Development Permit Application

Referral Form – RDCK File DP2404Hn

Date: March 18, 2024

You are requested to comment on the attached DEVELOPMENT PERMIT for potential effect on your agency's interests. We would appreciate your response WITHIN 30 DAYS (PRIOR TO APRIL 19, 2024). If no response is received within that time, it will be assumed that your agency's interests are unaffected.

LEGAL DESCRIPTION & GENERAL LOCATION:

243 Island View Road, Hills, Electoral Area 'H'

PARCEL A (BEING A CONSOLIDATION OF LOTS 1 AND 2, SEE CA6009524) DISTRICT LOT 10589 KOOTENAY DISTRICT PLAN NEP86587 (PID: 030-141-150)

PRESENT USE AND PURPOSE OF PERMIT REQUESTED:

The subject property is 0.4 hectares in size and is located on the western shore of Summit Lake close to where an unnamed stream empties into Summit Lake.

The property has been improved with a Bunkhouse, Outdoor Kitchen and Boat Storage Building that are currently serviced by two wells. There is also an existing recreational vehicle on the property being used as a seasonal residence that will be removed once the proposed cabin has been constructed.

The purpose of this Development Permit application is to authorize the construction of a 184 m^2 dwelling within the Development Permit Area. The location of the proposed dwelling is within the SPEA. In the Riparian assessment the QEP has indicated that complete avoidance of environmental impacts is not possible; therefore, minimization and on-site restoration are being proposed.

AREA OF PROPERTY AFFECTED	ALR STATUS	ZONING	OCP
0.4 hectares	N/A	N/A	Official Community Plan Bylaw No. 1967 Country Residential (R2)

APPLICANT:

Laura Mackay

OTHER INFORMATION: ADVISORY PLANNING COMMISSION PLEASE NOTE:

If your Advisory Planning Commission plans to hold a meeting to discuss this Development Permit application, please note that the applicants must be provided with an opportunity to attend such meeting, in accordance with Section 461, subsection (8) of the *Local Government Act*, which reads as follows:

"If the commission is considering an amendment to a plan or bylaw, or the issue of a permit, the applicant for the amendment or permit is entitled to attend meetings of the commission and be heard."

Please fill out the Response Summary on the back of this form. If your agency's interests are 'Unaffected' no further information is necessary. In all other cases, we would appreciate receiving additional information to substantiate your position and, if necessary, outline any conditions related to your position. Please note any legislation or official government policy which would affect our consideration of this permit.

ZACHARI GIACOMAZZO, PLANNER
REGIONAL DISTRICT OF CENTRAL KOOTENAY

☒ MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE ☒ HABITAT BRANCH (Environment) ☒ FRONTCOUNTER BC (MFLNRORD) ☐ AGRICULTURAL LAND COMMISSION	REGIONAL DISTRICT OF CENTRAL KOOTENAY DIRECTORS FOR: ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☒ H ☐ I ☐ J ☐ K ALTERNATIVE DIRECTORS FOR:

Nelson Office: Box 590, 202 Lakeside Drive, Nelson, BC. V1L 5R4
Phone: 250.352.6665 | Toll Free: 1.800.268.7325 (BC) | Email: info@rdck.ca | Fax: 250.352.9300

☐ REGIONAL AGROLOGIST ☐ ENERGY & MINES ☐ MUNICIPAL AFFAIRS & HOUSING ☒ INTERIOR HEALTH, HBE TEAM ☐ KOOTENAY LAKES PARTNERSHIP (FORESHORE DEVELOPMENT PERMITS) ☐ SCHOOL DISTRICT NO. ☐ WATER SYSTEM OR IRRIGATION DISTRICT ☒ UTILITIES (FORTIS, BC HYDRO, NELSON HYDRO, COLUMBIA POWER) FIRST NATIONS ☐ KTUNAXA NATION COUNCIL YAQAN NUʔKIY (LOWER KOOTENAY) ʔAKINK'UM‡ASNUQ‡IʔIT (TOBACCO PLAINS) ʔAKISQNUK (COLUMBIA LAKE) ʔAQ'AM (ST. MARY'S)	☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☒ H ☐ I ☐ J ☐ K ☐ APHC AREA ☐ RDCK FIRE SERVICES ☐ RDCK EMERGENCY SERVICES ☒ RDCK BUILDING SERVICES ☐ RDCK UTILITY SERVICES ☐ RDCK RESOURCE RECOVERY ☐ RDCK REGIONAL PARKS INSERT COMMENTS ON REVERSE . . .

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The personal information on this form is being collected pursuant to *Regional District of Central Kootenay Planning Procedures and Fees Bylaw No. 2457, 2015* for the purpose of determining whether the application will affect the interests of other agencies or adjacent property owners. The collection, use and disclosure of personal information are subject to the provisions of FIPPA. Any submissions made are considered a public record for the purposes of this application. Only personal contact information will be removed. If you have any questions about the collection of your personal information, contact the Regional District Privacy Officer at 250.352.6665 (toll free 1.800.268.7325), info@rdck.bc.ca, or RDCK Privacy Officer, Box 590, 202 Lakeside Drive, Nelson, BC V1L 5R4.

RESPONSE SUMMARY
FILE: DP2404Hn APPLICANT: LAURA MACKAY

Name: **Date:**

Agency: **Title:**

RETURN TO: ZACHARI GIACOMAZZO, PLANNER
DEVELOPMENT AND COMMUNITY SUSTAINABILITY SERVICES
REGIONAL DISTRICT OF CENTRAL KOOTENAY
BOX 590, 202 LAKESIDE DRIVE
NELSON, BC V1L 5R4
Ph. 250-352-8190
Email: plandept@rdck.bc.ca

RDCK Map

REGIONAL DISTRICT OF CENTRAL KOOTENAY
Box 590, 202 Lakeside Drive,
Nelson, BC V1L 5R4
Phone: 1-800-268-7325 www.rdck.bc.ca
maps@rdck.bc.ca

Legend

- Streams and Shorelines
- Lakes and Rivers
- Electoral Areas
- RDCK Streets
- Cadastre
- Address Points

Map Scale:

1:2,257

Date: February 9, 2024

RDCK Map

REGIONAL DISTRICT OF CENTRAL KOOTENAY
Box 590, 202 Lakeside Drive,
Nelson, BC V1L 5R4
Phone: 1-800-268-7325 www.rdck.bc.ca
maps@rdck.bc.ca

Legend

- Non Standard Flooding Erosion Area
- Electoral Areas
- RDCK Streets
- Cadastre
- Address Points

Map Scale:

1:2,257

N W E S

Date: February 9, 2024

RDCK Map

REGIONAL DISTRICT OF CENTRAL KOOTENAY
Box 590, 202 Lakeside Drive,
Nelson, BC V1L 5R4
Phone: 1-800-268-7325 www.rdck.bc.ca
maps@rdck.bc.ca

Legend

- Agriculture Land Reserve
- Electoral Areas
- RDCK Streets
- Cadastre
- Address Points

Map Scale:

1:2,257

N W E S

Date: February 9, 2024

RDCK Map

REGIONAL DISTRICT OF CENTRAL KOOTENAY
Box 590, 202 Lakeside Drive,
Nelson, BC V1L 5R4
Phone: 1-800-268-7325 www.rdck.bc.ca
maps@rdck.bc.ca

Official Community Plan

- Agriculture
- Country Residential
- Parks and Recreation

Legend

- Resource Area
- Electoral Areas
- RDCK Streets
- Cadastre
- Address Points

Map Scale:

1:2,257

Date: February 9, 2024

February 8, 2024

We have been proud owners of our property at Summit Lake for 9 years now. We love everything about Summit Lake and the surrounding area. As our family has grown and grandchildren have entered the picture, we have come to realize that creating a well-planned, well-built, environmentally conscious 4 season cabin that will facilitate the needs of young families, is important to us. Our grandkids find the property a treasure trove of natural exploration and fascination, a love of nature we wish to facilitate. Don and I are also committed to eventually making this cabin our primary (sole) residence. It has been an interesting process of thought and planning as our priority has always been to be respectful of the unique and precious environment in which we live and play. From the onset, anything we have done to or on the property has been done with minimal impact. I am proud to say we have only taken 2 large trees down in our stewardship of our property: One an assessed danger tree, the other a large popular near the covenanted septic field site that would have to be removed regardless. As well, we have encouraged and planted native species throughout the years, particularly verging on the wetland (In fact, the zone Masse Environment identified for revegetation is the very same area we began the process several years ago). And so, it was with a critical eye to preservation and least impactful practises that we carefully chose the very least intrusive site for our cabin. In our estimation, supported by Masse Environmental, our proposed cabin site along with diligent building methods and a dedication to post-construction mitigation, is truly the best area to build for all the reasons meticulously addressed in the environmental report. We have also conducted a FireSmart property assessment and are extremely familiar with requirements to meet firesafe building material and building expectations. The preservation of wetland adjacent to our property is vitally important in this regard as it provides a natural wildfire buffer zone. It is in our best interest, on so many levels, to minimize environmental interruption and follow regional best practise codes and regulations with the building of our cabin. We are excited to begin this next phase of our life at Summit Lake which incorporates a minimal impact strategy and long term gentle use philosophy.

19.0 DEVELOPMENT PERMIT AREAS

Background

The OCP may designate Development Permit Areas under the authority of local government legislation. Unless otherwise specified, a development permit must be approved by the Regional Board prior to any development or subdivision of land within a designated Development Permit Area.

Development Permit Areas allow for implementation of special guidelines for the protection of the natural environment, protection from hazardous conditions, for revitalization of designated areas, or to guide the form and character of development within the Slocan Lake North Plan area.

Where land is subject to more than one Development Permit Area designation, a single development permit is required. The application will be subject to the requirements of all applicable Development Permit Areas, and any development permit issued will be in accordance with the guidelines of all such Areas.

Development Permit Area #1: Watercourse Development Permit (WDP) Area

Category

The WDP area is designated under Section 488(1) (a) of the *Local Government Act* and applicable provisions of the *Community Charter* for the protection of the natural environment, its ecosystems, and biological diversity.

Area

The WDP area is comprised of:

1. Riparian assessment areas (Figure 1) for fish and wildlife habitat and drinking water, which include all watercourses and adjacent land:
    a. within 30 metres of the high water mark of a watercourse;
    b. within 30 metres of the top of the ravine bank in the case of a ravine less than 60 metres wide; and
    c. within 10 metres of the top of the ravine bank in the case of a wider ravine that link aquatic to terrestrial ecosystems and includes both existing and potential riparian vegetation and existing and potential upland vegetation that exerts an influence on the watercourse.

"high water mark" means the visible high water mark of a watercourse where the presence and action of the water are so common and usual, and so long continued in all ordinary

years, as to mark on the soil of the bed of the watercourse a character distinct from that of its banks in vegetation as well as in the nature of the soil itself, and includes the active floodplain;

"top of ravine bank" means the first significant break in a ravine slope where the break occurs such that the grade beyond the break is latter than 3:1 for a minimum distance of 15 metres measured perpendicularly from the break and the break does not include a bench within the ravine that could be developed;

"watercourse" includes any of the following: a watercourse, intermittent or not; a pond, lake, river, creek or brook, and a ditch, spring or wetland that is connected by surface flow to a watercourse.

Justification

The primary objective of this Development Permit Area designation is to regulate development activities in watercourses and their riparian areas so as to protect aquatic habitat; and to conserve, enhance, and where necessary, restore watercourses and their riparian areas.

The impact of development on watercourses can be minimized by carefully examining the proposed development and taking appropriate measures in relation to the environmentally sensitive riparian areas land.

Determining whether development falls within the WDP Area

To confirm whether a proposed development is within land identified as a riparian assessment area in the WDP area for which a Development Permit application is required, the following applies:

Any area located within 30 metres of the high water mark of a watercourse; within 30 metres of the top of the ravine bank in the case of a ravine less than 60 metres wide; and within 10 metres of the top of the ravine bank in the case of a wider ravine that link aquatic to terrestrial ecosystems and includes both existing and potential riparian vegetation and existing and potential upland vegetation that exerts an influence on the watercourse;

Unless the proposed development or alteration of land is clearly outside the riparian assessment area the location of the development shall be determined accurately by survey in relation to the WDP Area to determine whether a development permit application is required.

Guidelines

A Development Permit is required, except where specified under the exemptions section, for development or land alteration on land identified as a riparian assessment area within the WDP Area. Where not exempt, development requiring a development permit includes any of the following associated with or resulting from residential, commercial or industrial

activities or ancillary activities to the extent that they are subject to local government powers under Local government legislation the:

a. removal, alteration, disruption or destruction of vegetation;
b. disturbance of soils;
c. construction or erection of buildings and structures;
d. creation of non-structural impervious or semi-impervious surfaces;
e. flood protection works;
f. construction of roads, trails, docks, wharves and bridges;
g. provision and maintenance of sewer and water services;
h. development of drainage systems;
i. development of utility corridors;
j. subdivision as defined in section 455 of the *Local Government Act*.

Development shall be in accordance with the following guidelines:

1. All development proposals subject to this permit will be assessed by a Qualified Environmental Practitioner (QEP) in accordance with the Riparian Areas Regulation established by the Provincial and/or Federal governments as used elsewhere in the Province;
2. A WDP shall not be issued prior to the RDCK ensuring that a QEP has submitted a report certifying that they are qualified to carry out the assessment, that the assessment methods have been followed, and provides in their professional opinion that a lesser setback will not negatively affect the functioning of a watercourse or riparian area and that the criteria listed in the Riparian Areas Regulation has been fulfilled, and;
3. The Riparian Areas Regulation implemented through the WDP does not supersede other Federal, Provincial and or local government requirements, including that of other development permit areas, building permits, flood covenants, Federal or Provincial authorization. Land subject to more than one development permit area designation must ensure consistency with the guidelines of each development permit area, to provide comprehensive stewardship of both fish and wildlife habitat.

Exemptions

The WDP area does not apply to the following:

1. existing construction, alteration, addition, repair, demolition and maintenance of farm buildings;

2. existing institutional development containing no residential, commercial or industrial aspect;
3. reconstruction, renovation or repair of a permanent structure if the structure remains on its existing foundation. Only if the existing foundation is moved or extended in to a riparian assessment area would a WDP be required; and
4. an area where the applicant can demonstrate that the conditions of the WDP Area have already been satisfied or a development permit for the same area has already been issued in the past and the conditions in the development permit have all been met, or the conditions addressed in the previous development permit will not b affected.

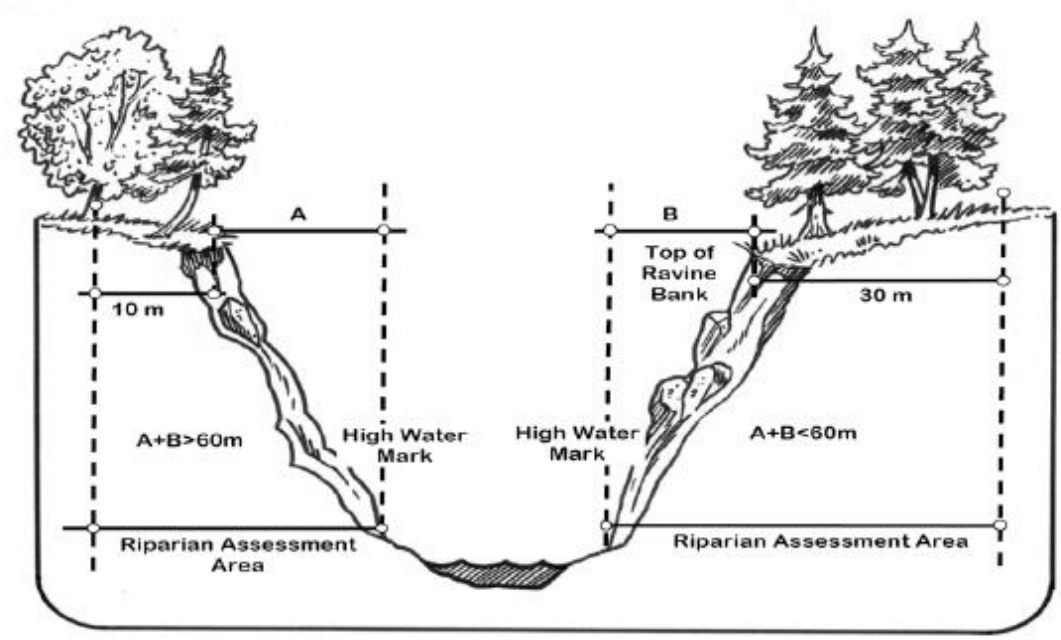

FIGURE 1: RIPARIAN ASSESSMENT AREA: means the area within 30 m of the high water mark of a watercourse; within 30 m of the top of the ravine bank in the case of a ravine less than 60 m wide; and within 10 m of the top of the ravine bank in the case of a wider ravine that link aquatic to terrestrial ecosystems and includes both existing and potential riparian vegetation and existing and potential upland vegetation that exerts an influence on the watercourse. Applies only to residential, commercial and industrial designations.

Source: British Columbia Ministry of Environment, *Riparian Areas Regulation Implementation Guidebook, March 2005*

MASSE ENVIRONMENTAL

243 Island View Road, Nakusp, B.C.

Riparian Assessment V1.0

Prepared for:

Regional District of Central Kootenay

202 Lakeside Drive

Nelson, BC, V1L 5R4

February 7, 2024

Disclosure Statement

This report has been prepared by Claire Peyton P.Ag., B.Sc. and reviewed by Fiona Lau B.Tech., AScT.

I, Fiona Lau, hereby certify that:

a) I am a qualified environmental professional (QEP), as defined in the Riparian Areas Regulation made under the Fish Protection Act;
b) I am qualified to carry out this part of the assessment of the development proposal made by the developer;
c) I have carried out my assessment of the development proposal, and my assessment is set out in this Assessment Report; and
d) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Protection Regulation.

This report has been prepared by a QEP who has not acted for, or as an agent(s) of the RDCK and was at the expense of the property owner.

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1 INTRODUCTION

Masse Environmental Consultants Ltd. was retained by Don Liszt and Laura Mackay (Owners) to conduct a riparian assessment to accompany an application for a Watercourse Development Permit (WDP) on their waterfront property at 243 Island View Road, Nakusp, B.C. (PLAN NEP86587 DISTRICT LOT 10589 KOOTENAY LAND DISTRICT PARCEL A, BEING A CONSOLIDATION OF LOTS 1 & 2, SEE CA6009524; PID 030-141-150). The development permit is required as residential development for a two-storey cabin is proposed within the 30 m WDP area of a wetland and unnamed stream.

A site visit was completed on January 10th, 2024 by Fiona Lau B.Tech., ASc T. and Claire Peyton P.Ag., B.Sc. to conduct a riparian assessment on the property. The Owners provided several photographs that were taken during the previous summer to help provide additional information on what the property looks like and what vegetation types could be found on the property.

The riparian assessment evaluates the existing conditions of the foreshore and riparian areas, identifies habitat values, assesses potential environmental impacts, and recommends measures to mitigate or compensate for the alteration of the riparian area to maintain ecological values. It is based on the following regulatory framework and best management practices documents:

- Western Toad Management Strategies for Summit Lake
- British Columbia Riparian Areas Protection Regulation
- British Columbia Water Sustainability Act
- British Columbia Wildlife Act
- Federal Migratory Birds Convention Act
- Natural Resources Best Management Practices
- Develop with Care. Environmental Guidelines for Urban and Rural Land Development in British Columbia
- On the Living Edge: Your Handbook for Waterfront Living

2 PROJECT OVERVIEW

2.1 Site Description

2.1.1 Location

The subject property is 1.03 acres in size and is located ~12 km southeast of the Village of Nakusp, BC, on Summit Lake (Appendix 1). Summit Lake is situated between the Valhalla and Selkirk Mountain Ranges at the north end of the Slocan Valley along Highway 6. The property has an eastern aspect and is slightly sloped downhill towards the shoreline of Summit Lake.

The property is bordered by private property to the north and south, MoTI Right of Way (RoW) to the west and Crown Land to the east. An unmapped wetland borders the property along the north boundary and extends around the east boundary between the subject property and Summit Lake. An unnamed stream transects the property; however, the alignment shown on provincial and regional mapping tools is incorrect (Figure 1; Parcel Map 2024). The corrected stream alignment, verified in the field by Masse is provided on the Site Plan (Appendix 2). In addition, the wetland boundary along the western and southern edge was mapped and is shown on the Site Plan (Appendix 2).

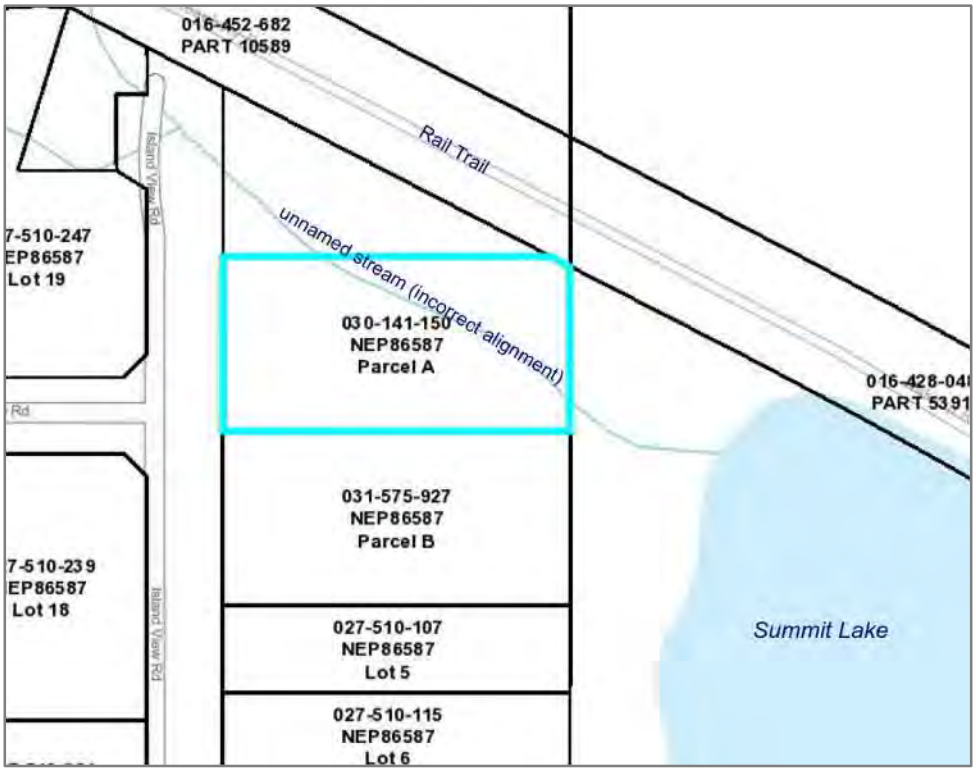


Figure 1. Location of Subject Property (Parcel Map, 2024).

The project area is within the Interior Cedar – Hemlock Slocan moist warm (ICHmw2) biogeoclimatic subzone. The ICHmw2 is present from valley bottom to mid-slopes (up to 1450 m) along Summit Lake and its tributaries. This zone has warm, moist summers, and cool to mild, moist winters with moderate snowfall. Snowpacks are moderately deep and persist from December through March or April, with frequent rain-on-snow events. The persistent snowpack and mild climate prevent soils from freezing to any significant depth. The ICHmw2 has a high species diversity with abundant Western red cedar (Thuja plicata), Western hemlock (Tsuga heterophylla), interior Douglas fir (Pseudotsuga menziesii var. glauca), and Western larch (Larix occidentalis), and a variety of other species including hybrid white spruce (Picea

engelmannii x glauca) in wet sites and black cottonwood (Populus balsamifera ssp. trichocarpa) in floodplain ecosystems (MacKillop and Ehman 2016).

This property is within the Bonanza Creek Watershed (12,232 ha) and the Bonanza Biodiversity Corridor (Figure 2), an ecologically important area with critical habitat, biological diversity, and landscape connectivity from Summit Lake to the north end of Slocan Lake (Mahr 2018).

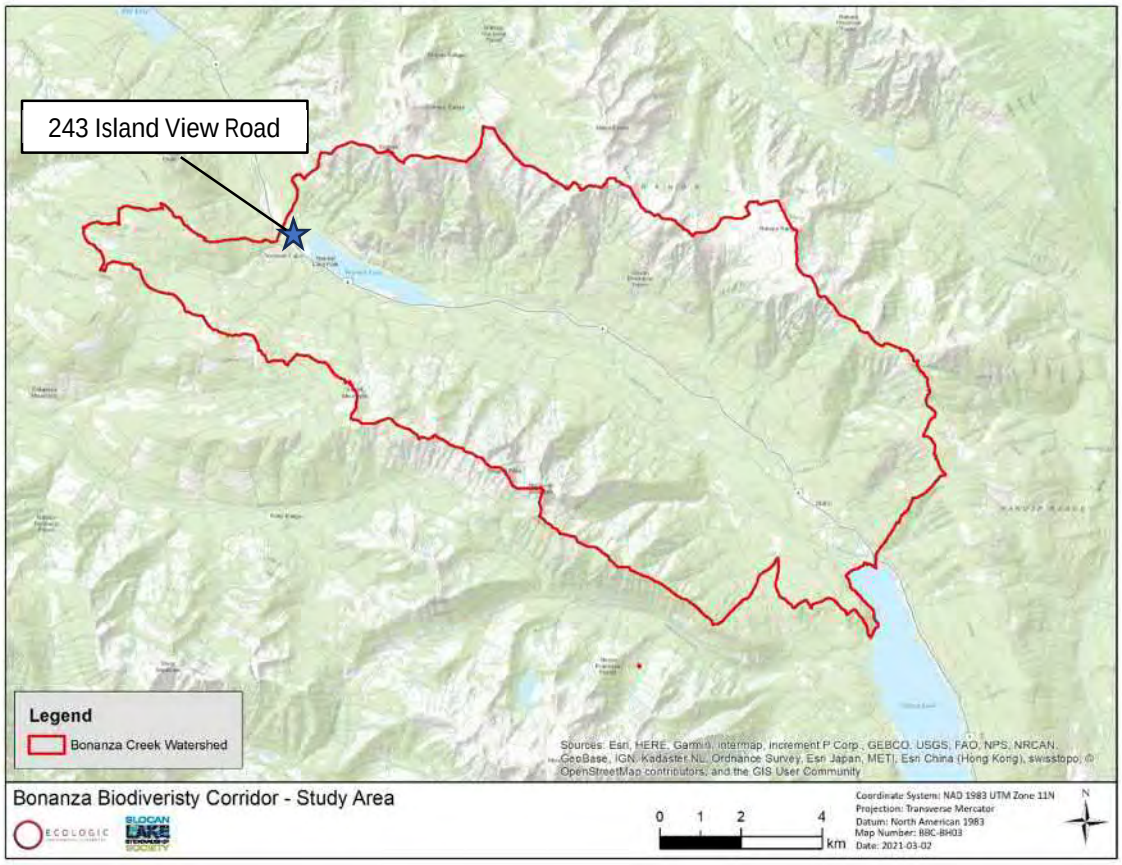


Figure 2. Bonanza Biodiversity Corridor Study Area (Durand & Ehlers, 2021).

2.1.2 Watercourses

Three watercourses were mapped within 30 m of the subject property: Summit Lake (Photo 1), an unnamed stream (Photo 2) and a swamp (Photo 3).

Summit Lake:

Summit Lake is a small, shallow mountain lake approximately 3.4 km in length, with an area of 1.57 km^2. The maximum depth (17 m) occurs at the northwestern end of the lake, near the project site. The lake is fed by eight tributaries and drains southeast via Lower Bonanza Creek. Typical lake levels are lowest from September to March and spike in the months of May and June during spring freshet.

Unnamed Stream:

The small unnamed stream has a low gradient (<1% gradient) and is meandering channel that flows through the swamp and enters Summit Lake. The creek's average width (during the winter) is approximately 0.5m. The creek substrate is composed of both fines and sands. The creek flows along the north side of the rail trail and then crosses the rail bed through a culvert, into the wetland and transects the northeast section of the subject property before flowing into Summit Lake. It is suspected that the stream channel may have been altered many years ago during the rail bed construction.

Swamp:

The wetland, classified as a swamp is in a low-lying area on the north and east sides of the parcel. Based on indicator species present, this wetland is classified as a Mountain Alder – Pink Spirea – Sitka sedge swamp (Alnus incana – Spiraea douglasii – Carex sitchensis, Ws02; Mackenzie and Moran 2004), a provincially yellow-listed ecological community (Photo 3 thru Photo 6). Soil test pits were hand dug within the extent of the wetland confirming a silty clay layer (hydric soils) within 30 cm of the ground surface, below saturated dark organic soil (Photo 7 and Photo 8). The Owners confirmed that the soils within the swamp area are saturated from spring to late fall (p comm. D Liszt and L Mackay).

Photo 1. View of Summit Lake looking east (Summer 2022).

Photo 2. View of unnamed stream crossing north-east section of property.

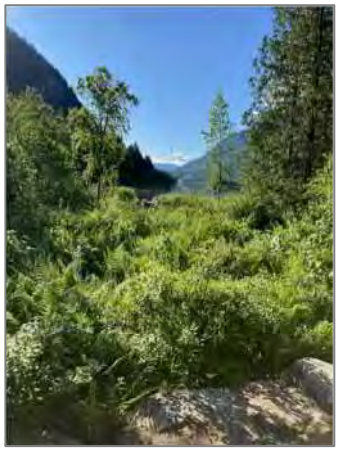


Photo 3. View of swamp between property and Summit Lake (Photo by Owners) .

Photo 4. View of swamp between subject property and Summit Lake during winter.

Photo 5. View of swamp looking north-east along property boundary.

Photo 6. View of swamp along northern property boundary during winter.

Photo 7. Soil test pit dug within along swamp perimeter-dark organic soil over silty clay layer.

Photo 8. Silty clay layer soil sample taken from test pit within swamp.

2.1.3 Riparian Vegetation

The subject property supports both undisturbed and disturbed riparian habitat. The undisturbed riparian habitat is located along the northern and eastern property boundaries and consists of wetland habitat (Photo 3 thru Photo 6). The dominant species in the swamp are mountain alder (Photo 9), pink spirea, and sedge sp. The sedge genus could not be identified due to snow cover during the site visit. Additional vegetation species observed in the swamp include paper birch (Betula papyrifera), willow sp (Salix sp.), red osier dogwood (Cornus sericea), wild raspberry (Rubus idaeus) and lady fern (Athyrium filix-femina). A mixed riparian forest stand with dominant Western red cedar exists within the north-west portion of the property (Photo 10).

Historical clearing of the riparian area within the property bounds was conducted by the Developer and was later turned into a lawn by the current Owners (Cover Photo and Photo 5; p. communication D. Liszt and L. Mackay)The Owners have planted some native shrubs and a weeping willow (Salix babylonica) along the edge of the lawn next to the swamp. Plant species observed on site are presented in Table 1. Due to substantial snow cover a full vegetation assessment was not completed.

Photo 9. Mountain alder within swamp.

Photo 10. Mixed riparian forest stand within north-west portion of property.

Table 1. Plant species list.

Common Name	Scientific Name	Common Name	Scientific Name
Trees		Herbaceous and Low Shrubs	
Western hemlock	Tsuga heterophylla	black raspberry	Rubus leucodermis
Western redcedar	Thuja plicata	bracken fern	Pteridium aquilinum
Western white pine	Pinus monticola	common horsetail	Equisetum arvense
paper birch	Betula papyrifera	fireweed	Chamaenerion angustifolium
Tall Shrubs		lady fern	Athyrium filix-femina
black twinberry	Lonicera involucrata	spiny wood fern	Dryopteris sp.
common snowberry	Symphoricarpos albus	red raspberry	Rubus idaeus
mountain alder	Alnus incana	thimbleberry	Rubus parviflorus
red-osier dogwood	Cornus stolonifera	Mosses/lichen	
rose sp.	Rosa sp.	common witch's hair	Alectoria sarmentosa
willow sp.	Salix sp.	lungwort	Lobaria pulmonaria
		Powdered shield	Parmelia sulcata

2.1.4 Aquatic Habitat

The unnamed stream provides potential rearing habitat for juvenile fish as it is directly connected to Summit Lake with no fish barriers (Photo 11). It also provides a food source (leaf litter and insect drop) pathway for fish feeding at the creek mouth. An aquatic habitat assessment could not be conducted along the shoreline fronting the property due to the ice and snow cover on the lake during the site visit. Aquatic information provided below was collected during a riparian assessment conducted by Masse in 2022 of the Camp Valhalla property (2384 Highway 6) located ~250m south of the subject property having very similar habitat features (Masse 2022).

The Summit Lake foreshore is predominantly low gradient riparian and lake margin. Substrate along most of the shoreline consists of fine sediment, organics and small angular gravel (Photo 12). Emergent aquatic vegetation occurs along the fringe of the lake including yellow pond lily (Nuphar lutea), water sedge (Carex aquatilis), bluejoint reedgrass (Calamagrostis canadensis), shore sedge (Carex lenticularis) and common spike-rush (Eleocharis palustris) with an abundance of overhanging vegetation (Photo 13). Aquatic and overhanging vegetation provide high value cover habitat for fish, while the shallow waters also provide juvenile rearing habitat.

Summit Lake has been extensively managed for fisheries, with chemical treatments to remove undesirable fish species applied during the period of 1957 - 1986. In 1985, a weir was constructed on Lower Bonanza Creek, ~1 km downstream of Summit Lake, to prevent non-sport fish from re-colonizing the lake. Since

that time, rainbow trout (Oncorhynchus mykiss) have been annually stocked in an effort to create a rainbow trout fishery (Oliver 2003). Recent information indicates that rainbow trout, sculpin (Cottus sp), and eastern brook trout (Salvelinus fontinalis) occur in Summit Lake (Baxter & Irvine 2014).

Freshwater mussel beds have been confirmed along the south shoreline of Summit Lake (Photo 14). Mussel beds in Summit Lake are mostly concentrated between 5-10 m horizontal distance from shore at water depths between 0.75-1.5 m. Mussel species present are the Western Floater (Anodonta kennerlyi; Masse 2022). An underwater survey for freshwater mussels was not conducted along the shoreline of the property.

Photo 11. Mouth of unnamed stream into Summit Lake.

Photo 12. Typical substrate along the foreshore of Summit Lake (Masse 2022).

Photo 13. Typical emergent and overhanging vegetation along the foreshore of Summit Lake (Masse 2022).

Photo 14. Underwater photo of live mussel in Summit Lake (Masse 2022).

2.1.5 Wildlife

Riparian ecosystems offer important habitat features for wildlife, affording them essential resources like water, shelter, and food. These areas frequently serve as migration corridors connecting aquatic, riparian, and upland environments, playing a pivotal role in the life cycles of numerous species.

The riparian area provides habitat for many species including several species of amphibians and reptiles. The subject property is likely visited by songbirds, waterfowl, and raptors particularly during the spring breeding season, as well as provides habitat for ungulates, bears and small mammals (including beaver). The area that the subject property is located is very rich in biodiversity.

No significant incidental wildlife observations were made during the site visit.

2.1.5.1 Reptiles and Amphibians

The project area supports endemic reptiles and amphibians, such as chorus frogs (Pseudacris regilla), Columbia spotted frogs (Rana luteiventris), Coeur d'Alene Salamanders (Plethodon idahoensis), garter snakes (Thamnophis sp.), Northern alligator lizards (Elgaria coerulea), long-toed salamanders (Ambystoma macrodactylum), and Western toads (Anaxyrus boreas) (Ehlers and Durand 2018). Western toadlets have been observed migrating up the stream corridor in August (p. communication D. Liszt).

2.1.5.2 Birds

The riparian area supports habitat for nesting, perching and foraging for a variety of birds. The swamp habitat provides high value nesting habitat for songbirds, while mature cedar trees on the property provide perch, nesting and feeding habitat for raptors, sapsuckers and cavity dwellers. Summit Lake provides high quality habitat for shorebirds and waterfowl. Numerous bird sightings have been documented near the subject property, including the Western Grebe (Aechmophorus occidentalis), a red-listed species, and the following blue-listed species: Bobolink (Dolichonyx oryzivorus), Great Blue Heron (Ardea herodias), and Winter Wren (Troglodytes hiemalis).

2.1.5.3 Mammals

Mammals that are expected to use the riparian area around the subject property include American beaver (Castor canadensis), American black bear (Ursus americanus), North-American river otter (Lontra canadensis), and white-tailed deer (Odocoileus virginianus); however bobcat (Lynx rufus), cougar (Puma concolor), coyote (Canis latrans), elk (Cervus elaphus), grizzly bear (Ursus arctos), moose (Alces alces), and other predators may also frequent these areas. The riparian area provides browse, cover, and fishing

opportunities, especially at the creek mouth. Bats and other small mammals are expected to frequent the property and utilize the large cottonwood trees for roosting.

2.1.5.4 Species at Risk

Species at risk information pertinent to the subject property was obtained through the following online databases:

1. The BC Conservation Data Center occurrence data and critical habitat for Federally listed species were queried within iMap tool (BC 2024), Habitat Wizard (BC 2024) using a 10 km buffer around the center point of the subject property.
2. A 10 km buffer around the subject property was used to query recorded observations on iNaturalist.
3. The Bonanza Conservation Values Assessment Report (Ecologic and Masse 2020) was referenced to identify other species at risk known to occur in the Bonanza Corridor.

The query results are presented in Appendix 3. Potential occurrence on the property was assessed as confirmed, likely, possible, unlikely, or unknown, according to known species habitat affinities, the habitat profile of the property, and on proximity to mapped occurrences. Based on these queries, fifteen species at risk were identified to be present in and around Summit Lake (including potential to be in close proximity to the subject property) (Table 2), with 46 species having potential to occur.

Table 2. Species at Risk confirmed in and around Summit Lake.

Species	Latin Name	BC List[1]	COSEWIC[2] / SARA[3]
Barn Swallow	Hirundo rustica	blue	Special concern/ Threatened
Bobolink	Dolichonyx oryzivorus	blue	Special concern/ Threatened
Broad-winged Hawk	Buteo platypterus	blue	Not at risk
Coeur d'Alene Salamander	Plethodon idahoensis	yellow	Special Concern/Special Concern
Coeur d'Alene Oregonian snail	Cryptomastix mullani	blue	Not at risk
Common Nighthawk	Chordeiles minor	yellow	Special concern/ Threatened
Great Blue Heron	Ardea herodias herodias	blue	Not at risk
Grizzly Bear	Ursus arctos	blue	Special concern/Special concern
Herrington Fingernailclam	Sphaerium occidentale	blue	Not at risk
Northern Goshwawk	Accipiter gentilis atricapillus	blue	Not at risk
Pale Jumping-slug	Hemphillia camelus	blue	Not at risk
Southern Mountain Woodland Caribou	Rangifer tarandus	red	Endangered

Species	Latin Name	BC List[1]	COSEWIC[2] / SARA[3]
Western Grebe	Aechmophorus occidentalis	red	Special concern/ Special concern
Western Toad	Anaxyrus boreas	yellow	Special Concern/Special Concern
Winter Wren	Troglodytes hiemalis	blue	Not at risk

1 BC Conservation Status (CDC): Red = extirpated, endangered, or threatened. Blue = special concern. Yellow = secure. 2COSEWIC/SARA: Endangered (E) = Facing imminent extirpation or extinction. Threatened (T) = Likely to become endangered. Special concern (SC) = May become a threatened or an endangered. Species listed on Schedule 1, SARA are legally protected

Summit Lake supports a regionally important population of Western toads (FLNRO, 2017). These toads are the most prevalent species at risk documented around the subject property. The subject property and surrounding areas contain important habitat for breeding, rearing, and migrating western toads. Western toads inhabit all forest and wetland types, with mature forests being the highest quality habitat due to the structural complexity, a wider variety or prey, diverse security features, protection from temperature extremes, and the availability of overwintering habitat. Western toads require connectivity between aquatic breeding sites and upland terrestrial foraging/overwintering areas. Due in part to mortality risks associated with highway infrastructure, there have been extensive efforts to monitor and protect the Summit Lake Western toad population. Recommended management strategies are outlined in Section 5.6.

Summit Lake and surrounding area (including the subject property) provides important spring forage and connectivity for grizzly bears (Ursus arctos) within Central Selkirk (ID: 436) and Valhalla (ID: 439) Grizzly Bear Population Units (BC, 2024).

The subject property is within a critical habitat polygon (matrix range) for Southern Mountain Woodland Caribou (ID: 1951) (EC 2014). Matrix range is the area adjacent to core habitat that has periodic or low use by caribou but supports primary prey and associated predators that have the potential to affect the caribou subpopulation. Critical habitat attributes for matrix range are those that provide "ecological conditions that allow for low predation risk, defined as wolf population densities of < 3 wolves/1000km^2" (EC 2014). However, the small number of mountain caribou in this herd are not likely to frequent low-elevation habitat with high human recreational use.

In addition to this list, many bat species are blue-listed in BC (e.g.: little brown myotis (Myotis lucifugus), Western small-footed myotis (Myotis ciliolabrum), and the Yuma myotis (Myotis yumanensis). The little brown myotis is also listed as 'endangered' under the Species At Risk Act. Bat roosting habitat includes tall, live or dead trees with crevices, peeling bark, or cavities. The mature trees on the property could

provide roosting habitat for bats and the riparian areas on and near the property could provide foraging habitat for bats.

2.1.6 Archeological Resources

Summit Lake is part of the traditional territory of the Sinixt, Syilx Okanagan, and Ktunaxa First Nations and is assumed to fall within an area of 'high' archaeological potential based on the foreshore environment and local history. A review of archaeological resources on this property is outside the scope of this report. However, Archaeological Chance Find Procedures are provided in Appendix 4 for guidance on which protocols to follow in the event of a chance archaeological find, to ensure that archaeological sites are documented and protected as required for compliance with the BC Heritage Conservation Act.

2.1.7 Invasive Species

Central Kootenay Invasive Species Society (CKISS) manages invasive species regionally using a prioritized approach. The management strategy for a specific species is based on a number of factors including the phase of invasion and the potential impacts of the species (CKISS 2023). Priority species lists can be found at https://ckiss.ca/species/invasive-plant-priority-lists/. Due to the timing of the site visit being during the winter, no invasive species assessment was conducted.

2.2 Existing Development

Existing development within the 30 m WDP area of the swamp is limited to the manicured lawn (Photo 15), a gravel driveway (Photo 16) and a 0.5 m wide elevated wooden boardwalk which crosses the swamp between the property and Summit Lake to access the foreshore. The boardwalk (located on Crown land) was constructed by the current Owners in consultation with the Province (p. communication D. Liszt and L. Mackay). A travel trailer has been temporarily parked along the north edge of the property, ~12 m from the swamp's natural boundary.

Development outside of the 30 m riparian area consists of an outdoor kitchen structure, boat storage shelter and a bunkhouse (Photo 17). The property is serviced by groundwater, which is extracted from two private wells (Photo 18). Refer to the Site Plan (Appendix 3) for structure locations.

Photo 15. View of well manicured lawn looking east (Photo provided by Owner).

Photo 16. View of lawn, travel trailer and driveway looking west (Photo provided by Owner).

Photo 17. View of boat storage, outdoor kitchen and bunkhouse

Photo 18. View of water pump at well location.

2.3 Proposed Development

Proposed development on the subject property within the 30 m WDP area includes:

- Construction of a two-storey cabin including deck and stairs 184m^2 (1980 ft^2).
- Installation of water line between well and cabin.
- Removal of the travel trailer.
- Removal of five mature conifer trees.

Proposed development outside the WDP includes installation of a septic system including the septic tank, septic field and line. The natural boundary from the swamp to the proposed cabin is 17 m, at its closest

corner. The proposed siting of the cabin was selected in an area that was previously disturbed and is currently lawn and gravel driveway, with exception to one corner where a few trees will need to be removed (Photo 19). Alternatively, the cabin could be sited outside of the WDP area; however, this would require the removal of many mature cedar trees, which provides nesting, feeding and perch habitat for birds.

The proposed site plan including relevant setbacks is provided in Appendix 2. Please note that there is a discrepancy between the property boundaries and the ortho imagery that can be seen in Appendix 3 and Appendix 4. In both these appendices the property boundaries are in the correct location; however, the ortho imagery is offset by approximately 7 m to the north.

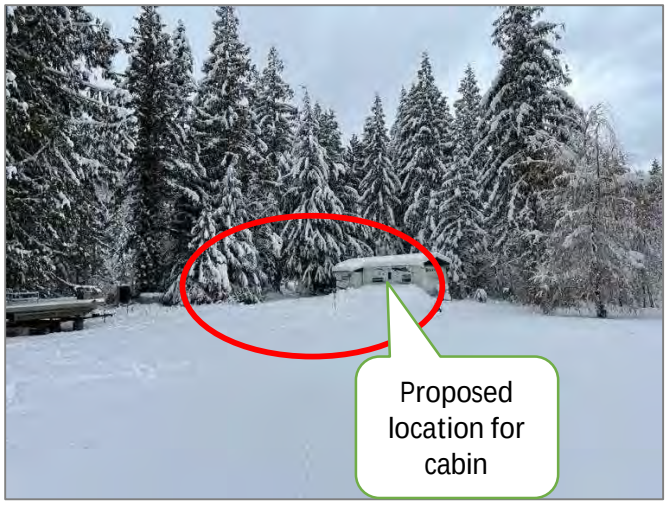


Photo 19. View of proposed siting of cabin.

3 REGULATORY OVERVIEW

3.1 Riparian Area Protection Regulation (RAPR) Review

The 30 m WDP setback from the boundary of the swamp was compared with the Riparian Area Protection Regulation (RAPR) criteria by conducting a detailed assessment of the subject property and determining the Streamside Protection and Enhancement Area (SPEA) setback. Results for the Zones of Sensitivity (ZOS) and SPEA are presented in Table 3 and Appendix 3.

As per the RAPR, the large woody debris (LWD) and litter ZOS were plotted 15 m inland from the natural boundary of the swamp with the shade ZOS plotted 4-30 m south from the natural boundary of the

swamp. The SPEA setback is determined based on the ZOS with the greatest width. Therefore, within the subject property the SPEA from the HWM of the swamp ranges from 15 m -30 m (Table 3).

Table 3. Results of detailed RAPR assessment for the swamp.

Feature Type	SPVT[1]	Zones of Sensitivity			SPEA[3]
		LWD[2]	Litter fall	Shade	
Swamp	TR	15 m	15 m	4-30 m	15-30m

[1] SPVT: site potential vegetation type (TR-tree)

[2] LWD- large woody debris

[3]SPEA- streamside protection and enhancement area

4 POTENTIAL ECOLOGICAL IMPACTS

Potential ecological impacts directly associated with the proposed development include:

- Reduction of suitable wildlife habitat (i.e. potential nesting and perch habitat), and nutrient cycling from removal of ~5 conifer trees.
- Change in cover habitat from natural forest and open lawn to anthropogenic structure within development footprint.
- Increased human presence, noise and activity during construction, which may lead to temporary decreases of wildlife presence and increases in human-wildlife contact.
- Increased risk of invasive weed introduction from construction equipment and exposed soils.

Mitigation measures to help minimize the potential negative impacts are detailed in Section 5 and a restoration plan to help mitigate and restore a portion of the degraded riparian area is prescribed in Section 6. The restoration plan will help to increased biodiversity replacing a section of lawn with native riparian vegetation.

5 MEASURES TO PROTECT THE INTEGRITY OF THE SPEA

This section provides measures to protect the integrity of the SPEA as described in the RAPR, as well as recommended best management practices to minimize the potential effects of the development.

5.1 Danger Trees

No danger trees around the proposed home were identified. Further assessment of potential danger trees is outside the scope of this report. Any proposed danger tree removal should be assessed by a certified arborist, prior to removal.

5.2 Windthrow

No significant clearing of trees is proposed on the property; therefore, changes to windthrow risk are minimal. Additional assessment of windthrow risk is beyond the scope of this report, and any such assessment should be led by a Registered Professional Forester (RPF).

5.3 Slope Stability

No signs of slope instability were observed on the property. Further assessment of geotechnical hazard is beyond the scope of this report, and any such assessment should be led by a P.Geo, or P.Eng.

5.4 Protection of Trees and Vegetation in the SPEA

The following protection measures have been incorporated into the design to minimize impacts to existing and potential trees and vegetation within the SPEA:

- Minimization of vegetation removal by siting the cabin within an area that is mostly lawn.
- Install a snow fence along the north side of the proposed cabin to minimize any encroachment and disturbance to riparian vegetation. The snow fence shall be removed once the cabin is constructed.

5.5 Encroachment

Protection measures to minimize effects of the encroachment within the SPEA are:

- Development footprint within 15-30 m of the swamp has been minimized.
- Overall plan to reduce the need to remove mature trees has been considered in the placement of new development.

5.6 Erosion and Sediment Control

Erosion and sediment control is not considered a significant risk, due to the relatively flat terrain and minimal excavation within the SPEA. The following mitigation measures should be implemented to reduce the risk of sediment input into a watercourse:

- Soils will be safely stockpiled in a manner that eliminates the possibility of erosion and sediment transport and stockpiles will be located as far away from the swamp as possible.
- Disturbed soils should be revegetated as soon as possible after construction.

5.7 Stormwater Management

The re-development of the property will result in an increase in the total impervious area. The following mitigation measures will help decrease stormwater impacts to the SPEA:

- Pervious materials (e.g., gravel) are recommended for driveways, parking areas, and pathways. This minimizes stormwater runoff from impervious materials (e.g., asphalt and concrete), which must be managed using natural hydrologic pathways. Storm water will not be permitted to discharge directly into the swamp or stream.
- Design roof rainwater collection systems that direct rainwater into suitable landscape features which can absorb and utilize runoff.
- Stormwater discharges must adhere to the Water Sustainability Act or any other applicable legislation.

5.8 Floodplain Concerns

The RDCK Floodplain Management Bylaw requires a 15 m setback and a 1.5 m flood construction level from the natural boundary of Summit Lake. No floodplain concerns were noted with the proposed siting of the building. Further assessment of flood risk hazard is beyond the scope of this report.

5.9 Fish and Wildlife Protection

To minimize disturbance to fish, wildlife, and their habitat, the following measures will be implemented:

- Adhere to erosion and sediment control best management practices outlined in this report to ensure that there is no release of deleterious materials into the swamp or unnamed stream.
- Clearing of vegetation shall be completed outside of the songbird breeding season (mid August – end of March) (Gov of Canada, 2023). If clearing of vegetation is completed within the breeding window, confirm that no active nests are present.
- Follow the Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (MOE 2013) if any active raptor nests are discovered within 100 m of the subject property. Active raptor nests are legally protected at all times of the year and some inactive nests (ex: Bald Eagle nests) are similarly protected.
- Specific Western Toad Management Strategies for Summit Lake (FLNRO 2017) have been developed to inform land use practices such as highway infrastructure, forestry operations, recreation, and private land development. Management strategies include:
    - Maintain a minimum width of 20 m from the stream centerline for riparian corridors.

- Retain intact vegetation along streams and maintaining windfirm edges.
- Leave woody debris and leaf litter in place.
- Avoid pesticide and herbicide use.

5.10 Invasive Plant Management

Construction activities can potentially increase prevalence of invasive plant species which can out-compete native riparian vegetation, causing damage to habitat and ecosystem function. The following mitigation measures are recommended in order to reduce the establishment and proliferation of invasive plant species on site:

- All equipment should be thoroughly washed and inspected before entering the project site to prevent the import of new invasive plant seeds and root fragments.
- Amount of vegetation clearing, and soil disturbance should be minimized.
- All exposed soils should be re-vegetated immediately following construction.

6 RIPARIAN RESTORATION PLAN

6.1 General Principles

General principles for this riparian restoration plan in order to achieve a "No Net Loss" of habitats is achieved by applying the following priority sequence of mitigation options:

1. Avoidance of environmental impacts;
2. Minimization of unavoidable impacts;
3. On-site restoration; and
4. Offset residual impacts that cannot be minimized through compensation.

Complete avoidance of environmental impacts was not possible; therefore, minimization and on-site restoration is being proposed. Minimization is achieved by constructing the cabin in the location that requires the least amount of removal of mature trees and is setback a considerable distance from Summit Lake. The majority of the building site is within an existing disturbed area (currently mowed grass).

On-site restoration to mitigate potential impacts of the proposed development within the SPEA is achieved by revegetating a historically disturbed riparian area of approximately 240 m^2 (2,583 ft^2) on the north and east property boundaries with native plants and seeds.

6.2 Restoration Goals and Design

The goals of the proposed revegetation plan include:

- naturalizing an existing disturbed riparian area within the SPEA;
- creating additional vegetation buffer between the development and the riparian area; and
- restoring multi-layered habitat, similar to the intact riparian vegetation with a mix of native trees, shrubs and low growing perennials.

The revegetation prescription entails removing the turf, loosening the soil, and revegetating the restoration area with 15 native trees (replacement ratio of 3:1 for trees removed), 140 native shrubs, and a native riparian seed mix. Refer to Appendix 5 for the proposed restoration area. A list of recommended plant species is provided in Table 4 with the recommended riparian seed blend prescribed in Table 5. Plant species were selected based on their suitability for the property (ecoregion, exposure, and moisture regime). The restoration area will require using a combination of live cuttings (collected locally), native potted stock (4" to 5 gallon pot size) and re-seeding with specifically formulated herbaceous seed blend.

Table 4. Recommended plant list.

Common Name	Latin name	Recommended Pot Size
Trees		
Black cottonwood	Pseudotsuga menziesii	Cuttings, #1, #2
Paper birch	Betula payrifera	#1, #2 or #5
Western red cedar	Thuja plicata	#2 or #5
Tall Shrubs		
Black hawthorn	Crataegus douglasii	#1 or #2
Black twinberry	Lonicera involucrata	#1 or #2
Blue elderberry	Sambucus cerulea	#1 or #2
Douglas maple	Acer glabrum	#1 or #2
Nootka rose	Rosa nutkana	#1 or #2
Mountain alder	Alnus incana	live cuttings or #1
Mountain ash	Sorbus americana	#1, #2 or #5
Red osier dogwood	Cornus stolonifera	live cuttings or #1
Saskatoon	Amelanchier alnifolia	#1
Scoulers willow or sitka willow	Salix scouleriana or sitka	live cuttings or #1
Low shrubs		
Common snowberry	Symphoricarpos albus	#1
Thimbleberry	Rubus parviflorus	4" or #1
Goat's beard	Aruncus dioicus	4" or #1

Common Name	Latin name	Recommended Pot Size
Pink spirea	Spirea douglasii	4” or #1
Grasses and Flowers		
Blue joint grass	Calamagrostis canadensis	4” or #1
Canada Goldenrod	Solidago altissima	4” or #1
Silky lupine	Lupinus sericeus	4” or #1
Yarrow	Achillea millefolium	Seed or 4”

Table 5. Recommended seed mix blend for riparian habitat.

Native Riparian Blend 1	% weight	% by species
slender wheatgrass	25.0%	18%
streambank wheatgrass	25.0%	18%
fringed brome grass	24.7%	9%
northern wheatgrass	20.0%	14%
sheep fescue	3.0 %	10%
tufted hairgrass	1.0 %	11%
fowl bluegrass	1.0 %	9%
Yarrow	0.3%	3%

The landscape design shall provide mixed plant structure and layering, which meets or exceeds the below prescription. The proposed revegetation will require ongoing maintenance (ie. irrigation and weeding), until they become naturalized over the moderate to long term.

Revegetation of disturbed areas within private property will include:

- Plant trees (min 1.5 m in height) at ≥ 3 meter spacing.
- Plant shrubs at >1 m spacing with a mixture of flowers, grasses and groundcover species interspersed throughout.
- Planting holes shall be three times the pot size.
- Lightly mulch around planted potted stock.
- Re-seed exposed soils by raking top 2 inches of planting area to loosen soil. Spread seed mix on soil at a rate of 25 kg/Ha.

General Planting and Maintenance Guidelines

- Planting should not occur during periods of hot dry weather unless they are irrigated daily.

- Live cuttings shall be collected locally and follow the Instructions for Harvesting, Transporting, and Storing Live Cuttings found in Appendix 6.
- Native riparian seed blend specially formulated for riparian area application is available at Interior Seed & Fertilizer https://interiorseedandfertilizer.ca and or through Masse Environmental in small volumes.
- Locally adapted native plants are preferable to those collected or grown outside the region. The species listed in Table 4 are available from Sagebrush Nursery in Oliver https://sagebrushnursery.com , or Nupqu Native Plants https://nupqu.com/native-plants-nursery-home/ near Kimberley.
- Use transplant fertilizer (ie. Mykes Mycorrhizae Tree and Shrub or similar) as per manufacturers specifications in each planting hole.
- Plantings which do not survive should be replaced to ensure complete establishment of native plants, and exclusion of exotic plants.
- Ensure the objective of the restoration is to naturalize the riparian area and not create a landscaped garden.
- Regularly irrigate new plantings during the plant establishment period for a minimum of 5 years and thereafter as required.
- Pull any invasive weeds on a yearly basis prior to going to seed.
- Replanting of riparian vegetation around buildings should adhere to principles of rural residential fire protection (for more information see the FireSmart Homeowner's Manual MFLNRO N.D.).

The anticipated effort for environmental monitoring and professional guidance on this project includes the following:

- QEP to provide guidance during revegetation, as required.
- QEP will conduct a post site visit once revegetation is complete to assess compliance and completion of the project and submit an environmental summary report to the RDCK.

7 CONCLUSION

The Developer is proposing the construction of a two-storey cabin and associated services within the Subject Parcel. The Owners are seeking a reduction in the WDP/SPEA setback from 30m to 17m from the swamp boundary to accommodate the construction of the proposed cabin.

From an ecological standpoint, the development when located as proposed, will result in the removal of less mature trees compared to a scenario where the development is entirely situated beyond the 30 m

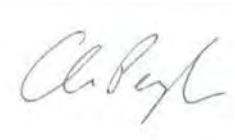
WDP area. The proposed development has a footprint of 184m^2 within the SPEA and will require the removal of five mature trees, contributing to cumulative local losses of wildlife and fish habitat within local riparian areas.

To help reduce the ecological impacts caused by the land development the Owners have incorporated these four important mitigation measures:

- Designed a cabin with a relatively small footprint (184m^2 total) within the 30 m SPEA.
- Minimization of mature tree removal with the SPEA by proposing development mostly within existing disturbed areas (most of which is mowed lawn and gravel driveway)
- Revegetation of disturbed area (240 m^2) to help mitigate loss of habitat and help restore riparian function on the subject property.

We, as QEPS, are of the professional opinion that the proposed relaxation of the riparian setback from 30m to 17 m from the swamp boundary is adequate to protect the ecological function and values of the swamp, as long as no further encroachment occurs beyond the construction the cabin, and that the mitigation and restoration measures recommended in this report are implemented.

Sincerely,



Claire Peyton, P.Ag., B.Sc.

Reviewed by:

Fiona Lau, BTech., AScT
Masse Environmental Consultants

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APPENDIX 1. SITE LOCATION MAP

RDCK Map

Legend

- Streams and Shorelines
- Wetlands
- Place Names
- Electoral Areas

243 Island View Rd
Summit Lake

Location Map

Map Scale:
1:40,000

N
W E
S

Date:
January 9, 2024

REGIONAL DISTRICT
OF CENTRAL KOOTENAY
Box 590, 202 Lakeside Drive,
Nelson, BC V1L 5R4
Phone: 1-800-268-7325
www.rdck.bc.ca
maps@rdck.bc.ca

APPENDIX 2. PROPOSED DEVELOPMENT SITE PLAN

RDCK Map

Legend

- Electoral Areas
- Cadastre - Legal Parcels
- Address Points

243 Island View Rd
Site Plan
Drawn by: FL
Date: Jan 11, 2024

15 m

Map Scale:
1:1,000

Date:
January 11, 2024

REGIONAL DISTRICT
OF CENTRAL KOOTENAY
Box 590, 202 Lakeside Drive,
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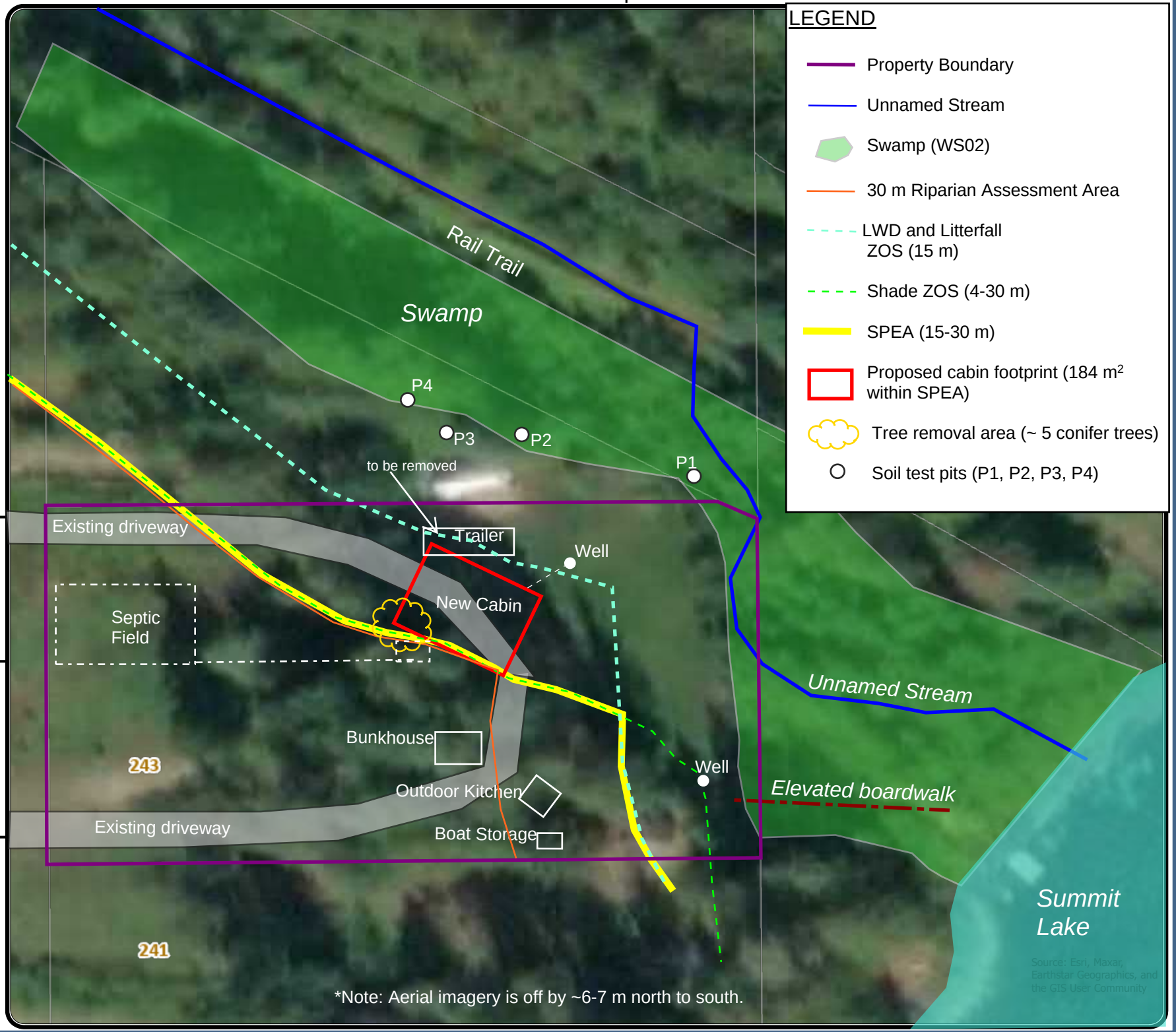

APPENDIX 3. SPECIES AT RISK

Species-at-Risk in the Bonanza Biodiversity Corridor (Ecologic and Masse 2020).

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
Anaxyrus boreas	Western Toad	amphibian	Yellow	Special Concern	Special Concern	confirmed	Summit Lake Toad Management Area, many local observations from Hills through Summit Lake
Plethodon idahoensis	Coeur d'Alene Salamander	amphibian	Yellow	Special Concern	Special Concern	possible	Reported from New Denver to Nakusp and suitable habitat exists
Argia vivida	Vivid Dancer	arthropod	Blue	Special Concern	Special Concern	possible	Nearby occurrences in Slocan Valley, Little Wilson Lake
Bombus occidentalis	Western Bumble Bee	arthropod	Blue	Threatened		possible	Observed at Snk'mip wetland (2018), near Bonanza bridge (June 2021); CDC occurrence in field near Alvarez road (2010).
Buckacrellis hispida	Bristly Grasshopper	arthropod	No Status			Possible	Montane species with global distribution apparently limited to the Selkirk Mtns. Assessed as Imperiled (S2) in BC by NatureServe Canada.
Libellula pulchella	Twelve-spotted Skimmer	arthropod	Blue			possible	Occurs in lower Slocan Valley and suitable habitat exists
Ophiogomphus occidentis	Sinuous Snaketail	arthropod	Blue			possible	Occurs in lower valley and suitable riparian habitats exist

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
Theridula emertoni	Emerton's Bitubercled Cobweaver	No Status				unknown	Assessed as Imperiled (S2) in BC (NatureServe Canada); 5 records in BC.
Accipiter gentilis atricapillus	Northern Goshawk	bird	Blue	Not at Risk		confirmed	One record at Summit Lake, one record at Bonanza Marsh (Gary Davidson); occurs nearby
Aechmophorus occidentalis	Western Grebe	bird	Red	Special Concern	Special Concern	confirmed	Several records at Summit Lake and also at north end of Slocan Lake (Gary Davidson)
Ardea herodias herodias	Great Blue Heron	bird	Blue			confirmed	Quite a few records from the Summit Lake area and Bonanza Marsh (Gary Davidson)
Buteo platypterus	Broad-winged Hawk	bird	Blue			confirmed	Observed at Summit Lake Oct. 2021 (T. Ehlers)
Chordeiles minor	Common Nighthawk	bird	Yellow	Special Concern	Threatened	confirmed	Several records from Summit Lake, although not recently (Gary Davidson)
Coccothraustes vespertinus	Evening Grosbeak	bird	Yellow	Special Concern	Special Concern	Possible	
Contopus cooperi	Olive-sided Flycatcher	bird	Blue	Special Concern	Threatened	Possible	This species breeds regularly at elevation above this region. There are

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
							one or two records of fall migrants within the corridor (Gary Davidson)
Cygnus columbianus	Tundra Swan	bird	Blue			possible	
Cypseloides niger	Black Swift	bird	Blue	Endangered	Endangered	possible	Has been reported flying over Summit Lake (Gary Davidson)
Dolichonyx oryzivorus	Bobolink	bird	Blue	Threatened	Threatened	possible	
Euphagus carolinus	Rusty Blackbird	bird	Blue	Special Concern	Special Concern	possible	Occurs nearby and suitable habitat exists
Hirundo rustica	Barn Swallow	bird	Blue	Special Concern	Threatened	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	bird	Blue			possible	Reported nearby and suitable habitat exists
Megascops kennicottii	Western Screech-Owl	bird	No Status	Threatened	Threatened	possible	Occurs in Slocan and suitable habitat exists
Melanerpes lewis	Lewis's Woodpecker	bird	Blue	Threatened	Threatened	unlikely	Occurs near Slocan, but unlikely to occur in the more dense brushy areas of the Bonanza corridor (Gary Davidson)

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
Podiceps auritus	Horned Grebe	bird	Yellow	Special Concern	Special Concern	possible	
Progne subis	Purple Martin	bird	Blue			unlikely	One record of a single bird flying over Bonanza marsh (Gary Davidson)
Riparia riparia	Bank Swallow	bird	Yellow	Threatened	Threatened	unlikely	
Tringa flavipes	Lesser Yellowlegs	bird	Yellow	Threatened		possible	
Acipenser transmontanus pop. 2	White Sturgeon	fish	Red	Endangered	Endangered	Unlikely	Historic occurrence in Slocan Lake
Cottus confusus	Shorthead Sculpin	fish	Blue	Special Concern	Special Concern	possible	Occurs in Slocan River, Little Slocan, and Springer Creek; shares habitat affinity and difficult to distinguish from Cottus bairdii which occurs in Bonanza Creek
Cottus hubbsi	Columbia Sculpin	fish	Blue	Special Concern	Special Concern	possible	Name changed from Cottus bairdi hubbsi in 2006; Bonanza Creek (as Mottled Sculpin); Little Slocan River
Lota lota pop. 1	Burbot	fish	Red			Unlikely	Historic occurrence in Slocan Lake near Evans Creek mouth
Oncorhynchus clarkii lewisi	Westslope Cutthroat Trout	fish	Blue	Special Concern	Special Concern	Unlikely	Not recorded in Summit Lake

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
Rhinichthys umatilla	Umatilla Dace	fish	Red	Threatened		Unlikely	Occurs nearby in Slocan River
Salvelinus confluentus	Bull Trout	fish	Blue	Special Concern		unlikely	In Slocan lake, could possible occur in lower reach of Bonanza Creek
Armillaria nabsnona		fungus	Blue			Possible	Field observations have morphological similarity to specimens found in Slocan that were identified from DNA
Arrhenia epichysium		fungus	Blue			Possible	
Arrhenia lobata		fungus	Blue			Possible	
Bjerkandera adusta		fungus	Blue			Possible	
Boletopsis grisea		fungus	Blue			Possible	
Cantharellus subalbidus	White Chanterelle	fungus	Blue			unlikely	
Cheilymenia fimicola		fungus	Blue			Possible	ID not confirmed, but similar to specimens found in lower Slocan Valley
Deconica angustispora		fungus	Blue			Possible	
Geastrum saccatum	Rounded Earthstar	fungus	Blue			Possible	
Gomphus clavatus	Pig's Ears	fungus	Blue			Possible	
Neournula pouchetii		fungus	Blue			Possible	

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
Peziza varia		fungus	Blue			Possible	
Trichoglossum hirsutum	Hairy Earthtongue	fungus	Blue			Possible	
Tricholomopsis decora		fungus	Blue			Possible	
Turbinellus floccosus	Scaly Chanterelle	fungus	Blue			Possible	
Nephroma occultum	Cryptic Paw	lichen	Blue	Threatened	Special Concern	possible	Nearby occurrences at Gardner Creek (near Kuskanax Road), Duncan Lake; suitable habitat exists
Corynorhinus townsendii	Townsend's Big-eared Bat	mammal	Blue			Possible	Snk'mip marsh
Gulo gulo luscus	Wolverine	mammal	Blue	Special Concern	Special Concern	possible	Occurs in the Valhalla and Central Selkirk Ranges (Kortello and Hausleitner 2015); most likely occurs in study area but has not been documented during surveys, likely due to harvesting pressure in the 90's (Doris Hausleitner pers. comm. 2022).
Myotis ciliolabrum	Western Small-footed Myotis	mammal	Blue			possible	
Myotis lucifugus	Little Brown Bat	mammal	Yellow	Endangered	Endangered	possible	Snk'mip marsh

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
Myotis septentrionalis	Northern Myotis	mammal	Blue	Endangered	Endangered	possible	
Oreamnos americanus	Mountain Goat	mammal	Blue			unlikely	Observed signs on subpeak of Mt. Ferrie during field surveys; known for the Central Selkirks
Pekania pennanti pop. 5	Fisher	mammal	Red			possible	Historic furbearer trapping data throughout the Slocan Valley; suitable habitat exists
Ursus arctos	Grizzly Bear	mammal	Blue	Special Concern	Special Concern	confirmed	Well known to occur along rail trail
Anguispira kochi	Banded Tigersnail	mollusc	Blue	Not at Risk		possible	Single occurrence at lower Bonanza Creek
Cryptomastix mullani	Coeur d'Alene Oregonian	mollusc	Blue			Possible	Near Snk'mip; throughout watershed at low elevations in riparian settings
Hemphillia camelus	Pale Jumping-slug	mollusc	Blue			possible	Single occurrence, upper Summit FSR (2020)
Kootenaia burkei	Pygmy Slug	mollusc	Blue	Special Concern	Special Concern	possible	Found nearby (East Wilson FSR)
Oreohelix subrudis	Subalpine Mountainsnail	mollusc	Blue			possible	Occurs in the West Kootenay and Oreohelix observed in BBC might be this species.

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
Sphaerium occidentale	Herrington fingernailclam	mollusc	Blue			confirmed	Single occurrence documented near Summit Lake in 2021
Zacoleus idahoensis	Sheathed Slug	mollusc	Blue	Special Concern	Special Concern	possible	Within the range of the species and suitable habitat exists.
Berula incisa	cut-leaved water-parsnip	plant	Blue			Possible	
Botrychium michiganense	Michigan moonwort	plant	Blue			unlikely	1 site in 2021 (ID Jamie Fenneman)
Botrychium montanum	mountain moonwort	plant	Blue			unlikely	3 sites
Epipactis gigantea	giant helleborine	plant	Yellow	Not at Risk		unlikely	Regionally rare species, only found within the BBC at Snk'mip marsh (SWAMP 2015); formerly blue listed
Pinus albicaulis	whitebark pine	plant	Blue	Endangered	Endangered	unlikely	Healthy stand near Mt. Ferrie observed 2020; BC CDC has mapped occurrences
Rubus nivalis	snow bramble	plant	Yellow				Regionally rare species occurs sporadically in the ICHmw2; formerly blue listed (currently S3S4 provincial rank)

Scientific Name	English Name	Taxa Group	BC List[1]	COSEWIC[2]	SARA[2]	Potential Occurrence at Summit Lake	Comment
Charina bottae	Northern Rubber Boa	reptile	Yellow	Special Concern	Special Concern	unlikely	Occurs in lower Slocan Valley (Lemon Ck., Winlaw) but no confirmed reports north of Slocan Lake; suitable habitat exists in warmest low elevation sites in SE corner of the BBC
Chrysemys picta pop. 2	Western Painted Turtle	reptile	Blue	Special Concern	Special Concern	Unlikely	Documented in newly created wetland at Snk'mip marsh (VFE 2021); occurs in Slocan River and Box Lake
Plestiodon skiltonianus	Western Skink	reptile	Blue	Special Concern	Special Concern	Unlikely	Occurs in lower Slocan Valley (Lemon Ck., Winlaw) but no confirmed reports north of Slocan Lake; suitable habitat exists in warmest low elevation sites in SE corner of the BBC

1 BC Conservation Status (CDC): Red = extirpated, endangered, or threatened. Blue = special concern. Yellow = secure. 2COSEWIC/SARA: Endangered (E) = Facing imminent extirpation or extinction. Threatened (T) = Likely to become endangered. Special concern (SC) = May become a threatened or an endangered. Species listed on Schedule 1, SARA are legally protected.

APPENDIX 4. ARCHAEOLOGICAL CHANCE FIND PROCEDURES

KTUNAXA NATION

Ktunaxa Nation Council
7825 Mission Road
Cranbrook, BC V1C 7E5
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fax: 250-489-2438

visit us at:
www.ktunaxa.org

Chance Find Procedures for Archaeological Material

This document provides information on how a developer and/or their contractor(s) can manage for potential archaeological material discoveries while undertaking construction and/or maintenance activities. This document can provide assistance to in-field contractors in the identification of archaeological remains and the procedures to follow if a discovery is made. The discovery of human remains initiates a different course of action and is outlined separately.

Under the provincial *Heritage Conservation Act (HCA)*, archaeological sites that pre-date 1846 are automatically protected whether on public or private land. Protected sites may not be damaged, altered or moved in any way without a Section 12 or 14 Permit as issued through the *HCA*. It is illegal to collect or remove any heritage object from an archaeological site unless authorized to do so under permit.

1. Activities occurring outside of known Archaeological Sites:

When archaeological material is encountered outside of known archaeological site areas work in the vicinity must stop immediately no matter what type of material or feature has been identified. Alteration to an archaeological site can only occur under a Section 12 (Site Alteration Permit) or Section 14 (Heritage Inspection Permit) *Heritage Conservation Act* permit. Such permit applications should be prepared by a professional archaeologist.

If archaeological material is discovered during the course of construction activities:

1.1 **Stop Work:** Halt all work in the area of the discovery and safely secure the area. Contact the project manager or site foreman.

1.2 **Contact an Archaeologist:** An archaeologist should be contacted as soon as possible. For a list of qualified archaeologists in the area, the proponent is directed to the BC Association of Professional Consulting Archaeologists website: www.bcapa.ca. The proponent may also wish to contact the Ktunaxa Nation Council's Archaeology Technician Nathalie Allard for direction (1-250-426-9549; nallard@ktunaxa.org).

1.3 **Archaeologist provides guidance:** The archaeologist will direct the proponent on the next courses of action, which will include notifying the Archaeology

Branch and First Nations with interest in the area.

2. Activities Occurring within Known Archaeological Site Boundaries:
Land altering activity within a previously recorded archaeological site must be conducted under a Section 12 HCA Site Alteration Permit (SAP), in some cases with an onsite archaeological monitor. It is common for additional archaeological material and features to be encountered during activities occurring within previously recorded archaeological sites. Minor finds (lithic flakes, diffuse charcoal or fire altered rock) may not require work to stop, however significant finds require a level of assessment by a professional archaeologist, and it is up to the onsite project manager to determine the level of significance based on criteria presented below.

2.1 Significant Cultural Finds that Require a Professional Archaeologist (described in detail in Section 4)

- Intact archaeological features, which can include but are not limited to hearths, cultural depressions (e.g. cache pits, house depressions) and rock alignments or forms (e.g. tipi rings, cairns, blinds)
- Significant archaeological materials, which include but are not limited to, the presence of formed lithic tools (e.g. projectile point, microblade core, scraper), a dense concentration of lithic waste flakes, or artistic items
- Human Remains (described in detail in Section 3)

2.2 Archaeological Site Management Options

2.2.1 **Site Avoidance**: If the boundaries of a site have been delineated, redesign the proposed development to avoid impacting the site. Avoidance is normally the fastest and most cost effective option for managing archaeological sites. Site avoidance could also be achieved through minimizing ground disturbance by looking for alternative constructive methods.

2.2.2 **Mitigation**: If it is not feasible to avoid the site through project redesign, it is necessary to conduct systematic data collection and analysis within the site prior to its loss. This could include surface collection and/or excavation. This work can be time-consuming and therefore expensive to conduct.

2.2.3 **Protection**: It may be possible to protect all or portions of the site which will be impacted through installation of barriers during the development period and possibly for a longer period of time. Methods for barrier construction could include fencing around site boundaries or applying

geotextile to the ground surface and capping it with fill. The exact method used would be site-specific.

3. Chance Find Procedures for Identified Human Remains

Procedures in the event of the discovery of human remains during construction are covered in depth by an Archaeology Branch Policy Statement, found on their website at www.for.gov.bc.ca/archaeology, and are summarized below.

3.1 Stop all construction activities immediately in the area of found or suspected human remains and contact the RCMP and/or Office of the Coroner.

3.2 The coroner must determine whether the remains are of contemporary forensic concern or archaeological/aboriginal.

3.3 If the remains are found to be of aboriginal ancestry then the next step involves the relevant First Nations collaboratively determining the appropriate treatment of those remains.

The key to respectfully dealing with ancient aboriginal remains is to involve the appropriate First Nations as early as possible in the process. However this must be done in a manner that does not interfere with the coroner's office ability to conduct their business in the manner that they see fit.

4. Site Identification Guide

The following are characteristics typical to site types found within the Ktunaxa Traditional Territory.

4.1 Artifact Scatters

Lithic (stone) scatters from the production and maintenance of stone tools are the most common type of archaeological site found in the region. Other materials that may be represented in artifact scatters are Fire Broken Rock (FBR), bone, antler and tooth.

Lithics: What to look for

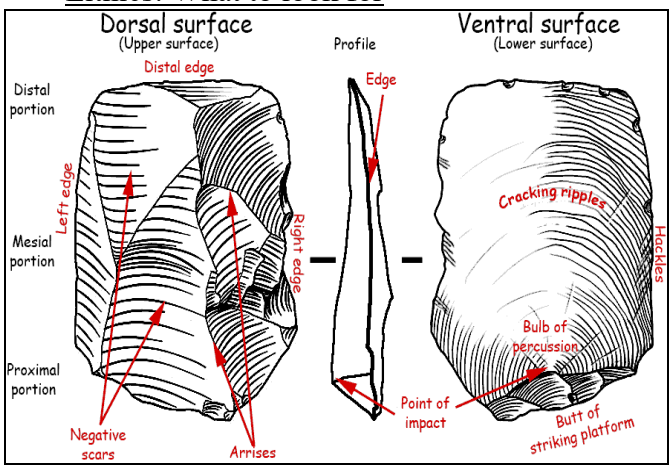

Image 1: Basic flake morphology

Image 2: Examples of lithic flakes

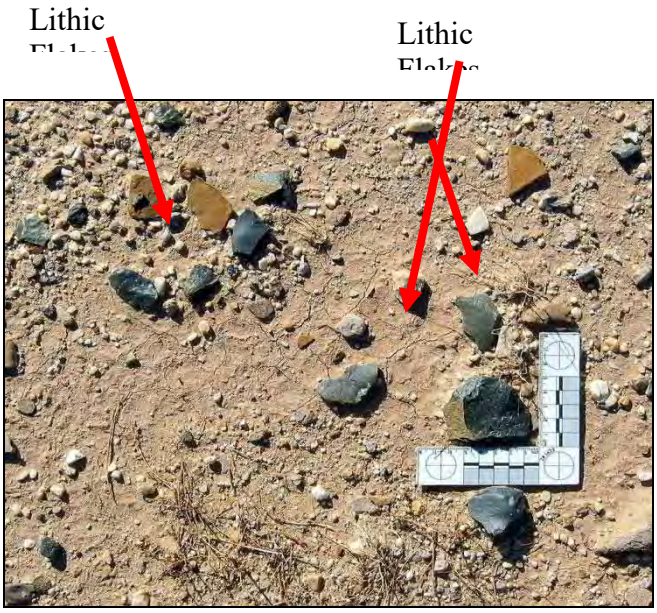

Image 3: Example of lithic scatter found on ground surface

Image 4: Example of formed lithic artifacts

Image 5: Ground stone artifacts

Bone, Tooth and Antler Artifacts: What to Look For

- Obvious shaping
- Incising
- Unnatural holes

Image 6: Bone and Antler artifacts

4.2 Fire Broken Rock and Hearths

Fire-broken rock (FBR) results from the use of fire during cooking, heating and processing activities. FBR is often associated with other features including hearths and cultural depressions, but can also be thinly scattered in concentrations away from the features with which they were first associated.

When looking for FBR, note concentrations of roughly fractured rock from rapid heating and cooling, rock showing signs of burning or oxidation and/or reddening or blackening of surrounding matrix.

Image 7: Example of FBR; note the zig/zag pattern of breakage common to FBR

A hearth feature is evidence of a fire pit or other fireplace feature of any period. Hearths were used for cooking, heating, and processing of some stone, wood, faunal, and floral resources and may be either lined with a wide range of materials like stone or left unlined. Occasionally site formation processes (e.g., farming or excavation) deform or disperse hearth features, making them difficult to identify without careful study.

Hearths: What to look for

- FBR
- reddening or blackening of the associated soil/sediment
- charcoal
- layering of FBR and charcoal, and
- depressions in the earth associated with FBR, reddened or blackened matrix and charcoal.

Image 8: Example of a hearth uncovered along the wall of an excavation unit

4.3 Cultural Depressions

Any depression seen on the ground surface that appears to have been excavated by man can be a cultural depression and have archaeological significance. These "pits" were dug for a variety of reasons such as for food storage, cooking or as a base for a dwelling. They can range in size from 1m across to 7-10m across, and are usually found associated with other artifacts such as FBR and lithic scatters.

To identify a cultural depression, look for:

- Subtle to deep scours on the ground surface that are circular to rectilinear in shape
- A raised rim along the edge of a depression
- Depressions associated with artifacts and FBR
- Depressions associated with fire reddening and blackening of the matrix

Image 9: Example of a large cultural depression in a natural setting

4.6 Rock Alignments

There are several types of rock alignments that occur within the culture area, which include tipi rings, medicine wheels, cairns and blinds. When attempting to identify rock alignments, look for a group of rocks that look purposefully placed as in a circle, pile or line; isolated groups of rock that do not seem to belong to that landscape; and/or rocks which form a pattern.

Image 10: Example of a Cairn or piling of rocks

Image 11: Example of a tipi ring in a natural setting

APPENDIX 5. RESTORATION PLAN

RDCK Map

Legend

Electoral Areas

Cadastre - Legal Parcels

Address Points

243 Island View Rd
Re-vegetation Plan
Drawn by: FL
Date: Jan 12, 2024

15 m

Map Scale:
1:1,000

Date:
January 11, 2024

REGIONAL DISTRICT
OF CENTRAL KOOTENAY
Box 590, 202 Lakeside Drive,
Nelson, BC V1L 5R4
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APPENDIX 6. INSTRUCTIONS FOR HARVESTING, TRANSPORTING, AND STORING LIVE CUTTINGS

Instructions for Harvesting, Transporting, and Storing Live Cuttings

for

Vegetating and Stabilizing Streambanks

Phil Balch

October 2008

Wildhorse Riverworks Inc.

INTRODUCTION

Live cuttings are leafless stem cuttings of woody plant species. These cuttings can be planted in various configurations to achieve certain vegetative and stabilization goals. The planting method(s) will be specified in the project or planting design. These methods may include: live siltation, brush layering, branch packing, brush mattress, live stakes, live poles, vegetated geo-grids, live crib-walls, joint planting, live fascines, and many others.

Willow and cottonwood cuttings are commonly used for riparian rehabilitation because they are easily established from cuttings. Although this document is primarily intended for willow species, the occasional inclusion of cottonwoods, sycamores, or other species as cuttings is acceptable. For additional species suitability, see the USDA, NRCS, publication National Engineering Handbook (NEH) Part 650. *Chapter 16: Streambank and Shoreline Protection.*

Cuttings can be obtained from commercial nurseries or cut from native stands located near project sites. When buying cuttings from commercial sources, the source and species shall be compatible with the planting area, i.e. native to the area and suitable for the local climate.

CUTTINGS FROM NATIVE STANDS

Native willow stands located near the project site are the best source of cuttings. On large stream systems, native willow stands are normally found on point bars directly across the river from project areas. Native stands of willow and cottonwood may have insect and disease infestations which can stress the plants. Extremely dry years or long periods of drought may also cause plant stress. This stress may reduce plant energy reserves resulting in decreased plant survival. When planning the number of cuttings to harvest, take stress indicators into account and harvest extra plants if needed.

Permission to harvest from the landowner, private or public, must be obtained prior to harvesting live cuttings.

CUTTINGS

Establishment success is significantly increased if cuttings are taken from live willows during the dormant season. This is the period between the fall leaf drop and the plant leaf budding in the spring.

See "Storage" section for procedures when harvesting well before the projected planting date.

Cutting Diameter

Cuttings shall be 1/2 inch diameter or larger depending upon the species. Ideal trees for cuttings should be from 3/4 inch to 3 inches in base diameter. Larger diameter cuttings have more energy and stored reserves than smaller diameter cuttings, but are often more difficult to place into the ground. Cuttings from 2 to 3 inches in diameter typically have the highest survival rates.

Cuttings as large as 8 inches can be used as poles instead of live stakes. Live poles provide more resistance to higher velocity flows and create roughness which reduces water velocity. However, larger diameter cuttings require longer cutting lengths and should be planted deeper in the soil. Deciding factors for selecting the cutting diameter are: stand density, size of the selected native species, and the selected planting method. When planting, cuttings should be large enough that they will not bend or break while being driven during installation. Smaller diameter cuttings, or limbs removed from larger cuttings are more suitable for brush mattresses, brush layering, branch packing, live fascines, or vegetated geo-grids.

Cutting Length

Cuttings shall have at least two leaf nodes, or bud scars, above the ground as illustrated on page 6. Cutting length is largely determined by the depth to the mid-summer vadose zone, or the area of moist soil at the lower bank. For ease of handling and transportation, cuttings should be harvested and stored at full length and then cut into shorter lengths prior to planting. Plantings should be placed on the lower portion of the streambank slope. Cuttings shall be long enough so the stem base reaches into the vadose zone. This zone extends slightly above the water surface elevation in most situations (See illustration on page 6).

- Several inches of the bottom of each cutting should be in the vadose zone.
- Each cutting should have a minimum of 2-4 buds above the ground.
- Observe the 2/3 or 3/4 rule: 2/3 to 3/4 of the cutting length should be placed below the soil surface.

Harvest of Cuttings

Once cutting size, source location is determined — and landowner permission obtained — the actual cutting process can begin. Lopping shears, pruning shears, a small wood saw, brush cutters, or a chain saw are appropriate tools for harvesting cuttings. Desired cutting size will determine the appropriate tool(s).

- Make clean cuts. Ensure all equipment is sharp.
- Use live wood at least 1 year old or older. Do not use very old or dry wood.
- Larger wood is difficult to root. The best wood is 2-5 years old with smooth bark which is not deeply furrowed.
- Avoid current year's growth. It lacks the stored energy reserves necessary to consistently sprout when planted.
- When harvesting from native stands, make sure the stand will not be denuded or destroyed by your cutting activity, most willow species will sprout and grow from base of harvested plant.
- Trim off all side branches so only the main stem remains.
- The side branches can be used in live fascines, branch packing, brush layering, etc.
- Harvested plant material shall be ¾ inch to 3 inches in diameter at the base and 6 to 12 feet tall.
- A processing alternative, when cutting limbs into live stakes, is to cut the top of cutting with a horizontal cut and bottom of cutting with a 45 degree cut, (See illustration on page 6). This allows quick recognition of the cutting top (see Caring for Harvested Cuttings).
- Care should be taken to select plant materials that are free of physical damage, disease, and insect damage.

Caring for Harvested Cuttings

One of the most important steps in this process is the identification of **TOP** of cutting. If cuttings are planted upside down, mortality will occur. Leaf scars are the most reliable indicator to identify the cutting top. Buds emerging from leaf scar always point up. Another key is the stem. Usually, the smaller diameter end is the top of cutting; however this is not always obvious.

Transportation and Storage

After being harvested, the cuttings should be tied into bundles small enough to be easily carried by 1 or 2 people. Each bundle may contain 25 – 50 trees, depending on their size. Placing the same number of cuttings in each bundle makes it easier to count the number of harvested cuttings.

During harvesting, transportation, and storage, willow bundles should be kept moist and protected from sunlight and wind by covering or wrapping the bundles with wet burlap or a reflective moisture barrier to protect cuttings from becoming desiccated.

To minimize storage time, harvest cuttings in early spring within two to three weeks of the planned planting date. If this is not possible, cuttings can be harvested in late fall or winter and stored in a large cooler at 34-38°F until immediately prior to planting. Cuttings can be stored for several months in this manner. If cuttings are kept in a cooler, root cellar, garage, or shop floor, make sure the storage area is dark, moist, and cool at all times. Maintain a storage temperature slightly above freezing. Cuttings may be wrapped in a black tarp or plastic to be kept dark, if stored in an out building. Cuttings should be checked periodically for signs of frost damage and/or to insure that mold is not forming.

Pre-plant Soaking of Cuttings

Soaking plant material, prior to planting, significantly increases the survival rate. Prior to planting, all cuttings should be soaked for a minimum of 36 hours, regardless whether they are stored or harvested for immediate planting. Research shows that soaking the cuttings for 7 to 10 days can double the survival rate. Cuttings should be removed from water prior to root emergence from the bark. This normally takes 7 to 10 days. Soaking initiates the root growth processes within the inner layer of bark in willows and cottonwoods.

Only the bottom 1/3 of the cuttings needs to be soaked. However, soaking the entire cutting is not detrimental. Soaking can be accomplished in any container that will hold enough water to the required depth. Cuttings can also be soaked in streams, ponds, lakes, or other bodies of water. Avoid soaking cuttings in areas that are susceptible to flooding or where beavers are present.

PLANTING LIVE CUTTINGS

Spacing Considerations

Plant the cuttings about 3-4 feet apart for all live cuttings. This spacing is suitable for both within and between rows. Normally, only the lower slope should be planted with willows. Live cuttings should be

planted on the first and/or second row above the edge of water. The first row is normally planted approximately 4 feet from the waters edge at low flow. Subsequent rows should be planted an additional 3 - 4 feet up slope from the previous row. Each row should be planted on an off-set pattern from the previous row (See attached design details on pages 6 and 7).

When to Plant

Cuttings should be planted in early spring after frost has left the soil, but no later that June 1. Avoid planting cuttings or rooted stock in summer because of heat stress and a shortened growing period.

Planting Methods and Planting Cuttings

One or two-person posthole power augers, hand soil augers, planting bars, shovels, soil probes, or simply pushing or driving the cutting into moist soil are appropriate tools to plant cuttings. When planting, keep several things in mind:

- Push the cutting into the soil when possible.
- If the soil is too firm to push the cutting into the soil, the cutting can be driven into the soil using a hammer. A 2-3 pound "dead blow hammer", or shot filled mallet, works well to drive cuttings. This type of hammer reduces the chance of splitting the cutting or stake.
- If a cutting is split while driving, trim the cutting to below the split to prevent desiccation and plant mortality.
- It is essential to have firm contact between the cutting and soil. Avoid creating air pockets around the cutting that can prevent roots from developing. Holding on to the cutting with one hand while driving reduces air pocket formation.
- Avoid damaging buds when inserting the cutting into the hole or when driving the cutting.
- If the soil is too compacted to drive the cutting, a hole can be formed by driving a rebar or other metal rod into the soil first and then placing the cutting into the hole. The hole diameter shall be smaller than the cutting diameter to prevent air pocket formation.
- Holes can be created with any of the tools mentioned at the start of this section.
- The planting depth will determine the planting method. Deeper holes will be made easier by using a power auger.
- If the hole dug is larger that the cutting, additional soil will be required to form a good soil to stem contact. Preference should be given to local topsoil to encourage mycorrhizal formation and/or nodule formation by nitrogen-fixing organisms. Do not backfill with clay.
- Carefully tamp the soil around the cutting firmly several times as you fill any drilled or augered hole.
- "Water In" the back-filled soil around large cutting holes to settle soil and provide good soil to cutting contact.

MANAGEMENT AND MAINTENANCE

Proper management is necessary to maintain healthy, competitive plants that perform the desired function. This is as important as the initial planting to ensure rehabilitation of the riparian area. Some maintenance is expected on-site for several years after planting. For the first few years after planting, vegetation should be evaluated and monitored annually, or after any flood event. Some replanting may be needed in succeeding years in order to insure the establishment of a functioning riparian corridor.

Monitoring of the site is necessary to detect any in-stream dead organic material (i.e. old logs, dead root masses, branches, etc.). In-channel organic material may cause erosive cross currents that can erode a planted streambank. If this condition develops, the organic material should be removed or repositioned. Any trimming of cuttings should be done in the dormant season so growth will not be slowed during the growing season. During the establishment period, leave standing dead branches within the plantings to reduce stream flow velocities, thus protecting the established plantings.

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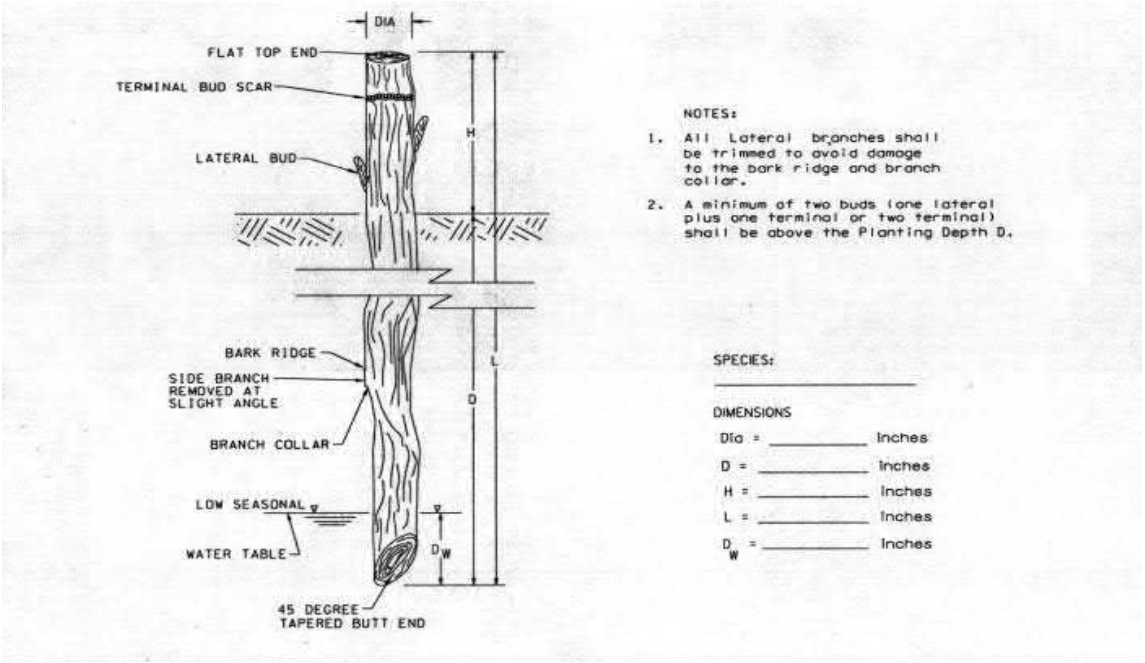
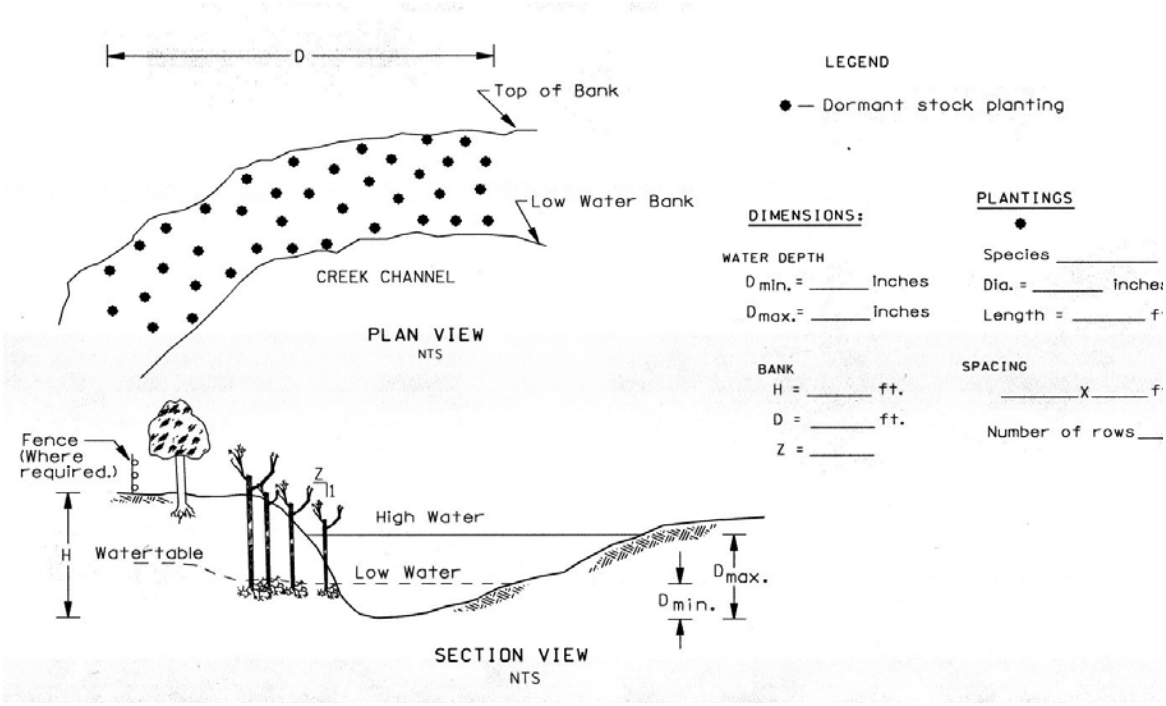


Source – USDA – Soil Conservation Service



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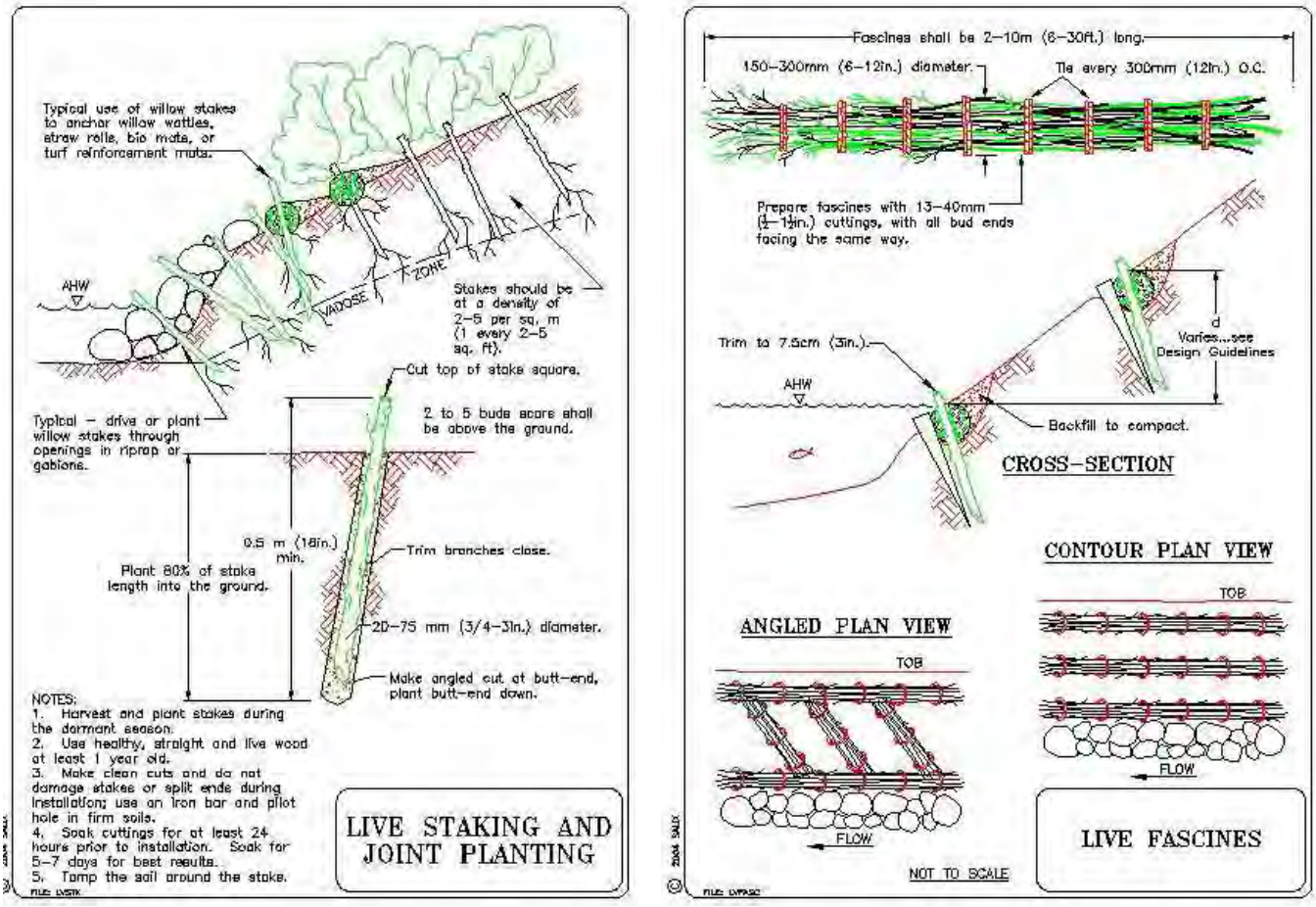

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