

2.3 Vegetation Communities

The Property occurs within the Moist Warm variant (IDFmw1) of the Interior Douglas-fir zone as defined by the BC Biogeoclimatic Ecosystem Classification system (Lloyd et. al 1990). Vegetation communities within the Property were delineated into distinct polygons using high resolution digital orthophotos adapting nomenclature from the Terrestrial Ecosystem Mapping convention and the BC Wetland Classification System (MacKenzie and Moran 2004). Refer to Figure 2 for an illustration of the polygons and Appendices A and B for detailed community descriptions. Each community is summarized below.

Old Field (CF) / Seasonally Flooded Field (FS)

These polygons are dominated by reed canarygrass in lower-lying areas and a cover of agronomic grasses (old pasture) in higher bench portions. These old and seasonally flooded fields have replaced previous low – high flood bench ecosystems following clearing and re-seeding for agricultural purposes (i.e., grazing). Prior to clearing these areas likely occurred as a patchy mosaic of low flood bench sites (Willow – Red-osier Dogwood) to high flood bench riparian ecosystems (Cedar – Interior Douglas-fir – Thimbleberry).

Reed Canarygrass Marsh (RG) Wm00

Similar to the Old Field sites, these polygons are dominated by reed canarygrass and are the result of land clearing and re-seeding for agricultural purposes. However, soil moisture is higher and these sites are very moist to wet. They typically represent a disclimax community that establishes or is seeded on cleared willow swamps, sedge meadows, and low-bench flood sites (MacKenzie and Moran 2004). Soil samples collected from polygons adjacent to the subject property are gleysolic and fine-textured in nature. This soil type is associated with wetland communities that are flooded periodically during the year (e.g., spring freshet) and are saturated by high water tables.

Shallow Water (OW)

A shallow pond (ox bow) occurs within the northern portion of the Property. A defined channel/surface water connection to this pond was not indicated in the RAR assessment (Stantec 2009). The river bank forms a minor levee along the Salmon River and visibly drops in elevation beyond (into the Property) joining with low flood (relic) channels and the pond – clearly visible in aerial overflight photos and digital orthophotos. However,

River (RI)

The River polygons represent the active channel of the Salmon River and Hobbs Creek. The **Salmon River is a regionally significant watercourse and has been listed among the most endangered rivers in BC (ORCBC 2009)**. Key reasons for concern include: riverside habitat loss, high sediment loads, and proposed commercial development at the river mouth.

Hobbs Creek is a channelized watercourse that drains agricultural areas south of the Property to Shuswap Lake. As such, it is connected to fish habitat and is considered a stream, as per the RAR.

Cottonwood Riparian (CD)

These are floodplain communities that have associated snowberry, red-osier dogwood and rose understories. They are classified as Fm01/Fm02, as per the BC Wetland Classification System (MacKenzie and Moran 2004). Floodplains are geomorphically dynamic and with continuous sediment deposition, bank erosion and channel migration, result in an ever-shifting condition.

Cottonwood riparian ecosystems have become extremely rare within the southern interior of BC. The mature cottonwood trees provide important habitat for a variety of birds and other cavity nesting species. The cottonwood communities within the Property are of varying structural stages (e.g., sapling to mature stands) and are mixed with non-native species such as Manitoba maple and elm. The cottonwood stands have been impacted historically by forest clearing, re-planting with grasses, grazing, and other disturbances. Without these disturbances the Cottonwood – Hybrid White Spruce – Red-osier Dogwood floodplain ecosystem would likely be the site potential vegetation type for the majority of the Property. Mid-bench locations in this climate regime tend to remain as pure cottonwood stands, because of the frequency of flooding events and the tolerance of this species to these active floodplain conditions (Mackenzie and Moran 2004; Inselberg pers. comm. 2009). High-bench floodplain sites (Cedar – Interior Douglas-fir – Thimbleberry) would have likely occurred as a patchy mosaic on higher areas that currently have a cover of agronomic grasses (old pasture).

Urban (UR)

Commercial and residential development, buildings, and other structures are characteristic of urban areas. Development of floodplains and riparian areas (FC) is prohibited in the

2.4 Rare Plants

While a rare plant survey was not completed on the Property, the shallow open water wetland (ox bow pond) has the potential for Mexican mosquito fern (*Azolla mexicana*), a floating aquatic fern that can form thick extensive mats in lakes, ponds, ditches, and quiet areas of streams. This threatened species is found at only three locales in the province: the North Thompson River area, the Shuswap Lake area (including Salmon River mouth), and Vernon (COSEWIC 2008).

The main threats to Mexican mosquito fern in B.C. are due to habitat loss and degradation associated with development and transportation corridor maintenance. In these situations, maintenance activities such as winter road salting, road construction or improvement, and herbicide treatments can either directly kill plants or affect water conditions, changing water chemistry and making sites unsuitable for the species. Other potential threats include events such as chemical and oil spills, water chemistry changes, water level, turbidity, or watercourse alteration (COSEWIC 2008).

2.5 Fish and Wildlife Values

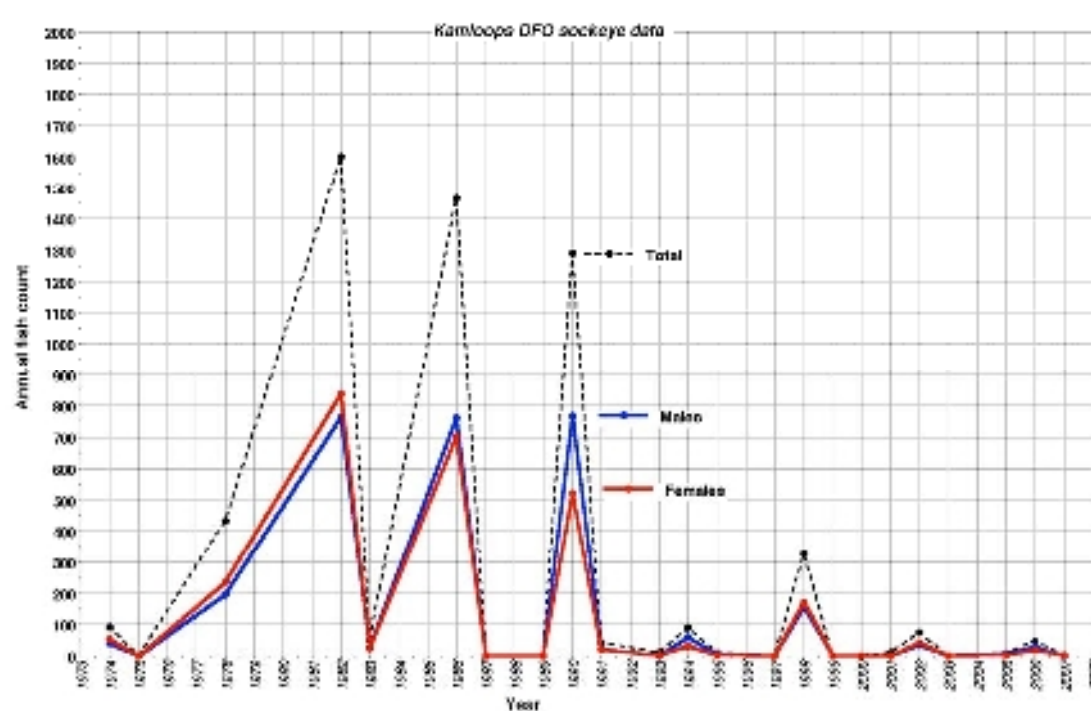
Historical impacts to the lower reaches of the Salmon River and surrounding riparian areas include removal of riparian vegetation for agricultural and commercial land use, withdrawals of water for agricultural and residential use, and livestock grazing. However, despite the rural and agricultural impacts that have occurred, the wetland and riparian communities and proximity to the Salmon River riparian ecosystem contribute to a high potential for biodiversity.

Multiple vegetation communities and forms occur throughout the Property ranging from cultivated field and cottonwood riparian communities to shallow open water marsh ecosystems. The variety on and adjacent to the site supports a diversity of fauna, thus providing wildlife viewing opportunities and enhanced social and ecological value for the City of Salmon Arm and the surrounding region. Moreover, the mosaic of forested and graminoid floodplain communities that occur in the north half and eastern portion of the Property form part of a provincially significant core habitat area.

The intact riparian area and adjacent woodland provide a critical wildlife corridor connecting the shoreline and aquatic environment along Shuswap Lake with upstream habitats. This is one of few remaining corridors in the area and is important for wildlife to migrate with adequate cover and forage from the surrounding mountains to the valley and

occur in the river include rainbow trout (*O. mykiss*), Dolly Varden (*Salvelinus malma*), and mountain whitefish (*Prosopium williamsoni*). Traditionally, the fishery has been used by the local First Nations (i.e., Neskonlith Band, Adams Lake Band) and has important regional recreational value.

The Salmon River sockeye run, along with the rest of the Fraser River system, has become drastically reduced over the years. Fisheries and Oceans Canada (DFO) conducts counts of spawning salmon within the Salmon River. The results of sockeye counts from 1974 to 2007 have been provided to Ecoscape and are illustrated below.



Graph 2. Results of DFO spawning sockeye counts in the Salmon River (Source: H. Tyson 2009).

As shown in Graph 2, the cyclic nature of the sockeye return in the Salmon River has diminished over time and a return of over 300 fish hasn't been witnessed in over 10 years. Intensive agriculture, which has denuded much of the riparian communities along the river, is a major contributing factor to degraded instream habitat (i.e., higher sediment loading, loss of spawning habitat, and reduced structural complexity). The scale of imperviousness and spatial extents of the proposed development will only further compound the problem.

these environments may constitute a Harmful Alteration Disruption or Destruction (HADD) to fish habitat, as defined by the DFO.

Wildlife

Detailed surveys for terrestrial wildlife have not been conducted within the Property as part of this assessment. However, observations of wildlife and signs of wildlife have been recorded throughout the surrounding area. Wildlife occurrences along the Salmon River and within Salmon Arm Bay are well-documented and detailed anecdotal and technical documentation is available.

Typical year-round bird species that have been observed within and adjacent the Property include: American Goldfinch (*Carduelis tristis*), American Robin (*Turdus migratorius*), Black-capped Chickadee (*Poecile atricapillus*), Cedar Waxwing (*Bombycilla cedrorum*), Northern Flicker (*Colaptes auratus*), Pileated Woodpecker (*Dryocopus pileatus*), Pine Siskin (*Carduelis pinus*), Red-tailed Hawk (*Buteo jamaicensis*), Sharp-shinned Hawk (*Accipiter striatus*), and Yellow-rumped Warbler (*Dendroica coronata*). Mallards (*Anas platyrhynchos*) and other dabbling ducks are common along the river. There are extensive signs of foraging and cavity nesting throughout the riparian areas.

Bald eagles (*Haliaeetus leucocephalus*) are commonly observed within the Property and a large nest occurs along the left bank of the Salmon River immediately north of the Property (see Figure 1). The province of BC recommends minimum setbacks of 100 m from bald eagle nests at all times and an additional 100 m setback during nesting (i.e., February to August).

Western Screech Owls (*Otus kennicottii macfarleni*) have been documented in the cottonwood floodplain communities of the Salmon River Delta (Beardmore et. al. 2004), with potential to occur/nest on the Subject Property. This species is provincially Red-listed and federally Endangered. Loss of cottonwood floodplain forests is one of the primary causes for this species' Endangered Status (COSEWIC 2002).

Herptiles observed along the Salmon River adjacent the Property included: Pacific chorus frog (*Pseudacris regilla*), Columbia spotted frog (*Rana luteiventris*), and common garter snake (*Thamnophis sirtalis*). The ox bow, and seasonally flooded backwater channels and shallow pools on the Property provide suitable reproductive habitat for the above-mentioned frogs as well as the western toad (*Bufo boreas*) and long-toed salamander (*Ambystoma macrodactylum*).

2.6 Rare and Endangered Species Potential

The rare cottonwood riparian ecosystem sustained within the Property provides suitable habitat for a number of rare or vulnerable wildlife species. Table 1 provides a summary of provincially and federally listed species that may occur within the Property.

Table 1. Summary of Provincially and Federally listed species with the potential to occur within the Property.			
Species Group		Provincial Listing¹	COSEWIC Listing²
Herptiles			
western painted turtle	<i>Chrysemys picta</i>	Blue Special	Concern
western toad	<i>Bufo boreas</i>	Yellow Special	Concern
Birds			
American Bittern	<i>Botaurus lentiginosus</i>	Blue -	
Great Blue Heron	<i>Ardea herodias</i>	Blue -	
Lewis's Woodpecker	<i>Melanerpes lewis</i>	Red Special	Concern
Western Grebe	<i>Aechmophorus occidentalis</i>	Red -	
Western Screech-owl	<i>Otus kennicottii macfarlanei</i>	Red Endangered	
Mammals			
fringed myotis	<i>Myotis thysanodes</i>	Blue Data	Deficient
northern myotis	<i>Myotis septentrionalis</i>	Blue -	
Fish			
Dolly Varden	<i>Salvelinus malma</i>	Blue -	

1 Source: <http://www.env.gov.bc.ca/cdc/>

Yellow: Not at risk.

Blue: Of special concern (formerly vulnerable).

Red: Extirpated, endangered, or threatened.

2 Source: <http://www.cosewic.gc.ca/>

Special Concern: A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Endangered: A wildlife species facing imminent extirpation or extinction.

Data Deficient: A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.

As indicated in Table 1, a number of provincially Red-listed species have the potential to be impacted by the proposed development. A provincially significant breeding area for Western Grebes is situated at the mouth of the Salmon River (Beardmore et. al. 2004). This is one of only three breeding sites in the southern interior, and probably the only remaining significant site. Although there is no official update report, the current (2009) understanding among those who are following Western Grebes in BC, is that Salmon Arm Bay is at this point the last western grebe nesting site of significance in BC (E. Dahl Pers com. 2009). While most breeding occurs within the Salmon River estuary, the

Bats and other small mammals also require secondary tree cavities for nesting, roosting and reproduction. The functional wetlands and floodplain provide habitat for amphibians, reptiles and birds, such as Great Blue Heron and American Bittern.

3.0 ENVIRONMENTALLY SENSITIVE AREAS

Environmental site sensitivity is illustrated in Figure 3.

Cottonwood Flood Ecosystems

Black cottonwood ecosystems have been ranked among the rarest plant communities in the province (MELP 1997). Within the southern interior, the remnant stands of cottonwood are typically fragmented and isolated. Large contiguous patches are extremely rare and require special management considerations and conservation strategies.

Within and adjacent to the Property, significant losses to the riparian ecosystem have occurred over the years, thereby reducing the overall forested cover and replacing it with extensive homogenous communities of reed canarygrass. This has caused a dramatic reduction in productive capability for birds and other wildlife as well as having impacts on channel stability, flow regimes and water quality of the Salmon River.

Cottonwood floodplain communities (Fm01/Fm02), by nature, are well-adapted to colonize and regenerate within suitable areas if left undisturbed. It is reasonable to assume that areas able to support cottonwood communities that are currently at an early structural stage (i.e., graminoid or pole/sapling) would eventually give rise to mature cottonwood stands, given they remain undisturbed for an adequate period of time. Maintenance of historical flood regimes would contribute to the natural regeneration of this sensitive vegetation community.

In order to conserve the current habitat values and to allow for the regeneration of potential cottonwood communities, setbacks and buffers should be delineated in accordance with the RAR that are relative to floodplain features such as marshes and floodwater channels. This will protect the existing critical habitat and maintain natural flood regimes which, in turn, will contribute to the long-term recovery of this imperiled ecosystem.

The Property also sustains rare communities at the landscape level. The Salmon River estuary and floodplain represent unique ecological features within the Shuswap watershed.

Wetlands

Wetland communities are important areas of biodiversity and provide critical habitat for a variety of sensitive species. Within the southern interior of BC wetlands are relatively rare, representing less than one percent of the landscape. These ecosystems are sensitive to disturbance and have been heavily impacted throughout the province. Conservation of remaining intact wetland communities and restoration of degraded wetlands are crucial to successful long-term management.

The relic backwater and flood channels within the Property provide riparian floodplain wetland habitat. These areas maintain natural flood regimes by allowing increased surface water pooling and flow during periods of high water (i.e., spring freshet). The slow-moving water areas are important for regulating the rate at which runoff is released to Shuswap Lake and help purify the water through settling and filtering of sediments and other particulate matter.

Additionally, when adequately wetted, the backwater channels may provide critical rearing and refuge habitat for salmon fry and other aquatic wildlife. Maintaining connectivity between the river, lake and floodplain features provides an overall connection of clean water, nutrients and wildlife habitat. In accordance with the RAR, when these wetlands support fish habitat they are required to be accurately identified and included in the SPEA, which would result in changes to the development boundaries.

The marsh communities are dominated by reed canarygrass, likely as a result of previous forest clearing and re-seeding. These communities are subject to flooding and water saturation, giving rise to gleysolic soils. As such, they are classified within the wetland site realm and require appropriate setbacks and management considerations.

4.0 TRADITIONAL USE

Traditional uses of the area include berry picking and medicinal plant use species such as high-bush cranberry (*Viburnum edule*), soopolallie (*Shepherdia canadensis*), and wapato (*Sagittaria latifolia*). The local residents have observed major declines of these previously abundant plants as the natural riparian and upland communities have been removed or degraded. For example, local knowledge indicates that the once abundant bulrush (*Scirpus* sp.) communities that comprised the riparian and foreshore areas along the lake have virtually disappeared and been replaced by homogenous communities of reed canarygrass. The

current sockeye fishery has been drastically reduced. These observations are consistent with the massive declines reported in sockeye returns over the last four seasons and resultant restrictions to the fishery.

5.0 IMPACT ASSESSMENT OVERVIEW OF INTERPRETED DEVELOPMENT FOOTPRINT

The current development proposal includes a report addressing the requirements of the provincial RAR and has suggested 35 to 50 metre (m) setbacks from the defined right bank (not floodplain) of the Salmon River and as little as 3 m setbacks from other wetland and riparian features within the Property. The clearing and development extents have been interpreted from the RAR report (Stantec, 2009) ¹ that was provided to Ecoscape by WA:TER. In doing so these areas were digitized and georeferenced using existing orthophoto imagery and cadastre baseline information (Figure 4). According to the spatial analysis of the proposed development, approximately 3.1 hectares (ha) of existing mid-flood bench cottonwood communities, accounting for over 50% of the community on the subject Property would be lost (Table 2).

Vegetation Community	ESA Value	Total Polygon Area (m ²)	Area Lost (m ²)	Area Remaining (m ²)	% Polygon Loss
Cottonwood Riparian	High	59494	31414	28080	53%
Shallow Water	High	1344	0	1344	0%
Reed Canarygrass Marsh High		41153	7440	33713	18%
River High		10153	0	10153	0%
Old Field	Low	58305	40371	17934	69%
Exposed Soil	Low	18762	18680	82	100%
Urban Low		38628	35560	3068	92%
Seasonally Flooded Field	Moderate	19444	15163	4281	78%
Rural Moderate		11252	10911	341	97%

Table 3. Summary of Environmental Sensitive Areas Lost to Development Footprint (Figure 4).				
ESA	Total Poly Area (m²)	Area Lost (m²)	Area Remain (m²)	% ESA Loss
High 121215	39428 81787	33%		
Moderate 46346	35569 10777	77%		
Low 90973	84540 6432	93%		

Review of aerial imagery taken in the spring of 2008 suggests that the demarcation of the Shuswap Lake high water level and active floodplain of the Salmon River presented in the RAR report (Stantec 2009) is inaccurate and areas proposed within the development footprint occur at or below the active floodplain level of the Salmon River. Because of the very low relief of the site, a detailed topographic survey is imperative, especially when identifying the mean annual high water level of Shuswap Lake and the active floodplain of the Salmon River.

Backwater channels and seasonally wetted areas are defined by the RAR process as streams if they are connected periodically to a fish bearing watercourse or lake. This definition includes floodplains and wetlands connected to streams. The RAR setbacks proposed for the Property account for the fish habitat associated with the Salmon River and Shuswap Lake. However, the RAR assessment does not consider the surrounding cottonwood floodplain ecosystem. In addition, the dynamic condition and interconnectedness of the river channel, backwater and flood channels, and shallow open water wetland (ox bow) has not been fully addressed – recognizing the field indicators (rafted debris and fresh alluvial deposits) identified along the Salmon River by Ecoscape.

The RAR assessment provided for the proposed development also fails to address sensitive or endangered species and ecosystems. The rarity of intact riparian cottonwood ecosystems in southern BC, the proximity of the site to a salmon-spawning river and critical migratory bird habitat within the downstream estuary, suggests a high potential for provincially and federally listed species to occur within the Property during critical life stages. More detailed surveys for At Risk wildlife are highly recommended.

Pre-loading of the site will cause compaction of the native substrates and cause unknown effects to the infiltration of water during major rain events and periods of high water. The effects on groundwater are also unknown. The impervious surface (i.e., asphalt, concrete) created by the proposed development will also have major effects on the distribution and quality of surface water runoff. While it is understood that a stormwater treatment facility will be incorporated in to the development scheme, the large extent of imperviousness (i.e., paving) proposed for the site draining surface waters into critical salmon rearing and