameter values, running the selection algorithm with the new index, and then quantifying the resulting changes in the conservation utility map. Recall that the suitability index equation is a weighted linear combination of factors:

$$\text{Suitability} = A * \text{management status} + B * \%\ \text{converted land} + C * \text{road density} + \\ D * \%\ \text{urban growth area} + E * \text{fire condition class}$$

where A + B + C + D + E = 1, and management status, % converted land, road density, % urban growth area, and fire condition class were each normalized to a maximum value of 1. Also, recall that MARXAN tries to minimize the "cost" of AUs. Therefore, the suitability index is actually formulated as an "unsuitability" index.

The values for parameters A, B, C, D and E were determined by averaging expert opinion using the Analytic Hierarchy Process (Saaty 1980). Each parameter was changed by +0.2, an amount that we thought might reflect moderately different opinions regarding the importance of each factor in the suitability index. After changing a parameter value, the other parameters were adjusted so that they all still summed to 1. Only the suitability index parameters were changed; none of the other inputs to the selection algorithm used to produce the original utility map were changed. We changed only one parameter at a time, and hence, did not investigate interactions between or among index parameters.

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[2] Table A16.2 is a modification of the older system (Master 1991) for species ranking, where G1/S1 equaled 1–5 occurrences, G2/S2 equaled 16–20 occurrences, and G3/S3 equaled 21–100 occurrences.

Resulting changes in the algorithm's output were quantified several ways. First, three similarity measures were calculated to compare the conservation utility maps generated: mean absolute difference in utility, Bray-Curtis similarity measure, and Spearman rank correlation (Krebs 1999). The Bray-Curtis similarity measure normalizes the sum absolute difference to a scale from 0 to 1. Hence, mean absolute difference and the Bray-Curtis similarity measure give the same result but on different scales. Because utility will be used for prioritizing AUs, the rank correlation is particularly informative. Rank correlation tells us how the relative AU priorities change in response to changes in the suitability index. Because we were interested in prioritizing AUs, we also calculated the mean absolute difference in rank.

5.3 Results

5.3.1 Terrestrial Analysis

The irreplaceability and utility maps for the terrestrial analysis are shown in Maps 14 and 15. The categories on these maps correspond to deciles. That is, the statistical distribution of utility and irreplaceability scores were each divided into 10% quantiles. The decile map depicts where the AUs with a selection frequency (or score) in the top 10 or 20% of all AUs are located. Scores at the 90th percentile were 77 for irreplaceability and 73 for utility. The percentage of AUs with a score greater than 90 was 3.8 % and 3.9 % for irreplaceability and utility, respectively (Figure A16.1).

AUs with scores equal to 100 are those selected in every replicate at every representation level— 2.5% had irreplaceability equal to 100, 2.6 % had utility equal to 100, and 2.3 % AUs had both scores equal to 100 (Table 5.1).

At the lowest representation level, the best solutions for irreplaceability and utility consisted of 6.0% and 6.6% of AUs, respectively. Scores greater than 90 were attained by 55% of AUs in both the irreplaceability best solution and the utility best solution, which demonstrates that some options existed for meeting the lowest representation level. That is, rare targets could only be captured at high scoring AUs, but there were many different AU combinations that could satisfy the minimum dynamic area requirement of ecological systems.

Table 5.1. Percentage of AUs with High Selection Frequencies for Both Terrestrial and Freshwater Analyses

Portfolio	Number of AUs	Selection Frequency	Irreplaceability (%)	Utility (%)	Both (%)
Terrestrial	19210	100 %	2.5	2.6	2.3
		≥ 95%	3.1	3.3	2.8
		≥ 90 %	4.0	4.4	3.4
Freshwater	4307	100 %	0.9	1.2	0.9
		≥ 95%	1.2	3.8	1.1
		≥ 90 %	2.6	6.6	1.9

5.3.2 Freshwater Analysis

The irreplaceability and utility maps for the freshwater only analysis are shown in Maps 16 and 17. The utility and irreplaceability scores are displayed two ways: (1) the distribution of values are divided into deciles (10% quantiles); and (2) the range of values are divided into 10 equal intervals. One decile contains 430 AUs. The number of AUs with a score greater than 90 was 119 (2.6%) and 301 (6.6%) for irreplaceability and utility, respectively (Figure A16.1 in Appendix 16). Forty-three AUs (0.9%) had an irreplaceability score of 100, 55 (1.2 %) had a utility score of 100, and 41 AUs (0.9%) had both scores equal to 100 (Table 5.1).

At the lowest representation level (10% of the current amount of coarse-and fine-filter targets), the best solutions for irreplaceability and utility consisted of 297 and 344 AUs, respectively. Perfect scores were attained by 31% of the irreplaceability best solution and 13% of the utility best solution, which demonstrates considerable flexibility at the lowest representation level. That is, the solution was not greatly affected by the location of rare targets.

5.3.3 Sensitivity Analysis

Changes to parameters A, C, and E, which reflect the influence of management status, road density, and fire condition class, respectively, had approximately the same effect on conservation utility values. Changes to these three parameters had a greater effect than parameters B and D. Changes to A, C, and E resulted in approximately the same values for mean absolute difference, the Bray-Curtis similarity measure, and Spearman rank correlation. (Figures A16.2 and A16.3). Changes to parameters B and D also had approximately the same effect on similarity measures. For changes to all parameters, the null hypothesis was accepted for all similarity measures. That is, none of the changes to index parameters resulted in significant changes to the overall utility map.

According to the similarity measures, there was little overall difference between the original and altered utility maps. However, many individual AUs did change and some showed statistically significant changes in utility (Figure A16.4). When A, C, or E were changed by 0.2, about 86– 87% of AUs changed utility score, but only about 17–21% had a statistically significant change. Utility scores were much less sensitive to changes in parameters B or D.

5.4 Discussion

How should our irreplaceability and conservation utility indices be interpreted? These indices were constructed by running MARXAN at 10 representation levels. The first level captured a very small amount of each target, and the last level captured everything—i.e., all known occurrences of all targets. Consider the first representation level as the amount of biodiversity to be captured in an initial set of reserves, the second level as an additional amount to be captured by an enlarged set of reserves, the third level as an even greater additional amount, and so on. At each level, MARXAN's output indicates the relative necessity of each AU for efficiently capturing that particular amount of biodiversity. When the outputs from each level are summed, the result specifies the most efficient sequence of AU protection that will eventually represent all biodiversity. The sequence in which AUs should be protected is one way to gauge their relative importance. AUs that have the highest irreplaceability or utility scores should be protected first, and therefore, are the most important AUs for biodiversity conservation.

The MARXAN algorithm generates a set of AUs corresponding to a local minimum of the objective function (Appendix 8). AUs are included in a solution because they serve to minimize the objective function. Therefore, AUs with high irreplaceability or high utility scores are those that (1) contain one or more rare targets and/or (2) contain a large number of target occurrences. High utility scores are also attained by AUs with low relative cost. AUs with scores of 100 are those that were selected in every replicate at every representation level. To be chosen in every replicate, the AU must be unique. That is, the

AU contained target occurrences that were found in no other AU, contained a substantially larger number of occurrences than other AUs, or contained targets and had a substantially lower cost than other AUs.

Irreplaceability and utility scores in the Okanagan Ecoregion exhibit abrupt changes at the international border—a much higher proportion of AUs in the British Columbian portion scored greater than 95 relative to Washington. There are two reasons for this, one proximal and one ultimate. First, the proximal reason is data density bias. Government and non-governmental organizations have conducted more plant and wildlife surveys on the Canadian side of the border. Hence, data density in British Columbia is much higher than in Washington; consequently, imperiled species appear to be more abundant on the Canadian side. Second, the ultimate reason is the national significance of the Okanagan valley. In Canada, the Okanagan valley is widely acknowledged as a biodiversity hotspot, and relative to the rest of Canada, it is. In the United States, the Okanogan valley is not considered to be nationally significant; consequently, government and non-governmental organizations have not directed resources for field inventory in this area. An investment in plant and animal surveys on the Washington side of the ecoregion might reveal species richness and rarity equal to that in British Columbia.

Utility and irreplaceability scores are different ways to prioritize places for conservation. Irreplaceability has been the most commonly used index (Andelman and Willig 2002; Noss et al. 2002; Leslie et al. 2003; Stewart et al. 2003), and it assumes that land area is the sole consideration for efficient conservation. Utility incorporates other factors that can affect efficient conservation, such as land management status and current condition. In our analysis, many AUs attained scores of 100 for both utility and irreplaceability. These results demonstrate that for scores at or near 100, the cost had little influence on selection frequency, and that occurrence data drove the results. More importantly, it demonstrated that the results are robust. Under two different assumptions about efficiency (area vs. suitability), the highest priority AUs were very similar.

Utility and irreplaceability scores were significantly different for many individual AUs at the middle and low end of the utility score range (see Appendix 16, Figure A16.2). This is useful information for prioritization. AUs at the low end of utility (or irreplaceability) typically are unremarkable in terms of biodiversity value. They contribute habitat or target occurrences, but they are interchangeable with other AUs. For these AUs, prioritizing on the basis of suitability rather than biodiversity value makes most sense. If an AU can be distinguished from other AUs because conservation there will be cheaper or more successful, then that AU should be a higher priority for action. For these AUs, the utility score should be used for prioritization.

The primary conclusion of the sensitivity analysis is that AU utility and rank vary in response to changes in the suitability index. Similarity measures that compare “before” and “after” utility maps of the entire ecoregion indicate that the overall map is relatively insensitive to changes in suitability index parameters. That is, the average change over all AUs is small. However, the utility and rank of many AUs do change, and some exhibit significant changes. The number of AUs that change significantly depends of which index parameter is changed and the amount of change to that parameter.

We investigated the sensitivity of the utility map to changes in the suitability index because of our uncertainty about the index. The variable selection and parameter estimates for the index were based on professional judgment. The results of the sensitivity analysis have two implications for conservation planning. First, highest priority AUs (approximately ranks 1 through 10; the top 3% AUs) are rather robust to changes in the suitability index. Therefore, regardless of the uncertainties in the suitability index, we can be confident about the most highly ranked AUs. These AUs were selected mainly for their relative biological value, not relative suitability. For similar reasons, the lowest ranked AUs (rank less than about 100), tend to be robust to changes in the suitability index—they maintain a low rank because they have relatively little biological value. Second, the utility of moderately ranked AUs (rank less than 10 and greater than 100; about 12% of AUs), is sensitive to changes in the suitability index. When choosing among AUs of moderate rank, we must explore how our assumptions about suitability affect rank. This is detailed in Appendix 18.

Chapter 6 – Portfolio of Conservation Areas

This chapter presents the development of the conservation portfolio and the results of the assessment. A conservation portfolio is a set of places where resources should be directed for the conservation of biodiversity. The conservation areas that make up the portfolio are summarized and the degree to which the portfolio represents fine- and coarse-filter targets is discussed. Alternative conservation portfolios reflecting different conservation goals for targets are reviewed.

6.1 Portfolio Development Process

Successful conservation will entail choices about where we should and should not expend limited resources (Ando et al. 1998; Pressey and Cowling 2001). Portfolio creation is a major step toward making informed choices about where conservation areas or reserves should be located. Selecting a set of sites that efficiently capture multiple occurrences of hundreds of targets from thousands of potential sites is a task that cannot be accomplished by expert judgment alone. For this reason, we used the optimal reserve selection algorithm, MARXAN (see Appendix 9 for in-depth description).

The portfolio creation process for the Okanagan Ecoregion occurred on two parallel tracks specific to two environmental realms—terrestrial and freshwater—that resulted in two portfolios (Maps 18 and 20). Portfolio creation was an iterative process that balanced the use of the optimal reserve selection algorithm with expert knowledge about important places for biodiversity conservation.

6.1.1 Terrestrial Process

The terrestrial portfolio identified a set of assessment units (AUs) that met conservation goals for terrestrial conservation targets in a way that maximized portfolio suitability (Map 18). Terrestrial conservation targets included coarse-filter targets such as terrestrial ecological systems and fine-filter targets such as rare plants, rare animals and rare communities (Chapter 3.0).

MARXAN analysis was completed and the resultant selected areas were used to create groups of AUs that would become terrestrial priority conservation areas.

6.1.2 Freshwater Process

The assessment of freshwater biodiversity used a different set of geographies than the ecoregion. It used ecological drainage units (EDUs) to define the analysis area, and these EDUs overlap or connect with ecoregion boundaries (Map 4 and Section 1.3.2). The freshwater portfolio was also developed using MARXAN. The freshwater portfolio identified a set of AUs that met conservation goals for freshwater conservation targets in a way that maximized portfolio suitability (Map 20). Freshwater conservation targets included coarse-filter targets such as freshwater ecological systems and fine-filter targets such as rare plants, rare animals and rare fishes.

6.2 Conservation Goals

Both the terrestrial and freshwater portfolios were created using conservation goals that specified a given number and distribution of populations (for species) and areas (for habitats) needed to sustain biodiversity in the ecoregion (for terrestrial) or ecological drainage unit (for freshwater) over the long term. Targets and goals summaries are listed in Appendix 5; setting goals is discussed in Appendix 6.

6.3 Summary of Portfolios

6.3.1 Portfolio Size and Distribution

The terrestrial portfolio, shown in Map 22, covers 3,093,000 ha (7,642,969 ac) or 32 % of the Okanagan Ecoregion. It includes a total of 137 priority conservation areas: 83 are entirely within British Columbia, 47 are entirely in Washington. Seven PCAs are shared between British Columbia and Washington. They range in size from 500 ha (i.e., 1 hexagon) to landscapes of 211,500 ha (522,600 ac).

Due to higher suitability/lower conservation costs, most conservation areas selected in the portfolio tend to build on to existing parks and protected areas. For example, the Cathedral (#75) and Cascades (# 81 and 72) PCAs encompass the majority of Cathedral and Manning provincial parks, and the Stein-Mehatl-Nahatlatch ((#43) and Spruce-Tyaughton (#8) PCAs encompass parts of Stein Valley, Mehatl Creek, Nahatlach, and Big Creek provincial parks. In Washington, the Pasayten-Upper Chelan (#93) and Colville (#94) PCAs encompass large portions of federal Forest Service lands. Despite low suitability/high cost, some PCAs were chosen in the area around Spokane (PCA # 132—Spokane, #136—Riverside, and #125—Little Blue Grouse). A quick overlay of the underlying data shows that it is reasonable to assume that these areas were partially chosen for the fine-filter target occurrences that occur there and could not be found elsewhere in the ecoregion. Interestingly, large areas of private land are also captured in British Columbia despite the high cost to the MARXAN model of including them in the portfolio. This is partly explained by the fact that much of the grassland ecosystems occur on private lands. This does not appear to be the case in Washington where most private land was avoided by MARXAN. Most of the South Okanagan in British Columbia and its extension into Washington is captured in the portfolio. As previously mentioned, this area is a national biological hotspot in Canada. Despite some higher suitability index scores along the river corridors running north-south, the biological importance of this area forces the MARXAN algorithm to select areas in the South Okanagan and into north-central Washington. Although the north-western portion of the ecoregion, the area west of Lillooet and Lytton, is generally high suitability/low cost, surprisingly not very much of the area is selected as PCAs. This may in part be due to the paucity of fine-filter data for this area relative to other parts of the ecoregion such as the South Okanagan. There are several transboundary PCAs that connect areas in British Columbia and Washington.

The freshwater portfolio includes 785 watersheds, totalling 9,173,851 ha (22,669,080 ac) and equalling 33% of the area contained in the four EDUs analyzed. The freshwater portfolio was aggregated and delineated as 135 PCAs for watersheds that intersected or were adjacent to the ecoregion (Map 23). The freshwater portfolio was reviewed by freshwater experts who added and deleted assessment units. A number of watersheds were added to the portfolio based on drainage network connectivity.

There are 113 delineated freshwater PCAs fully or partially in the Okanagan Ecoregion and covering 3,301,359 ha (8,157,835 ac) or 34% of the ecoregion. Of these, 73 are entirely within British Columbia, 38 are entirely in Washington. Two PCAs are shared between British Columbia and Washington. They range in size from partial watersheds of 82 ha (202 ac) to freshwater systems of 195,266 ha (482,513 ac).

The freshwater portfolio follows a similar pattern as the terrestrial portfolio in that most of the existing parks and protected areas are captured. The freshwater portfolio connects systems from Salmon Arm, British Columbia down through Okanagan, Skaha, and Osoyoos Lakes and the Okanagan River down to Tonasket, Washington. These watersheds are all rated as having high conservation value and high vulnerability. Other high value/high vulnerability watersheds are captured in the Omak Lake and Okanagan River drainages in Washington (PCA #114 and #109) and Methow River watersheds (PCA #104—Methow River and #122— Indian Dan). Most of the Kettle River system is also captured in the portfolio. Although there is a high cost/low suitability to capturing any freshwater systems in the Spokane area, the MARXAN model still captures watersheds in the Spokane River drainage (PCA #119—Eloika Lake, #120—Little Spokane, and #124—Spokane River-Deadman). Interestingly, these watersheds are rated from low conservation value/low vulnerability (PCA #119) to medium low conservation value/medium high vulnerability.

6.3.2 Land Ownership and Protected Status

The patterns of land ownership and management within the terrestrial portfolio of conservation areas are shown in Table 6.1. Public lands, both federal and state/provincial, make up the majority of the terrestrial portfolio: 61% of the portfolio is provincial public land, while 15% is U.S. federal land and 3% is state land. Private lands encompass approximately 13% of the PCAs, and tribal/First Nations lands represent 7% of the portfolio.

Approximately 23% of the terrestrial portfolio (12% of the ecoregion) is currently in designated protected areas (Table 6.2). Map 23 shows the area of overlap between the terrestrial portfolio and GAP 1 or GAP 2 areas. GAP definitions can be found in Appendix 1.

The patterns of land ownership and management within the freshwater portfolio of conservation areas are shown in Table 6.3. Public lands, both federal and state/provincial, make up the majority of the freshwater portfolio: 65% of the portfolio is provincial public land, while 9% is U.S. federal land and 2% is state land. Private lands encompass approximately 18% of the freshwater portfolio and tribal/First Nations lands encompass 6% of the portfolio.

Approximately 14% of the freshwater portfolio (to the extent of the EDUs in the ecoregion) is currently in designated protected areas (Table 6.4) Map 25 shows the area of overlap between the freshwater portfolio and GAP 1 or GAP 2 areas. GAP definitions can be found in Appendix 1.

Table 6.1. Land Ownership within the Terrestrial Portfolio

Jurisdiction	% in Portfolio	Hectares (Acres) in Portfolio	% in Ecoregion	Hectares (Acres) in Ecoregion
British Columbia				
Provincial Crown Land	38.3%	1,185,421 (2,929,239)	49.9%	4,793,157 (11,844,150)
Private Land	6.6%	203,168 (502,040)	7.1%	683,115 (1,688,013)
Provincial Park / Protected Area	14.1%	436,797 (1,079,350)	6.5%	622,977 (1,539,410)
Tree Farm License (Crown Land)	8.6%	267,343 (660,620)	3.4%	330,223 (816,000)
Indian Reserve	2.1%	63,904 (157,910)	1.7%	163,639 (404,361)
Conservation Trust Land	0.1%	3,529 (8,720)	0.1%	6,333 (15,649)
Federal Land	0.1%	1,755 (4,337)	0.0%	1,755 (4,337)

Jurisdiction	% in Portfolio	Hectares (Acres) in Portfolio	% in Ecoregion	Hectares (Acres) in Ecoregion
Washington—Federal Lands				
Forest Service: National Forest	9.6%	296,424 (732,480)	7.3%	700,471 (1,730,901)
Forest Service: Wilderness	3.6%	110,968 (274,208)	2.6%	246,004 (607,890)
National Park Service	0.7%	21,398 (52,877)	0.5%	46,119 (113,962)
Other Federal	0.3%	8,151 (20,142)	0.4%	41,244 (101,916)
Bureau of Land Management	0.5%	14,455 (35,720)	0.4%	40,920 (101,115)
Fish and Wildlife Service	0.4%	12,259 (30,294)	0.2%	17,117 (42,297)
Washington—State Lands				
Department of Natural Resources: trust lands	2.2%	67,553 (166,928)	1.9%	186,083 (459,821)
Department of Fish and Wildlife	0.6%	19,166 (47,359)	0.3%	28,237 (69,775)
Department of Natural Resources: NRCA and NAP	0.1%	5,224 (12,908)	0.1%	12,079 (29,847)
Parks and Recreation	0.1%	2,816 (6,958)	0.1%	5,303 (13,103)
Other State	0.0%		0.0%	706 (1,744)
Washington—Other Lands				
Private Land	6.8%	211,639 (522,971)	11.2%	1,073,561 (2,652,827)
Tribal Land	5.2%	159,839 (394,970)	5.9%	568,321 (1,404,352)
County or Municipal	0.0%	229 (567)	0.0%	4,077 (10,074)
Conservation Land (TNC/Other)	0.0%	960 (2,373)	0.0%	1,827 (4,514)

Table 6.2. Area of GAP* 1 to 4 Status Lands within the Terrestrial Portfolio.

	GAP 1	GAP 2	GAP 3	GAP 4	Total
Ecoregion Total (ha [ac])	846,459 (2,091,646)	294,306 (727,246)	5,995,740 (14,815,796)	2,468,495 (6,099,784)	9,605,000 (23,734,472)
% of Ecoregion	9%	3%	62%	26%	100%
Terrestrial Portfolio (ha [ac])	546,475 (1,350,370)	161,198 (398,330)	1,786,690 (4,415,007)	598,636 (1,479,262)	3,093,000 (7,642,969)
% of Portfolio	18%	5%	58%	19%	100%
BC Portion of Terrestrial Portfolio (ha [ac])	418,333 (1,033,723)	35,567 (87,889)	1,434,589 (3,544,946)	273,316 (675,380)	2,161,805 (5,341,937)
% of BC Portion	19%	2%	66%	13%	100%

	GAP 1	GAP 2	GAP 3	GAP 4	Total
WA Portion of Terrestrial Portfolio (ha [ac])	128,143 (316,647)	125,631 (310,441)	352,101 (870,061)	325,320 (803,882)	931,194 (2,301,031)
% of WA Portion	14%	13%	38%	35%	100%

* GAP status definitions are provided in Appendix 1

Table 6.3. Land Ownership within the Freshwater Portfolio

Jurisdiction	% in Portfolio	Hectares (Acres) in Portfolio	% in Ecoregion	Hectares (Acres) in Ecoregion *
British Columbia				
Provincial Crown Land	50.5%	1,667,711 (4,121,005)	49.0%	4,295,705 (10,614,919)
Private Land	9.2%	303,808 (750,727)	7.9%	696,110 (1,720,126)
Provincial Park or Protected Area	9.6%	316,775 (782,767)	5.8%	510,835 (1,262,300)
Tree Farm License (Crown Land)	4.7%	154,252 (381,166)	3.6%	311,822 (770,529)
Indian Reserve	2.4%	79,233 (195,790)	1.8%	156,824 (387,520)
Conservation Trust Land	0.2%	5,380 (13,294)	0.1%	6,333 (15,649)
Federal Land	0.1%	1,755 (4,337)	0.0%	1,755 (4,337)
Washington—Federal Lands				
Forest Service: National Forest	6.7%	221,307 (546,860)	7.6%	670,489 (1,656,813)
Forest Service: Wilderness	1.8%	59,319 (146,581)	2.5%	219,810 (543,163)
Other Federal	0.2%	7,874 (19,457)	0.5%	41,212 (101,838)
Bureau of Land Management	0.5%	15,583 (38,508)	0.5%	40,869 (100,990)
National Park Service	0.0%	0 (0)	0.4%	31,040 (76,703)
Fish and Wildlife Service	0.0%	0 (0)	0.2%	17,117 (42,297)
Washington—State Lands				
Department of Natural Resources: trust lands	1.5%	50,173 (123,981)	2.1%	184,311 (455,442)
Department of Fish and Wildlife	0.2%	7,767 (19,193)	0.3%	28,237 (69,775)
Department of Natural Resources: NRCA and NAP	0.1%	1,878 (4,639)	0.1%	11,748 (29.030)
Parks and Recreation	0.1%	3,761 (9,295)	0.1%	4,941 (12,210)
Other State	0.0%	0 (0)	0.0%	0 (0)

Jurisdiction	% in Portfolio	Hectares (Acres) in Portfolio	% in Ecoregion	Hectares (Acres) in Ecoregion *
Washington—Other Lands				
Private Land	8.7%	286,200 (707,215)	11.1%	969,754 (2,396,315)
Tribal Land	3.5%	116,620 (288,174)	6.5%	568,321 (1,404,352)
Conservation Land (TNC/Other)	0.0%	313 (774)	0.0%	1,827 (4,514)
County or Municipal	0.0%	1,620 (4,004)	0.0%	1,805 (4,461)

* Portion of ecoregion covered by a freshwater analysis units

Table 6.4. Area of GAP* 1 to 4 Status Lands within the Freshwater Portfolio.

	GAP 1	GAP 2	GAP 3	GAP 4	TOTAL
EDU's in Ecoregion (ha [ac])	707,861 (1,749,164)	279,527 (690,726)	5,444,474 (13,453,588)	2,339,121 (5,780,094)	8,770,983 (21,673,572)
% of EDUS in Ecoregion	8%	3%	62%	27%	100%
Freshwater Portfolio in Ecoregion (ha [ac])	357,583 (883,608)	107,457 (265,532)	2,069,943 (5,114,940)	766,375 (1,893,755)	3,301,359 (8,157,835)
% of Freshwater Portfolio in Ecoregion	11%	3%	63%	23%	100%
BC portion of Freshwater Portfolio in Ecoregion (ha [ac])	296,331 (732,250)	35,847 (88,580)	1,813,764 (4,481,907)	383,001 (946,416)	2,528,943 (6,249,154)
% of BC portion of Freshwater Portfolio in Ecoregion	12%	1%	72%	15%	100%
WA portion of Freshwater Portfolio in Ecoregion (ha [ac])	61,252 (151,358)	71,610 (176,952)	256,179 (633,032)	383,374 (947,338)	772,416 (1,908,681)
% of WA portion of Freshwater Portfolio in Ecoregion	8%	9%	33%	50%	100%

* GAP status definitions are provided in Appendix 1

6.3 Target Representation and Conservation Goals

Major ecological gradients and variability are well represented across the portfolio of conservation areas as evidenced by the high degree of representation of ecological systems and the ecological variables used to characterize them (vegetation, elevation, landform, geologic substrate, etc.).

The stated conservation goals were met for 91% of the terrestrial ecological systems and 6% of the terrestrial fine filter species. For targets in the terrestrial species groups, the conservation goals were met for 100% of the amphibians and reptiles, 47% of the birds, 8%

of the dragonflies, 70% of mammals, 8% of the vascular plants and none of the lepidopterans, mollusks and nonvascular plants (see Tables 6.5 and 6.6). Goals were not achieved for 175 fine-filter terrestrial targets and spatial data was not available for 48 of these.

The stated conservation goals were met for 77% of the freshwater ecological systems, and 60% of the species in the Middle Fraser EDU. The stated conservation goals were met for 55% of the freshwater ecological systems, and 58% of the species in the Okanagan EDU. The stated conservation goals were met for 68% of the freshwater ecological systems, and 52% of the species in the Thompson EDU. The stated conservation goals were met for 87% of the freshwater ecological systems, and 100% of the species in the Upper Fraser EDU. Targets were met for all salmon in all EDUs, but not met for insects-other, molluscs, reptiles or vascular plants in any EDU. Spatial data was not available for 23 freshwater fine filter targets in any EDU. Tables 6.7 and 6.8 provide a breakdown of targets met for each EDU. Table 6.9 provides information about the area and number of watershed in the freshwater portfolio by EDU.

A number of plants and rare plant communities have less than seven occurrences; therefore, the conservation goals for those species and communities could not be met until further inventories identify more occurrences. There were no documented occurrences or occurrence data were unsuitable for our terrestrial analyses for 15 animal, 32 vascular plant, 1 non-vascular plant and 54 plant association targets. Future work should focus on systematic inventory of conservation targets that lacked occurrence data (and representation in the portfolio) and targets with too few data to have their conservation goals met. With additional knowledge of target distributions and quality, we will further refine conservation goals for conservation targets.

The following tables summarize goal achievement by target type:

Table 6.5. Summary of Targets and Goal Performance for Okanagan Terrestrial Biological Groups

Biological Group	Number of Targets	Targets with Spatial Data	Targets Meeting Goals for Ecoregion	Percent Targets with Data Meeting Goals for Ecoregion	Targets Meeting Ecoregion Goals Meeting Distribution Goals	Percent Targets with Data Meeting Distribution Goals*
Amphibians	3	3	3	100%	3	100%
Birds	38	34	16	47%	9	56%
Dragonflies	12	12	1	8%	0	0%
Lepidopterans	16	12	0	0%	0	
Mammals **	22	20	14	70%	10	71%
Mollusks	5	2	0	0%	0	
Reptiles	7	5	5	100%	3	60%
Nonvascular Plants	11	10	0	0%	0	
Vascular Plants	106	74	6	8%	4	67%

* Distribution goals = meeting goals for all ecosections where target occurred

** Mountain goat and bighorn sheep in BC and WA counted as separate targets

Table 6.6. Summary of Targets and Goal Performance for Okanagan Terrestrial Ecological Systems

	Number of Systems Targets*	Targets Meeting Goals	Percent Targets with Data Meeting Goals for Ecoregion	Targets Meeting Ecoregion Goals Meeting Distribution Goals	Percent Targets Stratified by ELU Meeting Distribution Goals
Interior Transition Ranges	22	22	100%	22	100%
Thompson Okanagan Plateau	17	15	88%	15	100%
Northwestern Okanagan	17	15	88%	15	100%
Northern Cascade Ranges	22	20	91%	20	100%
Okanagan Highlands	16	14	88%	14	100%
	94	**86**	**91%**	**86**	

* Includes unique system/section combinations; does not include stratification by Ecological Land Unit (ELU). ELU stratification is distribution goals

Table 6.7. Summary of Targets and Goal Performance for Okanagan Freshwater Biological Groups

Biological Group by EDU	Number of Targets	Number of Targets with Spatial Data (with Goals) *	Number of Targets Meeting Conservation Goals	Percent of Targets Meeting Conservation Goals
Amphibians	9	4		
Middle Fraser		---**	---	---
Upper Fraser		---	---	---
Okanagan		4	4	100%
Thompson		2	0	0%
Birds	15	11		
Middle Fraser		6	1	17%
Upper Fraser		---	---	---
Okanagan		9	3	33%
Thompson		5	0	0%
Fish – Nonsalmonoid	18	16		
Middle Fraser		8	7	88%
Upper Fraser		5	5	100%
Okanagan		17	14	82%
Thompson		8	7	88%
Fish - Salmon	6	6		
Middle Fraser		4	4	100%
Upper Fraser		2	2	100%
Okanagan		2	2	100%
Thompson		4	4	100%

Biological Group by EDU	Number of Targets	Number of Targets with Spatial Data (with Goals) *	Number of Targets Meeting Conservation Goals	Percent of Targets Meeting Conservation Goals
Okanogan River Sockeye ESU		1	1	100%
Lake Wenatchee Sockeye ESU		1	1	100%
Columbia River OEU		2	2	100%
Fraser River OEU		2	2	100%
Puget Sound-Georgia Basin OEU		2	2	100%
EDT		3	3	100%
Insects - Dragonflies	13	9		
Middle Fraser		1	0	0%
Upper Fraser		---	---	---
Okanagan		9	4	44%
Thompson		---	---	---
Insects - Other	4	0		
Mammals	3	1		
Middle Fraser		---	---	---
Upper Fraser		---	---	---
Okanagan		1	1	100%
Thompson		1	0	0%
Mollusks	5	3		
Middle Fraser		---	---	---
Upper Fraser		---	---	---
Okanagan		3	0	0%
Thompson		---	---	---
Reptiles	1	1		
Middle Fraser		1	0	0%
Upper Fraser		---	---	---
Okanagan		1	0	0%
Thompson		1	0	0%

Biological Group by EDU	Number of Targets	Number of Targets with Spatial Data (with Goals) *	Number of Targets Meeting Conservation Goals	Percent of Targets Meeting Conservation Goals
Vascular Plants	2	2		
Middle Fraser		---	---	---
Upper Fraser		---	---	---
Okanagan		2	0	0%
Thompson		---	---	---

* Number of targets in the ecoregion only (does not include ecosection targets)
** Signifies no target species for that biological group in that EDU

Table 6.8. Summary of Targets and Goal Performance for Okanagan Freshwater Ecological Systems

Freshwater Systems by EDU	Number of Targets	Number of Targets with Spatial Data (i.e., with Goals)	Number of Targets Meeting Conservation Goals	Percent of Targets Meeting Conservation Goals
All systems	44			
Middle Fraser		43	33	77%
Upper Fraser		31	27	87%
Okanagan		33	18	55%
Thompson		41	28	68%

* Number of targets in the ecoregion only (does not include ecosection targets)

Table 6.9. Area and Number of Watersheds in the Freshwater Portfolio, by EDU, for Okanagan Freshwater Ecological Systems.

	Okanagan EDU	Thompson EDU	Middle Fraser EDU	Upper Fraser EDU
Total Area (ha [ac])	6,349,551 (15,690,082)	5,582,784 (13,795,360)	12,850,388 (31,754,000)	2,769,423 (6,843,393)
Area in Freshwater Portfolio (ha [ac])	2,005,405 (4,955,464)	1,939,415 (4,792,399)	4,187,240 (10,346,895)	1,041,791 (2,574,322)
Percent Area in Freshwater Portfolio	32%	35%	33%	38%
Total Number Watersheds	951	919	1964	473
NumberWatersheds in Freshwater Portfolio	185	184	322	94
Percent Watersheds in Freshwater Portfolio	19%	20%	16%	20%

6.5 Portfolio Integration Efforts and Portfolio Overlays

There is an underlying assumption in ecoregional assessment methodology. We want efficiency in selecting sites to reduce the cost of conservation, and minimizing portfolio area is one aspect of efficiency. This assumption also applies to the integration of the terrestrial and the freshwater portfolios. Ideally, integration between the portfolios would address common ecological functions, processes and biological elements that operate between them. However, we make no claims, even implicitly, regarding the integration between portfolios of these ecological factors.

In this assessment, we attempted to create an integrated portfolio by combining terrestrial and freshwater targets into one MARXAN run as described in Appendix 17. However, this presented several challenges. While the initial portfolio of selected sites was efficient in size at approximately 37% of the ecoregion, the sacrifices made to achieve this efficiency were not satisfactory.

Specifically, the goal of integration is to select areas of the highest-quality for the two portfolios to achieve a smaller spatial footprint. In our case, we found the process of integration to be exchanging too many high-quality sites for areas of marginal quality for the sake of a smaller footprint. During integration, we also had difficulty combining freshwater priority watersheds meaningfully within selected terrestrial hexagons, since watersheds and stream reaches would at times be selected in fragments. However, even before attempting integration, we could ascertain that with just 14% of the ecoregion overlapping between terrestrial and freshwater portfolios, it was clear that our intended integration method would result in a portfolio that, while efficient in spatial extent, would shift the selection away from important freshwater sites and important terrestrial sites to areas of lower value. This attempted integration did not achieve its intent, as it required too much compromise (too little area chosen, too many goals met in areas of marginal quality and too much fragmentation of freshwater priorities) than was acceptable by the Core Team.

The team discussed several methods for overcoming the lack of integration. This included alternate input parameters for the MARXAN model, including increased minimum dynamic area for stream networks, and using a hybrid cost index that favoured planning units selected in the separate portfolios. We also discussed using alternative methods, but the team decided that the small amount of overlap between the terrestrial and freshwater sites and the difference in the freshwater and terrestrial assessment units, made alternative methods just as likely to produce a suboptimal integrated portfolio. See Chapter 8.0 for further discussion. Future iterations of this assessment could produce a fully integrated portfolio.

6.5.1 Overlay of Freshwater and Terrestrial Portfolios

The terrestrial and freshwater portfolios were overlaid to show the total ecoregional area covered by the independent analyses. The area of overlap between the terrestrial and freshwater portfolios is relatively small – comprising only 14% of the ecoregion (1,341,400 ha/3,313,300 ac). Map 24 shows the overlay of the terrestrial and freshwater portfolios and the area of overlap. This does not represent an integrated portfolio, but the team determined it may be useful for the following reasons:

1) transparent - easy to identify why an area is selected
2) maintains the footprint of the expert-reviewed portfolios
3) neither portfolio is compromised
4) depicts where biodiversity values from each portfolio coincide

The overlapping areas may be further prioritized through the prioritization analyses of the freshwater and terrestrial portfolios (Chapter 5.0). Due to the need to practice freshwater conservation at the watershed scale and to address terrestrial conservation in the context of whole sites to incorporate areas large enough for natural disturbances, those referencing the area of overlap are advised to also consult the underlying freshwater and terrestrial sites.

This suite of sites collectively represents the biodiversity of the ecoregion. In addition to showing areas most important for terrestrial or freshwater species and natural systems, Map 24 also depicts areas of overlap where terrestrial and freshwater priorities can be found together.

The iterative nature of ecoregional assessments requires that we interpret results carefully. While the team compiled substantial new information, no amount of effort, within the timeframe of this project, could produce a “complete” dataset. We hope to clarify and fill information gaps over time, and to revisit/refine the portfolio as new information becomes available.

While these conservation areas were designed with knowledge of the area requirements of conservation targets, these areas do not specifically describe the lands and waters needed to maintain each target at that location. Site conservation planning is needed to determine what lands and waters are actually necessary to ensure conservation of the targets at any particular area. Also, because of the way in which portfolio conservation areas were assembled, it may be appropriate to join conservation areas at a later time. Similarly, it may be necessary to segregate individual conservation areas from larger ones. This refinement will be completed during later analyses that consider site-specific targets, threats, and goals. Thus the current boundaries are starting points for further analyses.

6.6 Alternative Portfolios

The size of the conservation portfolio is mainly determined by the goals—the larger the goals, the larger the portfolio. For this reason, goal setting is possibly the most critical step in creating a portfolio. We created three portfolios for this assessment for both the terrestrial (Map 19) and freshwater (Map 21) analyses.

The three alternative portfolios created for both the terrestrial and freshwater analyses represent different tolerances of risk to biodiversity loss, with the lower risk portfolio covering the largest geographic area and the higher risk the smallest. The three portfolios also are an acknowledgment of the uncertainty of how much is enough to conserve for the survival of biodiversity. Finally, the three portfolio levels illustrate that there are a range of policy options for biodiversity conservation. Due to our uncertainty, any portfolio’s absolute risk to the loss of biodiversity is unknown and the actual risk might be higher or lower than stated here.

6.6.1 Methods

The methods for developing alternate portfolio scenarios were essentially the same as those used in developing the terrestrial and freshwater portfolios.

Risk is related to the amount of habitat or the number of occurrences that are protected in the portfolio. Capturing more habitat and occurrences yields less risk. The goals for the lower risk and higher risk portfolios were based on the goals of the mid-risk portfolio. For higher risk, the goals were reduced. We multiplied all mid-risk coarse-filter goals by 0.6 and fine-filter goals by 0.5, but the goals could not be less than 1 for targets with occurrence goals. For the lower risk, the goals were increased. We multiplied mid-risk coarse-filter goals by 1.6 and fine-filter goals by 1.5, but the goals could not exceed the maximum available.

We created higher and lower risk alternative portfolios that were derived from the mid-risk alternative. The alternative portfolios are nested. That is, all the AUs in the higher risk portfolio belong to the mid-risk portfolio and all AUs in the mid-risk portfolio belong to the lower risk portfolio. MARXAN has a feature for locking AUs into or out of the optimal solution. To create a nested higher risk portfolio, we locked out all AUs that were not in the mid-risk portfolio. This limited the algorithm's selection space to only the mid-risk portfolio. To create a nested lower risk portfolio, we locked in all AUs that were in the mid-risk portfolio. Hence, the low-risk portfolio started with these locked-in AUs so the algorithm added more AUs to the mid-risk portfolio.

The site selection algorithm for both the lower risk and higher risk portfolios was run with the same target list (terrestrial, freshwater) and with the same boundary modifier and target penalty factors as those used for the mid-risk portfolio.

6.6.2 Results

The alternative portfolios for terrestrial and freshwater biodiversity are depicted on Maps 19 and 21. The terrestrial mid-risk portfolio included 32.2% of the hexagonal assessment units (Table 6.10). In contrast, the freshwater mid-risk portfolio included 18.2% of the watershed assessment units analyzed. However, the assessment units in the freshwater portfolio tend to be among the largest watersheds; consequently, the freshwater portfolio captured about 33.3% of the land area.

The number of AUs in the terrestrial higher risk portfolio was roughly 0.59 times the mid-risk portfolio (Table 6.10), and the number of AUs in the terrestrial lower risk portfolio was about 1.66 times the mid-risk portfolio. These ratios were roughly the same ratios used to alter the mid-risk coarse-filter goals. The same ratios for the freshwater alternatives were 0.65 and 1.56. Again, these ratios were about the same as those used to alter the mid-risk coarse-filter goals.

Table 6.10. Percent of all AUs Captured by Each of the Alternative Portfolios

Portfolio	**Percent of AUs Selected**			**Total AUs Available**
	Higher risk	Mid-risk	Lower risk	
Terrestrial*	19.1	32.2	53.6	19,210
Freshwater**	10.4	18.2	32.8	4,307

* Based on ecoregion boundary
** Based on four EDUs analyzed in the assessment

Table 6.11. Percent of Land Captured by Each of the Alternative Portfolios

(Hexagons were used for terrestrial portfolio, so values are the same as Table 6.1).

Portfolio	**Percent of Area Captured**			**Total Area Available (ha)**
	Higher risk	Mid-risk	Lower risk	
Terrestrial*	19.1	32.2	53.6	9,605,000
Freshwater**	21.4	33.3	52.0	27,552,000

* Based on ecoregion boundary
** Based on four EDUs analyzed in the assessment

6.7 Retrospective Analysis

We identified a number of species that, while of interest, were considered to be of less conservation concern or did not have data covering their entire habitat. Referred to as secondary targets (retro targets), most were included in the MARXAN analysis where spatial data were available, but had assigned goals of zero. With a zero goal, the MARXAN analysis would not actively try to capture any of these secondary targets but would report out on how many were incidentally captured in the portfolio. We reviewed the results and determined if secondary targets were adequately represented. If inadequately represented, we had the option of elevating the targets to primary status, where a goal would be assigned and the analysis re-run.

Similarly, a number of potential targets were considered, but ultimately rejected for inclusion in the primary or secondary target lists. Referred to as non-targets, some spatial data were incidentally collected and included in the MARXAN analysis. These species were treated in the same manner as secondary targets in the MARXAN analysis. Results of the retrospective analysis for each of the target groups are presented below.

6.7.1 Terrestrial Plant Associations

Plant association data were available only for Washington State and were provided by the Washington Natural Heritage Program. Of the 66 plant associations identified as targets, spatial data were available for 12 targets (32 occurrences). Of these, there are 6 targets (8 occurrences) represented in the portfolio.

6.7.2 Terrestrial Fine-filter Plants

All lichens for which we had spatial data were included as primary targets in the MARXAN analysis. Of the 332 vascular plants on the target list, 170 species were identified as secondary targets and 56 species of interest were not classified as a primary or secondary target. Table 6.12 identifies the number of secondary and non-targets and their relationship to the portfolio.

Table 6.12. Terrestrial Fine-filter Plant Secondary Targets and Non-targets

	Number of Targets with Data (total # targets)	Conservation Goal Achieved in Ecoregion	Targets with 100% of Occurrences in Portfolio	Targets with 30%–99% of Occurrences in Portfolio	Targets with No Occurrences in Portfolio
Secondary Targets	134 (170)	7	49	51	23
Non-targets	24 (56)	n/a	5	3	13

6.7.3 Terrestrial Fine-filter Animals

Of the 117 animal species on the fine-filter target list, 17 were identified as secondary targets. Table 6.13 identifies the number of secondary targets and their relationship to the portfolio.

Table 6.13. Terrestrial Fine-filter Animal Secondary Targets

	Number of Targets with Data (total # targets)	Conservation Goal Achieved in Ecoregion	Targets with 100% of Occurrences in Portfolio	Targets with 30%–99% of Occurrences in Portfolio	Targets with No Occurrences in Portfolio
Secondary Targets	11 (17)	3	5	5	0

6.7.4 Freshwater Fine-filter Targets

Of the 87 freshwater species on the target list, 28 species were identified as secondary targets and 11 species of interest were not classified as a primary or secondary target. Table 6.14 identifies the number of secondary and non-targets and their relationship to the portfolio.

Table 6.14. Freshwater Fine-filter Secondary Targets and Non-targets

	Number of Targets with Data (total # targets)	Conservation Goal Achieved in Ecoregion	Targets with 100% of Occurrences in Portfolio	Targets with 30%–99% of Occurrences in Portfolio	Targets with No Occurrences in Portfolio
Secondary Targets	18 (28)				
Middle Fraser EDU	3	1	0	2	0
Okanagan EDU	19	10	4	12	2
Thompson EDU	6	1	2	2	2
Non-targets	1 (11)	1	0	1	0

6.7.5 Grizzly Bear

Grizzly bear data were obtained from two sources. Much of the Northern Cascades Ranges Ecosection was covered by the North Cascades Grizzly Bear Recovery Zone from the Grizzly Bear Recovery Plan developed by the Interagency Grizzly Bear Committee[3]. The area covered by this data has been reduced through habitat modeling to include only core habitats, by buffering and removing roads, trails and developed areas. For the remainder of the ecoregion in British Columbia we used grizzly population units that are designated as Threatened by the BC Ministry of Environment.

Grizzly bear data were included in the MARXAN analysis as a fine-filter animal target whose goals were to be attained retrospectively rather than as a primary target. The amount of data used to represent grizzly bears was so great and the goals were so large (>40% of the area) that when grizzlies were used as a primary target their data skewed the entire portfolio toward grizzly bear recovery zones and population units (see Map 27) in an attempt to meet grizzly conservation goals. Consequently, making grizzly bears a secondary target allowed the site selection algorithm to select important sites for other conservation targets while also nearly meeting grizzly conservation goals in the process.

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[3] U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan; five-year revision draft. USDI Fish and Wildlife Service, Washington, DC.

A comparative analysis was made between the terrestrial portfolio and extent of grizzly recovery zone/population unit, which can be seen on Map 27. In total, grizzly habitat covers 2,626,305 ha (6,489,741 ac) of the ecoregion. This analysis shows that 33%, or 876,366 ha (3,183,718 ac), of the grizzly habitat falls within the terrestrial portfolio. The breakdown by ecosection is shown in Table 6.15.

Table 6.15. Grizzly Bear Habitat within the Terrestrial Portfolio

	Total Available (ha)	Total Captured (ha)	Target	% Captured
Okanagan Ecoregion	2,626,305	876,366	40% total	33%
Interior Transition Ranges Ecosection	1,288,405	355,257	40% total	28%
Thompson Okanagan Plateau Ecosection	26,015	2,251	40% total	9%
Central Okanagan Ecosection	317,625	85,501	40% total	27%
Northern Cascade Ranges Ecosection	967,278	425,166	67% total	44%
Okanagan Highlands Ecosection	25,982	8,191	40% total	32%

While the goal for grizzlies was to capture 40% of the area in threatened population units (for BC) or recovery zones (in WA), the terrestrial portfolio captured 33%. Although the 40% goal was not met for the ecoregion overall, it was exceeded (44%) in the North Cascade Ranges Ecosection, which contains the entire Washington recovery zone that lies within the ecoregion. Exceeding the 40% ecoregion goal for this ecosection is beneficial to grizzly bear conservation as it protects areas critical for bear recovery as well as areas that provide habitat connectivity throughout the North Cascades of Washington and British Columbia. While only 28% of the population unit within the Interior Transition Ranges was captured in the portfolio it identified a large amount (>355,000 ha, >876,850 ac) of bear habitat within the ecoregion and provides important habitat within a population unit and important connectivity within the North Cascades of British Columbia.

6.7.6 *Native Grasslands in British Columbia*

The Grasslands Conservation Council of British Columbia (GCC) mapped native grasslands for the entire province. This dataset was not included in the MARXAN analysis because it existed only for British Columbia and would have skewed the portfolio to British Columbia.

A comparative analysis was made between the terrestrial portfolio and extent of native grasslands in British Columbia. Native grasslands cover just over 400,000 ha (215,600 ac) of the British Columbia portion of the ecoregion. This analysis shows that 53% of the native grasslands mapped by the GCC fall within the terrestrial portfolio. Map 30 shows the native grasslands in British Columbia in comparison with the portfolio.

The GCC has categorized native grasslands according to four different types as shown in Table 6.16.

Table 6.16. Native Grasslands within the Terrestrial Portfolio

Grassland Type	Total Area in Ecoregion (ha)	Area Captured in Terrestrial Portfolio (ha)	Percent Area Captured in Terrestrial Portfolio
Open grasslands	373,003	199,085	53%
Open dry forest adjacent to open grasslands	14,473	7929	55%
Open dry forest in NDT4*	10,930	3436	31%
Burned forest in PP or BG BGC zone**	5047	3459	69%
Totals	**403,453**	**213,908**	**53%**

* Natural Disturbance Type 4

** Ponderosa Pine or Bunchgrass Biogeoclimatic zone

Chaper 7 – Prioritization of Portfolios

7.1 Introduction

Ecoregional assessments typically identify a large number of potential conservation areas.(Rumsey et al. 2003; Floberg et al. 2004). By virtue of its selection, each conservation area is worthy of action. However not all, areas are of equal conservation value or have the same degree of urgency in the need for action. The challenge of conserving all of the identified areas in an ecoregional assessment is overwhelming if not impossible for any single organization, but through establishing near-term priorities, resources can be focused upon an ambitious yet practical set of conservation areas, whose conservation may be within the collective reach of the conservation community as a whole or agency. Through a practical approach to priority setting, this challenge can be focused on an ambitious set of objectives, which if undertaken by the conservation community as a whole, is within our collective reach (Groves 2003).

These conservation portfolios are intended to serve as the conservation blueprint for protection of the ecoregion's native biodiversity. The prioritization of potential conservation areas is an essential element of conservation planning (Margules and Pressey 2000). The importance of prioritization is made evident by the extensive research conducted to develop better prioritization techniques (e.g., Margules and Usher 1981; Anselin et al. 1989; Kershaw et al. 1995; Pressey et al. 1996; Freitag and Van Jaarsveld 1997; Benayas et al. 2003). We chose MARXAN as our primary prioritization tool. The relative priorities were expressed as two indices – a measure of irreplaceability we refer to as conservation value and a measure of threats or vulnerability of an area. Assigning a relative priority to all conservation sites in the portfolio informs decision makers about their options for conservation.

7.2 Method

The portfolio delineation phase of the Okanagan Ecoregional Assessment identified a very large proportion of the ecoregion as Priority Conservation Areas (PCAs). With 32% of the ecoregion included in the terrestrial results and 34% in the freshwater, the team applied prioritization schemes to help distinguish which of these areas need conservation action more immediately than others. We also determined which areas within those PCAs require the most focus for implementing conservation strategies. The two most commonly used criteria in setting conservation priorities are conservation (or biodiversity) value and vulnerability (threat).

The method described below can provide conservation strategists working in the Okanagan Ecoregion with the means for evaluating priorities based on quantitative measures that emerged from the Okanagan Ecoregional Assessment. This work was based on criteria established in Groves et al. (2000) and on methods applied by Noss et al. (2002) in the Utah-Wyoming Rocky Mountains ecoregional plan. A more thorough evaluation of priorities is required and one that will need to build on the quantitative summary presented here with more qualitative measures related to conservation feasibility, opportunity and leverage.

7.3 Irreplaceability versus Vulnerability Scatterplot

The irreplaceability versus vulnerability scatterplot was first used by Pressey et al. (1996, as described by Margules and Pressey 2000) and was also recently used by Noss et al. (2002) and Lawler et al. (2003). These studies plotted irreplaceability versus vulnerability for a large number of potential conservation areas. We plotted irreplaceability versus vulnerability for the sites in both the terrestrial and freshwater conservation portfolios. Irreplaceability has been defined a number of different ways (Pressey et al. 1994; Ferrier et al. 2000; Noss et al. 2002; Leslie et al. 2003; Stewart et al. 2003). Our definition of irreplaceability (Section 5.2.1) is similar to those of Andelman and Willig (2002) and Leslie et al. (2003), where we selected two measures of irreplaceability to represent conservation value for each conservation area.

Margules and Pressey (2000) defined vulnerability as the risk of an area being transformed by any process which degrades its biodiversity value. The broader definition encompasses adverse impacts from additional factors such as invasive species and fire suppression. Vulnerability could also be defined from the perspective of target species—the relative likelihood that target species will be lost from an area. Since target persistence depends on habitat, a vulnerability index would be a function of current and likely future habitat conditions. Future habitat conditions are generally determined by the management practices and policies associated with an area. Our suitability index incorporated factors that reflected both current habitat conditions and management (Chapter 4.0). Therefore, for the purposes of prioritization, we assumed that our suitability index could also be used as a vulnerability index. We used two different measures from the suitability index to define vulnerability.

Margules and Pressey (2000) and Noss et al. (2002) divided their scatterplots into four quadrants which correspond to priority categories (Figure 7.1): high irreplaceability, high vulnerability (Q1); high irreplaceability, low vulnerability (Q2); low irreplaceability, high vulnerability (Q3) and low irreplaceability, low vulnerability (Q4). Potential conservation areas in Q1 could be considered the highest priority, although some might also prioritize areas in Q2 that are high value and less vulnerable because these areas tend to be in better condition (Pyke 2005). Some have argued that the highest priorities should be potential conservation areas in Q2 because such places have high biological value and a high likelihood of successful conservation.

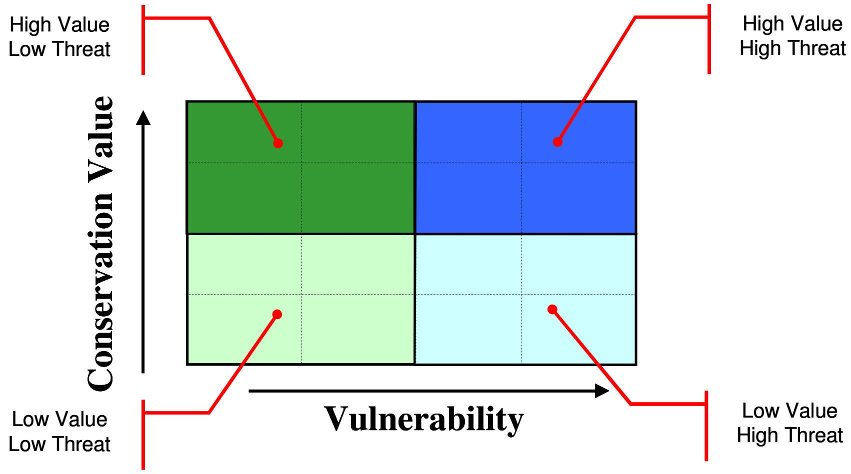

Figure 7.1. Graphing Relative Conservation Value and Vulnerability Scores

The purpose of dividing the scatterplot into quadrants is to assign sites in the freshwater and terrestrial portfolios into priority categories. But the scatterplot can be divided other ways as well. Utilizing a method used by Lawler et al. (2003), we divided the scatterplot into 16 sub-quadrants using the quartile values for irreplaceability and vulnerability. Each sub-quadrant corresponds to a priority category.

7.4 Prioritizing Terrestrial and Freshwater Portfolios in the Okanagan

Terrestrial and freshwater portfolios were prioritized separately using identical methodology. The first step was to define our measures of conservation value and vulnerability. For this analysis, our measures were a function of readily available GIS data compiled through the ecoregional assessment process. We based conservation value on irreplaceability measures, an output from running the MARXAN model; for vulnerability we used the suitability index that was an input to our model (Appendix 16). We populated these data into a custom Microsoft Excel spreadsheet allowing interactive weightings for each independent factor. Weightings included two different factors - certainty and importance. Certainty can be considered as a measure of how confident we are in the data, and how well the data reflect what we intend. Importance represents the assumptions about which factors best reflect conservation value, or alternatively which factors best reflect your organizational mandate. Weightings for certainty and importance are input as a range from zero to one (with 1 being greatest), then multiplied for a final cumulative weighting for each factor. The Core Team came to consensus on one set of weightings resulting in our preliminary site prioritization (Appendix 16).

7.5 Results

The following three products resulted from the prioritization:

1) scatterplots showing the relative position of portfolio sites for conservation value and vulnerability (Figure 7.2). Each of the factors comprising value and vulnerability were given weights reflecting the importance and confidence of each factor.

2) a table of portfolio sites organized by quartile position in the scatterplot (Volume 4, Map Book)

3) colour-coded maps combining the conservation value quartiles with the vulnerability quartiles results in 16 possible bins, represented by a 16 colour scatterplot grid (Maps 27, 27a, 28, 28a).

For planners at an ecoregional scale, this exercise allows potential conservation sites to be clearly sorted according to factors important for biodiversity value as well as those that pose threats. Relative positioning of sites on the scatterplot complements relative priority positioning of sites on the ecoregional map.

This prioritization method allows a way for alternative prioritization perspectives to be easily applied and compared. Such variations on prioritization, whether by use of a subset of factors used in this exercise or through an entirely new set of factors, are accommodated and examined by changing the values or value weights in an EXCEL spreadsheet. Future analysis could allow interested parties to experiment with different prioritization scenarios. The ability to quantify the relative relationship of conservation value and vulnerability provides a basis for strategic planning, and fosters debate on conservation needs.

The resulting scatterplots are shown below. The terrestrial priority conservation area results for individual sites accompany Map 27 and the scatterplot of terrestrial priority conservation areas is shown in Figure 7.2.

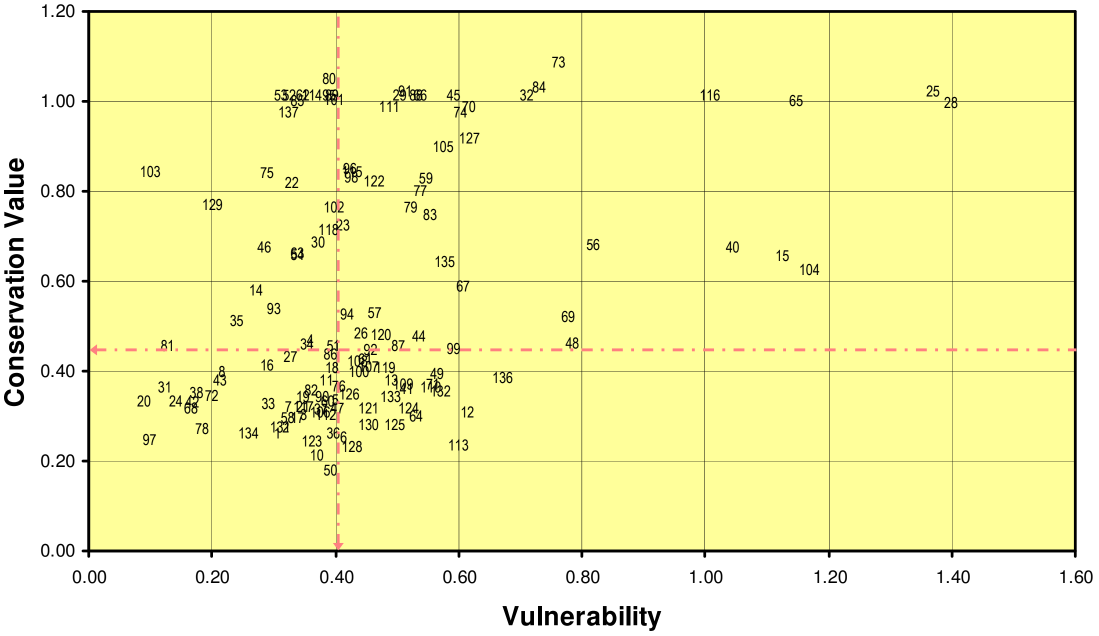

Figure 7.2. Terrestrial Prioritization Scatterplot

The scatterplot of weighted freshwater conservation areas is shown in Figure 7.3. Individual site results for freshwater priority conservation areas are shown accompanying Map 28.

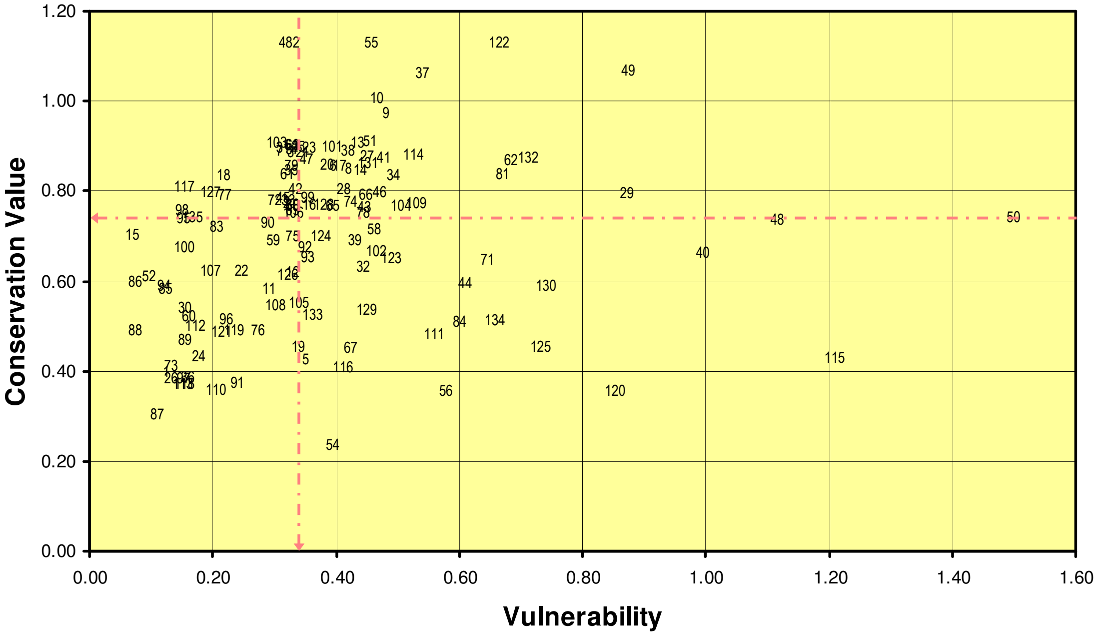

Figure 7.3. Freshwater Prioritization Scatterplot

Chapter 8 – Recommendations for Future Iterations

Ecoregional assessments are a work in progress. They represent the current state of knowledge for establishing region wide conservation priorities. It is expected that future iterations of assessments will be produced as needs change, methods are improved and new data are available. What follows is a list of suggestions to address in future iterations. Topics are arranged in approximate order of importance.

8.1 Data

There were a number of species, communities and natural systems for which the desired occurrence data did not exist, including many invertebrate species, non-vascular plants and imperiled and rare flora species and plant communities. As a broad strategy for filling this data gap, new survey efforts should focus on finding additional occurrences of these targets and documenting the condition of known occurrences. Up-to-date survey data would add considerably to the overall quality of the analysis.

In Washington, the density of species occurrence data is much lower than in British Columbia due in part to lack of survey effort. This data density bias between the political jurisdictions in the ecoregion can lead to problems in prioritizing areas—i.e., places may be identified as high priority because they were intensively surveyed, not because they are inherently more valuable for conservation.

A low cost method for overcoming the lack of occurrence data is to use species-habitat models to predict species occurrences (Scott et al. 2002). However, there were a number of reasons we did not use predictive models. First, we did not have any reasonably accurate species-specific habitat models. The ones available to us, (e.g., Cassidy et al. 1997), have low spatial precision and untested accuracy. Second, we did not have the resources needed to develop our own models for a large number of vertebrate species. Third, species-specific habitat models have both false negatives and false positives (areas where species exist or do not exist that are incorrectly represented in model results). Scientific literature suggests that false negatives inherent to survey data are likely to be less damaging than the false positives of habitat models. Freitag and Van Jaarsveld (1996) and Araujo and Williams (2000) recommend using only occurrence data because of the potential for false positives in habitat models. Loiselle et al. (2003) recommends that species-specific habitat models be used cautiously. Given the lack of readily available models of proven accuracy and without the resources to develop our own models, we believed the most prudent approach was to primarily use occurrence data (with the exception of five large mammals where we used existing models: grizzly bear, lynx, fisher, bighorn sheep and mountain goat).

Finally, gathering freshwater data was more challenging than gathering terrestrial data. The evaluations or assessments of drainage units are a useful beginning for freshwater conservation planning, the analyses varied considerably among ecological drainage units in terms of data availability and depth of expert input on such matters as watershed condition and importance. There is a pressing need for a comprehensive and coordinated approach to incorporating more species occurrence data into the freshwater analysis.

8.2 Conservation Goals

Establishing conservation goals is among the most difficult scientific endeavors in biodiversity conservation. There is much uncertainty, regarding the number of occurrences or the area of an ecological system necessary to maintain all species within an ecoregion (Soule and Sanjayan 1998).

Conservation goals are useful tools for assembling a portfolio of conservation areas that includes multiple examples of the ecoregion's biodiversity. These goals also provide a metric for gauging the contribution of different portions of the ecoregion to the conservation of its biodiversity, and the progress of conservation in the ecoregion over time.

Improving information about estimating with confidence the number and distribution of occurrences that will be sufficient to ensure survival will enhance future assessments.

8.3 Expert Opinion

All judgments are made with imperfect knowledge, and expert opinion may be affected by motivational biases (e.g., judgments influenced by political philosophy) and cognitive biases (e.g., poor problem solving abilities) (Tversky and Kahneman 1974). A group of experts working together may be adversely affected by "groupthink", personality conflicts, and power imbalances (Coughlan and Armour 1992). Nevertheless, the reliance upon expert opinion is decidedly a greater advantage than a disadvantage in the assessment process, as experts were essential in filling data gaps and addressing shortcomings in the methodology. Future assessments should use more elicitation techniques that reduce subjectivity and error in expert opinion solicitation (e.g., Saaty 1980).

8.4 Integration of Terrestrial and Freshwater Portfolios

Integration of the terrestrial and freshwater portfolio posed many challenges. Perhaps most importantly, the terrestrial and freshwater analyses were based on different types of planning units. The terrestrial analysis used hexagons and the freshwater used watersheds and stream reaches. While each type of assessment unit may be appropriate to its respective portfolio, combining terrestrial and freshwater into one planning unit (required by MARXAN), created too great a compromise. In attempting to attribute freshwater data to terrestrial hexagons, we unacceptably fragmented freshwater stream reaches and created slivers of watersheds that were less useful to planners than the stand alone freshwater and terrestrial portfolios.

The terrestrial model is designed to select portfolio sites far from development with little fragmentation of landcover, while the freshwater portfolio must include main stem reaches, which are the areas where most of the human development occurs. Since many of the lower reaches in the freshwater portfolio are urbanized, they do not contribute to terrestrial goals. The result of the team's attempted integration was a less efficient portfolio—i.e., there was only 14% overlap between the terrestrial and freshwater portfolios and the size of the total portfolio increased.

Although we attempted integration, in the final analysis we lacked a satisfactory analytical method for integration. Our experience suggests that developing a system in which terrestrial, marine and freshwater information can be assigned to one cohesive planning unit would greatly enhance our efforts. Additionally, integration might be improved by incorporating the ecological processes or targets that explicitly link terrestrial and freshwater realms. Future assessments should also consider using watersheds for both terrestrial and freshwater realms so that an analytical computer-driven process could be used to more effectively minimize these compromises.

8.5 Threats Assessments

Previous ecoregional assessments consulted regional experts to describe the greatest threats in the ecoregion to biodiversity, including rating the severity and urgency of threats for each area of the ecoregion or individual portfolio site. However, in an effort to be more objective, we decided to only use available GIS data layers to depict threats. For ecoregion-wide analysis, we were therefore limited primarily to the suitability index factors, which show where human impacts are greatest. The advantages of using the suitability index are that it is a quantitative measure based on available GIS data and it is transparent and repeatable. The disadvantage is that it may not capture all the relevant threat categories and does not adequately address future threats. Future assessments might again use expert input to identify the suite of threats not addressed by available GIS data, so a plan to gather important missing data could be developed.

8.6 Connectivity and MARXAN

The draft terrestrial portfolio used the solution provided by MARXAN that offered the set of assessment units meeting conservation goals with the maximum suitability (least human impacts). However, because MARXAN selects places of known populations, instead of areas where populations of animals might occasionally migrate through, it does not adequately address connectivity. Expert review was conducted to address this deficiency in the model by explicitly adding in corridors to maintain biological connectivity, but important corridors may still have been missed. In the future, an additional modeling algorithm could be run on the ecoregion after running MARXAN, in order to specifically address habitat corridors.

8.7 Vegetation Mapping

We constructed a vegetation map by piecing together landcover data from a number of sources. The accuracy of the source data was variable or in some cases unknown, and the accuracy of the resulting vegetation map was not fully tested across the ecoregion. However, there were a number of positive responses from reviewers of the vegetation map that provided confidence that it accurately reflected the existing vegetation at a scale that was suitable for the assessment. In addition, because the analysis was stratified by ecological sections and the vegetation data were generally uniform across a section, the effects of the data gaps were minimized.

Weaknesses in the vegetation map developed for this assessment could be improved upon by quantitative evaluation of map accuracy for all system types and seral stages, especially where the map was developed with restricted plot data and remapping of those types that are found to be least accurate.

8.8 Update of Assessments

Updates or new iterations of ecoregional assessments are driven by the needs of specific conservation projects within an ecoregion or the availability of new methods and data. Since ecoregional assessments are large, complex and costly undertakings that typically take several years to complete, the decision to undertake a new iteration is not trivial. At the same time, conservation biologists have become increasingly aware that in order to respond to rapid changes, more frequent and consistent updates are critical. This is because habitat, ownership, and land use patterns across the ecoregion will change, the abundance and spatial distribution of some species will change, our understanding of ecosystems will increase, analytical methods will improve, and occurrence data will become more comprehensive. Additionally, as further research on climate change is conducted, future iterations will have the opportunity to address the effect on portfolio boundaries as species' ranges shift.

Conservation biologists have recently realized that we need information that will enable us to respond effectively to a dynamic landscape. Depending on the magnitude of change, we may need to frequently re-prioritize actions using up-to-date information about the status of the landscape and likely alterations of the landscape in the near future. Developing a formal process for updating ecoregional assessments will ensure that planners and decision makers have recent, applicable information on which to base their decisions.

8.9 Involvement of Decision Makers

Our assessment process was largely a scientific endeavor, without the involvement of the general public or policy makers. While certain aspects of the assessment must remain purely scientific, the usefulness, and hence effectiveness, of the assessment may be enhanced by working with the public and decision makers. For example, Rumsey et al. (2004) worked with stakeholders and decision makers on an ecoregional assessment in British Columbia that resulted in a decision by the provincial government to designate a network of parks and protected areas.

To assist public decision makers in this process, MARXAN and other such algorithms used for this analysis are expected to become fully interactive in the next several years. This will allow real-time scenario building. In Australia, an interactive computer program was used by stakeholder negotiators to prioritize potential reserves and make land use designations (Finkel 1998). By using the computer interactively, negotiations took place in an objective and transparent environment.

One of the original motivations for using site selection algorithms was the recognition that funds for conservation are limited (Pressey et al. 1993; Justus and Sarkar 2002). Therefore, cost-efficient reserve networks are essential for maximizing biodiversity conservation. Our cost index dealt with the economic cost of conservation in a superficial way. To fully inform decision makers, the economic costs must be examined more closely (Shogren et al. 1999; Hughey et al. 2003). The next iteration of this assessment would be improved by considering socio-economic factors as targets so that they may be included along with biodiversity targets. These could include high value farm or forest land or lands for recreation and urban development, enabling the assessment to be more inclusive in terms of supporting people in the environment.

8.10 Climate Change

Much more attention needs to be given to the effects of climate change on the ecoregion. In the ecoregional assessment process, climate change was taken into account only superficially by selecting examples of targets along a variety of physical gradients. However, global circulation models for the next 100 years now exist that can be used to predict temperature and precipitation changes for large areas in the ecoregion. The spatial information from these models can show areas that are expected to be most and least affected by changes in climate, and this information could be used in computer vegetation models that might predict the vulnerability of basic vegetation types to change. As additional research concerning the impacts of climate change on ecological systems and biological diversity becomes available, it must be incorporated into future iterations of ecoregional assessments.

Chapter 9 – Assessment Products and Their Uses

The Okanagan Ecoregional Assessment was prepared to support effective long-term conservation of the ecoregion's biodiversity. It provides information for decisions and activities that occur at an ecoregional scale: establishing regional priorities for conservation action, coordinating programs for species or habitats that cross political boundaries, and judging the regional importance of any particular place.

9.1 Assessment Products

Three principal products emerged from this effort: (1) a comprehensive compilation of conservation data for the ecoregion, (2) conservation utility maps, and (3) a conservation portfolio map. A number of important ancillary products were also produced, such as the suitability index, that are of considerable interest to groups with specific questions regarding threats, freshwater conservation, policy alternatives, and conservation site priorities in the Okanagan Ecoregion.

Underlying Data

The data that have been compiled specifically for this assessment have proven to be one of the most sought after products. Agencies and groups regularly request these data, especially because they are in a GIS format. One of the uses of the data is to determine how much known biodiversity is located in existing protected areas. This assessment can be used for a GAP-style analysis to direct conservation actions to specific aspects of biodiversity that are most in need of conservation.

Irreplaceability and Utility Maps

Irreplaceability indices represent the relative conservation value of all assessment units (AUs) in the ecoregion. One form of irreplaceability index, conservation utility, is a prioritization of all AUs based on the biological contents and relative suitability of each AU. This map can be used to guide ecoregion-level conservation action and can inform smaller-scale conservation decisions as well. A sensitivity analysis of the terrestrial utility map showed that the ranking of highest ranked AUs was robust to changing assumptions about AU suitability.

Conservation Portfolios and Alternative Portfolios

The conservation portfolio maps depict sets of conservation areas that most efficiently meet a specific set of conservation goals. The conservation areas identified in each portfolio are important for a number of reasons. First, some are the only places where one or more species or plant community targets are known to occur. This is particularly true for species and plant communities associated with shrub-steppe and grassland habitat types. Second, some of these areas are the last large, relatively intact landscapes in the ecoregion. Many of these places are parks or wilderness areas. Large areas are especially important to wide-ranging extant species such as the grizzly bear, grey wolf, lynx, and northern goshawk (*Accipiter gentiles*). These areas make irreplaceable contributions to ecoregional biodiversity and possess significant potential for the maintenance of landscape-scale ecological processes.

Alternative portfolios were also produced for this assessment as an acknowledgement of the uncertainty associated with goal setting and an illustration of different levels of risk associated with the loss of biodiversity. Alternative portfolios represent higher and lower risk to the loss of biodiversity, as compared with the main mid-risk portfolio.

Suitability Index

Wherever possible, the assessment selected areas that are most promising for successful conservation. This assessment used a suitability index to map the relative likelihood of successful conservation across the ecoregion. The suitability index also relied on two assumptions: first, that existing public land is more suitable for conservation than private land; and second, rural areas are more suitable for conservation than urban areas. Application of these principles and assumptions generally guided site selection toward existing public lands and away from private land, and toward rural areas with low habitat fragmentation and away from urban areas. It is also important to realize that no areas in the ecoregion were excluded from the analysis. If the only place to get a needed population of a rare species to meet a goal was in the center of an urban area, then that area was most likely selected for conservation.

9.2 Caveats

This assessment has no regulatory authority. Rather, it is a guide to help inform conservation decision-making across the Okanagan Ecoregion. The sites described are approximate, and often large and complex enough to allow (or require) a wide range of resource management approaches. Ultimately, the boundaries and management of any priority conservation area will be based on the policies, values, and decisions of the affected landowners, conservation organizations, governments, and other community members.

Many of the high priority conservation areas described in this assessment may accommodate multiple uses as determined by landowners, local communities and appropriate agencies. Rather than creating protected areas in the usual sense, we speak of the need for portfolio sites to be conserved. While effective conservation can necessitate restricted use, it does not necessarily exclude all human activities.

A reliable assessment of restoration priorities would require a different approach than the one we have presented. Assessment units and portfolio sites were selected for the habitats and species that exist there now, not for their restoration potential. However, many high priority areas will contain lower-quality habitats in need of restoration and this restoration could greatly enhance the viability of these areas and the conservation targets they contain.

Users must be mindful of the large scale at which this assessment was prepared. Many places deemed low priority at the ecoregional scale are nevertheless locally important for their natural beauty, educational value, ecosystem services, and conservation of local biodiversity. These include many small wetlands, small patches of natural habitat, and other important parts of our natural landscape. They should be managed to maintain their own special values. Furthermore, due to their large size, high priority assessment units and conservation portfolio sites may include areas unsuitable for conservation. We expect that local planners equipped with more complete information and higher resolution data will develop refined boundaries for these sites. Users should remember that the intended geographic scale of use of the analysis and much of its data is 1:100,000.

Some factors in the suitability index require consideration of what are traditionally policy questions. For example, setting the index to favour the selection of public over private land presumes a policy of using existing public lands to meet goals wherever possible, thereby minimizing the involvement of private lands.

This assessment is one of many science-based tools that will assist conservation efforts by government agencies, non-governmental organizations, and individuals. It cannot replace, for example, recovery plans for endangered species, or the detailed planning required in designing a local conservation project. It does not address the special considerations of salmon or game management, and so, for example, cannot be used to ensure adequate populations for harvest.

Chapter 10 – Summary and Conclusions

10.1 Ecoregional Goals

Goals established for the number and distribution of populations (for species) and area (for habitats) within the ecoregion were generally met in the terrestrial and freshwater portfolios. However, meeting goals does not mean that these populations or areas of habitat are all adequately conserved. In this case meeting goals means that adequate target occurrences exist within the ecoregion, and if these areas are conserved, the expectation is that biodiversity would be sustained, subject to many uncertainties associated with our knowledge of species, natural communities and future conditions. Of course, we have no way of knowing how well our goals will reflect the actual needs of biodiversity, and future iterations will no doubt improve on these estimates. In the meantime, organizations can use the stated goals as a starting place to address gaps in biodiversity protection and track progress.

10.2 Sensitivity Analysis

High irreplaceability values—i.e., greater than about 85 to 90—are mostly insensitive to the suitability index. AUs achieve high scores because of their biological contents not because of suitability. In contrast, moderate scores, about 50 to 80, tend to be much more sensitive to the suitability index. Since the suitability index relies on the subjective judgments of individuals, AUs with moderate irreplaceability scores should be examined more closely. Software like MARXAN is often referred to as a “decision support tool.” Such tools can best support decisions by enabling us to explore the effect of various assumptions and differing perspectives. Both Davis et al. (1996) and Stoms et al. (1998) did the equivalent of a sensitivity analysis for their suitability indices. However, they referred to their different indices as “model variations” or “alternatives”; an implicit recognition that different sets of assumptions may have equal validity. To address uncertainties in suitability indices, AU priorities, especially for moderately ranked AUs, should be derived from several different analyses using different indices. This will enhance the robustness of analytical results and lead to more confident decision making.

10.3 Alternative Portfolios

The alternative portfolios are intended as an illustration of how the conservation areas change based on different goals for species and ecosystem targets. Deciding which goals are most appropriate is ultimately a decision for the user and society to make based on the best available science, value-based policy decisions and the results of tracking the persistence of biodiversity over time. These particular alternatives were selected to bracket the scientific uncertainty in the relationship between changes in biodiversity associated with different amounts of landscape fragmentation and loss.

The higher risk portfolio appears to be pessimistically small. As “higher risk” implies, if this portfolio were implemented, then some species are more likely to vanish from the ecoregion. On the other hand, the lower risk portfolio appears impractically large. Undoubtedly under this alternative much habitat would be conserved in multiple-use landscapes where land uses, such as forestry, can be compatible with biodiversity conservation. Among the portfolios, the mid-risk portfolio strikes a balance between the risk of species loss and the impracticality of conserving extremely large areas. The mid-risk portfolio is also based on the stated conservation goals, regarding the number, area and distribution of species and habitats that might be required to maintain biodiversity.

For our example we referred to the alternative portfolios as “higher” and “lower” risk. The higher risk portfolio does indeed impose a higher degree of risk than the mid-risk portfolio and the lower risk portfolio a lower degree of risk, but we do not know how much higher and lower. In fact, the “mid-risk” portfolio could actually be high risk. That is, it might result in a high probability of ecoregional extinction or extirpation for some species. For a small number of species we may have the scientific capacity to determine the level of risk imposed by each portfolio, but given the enormous human changes to the ecoregion that have occurred and are expected to occur, we of course cannot *guarantee* certainty of the persistence of biodiversity by meeting ecoregional goals. As much as possible, future ecoregional assessments should attempt to overcome this shortcoming.

10.4 Use of Assessment

Biodiversity conservation in the ecoregion will attain its fullest potential if all conservation organizations, government agencies and private landowners coordinate their conservation strategies according to the priorities identified through this assessment. The Okanagan Ecoregional Assessment puts forth a baseline to be built upon and refined by site-scale planning efforts. It is intended to guide users to areas with high biodiversity value and suitability. The specifics of conservation site delineation, planning and management will rely on more localized expertise.

Priority Conservation Areas (portfolio sites) span lands that fall under various ownerships and within various jurisdictions and we recognize that some organizations and agencies will be better suited to work in specific areas than others may be. The ultimate vision of the ecoregional assessment process is to facilitate the thoughtful coordination of current and future conservation efforts by the growing number of federal, provincial, state, local, private and non-governmental organizations engaged in this field.

To that end, we encourage wide use of the data and products developed and welcome comments on how future iterations may be improved.

VOLUME

2

APPENDICES

Okanagan
Ecoregional Assessment

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Okanagan Ecoregional Assessment

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APPENDIX 1 – GLOSSARY

Appendix 1 – Glossary

Aquatic/freshwater ecological systems: dynamic spatial assemblages of biological communities that occur together in an aquatic landscape with similar geomorphological patterns, are tied together by similar ecological processes (e.g. hydrologic and nutrient regimes, access to floodplains) or environmental gradients (e.g. temperature, chemical, habitat volume), and form a robust, cohesive, and distinguishable unit on a hydrography map.

Anadromous: fish that hatch in freshwater, migrate to saltwater and come back to freshwater to spawn

Assessment unit: the area-based polygon units used in the optimal site-selection algorithm and attributed with the amount and quality of all targets located within them. These units are non-overlapping and cover the entire ecoregion. The terrestrial assessment unit chosen for the Okanagan is a 500-hectare hexagon; watersheds were used as freshwater assessment units.

Automated portfolio: a data-driven portfolio created by the MARXAN site-selection algorithm operating on hexagonal assessment units (terrestrial) or watersheds (freshwater).

Cadastral: relating to landed property, usually including the dimensions and value of land parcels, used to record ownership.

Candidate species: plants and animals that the U.S. Fish and Wildlife Service believe should be considered for status review. A status review may conclude that the species should be added to the federal list of threatened and endangered species.

Coarse filter: refers to the biological communities or ecological systems, which if protected in sufficient quantity should conserve the vast majority of species in the ecoregion.

Conservation target: See Target

Core team: the bi-national interdisciplinary group that is accountable for the completion of the ecoregional assessment.

Cost: a component of the MARXAN algorithm that encourages MARXAN to minimize the area of the portfolio by assigning a penalty to factors that negatively affect biodiversity, such as proximity to roads and development. In the Okanagan assessment, a cost was assigned to each assessment unit in the ecoregion. Used synonymously with "suitability".

Crosswalk: a comparison of two different vegetation classification systems and resolving the differences between them to form a common standard.

Declining: species that have exhibited significant, long-term reduction in habitat/and or numbers, and are subject to continuing threats in the ecoregion.

Disjunct: See Distribution

Distribution: In ecoregional assessments, we think of distribution relative to the ecoregion and us it as a guide to establish numeric differentials in goal setting (higher with endemic, to lower with peripheral)

Endemic = >90% of global distribution in ecoregion

Limited = <90% of global distribution is with in the ecoregion, and distribution is limited to 2-3 ecoregions

Disjunct = distribution in ecoregion quite likely reflects significant genetic differentiation from main range due to historic isolation; roughly >2 ecoregions separate this ecoregion from other more central parts of it's range

Widespread = global distribution >3 ecoregions

Peripheral = <10% of global distribution in ecoregion

Drumlinoid: A rock drumlin (An elongated hill or ridge of glacial drift).

Ecological drainage unit (EDU): aggregates of watersheds that share ecological characteristics. These watersheds have similar climate, hydrologic regime, physiography, and zoogeographic history.

Ecological integrity: the probability of an ecological community or ecological system to persist at a given site is partially a function of its integrity. The ecological integrity or viability of a community is governed primarily by three factors: demography of component species populations; internal processes and structures among these components; and intactness of landscape-level processes which sustain the community or system.

Ecological land unit (ELU): mapping units used in large-scale conservation assessment projects that are typically defined by two or more environmental variables such as elevation, geological type, and landform (e.g., cliff, valley bottom, summit). Biophysical or environmental analyses based on ELUs combined with land cover types and satellite imagery can be useful tools for predicting locations of communities or systems when field surveys are lacking.

Ecological system: also known as terrestrial ecological system or freshwater ecological system.

Ecoregion: a relatively large area of land and water that contains geographically distinct assemblages of natural communities, with boundaries that are approximate. These communities share a large majority of their species, dynamics, and environmental conditions, and function together effectively as a conservation unit at global and continental scales.

Element occurrence (EO): a term originating from the methodology of the Natural Heritage Network that refers to a unit of land or water on which a population of a species or example of an ecological community occurs. For communities, these EOs represent a defined area that contains a characteristic species composition and structure.

Endangered species: any species which is in danger of extinction throughout all of its range; a species that is listed as Endangered by the U.S. Fish and Wildlife Service under the Endangered Species Act, the Canadian Species At Risk Act or the Committee On the Status of Endangered Wildlife In Canada.

Endemic: See Distribution

Esker: a long narrow ridge of sand and gravel deposited by glacial meltwaters.

ESU: Evolutionarily Significant Unit used to identify "distinct population segments" of Pacific salmon (*Oncorhynchus spp.*) stocks under the US Endangered Species Act. The basic spatial unit used to help describe a species diversity within its range and aid in the recovery of a listed species.

Extirpation: the extinction of a species or a group of organisms in a particular local area.

Fine filter: species of concern or aggregations that complement the coarse filter, helping to ensure that the coarse filter strategy adequately captures the range of viable, native species and biological communities. Endangered or threatened, declining, vulnerable, wide-ranging, very rare, endemic, and keystone species are some potential fine filter targets.

Focal group: a collection of organisms related by taxonomic or functional similarities.

Fragmentation: the process by which habitats are increasingly subdivided into smaller units, resulting in increased insularity as well as losses of total habitat area.

Functional landscapes: large areas (usually greater than 1,000 acres [405 hectares]) where the natural ecological processes needed to conserve biodiversity can be maintained or potentially restored.

Functional network: a well-connected set of functional landscapes within an ecoregion or across multiple

GAP (National Gap Analysis Program): Gap analysis is a scientific method for identifying the degree to which native animal species and natural communities are represented in our present-day mix of conservation lands. Those species and communities not adequately represented in the existing network of conservation lands constitute conservation “gaps.” The purpose of the Gap Analysis Program (GAP) is to provide broad geographic information on the status of ordinary species (those not threatened with extinction or naturally rare) and their habitats in order to provide land managers, planners, scientists, and policy makers with the information they need to make better-informed decisions. URL: http://gapanalysis.nbii.gov/portal/server.pt

GAP status: the classification scheme or category that describes the relative degree of management or protection of specific geographic areas for the purpose of maintaining biodiversity. The goal is to assign each mapped land unit with categories of management or protection status, ranging from 1 (highest protection for maintenance of biodiversity) to 4 (no or unknown amount of protection).

Biodiversity Management Status Categories of the GAP Analysis Program	
Category	**Description**
Status 1	An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.
Status 2	An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.
Status 3	An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or localized intense types (e.g., mining). It also confers protection to federally listed endangered and threatened species throughout the area.
Status 4	There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout.

GIS (Geographic Information System): a computerized system of organizing and analyzing spatially-explicit data and information.

Global rank: an assessment of a biological element's (species or plant association) relative imperilment and conservation status across its geographic distribution. The ranks range from G1 (critically imperiled) to G5 (secure). These ranks are assigned by the Natural Heritage Network and are determined by the number of occurrences or total area of coverage (plant associations only), modified by other factors such as condition, historic trend in distribution or condition, vulnerability, and impacts.

G1	Critically Imperiled – Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (<1,000) or acres (<2,000) or linear miles (>10).
G2	Imperiled – Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction or elimination. Typically 6-20 occurrences or few remaining individuals (1,000-3,000) or acres (2,000-10,000) or linear miles (10-50).
G3	Vulnerable – Vulnerable globally either because very rare and local throughout its range, found only in a restricted range, or because of other factors making it vulnerable to extinction or elimination. Typically 21-100 occurrences or between 3,000 and 10,000 individuals.
G4	Apparently Secure – Uncommon but not rare (although it may be rare in parts of its range) but possible cause for long-term concern. Typically more than 100 occurrences and more than 10,000 individuals.

G5	Secure – Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

Goal: in ecoregional assessments, a numerical value associated with a species or system that describes how many populations (for species targets) or how much area (for systems targets) the portfolio should include to represent each target, and how those target occurrences should be distributed across the ecoregion to better represent genetic diversity and hedge against local extirpations.

Ground truthing: assessing the accuracy of GIS data through field verification.

Historic species: species that were known to occupy an area, but most likely no longer exist in that area.

Hummocky: Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even. Often used to describe landslide deposition areas.

Impact: the combined concept of ecological stresses to a target and the sources of that stress to the target. Impacts are described in terms of severity and urgency. Sometimes used synonymously with “threat”.

Imperiled species: species that have a global rank of G1-G2 by Natural Heritage Programs/Conservation Data Centers. Regularly reviewed and updated by experts, these ranks take into account number of occurrences, quality and condition of occurrences, population size, range of distribution, impacts and protection status.

Integration: a portfolio assembly step whereby adjacent sites that contain high-quality occurrences of both freshwater and terrestrial targets are combined.

Limited: See Distribution

Linear communities or systems: occur as linear strips and are often ecotonal between terrestrial and aquatic systems. Similar to small patch communities, linear communities occur in specific conditions, and the aggregate of all linear communities comprises only a small percentage of the natural vegetation of the ecoregion.

Loess: A soil made up of small particles that were transported by the wind to their present location.

Macrohabitats: units of streams and lakes that are similar with respect to their size, thermal, chemical, and hydrological regimes. Each macrohabitat type represents a different physical setting that correlates with patterns in freshwater biodiversity.

MARXAN: Marine Reserve Design using Spatially Explicit Annealing. Software consisting of computerized optimal site selection algorithms that select conservation sites based on their biological value and suitability for conservation.
URL: www.ecology.uq.edu.au/marxan.htm

Matrix-forming systems or matrix communities: communities that form extensive and contiguous cover, occur on the most extensive landforms, and typically have wide ecological tolerances.

Minimum dynamic area (MDA): MDA is the smallest area needed to maintain a natural habitat, community, or population based on natural disturbance regimes and the ability of the biota to recolonize or restabilize component species. In this context, identification of a MDA for a particular conservation target is based on the size of patches created by various disturbances, the frequency of those disturbances, the longevity of the resulting patches, and the ability of the component species to disperse through the greater mosaic. More recent work in landscape ecology has expanded this definition to include not only issues related to species viability, but also the maintenance of the disturbance regime itself.

Moraines: The accumulations of fragments of rock brought down by glaciers.

National and Subnational Conservation Status Definitions: Listed below are definitions for interpreting NatureServe conservation status ranks at the national (N-rank) and subnational (S-rank) levels. The term "subnational" refers to province or state-level jurisdictions (e.g., British Columbia, Washington).

Assigning national and subnational conservation status ranks for species and ecological communities follows the same general principles as used in assigning global status ranks. A subnational rank, however, cannot imply that the species or community is more secure at the state/province level than it is nationally or globally (i.e., a rank of G1S3 cannot occur), and similarly, a national rank cannot exceed the global rank. Subnational ranks are assigned and maintained by state or provincial natural heritage programs and conservation data centers.

National (N) and Subnational (S) Conservation Status Ranks

Status	Definition
NX **SX**	**Presumed Extirpated**—Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
NH **SH**	**Possibly Extirpated** (Historical)—Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
N1 **S1**	**Critically Imperiled**—Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
N2 **S2**	**Imperiled**—Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
N3 **S3**	**Vulnerable**—Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
N4 **S4**	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
N5 **S5**	**Secure**—Common, widespread, and abundant in the nation or state/province.
NNR **SNR**	**Unranked**—Nation or state/province conservation status not yet assessed.
NU **SU**	**Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
NNA **SNA**	**Not Applicable** —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
N#N# **S#S#**	**Range Rank** —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
Not Provided	Species is known to occur in this nation or state/province. Contact the relevant natural heritage program for assigned conservation status.

NatureServe: NatureServe is a non-profit conservation organization that provides the scientific information and tools needed to help guide effective conservation action. NatureServe and its network of natural heritage programs are the leading source for information about rare and endangered species and threatened ecosystems. NatureServe represents an international network of biological inventories—known as natural heritage programs or conservation data centers—operating in all 50 of the United States, Canada, Latin America and the Caribbean. URL: www.natureserve.org

Non-vascular plant: in the Okanagan assessment, this term refers to lichens, mosses, and fungi.

Occurrence: spatially referenced locations of species, plant associations, or ecological systems. May be equivalent to Natural Heritage Program element occurrences, or may be more loosely defined locations delineated through the identification of areas by experts.

Ocean Ecoregional Units: OEU are defined as watershed-coastal ecosystems of distinct physical characteristics, including the full sequence of riverine, estuarine, and near-shore marine habitats used by juvenile anadromous salmonids. Augerot *et al.* (2004) developed a four-stage hierarchical classification to divide the North Pacific Rim into ecoregions.

Peripheral: See Distribution

Partners in Flight: a cooperative program among U.S. federal, state, and local governments, philanthropic foundations, professional organizations, conservation groups, industry, the academic community, and private individuals, to foster conservation of migratory bird populations and their habitats in the Western hemisphere.
URL: http://www.pwrc.usgs.gov/pif/

Plant association: a recurring plant community with a characteristic range in species composition, specific diagnostic species, and a defined range in habitat conditions and physiognomy or structure. Ex: red-osier dogwood/sedges; Idaho fescue-bluebunch wheatgrass.

Population: a group of individuals of a species living in a certain area that maintains some degree of reproductive isolation.

Portfolio: See Portfolio of Sites

Portfolio of sites: in the Okanagan Ecoregional Assessment, the identified suite of priority conservation areas that are considered the highest priorities for conservation in the ecoregion.

Priority conservation area: areas of biodiversity concentration that contain target species, plant associations, and ecological systems. Boundaries need to be refined during site conservation planning for adequate protection and to ensure supporting ecological processes are maintained for the targets within.

RBI: Relative Biodiversity Index. Abundance in query domain/abundance in area of interest) * 100.

Reach: the length of a stream channel that is uniform with respect to discharge, depth, area and slope.

Retro or Retrospective target: A large amount of habitat or modeled data can significantly influence the result of the site selection analysis. Rather than let one species dominate the result, we use some datasets retrospectively to evaluate the portfolio as defined by the goals and data of other targets. Retrospective evaluation has the benefit of simplifying the analysis by reducing the amount of data being input, and by reducing the influence of a large quantity of data or the influence of a species with a very high goal associated with its data. If the goals met from other targets do not capture enough of these retro targets in the portfolio, then the goals will be adjusted appropriately to incorporate more of that species. Used synonymously with secondary target.

Small patch systems: communities or systems that form small discrete areas of vegetation cover and that are dependent upon specific local environmental conditions, such as hydric soil.

Stenohaline: limited to or able to live only within a narrow range of saltwater concentrations.

Suitability: the likelihood of successful conservation at a particular place relative to other places in the ecoregion. The lower the suitability “value” the more suitable an assessment unit is for conservation. For the Okanagan assessment, 5 GIS layers were used to determine each terrestrial assessment unit’s suitability for conservation: management status, land use, road density, future urban potential, and fire condition class. For the freshwater assessment, the GIS layers used were management status, land use, road density and dams.

T Ranks: Infraspecific Taxon Conservation Status Ranks. Infraspecific taxa refer to subspecies, varieties and other designations below the level of the species. Infraspecific taxon status ranks (T-ranks) apply to plants and animal species only; these T-ranks do not apply to ecological communities. The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status. At this time, the T rank is not used for ecological communities.

Target: also called conservation target. An element of biodiversity selected as a focus for the conservation assessment. The three principle types of targets are species, plant associations, and ecological systems.

Terrestrial ecological systems/ecosystems: dynamic spatial assemblages of plant associations that 1) occur together on the landscape; 2) are tied together by similar ecological processes (e.g. fire, hydrology), underlying environmental features (e.g. soils, geology) or environmental gradients (e.g. elevation, hydrologically-related zones); and 3) form a robust, cohesive, and distinguishable unit on the ground. Ecological systems are characterized by both biotic and abiotic components. Ex: North Pacific Western Hemlock-Silver Fir Forest

Threatened species: any species that is likely to become an endangered species throughout all or a significant portion of its range; a species listed as Threatened by the U.S. Fish and Wildlife Service under the Endangered Species Act, the Canadian Species At Risk Act or the Committee On the Status of Endangered Wildlife In Canada.

Umbrella species: species that by being protected, may also protect the habitat and populations of other species.

Urban Growth Area (UGA): a designated area within which urban growth will be encouraged and outside of which growth can only occur if it is not urban in nature. In the United States, urban growth areas around cities are designated by the county in consultation with the cities; urban growth areas not associated with cities are designated by the county.

Viability: the ability of a species to persist for many generations or an ecological community or system to persist over some time period. Primarily used to refer to species in this document.

Vulnerable: vulnerable species are usually abundant, may or may not be declining, but some aspect of their life history makes them especially vulnerable (e.g., migratory concentration or rare/endemic habitat).

Widespread: See Distribution.

XAN: See Ocean Ecoregional Units.

APPENDIX 2 – OKANAGAN CORE TEAM, ADVISORS AND ASSISTANCE

Appendix 2 – Okanagan Core Team, Advisors and Assistance

CORE TEAM

Ciruna, Kristine
Director of Conservation Programs
Nature Conservancy of Canada–BC Region
300-1205 Broad Street, Victoria BC V8W 2A4
kristy.ciruna@natureconservancy.ca

Crawford, Rex
Vegetation Ecologist–Eastern Washington
Washington Natural Heritage Program
Washington Department of Natural Resources
P.O. Box 47014, Olympia WA 98504-7014
rex.crawford@wadnr.gov

Dye, Robin
(Formerly) Conservation Planner
The Nature Conservancy–Washington
1100-217 Pine Street, Seattle WA 98101

Fairbarns, Matt
Conservation Botanist
Aruncus Consulting
776 Falkland Road, Victoria BC V8S 4L8
aruncus_consulting@yahoo.ca

Floberg, John
(Formerly) Manager of Ecoregional Planning
The Nature Conservancy–Washington
1917 1st Avenue, Seattle, Washington 98101
jfloberg@tnc.org

Ford, Shane
Botanist, Ecosystems Branch
Conservation Data Centre
BC Ministry of Environment
Box 9358 Stn Prov Govt, Victoria BC V8W 9M2
shane.ford@gems6.gov.bc.ca

Goering, Mark
GIS Manager
The Nature Conservancy–Washington
1917 1st Avenue, Seattle, Washington 98101
mgoering@tnc.org

Heiner, Mike
The Nature Conservancy -Washington
(now with the TNC China Program).
mheiner@tnc.org

Iachetti, Pierre
Director of Conservation Planning
Nature Conservancy of Canada–BC Region
300-1205 Broad Street, Victoria BC V8W 2A4
pierre.iachetti@natureconservancy.ca

Kittel, Gwen
Vegetation Ecologist
NatureServe
201-2400 Spruce Street, Boulder CO 80302
gwen_kittel@natureserve.org

Lewis, Jeff
Wildlife Biologist, Wildlife Program
Washington Department of Fish and Wildlife
600 Capitol Way North, Olympia WA 98501
lewisjcl@dfw.wa.gov

Nicolson, Dave
Conservation Planner/GIS Analyst
Nature Conservancy of Canada–BC Region
300-1205 Broad Street, Victoria BC V8W 2A4
dave.nicolson@natureconservancy.ca

Pryce, Barbara *(Core Team Leader)*
Okanagan Program Manager
Nature Conservancy of Canada–BC Region
P.O. Box 642, Penticton BC V2A 6J9
barbara.pryce@natureconservancy.ca

Tyler, Sairah
Conservation Planning Consultant,
Nature Conservancy of Canada, BC Region
300-1205 Broad Street, Victoria, BC V8W 2A4
viridiaconsulting@yahoo.com

Warner, Nancy
North Central Washington Program Manager
The Nature Conservancy–Washington
6 Yakima Street, Suite 1A, Wenatchee WA 98801
nwarner@tnc.org

Wilhere, George
Conservation Biologist, Wildlife Program
Washington Department of Fish and Wildlife
600 Capitol Way North, Olympia WA 98501-1091
wilhegfw@dfw.wa.gov

ADVISORS

Farone, Steve. Northwest Ecoregional Applications Manager, The Nature Conservancy–Washington. Seattle, WA.

Garnett, Jan. Regional Vice President, Nature Conservancy of Canada–BC Region. Victoria, BC.

Gray, Elizabeth. Director of Conservation Science, The Nature Conservancy–Washington. Seattle, WA.

Holt, Alan. Senior Conservation Advisor, The Nature Conservancy–Washington. Seattle, WA.

Hurd, Jack. Director of Conservation Programs, The Nature Conservancy–Washington. Seattle, WA.

Ingraham, Molly, Assistant Director of Conservation Planning, The Nature Conservancy-Washington. Seattle, WA.

Rumsey, Chuck. (*Formerly*) Director of Conservation Programs, Nature Conservancy of Canada–BC Region. Victoria, BC

Skidmore, Peter, Aquatic Ecologist, The Nature Conservancy - Washington, Seattle, Washington.

Swann, Tom. General Manager and Director of Land Securement, Nature Conservancy of Canada–BC Region. Victoria, BC.

Weekes, David. Washington State Director, The Nature Conservancy–Washington. Seattle, WA.

Weiss, Andy. Ecoregional Data Management Team Coordinator, The Nature Conservancy–Washington. Seattle, WA.

ASSISTANCE

Brand, Emily. Ecoregional Data Management Team, The Nature Conservancy, Seattle, Washington.

Brodribb,Kara. Manager, Conservation Planning, Nature Conservancy of Canada National Office, Toronto, Ontario.

Fish, Joan. Photo Resources Coordinator, The Nature Conservancy–Washington. Seattle, WA.

Fisher, Kelly. Bachelor of Arts in Geography, University of Victoria June 2004.

Jacobson, John. GIS Analyst. Washington Department of Fish and Wildlife. Olympia, WA.

Markovic, Dušan. GIS Consultant, Nature Conservancy of Canada–BC Region. Victoria, BC.

Mortin, Rob. Financial and IT Consultant, Nature Conservancy of Canada–BC Region. Victoria, BC.

Olenick, Patrick. Director of Philanthropy and Corporate Services, Nature Conservancy of Canada-BC Region. Victoria, BC.

Swann, Tom. General Manager and Director of Land Securement, Nature Conservancy of Canada–BC Region. Victoria, BC.

Tyler, Sairah Mae. Conservation Planning Consultant, Nature Conservancy of Canada–BC Region. Victoria, BC.

Wang, Huilin. GIS Analyst. (*Formerly*) Washington Department of Fish and Wildlife. Olympia, WA.

Wootton, Lis. Office Administrator, Nature Conservancy of Canada–BC Region. Victoria, BC.

SUBTEAMS

Animals Sub-team

Cannings, Dick. Consulting Biologist, Cannings Holm Consulting. Naramata, BC.

Dyer, Orville. Senior Wildlife Biologist, BC Ministry of Environment. Penticton, BC.

Fitkin, Scott. District Wildlife Biologist, Washington Department of Fish and Wildlife. Twisp, WA.

Fleckenstein, John. Zoologist, Washington Natural Heritage Program, Washington Department of Fish and Wildlife. Olympia, WA.

Hallock, Lisa. Herpetologist, Washington Natural Heritage Program, Washington Department of Fish and Wildlife. Olympia, WA.

Hedges, Neal. Wildlife Biologist, USDI Bureau of Land Management. Wenatchee, WA.

Heinlen, Jeff. Wildlife Biologist, Washington Department of Fish and Wildlife. Tonasket, WA.

Krannitz, Pam. Plant Community Ecologist-SAR, Canadian Wildlife Service, Environment Canada. Delta, BC.

Lewis, Jeff. (*Sub-Team Leader*) Wildlife Biologist, Washington Department of Fish and Wildlife. Olympia, WA.

Priest, Jim. Wildlife Biologist, Fish and Wildlife Department, Colville Confederated Tribes. Nespelem, WA.

Rohrer, John. Supervisory Wildlife Biologist, Methow Valley Ranger District, Okanogan National Forest. Twisp, WA.

Scudder, Geoff. Professor Emeritus, Zoology, University of British Columbia. Vancouver, BC.

Stewart, Andy. Zoologist, Conservation Data Centre, BC Ministry of Environment. Victoria, BC.

Woodruff, Kent. District Wildlife Biologist, Tonasket Ranger District, Okanogan National Forest. Tonasket, WA.

Zender, Steve. District Wildlife Biologist, Washington Department of Fish and Wildlife. Chewelah, WA.

Plants Sub-team

Caplow, Florence. Rare Plant Botanist, Washington Natural Heritage Program, Washington Department of Fish and Wildlife. Olympia, WA.

Dye, Robin. Formerly Conservation Planner, The Nature Conservancy–Washington. Seattle, WA.

Fairbarns, Matt. (*Sub-Team Leader*) Conservation Botanist, Aruncus Consulting. Victoria, BC.

Ford, Shane. A/Director, BC Ministry of Environment, Conservation Data Centre. Victoria, BC.

Terrestrial Ecosystems Sub-team

Cadrin, Carmen. Ecologist, Conservation Data Centre, BC Ministry of Environment. Victoria, BC.

Crawford, Rex. (*Sub-Team Leader*) Vegetation Ecologist–Eastern Washington, Washington Natural Heritage Program, Washington Department of Natural Resources. Olympia, WA.

Heiner, Mike. GIS Specialist, The Nature Conservancy–Washington. Seattle, WA.

Kittel, Gwen. Vegetation Ecologist, NatureServe. Boulder, CO.

Freshwater Ecosystems Sub-team

Butterfield, Bart. Spatial Analyst/GIS Expert Consultant. Boise, ID.

Ciruna, Kristy. (*Sub-Team Leader*) Director of Conservation Programs, Nature Conservancy of Canada–BC Region. Victoria, BC.

Down, Ted. Manager of Aquatic Ecosystem Science, BC Ministry of the Environment

Heiner, Mike. GIS Specialist, The Nature Conservancy–Washington. Seattle. WA.

Horsman, Tracy. (*Formerly*) Spatial Analyst, The Nature Conservancy–Washington. Seattle, WA.

Mount, Craig. Aquatic Geomorphologist, BC Ministry of the Environment

Skidmore, Peter. Aquatic Ecologist, The Nature Conservancy–Washington. Seattle, WA.

Tautz, Art. Science Advisor, BC Ministry of the Environment

Tredger, Dave. Manager of Ecosystem Information, BC Ministry of the Environment

Freshwater Species Sub-team

Ciruna, Kristy. Director of Conservation Programs, Nature Conservancy of Canada

Lewis, Jeff. Wildlife Biologist, Washington Department of Fish and Wildlife, Olympia, WA.

Nicolson, Dave. Conservation Planner/GIS Analyst, Nature Conservancy of Canada–BC Region. Victoria, BC.

Scudder, Geoff. Professor Emeritus, University of British Columbia. Vancouver, BC

Skidmore, Peter. Aquatic Ecologist, The Nature Conservancy

Tyler, Sairah M. (*Sub-Team Leader*) Conservation Planning Consultant, Nature Conservancy of Canada

Wilhere, George. Conservation Biologist, Washington Department of Fish and Wildlife, Olympia, WA

Suitability Index Sub-team

Ciruna, Kristy. Director of Conservation Science, Nature Conservancy of Canada – BC Region, Victoria, BC.

Goering, Mark. GIS Manager, The Nature Conservancy–Washington. Seattle, WA.

Iachetti, Pierre. (*Sub-Team Leader*) Director of Conservation Planning, Nature Conservancy of Canada–BC Region. Victoria, BC.

Nicolson, Dave. Conservation Planner/GIS Analyst, Nature Conservancy of Canada-BC Region. Victoria, BC.

Warner, Nancy. North Central Washington Program Manager, The Nature Conservancy–Washington. Wenatchee, WA.

Wilhere, George. Conservation Biologist, Wildlife Program, Washington Department of Fish and Wildlife, Olympia, WA.

GIS/Data Management Sub-team

Brand, Emily. EDMT Project. The Nature Conservancy–Washington. Seattle, WA.

Farone, Steve. Northwest Ecoregional Applications Manager, The Nature Conservancy–Washington. Seattle, WA.

Ford, Shane. Botanist, Conservation Data Centre, BC Ministry of Environment. Victoria, BC.

Goering , Mark. GIS Coordinator, The Nature Conservancy–Washington. Seattle, WA.

Iachetti, Pierre. Director of Conservation Planning, Nature Conservancy of Canada–BC Region. Victoria, BC.

Langdon, Jesse. Conservation Information Specialist, The Nature Conservancy–Washington. Seattle, WA.

Nicolson, Dave. (*Sub-Team Leader*) Conservation Planner/GIS Analyst, Nature Conservancy of Canada–BC Region. Victoria, BC.

Field Sub-Team

Grandmason, Terra. Science Assistant, The Nature Conservancy–Washington. Seattle, WA.

McAllister, Pam. Communications Manager, The Nature Conservancy–Washington. Seattle, WA.

Miller, Anne. Administrative Assistant, The Nature Conservancy–Washington. Seattle, WA.

Pryce, Barbara. (*Sub-Team Leader*) Okanagan Program Manager, Nature Conservancy of Canada–BC Region. Penticton, BC.

Warner, Nancy. (*Sub-Team Leader*) North Central Washington Program Manager, The Nature Conservancy–Washington. Wenatchee, WA.

APPENDIX 3 – EXPERT REVIEW

Appendix 3 -- Expert Review

Workshop Participants, Peer Reviewers, Additional Input

Washington State Workshop Participants

Colville Workshop – October 28, 2004

Cline, Jerry. Little Pend Oreille National Wildlife Refuge, U.S. Fish and Wildlife Service. Colville, WA.

Current, Warren. Colville, WA.

Heustis, Roger. Washington State Department of Natural Resources. Colville, WA.

Loggers, Chris. Wildlife Biologist, Three Rivers Ranger District, Colville National Forest. Kettle Falls, WA.

Robinette, Kevin. Eastern Washington Wildlife Area Manager, Washington Department of Fish and Wildlife. Spokane Valley, WA.

Zender, Steve. District Wildlife Biologist, Washington Department of Fish and Wildlife. Chewelah, WA.

Nespelem Workshop – October 27, 2004

Browneagle, Vaneta. Fish and Wildlife Department, Colville Confederated Tribes. Nespelem, WA.

Coleman, Tim. Executive Director, Kettle Range Conservation Group. Republic, WA.

Fleenor, Richard. Vegetation Ecologist, Colville Confederated Tribes. Nespelem, WA.

Priest, Jim. Wildlife Biologist, Fish and Wildlife Department, Colville Confederated Tribes. Nespelem, WA.

Sears, Sheri. GIS Specialist, Colville Confederated Tribes. Nespelem, WA.

Thorn, Todd. Forest Practices Administrator, Colville Confederated Tribes. Nespelem, WA.

Okanogan Workshop – October 26, 2004

Baumgardner, Patti. Partnership Coordinator, U.S. Forest Service. Tonasket, WA.

Bill, Katharine. Stewardship Director, Methow Conservancy. Winthrop, WA.

Clausnitzer, Rod. Botanist/Ecologist, U.S. Forest Service. Okanogan, WA.

Fitkin, Scott. District Wildlife Biologist, Washington Department of Fish and Wildlife. Winthrop, WA.

Gaines, Bill. Forest Biologist, U.S. Forest Service. Wenatchee, WA.

Hedges, Neal. District Biologist, USDI Bureau of Land Management. Wenatchee, WA.

Heinlen, Jeff, Okanogan Field Biologist, Washington Department of Fish and Wildlife. Omak, WA.

Jahns, Phil. Vegetation Management Team Leader, U.S. Forest Service. Okanogan, WA.

Lillybridge, Terry R. Plant Ecologist/Forest Botanist, U.S. Forest Service. Wenatchee, WA.

MacDonald, Kenneth D. Forest Fish Program Manager, U.S. Forest Service. Wenatchee, WA.

Musser, John. Wildlife Biologist, U.S. Bureau of Land Management. Wenatchee, WA.

Swedberg, Dale. Wildlife Area Manager, Washington Department of Fish and Wildlife. Loomis, WA.

Thornton, George. Teacher/Consultant, Oroville School District. Oroville, WA.

Townsley, John. U.S. Forest Service. Okanogan, WA.

Wells, Nance. District Fish Biologist, U.S. Forest Service. Tonasket, WA.

Wooten, George. Associate, Conservation Northwest. Twisp, WA.

British Columbia Workshop Participants

Kamloops Workshop – October 20, 2004

Curry, Sean. Weyerhaeuser Canada Ltd.

Davis, Helen. Senior Biologist, Artemis Wildlife Consultants. Armstrong, BC.

Delesalle, Bruno. Executive Director, Grasslands Conservation Council of BC. Kamloops, BC.

Grant, Nelson. Client Services Manager, BC Ministry of Agriculture and Land. Kamloops, BC.

Hammond, Blair. Ecological Gifts Program Coordinator, Environment Canada. Gatineau, QC.

Harrison, Bruce. Senior Biologist, BC Intermountain and Peace Regions, Ducks Unlimited Canada. Kamloops, BC.

Hussey, Darryl. A/Section Head: Mid-Fraser-Thompson-Okanagan, Fisheries and Oceans Canada. Kamloops, BC.

Omelchuk, Susan. Planning Officer, BC Ministry of Agriculture and Lands. Kamloops, BC.

Surgenor, John. Wildlife Biologist, Fish and Wildlife Science and Allocation Section, BC Ministry of Environment. Kamloops, BC.

Wallace, Dan. Planning Services, Thompson Nicola Regional District. Kamloops, BC.

Weir, Richard. Senior Biologist, Artemis Wildlife Consultants. Armstrong, BC.

Wikeem, Brian. Consultant, Solterra Resources Inc. Kamloops, BC.

Lillooet Workshop – October 19, 2004

Birch-Jones, Vivian. President, Lillooet Naturalist Society. Lillooet, BC.

Brown, Don. Stewardship Forester, Ainsworth Lumber Company Ltd. Savona, BC.

Kennedy, Michael. Consultant/Field Laboratory. Lillooet, BC.

Macri, Mickey. Director–Electoral Area B Board, Squamish Lillooet Regional District. Pemberton, BC.

Mascher, Maria. Lillooet Naturalist Society. Lillooet, BC.

North, Kim. Lillooet Naturalist Society. Lillooet, BC.

Romain, Donna. Ecosystems Biologist, Ecosystems Section, BC Ministry of Environment. Kamloops, BC.

Walter, Bruce. First Nations/Stewardship Forester, BC Ministry of Forests and Range. Lillooet, BC.

Penticton Workshop – October 21, 2004

Bezener, Michael. Ornithologist, Partners In Flight. BC.

Black, Shawn. Okanagan Regional Manager, The Land Conservancy. Penticton, BC.

Bouwmeester, Tim. GIS Coordinator, Regional District of Okanagan Similkameen. Penticton, BC.

Brown, Brian. *(Formerly)* Parks Canada.

Cannings, Dick. Consulting Biologist, Cannings Holms Consultants. Naramata, BC.

Cashin, Todd. Environmental Technologist, Regional District of Central Okanagan. Kelowna, BC.

Clarke, Debbie. Allan Brooks Nature Centre/North Okanagan Parks and Natural Areas Trust. Vernon, BC.

Dyer, Orville. Wildlife Biologist, Fish and Wildlife Science and Allocation Section, BC Ministry of Environment. Penticton, BC.

Haney, Allison. Ophiuchus Consulting. Oliver, BC.

Jensen, Vic. Environmental Impact Biologist, Environmental Quality Section, BC Ministry of Environment. Penticton, BC.

Krannitz, Pam. Plant Community Ecologist-SAR, Canadian Wildlife Service, Environment Canada. Delta, BC.

Latimer, Susan. Ecosystems Biologist, Ecosystems Section, BC Ministry of Environment. Vernon, BC.

MacNaughton, Carl. South Okanagan Conservation Land Manager, The Nature Trust of British Columbia. Oliver, BC.

McLean, Alex. Range Officer, BC Ministry of Forests and Range. Vernon, BC.

Millar, Judy. Ecosystems Biologist, Ecosystems Section, BC Ministry of Environment. Penticton, BC.

Mondor, Claude. Director General, Parks Canada. Gatineau, QC.

Munro, Krista. University of British Columbia. Vancouver, BC.

Plamondon, Dan. Deputy Director of Planning, Regional District of Central Okanagan, Kelowna, BC.

Richardson, Howard. Biology Department, Penticton Campus, Okanagan University College; Science Team Lead, South Okanagan Similkameen Conservation Program. Penticton, BC.

Sarell, Mike. Ophiuchus Consulting. Oliver, BC.

Withler, Carl. Resource Stewardship Agrologist, BC Ministry of Agriculture and Lands. Kelowna, BC.

Woods, John. Mount Revelstoke and Glacier National Park Field Unit, Parks Canada. Revelstoke, BC.

Peer Review

Review of Animal Target List

Bezener, Andy. Ornithologist, Partners in Flight. BC.

Burke, Tom. Mollusk Specialist, Private Consultant.

Cannings, Robert. Curator of Entomology, Royal British Columbia Museum. Victoria, BC.

Hays, Dave. Endangered Species Biologist, Washington Department of Fish and Wildlife. Olympia, WA.

Paulson, Dennis. Director Emeritus, Slater Museum of Natural History, University of Puget Sound. Tacoma, WA.

Potter, Ann. Wildlife Biologist, Washington Department of Fish and Wildlife. Olympia, WA.

Pyle, Robert. Lepidopterist, Private Consultant. WA.

Ramsay, Leah. Program Zoologist, Conservation Data Centre, BC Ministry of Environment. Victoria, BC.

Salter, Su. Consulting Biologist.

Stinson, Derek. Wildlife Biologist, Washington Department of Fish and Wildlife.

Wind, Elke. Consulting Biologist, E. Wind Consulting. Nanaimo, BC.

Review of Plant Target List, Criteria, and/or Draft Portfolios

Ceska, Adolf. Botanist, Ceska Geobotanical Consulting. Victoria, BC.

Costanzo, Brenda. Plant SAR Botanist, Biodiversity Branch, BC Ministry of Environment. Victoria, BC.

Glew, Katherine. Assistant Curator/Botanist, University of Washington Herbarium. Seattle, WA.

Lea, Ted. Vegetation Ecologist, Biodiversity Branch, BC Ministry of Environment. Victoria, BC.

Lomer, Frank. Honourary Research Associate–Flora of BC, University of British Columbia Herbarium. Vancouver, BC.

Martin, Malcolm. Naturalist *(Retired)*, North Okanagan Naturalists' Club. Vernon, BC.

Penny, Jenifer. Botanist, Conservation Data Centre, BC Ministry of Environment. Victoria, BC.

Review of Terrestrial Systems, Methods, and/or Products

Clausnitzer, Rod. Botanist/Ecologist, U.S. Forest Service. Okanogan, WA.

Fleenor, Richard. Vegetation Ecologist, Colville Confederated Tribes. Nespelem, WA.

Holmes, Ryan. *(Formerly)* GIS Analyst, Grasslands Conservation Council of British Columbia. BC

Lillybridge, Terry R. Plant Ecologist/Forest Botanist, U.S. Forest Service. Wenatchee, WA.

Lloyd, Dennis. Research Plant Ecologist, Forest Sciences, BC Ministry of Forests and Range. Kamloops, BC.

Morrison, Peter. Executive Director, Pacific Biodiversity Institute. Winthrop, WA.

Peone, Rebecca. Resource Inventory Analysis, Colville Confederated Tribes. Nespelem, WA.

Ryan, Mike. Consultant,

Scudder, Geoff. Professor Emeritus, Zoology, University of British Columbia. Vancouver, BC.

Thorn, Todd. Forest Practices Administrator, Colville Confederated Tribes. Nespelem, WA.

Wikeem, Brian. Consultant, Solterra Resources Inc. Kamloops, BC.

Wooten, George. Associate, Conservation Northwest. Twisp, WA.

Review of Freshwater Systems, Methods, and/or Products

Bugert, Bob. *(Formerly)* Eastern Washington Regional Coordinator, Governor's Salmon Recovery Office. Wenatchee, WA.

Bull, Chris. Glenfir Resources, Naramata, BC.

Harrison, Bruce. Senior Biologist, BC Intermountain and Peace Regions, Ducks Unlimited Canada. Kamloops, BC.

Hessburg, Paul. Research Ecologist, Pacific Northwest Research Station, U.S. Forest Service. Wenatchee, WA.

Jensen, Vic. Environmental Impact Biologist, Environmental Quality Section, BC Ministry of Environment. Penticton, BC.

Long, Kari. Fisheries Department, Okanagan Nation Alliance, Westbank, BC

Machin, Deana. Fisheries Department. Okanagan Nation Alliance, Westbank, BC.

MacNaughton, Carl. South Okanagan Conservation Land Manager, The Nature Trust of British Columbia. Oliver, BC.

McLean, Alex. Range Officer, BC Ministry of Forests and Range. Vernon, BC.

Peone, Joe. Head, Fish and Wildlife Department, Colville Confederated Tribes. Nespelem, WA.

Rae, Rowena. Freshwater Consultant. Penticton, BC

Sears, Sheri. GIS Specialist, Colville Confederated Tribes. Nespelem, WA.

Smith, Ron. Planning Officer, BC Ministry of Agriculture and Lands. Kamloops, BC.

Theberge, Mary. Wildlife Ecologist, Osoyoos Ecological, Canadian Parks and Wilderness Society. Oliver, BC.

Theberge, John. Wildlife Ecologist, Osoyoos Ecological, Canadian Parks and Wilderness Society. Oliver, BC.

Wilson, Andrew. Fisheries Biologist, Fish and Wildlife Science and Allocation Section, BC Ministry of Environment. Penticton, BC.

Wolf, Keith. Principal Scientist, KWA Ecological Sciences, Inc. Duval, WA.

Review of Suitability Index

Braumandl, Tom. Consultant. Nelson, BC

Bugert, Bob. (Formerly) Eastern Washington Regional Coordinator, Governor's Salmon Recovery Office. Wenatchee, WA.

Ciruna, Kristy. Director of Conservation Programs, Nature Conservancy of Canada–BC Region. Victoria BC.

Crawford, Rex. Vegetation Ecologist–Eastern Washington Washington Natural Heritage Program, Washington Department of Natural Resources, Olympia WA

Fairbarns, Matt. Conservation Botanist, Aruncus Consulting, Victoria BC

Fleenor, Richard. Vegetation Ecologist, Colville Confederated Tribes. Nespelem, WA.

Ford, Shane. A/Director, BC Ministry of Environment, Conservation Data Centre

Furness, Grant. Senior Ecosystems Biologist, Ecosystems Section, BC Ministry of Environment. Penticton, BC.

Heinlen, Jeff. Okanogan Field Biologist, Washington Department of Fish and Wildlife. Omak, WA

Iachetti, Pierre. Director of Conservation Planning, Nature Conservancy of Canada, BC Region. Victoria, BC

Iverson, Kristi. Consultant, Iverson & Mackenzie Biological Consulting. Lac la Hache, BC

Jones, Dave. Wildlife Biologist, Ret., BC Ministry of Environment. Kamloops BC.

Nicolson, Dave. Conservation Planner/GIS Analyst, Nature Conservancy of Canada–BC Region. Victoria, BC

Pryce, Barb. Okanagan Program Manager, Nature Conservancy of Canada–BC Region. Penticton, BC

Sears, Sheri. GIS Specialist, Colville Confederated Tribes. Nespelem, WA.

Skidmore, Peter. Aquatic Ecologist, The Nature Conservancy - Washington, Seattle, WA.

Warner, Nancy. North Central Washington Program Manager, The Nature Conservancy–Washington. , Wenatchee WA

Weir, Richard. Senior Biologist, Artemis Wildlife Consultants. Armstrong, BC.

Wilhere, George. Conservation Biologist, Washington Department of Fish and Wildlife. Olympia, WA.

Zender, Steve. District Wildlife Biologist, Washington Department of Fish and Wildlife. Chewelah, WA

Review of Land Use History Section

Brodribb, Kara. Manager, Conservation Planning, Nature Conservancy of Canada, Toronto, Ontario

Nisbet, Jack. Writer. Spokane, WA.

Thornton, George. Teacher/Consultant, Oroville School District. Oroville, WA.

Additional Input

Allison, Tammy. Enow'kin Centre. Penticton, BC.

Armstrong, Jeanette. Executive Director, Enow'kin Centre. Penticton, BC.

Arner, Brad. Ducks Unlimited Canada. Kamloops, BC.

Bender, Jane. Water Technical Officer, Water Stewardship – Okanagan, BC Ministry of Environment. Penticton, BC.

Betz, Greg. Area Supervisor, Parks and Protected Areas, BC Ministry of Environment. Penticton, BC.

Birzins, Paul. Formerly Chief Forester, Okanagan Nation Alliance. Westbank, BC.

Brodie, Robert (Bob). Manager, Crown Land Partnership and Sales, BC Ministry of Agriculture and Lands. Kamloops, BC.

Carmichael, Drew. Regional Manager, Okanagan Regional Office, BC Ministry of Environment. Penticton, BC.

Cunningham, Ken. Regional Manager, Southern Interior, Water Stewardship, BC Ministry of Environment. Penticton, BC.

Dingle, Lora. Auxiliary Wildlife Biologist, BC Ministry of Environment. Penticton, BC.

Dyer, Orville. Wildlife Biologist, Fish and Wildlife Science and Allocation Section, BC Ministry of Environment, Member of Animals Team. Penticton, BC.

Enns, Rob. Area Supervisor, Parks and Protected Areas, BC Ministry of Environment. Kamloops, BC.

Epp, Phil. Hydrologist, Ecosystem Section, BC Ministry of Environment. Penticton, BC.

Ethier, Tom. Assistant Director, Fish and Wildlife Branch, BC Ministry of Environment. Victoria, BC.

Furness, Grant. A./Section Head, Ecosystem Section, BC Ministry of Environment. Penticton, BC.

Hare, Al. Land Officer, Crown Land Ajudication, BC Ministry of Agriculture and Land. Kamloops, BC.

Hawes, Rob. Formerly Program Manager, South Okanagan Similkameen Conservation Program. Penticton, BC.

Jensen, Vic. Environmental Impact Biologist, Environmental Quality Section, BC Ministry of Environment. Penticton, BC.

Jones, Dave. Ecosystem Section Head, BC Ministry of Environment. Penticton, BC.

Klenner, Walter. Research Wildlife Habitat Ecologist, Forest Services, BC Ministry of Forests and Range. Kamloops, BC.

Ladd, Mike. Parks Area Supervisor, Protected Areas Section, BC Ministry of Environment. Penticton, BC.

Lewis, Doug. Grad Student, Consultant.

Lincoln, Bob. Independent.

Lloyd, Dennis. Research Plant Ecologist, Forest Sciences, BC Ministry of Forests. Kamloops, BC.

Meeson, John. Section Head, Planning, Okanagan Regional Office, BC Ministry of Environment. Penticton, BC.

Michel, Henry. Forest Research Extension Partnership. Kamloops, BC.

Millar, Judy. Mountain Pine Beetle Specialist, Mountain Pine Beetle Response, BC Ministry of Environment. Penticton, BC.

Morrison, Ken. Manager, Land Acquisition and Management Section. Ministry of Environment. Victoria, BC.

Pryce, Conrad. Senior Environmental Protection Officer, BC Ministry of Environment. Nelson, BC.

Rae, Rowena. Science writer/editor, Independent.

Schebel, Wendy. Puddle Project Coordinator, Ducks Unlimited Canada

Sinclair, Earl. Section Head, Parks and Protected Areas, BC Ministry of Environment. Kamloops, BC.

Smith, Ron. Planning Officer, Land Use Planning, BC Ministry of Agriculture and Lands. Kamloops, BC.

Stewart, Robert. Ecosystem Biologist, Ecosystems Section, BC Ministry of Environment. Penticton, BC.

Townson, Ron. Environmental Protection Officer, EP-Municipal, Ministry of Environment

Trewhitt, John. Park Area Supervisor, Protected Areas Section, BC Ministry of Environment. Penticton, BC.

Weilandt, Peter. Regional Planning, Section Head, Thompson Regional Office, BC Ministry of Environment. Kamloops, BC.

Werstiuk, Mickey. Land Stewardship Manager, Okanagan Nation Alliance. Westbank, BC.

Weston, Mark. Sr. Park Ranger, East Okanagan, Protected Areas Section, BC Ministry of Environment. Penticton, BC.

Wilson, Andrew. Senior Fish Biologist, Fish and Wildlife Science and Allocation Section, BC Ministry of Environment. Penticton, BC.

APPENDIX 4 – DATA SOURCES

Appendix 4 – Data Sources

The following summarizes data sources used in the Okanagan Ecoregional Assessment.

Category/ Jurisdiction	Layer Name/Description	Source	Date	Scale
Terrestrial Assessment Units				
	Hexagons	Generated using ArcView Sites Extension	2003	500 ha
Freshwater Assessment Units				
British Columbia	BC Watershed Atlas	ftp://ftp.env.gov.bc.ca/dist/arcwhse/watershed_atlas/	2000	1:50,000
Washington State	Interior Columbia Basin Ecosystem Management Project watersheds	http://www.icbemp.gov/	1998	1:100,000
Land Ownership and Management Status				
British Columbia	BC Provincial Parks and Protected Areas (with IUCN rank assigned)	BC Government ftp://ftp.env.gov.bc.ca/dist/arcwhse/parks/	2005	1:20,000-1:250,000
	Goal 2 Protected Areas			
	Okanagan Shuswap LRMP	ftp://kamftp.env.gov.bc.ca/pub/outgoing/dist/sir_overview/arc_data/arcinfo_e00/	2003	1:20,000
	Kamloops LRMP		2003	1:20,000
	Lillooet LRMP	BC Government	2004	1:20,000
	West Kootenay Boundary Land Use Plan	ftp://nelftp.env.gov.bc.ca/pub/outgoing/hlp/data	1999	1:20,000 – 1:50,000
	Regional Park	Regional District of Okanagan Similkameen	2004	1:20,000
	Provincial tenures with conservation value	BC Government	1999-2003	1:20,000
	Conservation Trust Land	Nature Conservancy of Canada The Nature Trust The Land Trust	2002-2004	Various scales
	Areas owned or leased by land conservancy or designated for conservation in the Okanagan	ftp://kamftp.env.gov.bc.ca/pub/outgoing/dist/sir_overview/arc_data/arcinfo_e00/	2000-2002	1:20,000
	Wildlife Management Areas			
	South Okanagan WMA	ftp://kamftp.env.gov.bc.ca/pub/outgoing/dist/sir_overview/arc_data/arcinfo_e00/	2002	1:20,000
	South Okanagan Conservation Strategy Wildlife Reserves		2000	1:20,000
	Kamloops LRMP		1999	1:20,000
	Lillooet LRMP	BC Government	2004	1:20,000
	Canadian Wildlife Service National Wildlife Areas	Canadian Government	2004	1:20,000
	Indian Reserve	BC Government	2002	1:20,000
	Private Land			
	South Okanagan Conservation Strategy Land Status (South Okanagan Similkameen Conservation Program)	ftp://kamftp.env.gov.bc.ca/pub/outgoing/dist/sir_overview/arc_data/arcinfo_e00/	1999	1:20,000

Category/ Jurisdiction	Layer Name/Description	Source	Date	Scale
	Southern Interior forest cover private ownership Southern Interior Region ownership BC Provincial private land overview	BC Government	1997-2001 2001 Circa 1990s	1:20,000 1:20,000 1:250,000
	Tree Farm Licenses	BC Government	2002	1:20,000
	Regional Districts	BC Government	2002	1:250,000
	Municipalities	BC Government	2001	1:20,000
	Forest Districts	BC Government	2004	1:20,000
Washington State	Washington Department of Natural Resources Public land survey, Ownership, County, and Administration (POCA) Note – Includes Tribal Reserves	http://www3.wadnr.gov/dnrapp5/website/cadastre/links/other_dnr_gis_data/POCA.htm	2002	1:100,000
	Washington Department of Natural Resources Major Public Lands (MPL) – includes public lands for all local, state, and federal agencies in WA	http://www3.wadnr.gov/dnrapp5/website/cadastre/links/other_dnr_gis_data/NoDNR_Major_%20Public_Lands.htm	2000	1:100,000
	TNC, Land Trust, and more specific forest information such as LSR	Various via TNC GIS staff	2005	various
	Management Area Categories (MAC 1 and 2)	http://www.icbemp.gov/	1995/2000	1:24,000
	Colville Federated Tribes – Land Use Zoning, Wilderness Areas, Game Reserves	Colville Federated Tribes	2004	1:24,000
	County Boundary – created from Dept. of Natural Resources (POCA) dataset	Derived from Washington Dept. of Ecology county dataset	1998	1:24,000
Terrestrial Ecological Systems				
British Columbia	Existing Vegetation Biogeoclimatic Ecosystem Classification (BEC)	BC Ministry of Forests & Range http://www.for.gov.bc.ca/HRE/becweb/index.html	2003	1:250,000
	Climatic Zones, Potential Natural Vegetation Broad Ecosystem Inventory and Mapping (BEU)	BC Ministry of Agriculture and Lands (formerly MSRM) http://srmwww.gov.bc.ca/ecology/bei/index.html	1998	1:250,000
	Tree Size data Baseline Thematic Mapping (BTM)	BC Ministry of Agriculture and Lands (formerly MSRM) http://ilmbwww.gov.bc.ca/cis/initiatives/ias/btm/index.html	Imagery from 1990-97 Spatial: Jan 2001	1:250 000 (10-15 ha polygon size)
	Existing Vegetation, Tree size data Forest Cover Maps	BC Ministry of Forests and Range	Inventoried 1997 - 2001	1:20,000
	Elevation, topography for modeling Gridded Elevation Model (TDEM)	BC Ministry of Agriculture and Lands (formerly MSRM) - TRIM Program	2002	25 m grid resolution
British Columbia and Washington State	Existing Vegetation GeoCover Orthorectified Landsat Thematic Mapper Mosaics	Earth Satellite Corporation	1990	30m resolution

Category/ Jurisdiction	Layer Name/Description	Source	Date	Scale
	Climate Zones and Potential Natural Vegetation Regional and Zonal Ecosystems of the Shining Mountains	BC Ministry of Sustainable Resource Management (MSRM) http://srmwww.gov.bc.ca/ecology/bei/shiningmtns.html	2000	1:250,000
	Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. *Ecological Systems of the United States: A Working Classification of US Terrestrial Systems*. NatureServe, Arlington, Virginia.		2003	n/a
Washington State	Existing Vegetation Henderson, J.A., D.A. Peter, and R. Lesher. 1992. *Field Guide to the Forested Plant Associations of the Mt. Baker-Snoqualmie National Forest*. USDA USFS PNW Region. R6 ECOL Tech Paper 028-91. 196p.		1992	n/a
	Existing Vegetation Almack, J.A., W.L. Gaines, P.H. Morrison, J.R. Eby, G.F. Wooten, M.C. Snyder, S.H. Fitkin, and E.R. Garcia. 1993. *North Cascades Grizzly Bear Ecosystem Evaluation (NCGBE) - Final Report. Interagency Grizzly Bear Committee*. Denver, Colorado. 156 pp.		1993	n/a
	Modeled Existing Vegetation Henderson, J.A. 2001 revised draft. *The PNV Model - A gradient model for predicting environmental variables and units of Potential Natural Vegetation across a landscape.* USFS Mt. Baker Snoqualime NF. Mountlake Terrace, WA		2001	n/a
	Tree Size data Quadratic mean diameter, Interagency Vegetation Mapping Project (IVMP)	BLM Oregon, Forest Service Region 6	1996	30m grid resolution.
	Urban and Agricultural Land USGS Land Use and Land Cover (LULC) layer	US Geological Service http://edc.usgs.gov/products/landcover/lulc.html	1980s	1:250,000
	Urban and Agricultural Land USGS National Land Cover Dataset (NLCD) layer	US Geological Service http://landcover.usgs.gov/mapping_proc.php#explain	1999, 1996	30m grid resolution
	Elevation, topography for modeling National Elevation Dataset (NED), USGS EROS	US Geological Service	1999	30m grid resolution
Riparian Ecosystems (model / for reviewing results)				
	Digital Elevation Model (DEM) / DEM-derived hillshade grid	Derived from elevation data (see terrestrial ecological systems)		
	Satellite Imagery – NASA Geocover	https://zulu.ssc.nasa.gov/mrsid/mrsid.pl	2000/ 2001/ 2002	
	LULC, NLCD and BTM – see terrestrial systems above			
Terrestrial Plant Species Targets and Plant Associations				
	International Vegetation Classification (IVC) Grossman D.H., Faber-Langendoen D., Weakley A.S., Anderson M., Bourgeron P., Crawford R., Goodin K.,		1998	n/a

Category/ Jurisdiction	Layer Name/Description	Source	Date	Scale
	Landaal S., Metzler K., Patterson K.D., Pyne M., Reid M., and Sneddon L. 1998. *International classification of ecological communities: terrestrial vegetation of the United States. Volume I, The National Vegetation Classification System: development, status, and applications.* The Nature Conservancy: Arlington, VA.			
	British Columbia Conservation Data Centre	http://www.env.gov.bc.ca/cdc/index.html	2004	1:20,000
	Washington Natural Heritage Program		2004	
Lichens				
	See Dr. Katherine Glew's report in Appendix 11			
Terrestrial Animals Species Targets				
British Columbia	British Columbia Conservation Data Centre	http://www.env.gov.bc.ca/cdc/index.html	2004	1:20,000
	British Columbia Ministry of Environment	Formerly BC Ministry of Water, Land and Air Protection	2004	
	Royal British Columbia Museum		2004	
	Environment Canada (bird data)		2004	
	Bella Vista-Goose Lake Range Sensitive Ecosystem Inventory	BC Ministry of Environment http://www.env.gov.bc.ca/sei/bellavista/index.html	2003	1:20,000
	Artemis Wildlife Consultants		2004	
	Ophiuchus Consulting Ltd.		2004	
Washington State	Washington Department of Fish and Wildlife		2004	
	Washington Department of Natural Resources Heritage Program		2004	
	Okanogan, Colville and Wenatchee National Forests		2004	
	Dr. Dennis Paulson, University of Puget Sound		2004	
	Colville Federated Tribes – bald eagle nests, golden eagle nests, loon sites, lynx habitat		2004	
Freshwater Ecological Systems				
British Columbia	Drainage Area BC Watershed Atlas	BC Ministry of Environment http://www.bcfisheries.gov.bc.ca/fishinv/basemaps-technotes.html ftp://ftp.env.gov.bc.ca/dist/arcwhse/watershed_atlas/	2000	1:50,000
	Percentage of lake area to watershed polygon area BC Watershed Atlas	See above for watershed atlas	2000	1:50,000
	Percentage of wetland area to watershed polygon area BC Watershed Atlas	See above for watershed atlas	2000	1:50,000

Category/ Jurisdiction	Layer Name/Description	Source	Date	Scale
	Percent glacial influence BC Watershed Atlas Glaciers from BC TRIM mapping	See above for watershed atlas BC Ministry of Agriculture and Lands (formerly MSRM) - TRIM Program	2000	1:50,000 1:20,000
	Biogeoclimatic Zone Biogeoclimatic Ecosystem Classification (BEC)	BC Ministry of Forests & Range http://www.for.gov.bc.ca/HRE/becweb/index.html	2003	1:250,000
	Geology Digital Geology Map of British Columbia	BC Ministry of Energy and Mines http://www.em.gov.bc.ca/Mining/Geolsurv/Publications/catalog/bcgeolmap.htm	2003	1:250,000
	Mainstem and Tributary Stream Gradient BC Watershed Atlas BC TRIM DEM	See above for watershed atlas BC Ministry of Agriculture and Lands (formerly MSRM) - TRIM Program	2000 2002	1:50,000 1:20,000 (25 meter)
British Columbia and Washington State	Accumulative precipitation yield	ClimateSource http://www.climatesource.com	2004	n/a
Washington State	Drainage Area Hydrologic Unit Boundary (HUC) calculated watersheds	US Geological Service	2002	1:24,000
	Percentage of lake area to watershed polygon area National Hydrography Dataset (NHD)	US Geological Service http://nhd.usgs.gov/data.html	2004	1:100,000
	Percentage of wetland area to watershed polygon area National Hydrography Dataset (NHD)	US Geological Service http://nhd.usgs.gov/data.html	2004	1:100,000
	Percent glacial influence National Hydrography Dataset (NHD)	US Geological Service http://nhd.usgs.gov/data.html	2004	1:100,000
	Biogeoclimatic Zones Regional and Zonal Ecosystems of the Shining Mountains	BC Ministry of Sustainable Resource Management http://srmwww.gov.bc.ca/ecology/bei/shiningmtns.html	November 2000	1:250,000
	Geology Surface Geology	Washington Department of Natural Resources http://www.dnr.wa.gov/geology/dig100k.htm	2003	1:100,000
	Mainstem and Tributary Stream Gradient HUC calculated watersheds National Hydrography Dataset (NHD)	US Geological Service http://nhd.usgs.gov/data.html	2002 2004	1:24,000 1:100,000
Freshwater Species Targets				
British Columbia	British Columbia Fisheries/Canadian Department of Fisheries and Oceans; Fisheries Information Summary System (FISS)	http://www.bcfisheries.gov.bc.ca/fishinv/fiss.html	2004	1:50,000
	BC Conservation Data Centre	http://www.env.gov.bc.ca/cdc/index.html	2004	1:20,000

Category/ Jurisdiction	Layer Name/Description	Source	Date	Scale
	Royal British Columbia Museum		2004	
	British Columbia Ministry of Environment	Formerly British Columbia Ministry of Water, Land and Air Protection	2004	
Washington State	Pacific States Marine Fisheries Commission (Washington Department of Fish and Wildlife) Streamnet	http://www.streamnet.org	1995 to 2001	1:100,000
	American Fisheries Society (AFS) Fish Occurrence Data		2004	
	Washington Department of Fish and Wildlife Washington Lakes and Rivers Information System (WLRIS) – includes FishDist	Revision/updates to Streamnet	2004	1:24,000
	Washington Department of Fish and Wildlife Salmonid Stock Inventory(SaSI)	Derived from Streamnet http://wdfw.wa.gov/fish/sassi/intro.htm	2002	1:100,000
	Washington Department of Fish and Wildlife Ecosystem Diagnosis and Treatment (EDT) for Okanogan drainage [targets set by Ecologically Significant Units (ESU)]		2004	
	Washington Department of Fish and Wildlife Heritage Program / Fish Program (ResFish)		2004	
	Okanogan, Colville and Wenatchee National Forests		2004	
	Washington Department of Natural Resources Heritage Program		2004	
	Attributing freshwater species BC Macroreach stream network (BCMCRH1A)	BC Ministry of Environment (formerly MSRM)	2004	1:50,000
	Attributing freshwater species National Hydrography Dataset (NHD)	US Geological Service http://nhd.usgs.gov/data.html	2004	1:100,000
Suitability Indices				
British Columbia	Management Status See Land Ownership and Management Status			
	Land Use Baseline Thematic Mapping	http://ilmbwww.gov.bc.ca/cis/initiatives/ias/btm/luspec6.pdf	1990 to 1997	1:250,000
	Future Urban Potential Statistics Canada Urban Growth Core areas	2001 Census	2001	1:250,000
	Fire Condition Fire regime and condition class mapping	Bruce Blackwell and Associates http://www.bablackwell.com/fii-report.pdf	2003	1:20,000
	Road Density	BC Ministry of Agriculture and Lands TRIM Program	2002	1:20,000

Category/ Jurisdiction	Layer Name/Description	Source	Date	Scale
	Dams	Dam Safety Group Additional dam locations from BC Hydro	2001 2001	latitude and longitude coordinates (DMS)
Washington State	Management Status See Land Ownership and Management Status			
	Land Use USGS Land Use and Land Cover (LULC) layer	US Geological Service http://edc.usgs.gov/products/landcover/lulc.html	1980s	1:250,000
	Future Urban Potential Delineated urban areas	Washington Dept of Community, Trade, and Economic Development (CTED) ftp://ftp.wsdot.wa.gov/public/Cartography/UrbanAreas/UrbanAreaShapeFiles	Circa 2001	
	Fire Condition Fire regime and condition class mapping	USDA Forest Service wildland fire and fuel management http://www.fs.fed.us/fire/fuelman	2001	1 km grids
	Dams	Streamnet http://www.streamnet.org	1995 to 2001	1:100,000
	Road Density			
	Bureau of Land Management	http://www.blm.gov/or/gis/index.htm	Aug. 2004	1:24,000
	Colville National Forest	http://www.fs.fed.us/r6/data-library/gis/colville	2001 (July 2004)	1:24,000
	Geographic Data Technology Inc.	Dynamap/1000	1999	1:24,000
	Okanogan County	http://www.okanogancounty.org/planning/index.html	July 2004	1:24,000
	Tiger 2002	downloaded from NRCS Gateway	2002	1:100,000
	Washington Department of Natural Resources	http://www3.wadnr.gov/dnrapp6/dataweb/dmmatrix.html (download by county)	June 2004	1:24,000
	Wenatchee National Forest	http://www.fs.fed.us/r6/data-library/gis/wenatchee	2001 (July 2004)	1:24,000
Retrospective Analysis – Grizzly				
British Columbia	Grizzly Bear Population Units (GBPU)	British Columbia Ministry of Environment	2003	1:250,000
Washington State	North Cascades Grizzly bear recovery plan	US Fish and Wildlife Service	1993	1:250,000
Retrospective Analysis – BC Grasslands				
British Columbia	Native grasslands / grassland ecosystems	Grasslands Conservation Council of British Columbia	2000-2004	1:20,000

APPENDIX 5 – TARGETS AND GOALS SUMMARY

Okanagan Ecoregion Targets and Goals Summary

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Terrestrial										
Terrestrial Ecological Systems										
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests										
	Interior Transition Ranges Section				Primary Target	☑	848,803 ha	285,563 ha	254,641 ha	112
	Central Okanagan Section				Primary Target	☑	1,132,048 ha	375,991 ha	339,614 ha	111
	Okanagan Highlands Section				Primary Target	☑	894,723 ha	290,330 ha	268,417 ha	108
	Thompson Okanagan Plateau Section				Primary Target	☑	1,360,740 ha	432,370 ha	408,222 ha	106
	Northern Cascade Ranges Section				Primary Target	☑	1,292,406 ha	430,015 ha	387,722 ha	111
Aggregate - Ponderosa Pine and Sagebrush Steppe										
	Interior Transition Ranges Section				Primary Target	☑	169,711 ha	64,746 ha	50,913 ha	127
	Central Okanagan Section				Primary Target	☑	107,986 ha	36,429 ha	32,396 ha	112
	Okanagan Highlands Section				Primary Target	☑	623,297 ha	235,358 ha	186,989 ha	126
	Thompson Okanagan Plateau Section				Primary Target	☑	328,660 ha	104,682 ha	98,598 ha	106
	Northern Cascade Ranges Section				Primary Target	☑	211,721 ha	60,316 ha	63,516 ha	95
Columbia Basin Foothill Riparian Woodland and Shrubland										
	Interior Transition Ranges Section				Primary Target	☑	1,174 ha	561 ha	352 ha	159
	Central Okanagan Section				Primary Target	☑	872 ha	368 ha	262 ha	140
	Okanagan Highlands Section				Primary Target	☑	11,555 ha	4,631 ha	3,466 ha	134
	Thompson Okanagan Plateau Section				Primary Target	☑	4,204 ha	1,820 ha	1,261 ha	144
	Northern Cascade Ranges Section				Primary Target	☑	4,013 ha	1,667 ha	1,204 ha	138
East Cascades Mesic Montane Mixed Conifer Forest										
	Interior Transition Ranges Section				Primary Target	☑	7,610 ha	2,251 ha	2,283 ha	99
	Northern Cascade Ranges Section				Primary Target	☑	38,883 ha	11,727 ha	11,665 ha	101
Inter-Mountain Basins Big Sagebrush Steppe										
	Interior Transition Ranges Section				Primary Target	☑	13,854 ha	5,588 ha	4,156 ha	134
	Central Okanagan Section				Primary Target	☑	6,457 ha	2,692 ha	1,937 ha	139
	Okanagan Highlands Section				Primary Target	☑	413,377 ha	165,369 ha	124,013 ha	133
	Thompson Okanagan Plateau Section				Primary Target	☑	55,289 ha	22,816 ha	16,587 ha	138

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Northern Cascade Ranges Section				Primary Target	☑	139,301 ha	55,704 ha	41,790 ha	133
Inter-Mountain Basins Cliff and Canyon										
	Interior Transition Ranges Section				Primary Target	☑	4,685 ha	1,420 ha	1,406 ha	101
	Okanagan Highlands Section				Primary Target	☑	96 ha	30 ha	29 ha	103
	Northern Cascade Ranges Section				Primary Target	☑	698 ha	188 ha	209 ha	90
North American Alpine Ice Field										
	Interior Transition Ranges Section				Primary Target	☑	58,505 ha	17,651 ha	17,552 ha	101
	Northern Cascade Ranges Section				Primary Target	☑	2,806 ha	2,710 ha	842 ha	322
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest										
	Interior Transition Ranges Section				Primary Target	☑	125,298 ha	25,009 ha	37,589 ha	67
	Northern Cascade Ranges Section				Primary Target	☑	98,043 ha	28,526 ha	29,413 ha	97
North Pacific Maritime Mesic Parkland										
	Interior Transition Ranges Section				Primary Target	☑	17,289 ha	9,219 ha	5,187 ha	178
	Northern Cascade Ranges Section				Primary Target	☑	9,218 ha	2,771 ha	2,765 ha	100
North Pacific Montane Riparian Woodland and Shrubland										
	Interior Transition Ranges Section				Primary Target	☑	3,462 ha	1,032 ha	1,039 ha	99
	Northern Cascade Ranges Section				Primary Target	☑	2,722 ha	820 ha	817 ha	100
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland										
	Central Okanagan Section				Primary Target	☑	202,928 ha	63,049 ha	60,878 ha	104
	Thompson Okanagan Plateau Section				Primary Target	☑	301,769 ha	95,710 ha	90,531 ha	106
Northern Interior Lodgepole Pine-Douglas fir woodland and forest										
	Interior Transition Ranges Section				Primary Target	☑	280,639 ha	87,021 ha	84,192 ha	103
	Central Okanagan Section				Primary Target	☑	183,026 ha	58,992 ha	54,908 ha	107
	Okanagan Highlands Section				Primary Target	☑	2 ha	1 ha	1 ha	100
	Thompson Okanagan Plateau Section				Primary Target	☑	520,941 ha	157,975 ha	156,282 ha	101
	Northern Cascade Ranges Section				Primary Target	☑	191,674 ha	62,304 ha	57,502 ha	108

Okanagan Ecoregion Targets and Goals Summary

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Northern Interior Plateau Grassland										
	Interior Transition Ranges Section				Primary Target	☑	14,258 ha	8,575 ha	4,277 ha	200
	Central Okanagan Section				Primary Target	☑	31,080 ha	18,574 ha	9,324 ha	199
	Thompson Okanagan Plateau Section				Primary Target	☑	166,106 ha	99,666 ha	49,832 ha	200
	Northern Cascade Ranges Section				Primary Target	☑	6,710 ha	4,002 ha	2,013 ha	199
Northern Interior Spruce-Fir woodland and forest										
	Interior Transition Ranges Section				Primary Target	☑	186,438 ha	59,656 ha	55,931 ha	107
	Central Okanagan Section				Primary Target	☑	452,966 ha	142,390 ha	135,890 ha	105
	Okanagan Highlands Section				Primary Target	☑	7,791 ha	3,539 ha	2,337 ha	151
	Thompson Okanagan Plateau Section				Primary Target	☑	391,738 ha	123,890 ha	117,521 ha	105
	Northern Cascade Ranges Section				Primary Target	☑	341,629 ha	105,696 ha	102,489 ha	103
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland										
	Interior Transition Ranges Section				Primary Target	☑	10,648 ha	4,261 ha	3,194 ha	133
	Central Okanagan Section				Primary Target	☑	16,325 ha	6,529 ha	4,898 ha	133
	Okanagan Highlands Section				Primary Target	☑	18,220 ha	7,284 ha	5,466 ha	133
	Thompson Okanagan Plateau Section				Primary Target	☑	22,001 ha	8,799 ha	6,600 ha	133
	Northern Cascade Ranges Section				Primary Target	☑	15,151 ha	6,068 ha	4,545 ha	134
Northern Rocky Mountain Montane Mixed Conifer Forest										
	Okanagan Highlands Section				Primary Target	☑	671,598 ha	204,717 ha	201,479 ha	102
	Northern Cascade Ranges Section				Primary Target	☑	176,919 ha	58,455 ha	53,076 ha	110
Northern Rocky Mountain Subalpine Dry Parkland										
	Interior Transition Ranges Section				Primary Target	☑	40,365 ha	16,124 ha	12,110 ha	133
	Central Okanagan Section				Primary Target	☑	14,326 ha	5,748 ha	4,298 ha	134
	Okanagan Highlands Section				Primary Target	☑	8,041 ha	3,215 ha	2,412 ha	133
	Thompson Okanagan Plateau Section				Primary Target	☑	4,467 ha	2,114 ha	1,340 ha	158
	Northern Cascade Ranges Section				Primary Target	☑	52,729 ha	22,906 ha	15,819 ha	145
Northern Rocky Mountain Western Redcedar-Hemlock Forest										
	Central Okanagan Section				Primary Target	☑	32,250 ha	1,556 ha	9,675 ha	16
	Okanagan Highlands Section				Primary Target	☑	141,281 ha	22,952 ha	42,384 ha	54

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
	Thompson Okanagan Plateau Section				Primary Target	☑	70,718 ha	5,363 ha	21,215 ha	25
Rocky Mountain Alpine Composite										
	Interior Transition Ranges Section				Primary Target	☑	297,543 ha	89,296 ha	89,263 ha	100
	Central Okanagan Section				Primary Target	☑	4,267 ha	1,454 ha	1,280 ha	114
	Thompson Okanagan Plateau Section				Primary Target	☑	3,751 ha	3,203 ha	1,125 ha	285
	Northern Cascade Ranges Section				Primary Target	☑	92,598 ha	51,542 ha	27,779 ha	186
Rocky Mountain Alpine-Subalpine wetlands										
	Interior Transition Ranges Section				Primary Target	☑	349 ha	154 ha	105 ha	147
Rocky Mountain Cliff, Canyon and Massive Bedrock										
	Interior Transition Ranges Section				Primary Target	☑	34,375 ha	10,347 ha	10,312 ha	100
	Central Okanagan Section				Primary Target	☑	4,065 ha	1,186 ha	1,220 ha	97
	Okanagan Highlands Section				Primary Target	☑	2,949 ha	1,222 ha	885 ha	138
	Thompson Okanagan Plateau Section				Primary Target	☑	697 ha	362 ha	209 ha	173
	Northern Cascade Ranges Section				Primary Target	☑	12,606 ha	6,087 ha	3,782 ha	161
Rocky Mountain Ponderosa Pine Woodland and Savanna										
	Interior Transition Ranges Section				Primary Target	☑	155,892 ha	64,644 ha	46,768 ha	138
	Central Okanagan Section				Primary Target	☑	101,497 ha	42,087 ha	30,449 ha	138
	Okanagan Highlands Section				Primary Target	☑	343,050 ha	142,692 ha	102,915 ha	139
	Thompson Okanagan Plateau Section				Primary Target	☑	273,368 ha	111,901 ha	82,010 ha	136
	Northern Cascade Ranges Section				Primary Target	☑	99,351 ha	41,662 ha	29,805 ha	140
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland										
	Interior Transition Ranges Section				Primary Target	☑	187,769 ha	60,422 ha	56,331 ha	107
	Central Okanagan Section				Primary Target	☑	47,074 ha	15,812 ha	14,122 ha	112
	Okanagan Highlands Section				Primary Target	☑	111,712 ha	35,943 ha	33,514 ha	107
	Thompson Okanagan Plateau Section				Primary Target	☑	1,829 ha	604 ha	549 ha	110
	Northern Cascade Ranges Section				Primary Target	☑	296,872 ha	108,044 ha	89,062 ha	121
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland										
	Interior Transition Ranges Section				Primary Target	☑	192,372 ha	65,291 ha	57,712 ha	113
	Central Okanagan Section				Primary Target	☑	241,614 ha	74,298 ha	72,484 ha	103

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Okanagan Highlands Section				Primary Target	☑	104,190 ha	32,100 ha	31,257 ha	103
	Thompson Okanagan Plateau Section				Primary Target	☑	148,559 ha	47,593 ha	44,568 ha	107
	Northern Cascade Ranges Section				Primary Target	☑	287,040 ha	95,805 ha	86,112 ha	111
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland										
	Interior Transition Ranges Section				Primary Target	☑	4,117 ha	1,391 ha	1,235 ha	113
	Central Okanagan Section				Primary Target	☑	640 ha	220 ha	192 ha	115
	Okanagan Highlands Section				Primary Target	☑	173 ha	75 ha	52 ha	144
	Thompson Okanagan Plateau Section				Primary Target	☑	1,685 ha	719 ha	506 ha	142
	Northern Cascade Ranges Section				Primary Target	☑	2,627 ha	1,380 ha	788 ha	175
Species										
Amphibians										
Coastal tailed frog *Ascaphus truei*										
	Okanagan Ecoregion	G4		S4	Secondary Target	☑	119 occ	103 occ	13 occ	792
	Central Okanagan Section	G4		S4	Secondary Target	☑	14 occ	5 occ	2 occ	250
	Okanagan Highlands Section	G4		S4	Secondary Target	☑	98 occ	96 occ	2 occ	4800
	Thompson Okanagan Plateau Section	G4		S4	Secondary Target	☑	4 occ	0 occ	2 occ	0
	Northern Cascade Ranges Section	G4		S4	Secondary Target	☑	3 occ	2 occ	2 occ	100
Great Basin spadefoot *Spea intermontana*										
	Okanagan Ecoregion	G5	S3	S5	Primary Target	☑	100 occ	63 occ	13 occ	485
	Central Okanagan Section	G5	S3	S5	Primary Target	☑	18 occ	8 occ	2 occ	400
	Okanagan Highlands Section	G5	S3	S5	Primary Target	☑	44 occ	34 occ	2 occ	1700
	Thompson Okanagan Plateau Section	G5	S3	S5	Primary Target	☑	24 occ	10 occ	2 occ	500
	Northern Cascade Ranges Section	G5	S3	S5	Primary Target	☑	13 occ	11 occ	2 occ	550
Tiger salamander *Ambystoma tigrinum*										
	Okanagan Ecoregion	G5	S2	S3	Primary Target	☑	132 occ	79 occ	25 occ	316
	Central Okanagan Section	G5	S2	S3	Primary Target	☑	9 occ	5 occ	5 occ	100
	Okanagan Highlands Section	G5	S2	S3	Primary Target	☑	101 occ	56 occ	5 occ	1120
	Northern Cascade Ranges Section	G5	S2	S3	Primary Target	☑	23 occ	18 occ	5 occ	360

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Western toad *Bufo boreas*										
	Okanagan Ecoregion	G4		S3S4	Primary Target	☑	39 occ	16 occ	13 occ	123
	Central Okanagan Section	G4		S3S4	Primary Target	☑	5 occ	3 occ	2 occ	150
	Okanagan Highlands Section	G4		S3S4	Primary Target	☑	10 occ	3 occ	2 occ	150
	Northern Cascade Ranges Section	G4		S3S4	Primary Target	☑	24 occ	10 occ	2 occ	500
<u>Birds</u>										
American avocet *Recurvirostra americana*										
	Okanagan Ecoregion	G5	S2B,SZN	S4B,SZN	Primary Target	☑	3 occ	3 occ	13 occ	23
	Central Okanagan Section	G5	S2B,SZN	S4B,SZN	Primary Target	☑	2 occ	2 occ	2 occ	100
	Thompson Okanagan Plateau Section	G5	S2B,SZN	S4B,SZN	Primary Target	☑	1 occ	1 occ	2 occ	50
American bittern *Botaurus lentiginosis*										
	Okanagan Ecoregion	G4	S3B,SZN	S4B,S4N	Primary Target	☑	2 occ	2 occ	13 occ	15
	Central Okanagan Section	G4	S3B,SZN	S4B,S4N	Primary Target	☑	1 occ	1 occ	2 occ	50
	Okanagan Highlands Section	G4	S3B,SZN	S4B,S4N	Primary Target	☑	1 occ	1 occ	2 occ	50
American dipper *Cinclus mexicanus*										
	Okanagan Ecoregion	G5	S5B,S4N	S5	Secondary Target	☑	1 occ	1 occ	13 occ	8
	Northern Cascade Ranges Section	G5	S5B,S4N	S5	Secondary Target	☑	1 occ	1 occ	2 occ	50
Bald eagle *Haliaeetus leucocephalus*										
	Okanagan Ecoregion	G4	S4	S3S4B,S4	Primary Target	☑	104 nst	38 nst	38 nst	100
	Okanagan Highlands Section	G4	S4	S3S4B,S4	Primary Target	☑	88 nst	31 nst	7 nst	443
	Northern Cascade Ranges Section	G4	S4	S3S4B,S4	Primary Target	☑	16 nst	7 nst	7 nst	100
Barn owl *Tyto alba*										
	Okanagan Ecoregion	G5	S3	S4	Secondary Target	☑	3 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5	S3	S4	Secondary Target	☑	3 occ	3 occ	1 occ	300

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Black-backed woodpecker *Picoides arcticus*										
	Okanagan Ecoregion	G5		S3	Primary Target	☑	12 occ	12 occ	13 occ	92
	Central Okanagan Section	G5		S3	Primary Target	☑	0 occ	0 occ	2 occ	0
	Okanagan Highlands Section	G5		S3	Primary Target	☑	6 occ	6 occ	2 occ	300
	Northern Cascade Ranges Section	G5		S3	Primary Target	☑	6 occ	6 occ	2 occ	300
Blue grouse *Dendragapus obscurus*										
	Okanagan Ecoregion	G5	S4	S5	Primary Target	☑	6 occ	6 occ	13 occ	46
	Okanagan Highlands Section	G5	S4	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
	Thompson Okanagan Plateau Section	G5	S4	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
	Northern Cascade Ranges Section	G5	S4	S5	Primary Target	☑	4 occ	4 occ	2 occ	200
Bobolink *Dolichonyx oryzivorus*										
	Okanagan Ecoregion	G5	S3B,SZN	S3B,SZN	Primary Target	☑	23 occ	14 occ	13 occ	108
	Central Okanagan Section	G5	S3B,SZN	S3B,SZN	Primary Target	☑	2 occ	2 occ	2 occ	100
	Okanagan Highlands Section	G5	S3B,SZN	S3B,SZN	Primary Target	☑	14 occ	7 occ	2 occ	350
	Thompson Okanagan Plateau Section	G5	S3B,SZN	S3B,SZN	Primary Target	☑	2 occ	2 occ	2 occ	100
	Northern Cascade Ranges Section	G5	S3B,SZN	S3B,SZN	Primary Target	☑	5 occ	3 occ	2 occ	150
Brewer's sparrow (breweri ssp) *Spizella breweri breweri*										
	Okanagan Ecoregion	G5T4	S2B	S4B,SZN	Primary Target	☑	35 occ	33 occ	13 occ	254
	Okanagan Highlands Section	G5T4	S2B	S4B,SZN	Primary Target	☑	21 occ	19 occ	2 occ	950
	Northern Cascade Ranges Section	G5T4	S2B	S4B,SZN	Primary Target	☑	14 occ	13 occ	2 occ	650
Burrowing owl *Athene cunicularia*										
	Okanagan Ecoregion	G4	S1B,SZN	S3B,SZN	Secondary Target	☑	62 occ	45 occ	7 occ	643
	Okanagan Highlands Section	G4	S1B,SZN	S3B,SZN	Secondary Target	☑	43 occ	38 occ	1 occ	3800
	Thompson Okanagan Plateau Section	G4	S1B,SZN	S3B,SZN	Secondary Target	☑	9 occ	5 occ	1 occ	500
	Northern Cascade Ranges Section	G4	S1B,SZN	S3B,SZN	Secondary Target	☑	10 occ	2 occ	1 occ	200
Calliope hummingbird *Stellula calliope*										

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Okanagan Ecoregion	G5	S4S5B,S	S4S5B,SZ	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5	S4S5B,S	S4S5B,SZ	Primary Target	☑	1 occ	1 occ	2 occ	50
Canyon wren *Catherpes mexicanus*										
	Okanagan Ecoregion	G5	S3	S4	Primary Target	☑	60 occ	48 occ	13 occ	369
	Central Okanagan Section	G5	S3	S4	Primary Target	☑	10 occ	8 occ	2 occ	400
	Okanagan Highlands Section	G5	S3	S4	Primary Target	☑	40 occ	32 occ	2 occ	1600
	Northern Cascade Ranges Section	G5	S3	S4	Primary Target	☑	10 occ	8 occ	2 occ	400
Common Loon *Gavia immer*										
	Okanagan Ecoregion	G5	S4S5B,S	S2B,S5N	Primary Target	☑	23 occ	13 occ	13 occ	100
	Okanagan Highlands Section	G5	S4S5B,S	S2B,S5N	Primary Target	☑	20 occ	11 occ	2 occ	550
	Northern Cascade Ranges Section	G5	S4S5B,S	S2B,S5N	Primary Target	☑	3 occ	2 occ	2 occ	100
Ferruginous hawk *Buteo regalis*										
	Okanagan Ecoregion	G4	S1B	S2B,SZN	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G4	S1B	S2B,SZN	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G4	S1B	S2B,SZN	Secondary Target	☑	0 occ	0 occ	1 occ	0
Flammulated owl *Otus flammeolus*										
	Okanagan Ecoregion	G4	S3S4B,S	S3B,SZN	Primary Target	☑	118 nst	78 nst	38 nst	205
	Interior Transition Ranges Section	G4	S3S4B,S	S3B,SZN	Primary Target	☑	3 nst	3 nst	7 nst	43
	Central Okanagan Section	G4	S3S4B,S	S3B,SZN	Primary Target	☑	38 nst	21 nst	7 nst	300
	Okanagan Highlands Section	G4	S3S4B,S	S3B,SZN	Primary Target	☑	22 nst	21 nst	7 nst	300
	Thompson Okanagan Plateau Section	G4	S3S4B,S	S3B,SZN	Primary Target	☑	33 nst	21 nst	7 nst	300
	Northern Cascade Ranges Section	G4	S3S4B,S	S3B,SZN	Primary Target	☑	22 nst	12 nst	7 nst	171
Golden eagle *Aquila chrysaetos*										
	Okanagan Ecoregion	G5	S4B,SZN	S3B,S3N	Primary Target	☑	167 nst	66 nst	38 nst	174
	Okanagan Highlands Section	G5	S4B,SZN	S3B,S3N	Primary Target	☑	100 nst	43 nst	7 nst	614
	Northern Cascade Ranges Section	G5	S4B,SZN	S3B,S3N	Primary Target	☑	67 nst	23 nst	7 nst	329

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Grasshopper sparrow *Ammodramus savannarum*	Okanagan Ecoregion	G5	S2B	S3B,SZN	Primary Target	☑	32 nst	29 nst	38 nst	76
	Central Okanagan Section	G5	S2B	S3B,SZN	Primary Target	☑	10 nst	7 nst	7 nst	100
	Okanagan Highlands Section	G5	S2B	S3B,SZN	Primary Target	☑	16 nst	16 nst	7 nst	229
	Northern Cascade Ranges Section	G5	S2B	S3B,SZN	Primary Target	☑	6 nst	6 nst	7 nst	86
Great blue heron *Ardia herodius*	Okanagan Ecoregion	G5	S3B,S4N	S4S5	Primary Target	☑	35 occ	13 occ	13 occ	100
	Okanagan Highlands Section	G5	S3B,S4N	S4S5	Primary Target	☑	33 occ	11 occ	2 occ	550
	Thompson Okanagan Plateau Section	G5	S3B,S4N	S4S5	Primary Target	☑	2 occ	2 occ	2 occ	100
Great gray owl *Strix nebulosa*	Okanagan Ecoregion	G5	S4B,SZN	S2B,SZN	Primary Target	☑	4 nst	4 nst	38 nst	11
	Okanagan Highlands Section	G5	S4B,SZN	S2B,SZN	Primary Target	☑	3 nst	3 nst	7 nst	43
	Northern Cascade Ranges Section	G5	S4B,SZN	S2B,SZN	Primary Target	☑	1 nst	1 nst	7 nst	14
Lark sparrow *Chondestes grammacus*	Okanagan Ecoregion	G5	S2B,SZN	S4B,SZN	Primary Target	☑	33 occ	30 occ	13 occ	231
	Okanagan Highlands Section	G5	S2B,SZN	S4B,SZN	Primary Target	☑	23 occ	20 occ	2 occ	1000
	Northern Cascade Ranges Section	G5	S2B,SZN	S4B,SZN	Primary Target	☑	10 occ	9 occ	2 occ	450
Lewis' woodpecker *Melanerpes lewis*	Okanagan Ecoregion	G4	S3B,SZN	S3B,SZN	Primary Target	☑	144 nst	91 nst	38 nst	239
	Central Okanagan Section	G4	S3B,SZN	S3B,SZN	Primary Target	☑	18 nst	8 nst	7 nst	114
	Okanagan Highlands Section	G4	S3B,SZN	S3B,SZN	Primary Target	☑	91 nst	62 nst	7 nst	886
	Thompson Okanagan Plateau Section	G4	S3B,SZN	S3B,SZN	Primary Target	☑	2 nst	2 nst	7 nst	29
	Northern Cascade Ranges Section	G4	S3B,SZN	S3B,SZN	Primary Target	☑	33 nst	19 nst	7 nst	271
Long-billed curlew *Numenius americanus*	Okanagan Ecoregion	G5	S3B,SZN	S2B,S2N	Primary Target	☑	5 nst	5 nst	38 nst	13
	Okanagan Highlands Section	G5	S3B,SZN	S2B,S2N	Primary Target	☑	3 nst	3 nst	7 nst	43

Okanagan Ecoregion Targets and Goals Summary

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Northern Cascade Ranges Section	G5	S3B,SZN	S2B,S2N	Primary Target	☑	2 nst	2 nst	7 nst	29
Northern goshawk *Accipiter gentilis*										
	Okanagan Ecoregion	G5	S4B,S4N	S3B,S3N	Primary Target	☑	86 nst	39 nst	38 nst	103
	Okanagan Highlands Section	G5	S4B,S4N	S3B,S3N	Primary Target	☑	43 nst	24 nst	7 nst	343
	Thompson Okanagan Plateau Section	G5	S4B,S4N	S3B,S3N	Primary Target	☑	1 nst	1 nst	7 nst	14
	Northern Cascade Ranges Section	G5	S4B,S4N	S3B,S3N	Primary Target	☑	42 nst	14 nst	7 nst	200
Northern spotted owl *Strix occidentalis caurina*										
	Okanagan Ecoregion	G3	S1	S3	Primary Target	☑	512 nst	129 nst	67 nst	193
	Interior Transition Ranges Section	G3	S1	S3	Primary Target	☑	305 nst	63 nst	13 nst	485
	Northern Cascade Ranges Section	G3	S1	S3	Primary Target	☑	207 nst	66 nst	13 nst	508
Olive-sided flycatcher *Contopus borealis*										
	Okanagan Ecoregion	G4	S4B,SZN	S4S5B,SZ	Secondary Target	☑	1 occ	1 occ	13 occ	8
	Northern Cascade Ranges Section	G4	S4B,SZN	S4S5B,SZ	Secondary Target	☑	1 occ	1 occ	2 occ	50
Peregrine falcon *Falco peregrinus anatum*										
	Okanagan Ecoregion	G4T3	S2B,SZN	S2B,S3N	Primary Target	☑	4 occ	3 occ	7 occ	43
	Central Okanagan Section	G4T3	S2B,SZN	S2B,S3N	Primary Target	☑	0 occ	0 occ	1 occ	0
	Okanagan Highlands Section	G4T3	S2B,SZN	S2B,S3N	Primary Target	☑	4 occ	3 occ	1 occ	300
Prairie falcon *Falco mexicanus*										
	Okanagan Ecoregion	G5	S2B,SZN	S3B,S3N	Primary Target	☑	9 occ	9 occ	13 occ	69
	Interior Transition Ranges Section	G5	S2B,SZN	S3B,S3N	Primary Target	☑	1 occ	1 occ	2 occ	50
	Okanagan Highlands Section	G5	S2B,SZN	S3B,S3N	Primary Target	☑	6 occ	6 occ	2 occ	300
	Northern Cascade Ranges Section	G5	S2B,SZN	S3B,S3N	Primary Target	☑	2 occ	2 occ	2 occ	100
Rufus hummingbird *Selasphorus rufus*										
	Okanagan Ecoregion	G5	S4S5B,S	S5B,SZN	Primary Target	☑	1 occ	1 occ	13 occ	8
	Northern Cascade Ranges Section	G5	S4S5B,S	S5B,SZN	Primary Target	☑	1 occ	1 occ	2 occ	50

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Sage thrasher *Oreoscoptes montanus*										
	Okanagan Ecoregion	G5	S1B	S3B,SZN	Primary Target	☑	12 occ	12 occ	13 occ	92
	Okanagan Highlands Section	G5	S1B	S3B,SZN	Primary Target	☑	4 occ	4 occ	2 occ	200
	Northern Cascade Ranges Section	G5	S1B	S3B,SZN	Primary Target	☑	8 occ	8 occ	2 occ	400
Sandhill crane *Grus canadensis*										
	Okanagan Ecoregion	G5	S3S4B,S	S1B,S3N	Secondary Target	☑	15 occ	11 occ	7 occ	157
	Interior Transition Ranges Section	G5	S3S4B,S	S1B,S3N	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Central Okanagan Section	G5	S3S4B,S	S1B,S3N	Secondary Target	☑	3 occ	3 occ	1 occ	300
	Okanagan Highlands Section	G5	S3S4B,S	S1B,S3N	Secondary Target	☑	7 occ	7 occ	1 occ	700
	Thompson Okanagan Plateau Section	G5	S3S4B,S	S1B,S3N	Secondary Target	☑	4 occ	0 occ	1 occ	0
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*										
	Okanagan Ecoregion	G4T3	S2S3	S2	Primary Target	☑	125 nst	71 nst	64 nst	111
	Okanagan Highlands Section	G4T3	S2S3	S2	Primary Target	☑	76 nst	39 nst	12 nst	325
	Thompson Okanagan Plateau Section	G4T3	S2S3	S2	Primary Target	☑	42 nst	27 nst	12 nst	225
	Northern Cascade Ranges Section	G4T3	S2S3	S2	Primary Target	☑	7 nst	5 nst	12 nst	42
Short-eared owl *Asio flammeus*										
	Okanagan Ecoregion	G5	S3B,S2N	S4B,S4N	Primary Target	☑	2 occ	2 occ	13 occ	15
	Okanagan Highlands Section	G5	S3B,S2N	S4B,S4N	Primary Target	☑	2 occ	2 occ	2 occ	100
Swainson's hawk *Buteo swainsoni*										
	Okanagan Ecoregion	G5	S2B,SZN	S3B,SZN	Primary Target	☑	9 occ	9 occ	13 occ	69
	Central Okanagan Section	G5	S2B,SZN	S3B,SZN	Primary Target	☑	7 occ	7 occ	2 occ	350
	Thompson Okanagan Plateau Section	G5	S2B,SZN	S3B,SZN	Primary Target	☑	2 occ	2 occ	2 occ	100
Trumpeter swan (S. Thompson R.) *Cygnus buccinator*										
	Okanagan Ecoregion	G4	S4B,S4N	S3N	Primary Target	☑	4 nst	4 nst	23 nst	17
	Okanagan Highlands Section	G4	S4B,S4N	S3N	Primary Target	☑	3 nst	3 nst	4 nst	75
	Northern Cascade Ranges Section	G4	S4B,S4N	S3N	Primary Target	☑	1 nst	1 nst	4 nst	25

Okanagan Ecoregion Targets and Goals Summary

Habitat Type

Level of Biological Organization

Taxon

Common Name ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Vaux's swift *Chaetura vauxi*										
	Okanagan Ecoregion	G5	S4B,SZN	S3S4B,SZ	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5	S4B,SZN	S3S4B,SZ	Primary Target	☑	1 occ	1 occ	2 occ	50
Western grebe *Aechmophorus occidentalis*										
	Okanagan Ecoregion	G5	S1B,S3N	S3B,S5N	Secondary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5	S1B,S3N	S3B,S5N	Secondary Target	☑	1 occ	1 occ	2 occ	50
Western screech owl *Otus kennicotii macfarlanei*										
	Okanagan Ecoregion	G5T4	S1	S5	Primary Target	☑	86 nst	51 nst	38 nst	134
	Central Okanagan Section	G5T4	S1	S5	Primary Target	☑	38 nst	13 nst	7 nst	186
	Okanagan Highlands Section	G5T4	S1	S5	Primary Target	☑	30 nst	27 nst	7 nst	386
	Thompson Okanagan Plateau Section	G5T4	S1	S5	Primary Target	☑	2 nst	2 nst	7 nst	29
	Northern Cascade Ranges Section	G5T4	S1	S5	Primary Target	☑	16 nst	9 nst	7 nst	129
Western yellow-breasted chat *Icteria virens auricollis*										
	Okanagan Ecoregion	G5	S1B	S4B,SZN	Primary Target	☑	16 occ	13 occ	13 occ	100
	Central Okanagan Section	G5	S1B	S4B,SZN	Primary Target	☑	1 occ	1 occ	2 occ	50
	Okanagan Highlands Section	G5	S1B	S4B,SZN	Primary Target	☑	10 occ	9 occ	2 occ	450
	Northern Cascade Ranges Section	G5	S1B	S4B,SZN	Primary Target	☑	5 occ	3 occ	2 occ	150
White-headed woodpecker *Picoides albolarvatus*										
	Okanagan Ecoregion	G4	S1	S3	Primary Target	☑	21 nst	21 nst	38 nst	55
	Okanagan Highlands Section	G4	S1	S3	Primary Target	☑	20 nst	20 nst	7 nst	286
	Northern Cascade Ranges Section	G4	S1	S3	Primary Target	☑	1 nst	1 nst	7 nst	14
Williamson's sapsucker *Sphyrapicus thyroideus thyroideus*										
	Okanagan Ecoregion	G5	S3B,SZN	S4B,SZN	Primary Target	☑	39 nst	37 nst	38 nst	97
	Central Okanagan Section	G5	S3B,SZN	S4B,SZN	Primary Target	☑	18 nst	17 nst	7 nst	243
	Okanagan Highlands Section	G5	S3B,SZN	S4B,SZN	Primary Target	☑	15 nst	14 nst	7 nst	200
	Thompson Okanagan Plateau Section	G5	S3B,SZN	S4B,SZN	Primary Target	☑	2 nst	2 nst	7 nst	29

Okanagan Ecoregion Targets and Goals Summary

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Northern Cascade Ranges Section	G5	S3B,SZN	S4B,SZN	Primary Target	☑	4 nst	4 nst	7 nst	57
Wilson's phalarope *Phalaropus tricolor*										
	Okanagan Ecoregion	G5	S4S5B,S	S4B,SZN	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5	S4S5B,S	S4B,SZN	Primary Target	☑	1 occ	1 occ	2 occ	50
Dragonfly										
Black-tipped darner *Aeshna tuberculifera*										
	Okanagan Ecoregion	G4	S3	S4	Primary Target	☑	1 occ	1 occ	13 occ	8
	Central Okanagan Section	G4	S3	S4	Primary Target	☑	1 occ	1 occ	2 occ	50
Boreal whiteface *Leucorrhinia borealis*										
	Okanagan Ecoregion	G5	S5	S1	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S5	S1	Primary Target	☑	1 occ	1 occ	1 occ	100
Lance-tailed darner *Aechna constricta*										
	Okanagan Ecoregion	G5	S2S3	S4	Primary Target	☑	11 occ	11 occ	13 occ	85
	Central Okanagan Section	G5	S2S3	S4	Primary Target	☑	4 occ	4 occ	2 occ	200
	Okanagan Highlands Section	G5	S2S3	S4	Primary Target	☑	7 occ	7 occ	2 occ	350
Nez Perce dancer *Argia emma*										
	Okanagan Ecoregion	G5	S3S4	S5	Primary Target	☑	2 occ	2 occ	13 occ	15
	Okanagan Highlands Section	G5	S3S4	S5	Primary Target	☑	2 occ	2 occ	2 occ	100
Olive clubtail *Stylurus olivaceus*										
	Okanagan Ecoregion	G4	S2	S4	Primary Target	☑	2 occ	2 occ	13 occ	15
	Okanagan Highlands Section	G4	S2	S4	Primary Target	☑	2 occ	2 occ	2 occ	100
Pronghorn clubtail *Gomphus graslinellus*										
	Okanagan Ecoregion	G5	S2S3	S3	Primary Target	☑	8 occ	8 occ	25 occ	32

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Central Okanagan Section	G5	S2S3	S3	Primary Target	☑	4 occ	4 occ	5 occ	80
	Okanagan Highlands Section	G5	S2S3	S3	Primary Target	☑	4 occ	4 occ	5 occ	80
River jewelwing *Calopteryx aequabilis*										
	Okanagan Ecoregion	G5	S1	S4	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5	S1	S4	Primary Target	☑	1 occ	1 occ	2 occ	50
Subarctic (muskeg) darner *Aeshna subarctica*										
	Okanagan Ecoregion	G5	S5	S2	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S5	S2	Primary Target	☑	1 occ	1 occ	1 occ	100
Subarctic bluet *Coenagrion interrogatum*										
	Okanagan Ecoregion	G5	S4	S2	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S4	S2	Primary Target	☑	1 occ	1 occ	1 occ	100
Twelve-spotted skimmer *Libellula pulchella*										
	Okanagan Ecoregion	G5	S3	S5	Primary Target	☑	19 occ	14 occ	13 occ	108
	Central Okanagan Section	G5	S3	S5	Primary Target	☑	8 occ	3 occ	2 occ	150
	Okanagan Highlands Section	G5	S3	S5	Primary Target	☑	9 occ	9 occ	2 occ	450
	Thompson Okanagan Plateau Section	G5	S3	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
	Northern Cascade Ranges Section	G5	S3	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
Western pondhawk *Erythemis collocata*										
	Okanagan Ecoregion	G5	S3	S5	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5	S3	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
Western river cruiser *Macromia magnifica*										
	Okanagan Ecoregion	G4	S3	S3	Primary Target	☑	7 occ	7 occ	13 occ	54
	Central Okanagan Section	G4	S3	S3	Primary Target	☑	5 occ	5 occ	2 occ	250
	Okanagan Highlands Section	G4	S3	S3	Primary Target	☑	2 occ	2 occ	2 occ	100
Lepidopterans										

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Astarte fritillary *Boloria astarte*										
	Okanagan Ecoregion	G5	S5	S3	Primary Target	☑	5 occ	5 occ	13 occ	38
	Northern Cascade Ranges Section	G5	S5	S3	Primary Target	☑	5 occ	5 occ	2 occ	250
Behr's (Columbia) hairstreak *Satyrium behrii columbia*										
	Okanagan Ecoregion	G5	S2	S5	Primary Target	☑	10 occ	10 occ	13 occ	77
	Okanagan Highlands Section	G5	S2	S5	Primary Target	☑	9 occ	9 occ	2 occ	450
	Northern Cascade Ranges Section	G5	S2	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
California hairstreak *Satyrium californicum*										
	Okanagan Ecoregion	G5	S3	S5	Primary Target	☑	7 occ	7 occ	13 occ	54
	Okanagan Highlands Section	G5	S3	S5	Primary Target	☑	6 occ	6 occ	2 occ	300
	Northern Cascade Ranges Section	G5	S3	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
Eastern tailed blue *Everes comyntas*										
	Okanagan Ecoregion	G5	S3	S2	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S3	S2	Primary Target	☑	1 occ	1 occ	1 occ	100
Freija fritillary *Boloria freija*										
	Okanagan Ecoregion	G5	S5	S2	Primary Target	☑	4 occ	4 occ	13 occ	31
	Northern Cascade Ranges Section	G5	S5	S2	Primary Target	☑	4 occ	4 occ	2 occ	200
Juniper hairstreak *Callophrys gryneus*										
	Okanagan Ecoregion	G5	S4	S3	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5	S4	S3	Primary Target	☑	1 occ	1 occ	2 occ	50
Meadow fritillary *Boloria bellona toddi*										
	Okanagan Ecoregion	G5	S3	S2?	Primary Target	☑	7 occ	7 occ	13 occ	54
	Okanagan Highlands Section	G5	S3	S2?	Primary Target	☑	5 occ	5 occ	2 occ	250
	Northern Cascade Ranges Section	G5	S3	S2?	Primary Target	☑	2 occ	2 occ	2 occ	100

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Melissa arctic *Oeneis melissa*										
	Okanagan Ecoregion	G5	S5	S2	Primary Target	☑	5 occ	5 occ	13 occ	38
	Northern Cascade Ranges Section	G5	S5	S2	Primary Target	☑	5 occ	5 occ	2 occ	250
Mormon metalmark *Apodemia mormo*										
	Okanagan Ecoregion	G5	S1	S4	Primary Target	☑	4 occ	4 occ	13 occ	31
	Northern Cascade Ranges Section	G5	S1	S4	Primary Target	☑	4 occ	4 occ	2 occ	200
Silver-bordered fritillary *Boloria selene*										
	Okanagan Ecoregion	G5	S5	S3	Primary Target	☑	3 occ	3 occ	13 occ	23
	Okanagan Highlands Section	G5	S5	S3	Primary Target	☑	3 occ	3 occ	2 occ	150
Sonora skipper *Polites sonora*										
	Okanagan Ecoregion	G4	S1	S4	Primary Target	☑	2 occ	2 occ	13 occ	15
	Northern Cascade Ranges Section	G4	S1	S4	Primary Target	☑	2 occ	2 occ	2 occ	100
Sooty hairstreak *Satyrium fuliginosum*										
	Okanagan Ecoregion	G4	S1	S4	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G4	S1	S4	Primary Target	☑	1 occ	1 occ	2 occ	50
Mammals										
Badger *Taxidea taxus jeffersoni*										
	Okanagan Ecoregion	G5	S1	S5	Primary Target	☑	165 occ	74 occ	58 occ	128
	Interior Transition Ranges Section	G5	S1	S5	Primary Target	☑	4 occ	4 occ	11 occ	36
	Central Okanagan Section	G5	S1	S5	Primary Target	☑	50 occ	21 occ	11 occ	191
	Okanagan Highlands Section	G5	S1	S5	Primary Target	☑	19 occ	12 occ	11 occ	109
	Thompson Okanagan Plateau Section	G5	S1	S5	Primary Target	☑	77 occ	27 occ	11 occ	245
	Northern Cascade Ranges Section	G5	S1	S5	Primary Target	☑	15 occ	11 occ	11 occ	100

Okanagan Ecoregion Targets and Goals Summary

Habitat Type

Level of Biological Organization

Taxon

Common Name ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Bighorn sheep *Ovis canadensis*										
	Okanagan Ecoregion	G4	S2S3	S3S4	Primary Target	☑	276,589 ha	140,023 ha	55,318 ha	253
	Interior Transition Ranges Section	G4	S2S3	S3S4	Primary Target	☑	112,912 ha	40,267 ha	22,582 ha	178
	Central Okanagan Section	G4	S2S3	S3S4	Primary Target	☑	36,717 ha	21,674 ha	7,343 ha	295
	Okanagan Highlands Section	G4	S2S3	S3S4	Primary Target	☑	56,929 ha	40,913 ha	11,386 ha	359
	Thompson Okanagan Plateau Section	G4	S2S3	S3S4	Primary Target	☑	38,630 ha	16,699 ha	7,726 ha	216
	Northern Cascade Ranges Section	G4	S2S3	S3S4	Primary Target	☑	31,401 ha	20,470 ha	6,280 ha	326
Bighorn sheep-WA *Ovis canadensis*										
	Okanagan Ecoregion	G4	S2S3	S3S4		☑	24,282 ha	24,272 ha	24,282 ha	100
	Okanagan Highlands Section	G4	S2S3	S3S4		☑	23,720 ha	23,710 ha	23,720 ha	100
	Northern Cascade Ranges Section	G4	S2S3	S3S4		☑	562 ha	562 ha	562 ha	100
Fisher *Martes pennanti*										
	Okanagan Ecoregion	G5	S2	SH	Secondary Target	☑	1,670,904 ha	477,438 ha	668,362 ha	71
	Interior Transition Ranges Section	G5	S2	SH	Secondary Target	☑	337,169 ha	104,196 ha	134,868 ha	77
	Central Okanagan Section	G5	S2	SH	Secondary Target	☑	234,320 ha	63,837 ha	93,728 ha	68
	Okanagan Highlands Section	G5	S2	SH	Secondary Target	☑	16,848 ha	3,432 ha	6,739 ha	51
	Thompson Okanagan Plateau Section	G5	S2	SH	Secondary Target	☑	769,103 ha	209,164 ha	307,641 ha	68
	Northern Cascade Ranges Section	G5	S2	SH	Secondary Target	☑	313,464 ha	96,808 ha	125,386 ha	77
Fringed myotis *Myotis thysanodes*										
	Okanagan Ecoregion	G4G5	S2S3	S3?	Primary Target	☑	15 occ	13 occ	13 occ	100
	Central Okanagan Section	G4G5	S2S3	S3?	Primary Target	☑	3 occ	2 occ	2 occ	100
	Okanagan Highlands Section	G4G5	S2S3	S3?	Primary Target	☑	10 occ	9 occ	2 occ	450
	Thompson Okanagan Plateau Section	G4G5	S2S3	S3?	Primary Target	☑	2 occ	2 occ	2 occ	100
Gray wolf *Canis lupus*										
	Okanagan Ecoregion	G4	S4	SA	Secondary Target	☑	74 den	32 den	38 den	84
	Okanagan Highlands Section	G4	S4	SA	Secondary Target	☑	15 den	7 den	7 den	100
	Northern Cascade Ranges Section	G4	S4	SA	Secondary Target	☑	59 den	25 den	7 den	357

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Great Basin pocket mouse *Perognathus parvus*										
	Okanagan Ecoregion	G5	S2S3	S5	Primary Target	☑	37 occ	35 occ	13 occ	269
	Central Okanagan Section	G5	S2S3	S5	Primary Target	☑	5 occ	4 occ	2 occ	200
	Okanagan Highlands Section	G5	S2S3	S5	Primary Target	☑	27 occ	27 occ	2 occ	1350
	Northern Cascade Ranges Section	G5	S2S3	S5	Primary Target	☑	5 occ	4 occ	2 occ	200
Grizzly bear *Ursus arctos*										
	Okanagan Ecoregion	G4	S3	S1	Secondary Target	☑	2,625,305 ha	876,366 ha	1,050,522 ha	83
	Interior Transition Ranges Section	G4	S3	S1	Secondary Target	☑	1,288,405 ha	355,257 ha	515,362 ha	69
	Central Okanagan Section	G4	S3	S1	Secondary Target	☑	317,625 ha	85,501 ha	127,050 ha	67
	Okanagan Highlands Section	G4	S3	S1	Secondary Target	☑	25,982 ha	8,191 ha	10,393 ha	79
	Thompson Okanagan Plateau Section	G4	S3	S1	Secondary Target	☑	26,015 ha	2,251 ha	10,406 ha	22
	Northern Cascade Ranges Section	G4	S3	S1	Secondary Target	☑	967,278 ha	425,166 ha	648,076 ha	66
Long-legged myotis *Myotis volans*										
	Okanagan Ecoregion	G5	S4S5	S3	Primary Target	☑	6 occ	6 occ	13 occ	46
	Central Okanagan Section	G5	S4S5	S3	Primary Target	☑	0 occ	0 occ	2 occ	0
	Okanagan Highlands Section	G5	S4S5	S3	Primary Target	☑	2 occ	2 occ	2 occ	100
	Northern Cascade Ranges Section	G5	S4S5	S3	Primary Target	☑	4 occ	4 occ	2 occ	200
Lynx *Lynx canadensis*										
	Okanagan Ecoregion	G5	S4	S1S2	Primary Target	☑	687,549 ha	281,652 ha	275,020 ha	102
	Okanagan Highlands Section	G5	S4	S1S2	Primary Target	☑	124,009 ha	49,646 ha	49,604 ha	100
	Northern Cascade Ranges Section	G5	S4	S1S2	Primary Target	☑	563,540 ha	232,006 ha	225,416 ha	103
Mountain beaver *Aplodontia rufa rainieri*										
	Okanagan Ecoregion	G5T4	S3	S5	Primary Target	☑	78 occ	33 occ	13 occ	254
	Thompson Okanagan Plateau Section	G5T4	S3	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
	Northern Cascade Ranges Section	G5T4	S3	S5	Primary Target	☑	77 occ	32 occ	2 occ	1600
Mountain goat *Oreamos americanus*										

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Okanagan Ecoregion	G5	S4	S4S5	Primary Target	☑	152,524 ha	54,572 ha	30,505 ha	179
	Interior Transition Ranges Section	G5	S4	S4S5	Primary Target	☑	115,048 ha	36,894 ha	23,010 ha	160
	Central Okanagan Section	G5	S4	S4S5	Primary Target	☑	9,415 ha	5,560 ha	1,883 ha	295
	Okanagan Highlands Section	G5	S4	S4S5	Primary Target	☑	1,100 ha	1,100 ha	220 ha	500
	Thompson Okanagan Plateau Section	G5	S4	S4S5	Primary Target	☑	2,901 ha	1,790 ha	580 ha	309
	Northern Cascade Ranges Section	G5	S4	S4S5	Primary Target	☑	24,060 ha	9,228 ha	4,812 ha	192
Mountain goat-WA *Oreamos americanus*										
	Okanagan Ecoregion	G5	S4	S4S5		☑	47,283 ha	47,255 ha	47,283 ha	100
	Okanagan Highlands Section	G5	S4	S4S5		☑	368 ha	368 ha	368 ha	100
	Northern Cascade Ranges Section	G5	S4	S4S5		☑	46,915 ha	46,887 ha	46,915 ha	100
Nuttall's cottontail *Sylvilagus nutalli*										
	Okanagan Ecoregion	G5	S3	S5	Primary Target	☑	36 occ	33 occ	13 occ	254
	Central Okanagan Section	G5	S3	S5	Primary Target	☑	4 occ	2 occ	2 occ	100
	Okanagan Highlands Section	G5	S3	S5	Primary Target	☑	25 occ	25 occ	2 occ	1250
	Northern Cascade Ranges Section	G5	S3	S5	Primary Target	☑	7 occ	6 occ	2 occ	300
Pallid bat *Antrozous pallidus*										
	Okanagan Ecoregion	G5	S1	S3	Primary Target	☑	24 nst	24 nst	38 nst	63
	Okanagan Highlands Section	G5	S1	S3	Primary Target	☑	17 nst	17 nst	7 nst	243
	Northern Cascade Ranges Section	G5	S1	S3	Primary Target	☑	7 nst	7 nst	7 nst	100
Preble's shrew *Sorex preblei*										
	Okanagan Ecoregion	G4	S1S2	SR	Primary Target	☑	2 occ	2 occ	13 occ	15
	Okanagan Highlands Section	G4	S1S2	SR	Primary Target	☑	2 occ	2 occ	2 occ	100
Spotted bat *Euderma maculatum*										
	Okanagan Ecoregion	G4	S3S4	S3	Primary Target	☑	26 occ	20 occ	13 occ	154
	Interior Transition Ranges Section	G4	S3S4	S3	Primary Target	☑	4 occ	2 occ	2 occ	100
	Central Okanagan Section	G4	S3S4	S3	Primary Target	☑	2 occ	2 occ	2 occ	100
	Okanagan Highlands Section	G4	S3S4	S3	Primary Target	☑	13 occ	13 occ	2 occ	650
	Thompson Okanagan Plateau Section	G4	S3S4	S3	Primary Target	☑	1 occ	1 occ	2 occ	50

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Northern Cascade Ranges Section	G4	S3S4	S3	Primary Target	☑	6 occ	2 occ	2 occ	100
Townsend's big-eared bat *Coryhorhinus townsendii*										
	Okanagan Ecoregion	G4	S2S3	S2	Primary Target	☑	46 nst	38 nst	38 nst	100
	Central Okanagan Section	G4	S2S3	S2	Primary Target	☑	4 nst	4 nst	7 nst	57
	Okanagan Highlands Section	G4	S2S3	S2	Primary Target	☑	29 nst	22 nst	7 nst	314
	Northern Cascade Ranges Section	G4	S2S3	S2	Primary Target	☑	13 nst	12 nst	7 nst	171
Western gray squirrel *Sciurus griseus*										
	Okanagan Ecoregion	G5		S2	Primary Target	☑	58 occ	15 occ	13 occ	115
	Okanagan Highlands Section	G5		S2	Primary Target	☑	4 occ	3 occ	2 occ	150
	Northern Cascade Ranges Section	G5		S2	Primary Target	☑	54 occ	12 occ	2 occ	600
Western harvest mouse *Rheithrodontomys megalotis*										
	Okanagan Ecoregion	G5	S2S3	S5	Primary Target	☑	14 occ	14 occ	13 occ	108
	Central Okanagan Section	G5	S2S3	S5	Primary Target	☑	2 occ	2 occ	2 occ	100
	Okanagan Highlands Section	G5	S2S3	S5	Primary Target	☑	12 occ	12 occ	2 occ	600
Western red bat *Lasiurus blossevillii*										
	Okanagan Ecoregion	G5	S1		Primary Target	☑	2 occ	2 occ	13 occ	15
	Central Okanagan Section	G5	S1		Primary Target	☑	0 occ	0 occ	2 occ	0
	Okanagan Highlands Section	G5	S1		Primary Target	☑	1 occ	1 occ	2 occ	50
	Northern Cascade Ranges Section	G5	S1		Primary Target	☑	0 occ	0 occ	2 occ	0
Western small-footed myotis *Myotis ciliolabrum*										
	Okanagan Ecoregion	G5	S2S3	S4	Primary Target	☑	6 occ	6 occ	13 occ	46
	Central Okanagan Section	G5	S2S3	S4	Primary Target	☑	1 occ	1 occ	2 occ	50
	Okanagan Highlands Section	G5	S2S3	S4	Primary Target	☑	4 occ	4 occ	2 occ	200
	Northern Cascade Ranges Section	G5	S2S3	S4	Primary Target	☑	1 occ	1 occ	2 occ	50
Wolverine *Gulo gulo*										
	Okanagan Ecoregion	G4	S3	S1	Primary Target	☑	7 occ	7 occ	13 occ	54

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Okanagan Highlands Section	G4	S3	S1	Primary Target	☑	5 occ	5 occ	2 occ	250
	Northern Cascade Ranges Section	G4	S3	S1	Primary Target	☑	2 occ	2 occ	2 occ	100
<u>Mollusks</u>										
California floater *Anodonta californiensis*	Okanagan Ecoregion	G3		S1S2	Primary Target	☑	9 occ	8 occ	13 occ	62
	Okanagan Highlands Section	G3		S1S2	Primary Target	☑	8 occ	7 occ	2 occ	350
	Northern Cascade Ranges Section	G3		S1S2	Primary Target	☑	1 occ	1 occ	2 occ	50
Western pearlshell *Margaritifera falcata*	Okanagan Ecoregion	G4		S3	Primary Target	☑	3 occ	3 occ	13 occ	23
	Okanagan Highlands Section	G4		S3	Primary Target	☑	2 occ	2 occ	2 occ	100
	Northern Cascade Ranges Section	G4		S3	Primary Target	☑	1 occ	1 occ	2 occ	50
<u>Non-Vascular Plants</u>										
Lichen Agrestia hispida *Agrestia hispida*	Okanagan Ecoregion	G3		S1		☑	4 occ	4 occ	13 occ	31
Lichen Dactylina arctica *Dactylina arctica*	Okanagan Ecoregion	G4G5		S1		☑	3 occ	3 occ	13 occ	23
Lichen Dactylina ramulosa *Dactylina ramulosa*	Okanagan Ecoregion	G4G5				☑	1 occ	1 occ	13 occ	8
Lichen Hypogymnia austerodes *Hypogymnia austerodes*	Okanagan Ecoregion	G5				☑	1 occ	1 occ	13 occ	8
Lichen Massalongia microphylliza *Massalongia microphylliza*	Okanagan Ecoregion	G1?				☑	4 occ	4 occ	13 occ	31

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Lichen Ophioparma ventosa *Ophioparma ventosa*	Okanagan Ecoregion	G2				☑	1 occ	1 occ	13 occ	8
Lichen Peltigera lepidophora *Peltigera lepidophora*	Okanagan Ecoregion	G4		S1		☑	3 occ	3 occ	13 occ	23
Lichen Physcia dimidiata *Physcia dimidiata*	Okanagan Ecoregion	G5?	SNR	SNR		☑	6 occ	6 occ	13 occ	46
Lichen Physcia tribacia *Physcia tribacia*	Okanagan Ecoregion	G4?				☑	4 occ	4 occ	13 occ	31
Lichen Sclerophora amabilis *Sclerophora amabilis*	Okanagan Ecoregion	GNR				☑	1 occ	1 occ	13 occ	8
Lichen Umbilicaria hirsuta *Umbilicaria hirsuta*	Okanagan Ecoregion	G2G4				☑	1 occ	1 occ	13 occ	8
Lichen Umbilicaria nylanderiana *Umbilicaria nylanderiana*	Okanagan Ecoregion	G4				☑	1 occ	1 occ	13 occ	8
Lichen Xanthoparmelia angustiphylla *Xanthoparmelia angustiphylla*	Okanagan Ecoregion	G5				☑	1 occ	1 occ	13 occ	8
<u>Reptiles</u>										
Gopher snake *Pituophis catenifer deserticola*	Okanagan Ecoregion	G5	S3	S5	Primary Target	☑	84 occ	69 occ	13 occ	531

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Interior Transition Ranges Section	G5	S3	S5	Primary Target	☑	3 occ	2 occ	2 occ	100
	Central Okanagan Section	G5	S3	S5	Primary Target	☑	15 occ	8 occ	2 occ	400
	Okanagan Highlands Section	G5	S3	S5	Primary Target	☑	52 occ	45 occ	2 occ	2250
	Thompson Okanagan Plateau Section	G5	S3	S5	Primary Target	☑	2 occ	2 occ	2 occ	100
	Northern Cascade Ranges Section	G5	S3	S5	Primary Target	☑	12 occ	12 occ	2 occ	600
Night snake *Hypsiglena torquata*										
	Okanagan Ecoregion	G5		S2S3	Primary Target	☑	16 occ	15 occ	13 occ	115
	Central Okanagan Section	G5		S2S3	Primary Target	☑	1 occ	1 occ	2 occ	50
	Okanagan Highlands Section	G5		S2S3	Primary Target	☑	13 occ	12 occ	2 occ	600
	Northern Cascade Ranges Section	G5		S2S3	Primary Target	☑	2 occ	2 occ	2 occ	100
Racer *Coluber constricta*										
	Okanagan Ecoregion	G5	S3	S5	Primary Target	☑	130 occ	92 occ	13 occ	708
	Interior Transition Ranges Section	G5	S3	S5	Primary Target	☑	4 occ	2 occ	2 occ	100
	Central Okanagan Section	G5	S3	S5	Primary Target	☑	16 occ	8 occ	2 occ	400
	Okanagan Highlands Section	G5	S3	S5	Primary Target	☑	99 occ	74 occ	2 occ	3700
	Thompson Okanagan Plateau Section	G5	S3	S5	Primary Target	☑	1 occ	1 occ	2 occ	50
	Northern Cascade Ranges Section	G5	S3	S5	Primary Target	☑	10 occ	7 occ	2 occ	350
Western rattlesnake *Crotalus viridis*										
	Okanagan Ecoregion	G5	S3	S5	Primary Target	☑	124 nst	83 nst	38 nst	218
	Central Okanagan Section	G5	S3	S5	Primary Target	☑	29 nst	13 nst	7 nst	186
	Okanagan Highlands Section	G5	S3	S5	Primary Target	☑	54 nst	47 nst	7 nst	671
	Thompson Okanagan Plateau Section	G5	S3	S5	Primary Target	☑	16 nst	7 nst	7 nst	100
	Northern Cascade Ranges Section	G5	S3	S5	Primary Target	☑	25 nst	16 nst	7 nst	229
Western skink *Eumeces skiltonianus*										
	Okanagan Ecoregion	G5	S2S3	S4S5	Primary Target	☑	26 occ	21 occ	13 occ	162
	Central Okanagan Section	G5	S2S3	S4S5	Primary Target	☑	7 occ	4 occ	2 occ	200
	Okanagan Highlands Section	G5	S2S3	S4S5	Primary Target	☑	19 occ	17 occ	2 occ	850
Vascular Plants										

Okanagan Ecoregion Targets and Goals Summary

Habitat Type

Level of Biological Organization

Taxon

Common Name ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Abbreviated Bluegrass *Poa abbreviata ssp. pattersonii*										
	Okanagan Ecoregion	G5T5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Interior Transition Ranges Section	G5T5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	1 occ	100
Adder's-tongue *Ophioglossum pusillum*										
	Okanagan Ecoregion	G5	S2S3	S1S2	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G5	S2S3	S1S2	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5	S2S3	S1S2	Secondary Target	☑	1 occ	1 occ	1 occ	100
Alpine Anemone *Anemone drummondii var. drummondii*										
	Okanagan Ecoregion	G4T4	S2S3	SR	Secondary Target	☑	4 occ	2 occ	7 occ	29
	Northern Cascade Ranges Section	G4T4	S2S3	SR	Secondary Target	☑	4 occ	2 occ	1 occ	200
Alpine Buckwheat *Eriogonum pyrolifolium var. coryphaeum*										
	Okanagan Ecoregion	G4T4?	S2S3	SR	Secondary Target	☑	3 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G4T4?	S2S3	SR	Secondary Target	☑	3 occ	3 occ	1 occ	300
Alpine Sorrel *Rumex paucifolius*										
	Okanagan Ecoregion	G4	S2S3	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Central Okanagan Section	G4	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Andean Evening-primrose *Camissonia andina*										
	Okanagan Ecoregion	G4	S1	SR	Primary Target	☑	2 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G4	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G4	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Annual Paintbrush *Castilleja minor ssp. minor*										
	Okanagan Ecoregion	G5T5	S1	S?	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5T5	S1	S?	Primary Target	☑	1 occ	1 occ	1 occ	100

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Arctic Aster *Aster sibiricus var. meritus*										
	Okanagan Ecoregion	G5T5	S5	S1S2	Secondary Target	☑	1 occ	1 occ	13 occ	8
	Northern Cascade Ranges Section	G5T5	S5	S1S2	Secondary Target	☑	1 occ	1 occ	3 occ	33
Awned Cyperus *Cyperus squarrosus*										
	Okanagan Ecoregion	G5	S3	S4	Secondary Target	☑	7 occ	5 occ	7 occ	71
	Central Okanagan Section	G5	S3	S4	Secondary Target	☑	5 occ	3 occ	1 occ	300
	Okanagan Highlands Section	G5	S3	S4	Secondary Target	☑	2 occ	2 occ	1 occ	200
Beaked Sedge *Carex rostrata*										
	Okanagan Ecoregion	G5	S2S3	S1	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S2S3	S1	Primary Target	☑	1 occ	1 occ	1 occ	100
Beaked Spike-rush *Eleocharis rostellata*										
	Okanagan Ecoregion	G5	S2S3	S2	Secondary Target	☑	3 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5	S2S3	S2	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5	S2S3	S2	Secondary Target	☑	2 occ	2 occ	1 occ	200
Bearded Sedge *Carex comosa*										
	Okanagan Ecoregion	G5	S2S3	S2	Secondary Target	☑	4 occ	0 occ	7 occ	0
	Okanagan Highlands Section	G5	S2S3	S2	Secondary Target	☑	2 occ	0 occ	1 occ	0
	Thompson Okanagan Plateau Section	G5	S2S3	S2	Secondary Target	☑	2 occ	0 occ	1 occ	0
Bigleaf Sedge *Carex amplifolia*										
	Okanagan Ecoregion	G4	S2S3	SR	Secondary Target	☑	2 occ	0 occ	7 occ	0
	Central Okanagan Section	G4	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
	Thompson Okanagan Plateau Section	G4	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Birdfoot Buttercup *Ranunculus pedatifidus ssp. affinis*										
	Okanagan Ecoregion	G5T5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14

Okanagan Ecoregion Targets and Goals Summary

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Northern Cascade Ranges Section	G5T5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Black Snake-root *Sanicula marilandica*										
	Okanagan Ecoregion	G5	S3S4	S2	Secondary Target	☑	20 occ	12 occ	7 occ	171
	Okanagan Highlands Section	G5	S3S4	S2	Secondary Target	☑	11 occ	9 occ	1 occ	900
	Northern Cascade Ranges Section	G5	S3S4	S2	Secondary Target	☑	9 occ	3 occ	1 occ	300
Blackened Sedge atrosquama *Carex atrosquama*										
	Okanagan Ecoregion	G4?	S5	S1		☑	3 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G4?	S5	S1		☑	3 occ	1 occ	1 occ	100
Blue Grama *Bouteloua gracilis*										
	Okanagan Ecoregion	G5	S1	XX	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Interior Transition Ranges Section	G5	S1	XX	Secondary Target	☑	1 occ	1 occ	1 occ	100
Blue Vervain hastata *Verbena hastata var. scabra*										
	Okanagan Ecoregion	G5T5	S2	SR		☑	4 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G5T5	S2	SR		☑	1 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G5T5	S2	SR		☑	1 occ	0 occ	1 occ	0
	Northern Cascade Ranges Section	G5T5	S2	SR		☑	2 occ	1 occ	1 occ	100
Blue-eyed Grass *Sisyrinchium septentrionale*										
	Okanagan Ecoregion	G3G4	S3S4	S2S3	Primary Target	☑	21 occ	12 occ	7 occ	171
	Okanagan Highlands Section	G3G4	S3S4	S2S3	Primary Target	☑	21 occ	12 occ	1 occ	1200
Booth's Willow *Salix boothii*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	6 occ	2 occ	7 occ	29
	Interior Transition Ranges Section	G5	S2S3	SR	Secondary Target	☑	2 occ	1 occ	1 occ	100
	Central Okanagan Section	G5	S2S3	SR	Secondary Target	☑	0 occ	0 occ	1 occ	0
	Okanagan Highlands Section	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
	Thompson Okanagan Plateau Section	G5	S2S3	SR	Secondary Target	☑	3 occ	1 occ	1 occ	100

Okanagan Ecoregion Targets and Goals Summary

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Branched Phacelia *Phacelia ramosissima*										
	Okanagan Ecoregion	G4	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G4	S1	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
Brandegee's Lomatium *Lomatium brandegeei*										
	Okanagan Ecoregion	G3?	S2S3	SR	Secondary Target	☑	9 occ	8 occ	25 occ	32
	Northern Cascade Ranges Section	G3?	S2S3	SR	Secondary Target	☑	9 occ	8 occ	5 occ	160
Brewer's Monkey-flower *Mimulus breweri*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Okanagan Highlands Section	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Bristly Mousetail *Myosurus apetalus var. borealis*										
	Okanagan Ecoregion	G5TNR	S2	S?	Primary Target	☑	5 occ	5 occ	7 occ	71
	Interior Transition Ranges Section	G5TNR	S2	S?	Primary Target	☑	1 occ	1 occ	1 occ	100
	Okanagan Highlands Section	G5TNR	S2	S?	Primary Target	☑	2 occ	2 occ	1 occ	200
	Thompson Okanagan Plateau Section	G5TNR	S2	S?	Primary Target	☑	2 occ	2 occ	1 occ	200
Bulb-bearing Water Hemlock *Cicuta bulbifera*										
	Okanagan Ecoregion	G5	S3S4	S2	Secondary Target	☑	5 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G5	S3S4	S2	Secondary Target	☑	5 occ	2 occ	1 occ	200
Bushy Cinquefoil *Potentilla paradoxa*										
	Okanagan Ecoregion	G5	S1	SR	Secondary Target	☑	3 occ	3 occ	7 occ	43
	Interior Transition Ranges Section	G5	S1	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Okanagan Highlands Section	G5	S1	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5	S1	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Canadian Single-spike Sedge *Carex scirpoidea var. scirpoidea*										
	Okanagan Ecoregion	G5T4T5	S4	S2	Secondary Target	☑	6 occ	4 occ	7 occ	57

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Northern Cascade Ranges Section	G5T4T5	S4	S2	Secondary Target	☑	6 occ	4 occ	1 occ	400
Carolina Meadow-foxtail *Alopecurus carolinianus*										
	Okanagan Ecoregion	G5	S2	S4	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Northern Cascade Ranges Section	G5	S2	S4	Secondary Target	☑	2 occ	2 occ	1 occ	200
Cliff Paintbrush *Castilleja rupicola*										
	Okanagan Ecoregion	G2G3	S2	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G2G3	S2	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Close-flowered Knotweed *Polygonum polygaloides ssp. confertiflorum*										
	Okanagan Ecoregion	G4G5T3T4	S1	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G4G5T3T4	S1	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Cockscomb Cryptantha *Cryptantha celosioides*										
	Okanagan Ecoregion	G5	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Columbia Crazyweed *Oxytropis campestris var. columbiana*										
	Okanagan Ecoregion	G5T3	S3	S1	Secondary Target	☑	1 occ	1 occ	25 occ	4
	Okanagan Highlands Section	G5T3	S3	S1	Secondary Target	☑	1 occ	1 occ	5 occ	20
Columbian Goldenweed *Pyrrocoma carthamoides var. carthamoides*										
	Okanagan Ecoregion	G4G5T4	S2	SR	Primary Target	☑	10 occ	9 occ	7 occ	129
	Central Okanagan Section	G4G5T4	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Okanagan Highlands Section	G4G5T4	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Northern Cascade Ranges Section	G4G5T4	S2	SR	Primary Target	☑	6 occ	5 occ	1 occ	500
Cordroot Sedge *Carex chordorrhiza*										
	Okanagan Ecoregion	G5	S5	S1	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Northern Cascade Ranges Section	G5	S5	S1	Secondary Target	☑	1 occ	0 occ	1 occ	0

Habitat Type

Level of Biological Organization

Taxon

Common Name ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Crenulate Moonwort *Botrychium crenulatum*										
	Okanagan Ecoregion	G3	S1S3	S3	Secondary Target	☑	77 occ	29 occ	7 occ	414
	Okanagan Highlands Section	G3	S1S3	S3	Secondary Target	☑	58 occ	29 occ	1 occ	2900
	Northern Cascade Ranges Section	G3	S1S3	S3	Secondary Target	☑	19 occ	0 occ	1 occ	0
Crested Shield-fern *Dryopteris cristata*										
	Okanagan Ecoregion	G5	S2S3	S2	Secondary Target	☑	7 occ	1 occ	7 occ	14
	Central Okanagan Section	G5	S2S3	S2	Secondary Target	☑	1 occ	0 occ	1 occ	0
	Okanagan Highlands Section	G5	S2S3	S2	Secondary Target	☑	5 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G5	S2S3	S2	Secondary Target	☑	1 occ	0 occ	1 occ	0
Cup Clover *Trifolium cyathiferum*										
	Okanagan Ecoregion	G4	S1	SR	Primary Target	☑	2 occ	2 occ	7 occ	29
	Central Okanagan Section	G4	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Okanagan Highlands Section	G4	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Curly Sedge *Carex rupestris ssp. drummondiana*										
	Okanagan Ecoregion	G5T5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Interior Transition Ranges Section	G5T5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	1 occ	100
Curved Woodrush *Luzula arcuata*										
	Okanagan Ecoregion	G5	SR	S1	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	SR	S1	Secondary Target	☑	1 occ	1 occ	1 occ	100
Cushion Fleabane *Erigeron poliospermus var. poliospermus*										
	Okanagan Ecoregion	G4T4	S2S3	SR	Secondary Target	☑	3 occ	2 occ	25 occ	8
	Okanagan Highlands Section	G4T4	S2S3	SR	Secondary Target	☑	3 occ	2 occ	5 occ	40
Cusick's Paintbrush *Castilleja cusickii*										
	Okanagan Ecoregion	G4G5	S1	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Northern Cascade Ranges Section	G4G5	S1	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Dark Lamb's-quarters *Chenopodium atrovirens*										
	Okanagan Ecoregion	G5	S1	SR	Secondary Target	☑	3 occ	1 occ	7 occ	14
	Thompson Okanagan Plateau Section	G5	S1	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
	Northern Cascade Ranges Section	G5	S1	SR	Secondary Target	☑	2 occ	1 occ	1 occ	100
Diverse-leaved Cinquefoil *Potentilla diversifolia var. perdissecta*										
	Okanagan Ecoregion	G5T4	S2S3	S1	Secondary Target	☑	5 occ	4 occ	7 occ	57
	Northern Cascade Ranges Section	G5T4	S2S3	S1	Secondary Target	☑	5 occ	4 occ	1 occ	400
Dotted Smartweed *Polygonum punctatum*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Central Okanagan Section	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Dwarf Bramble *Rubus lasiococcus*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Dwarf Groundsmoke *Gayophytum humile*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	5 occ	5 occ	7 occ	71
	Thompson Okanagan Plateau Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	4 occ	4 occ	1 occ	400
Dwarf Woolly-heads *Psilocarphus brevissimus var. brevissimus*										
	Okanagan Ecoregion	G4T4	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G4T4	S1	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
Engelmann's Knotweed *Polygonum douglasii ssp. engelmannii*										
	Okanagan Ecoregion	G5T3T5	S2S3	XX	Primary Target	☑	1 occ	1 occ	7 occ	14
	Central Okanagan Section	G5T3T5	S2S3	XX	Primary Target	☑	1 occ	1 occ	1 occ	100

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
False-mermaid *Floerkea proserpinacoides*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	3 occ	2 occ	7 occ	29
	Central Okanagan Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Okanagan Highlands Section	G5	S2S3	SR	Secondary Target	☑	2 occ	1 occ	1 occ	100
False-pimpernel *Lindernia dubia var. anagallidea*										
	Okanagan Ecoregion	G5T4	S2S3	S3?	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Central Okanagan Section	G5T4	S2S3	S3?	Secondary Target	☑	1 occ	1 occ	1 occ	100
Field Dodder *Cuscuta pentagona*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Central Okanagan Section	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Five-leaved Cinquefoil *Potentilla quinquefolia*										
	Okanagan Ecoregion	G5T4	S2S3	S1	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5T4	S2S3	S1	Secondary Target	☑	1 occ	1 occ	1 occ	100
Flat-topped Broomrape *Orobanche corymbosa ssp. mutabilis*										
	Okanagan Ecoregion	G4T3?	S2	SR	Primary Target	☑	4 occ	4 occ	7 occ	57
	Central Okanagan Section	G4T3?	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Okanagan Highlands Section	G4T3?	S2	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G4T3?	S2	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Fox Sedge *Carex vulpinoidea*										
	Okanagan Ecoregion	G5	S2S3	S4	Secondary Target	☑	5 occ	2 occ	7 occ	29
	Central Okanagan Section	G5	S2S3	S4	Secondary Target	☑	1 occ	0 occ	1 occ	0
	Okanagan Highlands Section	G5	S2S3	S4	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G5	S2S3	S4	Secondary Target	☑	1 occ	0 occ	1 occ	0
	Northern Cascade Ranges Section	G5	S2S3	S4	Secondary Target	☑	2 occ	1 occ	1 occ	100

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Fragrant White Rein Orchid *Platanthera dilatata var. albiflora*										
	Okanagan Ecoregion	G5T3T5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5T3T5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Freckled Milk-vetch *Astragalus lentiginosus*										
	Okanagan Ecoregion	G5	S2	SR	Primary Target	☑	10 occ	7 occ	7 occ	100
	Interior Transition Ranges Section	G5	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Thompson Okanagan Plateau Section	G5	S2	SR	Primary Target	☑	6 occ	3 occ	1 occ	300
	Northern Cascade Ranges Section	G5	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
Geyer's Onion *Allium geyeri var. tenerum*										
	Okanagan Ecoregion	G4G5T3T5	S2	SR	Secondary Target	☑	4 occ	2 occ	13 occ	15
	Interior Transition Ranges Section	G4G5T3T5	S2	SR	Secondary Target	☑	2 occ	1 occ	3 occ	33
	Thompson Okanagan Plateau Section	G4G5T3T5	S2	SR	Secondary Target	☑	2 occ	1 occ	3 occ	33
Giant Helleborine *Epipactis gigantea*										
	Okanagan Ecoregion	G3	S2S3	S3	Primary Target	☑	8 occ	7 occ	7 occ	100
	Central Okanagan Section	G3	S2S3	S3	Primary Target	☑	1 occ	1 occ	1 occ	100
	Okanagan Highlands Section	G3	S2S3	S3	Primary Target	☑	3 occ	3 occ	1 occ	300
	Thompson Okanagan Plateau Section	G3	S2S3	S3	Primary Target	☑	4 occ	3 occ	1 occ	300
Glaucous Gentian *Gentiana glauca*										
	Okanagan Ecoregion	G4G5	S4	S2S3	Secondary Target	☑	9 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G4G5	S4	S2S3	Secondary Target	☑	9 occ	3 occ	1 occ	300
Glaucous Willow *Salix glauca*										
	Okanagan Ecoregion	G5?	S?	S1S2	Secondary Target	☑	5 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5?	S?	S1S2	Secondary Target	☑	5 occ	1 occ	1 occ	100
Golden Draba *Draba aurea*										

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Okanagan Ecoregion	G5	S4	S2	Secondary Target	☑	9 occ	9 occ	13 occ	69
	Northern Cascade Ranges Section	G5	S4	S2	Secondary Target	☑	9 occ	9 occ	3 occ	300
Grand Coulee Owl-clover *Orthocarpus barbatus*										
	Okanagan Ecoregion	G2G4	S1	S?	Primary Target	☑	1 occ	1 occ	25 occ	4
	Okanagan Highlands Section	G2G4	S1	S?	Primary Target	☑	1 occ	1 occ	5 occ	20
Gray Stickseed *Hackelia cinerea*										
	Okanagan Ecoregion	G4?	XX	S1	Primary Target	☑	4 occ	4 occ	25 occ	16
	Okanagan Highlands Section	G4?	XX	S1	Primary Target	☑	4 occ	4 occ	5 occ	80
Green Keeled Cotton-Grass *Eriophorum viridicarinatum*										
	Okanagan Ecoregion	G5	S4	S2	Secondary Target	☑	3 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G5	S4	S2	Secondary Target	☑	2 occ	2 occ	1 occ	200
	Northern Cascade Ranges Section	G5	S4	S2	Secondary Target	☑	1 occ	0 occ	1 occ	0
Hairgrass Dropseed *Sporobolus airoides*										
	Okanagan Ecoregion	G5	S1	SR	Primary Target	☑	5 occ	5 occ	7 occ	71
	Okanagan Highlands Section	G5	S1	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
	Northern Cascade Ranges Section	G5	S1	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
Hair-like Sedge *Carex capillaris*										
	Okanagan Ecoregion	G5	S4	S1	Secondary Target	☑	3 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S4	S1	Secondary Target	☑	2 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5	S4	S1	Secondary Target	☑	1 occ	0 occ	1 occ	0
Hairy Water-clover *Marsilea vestita*										
	Okanagan Ecoregion	G5	S1	SR	Primary Target	☑	4 occ	4 occ	7 occ	57
	Central Okanagan Section	G5	S1	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Okanagan Highlands Section	G5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Hairy-stemmed Willowherb *Epilobium mirabile*										
	Okanagan Ecoregion	G4Q	S2S3	SR	Secondary Target	☑	1 occ	1 occ	25 occ	4
	Northern Cascade Ranges Section	G4Q	S2S3	SR	Secondary Target	☑	1 occ	1 occ	5 occ	20
Hall's Willowherb *Epilobium halleanum*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	3 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Heterocodon *Heterocodon rariflorum*										
	Okanagan Ecoregion	G5	S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Holm's Rocky Mountain Sedge *Carex scopulorum var. bracteosa*										
	Okanagan Ecoregion	G5T3T5	S2S3	S4	Secondary Target	☑	9 occ	9 occ	7 occ	129
	Central Okanagan Section	G5T3T5	S2S3	S4	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5T3T5	S2S3	S4	Secondary Target	☑	8 occ	8 occ	1 occ	800
Howellia *Howellia aquatilis*										
	Okanagan Ecoregion	G3	XX	S2S3	Primary Target	☑	3 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G3	XX	S2S3	Primary Target	☑	3 occ	2 occ	1 occ	200
Hutchinsia *Hutchinsia procumbens*										
	Okanagan Ecoregion	G5	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G5	S1	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
Idaho Gooseberry *Ribes oxyacanthoides ssp. Irriguum*										
	Okanagan Ecoregion	G5T3T4		S2	Secondary Target	☑	2 occ	1 occ	7 occ	14

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
	Okanagan Highlands Section	G5T3T4		S2	Secondary Target	☑	2 occ	1 occ	1 occ	100
Kellogg's Knotweed *Polygonum polygaloides ssp. kelloggii*										
	Okanagan Ecoregion	G4G5T3T5	S2S3	S?	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Thompson Okanagan Plateau Section	G4G5T3T5	S2S3	S?	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G4G5T3T5	S2S3	S?	Secondary Target	☑	1 occ	1 occ	1 occ	100
Kidney-leaved Violet *Viola renifolia*										
	Okanagan Ecoregion	G5	S3S4	S2	Secondary Target	☑	5 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S3S4	S2	Secondary Target	☑	5 occ	1 occ	1 occ	100
Kotzebue's Grass-of-Parnassus *Parnassia kotzebuei*										
	Okanagan Ecoregion	G4	S4	S1	Secondary Target	☑	2 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G4	S4	S1	Secondary Target	☑	2 occ	1 occ	1 occ	100
Kruckeberg's Holly Fern *Polystichum kruckebergii*										
	Okanagan Ecoregion	G4	S2S3	S?	Secondary Target	☑	3 occ	2 occ	7 occ	29
	Northern Cascade Ranges Section	G4	S2S3	S?	Secondary Target	☑	3 occ	2 occ	1 occ	200
Lace Fern *Cheilanthes gracillima*										
	Okanagan Ecoregion	G4G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G4G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Lance-fruited Draba *Draba lonchocarpa var. thompsonii*										
	Okanagan Ecoregion	G4T3T4	S2S3	SR	Secondary Target	☑	2 occ	1 occ	25 occ	4
	Northern Cascade Ranges Section	G4T3T4	S2S3	SR	Secondary Target	☑	2 occ	1 occ	5 occ	20
Lance-leaved Draba *Draba cana*										
	Okanagan Ecoregion	G5	S4	S1S2	Primary Target	☑	5 occ	5 occ	7 occ	71
	Northern Cascade Ranges Section	G5	S4	S1S2	Primary Target	☑	5 occ	5 occ	1 occ	500

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Lance-leaved Figwort *Scrophularia lanceolata*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Leafy Mitrewort *Mitella caulescens*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Leiberg's Fleabane *Erigeron leibergii*										
	Okanagan Ecoregion	G3?	S1	S?	Primary Target	☑	1 occ	1 occ	25 occ	4
	Northern Cascade Ranges Section	G3?	S1	S?	Primary Target	☑	1 occ	1 occ	5 occ	20
Lemmon's Holly Fern *Polystichum lemmonii*										
	Okanagan Ecoregion	G4	S1	SR	Primary Target	☑	1 occ	1 occ	13 occ	8
	Central Okanagan Section	G4	S1	SR	Primary Target	☑	1 occ	1 occ	3 occ	33
Little Fescue *Festuca minutiflora*										
	Okanagan Ecoregion	G5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	13 occ	8
	Northern Cascade Ranges Section	G5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	3 occ	33
Low Hawksbeard *Crepis modocensis ssp. modocensis*										
	Okanagan Ecoregion	G4G5T4	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Interior Transition Ranges Section	G4G5T4	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Lyall's Mariposa Lily *Calochortus lyallii*										
	Okanagan Ecoregion	G3	S2	S?	Primary Target	☑	8 occ	8 occ	25 occ	32
	Okanagan Highlands Section	G3	S2	S?	Primary Target	☑	8 occ	8 occ	5 occ	160
	Northern Cascade Ranges Section	G3	S2	S?	Primary Target	☑	0 occ	0 occ	5 occ	0

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Many-headed Sedge *Carex sychnocephala*										
	Okanagan Ecoregion	G4	S3	S2	Secondary Target	☑	12 occ	7 occ	7 occ	100
	Central Okanagan Section	G4	S3	S2	Secondary Target	☑	2 occ	2 occ	1 occ	200
	Okanagan Highlands Section	G4	S3	S2	Secondary Target	☑	7 occ	4 occ	1 occ	400
	Northern Cascade Ranges Section	G4	S3	S2	Secondary Target	☑	3 occ	1 occ	1 occ	100
Mexican Mosquito Fern *Azolla mexicana*										
	Okanagan Ecoregion	G5	S2	SR	Primary Target	☑	2 occ	2 occ	7 occ	29
	Thompson Okanagan Plateau Section	G5	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
Montana Larkspur *Delphinium bicolor ssp. bicolor*										
	Okanagan Ecoregion	G4G5T4T5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G4G5T4T5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	1 occ	100
Moss Grass *Coleanthus subtilis*										
	Okanagan Ecoregion	GNR	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Thompson Okanagan Plateau Section	GNR	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Mount Hood Pussypaws *Calyptridium umbellatum var. caudiciferum*										
	Okanagan Ecoregion	G4G5T4T5	S2S3	SR	Secondary Target	☑	7 occ	6 occ	7 occ	86
	Northern Cascade Ranges Section	G4G5T4T5	S2S3	SR	Secondary Target	☑	7 occ	6 occ	1 occ	600
Mountain Holly Fern *Polystichum scopulinum*										
	Okanagan Ecoregion	G5	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G5	S1	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
Mutton Grass *Poa fendleriana ssp. fendleriana*										
	Okanagan Ecoregion	G5T5	S1	XX	Primary Target	☑	1 occ	1 occ	7 occ	14
	Thompson Okanagan Plateau Section	G5T5	S1	XX	Primary Target	☑	1 occ	1 occ	1 occ	100

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Nagoonberry *Rubus acaulis*										
	Okanagan Ecoregion	G5		S1	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G5		S1	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5		S1	Secondary Target	☑	1 occ	1 occ	1 occ	100
Narrowleaf Skullcap *Scutellaria angustifolia ssp. micrantha*										
	Okanagan Ecoregion	G5T3T5	XX	S2S3	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5T3T5	XX	S2S3	Primary Target	☑	1 occ	1 occ	3 occ	33
Narrow-leaved Brickellia *Brickellia oblongifolia ssp. oblongifolia*										
	Okanagan Ecoregion	G5T5	S2	SR	Primary Target	☑	5 occ	5 occ	7 occ	71
	Northern Cascade Ranges Section	G5T5	S2	SR	Primary Target	☑	5 occ	5 occ	1 occ	500
Narrow-leaved Sedge *Carex eleocharis*										
	Okanagan Ecoregion	G5	S3S4	S1	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Northern Cascade Ranges Section	G5	S3S4	S1	Secondary Target	☑	1 occ	0 occ	1 occ	0
Needle-leaved Navarretia *Navarretia intertexta*										
	Okanagan Ecoregion	G5?	S2	SR	Primary Target	☑	2 occ	2 occ	7 occ	29
	Interior Transition Ranges Section	G5?	S2	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Central Okanagan Section	G5?	S2	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Nettle-leaved Giant-hyssop *Agastache urticifolia*										
	Okanagan Ecoregion	G5	S3	SR	Secondary Target	☑	8 occ	6 occ	7 occ	86
	Okanagan Highlands Section	G5	S3	SR	Secondary Target	☑	5 occ	4 occ	1 occ	400
	Northern Cascade Ranges Section	G5	S3	SR	Secondary Target	☑	3 occ	2 occ	1 occ	200
Nodding Saxifrage *Saxifraga cernua*										
	Okanagan Ecoregion	G4	S5	S1S2	Secondary Target	☑	3 occ	2 occ	7 occ	29
	Northern Cascade Ranges Section	G4	S5	S1S2	Secondary Target	☑	3 occ	2 occ	1 occ	200

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Northern Bentgrass *Agrostis borealis*										
	Okanagan Ecoregion	G5	S3S4	S1S2	Secondary Target	☑	3 occ	2 occ	7 occ	29
	Northern Cascade Ranges Section	G5	S3S4	S1S2	Secondary Target	☑	3 occ	2 occ	1 occ	200
Northern Golden-Carpet *Chrysosplenium tetrandrum*										
	Okanagan Ecoregion	G5	S5	S2	Secondary Target	☑	9 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5	S5	S2	Secondary Target	☑	9 occ	3 occ	1 occ	300
Northern Linanthus *Linanthus septentrionalis*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	11 occ	10 occ	7 occ	143
	Central Okanagan Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Okanagan Highlands Section	G5	S2S3	SR	Secondary Target	☑	5 occ	4 occ	1 occ	400
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	5 occ	5 occ	1 occ	500
Northern Violet *Viola septentrionalis*										
	Okanagan Ecoregion	G5	S2S3	XX	Secondary Target	☑	2 occ	0 occ	13 occ	0
	Central Okanagan Section	G5	S2S3	XX	Secondary Target	☑	1 occ	0 occ	3 occ	0
	Thompson Okanagan Plateau Section	G5	S2S3	XX	Secondary Target	☑	1 occ	0 occ	3 occ	0
Nuttall's Draba *Draba densifolia*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Nuttall's Pussy-toes *Antennaria parvifolia*										
	Okanagan Ecoregion	G5	S4	S2	Secondary Target	☑	15 occ	5 occ	13 occ	38
	Okanagan Highlands Section	G5	S4	S2	Secondary Target	☑	15 occ	5 occ	3 occ	167
Nuttall's Waterweed *Elodea nuttallii*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Okanagan Highlands Section	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Obscure Cryptantha *Cryptantha ambigua*										
	Okanagan Ecoregion	G4	S2	SR	Primary Target	☑	5 occ	5 occ	7 occ	71
	Central Okanagan Section	G4	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Okanagan Highlands Section	G4	S2	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G4	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
Okanogan Fameflower *Talinum sediforme*										
	Okanagan Ecoregion	G3	S2S3	S2	Secondary Target	☑	13 occ	10 occ	50 occ	20
	Central Okanagan Section	G3	S2S3	S2	Secondary Target	☑	2 occ	1 occ	10 occ	10
	Thompson Okanagan Plateau Section	G3	S2S3	S2	Secondary Target	☑	11 occ	10 occ	10 occ	100
Okanogan Stickseed *Hackelia ciliata*										
	Okanagan Ecoregion	G3?	S1	S?	Primary Target	☑	2 occ	2 occ	25 occ	8
	Okanagan Highlands Section	G3?	S1	S?	Primary Target	☑	2 occ	2 occ	5 occ	40
Oniongrass *Melica bulbosa var. bulbosa*										
	Okanagan Ecoregion	G5T5	S2	SR	Primary Target	☑	5 occ	5 occ	7 occ	71
	Okanagan Highlands Section	G5T5	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Northern Cascade Ranges Section	G5T5	S2	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
Orange Balsam *Impatiens aurella*										
	Okanagan Ecoregion	G4?	S2S3	S3?	Secondary Target	☑	4 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G4?	S2S3	S3?	Secondary Target	☑	4 occ	1 occ	1 occ	100
Oregon Checker-mallow *Sidalcea oregana var. procera*										
	Okanagan Ecoregion	G5T4	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Thompson Okanagan Plateau Section	G5T4	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Oregon Willowherb *Epilobium oregonense*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0

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	Thompson Okanagan Plateau Section	G5	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Pale Alpine-forget-me-not *Eritrichium nanum var. elongatum*										
	Okanagan Ecoregion	G5T4	XX	S1	Primary Target	☑	2 occ	2 occ	7 occ	29
	Northern Cascade Ranges Section	G5T4	XX	S1	Primary Target	☑	2 occ	2 occ	1 occ	200
Peach-leaf Willow *Salix amygdaloides*										
	Okanagan Ecoregion	G5	S2	S?	Secondary Target	☑	7 occ	4 occ	7 occ	57
	Central Okanagan Section	G5	S2	S?	Secondary Target	☑	5 occ	2 occ	1 occ	200
	Okanagan Highlands Section	G5	S2	S?	Secondary Target	☑	2 occ	2 occ	1 occ	200
Pink Agoseris *Agoseris lackschewitzii*										
	Okanagan Ecoregion	G4	S2S3	XX	Secondary Target	☑	1 occ	1 occ	25 occ	4
	Northern Cascade Ranges Section	G4	S2S3	XX	Secondary Target	☑	1 occ	1 occ	5 occ	20
Poor Sedge *Carex magellanica ssp. irrigua*										
	Okanagan Ecoregion	G5T5	S3S4	S2S3	Secondary Target	☑	20 occ	10 occ	7 occ	143
	Okanagan Highlands Section	G5T5	S3S4	S2S3	Secondary Target	☑	1 occ	0 occ	1 occ	0
	Northern Cascade Ranges Section	G5T5	S3S4	S2S3	Secondary Target	☑	19 occ	10 occ	1 occ	1000
Porcupine Sedge *Carex hystricina*										
	Okanagan Ecoregion	G5	S2S3	S2	Secondary Target	☑	2 occ	0 occ	7 occ	0
	Thompson Okanagan Plateau Section	G5	S2S3	S2	Secondary Target	☑	2 occ	0 occ	1 occ	0
Porcupinegrass *Hesperostipa spartea*										
	Okanagan Ecoregion	G5	S2	XX	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Northern Cascade Ranges Section	G5	S2	XX	Secondary Target	☑	1 occ	0 occ	1 occ	0
Poverty-weed *Iva axillaris ssp. robustior*										
	Okanagan Ecoregion	G5TNR	S1		Secondary Target	☑	2 occ	1 occ	7 occ	14
	Interior Transition Ranges Section	G5TNR	S1		Secondary Target	☑	1 occ	1 occ	1 occ	100

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Thompson Okanagan Plateau Section	G5TNR	S1		Secondary Target	☑	1 occ	0 occ	1 occ	0
Prairie Cordgrass *Spartina pectinata*										
	Okanagan Ecoregion	G5	SR	S2	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Okanagan Highlands Section	G5	SR	S2	Secondary Target	☑	1 occ	0 occ	1 occ	0
Pulsifer's Monkey-flower *Mimulus pulsiferae*										
	Okanagan Ecoregion	G4?	XX	S2	Primary Target	☑	5 occ	5 occ	7 occ	71
	Northern Cascade Ranges Section	G4?	XX	S2	Primary Target	☑	5 occ	5 occ	1 occ	500
Purple Oniongrass *Melica spectabilis*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Pygmy Saxifrage *Saxifraga rivularis*										
	Okanagan Ecoregion	G5?	S4	S3	Secondary Target	☑	18 occ	5 occ	13 occ	38
	Northern Cascade Ranges Section	G5?	S4	S3	Secondary Target	☑	18 occ	5 occ	3 occ	167
Red-rooted Cyperus *Cyperus erythrorhizos*										
	Okanagan Ecoregion	G5	S1	SR	Secondary Target	☑	2 occ	1 occ	7 occ	14
	Central Okanagan Section	G5	S1	SR	Secondary Target	☑	2 occ	1 occ	1 occ	100
Regel's Rush *Juncus regelii*										
	Okanagan Ecoregion	G4?	S3	SR	Secondary Target	☑	9 occ	4 occ	13 occ	31
	Interior Transition Ranges Section	G4?	S3	SR	Secondary Target	☑	1 occ	0 occ	3 occ	0
	Central Okanagan Section	G4?	S3	SR	Secondary Target	☑	3 occ	1 occ	3 occ	33
	Okanagan Highlands Section	G4?	S3	SR	Secondary Target	☑	1 occ	1 occ	3 occ	33
	Thompson Okanagan Plateau Section	G4?	S3	SR	Secondary Target	☑	1 occ	0 occ	3 occ	0
	Northern Cascade Ranges Section	G4?	S3	SR	Secondary Target	☑	3 occ	2 occ	3 occ	67
Rice Cutgrass *Leersia oryzoides*										

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Central Okanagan Section	G5	S2S3	SR	Secondary Target	☑	2 occ	2 occ	1 occ	200
Rigid Fiddleneck *Amsinckia retrorsa*										
	Okanagan Ecoregion	G5	S1	S4	Primary Target	☑	1 occ	1 occ	7 occ	14
	Central Okanagan Section	G5	S1	S4	Primary Target	☑	1 occ	1 occ	1 occ	100
River Bulrush *Bolboschoenus fluviatilis*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Rocky Mountain Clubrush *Schoenoplectus saximontanus*										
	Okanagan Ecoregion	G5	S1	XX	Primary Target	☑	1 occ	1 occ	13 occ	8
	Okanagan Highlands Section	G5	S1	XX	Primary Target	☑	1 occ	1 occ	3 occ	33
Rough Dropseed *Sporobolus compositus var. compositus*										
	Okanagan Ecoregion	G5T5	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5T5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G5T5	S1	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
Salish fleabane *Erigeron salishii*										
	Okanagan Ecoregion	G2	S1	S2S3	Primary Target	☑	1 occ	1 occ	25 occ	4
	Northern Cascade Ranges Section	G2	S1	S2S3	Primary Target	☑	1 occ	1 occ	5 occ	20
Scalepod *Idahoa scapigera*										
	Okanagan Ecoregion	G5	S2	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S2	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Scandinavian Sedge *Carex norvegica*										
	Okanagan Ecoregion	G5	SR	S2	Secondary Target	☑	13 occ	1 occ	13 occ	8
	Northern Cascade Ranges Section	G5	SR	S2	Secondary Target	☑	13 occ	1 occ	3 occ	33

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Scarlet Ammannia *Ammannia robusta*										
	Okanagan Ecoregion	G5	S1	S?	Primary Target	☑	2 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G5	S1	S?	Primary Target	☑	2 occ	2 occ	1 occ	200
Scarlet Gaura *Gaura coccinea*										
	Okanagan Ecoregion	G5	S1	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Thompson Okanagan Plateau Section	G5	S1	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Scarlet Globe-mallow *Sphaeralcea coccinea*										
	Okanagan Ecoregion	G5?	S1	XX	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Thompson Okanagan Plateau Section	G5?	S1	XX	Secondary Target	☑	1 occ	0 occ	1 occ	0
Seep-spring Arnica *Arnica longifolia*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Short-fruited Smelowskia *Smelowskia ovalis*										
	Okanagan Ecoregion	G5	S2S3	SR	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Northern Cascade Ranges Section	G5	S2S3	SR	Secondary Target	☑	2 occ	2 occ	1 occ	200
Short-rayed Aster *Aster frondosus*										
	Okanagan Ecoregion	G4	S1	SR	Primary Target	☑	5 occ	5 occ	7 occ	71
	Okanagan Highlands Section	G4	S1	SR	Primary Target	☑	5 occ	5 occ	1 occ	500
Showy Phlox *Phlox speciosa ssp. occidentalis*										
	Okanagan Ecoregion	G5TNR	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G5TNR	S1	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
Silvercrown *Cacaliopsis nardosmia*										

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Okanagan Ecoregion	G4G5	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G4G5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Silvery Orache *Atriplex argentea ssp. argentea*										
	Okanagan Ecoregion	G5T5	S1	XX	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Thompson Okanagan Plateau Section	G5T5	S1	XX	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5T5	S1	XX	Secondary Target	☑	1 occ	1 occ	1 occ	100
Silvery Sagebrush *Artemisia cana ssp. cana*										
	Okanagan Ecoregion	G5T4?	S1	XX	Secondary Target	☑	2 occ	0 occ	7 occ	0
	Thompson Okanagan Plateau Section	G5T4?	S1	XX	Secondary Target	☑	2 occ	0 occ	1 occ	0
Skinny Moonwort *Botrychium lineare*										
	Okanagan Ecoregion	G1	XX	S1	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G1	XX	S1	Primary Target	☑	1 occ	1 occ	1 occ	100
Skunk Polemonium *Polemonium viscosum*										
	Okanagan Ecoregion	G5	S3S4	S1S2	Secondary Target	☑	8 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G5	S3S4	S1S2	Secondary Target	☑	8 occ	3 occ	1 occ	300
Slender Collomia *Collomia tenella*										
	Okanagan Ecoregion	G4?	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G4?	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Slender Crazyweed *Oxytropis campestris var. gracilis*										
	Okanagan Ecoregion	G5?		S2	Primary Target	☑	2 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G5?		S2	Primary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5?		S2	Primary Target	☑	1 occ	1 occ	1 occ	100
Slender Gentian tenella *Gentianella tenella*										
	Okanagan Ecoregion	G4G5	S?	S1		☑	3 occ	3 occ	7 occ	43

Habitat Type

Level of Biological Organization

Taxon

Common Name ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Northern Cascade Ranges Section	G4G5	S?	S1		☑	3 occ	3 occ	1 occ	300
Slender Gentian tenella tenella *Gentianella tenella ssp. tenella*										
	Okanagan Ecoregion	G4G5T4	S2S3	S?		☑	1 occ	0 occ	7 occ	0
	Interior Transition Ranges Section	G4G5T4	S2S3	S?		☑	1 occ	0 occ	1 occ	0
Slender Gilia *Gilia tenerrima*										
	Okanagan Ecoregion	G5	S1	XX	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S1	XX	Primary Target	☑	1 occ	1 occ	1 occ	100
Slender Hawksbeard *Crepis atribarba ssp. atribarba*										
	Okanagan Ecoregion	G5T5	S1	SR	Primary Target	☑	2 occ	2 occ	7 occ	29
	Interior Transition Ranges Section	G5T5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G5T5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Small northern bog-orchid *Platanthera obtusata*										
	Okanagan Ecoregion	G5	S?	S2	Secondary Target	☑	43 occ	18 occ	13 occ	138
	Okanagan Highlands Section	G5	S?	S2	Secondary Target	☑	43 occ	18 occ	3 occ	600
Small-flowered Ipomopsis *Ipomopsis minutiflora*										
	Okanagan Ecoregion	G2G3	S2	SR	Primary Target	☑	7 occ	7 occ	13 occ	54
	Interior Transition Ranges Section	G2G3	S2	SR	Primary Target	☑	2 occ	2 occ	3 occ	67
	Thompson Okanagan Plateau Section	G2G3	S2	SR	Primary Target	☑	3 occ	3 occ	3 occ	100
	Northern Cascade Ranges Section	G2G3	S2	SR	Primary Target	☑	2 occ	2 occ	3 occ	67
Small-flowered Lipocarpha *Lipocarpha micrantha*										
	Okanagan Ecoregion	G4	S1	S4	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G4	S1	S4	Primary Target	☑	1 occ	1 occ	1 occ	100
Smith's Melic *Melica smithii*										
	Okanagan Ecoregion	G4	S2S3	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
	Thompson Okanagan Plateau Section	G4	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Smooth Willowherb *Epilobium glaberrimum ssp. fastigiatum*										
	Okanagan Ecoregion	G5TNR	S2S3	SR	Secondary Target	☑	3 occ	0 occ	7 occ	0
	Northern Cascade Ranges Section	G5TNR	S2S3	SR	Secondary Target	☑	3 occ	0 occ	1 occ	0
Snake River Cryptantha *Cryptantha spiculifera*										
	Okanagan Ecoregion	G4?	XX	S2?	Secondary Target	☑	6 occ	0 occ	7 occ	0
	Okanagan Highlands Section	G4?	XX	S2?	Secondary Target	☑	6 occ	0 occ	1 occ	0
Snow Cinquefoil *Potentilla nivea*										
	Okanagan Ecoregion	G5	S?	S2	Secondary Target	☑	17 occ	9 occ	13 occ	69
	Northern Cascade Ranges Section	G5	S?	S2	Secondary Target	☑	17 occ	9 occ	3 occ	300
Spalding's Milk-vetch *Astragalus spaldingii var. spaldingii*										
	Okanagan Ecoregion	G3?T3?	S1	SR	Primary Target	☑	1 occ	1 occ	25 occ	4
	Okanagan Highlands Section	G3?T3?	S1	SR	Primary Target	☑	1 occ	1 occ	5 occ	20
Sparse-leaved Sedge *Carex tenuiflora*										
	Okanagan Ecoregion	G5		S1	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5		S1	Secondary Target	☑	1 occ	1 occ	1 occ	100
Spreading Stickseed *Hackelia diffusa*										
	Okanagan Ecoregion	G4	S2S3	S?	Secondary Target	☑	2 occ	2 occ	25 occ	8
	Interior Transition Ranges Section	G4	S2S3	S?	Secondary Target	☑	2 occ	2 occ	5 occ	40
Stalked Moonwort *Botrychium pedunculosum*										
	Okanagan Ecoregion	G2G3	S1S3	S2S3	Secondary Target	☑	7 occ	5 occ	7 occ	71
	Okanagan Highlands Section	G2G3	S1S3	S2S3	Secondary Target	☑	7 occ	5 occ	1 occ	500

Okanagan Ecoregion Targets and Goals Summary

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Steer's Head *Dicentra uniflora*										
	Okanagan Ecoregion	G4?	S2S3	SR	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Northern Cascade Ranges Section	G4?	S2S3	SR	Secondary Target	☑	2 occ	2 occ	1 occ	200
Steller's Rockbrake *Cryptogramma stelleri*										
	Okanagan Ecoregion	G5	S3S4	S1S2	Secondary Target	☑	3 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G5	S3S4	S1S2	Secondary Target	☑	3 occ	3 occ	1 occ	300
Stoloniferous Pussytoes *Antennaria flagellaris*										
	Okanagan Ecoregion	G5?	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G5?	S1	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
Strict Buckwheat *Eriogonum strictum var. proliferum*										
	Okanagan Ecoregion	G5TNR	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5TNR	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Sweet-marsh Butterweed *Senecio hydrophiloides*										
	Okanagan Ecoregion	G4G5	S1	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Okanagan Highlands Section	G4G5	S1	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Tall Beggarticks *Bidens vulgata*										
	Okanagan Ecoregion	G5	S1	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Thompson Okanagan Plateau Section	G5	S1	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Tall Bitter Fleabane *Trimorpha elata*										
	Okanagan Ecoregion	G4?	SR	S1	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G4?	SR	S1	Secondary Target	☑	2 occ	2 occ	1 occ	200
The Dalles Milk-vetch *Astragalus sclerocarpus*										

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Okanagan Ecoregion	G5	S2	SR	Primary Target	☑	5 occ	5 occ	7 occ	71
	Central Okanagan Section	G5	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Okanagan Highlands Section	G5	S2	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Northern Cascade Ranges Section	G5	S2	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Thick-leaved Thelypody *Thelypodium laciniatum var. laciniatum*										
	Okanagan Ecoregion	G5T5	S2S3	SR	Secondary Target	☑	10 occ	8 occ	13 occ	62
	Okanagan Highlands Section	G5T5	S2S3	SR	Secondary Target	☑	3 occ	3 occ	3 occ	100
	Northern Cascade Ranges Section	G5T5	S2S3	SR	Secondary Target	☑	7 occ	5 occ	3 occ	167
Threadstalk Milk-vetch *Astragalus filipes*										
	Okanagan Ecoregion	G5	S3	SR	Secondary Target	☑	8 occ	5 occ	7 occ	71
	Okanagan Highlands Section	G5	S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Thompson Okanagan Plateau Section	G5	S3	SR	Secondary Target	☑	7 occ	4 occ	1 occ	400
Three-flowered Waterwort *Elatine rubella*										
	Okanagan Ecoregion	G5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Central Okanagan Section	G5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	1 occ	100
Three-leaved Lewisia *Lewisia triphylla*										
	Okanagan Ecoregion	G4?	S2S3	SR	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Northern Cascade Ranges Section	G4?	S2S3	SR	Secondary Target	☑	1 occ	0 occ	1 occ	0
Thyme-leaved Spurge *Chamaesyce serpyllifolia ssp. serpyllifolia*										
	Okanagan Ecoregion	G5T5	S2S3	SR	Secondary Target	☑	6 occ	5 occ	7 occ	71
	Okanagan Highlands Section	G5T5	S2S3	SR	Secondary Target	☑	3 occ	3 occ	1 occ	300
	Thompson Okanagan Plateau Section	G5T5	S2S3	SR	Secondary Target	☑	3 occ	2 occ	1 occ	200
Toothcup Meadow-foam *Rotala ramosior*										
	Okanagan Ecoregion	G5	S1	S1	Primary Target	☑	3 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5	S1	S1	Primary Target	☑	2 occ	2 occ	1 occ	200
	Thompson Okanagan Plateau Section	G5	S1	S1	Primary Target	☑	1 occ	1 occ	1 occ	100

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Triangular-lobed Moonwort *Botrychium ascendens*										
	Okanagan Ecoregion	G2G3?	S2S3	S2S3	Secondary Target	☑	10 occ	3 occ	13 occ	23
	Okanagan Highlands Section	G2G3?	S2S3	S2S3	Secondary Target	☑	5 occ	3 occ	3 occ	100
	Northern Cascade Ranges Section	G2G3?	S2S3	S2S3	Secondary Target	☑	5 occ	0 occ	3 occ	0
Tweedy's Lewisia *Lewisia tweedyi*										
	Okanagan Ecoregion	G2G3	S1	S?	Primary Target	☑	1 occ	1 occ	25 occ	4
	Northern Cascade Ranges Section	G2G3	S1	S?	Primary Target	☑	1 occ	1 occ	5 occ	20
Tweedy's Willow *Salix tweedyi*										
	Okanagan Ecoregion	G3G4	S2S3	S3	Primary Target	☑	35 occ	11 occ	7 occ	157
	Thompson Okanagan Plateau Section	G3G4	S2S3	S3	Primary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G3G4	S2S3	S3	Primary Target	☑	34 occ	10 occ	1 occ	1000
Two-spiked Moonwort *Botrychium paradoxum*										
	Okanagan Ecoregion	G2	S1	S2	Primary Target	☑	9 occ	7 occ	7 occ	100
	Okanagan Highlands Section	G2	S1	S2	Primary Target	☑	4 occ	4 occ	1 occ	400
	Northern Cascade Ranges Section	G2	S1	S2	Primary Target	☑	5 occ	3 occ	1 occ	300
Umbellate Starwort *Stellaria umbellata*										
	Okanagan Ecoregion	G5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S2S3	XX	Secondary Target	☑	1 occ	1 occ	1 occ	100
Ute Ladies' Tresses *Spiranthes diluvialis*										
	Okanagan Ecoregion	G2	XX	S1	Primary Target	☑	4 occ	4 occ	7 occ	57
	Okanagan Highlands Section	G2	XX	S1	Primary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	G2	XX	S1	Primary Target	☑	3 occ	3 occ	1 occ	300
Valley Sedge vallicola *Carex vallicola*										
	Okanagan Ecoregion	G5		S2		☑	14 occ	4 occ	7 occ	57

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
	Northern Cascade Ranges Section	G5		S2		☑	14 occ	4 occ	1 occ	400
Valley Sedge vallicola vallicola *Carex vallicola var. vallicola*										
	Okanagan Ecoregion	G5T5	S1	XX		☑	4 occ	4 occ	7 occ	57
	Northern Cascade Ranges Section	G5T5	S1	XX		☑	4 occ	4 occ	1 occ	400
Velvet-leaf Blueberry *Vaccinium myrtilloides*										
	Okanagan Ecoregion	G5	S4	S1	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S4	S1	Primary Target	☑	1 occ	1 occ	1 occ	100
Water Avens *Geum rivale*										
	Okanagan Ecoregion	G5	S3S4	S2S3	Secondary Target	☑	6 occ	2 occ	7 occ	29
	Okanagan Highlands Section	G5	S3S4	S2S3	Secondary Target	☑	5 occ	2 occ	1 occ	200
	Northern Cascade Ranges Section	G5	S3S4	S2S3	Secondary Target	☑	1 occ	0 occ	1 occ	0
Watson's Cryptantha *Cryptantha watsonii*										
	Okanagan Ecoregion	G5	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Northern Cascade Ranges Section	G5	S1	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
Western Centaury *Centaurium exaltatum*										
	Okanagan Ecoregion	G5	S1	SR	Primary Target	☑	3 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5	S1	SR	Primary Target	☑	3 occ	3 occ	1 occ	300
Western Dogbane *Apocynum x floribundum*										
	Okanagan Ecoregion	GNA	S2S3	SR	Secondary Target	☑	2 occ	2 occ	7 occ	29
	Interior Transition Ranges Section	GNA	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
	Northern Cascade Ranges Section	GNA	S2S3	SR	Secondary Target	☑	1 occ	1 occ	1 occ	100
Western Ladies-tresses *Spiranthes porrifolia*										
	Okanagan Ecoregion	G4	XX	S2	Secondary Target	☑	2 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G4	XX	S2	Secondary Target	☑	1 occ	1 occ	1 occ	100

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
	Northern Cascade Ranges Section	G4	XX	S2	Secondary Target	☑	1 occ	0 occ	1 occ	0
Western Low Hawksbeard *Crepis modocensis ssp. rostrata*										
	Okanagan Ecoregion	G4G5T3T4	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Thompson Okanagan Plateau Section	G4G5T3T4	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Western Moonwort *Botrychium hesperium*										
	Okanagan Ecoregion	G3	S2S3	S1	Secondary Target	☑	3 occ	1 occ	7 occ	14
	Central Okanagan Section	G3	S2S3	S1	Secondary Target	☑	1 occ	0 occ	1 occ	0
	Okanagan Highlands Section	G3	S2S3	S1	Secondary Target	☑	2 occ	1 occ	1 occ	100
Western Stickseed *Lappula occidentalis var. cupulata*										
	Okanagan Ecoregion	G5T5	S1	SR	Primary Target	☑	4 occ	4 occ	7 occ	57
	Okanagan Highlands Section	G5T5	S1	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
	Northern Cascade Ranges Section	G5T5	S1	SR	Primary Target	☑	2 occ	2 occ	1 occ	200
White Wintergreen *Pyrola elliptica*										
	Okanagan Ecoregion	G5	S2S3	XX	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Northern Cascade Ranges Section	G5	S2S3	XX	Secondary Target	☑	1 occ	0 occ	1 occ	0
Whited's Halimolobos *Halimolobos whitedii*										
	Okanagan Ecoregion	G3?	S2	SR	Primary Target	☑	8 occ	8 occ	25 occ	32
	Okanagan Highlands Section	G3?	S2	SR	Primary Target	☑	4 occ	4 occ	5 occ	80
	Northern Cascade Ranges Section	G3?	S2	SR	Primary Target	☑	4 occ	4 occ	5 occ	80
Whitish Rush *Juncus albescens*										
	Okanagan Ecoregion	G5	S2S3	XX	Secondary Target	☑	2 occ	0 occ	7 occ	0
	Interior Transition Ranges Section	G5	S2S3	XX	Secondary Target	☑	2 occ	0 occ	1 occ	0
Wind River Draba *Draba ventosa*										
	Okanagan Ecoregion	G3	S2S3	XX	Secondary Target	☑	1 occ	0 occ	7 occ	0

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
	Interior Transition Ranges Section	G3	S2S3	XX	Secondary Target	☑	1 occ	0 occ	1 occ	0
Winged Combseed *Pectocarya penicillata*										
	Okanagan Ecoregion	G5	S1	S?	Primary Target	☑	1 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S1	S?	Primary Target	☑	1 occ	1 occ	1 occ	100
Woody-branched Rockcress *Arabis lignifera*										
	Okanagan Ecoregion	G5	S2S3	XX	Secondary Target	☑	1 occ	0 occ	7 occ	0
	Thompson Okanagan Plateau Section	G5	S2S3	XX	Secondary Target	☑	1 occ	0 occ	1 occ	0
Wyeth's Lupine *Lupinus wyethii*										
	Okanagan Ecoregion	G5	S1	SR	Primary Target	☑	1 occ	1 occ	7 occ	14
	Northern Cascade Ranges Section	G5	S1	SR	Primary Target	☑	1 occ	1 occ	1 occ	100
Yellow Bog Sedge *Carex dioica*										
	Okanagan Ecoregion	G5		S1	Secondary Target	☑	5 occ	0 occ	7 occ	0
	Okanagan Highlands Section	G5		S1	Secondary Target	☑	5 occ	0 occ	1 occ	0
Yellow Lady's-slipper *Cypripedium parviflorum*										
	Okanagan Ecoregion	G5	SR	S2	Secondary Target	☑	9 occ	3 occ	7 occ	43
	Okanagan Highlands Section	G5	SR	S2	Secondary Target	☑	7 occ	3 occ	1 occ	300
	Northern Cascade Ranges Section	G5	SR	S2	Secondary Target	☑	2 occ	0 occ	1 occ	0
Yellow Sedge *Carex flava*										
	Okanagan Ecoregion	G5	S4	S3	Secondary Target	☑	8 occ	1 occ	7 occ	14
	Okanagan Highlands Section	G5	S4	S3	Secondary Target	☑	8 occ	1 occ	1 occ	100
Yellow Widelip Orchid *Liparis loeselii*										
	Okanagan Ecoregion	G5	S1	S1	Secondary Target	☑	2 occ	2 occ	13 occ	15
	Thompson Okanagan Plateau Section	G5	S1	S1	Secondary Target	☑	2 occ	2 occ	3 occ	67

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Freshwater										
Species										
Amphibians										
Columbia Spotted Frog (EDU) *Rana luteiventris*	Okanagan EDU	G4		S4		☑	91 occ	33 occ	13 occ	254
Great Basin Spadefoot (EDU) *Spea intermontana*	Okanagan EDU	G5	S3	S5		☑	574 occ	430 occ	13 occ	3308
	Thompson EDU	G5	S3	S5		☑	34 occ	15 occ	13 occ	115
Tiger Salamander (EDU) *Ambystoma tigrinum*	Okanagan EDU	G5	S2	S3		☑	281 occ	166 occ	25 occ	664
Western toad (EDU) *Bufo boreas*	Okanagan EDU	G4		S3S4		☑	257 occ	91 occ	13 occ	700
	Thompson EDU	G4		S3S4		☑	12 occ	11 occ	13 occ	85
Birds										
American avocet (EDU) *Recurvirostra americana*	Okanagan EDU	G5	S2B,SZN	S4B,SZN		☑	2 occ	2 occ	13 occ	15
	Thompson EDU	G5	S2B,SZN	S4B,SZN		☑	4 occ	4 occ	13 occ	31
	Middle Fraser EDU	G5	S2B,SZN	S4B,SZN		☑	2 occ	2 occ	13 occ	15
American bittern (EDU) *Botaurus lentiginosus*	Okanagan EDU	G4	S3B,SZN	S4B,S4N		☑	2 occ	1 occ	13 occ	8
	Thompson EDU	G4	S3B,SZN	S4B,S4N		☑	1 occ	0 occ	13 occ	0
	Middle Fraser EDU	G4	S3B,SZN	S4B,S4N		☑	8 occ	0 occ	13 occ	0

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
American dipper (EDU) *Cinclus mexicanus*										
	Okanagan EDU	G5	S5B, S4N	S5		☑	1 occ	0 occ	13 occ	0
American White Pelican *Pelecanus erythrorhynchos*										
	Middle Fraser EDU	G3	S1B,SZN			☑	22 occ	0 occ	13 occ	0
Common Loon (EDU) *Gavia immer*										
	Okanagan EDU	G5	S4S5B, S	S2B,S5N		☑	151 occ	50 occ	13 occ	385
Harlequin duck (EDU) *Histrionicus histrionicus*										
	Okanagan EDU					☑	60 occ	31 occ	13 occ	238
Long-billed curlew (EDU) *Numenius americanus*										
	Okanagan EDU	G5	S3B,SZN	S2B,S2N		☑	37 nst	34 nst	38 nst	89
	Thompson EDU	G5	S3B,SZN	S2B,S2N		☑	7 nst	7 nst	38 nst	18
	Middle Fraser EDU	G5	S3B,SZN	S2B,S2N		☑	17 nst	2 nst	38 nst	5
Sandhill Crane (EDU) *Grus canadensis*										
	Okanagan EDU	G5	S3S4B,S			☑	11 occ	10 occ	7 occ	143
	Thompson EDU	G5	S3S4B,S			☑	4 occ	3 occ	7 occ	43
	Middle Fraser EDU	G5	S3S4B,S			☑	56 occ	2 occ	7 occ	29
Trumpeter swan (S. Thompson R.) (EDU) *Cygnus buccinator*										
	Okanagan EDU	G4	S4B, S4N	S3N		☑	10 nst	9 nst	7 nst	129
Upland Sandpiper *Bartramia longicauda*										
	Middle Fraser EDU	G5	S1S2B,S			☑	1 occ	0 occ	13 occ	0

Okanagan Ecoregion Targets and Goals Summary

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Western grebe (EDU) *Aechmophorus occidentalis*										
	Okanagan EDU	G5	S1B,S3N	S3B,S5N		☑	2 occ	2 occ	13 occ	15
	Thompson EDU	G5	S1B,S3N	S3B,S5N		☑	1 occ	1 occ	13 occ	8
Wilson's phalarope (EDU) *Phalaropus tricolor*										
	Okanagan EDU	G5	S4S5B, S	S4B,SZN		☑	2 occ	2 occ	13 occ	15
<u>Fishes</u>										
Bull trout *Salvelinus confluentus*										
	Okanagan EDU	G3	S3	S3		☑	529,817 m	346,741 m	264,908 m	131
	Thompson EDU	G3	S3	S3		☑	640,413 m	319,357 m	320,206 m	100
	Middle Fraser EDU	G3	S3	S3		☑	1,774,720 m	392,042 m	887,360 m	44
	Upper Fraser EDU	G3	S3	S3		☑	679,402 m	0 m	339,701 m	0
Chinook Salmon *Oncorhynchus tshawytscha*										
	Okanagan EDU					☑	3,215 m	2,133 m	1,608 m	133
	Thompson EDU					☑	3,444,139 m	1,803,533 m	1,033,242 m	175
	Middle Fraser EDU					☑	7,337,362 m	437,498 m	2,201,209 m	20
	Upper Fraser EDU					☑	2,943,282 m	0 m	882,985 m	0
Chiselmouth *Acrocheilus alutaceus*										
	Okanagan EDU	G5	S3?	S4		☑	138,548 m	94,006 m	41,564 m	226
	Thompson EDU	G5	S3?	S4		☑	83,731 m	24,887 m	25,119 m	99
	Middle Fraser EDU	G5	S3?	S4		☑	132,120 m	0 m	39,636 m	0
Chum Salmon *Oncorhynchus keta*										
	Okanagan EDU					☑	12,933 m	12,933 m	6,466 m	200
Coho Salmon *Oncorhynchus kisutch*										

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	Okanagan EDU		S3			☑	12,933 m	12,933 m	3,880 m	333
	Thompson EDU		S3			☑	3,973,157 m	1,943,364 m	1,191,947 m	163
	Middle Fraser EDU		S3			☑	2,767,086 m	502,614 m	830,126 m	61
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*										
	Okanagan EDU	G5	S3	S3?		☑	243,836 m	125,525 m	73,151 m	172
	Thompson EDU	G5	S3	S3?		☑	22,342 m	15,029 m	6,702 m	224
Lake chub *Cousius plumbeus*										
	Okanagan EDU	G5	S5	SU		☑	51,872 m	49,037 m	15,561 m	315
	Thompson EDU	G5	S5	SU		☑	220,129 m	69,626 m	66,039 m	105
	Middle Fraser EDU	G5	S5	SU		☑	1,608,714 m	2,233 m	482,614 m	0
	Upper Fraser EDU	G5	S5	SU		☑	75,593 m	0 m	22,678 m	0
Leopard dace *Rhinichthys falcatus*										
	Okanagan EDU	G4	S4	S2S3		☑	69,785 m	54,365 m	20,936 m	260
	Thompson EDU	G4	S4	S2S3		☑	291,367 m	165,748 m	87,410 m	190
	Middle Fraser EDU	G4	S4	S2S3		☑	453,475 m	6,708 m	136,043 m	5
	Upper Fraser EDU	G4	S4	S2S3		☑	44,656 m	0 m	13,397 m	0
Mountain sucker *Catostomus platyrhynchus*										
	Okanagan EDU	G5	S3?	S3		☑	2 occ	2 occ	2 occ	100
Mountain sucker - N. Thompson *Catostomus platyrhynchus*										
	Okanagan EDU	G5	S3?	S3		☑	66,585 m	59,012 m	19,975 m	295
	Thompson EDU	G5	S3?	S3		☑	60,730 m	54,939 m	18,219 m	302
Pacific Lamprey *Lampetra tridentata*										
	Okanagan EDU	G5	S4			☑	2 occ	2 occ	13 occ	15
Pink Salmon *Oncorhynchus gorbuscha*										

Okanagan Ecoregion Targets and Goals Summary

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
	Okanagan EDU					☑	12,933 m	12,933 m	6,466 m	200
Pygmy whitefish *Prosopium coulteri*										
	Okanagan EDU	G5	S4S5	S2		☑	2 occ	1 occ	2 occ	50
Pygmy whitefish - Okanagan Lake *Prosopium coulteri*										
	Okanagan EDU	G5	S4S5	S2		☑	126,058 m	125,365 m	37,818 m	331
	Thompson EDU	G5	S4S5	S2		☑	5,249 m	2,696 m	1,575 m	171
	Middle Fraser EDU	G5	S4S5	S2		☑	88,834 m	0 m	26,650 m	0
	Upper Fraser EDU	G5	S4S5	S2		☑	6,210 m	0 m	1,863 m	0
Shorthead sculpin *Cottus confusus*										
	Okanagan EDU	G5	S2S3	S3S4		☑	6,777 m	781 m	2,033 m	38
Sockeye Salmon *Oncorhynchus nerka*										
	Okanagan EDU					☑	196,026 m	190,347 m	98,012 m	194
	Thompson EDU					☑	2,144,470 m	1,276,012 m	643,341 m	198
	Middle Fraser EDU					☑	4,868,186 m	301,217 m	1,460,456 m	21
	Upper Fraser EDU					☑	978,667 m	0 m	293,600 m	0
Speckled dace *Rhinichthys osculus*										
	Okanagan EDU	G5	S2	S4		☑	167,336 m	124,744 m	50,201 m	248
Steelhead Salmon *Oncorhynchus mykiss*										
	Okanagan EDU					☑	12,745 m	8,798 m	6,372 m	138
	Thompson EDU					☑	2,359,919 m	891,374 m	707,976 m	126
	Middle Fraser EDU					☑	1,363,081 m	539,242 m	408,924 m	132
Umatilla dace *Rhinichthys umatilla*										
	Okanagan EDU	G4	S1S2	SU		☑	62,696 m	51,996 m	31,348 m	166

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Westslope cutthroat trout *Onchorynchus clarki lewisi*										
	Okanagan EDU	G4T3	S3SE	SU		☑	1,320,741 m	441,069 m	396,222 m	111
	Thompson EDU	G4T3	S3SE	SU		☑	76,420 m	57,979 m	22,926 m	253
White Sturgeon (Columbia River Population) *Acipenser transmontanus pop. 2*										
	Okanagan EDU	G4T3T4Q	S1			☑	2,477 m	2,477 m	743 m	333
White Sturgeon (Lower Fraser River Population) *Acipenser transmontanus pop. 4*										
	Middle Fraser EDU	G4T2Q	S2			☑	343,827 m	138,895 m	103,148 m	135
White Sturgeon (Nechako River Population) *Acipenser transmontanus pop. 3*										
	Middle Fraser EDU	G4T1Q	S1			☑	344,050 m	0 m	103,215 m	0
White Sturgeon (Upper Fraser River Population) *Acipenser transmontanus pop. 5*										
	Middle Fraser EDU	G4T1Q	S1			☑	99,459 m	0 m	29,838 m	0
	Upper Fraser EDU	G4T1Q	S1			☑	149,851 m	0 m	44,955 m	0
<u>Insects</u>										
Black-tipped darner (EDU) *Aeshna tuberculifera*										
	Okanagan EDU	G4	S3	S4		☑	1 occ	0 occ	13 occ	0
	Thompson EDU	G4	S3	S4		☑	9 occ	9 occ	13 occ	69
	Middle Fraser EDU	G4	S3	S4		☑	9 occ	0 occ	13 occ	0
Lance-tipped darner *Aechna constricta*										
	Okanagan EDU	G5	S2S3	S4		☑	24 occ	20 occ	13 occ	154
nez Perce dancer (EDU) *Argia emma*										
	Okanagan EDU	G5	S3S4	S5		☑	2 occ	2 occ	13 occ	15

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Olive clubtail (EDU) *Stylurus olivaceus*										
	Okanagan EDU	G4	S2	S4		☑	6 occ	4 occ	13 occ	31
Pronghorn clubtail (EDU) *Gomphus graslinellus*										
	Okanagan EDU	G5	S2S3	S3		☑	29 occ	24 occ	25 occ	96
River jewelwing (EDU) *Calopteryx aequabilis*										
	Okanagan EDU	G5	S1	S4		☑	6 occ	6 occ	13 occ	46
Twelve-spotted skimmer (EDU) *Libellula pulchella*										
	Okanagan EDU	G5	S3	S5		☑	69 occ	52 occ	13 occ	400
	Thompson EDU	G5	S3	S5		☑	3 occ	3 occ	13 occ	23
Western pondhawk (EDU) *Erythemis collocata*										
	Okanagan EDU	G5	S3	S5		☑	3 occ	3 occ	13 occ	23
Western river cruiser (EDU) *Macromia magnifica*										
	Okanagan EDU	G4	S3	S3		☑	28 occ	26 occ	13 occ	200
Mammals										
Mountain Beaver, Rainieri Subspecies *Aplodontia rufa rainieri*										
	Okanagan EDU	G5T4	S3	SA		☑	114 occ	49 occ	13 occ	377
	Thompson EDU	G5T4	S3	SA		☑	9 occ	1 occ	13 occ	8
Mollusks										
California floater (EDU) *Anodonta californiensis*										
	Okanagan EDU	G3	na	S1S2		☑	6 occ	6 occ	13 occ	46

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
Western pearlshell (EDU) *Margaritifera falcata*										
	Okanagan EDU	G4	na	S3		☑	6 occ	5 occ	13 occ	38
Western ridgemussel (EDU) *Gonidea angulata*										
	Okanagan EDU	G3	na	S2		☑	2 occ	2 occ	25 occ	8
<u>Reptiles</u>										
Painted Turtle *Chrysemys picta*										
	Okanagan EDU	G5	S3S4			☑	3 occ	3 occ	13 occ	23
	Thompson EDU	G5	S3S4			☑	1 occ	1 occ	13 occ	8
	Middle Fraser EDU	G5	S3S4			☑	1 occ	0 occ	13 occ	0
<u>Vascular Plants</u>										
Leafy Pondweed *Potamogeton foliosus*										
	Okanagan EDU	G5	S4	SNR		☑	9 occ	8 occ	9 occ	89
Nuttall's waterweed (EDU) *Elodea nuttalli*										
	Okanagan EDU	G5	S2S3	SNR		☑	6 occ	5 occ	7 occ	71
<u>Freshwater Ecological Systems</u>										
intermediate, intrusives, alluvium, elevation 820, shallow										
	Okanagan EDU					☑	437,766 ha	167,156 ha	131,329 ha	127
	Thompson EDU					☑	78,850 ha	49,631 ha	23,655 ha	210
intermediate, intrusives, elevation 1032, shallow, glacial										
	Okanagan EDU					☑	227,534 ha	182,506 ha	68,260 ha	267
	Thompson EDU					☑	496,767 ha	118,506 ha	149,030 ha	80

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	Middle Fraser EDU					☑	362,320 ha	103,695 ha	108,696 ha	95
	Upper Fraser EDU					☑	346,623 ha	0 ha	103,987 ha	0
intermediate, intrusives, elevation 722, shallow, lakes										
	Okanagan EDU					☑	164,997 ha	150,288 ha	49,499 ha	304
	Thompson EDU					☑	167,958 ha	123,330 ha	50,387 ha	245
	Middle Fraser EDU					☑	373,551 ha	0 ha	112,066 ha	0
intermediate, volcanics, alluvium, elevation 1080, shallow, lakes/wetlands										
	Thompson EDU					☑	394,574 ha	141,320 ha	118,372 ha	119
	Middle Fraser EDU					☑	2,269,939 ha	30,475 ha	680,982 ha	4
	Upper Fraser EDU					☑	188,785 ha	0 ha	56,636 ha	0
intermediate, volcanics, elevation 1001, shallow, lakes/wetlands										
	Okanagan EDU					☑	16,174 ha	16,174 ha	4,852 ha	333
	Thompson EDU					☑	30,800 ha	30,800 ha	9,240 ha	333
	Middle Fraser EDU					☑	337,460 ha	0 ha	101,238 ha	0
large volcanics, intrusives/alluvium, elevation 658, shallow										
	Middle Fraser EDU					☑	329,259 ha	93,749 ha	98,777 ha	95
large, intrusives, alluvium, elevation 621, shallow										
	Okanagan EDU					☑	323,058 ha	98,238 ha	96,917 ha	101
	Thompson EDU					☑	156,718 ha	92,547 ha	47,015 ha	197
	Middle Fraser EDU					☑	259,749 ha	0 ha	77,925 ha	0
large, intrusives, elevation 546, shallow										
	Okanagan EDU					☑	104,488 ha	30,146 ha	31,346 ha	96
	Thompson EDU					☑	117,591 ha	69,860 ha	35,277 ha	198
	Middle Fraser EDU					☑	99,304 ha	0 ha	29,791 ha	0
small, alluvium, elevation 1098, shallow										
	Okanagan EDU					☑	10,166 ha	5,663 ha	3,050 ha	186
	Thompson EDU					☑	114,440 ha	28,362 ha	34,333 ha	83

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
	Middle Fraser EDU					☑	397,028 ha	0 ha	119,109 ha	0
	Upper Fraser EDU					☑	6,329 ha	0 ha	1,899 ha	0
small, alluvium, elevation 1098, shallow, wetlands										
	Okanagan EDU					☑	302 ha	302 ha	91 ha	332
	Thompson EDU					☑	14,297 ha	3,685 ha	4,290 ha	86
	Middle Fraser EDU					☑	242,553 ha	0 ha	72,765 ha	0
	Upper Fraser EDU					☑	9,214 ha	0 ha	2,764 ha	0
small, alluvium, elevations 1118, shallow										
	Okanagan EDU					☑	23,119 ha	8,120 ha	6,936 ha	117
	Thompson EDU					☑	41,657 ha	10,089 ha	12,497 ha	81
	Middle Fraser EDU					☑	315,390 ha	0 ha	94,617 ha	0
small, alluvium, intrusives, elevation 919, shallow										
	Okanagan EDU					☑	403,817 ha	132,222 ha	121,144 ha	109
	Thompson EDU					☑	140,710 ha	40,561 ha	42,213 ha	96
	Middle Fraser EDU					☑	30,590 ha	8,475 ha	9,177 ha	92
small, alluvium, volcanics, 765, shallow										
	Okanagan EDU					☑	289,998 ha	86,260 ha	87,000 ha	99
	Thompson EDU					☑	8,063 ha	4,155 ha	2,419 ha	172
	Middle Fraser EDU					☑	6,318 ha	0 ha	1,895 ha	0
small, intrusives, alluvium, elevation 1058, shallow										
	Okanagan EDU					☑	128,139 ha	35,079 ha	38,442 ha	91
	Thompson EDU					☑	45,239 ha	13,393 ha	13,572 ha	99
	Middle Fraser EDU					☑	79,557 ha	0 ha	23,867 ha	0
	Upper Fraser EDU					☑	16,287 ha	0 ha	4,886 ha	0
small, intrusives, elevation 1035, shallow, lakes										
	Okanagan EDU					☑	112,468 ha	35,073 ha	33,741 ha	104
	Thompson EDU					☑	4,369 ha	4,369 ha	1,311 ha	333
	Middle Fraser EDU					☑	90,557 ha	0 ha	27,167 ha	0

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
small, intrusives, elevation 1141, shallow										
	Okanagan EDU					☑	150,751 ha	54,575 ha	45,226 ha	121
	Middle Fraser EDU					☑	10,839 ha	0 ha	3,252 ha	0
small, intrusives, elevation 1151, shallow										
	Okanagan EDU					☑	997,205 ha	307,921 ha	299,161 ha	103
	Thompson EDU					☑	186,918 ha	56,336 ha	56,075 ha	100
	Middle Fraser EDU					☑	83,551 ha	21,495 ha	25,065 ha	86
small, intrusives, elevation 1164, shallow										
	Okanagan EDU					☑	558,195 ha	185,467 ha	167,459 ha	111
	Thompson EDU					☑	223,097 ha	87,143 ha	66,929 ha	130
	Middle Fraser EDU					☑	36,173 ha	0 ha	10,852 ha	0
	Upper Fraser EDU					☑	372,829 ha	0 ha	111,849 ha	0
small, intrusives, elevation 1417, shallow										
	Okanagan EDU					☑	386,579 ha	136,058 ha	115,974 ha	117
	Thompson EDU					☑	438,182 ha	131,806 ha	131,455 ha	100
	Middle Fraser EDU					☑	60,890 ha	0 ha	18,267 ha	0
	Upper Fraser EDU					☑	13,809 ha	0 ha	4,143 ha	0
small, intrusives, elevation 1450, shallow										
	Okanagan EDU					☑	152,448 ha	98,902 ha	45,734 ha	216
	Thompson EDU					☑	240,135 ha	94,006 ha	72,041 ha	130
	Middle Fraser EDU					☑	270,240 ha	117,695 ha	81,072 ha	145
	Upper Fraser EDU					☑	193,317 ha	0 ha	57,995 ha	0
small, intrusives, elevation 1522, shallow										
	Okanagan EDU					☑	818,130 ha	253,395 ha	245,439 ha	103
	Thompson EDU					☑	402,075 ha	119,476 ha	120,623 ha	99
	Middle Fraser EDU					☑	170,312 ha	25,875 ha	51,094 ha	51
	Upper Fraser EDU					☑	11,289 ha	0 ha	3,387 ha	0

Habitat Type

Level of Biological Organization

Taxon

Common Name ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
small, intrusives, elevation 1597, shallow										
	Okanagan EDU					☑	61,463 ha	16,855 ha	18,438 ha	91
	Thompson EDU					☑	40,312 ha	10,537 ha	12,094 ha	87
	Middle Fraser EDU					☑	51,637 ha	3,063 ha	15,492 ha	20
	Upper Fraser EDU					☑	2,798 ha	0 ha	839 ha	0
small, intrusives, elevation 1648, shallow										
	Okanagan EDU					☑	82,083 ha	24,623 ha	24,625 ha	100
	Thompson EDU					☑	88,928 ha	28,042 ha	26,678 ha	105
	Middle Fraser EDU					☑	110,763 ha	24,522 ha	33,229 ha	74
	Upper Fraser EDU					☑	108,535 ha	0 ha	32,561 ha	0
small, intrusives, elevation 1758, shallow, glacial										
	Thompson EDU					☑	143,051 ha	43,636 ha	42,915 ha	102
	Middle Fraser EDU					☑	126,165 ha	0 ha	37,849 ha	0
	Upper Fraser EDU					☑	83,423 ha	0 ha	25,027 ha	0
small, intrusives, elevation 1907, shallow, glacial										
	Thompson EDU					☑	65,765 ha	19,441 ha	19,729 ha	99
	Middle Fraser EDU					☑	83,552 ha	0 ha	25,066 ha	0
	Upper Fraser EDU					☑	23,339 ha	0 ha	7,002 ha	0
small, intrusives, sediments, 1965, shallow/steep, glacial										
	Thompson EDU					☑	11,004 ha	3,372 ha	3,301 ha	102
	Middle Fraser EDU					☑	27,436 ha	18,167 ha	8,231 ha	221
	Upper Fraser EDU					☑	7,910 ha	0 ha	2,373 ha	0
small, intrusives, sediments, elevation 1279, shallow										
	Okanagan EDU					☑	37,173 ha	7,765 ha	11,152 ha	70
	Thompson EDU					☑	121,132 ha	36,311 ha	36,339 ha	100
	Middle Fraser EDU					☑	306,364 ha	19,506 ha	91,910 ha	21
	Upper Fraser EDU					☑	127,842 ha	0 ha	38,353 ha	0

Habitat Type Level of Biological Organization Taxon Common Name *Scientific Name*	Geographic Section	Global Rank	BC Rank	WA Rank	Target Status	Mapped Data	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
small, intrusives, volcanics, elevation 1019, shallow, lakes/wetlands													
	Okanagan EDU					☑	59,100	ha	16,086	ha	17,729	ha	91
	Thompson EDU					☑	153,938	ha	34,863	ha	46,182	ha	75
	Middle Fraser EDU					☑	659,568	ha	0	ha	197,870	ha	0
	Upper Fraser EDU					☑	46,272	ha	0	ha	13,882	ha	0
small, intrusives, volcanics, elevation 1032, shallow, lakes/wetlands													
	Okanagan EDU					☑	43,196	ha	9,702	ha	12,959	ha	75
	Thompson EDU					☑	119,978	ha	45,351	ha	35,993	ha	126
	Middle Fraser EDU					☑	294,824	ha	0	ha	88,447	ha	0
	Upper Fraser EDU					☑	6,703	ha	0	ha	2,011	ha	0
small, sediments, alluvium, elevation 972, shallow, lakes/wetlands													
	Thompson EDU					☑	4,255	ha	3,215	ha	1,277	ha	252
	Middle Fraser EDU					☑	32,014	ha	0	ha	9,604	ha	0
	Upper Fraser EDU					☑	2,603	ha	0	ha	781	ha	0
small, sediments, elevation 1683, shallow													
	Okanagan EDU					☑	259,456	ha	72,299	ha	77,836	ha	93
	Thompson EDU					☑	171,429	ha	51,142	ha	51,430	ha	99
	Middle Fraser EDU					☑	521,335	ha	107,360	ha	156,401	ha	69
	Upper Fraser EDU					☑	480,041	ha	0	ha	144,013	ha	0
small, sediments, elevation 1799, steep													
	Okanagan EDU					☑	23,154	ha	5,417	ha	6,946	ha	78
	Thompson EDU					☑	97,168	ha	29,059	ha	29,150	ha	100
	Middle Fraser EDU					☑	136,263	ha	19,767	ha	40,876	ha	48
	Upper Fraser EDU					☑	90,747	ha	0	ha	27,225	ha	0
small, sediments, elevation 791, shallow													
	Middle Fraser EDU					☑	130,033	ha	0	ha	39,010	ha	0
	Upper Fraser EDU					☑	90,959	ha	0	ha	27,287	ha	0

Habitat Type

Level of Biological Organization

Taxon

Common Name ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
small, volcanics, alluvium, elevation 1038, shallow, wetlands										
	Okanagan EDU					☑	2,404 ha	0 ha	721 ha	0
	Thompson EDU					☑	38,138 ha	11,096 ha	11,442 ha	97
	Middle Fraser EDU					☑	662,218 ha	0 ha	198,665 ha	0
	Upper Fraser EDU					☑	16,469 ha	0 ha	4,941 ha	0
small, volcanics, alluvium, elevation 1137, shallow, lakes/wetlands										
	Okanagan EDU					☑	149,261 ha	39,786 ha	44,778 ha	89
	Thompson EDU					☑	242,039 ha	73,456 ha	72,612 ha	101
	Middle Fraser EDU					☑	574,636 ha	0 ha	172,390 ha	0
small, volcanics, alluvium, elevation 1156, shallow, wetlands										
	Okanagan EDU					☑	206,642 ha	79,142 ha	61,993 ha	128
	Thompson EDU					☑	442,806 ha	128,629 ha	132,841 ha	97
	Middle Fraser EDU					☑	1,049,788 ha	26,712 ha	314,936 ha	8
	Upper Fraser EDU					☑	99,304 ha	0 ha	29,791 ha	0
small, volcanics, alluvium, elevation 1442, shallow, lakes										
	Okanagan EDU					☑	4,411 ha	4,411 ha	1,323 ha	333
	Thompson EDU					☑	65,745 ha	29,591 ha	19,724 ha	150
	Middle Fraser EDU					☑	49,881 ha	0 ha	14,965 ha	0
	Upper Fraser EDU					☑	20,454 ha	0 ha	6,136 ha	0
small, volcanics, elevation 1002, shallow, lakes/wetlands										
	Thompson EDU					☑	35,346 ha	35,346 ha	10,604 ha	333
	Middle Fraser EDU					☑	830,353 ha	0 ha	249,106 ha	0
	Upper Fraser EDU					☑	22,535 ha	0 ha	6,761 ha	0
small, volcanics, elevation 1303, intermediate/steep										
	Okanagan EDU					☑	107,440 ha	27,464 ha	32,232 ha	85
	Thompson EDU					☑	100,749 ha	29,702 ha	30,225 ha	98
	Middle Fraser EDU					☑	64,154 ha	19,191 ha	19,247 ha	100
	Upper Fraser EDU					☑	5,786 ha	0 ha	1,736 ha	0

Habitat Type **Level of Biological Organization** **Taxon** **Common Name** ***Scientific Name***	**Geographic Section**	**Global Rank**	**BC Rank**	**WA Rank**	**Target Status**	**Mapped Data**	**Amount Known**	**Captured in Porfolio**	**Conservation Goal**	**% of Goal Captured**
small, volcanics, elevation 950, shallow, wetlands										
	Thompson EDU					☑	43,272 ha	8,183 ha	12,981 ha	63
	Middle Fraser EDU					☑	460,687 ha	0 ha	138,208 ha	0
	Upper Fraser EDU					☑	127,563 ha	0 ha	38,269 ha	0
small, volcanics, intrusives, elevation 1418, shallow, lakes/glacial										
	Thompson EDU					☑	127,095 ha	53,730 ha	38,129 ha	141
	Middle Fraser EDU					☑	52,844 ha	0 ha	15,853 ha	0
	Upper Fraser EDU					☑	62,931 ha	0 ha	18,879 ha	0
small, volcanics, sediments, elevation 1017, shallow, lakes/wetlands										
	Thompson EDU					☑	51,436 ha	13,335 ha	15,431 ha	86
	Middle Fraser EDU					☑	659,594 ha	0 ha	197,878 ha	0
	Upper Fraser EDU					☑	7,999 ha	0 ha	2,400 ha	0
small, volcanics, sediments, elevation 1155, shallow										
	Okanagan EDU					☑	2,344 ha	832 ha	703 ha	118
	Thompson EDU					☑	17,740 ha	3,935 ha	5,322 ha	74
	Middle Fraser EDU					☑	75,129 ha	0 ha	22,538 ha	0
	Upper Fraser EDU					☑	157,837 ha	0 ha	47,352 ha	0
small, volcanics, sediments, elevation 907, shallow										
	Okanagan EDU					☑	6,094 ha	6,094 ha	1,828 ha	333
	Thompson EDU					☑	99,013 ha	39,827 ha	29,704 ha	134
	Middle Fraser EDU					☑	65,566 ha	25,997 ha	19,670 ha	132
	Upper Fraser EDU					☑	18,887 ha	0 ha	5,666 ha	0

Okanagan Ecoregion: Not Selected as Targets for this Assessment

Habitat Type

Level of Biological Organization

Taxon

Okanagan Ecoregion

Terrestrial

Species

Amphibians

Common Name	Scientific Name	ELCODE	G Rank	BC Rank	WA Rank	Primary or Secondary	Mapped Data?
Columbia spotted frog	Rana luteiventris	AAABH01290	G4				☐

Birds

Common Name	Scientific Name	ELCODE	G Rank	BC Rank	WA Rank	Primary or Secondary	Mapped Data?
American kestrel	Falco sparverius	ABNKD06020	G5	S4S5B	S5B,		☐
Band-tailed pigeon	Columba fasciata						☐
Black-billed magpie	Pica pica	ABPAV09010	G5	S5B,S	S5		☐
Bohemian waxwing	Bombycilla garrulus	ABPBN01010	G5	S5B,S	S5N		☐
Cinnamon teal	Anas cyanoptera	ABNJB10140	G5	S4S5B	S5B,		☐
Dusky flycatcher	Empidonax oberholseri	ABPAE33090	G5	S5B,S	S5B,		☐
Forster's tern	Sterna forsteri	ABNNM08090	G5	S1B,S			☐
Golden-crown kinglet	Regulus satrapa	ABPBJ05010	G5	S5B,S	S5B,		☐
Greater scaup	Aythya marila	ABNJB11060	G5	SZN	S5N		☐
Harlequin duck	Histrionicus histrionicus	ABNJB15010					☐
Killdeer	Charadrius vociferus	ABNNB03090	G5	S4S5B	S5B.		☐
Lazuli bunting	Passerina amoena	ABPBX64020	G5	S4S5B	S5B,		☐
Lesser goldfinch	Carduelis psaltria	ABPBY06090	G5	SA	S2B,		☐
Long-eared owl	Asio otus	ABNSB13010	G5	S4B,S	S4B,		☐
MacGillvray's warbler	Oporornis tolmiei	ABPBX11040	G5	S5B,S	S5B,		☐
N. hawk owl	Surnia ulula	ABNSB07010	G5	S4S5B	SA		☐
N. pygmy owl	Glaucidium gnoma	ABNSB08010	G5	S4S5B	S4B,		☐
N. rough-winged swallow	Stelgidopteryx serripennis	ABPAU07010	G5	S5B,S	S5B,		☐
Red-naped sapsucker	Sphyrapicus nuchalis	ABNYF05020	G5		S4S5		☐
Ruddy Duck	Oxyura jamaicensis	ABNJB22010	G5	S5B,S	S5B,		☐
Sage sparrow	Amphispiza belli	ABPBX97020	G5		S3B,		☐
Spotted towhee	Pipilo maculatus	ABPBX74080	G5	S5B,S	S5B,		☐

Habitat Type

Level of Biological Organization

Taxon

Common Name	Scientific Name	ELCODE	G Rank	BC Rank	WA Rank	Primary or Secondary	Mapped Data?
Steller's jay	Cynaositta stelleri	ABPAV02010	G5	S5B,S	S5		☐
Townsend's solitaire	Myadestes townsendi	ABPBJ16010	G5	S5B,S	S4S5		☐
Townsend's warbler	Dendroica townsendi	ABPBX03080	G5		S4N,		☐
Western tanager	Piranga ludoviciana	ABPBX45050	G5	S5B,S	S5B,		☐
Western wood-peewee	Contopus sordidulis	ABPAE32050	G5	S4B,S	S5B,		☐
Yellow rail	Coturnicops novaboracensis	ABNME01010	G4	S1B,S			☐
Yellow-billed cuckoo							☐
Yellow-headed blackbird	Xanthocephalus xanthocephalus	ABPBXB3010	G5	S4B,S	S4N,		☐
<u>Dragonfly</u>							
Familiar bluet	Enallagma civile	IIODO71130					☐
Forcipate emerald	Somatochlora forcipata	IIODO32080					☐
Kennedy's emerald	Somatochlora Kennedyi	IIODO32140					☐
Sweetflag spreadwing	Lestes forcipatus	IIODO67030	G5		S3		☐
Vivid dancer	Argia vivida	IIODO68290	G5	S2	S5		☐
Zigzag darner	Aeshna sitchensis	IIODO14160	G5		S3		☐
<u>Lepidopterans</u>							
Arctic green sulphur	Colias nastes	IILEPA8100	G5	S5	S3		☐
Callippe fritillary	Speyeria callippe chilicotensis	IILEPJ6090	G5	S4	S5		☐
Coral hairstreak	Satyrium titus titus	IILEPD4144	G5T5	S3	S2?		☐
Dun skipper	Euphyes vestris						☐
Egleis fritillary	Speyeria egleis	IILEPJ6100	G5				☐
Garita skipperling	Oarisma garita	IILEP57020	G5		S4		☐
Grizzled skipper	Pyrgus centaureae	IILEP38010	G5	S5	S2		☐
Lustrous copper	Lycaena cupreus	IILEPC1020	G5		S2S3		☐
Monarch	Danus plexippus	IILEPP2010	G4	S3B,	S4		☐
Mormon fritillary	Speyeria mormonia erinna	IILEPJ6130	G5TNR	S2S3	S3		☐
Moss elfin	Callophrys mossii	IILEPE2200	G4		S3		☐
Nevada skipper	Hesperia nevada	IILEP65180	G5		S2S3		☐
Obscure elfin	Callophrys polios	IILEPE2210	G5		S3		☐
Peck's skipper	Polites peckius	IILEP66010	G5		S2		☐
Thicket hairstreak	Callophrys spinetorum	IILEPE2090	G5		S2		☐
Vidler's alpine	Erebia vidleri	IILEPN8010	G4G5		S3		☐

Habitat Type

Level of Biological Organization

Taxon Common Name	Scientific Name	ELCODE	G Rank	BC Rank	WA Rank	Primary or Secondary	Mapped Data?
<u>Mammals</u>							
Moose	Alces alces	AMALC03010	G5		S2		☐
Mule deer							☐
Northern bog lemming	Synaptomys borealis artimisiae		G4T2T3	S2S3	S2?		☐
Pygmy shrew	Sorex hoyi	AMABA01250	G5				☐
Townsend's mole	Scapanus townsendii						☐
Woodland caribou	Rangifer tarandus caribou		G5TQ2				☐
<u>Reptiles</u>							
Rubber boa	Charina bottae	ARADA01010	G5				☐
Sharp-tailed snake	Contia tenuis				S4S5		☐
<u>Vascular Plants</u>							
Bog Clubmoss	Lycopodiella inundata	PPLYC03060	G5		S2		☐
Brewer's Cliff-brake	Pellaea breweri	PPADI0H040	G5		S2		☐
Brittle Prickly-pear	Opuntia fragilis	PDCAC0D0H0	G4G5	S5	S?	Not Target / retro	☑
Brown Beak-rush	Rhynchospora capillacea	PMCYP0N070	G5	S1			☐
Canadian St. John's-wort	Hypericum majus	PDCLU03120	G5		S2	Not Target / retro	☑
Chaffweed	Centunculus minimus	PDPRI01020	G5		S?	Not Target / retro	☑
Coast Mountain Draba	Draba ruaxes	PDBRA11280	G3	S2S3			☐
Common Blue-cup	Githopsis specularioides	PDCAM07060	G5		S3		☐
Common Twinpod	Physaria didymocarpa var. didymocarpa	PDBRA22071	G5T4	S2S3	S1		☐
Constricted Douglas' Onion	Allium constrictum	PMLIL022S0	G2G3		S2S3	Not Target / retro	☑
Different Nerve Sedge	Carex heteroneura	PMCYP035X0	G5	SR	S2	Not Target / retro	☑
Drummond's Campion	Silene drummondii var. drummondii	PDCAR0U0M1	G5T5	S3			☐
Dwarf Rush	Juncus hemiendytus var. hemiendytus	PMJUN011F2	G5T5		S1	Not Target / retro	☑
Elmera	Elmera racemosa var. racemosa	PDSAX0B012	G4G5T4	S2S3			☐
Flat-leaved Bladderwort	Utricularia intermedia	PDLNT020A0	G5		S2	Not Target / retro	☑
Fuzzytongue Penstemon	Penstemon eriantherus var. whitedii	PDSCR1L274	G4T2?		S2	Not Target / retro	☑
Gray's Bluegrass	Poa arctica ssp. arctica	PMPOA4Z085	G5T3T5	S4	S1S2	Not Target / retro	☑
Harkness Linanthus	Linanthus harknessii	PDPLM090L0	G4?	S1	S?		☐
Hoary Willow	Salix candida	PDSAL020K0	G5		S1		☐
Least Bladdery Milk-vetch	Astragalus microcystis	PDFAB0F5A0	G5		S2	Not Target / retro	☑
Lesser Bladderwort	Utricularia minor	PDLNT020D0	G5	S5	S2?	Not Target / retro	☑

Habitat Type

Level of Biological Organization

Taxon **Common Name**	**Scientific Name**	**ELCODE**	**G Rank**	**BC Rank**	**WA Rank**	**Primary or Secondary**	**Mapped Data?**
Little bluestem	Schizachyrium scoparium var. scoparium	PMPOA5D096	G5T5		S1S2	Not Target / retro	☑
MacCall's Willow	Salix maccalliana	PDSAL021T0	G5?		S1		☐
Marginal Wood Fern	Dryopteris marginalis	PPDRY0A0K0	G5	S1			☐
Mock-pennyroyal	Hedeoma hispida	PDLAM0M0P0	G5	S1	XX		☐
Mountain Moonwort	Botrychium montanum	PPOPH010K0	G3	S1			☐
Nevada Birds-foot Trefoil	Lotus nevadensis var. douglasii	PDFAB2A0U1	G5T3T5	SE1	SR		☐
Northern Tansy Mustard	Descurainia sophioides	PDBRA0X060	G5	S2S3	XX		☐
Northwestern yellowflax	Sclerolinon digynum	PDLIN04010	G5		S1?	Not Target / retro	☑
Nuttall Ragwort	Senecio megacephalus	PDAST8H200	G4?	S2S3	XX		☐
Palouse Goldenweed	Haplopappus liatriformis	PDASTDT0C0	G2		S2		☐
Palouse Milk-vetch	Astragalus arrectus	PDFAB0F0V0	G2G3		S2	Not Target / retro	☑
Prairie Moonwort	Botrychium campestre	PPOPH010W0	G3		S2	Not Target / retro	☑
Purple Meadowrue	Thalictrum dasycarpum	PDRAN0M060	G5	S	S2		☐
Rocky Mountain Sedge	Carex saximontana	PMCYP03C20	G5	SRF	S4		☐
Rush Aster	Aster borealis	PDASTE8070	G5		S1	Not Target / retro	☑
Sand Dropseed	Sporobolus cryptandrus	PMPOA5V070	G5	S3S4	SR		☐
Seely's Silene	Silene seelyi	PDCAR0U1N0	G1G2		S2S3	Not Target / retro	☑
Shining Flatsedge	Cyperus bipartitus	PMCYP063U0	G5		S2	Not Target / retro	☑
Short-beaked Fen Sedge	Carex simulata	PMCYP03CH0	G5	S2S3			☐
Sierra Cliff-brake	Pellaea brachyptera	PPADI0H030	G4G5		S2		☐
Small Bedstraw	Galium trifidum ssp. trifidum	PDRUB0N262	G5T5	S2S3			☐
Smooth Draba	Draba glabella var. glabella	PDBRA11101	G4G5T4	S2S3			☐
Spalding's Silene	Silene spaldingii	PDCAR0U1S0	G2		S2	Not Target / retro	☑
Strict Blue-eyed-grass	Sisyrinchium montanum	PMIRI0D110	G5		S1	Not Target / retro	☑
Tall Agoseris	Agoseris elata	PDAST09050	G4		S3	Not Target / retro	☑
Treelike Clubmoss	Lycopodium dendroideum	PPLYC010B0	G5		S2		☐
Washington Monkey-flower	Mimulus washingtonensis	PDSCR1B2T0	G4	XX	SX	Not Target / retro	☑
Water-pepper	Polygonum hydropiperoides	PDPGN0L170	G5	S2S3			☐
Western Mannagrass	Glyceria occidentalis	PMPOA2Y0D0	G5	S2S3			☐
White-scaled Sedge	Carex xerantica	PMCYP03EX0	G5	S2	SR	Not Target / retro	☑
Wilcox's Penstemon	Penstemon wilcoxii	PDSCR1L6Q0	G4		S1	Not Target / retro	☑
Wild Licorice	Glycyrrhiza lepidota	PDFAB1W020	G5	S2	SR		☐

APPENDIX 6 – SETTING GOALS: HOW MUCH IS ENOUGH?

Appendix 6 – Setting Goals: How Much Is Enough?

Conservation goals are the ecological criteria that we establish for measuring the persistence and variability of conservation targets across an ecoregion. Although it is impossible to say with certainty the exact number or distribution of any species, community, or ecological system that will ensure its persistence in the face of climatic or other environmental changes, conservation goals provide guidance as to "how much is enough?" (Noss 1996; Soule and Sanjayan 1998; TNC 2004).

Establishing conservation goals is one of the most crucial steps in the ecoregional conservation assessment process as it forms the basis from which to gauge the success of how well the Okanagan portfolio of conservation areas performs in conserving the ecoregion's biodiversity. Conservation goals set the context for planning and implementation, and measuring progress towards meeting established goals and objectives. These goals also provide a clear purpose for decisions and lend accountability and defensibility to the assessment (Pressey et al. 2003).

Setting conservation goals is also one of the most difficult steps in the assessment process. There is no scientific consensus on how much area or how many occurrences are necessary to conserve targets across their ranges. In highly fragmented regions, estimating historic conditions can be difficult, and setting goals based upon current conditions may result in targets not persisting over the long term. As a result, setting goals for conservation targets in the assessment primarily involves reliance on expert opinion and decisions based on the best available science at the time and is likely to have a high degree of uncertainty (Groves et al. 2000).

The difficulty inherent in setting conservation goals for the biodiversity targets cannot deter conservation practitioners from making these judgment calls as it is unlikely that more accurate estimates will be developed by the next generation of research, except perhaps on a species-by-species basis. Given the global "biodiversity crisis", there are irreparable consequences in delaying conservation efforts until new procedures or better estimates become available. As human populations continue to grow, many large habitat blocks will face development pressure to meet human needs.

Given our limited knowledge, numerical objectives for target representation must be considered 'working hypotheses' in nearly all cases. They also, to a certain degree, reflect societal risk (i.e., the risk of losing a species known to be endangered) (Comer 2005). They need to be clearly stated, well documented and measurable. They should be treated in an adaptive approach where they are refined through time by monitoring and re-evaluating the status and trends of targets. Levels of uncertainty and risk should be a component of goal setting and documentation.

Conservation goals define the abundance and spatial distribution of viable target occurrences necessary to adequately conserve those targets in an ecoregion and provide an estimate of how much effort will be necessary to sustain those targets well into the future. Individual target goals contribute to development of a portfolio that depicts characteristic landscape settings that support all of the ecoregion's biodiversity. Conservation goals are set for coarse-filter targets such as ecosystems or vegetation types and fine-filter targets such as species or populations that are not captured by coarse-filter targets. Coarse-filter vegetation maps have the advantage of covering the entire ecoregion, thereby eliminating the inherent spatial and taxonomic bias of species datasets (Lombard et al. 2003; Pressey et al. 2003).

Conservation goals define the overall ecoregional assessment design: how many components and where should they be placed. Setting conservation goals seeks to incorporate the “three R’s” as outlined by Tear et al. (2005): representation, redundancy, and resilience. Representation means capturing “some of everything” of the ecological element or target of interest (e.g., a population, species, or watershed type). Redundancy is necessary to reduce to an acceptable level the risk of losing representative examples of these targets. This also recognizes the fundamental importance of establishing multiple examples of protected populations to prevent environmental conditions or infrequent catastrophic events from affecting all protected populations simultaneously. The establishment of multiple populations might also preserve a large portion of the genetic variation that occurs across a broad landscape (Cox et al. 1994). Resilience, often referred to as the quality or health of an ecological element, is the ability of the element to persist through severe hardships. These concepts capture many of the other concepts and principles now considered important in conservation efforts, and provide a template for conserving evolutionary potential (Tear et al. 2005). Once a portfolio has been designed, gaps in progress towards goals inform the adequacy of proposed areas of biodiversity significance and existing conservation areas in maintaining biodiversity targets. Those gaps also inform inventory needs and define restoration needs to regenerate viability and integrity of target occurrences.

Conservation goals incorporate abundance and distribution goals. Abundance goals are the number, or percent area, of occurrences necessary for a target to persist. These goals provide redundancy. Distributional goals capture representation and define how the target occurrences should be arrayed spatially across an ecoregion. Conservation of multiple, viable examples of each target, located across its geographic and ecological range, addresses the ecological and genetic variability of the target, and provides sufficient redundancy and representation for persistence in the face of environmental stochasticity and human perturbations (Comer 2005).

Abundance Goals

Abundance goals should take into account attributes of target scale and pattern. Targets can be grouped according to these attributes so planners do not need to set goals for each target individually. For instance, terrestrial communities and ecological systems are often grouped as Matrix, Large Patch and Small Patch and Linear types (Figure A7.1). Freshwater ecological systems are grouped by different sizes, such as headwaters and small tributaries, or small, medium and large rivers. Commonly, smaller communities and ecological systems, and locally occurring targets are given higher abundance goals because they historically had more numerous occurrences and are more susceptible to disturbances than those that are larger and more widely distributed.

Abundance goals are set using both number of occurrences and percent area of targets. Number of occurrences is appropriate for species, community and small patch ecological system targets, where occurrences are represented as point locations. In addition, in fragmented landscapes where large patch and matrix forming ecological systems are distinct occurrences, applying these types of goals may be appropriate. Percent-area goals are often used for targets such as matrix forming, large patch and linear ecological systems which often occur as extensive mapped polygons on the landscape, and distinct, multiple occurrences are not common. It typically makes little sense to set goals based on number of occurrences, but instead should be based on the percent area of the historic and extant area of the ecological system.

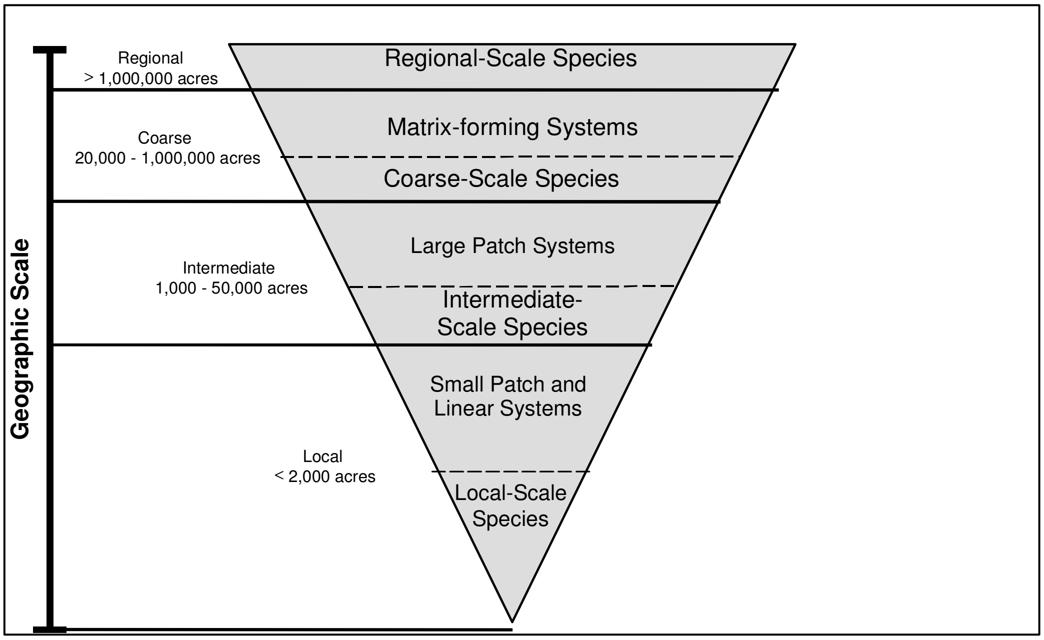

Figure A6.1. Categories Representing Geographic Scale of Conservation Targets. Spatial Ranges Are Approximate and Overlapping (Poiani et al., 2000).

Distribution Goals

Ecoregions are not homogeneous. They contain environmental gradients and non-random distributions of biodiversity. Ecoregions are stratified in a variety of ways to delineate broad patterns of environmental gradients. In order to help capture occurrences of targets across their natural range of genetic and environmental variation and to provide sufficient replication to ensure persistence in the face of predicted or unpredicted environmental change, we subdivided the ecoregion into stratification units and set representation goals for conservation targets within those units. For example, if the range of a species spans the entire ecoregion, it is preferable to select viable occurrences throughout the ecoregion, rather than clustered in one local area (TNC 2004). The ecoregion was stratified into five terrestrial (ecosections) and covered portions of three freshwater (Ecological Drainage Units) sections. Along with ecoregion-wide goals, representation goals for terrestrial targets were set using the terrestrial sections and aquatic goals were stratified across EDUs. Conservation goal values for most species and system targets were set using default values developed by The Nature Conservancy and NatureServe that account for both the geographic scale and distribution of targets (Comer 2005).

Table A6.1. Target Distribution (Groves et al. 2000).

TARGET DISTRIBUTION
Endemic: Target occurs primarily in one ecoregion. >90% of global distribution in ecoregion.
Limited: Target distribution is centered in a few ecoregions. <90% of global distribution is with in the ecoregion, and distribution is limited to 2-4 ecoregions.
Disjunct: Target is a distinct occurrence in the ecoregion isolated from other occurrences in adjacent ecoregions. Distribution in ecoregion quite likely reflects significant genetic differentiation from main range due to historic isolation. Roughly >2 ecoregions (or several hundred kilometers) separate this ecoregion from other more central parts of its range.
Widespread: Target occurs across several to many ecoregions. Goals should be established across the range of the targets, if possible.
Peripheral: Target has a small percentage of its distribution in the ecoregion. <10% of global distribution in ecoregion. Global distribution >3 ecoregions.

Table A6.2. Initial Representation Objectives for Coarse Filter and Fine Filter Targets, expressed as three levels for developing “High Risk” “Moderate Risk” and “Low Risk” conservation scenarios.

Distribution Relative to Ecoregion	Spatial Pattern of Occurrence					
	Matrix, Large Patch and Linear Ecological Systems			Small Patch Ecological Systems and All Rare Communities Fine Filter Species Targets		
	Default Area or Length, per Section or Ecological Drainage Unit* (% of historic)			Default Number of Occurrences**		
	“High Risk” Scenario	“Moderate Risk” Scenario	“Low Risk” Scenario	“Higher Risk” Scenario	“Middle Risk” Scenario (Default)	“Lower Risk” Scenario
Endemic	18%	30%	48%	P: 25 N: 63	P: 50 N: 125	P: 75 N: 188
Limited				P: 13 N: 34	P: 25 N: 67	P: 38 N: 101
Widespread/Disjunct				P: 7 N: 19	P: 13 N: 38	P: 20 N: 57
Peripheral				P: 4 N: 12	P: 7 N: 23	P: 11 N: 35

P = population EOs; N= nest EOs, based on z = 0.3

Summary

Key Steps in Setting Goals:

- Characterize species, community and ecological system targets by their range-wide distribution patterns (endemic, limited, disjunct, widespread, peripheral).
- Characterize targets by their spatial scale: regional, coarse-scale, intermediate, and local-scale.
- Evaluate existing stratification units of ecoregions or develop stratification units to delineate major environmental gradients such as climate, geology and elevation to provide a spatial framework to set distributional goals.
- Set abundance and distribution goals for every target either on an individual basis or as groups of targets with similar characteristics. Consult experts and existing guidance, recovery plans and conservation plans for specific targets when available. Use number of species, community and ecological system (when feasible) occurrences, and use percent area of matrix and large ecological systems to set goals. Review adjacent ecoregional assessments and information on wide-ranging species to inform goals.
- Document assumptions, data gaps and long term steps to monitor and re-evaluate goals.

- Once an ecoregional portfolio/vision has been developed, quantify its adequacy in terms of fulfilling the abundance and distribution goals for each target.
- Identify the potential for further data acquisition and/or surveys to document additional numbers of target occurrences to make progress in meeting goals by adding them to future iterations of ecoregional portfolios. Identify restoration needs and objectives to make progress in meeting goals where further data acquisition and/or surveys are not a great potential for further information.

Conservation Goals for Terrestrial Targets

Coarse-filter Targets

A coarse-filter strategy is aimed at maintaining the ecological processes that support the vast majority of species; thus permitting us to avoid targeting numerous species individually. In addition to maintaining non-target species, coarse-filter strategies emphasize the conservation of ecosystem services (e.g., carbon sequestration, water filtration, nutrient cycling, etc.). While goals for species correctly emphasize the health and viability of their populations, coarse-filter goals focus on representing ecological variability and environmental gradients. Put another way, we hope to use the coarse filter to 'keep common species common.'

Ecological systems are used as coarse filter targets. As such, they capture many common, untracked and unknown species as well as serving directly as large-scale conservation targets themselves. Many goals for ecological systems have been based on species diversity/area curves. These curves are conceptual models that provide an approximation of the proportion of species that might be lost given the reduction in habitat areas. These relationships grew from empirical observations of island biogeography (MacArthur and Wilson 1967), and have been shown to exist for habitat islands in terrestrial and aquatic landscapes. Estimations of terrestrial species loss associated with the percent habitat remaining suggest that 30-40% of the historic area of a given community or ecological system would likely contain 80-90% of the species that occur in them (Groves 2003). This model has not been tested, and regional analyses of species/area relationships would better inform goal setting using this as a framework.

All targets were represented across major biophysical gradients in order to capture environmental representation, ecological variability and potential genetic variability of targets. Representation of targets across major biophysical gradients also helps to ensure that each regional scenario encompasses native ecological system diversity while providing a hedge against a changing climate. This can be accomplished in several ways. First, as mentioned earlier, targets could be represented in each of the ecoregional sections/EDUs/geographical subdivisions of their natural distribution. Second, for large patch, linear, and matrix forming systems (both terrestrial and freshwater), they can be represented in combination with biophysical land units and aquatic biophysical environments to help represent ecological variability and gradients. For example, scenarios were generated in MARXAN that applied percent objectives to terrestrial/biophysical environment and riverine system/biophysical environment combinations; ensuring that the major biophysical gradients of each system would be represented in proportion to their occurrence for the ecoregion as a whole.

Terrestrial system targets were assigned area-based goals in stratification units where they represented a matrix-type system. Goals were set equal to 30% of the estimated historical (circa ~1860) extent of the system in the ecoregion. We used area rather than individual occurrences of these targets due to their distribution over large areas and our ability to map them as large polygons across the landscape. Our estimate of the historical extent of these large-scale system types was developed by examining relevant literature and current landcover data, combined with expert opinion.

Conservation Goals for Freshwater Targets

Coarse-filter Targets

The TNC freshwater ecosystem classification approach is spatially hierarchical and Ecological Drainage Units (EDUs) are similarly scaled and serve the same purpose for freshwater targets. So in reality we apply more than one stratification scheme for a given ecoregional assessment. Some degree of target occurrence replication is provided within each Section/EDU of their historical range within the ecoregion.

The goals for aquatic system targets were also set equal to 30% of the occurrences of each system target up to a maximum of three occurrences. Because system targets were nested within EDUs, there was no stratification of their goals across EDUs.

Fine-filter Targets

For targets in each EDU where the source data was habitat-based (spawning and rearing), goals were applied based on defaults suggested by NatureServe (Comer 2003), with changes to the defaults as shown in the table below. [1] Variations from the default goals were based upon expert knowledge of the freshwater team. NOAA fisheries biologists agreed that 50% of spawning and rearing habitat should be used for salmon in the USA, regardless of whether the targets are listed.

Table A6.3 Goals for Freshwater Fine-filter Targets

	British Columbia	Stratified By	Washington	Stratified By
Chinook Salmon	30%	EDU	50% 30%	ESU or EDU
Chum Salmon	30%	XAN	30%	EDU
Coho Salmon	30%	EDU	30%	EDU
Coho Salmon—Interior Fraser (In Thompson, Lower Fraser, Upper Fraser)	50%		n/a	n/a
Pink Salmon	30%	XAN	30%	EDU
Sockeye Salmon	30%	EDU	50% 30%	ESU or EDU
Sockeye Salmon—Adams River*	50%		n/a	n/a
Sockeye Salmon—Sakinaw Lake*	50%		n/a	n/a
Sockeye Salmon—Cultus Lake*	50%		n/a	n/a
Steelhead Salmon	30%	EDU	50% 30%	ESU or EDU
Steelhead Salmon—Thompson Drainage	50%		n/a	n/a
Aquatic Non-Salmonid	30%	EDU	30%	EDU

* These were given a 30% goal this iteration, but should upgraded to 50% in the next iteration.

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[1] FISS and SaSI had attributes for spawning, rearing and holding areas for each species. These were merged for this analysis by species. In the next iteration spawning, rearing and holding should remain separate and goals set for each type of habitat, so all are represented in the portfolio.

APPENDIX 7 – TERRESTRIAL ECOSECTION AND FRESHWATER ECOLOGICAL DRAINAGE UNIT DEFINITIONS

Appendix 7. Terrestrial Ecosection and Freshwater Ecological Drainage Unit Definitions

Terrestrial Ecosections[2]

The Okanagan Ecoregion is divided into 5 sections (Map 3) that roughly match the BC Ecoregion Classification's ecoregion-level delineation in the Shining Mountains Project, with the exception of the Thompson Okanagan Plateau which was split into two sections. In the context of the BC classification system, the term "ecoregion" applies to a lower level of ecological system classification than how is it being applied in this ecoregional assessment context. The term ecoregion as defined by TNC is roughly equivalent to the BC classification's Ecoprovince level of classification. In the BC classification, Ecoprovinces are areas with consistent climatic relief and regional landforms, and Ecoregions are areas with major physiographic and minor macroclimatic variation.

The Okanagan Ecoregion falls within the Dry Ecodomain which is an extension of the dry climate regime which extends up from the interior of northern Mexico and the northwestern United States. The two most commonly recognized climates are arid desert and semiarid steppe.

Okanagan Highlands

This section covers the southeast portion of the ecoregion and is mostly contained within Washington. It is a transitional mountain area lying between the Columbia Basin to the south and the Columbia Mountains to the northeast. This section contains a wide trench located between the Thompson Plateau to the west and the Northern Okanagan Highlands to the east, low rounded ridges and narrow valleys. Large lakes dominate the valley bottom, and the Bunchgrass Zone is predominant on the lower valley slopes. This section lies in the strong rain shadow created by the western Cascade Mountains and is very dry. This section has some of the hottest and driest climates in Washington and British Columbia.

Northern Cascades Ranges

This section is on the western edge of the ecoregion and straddles the BC-Washington border. Along the west border, the Hozameen Range lies on the east side of the Cascade Ranges' divide. It is mountainous and increases with ruggedness from north to south. This section also contains the Okanagan Range which is characterized by high mountains with deep, dry valleys that on the eastern side have Bunchgrass and Ponderosa Pine Zones. It also contains an area with dissected uplands. The climate is transitional between the drier and warmer climates farther south and moister and cooler climates to the north. It has warm, dry summers and mild winters with relatively high snowfall.

Interior Transition Ranges

This section covers the northwest portion of the ecoregion and is contained entirely within BC. This section lies on the east side of the Coast Mountains, but it has coast/interior transition climates. The Leeward Pacific Ranges have bold mountains with deep, narrow valleys in the north. In the south the mountains become subdued. The Pavilion Ranges is a

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[2] Terrestrial ecosection descriptions from Ecoregions of BC webpage: http://srmwww.gov.bc.ca/ecology/ecoregions/dryeco.html#sinteco

mountainous upland area that is transitional with the Coast Ranges to the west and the plateau surface to the east. The Fraser and Thompson rivers have dissected the upland surface. The Bunchgrass and Ponderosa Pine Zones dominate the lower mountain slopes upland surface. The Southern Chilcotin Ranges are high rounded mountains, with deep narrow valleys. Dry forests in the Alpine Tundra Zone are extensive.

Thompson - Okanagan Plateau

This section covers the northeast portion of the ecoregion and lies entirely within BC. This section is a broad plateau with low elevation basins. It has the driest and warmest climates in the province. Large lakes dominate the valley bottom, and the Bunchgrass Zone is predominant on the lower valley slopes. The Northern Okanagan Highland is a cool, moist, transitional mountain area, dominated by a rolling upland. The Northern Thompson Upland is an area with dissected uplands. The climate is transitional between the drier and warmer climates farther south and moister and cooler climates to the north. It has warm, dry summers and mild winters with relatively high snowfall. The Thompson Basin is a warm and exceptionally dry, low elevation area with a high diversity and abundance of wildlife.

Central Okanagan

This section covers the eastern flank of the ecoregion and is entirely within BC. This section shares the Northern Okanagan Basin with the Thompson - Okanagan Plateau section; a wide trench located between the Thompson Plateau to the west and the Northern Okanagan Highlands to the east. This section also shares the Southern Thomson Upland with the Thompson – Okanagan Plateau section; an area characterized by flat plateau uplands, steep sided plateau walls, and two large lowlands. It has a dry climate and has two large grassland areas.

Freshwater Ecological Drainage Unit Zoogeographic History

Zoogeography of Freshwater Fishes in the Middle Fraser, Thompson and Okanagan EDUs

Virtually all of British Columbia and the northern portion of Washington State were covered by Wisconsinan glaciers. Figure A7.1 illustrates a set of schematics of the ice sheet retreat from B.C. and WA and the major postglacial colonization routes. The major freshwater dispersal routes include: the upper Columbia River, the Missouri River watershed, south from the Nahanni River and from the upper Yukon River.

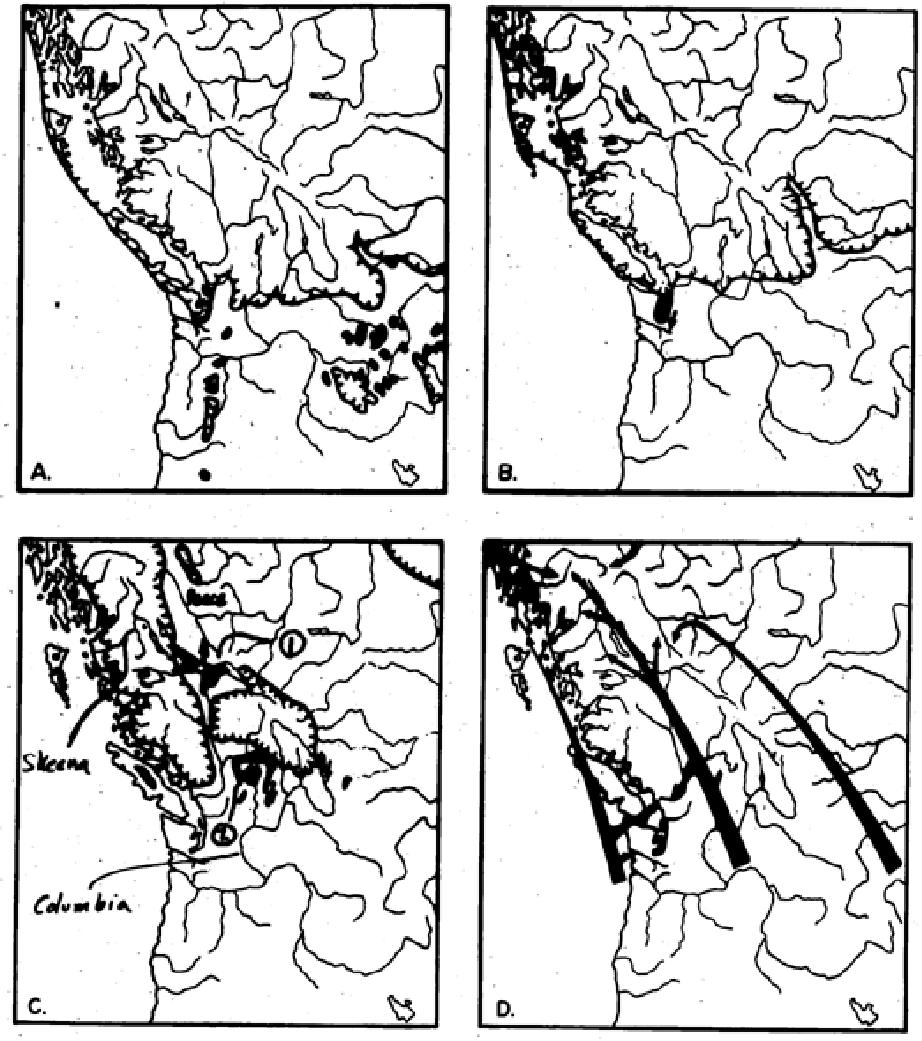

Figure 16.2 Late Pleistocene drainage changes in Cascadia: (A) maximum glaciation; (B) early deglaciation; (C) late deglaciation; and (D) major postglacial dispersal routes.

Figure A7.1. Ice sheet retreat from B.C. and WA and the major postglacial colonization routes (from Hocutt and Wiley, 1986).

Panel (c) of Figure A7.1 above illustrates that large proglacial lakes formed near the margins of retreating ice sheets at the junction of the upper Skeena, Fraser, and Peace rivers

("1", Lake Prince George) and also near where the middle Fraser and Columbia rivers (Lake Oliver, Penticton Quilchena, etc) come into close contact ("2"). Ice dams blocked the current outlets to the Pacific Ocean of both the Skeena and Fraser rivers. Consequently, during deglaciation the Fraser used to exit to the sea at the current mouth of the Columbia River as the Fraser flowed through the Columbia via the Okanagan valley and river system. In addition, glacial Lake Prince George (2 in Figure A7.2 below) facilitated the connection between the upper Fraser and upper Peace River as well as between the upper Skeena River and the Fraser. Such interdrainage connections resulted in faunal transfers between these river systems. These lakes were part of a large series of proglacial lakes across North America (Figure A7.2). The largest were associated with the margins of the Laurentide Ice Sheet as it retreated in a northeast direction in North America. Large lakes such as glacial lakes Agassiz (8/9), Tyrell (7) McConnell (6), Miette (4) and Edmonton (5) covered huge areas of North America and facilitated a great deal of exchange of aquatic faunas (indicated by arrows) among now isolated areas (see McPhail and Lindsey 1970; McPhail and Lindsay, 1986).

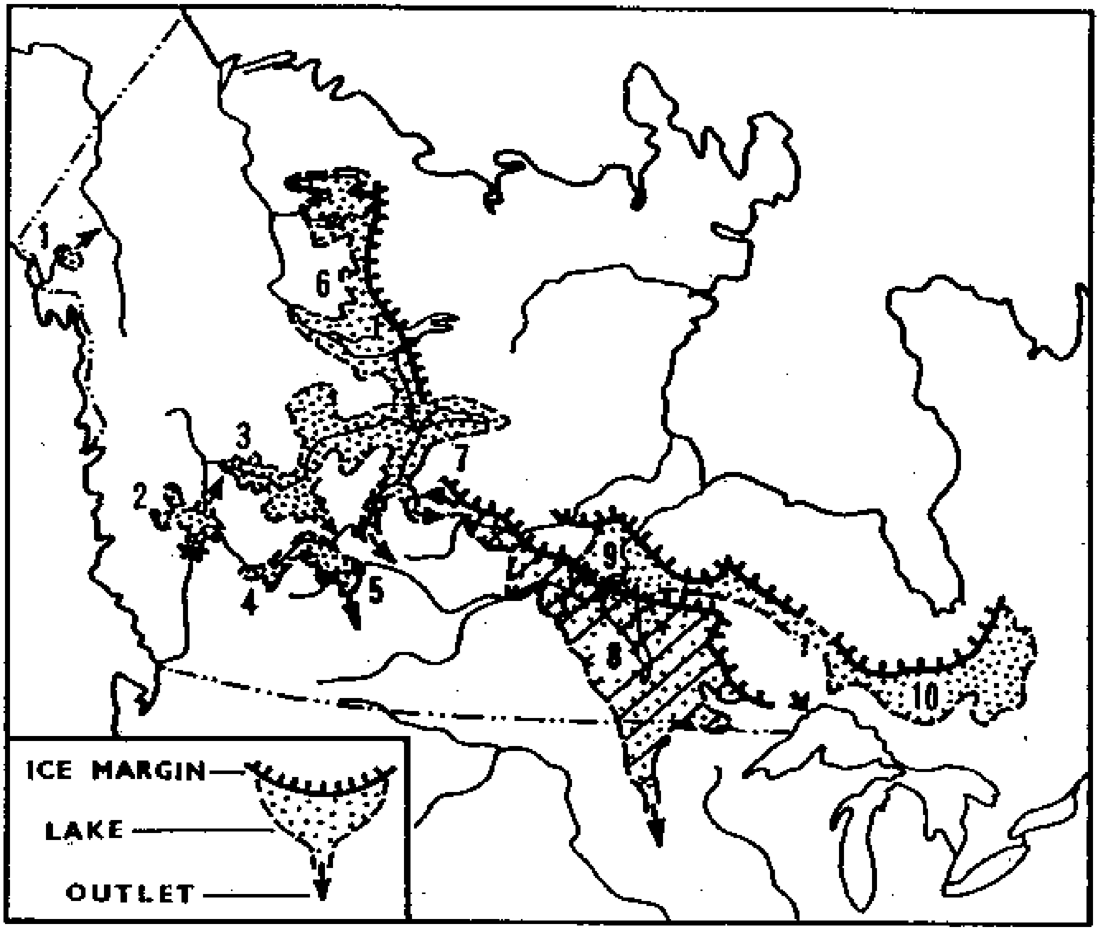

Figure A7.2. Proglacial lakes of the last glacial recession (Hocutt and Wiley, 1986).

The Columbia River is the major post-glacial recolonization "route" of the Cascadia region, acting as a migration route for fishes from the Columbia north to the Stikine River

(McPhail and Lindsey, 1986). Interdrainage connections among these major river systems has resulted in the observation that most of the freshwater fish faunas of these glaciated rivers are of Columbia origin. Table A7.1 below shows the extent of "faunal similarity" of major Pacific coast rivers with the Columbia (McPhail and Lindsey, 1986):

Table A7.1. Faunal Similarity of Major Pacific Coast Rivers with the Columbia

River	Similarity to Columbia River (All Freshwater Fishes)	Similarity to Columbia River (Stenohaline Species)
Fraser	84%	74%
Chehalis	85%	72%
Skeena	78%	60%
Nass	80%	63%
Stikine	71%	51%

Interdrainage connections have strongly influenced the biogeography and evolution of fishes in this region. The upper Skeena and Fraser rivers are the only rivers west of the continental divide with populations of the white sucker (*Catostomus commersoni*), a fish of Mississippi origin that entered the western rivers via faunal transfers between these rivers and (probably) the Peace River via glacial Lake Prince George. Similarly, the largescale sucker (*Catostomus macrocheilus*) is of Pacific basin origin (McPhail and Lindsay 1986).

APPENDIX 8 – MARXAN METHODOLOGY

Appendix 8 – MARXAN Methodology

In order to address the complexity and large amount of data used in the analyses, and to ensure the analysis is repeatable so that the reserve systems can be readily re-evaluated and modified over time as conditions change and new information is acquired, the assessment team chose to use the optimal reserve selection algorithm MARXAN[3] (Marine Reserve Design Using Spatially Explicit Annealing) (Ball and Possingham 2000). MARXAN is a stand-alone, optimization application that was developed to assist in designing a marine reserve system for the Great Barrier Reef in Australia and has gone on to be used in a variety of terrestrial and aquatic conservation planning settings with over 1100 registered users from at least 600 organizations in 95 countries (Possingham 2006) [4]. The application comes from a lineage of successful selection algorithms, beginning with SIMAN, SPEXAN, and SITES (Ball and Possingham 2000). In Canada, the application is used by many organizations, including Parks Canada, Department of Fisheries and Oceans, World Wildlife Fund, Living Ocean Society and is being considered by the BC Government (Evans et al. 2004; Loos 2006). Developed by Dr. Hugh Possingham, University of Queensland, and Dr Ian Ball, at Australian Antarctic Division in Tasmania, MARXAN receives spatially-explicit data generated through GIS and applies spatial optimization algorithms to achieve a reasonably efficient solution to the problem of selecting a system of spatially cohesive reserves that meet a suite multiple conservation targets (both coarse and fine filter) simultaneously.

We used MARXAN's simulated annealing algorithm (Kirkpatrick et al. 983) for the analysis. The solution offered by simulated annealing produces consistently closer to optimum results than other algorithms (Stewart et al. 2003). Heuristic optimization algorithms, such as greedy heuristic[5] – an extremely fast step-wise iterative process by which the assessment unit that improves the portfolio the most is sequentially added at each step until all goals are reached - might come closer to achieving a set of sites that offers the highest quality representation of the conservation targets, but creates a solution with a much larger footprint on the landscape. Simulated annealing is seen as more useful than other optimization techniques that have also been developed by mathematicians because it can be used to identify a large number of near-optimal portfolios which can then be used by planners to explore multiple scenarios when designing conservation networks (CLUZ 2006).

MARXAN is not meant to replace decision making; it is a decision support tool. Automated output (a portfolio or solution) from the program was reviewed and refined by the assessment team and other experts familiar with the ecoregion. This was necessary to compensate for gaps in the input data and other limitations of the automated portfolio, such as information which could not be easily quantified. Input received through expert reviews was used to modify the computer-generated portfolio.

Simulated Annealing

MARXAN uses simulated annealing to achieve an objective function - to find the lowest cost portfolio or solution. MARXAN evaluates the effectiveness of its solutions by measuring cost against goals and calculating whether a particular change to a portfolio

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[3] More information about this analytical tool can be found by visiting the following website: http://www.ecology.uq.edu.au/MARXAN.htm).

[4] See Loos 2006, pp 20 for a partial list of users.

[5] MARXAN can also be used to develop greedy heuristic solutions.

would improve its effectiveness. Successful (effective) portfolios have the lowest costs. Cost is defined as a cost for each assessment unit included in the solution and a penalty for not achieving goals for each target.[6] These cost elements are further described in the inputs section below. To achieve the objective function, MARXAN incorporates three basic elements (CLUZ 2006): iterative improvement, random cost increases and repetitiveness.

Iterative improvement:

The first element of the simulated annealing process is based on iterative improvement. MARXAN starts by creating a portfolio based on randomly selecting a number of assessment units. It then iteratively improves on this random selection, repeating the same simple set of rules a number of times to reduce the cost of the solution. In MARXAN's case the rules are:

1. Calculate the cost of the planning portfolio.
2. Choose an assessment unit at random and change its status (i.e. add or remove from the portfolio).
3. Calculate the new cost of the changed planning portfolio.
4. If the new portfolio has a lower cost than the original portfolio then make the change permanent. Otherwise, do not make the change.

This is one iteration and MARXAN can be used to repeat the process a number of times, so that the portfolio cost is gradually reduced. In general, a conservation planning exercise will use a large number of iterations.

Random and occasional cost increase

By itself, the iterative improvement strategy is unlikely to identify the most effective portfolio. This is because the process can get trapped in local optima by only accepting short term improvements instead of making changes that increase the portfolio cost in the short term which would allow long term improvements (Figure A8.1).

MARXAN overcomes this problem by adding a random element to the iterative process that allows changes to the portfolio that increases the cost value. This allows MARXAN to make “bad choices” - when it checks whether the random change to the portfolio reduces the total cost it will occasionally allow changes that make the portfolio more costly in the hope that it might achieve greater success later in the process.

This is illustrated in the Figure A8.1 (Loos 2006) where A is a local optima, B represents a short term cost increase and C represents a more optimum solution.

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[6] See Ball and Possingham, 2000 pp 9 for more details.

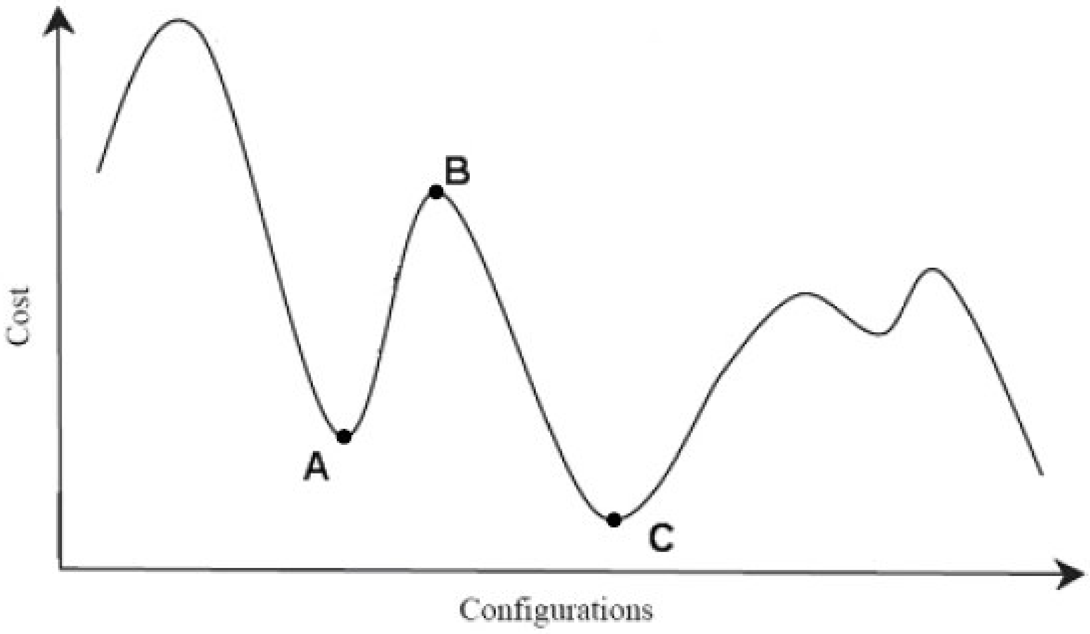

Figure A8.1. Local Optima (Loos 2006)

MARXAN is influenced by the size of the cost increase and is more likely to accept large increases to the portfolio cost at the beginning of the iterative process, as this is when these "backward steps" are most likely to produce long-term benefits. As the algorithm progresses, it becomes more choosy as to how much additional cost it is willing to accept to move closer to achieving the assigned conservation goals. This is referred to as the cooling process (see below). If the cost (boundary length modifier and/or suitability index, described below) of adding an assessment unit is too high in comparison with the penalty of not adding that unit (and the targets it contains) to the solution, the application may reject selecting that unit, even at the risk of not achieving all goals for the conservation targets.

Repetition and irreplaceability scores

Finally, MARXAN can run the process described above a number of times, which also increases the chances of finding a low-cost portfolio. MARXAN then identifies the most efficient portfolio from the different runs, presented as the automated solution. This “best” solution forms the basis for the delineated portfolio. MARXAN also provides information from each of the runs, counting the number of times an assessment unit appeared in the portfolios produced by the different runs. This “summed solution” forms the basis of the irreplaceability analysis conducted for this assessment (see Chapter 7.0).

This combination of 1) iterative improvement, 2) random backward steps towards the beginning of the process and 3) repetition, help ensure that an effective solution will be found. Increasing the number of iterations and increasing the number of repeats will also increase the likelihood of achieving effective solutions. However, increasing the number of iterations beyond a certain point will not increase the likelihood of finding other efficient solutions.

The following section describes some of the parameters used in the MARXAN analysis.

MARXAN Parameters

Several factors, besides the number and type of targets, influence the MARXAN analysis. These include type of assessment units, assessment unit cost measures (suitability index), penalty applied for dispersed rather than clustered assessment units in results (boundary length modifier), penalty applied for failure to meet target goals (species penalty factor), the goal level for each target, the spatial stratification of the analyses units, and the number of repeat runs of the algorithm (and number of iterations within each run).

Assessment Units

The assessment units are the basis for the MARXAN analysis. They can be any shape or size based on based on natural, administrative, or arbitrary features, however the size and shape of AUs can have a major effect of the MARXAN model output (Pressey and Logan 1998).

Considerable debate exists in the literature and among terrestrial and aquatic specialists, regarding the most appropriate assessment unit for MARXAN and the decision of which analysis unit to use involves trade-offs (Loos 2006). Benefits of unit types are outlined below.

Natural assessment units (such as watersheds):

- more likely to represent ecological systems or landscape patterns and may be more easily understood than a hexagon’s abstract representation of the landscape during expert review.

Squares:

- allow for nested analysis, and are units which may be easier to grasp for some users.

Grids or hexagons:

- have the advantage of consistent size, which helps to avoid area-related bias.

Hexagons have a number of advantages over natural assessment units or squares (G. Wilhere, personal communication, March 29, 2006; Z. Ferdana, personal communication, March 30, 2006; J. Ardron, personal communication, March 29, 2006), including:

- Larger area-to-edge ratio than squares (hexagons are closer in shape to circles than squares), allowing for more compact reserves. Squares artificially inflate this value because of their right-angle corners (Warman 2001).
- Shared edge with each of its neighbors, allowing for more compact and better shaped reserves (reserves which better reflect the features they are set up to conserve).
- The centroid-to-centroid distances between a hexagon and its 6 neighbors are all equal. A square has 2 different distances: between neighbors on an edge and neighbors on a vertex. (This is particularly important for when considering animal migration in target selection).
- When projected on the earth's surface, hexagons suffer less distortion than squares (White et al. 1992).

- In terms of data representation (or sampling), the larger area to edge ratio of hexagons (compared to squares), should result in fewer misassignments of target occurrences to AUs. That is, assuming square or hexagon AUs of equal area, element occurrences will be less likely to fall on or near an edge when using hexagons. Therefore, fewer occurrences will be assigned to the wrong AU due to spatial imprecision of the occurrence locations.[7]

- Hexagons can also be easily aggregated into larger units, providing more flexibility in modeling.

- Appropriately sized hexagons can accurately communicate the scale of the results of the modeling process, whereas watershed boundaries are generally drawn at a much finer scale and imply greater precision than this stage of the modeling process delivers.

Warman et al. (2004) conducted analysis on the impact of various sizes of assessment units. Generally the smaller in area the assessment unit, the more spatially explicit the outputs can be. However, small size needs to be balanced against computational constraints and limitations in resolution of data.[8]

Assessment units used for similar work were reviewed before determining which units to use in this assessment. The Willamette Valley – Puget Trough – Georgia Basin Ecoregional Assessment team used 750-ha hexes in the reserve selection model SITES, from which very detailed portfolio sites were later derived; this resulted in some presentation and display issues (Floberg et al. 2004). The Pacific Northwest Coast Ecoregional Assessment team used USGS HUC 6 watersheds in Washington and Oregon and third order watersheds in British Columbia for both the terrestrial and freshwater analyses; this approach had allowed for easy integration of the terrestrial and freshwater portfolios. The Coast Information Team Ecosystem Spatial Analysis conducted for the British Columbia's Central and North Coasts and Haida Gwaii utilized 500-ha hexes; this approach provided easy integration of terrestrial and marine coastal sites (Rumsey et al. 2004).

For the Okanagan terrestrial analysis, we chose 500-hectare hexagons, generated by using the ArcView SITES extension as our assessment unit. This size of assessment unit allowed for the efficient representation of local-scale targets in small functional sites while allowing for aggregation of ecological systems into extensive landscape scale conservation areas (Neely et al. 2001).

Each of the 19,210 units covering the study area was given a unique identifier. Terrestrial assessment units covered the entire ecoregion, any area within 5 km of the ecoregion boundary, and all gaps between the buffer of the revised Okanagan Ecoregion boundary and adjacent ecoregions which have already been assessed.

For the Okanagan freshwater analysis, we chose watersheds as assessment units in order to represent the connectivity and ecological integrity of freshwater systems. Furthermore the freshwater ecosystems (coarse-filter) were already mapped as watersheds. Freshwater assessment units in British Columbia consisted of third order watersheds. Watersheds in Washington State consisted of watershed units from the Interior Columbia Basin Ecosystem Management Project (http://www.icbemp.gov/). In the Upper Fraser, Middle Fraser,

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[7] See Appendix 13 for further information

[8] With 19,210 – 500 ha analysis units, initial MARXAN runs (10 runs at 1 million iterations per run) took approximately 10 hours to complete. The final analysis (20 runs at 15 million iterations per run) took 34 hours. Tests using 250 ha analysis units showed a logarithmic increase in time required to run the application.

Thompson and Okanagan EDUs there were 4,307 assessment units ranging in size from 61 to 189, 208 ha with a median size of 6,397 ha. Each assessment unit was assigned a unique identifier.

Assessment Unit Cost - Suitability Index

The MARXAN model seeks to minimize the total cost of the portfolio by selecting the set of hexagons that comprises as many targets as possible, up to some specified representation goal, with the least cost. The suitability of an assessment unit for selection is its negative cost. Suitability or negative cost can be quantified in a variety of ways, such as acquisition cost, some combination of acquisition plus management cost, or opportunity cost.

We chose to use primarily human impacts to define the suitability index. Assessment units with lower levels of human impacts should be chosen over those with higher levels of impacts, when other factors are equal. This general rule should lead to selection of areas that are more likely to contain viable examples of species and ecological systems. Furthermore, the automated solution generated by MARXAN is more likely to contain analysis units which have the least potential for conflict with human uses, thereby helping to ensure long-term conservation success.

Generally, human use costs consist of factors such as urban or residential areas, areas of high levels of resource extraction and areas with significant infrastructure development. The assumption is that these areas are likely to have reduced habitat effectiveness for many conservation targets and ecological systems. The specific factors used to represent human impacts are described in greater detail in Appendix 13.

Boundary Cost - Boundary Length Modifier

The boundary cost is the “cost” between two adjacent assessment units. This user-defined value can be a simple measure of the length of the edge between adjacent assessment units or incorporate more complex factors such as the ecological or conservation value of the adjacent assessment units (Munro 2006). Using edge length as the boundary cost means that a portfolio containing a connected patch of units will have a lower boundary cost than a number of scattered, unconnected units. We calculated the boundary cost as a simple assessment unit edge length (in metres) using an AML provided with SITES software (http://www.biogeog.ucsb.edu/projects/tnc/download.html).

MARXAN then multiplies this value by an arbitrary, user defined *Boundary Length Modifier* (BLM) constant. The BLM controls the relative importance placed on minimizing the boundary cost of the portfolio. Increasing the BLM number increases the cost of having a fragmented portfolio.

As MARXAN’s objective is to minimize costs, the BLM can be used to impact the cohesiveness or “clumpiness” of the automated portfolio. Using a low BLM would result in a solution that satisfies conservation goals for all targets with a minimum of area, but the fragmented nature of the solution provides a limited framework from which to design a connected, network of conservation areas that could be expected to provide the habitat security or effectiveness needed for conservation targets.

Conversely, high BLM values generate highly clumped conservation solutions containing fewer, larger areas with low edge to area ratios. Areas selected in such solutions are more likely to meet size and connectivity requirements for conservation targets. However, the high clumping factor will sweep areas into a conservation solution less because of inherent conservation values, and more because of the position or location of assessment units relative to the objective of reducing boundary length. Thus, highly clumped solutions tend to be ‘inefficient’ from the perspective that more area contains less conservation value than a more fragmented solution. Figure A8.2 (Loos 2006) shows the effects of assigning of higher BLM.

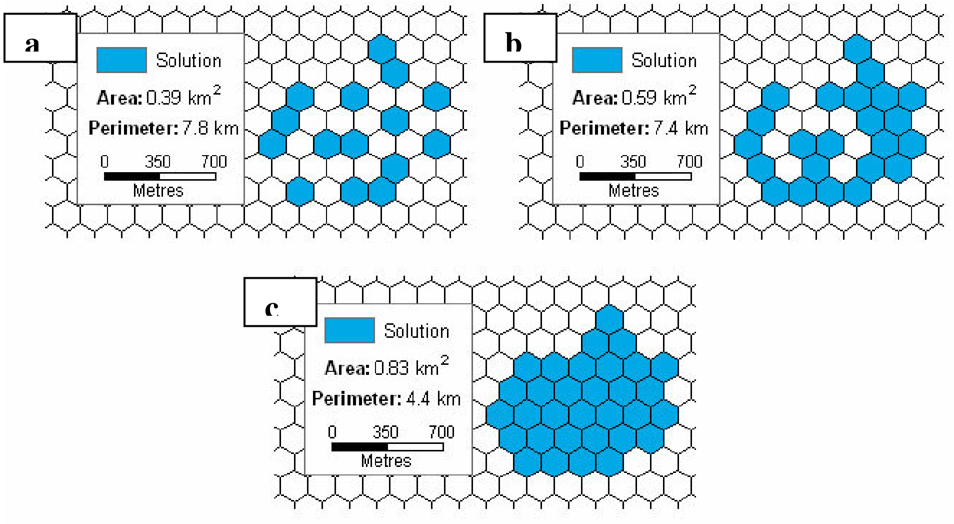

Figure A8.2. The effects of increasing clustering on solution area and perimeter.

a) Scattered (typical of low BLM). b) Slightly more clustered (typical of medium BLM). The perimeter has decreased, and the area has increased. c) Highly clustered (typical of high BLM). The perimeter has decreased significantly and the area has increased.

There is a point where the area in the automated solution increases dramatically, with an increase in the BLM. The ideal BLM is one that decreases boundary length, but does not cause an overly large increase in area (Possingham et al. 2000). In order to explore the balance between efficiency and contiguity, we varied the BLM parameter through a series of trial runs, while maintaining the relative contribution of human use costs. The selected BLM modifier variable (0.0025) was found to provide a balance between the increased regional and system values of high contiguity and the selection of AU representing high values for conservation targets.

Goals

To run the MARXAN algorithm, goals for each of the target species/systems are required. Goals for the representation of various conservation elements (e.g., terrestrial systems, fine filter targets) are user defined and described in Appendix 5.

MARXAN software requires strict enforcement of input file structures to run correctly. This entailed significant effort in applying the spatial data collected by the coarse filter and fine filter teams into the assessment units. See Appendix 12 for a description of assigning the coarse- and fine-filter data to assessment units.

Species Penalty Factor

MARXAN calculates whether the goal for each conservation feature is met by a portfolio and adds a cost derived from the *Species Penalty Factor* (SPF) [9] for any target whose goal has not been met. The SPF is a multiplicative factor which applies a penalty to the portfolio for not achieving conservation target goals. Setting a high SPF will increase the likelihood that a feature's target will be met (Smith 2005).

Different penalty values can be established for each conservation feature. The SPF can be set based on how important or desirable a target is or can be set to nudge MARXAN towards selecting assessment units which contain targets whose goal has not been achieved in earlier runs where no SPF was applied. We used the same penalty factor (one) for all targets because we had no scientific rationale to weight targets differently. The assessment team leads reviewed the results of the MARXAN runs and concluded higher SPF were not required for targets whose conservation goal was not achieved.

Spatial Stratification

To ensure that the analysis units containing conservation targets selected by MARXAN were distributed throughout the ecoregion, goals were set for each target across the ecoregion and across each ecosection in which the target fell. For freshwater targets, goals were set for each EDU in which a target was located.

Clumping (Spatial Aggregation)

Habitat aggregation or clumping is required to promote viability (persistence) of some elements. MARXAN incorporates population and ecological viability factors by letting the user specify the minimum viable clump size for each conservation feature and only counting viable clumps when determining whether the conservation targets have been met. This feature can also be used to set targets for the number of clumps, so that a target for a particular species could be 20,000 ha of habitat made up of at least 3 clumps of a minimum size of 6,000 ha.

Aside from aggregated terrestrial systems we did not include any clumping goals in the MARXAN input. We felt the 500-ha hexagons were already sufficiently large. In practice, the hexagons naturally clump together, given an appropriately applied Boundary Length Modifier.

Repeat Runs

During the initial testing and analysis, for each set of parameters (BLM, cost, goals etc) in the Okanagan ERA we made 10 repeat runs, each comprised of 1 million iterations of assessment unit selection. Each of the 10 runs contained the same scenario (inputs). For the final solutions presented in this report, the application was instructed to undertake 20 repeat runs, with each comprised of 15 million iterations of assessment unit selection. Longer runs (more iterations) are more likely to provide a more optimal solution. The "best" of the 20 runs is presented on Maps 18 and 20 while the summed solution (irreplaceability) is presented on Maps 14 and 16.

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[9] Some literature refers to this term as the conservation feature penalty factor.

Factors Not Employed

Separation Distance

Separation distance is a risk spreading mechanism which can be optionally applied in MARXAN. It assumes that there is a requirement to protect against the dangers of a localised disaster (such as wildfires or disease epidemics) destroying the total reserve holding of the given conservation feature. If set for a conservation feature, a given number of assessment units holding that conservation feature within the solution must be separated by the specified number of assessment units.

While we did not apply a separation factor for any of the targets, we achieved similar results by assigning targets an ecoregion goal as well as a goal for each ecosection that contained the target (distribution goal).

Cost Threshold Penalty (CPF)

The CPF function allows the user to set a maximum total portfolio cost. This means the user can ensure that MARXAN identifies portfolios that are less costly than a specified value, although these portfolios may be less effective at meeting the goals for conservation targets. We did not set any predetermined maximum portfolio costs.

Temperature

The closer you are to the end of a MARXAN run the less likely MARXAN is to accept changes that increase the cost. The cost increase that is acceptable diminishes as the run progresses in what is known as the annealing or cooling schedule. This factor is controlled by the temperature decreases. For Okanagan ERA this value was left at 100,000 (10% of the initial number of iterations) and not experimented with.

Selecting the Initial System

MARXAN allows users to start with a random reserve selection or to lock in or exclude certain assessment units, such as those which fall within protected areas. The assessment team chose to start with a random selection of assessment units.

Limitations

MARXAN was developed for marine reserve design rather than terrestrial. Meir et al., (2004) suggest that private land ownership and irreversible habitat change are more common factors on land than in the ocean. When terrestrial sites targeted for protection are privately owned, it takes time for the government to procure them for the network; conversely, any delays in designation increase the likelihood those habitats will experience irreversible change. As a result, computer-generated plans for terrestrial networks can fall out of date rapidly, even within a year, due to changes in habitat. The resulting networks, if still based on the original plan, are less than optimal. Due to the complexity of MARXAN, a lack of documentation, and the amount of work involved, it was not possible to experiment with many of the settings described above. Experimentation could be conducted on the size of the automated reserve system by first locking in all protected areas and then building out a reserve system.

More work on setting defensible criteria for selecting the optimum BLM should be considered. Possingham et al. (2000) suggest one possible method. As shown in Figure A8.3, as the boundary length modifier is increased, both the boundary length and boundary length/area measures decrease. This occurs at the expense of increased total portfolio area. In the example below the best balance between total area and clustering seems to be achieved with a boundary length modifier between 0.5 and 1. Here the area is increasing, but the boundary length is decreasing at a greater rate.

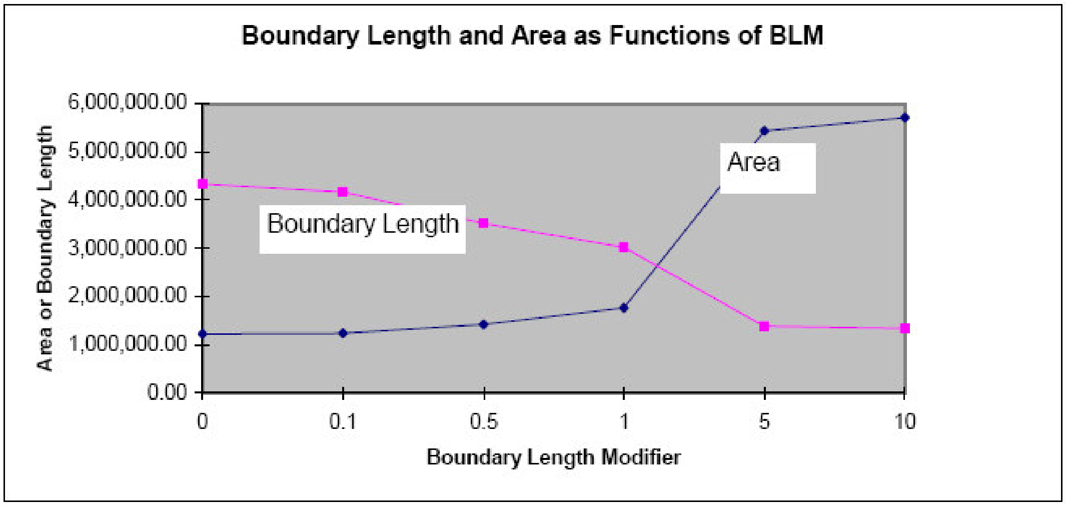


Figure A8.3. Graph of boundary length vs. area (from Possingham et al.2000)

APPENDIX 9 – TERRESTRIAL AND FRESHWATER METHODOLOGY

Appendix 9 – Terrestrial And Freshwater Methodology

1.0 Introduction

The Okanagan Ecoregional Assessment (ERA) was undertaken in order to identify a network of priority areas for biodiversity conservation, by creating a spatially explicit assessment of where the ecoregion's biodiversity values are located and what condition they are in. The ERA integrated two basic approaches to conservation planning often referred to as "coarse-filter" and "fine-filter" methodologies:

- "Coarse-filter" approaches seek to ensure representation of the biological features in the ecoregion and the range of environmental conditions under which they occur. Conserving representative samples of communities is seen as an efficient way to maintain high levels of species diversity. Coarse-filter strategies focus on higher levels of biological organization in part due to the realization that the "biodiversity crisis" cannot be stemmed with a species by species approach (Hunter, Jr. et al. 1988)
- "Fine-filter" approaches seek to protect concentrations of ecological communities; rare or at-risk ecological communities; rare physical habitats; concentrations of species; locations of at-risk species; locations of highly valued species or their habitats; locations of major genetic variants. These are species, communities, and habitats that may pass through the screen of the coarse- filter and therefore require special attention.

Each of these approaches arrives at different sets of conservation priorities. The data utilized for the two approaches varies greatly in type, spatial scale and resolution, and completeness. The ERA process utilizes and integrates a large amount of detailed information. It requires location-specific information for conservation targets as well as the past, current, and potential future status of lands and waters where they occur. Our team used the best available information for this assessment but recognizes that new and more comprehensive data will continually become available. Therefore, the ERA should be regarded as a living document and an initial step in an iterative and dynamic assessment process. Additionally, an effective ERA process is always cognizant of moving the planning process towards implementation from the beginning (Groves 2003).

Our rationale in applying a diversity of approaches to the conservation planning process is that it spreads the risk of failure of any single approach and potentially achieves a more comprehensive set of goals (Lindenmayer et al. 2002; Noss et al. 2002; Rumsey et al. 2004). The coarse-filter/fine-filter approach seeks to incorporate resiliency and redundancy into the network of conservation areas. The conservation targets that occur within the priority conservation areas should be resilient to natural and human-caused disturbances. Resiliency incorporates the concepts of population viability and ecological integrity. This implies that the conservation targets (e.g., species, communities, and ecosystems) chosen in the portfolio are of sufficient quality to persist for a long period of time. In creating the portfolio, we are also seeking to incorporate redundancy in the selection of priority conservation areas by representing conservation targets multiple times within the network of conservation areas. The idea behind incorporating redundancy into the portfolio is to avoid extinction or endangerment of the conservation targets caused by natural disasters and human related impacts (Groves 2003).

To undertake this ecoregional assessment, the two approaches were applied to terrestrial and freshwater environments using the following process (Groves et al. 2000; Groves 2003; Groves et al. 2002):

1. Select conservation targets (e.g., fine-filter “special elements” and coarse-filter ecological systems) that are used to characterize the biodiversity values within the ecoregion. These targets are essentially surrogates for overall biodiversity, which cannot be measured in its entirety.
2. Collect data for special element occurrences and create ecosystem classifications that are used to map the distribution of targets within the ecoregion.
3. Using available data, assess the potential viability of targets, assess existing conservation areas for their biodiversity values, and map human impacts in the ecoregion.
4. Set conservation goals to serve as benchmarks for identifying conservation priorities and as initial hypotheses about the level of effort and land allocation required to conserve biodiversity.
5. Integrate information for special elements and ecosystem representation in freshwater and terrestrial environments to create a spatially explicit assessment of conservation values for the ecoregion.
6. From that assessment, use goals and viability measures to develop options for creating a portfolio of conservation areas that will effectively conserve the region’s biodiversity in the long term.

This information is then used to create a conservation solution or “portfolio” of landscapes and watersheds, which when taken together and managed appropriately, allowing species to move and survive environmental changes, could ensure the long-term survival of the ecoregion’s biodiversity (Hunter, Jr. et al. 1988).

2.0 Terrestrial Methodology

2.1 Terrestrial Coarse-filter

The coarse-filter analysis is intended to identify and protect high-quality examples of all ecosystems in the ecoregion across their natural range of variation along environmental gradients (Groves 2003; Hunter, Jr. et al. 1988; Noss 1987). One of the strongest arguments for the representation strategy is that it is likely to capture species, genes, communities, and other elements of biodiversity that are poorly known or surveyed. For example, there is rarely comprehensive distribution information for bacteria, fungi, bryophytes, and many invertebrate groups. The coarse-filter in effect serves as a buffer for our lack of knowledge and information about biogeography (Hunter, Jr 1991).

Given that species distributions are determined largely by environmental factors, such as climate and substrate, and that vegetation and other species assemblages respond to gradients of these factors across the landscape, protecting examples of all types of vegetation or physical environmental classes is thought to capture the vast majority of species without having to consider those taxa individually (Noss and Cooperrider 1994). It has been estimated that 85-90% of all species can be protected by the coarse-filter (Groves 2003; Hunter, Jr. et al. 1988; Noss 1987). In regions with relatively low endemism, the coarse-filter is predicted to perform better than in regions with high endemism, where species populations are highly localized (Noss and Cooperrider 1994; Rumsey et al. 2004).

2.1.1 Terrestrial systems

A terrestrial ecological system is defined as a group of plant community types (associations) that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients (Comer et al. 2003; O'Neill 2001). Ecological processes include natural disturbances such as fire and flooding. Substrates may include a variety of soil surface and bedrock features, such as shallow soils, alkaline parent materials, sandy/gravelling soils, or peatlands (as described and classified by NRCS 1998). Finally, environmental gradients include local climates, hydrologically defined patterns in coastal zones, arid grassland or desert areas, or montane, alpine or subalpine zones (e.g. Bailey 1995, 1998; Takhtajan 1986).

A given terrestrial ecological system will typically occur on a landscape at intermediate geographic scales of 10s to 1,000s of hectares and persist for 50 or more years. Selecting this temporal scale shares some aspects with the "habitat type" approach to describe potential vegetation (Daubenmire 1952; Pfister and Arno 1980), but differs in that no "climax" vegetation is implied, and all seral components are explicitly included in the systems concept. Ecological system units are intended to provide "meso-scale" classification units for applications to resource management and conservation (Walter 1985). They may serve as practical units on their own or in combination with classification units defined at different spatial scales.

Upland and wetland ecological system units are defined to emphasize the natural or semi-natural portions of the landscape. Areas with very little natural vegetation, such as agricultural row crops and urban landscapes, are excluded from ecological systems. The temporal scale or bounds chosen also integrate successional dynamics into the concept of each unit. The spatial characteristics of ecological systems vary on the ground, but all fall into several recognizable and repeatable categories. With these temporal and spatial scales bounding the concept of ecological systems, we may then integrate multiple ecological factors – or *diagnostic classifiers* - to define each classification unit, not unlike the approach of Di Gregorio and Jansen (2000).

Multiple environmental factors are evaluated and combined in different ways to explain the spatial occurrence of vegetation associations. Continental-scale climate as well as broad patterns in phytogeography, are reflected in ecological division units that spatially frame the classification at subcontinental scales (e.g. Bailey 1998; Takhtajan 1986). We integrated bioclimatic categories to consistently characterize life zone concepts (e.g. maritime, lowland, montane, subalpine, alpine). Within the context of biogeographic and bioclimatic factors, ecological composition, structure, and function are strongly influenced by factors determined by local physiography, landform, and surface substrate. Some environmental variables are described through existing, standard classifications (e.g. soil and hydrogeomorphology) and serve as excellent diagnostic classifiers for ecological systems (NRCS, 1998; Cowardin et al., 1979; Brinson, 1993). Many dynamic processes are also sufficiently understood and described to serve as diagnostic classifiers (Anderson et al. 1999). The recurrent juxtaposition of recognizable vegetation communities provides an additional criterion for multi-factor classification (Austin and Heyligers 1989).

Ecological classification ideally proceeds through several phases, including qualitative description, quantitative data gathering, analysis, and field-testing. Our approach presented here is qualitative and rule-based, setting the stage for subsequent quantitative work. We relied on available interpretations of vegetation and ecosystem patterns across the study area and we reviewed associations of the International Vegetation Classification/National Vegetation Classification (IVC/NVC) in order to help define the limits of systems concepts

(NatureServe, 2005). In recent years, how well a systems approach could facilitate mapping of ecological patterns at intermediate-scales across the landscape has also been tested (Marshall et al. 2000; Moore et al. 2001; Hall et al. 2001; Nachlinger et al. 2001; Neely et al. 2001; Menard and Lauver 2002; Tuhy et al, 2002; Comer et al. 2002).

2.1.2 Methods

The terrestrial systems technical team goal was to provide a framework that assessed and captured the terrestrial biodiversity of the Okanagan Ecoregion at the coarsest scales of the assessment. To accomplish that goal, the terrestrial team developed: 1) a list of and definitions of fine-filter, rare plant associations, and coarse-filter, ecological systems - targets of the ecoregion, 2) spatial representations of the targets, 3) statement of limitations, confidence levels and uncertainties in the representation of coarse-filter and fine-filter targets, and 4) how conservation goals are defined given this context.

- **Develop target lists**

The technical team developed target lists for plant associations and ecological systems.

Associations

The BC Conservation Data Centre (BC CDC) in coordination with the BC Ministry of Forests and NatureServe conducted a quantitative crosswalk of described plant associations of the Southern Interior Ecoprovince (equivalent to the Okanagan Ecoregion, in BC and in Washington). Unfortunately, this crosswalk project was not completed in time to be utilized for the Okanagan ERA, and consequently, this assessment relied on a qualitative correlation of plant associations shared by BC and WA. The team's approach was conservative in that it accepted local classifications as unique high ranked types in the fine-filter analysis and considered utilizing this information to create more coarse-filter systems.

A NatureServe association list (NatureServe 2003), the BC CDC Red and Blue lists of associations, and Washington NHP list of associations not yet incorporated into NatureServe from the Okanagan ecoregion were combined into a list of 531 associations. Targets were G1 and G2 associations. Where BC associations were not yet incorporated into NatureServe, the team accepted provisional S-Ranks S1 and S2 as G-Ranks. The team reviewed BC associations with similar names and crosswalked them with NatureServe associations. BC Conservation Data Centre and NatureServe ecologists reviewed and commented on the final plant association list of 63 associations.

Ecological Systems

Ecological systems (ES) have been developed and applied to many ecoregional assessments. The process for their definition, application and limitations has been discussed most recently in the Willamette Valley- Puget Trough – Georgia Basin ERA (Floberg et al. 2004) and the Canadian Rocky Mountains ERA (Rumsey et al. 2003).

The terrestrial systems technical team began with ES lists compiled and developed by NatureServe (NatureServe 2003) and with tables maintained by Gwen Kittel, Regional Vegetation Ecologist with NatureServe with modifications to ES definitions from other on-going ecoregional assessments and projects. The original list of 325 ES occurring or possibly occurring in the Okanagan ecoregion was reduced to 68 ES. This review was done in conjunction with reviewing ES lists for East and West Cascades and Columbia Plateau ERAs. Additionally, BC plant associations were grouped into their presumed ES. That review and modification and edit of the existing descriptive text of each of the 68 possible ES was sent to BC Conservation Data Centre and NatureServe ecologists for comment. The list of 68 was reduced further to 41 ES based on review of ERA projects on the northern boundaries of the Okanagan. During review, the technical team noted groups of plant associations that were outside the variation of existing ES descriptions. Those served as the basis for recognition and definition of new ES. Most new ES represent systems associated with somewhat unique environments in the interior of the Okanagan ecoregion and modification to ES shared with the Cascades and Columbia Basin ecoregions.

Ecological System modification and description used the following:

1) Existing information provided by NatureServe that included plant associations from NatureServe National Vegetation Classification, ES – plant association correlation table previously developed by Gwen Kittel, and Broad Ecological Unit (BEU) from the Terrestrial working group, BC Province. BEUs are “a permanent area of the landscape that supports a distinct type of dominant vegetative cover, or distinct non-vegetated cover.” It includes “potential (climax) vegetation and any associated seral stages.” It integrates “vegetation, terrain, topography, and soil.” (Ecological Working Group 1998). They are developed from the site classification level of the biogeoclimatic ecosystem classification (Meidinger and Pojar 1991).

2) A list of Biogeoclimatic Ecological Classification (BEC) units in the ecoregion from the BC Ministry of Forests and corresponding BEU (Ecological Working Group 1998). The list of BEU and BEC was then correlated with the list of Ecological Systems using descriptions from each classification. Variation within BEU that did not correlate with existing ES served as the primary basis for recognizing new ES.

3) Review of literature associated with the USFS ecological assessment of the Interior Columbia River Basin (Quigley et al. 1997). Recent papers by:

   - Hessberg, et al. 2000. Recent Changes (1930s-1990s) in spatial patterns of interior northwest forests, USA. For.Ecol. and Mgmt. 136:53-83.

   - Hessberg and Agee. 2003. An environmental narrative of Inland Northwest United States forests, 1800-2000. For.Ecol. and Mgmt. 178:23-59.

   - Hessburg et al. 1999. Using estimates of natural variation to dietet ecologically important change in forest spatial patterns: a case study Cascades Range, eastern Washington. Res. Pap PNW-RP-514.

   - Everett et al. 2000. Fire history in the ponderosa pine/Douglas-fir forests on the east slope of Washington Cascades. For.Ecol. and Mgmt. 129:207-225.

The team did a preliminary synthesis of descriptions of BEU associated with ES to modify descriptions of existing ES and to serve as initial descriptions of new ES. The BC CDC ecologist then reviewed the final list of Okanagan ES particularly new types and the correlation of BEU to ES. Names and possible overlap of new ES were discussed by the team.

- **Spatial representations of the targets**

Plant Associations

A list of plant association occurrences from the BC CDC and the Washington Natural Heritage Program was reviewed to assess the coverage of plant association (fine-filter vegetation) targets. Twenty-five occurrences of eight plant association targets appear in Washington. Because occurrence information is generally lacking, plant association information was not used in the automated (MARXAN) portfolio evaluation process and will provide a basis for portfolio evaluation and site planning processes.

Ecological Systems

Ecological Systems (ES) were represented by combining different ecoregion-wide information data sources from BC and WA. In British Columbia, ES were mapped by combining the Broad Ecosystem Units (BEU) and a Biogeoclimatic Classification Unit (BEC) that best met ES definitions. For example, the Interior Douglas-fir (DF) forest BEU in the xeric, warm Bunchgrass (BGxw) BEC is defined as the Ponderosa Pine Woodland ES, whereas, DF in the dry, cold Engelmann Spruce- Subalpine fir (ESSFdc) BEC is defined as Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland.

Table A9.1. Spatial Patterns Used to Describe Ecological Systems and Plant Associations (modified slightly from Anderson et al. 1999).

Spatial Pattern	Definition	Typical Range of Occurrences
Matrix	Communities or systems that form extensive and contiguous cover, occur on the most extensive landforms, and typically have relatively wide ecological tolerances.	2,000 - 500,000 ha.
Large Patch	Communities or systems that form large areas of interrupted cover. Typically not limited by localized environmental features. Disturbance regimes and successional processes are typically important in the formation and maintenance of these systems or communities.	50-2,000 ha.
Small Patch	Communities or systems that form small, discrete areas of vegetation cover typically limited in distribution by localized environmental features.	1-50 ha.
Linear	Communities or systems that occur as linear strips and are often ecotonal between terrestrial and aquatic systems.	NA

Riparian Ecological Systems

To map riparian systems, riparian areas were initially delineated with a GIS model according to flow accumulation and local topography. Next, this preliminary delineation was edited based on photo-interpretation of GeoCover satellite imagery. Lakes and land currently under agriculture or urban land use were removed, according to land use/land cover as represented by the BTM, NLCD and LULC. Finally, the remaining riparian areas were assigned to a lowland or montane riparian ecological systems based on climatic zones represented by the Shining Mountains vegetation zones. The technical details of this method are described in Section 2.2.

2.1.3 Expert Review

Expert review of ES representation in British Columbia by Dennis Lloyd with the BC Ministry of Forests and Mike Ryan, Consultant occurred in Kamloops, BC in March 2004. The reviewed representation used the 2004 version of BEC. BC Ministry of Forests provided the up-dated BEC layer**.** The new BEC layer is more accurate and was combined with the BEU to represent ES using previously defined and modified relationships. The new map changed some ES shapes and sizes and created a few new BEC-BEU relationships.

Expert review modified and honed BEU-BEC relationships that define ES representations. Dennis Lloyd and Ryan Holmes (Grasslands Conservation Council of BC; GCC) suggested using the GCC mapping of grasslands instead BEC-BEU and fill in polygon with adjacent type. Because comparable grassland, shrub steppe mapping was not available in Washington, the GCC mapping was used in retrospective evaluation of the MARXAN portfolio. The retrospective review verified the occurrence of grassland systems mapped using BEU-BEC relationships and provides a measure of ecological quality not otherwise included in the process. In Washington, ES was represented for expert review by combining the Shining Mountains mapping of BEC subzone in Washington with a 1999 Utah State cover type mapping project. This combination of Shining Mountains and UT cover type yields a finer grain representation of the ES than that in BC. The Shining Mountains mapping in Washington is at the zone level of the Biogeoclimatic Ecological Classification (BEC) not the fine-scale subzone variant as mapped in adjacent BC. The Utah State cover classes are existing vegetation from image analysis. To represent ES, we assumed that both representations were correct and to be modified following expert review.

Expert review in Washington was by 1) USFS ecologist Terry Lillybridge and botanist Rod Clausnitzer, 2) Colville Tribe Natural Resource specialists Richard Fleener, Todd Thorn, and Rebecca Peone and 3) private consultants Peter Morrison and George Wooten. Major changes in the original ES representation following expert review were:

1. Subalpine larch is over-represented by the imagery classification and was not used to represent the Subalpine Larch ES. Since Subalpine Larch is included in the Whitebark pine BEU and therefore not represented in BC mapping, the Subalpine Larch ES was not represented in ES mapping in the ecoregion.

2. Recommend that ES polygons mapped as subalpine mesic forest and woodland ES in adjacent BC be mapped to represent the Subalpine dry-mesic forest and woodland ES

3. Although these experts did not recognize hybrid spruce in WA, they accepted the Shining Mountain mapping of the Montane Spruce zone (MS) in the North Cascades Ranges section, north of Methow and ES defined for it. The MS polygons south of Methow River valley would better represent Interior SAF zone (ESSF)

The following people provided technical review of the terrestrial coarse-filter:

Technical reviewers	
Name	**Affiliation**
Dennis Lloyd	Regional Ecologist, BC Ministry of Forests
Mike Ryan	Consultant, BC Ministry of Forests
Terry Lillybridge	USFS Ecologist
Rod Clausnitzer	USFS Ecologist
Peter Morrison	WA consultant, Pacific Biodiversity Institute
George Wooten	WA consultant
Richard Fleener	Colville Federated Tribes (now NRCS)
Todd Thorn	Colville Federated Tribes
Rebecca Peone	Colville Federated Tribes

• Goals for coarse-filter targets

MARXAN, the analytical tool used in this assessment requires goals be set for conservation targets. These goals were a method for assembling an efficient conservation portfolio, but they were also first approximations for the necessary and sufficient conditions for long-term survival of plant communities and ecological systems. Ideally, when setting goals, we are attempting to capture ecological and genomic variation across the ecoregion and ensure species persistence by spreading the risk of extirpation. As yet there is very little theory and no scientific consensus regarding how much of an ecological system or habitat area is necessary to maintain most species within an ecoregion (Soule and Sanjayan 1998).

Refer to Appendix 5 for details of specific goals set for the terrestrial coarse-filter.

• Cluster analysis of the physical landscape to stratify matrix-forming systems

Of the 28 ecological systems mapped, the 8 matrix-forming systems cover the largest total area, spanning broad physical gradients and thereby encompassing significant ecological and genetic variability. To represent this variability, the team conducted a cluster analysis to classify the landscape using four topographic indices known to correspond to vegetation patterns and that are readily mapped from a digital elevation model (DEM). The resulting clusters provide map units that function to stratify the matrix-forming systems and thereby influence the automated selection of potential conservation areas. The four topographic indices are topographic position measured by a moving window of 300m radius, topographic position measured by a moving window of 2,000m radius, an index of annual clear-sky insolation (SolarFlux, Rich *et al.,* 1995) and slope.

In each of the 4 ecoregional sub-sections, the landscape was classified into 9 abiotic units, or landforms. This produced 36 abiotic map units ecoregion-wide, used to stratify matrix-forming systems in the automated site selection. By stratifying the large number of hectares of matrix forming ecological systems, we ensure a capture of the spectrum of diversity found on all landforms.

The technical details of this method are described in Section 2.3.

2.2 GIS Delineation of Riparian Areas

While riparian habitat has high biodiversity value and is highly threatened, ecoregional assessments in the US and Canada have typically not included riparian ecological systems as terrestrial coarse-filter targets. This is because regional maps of riparian areas often do not exist or are inadequate, and manual delineation via photo-interpretation is laborious and costly. The semi-automated method described here enables the GIS analyst to map riparian areas consistently and quickly across large areas using GIS data that is widely available.

The GIS algorithm is designed to identify areas that are (1) influenced by fluvial processes (transport and deposition of alluvial materials and soils), (2) periodically inundated during floods, and (3) likely to exhibit hydrologic conditions that are the principal controls of spatial pattern of riparian vegetation.

The method consists of two steps. The first step, which is largely automated and scripted in AML, derives an initial riparian delineation from a digital elevation model (DEM). In the second step, the user edits the initial riparian delineation to remove lakes, agricultural fields, urban areas and artifacts.

The accuracy of the result is limited by the horizontal and vertical resolution of the DEM and by the topography of the study area. Like most DEM-derived flow models, the GIS algorithm functions best in areas of varied terrain. In areas of low relief, such as coastal plains and large river deltas, the model output will require some manual editing in the form of heads-up digitizing based on aerial photos or satellite imagery.

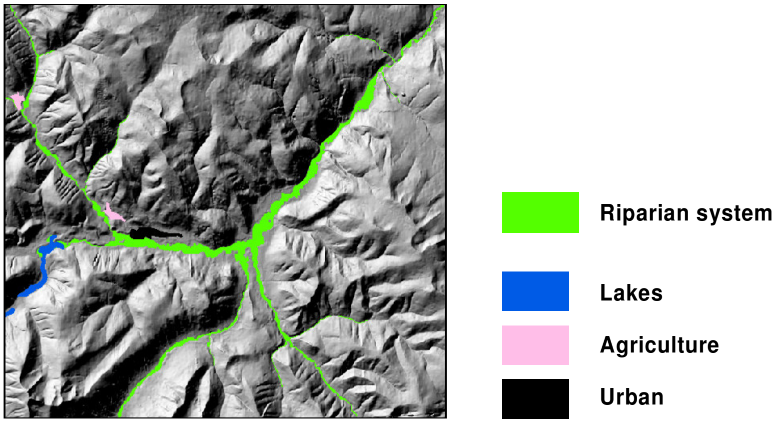


Figure A9.1. Sample result of automated delineation

2.2.1 Background

This method was developed and applied in the Okanagan and North Cascades ecoregions to map riparian ecological systems, as defined by NatureServe, at the ecoregional level and at a relatively coarse geographic scale. The DEM-derived component has been tested at several DEM resolutions, from 25m to 90m cell size. We found that resolutions as coarse as 90m can yield useful results.

As it is currently written, the AML script calculates model parameters based on the DEM resolution and the desired minimum catchment size, as specified by the user. The recommended default minimum catchment size of 20km^2 was appropriate for the characteristic topography and DEM resolution available in the Okanagan and North

Cascades ecoregions. For best results, it may help to compare the results generated using a variety of minimum catchment area values.

This minimum catchment size may be thought of as the minimum area necessary to provide flow accumulation that will produce alluvial deposition at low stream gradients. The choice of minimum catchment size value will profoundly affect the modeled distribution of stream lines and associated riparian areas. A higher value will result in a more sparse pattern of stream lines, restricted to higher flow accumulation, which may exclude smaller riparian areas higher in the stream network. A lower value will result in a more dense, dendritic pattern of stream lines that may over-represent smaller, upstream riparian areas.

2.2.2 Requirements

Data:

Digital Elevation Model (DEM), projected and with units in meters - the initial delineation is derived from the DEM via a flow model.

Imagery - for reviewing results. NASA Geocover imagery is useful and widely available (https://zulu.ssc.nasa.gov/mrsid/mrsid.pl)

Landcover data – optional but very useful for removing lakes, agriculture and urban areas.

DEM-derived hillshade grid – for reviewing results. Can be created with Spatial Analyst in ArcView or ArcGIS.

Software:

ArcINFO workstation, v 7.x or later, to run the two AML scripts.

ArcView 3.x, ArcView 8.x, ArcGIS 8.x or 9.x to view and edit the initial delineation.

Hardware:

Disk space depends on the extent of the study area and the resolution of the DEM. When applied to a 25m DEM of a 50,000 km2 ecoregion, 2-3 GB of disk space were required to accommodate the intermediate grids. The same process run using a 90m DEM might require only 500MB.

The GIS algorithm is demanding in terms of processing, so a fast CPU is recommended.

2.2.3. Method Outline

Functional AML commands shown in blue.

REM statements also contained in the AML script are shown in *green italics*.

2.2.3.1. dataprep.aml generates the filled DEM and flow accumulation grid.

To begin, copy the two AML files and a DEM grid of the study area into a single directory. The DEM grid must be projected and the units must be in meters. Run dataprep.aml (Arc: andr dataprep.aml). When prompted, enter the name of the input DEM grid. This will generate a filled DEM (FILL1), calculate a flowaccumulation grid (FACC1i) and calculate a slope grid (SLOPEi). These grids only need to be generated once, and will serve as the input data for the automated delineation in ripmethod.aml.

If your study area is large and your DEM cell size is less than 60m, this routine may take several hours to finish and tie up your CPU, so you may wish to start this process at the end of the day and let it run overnight.

```
/* USAGE: andr dataprep.aml
/* INPUT: projected DEM, units in meters
/* OUTPUT: FILL1, FACC1i, SLOPEi

andsv dem = [response 'Enter name of the input DEM grid']

/* fill sinks, derive flow accumulation and slope
grid

FILL %dem% fill1 SINK # fdir1
facc1 = FLOWACCUMULATION(fdir1)
/* to save space and time, converts floating point facc1 grid to integer
facc1i = INT(facc1 + 0.5)
andif [exists facc1i -grid] eq .TRUE. andthen anddo
kill facc1 all
andend
andelse anddo
andtype ERROR – facc1i not created
andend

/* derive slope; this will be used by the cost function
slope = SLOPE(FILL1)
/* to save space and time, converts floating point slope grid to integer
SLOPEi = Int((slope) + 0.5)
andif [exists SLOPEi -grid] eq .TRUE. andthen anddo
kill slope all
andend
andelse anddo
andtype SLOPEi not created
andend

quit
```

2.2.3.2. ripmodel.aml generates the initial automated delineation of riparian areas

Run ripmodel.aml in the same workspace (Arc: andr ripmodel.aml). When prompted, enter the desired minimum catchment size (see discussion in the section A.). This routine should take less time that dataprep.aml, but may still require several hours to finish and tie up your CPU. The final results are a grid (rip2c_20) and a polygon coverage (rip2c_20ply) that represent the initial automated riparian delineation.

To test alternate parameter values, particularly the minimum catchment size, copy FILL1, FACC1i, SLOPEi and ripmodel.aml into a new directory and run the routine using a different minimum catchment size. It is also possible to adjust other parameters within the body of the AML script, such as the cost surface factors or the elevation difference used to identify the riparian zone. Note that the names of the output grids include the minimum catchment size value.

```
/* USAGE: andr ripmodel.aml
/* INPUT: FILL1, FACC1i, SLOPEi
/* OUTPUT: rip2c, rip2c_poly and other grids produced by intermediate steps

andif [exists FILL1 -grid] eq .FALSE. andthen anddo
andtype ERROR – FILL1 does not exist.
andgoto exit
andend
andif [exists FACC1i -grid] eq .FALSE. andthen anddo
andtype ERROR – FACC1i does not exist.
andgoto exit
andend
andif [exists SLOPEi -grid] eq .FALSE. andthen anddo
andtype ERROR – SLOPEi does not exist.
andgoto exit
andend

/* Get cellsize from DEM
andsv catch = [response 'Enter minimum catchement size in square km (enter 20 as default) ']
anddescribe FILL1
andsv demres = %GRD$DX%

/* re-classify flow accumulation to create grid of stream reaches
/* facc threshold calculated from DEM resolution and catchement size
andsv facccut =  ( %catch% / ( %demres% * %demres% ) ) * 1000000
grid

strmgrd%catch% = setnull(facc1i < %facccut%, 1)

/* assigns elevation values to the stream grid
setmask strmgrd%catch%
strmelv%catch% = fill1
setmask off
```

COSTBACKLINK function: for every cell within the max search distancene, finds the least cost path to the stream (i.e. the shortest and least-steep path), and assigns the elevation of that closest stream cell. This makes it possible to calculate, for every cell, the difference b/w its elevation and the elevation of the nearest point in the stream.

Usage: COSTBACKLINK(<source_grid>, <cost_grid>, #, {o_allocate_grid}, {max-distance}, #)

o_allocate_grid: as used here, this assigns the elevation of the least-cost-distance (closest) stream cell.

max-distance: used here to reduce processing time, the max-distance value limits the distance from the stream wtihin which the algorithm will measure distance.

```
/*** COSTBACKLLINK using linear distance

/* creates a grid for which all cell values = 1
setcell FILL1
setwindow FILL1
setmask FILL1
mask = 1
setmask off

/* max cost distance of 2000 meters
cb_lin%catch% = COSTBACKLINK(strmelv%catch%, mask, #, al_lin%catch%, 2000, #)

/* calculate change in elevation relative to closest stream cell
ch_lin%catch% = fill1 - al_lin%catch%

/* classify elevation difference to delineate riparian zone
rip1_%catch% = CON(ch_lin%catch% <= 3, 1, -99)

/** focal majority filter to remove single-cell-width artifacts
rip1sn = CON(ISNULL(rip1_%catch%), -99, rip1_%catch%)
rip1_fm1 = FOCALMAJORITY(rip1sn, CIRCLE, 1, DATA)
rip1_fm2 = FOCALMAJORITY(rip1_fm1, CIRCLE, 1, DATA)
rip1_fm3 = FOCALMAJORITY(rip1_fm2, CIRCLE, 1, DATA)
rip2lin%catch% = SETNULL(rip1_fm3 == -99, rip1_fm3)
/* removes intermediate steps to save disk space
andif [exists rip2lin%catch% -grid] eq .TRUE. andthen anddo
kill (! rip1sn rip1_fm1 rip1_fm2 rip1_fm3 !) all
andend
andelse anddo
andtype ERROR - rip2lin%catch% not created
andend

/*** COSTBACKLLINK using slope-weighted distance

/* max cost distance of 1000 x accumulated slope values
cb_slp%catch% = COSTBACKLINK(strmelv%catch%, slopei, #, al_slp%catch%, 1000, #)
/* calculate change in elevation relative to closest stream cell
ch_slp%catch% = fill1 - al_slp%catch%
/* classify elevation difference to delineate riparian zone
rip1slp%catch% = CON(ch_slp%catch% <= 3, 1, -99)
/** focal majority filter to remove single-cell-width artifacts
rip1slp_sn = CON(ISNULL(rip1slp%catch%), -99, rip1slp%catch%)
rip1slp_fm1 = FOCALMAJORITY(rip1slp_sn, CIRCLE, 1, DATA)
rip1slp_fm2 = FOCALMAJORITY(rip1slp_fm1, CIRCLE, 1, DATA)
rip1slp_fm3 = FOCALMAJORITY(rip1slp_fm2, CIRCLE, 1, DATA)
rip2slp%catch% = SETNULL(rip1slp_fm3 == -99, rip1slp_fm3)
/* removes intermediate steps to save disk space
andif [exists rip2slp%catch% -grid] eq .TRUE. andthen anddo
kill (!rip1slp_sn rip1slp_fm1 rip1slp_fm2 rip1slp_fm3 !) all
andend
andelse anddo
andtype ERROR - rip2slp%catch% not created
andend
```

```
/* isolates only areas identified by both distance routines.
/* this removes artifacts unique to each distance measurement.
setmask rip2lin%catch%
rip2c_%catch% = rip2slp%catch%
quit

/* converts grid output to polygon, to allow manual editing
GRIDPOLY rip2c_%catch% rip2c_%catch%ply #
```

Cleanup: Once you're satisfied with the automated delineation represented by the grid (rip2c_##) and polygon coverage (rip2c_##ply), you can delete the other grids produced by intermediate steps in this routine.

2.2.3.3. Post-processing to remove artifacts, lakes, agriculture and urban areas

The automated delineation will include lakes and, depending on the study area, will also include areas that have been converted to agriculture and urban land use. Lakes, agriculture and urban areas can be removed using landcover data. The automated delineation will also include artifacts, or "mistakes," especially in areas of low topographic relief. These can be edited manually using aerial photos or satellite imagery such as the NASA Geocover. A useful rule of thumb for this manual editing is to choose and maintain a single on-screen map scale, to ensure that the edits are applied at a consistent scale across the study area.

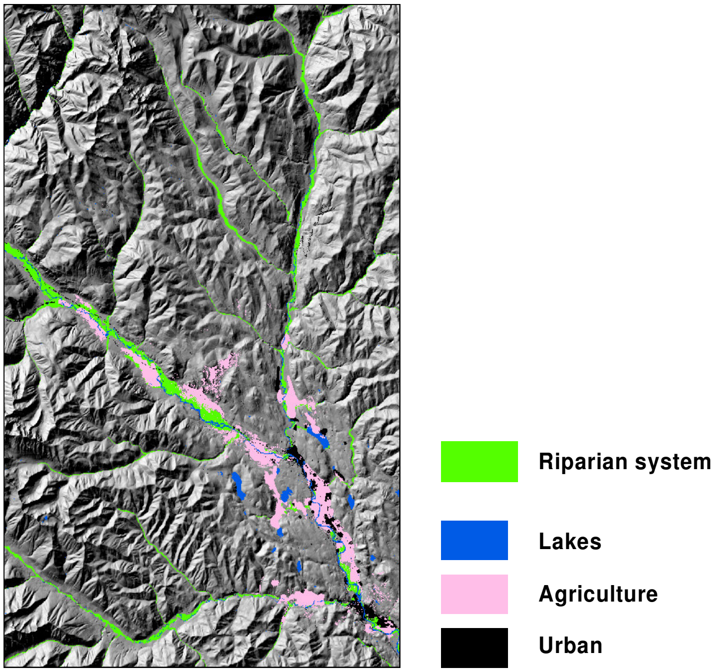


**Figure A9.2: Sample result of automated delineation.
This illustrates the effect of removing agricultural fields, lakes, and urban areas.**

Please direct questions and comments to:
Mike Heiner,
The Nature Conservancy, China Program
mheiner@tnc.org

2.3 Classifying and Mapping Landforms via Cluster Analysis

This section describes a fast, flexible method for classifying and mapping landforms through a cluster analysis of four topographic factors that are known to correspond to vegetation patterns and that are readily mapped from a digital elevation model (DEM). The four factors are:

a. Topographic position, relative to a 300 meter-radius circular neighborhood

b. Topographic position, relative to a 2,000 meter-radius circular neighborhood

c. Solar Flux, an index of clear-sky insolation

d. Slope

In ecoregional assessments, the suite of terrestrial coarse-filter targets typically includes several matrix-forming ecological systems that each cover a large total area, spanning broad physical gradients and thereby encompassing significant ecological and genetic variability. The method described here was developed for two Ecoregional Assessments, of the North Cascades and the Okanagan Ecoregions, as a means of spatially stratifying the matrix-forming systems, thereby describing the range of topographic settings occupied by each. As such, the topographic units serve as proxies for variation in the physical environment that influences genotypic and floristic diversity. Several empirical studies of the relationship between abiotic conditions and biotic composition include Burnett et al. (1998), Nichols et al. (1998), and Kintsch and Urban (2002). To read more regarding the coarse-filter strategy, see Hunter (1991), and its role in Ecoregional Assessment, see Groves (2003).

This technique of classifying and mapping landforms is intended to function as one component of an established method for classifying the abiotic environment into Ecological Land Units (ELUs), originally developed by Anderson et al. (1998). ELUs are mapped as unique, user-defined combinations of elevation zones, geology or soil types, and landforms (defined as unique combinations of topographic position, aspect classes, and slope classes). In the Okanagan ERA, the spatial stratification to define targets for site selection follows a method developed and applied for several Ecoregional Assessments in the Western US, wherein matrix-forming systems were stratified by ELUs.

When compared with user-defined landform classifications based on GIS rules established *a priori*, this method has several advantages and several limitations. Because this method requires no assumptions or empirical measurements regarding vegetation response to topographic gradients, results may be generated quickly. The full routine, including the cluster analysis, runs entirely in ARC/INFO GRID. The method is flexible in that the user specifies the number of map units based on the practical needs of the analysis. Because the clustering is driven by the terrain of the study area and the characteristic interaction of the four topographic indices, each study area will produce a characteristic landform classification.

Conversely, two limitations of this method are that it does not allow inclusion of expert knowledge regarding vegetation response to specific topographic thresholds, and does not allow the inclusion of categorical data, such as surficial geology or elevation zones, in the cluster analysis. By combining the mapped landforms with maps of soils or elevation zones, the user can further describe the abiotic template of the study area.

2.3.1 Overview

The Okanagan Ecoregion is highly transitional, climatically and biogeographically. In order to map the characteristic ecological systems of the ecoregion at a consistent geographic scale, a GIS model was developed through several iterations of data mining and expert review, utilizing a variety of spatial datasets and tools. The resulting map depicts the distribution of ecological systems (28 systems in the Okanagan; 14 in the North Cascades) and functions as a coarse-filter representation of the distribution of biodiversity characteristic of each ecoregion.

Model components include:

1. Climate and Landcover: Upland systems were mapped as combinations of climate zone, physiography and vegetation structure.
2. Riparian ecological systems: The distinct linear pattern of riparian systems was modeled via an automated, DEM-derived delineation of riparian areas.
3. Physical Landscape Classification: Of the full set of mapped ecological systems, a subset of matrix-forming upland systems were spatially stratified through the method described in this document. As a result, the set of terrestrial coarse-filter targets represented in the site selection included the full set of ecological systems as well as each unique combination of matrix-forming system and landform. This ensured that, for a given matrix-forming system, in order to meet area representation goals, the automated site selection would capture the full range of topographic gradients across which the target system occurs, and thereby presumably capture characteristic variation in genotypes and understory vegetation.

2.3.2. Requirements

Data: Digital Elevation Model (DEM)

Software: GRID license on ARC/INFO workstation , v 7.x or later.

Hardware: Disk space depends on the extent of the study area and the resolution of the DEM. When applied to a 25m DEM of a 50,000 km^2 ecoregion, 2 GB of disk space were required. The same process run using a 90m DEM might require only 500MB of disk space.

Processing Time: The initial steps of generating the topographic indices are demanding in terms of processing. For example, a 6 million ha study area with a 25m DEM running on a 2.8 GHz CPU required approximately 57 hours of processing time (the same analysis of a 90m DEM would require approximately 7 hours total processing time). The topographic position and Solar Flux calculations took approximately 15 hours and 41 hours, respectively. Therefore, unless you have a dual-processor computer, it’s recommended that you run the topographic position calculations overnight and the SolarFlux calculations over a weekend, The cluster analysis and mapping runs relatively quickly; each ISOCLUSTER and MLCLASSIFY step takes approximately 5 minutes to complete.

2.3.3. Discussion of Method and Rationale

Choice of topographic factors

The set of four topographic factors and corresponding GIS indices described here were chosen because:

a) Each produced a pattern that was meaningful for describing variation at the specific spatial scale of analysis, determined principally by the size of the terrestrial assessment units (500ha hexagons).

b) The four indices showed low spatial autocorrelation (the STACKSTATS command produces covariance and correlation statistics for the set of input indices).

c) All four factors are proxies for temperature and soil moisture and, hence, the water balance, and thereby serve as proxies for vegetation response.

The ideal number and choice of factors depends on the specific objectives of the analysis and on the geography, climate, and landscape ecology of the study area. Solar Flux, while a useful proxy in the temperate latitudes, may be a less significant proxy for vegetation pattern in the tropics or at high latitudes, i.e. boreal or arctic landscapes. Elevation, though strongly correlated with variation in precipitation and temperature, was not included as a factor in this assessment because the mapped pattern of matrix-forming systems already followed elevation zones. Several other indices that were evaluated but not used include the Compound Topographic Index (CTI - Evans 2001), Relative Slope Position (RSP - Townsend 1999), and Curvature (see ARC/INFO help menu for documentation of the CURVATURE command).

Topographic Position is a proxy for relative exposure, or topographic convergence, and for soil properties, all of which affect temperature and moisture regimes. The GIS index (Fels and Zobel 1995; Weiss 2001) is a measure of local elevation relative to the circular neighborhood; deep valleys receive high negative values, sharp ridges receive high positive values, while sideslopes and flat areas receive values near zero. Two indices were calculated, using two neighborhood radii, 300m and 2,000m, to capture the corresponding environmental variation at two scales.

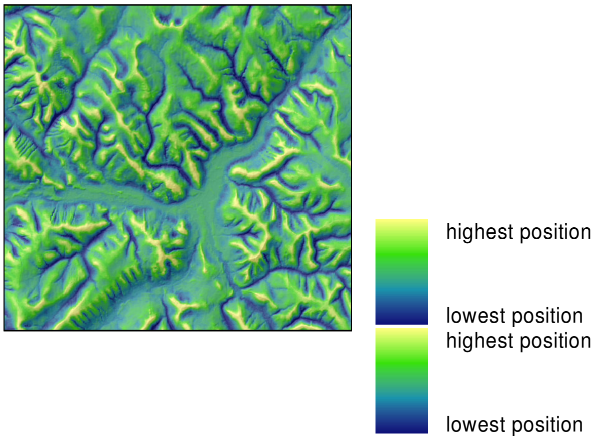


Figure A9.3: Topographic Position, neighborhood radius = 300meters

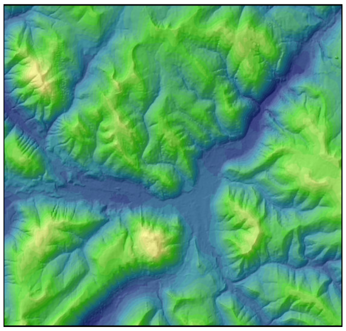
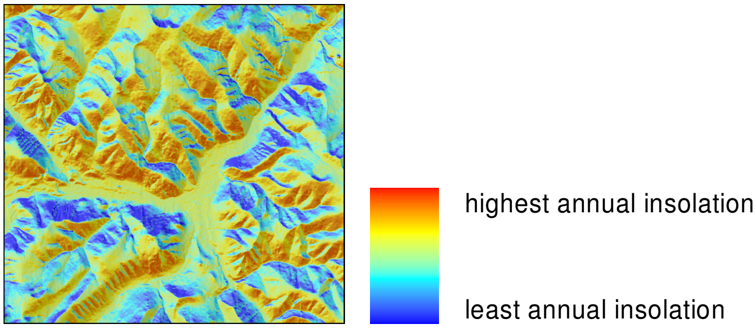


Figure A9.4: Topographic Position, neighborhood radius = 2,000meters

Solar flux (Rich 1995) is an index of annual clear-sky insolation, or radiation load, which affects temperature and moisture regimes. This is a function of aspect and slope, as well as latitude and shading from local terrain, and the time period chosen for the calculation. For a detailed discussion of the Solar Flux routine and parameters, see the user's manual, sf95_manual.html.

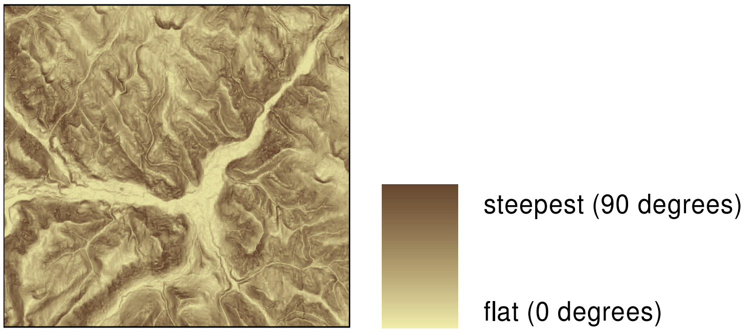
Because the objective of the Solar Flux analysis was simply to represent the possible range of environmental variation due to insolation, and in order to reduce processing time, index values were only calculated on three days during the year, the spring and fall equinoxes and the summer solstice. While the Solar Flux routine does allow the user to specify atmospheric transmissivity, note that this analysis did not recognize any geographic or seasonal variation in cloud cover. Solar Flux is recognized as a meaningful proxy for vegetation pattern in the temperate latitudes, but may be less meaningful in the tropics or high latitudes.

NOTE: Other routines exist for calculating insolation. This routine requires that you define the parameters in text files, but allows you to limit the calculation to just a few sample days during the year. A small number of sample days is adequate for a regional-level, non-predictive analysis, and will reduce the total run time.



FigureA9.5: Solar Flux

Slope is a proxy for soil properties and drainage, which affects temperature and moisture regimes.



FigureA9.6: Slope

Cluster Analysis

The cluster analysis functions similarly to an unsupervised classification of spectral bands used in remote sensing. The ISODATA (migrating means) algorithm produces groups with similar internal heterogeneity and with a minimum size criterion. This ensures that every mapped cluster represents a significant fraction of the landscape. For more information regarding this specific technique of cluster analysis, see the ISOCLUSTER item in the ARC/INFO help menu. For more information regarding cluster analysis, see http://www.nicholas.duke.edu/landscape/classes/env358/mv_pooling.pdf, and multivariate statistics in general, see http://www.nicholas.duke.edu/landscape/classes/env358/mv_syl.html.

For best results of the cluster analysis, all four input variables should have similar ranges of values. In this case, that is accomplished by reclassifying each range of values into a series of 33 bins according to deviation from the mean, wherein each bin spans ¼ standard deviation of the original range.

The GIS routine will define and map clusters at three group levels - 5, 10, and 15 clusters. Each cluster is defined by the corresponding four mean index values, which are listed in a signature file. To map the signatures defined in the cluster analysis, the MLCLASSIFY command assigns every grid cell to a cluster through a maximum-likelihood classification. To derive landform clusters at group levels other than 5, 10, or 15, simply edit clustermap.aml to change the number of classes specified in the ISOCLUSTER command, and change the corresponding MLCLASSIFY command to use the new signature file. While the resulting clusters are identified only by a number, you can create descriptive names for each landform based on the signature file and visual inspection of the map units. Note that the values in the signature file are based on the re-scaled indices, wherein the mean equals 16.

The Okanagan ecoregion is partitioned into five physiographically and climatically distinct sections; the North Cascades ecoregion contains four sections. We analyzed each sub-section independently, identifying and mapping characteristic landforms in each. In the Okanagan, we chose to classify 12 landforms per section, resulting in 60 landforms mapped across the ecoregion. In the North Cascades, we chose to classify 9 landforms per section, resulting in 36 landforms mapped across the ecoregion. In each ecoregion, we chose the number of landform classes after some experimentation, and determined that 12 and 9landforms, respectively, were enough to capture significant environmental variation while still yielding a tractable number of targets. Figures 5 and 6 compare the results of deriving 5 versus 8 landforms per section in the North Cascades.

It’s possible to apply a signature file generated from one study area (delineated by the grid stack of factors) to a different study area. In the Okanagan, signature files were derived for each ecoregional section, excluding a buffer, but the clusters were mapped to a larger area that included a 15 kilometer buffer of the ecoregion. This required creating two sets of factor grids and grid stacks – one excluding the buffer, for deriving the signature files with ISOCLUSTER, and one including the buffer, for mapping the clusters with MLCLASSIFY.

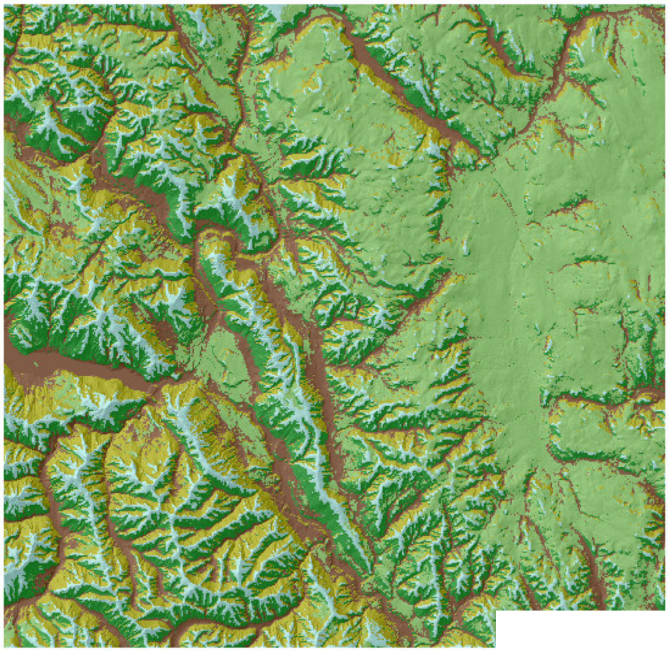


Figure 7: Mapped results of cluster analysis. Group level = 5 derived landforms.

- 🟨 1
- 🟫 2
- 🟩 3
- 🟩 4
- 🟦 5

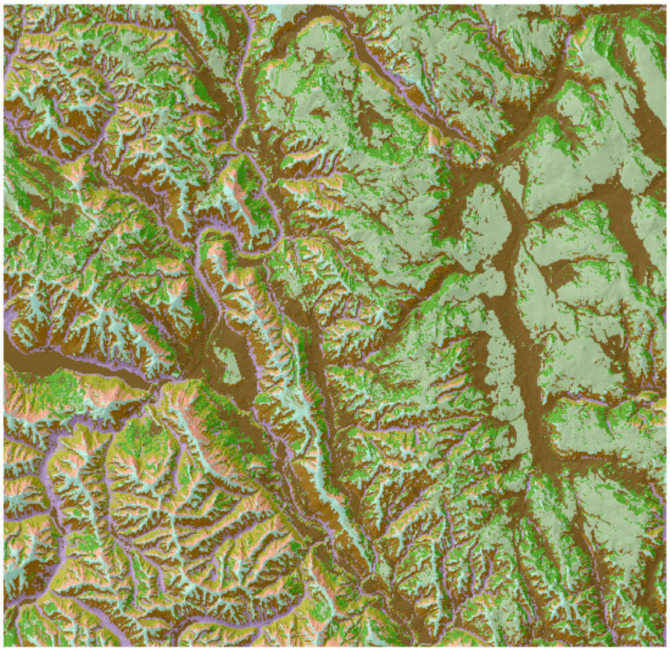


Figure 8: Mapped results of cluster analysis, Group level = 8 derived landforms

🟪 1	🟦 5
🟨 2	🟩 6
🟫 3	🟧 7
🟩 4	🟧 8

2.3.4. Method

This section describes how to reproduce the analysis conducted for the Okanagan Ecoregional Assessment.

Step 1: Derive topographic position and slope

1 Create an ARC/INFO workspace by copying the study area DEM and the ‘tpos.aml’ into an empty directory named \gridwork\.

2. Open an ARC/INFO workstation session, and navigate to the ‘gridwork’ workspace.

(for example, with Arc: **w D:\Okanagandressup\test1\gridwork)**

3. Run tpos.aml

   (Usage: Arc: **andr tpos.aml**)

4. When prompted, enter the DEM name, the first neighborhood radius (in meters), and the second neighborhood radius (in meters). The suggested radii are 300m and 2000m.

The AML script will generate the following grids:

- topographic position at the first neighborhood radius
- topographic position at the second window neighborhood radius
- zonal SD and zonal mean of each – used to re-scale the index values.
- slope, as an integer grid

Step 2: Derive Solar Flux

1. Decompress the contents of solarflux.tar.gz into the ‘gridwork’ directory. This will create a sub-directory called \gridwork\solarflux\

2. Copy the station files (j81.sf, j172.sf) into the \solarflux\ directory. Steps 3-7 describe how to edit the station files to fit your study area.

3. Choose the dates and the hour increment for which you would like to calculate the solar flux. Convert these to the Julian calendar (0-365). Note that the two equinoxes, March 21 and September 21, receive virtually identical clear-sky insolation, and do not need to be calculated separately.

4. Determine the approximate latitude, in degrees, of a point near the center of the study area. Using this latitude value, determine the approximate time of sunrise and sunset for each date selected in step 2, using the ephemeris generator at http://ssd.jpl.nasa.gov/cgi-bin/eph

5. Create a station file for each day selected in step 2 by editing the following lines in j81.sf. The station files are text files that set the parameters of the analysis. j81.sf and j172.sf are included as templates. Edit the following lines in each station file:

   day <julian calendar day> for example, for March 21st: **81**
   start_time <start time> for example, for 9am: **9.0**

end_time <end time> for example, for 6pm: **18.0**
increment <hour increment> for example, hourly: **1**
latitude <latitude> for example, for latitude=50: **50**
in_grid <location of input dem grid> for example:
D:\ncascades\gridwork\OK_dem
hillshade_on_outgrid <name of output grid> for example: **j81**

6. In /solarflux/solarflux.aml, edit the pathname in the following line:

   andsv sfpath /apps/solarflux

   (for example, change to **andsv sfpath D:\ncascades\gridwork\solarflux**).

7. Open an ARC/INFO workstation session, and navigate to the solarflux workspace.

   (for example, with Arc: **w D:\ncascades\gridwork\solarflux**)

   ignore the message '**WARNING: New location is not a workspace.**'

   NOTE: the dem grid does not have to be located in \solarflux\, but the dem path must be specified in the station files.

8. Start GRID and run the solarflux routine from the GRID prompt, as follows:

   Arc: grid
   Grid: andr SOLARFLUX FILE < list of station files >

   if you had chosen two dates and created the corresponding station files, the syntax would be: **Grid: andr SOLARFLUX FILE j81.sf j172.sf**

   When prompted with **Enter Station File:**, press <enter>

   NOTE: The solarflux calculation may take several hours to finish and tie up your CPU, so you may wish to start this process at the end of the day and let it run overnight.

9. Once the solarflux calculations are complete, calculate composite annual solar flux. For example, the following calculates composite solar flux as the sum of the two equinoxes and the summer solstice. Values are divided by 10,000 to allow building a grid VAT; the reduced precision is insignificant for this analysis.

   Grid: SFLUX1 = INT((2 * j81 / 10000) + (j172 / 10000) + 0.5)

10. Once you're satisfied with the result, delete the intermediate grids, which are floating-point and take up a lot of disk space.

Step 3: Re-scale the index values

1. Copy sflux1 into the \gridwork\ workspace
2. Navigate to the \gridwork\ workspace. If the names of the four factor grids are not tpi300, tpi2000, slope_i, and sflux1, change the factor names in rescale.aml.
3. Run rescale.aml **(GRID: andr rescale.aml)**

The resulting re-scaled grids will be the input factors for the cluster analysis. The name of each re-scaled grid will have an 'rc' suffix.

Step 4: Run cluster analysis and map the results

1. Navigate to the \gridwork\ workspace. If the names of the four factor grids are not tpi300, tpi200, slope_i, and sflux1, change the factor names in clustermap.aml, including the 'rc' suffix.
2. Run clustermap.aml (GRID: andr clustermap.aml)

NOTES:

Clusters containing fewer than the minimum number of cells specified by ISOCLUSTER will be subsumed into the most similar cluster. Hence, the number of mapped clusters may be less than the specified number of classes.

Occasionally the ISOCLUSTER analysis will generate erroneous results, and the subsequent MLCLASSIFY command will generate an error message similar to:

ERROR: The covariance matrix of input class 7 is singular.
MLClassify failed!

This problem can be corrected by changing the sampling interval or the number of classes specified in the ISOCLUSTER command (for example, changing the sampling interval from 10 to 11), and running MLCLASSIFY again with the new signature file.

2.3.5 Discussion

- **Terrestrial Systems**

Ecological Land Units

While any attempt to reduce and classify such a large area with its inherent ecological variability must, at some level, be disappointing to an ecologist, or land-based stakeholder, the ELU scheme we present represents a reasonable compromise between covering a large area with little data available and including enough ecology to allow reasonable coarse-scale interpretation for planning purposes. Any site level work would necessarily have to investigate the specific location of species, etc., at a finer scale but that sort of detail is hard to meaningfully put into a regional context.

2.3.6 Statement of limitations

- **Terrestrial Systems**
  - Final representation of Ecological Systems (ES) with available information required merging ES into fewer than the 66 ES initially defined for the Okanagan ecoregion. Assumptions, reasons and rationale for merging ES vary with systems and with layer used in representation. Below discusses generalizations that limit representation of ES.

Many large patch ES types are included in the variation of matrix types because of the lack of consistency between province and state data and among land management ownerships in Washington. For example, following the expert reviews, it was apparent that the Rocky Mountain Lodgepole Pine ES was defined as being confined to ESSF in BC but not mapped by any BEC-BEU combination. Although it is mapped in WA as a cover type, it was included in and represented by the Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland ES.

Small patch ES types are not well represented by our mapping because of spatial scale and limited spatial layers depicting them. Small patch types are listed by which matrix types they most likely appear. To increase the opportunity to capture large patch and small patch ES types, selection rules were written to capture the range of general landform types for each matrix system. For example, concave landforms of a particular matrix type will likely capture a set of wetland types, and convex will capture grassland or shrubland types

Rationale for representation of linear or riparian ES can be grouped into three strategies: 1) using a model which defined valley bottomland which in combination with matrix type or BEC zone represent specific riparian ES (Heiner 2005). For example, the Northern Rocky Mountain Lower Montane Riparian Woodland are valley bottoms in the Northern Rocky Mountain Montane mixed conifer system, 2) a similar general landform in matrix list as with small patch wetland types, and 3) in Washington, the Utah State deciduous cover type combined with valley bottom define forest and woodland riparian areas. Equivalent mapping of cottonwood in BC was acquired as part of the southern Okanagan grassland mapping project. The BC cottonwood mapping is a fine-scale representation without a WA equivalent and was used in final portfolio evaluations. Agricultural land and urban areas were clipped from the valley bottoms.

Representation of terrestrial systems did not include any estimation of ecological condition or integrity, that is, highly altered locations are not explicitly distinguished from undisturbed locations. We assumed that removing the agriculture, urban, developed area layers, the factors in the suitability index, and co-occurrence of fine-filter targets will differentiate higher from lower quality areas.

- **Limitations on use with regard to scale**

The accuracy of these map units is scale-dependent. While the map of systems is appropriate for use at the ecoregional level, this information should be regarded as a coarse-scale representation of the potential distribution of existing vegetation.

- **Fine-filter**

The Nature Conservancy (U.S.) and the Nature Conservancy of Canada have traditionally emphasized a fine-filter approach. In all cases, the fine-filter is dependent on reasonably comprehensive, or at least well-distributed, biological surveys to be most useful. Although surveys are typically not comprehensive for most ecoregions, to neglect areas known to be rich in element occurrences or other ecological values simply because survey data across the region are incomplete would be foolhardy. The fine-filter approach works well for plants and small-bodied animals, especially in regions where biodiversity databases (e.g., Conservation Data Centres/Natural Heritage Programs) are reasonably complete. It is not as well suited for large-bodied or wide-ranging animals, such as grizzly bears and salmon, whose life requisite needs are poorly represented through occurrence data.

Refer to Appendix 5 for details of specific goals for fine-filter targets.

2.3.7 *Data Gaps*

- **Terrestrial coarse-filter**

Scale and concept of matrix-forming system

Matrix forming systems by definition contain considerable environmental, ecological and genetic variation. Spatial data developed for this assessment is only accurate at a coarse scale. Our means of accounting for this internal heterogeneity was to stratify the matrix-forming systems by landforms

Wetland systems

The best-available spatial data was not adequate to map the four wetland systems accurately and consistently across the ecoregion. While we could not map and therefore directly choose wetlands, it is assumed that some were captured as part of the mapped area of matrix and large patch ecological systems, especially as low-lying landforms.

List of un-mapped wetland systems:

Temperate Pacific Subalpine-Montane Wet Meadow (small patch)
Temperate Pacific Tidal Salt and Brackish Marsh (small patch)
North Pacific Bog and Fen (small patch)
North Pacific Hardwood-Conifer Swamp (large patch)

3.0 Freshwater Methodology

3.1 Freshwater Coarse-filter Targets

Freshwater coarse-filter targets are freshwater ecosystems that consist of a group of strongly interacting freshwater and riparian / near-shore communities held together by shared physical habitat, environmental regimes, energy exchanges, and nutrient dynamics. They vary in their spatial extent, have indistinct boundaries, and can be hierarchically nested within one another depending on spatial scale (e.g., headwater lakes and streams are nested within larger coastal river systems). Perhaps the most distinguishing features of freshwater ecosystems from terrestrial ecosystems are their variability in form and their dynamic nature. They are extremely dynamic in that they often change where they exist (e.g., a migrating river channel) and when they exist (e.g., seasonal ponds) in a time frame that we can experience. Freshwater ecosystems are nearly always found connected to and dependant upon one another, and as such they form drainage networks that constitute even larger ecological systems. They exist in many different forms, depending upon their underlying climate, geology, vegetation, and other features of the watersheds in which they occur. In very general terms, however, freshwater ecosystems fall into three major groups: standing-water ecosystems (e.g., lakes and ponds); flowing-water ecosystems (e.g., rivers and streams); and freshwater dependent ecosystems that interface with the terrestrial ecosystems (e.g., wetlands and riparian areas).

Freshwater ecosystems support an exceptional concentration of biodiversity. Species richness is greater relative to habitat extent in freshwater ecosystems than in either marine or terrestrial ecosystems. They contain approximately 12% of all species, with almost 25% of all vertebrate species concentrated within these freshwater habitats (Stiassny 1996). The richness of freshwater species includes a wide variety of plants, fishes, mussels, crayfish, snails, reptiles, amphibians, insects, micro-organisms, birds, and mammals that live beneath the water or spend much of their time in or on the water. Many of these species depend upon the physical, chemical, and hydrologic processes and biological interactions found within freshwater ecosystems to trigger their various life cycle stages (e.g., spawning behavior of a specific fish species might need to be triggered by adequate flooding at the right time of the year, for a sufficient duration, and within the right temperature range, etc.; seed germination of a particular plant might require a different combination of variables).

Freshwater ecosystems support almost all terrestrial animal species since these species depend on freshwater ecosystems for water, food and various aspects of their life cycles. In addition, freshwater ecosystems provide environmental services such as electricity, drinking water, waste removal, crop irrigation and landscaping, transportation, manufacturing, food source, recreation, religion and sense of place, that form the basis of our economies and social values.

3.2 Classification of freshwater ecosystems

The classification of freshwater ecosystems is a relatively new pursuit. This classification model builds off of the BC freshwater ecosystem classifications completed for the Coast Information Teams' ecosystem spatial assessment (Rumsey et al. 2004) and the Muskwa Kechika's Conservation Area Design (Heinemeyer et al. 2004). For classification purposes, freshwater ecosystems are defined as networks of streams, lakes and wetlands that are distinct in geomorphological patterns, tied together by similar environmental processes (e.g., hydrologic and nutrient regimes, access to floodplains) and gradients (e.g., temperature, chemical and habitat volume), occur in the same part of the drainage network, and form a distinguishable drainage unit on a hydrography map. Freshwater ecosystems are spatially nested within major river drainages and ecological drainage units (EDUs), and are spatially represented as watershed units (specifically BC Watershed Atlas third order watersheds and WA USGS HUC 6). They are defined at a spatial scale that is practical for regional planning. Freshwater ecosystems provide a means to generalize about large-scale patterns in networks of streams and lakes, and the ecological processes that link them together as opposed to fine-scale freshwater systems which capture a detailed and often quite complex picture of physical diversity at the stream reach and lake level.

3.3 Methods

The types and distributions of freshwater ecosystems are characterized based on abiotic factors that have been shown to influence the distribution of species and the spatial extent of freshwater community types. This method aims to capture the range of variability of freshwater system types by characterizing different combinations of physical habitat and environmental regimes that potentially result in unique freshwater ecosystem and community types. It is virtually impossible to build a freshwater ecosystem classification founded on biological data given that freshwater communities have not been identified in most places, and there is generally a lack of adequate survey data for freshwater species. Given that freshwater ecosystems are themselves important targets for conservation because they provide a coarse-filter target and environmental context for species and communities, a classification approach that identifies and maps the diversity and distribution of these systems is a critical tool for comprehensive conservation and resource management planning. An additional advantage of such an approach is that data on physical and geographic features (hydrography, land use and soil types, roads and dams, topographic relief, precipitation, etc.), which influence the formation and current condition of freshwater ecosystems, is widely and consistently available.

The proposed freshwater ecosystem classification framework is based to a large extent on The Nature Conservancy's classification framework for aquatic ecosystems (Higgins et al. 2003). The framework classifies environmental features of freshwater landscapes at two spatial scales. It loosely follows the hierarchical model of Tonn (1990) and Maxwell et al. (1995). It includes ecological drainage units that take into account regional drainage (zoogeography, climatic, and physiographic) patterns, and mesoscale units (coarse-scale freshwater systems) that take into account dominant environmental and ecological processes occurring within a watershed.

Nine abiotic variables were used to delineate freshwater ecosystem types that capture the major abiotic drivers of freshwater systems: drainage area, underlying biogeoclimatic zone and geology, stream gradient, accumulative precipitation yield, lake and wetland influence, glacial connectivity, and Melton's R. Table 1 describes each variables and identifies its data source. These variables are widely accepted in the literature as being the dominant variables shaping coarse scale freshwater systems and their associated communities and also strongly co-varying with many other important physical processes (i.e., Vannote et al. 1980; Mathews 1998; Poff and Ward 1989; Poff and Alan 1995; Lyons 1989; Hart and Finelli 1999; Lewis and Magnuson 1999; Newall and Magnuson 1999; Brown et al. 2003).

Table A9.1. Summary of data used in freshwater ecosystem classification.

VARIABLE	DESCRIPTION	SOURCE
Accumulative precipitation yield	Accumulative precipitation yield per upstream drainage	ClimateSource
Drainage Area	Accumulative drainage area per upstream drainage	BC Watershed Atlas; USGS HUC calculated watersheds
Percentage of lake area to watershed polygon area	Percentage of lake area in each watershed polygon	BC Watershed Atlas; NHD dataset
Percentage of wetland area to watershed polygon area	Percentage of wetland area in each watershed polygon	BC Watershed Atlas; NHD dataset
Percent glacial influence	Percentage of accumulative upstream drainage area that is currently glaciated	BC Watershed Atlas; NHD dataset
Biogeoclimatic Zone / Shining Mountains Zone	Percentage of each watershed polygon within each of the 14 biogeoclimatic zones	BC Ministry of Forests (2004) Qbei_bc coverage from ARCWHSE
Geology	Percentage of accumulative upstream drainage in each of the 5 geology classes	BC Ministry of Energy and Mines at 1:250,000; WA DNR 1:100,000
Mainstem and Tributary Stream Gradient	Percentage of mainstem and tributary reaches of each watershed polygon in each of 6 gradient classes	BC Watershed Atlas, and BC 25m DEM; USGS HUC

3.4 *Statistics*

Descriptive statistics (mean, standard deviation, skewness, and variance) were calculated for each variable. Variables that were highly skewed (skewness values >=2) were log 10 transformed to help meet the assumptions of normality for parametric statistics. Variability in categorical variables such as gradient classes, biogeoclimatic zones, geology classes was reduced into two continuous axes using nonmetric multidimensional scaling. All variables were normalized for proportional comparisons between variables. Cluster analysis was performed on all normalized variables (agglomerative hierarchical clustering (Sorensen, flexible beta of –0.25)), and 46 freshwater system types were selected (Map 9).

3.5 *Results and Discussion*

Okanagan, Middle Fraser, and Thompson EDUs collectively consist of 3,927 freshwater systems that were classified into 46 freshwater system types. Table 2 summarizes the characteristics of each system type. Table 3 summarizes the classification of these freshwater ecosystems into system types within each of the EDUs. Map 9 spatially summarizes the abundance and distribution of these freshwater system types within each of the EDUs.

Table A9.2. Summary of freshwater ecosystem types

Eco-system ID	Drainage Area (km^2)[1]	Accumulative Precipitation Yield[1]	Biogeo-climatic Zone	Mainstem Gradient[1]	Tributary Gradient[1]	Lake Influence[1]	Wetland Influence[1]	Glacial Influence	Under-lying Geology
1	10-100	moderate	Alpine tundra	shallow	moderate	moderate	low	high	Intrusive
2	10-100	moderate	Alpine tundra	shallow	moderate	moderate	low	high	Intrusive
3	10-100	moderate	Interior Douglas- fir	moderate	steep	moderate	low	none	Volcanic
4	10-100	low	Sub-boreal spruce	moderate	steep	moderate	high	none	Alluvium
6	10-100	moderate	Coastal western hemlock	shallow	moderate	moderate	low	low	Intrusive
10	1000-10000	moderate-high	Sub-boreal spruce	shallow	moderate	very high	moderate	low	Volcanic
11	10-100	moderate	Alpine tundra	shallow	shallow	moderate	low	high	Intrusive
25	10-100	moderate	Interior Douglas- fir	moderate	steep	low	low	none	Volcanic
28	100-1000	high	Coastal western hemlock	shallow	moderate	moderate	low	low	Intrusive
38	>100000	very high	Sub-boreal spruce	shallow	shallow	moderate	moderate	low	Volcanic
40	100-1000	moderate-high	Interior Douglas- fir	moderate	moderate	very high	low	low	Intrusive
56	100-1000	moderate	Interior Douglas- fir	shallow	steep	low	low	low	Sedimen-tary

Eco-system ID	Drainage Area (km^2)[1]	Accumulative Precipitation Yield[1]	Biogeo-climatic Zone	Mainstem Gradient[1]	Tributary Gradient[1]	Lake Influence[1]	Wetland Influence[1]	Glacial Influence	Under-lying Geology
57	10-100	low	Engelmann spruce - subalpine fir	shallow	moderate	moderate	low	none	Sedimentary
61	10-100	moderate	Engelmann spruce - subalpine fir	moderate	steep	moderate	low	low	Sedimentary
65	10-100	low	Engelmann spruce - subalpine fir	moderate	moderate	high	high	low	Sedimentary
68	10-100	moderate	Sub-boreal spruce	shallow	steep	low	moderate	none	Sedimentary
80	10-100	moderate	Engelmann spruce - subalpine fir	shallow	steep	low	moderate	none	Intrusive
81	10-100	moderate	Sub-boreal spruce	shallow	steep	high	high	none	Volcanic
84	100-1000	moderate-high	Engelmann spruce - subalpine fir	moderate	steep	moderate	moderate	low	Sediment ary
99	10-100	moderate	Engelmann spruce - subalpine fir	shallow	moderate	moderate	high	low	Sedimentary
101	100-1000	moderate	Sub-boreal spruce	shallow	shallow	very high	high	low	Volcanic
106	1000-10000	moderate-high	Interior Douglas- fir	shallow	moderate	high	moderate	moderate	Intrusive
107	10-100	moderate	Sub-boreal spruce	shallow	shallow	high	high	none	Volcanic
122	10-100	low	Sub-boreal spruce	moderate	moderate	high	high	none	Volcanic
133	1000-10000	moderate-high	Sub-boreal spruce	shallow	shallow	high	high	low	Volcanic
139	10-100	moderate	Sub-boreal spruce	shallow	shallow	moderate	high	none	Sedimentary
145	100-1000	moderate	Sub-boreal spruce	shallow	steep	high	high	none	Volcanic
150	10-100	moderate	Sub-boreal spruce	moderate	steep	high	high	none	Volcanic
153	10-100	low	Engelmann spruce - subalpine fir	moderate	moderate	moderate	high	none	Intrusive
164	100-1000	moderate	Sub-boreal spruce	shallow	shallow	high	high	none	Volcanic

Eco-system ID	Drainage Area (km^2)[1]	Accumulative Precipitation Yield[1]	Biogeo-climatic Zone	Mainstem Gradient[1]	Tributary Gradient[1]	Lake Influence[1]	Wetland Influence[1]	Glacial Influence	Under-lying Geology
188	1000-10000	moderate-high	Interior Douglas- fir	shallow	shallow	low	low	low	Intrusive
197	100-1000	moderate	Montane spruce	moderate	moderate	moderate	moderate	none	Intrusive
236	10-100	moderate	Sub-boreal pine-spruce	shallow	shallow	moderate	moderate	none	Alluvium
275	100-1000	moderate	Interior Douglas- fir	moderate	moderate	high	moderate	none	Alluvium
280	100-1000	moderate	Interior Douglas- fir	steep	steep	high	high	low	Alluvium
295	100-1000	high	Sub-boreal spruce	shallow	moderate	moderate	high	none	Intrusive
296	100-1000	moderate	Bunchgrass	shallow	shallow	low	low	none	Alluvium
326	10000-100000	high	Bunchgrass	moderate	steep	moderate	low	low	Intrusive
338	100-1000	high	Coastal western hemlock	shallow	steep	high	moderate	low	Sedimentary
367	100-1000	moderate	Sub-boreal spruce	shallow	moderate	high	high	none	Volcanic
403	10000-1000000	high	Bunchgrass	shallow	shallow	moderate	moderate	low	Intrusive
426	10-100	moderate	Sub-boreal spruce	steep	steep	high	very high	none	Sedimentary
503	10-100	moderate	Coastal western hemlock	steep	steep	low	low	none	Sedimentary
559	10-100	low	Alpine Tundra	shallow	moderate	moderate	low	high	Sedimentary
1231	100-1000	moderate-high	Engelmann spruce - subalpine fir	shallow	moderate	high	moderate	high	Sedimentary
1305	1000-10000	moderate-high	Sub-boreal spruce	shallow	shallow	high	high	none	Volcanic

Drainage Area (km^2)	10-100; 100-1000, 1000-10000, 10000-100000, >100000
Accumulative Precipitation Yield	Low = >10000000; Moderate = 100000000-1000000000; High = 1000000000-10000000000; Very High = >100000000000
Mainstem Gradient	Shallow = <0.2; Moderate = 0.2 - 0.16; Steep = >0.16
Tributary Gradient	Shallow = <0.2; Moderate = 0.2 - 0.16; Steep = >0.16

Lake Influence	Low = <0.2% of watershed unit area; Moderate = 0.2 - 1.0%; High = 1.0 - 10.0%; Very High = >10.0%
Wetland Influence	Low = <0.2% of watershed unit area; Moderate = 0.2 - 1.0%; High = 1.0 - 10.0%; Very High = >10.0%
Glacial Influence	None; Low = <1.0 % of upstream drainage; Moderate = 1.0 - 5.0%; High = >5.0%

Table A9.3. Summary of freshwater system types by EDU.

	Okanagan	Middle Fraser	Thompson
Total number of watershed units	1045	1964	918
Total number of freshwater coarse-filter target types	34	43	41

A conservation goal of 30% was set for each freshwater coarse-filter system target type which was then stratified by EDU to ensure representation across EDUs. Freshwater ecosystem types derived from this assessment have value beyond supporting priority setting for biodiversity conservation. Freshwater ecosystem types can be used for evaluating and monitoring ecological potential and condition, predicting impacts from disturbance, and defining desirable future conditions. In addition, they can be used to inform sampling programs for biodiversity assessment and water quality monitoring, which requires an ecological framework in addition to a spatial framework to stratify sampling locations (Higgins et al. 2003).

We realize that this classification framework is a series of hypotheses that need to be tested and refined through additional data and expert review. We recommend that concurrently, data be gathered to refine/test the classification to bring the scientific rigor needed to further its development and use by conservation partners and agencies.

4.0 Freshwater Fine-filter Targets

Target List Development

The freshwater team lead, Dr. Kristy Ciruna from NCC, worked with the animals team lead, Jeff Lewis from the Washington Department of Fish and Wildlife to generate a list of freshwater fine filter targets. Additional review was provided by:

- Peter Skidmore – Aquatic Ecologist, The Nature Conservancy
- Sairah M. Tyler – Conservation Planning Consultant, Nature Conservancy of Canada, Subteam Lead
- George Wilhere – Conservation Biologist, Washington Department of Fish and Wildlife

A total of freshwater fine filter 48 targets were identified, 35 of which had spatial data. An additional 28 secondary targets, 18 with spatial data, were also identified. Species spanned the range of fish, amphibians, reptiles, mollusks, birds, insects, vascular plants and mammals. All 6 species of salmon and 4 separate populations of White sturgeon were included on the target list. Only 2 plants were included in the list due to a lack of available data.

See Appendix 5 for a list of targets.

Data Processing - Overview of Steps

After the list of freshwater fine filter targets was developed, the following steps were taken to collect and process the spatial data representing the targets.

1. Collect spatial datasets and document metadata;
2. Clean and normalize the datasets;
3. Separate each dataset into categories;
4. Merge similar spatial types (points with points / lines with lines etc.) together within each category;
5. Creation of MARXAN tables; and
6. Establish goals for each target.

1. Collect Data

Spatial data used to map the distribution of each target were collected from:

- BC Fisheries/Canadian Department of Fisheries and Oceans (DFO): Fisheries Information Summary System (FISS)
- American Fisheries Society (AFS): Fish Occurrence Data
- Pacific States Marine Fisheries Commission (PSMFC): StreamNet Project (Anadromous Fish)
- Washington Department of Fish and Wildlife (WDFW): Salmonid Stock Inventory (SaSI) and EDT

Additionally, datasets acquired from the following sources for the terrestrial fine filter were used to populate the freshwater fine filter:

- US National Forests: Colville, Wenatchee, and Okanogan
- Washington Department of Fish and Wildlife: including datasets specific to Herps, Spadefoot Toad, Mussel and Dragonfly
- BC Ministry of Water, Land, Air Protection: including data from the Conservation Data Centre

Data was collected to the extent of the EDU boundaries analyzed for this project.

2. Clean and Normalize Data

The following tasks were performed on all freshwater fine-filter datasets:

1. Project into BC Albers projection, NAD83 datum;

2. Clip to the Okanagan Ecological Drainage Units (Okanagan, Thompson, Middle Fraser, Upper Fraser);
3. Delete records for all non-target species;
4. Delete records where the last observation was older than 20 years;
5. Delete records where the "locational accuracy" was zero;
6. Delete records that did not include basic information on species or date recorded;
7. Standardize the species code field across all datasets. A species code field was created if none existed. For example, some datasets referred to Pinkeye Salmon as Pink, PINK, or PK; so all were standardized to PK. (see Section 4.1)
8. Standardized the data source field. A source field was created if none existed.
9. Assign a 3-digit unique ID to each species. (see Section 4.1)

3. Separate Each Dataset into Categories

Datasets were broken into the following categories (Note: The lists below includes the common name for all species on the target list, regardless of target status – target, retro, not target).

Aquatic Species (salmonid)

Salmon		
-Chinook	-Coho	-Sockeye
-Chum	-Pink	-Steelhead

Aquatic Species (non-salmonid)

Freshwater Fish			*Mollusks*
- Bull Trout	-Pacific Lamprey	-Umatilla Dace	-California Floater
-Chiselmouth	-Pygmy Longfin Smelt	-Westslope Cutthroat Trout	-Oregon Floater
-Lake Chub	-Pygmy Whitefish	-White Sturgeon (4 populations)	-Western Floater
-Leopard Dace	-Salish Sucker		-Western Ridgemussel
-Mottled Sculpin	-Shorthead Sculpin		-Western Pearlshell
-Northern Mountain Sucker	-Speckled Dace		

Non-aquatic Species

Insects	***Dragonflies***	***Birds***	*Amphibians*	***Reptiles***	***Mammals***
Beaverpond Baskettail	Black-tipped darner	American avocet	Coastal Giant Salamander	Painted Turtle	Mountain Beaver, Rainieri Subspecies
	Boreal whiteface	American bittern	Coastal tailed frog		
Black Petaltail	Familiar bluet	American dipper	Coeur d'Alene Salamander		Mountain Beaver, Rufa Subspecies
Blue Dasher	Forcipate emerald	American White Pelican	Columbia Spotted Frog		
Grappletail	Kennedy's emerald		Great Basin Spadefoot		Pacific Water Shrew
	Lance-tipped darner	Cinnamon teal	Northern leopard frog		
	nez Perce dancer	Common Loon	Oregon Spotted Frog		
	Olive clubtail	Forster's tern	Tiger Salamander		
	Pronghorn clubtail	Greater scaup	Western toad		
	River jewelwing	Green Heron		*Vascular Plants*	
	Subarctic bluet	Harlequin duck		Leafy Pondweed	
	Subarctic (muskeg) darner	Long-billed curlew		Nuttall's waterweed	
	Sweetflag spreadwing	Ruddy Duck			
	Twelve-spotted skimmer	Sandhill Crane			
	Vivid dancer	Trumpeter swan (S. Thompson R.)			
	Western pondhawk				
	Western river cruiser	Upland Sandpiper			
	Zigzag darner	Veery			
		Western grebe			
		Willow flycatcher			
		Wilson's phalarope			
		Yellow rail			
		Yellow warbler			

4. Merge Similar Spatial Types Together

For each of the groups of freshwater targets (salmonid, non-salmonid aquatic and non-aquatic) a similar procedure was followed. The specific steps for salmonid are described below. Variances to those steps for non-salmonid species are described afterwards.

Aquatic Species (salmonid)

1. All shapefiles were converted into coverages.
2. A unique ID was added to each record, allowing users to return to the source data to look up related information. All source coverages were archived as ArcInfo export (.e00) files.

3. All database attributes from each coverage were deleted, except for SPP_CODE, SOURCE, and UNI-ID[10]. Each species was assigned a unique 2-4 letter species code if the source data did not provide such a code.

4. Datasets representing targets as occurrences / points were appended into one coverage. Datasets representing targets as habitat / lines were appended into another coverage. There were 2 salmonid point and 3 line datasets.

5. Because data for a target was, in many instances, provided as point data from one source and line data from another, additional processing were required to incorporate both types of data into the analysis. Point data was attributed to lines by undertaking the following steps

    a. Each species from the point coverage was broken out into individual species layers;

    b. Each layer was attributed to a stream segment (macro reach) using the ArcInfo NEAR and JOINITEM commands, All lines from the stream coverage which had no identified salmonid presence were deleted.[11]

    c. Comparisons made between the line coverage create from points and the original line coverage – duplication removed. [12]

    d. All 6 individual line coverages (one for each species) created from the point coverage were merged into one file.

6. Targets represented by the EDT source data was removed from all of the processed input layers (summer steelhead, summer and fall Chinook and spring Chinook).

7. The line layers were intersected with the watershed layer in order to locate each portion of target habitat (stream segment) within a specific watershed and EDU. Salmonid were in some cases stratified by other units, such as ESU or XAN – these are listed in Section 4.1[13] Output tables were merged.

8. A database consisting of each species' common name, scientific name, species code, and 3-digit species id was linked to the output database from the previous step.

9. The resulting database then had the following actions performed:

    a. Converted to XLS and unnecessary fields deleted;

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[10] FISS and SaSI datasets had attributes for spawning, rearing and holding areas for each species. These were merged for this analysis by species. In the next iteration spawning, rearing and holding should remain separate and goals set for each type of habitat, so all are represented in the portfolio.

[11] This step may have introduced some error. The stream layer used did not incorporate centerlines for polygon features (lakes). Some point data that may have represented target species population in lakes as opposed to streams would have been incorrectly attributed to nearby stream segments or not attributed to a line segment and deleted.

[12] There may still be some double counted some lengths because StreamNet and SaSI were contained similar data (SaSI was derived from StreamNet). There was also identified overlap between

[13] Each watershed (assessment unit) was assigned a unique id (pu-id). Watersheds were intersected with each stratification unit (EDU, XAN Unit, Steelhead ESU, Chinook ESU, and Sockeye ESU), showing which stratification units each watershed falls in. Some watersheds were included in multiple stratification units.

b. All records with a watershed unit id ('pu-id') of 0 were deleted (this data was outside of the EDUs being analyzed through this project);

c. A 6-digit species code was developed for each species.

   i. Stratification Unit: 2-digit stratification unit code based on EDU or other stratification unit (See Appendix 1 for a list of the Stratification Units and associated Ids)

   ii. Aquatic Unit: coded "4"—referring to Aquatic Systems.

   iii. Species Id: 3 digit field – see Step 2 in methods.

Freshwater Analysis: Aquatic Species (non-salmonid)

Data provided from different sources (8 datasets) was broken out for each species. Point data was attributed to the nearest stream reach using the ArcInfo command NEAR and JOINITEM. Each layer (species) was then visually compared and duplicate habitat information deleted. For the Okanagan ERA, the nature of many of the data sources necessitated representing non-salmonid aquatic species using km of stream habitat[14] - future iterations should consider allocating the time to create element occurrences for non-salmonid targets.

Three species of mollusks were provided in one polygon layer. Because the location of these targets overlapped, each species was broken into their own layer and then intersected with the analysis units. Once intersected, the same steps applied to the salmonid targets were followed.

Freshwater Analysis: Non-aquatic Species

Similar steps were followed for non-aquatic targets as for aquatic targets. There were 6 separate layers of non-aquatic targets, merged into one coverage. However steps differed at step 4; since non-aquatic species were treated as Element Occurrences, points were not attributed to the nearest stream reach. Similar steps as above were followed for intersecting with the analysis units and assigning the six digit species code.

5. Creation of Marxan Tables

Output tables from Step 4 were merged according to the three categories described above and the following steps were taken to prepare the tables for MARXAN:

1. The 6-digit unique species id was merged with the unique analysis unit identifier. The two fields, consisting of the merged Species ID-Planning Unit ID (SPP_ID_PU-ID) and the Amount field (referring to the area, length of stream habitat, or number of occurrences), were pasted into a new worksheet.

2. The two columns were sorted and then subtotaled so that each unique species id falling in the same watershed would be totaled. This provided the area, length of stream habitat, or number of occurrences that are located in each analysis unit for each target species.

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[14] Data from BC sources was provided as lines – stream habitat. Data from WA sources was provided as points.

3. The subtotals were transferred to a new table and the species ID and assessment unit ID parsed – this became the basis for the Marxan table PUVSPR. Grand totals for each target species, as EO, area or km habitat, were also generated and this because the basis for establishing goals in the next step.

6. Set Goals for Each Species Occurrence

For targets in each EDU where the source data was habitat-based (spawning and rearing), goals were applied based on defaults suggested by Comer (2003), with changes to the defaults as shown in the table below.[15] Variations from the default goals were based upon expert knowledge of the freshwater team. NOAA fisheries biologists agreed that 50% of spawning and rearing habitat should be used for salmon in the USA, regardless of whether the targets are listed.

	British Columbia	Stratified By	Washington	Stratified By
Chinook Salmon	30%	EDU	50% 30%	ESU or EDU
Chum Salmon	30%	XAN	30%	EDU
Coho Salmon	30%	EDU	30%	EDU
Coho Salmon—Interior Fraser (In Thompson, Lower Fraser, Upper Fraser)	50%		n/a	n/a
Pink Salmon	30%	XAN	30%	EDU
Sockeye Salmon	30%	EDU	50% 30%	ESU or EDU
Sockeye Salmon—Adams River*	50%		n/a	n/a
Sockeye Salmon—Sakinaw Lake*	50%		n/a	n/a
Sockeye Salmon—Cultus Lake*	50%		n/a	n/a
Steelhead Salmon	30%	EDU	50% 30%	ESU or EDU
Steelhead Salmon—Thompson Drainage	50%		n/a	n/a
Aquatic Non-Salmonid	30%	EDU	30%	EDU

* These were given a 30% goal this iteration, but should upgraded to 50% in the next iteration.

Goals for targets (some aquatic freshwater targets and all non-aquatic freshwater targets) where the source data identified the number of occurrences were based on defaults suggested by Comer (2003), with modifications based on the amount available. See Appendix 5 for a list of targets.

Considerations for Next Iteration

1. Set correct goals for the sockeye sub-species which should be targets by determining which watersheds those hydrology units fall within, and then adjusting the goals within the MARXAN tables for that particular species and watershed.

---

[15] FISS and SaSI had attributes for spawning, rearing and holding areas for each species. These were merged for this analysis by species. In the next iteration spawning, rearing and holding should remain separate and goals set for each type of habitat, so all are represented in the portfolio.

2. Break out by spawning, rearing and holding for salmon.
3. For data where there was a mix of EO data (point) and habitat data (line), work with data providers to determine if it would be appropriate to turn all the data into habitat or occurrence data. If not, consider having each type of data as a separate target in MARXAN. For example, there could be 2 targets for Bull Trout in an EDU – one based on Element Occurrence and one based on habitat. Caution would be required to ensure information is not double-counted (e.g. an occurrence representing the same geographic space a stream segment of habitat).
4. Consider TNC method for using class 1, 2 and 3 watersheds in freshwater analysis.

4.1 Species ID Designations

The 1st 2 Digits of Species ID Correspond to Their Stratification Unit

19	EDU—Middle Fraser
20	EDU—Upper Fraser
21	EDU—Okanagan
22	EDU—Thompson
26	ESU—Sockeye Name2: Okanogan River
27	ESU—Sockeye Name2: Lake Wenatchee
29	Xan—Columbia River
30	Xan—Fraser River
31	Xan—Puget Sound-Georgia Basin
32	EDT

The 3rd Digit of Species ID is "4" for all records, denoting an Aquatic System.

The Last 3 Digits of Species ID Correspond to a Particular Species – two species ID codes indicate the species had occurrence and habitat data used in MARXAN.

Target Common Name	Scientific Name	SPP_CODE	SPP_ID	Taxonomic Group
Coastal Giant Salamander	Dicamptodon tenebrosus	DITE	149	Amphibian
Coastal tailed frog	Ascaphus truei	ASTR	129	Amphibian
Coeur d'Alene Salamander	Plethodon idahoensis	PLID	171	Amphibian
Great Basin Spadefoot	Spea intermontana	SPIN	184	Amphibian
Northern leopard frog	Rana pipiens	RAPI	174	Amphibian
Oregon Spotted Frog	Rana pretiosa	RAPR	175	Amphibian
Tiger Salamander	Ambystoma tigrinum	AMTI	122	Amphibian
Western toad	Bufo boreas	BUBO	133	Amphibian
American avocet	Recurvirostra americana	REAM	176	Bird
American White Pelican	Pelecanus erythrorhynchos	PEER	169	Bird
Common Loon	Gavia immer	GAIM	154	Bird
Green Heron	Butorides virescens	BUVI	134	Bird
Long-billed curlew	Numenius americanus	NUAM	164	Bird
Sandhill Crane	Grus canadensis	GRCA	157	Bird
Trumpeter swan (S. Thompson R.)	Cygnus buccinator	CYBU	147	Bird
Upland Sandpiper	Bartramia longicauda	BALO	131	Bird
Western grebe	Aechmophorus occidentalis	AEOC	116	Bird
Bull trout	Salvelinus confluentus	BT	180	Fish
Lake chub	Cousius plumbeus	LKC	146 750	Fish
Leopard dace	Rhinichthys falcatus	LDC	177	Fish
Mountain sucker - N. Thompson	Catostomus platyrhynchus	MSU	137	Fish
Mountain sucker	Catostomus platyrhynchus	MSU	702	Fish
Pacific Lamprey	Lampetra tridentata		780	Fish

Target Common Name	Scientific Name	SPP_ CODE	SPP_ID	Taxonomic Group
Pygmy Longfin Smelt	Spirinchus sp. 1	PLS	185	Fish
Pygmy whitefish - Okanagan Lake	Prosopium coulteri	PW	172830	Fish
Salish Sucker	Catostomus sp. 4	SSU	138	Fish
Umatilla dace	Rhinichthys umatilla	UDC	179850	Fish
Westslope cutthroat trout	Onchorynchus clarki lewisi	WCT	166	Fish
White Sturgeon (Columbia River Pop.)	Acipenser transmontanus pop. 2	WSG	1142	Fish
White Sturgeon (Lower Fraser River Pop.)	Acipenser transmontanus pop. 4	WSG	1144	Fish
White Sturgeon (Nechako River Pop.)	Acipenser transmontanus pop. 3	WSG	1143	Fish
White Sturgeon (Upper Fraser River Pop.)	Acipenser transmontanus pop. 5	WSG	1145	Fish
Beaverpond Baskettail	Epitheca canis	EPCA	152	Insects
Black Petaltail	Tanypteryx hageni	TAHA	188	Insects
Blue Dasher	Pachydiplax longipennis	PALO	168	Insects
Grappletail	Octogomphus specularis	OCSP	165	Insects
Pacific Water Shrew	Sorex bendirii	SOBE	183	Mammals
California floater	Anodonta californiensis	ANCA	124	Mollusks
Western pearlshell	Margaritifera falcata	MAFA	163	Mollusks
Western ridgemussel	Gonidea angulata	GOAN	156	Mollusks
Painted Turtle	Chrysemys picta	CHPI	139	Reptiles
Chinook Salmon	Oncorhynchus tshawytscha	CH	211	Salmon
Chum Salmon	Oncorhynchus keta	CM	213	Salmon
Coho Salmon	Oncorhynchus kisutch	CO	214	Salmon
Pink Salmon	Oncorhynchus gorbuscha	PK	216	Salmon
Sockeye Salmon	Oncorhynchus nerka	SK	215	Salmon
Steelhead Salmon	Oncorhynchus mykiss	ST	212	Salmon
Spring Chinook Salmon (EDT)	Oncorhynchus tshawytscha	CH EDT	221	Salmon
Summer Steelhead Salmon (EDT)	Oncorhynchus mykiss	ST EDT	222	Salmon
Summer & Fall Chinook Salmon (EDT)	Oncorhynchus tshawytscha	CH2 EDT	220	Salmon
Leafy Pondweed	Potamogeton foliosus		302	Vascular Plant
Nuttall's waterweed	Elodea nuttalli		301	Vascular Plant
RETRO Target Common Name	**Scientific Name**	**SPP_ CODE**	**SPP_ID**	**Taxonomic Group**
American dipper	Cinclus mexicanus	CIME	140	Bird
Veery	Catharus fuscescens	CAFU	136	Bird
Willow flycatcher	Empidonax traillii	EMTR	150	Bird
Yellow warbler	Dendroica petechia	DEPE	148	Bird
Black-tipped darner	Aeshna tuberculifera	AETU	120	Dragonfly
Boreal whiteface	Leucorrhinia borealis	LEBO	160	Dragonfly
Lance-tipped darner	Aechna constricta	AECO	117	Dragonfly
nez Perce dancer	Argia emma	AREM	127	Dragonfly
Subarctic (muskeg) darner	Aeshna subarctica	AESU	119	Dragonfly
Subarctic bluet	Coenagrion interrogatum	COIN	141	Dragonfly
Vivid dancer	Argia vivida	ARVI	128	Dragonfly
Chiselmouth	Acrocheilus alutaceus	CMC	115	Fish
Mountain Beaver, Rufa Subspecies	Aplodontia rufa rufa		190	Mammals
Oregon floater	Anodonta oregonensis	ANOR	126	Mollusks
Western floater	Anodonta kennerlyi	ANKE	125	Mollusks
Columbia Spotted Frog	Rana luteiventris	RALU	173	Amphibian
American bittern	Botaurus lentiginosus	BOLE	132	Bird
Wilson's phalarope	Phalaropus tricolor	PHTR	170	Bird
Olive clubtail	Stylurus olivaceus	STOL	187	Dragonfly
Pronghorn clubtail	Gomphus graslinellus	GOGR	155	Dragonfly
River jewelwing	Calopteryx aequabilis	CAAE	135	Dragonfly
Twelve-spotted skimmer	Libellula pulchella	LIPU	161	Dragonfly
Western pondhawk	Erythemis collocata	ERCO	153	Dragonfly
Western river cruiser	Macromia magnifica	MAMA	162	Dragonfly
Mottled sculpin	Cottus bairdi hubbsi	CBA	142	Fish

RETRO Target Common Name	**Scientific Name**	**SPP_ CODE**	**SPP_ID**	**Taxonomic Group**
Shorthead sculpin	Cottus confusus	CCN	143	Fish
Speckled dace	Rhinichthys osculus	SDC	178	Fish
Mountain Beaver, Rainieri Subspecies	Aplodontia rufa rainieri		189	Mammals
Considered for Target (but not currently included as target) Common Name	**Scientific Name**	**SPP_ CODE**	**SPP_ID**	**Taxonomic Group**
Cinnamon teal	Anas cyanoptera	ANCY	123	Bird
Forster's tern	Sterna forsteri	STFO	186	Bird
Greater scaup	Aythya marila	AYMA	130	Bird
Harlequin duck	Histrionicus histrionicus	HIHI	158	Bird
Ruddy Duck	Oxyura jamaicensis	OXJA	167	Bird
Yellow rail	Coturnicops novaboracensis	CONO	145	Bird
Familiar bluet	Enallagma civile	ENCI	151	Dragonfly
Forcipate emerald	Somatochlora forcipata	FOEM	181	Dragonfly
Kennedy's emerald	Somatochlora Kennedyi	SOKE	182	Dragonfly
Sweetflag spreadwing	Lestes forcipatus	LEFO	159	Dragonfly
Zigzag darner	Aeshna sitchensis	AESI	118	Dragonfly

APPENDIX 10 – TERRESTRIAL ECOLOGICAL SYSTEMS DESCRIPTIONS

APPENDIX 10 TERRESTRIAL ECOLOGICAL SYSTEMS DESCRIPTIONS

The following table provides a key to the systems descriptions provided by NatureServe:

Ecological Grouping	Coarse Filter Terrestrial System Target	Terrestrial System ScientificName	GELCODE
ALPINE	North American Alpine Ice Field	• North American Alpine Ice Field	CES300.728
	Rocky Mountain Alpine Composite	• North Pacific Alpine and Subalpine Bedrock and Scree	CES204.853
		• North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow	CES204.862
		• Rocky Mountain Alpine Bedrock and Scree	CES306.809
		• Rocky Mountain Alpine Dwarf-Shrubland	CES306.810
		• Rocky Mountain Alpine Fell-Field	CES306.811
		• Rocky Mountain Dry Tundra	CES306.816
SUBALPINE PARKLAND	North Pacific Maritime Mesic Parkland	• North Pacific Maritime Mesic Subalpine Parkland	CES204.837
	Northern Rocky Mountain Subalpine Dry Parkland	• North Pacific Alpine and Subalpine Dry Grassland	CES204.099
		• Northern Rocky Mountain Subalpine-Upper Montane Grassland	CES306.806
		• Northern Rocky Mountain Subalpine Woodland and Parkland	CES306.807

		• Northern Rocky Mountain Subalpine Larch Woodland	CES306.808
SUBALPINE FORESTS	Northern Interior Lodgepole Pine-Douglas fir Woodland and Forest	• Northern Interior Lodgepole Pine-Douglas fir Woodland and Forest	CES306.New3
	Northern Interior Spruce-Fir Woodland and Forest	• Northern Interior Spruce-Fir Woodland and Forest	CES306.New1
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	• Rocky Mountain Lodgepole Pine Forest	CES306.820
		• Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	CES306.828
		• North Pacific Mountain Hemlock Forest	CES204.838
		• Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	CES306.830
MID-MONTANE FORESTS and SHRUBLANDS	East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	• East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	CES204.086
	Inter-Mountain Basins Montane Grassland and Sagebrush Steppe	• Inter-Mountain Basins Montane Sagebrush Steppe	CES304.785
		• Northern Rocky Mountain Montane Grassland	CES306.836

North Pacific Western Hemlock-Silver Fir Forest	• North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest	CES204.098
	• North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	CES204.001
	• North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	CES204.002
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland	• Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland	CES306.New2
Northern Rocky Mountain Montane Mixed Conifer Forest	• North Pacific Montane Shrubland	CES204.087
	• Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	CES306.805
	• Northern Rocky Mountain Lower Montane-Foothill Deciduous Shrubland	CES306.994
	• Northern Rocky Mountain Western Larch Savanna	CES306.837
	• Rocky Mountain Aspen Forest and Woodland	CES306.813
Northern Rocky Mountain Western Red-cedar-Hemlock Forest	• Northern Rocky Mountain Western Hemlock-Western Red-cedar Forest	CES306.802
Rocky Mountain Cliff, Canyon and Massive Bedrock	• North Pacific Montane Massive Bedrock, Cliff and Talus	CES204.093
	• Rocky Mountain Cliff, Canyon and Massive Bedrock	CES306.815

-	Not mapped individually, modeled as steep slopes in several Forested Systems	• North Pacific Avalanche Chute Shrubland	CES204.854
		• Northern Rocky Mountain Avalanche Chute Shrubland	CES306.801
LOWER TREELINE FORESTS	Rocky Mountain Ponderosa Pine Woodland and Savanna	Northern Rocky Mountain Ponderosa Pine Savanna	CES306.030
STEPPE and SHRUB STEPPE	Inter-Mountain Basins Big Sagebrush Steppe	• Columbia Plateau Scabland Shrubland	CES304.770
		• Inter-Mountain Basins Big Sagebrush Steppe	CES304.778
	Inter-Mountain Basins Cliff and Canyon	• Inter-Mountain Basins Cliff and Canyon	CES304.779
	Northern Interior Plateau Grassland	• Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	CES306.040
WETLAND and RIPARIAN	Columbia Basin Foothill Riparian Woodland and Shrubland	• Columbia Basin Foothill Riparian Woodland and Shrubland	CES304.768
		• Inter-Mountain Basins Greasewood Flat	CES304.780
		• Inter-Mountain Basins Playa	CES304.786
		• North American Arid West Emergent Marsh	CES300.729
	North Pacific Montane Riparian Woodland and	• North Pacific Montane Riparian Woodland and Shrubland	CES204.866

	Shrubland		
	Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	• Northern Rocky Mountain Conifer Swamp	CES306.803
		• Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	CES306.804
	Rocky Mountain Alpine-Subalpine Wetlands	• Rocky Mountain Alpine-Montane Wet Meadow	CES306.812
		• Rocky Mountain Subalpine-Montane Mesic Meadow	CES306.829
		• Rocky Mountain Subalpine-Montane Fen	CES306.831
	Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland	• Rocky Mountain Subalpine-Montane Riparian Shrubland	CES306.832
		• Rocky Mountain Subalpine-Montane Riparian Woodland	CES306.833

INTERNATIONAL ECOLOGICAL CLASSIFICATION STANDARD:

TERRESTRIAL ECOLOGICAL CLASSIFICATIONS

Ecological System Descriptions
for the
Okanagan Ecoregion

(South Central British Columbia, CA
And
North Central Washington, US)

December 2005

by

NatureServe

1101 Wilson Blvd., 15th floor
Arlington, VA 22209

This subset of the International Ecological Classification Standard covers Terrestrial Ecological Systems attributed to the Okanagan Ecoregion**.** This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Gwen Kittel, Regional Vegetation Ecologist, NatureServe Western Office, gwen_kittel@natureserve.org and Rex Crawford, Ecologist, Natural Heritage Program, Rex.Crawford@WADNR.Gov.

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Citations:
The following citation should be used in any published materials which reference ecological system and/or International Vegetation Classification (IVC hierarchy) and association data:

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NatureServe
1101 Wilson Blvd, 15th floor
Arlington, VA 22209

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[1] NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

United States
Central NatureServe Office, Arlington, VA; Eastern Regional Office, Boston, MA; Midwestern Regional Office, Minneapolis, MN; Southeastern Regional Office, Durham, NC; Western Regional Office, Boulder, CO; Alabama Natural Heritage Program, Montgomery AL; Alaska Natural Heritage Program, Anchorage, AK; Arizona Heritage Data Management Center, Phoenix AZ; Arkansas Natural Heritage Commission Little Rock, AR; Blue Ridge Parkway, Asheville, NC; California Natural Heritage Program, Sacramento, CA; Colorado Natural Heritage Program, Fort Collins, CO; Connecticut Natural Diversity Database, Hartford, CT; Delaware Natural Heritage Program, Smyrna, DE; District of Columbia Natural Heritage Program/National Capital Region Conservation Data Center, Washington DC; Florida Natural Areas Inventory, Tallahassee, FL; Georgia Natural Heritage Program, Social Circle, GA; Great Smoky Mountains National Park, Gatlinburg, TN; Gulf Islands National Seashore, Gulf Breeze, FL; Hawaii Natural Heritage Program, Honolulu, Hawaii; Idaho Conservation Data Center, Boise, ID; Illinois Natural Heritage Division/Illinois Natural Heritage Database Program, Springfield, IL; Indiana Natural Heritage Data Center, Indianapolis, IN; Iowa Natural Areas Inventory, Des Moines, IA; Kansas Natural Heritage Inventory, Lawrence, KS; Kentucky Natural Heritage Program, Frankfort, KY; Louisiana Natural Heritage Program, Baton Rouge, LA; Maine Natural Areas Program, Augusta, ME; Mammoth Cave National Park, Mammoth Cave, KY; Maryland Wildlife & Heritage Division, Annapolis, MD; Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA; Michigan Natural Features Inventory, Lansing, MI; Minnesota Natural Heritage & Nongame Research and Minnesota County Biological Survey, St. Paul, MN; Mississippi Natural Heritage Program, Jackson, MI; Missouri Natural Heritage Database, Jefferson City, MO; Montana Natural Heritage Program, Helena, MT; National Forest in North Carolina, Asheville, NC; National Forests in Florida, Tallahassee, FL; National Park Service, Southeastern Regional Office, Atlanta, GA; Navajo Natural Heritage Program, Window Rock, AZ; Nebraska Natural Heritage Program, Lincoln, NE; Nevada Natural Heritage Program, Carson City, NV; New Hampshire Natural Heritage Inventory, Concord, NH; New Jersey Natural Heritage Program, Trenton, NJ; New Mexico Natural Heritage Program, Albuquerque , NM; New York Natural Heritage Program, Latham, NY; North Carolina Natural Heritage Program, Raleigh, NC; North Dakota Natural Heritage Inventory, Bismarck, ND; Ohio Natural Heritage Database, Columbus, OH; Oklahoma Natural Heritage Inventory, Norman, OK; Oregon Natural Heritage Program, Portland, OR; Pennsylvania Natural Diversity Inventory, PA; Rhode Island Natural Heritage Program, Providence, RI; South Carolina Heritage Trust, Columbia, SC; South Dakota Natural Heritage Data Base, Pierre, SD; Tennessee Division of Natural Heritage, Nashville, TN; Tennessee Valley Authority Heritage Program, Norris, TN; Texas Conservation Data Center, San Antonio, TX; Utah Natural Heritage Program, Salt Lake City, UT; Vermont Nongame & Natural Heritage Program, Waterbury, VT; Virginia Division of Natural Heritage, Richmond, VA; Washington Natural Heritage Program, Olympia, WA; West Virginia Natural Heritage Program, Elkins, WV; Wisconsin Natural Heritage Program, Madison, WI; Wyoming Natural Diversity Database, Laramie, WY

Canada
Alberta Natural Heritage Information Centre, Edmonton, AB, Canada; Atlantic Canada Conservation Data Centre, Sackville, New Brunswick, Canada; British Columbia Conservation Data Centre, Victoria, BC, Canada; Manitoba Conservation Data Centre. Winnipeg, MB, Canada; Ontario Natural Heritage Information Centre, Peterborough, ON, Canada; Quebec Conservation Data Centre, Quebec, QC, Canada; Saskatchewan Conservation Data Centre, Regina, SK, Canada; Yukon Conservation Data Centre, Yukon, Canada

Latin American and Caribbean
Centro de Datos para la Conservacion de Bolivia, La Paz , Bolivia; Centro de Datos para la Conservacion de Colombia, Cali,Valle, Columbia; Centro de Datos para la Conservacion de Ecuador, Quito, Ecuador; Centro de Datos para la Conservacion de Guatemala, Ciudad de Guatemala , Guatemala; Centro de Datos para la Conservacion de Panama, Querry Heights , Panama; Centro de Datos para la Conservacion de Paraguay, San Lorenzo , Paraguay; Centro de Datos para la Conservacion de Peru, Lima, Peru; Centro de Datos para la Conservacion de Sonora, Hermosillo, Sonora , Mexico; Netherlands Antilles Natural Heritage Program, Curacao , Netherlands Antilles; Puerto Rico-Departmento De Recursos Naturales Y Ambientales, Puerto Rico; Virgin Islands Conservation Data Center, St. Thomas, Virgin Islands.

NatureServe also has partnered with many International and United States Federal and State organizations, which have also contributed significantly to the development of the International Classification. Partners include the following The Nature Conservancy; Provincial Forest Ecosystem Classification Groups in Canada; Canadian Forest Service; Parks Canada; United States Forest Service; National GAP Analysis Program; United States National Park Service; United States Fish and Wildlife Service; United States Geological Survey; United States Department of Defense; Ecological Society of America; Environmental Protection Agency; Natural Resource Conservation Services; United States Department of Energy; and the Tennessee Valley Authority. Many individual state organizations and people from academic institutions have also contributed to the development of this classification.

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ALPINE

OKANAGAN COARSE FILTER TARGET: NORTH AMERICAN ALPINE ICE FIELD

CES300.728 NORTH AMERICAN ALPINE ICE FIELD

Primary Division:
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Ice Fields / Glaciers; Glaciated; Alpine Slopes
Concept Summary: This widespread ecological system is composed of unvegetated landscapes of annual/perennial ice and snow at the highest elevations, where snowfall accumulation exceeds melting. The primary ecological processes include snow/ice retention, wind desiccation, and permafrost. The snowpack/ice field never melts or, if so, then for only a few weeks. The alpine substrate/ice field ecological system is part of the alpine mosaic consisting of alpine bedrock and scree, tundra dry meadow, wet meadow, fell-fields, and dwarf-shrubland.
Comments: The barren rock and rubble within the glaciers is part of this system, not the alpine rock and scree systems.

DISTRIBUTION

Range: This ecological system is found throughout North America where altitude results in permanent ice and snow fields, from the mountains of Alaska south and east through the cordillera of the Cascades and the Rocky Mountains.
Divisions: 104:C, 105:C, 204:C, 306:C
TNC Ecoregions: 3:C, 7:C, 9:C, 20:C, 69:C, 70:C, 71:P, 76:C, 77:P, 78:C, 79:C
Subnations: AB, AK, BC, CO, ID, MT, OR, WA, WY

CONCEPT

Associations:

-

Alliances:

SOURCES

References: Comer et al. 2003, Meidinger and Pojar 1991, Neely et al. 2001
Version: 04 Apr 2005 **Stakeholders:** Canada, Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: ROCKY MOUNTAIN ALPINE COMPOSITE

CES204.853 NORTH PACIFIC ALPINE AND SUBALPINE BEDROCK AND SCREE

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil; Alpine Slopes

Concept Summary: This system includes all the exposed rock and rubble above the forest line (subalpine parkland and above) in the North Pacific mountain ranges. This ecological system is restricted to the highest elevations in the Cascade Range, from southwestern British Columbia south into northern California. It is composed of barren and sparsely vegetated alpine substrates, typically including both bedrock outcrops and scree slopes, with nonvascular- (lichen-) dominated communities. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. There can be sparse cover of forbs, grasses, lichens, shrubs and small trees.

DISTRIBUTION

Range: This ecological system is restricted to the highest elevations in the Cascade Range, from southwestern British Columbia south into northern California.
Divisions: 204:C
TNC Ecoregions: 1:C, 2:C, 3:C, 4:P, 81:C
Subnations: BC, CA, OR, WA

CONCEPT

Associations:

SPATIAL CHARACTERISTICS

SOURCES

References: Ecosystems Working Group 1998, Meidinger and Pojar 1991, Western Ecology Working Group n.d.
Version: 04 Apr 2005 **Stakeholders:** Canada, West
Concept Author: R. Crawford **LeadResp:** West

CES204.862 NORTH PACIFIC DRY AND MESIC ALPINE DWARF-SHRUBLAND, FELL-FIELD AND MEADOW

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Shrubland (Shrub-dominated)
Concept Summary: This system occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest Coast. It is confined to the coldest, wind-blown areas above treeline and above the subalpine parkland. This system is found at elevations above 2350 m (7200 feet) in the Klamath Mountains and Cascades north into the Cascade and Coastal mountains of British Columbia. It is commonly comprised of a mosaic of plant communities with characteristic species including *Cassiope mertensiana, Phyllodoce empetriformis, Phyllodoce glanduliflora, Luetkea pectinata, Saxifraga tolmiei*, and *Carex* spp. It occurs on slopes and depressions where snow lingers, the soil has become relatively stabilized, and the water supply is more or less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This system includes all vegetated areas in the alpine zone of the North Pacific. Typically it is a mosaic of dwarf-shrublands, fell-fields, tundra (sedge turfs), and sparsely vegetated snowbed communities. Small patches of krummholz (shrub-form trees) are also part of this system and occur at the lower elevations. Communities are dominated by graminoids, foliose lichens, dwarf-shrubs, and/or forbs. Vegetation cover ranges from about 5 or 10% (snowbeds) to nearly 100%. The alpine tundra of the northern Cascades has floristic affinities with many mountain regions in western North America. The strongest relationships are with the Arctic and Cordilleran regions to the north and east.

DISTRIBUTION

Range: This system occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest Coast.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 69:C, 70:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

Associations:

- *Antennaria lanata* Herbaceous Vegetation (CEGL001949, G4)
- *Arabis lyallii - Packera cana* Herbaceous Vegetation (CEGL001950, G3?)
- *Arctostaphylos uva-ursi* Dwarf-shrubland (CEGL001392, G3G4)
- *Calamagrostis purpurascens* Herbaceous Vegetation (CEGL001850, G2)
- *Carex breweri* Herbaceous Vegetation (CEGL001805, G3?)
- *Carex capitata* Herbaceous Vegetation (CEGL001807, G3?)
- *Carex nardina* Scree Herbaceous Vegetation (CEGL001812, GNR)
- *Carex pellita* Herbaceous Vegetation (CEGL001809, G3)
- *Carex proposita* Herbaceous Vegetation (CEGL001859, G3?)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Vegetation (CEGL001865, G3?)
- *Cassiope mertensiana - Phyllodoce empetriformis* Dwarf-shrubland (CEGL001398, G5)
- *Cassiope mertensiana / Luetkea pectinata* Dwarf-shrubland (CEGL001397, G3G4)
- *Cassiope mertensiana* Dwarf-shrubland (CEGL001395, G3G4)
- *Dryas octopetala* Dwarf-shrub Herbaceous Vegetation (CEGL001891, G3?)
- *Empetrum nigrum / Lupinus sellulus* var. *lobbii* Dwarf-shrubland (CEGL001400, G3G4)
- *Empetrum nigrum* Dwarf-shrubland (CEGL001399, G3G4)
- *Erigeron aureus - Lupinus sellulus* var. *lobbii* Herbaceous Vegetation (CEGL001961, G3G4)
- *Eriogonum pyrolifolium - Luzula piperi* Herbaceous Vegetation (CEGL001963, G4)
- *Festuca roemeri - Phlox diffusa* ssp. *longistylis* Herbaceous Vegetation (CEGL001622, G2)
- *Pedicularis contorta - Carex spectabilis* Herbaceous Vegetation (CEGL001977, G3?)
- *Phlox diffusa* ssp. *longistylis - Arenaria capillaris* Herbaceous Vegetation (CEGL001978, G3?)
- *Phlox diffusa* ssp. *longistylis - Carex spectabilis* Herbaceous Vegetation (CEGL001979, GNR)
- *Phyllodoce glanduliflora / Oreostemma alpigenum* Dwarf-shrubland (CEGL001408, G3G4)
- *Salix cascadensis / Festuca brachyphylla* Dwarf-shrubland (CEGL001433, G3G4)
- *Salix nivalis / Festuca brachyphylla* Dwarf-shrubland (CEGL001434, G3G4)
- *Saxifraga tolmiei - Luzula piperi* Herbaceous Vegetation (CEGL001986, G4)

Alliances:

- *Antennaria lanata* Herbaceous Alliance (A.1640)
- *Arabis lyallii* Herbaceous Alliance (A.1641)
- *Arctostaphylos uva-ursi* Dwarf-shrubland Alliance (A.1079)
- *Calamagrostis purpurascens* Herbaceous Alliance (A.1301)
- *Carex breweri* Herbaceous Alliance (A.1296)
- *Carex capitata* Herbaceous Alliance (A.1297)
- *Carex nardina* Herbaceous Alliance (A.1299)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex proposita* Herbaceous Alliance (A.1305)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Alliance (A.1306)
- *Cassiope mertensiana* Dwarf-shrubland Alliance (A.1081)
- *Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)
- *Empetrum nigrum* Dwarf-shrubland Alliance (A.1078)
- *Erigeron aureus* Herbaceous Alliance (A.1643)
- *Eriogonum pyrolifolium* Herbaceous Alliance (A.1644)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Pedicularis contorta* Herbaceous Alliance (A.1649)
- *Phlox diffusa* Herbaceous Alliance (A.1650)
- *Phyllodoce glanduliflora* Dwarf-shrubland Alliance (A.1084)
- *Salix (reticulata, nivalis)* Dwarf-shrubland Alliance (A.1119)
- *Salix cascadensis* Dwarf-shrubland Alliance (A.1118)
- *Saxifraga tolmiei* Herbaceous Alliance (A.1653)

Dynamics: Landfire VDDT models: #RALME includes this and Rocky Mountain alpine systems.

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Holland and Keil 1995, Viereck et al. 1992

Version: 31 Mar 2005 **Stakeholders:** Canada, West

Concept Author: K. Boggs, C. Chappell, R. Crawford **LeadResp:** West

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CES306.809 ROCKY MOUNTAIN ALPINE BEDROCK AND SCREE

Primary Division: Rocky Mountain (306)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil; Alpine Slopes

Concept Summary: This ecological system is restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia south into New Mexico, west into the highest mountain ranges of the Great Basin. It is composed of barren and sparsely vegetated alpine substrates, typically including both bedrock outcrop and scree slopes, with nonvascular- (lichen) dominated communities. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. There can be sparse cover of forbs, grasses, lichens and low shrubs.

DISTRIBUTION

Range: Restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia south into New Mexico, west into the highest mountain ranges of the Great Basin.

Divisions: 304:C, 306:C

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:C

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Aquilegia caerulea - Cirsium scopulorum* Scree Sparse Vegetation (CEGL001938, GU)
- *Aquilegia flavescens - Senecio megacephalus* Sparse Vegetation (CEGL005899, G2G3)
- *Athyrium americanum - Cryptogramma acrostichoides* Sparse Vegetation (CEGL005900, G2G3)
- *Cirsium scopulorum - Polemonium viscosum* Herbaceous Vegetation (CEGL001959, GU)
- *Claytonia megarhiza* Herbaceous Vegetation (CEGL001878, GU)
- *Ivesia cryptocaulis* Alpine Sparse Vegetation (CEGL002735, G1)
- *Phacelia hastata - (Penstemon ellipticus*) Sparse Vegetation (CEGL005901, G2G3)
- *Polemonium viscosum* Herbaceous Vegetation (CEGL001928, G3G4)
- *Saxifraga bronchialis* Scree Slope Sparse Vegetation (CEGL005902, G3?)
- *Saxifraga mertensiana* Cliff Crevice Sparse Vegetation (CEGL005903, G2?)
- *Senecio taraxacoides - Oxyria digyna* Herbaceous Vegetation (CEGL001932, GU)
- Sparse Nonvascular Vegetation (on rock and unconsolidated substrates) (CEGL002888, GNR)

Alliances:

- *Aquilegia (caerulea, flavescens)* Sparsely Vegetated Alliance (A.1603)
- *Athyrium americanum* Sparsely Vegetated Alliance (A.1625)
- *Cirsium scopulorum* Herbaceous Alliance (A.1608)
- *Claytonia megarhiza* Herbaceous Alliance (A.1626)
- *Ivesia cryptocaulis* Sparsely Vegetated Alliance (A.2513)
- *Phacelia hastata* Sparsely Vegetated Alliance (A.2634)
- *Polemonium viscosum* Herbaceous Alliance (A.1631)
- *Saxifraga (chrysantha, mertensiana)* Sparsely Vegetated Alliance (A.1632)
- *Saxifraga bronchialis* Sparsely Vegetated Alliance (A.2635)
- *Senecio taraxacoides* Herbaceous Alliance (A.1634)

- Sparse Nonvascular Vegetation Alliance (on rock and unconsolidated substrates) (A.2660)

SOURCES

References: Anderson 1999, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Nelson 1998, Willard 1963

Version: 20 Feb 2003 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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CES306.810 ROCKY MOUNTAIN ALPINE DWARF-SHRUBLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Patterned ground (undifferentiated); Glaciated; Acidic Soil; Udic; Very Long Disturbance Interval; Dwarf-Shrub; Alpine Slopes

Concept Summary: This widespread ecological system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana and in the mountains of Alberta. This system occurs in areas of level or concave glacial topography, with late-lying snow and subirrigation from surrounding slopes. Soils have become relatively stabilized in these sites, are moist but well-drained, strongly acid, and often with substantial peat layers. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This ecological system is characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Dense tuffs of graminoids and scattered forbs occur. *Dryas octopetala* or *Dryas integrifolia* communities are not included here, except for one very moist association, because they occur on more windswept and drier sites than the heath communities. Within these communities *Cassiope mertensiana, Salix arctica, Salix reticulata, Salix vestita*, or *Phyllodoce empetriformis* can be dominant shrubs. *Vaccinium* spp., *Ledum glandulosum, Phyllodoce glanduliflora*, and *Kalmia microphylla* may also be shrub associates. The herbaceous layer is a mixture of forbs and graminoids, especially sedges, including, *Erigeron* spp., *Luetkea pectinata, Antennaria lanata, Oreostemma alpigenum (= Aster alpigenus), Pedicularis* spp., *Castilleja* spp., *Deschampsia caespitosa, Caltha leptosepala, Erythronium* spp., *Juncus parryi, Luzula piperi, Carex spectabilis, Carex nigricans*, and *Polygonum bistortoides*. Fell-fields often intermingle with the alpine dwarf-shrubland.

DISTRIBUTION

Range: This system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana.

Divisions: 304:C, 306:C

TNC Ecoregions: 4:P, 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:P

Subnations: AB, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Cassiope mertensiana - Phyllodoce empetriformis* Dwarf-shrubland (CEGL001398, G5)
- *Cassiope mertensiana / Carex paysonis* Dwarf-shrubland (CEGL001396, G3?)
- *Dryas integrifolia - Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001890, G3Q)
- *Dryas octopetala - Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894, G3?)
- *Kalmia microphylla / Carex scopulorum* Dwarf-shrubland (CEGL001403, G3G4)
- *Phyllodoce empetriformis / Antennaria lanata* Dwarf-shrubland (CEGL001405, G3?)
- *Phyllodoce empetriformis / Lupinus latifolius* Dwarf-shrubland (CEGL001406, G4?)
- *Phyllodoce empetriformis / Vaccinium deliciosum* Dwarf-shrubland (CEGL001407, G4)
- *Phyllodoce empetriformis* Parkland Dwarf-shrubland (CEGL001404, G5)
- *Phyllodoce glanduliflora / Oreostemma alpigenum* Dwarf-shrubland (CEGL001408, G3G4)

- *Phyllodoce glanduliflora / Sibbaldia procumbens* Dwarf-shrubland (CEGL005877, G2G3)
- *Salix arctica - (Salix petrophila, Salix nivalis) / Polygonum bistortoides* Dwarf-shrubland (CEGL001431, G2G3Q)
- *Salix arctica - Salix nivalis* Dwarf-shrubland (CEGL001432, G2Q)
- *Salix arctica - Salix petrophila / Caltha leptosepala* Dwarf-shrubland (CEGL001429, G2G3)
- *Salix arctica / Carex nigricans* Dwarf-shrubland (CEGL005878, GNR)
- *Salix arctica / Geum rossii* Dwarf-shrubland (CEGL001430, G4)
- *Salix glauca* Shrubland (CEGL001136, G3?)
- *Salix nivalis / Geum rossii* Dwarf-shrubland (CEGL005936, GNR)
- *Salix reticulata / Caltha leptosepala* Dwarf-shrubland (CEGL001435, G3)
- *Vaccinium (caespitosum, scoparium)* Dwarf-shrubland (CEGL001140, G4)
- *Vaccinium (myrtillus, scoparium) / Luzula glabrata* var. *hitchcockii* Dwarf-shrubland (CEGL005879, G2G3)

Alliances:

- *Cassiope mertensiana* Dwarf-shrubland Alliance (A.1081)
- *Cassiope mertensiana* Temporarily Flooded Dwarf-shrubland Alliance (A.1089)
- *Dryas integrifolia* Dwarf-shrub Herbaceous Alliance (A.1576)
- *Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)
- *Kalmia microphylla* Saturated Dwarf-shrubland Alliance (A.1096)
- *Phyllodoce empetriformis* Dwarf-shrubland Alliance (A.1083)
- *Phyllodoce glanduliflora* Dwarf-shrubland Alliance (A.1084)
- *Salix (reticulata, nivalis)* Dwarf-shrubland Alliance (A.1119)
- *Salix arctica* Dwarf-shrubland Alliance (A.1117)
- *Salix arctica* Saturated Dwarf-shrubland Alliance (A.1124)
- *Salix glauca* Temporarily Flooded Shrubland Alliance (A.963)
- *Salix reticulata* Saturated Dwarf-shrubland Alliance (A.1125)
- *Vaccinium (caespitosum, myrtillus, scoparium)* Dwarf-shrubland Alliance (A.1114)

SOURCES

References: Anderson 1999, Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Ecosystems Working Group 1998, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Schwan and Costello 1951, Thilenius 1975, Willard 1963

Version: 01 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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CES306.811 ROCKY MOUNTAIN ALPINE FELL-FIELD

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Herbaceous; Ridge/Summit/Upper Slope; Oligotrophic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Very Short Disturbance Interval; W-Patch/High Intensity; Cushion plants; Alpine Slopes

Concept Summary: This ecological system is found discontinuously at alpine elevations throughout the Rocky Mountains, west into the mountainous areas of the Great Basin, and north into the Canadian Rockies. Small areas are represented in the west side of the Okanagan Ecoregion in the eastern Cascades. These are wind-scoured fell-fields that are free of snow in the winter, such as ridgetops and exposed saddles, exposing the plants to severe environmental stress. Soils on these windy unproductive sites are shallow, stony, low in organic matter, and poorly developed; wind deflation often results in a gravelly pavement. Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes and often densely haired and thickly cutinized. Plant cover is 15-50%, while exposed rocks make up the rest. Fell-fields are usually within or adjacent to alpine tundra dry meadows. Common species include *Arenaria capillaris, Geum rossii, Kobresia myosuroides,* *Minuartia obtusiloba, Myosotis asiatica, Paronychia pulvinata, Phlox pulvinata, Sibbaldia procumbens, Silene acaulis, Trifolium dasyphyllum*, and *Trifolium parryi*.

Comments: Alpine fell-fields in the Cascades occur at a very small-scale spatial pattern not mappable (recognizable) at landscape levels. These small-scale fell-fields are conceptually included here.

DISTRIBUTION

Range: This system is found discontinuously at alpine elevations throughout the Rocky Mountains, west into the mountainous areas of the Great Basin. Outlier sites occur in the northeastern Cascades and on Mount Rainier in Washington.

Divisions: 304:C, 306:C

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 68:C

Subnations: AB, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Arenaria capillaris / Polytrichum piliferum* Herbaceous Vegetation (CEGL005855, G2G3)
- *Carex albonigra - Myosotis asiatica* Herbaceous Vegetation (CEGL005863, G2G3)
- *Carex paysonis - Sibbaldia procumbens* Herbaceous Vegetation (CEGL005865, G3G4?)
- *Dasiphora fruticosa* ssp. *floribunda / Artemisia michauxiana* Shrub Herbaceous Vegetation [Provisional] (CEGL005833, G3G4)
- *Geum rossii - Minuartia obtusiloba* Herbaceous Vegetation (CEGL001965, G3?)
- *Kobresia myosuroides - Euphrasia disjuncta* Herbaceous Vegetation (CEGL005872, G2?)
- *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001919, G4)
- *Paronychia pulvinata - Silene acaulis* Dwarf-shrubland (CEGL001976, G5)
- *Phlox pulvinata - Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001980, G2Q)
- *Phlox pulvinata* Herbaceous Vegetation [Provisional] (CEGL002740, G4)
- *Potentilla sierrae-blancae* Herbaceous Vegetation (CEGL001982, G1)
- *Rubus idaeus* Scree Shrubland (CEGL001134, GU)
- *Sibbaldia procumbens - Polygonum bistortoides* Herbaceous Vegetation (CEGL001933, G3?)
- *Silene acaulis* Herbaceous Vegetation (CEGL001934, G5?)
- *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001935, G4)
- *Trifolium parryi* Herbaceous Vegetation (CEGL001936, GU)

Alliances:

- *Arenaria capillaris* Herbaceous Alliance (A.2630)
- *Carex albonigra* Herbaceous Alliance (A.2638)
- *Carex paysonis* Herbaceous Alliance (A.2640)
- *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Kobresia myosuroides* Herbaceous Alliance (A.1326)
- *Minuartia obtusiloba* Herbaceous Alliance (A.1630)
- *Paronychia pulvinata* Dwarf-shrubland Alliance (A.1085)
- *Phlox pulvinata* Herbaceous Alliance (A.1651)
- *Potentilla sierrae-blancae* Herbaceous Alliance (A.1652)
- *Rubus idaeus* ssp. *strigosus* Shrubland Alliance (A.927)
- *Sibbaldia procumbens* Herbaceous Alliance (A.1635)
- *Silene acaulis* Herbaceous Alliance (A.1636)
- *Trifolium (dasyphyllum, nanum)* Herbaceous Alliance (A.1637)
- *Trifolium parryi* Herbaceous Alliance (A.1638)

SOURCES

References: Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Hamann 1972, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Willard 1963

Version: 07 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.816 ROCKY MOUNTAIN DRY TUNDRA

Primary Division: Rocky Mountain (306)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Oligotrophic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; Very Long Disturbance Interval; Graminoid; Alpine Slopes
Concept Summary: This widespread ecological system occurs above upper treeline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and isolated alpine sites in the northeastern Cascades. It is found on gentle to moderate slopes, flat ridges, valleys, and basins, where the soil has become relatively stabilized and the water supply is more or less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This system is characterized by a dense cover of low-growing, perennial graminoids and forbs. Rhizomatous, sod-forming sedges are the dominant graminoids, and prostrate and mat-forming plants with thick rootstocks or taproots characterize the forbs. Dominant species include *Artemisia arctica, Carex elynoides, Carex siccata, Carex scirpoidea, Carex nardina, Carex rupestris, Deschampsia caespitosa, Festuca brachyphylla, Festuca idahoensis, Geum rossii, Kobresia myosuroides, Phlox pulvinata*, and *Trifolium dasyphyllum*. Although alpine tundra dry meadow is the matrix of the alpine zone, it typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet meadow systems.

DISTRIBUTION

Range: This system occurs above upper treeline throughout the North American Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and isolated alpine sites in the northeastern Cascades.
Divisions: 204:P, 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis* Dwarf-shrubland (CEGL005830, G3G4)
- *Arctostaphylos uva-ursi / Pseudoroegneria spicata* Dwarf-shrubland (CEGL005831, G2G3)
- *Arctostaphylos uva-ursi / Solidago multiradiata* Dwarf-shrubland (CEGL005832, G2G3)
- *Artemisia arctica* ssp. *arctica* Herbaceous Vegetation (CEGL001848, GU)
- *Calamagrostis purpurascens* Herbaceous Vegetation (CEGL001850, G2)
- *Carex arapahoensis* Herbaceous Vegetation (CEGL001851, GU)
- *Carex duriuscula - Poa secunda* Herbaceous Vegetation (CEGL001736, G2Q)
- *Carex ebenea - Trifolium parryi* Herbaceous Vegetation (CEGL001873, GUQ)
- *Carex elynoides - Geum rossii* Herbaceous Vegetation (CEGL001853, G4)
- *Carex elynoides - Lupinus argenteus* Herbaceous Vegetation (CEGL001854, G3)
- *Carex elynoides - Oreoxis* spp. Herbaceous Vegetation (CEGL001855, G4)
- *Carex elynoides - Oxytropis sericea* Herbaceous Vegetation (CEGL001856, G3)
- *Carex elynoides* Herbaceous Vegetation (CEGL001852, G4)
- *Carex haydeniana* Herbaceous Vegetation (CEGL001875, GU)
- *Carex perglobosa - Silene acaulis* Herbaceous Vegetation (CEGL001858, GU)
- *Carex rupestris - Geum rossii* Herbaceous Vegetation (CEGL001861, G4)
- *Carex rupestris - Potentilla ovina* Herbaceous Vegetation (CEGL001862, G4)
- *Carex rupestris - Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001863, G3G4)
- *Carex rupestris* var. *drummondiana* Herbaceous Vegetation (CEGL001864, G4)
- *Carex scirpoidea - Geum rossii* Herbaceous Vegetation (CEGL001866, G4)
- *Carex scirpoidea - Potentilla diversifolia* Herbaceous Vegetation (CEGL001867, G3?)
- *Carex scirpoidea - Zigadenus elegans* Herbaceous Vegetation (CEGL005866, G4G5)
- *Carex siccata - Geum rossii* Herbaceous Vegetation (CEGL001808, GU)
- *Carex* spp. - *Geum rossii* Herbaceous Vegetation (CEGL001870, G4Q)
- *Carex vernacula* Herbaceous Vegetation (CEGL001868, GU)

- *Cirsium scopulorum - Polemonium viscosum* Herbaceous Vegetation (CEGL001959, GU)
- *Dryas octopetala - Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892, G4)
- *Dryas octopetala - Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001893, G3?)
- *Dryas octopetala* Dwarf-shrub Herbaceous Vegetation (CEGL001891, G3?)
- *Festuca brachyphylla - Geum rossii* var. *turbinatum* Herbaceous Vegetation (CEGL001895, GUQ)
- *Festuca brachyphylla - Trisetum spicatum* Herbaceous Vegetation (CEGL001896, G3?)
- *Festuca brachyphylla* Herbaceous Vegetation (CEGL001797, G4?)
- *Festuca thurberi* Subalpine Grassland Herbaceous Vegetation (CEGL001631, G3)
- *Geum rossii - Carex albonigra* Herbaceous Vegetation (CEGL001966, G1G2Q)
- *Geum rossii - Minuartia obtusiloba* Herbaceous Vegetation (CEGL001965, G3?)
- *Geum rossii - Selaginella densa* Herbaceous Vegetation (CEGL001968, G2G3Q)
- *Geum rossii - Trifolium* spp. Herbaceous Vegetation (CEGL001970, G3)
- *Geum rossii* Herbaceous Vegetation (CEGL001964, G4G5Q)
- *Kobresia myosuroides - Carex rupestris* var. *drummondiana* Herbaceous Vegetation (CEGL001907, G3)
- *Kobresia myosuroides - Geum rossii* Herbaceous Vegetation (CEGL001908, G5)
- *Kobresia myosuroides - Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001909, GU)
- *Leucopoa kingii - Carex elynoides* Herbaceous Vegetation (CEGL001911, G3)
- *Leucopoa kingii - Oxytropis campestris* Herbaceous Vegetation (CEGL001912, G3?)
- *Leucopoa kingii - Phlox pulvinata* Herbaceous Vegetation (CEGL001913, G3)
- *Leucopoa kingii - Poa fendleriana* ssp. *fendleriana* Herbaceous Vegetation (CEGL001914, G3)
- *Leucopoa kingii* Herbaceous Vegetation (CEGL001910, G3Q)
- *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001919, G4)
- *Poa arctica* ssp. *grayana* Herbaceous Vegetation (CEGL001924, GU)
- *Poa lettermanii* Herbaceous Vegetation (CEGL001927, GU)
- *Poa nervosa - Achnatherum lettermanii* Herbaceous Vegetation (CEGL001656, G1G2)
- *Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666, G3?)
- *Ribes montigenum* Shrubland (CEGL001133, GU)
- *Saxifraga chrysantha* Sparse Vegetation (CEGL001929, GU)
- *Sibbaldia procumbens - Polygonum bistortoides* Herbaceous Vegetation (CEGL001933, G3?)

Alliances:

- *Arctostaphylos uva-ursi* Dwarf-shrubland Alliance (A.1079)
- *Artemisia arctica* Herbaceous Alliance (A.1624)
- *Calamagrostis purpurascens* Herbaceous Alliance (A.1301)
- *Carex (ebenea, haydeniana)* Herbaceous Alliance (A.1302)
- *Carex arapahoensis* Herbaceous Alliance (A.1319)
- *Carex duriuscula* Herbaceous Alliance (A.1283)
- *Carex elynoides* Herbaceous Alliance (A.1303)
- *Carex perglobosa* Herbaceous Alliance (A.1304)
- *Carex rupestris* Herbaceous Alliance (A.1307)
- *Carex scirpoidea* Herbaceous Alliance (A.1308)
- *Carex siccata* Herbaceous Alliance (A.1298)
- *Carex vernacula* Herbaceous Alliance (A.1309)
- *Cirsium scopulorum* Herbaceous Alliance (A.1608)
- *Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)
- *Festuca brachyphylla* Herbaceous Alliance (A.1321)
- *Festuca thurberi* Herbaceous Alliance (A.1256)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Kobresia myosuroides* Herbaceous Alliance (A.1326)
- *Leucopoa kingii* Herbaceous Alliance (A.1323)
- *Minuartia obtusiloba* Herbaceous Alliance (A.1630)
- *Poa arctica* Herbaceous Alliance (A.1311)
- *Poa lettermanii* Herbaceous Alliance (A.1327)
- *Poa nervosa* Herbaceous Alliance (A.1264)

- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Ribes montigenum* Shrubland Alliance (A.926)
- *Saxifraga (chrysantha, mertensiana)* Sparsely Vegetated Alliance (A.1632)
- *Sibbaldia procumbens* Herbaceous Alliance (A.1635)

SOURCES

References: Anderson 1999, Baker 1980a, Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Ecosystems Working Group 1998, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Schwan and Costello 1951, Thilenius 1975, Willard 1963

Version: 07 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

SUBAPLINE PARKLAND

OKANAGAN COARSE FILTER TARGET: NORTH PACIFIC MARITIME MESIC PARKLAND

CES204.837 NORTH PACIFIC MARITIME MESIC SUBALPINE PARKLAND

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Tsuga mertensiana; Late-lying snowpack

Concept Summary: This system occurs throughout the mountains of the Pacific Northwest, from the southern Cascades of Oregon to the mountains of south-central Alaska. It occurs at the transition zone of forest to alpine, forming a subalpine forest-meadow ecotone. Clumps of trees to small patches of forest interspersed with low shrublands and meadows characterize this system. Krummholz often occurs near the upper elevational limit of this type where it grades into alpine vegetation. Associations include woodlands, forested and subalpine meadow types. It occurs on the west side of the Cascade Mountains where deep, late-lying snowpack is the primary environmental factor. Major tree species are *Tsuga mertensiana, Abies amabilis, Chamaecyparis nootkatensis*, and *Abies lasiocarpa*. This system includes British Columbia Hypermaritime and Maritime Parkland (*Tsuga mertensiana*). Dominant dwarf-shrubs include *Phyllodoce empetriformis, Cassiope mertensiana*, and *Vaccinium deliciosum*. Dominant herbaceous species include *Lupinus arcticus ssp. subalpinus, Valeriana sitchensis, Carex spectabilis*, and *Polygonum bistortoides*. There is very little disturbance, either windthrow or fire. The major process controlling vegetation is the very deep long-lasting snowpacks (deepest in the North Pacific region) limiting tree regeneration. Trees get established only in favorable microsites (mostly adjacent to existing trees) or during drought years with low snowpack. It is distinguished from more interior dry parkland primarily by the presence of *Tsuga mertensiana* or *Abies amabilis* and absence or paucity of *Pinus albicaulis* and *Larix lyallii*.

DISTRIBUTION

Range: This system occurs throughout the mountains of the Pacific Northwest, from the southern Cascades of Oregon to the mountains of south-central Alaska.

Divisions: 204:C, 306:C

TNC Ecoregions: 1:C, 4:C, 7:C, 69:C, 70:C, 81:C

Subnations: AK, BC, OR, WA

CONCEPT

Associations:

- *Carex spectabilis - Polygonum bistortoides* Herbaceous Vegetation (CEGL001828, G4)
- *Carex spectabilis - Potentilla flabellifolia* Herbaceous Vegetation (CEGL001829, G4Q)

- *Carex spectabilis* Herbaceous Vegetation (CEGL001827, G5)
- *Cassiope mertensiana / Luetkea pectinata* Dwarf-shrubland (CEGL001397, G3G4)
- *Chamaecyparis nootkatensis* Subalpine Parkland Woodland (CEGL000350, G3)
- *Luetkea pectinata - Saxifraga tolmiei* Herbaceous Vegetation (CEGL001918, G5)
- *Lupinus arcticus* ssp. *subalpinus - Carex spectabilis* Herbaceous Vegetation (CEGL001973, G4)
- *Phyllodoce empetriformis / Lupinus latifolius* Dwarf-shrubland (CEGL001406, G4?)
- *Phyllodoce empetriformis / Vaccinium deliciosum* Dwarf-shrubland (CEGL001407, G4)
- *Phyllodoce empetriformis* Parkland Dwarf-shrubland (CEGL001404, G5)
- *Potentilla flabellifolia - Polygonum bistortoides* Herbaceous Vegetation (CEGL001981, G4Q)
- *Saussurea americana - Heracleum maximum* Herbaceous Vegetation (CEGL001945, G3G4)
- *Tsuga mertensiana - Abies amabilis / Phyllodoce empetriformis - Vaccinium deliciosum* Woodland (CEGL000914, G4)
- *Tsuga mertensiana / Cassiope mertensiana* Woodland (CEGL003251, G5)
- *Vaccinium deliciosum* Parkland Dwarf-shrubland (CEGL001427, G4G5)
- *Vaccinium membranaceum - Vaccinium deliciosum* Dwarf-shrubland (CEGL001428, G4?Q)
- *Valeriana sitchensis - Carex spectabilis* Herbaceous Vegetation (CEGL001996, G4)
- *Valeriana sitchensis - Ligusticum grayi* Herbaceous Vegetation (CEGL001997, G3G4Q)
- *Valeriana sitchensis - Veratrum viride* Herbaceous Vegetation (CEGL001998, G4)

Alliances:

- *Carex spectabilis* Herbaceous Alliance (A.1300)
- *Cassiope mertensiana* Dwarf-shrubland Alliance (A.1081)
- *Chamaecyparis nootkatensis* Woodland Alliance (A.554)
- *Luetkea pectinata - Saxifraga tolmiei* Herbaceous Alliance (A.1629)
- *Lupinus arcticus* Herbaceous Alliance (A.1609)
- *Phyllodoce empetriformis* Dwarf-shrubland Alliance (A.1083)
- *Potentilla flabellifolia* Herbaceous Alliance (A.1610)
- *Saussurea americana* Temporarily Flooded Herbaceous Alliance (A.1662)
- *Tsuga mertensiana - Abies amabilis* Woodland Alliance (A.555)
- *Tsuga mertensiana* Woodland Alliance (A.550)
- *Vaccinium deliciosum* Dwarf-shrubland Alliance (A.1115)
- *Valeriana sitchensis* Herbaceous Alliance (A.1611)

SOURCES

References: Banner et al. 1993, Comer et al. 2003, Franklin and Dyrness 1973, Green and Klinka 1994

Version: 08 Feb 2005 **Stakeholders:** Canada, West

Concept Author: G. Kittel **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: NORTHERN ROCKY MOUNTAIN SUBALPINE DRY PARKLAND

CES204.099 NORTH PACIFIC ALPINE AND SUBALPINE DRY GRASSLAND

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Montane [Upper Montane]; Herbaceous; Deep Soil; Ustic; Intermediate Disturbance Interval; Graminoid; Tussock-forming grasses

Concept Summary: This high-elevation, grassland system is dominated by perennial grasses and forbs found on dry sites, particularly south-facing slopes, typically imbedded in or above subalpine forests and woodlands. Disturbance such as fire also plays a role in maintaining these open grassy areas, although drought and exposed site locations are primary characteristics limiting tree growth. It is most extensive in the eastern Cascades, although it also occurs in the Olympic Mountains. Alpine and subalpine dry grasslands are small openings to large open ridges above or drier than high-elevation conifer trees. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. These grasslands, although composed primarily of tussock-forming species, do exhibit a dense sod that makes root penetration difficult for tree species. Typical dominant species include *Festuca idahoensis, Festuca viridula*, and *Festuca roemeri* (the latter species occurring only in the Olympic Mountains). This system is similar to ~Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)$$, differing in its including dry alpine habitats, more North Pacific floristic elements, greater snowpack, and higher precipitation.

DISTRIBUTION

Range: This system occurs only in the Pacific Northwest mountains (Coastal and westside Cascadian).
Divisions: 204:C, 306:C
TNC Ecoregions: 1:C, 3:C, 4:C, 81:C
Subnations: BC?, OR?, WA

CONCEPT

Associations:

- *Festuca roemeri - Delphinium glareosum* Herbaceous Vegetation (CEGL001613, G2)
- *Festuca roemeri - Phlox diffusa* ssp. *longistylis* Herbaceous Vegetation (CEGL001622, G2)
- *Festuca viridula - Eucephalus ledophyllus* Herbaceous Vegetation (CEGL001632, G4)
- *Festuca viridula - Festuca idahoensis* Herbaceous Vegetation (CEGL001633, G2?Q)
- *Festuca viridula - Lupinus latifolius* Herbaceous Vegetation (CEGL001635, G4)

SPATIAL CHARACTERISTICS

SOURCES

References: Ecosystems Working Group 1998, Western Ecology Working Group n.d.
Version: 31 Mar 2005 **Stakeholders:** Canada, West
Concept Author: R. Crawford **LeadResp:** West

CES306.806 NORTHERN ROCKY MOUNTAIN SUBALPINE-UPPER MONTANE GRASSLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Herbaceous; Deep Soil; Ustic; Intermediate Disturbance Interval; Graminoid; Tussock-forming grasses
Concept Summary: This is an upper montane to subalpine, high-elevation, lush grassland system dominated by perennial grasses and forbs on dry sites, particularly south-facing slopes. It is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera, extending south into western Montana, eastern Oregon, eastern Washington and Idaho. Subalpine dry grasslands are small meadows to large open parks surrounded by conifer trees but lack tree cover within them. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. Grasslands, although composed primarily of tussock-forming species, do exhibit a dense sod that makes root penetration difficult for tree species. Disturbance such as fire also plays a role in maintaining these open grassy areas. Typical dominant species include *Leymus innovatus (= Elymus innovatus), Koeleria macrantha, Festuca campestris, Festuca idahoensis, Festuca viridula, Achnatherum occidentale (= Stipa occidentalis), Achnatherum richardsonii (= Stipa richardsonii), Bromus inermis ssp. pumpellianus (= Bromus pumpellianus), Elymus trachycaulus, Phleum alpinum, Trisetum spicatum*, and a variety of Carices, such as *Carex hoodii, Carex obtusata*, and *Carex scirpoidea*. Important forbs include *Lupinus argenteus var. laxiflorus, Potentilla diversifolia, Potentilla flabellifolia, Fragaria virginiana*, and *Chamerion angustifolium (= Epilobium angustifolium)*. This system is similar to Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland CES306.040) but is found at higher elevations and is more often composed of *Festuca* spp. and *Achnatherum* and/or *Hesperostipa* spp. (= *Stipa* spp.) with additional floristic components of more subalpine taxa.

DISTRIBUTION

Range: It is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera, extending south into western Montana eastern Oregon, eastern Washington and Idaho.
Divisions: 306:C
TNC Ecoregions: 4:P, 7:C, 8:C, 9:P, 68:C
Subnations: AB, BC, ID, MT, OR, WA, WY

CONCEPT

Associations:

- *Calamagrostis rubescens* Herbaceous Vegetation (CEGL005862, G3G4?)
- *Carex hoodii - Festuca idahoensis* Herbaceous Vegetation (CEGL001595, G2)
- *Festuca campestris* Herbaceous Vegetation [Provisional] (CEGL001627, G3Q)
- *Festuca idahoensis - (Festuca campestris) / Potentilla diversifolia* Herbaceous Vegetation (CEGL001623, G3)
- *Festuca idahoensis - Carex obtusata* Herbaceous Vegetation (CEGL001611, G3Q)
- *Festuca idahoensis - Carex scirpoidea* Herbaceous Vegetation (CEGL001899, G2Q)
- *Festuca idahoensis - Danthonia intermedia* Herbaceous Vegetation (CEGL001612, G3?Q)
- *Festuca idahoensis - Elymus trachycaulus* Herbaceous Vegetation (CEGL001614, G4)
- *Festuca viridula - Carex hoodii* Herbaceous Vegetation (CEGL001596, G3)
- *Festuca viridula - Festuca idahoensis* Herbaceous Vegetation (CEGL001633, G2?Q)
- *Festuca viridula - Lupinus argenteus* var. *laxiflorus* Herbaceous Vegetation (CEGL001634, G3Q)
- *Festuca viridula - Potentilla flabellifolia* Herbaceous Vegetation (CEGL001636, GNRQ)
- *Phleum alpinum - Elymus trachycaulus* Herbaceous Vegetation (CEGL001923, G2Q)

Alliances:

- *Calamagrostis rubescens* Herbaceous Alliance (A.2637)
- *Carex hoodii* Herbaceous Alliance (A.1253)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Festuca viridula* Herbaceous Alliance (A.1257)
- *Phleum alpinum* Herbaceous Alliance (A.1310)

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1995, Johnson 2004
Version: 07 Sep 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.807 NORTHERN ROCKY MOUNTAIN SUBALPINE WOODLAND AND PARKLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Oligotrophic Soil; Very Short Disturbance Interval; W-Patch/High Intensity; W-Patch/Medium Intensity; W-Landscape/Medium Intensity; Larix lyallii; Upper Treeline; Long (>500 yrs) Persistence
Concept Summary: This system of the northern Rockies, Cascade Mountains, and northeastern Olympic Mountains is typically a high-elevation mosaic of stunted tree clumps, open woodlands, and herb- or dwarf-shrub-dominated openings, occurring above closed forest ecosystems and below alpine communities. It includes open areas with clumps of *Pinus albicaulis*, as well as woodlands dominated by *Pinus albicaulis* or *Larix lyallii*. In the Cascade Mountains and northeastern Olympic Mountains, the tree clump pattern is one manifestation, but these are also woodlands with an open canopy, without a tree clump/opening patchiness to them; in fact, that is quite common with *Pinus albicaulis*. The climate is typically very cold in winter and dry in summer. In the Cascades and Olympic Mountains, the climate is more maritime in nature and wind is not as extreme. The upper

and lower elevational limits, due to climatic variability and differing topography, vary considerably; in interior British Columbia, this system occurs between 1000 and 2100 m elevation, and in northwestern Montana it occurs up to 2380 m. Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, talus slopes, landslides and rockslides, and cirque headwalls and basins. Some sites have little snow accumulation because of high winds and sublimation. *Larix lyallii* stands generally occur at or near upper treeline on north-facing cirques or slopes where snowfields persist until June or July. In this harsh, often wind-swept environment, trees are often stunted and flagged from damage associated with wind and blowing snow and ice crystals, especially at the upper elevations of the type. The stands or patches often originate when *Picea engelmannii, Larix lyallii*, or *Pinus albicaulis* colonize a sheltered site such as the lee side of a rock. *Abies lasiocarpa* can then colonize in the shelter of the *Picea engelmannii* and may form a dense canopy by branch layering. Major disturbances are windthrow and snow avalanches. Fire is known to occur infrequently in this system, at least where woodlands are present; lightning damage to individual trees is common, but sparse canopies and rocky terrain limit the spread of fire. These high-elevation coniferous woodlands are dominated by *Pinus albicaulis, Abies lasiocarpa*, and/or *Larix lyallii*, with occasional *Picea engelmannii*. In the Cascades and Olympics, *Abies lasiocarpa* sometimes dominates the tree layer without *Pinus albicaulis*, though in this dry parkland *Tsuga mertensiana* and *Abies amabilis* are largely absent. The undergrowth is usually somewhat depauperate, but some stands support a near sward of heath plants, such as *Phyllodoce glanduliflora, Phyllodoce empetriformis, Empetrum nigrum, Cassiope mertensiana*, and *Kalmia polifolia*, and can include a slightly taller layer of *Ribes montigenum, Salix brachycarpa, Salix glauca, Salix planifolia, Vaccinium membranaceum, Vaccinium myrtillus*, or *Vaccinium scoparium* that may be present to codominant. The herbaceous layer is sparse under dense shrub canopies or may be dense where the shrub canopy is open or absent. *Vahlodea atropurpurea (= Deschampsia atropurpurea), Luzula glabrata var. hitchcockii*, and *Juncus parryi* are the most commonly associated graminoids.

DISTRIBUTION

Range: This system occurs in the northern Rocky Mountains, Cascade Mountains, and northeastern Olympic Mountains.
Divisions: 204:C, 306:C
TNC Ecoregions: 3:C, 7:C, 8:C, 9:P, 68:C
Subnations: AB, BC, ID, MT, WA, WY

CONCEPT

Associations:

- *Abies lasiocarpa - Picea engelmannii* Krummholz Shrubland (CEGL000985, G4)
- *Abies lasiocarpa - Picea engelmannii* Tree Island Forest (CEGL000329, GUQ)
- *Abies lasiocarpa - Pinus albicaulis / Arctostaphylos uva-ursi* Woodland (CEGL000751, G2Q)
- *Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium* Woodland (CEGL000752, G5?)
- *Larix lyallii / Vaccinium deliciosum* Woodland (CEGL000952, G3)
- *Larix lyallii / Vaccinium scoparium / Luzula glabrata* var. *hitchcockii* Woodland (CEGL000951, G2G3)
- *Pinus albicaulis - (Abies lasiocarpa) / Carex geyeri* Woodland (CEGL000754, G2G3)
- *Pinus albicaulis - (Picea engelmannii) / Dryas octopetala* Woodland (CEGL005840, G2G3?)
- *Pinus albicaulis - Abies lasiocarpa / Menziesia ferruginea / Xerophyllum tenax* Woodland (CEGL005836, G3?)
- *Pinus albicaulis - Abies lasiocarpa / Vaccinium membranaceum / Xerophyllum tenax* Woodland (CEGL005837, G3?)
- *Pinus albicaulis - Abies lasiocarpa / Vaccinium scoparium / Luzula glabrata* var. *hitchcockii* Woodland (CEGL005839, G3?)
- *Pinus albicaulis - Abies lasiocarpa / Vaccinium scoparium / Xerophyllum tenax* Woodland (CEGL005838, G3?)
- Pinus albicaulis - Abies lasiocarpa Woodland (CEGL000128, G5?)
- *Pinus albicaulis / Calamagrostis rubescens* Woodland (CEGL000753, G2)
- *Pinus albicaulis / Carex rossii* Forest (CEGL000129, G3)
- *Pinus albicaulis / Festuca idahoensis* Woodland (CEGL000755, G4)
- *Pinus albicaulis / Juniperus communis* Woodland (CEGL000756, G4?)

- *Pinus albicaulis / Luzula glabrata* var. *hitchcockii* Woodland (CEGL000758, G3)
- *Pinus albicaulis / Vaccinium scoparium* Forest (CEGL000131, G4)
- *Pinus albicaulis* Woodland [Placeholder] (CEGL000127, G5?)

Alliances:

- *Abies lasiocarpa - Picea engelmannii - Pinus flexilis* Krummholz Shrubland Alliance (A.811)
- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Larix lyallii* Woodland Alliance (A.631)
- *Pinus albicaulis - Abies lasiocarpa* Woodland Alliance (A.560)
- *Pinus albicaulis* Forest Alliance (A.132)
- *Pinus albicaulis* Woodland Alliance (A.531)

Environment: In the Cascades and Olympic Mountains, the climate is more maritime in nature and wind is not as extreme, but summer drought is a more important process than in the related North Pacific Maritime Mesic Subalpine Parkland (CES204.837).

Dynamics: *Larix lyallii* is a very slow-growing, long-lived tree, with individuals up to 1000 years in age. It is generally shade-intolerant; however, extreme environmental conditions limit potentially competing trees.

SOURCES

References: Arno 1970, Arno and Habeck 1972, Burns and Honkala 1990a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ecosystems Working Group 1998, Lillybridge et al. 1995, Meidinger and Pojar 1991, Williams and Lillybridge 1983, Williams and Smith 1990

Version: 06 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.808 NORTHERN ROCKY MOUNTAIN SUBALPINE LARCH WOODLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Oligotrophic Soil; Ustic; W-Patch/Medium Intensity; Needle-Leaved Tree; Larix lyallii; Upper Treeline; Long (>500 yrs) Persistence

Concept Summary: This system consists of high-elevation coniferous woodlands dominated by *Larix lyallii* or mixed larch forests on steep terrain and upper slopes of drier continental environments in the northern Rockies of Montana, Idaho and north into British Columbia and Alberta. This system generally occurs at or near the treeline on north-facing cirques or slopes where snowfields persist until June or July. Abrasion by wind-driven snow is characteristic, and leads to stunted or flagged trees in most stands. *Larix lyallii* is a very slow-growing, long-lived tree, with individuals up to 1000 years in age. It is generally shade-intolerant; however, extreme environmental conditions limit potentially competing trees. Major disturbances are windthrow and snow avalanches. Lightning damage to individual trees is common, but sparse canopies and rocky terrain limit the spread of fire. The undergrowth is usually somewhat depauperate, but some stands support a near sward of heath plants such as *Phyllodoce empetriformis, Empetrum nigrum*, and *Cassiope mertensiana*, and can include a slightly taller layer of *Vaccinium scoparium* or *Vaccinium myrtillus*. *Vahlodea atropurpurea (= Deschampsia atropurpurea), Luzula glabrata var. hitchcockii*, and *Juncus parryi* are the most commonly associated graminoids.

Comments: For Okanagan Ecoregion and USGS GAP map zone 1 project this is merged with the dry subalpine parkland system.

DISTRIBUTION

Range: Northern Rockies of Montana, Idaho and north into British Columbia and Alberta.

Divisions: 306:C

TNC Ecoregions: 7:C, 8:P, 68:C

Subnations: AB, BC, ID, MT, WA

CONCEPT

Associations:

- *Larix lyallii - Abies lasiocarpa* Forest [Placeholder] (CEGL000521, G4)
- *Larix lyallii / Vaccinium deliciosum* Woodland (CEGL000952, G3)
- *Larix lyallii / Vaccinium membranaceum / Luzula glabrata* var. *hitchcockii* Woodland (CEGL005884, G2G3)
- *Larix lyallii / Vaccinium scoparium / Luzula glabrata* var. *hitchcockii* Woodland (CEGL000951, G2G3)

Alliances:

- *Abies lasiocarpa - Larix lyallii* Forest Alliance (A.421)
- *Larix lyallii* Woodland Alliance (A.631)

SOURCES

References: Arno 1970, Arno and Habeck 1972, Burns and Honkala 1990a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ecosystems Working Group 1998, Lillybridge et al. 1995, Meidinger and Pojar 1991, Williams and Lillybridge 1983, Williams and Smith 1990

Version: 20 Feb 2003 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

SUBALPINE FORESTS

OKANAGAN COARSE FILTER TARGET: NORTHERN INTERIOR LODGEPOLE PINE-DOUGLAS FIR WOODLAND AND FOREST

CES306.NEW3 NORTHERN INTERIOR LODGEPOLE PINE- DOUGLAS-FIR WOODLAND AND FOREST (TENTATIVE NAME)

Spatial Scale & Pattern: matrix **Classification Confidence:** medium

Required Classifiers: Natural/Semi-natural, Vegetated (>10% vasc.), Upland

Diagnostic Classifiers: Forest and Woodland (Treed), Udic, Short Disturbance Interval, F-Landscape/ Low to Medium Intensity, Needle-Leaved Tree Pinus contorta & Picea glauca or P. engelmannii X glauca dominants, Long (> 100 yrs) Persistence

Non-Diagnostic Classifiers: Montane [Montane], Montane [Lower Montane], Lowland [Foothill], Side Slope, Toeslope/Valley Bottom, Temperate, Temperate [Temperate Continental], Glaciated , Mesotrophic Soil

Concept Summary: This system appears in interior British Columbia on the central Thompson Plateau, Fraser plateau, and the lee side of the Cascades. elevational limits range between 700m and 1400m although higher farther south, 1200m and 1650m. These fire-related forests, dominated or co-dominated by *Pinus contorta* ssp. *latifolia,* are usually dense stands typically seral to *Pseudotsuga menziesii* or *Picea engelmannii x glauca* on moister sites and northern areas. *Calamagrostis rubescens* is the common to dominant understory . Understories may have a moderate to sparse shrub layer that typically includes *Spiraea betulifolia, Shepherdia canadensi*s, *Rosa acicularis, Linnaea borealis,* and *Arctostaphylos uva-ursi.* Cool, moist areas may have *Paxistima myrsinites* in the sparse shrub layer. The moss cover can be very dense. Reindeer and dog lichens are also prominent in the moss and lichen layer. Following stand-replacing fires in typically less than 150 years, *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system are early to mid-successional forests which developed following fires. Stand maintaining fires occur at a 4-50 year interval and stand replacing fires are estimated a at 250 year return interval (Wong, 2004).

Comment: Differs from CES306.820 Rocky Mountain Lodgepole Pine Forest by having boreal elements (Picea glauca, P. mariana, hybrid spruce) and processes (more frigid climates, longer winters). Distinguishing features, little *Pinus ponderosa* and *Larix occidentalis* only in warmest, driest areas in okanagan, IDFdk1 23% dk2 17% dk3 11% xk2 10% xh1 8%; DL 50% SD 12% SF 11% DF 10%

DISTRIBUTION

Divisions: 306, 207
TNC Ecoregions:
Subnations/Nations: BC:c,

CONCEPT

BC Broad Terrestrial Ecological Classification (1998):

- **DL Douglas-fir - Lodgepole Pine** in ICHmk1, IDFdk1 dk1a,b dk2 dk2a,b dk3 dk4 dk5 dm1 mw2 ww ww2 xh1 xh1a xh2 xh2a xh3 xw
- **SL Subboreal White Spruce - Lodgepole Pine** in IDF dk1 dk1a dk2 dk2a dk3 dk5 ww2 xh1 xh2 xh2a xw
- **SF White Spruce – Subalpine fir** in IDFdk1 dk2 dk2b dk5 dm1 mw1 mw2 ww2 xh1 xh2 xh3
- **DF Interior Douglas-fir** in IDFdk1 dk1a,b dk2 dk2b dk3 dk5

BC Associations in Okanagan
CEBC000178 Pinus contorta / Juniperus communis - Vaccinium scoparium
CEBC000299 Pinus contorta / Spiraea betulifolia / Calamagrostis rubescens
CEBC000304 Pinus contorta / Arctostaphylos uva-ursi / Calamagrostis rubescens
CEBC000310 Pinus contorta / Vaccinium scoparium / Calamagrostis rubescens
CEBC000072 Pinus contorta / Calamagrostis rubescens - Lupinus arcticus
CEBC000086 Pinus contorta / Juniperus communis / Pleurozium schreberi
CEBC000097 Pinus contorta / Calamagrostis rubescens / Pleurozium schreberi
CEBC000135 Pinus contorta / Vaccinium membranaceum / Cladonia spp.

SOURCES

References: Ecosystems Working Group 1998, Meidinger and Pojar 1991, Lloyd et al. 1990.
Last updated: 5 Feb 2004 **Stakeholders:** WCS, CAN
Concept Author: R. Crawford **LeadResp:** WCS

OKANAGAN COARSE FILTER TARGET: NORTHERN INTERIOR SPRUCE-FIR WOODLAND AND FOREST

CES306.NEW1 NORTHERN INTERIOR SPRUCE-FIR WOODLAND AND FOREST (TENTATIVE NAME)

Spatial Scale & Pattern: Matrix **Classification Confidence:** medium
Required Classifiers: Natural/Semi-natural, Vegetated (>10% vasc.), Upland
Diagnostic Classifiers: Forest and Woodland (Treed), Udic, moderate Disturbance Interval, F-Landscape/Medium Intensity, Needle-Leaved Tree Picea glauca X engelmannii & Abies lasiocarpa dominants, Long (> 100 yrs) Persistence

Non-Diagnostic Classifiers: Montane [Montane], Montane [Lower Montane], Lowland [Foothill], Side Slope, Toeslope/Valley Bottom, Temperate, Temperate [Temperate Continental], Glaciated , Mesotrophic Soil

Concept Summary: This system occurs primarily in interior British Columbia at mid-elevations in the Thompson Plateau, the southern edge of the Fraser Plateau, the lee side of the Cascade Mountains and less commonly on the Okanagan Highland and Rocky Mountains. Cold winters and moderately short, warm summers characterize the climate. It occurs typically between 1275m and 1450m in the north and between 1000m and 1650m to the south. On zonal sites at mid elevations in the central part of the southern Fraser Plateau and Thompson Plateau in BC and on the Bonaparte Plateau in BC into adjacent Washington, this appears as a moderately open forest dominated by *Pinus contorta, P. glauca X engelmannii, P. engelmannii* and *Abies lasiocarpa*. Mature stand understories typically are dominated by *Calamagrostis rubescens* and *Vaccinium scoparium* with *Arnica arcticus, Lupinus* spp, and *Linnaea borealis*. Along the flanks of the adjacent Cascades Rocky Mountains *Paxistima myrsinites* and *Vaccinium membranaceum* are common in the shrub layer. *Pseudotsuga menziesii Arctostaphylos uva-ursi*and *Juniperus communis* are common on drier sites. *Picea engelmannii* X *glauca,* and *Abies lasiocarpa* increase in the upper canopy along with *Lonicera involucrata*, *Ribes lacustre*, *Cornus canadensis*, *Gymnocarpium dryopteris*, *Rubus pedatus,*and *Tiarella unifoliata* in the understory on wetter sites. A moderately developed moss and lichen layer occurs in this system. This system appears over a wide range of site and soils; middle to toe slopes, level areas or depressional areas usually morainal, fluvial or colluvial deposits. Some areas are moist, cool valley bottoms with cold air drainage.

Comments: as mapped in Okanagan MSdm2 30%, MSxk&mk3 20% MSmw 12% MSdm1 5%, SBS 8%. BEU: DL 20% EF 20%, SL 13% SF 12%, DF 8%. This differs from the Rocky Mountain Subalpine Mesic Spruce Fir Forest (CES306.830) because it has Picea engelmanii x glauca as an important dominant tree, and occurs further north, in the interior of the Coastal Mts in BC. It likely grades into the Rocky Mt type but as of yet is not know to occur in WA. It is also very similar to the Rocky Mountain Subalpine Dry-Mesic Spruce Fir Forest and Woodland (CES306.828), and the understory shrubs and herbaceous components are similar. Current plant association crosswalk work (Fall/Winter 05/06) is underway to compare and confirm the classification of component associations with this and similar systems.

DISTRIBUTION

Divisions: 207, 306
TNC Ecoregions:
Subnations/Nations: BC

CONCEPT

BC Broad Terrestrial Ecological Classification (1998):

- **DL Douglas-fir - Lodgepole Pine** in MSdc1 dc2 dm1 dm2 mw xk xk3 xv & SBSPmk SBS dw1 mm dw1
- **EF Engelmann Spruce – Subalpine fir Dry** in MS dc1 dc2 dm1 dm2 mw xk xk3 xv & SBS dw1 mm
- **SL Subboreal White Spruce - Lodgepole Pine** in MSdc1 dc2 dm2 xk xk3 & SBSPmk dw1 SBS mc1 mm
- **DF Interior Douglas-fir** in MSdc1 dc2 dm1 dm2 mw xk xk3 & SBSPS mk SBS dw1
- **SF White Spruce - Subalpine Fir** in MSdc1 cd2 dm1 dm2 mw xk xk3 & SBSdw1 mm

Associations:

SOURCES

References: Ecosystem Working Group 1998, Meidinger and Pojar 1991, Wong, et al 2004, Lloyd et al. 1990.

Last updated: 30 June 05 **Stakeholders:** WCS, CAN
Concept Author: R. Crawford **LeadResp:** WCS

OKANAGAN COARSE FILTER TARGET: ROCKY MOUNTAIN SUBALPINE DRY-MESIC SPRUCE-FIR FOREST AND WOODLAND

CES204.838 NORTH PACIFIC MOUNTAIN HEMLOCK FOREST

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Tsuga mertensiana
Concept Summary: This forested ecological system occurs throughout the mountains of the North Pacific, from the southern Cascades of Oregon north to southeastern Alaska. It is the predominant forest of subalpine elevations in the coastal mountains of British Columbia, southeastern Alaska, western Washington and western

Oregon. On the leeward side of the Cascades, this is usually a dense canopy composed of *Abies lasiocarpa* and *Tsuga mertensiana*, with some *Picea engelmannii* or *Abies amabilis*. These occur between 1275 and 1675 m elevation. It also occurs on mountain slopes on the outer coastal islands of British Columbia and Alaska. It lies between the Western Hemlock, Pacific Silver Fir, or Shasta Red Fir zones and the Subalpine Parkland or Alpine Tundra Zone, at elevations ranging from 300 to 2300 m (1000-7500 feet). The lower and upper elevation limits decrease from south to north and from east to west. The climate is generally characterized by short, cool summers, rainy autumns and long, cool, wet winters with heavy snow cover for 5-9 months. The heavy snowpack is ubiquitous, but at least in southern Oregon and perhaps the northern Rocky Mountains and eastern Cascades, summer drought is more significant. These more summer-dry climatic areas also have occasional high-severity fires, unlike the majority of the range of the system which experiences fires very rarely or never. *Tsuga mertensiana* and *Abies amabilis* are the characteristic dominant tree species over most of the range. *Abies amabilis* is absent from southern Oregon and less abundant than elsewhere in the central Oregon Cascades and the eastern slopes of the Cascades. *Chamaecyparis nootkatensis* is abundant in the more coastal portions, while *Abies lasiocarpa* is found inland and becomes increasingly common near the transition to the Subalpine Fir-Engelmann Spruce Zone. In the Cascades of central to southern Oregon, *Abies X shastensis* is typically present and often codominant. *Tsuga heterophylla* often occurs at lower elevations in this system but is much less abundant than *Tsuga mertensiana*. *Picea sitchensis* and *Thuja plicata* are occasionally present, especially on the outer coast of Alaska. Deciduous trees are rare. Parklands (open woodlands or sparse trees with dwarf-shrub or herbaceous vegetation) are not part of this system but of North Pacific Maritime Mesic Parkland (CES204.837).
Comments: Farther inland, *Tsuga mertensiana* becomes limited to the coldest and wettest pockets of the more continental subalpine fir forests, described from the eastern Cascades and northern Rocky Mountains. In the northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as patches within the matrix of Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830) only in the most maritime of environments and is included in the spruce-fir system. In the northern Rocky Mountains, this forest system is codominated by *Abies lasiocarpa* and/or *Picea engelmannii*.

DISTRIBUTION

Range: This system occurs throughout the mountains of the North Pacific, from the southern Cascades of Oregon north to southeastern Alaska.
Divisions: 204:C, 306:C
TNC Ecoregions: 1:C, 3:C, 69:C, 81:C
Subnations: AB, BC, OR, WA

CONCEPT

Associations:

- *Tsuga mertensiana - Abies amabilis / Caltha leptosepala* ssp. *howellii* Forest (CEGL000501, G3)
- *Tsuga mertensiana - Abies amabilis / Elliottia pyroliflorus* Woodland (CEGL000503, G3G4)
- *Tsuga mertensiana - Abies amabilis / Oplopanax horridus* Forest (CEGL000507, G3G4)
- *Tsuga mertensiana - Abies amabilis / Rhododendron albiflorum* Forest (CEGL002632, G5)
- *Tsuga mertensiana - Abies amabilis / Rhododendron macrophyllum* Forest (CEGL000124, G4)
- *Tsuga mertensiana - Abies amabilis / Rubus lasiococcus* Forest (CEGL000509, G3)
- *Tsuga mertensiana - Abies amabilis / Tiarella trifoliata* var. *unifoliata - Streptopus lanceolatus* Forest (CEGL000125, G3G4)
- *Tsuga mertensiana - Abies amabilis / Vaccinium membranaceum - Vaccinium ovalifolium* Forest (CEGL002620, G4G5)
- *Tsuga mertensiana - Abies amabilis / Vaccinium membranaceum - Valeriana sitchensis* Forest (CEGL002619, G4)
- *Tsuga mertensiana - Abies amabilis / Vaccinium membranaceum - Xerophyllum tenax* Forest (CEGL000515, G4)
- *Tsuga mertensiana - Abies amabilis / Vaccinium membranaceum* Forest (CEGL002618, G4?)
- *Tsuga mertensiana - Abies amabilis / Vaccinium ovalifolium - Clintonia uniflora* Forest (CEGL000512, G4G5)
- *Tsuga mertensiana - Abies amabilis / Vaccinium ovalifolium - Erythronium montanum* Forest (CEGL000513, G3G4)

- *Tsuga mertensiana - Abies amabilis / Vaccinium ovalifolium - Maianthemum dilatatum* Forest (CEGL002617, G3G4)
- *Tsuga mertensiana - Abies amabilis / Xerophyllum tenax* Forest (CEGL000500, G3)
- *Tsuga mertensiana - Chamaecyparis nootkatensis / Gaultheria shallon* Woodland (CEGL003214, G5)
- *Tsuga mertensiana - Chamaecyparis nootkatensis / Vaccinium ovalifolium* Forest (CEGL003208, G5)
- *Tsuga mertensiana / Chimaphila umbellata* Forest (CEGL000502, G4)
- *Tsuga mertensiana / Elliottia pyroliflorus* Woodland (CEGL003248, G4G5)
- *Tsuga mertensiana / Quercus sadleriana / Orthilia secunda* Forest (CEGL000123, G3G4)
- *Tsuga mertensiana* / Sparse Understory Forest (CEGL008685, G3G4)
- *Tsuga mertensiana / Vaccinium ovalifolium / Caltha leptosepala* ssp. *howellii* Woodland (CEGL003247, G5)
- *Tsuga mertensiana / Vaccinium ovalifolium / Nephrophyllidium crista-galli* Woodland (CEGL003245, G5)
- *Tsuga mertensiana / Vaccinium ovalifolium* Forest (CEGL003244, G5)
- *Tsuga mertensiana / Vaccinium scoparium* Forest (CEGL000126, G4)

Alliances:

- *Tsuga mertensiana - Abies amabilis* Forest Alliance (A.158)
- *Tsuga mertensiana - Abies amabilis* Giant Forest Alliance (A.113)
- *Tsuga mertensiana - Abies amabilis* Saturated Forest Alliance (A.207)
- *Tsuga mertensiana - Abies amabilis* Woodland Alliance (A.555)
- *Tsuga mertensiana* Forest Alliance (A.146)
- *Tsuga mertensiana* Woodland Alliance (A.550)

Dynamics: Landfire VDDT models: R#ABAMup.

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin 1988, Klinka and Chourmouzis 2002

Version: 31 Aug 2005 **Stakeholders:** Canada, West

Concept Author: G. Kittel and C. Chappell **LeadResp:** West

CES306.820 ROCKY MOUNTAIN LODGEPOLE PINE FOREST

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Acidic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Ustic; Long Disturbance Interval; F-Patch/High Intensity [Seasonality/Fall Fire]; F-Landscape/High Intensity; Needle-Leaved Tree; Pinus contorta; Moderate (100-500 yrs) Persistence

Concept Summary: This ecological system is widespread in upper montane to subalpine elevations of the Rocky Mountains, Intermountain region, and north into the Canadian Rockies. These are subalpine forests where the dominance of *Pinus contorta* is related to fire history and topo-edaphic conditions. Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests which developed following fires. This system includes *Pinus contorta*-dominated stands that, while typically persistent for >100-year time frames, may succeed to spruce-fir; in the southern and central Rocky Mountains it is seral to Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828). More northern occurrences are seral to Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830). Soils supporting these forests are typically well-drained, gravelly, coarse-textured, acidic, and rarely formed from calcareous parent materials. These forests are dominated by *Pinus contorta* with shrub, grass, or barren understories. Sometimes there are intermingled mixed conifer/*Populus tremuloides* stands, with the latter occurring with inclusions of deeper, typically fine-textured soils. The shrub stratum may be conspicuous to absent; common species include *Arctostaphylos uva-ursi, Ceanothus velutinus, Linnaea borealis, Mahonia repens, Purshia tridentata, Spiraea betulifolia, Spiraea douglasii, Shepherdia canadensis, Vaccinium caespitosum, Vaccinium scoparium, Vaccinium membranaceum, Symphoricarpos albus*, and *Ribes* spp. In southern interior British Columbia, this system is usually an open lodgepole pine forest found extensively between 500 and 1600 m elevation in the Columbia Range. In the

Interior Cedar Hemlock and Interior Douglas-fir zones, *Tsuga heterophylla* or *Pseudotsuga menziesii* may present.

DISTRIBUTION

Range: This systems occurs at upper montane to subalpine elevations of the Rocky Mountains, Intermountain region, and north into the Canadian Rockies.
Divisions: 304:C, 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 20:C, 68:C
Subnations: AB, BC, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Ceanothus velutinus* Shrubland (CEGL002167, GNR)
- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Pinus contorta / Angelica* spp. Woodland (CEGL005915, G3?)
- *Pinus contorta / Arnica cordifolia* Forest (CEGL000135, G4?)
- *Pinus contorta / Carex geyeri* Forest (CEGL000141, G4?)
- *Pinus contorta / Ceanothus velutinus* Forest (CEGL000145, G4)
- *Pinus contorta / Clintonia uniflora - Xerophyllum tenax* Woodland (CEGL005921, G4G5)
- *Pinus contorta / Clintonia uniflora* Forest (CEGL005916, G5)
- *Pinus contorta / Linnaea borealis* Forest (CEGL000153, G5)
- *Pinus contorta / Menziesia ferruginea / Clintonia uniflora* Forest (CEGL005922, G4G5)
- *Pinus contorta / Menziesia ferruginea* Forest (CEGL005928, G3G4)
- *Pinus contorta / Osmorhiza berteroi* Forest (CEGL000155, G3Q)
- *Pinus contorta / Pedicularis racemosa* Forest (CEGL000156, G2Q)
- *Pinus contorta / Shepherdia canadensis* Forest (CEGL000163, G3G4)
- *Pinus contorta / Spiraea betulifolia* Forest (CEGL000164, G3G4)
- *Pinus contorta / Spiraea douglasii* Forest (CEGL002604, G3G4)
- *Pinus contorta / Symphoricarpos albus* Forest (CEGL000166, G3Q)
- *Pinus contorta / Thalictrum occidentale* Forest (CEGL000167, G4Q)
- *Pinus contorta / Vaccinium caespitosum / Clintonia uniflora* Forest (CEGL005923, G4?)
- *Pinus contorta / Vaccinium caespitosum* Forest (CEGL000168, G5)
- *Pinus contorta / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005913, G4G5)
- *Pinus contorta / Vaccinium membranaceum* Forest (CEGL000170, G4?)
- *Pinus contorta / Vaccinium membranaceum* Rocky Mountain Forest (CEGL000169, G3G4)
- *Pinus contorta / Vaccinium scoparium / Calamagrostis rubescens* Forest (CEGL000174, G3Q)
- *Pinus contorta / Vaccinium scoparium / Xerophyllum tenax* Forest (CEGL005924, G3G4)
- *Pinus contorta / Vaccinium scoparium* Forest (CEGL000172, G5)
- *Pinus contorta / Xerophyllum tenax* Forest (CEGL000175, G5)
- *Pinus contorta* var. *latifolia / Vaccinium scoparium / Carex inops* ssp. *inops* Forest (CEGL000173, G3)

Alliances:

- *Ceanothus velutinus* Shrubland Alliance (A.787)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Pinus contorta* Forest Alliance (A.118)
- *Pinus contorta* Woodland Alliance (A.512)

Dynamics: *Pinus contorta* is an aggressively colonizing, shade-intolerant conifer which usually occurs in lower subalpine forests in the major ranges of the western United States. Establishment is episodic and linked to stand-replacing disturbances, primarily fire. The incidence of serotinous cones varies within and between varieties of *Pinus contorta*, being most prevalent in Rocky Mountain populations. Closed, serotinous cones appear to be strongly favored by fire, and allow rapid colonization of fire-cleared substrates (Burns and Honkala 1990a). Hoffman and Alexander (1980, 1983) report that in stands where *Pinus contorta* exhibits a multi-aged population structure, with regeneration occurring, there is typically a higher proportion of trees bearing nonserotinous cones.

SOURCES

References: Alexander 1986, Alexander et al. 1987, Anderson 1999, Arno et al. 1985, Barrows et al. 1977, Burns and Honkala 1990a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Despain 1973a, Despain 1973b, Ecosystems Working Group 1998, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson and Clausnitzer 1992, Johnston 1997, Kingery 1998, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Moir 1969a, Nachlinger et al. 2001, Neely et al. 2001, Pfister et al. 1977, Steele et al. 1981, Whipple 1975, Williams and Smith 1990

Version: 01 Sep 2005 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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CES306.828 ROCKY MOUNTAIN SUBALPINE DRY-MESIC SPRUCE-FIR FOREST AND WOODLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Acidic Soil; Ustic; Very Long Disturbance Interval [Seasonality/Summer Disturbance]; F-Patch/High Intensity; F-Landscape/High Intensity; Needle-Leaved Tree; Abies lasiocarpa - Picea engelmannii; RM Subalpine Mesic Spruce-Fir; Long (>500 yrs) Persistence

Concept Summary: Engelmann spruce and subalpine fir forests comprise a substantial part of the subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, south into New Mexico and the Intermountain region. They are the matrix forests of the subalpine zone, with elevations ranging from 1275 m in its northern distribution to 3355 m in the south (4100-11,000 feet). They often represent the highest elevation forests in an area. Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches. Despite their wide distribution, the tree canopy characteristics are remarkably similar, with *Picea engelmannii* and *Abies lasiocarpa* dominating either mixed or alone. *Pseudotsuga menziesii* may persist in occurrences of this system for long periods without regeneration. *Pinus contorta* is common in many occurrences, and patches of pure *Pinus contorta* are not uncommon, as well as mixed conifer/*Populus tremuloides* stands. In some areas, such as Wyoming, *Picea engelmannii*-dominated forests are on limestone or dolomite, while nearby codominated spruce-fir forests are on granitic or volcanic rocks. Upper elevation examples may have more woodland physiognomy, and *Pinus albicaulis* can be a seral component. Xeric species may include *Juniperus communis, Linnaea borealis, Mahonia repens*, or *Vaccinium scoparium*. More northern occurrences often have taller, more mesic shrub and herbaceous species, such as *Empetrum nigrum, Rhododendron albiflorum*, and *Vaccinium membranaceum*. Disturbance includes occasional blowdown, insect outbreaks and stand-replacing fire. Mean return interval for stand-replacing fire is 222 years as estimated in southeastern British Columbia.

DISTRIBUTION

Range: This system is found in the Cascades and Rocky Mountains from southern interior British Columbia east into Alberta, south into New Mexico and the Intermountain region.

Divisions: 304:C, 306:C

TNC Ecoregions: 4:C, 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 68:C

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Abies lasiocarpa - Picea engelmannii / Arnica cordifolia* Forest (CEGL000298, G5)
- *Abies lasiocarpa - Picea engelmannii / Arnica latifolia* Forest (CEGL000299, G4)
- *Abies lasiocarpa - Picea engelmannii / Calamagrostis rubescens* Forest (CEGL000301, G4G5)
- *Abies lasiocarpa - Picea engelmannii / Galium triflorum* Forest (CEGL000311, G4)

- *Abies lasiocarpa - Picea engelmannii / Juniperus communis* Woodland (CEGL000919, G4G5)
- *Abies lasiocarpa - Picea engelmannii / Linnaea borealis* Forest (CEGL000315, G5)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea* Forest (CEGL000319, G5)
- *Abies lasiocarpa - Picea engelmannii / Polemonium pulcherrimum* Forest (CEGL000373, G5)
- *Abies lasiocarpa - Picea engelmannii / Symphoricarpos albus* Forest (CEGL000337, G3)
- *Abies lasiocarpa - Picea engelmannii / Thalictrum occidentale* Forest (CEGL000338, G4)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium caespitosum* Forest (CEGL000340, G5)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341, G5)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium myrtillus* Forest (CEGL000343, G5)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium* Forest (CEGL000344, G5)
- *Abies lasiocarpa - Picea engelmannii* Krummholz Shrubland (CEGL000985, G4)
- *Abies lasiocarpa - Picea engelmannii* Tree Island Forest (CEGL000329, GUQ)
- *Abies lasiocarpa / Carex rossii* Forest (CEGL000305, G4G5)
- *Abies lasiocarpa / Carex siccata* Forest (CEGL000303, G2)
- *Abies lasiocarpa / Jamesia americana* Forest (CEGL000312, G1)
- *Abies lasiocarpa / Lathyrus lanszwertii* var. *leucanthus* Forest (CEGL000313, G3G4)
- *Abies lasiocarpa / Mahonia repens* Forest (CEGL000318, G5)
- *Abies lasiocarpa / Osmorhiza berteroi* Forest (CEGL000323, G4)
- *Abies lasiocarpa / Packera sanguisorboides* Forest (CEGL000333, G3)
- *Abies lasiocarpa / Paxistima myrsinites* Woodland (CEGL000324, G4)
- *Abies lasiocarpa / Pedicularis racemosa* Forest (CEGL000325, G5)
- *Abies lasiocarpa / Physocarpus malvaceus* Forest (CEGL000326, G3)
- *Abies lasiocarpa / Saxifraga bronchialis* Scree Woodland (CEGL000924, G4)
- *Abies lasiocarpa / Spiraea betulifolia* Forest (CEGL000335, G4)
- *Abies lasiocarpa / Xerophyllum tenax* Forest (CEGL000346, G5)
- *Abies lasiocarpa* Scree Woodland (CEGL000925, G5?)
- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Picea (engelmannii X glauca, engelmannii) / Clintonia uniflora* Forest (CEGL000406, G4)
- *Picea engelmannii / Arnica cordifolia* Forest (CEGL000355, G3G4)
- *Picea engelmannii / Clintonia uniflora* Forest (CEGL000360, G3)
- *Picea engelmannii / Erigeron eximius* Forest (CEGL000364, G5)
- *Picea engelmannii / Galium triflorum* Forest (CEGL002174, G4)
- *Picea engelmannii / Geum rossii* Forest (CEGL000366, G3?)
- *Picea engelmannii / Juniperus communis* Forest (CEGL005925, G3)
- *Picea engelmannii / Leymus triticoides* Forest (CEGL000362, G3)
- *Picea engelmannii / Linnaea borealis* Forest (CEGL002689, G4)
- *Picea engelmannii / Trifolium dasyphyllum* Forest (CEGL000377, G2?)
- *Picea engelmannii / Vaccinium myrtillus* Forest (CEGL000379, G4Q)
- *Picea engelmannii / Vaccinium scoparium* Forest (CEGL000381, G3G5)

Alliances:
- *Abies lasiocarpa - Picea engelmannii - Pinus flexilis* Krummholz Shrubland Alliance (A.811)
- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Picea engelmannii* Forest Alliance (A.164)

Dynamics: *Picea engelmannii* can be very long-lived, reaching 500 years of age. *Abies lasiocarpa* decreases in importance relative to *Picea engelmannii* with increasing distance from the region of Montana and Idaho where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. *Picea engelmannii* can rapidly recolonize and dominate burned sites, or can succeed other species such as *Pinus contorta* or *Populus tremuloides*. Due to great longevity, *Pseudotsuga menziesii* may persist in occurrences of this system for long periods without regeneration. Old-growth characteristics in *Picea engelmannii* forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags. Landfire VDDT models: #RSPFI.

SOURCES

References: Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, Anderson 1999, Brand et al. 1976, Canadian Rockies Ecoregional Plan 2002, Clagg 1975, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Fitzgerald et al. 1994, Fitzhugh et al. 1987, Graybosch and Buchanan 1983, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Hopkins 1979a, Hopkins 1979b, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, Major et al. 1981, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1992, Nachlinger et al. 2001, Neely et al. 2001, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Romme 1982, Schaupp et al. 1999, Steele and Geier-Hayes 1995, Steele et al. 1981, Tuhy et al. 2002, Veblen 1986, Whipple and Dix 1979, Williams and Lillybridge 1983, Williams et al. 1995, Wong and Iverson 2004, Wong et al. 2003, Youngblood and Mauk 1985

Version: 05 Apr 2005 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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CES306.830 ROCKY MOUNTAIN SUBALPINE MESIC SPRUCE-FIR FOREST AND WOODLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Acidic Soil; Udic; Very Long Disturbance Interval [Seasonality/Summer Disturbance]; F-Patch/High Intensity; F-Landscape/Medium Intensity; Abies lasiocarpa - Picea engelmannii; RM Subalpine Dry-Mesic Spruce-Fir; Long (>500 yrs) Persistence

Concept Summary: This is a high-elevation system of the Rocky Mountains, dry eastern Cascades and eastern Olympic Mountains dominated by *Picea engelmannii* and *Abies lasiocarpa*. It extends westward into the northeastern Olympic Mountains and the northeastern side of Mount Rainier in Washington. *Picea engelmannii* is generally more important in southern forests than those in the Pacific Northwest. Occurrences are typically found in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate. These forests are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces. In the northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as small to large patches within the matrix of this mesic spruce-fir system and only in the most maritime of environments (the coldest and wettest of the more Continental subalpine fir forests). In the Olympics and northern Cascades, the climate is more maritime than typical for this system, but due to the lower snowfall in these rainshadow areas, summer drought may be more significant than snowpack in limiting tree regeneration in burned areas. *Picea engelmannii* is rare in these areas. Mesic understory shrubs include *Menziesia ferruginea, Vaccinium membranaceum, Rhododendron albiflorum, Amelanchier alnifolia, Rubus parviflorus, Ledum glandulosum, Phyllodoce empetriformis*, and *Salix* spp. Herbaceous species include *Actaea rubra, Maianthemum stellatum, Cornus canadensis, Erigeron eximius, Gymnocarpium dryopteris, Rubus pedatus, Saxifraga bronchialis, Tiarella* spp., *Lupinus arcticus ssp. subalpinus, Valeriana sitchensis*, and graminoids *Luzula glabrata var. hitchcockii* or *Calamagrostis canadensis*. Disturbances include occasional blowdown, insect outbreaks (30-50 years), mixed-severity fire, and stand-replacing fire (every 150-500 years). The more summer-dry climatic areas also have occasional high-severity fires.

Comments: The subalpine fir-dominated forests of the northeastern Olympic Mountains and the northeastern side of Mount Rainier are included here. They are more similar to subalpine fir forests on the eastern slopes of the Cascades than they are to mountain hemlock forests.

DISTRIBUTION

Range: This system is found at high elevations of the Rocky Mountains, extending east into the northeastern Olympic Mountains and the northeastern side of Mount Rainier in Washington.

Divisions: 204:C, 304:C, 306:C

TNC Ecoregions: 1:C, 4:C, 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 68:C

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Abies lasiocarpa - Picea engelmannii / Acer glabrum* Forest (CEGL000294, G5)
- *Abies lasiocarpa - Picea engelmannii / Actaea rubra* Forest (CEGL000295, G4?)
- *Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis* Forest (CEGL000300, G5)
- *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest (CEGL000304, G5)
- *Abies lasiocarpa - Picea engelmannii / Clintonia uniflora - Xerophyllum tenax* Forest (CEGL005892, G4G5)
- *Abies lasiocarpa - Picea engelmannii / Clintonia uniflora* Forest (CEGL005912, G5)
- *Abies lasiocarpa - Picea engelmannii / Luzula glabrata* var. *hitchcockii* Woodland (CEGL000317, G5)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea - Vaccinium scoparium* Forest (CEGL005894, G2G4)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Clintonia uniflora* Forest (CEGL005893, G4G5)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Luzula glabrata* var. *hitchcockii* Woodland (CEGL005896, G4?)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Streptopus amplexifolius* Woodland (CEGL005897, G3G4)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Xerophyllum tenax* Forest (CEGL005895, G4G5)
- *Abies lasiocarpa - Picea engelmannii* / Moss Forest (CEGL000321, G4)
- *Abies lasiocarpa - Picea engelmannii / Ribes (montigenum, lacustre, inerme)* Forest (CEGL000331, G5)
- *Abies lasiocarpa - Picea engelmannii / Salix (brachycarpa, glauca)* Krummholz Shrubland (CEGL000986, GUQ)
- *Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius - Luzula glabrata* var. *hitchcockii* Woodland (CEGL005920, G2G3)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium caespitosum / Clintonia uniflora* Forest (CEGL005918, G3G4)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005917, GNR)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341, G5)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Thalictrum occidentale* Forest (CEGL005919, G3G4)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax* Forest (CEGL005914, G4G5)
- *Abies lasiocarpa - Picea engelmannii / Valeriana sitchensis* Woodland (CEGL005823, G2?)
- *Abies lasiocarpa - Picea engelmannii / Xerophyllum tenax - Luzula glabrata* var. *hitchcockii* Woodland (CEGL005898, G4G5)
- *Abies lasiocarpa - Picea engelmannii* Ribbon Forest (CEGL000328, GUQ)
- *Abies lasiocarpa / Caltha leptosepala* ssp. *howellii* Forest (CEGL000302, G3)
- *Abies lasiocarpa / Clematis columbiana* var. *columbiana* Forest (CEGL000306, G3?)
- *Abies lasiocarpa / Coptis occidentalis* Forest (CEGL000308, G4)
- *Abies lasiocarpa / Cornus canadensis* Forest (CEGL000309, G3G4)
- *Abies lasiocarpa / Erigeron eximius* Forest (CEGL000310, G5)
- *Abies lasiocarpa / Gymnocarpium dryopteris* Forest (CEGL002611, GNRQ)
- *Abies lasiocarpa / Ledum glandulosum* Forest (CEGL000314, G4)
- *Abies lasiocarpa / Phyllodoce empetriformis* Woodland (CEGL000920, G4Q)

- *Abies lasiocarpa / Rhododendron albiflorum* Woodland (CEGL000330, G4)
- *Abies lasiocarpa / Rubus parviflorus* Forest (CEGL000332, G5)
- *Abies lasiocarpa / Vaccinium membranaceum / Valeriana sitchensis* Forest (CEGL002612, G4)
- *Abies lasiocarpa / Vaccinium membranaceum* Forest (CEGL000342, G4)
- *Betula papyrifera* - Conifer / *Clintonia uniflora* Woodland (CEGL005904, G3G4)
- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Picea (engelmannii X glauca, engelmannii) / Packera streptanthifolia* Forest (CEGL000414, G4)
- *Picea engelmannii / Acer glabrum* Forest (CEGL000354, G2)
- *Picea engelmannii / Hypnum revolutum* Forest (CEGL000368, G3)
- *Picea engelmannii / Maianthemum stellatum* Forest (CEGL000415, G4?)
- *Picea engelmannii* / Moss Forest (CEGL000371, G4)
- *Picea engelmannii / Packera cardamine* Forest (CEGL000375, G2)
- *Picea engelmannii / Physocarpus malvaceus* Forest (CEGL002676, G3)
- *Picea engelmannii / Ribes montigenum* Forest (CEGL000374, G5?)
- *Populus balsamifera* ssp. *trichocarpa - Populus tremuloides* - Conifer / *Clintonia uniflora* Forest (CEGL005906, G3?)
- *Populus tremuloides - Abies lasiocarpa / Amelanchier alnifolia* Forest (CEGL000524, G3?)
- *Populus tremuloides - Abies lasiocarpa / Carex geyeri - Calamagrostis rubescens* Forest (CEGL000525, G3?)
- *Populus tremuloides - Abies lasiocarpa / Juniperus communis* Forest (CEGL000527, G3G4)
- *Tsuga mertensiana / Clintonia uniflora* Forest (CEGL000504, G3)
- *Tsuga mertensiana / Luzula glabrata* var. *hitchcockii* Forest (CEGL000505, G5)
- *Tsuga mertensiana / Menziesia ferruginea* Forest (CEGL000506, G4)
- *Tsuga mertensiana / Rhododendron albiflorum* Forest (CEGL000508, GNR)
- *Tsuga mertensiana / Streptopus amplexifolius* Forest (CEGL000511, G2)
- *Tsuga mertensiana / Vaccinium membranaceum* Forest (CEGL000514, G4)
- *Tsuga mertensiana / Xerophyllum tenax* Forest (CEGL000516, G4)

Alliances:

- *Abies lasiocarpa - Picea engelmannii - Pinus flexilis* Krummholz Shrubland Alliance (A.811)
- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa - Populus tremuloides* Forest Alliance (A.422)
- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Betula papyrifera* Woodland Alliance (A.603)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Picea engelmannii* Forest Alliance (A.164)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Tsuga mertensiana* Forest Alliance (A.146)
- *Tsuga mertensiana* Seasonally Flooded Forest Alliance (A.186)

Dynamics: Landfire VDDT models: #RSPFI and #RABLA.

SOURCES

References: Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, Anderson 1999, Brand et al. 1976, Canadian Rockies Ecoregional Plan 2002, Clagg 1975, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Fitzgerald et al. 1994, Graybosch and Buchanan 1983, Henderson et al. 1989, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, Major et al. 1981, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1996, Neely et al. 2001, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Romme 1982, Schaupp et al. 1999, Steele and Geier-Hayes 1995, Steele et al. 1981, Tuhy et al. 2002, Veblen 1986, Whipple and Dix 1979, Williams and Lillybridge 1983, Williams et al. 1995, Wong and Iverson 2004, Wong et al. 2003, Youngblood and Mauk 1985

Version: 01 Sep 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

MID-MONTANE FORESTS and SHRUBLANDS

OKANAGAN COARSE FILTER TARGET: EAST CASCADES MESIC MONTANE MIXED-CONIFER FOREST AND WOODLAND

CES204.086 EAST CASCADES MESIC MONTANE MIXED-CONIFER FOREST AND WOODLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Needle-Leaved Tree; Abies grandis - Mixed; Tsuga heterophylla, Thuja plicata; Pseudotsuga menziesii; Long (>500 yrs) Persistence
Concept Summary: This ecological system occurs on the upper east slopes of the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon. Elevations range from 610 to 1220 m (2000-4000 feet) in a very restricted range occupying less than 5% of the forested landscape in the east Cascades. This system is associated with a submesic climate regime with annual precipitation ranging from 100 to 200 cm (40-80 inches) and maximum winter snowpacks that typically melt off in spring at lower elevations. This ecological system is composed of variable montane coniferous forests typically below Pacific silver fir forests along the crest east of the Cascades. This system also includes montane forests along rivers and slopes, and in mesic "coves" which were historically protected from wildfires. Most occurrences of this system are dominated by a mix of *Pseudotsuga menziesii* with *Abies grandis* and/or *Tsuga heterophylla*. Several other conifers can dominate or codominate, including *Thuja plicata, Pinus contorta, Pinus monticola*, and *Larix occidentalis*. *Abies grandis* and other fire-sensitive, shade-tolerant species dominate forests on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by wildfire. They are very productive forests in the eastern Cascades which have been priority stands for timber production. *Mahonia nervosa, Linnaea borealis, Paxistima myrsinites, Acer circinatum, Spiraea betulifolia, Symphoricarpos hesperius, Cornus nuttallii, Rubus parviflorus*, and *Vaccinium membranaceum* are common shrub species. The composition of the herbaceous layer reflects local climate and degree of canopy closure and contains species more restricted to the Cascades, for example, *Achlys triphylla, Anemone deltoidea*, and *Vancouveria hexandra*. Typically, stand-replacement fire-return intervals are 150-500 years with moderate-severity fire-return intervals of 50-100 years.
Comments: Includes *Tsuga heterophylla* and *Thuja plicata* associations and moister *Abies grandis* associations in eastern Cascades.

DISTRIBUTION

Range: This ecological system occurs on the upper east slopes of the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon.
Divisions: 204:C
TNC Ecoregions: 4:C
Subnations: BC, OR, WA

CONCEPT

Associations:

- *Abies concolor - Pinus contorta / Carex pensylvanica - Achnatherum occidentale* Forest (CEGL000256, G3)
- *Abies grandis - Picea engelmannii / Maianthemum stellatum* Forest (CEGL000278, G2)
- *Abies grandis - Pseudotsuga menziesii / Trientalis borealis* ssp. *latifolia* Forest (CEGL000040, G3)
- *Abies grandis - Thuja plicata / Achlys triphylla* Forest (CEGL002669, G2)

- *Abies grandis - Tsuga heterophylla / Clintonia uniflora* Forest (CEGL000286, G2)
- *Abies grandis / Acer circinatum* Forest (CEGL000266, G4)
- *Abies grandis / Achlys triphylla* Forest (CEGL000268, G3)
- *Abies grandis / Arctostaphylos nevadensis* Woodland (CEGL000915, G2G3)
- *Abies grandis / Chrysolepis chrysophylla* Forest (CEGL000038, G1)
- *Abies grandis / Polemonium pulcherrimum* Forest (CEGL000039, G3)
- *Abies grandis / Symphoricarpos albus* Forest (CEGL000282, G3?)
- *Abies grandis / Vaccinium membranaceum - Achlys triphylla* Forest (CEGL000291, G2G3)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Abies grandis* Forest Alliance (A.153)
- *Abies grandis* Woodland Alliance (A.558)

Dynamics: Landfire VDDT models: R#MCONm Eastside mixed conifer moist (GF/DF) model is applied with stages A-B-E.

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: This system lies between and interfingers with the higher North Pacific Mountain Hemlock (CES204.838), North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097) or Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830) and the lower Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805). Westward in the Columbia River Gorge, this system merges with North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001).

SOURCES

References: Hessburg et al. 1999, Hessburg et al. 2000, Lillybridge et al. 1995, Topik 1989, Topik et al. 1988, Western Ecology Working Group n.d.

Version: 31 Mar 2005 **Stakeholders:** Canada, West

Concept Author: R. Crawford **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: INTER-MOUNTAIN BASINS MONTANE GRASSLAND AND SAGEBRUSH STEPPE

CES304.785 INTER-MOUNTAIN BASINS MONTANE SAGEBRUSH STEPPE

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane, Montane, Lower Montane]; Woody-Herbaceous

Concept Summary: This ecological system includes sagebrush communities occurring at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies. In British Columbia, it occurs between 450 and 1650 m in the southern Fraser Plateau and the Thompson and Okanagan basins. Climate is cool, semi-arid to subhumid. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. It is composed primarily of *Artemisia tridentata ssp. vaseyana* (mountain sagebrush) and related taxa such as *Artemisia tridentata ssp. spiciformis (= Artemisia spiciformis). Purshia tridentata* may codominate or even dominate some stands. Other common shrubs include *Symphoricarpos* spp., *Amelanchier* spp., *Ericameria nauseosa, Peraphyllum ramosissimum, Ribes cereum*, and *Chrysothamnus viscidiflorus*. Most stands have an abundant perennial herbaceous layer (over 25% cover), but this system also includes *Artemisia tridentata ssp. vaseyana* shrublands. Common graminoids include *Festuca arizonica, Festuca idahoensis, Hesperostipa comata, Poa fendleriana, Elymus trachycaulus, Bromus carinatus, Poa secunda, Leucopoa kingii, Deschampsia caespitosa,* *Calamagrostis rubescens*, and *Pseudoroegneria spicata*. In many areas, frequent wildfires maintain an open herbaceous-rich steppe condition, although at most sites, shrub cover can be unusually high for a steppe system (>40%), with the moisture providing equally high grass and forb cover.

DISTRIBUTION

Range: This system is found at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies. In British Columbia, it occurs in the southern Fraser Plateau and the Thompson and Okanagan basins.

Divisions: 304:C, 306:C

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 12:C, 18:C, 19:C, 20:C, 68:C

Subnations: AZ?, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Artemisia arbuscula* ssp. *arbuscula - Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Shrubland [Provisional] (CEGL002982, GNR)
- *Artemisia arbuscula* ssp. *thermopola / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001519, G2)
- *Artemisia rothrockii / Monardella odoratissima* Shrubland (CEGL008652, G3?)
- *Artemisia rothrockii* Shrubland [Provisional] (CEGL003014, G3?)
- *Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) - *Amelanchier utahensis* Shrubland (CEGL002820, GNR)
- *Artemisia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata* Upperzone Community Shrubland (CEGL001013, G5?)
- *Artemisia tridentata* ssp. *spiciformis / Bromus carinatus* Shrubland (CEGL002989, GNR)
- *Artemisia tridentata* ssp. *spiciformis / Carex geyeri* Shrubland (CEGL002990, GNR)
- *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Vegetation [Provisional] (CEGL002993, GNR)
- *Artemisia tridentata* ssp. *vaseyana - Purshia tridentata / Pseudoroegneria spicata* Shrubland (CEGL001032, G5?)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Bromus carinatus* Shrubland (CEGL001035, G4Q)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Elymus trachycaulus* ssp. *trachycaulus* Shrubland (CEGL001034, G3G4)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Festuca idahoensis* Shrubland (CEGL001036, G4)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Hesperostipa comata* Shrubland (CEGL001039, G3?)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Poa secunda* Shrubland (CEGL001037, G5?)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Pseudoroegneria spicata* Shrubland (CEGL001038, G5?)
- *Artemisia tridentata* ssp. *vaseyana / Achnatherum lettermanii* Shrubland (CEGL002811, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Achnatherum occidentale* Shrubland (CEGL001033, G2)
- *Artemisia tridentata* ssp. *vaseyana / Balsamorhiza sagittata* Shrubland (CEGL001020, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Bromus carinatus* Shrubland (CEGL001021, G4?)
- *Artemisia tridentata* ssp. *vaseyana / Carex exserta* Shrubland (CEGL008651, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Shrub Herbaceous Vegetation (CEGL001532, G3)
- *Artemisia tridentata* ssp. *vaseyana / Festuca campestris* Shrub Herbaceous Vegetation (CEGL001531, G3Q)
- *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis - Bromus carinatus* Shrubland (CEGL001023, G4Q)
- *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001533, G5)
- *Artemisia tridentata* ssp. *vaseyana / Festuca thurberi* Shrubland (CEGL001024, G3G4)
- *Artemisia tridentata* ssp. *vaseyana / Hesperostipa comata* Shrubland (CEGL002931, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Leucopoa kingii - Koeleria macrantha* Shrubland (CEGL001026, G4)
- *Artemisia tridentata* ssp. *vaseyana / Leucopoa kingii* Shrubland (CEGL001025, G3)
- *Artemisia tridentata* ssp. *vaseyana / Leymus cinereus* Shrubland (CEGL001027, G4?)

- *Artemisia tridentata* ssp. *vaseyana / Monardella odoratissima* Shrubland (CEGL003476, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Pascopyrum smithii* Shrubland (CEGL001028, G3?)
- *Artemisia tridentata* ssp. *vaseyana / Phlox condensata* Shrubland (CEGL002770, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Poa fendleriana* Shrubland (CEGL002812, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Poa secunda* Shrubland (CEGL001029, G3)
- *Artemisia tridentata* ssp. *vaseyana / Pseudoroegneria spicata - Poa fendleriana* Shrubland (CEGL001031, G5)
- *Artemisia tridentata* ssp. *vaseyana / Pseudoroegneria spicata* Shrubland (CEGL001030, G5)
- *Artemisia tridentata* ssp. *wyomingensis - Peraphyllum ramosissimum / Festuca idahoensis* Shrubland (CEGL001048, G2)
- *Symphoricarpos oreophilus* Shrubland (CEGL002951, GNR)

Alliances:

- *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A.2547)
- *Artemisia arbuscula* ssp. *thermopola* Shrub Herbaceous Alliance (A.2553)
- *Artemisia rothrockii* Shrubland Alliance (A.1098)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Alliance (A.2555)
- *Artemisia tridentata* ssp. *spiciformis* Shrubland Alliance (A.2550)
- *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance (A.1526)
- *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (A.831)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Symphoricarpos oreophilus* Shrubland Alliance (A.2530)

Environment: This ecological system occurs in many of the western United States, usually at middle elevations (1000-2500 m). The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25 to 90 cm/year. Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. Soils generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; soils often have a substantial volume of coarse fragments, and are derived from a variety of parent materials. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, but the higher elevation occurrences may be restricted to south- or west-facing slopes.

Vegetation: Vegetation types within this ecological system are usually less than 1.5 m tall and dominated by *Artemisia tridentata ssp. vaseyana, Artemisia cana ssp. viscidula*, or *Artemisia tridentata ssp. spiciformis*. A variety of other shrubs can be found in some occurrences, but these are seldom dominant. They include *Artemisia rigida, Artemisia arbuscula, Ericameria nauseosa, Chrysothamnus viscidiflorus, Symphoricarpos oreophilus, Purshia tridentata, Peraphyllum ramosissimum, Ribes cereum, Rosa woodsii, Ceanothus velutinus*, and *Amelanchier alnifolia*. The canopy cover is usually between 20-80%. The herbaceous layer is usually well represented, but bare ground may be common in particularly arid or disturbed occurrences. Graminoids that can be abundant include *Festuca idahoensis, Festuca thurberi, Festuca ovina, Elymus elymoides, Deschampsia caespitosa, Danthonia intermedia, Danthonia parryi, Stipa* spp., *Pascopyrum smithii, Bromus carinatus, Elymus trachycaulus, Koeleria macrantha, Pseudoroegneria spicata, Poa fendleriana*, or *Poa secunda*, and *Carex* spp. Forbs are often numerous and an important indicator of health. Forb species may include *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus*, and *Eriogonum, Balsamorhiza sagittata, Achillea millefolium, Antennaria rosea*, and *Eriogonum umbellatum, Fragaria virginiana, Artemisia ludoviciana, Hymenoxys hoopesii (= Helenium hoopesii)*, etc.

Dynamics: Healthy sagebrush shrublands are very productive, are often grazed by domestic livestock, and are strongly preferred during the growing season (Padgett et al. 1989). Prolonged livestock use can cause a decrease in the abundance of native bunch grasses and increase in the cover of shrubs and non-native grass species, such as *Poa pratensis*. *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). *Artemisia tridentata* is generally killed by fires and may take over ten years to form occurrences of some 20% cover or more. The condition of most sagebrush steppe has been degraded due to fire suppression and heavy livestock grazing. It is unclear how long restoration will take to restore degraded occurrences.

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Hansen et al. 1995, Hironaka et al. 1983, Johnston 2001, Mueggler and Stewart 1980, Neely et al. 2001, Padgett et al. 1989, West 1983c

Version: 09 Feb 2005 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.836 NORTHERN ROCKY MOUNTAIN MONTANE GRASSLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Loam Soil Texture; Silt Soil Texture; Ustic; Graminoid; Cool-season bunch grasses

Concept Summary: This ecological system of the northern Rocky Mountains is found at mid- to low-montane elevations in the mountains of northeastern Wyoming and Montana, west through Idaho into the Blue Mountains of Oregon, and north into the Okanagan and the Canadian Rockies. These dry grasslands are small meadows to large open parks surrounded by conifer trees but lack tree cover within them. Generally, the soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. These northern montane grasslands represent a shift in the precipitation regime from summer monsoons and cold snowy winters found in the southern Rockies to predominantly dry summers and winter rains. Montane grasslands are very similar and intergrade with their subalpine counterparts but are separated here to represent those species that do not occur at higher altitudes. The implied fire regime in montane grasslands is more frequent than the subalpine grassland system particularly in parkland and valleys near ponderosa pine systems. Occurrences have a moderately dense graminoid layer of cool-season, medium-tall bunch grasses dominated by *Festuca campestris, Pseudoroegneria spicata, Festuca idahoensis, Leymus cinereus, Elymus trachycaulus, Bromus inermis ssp. pumpellianus (= Bromus pumpellianus), Achnatherum richardsonii(= Stipa richardsonii), Achnatherum occidentale (= Stipa occidentalis), Koeleria macrantha*, and other graminoids such as *Carex filifolia* and *Danthonia intermedia*. Common associated forbs include *Geum triflorum, Galium boreale, Campanula rotundifolia, Antennaria microphylla, Geranium viscosissimum*, and *Potentilla gracilis*. Shrub cover is generally nonexistent in southern examples but can be adjacent in neighboring wetlands or riparian areas. In British Columbia, individual, stunted *Pinus contorta* and *Populus tremuloides* trees and *Amelanchier alnifolia, Symphoricarpos albus, Rosa acicularis*, or *Juniperus communis* shrubs may appear in these grasslands. These are sites where one might expect to see either *Artemisia tripartita* or *Artemisia tridentata ssp. vaseyana* within the forest zones.

DISTRIBUTION

Range: This system is found at montane elevation in the mountains of northeastern Wyoming and Montana west through Idaho into the Blue Mountains of Oregon and north into the Okanagan and the Canadian Rockies.

Divisions: 204:P, 306:C

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 68:C

Subnations: AB, BC, ID, MT, OR, UT, WA, WY

CONCEPT

Associations:

-

Alliances:

Dynamics: *Festuca campestris* is highly palatable throughout the grazing season. Summer overgrazing for 2 to 3 years can result in the loss of *Festuca campestris* in the stand. Although a light stocking rate for 32 years did not affect range condition, a modest increase in stocking rate led to a marked decline in range condition. The major change was a measurable reduction in basal area of *Festuca campestris*. Long-term heavy grazing on moister sites can result in a shift to a Kentucky bluegrass - timothy type. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris*. It tolerates dormant-period grazing well but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring. Exotic species threatening this ecological system through invasion and potential complete replacement of native species include *Bromus japonicus, Potentilla recta, Euphorbia esula*, and all manner of knapweed, especially *Centaurea biebersteinii (= Centaurea maculosa).*

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ecosystems Working Group 1998, Marriott 2000, McLean 1970, Meidinger and Pojar 1991, Mueggler and Harris 1969, Mueggler and Stewart 1980, Tisdale 1947, Tisdale 1982

Version: 09 Feb 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: NORTH PACIFIC WESTERN HEMLOCK-SILVER FIR FOREST

CES204.098 NORTH PACIFIC DRY-MESIC SILVER FIR-WESTERN HEMLOCK-DOUGLAS-FIR FOREST

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Tsuga heterophylla - Abies amabilis

Concept Summary: This forested system occurs only in the Pacific Northwest mountains, primarily west of the Cascade Crest. It generally occurs in an elevational band between *Pseudotsuga menziesii - Tsuga heterophylla* forests and *Tsuga mertensiana* forests. It dominates mid-montane dry to mesic maritime and some submaritime climatic zones from northwestern British Columbia to northwestern Oregon. In British Columbia and in the Olympic Mountains, this system occurs on the leeward side of the mountains only. In the Washington Cascades, it occurs on both windward and leeward sides of the mountains (in other words, it laps over the Cascade Crest to the "eastside"). Stand-replacement fires are regular with mean return intervals of about 200-500 years. Fire frequency tends to decrease with increasing elevation and continentality but still remains within this typical range. A somewhat variable winter snowpack that typically lasts for 2-6 months is characteristic. The climatic zone within which it occurs is sometimes referred to as the "rain-on-snow" zone because of the common occurrence of major winter rainfall on an established snowpack. *Tsuga heterophylla* and/or *Abies amabilis* dominate the canopy of late-seral stands, though *Pseudotsuga menziesii* is usually also common because of its long life span, and *Chamaecyparis nootkatensis* can be codominant, especially at higher elevations. *Abies procera* forests (usually mixed with silver fir) are included in this system and occur in the Cascades from central Washington to central Oregon and rarely in the Coast Range of Oregon. *Pseudotsuga menziesii* is a common species (unlike the mesic western hemlock-silver fir forest system) that regenerates after fires and therefore is frequent as a codominant, except at the highest elevations; the prevalence of this species is an important indicator in relation to the related climatically wetter ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$. *Abies lasiocarpa* sometimes occurs as a codominant on the east side of the Cascades and in submaritime British Columbia. Understory species that tend to be more common or unique in this type compared to the wetter ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$ include *Achlys triphylla, Mahonia nervosa, Xerophyllum tenax, Vaccinium membranaceum, Rhododendron macrophyllum*, and *Rhododendron albiflorum*. *Vaccinium ovalifolium*, while still common, only dominates on more moist sites within this type, unlike in the related type where it is nearly ubiquitous.

Comments: Unlike ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$, the dominant natural process here is stand-replacement fires which occur on average every 200-500 years. Where old-growth does exist, it is mostly "young old-growth" 200-500 years in age. Natural-origin stands less than 200 years old are also common. More mixed-severity fires occur to the south in this system, so structure, patch size and proportions will be different; further north more stand-replacing fires occur. In map zone 7, this system will get modeled as 2 different BpS because of the differences in regimes. In Oregon there are more mixed-severity fires.

DISTRIBUTION

Range: This system only occurs in the Pacific Northwest mountains, on the leeward side of coastal mountains in both British Columbia and in the Olympic Mountains of Washington. It occurs throughout most of the Washington Cascades on both west and east sides (sporadically on the east) and in the western Cascades of northern to central Oregon. It occurs very sporadically in the Willapa Hills of southwestern Washington and in the northern Oregon Coast Range. This type may also occur on the east side of the Oregon Cascades north of 45 degrees North latitude (Mount Hood National Forest - Hood River and Barlow ranger districts, and possibly the northern edge of Warm Springs Reservation in part of the McQuinn Strip).
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 69:C, 70:C, 81:C
Subnations: BC, OR, WA

CONCEPT

Associations:
- *Abies amabilis - Abies concolor / Mahonia nervosa* Forest (CEGL000215, G2G3)
- *Abies amabilis - Abies concolor / Maianthemum stellatum* Forest (CEGL000216, G4)
- *Abies amabilis / Achlys triphylla* Forest (CEGL000003, G4)
- *Abies amabilis / Gaultheria shallon* Forest (CEGL000220, G4)
- *Abies amabilis / Mahonia nervosa* Forest (CEGL000217, G4)
- *Abies amabilis / Menziesia ferruginea* Forest (CEGL000224, G4)
- *Abies amabilis / Oplopanax horridus* Forest (CEGL000004, G5)
- *Abies amabilis / Polystichum munitum* Forest (CEGL000006, G4)
- *Abies amabilis / Rhododendron albiflorum* Forest (CEGL000225, G5)
- *Abies amabilis / Rhododendron macrophyllum - Gaultheria shallon* Forest (CEGL000222, G4)
- *Abies amabilis / Rhododendron macrophyllum - Mahonia nervosa* Forest (CEGL000218, G4)
- *Abies amabilis / Rhododendron macrophyllum - Vaccinium ovalifolium* Forest (CEGL000226, G4)
- *Abies amabilis / Rhododendron macrophyllum / Xerophyllum tenax* Forest (CEGL000227, G4)
- *Abies amabilis / Tiarella trifoliata* Forest (CEGL000007, G4)
- *Abies amabilis / Vaccinium membranaceum - Tiarella trifoliata* Forest (CEGL000237, G4)
- *Abies amabilis / Vaccinium membranaceum - Vaccinium ovalifolium* Forest (CEGL002610, G4G5)
- *Abies amabilis / Vaccinium membranaceum / Clintonia uniflora* Forest (CEGL002625, G4)
- *Abies amabilis / Vaccinium membranaceum / Rubus lasiococcus* Forest (CEGL000236, G4)
- *Abies amabilis / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL000239, G4)
- *Abies amabilis / Vaccinium membranaceum* Forest (CEGL000235, G4)
- *Abies amabilis / Vaccinium ovalifolium - Gaultheria shallon* Forest (CEGL002626, G4)
- *Abies amabilis / Vaccinium ovalifolium / Clintonia uniflora* Forest (CEGL000233, G5)
- *Abies amabilis / Vaccinium ovalifolium / Mahonia nervosa* Forest (CEGL000232, G4)
- *Abies amabilis / Vaccinium ovalifolium / Tiarella trifoliata* Forest (CEGL000009, G4)
- *Abies amabilis / Vaccinium ovalifolium / Xerophyllum tenax* Forest (CEGL002609, G4)
- *Abies amabilis / Vaccinium ovalifolium* Forest (CEGL000231, G4G5)
- *Abies amabilis / Vaccinium scoparium* Forest (CEGL000238, G4)
- *Chamaecyparis nootkatensis / Vaccinium ovalifolium* Forest (CEGL000351, G4Q)

Dynamics: Landfire VDDT models: R#ABAMlo; they use *Pseudotsuga menziesii* as an indicator so some of the eastside *Abies amabilis* are included with *Picea engelmannii* or *Pinus monticola*.

SPATIAL CHARACTERISTICS

SOURCES

References: DeMeo et al. 1992, DeVelice et al. 1999, Franklin and Dyrness 1973, Martin et al. 1995, Viereck et al. 1992, Western Ecology Working Group n.d.
Version: 23 Jan 2006 **Stakeholders:** Canada, West

Concept Author: C. Chappell **LeadResp:** West

CES204.001 NORTH PACIFIC MARITIME DRY-MESIC DOUGLAS-FIR-WESTERN HEMLOCK FOREST

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Tsuga heterophylla, Pseudotsuga menziesii

Concept Summary: This ecological system comprises much of the major lowland forests of western Washington, northwestern Oregon, eastern Vancouver Island, and the southern Coast Ranges in British Columbia. In southwestern Oregon, it becomes local and more small-patch in nature. It occurs throughout low-elevation western Washington, except on extremely dry or moist to very wet sites. In Oregon it occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, and in the Coast Range. These forests occur on the drier to intermediate moisture habitats and microhabitats within the Western Hemlock Zone of the Pacific Northwest. Climate is relatively mild and moist to wet. Mean annual precipitation is mostly 90-254 cm (35-100 inches) (but as low as 20 inches in the extreme rainshadow) falling predominantly as winter rain. Snowfall ranges from rare to regular, and summers are relatively dry. Elevation ranges from sea level to 610 m (2000 feet) in northern Washington to 1067 m (3500 feet) in Oregon. Topography ranges from relatively flat glacial tillplains to steep mountainous terrain. This is generally the most extensive forest in the lowlands on the west side of the Cascades and forms the matrix within which other systems occur as patches. Throughout its range it occurs in a mosaic with ~North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)$$; in dry areas it occurs adjacent to or in a mosaic with ~North Pacific Dry Douglas-fir Forest and Woodland (CES204.845)$$ and at higher elevations intermingles with either ~North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)$$ or ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$.

Overstory canopy is dominated by *Pseudotsuga menziesii*, with *Tsuga heterophylla* generally present in the subcanopy or as a canopy dominant in old-growth stands. *Abies grandis, Thuja plicata*, and *Acer macrophyllum* codominants are also represented. In the driest climatic areas, *Tsuga heterophylla* may be absent, and *Thuja plicata* takes its place as a late-seral or subcanopy tree species. *Gaultheria shallon, Mahonia nervosa, Rhododendron macrophyllum, Linnaea borealis, Achlys triphylla*, and *Vaccinium ovatum* typify the poorly to well-developed shrub layer. *Acer circinatum* is a common codominant with one of more of these other species. The fern *Polystichum munitum* can be codominant with one or more of the evergreen shrubs on sites with intermediate moisture availability (mesic). If *Polystichum munitum* is thoroughly dominant or greater than about 40-50% cover, then the stand is probably in the more moist ~North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)$$. Young stands may lack *Tsuga heterophylla* or *Thuja plicata*, especially in the Puget Lowland. *Tsuga heterophylla* is generally the dominant regenerating tree species. Other common associates include *Acer macrophyllum, Abies grandis*, and *Pinus monticola*. In southwestern Oregon, *Pinus lambertiana, Calocedrus decurrens*, and occasionally *Pinus ponderosa* may occur in these forests. Soils are generally well-drained and are mesic to dry for much of the year. This is in contrast to ~North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)$$, which occurs on sites where soils remain moist to subirrigated for much of the year and fires were less frequent. Fire is (or was) the major natural disturbance. In the past (pre-1880), fires were high-severity or, less commonly, moderate-severity, with natural return intervals of 100 years or less in the driest areas, to a few hundred years in areas with more moderate to wet climates. In the drier climatic areas (central Oregon Cascades, Puget Lowlands, Georgia Basin), this system was typified by a moderate-severity fire regime involving occasional stand-replacing fires and more frequent moderate-severity fires. This fire regime would create a complex mosaic of stand structures across the landscape.

DISTRIBUTION

Range: This system comprises the major lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. In British Columbia and Washington, it is uncommon to absent on the windward side of the coastal mountains where fire is rare. It also occurs locally in far southwestern Oregon (Klamath ecoregion) as small to large patches.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 5:C, 69:C, 81:C
Subnations: BC, OR, WA

CONCEPT

Associations:

- *Pseudotsuga menziesii - (Tsuga heterophylla) / Rhododendron macrophyllum* Forest (CEGL000086, G3)
- *Pseudotsuga menziesii - Tsuga heterophylla / Gaultheria shallon* Forest (CEGL000084, G3)
- *Pseudotsuga menziesii - Tsuga heterophylla / Holodiscus discolor* Forest (CEGL000067, G3)
- *Pseudotsuga menziesii - Tsuga heterophylla / Mahonia nervosa* Forest (CEGL000083, G2)
- *Pseudotsuga menziesii - Tsuga heterophylla / Rhododendron macrophyllum - Vaccinium ovatum - Gaultheria shallon* Forest (CEGL002615, G2)
- *Pseudotsuga menziesii - Tsuga heterophylla / Vaccinium ovatum* Forest (CEGL002614, G2)
- *Pseudotsuga menziesii / Acer circinatum - Holodiscus discolor* Forest (CEGL000109, G3Q)
- *Pseudotsuga menziesii / Gaultheria shallon / Polystichum munitum* Forest (CEGL000070, G4)
- *Thuja plicata - Tsuga heterophylla / Rhododendron macrophyllum / Linnaea borealis* Forest (CEGL000485, G3)
- *Thuja plicata - Tsuga heterophylla / Whipplea modesta* Forest (CEGL000486, G2G3)
- *Tsuga heterophylla / Acer glabrum* var. *douglasii / Linnaea borealis* Forest (CEGL002608, G3Q)
- *Tsuga heterophylla / Achlys triphylla* Forest (CEGL000094, G4)
- *Tsuga heterophylla / Chrysolepis chrysophylla* Forest (CEGL000099, G3)
- *Tsuga heterophylla / Gaultheria shallon / Polystichum munitum* Forest (CEGL000101, G4)
- *Tsuga heterophylla / Linnaea borealis* Forest (CEGL000104, G3)
- *Tsuga heterophylla / Mahonia nervosa - Gaultheria shallon* Forest (CEGL000096, G4)
- *Tsuga heterophylla / Mahonia nervosa / Achlys triphylla* Forest (CEGL000095, G4)
- *Tsuga heterophylla / Mahonia nervosa / Linnaea borealis* Forest (CEGL000097, G3Q)
- *Tsuga heterophylla / Mahonia nervosa* Forest (CEGL000492, G4)
- *Tsuga heterophylla / Vaccinium membranaceum / Linnaea borealis* Forest (CEGL000119, G4)
- *Tsuga heterophylla / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL000120, G3)
- *Tsuga heterophylla / Vaccinium ovatum* Forest (CEGL000121, G3)

Dynamics: Fire is (or was) the major natural disturbance. In the past (pre-1880), fires were high-severity or, less commonly, moderate-severity, with natural return intervals of 100 years or less in the driest areas, to a few hundred years in areas with more moderate to wet climates. In the drier climatic areas (central Oregon Cascades, Puget Lowlands, Georgia Basin), this system was typified by a moderate-severity fire regime involving occasional stand-replacement fires and more frequent moderate-severity fires. This fire regime would create a complex mosaic of stand structures across the landscape. Landfire VDDT models: #RDFHEdry Douglas-fir Hemlock dry mesic describes general successional stage relationship with bias to OR.

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: In dry areas it occurs adjacent to or in a mosaic with ~North Pacific Dry Douglas-fir Forest and Woodland (CES204.845)$$ and at higher, moister elevations intermingles with either ~North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)$$ or ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$. Throughout its range it occurs in a mosaic with ~North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)$$.

SOURCES

References: Western Ecology Working Group n.d.
Version: 31 Mar 2005 **Stakeholders:** Canada, West
Concept Author: G. Kittel and C. Chappell **LeadResp:** West

CES204.002 NORTH PACIFIC MARITIME MESIC-WET DOUGLAS-FIR-WESTERN HEMLOCK FOREST

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix, Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Tsuga heterophylla, Pseudotsuga menziesii
Concept Summary: This ecological system is a significant component of the lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. It occurs throughout low-elevation western Washington, except on extremely dry sites and in the hypermaritime zone near the outer coast where it is rare. In Oregon it occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, and on the west side of the Coast Ranges, and is reduced to locally small patches in southwestern Oregon. In British Columbia, it occurs on the eastern (leeward) side of Vancouver Island, commonly and rarely on the windward side, and in the southern Coast Ranges. These forests occur on moist habitats and microhabitats, mainly lower slopes or valley landforms, within the Western Hemlock Zone of the Pacific Northwest. They differ from ~North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)$$ primarily in having more hydrophilic undergrowth species, moist to subirrigated soils, high abundance of shade- and moisture-tolerant canopy trees, as well as higher stand productivity, due to higher soil moisture and lower fire frequency. Climate is relatively mild and moist to wet. Mean annual precipitation is mostly 90-254 cm (35-100 inches) (but as low as 20 inches in the extreme rainshadow) predominantly as winter rain. Snowfall ranges from rare to regular (but consistent winter snowpacks are absent or minimal), and summers are relatively dry. Elevation ranges from sea level to 610 m (2000 feet) in northern Washington to 1067 m (3500 feet) in Oregon. Topography ranges from relatively flat glacial tillplains to steep mountainous terrain. This is an extensive forest in the lowlands on the west side of the Cascades. In some wetter climatic areas, it forms the matrix within which other systems occur as patches, especially riparian wetlands. In many rather drier climatic areas, it occurs as small to large patches within a matrix of ~North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)$$; in dry areas, it can occur adjacent to or in a mosaic with ~North Pacific Dry Douglas-fir Forest and Woodland (CES204.845)$$ and at higher elevations intermingles with either ~North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)$$ or ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$.

Overstory canopy is dominated by *Pseudotsuga menziesii, Tsuga heterophylla*, and/or *Thuja plicata*, as well as *Chamaecyparis lawsoniana* in southwestern Oregon. *Pseudotsuga menziesii* is usually at least present to more typically codominant or dominant. *Acer macrophyllum* and *Alnus rubra* (the latter primarily where there has been historic logging disturbance) are commonly found as canopy or subcanopy codominants, especially at lower elevations. In a natural landscape, small patches can be dominated in the canopy by these broadleaf trees for several decades after a severe fire. *Polystichum munitum, Oxalis oregana, Rubus spectabilis*, and *Oplopanax horridus* typify the poorly to well-developed herb and shrub layers. *Gaultheria shallon, Mahonia nervosa, Rhododendron macrophyllum*, and *Vaccinium ovatum* are often present but are generally not as abundant as the aforementioned indicators; except where *Chamaecyparis lawsoniana* is a canopy codominant, they may be the dominant understory. *Acer circinatum* is a very common codominant as a tall shrub. Forested stands with abundant *Lysichiton americanus* , an indicator of seasonally flooded or saturated soils, belong in ~North Pacific Coniferous Swamp (CES204.867)$$. Stands included are best represented on lower mountain slopes of the coastal ranges with high precipitation, long frost-free periods, and low fire frequencies. Young stands may lack *Tsuga heterophylla* or *Thuja plicata*, especially in the Puget Lowland. *Tsuga heterophylla* is generally the dominant regenerating tree species. Other common associates include *Abies grandis*, which can be a codominant especially in the Willamette Valley - Puget Trough - Georgia Basin ecoregion. Soils are moist to somewhat wet but not saturated for much of the year and are well-drained to somewhat poorly drained. Typical soils for *Polystichum* sites would be deep, fine- to moderately coarse-textured, and for *Oplopanax* sites, soils typically have an impermeable layer at a moderate depth. Both types of soils are well-watered from upslope sources, seeps, or hyperheic sources. This is in contrast to ~North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)$$, which occurs on well-drained soils, south-facing slopes, and dry ridges and slopes where soils remain mesic to dry for much of the year. Fire is (or was) the major natural disturbance in all but the wettest climatic areas. In the past (pre-1880), fires were high-severity or, less commonly, moderate-severity, with natural return intervals of a few hundred to several hundred years. This system was formerly supported by occasional, stand-replacing fires. More frequent moderate-severity fires would generally not burn these moister microsites.

DISTRIBUTION

Range: This system is a significant component of the lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. This system may also occur as very small patches in northern California, in the northern Coast Ranges.

Divisions: 204:C

TNC Ecoregions: 1:C, 3:C, 5:C, 69:C, 81:C

Subnations: BC, CA?, OR, WA

CONCEPT

Associations:

- *Abies grandis - Tsuga heterophylla / Polystichum munitum* Forest (CEGL000287, G2)
- *Acer macrophyllum / Acer circinatum* Forest (CEGL000560, G4G5)
- *Alnus rubra / Polystichum munitum* Forest (CEGL000638, G4)
- *Pseudotsuga menziesii - Tsuga heterophylla / Polystichum munitum* Forest (CEGL000085, G3?)
- *Pseudotsuga menziesii / Acer circinatum* Forest (CEGL000417, G5?)
- *Pseudotsuga menziesii / Polystichum munitum* Forest (CEGL000450, G4G5Q)
- *Thuja plicata - Tsuga heterophylla / Oxalis oregana* Forest (CEGL000483, G2)
- *Thuja plicata / Gaultheria shallon* Forest (CEGL000475, G1G2)
- *Thuja plicata / Linnaea borealis* Forest (CEGL000089, G2)
- *Tsuga heterophylla - (Thuja plicata) / Oplopanax horridus / Polystichum munitum* Forest (CEGL000497, G4)
- *Tsuga heterophylla / Acer circinatum - Rubus spectabilis* Forest (CEGL000092, G3G4)
- *Tsuga heterophylla / Acer circinatum / Achlys triphylla* Forest (CEGL000090, G3G4)
- *Tsuga heterophylla / Gaultheria shallon - Rubus spectabilis* Forest (CEGL000102, G4)
- *Tsuga heterophylla / Oxalis oregana - Polystichum munitum* Forest (CEGL000106, G3)
- *Tsuga heterophylla / Polystichum munitum - Tiarella trifoliata* Forest (CEGL002627, G3)
- *Tsuga heterophylla / Polystichum munitum* Forest (CEGL000108, G4)
- *Tsuga heterophylla / Rubus spectabilis* Forest (CEGL000114, G4)
- *Tsuga heterophylla / Vaccinium ovalifolium* Forest (CEGL000118, G4)

Dynamics: Fire is (or was) the major natural disturbance in all but the wettest climatic areas. In the past (pre-1880), fires were high-severity or, less commonly, moderate-severity, with natural return intervals of a few hundred to several hundred years. This system was formerly supported by occasional, stand-replacing fires. More frequent moderate-severity fires would generally not burn these moister microsites. Wind may be equally as important as fire, and in the Bull Run Watershed more important.

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: In some wetter climatic areas, it forms the matrix within which other systems occur as patches, especially riparian wetlands. In many rather drier climatic areas, it occurs as small to large patches within a matrix of ~North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)$$. In dry areas, it can occur adjacent to or in a mosaic with ~North Pacific Dry Douglas-fir Forest and Woodland (CES204.845)$$ and at higher elevations intermingles with either ~North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)$$ or ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$.

SOURCES

References: Western Ecology Working Group n.d.

Version: 23 Jan 2006 **Stakeholders:** Canada, West

Concept Author: G. Kittel and C. Chappell **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: NORTHERN INTERIOR DRY-MESIC MIXED CONIFER FOREST AND WOODLAND

CES306.NEW2 NORTHERN INTERIOR DRY-MESIC MIXED CONIFER FOREST (TENTATIVE NAME)

306, Forest and Woodland

Spatial Scale & Pattern: Matrix **Classification Confidence:** medium
Required Classifiers: Natural/Semi-natural, Vegetated (>10% vasc.), Upland
Diagnostic Classifiers: Forest and Woodland (Treed), Udic, Very Long Disturbance Interval, F-Landscape/Medium Intensity, Needle-Leaved Tree Pseudotsuga menziesii & Picea engelmann x glauca dominants, Long **(> 100 yrs) Persistence**

Non-Diagnostic Classifiers: Montane [Montane], Montane [Lower Montane], Lowland [Foothill], Side Slope, Toeslope/Valley Bottom, Temperate, Temperate [Temperate Continental], Glaciated , Mesotrophic Soil

Concept Summary: This ecological system occurs in interior British Columbia, primarily located in a large geographic area from the valleys of the Rocky mountains adjacent to and into the Thompson – Okanagan Plateau and the Okanagan Plateau between 500 and 1600 m elevation. The associated landscape is completely of glacial origin typical on gentle to steep slopes over well-drained to rapidly drained, nutrient poor, of colluvial, morainal, fluvial or glaciofluvial materials. Mature stands on zonal sits are mixed conifer stands dominated by *Pinus contorta* and *Pseudotsuga menziesii* with *Picea engelmannii* X *glauca, Thuja plicata* or *Abies lasiocarpa* in older stands in less fire prone areas. Dense mature stands of *Thuja plicata* and *Tsuga heterophylla* develop in cool, wetter climatic areas. *Betula papyifera* can be a common component of early and mid-seral stands. Shrub- or grass-dominated understories characterize this system. *Paxistima myrsinites, Vaccinium membranaceum, Alnus sinuata,*and *Lonicera involucurata.* are common shrubs. Ground cover is *Calamagrostis rubescens* , *Linnaea borealis, Clintonia uniflora* and *Cornus canadensis.* Understory dominance varies with local climate and site. Fire regimes are intermediate severity and frequency. Stand replacing fires estimated at 150 to 200 year return interval (Wong, 2004).

Comment: An absence of ponderosa pine in this system distinguishes it from the Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest system (CES306.805). Douglas-fir – ponderosa pine in bottomland position (IDFxh,xw) are part of the Ponderosa Pine Woodland and Savanna system (CES306.032) . This differs from the Northern Rocky Mountain Western hemlock – Western redcedar forest system (CES306.802) in the absense of *Larix occidentalis Abies grandis*, and greater abundance of *Betula papyifera Picea engelmannii x glauca,* and *Abies lasiocarpa* in tree canopies. *Thuja plicata* and *Tsuga heterophylla* are generally less important in early to mid-seral stands. Climate is cooler and more moist although summers are drier and warmer. **These could lump?** In okanagan map, ICHmw2,3,5 30%, ICHmk1&mk2 25%, IDFmw1 2 23% BEU= RD 35%, DF 25% RB 15%. CES306.802 ICHmw3 32% mk1 19%, dw 12%, mk2 6%

DISTRIBUTION

Divisions: 306
TNC Ecoregions:
Subnations/Nations: BC:c, WA:?

CONCEPT

BC Broad Terrestrial Ecological Classification (1998):

- **RB Western Redcedar - Paper Birch** in ICH mk1 mk2 mw2 mw5, IDFdk2 mw1 mw2 & MSdm2
- **RD Western Redcedar – Douglas-fir** in ICH mk1 mw2 mw3 mw5 & IDFdk2 dk2b dm1 mw1 mw2 xh1 xh1a xh2
- **DF Interior Douglas-fir** in ICH mk1 mk2 mw2 mw3 mw5 wk1 & IDFdm1 mw1 mw2 mw2b

- **DL Douglas-fir - Lodgepole Pine** in ICH mk2 mw2 mw3 mw5 wk1
- **SF White Spruce - Douglas-fir** in ICH mk1 mk2 mw3 mw5
- **IH Interior Western Hemlock** in ICH mk2

BC Associations in Okanagan

- CEBC000229 Pseudotsuga menziesii / Penstemon fruticosus - Calamagrostis rubescens
- CEBC000265 Pseudotsuga menziesii / Symphoricarpos albus / Pseudoroegneria spicata
- CEBC000266 Pseudotsuga menziesii / Calamagrostis rubescens / Pleurozium schreberi
- C2A2BCRAU1 Pseudotsuga menziesii / Calamagrostis rubescens - Arctostaphylos uva-ursi
- C2A2BCRLB1 Pseudotsuga menziesii / Calamagrostis rubescens - Linnaea borealis
- CEBC000070 Pseudotsuga menziesii / Symphoricarpos occidentalis / Pseudoroegneria spicata
- C1A9CPMAA1 Pseudotsuga menziesii / Symphoricarpos albus - Amelanchier alnifolia
- C1A9CPMTH1 Pseudotsuga menziesii - Tsuga heterophylla / Paxistima myrsinites
- CEBC000239 Pseudotsuga menziesii - Thuja plicata / Paxistima myrsinites

SOURCES

References: Ecosystems Working Group 1998, Meidinger and Pojar 1991, Lloyd et al. 1990.

Last updated: 2 Feb 2004 **Stakeholders:** WCS, CAN
Concept Author: R.Crawford **LeadResp:** WCS

OKANAGAN COARSE FILTER TARGET: NORTHERN ROCKY MOUNTAIN MONTANE MIXED CONIFER FOREST

CES204.087 NORTH PACIFIC MONTANE SHRUBLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Shrubland (Shrub-dominated)
Concept Summary: This system occurs as small to large patches scattered throughout the North Pacific region, but it is largely absent from the windward sides of the coastal mountains where fires are rare due to very wet climates. It is defined as long-lived seral shrublands that persist for several decades or more after major wildfires, or smaller patches of shrubland on dry sites that are marginal for tree growth and that have typically also experienced fire. This system occurs on ridgetops and upper to middle mountain slopes and is more common on sunny southern aspects. It occurs from about 152 m (500 feet) elevation up to the lower limits of subalpine parkland. Vegetation is mostly deciduous broadleaf shrubs, sometimes mixed with shrub-stature trees or sparse evergreen needleleaf trees. It can also be dominated by evergreen shrubs, especially *Xerophyllum tenax* (usually considered a forb). Species composition is highly variable, and some of most common species include *Acer circinatum, Vaccinium membranaceum, Ceanothus velutinus, Holodiscus discolor*, and *Rubus parviflorus*.

DISTRIBUTION

Range: This system occurs as small to large patches scattered throughout mountainous regions of the Pacific Northwest, from the southern Cascade and Coast ranges north to south-central Alaska.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 4:C, 69:C, 70:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

Associations:

- *Acer circinatum / Athyrium filix-femina - Tolmiea menziesii* Shrubland (CEGL003291, G5)
- *Amelanchier alnifolia / Xerophyllum tenax* Herbaceous Vegetation (CEGL001066, GNRQ)
- *Rubus parviflorus / Chamerion angustifolium - Heracleum maximum* Shrubland (CEGL001127, G4)
- *Vaccinium membranaceum / Xerophyllum tenax* Shrubland (CEGL005891, G3?)
- *Xerophyllum tenax - Sanguisorba officinalis* Herbaceous Vegetation (CEGL003439, G1)

SPATIAL CHARACTERISTICS

SOURCES

References: Chappell and Christy 2004, Franklin and Dyrness 1973, Western Ecology Working Group n.d.

Version: 08 Feb 2005 **Stakeholders:** Canada, West

Concept Author: C. Chappell **LeadResp:** West

CES306.805 NORTHERN ROCKY MOUNTAIN DRY-MESIC MONTANE MIXED CONIFER FOREST

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Montane]; Forest and Woodland (Treed); Ustic; Short Disturbance Interval; F-Patch/Low Intensity; Needle-Leaved Tree; Abies grandis - Mixed

Concept Summary: This ecological system is composed of highly variable montane coniferous forests found in the interior Pacific Northwest, from southernmost interior British Columbia, eastern Washington, eastern Oregon, northern Idaho, western Montana, and south along the east slope of the Cascades in Washington and Oregon. This system is associated with a submesic climate regime with annual precipitation ranging from 50 to 100 cm, with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevation sites. Elevations range from 460 to 1920 m. Most occurrences of this system are dominated by a mix of *Pseudotsuga menziesii* and *Pinus ponderosa* and other typically seral species, including *Pinus contorta, Pinus monticola*, and *Larix occidentalis*. *Picea engelmannii* becomes increasingly common towards the eastern edge of the range. The nature of this forest system is a matrix of large patches dominated or codominated by one or combinations of the above species; *Abies grandis* (a fire-sensitive, shade-tolerant species) has increased on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by low-severity wildfire. Presettlement fire regimes may have been characterized by frequent, low-intensity ground fires that maintained relatively open stands of a mix of fire-resistant species. Under present conditions the fire regime is mixed severity and more variable, with stand-replacing fires more common, and the forests are more homogeneous. With vigorous fire suppression, longer fire-return intervals are now the rule, and multi-layered stands of *Pseudotsuga menziesii, Pinus ponderosa*, and/or *Abies grandis* provide fuel "ladders," making these forests more susceptible to high-intensity, stand-replacing fires. They are very productive forests which have been priorities for timber production. They rarely form either upper or lower timberline forests. Understories are dominated by graminoids, such as *Pseudoroegneria spicata, Calamagrostis rubescens, Carex geyeri*, and *Carex rossii*, that may be associated with deciduous shrubs, such as *Acer glabrum, Physocarpus malvaceus, Symphoricarpos albus, Spiraea betulifolia*, or *Vaccinium membranaceum* on mesic sites.

Comments: Need to re-assess the concept of this system in relation to Northern Rocky Mountain Western Larch Woodland (CES306.837) and to East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086). In PNV (PAGs) concept, this is mostly *Pseudotsuga menziesii*, moist *Pinus ponderosa* series, dry *Abies grandis* or warm, dry *Abies lasiocarpa* series in the CanRock, northern Middle Rockies, East Cascades and Okanagan ecoregions. Everett et al. (2000) in east Cascades of Washington indicate that this system forms fire polygons due to abrupt north and south topography with presettlement fire-return intervals of 11-12 years typically covering less than 810 ha. Currently, fires have 40- to 45-year return intervals with thousands of hectares in size. Northern Rocky Mountain Western Larch Woodland (CES306.837) is a large-patch type that occurs typically within this matrix or the Northern Rocky Mountain Western Hemlock-Western Red-cedar Forest (CES306.802) matrix. We need to define the percent cover of larch over 50% or over 75% relative cover of all trees for an occurrence to be placed in Northern Rocky Mountain Western Larch Woodland (CES306.837). Needs to be relative because these look(ed) like ponderosa savanna in places. East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086) has North Pacific floristic composition, and is mostly east Cascades ecoregion, peripheral in Okanagan ecoregion, and west Cascades. PAGs most of the *Abies grandis*, dry western red-cedar and western hemlock in the east Cascades. Environmentally, it is equivalent to Northern Rocky Mountain Western Hemlock-Western Red-cedar Forest (CES306.802). Contrasting this system (CES306.805) with Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828) and Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830) is important in the Middle Rockies ecoregion and Oregon.

DISTRIBUTION

Range: This system is found in the interior Pacific Northwest, from southern interior British Columbia south and east into Oregon, Idaho (including north and central Idaho, down to the Boise Mountains), and western Montana, and south along the east slope of the Cascades in Washington and Oregon.

Divisions: 204:C, 304:P, 306:C

TNC Ecoregions: 2:P, 4:C, 6:C, 7:C, 8:C, 68:C

Subnations: BC, ID, MT, OR, WA

CONCEPT

Associations:

- *Abies grandis / Acer glabrum* Forest (CEGL000267, G3)
- *Abies grandis / Arctostaphylos nevadensis* Woodland (CEGL000915, G2G3)
- *Abies grandis / Bromus vulgaris* Forest (CEGL002601, G3)
- *Abies grandis / Calamagrostis rubescens* Woodland (CEGL000916, G4?)
- *Abies grandis / Carex geyeri* Woodland (CEGL000917, G3)
- *Abies grandis / Linnaea borealis* Forest (CEGL000275, G3)
- *Abies grandis / Physocarpus malvaceus* Forest (CEGL000277, G3)
- *Abies grandis / Spiraea betulifolia* Forest (CEGL000281, G2)
- *Abies grandis / Symphoricarpos albus* Forest (CEGL000282, G3?)
- *Pinus monticola / Clintonia uniflora* Forest (CEGL000176, G1Q)
- *Pinus ponderosa - Pseudotsuga menziesii / Arctostaphylos nevadensis* Woodland (CEGL000208, G2)
- *Pinus ponderosa - Pseudotsuga menziesii / Arctostaphylos patula* Woodland (CEGL000209, G3)
- *Pinus ponderosa - Pseudotsuga menziesii / Carex geyeri* Forest (CEGL000211, GNRQ)
- *Pinus ponderosa - Pseudotsuga menziesii / Penstemon fruticosus* Woodland (CEGL000212, G2G3)
- *Pinus ponderosa - Pseudotsuga menziesii / Physocarpus malvaceus* Forest (CEGL000213, GNRQ)
- *Pinus ponderosa - Pseudotsuga menziesii / Pseudoroegneria spicata* ssp. *inermis* Woodland (CEGL000207, G3Q)
- *Pinus ponderosa - Pseudotsuga menziesii / Purshia tridentata* Woodland (CEGL000214, G3)
- *Pseudotsuga menziesii / Angelica* spp. Forest (CEGL005853, G2?)
- *Pseudotsuga menziesii / Arctostaphylos uva-ursi - Purshia tridentata* Forest (CEGL000426, G3?)
- *Pseudotsuga menziesii / Arctostaphylos uva-ursi* Cascadian Forest (CEGL000425, G3G4)
- *Pseudotsuga menziesii / Arctostaphylos uva-ursi* Forest (CEGL000424, G4)
- *Pseudotsuga menziesii / Arnica cordifolia* Forest (CEGL000427, G4)
- *Pseudotsuga menziesii / Bromus ciliatus* Forest (CEGL000428, G4)
- *Pseudotsuga menziesii / Carex geyeri* Forest (CEGL000430, G4?)
- *Pseudotsuga menziesii / Carex rossii* Forest (CEGL000431, G2?)
- *Pseudotsuga menziesii / Clintonia uniflora - Xerophyllum tenax* Forest (CEGL005854, G4G5)
- *Pseudotsuga menziesii / Clintonia uniflora* Forest (CEGL005850, G4G5)
- *Pseudotsuga menziesii / Linnaea borealis* Forest (CEGL000441, G4)
- *Pseudotsuga menziesii / Menziesia ferruginea / Clintonia uniflora* Forest (CEGL005851, G3?)
- *Pseudotsuga menziesii / Osmorhiza berteroi* Forest (CEGL000445, G4G5)
- *Pseudotsuga menziesii / Paxistima myrsinites* Forest (CEGL000446, G2G3)

- *Pseudotsuga menziesii / Physocarpus malvaceus - Linnaea borealis* Forest (CEGL000448, G4)
- *Pseudotsuga menziesii / Symphoricarpos occidentalis* Forest (CEGL000461, G3?)
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Forest (CEGL000462, G5)
- *Pseudotsuga menziesii / Vaccinium caespitosum* Forest (CEGL000465, G5)
- *Pseudotsuga menziesii / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005852, G4G5)
- *Pseudotsuga menziesii / Vaccinium* spp. Forest (CEGL000464, G4Q)

Alliances:
- *Abies grandis* Forest Alliance (A.153)
- *Abies grandis* Woodland Alliance (A.558)
- *Pinus monticola* Forest Alliance (A.133)
- *Pinus ponderosa - Pseudotsuga menziesii* Forest Alliance (A.134)
- *Pinus ponderosa - Pseudotsuga menziesii* Woodland Alliance (A.533)
- *Pseudotsuga menziesii* Forest Alliance (A.157)

Dynamics: Landfire VDDT models: R#MCONdy.

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1987, Crawford and Johnson 1985, Daubenmire and Daubenmire 1968, Lillybridge et al. 1995, Pfister et al. 1977, Steele and Geier-Hayes 1995, Steele et al. 1981, Topik 1989, Topik et al. 1988, Williams and Lillybridge 1983

Version: 31 Aug 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.994 NORTHERN ROCKY MOUNTAIN LOWER MONTANE-FOOTHILL DECIDUOUS SHRUBLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Very Shallow Soil; Broad-Leaved Deciduous Shrub; Moderate (100-500 yrs) Persistence

Concept Summary: This shrubland ecological system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. The shrublands are usually found on steep slopes of canyons and in areas with some soil development, either loess deposits or volcanic clays; they occur on all aspects. Fire, flooding and erosion all impact these shrublands, but they typically will persist on sites for long periods. These communities develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe and steppe zones. *Physocarpus malvaceus, Prunus emarginata, Prunus virginiana, Rosa* spp., *Spiraea betulifolia, Symphoricarpos albus*, and *Holodiscus discolor* are the most common dominant shrubs. In moist areas *Crataegus douglasii* can be common. *Festuca idahoensis, Festuca campestris, Calamagrostis rubescens, Carex geyeri, Koeleria macrantha, Pseudoroegneria spicata*, and *Poa secunda* are the most important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Poa pratensis* and *Phleum pratense* are common introduced grasses. *Geum triflorum, Potentilla gracilis, Lomatium triternatum, Balsamorhiza sagittata*, and species of *Eriogonum, Phlox*, and *Erigeron* are important forbs.

DISTRIBUTION

Range: This system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies.

Divisions: 304:C, 306:C

TNC Ecoregions: 6:C, 7:C, 8:C, 68:C

Subnations: AB, BC, ID, MT, OR, WA

CONCEPT

Associations:

- *Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland (CEGL005885, GNR)
- *Crataegus douglasii / Rosa woodsii* Shrubland (CEGL001095, G2)
- *Holodiscus discolor* Shrubland [Placeholder] (CEGL003053, G4?)
- *Menziesia ferruginea / Xerophyllum tenax* Shrubland (CEGL005888, G3G4)
- *Physocarpus malvaceus - Symphoricarpos albus* Shrubland (CEGL001171, G3)
- *Prunus virginiana - (Prunus americana)* Shrubland (CEGL001108, G4Q)
- *Rhamnus alnifolia* Shrubland (CEGL001132, G3)
- *Rhus glabra / Aristida purpurea* var. *longiseta* Shrub Herbaceous Vegetation (CEGL001507, G1)
- *Rhus glabra / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001122, G2)
- *Ribes lacustre / Chamerion angustifolium* Shrubland [Provisional] (CEGL005889, G2?)
- *Rosa woodsii* Shrubland (CEGL001126, G5)
- *Spiraea betulifolia* Shrubland (CEGL005835, G3?)
- *Spiraea douglasii* Shrubland (CEGL001129, G5)
- *Symphoricarpos albus - Rosa nutkana* Shrubland (CEGL001130, G3)
- *Symphoricarpos albus* Shrubland (CEGL005890, G4?)
- *Vaccinium membranaceum / Xerophyllum tenax* Shrubland (CEGL005891, G3?)

Alliances:

- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Crataegus douglasii* Shrubland Alliance (A.917)
- *Holodiscus discolor* Shrubland Alliance (A.901)
- *Menziesia ferruginea* Shrubland Alliance (A.2633)
- *Physocarpus malvaceus* Shrubland Alliance (A.928)
- *Prunus virginiana* Shrubland Alliance (A.919)
- *Rhamnus alnifolia* Temporarily Flooded Shrubland Alliance (A.962)
- *Rhus glabra* Shrub Herbaceous Alliance (A.1536)
- *Ribes lacustre* Temporarily Flooded Shrubland Alliance (A.970)
- *Rosa woodsii* Temporarily Flooded Shrubland Alliance (A.959)
- *Spiraea betulifolia* Shrubland Alliance (A.2636)
- *Spiraea douglasii* Seasonally Flooded Shrubland Alliance (A.997)
- *Symphoricarpos albus* Shrubland Alliance (A.925)
- *Vaccinium membranaceum* Shrubland Alliance (A.2632)

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Poulton 1955, Tisdale 1986

Version: 01 Sep 2005 **Stakeholders:** Canada, West

Concept Author: M. Reid, J. Kagan **LeadResp:** West

CES306.837 NORTHERN ROCKY MOUNTAIN WESTERN LARCH SAVANNA

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Other Floristics/Dominants [User-defined]; Moderate (100-500 yrs) Persistence

Concept Summary: This ecological system is restricted to the interior montane zone of the Pacific Northwest in northern Idaho and adjacent Montana, Washington, Oregon, and in southeastern interior British Columbia. It also appears in the east Cascades of Washington. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from 680 to 2195 m (2230-7200 feet), and sites include drier, lower montane settings of toeslopes and ash deposits. This system is composed of open-canopied "savannas" of the deciduous conifer *Larix occidentalis*, which may have been initiated following stand-replacing crownfires of other conifer

systems, but are maintained by a higher frequency, surface-fire regime. These savannas are found in settings where low-intensity, high-frequency fires create open larch woodlands, often with the undergrowth dominated by low-growing *Arctostaphylos uva-ursi, Calamagrostis rubescens, Linnaea borealis, Spiraea betulifolia, Vaccinium caespitosum*, or *Xerophyllum tenax*. Less frequent or absence of fire creates mixed-dominance stands with often shrubby undergrowth; *Vaccinium caespitosum* is common, and taller shrubs can include *Acer glabrum, Ceanothus velutinus, Shepherdia canadensis, Physocarpus malvaceus, Rubus parviflorus*, or *Vaccinium membranaceum*. Fire suppression has led to invasion of the more shade-tolerant tree species *Abies grandis, Abies lasiocarpa, Picea engelmannii*, or *Tsuga* spp. and loss of much of the single-story canopy woodlands.
Comments: Stands initiated following crownfires in areas with stand-replacing fire frequencies greater than 150 years are included in the more mesic adjacent forest systems (~Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)$$ and ~Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)$$). This is a fire-dependant system and was much more extensive in the past; it is now very patchy in distribution. Most *Larix occidentalis* is a seral component of the dry-mesic mixed montane forest.

DISTRIBUTION

Divisions: 204:C, 306:C
TNC Ecoregions: 3:C, 4:C, 6:P, 7:C, 8:P, 68:C
Subnations: BC?, ID, MT, OR, WA

CONCEPT

Associations:
- *Larix occidentalis / Clintonia uniflora - Xerophyllum tenax* Forest (CEGL005881, GNR)
- *Larix occidentalis / Clintonia uniflora* Forest (CEGL005880, GNR)
- *Larix occidentalis / Vaccinium caespitosum / Clintonia uniflora* Forest (CEGL005883, GNR)
- *Larix occidentalis / Vaccinium caespitosum* Forest (CEGL005882, GNR)

Dynamics: *Larix occidentalis* is a long-lived species (in excess of 700 years in the northern Rocky Mountains), and thus stands fitting this concept are themselves long-persisting; the life of *Larix*-dominated stands probably does not much exceed 250 years due to various mortality sources and the ingrowth of shade-tolerant species. Occurrences of this ecological system are generated by stand-replacing fire, the fire-return interval for which is speculated to be on the order of 80 to 200 years. These sites may be maintained in a seral status for hundreds of years due to the fact that *Larix occidentalis* is a long-lived species and the understory is often dominated by *Pseudotsuga*, which will grow into the upper canopy. The potential dominants *Abies lasiocarpa, Picea engelmannii*, or *Abies grandis* are slow to establish on these sites and grow slowly presenting the distinct probability, given the fire-return intervals for this type, that the "climax" (long-term stable) condition is never realized.

It has been noted in northern Idaho that, following disturbance (particularly logging) in some mesic-site occurrences, *Larix occidentalis* does not necessarily succeed itself, the first tree-dominated successional stages being dominated by *Pseudotsuga menziesii, Pinus contorta*, or less frequently by more shade-tolerant species (Cooper et al. 1987); this response is a consequence of the episodic nature of favorable cone crop years in *Larix occidentalis*.

Landfire VDDT models: #RMCONm and #RMCONdy classes B, C, & D.

SPATIAL CHARACTERISTICS

SOURCES

References: Agee 1993, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Hessburg et al. 1999, Hessburg et al. 2000, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995
Version: 01 Sep 2005 **Stakeholders:** Canada, West
Concept Author: R.C. Crawford and M.S. Reid **LeadResp:** West

CES306.813 ROCKY MOUNTAIN ASPEN FOREST AND WOODLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Broad-Leaved Deciduous Tree; Populus tremuloides
Concept Summary: This widespread ecological system is more common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada. In California, this system is only found on the east side of the Sierra Nevada adjacent to the Great Basin. Large stands are found in the Inyo and White mountains, while small stands occur on the Modoc Plateau. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand. Secondarily, it is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. In California, *Symphyotrichum spathulatum (= Aster occidentalis)* is a common forb. Associated shrub species include *Symphoricarpos* spp., *Rubus parviflorus, Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. Occurrences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests.

DISTRIBUTION

Range: This system is more common in the southern and central Rocky Mountains, but it does occur in the montane and subalpine zones throughout much of the western U.S. and north into Canada, as well as west into California. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions.
Divisions: 204:C, 206:P, 304:C, 306:C
TNC Ecoregions: 1:P, 3:C, 4:P, 5:P, 7:C, 8:C, 9:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 81:P
Subnations: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CONCEPT

Associations:

- *Populus tremuloides* - Conifer / *Spiraea betulifolia - Symphoricarpos albus* Forest (CEGL005911, G3?)
- *Populus tremuloides / Acer glabrum* Forest (CEGL000563, G1G2)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Bromus carinatus* Forest (CEGL000566, G3G5)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000567, G4)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus* / Mixed Graminoid Forest (CEGL002816, GNR)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000568, G5)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri* Forest (CEGL000569, G5)
- *Populus tremuloides / Amelanchier alnifolia / Pteridium aquilinum* Forest (CEGL000565, G2G3)
- *Populus tremuloides / Amelanchier alnifolia* / Tall Forbs Forest (CEGL000570, G3G5)
- *Populus tremuloides / Amelanchier alnifolia / Thalictrum fendleri* Forest (CEGL000571, G3G4)
- *Populus tremuloides / Amelanchier alnifolia* Forest (CEGL000564, G4)
- *Populus tremuloides / Artemisia tridentata / Monardella odoratissima - Kelloggia galioides* Forest (CEGL003146, GNR)
- *Populus tremuloides / Artemisia tridentata* Forest (CEGL000572, G3G4)
- *Populus tremuloides / Bromus carinatus* Forest (CEGL000573, G5)

- *Populus tremuloides / Calamagrostis rubescens* Forest (CEGL000575, G5?)
- *Populus tremuloides / Carex geyeri* Forest (CEGL000579, G4)
- *Populus tremuloides / Carex rossii* Forest (CEGL000580, G5)
- *Populus tremuloides / Carex siccata* Forest (CEGL000578, G4)
- *Populus tremuloides / Ceanothus velutinus* Forest (CEGL000581, G2)
- *Populus tremuloides / Corylus cornuta* Forest (CEGL000583, G3)
- *Populus tremuloides / Festuca thurberi* Forest (CEGL000585, G4)
- *Populus tremuloides / Heracleum maximum* Forest (CEGL000595, G3)
- *Populus tremuloides / Heracleum sphondylium* Forest (CEGL000586, G4Q)
- *Populus tremuloides / Hesperostipa comata* Forest (CEGL000608, G2G4)
- *Populus tremuloides / Juniperus communis / Carex geyeri* Forest (CEGL000588, G4G5)
- *Populus tremuloides / Juniperus communis / Lupinus argenteus* Forest (CEGL000589, G3G4)
- *Populus tremuloides / Juniperus communis* Forest (CEGL000587, G4)
- *Populus tremuloides / Ligusticum filicinum* Forest (CEGL000591, G4Q)
- *Populus tremuloides / Lonicera involucrata* Forest (CEGL000592, G3)
- *Populus tremuloides / Lupinus argenteus* Forest (CEGL000593, GNR)
- *Populus tremuloides / Mahonia repens* Forest (CEGL000594, G3)
- *Populus tremuloides / Monardella odoratissima* Forest (CEGL003145, G3)
- *Populus tremuloides / Poa pratensis* Forest (CEGL003148, GNR)
- *Populus tremuloides / Prunus virginiana* Forest (CEGL000596, G3G4)
- *Populus tremuloides / Pteridium aquilinum* Forest (CEGL000597, G4)
- *Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus* Forest (CEGL000598, GNR)
- *Populus tremuloides / Ribes montigenum* Forest (CEGL000600, G2)
- *Populus tremuloides / Rosa woodsii* Forest (CEGL003149, GNR)
- *Populus tremuloides / Rubus parviflorus* Forest (CEGL000602, G2)
- *Populus tremuloides / Rudbeckia occidentalis* Forest (CEGL000603, GNRQ)
- *Populus tremuloides / Salix scouleriana* Forest (CEGL000604, G4)
- *Populus tremuloides / Sambucus racemosa* Forest (CEGL000605, G2G3)
- *Populus tremuloides / Shepherdia canadensis* Forest (CEGL000606, G3G4)
- *Populus tremuloides / Spiraea betulifolia* Forest (CEGL000607, G4Q)
- *Populus tremuloides / Symphoricarpos albus / Elymus glaucus* Woodland (CEGL000946, G3)
- *Populus tremuloides / Symphoricarpos albus* Forest (CEGL000609, G3?)
- *Populus tremuloides / Symphoricarpos occidentalis* Forest [Provisional] (CEGL005848, GNR)
- *Populus tremuloides / Symphoricarpos oreophilus / Bromus carinatus* Forest (CEGL000611, G5)
- *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000612, G3G5)
- *Populus tremuloides / Symphoricarpos oreophilus / Carex rossii* Forest (CEGL000613, G3G4)
- *Populus tremuloides / Symphoricarpos oreophilus / Festuca thurberi* Forest (CEGL000614, G3?)
- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615, G3G5)
- *Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri* Forest (CEGL000616, G5)
- *Populus tremuloides / Symphoricarpos oreophilus / Wyethia amplexicaulis* Forest (CEGL000617, G4Q)
- *Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610, G5)
- *Populus tremuloides* / Tall Forbs Forest (CEGL000618, G5)
- *Populus tremuloides / Thalictrum fendleri* Forest (CEGL000619, G5)
- *Populus tremuloides / Urtica dioica* Forest [Provisional] (CEGL005849, G2G3)
- *Populus tremuloides / Vaccinium myrtillus* Forest (CEGL000620, G3)
- *Populus tremuloides / Wyethia amplexicaulis* Forest (CEGL000622, G3)

Alliances:

- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Populus tremuloides* Woodland Alliance (A.610)

Environment: Climate is temperate with a relatively long growing season, typically cold winters and deep snow. Mean annual precipitation is greater than 15 inches and typically greater than 20 inches, except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or large snow drifts.

Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondarily, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable, sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites. The soils are typically deep and well developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loams. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).
Vegetation: Occurrences have a somewhat closed canopy of trees of 5-20 m tall that is dominated by the cold-deciduous, broad-leaved tree *Populus tremuloides*. Conifers that may be present but never codominant include *Abies concolor, Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 15% of the tree canopy before the occurrence is reclassified as a mixed occurrence. Because of the open growth form of *Populus tremuloides*, enough light can penetrate for lush understory development. Depending on available soil moisture and other factors like disturbance, the understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs.

Common shrubs include *Acer glabrum, Amelanchier alnifolia, Artemisia tridentata, Juniperus communis, Prunus virginiana, Rosa woodsii, Shepherdia canadensis, Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus, Calamagrostis rubescens, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii, Elymus glaucus, Elymus trachycaulus, Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium, Eucephalus engelmannii (= Aster engelmannii), Delphinium* spp., *Geranium viscosissimum, Heracleum sphondylium, Ligusticum filicinum, Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis), Pteridium aquilinum, Rudbeckia occidentalis, Thalictrum fendleri, Valeriana occidentalis, Wyethia amplexicaulis*, and many others. Exotic grasses such as the perennials *Poa pratensis* and *Bromus inermis* and the annual *Bromus tectorum* are often common in occurrences disturbed by grazing.
Dynamics: Occurrences in this ecological system often originate, and are likely maintained, by stand-replacing disturbances such as crown fire, disease and windthrow, or clearcutting by man or beaver. The stems of these thin-barked, clonal trees are easily killed by ground fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1993). The stems are relatively short-lived (100-150 years), and the occurrence will succeed to longer-lived conifer forest if undisturbed. Occurrences are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because of the long moist conditions required to establish are rare in the habitats that it occurs in. Superficial soil drying will kill seedlings (Knight 1993).

SOURCES

References: Bartos 1979, Bartos and Cambell 1998, Bartos and Mueggler 1979, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, DeByle and Winokur 1985, DeVelice et al. 1986, Henderson et al. 1977, Hess and Wasser 1982, Johnston and Hendzel 1985, Keammerer 1974a, Mueggler 1988, Neely et al. 2001, Powell 1988a, Tuhy et al. 2002, Youngblood and Mauk 1985
Version: 07 Oct 2005 **Stakeholders:** Canada, Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: NORTHERN ROCKY MOUNTAIN WESTERN RED-CEDAR-HEMLOCK FOREST

CES306.802 NORTHERN ROCKY MOUNTAIN WESTERN HEMLOCK-WESTERN RED-CEDAR FOREST

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Needle-Leaved Tree; Tsuga heterophylla and Thuja plicata; Long (>500 yrs) Persistence
Concept Summary: This ecological system occurs in the northern Rockies of western Montana west into northeastern Washington and southern British Columbia. These are vegetation types dominated by *Tsuga heterophylla* and *Thuja plicata*, found in areas influenced by incursions of mild, wet, Pacific maritime air masses. Much of the annual precipitation occurs as rain, but where snow does occur, it can generally be melted by rain during warm winter storms. Occurrences generally are found on all slopes and aspects but grow best on sites with high soil moisture, such as toeslopes and bottomlands. At the periphery of its distribution this system is confined to moist canyons and cooler, moister aspects. Generally these are moist, non-flooded or upland sites that are not saturated yearlong. Along with *Tsuga heterophylla* and *Thuja plicata, Pseudotsuga menziesii* commonly shares the canopy, and *Pinus monticola, Pinus contorta, Abies grandis, Taxus brevifolia*, and *Larix occidentalis* are major associates. *Picea engelmannii, Abies lasiocarpa*, and *Pinus ponderosa* may be present but only on the coldest or warmest and driest sites. *Linnaea borealis, Paxistima myrsinites, Alnus incana, Acer glabrum, Spiraea betulifolia, Rubus parviflorus*, and *Vaccinium membranaceum* are common shrub species. The composition of the herbaceous layer reflects local climate and degree of canopy closure; it is typically highly diverse in all but closed-canopy conditions. Typically, stand-replacement, fire-return intervals are 150-500 years with moderate-severity fire intervals of 50-100 years.

DISTRIBUTION

Range: This system occurs in the northern Rockies of western Montana west into northeastern Washington and southern British Columbia.
Divisions: 306:C
TNC Ecoregions: 7:C, 8:C, 68:C
Subnations: BC, ID, MT, OR, WA

CONCEPT

Associations:

- *Betula papyrifera* Forest [Provisional] (CEGL000520, G4Q)
- *Pinus monticola / Clintonia uniflora* Forest (CEGL000176, G1Q)
- *Thuja plicata / Adiantum pedatum* Forest (CEGL000470, G2?)
- *Thuja plicata / Aralia nudicaulis* Forest (CEGL000471, G2)
- *Thuja plicata / Asarum caudatum* Forest (CEGL000472, G5)
- *Thuja plicata / Clintonia uniflora - Xerophyllum tenax* Forest (CEGL005930, G4?)
- *Thuja plicata / Clintonia uniflora* Forest (CEGL000474, G4)
- *Thuja plicata / Gymnocarpium dryopteris* Forest (CEGL000476, G3)
- *Thuja plicata / Taxus brevifolia / Asarum caudatum* Forest (CEGL000480, G2)
- *Thuja plicata / Vaccinium membranaceum* Forest (CEGL000487, G3G4)
- *Tsuga heterophylla / Aralia nudicaulis* Forest (CEGL000488, G3)
- *Tsuga heterophylla / Asarum caudatum* Forest (CEGL000490, G4)
- *Tsuga heterophylla / Clintonia uniflora* Forest (CEGL000493, G4)
- *Tsuga heterophylla / Gymnocarpium dryopteris* Forest (CEGL000494, G3G4)
- *Tsuga heterophylla / Menziesia ferruginea* Forest (CEGL000496, G2)
- *Tsuga heterophylla / Rubus pedatus* Forest (CEGL000113, G2)
- *Tsuga heterophylla / Xerophyllum tenax* Forest (CEGL000499, G2)

Alliances:

- *Betula papyrifera* Forest Alliance (A.267)
- *Pinus monticola* Forest Alliance (A.133)
- *Thuja plicata* Forest Alliance (A.166)
- *Tsuga heterophylla* Forest Alliance (A.145)

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Meidinger and Pojar 1991, Pfister et al. 1977

Version: 06 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: ROCKY MOUNTAIN CLIFF, CANYON AND MASSIVE BEDROCK

CES204.093 NORTH PACIFIC MONTANE MASSIVE BEDROCK, CLIFF AND TALUS

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Canyon; Cliff (Substrate); Talus (Substrate); Rock Outcrops/Barrens/Glades; Temperate [Temperate Oceanic]

Concept Summary: This ecological system is found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and larger rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus that typically occur below cliff faces. The dominant process is drought and other extreme growing conditions created by exposed rock or unstable slopes typically associated with steep slopes. Fractures in the rock surface and less steep or more stable slopes may be occupied by small patches of dense vegetation, typically scattered trees and/or shrubs. Characteristic trees includes *Chamaecyparis nootkatensis, Tsuga* spp., *Thuja plicata, Pseudotsuga menziesii*, or *Abies* spp. There may be scattered shrubs present, such as *Acer circinatum, Alnus* spp., and *Ribes* spp. Soil development is limited as is herbaceous cover. Mosses or lichens may be very dense, well-developed and display cover well over 10%.

Comments: This system was distinguished from montane cliffs and barrens in the Rockies based on a change in floristic division and the apparent abundance of nonvascular cover on rocks compared to drier divisions.

DISTRIBUTION

Range: This system occurs from northern California (north of ~Sierra Nevada Cliff and Canyon (CES206.901)$$) to southeastern Alaska.

Divisions: 204:C

TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 5:P, 69:C, 81:C

Subnations: AK, BC, OR, WA

CONCEPT

Associations:

SPATIAL CHARACTERISTICS

SOURCES

References: Western Ecology Working Group n.d.

Version: 30 Mar 2005 **Stakeholders:** Canada, West

Concept Author: R. Crawford **LeadResp:** West

CES306.815 ROCKY MOUNTAIN CLIFF, CANYON AND MASSIVE BEDROCK

Primary Division: Rocky Mountain (306)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Canyon; Cliff (Landform); Ridgetop bedrock outcrop; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil; Landslide
Concept Summary: This ecological system of barren and sparsely vegetated landscapes (generally <10% plant cover) is found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. It is located throughout the Rocky Mountains and northeastern Cascade Ranges in North America. Also included are unstable scree and talus slopes that typically occur below cliff faces. In general these are the dry sparsely vegetated places on a landscape. The biota on them reflect what is surrounding them, unless it is an extreme parent material. There may be small patches of dense vegetation, but it typically includes scattered trees and/or shrubs. Characteristic trees includes species from the surrounding landscape, such as *Pseudotsuga menziesii, Pinus ponderosa, Pinus flexilis, Populus tremuloides, Abies concolor, Abies lasiocarpa*, or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus, Ribes, Physocarpus, Rosa, Juniperus*, and *Jamesia americana, Mahonia repens, Rhus trilobata*, or *Amelanchier alnifolia*. Soil development is limited, as is herbaceous cover.
Comments: This has a very broad elevation range (<3350 m) for a system; consider dividing into foothills/montane and subalpine. And/or by floristic division. This is in the Okanagan and Rockies as the montane sparse. North Pacific Montane Massive Bedrock, Cliff and Talus (CES204.093) includes everything in the Cascades and west, except the northeastern Cascades, where occurrences are this system (CES306.815). Inter-Mountain Basins Cliff and Canyon (CES304.779) occurs in the dry foothills on the east side of EDC MapZone1.

DISTRIBUTION

Range: This system is located throughout the Rocky Mountain and northeastern Cascade Ranges in North America.
Divisions: 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 20:C, 21:C, 25:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, OR, TX, UT, WA, WY

CONCEPT

Associations:
- *Abies concolor / Holodiscus dumosus* Scree Woodland (CEGL000889, G4)
- *Abies concolor / Jamesia americana* Scree Woodland (CEGL000890, GNR)
- *Abies lasiocarpa / Holodiscus dumosus* Scree Woodland (CEGL000918, G3)
- *Abies lasiocarpa / Salix brachycarpa* Scree Woodland (CEGL000922, GUQ)
- *Abies lasiocarpa / Salix glauca* Scree Woodland (CEGL000923, GUQ)
- *Abies lasiocarpa / Saxifraga bronchialis* Scree Woodland (CEGL000924, G4)
- *Abies lasiocarpa* Scree Woodland (CEGL000925, G5?)
- *Aletes anisatus - Scutellaria brittonii* Scree Herbaceous Vegetation (CEGL001948, GU)
- *Athyrium americanum* Sparse Vegetation (CEGL001849, GU)
- *Carex nardina* Scree Herbaceous Vegetation (CEGL001812, GNR)
- Granite - Metamorphic Black Hills Rock Outcrop Sparse Vegetation (CEGL002295, G4)
- *Heuchera bracteata - Heuchera parvifolia* var. *nivalis* Herbaceous Vegetation (CEGL001971, GU)
- Igneous - Metamorphic Black Hills Butte Sparse Vegetation (CEGL005283, GNR)
- *Jamesia americana* Rock Outcrop Shrubland (CEGL002783, GNR)
- *Picea engelmannii / Saxifraga bronchialis* Scree Sparse Vegetation (CEGL000893, G4)
- *Pinus contorta* Scree Woodland (CEGL000766, G5?)
- *Pinus flexilis* Scree Woodland (CEGL000815, G3Q)
- *Pinus ponderosa / Ribes inerme* Scree Woodland (CEGL000876, G4)
- *Pinus ponderosa* Limestone Cliff Sparse Vegetation (CEGL002055, G4?)
- *Populus tremuloides / Physocarpus malvaceus - Amelanchier alnifolia* Scree Woodland (CEGL000945, G4Q)
- *Pseudotsuga menziesii / Holodiscus dumosus* Scree Woodland (CEGL000902, G3G4)
- *Pseudotsuga menziesii* Scree Woodland (CEGL000911, G5)
- *Ribes cereum / Leymus ambiguus* Shrubland (CEGL001124, G2)

- *Rubus idaeus* Scree Shrubland (CEGL001134, GU)
- *Saxifraga rivularis* Herbaceous Vegetation (CEGL001930, GU)
- Scree - Talus Black Hills Sparse Vegetation (CEGL002307, GNR)
- Sparse Nonvascular Vegetation (on rock and unconsolidated substrates) (CEGL002888, GNR)

Alliances:

- *Abies concolor* Woodland Alliance (A.553)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Aletes anisatus* Herbaceous Alliance (A.1639)
- *Athyrium americanum* Sparsely Vegetated Alliance (A.1625)
- *Carex nardina* Herbaceous Alliance (A.1299)
- *Heuchera bracteata* Herbaceous Alliance (A.1646)
- *Jamesia americana* Shrubland Alliance (A.2566)
- *Picea engelmannii* Sparsely Vegetated Alliance (A.556)
- *Pinus contorta* Woodland Alliance (A.512)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Populus tremuloides* Woodland Alliance (A.610)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)
- *Ribes cereum* Shrubland Alliance (A.923)
- *Rubus idaeus* ssp. *strigosus* Shrubland Alliance (A.927)
- *Saxifraga rivularis* Herbaceous Alliance (A.1633)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- Rock Outcrop Sparsely Vegetated Alliance (A.1838)
- Sparse Nonvascular Vegetation Alliance (on rock and unconsolidated substrates) (A.2660)

SOURCES

References: Andrews and Righter 1992, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ecosystems Working Group 1998, Hess and Wasser 1982, Larson et al. 2000, Neely et al. 2001, Peet 1981

Version: 04 Apr 2005 **Stakeholders:** Canada, Midwest, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: NOT MAPPED INDIVIDUALLY

CES204.854 NORTH PACIFIC AVALANCHE CHUTE SHRUBLAND

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Montane]; Shrubland (Shrub-dominated); Avalanche

Concept Summary: This tall shrubland system occurs throughout mountainous regions of the Pacific Northwest, from the southern Cascades and Coast Ranges north to south-central Alaska. This system occurs on sideslopes of mountains on glacial till or colluvium. These habitats range from moderately xeric to wet and occur on snow avalanche chutes at montane elevations. In the mountains of Washington, talus sites and snow avalanche chutes very often coincide spatially. On the west side of the Cascades, the major dominant species are *Acer circinatum, Alnus viridis ssp. sinuata, Rubus parviflorus*, and small trees, especially *Chamaecyparis nootkatensis*. Forbs, grasses, or other shrubs can also be locally dominant. *Prunus virginiana, Amelanchier alnifolia, Vaccinium membranaceum* or *Vaccinium scoparium*, and *Fragaria* spp. are common species on drier avalanche tracks on the east side of the Cascades (Ecosystems Working Group 1998). The main feature of this system is that it occurs on steep, frequently disturbed (snow avalanches) slopes. Avalanche chutes can be quite long, extending from the subalpine into the montane and foothill toeslopes.

DISTRIBUTION

Range: This system occurs throughout mountainous regions of the Pacific Northwest, from the southern Cascades and Coast Ranges north to south-central Alaska.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 4:C, 69:C, 70:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

Associations:

- *Alnus viridis* ssp. *sinuata / Acer circinatum* Shrubland (CEGL001155, G4G5)
- *Chamaecyparis nootkatensis / Oplopanax horridus* Forest (CEGL000349, G3)

Alliances:

- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Chamaecyparis nootkatensis* Temporarily Flooded Forest Alliance (A.178)

SOURCES

References: Boggs 2000, Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Viereck et al. 1992
Version: 31 Mar 2005 **Stakeholders:** Canada, West
Concept Author: K. Boggs and G. Kittel **LeadResp:** West

CES306.801 NORTHERN ROCKY MOUNTAIN AVALANCHE CHUTE SHRUBLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Mixed Upland and Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland
Diagnostic Classifiers: Shrubland (Shrub-dominated); Avalanche chute; Very Short Disturbance Interval [Periodicity/Nonrandom Disturbance]; Avalanche
Concept Summary: This ecological system occurs in the mountains throughout the northern Rockies, from Wyoming north and west into British Columbia and Alberta. It is composed of a diverse mix of deciduous shrubs or trees, and conifers found on steep, frequently disturbed slopes in the mountains. Occurrences are found on the lower portions and runout zones of avalanche tracks, and slopes are generally steep, ranging from 15-60%. Aspects vary, but are more common where unstable or heavy snowpack conditions frequently occur. Sites are often mesic to wet because avalanche paths are often in stream gullies, and snow deposition can be heavy in the run-out zones. The vegetation consists of moderately dense, woody canopy characterized by dwarfed and damaged conifers and small, deciduous trees/shrubs. Characteristic species include *Abies lasiocarpa, Acer glabrum, Alnus viridis ssp. sinuata* or *Alnus incana, Populus balsamifera ssp. trichocarpa, Populus tremuloides*, or *Cornus sericea*. Other common woody plants include *Paxistima myrsinites, Sorbus scopulina*, and *Sorbus sitchensis*. The ground cover is moderately dense to dense forb-rich, with *Senecio triangularis, Castilleja* spp., *Athyrium filix-femina, Thalictrum occidentale, Urtica dioica, Erythronium grandiflorum, Myosotis asiatica (= Myosotis alpestris), Veratrum viride, Heracleum maximum (= Heracleum lanatum)*, and *Xerophyllum tenax*. Mosses and ferns are often present.

DISTRIBUTION

Range: This ecological system occurs in the mountains throughout the northern Rockies, from Wyoming north and west into British Columbia and Alberta. It is likely to occur in the Colorado Rockies, but no association from that area have been classified as "avalanche chute" communities.
Divisions: 306:C
TNC Ecoregions: 7:C, 8:C, 9:C
Subnations: AB, BC, CO, MT, OR, WA, WY

CONCEPT

Associations:

- *Abies lasiocarpa - Acer glabrum* Avalanche Chute Shrubland (CEGL000984, G5)

- *Acer glabrum* Avalanche Chute Shrubland (CEGL001061, G5)
- *Alnus* spp. Avalanche Chute Shrubland (CEGL001158, G5)
- *Alnus viridis* ssp. *sinuata / Athyrium filix-femina - Cinna latifolia* Shrubland (CEGL001156, G4)
- *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland (CEGL002633, G3G4)
- *Populus balsamifera* ssp. *trichocarpa / Cornus sericea* Forest (CEGL000672, G3G4)
- *Populus tremuloides / Amelanchier alnifolia* Avalanche Chute Shrubland (CEGL005886, G3?)
- *Populus tremuloides / Cornus sericea* Forest (CEGL000582, G4)

Alliances:

- *Abies lasiocarpa - Acer glabrum* Shrubland Alliance (A.1052)
- *Acer glabrum* Shrubland Alliance (A.915)
- *Alnus (viridis* ssp. *sinuata, incana)* Temporarily Flooded Shrubland Alliance (A.965)
- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)

SOURCES

References: Butler 1979, Butler 1985, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Malanson and Butler 1984

Version: 20 Feb 2003 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

LOWER TREELINE FORESTS

OKANAGAN COARSE FILTER TARGET: ROCKY MOUNTAIN PONDEROSA PINE WOODLAND AND SAVANNA

CES306.030 NORTHERN ROCKY MOUNTAIN PONDEROSA PINE WOODLAND AND SAVANNA

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Woody-Herbaceous; Shallow Soil; Aridic; Short Disturbance Interval; F-Patch/Low Intensity; F-Landscape/Low Intensity; Needle-Leaved Tree; Graminoid; Pinus ponderosa with grassy understory

Concept Summary: This inland Pacific Northwest ecological system occurs in the foothills of the northern Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. These woodlands and savannas occur at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on glacial till, glacio-fluvial sand and gravel, dune, basaltic rubble, colluvium, to deep loess or volcanic ash-derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. In the Oregon "pumice zone" this system occurs as matrix-forming, extensive woodlands on rolling pumice plateaus and other volcanic deposits. These woodlands in the eastern Cascades, Okanagan and northern Rockies regions receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the central Rockies. Pinus ponderosa (primarily var. ponderosa) is the predominant conifer; Pseudotsuga menziesii may be present in the tree canopy but is usually absent. In southern interior British Columbia, Pseudotsuga menziesii or Pinus flexilis may form woodlands or fire-maintained savannas with and without Pinus ponderosa var. ponderosa at the lower treeline transition into grassland or shrub-steppe. The understory can be shrubby, with Artemisia tridentata, Arctostaphylos patula, Arctostaphylos uva-ursi, Cercocarpus ledifolius, Physocarpus malvaceus, Purshia

tridentata, Symphoricarpos oreophilus or Symphoricarpos albus, Prunus virginiana, Amelanchier alnifolia, and Rosa spp. common species. Understory vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. These more open stands support grasses such as Pseudoroegneria spicata, Hesperostipa spp., Achnatherum spp., dry Carex species (Carex inops), Festuca idahoensis, or Festuca campestris. The more mesic portions of this system may include Calamagrostis rubescens or Carex geyeri, species more typical of Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805). Mixed fire regimes and ground fires of variable return intervals maintain these woodlands typically with a shrub-dominated or patchy shrub layer, depending on climate, degree of soil development, and understory density. This includes the northern race of Interior Ponderosa Pine old-growth (USFS Region 6, USFS Region 1). Historically, many of these woodlands and savannas lacked the shrub component as a result of 3- to 7-year fire-return intervals.
Comments: Hot, dry Douglas-fir types with grass are included here. Rocky Mountain Ponderosa Pine Woodland (CES306.827) and Southern Rocky Mountain Ponderosa Pine Savanna (CES306.826) contain mostly Pinus ponderosa var. scopulorum and Pinus arizonica var. arizonica (= Pinus ponderosa var. arizonica). The FRIS site describes different varieties of Pinus ponderosa and associated species. Johansen and Latta (2003) have mapped the distribution of the two varieties using mitochondrial DNA. They hybridize along the Continental Divide in Montana backing up the FRIS information. Another ponderosa pine system remains to be defined and described for the woodlands and savannas occurring in central and eastern Montana and the Black Hills region. These "northwestern Great Plains ponderosa pine woodlands" are likely to have a floristic component that is more northern Great Plains mixedgrass in nature, as well as being open woodlands generally found in a grassland matrix. Further work is need to identify the geographic and conceptual boundaries between Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030) and the northwestern Great Plains system.

Meeting of Pacific Northwest ecologists for Landfire concluded that the "true savanna" of high-frequency / low-intensity fires and grassy understories is now minimally in existence. Most areas that may have been savanna in the past are now more nearly closed-canopy woodlands/forests. Conclusion was that these true savannas should be included with this woodland system, rather than with the climatically-edaphically controlled Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958). Hence, the "true fire-maintained savanna" is included in this woodland system.

Louisa Evers (pers. comm. 2006) notes that she has not found any evidence that ponderosa pine savanna existed historically in north-central and central Oregon. In north-central Oregon, the savanna would have been oak or pine-oak. In central Oregon, it may well have been western juniper. Condition surveys of the Cascades Forest Reserve and General Land Office survey notes suggest that ponderosa pine formed a woodland with grassy understories, but still was often referred to as open-parklike. Conversely pine-oak and Douglas-fir-oak savannas appeared to have once been quite common in the Willamette Valley (and are classified in North Pacific Oak Woodland (CES204.852)).

DISTRIBUTION

Range: This system is found in the Fraser River drainage of southern British Columbia south along the Cascades and northern Rocky Mountains of Washington, Oregon and California. In the northeastern part of its range, it extends across the northern Rocky Mountains west of the Continental Divide into northwestern Montana, south to the Snake River Plain in Idaho, and east into the foothills of western Montana.
Divisions: 204:C, 304:C, 306:C
TNC Ecoregions: 4:P 6:C 7:C, 8:C, 9:C, 10:C, 26:P, 33:P, 68:C
Subnations: BC, ID, MT, NV, OR, WA

CONCEPT

Associations:

- *Pinus ponderosa / Arctostaphylos patula - Arctostaphylos viscida* Forest CEGL000061
- *Pinus ponderosa / Arctostaphylos patula - Ceanothus velutinus* Woodland CEGL000062
- *Pinus ponderosa / Arctostaphylos patula - Purshia tridentata* Woodland CEGL000063

- *Pinus ponderosa / Ceanothus velutinus - Purshia tridentata* Woodland CEGL000064
- *Pinus ponderosa / Artemisia tridentata* ssp. *vaseyana / Poa nervosa* Woodland CEGL000180
- *Pinus ponderosa / Calamagrostis rubescens* Forest CEGL000181
- *Pinus ponderosa / Carex geyeri* Woodland CEGL000182
- *Pinus ponderosa / Elymus glaucus* Forest CEGL000184
- *Pinus ponderosa / Mahonia repens* Forest CEGL000187
- *Pinus ponderosa / Physocarpus malvaceus* Forest CEGL000189
- *Pinus ponderosa / Purshia tridentata / Carex rossii* Woodland CEGL000194
- *Pinus ponderosa / Purshia tridentata / Festuca idahoensis* Woodland CEGL000195
- *Pinus ponderosa / Purshia tridentata / Pseudoroegneria spicata* Woodland CEGL000197
- *Pinus ponderosa / Spiraea betulifolia* Forest CEGL000202
- *Pinus ponderosa / Symphoricarpos albus* Forest CEGL000203
- *Pinus ponderosa / Symphoricarpos oreophilus* Forest CEGL000205
- *Pinus ponderosa - Pseudotsuga menziesii / Pseudoroegneria spicata* ssp. *inermis* Woodland CEGL000207
- *Pinus ponderosa / Artemisia arbuscula* Woodland CEGL000845
- *Pinus ponderosa / Cercocarpus ledifolius* Woodland CEGL000850
- *Pinus ponderosa / Festuca idahoensis* Woodland CEGL000857
- *Pinus ponderosa / Juniperus communis* Woodland CEGL000859
- *Pinus ponderosa / Pseudoroegneria spicata* Woodland CEGL000865
- *Pinus ponderosa / Hesperostipa comata* Woodland CEGL000879
- *Pseudotsuga menziesii / Festuca idahoensis* Woodland CEGL000900
- *Pseudotsuga menziesii / Festuca campestris* Woodland CEGL000901
- *Pseudotsuga menziesii / Pseudoroegneria spicata* Woodland CEGL000908
- *Pinus ponderosa / Purshia tridentata / Carex geyeri* Woodland CEGL002606
- *Pinus ponderosa / Vaccinium caespitosum* Woodland CEGL005841

Alliances:

- *Pinus ponderosa* Forest Alliance (A.124)
- *Pinus ponderosa* Wooded Tall Herbaceous Alliance (A.1488)
- *Pinus ponderosa* Woodland Alliance (A.530)

Other Comments:

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Version: 23Feb2006 **Stakeholders:** Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

STEPPE and SHRUB STEPPE

OKANAGAN COARSE FILTER TARGET: INTER-MOUNTAIN BASINS BIG SAGEBRUSH STEPPE

CES304.770 COLUMBIA PLATEAU SCABLAND SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Basalt; Shallow Soil
Concept Summary: This ecological system is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer. Vegetation is characterized by an open dwarf-shrub canopy dominated by *Artemisia rigida* along with other shrub and dwarf-shrub species, particularly *Eriogonum* spp. Low cover of perennial bunch grasses such as *Danthonia unispicata, Elymus elymoides, Festuca idahoensis*, or primarily *Poa secunda*, as well as scattered forbs including species of *Allium, Antennaria, Balsamorhiza, Lomatium, Phlox*, and *Sedum*, characterize these sites. Individual sites can be dominated by grasses and semi-woody forbs, such as *Stenotus stenophyllus*. Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1-60% cover).

DISTRIBUTION

Range: Columbia Plateau.
Divisions: 304:C
TNC Ecoregions: 6:C, 7:C, 68:C
Subnations: CA?, ID, NV, OR, UT?, WA

CONCEPT

Associations:
- *Artemisia rigida / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL002995, G2)
- *Artemisia rigida / Poa secunda* Shrub Herbaceous Vegetation (CEGL001528, G4)
- *Artemisia rigida / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001529, G3)
- *Danthonia californica - Festuca idahoensis* Herbaceous Vegetation (CEGL001607, G1Q)
- *Danthonia unispicata - Poa secunda* Herbaceous Vegetation (CEGL001783, G3)
- *Eriogonum compositum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001784, G2)

- *Eriogonum douglasii / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001785, G4)
- *Eriogonum microthecum - Physaria oregona* Dwarf-shrubland (CEGL001737, G2)
- *Eriogonum niveum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001786, G3)
- *Eriogonum sphaerocephalum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001448, G3)
- *Eriogonum strictum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001788, G3)
- *Eriogonum thymoides / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001449, G3)
- *Lomatium cous - Poa secunda* Herbaceous Vegetation (CEGL001790, G4)

Alliances:

- *Artemisia rigida* Shrub Herbaceous Alliance (A.1574)
- *Danthonia californica* Herbaceous Alliance (A.1254)
- *Eriogonum microthecum* Dwarf-shrubland Alliance (A.1107)
- *Poa secunda* Dwarf-shrub Herbaceous Alliance (A.1568)
- *Poa secunda* Herbaceous Alliance (A.1291)

SOURCES

References: Comer et al. 2003, Copeland 1980a, Daubenmire 1970, Ganskopp 1979, Hall 1973, Johnson and Simon 1985, Poulton 1955

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: J. Kagan **LeadResp:** West

CES304.778 INTER-MOUNTAIN BASINS BIG SAGEBRUSH STEPPE

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Deep Soil; Aridic; Xeromorphic Shrub; Bunch grasses; Artemisia tridentata ssp. tridentata

Concept Summary: This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming and is found at slightly higher elevations farther south. Soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with *Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. xericensis, Artemisia tridentata ssp. wyomingensis, Artemisia tripartita ssp. tripartita*, and/or *Purshia tridentata* dominating or codominating the open to moderately dense (10-40% cover) shrub layer. *Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa, Tetradymia* spp., or *Artemisia frigida* may be common especially in disturbed stands. Associated graminoids include *Achnatherum hymenoides, Calamagrostis montanensis, Elymus lanceolatus ssp. lanceolatus, Festuca idahoensis, Festuca campestris, Koeleria macrantha, Poa secunda*, and *Pseudoroegneria spicata*. Common forbs are *Phlox hoodii, Arenaria* spp., and *Astragalus* spp. Areas with deeper soils more commonly support *Artemisia tridentata ssp. tridentata* but have largely been converted for other land uses. The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Where fire frequency has allowed for shifts to a native grassland condition, maintained without significant shrub invasion over a 50- to 70-year interval, the area would be considered Columbia Basin Foothill and Canyon Dry Grassland (CES304.993).

DISTRIBUTION

Range: Occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming, and is found at slightly higher elevations further south.

Divisions: 304:C, 306:C

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 20:C, 26:C

Subnations: BC, CA, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Artemisia tridentata* (ssp. *tridentata,* ssp. *xericensis) / Pseudoroegneria spicata - Poa secunda* Shrub Herbaceous Vegetation (CEGL001019, G1)
- *Artemisia tridentata* (ssp. *tridentata,* ssp. *xericensis) / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001018, G2G4)
- *Artemisia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata / Leymus cinereus* Shrub Herbaceous Vegetation (CEGL001458, G2G4)
- *Artemisia tridentata / Sporobolus cryptandrus - Achnatherum hymenoides* Shrub Herbaceous Vegetation (CEGL001545, G2?)
- *Artemisia tridentata* ssp. *tridentata - Grayia spinosa* Shrubland (CEGL001004, G5)
- *Artemisia tridentata* ssp. *tridentata / Distichlis spicata* Shrubland (CEGL001000, G5)
- *Artemisia tridentata* ssp. *tridentata / Festuca idahoensis* Shrubland (CEGL001014, G4?)
- *Artemisia tridentata* ssp. *tridentata / Hesperostipa comata* Shrubland (CEGL002966, G4?)
- *Artemisia tridentata* ssp. *tridentata / Leymus cinereus* Shrubland (CEGL001016, G2)
- *Artemisia tridentata* ssp. *tridentata / Pascopyrum smithii - (Elymus lanceolatus)* Shrubland (CEGL001017, G3?)
- *Artemisia tridentata* ssp. *tridentata / Pleuraphis jamesii* Shrubland (CEGL001015, G2G4)
- *Artemisia tridentata* ssp. *tridentata / Poa secunda* Shrubland (CEGL001008, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001047, G4)
- *Artemisia tridentata* ssp. *wyomingensis / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001535, G4)
- *Artemisia tripartita* ssp. *tripartita / Festuca campestris* Shrub Herbaceous Vegetation (CEGL001537, G2?)
- *Artemisia tripartita* ssp. *tripartita / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001536, G3)
- *Artemisia tripartita* ssp. *tripartita / Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001539, G1)
- *Artemisia tripartita* ssp. *tripartita / Leymus cinereus* Shrub Herbaceous Vegetation (CEGL002994, GU)
- *Artemisia tripartita* ssp. *tripartita / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001538, G2G3)
- *Purshia tridentata / Festuca campestris* Shrub Herbaceous Vegetation (CEGL001494, G2?)
- *Purshia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL002674, G3G5)
- *Purshia tridentata / Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001498, G2)
- *Purshia tridentata / Poa secunda* Shrubland (CEGL001059, G1?Q)
- *Purshia tridentata / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001495, G3)

Alliances:

- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous Alliance (A.1528)
- *Purshia tridentata* Shrub Herbaceous Alliance (A.1523)
- *Purshia tridentata* Shrubland Alliance (A.825)
- *Sporobolus cryptandrus* Shrub Herbaceous Alliance (A.1525)

Dynamics: The natural fire regime of this ecological system likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Microphytic crust is very important in this ecological system.

SOURCES

References: Barbour and Major 1977, Barbour and Major 1988, Comer et al. 2003, Daubenmire 1970, Ecosystems Working Group 1998, Knight 1994, Mueggler and Stewart 1980, West 1983c

Version: 08 Sep 2004 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: INTER-MOUNTAIN BASINS CLIFF AND CANYON

CES304.779 INTER-MOUNTAIN BASINS CLIFF AND CANYON

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Cliff (Landform); Rock Outcrops/Barrens/Glades
Concept Summary: This ecological system is found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included is vegetation of unstable scree and talus slopes that typically occurs below cliff faces. Widely scattered trees and shrubs may include *Abies concolor, Pinus edulis, Pinus flexilis, Pinus monophylla, Juniperus* spp., *Artemisia tridentata, Purshia tridentata, Cercocarpus ledifolius, Ephedra* spp., *Holodiscus discolor*, and other species often common in adjacent plant communities.

DISTRIBUTION

Divisions: 304:C
TNC Ecoregions: 4:?, 6:C, 11:C, 18:C
Subnations: CA, ID, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Cercocarpus intricatus* Montane Shrubland (CEGL002587, GNR)
- *Cercocarpus intricatus* Slickrock Sparse Vegetation (CEGL002977, GNR)
- *Cercocarpus montanus* Rock Pavement Sparse Vegetation (CEGL002978, GNR)
- *Chrysothamnus viscidiflorus* Talus Shrubland (CEGL002347, GNR)
- *Crataegus rivularis* Shrubland (CEGL002889, G2Q)
- *Glossopetalon spinescens* var. *aridum / Pseudoroegneria spicata* Shrubland (CEGL001100, G4)
- *Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Leymus salinus* Shale Sparse Vegetation (CEGL002745, GNR)
- *Pinus monophylla - Juniperus osteosperma* / Sparse Understory Woodland (CEGL000829, G5)
- *Pinus ponderosa* Slickrock Sparse Vegetation (CEGL002972, GNR)

Alliances:

- *Cercocarpus intricatus* Shrubland Alliance (A.2659)
- *Cercocarpus intricatus* Sparsely Vegetated Alliance (A.2543)
- *Cercocarpus montanus* Sparsely Vegetated Alliance (A.2544)
- *Chrysothamnus viscidiflorus* Shrubland Alliance (A.2651)
- *Crataegus rivularis* Temporarily Flooded Shrubland Alliance (A.2597)
- *Glossopetalon spinescens* Shrubland Alliance (A.1032)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Leymus salinus* ssp. *salmonis* Sparsely Vegetated Alliance (A.1258)
- *Pinus monophylla - (Juniperus osteosperma)* Woodland Alliance (A.543)
- Wooded Bedrock Sparsely Vegetated Alliance (A.2546)

SOURCES

References: Comer et al. 2003, Knight 1994
Version: 20 Feb 2003 **Stakeholders:** Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: NORTHERN INTERIOR PLATEAU GRASSLAND

CES306.040 NORTHERN ROCKY MOUNTAIN LOWER MONTANE, FOOTHILL AND VALLEY GRASSLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Herbaceous; Sideslope; Very Shallow Soil; Loam Soil Texture; Silt Soil Texture; Ustic; Landslide; Graminoid; Cool-season bunch grasses

Concept Summary: This ecological system of the northern Rocky Mountains is found at lower montane to foothill elevations in the mountains and large valleys of northeastern Wyoming and western Montana, west through Idaho into the Blue Mountains of Oregon, and north into the Okanagan and Fraser plateaus of British Columbia and the Canadian Rockies. These grasslands are floristically similar to Inter-Mountain Basins Big Sagebrush Steppe (CES304.778), Columbia Basin Foothill and Canyon Dry Grassland (CES304.993), and Columbia Basin Palouse Prairie (CES304.792), but are defined by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. These northern lower montane and valley grasslands represent a shift in the precipitation regime from summer monsoons and cold snowy winters found in the southern Rockies to predominantly dry summers and winter rains. They are found at elevations from 300 to 1650 m, ranging from small meadows to large open parks surrounded by conifers in the lower montane, to extensive foothill and valley grasslands below the lower treeline. Many of these valleys may have been primarily sage-steppe with patches of grassland in the past, but because of land-use history post-settlement (herbicide, grazing, fire suppression, pasturing, etc.), they have been converted to grassland-dominated areas. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline, often with a microphytic crust. The most important species are cool-season perennial bunch grasses and forbs (>25% cover), sometimes with a sparse (<10% cover) shrub layer. *Pseudoroegneria spicata, Festuca campestris, Festuca idahoensis*, or *Hesperostipa comata* commonly dominate sites on all aspects of level to moderate slopes and on certain steep slopes with a variety of other grasses, such as *Achnatherum hymenoides, Achnatherum richardsonii, Hesperostipa curtiseta, Koeleria macrantha, Leymus cinereus, Elymus trachycaulus, Bromus inermis ssp. pumpellianus (= Bromus pumpellianus), Achnatherum occidentale (= Stipa occidentalis), Pascopyrum smithii*, and other graminoids such as *Carex filifolia* and *Danthonia intermedia*. Other grassland species include *Opuntia fragilis, Artemisia frigida, Carex petasata, Antennaria* spp., and *Selaginella densa*. Important exotic grasses include *Phleum pratense, Bromus inermis*, and *Poa pratensis*. Shrub species may be scattered, including *Amelanchier alnifolia, Rosa* spp., *Symphoricarpos* spp., *Juniperus communis, Artemisia tridentata*, and in Wyoming *Artemisia tripartita ssp. rupicola*. Common associated forbs include *Geum triflorum, Galium boreale, Campanula rotundifolia, Antennaria microphylla, Geranium viscosissimum*, and *Potentilla gracilis*. A soil crust of lichen covers almost all open soil between clumps of grasses; *Cladonia* and *Peltigera* are the most common lichens. Unvegetated mineral soil is commonly found between clumps of grass and the lichen cover. The fire regime of this ecological system maintains a grassland due to rapid fire return that retards shrub invasion or landscape isolation and fragmentation that limits seed dispersal of native shrub species. Fire frequency is presumed to be less than 20 years. These are extensive grasslands, not grass-dominated patches within the sagebrush shrub steppe ecological system. *Festuca campestris* is easily eliminated by grazing and does not occur in all areas of this system.

Comments: This is the same as the Interior Plateau Grassland also called "Northern Plateau Grassland" of the Okanagan Ecoregional Plan.

DISTRIBUTION

Range: This lower montane, foothill and valley grassland system occurs throughout the southern interior and southern portion of the Fraser Plateau, as well as the valleys around the Fraser River in the Pavilion Ranges, the Nicola River and the Similkameen River in British Columbia. It also occurs in the mountains and large valleys of northeastern Wyoming and western Montana, west through Idaho into the Blue Mountains of Oregon. In northern Idaho it has been nearly eliminated by conversion to agriculture, and many occurrences in other portions of its range have been similarly converted or heavily managed, grazed, or pastured.

Divisions: 207:C, 306:C

TNC Ecoregions: 7:C, 68:C

Subnations: BC, ID, MT, OR?, WA, WY

CONCEPT

Associations:

- *Achnatherum nelsonii - Lupinus sericeus* Herbaceous Vegetation (CEGL005860, G2G3)
- *Bromus marginatus - Pseudoroegneria spicata* Herbaceous Vegetation [Provisional] (CEGL005861, G2?)
- *Calamagrostis rubescens* Herbaceous Vegetation (CEGL005862, G3G4?)
- *Elymus repens* Semi-natural Herbaceous Vegetation (CEGL005868, GNA)
- *Festuca campestris - (Festuca idahoensis) - Achnatherum richardsonii* Herbaceous Vegetation (CEGL005869, G2G3?)
- *Festuca campestris - Festuca idahoensis - Geranium viscosissimum* Herbaceous Vegetation (CEGL005870, G3?)
- *Festuca campestris - Festuca idahoensis* Herbaceous Vegetation (CEGL005875, G3)
- *Festuca campestris - Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629, G4)
- *Festuca idahoensis - Achnatherum richardsonii* Herbaceous Vegetation (CEGL001625, G3)
- *Festuca idahoensis - Carex filifolia* Herbaceous Vegetation (CEGL001898, G3)
- *Festuca idahoensis - Carex hoodii* Herbaceous Vegetation (CEGL001609, G3G4)
- *Festuca idahoensis - Koeleria macrantha* Herbaceous Vegetation (CEGL001620, G3Q)
- *Festuca idahoensis - Leucopoa kingii* Herbaceous Vegetation (CEGL001901, G2?)
- *Festuca idahoensis - Pascopyrum smithii* Herbaceous Vegetation (CEGL001621, G4)
- *Festuca idahoensis - Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001624, G4)
- *Festuca idahoensis* Herbaceous Vegetation (CEGL001897, G3Q)
- *Leymus salinus* ssp. *salmonis - Enceliopsis nudicaulis* Sparse Vegetation (CEGL001642, G2Q)
- *Leymus salinus* ssp. *salmonis - Lupinus argenteus* Sparse Vegetation (CEGL001643, G2Q)
- *Phleum pratense - Poa pratensis - Bromus inermis* Semi-natural Herbaceous Vegetation (CEGL005874, GNA)
- *Pseudoroegneria spicata - Carex filifolia* Herbaceous Vegetation (CEGL001665, G4)

Alliances:

- *Achnatherum nelsonii* Herbaceous Alliance (A.1271)
- *Calamagrostis rubescens* Herbaceous Alliance (A.2637)
- *Elymus repens* Herbaceous Alliance (A.2658)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Leymus salinus* ssp. *salmonis* Sparsely Vegetated Alliance (A.1258)
- *Poa pratensis* Semi-natural Herbaceous Alliance (A.3562)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)

Dynamics: The natural fire regime of this ecological system likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression. Microphytic crust is very important in this ecological system. *Festuca campestris* is highly palatable throughout the grazing season. Summer overgrazing for 2 to 3 years can result in the loss of *Festuca campestris* in the stand. Although a light stocking rate for 32 years did not affect range condition, a modest increase in stocking rate led to a marked decline in range condition. The major change was a measurable reduction in basal area of *Festuca campestris*. Long-term heavy grazing on moister sites can result in a shift to a *Poa pratensis - Phleum pratense* (Kentucky bluegrass - timothy) type. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris*. It tolerates dormant-period grazing well but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring. Exotic species threatening this ecological system through invasion and potential complete replacement of native species include *Bromus japonicus, Potentilla recta, Euphorbia esula*, and all manner of knapweed, especially *Centaurea biebersteinii (= Centaurea maculosa).*

SOURCES

References: BCCDC unpubl. data, Ecosystems Working Group 1998, Western Ecology Working Group n.d.
Version: 01 Sep 2005 **Stakeholders:** Canada, West
Concept Author: R. Crawford **LeadResp:** West

WETLAND and RIPARIAN

OKANAGAN COARSE FILTER TARGET: COLUMBIA BASIN FOOTHILL RIPARIAN WOODLAND AND SHRUBLAND

CES304.768 COLUMBIA BASIN FOOTHILL RIPARIAN WOODLAND AND SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Riverine / Alluvial; Short (<5 yrs) Flooding Interval; Short (50-100 yrs) Persistence
Concept Summary: This is a low-elevation riparian system found on the periphery of the mountains surrounding the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations. This is the riparian system associated with all streams at and below lower treeline, including permanent, intermittent and ephemeral streams with woody riparian vegetation. These forests and woodlands require flooding and some gravels for reestablishment. They are found in low-elevation canyons and draws, on floodplains, or in steep-sided canyons, or narrow V-shaped valleys with rocky substrates. Sites are subject to temporary flooding during spring runoff. Underlying gravels may keep the water table just below the ground surface and are favored substrates for cottonwood. Large bottomlands may have large occurrences, but most have been cut over or cleared for agriculture. Rafted ice and logs in freshets may cause considerable damage to tree boles. Beavers crop younger cottonwood and willows and frequently dam side channels occurring in these stands. In steep-sided canyons, streams typically have perennial flow on mid to high gradients. Important and diagnostic trees include *Populus balsamifera ssp. trichocarpa, Alnus rhombifolia, Populus tremuloides, Celtis laevigata var. reticulata, Betula occidentalis*, or *Pinus ponderosa*. Important shrubs include *Crataegus douglasii, Philadelphus lewisii, Cornus sericea, Salix lucida ssp. lasiandra, Salix eriocephala, Rosa nutkana, Rosa woodsii, Amelanchier alnifolia, Prunus virginiana*, and *Symphoricarpos albus*. Grazing is a major influence in altering structure, composition, and function of the community.

DISTRIBUTION

Range: Found on the periphery of the northern Rockies in the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 7:C, 68:C
Subnations: BC, CA, ID, MT?, NV, OR, UT, WA

CONCEPT

Associations:

- *(Populus tremuloides) / Crataegus douglasii / Heracleum maximum* Shrubland (CEGL001094, G1)
- *(Populus tremuloides) / Crataegus douglasii / Symphoricarpos albus* Shrubland (CEGL001096, G3)
- *Alnus rhombifolia - Abies grandis* Forest (CEGL000630, G2?)
- *Alnus rhombifolia / Amelanchier alnifolia* Forest (CEGL000631, G3)
- *Alnus rhombifolia / Betula occidentalis* Forest (CEGL000632, G1)
- *Alnus rhombifolia / Celtis laevigata* var. *reticulata* Forest (CEGL000633, G1?)

- *Alnus rhombifolia / Philadelphus lewisii* Forest (CEGL000634, G1)
- *Alnus rhombifolia / Prunus virginiana* Forest (CEGL000635, G1?)
- *Alnus rhombifolia / Rosa woodsii* Forest (CEGL000636, G1)
- *Alnus rhombifolia / Sambucus nigra* ssp. *caerulea* Forest (CEGL000637, G2?)
- *Alnus rhombifolia* Forest [Placeholder] (CEGL000629, G2Q)
- *Alnus rubra / Adiantum pedatum* Forest (CEGL002600, G1)
- *Alnus rubra / Athyrium filix-femina - Asarum caudatum* Forest (CEGL000008, G1)
- *Alnus rubra / Physocarpus capitatus - Philadelphus lewisii* Forest (CEGL000002, G1)
- *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland (CEGL002633, G3G4)
- *Alnus viridis* ssp. *sinuata / Rubus (lasiococcus, parviflorus)* Shrubland (CEGL002602, G4)
- *Betula occidentalis - Celtis laevigata* var. *reticulata* Shrubland (CEGL003450, G2)
- *Betula occidentalis / Crataegus douglasii* Shrubland (CEGL001081, G1)
- *Betula occidentalis / Philadelphus lewisii - Symphoricarpos albus* Shrubland (CEGL000489, G1G2)
- *Betula occidentalis / Philadelphus lewisii* Shrubland (CEGL002668, G2)
- *Betula occidentalis* Shrubland (CEGL001080, G3G4)
- *Celtis laevigata* var. *reticulata / Philadelphus lewisii* Woodland (CEGL000792, G1)
- *Celtis laevigata* var. *reticulata / Pseudoroegneria spicata* Woodland (CEGL001085, G2G3)
- *Celtis laevigata* var. *reticulata / Toxicodendron rydbergii* Woodland (CEGL003451, G2)
- *Cornus sericea / Heracleum maximum* Shrubland (CEGL001167, G3)
- *Crataegus douglasii / Rosa woodsii* Shrubland (CEGL001095, G2)
- *Philadelphus lewisii / Symphoricarpos albus* Shrubland (CEGL000875, G1G2)
- *Philadelphus lewisii* Intermittently Flooded Shrubland (CEGL001170, G2)
- *Pinus monticola / Deschampsia caespitosa* Forest (CEGL003441, G1)
- *Pinus ponderosa / Symphoricarpos albus* Temporarily Flooded Woodland (CEGL000866, G2)
- *Populus balsamifera* (ssp. *trichocarpa*, ssp. *balsamifera*) / *Symphoricarpos (albus, oreophilus, occidentalis)* Forest (CEGL000677, G2)
- *Populus balsamifera* ssp. *trichocarpa / Alnus incana* Forest (CEGL000667, G3)
- *Populus balsamifera* ssp. *trichocarpa / Cicuta douglasii* Forest (CEGL000671, G1)
- *Populus balsamifera* ssp. *trichocarpa / Cornus sericea* Forest (CEGL000672, G3G4)
- *Populus balsamifera* ssp. *trichocarpa / Crataegus douglasii* Forest (CEGL000673, G1)
- *Populus balsamifera* ssp. *trichocarpa* / Mixed Herbs Forest (CEGL000675, G3?)
- *Populus balsamifera* ssp. *trichocarpa / Salix exigua* Forest (CEGL000676, G1)
- *Populus balsamifera* ssp. *trichocarpa / Salix lucida* ssp. *caudata* Woodland (CEGL003431, G2)
- *Populus tremuloides / Alnus incana / Betula nana - Ribes* spp. Forest (CEGL001149, G1)
- *Populus tremuloides / Carex pellita* Forest (CEGL000577, G2)
- *Salix amygdaloides / Salix exigua* Woodland (CEGL000948, G1Q)

Alliances:

- *Abies grandis - Alnus rhombifolia* Forest Alliance (A.429)
- *Alnus rhombifolia* Temporarily Flooded Forest Alliance (A.306)
- *Alnus rubra* Temporarily Flooded Forest Alliance (A.305)
- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Betula occidentalis* Intermittently Flooded Shrubland Alliance (A.936)
- *Betula occidentalis* Seasonally Flooded Shrubland Alliance (A.996)
- *Celtis laevigata* var. *reticulata* Woodland Alliance (A.632)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Crataegus douglasii* Intermittently Flooded Shrubland Alliance (A.937)
- *Crataegus douglasii* Shrubland Alliance (A.917)
- *Philadelphus lewisii* Intermittently Flooded Shrubland Alliance (A.939)
- *Pinus monticola* Seasonally Flooded Forest Alliance (A.2590)
- *Pinus ponderosa* Temporarily Flooded Woodland Alliance (A.565)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Woodland Alliance (A.635)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)

- *Salix amygdaloides* Temporarily Flooded Woodland Alliance (A.645)

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Johnson and Simon 1985
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES304.780 INTER-MOUNTAIN BASINS GREASEWOOD FLAT

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Mixed Upland and Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Alkaline Soil; Deep Soil; Xeromorphic Shrub
Concept Summary: This ecological system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus*. *Atriplex canescens, Atriplex confertifolia*, or *Krascheninnikovia lanata* may be present to codominant. Occurrences are often surrounded by mixed salt desert scrub. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Sporobolus airoides, Distichlis spicata* (where water remains ponded the longest), or *Eleocharis palustris* herbaceous types.

DISTRIBUTION

Range: Occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains.
Divisions: 303:C, 304:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Distichlis spicata - (Scirpus nevadensis)* Herbaceous Vegetation (CEGL001773, G4)
- *Distichlis spicata - Lepidium perfoliatum* Herbaceous Vegetation (CEGL001772, GNA)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Distichlis spicata* Mixed Herb Herbaceous Vegetation (CEGL001771, G3G5)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Ericameria nauseosa / Sporobolus airoides* Shrubland (CEGL002918, G3Q)
- *Leymus cinereus - Distichlis spicata* Herbaceous Vegetation (CEGL001481, G3)
- *Leymus cinereus* Bottomland Herbaceous Vegetation (CEGL001480, G1)
- *Leymus cinereus* Herbaceous Vegetation (CEGL001479, G2G3Q)
- *Puccinellia nuttalliana* Herbaceous Vegetation (CEGL001799, G3?)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Sarcobatus vermiculatus - Atriplex parryi / Distichlis spicata* Shrubland (CEGL002764, GNR)
- *Sarcobatus vermiculatus - Psorothamnus polydenius* Shrubland (CEGL002763, GNR)
- *Sarcobatus vermiculatus / Achnatherum hymenoides* Shrubland (CEGL001373, G4)
- *Sarcobatus vermiculatus / Artemisia tridentata* Shrubland (CEGL001359, G4)
- *Sarcobatus vermiculatus / Atriplex confertifolia - (Picrothamnus desertorum, Suaeda moquinii)* Shrubland (CEGL001371, G5?)
- *Sarcobatus vermiculatus / Atriplex gardneri* Shrubland (CEGL001360, G4?)
- *Sarcobatus vermiculatus / Bouteloua gracilis* Shrubland (CEGL001361, G1Q)
- *Sarcobatus vermiculatus / Distichlis spicata* Shrubland (CEGL001363, G4)

- *Sarcobatus vermiculatus / Elymus elymoides - Pascopyrum smithii* Shrubland (CEGL001365, G2?)
- *Sarcobatus vermiculatus / Elymus elymoides* Shrubland (CEGL001372, G4)
- *Sarcobatus vermiculatus / Juncus balticus* Sparse Vegetation (CEGL002919, G3?)
- *Sarcobatus vermiculatus / Leymus cinereus* Shrubland (CEGL001366, G3)
- *Sarcobatus vermiculatus / Nitrophila occidentalis - Suaeda moquinii* Shrubland (CEGL001369, G5?)
- *Sarcobatus vermiculatus / Pascopyrum smithii - (Elymus lanceolatus)* Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Sarcobatus vermiculatus / Pseudoroegneria spicata* Shrubland (CEGL001367, G3)
- *Sarcobatus vermiculatus / Sporobolus airoides* Sparse Vegetation (CEGL001368, G3?)
- *Sarcobatus vermiculatus / Suaeda moquinii* Shrubland (CEGL001370, GUQ)
- *Sarcobatus vermiculatus* Shrubland (CEGL001357, G5)
- *Sporobolus airoides - Distichlis spicata* Herbaceous Vegetation (CEGL001687, G4?)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)

Alliances:
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Eleocharis palustris* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Leymus cinereus* Intermittently Flooded Herbaceous Alliance (A.1329)
- *Puccinellia nuttalliana* Intermittently Flooded Herbaceous Alliance (A.1335)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sarcobatus vermiculatus* Intermittently Flooded Sparsely Vegetated Alliance (A.1877)
- *Sarcobatus vermiculatus* Shrubland Alliance (A.1041)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus airoides* Intermittently Flooded Herbaceous Alliance (A.1331)

Other Comments: Carmen says this is NOT in Okanagan in BC. She put their DISSTR in to playas.

SOURCES

References: Comer et al. 2003, Knight 1994, West 1983b

Version: 20 Feb 2003 **Stakeholders:** Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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CES304.786 INTER-MOUNTAIN BASINS PLAYA

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Lowland [Lowland]; Playa; Temperate [Temperate Xeric]; Depressional; Alkaline Soil; Saline Substrate Chemistry; Aridic; Alkaline Water; Saline Water Chemistry; Caliche Layer; Impermeable Layer; Intermittent Flooding

Concept Summary: This ecological system is composed of barren and sparsely vegetated playas (generally <10% plant cover) found in the intermountain western U.S. Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. These systems are intermittently flooded. The water is prevented from percolating through the soil by an impermeable soil subhorizon and is left to evaporate. Soil salinity varies greatly with soil moisture and greatly affects species composition. Characteristic species may include *Allenrolfea occidentalis, Sarcobatus vermiculatus, Grayia spinosa, Puccinellia lemmonii, Leymus cinereus, Distichlis spicata*, and/or *Atriplex* spp.

Comments: Bjork (1997) refers to these as vernal lakes in Washington; his one example was ditched and may be artificial. There might have been these in Grand Coulee prior to Columbia Basin irrigation project.

DISTRIBUTION

Range: This system occurs throughout the Intermountain western U.S., extending east into the southwestern Great Plains.
Divisions: 304:C
TNC Ecoregions: 6:C, 10:C, 11:C, 19:C
Subnations: CA, CO, ID, NM, NV, OR, UT, WA?, WY

CONCEPT

Associations:

- *(Sarcocornia utahensis) - (Arthrocnemum subterminale)* Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003120, GNR)
- *Allenrolfea occidentalis / Atriplex gardneri* Shrubland (CEGL000989, G4?)
- *Allenrolfea occidentalis* Shrubland (CEGL000988, G3)
- *Artemisia papposa / Danthonia californica - Festuca idahoensis* Shrubland (CEGL002991, GNR)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Chrysothamnus albidus / Puccinellia nuttalliana* Shrubland (CEGL001328, G3)
- *Distichlis spicata - (Scirpus nevadensis)* Herbaceous Vegetation (CEGL001773, G4)
- *Distichlis spicata - Lepidium perfoliatum* Herbaceous Vegetation (CEGL001772, GNA)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Distichlis spicata* Mixed Herb Herbaceous Vegetation (CEGL001771, G3G5)
- *Hordeum jubatum* Herbaceous Vegetation (CEGL001798, G4)
- *Krascheninnikovia lanata / Poa secunda* Dwarf-shrubland (CEGL001326, G3)
- *Leymus cinereus - Distichlis spicata* Herbaceous Vegetation (CEGL001481, G3)
- *Leymus cinereus - Pascopyrum smithii* Herbaceous Vegetation (CEGL001483, G3Q)
- *Leymus cinereus* Bottomland Herbaceous Vegetation (CEGL001480, G1)
- *Leymus triticoides - Carex* spp. Herbaceous Vegetation (CEGL001571, G4?)
- *Leymus triticoides - Poa secunda* Herbaceous Vegetation (CEGL001572, G2)
- *Pluchea sericea* Seasonally Flooded Shrubland [Placeholder] (CEGL003080, G3?)
- *Poa secunda - Muhlenbergia richardsonis* Herbaceous Vegetation (CEGL002755, GNR)
- *Puccinellia lemmonii - Poa secunda* Seasonally Flooded Herbaceous Vegetation (CEGL001658, G1)
- *Sarcobatus vermiculatus - Atriplex parryi / Distichlis spicata* Shrubland (CEGL002764, GNR)
- *Sarcobatus vermiculatus - Psorothamnus polydenius* Shrubland (CEGL002763, GNR)
- *Sarcobatus vermiculatus / Achnatherum hymenoides* Shrubland (CEGL001373, G4)
- *Sarcobatus vermiculatus / Artemisia tridentata* Shrubland (CEGL001359, G4)
- *Sarcobatus vermiculatus / Atriplex confertifolia - (Picrothamnus desertorum, Suaeda moquinii)* Shrubland (CEGL001371, G5?)
- *Sarcobatus vermiculatus / Distichlis spicata* Shrubland (CEGL001363, G4)
- *Sarcobatus vermiculatus / Elymus elymoides - Pascopyrum smithii* Shrubland (CEGL001365, G2?)
- *Sarcobatus vermiculatus / Elymus elymoides* Shrubland (CEGL001372, G4)
- *Sarcobatus vermiculatus / Ericameria nauseosa* Shrubland (CEGL001362, G5)
- *Sarcobatus vermiculatus / Leymus cinereus* Shrubland (CEGL001366, G3)
- *Sarcobatus vermiculatus / Nitrophila occidentalis - Suaeda moquinii* Shrubland (CEGL001369, G5?)
- *Sarcobatus vermiculatus / Pascopyrum smithii - (Elymus lanceolatus)* Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Sarcobatus vermiculatus / Sporobolus airoides* Sparse Vegetation (CEGL001368, G3?)
- *Sarcobatus vermiculatus* Shrubland (CEGL001357, G5)
- *Spartina gracilis* Herbaceous Vegetation (CEGL001588, GU)
- *Sporobolus airoides - Distichlis spicata* Herbaceous Vegetation (CEGL001687, G4?)
- *Suaeda moquinii* Shrubland (CEGL001991, G5)

Alliances:

- *(Sarcocornia utahensis) - (Arthrocnemum subterminale)* Semipermanently Flooded Herbaceous Alliance (A.1676)
- *Allenrolfea occidentalis* Shrubland Alliance (A.866)
- *Artemisia papposa* Shrubland Alliance (A.2551)

- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Chrysothamnus albidus* Shrubland Alliance (A.834)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Hordeum jubatum* Temporarily Flooded Herbaceous Alliance (A.1358)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Leymus cinereus* Intermittently Flooded Herbaceous Alliance (A.1329)
- *Leymus triticoides* Temporarily Flooded Herbaceous Alliance (A.1353)
- *Pluchea sericea* Seasonally Flooded Shrubland Alliance (A.798)
- *Poa secunda* Seasonally Flooded Herbaceous Alliance (A.1410)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sarcobatus vermiculatus* Intermittently Flooded Sparsely Vegetated Alliance (A.1877)
- *Spartina gracilis* Seasonally Flooded Herbaceous Alliance (A.1407)
- *Sporobolus airoides* Intermittently Flooded Herbaceous Alliance (A.1331)
- *Suaeda moquinii* Intermittently Flooded Shrubland Alliance (A.941)

SOURCES

References: Bjork 1997, Comer et al. 2003, Knight 1994, Nachlinger et al. 2001
Version: 14 Dec 2004 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES300.729 NORTH AMERICAN ARID WEST EMERGENT MARSH

Primary Division:
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Herbaceous; Depressional [Lakeshore, Pond]; Mineral: W/ A-Horizon >10 cm; Aquatic Herb; Graminoid; Deep (>15 cm) Water; Saturated Soil
Concept Summary: This widespread ecological system occurs throughout much of the arid and semi-arid regions of western North America, typically surrounded by savanna, shrub steppe, steppe, or desert vegetation. Natural marshes may occur in depressions in the landscape (ponds, kettle ponds), as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). Marshes are frequently or continually inundated, with water depths up to 2 m. Water levels may be stable, or may fluctuate 1 m or more over the course of the growing season. Water chemistry may include some alkaline or semi-alkaline situations, but the alkalinity is highly variable even within the same complex of wetlands. Marshes have distinctive soils that are typically mineral, but can also accumulate organic material. Soils have characteristics that result from long periods of anaerobic conditions in the soils (e.g., gleyed soils, high organic content, redoximorphic features). The vegetation is characterized by herbaceous plants that are adapted to saturated soil conditions. Common emergent and floating vegetation includes species of *Scirpus* and/or *Schoenoplectus, Typha, Juncus, Potamogeton, Polygonum, Nuphar*, and *Phalaris*. This system may also include areas of relatively deep water with floating-leaved plants (*Lemna, Potamogeton*, and *Brasenia*) and submergent and floating plants (*Myriophyllum, Ceratophyllum*, and *Elodea*).
Comments: This ecological system occurs in the arid and semi-arid regions of western North America, where semipermanently flooded habitats are found as small patches in the matrix of a relatively dry landscape.

DISTRIBUTION

Range: Occurs throughout much of the arid and semi-arid regions of western North America.
Divisions: 301:C, 302:C, 303:C, 304:C, 305:C, 306:C
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 11:C, 17:C, 18:C, 19:C, 20:C, 21:C, 23:C, 24:C, 26:C, 27:C, 28:C, 29:?, 30:C, 68:C
Subnations: AB, AZ, BC, CA, CO, ID, MT, MXBC, MXCH, MXSO, ND, NE, NM, NV, OK, OR, SD, TX, UT, WA, WY

CONCEPT

Associations:

- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex vesicaria* Herbaceous Vegetation (CEGL002661, G4Q)
- *Distichlis spicata - (Scirpus nevadensis)* Herbaceous Vegetation (CEGL001773, G4)
- *Eleocharis (montevidensis, palustris, quinqueflora)* Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003050, G5)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Juncus balticus - Carex rossii* Herbaceous Vegetation (CEGL001839, G2G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Lemna* spp. Permanently Flooded Herbaceous Vegetation (CEGL003059, G3?)
- *Myriophyllum sibiricum* Herbaceous Vegetation (CEGL002000, GUQ)
- *Nuphar lutea* ssp. *polysepala* Herbaceous Vegetation (CEGL002001, G5)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474, G5)
- *Phragmites australis* Western North America Temperate Semi-natural Herbaceous Vegetation (CEGL001475, G5)
- *Potamogeton diversifolius* Herbaceous Vegetation (CEGL002007, G1?)
- *Potamogeton foliosus* Herbaceous Vegetation (CEGL002742, G3?)
- *Potamogeton natans* Herbaceous Vegetation (CEGL002925, G5?)
- *Ranunculus aquatilis - Callitriche palustris* Herbaceous Vegetation (CEGL001984, GU)
- *Ruppia (cirrhosa, maritima)* Permanently Flooded Herbaceous Vegetation [Placeholder] (CEGL003119, G1G3)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Schoenoplectus acutus - Typha latifolia - (Schoenoplectus tabernaemontani)* Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840, G5)
- *Schoenoplectus americanus - Carex* spp. Herbaceous Vegetation (CEGL004144, GNR)
- *Schoenoplectus americanus - Eleocharis palustris* Herbaceous Vegetation (CEGL001585, G4)
- *Schoenoplectus americanus - Eleocharis* spp. Herbaceous Vegetation (CEGL001586, GNR)
- *Schoenoplectus americanus - Flaveria chlorifolia - (Helianthus paradoxus)* Herbaceous Vegetation (CEGL004592, G1)
- *Schoenoplectus americanus* Western Herbaceous Vegetation (CEGL001841, G3Q)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)
- *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001587, G3G4)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623, G5)
- *Sparganium angustifolium* Herbaceous Vegetation (CEGL001990, G4)
- *Sparganium eurycarpum* Herbaceous Vegetation (CEGL003323, G4)
- *Spartina gracilis* Herbaceous Vegetation (CEGL001588, GU)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)
- *Stuckenia filiformis* Herbaceous Vegetation (CEGL002008, GU)
- *Triglochin maritima* Herbaceous Vegetation (CEGL001995, GU)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010, G5)
- *Typha domingensis* Western Herbaceous Vegetation (CEGL001845, G5?)

Alliances:

- *(Potamogeton diversifolius, Stuckenia filiformis)* Permanently Flooded Herbaceous Alliance (A.1763)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Eleocharis (montevidensis, palustris, quinqueflora)* Seasonally Flooded Herbaceous Alliance (A.1371)

- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Lemna* spp. Permanently Flooded Herbaceous Alliance (A.1747)
- *Myriophyllum sibiricum* Permanently Flooded Herbaceous Alliance (A.1761)
- *Nymphaea odorata - Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Potamogeton foliosus* Permanently Flooded Herbaceous Alliance (A.2518)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Ranunculus aquatilis* Semipermanently Flooded Herbaceous Alliance (A.1679)
- *Ruppia (cirrhosa, maritima)* Permanently Flooded Herbaceous Alliance (A.1755)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Schoenoplectus acutus - (Schoenoplectus tabernaemontani)* Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Sparganium angustifolium* Permanently Flooded Herbaceous Alliance (A.1760)
- *Sparganium eurycarpum* Permanently Flooded Herbaceous Alliance (A.2598)
- *Spartina gracilis* Seasonally Flooded Herbaceous Alliance (A.1407)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Triglochin maritima* Semipermanently Flooded Herbaceous Alliance (A.1681)
- *Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha domingensis* Seasonally Flooded Temperate Herbaceous Alliance (A.1392)

SOURCES

References: Brown 1982, Comer et al. 2003, Cooper 1986b, Dick-Peddie 1993, Faber-Langendoen et al. 1997, Hansen et al. 1995, Kittel et al. 1994, Neely et al. 2001, Padgett et al. 1989, Rondeau 2001, Szaro 1989, Ungar 1965, Ungar 1972

Version: 14 Dec 2004 **Stakeholders:** Canada, Latin America, Midwest, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: NORTH PACIFIC MONTANE RIPARIAN WOODLAND AND SHRUBLAND

CES204.866 NORTH PACIFIC MONTANE RIPARIAN WOODLAND AND SHRUBLAND

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Riverine / Alluvial

Concept Summary: This system occurs throughout mountainous areas of the Pacific Northwest coast, both on the mainland and on larger islands. It occurs on steep streams and narrow floodplains above foothills but below the alpine environments, e.g., above 1500 m (4550 feet) elevation in the Klamath Mountains and western Cascades of Oregon, up as high as 3300 m (10,000 feet) in the southern Cascades, and above 610 m (2000 feet) in northern Washington. Surrounding habitats include subalpine parklands and montane forests. In Washington they are defined as occurring primarily above the *Tsuga heterophylla* zone, i.e., beginning at or near the lower boundary of the *Abies amabilis* zone. Dominant species include *Pinus contorta var. murrayana, Populus balsamifera ssp. trichocarpa, Abies concolor, Abies magnifica, Populus tremuloides, Alnus incana ssp. tenuifolia (= Alnus tenuifolia), Alnus viridis ssp. crispa (= Alnus crispa), Alnus viridis ssp. sinuata (= Alnus sinuata), Alnus rubra, Rubus spectabilis, Ribes bracteosum, Oplopanax horridus, Acer circinatum*, and several

Salix species. In Western Washington, major species are *Alnus viridis ssp. sinuata, Acer circinatum, Salix, Oplopanax horridus, Alnus rubra, Petasites frigidus, Rubus spectabilis*, and *Ribes bracteosum*. These are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance. They occur on streambanks where the vegetation is significantly different than surrounding forests, usually because of its shrubby or deciduous character.

DISTRIBUTION

Range: This system occurs throughout mountainous areas of the Pacific Northwest Coast, both on the mainland and on larger islands, above 1500 m (4550 feet) elevation in the Klamath Mountains and western Cascades, up as high as 3300 m (10,000 feet) in the southern Cascades, and above 610 m (2000 feet) in northern Washington.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 4:C, 69:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

Associations:

- *Alnus incana / Athyrium filix-femina* Shrubland (CEGL002628, G3)
- *Alnus incana / Cornus sericea* Shrubland (CEGL001145, G3G4)
- *Alnus incana / Equisetum arvense* Shrubland (CEGL001146, G3)
- *Alnus incana* / Mesic Forbs Shrubland (CEGL001147, G3)
- *Alnus incana / Spiraea douglasii* Shrubland (CEGL001152, G3)
- *Alnus incana / Symphoricarpos albus* Shrubland (CEGL001153, G3G4)
- *Alnus incana* Shrubland (CEGL001141, GNRQ)
- *Alnus viridis* ssp. *sinuata / Athyrium filix-femina - Cinna latifolia* Shrubland (CEGL001156, G4)
- *Alnus viridis* ssp. *sinuata / Oplopanax horridus* Shrubland (CEGL001157, G4G5)
- *Betula nana / Carex utriculata* Shrubland (CEGL001079, G4?)
- *Salix (boothii, geyeriana) / Carex aquatilis* Shrubland (CEGL001176, G3)
- *Salix boothii - Salix eastwoodiae / Carex nigricans* Shrubland (CEGL002607, G3)
- *Salix boothii - Salix geyeriana / Carex angustata* Shrubland (CEGL001185, G2)
- *Salix boothii - Salix lemmonii* Shrubland (CEGL001186, G3)
- *Salix boothii / Carex utriculata* Shrubland (CEGL001178, G4)
- *Salix commutata / Carex scopulorum* Shrubland (CEGL001189, G3)
- *Salix drummondiana / Carex utriculata* Shrubland (CEGL002631, G4)
- *Salix sitchensis / Equisetum arvense - Petasites frigidus* Shrubland (CEGL003296, G4?)

Alliances:

- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Alnus viridis* ssp. *sinuata* Seasonally Flooded Shrubland Alliance (A.1000)
- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Betula nana* Seasonally Flooded Shrubland Alliance (A.995)
- *Salix boothii* Seasonally Flooded Shrubland Alliance (A.1001)
- *Salix boothii* Temporarily Flooded Shrubland Alliance (A.972)
- *Salix commutata* Seasonally Flooded Shrubland Alliance (A.1003)
- *Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)
- *Salix sitchensis* Seasonally Flooded Shrubland Alliance (A.2599)

SOURCES

References: Comer et al. 2003, Franklin and Dyrness 1973, Holland and Keil 1995
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: G. Kittel **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: NORTHERN ROCKY MOUNTAIN LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND

CES306.803 NORTHERN ROCKY MOUNTAIN CONIFER SWAMP

Primary Division: Rocky Mountain (306)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Forest and Woodland (Treed); Seepage-Fed Sloping [Mineral]; Depressional; Mineral: W/ A-Horizon <10 cm; Saturated Soil
Concept Summary: This ecological system occurs in the northern Rocky Mountains from northwestern Wyoming north into the Canadian Rockies and west into eastern Oregon and Washington. It is dominated by conifers on poorly drained soils that are saturated year-round or may have seasonal flooding in the spring. These are primarily on flat to gently sloping lowlands, but also occur up to near the lower limits of continuous forest (below the subalpine parkland). It can occur on steeper slopes where soils are shallow over unfractured bedrock. This system is indicative of poorly drained, mucky areas, and areas are often a mosaic of moving water and stagnant water. Soils can be woody peat, muck or mineral but tend toward mineral. Stands generally occupy sites on benches, toeslopes or valley bottoms along mountain streams. Associations present include wetland phases of *Thuja plicata, Tsuga heterophylla*, and *Picea engelmannii* forests. The wetland types are generally distinguishable from other upland forests and woodlands by shallow water tables and mesic or hydric undergrowth vegetation; some of the most typical species include *Athyrium filix-femina, Dryopteris* spp., *Lysichiton americanus, Equisetum arvense, Senecio triangularis, Mitella breweri, Mitella pentandra, Streptopus amplexifolius, Calamagrostis canadensis*, or *Carex disperma*.
Comments: May need to split out calcareous cedar (*Thuja plicata*) swamps from the other conifer swamps-needs more review.

DISTRIBUTION

Range: Occurs in the northern Rocky Mountains from northwestern Wyoming north into the Canadian Rockies and west into eastern Oregon and Washington.
Divisions: 306:C
TNC Ecoregions: 7:C, 8:C, 9:P, 68:C
Subnations: AB, BC, ID, MT, OR, WA, WY

CONCEPT

Associations:
- *Betula nana / Carex* spp. Shrubland (CEGL005887, GNR)
- *Betula nana / Carex utriculata* Shrubland (CEGL001079, G4?)
- *Picea (engelmannii X glauca, engelmannii) / Carex disperma* Forest (CEGL000405, G2Q)
- *Picea (engelmannii X glauca, engelmannii) / Lysichiton americanus* Forest (CEGL000412, G2)
- *Picea engelmannii / Calamagrostis canadensis* Forest (CEGL002678, G4)
- *Picea engelmannii / Caltha leptosepala* Forest (CEGL000357, G3?)
- *Picea engelmannii / Carex disperma* Forest (CEGL000358, G2)
- *Thuja plicata - Tsuga heterophylla / Lysichiton americanus / Sphagnum* spp. Forest (CEGL001787, G3G4)
- *Thuja plicata - Tsuga heterophylla / Lysichiton americanus* Forest (CEGL002670, G3?)
- *Thuja plicata - Tsuga heterophylla / Oplopanax horridus* Rocky Mountain Forest (CEGL000479, G3)
- *Thuja plicata / Athyrium filix-femina* Forest (CEGL000473, G3G4)
- *Thuja plicata / Carex disperma* Forest [Provisional] (CEGL005931, G2?)

Alliances:
- *Betula nana* Seasonally Flooded Shrubland Alliance (A.995)
- *Picea engelmannii* Saturated Forest Alliance (A.204)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Thuja plicata* Forest Alliance (A.166)
- *Thuja plicata* Seasonally Flooded Forest Alliance (A.193)
- *Tsuga heterophylla* Saturated Forest Alliance (A.203)

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Meidinger and Pojar 1991

Version: 07 Sep 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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CES306.804 NORTHERN ROCKY MOUNTAIN LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Montane [Lower Montane]; Riverine / Alluvial; Short (<5 yrs) Flooding Interval [Short interval, Spring Flooding]
Concept Summary: This ecological system of the northern Rocky Mountains and the east slopes of the Cascades consists of deciduous, coniferous, and mixed conifer-deciduous forests that occur on streambanks and river floodplains of the lower montane and foothill zones. Riparian forest stands are maintained by annual flooding and hydric soils throughout the growing season. Riparian forests are often accompanied by riparian shrublands or open areas dominated by wet meadows. *Populus balsamifera* is the key indicator species. Several other tree species can be mixed in the canopy, including *Populus tremuloides, Betula papyrifera, Betula occidentalis, Picea mariana*, and *Picea glauca*. *Abies grandis, Thuja plicata*, and *Tsuga heterophylla* are commonly dominant canopy species in western Montana and northern Idaho occurrences, in lower montane riparian zones. Shrub understory components include *Cornus sericea, Acer glabrum, Alnus incana, Betula papyrifera, Oplopanax horridus*, and *Symphoricarpos albus*. Ferns and forbs of mesic sites are commonly present in many occurrences, including such species as *Athyrium filix-femina, Gymnocarpium dryopteris*, and *Senecio triangularis*.
Comments: This system is from the Canadian Rockies ecoregion project and represents lower montane riparian in Montana north into Canada. In the Okanagan, this is defined as all the cottonwood-dominated or codominated riparian systems below subalpine and above the Ponderosa pine zone. This system occurs in fire-dominated landscapes, which distinguishes it from North Pacific and subalpine/alpine landscapes that have significantly different fire regimes. This system is distinguished from the similar Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833) by the floristic component of northern Rocky Mountain species, both in the woody layers and in the herbaceous taxa.

DISTRIBUTION

Range: This system is found in the northern Rocky Mountains.
Divisions: 303:P, 306:C
TNC Ecoregions: 7:C, 8:C, 68:C
Subnations: AB, BC, ID, MT, OR?, WA

CONCEPT

Associations:
- *Abies grandis / Athyrium filix-femina* Forest (CEGL000270, G3Q)
- *Abies grandis / Senecio triangularis* Forest (CEGL000280, G3)
- *Betula papyrifera* Forest [Provisional] (CEGL000520, G4Q)
- *Populus balsamifera* (ssp. *trichocarpa*, ssp. *balsamifera*) / *Symphoricarpos (albus, oreophilus, occidentalis)* Forest (CEGL000677, G2)
- *Populus balsamifera* ssp. *trichocarpa - (Populus tremuloides) / Heracleum maximum* Forest (CEGL000542, G2)
- *Populus balsamifera* ssp. *trichocarpa / Alnus incana* Forest (CEGL000667, G3)
- *Populus balsamifera* ssp. *trichocarpa / Betula papyrifera* Forest (CEGL000670, GNRQ)
- *Populus balsamifera* ssp. *trichocarpa / Calamagrostis canadensis* Forest [Provisional] (CEGL005845, G2?)
- *Populus balsamifera* ssp. *trichocarpa / Cornus sericea* Forest (CEGL000672, G3G4)
- *Populus balsamifera* ssp. *trichocarpa / Oplopanax horridus - Acer glabrum* Forest (CEGL000482, G2)
- *Thuja plicata - Tsuga heterophylla / Oplopanax horridus* Rocky Mountain Forest (CEGL000479, G3)
- *Thuja plicata / Gymnocarpium dryopteris* Forest (CEGL000476, G3)

- *Tsuga heterophylla / Athyrium filix-femina* Forest (CEGL000491, G2Q)
- *Tsuga heterophylla / Gymnocarpium dryopteris* Forest (CEGL000494, G3G4)

Alliances:

- *Abies grandis* Temporarily Flooded Forest Alliance (A.176)
- *Betula papyrifera* Forest Alliance (A.267)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Thuja plicata* Forest Alliance (A.166)
- *Thuja plicata* Seasonally Flooded Forest Alliance (A.193)
- *Tsuga heterophylla* Forest Alliance (A.145)
- *Tsuga heterophylla* Temporarily Flooded Forest Alliance (A.174)

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ecosystems Working Group 1998, Hansen et al. 1988b, Hansen et al. 1989

Version: 07 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: ROCKY MOUNTAIN ALPINE-SUBALPINE WETLANDS

CES306.812 ROCKY MOUNTAIN ALPINE-MONTANE WET MEADOW

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Montane [Upper Montane]; Herbaceous; Seepage-Fed Sloping [Mineral]; Depressional [Lakeshore, Pond]; Graminoid

Concept Summary: These are high-elevation communities found throughout the Rocky Mountains and Intermountain regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from montane to alpine (1000-3600 m). These types occur as large meadows in montane or subalpine valleys, as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on sub-irrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this system may be mineral or organic. In either case, soils show typical hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This system often occurs as a mosaic of several plant associations, often dominated by graminoids, including *Calamagrostis stricta, Caltha leptosepala, Cardamine cordifolia, Carex illota, Carex microptera, Carex nigricans, Carex scopulorum, Carex utriculata, Carex vernacula, Deschampsia caespitosa, Eleocharis quinqueflora, Juncus drummondii, Phippsia algida, Rorippa alpina, Senecio triangularis, Trifolium parryi*, and *Trollius laxus*. Often alpine dwarf-shrublands, especially those dominated by *Salix*, are immediately adjacent to the wet meadows. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding.

Comments: Similar systems to this one include Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998) and Boreal Wet Meadow (CES103.873). The Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) occurs to the east of the coastal and Sierran mountains, in the semi-arid interior regions of western North America. Boreal wet meadow systems occur further north and east in boreal regions where the climatic regime is generally colder than that of the Rockies or Pacific Northwest regions. Floristics of these three systems are somewhat similar, but there are differences related to biogeographic affinities of the species composing the vegetation.

DISTRIBUTION

Range: Found throughout the Rocky Mountains and Intermountain regions, ranging in elevation from montane to alpine (1000-3600 m).

Divisions: 304:C, 306:C

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 22:P, 25:C, 68:C

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CONCEPT

Associations:

- *Betula nana / Carex* spp. Shrubland (CEGL005887, GNR)
- *Betula nana / Carex utriculata* Shrubland (CEGL001079, G4?)
- *Betula nana* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653, G3G4)
- *Calamagrostis canadensis - Carex scopulorum - Mertensia ciliata* Herbaceous Vegetation (CEGL001560, GUQ)
- *Calamagrostis canadensis - Senecio triangularis* Herbaceous Vegetation (CEGL001561, G2Q)
- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Calamagrostis stricta* Herbaceous Vegetation [Provisional] (CEGL002891, GU)
- *Caltha leptosepala - Polygonum bistortoides* Herbaceous Vegetation (CEGL001956, G2Q)
- *Caltha leptosepala - Rhodiola rhodantha* Herbaceous Vegetation (CEGL001957, GNRQ)
- *Caltha leptosepala* Herbaceous Vegetation (CEGL001954, G4)
- *Camassia cusickii* Herbaceous Vegetation (CEGL003440, G2)
- *Cardamine cordifolia - Caltha leptosepala* Herbaceous Vegetation (CEGL001958, GU)
- *Cardamine cordifolia - Mertensia ciliata - Senecio triangularis* Herbaceous Vegetation (CEGL002662, G4)
- *Carex amplifolia* Herbaceous Vegetation (CEGL003427, G3)
- *Carex aperta* Herbaceous Vegetation (CEGL001801, G1?)
- *Carex aquatilis - Carex utriculata* Herbaceous Vegetation (CEGL001803, G4)
- *Carex aquatilis - Pedicularis groenlandica* Herbaceous Vegetation (CEGL001804, GU)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802, G5)
- *Carex aquatilis* var. *dives* Herbaceous Vegetation (CEGL001826, G4)
- *Carex capillaris - Polygonum viviparum* Herbaceous Vegetation (CEGL001872, GU)
- *Carex duriuscula* Herbaceous Vegetation (CEGL001874, GUQ)
- *Carex illota* Herbaceous Vegetation (CEGL001876, GUQ)
- *Carex lachenalii* Herbaceous Vegetation (CEGL001871, GU)
- *Carex microglochin* Herbaceous Vegetation (CEGL001877, GU)
- *Carex microptera* Herbaceous Vegetation (CEGL001792, G4)
- *Carex nebrascensis - Carex microptera* Herbaceous Vegetation (CEGL001815, G3G4)
- *Carex nebrascensis - Catabrosa aquatica* Herbaceous Vegetation (CEGL001814, G1?)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex nebrascensis* Slope Herbaceous Vegetation (CEGL002890, GU)
- *Carex nigricans - Juncus drummondii* Herbaceous Vegetation (CEGL001818, GU)
- *Carex nigricans - Sibbaldia procumbens* Herbaceous Vegetation (CEGL005824, G4G5)
- *Carex nigricans* Herbaceous Vegetation (CEGL001816, G4)
- *Carex pellita* Herbaceous Vegetation (CEGL001809, G3)
- *Carex praegracilis - Carex aquatilis* Herbaceous Vegetation (CEGL001821, G3)
- *Carex praegracilis* Herbaceous Vegetation (CEGL002660, G3G4)
- *Carex pyrenaica* Herbaceous Vegetation (CEGL001860, GU)
- *Carex saxatilis* Herbaceous Vegetation (CEGL001769, G3)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Vegetation (CEGL001865, G3?)
- *Carex scopulorum - Caltha leptosepala* Herbaceous Vegetation (CEGL001823, G4)
- *Carex scopulorum - Elymus trachycaulus* Herbaceous Vegetation (CEGL001824, GU)
- *Carex scopulorum* Herbaceous Vegetation (CEGL001822, G5)
- *Carex simulata* Herbaceous Vegetation (CEGL001825, G4)
- *Carex spectabilis - Arnica X diversifolia* Herbaceous Vegetation (CEGL005867, G3G4)
- *Carex straminiformis* Herbaceous Vegetation (CEGL001793, G3?)

- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex vernacula - Poa fendleriana* Herbaceous Vegetation (CEGL001869, G2G3)
- *Carex vesicaria* Herbaceous Vegetation (CEGL002661, G4Q)
- *Dasiphora fruticosa* ssp. *floribunda / Carex* spp. Shrubland (CEGL001106, G3?)
- *Dasiphora fruticosa* ssp. *floribunda / Deschampsia caespitosa* Shrubland (CEGL001107, G4)
- *Dasiphora fruticosa* ssp. *floribunda* Shrubland [Provisional] (CEGL001105, G5?)
- *Deschampsia caespitosa - Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880, G5)
- *Deschampsia caespitosa - Caltha leptosepala* Herbaceous Vegetation (CEGL001882, G4)
- *Deschampsia caespitosa - Carex douglasii* Herbaceous Vegetation (CEGL001602, G2)
- *Deschampsia caespitosa - Carex microptera* Herbaceous Vegetation (CEGL001883, G2G3)
- *Deschampsia caespitosa - Carex nebrascensis* Herbaceous Vegetation (CEGL001601, G3?Q)
- *Deschampsia caespitosa - Carex* spp. Herbaceous Vegetation (CEGL001603, G4Q)
- *Deschampsia caespitosa - Geum rossii* Herbaceous Vegetation (CEGL001884, G5)
- *Deschampsia caespitosa - Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885, GU)
- *Deschampsia caespitosa - Luzula multiflora* Herbaceous Vegetation (CEGL001886, G2Q)
- *Deschampsia caespitosa - Mertensia ciliata* Herbaceous Vegetation (CEGL001887, GU)
- *Deschampsia caespitosa - Phleum alpinum* Herbaceous Vegetation (CEGL001888, G3Q)
- *Deschampsia caespitosa - Potentilla diversifolia* Herbaceous Vegetation (CEGL001889, G5)
- *Deschampsia caespitosa - Symphyotrichum foliaceum* Herbaceous Vegetation (CEGL001881, G2Q)
- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599, G4)
- *Eleocharis acicularis* Herbaceous Vegetation (CEGL001832, G4?)
- *Eleocharis palustris - Distichlis spicata* Herbaceous Vegetation (CEGL001834, G2G4)
- *Eleocharis palustris - Juncus balticus* Herbaceous Vegetation (CEGL001835, G2G4)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Eleocharis quinqueflora - Carex scopulorum* Herbaceous Vegetation (CEGL001837, G3G4)
- *Eleocharis quinqueflora* Herbaceous Vegetation (CEGL001836, G4)
- *Eleocharis rostellata* Herbaceous Vegetation (CEGL003428, G3)
- *Equisetum arvense* Herbaceous Vegetation (CEGL003314, G5)
- *Equisetum fluviatile* Herbaceous Vegetation (CEGL002746, G4)
- *Geum rossii - Polygonum bistortoides* Herbaceous Vegetation (CEGL001967, G4G5)
- *Geum rossii - Sibbaldia procumbens* Herbaceous Vegetation (CEGL001969, GU)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Glyceria grandis* Herbaceous Vegetation (CEGL003429, G2?)
- *Glyceria striata* Herbaceous Vegetation (CEGL000219, G3)
- *Heracleum maximum - Rudbeckia occidentalis* Herbaceous Vegetation (CEGL001940, G4)
- *Heracleum maximum* Herbaceous Vegetation (CEGL005857, G3G4)
- *Juncus balticus - Carex rossii* Herbaceous Vegetation (CEGL001839, G2G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Juncus drummondii - Antennaria lanata* Herbaceous Vegetation (CEGL001904, G3?)
- *Juncus drummondii - Carex* spp. Herbaceous Vegetation (CEGL001905, G4)
- *Juncus parryi - Erigeron ursinus* Herbaceous Vegetation (CEGL001906, G2?)
- *Juncus parryi / Sibbaldia procumbens* Herbaceous Vegetation (CEGL005871, G3G4)
- *Phippsia algida* Herbaceous Vegetation (CEGL002892, GU)
- *Phleum alpinum - Carex aquatilis* Herbaceous Vegetation (CEGL001921, G2Q)
- *Phleum alpinum - Carex microptera* Herbaceous Vegetation (CEGL001922, G2Q)
- *Poa glauca* Herbaceous Vegetation (CEGL001926, GU)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Primula parryi* Herbaceous Vegetation (CEGL001983, GNR)
- *Rhodiola rhodantha* Herbaceous Vegetation (CEGL001931, GU)
- *Rorippa alpina* Herbaceous Vegetation (CEGL002009, GU)
- *Saxifraga odontoloma* Herbaceous Vegetation (CEGL001985, GU)
- *Senecio triangularis - Mimulus guttatus* Herbaceous Vegetation (CEGL001988, G3?)
- *Senecio triangularis - Veratrum californicum* Herbaceous Vegetation (CEGL001989, G4)

- *Senecio triangularis* Herbaceous Vegetation (CEGL001987, G5?)
- *Trichophorum caespitosum - Carex livida* Herbaceous Vegetation (CEGL001842, G1)
- *Trollius laxus - Parnassia fimbriata* Herbaceous Vegetation (CEGL005858, G3?)
- *Valeriana sitchensis - Veratrum viride* Herbaceous Vegetation (CEGL001998, G4)

Alliances:

- *Betula nana* Seasonally Flooded Shrubland Alliance (A.995)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Calamagrostis stricta* Temporarily Flooded Herbaceous Alliance (A.2594)
- *Caltha leptosepala* Saturated Herbaceous Alliance (A.1698)
- *Camassia (cusickii, quamash)* Seasonally Flooded Herbaceous Alliance (A.2587)
- *Cardamine cordifolia* Saturated Herbaceous Alliance (A.1699)
- *Carex (lachenalii, capillaris, illota)* Seasonally Flooded Herbaceous Alliance (A.1424)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex amplifolia* Saturated Herbaceous Alliance (A.2584)
- *Carex aperta* Saturated Herbaceous Alliance (A.1468)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex aquatilis* var. *dives* Seasonally Flooded Herbaceous Alliance (A.1412)
- *Carex duriuscula* Herbaceous Alliance (A.1283)
- *Carex microglochin* Saturated Herbaceous Alliance (A.1470)
- *Carex microptera* Seasonally Flooded Herbaceous Alliance (A.1411)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex nigricans* Seasonally Flooded Herbaceous Alliance (A.1418)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex praegracilis* Seasonally Flooded Herbaceous Alliance (A.1419)
- *Carex pyrenaica* Herbaceous Alliance (A.1320)
- *Carex saxatilis* Temporarily Flooded Herbaceous Alliance (A.1357)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Alliance (A.1306)
- *Carex scopulorum* Seasonally Flooded Herbaceous Alliance (A.1420)
- *Carex simulata* Saturated Herbaceous Alliance (A.1469)
- *Carex spectabilis* Herbaceous Alliance (A.1300)
- *Carex straminiformis* Herbaceous Alliance (A.1314)
- *Carex vernacula* Herbaceous Alliance (A.1309)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)
- *Dasiphora fruticosa* Temporarily Flooded Shrubland Alliance (A.958)
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Eleocharis (quinqueflora, rostellata)* Saturated Herbaceous Alliance (A.1423)
- *Eleocharis acicularis* Seasonally Flooded Herbaceous Alliance (A.1421)
- *Eleocharis palustris* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Equisetum (arvense, variegatum, hyemale)* Semipermanently Flooded Herbaceous Alliance (A.3539)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Glyceria (grandis, striata)* Seasonally Flooded Herbaceous Alliance (A.2578)
- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Heracleum maximum* Temporarily Flooded Herbaceous Alliance (A.1661)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Juncus drummondii* Herbaceous Alliance (A.1324)
- *Juncus parryi* Herbaceous Alliance (A.1325)
- *Phippsia algida* Saturated Herbaceous Alliance (A.2595)
- *Phleum alpinum* Temporarily Flooded Herbaceous Alliance (A.1360)
- *Poa glauca* Temporarily Flooded Herbaceous Alliance (A.1361)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)

- *Primula parryi* Temporarily Flooded Herbaceous Alliance (A.1665)
- *Rhodiola rhodantha* Temporarily Flooded Herbaceous Alliance (A.1659)
- *Rorippa alpina* Saturated Herbaceous Alliance (A.1700)
- *Saxifraga odontoloma* Temporarily Flooded Herbaceous Alliance (A.1666)
- *Senecio triangularis* Semipermanently Flooded Herbaceous Alliance (A.1680)
- *Senecio triangularis* Temporarily Flooded Herbaceous Alliance (A.1667)
- *Trichophorum caespitosum* Semipermanently Flooded Herbaceous Alliance (A.1446)
- *Trollius laxus* Saturated Herbaceous Alliance (A.2631)
- *Valeriana sitchensis* Herbaceous Alliance (A.1611)

Environment: Moisture for these wet meadow community types is acquired from groundwater, stream discharge, overland flow, overbank flow, and on-site precipitation. Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. Depending on the slope, topography, hydrology, soils and substrate, intermittent, ephemeral, or permanent pools may be present. These areas may support species more representative of purely aquatic environments. Standing water may be present during some or all of the growing season, with water tables typically remaining at or near the soil surface. Fluctuations of the water table throughout the growing season are not uncommon, however. On drier sites supporting the less mesic types, the late-season water table may be one meter or more below the surface.

Soils typically possess a high proportion of organic matter, but this may vary considerably depending on the frequency and magnitude of alluvial deposition (Kittel et. al. 1998). Organic composition of the soil may include a thin layer near the soil surface or accumulations of highly sapric material of up to 120 cm thick. Soils may exhibit gleying and/or mottling throughout the profile.

Wet meadow ecological systems provide important water filtration, flow attenuation, and wildlife habitat functions.

Dynamics: Associations in this ecological system are adapted to soils that may be flooded or saturated throughout the growing season. They may also occur on areas with soils that are only saturated early in the growing season, or intermittently. Typically these associations are tolerant of moderate-intensity ground fires and late-season livestock grazing (Kovalchik 1987). Most appear to be relatively stable types, although in some areas these may be impacted by intensive livestock grazing.

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Cooper 1986b, Crowe and Clausnitzer 1997, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Meidinger and Pojar 1991, Nachlinger 1985, Nachlinger et al. 2001, Neely et al. 2001, Padgett et al. 1988a, Reed 1988, Sanderson and Kettler 1996, Tuhy et al. 2002

Version: 14 Dec 2004 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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CES306.829 ROCKY MOUNTAIN SUBALPINE-MONTANE MESIC MEADOW

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Herbaceous; Silt Soil Texture; Clay Soil Texture; Udic; Forb

Concept Summary: This Rocky Mountain ecological system is restricted to sites from lower montane to subalpine where finely textured soils, snow deposition, or windswept dry conditions limit tree establishment. It is found typically above 2000 m in elevation in the southern part of its range and above 600 m in the northern part. These upland communities occur on gentle to moderate-gradient slopes. The soils are typically seasonally moist to saturated in the spring, but if so will dry out later in the growing season. These sites are not as wet as those found in Rocky Mountain Alpine-Montane Wet Meadow (CES306.812). Vegetation is typically forb-rich, with forbs contributing more to overall herbaceous cover than graminoids. Important taxa include *Erigeron* spp., Asteraceae spp., *Mertensia* spp., *Penstemon* spp., *Campanula* spp., *Lupinus* spp., *Solidago* spp., *Ligusticum* spp., *Thalictrum occidentale, Valeriana sitchensis, Rudbeckia occidentalis, Balsamorhiza sagittata, Wyethia* spp., *Deschampsia caespitosa, Koeleria macrantha*, and *Dasiphora fruticosa*. Burrowing mammals can increase the forb diversity.

DISTRIBUTION

Range: Rocky Mountains.
Divisions: 304:C, 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Agastache urticifolia - Heliomeris multiflora* Herbaceous Vegetation (CEGL001937, GNR)
- *Antennaria microphylla - Artemisia scopulorum* Herbaceous Vegetation (CEGL001847, G1Q)
- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Deschampsia caespitosa - Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880, G5)
- *Deschampsia caespitosa - Geum rossii* Herbaceous Vegetation (CEGL001884, G5)
- *Deschampsia caespitosa - Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885, GU)
- *Deschampsia caespitosa - Mertensia ciliata* Herbaceous Vegetation (CEGL001887, GU)
- *Deschampsia caespitosa - Phleum alpinum* Herbaceous Vegetation (CEGL001888, G3Q)
- *Deschampsia caespitosa - Potentilla diversifolia* Herbaceous Vegetation (CEGL001889, G5)
- *Deschampsia caespitosa - Symphyotrichum foliaceum* Herbaceous Vegetation (CEGL001881, G2Q)
- *Geum rossii - Trifolium* spp. Herbaceous Vegetation (CEGL001970, G3)
- *Heracleum maximum - Rudbeckia occidentalis* Herbaceous Vegetation (CEGL001940, G4)
- *Ivesia gordonii - Eriogonum caespitosum* Herbaceous Vegetation (CEGL001903, G2?)
- *Ivesia gordonii - Minuartia obtusiloba* Herbaceous Vegetation (CEGL001902, G2?)
- *Ligusticum filicinum - Delphinium X occidentale* Herbaceous Vegetation (CEGL001941, G3)
- *Ligusticum porteri - Lupinus parviflorus* ssp. *myrianthus* Herbaceous Vegetation (CEGL001915, GU)
- *Ligusticum porteri - Vicia americana* Herbaceous Vegetation (CEGL001916, G3)
- *Ligusticum tenuifolium - Trollius laxus* ssp. *albiflorus* Herbaceous Vegetation (CEGL001917, GU)
- *Lupinus argenteus - Fragaria virginiana* Herbaceous Vegetation (CEGL001942, G3?)
- *Lupinus* spp. - *Poa* spp. Herbaceous Vegetation (CEGL001943, G1Q)
- *Luzula glabrata* var. *hitchcockii - Erythronium grandiflorum* Herbaceous Vegetation (CEGL005873, GNR)
- *Mertensia ciliata* Herbaceous Vegetation (CEGL001944, G3)
- *Phleum alpinum - Achillea millefolium* Herbaceous Vegetation (CEGL001920, G5)
- *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001935, G4)
- *Trifolium parryi* Herbaceous Vegetation (CEGL001936, GU)
- *Wyethia amplexicaulis* Herbaceous Vegetation (CEGL001947, G3?)
- *Xerophyllum tenax* Herbaceous Vegetation (CEGL005859, GNR)

Alliances:

- *Agastache urticifolia* Herbaceous Alliance (A.1602)
- *Antennaria microphylla* Herbaceous Alliance (A.1623)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Heracleum maximum* Temporarily Flooded Herbaceous Alliance (A.1661)
- *Ivesia gordonii* Herbaceous Alliance (A.1627)
- *Ligusticum filicinum* Herbaceous Alliance (A.1604)
- *Ligusticum porteri* Herbaceous Alliance (A.1601)
- *Ligusticum tenuifolium* Herbaceous Alliance (A.1628)
- *Lupinus argenteus* Herbaceous Alliance (A.1605)
- *Luzula glabrata* var. *hitchcockii* Herbaceous Alliance (A.2641)

- *Mertensia ciliata* Herbaceous Alliance (A.1606)
- *Phleum alpinum* Herbaceous Alliance (A.1310)
- *Trifolium (dasyphyllum, nanum)* Herbaceous Alliance (A.1637)
- *Trifolium parryi* Herbaceous Alliance (A.1638)
- *Wyethia amplexicaulis* Herbaceous Alliance (A.1607)
- *Xerophyllum tenax* Herbaceous Alliance (A.1600)

SOURCES

References: Buckner 1977, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ellison 1954, Fritz 1981, Gregory 1983, Hall 1971, Hammerson 1979, Marr 1977a, Meidinger and Pojar 1991, Nachlinger 1985, Neely et al. 2001, Potkin and Munn 1989, Starr 1974

Version: 07 Sep 2005 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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CES306.831 ROCKY MOUNTAIN SUBALPINE-MONTANE FEN

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Moss/Lichen (Nonvascular); Seepage-Fed Sloping [Peaty]; Organic Peat (>40 cm); Graminoid; Bryophyte; Extreme (Mineral) Rich and Iron-Rich; Saturated Soil

Concept Summary: This system occurs infrequently throughout the Rocky Mountains from Colorado north into Canada. It is confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. This system includes extreme rich fens and iron fens, both being quite rare. Fens form at low points in the landscape or near slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, the extreme rich and iron fens have distinct soil and water chemistry, with high levels of one or more minerals such as calcium, magnesium, or iron. These fens usually occur as a mosaic of several plant associations dominated by *Carex aquatilis, Carex limosa, Carex lasiocarpa, Betula nana, Kobresia myosuroides, Kobresia simpliciuscula*, and *Trichophorum pumilum (= Scirpus pumilus). Sphagnum* spp. (peatmoss) is indicative of iron fens. The surrounding landscape may be ringed with other wetland systems, e.g., riparian shrublands, or a variety of upland systems from grasslands to forests.

Comments: Need to clarify this system in relation to Boreal Fen system.

DISTRIBUTION

Range: Occurs infrequently throughout the Rocky Mountains from Colorado north into Canada.

Divisions: 304:C, 306:C

TNC Ecoregions: 7:C, 8:P, 9:P, 11:P, 18:C, 19:P, 20:C, 21:P, 68:P

Subnations: AB, AZ, BC, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Betula nana / Carex* spp. Shrubland (CEGL005887, GNR)
- *Betula nana / Sphagnum* spp. Shrubland (CEGL002899, GU)
- *Carex aquatilis - Sphagnum* spp. Herbaceous Vegetation (CEGL002898, G2G3)
- *Carex buxbaumii* Herbaceous Vegetation (CEGL001806, G3)
- *Carex lasiocarpa* Herbaceous Vegetation (CEGL001810, G4?)
- *Carex limosa* Herbaceous Vegetation (CEGL001811, G2)
- *Carex simulata* Herbaceous Vegetation (CEGL001825, G4)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex utriculata* Perched Wetland Herbaceous Vegetation (CEGL002922, G3?)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Vegetation (CEGL001831, G3)
- *Kobresia myosuroides - Thalictrum alpinum* Herbaceous Vegetation (CEGL002900, G2)

- *Kobresia simpliciuscula - Trichophorum pumilum* Saturated Herbaceous Vegetation (CEGL002901, G2)
- *Ledum glandulosum* Shrubland [Provisional] (CEGL002739, G4)

Alliances:

- *Betula nana* Seasonally Flooded Shrubland Alliance (A.995)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex buxbaumii* Seasonally Flooded Herbaceous Alliance (A.1413)
- *Carex lasiocarpa* Seasonally Flooded Herbaceous Alliance (A.1415)
- *Carex limosa* Seasonally Flooded Herbaceous Alliance (A.1416)
- *Carex simulata* Saturated Herbaceous Alliance (A.1469)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Kobresia myosuroides - (Kobresia simpliciuscula)* Saturated Herbaceous Alliance (A.2504)
- *Ledum glandulosum* Saturated Shrubland Alliance (A.2514)

Environment: The montane fen ecological system is a small-patch system comprised of mountain wetlands that support a unique ecology of rare plants not found in other types of wetlands. These fens are confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. Fens form at low points in the landscape or near slopes where groundwater intercepts the soil surface (Rondeau 2001). Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels lead to accumulations of organic material (Rondeau 2001).

Within the region this system occurs at montane elevations ranging from 2440-3500 m (8000-11480 feet) and is characterized by mosaics of plant communities. These communities typically occur in seeps and wet sub-irrigated meadows in narrow to broad valley bottoms. Surface topography is typically smooth to concave with slopes ranging from 0-10%. The soils within this system are organic Histosols with 40 cm or more of organic material. These Histosols range in texture from clayey-skeletal to loamy-skeletal and fine-loams. They may occur on a variety of parent materials including alluvial and colluvial deposits of granitic and gneiss origins (NatureServe 2001). The pH of wetlands within this system in generally between 4.8 and 6.0-7.0.

Dynamics: Mountain fens act as natural filters cleaning ground and surface water. Fens also act as sponges by absorbing heavy precipitation, slowly releasing it downstream, minimizing erosion and recharging groundwater systems (Windell et al. 1986). The persistent groundwater and cold temperatures allow organic matter to accumulate (forming peat) which allows classification of wetlands within this system as fens. Fens produce peat that accumulates at the rate of 8 to 11 inches per 1000 years, making peatlands a repository of 10,000 years of post glacial history (Windell et al. 1986).

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper 1986b, Cooper and Sanderson 1997, Neely et al. 2001, Rondeau 2001, Windell et al. 1986

Version: 14 Dec 2004 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

OKANAGAN COARSE FILTER TARGET: ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN WOODLAND AND SHRUBLAND

CES306.832 ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN SHRUBLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Montane [Upper Montane, Montane]; Shrubland (Shrub-dominated); Riverine / Alluvial; Broad-Leaved Deciduous Shrub; Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Woodland; Short (50-100 yrs) Persistence

Concept Summary: This system is found throughout the Rocky Mountain cordillera from New Mexico north into Montana, and also occurs in mountainous areas of the Intermountain region and Colorado Plateau. These are montane to subalpine riparian shrublands occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally it is found at higher elevations, but can be found anywhere from 1700-3475 m. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Many of the plant associations found within this system are associated with beaver activity. This system often occurs as a mosaic of multiple communities that are shrub- and herb-dominated and includes above-treeline, willow-dominated, snowmelt-fed basins that feed into streams. The dominant shrubs reflect the large elevational gradient and include *Alnus incana, Betula nana, Betula occidentalis, Cornus sericea, Salix bebbiana, Salix boothii, Salix brachycarpa, Salix drummondiana, Salix eriocephala, Salix geyeriana, Salix monticola, Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these riparian systems are of either conifer or aspen forests.

DISTRIBUTION

Range: Found throughout the Rocky Mountain cordillera from New Mexico north into Montana, and also occurs in mountainous areas of the Intermountain region and Colorado Plateau.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CONCEPT

Associations:

- *Acer glabrum* Drainage Bottom Shrubland (CEGL001062, G4?)
- *Alnus incana - Betula occidentalis* Shrubland (CEGL001142, G2G3)
- *Alnus incana - Salix (monticola, lucida, ligulifolia)* Shrubland (CEGL002651, G3)
- *Alnus incana - Salix drummondiana* Shrubland (CEGL002652, G3)
- *Alnus incana / Athyrium filix-femina* Shrubland (CEGL002628, G3)
- *Alnus incana / Calamagrostis canadensis* Shrubland (CEGL001143, G3Q)
- *Alnus incana / Carex (aquatilis, deweyana, lenticularis, luzulina, pellita)* Shrubland (CEGL001144, G3)
- *Alnus incana / Carex scopulorum* var. *prionophylla* Shrubland (CEGL000122, G1)
- *Alnus incana / Cornus sericea* Shrubland (CEGL001145, G3G4)
- *Alnus incana / Equisetum arvense* Shrubland (CEGL001146, G3)
- *Alnus incana / Glyceria striata* Shrubland (CEGL000228, G3)
- *Alnus incana / Lysichiton americanus* Shrubland (CEGL002629, G3)
- *Alnus incana* / Mesic Forbs Shrubland (CEGL001147, G3)
- *Alnus incana* / Mesic Graminoids Shrubland (CEGL001148, G3)
- *Alnus incana / Ribes (inerme, hudsonianum, lacustre)* Shrubland (CEGL001151, G3)
- *Alnus incana / Scirpus microcarpus* Shrubland (CEGL000481, G2G3)
- *Alnus incana / Spiraea douglasii* Shrubland (CEGL001152, G3)
- *Alnus incana / Symphoricarpos albus* Shrubland (CEGL001153, G3G4)
- *Alnus incana* Shrubland (CEGL001141, GNRQ)
- *Alnus incana* ssp. *tenuifolia - Salix irrorata* Shrubland (CEGL002687, G3)
- *Alnus oblongifolia / Symphoricarpos oreophilus* Forest (CEGL001063, GU)
- *Alnus viridis* ssp. *sinuata / Athyrium filix-femina - Cinna latifolia* Shrubland (CEGL001156, G4)
- *Alnus viridis* ssp. *sinuata* Shrubland [Placeholder] (CEGL001154, GNRQ)
- *Betula nana* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653, G3G4)
- *Betula occidentalis - Dasiphora fruticosa* ssp. *floribunda* Shrubland (CEGL001083, G2Q)
- *Betula occidentalis / Cornus sericea* Shrubland (CEGL001161, G3)
- *Betula occidentalis / Maianthemum stellatum* Shrubland (CEGL001162, G4?)
- *Betula occidentalis* / Mesic Graminoids Shrubland (CEGL002654, G3)
- *Betula occidentalis* Shrubland (CEGL001080, G3G4)
- *Cornus sericea / Galium triflorum* Shrubland (CEGL001166, G3?)
- *Cornus sericea / Heracleum maximum* Shrubland (CEGL001167, G3)
- *Cornus sericea* Shrubland (CEGL001165, G4Q)
- *Corylus cornuta* Shrubland [Provisional] (CEGL002903, G3)

- *Dasiphora fruticosa* ssp. *floribunda / Deschampsia caespitosa* Shrubland (CEGL001107, G4)
- *Fraxinus anomala* Woodland (CEGL002752, GUQ)
- *Ribes lacustre - Ribes hudsonianum / Cinna latifolia* Shrubland (CEGL003445, G2)
- *Ribes lacustre - Ribes hudsonianum / Glyceria striata* Shrubland (CEGL003446, G2G3)
- *Ribes lacustre / Mertensia ciliata* Shrubland (CEGL001172, G1G2Q)
- *Salix (boothii, geyeriana) / Carex aquatilis* Shrubland (CEGL001176, G3)
- *Salix bebbiana* / Mesic Graminoids Shrubland (CEGL001174, G3)
- *Salix bebbiana* Shrubland (CEGL001173, G3?)
- *Salix boothii - Salix eastwoodiae / Carex nigricans* Shrubland (CEGL002607, G3)
- *Salix boothii - Salix geyeriana / Carex angustata* Shrubland (CEGL001185, G2)
- *Salix boothii - Salix geyeriana* Shrubland (CEGL001184, GU)
- *Salix boothii - Salix lemmonii* Shrubland (CEGL001186, G3)
- *Salix boothii / Calamagrostis canadensis* Shrubland (CEGL001175, G3G4Q)
- *Salix boothii / Carex nebrascensis* Shrubland (CEGL001177, G4G5)
- *Salix boothii / Carex utriculata* Shrubland (CEGL001178, G4)
- *Salix boothii / Deschampsia caespitosa - Geum rossii* Shrubland (CEGL002904, G4)
- *Salix boothii / Equisetum arvense* Shrubland (CEGL002671, G3)
- *Salix boothii / Maianthemum stellatum* Shrubland (CEGL001187, G3Q)
- *Salix boothii* / Mesic Forbs Shrubland (CEGL001180, G3)
- *Salix boothii* / Mesic Graminoids Shrubland (CEGL001181, G3?)
- *Salix boothii / Poa palustris* Shrubland (CEGL001183, GNA)
- *Salix brachycarpa / Carex aquatilis* Shrubland (CEGL001244, G2G3)
- *Salix brachycarpa* / Mesic Forbs Shrubland (CEGL001135, G4)
- *Salix candida / Carex utriculata* Shrubland (CEGL001188, G2)
- *Salix commutata / Carex scopulorum* Shrubland (CEGL001189, G3)
- *Salix commutata* / Mesic Graminoid Shrubland (CEGL003497, GNR)
- *Salix drummondiana / Calamagrostis canadensis* Shrubland (CEGL002667, G3)
- *Salix drummondiana / Carex scopulorum* var. *prionophylla* Shrubland (CEGL001584, G2G3)
- *Salix drummondiana / Carex utriculata* Shrubland (CEGL002631, G4)
- *Salix drummondiana* / Mesic Forbs Shrubland (CEGL001192, G4)
- *Salix drummondiana* Shrubland [Placeholder] (CEGL001190, G3Q)
- *Salix eriocephala / Ribes aureum - Rosa woodsii* Shrubland (CEGL001233, G3)
- *Salix geyeriana - Salix eriocephala* Shrubland (CEGL001213, GU)
- *Salix geyeriana - Salix lemmonii / Carex aquatilis* var. *dives* Shrubland (CEGL001212, G3)
- *Salix geyeriana - Salix monticola / Calamagrostis canadensis* Shrubland (CEGL001247, G3)
- *Salix geyeriana - Salix monticola* / Mesic Forbs Shrubland (CEGL001223, G3)
- *Salix geyeriana / Calamagrostis canadensis* Shrubland (CEGL001205, G5)
- *Salix geyeriana / Carex aquatilis* Shrubland (CEGL001206, G3)
- *Salix geyeriana / Carex utriculata* Shrubland (CEGL001207, G5)
- *Salix geyeriana / Deschampsia caespitosa* Shrubland (CEGL001208, G4)
- *Salix geyeriana* / Mesic Forbs Shrubland (CEGL002666, G3)
- *Salix geyeriana* / Mesic Graminoids Shrubland (CEGL001210, G3?)
- *Salix geyeriana / Poa palustris* Shrubland (CEGL001211, GNA)
- *Salix glauca / Deschampsia caespitosa* Shrubland (CEGL001137, G4)
- *Salix lemmonii* / Mesic-Tall Forbs Shrubland (CEGL002771, G3?)
- *Salix lemmonii / Rosa woodsii* Shrubland (CEGL002772, G3)
- *Salix ligulifolia / Carex utriculata* Shrubland [Provisional] (CEGL002975, GNR)
- *Salix ligulifolia* Shrubland (CEGL001218, G2G3)
- *Salix lucida* ssp. *caudata / Rosa woodsii* Shrubland (CEGL002621, G3)
- *Salix lucida* ssp. *caudata* Shrubland [Provisional] (CEGL001215, G3Q)
- *Salix lutea / Calamagrostis canadensis* Shrubland (CEGL001219, G3?)
- *Salix lutea / Carex utriculata* Shrubland (CEGL001220, G4)
- *Salix lutea* / Mesic Forbs Shrubland (CEGL002774, G3?)

- *Salix lutea / Rosa woodsii* Shrubland (CEGL002624, G3)
- *Salix monticola / Angelica ampla* Shrubland (CEGL001221, GNR)
- *Salix monticola / Calamagrostis canadensis* Shrubland (CEGL001222, G3)
- *Salix monticola / Carex aquatilis* Shrubland (CEGL002656, G3)
- *Salix monticola / Carex utriculata* Shrubland (CEGL002657, G3)
- *Salix monticola* / Mesic Forbs Shrubland (CEGL002658, G4)
- *Salix monticola* / Mesic Graminoids Shrubland (CEGL002659, G3)
- *Salix monticola* Thicket Shrubland (CEGL001139, G2Q)
- *Salix planifolia / Calamagrostis canadensis* Shrubland (CEGL001225, G4)
- *Salix planifolia / Caltha leptosepala* Shrubland (CEGL002665, G4)
- *Salix planifolia / Carex aquatilis* Shrubland (CEGL001227, G5)
- *Salix planifolia / Carex scopulorum* Shrubland (CEGL001229, G4)
- *Salix planifolia / Deschampsia caespitosa* Shrubland (CEGL001230, G2G3)
- *Salix planifolia* / Mesic Forbs Shrubland (CEGL002893, G4)
- *Salix planifolia* Shrubland (CEGL001224, G4)
- *Salix wolfii / Carex aquatilis* Shrubland (CEGL001234, G4)
- *Salix wolfii / Carex microptera* Shrubland (CEGL001235, G3Q)
- *Salix wolfii / Carex nebrascensis* Shrubland (CEGL001236, G3Q)
- *Salix wolfii / Carex utriculata* Shrubland (CEGL001237, G4)
- *Salix wolfii / Deschampsia caespitosa* Shrubland (CEGL001238, G3)
- *Salix wolfii / Fragaria virginiana* Shrubland (CEGL001239, G4?)
- *Salix wolfii* / Mesic Forbs Shrubland (CEGL001240, G3)
- *Salix wolfii / Poa palustris* Shrubland (CEGL001241, GNA)
- *Salix wolfii / Swertia perennis - Pedicularis groenlandica* Shrubland (CEGL001242, G2)

Alliances:

- *Acer glabrum* Temporarily Flooded Shrubland Alliance (A.952)
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Alnus oblongifolia* Temporarily Flooded Forest Alliance (A.953)
- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Betula nana* Seasonally Flooded Shrubland Alliance (A.995)
- *Betula occidentalis* Seasonally Flooded Shrubland Alliance (A.996)
- *Betula occidentalis* Temporarily Flooded Shrubland Alliance (A.967)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Corylus cornuta* Temporarily Flooded Shrubland Alliance (A.2596)
- *Dasiphora fruticosa* Temporarily Flooded Shrubland Alliance (A.958)
- *Fraxinus anomala* Temporarily Flooded Woodland Alliance (A.2511)
- *Ribes lacustre* Temporarily Flooded Shrubland Alliance (A.970)
- *Salix bebbiana* Temporarily Flooded Shrubland Alliance (A.971)
- *Salix boothii* Seasonally Flooded Shrubland Alliance (A.1001)
- *Salix boothii* Temporarily Flooded Shrubland Alliance (A.972)
- *Salix brachycarpa* Seasonally Flooded Shrubland Alliance (A.998)
- *Salix candida* Seasonally Flooded Shrubland Alliance (A.1002)
- *Salix commutata* Seasonally Flooded Shrubland Alliance (A.1003)
- *Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)
- *Salix drummondiana* Temporarily Flooded Shrubland Alliance (A.973)
- *Salix eriocephala* Temporarily Flooded Shrubland Alliance (A.974)
- *Salix geyeriana* Seasonally Flooded Shrubland Alliance (A.1006)
- *Salix geyeriana* Temporarily Flooded Shrubland Alliance (A.975)
- *Salix glauca* Temporarily Flooded Shrubland Alliance (A.963)
- *Salix lemmonii* Seasonally Flooded Shrubland Alliance (A.2523)
- *Salix ligulifolia* Temporarily Flooded Shrubland Alliance (A.978)
- *Salix lucida* Temporarily Flooded Shrubland Alliance (A.979)

- *Salix lutea* Seasonally Flooded Shrubland Alliance (A.1007)
- *Salix lutea* Temporarily Flooded Shrubland Alliance (A.980)
- *Salix monticola* Temporarily Flooded Shrubland Alliance (A.981)
- *Salix planifolia* Seasonally Flooded Shrubland Alliance (A.1008)
- *Salix planifolia* Temporarily Flooded Shrubland Alliance (A.982)
- *Salix wolfii* Seasonally Flooded Shrubland Alliance (A.1009)
- *Salix wolfii* Temporarily Flooded Shrubland Alliance (A.983)

SOURCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Crowe and Clausnitzer 1997, Kittel 1993, Kittel 1994, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Manning and Padgett 1995, Muldavin et al. 2000a, Nachlinger et al. 2001, Neely et al. 2001, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Rondeau 2001, Szaro 1989, Tuhy et al. 2002, Walford 1996

Version: 20 Feb 2003 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.833 ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN WOODLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Montane [Upper Montane, Montane]; Forest and Woodland (Treed); Riverine / Alluvial; Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Shrubland

Concept Summary: This riparian woodland system is comprised of seasonally flooded forests and woodlands found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain region and the Colorado Plateau. It occurs throughout the interior of British Columbia and the eastern slopes of the Cascade Mountains. This system contains the conifer and aspen woodlands that line montane streams. These are communities tolerant of periodic flooding and high water tables. Snowmelt moisture in this system may create shallow water tables or seeps for a portion of the growing season. Stands typically occur at elevations between 1500 and 3300 m (4920-10,830 feet), farther north elevation ranges between 900 and 2000 m. This is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderate-wide valley bottoms on large floodplains along broad, meandering rivers, and on pond or lake margins. Dominant tree species vary across the latitudinal range, although it usually includes *Abies lasiocarpa* and/or *Picea engelmannii*; other important species include *Pseudotsuga menziesii, Picea pungens, Picea engelmannii X glauca, Populus tremuloides*, and *Juniperus scopulorum*. Other trees possibly present but not usually dominant include *Alnus incana, Abies concolor, Abies grandis, Pinus contorta, Populus angustifolia, Populus balsamifera ssp. trichocarpa*, and *Juniperus osteosperma*.

DISTRIBUTION

Range: This system is found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Alberta and British Columbia, and west into the Intermountain region and the Colorado Plateau.

Divisions: 204:P, 304:C, 306:C

TNC Ecoregions: 4:P, 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 68:C

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CONCEPT

Associations:

- *Abies concolor - Picea pungens - Populus angustifolia / Acer glabrum* Forest (CEGL000255, G2)
- *Abies lasiocarpa - Picea engelmannii / Alnus incana* Forest (CEGL000296, G5)
- *Abies lasiocarpa - Picea engelmannii / Alnus viridis* ssp. *sinuata* Forest (CEGL000297, G4)

- *Abies lasiocarpa - Picea engelmannii / Mertensia ciliata* Forest (CEGL002663, G5)
- *Abies lasiocarpa - Picea engelmannii / Oplopanax horridus* Forest (CEGL000322, G3)
- *Abies lasiocarpa - Picea engelmannii / Salix drummondiana* Forest (CEGL000327, G5)
- *Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius* Forest (CEGL000336, G4)
- *Abies lasiocarpa / Carex aquatilis* Forest (CEGL002636, G4)
- *Abies lasiocarpa / Trautvetteria caroliniensis* Forest (CEGL000339, G3)
- *Picea engelmannii - Populus angustifolia / Heracleum maximum* Forest (CEGL000367, G3G4)
- *Picea engelmannii / Caltha leptosepala* Forest (CEGL000357, G3?)
- *Picea engelmannii / Carex angustata* Forest (CEGL000359, G3)
- *Picea engelmannii / Carex scopulorum* var. *prionophylla* Woodland (CEGL002630, G3)
- *Picea engelmannii / Cornus sericea* Woodland (CEGL002677, G3)
- *Picea engelmannii / Eleocharis quinqueflora* Woodland (CEGL000361, G3)
- *Picea engelmannii / Salix drummondiana* Woodland [Provisional] (CEGL005843, G2G3)
- *Picea engelmannii / Senecio triangularis* Forest (CEGL000376, G3Q)
- *Picea glauca* Alluvial Black Hills Forest (CEGL002057, G2G3)
- *Picea pungens / Alnus incana* Woodland (CEGL000894, G3)
- *Picea pungens / Betula occidentalis* Woodland (CEGL002637, G2)
- *Picea pungens / Cornus sericea* Woodland (CEGL000388, G4)
- *Picea pungens / Dasiphora fruticosa* ssp. *floribunda* Woodland (CEGL000396, G2G3)
- *Picea pungens / Equisetum arvense* Woodland (CEGL000389, G3?)
- *Picea pungens / Rosa woodsii* Woodland (CEGL000398, GNR)
- *Pinus contorta / Calamagrostis canadensis* Forest (CEGL000138, G5)
- *Pinus contorta / Carex (aquatilis, angustata)* Woodland (CEGL000140, G4Q)
- *Pinus contorta / Cornus sericea* Woodland (CEGL005929, G2G3)
- *Pinus contorta / Deschampsia caespitosa* Forest (CEGL000147, G3)
- *Populus balsamifera* ssp. *trichocarpa* - Conifer / *Cornus sericea* Forest (CEGL005905, G2G3)
- *Populus balsamifera* ssp. *trichocarpa - Picea engelmannii / Equisetum arvense* Forest (CEGL005907, G2?)
- *Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis* Forest [Provisional] (CEGL005909, G2?)
- *Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius* Forest (CEGL005908, G2G3)
- *Populus tremuloides* - Conifer / *Heracleum maximum* Forest (CEGL005910, G2?)
- *Populus tremuloides / Alnus incana - Salix* spp. Forest (CEGL001082, G4)
- *Populus tremuloides / Alnus incana / Betula nana - Ribes* spp. Forest (CEGL001149, G1)
- *Populus tremuloides / Alnus incana* Forest (CEGL001150, G3)
- *Populus tremuloides / Betula occidentalis* Forest (CEGL002650, G3)
- *Populus tremuloides / Calamagrostis canadensis* Forest (CEGL000574, G3)
- *Populus tremuloides / Carex aquatilis* var. *aquatilis* Forest (CEGL003442, G1?)
- *Populus tremuloides / Carex obnupta* Forest (CEGL003371, G2)
- *Populus tremuloides / Carex pellita* Forest (CEGL000577, G2)
- *Populus tremuloides / Cornus sericea* Forest (CEGL000582, G4)
- *Populus tremuloides / Corylus cornuta* Forest (CEGL000583, G3)
- *Populus tremuloides / Equisetum arvense* Forest (CEGL000584, G4)
- *Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus* Forest (CEGL000598, GNR)
- *Populus tremuloides / Ranunculus alismifolius* Forest (CEGL000599, G2?)
- *Populus tremuloides / Ribes montigenum* Forest (CEGL000600, G2)
- *Populus tremuloides / Salix drummondiana* Forest (CEGL002902, G3G4)
- *Populus tremuloides / Senecio bigelovii* var. *bigelovii* Forest (CEGL000590, G1?)
- *Populus tremuloides / Veratrum californicum* Forest (CEGL000621, G3?)
- *Populus tremuloides* Canyon Formation Forest (CEGL000576, GUQ)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Abies lasiocarpa - Populus tremuloides* Forest Alliance (A.422)

- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Picea engelmannii* Seasonally Flooded Woodland Alliance (A.572)
- *Picea engelmannii* Temporarily Flooded Forest Alliance (A.179)
- *Picea engelmannii* Temporarily Flooded Woodland Alliance (A.566)
- *Picea glauca* Temporarily Flooded Forest Alliance (A.172)
- *Picea pungens* Temporarily Flooded Woodland Alliance (A.567)
- *Pinus contorta* Seasonally Flooded Forest Alliance (A.188)
- *Pinus contorta* Temporarily Flooded Forest Alliance (A.175)
- *Pinus contorta* Temporarily Flooded Woodland Alliance (A.562)
- *Pinus contorta* Woodland Alliance (A.512)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Seasonally Flooded Forest Alliance (A.340)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)

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Version: 09 Feb 2005 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

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APPENDIX 11 – LICHENS REPORT

Appendix 11 – Lichens Report

Report on Rare Lichens
found in the
Okanogan Ecoregion
of
Washington State, USA and British Columbia, Canada

Katherine Glew, Ph.D. ©

May 10, 2004

Report for The Nature Conservancy

Lichens recommended for list, based on occurrence and rarity:

**Agrestia hispida*
**Massalongia microphylliza*
Ophioparma ventosa
**Peltigera lepidophora*
Physcia callosa
Umbilicaria nylanderiana
**Xanthoparmelia angustiphylla (X. planilobata* incorrect identification)

*from original suggested list

Rationale for Selection

The above lichens were selected based on rarity and frequency in the Okanogan Ecoregion of British Columbia, Canada and Washington State, USA. Some lichens are only found in British Columbia. They are likely to be found in Washington State due to their proximity to the border (currently no records for Washington).

Agrestia hispida - Five sites from British Columbia's Okanogan, no Washington Okanogan sites. This lichen has been found in the Umptanum Mountains near Ellensburg.

Massalongia microphylliza - Four sites from the British Columbia's Okanogan, no Washington records (potential is good for finding it in Washington, since BC sites are close to border).

Ophioparma ventosa - One record from Washington's Okanogan, two sites from Chelan County. There may be more Washington occurrences in future. Some British Columbia (BC) collections of *Haematomma lapponicum* from the University of British Columbia herbarium (UBC), may be *O. ventosa.*

Peltigera lepidophora - More common in British Columbia, Canada, rare in Washington's Okanogan.

Physcia callosa - Rare in both British Columbia's Okanogan and Washington. Only three sites found.

Umbilicaria nylanderiana - Two Washington Okanogan sites, no BC records (likely to occur there).

Xanthoparmelia angustiphylla - One British Columbia Okanogan, none for Washington Okanogan. Known for Washington State: three collections found in San Juan Islands.

Several species were found to be *rare* in the Okanogan Ecoregion of Washington, but not rare in Canada. These were: *Dactylina arctica, Dactylina ramulosa, Hypogymnia austerodes,* ***Peltigera lepidophora****, Physcia dimidiata, and Umbilicaria lambii* (Trevor Goward and Bruce McCune feel that *U. lambii* is much more common in the Cascades Mountains, but under collected, therefore not fully represented by vouchers). *Hypogymnia vittata* and *Nephroma arcticum* have no records for Washington State but have potential for occurring.

From the original list, *Dermatocarpon atrogranulosum* (just found in British Columbia in 2003), *Massalongia microphylliza, Physcia dimidiata, Physcia tribacia, Sclerophora nivea, Umbilicaria hirsuta, Xanthoparmelia planilobata*, have no records in Washington's Okanogan. Many of these were only found once or twice in British Columbia.

Keeping in mind it is difficult to determine the "rarity" of these lichens and a few others not mentioned on the list, some lichen species may appear to be *rare* because of limited collections found in herbaria. If the lichens occur in more remote habitats, with no roads into these areas, rarity appears to increase.

Some suggestions have been provided for potential lichens meriting further observation. They are rare, but found in adjacent counties of Washington. They could potentially be found in the Okanogan Ecoregion as well, but to date, no collections exist to represent their occurrence in the ecoregion.

Few collections have been made by knowledgeable lichenologists in the Okanogan Ecoregion, especially Washington State. In some cases, lichenologists have limited access to the literature. It may be that a collection exist for one or more of the lichens on the list, but the lichenologist is not able to identify the species due to a limited library. Creating this list alerts lichenologists to watch for these species and obtain references of their descriptions.

Another complication to address is the terminology of ecoregion vs. country/state. British Columbia contains part of the Rocky Mountains, which has more lichen species. Washington does not have some of these species. Certain lichen species appear to be "rare" in state, when they may not be for the "ecoregion". An example of this is *Peltigera lepidophora*. The higher latitude of British Columbia also provides habitat for some boreal/arctic lichens that are rare for Washington.

Recommendations

Few lichen surveys have taken place in Washington State's Okanogan County. It is recommended that The Nature Conservancy conduct more inventories by trained lichenologists. Undoubtedly, there will be more lichens to add to the list that are rare within this ecoregion. I have listed many alpine and subalpine species, partially due to my previous work in those environments. Others who conducted studies in these ecosystems also worked at higher elevations. However, lowland surveys must also be conducted to determine rare lichens from these elevations and other types of environments, such as montane, wetlands, arid regions, riparian areas, etc.

Herbaria Consulted

Institutions:

CAN - Canadian Museum of Nature, Ottawa, Ontario. E-mailed Dr. Ernie Brodo, waiting for response. E-mailed Pak Yau Wong, collections manager - waiting for response.

MICH - University of Michigan, Ann Arbor, Michigan. Web site.

MSC - Michigan State University, East Lansing. Consulted web site.

UBC - University of British Columbia. Vancouver - online for collections up to year 2000. Contacted herbarium collections manager, Olivia Lee for collections post 2000

WWB - Western Washington University, Bellingham - visited, contacted lichen collections associate, Dr. Fred Rhoades

WSU - Marion Ownby Herbarium, Washington State University - consulted web site, online.

WTU - University of Washington, Seattle - visited

Personal:

Mildred Arnot - Arlington, WA. Contacted via telephone and letter

Dr. Katherine Glew - Seattle, personal herbarium

Trevor Goward - Clearwater, BC, personal collections and journal articles. Contacted via e-mail.

Gayle McHenry-Teller - Seattle, personal herbarium

Dr. Bruce McCune - Corvallis, OR. Contacted for personal herbarium. No Okanogan collections.

Jim Riley - Randle WA, personal collection. No Okanogan collections

Dr. Roger Rosentreter - Boise, ID, personal collections. Was going to check. No further response.

Dr. Bruce Ryan - personal herbarium housed at WWB, Bellingham. Pacific Northwest collections.

Suggested List Results:

Lichens	Location	Collector	Number	Global Ranking
**Agrestia hispida* (Mereschk.) Hale and Culb.	1. Kamloops area, NW of Tranquille, BC CAN 50°47'N, 120°34'W 2. Thomson River Basin, Dewdrop Range, BC CAN ele. 850m 50°46'N, 120°33'W 3. Mt. Mara, Kamloops area, BC CAN ele. 1006m 50°45'N, 118°52'W 4. Fraser River Basin (Kamloops area), NW of Tranquille, near Dewdrop Ridge, BC CAN ele. 1000m 50°47'N, 120°34'W 5. Summit of Buse Hill, Kamloops area, BC CAN ele. 1150 m ca. 50°40'N 120°19'W 6. Rare in Washington, but no WA Okanogan records found	1. 2. Goward 3. Goward 88-03-19 4. Goward 88-05-28 5. Goward 88-05-30	1. 2. 87-188 3. 88-12 4. 87-118 5. 88-131	G3
**Dermatocarpon atrogranulosum*	**New** to Pacific Northwest in 2003. Found in BC CAN by Breuss. Rare, but no WA Okanogan records found	Breuss		G1
**Massalongia microphylliza* (Nyl. *ex* Hasse) Henssen	1. Okanogan River Basin, Osoyoos Lake area, Indian Reserve, near Wolfcub Creek, BC CAN ele. 400m, 49°11'N,	1. T. Goward 2. 3. 4.	1. 91-210a 2. 3. 4.	G1?

	119°28'W 2. Vaseux Lake area, 1km SE of Mud Lake, BC CAN ca. 49°14'N, 119°32'W 3. Naramata area, ca. 3km N of town, BC CAN 49°36'N, 119°36'W 4. Osoyoos area W side of Similkalmeen River, near US border, BC CAN 49°00'N, 119°40'W 5. Rare in Pacific Northwest, but no WA Okanogan records found.			
Peltigera lepidophora (Vainio) Bitter	1. Tatie Peak, Okanogan Co. on Pacific Crest Trail, Okanogan, USA T37N, R17E, S22 ele. 7,000 ft. 48°41’50" N, 120°42’ 05" W 2. Slate Peak, Okanogan Co. USA ele. 7488 48°44'32"N 120°40'44"W 3. Bald Mountain, E side Okanogan NF, Okanogan Co. USA ele. 7110 T40N, R21E, S20 48°57'24.4"N, 120°15'15.9"W 4. China Flats, near confluence of Fraser River and Alkali Creek, BC CAN ele. 350 m 51°43'N 122°21'W 5. Cariboo Zone, bunchgrass, BC CAN ele. 671m 51°50'N, 122° 32'W 6. same as above ele. 674m 51°48'N, 122°30'W 7. 25 km SSW of Tatla: northern flank of Razorback Mountain, BC CAN, ele. 2400 m 51°42'N, 124°45'W 8. Chilcotin River at	1. K. Glew 94-08-11 2. Imshaug 3. J. Harpel 02-08-11 4. Goward 94-06-13 5. C.E. Beil 1968 6. C.E. Beil 1967 7. Goward 81-07-21 8. C. Beil Aug. 1971	1. 940811-11 2. 18600 3. 30357 4. 94-40, 94-55, 94-87 5. pl. 064 6. pl. 043 7. 81-1477 8. plot200-5, plot204-3	G3

	Farewell Canyon, BC CAN, ele. 700m and 914m ca 51°N, 122°W			
**Physcia dimidiata* (Arnold) Nyl.	1. Thompson River Basin, 12km W Kamloops, BC CAN ele. 300m 50°41'N, 120°27'W. 2. Okanogan Falls area, ca 1.5 km E of town, BC CAN ele. ca 400 m 49°20'N, 119°31'W 3. Kamloops, 4 mi W of city centre, S facing slope, BC CAN ele. 366m ca 50°40'N, 120°19'W 4. Kamloops, 9.75 mi. E of city centre, S facing slope, BC CAN ele. 396m ca 50°40'N 120°19'W 5. Kamloops, 10 mi. W of city centre, N facing slope, BC CAN ele. 366m ca 50°40'N 120°19'W 6. Okanagan Valley: Okanagan Falls Provincial Park, BC CAN ele. 300 m 49°20'N, 119°35'W 7. Rare in Washington, but no WA Okanogan records found	1. Goward 2. Goward 92-06-13 3. 3. Goward 87-01-18 4. Goward 8702-05 5. Goward 87-03-06 6. Goward 90-04-20	1. 87-125 2. 92-194 3. 87-150 4. 87-168 5. 87-179	G3?
**Physcia tribacia* (Ach.) Nyl.	1. Marble Canyon Provincial Park, Crown Lake, BC CAN 50°50'N, 121°42'W 2. Two collections found at WTU, but were determined to be incorrect identifications by K. Glew	1. 2. G. Howard	1.	G3?
**Sclerophora nivea* (Hoffm.) Tibell	Rare in Pacific Northwest, but no WA Okanogan records found			G2

Stereocaulon nivale (Follmann) Fryday	Rare in Washington, but no Okanogan records found			G1
**Umbilicaria hirsuta* (Sw. ex Westr.) Hoffm.	1. Okanogan River Basin, Vaseux Lake, BC CAN ele. ca. 350m 49°17'N, 119°29'W 2. No Washington records found.	1. McDermott det. T.Goward	1. *s.n.*	G4
Umbilicaria lambii Inshaug	1. Pugh Mountain, Snohomish Co. USA, ele 7150. (nearest site WA) 2. **Type Collection:** Sunburst Lake, Mount Assiniboine Provincial Park, BC CAN ele. 2400m 50°55'00" N, 115° 39'00"W 3. Trophy Mtn., S of Wells Gray Provincial Park, BC CAN 51°48'N, 119°52'W ele. 2377m	1. Imshaug 2. I.M. Lamb 51-08-03 3. Goward 84-08-22	1. 18489 2. 6584 3. 84-970	G2
Vulpicida tilesii (Ach.) J.-E. Mattsson and M. J. Lai	Rare in Washington, but no WA Okanogan records found			G4
**Xanthoparmelia angustiphylla* (Gyelnik) Hale misidentification of *X. planilobata* (Gyelnik) Hale (pers. comm. T. Goward, 04-04-30)	1. S slope of Anarchis Mountain, BC CAN, ele. 500m 49°01'N, 119°24'W 2. Rare in Pacific Northwest, but no WA Okanogan records found	1. T. Goward	1. 90-942	G3
*Those suggested by Trevor Goward (via Matt Fairbarns)				

Added Suggestions for Washington:

Lichens	Location	Collector	Number	Global Ranking
Dactylina arctica (Richardson) Nyl.	1. Windy Peak, Okanogan Co. USA ele. 8345' 48°55'43"N 119°58'11"W	1. Imshaug 2. R. Lesher 80-08-05	1. 18648a, 18703 2. WWB-	G3

	2. Okanogan, USA 3. Horseshoe Mountain, Okanogan Co., USA 48°57'49"N 119°54'46"W 4. Silvertip Mountain, Bow Range Kootenay National Park of Canada , BC CAN 2850m 49°10'00"N, 121°13'00"W 5. More common in northern BC	3. G. Douglas 4. Lamb	002255 3. 4522 4. 6439	
Dactylina ramulosa (Hook.) Tuck.	1. Tiffany Mountain, Okanogan Co. USA 48°40'11"N 119°55'51"W 2. Rare in WA, only one record found for Okanogan 3. Much more common in BC	E. Burnnett		G3
Hypogymnia austerodes (Nyl.) Räsänen	1. Trail to Roger Lake, E side Okanogan Co. USA ele. ca. 5880ft. 48°39'01"N 119°58'01"W 2. Rare in WA, only one record found for Okanogan 3. Much more common in BC	1. B. Ryan 93-10-14	1. 30704	G2
Hypogymnia vittata (Ach.) Parrique	No WA Okanogan records, but found north in BC			G2
Nephroma arcticum (L.) Torss.	No WA Okanogan records, but found at Longmire on Mount Rainier[1] and north in BC.	1. Imshaug		G3-4
Ophioparma ventosa (L.) Norman	1. 2.5 miles N of Leavenworth, Chelan Co. , USA ele. ca. 1850' T24N, R17E, S3/4 2. Dirty Face Mountain ca 2 mi. N of Lake Wenatchee, trailhead behind ranger station. Chelan Co., USA ele. 5990'. 3. Big Chief Mountain, 1 mi E of Stevens Pass, US2. Chelan Co. USA ele. 5750' 4. Hoodoo Peak, Okanogan Co. USA 48°15'07"N 120°20'29"W 5. No Canadian collections but some of those for *Haematomma lapponicum* for BC (12) may be misidentifications of *O. ventosa*	1. M. Arnot 94-04-28 2. M. Arnot 95-07-05 3. M. Arnot 95-07-03 4. Douglas and Douglas	1. L35 2. L353 3. L349 4. 4123	G2

Physcia callosa Nyl	1. Okanogan River Basin, Mud Lake, S. Vaseux Lake, BC CAN ele. 300m, 49°14N, 119°32W 2. Near Kettle Falls, Stevens Co. USA 48°3639N 118°0317W 3. Scatter Creek Road, Ferry Co. USA ele. 2540', T36N, R32E 48°32'50.8"N, 118°45'21.9"W 4. No additional Canadian collections	1. T. Goward 2. Eyerdam 61-11-17 3. G. McHenry-Teller 99-07-09	1. 91-365 2. 3267 3. 70999.49	
Umbilicaria nylanderiana (Zahlbr) H. Magn.	1. Dirty Face Mountain, 2 miles N of Lake Wenatchee, Chelan Co. USA 2. Slate Peak, Okanogan Co. USA ele. 7488 48°44'32"N 120°40'44"W	1. M. Arnot 95-07-05 2. K. Glew	1. L362 2. no voucher kept	G4
Umbilicaria scholanderi (Llano) Krog	Rare in Washington, but no WA Okanogan records found.			G1
Usnea sphacelata R. Br.	Rare in Washington, but no WA Okanogan records found. Glacier Peak[1] and Mount Adams[2].	1. Weber 2. J. Riley		G1
Vestergrenopsis isidiata (Degel.) E. Dahl	No Okanogan records, but found on Mount Baker, WA, and Whistler Mt. BC CAN			G2

Missing collectors' names and numbers indicates information not found

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APPENDIX 12 – ADDING OCCURRENCE DATA TO TERRESTRIAL ASSESSMENT UNITS

Appendix 12 – Adding Occurrence Data to Terrestrial Assessment Units

Fine-Filter Data Screening for Modeling Using MARXAN

The automated mapping of conservation site portfolios resulting from ecoregional assessment has been advanced significantly through use of the MARXAN software. This Appendix presents a rationale and guidelines for improving our methods of using fine-filter target occurrence data in this modeling process, with focus on local and intermediate scale targets as defined by Comer (2001).

The target occurrence data layers compiled during the process of ecoregional assessment not only inform the model in producing the resulting ecoregional site portfolio but, if well constructed, can also provide data for additional conservation priorities analyses.

Recent developments in ecoregional-scale modeling have focused on improving the representation of ecoregional-scale coarse-filter targets through the modeling and mapping of terrestrial and freshwater ecological systems, as well as improving conservation suitability/cost indices. Meanwhile, methods for representing fine-filter target habitats for modeling at this scale have received less attention.

To put the importance of fine-filter target occurrence data in perspective, it is important to understand their role in ecoregional assessment. Targets for ecoregional assessment are chosen to represent biodiversity through a coarse-filter/fine-filter approach: coarse-filter targets capturing ecological systems and their functions, and fine-filter targets representing rare or vulnerable populations of species or habitats which may not be adequately represented within coarse filter targets. To execute coarse-filter/fine-filter target capture through a data-driven model, spatial data layers must be created from available data to represent the distributions, locations, and extents of viable occurrences of both types of targets modeled at the appropriate scale.

Also notable is that the bulk of fine-filter occurrence data represent sites field inventoried by conservation biologists. Whereas coarse-filter occurrence data and suitability index data represent predictive models which include no quality assessment, the fine-filter occurrence data are ground-truthed sites which in many cases directly identify quality habitats needed for capture in the portfolio/scenario.

For these reasons, assembling a portfolio of sites which could conserve higher quality habitats for all targets will depend on how well the occurrence data presented to the model reflects the spatial extents and distributions of these occurrences. How efficient the portfolio will be in capturing these areas within a small portfolio footprint will depend upon how well the occurrence data are represented at the spatial scale of the model.

Achieving this goal is complicated by the wide variety of source data used for representing occurrences of fine-filter targets in ecoregional assessment. These source data may vary in how they represent target distribution and abundance, and in their spatial data types and scale accuracy, yet these data must be made comparable and merged to produce a data layer which informs the modeling process.

Results of the modeling process using a portfolio optimization tool such as MARXAN can be no more robust or defensible than the compiled data made available to the model as input data. With this in mind, two types of issues should be addressed when compiling and representing target occurrence data for modeling: *comparability* of occurrences, and *spatial representation* of occurrences at the scale of modeling.

Comparability: Meaningful statements of accounting for target capture through protecting portfolio conservation areas can only be made if we first have meaningful accounting of target presence, populations, abundance, and population viability in the modeled data from which the portfolio of sites was selected. For spatial modeling to succeed, it is essential that these data provide meaningful comparisons between individual populations, meta-populations, and habitats.

Likewise, *spatially representing occurrences* at the scale of modeling (best expressed by the size of analysis units used to model the data) is essential for automated site selection to succeed in capturing the extent of habitats supporting these targets, as expressed in the available data. Appropriate attention to scale and spatial data representation can improve our accuracy in modeling target habitats for prioritization within efficient conservation scenarios.

Step I. Data Screening

Target Occurrences are typically *disqualified* from occurrence data used in assessment based on these criteria:

- Old Observations: Observations greater than 20 years old may typically be disqualified; consider advice of data source, recent impacts to landscape, etc. Occurrences not found during recent surveys (element occurrences rank = f, ‘failed to find’) may be included or removed depending on priority of target and advice of data source.
- Historic or Extirpated: Occurrences known to be extirpated should not be used.
- Low Data Confidence: Consider eliminating unverified sightings, or records from non-credible sources.
- Not Viable: Occurrences with known low quality rankings or low probability of viability based on size/condition/landscape context (e.g., element occurrence rank below ‘c’) should not be used, particularly if data representing known viable populations are available.

From Global Priorities Group, Purpose, Principles, and Standards for Ecoregional Assessments in The Nature Conservancy. Draft - 26 November, 2003:

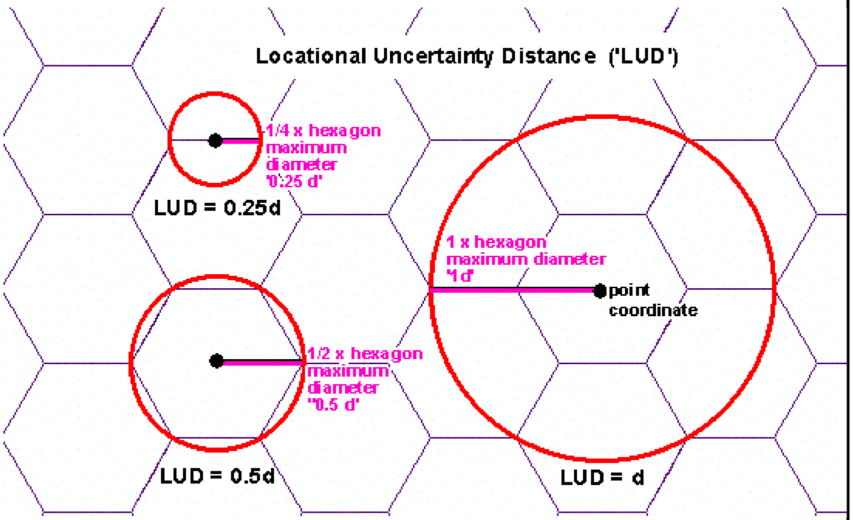
> “Where occurrences ranked for viability are available, those occurrences for which rank is unknown may be considered captured by the portfolio but should not be counted toward satisfaction of target goal.”

- Wide-ranging Animal Species: Wide-ranging animal species - or coarse-scale and regional-scale animal target occurrences as described by Comer (2003) - may require additional data screening steps, such as selecting habitat use areas or sub-EOs (non-contiguous patches within one element occurrence distinguished by distinct behaviors/life history functions, composition, density, quality, or conservation concern) such as nest sites, dens, etc. to be used in assessment.
- Imprecise locations: Mapped occurrences with high locational uncertainty should be disqualified.

Figure A12.1

Locational Uncertainty is the estimated inaccuracy of any mapped location. This can be expressed as 'Locational Uncertainty Distance', in meters. Users can judge how locational uncertainty of occurrence data will affect spatial modeling performed by MARXAN by comparing this measure to the size of the analysis units surface used for modeling. In general, a data point coordinate mapped with a locational uncertainty distance less than the maximum diameter of the analysis unit (LUD<1d) may be suitable for use in modeling, while less accurately-mapped data (LUD>1d) are not. Data points mapped with LUD>0.25d should be used only with appropriate decision rules applied. These are discussed in Step II.

Hexagonal AU Area	Hexagonal AU maximum diameter 'd'
250 ha	1960 m
500 ha	2660 m
750 ha	3260 m



Locational uncertainty of three data points. Thresholds of LUD<0.25 d, and (0.25d<LUD<1d) are referred to in Step II.

Figure A12.2

To scale point or small polygon-based occurrences to the analysis surface used for modeling, estimate the locational uncertainty of the data and compare this to the size of the AU. Point occurrence data acquired from NatureServe Biotics, BCD, CDC or other sources include codes or values which may be translated into locational uncertainty distance in meters. The table below categorizes data by locational uncertainty, and relates these to the modeling treatments described in Step II.

Locational Uncertainty Distance (LUD) of data	Other values used to express LUD			Occurrence modeling categorized by Locational Uncertainty Distance (LUD) of data relative to size of AU.
(m) - *NatureServe* - *TNC EA Data Standard 1.0*	Precision Code - *BCD,* *NatureServe*	Township Range Section - *U.S.*	COORD Code - *WA DFW*	LUD of data relative to diameter (‘*d*’) of 500-ha hexagon AU
100	S	¼ ¼ section	-	LUD < 0.25d
400	-	¼ section	C or U	LUD < 0.25d
1000 - 1300	M	section	N	0.25d < LUD < 0.5d
1300 - 2600	M	multiple sections	N	0.5d < LUD < 1d
> 4000	G	township +	G	LUD > 1d

Step II. Populating MARXAN with fine-filter target occurrence data

Automated modeling of a conservation portfolio is accomplished through MARXAN by subdividing the planning region into analysis units equal or smaller in size than the size desired to represent portfolio sites. The conservation site portfolio is determined by selecting those analysis units to be included or excluded from the portfolio. The scale of modeling is best described by referencing the size of analysis unit surface used.

Practitioners of automated portfolio assembly should consider the scale accuracy and extents of the spatial representations of target occurrences used for modeling in relation to the scale of spatial analysis units to which these occurrences will be assigned to build portfolio scenarios. A simple use of MARXAN will allow all fine filter occurrences to be represented as point locations modeled against large hexagonal analysis units, but this is likely to result in an automated portfolio of sites with a large and poorly-defined portfolio footprint. Modeling with smaller analysis units may produce a smaller-footprint portfolio in which these units agglomerate into sites which better represent the spatial extents of target habitats. In this case, the spatial extent of some individual occurrences may be significantly larger than the analysis unit size, and representation of larger occurrences would utilize multiple units. This provides an opportunity to improve the efficiency and spatial accuracy of the automated portfolio.

An adequate method should result in high probability of capturing sites which circumscribe viable occurrences and habitats, while enabling efficient solutions (reducing the footprint size of the portfolio/scenario). Achieving this balance through modeling commonly available fine-filter data presents some challenges, particularly in cases where occurrences are inaccurately located but are needed for capture in the portfolio/scenario, or where occurrences are represented by multiple point-observation records (rather than element occurrence records, or population-based, records). In refining this method, these rules of thumb were observed:

- Comparability across the spatial extent of the data: Represent occurrences scaled to the analysis unit (hexes/hucs) used for modeling such that any subset of analysis units are likely to provide target presence and abundance results comparable to any other subset of analysis units. Similar methodology used in adjacent sections of ecoregions should yield comparable results.

- Comparability of measures: Seek comparability of occurrence measures (count, abundance, extent, and viability) within each target. Establish one measurement for all occurrences of a target whenever possible. Insure that populations which spatially occupy multiple analysis units are counted and captured as single populations.

Below, five different treatments are described to achieve fine-filter target representation in the populated analysis units used for modeling in MARXAN. Each treatment is designed to optimize the representation a common spatial type of occurrence data. Each of these treatments is designed to populate the SPECIES.DAT and PUVSPR.DAT data files.

1. Area Occurrences
2. Single Point Occurrences
3. NatureServe Multi-polygon Element Occurrences
   or Precisely-Mapped Species Population Polygon Occurrences
4. Multi-point Occurrences
5. Imprecise Occurrences

The first two treatments should be familiar to MARXAN practitioners, while the 3rd, 4th, and 5th treatments represent innovations which were tested using the Okanagan and North Cascades Ecoregional Assessments. These methods should be applicable for modeling using analysis units ranging from 250 – 750 hectares or so. The examples below assume a 500-hectare analysis unit.

Abbreviations:

TGT=Target, TO=Target Occurrence, LUD=Locational Uncertainty Distance, AU=Analysis Unit, S = side length of hex.

Definitions: (following TNC Ecoregional Data Standard 1.0)

Locational Uncertainty: The estimated inaccuracy of any mapped point, expressed in meters. Locational uncertainty distance associated with a point represents a potential area of land/water surrounding that point where the occurrence may exist, and so represents an area which must be captured if the occurrence is to be considered captured.

This area of uncertainty corresponds to the scale at which the point data are accurate. Use of this term in our data standard conceptually follows the NatureServe Element Occurrence standard (specifically, the “point areal estimated uncertainty” definition), but since ecoregional assessment occurrence data are managed only to support coarse-scale modeling, target occurrences *are not* managed to meet the NatureServe standard.

TO Abundance: “Target Occurrence Abundance”: Known or estimated amount of the target represented in an occurrence, as expressed in number of occurrences, number of hectares in size, number of kilometers in length, etc.

Modeling Treatments:

1. Polygon-mapped data representing populations, habitats, or systems which are delineated and measured as areas.

Identify targets whose occurrences must be measured as areas. Examples include system targets for which patches may be aggregated to represent a minimum dynamic area of the system, polygon-mapped data representing habitat areas used by a species and which must be measured by area, or large polygon-mapped community element occurrences which span many AUs.

Occurrences GIS Layer:

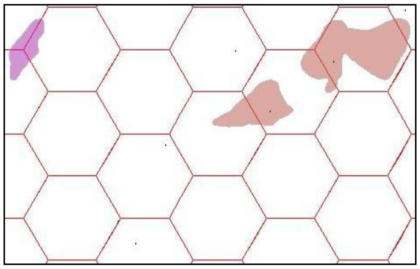
- Use polygon element occurrences or habitat areas mapped with high precision (LUD < 0.25d)

MARXAN PUVSPR.DAT[16]:

- Intersect TO polygons with AUs. For each Target, the sum of TO Abundance in AU (in area) = ‘Amount’.

MARXAN SPECIES.DAT:

- Set TGT Minimum Area in hectares (MARXAN SPECIES.DAT Target2 = ’#’) to insure that adjacent AUs are selected until the entire occurrence area is captured.



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[16] See end of Appendix 13 for how MARXAN applies the fine filter targets to the SPEC.dat and PUVSPR.dat.

2. Single Point Occurrences: (Single-point observation, polygon, or EO, with locational uncertainty distance and extent both < 0.5d):

Fine-filter target occurrences which are represented in source data as single point locations with low locational uncertainty can be modeled in MARXAN by simply intersecting the point layer with the AU layer. Source data of this type may include point data originating from NatureServe member program data in the old BCD format for Element Occurrence Records (representing populations or sub-populations), or from other sources of single point observations deemed representative of extant populations.

In some cases, polygon or multi-point representations of populations may be reduced to the single-point occurrence type for modeling, but this treatment sacrifices the ability to represent the full spatial extents of target habitats at the scale of the model. Appropriate treatments for those data types are discussed below.

Occurrences GIS Layer:

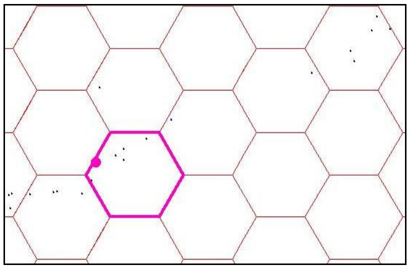
- One point per occurrence record
- For each target, separation distance (as standardized by current NatureServe element specification) between observations is examined, and point observations within separation distance should be represented as multi-point observations (see #4).

MARXAN PUVSPR.DAT:

- Intersect TO points with AUs. For each Target, ‘Amount’ = the sum of TO Abundance within AU (in number of occurrences).

MARXAN SPECIES.DAT:

- TGT Minimum Area not needed (MARXAN SPECIES.DAT Target2 = ’0’)



3a. Polygons representing populations and which incorporate locational uncertainty (e.g. NatureServe Biotics Multi-polygon Element Occurrences):

3a) Biotics EO spatial reps are polygons which include a measure of locational uncertainty incorporated in the polygons. To model these data at ecoregional scale, we must filter out those polygons which represent a level of uncertainty too coarse to inform our spatial model. This can be largely accomplished by identifying circular polygons larger than a given size - which represent point source data represented with added locational uncertainty – and removing these data from our target occurrence spatial layer which will be intersected with AUs to populate PUVSPR.DAT.

Occurrences GIS Layer:

- Set a field in your occurrences table which represents each unique occurrence (EOCODE or EOID will work, or create a field from ELCODE+EO Number). Keep this attached to your data until ready to create the final PUVSPR.
- Identify and remove circular polygons > 1d in diameter (These represent point-sources with LUD>0.5d) (see Fig. 1). Remove only these polygons and not other polygons comprising those EOs. Do not remove polygons if they are not circular. These may be set aside in a separate data set and
- Each multi-polygon EO represents '1 occurrence', regardless of the numbers or sizes of polygons. The spatial rep includes a measure of uncertainty
- Intersect polygons with AUs. Calculate 'Proportional Amount' = proportion of area of the occurrence captured within an AU. (i.e., ½ area of polygons for one EO captured in an AU yields an Amount=0.5 occurrences for that Target.
- Note that some AUs containing a Proportional Amount are sliver polygons resulting from the GIS intersection of EO rep polygons (incorporating LUD) and AUs. These 'sliver amount' AUs have a low probability of target presence. Filter these from your data so that these AUs are not selected in your solution. To do this, delete the intersected AUxOccurrence records which contain the smallest Proportional Amount while preserving > 75% of the area of each occurrence. This will provide the PUVSPR with only the 'core areas' of these occurrences represented in AUs, and not force the model to select AUs which have low probability of target presence based on locational uncertainty of the source data.
- Since removing these 'sliver amounts' has reduced Proportional Amount to less than 1 for some occurrences, normalize all Proportional Amounts so that they sum to 1 for each occurrence. Use this new value for 'AMOUNT' in PUVSPR.
- This will now allow AUs representing the core 75% of 'mapped+uncertainty' areas to be captured by the model to satisfy goals, while representing the count of occurrences in PUVSPR data to remain equal to that represented in the original polygon data.

MARXAN SPECIES.DAT:

- Since not all occurrences occupy contiguous AUs (non-contiguous clumps of AUs will represent occurrences), we cannot use Target Minimum Area to force contiguous AUs to be captured intact. SPECIES.DAT Target2 must be left at 0.

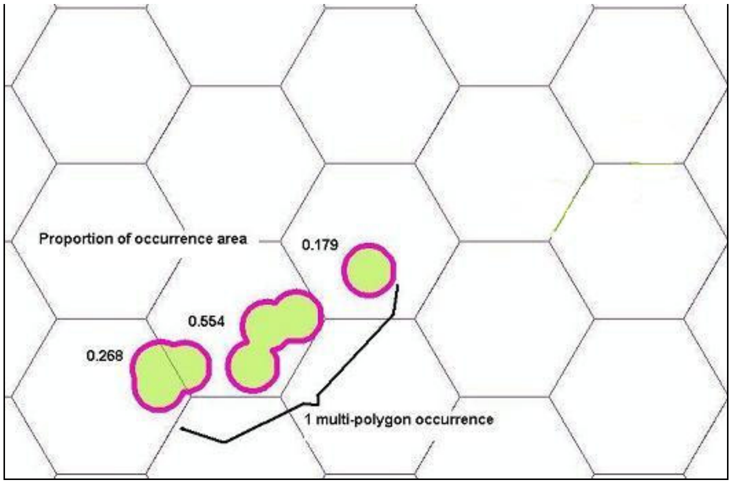
Alternate method: For occurrences occupying contiguous AUs (contiguous clumps of AUs represent each occurrence), then:

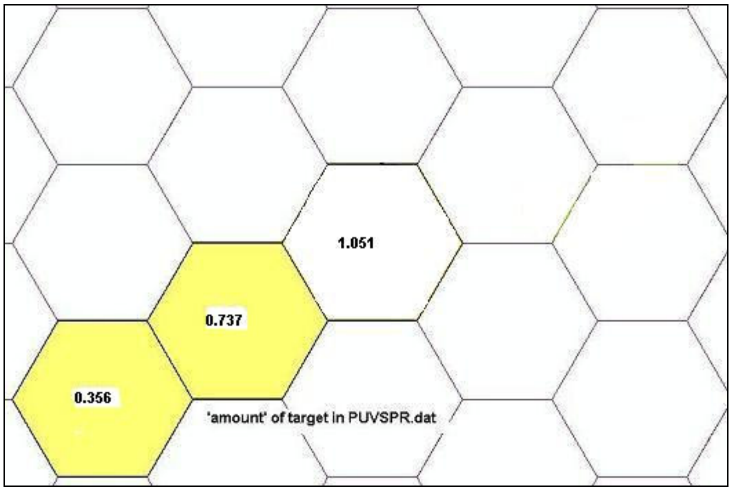
MARXAN PUVSPR.DAT:

- Multiply These Proportional Amounts X 1.33 and use this value for 'AMOUNT'. This will allow AUs representing the core 75% of 'mapped+uncertainty' areas to be captured by the model to satisfy a '1 occurrence' goal. By using Target2 in Spec.dat, the model will not be required to capture all of those slivers when capturing occurrence.

MARXAN SPECIES.DAT:

- Set the Target Minimum Area to '1 occurrence' (MARXAN SPECIES.DAT Target2 = 1) to force contiguous AUs representing one occurrence to be captured intact. Once MARXAN has captured AUs totaling 1 occurrence for the target. For targets in which single occurrences are represented by non-contiguous AUs, Target2 must be left at 0.





3b. Polygons representing populations which are precisely-mapped:

Polygons mapped with high precision and measured in 'occurrences' (instead of 'hectares') can be treated similarly to (a), minus the first step in which large LUC circular polygons were deleted. The key is to insure than intersected polygons are cumulatively counted as '1 occurrence', and the model is encouraged to clump these units to meet the minimum area requirement of 1.

Occurrences GIS Layer:

- Set TO Abundance of each multi-polygon EO = '1 occurrence'.

MARXAN PUVSPR.DAT:

- Intersect polygons with AUs. ‘Amount’ = proportion of area of the occurrence captured within an AU. (i.e., ½ area of polygons for one EO captured in an AU yields an Amount=0.5 occurrences for that Target.

MARXAN SPECIES.DAT:

- For any Target in which all occurrences are represented in PUVSPR as contiguous clumps of AUs, the modeling may be improved by setting the Target Minimum Area to ‘1 occurrence’ to force contiguous AUs representing one occurrence to be captured intact. Additionally, this value may be reduced to a value such as, for example, 0.90 occurrence (MARXAN SPECIES.DAT Target2 = ’0.90’) to allow the model to ignore slivers of area polygons comprising <10% of the occurrence, so that the model does not over-represent the extent of these occurrences by selecting AUs containing little Target amount. For targets in which single occurrences are represented by non-contiguous AUs, Target2 must be left at 0.

4. Multi-Point Occurrences (Multiple point-observations mapped within element separation distance):

Use this method to represent occurrences at scale when the occurrence is represented by a group of observation points (or EO source features) which represent the known location and extent of a population or subpopulation which has a spatial extent significantly greater than one AU. Occurrences are distinguished from one another based on the species-specific separation distance (as defined by NatureServe) and on the presence of movement barriers or intervening large gaps in suitable habitat, where this information is known.

Occurrences GIS Layer:

- Screen data for age, quality, viability.
- Use only low LUD data points, screen out LUD > 0.5d.
- Apply element separation distance between occurrences.
- Select points with locational uncertainty distance < 1 km, identify each point record belonging to one occurrence with the same occurrence number.

MARXAN PUVSPR.DAT:

- Each multi-polygon EO represents ‘1 occurrence’, regardless of the numbers or sizes of polygons. The spatial rep includes a measure of uncertainty
- Intersect polygons with AUs. Calculate ‘Proportional Amount’ = proportion of area of the occurrence captured within an AU. (i.e., ½ area of polygons for one EO captured in an AU yields an Amount=0.5 occurrences for that Target.
- Note that some AUs containing a Proportional Amount are sliver polygons resulting from the GIS intersection of population-based polygons (incorporating negligible locational uncertainty) and AUs. These ‘sliver amount’ AUs have a low probability of target presence. Filter these from your data so that these AUs are not selected in your solution. To do this, delete the intersected AUxOccurrence records which contain the smallest Proportional Amount while preserving > 85% of the area of each occurrence. This will provide the PUVSPR with only the ‘core areas’ of these

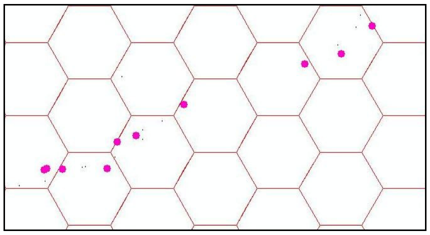
occurrences represented in AUs, and not force the model to select AUs which have low probability of target presence based on locational uncertainty of the source data.

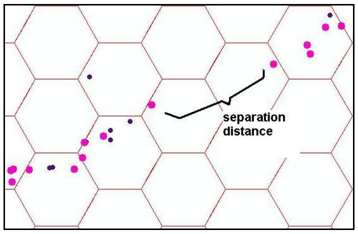
- Since removing these ‘sliver amounts’ has reduced Proportional Amount to less than 1 for some occurrences, normalize all Proportional Amounts so that they sum to 1 for each occurrence. Use this new value for ‘AMOUNT’ in PUVSPR.

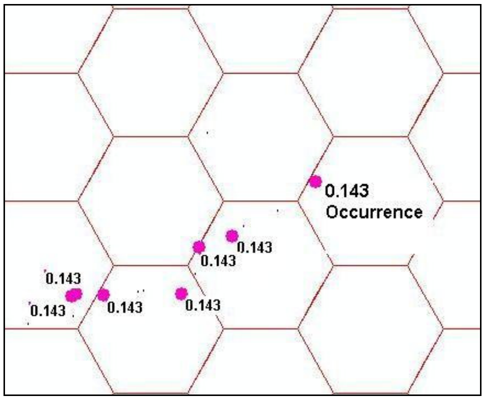
- This will now allow AUs representing the core 85% of ‘mapped population’ areas to be captured by the model to satisfy goals, while representing the count of occurrences in PUVSPR data to remain equal to that represented in the original polygon data.

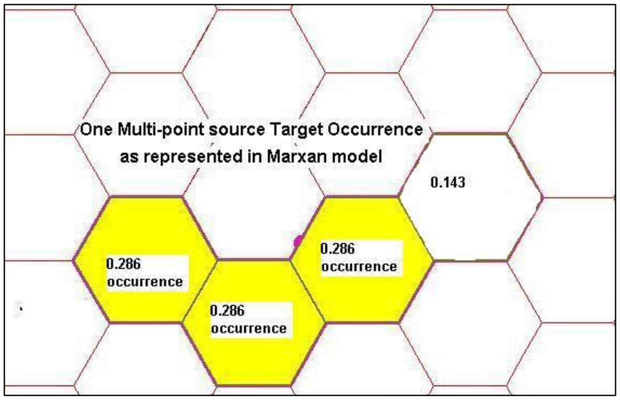
MARXAN SPECIES.DAT:

- For any Target in which all occurrences are represented in PUVSPR as contiguous clumps of AUs, the modeling may be improved by setting the Target Minimum Area to ‘1 occurrence’ to force contiguous AUs representing one occurrence to be captured intact (MARXAN SPECIES.DAT Target2 = ’1’). For targets in which single occurrences are represented by non-contiguous AUs, Target2 must be left at 0.









5. Spatially Imprecise Point Occurrences - Single-point observation or EO, separation >= element separation distance, with location uncertainty distance (0.25d< LUD<1d) (e.g., NatureServe M precision EOs):

Some rare species have few or poorly-mapped data available. Yet, sometimes poorly-mapped data must be used to represent capture of a target to achieve a desired goal. In general, a data point coordinate mapped with a locational uncertainty distance less than the maximum diameter of the analysis unit (LUD<1d) may be suitable for use in SITES/MARXAN modeling, while less accurately-mapped data (LUD>1d) are not.

A simple intersection of data points mapped with (0.25d< LUD<1d) with AU polygons will result in a high probability of populating AUs with targets incorrectly in the PUVSPR.DAT.

To use data points mapped with (0.25d< LUD<1d), consider the footprint area of AUs which would be need to be captured for high probability of capturing the occurrence, and the likelihood of the occurrence being present in each of those AUs. Using these data in this model will require that portfolio sites intended to capture these occurrences may have a larger footprint which incorporates this locational uncertainty.

Occurrences GIS Layer:

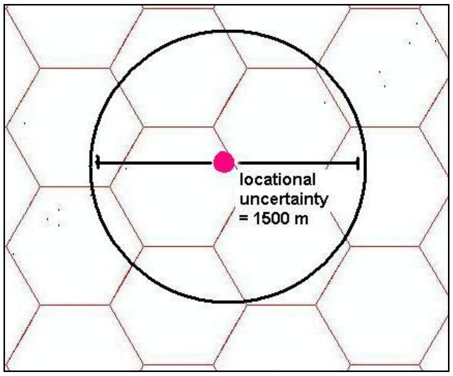
- Data with higher locational uncertainty (0.25d to 1d, or 665 to 2660-m with 500-ha AU) should be used only where more precisely located occurrences are too few in number to meet the goal for the target.
- Occurrences with LUD>1d may be unsuitable for modeling.
- Use only those imprecise points which pass rigorous data screening.
- Separation distance between occurrences should consider LUD.

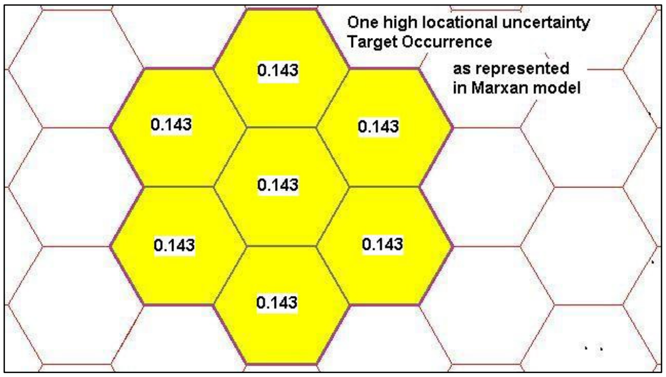
MARXAN PUVSPR.DAT:

- Intersect TO points with AUs. For each AU populated by one of these occurrences, populate the target's "Amount=0.143 occurrences" to represent the *probability* of the occurrence being present within that AU, then
- in the six AUs surrounding that AU, populate the target as "Amount'=0.143 occurrences" to represent the *probability* that the occurrence may be present in any of those 7 AUs.

MARXAN SPECIES.DAT:

- TGT Minimum Area = 1 occurrence (MARXAN SPECIES.DAT Target2 = '1') to insure that if the occurrence is captured, all AUs which have a probability of containing the occurrence are captured until it becomes likely that 1 occurrence has been captured.
- This spatial footprint of 7 AUs provides high likelihood that the automated portfolio will capture these rare and poorly mapped occurrences.





SPEC.dat and PUVSPR.dat in MARXAN

To design an optimal conservation portfolio/scenario through an automated and data-driven method, MARXAN examines each individual analysis unit for the abundance of targets represented within that geographic space. The model then selects and aggregates these units to meet the goals and minimum area requirements assigned to each target.

An understanding of how data are represented in the MARXAN model is necessary to understand the fine-filter modeling scenarios presented below. Target, and target occurrence data are represented in two files: SPECIES.DATA and PUVSPR.DAT.

The SPECIES.DAT file contains one record for every conservation target in each stratification unit. Each record identifies the stratified target, its goal, minimum clump size, and penalty factor. The goal represents the total abundance of the target desired for capture across a stratification unit, and is expressed as number of occurrences, hectares (area of system or habitat), or points (representing weighted occurrences or hectares) that should be captured by MARXAN analysis units selected in the automated portfolio. Minimum clump size (“Target2” field in SPECIES.DAT), refers to the minimum abundance of a target which must be captured by adjacent selected analysis units in order for those captured occurrences to count toward satisfaction of the target’s goal for capture. Setting a minimum clump size for a target increases the likelihood that the portfolio will represent conservation areas which capture entire occurrences, and reduces fragmentation over the automated portfolio.

The PUVSPR.DAT file in MARXAN reports the abundance of any target represented in each analysis unit. To achieve this representation, GIS is used to intersect the spatial layer representing target occurrences must be intersected with the spatial layer of analysis units. This recompiles the occurrences at the scale of the analysis unit, and may cause occurrences of targets to be aggregated into analysis units or split between units, depending on their spatial arrangement and representation.

APPENDIX 13 – SUITABILITY INDICES

Appendix 13 – Suitability Indices

Chapter 4.0 describes the theory, assumptions and methods behind application of a suitability index (SI) for use in MARXAN. This appendix details the weights applied to each SI factor and how the input layers were developed for factors.

Terrestrial Suitability Index

The terrestrial suitability is expressed quantitatively as:

*Terrestrial Suitability = A * management_status + B * land_use + C * road_density + D * future_urban_potential + E * fire_condition*

A, B, C, D and E are weighting factors, calculated from expert input and pairwise comparison, which collectively sum to 100%. The individual suitability index factors are shown in Map 11. Map 12 shows the combined terrestrial suitability index factors.

Weights, summing to 100% of the category, were also applied to sub-factors within management status, land use and fire condition class. For example:

*Land_use = q * % urban + r * % agriculture + s * % mine*

Values for each factor (or sub-factor) are based on the percent area of that factor in the assessment unit. Values for each factor are normalized to between 0 and 1 according to the following equation:

*Normalized score = (score for that AU / highest score for all AU)*100*

The same equation is used to normalize the final suitability score for each AU.

Inputs on the suitability indices and weights were obtained through expert input from the following people:

- Braumandl, Tom. Consultant. Nelson, BC
- Crawford, Rex. Vegetation Ecologist–Eastern Washington Washington Natural Heritage Program, Washington Department of Natural Resources, Olympia WA
- Fairbarns, Matt. Conservation Botanist, Aruncus Consulting, Victoria BC
- Fleenor, Richard. Vegetation Ecologist, Colville Confederated Tribes. Nespelem, WA.
- Ford, Shane. A/Director, BC Ministry of Environment, Conservation Data Centre
- Furness, Grant. Senior Ecosystems Biologist, Ecosystems Section, BC Ministry of Environment. Penticton, BC.
- Heinlen, Jeff. Okanogan Field Biologist, Washington Department of Fish and Wildlife. Omak, WA
- Iachetti, Pierre. Director of Conservation Planning, Nature Conservancy of Canada, BC Region. Victoria, BC

- Iverson, Kristi. Consultant, Iverson & Mackenzie Biological Consulting. Lac la Hache, BC
- Jones, Dave. Wildlife Biologist, Ret., BC Ministry of Environment. Kamloops BC.
- Nicolson, Dave. Conservation Planner/GIS Analyst, Nature Conservancy of Canada–BC Region. Victoria, BC
- Pryce, Barb. Okanagan Program Manager, Nature Conservancy of Canada–BC Region. Penticton, BC
- Sears, Sheri. GIS Specialist, Colville Confederated Tribes. Nespelem, WA.
- Skidmore, Peter. Aquatic Ecologist, The Nature Conservancy - Washington, Seattle, WA.
- Warner, Nancy. North Central Washington Program Manager, The Nature Conservancy–Washington. , Wenatchee WA
- Weir, Richard. Senior Biologist, Artemis Wildlife Consultants. Armstrong, BC.
- Wilhere, George. Conservation Biologist, Washington Department of Fish and Wildlife. Olympia, WA.
- Zender, Steve. District Wildlife Biologist, Washington Department of Fish and Wildlife. Chewelah, WA

Table A13.1. Components of the Terrestrial Suitability Index

Factor/Sub-factor	Weight	Description
Management Status	0.092	mean level of protection given biodiversity; based on all landowners or land managers within assessment unit
Gap1	0.04	
Gap2	0.091	
Gap3	0.238	
Gap4	0.632	
Converted Land Use	0.406	percent of area converted to urban, agricultural, and mine land uses
Agriculture	0.218	
Urban	0.454	
Mining	0.329	
Road Density	0.138	road km/km^2 within assessment unit
Value1	0.138	> 6.55931 km/ km^2
Value2	0.061	6.55930-2.92104 km/ km^2
Value3	0.028	2.92103 -1.41615 km/ km^2
Value4	0.016	1.41614-0.00068 km/ km^2
Value5	0.008	< 0.00068 km/ km^2
Future Urban Potential	0.236	potential for future residential development; based on urban growth modeling
Value1	0.236	Value > 1,030,000,000
Value2	0.114	Value between 300,000,000 and 1,030,000,000

Factor/Sub-factor	Weight	Description
Value3	0.062	Value between 30,000,000 and 300,000,000
Value4	0.033	Value between 1 and 30,000,000
Fire Condition	0.128	the degree of departure from historical fire regimes
Class1	0.067	
Class2	0.223	
Class3	0.709	

The initial factors for the terrestrial suitability index were identified through expert interview and the on-the-ground knowledge of team members. These factors were prioritized and we were only able to use the top priority ones which we had data for. Other factors considered, but ultimately not incorporated in the suitability index, include:

Table A13.2. Factors Considered but not used in the Terrestrial Suitability Index

Factor	Comments
Dams	Used in freshwater. Could consider reservoirs and/or flooded landscapes in future iterations.
Pests and Disease	Forest health data available from BC MoF Southern Interior Region (1996-2003). Forest health and protection data, forest insect, and disease aerial surveys (1980-2003) available from US Forest Service. Data in differing formats and does not consistently/comprehensively cover the ecoregion.
Invasive / Alien Species	Many local datasets, differing resolution – lack of a comprehensive dataset. Different species have differing impacts on various elements of biodiversity.
Timber Harvest/ Managed Conifer Plantation	Tree farms removed from Ecological Systems layer. Data dated / unavailable.
Grazing	Lack of data.
Pollution	Level of emissions not equivalent to amount of impact to biodiversity. Difficult to correlate the two, so not considered for index.
Climate Change	Time and resources did not permit inclusion of climate change data.

Freshwater Suitability Index

The freshwater suitability is expressed quantitatively as:

$$Freshwater\ Suitability = A * management\_status\_score + B * land\_use\_score + C * road\_density\_score + D * dams\_score$$

A, B, C, and D are weighting factors, calculated from expert input and pairwise comparison, which collectively sum to 100%. Map 13 shows the combined freshwater suitability index factors.

Weights, summing to 100% of the category, were also applied to sub-categories within management status, land use and fire condition class. For example:

$$Land\_use = q * \%\_urban + r * \%\ agriculture + s * \%\ mine$$

Values for each factor (or sub-factor) are based on the percent area of that factor in the assessment unit. Values for each factor are normalized to between 0 and 1 according to the following equation:

*Normalized score = (score for that AU / highest score for all AU)*100*

The same equation is used to normalize the final suitability score for each AU.

Inputs on the suitability indices factors and weights for each freshwater factor were obtained from the following people:

- Bugert, Bob. (Formerly) Eastern Washington Regional Coordinator, Governor's Salmon Recovery Office. Wenatchee, WA.
- Ciruna, Kristy. Director of Conservation Programs, Nature Conservancy of Canada–BC Region. Victoria BC.
- Crawford, Rex. Vegetation Ecologist–Eastern Washington Washington Natural Heritage Program, Washington Department of Natural Resources, Olympia WA
- Furness, Grant. Senior Ecosystems Biologist, Ecosystems Section, BC Ministry of Environment. Penticton, BC.
- Heinlen, Jeff. Okanogan Field Biologist, Washington Department of Fish and Wildlife. Omak, WA
- Iachetti, Pierre. Director of Conservation Planning, Nature Conservancy of Canada, BC Region. Victoria, BC
- Iverson, Kristi. Consultant, Iverson & Mackenzie Biological Consulting. Lac la Hache, BC
- Jones, Dave. Wildlife Biologist, Ret., BC Ministry of Environment. Kamloops BC.
- Nicolson, Dave. Conservation Planner/GIS Analyst, Nature Conservancy of Canada–BC Region. Victoria, BC
- Sears, Sheri. GIS Specialist, Colville Confederated Tribes. Nespelem, WA.
- Skidmore, Peter. Aquatic Ecologist, The Nature Conservancy - Washington, Seattle, WA.
- Warner, Nancy. North Central Washington Program Manager, The Nature Conservancy–Washington. , Wenatchee WA
- Wilhere, George. Conservation Biologist, Washington Department of Fish and Wildlife. Olympia, WA.

Table A13.3. Components of the Freshwater Suitability Index

Factor/Sub-factor	Weight	Description
Management Status	0.142	mean level of protection given biodiversity; based on all landowners or land managers within assessment unit
Gap1	0.044	
Gap2	0.094	
Gap3	0.248	
Gap4	0.614	
Converted Land Use	0.249	percent of area converted to urban, agricultural, and mine land uses
Agriculture	0.106	
Urban	0.618	
Mining	0.276	
Road Density	0.135	road km/km^2 within assessment unit
Value1	0.135	> 2.75280 km/ km^2
Value2	0.061	2.75280 - 1.51994 km/ km^2
Value3	0.030	1.51993 - 0.07348 km/ km^2
Value4	0.016	0.07347 - 0.00009 km/ km^2
Value5	0.008	< 0.00009 km/ km^2
Dams	0.474	Presence of dams in watershed
1 dam	0.044	
2 dams	0.093	
3 dams	0.201	
4 or more dams	0.474	

The initial factors for the terrestrial suitability index were identified through expert interview and the on-the-ground knowledge of team members. These factors were prioritized and we were only able to use the top priority ones which we had data for. Other factors considered, but ultimately not incorporated in the suitability index, include:

Table A13.4. Factors Considered but not used in the Freshwater Suitability Index

Factor	Comments
Water withdrawals	Water extraction is widely recognized as one of the major impacts on both terrestrial and aquatic biodiversity, especially when considering downstream and/or cumulative effects (Convention on Biological Diversity, 2005; Klaphake et al., 2001). Water extraction is of particular concern for a wide variety of users in the Okanagan, including First Nations, agriculture, fisheries, industry, recreational, and residential users (Pacific Fisheries Resource Conservation Council, 2006; BC Outdoor Recreation Council, 2005; Scherer and Pike, 2003; Argent, 1997). However, data did not exist in a comprehensive and usable format throughout the ecoregion.
Hatcheries	Hatcheries were not included in the suitability index because the information on species raised and released was very unreliable. This problem is compounded by the common practice of trucking smolts to other drainages for release. Also, the effects of hatcheries vary with management and the size of the hatchery.
Water Quality	No comparable BC dataset to 303d streams in WA.

Factor	Comments
Invasive / Alien Species	Lack of available data.
Climate change	While climate change can have significant impacts of the freshwater environment, ranging from elimination of glaciers to altering the peak-flow, adequate modeling was not available.
Species extraction	Harvest of aquatic species, both legal for recreational and commercial purposes and illegal, lack data.
Hydrographic changes	Alterations to peak flow have a significant impact on biodiversity, but could not be modeled for inclusion to the index at a suitable scale in the timeframe available for this project.

Suitability Index Inputs

Management Status

Management status is used to influence the selection of an assessment unit as part of the portfolio by steering the model to select areas already explicitly managed for conservation such as a park or wildlife management area. Although the existing network of conservation lands leaves several significant gaps in the representative coverage of biodiversity in the Okanagan ecoregion, they form a basis from which an adequate network of conservation areas can be built.

Allowing the model to preferentially select existing conservation lands is based on two assumptions. First, because these lands are actively managed for conservation values, they are likely to support viable species and ecosystems. Healthy and persistent species and ecosystems improve the likelihood of conservation success. Second, the financial and social costs of conservation are lessened if adequate conservation can be achieved on lands already managed for conservation, freeing other areas for alternate uses, such as development.

To integrate management status in the cost suitability index, we assigned one of four stewardship ranks, also know as Biodiversity Management Status Categories, to lands and waters across the ecoregion. Ranks were based on the scale developed by the National GAP Analysis Program (GAP) designed by the US Department of Interior and the United States Geological Survey (USGS)[17].

In GAP, the land stewardship rank combines attributes of ownership, management, and a measure of intent to maintain biodiversity. The term "stewardship" is used because the legal owner of a piece of land is not necessarily the same as the land manager or management regime. It should be noted that management and ownership of lands and waters are complex and change rapidly – what has been created for this ERA is a small scale overview using the best information available at the time.

Using the above criteria, the four biodiversity management status categories can generally be defined as follows (Crist, 2000 - after Scott et al*.,* 1993; Edwards et al., 1994; Crist et al., 1996):

Status 1: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which

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[17] http://gapanalysis.nbii.gov/portal/server.pt

disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.

> Examples: national parks, wilderness areas, and nature preserves, provincial ecological reserves

Status 2: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.

> Examples: state and provincial parks, wildlife refuges, and national recreation areas

Status 3: An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or localized intense type (e.g., mining). It also confers protection to federally listed endangered and threatened species throughout the area.

> Examples: national forests, wildlife management areas, and Bureau of Land Management lands.

Status 4: There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout.

Land management data was most difficult to obtain. Land ownership and management statuses are fairly fluid creating a difficult, moving target for the planner. Additionally, Canadian land management categories are very different from American, making a uniform dataset across the ecoregion even more difficult to create.

Land management for Washington was based on a managed land data layer created by TNC staff. This layer was based primarily on Washington Department of Natural Resources Public land survey, Ownership, County, and Administration POCA[18] and Major Public Lands (MPL)[19] data sets, updated with lands owned by TNC and other Land Trusts, more specific Federal land management information such as Late Successional Reserves (LSR), Management Area Categories (MAC) 1 and 2 (from ICBEMP[20]), and Colville Federated Tribes wilderness areas and Game Reserves. TNC staff assigned a GAP code for each parcel based on the management and/or manager of the land parcel. For portions of the assessment units in Idaho, spatial data containing GAP codes assigned in 2001 were downloaded from the GAP website[21].

Land management for BC was developed by merging the numerous data layers (listed below) together and following the procedure laid out by Crist (2000) to assign a GAP code for each parcel.

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[18] http://www3.wadnr.gov/dnrapp5/website/cadastre/links/other_dnr_gis_data/POCA.htm

[19] http://www3.wadnr.gov/dnrapp5/website/cadastre/links/other_dnr_gis_data/NonDNR_Major_%20Public_Lands.htm

[20] http://www.icbemp.gov/

[21] http://gapanalysis.nbii.gov/portal/server.pt

Table A13.5. Data Sources for BC GAP

Layer	Source	Date	Scale
Provincial Park	BC Government With IUCN rank assigned	2005	1:20,000-1:250,000
Goal 2 Protected Areas	Okanagan Shuswap LRMP Kamloops LRMP Lillooet LRMP West Kootenay Boundary Land Use Plan	2003 2004 1999	1:20,000 1:20,000 1:20,000 – 1:50,000
Regional Park	Regional District of Okanagan Similkameen	2004	1:20,000
Provincial tenures w/conservation value	BC Government	1999-2003	1:20,000
Trust Land	Nature Conservancy of Canada The Nature Trust The Land Trust	2002-2004	Various scales
Wildlife Management Areas	BC Government		
	- SOWMA	2002	1:20,000
	- Kamloops LRMP	2000	1:20,000
	- SOSCP	1999	1:20,000
	- Lillooet LRMP	2004	1:20,000
	CWS NWA	2005	
Indian Reserve	BC Government	2002	1:20,000
Private land	BC Government		
	- SOSCP	1999	1:20,000
	- forest cover private ownership	1997-2001	1:20,000
	- Southern Interior Reg.	2001	1:20,000
	- Overview	Circa 1990s	1:250,000
Tree Farm Licenses	BC Government	2002	1:20,000

Provincial parks and protected areas were assigned an IUCN code based on a preliminary assessment by provincial government staff. IUCN codes, their meaning and corresponding GAP code are as follows:

Table A13.6. IUCN Code and GAP Code Equivalents

IUCN Code	GAP Code	Description
Ia	1	Strict Nature Reserve: protected area managed mainly for science
Ib	1	Wilderness Area: protected area managed mainly for wilderness protection
II	1	National Park: protected area managed mainly for ecosystem protection and recreation
III	1	Natural Monument: protected area managed mainly for conservation of specific natural features
IV	2	Habitat/Species Management Area; protected area managed mainly for conservation through management intervention
V	2	Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation
VI	3	Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems

IUCN Code	GAP Code	Description
VII	3	This additional Non-IUCN Land base Inventory Category employed by the Canadian Parks Council is to include parks/protected areas where the primary focus of management is on the provision of facility-based outdoor recreation opportunities (campgrounds, picnic sites, golf courses, public swimming beaches, etc.).

Data along the BC/WA border was adjusted to eliminate overlap between data sources, resulting from using data compiled at multiple scales. Resultant datasets were merged.

Potential improvements to the dataset would include incorporating sub-gap weightings and additional datasets, including community watersheds, old growth management areas and wildlife habitat areas as well as more current information in private land ownership.

Converted Land

Some landscapes, converted from native habitat by direct anthropogenic disturbance, have been identified as being less compatible for the conservation of natural biodiversity than others (Noss, 1995; Miller et al., 1998). Converted land represents, along with road density, habitat fragmentation. We mapped three types of converted land:

- Agriculture
- Mining
- Urban

We did not account for future or potential land conversion, only for current habitat conditions. Also, we did not consider restoration potential.

In British Columbia these layers were extracted from the provincial Baseline Thematic Mapping, a 1:250,000 scale dataset interpreted primarily from 1990 to 1997 LANDSAT imagery.[22] Other ancillary data layers used to create the BTM include 1:70,000 aerial photographs, Ministry of Forests Mapgen age class information, Biogeoclimatic data, and structured digital 1:250,000 topography. Minimum mapped area is 15 hectares. A full description of the mapping methods can be found at http://ilmbwww.gov.bc.ca/cis/initiatives/ias/btm/btm2specaug1.pdf

In Washington, the layers were extracted from the USGS Land Use and Land Cover (LULC) layer[23]. LULC data consists of historical land use and land cover classification data, based primarily on the manual interpretation of 1970's and 1980's aerial photography. Secondary sources included land use maps and surveys. There are 21 possible categories of cover type. The data is based on 1:100,000- and 1:250,000-scale USGS topographic quadrangles with minimum polygon area of 4 hectares and a minimum width of 200 meters for manmade features. Non-urban or natural features have a minimum polygon area of 16 hectares with a minimum width of 400 meters.

Datasets were fused together to provide a continuous land use layer across the entire buffered ecoregion. The attributes were cross walked as per the following table:

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[22] http://ilmbwww.gov.bc.ca/cis/initiatives/ias/btm/luspec6.pdf

[23] http://edc.usgs.gov/products/landcover/lulc.html

Table A13.7 Cross walk of Converted Land Classifications

	BC - BTM	WA - LULC
Agriculture	agriculture	confined feeding operations
		cropland and pasture
		orchards, groves, vineyards, nurseries
		other agricultural land
Mining	mining	strip mines, quarries, and gravel pits
		transitional areas
Urban	recreation activities	residential
	residential/ agriculture mixtures	commercial and services
	urban	industrial
		mixed urban or built-up land
		other urban or built-up land
		transportation, communication, utilities

Road Density (Infrastructure)

Roads are known to have significant impacts on biodiversity and habitat. Summarized by Hawbaker and Radeloff (2004), these include:

- Direct habitat removal during construction
- Habitat fragmentation (leading to potential changes in species composition)
- Altered hydrology regime (interruption and redirection of surface and groundwater flows, altered peak flows)
- Introduction of heavy metals, salts and other by-products of vehicle operations and road management activities
- Dispersal corridors for invasive species
- Species mortality through collision
- Alteration in movement or migration patterns
- Access for human use of adjacent areas
- Influence on settlement and land-use patterns

In general, the higher the road density, the greater the habitat fragmentation, and the higher the suitability cost value.

Road density was calculated as the km of road per square km of land in the analysis unit. Area covered by lakes and large rivers were subtracted from the density calculation.

For British Columbia the roads were identified as any road or trail (based on FCODE) in the TRIM/TRIMII basemap.

For Washington there was no one comprehensive source of roads data. Hawbaker and Radeloff (2004) suggest many commonly available digital road data may miss up to 50% of the roads, primarily unimproved or secondary roads. To overcome this limitation we built a road density layer based on roads mapped by DNR, augmented by adding roads not included in the DNR data from other data sets. Road data sources included:

- Colville National Forest (July 2004)
- GDT (circa 2002)
- Okanogan County (July 2004)
- Tiger 2002 (downloaded from NRCS Gateway)
- US Bureau of Land Management (Aug. 2004)
- Washington Department of Natural Resources (June 2004)
- Wenatchee National Forest (July 2004)

Roads were not weighted by surface type or size – for the purposes of this assessment gravel resource roads, paved roads, multi-lane highways and lanes/alleys were all considered to have the same impact, although in reality each have differing impacts on an area's ability to support biodiversity and each should have differing weights. Future iterations could consider excluding alpine areas and glaciated lands. Further research should be conducted to determine if trails should be included as a factor in road density. Other linear man-made factors, such as power lines, pipelines and railways, were not included in the road density calculation.

Future Urban Potential

Residential development and urban growth leads to habitat fragmentation and is a leading cause of species imperilment (Theobald, 2003). Population growth in the Okanagan Similkameen Regional District is anticipated to be 46% between 1996 and 2006 (RDOS, 2003) and Kelowna is said to be the fastest growing city in British Columbia. Although urban areas were included in the converted land factor, future urban growth potential can have significant impacts on biodiversity and therefore was incorporated into the suitability index to move the selection of analysis units in the portfolio away from areas where there is a greater potential of impact due to expanding urban areas.

We assembled GIS data for urban growth areas (UGAs) in Washington, and British Columbia. UGAs delineate the location of current urban areas and future urbanization. For BC the UGA data consisted of urban areas identified by Statistics Canada from the 2001 census. In Washington the UGA data consisted of urban areas delineated by the Washington Dept of Community, Trade, and Economic Development (CTED) (circa 2001) for the Growth Management Act (GMA), and are loosely based on city limits created by the Washington State Department of Transportation[24].

UGAs within 10 km of the ecoregion were included in the base dataset to allow for the influence of any UGAs just outside the ecoregion whose growth might impact the ecoregion. Each UGA was buffered by 10 concentric rings. Ring widths (buffers) were a function of the size of the core UGA area. The area of the first concentric buffer was approximately half the UGA's area. The next nine buffers had the same width as the first. Bigger UGAs had wider buffers because we would expect their negative influence to extend further out from their boundary. Inside the UGA, the cost was maximum (1,000,000,000), outside the ten concentric buffers the cost was zero. The values assigned to each successive concentric buffer decreased linearly by a factor of 10. Where buffers from two or more nearby UGAs overlapped, the costs at that point in space were added to reflect the cumulative impacts of multiple UGAs on a conservation area. Large bodies of water and

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[24] http://www.wsdot.wa.gov/mapsdata/geodatacatalog/Maps/24K/DOT_Cartog/city.htm

areas excluded from development, including parks, were deleted from the final layer prior to intersection with the analysis units.

The size of the rings were based on the following formula:

area = 0.5 * UGA polygon area
where area = length * width
and therefore, width of the first ring was:
width = (0.5 * UGA area) / (perimeter of UGA polygon)
and the width of all the other rings was the same as the first.

Attempts made to model Urban Growth Potential following the methods of Theobald (2003) were abandoned primarily due to complexities associated with translating 1996 and earlier data associated with Statistics Canada Census blocks to the new 2001 census blocks. The analysis could be improved through the inclusion of additional datasets depicting urban areas (e.g. BC TRIM built-up area, TRIM points depicting structures, regional district zoning information). The Statistics Canada urban growth base layer, in particular, had deficiencies as it was based on Stats Canada boundaries rather than actual areas of urban population concentration, and therefore included portions of municipalities or census areas which had minimal population because they were associated with areas of denser population.

Fire Condition Class

Divergence from the historic fire regime, particularly in the dry interior forests, negatively impacts biodiversity through excessive tree in-growth within forest stands, tree encroachment into areas that were historically grasslands, excessive build-up of fuel resulting in higher severity fires, and increased incidence of pests and disease (Blackwell, 2003). Fire regime condition class is a classification of the amount of departure from the natural regime (Hann and Bunnell, 2001).

In British Columbia, fire condition mapping was conducted by Bruce Blackwell and Associates (2003) for most of the ecoregion. Condition class was mapped as irregular polygons, based on historic natural fire regime, forest cover mapping and burn history.

In Washington the current condition class data was from USDA Forest Service coarse-scale (1 km grids) spatial data for wildland fire and fuel management (2001)[25].

Both BC and Washington data used the following 3 classes to map divergence from natural fire regimes. BC and Washington data was merged together and reconciled along the international boundary. Our model considered a higher class as having a greater threat to biodiversity.

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[25] http://www.fs.fed.us/fire/fuelman/

Table A13.8 Condition Class Descriptions (from Hardy et al., 2001;Hann and Bunnell, 2001)

Condition Class	Departure from HRV	Attributes	Example management options
Class 1	Low	• Fire regimes are within or near a historical range • The risk of losing key ecosystem components • Fire frequencies have departed from historical frequencies by no more than one return interval • Vegetation attributes (species composition and structure) are intact and functioning within an historical range • Disturbance agents, native species habitats, and hydrologic functions are within the historical range variability • Smoke production potential is low in volume	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as management ignited prescribed fire or prescribed natural fire
Class 2	Moderate	Fire regimes have been moderately altered from their historical range • The risk of losing key ecosystem components has increased to moderate • Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval This results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns • Disturbance agents, native species habitats, and hydrologic functions are outside the historical range of variability • Smoke production potential has increased moderately in volume and duration	Where appropriate, these areas may need moderate levels of restoration treatments, such as management ignited prescribed fire and hand or mechanical treatments, to be restored to the historical fire regime
Class 3	High	Fire regimes have been significantly altered from their historical range • Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns • Vegetation attributes have been significantly altered from their historical range • Disturbance agents, native species habitats, and hydrologic functions are substantially outside the historical range of variability • Smoke production potential has increased with risks of high volume production of long duration	Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments. These treatments may be necessary before fire is used to restore the historical fire regime

Dams

Dams form a barrier to the natural flow of biodiversity (Kingsford, 2000; McAllister et al., 2001). Reservoirs created by dams alter the natural habitat, creating space for some species and activities while reducing opportunities for others. Dams effectively truncate the ranges of populations that may otherwise interbreed. Downstream populations may still receive breeding individuals from upstream habitats, but individuals above the blockage are, to varying degrees, isolated from the lower basin.

For British Columbia we used latitude and longitude coordinates of dam locations provided by the Dam Safety Group, with some additional dam locations provided by BC Hydro, to create a layer of 146 dams, 44 of which were in the EDUs assessed. For Washington we used a layer of dams compiled by Streamnet[26] containing 2,464 dams, 145 of which were in the EDUs assessed.

The dam value portion of the Suitability Index was based on the number of dams in the assessment unit, with units containing the highest number dams having the greatest impact. Most assessment units with dams had only 1; the maximum number of dams in an assessment unit was 7.

Generally, hydrologic impacts affect the assessment unit containing the dam and downstream assessment units. Impacts tend to diminish with downstream distance from the dam as additional undammed streams contribute their flow. Fish passage impacts tend to affect the assessment unit with the dam and upstream assessment units in the basin. Passage impacts do not diminish with upstream distance from a dam as the blockage reduces the number of fish available to disperse throughout the entire upper basin. Mortality rates are also increased for juveniles coming downstream over a dam, reducing survival from the sub-populations from the blocked portion of the basin. Future iterations should consider adding measures to incorporate upstream and downstream impacts, such as each dam's impact to hydrology and fish passage. Instead of the number of dams, future iterations could consider weighting the dam impact by the size of the dam or reservoir the dam contains.

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[26] http://www.streamnet.org/

APPENDIX 14 – THREATS ASSESSMENT

Appendix 14 – Threats Assessment

Human disturbances have the potential to cause destruction, degradation, or impairment of biodiversity and can be characterized as “threats”. The assessment of threats in ecoregional planning is a critical step in developing effective conservation strategies (Groves, 2003). Identifying and quantifying threats has been a part of site conservation planning at The Nature Conservancy for many years. At the scale of an ecoregion, however, the process for identifying threats has generally been subjective, difficult to standardize across the entire ecoregion, and has taken on a variety of forms, depending on the level of available information. Past efforts have largely relied on expert opinion and the qualitative ranking of a pre-determined suite of threats at each portfolio site within the ecoregion. As was noted in the Suitability Index discussion (Chapter 4), one input to the selection process is a quantitative index related to a place's suitability for conservation. The Suitability Index consisted of GIS datasets that were available to spatially quantify some of the threats to biodiversity in the Okanagan ecoregion. However, several other threats to biodiversity were identified by experts or project team members whereby there was either no comprehensive data to spatially portray the threat or the project team did not have the time or capacity to develop these datasets. As a result, this cursory threats assessment will discuss the threats to biodiversity included in the Suitability Index and expand to other threats that are present or emerging.

From a regional planning perspective, an assessment of threats to individual conservation areas serves two specific purposes: (1) identifying conservation areas that are in most urgent need of attention to abate a current or imminent threat and (2) identifying threats that recur across multiple conservation areas and may best be addressed at a scale greater than the individual conservation area (Groves, 2003). Threats can be said to have both *stresses* and *sources* (Poiani et al., 1998; TNC 2000). It is unlikely that a regional assessment will ascertain all or even the most important sources of some stresses. These would emerge during more detailed planning at the scale of the conservation area (Groves, 2003). For purposes of this general ecoregional threats analysis, the team decided the most meaningful factor to evaluate threats to species, communities, and systems at conservation areas was the source of stress - the cause of destruction, degradation, fragmentation, or impairment of conservation targets at a conservation area. Understanding the threats to targets at specific conservation areas and patterns of threats across multiple areas helps to determine which conservation areas are in urgent need of conservation action, and to inform the development of multi-site strategies. Further work through site conservation planning is needed to update and refine threats to targets within portfolio conservation areas.

Threats to biodiversity in the ecoregion were compiled through assessment team members’ experience and on-the-ground knowledge of the ecoregion, interviews with experts knowledgeable about the area (Appendix 3, Appendix 4), and through literature review. The major threats to biodiversity identified in the Okanagan Ecoregion include:

- Urban growth
- Agricultural practices
- Water management
- Invasive species, pests, and pathogens
- Roads
- Transportation and utility corridors
- Forest practices
- Altered fire regimes

- Climate change
- Point/non-point source pollution
- Recreational development and use

Urban Growth

In the Okanagan Ecoregion many conservation groups active in the area list urban and industrial developments as the main threats to biodiversity. The Grasslands Conservation Council of British Columbia (GCC) states that “urban and industrial development in the Okanagan has led to the disappearance of roughly 13,500 ha of the region’s grasslands, with over half of this loss occurring around towns and cities in the North Okanagan Basin.” The GCC specifies Vernon, Kelowna, and Penticton as areas where there has been significant loss, and that Armstrong has lost over 95% of their historic grasslands (Grasslands Conservation Council of British Columbia, 2004).

Agricultural practices

Conversion of natural terrestrial systems to agricultural crops such as:

- Orchards
- Vineyards
- Hayfields
- Ground crops
- Intensive grazing by domestic animals

Water management

The result of these human modifications of watersheds and stream systems has led to severe impacts on freshwater systems through the ecoregion.

- Water withdrawals
- Water diversions
- Channelization
- Removal of or disturbance to riparian systems
- Dams

Invasive Species, Pests, and Pathogens

Invasive species have the potential to alter the structure, composition, and function of ecological communities and are known to directly eliminate native species from an ecosystem (Christian and Wilson, 1999, Cole and Landres, 1996). Although the long-term ecological impact of many invasive species is unknown, there is great concern with the increased number and distribution of invasive species in this ecoregion. The scientific study of invasion is in its infancy. We know enough, however, to be confident that aggressive action is warranted to slow the flow of new invasive species and to reduce the impacts of established, habitat-altering species. Many impacts are poorly understood, and these include the long-term impacts of some control methods (e.g., chemical, mechanical, or biological methods) that may themselves pose a threat to native systems. Of the many invasive species that may be introduced to a native ecosystem, some act as competitors, predators, pathogens, or disrupters of key ecological processes (nutrient cycling, flood or fire regimes, etc.). Others exhibit no clear negative impacts, or may enhance the habitat for certain native species while harming other native components.

The following are some of the known invasive species within the ecoregion:

- Introduced terrestrial animal species such as starlings, house sparrows, Norway rats, house mice, black rats, European hares, eastern cottontail rabbits, eastern grey squirrels, fox squirrels, chukar, grey partridge, ring necked pheasant, wild turkeys, California quail, pigeon, red fox, cats, dogs, wild horses and feral pigs.

- Introduced freshwater animal species such as bullfrogs, snapping turtles, sunfish, black crappie, white crappie, walleye, pike, red eared slider, bass and mises shrimp.

- Invasive flora species such as dalmation toadflax, knapweeds, sulphur cinquefoil, cheatgrass, purple loosestrife

The mountain pine beetle (MPB) is indigenous to western North America pine forests. Under normal conditions, beetles exist at endemic levels and cause less than 2% mortality in forest stands. Currently, the species is at epidemic levels and is the most damaging biotic disturbance agent in mature lodgepole pine in western Canada (Hélie et al., 2005). The outbreak threatens to kill 80–95 % of the mature lodgepole pine in British Columbia and has the potential to spread to jack pine (*Pinus banksiana*), which would dramatically impact the vast boreal forests of western and central Canada (Eng et al., 2005, Nigh et al., 2006). The current beetle outbreak in British Columbia is unprecedented in scale and is having unavoidable ecological and economic impacts (Thomson and Moshenko, 2005, McGarrity and Hoberg, 2005, Nigh et al.,2006). The abundance of mature lodgepole pine coupled with warmer, drier summers and infrequent cold winters has altered the balance between pest and host in these forest ecosystems (MPB Emergency Response Strategy, 2005). Currently, the infestation covers more than 8.5 million hectares.

Roads

Road building is one of the most damaging threats to intact landscapes, particularly regarding hydrological function and habitat fragmentation. Roads are corridors for dispersal of invasive species, they inhibit some wildlife movement, and can cause elevated mortality of wildlife species (Knight el al. 2000). In particular, species such as grizzly bear are impacted by road networks that extend into what would be otherwise remote wilderness areas. These roads increase the frequency of human/bear contact—an interaction that often results in a bear being killed either accidentally or intentionally (McLellan and Shackleton 1988).

In the Okanagan, road proliferation is largely a consequence of other activities such as forestry operations, residential and recreational development. Public policies on road management will greatly impact several conservation targets including natural communities, freshwater species, and wide-ranging carnivores.

Transportation and Utility Corridors

Transportation and utility corridors have been specifically differentiated from other impacts posed by road density and proliferation, due to the dramatic fragmenting effect large improved highway systems, utility and railway development can have at an ecoregional scale. These activities pose significant threat to wide-ranging species conservation targets. Carnivores are particularly vulnerable to habitat fragmentation from corridor development because they have large spatial requirements to meet their life cycle requisites. Highways adversely affect carnivores by an increase in direct and indirect mortality, displacement and avoidance of habitat near highways, habitat fragmentation, direct habitat loss and habitat loss due to associated human developments. The impacts on carnivores resulting from upgrading highways are often permanent and severe (Ruediger et al. 2000).

Forest practices

Forest practices including timber harvesting, silviculture activities and road building all have the potential to impact biodiversity values, particularly where practices are not regulated. Timber harvest changes upland and riparian vegetative cover and influences snow accumulation and melt rates. Habitat fragmentation and sediment delivery to freshwater systems from these activities could also impact natural values. Native plant communities may be replaced by non-native species following timber harvest. Silviculture and timber harvest practices such as leaving riparian and connectivity corridors and retaining normal patch size distribution patterns can be conducted in ways that support biodiversity enhancement.

Altered fire regimes

For thousands of years, western forests have been under the influence of burning. Frequent, small, low-intensity fires once cleared out brush and small trees, leaving a mosaic of seral stages and openings. In the past 150 years, humans have significantly altered fire regimes, both in terms of setting fires and suppressing them, changing both the severity and frequency across the landscape. Before Euro-American settlement, most fires in the low and mid-elevation forest were non-lethal. Forests and grasslands benefited from the frequent, surface fires, which thinned vegetation and favoured growth of fire-tolerant trees. Lethal or stand-replacing fires played a lesser role in the landscape. Lethal fire regimes now exceed non-lethal fire regimes in forested areas throughout the ecoregion. Rural development, fire suppression and exclusion, slash and burn timber harvest techniques and invasion by non-native fire adapted plants have contributed to these changes. (Quigley and Cole, 1997)

The historic frequency and severity of fires varied considerably throughout the Okanagan ecoregion. Climate variability, anthropogenic influence, patterns of fuel accumulation, and interactions between each of these factors influence fire patterns. Since the 1800's, fire patterns seem to have been more heavily influenced by humans, with increased sources of ignition and management that has altered forest conditions through the prevention of natural forest fires (Duncan 2002). Fire suppression has also played a greater role in forest management since the 1950's. These impacts may have had a larger total effect in areas that naturally burned more frequently.

As a result, several range and forest characteristics have changed dramatically. Native grasslands and shrublands have declined. Invasive weed spread is expected to accelerate. When fires occur outside a range of historical or natural variability—too much, too little or the wrong kind—ecosystems often undergo wholesale changes, including loss of biodiversity at several levels. “Fire-adapted” ecosystems possess a structure, composition and function resilient over time to repeated fire, and include many native fire-dependent species. When fire is excluded, vegetative succession occurs. Seral species are lost. Flammable fuels accumulate, ultimately resulting in large and destructive wildfires. In contrast, “fire-sensitive” ecosystems rarely experience natural fire. In these ecosystems, large, intense wildfires lead to reductions in diversity and conversion of plant communities.

Climate Change

Many scientists are convinced that our climate will change over the next century due to global increases in greenhouse gas emissions. Global climate models, however, are still quite variable with regard to predicted temperature increases and the seasonally of weather patterns. Most models generated for the Pacific Northwest show a rise in temperature of approximately 3.5 °F (2 °C) and an increase in winter precipitation (Mote et al. 1999). Some models predict wetter summers and others predict drier summers. Climates will also continue to be modified by the El Niño-Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO) and the result of interactions between climate change and recurring climatic variations is largely unknown. In general, the greatest changes are expected to occur at lower and higher elevations where ecotones between some natural systems are sharply defined.

The team addressed potential climate change impacts in this assessment by ensuring that the portfolio as a whole spanned the full range of climatic gradients in the ecoregion and that individual conservation areas spanned the greatest possible altitudinal range within contiguous natural areas. This was accomplished by: 1) classifying terrestrial and freshwater ecosystems and mapping their current distributions in a near-comprehensive manner; 2) establishing minimum size thresholds for each system type to account for a wide potential range of variation in natural disturbance regimes; 3) using sections and Ecological Drainage Units to ensure sub-ecoregion-scale climatic variation was well represented among both terrestrial and freshwater systems; and 4) using Ecological Land Units (ELU) to represent local-scale variability within and among ecological systems in contiguous portfolio areas. The ELU and freshwater classification models address factors of elevation, slope/aspect, hydrologic gradient, stream size, landscape position, geologic substrate, and soil moisture regime. This ensured the inclusion of contiguous ecological gradients, and likely habitat “refugia” with climate changes we have yet to measure. Additionally, as evidenced by major vegetation types, most portfolio areas include wide elevational gradients, many from alpine to foothills.

Climate change was not addressed in the direct analysis of threats to conservation targets by conservation area. The team recognized that climate change could significantly impact biodiversity over time at some level in all of the conservation areas. Specific impacts to conservation targets at conservation areas are highly speculative at this point. While it was not possible for this team to address specifics related to biodiversity conservation and global climate change, regional research provide some clues as to expected impacts to some conservation targets.

Point/Non-Point Source Pollution

Non-point source pollution (NPS) occurs when pollution originates from many different sources rather than one specific, identifiable source. NPS occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers or lakes, or introduces them into ground water. Not only can it contaminate water, it can also cause adverse changes to the vegetation and affect the shape and flow of streams and other freshwater systems. Point sources of pollution come from a concentrated originating point that directly discharges wastes into water bodies, such as an industrial factory, sewage treatment plant, or livestock facility. In the Okanagan ecoregion, point sources include a pulp mill, domestic sewage, and mining operations.

Recreational Development and Use

Recreational use, especially off-road vehicles, can degrade or destroy small populations of rare plants, disturb wildlife, modify habitat, spread invasive species, and fragment large-scale ecological systems (Knight and Gutzwiller 1995, Knight et al. 2000). The ecoregion has long been known for its outstanding recreational opportunities. It has been and continues to be used intensively for hunting, fishing, camping, hiking, touring, horseback riding, biking, skiing, and off-road vehicle use. Public policies toward recreational uses will also have a great impact on some conservation targets. A shift toward more commercial recreation permits and tenures in British Columbia will likely cause increases in numbers of recreational users as well as a potential increase in the distribution or location of recreational use.

Summary

Critical threats are ones that likely degrade conservation targets in many places within a conservation area or portfolio site. These threats are assessed by their degree of severity in damaging or destroying conservation targets. Within the ecoregional planning framework threats are usually evaluated by conservation area and not individual target. This is due to the fact that a comprehensive study of what threats are impacting specific species and/or habitats is outside the scope of ecoregional assessment. This activity is better suited for planning within individual conservation priority areas.

APPENDIX 15 – PRIORITIZATION OF ASSESSMENT UNITS

Appendix 15 – Prioritization of Assessment Units

A conservation portfolio could serve as a conservation plan to be implemented over time by nongovernmental organizations, government agencies and private land owners. In reality, however, an entire portfolio cannot be protected immediately and some conservation areas in the portfolio may never be protected (Meir et al. 2004). Limited resources and other social or economic considerations may make protection of the entire portfolio impractical. This inescapable situation can be addressed two ways. First, we should narrow our immediate attention to the most important conservation areas within the portfolio. This can be facilitated by prioritizing conservation areas. Second, we should provide organizations, agencies and land owners with the flexibility to pursue other options when portions of the portfolio are too difficult to protect. Assigning a relative priority to all AUs in the ecoregion will help planners explore options for conservation.

The prioritization of potential conservation areas is an essential element of conservation planning (Margules and Pressey 2000). The importance of prioritization is made evident by the extensive research conducted to develop better prioritization techniques (e.g., Margules and Usher 1981; Anselin et al. 1989; Kershaw et al. 1995; Pressey et al. 1996; Freitag and Van Jaarsveld 1997; Benayas et al. 2003). Consequently, many different techniques are available for addressing the prioritization problem. None are obviously better than the rest. We used the optimal site selection algorithm, MARXAN, to assign a relative priority to every AU in the ecoregion. The relative priorities were expressed as two indices – irreplaceability and utility.

AUs were prioritized for the terrestrial and freshwater realms. A more extensive analysis was done for the terrestrial realm only because: (1) the terrestrial data have a greater influence on the portfolio than the freshwater data; (2) terrestrial environments and species have been more thoroughly studied, and therefore, our assumptions about terrestrial biodiversity are more robust than for freshwater biodiversity; and (3) the terrestrial portfolio has the greatest potential influence on land use planning and policy decisions affecting private lands.

Methods

Irreplaceability

Irreplaceability is an index that indicates the relative conservation value of a place. Irreplaceability has been defined a number of different ways (Pressey et al. 1994; Ferrier et al. 2000; Noss et al. 2002; Leslie et al. 2003; Stewart et al. 2003). However, the original operational definition was given by Pressey at al. (1994). They defined irreplaceability of a site as the percentage of alternative reserve systems in which it occurs. Following this definition, Andelman and Willig (2002) and Leslie et al. (2003) each exploited the stochastic nature of the simulated annealing algorithm to calculate an irreplaceability index.

Simulated annealing is a stochastic heuristic search for the global minimum of an objective function. Since it is stochastic, or random, simulated annealing can arrive at different answers for a single optimization problem. The algorithm may not converge on the optimal solution, i.e., the global minimum, but it will find local minima that are nearly as good as the global minimum (McDonnell et al. 2002). The random search of simulated annealing enables it to find multiple nearly-optimal solutions, and an AU may belong to many different nearly-optimal solutions.

The number of simulated annealing solutions that include a particular AU is a good indication of that AU's irreplaceability. This is the assumption made by Andelman and Willig (2002) and Leslie et al. (2003) for their irreplaceability index. The index of Andelman and Willig (2002) was:

$$I_j = (1/n) \sum_{i=1}^{n} s_i \qquad (1)$$

Where I is relative irreplaceability, n is the number of solutions, and s_i is a binary variable that equals 1 when AU_j is selected but 0 otherwise. I_j have values between 0 and 1, and are obtained from a running the simulated annealing algorithm n times at a single representation level.

Irreplaceability is a function of the desired representation level (Pressey et al. 1994; Warman et al. 2004). Changing the representation level for target species often changes the number of AUs needed for the solution. For instance, low representation levels typically yield a small number of AUs with high irreplaceability and many AUs with zero irreplaceability, but as the representation level increases, some AUs attain higher irreplaceability values. The fact that some AUs go from zero irreplaceability to a positive irreplaceability demonstrates that Willig and Andelman's index is somewhat misleading – at low representation levels, some AUs are shown to have no value for biodiversity conservation when they actually do. We created an index for relative irreplaceability that addresses this shortcoming. Our global irreplaceability index for AU_j was defined as:

$$G_j = (1/m) \sum_{k=1}^{m} I_{jk} \qquad (2)$$

where I_{jk} are relative irreplaceability values as defined in equation (2) and m is the number of representation levels used in the site selection algorithm. G_j have values between 0 and 1. Each I_{jk} is relative irreplaceability at a particular representation level. We ran MARXAN at ten representation levels for coarse and fine filter targets. At the highest representation level nearly all AUs attained a positive irreplaceability.

Many applications of "irreplaceability" have implicitly subsumed some type of conservation efficiency (e.g., Andelman and Willig 2002; Noss et al. 2002; Leslie et al. 2003; Stewart et al. 2003). Efficiency is usually achieved by minimizing the total area needed to satisfy the desired representation level. All AUs were 500 ha hexagons, and therefore, MARXAN minimized area by minimizing the total number of AUs.

Conservation Utility

We extended upon the concept of irreplaceability with *conservation utility*, invented by Rumsey et al. (2004). Conservation utility is defined by equation (2), but the optimization algorithm is run with the AU costs incorporating a suitability index. To generate irreplaceability, AU "cost" equals the AU area. To create a map of conservation utility values, AU "cost" reflects practical aspects of conservation – current land uses, current management practices, habitat condition, etc. (see Appendix 13). In effect, conservation utility is a function of both biodiversity value and the likelihood of successful conservation.

Representation Levels

Each representation level corresponds to a different degree of risk for species extinction. Although we cannot estimate the actual degree of risk, we do know that risk is not a linear function of representation. It is roughly logarithmic.

Coarse Filter

We based the assumption that there is a logarithmic relationship between the risk of species extinction and the amount of habitat on the species-area curve. The species-area curve is arguably the most thoroughly established quantitative relationship in all of ecology (Conner and McCoy 1979; Rosenzweig 1995). The curve is defined by the equation $S=cA^z$, where S is the number of species in a particular area, A is the given area, c and z are constants. The equation says that the number of species (S) found in a particular area increases as the habitat area (A) increases. The parameter z takes on a wide range of values depending on the taxa, region of the earth, and landscape setting of the study. Most values lie between 0.15 and 0.35 (Wilson 1992). An oft cited rule-of-thumb for the z's value is called Darlington's Rule (MacArthur and Wilson 1967; Morrison et al. 1998). The rule states that a doubling of species occurs for every 10 fold increase in area, hence z = log(2) or 0.301. We used this relationship to derive representation levels that roughly correspond to equal increments of biodiversity – i.e., each increase in coarse filter area captured an additional 10% of species.

Coarse filter representation levels specify a minimum area, i.e., hectares, of each habitat type to be captured within a set of conservation areas. Other ecoregional assessments have used representation levels that increased linearly. For instance, Rumsey et al. (2004) set levels at 30, 40, 50, 60, 70 percent of the currently extant area of each habitat type. Each of these representation levels captured the same incremental area of habitat, but from the species-area curve we know that each of these representation levels captures successively smaller increments of total biodiversity. That is, the step from 10 to 20 percent may capture 12 percent of all species but the step from 60 to 70 percent may capture about only 4 percent (assuming z = 0.301). In effect, the first 10 percent of habitat is more important than the last 10 percent.

We used the species-area relationship to create representation levels that correspond to equal increments of risk. The coarse filter representation levels did not increase linearly but rather according to a power function: $S = A^z$. To derive the coarse filter levels, the desired amount of biodiversity was increased linearly (10, 20, 30, . . ., 100 percent) and the corresponding area was calculated for each (Table A15.1).

Table A15.1. Coarse filter representation levels derived from the species area curve with z = 0.301.

Percent species	10	20	30	40	50	60	70	80	90	100
Representation Level (percent extant area)	0.05	0.5	1.8	4.8	10	18	31	48	70	100

Fine Filter

Fine filter representation levels specify the number of species occurrences to be captured within a set of conservation areas. The relationship between species survival and number of isolated populations is also a power function:

$$\text{Species Persistence Probability} = \quad 1 - [\ 1 - pr(P)\ ]^n$$

where pr(P) is the persistence probability of each isolated population and n is the number of populations. This equation says, in effect, that the first population (i.e., occurrence) is more important than the second population and much more important than the tenth population. According to this relationship, if we want representation levels to correspond to equal degrees of risk, then fine filter representation levels should not increase linearly but logarithmically. However, the above equation won't work for our purposes. We don't know pr(P), but even if we did, pr(P) is not equal across all populations.

Luckily, other relationships were available to us. The natural heritage programs use many criteria to determine G and S ranks. These criteria indicate the degree of imperilment, i.e., the risk of extinction. One such criterion relates the number of occurrences to degree of imperilment (Table A15.2) (Master et al. 2003)[27]. This system expresses the idea that the first 5 occurrences make about the same contribution toward species rank as the next 21 to 80 occurrences.

If we assume equal imperilment intervals and equate A, B, C (a nominal scale) with 1, 2, 3 (an ordinal scale), then the relationship in the above table can be modeled as a power function. We used the function to interpolate between 1, 2, and 3 to yield multiple regularly spaced steps for the fine filter levels. We did this to give 10 representation levels; the same number as for the coarse filter.

Table A15.2. Categories for the known occurrence ranking criterion used by NatureServe and natural heritage programs to assign species S ranks and G ranks.

Condition Status	Number of Known Occurrences
A	1 to 5
B	6 to 20
C	21 to 80
D	81 to 300
E	>300

Table A15.3. Representation levels for target occurrences that roughly correspond to populations, subpopulations, or populations segments.

Condition Status	A			B			C			D
Regular steps within condition status	⅓	⅔	1	1⅓	1⅔	2	2⅓	2⅔	3	3⅓ - 4
Representation Level (number of occurrences)	2	3	5	8	13	20	31	49	80	all occurrences

Table A15.3 is to be used for species for which target occurrences (TOs)[28] roughly correspond to populations, subpopulations, or populations segments. Fine filter representation levels are complicated because the TOs currently in our databases do not

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[27] Table2 is a modification of the older system (Master 1994) for species ranking, where G1/S1 equaled 1 to 5 occurrences, G2/S2 equaled 6 to 20 occurrences, and G3/S3 equaled 21 to 100 occurrences.

[28] Target occurrence (TO) roughly corresponds to an element occurrence (EO). However, since many of our TOs did not meet the NatureServe species-specific EO definitions we used different terminology.

have consistent meaning. Some TOs roughly represent a population or population segment (e.g., plant, invertebrates, and amphibians). Other TOs may simply represent a nest, a concentration of nests, or a territory (e.g., raptors, marbled murrelets). TOs of this type must be dealt with somewhat differently. We followed the same approach as above but used a different G/S rank criterion that relates the number of individuals in a population to degree of imperilment (Table A15.4) (Master et al. 2003).

We converted the number of individuals to number of nests simply by dividing by 2. Again, if we assume equal imperilment intervals and equate A, B, C with 1, 2, 3, then the relationship in the above table can be modeled as a power function. We used the function to interpolate between 1, 2, and 3 to yield multiple regularly spaced steps for the fine filter levels and created 10 representation levels (Table A15.5).

Table A15.4. Categories for the number of individual ranking criterion used by natural heritage programs to assign species S ranks and G ranks. We derived the maximum number of nests or from the number of individuals.

Condition Status	Number of Individuals	Maximum Number of Nests or Dens
A	1 to 50	25
B	51 to 250	125
C	251 to 1000	500
D	1001 to 2500	1250
E	2501 to 10000	5000

Table A15.5. Representation levels for target occurrences that correspond to nests, den, or territory.

Condition Status	A				B				C	
Regular steps within condition status	¼	½	¾	1	1¼	1½	1¾	2	2¼	2½ - 3
Representation Level (number of nests)	8	12	18	25	38	55	80	125	170	all occurrences

Species-specific habitat maps were used to represent the spatial distribution of five animal species – grizzly bear, lynx, fisher, bighorn sheep, and mountain goat. Hence, representation levels had to be set for the amount of each species' habitat. Table A15.5 was used to set the number of territories needed at each representation level. The mean exclusive home range size of each species was multiplied by the number of territories to yield the amount of habitat needed. Mean home range sizes were 4144 ha for grizzly bear (USFWS 1993), 2835 ha for lynx (Brittell et al. 1989; Koehler 1990), 2495 ha for fisher (Lewis and Hayes 2004), 2520 ha for bighorn sheep (Verts and Carraway, 1998, pp. 499-501), and 1550 ha for mountain goat (Houston et al 1994, p. 95). Grizzly bear home range size was based on population density estimates which should account for territory overlap. Values for lynx and fisher were female home ranges. Exclusive home range size for female lynx was adjusted using territory overlap estimate given by Koehler and Aubrey 1994; p. 91). Powell and Zielinski (1994; p. 59) state that female fisher territories overlap little.

We emphasize that even though we used natural heritage program criteria for imperilment, the representation levels should not be interpreted to reflect levels of imperilment. The numbers are just a device for creating a map that shows relative priorities of all assessment units in an ecoregion. We used a power function (or logarithmic scale) in recognition of the fact that risk of extinction is nonlinear. We did not have the resources to estimate the actual risk, but we believe that nonlinear representation levels generated a more useful prioritization of places.

Comparing Utility and Irreplaceability

We would like to know how the suitability index influences the relative priority of assessment units. We compared the utility and irreplaceability maps several ways. First, three similarity measures were calculated: mean absolute difference, Bray-Curtis similarity measure, and Spearman rank correlation (Krebs, 1999; pp 379-386). The Bray-Curtis similarity measure normalizes the sum absolute difference to a scale from 0 to 1. Because utility and irreplaceability will be used for prioritizing AUs, rank correlation is a particularly informative because it told us how the relative AU priorities changed. We were especially interested in how the ranks of the most highly ranked AUs would change. To examine this, we also calculated a weighted Spearman rank correlation using Savage scores (Zar 1996, pp. 393-395).

Second, we determined whether the difference between utility and irreplaceability was significantly different. This was done by testing the following hypothesis for mean absolute difference:

H_{01}: the mean absolute difference between utility and irreplaceability maps equals zero.

H_{A1}: the mean absolute difference between utility and irreplaceability maps is greater than zero.

and for the Bray-Curtis similarity measure and Spearman rank correlation, this hypothesis:

H_{02}: similarity between the utility and irreplaceability maps equals one.

H_{A2}: similarity between the utility and irreplaceability maps is less than one

The hypotheses were tested using a randomization test (Sokal and Rohlf 1995, pp. 808-810). Pairs of random maps were generated by lumping together all scores from the original utility and irreplaceability maps, reshuffling the scores, and then assigning half the scores to one random map and the other half to a second random map (i.e., random sampling of utility and irreplaceability scores without replacement). The four measures of similarity were calculated for 1000 random map pairs. The proportion of times that the mean absolute difference between the random map pairs is smaller (or the similarity is larger) than the difference between the utility map and irreplaceability maps equals the probability that utility map and irreplaceability map are significantly different. This was a one-tailed test of significance with $\alpha = 0.05$. Since we were using a randomization test, the hypotheses could be restated as follows:

H_{01}: the mean absolute difference between the utility map and the irreplaceability map is equal to or less than the mean absolute difference between random map pairs;

H_{A1}: the mean absolute difference between the utility and the irreplaceability maps is greater than the mean absolute difference between random map pairs;

H_{02}: similarity between the utility map and the irreplaceability map is equal to or greater than the similarity between random map pairs;

H_{A2}: similarity between the utility map and irreplaceability map is less than the similarity between random map pairs.

If the observed similarity measure is significantly less than (or the distance is significantly greater than) that expected from chance, then the null hypothesis is false, and we can state that the utility and irreplaceability maps are different. For Spearman rank correlation, the alternative hypothesis is equivalent to $r \leq 0$. This test is similar to that done by Warman et al. (2004)

Third, a contingency table analysis was done to compare the utility values and irreplaceability values of paired AUs. The log-likelihood ratio method (Zar 1996; pp. 502-503) was used to test the following hypotheses:

H_{03}: AU selection is independent of cost index

H_{A3}: AU selection is dependent on cost index

Paired AUs were considered to be significantly different for $P <= 0.05$.

Running the Selection Algorithm

MARXAN produces an output that is equivalent to nI_j, i.e., the number of times an AU was selected out of n replicates. We ran 25 replicates at each representation level. Hence, the product m•n equaled 250 for both irreplaceability and conservation utility. The irreplaceability and conservation utility values were normalized such that 250 equaled 100. For the terrestrial and freshwater analyses, BM was set to zero. When BM is set to zero, neighboring AUs have no influence on the selection frequency of an AU.

We set a minimum clump size for grizzly bear, lynx, fisher, bighorn sheep, and mountain goat habitats and some ecological systems. For the large mammals, the minimum clump size equaled the mean exclusive home range size of each species. Hence, an “occurrence” for each of these species was a cluster of hexagons that encompassed an amount of habitat equal to the minimum clump size. The clump sizes for ecological systems were those described in section 2.XX.

MARXAN has three options for clump type (Ball and Possingham 2000; pp. 13-14). We used option 0 – clumps less than the minimum size are not counted toward meeting the representation level. Clumping was done for the first eight representation levels only. At the ninth level, clumping became impractical because of extremely long computer processing times, and at the tenth level, the representation level was 100% of all habitat so clumping was meaningless.

The algorithm’s objective function says, in effect, minimize cost (or unsuitability) subject to T constraints, where T equals the number of targets. All T constraints are the same – the amount captured must be greater than or equal to the target’s desired representation level. The third term in the objective function imposes these constraints, however, they are soft constraints. “Soft” means that the constraints can be violated. Each constraint’s “hardness” is determined by the penalty factors (PFs) set for each target – the larger the PF, the firmer the constraint. Hard constraints can be established by setting an arbitrarily large PF. However, very large PFs can create ill-conditioned objective functions exhibiting sharp peaks or valleys, both of which make optimization more difficult, i.e., requiring many more iterations to find the optimal solution (Gottfried and Weisman 1973). The best set of PFs is problem dependent.

Clearly, setting PF values is tricky. To address this problem, we used an iterative search to set PF values. We began the search with PF equal to 1 for every target. We ran MARXAN (5 replicates, 1 million iterations per replicate) and then checked the results of the best solution. MARXAN reports how much of the representation level was met for each target. If a target's representation level was not met, we incremented its PF. We repeated these steps until the representation level was met for all targets. The iterative search was done at each of the ten representation levels. Hence, a target could have a different PF at each representation level. For the vast majority of targets, this process found the PF value in a reasonable amount of time. However, finding the PF value that yields 100 % of the desired representation level for every target took too much processing time. Hence, we terminated the PF search when only 98 % of a target's representation level was met or when PF equaled 40. On average, about 88 % of targets (both ecoregional and eco-sectional) had PF values equal to 1. Other details about running MARXAN are summarized in Table A15.6.

The spatial representation of TOs was different than that used for generating the portfolio. For the portfolio, each TO was represented as a circle with a radius corresponding to the assumed locational uncertainty of the target. For the irreplaceability analysis, TOs were represented as points.

Freshwater Analysis

The generation of freshwater utility and irreplaceability maps followed the same methods as the terrestrial maps except for the following:

- The analysis was done separately for each of the five ecological drainage units (EDUs) that intersect the ecoregion.
- Assessment units were watersheds not hexagons. Watersheds ranged in size from 44 to 189,208 ha with mean and median sizes being 6470 and 3234 ha, respectively.
- Representation levels were linear not logarithmic. We set representation levels at 10, 20, 30, . . ., 90, and 100 percent of the total amount available for each target in the EDU. The nature of freshwater systems and EDT, which were much different than any terrestrial targets, did not allow us to develop logarithmic relationships.
- There was no minimum clump size for any freshwater systems or salmon habitats.

Table A15.6 Values for MARXAN parameters used for irreplaceability and utility analyses.

Parameter	Function	Terrestrial		Freshwater	
		Irreplaceability	Utility	Irreplaceability	Utility
Algorithm	Type of optimization routine	simulated annealing		simulated annealing	
Replications	Number of times to repeat optimization per representation level	25		25	
Iterations	Number of times to create new combination of AUs	2,000,000		2,000,000	
Boundary modifier	Weighting factor for "cost" of AU perimeter. Encourages clusters of AUs	0		0	
Target penalty factor	"cost" of not meeting a target's represen-tation level	automatically set		automatically set	

Parameter	Function	Terrestrial		Freshwater	
		Irreplaceability	Utility	Irreplaceability	Utility
AU status	Initial selection state of each AU	0 for all hexagons (no “lock-ins”)		0 for all hexagons	
Suitability Index	Indicates likelihood of successful conservation at AU	1 hexagon = 100	Equation A	1 watershed = 100	Equation B

Equation A = A * management_status + B * land_use + C * road_density + D * future_urban_potential + E * fire_condition_class

Equation B = A * management_status + B * land_use + C * road_density + D * dams

Results

Terrestrial Analysis

The utility and irreplaceability maps for the terrestrial only analysis are shown in Maps 14 and 15. The categories on these maps correspond to deciles. That is, the statistical distribution of utility and irreplaceability scores were each divided into 10% quantiles. The decile map depicts the location of the AUs with a selection frequency (or score) in the top 10 or 20 percent of all AUs. Scores at the 90th percentile were 77 for irreplaceability and 73 for utility. The percentage of AUs with a score greater than 90 was 3.8 % and 3.9 % for irreplaceability and utility, respectively (Figure A15.1).

AUs with scores equal to 100 are those selected in every replicate at every representation level – 2.5% had irreplaceability equal to 100, 2.6 % had utility equal to 100, and 2.3 % AUs had both scores equal to 100 (Table A15.7).

At the lowest representation level, the best solutions for irreplaceability and utility consisted of 6.0 % and 6.6 % of AUs, respectively. Scores greater than 90 were attained by 55% percent of AUs in both the irreplaceability best solution and the utility best solution, which demonstrates that some options existed for meeting the lowest representation level. That is, rare targets could only be captured at high scoring AUs, but there were many different AU combinations that could satisfy the minimum dynamic area requirement of ecological systems.

Freshwater Analysis

The utility and irreplaceability maps for the freshwater only analysis are shown in Maps 16 and 17. The utility and irreplaceability scores are displayed two ways: (1) the distribution of values divided into deciles (10% quantiles); and (2) range of values divided into 10 equal intervals. One decile contains 457 AUs. The number of AUs with a score greater than 90 was 119 (2.6%) and 301 (6.6%) for irreplaceability and utility, respectively (Figure A15.1). Forty-three AUs (0.9%) had an irreplaceability score of 100, 55 (1.2 %) had a utility score of 100, and 41 AUs had both scores equal to 100 (Table A15.7).

At the lowest representation level (10 percent of the current amount of coarse and fine filter targets), the best solutions for irreplaceability and utility consisted of 297 and 344 AUs, respectively. Perfect scores were attained by 31 percent of the irreplaceability best solution and 13 percent of the utility best solution, which demonstrates considerable flexibility at the lowest representation level. That is, the solution was not greatly affected by the location of rare targets.

Table A15.7. Percentage of AUs with high selection frequencies for both terrestrial and freshwater analyses.

Realm	Number of AUs	Selection Frequency	Irreplaceability	Utility	Both
Terrestrial	19210	100 %	2.5	2.6	2.3
		≥ 95%	3.1	3.3	2.8
		≥ 90 %	4.0	4.4	3.4
Freshwater	4570	100 %	0.9	1.2	0.9
		≥ 95%	1.2	3.8	1.1
		≥ 90 %	2.6	6.6	1.9

Utility versus Irreplaceability

Terrestrial

By all similarity measures, the utility and irreplaceability maps from the terrestrial analysis were similar to a statistically significant degree (Table A15.8). The values for weighted Spearman rank correlation show that differences between maps at high scores are less than differences at low scores.

As demonstrated in Table A15.8, the overall patterns of utility and irreplaceability scores are very similar. That is, a side-by-side comparison shows that the maps generally agree. If examined AU by AU, we find that about 92 percent are different and that 42 percent have a significant difference between utility and irreplaceability (Table A15.9). However, very few significant changes occur at high utility scores. Of all the AUs with significant differences between utility and irreplaceability, only 0.4 percent had utility scores equal to 100. Seventy-one percent of the significant changes were for AUs with utility scores less than or equal to 50 (Figure A15.2).

482 AUs had an irreplaceability score of 100, 492 had a utility score of 100, and 439 AUs had both scores equal to 100. The overlap between utility and irreplaceability at the highest possible score is evident in Maps 18 and 20. The large overlap indicates that suitability had a small influence on which AUs attained scores equal to 100. In other words, target locations greatly determined which AUs attained a perfect score. Such AUs contained rare targets, targets for which we had very little occurrence data, occurrences of multiple targets, or a large number of occurrences per target.

Freshwater

Utility and irreplaceability maps in the freshwater analysis were less similar than those in the terrestrial analysis. By all similarity measures, the utility and irreplaceability maps from the freshwater analysis were similar to a statistically significant degree (Table A15.8). The values for weighted Spearman rank correlation show that differences between maps at high scores are more than differences at low scores.

About 84 percent of AUs had different scores for irreplaceability and utility and 51 percent had a significant difference between utility and irreplaceability (Table A15.9). However, very few significant changes occur at high utility scores. Of all the AUs with significant differences between utility and irreplaceability, only 0.8 percent had utility scores equal to 100. Forty-two percent of the significant changes were for AUs with utility scores less than or equal to 50.

Table A15.8. Similarity measures for comparison of conservation utility and irreplaceability maps. There was no significant difference between the utility and irreplaceability maps for any of the similarity measures (alpha = 0.05).

	Terrestrial	Freshwater
Mean absolute difference	22.1	29.3
Bray-Curtis measure	0.871	0.851
Spearman rank correlation	0.780	0.816
Weighted Spearman rank correlation	0.853	0.768

Table A15.9. Comparison of conservation utility and irreplaceability maps: percent of AUs that are different between the two maps. Significant differences based on log-likelihood ratio method (alpha = 0.05)

	Terrestrial	Freshwater
Number of AUs	19210	4570
Percent AUs different	92.4	84.1
Percent significantly different	42.3	51.3

Discussion

How should our irreplaceability and conservation utility indices be interpreted? These indices were constructed by running MARXAN at ten representation levels. The first level captured a very small amount of each target and the last level captured everything, i.e., all known occurrences of all targets. Think of the first representation level as the amount of biodiversity to be captured in an initial set of reserves, the second level as an additional amount to be captured by an enlarged set of reserves, the third level as an even greater additional amount, and so on. At each level, MARXAN’s output indicates the relative necessity of each AU for efficiently capturing that particular amount of biodiversity. When the outputs from each level are summed together, the result specifies the most efficient sequence of AU protection that will eventually capture all biodiversity. The sequence in which AUs should be protected is one way to gauge their relative importance. AUs that have the highest irreplaceability or utility scores should be protected first, and therefore, are the most important AUs for biodiversity conservation.

The selection algorithm generates a set of AUs corresponding to a local minimum of the objective function. AUs are included in a solution because they serve to minimize the objective function. Therefore, AUs with high irreplaceability or high utility scores are those that (1) contain one or more rare targets and/or (2) contain a large number of target occurrences. High utility scores are also attained by AUs with low relative cost. AUs with scores of 100 are those that were selected in every replicate at every representation level. To be chosen in every replicate the AU must be unique. That is, the AU contained target occurrences that were found in no other AU, contained a substantially larger number of occurrences than other AUs, or contained targets and had a substantially lower cost than other AUs.

Table A15.10 shows the main targets for the selection of some AUs with high utility and irreplaceability scores. In some cases the AU had the only occurrence in the ecoregion – AUs 116330, 114087, 113724. In several of these examples, the AU had one of only two occurrences in the entire ecosection, and because the minimum representation level equaled two occurrences per ecosection, these AUs had a selection frequency of 100. Several examples have utility scores less than 100. In each case, the optimal selection algorithm had other AUs where targets could be captured, however, these AUs attained high scores because they were more efficient places to capture the targets.

The preceding paragraph helps to explain a shortcoming of the analysis: irreplaceability and utility scores in the Okanagan valley exhibit abrupt changes exactly at the international border. There are two reasons for this, one proximal and one ultimate. First, the proximal reason is data density bias. Government and non-governmental organizations have conducted more plant and wildlife surveys on the Canadian side of the border. Hence, the data density in British Columbia is much higher than in Washington, and consequently, imperiled species appear to be more abundant on the Canadian side. Second, the ultimate reason is the national significance of the Okanagan Valley. In Canada, the Okanagan Valley is widely acknowledged as biodiversity hotspot, and relative to the rest of Canada it is. In the United States, the Okanogan valley is not considered to be nationally significant, and consequently, government and non-governmental organizations have paid far less attention to it. More plant and animal surveys on the Washington side of the valley might reveal species richness and rarity equal to that in British Columbia.

Given the extreme data density bias between Washington and British Columbia, some may question the reliability of utility and irreplaceability scores. No or low survey may be effectively equivalent to false negatives. As a consequence, the utility and irreplaceability scores do not reflect reality, and we may be missing some places important for biodiversity conservation. A low cost method for overcoming the lack of occurrence data is to use species-habitat models to predict species occurrences (Scott et al. 2002). However, there were a number of reasons we did not use predictive models. First, we did not have any reasonably accurate species-specific habitat models. The ones available to us, (e.g., Cassidy et al. 1997), have low spatial precision and untested accuracy. Second, we did not have the resources needed to develop our own models for a large number of vertebrate species. Third, species-specific habitat models have both false negatives and false positives. False positive errors are a major concern. We don't want to select places for conservation where the species of concern don't actually exist. The prevailing opinion in the scientific literature is that false negatives inherent to survey data are likely to be less damaging than the false positives of habitat models. Freitag and Van Jaarsveld (1996) and Araujo and Williams (2000) recommend using only occurrence data because of the potential for false positives in habitat models. Loiselle, B.A (2003) recommends that species-specific habitat models be used cautiously. Given the lack of readily available models of proven accuracy and our incapacity to develop our own models, we believed the most cautious approach was to use occurrence data (with the exception of five large mammals: grizzly bear, lynx, fisher, bighorn sheep and mountain goat).

Table A15.10. Examples of main targets for selection of AUs with high utility scores. In some instances, number of target occurrences rounded to integer.

General Location	AU Number	Utility Score	Irreplace-ability Score	Suitability	Number of Targets	Main Targets for Selection	Amount per Ecosection	Amount per Ecoregion
Ecosection: Northern Cascades Ranges								
Methow River Valley	116330	100	100	27.7	6	*Selasphorus rufus*	1/1	1/1
Methow River Valley	116447	100	100	23.1	6	*Cygnus buccinator* *Gavia immer*	1/1 1/3	1/4 1.23
Methow River Valley	116987	100	100	24.5	8	*Cypripedium parviflorum*	1/2	1/9
Methow River Valley	117048	100	100	17.9	6	*Cypripedium parviflorum*	1/2	1/9
Methow River Valley	116329	93	98	19.4	5	*Carex sychnocephala*	1/3	1/12
Methow River Valley	116686	93	91	13.7	5	*Haliaeetus leucocephalus* Riparian Woodland and Shrubland	1/16 1%	1/104 --
Methow River Valley	116746	92	100	22.9	6	*Carex xerantica*	1/3	1/8
Methow River Valley	117556	87	97	24.0	6	*Myotis volans* *Antrozous pallidus*	1/3 1/7	1/6 1/24
Similkameen River Valley	113696	100	100	15.3	8	*Aster sibiricus var. meritus*	1/1	1/1
Similkameen River Valley	113222	100	100	15.9	15	*Camissonia andina* *Sporobolus airoides* *Lappula occidentalis* *Ipomopsis minutiflora*	1/1 1/2 1/2 1/2	1/2 1/5 1/4 1/7
Similkameen River Valley	113225	90	90	6.0	5	*Sporobolus airoides* *Agastache urticifolia*	1/3 1/5	1/5 1/8
Ecosection: Okanagan Highlands								
Similkameen River Valley	113282	100	100	11.9	16	*Atriplex argentea ssp.* *Sporobolus airoides* *Numenius americanus* *Halimolobos whitedii*	1/1 1/2 1/2 1/3	1/2 1/5 1/5 1/8
Similkameen River Valley	113284	100	100	80	4	*Cryptantha celosioides*	1/1	1/1
Okanogan River Valley	115042	100	100	24.7	3	*Falco mexicanus*	1/5	1/9

General Location	AU Number	Utility Score	Irreplace-ability Score	Suitability	Number of Targets	Main Targets for Selection	Amount per Ecosection	Amount per Ecoregion
Ecosection: Okanagan Highlands								
Okanogan River Valley	115692	100	99	14.7	3	*Cryptantha spiculifera*	2/6	2/6
Okanogan River Valley	116518	100	100	34.9	3	*Margaritifera falcata*	1/2	1/3
Okanogan River Valley	114065	99	98	8.7	6	*Sciurus griseus*	1/4	1/58
Okanogan River Valley	116167	70	79	32.0	3	*Cryptantha spiculifera*	1/6	1/6
Kettle River Valley	114087	100	100	13.6	5	*Oxytropis campestris*	1/1	1/1
Kettle River Valley	113724	100	100	14.7	5	*Callophrys gryneus*	1/1	1/1
Kettle River Valley	112678	100	100	26.0	8	*Macromia magnifica* *Agastache urticifolia*	1/2 1/5	1/7 1/8
Kettle River Valley	113965	97	93	9.1	7	*Sanicula marilandica* *Cypripedium parviflorum* *Sisyrinchium septentrionale*	2/11 1/7 1/21	2/20 1/9 1/21
Kettle River Valley	113966	77	92	21.3	5	*Anodonta californiensis* *Haliaeetus leucocephalus*	1/8 1/88	1/9 1/104
Kettle River Valley	113361	69	68	11.5	5	*Sanicula marilandica*	1/11	1/20
Bonaparte Creek	114477	100	100	15.1	7	*Rubus acaulis* *Trimorpha elata*	1/1 1/2	1/2 1/2
Granite Creek	114821	80	85	15.5	4	*Physcia tribacia*	1/3	1/4
Wannacut Lake	113761	100	100	12.8	5	*Eleocharis rostellata*	1/1	1/3
Curlew lake	114428	85	89	18.8	6	*Carex sychnocephala* *Gavia immer*	1/6 1/20	1/12 1/23
Colville River Valley	116430	95	92	14.8	3	*Impatiens aurella*	1/4	1/4

Utility and irreplaceability scores are different ways to prioritize places for conservation. Irreplaceability has been the most commonly used index (e.g., Andelman and Willig 2002; Noss et al. 2002; Leslie et al. 2003; Stewart et al. 2003), and it assumes that land area is the sole consideration for efficient conservation. Utility incorporates other factors that can effect efficient conservation such as land management status and current condition. In our analysis, many AUs attained scores of 100 for both utility and irreplaceability. These results demonstrate that for scores at or near 100 the cost had little influence on selection frequency; occurrence data drove the results. More importantly, it demonstrated that the results are robust. Under two different assumptions about efficiency (area versus suitability), the highest priority AUs were very similar.

Utility and irreplaceability scores were significantly different for many individual AUs at the middle and low end of the utility score range (Figure A15.2). This is useful information for prioritization. AUs at the low end of utility (or irreplaceability) typically are unremarkable in terms of biodiversity value. They contribute habitat or target occurrences, but they are interchangeable with other AUs. For these AUs, prioritizing on the basis of suitability rather than biodiversity value makes most sense. If an AU can be distinguished from other AUs because conservation there will be cheaper or more successful, then that AU should be a higher priority for action. For these AUs, the utility score should be used for prioritization.

APPENDIX 16 – PORTFOLIO PRIORITIZATION

Appendix 16 – Portfolio Prioritization

Calculating Conservation Value and Vulnerability for Site Prioritization

Terrestrial and freshwater portfolios were prioritized separately using identical methodology. The first step was to define our measures of conservation value and vulnerability. For this analysis, our measures were a function of readily available GIS data compiled through the ecoregional assessment process. We based conservation value on irreplaceability measures, an output from running the MARXAN model; for vulnerability we used the suitability index that was an input to our model.

Conservation Value - For this analysis we define places of highest conservation value as those areas of critical importance due to their biodiversity or landscape values. We based conservation value on two factors:

1. Mean Irreplaceability (C_1) – The MARXAN algorithm output was used to measure the irreplaceability of a conservation area. We ran 10 replicates of MARXAN without the suitability index and with increasing goal levels (Appendix 8). The number of times a hexagon was selected corresponded to its relative importance, or irreplaceability. The irreplaceability value for a conservation area was the mean of all the hexagons intersecting the conservation area. Without the suitability index, MARXAN will preferentially select hexagons that have imperiled species and/or many targets over hexagons with common species and fewer targets.
2. Count of Maximum Irreplaceability (C_2) - Each site is made up of one or more assessment units. A site made up of many planning units might contain areas of high irreplaceability along with areas of moderate irreplaceability, giving the site a moderate average score. This factor represents a count of assessment units in a site that achieved the maximum irreplaceability score (in our case 250), and gives a higher value to sites that may have a moderate average score but include areas of high importance.

These two factors were combined as follows:

$$\text{Conservation value} = Ai\ Bi\ C_1 + Ai\ Bi\ C_2$$

where Ai is a subjective weight that expresses certainty or confidence in GIS data, Bi is a subjective weight that expresses the importance of the factor, C_1 is normalized mean irreplaceability, and C_2 is normalized count of maximum irreplaceability score for each site. When determining the subjective weights, the factor considered the most important was given a weight of 1 for Bi, and the factor with the highest quality GIS data was given a weight of 1 for Ai. See Table A16.1 for the weightings used for conservation value. These factors were put into the prioritization tool to calculate conservation value for each of the 137 terrestrial sites and 135 freshwater sites.

Table A16.1. Conservation value weightings for both Terrestrial and Freshwater prioritization schemes.

Conservation Value	Count Max SS	Mean SS
CERTAINTY	1.00	1.00
IMPORTANCE	0.50	1.00
Weight	0.50	1.00

Vulnerability- We define vulnerability as a measure of threat to the conservation value of a site. We based vulnerability on two factors:

1. mean suitability index score (V_1) – Indicates the relative likelihood of successful conservation at a site and is measured by human impacts such as land use, land management and distance from urban areas. This factor is derived by calculating the mean suitability index score from in the MARXAN model.
2. max suitability score (V_2) – Indicates the score of the least suitable assessment unit for a given site.

Suitability index mean and maximum values at each site were combined into vulnerability ratings as follows:

$$\text{Vulnerability} = \text{Ai Bi } V_1 + \text{Ai Bi } V_2$$

where Ai is a subjective weight that expresses certainty or confidence in GIS data, Bi is a subjective weight that expresses the importance of the factor, V_1 is the normalized mean suitability index value for each site, and V_2 is normalized maximum suitability index value for each site. Table A16.2 displays the weightings used for calculating vulnerability.

Table A16.2.. Vulnerability Weightings for Both Terrestrial and Freshwater Prioritization Schemes.

Vulnerability	Max Cost	Mean Cost
CERTAINTY	1.00	1.00
IMPORTANCE	0.50	1.00
Weight	0.50	1.00

APPENDIX 17 – ATTEMPTED INTEGRATION

Appendix 17 – Attempted Integration

The following paper describes the integration methods that were attempted for the Okanagan Ecoregional Assessment. This method was not successful.

Integration Methods
November 29, 2004

Authors: Kristy Ciruna, Zach Ferdaña, John Floberg, Mark Goering, Ken Popper, Peter Skidmore, George Wilhere

Purpose:

To develop methods and recommendations for integration of freshwater, terrestrial and marine realms of ecoregional assessments. This method will be adopted by TNC, NCC and WDFW and all partners entering into agreement and used for the E/W Cascades, North Cascades and Okanagan Ecoregional Assessments. There is an underlying assumption in TNC's ecoregional assessment methodology, as described in Geography of Hope (TNC 2001): we want efficiency in selecting and working at sites to reduce the cost of conservation, and that minimizing portfolio area is one aspect of efficiency. This assumption applies to the integration of realms. There is particular interest in developing consistent methods so that different ecoregions can be joined together for multi-ecoregional as well as state or provincial analyses. We acknowledge that significant work is ongoing by others in the larger planning context as it relates to integrative analyses. This agreement provides a methodology for combining the separate realms into an integrated portfolio for all remaining first iteration assessments.

Limitations of Integration for Ecoregional Assessments:

This document prescribes a technical approach to integrate separate analyses for the purpose of portfolio development. We strongly recommend that integration be at the forethought of all assessment efforts. Subteams should discuss integration throughout the process. Decisions need to be made early on concerning targets that might be analyzed in multiple realms.

We make no claims, even implicitly, regarding the integration of "ecological function." While one could rightly assume that places selected for multiple realms would support functional ecological relationships among realms, we do not have adequate resources to analyze ecological function at the ecoregional scale. Post-assessment analysis at the sub-ecoregional scale is necessary to assess ecological function.

Proposed Methods

I. *Analyses of Areas of High Biodiversity Value for Terrestrial, Freshwater, and Marine Realms are done separately. Each team is responsible for coordinating with the technical team for the completion of these tasks.*

1. Each ecological realm analysis will be conducted across an appropriate spatial extent: terrestrial = ecoregion; freshwater = ecological drainage unit; nearshore marine = marine ecoregion.
2. Appropriate assessment units (AUs) are chosen for terrestrial, freshwater, and nearshore marine realm. These are determined by the realm subteams with Core Team input, e.g., terrestrial = hexagons, freshwater = watersheds, nearshore marine = shoreline units, nested grids, or hexagons. Different realms may have the same assessment unit.
3. Where targets cross realms, they can be addressed in both realms. For example, targets in estuaries might be included in both marine and freshwater analyses, or targets on marine shorelines could be included in both terrestrial and marine analyses.
4. Develop separate suitability indices for each realm based on realm subteam decision with core team input. There may be considerable overlap in suitability indices among realms.
5. Create selected AU sets of priority areas for each realm for the mid-level goals as described in Phase 3.

II. Data Integration

An integrated portfolio is created by populating all of the target data from the separate realms into a single MARXAN model. Purpose of core AUs: These areas are selected by concurrence of portfolio sites from more than one of the separate realm portfolios. Concurrence across multiple realms suggests that conservation effort in these areas will benefit multiple realms.

1. All target data is input into one set of MARXAN tables.
2. Assessment units with portfolio sites from two or more overlapping realms are locked into the model using the input.dat file. This represents “core areas” which will be included in the final integrated portfolio. Additional AU selection is thus built upon these core areas.
3. Protected areas are NOT locked into the integrated MARXAN models. If protected areas were chosen to be locked into the separate realm portfolios, then this will already be reflected by the “core” lock-ins.
4. The purpose of locking in core areas of concurrence is to insure the integrated portfolio includes areas of concurrence across realms. However, some of the important sites selected by the individual realm may be absent from the final portfolio for the sole sake of “efficiency.” Therefore, technical teams should conduct a sensitivity analysis comparing models run with and without core lock-ins to understand the extent that core areas drive the portfolio, as related in section IV, 3.

III. Integrated Contour Maps

1. The technical team will develop a suitability index for the integrated assessment units. All factors used in the separate realms should be considered as potential

factors and the index should use the same underlying data as the individual analyses

2. The technical team creates Contour maps using the integrated assessment unit that incorporates all realms as described in Phase 2b of the Agreement. These should first be run with core AUs locked in.

IV. Integrated Portfolios

1. Mid-risk portfolio - use core AUs to drive mid-level (30% goal) portfolio. Because freshwater realm analysis is done by EDU, goals for freshwater targets will generally need to be adjusted to capture the correct proportion of EDU goals within the ecoregion. For instance, if the goal for the EDU was 30% of FW system A, and 40% of that target's goals were met within the ecoregion (i.e. 12% of FW system A is captured in the area where the freshwater portfolio overlaps the ecoregion), than the goal for the ecoregional analysis should be 12% of System A occurrences.

2. Use minimum clump size and boundary modifier parameter variable in MARXAN to create connectivity among stream segments.

3. A sensitivity analysis should be done to determine how much the core units are driving the portfolio and to test the efficiency of the resultant portfolio. Use of core area lock-ins can be modified if core areas drive the model to an inefficient portfolio.

4. For the higher risk solution (18% goal) lock out everything outside mid-level portfolio and select from assessment units within the mid-level portfolio to reach high risk goals as described in the Agreement.

5. For the lower risk solution (48% goal) lock in the mid-level portfolio and add to it to reach lower risk goals as described in Phase 3 of the Agreement.

6. Review the mid-level integrated portfolios paying particular attention to connectivity of systems. Address by comparing results to individual realm portfolios. If the draft integrated portfolio is deemed unacceptable for any reason (fragmentation, efficiency, etc.), core teams can use a variety of techniques necessary to refine the portfolio. This could include expert review, manual editing and additional analysis. This is not intended to create a new portfolio, but to refine the current portfolio until it meets expectations of the core team.

V. Products.

The mid-risk integrated portfolio is the TNC preferred portfolio and is displayed as the "portfolio." We display contour maps of irreplaceability for integrated assessment. Low and high-risk portfolio maps will be displayed in conjunction with the mid-risk portfolio. In addition to the integrated results as described in agreement (conservation portfolio, utility map, etc.), every ecoregional assessment will also present the expert-reviewed mid-level analysis for each individual realm with the integrated portfolio.

VI. Terms Used

Conservation utility map – Internal tern for a contour map displaying results of combined "sum solutions" model runs with multiple goal scenarios, with a suitability index

Contour map – short-hand name for both irreplacibility and conservation utility maps.

Core portfolio - The locked in set of IAUs in the integrated MARXAN runs. These units represent concurrence areas from individual realm priority areas

Ecological realm –different physical environments consisting of terrestrial, freshwater, and marine.

Irreplaceability map – Contour map displaying results of combined “sum solutions” model runs, potentially with multiple goal scenarios, multiple boundary modifiers, and alternative suitability indices.

APPENDIX 18 – SENSITIVITY ANALYSIS

Appendix 18 – Sensitivity Analysis

A sensitivity analysis is necessary whenever there is considerable uncertainty regarding modeling assumptions or parameter values. A sensitivity analysis determines what happens to model outputs in response to a systematic change of model inputs (Jorgensen and Bendoricchio 2001, pp. 59-61). Sensitivity analysis serves two main purposes: (1) to measure how much influence each parameter has on the model output; and (2) to evaluate the potential effects of poor parameter estimates or weak assumptions (Caswell 1989). Through a sensitivity analysis, we can ascertain the robustness of our results and judge how much confidence we should have in our conclusions.

Appendix 8 explains the inputs to the site selection algorithm. The input with the greatest uncertainty is the suitability index. The suitability index was not a statistical model – variable selection and parameter estimates for the index were based on professional judgment. For this reason, the sensitivity analysis focused on the index. Other assessments have incorporated a suitability index or something similar into an optimal site selection algorithm (Davis et al. 1996; Nantel et al. 1998; Stoms et al. 1998; Davis et al. 1999; Lawler et al. 2003). Only Davis et al. (1996) and Stoms et al. (1998) investigated the sensitivity of site selection to changes in their index.

The sensitivity analysis was done only for the terrestrial portion of the conservation utility maps because: (1) the terrestrial data have a greater influence on the portfolio than the freshwater data; (2) terrestrial environments and species have been more thoroughly studied, and therefore, our assumptions about terrestrial biodiversity are more robust than for estuary or freshwater biodiversity; and (3) the terrestrial portfolio has the greatest potential influence on land use planning and policy decisions affecting private lands.

Methods

We explored sensitivity to the suitability index by altering the index's parameter values, running the selection algorithm with the new index, and then quantifying the resulting changes in the conservation utility map. Recall that the suitability index equation is a weighted linear combination of factors:

$$\begin{aligned}&Suitability = A \text{ x } management\ status + B \text{ x } \%converted\ land + C \text{ x } road\ density\\&D \text{ x } \%urban\ growth\ area + E \text{ x } fire\ condition\ class \qquad (1)\end{aligned}$$

where A + B + C + D + E = 1; and management status, % converted land, road density, % urban growth area, and fire condition class were each normalized to a maximum value of 1. Also, recall that MARXAN tries to minimize the "cost" of AUs. Therefore, the suitability index is actually formulated as an "unsuitability" index.

The values for parameters A, B, C, D, and E were determined by averaging expert opinion using the Analytic Hierarchy Process (AHP; Saaty 1980). Each parameter was changed by +0.2. After changing a parameter value, the other parameters were adjusted so that they all still summed to 1. For instance, if A was changed to A", then:

$$\begin{aligned}B'' &= B \bullet (1\text{-}A'') / (B + C + D + E)\\C'' &= C \bullet (1\text{-}A'') / (B + C + D + E)\\D'' &= D \bullet (1\text{-}A'') / (B + C + D + E)\\E'' &= E \bullet (1\text{-}A'') / (B + C + D + E) \quad \text{or} \quad E'' = 1 - A'' - B'' - C'' - D''\end{aligned}$$

Only the suitability index parameters were changed; none of the other inputs to the selection algorithm used to produce the original utility map were changed. We changed only one parameter at a time, and hence, did not investigate interactions between or amongst index parameters.

Resulting changes in the algorithm's output were quantified several ways. First, three similarity measures were calculated to compare the conservation utility maps generated: mean absolute difference in utility, Bray-Curtis similarity measure, and Spearman rank correlation (Krebs 1999; pp 379-386). The Bray-Curtis similarity measure normalizes the sum absolute difference to a scale from 0 to 1. Hence, mean absolute difference and the Bray-Curtis similarity measure give the same result but on different scales. Because utility will be used for prioritizing AUs, the rank correlation is particularly informative. Rank correlation tells us how the relative AU priorities change in response to changes in the suitability index. Because we were interested in prioritizing AUs, we also calculated the mean absolute difference in rank. We were especially interested in how the ranks of the most highly ranked AUs (i.e., AUs with highest utility scores) would change. To examine this, we also calculated: (1) a weighted Spearman rank correlation using Savage scores (Zar 1996, pp. 392-395) with highly ranked AUs contributing more heavily to the rank correlation value; and (2) the mean absolute change in rank for only AUs with original rank equal to 1. When calculating rank correlation, AUs that had tied ranks were given the mean of the ranks that would have been assigned had they not been tied (Zar 1996, p. 150). When calculating mean absolute difference in rank, all AUs that had tied ranks were assigned the lowest rank and the next highest rank was assigned to the next AU that was not tied to these AUs. Each similarity measure gives a single number that indicates the degree of change. They can be used to determine which suitability index parameter has the most influence on the utility. Parameters with more influence will cause a larger change in the similarity measures.

Second, we determined whether the difference between utility and irreplaceability was significantly different. This was done by testing the following hypothesis for mean absolute difference:

H_{01}: the mean absolute difference between utility and irreplaceability maps equals zero.

H_{A1}: the mean absolute difference between utility and irreplaceability maps is greater than zero.

and for the Bray-Curtis similarity measure and Spearman rank correlation, this hypothesis:

H_{02}: similarity between the utility and irreplaceability maps equals one.

H_{A2}: similarity between the utility and irreplaceability maps is less than one

The hypotheses were tested using a randomization test (Sokal and Rohlf 1995, pp. 808-810). Pairs of random maps were generated by lumping together all scores from the original utility and irreplaceability maps, reshuffling the scores, and then assigning half the scores to one random map and the other half to a second random map (i.e., random sampling of utility and irreplaceability scores without replacement). The four measures of similarity were calculated for 1000 random map pairs. The proportion of times that the mean absolute difference between the random map pairs is smaller (or the similarity is larger) than the difference between the utility map and irreplaceability maps equals the probability that utility map and irreplaceability map are significantly different. This was a one-tailed test of significance with $\alpha = 0.05$. Since we were using a randomization test, the hypotheses could be restated as follows:

H_{01}: the mean absolute difference between the utility map and the irreplaceability map is equal to or less than the mean absolute difference between random map pairs;

H_{A1}: the mean absolute difference between the utility and the irreplaceability maps is greater than the mean absolute difference between random map pairs;

H_{02}: similarity between the utility map and the irreplaceability map is equal to or greater than the similarity between random map pairs;

H_{A2}: similarity between the utility map and irreplaceability map is less than the similarity between random map pairs.

If the observed similarity measure is significantly less than (or the distance is significantly greater than) that expected from chance, then the null hypothesis is false, and we can state that the utility and irreplaceability maps are different. For Spearman rank correlation, the alternative hypothesis is equivalent to $r \leq 0$. This test is similar to that done by Warman et al. (2004)

Third, a contingency table analysis was done to compare the utility values and irreplaceability values of paired AUs. The log-likelihood ratio method (Zar 1996; pp. 502-503) was used to test the following hypotheses:

H_{03}: AU selection is independent of cost index

H_{A3}: AU selection is dependent on cost index

Paired AUs were considered to be significantly different for P <= 0.05.

Running the Selection Algorithm

MARXAN produces an output that is equivalent to nI_j, i.e., the number of times an AU was selected out of n replicates. We ran 25 replicates at each representation level. Hence, the product m x n equaled 250 for both irreplaceability and conservation utility. The irreplaceability and conservation utility values were normalized such that 250 equaled 100. For the terrestrial and freshwater analyses, BM was set to zero. When BM is set to zero, neighboring AUs have no influence on the selection frequency of an AU.

We set a minimum clump size for grizzly bear, lynx, fisher, bighorn sheep, and mountain goat habitats and some ecological systems. For the large mammals, the minimum clump size equaled the mean exclusive home range size of each species. Hence, an “occurrence” for each of these species was a cluster of hexagons that encompassed an amount of habitat equal to the minimum clump size. The clump sizes for ecological systems were those described in Appendix 8. MARXAN has three options for clump type (Ball and Possingham 2000; pp. 13-14). We used option 0 – clumps less than the minimum size are not counted toward meeting the representation level. Clumping was done for the first eight representation levels only. At the ninth level, clumping became impractical because of extremely long computer processing times, and at the tenth level, the representation level was 100% of all habitat so clumping was meaningless.

The algorithm’s objective function says, in effect, minimize cost (or unsuitability) subject to T constraints, where T equals the number of targets. All T constraints are the same – the amount captured must be greater than or equal to the target’s desired representation level. The third term in the objective function imposes these constraints, however, they are soft constraints. “Soft” means that the constraints can be violated. Each constraint’s “hardness” is determined by the penalty factors (PFs) set for each target – the larger the PF, the firmer the constraint. Hard constraints can be established by setting an arbitrarily large PF. However, very large PFs can create ill-conditioned objective functions exhibiting sharp peaks or valleys, both of which make optimization more difficult, i.e., requiring many more iterations to find the optimal solution (Gottfried and Weisman 1973). The best set of PFs is problem dependent.

We used an iterative search to set PF values. We began the search with PF equal to 1 for every target. We ran MARXAN (5 replicates, 1 million iterations per replicate) and then checked the results of the best solution. MARXAN reports how much of the representation level was met for each target. If a target's representation level was not met, we incremented its PF. We repeated these steps until the representation level was met for all targets. The iterative search was done at each of the ten representation levels. Hence, a target could have a different PF at each representation level. For the vast majority of targets, this process found the PF value in a reasonable amount of time. However, finding the PF value that yields 100 % of the desired representation level for every target took too much processing time. Hence, we terminated the PF search when only 98 % of a target's representation level was met or when PF equaled 40. On average, about 88 % of targets (both ecoregional and eco-sectional) had PF values equal to 1. Other details about running MARXAN are summarized in Table A15.6.

The spatial representation of TOs (target occurrence) was different than that used for generating the portfolio. For the portfolio, each TO was represented as a circle with a radius corresponding to the assumed locational uncertainty of the target. For the irreplaceability analysis, TOs were represented as points.

Table A18.1. Values for MARXAN parameters used in all sensitivity analyses of the terrestrial conservation utility map.

Parameter	Function	Value
Algorithm	Type of optimization routine	simulated annealing
Replications	Number of times to repeat optimization per representation level	25
Iterations	Number of times to create new combination of AUs	2,000,000
Boundary modifier	Weighting factor for "cost" of AU perimeter. Encourages clusters of AUs	0
Target Penalty Factor	weighs "cost" of not meeting a target's representation level	automatically set
Representation Level	amount of target the algorithm must capture	10 levels
AU Status	Initial selection state of each AU	0 for all hexagons
Suitability Index	indicates likelihood of successful conservation at AU	equation 1

Results

Changes to suitability index parameters result in changes in AU utility scores (Figure A18.1). For example, when parameter A is changed by 0.4, a linear regression shows a significant ($p < 0.0001$) but weak relationship ($r^2 = 0.15$) between change in suitability index and change in utility scores – as the AU "unsuitability" decreases the utility score increases. In this example, 21% of AUs did not follow this general trend between change in utility and change in unsuitability. That is, unsuitability increased and utility increased, or unsuitability decreased and utility decreased. This counter-intuitive result occurs because AU selection is based on relative suitability. An AU's unsuitability and utility can both decrease if many AUs with the same targets have a much greater decrease in unsuitability.

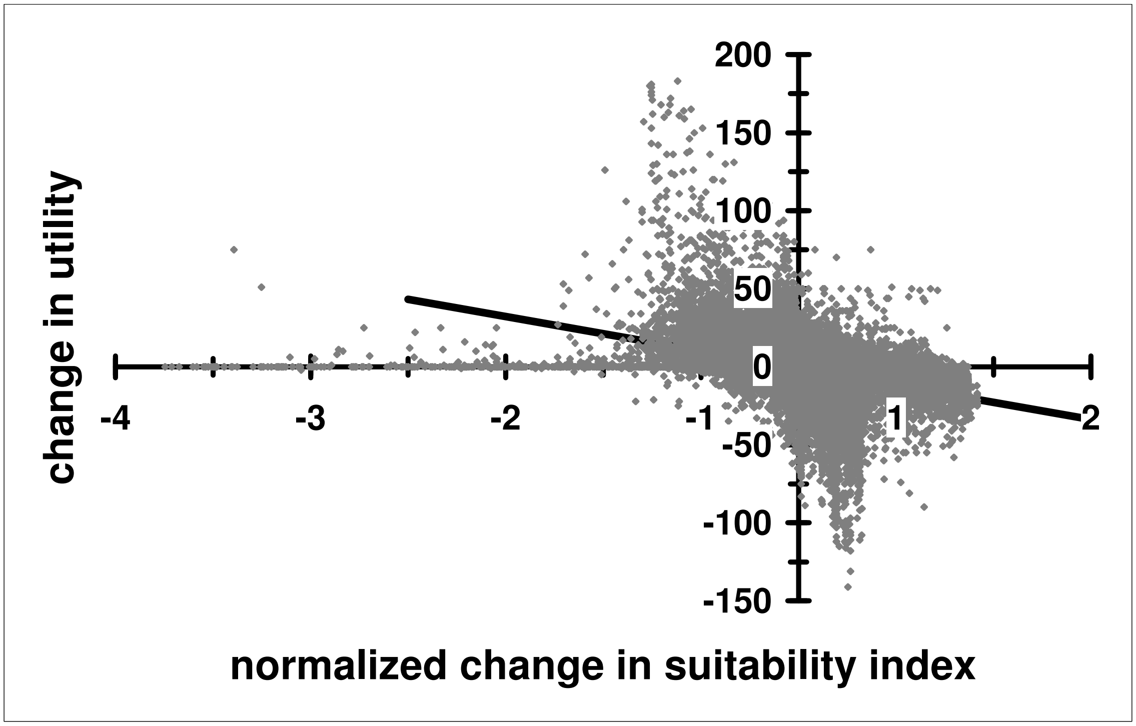


Figure A18.1. Relationship between change in suitability index and change in utility score for parameter A+0.4. One point represents one AU; 19210 total points. Line shows results of linear regression (r^2 = 0.15, p < 0.0001).

Changes to parameters A, C, and E, which control the influence of management status, road density, and fire condition class, respectively, had about the same effect on conservation utility values. Changes to these three parameters had a greater effect than parameters B and D. Changes to A, C, and E resulted in approximately the same values for mean absolute difference, the Bray-Curtis similarity measure, and Spearman rank correlation. (Figures A18.2 and A18.3). Changes to parameters B and D also had about the same effect on similarity measures. For changes to all parameters, the null hypothesis was accepted for all similarity measures. That is, none of the changes to index parameters resulted in significant changes to the overall utility map. With one exception, all values for weighted Spearman rank correlation were larger than those for unweighted Spearman rank correlation, which demonstrates even greater similarity among AUs with higher utility scores than lower scores. The one exception was parameter B. Apparently, land use has more influence on AUs with the higher utility scores than on AUs with lower utility scores.

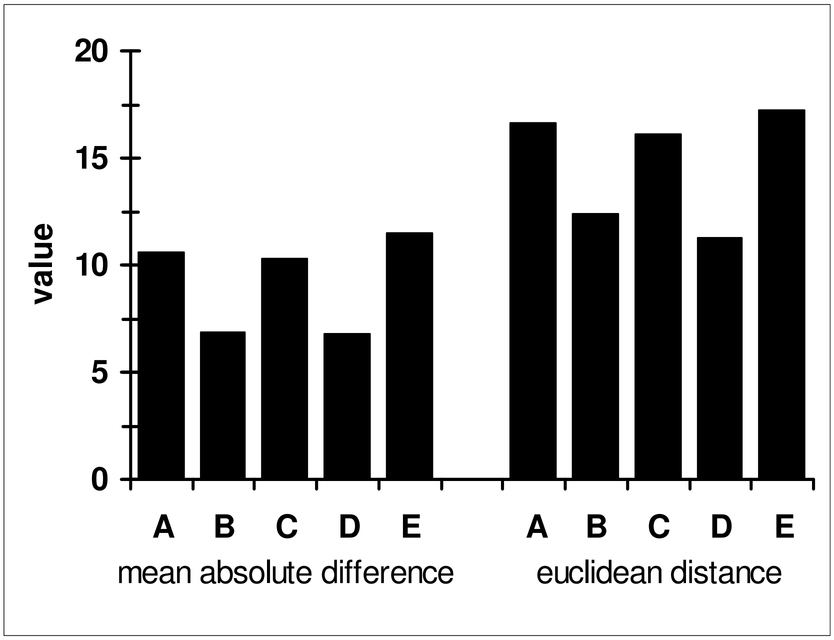


Figure A18.2. Mean absolute difference and mean Euclidean distance between original utility scores and utility scores resulting from +0.2 changes to suitability index parameters A, B, C, D, and E.

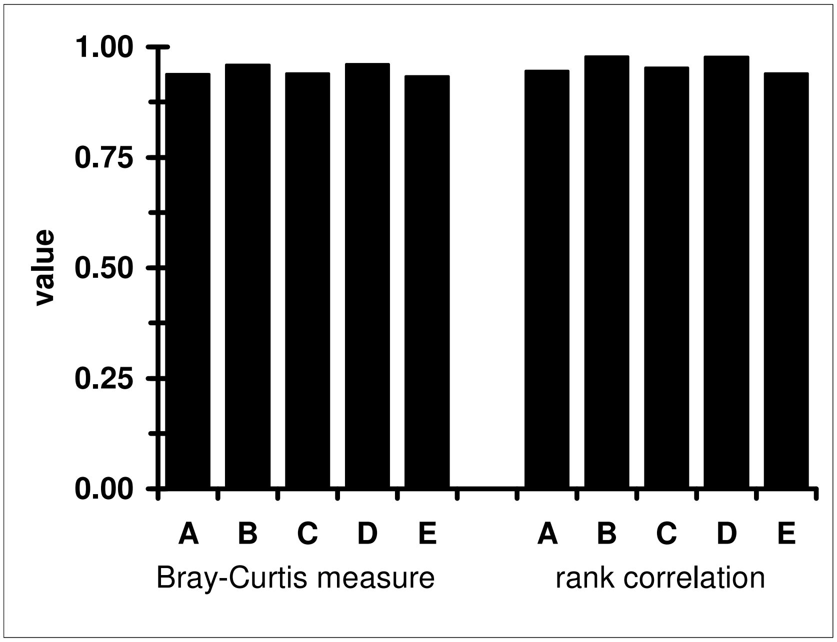
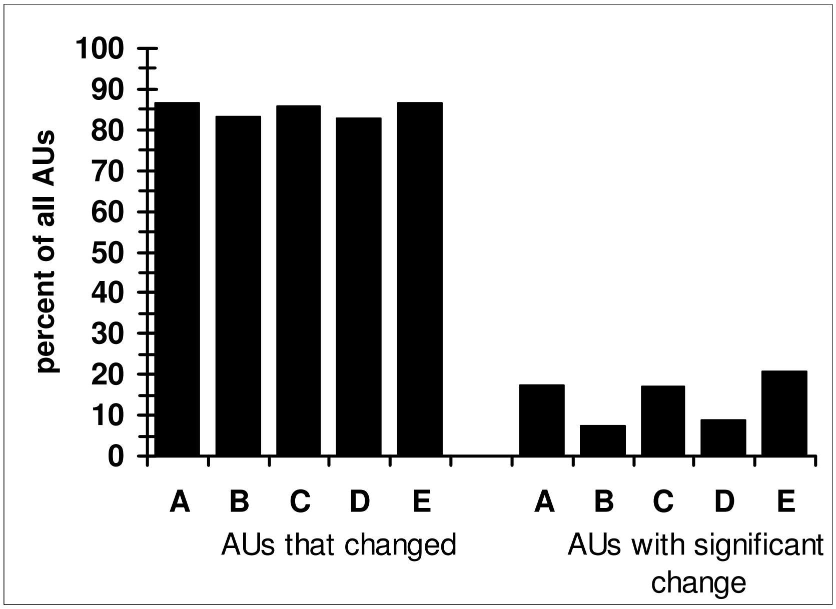


Figure A18.3. Comparison using Bray-Curtis measure and Spearman rank correlation of original utility scores and utility scores resulting from +0.2 change to suitability index parameters A, B, C, D, and E.

According to the similarity measures there was little overall difference between the original and altered utility maps. However, many individual AUs did change and some showed statistically significant changes in utility (Figure A18.4). When A, C, or E were changed by 0.2, about 86 to 87% of AUs changed utility score but only about 17 to 21% had a statistically significant change. Utility scores were much less sensitive to changes in parameters B or D.



FigureA18.4. Percent of AUs with changed utility scores as a result of changing the suitability index parameters A, B, C, D, and E by+0.2. On left, percent of all AUs that changed. On right, percent of all AUs with a statistically significant change.

Since utility will be used to prioritize AUs for conservation, the sensitivity of AU rank to changes in the suitability index is especially important. We restricted this analysis to AUs that were highly ranked. For AUs with rank greater than 100 (i.e., rank equal to 1, 2, 3, . . ., 100; 8.5% of AUs), changes to C caused the greatest mean absolute difference in rank, followed by E, then A, and then B (Figure AX.5). For AUs with the rank equal to 1 (i.e., utility=100; n=492), when parameter values were changed by 0.2, parameter E caused the greatest mean absolute change in rank followed by parameter C. Overall, few AUs with rank equal to 1 changed rank in response to parameters changes. Changes to A and D caused only 7% of them to change rank. Changes to B and E caused about 17% of them to change rank.

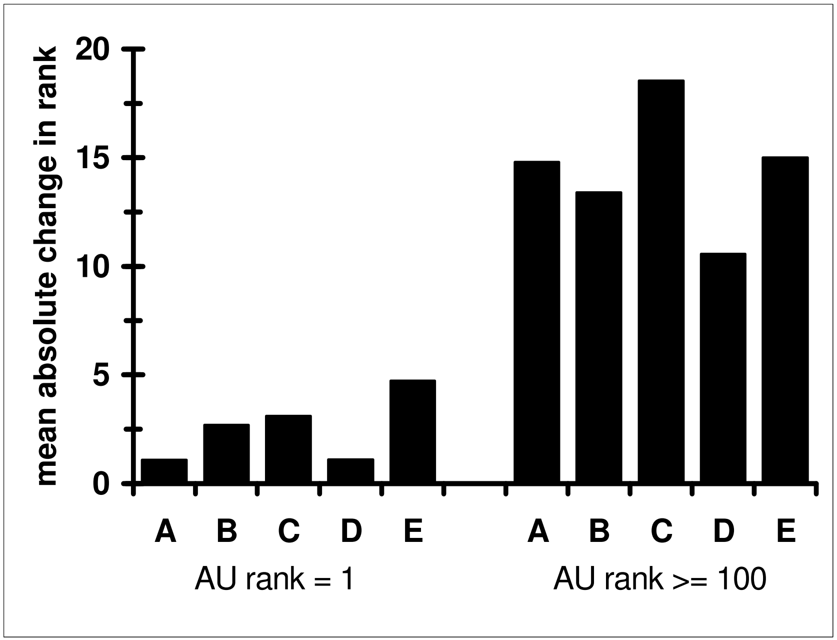


Figure A18.5. Mean absolute change in rank in response to changing each suitability index parameter by +0.2. On left, AUs with original rank equal to 1 (utility score = 100). On right, AUs with original rank greater than or equal to 100. Maximum rank equaled 227.

Discussion

The basic conclusion of the sensitivity analysis is that AU utility and rank change in response to changes in the suitability index. Similarity measures that compare "before" and "after" utility maps of the entire ecoregion indicate that the overall map is relatively insensitive to changes in suitability index parameters. That is, the average change over all AUs is small. However, the utility and rank of many AUs do change and some exhibit significant changes. The number of AUs that change significantly depends on which index parameter is changed and the amount of change to that parameter.

The effect of changing A, C, or E by the same amount results in about the same degree of change in the utility map, but changes to individual AUs will be different. Overall, the influence of parameters A, C, and E was greater than that of parameters B and D. The reasons for this are easy to discern. A, C, and E control the influence of management status, road density, and fire condition class, respectively. Nearly every AU has a nonzero value for each of these factors. In contrast, parameters B and D control the influence of percent converted land and percent urban growth area. Converted lands were those used for agriculture, residential or commercial development, or mining. Urban growth area was a simple model depicting current and potential future urban lands. In the Okanagan Ecoregion, these two factors – percent converted land and percent urban growth area. – have nonzero values over a small proportion of the ecoregion. In addition, utility had similar sensitivity to A, C, and E because these parameters had similar values: 0.092, 0.138, and 0.128, respectively. Parameters B and D had larger values, 0.406 and 0.236, but utility was still much less sensitive to changes in these parameters because the vast majority of hexagons had zero values for them.

We investigated the sensitivity of the utility map to changes in the suitability index because of our uncertainty about the index. The variable selection and parameter estimates for the index were based on professional judgment. The results of the sensitivity analysis have two implications for conservation planning. First, highest priority AUs (about ranks 1 through 10; the top 3% AUs) are rather robust to changes in the suitability index. Therefore, regardless of the uncertainties in the suitability index, we can be confident about the most highly ranked AUs. These AUs were selected mainly for their relative biological value, not relative suitability. For similar reasons, the lowest ranked AUs (rank less than about 100), tend to be robust to changes in the suitability index – they maintain a low rank because they have relatively little biological value. Second, the utility of moderately ranked AUs (rank less than 10 and greater than 100; about 12% of AUs), is sensitive to changes in the suitability index. When choosing among AUs of moderate rank we must explore how our assumptions about suitability affect rank.

The results of the sensitivity analysis put extra emphasis on the proper use of MARXAN or any optimal site selection algorithm. AU priorities are influenced by the suitability index, but the suitability index relies heavily on subjective judgments. Software like MARXAN is often referred to as “decision support tools.” Such tools can best support decisions by enabling us to explore the effect of various assumptions and differing opinions. Both Davis et al. (1996) and Stoms et al. (1998) did the equivalent of a sensitivity analysis for their suitability indices. However, they referred to their different indices as “model variations” or “alternatives”; an implicit recognition that different sets of assumptions may have equal validity. To address uncertainties in suitability indices, AU priorities, especially for moderately ranked AUs, should be derived from several different analyses using different indices. This will enhance the robustness of analytical results and lead to more confident decision making.

The other major source of uncertainty in this assessment was the biological data – both the ecological systems map and the target occurrence data. The potential consequences for optimal site selection of incomplete (Freitag and Van Jaarsfeld 1998; Gaston and Rodrigues 2003; Gladstone and Davis 2003) or inaccurate (Flather et al. 1997; Polasky et al. 2000) biological data have been investigated. Not surprisingly, each study found that inaccurate data will substantially alter the results of site selection. However, Gaston and Rodrigues found that incomplete species surveys, that is, surveys with low or zero survey effort in portions of a region may not substantially alter the results of site selection. This is because biologists bias surveys toward places where they think species will be found and such places tend to have peaks in species abundance. While there is uncertainty about the occurrence data, it is the best information we have. Survey data have errors, but recent data (less than about 5 years old) are more likely to have false negatives than false positives. False negatives are preferred over false positives, because we don't want to select places for conservation where targets don’t actually exist (Freitag and Van Jaarsveld 1996; Araujo and Williams 2000). In short, we have to work with the occurrence data we have, and unlike the suitability index, we cannot readily alter the occurrence data in a way that will give us greater confidence in AU prioritization.

APPENDIX 19 – COMER MEMOS

Appendix 19 – Comer Memos

The Nature Conservancy®
Saving the Last Great Places

MEMORANDUM

Conservation Science Division
2060 Broadway, Suite 230, Boulder, CO 80302
voice: (303) 541-0352 fax: (303) 449-4328 e-mail: pcomer@tnc.org

To: Ecoregional Planning Team Leaders - West
From: Pat Comer
CC: Leni Wilsmann, Jeff Baumgartner, Laura Valutis, Jonathan Higgins, Mike Beck, and others…

Re: Observations and recommendations for setting conservation goals in ecoregional plans
Date: January 8, 2001

Over the past few years we have made enormous progress in developing solid and defensible methods for ecoregional planning. Refinements in target identification, information gathering, and portfolio assembly have been impressive, but we have some tough issues yet to resolve. Notably, we have a way to go to develop consistent and defensible conservation goals for targets in our ecoregional plans. Given the critical importance of this issue, I hope to serve as a conduit to share the many good ideas that have come out of different planning efforts. This memo is intended to pass along some of the good ideas I've encountered in my experience with a wide variety of planning processes, including recent discussions with the Southern Rocky Mountains team. I have also taken a few liberties using some material developed on this issue by Steve Chaplin. First, I'll provide some background and primary lessons learned, then touch on a variety of core issues. I'll then dig a little deeper with ecological and technical decisions faced by each planning team. Finally, I propose some initial ecoregional goals for different types of conservation targets. Please let me know what you think.

Conservation Goals – Background

Conservation goals represent the end toward which we direct conservation efforts for targeted species, communities, and ecosystems. Goals provide the quantitative basis for identifying and prioritizing areas that contribute to the reserve network. Reserve design is appropriately dictated by target goals, thus creating a vision of landscape functionality at a regional scale. Establishing conservation goals is among the most difficult - and most important - scientific questions in biodiversity conservation (e.g., How much is enough? How many discrete populations and in what spatial distribution are needed for long-term viability?). As some have pointed out (e.g. Noss 1996, Soule and Sanjayan 1998), these questions can't really be answered by theory, but require an empirical approach, target-by-target, and a commitment to monitoring and continual re-evaluation over the long-term. We can, however, use our knowledge of conservation targets to develop some empirical generalizations to serve as guiding principles; and our own experience may provide some very important insights.

For our purposes, we define a **viable species** or **population** as one that has a high probability of continued existence[29] in a state that maintains its vigor and potential for evolutionary adaptation[30] over a specified period of time. Footnotes included, conservation goals should support the evolutionary pathway of target species in continually changing ecosystems, looking into the future at least 100 years or 10 generations. While that concept of viability could be said to apply to all targets, in practice we use several closely related, though distinct, groups of targets. It is important to distinguish "fine filter" (*species*) targets from "coarse filter" (*communities* and *ecosystems*) targets in terms of conservation strategies. Fine filter strategies appropriately emphasize recovery and evolutionary adaptation of individual species. In addition to species viability, coarse filter strategies emphasize the conservation of ecosystem services (e.g. air, water, nutrient cycling, etc.), perhaps better characterized as **ecological integrity** at an ecoregion scale (Pimentel, Westra, and Noss 2000).

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[29] 95% certainty of surviving 100 years and/or 10 generations

[30] Potential for adaptation implies that the species or population has sufficient genetic variation to adapt by natural selection to changing environmental conditions within a predicted range of frequency and amplitude of disturbance and change.

These differences may result in different approaches for setting conservation goals. While conservation goals for species correctly emphasize genetic fitness and the functional roles of species in ecosystems, coarse filter goals focus more strongly on representation of ecological variability and environmental gradients.

Lessons Learned

Primary lessons learned so far when setting conservation goals in ecoregional planning include:

1) As already mentioned, an **adaptive approach** to setting conservation goals is essential. We simply do not have sufficient knowledge or data while establishing goals and the environment supporting our targets will continue to change. This requires careful documentation and a long-term commitment to research and monitoring.
2) We should **set quantitative, measurable goals** for all targets. This is required to measure our success. In addition to quantitative goals, more "qualitative" or descriptive goals can be very useful.
3) Develop useful **target groupings** and establish **initial goals** to apply when lacking specialized knowledge, then **refine goals** as possible with target-by-target information.
4) **Err on the side of redundancy**. Errors in the other direction are, literally, fatal to our conservation targets.
5) **Ecoregional goals should be rolled up into rangewide goals** for all targets. This means that targets must be clearly defined across ecoregions and we should always consult established goals from surrounding ecoregions. However, we have to acknowledge that we are working our way through our first iteration of ecoregional planning. Goals established by surrounding ecoregions should certainly be consulted, but first-iteration goals should not unduly constrain your approach to setting goals.
6) **Document assumptions** made in the goal-setting process. We'll surely need to revisit them, so documentation today is essential.

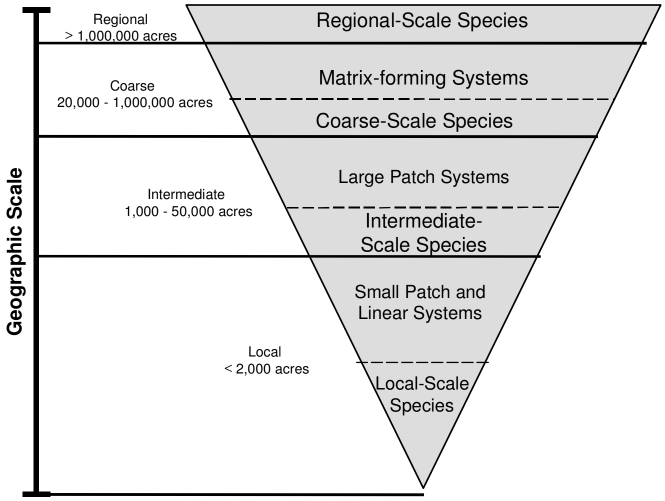
As a general rule, conservation of multiple examples of each target, stratified across its geographic range, is necessary to represent the variability of the target and its environment, and to provide some level of "replication." Replication is needed to ensure persistence in the face of environmental stochasticity and likely effects of climate change. It is also required to allow for comparative study – to better understand our targets! – and to reliably detect change.

Although information is limited, we should take existing knowledge of our targets as far as possible with a first-iteration ecoregion plan. The following issues and approaches might be considered in light of existing knowledge.

- *Spatial Pattern and Biodiversity:* Characteristic spatial patterns for ecosystems and species habitat often reflect key ecosystem processes and important life-history traits. Scaling of targets, as described by Poiani et al. (2000) can be quite useful and effects how we evaluate viability at an occurrence level (Figure 1). It can also effect the assumptions we make as we express conservation goals. It is therefore useful to categorize each target according to its presumed spatial character, as it has occurred in recent millennia without significant human alteration.

- *Link Species Targets to Ecosystem targets*: In many instances, habitat requirements for target species are well enough understood that one-several ecosystem targets could be said to encompass and/or characterize those requirements. Where this link can be made, it allows for better integration of "coarse filter" and "fine filter" targets. In some instances, critical habitat requirements for target species can be integrated into viability criteria for system occurrences. In other instances, mapped system occurrences may be used to characterize potential habitat for species targets.

Figure 1: Categories representing geographic scale of conservation targets. Areal ranges are approximate and overlapping (Poiani et al. 2000).



- *Meta-population dynamics on real land/waterscapes underlie species viability.* In order to understand populations and simple models of metapopulation dynamics, we need information on: 1) number of habitat patches, 2) probability of patch (i.e. *local population*) extinction, 3) rate of movement between patches, and 4) correlation of fates of separate populations (Morris et al. 1999). Number four is the instance where, for example, stochastic events effect multiple populations simultaneously due to their proximity to each other. A sort of "dynamic tension" therefore exists between factors 3 and 4, in that we need to allow for dispersal between distinct populations, but if too many are clustered, their fates may be strongly correlated. Theory, at least, suggests a combination of clustered and isolated populations. These are very important considerations as they apply to setting conservation goals and reserve design. For example, if the fates of all populations are highly correlated, you don't gain very much from redundancy. If there is no correlation of fates and no movement, you can greatly reduce the overall chance of extinction by protecting best examples; but you gain little by adding poor quality examples (Morris et al. 1999; Chaplin 1999).

Unfortunately, available information tends to be limited to the first and second points above; e.g. locations of *occurrences* and some estimate of the *occurrence viability*. There are very few cases where we have any knowledge of points three and four. Even with the occurrence data we have, the relationship between populations and occurrences is not straightforward. We need to establish working assumptions about separation distances between extant occurrences so that clustered occurrences may be treated as one "meta-occurrence" counting towards conservation goals, if that is the likely biological reality. For species targets, knowledge of life history (e.g. home range, known dispersal distance) can form the basis for these assumptions. Similarly, knowledge of supporting processes and environments can inform these assumptions for local ecosystems.

- *Proportional Representation:* conservation goals should reflect the "natural" or historic range of distribution for the target. For example, if 50% of the known, natural range of the target falls within a given ecoregion, the goal for that ecoregion should reflect roughly 50% of a rangewide goal. In practical terms, we have used the target's distribution, *relative to the ecoregion* as a guide to establish numeric differentials in goal setting (higher with endemic, to lower with peripheral)
  endemic = >90% of global distribution in ecoregion*,*
  limited = global distribution in 2-3 ecoregions,
  disjunct = distribution in ecoregion quite likely reflects significant genetic differentiation from main range due to historic isolation; roughly >2 ecoregions separate this ecoregion from central parts of it's range
  widespread = global distribution >3 ecoregions*,*
  peripheral = <10% of global distribution in ecoregion

- *Spatial Stratification:* For domestic ecoregions, we have generally adopted USFS *Sections* (U.S. Forest Service 1999 draft) as primary stratification units for terrestrial targets. The Freshwater Initiative's ecosystem classification approach is spatially hierarchical, and *Ecological Drainage Units* (EDUs) are similarly scaled and serve the same purpose. Because much of our marine emphasis is on coastal-nearshore systems, or habitat for targeted marine species, terrestrial stratification can often be extended offshore. In a number of instances, however, additional information on nearshore currents, temperature regime, and population distributions are needed to establish a truly meaningful marine stratification. So in reality we apply *more than one stratification scheme* for a given ecoregional assessement. Because the freshwater EDU's overlap our terrestrial ecoregion boundaries, we are in effect using multiple ecoregions as well. This is not a problem. We simply need to apply spatial structures appropriate to the targets at hand. We will still arrive at a set of prioritized conservation areas within and across the ecoregions where we work.

  The spatial scale of stratification unit is another important consideration. For example, the USFS *Section* is one scale among several. They reflect broad variation in climate and physiography nested within our ecoregions. USFS *Subsections* are nested within *Sections*, reflecting more local patterns (*and less variability*) for climate, landform, soil, and potential vegetation. One might choose to establish goals that *represent,* or even *replicate* occurrences in each *Subsection* throughout the range of target, if in fact this level of environmental variation is thought to be significant to the target. However, we have tended to establish initial goals requiring *replication (2 or more) at the Section scale.* As we work in cross-border/ international settings where USFS *Sections* do not currently exist, we need to be cognisant of scale of variation represented by the stratification units we select. They should be comparable to units we use domestically.

- *The "Ecological Backdrop:"* As we formulate conservation goals, we make assumptions about the expected land use that will occur *outside* of the reserve network, i.e. the "ecological backdrop," or as Westra (1994) notes, the area "in the buffer." How might we address this? First, it's helpful to review trends in land use and our knowledge of effects on specific ecosystems. Are some ecosystems significantly more altered/degraded than others? Are these land-use effects from on-going development, or are they legacies from the past? Recent trends in land use, as well as projections of future land use, are important components of ecoregional plans. To the extent that we can identify ecosystem and species targets that are relatively more vulnerable to current and future land uses, we can *anticipate an increased probability of future losses*. It may then be prudent to build a greater degree of "redundancy" into goals for effected targets. We should also look to "the backdrop" as we develop ecoregion-wide conservation strategies. While our plan should provide us with appropriate focus on specific areas, it should also indicate where conservation could be strategically pursued across entire ecoregions.

- *Some Preliminary Numbers:* So where to we begin to establish overall numerical goals? In a limited number of cases, existing recovery plans have established explicit, numerical goals that address the continued recovery and long-term viability of target species. In many cases, however, goals have not been stated quantitatively, or are not true rangewide goals, but reflect political jurisdictions and compromises. They also can reflect bare-minimum numbers required for genetic fitness of individuals in populations, but do not truly address long-term viability and the functional roles of target species in ecosystems. Theoretical work on species viability (e.g. Quinn and Hastings 1987) has been applied to coarse-scale species in Florida (Cox et al. 1994), with apparent success. This suggests that 10 distinct populations of 200 individuals should be sufficient for survival over 10 generations/100 years. Though again, these are bare minimums for genetic fitness.

  Our own experience, and that of the Natural Heritage Network, in ranking the conservation status of each target might be a most useful place to look for establishing preliminary numbers. We have tended to use global ranks for species targets as categories for expressing conservation goals. However, we might more appropriately view global ranks as an indicator for the *urgency of conservation action*, and look to underlying ranking criteria to inform numerical goals. These criteria include factors such as number of occurrences, condition/occurrence viability, trends, threats, fragility, and degree of existing protection (Stein et al. 2000). In very general terms, a given community or species is ranked G3 by the NHP network when it is known from 21 – 100 occurrences, or 1,000 – 3,000 individuals, across its known range. A G3 rank signifies that, while the element remains quite rare, it is considerably less imperiled, due to its rarity and apparent threat, than those types ranked G1-G2. With this as a guide, we should seek to protect at least 25 examples rangewide within the reserve network (slight redundancy built in to partially account for other ranking factors). The ecological diversity that they represent is likely to be retained within each ecoregion over the next 100 years/10 generations. Again, lacking target-specific knowledge, this is a reasonable, and defensible, point of departure for many targets. It is based in our own and our partners' direct experience.

Species Targets

Given our limited knowledge of target viability and population dynamics, the following should serve a guide for representing species targets and developing replication goals in support of reserve design. These guidelines are organized by geographic scale, so categorizing targets in this way is strongly encouraged.

Local scale: These typically include all/most plants, invertebrates, herps, and small mammals. They are often associated with "small patch" and "large patch" terrestrial ecosystems, and small lake/stream systems. Figure 1 suggests a habitat size <2,000 acres (800 hectares) may encompass much of the habitat for populations of several hundred individuals. These localized occurrences are efficiently represented on maps as *points*. Detailed review and calculation of home range size is helpful for animals, though likely not essential for this group of targets. A simple rule for establishing minimum distance between occurrences (i.e. we assume that closer occurrences are one "population") could be *3 times the diameter of a circular patch of the minimum area*. For the case of a patch size of 800 hectares, a 9675m, or roughly 10 km (6 miles) minimum distance between points would suffice. Botanists have commonly used a separation distance of roughly 5 km (3 miles) for plant targets. Because this group of targets may be more likely to be found in more specialized habitats, they may be benefit from replication at a *subsection* scale (or finer). Additional stratification of aquatic species targets in this group should be considered.

Intermediate scale: These typically include small/medium-size mammals, birds, and fish, and some herps. They are often associated with "large patch" and "linear" terrestrial ecosystems, and medium-size lake and river systems. Review of home range size and habitat characteristics (e.g. link to system targets) is very useful with this group of targets. In most cases, we should aim to represent these targets as *polygons* of *"occupied habitat"* (*lines* for river-dwelling fish, etc.). In some instances, point locations may suffice. Lacking specific information on home range size, an initial assumption of 5,000 acres (2,000 hectares) could be used for terrestrial targets. Using our 3X rule, this gives a minimum distance of about 15 km (9 miles) between occupied habitat polygons. *Section*-scale (and *EDU*-scale) replication is appropriate for these targets.

Coarse scale: These typically include medium-size mammals, birds, and fish. They are often associated with "matrix-forming" terrestrial ecosystems, large lakes and medium-large river systems. Review of home range size and habitat characteristics is very important with this group of targets. In all cases, we should aim to represent these targets as *polygons (or lines)* of *"occupied habitat."* Spatially explicit habitat models would be very useful for these targets. Lacking specific information on home range size, an initial assumption of 30,000 acres (12,000 hectares) could be used for terrestrial targets. Using our 3X rule, this gives a minimum distance of about 37 km (23 miles) between occupied habitat polygons. Because of home range size, some ecoregions may not support multiple occurrences of these targets within the same *Section*, so clusters of 2-3 *Sections* may form the appropriate stratification unit. While *Section*-scale *replication* is preferred, *representation* of *Sections,* and *replication* within *Section clusters* may be appropriate for this target group.

Regional scale: These typically include large mammals and fish associated with diverse and extensive complexes of terrestrial, aquatic, and marine ecosystems. Review of home range size and habitat characteristics is essential with this group of targets. In all cases, we should aim to represent these targets as *polygons (or lines)* of *"potentially occupied habitat"* and where possible, *polygons* of *specific habitat components.* It may not be possible to identify discrete populations; indeed, there are many instances where only one population occurs across multiple ecoregions. In these cases, minimum patch sizes refer to areas of high-quality habitat components; e.g. breeding, feeding, over-wintering habitat, etc., and typically do not encompass enough area to support several hundred individuals. It is important to realize that, in some instances, the long-term persistence of these species in the ecoregion may be determined more by the in-migration of individuals from adjacent areas rather than productivity within the ecoregion. Our intent should be to provide enough high-quality core and connecting habitat to insure persistence across multiple ecoregions. In this sense, one could view setting conservation goals for regional species in much the same way we develop customized management goals for site conservation; the ecoregion is essentially "the site" for some of these targets.

Table 1 provides a summary of initial goals for species targets. Again, this could be used as a starting point when target-specific information is lacking. All additional knowledge could apply toward customizing beyond these numbers. Targets are grouped according to spatial pattern and distribution relative to the ecoregion. Numbers decrease as target endemism decreases, in rough proportion to the ecoregions share of the global distribution. Stratification implies a level of replication (>1 occurrence) is achievable at the given spatial scale (*e.g. Section*) throughout its natural distribution in the ecoregion. In most North American ecoregions, home range sizes for intermediate and coarse-scale species targets would preclude the possibility that 24 distinct occurrences could occur within one ecoregion (where they are endemic), so goals for these categories are decreased for these initial goals. However, they would never fall below 10 as a rangewide goal.

Table 1. Initial Ecoregional Conservation Goals for Species Targets

Spatial Pattern	**Regional[§]**	**Coarse[β]**	**Intermediate[ψ]**	**Local***
Distribution				
Endemic	Case-by-case, defining core and connecting habitat components	10	18	25
Limited		5	9	13
Disjunct		5	9	13
Widespread		3	5	7

Peripheral		1	2	3

[§] Target-by-target, rangewide (multi-ecoregional) goals are often required. Targets represented within each ecoregion by "potentially occupied" core and connecting habitat components.

[β] Ecoregional goal stratified by USFS Section/Ecological Drainage Unit, or by clusters of 2-3 USFS Sections/Ecological Drainage Units. Targets represented by "known occupied habitat."

[ψ] Ecoregional goal stratified by USFS Section/Ecological Drainage Unit. Targets represented by "known occupied habitat."

* Ecoregional goal stratified by USFS Section/Ecological Drainage Unit. Separation Distance for each target occurrence should be specified. An initial assumption of 10 km may be applied if lacking sufficient life history information. Many naturally rare and endemic G1-G2 species may have historically occurred with fewer than 25 populations. In these cases, the goal is 'all potentially viable occurrences up to 25.'

Communities

Above the species level, targets can be grouped as communities and ecological systems. Communities encompass "fine filter" targets such as species aggregations (bat caves, migratory bird stopover sites, etc.) where multiple species and their habitat can be efficiently targeted as a group. Throughout North America, terrestrial "coarse-filter" targets may be well represented in a two-tiered classification of 20-50 ecological systems with 10s -100s of nested, local communities defined by plant associations of the U. S. National Vegetation Classification (Grossman et al. 1998). Rare plant associations (typically ranked G1-G3) represent rare communities found in uncommon environments, and because they may not be adequately represented using the more broadly defined ecological systems, should be specifically targeted to ensure their representation within the reserve network.

Nearly all community targets can be categorized as *Intermediate* (large patch) or *Local* (small patch, linear), depending on the degree of habitat specificity and landscape-scale dynamics that characterize their occurrences in the ecoregion (Anderson et al. 1999); though occasionally community targets could be categorized at *Coarse* (matrix-forming) scales. These localized occurrences are efficiently represented on maps as *points* or *polygons*. In all cases, the same logic for goal setting applied to species targets can be applied to community targets, and the initial goals established in Table 1 are appropriate.

Ecological Systems

Ecological systems encompass diverse assemblages of communities that occur in similar environments and are driven by similar dynamic processes. While ecosystems can be defined and described from an infinite number of perspectives, we are defining terrestrial, freshwater, and coastal marine systems to reflect local landscape-scale composition and dynamics that will be useful for habitat modeling, management, and monitoring. As with species and community targets, conservation goals for ecological systems should consider the target's distribution relative to the ecoregion and their typical spatial pattern. The latter factor may effect how goals are expressed. For matrix, and most large patch and linear systems, occurrences should be mapped as *polygons* or *lines*, and conservation goals may be expressed as a percentage of historical extent (e.g. *circa* 1850) proportionally represented across all major physical gradients (e.g. using *Section/EDU* stratification and *Ecological Land Units / aquatic macrohabitats*). Goals for remaining large patch systems, small patch systems – or where landscape fragmentation precludes mapping and modeling – may be mapped as *polygons and points*, ands goals are best expressed as numbers of occurrences. Separation distances between system occurrences should be established target-by-target, but if needed, default separation distances as described for plant targets (3 miles) may be applied.

In the context of identifying a network of conservation areas, expressing "coarse filter" goals as areal extent has several advantages. Matrix-forming terrestrial ecosystems historically dominated the landscapes of each ecoregion. They, along with large patch systems, should also dominate interconnected reserve networks. There is little utility to artificially dividing up an interconnected network into discrete blocks in order to assess how well conservation goals were met. Areal measures have been commonly applied to reserve design goals at national scales using theory from island biogeography (MacArthur and Wilson 1967, Wilcox 1980) and working hypotheses on the role of species diversity in ecosystem function (e.g. see Hart et al. 2001). A well established (albeit quite general) relationship exists between habitat area and the number of species that an area can support (e.g. Wilcox 1980). Loss of habitat tends, over time, to result in the loss of species within an approximate range. This relationship formed the basis for international goals (12% of country area) set by IUCN for member countries (WCED 1987). However, one could argue that the goals set by IUCN were far too low. For instance, it is estimated that with an 88% decrease in habitat extent (e.g., conservation goal = 12%), one could expect a decrease over time of 27-50% of species supported by the habitat (Wilcox 1980) (Figure 2). Regardless of future land use outside of the reserve network, the species/area relationship suggests that our ecoregional goals should be set significantly higher than 12%.

IUCN goals were also expressed in terms of *current* extent of an entire country. Our conservation goals should be stated for each target, and establish some historic context wherever possible, by expressing the desired extent as a percentage of estimated area *circa* e.g. 1850, or the time period immediately prior to wide-spread European-American settlement of a given ecoregion. Ecosystems are dynamic, changing at varying rates, with short-term cycles, and long-term trajectories. However, in many places, short-term cycles *and* long-term trajectories have been abruptly altered through human land use, and have had obvious impact on native biodiversity (Wilson 1992). Our task is to understand natural dynamics, then evaluate our alterations and mitigate their effects. For example, in the Southern Rock Mountains, fire, water diversion, and hunting historically supported Native American cultures over millennia, but the most rapid change to the upland matrix of this ecoregion has been through mine-related wildfire, logging, over-grazing, road construction, fire suppression, and urbanization. The 1850 time period marks the beginning of rapid and transforming, human/technology-driven changes to ecosystems, but is recent enough to reflect vegetation patterns under modern climatic conditions (see e.g. Veblen and Lorenz 1991). It therefore, provides a useful and important reference point.

Establishing an estimate of historic extent for ecological systems is no simple task. In some highly altered ecoregions, it is nearly impossible. However, for purposes of establishing numerical conservation goals, a reasonable approximation will do. In the Southern Rocky Mountains example (Appendix), historic extent for linear riparian systems was modeled using riverine ecological systems and Ecological Land Units. For most other terrestrial systems, percent change for each ecological system was estimated within 10% intervals using current land use/land cover data, as well as specific studies (e.g. Miller and Wigand 1994, Kaufmann et al. in press). We then added (or subtracted) area from the current mapped extent to approximate extent *circa* 1850. Where change was estimated to be less than 10%, current extent was used.

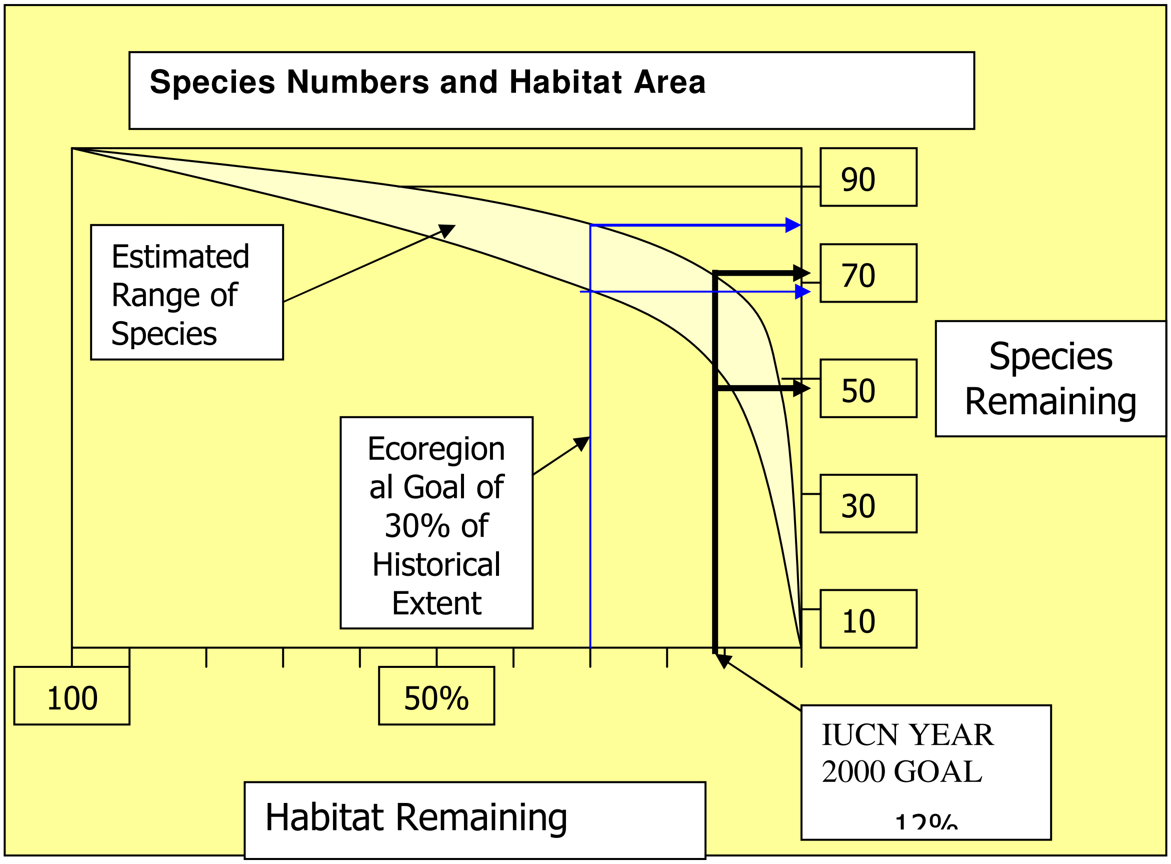


Figure 2: Estimated species loss with % area of habitat loss over time (curve taken from Dobson 1996).

In addition to a goal for areal extent, all Southern Rocky Mountain systems were represented proportionally across major biophysical gradients. Representation of major biophysical gradients helps to ensure that the reserve network represents native ecosystem diversity while providing a hedge against a changing climate. This was accomplished in two ways. First, all systems were represented in each of the ecoregional *Sections/EDUs* of their natural distribution. Second, for large patch, linear, and matrix forming systems that were reliably mapped, they were represented in combination with Ecological Land Units and aquatic macrohabitats to help represent ecological variability and gradients. The portfolio design software (SITES) was programmed to apply percent goals to vegetation/ELU and river system/macrohabitat combinations; ensured that the major biophysical gradients of each system would be represented in the portfolio in proportion to their occurrence for the ecoregion as a whole.

In order to establish an initial percent area goal, we should consider the species/area relationship (Figure 2), proportional representation of biophysical gradients, and the "ecological backdrop." In addition to this, we should consider the fact that several hundred of the most vulnerable and sensitive species are targeted either individually, or in communities. In the Southern Rocky Mountains, we selected an initial goal of 30% of historic extent (as estimated *circa* 1850) for each system in the ecoregion. This percentage, on its own, would suggest that we could lose between 15% and 35% of native species (Figure 2). But given the other targets and considerations, this 30% goal is an adequate point of departure. This should also be a reasonable starting point for most other North American ecoregions.

Table 2 provides a summary of recommended initial conservation goals for ecological systems. As noted, conservation goals for many "patch-forming" ecological systems are expressed as a number of occurrences. These goals follow similar assumptions and numerical estimates described by Anderson et al. (1999), as well as those applied to species and community goals in Table 1. Numerical estimates should be at the higher end of those ranges however, since not all component communities are likely to be represented in every system occurrence. In highly fragmented ecoregions where matrix, large patch, and linear systems must be addressed as the number of occurrences, teams should fall back to occurrence numbers established here in Table 2. Again, these numbers represent an initial goal for each system that should be tested and refined over time.

Table 2. Initial Ecoregional Conservation Goals for Ecological Systems

Distribution Relative to Ecoregion	Conservation Goals for selected *large patch* and *small patch* systems (expressed as a number of occurrences) and for remaining *large patch*, *matrix* and *linear* vegetation systems (expressed as a percentage of historic extent).	
	Spatial Pattern in Ecoregion	
	Selected Large Patch and all Small Patch Systems	*Matrix, Large Patch, and Linear Systems*
Endemic	25 occurrences	30% [1]
Limited/Disjunct	13 occurrences	
Widespread	7 occurrences	
Peripheral	3 occurrences	

[1] 30% of estimated historic extent *circa* 1600-1850 (in the Americas)

I hope this provides a reasonable basis for establishing conservation goals, as well as a useful point of departure for discussions among technical teams. I anticipate continued evolution and refinement in our approaches to establishing initial goals, and making target-by-target refinements.

Again, any and all comments on this are most welcome!

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NatureServe
A Network Connecting Science With Conservation

MEMORANDUM

NatureServe
2060 Broadway, Suite 230, Boulder, CO 80302
voice: (303) 541-0352 fax: (303) 449-4328 e-mail: pat_comer@natureserve.org

To: UT High Plateaus Ecoregional Assessment Team
From: Pat Comer, Chief Ecologist

Re: Conservation Goals and Scenario Building in the Utah High Plateaus Assessment
Date: June 2003

Introduction

For the Utah High Plateaus Ecoregional Assessment, we hope to provide an initial synthesis of biodiversity and conservation information that will inform subsequent management and land use planning. Indeed, there are likely to be perspectives and context for land management and land use that only become apparent through analysis at regional scales. In a document currently being prepared, we will describe aspects of land management scenario generation that use socioeconomic and land use data to create distinct conservation scenarios. This document approaches scenario generation from a different angle. Here I outline what one might call a "goal-based" approach to generating regional scenarios in support of biodiversity conservation.

This approach establishes overall conservation goals, and then develops explicit, numerical objectives for representing targeted species, communities, and ecological systems throughout the ecoregion. Objective setting forces us to address the "how much is enough?" questions in conservation. Objectives should provide the quantitative basis for identifying and prioritizing areas that substantially contribute to biodiversity conservation. These areas may still be managed for multiple uses, but biodiversity conservation would be a principle consideration. To make that consideration operational, management actions would need to be compatible with the ecological processes that support targeted biodiversity elements in each area. So for example, aspects of composition, structure, and dynamic processes supporting forest, riparian/wetland, and aquatic systems, and the habitat requirements of sensitive species, would be principle considerations in establishing compatible management regimes within these selected areas.

Here I provide background explanation, lessons learned, and recommendations for science-based objective setting. Since explicit conservation objectives are working hypotheses that, to a certain degree, reflect societal risk, alternative conservation scenarios may be developed by varying these numerical objectives; i.e. with low numerical objectives representing "high-risk" scenarios for conserving biodiversity, and higher numerical objectives representing "low-risk" scenarios.

Conservation Goals and Objectives – Background

It may be useful to describe this approach in terms of Conservation Goals and Conservation Objectives. Conservation Goals represent the end – or desired condition - toward which we direct conservation efforts for targeted species, communities, and ecosystems. These overarching goals differ among targeted elements. These differences are imbedded in our "coarse-filter/fine-filter" strategy and the purposes for which we targeted different groups of elements. For example, we have targeted a suite of imperiled, rare, and vulnerable species, and vulnerable species assemblages, as "fine-filter" conservation elements in the Utah High Plateaus. We have targeted them individually because we believe that is the only way we can ensure that their individual needs can be addressed. Our Conservation Goal focuses on the viability of these species within the ecoregion. For practical purposes, we can define a **viable species** as one that has a high probability of continued existence[31] in a state that maintains its vigor and potential for evolutionary adaptation[32] over a specified period of time. Footnotes included, conservation objectives should support the evolutionary pathway of targeted species in continually changing environmental settings, looking into the future at least 100 years or 10 generations. So our Conservation Goals for species might be stated as: *"targeted species remain invulnerable to loss of viability within the ecoregion.*" Importantly, this statement suggests that not only do we intend to maintain "minimum viable" populations, but *we also hope to specifically address the vulnerabilities they face*, due to habitat loss, habitat conversion, or direct exploitation.

Our "coarse-filter" elements include rare vegetation communities and both terrestrial and freshwater ecological systems. A "coarse-filter" strategy is aimed at maintaining the ecological processes that support the vast majority of species; thus permitting us to avoid targeting numerous species individually. In addition to maintaining non-target species, coarse-filter strategies emphasize the conservation of ecosystem services (e.g. air, water, nutrient cycling, etc.). This overall purpose for coarse-filter conservation may be best characterized as maintenance of **ecological integrity** at an ecoregion scale (Pimentel, Westra, & Noss 2000). While conservation goals for species correctly emphasize genetic fitness and the functional roles of individual species in ecosystems, coarse-filter goals focus on representation of ecological variability and environmental gradients. So our Conservation Goal for communities and ecological systems might be stated: *"essential ecosystem services are secure and non-target species remain invulnerable to the loss of viability*."

Conservation Objectives are the explicit - and hopefully quantifiable - expressions of broader conservation goals. Objectives express the "how much?" "how many?" and "in what spatial

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[31] 90% certainty of surviving 100 years and/or 10 generations

[32] Potential for adaptation implies that the species or population has sufficient genetic variation to adapt by natural selection to changing environmental conditions within a predicted range of frequency and amplitude of disturbance and change.

distribution?" questions underlying element conservation. Regional conservation scenario building is appropriately dictated by these explicit, numerical objectives for each targeted species, community type, or ecological system type. By mapping out areas that contribute to these objectives, we create a vision of landscape functionality at a regional scale. Establishing conservation objectives is among the most difficult - and most important - scientific questions in biodiversity conservation. As some have pointed out (e.g. Noss 1996, Soule & Sanjayan 1998), these questions can't really be answered by theory, but require an empirical approach, element-by-element, and a commitment to monitoring and continual re-evaluation over the long-term. We can, however, use our knowledge of species, communities and ecosystems, and the collective experience of the international conservation community, to develop some empirical generalizations – or working hypotheses - to serve as guidance.

Lessons Learned

Some primary lessons learned in conservation objective-setting in regional assessments include:

7) As already mentioned, an *adaptive approach* to setting conservation objectives is essential. We simply do not have sufficient knowledge or data while establishing objectives and the ecosystems supporting our targeted elements will continue to change. All conservation objectives should use the best available knowledge, but should also be viewed as "working hypotheses." This requires careful documentation and a long-term commitment to research and monitoring.
8) We will always be dealing with both *uncertainty* and *risk*. This should be clearly acknowledged. Uncertainty results from our incomplete knowledge and our inability predict future events. Risk reflects the fact that conservation objectives are, in the end, social decisions, based upon societal willingness to accept the risk of biodiversity loss.
9) *Both risk levels and uncertainty should decrease with increasing element vulnerability*. For elements that are considered highly endangered due to rarity and current threats, we must urgently pursue necessary research to reduce uncertainty and set objectives that reduce the risk of loss.
10) *The spatial context of selected conservation lands is important*. That is, in setting objectives, one should not presume that the lands and water forming the "matrix" around selected conservation lands contribute no biodiversity value. In fact, land and water management throughout a given region will continue within a policy framework established by existing regulation, so considerable contributions of biodiversity values can be expected from surrounding lands.
11) We should *set quantitative, measurable objectives* for all targeted elements. This is required to develop conservation scenarios and to measure our success over time. However, in addition to quantitative objectives, more "qualitative" or descriptive objectives can be very useful.
12) Given the common circumstance where there is a high level of uncertainty, objectives may be best expressed within *a range of measurable values.*
13) *Ecoregional objectives should be placed in the context of rangewide objectives* for all targeted elements. This means that elements must be clearly defined across ecoregions (e.g. using standardized plant and animal taxonomies and classifications for communities and ecological systems), and any existing rangewide objectives should be evaluated to determine the appropriate contribution from within a given ecoregion.
14) *Use history as a guide to the future.* Wherever possible, use knowledge of element distribution and abundance over recent millennia to guide establishment of conservation objectives.
15) Where available, existing *recovery plans* for individual species should be fully utilized in the development of conservation objectives.

16) Develop useful *element groupings* and establish *initial objectives* to apply when lacking specialized knowledge, then *refine objectives* as possible with element-specific information.
17) *Use established guidelines* to describe the conservation status of species, especially to define a threshold of "vulnerable" status. IUCN "Vulnerable" criteria, along with those established by NatureServe (Global Ranks 3 thresholds), should be used as a guide for objective setting.
18) *Sub-regional geographic stratification* can be used as a practical tool to represent environmental variability supporting targeted elements; especially for communities and ecological systems. Stratification for terrestrial elements may differ fundamentally from aquatic elements. Subregional stratification is less important for rare-to-imperiled elements and wide-ranging species.
19) *State conservation objectives within set time frames.* All objectives could be stated within e.g. 25-100 year time frame. For highly threatened elements, objectives stated within shorter time frames (5-10 years) are appropriate.

As a general rule, conservation of multiple examples of each element, stratified across its geographic range, is necessary to represent the variability of the element and its environment, and to provide some level of "replication." Replication is needed to ensure persistence in the face of environmental stochasticity and likely effects of climate change. It is also required to allow for comparative study – to understand our targeted elements better – and to detect change reliably. Although information is limited, we should take existing knowledge of our targets as far as possible. The following issues and approaches might be considered in light of existing knowledge.

- *Proportional Range Representation:* conservation objectives should reflect the historic range of distribution (e.g. under climatic regimes of the past 2,000 years) for the targeted element. For example, if 50% of the known, historical range of the element falls within a given ecoregion, the goal for that ecoregion should reflect roughly 50% of a rangewide goal. In practical terms, we have used the target's distribution, *relative to the ecoregion* as a guide to establish numeric differentials in objective-setting (higher with endemic, to lower with peripheral). These categories may be assigned to all conservation targets.

  Endemic = >90% of global distribution in ecoregion,
  Limited = <90% of global distribution is with in the ecoregion, and distribution is limited to 2-3 ecoregions,
  Disjunct = distribution in ecoregion quite likely reflects significant genetic differentiation from main range due to historic isolation; roughly >2 ecoregions separate this ecoregion from other more central parts of it's range
  Widespread = global distribution >3 ecoregions,
  Peripheral = <10% of global distribution in ecoregion

- *Meta-population dynamics on real land/waterscapes underlie species viability.* In order to understand populations and simple models of metapopulation dynamics, we need information on: 1) number of habitat patches, 2) probability of patch (i.e. *local population*) extinction, 3) rate of movement between patches, and 4) correlation of fates of separate populations (Morris et al. 1999). Number four is the instance where stochastic events effect multiple populations simultaneously due to their proximity to each other. A sort of "dynamic tension" therefore exists between factors 3 and 4, in that we need to allow for dispersal between distinct populations, but if too many are clustered, their fates may be strongly correlated. Theory, at least, suggests a combination of clustered and isolated populations. These are very important considerations as they apply to setting conservation objectives and scenario building. For example, if the fates of all populations are highly correlated, we gain little from "replicating" multiple occurrences. If there is no correlation of fates and no movement, you can greatly reduce the overall chance of extinction by protecting best examples; but you gain little by adding poor quality examples (Morris et al. 1999; Chaplin 1999).

Unfortunately, available information tends to be limited to the first and second points above; e.g. locations of *occurrences* and some estimate of the *occurrence quality*. There are very few cases where we have any knowledge of points three and four. Even with the occurrence data we have, the relationship between populations and occurrences is not straightforward. NatureServe has established working assumptions about separation distances between extant occurrences so that clustered occurrences may be treated as one "meta-occurrence" counting towards conservation objectives, if that is the likely biological reality. For species targets, knowledge of life history (e.g. home range, known dispersal distance) forms the basis for these assumptions. Similarly, knowledge of supporting processes and environments can inform these assumptions for community types and ecological systems.

- *Spatial Stratification:* In the United States, USFS *Sections* (U.S. Forest Service 1999 draft) have commonly been adopted as primary stratification units for terrestrial elements. The TNC Freshwater Initiative's ecosystem classification approach is spatially hierarchical, and *Ecological Drainage Units* (EDUs) are similarly scaled and serve the same purpose for freshwater elements. So in reality we apply *more than one stratification scheme* for a given ecoregional assessment. In most instances, some degree of element occurrence replication should be provided within each *Section/EDU* of their historical range within the ecoregion.

- *Spatial Pattern and Targeted Elements:* Characteristic spatial patterns for ecosystems and species habitat (Figure 1) often reflect key ecosystem processes and important life-history traits. Scaling of elements, as described by Poiani et al. (2000) can effect the assumptions we make as we express conservation objectives. It is therefore useful to categorize each element according to its presumed spatial character, as it has occurred in recent millennia without significant human alteration. For matrix, and most large patch and linear systems, occurrences should be mapped as *large, continuous polygons* or *lines*, and conservation objectives may be expressed as a percentage of historical extent (e.g. *circa* 1850) proportionally represented across all major physical gradients. Objectives for remaining large patch systems, small patch systems – or where landscape fragmentation precludes mapping and modeling – may be mapped as *scattered polygons* and *points*, ands objectives are best expressed as numbers of occurrences

Figure 1: Categories representing geographic scale of conservation elements. Areal ranges are approximate and overlapping (Poiani et al. 2000).

- *Specialized Objectives vs. Element Groupings:* Some entire categories of elements must be reviewed individually, and element-specific conservation objectives must be established for scenario building. For example, regional scale species tend to be wide-ranging mammals and birds. Individuals of these species may range across and beyond a given ecoregion. We typically represent these elements as *polygons (or lines)* of *"potentially occupied habitat"* and where possible, *polygons* of *specific habitat components.* In one case with the High Plateaus (grey wolf), we have a simulated population viability model that may be run under different regional scenarios. Analysis of their habitat requirements, especially identifying critical core habitats and landscape linkages is best assessed sequentially with each regional scenario developed using all other elements. That way, regional scenarios can be evaluated individually for their impact on these species; then modified accordingly.

Another class of elements requiring individual attention includes those that are extremely rare. Many naturally rare and endemic G1-G2 elements[1] have existed over millennia with very few distinct occurrences. In these cases, an objective of "all potentially viable occurrences" is appropriate.

A third class of elements includes Threatened and Endangered species with current recovery plans. Plans should be reviewed against agreed-upon goals to define explicit conservation objectives, and where applicable, these numbers should be applied to conservation scenario building.

Another, sometimes overlapping class includes elements for which conservation action is most urgent. These tend to be G1-G2 elements that occur in landscape where rapid land use conversion is taking place. For these elements, specific short-term (5-10 year) conservation objectives should be established.

- *Preliminary Numbers for Element Groupings*: The majority of species, communities, and ecological systems fall outside the categories where specialized objective setting is essential. For these numerous cases, we also lack specialized knowledge to create element-specific objectives. So where do we begin to establish objectives? Theoretical work on species viability (e.g. Quinn and Hastings 1987) has been applied to many species in Florida (Cox et al. 1994). This suggests that 10 distinct subpopulation of 200 individuals should be sufficient for survival of at least one subpopulation over 10 generations/100 years. Though again, these were intended to represent minimum-viability estimates for genetic fitness.

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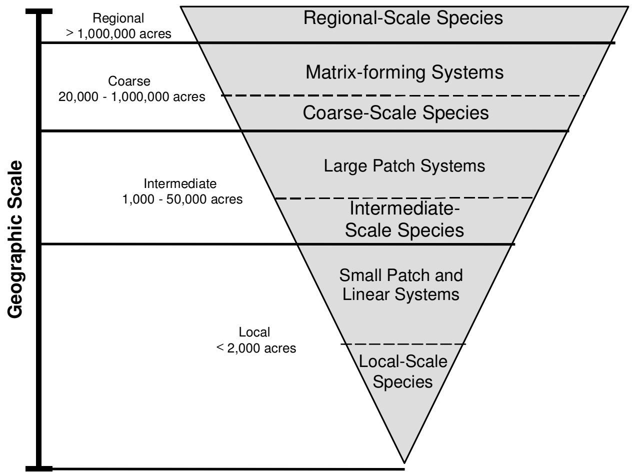
[1] See Appendix 1 for explanation of NatureServe global ranks



> Guidelines for determining the conservation status of species have been established by NatureServe and Natural Heritage Network (Master et al. 2002), and by the IUCN (Mace et al. 1994). We can appropriately look to these published guidelines to inform our conservation objective setting. After all, our conservation goals state directly that we intend to either improve or maintain the conservation status of targeted elements. These criteria include factors such as total population size, number of sub-populations or occurrences, condition/occurrence viability, range extent, trends, threats (severity, scope, and immediacy), intrinsic vulnerability, environmental specificity, and current levels of protection. Both the NatureServe and IUCN systems definere "vulnerable" conservation status for species. Our Conservation Goals are to move species beyond "vulnerable" status. We want our coarse filter to prevent new species from becoming "vulnerable." So for example, in general terms, a given community type or species is ranked G3 ("Vulnerable") by NatureServe when it is known from 21 – 80 occurrences, or (for species) 2,500 – 10,000 individuals, measurable declines <10% over 10 years or 3 generations, and many (>40) occurrences under protective management across its known range.

> These numbers of occurrences could form the basis for describing three distinct levels that depict "high risk" "moderate risk" and "low risk" scenarios for many elements; i.e. with low numerical objectives representing "high-risk" scenarios for conserving biodiversity, and higher numerical objectives representing "low-risk" scenarios.

"Fine-Filter" Objectives

Table 1 provides a summary of initial objectives for targeted species and species assemblages. Again, this could be used as a starting point when element-specific information is lacking. Here, elements are grouped according to distribution relative to the ecoregion. Numbers decrease as endemism decreases, in rough proportion to the ecoregion's share of the global distribution. Within-ecoregion stratification is implied here with some degree of replication (>1 occurrence) in each stratification unit (*re: Section/EDU*) throughout its natural distribution in the ecoregion.

Table 1. Initial Conservation Objectives for Targeted Species and Species Assemblages, expressed as three levels for developing "High Risk" "Moderate Risk" and "Low Risk" conservation scenarios.

Distribution	"High Risk" Scenario	"Moderate Risk" Scenario	"Low Risk" Scenario
	Number of Occurrences		
Endemic	25	50	80
Limited	13	25	40
Disjunct	7	13	20
Widespread	7	13	20
Peripheral	3	7	10

These estimates form a practical starting point for scenario building. Experience suggests that the number of available occurrences for many species elements will be a limiting factor in fleshing out scenarios that are based on these numbers.

"Coarse-Filter" Objectives

Conservation objectives for ecological systems and communities should also take into account the element's distribution relative to the ecoregion, as well as differences in their typical spatial pattern. Coarse-filter objectives are commonly expressed as areal extent. Areal measures have been commonly applied to conservation objective-setting at national scales using theory from island biogeography (MacArthur and Wilson 1967, Wilcox 1992) and working hypotheses on the role of species diversity in ecosystem function (e.g. see Hart et al. 2001). A well-established (albeit quite general) relationship exists between habitat area and the number of species that an area can support (e.g. Wilcox 1992). Loss of habitat tends, over time, to result in the loss of species within an approximate range. This relationship formed the basis for international objectives (12% of country area) set by IUCN for member countries (WCED 1987). However, one could argue that the objectives set by IUCN were far too low. For instance, it is estimated that with an 88% decrease in habitat extent (e.g., conservation objective = 12%), one could expect a decrease over time of 27-50% of species supported by the habitat (Wilcox 1992). This idea is graphically represented below and was adapted from Cincotta and Engleman (2000) (Figure 2).

IUCN objectives were also expressed in terms of extent for an entire country. Our conservation objectives should be stated for each targeted element, and establish some historic context wherever possible, by expressing the desired extent as a percentage of estimated area *circa* e.g. 1850, or the time period immediately prior to wide-spread European-American settlement of a given ecoregion. Ecosystems are dynamic, changing at varying rates, with short-term cycles, and long-term trajectories. However, in many places, short-term cycles *and* long-term trajectories have been abruptly altered through human land use, and have had obvious impact on native biodiversity (Wilson 1992). Our task is to understand natural dynamics, then evaluate our alterations and mitigate their effects. For example, in the Utah High Plateaus, fire, water diversion, and hunting historically supported Native American cultures over millennia, but the most rapid change to the upland matrix of this ecoregion has been through mine-related wildfire, logging, intensive grazing, road construction, fire suppression, and urbanization. The 1850 time period marks the beginning of rapid and transforming, human/technology-driven changes to ecosystems, but is recent enough to reflect vegetation patterns under modern climatic conditions. It therefore, provides a useful and important reference point.

Establishing an estimate of historic extent for ecological systems is no simple task. In some highly altered ecoregions, it is nearly impossible. However, for purposes of establishing numerical conservation objectives, a reasonable approximation will suffice. Historic extent for linear riparian systems can be modeled using riverine ecological systems and Ecological Land Units. For most other terrestrial ecological systems, percent change for each system type can be estimated within 10% intervals using current land use/land cover data, as well as specific studies. We can then add (or subtract) area from the current mapped extent to approximate extent *circa* 1850. Where change was estimated to be less than 10%, current extent can be used.

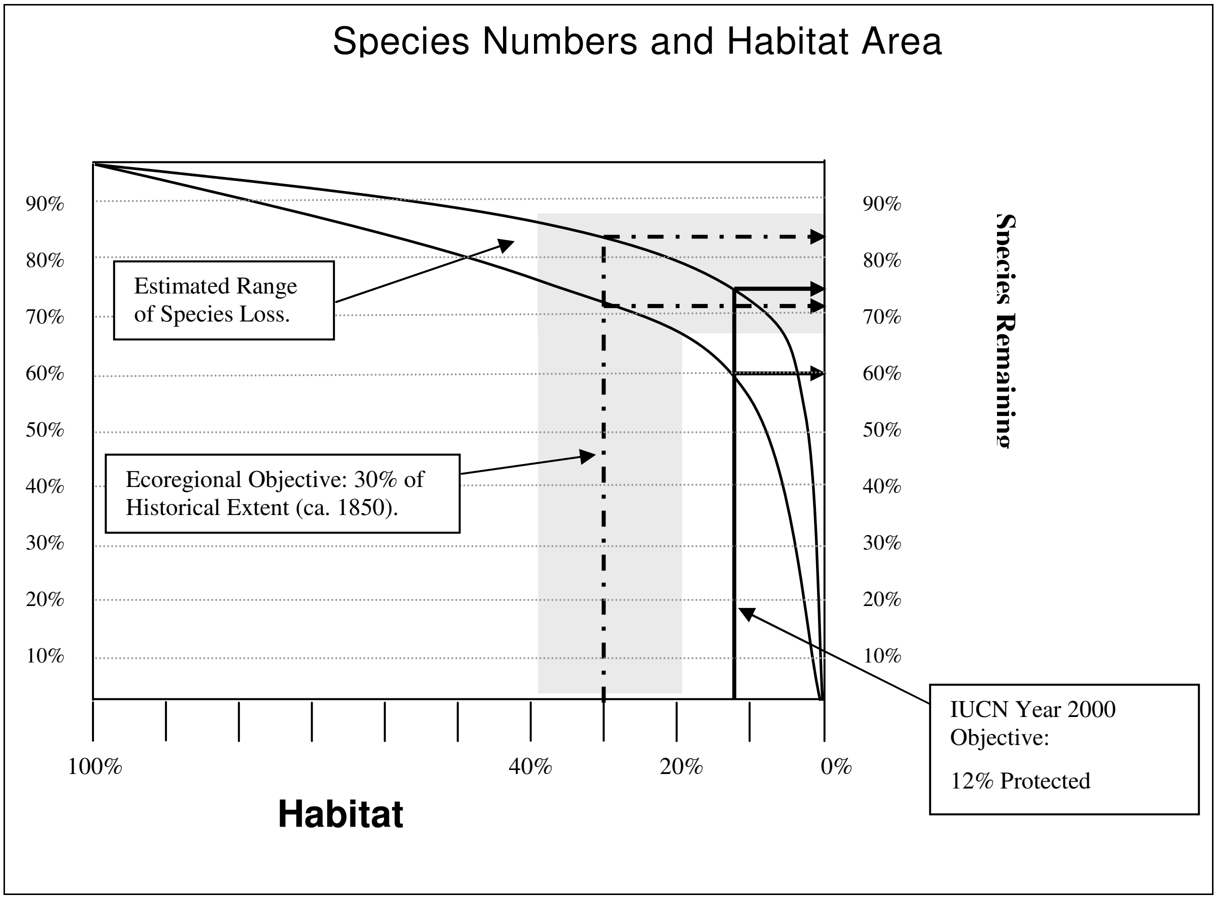


Figure 2: Estimated species loss with percent area of habitat loss over time (modified from Dobson 1996).

In addition to a goal for areal extent, all ecological systems should be represented proportionally across major biophysical gradients. Representation of major biophysical gradients helps to ensure that each regional scenario represents native ecosystem diversity while providing a hedge against a changing climate. This can be accomplished in two ways. First, as mentioned earlier, all systems should be represented in each of the ecoregional *Sections/EDUs* of their natural distribution. Second, for large patch, linear, and matrix forming systems that can be reliably mapped, they should be represented in combination with Ecological Land Units and aquatic macrohabitats to help represent ecological variability and gradients. The portfolio design software (SITES) can be programmed to apply percent objectives to vegetation/ELU and river system/macrohabitat combinations; ensuring that the major biophysical gradients of each system would be represented in proportion to their occurrence for the ecoregion as a whole.

In order to establish an initial percent area goal, we should consider the species/area relationship (Figure 2) and proportional representation of biophysical gradients. In addition to this, we should consider the fact that several hundred of the most vulnerable and sensitive species are targeted either individually, or in rare communities. In many ecoregions, we have selected an initial objective of 30% of historic extent (as estimated *circa* 1850) for each system in the ecoregion. This percentage, on its own, would suggest that we could lose between 15% and 35% of native species (Figure 2). But given the other targets and considerations, this 30% goal is an adequate point of departure. This should also be a reasonable "middle point" for developing three distinct scenarios; from " 20% = High Risk" to "30% = Moderate Risk" to "40% = Low Risk" scenarios.

Table 2 provides a summary of recommended initial conservation objectives for coarse-filter elements. As noted, conservation objectives for many "patch-forming" elements are expressed as a number of occurrences. These objectives draw on similar assumptions and numerical estimates used above for fine-filter elements as well as those described by Anderson et al. (1999). Again, as with fine-filter elements, Section/EDU scale stratification is implied in these numbers for the entire ecoregion. In addition to these numerical estimates, biophysical models should be used to "represent major biophysical variability and gradients" as described earlier.

Table 2. Initial Conservation Objectives for Ecological-System and Rare-Community Elements, expressed as three levels for developing “High Risk” “Moderate Risk” and “Low Risk” conservation scenarios.

Distribution Relative to Ecoregion	**Spatial Pattern of Occurrence**					
	Matrix, Large Patch and Linear **Ecological Systems**			**Small Patch Ecological Systems and All Rare Communities**		
	Area or Length, per Section **or Ecological Drainage Unit**			**Number of Occurrences**		
	“High Risk” Scenario	**“Moderate Risk” Scenario**	**“Low Risk” Scenario**	**“High Risk” Scenario**	**“Moderate Risk” Scenario**	**“Low Risk” Scenario**
Endemic	**20%**	**30%**	**40%**	25	50	80
Limited				13	25	40
Widespread				7	13	20
Peripheral				3	7	10

Conclusions

For the Utah High Plateaus Ecoregional Assessment, we hope to provide an initial synthesis of biodiversity and conservation information that will inform subsequent management and land use planning. We plan to develop several distinct land management scenarios utilizing both “goal-based” biodiversity representation and socioeconomic/land use options. Here I outline background and numerical objectives for the “goal-based” approach to generating regional scenarios. Three distinct levels of biodiversity representation are presented for species, rare communities, and ecological system targets. These distinct levels allow us to express a range of societal risk and scientific uncertainty, forming the basis for distinct land management scenarios.

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Appendix 1. NATURAL HERITAGE NETWORK GLOBAL CONSERVATION STATUS DEFINITIONS

The Global (G) Conservation Status (Rank) of a species or ecological community is based on the *range-wide* status of that species or community. The rank is regularly reviewed and updated by experts, and takes into account such factors as number and quality/condition of occurrences, population size, range of distribution, population trends, protection status, and fragility. The definitions of these ranks, which are not to be interpreted as legal designations, are as follows:

GX	**Presumed Extinct**: Not located despite intensive searches and virtually no likelihood of rediscovery
GH	**Possibly Extinct**: Missing; known only from historical occurrences but still some hope of rediscovery
G1	**Critically Imperiled**: At high risk of extinction due to extreme rarity (often 5 or fewer occurrences), very steep declines, or other factors.
G2	**Imperiled**: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	**Vulnerable**: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4	**Apparently Secure**: Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	**Secure**: Common; widespread and abundant.

G(#)**T**(#): Trinomial (T) rank applies to subspecies or varieties; these taxa are T-ranked using the same definitions as the G-ranks above.

Variant Global Ranks

G#G#	**Range Rank**: A numeric range rank (e.g., G2G3) is used to indicate uncertainty about the exact status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
GU	**Unrankable**: Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible, the most likely rank is assigned and the question mark qualifier is added (e.g., G2?) to express uncertainty, or a range rank (e.g., G2G3) is used to delineate the limits (range) of uncertainty.
GNR	**Not ranked**: Global rank not assessed.

Rank Qualifiers

?	**Inexact Numeric Rank**: Denotes inexact numeric rank.
Q	**Questionable taxonomy that may reduce conservation priority**: Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank.

APPENDIX 20 – REFERENCES

Appendix 20 – References

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24b. Numerical Index of Freshwater Priority Conservation Areas

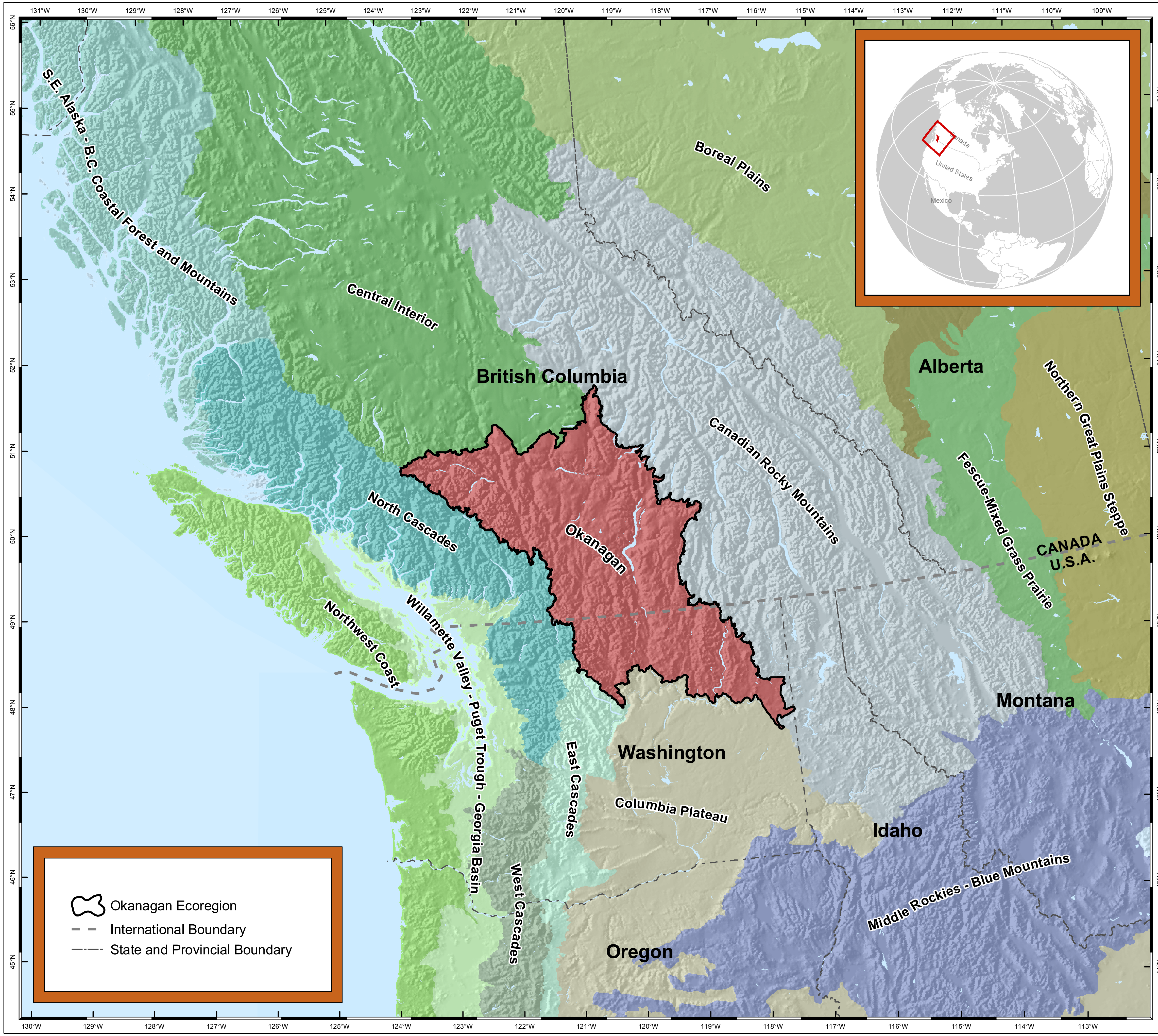
25. Protected Lands and Freshwater Priority Conservation Areas
26. Combined Portfolio
27. Terrestrial Priority Conservation Areas by Relative Importance

27a. Terrestrial Priority Conservation Areas by Relative Importance

28. Freshwater Priority Conservation Areas by Relative Importance

28a. Freshwater Priority Conservation Areas by Relative Importance

29. Comparative Analysis: Grizzly Bear
30. Comparative Analysis: British Columbia Grasslands



OKANAGAN ECOREGION:

Map 1. Ecoregions of the Pacific Northwest - Southern British Columbia

The boundary utilized for the Okanagan Ecoregional Assessment corresponds very closely with the British Columbia Ecoregion Classification system's delineation of the Southern Interior Ecoprovince (SIR) (Demarchi, 1996). The boundary for the SIR was extended into Washington State as part of the Shining Mountains Project, which was developed by the provincial government with numerous federal, provincial and state government, academic, and First Nations/tribal partners in British Columbia, Alberta, Yukon, Alaska, Washington, Idaho, and Montana in the 1990s. The purpose of the Shining Mountains Project was to determine the extent and distribution of regional and zonal ecosystems which British Columbia shared with its neighboring jurisdictions (MSRM, 2005). In Washington, the boundary also corresponds with The Nature Conservancy's (TNC) ecoregion framework based on Bailey's (1994) ecoregion map for the United States. Ecoregions are large areas of land or water defined by their distinct climate, geology, and native species.

Scale 1:5,000,000

0 25 50 100 Miles

0 35 70 140 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area

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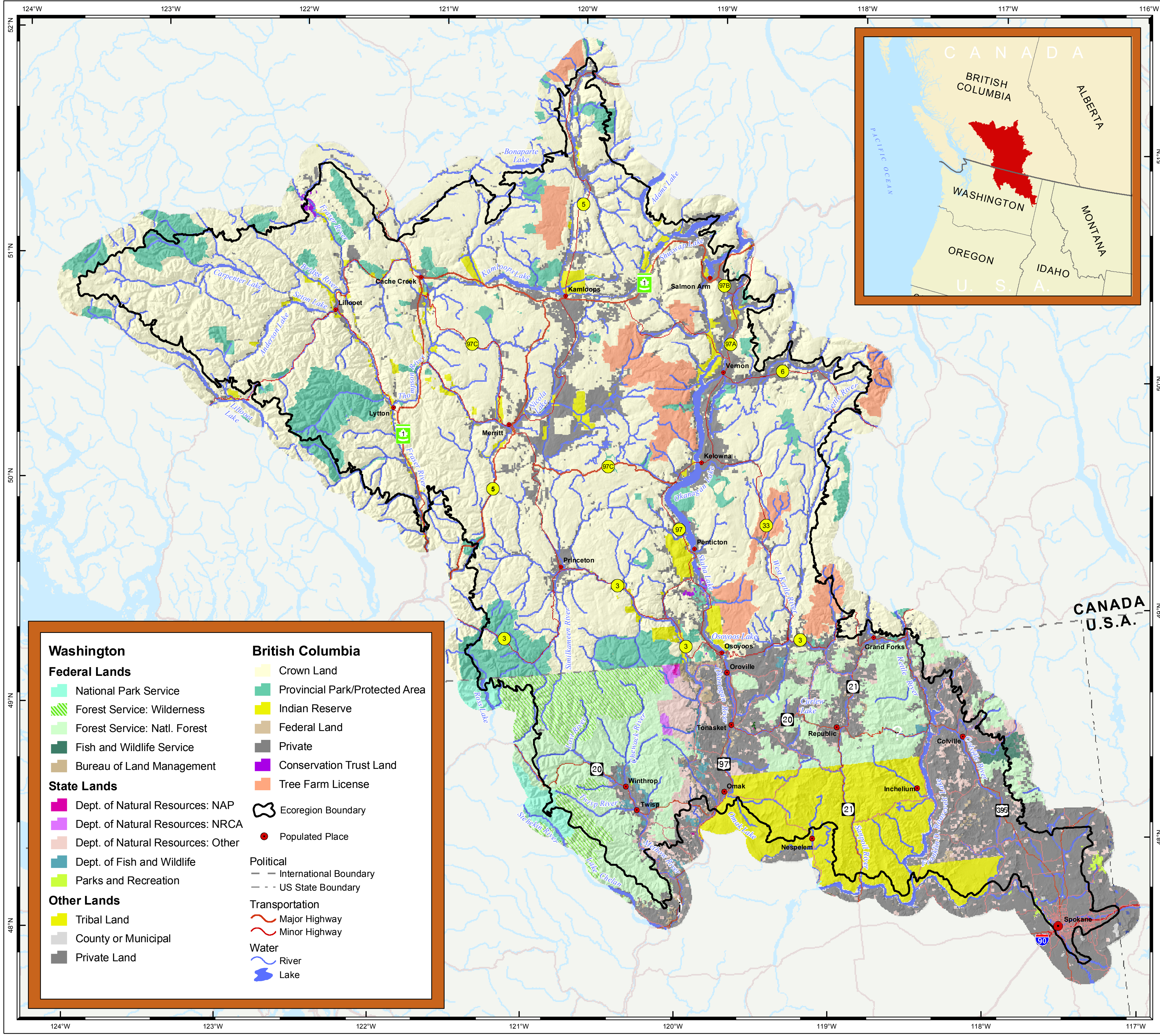

OKANAGAN ECOREGION:

Map 2. Land Ownership and Management

The Okanagan Ecoregion spans 9,605,000 ha (23,724,350 ac) with about 69% in British Columbia and 31% in Washington State. Land ownership and management patterns vary greatly across British Columbia and Washington, creating a wide variety of policies and practices which impact biodiversity conservation to varying degrees.

Managed Land - Washington		Percent of Ecoregion
Federal Lands	Forest Service: National Forest	7.3%
	Forest Service: Wilderness	2.6%
	National Park Service	0.5%
	Bureau of Land Management	0.4%
	Other	0.4%
	Fish and Wildlife Service	0.2%
State Lands	DNR: Other	1.9%
	Department of Fish and Wildlife	0.3%
	DNR: NRCA	0.1%
	Parks and Recreation	0.1%
	DNR: NAP	<0.1%
Other Lands	Private Land	11.2%
	Tribal Land	5.9%
	County or Municipal	<0.1%
Managed Land - British Columbia		
	Provincial Crown Land	49.9%
	Private Land	7.4%
	Provincial Park / Protected Area	6.5%
	Tree Farm License (Crown & Private)	3.4%
	Indian Reserve	1.7%
	Federal Land	0.11%
	Conservation Trust Land	<0.1%

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

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Washington Chapter
October 2006

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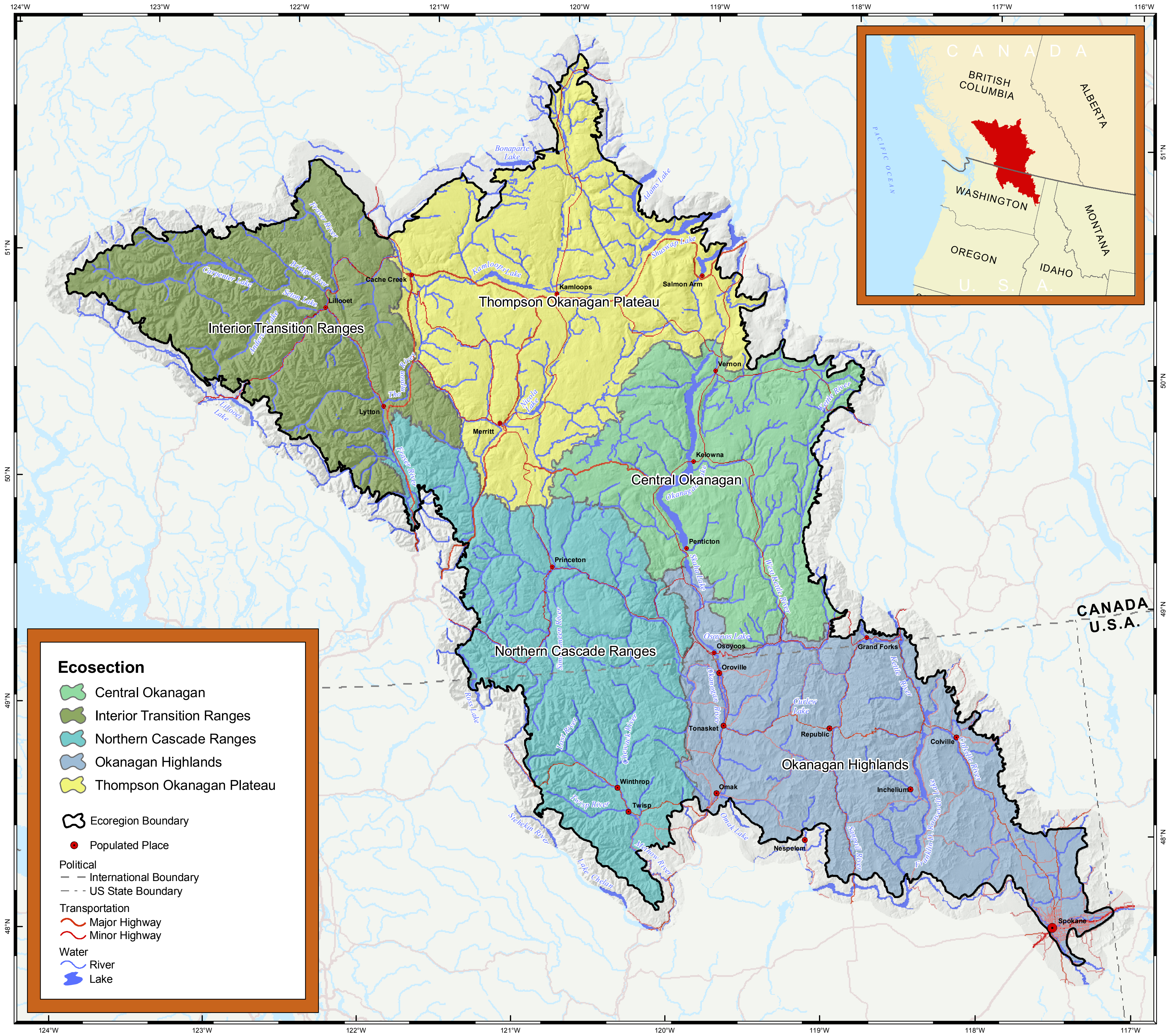

OKANAGAN ECOREGION:

Map 3. Terrestrial Ecosections

The Okanagan Ecoregion is divided into 5 sections that roughly match the British Columbia Ecoregion Classification's ecoregion-level delineation in the Shining Mountains Project, with the exception of the Thompson Okanagan Plateau which was split into two sections. In the context of the British Columbia classification system, the term "ecoregion" applies to a lower level of ecological system classification than how it is being applied in this ecoregional assessment context. The term ecoregion is roughly equivalent to the BC classification's ecoprovince level of classification. In the BC classification, ecoprovinces are areas with consistent climatic relief and regional landforms, and ecoregions are areas with major physiographic and minor macroclimatic variation. The Okanagan Ecoregion falls within the Dry Ecodomain which is an extension of the dry climate regime which extends up from the interior of northern Mexico and the northwestern United States. The two most commonly recognized climates are arid desert and semiarid steppe.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
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WA Dept. of Fish and Wildlife,
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USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area

OKANAGAN ECOREGION:

Map 4. Ecological Drainage Units of the Pacific Northwest - Southern British Columbia

Ecological drainage units (EDUs) are comprised of river ecosystems that share a common zoogeographic history and therefore likely have a distinct set of freshwater assemblages and habitats. This map illustrates all ecological drainage units within the Pacific Northwest of North America.

Scale 1:4,000,000

0 20 40 80 Miles

0 25 50 100 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
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USGS, ESRI

The Nature Conservancy
Washington Chapter
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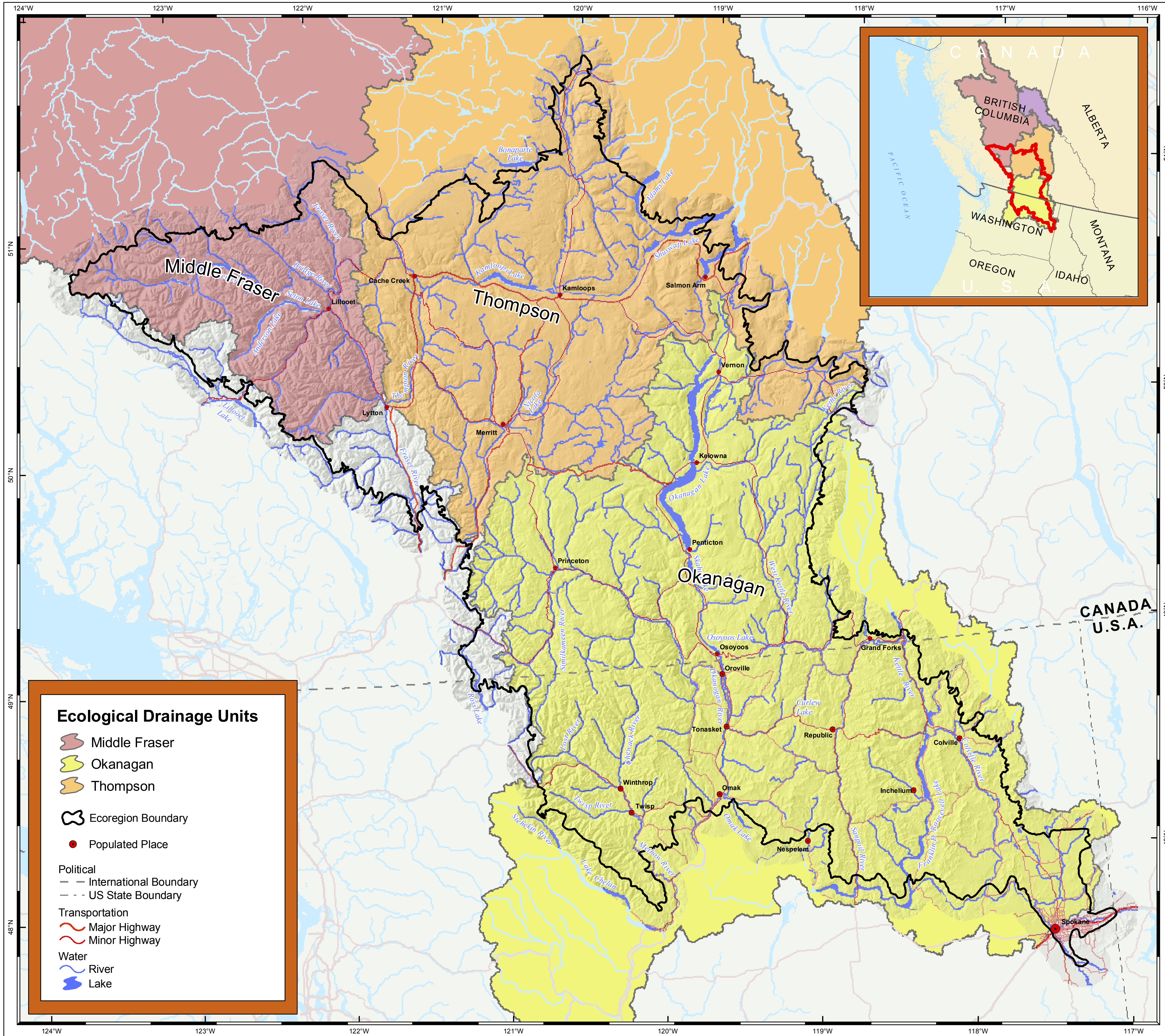

OKANAGAN ECOREGION:

Map 5. Ecological Drainage Units of the Okanagan Ecoregion

Ecological drainage units (EDUs) are comprised of river ecosystems that share a common zoogeographic history and therefore likely have a distinct set of freshwater assemblages and habitats. The assessment of freshwater biodiversity for the Okanagan Ecoregion was conducted at the full extent of the Okanagan, Thompson, Middle Fraser, and Upper Fraser EDUs. The Upper Fraser EDU does not overlap with the Okanagan Ecoregion, but from a freshwater assessment perspective, it needed to be included in analysis for the entire Fraser drainage. The Lower Fraser, Fraser Canyon, and Puget Sound EDUs were assessed as part of the North Cascades and Pacific Ranges Ecoregional Assessment.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
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WA Dept. of Natural Resources,
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October 2006

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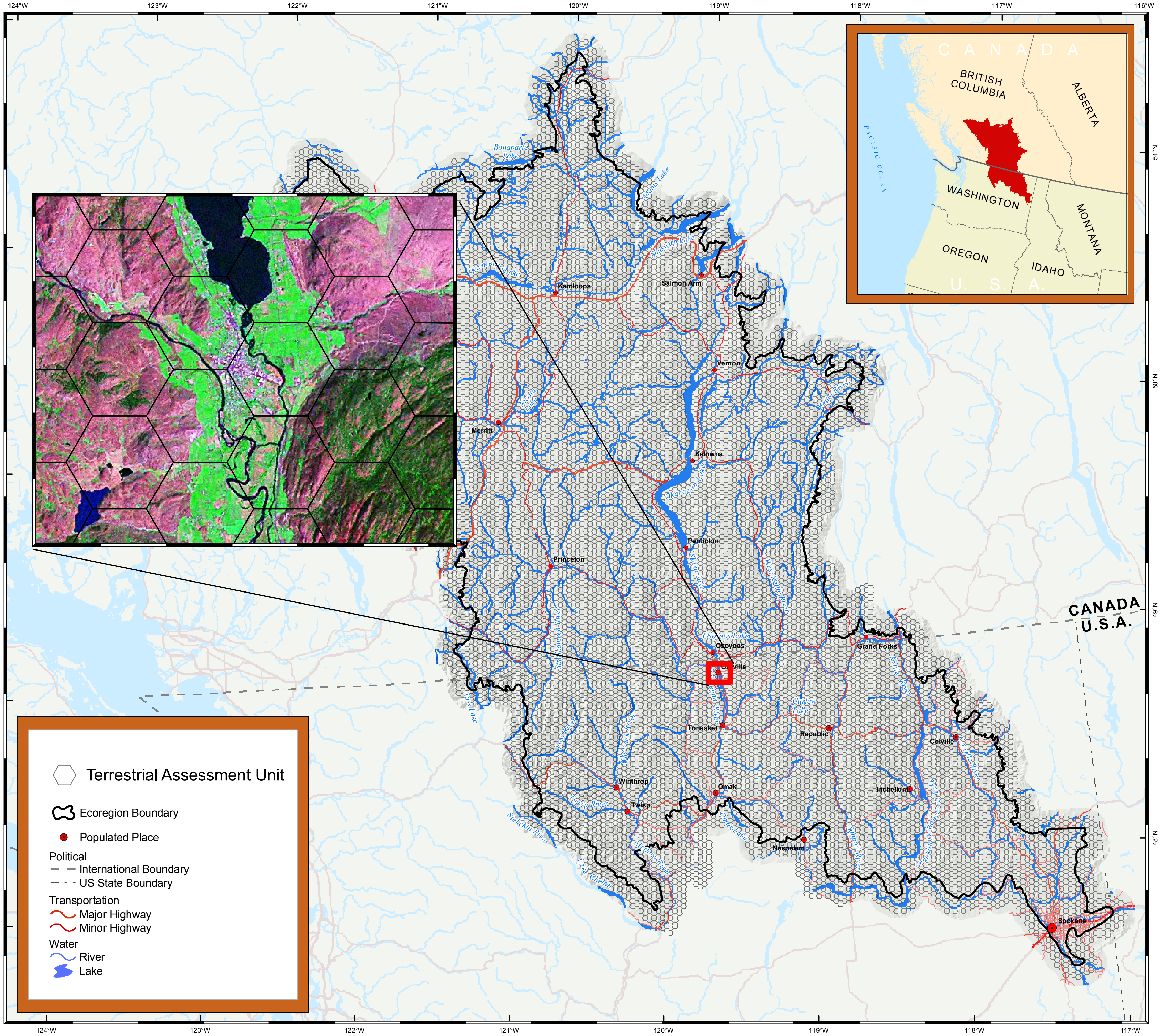

OKANAGAN ECOREGION:

Map 6. Terrestrial Assessment Units

For the terrestrial analysis, 500 ha hexagons were used as the assessment units. Using a consistently sized assessment unit eliminates one variable in the MARXAN algorithm. The rationale for this size was that it was "sufficient for efficiently representing local-scale targets in small functional sites while allowing for aggregation of ecological systems into extensive landscape scale conservation areas" (Neely et al., 2001). The decision to use hexagons required the team to accept the limitations of any analysis unit: 1) the shape does not match the size or shape of many landscape features (e.g., forest tracts, grasslands, wetlands); and 2) that the arbitrary placement of hexagons may split landscape features that might otherwise fit within fewer hexagons.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
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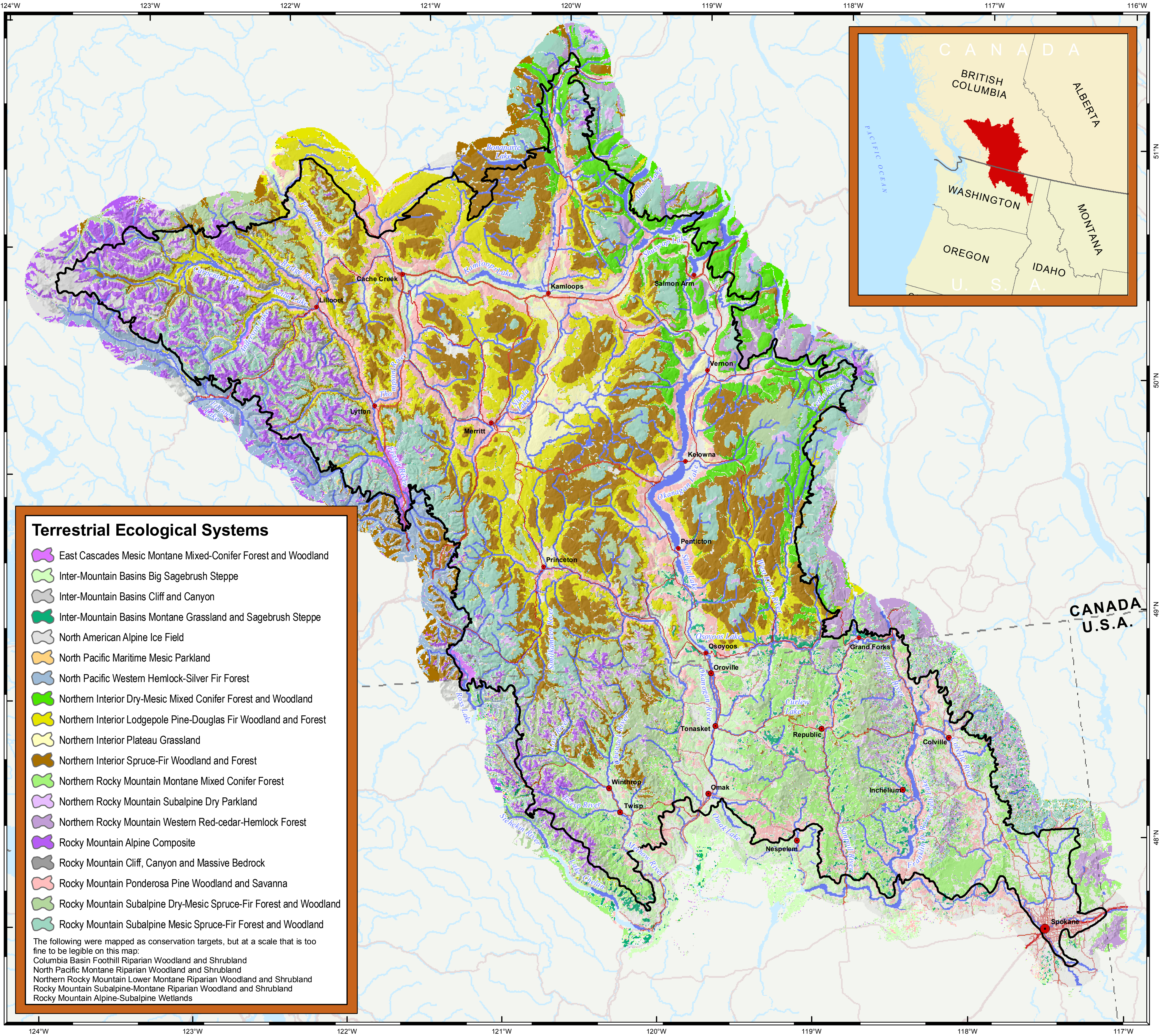

Terrestrial Ecological Systems

- East Cascades Mesic Montane Mixed-Conifer Forest and Woodland
- Inter-Mountain Basins Big Sagebrush Steppe
- Inter-Mountain Basins Cliff and Canyon
- Inter-Mountain Basins Montane Grassland and Sagebrush Steppe
- North American Alpine Ice Field
- North Pacific Maritime Mesic Parkland
- North Pacific Western Hemlock-Silver Fir Forest
- Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland
- Northern Interior Lodgepole Pine-Douglas Fir Woodland and Forest
- Northern Interior Plateau Grassland
- Northern Interior Spruce-Fir Woodland and Forest
- Northern Rocky Mountain Montane Mixed Conifer Forest
- Northern Rocky Mountain Subalpine Dry Parkland
- Northern Rocky Mountain Western Red-cedar-Hemlock Forest
- Rocky Mountain Alpine Composite
- Rocky Mountain Cliff, Canyon and Massive Bedrock
- Rocky Mountain Ponderosa Pine Woodland and Savanna
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

The following were mapped as conservation targets, but at a scale that is too fine to be legible on this map:
Columbia Basin Foothill Riparian Woodland and Shrubland
North Pacific Montane Riparian Woodland and Shrubland
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland
Rocky Mountain Alpine-Subalpine Wetlands

OKANAGAN ECOREGION:

Map 7. Terrestrial Ecological Systems

This map represents the predicted distribution of 19 of the 24 ecological systems, or "coarse-filter" conservation targets, used to guide conservation area selection for the ecoregional assessment. Terrestrial ecological systems are groups of plant community types that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. A variety of landcover datasets, DEM-derived topographic features, and delineated climate zones were combined, along with expert knowledge, as input for this predictive model.

Due to the limitations of the source data, it was not possible to map all of the ecoregion's characteristic systems. Several map units represent an aggregation of several systems. For example, the "Mountain Hemlock Forest" system, while not mapped, is known to occur within the mapped "Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland" system. Similarly, wetlands and avalanche chute systems are known to occur within the mapped matrix-forming systems. Terrestrial ecological systems descriptions are in Appendix 10.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
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The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

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October 2006

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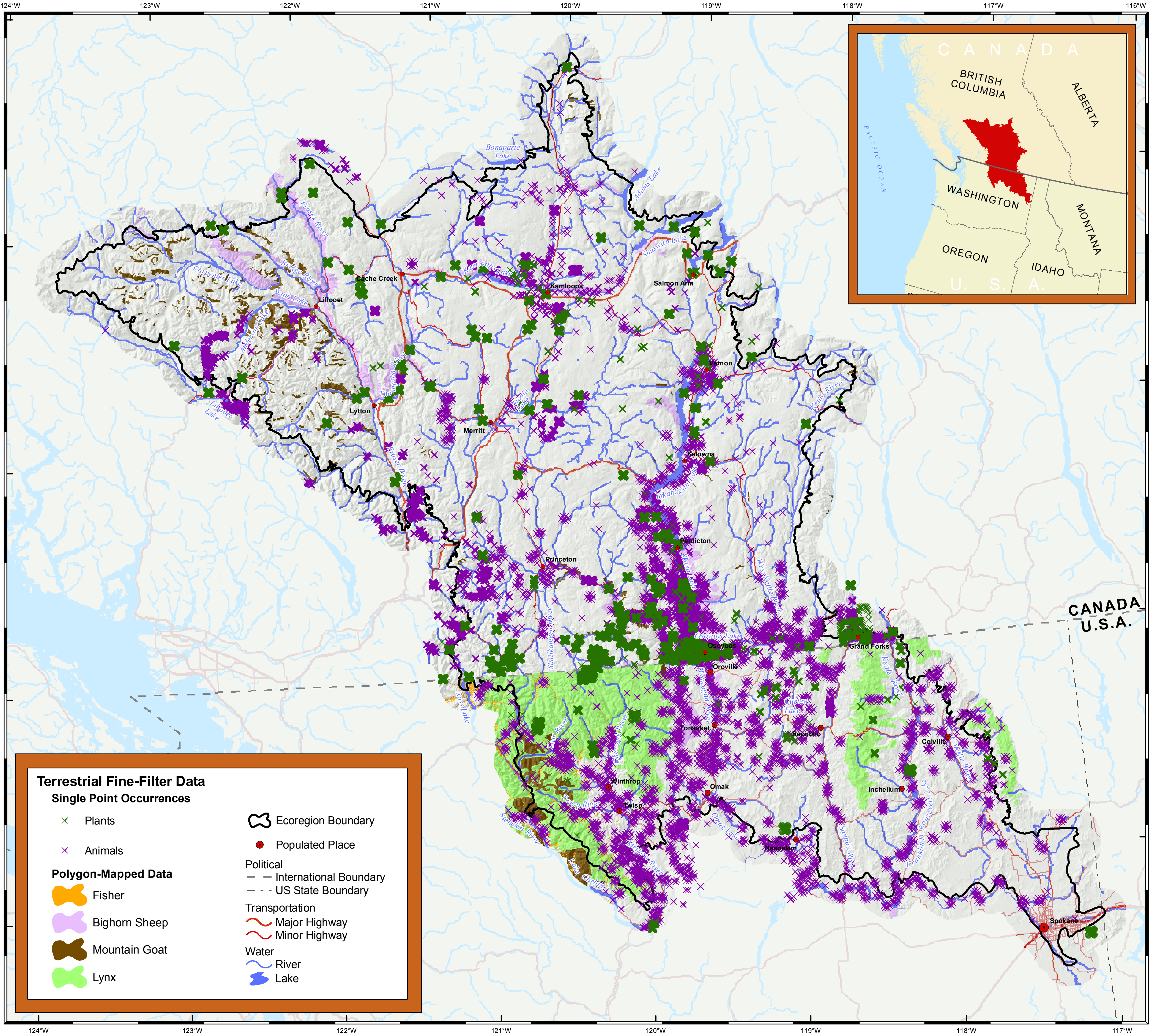

OKANAGAN ECOREGION:

Map 8. Terrestrial Fine-Filter Targets

This map represents the extent of fine-filter target species (i.e., plants and animals) in the Okanagan Ecoregion by illustrating the locations of individuals, sub-populations, or populations. The terrestrial fine-filter data come from a number of sources including natural heritage and conservation data centre programs along with agencies and individuals in British Columbia and Washington (Appendix 4). They have been screened to include the most reliable observations; some data from reliable sources could not be used as it was locationally imprecise. Fine-filter data are used in conjunction with coarse-filter ecosystem data to identify high priority conservation areas (Map 22).

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
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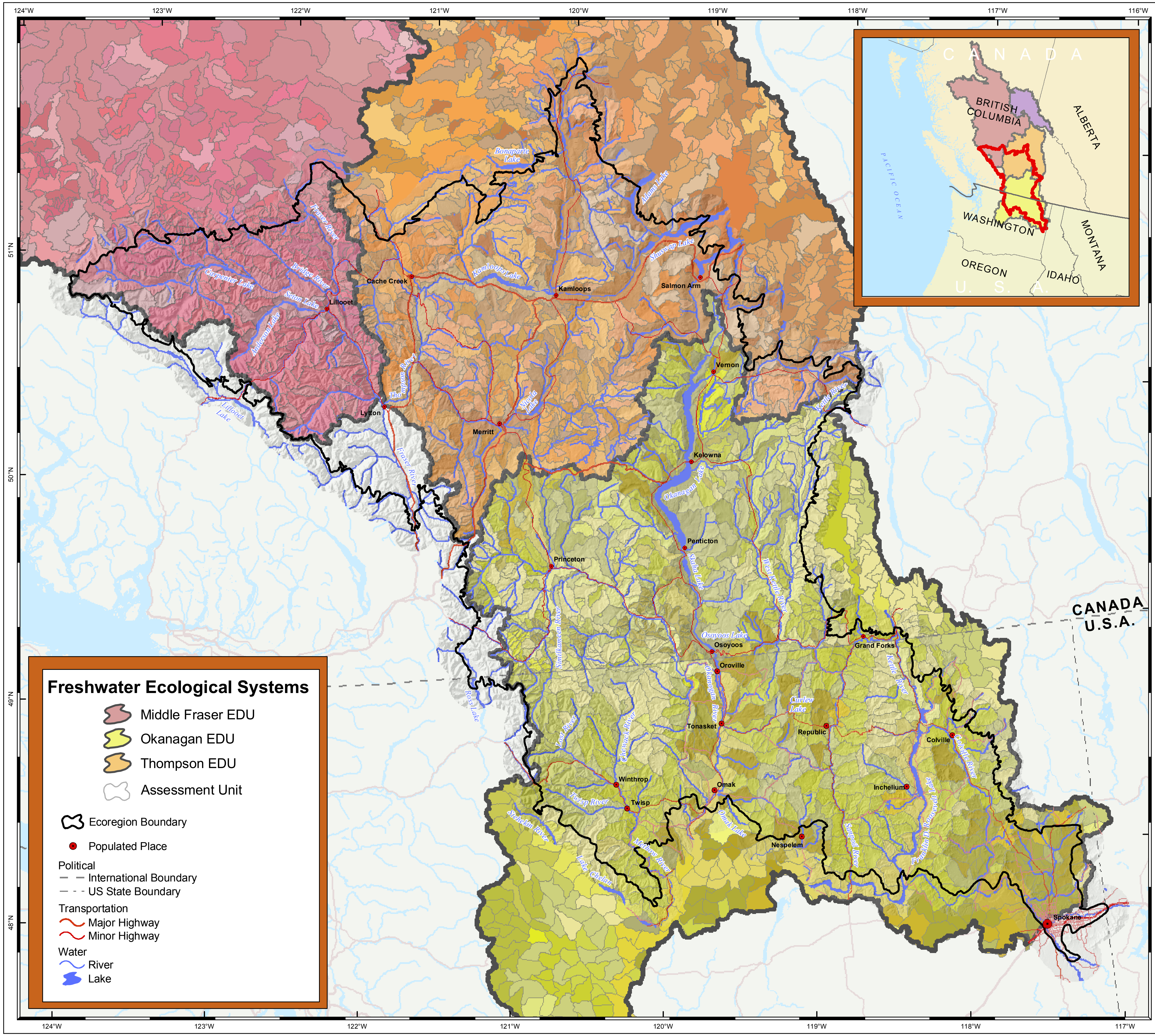

OKANAGAN ECOREGION:

Map 9. Freshwater Ecological Systems

This map represents the distribution of freshwater ecosystems across three of the four ecological drainage units (EDUs) that were part of the Okanagan Ecoregional Assessment. Freshwater ecosystems are nested spatial units that are composed of stream and lake networks that are distinct in geomorphological patterns, tied together by similar ecological characteristics and processes. Freshwater ecosystems are used as "coarse-filter" conservation targets to guide conservation area selection for the freshwater component of the ecoregional assessment. Within an EDU, the different shades of a given color represent distinct freshwater ecological systems; these ecosystems contain the assessment units.

Freshwater assessment units in British Columbia are third order watersheds from BC's watershed atlas. Freshwater assessment units in Washington State are watershed units from the Interior Columbia Basin Ecosystem Management Project.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
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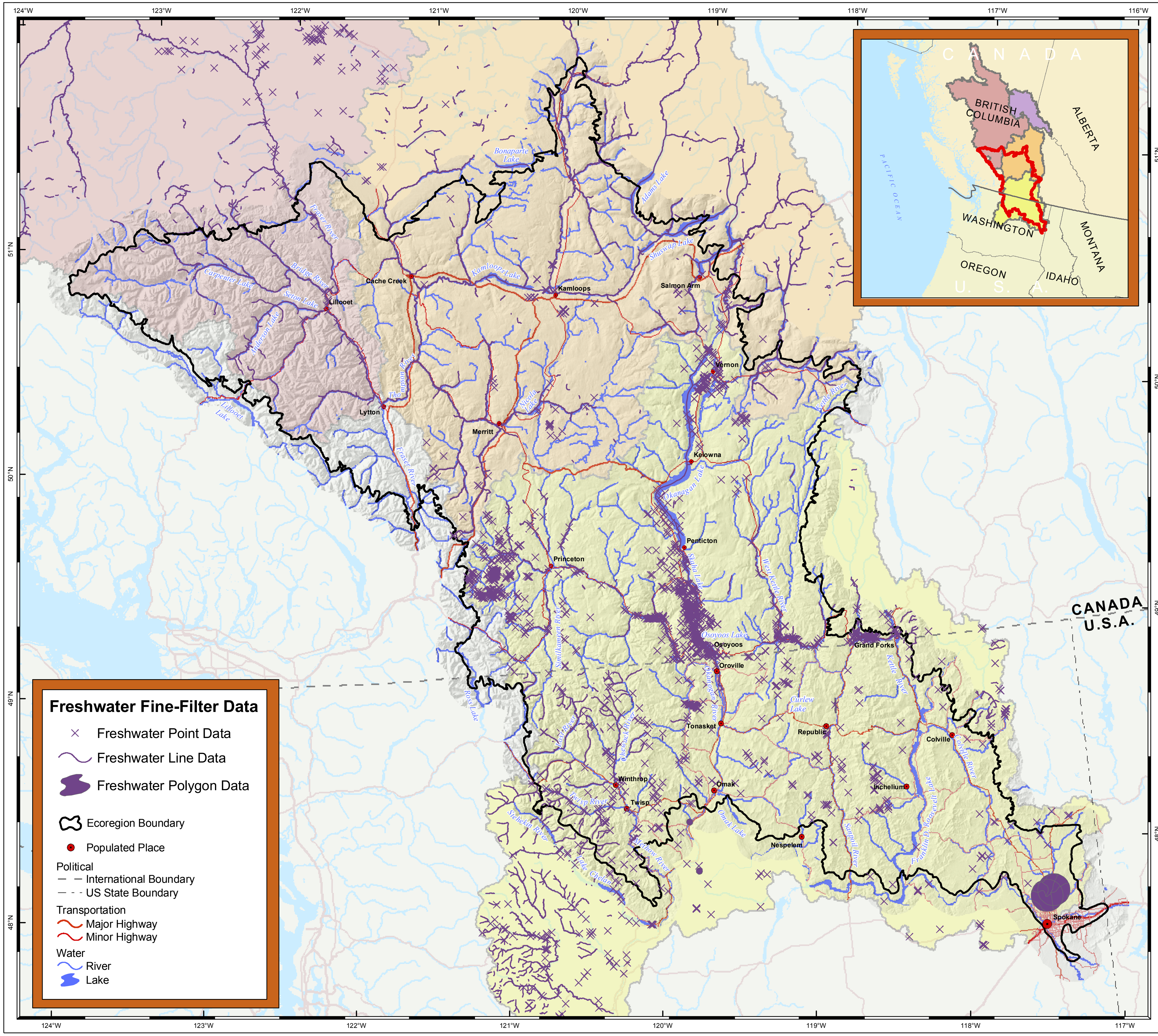

OKANAGAN ECOREGION:

Map 10. Freshwater Fine-Filter Targets

This map represents the distribution of freshwater fine-filter targets across three of the four ecological drainage units (EDUs) that were part of the Okanagan Ecoregional Assessment. While coarse-filter targets capture ecological systems and their functions, fine-filter targets represent rare or vulnerable populations of species or habitats that may not be adequately represented by coarse-filter targets. Targets are generally defined as those species that are currently imperiled, threatened, or endangered; make up species aggregations or groups; or are of special concern due to endemic, disjunct, vulnerable, keystone, or wide-ranging status. These data are used in conjunction with coarse-filter ecosystem data to identify high priority conservation areas (Map 24). Refer to Appendix 4 for information on data sources.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
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WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area

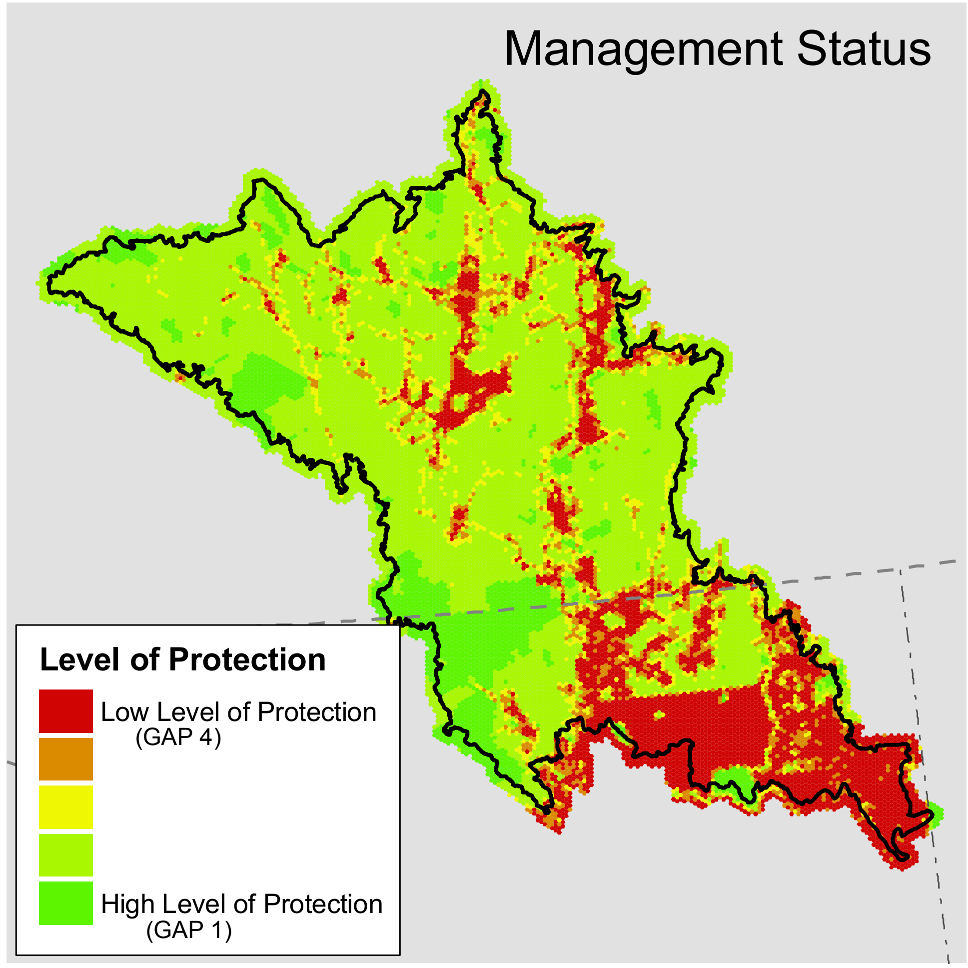
OKANAGAN ECOREGION:

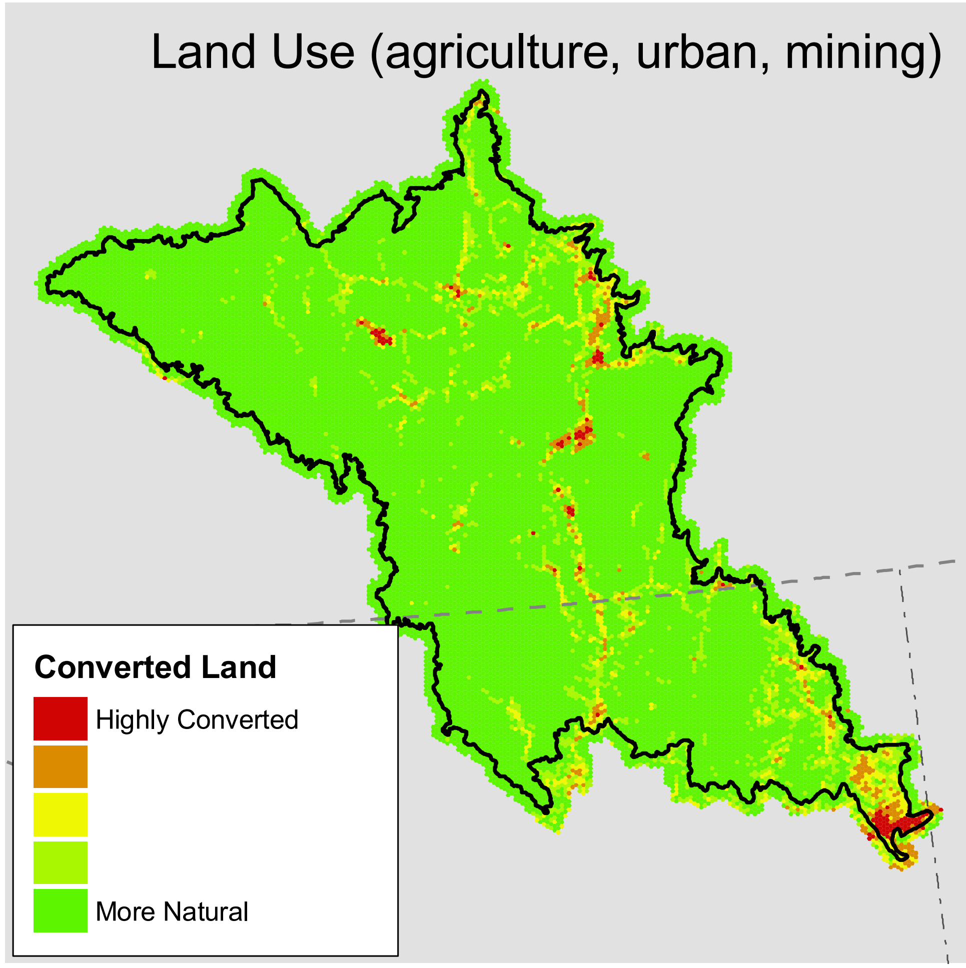
Map 11. Terrestrial Suitability Index Assembly

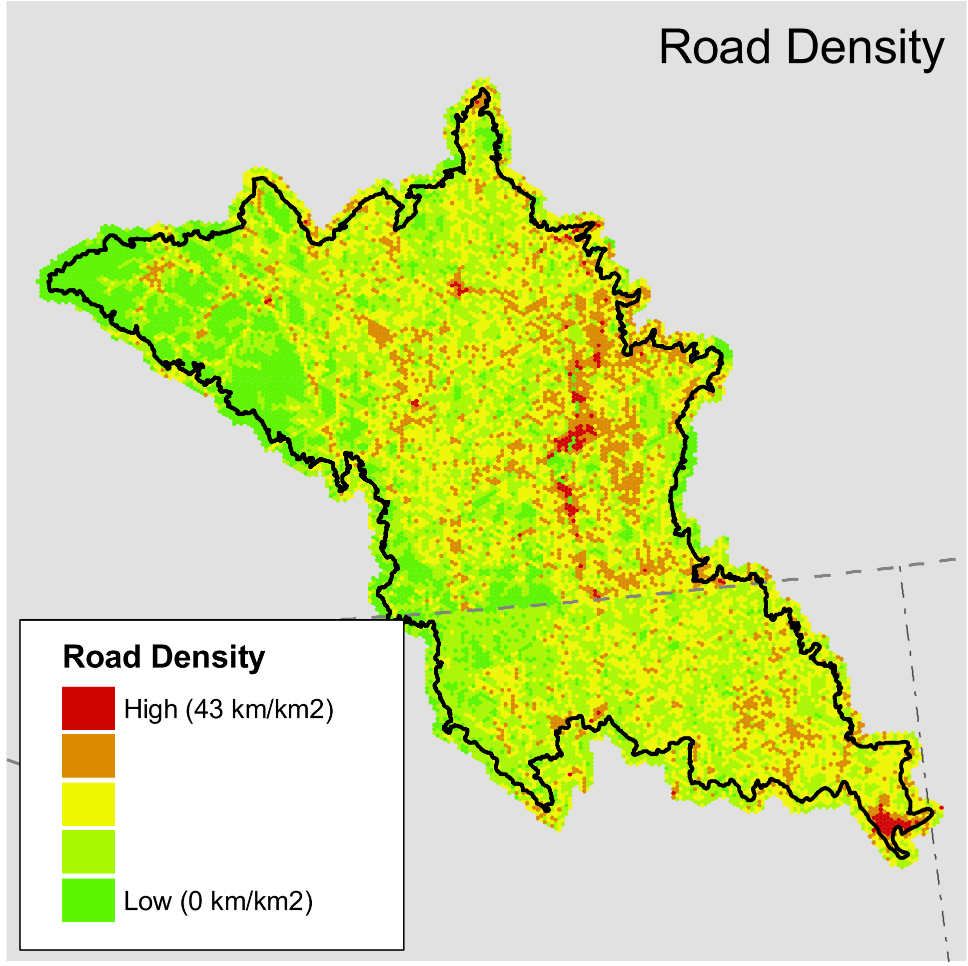
One input to MARXAN's optimal reserve selection process is a quantitative index related to a place's suitability for conservation. "Suitability" can be thought of as the "relative likelihood of successful conservation" at a given place. The suitability index can incorporate both biological and non-biological factors, integrate land use factors for a given geographic area, and is used to help select among analysis units that contain conservation targets.

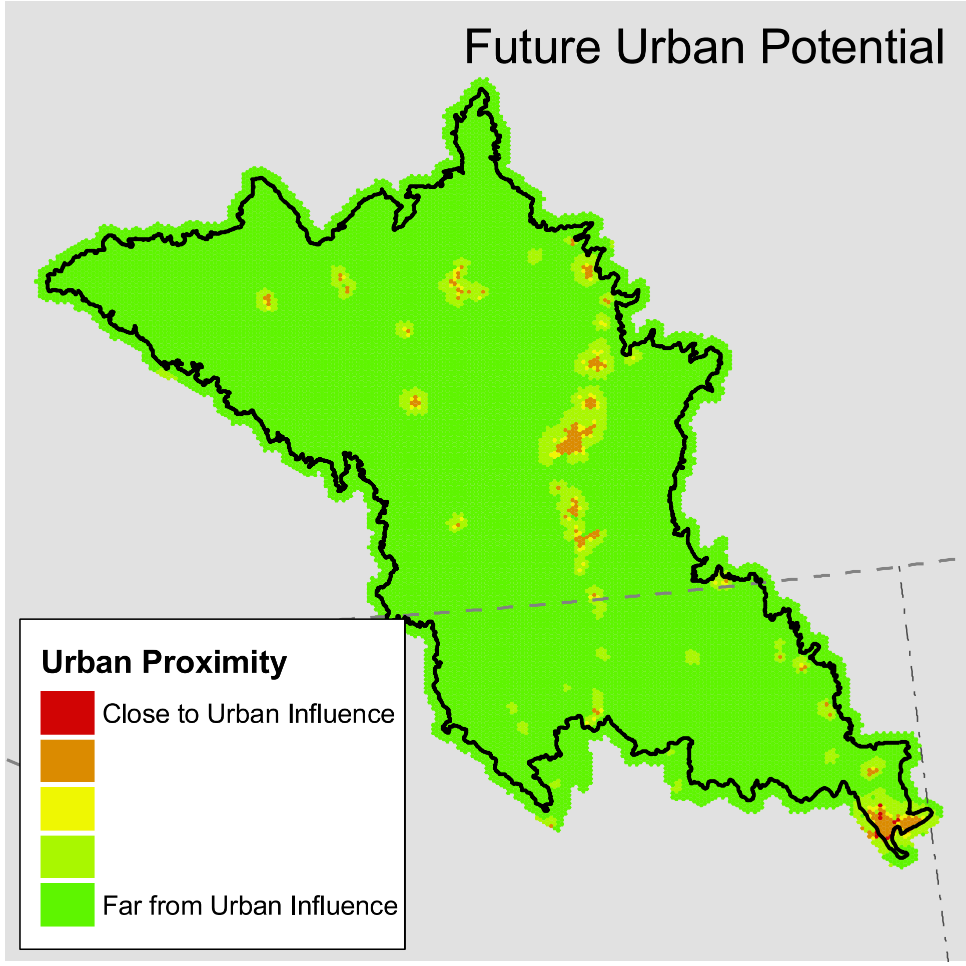
The five factors used in the terrestrial suitability index were management status, land use, road density, future urban potential, and fire condition class. Each factor is defined below:
- Management status: level of protection given to biodiversity; based on all landowners or land managers within the area
- Land use: percent of area converted to urban, agricultural, and mine land uses
- Road density: road km/km2 within area
- Future urban potential: future urban growth potential; based on distance from urban areas
- Fire condition class: the degree of departure from historical fire regimes

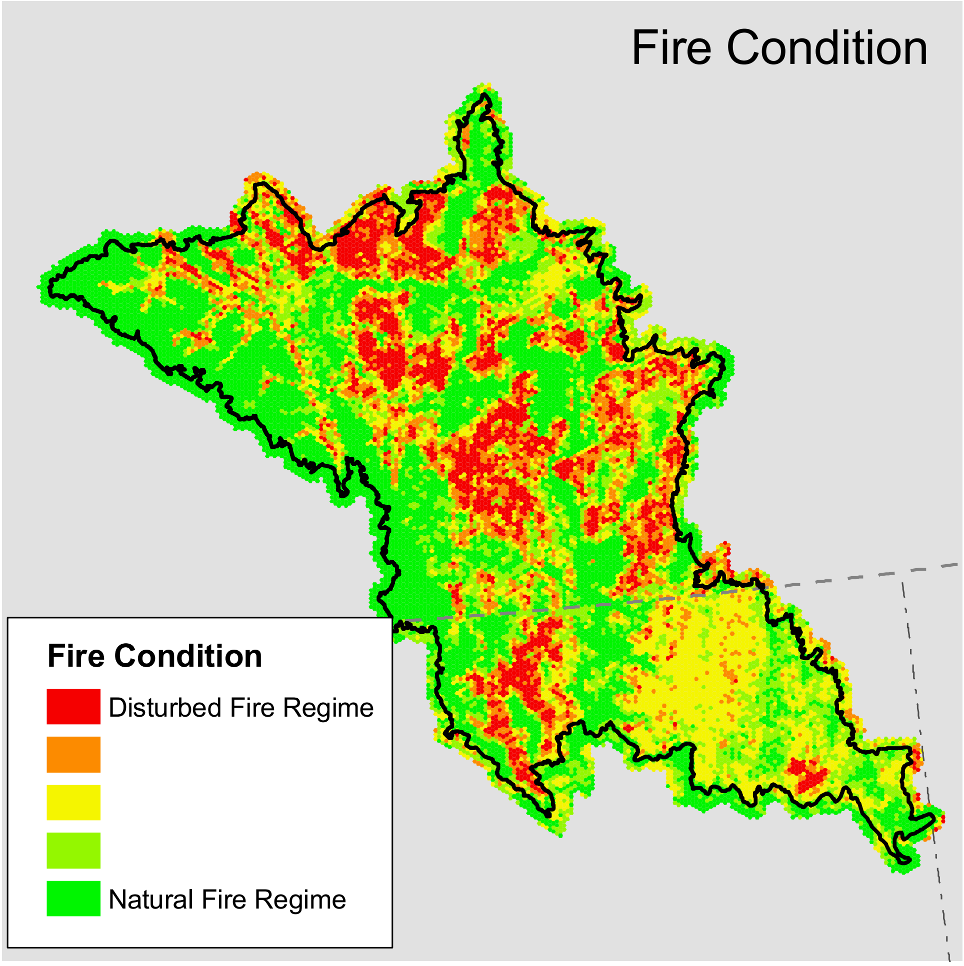
Refer to Appendix 4 for information on data sources. Appendix 13 describes the methods and provides further clarification of the definitions.

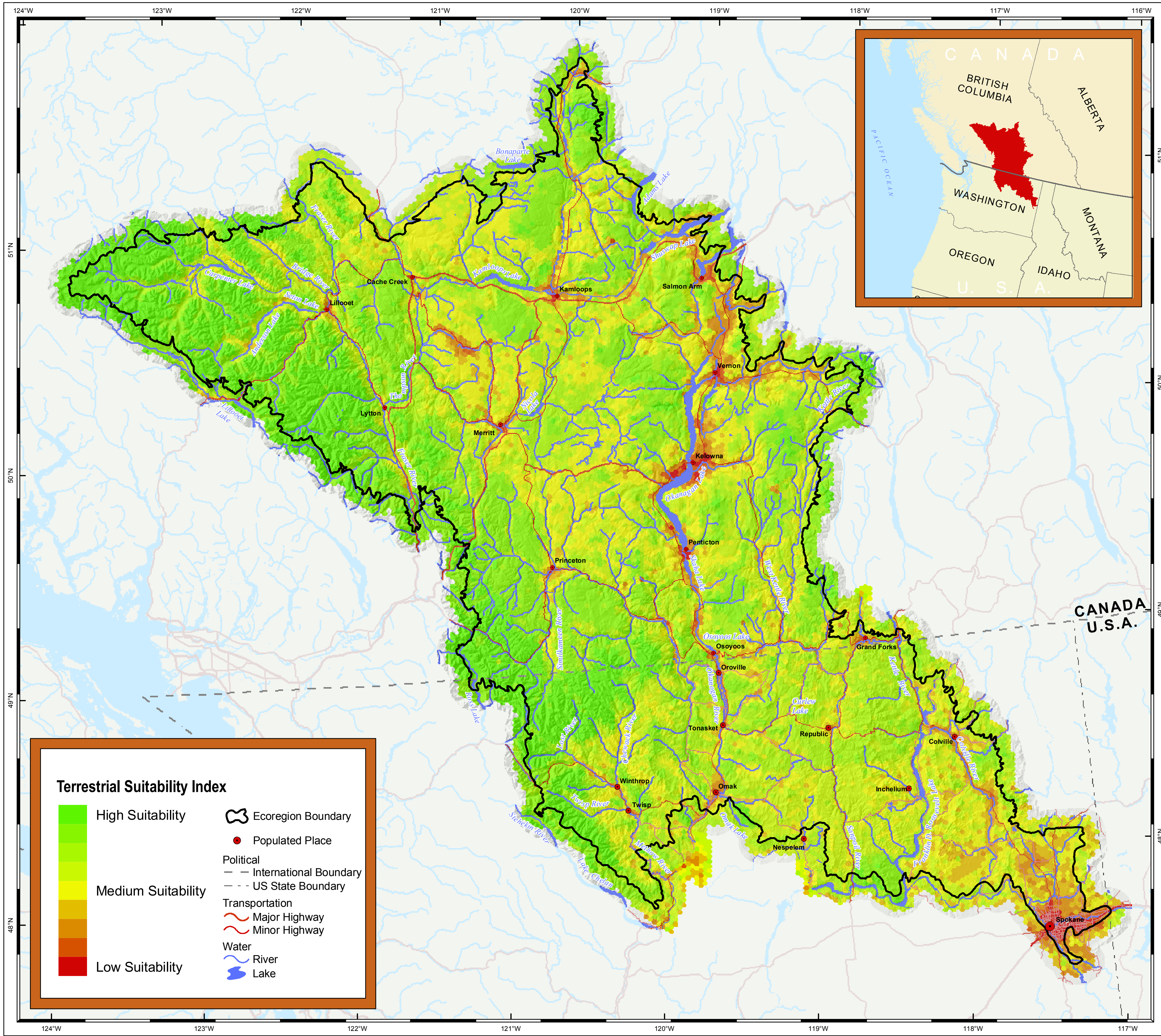












OKANAGAN ECOREGION:

Map 12. Terrestrial Suitability Index

The objective of a suitability index is to promote the MARXAN model to select more intact or viable areas when all other factors were equal, rather than randomly selecting less intact, fragmented, or less viable areas. A suitability index was developed using readily available spatial data sets representative of land use in the Okanagan, and was applied to each 500 ha assessment unit. Factors used included management status, land ownership, road density, amount of native habitat converted to non-native cover types, and a classification of the departure from the natural fire regime.

The values for each factor were determined through expert opinion using the methods of Saaty (1977). Experts were asked to assign relative weights to each of the five factors. We recognize that other variables influence the relative likelihood of successful conservation, but the terms in the index equation are limited to data readily available in GIS. Refer to Appendix 4 for information on data sources. Appendix 13 describes the methods and provides further clarification of the definitions.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
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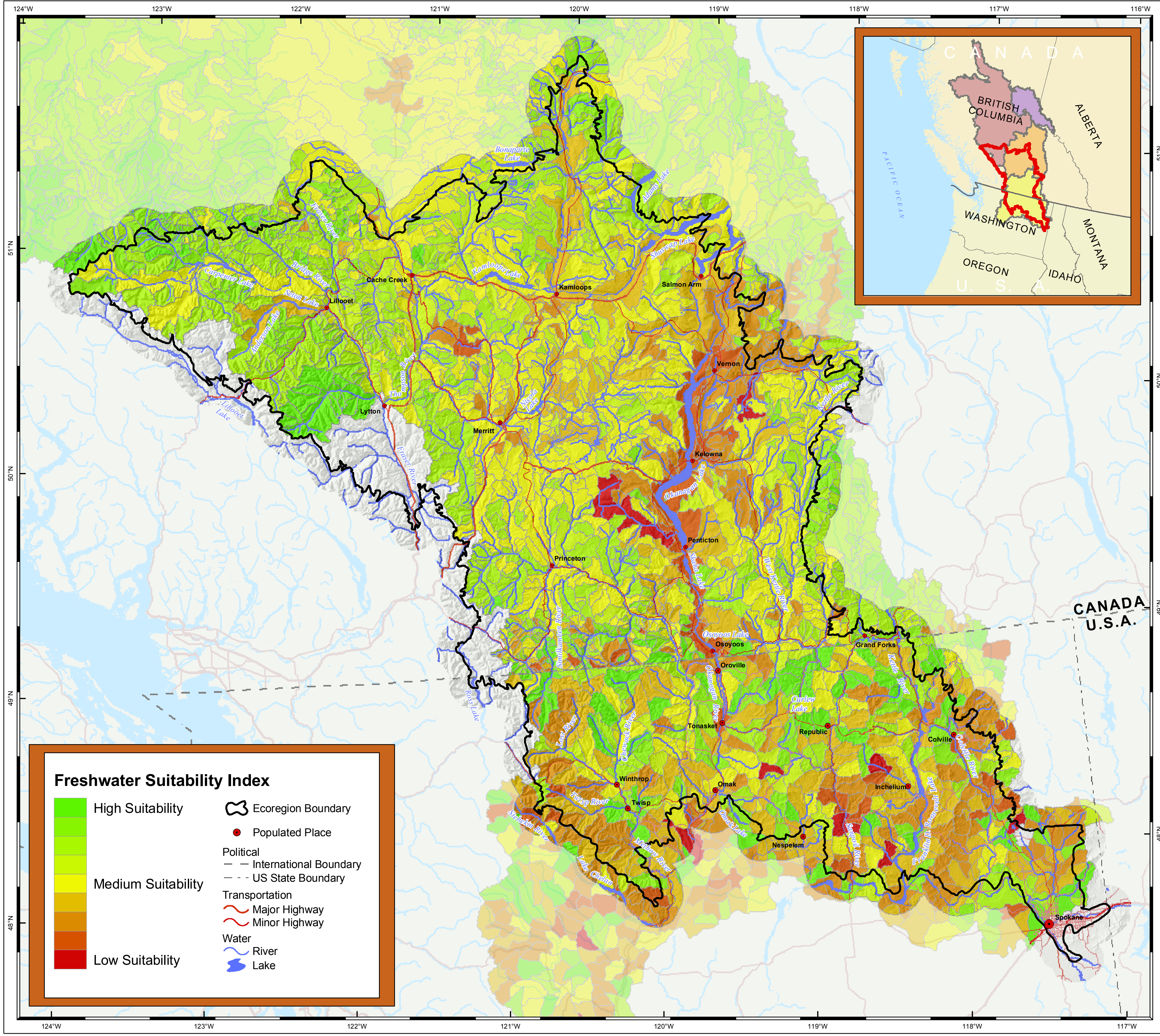
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 13. Freshwater Suitability Index

The four factors used in the freshwater suitability index were management status, land use, road density and aquatic factors. Each factor is defined below:

- Management status: level of protection given to biodiversity; based on all landowners or land managers within the area
- Land use: percent of area converted to urban, agricultural, and mine land uses
- Road density: road km/km2 within area
- Aquatic factors: dams

The values for each factor were determined through expert opinion using the methods of Saaty (1977). Experts were asked to assign relative weights to each of the four factors. We recognize that other variables influence the relative likelihood of successful conservation, but the terms in the index equation are limited to data readily available in GIS. Refer to Appendix 4 for information on data sources. Appendix 13 describes the methods and provides further clarification of the definitions.

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0 5 10 Miles

0 10 20 Kilometres

N

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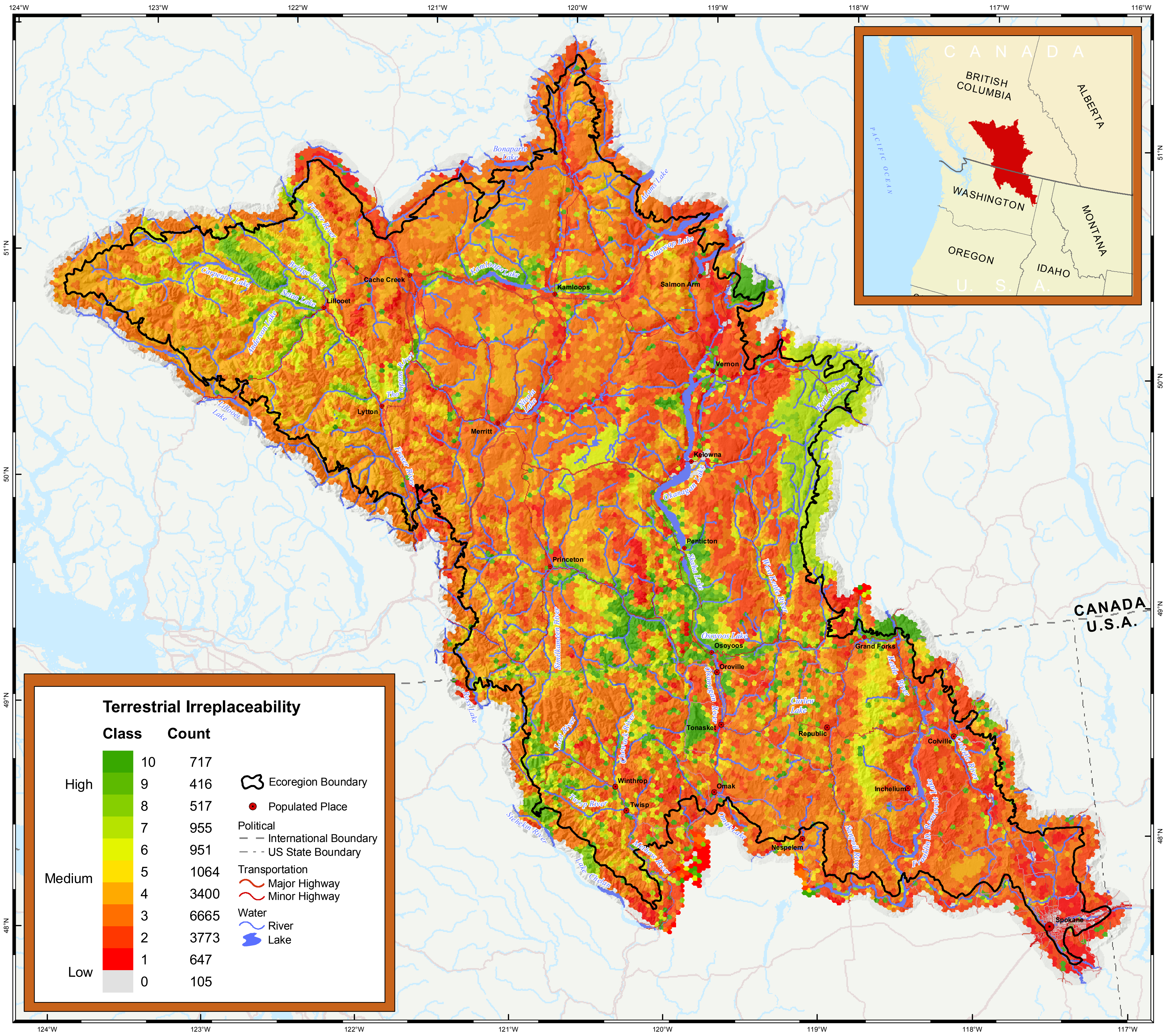

Terrestrial Irreplaceability

	Class	Count
High	10	717
	9	416
	8	517
	7	955
	6	951
Medium	5	1064
	4	3400
	3	6665
	2	3773
	1	647
Low	0	105

OKANAGAN ECOREGION:

Map 14. Terrestrial Irreplaceability Analysis

Irreplaceability scores indicate the biodiversity value of an assessment unit. The scores are generated with MARXAN under the assumption that all assessment units are equally suitable for conservation (i.e., the suitability index was not used). The algorithm assigns a high irreplaceability score to assessment units that contain rare targets, contain a large amount of a target (i.e., has high representation of a target), or has a high number of targets (i.e., has high target richness). Assessment units with a score of 10 are literally irreplaceable; they have high representation for at least one rare target.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

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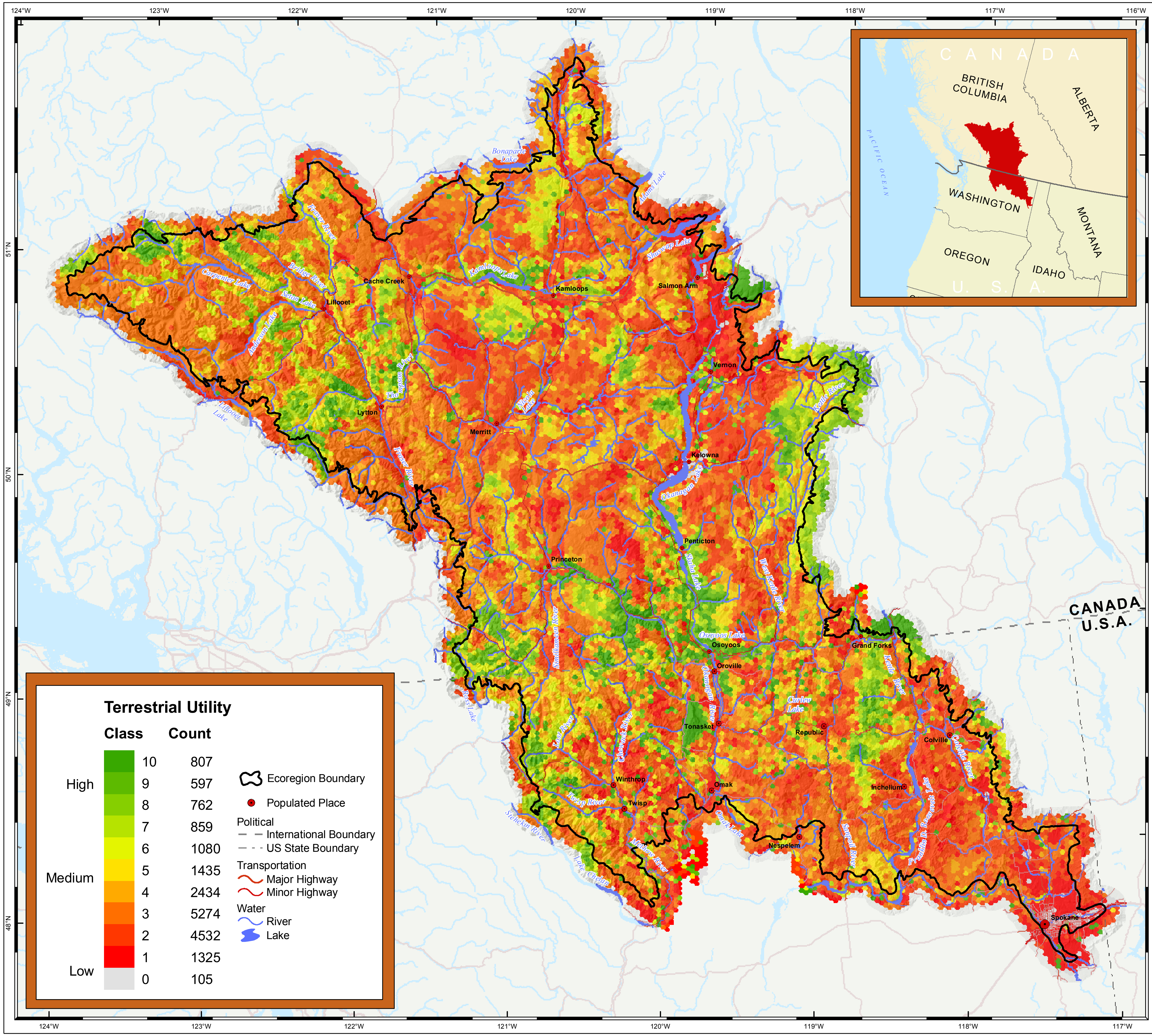

OKANAGAN ECOREGION:

Map 15. Terrestrial Utility Analysis

Utility scores indicate both the biodiversity value of an assessment unit and its suitability for conservation. The scores are generated with MARXAN under the assumption that all assessment units are not equally suitable for conservation (i.e., the suitability index was used). For instance, lands adjacent to intensive agriculture or residential development are considered less suitable for conservation than lands adjacent to undisturbed forest. The algorithm assigns a high utility score to assessment units that contain rare targets, contain a large amount of a target (i.e., has high representation of a target), or has a high number of targets (i.e., has high target richness). When a set of assessment units have similar biological contents, MARXAN uses the suitability index to choose the best assessment unit from the set. Assessment units with a score of 10 are either irreplaceable or are the most suitable place to conserve particular targets.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
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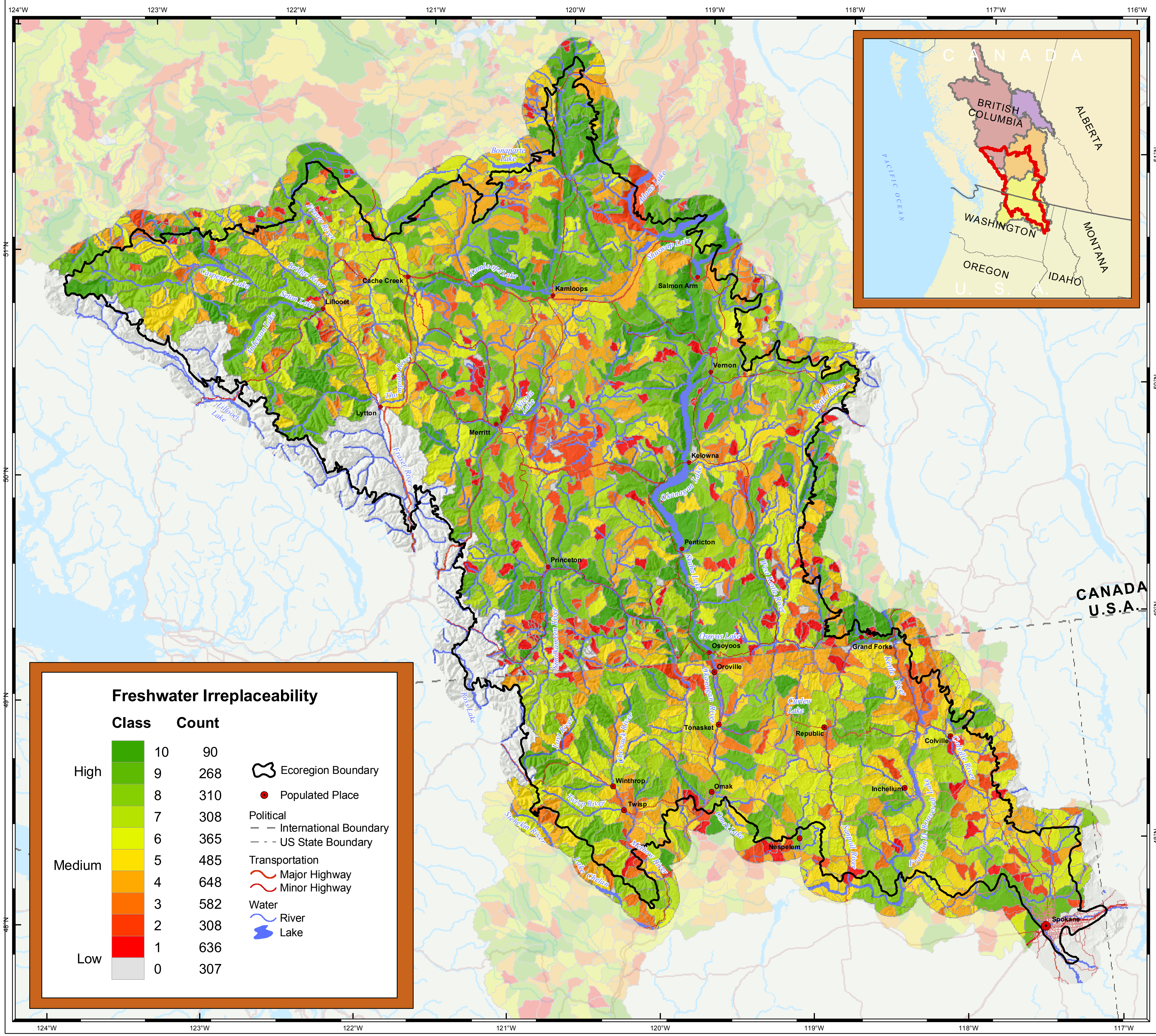

OKANAGAN ECOREGION:

Map 16. Freshwater Irreplaceability Analysis

Irreplaceability scores indicate the biodiversity value of an assessment unit. The scores are generated with MARXAN under the assumption that all assessment units are equally suitable for conservation (i.e., the suitability index was not used). The algorithm assigns a high irreplaceability score to assessment units that contain rare targets, contain a large amount of a target (i.e., has high representation of a target), or has a high number of targets (i.e., has high target richness). Assessment units with a score of 10 are literally irreplaceable; they have high representation for at least one rare target.

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0 5 10 Miles

0 10 20 Kilometres

N

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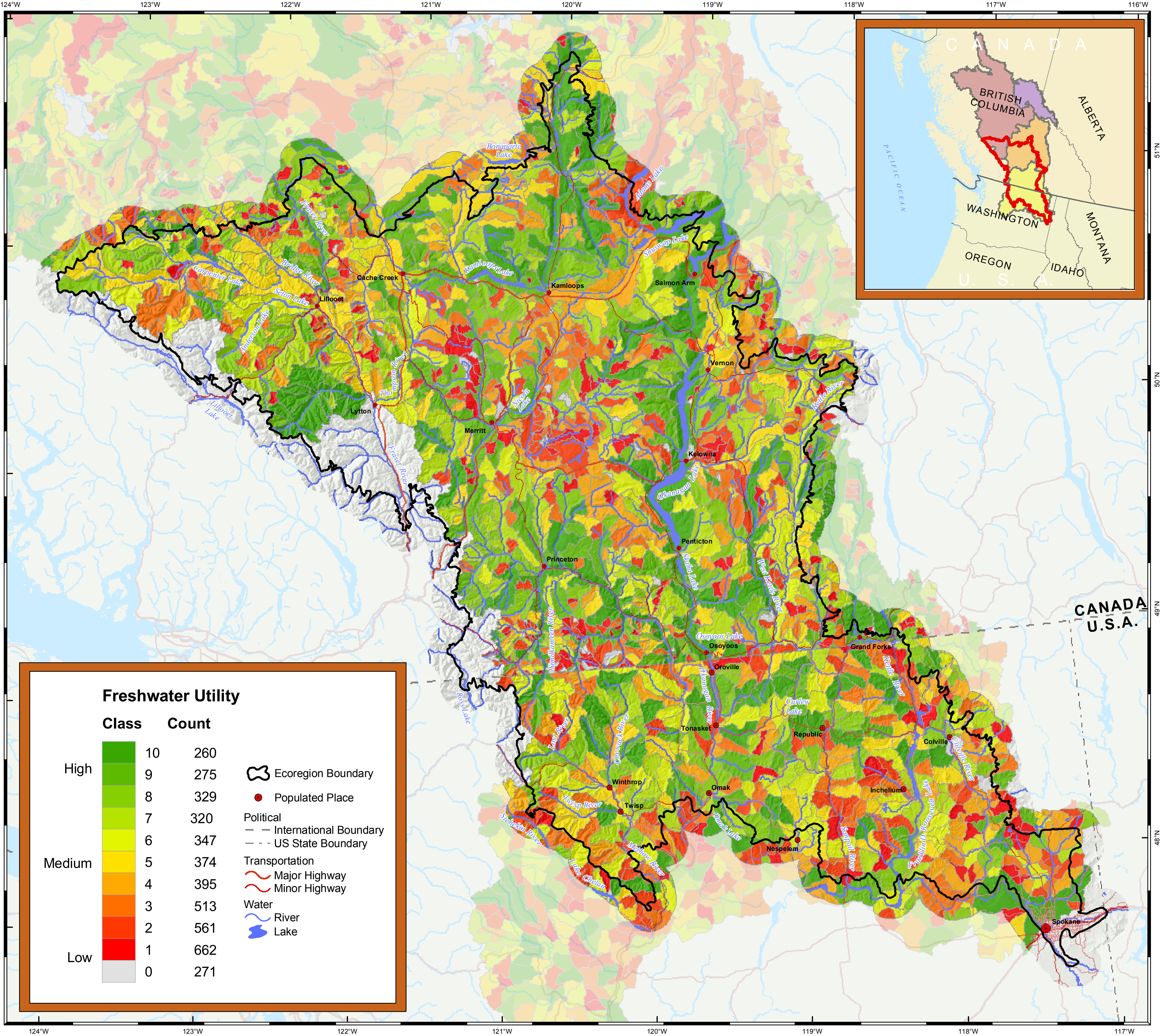

Freshwater Utility

	Class	Count
High	10	260
	9	275
	8	329
	7	320
	6	347
Medium	5	374
	4	395
	3	513
	2	561
Low	1	662
	0	271

Ecoregion Boundary

● Populated Place

Political
- International Boundary
- US State Boundary

Transportation
- Major Highway
- Minor Highway

Water
- River
- Lake

OKANAGAN ECOREGION:

Map 17. Freshwater Utility Analysis

Utility scores indicate both the biodiversity value of an assessment unit and its suitability for conservation. The scores are generated with MARXAN under the assumption that all assessment units are not equally suitable for conservation (i.e., the suitability index was used). For instance, lands adjacent to intensive agriculture or residential development are considered less suitable for conservation than lands adjacent to undisturbed forest. The algorithm assigns a high utility score to assessment units that contain rare targets, contain a large amount of a target (i.e., have high representation of a target), or has a high number of targets (i.e., has high target richness). When a set of assessment units have similar biological contents, MARXAN uses the suitability index to choose the best assessment unit from the set. Assessment units with a score of 10 are either irreplaceable or are the most suitable place to conserve particular targets.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

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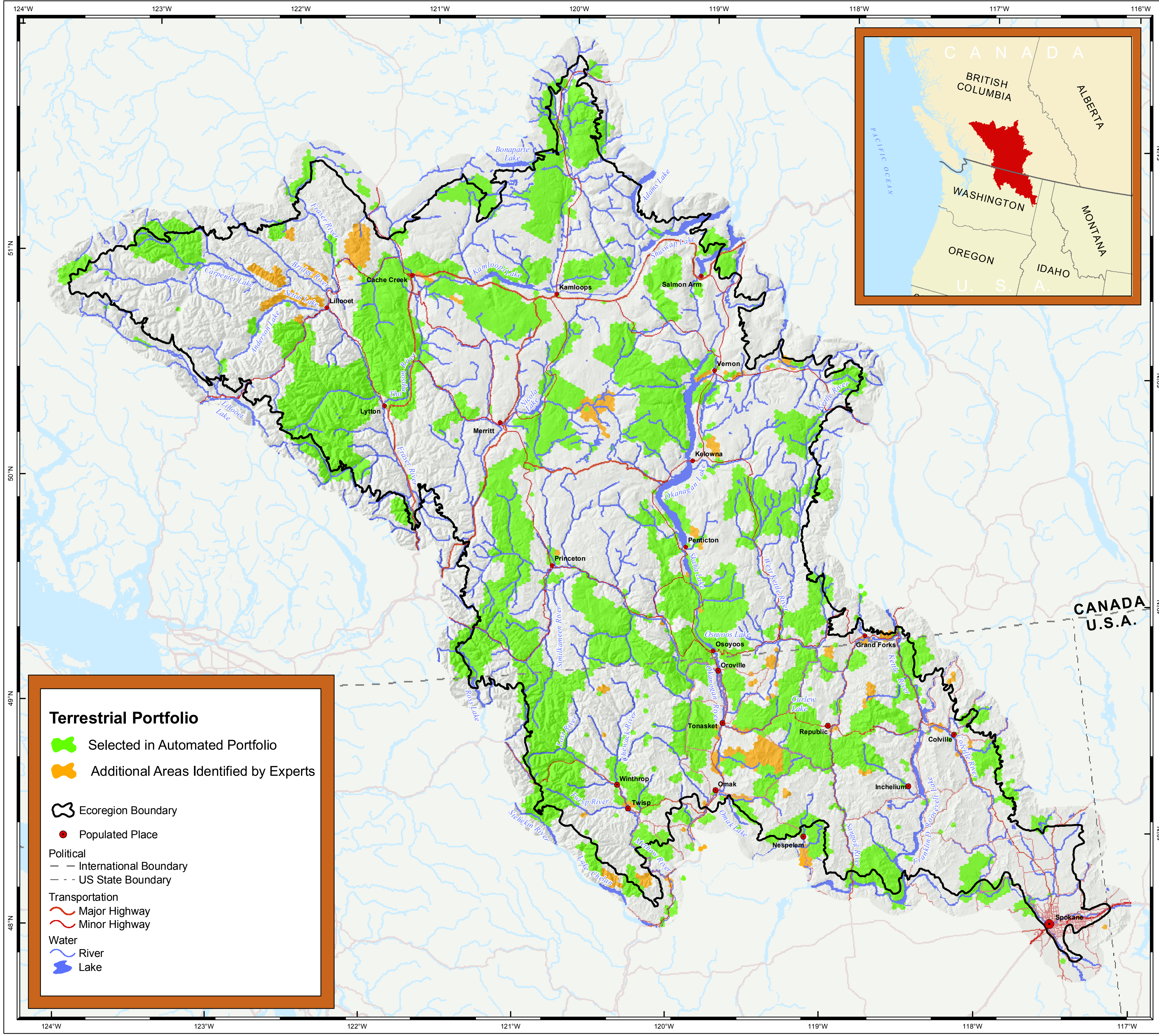
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 18. Terrestrial Portfolio

This portfolio was generated using MARXAN only. It has not been modified through expert review, so expert identified areas are shown separately. No assessment units were "locked in" to the solution, "mid-risk" goals were used, and the boundary length modifier was 0.0025. This portfolio includes 6191 assessment units, about 32% of the ecoregion. Conservation goals are set by ecoregion, by ecosection or both for each target in the ecoregion. In many instances, there were insufficient target occurrences to meet the conservaton goals.

Target	Number of Targets*	Targets Meeting Goals	%Targets Meeting Goals
Terrestrial Ecological Systems			
Interior Transition Ranges	22	22	100%
Thompson Okanagan Plateau	17	15	88%
Northwestern Okanagan	17	15	88%
Northern Cascade Ranges	22	20	91%
Okanagan Highlands	16	14	88%
Animal fine-filter	103	39	38%
Vascular plant fine-filter	106	6	6%
Non-vascular plant fine-filter	11	0	0%

Scale 1:1,900,000

0 5 10 Miles

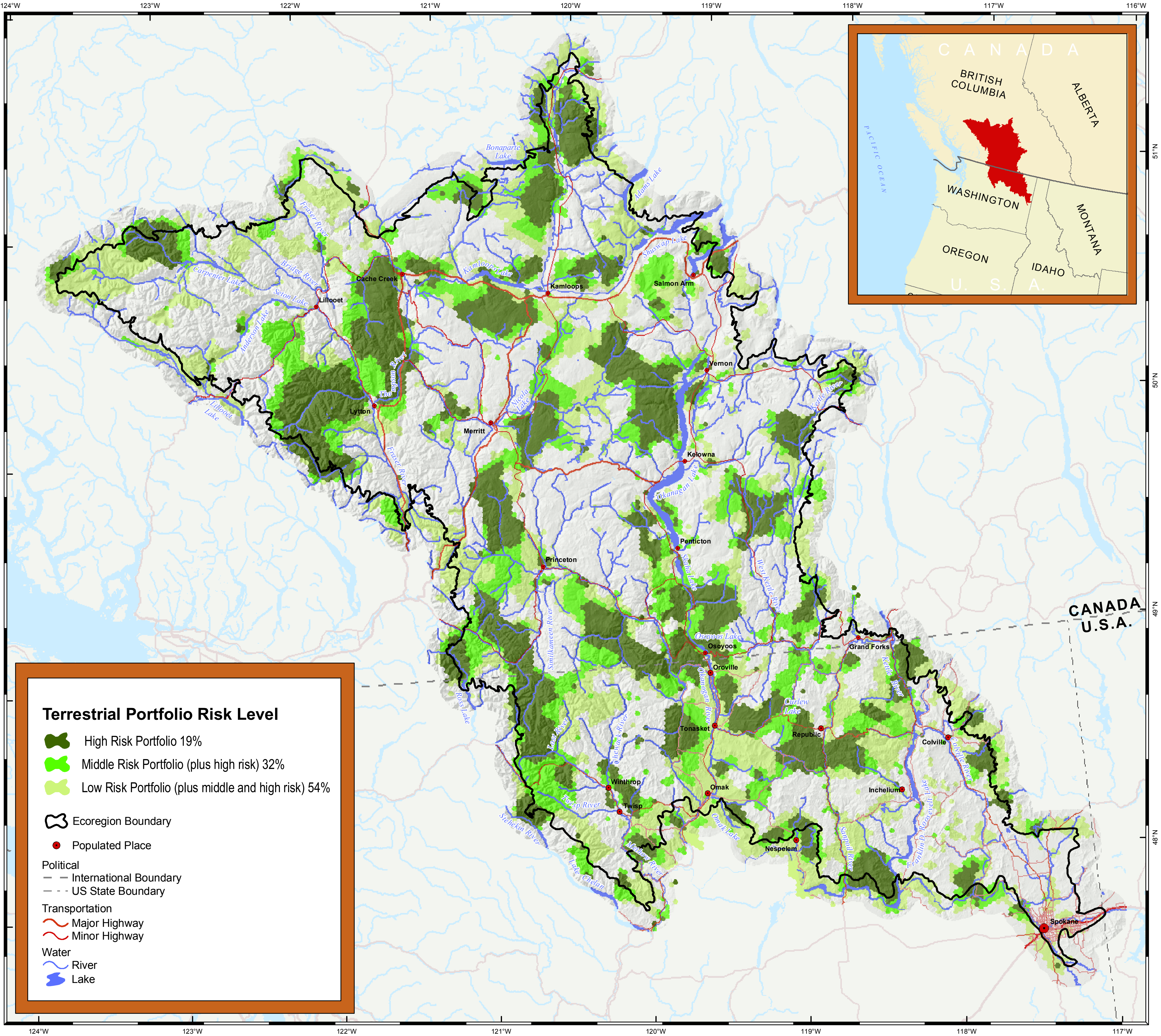
0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 19. Alternative Terrestrial Portfolios: High, Middle, and Low Risk

The middle risk portfolio represents one level of risk to biodiversity. This map illustrates how the size of the portfolio changes when the risk to biodiversity is decreased or increased. Lower risk encompasses more area; higher risk encompasses less. The high risk portfolio is nested within the middle portfolio, and the middle portiolio is nested within the lower risk portfolio.

Level of Risk to Biodiversity	Goal Level (% of historical)	Size of Portfolio (% of Ecoregion)
High	18%	19%
Middle	30%	32%
Low	48%	54%

Scale 1:1,900,000

0 5 10 Miles

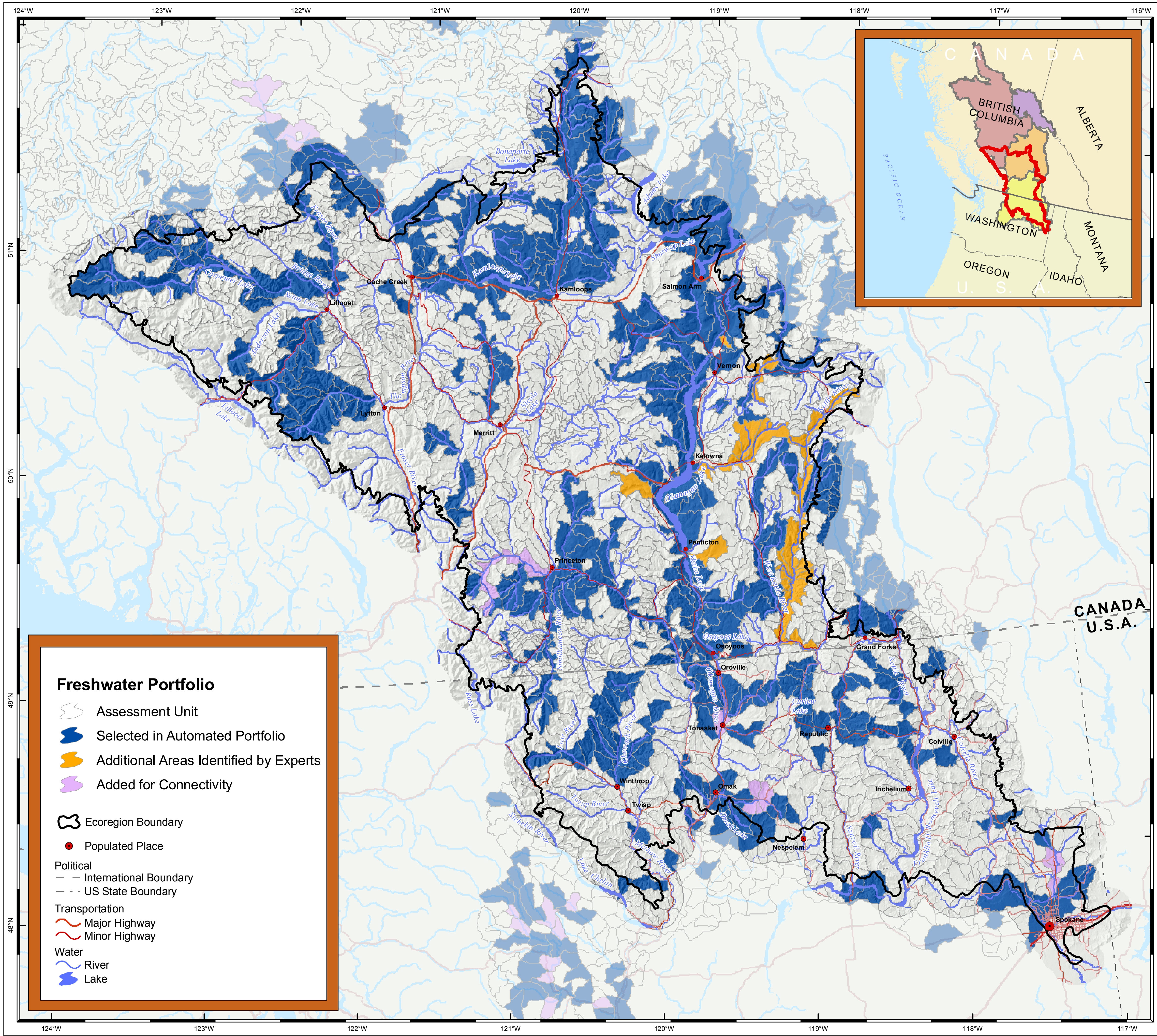
0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 20. Freshwater Portfolio

This portfolio was generated using MARXAN only. It has not been modified through expert review so expert identified watersheds and connectivity watersheds are shown separately. No assessment units were "locked in" to the solution, goals were the "middle risk" goals, and the boundary length modifier was 0.0001. This portfolio includes 1414 assessment units in three Ecological Drainage Units (EDUs), about 33% of the assessment units or 52% of the area of three EDUs combined. Conservation goals are set for each target in each EDU where the target is expected to be found. In many instances, there were insufficient target occurrences to meet the conservation goals.

Target	Number of Targets*	Targets Meeting Goals	%Targets Meeting Goals
Freshwater Ecological Systems			
Middle Fraser EDU	43	33	77%
Okanagan EDU	33	18	55%
Thompson EDU	41	28	68%
Upper Fraser EDU	31	27	87%
Freshwater Fine-Filter			
Middle Fraser EDU	48	11	23%
Okanagan EDU	48	19	40%
Thompson EDU	48	10	21%
Upper Fraser EDU	48	7	15%

Scale 1:1,900,000

0 5 10 Miles

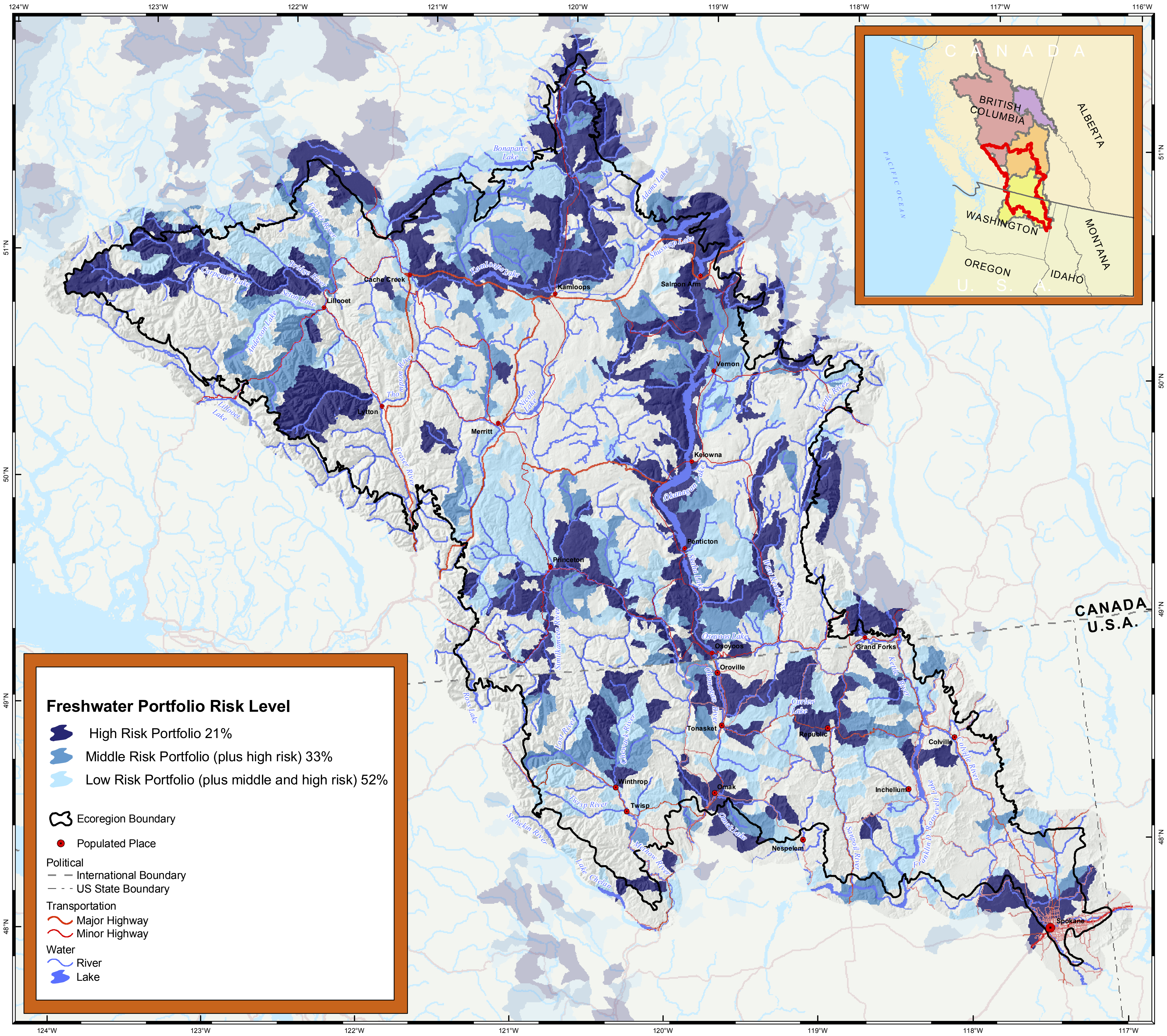
0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 21. Alternative Freshwater Portfolios: High, Middle, and Low Risk

The middle risk portfolio represents one level of risk to biodiversity. This map illustrates how the size of the portfolio changes when the risk to biodiversity is decreased or increased. Lower risk encompasses more area; higher risk encompasses less. The high risk portfolio is nested within the middle portfolio, and the middle portiolio is nested within the lower risk portfolio.

Level of Risk to Biodiversity	Goal Level (% of historical)	Size of Portfolio (% of Ecoregion)
High	18%	21%
Middle	30%	33%
Low	48%	52%

Scale 1:1,900,000

0 5 10 Miles

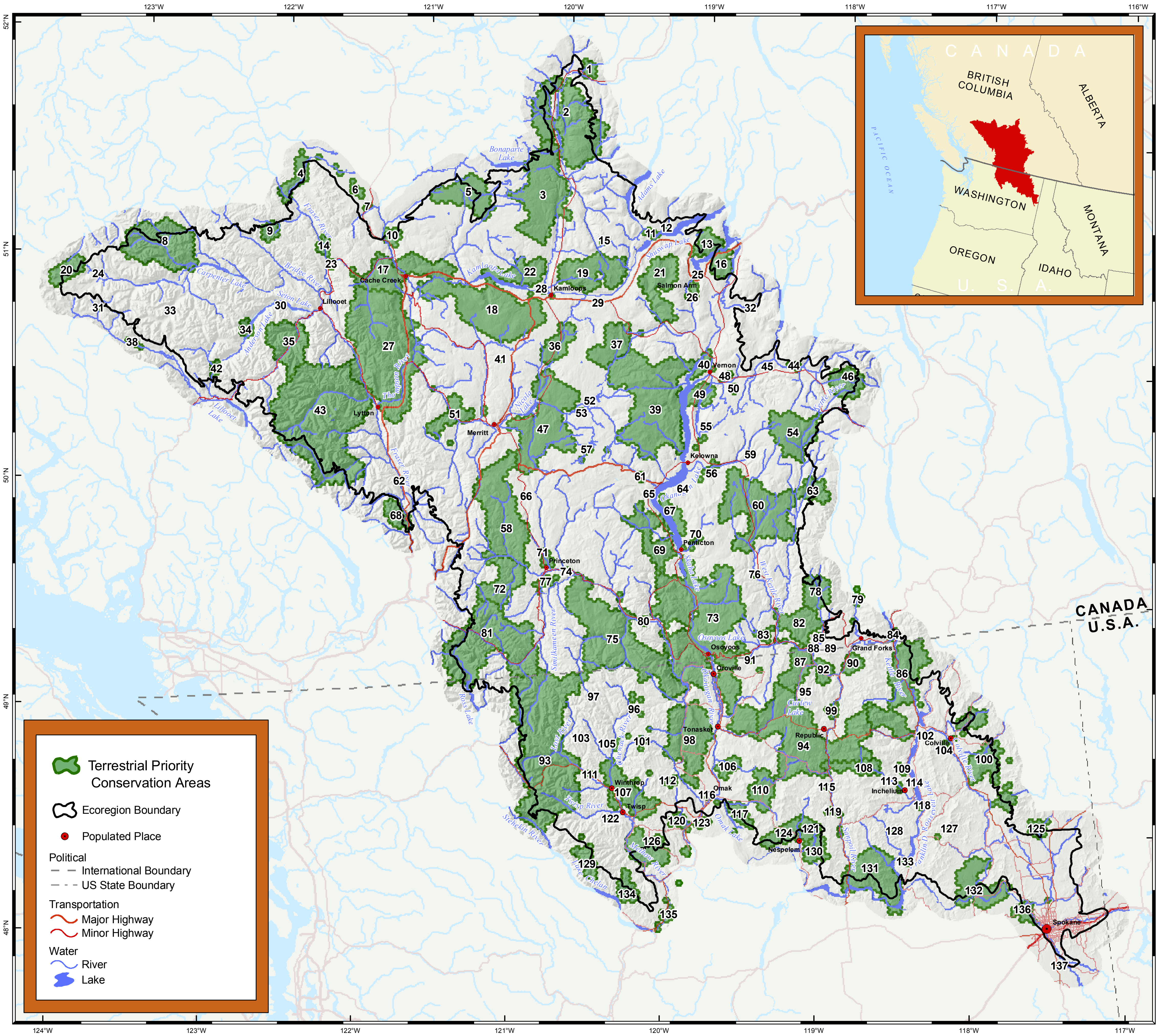
0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 22. Terrestrial Priority Conservation Areas

Terrestrial Priority Conservation Areas, or a portfolio, are one solution which represents the biodiversity of an ecoregion in an efficient and effective manner. Portfolios are designed to achieve conservation goals set for targets on the smallest landbase possible. Current conservation and resource management practices, land ownership, levels of threats, and costs of implementing conservation actions are considered when selecting portfolio sites for conservation. Portfolios create a common focus to galvanize actions among partners on places that will make the greatest contribution to conserving the ecoregion's biodiversity.

The terrestrial portfolio totals 3,093,000 hectares (7,642,969 acres) and equals 32% of the ecoregion. Expert identified sites are shown separately in Map 18. Refer to the Alphabetical and Numerical Terrestrial Priority Conservation Areas Indices that follow this map.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area

Index Number	Conservation Area Name	HECTARES	ACRES
11	Adams River	3,000	7,413
77	Allenby	5,500	13,591
71	Allison	4,500	11,120
85	Anaconda	500	1,236
34	Anderson	4,500	11,120
97	Ash	500	1,236
3	Beauregard	82,000	202,626
76	Beaverdell	500	1,236
135	Beebe	5,500	13,591
40	Bella Vista-Goose Lake Range	7,500	18,533
64	Bellevue	500	1,236
4	Big Bar	16,500	40,772
122	Big Buck	500	1,236
42	Birkenhead	3,000	7,413
73	Bitterbrush	211,500	522,628
115	Black Meadows	500	1,236
5	Bonaparte West	35,500	87,722
62	Boston Bar	500	1,236
101	Boulder	2,500	6,178
24	Bridge	500	1,236
72	Cascade North	33,500	82,780
81	Cascade South	113,500	280,464
75	Cathedral	127,000	313,824
35	Cayoosh	37,500	92,664
52	Chapperon	500	1,236
105	Chewack	1,500	3,707
120	Chiliwist	7,500	18,533
84	Christina	1,500	3,707
2	Chu Chua	92,500	228,573
7	Clinton	1,000	2,471
48	Coldstream	1,500	3,707
94	Colville	129,500	320,001
82	Copper Mountain British Columbia	25,000	61,776
134	Cooper Mountain Washington	11,500	28,417
123	Corkscrew Potholes	3,000	7,413
66	Deadman	500	1,236
110	Disautel-Moses Meadows-Crawfish	19,500	48,185
53	Douglas Lake	500	1,236
50	Duteau	1,000	2,471
56	East Kelowna	5,000	12,355
14	Edge Hills	5,000	12,355
103	Eight Mile	500	1,236
6	Fiftyseven	3,500	8,649
63	Goatskin	14,000	34,595
128	Gold Mountain	500	1,236
54	Graystokes-Upper Kettle	39,000	96,371
18	Greenstone-Glossy	121,500	300,233
108	Grizzly	15,500	38,301
41	Guichon	500	1,236
113	Hall Creek	1,000	2,471
74	Hayes	500	1,236
131	Hellsgate	55,500	137,144
90	Hurlburt	7,500	18,533
33	Hurley	500	1,236
109	Jim Creek	1,500	3,707
49	Kalamalka	12,500	30,888
28	Kamloops	1,000	2,471
130	Keller	12,000	29,653
86	Kettle Range	63,000	155,677
118	Kewa	1,000	2,471
22	Lac du Bois	25,500	63,012
16	Larch Hills	12,000	29,653
38	Lillooet River	2,000	4,942
125	Little Blue Grouse	7,000	17,297
100	Little Pend d'Oreille	44,500	109,962
92	Little Vulcan	8,500	21,004
79	Lower Granby	2,500	6,178
17	Lower Hat-Medicine	30,000	74,132
51	Lower Nicola	21,000	51,892
114	Magee	500	1,236
126	Methow	26,500	65,483
44	Mid-Shuswap	2,000	4,942
99	Midnight Mountain	3,500	8,649
88	Midway	500	1,236
104	Mill Creek	1,000	2,471
59	Mission Creek	500	1,236
37	Monte Hills	28,500	70,425
91	Myers	1,000	2,471
67	Naramata	11,500	28,417
19	Niskonlith	43,000	106,256
124	Northstar	15,500	38,302
96	Okanagan National Forest	3,000	7,413
116	Omak	500	1,236
117	Omak Lake	10,000	24,710
121	Owhi	10,000	24,710
93	Pasayten-Upper Chelan	189,000	467,029
23	Pavilion	1,000	2,471
65	Peachland	500	1,236
57	Pennask	2,500	6,178
70	Penticton Creek	2,500	6,178
69	Penticton Grasslands	34,500	85,251
89	Phoenix	500	1,236
46	Pinnacles	19,500	48,186
133	Pugh-Enterprise	1,000	2,471
1	Raft	5,000	12,355
45	Rawlings	500	1,236
13	Reienecker	14,000	34,595
111	Rendevous	500	1,236
107	Rendevous-Methow	36,000	88,958
136	Riverside	9,000	22,240
29	Robbins	500	1,236
83	Rock Creek	5,000	12,355
102	Roosevelt	500	1,236
127	Roosevelt Lake	1,000	2,471
31	Salal	500	1,236
25	Salmon Arm	1,000	2,471
119	Sanpoil	3,000	7,413
129	Sawtooth	12,500	30,888
12	Scotch Creek	500	1,236
10	Scottie	6,000	14,826
30	Seton Lake	500	1,236
58	Shovelnose-Otter	85,000	210,040
21	Shuswap	37,500	92,665
26	Silver-Salmon	3,500	8,649
80	Similkameen	2,500	6,178
98	Sinlahekin	62,000	153,206
112	South Fork Salmon Creek	2,500	6,178
132	Spokane	39,000	96,371
137	Spokane South	500	1,236
8	Spruce-Tyaughton	67,000	165,561
68	Spuzzum	12,000	29,653
43	Stein-Mehatl-Nahatlatch	199,000	491,740
15	Tod	1,000	2,471
95	Tonota	500	1,236
87	Toroda-Ingram	21,000	51,892
36	Trapp Lake	19,000	46,950
61	Trepanier	1,000	2,471
32	Trinity	500	1,236
20	Ts'yl-os	15,000	37,066
106	Tunk Creek	8,000	19,768
78	Upper Boundary	19,000	46,950
27	Upper Hat	167,000	412,666
60	Upper Kettle	85,000	210,039
47	Upper Nicola	90,500	223,631
39	West Slopes	135,000	333,593
55	Winfield	1,000	2,471
9	Yalakom Highlands	7,000	17,297

OKANAGAN ECOREGION

22a. Alphabetical Index of Terrestrial Priority Conservation Areas

This index is intended to help the reader identify Terrestrial Priority Conservation Areas on Maps 22, 23 and 27, using their PCA numbers. The conservation areas are not ranked on the previous map, nor here. Rankings can be found on Map 27. The conservation areas are listed in alphabetical order and are indexed as they fall geographically from north to south.
Area values are calculated as the sum of the area of all assessment units which make up a single site.

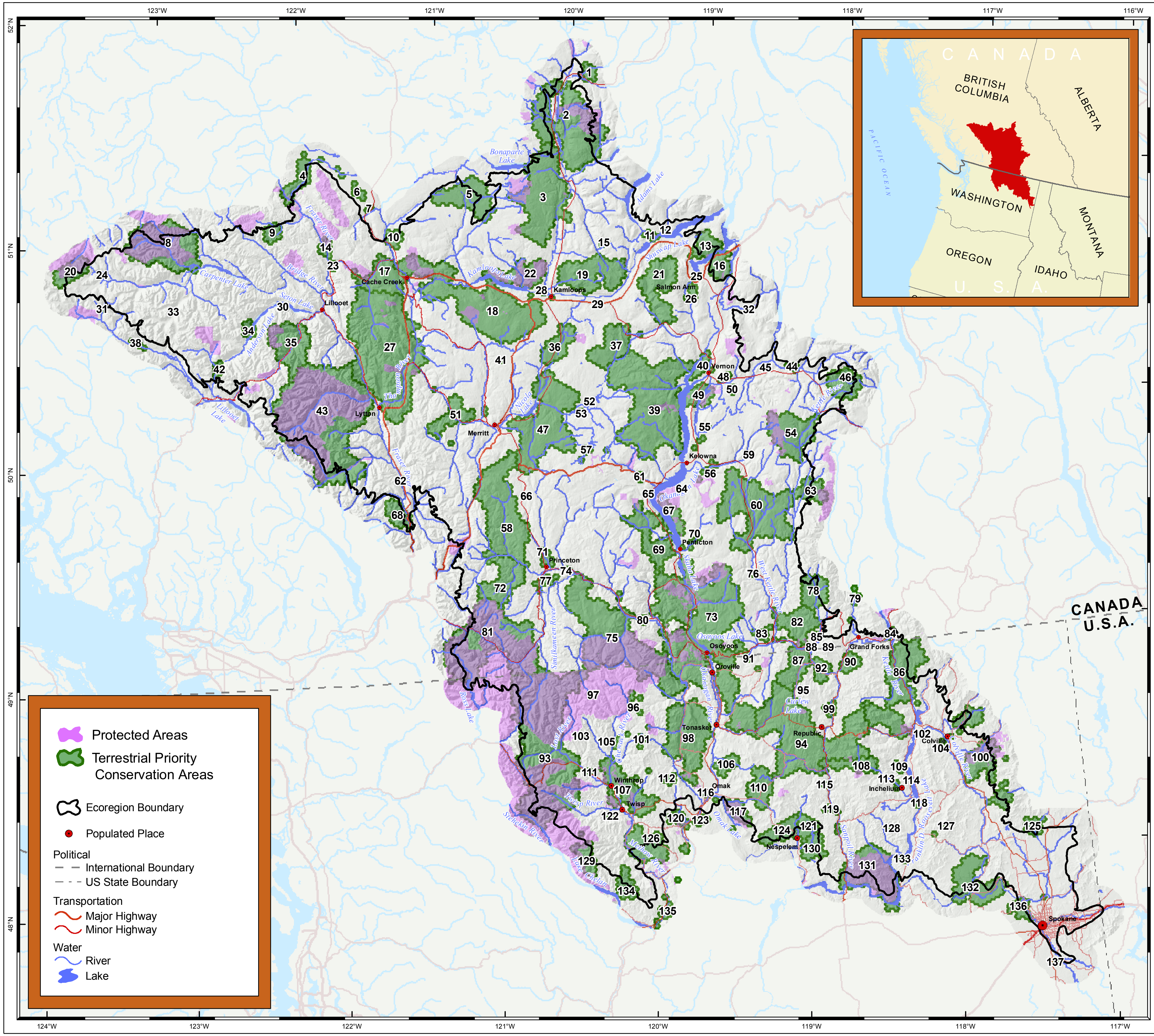
Nature Conservancy Canada
Conservation de la Nature Canada
The Nature Conservancy
Washington Department of Fish and Wildlife
Washington's Natural Heritage Program
B.C. Conservation Data Centre
NatureServe

Index Number	Conservation Area Name	HECTARES	ACRES
1	Raft	5,000	12,355
2	Chu Chua	92,500	228,573
3	Beauregard	82,000	202,626
4	Big Bar	16,500	40,772
5	Bonaparte West	35,500	87,722
6	Fiftyseven	3,500	8,649
7	Clinton	1,000	2,471
8	Spruce-Tyaughton	67,000	165,561
9	Yalakom Highlands	7,000	17,297
10	Scottie	6,000	14,826
11	Adams River	3,000	7,413
12	Scotch Creek	500	1,236
13	Reienecker	14,000	34,595
14	Edge Hills	5,000	12,355
15	Tod	1,000	2,471
16	Larch Hills	12,000	29,653
17	Lower Hat-Medicine	30,000	74,132
18	Greenstone-Glossy	121,500	300,233
19	Niskonlith	43,000	106,256
20	Ts'yl-os	15,000	37,066
21	Shuswap	37,500	92,665
22	Lac du Bois	25,500	63,012
23	Pavilion	1,000	2,471
24	Bridge	500	1,236
25	Salmon Arm	1,000	2,471
26	Silver-Salmon	3,500	8,649
27	Upper Hat	167,000	412,666
28	Kamloops	1,000	2,471
29	Robbins	500	1,236
30	Seton Lake	500	1,236
31	Salal	500	1,236
32	Trinity	500	1,236
33	Hurley	500	1,236
34	Anderson	4,500	11,120
35	Cayoosh	37,500	92,664
36	Trapp Lake	19,000	46,950
37	Monte Hills	28,500	70,425
38	Lillooet River	2,000	4,942
39	West Slopes	135,000	333,593
40	Bella Vista-Goose Lake Range	7,500	18,533
41	Guichon	500	1,236
42	Birkenhead	3,000	7,413
43	Stein-Mehatl-Nahatlatch	199,000	491,740
44	Mid-Shuswap	2,000	4,942
45	Rawlings	500	1,236
46	Pinnacles	19,500	48,186
47	Upper Nicola	90,500	223,631
48	Coldstream	1,500	3,707
49	Kalamalka	12,500	30,888
50	Duteau	1,000	2,471
51	Lower Nicola	21,000	51,892
52	Chapperon	500	1,236
53	Douglas Lake	500	1,236
54	Graystokes-Upper Kettle	39,000	96,371
55	Winfield	1,000	2,471
56	East Kelowna	5,000	12,355
57	Pennask	2,500	6,178
58	Shovelnose-Otter	85,000	210,040
59	Mission Creek	500	1,236
60	Upper Kettle	85,000	210,039
61	Trepanier	1,000	2,471
62	Boston Bar	500	1,236
63	Goatskin	14,000	34,595
64	Bellevue	500	1,236
65	Peachland	500	1,236
66	Deadman	500	1,236
67	Naramata	11,500	28,417
68	Spuzzum	12,000	29,653
69	Penticton Grasslands	34,500	85,251
70	Penticton Creek	2,500	6,178
71	Allison	4,500	11,120
72	Cascade North	33,500	82,780
73	Bitterbrush	211,500	522,628
74	Hayes	500	1,236
75	Cathedral	127,000	313,824
76	Beaverdell	500	1,236
77	Allenby	5,500	13,591
78	Upper Boundary	19,000	46,950
79	Lower Granby	2,500	6,178
80	Similkameen	2,500	6,178
81	Cascade South	113,500	280,464
82	Copper Mountain British Columbia	25,000	61,776
83	Rock Creek	5,000	12,355
84	Christina	1,500	3,707
85	Anaconda	500	1,236
86	Kettle Range	63,000	155,677
87	Toroda-Ingram	21,000	51,892
88	Midway	500	1,236
89	Phoenix	500	1,236
90	Hurlburt	7,500	18,533
91	Myers	1,000	2,471
92	Little Vulcan	8,500	21,004
93	Pasayten-Upper Chelan	189,000	467,029
94	Colville	129,500	320,001
95	Tonota	500	1,236
96	Okanagan National Forest	3,000	7,413
97	Ash	500	1,236
98	Sinlahekin	62,000	153,206
99	Midnight Mountain	3,500	8,649
100	Little Pend d'Oreille	44,500	109,962
101	Boulder	2,500	6,178
102	Roosevelt	500	1,236
103	Eight Mile	500	1,236
104	Mill Creek	1,000	2,471
105	Chewack	1,500	3,707
106	Tunk Creek	8,000	19,768
107	Rendevous-Methow	36,000	88,958
108	Grizzly	15,500	38,301
109	Jim Creek	1,500	3,707
110	Disautel-Moses Meadows-Crawfish	19,500	48,185
111	Rendevous	500	1,236
112	South Fork Salmon Creek	2,500	6,178
113	Hall Creek	1,000	2,471
114	Magee	500	1,236
115	Black Meadows	500	1,236
116	Omak	500	1,236
117	Omak Lake	10,000	24,710
118	Kewa	1,000	2,471
119	Sanpoil	3,000	7,413
120	Chiliwist	7,500	18,533
121	Owhi	10,000	24,710
122	Big Buck	500	1,236
123	Corkscrew Potholes	3,000	7,413
124	Northstar	15,500	38,302
125	Little Blue Grouse	7,000	17,297
126	Methow	26,500	65,483
127	Roosevelt Lake	1,000	2,471
128	Gold Mountain	500	1,236
129	Sawtooth	12,500	30,888
130	Keller	12,000	29,653
131	Hellsgate	55,500	137,144
132	Spokane	39,000	96,371
133	Pugh-Enterprise	1,000	2,471
134	Cooper Mountain Washington	11,500	28,417
135	Beebe	5,500	13,591
136	Riverside	9,000	22,240
137	Spokane South	500	1,236

OKANAGAN ECOREGION

22b. Numerical Index of Terrestrial Priority Conservation Areas

This index is intended to help the reader identify Terrestrial Priority Conservation Areas on Maps 22, 23 and 27. The conservation areas are not ranked on Maps 22 and 23, nor here. Rankings can be found on Map 27. The conservation areas are listed in numerical order and are indexed as they fall geographically from north to south.
Area values are calculated as the sum of the area of all assessment units which make up a single site.



OKANAGAN ECOREGION:

Map 23. Protected Lands and Terrestrial Priority Conservation Areas

Designated parks and protected areas (classified as GAP status 1 and GAP status 2) overlap with Terrestrial Conservation Areas. Approximately 23% of the terrestrial portfolio is currently in designated areas. MARXAN is predisposed to select analysis units that are within a protected area so that the "cost" of an area is minimised. Approximately 12% of the ecoregion is currently within designated areas. In order to conserve the entire terrestrial portfolio, conservation strategies over the remaining portion of the portfolio, or 25% of the ecoregion, would need to be applied. See Appendix 1 for GAP status definitions.

Scale 1:1,900,000

0 5 10 Miles

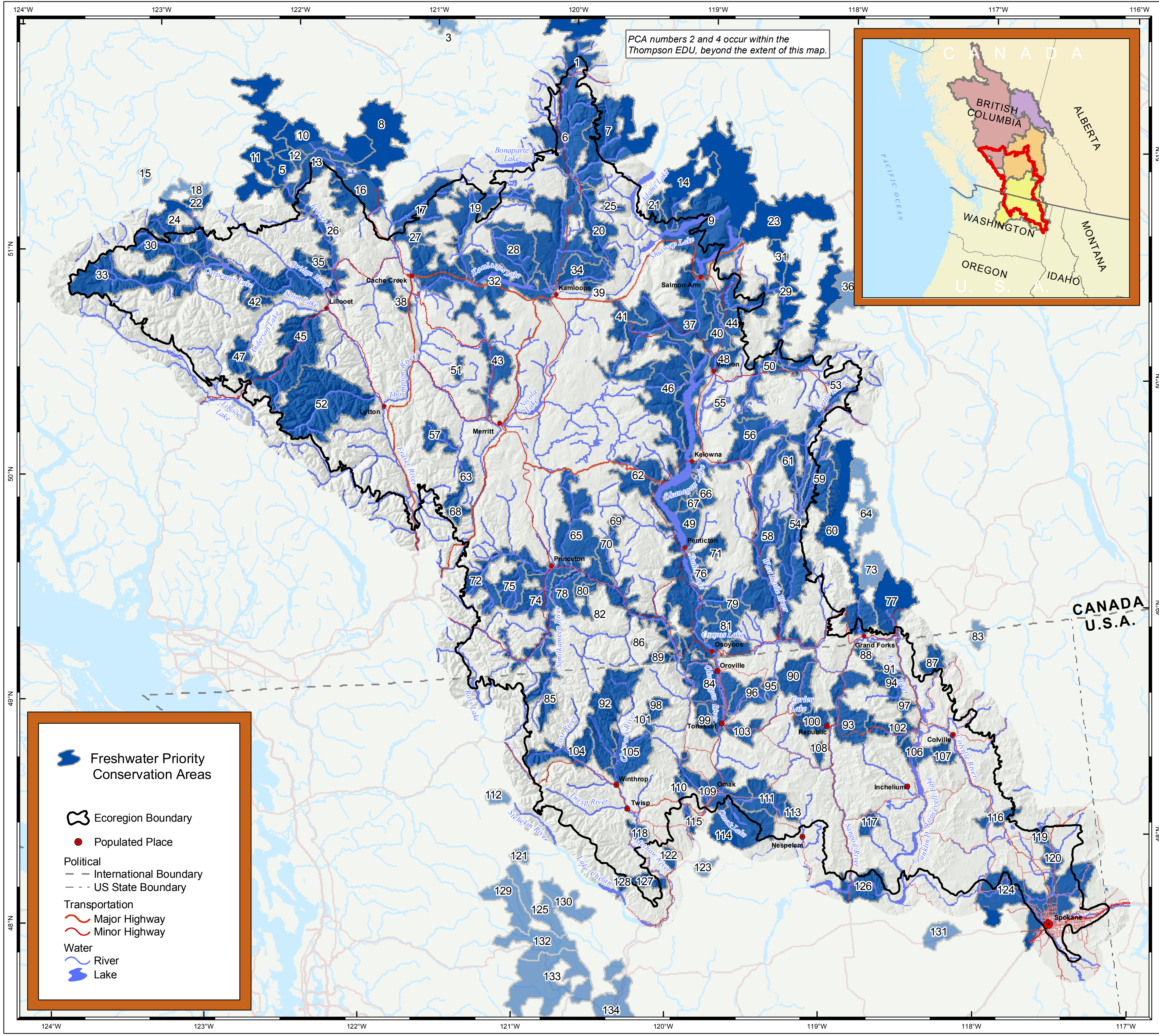
0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 24. Freshwater Priority Conservation Areas

Freshwater Priority Conservation Areas, or a portfolio, are one solution which represents the biodiversity of an ecoregion in an efficient and effective manner. Portfolios are designed to achieve conservation goals set for targets in the smallest landbase possible. Current conservation and resource management practices, land ownership, levels of threats, and costs of implementing conservation actions are all considered when selecting portfolio sites for conservation. Portfolios create a common focus to galvanize actions among partners on places that will make the greatest contribution to conserving the ecoregion's biodiversity.
The freshwater conservation portfolio for the ecoregion totals 3,301,359 hectares (8,157,835 acres), 34% of the Okanagan Ecoregion. Expert identified sites are shown separately in Map 20. Refer to the Alphabetical and Numerical Freshwater Priority Conservation Areas Indices that follow this map.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area

Nature Conservancy Canada
Conservation de la Nature Canada
The Nature Conservancy
Washington Department of Fish and Wildlife
Washington's Natural Heritage Program
B.C. Conservation Data Centre
NatureServe

OKANAGAN ECOREGION

24a. Alphabetical Index of Freshwater Priority Conservation Areas

This index is intended to help the reader identify Freshwater Priority Conservation Areas on Maps 24, 25 and 28. The conservation areas are not ranked on the previous map, nor here. Rankings can be found on Map 28. The conservation areas are listed in alphabetical order and are indexed as they fall geographically from north to south.

Area values are calculated as the sum of the area of all assessment units which make up a single site.

Index Number	Conservation Area Name	HECTARES	ACRES
50	Aberdeen	28,143	69,542
96	Antoine Creek	20,171	49,843
48	B.X.	13,066	32,286
7	Barriere	88,805	219,442
66	Bellevue	9,295	22,969
13	Big Bar	26,712	66,007
127	Black Canyon Creek	9,454	23,361
94	Boulder Creek	14,619	36,126
33	Bridge	136,307	336,823
64	Burrell	30,228	74,695
10	Canoe	47,662	117,775
118	Carlton	7,312	18,067
45	Cayoosh	80,623	199,224
105	Chewack River	37,384	92,379
92	Chewack Tributaries	65,329	161,431
87	China Bend	12,612	31,166
12	China Creek	8,475	20,943
125	Chiwawa River	32,266	79,730
77	Christina	42,751	105,641
67	Chute	7,924	19,580
25	Cicero	5,814	14,367
83	Columbia Boundary	8,487	20,971
131	Cottonwood Creek	15,331	37,884
93	Curlew Lake	45,762	113,081
61	Damfino	11,463	28,327
18	Dash	12,492	30,869
97	Deadman Creek	5,226	12,914
19	Deadman River	60,415	149,288
40	Deep	23,018	56,880
23	Eagle	61,928	153,027
3	Eagle Lake	44,919	110,998
91	East Deer	5,209	12,872
26	Edge Hills	4,644	11,475
71	Ellis	12,182	30,103
119	Eloika Lake	6,889	17,023
130	Entiat River	31,481	77,790
16	Fifties	42,773	105,693
8	Flat Lake Complex	58,342	144,167
44	Fortune Creek	14,256	35,228
5	Fraser - Lillooet to Chilcotin R	93,749	231,658
47	Gates	16,671	41,195
60	Granby	89,905	222,161
75	Granite	23,779	58,759
100	Granite Creek	18,049	44,599
11	Grinder - Lone Cabin - French Bar	30,305	74,886
43	Guichon Creek	42,167	104,196
30	Gun	36,334	89,783
107	Haller Creek	10,088	24,929
65	Hayes	60,940	150,586
99	Horse Springs Coulee	10,733	26,522
122	Indian Dan	6,094	15,057
81	Inkaneep	18,763	46,364
86	Joe	2,153	5,319
68	Juliet	6,903	17,059
116	Jumpoff Joe Creek	11,227	27,744
39	Juniper	3,283	8,112
54	Kettle	100,690	248,809
31	Kingfisher	11,239	27,772
123	Lake Pateros	6,767	16,721
132	Lake Wenatchee	33,787	83,489
120	Little Spokane	13,242	32,722
88	Lone Ranch Creek	6,028	14,896
22	Lone Valley	7,014	17,332
17	Loon	39,325	97,175
69	Lost Chain	3,891	9,616
20	Louis	34,457	85,144
103	Lower Bonaparte Creek	14,087	34,809
115	Lower Loup Creek	6,297	15,559
73	Lynch	18,333	45,302
63	Maka	15,894	39,274
70	McNulty	14,988	37,036
38	Medicine - Cornwal	11,085	27,392
104	Methow River	31,266	77,260
6	Middle - Lower North Thompson	162,358	401,197
113	Mill Creek Headwaters	5,026	12,420
56	Mission	46,000	113,668
41	Monte	18,464	45,625
95	Myers Creek Headwaters	7,089	17,518
21	Nikwikwaia	9,857	24,356
117	Ninemile Creek Headwaters	9,160	22,634
46	North Okanagan	73,606	181,886
49	Okanagan	195,266	482,514
109	Omak - Salmon	43,958	108,623
111	Omak Creek Headwaters	26,864	66,383
114	Omak Lake	52,296	129,227
55	Oyama	4,411	10,900
112	Park Creek	7,464	18,445
85	Pasayten	28,450	70,301
34	Paul Creek (North)	27,286	67,424
82	Paul Creek (South)	302	747
62	Peachland	31,333	77,425
4	Pendleton	4,369	10,796
135	Peshastin Headwaters	9,327	23,048
128	Poison - Gold	5,010	12,380
57	Prospect	17,688	43,707
121	Railroad Creek Lakes	6,509	16,085
24	Relay	40,564	100,236
59	Rendell	36,473	90,127
106	Roosevelt Lake	13,534	33,443
37	Salmon River	102,765	253,937
126	Sanpoil Confluence	28,272	69,861
108	Scatter Creek	5,932	14,657
14	Scotch	44,844	110,812
27	Scottie	12,972	32,055
102	Sherman Creek	19,201	47,447
9	Shuswap Lake	180,993	447,242
29	Shuswap River	118,506	292,835
74	Similkameen - Skagit	104,665	258,632
84	Similkameen Confluence	61,151	151,109
76	Skaha	6,065	14,987
35	Slok	5,155	12,739
80	Smith	10,399	25,696
89	Snehumption	6,194	15,305
98	Southfork Touts Coulee	8,885	21,954
51	Spences	4,979	12,304
124	Spokane River - Deadman Creek	101,424	250,624
52	Stein	108,494	268,095
32	Thompson - Kamloops	102,609	253,552
15	Tom	3,063	7,568
90	Toroda Creek	37,012	91,458
28	Tranquille	44,192	109,201
72	Tulameen	40,786	100,784
101	Twentymile Headwaters	4,533	11,200
110	Upper Loup Creek	5,304	13,108
2	Upper North Thompson Tributaries	33,959	83,915
36	Upper Shuswap Tributaries	24,274	59,984
79	Vaseux	21,850	53,992
1	Wells Gray	469,163	1,159,326
134	Wenatchee Confluence	40,925	101,128
133	Wenatchee River	80,917	199,950
58	West Kettle	86,930	214,809
129	White River	29,328	72,471
42	Whitecap	7,481	18,485
78	Willis	23,600	58,317
53	Yeoward	2,151	5,315

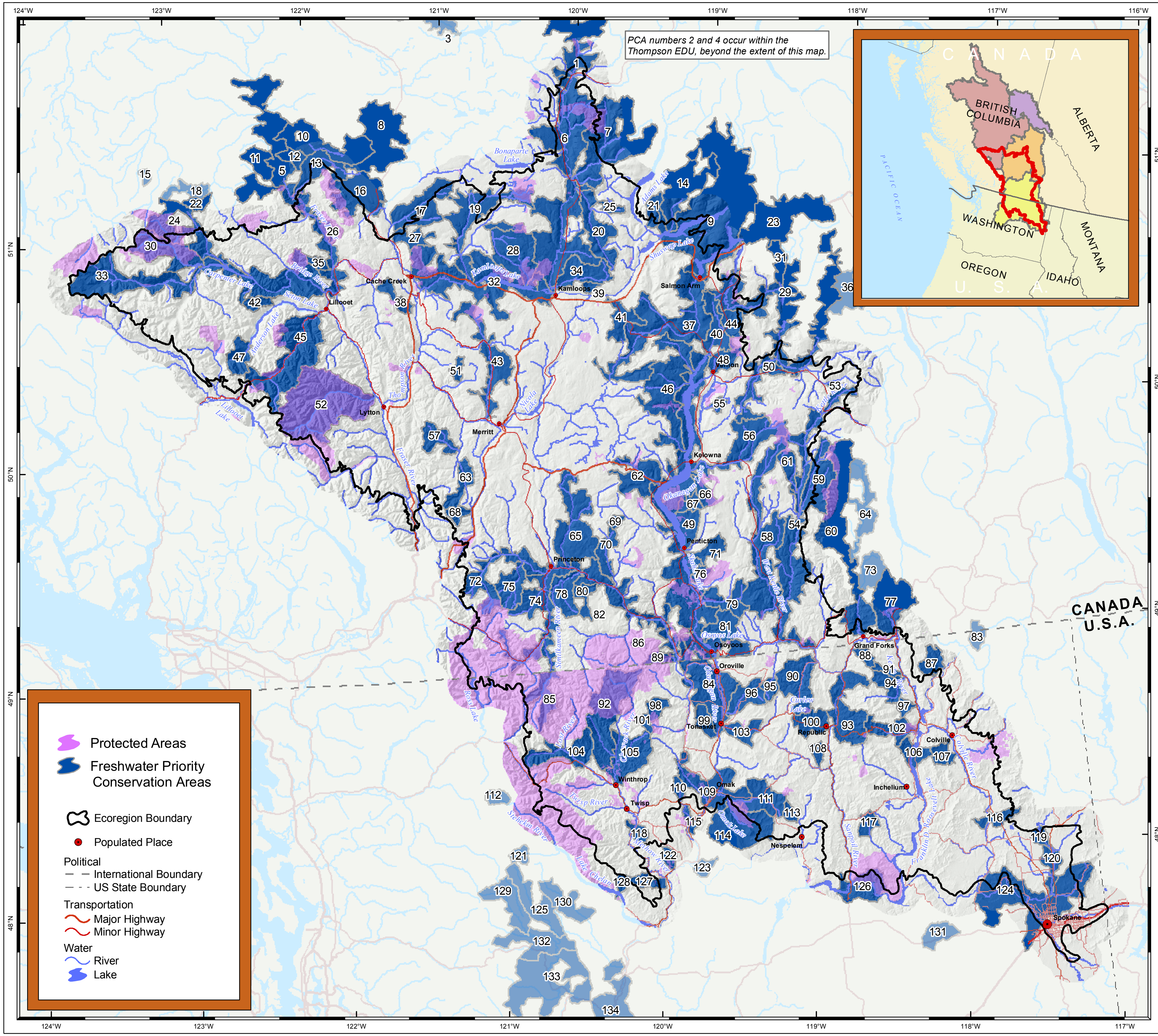
Index Number	Conservation Area Name	HECTARES	ACRES
1	Wells Gray	469,163	1,159,326
2	Upper North Thompson Tributaries	33,959	83,915
3	Eagle Lake	44,919	110,998
4	Pendleton	4,369	10,796
5	Fraser - Lillooet to Chilcotin R	93,749	231,658
6	Middle - Lower North Thompson	162,358	401,197
7	Barriere	88,805	219,442
8	Flat Lake Complex	58,342	144,167
9	Shuswap Lake	180,993	447,242
10	Canoe	47,662	117,775
11	Grinder - Lone Cabin - French Bar	30,305	74,886
12	China Creek	8,475	20,943
13	Big Bar	26,712	66,007
14	Scotch	44,844	110,812
15	Tom	3,063	7,568
16	Fifties	42,773	105,693
17	Loon	39,325	97,175
18	Dash	12,492	30,869
19	Deadman River	60,415	149,288
20	Louis	34,457	85,144
21	Nikwikwaia	9,857	24,356
22	Lone Valley	7,014	17,332
23	Eagle	61,928	153,027
24	Relay	40,564	100,236
25	Cicero	5,814	14,367
26	Edge Hills	4,644	11,475
27	Scottie	12,972	32,055
28	Tranquille	44,192	109,201
29	Shuswap River	118,506	292,835
30	Gun	36,334	89,783
31	Kingfisher	11,239	27,772
32	Thompson - Kamloops	102,609	253,552
33	Bridge	136,307	336,823
34	Paul Creek (North)	27,286	67,424
35	Slok	5,155	12,739
36	Upper Shuswap Tributaries	24,274	59,984
37	Salmon River	102,765	253,937
38	Medicine - Cornwal	11,085	27,392
39	Juniper	3,283	8,112
40	Deep	23,018	56,880
41	Monte	18,464	45,625
42	Whitecap	7,481	18,485
43	Guichon Creek	42,167	104,196
44	Fortune Creek	14,256	35,228
45	Cayoosh	80,623	199,224
46	North Okanagan	73,606	181,886
47	Gates	16,671	41,195
48	B.X.	13,066	32,286
49	Okanagan	195,266	482,514
50	Aberdeen	28,143	69,542
51	Spences	4,979	12,304
52	Stein	108,494	268,095
53	Yeoward	2,151	5,315
54	Kettle	100,690	248,809
55	Oyama	4,411	10,900
56	Mission	46,000	113,668
57	Prospect	17,688	43,707
58	West Kettle	86,930	214,809
59	Rendell	36,473	90,127
60	Granby	89,905	222,161
61	Damfino	11,463	28,327
62	Peachland	31,333	77,425
63	Maka	15,894	39,274
64	Burrell	30,228	74,695
65	Hayes	60,940	150,586
66	Bellevue	9,295	22,969
67	Chute	7,924	19,580
68	Juliet	6,903	17,059
69	Lost Chain	3,891	9,616
70	McNulty	14,988	37,036
71	Ellis	12,182	30,103
72	Tulameen	40,786	100,784
73	Lynch	18,333	45,302
74	Similkameen - Skagit	104,665	258,632
75	Granite	23,779	58,759
76	Skaha	6,065	14,987
77	Christina	42,751	105,641
78	Willis	23,600	58,317
79	Vaseux	21,850	53,992
80	Smith	10,399	25,696
81	Inkaneep	18,763	46,364
82	Paul Creek (South)	302	747
83	Columbia Boundary	8,487	20,971
84	Similkameen Confluence	61,151	151,109
85	Pasayten	28,450	70,301
86	Joe	2,153	5,319
87	China Bend	12,612	31,166
88	Lone Ranch Creek	6,028	14,896
89	Snehumption	6,194	15,305
90	Toroda Creek	37,012	91,458
91	East Deer	5,209	12,872
92	Chewack Tributaries	65,329	161,431
93	Curlew Lake	45,762	113,081
94	Boulder Creek	14,619	36,126
95	Myers Creek Headwaters	7,089	17,518
96	Antoine Creek	20,171	49,843
97	Deadman Creek	5,226	12,914
98	Southfork Touts Coulee	8,885	21,954
99	Horse Springs Coulee	10,733	26,522
100	Granite Creek	18,049	44,599
101	Twentymile Headwaters	4,533	11,200
102	Sherman Creek	19,201	47,447
103	Lower Bonaparte Creek	14,087	34,809
104	Methow River	31,266	77,260
105	Chewack River	37,384	92,379
106	Roosevelt Lake	13,534	33,443
107	Haller Creek	10,088	24,929
108	Scatter Creek	5,932	14,657
109	Omak - Salmon	43,958	108,623
110	Upper Loup Creek	5,304	13,108
111	Omak Creek Headwaters	26,864	66,383
112	Park Creek	7,464	18,445
113	Mill Creek Headwaters	5,026	12,420
114	Omak Lake	52,296	129,227
115	Lower Loup Creek	6,297	15,559
116	Jumpoff Joe Creek	11,227	27,744
117	Ninemile Creek Headwaters	9,160	22,634
118	Carlton	7,312	18,067
119	Eloika Lake	6,889	17,023
120	Little Spokane	13,242	32,722
121	Railroad Creek Lakes	6,509	16,085
122	Indian Dan	6,094	15,057
123	Lake Pateros	6,767	16,721
124	Spokane River - Deadman Creek	101,424	250,624
125	Chiwawa River	32,266	79,730
126	Sanpoil Confluence	28,272	69,861
127	Black Canyon Creek	9,454	23,361
128	Poison - Gold	5,010	12,380
129	White River	29,328	72,471
130	Entiat River	31,481	77,790
131	Cottonwood Creek	15,331	37,884
132	Lake Wenatchee	33,787	83,489
133	Wenatchee River	80,917	199,950
134	Wenatchee Confluence	40,925	101,128
135	Peshastin Headwaters	9,327	23,048

OKANAGAN ECOREGION

24b. Numerical Index of Freshwater Priority Conservation Areas

This index is intended to help the reader identify Freshwater Priority Conservation Areas on Maps 24, 25 and 28. The conservation areas are not ranked on Map 24, nor here. Rankings can be found on Map 28. The conservation areas are listed in numerical order and are indexed as they fall geographically from north to south.

Area values are calculated as the sum of the area of all assessment units which make up a single site.



PCA numbers 2 and 4 occur within the Thompson EDU, beyond the extent of this map.

OKANAGAN ECOREGION:

Map 25. Protected Lands and Freshwater Priority Conservation Areas

Designated parks and protected areas (classified as GAP status 1 and GAP status 2) overlap with Freshwater Conservation Areas. Approximately 14% of the freshwater portfolio is currently in designated areas. MARXAN is predisposed to select analysis units that are within a protected area so that the "cost" of an area is minimised. In order to conserve the freshwater portfolio that lies within the ecoregion, conservation strategies over the remaining portion of the portfolio in the ecoregion, or 30% of the ecoregion, would need to be applied. See Appendix 1 for GAP status definitions.

Scale 1:1,900,000

0 5 10 Miles

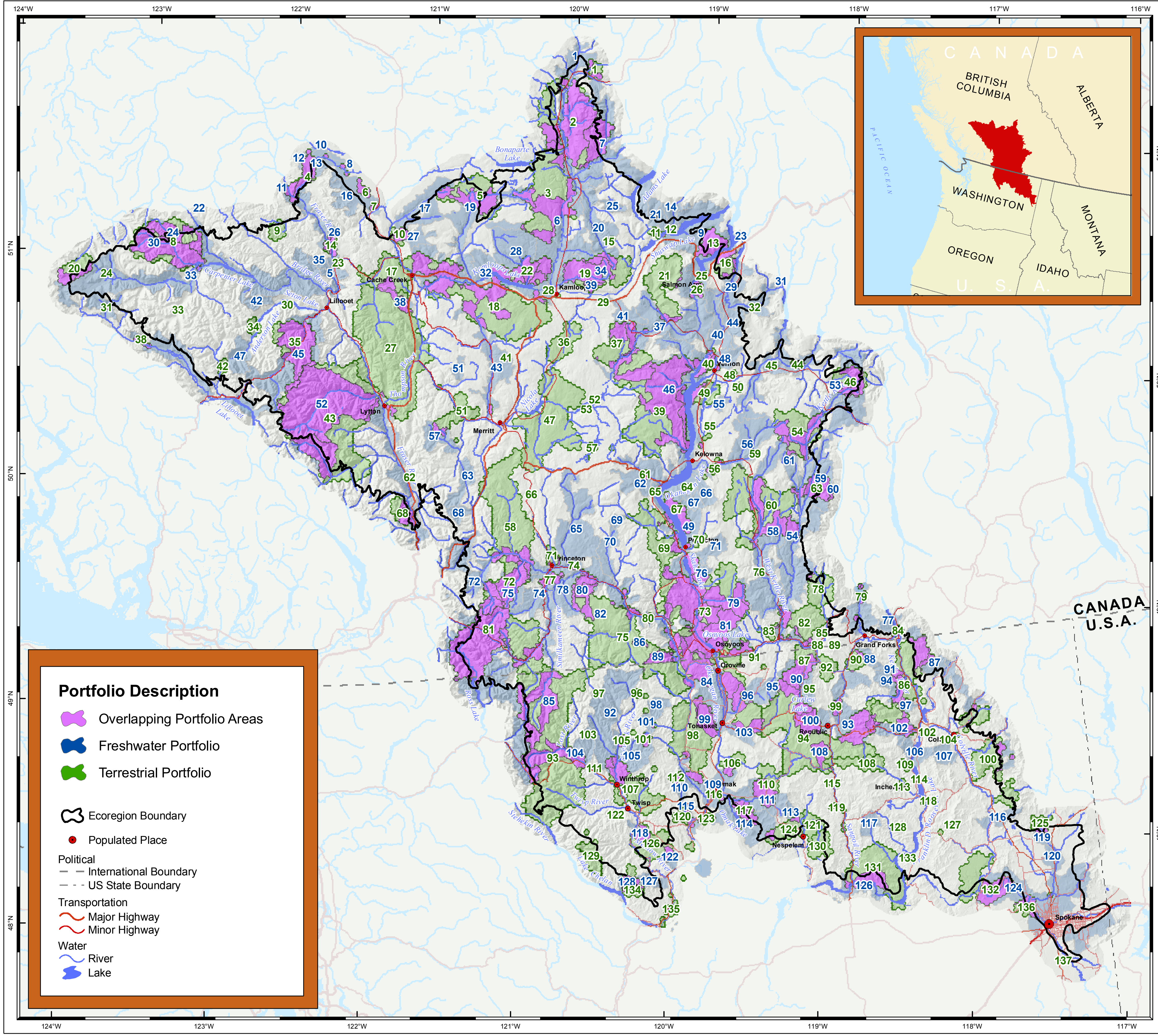
0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 26. Combined Portfolio

The overlap between the Terrestrial and Freshwater* Priority Conservation Areas is portrayed on this map. When combined, 58% of the ecoregion is found in a Priority Conservation Area. Of that, 24% (14% of the ecoregion) is identified as both a Terrestrial and Freshwater Priority Conservation Area. Some reasons for the relatively small amount of overlap between the two realms include:

- Different assessment units (watersheds vs hexagons)
- Landscape characteristics - terrestrial priority sites tend to be in areas with the least impact whereas freshwater priority sites include main stream reaches, where most of the region's development occurs
- Freshwater ecological systems targets require all larger reaches in that system be selected in a portfolio for that target goal to be achieved.

* Note - Freshwater Priority Conservation Areas include those identified through other EDU analyses which overlap the Okanagan Ecoregion.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

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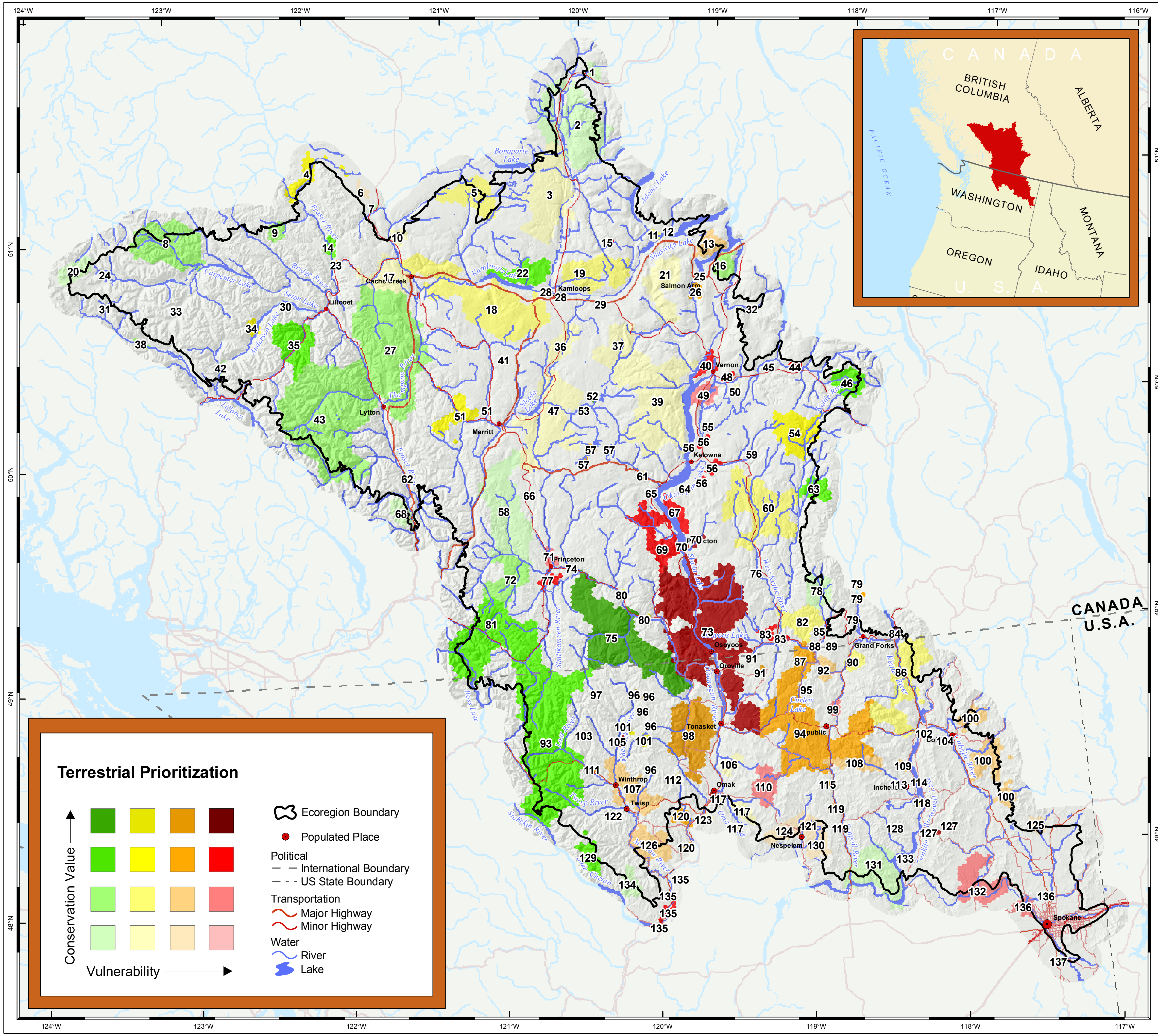
B.C. Conservation Data Centre

OKANAGAN ECOREGION:

Map 27. Terrestrial Priority Conservation Areas by Relative Importance



Every conservation area is worthy of conservation action, however not all areas are of equal value or in need of attention with the same degree of urgency. Through a practical approach to priority setting, the challenge of conserving identified areas can be focused down to an ambitious set of objectives, which if undertaken by the conservation community as a whole, is within our collective reach (Groves, 2003). We prioritized the 137 terrestrial sites identified in the Okanagan Ecoregion and developed a tool that can be customized for a variety of users. Prioritization evaluated the relative importance among sites using criteria for measuring conservation value and vulnerability (Pressey et al., 1994; Noss et al., 2001; Rumsey et al., 2003). Refer to Map 27a. that follows this page.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area

Nature Conservancy Canada
Conservation de la Nature Canada
The Nature Conservancy
Saving the last great places on earth
Washington Department of Fish and Wildlife
Washington's Natural Heritage Program
B.C. Conservation Data Centre
NatureServe

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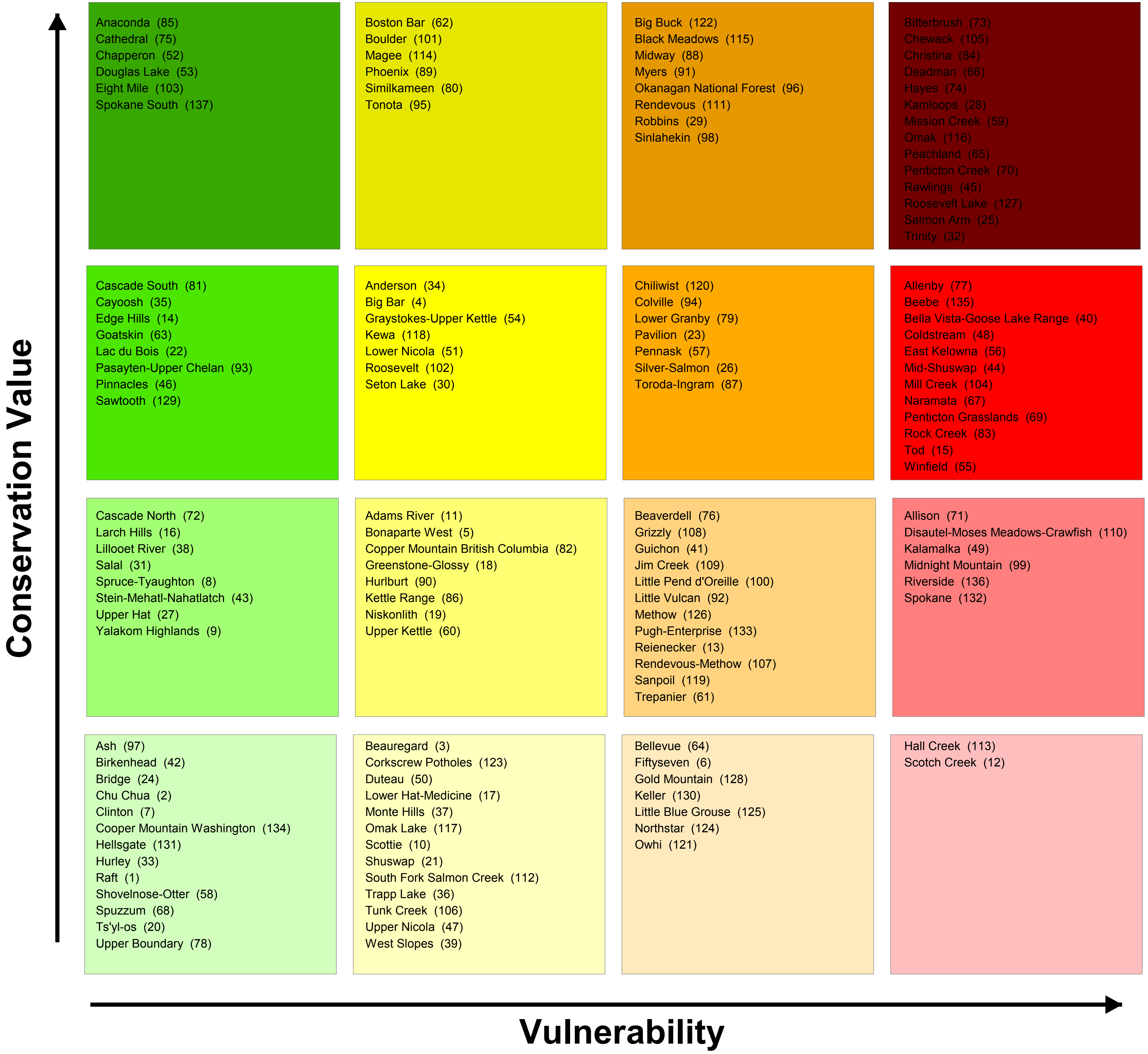
OKANAGAN ECOREGION:

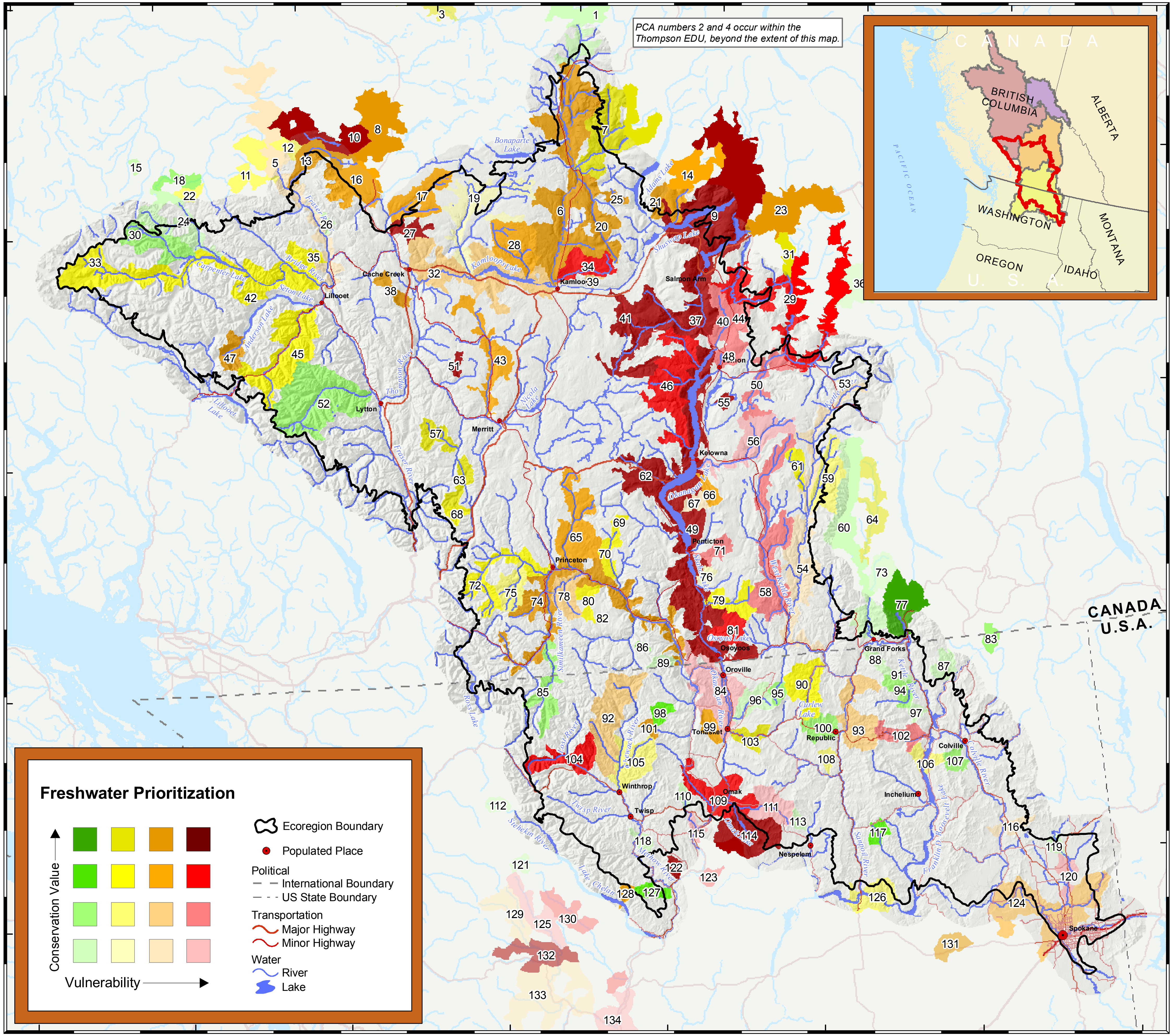
Map 27a. Terrestrial Priority Conservation Areas by Relative Importance

This table identifies the relative importance of 137 Terrestrial Priority Conservation Areas (PCAs) across the ecoregion using criteria for measuring conservation value and vulnerablity, as depicted in Map 27. We based conservation value on irreplaceability measures, one of the MARXAN model outputs. Vulnerability was based on the suitability index which was an input to the model (Section 7.4).

PCAs are sorted in the table according to factors important for biodiversity value as well as those that pose threats. The Priority Conservation Area names are listed according to their relative ranking, followed by the index number for ease of reference to Map 27.



Anaconda (85) Cathedral (75) Chapperon (52) Douglas Lake (53) Eight Mile (103) Spokane South (137)	Boston Bar (62) Boulder (101) Magee (114) Phoenix (89) Similkameen (80) Tonota (95)	Big Buck (122) Black Meadows (115) Midway (88) Myers (91) Okanagan National Forest (96) Rendevous (111) Robbins (29) Sinlahekin (98)	Bitterbrush (73) Chewack (105) Christina (84) Deadman (66) Hayes (74) Kamloops (28) Mission Creek (59) Omak (116) Peachland (65) Penticton Creek (70) Rawlings (45) Roosevelt Lake (127) Salmon Arm (25) Trinity (32)
Cascade South (81) Cayoosh (35) Edge Hills (14) Goatskin (63) Lac du Bois (22) Pasayten-Upper Chelan (93) Pinnacles (46) Sawtooth (129)	Anderson (34) Big Bar (4) Graystokes-Upper Kettle (54) Kewa (118) Lower Nicola (51) Roosevelt (102) Seton Lake (30)	Chiliwist (120) Colville (94) Lower Granby (79) Pavilion (23) Pennask (57) Silver-Salmon (26) Toroda-Ingram (87)	Allenby (77) Beebe (135) Bella Vista-Goose Lake Range (40) Coldstream (48) East Kelowna (56) Mid-Shuswap (44) Mill Creek (104) Naramata (67) Penticton Grasslands (69) Rock Creek (83) Tod (15) Winfield (55)
Cascade North (72) Larch Hills (16) Lillooet River (38) Salal (31) Spruce-Tyaughton (8) Stein-Mehatl-Nahatlatch (43) Upper Hat (27) Yalakom Highlands (9)	Adams River (11) Bonaparte West (5) Copper Mountain British Columbia (82) Greenstone-Glossy (18) Hurlburt (90) Kettle Range (86) Niskonlith (19) Upper Kettle (60)	Beaverdell (76) Grizzly (108) Guichon (41) Jim Creek (109) Little Pend d'Oreille (100) Little Vulcan (92) Methow (126) Pugh-Enterprise (133) Reienecker (13) Rendevous-Methow (107) Sanpoil (119) Trepanier (61)	Allison (71) Disautel-Moses Meadows-Crawfish (110) Kalamalka (49) Midnight Mountain (99) Riverside (136) Spokane (132)
Ash (97) Birkenhead (42) Bridge (24) Chu Chua (2) Clinton (7) Cooper Mountain Washington (134) Hellsgate (131) Hurley (33) Raft (1) Shovelnose-Otter (58) Spuzzum (68) Ts'yl-os (20) Upper Boundary (78)	Beauregard (3) Corkscrew Potholes (123) Duteau (50) Lower Hat-Medicine (17) Monte Hills (37) Omak Lake (117) Scottie (10) Shuswap (21) South Fork Salmon Creek (112) Trapp Lake (36) Tunk Creek (106) Upper Nicola (47) West Slopes (39)	Bellevue (64) Fiftyseven (6) Gold Mountain (128) Keller (130) Little Blue Grouse (125) Northstar (124) Owhi (121)	Hall Creek (113) Scotch Creek (12)



OKANAGAN ECOREGION:

Map 28. Freshwater Priority Conservation Areas by Relative Importance

Every conservation area is worthy of conservation action, however not all areas are of equal value or in need of attention with the same degree of urgency. Through a practical approach to priority setting, the challenge of conserving identified areas can be focused down to an ambitious set of objectives, which if undertaken by the conservation community as a whole, is within our collective reach (Groves, 2003). We prioritized the 135 freshwater sites identified in the Okanagan Ecoregion and developed a tool that can be customized for a variety of users. Prioritization evaluated the relative importance among sites using criteria for measuring conservation value and vulnerability (Pressey et al.,1994; Noss et al., 2001; Rumsey et al., 2003). Refer to Map 28a. following this page.

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

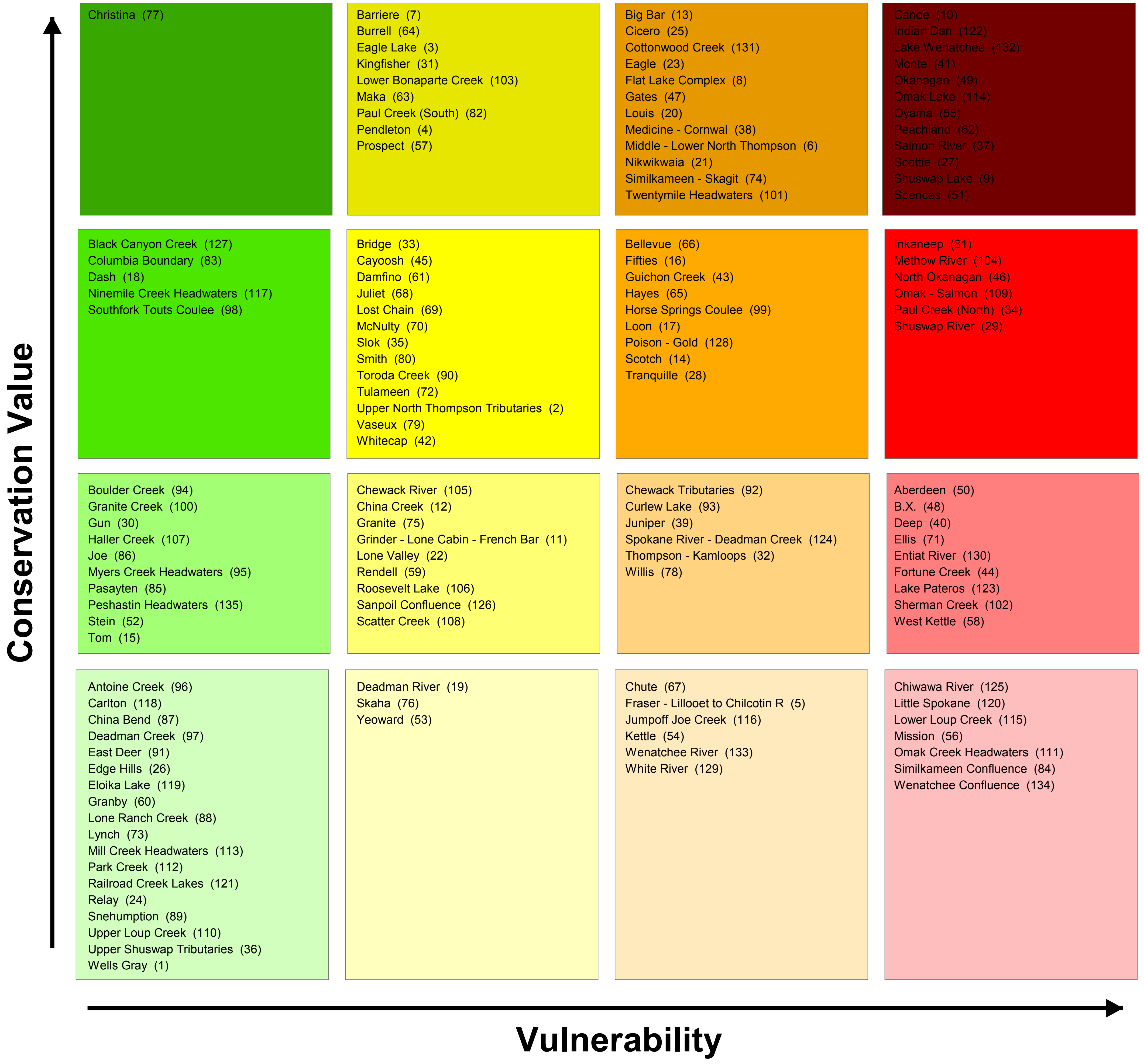
Projection: BC Albers Equal Area

OKANAGAN ECOREGION:

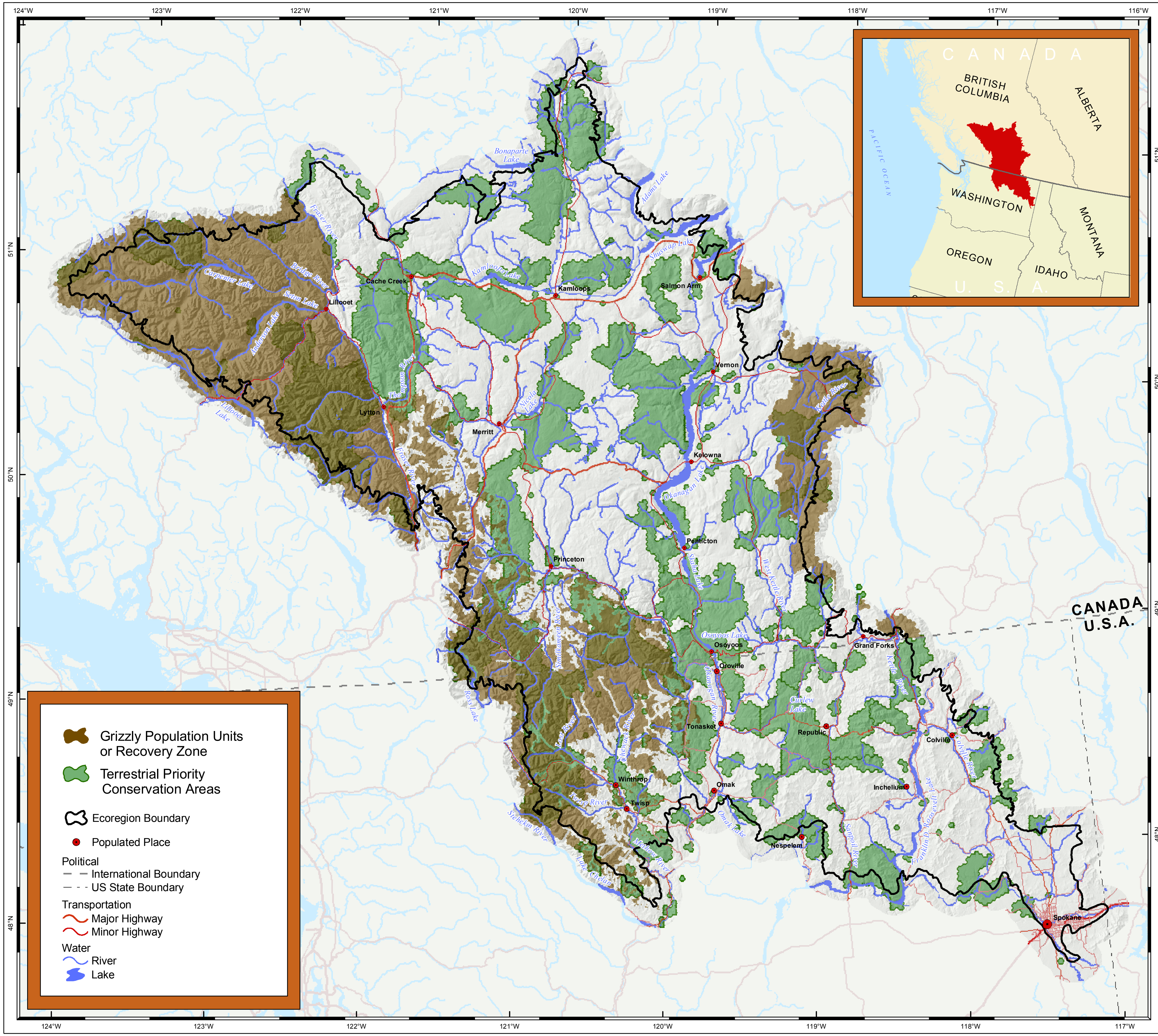
Map 28a. Freshwater Priority Conservation Areas by Relative Importance

This table identifies the relative importance of 135 Freshwater Priority Conservation Areas (PCAs) across the ecoregion using criteria for measuring conservation value and vulnerablity, as depicted in Map 28. We based conservation value on irreplaceability measures, one of the MARXAN model outputs. Vulnerability was based on the suitability index which was an input to the model (Section 7.4).

PCAs are sorted in the table according to factors important for biodiversity value as well as those that pose threats. The Priority Conservation Area names are listed according to their relative ranking, followed by the index number for ease of reference to Map 28.



Christina (77)	Barriere (7) Burrell (64) Eagle Lake (3) Kingfisher (31) Lower Bonaparte Creek (103) Maka (63) Paul Creek (South) (82) Pendleton (4) Prospect (57)	Big Bar (13) Cicero (25) Cottonwood Creek (131) Eagle (23) Flat Lake Complex (8) Gates (47) Louis (20) Medicine - Cornwal (38) Middle - Lower North Thompson (6) Nikwikwaia (21) Similkameen - Skagit (74) Twentymile Headwaters (101)	Canoe (10) Indian Dan (122) Lake Wenatchee (132) Monte (41) Okanagan (49) Omak Lake (114) Oyama (55) Peachland (62) Salmon River (37) Scottie (27) Shuswap Lake (9) Spences (51)
Black Canyon Creek (127) Columbia Boundary (83) Dash (18) Ninemile Creek Headwaters (117) Southfork Touts Coulee (98)	Bridge (33) Cayoosh (45) Damfino (61) Juliet (68) Lost Chain (69) McNulty (70) Slok (35) Smith (80) Toroda Creek (90) Tulameen (72) Upper North Thompson Tributaries (2) Vaseux (79) Whitecap (42)	Bellevue (66) Fifties (16) Guichon Creek (43) Hayes (65) Horse Springs Coulee (99) Loon (17) Poison - Gold (128) Scotch (14) Tranquille (28)	Inkaneep (81) Methow River (104) North Okanagan (46) Omak - Salmon (109) Paul Creek (North) (34) Shuswap River (29)
Boulder Creek (94) Granite Creek (100) Gun (30) Haller Creek (107) Joe (86) Myers Creek Headwaters (95) Pasayten (85) Peshastin Headwaters (135) Stein (52) Tom (15)	Chewack River (105) China Creek (12) Granite (75) Grinder - Lone Cabin - French Bar (11) Lone Valley (22) Rendell (59) Roosevelt Lake (106) Sanpoil Confluence (126) Scatter Creek (108)	Chewack Tributaries (92) Curlew Lake (93) Juniper (39) Spokane River - Deadman Creek (124) Thompson - Kamloops (32) Willis (78)	Aberdeen (50) B.X. (48) Deep (40) Ellis (71) Entiat River (130) Fortune Creek (44) Lake Pateros (123) Sherman Creek (102) West Kettle (58)
Antoine Creek (96) Carlton (118) China Bend (87) Deadman Creek (97) East Deer (91) Edge Hills (26) Eloika Lake (119) Granby (60) Lone Ranch Creek (88) Lynch (73) Mill Creek Headwaters (113) Park Creek (112) Railroad Creek Lakes (121) Relay (24) Snehumption (89) Upper Loup Creek (110) Upper Shuswap Tributaries (36) Wells Gray (1)	Deadman River (19) Skaha (76) Yeoward (53)	Chute (67) Fraser - Lillooet to Chilcotin R (5) Jumpoff Joe Creek (116) Kettle (54) Wenatchee River (133) White River (129)	Chiwawa River (125) Little Spokane (120) Lower Loup Creek (115) Mission (56) Omak Creek Headwaters (111) Similkameen Confluence (84) Wenatchee Confluence (134)



OKANAGAN ECOREGION:

Map 29. Comparative Analysis: Grizzly Bear

A comparative analysis was made between the terrestrial portfolio and extent of Threatened Grizzly Bear Population Units (GBPUs) as mapped by the British Columbia Provincial Government and Grizzly Bear Recovery Zones as mapped by the United States Fish and Wildlife Service. The population units and recovery zones together cover 2,615,045 ha (6,461,917 ac) of the ecoregion. The results of this analysis show that 33%, or 871,546 ha (2,153,636 ac) of these Grizzly Bear units or zones fall within the terrestrial portfolio.

Scale 1:1,900,000

0 5 10 Miles

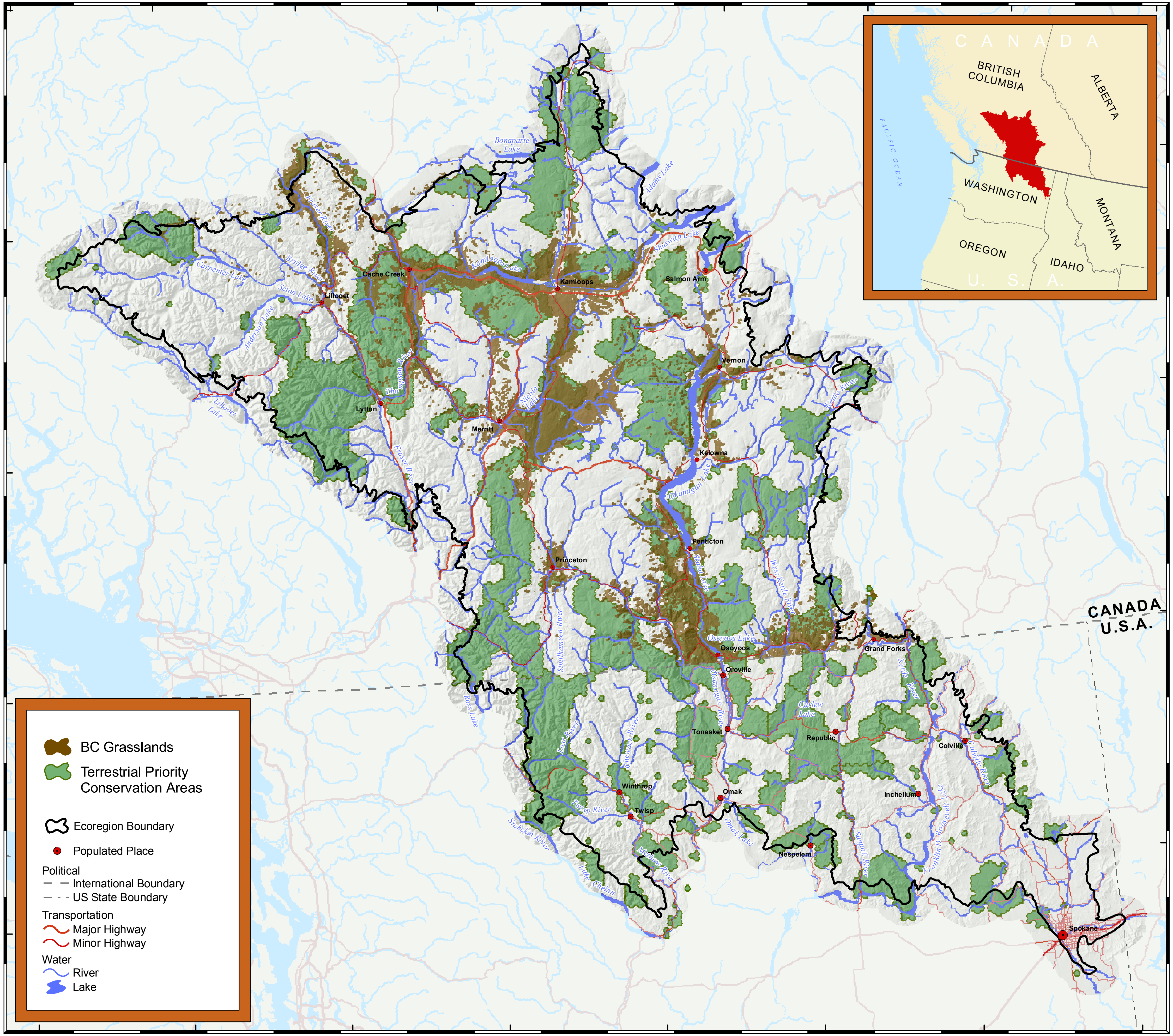
0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area



OKANAGAN ECOREGION:

Map 30. Comparative Analysis: British Columbia Grasslands

A comparative analysis was made between the terrestrial portfolio and extent of native grasslands in British Columbia, as mapped by the Grasslands Conservation Council of British Columbia (April, 2005). Native grasslands cover just over 400,000 ha (215,600 ac) of the British Columbia portion of the ecoregion. This analysis shows that 53% of the native grasslands mapped by the Grassland Conservation Council fall within the terrestrial portfolio.

Grassland Type	Total Area in Ecoregion (ha)	Area Captured in Terrestrial Portfolio (ha)	Percent Captured in Terrestrial Portfolio
Open grasslands	373,003	199,085	53%
Open dry forest near open grasslands	14,473	7,929	55%
Open dry forest in NDT4[1]	10,930	3,436	31%
Burned forest in PP or BG BGC[2] zone	5,047	3,459	69%
Totals	**403,453**	**213,908**	**53%**

[1] Natural Disturbance Type
[2] Ponderosa Pine or Bunchgrass Biogeoclimatic zones

Scale 1:1,900,000

0 5 10 Miles

0 10 20 Kilometres

N

Sources:
BC Ministry of Agriculture and Lands,
Nature Conservancy of Canada,
The Nature Conservancy,
WA Dept. of Fish and Wildlife,
WA Dept. of Natural Resources,
USGS, ESRI

The Nature Conservancy
Washington Chapter
October 2006

Projection: BC Albers Equal Area

VOLUME

4

SITE

SUMMARIES

Okanagan Ecoregional Assessment

October 2006

Nature Conservancy Canada

Conservation de la Nature Canada

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Washington Department of Fish and Wildlife

Okanagan Ecoregional Assessment

Volume 4 – Site Summaries

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Adams River

Site No 11

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	18 %	US National	0 %	Can National:	0 %
Area:	3,000	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	67 %
	7,410	ac	Water	10 %	GAP 3	49 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	33 %	US Indigenous:	0 %	Can Indigenous:	28 %
							US Private	0 %	Can Private:	6 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,208 ha	0.1 %	8.90	0.3 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		874 ha	0.0 %	1.68	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,207 ha	0.1 %	13.17	0.4 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		295 ha	0.4 %	38.05	1.2 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		875 ha	0.2 %	18.41	0.6 %	151,409 ha	105 %
Species							
Mammals							
Fringed myotis *Myotis thysanodes*	G4G5	1 occ	6.7 %	245.09	7.7 %	13 occ	100 %

Allenby

Site No 77

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	5,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	41 %
	13,585	ac	Water	0 %	GAP 3	41 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	59 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	59 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		2,099 ha	0.0%	2.20	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		2,999 ha	0.3%	17.85	1.0 %	291,947 ha	138 %
Northern Interior Plateau Grassland		137 ha	0.1%	3.64	0.2 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		84 ha	0.1%	5.91	0.3 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		2,096 ha	0.2%	10.32	0.6 %	352,885 ha	104 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		2,996 ha	0.2%	12.04	0.7 %	432,412 ha	116 %
Species							
Birds							
Williamson's sapsucker *Sphyrapicus thyroideus thyroideus*	G5	4 nst	10.3%	182.94	10.5 %	38 nst	97 %
Northern goshawk *Accipiter gentilis*	G5	1 nst	1.2%	45.73	2.6 %	38 nst	103 %
Mammals							
Fisher *Martes pennanti*	G5	1,976 ha	0.1%	5.14	0.3 %	668,362 ha	71 %
Grizzly bear *Ursus arctos*	G4	497 ha	0.0%	0.82	0.0 %	1,050,522 ha	83 %

Vascular Plants

Dark Lamb's-quarters *Chenopodium atrovirens*	G5	1 occ	33.3 %	248.27	14.3 %	7 occ	14 %
Stoloniferous Pussytoes *Antennaria flagellaris*	G5?	3 occ	100.0 %	744.82	42.9 %	7 occ	43 %
Valley Sedge vallicola vallicola *Carex vallicola var. vallicola*	G5T5	4 occ	100.0 %	993.09	57.1 %	7 occ	57 %
Slender Collomia *Collomia tenella*	G4?	1 occ	100.0 %	248.27	14.3 %	7 occ	14 %
Oniongrass *Melica bulbosa var. bulbosa*	G5T5	2 occ	40.0 %	496.54	28.6 %	7 occ	71 %
Dwarf Woolly-heads *Psilocarphus brevissimus var. brevissimus*	G4T4	3 occ	100.0 %	744.82	42.9 %	7 occ	43 %
Cusick's Paintbrush *Castilleja cusickii*	G4G5	1 occ	100.0 %	248.27	14.3 %	7 occ	14 %
Dwarf Groundsmoke *Gayophytum humile*	G5	2 occ	40.0 %	496.54	28.6 %	7 occ	71 %
Close-flowered Knotweed *Polygonum polygaloides ssp. confertiflorum*	G4G5T3	1 occ	100.0 %	248.27	14.3 %	7 occ	14 %
Kellogg's Knotweed *Polygonum polygaloides ssp. kelloggii*	G4G5T3	1 occ	50.0 %	248.27	14.3 %	7 occ	29 %
Carolina Meadow-foxtail *Alopecurus carolinianus*	G5	2 occ	100.0 %	496.54	28.6 %	7 occ	29 %

Allison

Site No 71

Northern Cascade Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	12 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	4,500 ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	11 %
	11,115 ac	Water	0 %	GAP 3	11 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	89 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	89 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		336 ha	0.0 %	1.65	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		39 ha	0.0 %	0.05	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		337 ha	0.0 %	2.45	0.1 %	291,947 ha	138 %
Northern Interior Plateau Grassland		3,464 ha	1.6 %	112.43	5.3 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		35 ha	0.0 %	3.01	0.1 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		39 ha	0.0 %	0.23	0.0 %	352,885 ha	104 %
Columbia Basin Foothill Riparian Woodland and Shrubland		30 ha	0.1 %	9.74	0.5 %	6,545 ha	138 %
Species							
Birds							
Lewis' woodpecker *Melanerpes lewis*	G4	1 nst	0.7 %	55.90	2.6 %	38 nst	239 %
Prairie falcon *Falco mexicanus*	G5	1 occ	11.1 %	1,062.04	50.0 %	2 occ	450 %
Mammals							
Fisher *Martes pennanti*	G5	44 ha	0.0 %	0.14	0.0 %	668,362 ha	71 %

Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.8 %	48.83	2.3 %	58 occ	128 %

Anaconda

Site No 85

Okanagan Highlands Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	66 %
	1,235 ac	Water	0 %	GAP 3	66 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	34 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	34 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		14 ha	0.0 %	0.64	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		143 ha	0.0 %	1.65	0.0 %	1,658,616 ha	109 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		259 ha	0.5 %	301.76	1.6 %	16,408 ha	117 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		14 ha	0.0 %	0.92	0.0 %	291,947 ha	138 %
Northern Interior Spruce-Fir woodland and forest		82 ha	0.0 %	3.78	0.0 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		61 ha	0.0 %	3.30	0.0 %	352,885 ha	104 %
Inter-Mountain Basins Big Sagebrush Steppe		87 ha	0.0 %	8.82	0.0 %	188,483 ha	134 %
Species							
Birds							
Canyon wren *Catherpes mexicanus*	G5	1 occ	1.7 %	1,470.55	7.7 %	13 occ	369 %
Mammals							
Fisher *Martes pennanti*	G5	246 ha	0.0 %	7.03	0.0 %	668,362 ha	71 %
Fringed myotis *Myotis thysanodes*	G4G5	1 occ	6.7 %	1,470.55	7.7 %	13 occ	100 %

Townsend's big-eared bat *Coryhorhinus townsendii*	G4	1	nst	2.2%	503.08	2.6 %	38	nst	100 %
Reptiles									
Racer *Coluber constricta*	G5	1	occ	0.8%	1,470.55	7.7 %	13	occ	708 %

Anderson

Site No 34

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	4,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	91 %
	11,115	ac	Water	21 %	GAP 3	91 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	9 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	9 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,838 ha	0.0%	2.35	0.1 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		439 ha	0.0%	3.19	0.2 %	292,133 ha	108 %
Rocky Mountain Alpine Composite		66 ha	0.0%	1.17	0.1 %	119,447 ha	122 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		189 ha	0.3%	24.47	1.2 %	16,408 ha	117 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		53 ha	0.1%	4.56	0.2 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		471 ha	0.0%	2.42	0.1 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		931 ha	0.1%	5.60	0.3 %	352,885 ha	104 %
East Cascades Mesic Montane Mixed Conifer Forest		1,452 ha	3.1%	221.12	10.4 %	13,948 ha	100 %
Species							
Birds							
Northern spotted owl *Strix occidentalis caurina*	G3	8 nst	1.6%	253.63	11.9 %	67 nst	193 %
Mammals							
Grizzly bear *Ursus arctos*	G4	4,500 ha	0.2%	9.10	0.4 %	1,050,522 ha	83 %

Mountain goat *Oreamos americanus*	G5	819 ha	0.5%	57.03	2.7 %	30,505 ha	179 %
Reptiles							
Racer *Coluber constricta*	G5	1 occ	0.8%	163.39	7.7 %	13 occ	708 %

Ash

Site No 97

Northern Cascade Ranges Section

Terrestrial Site

Area: 500 ha
1,235 ac

Land Use/Land Cover

Agriculture 0 %
Developed 0 %
Water 1 %

GAP Management Status

GAP 1 100 %
GAP 2 0 %
GAP 3 0 %
GAP 4 0 %

Land Ownership

US National 100 %
US State: 0 %
US Local: 0 %
US Indigenous: 0 %
US Private 0 %
US NGO 0 %

Can National: 0 %
BC Provincial: 0 %
BC Regional: 0 %
Can Indigenous: 0 %
Can Private: 0 %
Can NGO: 0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		26 ha	0.0%	0.30	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		26 ha	0.0%	2.57	0.0 %	193,578 ha	114 %
Rocky Mountain Alpine Composite		280 ha	0.1%	44.81	0.2 %	119,447 ha	122 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		15 ha	0.0%	17.48	0.1 %	16,408 ha	117 %
Northern Rocky Mountain Subalpine Dry Parkland		179 ha	0.1%	95.10	0.5 %	35,979 ha	139 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	500 ha	0.0%	9.10	0.0 %	1,050,522 ha	83 %
Lynx *Lynx canadensis*	G5	500 ha	0.1%	34.75	0.2 %	275,020 ha	102 %
Wolverine *Gulo gulo*	G4	1 occ	0.7%	75.41	0.4 %	13 occ	54 %

Beauregard

Site No 3

Thompson Okanagan Plateau Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	1 %	GAP 1	7 %	US National	0 %	Can National:	0 %
Area:	82,000 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	97 %
	202,540 ac	Water	2 %	GAP 3	90 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	3 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		6,413 ha	0.4%	1.73	1.5 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		71,780 ha	1.3%	5.04	4.3 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		13 ha	0.1%	0.55	0.5 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		13,566 ha	1.4%	5.41	4.6 %	292,133 ha	108 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		6,412 ha	0.7%	2.56	2.2 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,064 ha	1.3%	5.02	4.3 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		40,388 ha	2.9%	11.37	9.8 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		5,103 ha	0.4%	1.69	1.4 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		12,730 ha	2.5%	9.80	8.4 %	151,409 ha	105 %
Species							
Birds							
Williamson's sapsucker *Sphyrapicus thyroideus thyroideus*	G5	1 nst	2.6%	3.07	2.6 %	38 nst	97 %
Bobolink *Dolichonyx oryzivorus*	G5	1 occ	4.3%	8.97	7.7 %	13 occ	108 %

Mammals							
Fisher *Martes pennanti*	G5	11,244 ha	0.7%	1.96	1.7 %	668,362 ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	5 occ	3.1%	10.23	8.8 %	58 occ	128 %

Beaverdell

Site No 76

Central Okanagan Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	75 %
	1,235 ac	Water	0 %	GAP 3	75 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	25 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	25 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		337 ha	0.0%	3.89	0.0 %	1,658,616 ha	109 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		73 ha	0.1%	56.49	0.3 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		37 ha	0.0%	1.71	0.0 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		300 ha	0.0%	16.25	0.1 %	352,885 ha	104 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	436 ha	0.0%	12.48	0.1 %	668,362 ha	71 %

Beebe

Site No 135

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	10 %	GAP 1	0 %	US National	17 %	Can National:	0 %
Area:	5,500	ha	Developed	0 %	GAP 2	4 %	US State:	12 %	BC Provincial:	0 %
	13,585	ac	Water	9 %	GAP 3	25 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	72 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	72 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		3,622 ha	0.3%	14.56	0.8 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		100 ha	0.0%	0.60	0.0 %	291,947 ha	138 %
Inter-Mountain Basins Cliff and Canyon		17 ha	0.3%	17.97	1.0 %	1,644 ha	100 %
Inter-Mountain Basins Big Sagebrush Steppe		3,906 ha	0.6%	36.02	2.1 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		51 ha	0.2%	13.54	0.8 %	6,545 ha	138 %
Species							
Birds							
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	4 nst	3.2%	108.62	6.3 %	64 nst	111 %
Bald eagle *Haliaeetus leucocephalus*	G4	2 nst	1.9%	91.47	5.3 %	38 nst	100 %
Golden eagle *Aquila chrysaetos*	G5	2 nst	1.2%	91.47	5.3 %	38 nst	174 %
Mammals							
Western gray squirrel *Sciurus griseus*	G5	1 occ	1.7%	133.68	7.7 %	13 occ	115 %
Vascular Plants							

Adder's-tongue *Ophioglossum pusillum*	G5	1 occ	50.0%	248.27	14.3 %	7 occ	29 %
Ute Ladies' Tresses *Spiranthes diluvialis*	G2	3 occ	75.0%	744.81	42.9 %	7 occ	57 %

Bella Vista-Goose Lake Range

Site No 40

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	21 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	7,500	ha	Developed	10 %	GAP 2	0 %	US State:	0 %	BC Provincial:	15 %
	18,525	ac	Water	14 %	GAP 3	15 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	85 %	US Indigenous:	0 %	Can Indigenous:	48 %
							US Private	0 %	Can Private:	37 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Rocky Mountain Ponderosa Pine Woodland and Savanna		337 ha	0.0%	1.47	0.1 %	291,947 ha	138 %
Northern Interior Plateau Grassland		3,699 ha	1.7%	72.03	5.7 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		13 ha	0.0%	0.67	0.1 %	24,703 ha	133 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		335 ha	0.0%	0.99	0.1 %	432,412 ha	116 %
Species							
Amphibians							
Coastal tailed frog *Ascaphus truei*	G4	1 occ	0.8%	98.04	7.7 %	13 occ	792 %
Great Basin spadefoot *Spea intermontana*	G5	2 occ	1.8%	174.19	13.7 %	13 occ	485 %
Birds							
Grasshopper sparrow *Ammodramus savannarum*	G5	5 nst	15.6%	167.69	13.2 %	38 nst	76 %
Swainson's hawk *Buteo swainsoni*	G5	3 occ	33.3%	294.11	23.1 %	13 occ	69 %
Lewis' woodpecker *Melanerpes lewis*	G4	1 nst	0.7%	33.54	2.6 %	38 nst	239 %
Dragonfly							

Twelve-spotted skimmer *Libellula pulchella*	G5	1	occ	5.3%	98.04	7.7 %	13	occ	108 %
Mammals									
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.6%	21.97	1.7 %	58	occ	128 %
Great Basin pocket mouse *Perognathus parvus*	G5	1	occ	1.4%	49.02	3.8 %	13	occ	269 %
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	1	nst	2.2%	33.54	2.6 %	38	nst	100 %
Reptiles									
Gopher snake *Pituophis catenifer deserticola*	G5	1	occ	1.2%	98.04	7.7 %	13	occ	531 %
Racer *Coluber constricta*	G5	5	occ	3.5%	450.97	35.4 %	13	occ	708 %
Vascular Plants									
Giant Helleborine *Epipactis gigantea*	G3	1	occ	12.5%	182.07	14.3 %	7	occ	100 %
Hairy Water-clover *Marsilea vestita*	G5	1	occ	25.0%	182.07	14.3 %	7	occ	57 %
Red-rooted Cyperus *Cyperus erythrorhizos*	G5	1	occ	13.0%	47.37	3.7 %	7	occ	14 %
Awned Cyperus *Cyperus squarrosus*	G5	1	occ	14.3%	182.07	14.3 %	7	occ	71 %

Bellevue

Site No 64

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	45 %
	1,235	ac	Water	0 %	GAP 3	45 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	55 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	55 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		458 ha	0.0%	20.26	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		40 ha	0.0%	0.46	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		458 ha	0.0%	29.99	0.2 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		2 ha	0.0%	1.55	0.0 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		17 ha	0.0%	0.92	0.0 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		23 ha	0.0%	2.90	0.0 %	151,409 ha	105 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	16 ha	0.0%	0.46	0.0 %	668,362 ha	71 %

Big Bar

Site No 4

Interior Transition Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	16,500 ha	Developed	0 %	GAP 2	5 %	US State:	0 %	BC Provincial:	74 %
	40,755 ac	Water	1 %	GAP 3	74 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	22 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	22 %
						US NGO	0 %	Can NGO:	4 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Inter-Mountain Basins Big Sagebrush Steppe		988 ha	0.2 %	3.04	0.5 %	188,483 ha	134 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		3,301 ha	0.2 %	4.42	0.8 %	432,412 ha	116 %
Columbia Basin Foothill Riparian Woodland and Shrubland		80 ha	0.4 %	7.08	1.2 %	6,545 ha	138 %
Inter-Mountain Basins Cliff and Canyon		960 ha	17.5 %	338.28	58.4 %	1,644 ha	100 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		6,408 ha	0.5 %	10.52	1.8 %	352,885 ha	104 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		621 ha	0.8 %	14.56	2.5 %	24,703 ha	133 %
Northern Interior Plateau Grassland		4,698 ha	2.2 %	41.58	7.2 %	65,446 ha	200 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		2,313 ha	0.2 %	4.59	0.8 %	291,947 ha	138 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		6,401 ha	0.1 %	2.24	0.4 %	1,658,616 ha	109 %
Species							
Birds							
Sandhill crane *Grus canadensis*	G5	1 occ	6.7 %	82.76	14.3 %	7 occ	157 %
Mammals							

Bighorn sheep *Ovis canadensis*	G4	4,476	ha	1.6%	46.87	8.1%	55,318	ha	253 %
Grizzly bear *Ursus arctos*	G4	1,648	ha	0.1%	0.91	0.2%	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	1,749	ha	0.1%	1.52	0.3%	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	2	occ	1.2%	19.98	3.4%	58	occ	128 %
Mountain goat *Oreamos americanus*	G5	45	ha	0.0%	0.85	0.1%	30,505	ha	179 %
Reptiles									
Gopher snake *Pituophis catenifer deserticola*	G5	1	occ	1.2%	44.56	7.7%	13	occ	531 %
Racer *Coluber constricta*	G5	1	occ	0.8%	44.56	7.7%	13	occ	708 %
Vascular Plants									
Blue Grama *Bouteloua gracilis*	G5	1	occ	100.0%	82.76	14.3%	7	occ	14 %
Western Dogbane *Apocynum x floribundum*	GNA	1	occ	50.0%	82.76	14.3%	7	occ	29 %

Big Buck

Site No 122

Northern Cascade Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	100 %	Can National:	0 %
Area:	500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	1,235 ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		18 ha	0.0%	0.78	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		381 ha	0.0%	4.39	0.0 %	1,658,616 ha	109 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		1 ha	0.0%	1.17	0.0 %	16,408 ha	117 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		18 ha	0.0%	1.18	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		6 ha	0.0%	4.64	0.0 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		380 ha	0.0%	28.54	0.1 %	254,555 ha	103 %
Northern Interior Spruce-Fir woodland and forest		1 ha	0.0%	0.00	0.0 %	414,168 ha	105 %
Inter-Mountain Basins Big Sagebrush Steppe		93 ha	0.0%	9.43	0.0 %	188,483 ha	134 %
Species							
Birds							
Black-backed woodpecker *Picoides arcticus*	G5	1 occ	8.3%	1,470.55	7.7 %	13 occ	92 %
Mammals							
Grizzly bear *Ursus arctos*	G4	285 ha	0.0%	5.19	0.0 %	1,050,522 ha	83 %

Fisher *Martes pennanti*	G5	5	ha	0.0%	0.15	0.0%	668,362 ha	71 %

Birkenhead

Site No 42

Interior Transition Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	3,000 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	87 %
	7,410 ac	Water	0 %	GAP 3	87 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	13 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	13 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		399 ha	0.0%	0.77	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		266 ha	0.0%	2.90	0.1 %	292,133 ha	108 %
Rocky Mountain Alpine Composite		24 ha	0.0%	0.64	0.0 %	119,447 ha	122 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		236 ha	0.3%	30.44	1.0 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		133 ha	0.0%	1.20	0.0 %	352,885 ha	104 %
North Pacific Montane Riparian Woodland and Shrubland		2 ha	0.0%	3.43	0.1 %	1,856 ha	100 %
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest		1,923 ha	0.9%	91.45	2.9 %	67,002 ha	80 %
East Cascades Mesic Montane Mixed Conifer Forest		420 ha	0.9%	95.94	3.0 %	13,948 ha	100 %
Species							
Birds							
Northern spotted owl *Strix occidentalis caurina*	G3	40 nst	7.8%	1,902.21	59.7 %	67 nst	193 %
Mammals							
Grizzly bear *Ursus arctos*	G4	3,000 ha	0.1%	9.10	0.3 %	1,050,522 ha	83 %

Bitterbrush

Site No 73

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	7 %	US National	8 %	Can National:	1 %
Area:	211,500	ha	Developed	1 %	GAP 2	7 %	US State:	2 %	BC Provincial:	51 %
	522,405	ac	Water	2 %	GAP 3	49 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	36 %	US Indigenous:	0 %	Can Indigenous:	8 %
							US Private	16 %	Can Private:	13 %
							US NGO	0 %	Can NGO:	1 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Plateau Grassland		576 ha	0.3%	0.40	0.9 %	65,446 ha	200 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		109,550 ha	7.6%	11.45	25.3 %	432,412 ha	116 %
Inter-Mountain Basins Big Sagebrush Steppe		73,328 ha	11.7%	17.58	38.9 %	188,483 ha	134 %
Inter-Mountain Basins Cliff and Canyon		164 ha	3.0%	4.51	10.0 %	1,644 ha	100 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		474 ha	0.1%	0.14	0.3 %	151,409 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		16,265 ha	1.4%	2.08	4.6 %	352,885 ha	104 %
Northern Interior Spruce-Fir woodland and forest		26,337 ha	1.9%	2.87	6.4 %	414,168 ha	105 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		595 ha	0.7%	1.09	2.4 %	24,703 ha	133 %
Columbia Basin Foothill Riparian Woodland and Shrubland		2,358 ha	10.8%	16.28	36.0 %	6,545 ha	138 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		50,749 ha	5.2%	7.86	17.4 %	291,947 ha	138 %
Northern Rocky Mountain Subalpine Dry Parkland		118 ha	0.1%	0.15	0.3 %	35,979 ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		1,188 ha	2.2%	3.27	7.2 %	16,408 ha	117 %

Rocky Mountain Alpine Composite		58	ha	0.0%	0.02	0.0 %	119,447	ha	122 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		1,049	ha	0.2%	0.24	0.5 %	193,578	ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		7,251	ha	0.7%	1.12	2.5 %	292,133	ha	108 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		3	ha	0.0%	0.05	0.1 %	2,773	ha	136 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		59,204	ha	1.1%	1.61	3.6 %	1,658,616	ha	109 %
Northern Rocky Mountain Montane Mixed Conifer Forest		7,832	ha	0.9%	1.39	3.1 %	254,555	ha	103 %

Species

Amphibians

Coastal tailed frog *Ascaphus truei*	G4	98	occ	82.4%	340.69	753.8 %	13	occ	792 %
Tiger salamander *Ambystoma tigrinum*	G5	65	occ	49.1%	117.14	259.2 %	25	occ	316 %
Western toad *Bufo boreas*	G4	1	occ	2.6%	3.48	7.7 %	13	occ	123 %
Great Basin spadefoot *Spea intermontana*	G5	41	occ	41.5%	144.13	318.9 %	13	occ	485 %

Birds

Brewer's sparrow (breweri ssp) *Spizella breweri breweri*	G5T4	33	occ	93.2%	113.43	251.0 %	13	occ	254 %
Long-billed curlew *Numenius americanus*	G5	3	nst	60.0%	3.57	7.9 %	38	nst	13 %
Sage thrasher *Oreoscoptes montanus*	G5	10	occ	83.3%	34.76	76.9 %	13	occ	92 %
Flammulated owl *Otus flammeolus*	G4	30	nst	25.4%	35.68	78.9 %	38	nst	205 %
Western screech owl *Otus kennicotii macfarlanei*	G5T4	32	nst	37.2%	38.06	84.2 %	38	nst	134 %
Wilson's phalarope *Phalaropus tricolor*	G5	1	occ	100.0%	3.48	7.7 %	13	occ	8 %
Black-backed woodpecker *Picoides arcticus*	G5	2	occ	16.7%	6.95	15.4 %	13	occ	92 %
Lewis' woodpecker *Melanerpes lewis*	G4	71	nst	49.3%	84.44	186.8 %	38	nst	239 %
Burrowing owl *Athene cunicularia*	G4	34	occ	54.8%	219.51	485.7 %	7	occ	643 %
Ferruginous hawk *Buteo regalis*	G4	1	occ	100.0%	6.46	14.3 %	7	occ	14 %
Sandhill crane *Grus canadensis*	G5	7	occ	46.7%	45.19	100.0 %	7	occ	157 %

Barn owl *Tyto alba*	G5	3	occ	100.0%	19.37	42.9 %	7	occ	43 %
Williamson's sapsucker *Sphyrapicus thyroideus thyroideus*	G5	18	nst	46.2%	21.41	47.4 %	38	nst	97 %
White-headed woodpecker *Picoides albolarvatus*	G4	16	nst	76.2%	19.03	42.1 %	38	nst	55 %
Grasshopper sparrow *Ammodramus savannarum*	G5	22	nst	68.8%	26.16	57.9 %	38	nst	76 %
Western yellow-breasted chat *Icteria virens auricollis*	G5	12	occ	76.8%	42.72	94.5 %	13	occ	100 %
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	9	nst	7.2%	6.36	14.1 %	64	nst	111 %
Golden eagle *Aquila chrysaetos*	G5	5	nst	3.0%	5.95	13.2 %	38	nst	174 %
Great blue heron *Ardia herodius*	G5	3	occ	7.1%	8.69	19.2 %	13	occ	100 %
Short-eared owl *Asio flammeus*	G5	2	occ	100.0%	6.95	15.4 %	13	occ	15 %
American bittern *Botaurus lentiginosis*	G4	1	occ	50.0%	3.48	7.7 %	13	occ	15 %
Canyon wren *Catherpes mexicanus*	G5	38	occ	63.2%	131.85	291.7 %	13	occ	369 %
Lark sparrow *Chondestes grammacus*	G5	29	occ	86.7%	99.43	220.0 %	13	occ	231 %
Trumpeter swan (S. Thompson R.) *Cygnus buccinator*	G4	3	nst	75.0%	5.89	13.0 %	23	nst	17 %
Blue grouse *Dendragapus obscurus*	G5	2	occ	33.3%	6.95	15.4 %	13	occ	46 %
Bobolink *Dolichonyx oryzivorus*	G5	8	occ	32.6%	26.07	57.7 %	13	occ	108 %
Prairie falcon *Falco mexicanus*	G5	3	occ	33.3%	67.79	150.0 %	2	occ	450 %
Peregrine falcon *Falco peregrinus anatum*	G4T3	3	occ	75.0%	19.37	42.9 %	7	occ	43 %
Common Loon *Gavia immer*	G5	1	occ	2.2%	1.74	3.8 %	13	occ	100 %
Bald eagle *Haliaeetus leucocephalus*	G4	1	nst	1.0%	1.19	2.6 %	38	nst	100 %
Northern goshawk *Accipiter gentilis*	G5	1	nst	1.2%	1.19	2.6 %	38	nst	103 %
Dragonfly									
Nez Perce dancer *Argia emma*	G5	1	occ	50.0%	3.48	7.7 %	13	occ	15 %
Western river cruiser *Macromia magnifica*	G4	1	occ	14.3%	3.48	7.7 %	13	occ	54 %

Olive clubtail *Stylurus olivaceus*	G4	1	occ	50.0%	3.48	7.7%	13	occ	15%
Lance-tailed darner *Aechna constricta*	G5	7	occ	63.6%	24.34	53.8%	13	occ	85%
Western pondhawk *Erythemis collocata*	G5	1	occ	100.0%	3.48	7.7%	13	occ	8%
Twelve-spotted skimmer *Libellula pulchella*	G5	9	occ	47.4%	31.29	69.2%	13	occ	108%
Pronghorn clubtail *Gomphus graslinellus*	G5	4	occ	47.9%	6.93	15.3%	25	occ	32%
<u>Lepidopterans</u>									
Mormon metalmark *Apodemia mormo*	G5	2	occ	50.0%	6.95	15.4%	13	occ	31%
Behr's (Columbia) hairstreak *Satyrium behrii columbia*	G5	10	occ	100.0%	34.76	76.9%	13	occ	77%
California hairstreak *Satyrium californicum*	G5	7	occ	100.0%	24.34	53.8%	13	occ	54%
Sooty hairstreak *Satyrium fuliginosum*	G4	1	occ	100.0%	3.48	7.7%	13	occ	8%
<u>Mammals</u>									
Western gray squirrel *Sciurus griseus*	G5	3	occ	5.2%	10.43	23.1%	13	occ	115%
Preble's shrew *Sorex preblei*	G4	2	occ	100.0%	6.95	15.4%	13	occ	15%
Bighorn sheep-WA *Ovis canadensis*	G4	3,503	ha	14.4%	6.52	14.4%	24,282	ha	100%
Nuttall's cottontail *Sylvilagus nutalli*	G5	29	occ	80.6%	100.82	223.1%	13	occ	254%
Fisher *Martes pennanti*	G5	21,124	ha	1.3%	1.43	3.2%	668,362	ha	71%
Pallid bat *Antrozous pallidus*	G5	16	nst	66.7%	19.03	42.1%	38	nst	63%
Western harvest mouse *Rheithrodontomys megalotis*	G5	14	occ	100.0%	48.67	107.7%	13	occ	108%
Badger *Taxidea taxus jeffersoni*	G5	14	occ	8.4%	10.77	23.8%	58	occ	128%
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	25	nst	54.3%	29.73	65.8%	38	nst	100%
Spotted bat *Euderma maculatum*	G4	13	occ	49.3%	44.56	98.6%	13	occ	154%
Grizzly bear *Ursus arctos*	G4	309	ha	0.0%	0.01	0.0%	1,050,522	ha	83%
Western red bat *Lasiurus blossevillii*	G5	1	occ	50.0%	3.48	7.7%	13	occ	15%

Western small-footed myotis *Myotis ciliolabrum*	G5	3	occ	43.6%	9.09	20.1%	13	occ	46 %
Fringed myotis *Myotis thysanodes*	G4G5	8	occ	54.4%	28.36	62.8%	13	occ	100 %
Long-legged myotis *Myotis volans*	G5	2	occ	38.1%	7.95	17.6%	13	occ	46 %
Mountain goat *Oreamos americanus*	G5	1,489	ha	1.0%	2.21	4.9%	30,505	ha	179 %
Bighorn sheep *Ovis canadensis*	G4	49,441	ha	17.9%	40.39	89.4%	55,318	ha	253 %
Great Basin pocket mouse *Perognathus parvus*	G5	33	occ	89.2%	114.72	253.8%	13	occ	269 %
<u>Non-Vascular Plants</u>									
Lichen Umbilicaria hirsuta *Umbilicaria hirsuta*	G2G4	1	occ	100.0%	3.48	7.7%	13	occ	8 %
Lichen Massalongia microphylliza *Massalongia microphylliza*	G1?	3	occ	75.0%	10.43	23.1%	13	occ	31 %
Lichen Physcia dimidiata *Physcia dimidiata*	G5?	2	occ	33.3%	6.95	15.4%	13	occ	46 %
Lichen Physcia tribacia *Physcia tribacia*	G4?	1	occ	25.0%	3.48	7.7%	13	occ	31 %
Lichen Xanthoparmelia angustiphylla *Xanthoparmelia angustiphylla*	G5	1	occ	100.0%	3.48	7.7%	13	occ	8 %
<u>Reptiles</u>									
Gopher snake *Pituophis catenifer deserticola*	G5	56	occ	66.4%	193.87	429.0%	13	occ	531 %
Racer *Coluber constricta*	G5	75	occ	57.8%	261.26	578.1%	13	occ	708 %
Western rattlesnake *Crotalus viridis*	G5	56	nst	45.2%	66.60	147.4%	38	nst	218 %
Night snake *Hypsiglena torquata*	G5	15	occ	93.8%	52.15	115.4%	13	occ	115 %
Western skink *Eumeces skiltonianus*	G5	19	occ	73.1%	66.05	146.2%	13	occ	162 %
<u>Vascular Plants</u>									
Two-spiked Moonwort *Botrychium paradoxum*	G2	1	occ	11.1%	6.46	14.3%	7	occ	100 %
Beaked Spike-rush *Eleocharis rostellata*	G5	3	occ	100.0%	19.37	42.9%	7	occ	43 %
The Dalles Milk-vetch *Astragalus sclerocarpus*	G5	3	occ	66.5%	21.47	47.5%	7	occ	71 %
Ute Ladies' Tresses *Spiranthes diluvialis*	G2	1	occ	25.0%	6.46	14.3%	7	occ	57 %

Hairgrass Dropseed *Sporobolus airoides*	G5	5 occ	100.0%	32.28	71.4 %	7 occ	71 %
Rough Dropseed *Sporobolus compositus var. compositus*	G5T5	1 occ	33.3%	6.46	14.3 %	7 occ	43 %
Nettle-leaved Giant-hyssop *Agastache urticifolia*	G5	5 occ	62.5%	32.28	71.4 %	7 occ	86 %
Western Dogbane *Apocynum x floribundum*	GNA	1 occ	50.0%	6.46	14.3 %	7 occ	29 %
Threadstalk Milk-vetch *Astragalus filipes*	G5	1 occ	12.5%	6.46	14.3 %	7 occ	71 %
Silvery Orache *Atriplex argentea ssp. argentea*	G5T5	1 occ	50.0%	6.46	14.3 %	7 occ	29 %
River Bulrush *Bolboschoenus fluviatilis*	G5	1 occ	100.0%	6.46	14.3 %	7 occ	14 %
Triangular-lobed Moonwort *Botrychium ascendens*	G2G3?	1 occ	10.0%	3.48	7.7 %	13 occ	23 %
Holm's Rocky Mountain Sedge *Carex scopulorum var. bracteosa*	G5T3T5	1 occ	11.1%	6.46	14.3 %	7 occ	129 %
Many-headed Sedge *Carex sychnocephala*	G4	2 occ	16.7%	12.91	28.6 %	7 occ	100 %
Fox Sedge *Carex vulpinoidea*	G5	2 occ	40.0%	12.91	28.6 %	7 occ	29 %
Rocky Mountain Clubrush *Schoenoplectus saximontanus*	G5	1 occ	100.0%	3.48	7.7 %	13 occ	8 %
Regel's Rush *Juncus regelii*	G4?	1 occ	11.1%	3.48	7.7 %	13 occ	31 %
Blue Vervain hastata *Verbena hastata var. scabra*	G5T5	2 occ	50.0%	12.91	28.6 %	7 occ	29 %
Thick-leaved Thelypody *Thelypodium laciniatum var. laciniatum*	G5T5	4 occ	42.0%	14.60	32.3 %	13 occ	62 %
Booth's Willow *Salix boothii*	G5	1 occ	4.0%	1.56	3.4 %	7 occ	29 %
Peach-leaf Willow *Salix amygdaloides*	G5	2 occ	28.6%	12.91	28.6 %	7 occ	57 %
Bushy Cinquefoil *Potentilla paradoxa*	G5	2 occ	66.7%	12.91	28.6 %	7 occ	43 %
Thyme-leaved Spurge *Chamaesyce serpyllifolia ssp. serpyllifolia*	G5T5	3 occ	50.0%	19.37	42.9 %	7 occ	71 %
Northern Linanthus *Linanthus septentrionalis*	G5	7 occ	63.6%	45.19	100.0 %	7 occ	143 %
Awned Cyperus *Cyperus squarrosus*	G5	2 occ	28.6%	12.91	28.6 %	7 occ	71 %
Heterocodon *Heterocodon rariflorum*	G5	1 occ	100.0%	6.46	14.3 %	7 occ	14 %

Dwarf Groundsmoke *Gayophytum humile*	G5	1	occ	20.0%	6.46	14.3 %	7	occ	71 %
Cushion Fleabane *Erigeron poliospermus var. poliospermus*	G4T4	2	occ	76.4%	4.14	9.2 %	25	occ	8 %
Hall's Willowherb *Epilobium halleanum*	G5	1	occ	33.3%	6.46	14.3 %	7	occ	43 %
Nuttall's Waterweed *Elodea nuttallii*	G5	1	occ	21.5%	1.39	3.1 %	7	occ	0 %
Tweedy's Willow *Salix tweedyi*	G3G4	1	occ	2.9%	6.46	14.3 %	7	occ	157 %
Small northern bog-orchid *Platanthera obtusata*	G5	1	occ	0.3%	0.52	1.1 %	13	occ	138 %
Western Stickseed *Lappula occidentalis var. cupulata*	G5T5	4	occ	100.0%	25.83	57.1 %	7	occ	57 %
Short-rayed Aster *Aster frondosus*	G4	5	occ	100.0%	32.28	71.4 %	7	occ	71 %
Spalding's Milk-vetch *Astragalus spaldingii var. spaldingii*	G3?T3?	1	occ	100.0%	1.81	4.0 %	25	occ	4 %
Narrow-leaved Brickellia *Brickellia oblongifolia ssp. oblongifolia*	G5T5	1	occ	20.0%	6.46	14.3 %	7	occ	71 %
Lyall's Mariposa Lily *Calochortus lyallii*	G3	8	occ	100.0%	14.46	32.0 %	25	occ	32 %
Andean Evening-primrose *Camissonia andina*	G4	2	occ	100.0%	12.91	28.6 %	7	occ	29 %
Annual Paintbrush *Castilleja minor ssp. minor*	G5T5	1	occ	100.0%	6.46	14.3 %	7	occ	14 %
Western Centaury *Centaurium exaltatum*	G5	3	occ	100.0%	19.37	42.9 %	7	occ	43 %
Obscure Cryptantha *Cryptantha ambigua*	G4	1	occ	29.1%	9.39	20.8 %	7	occ	71 %
Cockscomb Cryptantha *Cryptantha celosioides*	G5	1	occ	100.0%	6.46	14.3 %	7	occ	14 %
Watson's Cryptantha *Cryptantha watsonii*	G5	2	occ	66.7%	12.91	28.6 %	7	occ	43 %
Giant Helleborine *Epipactis gigantea*	G3	3	occ	37.5%	19.37	42.9 %	7	occ	100 %
Strict Buckwheat *Eriogonum strictum var. proliferum*	G5TNR	1	occ	100.0%	6.46	14.3 %	7	occ	14 %
Whited's Halimolobos *Halimolobos whitedii*	G3?	8	occ	100.0%	14.46	32.0 %	25	occ	32 %
Blue-eyed Grass *Sisyrinchium septentrionale*	G3G4	1	occ	5.3%	7.18	15.9 %	7	occ	171 %
Grand Coulee Owl-clover *Orthocarpus barbatus*	G2G4	1	occ	100.0%	1.81	4.0 %	25	occ	4 %

Toothcup Meadow-foam *Rotala ramosior*	G5	2	occ	66.7%	12.91	28.6 %	7	occ	43 %
Columbian Goldenweed *Pyrrocoma carthamoides var. carthamoides*	G4G5T4	6	occ	64.4%	41.55	91.9 %	7	occ	129 %
Lemmon's Holly Fern *Polystichum lemmonii*	G4	1	occ	100.0%	3.48	7.7 %	13	occ	8 %
Showy Phlox *Phlox speciosa ssp. occidentalis*	G5TNR	3	occ	100.0%	19.37	42.9 %	7	occ	43 %
Branched Phacelia *Phacelia ramosissima*	G4	3	occ	100.0%	19.37	42.9 %	7	occ	43 %
Hutchinsia *Hutchinsia procumbens*	G5	1	occ	33.3%	6.46	14.3 %	7	occ	43 %
Slender Crazyweed *Oxytropis campestris var. gracilis*	G5?	1	occ	50.0%	6.46	14.3 %	7	occ	29 %
Small-flowered Ipomopsis *Ipomopsis minutiflora*	G2G3	1	occ	14.3%	3.48	7.7 %	13	occ	54 %
Flat-topped Broomrape *Orobanche corymbosa ssp. mutabilis*	G4T3?	1	occ	25.0%	6.46	14.3 %	7	occ	57 %
Bristly Mousetail *Myosurus apetalus var. borealis*	G5TNR	2	occ	40.0%	12.91	28.6 %	7	occ	71 %
Oniongrass *Melica bulbosa var. bulbosa*	G5T5	2	occ	40.0%	12.91	28.6 %	7	occ	71 %
Hairy Water-clover *Marsilea vestita*	G5	1	occ	25.0%	6.46	14.3 %	7	occ	57 %
Small-flowered Lipocarpha *Lipocarpha micrantha*	G4	1	occ	100.0%	6.46	14.3 %	7	occ	14 %
Scarlet Ammannia *Ammannia robusta*	G5	2	occ	100.0%	12.91	28.6 %	7	occ	29 %
Winged Combseed *Pectocarya penicillata*	G5	1	occ	100.0%	6.46	14.3 %	7	occ	14 %

Black Meadows

Site No 115

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	1,235	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		244 ha	0.0%	10.78	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		207 ha	0.0%	2.38	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		244 ha	0.0%	15.98	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		3 ha	0.0%	2.32	0.0 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		206 ha	0.0%	15.47	0.1 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		44 ha	0.0%	4.46	0.0 %	188,483 ha	134 %
Species							
Lepidopterans							
Meadow fritillary *Boloria bellona toddi*	G5	1 occ	14.3%	1,470.55	7.7 %	13 occ	54 %

Bonaparte West

Site No 5

Thompson Okanagan Plateau Section

Terrestrial Site		
Area:	35,500	ha
	87,685	ac

Land Use/Land Cover	
Agriculture	0 %
Developed	0 %
Water	2 %

GAP Management Status	
GAP 1	0 %
GAP 2	0 %
GAP 3	94 %
GAP 4	6 %

Land Ownership			
US National	0 %	Can National:	0 %
US State:	0 %	BC Provincial:	94 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	0 %	Can Private:	6 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		612 ha	0.0%	0.38	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		32,921 ha	0.6%	5.34	2.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		577 ha	6.2%	56.03	20.8 %	2,773 ha	136 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		613 ha	0.1%	0.57	0.2 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		858 ha	1.0%	9.35	3.5 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		14,539 ha	1.1%	9.45	3.5 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		18,398 ha	1.6%	14.04	5.2 %	352,885 ha	104 %
Species							
Birds							
American avocet *Recurvirostra americana*	G5	1 occ	33.3%	20.71	7.7 %	13 occ	23 %
Mammals							
Fisher *Martes pennanti*	G5	1,604 ha	0.1%	0.65	0.2 %	668,362 ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	4 occ	2.4%	18.57	6.9 %	58 occ	128 %

Boston Bar

Site No 62

Northern Cascade Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	80 %
	1,235 ac	Water	0 %	GAP 3	80 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	20 %	US Indigenous:	0 %	Can Indigenous:	4 %
						US Private	0 %	Can Private:	17 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		3 ha	0.0%	2.32	0.0 %	24,703 ha	133 %
East Cascades Mesic Montane Mixed Conifer Forest		458 ha	1.0%	627.74	3.3 %	13,948 ha	100 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	354 ha	0.0%	6.44	0.0 %	1,050,522 ha	83 %
Vascular Plants							
Scalepod *Idahoa scapigera*	G5	1 occ	100.0%	2,731.03	14.3 %	7 occ	14 %

Boulder

Site No 101

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	7 %	US National	100 %	Can National:	0 %
Area:	2,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	6,175	ac	Water	0 %	GAP 3	93 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Inter-Mountain Basins Big Sagebrush Steppe		20 ha	0.0%	0.41	0.0 %	188,483 ha	134 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		5 ha	0.1%	6.89	0.2 %	2,773 ha	136 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		1,698 ha	0.3%	33.54	0.9 %	193,578 ha	114 %
Rocky Mountain Alpine Composite		210 ha	0.1%	6.72	0.2 %	119,447 ha	122 %
Northern Rocky Mountain Subalpine Dry Parkland		244 ha	0.2%	25.93	0.7 %	35,979 ha	139 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		7 ha	0.0%	1.08	0.0 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		28 ha	0.0%	0.42	0.0 %	254,555 ha	103 %
Northern Interior Spruce-Fir woodland and forest		254 ha	0.0%	2.34	0.1 %	414,168 ha	105 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,984 ha	0.0%	4.57	0.1 %	1,658,616 ha	109 %
Species							
Lepidopterans							
Freija fritillary *Boloria freija*	G5	1 occ	25.0%	294.11	7.7 %	13 occ	31 %
Mammals							

Grizzly bear *Ursus arctos*	G4	1,472	ha	0.1%	5.36	0.1%	1,050,522	ha	83 %
Gray wolf *Canis lupus*	G4	1	den	1.4%	100.62	2.6%	38	den	84 %
Wolverine *Gulo gulo*	G4	1	occ	0.7%	15.08	0.4%	13	occ	54 %
Lynx *Lynx canadensis*	G5	2,500	ha	0.4%	34.76	0.9%	275,020	ha	102 %

Non-Vascular Plants

Lichen Dactylina ramulosa *Dactylina ramulosa*	G4G5	1	occ	100.0%	294.11	7.7%	13	occ	8 %
Lichen Hypogymnia austerodes *Hypogymnia austerodes*	G5	1	occ	100.0%	294.11	7.7%	13	occ	8 %

Vascular Plants

Slender Crazyweed *Oxytropis campestris var. gracilis*	G5?	1	occ	50.0%	546.20	14.3%	7	occ	29 %
Nagoonberry *Rubus acaulis*	G5	1	occ	50.0%	546.20	14.3%	7	occ	29 %
Tweedy's Willow *Salix tweedyi*	G3G4	2	occ	5.9%	1,119.63	29.3%	7	occ	157 %
Poor Sedge *Carex magellanica ssp. irrigua*	G5T5	1	occ	5.0%	546.20	14.3%	7	occ	143 %
Scandinavian Sedge *Carex norvegica*	G5	1	occ	5.7%	218.45	5.7%	13	occ	8 %
Snow Cinquefoil *Potentilla nivea*	G5	2	occ	9.8%	490.80	12.8%	13	occ	69 %
Glaucous Willow *Salix glauca*	G5?	1	occ	20.0%	546.20	14.3%	7	occ	14 %
Nodding Saxifrage *Saxifraga cernua*	G4	1	occ	33.3%	546.20	14.3%	7	occ	29 %
Pygmy Saxifrage *Saxifraga rivularis*	G5?	1	occ	5.6%	294.11	7.7%	13	occ	38 %
Sparse-leaved Sedge *Carex tenuiflora*	G5	1	occ	100.0%	546.20	14.3%	7	occ	14 %

Bridge

Site No 24

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	1,235	ac	Water	3 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		500 ha	0.0%	5.76	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		450 ha	0.1%	44.44	0.2 %	193,578 ha	114 %
Northern Interior Spruce-Fir woodland and forest		50 ha	0.0%	2.31	0.0 %	414,168 ha	105 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	500 ha	0.0%	9.10	0.0 %	1,050,522 ha	83 %

Cascade North

Site No 72

Northern Cascade Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	1 %	US National	0 %	Can National:	0 %
Area:	33,500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	99 %
	82,745 ac	Water	0 %	GAP 3	98 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	1 %
						US NGO	0 %	Can NGO:	0 %

Terrestrial

Terrestrial Ecological Systems

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Northern Interior Spruce-Fir woodland and forest		11,537 ha	0.8%	7.95	2.8 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		5,721 ha	0.5%	4.63	1.6 %	352,885 ha	104 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		355 ha	0.0%	0.23	0.1 %	432,412 ha	116 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		396 ha	0.5%	4.57	1.6 %	24,703 ha	133 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		354 ha	0.0%	0.35	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Subalpine Dry Parkland		584 ha	0.5%	4.63	1.6 %	35,979 ha	139 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		302 ha	0.0%	0.45	0.2 %	193,578 ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		13,541 ha	1.4%	13.23	4.6 %	292,133 ha	108 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		18 ha	0.2%	1.85	0.6 %	2,773 ha	136 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		31,093 ha	0.6%	5.35	1.9 %	1,658,616 ha	109 %
North Pacific Maritime Mesic Parkland		1,053 ha	4.0%	37.78	13.2 %	7,952 ha	151 %

Species

Birds

Northern goshawk *Accipiter gentilis*	G5	1	nst	1.2%	7.51	2.6 %	38	nst	103 %
Mammals									
Grizzly bear *Ursus arctos*	G4	18,267	ha	0.7%	4.96	1.7 %	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	5,073	ha	0.3%	2.17	0.8 %	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.6%	4.92	1.7 %	58	occ	128 %
Mountain beaver *Aplodontia rufa rainieri*	G5T4	21	occ	26.7%	456.95	160.1 %	13	occ	254 %
Vascular Plants									
Kruckeberg's Holly Fern *Polystichum kruckebergii*	G4	1	occ	33.3%	40.76	14.3 %	7	occ	29 %
Mountain Holly Fern *Polystichum scopulinum*	G5	1	occ	33.3%	40.76	14.3 %	7	occ	43 %

Cascade South

Site No 81

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	80 %	US National	1 %	Can National:	0 %
Area:	113,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	98 %
	280,344	ac	Water	1 %	GAP 3	20 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest		17,008 ha	7.6%	21.38	25.4 %	67,002 ha	80 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		71,586 ha	1.3%	3.63	4.3 %	1,658,616 ha	109 %
East Cascades Mesic Montane Mixed Conifer Forest		8,619 ha	18.5%	52.04	61.8 %	13,948 ha	100 %
North Pacific Maritime Mesic Parkland		816 ha	3.1%	8.64	10.3 %	7,952 ha	151 %
North Pacific Montane Riparian Woodland and Shrubland		458 ha	7.4%	20.78	24.7 %	1,856 ha	100 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		2,804 ha	0.2%	0.67	0.8 %	352,885 ha	104 %
Northern Interior Spruce-Fir woodland and forest		16,010 ha	1.2%	3.26	3.9 %	414,168 ha	105 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,389 ha	1.7%	4.74	5.6 %	24,703 ha	133 %
Northern Rocky Mountain Subalpine Dry Parkland		3,813 ha	3.2%	8.93	10.6 %	35,979 ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		720 ha	1.3%	3.70	4.4 %	16,408 ha	117 %
Rocky Mountain Alpine Composite		4,753 ha	1.2%	3.35	4.0 %	119,447 ha	122 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		52,629 ha	5.4%	15.17	18.0 %	292,133 ha	108 %

Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		338	ha	3.7%	10.27	12.2 %	2,773	ha	136 %
Northern Rocky Mountain Montane Mixed Conifer Forest		140	ha	0.0%	0.05	0.1 %	254,555	ha	103 %
Species									
Birds									
Northern spotted owl *Strix occidentalis caurina*	G3	57	nst	11.1%	71.65	85.1 %	67	nst	193 %
Mammals									
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.6%	1.45	1.7 %	58	occ	128 %
Grizzly bear *Ursus arctos*	G4	99,147	ha	3.8%	7.95	9.4 %	1,050,522	ha	83 %
Mountain beaver *Aplodontia rufa rainieri*	G5T4	6	occ	7.5%	37.74	44.8 %	13	occ	254 %
Gray wolf *Canis lupus*	G4	2	den	2.7%	4.43	5.3 %	38	den	84 %
Lynx *Lynx canadensis*	G5	211	ha	0.0%	0.06	0.1 %	275,020	ha	102 %
Fisher *Martes pennanti*	G5	4,390	ha	0.3%	0.55	0.7 %	668,362	ha	71 %
Non-Vascular Plants									
Lichen Dactylina arctica *Dactylina arctica*	G4G5	1	occ	33.3%	6.48	7.7 %	13	occ	23 %
Vascular Plants									
Tweedy's Lewisia *Lewisia tweedyi*	G2G3	1	occ	100.0%	3.37	4.0 %	25	occ	4 %
Brandegee's Lomatium *Lomatium brandegeei*	G3?	4	occ	44.4%	13.47	16.0 %	25	occ	32 %
Silvercrown *Cacaliopsis nardosmia*	G4G5	1	occ	100.0%	12.03	14.3 %	7	occ	14 %
Cliff Paintbrush *Castilleja rupicola*	G2G3	1	occ	100.0%	12.03	14.3 %	7	occ	14 %
Slender Hawksbeard *Crepis atribarba ssp. atribarba*	G5T5	1	occ	50.0%	12.03	14.3 %	7	occ	29 %
Oniongrass *Melica bulbosa var. bulbosa*	G5T5	1	occ	20.0%	12.03	14.3 %	7	occ	71 %
Alpine Anemone *Anemone drummondii var. drummondii*	G4T4	1	occ	25.0%	12.03	14.3 %	7	occ	29 %
Lace Fern *Cheilanthes gracillima*	G4G5	1	occ	100.0%	12.03	14.3 %	7	occ	14 %
Steer's Head *Dicentra uniflora*	G4?	2	occ	100.0%	24.06	28.6 %	7	occ	29 %

Hall's Willowherb *Epilobium halleanum*	G5	1 occ	33.3%	12.03	14.3 %	7 occ	43 %
Hairy-stemmed Willowherb *Epilobium mirabile*	G4Q	1 occ	100.0%	3.37	4.0 %	25 occ	4 %
Regel's Rush *Juncus regelii*	G4?	2 occ	22.2%	12.96	15.4 %	13 occ	31 %
Leafy Mitrewort *Mitella caulescens*	G5	1 occ	100.0%	12.03	14.3 %	7 occ	14 %
Fragrant White Rein Orchid *Platanthera dilatata var. albiflora*	G5T3T5	1 occ	100.0%	12.03	14.3 %	7 occ	14 %
Dwarf Bramble *Rubus lasiococcus*	G5	1 occ	100.0%	12.03	14.3 %	7 occ	14 %
Lance-leaved Figwort *Scrophularia lanceolata*	G5	1 occ	100.0%	12.03	14.3 %	7 occ	14 %
Umbellate Starwort *Stellaria umbellata*	G5	1 occ	100.0%	12.03	14.3 %	7 occ	14 %
Dwarf Groundsmoke *Gayophytum humile*	G5	1 occ	20.0%	12.03	14.3 %	7 occ	71 %

Cathedral

Site No 75

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	44 %	US National	5 %	Can National:	0 %
Area:	127,000	ha	Developed	0 %	GAP 2	3 %	US State:	10 %	BC Provincial:	81 %
	313,690	ac	Water	1 %	GAP 3	49 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	4 %	US Indigenous:	0 %	Can Indigenous:	2 %
							US Private	2 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Spruce-Fir woodland and forest		38,083 ha	2.8%	6.92	9.2 %	414,168 ha	105 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		13,168 ha	0.9%	2.29	3.0 %	432,412 ha	116 %
Columbia Basin Foothill Riparian Woodland and Shrubland		230 ha	1.1%	2.64	3.5 %	6,545 ha	138 %
Inter-Mountain Basins Big Sagebrush Steppe		4,896 ha	0.8%	1.96	2.6 %	188,483 ha	134 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		17,400 ha	1.5%	3.71	4.9 %	352,885 ha	104 %
Northern Rocky Mountain Montane Mixed Conifer Forest		2,528 ha	0.3%	0.75	1.0 %	254,555 ha	103 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		924 ha	1.1%	2.82	3.7 %	24,703 ha	133 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		8,983 ha	0.9%	2.32	3.1 %	291,947 ha	138 %
Northern Rocky Mountain Subalpine Dry Parkland		4,587 ha	3.8%	9.60	12.7 %	35,979 ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		2,161 ha	4.0%	9.91	13.2 %	16,408 ha	117 %
Rocky Mountain Alpine Composite		6,469 ha	1.6%	4.08	5.4 %	119,447 ha	122 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		37,722 ha	5.8%	14.67	19.5 %	193,578 ha	114 %

Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		121	ha	1.3%	3.28	4.4 %	2,773	ha	136 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		95,745	ha	1.7%	4.34	5.8 %	1,658,616	ha	109 %
Inter-Mountain Basins Cliff and Canyon		4	ha	0.1%	0.18	0.2 %	1,644	ha	100 %
<u>Species</u>									
<u>Amphibians</u>									
Great Basin spadefoot *Spea intermontana*	G5	2	occ	1.5%	8.68	11.5 %	13	occ	485 %
Western toad *Bufo boreas*	G4	1	occ	2.6%	5.79	7.7 %	13	occ	123 %
<u>Birds</u>									
Great gray owl *Strix nebulosa*	G5	1	nst	25.0%	1.98	2.6 %	38	nst	11 %
Bald eagle *Haliaeetus leucocephalus*	G4	1	nst	1.0%	1.98	2.6 %	38	nst	100 %
American dipper *Cinclus mexicanus*	G5	1	occ	100.0%	5.79	7.7 %	13	occ	8 %
Western screech owl *Otus kennicotii macfarlanei*	G5T4	2	nst	2.3%	3.96	5.3 %	38	nst	134 %
Lewis' woodpecker *Melanerpes lewis*	G4	2	nst	1.4%	3.96	5.3 %	38	nst	239 %
Blue grouse *Dendragapus obscurus*	G5	1	occ	16.7%	5.79	7.7 %	13	occ	46 %
Lark sparrow *Chondestes grammacus*	G5	1	occ	3.0%	5.79	7.7 %	13	occ	231 %
Northern goshawk *Accipiter gentilis*	G5	2	nst	2.3%	3.96	5.3 %	38	nst	103 %
Canyon wren *Catherpes mexicanus*	G5	1	occ	1.7%	5.79	7.7 %	13	occ	369 %
Golden eagle *Aquila chrysaetos*	G5	2	nst	1.2%	3.96	5.3 %	38	nst	174 %
Prairie falcon *Falco mexicanus*	G5	1	occ	11.1%	37.63	50.0 %	2	occ	450 %
<u>Lepidopterans</u>									
Astarte fritillary *Boloria astarte*	G5	2	occ	40.0%	11.58	15.4 %	13	occ	38 %
Melissa arctic *Oeneis melissa*	G5	3	occ	60.0%	17.37	23.1 %	13	occ	38 %
Mormon metalmark *Apodemia mormo*	G5	1	occ	25.0%	5.79	7.7 %	13	occ	31 %
<u>Mammals</u>									
Bighorn sheep *Ovis canadensis*	G4	17,727	ha	6.4%	24.12	32.0 %	55,318	ha	253 %

Mountain goat-WA *Oreamos americanus*	G5	1,984	ha	4.2%	3.16	4.2 %	47,283	ha	100 %
Grizzly bear *Ursus arctos*	G4	91,524	ha	3.5%	6.56	8.7 %	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	48,438	ha	2.9%	5.45	7.2 %	668,362	ha	71 %
Gray wolf *Canis lupus*	G4	1	den	1.4%	1.98	2.6 %	38	den	84 %
Badger *Taxidea taxus jeffersoni*	G5	4	occ	2.4%	5.19	6.9 %	58	occ	128 %
Mountain goat *Oreamos americanus*	G5	7,478	ha	4.9%	18.45	24.5 %	30,505	ha	179 %
Western small-footed myotis *Myotis ciliolabrum*	G5	1	occ	16.7%	5.79	7.7 %	13	occ	46 %
Lynx *Lynx canadensis*	G5	12,375	ha	1.8%	3.39	4.5 %	275,020	ha	102 %
Spotted bat *Euderma maculatum*	G4	1	occ	5.2%	7.78	10.3 %	13	occ	154 %
Mountain beaver *Aplodontia rufa rainieri*	G5T4	1	occ	1.3%	5.79	7.7 %	13	occ	254 %
Pallid bat *Antrozous pallidus*	G5	1	nst	4.2%	1.98	2.6 %	38	nst	63 %
Western gray squirrel *Sciurus griseus*	G5	1	occ	1.7%	5.79	7.7 %	13	occ	115 %
Nuttall's cottontail *Sylvilagus nutalli*	G5	1	occ	2.8%	5.79	7.7 %	13	occ	254 %

Non-Vascular Plants

Lichen Dactylina arctica *Dactylina arctica*	G4G5	2	occ	66.7%	11.58	15.4 %	13	occ	23 %
Lichen Peltigera lepidophora *Peltigera lepidophora*	G4	1	occ	33.3%	5.79	7.7 %	13	occ	23 %

Reptiles

Western rattlesnake *Crotalus viridis*	G5	1	nst	0.8%	1.98	2.6 %	38	nst	218 %

Vascular Plants

Two-spiked Moonwort *Botrychium paradoxum*	G2	2	occ	22.2%	21.50	28.6 %	7	occ	100 %
The Dalles Milk-vetch *Astragalus sclerocarpus*	G5	1	occ	13.5%	7.25	9.6 %	7	occ	71 %
Freckled Milk-vetch *Astragalus lentiginosus*	G5	2	occ	20.0%	21.50	28.6 %	7	occ	100 %
Narrow-leaved Brickellia *Brickellia oblongifolia ssp. oblongifolia*	G5T5	4	occ	80.0%	43.01	57.1 %	7	occ	71 %

Tweedy's Willow *Salix tweedyi*	G3G4	5 occ	14.3%	53.76	71.4 %	7 occ	157 %
Diverse-leaved Cinquefoil *Potentilla diversifolia var. perdissecta*	G5T4	4 occ	80.0%	43.01	57.1 %	7 occ	57 %
Lance-fruited Draba *Draba lonchocarpa var. thompsonii*	G4T3T4	1 occ	50.0%	3.01	4.0 %	25 occ	4 %
Alpine Buckwheat *Eriogonum pyrolifolium var. coryphaeum*	G4T4?	3 occ	100.0%	32.26	42.9 %	7 occ	43 %
Little Fescue *Festuca minutiflora*	G5	1 occ	100.0%	5.79	7.7 %	13 occ	8 %
Glaucous Gentian *Gentiana glauca*	G4G5	3 occ	33.3%	32.26	42.9 %	7 occ	43 %
Regel's Rush *Juncus regelii*	G4?	1 occ	4.4%	2.28	3.0 %	13 occ	31 %
Northern Linanthus *Linanthus septentrionalis*	G5	1 occ	9.1%	10.75	14.3 %	7 occ	143 %
Flat-topped Broomrape *Orobanche corymbosa ssp. mutabilis*	G4T3?	1 occ	25.0%	10.75	14.3 %	7 occ	57 %
Purple Oniongrass *Melica spectabilis*	G5	1 occ	100.0%	10.75	14.3 %	7 occ	14 %
Montana Larkspur *Delphinium bicolor ssp. bicolor*	G4G5T4	1 occ	100.0%	10.75	14.3 %	7 occ	14 %
Snow Cinquefoil *Potentilla nivea*	G5	4 occ	23.5%	23.16	30.8 %	13 occ	69 %
Five-leaved Cinquefoil *Potentilla quinquefolia*	G5T4	1 occ	100.0%	10.75	14.3 %	7 occ	14 %
Birdfoot Buttercup *Ranunculus pedatifidus ssp. affinis*	G5T5	1 occ	100.0%	10.75	14.3 %	7 occ	14 %
Pygmy Saxifrage *Saxifraga rivularis*	G5?	2 occ	11.1%	11.58	15.4 %	13 occ	38 %
Short-fruited Smelowskia *Smelowskia ovalis*	G5	2 occ	100.0%	21.50	28.6 %	7 occ	29 %
Western Ladies-tresses *Spiranthes porrifolia*	G4	1 occ	8.0%	1.73	2.3 %	7 occ	14 %
Thick-leaved Thelypody *Thelypodium laciniatum var. laciniatum*	G5T5	3 occ	30.0%	17.37	23.1 %	13 occ	62 %
Brandegee's Lomatium *Lomatium brandegeei*	G3?	4 occ	44.4%	12.04	16.0 %	25 occ	32 %
Seep-spring Arnica *Arnica longifolia*	G5	1 occ	100.0%	10.75	14.3 %	7 occ	14 %
Lance-leaved Draba *Draba cana*	G5	1 occ	20.0%	10.75	14.3 %	7 occ	71 %
Leiberg's Fleabane *Erigeron leibergii*	G3?	1 occ	100.0%	3.01	4.0 %	25 occ	4 %

Slender Gentian tenella *Gentianella tenella*	G4G5	3	occ	100.0%	32.26	42.9 %	7	occ	43 %
Small-flowered Ipomopsis *Ipomopsis minutiflora*	G2G3	1	occ	14.3%	5.79	7.7 %	13	occ	54 %
Wyeth's Lupine *Lupinus wyethii*	G5	1	occ	100.0%	10.75	14.3 %	7	occ	14 %
Columbian Goldenweed *Pyrrocoma carthamoides var. carthamoides*	G4G5T4	1	occ	10.0%	10.75	14.3 %	7	occ	129 %
Pink Agoseris *Agoseris lackschewitzii*	G4	1	occ	100.0%	3.01	4.0 %	25	occ	4 %
Nuttall's Draba *Draba densifolia*	G5	1	occ	100.0%	10.75	14.3 %	7	occ	14 %
Alpine Anemone *Anemone drummondii var. drummondii*	G4T4	1	occ	25.0%	10.75	14.3 %	7	occ	29 %
Golden Draba *Draba aurea*	G5	4	occ	44.4%	23.16	30.8 %	13	occ	69 %
Arctic Aster *Aster sibiricus var. meritus*	G5T5	1	occ	100.0%	5.79	7.7 %	13	occ	8 %
Mount Hood Pussypaws *Calyptridium umbellatum var. caudiciferum*	G4G5T4	6	occ	85.7%	64.51	85.7 %	7	occ	86 %
Blackened Sedge atrosquama *Carex atrosquama*	G4?	1	occ	33.3%	10.75	14.3 %	7	occ	14 %
Poor Sedge *Carex magellanica ssp. irrigua*	G5T5	3	occ	15.0%	32.26	42.9 %	7	occ	143 %
Canadian Single-spike Sedge *Carex scirpoidea var. scirpoidea*	G5T4T5	1	occ	16.7%	10.75	14.3 %	7	occ	57 %
Holm's Rocky Mountain Sedge *Carex scopulorum var. bracteosa*	G5T3T5	8	occ	88.9%	86.02	114.3 %	7	occ	129 %
Watson's Cryptantha *Cryptantha watsonii*	G5	1	occ	33.3%	10.75	14.3 %	7	occ	43 %
Northern Bentgrass *Agrostis borealis*	G5	2	occ	66.7%	21.50	28.6 %	7	occ	29 %

Cayoosh

Site No 35

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	37,500	ha	Developed	0 %	GAP 2	15 %	US State:	0 %	BC Provincial:	100 %
	92,625	ac	Water	1 %	GAP 3	84 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Rocky Mountain Subalpine Dry Parkland		1,880 ha	1.6 %	13.32	5.2 %	35,979 ha	139 %
North Pacific Maritime Mesic Parkland		562 ha	2.1 %	18.01	7.1 %	7,952 ha	151 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		3,803 ha	0.3 %	2.75	1.1 %	352,885 ha	104 %
Northern Interior Spruce-Fir woodland and forest		3,674 ha	0.3 %	2.26	0.9 %	414,168 ha	105 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		441 ha	0.0 %	0.39	0.2 %	291,947 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		442 ha	0.0 %	0.26	0.1 %	432,412 ha	116 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		1,346 ha	2.5 %	20.91	8.2 %	16,408 ha	117 %
Rocky Mountain Alpine Composite		12,346 ha	3.1 %	26.35	10.3 %	119,447 ha	122 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		9,825 ha	1.5 %	12.94	5.1 %	193,578 ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		2,304 ha	0.2 %	2.01	0.8 %	292,133 ha	108 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		100 ha	1.1 %	9.19	3.6 %	2,773 ha	136 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		19,606 ha	0.4 %	3.01	1.2 %	1,658,616 ha	109 %

Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		315	ha	0.4%	3.25	1.3 %	24,703	ha	133 %
Species									
Birds									
Northern spotted owl *Strix occidentalis caurina*	G3	13	nst	2.5%	49.46	19.4 %	67	nst	193 %
Mammals									
Grizzly bear *Ursus arctos*	G4	37,500	ha	1.4%	9.10	3.6 %	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	3,692	ha	0.2%	1.41	0.6 %	668,362	ha	71 %
Mountain goat *Oreamos americanus*	G5	11,960	ha	7.8%	99.94	39.2 %	30,505	ha	179 %

Chapperon

Site No 52

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	1,235	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	100 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Plateau Grassland		478 ha	0.2 %	139.63	0.7 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		6 ha	0.0 %	4.64	0.0 %	24,703 ha	133 %
Columbia Basin Foothill Riparian Woodland and Shrubland		5 ha	0.0 %	14.60	0.1 %	6,545 ha	138 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	0.8 %	1,122.80	5.9 %	13 occ	485 %
Birds							
Swainson's hawk *Buteo swainsoni*	G5	1 occ	11.1 %	1,470.55	7.7 %	13 occ	69 %

Chewack

Site No 105

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	100 %	Can National:	0 %
Area:	1,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	3,705	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		242 ha	0.0%	3.56	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,005 ha	0.0%	3.86	0.1 %	1,658,616 ha	109 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		15 ha	0.0%	5.83	0.1 %	16,408 ha	117 %
Northern Rocky Mountain Subalpine Dry Parkland		101 ha	0.1%	17.89	0.3 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		242 ha	0.0%	5.28	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		105 ha	0.1%	27.09	0.4 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		782 ha	0.1%	19.58	0.3 %	254,555 ha	103 %
Northern Interior Spruce-Fir woodland and forest		222 ha	0.0%	3.42	0.1 %	414,168 ha	105 %
Species							
Amphibians							
Western toad *Bufo boreas*	G4	1 occ	2.6%	490.17	7.7 %	13 occ	123 %
Birds							
Olive-sided flycatcher *Contopus borealis*	G4	1 occ	100.0%	490.17	7.7 %	13 occ	8 %

Golden eagle *Aquila chrysaetos*	G5	2	nst	1.2 %	335.38	5.3 %	38	nst	174	%
<u>Mammals</u>										
Grizzly bear *Ursus arctos*	G4	85	ha	0.0 %	0.52	0.0 %	1,050,522	ha	83	%
Fisher *Martes pennanti*	G5	118	ha	0.0 %	1.13	0.0 %	668,362	ha	71	%
<u>Vascular Plants</u>										
Black Snake-root *Sanicula marilandica*	G5	3	occ	15.0 %	2,730.97	42.9 %	7	occ	171	%
Pulsifer's Monkey-flower *Mimulus pulsiferae*	G4?	2	occ	40.0 %	1,820.65	28.6 %	7	occ	71	%

Chiliwist

Site No 120

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	13 %	GAP 1	0 %	US National	5 %	Can National:	0 %
Area:	7,500	ha	Developed	1 %	GAP 2	22 %	US State:	50 %	BC Provincial:	0 %
	18,525	ac	Water	1 %	GAP 3	33 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	45 %	US Indigenous:	7 %	Can Indigenous:	0 %
							US Private	37 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		5,652 ha	0.4 %	16.66	1.3 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		749 ha	0.1 %	3.27	0.3 %	291,947 ha	138 %
Inter-Mountain Basins Cliff and Canyon		2 ha	0.0 %	1.55	0.1 %	1,644 ha	100 %
Inter-Mountain Basins Big Sagebrush Steppe		4,901 ha	0.8 %	33.14	2.6 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		102 ha	0.5 %	19.86	1.6 %	6,545 ha	138 %
Species							
Birds							
Burrowing owl *Athene cunicularia*	G4	2 occ	3.2 %	364.13	28.6 %	7 occ	643 %
Long-billed curlew *Numenius americanus*	G5	1 nst	20.0 %	33.54	2.6 %	38 nst	13 %
Bald eagle *Haliaeetus leucocephalus*	G4	1 nst	1.0 %	33.54	2.6 %	38 nst	100 %
Golden eagle *Aquila chrysaetos*	G5	1 nst	0.6 %	33.54	2.6 %	38 nst	174 %
Mammals							
Wolverine *Gulo gulo*	G4	1 occ	14.3 %	98.04	7.7 %	13 occ	54 %

Mollusks

Western pearlshell *Margaritifera falcata*	G4	1 occ	33.3 %	98.04	7.7 %	13 occ	23 %
California floater *Anodonta californiensis*	G3	1 occ	11.1 %	98.04	7.7 %	13 occ	62 %

Christina

Site No 84

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,500	ha	Developed	18 %	GAP 2	1 %	US State:	0 %	BC Provincial:	32 %
	3,705	ac	Water	5 %	GAP 3	30 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	68 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	68 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		748 ha	0.1%	11.02	0.2 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		155 ha	0.0%	0.60	0.0 %	1,658,616 ha	109 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		147 ha	0.1%	12.78	0.2 %	73,274 ha	41 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		749 ha	0.1%	16.35	0.3 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		103 ha	0.1%	26.57	0.4 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		156 ha	0.0%	3.91	0.1 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		35 ha	0.0%	1.18	0.0 %	188,483 ha	134 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	1.0%	490.18	7.7 %	13 occ	485 %
Tiger salamander *Ambystoma tigrinum*	G5	1 occ	0.4%	127.45	2.0 %	25 occ	316 %
Birds							
Canyon wren *Catherpes mexicanus*	G5	1 occ	1.7%	490.18	7.7 %	13 occ	369 %

Dragonfly									
Twelve-spotted skimmer *Libellula pulchella*	G5	1	occ	5.3%	490.18	7.7 %	13	occ	108 %
River jewelwing *Calopteryx aequabilis*	G5	1	occ	100.0%	490.18	7.7 %	13	occ	8 %
Olive clubtail *Stylurus olivaceus*	G4	1	occ	50.0%	490.18	7.7 %	13	occ	15 %
Western river cruiser *Macromia magnifica*	G4	1	occ	14.3%	490.18	7.7 %	13	occ	54 %
Nez Perce dancer *Argia emma*	G5	1	occ	50.0%	490.18	7.7 %	13	occ	15 %
Mammals									
Grizzly bear *Ursus arctos*	G4	877	ha	0.0%	5.32	0.1 %	1,050,522	ha	83 %
Bighorn sheep *Ovis canadensis*	G4	459	ha	0.2%	52.87	0.8 %	55,318	ha	253 %
Reptiles									
Gopher snake *Pituophis catenifer deserticola*	G5	1	occ	1.2%	490.18	7.7 %	13	occ	531 %
Western skink *Eumeces skiltonianus*	G5	1	occ	3.8%	490.18	7.7 %	13	occ	162 %
Racer *Coluber constricta*	G5	2	occ	1.5%	980.37	15.4 %	13	occ	708 %
Vascular Plants									
Cup Clover *Trifolium cyathiferum*	G4	1	occ	50.0%	910.34	14.3 %	7	occ	29 %
Nettle-leaved Giant-hyssop *Agastache urticifolia*	G5	1	occ	6.6%	480.23	7.5 %	7	occ	86 %
False-mermaid *Floerkea proserpinacoides*	G5	1	occ	33.3%	910.34	14.3 %	7	occ	29 %

Chu Chua

Site No 2

Thompson Okanagan Plateau Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	2 %	GAP 1	17 %	US National	0 %	Can National:	0 %
Area:	92,500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	91 %
	228,476 ac	Water	1 %	GAP 3	74 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	9 %	US Indigenous:	0 %	Can Indigenous:	1 %
						US Private	0 %	Can Private:	8 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		6,350 ha	0.4 %	1.52	1.5 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		73,452 ha	1.3 %	4.58	4.4 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		123 ha	1.3 %	4.58	4.4 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		21,446 ha	2.2 %	7.59	7.3 %	292,133 ha	108 %
Rocky Mountain Alpine Composite		3,203 ha	0.8 %	2.77	2.7 %	119,447 ha	122 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		2,064 ha	0.8 %	2.91	2.8 %	73,274 ha	41 %
Northern Rocky Mountain Subalpine Dry Parkland		2,088 ha	1.7 %	6.00	5.8 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		6,350 ha	0.7 %	2.25	2.2 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		932 ha	1.1 %	3.90	3.8 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		13,891 ha	1.0 %	3.47	3.4 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		1,143 ha	0.1 %	0.33	0.3 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		36,969 ha	7.3 %	25.23	24.4 %	151,409 ha	105 %
Species							

Mammals								
Fisher *Martes pennanti*	G5	3,395 ha	0.2 %	0.52	0.5 %	668,362 ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	2 occ	1.2 %	3.56	3.4 %	58 occ	128 %
Mountain goat *Oreamos americanus*	G5	1,790 ha	1.2 %	6.06	5.9 %	30,505 ha	179 %

Clinton

Site No 7

Interior Transition Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	3 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	79 %
	2,470 ac	Water	0 %	GAP 3	79 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	21 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	21 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		953 ha	0.1 %	21.07	0.2 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		952 ha	0.1 %	31.17	0.3 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		12 ha	0.0 %	4.64	0.0 %	24,703 ha	133 %

Coldstream

Site No 48

Central Okanagan Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	18 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,500 ha	Developed	6 %	GAP 2	0 %	US State:	0 %	BC Provincial:	35 %
	3,705 ac	Water	0 %	GAP 3	35 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	65 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	65 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		2 ha	0.0%	0.03	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		221 ha	0.0%	0.85	0.0 %	1,658,616 ha	109 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		44 ha	0.0%	3.83	0.1 %	73,274 ha	41 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		2 ha	0.0%	0.04	0.0 %	291,947 ha	138 %
Northern Interior Plateau Grassland		849 ha	0.4%	82.66	1.3 %	65,446 ha	200 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		223 ha	0.0%	9.39	0.1 %	151,409 ha	105 %
Species							
Birds							
Swainson's hawk *Buteo swainsoni*	G5	1 occ	11.1%	488.61	7.7 %	13 occ	69 %

Colville

Site No 94

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	1 %	US National	64 %	Can National:	0 %
Area:	129,500	ha	Developed	0 %	GAP 2	0 %	US State:	4 %	BC Provincial:	0 %
	319,865	ac	Water	0 %	GAP 3	67 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	32 %	US Indigenous:	5 %	Can Indigenous:	0 %
							US Private	27 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Rocky Mountain Ponderosa Pine Woodland and Savanna		10,093 ha	1.0%	2.55	3.5 %	291,947 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		11,936 ha	0.8%	2.04	2.8 %	432,412 ha	116 %
Columbia Basin Foothill Riparian Woodland and Shrubland		104 ha	0.5%	1.17	1.6 %	6,545 ha	138 %
Inter-Mountain Basins Big Sagebrush Steppe		8,992 ha	1.4%	3.52	4.8 %	188,483 ha	134 %
Northern Interior Spruce-Fir woodland and forest		3,452 ha	0.3%	0.62	0.8 %	414,168 ha	105 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,458 ha	1.8%	4.36	5.9 %	24,703 ha	133 %
Northern Rocky Mountain Subalpine Dry Parkland		2,612 ha	2.2%	5.36	7.3 %	35,979 ha	139 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		25 ha	0.0%	0.03	0.0 %	73,274 ha	41 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		80 ha	0.1%	0.36	0.5 %	16,408 ha	117 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		19,514 ha	3.0%	7.44	10.1 %	193,578 ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		500 ha	0.1%	0.13	0.2 %	292,133 ha	108 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		9 ha	0.1%	0.24	0.3 %	2,773 ha	136 %

Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		103,450	ha	1.9%	4.60	6.2 %	1,658,616	ha	109 %
Northern Rocky Mountain Montane Mixed Conifer Forest		79,978	ha	9.4%	23.19	31.4 %	254,555	ha	103 %

Species

Birds

Golden eagle *Aquila chrysaetos*	G5	9	nst	5.4%	17.48	23.7 %	38	nst	174 %
White-headed woodpecker *Picoides albolarvatus*	G4	1	nst	4.8%	1.94	2.6 %	38	nst	55 %
Northern goshawk *Accipiter gentilis*	G5	16	nst	18.6%	31.08	42.1 %	38	nst	103 %
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	1	nst	0.8%	1.15	1.6 %	64	nst	111 %
Great gray owl *Strix nebulosa*	G5	2	nst	50.0%	3.88	5.3 %	38	nst	11 %
Flammulated owl *Otus flammeolus*	G4	1	nst	0.8%	1.94	2.6 %	38	nst	205 %
Bald eagle *Haliaeetus leucocephalus*	G4	1	nst	1.0%	1.94	2.6 %	38	nst	100 %
Common Loon *Gavia immer*	G5	1	occ	6.1%	7.95	10.8 %	13	occ	100 %
Great blue heron *Ardia herodius*	G5	2	occ	5.7%	11.36	15.4 %	13	occ	100 %
Bobolink *Dolichonyx oryzivorus*	G5	2	occ	6.5%	8.52	11.5 %	13	occ	108 %

Lepidopterans

Silver-bordered fritillary *Boloria selene*	G5	1	occ	33.3%	5.68	7.7 %	13	occ	23 %

Mammals

Wolverine *Gulo gulo*	G4	2	occ	28.6%	11.36	15.4 %	13	occ	54 %
Lynx *Lynx canadensis*	G5	18,855	ha	2.7%	5.06	6.9 %	275,020	ha	102 %
Gray wolf *Canis lupus*	G4	4	den	5.4%	7.77	10.5 %	38	den	84 %

Non-Vascular Plants

Lichen Physcia tribacia *Physcia tribacia*	G4?	1	occ	25.0%	5.68	7.7 %	13	occ	31 %

Vascular Plants

Poor Sedge *Carex magellanica ssp. irrigua*	G5T5	1	occ	0.7%	1.56	2.1 %	7	occ	143 %
Northern Golden-Carpet *Chrysosplenium tetrandrum*	G5	3	occ	33.3%	31.63	42.9 %	7	occ	43 %

Tall Bitter Fleabane *Trimorpha elata*	G4?	2	occ	100.0%	21.09	28.6 %	7	occ	29 %
Nagoonberry *Rubus acaulis*	G5	1	occ	50.0%	10.54	14.3 %	7	occ	29 %
Idaho Gooseberry *Ribes oxyacanthoides ssp. Irriguum*	G5T3T4	1	occ	50.0%	10.54	14.3 %	7	occ	14 %
Small northern bog-orchid *Platanthera obtusata*	G5	14	occ	32.8%	80.10	108.5 %	13	occ	138 %
Orange Balsam *Impatiens aurella*	G4?	1	occ	25.0%	10.54	14.3 %	7	occ	14 %
Hair-like Sedge *Carex capillaris*	G5	1	occ	33.3%	10.54	14.3 %	7	occ	14 %
Yellow Lady's-slipper *Cypripedium parviflorum*	G5	1	occ	11.1%	10.54	14.3 %	7	occ	43 %
Two-spiked Moonwort *Botrychium paradoxum*	G2	1	occ	11.1%	10.54	14.3 %	7	occ	100 %
Yellow Bog Sedge *Carex dioica*	G5	1	occ	6.8%	3.58	4.9 %	7	occ	0 %
Stalked Moonwort *Botrychium pedunculosum*	G2G3	1	occ	14.3%	10.54	14.3 %	7	occ	71 %
Crenulate Moonwort *Botrychium crenulatum*	G3	2	occ	2.3%	18.51	25.1 %	7	occ	414 %
Velvet-leaf Blueberry *Vaccinium myrtilloides*	G5	1	occ	100.0%	10.54	14.3 %	7	occ	14 %
Blue-eyed Grass *Sisyrinchium septentrionale*	G3G4	7	occ	33.3%	73.81	100.0 %	7	occ	171 %
Beaked Sedge *Carex rostrata*	G5	1	occ	100.0%	10.54	14.3 %	7	occ	14 %
Green Keeled Cotton-Grass *Eriophorum viridicarinatum*	G5	1	occ	33.3%	10.54	14.3 %	7	occ	29 %

Cooper Mountain Washington

Site No 134

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	99 %	Can National:	0 %
Area:	11,500	ha	Developed	0 %	GAP 2	1 %	US State:	0 %	BC Provincial:	0 %
	28,405	ac	Water	0 %	GAP 3	99 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	1 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		899 ha	0.1%	2.12	0.3 %	352,885 ha	104 %
Inter-Mountain Basins Big Sagebrush Steppe		2,699 ha	0.4%	11.90	1.4 %	188,483 ha	134 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		956 ha	0.1%	1.84	0.2 %	432,412 ha	116 %
Northern Interior Spruce-Fir woodland and forest		10 ha	0.0%	0.02	0.0 %	414,168 ha	105 %
Northern Rocky Mountain Montane Mixed Conifer Forest		7,411 ha	0.9%	24.20	2.9 %	254,555 ha	103 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		18 ha	0.0%	0.61	0.1 %	24,703 ha	133 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		374 ha	0.0%	1.06	0.1 %	291,947 ha	138 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		22 ha	0.0%	0.09	0.0 %	193,578 ha	114 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		8,339 ha	0.2%	4.18	0.5 %	1,658,616 ha	109 %
Columbia Basin Foothill Riparian Woodland and Shrubland		4 ha	0.0%	0.51	0.1 %	6,545 ha	138 %
Species							
Birds							
Lewis' woodpecker *Melanerpes lewis*	G4	1 nst	0.7%	21.87	2.6 %	38 nst	239 %

Black-backed woodpecker *Picoides arcticus*	G5	1	occ	8.3 %	63.94	7.7 %	13	occ	92 %
Mammals									
Grizzly bear *Ursus arctos*	G4	3,527	ha	0.1 %	2.79	0.3 %	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	236	ha	0.0 %	0.29	0.0 %	668,362	ha	71 %
Western gray squirrel *Sciurus griseus*	G5	1	occ	1.7 %	63.94	7.7 %	13	occ	115 %
Lynx *Lynx canadensis*	G5	8,222	ha	1.2 %	24.85	3.0 %	275,020	ha	102 %

Copper Mountain British Columbia

Site No 82

Okanagan Highlands Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	25,000 ha	Developed	0 %	GAP 2	2 %	US State:	0 %	BC Provincial:	88 %
	61,750 ac	Water	0 %	GAP 3	86 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	12 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	12 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		5,274 ha	1.0%	13.32	3.5 %	151,409 ha	105 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		615 ha	0.0%	0.54	0.1 %	432,412 ha	116 %
Inter-Mountain Basins Big Sagebrush Steppe		913 ha	0.1%	1.85	0.5 %	188,483 ha	134 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		8,670 ha	0.7%	9.39	2.5 %	352,885 ha	104 %
Northern Interior Spruce-Fir woodland and forest		7,216 ha	0.5%	6.66	1.7 %	414,168 ha	105 %
Northern Rocky Mountain Montane Mixed Conifer Forest		302 ha	0.0%	0.45	0.1 %	254,555 ha	103 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		200 ha	0.2%	3.10	0.8 %	24,703 ha	133 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		615 ha	0.1%	0.81	0.2 %	291,947 ha	138 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		1,003 ha	1.8%	23.37	6.1 %	16,408 ha	117 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		21,479 ha	0.4%	4.95	1.3 %	1,658,616 ha	109 %
Columbia Basin Foothill Riparian Woodland and Shrubland		1 ha	0.0%	0.06	0.0 %	6,545 ha	138 %
Species							
Amphibians							

Tiger salamander *Ambystoma tigrinum*	G5	1	occ	1.0%	20.39	5.3%	25	occ	316 %
<u>Birds</u>									
Williamson's sapsucker *Sphyrapicus thyroideus thyroideus*	G5	6	nst	15.4%	60.37	15.8%	38	nst	97 %
Swainson's hawk *Buteo swainsoni*	G5	1	occ	11.1%	29.41	7.7%	13	occ	69 %
Canyon wren *Catherpes mexicanus*	G5	1	occ	1.7%	29.41	7.7%	13	occ	369 %
Lewis' woodpecker *Melanerpes lewis*	G4	3	nst	2.1%	30.18	7.9%	38	nst	239 %
Flammulated owl *Otus flammeolus*	G4	2	nst	1.7%	20.12	5.3%	38	nst	205 %
<u>Mammals</u>									
Fisher *Martes pennanti*	G5	6,460	ha	0.4%	3.70	1.0%	668,362	ha	71 %
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	3	nst	6.5%	30.18	7.9%	38	nst	100 %
Western small-footed myotis *Myotis ciliolabrum*	G5	1	occ	3.3%	5.82	1.5%	13	occ	46 %
Fringed myotis *Myotis thysanodes*	G4G5	1	occ	1.4%	6.30	1.6%	13	occ	100 %
Bighorn sheep *Ovis canadensis*	G4	525	ha	0.2%	3.63	0.9%	55,318	ha	253 %
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.6%	6.59	1.7%	58	occ	128 %
<u>Reptiles</u>									
Racer *Coluber constricta*	G5	1	occ	0.8%	29.41	7.7%	13	occ	708 %

Corkscrew Potholes

Site No 123

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	3,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	7,410	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		2,955 ha	0.2 %	21.77	0.7 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		584 ha	0.1 %	6.37	0.2 %	291,947 ha	138 %
Inter-Mountain Basins Big Sagebrush Steppe		2,369 ha	0.4 %	40.05	1.3 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		5 ha	0.0 %	2.43	0.1 %	6,545 ha	138 %

Deadman

Site No 66

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	59 %
	1,235	ac	Water	0 %	GAP 3	59 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	41 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	41 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		500 ha	0.0%	5.76	0.0 %	1,658,616 ha	109 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		500 ha	0.0%	27.09	0.1 %	352,885 ha	104 %
Species							
Birds							
Northern goshawk *Accipiter gentilis*	G5	1 nst	1.2%	503.08	2.6 %	38 nst	103 %
Mammals							
Fisher *Martes pennanti*	G5	500 ha	0.0%	14.30	0.1 %	668,362 ha	71 %

Disautel-Moses Meadows-Crawfish

Site No 110

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	8 %	Can National:	0 %
Area:	19,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	48,165	ac	Water	0 %	GAP 3	8 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	92 %	US Indigenous:	91 %	Can Indigenous:	0 %
							US Private	2 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		4,536 ha	0.3 %	5.14	1.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		13,338 ha	0.2 %	3.94	0.8 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		66 ha	0.7 %	11.67	2.4 %	2,773 ha	136 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		3,347 ha	0.5 %	8.48	1.7 %	193,578 ha	114 %
Northern Rocky Mountain Subalpine Dry Parkland		2 ha	0.0 %	0.03	0.0 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		4,470 ha	0.5 %	7.51	1.5 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		306 ha	0.4 %	6.07	1.2 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		9,985 ha	1.2 %	19.23	3.9 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		929 ha	0.1 %	2.42	0.5 %	188,483 ha	134 %
Species							
Birds							
Common Loon *Gavia immer*	G5	1 occ	4.3 %	37.71	7.7 %	13 occ	100 %
Lepidopterans							

Silver-bordered fritillary *Boloria selene*	G5	1 occ	33.3 %	37.71	7.7 %	13 occ	23 %
Meadow fritillary *Boloria bellona toddi*	G5	3 occ	42.9 %	113.12	23.1 %	13 occ	54 %
Mammals							
Gray wolf *Canis lupus*	G4	1 den	1.4 %	12.90	2.6 %	38 den	84 %

Douglas Lake

Site No 53

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	1,235	ac	Water	2 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	100 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Plateau Grassland		500 ha	0.2 %	146.05	0.8 %	65,446 ha	200 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	0.0 %	17.66	0.1 %	13 occ	485 %
Vascular Plants							
Hutchinsia *Hutchinsia procumbens*	G5	1 occ	33.3 %	2,731.03	14.3 %	7 occ	43 %

Duteau

Site No 50

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	87 %
	2,470	ac	Water	0 %	GAP 3	87 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	13 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	13 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		32 ha	0.0%	0.70	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		968 ha	0.0%	5.58	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		31 ha	0.0%	1.01	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1 ha	0.0%	0.00	0.0 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		121 ha	0.0%	2.79	0.0 %	414,168 ha	105 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		847 ha	0.2%	53.47	0.6 %	151,409 ha	105 %

East Kelowna

Site No 56

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	11 %	GAP 1	11 %	US National	0 %	Can National:	0 %
Area:	5,000	ha	Developed	5 %	GAP 2	0 %	US State:	0 %	BC Provincial:	26 %
	12,350	ac	Water	1 %	GAP 3	14 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	74 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	74 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		351 ha	0.0%	0.40	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		2,190 ha	0.2%	14.34	0.8 %	291,947 ha	138 %
Northern Interior Plateau Grassland		1,206 ha	0.6%	35.23	1.8 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		67 ha	0.1%	5.18	0.3 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		351 ha	0.1%	4.43	0.2 %	151,409 ha	105 %
Columbia Basin Foothill Riparian Woodland and Shrubland		39 ha	0.2%	11.39	0.6 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		2,187 ha	0.2%	9.67	0.5 %	432,412 ha	116 %
Species							
Birds							
Western screech owl *Otus kennicotii macfarlanei*	G5T4	1 nst	1.2%	50.31	2.6 %	38 nst	134 %
American avocet *Recurvirostra americana*	G5	1 occ	29.9%	131.84	6.9 %	13 occ	23 %
Lewis' woodpecker *Melanerpes lewis*	G4	2 nst	1.4%	100.62	5.3 %	38 nst	239 %
Dragonfly							

Twelve-spotted skimmer *Libellula pulchella*	G5	1	occ	0.6%	16.34	0.9 %	13	occ	108 %
Mammals									
Spotted bat *Euderma maculatum*	G4	1	occ	3.7%	142.12	7.4 %	13	occ	154 %
Mountain goat *Oreamos americanus*	G5	111	ha	0.1%	6.96	0.4 %	30,505	ha	179 %
Badger *Taxidea taxus jeffersoni*	G5	2	occ	1.2%	65.92	3.4 %	58	occ	128 %
Vascular Plants									
Three-flowered Waterwort *Elatine rubella*	G5	1	occ	100.0%	273.10	14.3 %	7	occ	14 %
Rigid Fiddleneck *Amsinckia retrorsa*	G5	1	occ	100.0%	273.10	14.3 %	7	occ	14 %
Hairy Water-clover *Marsilea vestita*	G5	1	occ	25.0%	273.10	14.3 %	7	occ	57 %
Many-headed Sedge *Carex sychnocephala*	G4	1	occ	8.3%	273.10	14.3 %	7	occ	100 %
Awned Cyperus *Cyperus squarrosus*	G5	1	occ	14.3%	273.10	14.3 %	7	occ	71 %
Rice Cutgrass *Leersia oryzoides*	G5	2	occ	100.0%	546.20	28.6 %	7	occ	29 %
False-pimpernel *Lindernia dubia var. anagallidea*	G5T4	1	occ	100.0%	273.10	14.3 %	7	occ	14 %
Peach-leaf Willow *Salix amygdaloides*	G5	2	occ	28.6%	546.20	28.6 %	7	occ	57 %
Red-rooted Cyperus *Cyperus erythrorhizos*	G5	1	occ	50.0%	273.10	14.3 %	7	occ	14 %

Edge Hills

Site No 14

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	31 %	US National	0 %	Can National:	0 %
Area:	5,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	96 %
	12,350	ac	Water	0 %	GAP 3	65 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	4 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	4 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		4,049 ha	0.3 %	17.90	0.9 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		288 ha	0.0 %	0.33	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,900 ha	0.2 %	12.44	0.7 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		31 ha	0.0 %	2.40	0.1 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		13 ha	0.0 %	0.06	0.0 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		275 ha	0.0 %	1.49	0.1 %	352,885 ha	104 %
Inter-Mountain Basins Cliff and Canyon		460 ha	8.4 %	534.91	28.0 %	1,644 ha	100 %
Inter-Mountain Basins Big Sagebrush Steppe		2,154 ha	0.3 %	21.85	1.1 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		33 ha	0.2 %	9.64	0.5 %	6,545 ha	138 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	2,233 ha	0.1 %	4.06	0.2 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	297 ha	0.0 %	0.85	0.0 %	668,362 ha	71 %

Bighorn sheep *Ovis canadensis*	G4	3,610 ha	1.3 %	124.76	6.5 %	55,318 ha	253 %

Eight Mile

Site No 103

Northern Cascade Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	100 %	Can National:	0 %
Area:	500 ha 1,235 ac	Developed	0 %	GAP 2	100 %	US State:	0 %	BC Provincial:	0 %
		Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		309 ha	0.0 %	3.56	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		307 ha	0.0 %	30.32	0.2 %	193,578 ha	114 %
Rocky Mountain Alpine Composite		89 ha	0.0 %	14.24	0.1 %	119,447 ha	122 %
Northern Rocky Mountain Subalpine Dry Parkland		101 ha	0.1 %	53.67	0.3 %	35,979 ha	139 %
Northern Interior Spruce-Fir woodland and forest		2 ha	0.0 %	0.09	0.0 %	414,168 ha	105 %
Species							
Lepidopterans							
Astarte fritillary *Boloria astarte*	G5	1 occ	20.0 %	1,470.55	7.7 %	13 occ	38 %
Mammals							
Grizzly bear *Ursus arctos*	G4	500 ha	0.0 %	9.10	0.0 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	1 ha	0.0 %	0.01	0.0 %	668,362 ha	71 %
Lynx *Lynx canadensis*	G5	500 ha	0.1 %	34.76	0.2 %	275,020 ha	102 %

Fiftyseven

Site No 6

Interior Transition Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	3,500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	87 %
	8,645 ac	Water	1 %	GAP 3	87 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	13 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	13 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		3,051 ha	0.1%	5.02	0.2 %	1,658,616 ha	109 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		407 ha	0.5%	45.00	1.6 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		3,048 ha	0.3%	23.59	0.9 %	352,885 ha	104 %
Species							
Mammals							
Badger *Taxidea taxus jeffersoni*	G5	1 occ	0.6%	47.09	1.7 %	58 occ	128 %

Goatskin

Site No 63

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	17 %	US National	0 %	Can National:	0 %
Area:	14,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	34,580	ac	Water	0 %	GAP 3	83 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		11,306 ha	0.2 %	4.65	0.7 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		11 ha	0.1 %	2.71	0.4 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		4,679 ha	0.5 %	10.94	1.6 %	292,133 ha	108 %
Rocky Mountain Alpine Composite		755 ha	0.2 %	4.32	0.6 %	119,447 ha	122 %
Northern Rocky Mountain Subalpine Dry Parkland		1,654 ha	1.4 %	31.39	4.6 %	35,979 ha	139 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		243 ha	0.3 %	6.72	1.0 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		32 ha	0.0 %	0.06	0.0 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		6,587 ha	1.3 %	29.70	4.4 %	151,409 ha	105 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	14,000 ha	0.5 %	9.10	1.3 %	1,050,522 ha	83 %

Gold Mountain

Site No 128

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	1,235	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		43 ha	0.0%	1.90	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		387 ha	0.0%	4.46	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		122 ha	0.0%	7.98	0.0 %	292,133 ha	108 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		43 ha	0.0%	2.82	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		265 ha	0.0%	19.90	0.1 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		70 ha	0.0%	7.10	0.0 %	188,483 ha	134 %

Graystokes-Upper Kettle

Site No 54

Central Okanagan Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	25 %	US National	0 %	Can National:	0 %
Area:	39,000 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	96,330 ac	Water	1 %	GAP 3	75 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		34,850 ha	0.6%	5.15	2.1 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		73 ha	0.8%	6.45	2.6 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		13,335 ha	1.4%	11.19	4.6 %	292,133 ha	108 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		10,437 ha	1.6%	13.21	5.4 %	193,578 ha	114 %
Northern Rocky Mountain Subalpine Dry Parkland		3,241 ha	2.7%	22.08	9.0 %	35,979 ha	139 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		652 ha	0.8%	6.47	2.6 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		664 ha	0.1%	0.46	0.2 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		10,427 ha	2.1%	16.88	6.9 %	151,409 ha	105 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	37,133 ha	1.4%	8.66	3.5 %	1,050,522 ha	83 %
Badger *Taxidea taxus jeffersoni*	G5	2 occ	1.2%	8.45	3.4 %	58 occ	128 %
Vascular Plants							

Regel's Rush *Juncus regelii*	G4?	1	occ	11.1 %	18.85	7.7 %	13 occ	31 %

Greenstone-Glossy

Site No 18

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	8 %	US National	0 %	Can National:	0 %
Area:	121,500	ha	Developed	0 %	GAP 2	3 %	US State:	0 %	BC Provincial:	91 %
	300,105	ac	Water	1 %	GAP 3	79 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	9 %	US Indigenous:	0 %	Can Indigenous:	1 %
							US Private	0 %	Can Private:	8 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Columbia Basin Foothill Riparian Woodland and Shrubland		354 ha	1.6%	4.26	5.4 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		45,267 ha	3.1%	8.24	10.5 %	432,412 ha	116 %
Inter-Mountain Basins Big Sagebrush Steppe		11,698 ha	1.9%	4.88	6.2 %	188,483 ha	134 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		37,430 ha	3.2%	8.34	10.6 %	352,885 ha	104 %
Northern Interior Spruce-Fir woodland and forest		20,602 ha	1.5%	3.91	5.0 %	414,168 ha	105 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,029 ha	1.2%	3.28	4.2 %	24,703 ha	133 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		33,576 ha	3.5%	9.05	11.5 %	291,947 ha	138 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		218 ha	0.0%	0.09	0.1 %	193,578 ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		1,804 ha	0.2%	0.49	0.6 %	292,133 ha	108 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		60,041 ha	1.1%	2.85	3.6 %	1,658,616 ha	109 %
Northern Interior Plateau Grassland		11,009 ha	5.0%	13.23	16.8 %	65,446 ha	200 %
Species							
Amphibians							

Great Basin spadefoot *Spea intermontana*	G5	1	occ	1.3 %	8.07	10.3 %	13	occ	485 %
<u>Birds</u>									
Lewis' woodpecker *Melanerpes lewis*	G4	1	nst	0.7 %	2.07	2.6 %	38	nst	239 %
Western screech owl *Otus kennicotii macfarlanei*	G5T4	1	nst	1.2 %	2.07	2.6 %	38	nst	134 %
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	2	nst	1.6 %	2.46	3.1 %	64	nst	111 %
Williamson's sapsucker *Sphyrapicus thyroideus thyroideus*	G5	1	nst	2.6 %	2.07	2.6 %	38	nst	97 %
<u>Mammals</u>									
Fisher *Martes pennanti*	G5	61,749	ha	3.7 %	7.27	9.2 %	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	3	occ	2.0 %	4.41	5.6 %	58	occ	128 %
Bighorn sheep *Ovis canadensis*	G4	3,806	ha	1.4 %	5.41	6.9 %	55,318	ha	253 %
<u>Non-Vascular Plants</u>									
Lichen Physcia dimidiata *Physcia dimidiata*	G5?	1	occ	16.7 %	6.05	7.7 %	13	occ	46 %
<u>Reptiles</u>									
Gopher snake *Pituophis catenifer deserticola*	G5	2	occ	2.4 %	12.10	15.4 %	13	occ	531 %
<u>Vascular Plants</u>									
Booth's Willow *Salix boothii*	G5	1	occ	10.1 %	6.82	8.7 %	7	occ	29 %
Freckled Milk-vetch *Astragalus lentiginosus*	G5	1	occ	10.0 %	11.24	14.3 %	7	occ	100 %
Dwarf Groundsmoke *Gayophytum humile*	G5	1	occ	20.0 %	11.24	14.3 %	7	occ	71 %
Okanogan Fameflower *Talinum sediforme*	G3	3	occ	23.1 %	4.72	6.0 %	50	occ	20 %
Rough Dropseed *Sporobolus compositus var. compositus*	G5T5	1	occ	33.3 %	11.24	14.3 %	7	occ	43 %

Grizzly

Site No 108

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	2 %	US National	33 %	Can National:	0 %
Area:	15,500	ha	Developed	0 %	GAP 2	5 %	US State:	0 %	BC Provincial:	0 %
	38,285	ac	Water	0 %	GAP 3	31 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	62 %	US Indigenous:	67 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		702 ha	0.0 %	1.00	0.2 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		13,405 ha	0.2 %	4.98	0.8 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		1,086 ha	0.1 %	2.29	0.4 %	292,133 ha	108 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		3,331 ha	0.5 %	10.61	1.7 %	193,578 ha	114 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		29 ha	0.1 %	1.09	0.2 %	16,408 ha	117 %
Northern Rocky Mountain Subalpine Dry Parkland		423 ha	0.4 %	7.25	1.2 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		704 ha	0.1 %	1.49	0.2 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		313 ha	0.4 %	7.81	1.3 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		9,014 ha	1.1 %	21.84	3.5 %	254,555 ha	103 %
Northern Interior Spruce-Fir woodland and forest		5 ha	0.0 %	0.01	0.0 %	414,168 ha	105 %
Inter-Mountain Basins Big Sagebrush Steppe		533 ha	0.1 %	1.74	0.3 %	188,483 ha	134 %
Species							
Birds							

Golden eagle *Aquila chrysaetos*	G5	2 nst	1.2%	32.46	5.3 %	38 nst	174 %
Lepidopterans							
Meadow fritillary *Boloria bellona toddi*	G5	1 occ	14.3%	47.44	7.7 %	13 occ	54 %
Mammals							
Lynx *Lynx canadensis*	G5	6,870 ha	1.0%	15.40	2.5 %	275,020 ha	102 %

Guichon

Site No 41

Thompson Okanagan Plateau Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	1,235 ac	Water	3 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		447 ha	0.0%	5.16	0.0 %	1,658,616 ha	109 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		53 ha	0.1%	41.02	0.2 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		437 ha	0.0%	20.17	0.1 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		10 ha	0.0%	0.54	0.0 %	352,885 ha	104 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	500 ha	0.0%	14.30	0.1 %	668,362 ha	71 %

Hall Creek

Site No 113

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	9 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	2,470	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		373 ha	0.0 %	8.25	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		107 ha	0.0 %	0.61	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		373 ha	0.0 %	12.21	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		318 ha	0.4 %	123.04	1.3 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		107 ha	0.0 %	4.02	0.0 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		101 ha	0.0 %	5.12	0.1 %	188,483 ha	134 %

Hayes

Site No 74

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	28 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	58 %
	1,235	ac	Water	0 %	GAP 3	58 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	42 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	42 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		227 ha	0.0%	10.04	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		54 ha	0.0%	0.62	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		227 ha	0.0%	14.86	0.1 %	291,947 ha	138 %
Northern Interior Plateau Grassland		3 ha	0.0%	0.88	0.0 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		74 ha	0.1%	57.26	0.3 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		54 ha	0.0%	2.93	0.0 %	352,885 ha	104 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	63 ha	0.0%	1.15	0.0 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	59 ha	0.0%	1.68	0.0 %	668,362 ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	1 occ	0.6%	329.59	1.7 %	58 occ	128 %
Mountain goat *Oreamos americanus*	G5	76 ha	0.0%	47.63	0.2 %	30,505 ha	179 %

Hellsgate

Site No 131

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	12 %	Can National:	0 %
Area:	55,500	ha	Developed	0 %	GAP 2	70 %	US State:	0 %	BC Provincial:	0 %
	137,085	ac	Water	10 %	GAP 3	12 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	18 %	US Indigenous:	85 %	Can Indigenous:	0 %
							US Private	3 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		24,040 ha	1.7 %	9.57	5.6 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		17,095 ha	0.3 %	1.78	1.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		1,136 ha	0.1 %	0.67	0.4 %	292,133 ha	108 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		14,623 ha	1.5 %	8.63	5.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		601 ha	0.7 %	4.19	2.4 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		15,965 ha	1.9 %	10.80	6.3 %	254,555 ha	103 %
Inter-Mountain Basins Cliff and Canyon		5 ha	0.1 %	0.52	0.3 %	1,644 ha	100 %
Inter-Mountain Basins Big Sagebrush Steppe		15,812 ha	2.5 %	14.45	8.4 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		207 ha	0.9 %	5.45	3.2 %	6,545 ha	138 %
Species							
Amphibians							
Western toad *Bufo boreas*	G4	2 occ	5.1 %	26.50	15.4 %	13 occ	123 %
Birds							

Bald eagle *Haliaeetus leucocephalus*	G4	14	nst	13.5%	63.45	36.8 %	38 nst	100 %
Golden eagle *Aquila chrysaetos*	G5	1	nst	0.6%	4.53	2.6 %	38 nst	174 %
<u>Mammals</u>								
Bighorn sheep-WA *Ovis canadensis*	G4	918	ha	3.8%	6.51	3.8 %	24,282 ha	100 %
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	1	nst	2.2%	4.53	2.6 %	38 nst	100 %

Hurlburt

Site No 90

Okanagan Highlands Section

Terrestrial Site

Area: 7,500 ha
18,525 ac

Land Use/Land Cover	
Agriculture	1 %
Developed	0 %
Water	0 %

GAP Management Status	
GAP 1	0 %
GAP 2	0 %
GAP 3	55 %
GAP 4	45 %

Land Ownership			
US National	51 %	Can National:	0 %
US State:	4 %	BC Provincial:	0 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	45 %	Can Private:	0 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,116 ha	0.1%	3.29	0.3 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		4,914 ha	0.1%	3.78	0.3 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		418 ha	0.1%	2.75	0.2 %	193,578 ha	114 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,029 ha	0.1%	4.49	0.4 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		227 ha	0.3%	11.71	0.9 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		4,480 ha	0.5%	22.43	1.8 %	254,555 ha	103 %
Northern Interior Spruce-Fir woodland and forest		10 ha	0.0%	0.03	0.0 %	414,168 ha	105 %
Inter-Mountain Basins Big Sagebrush Steppe		1,102 ha	0.2%	7.45	0.6 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		24 ha	0.1%	4.67	0.4 %	6,545 ha	138 %
Species							
Birds							
Golden eagle *Aquila chrysaetos*	G5	1 nst	0.6%	33.54	2.6 %	38 nst	174 %
Mammals							

Lynx *Lynx canadensis*	G5	190	ha	0.0%	0.88	0.1 %	275,020	ha	102 %
Vascular Plants									
Black Snake-root *Sanicula marilandica*	G5	2	occ	10.0%	364.13	28.6 %	7	occ	171 %
Blue-eyed Grass *Sisyrinchium septentrionale*	G3G4	1	occ	4.8%	182.07	14.3 %	7	occ	171 %

Hurley

Site No 33

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	94 %
	1,235	ac	Water	0 %	GAP 3	94 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	6 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	6 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal		% of Goal Captured by Portfolio
Terrestrial									
Terrestrial Ecological Systems									
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		422	ha	0.0%	4.87	0.0 %	1,658,616	ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		86	ha	0.0%	5.63	0.0 %	292,133	ha	108 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		31	ha	0.0%	3.06	0.0 %	193,578	ha	114 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		78	ha	0.1%	60.36	0.3 %	24,703	ha	133 %
Northern Interior Spruce-Fir woodland and forest		305	ha	0.0%	14.08	0.1 %	414,168	ha	105 %
Species									
Mammals									
Grizzly bear *Ursus arctos*	G4	500	ha	0.0%	9.10	0.0 %	1,050,522	ha	83 %
Mountain goat *Oreamos americanus*	G5	54	ha	0.0%	33.84	0.2 %	30,505	ha	179 %

Jim Creek

Site No 109

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	3,705	ac	Water	1 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal		% of Goal Captured by Portfolio
Terrestrial									
Terrestrial Ecological Systems									
Aggregate - Ponderosa Pine and Sagebrush Steppe		836	ha	0.1 %	12.32	0.2 %	432,412	ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		170	ha	0.0 %	0.65	0.0 %	1,658,616	ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		837	ha	0.1 %	18.27	0.3 %	291,947	ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		110	ha	0.1 %	28.38	0.4 %	24,703	ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		171	ha	0.0 %	4.28	0.1 %	254,555	ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		178	ha	0.0 %	6.02	0.1 %	188,483	ha	134 %
Species									
Birds									
Bald eagle *Haliaeetus leucocephalus*	G4	1	nst	1.0 %	167.69	2.6 %	38	nst	100 %
Great blue heron *Ardia herodius*	G5	1	occ	2.9 %	490.17	7.7 %	13	occ	100 %

Kalamalka

Site No 49

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	3 %	GAP 1	21 %	US National	0 %	Can National:	0 %
Area:	12,500	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	52 %
	30,875	ac	Water	24 %	GAP 3	31 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	48 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	48 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		3,378 ha	0.2%	5.97	0.8 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,238 ha	0.0%	0.57	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		3,374 ha	0.3%	8.84	1.2 %	291,947 ha	138 %
Northern Interior Plateau Grassland		4,421 ha	2.0%	51.66	6.8 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		122 ha	0.1%	3.78	0.5 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		1,238 ha	0.2%	6.25	0.8 %	151,409 ha	105 %
Species							
Amphibians							
Coastal tailed frog *Ascaphus truei*	G4	4 occ	3.4%	235.29	30.8 %	13 occ	792 %
Great Basin spadefoot *Spea intermontana*	G5	4 occ	4.0%	235.29	30.8 %	13 occ	485 %
Birds							
Swainson's hawk *Buteo swainsoni*	G5	2 occ	22.2%	117.64	15.4 %	13 occ	69 %
Grasshopper sparrow *Ammodramus savannarum*	G5	1 nst	3.1%	20.12	2.6 %	38 nst	76 %

Dragonfly									
Twelve-spotted skimmer *Libellula pulchella*	G5	1	occ	7.0%	78.43	10.3 %	13	occ	108 %
Lance-tailed darner *Aechna constricta*	G5	2	occ	18.2%	117.64	15.4 %	13	occ	85 %
Reptiles									
Western rattlesnake *Crotalus viridis*	G5	2	nst	1.6%	40.25	5.3 %	38	nst	218 %
Vascular Plants									
Many-headed Sedge *Carex sychnocephala*	G4	1	occ	8.3%	109.24	14.3 %	7	occ	100 %
Engelmann's Knotweed *Polygonum douglasii ssp. engelmannii*	G5T3T5	1	occ	100.0%	109.24	14.3 %	7	occ	14 %

Kamloops

Site No 28

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000	ha	Developed	52 %	GAP 2	0 %	US State:	0 %	BC Provincial:	28 %
	2,470	ac	Water	0 %	GAP 3	28 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	72 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	72 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		318 ha	0.0 %	7.03	0.1 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		149 ha	0.0 %	4.88	0.1 %	291,947 ha	138 %
Inter-Mountain Basins Big Sagebrush Steppe		172 ha	0.0 %	8.72	0.1 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		10 ha	0.0 %	14.60	0.2 %	6,545 ha	138 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	1.0 %	735.25	7.7 %	13 occ	485 %
Mammals							
Badger *Taxidea taxus jeffersoni*	G5	1 occ	0.1 %	19.62	0.2 %	58 occ	128 %
Non-Vascular Plants							
Lichen Physcia dimidiata *Physcia dimidiata*	G5?	3 occ	50.0 %	2,205.76	23.1 %	13 occ	46 %
Lichen Agrestia hispida *Agrestia hispida*	G3	1 occ	25.0 %	735.25	7.7 %	13 occ	31 %
Vascular Plants							
Threadstalk Milk-vetch *Astragalus filipes*	G5	1 occ	8.5 %	925.50	9.7 %	7 occ	71 %

Toothcup Meadow-foam *Rotala ramosior*	G5	1 occ	33.3 %	1,365.47	14.3 %	7 occ	43 %

Keller

Site No 130

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	12,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	29,640	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		9,484 ha	0.7 %	17.47	2.2 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,249 ha	0.0 %	0.60	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,906 ha	0.2 %	5.20	0.7 %	291,947 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		1,251 ha	0.1 %	3.91	0.5 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		7,708 ha	1.2 %	32.57	4.1 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		184 ha	0.8 %	22.39	2.8 %	6,545 ha	138 %
Species							
Birds							
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	14 nst	11.2 %	174.24	21.9 %	64 nst	111 %

Kettle Range

Site No 86

Okanagan Highlands Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	2 %	GAP 1	0 %	US National	71 %	Can National:	0 %
Area:	63,000 ha	Developed	0 %	GAP 2	3 %	US State:	10 %	BC Provincial:	0 %
	155,610 ac	Water	0 %	GAP 3	79 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	19 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	19 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Columbia Basin Foothill Riparian Woodland and Shrubland		1 ha	0.0%	0.02	0.0 %	6,545 ha	138 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		31,708 ha	0.6%	2.90	1.9 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		1 ha	0.0%	0.00	0.0 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		10,195 ha	1.0%	5.29	3.5 %	292,133 ha	108 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		6,613 ha	1.0%	5.18	3.4 %	193,578 ha	114 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		13,616 ha	5.6%	28.19	18.6 %	73,274 ha	41 %
Northern Rocky Mountain Subalpine Dry Parkland		127 ha	0.1%	0.54	0.4 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		12,189 ha	1.3%	6.33	4.2 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,019 ha	1.2%	6.26	4.1 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		14,906 ha	1.8%	8.88	5.9 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		1,783 ha	0.3%	1.44	0.9 %	188,483 ha	134 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		12,237 ha	0.8%	4.29	2.8 %	432,412 ha	116 %
Species							

Amphibians									
Western toad *Bufo boreas*	G4	1	occ	2.6%	11.67	7.7 %	13	occ	123 %
Birds									
Bald eagle *Haliaeetus leucocephalus*	G4	1	nst	1.0%	3.99	2.6 %	38	nst	100 %
Golden eagle *Aquila chrysaetos*	G5	1	nst	0.6%	3.99	2.6 %	38	nst	174 %
Common Loon *Gavia immer*	G5	1	occ	4.3%	11.67	7.7 %	13	occ	100 %
Dragonfly									
Subarctic (muskeg) darner *Aeshna subarctica*	G5	1	occ	100.0%	21.67	14.3 %	7	occ	14 %
Subarctic bluet *Coenagrion interrogatum*	G5	1	occ	100.0%	21.67	14.3 %	7	occ	14 %
Lepidopterans									
Juniper hairstreak *Callophrys gryneus*	G5	1	occ	100.0%	11.67	7.7 %	13	occ	8 %
Mammals									
Lynx *Lynx canadensis*	G5	19,326	ha	2.8%	10.66	7.0 %	275,020	ha	102 %
Grizzly bear *Ursus arctos*	G4	70	ha	0.0%	0.01	0.0 %	1,050,522	ha	83 %
Mollusks									
California floater *Anodonta californiensis*	G3	1	occ	11.1%	11.67	7.7 %	13	occ	62 %
Non-Vascular Plants									
Lichen Physcia tribacia *Physcia tribacia*	G4?	1	occ	25.0%	11.67	7.7 %	13	occ	31 %
Vascular Plants									
Yellow Lady's-slipper *Cypripedium parviflorum*	G5	2	occ	22.2%	43.35	28.6 %	7	occ	43 %
Skinny Moonwort *Botrychium lineare*	G1	1	occ	100.0%	21.67	14.3 %	7	occ	14 %
Two-spiked Moonwort *Botrychium paradoxum*	G2	1	occ	11.1%	21.67	14.3 %	7	occ	100 %
Blue-eyed Grass *Sisyrinchium septentrionale*	G3G4	1	occ	4.8%	21.67	14.3 %	7	occ	171 %
Triangular-lobed Moonwort *Botrychium ascendens*	G2G3?	2	occ	20.0%	23.34	15.4 %	13	occ	23 %
Crenulate Moonwort *Botrychium crenulatum*	G3	24	occ	31.8%	530.57	349.7 %	7	occ	414 %

Yellow Sedge *Carex flava*	G5	1 occ	12.5%	21.67	14.3 %	7 occ	14 %
Green Keeled Cotton-Grass *Eriophorum viridicarinatum*	G5	1 occ	33.3%	21.67	14.3 %	7 occ	29 %
Columbia Crazyweed *Oxytropis campestris var. columbiana*	G5T3	1 occ	100.0%	6.07	4.0 %	25 occ	4 %
Black Snake-root *Sanicula marilandica*	G5	7 occ	35.0%	151.72	100.0 %	7 occ	171 %
Kidney-leaved Violet *Viola renifolia*	G5	1 occ	20.0%	21.67	14.3 %	7 occ	14 %
Stalked Moonwort *Botrychium pedunculosum*	G2G3	1 occ	14.3%	21.67	14.3 %	7 occ	71 %

Kewa

Site No 118

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	32 %	Can National:	0 %
Area:	1,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	2,470	ac	Water	23 %	GAP 3	32 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	68 %	US Indigenous:	45 %	Can Indigenous:	0 %
							US Private	23 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		698 ha	0.0%	15.44	0.2 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1 ha	0.0%	0.00	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		699 ha	0.1%	22.89	0.2 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		39 ha	0.0%	15.09	0.2 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		1 ha	0.0%	0.00	0.0 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		1 ha	0.0%	0.00	0.0 %	188,483 ha	134 %
Species							
Birds							
Bald eagle *Haliaeetus leucocephalus*	G4	2 nst	1.9%	503.07	5.3 %	38 nst	100 %
Mollusks							
California floater *Anodonta californiensis*	G3	1 occ	11.1%	735.25	7.7 %	13 occ	62 %

Lac du Bois

Site No 22

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	56 %	US National	0 %	Can National:	0 %
Area:	25,500	ha	Developed	0 %	GAP 2	14 %	US State:	0 %	BC Provincial:	95 %
	62,985	ac	Water	6 %	GAP 3	25 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		3,854 ha	0.1%	0.87	0.2 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		9,629 ha	1.0%	12.36	3.3 %	291,947 ha	138 %
Northern Interior Plateau Grassland		6,385 ha	2.9%	36.57	9.8 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		78 ha	0.1%	1.18	0.3 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		3,854 ha	0.3%	4.09	1.1 %	352,885 ha	104 %
Inter-Mountain Basins Big Sagebrush Steppe		3,818 ha	0.6%	7.59	2.0 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		180 ha	0.8%	10.31	2.8 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		13,459 ha	0.9%	11.67	3.1 %	432,412 ha	116 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	1.0%	28.83	7.7 %	13 occ	485 %
Birds							
Flammulated owl *Otus flammeolus*	G4	10 nst	8.5%	98.64	26.3 %	38 nst	205 %

Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	5	nst	4.0%	29.28	7.8 %	64	nst	111 %
Bobolink *Dolichonyx oryzivorus*	G5	1	occ	4.3%	28.83	7.7 %	13	occ	108 %
Burrowing owl *Athene cunicularia*	G4	2	occ	3.2%	107.10	28.6 %	7	occ	643 %
Mammals									
Badger *Taxidea taxus jeffersoni*	G5	2	occ	1.2%	12.93	3.4 %	58	occ	128 %
Fringed myotis *Myotis thysanodes*	G4G5	1	occ	6.7%	28.83	7.7 %	13	occ	100 %
Bighorn sheep *Ovis canadensis*	G4	8,406	ha	3.0%	56.96	15.2 %	55,318	ha	253 %
Fisher *Martes pennanti*	G5	4,232	ha	0.3%	2.37	0.6 %	668,362	ha	71 %
Non-Vascular Plants									
Lichen Agrestia hispida *Agrestia hispida*	G3	3	occ	75.0%	86.50	23.1 %	13	occ	31 %
Reptiles									
Western rattlesnake *Crotalus viridis*	G5	6	nst	4.8%	59.19	15.8 %	38	nst	218 %
Vascular Plants									
Oregon Checker-mallow *Sidalcea oregana var. procera*	G5T4	1	occ	100.0%	53.55	14.3 %	7	occ	14 %
Western Low Hawksbeard *Crepis modocensis ssp. rostrata*	G4G5T3	1	occ	100.0%	53.55	14.3 %	7	occ	14 %
Bristly Mousetail *Myosurus apetalus var. borealis*	G5TNR	1	occ	20.0%	53.55	14.3 %	7	occ	71 %
Geyer's Onion *Allium geyeri var. tenerum*	G4G5T3	1	occ	25.0%	28.83	7.7 %	13	occ	15 %
Silvery Orache *Atriplex argentea ssp. argentea*	G5T5	1	occ	50.0%	53.55	14.3 %	7	occ	29 %
Scarlet Gaura *Gaura coccinea*	G5	1	occ	100.0%	53.55	14.3 %	7	occ	14 %
Okanogan Fameflower *Talinum sediforme*	G3	6	occ	46.2%	44.98	12.0 %	50	occ	20 %
Small-flowered Ipomopsis *Ipomopsis minutiflora*	G2G3	2	occ	28.6%	57.67	15.4 %	13	occ	54 %

Larch Hills

Site No 16

Thompson Okanagan Plateau Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	1 %	GAP 1	2 %	US National	0 %	Can National:	0 %
Area:	12,000 ha	Developed	0 %	GAP 2	2 %	US State:	0 %	BC Provincial:	95 %
	29,640 ac	Water	5 %	GAP 3	91 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	5 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		10,949 ha	0.2 %	5.26	0.7 %	1,658,616 ha	109 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		143 ha	0.1 %	1.55	0.2 %	73,274 ha	41 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		60 ha	0.1 %	1.93	0.2 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		10,949 ha	2.2 %	57.60	7.2 %	151,409 ha	105 %
Species							
Vascular Plants							
Yellow Widelip Orchid *Liparis loeselii*	G5	1 occ	50.0 %	61.27	7.7 %	13 occ	15 %
Thyme-leaved Spurge *Chamaesyce serpyllifolia ssp. serpyllifolia*	G5T5	1 occ	16.7 %	113.79	14.3 %	7 occ	71 %
Giant Helleborine *Epipactis gigantea*	G3	2 occ	25.0 %	227.58	28.6 %	7 occ	100 %

Lillooet River

Site No 38

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	2,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	98 %
	4,940	ac	Water	0 %	GAP 3	98 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	2 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	2 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		38 ha	0.0 %	7.35	0.2 %	24,703 ha	133 %
North Pacific Montane Riparian Woodland and Shrubland		219 ha	3.5 %	563.93	11.8 %	1,856 ha	100 %
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest		1,374 ha	0.6 %	98.01	2.1 %	67,002 ha	80 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	2,000 ha	0.1 %	9.10	0.2 %	1,050,522 ha	83 %

Little Blue Grouse

Site No 125

Okanagan Highlands Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	7,000 ha	Developed	0 %	GAP 2	0 %	US State:	4 %	BC Provincial:	0 %
	17,290 ac	Water	2 %	GAP 3	4 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	96 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	96 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		1 ha	0.0%	0.00	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		6,008 ha	0.1%	4.95	0.4 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		4,990 ha	0.5%	23.32	1.7 %	292,133 ha	108 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		82 ha	0.0%	1.53	0.1 %	73,274 ha	41 %
Northern Rocky Mountain Subalpine Dry Parkland		1 ha	0.0%	0.00	0.0 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1 ha	0.0%	0.00	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		221 ha	0.3%	12.22	0.9 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		1,011 ha	0.1%	5.42	0.4 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		188 ha	0.0%	1.36	0.1 %	188,483 ha	134 %
Species							
Vascular Plants							
Bulb-bearing Water Hemlock *Cicuta bulbifera*	G5	1 occ	3.2%	31.46	2.3 %	7 occ	29 %
Bearded Sedge *Carex comosa*	G5	1 occ	4.0%	31.46	2.3 %	7 occ	0 %

Little Pend d'Oreille

Site No 100

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	68 %	Can National:	0 %
Area:	44,500	ha	Developed	0 %	GAP 2	24 %	US State:	6 %	BC Provincial:	0 %
	109,915	ac	Water	0 %	GAP 3	50 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	26 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	26 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		752 ha	0.9 %	6.54	3.0 %	24,703 ha	133 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		2,074 ha	0.1 %	1.03	0.5 %	432,412 ha	116 %
Columbia Basin Foothill Riparian Woodland and Shrubland		146 ha	0.7 %	4.79	2.2 %	6,545 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		15,995 ha	1.9 %	13.50	6.3 %	254,555 ha	103 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,980 ha	0.2 %	1.46	0.7 %	291,947 ha	138 %
Northern Rocky Mountain Subalpine Dry Parkland		14 ha	0.0 %	0.08	0.0 %	35,979 ha	139 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		7,480 ha	3.1 %	21.93	10.2 %	73,274 ha	41 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		829 ha	0.1 %	0.92	0.4 %	193,578 ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		13,328 ha	1.4 %	9.80	4.6 %	292,133 ha	108 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		30,146 ha	0.5 %	3.90	1.8 %	1,658,616 ha	109 %
Inter-Mountain Basins Big Sagebrush Steppe		1,685 ha	0.3 %	1.92	0.9 %	188,483 ha	134 %
Species							
Birds							

Common Loon *Gavia immer*	G5	1	occ	4.3%	16.52	7.7 %	13	occ	100 %
White-headed woodpecker *Picoides albolarvatus*	G4	3	nst	14.3%	16.96	7.9 %	38	nst	55 %
Calliope hummingbird *Stellula calliope*	G5	1	occ	100.0%	16.52	7.7 %	13	occ	8 %
Northern goshawk *Accipiter gentilis*	G5	3	nst	3.5%	16.96	7.9 %	38	nst	103 %
Black-backed woodpecker *Picoides arcticus*	G5	3	occ	25.0%	49.57	23.1 %	13	occ	92 %
Western screech owl *Otus kennicotii macfarlanei*	G5T4	1	nst	1.2%	5.65	2.6 %	38	nst	134 %
Sandhill crane *Grus canadensis*	G5	1	occ	6.7%	30.69	14.3 %	7	occ	157 %
Bald eagle *Haliaeetus leucocephalus*	G4	3	nst	2.9%	16.96	7.9 %	38	nst	100 %
Bobolink *Dolichonyx oryzivorus*	G5	1	occ	2.5%	9.44	4.4 %	13	occ	108 %
Great blue heron *Ardia herodius*	G5	1	occ	3.4%	19.83	9.2 %	13	occ	100 %
Flammulated owl *Otus flammeolus*	G4	1	nst	0.8%	5.65	2.6 %	38	nst	205 %

Mammals

Gray wolf *Canis lupus*	G4	1	den	1.4%	5.65	2.6 %	38	den	84 %
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.6%	3.70	1.7 %	58	occ	128 %
Lynx *Lynx canadensis*	G5	3,451	ha	0.5%	2.70	1.3 %	275,020	ha	102 %
Wolverine *Gulo gulo*	G4	1	occ	14.3%	16.52	7.7 %	13	occ	54 %
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	1	nst	2.2%	5.65	2.6 %	38	nst	100 %

Vascular Plants

Crenulate Moonwort *Botrychium crenulatum*	G3	2	occ	2.6%	61.37	28.6 %	7	occ	414 %
Two-spiked Moonwort *Botrychium paradoxum*	G2	2	occ	22.2%	61.37	28.6 %	7	occ	100 %
Nuttall's Pussy-toes *Antennaria parvifolia*	G5	1	occ	6.7%	16.52	7.7 %	13	occ	38 %
Western Moonwort *Botrychium hesperium*	G3	1	occ	33.3%	30.69	14.3 %	7	occ	14 %
Stalked Moonwort *Botrychium pedunculosum*	G2G3	3	occ	40.0%	85.94	40.0 %	7	occ	71 %

Yellow Sedge *Carex flava*	G5	1 occ	4.6%	11.35	5.3 %	7 occ	14 %
Bulb-bearing Water Hemlock *Cicuta bulbifera*	G5	1 occ	27.0%	41.40	19.3 %	7 occ	29 %
Crested Shield-fern *Dryopteris cristata*	G5	1 occ	20.5%	44.00	20.5 %	7 occ	14 %
Water Avens *Geum rivale*	G5	2 occ	33.3%	61.37	28.6 %	7 occ	29 %
Adder's-tongue *Ophioglossum pusillum*	G5	1 occ	50.0%	30.69	14.3 %	7 occ	29 %
Blue-eyed Grass *Sisyrinchium septentrionale*	G3G4	1 occ	4.8%	30.69	14.3 %	7 occ	171 %

Little Vulcan

Site No 92

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	0 %	US National	55 %	Can National:	0 %
Area:	8,500	ha	Developed	0 %	GAP 2	0 %	US State:	10 %	BC Provincial:	0 %
	20,995	ac	Water	1 %	GAP 3	65 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	35 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	35 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Rocky Mountain Montane Mixed Conifer Forest		4,135 ha	0.5%	18.27	1.6 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		1,585 ha	0.3%	9.46	0.8 %	188,483 ha	134 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		776 ha	0.1%	2.02	0.2 %	432,412 ha	116 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		55 ha	0.1%	2.50	0.2 %	24,703 ha	133 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		452 ha	0.0%	1.74	0.2 %	291,947 ha	138 %
Northern Rocky Mountain Subalpine Dry Parkland		1 ha	0.0%	0.00	0.0 %	35,979 ha	139 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		540 ha	0.2%	8.29	0.7 %	73,274 ha	41 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		344 ha	0.1%	2.00	0.2 %	193,578 ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		682 ha	0.1%	2.63	0.2 %	292,133 ha	108 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		5,157 ha	0.1%	3.50	0.3 %	1,658,616 ha	109 %
Columbia Basin Foothill Riparian Woodland and Shrubland		2 ha	0.0%	0.34	0.0 %	6,545 ha	138 %
Species							
Birds							

Northern goshawk *Accipiter gentilis*	G5	1	nst	1.2%	29.59	2.6 %	38	nst	103 %
Blue grouse *Dendragapus obscurus*	G5	1	occ	16.7%	86.50	7.7 %	13	occ	46 %
Golden eagle *Aquila chrysaetos*	G5	5	nst	3.0%	147.96	13.2 %	38	nst	174 %
<u>Mammals</u>									
Bighorn sheep-WA *Ovis canadensis*	G4	2,629	ha	10.8%	121.75	10.8 %	24,282	ha	100 %
Lynx *Lynx canadensis*	G5	811	ha	0.1%	3.32	0.3 %	275,020	ha	102 %
<u>Vascular Plants</u>									
Small northern bog-orchid *Platanthera obtusata*	G5	1	occ	2.3%	86.50	7.7 %	13	occ	138 %
Crenulate Moonwort *Botrychium crenulatum*	G3	1	occ	1.1%	131.46	11.7 %	7	occ	414 %

Lower Granby

Site No 79

Okanagan Highlands Section

Terrestrial Site

Area: 2,500 ha
6,175 ac

Land Use/Land Cover

Agriculture	18 %
Developed	0 %
Water	0 %

GAP Management Status

GAP 1	0 %
GAP 2	0 %
GAP 3	67 %
GAP 4	33 %

Land Ownership

US National	0 %	Can National:	0 %
US State:	0 %	BC Provincial:	67 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	0 %	Can Private:	33 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,336 ha	0.0%	3.08	0.1 %	1,658,616 ha	109 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		272 ha	0.5%	63.38	1.7 %	16,408 ha	117 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		143 ha	0.1%	7.46	0.2 %	73,274 ha	41 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		206 ha	0.3%	31.88	0.8 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		658 ha	0.1%	9.88	0.3 %	254,555 ha	103 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		677 ha	0.1%	7.34	0.2 %	352,885 ha	104 %
Species							
Birds							
Western screech owl *Otus kennicotii macfarlanei*	G5T4	1 nst	1.2%	100.62	2.6 %	38 nst	134 %
Bobolink *Dolichonyx oryzivorus*	G5	1 occ	4.3%	294.11	7.7 %	13 occ	108 %
Mammals							
Grizzly bear *Ursus arctos*	G4	317 ha	0.0%	1.15	0.0 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	599 ha	0.0%	3.43	0.1 %	668,362 ha	71 %

Bighorn sheep *Ovis canadensis*	G4	1,192	ha	0.4%	82.39	2.2 %	55,318	ha	253 %
Mountain goat *Oreamos americanus*	G5	89	ha	0.1%	11.16	0.3 %	30,505	ha	179 %
Western small-footed myotis *Myotis ciliolabrum*	G5	1	occ	16.7%	294.11	7.7 %	13	occ	46 %
Vascular Plants									
Cup Clover *Trifolium cyathiferum*	G4	1	occ	50.0%	546.21	14.3 %	7	occ	29 %

Lower Hat-Medicine

Site No 17

Thompson Okanagan Plateau Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	2 %	GAP 1	1 %	US National	0 %	Can National:	0 %
Area:	30,000 ha	Developed	0 %	GAP 2	3 %	US State:	0 %	BC Provincial:	86 %
	74,100 ac	Water	0 %	GAP 3	81 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	14 %	US Indigenous:	0 %	Can Indigenous:	9 %
						US Private	0 %	Can Private:	5 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		14,468 ha	1.0%	10.66	3.3 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		13,057 ha	0.2%	2.51	0.8 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		13,039 ha	1.3%	14.23	4.5 %	291,947 ha	138 %
Northern Interior Plateau Grassland		1,232 ha	0.6%	6.00	1.9 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		216 ha	0.3%	2.79	0.9 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		875 ha	0.1%	0.67	0.2 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		12,190 ha	1.0%	11.01	3.5 %	352,885 ha	104 %
Inter-Mountain Basins Big Sagebrush Steppe		1,436 ha	0.2%	2.43	0.8 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		159 ha	0.7%	7.74	2.4 %	6,545 ha	138 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	12,764 ha	0.8%	6.08	1.9 %	668,362 ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	1 occ	0.6%	5.49	1.7 %	58 occ	128 %

Non-Vascular Plants

Lichen Physcia tribacia *Physcia tribacia*	G4?	1 occ	25.0%	24.51	7.7 %	13 occ	31 %

Vascular Plants

Booth's Willow *Salix boothii*	G5	1 occ	16.7%	45.52	14.3 %	7 occ	29 %
Bushy Cinquefoil *Potentilla paradoxa*	G5	1 occ	33.3%	45.52	14.3 %	7 occ	43 %
Poverty-weed *Iva axillaris ssp. robustior*	G5TNR	1 occ	50.0%	45.52	14.3 %	7 occ	14 %

Lower Nicola

Site No 51

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	21,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	83 %
	51,870	ac	Water	0 %	GAP 3	83 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	17 %	US Indigenous:	0 %	Can Indigenous:	14 %
							US Private	0 %	Can Private:	3 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio

Terrestrial

Terrestrial Ecological Systems

Inter-Mountain Basins Big Sagebrush Steppe		1,655 ha	0.3%	4.00	0.9 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		198 ha	0.9%	13.77	3.0 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		10,450 ha	0.7%	11.00	2.4 %	432,412 ha	116 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		3,683 ha	0.3%	4.75	1.0 %	352,885 ha	104 %
Northern Interior Spruce-Fir woodland and forest		1,933 ha	0.1%	2.12	0.5 %	414,168 ha	105 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		63 ha	0.1%	1.16	0.3 %	24,703 ha	133 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		8,802 ha	0.9%	13.72	3.0 %	291,947 ha	138 %
Northern Rocky Mountain Subalpine Dry Parkland		117 ha	0.1%	1.48	0.3 %	35,979 ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		362 ha	0.7%	10.04	2.2 %	16,408 ha	117 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		3,434 ha	0.4%	5.35	1.2 %	292,133 ha	108 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		9,045 ha	0.2%	2.48	0.5 %	1,658,616 ha	109 %
Northern Interior Plateau Grassland		232 ha	0.1%	1.61	0.4 %	65,446 ha	200 %

Species

Birds									
Blue grouse *Dendragapus obscurus*	G5	1	occ	16.7%	35.01	7.7 %	13	occ	46 %
Flammulated owl *Otus flammeolus*	G4	8	nst	6.8%	95.82	21.1 %	38	nst	205 %
Mammals									
Bighorn sheep *Ovis canadensis*	G4	20	ha	0.0%	0.16	0.0 %	55,318	ha	253 %
Grizzly bear *Ursus arctos*	G4	5,344	ha	0.2%	2.32	0.5 %	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	3,967	ha	0.2%	2.70	0.6 %	668,362	ha	71 %
Reptiles									
Western rattlesnake *Crotalus viridis*	G5	1	nst	0.8%	11.98	2.6 %	38	nst	218 %
Racer *Coluber constricta*	G5	1	occ	0.8%	35.01	7.7 %	13	occ	708 %
Vascular Plants									
Threadstalk Milk-vetch *Astragalus filipes*	G5	1	occ	12.5%	65.02	14.3 %	7	occ	71 %
Small-flowered Ipomopsis *Ipomopsis minutiflora*	G2G3	1	occ	10.2%	25.07	5.5 %	13	occ	54 %
Obscure Cryptantha *Cryptantha ambigua*	G4	1	occ	15.9%	51.57	11.3 %	7	occ	71 %

Magee

Site No 114

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	90 %	Can National:	0 %
Area:	500	ha	Developed	1 %	GAP 2	0 %	US State:	3 %	BC Provincial:	0 %
	1,235	ac	Water	85 %	GAP 3	93 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	7 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	7 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		28 ha	0.0 %	1.26	0.0 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		28 ha	0.0 %	1.83	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		34 ha	0.0 %	26.31	0.1 %	24,703 ha	133 %
Species							
Lepidopterans							
Eastern tailed blue *Everes comyntas*	G5	1 occ	100.0 %	2,731.03	14.3 %	7 occ	14 %

Methow

Site No 126

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	4 %	GAP 1	0 %	US National	18 %	Can National:	0 %
Area:	26,500	ha	Developed	0 %	GAP 2	1 %	US State:	41 %	BC Provincial:	0 %
	65,455	ac	Water	0 %	GAP 3	58 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	41 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	41 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Inter-Mountain Basins Big Sagebrush Steppe		13,413 ha	2.1%	25.67	7.1 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		235 ha	1.1%	12.95	3.6 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		19,278 ha	1.3%	16.08	4.5 %	432,412 ha	116 %
Inter-Mountain Basins Cliff and Canyon		20 ha	0.4%	4.39	1.2 %	1,644 ha	100 %
Northern Interior Spruce-Fir woodland and forest		3 ha	0.0%	0.00	0.0 %	414,168 ha	105 %
Northern Rocky Mountain Montane Mixed Conifer Forest		3,617 ha	0.4%	5.13	1.4 %	254,555 ha	103 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		6,907 ha	0.7%	8.53	2.4 %	291,947 ha	138 %
Northern Rocky Mountain Subalpine Dry Parkland		1 ha	0.0%	0.00	0.0 %	35,979 ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		4 ha	0.0%	0.09	0.0 %	16,408 ha	117 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		527 ha	0.1%	0.98	0.3 %	193,578 ha	114 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		4,145 ha	0.1%	0.90	0.2 %	1,658,616 ha	109 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		24 ha	0.0%	0.35	0.1 %	24,703 ha	133 %
Species							

Amphibians									
Tiger salamander *Ambystoma tigrinum*	G5	1	occ	0.3%	4.81	1.3 %	25	occ	316 %
Birds									
Northern goshawk *Accipiter gentilis*	G5	4	nst	4.7%	37.97	10.5 %	38	nst	103 %
Golden eagle *Aquila chrysaetos*	G5	2	nst	1.2%	18.98	5.3 %	38	nst	174 %
Bald eagle *Haliaeetus leucocephalus*	G4	1	nst	1.0%	9.49	2.6 %	38	nst	100 %
Lewis' woodpecker *Melanerpes lewis*	G4	1	nst	0.7%	9.49	2.6 %	38	nst	239 %
Mammals									
Grizzly bear *Ursus arctos*	G4	715	ha	0.0%	0.25	0.1 %	1,050,522	ha	83 %
Pallid bat *Antrozous pallidus*	G5	6	nst	25.0%	56.95	15.8 %	38	nst	63 %
Long-legged myotis *Myotis volans*	G5	1	occ	19.4%	32.37	9.0 %	13	occ	46 %
Fisher *Martes pennanti*	G5	2	ha	0.0%	0.00	0.0 %	668,362	ha	71 %
Western gray squirrel *Sciurus griseus*	G5	7	occ	12.4%	198.76	55.1 %	13	occ	115 %
Vascular Plants									
Pulsifer's Monkey-flower *Mimulus pulsiferae*	G4?	2	occ	40.0%	103.06	28.6 %	7	occ	71 %

Midnight Mountain

Site No 99

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	4 %	GAP 1	0 %	US National	5 %	Can National:	0 %
Area:	3,500	ha	Developed	3 %	GAP 2	0 %	US State:	9 %	BC Provincial:	0 %
	8,645	ac	Water	9 %	GAP 3	13 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	87 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	87 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,785 ha	0.1%	11.28	0.4 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		789 ha	0.0%	1.30	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,267 ha	0.1%	11.85	0.4 %	291,947 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		787 ha	0.1%	8.44	0.3 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		667 ha	0.1%	9.66	0.4 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		94 ha	0.4%	39.22	1.4 %	6,545 ha	138 %
Species							
Birds							
Bald eagle *Haliaeetus leucocephalus*	G4	1 nst	1.0%	71.87	2.6 %	38 nst	100 %
Common Loon *Gavia immer*	G5	1 occ	4.3%	210.08	7.7 %	13 occ	100 %
Great blue heron *Ardia herodius*	G5	2 occ	6.2%	455.17	16.7 %	13 occ	100 %
Mollusks							
California floater *Anodonta californiensis*	G3	1 occ	11.1%	210.08	7.7 %	13 occ	62 %

Vascular Plants							
Many-headed Sedge *Carex sychnocephala*	G4	1 occ	8.3 %	390.15	14.3 %	7 occ	100 %

Mid-Shuswap

Site No 44

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	11 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	2,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	45 %
	4,940	ac	Water	0 %	GAP 3	45 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	55 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	55 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,588 ha	0.0 %	4.57	0.1 %	1,658,616 ha	109 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		38 ha	0.0 %	2.48	0.1 %	73,274 ha	41 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		118 ha	0.1 %	22.83	0.5 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		1,586 ha	0.3 %	50.06	1.0 %	151,409 ha	105 %
Species							
Birds							
Bobolink *Dolichonyx oryzivorus*	G5	1 occ	4.3 %	367.63	7.7 %	13 occ	108 %
Mammals							
Grizzly bear *Ursus arctos*	G4	821 ha	0.0 %	3.73	0.1 %	1,050,522 ha	83 %

Midway

Site No 88

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	1,235	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	100 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		180 ha	0.0%	7.96	0.0 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		180 ha	0.0%	11.79	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1 ha	0.0%	0.00	0.0 %	24,703 ha	133 %
Inter-Mountain Basins Big Sagebrush Steppe		284 ha	0.0%	28.81	0.2 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		7 ha	0.0%	20.45	0.1 %	6,545 ha	138 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	1.0%	1,470.55	7.7 %	13 occ	485 %
Tiger salamander *Ambystoma tigrinum*	G5	1 occ	0.8%	764.69	4.0 %	25 occ	316 %
Birds							
Lewis' woodpecker *Melanerpes lewis*	G4	1 nst	0.7%	503.08	2.6 %	38 nst	239 %
Mammals							
Fisher *Martes pennanti*	G5	3 ha	0.0%	0.10	0.0 %	668,362 ha	71 %

Reptiles							
Gopher snake *Pituophis catenifer deserticola*	G5	1 occ	1.2%	1,470.55	7.7 %	13 occ	531 %
Vascular Plants							
Okanogan Stickseed *Hackelia ciliata*	G3?	1 occ	41.4%	632.97	3.3 %	25 occ	8 %

Mill Creek

Site No 104

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	12 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000	ha	Developed	41 %	GAP 2	0 %	US State:	14 %	BC Provincial:	0 %
	2,470	ac	Water	0 %	GAP 3	14 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	86 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	86 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		288 ha	0.0%	6.37	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		135 ha	0.0%	0.78	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		284 ha	0.0%	9.30	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		135 ha	0.0%	5.07	0.1 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		4 ha	0.0%	0.20	0.0 %	188,483 ha	134 %
Species							
Birds							
Vaux's swift *Chaetura vauxi*	G5	1 occ	100.0%	735.28	7.7 %	13 occ	8 %

Mission Creek

Site No 59

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	92 %
	1,235	ac	Water	0 %	GAP 3	92 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	8 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	8 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		452 ha	0.0%	5.21	0.0 %	1,658,616 ha	109 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		48 ha	0.1%	37.15	0.2 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		451 ha	0.1%	56.94	0.3 %	151,409 ha	105 %
Species							
Dragonfly							
Western river cruiser *Macromia magnifica*	G4	1 occ	14.3%	1,470.55	7.7 %	13 occ	54 %

Monte Hills

Site No 37

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	3 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	28,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	96 %
	70,395	ac	Water	1 %	GAP 3	96 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	4 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	4 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		4,271 ha	0.3%	3.31	1.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		22,760 ha	0.4%	4.60	1.4 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		1,221 ha	0.1%	1.40	0.4 %	292,133 ha	108 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		386 ha	0.1%	0.67	0.2 %	193,578 ha	114 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		4,273 ha	0.4%	4.91	1.5 %	291,947 ha	138 %
Northern Interior Plateau Grassland		70 ha	0.0%	0.36	0.1 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		317 ha	0.4%	4.30	1.3 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		11,385 ha	0.8%	9.22	2.7 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		9,769 ha	0.8%	9.28	2.8 %	352,885 ha	104 %
Species							
Birds							
Flammulated owl *Otus flammeolus*	G4	1 nst	0.8%	8.83	2.6 %	38 nst	205 %
Mammals							

Fisher *Martes pennanti*	G5	13,363	ha	0.8%	6.71	2.0 %	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.7%	6.75	2.0 %	58	occ	128 %
Vascular Plants									
Bristly Mousetail *Myosurus apetalus var. borealis*	G5TNR	1	occ	20.0%	47.91	14.3 %	7	occ	71 %

Myers

Site No 91

Okanagan Highlands Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	11 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000 ha 2,470 ac	Developed	2 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
		Water	1 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	100 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	100 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		46 ha	0.0%	1.01	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		453 ha	0.0%	2.61	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		43 ha	0.0%	1.41	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		5 ha	0.0%	1.93	0.0 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		452 ha	0.1%	16.97	0.2 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		209 ha	0.0%	10.60	0.1 %	188,483 ha	134 %
Species							
Dragonfly							
Boreal whiteface *Leucorrhinia borealis*	G5	1 occ	100.0%	1,365.52	14.3 %	7 occ	14 %
Lepidopterans							
Silver-bordered fritillary *Boloria selene*	G5	1 occ	33.3%	735.28	7.7 %	13 occ	23 %
Mammals							
Fisher *Martes pennanti*	G5	303 ha	0.0%	4.34	0.0 %	668,362 ha	71 %

Naramata

Site No 67

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	37 %	US National	0 %	Can National:	0 %
Area:	11,500	ha	Developed	1 %	GAP 2	7 %	US State:	0 %	BC Provincial:	80 %
	28,405	ac	Water	17 %	GAP 3	38 %	US Local:	0 %	BC Regional:	1 %
					GAP 4	18 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	18 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,687 ha	0.0%	0.85	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		6,777 ha	0.7%	19.29	2.3 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		23 ha	0.0%	0.77	0.1 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		1,684 ha	0.1%	3.97	0.5 %	352,885 ha	104 %
Columbia Basin Foothill Riparian Woodland and Shrubland		39 ha	0.2%	4.95	0.6 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		6,779 ha	0.5%	13.03	1.6 %	432,412 ha	116 %
Species							
Birds							
Flammulated owl *Otus flammeolus*	G4	2 nst	1.7%	43.75	5.3 %	38 nst	205 %
Western screech owl *Otus kennicotii macfarlanei*	G5T4	2 nst	2.3%	43.75	5.3 %	38 nst	134 %
Canyon wren *Catherpes mexicanus*	G5	4 occ	6.7%	255.75	30.8 %	13 occ	369 %
Dragonfly							
Lance-tailed darner *Aechna constricta*	G5	1 occ	9.1%	63.94	7.7 %	13 occ	85 %

Pronghorn clubtail *Gomphus graslinellus*	G5	1	occ	12.5%	33.25	4.0 %	25	occ	32 %
Western river cruiser *Macromia magnifica*	G4	2	occ	28.6%	127.87	15.4 %	13	occ	54 %
Mammals									
Fisher *Martes pennanti*	G5	1,835	ha	0.1%	2.28	0.3 %	668,362	ha	71 %
Spotted bat *Euderma maculatum*	G4	1	occ	3.8%	63.94	7.7 %	13	occ	154 %
Western red bat *Lasiurus blossevillii*	G5	1	occ	25.0%	31.97	3.8 %	13	occ	15 %
Western small-footed myotis *Myotis ciliolabrum*	G5	1	occ	0.2%	0.63	0.1 %	13	occ	46 %
Mountain goat *Oreamos americanus*	G5	153	ha	0.1%	4.17	0.5 %	30,505	ha	179 %
Badger *Taxidea taxus jeffersoni*	G5	2	occ	1.2%	28.66	3.4 %	58	occ	128 %
Nuttall's cottontail *Sylvilagus nutalli*	G5	1	occ	2.8%	63.94	7.7 %	13	occ	254 %
Non-Vascular Plants									
Lichen Massalongia microphylliza *Massalongia microphylliza*	G1?	1	occ	25.0%	63.94	7.7 %	13	occ	31 %
Reptiles									
Western rattlesnake *Crotalus viridis*	G5	9	nst	7.3%	196.86	23.7 %	38	nst	218 %
Western skink *Eumeces skiltonianus*	G5	1	occ	3.8%	63.94	7.7 %	13	occ	162 %
Gopher snake *Pituophis catenifer deserticola*	G5	2	occ	2.4%	127.87	15.4 %	13	occ	531 %

Niskonlith

Site No 19

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	43,000	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	75 %
	106,210	ac	Water	2 %	GAP 3	75 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	25 %	US Indigenous:	0 %	Can Indigenous:	11 %
							US Private	0 %	Can Private:	14 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Spruce-Fir woodland and forest		8,278 ha	0.6%	4.44	2.0 %	414,168 ha	105 %
Columbia Basin Foothill Riparian Woodland and Shrubland		119 ha	0.5%	4.04	1.8 %	6,545 ha	138 %
Inter-Mountain Basins Big Sagebrush Steppe		644 ha	0.1%	0.76	0.3 %	188,483 ha	134 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		9,305 ha	0.8%	5.86	2.6 %	352,885 ha	104 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		9,749 ha	0.7%	5.01	2.3 %	432,412 ha	116 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		190 ha	0.2%	1.71	0.8 %	24,703 ha	133 %
Northern Interior Plateau Grassland		6,102 ha	2.8%	20.73	9.3 %	65,446 ha	200 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		9,100 ha	0.9%	6.93	3.1 %	291,947 ha	138 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		954 ha	0.4%	2.89	1.3 %	73,274 ha	41 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		98 ha	0.0%	0.07	0.0 %	292,133 ha	108 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		24,649 ha	0.4%	3.30	1.5 %	1,658,616 ha	109 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		6,963 ha	1.4%	10.22	4.6 %	151,409 ha	105 %
Species							

Birds									
Flammulated owl *Otus flammeolus*	G4	5	nst	4.2%	29.25	13.2 %	38	nst	205 %
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	3	nst	2.4%	10.42	4.7 %	64	nst	111 %
Mammals									
Fisher *Martes pennanti*	G5	12,270	ha	0.7%	4.08	1.8 %	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	5	occ	3.0%	19.16	8.6 %	58	occ	128 %
Bighorn sheep *Ovis canadensis*	G4	734	ha	0.3%	2.95	1.3 %	55,318	ha	253 %

Northstar

Site No 124

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	15,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	38,285	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		12,185 ha	0.8 %	17.38	2.8 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,166 ha	0.0 %	0.43	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		9,687 ha	1.0 %	20.46	3.3 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		383 ha	0.5 %	9.56	1.6 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		1,166 ha	0.1 %	2.82	0.5 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		2,953 ha	0.5 %	9.66	1.6 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		123 ha	0.6 %	11.59	1.9 %	6,545 ha	138 %
Species							
Birds							
Golden eagle *Aquila chrysaetos*	G5	1 nst	0.6 %	16.23	2.6 %	38 nst	174 %
Mammals							
Gray wolf *Canis lupus*	G4	1 den	1.4 %	16.23	2.6 %	38 den	84 %
Vascular Plants							

Many-headed Sedge *Carex sychnocephala*	G4	1 occ	8.3%	88.10	14.3%	7 occ	100 %

Okanagan National Forest

Site No 96

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	12 %	US National	90 %	Can National:	0 %
Area:	3,000	ha	Developed	0 %	GAP 2	10 %	US State:	10 %	BC Provincial:	0 %
	7,410	ac	Water	0 %	GAP 3	78 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		2,941 ha	0.1%	5.65	0.2 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		2,380 ha	0.4%	39.17	1.2 %	193,578 ha	114 %
Northern Rocky Mountain Subalpine Dry Parkland		27 ha	0.0%	2.39	0.1 %	35,979 ha	139 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		2 ha	0.0%	0.26	0.0 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		90 ha	0.0%	1.13	0.0 %	254,555 ha	103 %
Northern Interior Spruce-Fir woodland and forest		410 ha	0.0%	3.15	0.1 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		60 ha	0.0%	0.54	0.0 %	352,885 ha	104 %
Species							
Birds							
Black-backed woodpecker *Picoides arcticus*	G5	1 occ	8.3%	245.09	7.7 %	13 occ	92 %
Lepidopterans							
Sonora skipper *Polites sonora*	G4	1 occ	50.0%	245.09	7.7 %	13 occ	15 %
Freija fritillary *Boloria freija*	G5	3 occ	75.0%	735.28	23.1 %	13 occ	31 %

Mammals							
Grizzly bear *Ursus arctos*	G4	1,516 ha	0.1 %	4.60	0.1 %	1,050,522 ha	83 %
Lynx *Lynx canadensis*	G5	3,000 ha	0.4 %	34.76	1.1 %	275,020 ha	102 %
Vascular Plants							
Valley Sedge vallicola *Carex vallicola*	G5	2 occ	14.3 %	910.34	28.6 %	7 occ	57 %
Poor Sedge *Carex magellanica ssp. irrigua*	G5T5	2 occ	11.1 %	1,014.70	31.8 %	7 occ	143 %
Tweedy's Willow *Salix tweedyi*	G3G4	1 occ	2.9 %	455.17	14.3 %	7 occ	157 %

Omak

Site No 116

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	48 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	17 %	GAP 2	1 %	US State:	1 %	BC Provincial:	0 %
	1,235	ac	Water	3 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	99 %	US Indigenous:	8 %	Can Indigenous:	0 %
							US Private	91 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		71 ha	0.0 %	3.12	0.0 %	432,412 ha	116 %
Inter-Mountain Basins Big Sagebrush Steppe		70 ha	0.0 %	7.10	0.0 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		15 ha	0.1 %	43.81	0.2 %	6,545 ha	138 %
Species							
Mollusks							
Western pearlshell *Margaritifera falcata*	G4	1 occ	33.3 %	1,470.55	7.7 %	13 occ	23 %

Omak Lake

Site No 117

Okanagan Highlands Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	3 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	10,000 ha	Developed	0 %	GAP 2	67 %	US State:	0 %	BC Provincial:	0 %
	24,700 ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	33 %	US Indigenous:	100 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		7,203 ha	0.5%	15.92	1.7 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,279 ha	0.0%	0.74	0.1 %	1,658,616 ha	109 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		28 ha	0.1%	1.63	0.2 %	16,408 ha	117 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		2,736 ha	0.3%	8.96	0.9 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		16 ha	0.0%	0.62	0.1 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		1,278 ha	0.2%	4.80	0.5 %	254,555 ha	103 %
Inter-Mountain Basins Cliff and Canyon		5 ha	0.1%	2.91	0.3 %	1,644 ha	100 %
Inter-Mountain Basins Big Sagebrush Steppe		5,430 ha	0.9%	27.54	2.9 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		70 ha	0.3%	10.22	1.1 %	6,545 ha	138 %
Species							
Birds							
Long-billed curlew *Numenius americanus*	G5	1 nst	20.0%	25.15	2.6 %	38 nst	13 %
Golden eagle *Aquila chrysaetos*	G5	1 nst	0.6%	25.15	2.6 %	38 nst	174 %

Mammals

Pallid bat *Antrozous pallidus*	G5	1 nst	4.2 %	25.15	2.6 %	38 nst	63 %

Owhi

Site No 121

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	9 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	10,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	24,700	ac	Water	3 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		7,261 ha	0.5%	16.05	1.7 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		782 ha	0.0%	0.45	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		3,186 ha	0.3%	10.43	1.1 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		110 ha	0.1%	4.26	0.4 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		781 ha	0.1%	2.93	0.3 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		4,268 ha	0.7%	21.64	2.3 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		59 ha	0.3%	8.62	0.9 %	6,545 ha	138 %
Species							
Birds							
Western grebe *Aechmophorus occidentalis*	G5	1 occ	100.0%	73.53	7.7 %	13 occ	8 %
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	5 nst	4.0%	74.68	7.8 %	64 nst	111 %
Common Loon *Gavia immer*	G5	1 occ	2.2%	36.76	3.8 %	13 occ	100 %

Pasayten-Upper Chelan

Site No 93

Northern Cascade Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	61 %	US National	98 %	Can National:	0 %
Area:	189,000 ha	Developed	0 %	GAP 2	23 %	US State:	0 %	BC Provincial:	1 %
	466,830 ac	Water	0 %	GAP 3	15 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	1 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Rocky Mountain Montane Mixed Conifer Forest		22,044 ha	2.6%	4.38	8.7 %	254,555 ha	103 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		265 ha	0.0%	0.03	0.1 %	432,412 ha	116 %
East Cascades Mesic Montane Mixed Conifer Forest		91 ha	0.2%	0.33	0.7 %	13,948 ha	100 %
Inter-Mountain Basins Big Sagebrush Steppe		1,233 ha	0.2%	0.33	0.7 %	188,483 ha	134 %
North American Alpine Ice Field		2,710 ha	4.4%	7.45	14.7 %	18,394 ha	111 %
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest		7,460 ha	3.3%	5.63	11.1 %	67,002 ha	80 %
North Pacific Maritime Mesic Parkland		692 ha	2.6%	4.40	8.7 %	7,952 ha	151 %
North Pacific Montane Riparian Woodland and Shrubland		322 ha	5.2%	8.77	17.3 %	1,856 ha	100 %
Northern Interior Spruce-Fir woodland and forest		14,727 ha	1.1%	1.80	3.6 %	414,168 ha	105 %
Columbia Basin Foothill Riparian Woodland and Shrubland		95 ha	0.4%	0.73	1.5 %	6,545 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,889 ha	2.3%	3.87	7.6 %	24,703 ha	133 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		220 ha	0.0%	0.04	0.1 %	291,947 ha	138 %

Northern Rocky Mountain Subalpine Dry Parkland		11,360	ha	9.5%	15.97	31.6 %	35,979	ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		1,475	ha	2.7%	4.55	9.0 %	16,408	ha	117 %
Rocky Mountain Alpine Composite		34,975	ha	8.8%	14.81	29.3 %	119,447	ha	122 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		54,225	ha	8.4%	14.17	28.0 %	193,578	ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		25,358	ha	2.6%	4.39	8.7 %	292,133	ha	108 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		882	ha	9.5%	16.09	31.8 %	2,773	ha	136 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		116,819	ha	2.1%	3.56	7.0 %	1,658,616	ha	109 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		487	ha	0.0%	0.07	0.1 %	352,885	ha	104 %
Species									
Amphibians									
Western toad *Bufo boreas*	G4	5	occ	12.8%	19.45	38.5 %	13	occ	123 %
Birds									
Northern spotted owl *Strix occidentalis caurina*	G3	9	nst	1.8%	6.79	13.4 %	67	nst	193 %
Northern goshawk *Accipiter gentilis*	G5	2	nst	2.3%	2.66	5.3 %	38	nst	103 %
Common Loon *Gavia immer*	G5	1	occ	4.3%	3.89	7.7 %	13	occ	100 %
Golden eagle *Aquila chrysaetos*	G5	6	nst	3.6%	7.99	15.8 %	38	nst	174 %
Lepidopterans									
Astarte fritillary *Boloria astarte*	G5	2	occ	40.0%	7.78	15.4 %	13	occ	38 %
Melissa arctic *Oeneis melissa*	G5	2	occ	40.0%	7.78	15.4 %	13	occ	38 %
Mammals									
Lynx *Lynx canadensis*	G5	179,494	ha	26.1%	33.01	65.3 %	275,020	ha	102 %
Gray wolf *Canis lupus*	G4	17	den	23.0%	22.63	44.7 %	38	den	84 %
Fisher *Martes pennanti*	G5	7,233	ha	0.4%	0.55	1.1 %	668,362	ha	71 %
Grizzly bear *Ursus arctos*	G4	165,130	ha	6.3%	7.95	15.7 %	1,050,522	ha	83 %
Mountain goat-WA *Oreamos americanus*	G5	36,614	ha	77.4%	39.16	77.4 %	47,283	ha	100 %

Long-legged myotis *Myotis volans*	G5	1 occ	20.6%	4.82	9.5 %	13 occ	46 %
Wolverine *Gulo gulo*	G4	1 occ	11.7%	3.19	6.3 %	13 occ	54 %
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	3 nst	6.5%	3.99	7.9 %	38 nst	100 %
Western gray squirrel *Sciurus griseus*	G5	1 occ	1.7%	3.89	7.7 %	13 occ	115 %

Non-Vascular Plants

Lichen Umbilicaria nylanderiana *Umbilicaria nylanderiana*	G4	1 occ	100.0%	3.89	7.7 %	13 occ	8 %
Lichen Peltigera lepidophora *Peltigera lepidophora*	G4	2 occ	66.7%	7.78	15.4 %	13 occ	23 %

Reptiles

Western rattlesnake *Crotalus viridis*	G5	1 nst	0.8%	1.33	2.6 %	38 nst	218 %

Vascular Plants

Kotzebue's Grass-of-Parnassus *Parnassia kotzebuei*	G4	1 occ	50.0%	7.22	14.3 %	7 occ	14 %
Lance-leaved Draba *Draba cana*	G5	4 occ	80.0%	28.90	57.1 %	7 occ	71 %
Salish fleabane *Erigeron salishii*	G2	1 occ	100.0%	2.02	4.0 %	25 occ	4 %
Poor Sedge *Carex magellanica ssp. irrigua*	G5T5	4 occ	20.0%	28.90	57.1 %	7 occ	143 %
Canadian Single-spike Sedge *Carex scirpoidea var. scirpoidea*	G5T4T5	3 occ	50.0%	21.67	42.9 %	7 occ	57 %
Steller's Rockbrake *Cryptogramma stelleri*	G5	3 occ	100.0%	21.67	42.9 %	7 occ	43 %
Curved Woodrush *Luzula arcuata*	G5	1 occ	100.0%	7.22	14.3 %	7 occ	14 %
Skunk Polemonium *Polemonium viscosum*	G5	3 occ	37.5%	21.67	42.9 %	7 occ	43 %
Snow Cinquefoil *Potentilla nivea*	G5	3 occ	17.6%	11.67	23.1 %	13 occ	69 %
Nodding Saxifrage *Saxifraga cernua*	G4	1 occ	33.3%	7.22	14.3 %	7 occ	29 %
Pygmy Saxifrage *Saxifraga rivularis*	G5?	1 occ	5.6%	3.89	7.7 %	13 occ	38 %
Golden Draba *Draba aurea*	G5	5 occ	55.6%	19.45	38.5 %	13 occ	69 %

Pavilion

Site No 23

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	29 %
	2,470	ac	Water	0 %	GAP 3	29 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	71 %	US Indigenous:	0 %	Can Indigenous:	49 %
							US Private	0 %	Can Private:	23 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		981 ha	0.1%	21.68	0.2 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		585 ha	0.1%	19.15	0.2 %	291,947 ha	138 %
Inter-Mountain Basins Big Sagebrush Steppe		395 ha	0.1%	20.03	0.2 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		19 ha	0.1%	27.75	0.3 %	6,545 ha	138 %
Species							
Mammals							
Bighorn sheep *Ovis canadensis*	G4	598 ha	0.2%	103.33	1.1 %	55,318 ha	253 %
Vascular Plants							
Slender Hawksbeard *Crepis atribarba ssp. atribarba*	G5T5	1 occ	50.0%	1,365.51	14.3 %	7 occ	29 %

Peachland

Site No 65

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	52 %	GAP 2	0 %	US State:	0 %	BC Provincial:	38 %
	1,235	ac	Water	8 %	GAP 3	38 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	62 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	62 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		175 ha	0.0 %	7.75	0.0 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		176 ha	0.0 %	11.52	0.1 %	291,947 ha	138 %
Species							
Birds							
Lewis' woodpecker *Melanerpes lewis*	G4	1 nst	0.7 %	503.08	2.6 %	38 nst	239 %
Non-Vascular Plants							
Lichen Sclerophora amabilis *Sclerophora amabilis*	GNR	1 occ	100.0 %	1,470.55	7.7 %	13 occ	8 %

Pennask

Site No 57

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	2,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	75 %
	6,175	ac	Water	5 %	GAP 3	75 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	25 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	25 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,927 ha	0.0%	4.44	0.1 %	1,658,616 ha	109 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		467 ha	0.6%	72.28	1.9 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		1,899 ha	0.1%	17.53	0.5 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		29 ha	0.0%	0.31	0.0 %	352,885 ha	104 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	2,500 ha	0.1%	14.30	0.4 %	668,362 ha	71 %

Penticton Creek

Site No 70

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	14 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	2,500	ha	Developed	2 %	GAP 2	0 %	US State:	0 %	BC Provincial:	73 %
	6,175	ac	Water	1 %	GAP 3	73 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	27 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	27 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,359 ha	0.1 %	12.02	0.3 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		647 ha	0.0 %	1.49	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,361 ha	0.1 %	17.82	0.5 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		28 ha	0.0 %	4.33	0.1 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		311 ha	0.0 %	2.87	0.1 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		251 ha	0.0 %	2.72	0.1 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		85 ha	0.0 %	2.15	0.1 %	151,409 ha	105 %
Columbia Basin Foothill Riparian Woodland and Shrubland		5 ha	0.0 %	2.92	0.1 %	6,545 ha	138 %
Species							
Birds							
Flammulated owl *Otus flammeolus*	G4	1 nst	0.8 %	100.62	2.6 %	38 nst	205 %
Dragonfly							
Pronghorn clubtail *Gomphus graslinellus*	G5	1 occ	12.5 %	152.94	4.0 %	25 occ	32 %

Mammals									
Fisher *Martes pennanti*	G5	608	ha	0.0 %	3.48	0.1 %	668,362	ha	71 %
Bighorn sheep *Ovis canadensis*	G4	2,260	ha	0.8 %	156.20	4.1 %	55,318	ha	253 %
Mountain goat *Oreamos americanus*	G5	737	ha	0.5 %	92.37	2.4 %	30,505	ha	179 %
Vascular Plants									
Flat-topped Broomrape *Orobanche corymbosa ssp. mutabilis*	G4T3?	1	occ	19.1 %	416.54	10.9 %	7	occ	57 %

Penticton Grasslands

Site No 69

Central Okanagan Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	6 %	GAP 1	2 %	US National	0 %	Can National:	0 %
Area:	34,500 ha	Developed	2 %	GAP 2	0 %	US State:	0 %	BC Provincial:	55 %
	85,215 ac	Water	3 %	GAP 3	53 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	45 %	US Indigenous:	0 %	Can Indigenous:	27 %
						US Private	0 %	Can Private:	18 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		5,442 ha	0.1%	0.91	0.3 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		16,594 ha	1.7%	15.75	5.7 %	291,947 ha	138 %
Northern Interior Plateau Grassland		5,319 ha	2.4%	22.52	8.1 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		219 ha	0.3%	2.46	0.9 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		131 ha	0.0%	0.09	0.0 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		5,313 ha	0.5%	4.17	1.5 %	352,885 ha	104 %
Inter-Mountain Basins Big Sagebrush Steppe		2,698 ha	0.4%	3.97	1.4 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		241 ha	1.1%	10.20	3.7 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		19,277 ha	1.3%	12.35	4.5 %	432,412 ha	116 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	0.3%	7.10	2.6 %	13 occ	485 %
Tiger salamander *Ambystoma tigrinum*	G5	4 occ	3.4%	49.87	18.0 %	25 occ	316 %

Birds									
Grasshopper sparrow *Ammodramus savannarum*	G5	1	nst	3.1%	7.29	2.6 %	38	nst	76 %
Sandhill crane *Grus canadensis*	G5	1	occ	6.7%	39.58	14.3 %	7	occ	157 %
Western screech owl *Otus kennicotii macfarlanei*	G5T4	8	nst	9.3%	58.33	21.1 %	38	nst	134 %
Flammulated owl *Otus flammeolus*	G4	15	nst	12.7%	109.36	39.5 %	38	nst	205 %
Lewis' woodpecker *Melanerpes lewis*	G4	1	nst	0.7%	7.29	2.6 %	38	nst	239 %
Canyon wren *Catherpes mexicanus*	G5	1	occ	1.7%	21.31	7.7 %	13	occ	369 %
Western yellow-breasted chat *Icteria virens auricollis*	G5	1	occ	4.0%	13.65	4.9 %	13	occ	100 %
Dragonfly									
Western river cruiser *Macromia magnifica*	G4	2	occ	23.8%	35.52	12.8 %	13	occ	54 %
Lance-tailed darner *Aechna constricta*	G5	1	occ	9.1%	21.31	7.7 %	13	occ	85 %
Pronghorn clubtail *Gomphus graslinellus*	G5	2	occ	25.0%	22.16	8.0 %	25	occ	32 %
Twelve-spotted skimmer *Libellula pulchella*	G5	1	occ	5.3%	21.31	7.7 %	13	occ	108 %
Mammals									
Fisher *Martes pennanti*	G5	5,082	ha	0.3%	2.11	0.8 %	668,362	ha	71 %
Fringed myotis *Myotis thysanodes*	G4G5	1	occ	6.7%	21.31	7.7 %	13	occ	100 %
Mountain goat *Oreamos americanus*	G5	389	ha	0.3%	3.53	1.3 %	30,505	ha	179 %
Bighorn sheep *Ovis canadensis*	G4	265	ha	0.1%	1.33	0.5 %	55,318	ha	253 %
Great Basin pocket mouse *Perognathus parvus*	G5	1	occ	3.6%	28.42	10.3 %	13	occ	269 %
Badger *Taxidea taxus jeffersoni*	G5	4	occ	2.1%	16.72	6.0 %	58	occ	128 %
Nuttall's cottontail *Sylvilagus nutalli*	G5	1	occ	3.7%	28.42	10.3 %	13	occ	254 %
Reptiles									
Racer *Coluber constricta*	G5	1	occ	0.8%	21.31	7.7 %	13	occ	708 %
Western rattlesnake *Crotalus viridis*	G5	1	nst	0.8%	7.29	2.6 %	38	nst	218 %

Gopher snake *Pituophis catenifer deserticola*	G5	1	occ	1.2 %	21.31	7.7 %	13 occ	531 %
<u>Vascular Plants</u>								
The Dalles Milk-vetch *Astragalus sclerocarpus*	G5	1	occ	20.0 %	39.58	14.3 %	7 occ	71 %
Obscure Cryptantha *Cryptantha ambigua*	G4	1	occ	20.0 %	39.58	14.3 %	7 occ	71 %
Flat-topped Broomrape *Orobanche corymbosa ssp. mutabilis*	G4T3?	1	occ	25.0 %	39.58	14.3 %	7 occ	57 %
Columbian Goldenweed *Pyrrocoma carthamoides var. carthamoides*	G4G5T4	2	occ	18.2 %	71.90	26.0 %	7 occ	129 %
Dotted Smartweed *Polygonum punctatum*	G5	1	occ	46.9 %	18.56	6.7 %	7 occ	0 %

Phoenix

Site No 89

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	24 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	70 %
	1,235	ac	Water	0 %	GAP 3	94 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	6 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	6 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		48 ha	0.0%	0.55	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		36 ha	0.0%	2.36	0.0 %	292,133 ha	108 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		13 ha	0.0%	1.28	0.0 %	193,578 ha	114 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		448 ha	0.2%	116.88	0.6 %	73,274 ha	41 %
Species							
Mammals							
Lynx *Lynx canadensis*	G5	143 ha	0.0%	9.94	0.1 %	275,020 ha	102 %
Wolverine *Gulo gulo*	G4	1 occ	4.8%	490.18	2.6 %	13 occ	54 %

Pinnacles

Site No 46

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	19,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	48,165	ac	Water	1 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		16,544 ha	0.3%	4.89	1.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		64 ha	0.7%	11.31	2.3 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		12,937 ha	1.3%	21.71	4.4 %	292,133 ha	108 %
Rocky Mountain Alpine Composite		641 ha	0.2%	2.63	0.5 %	119,447 ha	122 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		1,518 ha	0.6%	10.15	2.1 %	73,274 ha	41 %
Northern Rocky Mountain Subalpine Dry Parkland		471 ha	0.4%	6.42	1.3 %	35,979 ha	139 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		176 ha	0.2%	3.49	0.7 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		3,618 ha	0.7%	11.71	2.4 %	151,409 ha	105 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	19,500 ha	0.7%	9.10	1.9 %	1,050,522 ha	83 %
Mountain goat *Oreamos americanus*	G5	859 ha	0.6%	13.80	2.8 %	30,505 ha	179 %

Pugh-Enterprise

Site No 133

Okanagan Highlands Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	14 %	GAP 1	0 %	US National	14 %	Can National:	0 %
Area:	1,000 ha 2,470 ac	Developed	0 %	GAP 2	0 %	US State:	29 %	BC Provincial:	0 %
		Water	11 %	GAP 3	43 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	57 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	57 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		732 ha	0.1%	16.19	0.2 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		3 ha	0.0%	0.02	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		732 ha	0.1%	23.97	0.3 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1 ha	0.0%	0.39	0.0 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		3 ha	0.0%	0.11	0.0 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		8 ha	0.0%	0.41	0.0 %	188,483 ha	134 %
Species							
Birds							
Great blue heron *Ardia herodius*	G5	1 occ	2.4%	612.73	6.4 %	13 occ	100 %

Raft

Site No 1

Thompson Okanagan Plateau Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	5,000 ha 12,350 ac	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	94 %
		Water	0 %	GAP 3	94 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	6 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	6 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		55 ha	0.0 %	0.24	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		4,511 ha	0.1 %	5.20	0.3 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		203 ha	0.0 %	1.33	0.1 %	292,133 ha	108 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		56 ha	0.0 %	0.37	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		144 ha	0.2 %	11.14	0.6 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		626 ha	0.0 %	2.89	0.2 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		56 ha	0.0 %	0.30	0.0 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		3,631 ha	0.7 %	45.84	2.4 %	151,409 ha	105 %

Rawlings

Site No 45

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	24 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	61 %
	1,235	ac	Water	7 %	GAP 3	61 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	39 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	39 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		285 ha	0.0 %	3.29	0.0 %	1,658,616 ha	109 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		284 ha	0.1 %	35.86	0.2 %	151,409 ha	105 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	0.5 %	735.28	3.8 %	13 occ	485 %
Birds							
Sandhill crane *Grus canadensis*	G5	1 occ	6.7 %	2,731.03	14.3 %	7 occ	157 %
American avocet *Recurvirostra americana*	G5	1 occ	33.3 %	1,470.55	7.7 %	13 occ	23 %

Reienecker

Site No 13

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	2 %	US National	0 %	Can National:	0 %
Area:	14,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	93 %
	34,580	ac	Water	9 %	GAP 3	92 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	7 %	US Indigenous:	0 %	Can Indigenous:	1 %
							US Private	0 %	Can Private:	6 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		11,762 ha	0.2 %	4.84	0.7 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		1,417 ha	0.1 %	3.31	0.5 %	292,133 ha	108 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		599 ha	0.2 %	5.58	0.8 %	73,274 ha	41 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		81 ha	0.1 %	2.24	0.3 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		10,350 ha	2.1 %	46.67	6.8 %	151,409 ha	105 %
Species							
Mammals							
Spotted bat *Euderma maculatum*	G4	1 occ	3.8 %	52.52	7.7 %	13 occ	154 %
Vascular Plants							
Yellow Widelip Orchid *Liparis loeselii*	G5	1 occ	50.0 %	52.52	7.7 %	13 occ	15 %
Giant Helleborine *Epipactis gigantea*	G3	1 occ	12.5 %	97.54	14.3 %	7 occ	100 %
Mexican Mosquito Fern *Azolla mexicana*	G5	1 occ	37.7 %	73.48	10.8 %	7 occ	29 %

Rendevous

Site No 111

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	0 %	US National	69 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	5 %	US State:	0 %	BC Provincial:	0 %
	1,235	ac	Water	0 %	GAP 3	69 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	27 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	27 %	Can Private:	0 %
							US NGO	5 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		211 ha	0.0%	9.32	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		170 ha	0.0%	1.96	0.0 %	1,658,616 ha	109 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		45 ha	0.1%	52.43	0.3 %	16,408 ha	117 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		201 ha	0.0%	13.16	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		169 ha	0.0%	12.69	0.1 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		10 ha	0.0%	1.01	0.0 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		40 ha	0.2%	116.84	0.6 %	6,545 ha	138 %
Species							
Birds							
Golden eagle *Aquila chrysaetos*	G5	1 nst	0.6%	503.08	2.6 %	38 nst	174 %
Mammals							
Grizzly bear *Ursus arctos*	G4	70 ha	0.0%	1.27	0.0 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	30 ha	0.0%	0.86	0.0 %	668,362 ha	71 %

Long-legged myotis *Myotis volans*	G5	1	occ	5.2%	455.17	2.4 %	13	occ	46 %
Reptiles									
Western rattlesnake *Crotalus viridis*	G5	1	nst	0.8%	503.08	2.6 %	38	nst	218 %
Vascular Plants									
Pulsifer's Monkey-flower *Mimulus pulsiferae*	G4?	1	occ	20.0%	2,731.03	14.3 %	7	occ	71 %

Rendevous-Methow

Site No 107

Northern Cascade Ranges Section

Terrestrial Site

Area:	36,000	ha
	88,920	ac

Land Use/Land Cover

Agriculture	3 %
Developed	1 %
Water	1 %

GAP Management Status

GAP 1	0 %
GAP 2	22 %
GAP 3	45 %
GAP 4	33 %

Land Ownership

US National	41 %	Can National:	0 %
US State:	24 %	BC Provincial:	0 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	33 %	Can Private:	0 %
US NGO	1 %	Can NGO:	0 %

Terrestrial

Terrestrial Ecological Systems

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Columbia Basin Foothill Riparian Woodland and Shrubland		413 ha	1.9 %	16.75	6.3 %	6,545 ha	138 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		11,877 ha	0.2 %	1.90	0.7 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		1,547 ha	0.2 %	2.12	0.8 %	193,578 ha	114 %
Northern Rocky Mountain Subalpine Dry Parkland		197 ha	0.2 %	1.45	0.5 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		5,216 ha	0.5 %	4.74	1.8 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		232 ha	0.3 %	2.49	0.9 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		7,161 ha	0.8 %	7.47	2.8 %	254,555 ha	103 %
Northern Interior Spruce-Fir woodland and forest		2,958 ha	0.2 %	1.90	0.7 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		213 ha	0.0 %	0.16	0.1 %	352,885 ha	104 %
Inter-Mountain Basins Cliff and Canyon		1 ha	0.0 %	0.16	0.1 %	1,644 ha	100 %
Inter-Mountain Basins Big Sagebrush Steppe		14,607 ha	2.3 %	20.58	7.7 %	188,483 ha	134 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		18,317 ha	1.3 %	11.25	4.2 %	432,412 ha	116 %

Species

<u>Amphibians</u>									
Tiger salamander *Ambystoma tigrinum*	G5	4	occ	2.7%	37.17	14.0 %	25	occ	316 %
Western toad *Bufo boreas*	G4	3	occ	8.5%	68.08	25.6 %	13	occ	123 %
<u>Birds</u>									
White-headed woodpecker *Picoides albolarvatus*	G4	1	nst	4.8%	6.99	2.6 %	38	nst	55 %
Golden eagle *Aquila chrysaetos*	G5	2	nst	1.2%	13.97	5.3 %	38	nst	174 %
Trumpeter swan (S. Thompson R.) *Cygnus buccinator*	G4	1	nst	25.0%	11.54	4.3 %	23	nst	17 %
Common Loon *Gavia immer*	G5	1	occ	4.3%	20.42	7.7 %	13	occ	100 %
Bald eagle *Haliaeetus leucocephalus*	G4	3	nst	2.9%	20.96	7.9 %	38	nst	100 %
Rufus hummingbird *Selasphorus rufus*	G5	1	occ	100.0%	20.42	7.7 %	13	occ	8 %
Black-backed woodpecker *Picoides arcticus*	G5	2	occ	16.7%	40.85	15.4 %	13	occ	92 %
Northern goshawk *Accipiter gentilis*	G5	1	nst	1.2%	6.99	2.6 %	38	nst	103 %
<u>Lepidopterans</u>									
Meadow fritillary *Boloria bellona toddi*	G5	2	occ	28.6%	40.85	15.4 %	13	occ	54 %
<u>Mammals</u>									
Fisher *Martes pennanti*	G5	377	ha	0.0%	0.15	0.1 %	668,362	ha	71 %
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	1	nst	2.2%	6.99	2.6 %	38	nst	100 %
Wolverine *Gulo gulo*	G4	1	occ	0.7%	1.05	0.4 %	13	occ	54 %
Lynx *Lynx canadensis*	G5	4,824	ha	0.7%	4.66	1.8 %	275,020	ha	102 %
Western gray squirrel *Sciurus griseus*	G5	1	occ	1.7%	20.42	7.7 %	13	occ	115 %
Grizzly bear *Ursus arctos*	G4	6,199	ha	0.2%	1.57	0.6 %	1,050,522	ha	83 %
Long-legged myotis *Myotis volans*	G5	1	occ	16.7%	20.42	7.7 %	13	occ	46 %
<u>Reptiles</u>									
Western rattlesnake *Crotalus viridis*	G5	4	nst	3.2%	27.95	10.5 %	38	nst	218 %

Riverside

Site No 136

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	13 %	GAP 1	0 %	US National	2 %	Can National:	0 %
Area:	9,000	ha	Developed	3 %	GAP 2	0 %	US State:	28 %	BC Provincial:	0 %
	22,230	ac	Water	2 %	GAP 3	30 %	US Local:	1 %	BC Regional:	0 %
					GAP 4	70 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	70 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		5,978 ha	0.4%	14.68	1.4 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		14 ha	0.0%	0.01	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		5,889 ha	0.6%	21.42	2.0 %	291,947 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		13 ha	0.0%	0.05	0.0 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		150 ha	0.0%	0.85	0.1 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		538 ha	2.5%	87.30	8.2 %	6,545 ha	138 %
Species							
Birds							
Bald eagle *Haliaeetus leucocephalus*	G4	2 nst	1.9%	55.90	5.3 %	38 nst	100 %
Great blue heron *Ardia herodius*	G5	1 occ	3.4%	98.04	9.2 %	13 occ	100 %
Mollusks							
California floater *Anodonta californiensis*	G3	2 occ	22.2%	163.39	15.4 %	13 occ	62 %
Vascular Plants							

Prairie Cordgrass *Spartina pectinata*	G5	1 occ	17.7%	26.78	2.5 %	7 occ	0 %
Howellia *Howellia aquatilis*	G3	1 occ	33.3%	151.72	14.3 %	7 occ	29 %
Gray Stickseed *Hackelia cinerea*	G4?	1 occ	25.0%	42.48	4.0 %	25 occ	16 %

Robbins

Site No 29

Thompson Okanagan Plateau Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	4 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	78 %
	1,235 ac	Water	4 %	GAP 3	78 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	22 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	22 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		466 ha	0.0%	20.61	0.1 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		466 ha	0.0%	30.51	0.2 %	291,947 ha	138 %
Species							
Vascular Plants							
Hutchinsia *Hutchinsia procumbens*	G5	1 occ	33.3%	2,731.03	14.3 %	7 occ	43 %

Rock Creek

Site No 83

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	9 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	5,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	63 %
	12,350	ac	Water	0 %	GAP 3	63 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	37 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	37 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,018 ha	0.1%	4.50	0.2 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		2,622 ha	0.0%	3.02	0.2 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,021 ha	0.1%	6.69	0.3 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		38 ha	0.0%	2.94	0.2 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		51 ha	0.0%	0.24	0.0 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		2,546 ha	0.2%	13.79	0.7 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		30 ha	0.0%	0.38	0.0 %	151,409 ha	105 %
Inter-Mountain Basins Big Sagebrush Steppe		783 ha	0.1%	7.94	0.4 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		26 ha	0.1%	7.59	0.4 %	6,545 ha	138 %
Species							
Amphibians							
Tiger salamander *Ambystoma tigrinum*	G5	3 occ	2.5%	248.52	13.0 %	25 occ	316 %
Great Basin spadefoot *Spea intermontana*	G5	1 occ	0.5%	66.17	3.5 %	13 occ	485 %

<u>Birds</u>									
Williamson's sapsucker *Sphyrapicus thyroideus thyroideus*	G5	7	nst	17.9%	352.16	18.4 %	38	nst	97 %
Lewis' woodpecker *Melanerpes lewis*	G4	2	nst	1.4%	100.62	5.3 %	38	nst	239 %
<u>Mammals</u>									
Fisher *Martes pennanti*	G5	3,748	ha	0.2%	10.72	0.6 %	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.2%	9.42	0.5 %	58	occ	128 %
Bighorn sheep *Ovis canadensis*	G4	417	ha	0.2%	14.41	0.8 %	55,318	ha	253 %
Fringed myotis *Myotis thysanodes*	G4G5	1	occ	1.9%	42.02	2.2 %	13	occ	100 %
Western small-footed myotis *Myotis ciliolabrum*	G5	1	occ	19.1%	168.89	8.8 %	13	occ	46 %
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	1	nst	2.2%	50.31	2.6 %	38	nst	100 %
<u>Reptiles</u>									
Gopher snake *Pituophis catenifer deserticola*	G5	1	occ	0.6%	78.43	4.1 %	13	occ	531 %
Racer *Coluber constricta*	G5	1	occ	0.2%	36.76	1.9 %	13	occ	708 %
<u>Vascular Plants</u>									
Northern Linanthus *Linanthus septentrionalis*	G5	1	occ	9.1%	273.10	14.3 %	7	occ	143 %
Slender Gilia *Gilia tenerrima*	G5	1	occ	100.0%	273.10	14.3 %	7	occ	14 %

Roosevelt

Site No 102

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	9 %	GAP 1	0 %	US National	15 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	12 %	BC Provincial:	0 %
	1,235	ac	Water	8 %	GAP 3	27 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	73 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	73 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		323 ha	0.0%	14.27	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		44 ha	0.0%	0.51	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		291 ha	0.0%	19.05	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		45 ha	0.0%	3.38	0.0 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		34 ha	0.0%	3.45	0.0 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		21 ha	0.1%	61.33	0.3 %	6,545 ha	138 %
Species							
Mollusks							
California floater *Anodonta californiensis*	G3	1 occ	11.1%	1,470.46	7.7 %	13 occ	62 %

Roosevelt Lake

Site No 127

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	23 %	GAP 1	0 %	US National	14 %	Can National:	0 %
Area:	1,000	ha	Developed	0 %	GAP 2	0 %	US State:	3 %	BC Provincial:	0 %
	2,470	ac	Water	0 %	GAP 3	17 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	83 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	83 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		70 ha	0.0%	1.55	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		168 ha	0.0%	0.97	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		25 ha	0.0%	0.82	0.0 %	292,133 ha	108 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		471 ha	0.2%	61.44	0.6 %	73,274 ha	41 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		70 ha	0.0%	2.29	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		14 ha	0.0%	5.42	0.1 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		143 ha	0.0%	5.37	0.1 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		29 ha	0.0%	1.47	0.0 %	188,483 ha	134 %
Species							
Birds							
Black-backed woodpecker *Picoides arcticus*	G5	1 occ	8.3%	735.25	7.7 %	13 occ	92 %
Mammals							
Wolverine *Gulo gulo*	G4	1 occ	14.3%	735.25	7.7 %	13 occ	54 %

Salal

Site No 31

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	1,235	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Rocky Mountain Alpine Composite		4 ha	0.0%	0.64	0.0 %	119,447 ha	122 %
North Pacific Montane Riparian Woodland and Shrubland		62 ha	1.0%	638.61	3.3 %	1,856 ha	100 %
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest		295 ha	0.1%	84.17	0.4 %	67,002 ha	80 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	500 ha	0.0%	9.10	0.0 %	1,050,522 ha	83 %

Salmon Arm

Site No 25

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	13 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000	ha	Developed	46 %	GAP 2	0 %	US State:	0 %	BC Provincial:	26 %
	2,470	ac	Water	21 %	GAP 3	26 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	74 %	US Indigenous:	0 %	Can Indigenous:	21 %
							US Private	0 %	Can Private:	53 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		125 ha	0.2 %	48.37	0.5 %	24,703 ha	133 %
Species							
Vascular Plants							
Thyme-leaved Spurge *Chamaesyce serpyllifolia ssp. serpyllifolia*	G5T5	1 occ	16.7 %	1,365.47	14.3 %	7 occ	71 %
Hairy Water-clover *Marsilea vestita*	G5	1 occ	25.0 %	1,365.47	14.3 %	7 occ	57 %
Moss Grass *Coleanthus subtilis*	GNR	1 occ	100.0 %	1,365.47	14.3 %	7 occ	14 %
Mexican Mosquito Fern *Azolla mexicana*	G5	1 occ	50.0 %	1,365.47	14.3 %	7 occ	29 %

Sanpoil

Site No 119

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	3 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	3,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	7,410	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,004 ha	0.1 %	7.40	0.2 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,356 ha	0.0 %	2.61	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,007 ha	0.1 %	10.99	0.3 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		326 ha	0.4 %	42.05	1.3 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		1,362 ha	0.2 %	17.05	0.5 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		120 ha	0.0 %	2.03	0.1 %	188,483 ha	134 %
Species							
Birds							
Golden eagle *Aquila chrysaetos*	G5	2 nst	1.2 %	167.70	5.3 %	38 nst	174 %
Mollusks							
Western pearlshell *Margaritifera falcata*	G4	1 occ	33.3 %	245.09	7.7 %	13 occ	23 %

Sawtooth

Site No 129

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	40 %	US National	100 %	Can National:	0 %
Area:	12,500	ha	Developed	0 %	GAP 2	53 %	US State:	0 %	BC Provincial:	0 %
	30,875	ac	Water	0 %	GAP 3	7 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		310 ha	0.0%	0.67	0.1 %	352,885 ha	104 %
Inter-Mountain Basins Big Sagebrush Steppe		59 ha	0.0%	0.24	0.0 %	188,483 ha	134 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		6,074 ha	0.1%	2.80	0.4 %	1,658,616 ha	109 %
Northern Interior Spruce-Fir woodland and forest		5 ha	0.0%	0.01	0.0 %	414,168 ha	105 %
Northern Rocky Mountain Montane Mixed Conifer Forest		1,867 ha	0.2%	5.61	0.7 %	254,555 ha	103 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		38 ha	0.0%	1.18	0.2 %	24,703 ha	133 %
Northern Rocky Mountain Subalpine Dry Parkland		1,318 ha	1.1%	28.01	3.7 %	35,979 ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		127 ha	0.2%	5.92	0.8 %	16,408 ha	117 %
Rocky Mountain Alpine Composite		4,766 ha	1.2%	30.51	4.0 %	119,447 ha	122 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		3,895 ha	0.6%	15.39	2.0 %	193,578 ha	114 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		14 ha	0.2%	3.86	0.5 %	2,773 ha	136 %
Species							
Mammals							

Lynx *Lynx canadensis*	G5	12,423	ha	1.8%	34.54	4.5%	275,020	ha	102 %
Mountain goat-WA *Oreamos americanus*	G5	8,657	ha	18.3%	140.00	18.3%	47,283	ha	100 %
Grizzly bear *Ursus arctos*	G4	7,623	ha	0.3%	5.55	0.7%	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	168	ha	0.0%	0.19	0.0%	668,362	ha	71 %
Gray wolf *Canis lupus*	G4	2	den	2.7%	40.25	5.3%	38	den	84 %

Non-Vascular Plants

Lichen Ophioparma ventosa *Ophioparma ventosa*	G2	1	occ	100.0%	58.82	7.7%	13	occ	8 %

Vascular Plants

Tweedy's Willow *Salix tweedyi*	G3G4	1	occ	2.9%	109.24	14.3%	7	occ	157 %
Pale Alpine-forget-me-not *Eritrichium nanum var. elongatum*	G5T4	2	occ	100.0%	218.48	28.6%	7	occ	29 %
Pygmy Saxifrage *Saxifraga rivularis*	G5?	1	occ	7.9%	84.07	11.0%	13	occ	38 %

Scotch Creek

Site No 12

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	8 %
	1,235	ac	Water	8 %	GAP 3	8 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	92 %	US Indigenous:	0 %	Can Indigenous:	90 %
							US Private	0 %	Can Private:	2 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio

Terrestrial

Terrestrial Ecological Systems

Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		279 ha	0.0 %	3.22	0.0 %	1,658,616 ha	109 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		180 ha	0.2 %	139.30	0.7 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		279 ha	0.1 %	35.23	0.2 %	151,409 ha	105 %

Scottie

Site No 10

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	6,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	95 %
	14,820	ac	Water	0 %	GAP 3	95 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		4,499 ha	0.3%	16.57	1.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,054 ha	0.0%	1.01	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		4,499 ha	0.5%	24.55	1.5 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		24 ha	0.0%	1.55	0.1 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		1,054 ha	0.1%	4.76	0.3 %	352,885 ha	104 %
Columbia Basin Foothill Riparian Woodland and Shrubland		24 ha	0.1%	5.84	0.4 %	6,545 ha	138 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	959 ha	0.1%	2.29	0.1 %	668,362 ha	71 %
Vascular Plants							
Dark Lamb's-quarters *Chenopodium atrovirens*	G5	1 occ	5.3%	36.52	2.3 %	7 occ	14 %

Seton Lake

Site No 30

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	1,235	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		92 ha	0.0%	4.09	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		407 ha	0.0%	4.69	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		66 ha	0.0%	6.52	0.0 %	193,578 ha	114 %
Northern Rocky Mountain Subalpine Dry Parkland		1 ha	0.0%	0.00	0.0 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		92 ha	0.0%	6.02	0.0 %	291,947 ha	138 %
Northern Interior Spruce-Fir woodland and forest		67 ha	0.0%	3.09	0.0 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		274 ha	0.0%	14.84	0.1 %	352,885 ha	104 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	500 ha	0.0%	9.10	0.0 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	278 ha	0.0%	7.97	0.0 %	668,362 ha	71 %
Mountain goat *Oreamos americanus*	G5	198 ha	0.1%	124.08	0.6 %	30,505 ha	179 %

Shovelnose-Otter

Site No 58

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	85,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	90 %
	209,950	ac	Water	1 %	GAP 3	90 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	10 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	10 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,708 ha	2.1%	7.78	6.9 %	24,703 ha	133 %
Inter-Mountain Basins Big Sagebrush Steppe		292 ha	0.0%	0.17	0.2 %	188,483 ha	134 %
Northern Interior Spruce-Fir woodland and forest		19,058 ha	1.4%	5.17	4.6 %	414,168 ha	105 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,693 ha	0.1%	0.44	0.4 %	432,412 ha	116 %
Northern Interior Plateau Grassland		396 ha	0.2%	0.68	0.6 %	65,446 ha	200 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,402 ha	0.1%	0.54	0.5 %	291,947 ha	138 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		3,557 ha	0.6%	2.07	1.8 %	193,578 ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		3,361 ha	0.3%	1.29	1.2 %	292,133 ha	108 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		2 ha	0.0%	0.08	0.1 %	2,773 ha	136 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		79,821 ha	1.4%	5.41	4.8 %	1,658,616 ha	109 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		53,847 ha	4.6%	17.16	15.3 %	352,885 ha	104 %
Species							
Birds							

Flammulated owl *Otus flammeolus*	G4	1	nst	0.8%	2.96	2.6 %	38	nst	205 %
Mammals									
Grizzly bear *Ursus arctos*	G4	8,510	ha	0.3%	0.91	0.8 %	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	57,544	ha	3.4%	9.68	8.6 %	668,362	ha	71 %
Mountain beaver *Aplodontia rufa rainieri*	G5T4	5	occ	6.4%	43.25	38.5 %	13	occ	254 %
Vascular Plants									
Kruckeberg's Holly Fern *Polystichum kruckebergii*	G4	1	occ	28.5%	13.73	12.2 %	7	occ	29 %
Mountain Holly Fern *Polystichum scopulinum*	G5	2	occ	66.7%	32.13	28.6 %	7	occ	43 %

Shuswap

Site No 21

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	37,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	93 %
	92,625	ac	Water	0 %	GAP 3	93 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	7 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	7 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,681 ha	0.1%	0.99	0.4 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		33,426 ha	0.6%	5.14	2.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		6 ha	0.1%	0.55	0.2 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		7,330 ha	0.8%	6.40	2.5 %	292,133 ha	108 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		744 ha	0.3%	2.59	1.0 %	73,274 ha	41 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,679 ha	0.2%	1.47	0.6 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		469 ha	0.6%	4.84	1.9 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		9,840 ha	0.7%	6.06	2.4 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		5,345 ha	0.5%	3.86	1.5 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		10,909 ha	2.2%	18.37	7.2 %	151,409 ha	105 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	6,357 ha	0.4%	2.42	1.0 %	668,362 ha	71 %

Bighorn sheep *Ovis canadensis*	G4	269	ha	0.1 %	1.24	0.5 %	55,318	ha	253 %

<u>Vascular Plants</u>

Tweedy's Willow *Salix tweedyi*	G3G4	1	occ	2.9 %	36.41	14.3 %	7	occ	157 %

Silver-Salmon

Site No 26

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	17 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	3,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	75 %
	8,645	ac	Water	0 %	GAP 3	75 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	25 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	25 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		130 ha	0.0%	0.82	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,883 ha	0.0%	3.10	0.1 %	1,658,616 ha	109 %
Northern Rocky Mountain Western Redcedar-Hemlock Forest		815 ha	0.3%	30.38	1.1 %	73,274 ha	41 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		131 ha	0.0%	1.23	0.0 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1 ha	0.0%	0.00	0.0 %	24,703 ha	133 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		1,885 ha	0.4%	34.00	1.2 %	151,409 ha	105 %
Species							
Birds							
Great blue heron *Ardia herodius*	G5	1 occ	2.9%	210.07	7.7 %	13 occ	100 %
Dragonfly							
Twelve-spotted skimmer *Libellula pulchella*	G5	1 occ	5.3%	210.07	7.7 %	13 occ	108 %

Similkameen

Site No 80

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	11 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	2,500	ha	Developed	0 %	GAP 2	1 %	US State:	0 %	BC Provincial:	70 %
	6,175	ac	Water	0 %	GAP 3	69 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	30 %	US Indigenous:	0 %	Can Indigenous:	9 %
							US Private	0 %	Can Private:	21 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Columbia Basin Foothill Riparian Woodland and Shrubland		2 ha	0.0%	1.17	0.0 %	6,545 ha	138 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		188 ha	0.0%	0.43	0.0 %	1,658,616 ha	109 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		237 ha	0.4%	55.22	1.4 %	16,408 ha	117 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,341 ha	0.1%	17.56	0.5 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		33 ha	0.0%	5.11	0.1 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		187 ha	0.0%	2.03	0.1 %	352,885 ha	104 %
Inter-Mountain Basins Big Sagebrush Steppe		22 ha	0.0%	0.45	0.0 %	188,483 ha	134 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		1,362 ha	0.1%	12.04	0.3 %	432,412 ha	116 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	0.2%	57.19	1.5 %	13 occ	485 %
Birds							
Western screech owl *Otus kennicotii macfarlanei*	G5T4	1 nst	1.2%	100.61	2.6 %	38 nst	134 %

Sage thrasher *Oreoscoptes montanus*	G5	2	occ	16.7%	588.19	15.4 %	13	occ	92 %
Lewis' woodpecker *Melanerpes lewis*	G4	1	nst	0.7%	100.61	2.6 %	38	nst	239 %
Canyon wren *Catherpes mexicanus*	G5	1	occ	1.7%	294.10	7.7 %	13	occ	369 %
Blue grouse *Dendragapus obscurus*	G5	1	occ	16.7%	294.10	7.7 %	13	occ	46 %
<u>Lepidopterans</u>									
Mormon metalmark *Apodemia mormo*	G5	1	occ	22.7%	267.36	7.0 %	13	occ	31 %
<u>Mammals</u>									
Spotted bat *Euderma maculatum*	G4	1	occ	3.9%	295.55	7.7 %	13	occ	154 %
Fisher *Martes pennanti*	G5	297	ha	0.0%	1.70	0.0 %	668,362	ha	71 %
Western red bat *Lasiurus blossevillii*	G5	1	occ	25.0%	147.05	3.8 %	13	occ	15 %
Mountain goat *Oreamos americanus*	G5	1,182	ha	0.8%	148.14	3.9 %	30,505	ha	179 %
Bighorn sheep *Ovis canadensis*	G4	2,208	ha	0.8%	152.60	4.0 %	55,318	ha	253 %
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.6%	65.92	1.7 %	58	occ	128 %
Grizzly bear *Ursus arctos*	G4	474	ha	0.0%	1.73	0.0 %	1,050,522	ha	83 %
Nuttall's cottontail *Sylvilagus nutalli*	G5	1	occ	2.8%	294.10	7.7 %	13	occ	254 %
<u>Reptiles</u>									
Racer *Coluber constricta*	G5	2	occ	1.5%	588.19	15.4 %	13	occ	708 %
<u>Vascular Plants</u>									
Thick-leaved Thelypody *Thelypodium laciniatum var. laciniatum*	G5T5	1	occ	10.0%	294.10	7.7 %	13	occ	62 %

Sinlahekin

Site No 98

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	4 %	GAP 1	0 %	US National	11 %	Can National:	0 %
Area:	62,000	ha	Developed	0 %	GAP 2	3 %	US State:	41 %	BC Provincial:	0 %
	153,141	ac	Water	1 %	GAP 3	50 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	47 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	47 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio

Terrestrial

Terrestrial Ecological Systems

	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Columbia Basin Foothill Riparian Woodland and Shrubland		685 ha	3.1%	16.14	10.5 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		36,574 ha	2.5%	13.04	8.5 %	432,412 ha	116 %
Inter-Mountain Basins Big Sagebrush Steppe		29,178 ha	4.6%	23.87	15.5 %	188,483 ha	134 %
Inter-Mountain Basins Cliff and Canyon		1 ha	0.0%	0.00	0.0 %	1,644 ha	100 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		1,108 ha	0.1%	0.48	0.3 %	352,885 ha	104 %
Northern Rocky Mountain Montane Mixed Conifer Forest		12,511 ha	1.5%	7.58	4.9 %	254,555 ha	103 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		9,977 ha	1.0%	5.27	3.4 %	291,947 ha	138 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		246 ha	0.4%	2.31	1.5 %	16,408 ha	117 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		1,715 ha	0.3%	1.37	0.9 %	193,578 ha	114 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		15,337 ha	0.3%	1.43	0.9 %	1,658,616 ha	109 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		149 ha	0.2%	0.93	0.6 %	24,703 ha	133 %

Species

Birds

Prairie falcon *Falco mexicanus*	G5	2	occ	22.2%	154.17	100.0%	2	occ	450 %
Flammulated owl *Otus flammeolus*	G4	1	nst	0.8%	4.06	2.6%	38	nst	205 %
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	7	nst	5.6%	16.86	10.9%	64	nst	111 %
Burrowing owl *Athene cunicularia*	G4	4	occ	6.5%	88.10	57.1%	7	occ	643 %
Golden eagle *Aquila chrysaetos*	G5	17	nst	10.2%	68.97	44.7%	38	nst	174 %
Northern goshawk *Accipiter gentilis*	G5	3	nst	3.5%	12.17	7.9%	38	nst	103 %
Common Loon *Gavia immer*	G5	3	occ	10.9%	29.65	19.2%	13	occ	100 %
<u>Lepidopterans</u>									
Sonora skipper *Polites sonora*	G4	1	occ	50.0%	11.86	7.7%	13	occ	15 %
<u>Mammals</u>									
Gray wolf *Canis lupus*	G4	2	den	2.7%	8.11	5.3%	38	den	84 %
Lynx *Lynx canadensis*	G5	7,836	ha	1.1%	4.39	2.8%	275,020	ha	102 %
Bighorn sheep-WA *Ovis canadensis*	G4	17,222	ha	70.9%	109.34	70.9%	24,282	ha	100 %
Grizzly bear *Ursus arctos*	G4	12,055	ha	0.5%	1.77	1.1%	1,050,522	ha	83 %
<u>Vascular Plants</u>									
Many-headed Sedge *Carex sychnocephala*	G4	1	occ	8.3%	22.02	14.3%	7	occ	100 %
Valley Sedge vallicola *Carex vallicola*	G5	2	occ	11.8%	36.43	23.6%	7	occ	57 %
Blue-eyed Grass *Sisyrinchium septentrionale*	G3G4	1	occ	4.8%	22.02	14.3%	7	occ	171 %

South Fork Salmon Creek

Site No 112

Northern Cascade Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	38 %	Can National:	0 %
Area:	2,500 ha	Developed	0 %	GAP 2	0 %	US State:	53 %	BC Provincial:	0 %
	6,175 ac	Water	0 %	GAP 3	92 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	8 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	8 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		504 ha	0.0%	4.46	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		1,921 ha	0.0%	4.43	0.1 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		121 ha	0.0%	2.39	0.1 %	193,578 ha	114 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		504 ha	0.1%	6.60	0.2 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		17 ha	0.0%	2.63	0.1 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		1,735 ha	0.2%	26.06	0.7 %	254,555 ha	103 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		64 ha	0.0%	0.69	0.0 %	352,885 ha	104 %
Inter-Mountain Basins Big Sagebrush Steppe		32 ha	0.0%	0.65	0.0 %	188,483 ha	134 %
Species							
Birds							
Black-backed woodpecker *Picoides arcticus*	G5	1 occ	8.3%	294.10	7.7 %	13 occ	92 %
Northern goshawk *Accipiter gentilis*	G5	1 nst	1.2%	100.61	2.6 %	38 nst	103 %
Mammals							

Grizzly bear *Ursus arctos*	G4	94	ha	0.0 %	0.34	0.0 %	1,050,522 ha	83 %
Lynx *Lynx canadensis*	G5	121	ha	0.0 %	1.68	0.0 %	275,020 ha	102 %

Spokane

Site No 132

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	3 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	39,000	ha	Developed	0 %	GAP 2	0 %	US State:	5 %	BC Provincial:	0 %
	96,330	ac	Water	4 %	GAP 3	6 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	94 %	US Indigenous:	51 %	Can Indigenous:	0 %
							US Private	42 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		14,079 ha	1.0%	7.98	3.3 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		16,975 ha	0.3%	2.51	1.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		13,020 ha	1.3%	10.93	4.5 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		233 ha	0.3%	2.31	0.9 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		16,975 ha	2.0%	16.34	6.7 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		3,829 ha	0.6%	4.98	2.0 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		333 ha	1.5%	12.47	5.1 %	6,545 ha	138 %
Species							
Birds							
Bald eagle *Haliaeetus leucocephalus*	G4	4 nst	3.8%	25.80	10.5 %	38 nst	100 %
Common Loon *Gavia immer*	G5	2 occ	8.7%	37.71	15.4 %	13 occ	100 %
Mollusks							
California floater *Anodonta californiensis*	G3	1 occ	11.1%	18.85	7.7 %	13 occ	62 %

Vascular Plants

Western Ladies-tresses *Spiranthes porrifolia*	G4	1 occ	50.0%	35.01	14.3 %	7 occ	14 %
Nuttall's Pussy-toes *Antennaria parvifolia*	G5	4 occ	26.7%	75.41	30.8 %	13 occ	38 %
Gray Stickseed *Hackelia cinerea*	G4?	3 occ	75.0%	29.41	12.0 %	25 occ	16 %

Spokane South

Site No 137

Okanagan Highlands Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500 ha	Developed	0 %	GAP 2	0 %	US State:	20 %	BC Provincial:	0 %
	1,235 ac	Water	0 %	GAP 3	20 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	80 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	80 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		257 ha	0.0%	11.38	0.1 %	432,412 ha	116 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		100 ha	0.0%	6.55	0.0 %	291,947 ha	138 %
Inter-Mountain Basins Big Sagebrush Steppe		353 ha	0.1%	35.80	0.2 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		3 ha	0.0%	8.76	0.0 %	6,545 ha	138 %
Species							
Vascular Plants							
Howellia *Howellia aquatilis*	G3	1 occ	33.3%	2,731.03	14.3 %	7 occ	29 %

Spruce-Tyaughton

Site No 8

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	67 %	US National	0 %	Can National:	0 %
Area:	67,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	165,490	ac	Water	1 %	GAP 3	33 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Rocky Mountain Ponderosa Pine Woodland and Savanna		21 ha	0.0%	0.01	0.0 %	291,947 ha	138 %
North American Alpine Ice Field		1,031 ha	1.7%	8.00	5.6 %	18,394 ha	111 %
North Pacific Maritime Mesic Parkland		222 ha	0.8%	3.98	2.8 %	7,952 ha	151 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		4,894 ha	0.4%	1.98	1.4 %	352,885 ha	104 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		469 ha	0.6%	2.71	1.9 %	24,703 ha	133 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		21 ha	0.0%	0.01	0.0 %	432,412 ha	116 %
Northern Rocky Mountain Subalpine Dry Parkland		7,726 ha	6.4%	30.64	21.5 %	35,979 ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		2,186 ha	4.0%	19.01	13.3 %	16,408 ha	117 %
Rocky Mountain Alpine Composite		21,714 ha	5.5%	25.93	18.2 %	119,447 ha	122 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		22,658 ha	3.5%	16.70	11.7 %	193,578 ha	114 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		585 ha	6.3%	30.10	21.1 %	2,773 ha	136 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		32,346 ha	0.6%	2.78	2.0 %	1,658,616 ha	109 %

Northern Interior Spruce-Fir woodland and forest		4,794 ha	0.3%	1.65	1.2 %	414,168 ha	105 %
Species							
Mammals							
Mountain goat *Oreamos americanus*	G5	6,005 ha	3.9%	28.08	19.7 %	30,505 ha	179 %
Grizzly bear *Ursus arctos*	G4	67,000 ha	2.6%	9.10	6.4 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	4,627 ha	0.3%	0.99	0.7 %	668,362 ha	71 %
Bighorn sheep *Ovis canadensis*	G4	3,865 ha	1.4%	9.97	7.0 %	55,318 ha	253 %

Spuzzum

Site No 68

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	12,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	89 %
	29,640	ac	Water	0 %	GAP 3	89 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	11 %	US Indigenous:	0 %	Can Indigenous:	2 %
							US Private	0 %	Can Private:	9 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		4,622 ha	0.1%	2.22	0.3 %	1,658,616 ha	109 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		540 ha	1.0%	26.21	3.3 %	16,408 ha	117 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		46 ha	0.1%	1.48	0.2 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		4,627 ha	0.3%	8.90	1.1 %	414,168 ha	105 %
North Pacific Montane Riparian Woodland and Shrubland		40 ha	0.6%	17.17	2.2 %	1,856 ha	100 %
North Pacific Maritime Mesic Parkland		9 ha	0.0%	0.90	0.1 %	7,952 ha	151 %
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest		4,058 ha	1.8%	48.24	6.1 %	67,002 ha	80 %
East Cascades Mesic Montane Mixed Conifer Forest		2,559 ha	5.5%	146.14	18.3 %	13,948 ha	100 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	11,918 ha	0.5%	9.04	1.1 %	1,050,522 ha	83 %

Stein-Mehatl-Nahatlatch

Site No 43

Interior Transition Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	66 %	US National	0 %	Can National:	0 %
Area:	199,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	491,530	ac	Water	1 %	GAP 3	33 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
North Pacific Montane Riparian Woodland and Shrubland		749 ha	12.1 %	19.38	40.4 %	1,856 ha	100 %
Columbia Basin Foothill Riparian Woodland and Shrubland		54 ha	0.2 %	0.40	0.8 %	6,545 ha	138 %
East Cascades Mesic Montane Mixed Conifer Forest		379 ha	0.8 %	1.31	2.7 %	13,948 ha	100 %
North American Alpine Ice Field		4,913 ha	8.0 %	12.83	26.7 %	18,394 ha	111 %
North Pacific Maritime Mesic Parkland		8,435 ha	31.8 %	50.95	106.1 %	7,952 ha	151 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		5,886 ha	0.4 %	0.65	1.4 %	432,412 ha	116 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		9,150 ha	0.8 %	1.25	2.6 %	352,885 ha	104 %
Northern Interior Spruce-Fir woodland and forest		11,548 ha	0.8 %	1.34	2.8 %	414,168 ha	105 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,112 ha	1.4 %	2.16	4.5 %	24,703 ha	133 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		671 ha	7.3 %	11.62	24.2 %	2,773 ha	136 %
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest		21,417 ha	9.6 %	15.35	32.0 %	67,002 ha	80 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		90,811 ha	1.6 %	2.63	5.5 %	1,658,616 ha	109 %

Rocky Mountain Ponderosa Pine Woodland and Savanna		5,885	ha	0.6%	0.97	2.0%	291,947	ha	138 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		55,646	ha	5.7%	9.15	19.0%	292,133	ha	108 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		14,487	ha	2.2%	3.59	7.5%	193,578	ha	114 %
Rocky Mountain Alpine Composite		52,327	ha	13.1%	21.04	43.8%	119,447	ha	122 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		3,438	ha	6.3%	10.06	21.0%	16,408	ha	117 %
Northern Rocky Mountain Subalpine Dry Parkland		5,531	ha	4.6%	7.38	15.4%	35,979	ha	139 %
Species									
Birds									
Northern spotted owl *Strix occidentalis caurina*	G3	2	nst	0.4%	1.43	3.0%	67	nst	193 %
Mammals									
Grizzly bear *Ursus arctos*	G4	198,075	ha	7.5%	9.06	18.9%	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	3,872	ha	0.2%	0.28	0.6%	668,362	ha	71 %
Bighorn sheep *Ovis canadensis*	G4	498	ha	0.2%	0.43	0.9%	55,318	ha	253 %
Mountain goat *Oreamos americanus*	G5	16,629	ha	10.9%	26.18	54.5%	30,505	ha	179 %
Vascular Plants									
Spreading Stickseed *Hackelia diffusa*	G4	1	occ	50.0%	1.92	4.0%	25	occ	8 %
Bristly Mousetail *Myosurus apetalus var. borealis*	G5TNR	1	occ	20.0%	6.86	14.3%	7	occ	71 %
Abbreviated Bluegrass *Poa abbreviata ssp. pattersonii*	G5T5	1	occ	100.0%	6.86	14.3%	7	occ	14 %

Tod

Site No 15

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	1,000	ha	Developed	58 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	2,470	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		975 ha	0.0%	5.62	0.1 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		508 ha	0.1%	16.62	0.2 %	292,133 ha	108 %
Northern Rocky Mountain Subalpine Dry Parkland		26 ha	0.0%	6.91	0.1 %	35,979 ha	139 %
Northern Interior Spruce-Fir woodland and forest		339 ha	0.0%	7.82	0.1 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		126 ha	0.0%	3.41	0.0 %	352,885 ha	104 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	10 ha	0.0%	0.14	0.0 %	668,362 ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	1 occ	0.6%	164.80	1.7 %	58 occ	128 %
Vascular Plants							
Hall's Willowherb *Epilobium halleanum*	G5	1 occ	33.3%	1,365.51	14.3 %	7 occ	43 %
Mutton Grass *Poa fendleriana ssp. fendleriana*	G5T5	1 occ	100.0%	1,365.51	14.3 %	7 occ	14 %

Tonota

Site No 95

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	40 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	3 %	BC Provincial:	0 %
	1,235	ac	Water	0 %	GAP 3	44 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	56 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	56 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		498 ha	0.0 %	5.74	0.0 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		275 ha	0.0 %	27.16	0.1 %	193,578 ha	114 %
Northern Rocky Mountain Subalpine Dry Parkland		2 ha	0.0 %	1.06	0.0 %	35,979 ha	139 %
Northern Rocky Mountain Montane Mixed Conifer Forest		217 ha	0.0 %	16.30	0.1 %	254,555 ha	103 %
Northern Interior Spruce-Fir woodland and forest		5 ha	0.0 %	0.23	0.0 %	414,168 ha	105 %
Species							
Vascular Plants							
Narrowleaf Skullcap *Scutellaria angustifolia ssp. micrantha*	G5T3T5	1 occ	100.0 %	1,470.55	7.7 %	13 occ	8 %

Toroda-Ingram

Site No 87

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	3 %	GAP 1	0 %	US National	49 %	Can National:	0 %
Area:	21,000	ha	Developed	0 %	GAP 2	1 %	US State:	12 %	BC Provincial:	4 %
	51,870	ac	Water	0 %	GAP 3	64 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	34 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	28 %	Can Private:	6 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		13,122 ha	0.2%	3.60	0.8 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		210 ha	0.0%	0.49	0.1 %	193,578 ha	114 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		8 ha	0.0%	0.22	0.0 %	16,408 ha	117 %
Northern Rocky Mountain Subalpine Dry Parkland		20 ha	0.0%	0.25	0.1 %	35,979 ha	139 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		3,834 ha	0.4%	5.98	1.3 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		280 ha	0.3%	5.16	1.1 %	24,703 ha	133 %
Northern Rocky Mountain Montane Mixed Conifer Forest		12,917 ha	1.5%	23.10	5.1 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		2,726 ha	0.4%	6.58	1.4 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		42 ha	0.2%	2.92	0.6 %	6,545 ha	138 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		3,845 ha	0.3%	4.05	0.9 %	432,412 ha	116 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	1 occ	1.0%	35.01	7.7 %	13 occ	485 %

Birds									
Northern goshawk *Accipiter gentilis*	G5	2	nst	2.3%	23.96	5.3 %	38	nst	103 %
Great gray owl *Strix nebulosa*	G5	1	nst	25.0%	11.98	2.6 %	38	nst	11 %
Common Loon *Gavia immer*	G5	1	occ	0.9%	7.00	1.5 %	13	occ	100 %
Lewis' woodpecker *Melanerpes lewis*	G4	1	nst	0.7%	11.98	2.6 %	38	nst	239 %
Golden eagle *Aquila chrysaetos*	G5	1	nst	0.6%	11.98	2.6 %	38	nst	174 %
Prairie falcon *Falco mexicanus*	G5	1	occ	11.1%	227.58	50.0 %	2	occ	450 %
Mammals									
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.5%	5.89	1.3 %	58	occ	128 %
Bighorn sheep *Ovis canadensis*	G4	676	ha	0.2%	5.56	1.2 %	55,318	ha	253 %
Fringed myotis *Myotis thysanodes*	G4G5	1	occ	0.5%	2.50	0.5 %	13	occ	100 %
Wolverine *Gulo gulo*	G4	1	occ	9.5%	23.34	5.1 %	13	occ	54 %
Townsend's big-eared bat *Coryhorhinus townsendii*	G4	1	nst	2.2%	11.98	2.6 %	38	nst	100 %
Fisher *Martes pennanti*	G5	158	ha	0.0%	0.11	0.0 %	668,362	ha	71 %
Reptiles									
Western rattlesnake *Crotalus viridis*	G5	1	nst	0.8%	11.98	2.6 %	38	nst	218 %
Gopher snake *Pituophis catenifer deserticola*	G5	2	occ	2.4%	70.03	15.4 %	13	occ	531 %
Racer *Coluber constricta*	G5	2	occ	1.5%	70.03	15.4 %	13	occ	708 %
Vascular Plants									
Okanogan Stickseed *Hackelia ciliata*	G3?	1	occ	50.0%	18.21	4.0 %	25	occ	8 %
Small northern bog-orchid *Platanthera obtusata*	G5	3	occ	5.9%	89.16	19.6 %	13	occ	138 %

Trapp Lake

Site No 36

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	19,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	38 %
	46,930	ac	Water	3 %	GAP 3	38 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	62 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	62 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		3,295 ha	0.2%	3.83	0.8 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		2,062 ha	0.0%	0.63	0.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		3,298 ha	0.3%	5.68	1.1 %	291,947 ha	138 %
Northern Interior Plateau Grassland		11,651 ha	5.3%	89.56	17.8 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		264 ha	0.3%	5.38	1.1 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		2,063 ha	0.2%	2.94	0.6 %	352,885 ha	104 %
Columbia Basin Foothill Riparian Woodland and Shrubland		160 ha	0.7%	12.30	2.4 %	6,545 ha	138 %
Species							
Birds							
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	5 nst	4.0%	39.30	7.8 %	64 nst	111 %
Mammals							
Fisher *Martes pennanti*	G5	2,105 ha	0.1%	1.58	0.3 %	668,362 ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	1 occ	0.6%	8.67	1.7 %	58 occ	128 %

Vascular Plants

Okanogan Fameflower *Talinum sediforme*	G3	1 occ	3.8%	5.03	1.0 %	50 occ	20 %
Freckled Milk-vetch *Astragalus lentiginosus*	G5	1 occ	10.0%	71.87	14.3 %	7 occ	100 %

Trepanier

Site No 61

Central Okanagan Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	5 %	US National	0 %	Can National:	0 %
Area:	1,000 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	93 %
	2,470 ac	Water	0 %	GAP 3	88 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	7 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	7 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		163 ha	0.0%	3.59	0.0 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		804 ha	0.0%	4.64	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		163 ha	0.0%	5.34	0.1 %	291,947 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		33 ha	0.0%	12.77	0.1 %	24,703 ha	133 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		804 ha	0.1%	21.78	0.2 %	352,885 ha	104 %
Species							
Mammals							
Fisher *Martes pennanti*	G5	898 ha	0.1%	12.85	0.1 %	668,362 ha	71 %

Trinity

Site No 32

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	66 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	1,235	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		118 ha	0.0%	1.36	0.0 %	1,658,616 ha	109 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		118 ha	0.0%	14.90	0.1 %	151,409 ha	105 %
Species							
Birds							
Great blue heron *Ardia herodius*	G5	1 occ	2.9%	1,470.55	7.7 %	13 occ	100 %

Ts'yl-os

Site No 20

Interior Transition Ranges Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	56 %	US National	0 %	Can National:	0 %
Area:	15,000 ha 37,050 ac	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
		Water	0 %	GAP 3	44 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		927 ha	0.0%	0.36	0.1 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		35 ha	0.4%	8.04	1.3 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		1 ha	0.0%	0.00	0.0 %	292,133 ha	108 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		924 ha	0.1%	3.04	0.5 %	193,578 ha	114 %
Rocky Mountain Alpine Composite		1,884 ha	0.5%	10.05	1.6 %	119,447 ha	122 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		290 ha	0.5%	11.26	1.8 %	16,408 ha	117 %
Rocky Mountain Alpine-Subalpine wetlands		154 ha	44.1%	934.60	146.7 %	105 ha	147 %
North American Alpine Ice Field		11,707 ha	19.1%	405.57	63.6 %	18,394 ha	111 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	15,000 ha	0.6%	9.10	1.4 %	1,050,522 ha	83 %

Tunk Creek

Site No 106

Okanagan Highlands Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	8,000	ha	Developed	0 %	GAP 2	0 %	US State:	43 %	BC Provincial:	0 %
	19,760	ac	Water	0 %	GAP 3	43 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	57 %	US Indigenous:	4 %	Can Indigenous:	0 %
							US Private	53 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		7,501 ha	0.5%	20.73	1.7 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		18 ha	0.0%	0.01	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		1,204 ha	0.1%	4.93	0.4 %	291,947 ha	138 %
Northern Rocky Mountain Montane Mixed Conifer Forest		18 ha	0.0%	0.08	0.0 %	254,555 ha	103 %
Inter-Mountain Basins Big Sagebrush Steppe		6,347 ha	1.0%	40.23	3.4 %	188,483 ha	134 %
Columbia Basin Foothill Riparian Woodland and Shrubland		66 ha	0.3%	12.05	1.0 %	6,545 ha	138 %
Species							
Birds							
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	4 nst	3.2%	74.68	6.3 %	64 nst	111 %
Golden eagle *Aquila chrysaetos*	G5	2 nst	1.2%	62.88	5.3 %	38 nst	174 %

Upper Boundary

Site No 78

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	19,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	46,930	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		18,377 ha	0.3 %	5.57	1.1 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		3,872 ha	0.4 %	6.67	1.3 %	292,133 ha	108 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		42 ha	0.1 %	1.29	0.3 %	16,408 ha	117 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		327 ha	0.4 %	6.66	1.3 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		9,142 ha	0.7 %	11.10	2.2 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		1,759 ha	0.1 %	2.51	0.5 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		3,610 ha	0.7 %	11.99	2.4 %	151,409 ha	105 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	3,996 ha	0.2 %	1.91	0.4 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	1,285 ha	0.1 %	0.97	0.2 %	668,362 ha	71 %

Upper Hat

Site No 27

Northern Cascade Ranges Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	2 %	US National	0 %	Can National:	0 %
Area:	167,000	ha	Developed	0 %	GAP 2	2 %	US State:	0 %	BC Provincial:	91 %
	412,490	ac	Water	0 %	GAP 3	87 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	9 %	US Indigenous:	0 %	Can Indigenous:	4 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Terrestrial

Terrestrial Ecological Systems

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Northern Interior Spruce-Fir woodland and forest		34,822 ha	2.5%	4.81	8.4 %	414,168 ha	105 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		60,143 ha	4.2%	7.96	13.9 %	432,412 ha	116 %
Inter-Mountain Basins Big Sagebrush Steppe		4,749 ha	0.8%	1.44	2.5 %	188,483 ha	134 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		44,323 ha	3.8%	7.19	12.6 %	352,885 ha	104 %
Columbia Basin Foothill Riparian Woodland and Shrubland		482 ha	2.2%	4.22	7.4 %	6,545 ha	138 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		772 ha	0.9%	1.79	3.1 %	24,703 ha	133 %
Northern Interior Plateau Grassland		4,831 ha	2.2%	4.23	7.4 %	65,446 ha	200 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		55,396 ha	5.7%	10.86	19.0 %	291,947 ha	138 %
Northern Rocky Mountain Subalpine Dry Parkland		1,220 ha	1.0%	1.94	3.4 %	35,979 ha	139 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		2,462 ha	4.5%	8.59	15.0 %	16,408 ha	117 %
Rocky Mountain Alpine Composite		931 ha	0.2%	0.45	0.8 %	119,447 ha	122 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		8,407 ha	1.3%	2.49	4.3 %	193,578 ha	114 %

Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		4,031	ha	0.4%	0.79	1.4 %	292,133	ha	108 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		91,582	ha	1.7%	3.16	5.5 %	1,658,616	ha	109 %
North Pacific Maritime Mesic Parkland		201	ha	0.8%	1.45	2.5 %	7,952	ha	151 %
Species									
Birds									
Prairie falcon *Falco mexicanus*	G5	1	occ	10.6%	27.25	47.6 %	2	occ	450 %
Mammals									
Spotted bat *Euderma maculatum*	G4	2	occ	7.7%	8.81	15.4 %	13	occ	154 %
Mountain goat *Oreamos americanus*	G5	982	ha	0.6%	1.84	3.2 %	30,505	ha	179 %
Bighorn sheep *Ovis canadensis*	G4	30,684	ha	11.1%	31.75	55.5 %	55,318	ha	253 %
Fisher *Martes pennanti*	G5	81,521	ha	4.9%	6.98	12.2 %	668,362	ha	71 %
Grizzly bear *Ursus arctos*	G4	13,784	ha	0.5%	0.75	1.3 %	1,050,522	ha	83 %
Reptiles									
Gopher snake *Pituophis catenifer deserticola*	G5	1	occ	1.2%	4.40	7.7 %	13	occ	531 %
Vascular Plants									
Freckled Milk-vetch *Astragalus lentiginosus*	G5	2	occ	20.0%	16.35	28.6 %	7	occ	100 %
Low Hawksbeard *Crepis modocensis ssp. modocensis*	G4G5T4	1	occ	100.0%	8.18	14.3 %	7	occ	14 %
Small-flowered Ipomopsis *Ipomopsis minutiflora*	G2G3	2	occ	28.6%	8.81	15.4 %	13	occ	54 %
Needle-leaved Navarretia *Navarretia intertexta*	G5?	1	occ	50.0%	8.18	14.3 %	7	occ	29 %
Rough Dropseed *Sporobolus compositus var. compositus*	G5T5	1	occ	33.3%	8.18	14.3 %	7	occ	43 %
Geyer's Onion *Allium geyeri var. tenerum*	G4G5T3	1	occ	25.0%	4.40	7.7 %	13	occ	15 %
Spreading Stickseed *Hackelia diffusa*	G4	1	occ	50.0%	2.29	4.0 %	25	occ	8 %
Curly Sedge *Carex rupestris ssp. drummondiana*	G5T5	1	occ	100.0%	8.18	14.3 %	7	occ	14 %

Upper Kettle

Site No 60

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	85,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	97 %
	209,950	ac	Water	1 %	GAP 3	97 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	3 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		81,960 ha	1.5%	5.56	4.9 %	1,658,616 ha	109 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		2 ha	0.0%	0.08	0.1 %	2,773 ha	136 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		5,568 ha	0.6%	2.14	1.9 %	292,133 ha	108 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,821 ha	2.2%	8.29	7.4 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		49,819 ha	3.6%	13.53	12.0 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		16,901 ha	1.4%	5.39	4.8 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		9,692 ha	1.9%	7.20	6.4 %	151,409 ha	105 %
Species							
Amphibians							
Western toad *Bufo boreas*	G4	2 occ	5.1%	17.30	15.4 %	13 occ	123 %
Birds							
American bittern *Botaurus lentiginosis*	G4	1 occ	50.0%	8.65	7.7 %	13 occ	15 %
Dragonfly							

Black-tipped darner *Aeshna tuberculifera*	G4	1	occ	100.0%	8.65	7.7 %	13	occ	8 %
Mammals									
Grizzly bear *Ursus arctos*	G4	9,734	ha	0.4%	1.04	0.9 %	1,050,522	ha	83 %
Fisher *Martes pennanti*	G5	15,097	ha	0.9%	2.54	2.3 %	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	6	occ	3.6%	11.63	10.3 %	58	occ	128 %
Mountain goat *Oreamos americanus*	G5	300	ha	0.2%	1.11	1.0 %	30,505	ha	179 %

Upper Nicola

Site No 47

Thompson Okanagan Plateau Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	90,500	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	32 %
	223,535	ac	Water	2 %	GAP 3	31 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	68 %	US Indigenous:	0 %	Can Indigenous:	9 %
							US Private	0 %	Can Private:	60 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Inter-Mountain Basins Big Sagebrush Steppe		695 ha	0.1%	0.39	0.4 %	188,483 ha	134 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		5,339 ha	0.4%	1.30	1.2 %	432,412 ha	116 %
Columbia Basin Foothill Riparian Woodland and Shrubland		504 ha	2.3%	8.13	7.7 %	6,545 ha	138 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		19,925 ha	1.7%	5.96	5.6 %	352,885 ha	104 %
Northern Interior Spruce-Fir woodland and forest		772 ha	0.1%	0.20	0.2 %	414,168 ha	105 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		993 ha	1.2%	4.25	4.0 %	24,703 ha	133 %
Northern Interior Plateau Grassland		59,840 ha	27.4%	96.57	91.4 %	65,446 ha	200 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		4,647 ha	0.5%	1.68	1.6 %	291,947 ha	138 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		20,701 ha	0.4%	1.32	1.2 %	1,658,616 ha	109 %
Species							
Amphibians							
Great Basin spadefoot *Spea intermontana*	G5	6 occ	6.0%	48.75	46.2 %	13 occ	485 %
Birds							

Lewis' woodpecker *Melanerpes lewis*	G4	1	nst	0.7%	2.78	2.6 %	38	nst	239 %
Burrowing owl *Athene cunicularia*	G4	3	occ	4.8%	45.27	42.9 %	7	occ	643 %
Sharp-tailed grouse (columbianus ssp) *Tymphanuchus phasianellus columbianus*	G4T3	12	nst	9.6%	19.80	18.8 %	64	nst	111 %
Western screech owl *Otus kennicotii macfarlanei*	G5T4	1	nst	1.2%	2.78	2.6 %	38	nst	134 %
Swainson's hawk *Buteo swainsoni*	G5	1	occ	11.1%	8.12	7.7 %	13	occ	69 %
Mammals									
Fisher *Martes pennanti*	G5	28,452	ha	1.7%	4.50	4.3 %	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	2	occ	1.2%	3.64	3.4 %	58	occ	128 %
Vascular Plants									
Threadstalk Milk-vetch *Astragalus filipes*	G5	2	occ	25.0%	30.18	28.6 %	7	occ	71 %
Freckled Milk-vetch *Astragalus lentiginosus*	G5	1	occ	10.0%	15.09	14.3 %	7	occ	100 %

West Slopes

Site No 39

Central Okanagan Section

Terrestrial Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	2 %	US National	0 %	Can National:	0 %
Area:	135,000	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	95 %
	333,450	ac	Water	2 %	GAP 3	92 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	1 %
							US Private	0 %	Can Private:	4 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		20,653 ha	1.8%	4.14	5.9 %	352,885 ha	104 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		18,159 ha	3.6%	8.49	12.0 %	151,409 ha	105 %
Aggregate - Ponderosa Pine and Sagebrush Steppe		8,563 ha	0.6%	1.40	2.0 %	432,412 ha	116 %
Northern Interior Spruce-Fir woodland and forest		47,240 ha	3.4%	8.08	11.4 %	414,168 ha	105 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		1,744 ha	2.1%	5.00	7.1 %	24,703 ha	133 %
Northern Interior Plateau Grassland		3,268 ha	1.5%	3.54	5.0 %	65,446 ha	200 %
Northern Rocky Mountain Subalpine Dry Parkland		279 ha	0.2%	0.55	0.8 %	35,979 ha	139 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		5,375 ha	0.8%	1.97	2.8 %	193,578 ha	114 %
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		26,656 ha	2.7%	6.46	9.1 %	292,133 ha	108 %
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland		67 ha	0.7%	1.71	2.4 %	2,773 ha	136 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		118,066 ha	2.1%	5.04	7.1 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		8,562 ha	0.9%	2.08	2.9 %	291,947 ha	138 %

Columbia Basin Foothill Riparian Woodland and Shrubland		24	ha	0.1%	0.26	0.4 %	6,545	ha	138 %
Species									
Birds									
Western screech owl *Otus kennicotii macfarlanei*	G5T4	1	nst	1.2%	1.86	2.6 %	38	nst	134 %
Mammals									
Mountain goat *Oreamos americanus*	G5	2,838	ha	1.9%	6.59	9.3 %	30,505	ha	179 %
Fisher *Martes pennanti*	G5	29,113	ha	1.7%	3.08	4.4 %	668,362	ha	71 %
Badger *Taxidea taxus jeffersoni*	G5	1	occ	0.6%	1.22	1.7 %	58	occ	128 %
Bighorn sheep *Ovis canadensis*	G4	7,887	ha	2.9%	10.09	14.3 %	55,318	ha	253 %
Reptiles									
Gopher snake *Pituophis catenifer deserticola*	G5	1	occ	1.2%	5.45	7.7 %	13	occ	531 %
Vascular Plants									
Okanogan Fameflower *Talinum sediforme*	G3	1	occ	7.7%	1.42	2.0 %	50	occ	20 %
Kellogg's Knotweed *Polygonum polygaloides ssp. kelloggii*	G4G5T3	1	occ	50.0%	10.11	14.3 %	7	occ	29 %
Obscure Cryptantha *Cryptantha ambigua*	G4	1	occ	20.0%	10.11	14.3 %	7	occ	71 %

Winfield

Site No 55

Central Okanagan Section

Terrestrial Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	4 %	US National	0 %	Can National:	0 %
Area:	1,000 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	17 %
	2,470 ac	Water	0 %	GAP 3	13 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	83 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	83 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Ponderosa Pine and Sagebrush Steppe		365 ha	0.0 %	8.08	0.1 %	432,412 ha	116 %
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		177 ha	0.0 %	1.02	0.0 %	1,658,616 ha	109 %
Rocky Mountain Ponderosa Pine Woodland and Savanna		366 ha	0.0 %	11.98	0.1 %	291,947 ha	138 %
Northern Interior Plateau Grassland		451 ha	0.2 %	65.87	0.7 %	65,446 ha	200 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		4 ha	0.0 %	1.55	0.0 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		34 ha	0.0 %	0.78	0.0 %	414,168 ha	105 %
Northern Interior Dry-Mesic Mixed Conifer Forest and Woodland		142 ha	0.0 %	8.96	0.1 %	151,409 ha	105 %
Columbia Basin Foothill Riparian Woodland and Shrubland		2 ha	0.0 %	2.92	0.0 %	6,545 ha	138 %
Species							
Vascular Plants							
Northern Linanthus *Linanthus septentrionalis*	G5	1 occ	9.1 %	1,365.51	14.3 %	7 occ	143 %
False-mermaid *Floerkea proserpinacoides*	G5	1 occ	33.3 %	1,365.51	14.3 %	7 occ	29 %

Awned Cyperus *Cyperus squarrosus*	G5	1 occ	14.3%	1,365.51	14.3 %	7 occ	71 %
Needle-leaved Navarretia *Navarretia intertexta*	G5?	1 occ	50.0%	1,365.51	14.3 %	7 occ	29 %
Obscure Cryptantha *Cryptantha ambigua*	G4	1 occ	10.9%	745.11	7.8 %	7 occ	71 %

Yalakom Highlands

Site No 9

Interior Transition Ranges Section

Terrestrial Site

Area: 7,000 ha
17,290 ac

Land Use/Land Cover

Agriculture	0 %
Developed	0 %
Water	0 %

GAP Management Status

GAP 1	0 %
GAP 2	0 %
GAP 3	100 %
GAP 4	0 %

Land Ownership

US National	0 %	Can National:	0 %
US State:	0 %	BC Provincial:	100 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	0 %	Can Private:	0 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in Ecoregion	Relative Abundance	Contribution to Ecoregional Goal	Ecoregion Goal	% of Goal Captured by Portfolio
Terrestrial							
Terrestrial Ecological Systems							
Aggregate - Interior and Rocky Mt Subalpine and Montane Forests		6,488 ha	0.1%	5.34	0.4 %	1,658,616 ha	109 %
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland		3,574 ha	0.6%	25.21	1.8 %	193,578 ha	114 %
Rocky Mountain Cliff, Canyon and Massive Bedrock		436 ha	0.8%	36.28	2.7 %	16,408 ha	117 %
Northern Rocky Mountain Subalpine Dry Parkland		45 ha	0.0%	1.71	0.1 %	35,979 ha	139 %
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland		31 ha	0.0%	1.71	0.1 %	24,703 ha	133 %
Northern Interior Spruce-Fir woodland and forest		1,724 ha	0.1%	5.68	0.4 %	414,168 ha	105 %
Northern Interior Lodgepole Pine-Douglas fir woodland and forest		1,185 ha	0.1%	4.59	0.3 %	352,885 ha	104 %
Species							
Mammals							
Grizzly bear *Ursus arctos*	G4	7,000 ha	0.3%	9.10	0.7 %	1,050,522 ha	83 %
Fisher *Martes pennanti*	G5	2,427 ha	0.1%	4.96	0.4 %	668,362 ha	71 %
Mountain goat *Oreamos americanus*	G5	389 ha	0.3%	17.41	1.3 %	30,505 ha	179 %

Aberdeen

Site No 50

Thompson EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	15 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	28,143 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	66 %
	69,512 ac	Water	0 %	GAP 3	66 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	34 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	34 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	3 occ	8.8%	45.78	23.1 %	13 occ	115 %
Western toad (EDU) *Bufo boreas*	G4	8 occ	66.7%	122.08	61.5 %	13 occ	85 %
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		16,834 m	0.8%	5.19	2.6 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		83,306 m	2.1%	13.86	7.0 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		77,401 m	2.2%	14.86	7.5 %	1,033,242 m	175 %
Freshwater Ecological Systems							
small, intrusives, elevation 1164, shallow		11,761 ha	5.3%	34.86	17.6 %	66,929 ha	130 %
small, volcanics, elevation 1303, intermediate/steep		4,901 ha	4.9%	32.17	16.2 %	30,225 ha	98 %
small, volcanics, alluvium, elevation 1156, shallow, wetlands		11,481 ha	2.6%	17.14	8.6 %	132,841 ha	97 %

Antoine Creek

Site No 96

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	15 %	GAP 1	0 %	US National	20 %	Can National:	0 %
Area:	20,171	ha	Developed	0 %	GAP 2	0 %	US State:	6 %	BC Provincial:	0 %
	49,821	ac	Water	0 %	GAP 3	26 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	74 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	74 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Common Loon (EDU) *Gavia immer*	G5	1 occ	0.7 %	190.80	7.7 %	13 occ	385 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		1 m	0.0 %	0.00	0.0 %	6,372 m	138 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		15,229 ha	1.5 %	126.26	5.1 %	299,161 ha	103 %
small, alluvium, intrusives, elevation 919, shallow		4,942 ha	1.2 %	101.18	4.1 %	121,144 ha	109 %

B.X.

Site No 48

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	7 %	GAP 1	8 %	US National	0 %	Can National:	0 %
Area:	13,066	ha	Developed	20 %	GAP 2	0 %	US State:	0 %	BC Provincial:	37 %
	32,272	ac	Water	0 %	GAP 3	28 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	63 %	US Indigenous:	0 %	Can Indigenous:	3 %
							US Private	0 %	Can Private:	60 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	13 occ	2.3 %	3,829.14	100.0 %	13 occ	3308 %
Birds							
Long-billed curlew (EDU) *Numenius americanus*	G5	1 nst	2.7 %	100.77	2.6 %	38 nst	89 %
Western grebe (EDU) *Aechmophorus occidentalis*	G5	1 occ	50.0 %	294.55	7.7 %	13 occ	15 %
Freshwater Ecological Systems							
small, alluvium, intrusives, elevation 919, shallow		13,066 ha	3.2 %	412.99	10.8 %	121,144 ha	109 %

Barriere

Site No 7

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	8 %	US National	0 %	Can National:	0 %
Area:	88,805	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	95 %
	219,349	ac	Water	0 %	GAP 3	87 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		99,398 m	4.6%	9.71	15.5 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		104,909 m	2.6%	5.53	8.8 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		77,669 m	2.3%	4.73	7.5 %	1,033,242 m	175 %
Bull trout *Salvelinus confluentus*	G3	89,544 m	14.0%	17.58	28.0 %	320,206 m	100 %
Reptiles							
Painted Turtle *Chrysemys picta*	G5	1 occ	100.0%	4.84	7.7 %	13 occ	8 %
Freshwater Ecological Systems							
small, intrusives, sediments, elevation 1279, shallow		7,002 ha	5.8%	12.11	19.3 %	36,339 ha	100 %
small, intrusives, elevation 1522, shallow		2,758 ha	0.7%	1.44	2.3 %	120,623 ha	99 %
small, volcanics, sediments, elevation 907, shallow		39,827 ha	40.2%	84.29	134.1 %	29,704 ha	134 %
small, intrusives, elevation 1417, shallow		16,083 ha	3.7%	7.69	12.2 %	131,455 ha	100 %
small, intrusives, volcanics, elevation 1019, shallow, lakes/wetlands		23,134 ha	15.0%	31.49	50.1 %	46,182 ha	75 %

Bellevue

Site No 66

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	40 %	US National	0 %	Can National:	0 %
Area:	9,295	ha	Developed	5 %	GAP 2	0 %	US State:	0 %	BC Provincial:	92 %
	22,960	ac	Water	0 %	GAP 3	51 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	8 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	8 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		9,295 ha	0.9 %	167.23	3.1 %	299,161 ha	103 %

Big Bar

Site No 13

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	5 %	US National	0 %	Can National:	0 %
Area:	26,712	ha	Developed	0 %	GAP 2	1 %	US State:	0 %	BC Provincial:	83 %
	65,979	ac	Water	0 %	GAP 3	78 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	15 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	15 %
							US NGO	0 %	Can NGO:	1 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Sandhill Crane (EDU) *Grus canadensis*	G5	1 occ	1.8 %	68.72	14.3 %	7 occ	29 %
Freshwater Ecological Systems							
small, volcanics, alluvium, elevation 1156, shallow, wetlands		26,712 ha	2.5 %	40.80	8.5 %	314,936 ha	8 %

Black Canyon Creek

Site No 127

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	3 %	US National	82 %	Can National:	0 %
Area:	9,454	ha	Developed	1 %	GAP 2	0 %	US State:	3 %	BC Provincial:	0 %
	23,351	ac	Water	0 %	GAP 3	83 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	15 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	15 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	2 occ	0.8 %	814.17	15.4 %	13 occ	700 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		1 m	0.0 %	0.00	0.0 %	6,372 m	138 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		9,454 ha	0.9 %	167.24	3.2 %	299,161 ha	103 %

Boulder Creek

Site No 94

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	98 %	Can National:	0 %
Area:	14,619	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	36,110	ac	Water	0 %	GAP 3	98 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	2 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	2 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		8,548 ha	1.0 %	119.18	3.5 %	245,439 ha	103 %
small, intrusives, elevation 1151, shallow		6,071 ha	0.6 %	69.45	2.0 %	299,161 ha	103 %

Bridge

Site No 33

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	136,307	ha	Developed	0 %	GAP 2	6 %	US State:	0 %	BC Provincial:	96 %
	336,679	ac	Water	0 %	GAP 3	90 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	4 %	US Indigenous:	0 %	Can Indigenous:	3 %
							US Private	0 %	Can Private:	1 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal		% of Goal Captured by Portfolio
Freshwater									
Species									
Fishes									
Sockeye Salmon *Oncorhynchus nerka*		117,266	m	2.4 %	7.57	8.0 %	1,460,456	m	21 %
Coho Salmon *Oncorhynchus kisutch*		182,037	m	6.6 %	20.67	21.9 %	830,126	m	61 %
Steelhead Salmon *Oncorhynchus mykiss*		174,932	m	12.8 %	40.33	42.8 %	408,924	m	132 %
Chinook Salmon *Oncorhynchus tshawytscha*		127,892	m	1.7 %	5.48	5.8 %	2,201,209	m	20 %
Bull trout *Salvelinus confluentus*	G3	62,494	m	3.5 %	6.64	7.0 %	887,360	m	44 %
Freshwater Ecological Systems									
small, sediments, elevation 1799, steep		5,053	ha	3.7 %	11.65	12.4 %	40,876	ha	48 %
small, intrusives, sediments, 1965, shallow/steep, glacial		18,167	ha	66.2 %	208.08	220.7 %	8,231	ha	221 %
small, volcanics, elevation 1303, intermediate/steep		9,393	ha	14.6 %	46.01	48.8 %	19,247	ha	100 %
intermediate, intrusives, elevation 1032, shallow, glacial		103,695	ha	28.6 %	89.94	95.4 %	108,696	ha	95 %

Burrell

Site No 64

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	3 %	US National	0 %	Can National:	0 %
Area:	30,228	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	99 %
	74,664	ac	Water	0 %	GAP 3	96 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	1 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	2,436 m	0.2%	10.18	0.6 %	396,222 m	111 %
Freshwater Ecological Systems							
small, intrusives, elevation 1164, shallow		30,228 ha	5.4%	298.76	18.1 %	167,459 ha	111 %

Canoe

Site No 10

Middle Fraser EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	47,662 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	92 %
	117,725 ac	Water	0 %	GAP 3	92 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	8 %	US Indigenous:	0 %	Can Indigenous:	4 %
						US Private	0 %	Can Private:	4 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
American avocet (EDU) *Recurvirostra americana*	G5	2 occ	100.0 %	41.48	15.4 %	13 occ	15 %
Sandhill Crane (EDU) *Grus canadensis*	G5	1 occ	1.8 %	38.52	14.3 %	7 occ	29 %
Fishes							
Lake chub *Cousius plumbeus*	G5	2,233 m	0.1 %	1.25	0.5 %	482,614 m	0 %
Freshwater Ecological Systems							
small, volcanics, sediments, elevation 907, shallow		17,187 ha	26.2 %	235.58	87.4 %	19,670 ha	132 %
intermediate, volcanics, alluvium, elevation 1080, shallow, lakes/wetlands		30,475 ha	1.3 %	12.07	4.5 %	680,982 ha	4 %

Carlton

Site No 118

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	0 %	US National	33 %	Can National:	0 %
Area:	7,312	ha	Developed	2 %	GAP 2	0 %	US State:	33 %	BC Provincial:	0 %
	18,060	ac	Water	0 %	GAP 3	65 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	34 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	34 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	6 occ	1.0%	3,158.09	46.2 %	13 occ	3308 %
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	1 occ	0.4%	273.70	4.0 %	25 occ	664 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		56 m	0.4%	60.14	0.9 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		4 m	0.0%	4.47	0.1 %	6,120 m	155 %
Chinook Salmon *Oncorhynchus tshawytscha*		72 m	2.2%	306.38	4.5 %	1,608 m	133 %
Freshwater Ecological Systems							
intermediate, intrusives, alluvium, elevation 820, shallow		7,312 ha	1.7%	380.97	5.6 %	131,329 ha	127 %

Cayoosh

Site No 45

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	3 %	US National	0 %	Can National:	0 %
Area:	80,623	ha	Developed	0 %	GAP 2	6 %	US State:	0 %	BC Provincial:	100 %
	199,139	ac	Water	0 %	GAP 3	91 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal		% of Goal Captured by Portfolio
Freshwater									
Species									
Fishes									
Sockeye Salmon *Oncorhynchus nerka*		3,282	m	0.1%	0.36	0.2 %	1,460,456	m	21 %
Coho Salmon *Oncorhynchus kisutch*		1,065	m	0.0%	0.20	0.1 %	830,126	m	61 %
Steelhead Salmon *Oncorhynchus mykiss*		1,065	m	0.1%	0.42	0.3 %	408,924	m	132 %
Chinook Salmon *Oncorhynchus tshawytscha*		3,282	m	0.0%	0.24	0.1 %	2,201,209	m	20 %
Bull trout *Salvelinus confluentus*	G3	89,438	m	5.0%	16.06	10.1 %	887,360	m	44 %
Freshwater Ecological Systems									
small, intrusives, elevation 1450, shallow		42,445	ha	15.7%	83.45	52.4 %	81,072	ha	145 %
small, sediments, elevation 1683, shallow		32,162	ha	6.2%	32.78	20.6 %	156,401	ha	69 %
small, sediments, elevation 1799, steep		6,015	ha	4.4%	23.45	14.7 %	40,876	ha	48 %

Chewack River

Site No 105

Okanagan EDU

Freshwater Site

Area:	37,384	ha
	92,340	ac

Land Use/Land Cover

Agriculture	1 %
Developed	0 %
Water	0 %

GAP Management Status

GAP 1	0 %
GAP 2	5 %
GAP 3	84 %
GAP 4	10 %

Land Ownership

US National	84 %	Can National:	0 %
US State:	6 %	BC Provincial:	0 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	10 %	Can Private:	0 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Columbia Spotted Frog (EDU) *Rana luteiventris*	G4	8 occ	8.8%	823.54	61.5 %	13 occ	254 %
Western toad (EDU) *Bufo boreas*	G4	3 occ	1.2%	308.83	23.1 %	13 occ	700 %
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	1 occ	0.4%	53.53	4.0 %	25 occ	664 %
Birds							
Common Loon (EDU) *Gavia immer*	G5	1 occ	0.7%	102.94	7.7 %	13 occ	385 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		188 m	1.5%	39.48	3.0 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		130 m	1.1%	28.43	2.1 %	6,120 m	155 %
Chinook Salmon *Oncorhynchus tshawytscha*		1 m	0.0%	0.83	0.1 %	1,608 m	133 %
Bull trout *Salvelinus confluentus*	G3	33,391 m	6.3%	168.68	12.6 %	264,908 m	131 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	26,743 m	2.0%	90.33	6.7 %	396,222 m	111 %
Vascular Plants							
Leafy Pondweed *Potamogeton foliosus*	G5	1 occ	11.1%	148.70	11.1 %	9 occ	89 %

Freshwater Ecological Systems

small, intrusives, elevation 1522, shallow	14,715 ha	1.8 %	80.23	6.0 %	245,439 ha	103 %
small, intrusives, elevation 1164, shallow	16,368 ha	2.9 %	130.81	9.8 %	167,459 ha	111 %
small, intrusives, elevation 1151, shallow	6,301 ha	0.6 %	28.19	2.1 %	299,161 ha	103 %

Chewack Tributaries

Site No 92

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	57 %	US National	98 %	Can National:	0 %
Area:	65,329	ha	Developed	0 %	GAP 2	21 %	US State:	0 %	BC Provincial:	0 %
	161,362	ac	Water	0 %	GAP 3	20 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	2 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	2 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Columbia Spotted Frog (EDU) *Rana luteiventris*	G4	7 occ	7.7 %	412.36	53.8 %	13 occ	254 %
Western toad (EDU) *Bufo boreas*	G4	9 occ	3.5 %	530.18	69.2 %	13 occ	700 %
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	3 occ	1.1 %	91.90	12.0 %	25 occ	664 %
Birds							
Common Loon (EDU) *Gavia immer*	G5	3 occ	2.0 %	176.73	23.1 %	13 occ	385 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		155 m	1.2 %	18.63	2.4 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		50 m	0.4 %	6.26	0.8 %	6,120 m	155 %
Bull trout *Salvelinus confluentus*	G3	15,087 m	2.8 %	43.62	5.7 %	264,908 m	131 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	95,159 m	7.2 %	183.92	24.0 %	396,222 m	111 %
Reptiles							
Painted Turtle *Chrysemys picta*	G5	1 occ	33.3 %	58.91	7.7 %	13 occ	23 %
Freshwater Ecological Systems							

small, intrusives, elevation 1522, shallow		13,622 ha	1.7 %	42.50	5.6 %	245,439 ha	103 %
small, sediments, elevation 1683, shallow		13,823 ha	5.3 %	136.00	17.8 %	77,836 ha	93 %
small, intrusives, elevation 1151, shallow		24,870 ha	2.5 %	63.66	8.3 %	299,161 ha	103 %
small, intrusives, elevation 1417, shallow		13,013 ha	3.4 %	85.93	11.2 %	115,974 ha	117 %

China Bend

Site No 87

Okanagan EDU

Freshwater Site

Area: 12,612 ha
31,152 ac

Land Use/Land Cover

Agriculture	1 %
Developed	0 %
Water	0 %

GAP Management Status

GAP 1	0 %
GAP 2	0 %
GAP 3	54 %
GAP 4	46 %

Land Ownership

US National	38 %	Can National:	0 %
US State:	17 %	BC Provincial:	0 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	46 %	Can Private:	0 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		8,375 ha	1.0 %	135.36	3.4 %	245,439 ha	103 %
small, intrusives, elevation 1151, shallow		4,238 ha	0.4 %	56.19	1.4 %	299,161 ha	103 %

China Creek

Site No 12

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	8,475	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	94 %
	20,934	ac	Water	0 %	GAP 3	94 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	6 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	6 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, alluvium, intrusives, elevation 919, shallow		8,475 ha	27.7 %	1,400.19	92.3 %	9,177 ha	92 %

Chiwawa River

Site No 125

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	27 %	US National	98 %	Can National:	0 %
Area:	32,266	ha	Developed	0 %	GAP 2	65 %	US State:	1 %	BC Provincial:	0 %
	79,696	ac	Water	0 %	GAP 3	6 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	1 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		1,780 m	14.0%	433.15	27.9 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		2,541 m	20.8%	643.79	41.5 %	6,120 m	155 %
Bull trout *Salvelinus confluentus*	G3	48,341 m	9.1%	282.95	18.2 %	264,908 m	131 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	31,130 m	2.4%	121.82	7.9 %	396,222 m	111 %
Freshwater Ecological Systems							
small, intrusives, elevation 1141, shallow		19,426 ha	12.9%	666.02	43.0 %	45,226 ha	121 %
small, intrusives, elevation 1164, shallow		12,839 ha	2.3%	118.88	7.7 %	167,459 ha	111 %

Christina

Site No 77

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	48 %	US National	0 %	Can National:	0 %
Area:	42,751	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	96 %
	105,596	ac	Water	0 %	GAP 3	48 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	4 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	4 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	2 occ	0.3%	180.04	15.4 %	13 occ	3308 %
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	1 occ	0.4%	46.81	4.0 %	25 occ	664 %
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		3,562 m	6.6%	258.62	22.1 %	16,118 m	156 %
Chiselmouth *Acrocheilus alutaceus*	G5	4,485 m	3.2%	126.26	10.8 %	41,564 m	226 %
Insects							
Olive clubtail (EDU) *Stylurus olivaceus*	G4	4 occ	66.7%	360.08	30.8 %	13 occ	31 %
Western river cruiser (EDU) *Macromia magnifica*	G4	2 occ	7.1%	180.04	15.4 %	13 occ	200 %
Twelve-spotted skimmer (EDU) *Libellula pulchella*	G5	1 occ	1.4%	90.02	7.7 %	13 occ	400 %
River jewelwing (EDU) *Calopteryx aequabilis*	G5	6 occ	100.0%	540.12	46.2 %	13 occ	46 %
nez Perce dancer (EDU) *Argia emma*	G5	1 occ	50.0%	90.02	7.7 %	13 occ	15 %
Freshwater Ecological Systems							

small, intrusives, elevation 1522, shallow		22,787 ha	2.8 %	108.65	9.3 %	245,439 ha	103 %
small, sediments, elevation 1799, steep		1,393 ha	6.0 %	234.69	20.1 %	6,946 ha	78 %
small, intrusives, elevation 1035, shallow, lakes		18,571 ha	16.5 %	644.11	55.0 %	33,741 ha	104 %

Chute

Site No 67

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	15 %	US National	0 %	Can National:	0 %
Area:	7,924 ha 19,572 ac	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	99 %
		Water	0 %	GAP 3	84 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	1 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1417, shallow		7,924 ha	2.0 %	431.40	6.8 %	115,974 ha	117 %

Cicero

Site No 25

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	5,814	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	97 %
	14,361	ac	Water	0 %	GAP 3	97 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	3 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, alluvium, elevation 1098, shallow		5,814 ha	5.1 %	162.60	16.9 %	34,333 ha	83 %

Columbia Boundary

Site No 83

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	8,487	ha	Developed	0 %	GAP 2	0 %	US State:	17 %	BC Provincial:	21 %
	20,962	ac	Water	0 %	GAP 3	37 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	63 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	55 %	Can Private:	8 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
White Sturgeon (Columbia River Population) *Acipenser transmontanus pop. 2*	G4T3T4	2,477 m	100.0%	9,655.92	333.4 %	743 m	333 %
Sockeye Salmon *Oncorhynchus nerka*		781 m	1.5%	285.65	4.8 %	16,118 m	156 %
Bull trout *Salvelinus confluentus*	G3	994 m	0.2%	22.12	0.4 %	264,908 m	131 %
Umatilla dace *Rhinichthys umatilla*	G4	1,775 m	2.8%	333.75	5.7 %	31,348 m	166 %
Leopard dace *Rhinichthys falcatus*	G4	994 m	1.4%	279.86	4.7 %	20,936 m	260 %
Pygmy whitefish - Okanagan Lake *Prosopium coulteri*	G5	994 m	0.8%	154.93	2.6 %	37,818 m	331 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	994 m	0.1%	14.79	0.3 %	396,222 m	111 %
Lake chub *Cousius plumbeus*	G5	994 m	1.9%	376.52	6.4 %	15,561 m	315 %
Shorthead sculpin *Cottus confusus*	G5	781 m	11.5%	2,264.30	38.4 %	2,033 m	38 %
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	781 m	0.3%	62.93	1.1 %	73,151 m	172 %
Chiselmouth *Acrocheilus alutaceus*	G5	994 m	0.7%	140.97	2.4 %	41,564 m	226 %
Freshwater Ecological Systems							

small, intrusives, elevation 1164, shallow	8,487 ha	1.5 %	298.77	5.1 %	167,459 ha	111 %

Cottonwood Creek

Site No 131

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	84 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	15,331	ha	Developed	2 %	GAP 2	0 %	US State:	4 %	BC Provincial:	0 %
	37,868	ac	Water	0 %	GAP 3	4 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	96 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	96 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	1 occ	0.4 %	130.53	4.0 %	25 occ	664 %
Freshwater Ecological Systems							
small, alluvium, volcanics, 765, shallow		15,331 ha	5.3 %	575.05	17.6 %	87,000 ha	99 %

Curlew Lake

Site No 93

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	3 %	GAP 1	1 %	US National	40 %	Can National:	0 %
Area:	45,762	ha	Developed	1 %	GAP 2	0 %	US State:	8 %	BC Provincial:	0 %
	113,032	ac	Water	0 %	GAP 3	47 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	52 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	52 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	2 occ	0.8%	168.19	15.4 %	13 occ	700 %
Birds							
Common Loon (EDU) *Gavia immer*	G5	1 occ	0.7%	84.10	7.7 %	13 occ	385 %
Mollusks							
California floater (EDU) *Anodonta californiensis*	G3	1 occ	16.7%	84.10	7.7 %	13 occ	46 %
Freshwater Ecological Systems							
small, intrusives, elevation 1164, shallow		10,324 ha	1.8%	67.40	6.2 %	167,459 ha	111 %
small, intrusives, elevation 1151, shallow		26,242 ha	2.6%	95.90	8.8 %	299,161 ha	103 %
small, intrusives, volcanics, elevation 1019, shallow, lakes/wetlands		9,197 ha	15.6%	567.12	51.9 %	17,729 ha	91 %

Damfino

Site No 61

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	5 %	US National	0 %	Can National:	0 %
Area:	11,463	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	28,315	ac	Water	0 %	GAP 3	95 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		5,099 m	9.5 %	1,380.68	31.6 %	16,118 m	156 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		11,463 ha	1.4 %	203.83	4.7 %	245,439 ha	103 %

Dash

Site No 18

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	16 %	US National	0 %	Can National:	0 %
Area:	12,492	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	30,856	ac	Water	0 %	GAP 3	84 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Bull trout *Salvelinus confluentus*	G3	26,541 m	1.5 %	30.77	3.0 %	887,360 m	44 %
Freshwater Ecological Systems							
small, intrusives, sediments, elevation 1279, shallow		12,492 ha	4.1 %	139.81	13.6 %	91,910 ha	21 %

Deadman Creek

Site No 97

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	65 %	Can National:	0 %
Area:	5,226	ha	Developed	0 %	GAP 2	0 %	US State:	2 %	BC Provincial:	0 %
	12,909	ac	Water	0 %	GAP 3	68 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	32 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	32 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		5,226 ha	0.5 %	167.23	1.7 %	299,161 ha	103 %

Deadman River

Site No 19

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	11 %	US National	0 %	Can National:	0 %
Area:	60,415	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	86 %
	149,224	ac	Water	0 %	GAP 3	75 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	14 %	US Indigenous:	0 %	Can Indigenous:	9 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
American avocet (EDU) *Recurvirostra americana*	G5	2 occ	50.0%	14.22	15.4 %	13 occ	31 %
Sandhill Crane (EDU) *Grus canadensis*	G5	1 occ	25.0%	13.20	14.3 %	7 occ	43 %
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		59,307 m	2.8%	8.52	9.2 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		86,772 m	2.2%	6.73	7.3 %	1,191,947 m	163 %
Steelhead Salmon *Oncorhynchus mykiss*		252,607 m	10.7%	32.97	35.7 %	707,976 m	126 %
Chinook Salmon *Oncorhynchus tshawytscha*		86,772 m	2.5%	7.76	8.4 %	1,033,242 m	175 %
Lake chub *Cousius plumbeus*	G5	5,899 m	2.7%	8.25	8.9 %	66,039 m	105 %
Chiselmouth *Acrocheilus alutaceus*	G5	8,774 m	10.5%	32.28	34.9 %	25,119 m	99 %
Freshwater Ecological Systems							
small, volcanics, sediments, elevation 1017, shallow, lakes/wetlands		3,575 ha	7.0%	21.41	23.2 %	15,431 ha	86 %
small, volcanics, alluvium, elevation 1038, shallow, wetlands		4,844 ha	12.7%	39.12	42.3 %	11,442 ha	97 %

small, volcanics, alluvium, elevation 1156, shallow, wetlands	5,947 ha	1.3 %	4.14	4.5 %	132,841 ha	97 %
intermediate, volcanics, alluvium, elevation 1080, shallow, lakes/wetlands	46,050 ha	11.7 %	35.95	38.9 %	118,372 ha	119 %

Deep

Site No 40

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	44 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	23,018 ha	Developed	2 %	GAP 2	0 %	US State:	0 %	BC Provincial:	39 %
	56,856 ac	Water	0 %	GAP 3	39 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	61 %	US Indigenous:	0 %	Can Indigenous:	7 %
						US Private	0 %	Can Private:	54 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	10 occ	1.7 %	1,671.90	76.9 %	13 occ	3308 %
Birds							
Long-billed curlew (EDU) *Numenius americanus*	G5	2 nst	5.4 %	114.39	5.3 %	38 nst	89 %
Insects							
Lance-tipped darner *Aechna constricta*	G5	1 occ	4.2 %	167.19	7.7 %	13 occ	154 %
Freshwater Ecological Systems							
small, intrusives, elevation 1164, shallow		21,200 ha	3.8 %	275.16	12.7 %	167,459 ha	111 %
small, volcanics, elevation 1303, intermediate/steep		1,818 ha	1.7 %	122.59	5.6 %	32,232 ha	85 %

Eagle

Site No 23

Thompson EDU

Freshwater Site	Land Use/Land Cover		GAP Management Status		Land Ownership			
	Agriculture	4 %	GAP 1	1 %	US National	0 %	Can National:	0 %
Area: 61,928 ha	Developed	1 %	GAP 2	1 %	US State:	0 %	BC Provincial:	91 %
152,961 ac	Water	0 %	GAP 3	89 %	US Local:	0 %	BC Regional:	0 %
			GAP 4	9 %	US Indigenous:	0 %	Can Indigenous:	0 %
					US Private	0 %	Can Private:	9 %
					US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		134,655 m	6.3%	18.87	20.9 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		142,169 m	3.6%	10.75	11.9 %	1,191,947 m	163 %
Steelhead Salmon *Oncorhynchus mykiss*		31,552 m	1.3%	4.02	4.5 %	707,976 m	126 %
Chinook Salmon *Oncorhynchus tshawytscha*		130,613 m	3.8%	11.40	12.6 %	1,033,242 m	175 %
Bull trout *Salvelinus confluentus*	G3	9,299 m	1.5%	2.62	2.9 %	320,206 m	100 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	54,918 m	71.9%	215.95	239.5 %	22,926 m	253 %
Lake chub *Cousius plumbeus*	G5	27,844 m	12.6%	38.01	42.2 %	66,039 m	105 %
Freshwater Ecological Systems							
small, sediments, elevation 1683, shallow		12,296 ha	7.2%	21.55	23.9 %	51,430 ha	99 %
intermediate, intrusives, alluvium, elevation 820, shallow		49,631 ha	62.9%	189.14	209.8 %	23,655 ha	210 %

Eagle Lake

Site No 3

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	6 %	US National	0 %	Can National:	0 %
Area:	44,919	ha	Developed	0 %	GAP 2	1 %	US State:	0 %	BC Provincial:	97 %
	110,951	ac	Water	0 %	GAP 3	90 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	3 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, alluvium, elevation 1098, shallow		3,321 ha	2.9 %	12.02	9.7 %	34,333 ha	83 %
small, volcanics, elevation 1002, shallow, lakes/wetlands		35,346 ha	100.0 %	414.28	333.3 %	10,604 ha	333 %
small, volcanics, alluvium, elevation 1038, shallow, wetlands		6,252 ha	16.4 %	67.91	54.6 %	11,442 ha	97 %

East Deer

Site No 91

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	94 %	Can National:	0 %
Area:	5,209	ha	Developed	0 %	GAP 2	0 %	US State:	2 %	BC Provincial:	0 %
	12,866	ac	Water	0 %	GAP 3	97 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	3 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		5,209 ha	0.6 %	203.84	2.1 %	245,439 ha	103 %

Edge Hills

Site No 26

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	99 %	US National	0 %	Can National:	0 %
Area:	4,644	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	11,470	ac	Water	0 %	GAP 3	1 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, volcanics, elevation 1303, intermediate/steep		4,643 ha	7.2 %	667.55	24.1 %	19,247 ha	100 %

Ellis

Site No 71

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	12,182	ha	Developed	2 %	GAP 2	0 %	US State:	0 %	BC Provincial:	95 %
	30,090	ac	Water	0 %	GAP 3	95 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1417, shallow		12,182 ha	3.2 %	431.38	10.5 %	115,974 ha	117 %

Eloika Lake

Site No 119

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	13 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	6,889	ha	Developed	3 %	GAP 2	0 %	US State:	4 %	BC Provincial:	0 %
	17,016	ac	Water	0 %	GAP 3	4 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	96 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	96 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Common Loon (EDU) *Gavia immer*	G5	1 occ	0.7 %	558.64	7.7 %	13 occ	385 %
Vascular Plants							
Nuttall's waterweed (EDU) *Elodea nuttalli*	G5	2 occ	33.3 %	2,074.96	28.6 %	7 occ	71 %
Freshwater Ecological Systems							
small, intrusives, volcanics, elevation 1019, shallow, lakes/wetlands		6,889 ha	11.7 %	2,821.88	38.9 %	17,729 ha	91 %

Entiat River

Site No 130

Okanagan EDU

Freshwater Site		
Area:	31,481	ha
	77,757	ac

Land Use/Land Cover	
Agriculture	2 %
Developed	0 %
Water	0 %

GAP Management Status	
GAP 1	5 %
GAP 2	27 %
GAP 3	61 %
GAP 4	7 %

Land Ownership			
US National	89 %	Can National:	0 %
US State:	4 %	BC Provincial:	0 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	7 %	Can Private:	0 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	1 occ	0.4%	122.25	7.7 %	13 occ	700 %
Birds							
Harlequin duck (EDU) *Histrionicus histrionicus*		7 occ	11.7%	855.74	53.8 %	13 occ	238 %
Fishes							
Pacific Lamprey *Lampetra tridentata*	G5	2 occ	100.0%	244.50	15.4 %	13 occ	15 %
Steelhead Salmon *Oncorhynchus mykiss*		603 m	4.7%	150.39	9.5 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		897 m	7.3%	232.93	14.7 %	6,120 m	155 %
Chinook Salmon *Oncorhynchus tshawytscha*		25 m	0.8%	24.71	1.6 %	1,608 m	133 %
Bull trout *Salvelinus confluentus*	G3	466 m	0.1%	2.79	0.2 %	264,908 m	131 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	40,758 m	3.1%	163.48	10.3 %	396,222 m	111 %
Freshwater Ecological Systems							
small, intrusives, elevation 1164, shallow		31,480 ha	5.6%	298.76	18.8 %	167,459 ha	111 %

Fifties

Site No 16

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	16 %	US National	0 %	Can National:	0 %
Area:	42,773	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	90 %
	105,648	ac	Water	0 %	GAP 3	74 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	10 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	10 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Sandhill Crane (EDU) *Grus canadensis*	G5	2 occ	50.0 %	37.29	28.6 %	7 occ	43 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		15,997 ha	8.6 %	37.24	28.5 %	56,075 ha	100 %
small, alluvium, volcanics, 765, shallow		4,155 ha	51.5 %	224.21	171.8 %	2,419 ha	172 %
small, intrusives, elevation 1417, shallow		12,861 ha	2.9 %	12.77	9.8 %	131,455 ha	100 %
small, volcanics, sediments, elevation 1017, shallow, lakes/wetlands		9,760 ha	19.0 %	82.56	63.3 %	15,431 ha	86 %

Flat Lake Complex

Site No 8

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	7 %	US National	0 %	Can National:	0 %
Area:	58,342	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	95 %
	144,106	ac	Water	0 %	GAP 3	87 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
American avocet (EDU) *Recurvirostra americana*	G5	2 occ	50.0%	14.72	15.4 %	13 occ	31 %
Fishes							
Lake chub *Cousius plumbeus*	G5	14,003 m	6.4%	20.29	21.2 %	66,039 m	105 %
Freshwater Ecological Systems							
small, sediments, alluvium, elevation 972, shallow, lakes/wetlands		3,215 ha	75.6%	240.99	251.8 %	1,277 ha	252 %
intermediate, volcanics, elevation 1001, shallow, lakes/wetlands		30,800 ha	100.0%	318.97	333.3 %	9,240 ha	333 %
small, volcanics, alluvium, elevation 1137, shallow, lakes/wetlands		24,327 ha	10.1%	32.06	33.5 %	72,612 ha	101 %

Fortune Creek

Site No 44

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	28 %	GAP 1	8 %	US National	0 %	Can National:	0 %
Area:	14,256	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	59 %
	35,213	ac	Water	0 %	GAP 3	51 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	41 %	US Indigenous:	0 %	Can Indigenous:	10 %
							US Private	0 %	Can Private:	31 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Long-billed curlew (EDU) *Numenius americanus*	G5	2 nst	28.6%	20.61	5.3 %	38 nst	18 %
Fishes							
Coho Salmon *Oncorhynchus kisutch*		44,867 m	1.1%	14.74	3.8 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		33,393 m	1.0%	12.66	3.2 %	1,033,242 m	175 %
Freshwater Ecological Systems							
small, intrusives, elevation 1164, shallow		14,256 ha	6.4%	83.41	21.3 %	66,929 ha	130 %

Fraser - Lillooet to Chilcotin R

Site No 5

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	14 %	US National	0 %	Can National:	0 %
Area:	93,749	ha	Developed	0 %	GAP 2	3 %	US State:	0 %	BC Provincial:	78 %
	231,560	ac	Water	0 %	GAP 3	64 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	20 %	US Indigenous:	0 %	Can Indigenous:	7 %
							US Private	0 %	Can Private:	12 %
							US NGO	0 %	Can NGO:	3 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Long-billed curlew (EDU) *Numenius americanus*	G5	2 nst	11.8%	7.21	5.3 %	38 nst	5 %
Fishes							
White Sturgeon (Lower Fraser River Population) *Acipenser transmontanus pop. 4*	G4T2Q	138,895 m	40.4%	184.58	134.7 %	103,148 m	135 %
Sockeye Salmon *Oncorhynchus nerka*		148,405 m	3.0%	13.93	10.2 %	1,460,456 m	21 %
Coho Salmon *Oncorhynchus kisutch*		198,132 m	7.2%	32.72	23.9 %	830,126 m	61 %
Steelhead Salmon *Oncorhynchus mykiss*		168,642 m	12.4%	56.53	41.2 %	408,924 m	132 %
Chinook Salmon *Oncorhynchus tshawytscha*		199,602 m	2.7%	12.43	9.1 %	2,201,209 m	20 %
Bull trout *Salvelinus confluentus*	G3	297 m	0.0%	0.05	0.0 %	887,360 m	44 %
Freshwater Ecological Systems							
large volcanics, intrusives/alluvium, elevation 658, shallow		93,749 ha	28.5%	130.09	94.9 %	98,777 ha	95 %

Gates

Site No 47

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	16,671	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	90 %
	41,178	ac	Water	0 %	GAP 3	90 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	10 %	US Indigenous:	0 %	Can Indigenous:	4 %
							US Private	0 %	Can Private:	6 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		32,264 m	0.7 %	17.03	2.2 %	1,460,456 m	21 %
Coho Salmon *Oncorhynchus kisutch*		32,737 m	1.2 %	30.40	3.9 %	830,126 m	61 %
Bull trout *Salvelinus confluentus*	G3	35,566 m	2.0 %	30.89	4.0 %	887,360 m	44 %
Freshwater Ecological Systems							
small, intrusives, elevation 1648, shallow		16,671 ha	15.1 %	386.72	50.2 %	33,229 ha	74 %

Granby

Site No 60

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	3 %	GAP 1	40 %	US National	0 %	Can National:	0 %
Area:	89,905	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	92 %
	222,066	ac	Water	0 %	GAP 3	52 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	8 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	8 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	12 occ	4.3%	267.11	48.0 %	25 occ	664 %
Fishes							
Speckled dace *Rhinichthys osculus*	G5	31,747 m	19.0%	351.92	63.2 %	50,201 m	248 %
Freshwater Ecological Systems							
small, sediments, elevation 1683, shallow		8,311 ha	3.2%	59.42	10.7 %	77,836 ha	93 %
small, sediments, elevation 1799, steep		2,828 ha	12.2%	226.56	40.7 %	6,946 ha	78 %
intermediate, intrusives, alluvium, elevation 820, shallow		78,765 ha	18.0%	333.75	60.0 %	131,329 ha	127 %

Granite

Site No 75

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	23,779	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	58,734	ac	Water	0 %	GAP 3	99 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	6,736 m	2.8%	193.74	9.2 %	73,151 m	172 %
Mammals							
Mountain Beaver, Rainieri Subspecies *Aplodontia rufa rainieri*	G5T4	11 occ	9.6%	1,780.28	84.6 %	13 occ	377 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		23,779 ha	2.9%	203.84	9.7 %	245,439 ha	103 %

Granite Creek

Site No 100

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	44 %	Can National:	0 %
Area:	18,049	ha	Developed	1 %	GAP 2	0 %	US State:	8 %	BC Provincial:	0 %
	44,580	ac	Water	0 %	GAP 3	52 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	47 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	47 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		8,670 ha	0.9 %	80.33	2.9 %	299,161 ha	103 %
small, alluvium, intrusives, elevation 919, shallow		9,379 ha	2.3 %	214.60	7.7 %	121,144 ha	109 %

Grinder - Lone Cabin - French Bar

Site No 11

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	23 %	US National	0 %	Can National:	0 %
Area:	30,305	ha	Developed	0 %	GAP 2	3 %	US State:	0 %	BC Provincial:	100 %
	74,854	ac	Water	0 %	GAP 3	74 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Coho Salmon *Oncorhynchus kisutch*		9,984 m	0.4 %	5.10	1.2 %	830,126 m	61 %
Steelhead Salmon *Oncorhynchus mykiss*		10,225 m	0.8 %	10.60	2.5 %	408,924 m	132 %
Chinook Salmon *Oncorhynchus tshawytscha*		9,920 m	0.1 %	1.91	0.5 %	2,201,209 m	20 %
Bull trout *Salvelinus confluentus*	G3	40,145 m	2.3 %	19.18	4.5 %	887,360 m	44 %
Freshwater Ecological Systems							
small, volcanics, sediments, elevation 907, shallow		8,810 ha	13.4 %	189.92	44.8 %	19,670 ha	132 %
small, intrusives, elevation 1151, shallow		21,495 ha	25.7 %	363.63	85.8 %	25,065 ha	86 %

Guichon Creek

Site No 43

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	3 %	GAP 1	6 %	US National	0 %	Can National:	0 %
Area:	42,167	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	77 %
	104,152	ac	Water	0 %	GAP 3	71 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	23 %	US Indigenous:	0 %	Can Indigenous:	8 %
							US Private	0 %	Can Private:	15 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	3 occ	25.0%	30.55	23.1 %	13 occ	85 %
Fishes							
Coho Salmon *Oncorhynchus kisutch*		75,142 m	1.9%	8.35	6.3 %	1,191,947 m	163 %
Steelhead Salmon *Oncorhynchus mykiss*		88,511 m	3.8%	16.55	12.5 %	707,976 m	126 %
Chinook Salmon *Oncorhynchus tshawytscha*		45,681 m	1.3%	5.85	4.4 %	1,033,242 m	175 %
Freshwater Ecological Systems							
small, volcanics, alluvium, elevation 1137, shallow, lakes/wetlands		32,078 ha	13.3%	58.49	44.2 %	72,612 ha	101 %
small, alluvium, elevations 1118, shallow		10,089 ha	24.2%	106.89	80.7 %	12,497 ha	81 %

Gun

Site No 30

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	79 %	US National	0 %	Can National:	0 %
Area:	36,334	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	89,745	ac	Water	0 %	GAP 3	21 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Bull trout *Salvelinus confluentus*	G3	39,203 m	2.2 %	15.63	4.4 %	887,360 m	44 %
Freshwater Ecological Systems							
small, intrusives, elevation 1450, shallow		22,473 ha	8.3 %	98.04	27.7 %	81,072 ha	145 %
small, sediments, elevation 1683, shallow		3,020 ha	0.6 %	6.83	1.9 %	156,401 ha	69 %
small, sediments, elevation 1799, steep		2,990 ha	2.2 %	25.87	7.3 %	40,876 ha	48 %
small, intrusives, elevation 1648, shallow		7,851 ha	7.1 %	83.56	23.6 %	33,229 ha	74 %

Haller Creek

Site No 107

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	7 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	10,088	ha	Developed	0 %	GAP 2	0 %	US State:	27 %	BC Provincial:	0 %
	24,918	ac	Water	0 %	GAP 3	27 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	73 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	73 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, alluvium, intrusives, elevation 919, shallow		10,088 ha	2.5 %	412.97	8.3 %	121,144 ha	109 %

Hayes

Site No 65

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	2 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	60,940	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	93 %
	150,522	ac	Water	0 %	GAP 3	93 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	7 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	7 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	23,028 m	9.4 %	258.44	31.5 %	73,151 m	172 %
Freshwater Ecological Systems							
small, intrusives, elevation 1417, shallow		11,941 ha	3.1 %	84.53	10.3 %	115,974 ha	117 %
small, intrusives, elevation 1597, shallow		5,102 ha	8.3 %	227.17	27.7 %	18,438 ha	91 %
small, volcanics, alluvium, elevation 1156, shallow, wetlands		43,897 ha	21.2 %	581.33	70.8 %	61,993 ha	128 %

Horse Springs Coulee

Site No 99

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	7 %	GAP 1	0 %	US National	1 %	Can National:	0 %
Area:	10,733	ha	Developed	0 %	GAP 2	0 %	US State:	17 %	BC Provincial:	0 %
	26,511	ac	Water	0 %	GAP 3	18 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	82 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	82 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	13 occ	5.1 %	4,661.28	100.0 %	13 occ	700 %
Birds							
Common Loon (EDU) *Gavia immer*	G5	1 occ	0.7 %	358.56	7.7 %	13 occ	385 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		1 m	0.0 %	0.00	0.0 %	6,372 m	138 %
Freshwater Ecological Systems							
small, alluvium, volcanics, 765, shallow		10,733 ha	3.7 %	575.05	12.3 %	87,000 ha	99 %

Indian Dan

Site No 122

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	9 %	GAP 1	0 %	US National	3 %	Can National:	0 %
Area:	6,094	ha	Developed	0 %	GAP 2	22 %	US State:	41 %	BC Provincial:	0 %
	15,051	ac	Water	0 %	GAP 3	23 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	55 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	55 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, volcanics, sediments, elevation 907, shallow		6,094 ha	100.0%	7,369.91	333.4 %	1,828 ha	333 %

Inkaneep

Site No 81

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	18,763	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	82 %
	46,344	ac	Water	0 %	GAP 3	82 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	18 %	US Indigenous:	0 %	Can Indigenous:	17 %
							US Private	0 %	Can Private:	1 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal		% of Goal Captured by Portfolio
Freshwater									
Species									
Amphibians									
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	10	occ	3.6 %	1,066.58	40.0 %	25	occ	664 %
Birds									
Long-billed curlew (EDU) *Numenius americanus*	G5	1	nst	2.7 %	70.17	2.6 %	38	nst	89 %
Fishes									
Chinook Salmon *Oncorhynchus tshawytscha*		1	m	0.0 %	0.00	0.0 %	1,608	m	133 %
Freshwater Ecological Systems									
small, intrusives, elevation 1417, shallow		18,763	ha	4.9 %	431.39	16.2 %	115,974	ha	117 %

Joe

Site No 86

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	100 %	US National	0 %	Can National:	0 %
Area:	2,153	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	5,317	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, volcanics, elevation 1303, intermediate/steep		2,153 ha	2.0%	1,552.53	6.7 %	32,232 ha	85 %

Juliet

Site No 68

Thompson EDU

Freshwater Site		
Area:	6,903	ha
	17,051	ac

Land Use/Land Cover	
Agriculture	0 %
Developed	0 %
Water	0 %

GAP Management Status	
GAP 1	0 %
GAP 2	0 %
GAP 3	100 %
GAP 4	0 %

Land Ownership			
US National	0 %	Can National:	0 %
US State:	0 %	BC Provincial:	100 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	0 %	Can Indigenous:	0 %
US Private	0 %	Can Private:	0 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Coho Salmon *Oncorhynchus kisutch*		2,188 m	0.1 %	1.48	0.2 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		2,188 m	0.1 %	1.71	0.2 %	1,033,242 m	175 %
Bull trout *Salvelinus confluentus*	G3	2,188 m	0.3 %	5.53	0.7 %	320,206 m	100 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		6,903 ha	1.7 %	46.28	5.7 %	120,623 ha	99 %

Jumpoff Joe Creek

Site No 116

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	19 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	11,227	ha	Developed	1 %	GAP 2	0 %	US State:	4 %	BC Provincial:	0 %
	27,732	ac	Water	0 %	GAP 3	4 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	96 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	96 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Common Loon (EDU) *Gavia immer*	G5	1 occ	0.7%	342.77	7.7 %	13 occ	385 %
Vascular Plants							
Leafy Pondweed *Potamogeton foliosus*	G5	1 occ	11.1%	495.11	11.1 %	9 occ	89 %
Freshwater Ecological Systems							
small, alluvium, volcanics, 765, shallow		6,854 ha	2.4%	351.05	7.9 %	87,000 ha	99 %
small, alluvium, intrusives, elevation 919, shallow		4,374 ha	1.1%	160.89	3.6 %	121,144 ha	109 %

Juniper

Site No 39

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	3,283	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	70 %
	8,108	ac	Water	0 %	GAP 3	70 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	30 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	30 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Chinook Salmon *Oncorhynchus tshawytscha*		1,873 m	0.1 %	3.08	0.2 %	1,033,242 m	175 %
Freshwater Ecological Systems							
small, volcanics, elevation 1303, intermediate/steep		3,283 ha	3.3 %	184.73	10.9 %	30,225 ha	98 %

Kettle

Site No 54

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	4 %	GAP 1	1 %	US National	0 %	Can National:	0 %
Area:	100,690	ha	Developed	0 %	GAP 2	1 %	US State:	0 %	BC Provincial:	87 %
	248,703	ac	Water	0 %	GAP 3	85 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	13 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	13 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	29 occ	5.1%	1,108.41	223.1 %	13 occ	3308 %
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	34 occ	12.1%	675.75	136.0 %	25 occ	664 %
Fishes							
Speckled dace *Rhinichthys osculus*	G5	41,006 m	24.5%	405.86	81.7 %	50,201 m	248 %
Leopard dace *Rhinichthys falcatus*	G4	14 m	0.0%	0.32	0.1 %	20,936 m	260 %
Chiselmouth *Acrocheilus alutaceus*	G5	5,624 m	4.1%	67.23	13.5 %	41,564 m	226 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		6,676 ha	0.8%	13.52	2.7 %	245,439 ha	103 %
small, intrusives, elevation 1151, shallow		8,207 ha	0.8%	13.63	2.7 %	299,161 ha	103 %
intermediate, intrusives, elevation 1032, shallow, glacial		85,806 ha	37.7%	624.59	125.7 %	68,260 ha	267 %

Kingfisher

Site No 31

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	13 %	US National	0 %	Can National:	0 %
Area:	11,239	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	98 %
	27,760	ac	Water	0 %	GAP 3	85 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	2 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	2 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Coho Salmon *Oncorhynchus kisutch*		27,638 m	0.7 %	11.52	2.3 %	1,191,947 m	163 %
Bull trout *Salvelinus confluentus*	G3	829 m	0.1 %	1.29	0.3 %	320,206 m	100 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		11,239 ha	2.8 %	46.28	9.3 %	120,623 ha	99 %

Lake Pateros

Site No 123

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	36 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	6,767	ha	Developed	1 %	GAP 2	6 %	US State:	1 %	BC Provincial:	0 %
	16,714	ac	Water	0 %	GAP 3	1 %	US Local:	5 %	BC Regional:	0 %
					GAP 4	94 %	US Indigenous:	80 %	Can Indigenous:	0 %
							US Private	14 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Common Loon (EDU) *Gavia immer*	G5	1 occ	0.7 %	568.72	7.7 %	13 occ	385 %
Mollusks							
Western ridgemussel (EDU) *Gonidea angulata*	G3	1 occ	50.0 %	295.73	4.0 %	25 occ	8 %
Freshwater Ecological Systems							
large, intrusives, alluvium, elevation 621, shallow		6,767 ha	2.1 %	516.22	7.0 %	96,917 ha	101 %

Lake Wenatchee

Site No 132

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	2 %	GAP 1	3 %	US National	72 %	Can National:	0 %
Area:	33,787 ha	Developed	0 %	GAP 2	27 %	US State:	1 %	BC Provincial:	0 %
	83,453 ac	Water	0 %	GAP 3	42 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	27 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	27 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Common Loon (EDU) *Gavia immer*	G5	6 occ	4.0%	683.43	46.2 %	13 occ	385 %
Harlequin duck (EDU) *Histrionicus histrionicus*		9 occ	15.0%	1,025.14	69.2 %	13 occ	238 %
Fishes							
Chinook Salmon *Oncorhynchus tshawytscha*		188 m	5.8%	173.12	11.7 %	1,608 m	133 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	27,284 m	2.1%	101.96	6.9 %	396,222 m	111 %
Bull trout *Salvelinus confluentus*	G3	59,059 m	11.1%	330.12	22.3 %	264,908 m	131 %
Chinook Salmon *Oncorhynchus tshawytscha*		2,004 m	16.4%	484.88	32.7 %	6,120 m	155 %
Steelhead Salmon *Oncorhynchus mykiss*		1,849 m	14.5%	429.68	29.0 %	6,372 m	138 %
Sockeye Salmon *Oncorhynchus nerka*		23,309 m	52.9%	1,565.80	105.7 %	22,043 m	200 %
Mountain sucker *Catostomus platyrhynchus*	G5	2 occ	100.0%	1,480.76	100.0 %	2 occ	100 %
Umatilla dace *Rhinichthys umatilla*	G4	1 occ	33.3%	493.59	33.3 %	3 occ	100 %
Mollusks							

Western pearlshell (EDU) *Margaritifera falcata*	G4	4	occ	66.7%	455.62	30.8 %	13	occ	38 %
<u>Vascular Plants</u>									
Leafy Pondweed *Potamogeton foliosus*	G5	1	occ	11.1%	164.53	11.1 %	9	occ	89 %
Nuttall's waterweed (EDU) *Elodea nuttalli*	G5	2	occ	33.3%	423.07	28.6 %	7	occ	71 %
<u>Freshwater Ecological Systems</u>									
small, intrusives, volcanics, elevation 1032, shallow, lakes/wetlands		5,671	ha	13.1%	648.01	43.8 %	12,959	ha	75 %
small, intrusives, elevation 1141, shallow		8,905	ha	5.9%	291.56	19.7 %	45,226	ha	121 %
small, intrusives, elevation 1164, shallow		8,799	ha	1.6%	77.81	5.3 %	167,459	ha	111 %
intermediate, intrusives, alluvium, elevation 820, shallow		10,413	ha	2.4%	117.41	7.9 %	131,329	ha	127 %

Little Spokane

Site No 120

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	19 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	13,242 ha	Developed	8 %	GAP 2	0 %	US State:	3 %	BC Provincial:	0 %
	32,708 ac	Water	0 %	GAP 3	4 %	US Local:	1 %	BC Regional:	0 %
				GAP 4	96 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	96 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Mollusks							
Western pearlshell (EDU) *Margaritifera falcata*	G4	1 occ	3.3%	58.13	1.5 %	13 occ	38 %
California floater (EDU) *Anodonta californiensis*	G3	1 occ	3.3%	58.13	1.5 %	13 occ	46 %
Freshwater Ecological Systems							
small, alluvium, volcanics, 765, shallow		7,403 ha	2.6%	321.49	8.5 %	87,000 ha	99 %
small, volcanics, alluvium, elevation 1156, shallow, wetlands		5,839 ha	2.8%	355.86	9.4 %	61,993 ha	128 %

Lone Ranch Creek

Site No 88

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	87 %	Can National:	0 %
Area:	6,028	ha	Developed	0 %	GAP 2	0 %	US State:	1 %	BC Provincial:	0 %
	14,890	ac	Water	0 %	GAP 3	88 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	12 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	12 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		6,028 ha	0.6 %	167.23	2.0 %	299,161 ha	103 %

Lone Valley

Site No 22

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	7,014	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	17,324	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Bull trout *Salvelinus confluentus*	G3	3,840 m	0.2 %	7.93	0.4 %	887,360 m	44 %
Freshwater Ecological Systems							
small, intrusives, sediments, elevation 1279, shallow		7,014 ha	2.3 %	139.82	7.6 %	91,910 ha	21 %

Loon

Site No 17

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	39,325	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	96 %
	97,133	ac	Water	0 %	GAP 3	96 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	4 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	4 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		6,084 m	0.3 %	1.22	0.9 %	707,976 m	126 %
Chinook Salmon *Oncorhynchus tshawytscha*		5,233 m	0.2 %	0.72	0.5 %	1,033,242 m	175 %
Freshwater Ecological Systems							
small, volcanics, elevation 950, shallow, wetlands		8,183 ha	18.9 %	89.49	63.0 %	12,981 ha	63 %
small, volcanics, alluvium, elevation 1156, shallow, wetlands		31,142 ha	7.0 %	33.28	23.4 %	132,841 ha	97 %

Lost Chain

Site No 69

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	3,891	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	9,612	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1597, shallow		3,891 ha	6.3%	2,713.12	21.1 %	18,438 ha	91 %

Louis

Site No 20

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	34,457	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	87 %
	85,108	ac	Water	0 %	GAP 3	87 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	13 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	13 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Coho Salmon *Oncorhynchus kisutch*		104,718 m	2.6%	14.23	8.8 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		75,520 m	2.2%	11.84	7.3 %	1,033,242 m	175 %
Bull trout *Salvelinus confluentus*	G3	10,254 m	1.6%	5.19	3.2 %	320,206 m	100 %
Freshwater Ecological Systems							
small, intrusives, elevation 1164, shallow		34,457 ha	15.4%	83.41	51.5 %	66,929 ha	130 %

Lower Bonaparte Creek

Site No 103

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	4 %	GAP 1	1 %	US National	11 %	Can National:	0 %
Area:	14,087 ha	Developed	0 %	GAP 2	0 %	US State:	13 %	BC Provincial:	0 %
	34,794 ac	Water	0 %	GAP 3	24 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	75 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	75 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	1 occ	0.4 %	273.20	7.7 %	13 occ	700 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		1 m	0.0 %	0.00	0.0 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		1 m	0.0 %	2.21	0.1 %	1,608 m	133 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		14,087 ha	1.4 %	167.24	4.7 %	299,161 ha	103 %

Lower Loup Creek

Site No 115

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	14 %	GAP 1	0 %	US National	5 %	Can National:	0 %
Area:	6,297	ha	Developed	1 %	GAP 2	6 %	US State:	27 %	BC Provincial:	0 %
	15,552	ac	Water	0 %	GAP 3	26 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	68 %	US Indigenous:	47 %	Can Indigenous:	0 %
							US Private	22 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		1 m	0.0 %	1.25	0.0 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		30 m	0.9 %	148.24	1.9 %	1,608 m	133 %
Mollusks							
California floater (EDU) *Anodonta californiensis*	G3	1 occ	16.7 %	611.20	7.7 %	13 occ	46 %
Freshwater Ecological Systems							
large, intrusives, alluvium, elevation 621, shallow		6,297 ha	1.9 %	516.25	6.5 %	96,917 ha	101 %

Lynch

Site No 73

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	81 %	US National	0 %	Can National:	0 %
Area:	18,333	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	45,283	ac	Water	0 %	GAP 3	19 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		18,334 ha	2.2 %	203.85	7.5 %	245,439 ha	103 %

Maka

Site No 63

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	15,894	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	39,258	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Coho Salmon *Oncorhynchus kisutch*		42,746 m	1.1%	12.60	3.6 %	1,191,947 m	163 %
Steelhead Salmon *Oncorhynchus mykiss*		78,285 m	3.3%	38.84	11.1 %	707,976 m	126 %
Chinook Salmon *Oncorhynchus tshawytscha*		42,746 m	1.2%	14.53	4.1 %	1,033,242 m	175 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		15,894 ha	4.0%	46.28	13.2 %	120,623 ha	99 %

McNulty

Site No 70

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	14,988	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	37,021	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1417, shallow		14,988 ha	3.9 %	431.39	12.9 %	115,974 ha	117 %

Medicine - Cornwal

Site No 38

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	6 %	US National	0 %	Can National:	0 %
Area:	11,085	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	78 %
	27,380	ac	Water	0 %	GAP 3	72 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	22 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	22 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, alluvium, elevation 1098, shallow		5,891 ha	5.1 %	86.42	17.2 %	34,333 ha	83 %
small, volcanics, elevation 1303, intermediate/steep		5,194 ha	5.2 %	86.55	17.2 %	30,225 ha	98 %

Methow River

Site No 104

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	1 %	US National	95 %	Can National:	0 %
Area:	31,266	ha	Developed	0 %	GAP 2	94 %	US State:	0 %	BC Provincial:	0 %
	77,227	ac	Water	0 %	GAP 3	1 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	5 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		761 m	6.0%	191.10	11.9 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		220 m	1.8%	57.52	3.6 %	6,120 m	155 %
Chinook Salmon *Oncorhynchus tshawytscha*		115 m	3.6%	114.44	7.2 %	1,608 m	133 %
Bull trout *Salvelinus confluentus*	G3	39,628 m	7.5%	239.36	15.0 %	264,908 m	131 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	19,335 m	1.5%	78.08	4.9 %	396,222 m	111 %
Freshwater Ecological Systems							
small, sediments, elevation 1683, shallow		12,212 ha	4.7%	251.05	15.7 %	77,836 ha	93 %
small, intrusives, elevation 1164, shallow		9,795 ha	1.8%	93.60	5.8 %	167,459 ha	111 %
small, intrusives, elevation 1151, shallow		9,259 ha	0.9%	49.52	3.1 %	299,161 ha	103 %

Middle - Lower North Thompson

Site No 6

Thompson EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	7 %	GAP 1	11 %	US National	0 %	Can National:	0 %
Area:	162,358 ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	80 %
	401,025 ac	Water	0 %	GAP 3	69 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	20 %	US Indigenous:	0 %	Can Indigenous:	3 %
						US Private	0 %	Can Private:	17 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	3 occ	8.8 %	7.94	23.1 %	13 occ	115 %
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		191,459 m	8.9 %	10.23	29.8 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		279,477 m	7.0 %	8.06	23.4 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		282,526 m	8.2 %	9.40	27.3 %	1,033,242 m	175 %
Bull trout *Salvelinus confluentus*	G3	89,663 m	14.0 %	9.63	28.0 %	320,206 m	100 %
Leopard dace *Rhinichthys falcatus*	G4	28,522 m	9.8 %	11.22	32.6 %	87,410 m	190 %
Mountain sucker - N. Thompson *Catostomus platyrhynchus*	G5	54,939 m	90.5 %	103.69	301.5 %	18,219 m	302 %
Freshwater Ecological Systems							
small, volcanics, alluvium, elevation 1442, shallow, lakes		10,769 ha	16.4 %	18.77	54.6 %	19,724 ha	150 %
large, intrusives, alluvium, elevation 621, shallow		92,547 ha	59.1 %	67.69	196.8 %	47,015 ha	197 %
small, alluvium, elevation 1098, shallow		13,336 ha	11.7 %	13.36	38.8 %	34,333 ha	83 %

small, alluvium, intrusives, elevation 919, shallow	15,735 ha	11.2%	12.82	37.3 %	42,213 ha	96 %
small, intrusives, elevation 1417, shallow	29,972 ha	6.8%	7.84	22.8 %	131,455 ha	100 %

Mill Creek Headwaters

Site No 113

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	5,026 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	12,415 ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		5,026 ha	0.5%	167.22	1.7 %	299,161 ha	103 %

Mission

Site No 56

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	8 %	US National	0 %	Can National:	0 %
Area:	46,000	ha	Developed	2 %	GAP 2	0 %	US State:	0 %	BC Provincial:	85 %
	113,620	ac	Water	0 %	GAP 3	76 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	15 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	15 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	5 occ	1.9 %	418.31	38.5 %	13 occ	700 %
Insects							
Western river cruiser (EDU) *Macromia magnifica*	G4	2 occ	7.1 %	167.33	15.4 %	13 occ	200 %
Freshwater Ecological Systems							
small, intrusives, elevation 1450, shallow		28,464 ha	18.7 %	676.91	62.2 %	45,734 ha	216 %
small, intrusives, elevation 1522, shallow		2,872 ha	0.4 %	12.73	1.2 %	245,439 ha	103 %
small, volcanics, alluvium, elevation 1156, shallow, wetlands		14,664 ha	7.1 %	257.27	23.7 %	61,993 ha	128 %

Monte

Site No 41

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	18,464	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	93 %
	45,606	ac	Water	0 %	GAP 3	93 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	7 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	7 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Coho Salmon *Oncorhynchus kisutch*		9,816 m	0.2%	2.49	0.8 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		9,816 m	0.3%	2.87	1.0 %	1,033,242 m	175 %
Freshwater Ecological Systems							
small, intrusives, elevation 1417, shallow		18,464 ha	4.2%	42.47	14.0 %	131,455 ha	100 %

Myers Creek Headwaters

Site No 95

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	6 %	GAP 1	0 %	US National	60 %	Can National:	0 %
Area:	7,089	ha	Developed	0 %	GAP 2	0 %	US State:	6 %	BC Provincial:	0 %
	17,511	ac	Water	0 %	GAP 3	67 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	33 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	33 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Common Loon (EDU) *Gavia immer*	G5	6 occ	4.0 %	3,257.11	46.2 %	13 occ	385 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		7,089 ha	0.7 %	167.23	2.4 %	299,161 ha	103 %

Nikwikwaia

Site No 21

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	9,857	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	95 %
	24,346	ac	Water	0 %	GAP 3	95 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	5 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		10,256 m	0.5 %	9.03	1.6 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		10,256 m	0.3 %	4.87	0.9 %	1,191,947 m	163 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		9,857 ha	2.5 %	46.28	8.2 %	120,623 ha	99 %

Ninemile Creek Headwaters

Site No 117

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	9,160	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	22,624	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	100 %	US Indigenous:	100 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		9,160 ha	0.9 %	167.24	3.1 %	299,161 ha	103 %

North Okanagan

Site No 46

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	4 %	US National	0 %	Can National:	0 %
Area:	73,606	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	93 %
	181,808	ac	Water	0 %	GAP 3	89 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	7 %	US Indigenous:	0 %	Can Indigenous:	1 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Insects							
Twelve-spotted skimmer (EDU) *Libellula pulchella*	G5	4 occ	5.8 %	209.14	30.8 %	13 occ	400 %
Lance-tipped darner *Aechna constricta*	G5	2 occ	8.3 %	104.57	15.4 %	13 occ	154 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		42,068 ha	4.2 %	95.58	14.1 %	299,161 ha	103 %
small, alluvium, intrusives, elevation 919, shallow		14,849 ha	3.7 %	83.31	12.3 %	121,144 ha	109 %
small, intrusives, elevation 1417, shallow		16,689 ha	4.3 %	97.81	14.4 %	115,974 ha	117 %

Okanagan

Site No 49

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	9 %	GAP 1	9 %	US National	0 %	Can National:	1 %
Area:	195,266 ha	Developed	6 %	GAP 2	4 %	US State:	0 %	BC Provincial:	58 %
	482,308 ac	Water	0 %	GAP 3	48 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	40 %	US Indigenous:	0 %	Can Indigenous:	13 %
						US Private	0 %	Can Private:	27 %
						US NGO	0 %	Can NGO:	1 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	98 occ	34.9%	1,004.36	392.0 %	25 occ	664 %
Western toad (EDU) *Bufo boreas*	G4	29 occ	11.3%	571.56	223.1 %	13 occ	700 %
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	313 occ	54.5%	6,168.86	2407.7 %	13 occ	3308 %
Birds							
American avocet (EDU) *Recurvirostra americana*	G5	2 occ	100.0%	39.42	15.4 %	13 occ	15 %
Western grebe (EDU) *Aechmophorus occidentalis*	G5	1 occ	50.0%	19.71	7.7 %	13 occ	15 %
American bittern (EDU) *Botaurus lentiginosus*	G4	1 occ	50.0%	19.71	7.7 %	13 occ	8 %
Trumpeter swan (S. Thompson R.) (EDU) *Cygnus buccinator*	G4	9 nst	90.0%	329.42	128.6 %	7 nst	129 %
Sandhill Crane (EDU) *Grus canadensis*	G5	8 occ	72.7%	292.82	114.3 %	7 occ	143 %
Long-billed curlew (EDU) *Numenius americanus*	G5	20 nst	54.1%	134.85	52.6 %	38 nst	89 %
Wilson's phalarope (EDU) *Phalaropus tricolor*	G5	2 occ	100.0%	39.42	15.4 %	13 occ	15 %
Fishes							

Leopard dace *Rhinichthys falcatus*	G4	2,288	m	3.3%	28.01	10.9%	20,936	m	260 %
Pygmy whitefish - Okanagan Lake *Prosopium coulteri*	G5	124,371	m	98.7%	842.60	328.9%	37,818	m	331 %
Lake chub *Cousius plumbeus*	G5	1,143	m	2.2%	18.83	7.3%	15,561	m	315 %
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	563	m	0.2%	1.97	0.8%	73,151	m	172 %
Chinook Salmon *Oncorhynchus tshawytscha*		1	m	0.0%	0.16	0.1%	1,608	m	133 %
Steelhead Salmon *Oncorhynchus mykiss*		1	m	0.0%	0.00	0.0%	6,372	m	138 %
Sockeye Salmon *Oncorhynchus nerka*		174,678	m	89.1%	456.63	178.2%	98,012	m	194 %
Bull trout *Salvelinus confluentus*	G3	3,509	m	0.7%	3.39	1.3%	264,908	m	131 %
Chiselmouth *Acrocheilus alutaceus*	G5	75,785	m	54.7%	467.17	182.3%	41,564	m	226 %
<u>Insects</u>									
Lance-tipped darner *Aechna constricta*	G5	17	occ	70.8%	335.05	130.8%	13	occ	154 %
Western river cruiser (EDU) *Macromia magnifica*	G4	22	occ	78.6%	433.59	169.2%	13	occ	200 %
Twelve-spotted skimmer (EDU) *Libellula pulchella*	G5	42	occ	60.9%	827.77	323.1%	13	occ	400 %
Pronghorn clubtail (EDU) *Gomphus graslinellus*	G5	24	occ	82.8%	245.97	96.0%	25	occ	96 %
nez Perce dancer (EDU) *Argia emma*	G5	1	occ	50.0%	19.71	7.7%	13	occ	15 %
Western pondhawk (EDU) *Erythemis collocata*	G5	3	occ	100.0%	59.13	23.1%	13	occ	23 %
<u>Reptiles</u>									
Painted Turtle *Chrysemys picta*	G5	2	occ	66.7%	39.42	15.4%	13	occ	23 %
<u>Freshwater Ecological Systems</u>									
intermediate, intrusives, elevation 722, shallow, lakes		150,288	ha	91.1%	777.91	303.6%	49,499	ha	304 %
small, intrusives, elevation 1151, shallow		6,911	ha	0.7%	5.92	2.3%	299,161	ha	103 %
small, alluvium, volcanics, 765, shallow		1,529	ha	0.5%	4.50	1.8%	87,000	ha	99 %
small, intrusives, alluvium, elevation 1058, shallow		12,194	ha	9.5%	81.27	31.7%	38,442	ha	91 %

small, volcanics, elevation 1303, intermediate/steep	16,225	ha	15.1%	128.97	50.3 %	32,232 ha	85 %
small, alluvium, elevations 1118, shallow	8,120	ha	35.1%	299.96	117.1 %	6,936 ha	117 %

Omak - Salmon

Site No 109

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	16 %	GAP 1	0 %	US National	8 %	Can National:	0 %
Area:	43,958 ha	Developed	4 %	GAP 2	5 %	US State:	14 %	BC Provincial:	0 %
	108,577 ac	Water	0 %	GAP 3	19 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	76 %	US Indigenous:	42 %	Can Indigenous:	0 %
						US Private	36 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	2 occ	0.8%	175.10	15.4 %	13 occ	700 %
Birds							
Common Loon (EDU) *Gavia immer*	G5	8 occ	5.3%	700.39	61.5 %	13 occ	385 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		285 m	2.2%	50.91	4.5 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		83 m	2.6%	58.75	5.2 %	1,608 m	133 %
Mollusks							
Western ridgemussel (EDU) *Gonidea angulata*	G3	1 occ	50.0%	45.53	4.0 %	25 occ	8 %
Vascular Plants							
Leafy Pondweed *Potamogeton foliosus*	G5	2 occ	22.2%	252.92	22.2 %	9 occ	89 %
Nuttall's waterweed (EDU) *Elodea nuttalli*	G5	1 occ	16.7%	162.59	14.3 %	7 occ	71 %
Freshwater Ecological Systems							
large, intrusives, alluvium, elevation 621, shallow		18,946 ha	5.9%	222.49	19.5 %	96,917 ha	101 %

small, intrusives, alluvium, elevation 1058, shallow		14,208 ha	11.1%	420.65	37.0 %	38,442 ha	91 %
small, alluvium, intrusives, elevation 919, shallow		10,805 ha	2.7%	101.51	8.9 %	121,144 ha	109 %

Omak Creek Headwaters

Site No 111

Okanagan EDU

Freshwater Site

Area: 26,864 ha
66,355 ac

Land Use/Land Cover	
Agriculture	1 %
Developed	0 %
Water	0 %

GAP Management Status	
GAP 1	0 %
GAP 2	5 %
GAP 3	0 %
GAP 4	95 %

Land Ownership			
US National	0 %	Can National:	0 %
US State:	0 %	BC Provincial:	0 %
US Local:	0 %	BC Regional:	0 %
US Indigenous:	100 %	Can Indigenous:	0 %
US Private	0 %	Can Private:	0 %
US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		9 m	0.1%	2.63	0.1 %	6,372 m	138 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		19,530 ha	2.0%	121.58	6.5 %	299,161 ha	103 %
small, intrusives, elevation 1417, shallow		7,334 ha	1.9%	117.77	6.3 %	115,974 ha	117 %

Omak Lake

Site No 114

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	3 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	52,296 ha	Developed	0 %	GAP 2	12 %	US State:	0 %	BC Provincial:	0 %
	129,171 ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	88 %	US Indigenous:	100 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1035, shallow, lakes		11,492 ha	10.2 %	325.84	34.1 %	33,741 ha	104 %
intermediate, volcanics, elevation 1001, shallow, lakes/wetlands		16,174 ha	100.0 %	3,189.00	333.3 %	4,852 ha	333 %
small, intrusives, elevation 1151, shallow		13,690 ha	1.4 %	43.78	4.6 %	299,161 ha	103 %
small, alluvium, intrusives, elevation 919, shallow		10,941 ha	2.7 %	86.40	9.0 %	121,144 ha	109 %

Oyama

Site No 55

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	1 %	US National	0 %	Can National:	0 %
Area:	4,411	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	97 %
	10,895	ac	Water	0 %	GAP 3	96 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	3 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, volcanics, alluvium, elevation 1442, shallow, lakes		4,411 ha	100.0 %	7,805.50	333.3 %	1,323 ha	333 %

Park Creek

Site No 112

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	2 %	US National	100 %	Can National:	0 %
Area:	7,464	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	18,437	ac	Water	0 %	GAP 3	97 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	21,226 m	1.6 %	359.06	5.4 %	396,222 m	111 %
Freshwater Ecological Systems							
small, intrusives, elevation 1648, shallow		7,464 ha	9.1 %	2,031.60	30.3 %	24,625 ha	100 %

Pasayten

Site No 85

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	77 %	US National	77 %	Can National:	0 %
Area:	28,450	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	22 %
	70,271	ac	Water	0 %	GAP 3	22 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	1 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal		% of Goal Captured by Portfolio
Freshwater									
Species									
Amphibians									
Western toad (EDU) *Bufo boreas*	G4	1	occ	0.4 %	135.27	7.7 %	13	occ	700 %
Fishes									
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	26,643	m	2.0 %	118.25	6.7 %	396,222	m	111 %
Freshwater Ecological Systems									
small, volcanics, sediments, elevation 1155, shallow		832	ha	35.5 %	2,080.71	118.3 %	703	ha	118 %
small, sediments, elevation 1683, shallow		27,617	ha	10.6 %	623.94	35.5 %	77,836	ha	93 %

Paul Creek (North)

Site No 34

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	4 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	27,286	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	54 %
	67,396	ac	Water	0 %	GAP 3	54 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	46 %	US Indigenous:	0 %	Can Indigenous:	27 %
							US Private	0 %	Can Private:	19 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Leopard dace *Rhinichthys falcatus*	G4	4,103 m	1.4 %	9.60	4.7 %	87,410 m	190 %
Freshwater Ecological Systems							
small, volcanics, alluvium, elevation 1156, shallow, wetlands		27,286 ha	6.2 %	42.03	20.5 %	132,841 ha	97 %

Paul Creek (South)

Site No 82

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	302	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	747	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, alluvium, elevation 1098, shallow, wetlands		302 ha	100.0%	1,283.95	333.1 %	91 ha	333 %

Peachland

Site No 62

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	3 %	US National	0 %	Can National:	0 %
Area:	31,333	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	95 %
	77,392	ac	Water	0 %	GAP 3	92 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	5 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	5 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		2,681 m	5.0 %	265.59	16.6 %	16,118 m	156 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		17,152 ha	1.7 %	91.55	5.7 %	299,161 ha	103 %
small, alluvium, intrusives, elevation 919, shallow		14,181 ha	3.5 %	186.91	11.7 %	121,144 ha	109 %

Pendleton

Site No 4

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	9 %	US National	0 %	Can National:	0 %
Area:	4,369	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	10,791	ac	Water	0 %	GAP 3	91 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1035, shallow, lakes		4,369 ha	100.0 %	4,259.76	333.3 %	1,311 ha	333 %

Peshastin Headwaters

Site No 135

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	75 %	Can National:	0 %
Area:	9,327	ha	Developed	0 %	GAP 2	19 %	US State:	0 %	BC Provincial:	0 %
	23,038	ac	Water	0 %	GAP 3	56 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	25 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	25 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Harlequin duck (EDU) *Histrionicus histrionicus*		1 occ	1.7 %	412.61	7.7 %	13 occ	238 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		7 m	0.1 %	5.89	0.1 %	6,372 m	138 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		9,327 ha	1.1 %	203.84	3.8 %	245,439 ha	103 %

Poison - Gold

Site No 128

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	92 %	Can National:	0 %
Area:	5,010	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	12,375	ac	Water	0 %	GAP 3	92 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	8 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	8 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	2 occ	0.8%	1,536.28	15.4 %	13 occ	700 %
Fishes							
Pygmy whitefish *Prosopium coulteri*	G5	1 occ	50.0%	4,992.91	50.0 %	2 occ	50 %
Freshwater Ecological Systems							
small, intrusives, elevation 1035, shallow, lakes		5,010 ha	4.5%	1,482.74	14.8 %	33,741 ha	104 %

Prospect

Site No 57

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	17,688	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	43,688	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Mammals							
Mountain Beaver, Rainieri Subspecies *Aplodontia rufa rainieri*	G5T4	1 occ	11.1 %	24.28	7.7 %	13 occ	8 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		14,490 ha	3.6 %	37.92	12.0 %	120,623 ha	99 %
small, intrusives, elevation 1597, shallow		3,198 ha	7.9 %	83.46	26.4 %	12,094 ha	87 %

Railroad Creek Lakes

Site No 121

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	100 %	US National	100 %	Can National:	0 %
Area:	6,509	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	0 %
	16,078	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Columbia Spotted Frog (EDU) *Rana luteiventris*	G4	1 occ	1.1 %	591.23	7.7 %	13 occ	254 %
Fishes							
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	16,273 m	1.2 %	315.68	4.1 %	396,222 m	111 %
Freshwater Ecological Systems							
small, intrusives, elevation 1648, shallow		6,509 ha	7.9 %	2,031.59	26.4 %	24,625 ha	100 %

Relay

Site No 24

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	54 %	US National	0 %	Can National:	0 %
Area:	40,564	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	99 %
	100,194	ac	Water	0 %	GAP 3	45 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	1 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Chinook Salmon *Oncorhynchus tshawytscha*		8,223 m	0.1 %	1.18	0.4 %	2,201,209 m	20 %
Bull trout *Salvelinus confluentus*	G3	81,713 m	4.6 %	29.17	9.2 %	887,360 m	44 %
Freshwater Ecological Systems							
small, sediments, elevation 1683, shallow		34,854 ha	6.7 %	70.60	22.3 %	156,401 ha	69 %
small, sediments, elevation 1799, steep		5,709 ha	4.2 %	44.24	14.0 %	40,876 ha	48 %

Rendell

Site No 59

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	4 %	US National	0 %	Can National:	0 %
Area:	36,473	ha	Developed	0 %	GAP 2	1 %	US State:	0 %	BC Provincial:	99 %
	90,089	ac	Water	0 %	GAP 3	94 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	1 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		36,474 ha	4.5 %	203.84	14.9 %	245,439 ha	103 %

Roosevelt Lake

Site No 106
Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	12 %	GAP 1	0 %	US National	36 %	Can National:	0 %
Area:	13,534	ha	Developed	0 %	GAP 2	0 %	US State:	7 %	BC Provincial:	0 %
	33,429	ac	Water	0 %	GAP 3	43 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	57 %	US Indigenous:	5 %	Can Indigenous:	0 %
							US Private	52 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Vascular Plants							
Leafy Pondweed *Potamogeton foliosus*	G5	1 occ	11.1 %	410.73	11.1 %	9 occ	89 %
Freshwater Ecological Systems							
large, intrusives, alluvium, elevation 621, shallow		13,534 ha	4.2 %	516.21	14.0 %	96,917 ha	101 %

Salmon River

Site No 37

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	13 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	102,765	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	74 %
	253,829	ac	Water	0 %	GAP 3	74 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	26 %	US Indigenous:	0 %	Can Indigenous:	4 %
							US Private	0 %	Can Private:	22 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	3 occ	8.8 %	12.54	23.1 %	13 occ	115 %
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		87,348 m	4.1 %	7.38	13.6 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		119,947 m	3.0 %	5.47	10.1 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		111,531 m	3.2 %	5.86	10.8 %	1,033,242 m	175 %
Insects							
Twelve-spotted skimmer (EDU) *Libellula pulchella*	G5	3 occ	100.0 %	12.54	23.1 %	13 occ	23 %
Freshwater Ecological Systems							
small, intrusives, elevation 1450, shallow		89,509 ha	37.3 %	67.50	124.2 %	72,041 ha	130 %
small, intrusives, elevation 1151, shallow		13,256 ha	7.1 %	12.84	23.6 %	56,075 ha	100 %

Sanpoil Confluence

Site No 126

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	19 %	GAP 1	0 %	US National	18 %	Can National:	0 %
Area:	28,272	ha	Developed	0 %	GAP 2	38 %	US State:	2 %	BC Provincial:	0 %
	69,831	ac	Water	0 %	GAP 3	20 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	42 %	US Indigenous:	47 %	Can Indigenous:	0 %
							US Private	34 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	1 occ	0.4 %	70.78	4.0 %	25 occ	664 %
Freshwater Ecological Systems							
large, intrusives, alluvium, elevation 621, shallow		28,272 ha	8.8 %	516.22	29.2 %	96,917 ha	101 %

Scatter Creek

Site No 108

Okanagan EDU

Freshwater Site		
Area:	5,932	ha
	14,651	ac

Land Use/Land Cover		
Agriculture	0	%
Developed	0	%
Water	0	%

GAP Management Status		
GAP 1	0	%
GAP 2	0	%
GAP 3	93	%
GAP 4	7	%

Land Ownership					
US National	89	%	Can National:	0	%
US State:	4	%	BC Provincial:	0	%
US Local:	0	%	BC Regional:	0	%
US Indigenous:	3	%	Can Indigenous:	0	%
US Private	4	%	Can Private:	0	%
US NGO	0	%	Can NGO:	0	%

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Common Loon (EDU) *Gavia immer*	G5	4 occ	2.6%	2,595.23	30.8 %	13 occ	385 %
Vascular Plants							
Leafy Pondweed *Potamogeton foliosus*	G5	1 occ	11.1%	937.17	11.1 %	9 occ	89 %
Freshwater Ecological Systems							
small, alluvium, intrusives, elevation 919, shallow		5,932 ha	1.5%	413.01	4.9 %	121,144 ha	109 %

Scotch

Site No 14

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	2 %	US National	0 %	Can National:	0 %
Area:	44,844	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	97 %
	110,765	ac	Water	0 %	GAP 3	95 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	2 %
							US Private	0 %	Can Private:	2 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		42,513 m	2.0%	8.23	6.6 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		38,311 m	1.0%	4.00	3.2 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		32,977 m	1.0%	3.97	3.2 %	1,033,242 m	175 %
Bull trout *Salvelinus confluentus*	G3	28,609 m	4.5%	11.12	8.9 %	320,206 m	100 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		18,175 ha	4.5%	18.76	15.1 %	120,623 ha	99 %
small, intrusives, elevation 1164, shallow		26,669 ha	12.0%	49.61	39.8 %	66,929 ha	130 %

Scottie

Site No 27

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	1 %	US National	0 %	Can National:	0 %
Area:	12,972	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	98 %
	32,041	ac	Water	0 %	GAP 3	97 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	2 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	2 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		20,427 m	0.9 %	12.42	2.9 %	707,976 m	126 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		12,972 ha	6.9 %	99.56	23.1 %	56,075 ha	100 %

Sherman Creek

Site No 102

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	88 %	Can National:	0 %
Area:	19,201	ha	Developed	0 %	GAP 2	11 %	US State:	11 %	BC Provincial:	0 %
	47,427	ac	Water	0 %	GAP 3	88 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	1 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Vascular Plants							
Leafy Pondweed *Potamogeton foliosus*	G5	1 occ	11.1%	289.51	11.1 %	9 occ	89 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		10,524 ha	1.3%	111.72	4.3 %	245,439 ha	103 %
small, intrusives, alluvium, elevation 1058, shallow		8,677 ha	6.8%	588.12	22.6 %	38,442 ha	91 %

Shuswap Lake

Site No 9

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	3 %	US National	0 %	Can National:	0 %
Area:	180,993	ha	Developed	2 %	GAP 2	0 %	US State:	0 %	BC Provincial:	86 %
	447,052	ac	Water	0 %	GAP 3	83 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	14 %	US Indigenous:	0 %	Can Indigenous:	1 %
							US Private	0 %	Can Private:	13 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal		% of Goal Captured by Portfolio
Freshwater									
Species									
Birds									
Western grebe (EDU) *Aechmophorus occidentalis*	G5	1	occ	100.0%	2.37	7.7 %	13	occ	8 %
Fishes									
Sockeye Salmon *Oncorhynchus nerka*		278,578	m	13.0%	13.36	43.3 %	643,341	m	198 %
Coho Salmon *Oncorhynchus kisutch*		290,861	m	7.3%	7.53	24.4 %	1,191,947	m	163 %
Steelhead Salmon *Oncorhynchus mykiss*		110,430	m	4.7%	4.81	15.6 %	707,976	m	126 %
Chinook Salmon *Oncorhynchus tshawytscha*		253,738	m	7.4%	7.57	24.6 %	1,033,242	m	175 %
Leopard dace *Rhinichthys falcatus*	G4	102,801	m	35.3%	36.28	117.6 %	87,410	m	190 %
Pygmy whitefish - Okanagan Lake *Prosopium coulteri*	G5	2,696	m	51.4%	52.80	171.2 %	1,575	m	171 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	3,061	m	4.0%	4.12	13.4 %	22,926	m	253 %
Lake chub *Cousius plumbeus*	G5	20,315	m	9.2%	9.49	30.8 %	66,039	m	105 %
Freshwater Ecological Systems									
small, intrusives, sediments, elevation 1279, shallow		5,354	ha	4.4%	4.54	14.7 %	36,339	ha	100 %

small, sediments, elevation 1683, shallow	10,725	ha	6.3 %	6.43	20.9 %	51,430	ha	99	%
small, alluvium, intrusives, elevation 919, shallow	13,865	ha	9.9 %	10.13	32.8 %	42,213	ha	96	%
small, volcanics, elevation 1303, intermediate/steep	4,962	ha	4.9 %	5.06	16.4 %	30,225	ha	98	%
small, intrusives, elevation 1417, shallow	22,756	ha	5.2 %	5.34	17.3 %	131,455	ha	100	%
intermediate, intrusives, elevation 722, shallow, lakes	123,330	ha	73.4 %	75.50	244.8 %	50,387	ha	245	%

Shuswap River

Site No 29

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	9 %	GAP 1	3 %	US National	0 %	Can National:	0 %
Area:	118,506	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	80 %
	292,710	ac	Water	0 %	GAP 3	77 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	20 %	US Indigenous:	0 %	Can Indigenous:	1 %
							US Private	0 %	Can Private:	19 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal		% of Goal Captured by Portfolio
Freshwater									
Species									
Birds									
Long-billed curlew (EDU) *Numenius americanus*	G5	4	nst	57.1%	4.96	10.5 %	38	nst	18 %
Fishes									
Sockeye Salmon *Oncorhynchus nerka*		219,197	m	10.2%	16.05	34.1 %	643,341	m	198 %
Coho Salmon *Oncorhynchus kisutch*		255,224	m	6.4%	10.09	21.4 %	1,191,947	m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		245,234	m	7.1%	11.18	23.7 %	1,033,242	m	175 %
Bull trout *Salvelinus confluentus*	G3	12,386	m	1.9%	1.82	3.9 %	320,206	m	100 %
Leopard dace *Rhinichthys falcatus*	G4	7,949	m	2.7%	4.28	9.1 %	87,410	m	190 %
Lake chub *Cousius plumbeus*	G5	1,565	m	0.7%	1.12	2.4 %	66,039	m	105 %
Chiselmouth *Acrocheilus alutaceus*	G5	16,113	m	19.2%	30.22	64.1 %	25,119	m	99 %
Freshwater Ecological Systems									
intermediate, intrusives, elevation 1032, shallow, glacial		118,506	ha	23.9%	37.46	79.5 %	149,030	ha	80 %

Similkameen - Skagit

Site No 74

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	5 %	GAP 1	14 %	US National	0 %	Can National:	0 %
Area:	104,665	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	78 %
	258,522	ac	Water	0 %	GAP 3	65 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	22 %	US Indigenous:	0 %	Can Indigenous:	8 %
							US Private	0 %	Can Private:	13 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	1 occ	0.4 %	19.12	4.0 %	25 occ	664 %
Western toad (EDU) *Bufo boreas*	G4	3 occ	1.2 %	110.31	23.1 %	13 occ	700 %
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	45 occ	7.8 %	1,654.63	346.2 %	13 occ	3308 %
Birds							
Long-billed curlew (EDU) *Numenius americanus*	G5	4 nst	10.8 %	50.32	10.5 %	38 nst	89 %
Fishes							
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	76,074 m	31.2 %	497.10	104.0 %	73,151 m	172 %
Mountain sucker - N. Thompson *Catostomus platyrhynchus*	G5	34,588 m	51.9 %	827.69	173.2 %	19,975 m	295 %
Lake chub *Cousius plumbeus*	G5	46,899 m	90.4 %	1,440.66	301.4 %	15,561 m	315 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	26 m	0.0 %	0.03	0.0 %	396,222 m	111 %
Leopard dace *Rhinichthys falcatus*	G4	48,885 m	70.1 %	1,116.12	233.5 %	20,936 m	260 %
Umatilla dace *Rhinichthys umatilla*	G4	48,885 m	78.0 %	745.41	155.9 %	31,348 m	166 %

Chum Salmon *Oncorhynchus keta*		12,933	m	100.0%	956.08	200.0 %	6,466	m	200	%
Coho Salmon *Oncorhynchus kisutch*		12,933	m	100.0%	1,593.30	333.3 %	3,880	m	333	%
Sockeye Salmon *Oncorhynchus nerka*		12,933	m	24.1%	383.55	80.2 %	16,118	m	156	%
Pink Salmon *Oncorhynchus gorbuscha*		12,933	m	100.0%	956.08	200.0 %	6,466	m	200	%
Chiselmouth *Acrocheilus alutaceus*	G5	836	m	0.6%	9.62	2.0 %	41,564	m	226	%
Mammals										
Mountain Beaver, Rainieri Subspecies *Aplodontia rufa rainieri*	G5T4	9	occ	7.9%	330.93	69.2 %	13	occ	377	%
Freshwater Ecological Systems										
intermediate, intrusives, elevation 1032, shallow, glacial		85,644	ha	37.6%	599.73	125.5 %	68,260	ha	267	%
small, intrusives, elevation 1522, shallow		14,902	ha	1.8%	29.02	6.1 %	245,439	ha	103	%
small, sediments, elevation 1799, steep		1,196	ha	5.2%	82.30	17.2 %	6,946	ha	78	%
small, volcanics, elevation 1303, intermediate/steep		2,923	ha	2.7%	43.35	9.1 %	32,232	ha	85	%

Similkameen Confluence

Site No 84

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	13 %	GAP 1	4 %	US National	23 %	Can National:	0 %
Area:	61,151 ha	Developed	1 %	GAP 2	0 %	US State:	6 %	BC Provincial:	9 %
	151,044 ac	Water	0 %	GAP 3	34 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	62 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	62 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal		% of Goal Captured by Portfolio
Freshwater									
Species									
Amphibians									
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	11	occ	1.9%	692.27	84.6 %	13	occ	3308 %
Tiger Salamander (EDU) *Ambystoma tigrinum*	G5	3	occ	1.1%	98.18	12.0 %	25	occ	664 %
Western toad (EDU) *Bufo boreas*	G4	14	occ	5.4%	881.07	107.7 %	13	occ	700 %
Birds									
Long-billed curlew (EDU) *Numenius americanus*	G5	6	nst	16.2%	129.18	15.8 %	38	nst	89 %
Sandhill Crane (EDU) *Grus canadensis*	G5	2	occ	18.2%	233.75	28.6 %	7	occ	143 %
Common Loon (EDU) *Gavia immer*	G5	8	occ	5.3%	503.47	61.5 %	13	occ	385 %
Fishes									
Chinook Salmon *Oncorhynchus tshawytscha*		239	m	7.4%	121.60	14.9 %	1,608	m	133 %
Umatilla dace *Rhinichthys umatilla*	G4	1	occ	33.3%	272.71	33.3 %	3	occ	100 %
Steelhead Salmon *Oncorhynchus mykiss*		1	m	0.0%	0.00	0.0 %	6,372	m	138 %
Sockeye Salmon *Oncorhynchus nerka*		15,669	m	8.0%	130.79	16.0 %	98,012	m	194 %
Insects									

Twelve-spotted skimmer (EDU) *Libellula pulchella*	G5	1 occ	1.4 %	62.93	7.7 %	13 occ	400 %
Freshwater Ecological Systems							
small, intrusives, volcanics, elevation 1032, shallow, lakes/wetlands		4,031 ha	9.3 %	254.49	31.1 %	12,959 ha	75 %
large, intrusives, alluvium, elevation 621, shallow		24,422 ha	7.6 %	206.16	25.2 %	96,917 ha	101 %
small, intrusives, elevation 1151, shallow		1,283 ha	0.1 %	3.51	0.4 %	299,161 ha	103 %
small, alluvium, intrusives, elevation 919, shallow		16,016 ha	4.0 %	108.16	13.2 %	121,144 ha	109 %
small, volcanics, elevation 1303, intermediate/steep		4,345 ha	4.0 %	110.29	13.5 %	32,232 ha	85 %
intermediate, intrusives, elevation 1032, shallow, glacial		11,056 ha	4.9 %	132.51	16.2 %	68,260 ha	267 %

Skaha

Site No 76

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	3 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	6,065 ha	Developed	0 %	GAP 2	60 %	US State:	0 %	BC Provincial:	87 %
	14,981 ac	Water	0 %	GAP 3	33 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	6 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	6 %
						US NGO	0 %	Can NGO:	6 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		6,065 ha	0.6 %	167.24	2.0 %	299,161 ha	103 %

Slok

Site No 35

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	5,155	ha	Developed	0 %	GAP 2	2 %	US State:	0 %	BC Provincial:	100 %
	12,733	ac	Water	0 %	GAP 3	98 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, volcanics, elevation 1303, intermediate/steep		5,155 ha	8.0%	667.63	26.8 %	19,247 ha	100 %

Smith

Site No 80

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	10,399	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	25,685	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Leopard dace *Rhinichthys falcatus*	G4	2,164 m	3.1%	497.41	10.3 %	20,936 m	260 %
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	2,164 m	0.9%	142.36	3.0 %	73,151 m	172 %
Mountain sucker - N. Thompson *Catostomus platyrhynchus*	G5	2,164 m	3.3%	521.34	10.8 %	19,975 m	295 %
Chiselmouth *Acrocheilus alutaceus*	G5	2,164 m	1.6%	250.55	5.2 %	41,564 m	226 %
Mammals							
Mountain Beaver, Rainieri Subspecies *Aplodontia rufa rainieri*	G5T4	1 occ	0.9%	370.09	7.7 %	13 occ	377 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		10,399 ha	1.3%	203.84	4.2 %	245,439 ha	103 %

Snehumption

Site No 89

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	91 %	US National	0 %	Can National:	0 %
Area:	6,194	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	98 %
	15,299	ac	Water	0 %	GAP 3	7 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	1 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Insects							
Twelve-spotted skimmer (EDU) *Libellula pulchella*	G5	4 occ	5.8%	2,485.38	30.8 %	13 occ	400 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		6,194 ha	0.8%	203.85	2.5 %	245,439 ha	103 %

Southfork Touts Coulee

Site No 98

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	10 %	Can National:	0 %
Area:	8,885	ha	Developed	0 %	GAP 2	17 %	US State:	90 %	BC Provincial:	0 %
	21,945	ac	Water	0 %	GAP 3	83 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		8,885 ha	1.1 %	203.85	3.6 %	245,439 ha	103 %

Spences

Site No 51

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	4,979	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	12,298	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		5,942 m	0.3 %	9.41	0.8 %	707,976 m	126 %
Freshwater Ecological Systems							
small, intrusives, elevation 1597, shallow		4,979 ha	12.4 %	461.61	41.2 %	12,094 ha	87 %

Spokane River - Deadman Creek

Site No 124

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	30 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	101,424	ha	Developed	9 %	GAP 2	0 %	US State:	8 %	BC Provincial:	0 %
	250,517	ac	Water	0 %	GAP 3	9 %	US Local:	1 %	BC Regional:	0 %
					GAP 4	91 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	91 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Birds							
Common Loon (EDU) *Gavia immer*	G5	2 occ	1.3 %	75.89	15.4 %	13 occ	385 %
Mollusks							
Western pearlshell (EDU) *Margaritifera falcata*	G4	1 occ	13.3 %	30.36	6.2 %	13 occ	38 %
California floater (EDU) *Anodonta californiensis*	G3	2 occ	25.0 %	56.92	11.5 %	13 occ	46 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		8,084 ha	1.0 %	16.25	3.3 %	245,439 ha	103 %
small, alluvium, volcanics, 765, shallow		44,410 ha	15.3 %	251.80	51.0 %	87,000 ha	99 %
small, volcanics, alluvium, elevation 1137, shallow, lakes/wetlands		39,786 ha	26.7 %	438.28	88.9 %	44,778 ha	89 %
small, alluvium, intrusives, elevation 919, shallow		9,144 ha	2.3 %	37.23	7.5 %	121,144 ha	109 %

Stein

Site No 52

Middle Fraser EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	100 %	US National	0 %	Can National:	0 %
Area:	108,494	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	267,980	ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance		% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal		% of Goal Captured by Portfolio
Freshwater									
Species									
Fishes									
Coho Salmon *Oncorhynchus kisutch*		78,659	m	2.8%	11.22	9.5 %	830,126	m	61 %
Steelhead Salmon *Oncorhynchus mykiss*		184,378	m	13.5%	53.40	45.1 %	408,924	m	132 %
Chinook Salmon *Oncorhynchus tshawytscha*		88,579	m	1.2%	4.77	4.0 %	2,201,209	m	20 %
Leopard dace *Rhinichthys falcatus*	G4	6,708	m	1.5%	5.84	4.9 %	136,043	m	5 %
Freshwater Ecological Systems									
small, intrusives, elevation 1450, shallow		52,777	ha	19.5%	77.11	65.1 %	81,072	ha	145 %
small, intrusives, elevation 1522, shallow		25,875	ha	15.2%	59.98	50.6 %	51,094	ha	51 %
small, sediments, elevation 1683, shallow		29,843	ha	5.7%	22.60	19.1 %	156,401	ha	69 %

Thompson - Kamloops

Site No 32

Thompson EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	5 %	GAP 1	11 %	US National	0 %	Can National:	0 %
Area:	102,609 ha	Developed	2 %	GAP 2	7 %	US State:	0 %	BC Provincial:	84 %
	253,444 ac	Water	0 %	GAP 3	66 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	16 %	US Indigenous:	0 %	Can Indigenous:	2 %
						US Private	0 %	Can Private:	14 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	6 occ	17.6%	25.11	46.2 %	13 occ	115 %
Birds							
Long-billed curlew (EDU) *Numenius americanus*	G5	1 nst	14.3%	1.43	2.6 %	38 nst	18 %
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		121,810 m	5.7%	10.30	18.9 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		138,750 m	3.5%	6.33	11.6 %	1,191,947 m	163 %
Steelhead Salmon *Oncorhynchus mykiss*		280,823 m	11.9%	21.58	39.7 %	707,976 m	126 %
Chinook Salmon *Oncorhynchus tshawytscha*		170,019 m	4.9%	8.95	16.5 %	1,033,242 m	175 %
Bull trout *Salvelinus confluentus*	G3	3,438 m	0.5%	0.58	1.1 %	320,206 m	100 %
Leopard dace *Rhinichthys falcatus*	G4	22,373 m	7.7%	13.93	25.6 %	87,410 m	190 %
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	621 m	2.8%	5.04	9.3 %	6,702 m	224 %
Freshwater Ecological Systems							

large, intrusives, elevation 546, shallow		69,860 ha	59.4 %	107.75	198.0 %	35,277 ha	198 %
small, intrusives, elevation 1151, shallow		14,111 ha	7.5 %	13.69	25.2 %	56,075 ha	100 %
small, alluvium, intrusives, elevation 919, shallow		10,961 ha	7.8 %	14.13	26.0 %	42,213 ha	96 %
small, volcanics, elevation 1303, intermediate/steep		7,676 ha	7.6 %	13.82	25.4 %	30,225 ha	98 %

Tom

Site No 15

Middle Fraser EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	100 %	US National	0 %	Can National:	0 %
Area:	3,063 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	7,565 ac	Water	0 %	GAP 3	0 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Freshwater Ecological Systems							
small, intrusives, elevation 1597, shallow		3,063 ha	5.9 %	829.62	19.8 %	15,492 ha	20 %

Toroda Creek

Site No 90

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	1 %	US National	56 %	Can National:	0 %
Area:	37,012	ha	Developed	0 %	GAP 2	0 %	US State:	13 %	BC Provincial:	0 %
	91,419	ac	Water	0 %	GAP 3	67 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	31 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	31 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Columbia Spotted Frog (EDU) *Rana luteiventris*	G4	6 occ	6.6 %	623.88	46.2 %	13 occ	254 %
Birds							
Common Loon (EDU) *Gavia immer*	G5	5 occ	3.3 %	519.90	38.5 %	13 occ	385 %
Fishes							
Lake chub *Cousius plumbeus*	G5	1 occ	100.0 %	1,351.74	100.0 %	1 occ	100 %
Freshwater Ecological Systems							
small, intrusives, elevation 1164, shallow		22,843 ha	4.1 %	184.39	13.6 %	167,459 ha	111 %
small, alluvium, elevation 1098, shallow		5,663 ha	55.7 %	2,509.73	185.7 %	3,050 ha	186 %
small, alluvium, intrusives, elevation 919, shallow		8,505 ha	2.1 %	94.90	7.0 %	121,144 ha	109 %

Tranquille

Site No 28

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	15 %	US National	0 %	Can National:	0 %
Area:	44,192	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	98 %
	109,155	ac	Water	0 %	GAP 3	83 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	2 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	2 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		1,668 m	0.1 %	0.33	0.3 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		16,713 m	0.4 %	1.77	1.4 %	1,191,947 m	163 %
Steelhead Salmon *Oncorhynchus mykiss*		16,713 m	0.7 %	2.98	2.4 %	707,976 m	126 %
Chinook Salmon *Oncorhynchus tshawytscha*		16,713 m	0.5 %	2.04	1.6 %	1,033,242 m	175 %
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	14,408 m	64.5 %	271.59	215.0 %	6,702 m	224 %
Freshwater Ecological Systems							
small, volcanics, alluvium, elevation 1156, shallow, wetlands		44,192 ha	10.0 %	42.03	33.3 %	132,841 ha	97 %

Tulameen

Site No 72

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	15 %	US National	0 %	Can National:	0 %
Area:	40,786	ha	Developed	1 %	GAP 2	0 %	US State:	0 %	BC Provincial:	93 %
	100,741	ac	Water	0 %	GAP 3	78 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	7 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	7 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		20 m	0.0%	1.52	0.1 %	16,118 m	156 %
Umatilla dace *Rhinichthys umatilla*	G4	1,336 m	2.1%	52.29	4.3 %	31,348 m	166 %
Leopard dace *Rhinichthys falcatus*	G4	20 m	0.0%	1.18	0.1 %	20,936 m	260 %
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	12,926 m	5.3%	216.76	17.7 %	73,151 m	172 %
Mountain sucker - N. Thompson *Catostomus platyrhynchus*	G5	21,813 m	32.8%	1,339.51	109.2 %	19,975 m	295 %
Mammals							
Mountain Beaver, Rainieri Subspecies *Aplodontia rufa rainieri*	G5T4	24 occ	21.1%	2,264.58	184.6 %	13 occ	377 %
Freshwater Ecological Systems							
small, intrusives, sediments, elevation 1279, shallow		7,765 ha	20.9%	854.09	69.6 %	11,152 ha	70 %
intermediate, intrusives, alluvium, elevation 820, shallow		29,692 ha	6.8%	277.33	22.6 %	131,329 ha	127 %
small, intrusives, elevation 1597, shallow		3,329 ha	5.4%	221.47	18.1 %	18,438 ha	91 %

Twentymile Headwaters

Site No 101

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	98 %	Can National:	0 %
Area:	4,533	ha	Developed	0 %	GAP 2	2 %	US State:	2 %	BC Provincial:	0 %
	11,195	ac	Water	0 %	GAP 3	98 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Columbia Spotted Frog (EDU) *Rana luteiventris*	G4	3 occ	3.3%	2,547.21	23.1 %	13 occ	254 %
Western toad (EDU) *Bufo boreas*	G4	1 occ	0.4%	849.07	7.7 %	13 occ	700 %
Fishes							
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	4,680 m	0.4%	130.37	1.2 %	396,222 m	111 %
Freshwater Ecological Systems							
small, intrusives, elevation 1597, shallow		4,533 ha	7.4%	2,713.69	24.6 %	18,438 ha	91 %

Upper Loup Creek

Site No 110

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	3 %	Can National:	0 %
Area:	5,304	ha	Developed	0 %	GAP 2	0 %	US State:	90 %	BC Provincial:	0 %
	13,102	ac	Water	0 %	GAP 3	92 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	8 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	8 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		1 m	0.0 %	0.00	0.0 %	6,372 m	138 %
Freshwater Ecological Systems							
small, intrusives, elevation 1151, shallow		5,304 ha	0.5 %	167.22	1.8 %	299,161 ha	103 %

Upper North Thompson Tributaries

Site No 2

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	33,959	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	83,880	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Bull trout *Salvelinus confluentus*	G3	46,818 m	7.3%	24.04	14.6 %	320,206 m	100 %
Freshwater Ecological Systems							
small, volcanics, sediments, elevation 1155, shallow		3,935 ha	22.2%	121.55	73.9 %	5,322 ha	74 %
small, sediments, elevation 1683, shallow		6,146 ha	3.6%	19.65	12.0 %	51,430 ha	99 %
small, intrusives, elevation 1758, shallow, glacial		11,404 ha	8.0%	43.69	26.6 %	42,915 ha	102 %
small, intrusives, elevation 1648, shallow		12,475 ha	14.0%	76.87	46.8 %	26,678 ha	105 %

Upper Shuswap Tributaries

Site No 36

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	64 %	US National	0 %	Can National:	0 %
Area:	24,274	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	59,958	ac	Water	0 %	GAP 3	36 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Bull trout *Salvelinus confluentus*	G3	20,611 m	3.2 %	14.80	6.4 %	320,206 m	100 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		1,279 ha	0.3 %	2.44	1.1 %	120,623 ha	99 %
small, sediments, elevation 1683, shallow		8,349 ha	4.9 %	37.34	16.2 %	51,430 ha	99 %
small, sediments, elevation 1799, steep		1,252 ha	1.3 %	9.88	4.3 %	29,150 ha	100 %
small, intrusives, elevation 1758, shallow, glacial		13,394 ha	9.4 %	71.78	31.2 %	42,915 ha	102 %

Vaseux

Site No 79

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	6 %	US National	0 %	Can National:	1 %
Area:	21,850	ha	Developed	0 %	GAP 2	1 %	US State:	0 %	BC Provincial:	96 %
	53,969	ac	Water	0 %	GAP 3	89 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	1 %
							US Private	0 %	Can Private:	2 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Great Basin Spadefoot (EDU) *Spea intermontana*	G5	1 occ	0.2 %	176.13	7.7 %	13 occ	3308 %
Western toad (EDU) *Bufo boreas*	G4	1 occ	0.4 %	176.13	7.7 %	13 occ	700 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		1 m	0.0 %	0.00	0.0 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		1 m	0.0 %	0.00	0.0 %	1,608 m	133 %
Freshwater Ecological Systems							
small, intrusives, elevation 1417, shallow		21,850 ha	5.7 %	431.40	18.8 %	115,974 ha	117 %

Wells Gray

Site No 1

Thompson EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	94 %	US National	0 %	Can National:	0 %
Area:	469,163 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	99 %
	1,158,832 ac	Water	0 %	GAP 3	6 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	1 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		12,989 m	0.6 %	0.24	2.0 %	643,341 m	198 %
Coho Salmon *Oncorhynchus kisutch*		69,554 m	1.8 %	0.69	5.8 %	1,191,947 m	163 %
Chinook Salmon *Oncorhynchus tshawytscha*		101,890 m	3.0 %	1.17	9.9 %	1,033,242 m	175 %
Insects							
Black-tipped darner (EDU) *Aeshna tuberculifera*	G4	9 occ	100.0 %	8.24	69.2 %	13 occ	69 %
Freshwater Ecological Systems							
small, intrusives, alluvium, elevation 1058, shallow		13,393 ha	29.6 %	11.74	98.7 %	13,572 ha	99 %
small, intrusives, volcanics, elevation 1032, shallow, lakes/wetlands		45,351 ha	37.8 %	14.99	126.0 %	35,993 ha	126 %
small, intrusives, volcanics, elevation 1019, shallow, lakes/wetlands		11,729 ha	7.6 %	3.02	25.4 %	46,182 ha	75 %
small, intrusives, elevation 1758, shallow, glacial		18,838 ha	13.2 %	5.22	43.9 %	42,915 ha	102 %
small, alluvium, elevation 1098, shallow, wetlands		3,685 ha	25.8 %	10.22	85.9 %	4,290 ha	86 %
intermediate, volcanics, alluvium, elevation 1080, shallow, lakes/wetlands		95,270 ha	24.1 %	9.58	80.5 %	118,372 ha	119 %

small, volcanics, alluvium, elevation 1156, shallow, wetlands	8,581	ha	1.9%	0.77	6.5 %	132,841	ha	97	%
small, intrusives, elevation 1597, shallow	2,360	ha	5.9%	2.32	19.5 %	12,094	ha	87	%
small, intrusives, elevation 1417, shallow	31,670	ha	7.2%	2.87	24.1 %	131,455	ha	100	%
small, intrusives, elevation 1907, shallow, glacial	19,441	ha	29.6%	11.73	98.5 %	19,729	ha	99	%
small, volcanics, intrusives, elevation 1418, shallow, lakes/glacial	53,730	ha	42.3%	16.77	140.9 %	38,129	ha	141	%
small, intrusives, elevation 1648, shallow	15,567	ha	17.5%	6.94	58.4 %	26,678	ha	105	%
small, volcanics, alluvium, elevation 1137, shallow, lakes/wetlands	17,051	ha	7.0%	2.79	23.5 %	72,612	ha	101	%
small, intrusives, sediments, 1965, shallow/steep, glacial	3,372	ha	30.6%	12.16	102.2 %	3,301	ha	102	%
small, sediments, elevation 1799, steep	27,807	ha	28.6%	11.35	95.4 %	29,150	ha	100	%
small, sediments, elevation 1683, shallow	13,626	ha	7.9%	3.15	26.5 %	51,430	ha	99	%
small, volcanics, alluvium, elevation 1442, shallow, lakes	18,822	ha	28.6%	11.36	95.4 %	19,724	ha	150	%
small, intrusives, elevation 1522, shallow	38,881	ha	9.7%	3.84	32.2 %	120,623	ha	99	%
small, intrusives, elevation 1450, shallow	4,497	ha	1.9%	0.74	6.2 %	72,041	ha	130	%
small, intrusives, sediments, elevation 1279, shallow	23,955	ha	19.8%	7.84	65.9 %	36,339	ha	100	%
small, volcanics, elevation 1303, intermediate/steep	1,535	ha	1.5%	0.60	5.1 %	30,225	ha	98	%

Wenatchee Confluence

Site No 134

Okanagan EDU

Freshwater Site		
Area:	40,925	ha
	101,085	ac

Land Use/Land Cover		
Agriculture	25	%
Developed	9	%
Water	0	%

GAP Management Status		
GAP 1	0	%
GAP 2	1	%
GAP 3	23	%
GAP 4	76	%

Land Ownership					
US National	15	%	Can National:	0	%
US State:	8	%	BC Provincial:	0	%
US Local:	0	%	BC Regional:	0	%
US Indigenous:	0	%	Can Indigenous:	0	%
US Private	76	%	Can Private:	0	%
US NGO	0	%	Can NGO:	0	%

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Western toad (EDU) *Bufo boreas*	G4	2 occ	0.8%	188.07	15.4 %	13 occ	700 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		255 m	2.0%	48.92	4.0 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		335 m	2.7%	66.92	5.5 %	6,120 m	155 %
Chinook Salmon *Oncorhynchus tshawytscha*		268 m	8.3%	203.75	16.7 %	1,608 m	133 %
Bull trout *Salvelinus confluentus*	G3	16,720 m	3.2%	77.16	6.3 %	264,908 m	131 %
Umatilla dace *Rhinichthys umatilla*	G4	1 occ	33.3%	407.49	33.3 %	3 occ	100 %
Mollusks							
California floater (EDU) *Anodonta californiensis*	G3	1 occ	16.7%	94.04	7.7 %	13 occ	46 %
Freshwater Ecological Systems							
large, intrusives, elevation 546, shallow		30,146 ha	28.9%	1,175.67	96.2 %	31,346 ha	96 %
intermediate, intrusives, alluvium, elevation 820, shallow		10,779 ha	2.5%	100.34	8.2 %	131,329 ha	127 %

Wenatchee River

Site No 133

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	36 %	US National	77 %	Can National:	0 %
Area:	80,917	ha	Developed	1 %	GAP 2	17 %	US State:	2 %	BC Provincial:	0 %
	199,865	ac	Water	0 %	GAP 3	26 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	21 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	21 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Columbia Spotted Frog (EDU) *Rana luteiventris*	G4	5 occ	5.5%	237.80	38.5 %	13 occ	254 %
Birds							
Harlequin duck (EDU) *Histrionicus histrionicus*		11 occ	18.3%	523.17	84.6 %	13 occ	238 %
Fishes							
Steelhead Salmon *Oncorhynchus mykiss*		2,005 m	15.7%	194.55	31.5 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		1,887 m	15.4%	190.64	30.8 %	6,120 m	155 %
Chinook Salmon *Oncorhynchus tshawytscha*		1,110 m	34.5%	426.80	69.0 %	1,608 m	133 %
Bull trout *Salvelinus confluentus*	G3	107,138 m	20.2%	250.06	40.4 %	264,908 m	131 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	99,733 m	7.6%	155.63	25.2 %	396,222 m	111 %
Mollusks							
California floater (EDU) *Anodonta californiensis*	G3	1 occ	16.7%	47.56	7.7 %	13 occ	46 %
Freshwater Ecological Systems							

small, intrusives, elevation 1450, shallow	6,537 ha	4.3%	88.38	14.3 %	45,734 ha	216 %
small, sediments, elevation 1683, shallow	10,336 ha	4.0%	82.10	13.3 %	77,836 ha	93 %
small, intrusives, elevation 1141, shallow	7,566 ha	5.0%	103.44	16.7 %	45,226 ha	121 %
small, intrusives, elevation 1164, shallow	13,104 ha	2.3%	48.38	7.8 %	167,459 ha	111 %
small, intrusives, elevation 1151, shallow	13,179 ha	1.3%	27.24	4.4 %	299,161 ha	103 %
intermediate, intrusives, alluvium, elevation 820, shallow	30,195 ha	6.9%	142.16	23.0 %	131,329 ha	127 %

West Kettle

Site No 58

Okanagan EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	2 %	GAP 1	3 %	US National	0 %	Can National:	0 %
Area:	86,930 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	94 %
	214,717 ac	Water	0 %	GAP 3	91 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	6 %	US Indigenous:	0 %	Can Indigenous:	0 %
						US Private	0 %	Can Private:	6 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Speckled dace *Rhinichthys osculus*	G5	51,991 m	31.1%	596.05	103.6 %	50,201 m	248 %
Freshwater Ecological Systems							
small, intrusives, elevation 1450, shallow		63,901 ha	41.9%	804.13	139.7 %	45,734 ha	216 %
small, intrusives, elevation 1151, shallow		8,287 ha	0.8%	15.94	2.8 %	299,161 ha	103 %
small, volcanics, alluvium, elevation 1156, shallow, wetlands		14,742 ha	7.1%	136.86	23.8 %	61,993 ha	128 %

White River

Site No 129

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	75 %	US National	97 %	Can National:	0 %
Area:	29,328	ha	Developed	0 %	GAP 2	9 %	US State:	0 %	BC Provincial:	0 %
	72,441	ac	Water	0 %	GAP 3	13 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	3 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	3 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Amphibians							
Columbia Spotted Frog (EDU) *Rana luteiventris*	G4	3 occ	3.3%	393.66	23.1 %	13 occ	254 %
Birds							
Harlequin duck (EDU) *Histrionicus histrionicus*		3 occ	5.0%	393.66	23.1 %	13 occ	238 %
Common Loon (EDU) *Gavia immer*	G5	1 occ	0.7%	131.22	7.7 %	13 occ	385 %
Fishes							
Sockeye Salmon *Oncorhynchus nerka*		20,777 m	47.1%	1,607.90	94.3 %	22,043 m	200 %
Steelhead Salmon *Oncorhynchus mykiss*		844 m	6.6%	225.95	13.2 %	6,372 m	138 %
Chinook Salmon *Oncorhynchus tshawytscha*		1,400 m	11.4%	390.23	22.9 %	6,120 m	155 %
Bull trout *Salvelinus confluentus*	G3	22,408 m	4.2%	144.30	8.5 %	264,908 m	131 %
Westslope cutthroat trout *Onchorynchus clarki lewisi*	G4T3	28,649 m	2.2%	123.34	7.2 %	396,222 m	111 %
Freshwater Ecological Systems							
small, intrusives, elevation 1141, shallow		18,678 ha	12.4%	704.52	41.3 %	45,226 ha	121 %

small, intrusives, elevation 1648, shallow		10,650 ha	13.0 %	737.77	43.2 %	24,625 ha	100 %

Whitecap

Site No 42

Middle Fraser EDU

Freshwater Site		Land Use/Land Cover		GAP Management Status		Land Ownership			
		Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	7,481 ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	99 %
	18,477 ac	Water	0 %	GAP 3	99 %	US Local:	0 %	BC Regional:	0 %
				GAP 4	1 %	US Indigenous:	0 %	Can Indigenous:	1 %
						US Private	0 %	Can Private:	0 %
						US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Bull trout *Salvelinus confluentus*	G3	12,806 m	0.7 %	24.79	1.4 %	887,360 m	44 %
Freshwater Ecological Systems							
small, sediments, elevation 1683, shallow		7,481 ha	1.4 %	82.17	4.8 %	156,401 ha	69 %

Willis

Site No 78

Okanagan EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	1 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	23,600	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	91 %
	58,292	ac	Water	0 %	GAP 3	91 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	9 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	9 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Columbia Mottled Sculpin, Hubbsi Subspecies *Cottus bairdi hubbsi*	G5	3,251 m	1.3 %	94.22	4.4 %	73,151 m	172 %
Mountain sucker - N. Thompson *Catostomus platyrhynchus*	G5	447 m	0.7 %	47.40	2.2 %	19,975 m	295 %
Chiselmouth *Acrocheilus alutaceus*	G5	4,117 m	3.0 %	210.00	9.9 %	41,564 m	226 %
Mammals							
Mountain Beaver, Rainieri Subspecies *Aplodontia rufa rainieri*	G5T4	4 occ	3.5 %	652.29	30.8 %	13 occ	377 %
Freshwater Ecological Systems							
small, intrusives, elevation 1522, shallow		12,226 ha	1.5 %	105.60	5.0 %	245,439 ha	103 %
small, intrusives, elevation 1417, shallow		11,374 ha	2.9 %	207.91	9.8 %	115,974 ha	117 %

Yeoward

Site No 53

Thompson EDU

Freshwater Site			Land Use/Land Cover		GAP Management Status		Land Ownership			
			Agriculture	0 %	GAP 1	0 %	US National	0 %	Can National:	0 %
Area:	2,151	ha	Developed	0 %	GAP 2	0 %	US State:	0 %	BC Provincial:	100 %
	5,313	ac	Water	0 %	GAP 3	100 %	US Local:	0 %	BC Regional:	0 %
					GAP 4	0 %	US Indigenous:	0 %	Can Indigenous:	0 %
							US Private	0 %	Can Private:	0 %
							US NGO	0 %	Can NGO:	0 %

Targets known in this Conservation Area:	GRank	Abundance	% of Total Known in EDU	Relative Abundance	Contribution to EDU Goal	EDU Goal	% of Goal Captured by Portfolio
Freshwater							
Species							
Fishes							
Bull trout *Salvelinus confluentus*	G3	5,718 m	0.9 %	46.35	1.8 %	320,206 m	100 %
Freshwater Ecological Systems							
small, volcanics, elevation 1303, intermediate/steep		2,151 ha	2.1 %	184.73	7.1 %	30,225 ha	98 %