ROSEBERY TO SUMMIT LAKE RAIL TRAIL AND MOTO-BYPASS ENVIRONMENTAL IMPACT ASSESSMENT

Prepared for:

Recreation Sites and Trails British Columbia

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Executive Summary

Recreation Sites and Trails BC (RST) has approved in principle a proposed multi-use trail network between Rosebery, BC and Summit Lake, BC. The trail would include the existing trail system along the old rail line, several existing and proposed forest service roads, and the construction of two new trails. The trail system will support both non-motorized and motorized recreational uses. Motorized sections will be limited to quad and side-by-side style all-terrain vehicles (ATV). This area has been identified a priority for conservation in the Slocan Watershed, and has a large number of high profile ecological values, such as the annual western toad migration from Summit Lake.

EcoLogic Consultants Ltd. and Masse Environmental Consultants Ltd. were contracted to provide guidance to ensure that ecological values are identified and protected in development and management of the trail network. This report provides an ecological overview of the project area with management recommendations supported by available information, existing research, and field observations.

Based on the current trail design and available information we are able to make several conclusions; however, without detailed construction plans and more directed field investigation, the precise environmental impacts cannot effectively be determined. We believe that while there will be a potential negative effect (primarily on bear habitat and western toads) of a motorized trail connecting the existing portions of the Bonanza Forest Service Road (FSR), the removal of motorized vehicles from the existing trail, from the north end of Summit Lake to the gravel pit near Hills, is a larger benefit. The proposed crossing over Bonanza Creek near Shannon FSR will have a significant impact to multiple ecological values (including at-risk species and ecosystems, and Kokanee spawning habitat) and given that there is an existing bridge over the creek a short distance away, the need for a new bridge must be carefully evaluated. The contentious issue of permitting a multi-use trail beside the Snk'mip Nature Reserve and the larger Bonanza wetland complex is likely to have a negative influence on the wetland and should also be carefully evaluated.

To minimize the identified impacts of the current proposal, we suggest that a trail design is considered that includes the completion of the Bonanza FSR to create a motorized trail connection from north to south, while removing motorized use through the high value lowland areas. The motorized trail system could then connect to the existing FSR network (Bonanza and Shannon FSRs) to enable access to a large area with few new environmental impacts. If motorized access to Slocan Lake is important, then the existing FSRs could be used to connect the trail system to the established forest recreation site at Wragge Beach. We believe this approach would result in a trail system that would have the fewest new environmental impacts (eliminate the new trail and crossing over Bonanza Creek), reduce the threat to existing ecological values along the current trail (by removing motorized use), and balance community and social concerns regarding the current and proposed trail systems.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDICES

1 INTRODUCTION

Recreation Sites and Trails BC (RST) has approved in principle a proposed multi-use trail network between Rosebery, BC and Summit Lake, BC. The trail system will support both non-motorized and motorized recreational uses. Motorized sections will be limited to quad and side-by-side style all-terrain vehicles (ATV).

Ryan Durand, R.P.Bio (EcoLogic Consultants Ltd.) and Tyson Ehlers, R.P.Bio (Masse Environmental Consultants Ltd.) were consulted to provide guidance to ensure that ecological values are identified and protected in development and management of the trail network. This report provides an ecological overview of the project area with management recommendations supported by available information, existing research and field observations.

The Bonanza Corridor has been identified as one of the top conservation priorities in the Slocan Lake Watershed (Slocan Lake Stewardship Society 2017). The Bonanza Biodiversity Corridor (BBC) Working Group has been established recently with a mandate to seek a conservation designation for the Bonanza corridor, to "enhance landscape connectivity and protect critical habitat and biological diversity from Bonanza Marsh to Summit Lake" (Mahr 2018). In 2015, the Rosebery-Summit Lake Rail Trail Steering Committee developed an initial proposal for management of the rail trail from the north end of Summit Lake to Rosebery and conducted a community poll. Trail uses at the time were identified and included:

- mountain biking – all sections;
- hiking/walking/jogging/running – all sections;
- beach access – high use along Slocan Lake;
- cross-country skiing, snowshoeing - high use along Bonanza Creek and Summit Lake sections, limited along Slocan lakeshore due to low snowfall;
- ATV riding, dirt-biking – occasional in all sections;
- fishing – all sections;
- snowmobiling - rare in all sections;
- wildlife and bird viewing – high in all sections;
- horseback riding - occasional at Summit Lake end, rare along Slocan Lake and Bonanza Creek;
- adjacent landowner use for moving equipment, access to property – occasional in the Rosebery, Hills, and Summit Lake areas;
- educational use by local students/teachers, nature study groups – all sections; and
- scientific wetland research – Bonanza Marsh, Hunter Siding, Summit Lake Marsh

The purpose of the 2015 Management Plan Proposal was to:

- officially establish the Rosebery-Summit Lake rail trail as a recognized provincial recreational trail,
- protect and foster an appreciation for the trail's ecological and cultural values,
- provide safe and high quality recreational opportunities,
- recognize and support the pattern of established local trail uses,
- provide a suitable framework for public input, and

- limit development to what is necessary to meet these objectives.

In January 2018, an application under Section 57 of the *Forest and Range Practices Act* (FRPA) proceeded with the addition of a separate moto-bypass trail and motorized crossing of Bonanza Creek in the Hills community. Section 57 of FRPA requires authorization for constructing, maintaining or rehabilitating trails or recreation facilities on Crown land. The 2015 Management Plan Proposal and the S.57 Application for recreational development included the requirement to conduct independent Environmental Impact Assessments (EIA) on all sections of the trail (motorized and non-motorized) prior to construction or development of any of the proposed trail sections. This EIA is intended to meet those requirements.

Study Area

The study area is broadly defined as the Bonanza Creek corridor, including the north end of Summit Lake to Rosebery (west side of Wilson Creek). Specific environmental assessments are concerned with individual sections of the proposed trail network as defined below. The trail network has been divided into three groups based on the proposed future use, and multiple sections within each group based on potential ecological values and sensitivities. The assessments areas are as follows (Figure 1.1-1):

Non-motorized Trail (NMT)

- NMT Section 1 - Rosebery to the Girl Guide Camp
- NMT Section 2 - Hills gravel pit to Highway 6
- NMT Section 3 - Northeast Summit Lake (Ruby Range Road)

Motorized Trail (MT)

- MT Section 1 - Hills gravel pit to Shannon Creek FSR (new construction)
- MT Section 2 - Shannon Creek FSR to end of BCTS Bonanza Creek FSR South
- MT Section 3 - Central Bonanza Creek (new construction)
- MT Section 4 - North Bonanza Creek FSR to north end of Summit Lake

Multi-use Trail (MUT)

- MUT Section 1 - Girl Guide camp to Snk'mip
- MUT Section 2 - Snk'mip to gravel pit

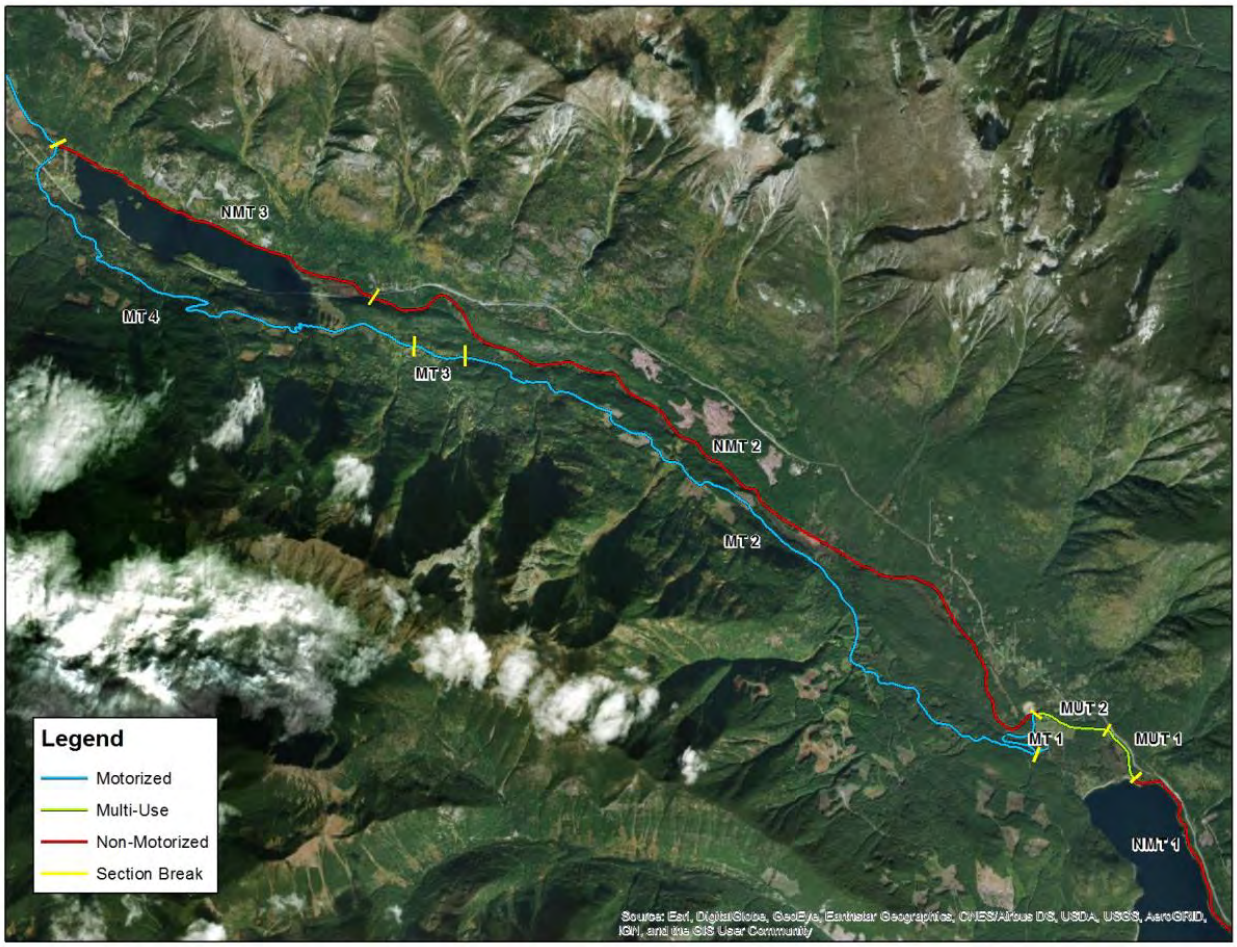

Figure 1.1-1. Overview Map of the Trail Sections used for the Environmental Impact Assessment

1.1 Scope

The primary intent of this report is to identify ecological values along the proposed trail route (with a focus on new construction), identify what threats the trail poses to these values, and recommend appropriate trail management practices and related mitigation activities.

The purpose of this report is to:

1. identify and describe ecological values that could be impacted by the proposed Rosebery to Summit Lake recreation trails, and
2. provide recommendations to protect and conserve those ecological values.

This EIA is guided by the following terms of reference:

1. Catalogue ecological values along the trail network supported by field work. Prioritize ground-truthing based on perceived impacts from trail development, recognizing that the majority of this trail network is on existing road/rail way.

2. Incorporate additional ecological and biodiversity values as identified in existing Bonanza Corridor research, including but not limited to, species at risk, fish and fish habitat, migratory birds and related habitats.
3. Identify threats and risks to those identified values, including impacts of motorized and non-motorized recreational use, emissions, dogs, etc.
4. Develop and recommend best practices to mitigate identified threats, including signage, trail closures and other trail management policies like bells on bikes, dogs on leash, etc.

All archaeological, cultural, or geotechnical assessments are outside the scope of this EIA. These reviews and assessments are being conducted and reported separately to the Implementation Team. This report specifically excludes any coverage of jurisdictional and/or regulatory approvals that would be required given the design and nature of the proposed trail system. The onus is on the Implementation Team to ensure all jurisdictional and regulatory approvals have been obtained prior to construction proceeding.

2 ASSESSMENT APPROACH AND METHODOLOGY

2.1 Field Studies

Direct field work for this project was limited by time and budget constraints. As a result, field studies were focused on reconnaissance-level walk-through of those portions of the proposed trails requiring new construction. Information that was collected included general site descriptions, existing conditions, identification of significant or sensitive ecosystems, at-risk species, vegetation communities, wildlife habitats and stream crossings. The proposed routes were assessed to determine the potential impact of trail construction, future usage and maintenance requirements. In addition, existing knowledge and expertise was also provided by the authors' direct experience in the area conducting ecological research in the subject area and as recreational users of the corridor.

2.2 Research and Analysis

The entire trail system under review has been subject to numerous environmental studies and projects over the years. Consequently, this project was primarily conducted doing a desktop review of existing information and research studies related to the subject area. From this wealth of relevant information, an ecological profile was developed for each section of the proposed trail system. Key ecological values were identified and any potential threats and/or impacts to these values were determined for each section of the trail.

2.2.1 Species and Ecosystems at Risk

Species at risk are tracked provincially (Red- and Blue-listed) by the BC Conservation Data Centre (CDC), and federally (designated as 'Special Concern', 'Threatened', 'Endangered', 'Extirpated' or 'Extinct') by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Legal protection for species and their habitats in Canada is mandated through the Species at Risk Act (SARA). The CDC database was queried to generate a list of potentially occurring at-risk plant and animal species in the project area (BC CDC 2018) using the criteria:

- BC Conservation Status: Red (Extirpated, Endangered, or Threatened) OR Blue (Special Concern)
- COSEWIC Status: Extinct OR Extirpated OR Endangered OR Threatened OR Special Concern
- Forest District: Arrow Boundary Forest District (DAB) (Restricted to Red, Blue, and Legally designated species)
- Regional District: Central Kootenay (RDCK)
- BGC Zone: ICH
- Ministry of Environment Region 4 - Kootenay

Independent queries were combined and the resulting list was filtered to include only those species with potential to occur within the project area based on known occurrence, habitat associations, and local knowledge. CDC records of non-vascular plants (i.e., mosses and lichens) and invertebrates (i.e., insects and molluscs) were retained where insufficient ecological or spatial information was available to rule out potential occurrence.

All listed species were ranked for their potential of occurrence within the study area according to the following categories:

- **Confirmed -** Species has been directly observed within the study area.
- **Likely -** Species is known to occur in the local area and in similar habitat.
- **Possible** - Species has been found in similar habitats, but has not been found in the immediate local area.
- **Unlikely -** Project area has unsuitable habitat and/or located a long distance from known populations.
- **Uncertain -** Not enough is known of the species distribution and habitat requirements to confidently assign likelihood of occurrence.

Ecosystems are named by the characteristic plant association. The BC CDC (2018) database was queried to produce a list of at-risk ecosystem types with known or potential occurrence in the study area. The search criteria used for the CDC database included:

- Ecosystem Realm-Groups: Flood Group (F) OR Forest OR Grassland Group (G) OR Hydrogenic Group (H) OR Rock Group (R) OR Subalpine Shrub Group (S) OR Mineral Wetland Group OR Peatland Group OR Estuarine Realm OR Alpine Group (A) OR Beach Group (B)
- AND BC Conservation Status: Red (Extirpated, Endangered, or Threatened) OR Blue (Special Concern)
- AND Forest Districts: Arrow Boundary Forest District (DAB) (Restricted to Red, Blue, and Legally designated species)
- OR BGC Zone: ICH

Occurrence was rated as: confirmed, likely, or possible based on published information (e.g., Durand 2016) and the authors' local knowledge.

3 ECOLOGICAL OVERVIEW

The Bonanza Corridor is well known to be an important ecological area in the Slocan Watershed that has attracted attention from numerous conservation groups (Mahr 2017). It is a regional hotspot for the western toad (*Anaxyrus boreas*) a federal species of Special Concern, with Summit Lake serving as an important breeding and migration area (Dulisse 2015, McCrory 2016, MOFLNRO 2017). The area approximately centrally located between Hills and the east end of Summit Lake, has been identified as the best east-west movement corridor for wildlife between the Valhalla and Central Selkirk ranges, based on habitat features and current impacts such as human settlement, road density and forestry activity (M. Proctor, in: Mahr 2018; Figure 3-1). Many other species-at-risk are known or expected to occur in the Bonanza Area (see Section 3.6 below), and extensive information is available regarding the regionally high number of known bird species that utilize the corridor (pers. comm. G. Davidson 2018 and R. Johnson 2018). The area also contains two major lakes and numerous creeks and streams, including at-risk fish species and significant Kokanee spawning grounds (see Section 3.4).

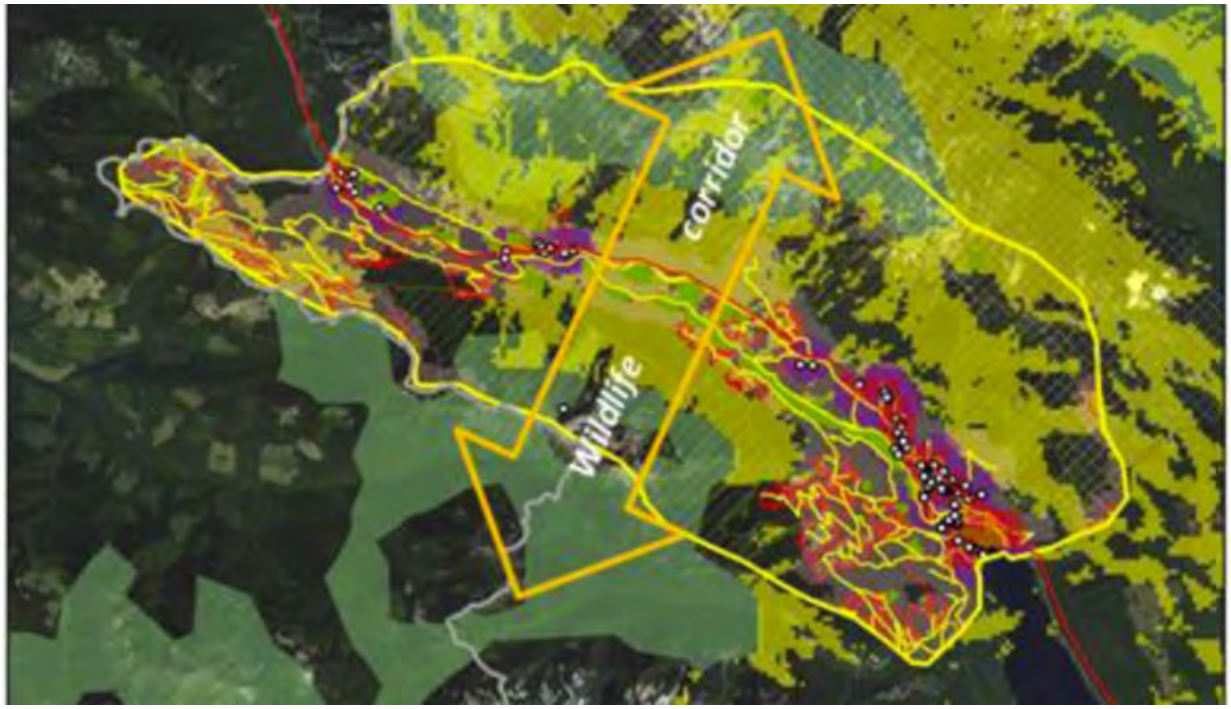

FIGURE 3-1. HIGH VALUE WILDLIFE CORRIDOR WITHIN THE BONANZA CORRIDOR (ADAPTED FROM MAHR 2018)

3.1 Biogeoclimatic Ecosystem Classification (BEC)

The trail system runs through two biogeoclimatic subzone/variants: the West Kootenay Dry Warm Interior Cedar-Hemlock (ICHdw1) and the Slocan Moist Warm Interior Cedar-Hemlock (ICHmw2). The ICHdw1 occurs along the northeast end of Slocan Lake from valley bottom to about 1,300 m on neutral-warm aspects, and is replaced in similar locations to the north by the ICHmw2 (Figure 3.1-1). The ICHdw1 is

characterized by moist, warm springs, hot to very hot dry summers, and mild, dry winters with moderate to shallow snowpacks. This unit is highly productive and tree diversity is high, including western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*), western larch (*Larix occidentalis*), lodgepole pine (*Pinus contorta*), paper birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*). Old-growth stands are rare in the ICHdw1 due to human and fire disturbance, with young to mature stands dominating most of the unit. The ICHdw1 provides an abundance of wildlife habitat, including numerous species-at-risk, as well as important ungulate winter habitat. (MacKillop & Ehman 2016)

The ICHmw2 is one of the most common biogeoclimatic units in the Southern Interior and it includes the valley bottom to mid-slopes along most of Slocan Lake (Figure 3.1-1). It typically occurs from valley bottom to around 1,200 metres where it transitions into the Engelmann Spruce Subalpine Fir (ESSF) zones. The ICHmw2 is located in a climate that is characterized by warm, moist summers and cool, moist winters with moderately deep, persistent snowpacks. The ICHmw2 is both productive and species-rich. Mature and old zonal forests are typically dominated by western hemlock and western redcedar, with minor amounts of Douglas-fir and western larch. Early seral stands and sites in dryer areas can contain trembling aspen, lodgepole pine, and paper birch. Wetter sites, and higher elevation areas typically contain Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*), while floodplains are often dominated by black cottonwood (*Populus trichocarpa*). The ICHmw2 supports a wide range of habitat, with mature and old stands in particular providing habitat for numerous species, including species-at-risk (MacKillop & Ehman 2016).

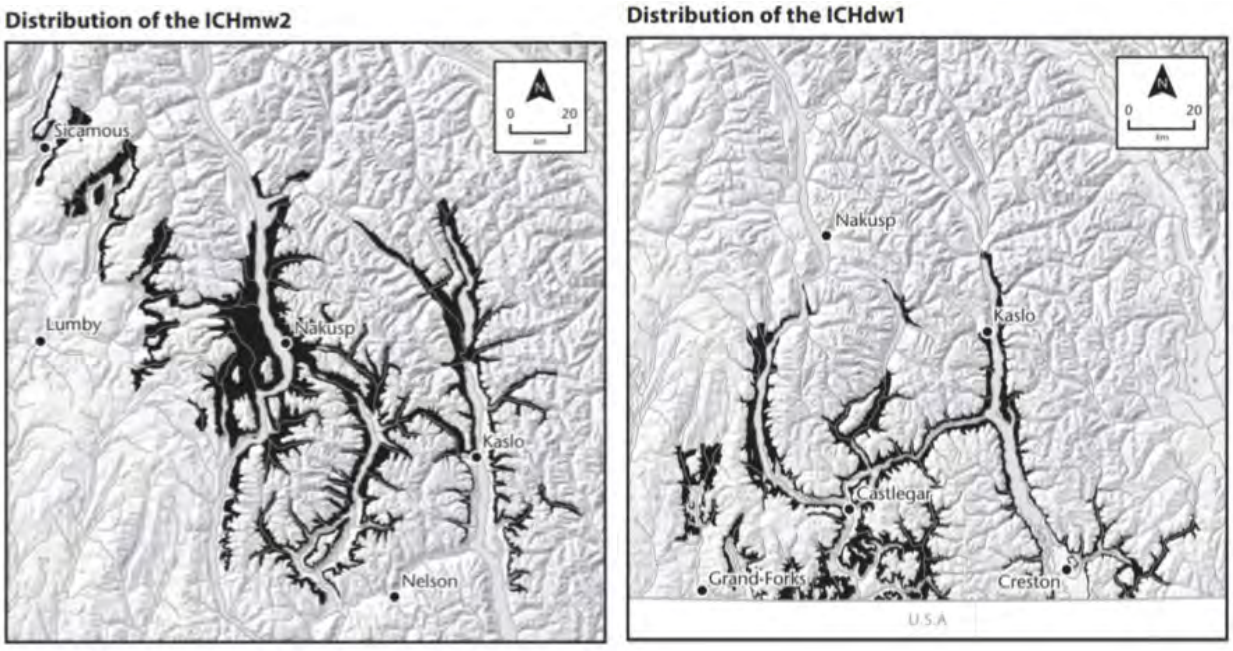

FIGURE 3.1-1. DISTRIBUTION OF THE ICHMW2 AND ICHDW1 (ADAPTED FROM MACKILLOP & EHMAN 2016)

3.2 Ecosystem Types in the Rosebery – Summit Lake Corridor

The trail system passes through a wide range of ecosystem types, from steep dry forest in the south through large wetland complexes, moist to wet cool aspect forests, riparian shrub and floodplain communities, and all along the trail there are nearby open-water features including Slocan and Summit Lakes, Bonanza Creek, and several smaller tributary streams.

3.2.1 Wetlands and Floodplains

The Bonanza corridor contains a number of significant wetlands, including marsh, swamp, fen and shallow-water types (Table 3.2-1). The Bonanza marsh complex at the north end of Slocan Lake (Plate 3.3-1) is the largest wetland bordering Slocan Lake and is well-known for its regional ecological importance. Floodplain ecosystems are included in this section as transitional sites from wetland or riparian to upland communities. Wetland classification is based on *Wetlands of BC: A Guide to Identification* (Mackenzie and Moran 2004). Detailed wetland mapping has been carried out at the north end of Slocan Lake in the "Bonanza Marsh Wetland Complex" (Durand *et al*. 2015), and described for the Slocan Watershed (Durand 2016). The Bonanza wetland complex, bordered by the rail trail to the east and beachfront human settlement to the west, is an ecologically significant area that has been the focus of conservation initiatives (Mahr 2017) and includes "Snip'mik Marsh Sanctuary", a private parcel purchased by the Valhalla Foundation for Ecology and the focus of past and ongoing research into its unique ecological values. Table 3.2-1 lists the known and expected wetlands and floodplain associations within the Bonanza Corridor. The wetland and floodplain classes are further described below based on the 2016 Slocan Wetland Assessment and Monitoring Project report (Durand 2016).

Plate 3.3-1. The Bonanza Wetland Complex (looking towards the Snk'mip Marsh Nature Reserve).

Table 3.2-1. Wetland types known or expected to occur in the Bonanza corridor*

Code	Common Name	Confirmed in the Bonanza corridor?	Notes	Source
Marsh				
Wm00	Unclassified	yes	Marsh wetlands lacking distinct vegetation communities.	Durand 2016
Wm00	Reed canarygrass	likely	Common in Slocan watershed	Durand 2016
Wm00	Cusick's sedge	yes	Bonanza wetland, marsh dominated by Cusick's sedge, an unclassified site association.	Durand et al. 2015
Wm01	Beaked sedge - Water sedge	yes	Throughout area	Durand 2016
Wm02	Swamp horsetail - beaked sedge	yes	Summit Lake	Durand 2016
Wm04	Common spike-rush	yes	Uncommon on lake margins and river side-channels	R. Durand observation
Wm05	Cattail	yes	Bonanza wetland, Summit Lake	
Wm06	Great bulrush	yes	Bonanza wetland	Durand et al. 2015
Wm09	Inflated sedge	possible		
Wm15	Bluejoint - Beaked sedge	possible	Some Wm00 likely in this association	
Wm51	Three-way sedge	possible	Could be a component of large fen b/w highway and NMT Section 2	T. Ehlers obs.
Fen				
Wf00	Unclassified	yes	Part of Snk'mip marsh; calcareous fen with unique species assemblage.	Durand et al. 2015
Wf01	Water sedge - Beaked sedge	yes	Common throughout area	Durand 2016
Wf05	Slender sedge - Common hook moss	yes	Hills to Summit Lake	Durand 2016
Wf06	Buckbean - Slender sedge	yes	North of Summit Lake	Durand et al. 2015
Wf11	Tufted clubrush - Star moss	possible	Found at Red Mountain (Peyton wetland)	T. Ehlers obs.
Wf12	Narrow-leaved cotton-grass - white mountain marsh marigold	possible	Potential at higher elevations	Durand 2016
Wf13	Narrow-leaved cotton-grass - Shore sedge	possible	Potential at higher elevations, above Section 2 of NMT	Durand 2016, T. Ehlers obs.
Wf52	Myrica gale - Carex sitchensis	yes	North of Summit Lake	Durand et al. 2015
Swamp				

Code	Common Name	Confirmed in the Bonanza corridor?	Notes	Source
Ws00	Unclassified	yes	Swamp communities, often with disturbance history, with no distinct vegetation community	Durand 2016
Ws01	Mountain alder - Skunk cabbage - Lady fern	yes	Bonanza wetland; common throughout area	Durand et al. 2015
Ws02	Pink spirea - Sitka sedge	yes	South end of Summit Lake	SWAMP
Ws06	Sitka willow - Sitka sedge	yes	Bonanza wetland	Durand et al. 2015
Ws08	subalpine fir – Sitka valerian – common horsetail	possible	Potential at higher elevations	Durand 2016
Ws10	Western redcedar - Spruce - Skunk cabbage	yes	Bonanza wetland; common throughout area	Durand et al. 2015, Durand 2016
Shallow Water				
Yellow pond lily		yes	Common in area	T. Ehlers observation
pondweed		yes	Common in area	T. Ehlers observation
Floodplain				
Fm01	Cottonwood - Snowberry - Rose	possible	Warmer community type occurring along creeks and rivers.	
Fm02	Cottonwood - Spruce - Dogwood	yes	Common the in Slocan Watershed	Durand et al. 2015
Fm04	Cottonwood - Redcedar - Dogwood - Lady fern	yes	Newly described association that is likely to occur in the area	R. Durand observation
Fl01	Mountain alder - Common horsetail	yes	Common in area along low gradient creeks	Durand et al. 2015
Fl02	Mountain alder - Red-osier dogwood - Lady fern	yes	Common in area along low gradient creeks	R. Durand observation
Fl04	Sitka willow - Red-osier dogwood - Horsetail	yes	Common in area along low gradient creeks	R. Durand observation
Fl06	Sandbar willow - Scouring rush	possible	Uncommon along larger river sandbars	R. Durand observation

**Shading indicates the wetland is a Red- or Blue-listed Ecosystem Type (BC CDC).*

3.2.1.1 Marsh Class (Wm)

Marshes are permanently to seasonally flooded mineral wetland dominated by emergent grass-like vegetation (MacKenzie & Moran 2004). Marshes typically contain simplistic vegetation communities that are dominated by a small number of species, often in response to specific water regimes or other

favourable conditions. Shrubs, trees and bryophytes (mosses) are generally absent or very sparse, while aquatic plants are often present. Marshes occur in dynamic hydrological systems, where there are significant fluctuations in water levels through the year. They are generally nutrient-rich and more frequently present in warmer climates. Marshes occur in a variety of landscape positions, but most often as pond and lake margins and river backwaters as a component of a larger wetland complex. Peat accumulation is generally limited due to the occurrence in warmer climates and the dynamic water levels, both of which promote decomposition of organic material, resulting in most marshes being comprised mainly of mineral soils. Marshes are generally flooded in the spring, while drier months may see a persistent high water table, or substantial drying and substrate exposure.

3.2.1.2 Fen Class (Wf)

Fens are nutrient-medium peatland ecosystem dominated by sedges, cottongrass and brown mosses, where mineral-bearing groundwater is within the rooting zone and minerotrophic plant species are common (MacKenzie & Moran 2004). Fens rely on steady groundwater inflow that provides relatively high nutrient contents and maintains the water table near the peat surface for most of the growing season, resulting in soils with richer nutrient regimes. They develop on a variety on landscape positions, including basins, lake and river margins, and seepage slopes. These sites are characterized by non-ericaceous shrubs, sedges, grasses, reeds, and brown mosses (MacKenzie & Moran 2004), while tall shrubs and trees are absent.

3.2.1.3 Swamp Class

Swamps are nutrient-rich wetland ecosystem where significant groundwater inflow, periodic surface aeration, and/or elevated microsites allow for growth of large trees or tall shrubs under subhydric conditions (MacKenzie & Moran 2004). Swamps are dominated by conifer or broadleaf trees (often on mounded microsites), or tall shrubs. Herbaceous species are variable, and can range from thick to sparse covers, while bryophytes are generally limited. Tree dominated swamps typically occur as transitional areas between water or other wetlands and upland terrestrial communities, while shrub-dominated swamps occur in a wide variety of conditions. Swamps range from moderate to rich communities that have significant groundwater flow and water tables that remain near or above the surface throughout the growing season. They typically occur on mineral soils that have a surface layer of well-decomposed organic material.

3.2.1.4 Shallow Water Class (Ww)

Shallow open-water wetlands are aquatic wetlands permanently flooded by still or slow-moving water and dominated by rooted submerged and floating-leaved aquatic plants (MacKenzie & Moran 2004). These aquatic wetlands are simplistic communities that typically have less than 10% cover of emergent species. Shallow open-water wetlands occur as a component of still or slowly moving waterbodies, and are normally a small component of a larger wetland or aquatic complexes. They occur in water that is less than two metres deep (deeper water limits light penetration and the ability for most rooted emergent species to grow). There are currently not any formal wetland associations or site series for shallow open water ecosystems.

Shallow water communities are broadly grouped into yellow pond lily and pondweed types and are found in association with other wetland types throughout the Bonanza corridor.

3.2.1.5 Floodplain Ecosystems

Flood associations are non-wetland ecosystems that occur in riparian areas that are regularly flooded or have seasonally high water tables. They range from low-bench floodplains that flood annually, either accumulates or loose sediment (scoured), and support a low diversity of flood tolerant shrubs (willow, alder, or young cottonwood). Mid-bench floodplains occupy a slightly higher elevation in fluvial floodplains, where they are flooded on an annual basis, but the flood waters are generally slow gradient and do not persist for as long as the low-bench floodplains. As result, the mid-bench flood associations' support forested communities that often have a lush and diverse assemblage of species.

3.2.2 Forested Ecosystems

A variety of forested ecosystems described in the ICHdw1 and ICHmw2 BEC subzone/variants occur along the proposed trail system. Forest types represent a spectrum from dry to very wet, with only very dry sites (typically characterised as steep, warm aspect with exposed bedrock) lacking. Although it was beyond the scope of this assessment to determine the full suite of forest types intersected by the proposed trail system, it appears that the age class distribution is primarily young to mature conifer stands, with a lack of very old forest (age classes 8 and 9), refelecting the logging and fire history of the area. Seral stands of trembling aspen and paper birch occur sporadically, as do small areas of young to mature black cottonwoods. Two at-risk forested ecosystems are known or likley to occur in the Bonanza Corridor (Table 3.2-2).

Table 3.2-2. At-risk Forested Ecosystems Types Known or Expected to Occur in the Bonanza Corridor*

Code	Common Name	Confirmed in the Bonanza corridor?	Notes	Source
ICHdw1/02	Douglas-fir / tall Oregon-grape / parsley fern	Likely	Expected to occur on upper, rocky slopes	T. Ehlers and R. Durand 2018
ICHmw2/07	western redcedar - western hemlock / common horsetail	Yes	Uncommon in the Slocan	T. Ehlers and R. Durand 2018

** Shading indicates the community is a Red- or Blue-listed ecosystem type (BC CDC 2018).*

3.2.3 Avalanche Ecosystems

Avalanche ecosystems are located in areas where regularly occurring avalanches modify vegetation communities and limit natural succession. They are broadleaf classified as Avalanche Treed Class (Vt) or Avalanche Herb Meadow Class (Vh). Multiple Vh site associations have recently been described for the region, while the Vt associations are under development (MacKillop & Ehman 2016). These ecosystem types are common in the Bonanza corridor, typically consisting of Vh communities at higher elevations and Vt at lower elevations. The herb meadow class often provides important wildlife habitat for grizzly bears and other animals.

3.3 Species and Ecosystems at Risk in the Project Area

A list of over 250 provincial and/or federal species at risk with potential occurrence in the greater project area was compiled from searching the CDC database (Appendix 1). Forty-eight species at risk were confirmed (17), likely (4), or possible (27) to occur in the project area (Table 3.3-1). An additional five species that are confirmed or likely to occur have recently been de-listed by the CDC, though are still considered locally rare in the Kootenays.

Fourteen Red- and Blue-listed ecosystem types with known or potential occurrence were Identified for the project area; 13 of these are wetland ecosystems (Table 3.3-1). One forested type, the Blue-listed ICHmw2/07 (western redcedar - western hemlock / common horsetail) community known from Silverton and Nakusp likely occurs in the area. This site series is equivalent to the ICHmw2/113 and occurs on level receiving sites with moisture close to the surface, typically in riparian areas with cold air drainage (MacKillop & Ehman 2016).

3.4 Fish and Fish Habitat

Fisheries-sensitive features occur along the trail network and include the littoral zones of Slocan and Summit Lake, Bonanza Creek, and tributary streams and wetlands. Bonanza Creek is a 4th order stream that flows in a southeasterly direction over a distance of 14 km from Summit Lake to the northwest and into Slocan Lake to the southeast. The stream meanders through a relatively narrow valley with steep valley walls. Bonanza Creek has gentle gradients (less than 3%), and has a riffle-pool morphology for most of its entire length, punctuated by the presence of wetlands throughout the valley bottom. Bonanza Creek has been identified as an important tributary stream to Slocan Lake for kokanee (*Oncorhynchus nerka*) and rainbow trout (*O. mykiss;* AMEC 2015). Tributary streams originating from the south offer limited fisheries habitat (200 to 400 m) due to steep gradients thereafter. On the other hand, tributary streams to the north provide greater fisheries habitat potential due to more extensive area with gentler gradients and presence of a number of wetlands.

Summit Lake, which has a surface area of 150 m^2, is managed as a recreational fishery and was regularly stocked with rainbow trout since the 1920s. A coarse fish barrier was first installed in Bonanza Creek in 1965 and then reconstructed in 1986 approximately 1.2 km downstream of Summit Lake in order to prevent coarse fish from entering Summit Lake. The lake was chemically treated on two occasions to remove all fish from the lake with the goal of establishing a healthy self-sustainable rainbow trout population. Rainbow trout have been observed using Bonanza Creek downstream of Summit Lake and upstream of the dam for rearing and spawning (Baxter 2013). This area was identified as a Fisheries Sensitive Zone due to the high complexity created by the presence of beaver dams, meandering channels, and wetlands (Kokanee 1997).

Table 3.3-1. Species At Risk with Confirmed and Potential Occurrence in the Study Area (BC CDC 2018).

Scientific Name	English Name	BC List	COSEWIC[1]	SARA	Occurrence	Source/Rationale[2]
Amphibians						
Ambystoma mavortium	Blotched Tiger Salamander	Red	E (Nov 2012)	1-E (Feb 2018)	possible	Not known from the West Kootenay, but found in Fernie, ICH (BC CDC 2018)
Anaxyrus boreas	Western Toad	Yellow	SC (Nov 2012)	1-SC (Jun 2018)	confirmed	Summit Lake Toad Management Area, many local observations from Hills through Summit Lake; Snk'mip marsh (T. Ehlers)
Plethodon idahoensis	Coeur d'Alene Salamander	Yellow	SC (Nov 2007)	1-SC (Jun 2003)	likely	Reported from New Denver to Nakusp (BC CDC 2018)
Birds						
Accipiter gentilis atricapillus	Northern Goshawk, *atricapillus* subspecies	Blue			possible	Slocan SAR (2017); one record at Summit Lake, one record at Bonanza Marsh (Gary Davidson)
Aechmophorus occidentalis	Western Grebe	Red		1-SC (Nov 2017)	confirmed	Several records at Summit Lake and also at north end of Slocan Lake (Gary Davidson)
Ardea herodias herodias	Great Blue Heron, *herodias* subspecies	Blue			confirmed	Quite a few records from the Summit Lake area and Bonanza Marsh (Gary Davidson)
Chordeiles minor	Common Nighthawk	Yellow	SC (May 2018)	1-T (Feb 2010)	confirmed	Several records from Summit Lake, although not recently (Gary Davidson)
Coccothraustes vespertinus	Evening Grosbeak	Yellow	SC (Nov 2016)		likely	No records for this region. Given the irruptive nature of the species it should occur on occasion (Gary Davidson)
Contopus cooperi	Olive-sided Flycatcher	Blue	SC (May 2018)	1-T (Feb 2010)	confirmed	This species breeds regularly at elevation above this region. There are one or two records of fall migrants within the corridor (Gary Davidson)
Cypseloides niger	Black Swift	Blue	E (May 2015)		confirmed	Has been reported flying over Summit Lake (Gary Davidson)
Dolichonyx oryzivorus	Bobolink	Blue	T (Apr 2010)	1-T (Nov 2017)	possible	Slocan SAR (2017)
Hirundo rustica	Barn Swallow	Blue	T (May 2011)	1-T (Nov 2017)	confirmed	Feeds regularly over the marsh at Summit Lake and Bonanza Marsh. Nests annually on nearby buildings, (i.e. Summit Lake Ski Lodge) (Gary Davidson)
Larus californicus	California Gull	Blue			likely	P. McIver, South West Kootenay Bird Survey

Scientific Name	English Name	BC List	COSEWIC[1]	SARA	Occurrence	Source/Rationale[2]
Megascops kennicottii macfarlanei	Western Screech-Owl, *macfarlanei* subspecies	Blue	T (May 2012)	1-T	possible	Slocan SAR (2017); observed in Slocan
Melanerpes lewis	Lewis's Woodpecker	Blue	T (Apr 2010)	1-T (Jul 2012)	possible	Observed near Slocan (T. Ehlers), but unlikely to occur in the more dense brushy areas of the Bonanza corridor (Gary Davidson)
Progne subis	Purple Martin	Blue			confirmed	One record of a single bird flying over Bonanza marsh (Gary Davidson)
Cygnus columbianus	Tundra Swan	Blue			likely	Slocan SAR (2017); Slocan River, between Lemon Creek and Slocan city
Riparia riparia	Bank Swallow	yellow	T		possible	Slocan SAR (2017)
Molluscs						
Anguispira kochi	Banded Tigersnail	Blue			likely	Throughout lower valley
Cryptomastix mullani	Coeur d'Alene Oregonian	Blue			confirmed	Slocan SAR (2017); along proposed trail route and Bonanza Creek crossing (R. Durand)
Hemphillia camelus	Pale Jumping-slug	Blue			possible	Slocan SAR (2017); Near Red Mtn. Road
Kootenaia burkei	Pygmy Slug	Blue	SC (Apr 2016)		possible	Slocan SAR (2017); Wilson Creek, Red Mtn. Road
Insects						
Argia vivida	Vivid Dancer	Blue			possible	Slocan SAR (2017); Little Wilson Lake
Bombus occidentalis	Western Bumble Bee	Blue	T (May 2014)		confirmed	Snk'mip wetland July 2018 (T. Ehlers)
Cicindela hirticollis	Hairy-necked Tiger Beetle	Blue			possible	Beach, riparian habitat along streams (BC CDC 2018)
Libellula pulchella	Twelve-spotted Skimmer	Blue			possible	Occurs to the south along Slocan River (T.Ehlers)
Lichens						
Nephroma occultum	cryptic paw	Blue	SC (Apr 2006)	1-SC (Dec 2007)	possible	Slocan SAR (2017); Gardner Creek (near Kuskanax Road), Duncan Lake
Usnea glabrata	lustrous beard	Blue			possible	T. Ehlers collection, unconfirmed specimen
Pseudocyphellaria crocata	Flaming specklebelly	Blue			possible	Slocan SAR (2017), found at Wilson falls
Mammals						

Scientific Name	English Name	BC List	COSEWIC[1]	SARA	Occurrence	Source/Rationale[2]
Gulo gulo luscus	Wolverine, *luscus* subspecies	Blue	SC (May 2014)	1-SC (Jun 2018)	possible	Occurs in the Valhalla and Central Selkirk Ranges (Kortello and Hausleitner 2015), could pass through lower elevations as this is a large ranging animal
Myotis lucifugus	Little Brown Myotis	Yellow	E (Nov 2013)	1-E (Dec 2014)	confirmed	BC Wildlife Federation's Wetland Education Program New Denver BioBlitz, June 2013 Summary Report
Myotis septentrionalis	Northern Myotis	Blue	E (Nov 2013)	1-E (Dec 2014)	possible	Slocan SAR (2017)
Oreamnos americanus	Mountain Goat	Blue			confirmed	Slocan SAR (2017); Slocan Ridge, Valhalla range, Central Selkirk range (Prov. of British Columbia)
Pekania pennanti	Fisher	Blue			possible	Slocan SAR (2017); Historic furbearer trapping data throughout the Slocan Valley
Ursus arctos	Grizzly Bear	Blue	SC (May 2002)	1-SC (Jun 2018)	confirmed	Well known to occur along rail trail (W. McCrory); Valhalla and Central Selkirk grizzly bear population units border along Bonanza Ck. (Prov. of British Columbia).
Myotis ciliolabrum	Western Small-footed Myotis	Blue			possible	Slocan SAR (2017)
Fish						
Acipenser transmontanus pop. 2	White Sturgeon (Columbia River pop.)	Red		1-E (Aug 2006)	possible	Historically occurs in Slocan Lake; BC CDC 2018
Cottus confusus	Shorthead Sculpin	Blue	SC (Nov 2010)	1-SC	possible	Slocan SAR (2017); Slocan River, 4 areas (Springer Ck.)
Cottus hubbsi	Columbia Sculpin	Blue	SC (Nov 2010)	1-SC (Jun 2003)	possible	Slocan SAR (2017); Kootenay River below Slocan River
Lota lota pop. 1	Burbot (lower Kootenay population)	Red			confirmed	Slocan SAR (2017); Slocan Lake near Evans Creek mouth
Oncorhynchus clarkii lewisi	Cutthroat Trout, *lewisi* subspecies	Blue	SC (Nov 2016)	1-SC (Feb 2010)	confirmed	Shannon Creek, Slocan River
Rhinichthys umatilla	Umatilla Dace	Red	T (Apr 2010)	3 (Mar 2005)	possible	Slocan SAR (2017); Slocan River near mouth
Salvelinus confluentus	Bull Trout	Blue	SC (Nov 2012)		confirmed	Slocan SAR (2017); Slocan Lake, Silverton, Wilson, Carpenter, Dennis Creeks/Slocan River Lemon pool, Lemon Creek

Scientific Name	English Name	BC List	COSEWIC[1]	SARA	Occurrence	Source/Rationale[2]
Reptiles						
Charina bottae	Northern Rubber Boa	Yellow	SC (Apr 2016)	1-SC (Jan 2005)	possible	Slocan SAR (2017); Lemon Ck., Winlaw
Plestiodon skiltonianus	Western Skink	Blue	SC (Nov 2014)	1-SC (Jan 2005)	possible	Slocan SAR (2017); multiple occurrences in southern Slocan Valley; known to occur at Lemon Creek (T. Ehlers)
Chrysemys picta pop. 2	Painted Turtle - Intermountain - Rocky Mountain Population	Blue	SC (Nov 2016)	1-SC (Dec 2007)	possible	Slocan SAR (2017); occurs in Slocan River
Plants						
Botrychium montanum	mountain moonwort	Blue			confirmed	found near proposed Bonanza Creek crossing (R. Durand & T. Ehlers 2018)
Callitriche heterophylla ssp *heterophylla*	two-edged water-starwort	Blue			possible	Slocan SAR (2017); lower Slocan Valley
Delphinium sutherlandii	Sutherland`s larkspur	Yellow			likely	Slocan SAR (2017); no longer listed (2018)
Dryopteris cristata	crested wood fern	Yellow			likely	Slocan SAR (2017); no longer listed (2017)
Eleocharis rostellata	beaked spike-rush	Yellow			confirmed	Slocan SAR (2017); no longer listed (2017) but is a rare occurrence in the West Kootenay
Epilobium glaberrimum ssp. *fastigiatum*	glaucous willowherb	Yellow			likely	Slocan SAR (2017); no longer listed (2016)
Epipactis gigantea	giant helleborine	Yellow	NAR (Nov 2015)		confirmed	de-listed 2016, but rare in the Kootenays

[1] E: Endangered; NAR: Not at Risk; SC: Special Concern; T: Threatened

[2] Slocan SAR – Durand and MacKenzie 2017. Species at Risk Inventory for the Slocan Watershed.

A fish survey was conducted in 1996 and confirmed the presence of kokanee, rainbow trout, and prickly sculpin (*Cottus asper*) within the Bonanza Creek watershed (Kokanee 1997). Kokanee were observed utilizing the mainstem of Bonanza Creek for spawning. A kokanee spawning assessment was conducted in 2015, estimating the presence of 27,000 spawning kokanee (AMEC 2015). A number of logjams were identified along the mainstem as partial barriers since a number of kokanee were observed spawning beyond these logjams. Even though bull trout (*Salvelinus confluentus*) are present in Slocan Lake, this species has not been reported in Bonanza Creek, likely due to high water temperatures during the summer and low stream gradients (Pers. Comm. Jeremy Baxter, 2018).

Bonanza Creek flows into Slocan Lake, which is a large oligotrophic lake with a surface area of 6,928 m^2. Fish species reported in Slocan Lake include Eastern brook trout (*Salvelinus fontinalis*), bull trout, burbot (*Lota lota*), dace (*Rhinichthys* sp.), kokanee, lake chub (*Couesius plumbeus*), largescale sucker (*Catostomus macrocheilus*), mountain whitefish (*Prosopium williamsoni*), northern pikeminnow (*Ptychocheilus oregonensis*), peamouth chub (*Mylocheilus caurinus*), rainbow trout, redside shiner (*Richardsonius balteatus*), sculpin (*Cottus* sp.), westslope cutthroat trout (*O. clarki lewisi*), and white sturgeon (*Acipenser transmontanus*; MOE 2018). Rainbow trout and kokanee have been regularly stocked in Slocan Lake since the early 1900s. The lake is renowned for its year-round fishing, particularly for the sizeable rainbow trout (Galena 2011).

3.5 Wildlife

There is a wide variety of wildlife species documented in the project area. The ICHmw2 provides habitat for large animals, including mountain caribou, wolverine, grizzly bear, black bear, moose, mule deer and Rocky Mountain elk (MacKillop & Ehman 2016). Wetlands and riparian forests support a number of fur-bearing animals including American mink and North American river otter. The area is particularly rich in bird diversity, with nearly 100 species documented (G. Davidson in: Mahr 2017). Six bat species and four amphibian species were identified during a Bioblitz held in 2013 (BC Wildlife Federation 2013). Though less documented, invertebrates including molluscs and insects are highly diverse and abundant, with several at-risk species confirmed or potentially occurring in habitats along the trail corridor (Table 3.3-1).

4 KEY ECOLOGICAL VALUES

4.1 Water Courses and Fisheries

The proposed trail system runs adjacent to and crosses numerous waterbodies, many of which are fish-bearing. Bonanza Creek and its tributaries are the most significant headwaters of the Slocan Watershed and provide important kokanee spawning habitat. Management practices should be implemented to protect water quality and fish habitat. Works that involve changes in and about a stream may be subject to authorizations under the BC *Water Sustainability Act* and federal *Fisheries Act*.

General recommendations to protect water quality and fish along the proposed trail network include:

- Streamside vegetation and undergrowth must be preserved wherever possible.

- Trees removed from areas adjacent to a stream must be felled away from the stream.
- Disturbance to stream bank and riparian areas must be minimized.
- Site isolation is required for any instream work.
- Upgrade works to the trails and stream crossings must not cause sedimentation into watercourses.
- All equipment must be clean (including excessive hydraulic fluids, soil, and plant parts) and free of leaks to prevent propagation of invasive plant species and delivery of contaminants to the environment.
- Designated staging areas for fueling and maintenance must be clearly marked on site at a location at least 30 m away from any watercourses.
- Spill kits must be readily available during all works. Each piece of equipment must be equipped with a spill response kit.
- Small containers of fuel and oil must be stored in appropriate secondary containment within the staging areas to minimize the effect of a spill.

- Any small equipment including generators and pumps must be placed in secondary containment basins to contain any fuel leaks.

4.2 Western Toad and other amphibians

Western toad (*Anaxyrus boreas*) is a federal Species of Special Concern (COSEWIC 2012), and Summit Lake is a regionally important habitat area for western toad where there have been extensive efforts to monitor and protect this population (Dulisse, Boulanger and Manley 2016). There are three main toad migrations:

- March–May: adults move from upland overwintering habitat to breeding grounds
- April–June: adults move back into upland habitats after spawning
- July–September: toadlets begin migrating intermittently into adjacent forest habitats (2–6 years before reaching sexual maturity)

Adult toads have been captured along the roads and trails upwards of two kilometers from breeding sites. Around Summit Lake, they have been detected on surrounding forest roads and trails, including Bonanza FSR and the rail trail (Figure 4.2-1).

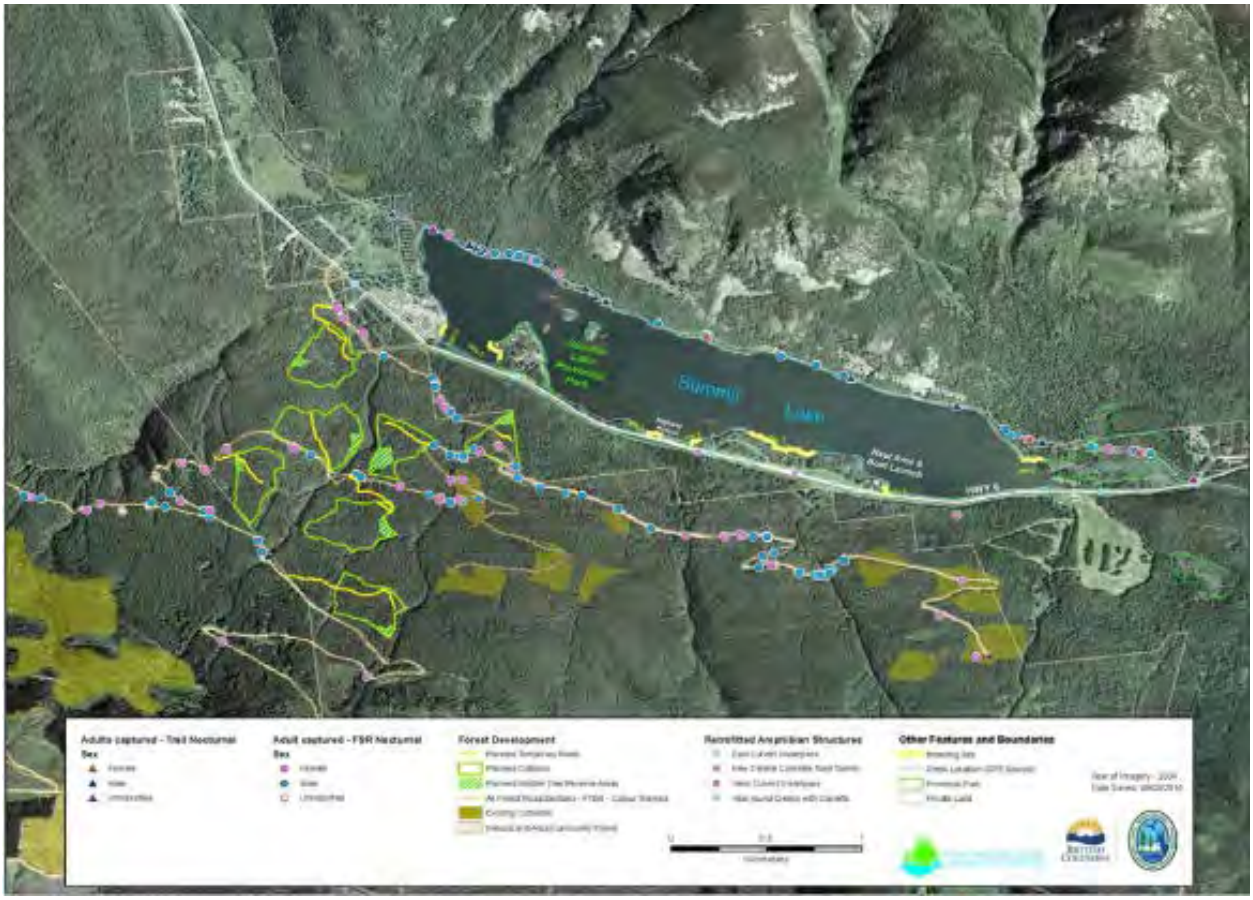

FIGURE 4.2-1. ADULT WESTERN TOAD DETECTIONS ON FOREST SERVICE ROADS AND RAIL TRAILS SURROUNDING SUMMIT LAKE 2015 (ADAPTED FROM DULISSE, BOULANGER AND MANLEY 2016)

Western toad management strategies developed for Summit Lake (MOFLNRO 2017) can be adapted to the construction, maintenance, and operation of the proposed recreation trail system. These include (additions in italics):

- Road (*trail*) construction, maintenance, and hauling activities between March 1 and October 31 should be accompanied by an environmental monitor to ensure that these activities do not cause inadvertent toad mortality.
- Motorized activity on recreational trails should be conducted during daylight hours only (sunrise to sunset). This provision applies to all trails within 2 km of Summit Lake (*and other identified migration locations*) from April 1st to October 31st.
- The Rosebery to Summit Lake Rail Trail network immediately adjacent to the lake (*and other identified breeding locations along the trail network*) should not be used during peak toadlet migrations, *the timing of which* occurs between July 15th and September 15th. This period of non-use applies to both motorized and non-motorized traffic.
- Public information signs will be located at vehicle staging/access points to detail western toad habitat life history, sensitivity to motorized activities, and detail boundaries of restricted use areas.

These management strategies are applicable to the following trail sections where toads have been detected and suitable habitat exists:

- MT Section 4 - North Bonanza Creek FSR to north end of Summit Lake
- MUT Section 1 - Girl Guide camp to Snk'mip
- MUT Section 2 - Snk'mip to gravel pit
- NMT Section 2 - Hills gravel pit to Highway 6
- NMT Section 3 - Northeast Summit Lake (Ruby Range Road)

In addition, nocturnal movements in and around the breeding areas could place toads on and around the trails.

4.3 Large Mammals

4.3.1 Bears

Both American black bear (*Ursus americanus*) and grizzly bear (*Ursus arctos*) frequent the proposed trail network. The grizzly bear has been assessed as a species of special concern federally and is Blue-listed provincially (BC CDC 2018). Grizzly bear are assessed in British Columbia as threatened or viable by population unit.

Paquet and McCrory (2012) conducted a Bear Hazard Assessment for the upper Slocan Valley, including the rail trail. They found that bear habitat values between Hills and the north end of Slocan Lake were low, and primarily supported black bears using the trail for travel. The highest bear hazard area they identified was along the proposed NMT Section 2 - Hills gravel pit to Highway 6 section:

> "*The primary habitat-related hazard concern is during Spring from about 2 km north of Slocan Lake (where the railroad trail skirts the north end of private lands in Hills) through the extensive marshlands near "Red House" (an old CPR cabin) and on through to the south end of Summit Lake. From Red House to Summit Lake, there are small wetlands along the rail trail that contribute to high bear habitat values*." (Paquet and McCrory 2012).

There is abundant spring forage for grizzly bear in this area, and it is part of a major cross-valley migration corridor. Recommendations from their report directly applicable to Rosebery-Summit Lake trails include:

1. A policy for non-motorized use should be implemented to minimize disturbances to bears and other wildlife, such as wintering deer, moose, and elk.
2. This 5–6 km wetland trail section between north Hills and Summit Lake should be given priority for improvement, including brushing out all CPR rights-of-way to improve visibility.
3. Bear warning signage should be posted for May and June at either end of this section. Signs need to be removed when bear sign drops off in early summer (currently this is done by volunteers).

4. RDCK needs to have a guideline in place for temporarily closing the trail should a high hazard situation be identified, such as a mother grizzly and young feeding along the right-of-way, or a grizzly or black bear feeding on a large mammal carcass.
5. Residents have identified concerns of disturbances by winter recreation to over-wintering moose, deer, and elk. Some uncontrolled dogs have chased wildlife during deep snow conditions; this needs to be addressed by RDCK through posting warning signs in the winter.
6. RDCK needs to have a dog-on-leash rule to prevent unpleasant encounters between users and grizzly bears and to minimize disturbances to wildlife during all seasons.

General management strategies to protect bears along the proposed trail network include:

- Cease all motorized activity within 500 m of a grizzly bear or known denning site (BC MOE 2006).
- Employ the "avoid when seen" strategy to shut down sections of the trail where bears are sighted. Cease all non-motorized activity within 100 m of bears or known den sites (BC MOE 2006).

4.3.2 Ungulates

4.3.2.1 Ungulate Winter Range

Ungulate Winter Range (UWR) #U-4-001 is established for Rocky Mountain elk (*Cervus elaphus nelsoni*), white-tailed deer (*Odocoileus virginianus*), mule deer (*Odoceilus hemionus*), and moose (*Alces alces*). An Ungulate Winter Range is defined as an area that contains habitat that is necessary to meet the winter habitat requirements of an ungulate species. UWRs identify forest management goals to maintain suitable ungulate winter range habitat and outline general wildlife measures to guide forest practices, but do not specifically apply to recreational trail operations. UWR #U-4-001 overlaps the following sections of the proposed trail:

- NMT Section 1 - Rosebery to the Girl Guide Camp
- NMT Section 2 - Hills gravel pit to Highway 6
- NMT Section 3 - Northeast Summit Lake (Ruby Range Road)
- MT Section 1 - Hills gravel pit to Shannon Creek FSR (new construction)
- MT Section 2 - Shannon Creek FSR to end of BCTS Bonanza Creek FSR South
- MUT Section 1 - Girl Guide camp to Snk'mip
- MUT Section 2 - Snk'mip to gravel pit

4.3.2.2 Caribou

The north side of Summit Lake is within an identified critical habitat area of Central Kootenay southern mountain caribou population. The Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) is Red-listed in BC, considered Endangered by COSEWIC (2014), and Threatened under SARA (BC CDC 2018). This critical habitat area borders trail sections:

- NMT Section 3 - Northeast Summit Lake

- MT Section 4 - North Bonanza Creek FSR to north end of Summit Lake

Recent federal determination is that the most significant and immediate threat to recovery of the southern mountain caribou population is unsustainable predation, resulting from habitat changes and subsequent changes to predator and prey communities. The greatest perceived threat to mountain caribou from the proposed trail development is increased disturbance through human activities. This threat is considered low since the trail sections do not involve new construction, and caribou are unlikely to be encountered along the trail due to habitat characteristics and low population numbers.

4.4 Birds

The bonanza corridor from the marsh complex at North Slocan Lake to Summit Lake includes some of the West Kootenay's most important bird habitat and core birding 'hot-spots' (Sullivan et al. 2009). The variety of habitats along the trail corridor, including open water, riparian and wetland shrub complexes, and mature forest support the life requisites for a wide diversity of species. Seven at-risk bird species have been confirmed to occur in the project area, with an additional eight at-risk species likely or possible (Table 3.3-1). Birding 'hot-spots' are a function of both bird diversity and 'viewability'- places where bird watchers are likely to come and record their observations. The rail trail along Summit Lake is one such spot, with 65 species recorded by active birders in 2018 (Sullivan et al. 2009). Bird watching is a popular activity and undoubtedly will increase along the rest of the rail-trail between Summit Lake and Hills when the trail is made more accessible.

General management strategies to protect birds along the proposed trail network include:

- Nest surveys should be conducted prior to any vegetation clearing or danger-tree falling for trail construction and maintenance activities during the breeding bird season (mid-March through mid-August).
- Avoid the use of pesticides and herbicides.

Management recommendations specific to raptors (adapted from Guidelines for Raptor Conservation 2013) include:

- Preserve all trees and snags used, or suspected of being used, by raptors as nesting sites.
- Where a species-at-risk has a Recovery Plan or if a qualified raptor professional provides advice, use their recommended minimum buffer distances.
- Protect any trees, cliffs, or other specific sites that raptors regularly use for roosting, perching, or feeding.
- Protect good foraging sites including shorelines, wetlands, shrubby areas, old fields, hedgerows, and riparian areas.
- Locate new trails, buildings, and roads away from raptor nesting, roosting, and foraging areas.
- Keep machinery, people, and pets away from nesting, brood rearing, roosting, and foraging areas.

5 THREAT AND IMPACT ANALYSIS

Threats and impacts vary according to values associated with each section of the trail, the construction and maintenance requirements, and the intended usage. The direct and indirect potential impacts to each value were summarized by trail section. The current plan is to have the rail trail open to all users until the proposed trail network is established with designated uses for each section. The operational impacts are difficult to assess with uncertainty about the intensity of future use. For example, the number of all-terrain vehicles (ATVs) over a given time period may have a significant influence in terms of disturbance impacts to wildlife. There is also a lack of detailed information on a number of the values to properly assess all threats and impacts the trails will have on identified ecological values. For these reasons, the threat analysis was completed at a high level, capturing those values most impacted by the proposed usage policy for that section of trail.

The majority of the entire trail system overlaps the historic CPR railway from Hills to the south end of Summit Lake. The motorized section will use existing roads including the Bonanza FSR and the Summit Lake Ski hill area. Connecting these two road networks will require a new section of trail to be built.

5.1 NMT - Non-motorized Trail

5.1.1 NMT Section 1 - Rosebery to the Girl Guide Camp

The Rosebery to Girl Guide Camp was not included in the terms of reference for this report. Relevant information pertaining to this section is derived from Rosebery-Summit Lake Rail Trail Steering Committee Management proposal (2015):

Ecological Values:

- This section is characterized by close proximity to Slocan Lake shoreline with access to small beaches.
- Common wildlife includes deer, black bear, and coyote. Bald eagle, loon, and various waterfowl are common.

Construction and Maintenance Impacts:

- Drainage improvements, trail repair, and brushing are required in several locations due to unmanaged bank seepages, rockfall, and bank sloughing. It is grown-in and narrow with poor sight lines in several places.

Operational Impacts:

- The large majority of present use is non-motorized, and at the south end it connects to the non-motorized Galena Trail.

Management Recommendations:

- The Rosebery-Summit Lake Rail Trail Steering Committee (2015) recommended this section "*be managed for non-motorized use with very limited ATV access. There is potential to provide wheel-chair access to the lakeshore*."

5.1.2 NMT Section 2 - Hills Gravel Pit to Highway 6

This section of the trail was identified in the 2015 management proposal as a high priority for environmental impact assessment due to high ecological values. It was recommended that consideration should be given to designating this area as a Wildlife Management Area under the *BC Wildlife Act*. Exclusive non-motorized use alleviates many of the environmental concerns related to motorized traffic; however, there are still management issues that should be addressed.

Ecological Values:

- riparian zone of Bonanza creek;
- multiple stream crossings;
- fish and fish habitat;
- sensitive wetlands;
- major wildlife values, especially:
    - grizzly bear;
    - moose, elk, and deer;
    - landscape-level migration corridor between the central Selkirk and Valhalla ranges;
    - high-quality bird habitat in riparian shrub communities and wetlands; and
    - amphibians, including at-risk western toad.

Construction Impacts:

- A major repair is required on a small ephemeral, non-fish-bearing stream crossing north of the gravel pit (Plate 5.1-1). A recent geotechnical review by Sitkum Consulting Limited (SCL 2018) recommended "a culvert at the stream crossing, raising the Rail Trail grade and constructing a section of new trail which will start from the stream crossing and meander for approximately 100 m to the southeast and within 20 m to 30 m of the existing trail to eventually rejoin the Rail Trail to the north." This work will require more detailed site-specific environmental review to assess the new trail route.

Maintenance Impacts:

- Brushing could impact nesting birds.
- Bridge repairs over several stream crossings will require approval under the *Water Sustainability Act* and environmental oversight for works in and around streams (Plates 5.1.2 to 5.1-8).

Operational Impacts:

- Increased human presence along this section increases the chance of interactions with bears and other wildlife.
- Impacts to toads, particularly during migration events.
- Increased spread of invasive plants such as spotted knapweed (*Centaurea stoebe*) and common St. John's wort (*Hypericum perforatum*) which dominate along parts of this trail.

Management Recommendations:

- Improved signage to inform users of western toad conservation initiatives.
- Follow best management practices to avoid conflicts with bears and other wildlife:
    - Implement a policy to temporarily close the trail when bear activity is observed, particularly in the spring and fall.
    - Maintain signage at entrance points to inform users of bear hazard and seasonal closures when bears are in the area.
    - Implement a 'dog on leash' rule to minimize wildlife harassment.
    - Maintain site lines by brushing dense sections along the trail (to about 4-m width).
- Ensure that proper authorizations are secured in advance of implementing work on stream crossings.
- Conduct nest surveys prior to vegetation clearing activities during the breeding bird season (mid-March to mid-August).
- Implement an invasive plant management strategy.

Plate 5.1-1. Steep section of rail trail near the gravel pit which a geotechnical review recommended is re-aligned and culverted.

Plate 5.1-2. Bonanza Creek. Good fish spawning habitat and riparian shrub habitat adjacent to the rail-trail from Hills to Summit Lake.

Plate 5.1-3. Section of the old rail trail between Hills and Summit Lake where water is currently pooling and drainage improvements are needed.

Plate 5.1-4. Temporary bridge used by ATVs along the old rail trail between Hills and Summit Lake. Bridge crossings will need to be improved following appropriate authorizations.

Plate 5.1-5. Sign warning of grizzly bear in the area along the rail-trail from Hills to Summit Lake. This signage should be actively maintained and trail closures implemented when bears are in the area.

Plate 5.1-6. The old rail trail between Hills and Summit Lake passes through this large fen that is part of an important wildlife corridor. Note high cover of knapweed and St. John's wort.

Plate 5.1-7. A sign is currently in place to inform the public about western toads along the rail-trail from Hills to Summit Lake.

Plate 5.1-8. The rail trail between Hills and Summit Lake becomes highly overgrown and will require extensive brushing towards the north end. This should be done outside the bird nesting season (mid-March to mid-August) or in conjunction with nest surveys.

5.1.3 NMT Section 3 - Northeast Summit Lake (Ruby Range Road)

This section is along the old CPR rail bed running from Highway 6 in the south and for the most part borders Summit Lake, terminating at the intersection with the proposed motorized trail section (MT Section 4) at Ruby Range Road. This section is likely well-used due to its proximity to provincial and private campgrounds and accessibility from the highway. The lower part of this trail along the outlet of Summit Lake frequently experiences seasonal flooding and will likely need drainage improvements. Grizzly bear hazard is generally low, except at the north end where riparian areas contribute to higher value habitat and cross-valley corridor values. Adjacent mountain goat (*Oreamnos americanus*) habitat "leads to the occasional dead mountain goat along the way" (Paquet and McCrory 2012).

Ecological Values:

- western toad and other amphibians and reptiles;
- bears, bats and other mammals;
- fish and fish habitat;
- High-value breeding and migratory bird habitat;
- sensitive ecosystems (wetlands at south east end of lake, riparian areas, and a small wetland near Ruby Range Road intersection); and
- landscape connectivity between rich valley bottom habitat and upland habitat to the Central Selkirk range.

Construction Impacts:

- None anticipated.

Maintenance Impacts:

- Brushing and weed control could impact breeding birds.
- Any machine work necessary for installation of cross-ditches and other drainage features could pose a risk to fisheries-sensitive zones along Bonanza creek and the littoral zone of Summit Lake.

Operational Impacts:

- toad mortality mostly related to bicycles during peak migration times; and
- bear encounters, particularly in the spring and fall.

Management Recommendations:

- Post signage to inform users of western toad conservation initiatives.
- Follow best management practices to avoid conflicts with bears and other wildlife.
- Implement trail closures when bear activity is observed, particularly in the spring and fall.
- Ensure that proper authorizations are secured in advance of implementing work that could impact water courses.
- Conduct nest surveys prior to vegetation-clearing activities during the breeding bird season (mid-March to mid-August).

5.2 MT - Motorized Trail

5.2.1 MT Section 1 - Hills Gravel Pit to Shannon Creek FSR (New Construction)

The proposed trail is mainly along old partially overgrown roads on both side of the creek (Plate 5.2-1), with a short section of new road construction required on the south side of the creek just before the crossing location. The existing roads on both sides of the creek appeared to be in overall good condition with minimal required construction to enable ATV use. Portions of the road on the north side of the creek have eroded and will require re-construction, and a culvert will be required to cross a small intermittent stream.

Plate 5.2-1. Example of the existing old road to the south of Bonanza Creek in MT Section 1.

The proposed crossing location (Plates 5.2-2 and 5.2-3) will require a clear span bridge of 10 to 15 m in length depending on the specific location selected, likely with some type of bank armouring to keep the bridge foundation in place. It will also require up to 30 m of trail through the wet forests and floodplain forests on either side of the creek. Due to the active nature of these floodplains, potential for large high-energy events and saturated soils, this portion of the trail will require either a raised boardwalk or the use of aggregate and culverts (to allow for fish passage through the side channels).

Plate 5.2-2. Approximate proposed crossing location on Bonanza Creek.

Plate 5.2-3. Aerial view of the proposed crossing location on Bonanza Creek.

Most of the trail on the south side of the creek, and all of the proposed trail in the vicinity of the Bonanza Creek, run adjacent to young (small areas of mature) wet forest, floodplain, and forested swamps. Ecosystem types observed in the area where the trail and creek crossing will be situated include:

- large areas of young mixed ICHmw2/113 (CwHw – Horsetail-Lady fern) mixed with mid-bench floodplains (Plate 5.2-4);
- small areas of mature to old mixed to conifer ICHmw2/114 (CwSxw – Skunk cabbage) and Ws10 (CwSx – Skunk cabbage) swamp along older inactive floodplains;
- small areas of active young broadleaf Fm04 (ActCw – Dogwood – Lady fern) mid-bench floodplain; and
- large areas of wet ICHwm2/111 (CwHw – Devil's club – Lady fern) young conifer stands on the toe of the steep slopes along the southern side of Bonanza Creek.

Plate 5.2-4. Blue-listed ICHm2/113 forest in the vicinity of the proposed Bonanza Creek crossing.

The 113 ecosystem is roughly equal to the pre-2016 (date of the new BEC guidebook for the region) 07 site series that is Blue-listed by the CDC. The 111 and 114 ecosystems are considered to have high habitat value, ecosystem function as rich and riparian communities, and are highly susceptible to soil erosion and compaction. The Ws10 occurs in rich riparian areas and is increasingly uncommon in the region due to human disturbance (MacKillop & Ehman 2016). It contains deep, peaty soils that are saturated throughout the year and are highly susceptible to erosion and invasive species. Windthrow is an ongoing concern in the Ws10, as trees are often shallow and poorly rooted. The Fm04 is a newly described ecosystem unit (MacKillop & Ehman 2016) that has not been assessed by the CDC for conservation status and the full extent of the ecosystem is unknown. The floodplain has evidence of annual moderate to high-energy flooding, with the creek creating new flood channels on a regular basis (Plate 5.2-5).

Plate 5.2-5. Floodplain along the south bank of Bonanza Creek near the proposed crossing in MT Section

The numerous side channels found in the active floodplains contain fish--rearing habitat, with numerous young trout fry observed in September, 2018. Active kokanee spawning was observed in Bonanza Creek in September, 2018 (Plate 5.2-6). It is expected that more detailed surveys would locate additional species-at--risk in this area of obvious high biodiversity. These wet and riparian ecosystems provide high-value habitat to numerous species, including bear, ungulates, birds, and known at-risk species such as the Blue-listed Coeur d'Alene Oregonian (*Cryptomastic mullani*) snail and the Blue-listed mountain moonwort (*Botrychium montanum*) plant (Plate 5.2-7).

Construction of trail along existing old roads will cause minimal direct impact, but will include potentially falling of high value wildlife trees for safety. Extensive erosion and sedimentation controls will be necessary to prevent runoff into the fish bearing creek during construction. If the trail section on the south side of the creek (immediately before the proposed crossing location) is routed along the steep (50%+) slope above the creek, there is the potential for significant erosion and sedimentation issues. This construction will require significant erosion and sedimentation controls during construction to avoid siltation into the creek, and it is expected that this portion will be an ongoing maintenance issue with potential for runoff into the creek.

Plate 5.2-6. Spawning Kokanee near the proposed Bonanza Creek crossing.

Plate 5.2-7. Blue-listed mountain moonwort located on the edge of the old road on the north side of Bonanza Creek near the proposed crossing location.

Any trail construction or modification along the floodplain area will likely require ongoing maintenance due to erosion. These areas are also susceptible to significant erosion during high water years (large areas of scoured side-channel were observed on the south side of the creek from the 2018 freshet) , which may result in the need for partial trail replacement in the future.

As Bonanza Creek has numerous known fish species inhabiting it and has multiple Kokanee spawning locations in the immediate vicinity of the crossing, the crossing and trail construction will require additional fish and impact assessments and extensive provincial and federal permitting. It will also require any construction to occur within designated fish windows and the use of an environmental monitor for the full length of construction activities.

Construction Impacts:

- Bridge crossing. The bridge construction will have adverse impacts; however, a detailed crossing location and design, as well as additional studies are required to determine specific impacts.
- Impact to fish and fish habitat from the bridge are likely, depending on design and specific location. An erosion and sedimentation plan, as well as fish exclusions and salvage, are likely required during construction to minimize impacts.
- Potential changes in downstream river from bank alteration (hardening/constraining flow).
- Impact to high value wildlife habitat. The riparian corridor is a high-value wildlife area that currently has no vehicle or other access. Opening the area up to motorized or non-motorized use will have a negative effect on wildlife that use the area.
- Loss of wildlife trees. An unknown number of wildlife trees will have to be removed for safety throughout this section. It is unknown what specific species use wildlife trees in the area, including the presence of any at-risk species.
- Impact to multiple occurrences of Blue-listed Coeur d'Alene Oregonian and potential impacts to Blue-listed mountain moonwort, as well as direct loss of habitat for both species. High chance of additional at-risk molluscs in the area, as well as other at-risk species.
- Impact to the Blue-listed 113 ecosystem. Potential to minimize this impact with trail route selection.

Operational Impacts:

- Invasive species. High potential for the introduction of invasive species into an area that currently has few weeds.
- Wildlife interactions. Negative wildlife interactions in a high value corridor.
- Fish habitat. Ongoing potential for siltation from the trail system and bridge construction.
- Continual road/bridge apron armouring.

Maintenance Impacts:

- Siltation from any trail stabilization works on steep slopes.

- Wildlife trees (including natural windthrow). There is expected to be an ongoing issue of windthrow and danger trees in this section, including the need to remove danger trees that occur within one tree length of the trail in the swamp and floodplain areas.

Management Recommendations:

- Consider wildlife trees in the trail route to minimize future tree removal.
- Consider bridge design to make the span as long as possible to avoid impacting floodplain, fish, and water quality.
- Education (signs, etc.) to reduce introduction of invasive species, avoid disturbance to sensitive floodplain and swamp area, and reduce wildlife interactions.

5.2.2 MT Section 2 - Shannon Creek FSR to end of BCTS Bonanza Creek FSR South

MT Section 2 consists of an existing FSR and BCTS road. While these roads were not assessed in the field for this project, it is assumed that they were built to provincial standard (adequate culvert and/or bridge crossings, etc.) and maintained as necessary. It is also assumed that there will be no additional construction required in this section to use it as a future ATV trail.

Construction Impacts:

- No construction related impacts expected.

Operational Impacts:

- bear (and to a lesser degree ungulate) interactions along a well-known movement corridor;
- potential for increased hunting of large mammals via maintained trail access;
- invasive species introduction (primarily plants) via ATV use;
- potential wildlife tree removal (danger trees), although that is expected to be a minimal concern; and
- potential water quality issues if the road and existing crossings and drainage systems are not properly maintained.

Management Recommendations:

- implementing seasonal closures to limit impact to grizzly bear;
- installing gates as far south as possible on the existing roads to restrict use of the trail by other types of motorized vehicle; and
- monitoring and treating the spread of invasive species, and installing educational signage to help reduce introduction of weeds.

5.2.3 MT Section 3 - Central Bonanza Creek (New Construction)

This section of the MT trail is new construction. The proposed trail connects existing roads to provide the line between the north and south of the Bonanza Corridor. The proposed route passes through a variety

of ecosystem types, mainly young dry to mesic conifer stands, several moist deciduous stands, and a forested swamp. It will also require crossings to be built over two permanent streams.

The forested swamp is the main ecosystem that will be impacted by the current route. It was classified as a Ws10 (best fit) swamp (Plate 5.2-8) with some ICHmw2/111 and is located immediately upslope of the proposed trail route just after the end of the existing road. The trail could be routed slightly downslope of the proposed route to avoid the swamp and sensitive soils.

Plate 5.2-8. The Ws10 (best fit) swamp near the proposed trail route in MT Section 3.

Blue-listed Coeur d'Alene Oregonian was found in multiple locations in the forested swamp and in moist areas of the proposed trail route (Plate 5.2-9). It is likely widespread through the area, but concentrated in moist sites with abundant leaf litter. This species is small, hard to detect, and locally abundant in the Slocan Watershed. Avoiding direct impacts to the species is difficult, with the only mitigation strategy being routing the trail along dry areas with minimal leaf litter. Due to its small size and lack of a strong affiliation to a specific habitat type, pre-construction surveys are unlikely to be an effective mitigation measure. After trail construction, the snail is unlikely to use areas of dry, exposed soil, so ongoing impacts to the species are not expected.

Multiple stream crossings will be required on the new section of road. Assuming the crossings will be built to ministry standard, they are not likely to have a significant negative effect to water quality. The streams are unlikely to be fish-bearing due to slope and elevation.

Plate 5.2-9. Blue-listed Coeur d'Alene Oregonian (*Cryptomastic mullani*) shell found in moist areas along the proposed trail route in MT Section 3.

Construction Impacts:

- Impact to bear habitat and movement. This section is one of the only un-roaded parts of the valley in an area that is well known to be important for bear habitat and movement. The creation of the trail may have negative effects on bear use depending on actual ATV use.
- Direct impact to Blue-listed Coeur d'Alene Oregonian habitat from trail construction. While this mollusc is widespread in the region, it is a species-at-risk that is known to inhabit the area where the trail will be built. It is a small (about 15 mm wide) species that is typically found in or under leaf litter and therefore difficult to locate and likely impossible to salvage before trail construction.
- Water quality. The proposed trail route crosses several streams. While the streams are unlikely to be fish-bearing, proper crossings will be required to minimize effects on water quality. Fords are not recommended in this area due to the incised nature of the streams and increased likelihood of siltation. Bridges or large culverts are the preferred crossing types.
- Western toad habitat. While this section of the trail is outside of the Summit Lake toad management area, it is likely used by adult toads as living habitat.
- Clearing of forest. The new trail construction though this area will require the removal of a variety of forested ecosystem types, including a Ws10 swamp. The forests are young broadleaf and conifer stands that are both common and not particularly sensitive. Care should be taken to route the trail to avoid current and future wildlife trees. Additional surveys of wildlife trees and nesting birds will likely be required.

Operational Impacts:

- Ongoing wildlife (bear and ungulates) interactions will be a concern.
- Danger tree removal will be an ongoing concern.
- Introduction of invasive species in an area that currently is weed-free will require ongoing education to limit introductions and monitoring to ensure weed establishment does not occur.

Maintenance Impacts:

- This section will require maintenance of the stream crossings to ensure they are properly functioning and not resulting in downstream siltation.

Management Recommendations:

- Implement seasonal closures during important grizzly bear and western toad times to limit impact.
- Install signage and education to keep users out of sensitive soils in the forested swamp and creeks.
- Design the trail (shift downslope to slope break) to avoid forested swamp.

5.2.4 MT Section 4 - North Bonanza Creek FSR to north end of Summit Lake

MT Section 4 follows existing BCTS roads and roads through the Summit Lake Ski Hill. In general, the roads are in good condition and we do not expect they would require significant work to enable use as ATV trails. The road crosses numerous small streams, and falls within the Summit Lake toad management area. The southern portion of the road past the skill hill is overgrown and includes a crossing through (no bridge or culvert) a small stream that drains a large swamp (Plate 5.2-10). The wetland is an alder-willow swamp with portions of old Ws10 cedar swamp. It is a shallow pond portion near the existing road that appeared to be an old, inactive beaver pond, which is a potential western toad breeding site. The swamp is uncommon across the slope and elevation, and likely has very high wildlife use. The existing road also goes though high-value bear and ungulate habitat (Plate 5.2-11), with extensive use observed in moist broadleaf stands, swamps, and bottom of avalanche run-out.

Plate 5.2-10. Large swamp and small pond with potential western toad breeding sites.

Plate 5.2-11. High value ungulate and bear habitat and potential rare mollusc habitat at the base of an avalanche slope near the proposed trail in MT Section 4.

Construction Impacts:

- Blue-listed Coeur d'Alene Oregonian found in multiple locations in the area, including on the edge of the existing road and the proposed new road. Difficult to mitigate as it is a small species that is locally abundant. There is abundant potential habitat for this species in the area, so the loss of the habitat and individuals that inhabit the existing road should not affect the larger population.
- The existing overgrown road is used by a variety of wildlife, including bear and ungulates. The construction of the trail will have a negative effect on these species, specifically in the area where the existing road passes below the large avalanche ecosystem.
- The crossing over the stream that flows out of the large swamp south of the ski hill is a concern. At the minimum, the road will require a culvert and some fill to create a functional drainage. However, the ponded area adjacent to the road appears to be an old beaver pond, so there is a potential for maintenance issues at this location. There are other existing roads in the vacuity of this crossing that could be explored for suitability to avoid the wetland.
- Potential for pond portion of the wetland to be a breeding site for toads, and is certainly high value living habitat for toads, amphibians, and all wildlife.

Operational Impacts:

- To prevent erosion and sedimentation, multiple culverts will have to be maintained.
- As mentioned above, a trail closure during the period of July 15th and September 15th should be enacted for this section to protect western toad migrations.
- Seasonal closures for spring grizzly bear use should be considered, as well other general concerns discussion in Section 4.3.1.

Management Recommendations:

- Install education/signage to keep users on the road to avoid impacts to the wetland and forested areas.
- Implement an invasive species program to limit introduction of more weeds to the trail system (the existing roads through the ski hill contain numerous weeds and invasive species).

5.3 MUT - Multi-use Trail

5.3.1 MUT Section 1 - Girl Guide Camp to Snk'mip

This section lies directly below highway 6, from the northeast shoreline of Slocan Lake to the Valhalla Foundation for Ecology and Social Justice (VFE) Snk'mip Marsh Nature Preserve property (Plates 5.3-1 and 5.3-2) which forms the southern boundary of the Bonanza Biodiversity Corridor (Mahr 2018). This property was purchased with support from the Fish and Wildlife Compensation Program and has become a focal point for public engagement in conservation initiatives (e.g., The Valley Voice 2018).

Plate 5.3-1. Snk'mip Marsh adjacent to the rail trail. Note the eagle nest in the tall cottonwood (upper left).

Plate 5.3-2. Snk'mip Marsh looking east toward the rail trail. Note Canada Goose nest with eggs in the cattail marsh.

Ecological Values:

- Sensitive ecosystems:
    - Slocan lake shoreline, and

    - Snk'mip marsh is a unique regionally rare ecosystem type directly below the rail trail.
- Fish and fish habitat.
- High quality bird habitat:
    - concentrated area of riparian shrub communities and wetlands used by breeding birds,
    - part of a migratory bird corridor including the Blue-listed tundra swan, and
    - bald eagle nest in a large cottonwood along marsh.
- Amphibian and reptile habitat, including at-risk western toad.
- Wildlife migratory corridor between Slocan Lake and Summit Lake.

Construction Impacts:

- There should be limited construction-related impacts as the trail is along the existing rail bed. Safety issues related to bank stabilization for ATV usage may dictate more extensive repairs, and should be assessed when there is a construction plan in place.

Maintenance impacts:

- The slope between the highway and the rail trail is prone to rock fall and tree fall which will need to be managed for public safety and accessibility.
- A recent geotechnical site assessment noted some minor cut slope ravelling, an old small fill slope failure, and poor drainage control where surface water was encountered (SCL 2018). These issues will ultimately have to be addressed.

Operational impacts:

- The proximity of the trail to motorized vehicles pose an increased risk of deleterious substances entering the sensitive ecosystems and fish habitat immediately below the existing rail trail.
- Potential exists for the spread of invasive weeds which are already well-established along this section.
- Increased noise disturbance from motorized vehicle traffic could disrupt birds and other wildlife. It is also incompatible with other seeking peaceful wildlife-viewing experiences.

Management recommendations:

- There should be no refueling of machines along this section of trail.
- A site-specific environmental review and environmental monitoring should be part of any major maintenance activities to the bed surface or adjacent slopes along this trail section.

5.3.2 MUT Section 2 - Snk'mip to Gravel Pit

This section is located along the existing old rail bed and is largely adjacent to Highway 6 and residential areas.

Ecological values

- Arthur Creek (Plates 5.3-3 and 5.3-4) is a fish-bearing stream that crosses the rail trail between Bonanza Road and the gravel pit.

Construction and maintenance impacts:

- There are no known construction impacts expected for this section of the trail. Maintenance activities could involve work in and around Arthur Creek that could impact water quality and fisheries.

Operational impacts:

- Invasive weeds are well-established along this section and vehicle traffic will increase the risk of spread.

Management recommendations:

- Develop an invasive plant management strategy.
- Ensure no refueling of machines is done within 30 m of Arthur Creek. Markers could be placed at the stream crossing to bring awareness to trail users and maintenance workers.

Plate 5.3-3. Arthur Creek, looking upstream from the rail trail crossing.

Plate 5.3-4. Arthur Creek, looking downstream to the old culvert at the rail trail crossing.

6 RECOMMENDATIONS

This report provides a higher-level overview of potential environmental impacts related to the proposed Rosebery-Summit Lake multi-use recreational trail plan. The project area contains a wide range of ecological values, many of which are regionally significant. Recommendations to mitigate potential impacts to ecological values identified in this report are based on best management practices, with limited field work and site-specific information that should be part of a more detailed environmental assessment.

The proposed recreational trail system runs through a complex and diverse series of ecosystems, wildlife corridors and land ownerships. A wide range of stakeholders have a vested interest in the conservation and protection of this corridor and its ecosystems. Although it is beyond the scope of this study to evaluate all of the stakeholder interests and jurisdictional aspects, it is important to note that stakeholder involvement will be critical to the success of the proposed trail network. Conservation and jurisdictional stakeholders would include, but are not limited to:

- regulatory bodies (Provincial Agricultural Land Reserve Commission, BC Ministry of Transportation and Infrastructure, BC Ministry of Forests Lands and Natural Resource Operations, BC Ministry of Environment, etc.);
- local and regional conservation groups (Kootenay Conservation Program, Slocan Lake Stewardship Society, Valhalla Foundation for Ecology and Social Justice, Nature Conservancy of Canada, Bonanza Biodiversity Corridor Working Group, etc.); and
- local recreational societies (Hills Recreation Society, North Slocan Lake Trails Society, Rosebery Parklands and Trails Commission (Galena Trail), Summit Lake Ski Hill, etc.).

Construction Recommendations:

- Develop a construction environmental management plan (CEMP) detailing specific construction activities, both for new trail sections and existing roads, particularly for any trail construction over streams, and in proximity to sensitive ecosystems and other ecological values identified in this report. Elements of a CEMP should include:
    - species at risk surveys,
    - erosion control measures,
    - water protection measures,
    - fish and fish habitat protection measures,
    - wildlife habitat protection,
    - amphibian salvage operations,
    - breeding bird protection measures, and
    - site remediation and revegetation strategies.
- Ensure all necessary federal and provincial regulatory approvals have been obtained prior to construction (e.g., Sec. 11 for changes in and about a stream).

Maintenance Recommendations:

- There is potential for contaminated soil along much of the existing rail bed. Any works involving large amounts of soil displacement should incorporate a soil-testing and hazardous materials disposal program.

- Develop a management plan to schedule maintenance activities according to the least risk for the primary ecological values identified in this report, including:
    - fish in-stream operating windows,
    - breeding bird windows,
    - western toad migrations, and
    - grizzly bear activity.
- Develop an invasive plant management strategy:
    - Work with a regional group (e.g., CKISS) to inventory current infestations.
    - Use mechanical treatments to target priority weed-control areas.
- Assess and develop a wildlife and danger tree management plan for all trail sections to plan any tree removal for a suitable period based on the species inhabiting it, as well as potential methods to minimize the number of trees removed.

Operation Recommendations:

- The number of trail users is a major factor determining operational impacts. We recommend that a monitoring program be implemented to quantify and assess trail usage and better evaluate the cumulative user impacts on the environment. Options to consider include:
    - installing trail counters along the proposed motorized and multi-use sections, and
    - restricting ATV users to those with membership in an official trail management society.
- Signage is recommended to increase public awareness and inform trail users about:
    - designated trail use (NMT, MT, MUT);
    - seasonal use restrictions (i.e. western toad migration windows, spring grizzly bear forage areas);
    - general wildlife precautions (managing bear attractants, controlling dogs, etc.); and
    - trail closures for public safety (e.g., bear sightings in area, washouts, rockfall, windfall, maintenance works, etc.).
- Advocate responsible ATV use:
    - ATVs restricted to designated trails only,
    - no off-road driving,
    - speed limits in wildlife-sensitive areas and especially on multi-use sections,
    - no night driving,
    - refueling at least 30 m from streams,
    - no discharging firearms along trail, and
    - inspection of vehicles for invasive plants.
- Record and report any grizzly bear, caribou, and other at-risk species sightings, including operational responses to encounters.

7 CONCLUSIONS

Based on the current trail design and available information presented in this report, we present the following conclusions regarding the impact of the project. While we are able to make specific statements regarding the impact of some trail sections, without detailed construction plans and more directed field investigation, the precise environmental impacts cannot effectively be determined.

- Trail sections developed to accommodate motorized users have the greatest environmental concerns; however, the development of motorized specific trails (if motorized use can effectively be removed from the current NMT Section 2 and 3) may have a positive environmental impact. While there is a demonstrable negative effect of creating MT Section 3 to connect existing roads (MT 2 and 4) across an important wildlife (namely grizzly bear) corridor, there is a larger benefit from removing motorized use from NMT Sections 2 and 3. The operational recommendations we presented, namely seasonal closures for western toad migration and grizzly bear use, will go a long way to mitigate the impact of the MT 3 construction.
- The proposed bridge crossing over Bonanza Creek is not appropriate for the area. It is redundant when there is an existing bridge nearby and it will have a negative effect on fish and fish habitat, as well as a negative effect on an important floodplain ecosystem and wildlife area. The crossing and associated trail will have a direct impact on two Blue-listed species and one Blue-listed ecosystem. There is insufficient information available to determine the precise scale and significance of the effects of the crossing (including a detailed construction design and accurate crossing location), including limited knowledge the full range of wildlife use and species at risk that may inhabit the area.
- The proposed use of MUT Section 1 adjacent to the Snk'mip Nature Reserve and the larger Bonanza wetland complex may have a negative influence on the wetlands and wildlife that use them, and will certainly have a negative social effect.
- If the crossing cannot be made over Bonanza Creek, then we suggest that options be considered to connect the trails to the existing FSRs near Shannon Creek to enable an expanded trail system, while avoiding known areas of high ecological value (Bonanza Creek and the Bonanza wetland complex) and the need for the impact of additional trail construction.

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Appendix 1 – Comprehensive Species At Risk List generated for the Rosebery to Summit Lake Area

Scientific Name	English Name	SARA	BC Status
Accipiter gentilis atricapillus	Northern Goshawk, atricapillus subspecies	NAR (May 1995)	Blue
Acipenser transmontanus	White Sturgeon	E (Nov 2003)	No Status
Acipenser transmontanus pop. 1	White Sturgeon (Kootenay River population)	E (Nov 2012)	Red
Acipenser transmontanus pop. 2	White Sturgeon (Columbia River population)	E (Nov 2012)	Red
Acipenser transmontanus pop. 5	White Sturgeon (Upper Fraser River population)	E (Nov 2012)	Red
Acorus americanus	American sweet-flag		Blue
Acrocheilus alutaceus	Chiselmouth	NAR (May 2003)	Blue
Aechmophorus occidentalis	Western Grebe	SC (May 2014)	Red
Aeronautes saxatalis	White-throated Swift		Blue
Aeshna constricta	Lance-tipped Darner		Blue
Ahtiana sphaerosporella	mountain candlewax		Blue
Ambystoma mavortium	Blotched Tiger Salamander	E (Nov 2012)	Red
Anaxyrus boreas	Western Toad	SC (Nov 2012)	Yellow
Anguispira kochi	Banded Tigersnail	NAR (Apr 2017)	Blue
Antigone canadensis	Sandhill Crane	NAR (May 1979)	Yellow
Arctoparmelia subcentrifuga	abrading ring		Blue
Ardea herodias herodias	Great Blue Heron, herodias subspecies		Blue
Argia vivida	Vivid Dancer	SC (May 2015)	Blue
Arnica longifolia	seep-spring arnica		Blue
Ascaphus montanus	Rocky Mountain Tailed Frog	T (Nov 2013)	Blue
Ascaphus truei	Coastal Tailed Frog	SC (Nov 2011)	Yellow
Asio flammeus	Short-eared Owl	SC (Mar 2008)	Blue
Astragalus microcystis	least bladdery milk-vetch		Red
Astragalus vexilliflexus var. *vexilliflexus*	bent-flowered milk-vetch		Blue
Azolla mexicana	Mexican mosquito fern	T (Nov 2008)	Red
Barbula convoluta var. *eustegia*			Red
Bartramia halleriana	Haller's apple moss	T (Nov 2011)	Red
Bartramia longicauda	Upland Sandpiper		Red
Bidens vulgata	tall beggarticks		Blue
Boloria alberta	Albert's Fritillary		Blue
Boloria astarte distincta	Astarte Fritillary, distincta subspecies		Blue
Botaurus lentiginosus	American Bittern		Blue
Botrychium alaskense	Alaska moonwort		Blue
Botrychium michiganense	Michigan moonwort		Blue
Botrychium montanum	mountain moonwort		Blue
Brachythecium holzingeri			Blue
Brickellia grandiflora	large-flowered brickellia	NAR (May 1996)	Red
Buteo lagopus	Rough-legged Hawk	NAR (May 1995)	Blue

Scientific Name	English Name	SARA	BC Status
Buteo platypterus	Broad-winged Hawk		Blue
Buteo swainsoni	Swainson's Hawk		Red
Butorides virescens	Green Heron		Blue
Campylium calcareum			Red
Campylium radicale			Blue
Carex adusta	lesser brown sedge		Blue
Carex pedunculata	peduncled sedge		Blue
Castilleja tenuis	hairy paintbrush		Red
Catherpes mexicanus	Canyon Wren	NAR (May 1992)	Blue
Charina bottae	Northern Rubber Boa	SC (Apr 2016)	Yellow
Chenopodium atrovirens	dark lamb's-quarters		Blue
Chondestes grammacus	Lark Sparrow		Blue
Chordeiles minor	Common Nighthawk	SC (May 2018)	Yellow
Chrosomus eos	Northern Redbelly Dace		Blue
Chrysemys picta	Painted Turtle	E/SC (Apr 2006)	No Status
Chrysemys picta pop. 2	Painted Turtle - Intermountain - Rocky Mountain Population	SC (Nov 2016)	Blue
Cicindela hirticollis	Hairy-necked Tiger Beetle		Blue
Cladonia cyanipes	blue-footed pixie		Blue
Cladonia decorticata	strip-tease pixie		Blue
Cladonia luteoalba	lemon pixie		Blue
Cladonia parasitica	fence-rail pixie		Red
Clarkia rhomboidea	common clarkia		Red
Coccothraustes vespertinus	Evening Grosbeak	SC (Nov 2016)	Yellow
Coccyzus americanus	Yellow-billed Cuckoo		Red
Colias pelidne	Pelidne Sulphur		Blue
Collema bachmanianum	Caesar's tarpaper		Red
Coluber constrictor	North American Racer	T (Nov 2015)	Blue
Contopus cooperi	Olive-sided Flycatcher	SC (May 2018)	Blue
Copablepharon absidum	Columbia Dune Moth	DD (Apr 2017)	Red
Coreopsis tinctoria var. *atkinsoniana*	Atkinson's coreopsis		Red
Corynorhinus townsendii	Townsend's Big-eared Bat		Blue
Cottus aleuticus	Coastrange Sculpin		Yellow
Cottus confusus	Shorthead Sculpin	SC (Nov 2010)	Blue
Cottus hubbsi	Columbia Sculpin	SC (Nov 2010)	Blue
Couesius plumbeus	Lake Chub	DD	Yellow
Cryptomastix mullani	Coeur d'Alene Oregonian		Blue
Cupido comyntas	Eastern Tailed Blue		Blue
Cypseloides niger	Black Swift	E (May 2015)	Blue
Danaus plexippus	Monarch	E (Nov 2016)	Blue
Delphinium bicolor ssp. *bicolor*	Montana larkspur		Blue
Dicentra uniflora	steer's head		Blue
Dolichonyx oryzivorus	Bobolink	T (Apr 2010)	Blue

Scientific Name	English Name	SARA	BC Status
Dryobates albolarvatus	White-headed Woodpecker	E (Nov 2010)	Red
Elymus curvatus	beardless wildrye		Red
Enallagma clausum	Alkali Bluet		Blue
Encalypta mutica			Blue
Entosthodon fascicularis	banded cord-moss	SC (May 2015)	Blue
Epargyreus clarus	Silver-spotted Skipper		Blue
Epargyreus clarus clarus	Silver-spotted Skipper, clarus subspecies		Blue
Epilobium hornemannii ssp. *behringianum*	Hornemann's willowherb		Blue
Epilobium oregonense	Oregon willowherb		Blue
Epipactis gigantea	giant helleborine	NAR (Nov 2015)	Yellow
Erebia magdalena	Magdalena Alpine		Red
Eremophila alpestris merrilli	Horned Lark, merrilli subspecies		Blue
Erynnis afranius	Afranius Duskywing		Red
Erysimum capitatum	western wallflower		Red
Erysimum capitatum var. purshii	Pursh's wallflower		Red
Euptoieta claudia	Variegated Fritillary		Blue
Eutrochium maculatum var. *bruneri*	Joe-pye weed		Red
Evernia divaricata	mountain oakmoss		Blue
Falco mexicanus	Prairie Falcon	NAR (May 1996)	Red
Falco peregrinus	Peregrine Falcon	SC (Apr 2007)	No Status
Falco rusticolus	Gyrfalcon	NAR (May 1987)	Blue
Fisherola nuttalli	Shortface Lanx	E (Apr 2016)	Red
Fluminicola fuscus	Ashy Pebblesnail		Red
Fuscopannaria ahlneri	corrugated crackers		Blue
Galba bulimoides	Prairie Fossaria		Blue
Galba dalli	Dusky Fossaria		Blue
Galba obrussa	Golden Fossaria		Blue
Galba truncatula	Attenuate Fossaria		Blue
Gentianopsis virgata ssp. *macounii*	Macoun's fringed gentian		Blue
Glycyrrhiza lepidota	wild licorice		Blue
Grimmia mollis			Blue
Gulo gulo	Wolverine	SC (May 2014)	No Status
Gulo gulo luscus	Wolverine, luscus subspecies	SC (May 2014)	Blue
Gyraulus crista	Star Gyro		Blue
Hemphillia camelus	Pale Jumping-slug		Blue
Hesperochiron pumilus	dwarf hesperochiron		Red
Heterocodon rariflorus	heterocodon		Blue
Hirundo rustica	Barn Swallow	T (May 2011)	Blue
Hydroprogne caspia	Caspian Tern	NAR (May 1999)	Blue
Hygrohypnum alpinum			Blue
Hygrohypnum norvegicum			Red
Icteria virens	Yellow-breasted Chat	E (Nov 2011)	Red
Impatiens ecornuta	spurless touch-me-not		Red

Scientific Name	English Name	SARA	BC Status
Impatiens x pacifica	Pacific jewelweed		Red
Ischnura damula	Plains Forktail		Red
Isoetes howellii	Howell's quillwort		Blue
Isoetes minima	midget quillwort		Red
Kootenaia burkei	Pygmy Slug	SC (Apr 2016)	Blue
Lappula occidentalis var. *cupulata*	western stickseed		Blue
Larus californicus	California Gull		Blue
Leptogium cyanescens	blue-blue vinyl		Red
Lepus townsendii	White-tailed Jackrabbit		Red
Limenitis archippus	Viceroy		Red
Limnodromus griseus	Short-billed Dowitcher		Blue
Liparis loeselii	yellow widelip orchid		Blue
Lithobates pipiens	Northern Leopard Frog	E (Apr 2009)	Red
Lota lota pop. 1	Burbot (lower Kootenay population)		Red
Lupinus arbustus ssp. *pseudoparviflorus*	Montana lupine		Blue
Lycaena hyllus	Bronze Copper		Blue
Lycaena nivalis	Lilac-bordered Copper		Blue
Lymnaea atkaensis	Frigid Lymnaea		Blue
Magnipelta mycophaga	Magnum Mantleslug	SC (May 2012)	Blue
Megascops kennicottii	Western Screech-Owl	T (May 2012)	No Status
Megascops kennicottii macfarlanei	Western Screech-Owl, macfarlanei subspecies	T (May 2012)	Blue
Melanerpes lewis	Lewis's Woodpecker	T (Apr 2010)	Blue
Melanitta perspicillata	Surf Scoter		Blue
Mertensia oblongifolia	oblong-leaved bluebells		Red
Monardella odoratissima ssp. *discolor*	monardella		Red
Muhlenbergia filiformis	slender muhly		Red
Musculium partumeium	Swamp Fingernailclam		Blue
Musculium transversum	Long Fingernailclam		Blue
Myotis lucifugus	Little Brown Myotis	E (Nov 2013)	Yellow
Myotis septentrionalis	Northern Myotis	E (Nov 2013)	Blue
Myotis thysanodes	Fringed Myotis	DD (May 2004)	Blue
Navarretia intertexta	needle-leaved navarretia		Red
Neotamias ruficaudus simulans	Red-tailed Chipmunk, simulans subspecies		Blue
Nephroma isidiosum	pebbled paw		Blue
Nephroma occultum	cryptic paw	SC (Apr 2006)	Blue
Numenius americanus	Long-billed Curlew	SC (May 2011)	Blue
Nycticorax nycticorax	Black-crowned Night-heron		Red
Oeneis jutta chermocki	Jutta Arctic, chermocki subspecies		Blue
Olsynium douglasii var. *inflatum*	satinflower		Red
Oncorhynchus clarkii clarkii	Cutthroat Trout, clarkii subspecies		Blue
Oncorhynchus clarkii lewisi	Cutthroat Trout, lewisi subspecies	SC (Nov 2016)	Blue

Scientific Name	English Name	SARA	BC Status
Ophioglossum pusillum	northern adder's-tongue		Blue
Ophiogomphus occidentis	Sinuous Snaketail		Blue
Oreamnos americanus	Mountain Goat		Blue
Oreas martiana			Red
Oreohelix subrudis	Subalpine Mountainsnail		Blue
Oreoscoptes montanus	Sage Thrasher	E (Nov 2010)	Red
Orthotrichum pallens			Blue
Ovis canadensis	Bighorn Sheep		Blue
Papilio machaon dodi	Old World Swallowtail, dodi subspecies		Red
Patagioenas fasciata	Band-tailed Pigeon	SC (Nov 2008)	Blue
Pekania pennanti	Fisher		Blue
Pelecanus erythrorhynchos	American White Pelican	NAR (May 1987)	Red
Peltigera evansiana	peppered pelt		Red
Phalacrocorax auritus	Double-crested Cormorant	NAR (May 1978)	Blue
Phalaropus lobatus	Red-necked Phalarope	SC (Nov 2014)	Blue
Philonotis marchica			Blue
Philonotis yezoana			Blue
Pholisora catullus	Common Sootywing		Blue
Physella columbiana	Rotund Physa		Red
Physella virginea	Sunset Physa		Blue
Pinus albicaulis	whitebark pine	E (Apr 2010)	Blue
Plagiobothrys hispidulus	harsh popcornflower		Blue
Planorbula campestris	Meadow Rams-horn		Blue
Platyhypnidium riparioides			Blue
Plestiodon skiltonianus	Western Skink	SC (Nov 2014)	Blue
Plethodon idahoensis	Coeur d'Alene Salamander	SC (Nov 2007)	Yellow
Pluvialis dominica	American Golden-Plover		Blue
Podiceps nigricollis	Eared Grebe		Blue
Pohlia elongata			Blue
Polemonium californicum	California Jacob's ladder		Red
Polites sabuleti	Sandhill Skipper		Red
Polites themistocles themistocles	Tawny-edged Skipper, themistocles subspecies		Blue
Polygonum polygaloides ssp. *confertiflorum*	close-flowered knotweed		Blue
Pristiloma arcticum	Northern Tightcoil		Blue
Progne subis	Purple Martin		Blue
Pylaisia intricata			Red
Pyrgus communis	Checkered Skipper		Blue
Pyrola elliptica	shinleaf wintergreen		Blue
Rangifer tarandus	Caribou		No Status
Rangifer tarandus pop. 1	Caribou (southern mountain population)	E (May 2014)	Red
Recurvirostra americana	American Avocet		Blue
Rhinichthys umatilla	Umatilla Dace	T (Apr 2010)	Red

Scientific Name	English Name	SARA	BC Status
Rhodobryum roseum			Blue
Rhynchospora capillacea	brown beak-rush		Red
Salix tweedyi	Tweedy's willow		Blue
Salvelinus confluentus	Bull Trout	SC (Nov 2012)	Blue
Satyrium californica	California Hairstreak		Blue
Scirpus pallidus	pale bulrush		Red
Scouleria marginata	margined streamside moss	E (May 2012)	Red
Scrophularia lanceolata	lance-leaved figwort		Blue
Seligeria tristichoides			Blue
Senecio hydrophiloides	sweet-marsh butterweed		Blue
Senecio hydrophilus	alkali-marsh butterweed		Red
Setophaga castanea	Bay-breasted Warbler		Red
Setophaga virens	Black-throated Green Warbler		Blue
Somatochlora brevicincta	Quebec Emerald		Blue
Speyeria aphrodite whitehousei	Aphrodite Fritillary, whitehousei subspecies		Blue
Sphaerium occidentale	Herrington Fingernailclam		Blue
Sphaerium striatinum	Striated Fingernailclam		Blue
Sphagnum jensenii			Red
Sphagnum wulfianum			Blue
Sphenopholis obtusata	prairie wedgegrass		Red
Sphyrapicus thyroideus	Williamson's Sapsucker	E (Dec 2017)	Blue
Sphyrapicus thyroideus thyroideus	Williamson's Sapsucker, thyroideus subspecies	E (Dec 2017)	No Status
Stagnicola caperata	Wrinkled Marshsnail		Blue
Stagnicola traski	Widelip Pondsnail		Blue
Sterna forsteri	Forster's Tern	DD (May 1996)	Red
Symphyotrichum ascendens	long-leaved aster		Red
Taxidea taxus	American Badger	E (Nov 2012)	Red
Thalictrum dasycarpum	purple meadowrue		Red
Thomomys talpoides segregatus	Northern Pocket Gopher, segregatus subspecies		Red
Tortula obtusifolia			Blue
Trichostema oblongum	mountain blue-curls		Red
Trifolium cyathiferum	cup clover		Blue
Tyto alba	Barn Owl	T (Nov 2010)	Red
Ulota curvifolia			Blue
Ursus arctos	Grizzly Bear	SC (May 2002)	Blue
Usnea glabrata	lustrous beard		Blue
Utricularia ochroleuca	ochroleucous bladderwort		Blue
Valvata humeralis	Glossy Valvata		Red
Valvata tricarinata	Threeridge Valvata		Red
Warnstorfia tundrae			Red
Zacoleus idahoensis	Sheathed Slug	SC (Apr 2016)	Blue

Appendix 2 – Fish-Stream Inventory Data for the Bonanza Creek Drainage

Fish Inventory Map #	Stream Name	Watershed Code	Stream Length (km)	Fish or potentially fish bearing section (m)	Average Channel Width (m)	Average Gradient	Fish Observation	Comments
	Arthur Creek	340-047200-99600-01000	4.6				BT, KO, RB	last observed in 1982 – Habitat Wizard
Trib 0	Trib to Bonanza Creek	340-047200-99600-11000	3.5	100	1.8	13	KO	KO observed at mouth of Reach 1. Reach 2 NFP with gradient >20 %.
Trib 1	Trib to Bonanza Creek	340-047200-99600-13400	5.7	600	2.2	12	RB	A waterfall barrier (3 m in height) located ~600 m upstream from mouth with no fish captured upstream.
	Cadden Creek	340-047200-99600-25700	4.4	1400			(RB, KO)	Potentially fish bearing, no fish caught at time of survey as stream was dry. No information on channel.
Trib 2	Trib to Cadden Creek	No watershed code	2.4	1200	0.9	3	(NFC)	Highway culvert had a 0.6 m drop and would be a barrier to upstream fish migration. Stream channel may be disconnected from Bonanza Creek. (only minnow traps used)
	Owl Creek	340-047200-99600-32900	4.4	2200	2	11	(NFC)	Highway culvert had a 1 m drop and is a barrier to upstream fish migration. Electrofishing conducted from highway to Bonanza Creek

Fish Inventory Map #	Stream Name	Watershed Code	Stream Length (km)	Fish or potentially fish bearing section (m)	Average Channel Width (m)	Average Gradient	Fish Observation	Comments
								with NFC. Habitat seemed suitable to fish and connected to Bonanza Creek.
Trib 3	Trib to Bonanza Creek	No watershed code	3.8	1600	0.8	16		Fish presence not confirmed but classified as (S4) based on gradient. Reported to have been diverted from original channel.
Trib 4A	Trib to Bonanza Creek	340-047200-99600-34900	6	2500	3.8-4.1	2-12	RB	RB found u/s and d/s of highway culvert.
Trib 4B	Trib to Bonanza Creek	340-047200-99600-39900	1.2	1200	1.9	9	RB	RB found u/s and d/s of highway culvert.
Trib 5	Trib to Bonanza Creek	340-047200-99600-42300	1.7	300	2.1	15	RB	RB captured within 30 m of mouth, no fish catpure above, however Reach 1 was designated as fish bearing due to connectivity with Bonanza Creek.
Trib 6	Trib to Bonanza Creek	340-047200-99600-46700	3	200	3.5	11	(RB)	Not sampled as channel was dry, fish could utilize first 200 m due to connectivity with Bonanza Creek.

Fish Inventory Map #	Stream Name	Watershed Code	Stream Length (km)	Fish or potentially fish bearing section (m)	Average Channel Width (m)	Average Gradient	Fish Observation	Comments
Trib 7A	Trib to Bonanza Creek	340-047200-99600-51800	3.8	800	2.5	2	RB, CC	Extensive wetland below highway. Highway culvert is a barrier but limited habitat above due to increasing gradient.
Trib 7B	Trib to Bonanza Creek	trib to -51800	2	800	1.6	11	RB	Forested swamp below highway. Highway culvert is a barrier but limited habitat above due to increasing gradient.
Trib 8	Trib to Bonanza Creek	340-047200-99600-59100	4.3	1600	3-1.6	3-9	RB	Fish captured d/s and u/s of railway crossing. May be partial barrier. Highway culvert a barrier.
Trib 9	Trib to Bonanza Creek	340-047200-99600-64400	4.1	300	2.9	11	RB	
Trib 10	Trib to Bonanza Creek	340-047200-99600-66900	3.6	500	2.1	10	(RB)	No electrofishing conducted, but assumed fish bearing due to connectivity with Bonanza Creek.
	Charlie's Creek	340-047200-99600-77400	5	1200	2.5-3.1	3-6	RB	RB caught u/s and d/s of highway culvert. CPR potential seasonal barrier. Section of the stream reported to dry up due to

Fish Inventory Map #	Stream Name	Watershed Code	Stream Length (km)	Fish or potentially fish bearing section (m)	Average Channel Width (m)	Average Gradient	Fish Observation	Comments
								excession water consumption.
Trib 11	Trib to Bonanza Creek	340-047200-99600-80500	4.4	1200	2.8	3	RB, CAS	Flows along the uphill side of the old rai grade for ~900 m. Multiple channels throughout under dense vegetation.
Trib 12	Trib to Bonanza Creek	No watershed code	2.6	200	3.3	15	RB	Mouth is located 200 m d/s from Summit Lake and flows north. RB present in first 200 m of the stream.
Trib 1	Trib to Summit Lake	340-047200-99600-81400	3.8	400	1.5	10	RB	Rail grade culvert becomes passable at high water levels in Summit Lake. RB found upstream of rail grade.
Trib 6	Trib to Summit Lake	340-047200-99600	5.2	800	3.8	4	(RB)	Stream was dry, however could be utilized by RB.
Trib 11	Trib to Summit Lake	340-047200-99600-78900	4	200	1	6	RB	Fry observed upstream of highway culvert.
Trib 12	Trib to -99600-78900	No watershed code	3	200	1.1		RB	RB confirmed downstream of highway culvert.