Sensitive Ecosystems Inventory: Central Okanagan Joe Rich, 2006

Methods, Ecological Descriptions, Results, and Expanded Legend

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We would like to thank the Joe Rich landowners who provided us with access to their lands for sampling.

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Abstract

The Central Okanagan Sensitive Ecosystems Inventory (SEI) was completed in 2000 – 2001 in response to an urgent need for inventory information on rare and fragile ecosystems to support sound land management decisions. The project area included portions of the lower elevation ecosystems in the central Okanagan. In 2006, funding was obtained to extend the SEI to cover the Joe Rich area. This technical report updates the original Sensitive Ecosystems Inventory report[7] and Terrestrial Ecosystem Mapping (TEM) report[8] reports with methods, results, and an expanded legend for the Joe Rich SEI and TEM.

Thirty-three percent of the study area was in Sensitive Ecosystems (SE); fifteen percent of the area was included in the Other Important Ecosystem (OIE) categories. The inventory results indicated that broadleaf woodlands, wetlands, and sparsely vegetated ecosystems were extremely rare in the study area.

Many of the sites identified by the SEI were at high risk of conversion to other land uses, or further degradation by human use and invasion by non-native plants.

[7] Iverson and Cadrin 2003
[8] Iverson et al. 2004

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1 Introduction

This report provides updates to Volume 1 and Volume 2 of the Central Okanagan Sensitive Ecosystems Inventory based on additional mapping of the Joe Rich area.

This report provides updates to both the Terrestrial Ecosystem Mapping (TEM) and Sensitive Ecosystems Inventory (SEI). **Surface Erosion Potential, Terrain Stability and Wildlife Habitat mapping were not completed for the Joe Rich study area**.

Since the completion of the original Central Okanagan SEI, the District of Lake Country has also been mapped (TEM, SEI, Surface Erosion Potential, Terrain Stability and Wildlife Habitat mapping). The Lake Country SEI follows the same methods as the Central Okanagan SEI. There is a small area of overlap at the south-east edge of the Lake Country mapping and north-east portion of the Central Okanagan mapping. As the Lake Country mapping is more recent, this mapping should take precedence in the overlap area.

The Ellison portion of the original Central Okanagan SEI also had some updates completed in 2005 (1684 ha). Where possible, polygons were divided using a 1:10,000 orthophoto base to provide fewer complex polygons. Additional field verification was completed to improve the map reliability and the map database was updated. A small additional area to the east of the original study area (234 ha in the IDFmw1) was mapped from the orthophoto base to complete the coverage of the Ellison area.

Study Area

The study area (Figure 1) is located eastern edge of the City of Kelowna along Mission, Joe Rich and Belgo Creeks in the central Okanagan Valley of south-central British Columbia. The area covers 4825 ha, and includes private and publicly-owned lands. The Ellison mapping area is shown in Figure 2.

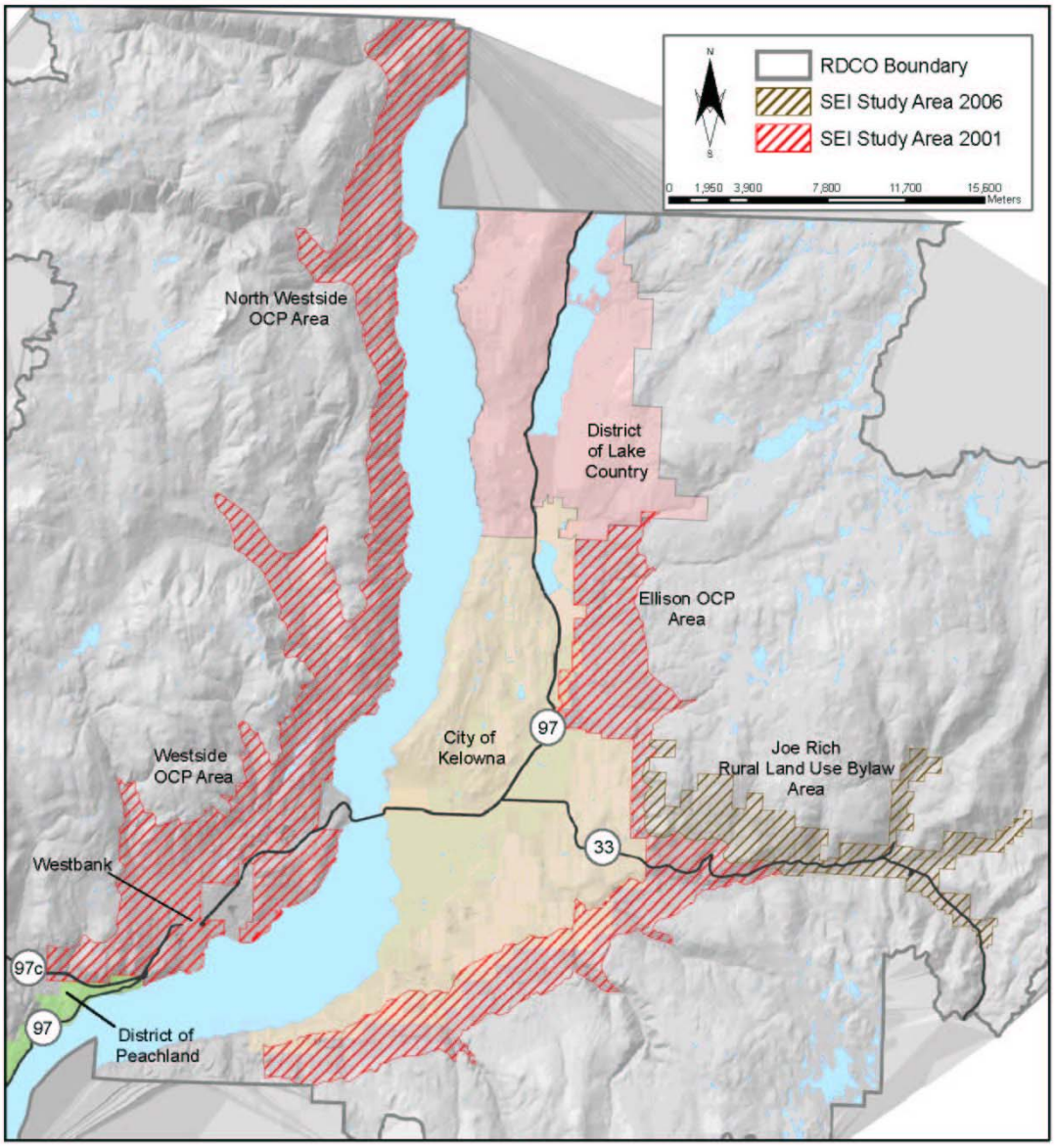

Figure 1. Study area. The original Central Okanagan SEI study area from 2000-2001 is shown in red. The new Joe Rich study area (2006) is shown in brown.

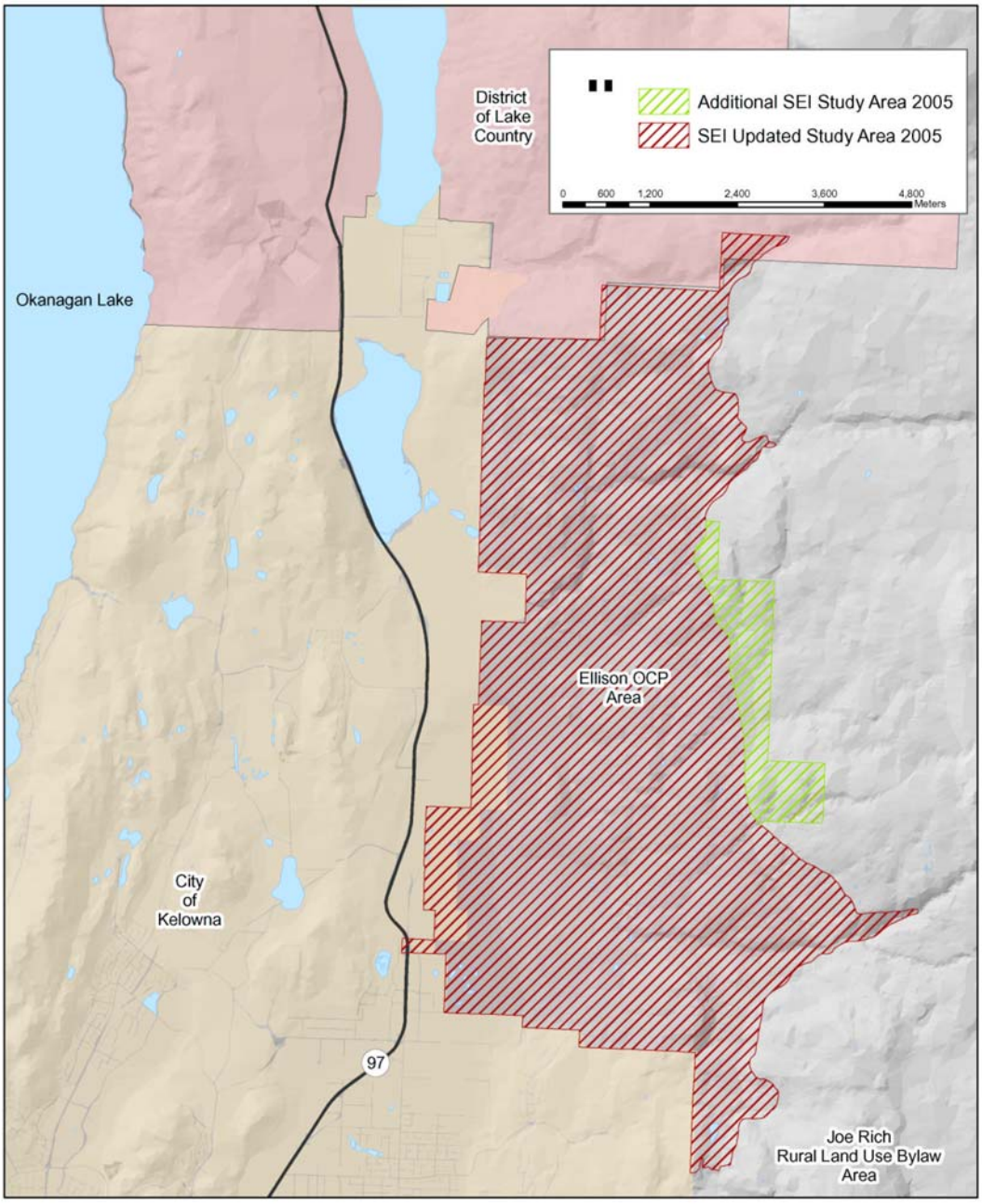

Figure 2. Ellison study area showing the area in red where the ecosystem mapping was updated and the area in green showing the additional mapped area.

Ecoregional and Biogeoclimatic Classification

The Joe Rich study area is located within the Southern Interior Ecoprovince, the northern extension of the Columbia Basin that extends south to Oregon. Situated within the southernmost region of the Interior Plateau of British Columbia, the region lies west of the Columbia Mountains and east of the Coast and Cascade Mountains within the North Okanagan Highland Ecosection (NOH), a cool, moist, transitional mountain area, dominated by a rolling upland.

One biogeoclimatic variant is represented within the study area: the Shuswap Moist Warm Interior Douglas-fir Variant (IDFmw1). The **IDFmw1** has a warm, dry climatic regime and a relatively long growing season with summer drought**Error! Bookmark not defined.**. It is cooler, moister and higher elevation than the areas mapped in 2000-2001. Mature forests are dominated by Douglas-fir with some western redcedar and western larch.

Most of the land (78.9%) within the Joe Rich study area is privately owned. The remainder of the land is Crown Land (21.1%). None of the Joe Rich study area is protected nor is part of an Indian Reserve. The study area was selected to cover all private land within the Joe Rich Rural Land Use Bylaw Area; it does not follow any ecological boundaries.

What are Sensitive Ecosystems?

This sensitive ecosystems project recognises both *sensitive ecosystems* and *other important ecosystems* in the study area. One additional other important ecosystem was mapped: Seasonally Flooded Agricultural Fields. The definition of Disturbed Grasslands was adjusted compared to that for the Central Okangan (approximately more than 20 – 50% non-native plants in the original Central Okanagan and generally >50% non-native plants for the Joe Rich Area). This was done to reflect new provincial mapping standards.

2 Impacts of Concern

The primary current impacts of concern within the Joe Rich study area are forest harvesting, intensive grazing, fire suppression, water management, and urban development.

The landscape is partly fragmented, particularly some riparian ecosystems that are isolated in places from the surrounding uplands. Forestry roads and cut blocks and agricultural and urban developments have been the primary agents of landscape fragmentation in the study area.

A major landscape level change in the study area has been the exclusion and suppression of natural fire. Fire exclusion and fire suppression over a long period of time has resulted in forest ingrowth of Douglas-fir and other conifers. Increased forest densities will increase the severity of future forest fires in the study area.

Another major landscape level change that has occurred in the study area has been the use of control structures to prevent flooding of many riparian ecosystems. The prevention of natural flooding events reduces the diversity and complexity of riparian ecosystems, and alters habitat values, resulting in loss of some functions and part of the riparian habitat. Many riparian areas have been converted to agricultural land and also have structures built on them, increasing the complexity and difficulty of restoring the natural flooding regime.

Most grasslands in the study area have been altered by invasive alien plants including (but not limited to): cheatgrass (*Bromus tectorum*) and other annual bromes (*Bromus* spp.), diffuse knapweed (*Centaurea diffusa*), and sulphur cinquefoil (*Potentilla recta*). Invasive plants displace many native plants and cause a loss of forage for both domestic livestock and many wildlife species. Improperly managed grazing by domestic animals can exacerbate the spread of invasive plants.

3 Methods and Limitations

This chapter describes the methods that were used to generate the sensitive ecosystems map. The provincially recognised Terrestrial Ecosystem Mapping[9] (TEM) approach was used as a base map. Ecosystems were evaluated for sensitive ecosystems status and a sensitive ecosystems theme map was developed.

Terrestrial Ecosystem Mapping

Terrestrial Ecosystem Mapping was completed according to the methods outlined in *Standard for Terrestrial Ecosystem Mapping in British Columbia* (RIC 1998). Mapping was completed at a scale of 1:20,000 using Resource Inventory Committee (RIC) survey intensity level four.

Preliminary bioterrain mapping was completed on colour aerial photographs at a scale of approximately 1: 15 000 (**Error! Reference source not found.**). Polly Uunila, P.Geo. delineated the polygons and added a terrain symbol and soil drainage class to each polygon. The linework was transferred to a digital map base by mono-restitution.

Table 1. Mapsheet and aerial photograph list.

TRIM Mapsheets	082E084 082E085
Flight Line and Air Photo Numbers	30BCC 96035: No. 87 - 89 30BCC 96037: No. 20, 21, 28, 29 30BCC 96037: No. 206 - 215 30BCC 96038: No. 17 - 29 30BCC 96038: No. 207 - 215

Polygon delineation was based on the following:

- terrain type;
- material depths;
- drainage;
- slope breaks;
- slope position;
- aspect: cool (from 285 to 135°) and warm (from135 to 285°);
- geomorphological processes;
- surface expression and slope morphology (e.g., concave or convex);
- vegetation changes;
- riparian zones and corridors; and
- any other ecologically significant areas such as cliffs, talus slopes, and ponds.

[9] Resources Inventory Committee 1998

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

- stand composition modifiers (for example: coniferous, mixed, or broadleaf stand),
- quality and condition of the ecosystem.

TEM formed the foundation of the thematic sensitive ecosystems map that was created for this project. Polygons were delineated on 1:15,000 colour aerial photographs using a bioterrain approach. Polygons were drawn around areas of uniform vegetation, topography and terrain features. Ecosystem, terrain, and conservation evaluations were recorded in a polygon database. The polygons were digitized and compiled in a geographic information system (GIS), and linked to the polygon database.

Sensitive Ecosystems Mapping

TEM units were evaluated for rarity and ecological sensitivity and were assigned to sensitive ecosystems and other important ecosystems categories accordingly. Criteria for ecological sensitivity included the presence of shallow soils, the susceptibility of the site to hydrological changes, erosion, and invasion by noxious weeds, and sensitivity associated with human disturbance. Rarity was based on rankings by the Conservation Data Centre (CDC), and ecosystems proposed for ranking by the CDC based on the local and provincial distribution of those ecosystems (especially in an undisturbed state) and the threats to them. If the ecosystem was determined to be ecologically fragile or rare, it was assigned to the applicable sensitive ecosystems category. In cases where a given ecosystem could be assigned to more than one Sensitive Ecosystems category, it was always assigned to the more sensitive category. For example, old riparian forests were assigned to the 'riparian' rather than the 'old forest' category.

Ecosystems were grouped into sensitive ecosystems categories using the Ecosystem-based Resource (ERM) Table Tool[10]. This tool allows ratings, or in this case, SEI categories, to be assigned to each ecosystem. Detailed conversion tables can be found in Appendix C.

Field Sampling and Conservation Evaluation

Prior to initiating the fieldwork for this project, a letter was sent out to all landowners with large properties in the Joe Rich electoral area of the RDCO. The letter informed the landowners of the fieldwork required for the inventory; landowners were contacted by phone to request permission to access their property.

The sampling plan involved using vegetation resources inventory (VRI) maps to identify areas of potentially old forest, and aerial photographs to identify accessible potentially sensitive ecosystems including grasslands, wetlands, ponds, riparian areas, rock outcrops and talus slopes. Field sampling was completed in the fall of 2006, and a total of 142

[10] See the following website for more information on the ERM tools and to download ERM tools: http://srmwww.gov.bc.ca/rib/wis/whr/sta.htm

sites were field-checked. A team of two scientists including a plant ecologist and terrain specialist conducted the sampling.

Three types of sample plots were used to identify and assess ecosystems: detailed ecological plots, ground inspections, and visual inspections. Sampling procedures for detailed ecological plots and ground inspections are outlined in *Field Manual for Describing Terrestrial Ecosystems*[11]. The *Standard for Terrestrial Ecosystem Mapping*[12] in British Columbia provides guidelines for visual inspection data collection.

Field crews also assessed the conservation values of the site. Condition and Landscape Context were evaluated; Appendix B provides definitions of terms and requirements for each factor in the conservation evaluation.

After field work was complete, the bioterrain mapping was revised by P. Uunila based on field observations. Field data also provided points of calibration used to photo-interpret ecosystems that were not visited for the TEM.

[11] BC Ministry of Environment, Lands and Parks and BC Ministry of Forests 1998
[12] Resources Inventory Committee 1998

4 Inventory Results

This chapter provides a summary of the distribution and extent of sensitive ecosystems and other important ecosystems in the study area. Further details can be found in each of the ecosystem chapters.

SEI Summary Results

Seven types of sensitive ecosystems and three types of other important ecosystems were identified. Collectively the seven sensitive ecosystems (SE) covered 32.72% (1579 ha) of the study area, while modified landscapes covered the remaining 67.28% (Figure 3 and Table 2). The three other important ecosystems (OIE) mapped covered 15.18% (733 ha) of the study area.

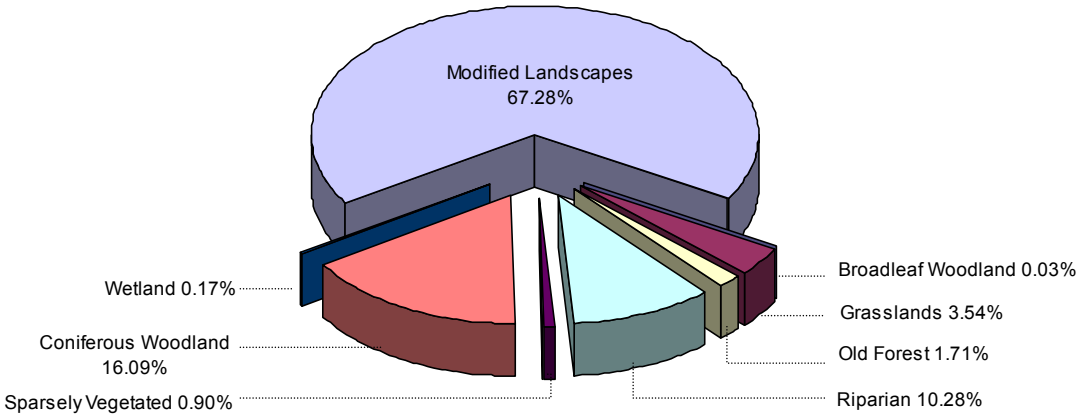

Figure 3. Relative proportion of sensitive ecosystems and modified landscapes in the study area.

Table 2. Area of sensitive ecosystems and other important ecosystems in the study area.

	Area (ha)	Percent of Study Area
Sensitive Ecosystems (SE)		
Broadleaf Woodland	1	0.03
Grassland	171	3.54
Old Forest	83	1.71
Riparian	496	10.28
Sparsely Vegetated	44	0.90
Coniferous Woodland	776	16.09
Wetland	8	0.17
Total SE	**1579**	**32.72**
Other Important Ecosystems (OIE)		
Disturbed Grassland	111	2.30
Mature Forest	528	10.94
Seasonally Flooded Fields	93	1.94
Total OIE	**733**	**15.18**
TOTAL SEI and OIE	**2312**	**47.90**

Bioterrain Mapping

Findings significant for urban and rural developments are discussed below.

Slope Instability

Slope instability, including landslides, rockfall and slumping, was not the focus of this study, however the processes mapped will be briefly discussed in this section. Geomorphological process symbols are added to the terrain label in polygons where these features exist. Only those features that are large enough (larger than about 2 ha and not obscured by thick vegetation or in shadows) to be visible on a 1:15,000 scale air photo are mapped. The field sampling plan did not include searching for unknown landslides or assessing the known features. The following slope instabilities are mapped in the study area (definitions are provided in Appendix A):

- bedrock slump (-Fm);
- slump in surficial material (-Fu);
- debris slide (-Rs);
- debris flow (-Rd); and
- rockfall (-Rb).
- tension cracks (-Fk);

Bedrock Slumps

A slump in bedrock refers to a rotational slump where portions of the slide mass remain internally cohesive. Rotational slumps develop due to failure along vertical joints and horizontal weak layers. In the study area, a couple of bedrock slumps are mapped (geomorphological process "-Fm"). However, there are three large (approximately 1 km^2 each), poorly defined slumps that are not mapped other than the approximate outlines of each slide deposit is outlined on the untyped aerial photo stereopair. The geomorphological process symbol of "-Fm" is not added to the terrain symbols for the polygons on these three features. The slumps are located:

- Aerial photograph 30BCC96037 #206, north of Black Knight Mountain on west facing slope
- Aerial photograph 30BCC96038 #23, between Cardinal Creek and Belgo Creek upslope from Philpott Road
- Aerial photograph 30BCC96038 #19, at the east end of the study area, upslope from Three Forks Road

The three slumps appear to be relict (pre-date most recent glacial retreat of about 12,000 years ago) and inactive. The features are poorly defined as it is believed that they were overridden by the most recent glaciation. The headscarps are subdued, and the deposits appear to be largely covered by till.

Slumps in Surficial Materials

Slumps in surficial materials (-Fu) consist of deep-seated, rotational failures along a zone of weakness within thick deposits. Slumping in fine-grained sediments, such as, glaciolacustrine materials are common. In the study area, terraces of thick surficial materials are located along Mission Creek which contain existing large slump deposits. One such slump occurred in the escarpment immediately east of the study area in October of 1984 (Roed, 1995). This hillslope is susceptible to slumping due to a combination of factors, such as, thick surficial materials especially with layers of fine-grained sediments (ie glaciolacustrine sediments), undercutting of the toe slope by the creek, steep slopes and a receiving area for groundwater.

Debris Slides and Debris Flows

Debris flows (-Rd) initiate in steep gullies and debris slides (-Rd) initiate on steep hillsides. They occur when a mass of surficial material slides rapidly downslope often as a result of the loss of soil strength due to high pore water pressure. Debris slides (non-channelized movement of debris) and debris flows (channelized movement of debris) are initiated on steep slopes where material slides along a shear plane. The shear plane often coincides with the boundary between more permeable and less permeable material (e.g. between weathered and unweathered material or between surficial material and bedrock). Debris flows and debris slides are triggered by heavy rain, water from snow melt, and/or rain on snow events, and result from loss of soil strength due to high pore water pressure. During wet conditions, slides are also triggered by wind stress on trees, tree throw, impact of falling rocks from up slope, and vibrations due to earthquakes or human activity. In logged areas, debris slides that occur several years after logging can be due to

the loss of soil strength that results from root decay. Diverted drainage from roads commonly trigger failure of sidecast material and may initiate landslides some distance downslope. A debris flow may move downslope for several hundred metres or more before it is arrested by gentler terrain or by de-watering, or it may enter a trunk stream. Debris flows are effective agents of erosion, commonly increasing the volume of material as it progresses downslope. Debris slides and debris flows are significant potential sources of stream sediment and a hazard to activities or structures (roads, culverts) located in runout zones.

Between June 11 and 13, 1990, five debris flows and one large debris slide occurred along Philpott Road and Belgo Creek[13]. These events followed one of the wetter years on record and intense rainstorm combined with snowmelt[13]. Debris slides are mapped along the escarpments of thick surficial materials bordering the larger creeks in the study area, including Mission Creek, Belgo Creek, and Joe Rich Creek. Escarpments along the smaller creeks have potential for slope instability, for example, Prather Creek and Daves Creek. Slopes greater than about 50% covered by surficial materials have the potential for slope instability. Slopes greater than about 30% in glaciolacustrine sediments have the potential for slides and slumps. Gullies steeper than about 45% percent have the potential for debris flows.

Recommendations

It is recommended that prior to development a Qualified Registered Professional (e.g. Geotechnical Engineer) examine the areas within or near polygons containing terrain labels with the following geomorphological processes:

- bedrock slump (-Fm);
- slump in surficial material (-Fu);
- debris slide (-Rs);
- debris flow (-Rd); and
- rockfall (-Rb).
- tension cracks (-Fk);

Other areas that require a more detailed assessment prior to proposed development include:

- slopes steeper than about 50%
- slopes steeper than about 30% if glaciolacustrine sediments
- gullies steeper than about 45%

Other hazardous locations include runout zones below potentially unstable terrain, including colluvial fans and talus slopes, and gentle terrain located immediately upslope of potential unstable terrain.

Mapping Limitations

The purpose of the bioterrain mapping is to provide general information about the study

[13] Roed 1995

area and to identify areas that require further investigation. Detailed analysis and field assessment of slope instability was not conducted during this study. The mapping was completed at 1:15,000 scale and is intended to be used at this or a larger scale. The information and analyses contained in this report and on the air photos are based on observations of land-surface conditions and current understanding of slope processes. However, because slope stability is strongly influenced by subsurface conditions that are not apparent from surface observations or air photo interpretation (e.g., characteristics of subsurface materials and subsurface hydrologic conditions), by events whose time of occurrence cannot be predicted (e.g., extreme storms, earthquakes) and by land management practices, the results and recommendations provided in this report cannot guarantee that no landslides will occur in areas affected by development. Appropriate use of terrain information and implementation of recommendations will, however, reduce the risk of landslides and erosion.

Terrestrial Ecosystem Mapping

Table 3 below lists the ecosystems mapped in the study area, the area they covered, and the percentage of the study area landbase. All ecosystem units are within the IDFmw1 biogeoclimatic unit. The Expanded Legend in Appendix D provides a complete description of each ecosystem.

Table 3. Ecosystem Units mapped, their area, and their percent of the study area.

Ecosystem Unit Code/ Number	Ecosystem Unit Name	Area (hectares)	% of study area
AS /00	Trembling aspen – Snowberry – Kentucky bluegrass	1.2	0.03
BR /00	Baltic Rush Marsh-Meadow	0.6	0.01
CB /00	Cutbank	2.9	0.06
CD /00	Black Cottonwood/Douglas-fir – Common Snowberry – Red-osier Dogwood Riparian	51	1.1
CF /00	Cultivated Field	257	5.3
CL /00	Cliff	4.0	0.08
CT /00	Cattail Marsh	1.4	0.03
DF /01	Douglas-fir / Western redcedar – Falsebox – Prince's pine	902	18.7
DP /04	Douglas-fir – Pinegrass – Feathermoss	1491	30.9
DS /02	Douglas-fir / Ponderosa pine – Snowberry – Bluebunch wheatgrass	118	2.4
ES /00	Exposed Soil	14	0.29
FW /00	Idaho fescue – Bluebunch wheatgrass	10	0.21
OW /00	Shallow Open Water	3.3	0.07
PP /03	Douglas-fir – Penstemon – Pinegrass	976	20.2
RD /06	Western redcedar – Devil's club – Foamflower	64	1.3
RF /00	Prairie Rose – Idaho fescue	46	0.96
RI /00	River	40	0.83
RO /00	Rock Outcrop	2.1	0.04
RR /05	Western redcedar / Douglas-fir - Dogwood	281	5.8
RW /00	Rural	220	4.6
RZ /00	Road Surface	75	1.6
SB /00	Selaginella – Bluebunch wheatgrass rock outcrop	16	0.33
SO /00	Saskatoon – Mock orange Talus	14	0.29
TA /00	Talus	7.8	0.16
WB /00	Bluebunch wheatgrass – Balsamroot	226	4.7
WS /00	Willow – Sedge Wetland	2.7	0.06
TOTAL		**4825**	**100**

5 Seasonally Flooded Agricultural Fields

Other Sensitive and Other Important Ecosystem are described in the original reports.

What are seasonally flooded agricultural field ecosystems?

Seasonally flooded agricultural fields are lands that have been converted to agricultural use but have seasonally important wildlife habitat values. They are located along low lying areas in the floodplain adjacent to Mission and Joe Rich Creek. These sites may flood some springs or have patches of water, providing habitat for waterfowl and other birds. Vegetation is dominated by agronomic grass species.

Wildlife of Seasonally Flooded Agricultural Fields

Amphibians & Reptiles: *Amphibians such as Long-toed Salamanders, Western Toads, Tree Frogs and potentially the Great Basin Spadefoot may use these areas for breeding when the fields are flooded or where ponding has occurred. These temporarily flooded areas are particularly important in locations where most permanent wetlands contain fish (that predate on amphibians). Rubber Boas and garter snakes may forage in and around these areas while flooded and dry.*

Birds: *Wetlands provide foraging or nesting habitat for many birds, including the Great Blue Heron, American Avocet, American Bittern, Red-necked Phalarope, and possibly Long-billed Curlews. Raptors also use these fields for foraging year round.*

Mammals: *While flooded, the edges of these sites are extremely productive sites for small mammals, and provide nesting opportunities while dry. In turn, this will attract carnivores such as weasels and coyotes. Drier portions of the fields may have pocket gophers whose tunnels provide subterranean access for many species of wildlife.*

Ungulates such as Elk and both White-tailed and Mule deer use fields for foraging. These insect-rich sites also provide important foraging habitat for many species of bats including Townsend's Big-eared Bat, Fringed Myotis, and Spotted Bat.

Why are they important?

Ecological attributes and socio-economic values of seasonally flooded agricultural ecosystems are listed below.

- **Agricultural benefits**: Provide areas for growing crops.
- **Biodiversity**: Seasonally flooded agricultural fields provide important habitat for waterfowl and other bird species.
- **Linkages and travel corridors**: These sites provide opportunities for wildife to travel between riparian and upland habitats.
- **Future riparian habitat**: These sites have the potential to recover riparian vegetation if agricultural use is discontinued.

Rare vertebrates[14] of Seasonally Flooded Agricultural Fields
Great Basin Spadefoot (B, COSEWIC-T) Spea intermontana
Western Toad (Y, COSEWIC-SC) *Bufo boreas*
Gopher Snake, deserticola subspecies (B, COSEWIC-T) *Pituophis catenifer* ssp. *deserticola*
Racer (B, COSEWIC-SC) *Coluber constrictor*
Rubber Boa (Y, COSEWIC-SC) *Charina bottae*
Western Rattlesnake (B, COSEWIC-T) *Crotalus oreganus*
Western Skink (B, COSEWIC-SC) *Eumeces skiltonianus*

American Avocet (R) *Recurvirostra americana*
American Bittern (B) *Botaurus lentiginosus*
Bobolink (B) *Dolichonyx oryzivorus*
Great Blue Heron, herodia subspecies (B) *Ardea herodias* ssp. *herodias*
Long-billed curlew (B, COSEWIC-SC) *Numenius americanus*
Short-eared Owl (B, COSEWIC-SC) *Asio flammeus*
Swainson's Hawk (R) *Buteo swainsonii*

Badger (R, COSEWIC-E) *Taxidea taxus*
Fringed Myotis (B) *Myotis thysanodes*
Townsend's Big-eared Bat (B) *Corynorhinus townsendii*
Western Harvest Mouse (B, COSEWIC-SC) *Reithrodontomys megalotis*
Western Small-footed Myotis (B) *Myotis ciliolabrum*

Status

Seasonally flooded agricultural fields occupy 93 ha or 1.9% of the land base in the study area.

Management Recommendations[15]

Avoid Direct and Indirect Impacts

- **Maintain or restore hydrological regime**: allow natural flooding to occur to improve wildlife habitat and to ensure continued health of adjacent riparian ecosystems.
- **Control invasive plant species**: Canada thistle and other unwanted introduced species can threaten both the wildlife and agronomic and native plant species.
- **Discourage human settlement or other land developments adjacent to seasonally flooded agricultural field ecosystems**. These sites are not suitable for development because they are prone to flooding; adjacent developments can distrupt connections to other ecosystems.

[14] Provincially endangered or threatened (R-red-listed) or special concern (B-blue-listed) vertebrate species as of June 2005 are noted. Nationally rare vertebrate species ranked by COSEWIC, as of May 2005, are noted as endangered (E), threatened (T), or of special concern (SC).
[15] Many of the management recommendations have been adapted from McPhee et al. 2000.

- **Prevent disturbance of nesting sites and breeding areas**. Many waterfowl are ground-nesters. Avoid haying during the nesting season.
- **Avoid use of pesticides in, or near, important foraging areas for wildlife**. Pesticide use near foraging habitat for animals that feed on insects (e.g., Lewis's woodpecker) should be avoided.

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Appendix A: Description of Geomorphological Processes

Channeled by Meltwater (-E, -EV)

Meltwater channels form alongside, beneath, or in front of a glacier or ice sheet. Glacial meltwater channels are typically sinuous in plan, flat-floored, and steep-sided in cross-section. The floors of the meltwater channel may contain glaciofluvial sediments, indicative of the water flow that once took place here.

Slow Mass Movement (-F, -F"k, -F"m, -F"u)

Slow mass movement refers to slope failures where movement occurs slowly and/or where the displaced material moves only a short distance downslope. The double prime symbol (") indicates the initiation zone of slow mass movement. Tension cracks are indicated by the subclass "k" (-Fk). Failures occurring in bedrock are indicated by the subclass "m" (e.g. –Fm). Failures occurring in thick surficial materials are indicated by the subclass 'u' (e.g. -Fu).

Tension cracks (-Fk) are open fissures commonly located near ridge tops. They indicate slow slope spreading, and may be the precursor to catastrophic slope failure.

A **slump in bedrock (-Fm)** refers to a rotational slump where portions of the slide mass remains internally cohesive. Rotational slumps develop due to failure along vertical joints and horizontal weak layers.

Slumps in surficial materials (-Fu) consist of deep-seated, rotational failures along a zone of weakness within thick deposits. Slumping in fine-grained sediments, such as, glaciolacustrine materials are common.

Surface Seepage (-L)

Seepage is mapped where relatively wet soils are widespread in a polygon. This commonly occurs where soils are on slowly permeable materials such as till, where thin surficial materials overlie bedrock, and on lower slopes where shallow subsurface water is received from a relatively large catchment area further upslope. They may also occur where groundwater is concentrated at the surface by a physical conduit such as a geological fault.

Rapid Mass Movement (-R, -R"b, -R"d, -R"s)

Rapid mass movement refers to downslope movement by falling, rolling or sliding of debris derived from surficial material and/or bedrock. Where a double prime symbol (**"**)

is used with a mass movement process (e.g., -R"s), slope failure has initiated within the polygon. Mass movement symbols without the double prime symbol (e.g., -Rb) indicate a polygon that contains the transport or deposition zone of rapid mass movement. Transportation zones are generally not recognized as areas where landslides initiate; they may contribute additional volume of transported material to a failure. Transport and deposition zones represent hazardous areas downslope of slides or rockfall.

Rockfall (-Rb, -R"b) occurs when either a single block or a mass of bedrock falls, bounces and rolls downslope. In the study area, rockfall from local outcrops creates talus slopes, colluvial veneers and blankets. Polygons with rockfall are scattered throughout the study area in association with local bedrock outcrops or cliffs.

Debris flows (-Rd) initiate in steep gullies and debris slides (-Rd) initiate on steep hillsides. They occur when a mass of surficial material slides rapidly downslope often as a result of the loss of soil strength due to high pore water pressure. Debris slides (non-channelized movement of debris) and debris flows (channelized movement of debris) are initiated on steep slopes where material slides along a shear plane. The shear plane often coincides with the boundary between more permeable and less permeable material (e.g. between weathered and unweathered material or between surficial material and bedrock).

Debris flows and debris slides are triggered by heavy rain, water from snow melt, and/or rain on snow events, and result from loss of soil strength due to high pore water pressure. During wet conditions, slides are also triggered by wind stress on trees, tree throw, impact of falling rocks from up slope, and vibrations due to earthquakes or human activity. In logged areas, debris slides that occur several years after logging can be due to the loss of soil strength that results from root decay. Diverted drainage from roads commonly trigger failure of sidecast material and may initiate landslides some distance downslope. A debris flow may move downslope for several hundred metres or more before it is arrested by gentler terrain or by de-watering, or it may enter a trunk stream. Debris flows are effective agents of erosion, commonly increasing the volume of material as it progresses downslope. Debris slides and debris flows are significant potential sources of stream sediment and a hazard to activities or structures (roads, culverts) located in runout zones.

Gully Erosion (-V)

Gullies are small ravines with V-shaped cross sections that can form in either glacial drift or bedrock. Gully erosion has been mapped in two kinds of terrain: (i) slopes with several parallel shallow gullies in drift materials (dissected slope) and (ii) single gullies where streams have exploited joints in bedrock or have cut down into thick drift. Gullied terrain is an indicator of either former or active erosion, and the symbol serves to identify material that is potentially subject to erosion or mass movement (e.g., Uk-V). Gully sideslopes and steep headwalls are common sites of slope failures.

Appendix B: Landscape Context and Condition[16]

Landscape Context

Landscape context considers both the abiotic and biotic features of the geographic area adjacent to and surrounding the element occurrence (EO). The condition of the landscape is assessed by the integrity of ecological processes, species composition, and structure of the vegetation, including its maturity and stability, and the stability of the abiotic features of the landscape. Patchiness, fragmentation, and connectivity are specific attributes of the landscape. Fragmentation is a measure of the proportion of the landscape that is fragmented. Fragmentation by anthropogenic influences can generally be determined from air photo or satellite imagery or from analysis of a digital base map such as TRIM.

Excellent: The surrounding landscape has little to no fragmentation (<5%) due to anthropogenic influences (no roads, other transportation corridors, rural settlement or urban developments, no industrial activity or recent forest harvesting). The EO occurs within a larger landscape that has some formal protected status (e.g., Federal or Provincial park/reserve). There may be some defacto protection where no future development is foreseen, e.g., access restricts use, or there is no known plan to develop or disturb present conditions, or the site is protected by conservation covenants.

Good: Up to 25% of the surrounding landscape is fragmented. The larger landscape context provides some protection from anthropogenic disturbance (e.g., park land or crown land rather than private land) but effects of natural disturbances and harvesting may influence the element occurrence (e.g., fire suppression within a landscape previously dominated by frequent fire).

Fair[17]: More than 25% of the surrounding landscape is fragmented and affected by anthropogenic influences. Current management and development of the surrounding landscape may affect the continued existence of the element occurrence, i.e., removal of vegetation, hydrological changes, invasive alien species, etc.

Poor: Less than 25% of the surrounding landscape consists of natural or semi-natural vegetation. Fragmentation is due to urban and agricultural land use, or other cultural vegetation. Current plans will result in significant alteration or destruction of the element occurrence, e.g., development plans, harvesting plans, mining operations, anthropogenic structures.

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[16] Exerpted from *Standard for mapping ecosystems at risk in British Columbia* (Resources Inventory Standards Committee ***in press***)

[17] Formerly referred to as 'marginal'

Condition

Condition is an assessment of the composition, structure, and ecological function of the ecological community. Condition can be thought of as the degree of departure from the structure, function, and distribution of late seral ecological communities prior to European settlement. Successional stage, stability, ecological processes, disturbance regimes, alteration of physical or chemical processes, and changes in species composition are all factored in to the assessment of condition. Condition is a primary factor in conservation assessments for small and large patch systems, and secondary or equivalent to landscape context for linear systems, and matrix forest and grasslands in heavily altered landscapes.

The stage of vegetation development, such as mature forest or old forest, reflects the level of ecological stability in long lived forest ecosystems. However, younger successional stages originating from natural disturbance are ranked higher than those originating from human disturbance.

Changes in natural disturbance regimes and anthropogenic disturbances reduce condition. Intact natural disturbance regimes, particularly for fire-maintained systems and flood systems, are critical to ecological integrity. For wetland ecological communities, alterations in the hydrological regime can be a primary degrader of condition. The type and degree of anthropogenic disturbance will also influence the rank. For example, recovery of any ecosystem after soil removal is not likely; recovery of a grassland ecosystem after moderate grazing is likely.

Invasion of alien species is a special form of disturbance. The introduction of alien species can have devastating effects on native species populations and ecosystems. The presence of alien species, especially invasive alien species, degrades the condition of a site more than the presence of native, early successional species. The proportion of invasive alien species is critical for determining grassland condition.

The types and extent of disturbance and current land use can, to a certain level, be interpreted from imagery. Artificial structures, agricultural development, wetland modifications can all be observed, recorded, and assessed in the mapping process. Field data documenting the presence, extent, and proportion of alien plant species provides additional data to assess the condition of each ecosystem.

Excellent:

a. Typical climax vegetation.
b. No anthropogenic disturbances or changes to natural disturbance regimes have altered the EO (including fire exclusion or flood control), no vegetation or soil removal has occurred. Forested ecological communities are generally late seral vegetation. Wetland and riparian communities have intact hydrologic regimes. There is minimal influence of domestic grazing.
c. No alien species occur at the site.
d. No artificial structures occur at the site.
e. There is little or no internal fragmentation (< 5%) of the occurrence.

Good:

a. Typical mature seral vegetation
b. For forested communities, there has been no soil removal or disturbance to soil surface; little or no influence of old road beds or skid tracks, no construction evidence, old selection harvesting only, minimal changes to natural disturbance regimes (including fire exclusion or flood control). Forested ecological communities are late seral or mature, or younger if from natural disturbance. Wetland and riparian communities have largely intact hydrologic regimes. There is low-moderate influence of domestic grazing.
c. Minor cover (<5% except <20% in grasslands) of alien species may occur at the site. Some earlier successional species occur.
d. Some artificial structures may occur at the site (< 2% of total area of occurrence).
e. There is little or no internal fragmentation (<5%) of the occurrence.

Fair[18]:

a. Anthropogenic disturbances and changes to natural disturbance regimes have occurred. Forested ecological communities are young seral stages after harvesting. There is moderate to high influence of domestic grazing in grassland ecological communities. There may be significant alterations to the hydrologic regime in wetlands and riparian ecosystems.
b. Significant cover of alien species occurs (5-20% in forests and riparian systems, up to 60 % in grasslands). Most of the plants in grassland communities are early successional species.
c. Some artificial structures may be present (less than 10% of total area).
d. There is minor internal fragmentation (<5%) of the EO.

Poor:

a. Significant anthropogenic disturbances have occurred, particularly removal or disturbance of soil materials and vegetation. There are significant alterations to the hydrologic regime of wetlands and riparian ecosystems.
b. Alien species may dominate a vegetation layer or may total more than 20% (>60% for grasslands) cover overall.
c. Significant artificial structures occur (>10% of total area of occurrence).
d. The element occurrence is fragmented by artificial structures or barriers.

[18] Formerly referred to as 'marginal'

Appendix C: Sensitive Ecosystems (SEI) Units and related Terrestrial Ecosystem Mapping (TEM) units.

Sensitive Ecosystems

SEI Unit	Code	TEM Unit	Code[19]	Subzone / Site Series
Wetland, marsh	WN:ms	Baltic rush marsh-meadow	BR	IDFmw1 /00
		Cattail marsh	CT	IDFmw1 /00
		Willow – Sedge wetland	WS (structural stage 2)	IDFmw1 /00
Wetland, swamp	WN:sp	Willow – Sedge wetland	WS	IDFmw1 /00
Wetland, shallow open water	WN:sw	Shallow open water	OW	IDFmw1 /00
Riparian, bench	RI:fp	Black cottonwood – Douglas-fir – Common snowberry – Red-osier dogwood riparian	CD	IDFmw1 /00
		Douglas-fir/Western red cedar - Falsebox - Prince's pine	DFt	IDFmw1/01
		Western red cedar - Devil's club - Foamflower	RDa, RDt	IDFmw1 /06
		Western red cedar/Douglas-fir - Dogwood	RRa, RRpt, RRt	IDFmw1 /05
Riparian, gully	RI:gu	Western red cedar - Devil's club - Foamflower	RDg	IDFmw1 /06
		Western red cedar/Douglas-fir - Dogwood	RRg, RRgk, RRgp, RRgw	IDFmw1 /05
Riparian, fringe	RI:ff	Western red cedar - Devil's club - Foamflower	RD	IDFmw1 /06
		Western red cedar/Douglas-fir - Dogwood	RR, RRk, RRn, RRw	IDFmw1 /05
Riparian, river	RI:ri	River	RI	IDFmw1 /00
Old Forest, coniferous	OF:co	Douglas-fir/Western red cedar - Falsebox - Prince's pine	DF7C	IDFmw1 /01
		Douglas-fir - Pinegrass - Feathermoss	DP7C, DPw7C	IDFmw1 /04
		Douglas-fir/Ponderosa pine - Snowberry - Bluebunch wheatgrass	DSkv7C, DSvw7C, DSvz7C	IDFmw1 /02
		Douglas-fir - Penstemon - Pinegrass	PPc7C, PPs7C	IDFmw1 /03
Grassland, grassland	GR:gr	Idaho fescue – Bluebunch wheatgrass	FW (no seral association)	IDFmw1 .00
		Bluebunch wheatgrass – Balsamroot	WB (no seral association)	IDFmw1 /00
Grassland, shrubland	GR:sh	Prairie Rose – Idaho fescue	RF	IDFmw1 /00
Broadleaf woodland, aspen copse	BW:ac	Trembling aspen – Snowberry – Kentucky bluegrass	AS	IDFmw1 /00
Coniferous Woodland	WD	Douglas-fir/Ponderosa pine - Snowberry - Bluebunch wheatgrass	DS (structural stage 4 -6)	IDFmw1 /02
		Douglas-fir - Penstemon - Pinegrass	PP (structural stage 4-6)	IDFmw1 /03
Sparsely Vegetated, rock outcrop	SV:ro	Rock outcrop	RO	IDFmw1 /00
		Selaginella – Bluebunch wheatgrass rocky bluff	SB	IDFmw1 /00
Sparsely Vegetated,	SV:ta	Saskatoon – Mock orange talus	SO	IDFmw1 /00

[19] All site modifier combinations, structural stages, and seral associations are included unless otherwise noted. Seral stages are indicated by the two letters following a '$' (e.g., $wk). Structural stages are indicated by a number (e.g. '7'). Structural stage stand composition modifiers are indicated by a capital letter after the number (e.g., 'C' in '7C'). See Appendix C for descriptions of site modifiers, structural stages, seral associations, and TEM units.

SEI Unit	Code	TEM Unit	Code[19]	Subzone / Site Series
talus		Talus	TA	IDFmw1 /00
Sparsely Vegetated, cliff	SV:cl	Cliff	CL	IDFmw1 /00

Other Important Ecosystems

SEI Unit	Code	TEM Unit	Code[20]	Subzone / Site Series
Mature Forest, broadleaf	MF:bd	Douglas-fir/Western red cedar - Falsebox - Prince's pine	DF 6B	IDFmw1/01
Mature Forest, coniferous	MF:co	Douglas-fir/Western red cedar - Falsebox - Prince's pine	DF 6C	IDFmw1/01
		Douglas-fir - Pinegrass - Feathermoss	DP 6C	IDFmw1 /04
Mature Forest, mixed	MF:mx	Douglas-fir/Western red cedar - Falsebox - Prince's pine	DF 6M	IDFmw1/01
Disturbed Grassland[21]	DG	Idaho fescue – Bluebunch wheatgrass	FW:$wk	IDFmw1 .00
		Bluebunch wheatgrass – Balsamroot	WB:$wk	IDFmw1 /00
Seasonally Flooded Fields	SF	Cultivated Field	CFy	IDFmw1 /00

[20] All site modifier combinations, structural stages, and seral associations are included unless otherwise noted.

[21] Disturbed Grasslands are considered a subclass of grasslands under the new mapping standards. They are included as an Other Important Ecosystem here for consistency with the original Central Okangan SEI.

Appendix D: Expanded Legend

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
AS	**Trembling aspen – Snowberry – Kentucky bluegrass**	**IDFmw1**	**00**

Typic unit occurs on gentle slopes with deep, medium-textured soils (assumed modifiers are d, j, and m)

This forest ecosystem commonly occurs in large, broad depressions in grassland areas. These sites collect moisture from surrounding grassland areas. They have an overstory of trembling aspen and a shrubby understory dominated by snowberry and roses.

List of mapped units:

ASw warm aspect; slope >25%

SITE INFORMATION

Common Terrain Types:

- morainal blankets, colluvial slopewash and sometimes glaciofluvial blankets

Slope position:	lower, toe, depression, mid
Slope (%):	0 – 10 (20)
Aspect:	none
Soil Moisture Regime:	subhygric
Soil Nutrient Regime:	rich

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
AS	Trembling aspen – Snowberry – Kentucky bluegrass	IDFmw1	00

	Structural Stage	3	4	5	6	7	
Trees	*Populus tremuloides*	*	***	***	***	***	trembling aspen
Shrubs	*Amelanchier alnifolia*	***	*	*	*	*	saskatoon
	Acer glabrum	**	**	**	**	**	Douglas maple
	Mahonia aquifolium	*	*	*	*	*	tall Oregon-grape
	Prunus virginiana	*	*	*	*	*	choke cherry
	Symphoricarpos albus	*****	****	*****	*****	*****	common snowberry
	Rosa spp.	**	**	**	**	**	roses
Grasses	*Poa pratensis*	**	*	**	**	**	Kentucky bluegrass
Herbs	*Osmorhiza berteroi*	*	*	*	**	**	mountain sweet-cicely
	Thalictrum occidentalis	**	*	*	*	*	western meadowrue
Mosses	*Brachythecium* sp.		*	*	*	*	ragged moss
PLOTS							

Species – non-native species
* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites
Wetter sites may have water birch, drier sites have more Oregon-grape and little or no Douglas maple.

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
BR	**Baltic Rush Marsh-Meadow**	**IDFmw1**	**00**

Typic unit occurs on level sites with deep, fine-textured soils (assumed modifiers are d, f, and j).

This unit is equivalent to the *Baltic rush – Field sedge marsh* association in the provincial classification.

This marsh-meadow wetland ecosystem occurs in areas where water draws down below the soil surface most summers (seasonal flooding). This unit is rare in the study area. These sites are dominated by baltic rush. Field sedge may also occur in slightly drier situations. Soils are typically mineral.

SITE INFORMATION

Common Terrain Types:

- lacustrine veneer over thick morainal or glaciofluvial materials

Slope position:	toe, depression, (lower)
Slope (%):	0
Aspect:	none
Soil Moisture Regime:	hygric
Soil Nutrient Regime:	rich

	Structural Stage	**2b**	
Rushes	*Juncus balticus*	***	baltic rush
Sedges	*Carex praegracilis*	**	field sedge
Grasses	*Poa pratensis*	**	Kentucky bluegrass
Herbs	*Potentilla anserine*	**	common silverweed
PLOTS			

Species – non-native species
* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
CB	**Cutbank**	**IDFmw1**	**N/A**
Part of a road corridor which is created by excavation or erosion of the hillside.			
List of mapped units:			
CBw warm aspect, slope >25%			

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
CD	**Black Cottonwood –Common Snowberry – Red-osier Dogwood**	**IDFmw1**	**00**

Typic unit occurs on level or very gently sloping sites with deep, medium textured soils (d, j and m are assumed modifiers).

This forest ecosystem is uncommon but was found along major creeks including Mission Creek. Forests are often mixed black cottonwood with some western redcedar. The understory is typically rich and shrubby, often dominated by mountain alder. Forbs are sparse to moderately abundant and include lady fern, common horsetail, and scattered other species.

List of mapped units:

CDa active floodplain CDt terrace

SITE INFORMATION

Common Terrain Types:

- colluvial slopewash , lacustrine, and fluvial

Slope position:	lower and toe
Slope (%):	0-5
Aspect:	none
Soil Moisture Regime:	hygric
Soil Nutrient Regime:	rich

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
CD	**Black cottonwood –Common Snowberry – Red-osier Dogwood**	**IDFmw1**	**00**

	Structural Stage	3	4	5	6	7	
Trees	*Populus balsamifera* ssp. *trichocarpa*	**	***	***	***	***	black cottonwood
	Thuja plicata			*	**	**	western redcedar
Shrubs	*Alnus incana*	***	**	***	***	***	mountain alder
	Oplopanax horridus	*	**	***	***	***	devil's club
	Ribes lacustre	**	*	**	**	***	black gooseberry
	Cornus stolonifera	***	**	**	**	**	red-osier dogwood
Herbs	*Equisetum arvense*	**	*	*	*	**	common horsetail
	Athyrium filix-femina	**	*	**	***	***	lady fern
Mosses	*Plagiomnium* or *Mnium* spp.	**	*	**	**	**	leafy mosses
PLOTS							

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
CF	**Cultivated Field**	**IDFmw1**	**N/A**
These are agricultural fields with tilled soils and planted crops or ground cover.			
List of mapped units:			
CFw	warm aspect, slope >25%	CFy	moister than average, used for seasonally flooded agricultural fields

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
CL	**Cliff**	**IDFmw1**	**N/A**
These are steep, vertical or overhanging rock faces. Typically there are scattered plants such as saskatoon and cliff ferns occurring in rock fractures or soil pockets. Plot: G30			
List of mapped units:			
CLz	very steep warm aspect		

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
CT	**Cattail Marsh**	**IDFmw1**	**00**

Typic unit occurs on level sites with deep, medium-textured soils (assumed modifiers are d, j, m).

This unit is equivalent to the *Cattail marsh* association in the provincial classification.

This marsh wetland ecosystem occurs as a fringe on pond edges or in depressions, often adjacent to shallow open water (OW). This unit is rare in the study area. Water depths are typically up to 1 m in spring but draw down to the soil surface by late summer; soils remain saturated for most of the season. Some wetlands convert to cattail marshes when they are subject to nutrient loading. These sites are dominated by cattails with few other species. Soils are typically mineral, but may have a thin organic veneer on top.

SITE INFORMATION

Common Terrain Types:

- thin organic veneer over lacustrine materials

Slope position:	depression
Slope (%):	0
Aspect:	none
Soil Moisture Regime:	subhydric
Soil Nutrient Regime:	rich

	Structural Stage	**2a**	
Herbs	*Typha latifolia*	****	common cattail
	Eleocharis palustris	**	common spike-rush
Mosses	*Aulacomnium palustre*	***	glowmoss
PLOTS		G33	

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
DF	**Douglas-fir/Western Redcedar – Falsebox – Prince's pine**	**IDFmw1**	**01**

Typic unit occurs on gentle slopes with deep, medium textured soils (d, j and m are assumed modifiers).

This forest ecosystem is commonly associated with mesic gently sloping sites. Mature forests have an overstory dominated by western redcedar with a sparse understory.

List of mapped units:

DFc	coarse-textured soils (glaciofluvial)	DFck	coarse-textured soils (glaciofluvial); cool aspect, slope >25%
DFf	fine-textured soils (glaciolacustrine)	DFg	gully
DFgw	gully, warm aspect, slope >35%	DFk	cool aspect, slope >25%
DFks	cool aspect, slope >25%, shallow soils (50-100cm)	DFn	fan
DFs	shallow soils (50-100cm)	DFt	terrace
DFw	warm aspect (often SE or NW), slope >25%		

SITE INFORMATION

Common Terrain Types:

- deep morainal, glaciofluvial, and glaciolacustrine materials on level and gentle slopes
- moderate to steep cool aspect morainal and colluvial slopes

Slope position:	lower to middle
Slope (%):	0-30; steeper on cool aspects
Aspect:	all
Soil Moisture Regime:	mesic – submesic
Soil Nutrient Regime:	medium

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
DF	**Douglas-fir/Western Redcedar – Falsebox – Prince's pine**	**IDFmw1**	**01**

	Structural Stage	3	4	5	6	7	
Trees	*Thuja plicata*	***	***	***	****	***	western redcedar
	Populus tremuloides	**	**	**	*		trembling aspen
	Pinus contorta	***	***	**	*		lodgepole pine
	Pseudotsuga menzeisii	**	**	***	***	***	Douglas-fir
	Larix occidentalis			**	**	**	Western larch
Shrubs	*Paxi stima myrsinites*	**	*	**	**	**	falsebox
	Mahonia aquifolium	**	*	**	**	**	tall Oregon-grape
	Rosa aciularis	***	*	**	**	*	prickly rose
	Spirea betufolia	***	*	**	**	**	birch-leaved spirea
	Symphoricarpus albus	***	*	***	***	**	common snowberry
Grasses	*Calamagrostis rubescens*	**	*	**	**	**	pinegrass
Herbs	*Epilobium angustifolium*	****	*				fireweed
	Linnaea borealis	*	*	**	**	**	twinflower
	Fragaria virginiana	***	*	**	**	**	wild strawberr
Mosses	*Pleurozium shreberi*		*	**	***	***	red-stemmed feathermoss
PLOTS				G7 G20 G21	G8 G9 G13 G16 G27		

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
DP	**Douglas-fir – Pinegrass – Feathermoss**	**IDFmw1**	**04**

Typic unit occurs on gentle slopes with deep, medium textured soils (d, j and m are assumed modifiers).

This forest ecosystem is common on warm aspects. The overstory is dominated by Douglas-fir and the understory is dominated by pinegrass with showy aster, snowberry and other scattered shrubs and forbs.

List of mapped units:

DPck	coarse-textured soils (generally glaciofluvial); cool aspect, slope >25%	DPct	coarse-textured soils, glaciofluvial terrace
DPcw	coarse-textured soils (generally glaciofluvial); warm aspect, slope >25%	DPk	cool aspect (NNW or ESE), slope>25%
DPks	cool aspect (NNW or ESE), slope >25%, shallow soils (50-100cm)	DPs	shallow soils (50-100cm)
DPsw	shallow soils (50-100cm); warm aspect, slope >25%	DPt	glaciofluvial terrace
DPw	warm aspect, slope >25%		

SITE INFORMATION

Common Terrain Types:

- deep morainal or glaciolacustrine materials on moderate to steep warm aspect slopes

Slope position:	middle and upper
Slope (%):	35 – 85
Aspect:	southeast to west
Soil Moisture Regime:	subxeric to submesic
Soil Nutrient Regime:	poor to medium

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
DP	**Douglas-fir – Pinegrass – Feathermoss**	**IDFmw1**	**04**

	Structural Stage	3	4	5	6	7	
Trees	*Pinus contorta*	**	***	**	*		lodgepole pine
	Pseudotsuga menziesii var. *glauca*	**	****	***	***	***	Douglas-fir
	Larix occidentalis		*	**	**	**	Western larch
Shrubs	*Symphoricarpos albus*	****	*	**	**	**	common snowberry
	Mahonia aquifolium	**	*	*	*	*	tall oregon-grape
Grasses	*Calamagrostis rubescens*	***	**	****	****	****	pinegrass
Herbs	*Aster conspicuus*	***	**	***	***	***	showy aster
	Lupinus sericeus	***	**	***	***	***	silky lupine
Mosses	*Pleurozium schreberi*	*	**	***	***	**	red-stemmed feathermoss
PLOTS				G5 G6	G17 G22 G29		

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
DS	**Douglas-fir/Ponderosa pine – Snowberry – Bluebunch wheatgrass**	**IDFmw1**	**02**

Typic unit occurs on gentle slopes with deep, medium textured soils on ridges or crests (d, j, m and r are assumed modifiers).

This forest ecosystem occurs on very dry sites, often with some exposed bedrock.

List of mapped units:

DSkv	cool aspect, slope >25%; very shallow soils (<20cm deep)	DSrv	ridge; very shallow soils (<20cm deep)
DSv	very shallow soils (<20cm deep)	DSvw	very shallow soils (<20cm deep), warm aspect
DSvz	very shallow soils (<20cm deep); very steep warm aspect (slope >70%)		

SITE INFORMATION

Common Terrain Types:

- shallow till and colluvial slopes, rock

Slope position:	upper, crest
Slope (%):	0 – 60
Aspect:	none or warm
Soil Moisture Regime:	xeric
Soil Nutrient Regime:	poor to medium

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
DS	**Douglas-fir/Ponderosa pine – Snowberry – Bluebunch wheatgrass**	**IDFmw1**	**02**

	Structural Stage	3	4	5	6	7	
Trees	*Pseudotsuga menziesii* var. *glauca*	**	****	****	***	***	Douglas-fir
	Pinus contorta	**	**	***	*		lodgepole pine
Shrubs	*Amelanchier alnifolia*	*	*	*	**	**	tall oregon-grape
	Juniper communis	**	**	**	**	**	common juniper
Grasses	*Pseudoroegneria spicata*	**		*	*	**	bluebunch wheatgrass
Herbs	*Balsamorhiza sagittata*	**	*	**	**	**	arrow-leaved balsamroot
	Penstemon fruticosa	**	*	**	**	**	shrubby penstemon
	Selaginella densa	**	*	**	**	**	compact selaginella
	Achillea millefolium	**	*	**	**	**	yarrow
PLOTS					G15		

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
ES	**Exposed Soil**	**IDFmw1**	**N/A**

These are areas of exposed soils and typically include recent disturbances such as soil erosion.

List of mapped units:

ESk	cool aspect; slope >25%	ESw	warm aspect; slope >25%

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
FW	**Idaho fescue – Bluebunch wheatgrass**	**IDFmw1**	**00**

Typic unit occurs on gentle slopes with deep, medium-textured soils (assumed modifiers are d, j, m)

This grassland ecosystem occurs on gentle warm aspects and levels sites cool aspects. A mixture of Idaho fescue and bluebunch wheatgrass with balsamroot and other herbs dominates late seral sites, but late seral sites are rare in the study area and no climax sites were observed. Soils are typically dark brown or black chernozems. Most of these sites are highly disturbed and some have a significant component of non-native plants. One seral association was mapped and is described below.

FW:wk $*Bluebunch wheatgrass – Knapweed seral association*
This is a mid- to late-seral seral association. On these sites there is still a reasonable component of bluebunch wheatgrass with knapweed, sulphur cinquefoil, or cheatgrass.

List of mapped units:

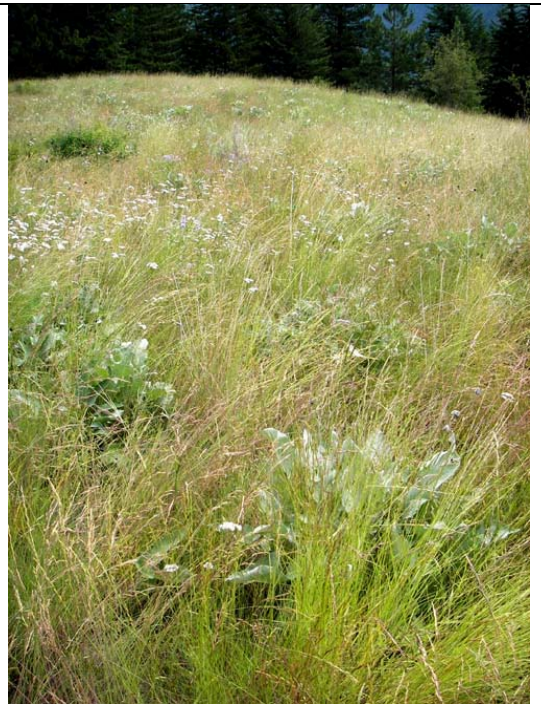
FWks	cool aspect, shallow soils (20-100cm)	FWs	shallow soils (50-100cm)

SITE INFORMATION

Common Terrain Types:

- morainal and glaciofluvial blankets, often with an aeolian veneer

Slope position:	lower to upper
Slope (%):	0-35% (up to 60% on cool aspects
Aspect:	all
Soil Moisture Regime:	mesic
Soil Nutrient Regime:	rich



Site Unit Symbol	Site Unit Name	BGC	Site Series Number
FW	Idaho fescue – Bluebunch wheatgrass	IDFmw1	00

	Structural Stage Seral Association	2b FW	2b FW:wk	
Shrubs	*Artemisia tridentata*			big sagebrush
Grasses	*Festuca idahoensis*	****		Idaho fescue
	Festuca campestris	**		rough fescue
	Pseudoroegneria spicata	***	***	bluebunch wheatgrass
	Koeleria macrantha	**		junegrass
	Achnatherum nelsonii		*	Columbian needlegrass
	Bromus tectorum or *Bromus japonicus*		***	cheatgrass or Japanese brome
Herbs	*Balsamorhiza sagittata*	***	**	arrowleaf balsamroot
	Lupinus sericeus	**	**	silky lupine
	Eriogonum heracleoides	**	*	parsnip-flowered buckwheat
	Lithospermum ruderale	*	*	lemonweed
	Calochortus macrocarpus	*		sagebrush mariposa lily
	Centaurea diffusa		**	diffuse knapweed
	Potentilla recta		**	sulphur cinquefoil
Mosses and Lichens	*Cladonia* spp.	**		clad lichens
	Tortula ruralis	**	*	sidewalk moss
	Peltigera rufescens or *Peltigera ponojensis*	**		felt pelt felt pelt

Species – non-native species
* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
OW	**Shallow Open Water**	**IDFmw1**	**N/A**
These are areas of permanent open water that are less than 2m deep. There is less than 10% emergent vegetation but floating aquatics such as bladderwort are often present. Shallow open water commonly occurs in association with marsh ecosystems.			
List of mapped units:			
OWx	drier than typic; usually dry by mid-summer		

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
PP	**Douglas-fir – Penstemon – Pinegrass**	**IDFmw1**	**03**

Typic unit occurs on significant warm slopes with deep, medium textured soils (d, m, and w are assumed modifiers).

This forest ecosystem is characterized by an open Douglas-fir canopy with a mixed pinegrass – shrub – forb understory.

List of mapped units:

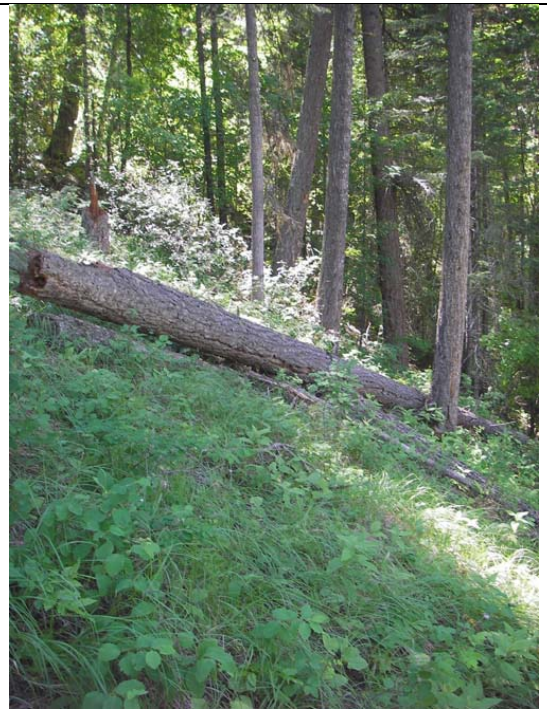
PPc	coarse-textured soils	PPks	cool aspect (usually NNW or ESE); shallow soils
PPn	fan	PPrv	ridge; very shallow soils (<50 cm deep)
PPs	shallow soils (50-100cm deep)	PPv	very shallow soils (<50 cm deep)
PPz	very steep warm aspect (slope >70%)		

SITE INFORMATION

Common Terrain Types:

- moderate to steeply slope till and colluvium

Slope position:	middle and upper
Slope (%):	50-70
Aspect:	south – west
Soil Moisture Regime:	submesic – subxeric
Soil Nutrient Regime:	medium, poor



Site Unit Symbol	Site Unit Name	BGC	Site Series Number
PP	**Douglas-fir – Penstemon – Pinegrass**	**IDFmw1**	**03**

	Structural Stage	3	4	5	6	7	
Trees	*Pseudotsuga menziesii* var. *glauca*	**	**	****	***	***	Douglas-fir
	Pinus contorta	*	**	**	*		lodgepole pine
Shrubs	*Spirea betulifolia*	***	*	***	***	***	birch-leaved spirea
	Juniper communis	**	*	**	**	**	common juniper
Grasses	*Calamagrostis rubescens*	***	**	****	****	****	pinegrass
	Festuca occidentalis	**	*	**	**	**	western fescue
Herbs	*Aster conspicuus*	***	**	***	***	***	showy aster
	Arnica cordifolia	***	**	***	***	***	heart-leaved arnica
Mosses and Lichens	*Brachythecium albicans*	*	*	*	**	**	lawn moss
	Peltigera spp.	*		*	*	**	pelt lichens
	Cladina or *Cladonia* spp.	*	*	*	*	*	clad lichens
PLOTS				G31		G1	

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RD	**Western redcedar – Devil's club – Foamflower**	**IDFmw1**	**06**

Typic unit occurs on gentle toe slopes or depressions with seepage and deep, medium textured soils (d, j and m are assumed modifiers).

This forest ecosystem occurs on moist sites with seepage. Mature forests are dominated by western redcedar and hybrid white spruce with an understory characterized by Devil's club and rich forbs. Seral forest are often deciduous and are dominated by paper birch and black cottonwood.

List of mapped units:

RDa	active floodplain	RDg	gully
RDp	organic soils	RDt	fluvial terrace; adjacent to creek

SITE INFORMATION

Common Terrain Types:

- Fluvial and slopewash colluvial materials on gentle toe slopes

Slope position:	toe
Slope (%):	0 – 10
Aspect:	none
Soil Moisture Regime:	hygric (subhygric)
Soil Nutrient Regime:	rich

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RD	**Western redcedar – Devil's club – Foamflower**	**IDFmw1**	**06**

	Structural Stage	3	4	5	6	7	
Trees	*Thuja plicata*	**	****	****	***	***	western redcedar
	Picea engelmannii x glauca	**	***	***	**	**	hybrid white spruce
	Betula papyrifera	*	*	**	*		paper birch
	Populus balsamifera	*	**	**	*		black cottonwood
Shrubs	*Oplopanax horridus*		*	**	***	***	Devil's club
	Ribes lacustre	**	*	**	**	**	black gooseberry
	Cornus stolonifera	***	*	**	**	**	red-osier dogwood
Herbs	*Aralia nudicaulus*	**	*	*	*	**	wild sarsaparilla
	Athyrium filix-femina	**	**	**	**	**	lady fern
	Gymnocarpium dryopteris		*	**	***	***	oak fern
	Mitella nuda	*	*	*	*	*	common mitrewort
	Tiarella trifoliate	**	**	**	**	**	three-leaved foamflower
Mosses	*Mnium* or *Plagiomnium* spp.			*	**	**	leafy mosses
	Brachythecium sp.	*	*	*	**	**	
PLOTS					G11 G18	V22	

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RF	**Prairie Rose – Idaho fescue**	**IDFmw1**	**00**

Typic unit occurs on gentle slopes with deep, medium-textured soils (assumed modifiers are d, j, and m)

This shrubland ecosystem commonly occurs in moisture collecting depressions, seepage slopes and swales in grassland areas. This unit sometimes occurs as patches on grassland slopes. These sites are dominated by shrubs, primarily snowberry and roses. Forbs and grasses are scattered in openings between shrubs. Soils are very rich black chernozems.

List of mapped units:

RFw warm aspect, slope >25%

SITE INFORMATION

Common Terrain Types:

- morainal blankets

Slope position:	mid, toe, depression
Slope (%):	0-25
Aspect:	none, variable
Soil Moisture Regime:	subhygric
Soil Nutrient Regime:	rich

	Structural stage	**3a or 3b**	
Shrubs	*Symphoricarpos albus*	*****	common snowberry
	Rosa woodsii	***	prairie rose
	Rosa nutkana	***	Nootka rose
Grasses	*Poa pratensis*	**	Kentucky bluegrass
	Achnatherum nelsonii	**	Columbian needlegrass
PLOTS			

Species – non-native species
* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RI	**River**	**IDFmw1**	**N/A**
A permanent watercourse that flows within continuous permanent banks.			

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RO	**Rock Outcrop**	**IDFmw1**	**N/A**
These are areas of exposed bedrock with less than 10% vegetation cover. On sites with fractured bedrock, some plants may be growing out of rock cracks.			
List of mapped units:			
ROk	cool aspect, slope >25%	ROz	very steep warm aspect, slope >70%

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RR	**Western redcedar/Douglas-fir – Dogwood**	**IDFmw1**	**05**

Typic unit occurs on gentle to level lower slopes, receiving sites with deep, medium textured soils (d, j and m are assumed modifiers).

This moist forest ecosystem is found on receiving sites and sometimes adjacent to small creeks. It has a rich understory characterized by abundant thimbleberry.

List of mapped units:

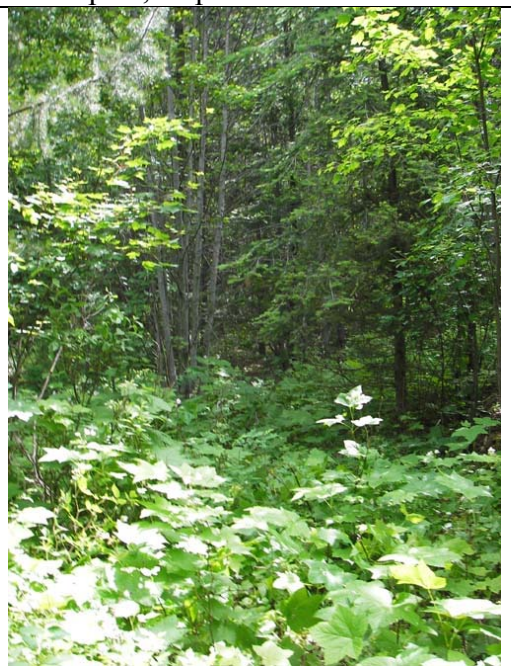
RRa	active floodplain, occurs adjacent to creek	RRg	gully
RRgk	gully, cool aspect, slope >25%	RRgp	gully; organic soils
RRgw	gully, warm aspect, slope >25%	RRk	cool aspect, slope >25%
RRn	fluvial fan	RRpt	organic soils; fluvial terrace
RRt	fluvial terrace	RRw	warm aspect, slope >25%

SITE INFORMATION

Common Terrain Types:

- slopewash, fluvial and till

Slope position:	toe (middle)
Slope (%):	0 – 20
Aspect:	none, all
Soil Moisture Regime:	subhygric (hygric)
Soil Nutrient Regime:	rich



Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RR	**Western redcedar/Douglas-fir – Dogwood**	**IDFmw1**	**05**

	Structural Stage	3	4	5	6	7	
Trees	*Pseudotsuga menziesii* var. *glauca*	**	****	****	***	***	Douglas-fir
	Thuja plicata	**	***	***	**	**	Western redcedar
	Betula papyrifera	**	***	**	*	*	paper birch
Shrubs	*Symphoricarpos albus*	***	*	**	***	**	common snowberry
	Acer glabrum	**	*	**	**	**	Douglas maple
	Rubus parviflorus	**	*	**	**	**	thimbleberry
	Ribes lacustre	**	*	*	*	*	black currant
	Cornus stolonifera	**	*	*	*	*	red-osier dogwood
Herbs	*Osmorhiza berteroi*	*	*	**	**	**	mountain sweet-cicely
	Linnea borealis	**	*	**	**	**	twinflower
	Geum macrophyllum	**	*	*	*	*	large-leaved avens
	Cornus Canadensis	***		**	**	**	bunchberry
Mosses	*Mnium* or *Plagiomnium* spp.	*	*	*	**	**	leafy mosses
	Brachythecium sp.	*	*	*	**	**	
PLOTS		G10 G23 G24 G28		G4	9901774 G2, G12 G14, G25 G26, G32		

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RW	**Rural**	**IDFmw1**	**N/A**
Rural areas of human settlement with scattered houses intermingled with native vegetation or cultivated areas.			

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
RZ	**Road Surface**	**IDFmw1**	**N/A**
A gravel or paved road used for vehicular travel.			

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
SB	**Selaginella – Bluebunch wheatgrass rock outcrop**	**IDFmw1**	**00**

Typic unit occurs on gentle slopes with very shallow soils (assumed modifiers are j and v)

This grassland ecosystem commonly occurs on bedrock outcrops. The bedrock is generally low relief and unfractured. This is an uncommon unit in the study area. Selaginella and rusty steppe moss with some grasses and forbs dominate these sites. This unit is commonly scattered as small sites in a grassland matrix.

SB:cg *Cheatgrass seral association*
This seral association is dominated by cheatgrass or sulphur cinquefoil with selaginella and rusty steppe moss.

List of mapped units:

SBk cool aspect, slope >25%

SBw warm aspect, slope >25%

SITE INFORMATION

Common Terrain Types:

- rock, very thin morainal and colluvial veneers and weathered bedrock

Slope position:	crest, upper
Slope (%):	0 – 50
Aspect:	variable
Soil Moisture Regime:	xeric – very xeric
Soil Nutrient Regime:	poor

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
SB	**Selaginella – Bluebunch wheatgrass rock outcrop**	**IDFmw1**	**00**

	Structural Stage Seral stage	**2a SB**	**2a SB:$cg**	
Shrubs	*Amelanchier alnifolia*	*	*	saskatoon
Grasses	*Pseudoroegneria spicata*	**	*	bluebunch wheatgrass
	Koeleria macrantha	**	*	junegrass
	Poa secunda	**	**	Sandberg's bluegrass
	Bromus japonicus or *tectorum*	*	***	Japanese brome or cheatgrass
Herbs	*Selaginella densa*	***	***	compact selaginella
	Eriogonum heracleoides	*	*	parsnip-flowered buckwheat
	Potentilla recta		***	sulphur cinquefoil
	Centaurea diffusa		**	diffuse knapweed
Mosses and Lichens	*Cladonia* spp.	**	*	clad lichens
	Tortula ruralis	***	**	sidewalk moss
	Polytrichum piliferum	***	*	awned haircap moss
PLOTS			G3	

Species – non-native species
* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
SO	**Saskatoon – Mock orange Talus**	**IDFmw1**	**00**

Typic unit occurs on both warm and cool steep slopes with deep, coarse textured soils (blocky) (c and d are assumed modifiers).

This ecosystem is commonly associated with steep, blocky talus slopes with minimal soil in pockets between blocks. This is an uncommon unit in the study area. Scattered trees (Douglas-fir or aspen) and scattered shrubs (snowberry, saskatoon) grow in soil pockets between blocks. Often cliff ferns (a very characteristic species) and scattered grasses are found growing in soil pockets. Vegetation cover is generally higher on sites with smaller blocks and more soil. Cool aspects more commonly have trees on them. Sites that are dominated by shrubs will not necessarily develop into a forested structural stage.

List of mapped units:

SOk cool aspect; slope >25%

SOw warm aspect; slope >25%

SITE INFORMATION

Common Terrain Types:

- rubbly colluvial slopes

Slope position:	lower to upper
Slope (%):	60 – 70%
Aspect:	all
Soil Moisture Regime:	subxeric – xeric
Soil Nutrient Regime:	poor

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
SO	**Saskatoon – Mock orange Talus**	**IDFmw1**	**00**

	Structural Stage	3	4	5	6	7	
Trees	*Pseudotsuga menziesii* var. *glauca*	*	**	**	**	***	Douglas-fir
	Populus tremuloides	*	**	**	**	**	trembling aspen
Shrubs	*Amelanchier alnifolia*	**	**	**	**	**	saskatoon
	Juniper communis	*	*	*	*	*	common juniper
	Paxistima myrsinites	*	*	*	*	*	falsebox
Herbs	*Woodsia scopulorum*	*	*	*	*	*	cliff fern
	Arctostaphylos uva-ursi	*	*	*	*	*	kinnikinnick
PLOTS		G19					

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
TA	**Talus**	**IDFmw1**	**N/A**
Steep colluvial deposits of angular rock fragments that result from rockfall. These sites have less than 10% vegetation cover.			
List of mapped units:			
TAw warm aspect, slope usually 60-70%			

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
WB	**Bluebunch wheatgrass – Balsamroot**	**IDFmw1**	**00**

Typic unit occurs on warm aspects with deep, medium-textured soils (assumed modifiers are d, m, and w)

This grassland ecosystem commonly occurs on moderately steep to steep warm slopes. Often surface soils are actively ravelling on steeper slopes. Bluebunch wheatgrass and balsamroot dominate these sites. Bunchgrasses are more widely spaced than on gentler slopes. Some of these sites are disturbed and have a significant component of non-native plants. One seral association was mapped and is described below.

WB:wk $*Bluebunch wheatgrass – Knapweed seral association*
This is a mid- to late-seral seral association. On these sites there is still a reasonable component of bluebunch wheatgrass with knapweed, sulphur cinquefoil, or cheatgrass.

List of mapped units:

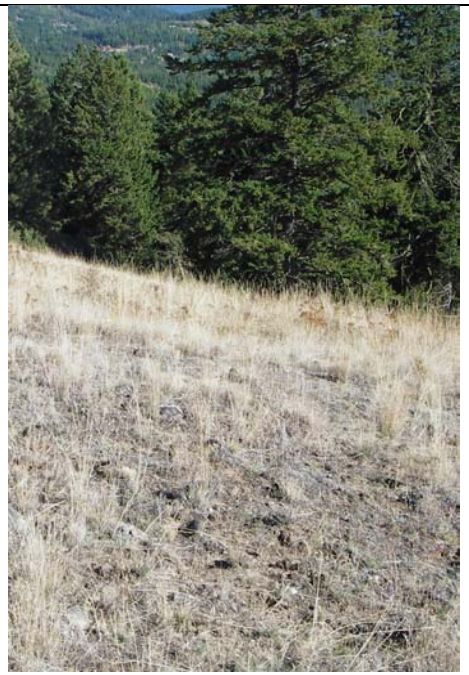
WBs shallow soils (50-100cm deep)

SITE INFORMATION

Common Terrain Types:

- morainal blankets and veneers and colluvial veneers

Slope position:	middle, upper, crest
Slope (%):	25 – 65%
Aspect:	south, southwest, west
Soil Moisture Regime:	subxeric – submesic
Soil Nutrient Regime:	medium – poor



Site Unit Symbol	Site Unit Name	BGC	Site Series Number
WB	**Bluebunch wheatgrass – Balsamroot**	**IDFmw1**	**00**

	Structural Stage Seral Association	2b WB	2b WB:wk	
Grasses	*Pseudoroegneria spicata*	****		bluebunch wheatgrass
	Koeleria macrantha	**		junegrass
Herbs	*Artemisia frigida*	**		pasture sage
	Balsamorhiza sagittata	***		arrowleaf balsamroot
	Lupinus sericeus	**		silky lupine
	Lithospermum ruderale	**		lemonweed
Mosses	*Cladonia* spp.	**		clad lichens
Lichens	*Tortula ruralis*	**		sidewalk moss
PLOTS		9901775		

Species – non-native species
* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
WS	**Willow - Sedge**	**IDFmw1**	**00**

Typic unit occurs on level sites with deep, organic soils (d, j and p are assumed modifiers).

This is a generalized wetland ecosystem that has variable site conditions and plant composition.

List of mapped units:

WSa active floodplain

SITE INFORMATION

Common Terrain Types:

- Organic

Slope position:	depression
Slope (%):	0
Aspect:	none
Soil Moisture Regime:	hygric - hydric
Soil Nutrient Regime:	medium - rich

Site Unit Symbol	Site Unit Name	BGC	Site Series Number
WS	**Willow – Sedge**	**IDFmw1**	**00**

	Structural Stage	2	3	
Shrubs	*Salix* spp.	*	***	willows
	Alnus incana		**	mountain alder
Sedges	*Carex aquatilis*	***	*	water sedge
	Carex utriculata	***	*	beaked sedge
Herbs	*Typha latifolia*	*	**	common cattail
	Ranunculus flabellaris		**	yellow water-buttercup
Mosses	*Drepanocladus* spp.	**	***	hook-moss
PLOTS		9901776		

* incidental cover (less than 1% cover); used as indicator species
** 1-5% cover; occurs in 60% or more of sites
*** 6-25% cover; occurs in 60% or more of sites
**** 26-50% cover; occurs in 60% or more of sites
***** >50% cover; occurs in 60% or more of sites
Comments: Very limited data; other sites are likely dominated by different species.