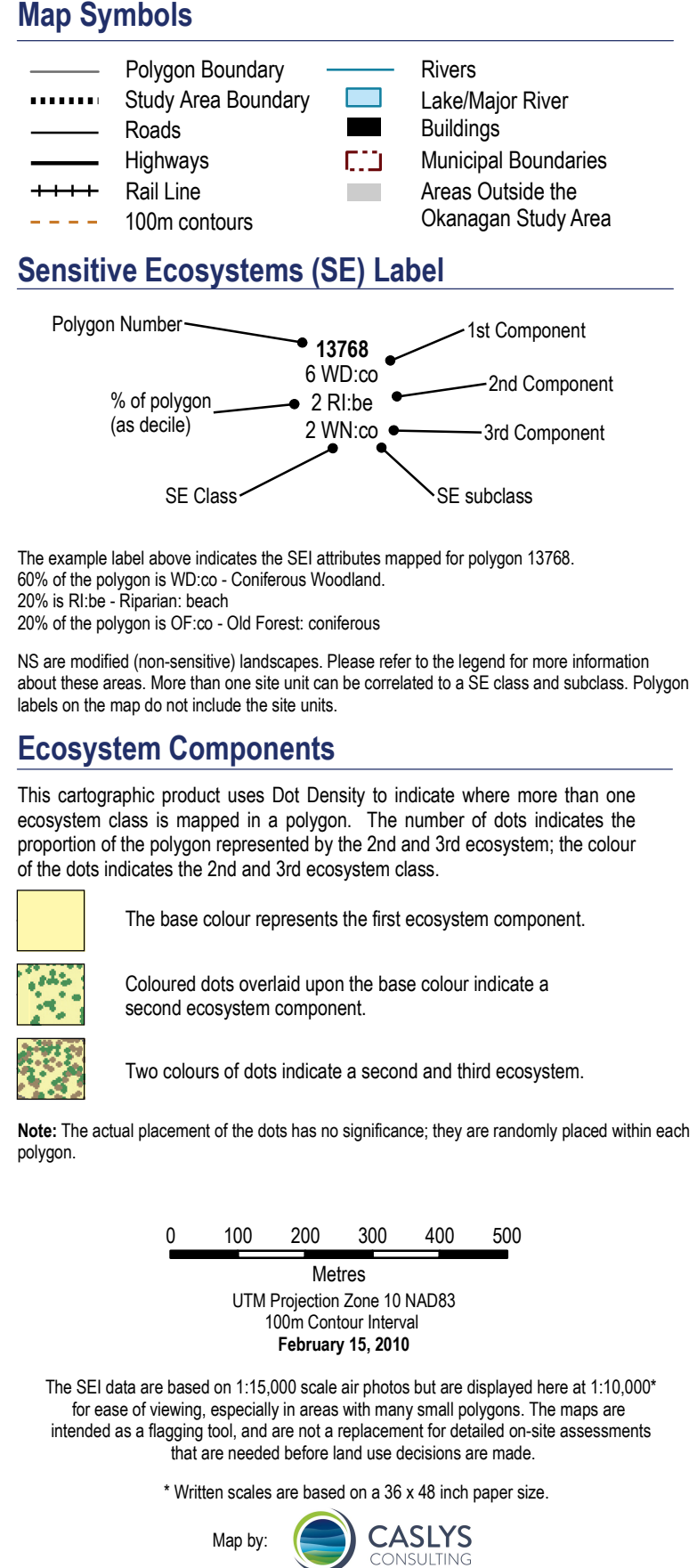


Other Important Ecosystems



WHAT IS A SENSITIVE ECOSYSTEM?

For the purpose of this study, an ecosystem is considered to be a portion of the landscape with relatively uniform natural resources.

Sensitive Ecosystems are ecosystems that are particularly sensitive and/or rare in the landscape.

Rationale

The Okanagan Valley Region covers one of the most rapidly growing portions of British Columbia, and development pressure is escalating. The is under immense pressure due to urban sprawl and rural homes spreading as well as the B.C. and U.S. border, which has experienced significant growth. The ecosystem structure and function throughout the spread of invasive alien species and the loss of native species. The pressure on the landscape is increasing due to the pressure on the landscape, underneath the need for food, conservation and land use decision making throughout the Okanagan Valley.

Regional and municipal governments of the Okanagan Valley and conservation organizations, assisted by Environment Canada's Canadian Wildlife Service and the B.C. Ministry of Environment, have completed regional and local Sensitive Ecosystems inventory mapping projects as a means to identify and protect sensitive ecosystems. The purpose of the mapping project was to provide a tool that uses scientific information and mapping to inform local governments, landowners, developers, and others to be aware of the presence of sensitive ecosystems and to avoid or minimize impacts. Conservation of these ecosystems is increasingly important as rapid population growth in the Okanagan continues to cause fragmentation, degradation, and loss of sensitive ecosystems.

An ecosystem, for the purpose of this study, is a portion of the landscape with relatively uniform vegetation and soils. Sensitive ecosystems are those that are ecologically fragile and/or at risk. Criteria for ecological sensitivity include the presence of shallow soils, susceptibility to soil erosion, vulnerability to hydrological changes, sensitivity to the introduction and spread of invasive plants, and sensitivity to recreational activity and human disturbance. Within the province of British Columbia, the Sensitive Ecosystems are determined by the B.C. Conservation Data Centre (CDC), a member organization of the National Terrestrial Ecoregions (NTE) project. Communities can help to determine if a particular ecosystem is representative of an at-risk ecological community.

Ecological Significance

The Okanagan Valley is characterized by a complex landscape of rugged, rocky terrain and gently sloping terraces. These formations result in a mosaic of habitats and ecosystems that are highly diverse. The landscape is the last glacial. The complex terrain, combined with a moderated semi-arid climate, supports diverse ecosystems and organisms. Over the past century, wetland ecosystems often occur in close proximity to one another. The wetland ecosystems are highly localized in the landscape and are very species

The Valley is a region of highly localized ecological and biological diversity

Canaries, Broadwings, woodpeckers, bluebirds, blue jays, song sparrows, and other forest songbirds, occur well-represented in the Okeanogan National Forest. The inventory results indicate that the forest shows losses of greater than 50% of some ecosystem types in the Okeanogan Valley.

Healthy, functioning natural ecosystems play an important role in adapting to and mitigating the impacts of climate change. Climate change adaptation strategies such as reducing stressors, improving ecosystem condition, and landscape connectivity contribute to ecosystem resilience and adaptive capacity in the face of climate change. The Okeanogan National Forest is particularly vulnerable because of its rarity and fragility and also for the important ecosystem services it provides, such as wildlife habitat, water supply, and recreation. The forest's natural, historic, cultural, scientific, and recreational values and more. Sensitive ecosystems must be considered in the context of the overall conservation plan. The use of ecosystem services is particularly important for ecosystem health, which includes other ecosystems that also contribute to ecosystem services.

Study Area

The Okeanogan Valley SEI project is comprised of a number of individual SEI projects: Bella Vista – Goosie Lake Range, Central Okeanogan; City of Kelowna – Vernon Communities; District of Lakeshore; Joe Roth, TFL 15, Naramata; and the Okeanogan National Forest. The following table provides information about these projects and the methods used; please refer to the References section in this map.

The purpose of the SEI Okeanogan Valley project is to combine all of the individual SEI projects that have been completed in the Okeanogan Valley from Vernon to Kelowna, and to consider and present them as a whole in a conservation plan to aid land use planning and to encourage landscape-level management of the Okeanogan Valley. The project will also provide information on ecosystem services available 150 SEI miles at a 1:100,000 scale on a Terrestrial Resource Inventory (TRI) map. The project will also provide information on ecosystem services reported details the methods used, study results, descriptions of the ecosystems, and conservation tools for management (see References section).

Sensitive Ecosystems Inventory Methods

Sensitive Ecosystems Inventory was developed as a conservation tool. It is flexible and can be completed in a short time with limited funding when the user has sufficient information for analysis. The tool is designed for advanced conservation planning and sustainable development.

Most Okeanogan SEI projects were developed by first undertaking Terrestrial Ecosystem Mapping (TEM), except in the Narameta project area where the SEI was developed using the Ecosystem-based Resource Mapping (ESRM) system. This tool allows SEI classes and sub-classes to be assigned to each TEM unit. In the mapped TEM unit is included within an at-risk ecosystem category. The SEI project results are then used to identify the areas of the landscape that are assigned to one of the applicable ecosystem categories and sub-classes. In cases where the SEI project results show more than one class, it is always assigned to the more sensitive class.

Many of the sites identified by the SEI are at high risk of conversion to other lands and/or further degradation. Within the SEI area, 47.9% was mapped as Sensitive Ecosystems (SEI) and 7.9% fell into the Other Important Ecosystems (OIE) category. The inventory results indicate that the forests, riparian areas, meadows, bluegrass-bush steppe, sagebrush steppe and old forest ecosystems were extremely rare – covering less than 5% of the study area. Although these ecosystems are rare, they are important, and mature forests remain, many have been altered significantly and therefore few have survived. The loss of these ecosystems could have a significant impact on the regional fragmentation, human use, livestock grazing, and alien species.

The services and benefits SEI provide and the wildlife species they support are critically important to the quality of life in the Okeanogan. With its few and fragile ecosystems remaining, it is essential that each site be carefully managed and that the use of ecosystem services be fully realized prior to initiating any changes in these areas.

Data Limitations

The SEI Information is intended to alert local and regional decision-makers to the presence of sensitive and other important ecosystems and ecological values. The SEI is not intended to be used as a basis for land use planning in areas where land use changes are proposed. The accuracy of polygon boundaries is limited by the scale of 1:50,000 for all projects except the City of Kelowna and Vernon communities at 1:100,000 scale. The SEI is not intended to be a set of aerial photographs on which the sites are delineated (i.e., changes have taken place since the photos were taken). It is recommended that digital data be used to update the SEI polygons. The SEI is not intended to be used in interpreting a photos and field sampling in conjunction with other datasets. The SEI is not intended to be used as a basis for land use planning in areas where land use changes are proposed. The accuracy of polygon data is dominated by the scale of the SEI. It is important to remember that a polygon may contain a complex, or mosaic, of ecosystems, and sensitive ecosystems may not occupy a portion of that area.

Species at Risk

The large variety of ecosystems in the Okeanogan Valley provide for diverse habitat needs for many wildlife and plant species, including a remarkable number of at-risk and animal species. Many of these species have been identified by the Okeanogan National Forest as being at risk. A high proportion of these species considered at-risk, either provincially or federally listed, are found in the Okeanogan National Forest. The following table lists the at-risk habitat values found only in the at-risk and sensitive ecosystems.

Within the province, species are assessed by the B.C. Conservation Data Centre. Species at risk are identified on the B.C. Red and Blue Lists. Red-listed species are extirpated, endangered, or threatened; blue-listed species are vulnerable, or of concern; and yellow-listed species are of concern. The activities or status of endangered species are ranked by the British Columbia Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The following table lists the species at risk that are found in the Okeanogan National Forest. The species are listed by their conservation status (extirpated or endangered; threatened species may become endangered or extirpated) and their habitat requirements. The table is particularly sensitive to human activities or natural events. Endangered

Risk Assessment Act protected protection on federal lands, and the new B.C. Wildlife Amendment Act will protect their populations and habitats on provincial lands.

Project partners include: BC Ministry of Environment, Environment Canada (Canadian Wildlife Service), the Alaska Brooks Nature Centre, Regional District of Central Okanagan, Regional District of Central Kelowna, City of Kelowna, City of Vernon, District of Kelowna, and the Regional District of North Okanagan.

Financial or In-kind support for the project was provided by: The British Columbia Conservation Data Centre (Environment Canada), Environment Canada (Canadian Wildlife Service), Real Estate Foundation of C.B. Habitat Conservation Trust Fund, the Habitat Stewardship Program, Greater Vancouver Regional Authority, Regional District of Central Kelowna, Regional District of the North Okanagan, Regional District of the Okanagan-Simikameen, Alaska Brooks Nature Centre, City of Vernon, District of Kelowna, Wilderhearts Association, District of Coldestream, City of Kelowna, & B.C. Conservation Foundation.

Cartography: Lisa Zetserman and Ann Bylinj (Cassidy Consulting Ltd.) for Jan Klironof, Environment Canada (Canadian Wildlife Service). Thanks to Anker Hovgaard, Environment Canada (Canadian Wildlife Service) for his assistance. And Kim Everett for their assistance in developing the map.

References

Information and access to full reports and maps products for the Okanagan Valley SEI projects are available at EcoAtlas, www.env.gov.bc.ca/ecotool/ (see Key SEI Reports).

Key SEI Report:

Alexander, E.E., D.L. Cairn, T.L. Fleming, and A.J. Van Ouden. 2008. *Sensitive Ecosystems Inventory - Okanagan Valley, Results to Conserving 2007-2007 Methods, Ecological Descriptions, Results and Observations*. Tools for Biodiversity Series No. 69. Canadian Wildlife Service, Pacific and Yukon Region, British Columbia.

This map can be cited as:

Environment Canada. Sensitive Ecosystems Inventory, Okanagan Valley Watersheds, 2008–2007. 12,000 copies. Vancouver, BC: Canadian Wildlife Service, Pacific and Yukon Region. 2008.

Naturalists: Dalzell, Rob. 2006. *Naravate Sensitive Ecosystems Inventory*. 12,000 copies.

Other sources (including south slopes): Iverson, K. and J. Shipkita. 2009. Conservation analyses and updated ecosystem mapping for the Central Okanagan valley. Central Okanagan, South Slopes, Kelowna, Elliott and Joe Rivers. Final report prepared for the Okanagan Collaborative Conservation Program.

Iverson, K. and E. Evelyn. 2001. 2002. *Ecosystem Mapping of Portions of the PPRAT and FRCIT in the Central Okanagan*. Prepared for the Regional District of Central Okanagan and the Ministry of Sustainable Resource Management. 12,000 maps.

Terra Nova Ecology Land County, 2005. 12,000 maps.

FTL IS: Buhyal, D. and S. Robertson. 1999. *Ecosystem Mapping of Weyerhaeuser Canada Ltd. Timber Farm License 15*. Prepared for Weyerhaeuser Canada Ltd. Okanagan. Jointly developed with FRBC and Ministry of Forestry, Kamloops, BC. 12,000 Maps.

Vernon – Comogone. Iverson, Krista. 2005. *Sensitive Ecosystems Inventory*. 12,000 maps.

Bella Vista – Goose Lake River. Iverson, K. and J. Shipkita. 2002. *Terrestrial Ecosystem Mapping Of The Bella Vista – Goose Lake Watershed*. 12,000 maps.

Coldstream – Vernion. Iverson, K. and P. Unila. 2008. *Sensitive Ecosystems Inventory Coldstream – Vernion*. 12,000 maps.

Kelowna: Iverson, K. and P. Unila. 2008. *Sensitive Ecosystems Inventory Kelowna*. 12,000 maps.

South Okanagan: Iverson, K. and A. Haney. 2009. *Revised and updated ecosystem mapping for the South Okanagan and lower Simikameen Valley*, report prepared for the Regional District of the Okagan – Simikameen.

K. Iverson. 2005. *Terrestrial Ecosystem Mapping South Okanagan*. [This is an update to Leck, R. Maxwell. 1995. Biophysical Baseline Analysis of the South Okanagan]. 12,000 maps.

Joe River: Iverson, K. and P. Unila. 2005. *Sensitive Ecosystems Inventory Central Okanagan Joe Rivr*. 12,000 maps.

British Columbian Conservation Data Centre (CBCD). Ecosystems Branch. BC Ministry of Environment. [www.env.gov.bc.ca/cdco](#).

Related Publications and Links

Green Bylaws Toolkit for Conserving Sensitive Ecosystems and Open Spaces: [www.greenbylaws.ca](#)

Invasive Species Management and Control: Many provisions currently in use across B.C., including model provisions for Reginal Growth Strategies, Official Community Plans, Development Permit Areas, Zoning, Tax Exemptions, Environmental Monitoring, and other regulatory tools. Includes several examples and case studies of successful green infrastructure projects and bylaws.

Climate Change: Wilson, S.J. and H. Rehbein. *Mitigating and Adapting to Climate Change through Smart Growth and Green Infrastructure*. Available at: [www.landinturbance.ca/search.html](#)

Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia. BC Ministry of Environment. [http://www.gov.bc.ca/developmentandplanning/2006-develop_w_care.htm](#)

Talking Nature's Pulse: The Status of Biodiversity in British Columbia. Austin, M.A., D. Buffett, D.J. Nicolson, G.G. Souder and V. Stevens 2005. *Talking Nature's Pulse: The Status of Biodiversity in British Columbia*. Natural Heritage Society of British Columbia. Available at: [www.biodiversity.org.uk](#)

Alpine (AP):


Alpine ecosystems are high-elevation alpine and parkland ecosystems including **herbaceous** ecosystems dominated by forbs (AP-2), and **shrubby** ecosystems dominated by dwarf shrubs such as heather (AP-3). Alpine ecosystems are found in snow cover for large parts of the year. Alpine ecosystems are sensitive to disturbance, as the shallow soils and cold temperatures

Alpine Ecosystems provide the following services:

- Erosion control
- Fresh water
- Climate regulation
- Nutrient cycling and maintenance of productive soils
- Pollination
- Food production
- Soil formation

Some species are:

- American Badger
- Peregrine Falcon
- Wolverine



Other Important Ecosystems

Seasonally Flooded Agricultural Fields (FS):


Seasonally Flooded Agricultural Fields ecosystems are cultivated fields that flood annually, providing important migration and waterfowl and other bird species, small mammals, and many types of predators. They are located along low-lying areas or in some cases, these areas could be restored to Wetland or Riparian ecosystems if natural flood regimes and vegetation are restored.

Seasonally Flooded Agricultural Fields Ecosystems provide the following services:

- Flood control
- Drought recovery
- Storm protection
- Draining and natural irrigation
- Fresh water
- Carbon storage
- Maintenance of productive soils
- Pollination
- Pest regulation
- Food production

Some species are:

- Great Basin Sparrow
- Long-billed Curlew
- Peregrine Falcon
- American Badger
- Great Basin Goshawk
- Western Rattlesnake



Mature Forest (MF):


Mature Forest ecosystems are dominated by mature trees, including **bracketed (MF-1)** forests, **coniferous (MF-2)** forests, mature riparian forests, and mature conifer and broadleaf woodlands. Mature forests are important buffer to sensitive ecosystems and can also be important recruitment sites for Old Forests. Mature forest ecosystems have many important sub-

Mature Forest Ecosystems provide the following services:

- Climate regulation
- Carbon storage
- Air quality
- Erosion control
- Sediment retention
- Nutrient cycling and maintenance of productive soils
- Flood control
- Pest regulation
- Pollination
- Pollution control
- Food production

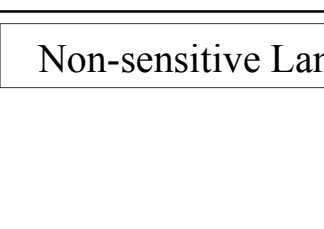
Some species are:

- Lyall's Marmoset
- Wolverine
- Williamson's Sparrow
- Golden-collared Flycatcher
- Snowy Plover
- Western Rattlesnake



Non-sensitive Landscapes (NS): (Areas not mapped as sensitive or other important ecosystems)

Non-sensitive Landscapes are modified areas not occupied by sensitive ecosystems, and include urban areas, disturbed rural areas or disturbances that are dominant across the landscape. Disturbed rural areas can be interspersed with large, rural and urban stands with an age range between 0 and 40 years. Non-sensitive landscapes are shown in white in the areas that are not considered polygons due to location of disturbed areas may have a modified landscape (with the sensitive ecosystems), in and



graminoid vegetation (Ap.7), **parkland forests** where trees occur in distinct row elevations in the South Canadian (TF, 15) where there is significant slow vegetation recovery.

ated with Alpine Ecosystems are:

American Badger

 (North America)
 Photo by Yana Ganeva W. Lynch

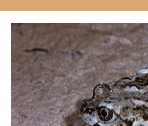
Wolverine

 (North America)
 (Alaskan, Speed Control)
 Photo by Yana Ganeva W. Lynch

MS

ering habitat for birds. They provide important habitat for amphibians, foodpans that have been isolated by channelization of creeks and rivers, ablated.


ated with Seasonally Flooded Agricultural Fields are:


Great Blue Spiderherp

 (North America, Treated)
 Photo by Yana Ganeva W. Lynch
 CaliforniaTerra.com

Pennsylvanian Falcon


 (North America)
 (Great Blue Spiderherp)
 Photo by Yana Ganeva W. Lynch

ated with Mature Forest Ecosystems are:

Western Screech Owl

 (North America)
 (Flammulated Owl)

Flammulated Owl

 (North America)
 (Great Blue Spiderherp)
 Photo by Yana Ganeva W. Lynch

ated with Mature Forest Ecosystems are:

Western Screech Owl

 (North America)
 (Flammulated Owl)

Flammulated Owl

 (North America)
 (Great Blue Spiderherp)
 Photo by Yana Ganeva W. Lynch

ated with Mature Forest Ecosystems are:

Western Screech Owl

 (North America)
 (Flammulated Owl)

Flammulated Owl

 (North America)
 (Great Blue Spiderherp)
 Photo by Yana Ganeva W. Lynch

are depicted in white)

scapes, and young forests. Young forests have human-influenced features (e.g., vegetation, or cultivated crops). Young forests are conifer-dominated by a sensitive ecosystem. In addition, many sensitive ecosystems (e.g., sensitive ecosystems) are too small to map individually. These modified

Non-sensitive Landscapes (NS): (Areas not mapped as sensitive or other important ecosystems are depicted in white)

Non-sensitive Landscapes are modified areas not occupied by sensitive ecosystems, and include urban areas, disturbed rural landscapes, and young forests. Urban areas are human-influenced features or disturbances that are dominant across the landscape. Disturbed rural areas can be interspersed with range, farmland and native vegetation, or cultivated crops. Young forests are conifer-dominated stands with an age range between 0 and 80 years. Non-sensitive landscapes are shown in white in the areas that are not designated by a sensitive ecosystem. In addition, many sensitive ecosystem polygons occur alone or disturbed areas may have a modified landscape interspersed with the sensitive ecosystem(s), in which the sensitive ecosystems are too small to map individually. These modified