Sensitive Ecosystems Inventory: South Okanagan Gap Areas, 2010

Methods and Results

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I would like to thank the many landowners that gave me permission to access their lands for field sampling.

[1] Iverson & MacKenzie Biological Consulting Ltd.

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1 Introduction

The Okanagan Valley is highly significant ecologically and continues to be threatened by urban growth. A Sensitive Ecosystems Inventory (SEI) can provide base-line information to help direct development decisions. This project provides detailed terrestrial ecosystem mapping (TEM) of the areas identified by the Regional District of the Okanagan – Similkameen that were not previously mapped as part of the South Okanagan SEI. Due to funding limitations, bioterrain features were not mapped. The ecosystem mapping was done using a DiAP Viewer with 1:15 000 scale, year 2007, colour digital imagery. The TEM was used to produce a Sensitive Ecosystems Inventory (SEI) map suitable for strategic planning by the Regional District of the Okanagan - Similkameen. This mapping is directly compatible with the existing South Okanagan SEI mapping.

Study Area

The study area lies within the south Okanagan Valley of south-central British Columbia and includes four components: Summerland North Electoral Area F, Trout Creek Corridor Electoral Area F, Yellow and Twin Lakes Area D, and Ripley Lake Area C. All components are directly adjacent to the pre-existing SEI mapping for the South Okanagan - Similkameen. The study area includes private and publicly owned lands.

The study area lies within the Okanagan Very Dry Hot Bunchgrass Variant (BGxh1), Okanagan Very Dry Hot Ponderosa Pine (PPxh1) the Okanagan Dry Cool Interior Douglas-fir (IDFdk1) and the Okanagan Very Dry Hot Interior Douglas-fir (IDFxh1) biogeoclimatic variants.

Project Objectives

The following objectives were identified for this project:

- Delineate polygons that readily differentiate sensitive ecosystems from non-sensitive areas wherever possible.
- Ensure that complex polygons containing sensitive ecosystems have more than 30% sensitive ecosystems within them.
- Provide detailed delineation of wetlands.
- Provide continuous mapping of riparian corridors.
- Produce a high-quality terrestrial ecosystem map (TEM) database for the study area.
- Produce a sensitive ecosystems inventory database and map for the study area.
- Produce a sampling plan.
- Document methods, results and a sampling plan in a clear and understandable report.

2 Ecosystems of Concern

What are Sensitive and Other Important Ecosystems?

This sensitive ecosystems project recognizes both ***sensitive ecosystems*** (SE) and ***other important ecosystems*** (OIE) in the study area. *Sensitive ecosystems* refers to seven ecosystem types that are ecologically fragile or are rare in the provincial landscape and are relatively unmodified by human influences[2] (Table 1). These sensitive ecosystems are generalized groupings of ecosystems that share many characteristics, particularly ecological sensitivities, ecological processes, rarity, and wildlife habitat values. These categories follow the provincial Standard for Mapping Ecosystems at Risk in British Columbia[3].

Table 1. Sensitive ecosystems mapped in the study area including the code, name and description.

Code	Sensitive Ecosystems	Ecosystem Description
WN	Wetlands	Non-forested ecosystems where the water table is at or near the surface; includes **wet meadows** (WN:md), **marshes** (WN:ms), **swamps** (WN:sp), and **shallow open water** (WN:sw) ecosystems including ponds.
RI	Riparian	Ecosystems in gullies (**gully**, RI:gu); beaches (**beach**, RI:be), bench riparian ecosystems along floodplains (**bench,** RI:fp), fringe ecosystems associated with the edges of wetlands, ponds and lakes (**fringe**, RI:ff), and **river** ecosystems (RI:ri).
OF	Old Forest	Forest ecosystems dominated by large, old coniferous trees (OF:co); excludes old riparian forests; includes old Coniferous Woodlands and old Broadleaf Woodlands.
GR	Grasslands	Ecosystems dominated by bunchgrasses (**grassland**; GR:gr), invasive alien plants and bunchgrasses (**disturbed grassland**; GR:dg) and **shrubland** (GR:sh) ecosystems that occur in a grassland matrix.
SS	Sagebrush Steppe	Gently sloping ecosystems dominated by big sagebrush and bunchgrasses (SS:ss), **steep slope** sagebrush steppe (SS:st), **steep, shallow** soil sagebrush steppe (SS:st), and **disturbed** sagebrush steppe dominated by big sagebrush and invasive alien plants (SS:ds).
BW	Broadleaf Woodlands	Aspen copse ecosystems dominated by trembling aspen (BW:ac) occurring in depressions and moist areas in grasslands; old Broadleaf Woodlands are part of the Old Forest category.
WD	Coniferous Woodlands	Open stands of Douglas-fir or ponderosa pine, often on shallow soils, with typically grassy understories; old Coniferous Woodlands are part of the Old Forest category.
SV	Sparsely Vegetated	Shrubby rock outcrops (**shrub**; SV:sh), grassy or unvegetated **rock outcrops** (SV:ro), **talus** (SV:ta) slopes, and **cliffs** (SV:cl).

Other important ecosystems are partially modified ecosystems that provide many natural values including wildlife habitat, wildlife corridors, buffers between developed areas and sensitive ecosystems, and sources of potential recruitment for some sensitive ecosystems (Table 2).

[2] originally defined by Ward et al. 1998

[3] Ministry of Environment Ecosystems Branch 2006

Within developed landscapes, sensitive and other important ecosystems provide natural areas with intrinsic value and critical habitats for many species. They provide ecological functions that regulate the climate, clean freshwater, regulate and clean soils, maintain genetic diversity, maintain the water cycle, recycle nutrients, and pollinate crops. They are vital in creating healthy and attractive communities for people.

Table 2. Other important ecosystems mapped in the study area including the code, name and description.

Code	Other Important Ecosystems	Ecosystem Description
MF	Mature Forest	Forests dominated by coniferous mature trees (MF:co); excludes mature riparian forests and mature coniferous and broadleaf woodlands

3 Methods and Limitations

Terrestrial Ecosystem Mapping and Sensitive Ecosystems Inventory methods followed the provincial Resources Information Standards Committee 'Standard for Terrestrial Ecosystem Mapping in British Columbia' (except that bioterrain was not mapped), 'Standard for Mapping Ecosystems at Risk in British Columbia' and other relevant standards documents.

Photo Delineation, Preliminary Mapping, and Digital Data Capture

Terrestrial Ecosystem Mapping (TEM) formed the foundation of the thematic sensitive ecosystems map that was created for this project. Polygons were digitally delineated in a softcopy environment using a DiAP Viewer system and the 2007 1:15,000 digital aerial photographs from the Province of British Columbia. Polygons were delineated around areas of relatively uniform vegetation, topography and terrain features. Draft ecosystem and conservation attributes were recorded in a polygon database. Up to three ecosystems units were mapped for each polygon. The percentage of each ecosystem unit present is indicated by deciles ranging from 1 to 10 (1=10%; 10=100%). The polygon delineations were digitally cleaned and linked to the polygon database.

Polygon delineation focussed on separating sensitive ecosystems from modified landscapes. Where it was possible, different sensitive ecosystems were mapped as separate polygons. Where complex polygons were necessary, they were delineated to ensure that a minimum of 30% of the polygon was sensitive. Special focus was given to delineating wetlands as separate polygons. Riparian areas were mapped as continuous corridors (where they occurred as such) to facilitate planning to prevent fragmentation of these corridors.

In addition to the required ecology map attributes[4], the following map attributes were also recorded for each polygon:

- structural stage modifiers for shrub ecosystems

[4] As bioterrain mapping was not completed, no bioterrain attributes were recorded in the database.

- stand composition modifiers (e.g., coniferous, mixed or broadleaf stand),
- disturbance class and subclass,
- condition of the ecosystem (Cond) for all non-anthropogentic ecosystems,
- viability of the ecosystem (Viab) for sensitive and other important ecosystems,

This database was used to create a SEI ratings table; from this an SEI database and SEI maps were created.

Field Sampling

I developed a field sampling plan to target sampling of sensitive ecosystems, particularly those of high ecological condition. The draft SEI maps were used to identify and mark out areas of high priority for field sampling. Access based on road networks and accessibility of the terrain for hiking was considered.

Landowners of properties identified in the sampling plan were notified by letter by the Regional District of the Okanagan – Similkameen prior to fieldwork and many landowners granted us access to sample on their lands. Field sampling took place over ten days from July 19th – 23rd, 2010 in the Summerland and Trout Creek portions of the study area, and August 9th – 13th, 2010 in the Yellow and Twin Lakes and Ripley Lake portions of the study area. Kristi Iverson, R.P. Bio. completed all of the field work.

The sampling plan was modified in the field based on actual road access (some roads shown on maps were not accessible), permitted private property access, and the length of the field days. Some areas that could not be accessed were visually assessed from public roads using binoculars.

Ground inspections and visual inspections sample plots were used to identify and assess ecosystems. Field sampling procedures for ground inspections are outlined in *Field Manual for Describing Terrestrial Ecosystems*[5]. I followed guidelines from the *Standard for Terrestrial Ecosystem Mapping in British Columbia*[6] for visual inspection data collection. Additionally, I used a site conservation evaluation form developed by the B.C. Conservation Data Centre to evaluate the condition and ecological integrity of all non-anthropogenic ecosystems as per the Standard for Mapping Ecosystems at Risk in British Columbia[7]. Land owner/jurisdiction, type and level of disturbance, known threats, adjacent land use, invasive alien plants, successional status and fragmentation use were recorded.

The locations of all plots were recorded by GPS. Field sampling locations are shown below in Figure 1 and Figure 2.

[5] B.C. Ministry of Environment, Lands and Parks and B.C. Ministry of Forests 1998

[6] Resources Inventory Committee 1998

[7] Ministry of Environment Ecosystems Branch 2006

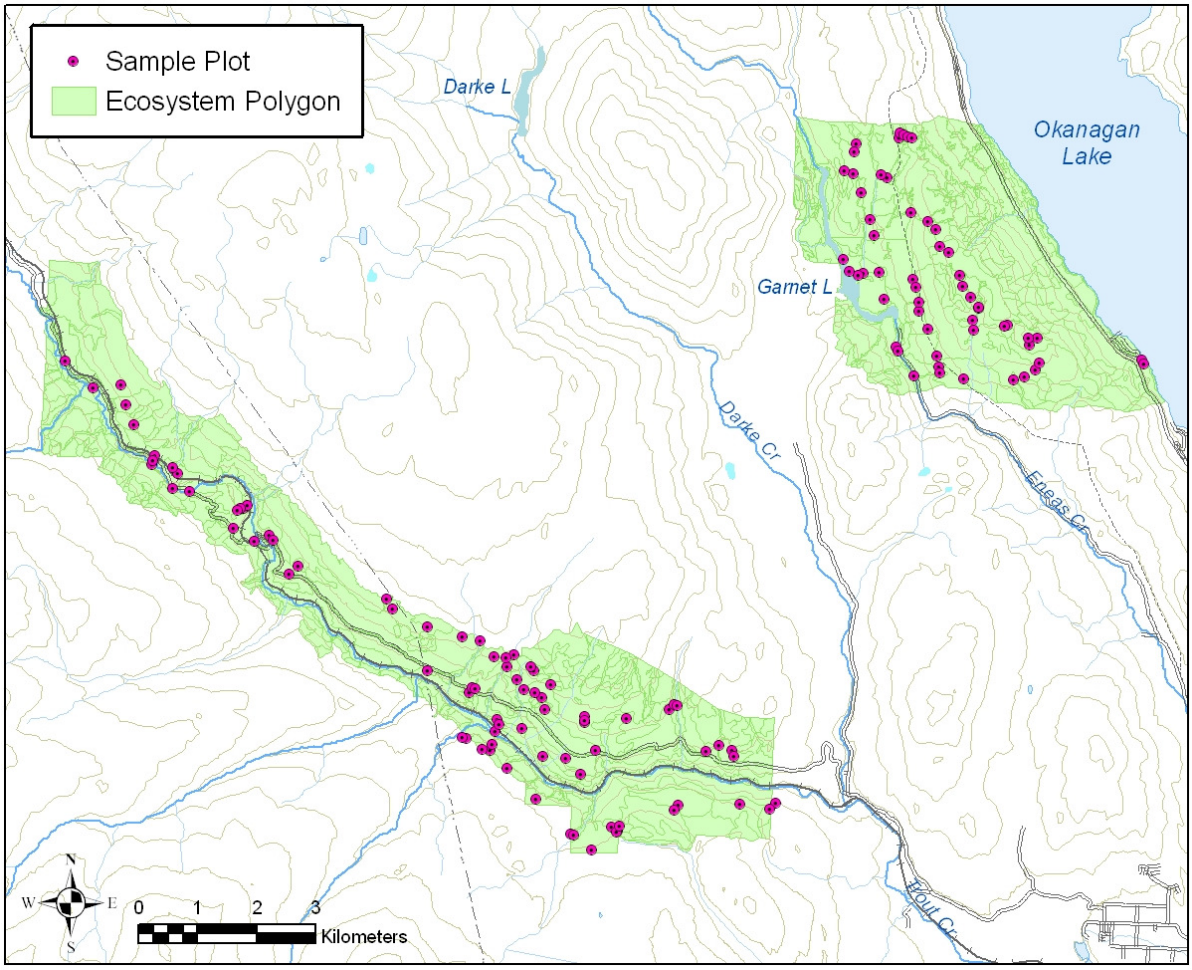

Figure 1. Field sampling locations for Summerland North Electoral Area F and Trout Creek Corridor Electoral Area F.

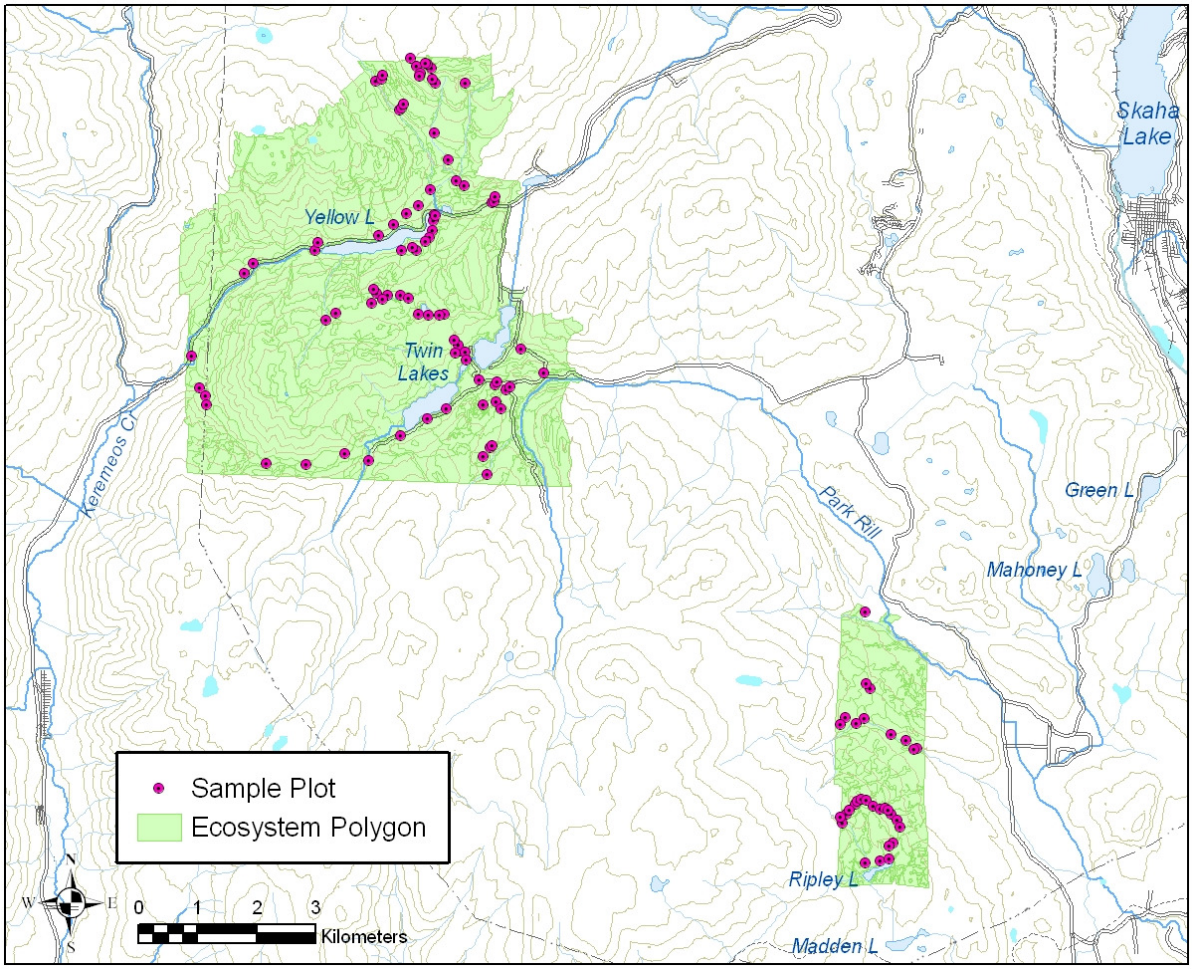

Figure 2. Field sampling locations for Yellow and Twin Lakes Area D and Ripley Lake Area C.

Forested and grassland ecosystems were identified using existing site series described in *A Field Guide for Site Identification and Interpretation for the Kamloops Forest Region*[8]. Most non-forested ecosystems such as wetlands and rock outcrops were adopted from previous projects: the South Okanagan SEI, Kelowna SEI[9], Lake Country SEI[10], Vernon Commonage SEI[11], Bella Vista – Goose Lake Range SEI[12] and the Central Okanagan SEI[13]. These units were originally described based on field data and units were developed in conjunction with Dennis Lloyd, the Ministry of Forests and Range's Regional Ecologist in Kamloops. Additional wetland units mapped were adopted from the provincial wetland classification[14].

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[8] Lloyd et al. 1990

[9] Iverson and Uunila 2008

[10] Iverson and Uunila 2005

[11] Iverson and Uunila 2006

[12] Iverson and Shypitka 2003

[13] Iverson et al. 2004

[14] MacKenzie and Moran 2004

Ground inspections were used primarily to sample good condition sensitive ecosystems and representative examples of ecosystem units. Visuals were primarily used to verify ecosystem units and structural stages. Plot sampling statistics are presented below; survey intensity level 4 was achieved.

Table 3. Sites visited with ecological data.

Ground Inspections	Visuals	TOTAL
70	183	253

Table 4. Field checking statistics.

Total Area	Total Number of Polygons	Total Number of Field Sites	Percentage Polygons Field Checked	Hectares per Field Inspection
9299 ha	1165	253	21.7 %	37

Plot data

Data from field plots were entered into a digital database using Resources Inventory Committee standard software (VENUS Version 5).

Final Mapping

Following field work, revisions were made to the polygon boundaries using a DiAP Viewer with digital 1:15,000 scale imagery from 2007. Where new polygons were delineated, ecosystem attributes were recorded in the map database. Existing ecosystem units and attributes were verified or changed in the database based on data from field sampling.

Sensitive Ecosystems Mapping

TEM units were assigned to sensitive ecosystems and other important ecosystems class and subclass following the existing South Okanagan – Similkameen SEI[15]. While no new SEI categories resulted from this inventory, a few different TEM units were encountered; these wetland units were assigned to the applicable SEI unit. All unique TEM ecosystem units were assigned an SEI class, SEI subclass and reconciled conservation rank in the Ecosystem-based Resource Mapping (ERM) Ratings Table Tool[16]. The resulting SEI ratings table was used to produce a thematic SEI map and SEI database.

In the SEI map, each polygon can have up to three ecosystem components mapped in it. The three components were ordered by area of occupancy from largest to smallest. The sensitive ecosystems map used dot density to indicate the components of the polygon. The first component of the polygon was shown by the base colour; the colour was specific to the sensitive ecosystem class. The dots indicated the second and third ecosystem components; the colour of the dots indicated the ecosystem class. The number of dots indicated the proportion of the polygon represented by the second and third ecosystem class.

[15] Iverson and Haney 2010

[16] See http://www.env.gov.bc.ca/wildlife/whr/erm_system_flow.html for more information on the ERM tools.

4 Results

The following ecosystems were encountered that were not previously recorded in the South Okanagan – Similkameen SEI, although they may occur there.

Table 5. New ecosystem units in the South Okanagan SEI gap areas.

Subzone / Code SiteMC_S1 / Site_S1 SiteMC_S2 / Site_S2 SiteMC_S3 / Site_S3	Name	Description & Mapping Notes
IDFdk1 Fl05	Drummond's willow – bluejoint low bench site	This floodplain ecosystem occurs on low benches along Trout Creek, often in association with RD. It is dominated by willows, particularly Drummond's willow, twinberry, and scattered sedges and forbs. Assumed modifiers: c
IDFdk1 RD	Red-osier dogwood floodplain	This is a dense shrubby swamp that occurred along the floodplain of Trout Creek. It is characterized by dense red-osier dogwood with other shrubs and willows and very few forbs because of the thick shrub cover. Assumed modifiers: c
IDFdk1 SA	Antelope-brush – Selaginella	Rocky areas with scattered shrubs and bunchgrasses. Rock is generally fractured and with vegetation growing in cracks and in shallow soils on ledges. Shrubs (saskatoon, mock orange, antelope-brush, choke cherry) together with bunchgrasses and lichens dominate the pockets of vegetation. Non-standard unit from the IDFxh1. Antelope-brush is limited to its core range but does not actually occur in the study area. Assumed modifiers: j, m, s
IDFxh1 FO	Douglas-fir / Ponderosa pine – Saskatoon - Mock orange	This forest ecosystem occurs on steep, rocky colluvial sites. The soil matrix is a mixture of both angular rocks and sandy, silty material. The overstory is generally open and dominated by Douglas-fir with scattered ponderosa pine. The understories is usually quite shrubby with snowberry, saskatoon, oceanspray and Douglas maple. There are usually scattered bluebunch wheatgrass plants and forbs such as cliff fern. Assumed modifiers: c, d

Subzone / Code SiteMC_S1 / Site_S1 SiteMC_S2 / Site_S2 SiteMC_S3 / Site_S3	Name	Description & Mapping Notes
PPxh1 CG	Reed Canarygrass Marsh	This marsh-meadow wetland ecosystem occurs in areas where water draws down below the soil surface most summers (seasonal flooding). These sites have thick cover of reed canarygrass with few other species. These sites may have been dominated by other marsh species such as large water sedges previously. Assumed modifiers are d, f, and j.
PPxh1 FO	Douglas-fir / Ponderosa pine – Saskatoon - Mock orange	This forest ecosystem occurs on steep, rocky colluvial sites. The soil matrix is a mixture of both angular rocks and sandy, silty soil. The overstory is generally open and dominated by Douglas-fir and ponderosa pine. The understory is usually quite shrubby with snowberry, saskatoon, and oceanspray. There are usually scattered bluebunch wheatgrass plants and forbs such as cliff fern. Assumed modifiers: c, d

5 Limitations

The SEI and TEM information is intended for use in alerting local and regional decision-makers of the presence of important ecosystems and ecological features. ***The SEI and TEM do not replace the need for on-site assessments of areas where land use changes are proposed or contemplated***.

The accuracy of polygon boundaries is limited by the scale (1:10,000) and date (2007 imagery for all polygon attributes) of the aerial photographs on which the sites are delineated. ***Data should not be enlarged beyond the scale of the photos as this may result in unacceptable distortion and faulty registration with other data sets.***

Given the continuing land-uses within the study area, including human settlement and agricultural development, attributes of some polygons will change with time.

One of the primary limitations of aerial photograph interpretations is the limited ability to see disturbances such as grazing and invasive plants. I applied information based on extrapolation from field data, current land use, and based on the tone and texture seen on the aerial photographs.

My ability to delineate polygons around small sensitive features or ecosystems was limited by the scale of the aerial photographs and intended scale of display. Where I could not delineate a separate polygon, these ecosystems are captured as a component of a larger polygon dominated by another ecosystem. Many polygons are a complex of ecosystems and sensitive ecosystems may only occupy

a portion of that polygon. Every effort was made to delineate polygons around sensitive ecosystems such that a minimum of 30% of the polygon was sensitive.

6 Deliverables and Metadata

The project was assigned the BAPID 5673 by the Province of British Columbia; all file names use this number. The data will be posted and publicly available on EcoCat http://a100.gov.bc.ca/pub/acat/public/welcome.do

- ARCInfo spatial databases:
    - **TEM_5673_ecp.csv** –TEM & SEI polygon coverage; links to non-spatial data via ECP_Tag
    - **TEM-5673_eci.csv** – spatial locations of field plots
- non-spatial polygon data including TEM data, Sensitive Ecosystems data
    - **TEM_5673_ecp.csv** – standard TEM database, links to spatial data via ECP_Tag
    - **TEM_5673_mta.csv** – TEM project meta-data
    - **TEM_5673_usr.csv** – list of user-defined ecosystem map units
    - **SEI_5673_ecp.csv** – standard SEI database, links to spatial data via ECP_Tag
    - **SEI_5673_mta.csv** – SEI project meta-data
    - **SEI_5673_usr.csv** – list of user-defined ecosystem map units
    - **SEI_5673_eci.mdb** – VENUS 5.0 database with all plot data. VENUS can be downloaded at
- SEI and Reconciled Conservation Rank ratings table
    - **SEI_5673_rt.csv** – ratings table links TEM database to SEI and conservation ranks using the Resource Ratings Modelling Tool http://www.env.gov.bc.ca/wildlife/whr/rrm_tool/index.htm
- Report
    - SEI_5673_rpt.doc
- Maps: 1:10,000 scale SEI maps in pdf format
    - **SOK_2010_Gaps_SEI_082E022.2.pdf**
    - **SOK_2010_Gaps_SEI_082E022.4.pdf**
    - **SOK_2010_Gaps_SEI_082E032.1.pdf**
    - **SOK_2010_Gaps_SEI_082E032.3.pdf**
    - **SOK_2010_Gaps_SEI_082E061.1.pdf**
    - **SOK_2010_Gaps_SEI_082E061.2.pdf**
    - **SOK_2010_Gaps_SEI_082E061.3.pdf**
    - **SOK_2010_Gaps_SEI_082E062.3.pdf**
    - **SOK_2010_Gaps_SEI_082E072.1.pdf**

7 References

B.C. Ministry of Environment, Lands and Parks and B.C. Ministry of Forests. 1998. *Field Manual for Describing Terrestrial Ecosystems*. Land Management Handbook Number 25. Province of British Columbia, Victoria, B.C.

Iverson, K. and P. Uunila. 2008. Sensitive Ecosystems Inventory: City of Kelowna. Volume 2: Terrestrial Ecosystem Mapping, Terrain, Terrain Stability, Soil Erosion Potential Mapping, and Expanded Legend. Unpub. report prepared for the City of Kelowna

Iverson, K., C. Cadrin, D. S. Filatow, and C. Erwin. 2004. Sensitive Ecosystems Inventory: Central Okanagan, 2000 – 2001. Volume 2: Terrestrial Ecosystem Mapping, Surface Erosion and Slope Stability, and Expanded Legend. Unpub. report prepared for the Regional District of the Central Okanagan.

Iverson, K. and A. Haney. 2010. Refined and updated ecosystem mapping for the South Okanagan and lower Similkameen Valley. Compendium of projects prepared for the Regional District Okanagan – Similkameen, the South Okanagan – Similkameen Conservation Program, and Parks Canada.

Iverson, K., and S. Shypitka. 2003. Sensitive Ecosystems Inventory: Bella Vista – Goose Lake Range. Volume 2: Terrestrial Ecosystem Mapping, Soil Erosion and Slope Stability, and Expanded Legends. Unpub. report prepared for the Okanagan Indian Band and Allan Brooks Nature Centre.

Iverson, K., and P. Uunilla. 2008. Sensitive Ecosystems Inventory: Coldstream Vernon. Volume 2: Terrestrial Ecosystem, Terrain, Terrain Stability and Soil Erosion Potential Mapping, and Expanded Legend. Unpub. report prepared for the Ministry of Environment and Allan Brooks Nature Centre.

Iverson, K., and P. Uunilla. 2006. Sensitive Ecosystems Inventory: Vernon Commonage. Volume 2: Terrestrial Ecosystem Mapping and Expanded Legends. Unpub. report prepared for the Ministry of Environment and Allan Brooks Nature Centre.

Iverson, K., and P. Uunilla. 2005. Sensitive Ecosystems Inventory: Lake Country. Volume 2: Terrestrial Ecosystem Mapping, Soil Erosion and Slope Stability, and Expanded Legends. Unpub. report prepared for the District of Lake Country and Ministry of Environment.

Lloyd, D., K. Angrove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. Land management handbook no. 23. BC Ministry of Forests. Victoria, B.C.

MacKenzie, W. H. and J. R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Land management handbook no. 52. B.C Ministry of Forests. Victoria, B.C.

Ministry of Environment Ecosystems Branch. 2006. Standard for Mapping Ecosystems at Risk: An Approach to Mapping Ecosystems at Risk and Other Sensitive Ecosystems. Version 1.0. Victoria, B.C.

Resources Inventory Committee. 2000a. Provincial site series mapping codes and typical environmental conditions. Ecosystems Working Group. Victoria, B.C. http://www.publications.gov.bc.ca

_____. 2000b. Standard for Terrestrial Ecosystem Mapping (TEM) – Digital Data Capture in British Columbia, Version 3.0. Victoria, B.C.

_____. 1998. Standard for Terrestrial Ecosystem Mapping in British Columbia. Victoria, B.C.