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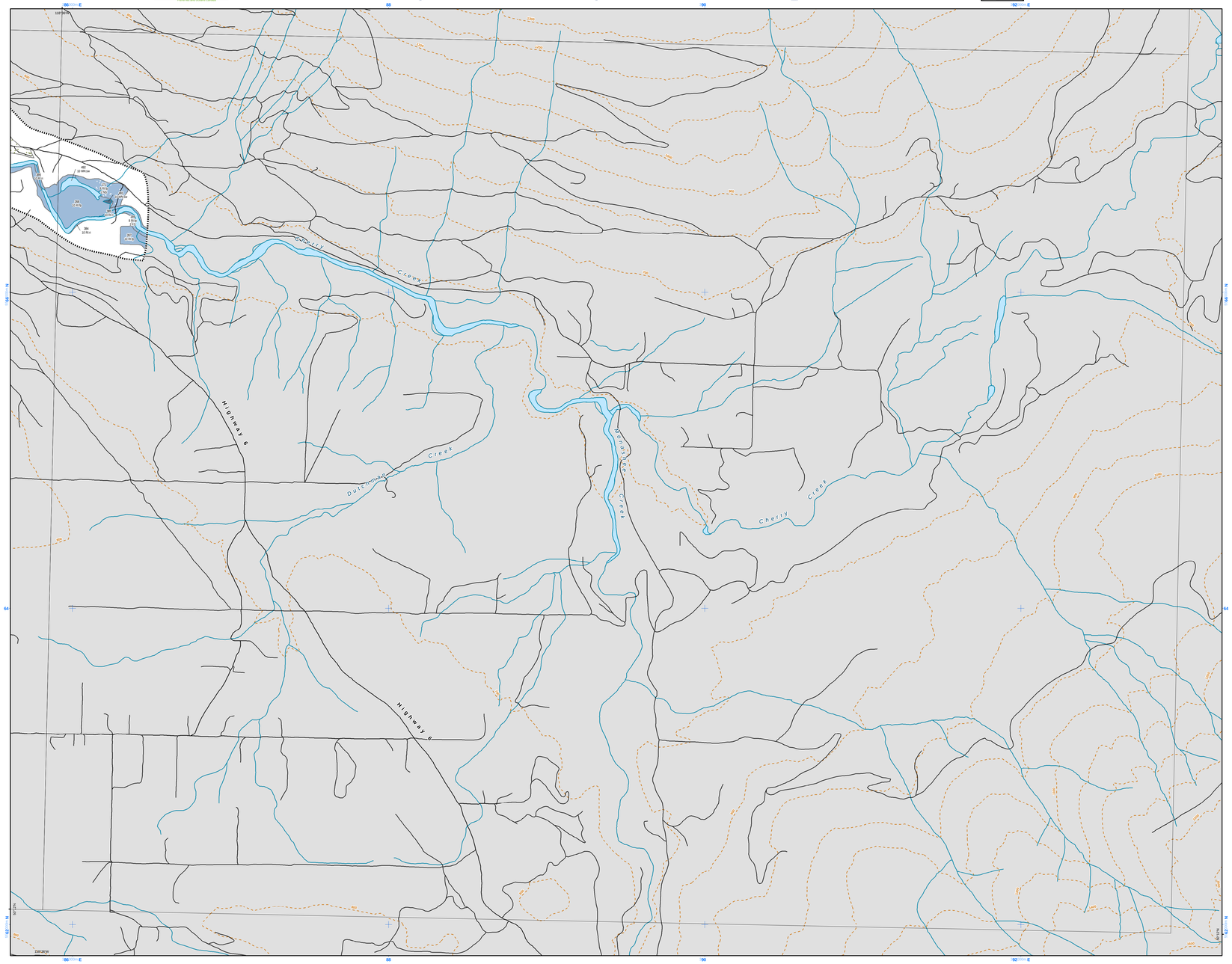
FISH AND WILDLIFE COMPENSATION PROGRAM
A partnership between BC Hydro, the Province of B.C. and Fisheries and Oceans Canada

Sensitive Ecosystems Inventory: Middle Shuswap River - 2011

Okanagan Collaborative Conservation Program



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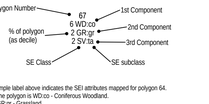
Map Symbols

- Polygon Boundary
- Study Area Boundary
- Roads
- 100m contours
- Rivers
- Lake/Major River
- Areas Outside the Study Area

Sensitive Ecosystems (SE) Label



The example label above indicates the SEI attributes mapped for polygon 64.
60% of the polygon is WD:co - Coniferous Woodland.
20% is GR:gr - Grassland
20% of the polygon is SV:ta - Sparsely Vegetated: talus slope

NS are modified (non-sensitive) landscapes. Please refer to the legend for more information about these areas. More than one site unit can be correlated to a SE class and subclass. Polygon labels on the map do not include the site units.

Ecosystem Components

This cartographic product uses Dot Density to indicate where more than one ecosystem class is mapped in a polygon. The number of dots indicates the proportion of the polygon represented by the 2nd and 3rd ecosystem; the colour of the dots indicates the 2nd and 3rd ecosystem class.

The base colour represents the first ecosystem component.

Coloured dots overlaid upon the base colour indicate a second ecosystem component.

Two colours of dots indicate a second and third ecosystem.

Note: The actual placement of the dots has no significance; they are randomly placed within each polygon.

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 dominant vegetation.

Sensitive Ecosystems are ecosystems that are ecologically sensitive and/or at risk in the landscape.

Rationale

The Middle Shuswap River study area contains extensive riparian floodplain habitats, areas of coniferous woodlands, grasslands, mature forests, and sparsely vegetated ecosystems. The area is under pressure from agricultural and residential development, logging, recreation, and intensive domestic grazing. High ecological values, combined with human pressure on the landscape, underscore the need for careful, conservation-based land-use decision making.

Conservation organizations, assisted by the North Okanagan Regional District, with substantial funding from the BC Hydro Fish and Wildlife Compensation Program-Coastal, have completed this Sensitive Ecosystems Inventory (SEI) mapping project as a means to identify the remaining sensitive ecosystems in the Middle Shuswap River valley. The SEI is intended to provide a tool that uses scientific information and mapping to encourage local government, landowners, developers, and other citizens to become involved in protecting, conserving, and restoring sensitive ecosystems. Conservation of these ecosystems is increasingly important as population growth continues to cause fragmentation, degradation, and loss of sensitive ecosystems.

An ecosystem, for the purpose of this inventory, 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 other human disturbances. Within the province, at-risk status for species and ecological communities is determined by the B.C. Conservation Data Centre (CDC), a member program of the international NatureServe network. The CDC list of Ecological Communities can help to determine if a particular ecosystem is representative of an at-risk ecological community.

Ecological Significance

The Middle Shuswap River valley is characterized by complex terrain including gently rounded uplands and moderately steep to steep valley sides. The Shuswap River has carved a path through a series of terraces and benches that stretch about a kilometre across the valley bottom.

The soils that support plant communities within the study area vary in thickness - the thicker soils tend to exist on gentler terrain and on lower slopes. Soils tend to become thinner on the upper slopes and where slopes are steeper. There are scattered rock outcrops throughout the study area. Soil texture varies throughout the study area where common textures include sand, sand and gravel, mixed sand, silt and gravel, and a combination of silt, fine sand and clay.

The Middle Shuswap River valley is both ecologically and biologically diverse and is home to many at-risk species and ecological communities. Upland old forest ecosystems, once well-represented, have been eliminated from the study area.

The ecosystems mapped in this project are ecologically significant because of their rarity and fragility and also for the important ecosystem services they provide, such as climate regulation, water filtration, productive soil, carbon sequestration, nutrient cycling, pollination, wildlife habitat and more. Sensitive ecosystems must be considered in the context of the overall landscape, which includes other ecosystems that also contribute to ecosystem services. Healthy, functioning natural ecosystems play an important role in adapting to, and mitigating, the impacts of climate change.

Study Area

The Middle Shuswap River SEI project covers a swath varying from about 200 m to over two kilometres on either side of the Shuswap River between the Wilsey and Sugar Lake (Peers) dams and approximately two kilometres up Cherry, Ferry, and Woodward creeks, and some areas below Wilsey Dam.

The purpose of this SEI is to aid land use planning and to encourage landscape-level conservation planning. The project presents the SEI maps with a Terrain Resource Information Management (TRIM) base. The project report (see References section) details the methods used, study results, descriptions of the ecosystems, and conservation tools for management.

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 necessary, or expanded to incorporate more information for advanced conservation planning and sustainable development.

This SEI was developed by first undertaking Terrestrial Ecosystem Mapping (TEM). TEM provided the foundation for the SEI thematic mapping, and the TEM units were analyzed for at-risk status and ecological sensitivity. Sensitive ecosystems were grouped using the Ecosystem-based Resource Mapping (ERM) table tool. This tool allows SEI classes and subclasses to be assigned to each TEM unit.

If the mapped TEM unit is included within an at-risk ecological community, as defined and listed by the CDC, or if it is ecologically sensitive, the unit was assigned to one of the applicable ecosystem classes and subclasses. In cases where a given ecosystem falls into more than one class, it is always assigned to the more sensitive class.

For more information about different projects and the methods used, please see the Sensitive Ecosystems Inventory: Middle Shuswap River, 2011. Methods, Ecological Descriptions, Results and Conservation Tools (To access SEI data see the References section).

Inventory Results

Many of the sites identified by the SEI are at high risk of conversion to other land uses or further degradation. Within the study area, 27.3% was mapped as Sensitive Ecosystems (SE) and 4.8% fell into the Other Important Ecosystems category (see Legend). The inventory results indicated that wetlands, grasslands and sparsely vegetated ecosystems were extremely rare - covering just 5% of the study area. There were no old forests remaining in the study area except within riparian ecosystems. Although areas of riparian and coniferous woodlands ecosystems remain, many have been altered significantly and therefore few high quality sites remain. The study found many SEs that have been degraded by fragmentation, forest harvesting, human use, livestock grazing, and alien species.

The services and benefits SEs provide and the wildlife species they support are critically important to the quality of life in the Shuswap River valley. With so few at-risk and fragile ecosystems remaining, it is essential that each site be carefully considered and all land use options be fully evaluated 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 features. The SEI mapping does not replace the need for on-site assessments in areas where land use changes are proposed. The accuracy of polygon boundaries is limited by the scale (1:15,000) and date of the orthophotos (2007) used for the final mapping (i.e., changes may have taken place since the photos were taken). It is recommended that digital data not be enlarged beyond the scale of the photos, as this may result in unacceptable distortion and faulty registration with other datasets. The ability to see specific disturbances (e.g., invasive plants) is limited when interpreting air photos, and field sampling is needed to supplement the interpretation. It can also be difficult to delineate small sensitive ecosystems. In many cases these ecosystems are captured as a small component of a larger polygon that is dominated by another ecosystem.

It is important to remember that a polygon may contain a complex, or mosaic, of ecosystems, and sensitive ecosystems may only occupy a portion of that polygon.

Species at Risk

The large variety of ecosystems in the Middle Shuswap River valley provide for diverse habitat needs of many wildlife and plant species, including a number of at-risk animal species. Many of these species rely on the habitat values found only in the at-risk and sensitive ecosystems of the valley.

Nationally, at-risk species are ranked by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered, Threatened, or of Special Concern. Endangered species face imminent extirpation or extinction; Threatened species may become endangered if limiting factors are not reversed. Species of Special Concern are particularly sensitive to human activities or natural events. Endangered or Threatened species that have been included in Schedule 1 of the Species at Risk Act are afforded protection on federal lands, and the B.C. Wildlife Amendment Act will protect their populations and habitats on provincial lands. Protection of Species at Risk and their important habitats on private lands is primarily achieved through careful land use planning and municipal bylaws. For more information on Species at Risk, see Species at Risk section in Related Publications and Links.

Within the province, species are assessed by the B.C. Conservation Data Centre. At-risk species are identified on the B.C. Red and Blue lists. Red-listed species are extirpated, endangered, or threatened; blue-listed species are of special concern due to low or declining populations and are sensitive to human activities or natural events.

Acknowledgements

Project partners include: The Okanagan Collaborative Conservation Program; BC Hydro Fish and Wildlife Compensation Program-Coastal (on behalf of its program partners BC Hydro, the Province of B.C. and Fisheries and Oceans Canada who work together to conserve and enhance fish and wildlife impacted by the construction of BC Hydro dams); Regional District of the North Okanagan; and the Splatsin First Nation.

Financial or in-kind support for the projects was provided by: The Okanagan Collaborative Conservation Program; BC Hydro Fish and Wildlife Compensation Program-Coastal; Regional District of the North Okanagan; Village of Lumby; Splatsin First Nation; Allan Brooks Nature Centre Society; SDL Environmental Consulting; and the Ministry of Forests, Lands and Natural Resources Operations.

Base Terrestrial Ecosystem Mapping:
Polly Uunila, P. Geo. (Polar Geoscience Ltd.) and Kristi Iverson, R.P. Bio. (Iverson & MacKenzie Biological Consulting Ltd.), with draft ecosystem mapping by John Grods (Makonis Consulting Ltd.).

Sensitive Ecosystems Theme: Ratings tables were developed by Kristi Iverson.

Base Mapping Data: selected digital layers are from the Terrain Resources Information Management (TRIM) Program, Base Mapping and Geomatic Services Branch, Integrated Land Management Bureau, Ministry of Forests, Lands, and Natural Resource Operations.

GIS: Bon Lee, Baseline Geomatics Inc., Victoria, B.C., with Arcview and Google Earth digitizing also completed by Polly Uunila, Allison Haney, and Kristi Iverson.

Photographs: A number of local photographers have allowed the use of their photos for this project. Credits are provided beside each photo. See also the electronic atlas for fauna in B.C. at the following website: www.eflauna.bc.ca

References

Full report on this SEI project:
Iverson, K. E., 2011. Sensitive Ecosystems Inventory: Middle Shuswap River, 2011. Methods, Ecological Descriptions, Results and Conservation Tools. Available at www.env.gov.bc.ca/ecocat (type in SEI Shuswap as a keyword).

This map can be cited as:
Iverson, K. and P. Uunila. 2011. Sensitive Ecosystems Inventory: Middle Shuswap River. 1:10,000 maps.

To access SEI data:
For more detailed information, go to EcoCat;
http://a100.gov.bc.ca/pub/acat/public/welcome.do
and search on 'Sensitive Ecosystems Inventory' and the project area name, e.g., Shuswap.

Related Publications and Links

Green Bylaws Toolkit for Conserving Sensitive Ecosystems and Green Infrastructure

www.greenbylaws.ca

This comprehensive document is designed to provide municipal and regional governments with practical tools for protecting the green infrastructure within their jurisdictions.

The Toolkit contains practical examples of bylaw provisions currently in use in B.C., including model provisions for Regional Growth Strategies, Official Community Plans, Development Permit Areas, Zoning, Tax Exemptions, Environmental Assessment, Stormwater Management and other regulatory tools. It includes several examples and case studies of successful green infrastructure projects and bylaws.

Species at Risk

For more information on Species at Risk, visit the following web sites;

- B.C. Species and Ecosystems Explorer
  www.env.gov.bc.ca/atrisk/toolintro.html
- Species at Risk Act www.sararegistry.gc.ca
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC) www.cosewic.gc.ca
- Species at Risk & Local Governments: A Primer for British Columbia. www.speciesatrisk.bc.ca

Climate Change

Wilson, S.J. and R.H. Hebda. Mitigating and Adapting to Climate Change through the Conservation of Nature. Available at http://www.landtrustalliance.bc.ca/research.html

Develop with Care

Environmental Guidelines for Urban and Rural Land Development in British Columbia. B.C. Ministry of Environment
http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare2006/develop_with_care_intro.html

Sensitive Ecosystems Legend

Sensitive ecosystems are fragile and/or rare, or are ecologically important because of the diversity of species they support and the ecosystem services they provide.

Some at-risk wildlife are associated with Sensitive Ecosystems, and are listed below. Species At Risk are those species which are considered Endangered, Threatened or of Special Concern.
Please note that many of the species listed in this map can be found in other sensitive ecosystems as well as non-sensitive ecosystems found throughout the Middle Shuswap River valley.

Note: Information on Species at Risk is included in the map legend to highlight the species habitat values of the sensitive ecosystems. This map series does not include the actual mapping of species locations. For information on species location mapping see the B.C. Conservation Data Centre reference below.

Grasslands (GR):

Grassland ecosystems occupy areas that are generally too hot and dry for forests to establish, and are dominated by bunchgrasses (grassland; GR:gr), low shrubs (shrubland; GR:sh) and disturbed grasslands dominated by invasive alien plants (GR:dg). Given the very limited extent of grasslands, these are important sites for grassland restoration, soil conservation, and maintenance of many other grassland values, including habitat for many at-risk and endangered species.

Grassland ecosystems provide the following services:
- Carbon storage
- Nutrient cycling and maintenance of productive soils
- Pollination
- Pest regulation
- Food production
- Erosion control
- Sediment retention

Some at-risk species associated with Grassland ecosystems are:
- Western Skink
- Northern Rubber Boa
- American Badger
- Lewis's Woodpecker
- Common Nighthawk


American Badger
Taxidea taxus
(Mammal, Endangered)
Parks Canada/ W. Lynch


Common Nighthawk
Chordeiles minor
(Bird, Threatened)
Photo by Ken Schneider

Sparsely Vegetated (SV):

Sparsely Vegetated ecosystems are sites where rock or talus (angular rock fragments) limits vegetation establishment; vegetation cover is discontinuous and interspersed with bedrock or blocks of rock. Sparsely vegetated ecosystems are subdivided into Talus Slope (SV:ta) and Rock Outcrop (SV:ro) ecosystems. The coarse or shallow soils of these ecosystems make them sensitive to disturbance and soil erosion.

Sparsely Vegetated ecosystems provide the following services:
- Erosion control
- Nutrient cycling and maintenance of productive soils
- Pollination
- Soil formation

Some at-risk species associated with Sparsely Vegetated ecosystems are:
- Northern Rubber Boa
- Western Skink


Northern Rubber Boa
Charina bottae
(Reptile, Special Concern)
Photo by Kristina Ovaska


Western Skink
Plestiodon skiltonianus
(Reptile, Special Concern)
Photo by Gary Nafis

Coniferous Woodlands (WD):

Coniferous Woodlands are open stands of Douglas-fir, sometimes with ponderosa pine (WD:co), often on shallow soils, with grass and shrub-dominated understories. They most commonly occur on steep warm slopes and on rocky knolls with very shallow soils. Numerous sites have been altered by forest harvesting, ingrowth of trees associated with fire exclusion, domestic livestock grazing, and other human disturbances.

Coniferous Woodland ecosystems provide the following services:
- Climate regulation
- Air quality
- Erosion control
- Sediment retention
- Carbon storage
- Pest regulation
- Nutrient cycling and maintenance of productive soils
- Pollination
- Pollution control
- Flood control
- Food production

Some at-risk species associated with Coniferous Woodland ecosystems are:
- Northern Rubber Boa
- Olive-sided Flycatcher
- Lewis's Woodpecker
- Flammulated Owl
- Common Nighthawk


Northern Rubber Boa
Charina bottae
(Reptile, Special Concern)
Photo by Jared Hobbs


Lewis's Woodpecker
Melanerpes lewis
(Bird, Special Concern)
Photo by USF & WS

Riparian (RI):

Riparian ecosystems are rivers, streamside, riverside and gully ecosystems or sites with significant seepage; includes ecosystems on floodplains and benches along creeks and rivers (bench, RI:fp), ecosystems in gullies, often with creeks (gully, RI:gu); fringe ecosystems associated with significant seepage (fringe, RI:ff), and the river bed of large systems (river, RI:ri). These sites frequently form natural corridors through the landscape, connecting other ecosystems and providing passageways for animals. Damming and diversions have seriously affected many riparian ecosystems.

Riparian ecosystems provide the following services:
- Fresh water
- Flood control
- Drought recovery
- Storm protection
- Drainage and natural irrigation
- Nutrient cycling and maintenance of productive soils
- Climate regulation
- Soil and nutrient deposition
- Pollination
- Pest regulation
- Food production

Some at-risk species associated with Riparian ecosystems are:
- Western Toad
- Western Painted Turtle
- Western Screech-owl
- Grizzly Bear
- Mountain Caribou (historically)


Western Screech Owl
Megascops kennicottii macfarlanei
(Bird, Endangered)
Photo by Rod Innes


Grizzly Bear
Ursus arctos
(Mammal, Special Concern)
Photo by Jared Hobbs

Wetlands (WN):

Wetland ecosystems occur on sites where the water table is at, near, or above the soil surface for a sufficient period of time to influence soil and vegetation development; includes marshes (WN:ms) and shallow open water (WN:sw) ecosystems. They are typically associated with old back channels of the Shuswap River. They are extremely important because of their natural rarity in this area and the critically important ecosystem services they provide.

Wetland ecosystems provide the following services:
- Drought recovery
- Flood control
- Storm protection
- Drainage and natural irrigation
- Fresh water
- Filtration and pollution control
- Nutrient cycling and maintenance of productive soils
- Silt storage
- Climate regulation
- Pollination
- Pest regulation
- Food production
- Carbon storage
- Maintenance of productive soils

Some at-risk species associated with Wetland ecosystems are:
- Western Toad
- Western Painted Turtle


Western Painted Turtle
Chrysemys picta bellii
(Reptile, Special Concern)
Photo by Jared Hobbs


Western Toad
Anaxyrus boreas
(Amphibian, Special Concern)
Photo by Jared Hobbs

Other Important Ecosystems

Seasonally Flooded Agricultural Fields (FS):

Seasonally Flooded Agricultural Field ecosystems are cultivated fields that flood most years; providing important migration and wintering habitat for birds. They provide important habitat for amphibians, waterfowl and other bird species, small mammals, and many types of predators. They are located along low-lying areas or floodplains that have been tilled and planted. In some cases, these areas could be restored to Wetland or Riparian ecosystems if natural flood regimes and vegetation are re-established.

Seasonally Flooded Agricultural Fields provide the following services:
- Flood control
- Drought recovery
- Storm protection
- Drainage and natural irrigation
- Fresh water
- Carbon storage
- Maintenance of productive soils
- Pollination
- Pest regulation
- Food production

Some at-risk species associated with Seasonally Flooded Agricultural Fields are:
- Western Toad
- Barn Swallow
- Bobolink
- Common Nighthawk
- American Badger


Barn Swallow
Hirundo rustica
(Bird, Threatened)
Photo by Mark I Watson


Bobolink
Dolichonyx oryzivorus
(Bird, Threatened)
Photo by Hilke Binder

Mature Forest (MF):

Mature Forest ecosystems are dominated by mature trees; including coniferous (MF:co) forests and mixed (MF:mx) deciduous and coniferous forests; however it excludes mature riparian forests, and mature coniferous woodlands. Mature Forests are important buffers to sensitive ecosystems. They provide recruitment for Old Forest ecosystems which have been eliminated from the upland portion of the study area. Mature forest ecosystems have many important structural attributes, including some remaining large, old trees.

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

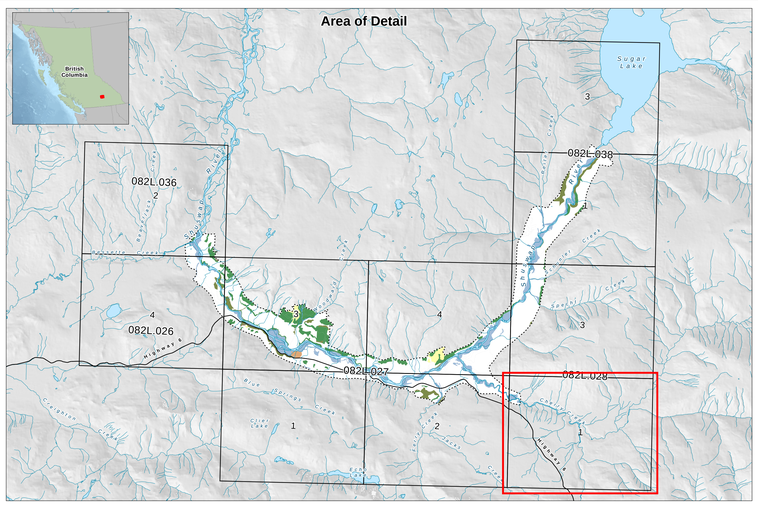
Some at-risk species associated with Mature Forest ecosystems are:
- Olive-sided Flycatcher
- Western Screech-owl
- Flammulated Owl
- Grizzly Bear
- Wolverine
- Mountain Caribou (historically, in old forests)


Flammulated Owl
Otus flammeolus
(Bird, Special Concern)
Photo by Parks Canada/ W. Lynch


Olive-sided Flycatcher
Contopus cooperi
(Bird, Threatened)
Photo by Jerry Oldenettel

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 or other important ecosystems - they include disturbed rural landscapes, agricultural areas and young forests. Disturbed rural areas can be interspersed with range, farmland and native vegetation, or cultivated crops. Young forests have 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, close to urban 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 areas are depicted as NS (non-sensitive) on the map.



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Metres

UTM Projection Zone 11 NAD83
100m Contour Interval
February 15, 2012

The SEI data are based on 1:15,000 scale air photos but are displayed here at 1:10,000* for ease of viewing, especially in areas with many small polygons. The maps are intended as a flagging tool, and are not a replacement for detailed on-site assessments that are needed before land use decisions are made.

* Written scales are based on a 36 x 48 inch paper size.

Map by: CASLYS CONSULTING

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