



Larch Hills Trail Lighting Project - Phases 1-4

Environmental Impact Assessment

Background Report

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Prepared for:

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Summary

The Larch Hills Nordic Society is a volunteer driven, 1000 member non-profit organization that builds and maintains cross country ski and snowshoe trails and associated facilities at Larch Hills Recreation Area. With limited daylight during the winter, trail lighting will extend the availability of safely lit trails from 4 PM to 9 PM. Installation of light poles and underground wiring will be a multi-phased approach based on the availability of funding to eventually creating 6 km of lit trail (Phase 1 = 1.64 km, Phase 2 = 1.79 km, Phase 3 = 1.75 km, Phase 4 = 0.89 km). All lit trail sections will be on previously developed road bed, some sections of the lit trail will cross through the Upper Violet Creek Provincial Park.

This environmental impact assessment (EIA) was completed to inform the Section 57 application submitted by the Larch Hills Nordic Society to the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD). The EIA considers all four phases (6 km) of the trail lighting project in the assessment of environmental impacts and consideration of appropriate mitigation measures. Further field assessments will be completed during the spring-summer 2020 prior to excavation and installation of the lighting system.

The lighting system will require installation of ~133 steel poles at ~48 m spacing, with each pole supported by a pre-cast concrete base. Engineered drawings have been submitted with the Section 57 application to Recreation Sites and Trails BC. The lighting system will utilize LED lights connected by underground wiring. A small excavator or backhoe will be used to dig trenches for the underground wiring. Installation for each phase will be planned during the summer to fall period, with Phase 1 (and possibly 2) will be completed prior to the 2020-2021 winter ski season.

Key Recommendations

1. Follow current protocols and mitigation measures prior to further tree removal to reduce impacts on nesting birds.
2. Install sediment and erosion control structures (eg. silt fencing) where excavation is required adjacent to stream crossings to keep sediment laden water from entering water course, and follow standard best practices for working near water (eg. machinery is clean and free of oil leaks).
3. Complete site restoration after trenches and light stands are backfilled using appropriate grass seed mixtures that promote native plants and reduce the distribution and abundance of invasive plants.
4. Follow the mitigation matrix provided in Appendix A to develop an effective long-term environmental management plan for the Larch Hills recreation area.

Assessment Methods

The office-based component of this EIA involved information gathering from several online geographic data sources (e.g., iMAP, GeoBC) and the review of related planning documents and literature (e.g., Upper Violet Creek Provincial Park Purpose Statement and Zoning Plan).

The field assessment for the EIA will be conducted when the project area is snow-free (late spring to fall 2020), and during times appropriate to assess the presence of specific plant and animal species at risk within the project limits. The field assessment will be conducted by walking the proposed new lit trail corridor with qualified professionals following standard plant and animal inventory techniques. Field assessment will document observations of wildlife, their sign and habitats (e.g., nesting trees) as well as locations of any plant species or communities at risk (Provincially Red or Blue listed).

Although all excavation work is planned to occur within existing road beds with minimal tree/vegetation removal, we will conduct field assessments for wildlife habitat trees and nest trees prior to any required tree removal. Site specific nest surveys will determine if any active bird nests are present prior to any tree clearing that is required. If active nests are identified, tree clearing may be delayed until fledglings have left the nest or another nest survey has been completed to verify that there are no active nests on site. Nest trees are protected by both provincial and federal law (BC Wildlife Act, Federal Migratory Birds Convention Act).

Detailed ecological information collected during the field work for this EIA will be summarized in a report and may be used in the future to contribute to ecological education and outreach efforts (e.g., interpretive signage), which have been an important component of the Larch Hills Trail System for decades.

Office-based Assessment Results

The Larch Hills Nordic Society's ski and snowshoe trails are located 12 km southeast of Salmon Arm on the southeastern edge of the Larch Hills. Many existing ski and snowshoe trails cross within the Upper Violet Creek Provincial Park. The entire 6 km route proposed for the Trail Lighting Project is within existing road beds that have a history of both industrial forestry use and motorized recreation during spring-fall seasons. Trenching for underground wiring and excavation for concrete light post bases will be mainly within these previously disturbed areas of road way. Some light posts may require minimal clearing to offset them outside of the road bed in order to allow safe passage during winter tracksetting. The proposed trail lighting route has been selected to avoid all wetlands, there is no requirement for trenching or excavation within any wetlands or streamside riparian areas.

The Upper Violet Creek Provincial Park was created primarily to protect two major water sources that enter Mara Meadows Ecological Reserve downstream of the ski trails (see Map 2). The Mara Meadows Ecological Reserve is a rare mid-elevation calcareous fen, a unique wetland habitat that supports rare plants and is dependent on the maintenance of the existing quantity and quality of water flowing in from Upper Violet Creek. The secondary role of the Upper Violet Creek Park is to provide for the continued recreational use of the cross country ski trails that cross through the area and are thought to pose little threat to the park values (Upper Violet Creek Provincial Park Purpose Statement and Zoning Plan 2006). The Upper Violet Creek Park boundaries are roughly 50 m parallel on either side of the main Violet Creek stream channel, including the 2 tributaries that are the outlets to boggy wetlands known as Bilbo's bog and Frodo's bog.

Biophysical land classification in this area includes the Shuswap Highland Ecosection, which is well represented (17%) in the Provincial Parks and Protected Areas system. The Trail Lighting Project trails are also within the ICH mw5 (Interior Cedar-Hemlock Granby moist warm) biogeoclimatic subzone variant. The Natural Disturbance Type here is listed as NDT2 (ecosystems with infrequent stand-initiating events). The ICHmw5 biogeoclimatic subzone variant encompasses a 5800 hectare area above ~1000 m elevation and extends north to Sicamous across the entire larch Hills. All four Phases of the Trail Lighting Project will be between 1000 and 1060 m elevation. The vegetation along the trail corridor is typical of the ICHmw5.

A list of plant and animal species at risk was generated by using the BC Conservation Data Centre's BC Species and Ecosystem Explorer, and querying based on biogeoclimatic zone (ICH) within the Columbia Shuswap Regional District. The list was further refined based on knowledge of the project site (e.g., fish species and aquatic plants were removed). The result is that there are 2 Red-listed plant and animal species (any species or ecosystem that is at risk of being extirpated, endangered or threatened) that may occur within the project area, and 7 Blue-listed species (any species or ecosystem that is of special concern). Table 1 will form the basis of rare plant and animal field assessments that will occur during the spring and summer prior to any site preparation or excavation work. Discussions with locals and naturalists may add to this list of species. Field assessments will include presence/not detected surveys (following available provincial standards developed by the Resources Information Standards Committee – RISC), as well as a general assessment of wildlife trees and nest surveys to avoid any removal of nesting trees.

Table 1. BC Conservation Data Centre Results for Red and Blue Species Occurrence within the Columbia Shuswap Regional District Interior Cedar Hemlock biogeoclimatic zone.

English Name	Scientific Name	BC List	Name Category	Habitat Subtype
Vivid Dancer	<i>Argia vivida</i>	Blue	Invertebrate Animal	Stream/River;Hot Spring;Warm Spring;Cold Spring
Mexican mosquito fern	<i>Azolla mexicana</i>	Blue	Vascular Plant	Riparian Shrub;Pond/Open Water
Haller's apple moss	<i>Bartramia halleriana</i>	Red	Nonvascular Plant	
Monarch	<i>Danaus plexippus</i>	Blue	Invertebrate Animal	Pasture/Old Field;Cultivated Field;Hedgerow;Meadow;Grassland;Sagebrush Steppe;Urban/Suburban
Magnum Mantleslug	<i>Magnipelta mycophaga</i>	Blue	Invertebrate Animal	Talus;Conifer Forest - Moist/wet
Lewis's Woodpecker	<i>Melanerpes lewis</i>	Blue	Vertebrate Animal	Riparian Forest;Pasture/Old Field;Cultivated Field;Hedgerow;Meadow;Grassland;Sagebrush Steppe;Deciduous/Broadleaf Forest;Conifer Forest - Dry;Urban/Suburban;Antelope-brush Steppe
Northern Myotis	<i>Myotis septentrionalis</i>	Blue	Vertebrate Animal	Riparian Forest;Stream/River;Lake;Caves;Conifer Forest - Mesic (average);Conifer Forest - Dry;Conifer Forest - Moist/wet;Urban/Suburban;Pond/Open Water
Western Skink	<i>Plestiodon skiltonianus</i>	Blue	Vertebrate Animal	Riparian Forest;Riparian Shrub;Stream/River;Sub-soil;Rock/Sparsely Vegetated Rock;Talus;Meadow;Grassland;Sagebrush Steppe;Conifer Forest - Mesic (average);Conifer Forest - Dry;Mixed Forest (deciduous/coniferous mix);Riparian Herbaceous;Antelope-brush Steppe;Gravel Bar
American Badger	<i>Taxidea taxus</i>	Red	Vertebrate Animal	Sub-soil;Pasture/Old Field;Talus;Meadow;Grassland;Shrub - Natural;Sagebrush Steppe;Conifer Forest - Mesic (average);Conifer Forest - Dry;Krummholtz;Antelope-brush Steppe;Shrub - Logged;Alpine Grassland

There were no wildlife observations recorded in the provincial wildlife species inventory database (WSI) that was accessed through iMAP BC's interactive mapping site. There were also no wildlife habitat areas, habitat features, or ungulate winter ranges nearby the Trail Lighting Project area in the Larch Hills. Temporary impacts to wildlife during installation of the lighting system (spring-fall) will include sound disturbance from machinery. Trenching and light pole excavations will be backfilled immediately following installation of underground wiring. Impacts to wildlife during winter use of the lit trails are expected to be low. Most animals are either dormant or have migrated away during winter months when 6 km of trail corridor will be illuminated. Those animals that remain during the winter are likely habituated to skiers and snowshoers, or have already altered movement patterns to avoid these well-used trails. The Trail Lighting Project may actually create more predictable use of lit trails during specific times (e.g. 4:00 -9:00 PM) compared with the current situation. Several wildlife species have been shown to display less behavioural change when human presence is predictable and recreational use is contained within a trail corridor, in contrast to more random movements (Wiedmann and Bleich 2014).

Likely the most environmentally sensitive sites within the project area will be where the lit trail crosses or is adjacent to stream channels. The impacts of concern will be directly related to installation of trail light poles and trenching underground wiring. Although trenching and pole installation be within previously disturbed road beds, specific

mitigation measures will be required to protect water quality and sensitive riparian plant and animal habitat when in close proximity to stream channels (i.e., along Larch Hills Road). These mitigation measures will include locating light poles where they will have minimal disturbance/damage to riparian trees and vegetation, as well as controlling the potential for sediment and erosion to occur during construction, resulting in sediment-laden water entering the stream channel. Depending on site specific details, sediment and erosion control measures may include installing silt fences, avoiding excavation or tarping stockpiled soil during heavy rain events, and grass seeding immediately following installation of light poles and trenching within these sensitive areas. Details of this riparian mitigation will be developed during the spring-fall 2020 prior to any excavation work.

Post construction site remediation will include grass seeding with a standard forestry reclamation grass seed mixture that will help to stabilize exposed soils and reduce the likelihood of spread of invasive plants.

Field Results

We assessed the light post sites for Phase 1 (33 posts) and Phase 2 (38 posts) in early August 2020. No plant species at risk were identified and no signs of wildlife or wildlife habitat features were observed within the impact area of each light post. The area of impact that was visually assessed was approximately 9 m² (3 m x 3m) centered on each staked light post.

Light post locations and trench corridors that were assessed for this environmental review, were all within previously developed roadway edges. These roads have been used for decades for intensive forestry (logging, planting, silviculture) and recreation (summer motorized, equestrian, and winter skiing). The plant communities found along these roadways are typical of disturbed sites and contain many examples of invasive plant species. After installation of the light posts has been completed and trenched wiring is in place and backfilled, disturbed areas should be seeded with a restoration grass seed mixture that promotes native species and controls the expanded distribution and abundance of invasive plant species.



Figure 1. Photo of a staked light post location along Phase 1 of the Larch Hills trail lighting project. Each light post location was visibly assessed for plant species at risk (based on Table 1), signs of wildlife and wildlife habitat features (eg. nests).

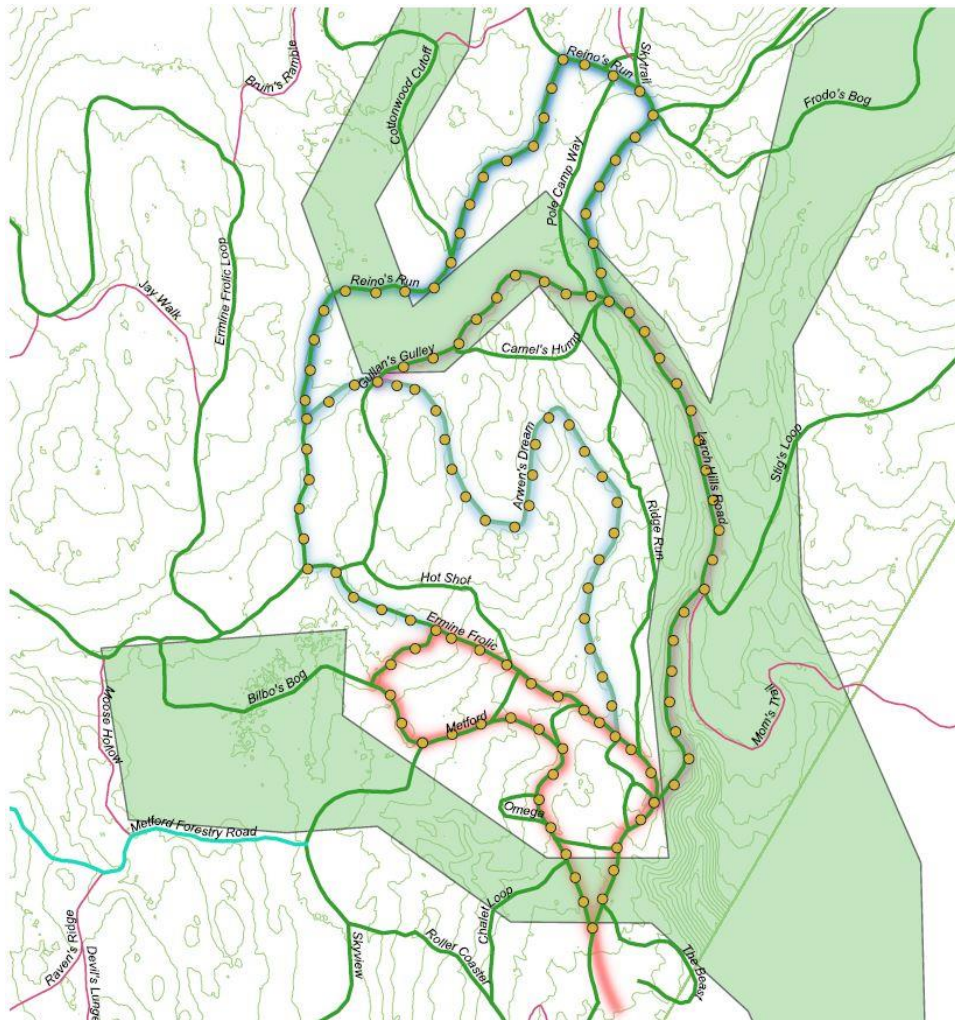
At the time of this field assessment, salvage logging along several trails had recently been completed. Lamp post sites were likely selected where tree removal had already occurred. Future phases of the trail lighting project that require tree removal at lamp post sites should follow current protocols for the protection of bird nests prior to any tree removal. Nests and nesting birds are protected under the Migratory Bird Conventions Act. These protocols or mitigation measures include:

- Avoid tree removal during general nesting period (mid-March - late August).
- Conduct Danger Tree Assessment and protect Wildlife Trees wherever possible.
- Nest surveys may be appropriate when conducted by an experienced observer, using appropriate methods, and in a specific area.

- Consider that nesting periods vary with bird species, climate, elevation, and habitat type.
- If tree removal is unavoidable during nesting periods, determine whether nests are present prior to tree removal.
- Nest surveys should also be considered when looking for conspicuous nest structures, and cavity nests in snags.
- If nests are discovered, halt all disruptive activities in the nesting area, avoid disturbing surrounding vegetation until the young have naturally left the vicinity, and protect the nest with a buffer zone.
- Nests of migratory birds are protected all year. It is prohibited to damage, destroy, or remove a non-active nest without a permit or authorization.

The list of mitigation measures above designed to reduce the impact of this development on nesting migratory birds, is one of many lists of measures that should be considered to help protect all environmental values of the Larch Hills. Beyond an initial environmental impact assessment, an effective long-term management plan requires an adaptive management approach where pre-set corrective actions are triggered when indicators of negative effects show that unacceptable impacts are happening. The mitigation matrix (Appendix A) provides these components (from environmental features to corrective actions) and is intended to guide a long term management plan.

Maps

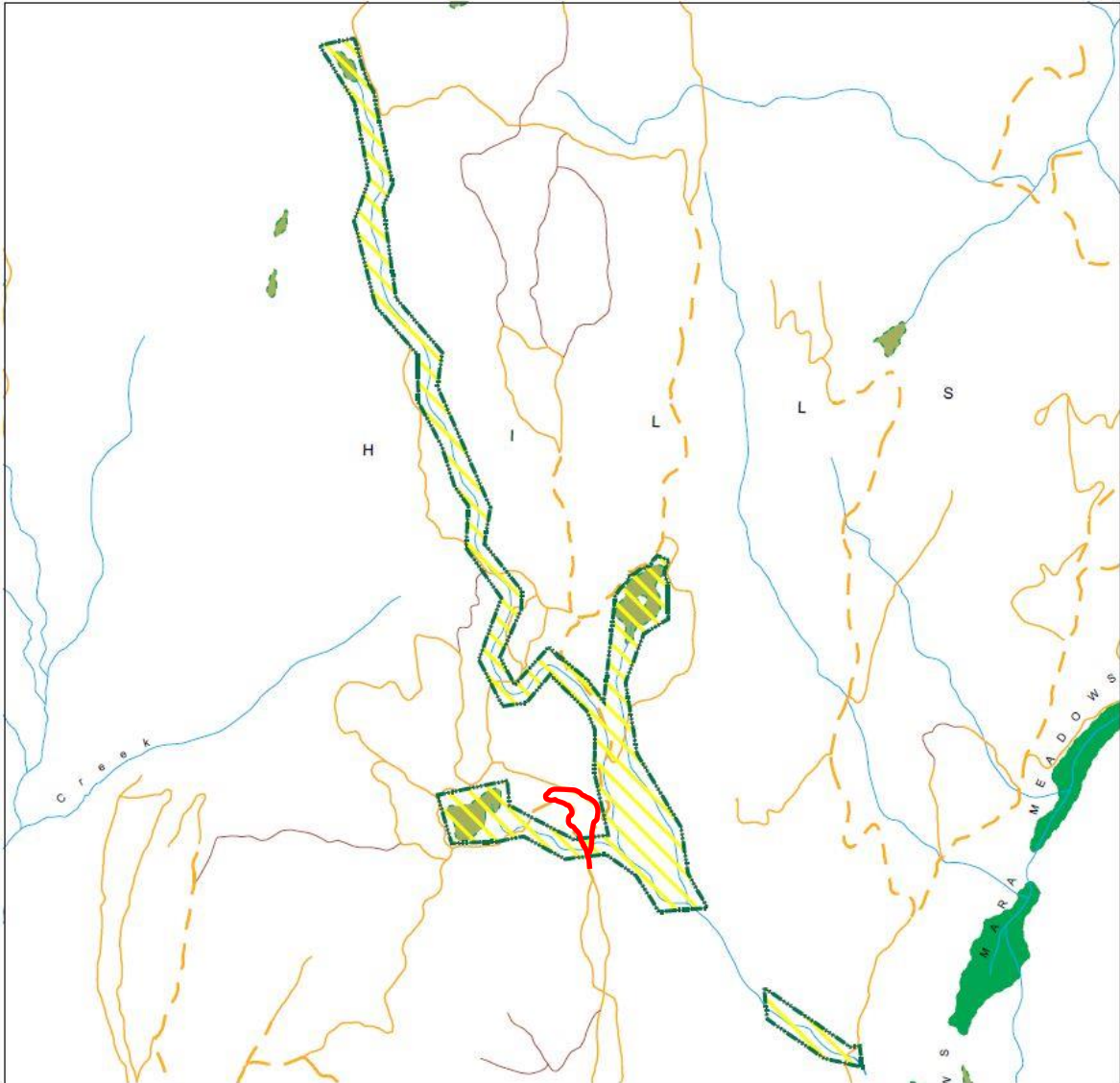


Lighting Concept

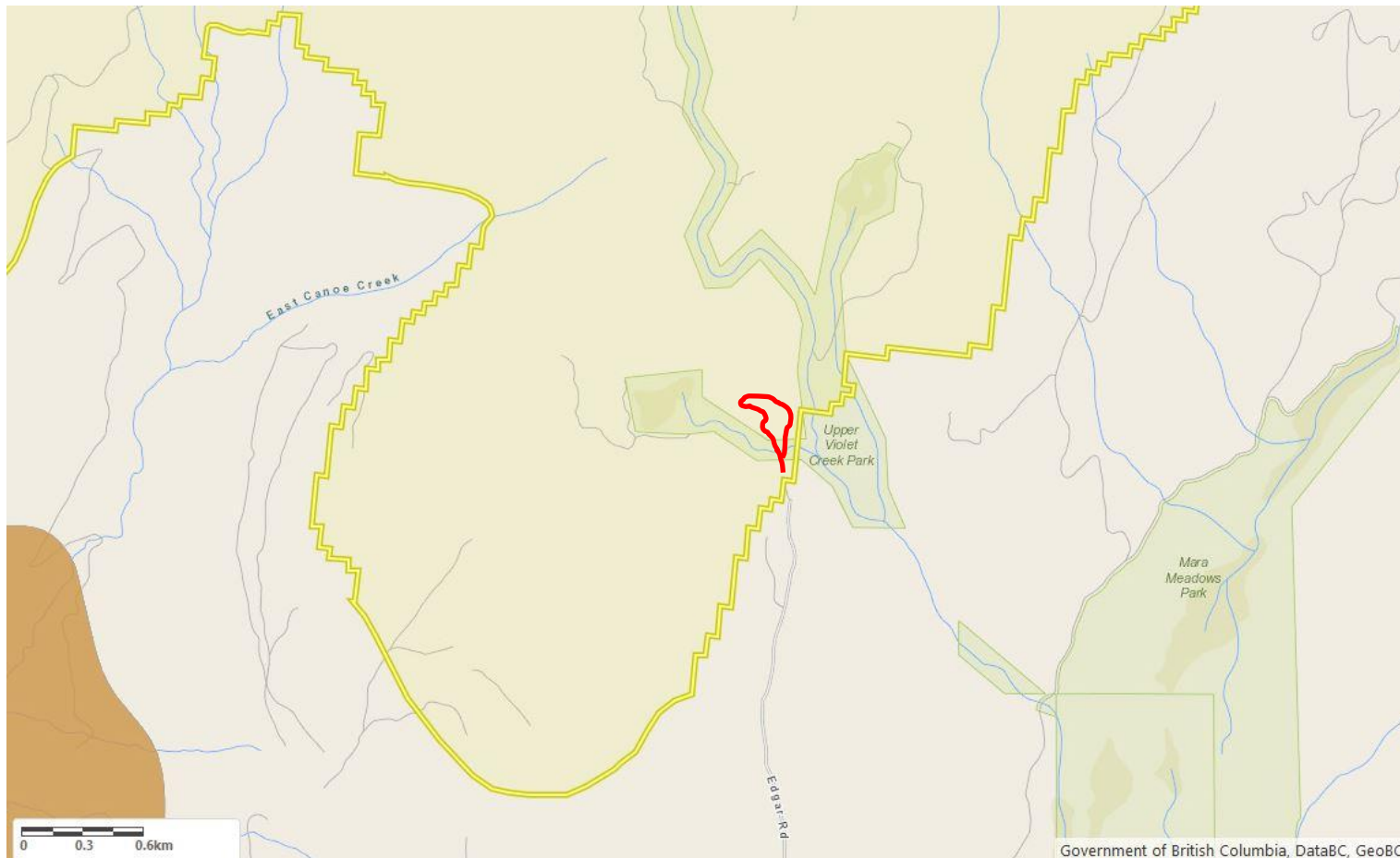
- Light Poles [126]
- Lighting Phases
- Phase 1
- Phase 2
- Phase 3
- Phase 4

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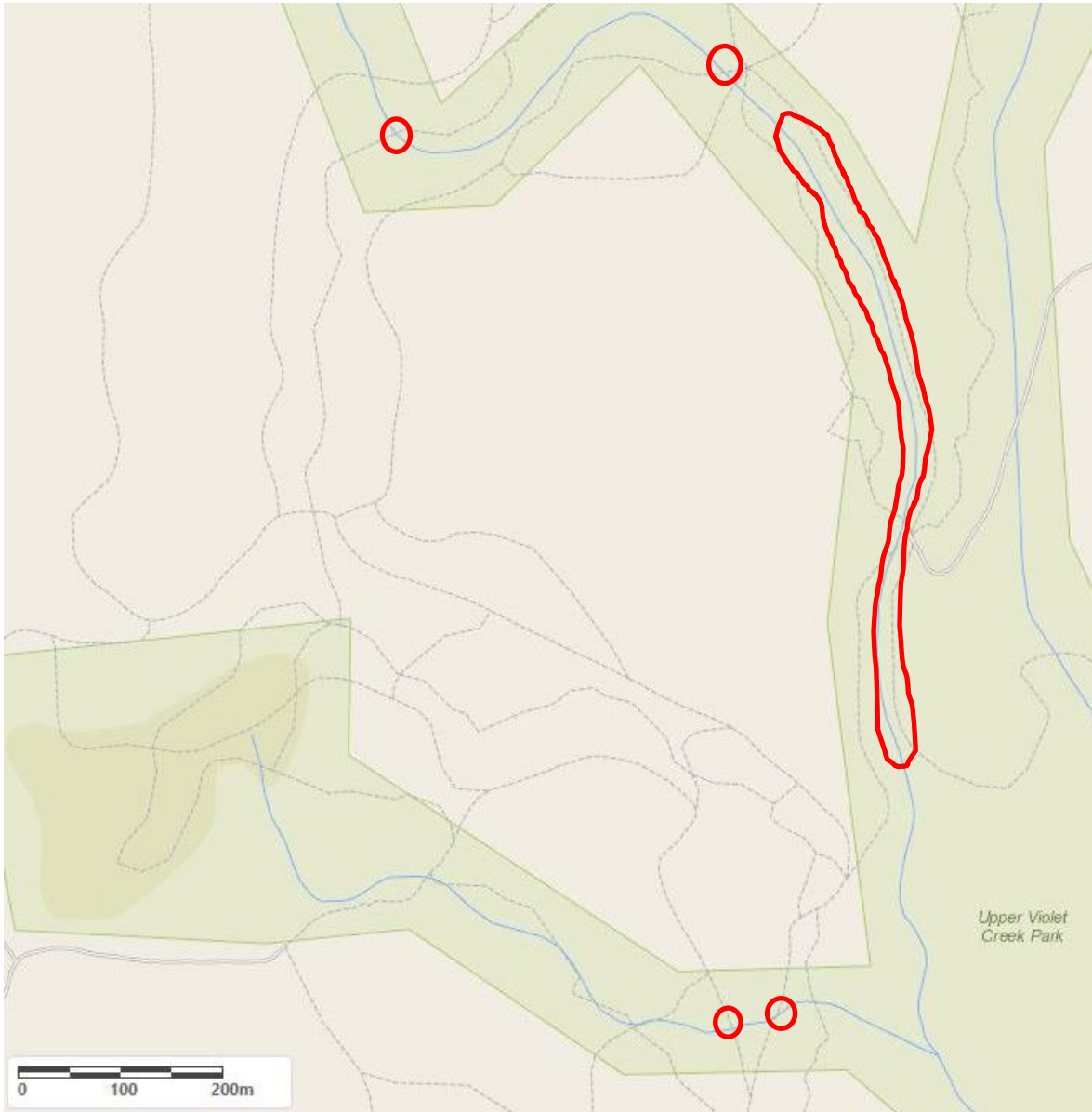
Map 1. Larch Hills central ski trails showing the 4 phases of development of lit trail and the location of the Upper Violet Creek Provincial Park.



Map 2. The location of Larch Hills Trail Lighting Project Phase 1 (red) as a reference to the location of the Upper Violet Creek Provincial Park (yellow cross-hatch) and the Mara Meadows Ecological Reserve (dark green) downstream of the Park and ski trails.



Map 3. The location of the Phase 1 trail section (red) as a reference for the Trail Lighting Project that is entirely within the ICH mw 5 (Interior Cedar Hemlock moist warm Granby) biogeoclimatic subzone variant (yellow), which extends north across the Larch Hills above ~1000 m elevation.



Map 4. This map shows the location of the Upper Violet Creek stream channel and areas where the Larch Hills Trail Lighting Project will cross within close proximity to the stream channel on existing road beds (red circles). Specific riparian tree/vegetation protection as well as sediment and erosion control measures will be required in these areas to avoid negative impacts to sensitive aquatic and riparian habitat values.

Appendix A:

Larch Hills Trail Lighting Mitigation Matrix. Intended to help guide the development of a long term adaptive management plan to protect environmental values.

Environmental Category	Environmental Feature	Potential Environmental Effects	Mitigation Measures	Links to Legislation and Guidelines	Monitoring	Indicators of Negative Effects	Limits of Indicators	Corrective Actions
Water	Riparian Areas (within 30 m of stream, pond, or lake connected to downstream fish habitat)	Loss of vegetation reduces quality of fish habitat (shade, nutrient inputs: leaf fall and insect drop). Trampling of stream/lake banks causes erosion, decreases water quality, and harms fish. Soil compaction and vegetation removal will encourage introduction of invasive plants.	Avoid riparian areas. Minimize vegetation removal within riparian areas. Use existing trails where possible within riparian areas. Avoid trail layout in close proximity and parallel to streams. Conduct invasive plant inventory for baseline information. Use seasonal trail closure signs if wet conditions increase negative impacts on riparian vegetation and cause sediment and erosion concerns.	Working Near Water: http://www.pac.dfo-mpo.gc.ca/habitat/index-eng.htm . RAR Implementation Guidebook: http://www.env.gov.bc.ca/habitat/fish_protection_act/riparian/documents/ImplementationGuidebook.pdf . DFO Operational Statement on Riparian Vegetation Maintenance: http://www.pac.dfo-mpo.gc.ca/habitat/os-er/riparian-riveraine-eng.htm .	Annual maintenance inspections. Trail user forms. Record of public complaints.	Loss of riparian vegetation. Increase of invasive plants. Increased soil exposure. Evidence of bank erosion and downstream siltation (cloudy sediment-laden water).	No unnecessary increase of trail surface within riparian areas. No loss of native riparian vegetation (understory shrubs) from trampling. No increase abundance and distribution of invasive plants.	Increase user education efforts (e.g. Stay on Trail!). Seasonal trail closures. Remove or relocate trail surface outside riparian area. Invasive plant removal. Create rehabilitation plan that presets criteria that are required re-open trail.
	Stream Crossing	Stream bank instability can cause sedimentation and reduce water quality downstream. Poorly designed bridge crossings can cause debris jams and floods. Bridge abutments can fill in channel and remove fish habitat. Bridge abutments can change hydraulics and cause scouring and erosion downstream	Use existing stream crossings. Construct clear-span bridges (follow DFO Operational Statement). Avoid any instream works. Schedule instream work within regional fisheries least-impact timing window. New stream crossings require Change Approval or Submit Notification of Instream Works (Section 11, Water Sustainability Act).	Follow Provincial Government Standards and Best Practices for Instream Works. Apply for Change Approval or Submit Notification of Instream Works: https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-licences-approvals/apply-for-a-change-approval-or-submit-notification-of-instream-work	Annual maintenance inspections. Trail user forms. Record of public complaints.	Woody debris collected at bridge or culvert crossings. Increased scouring of banks downstream of bridge/culvert. Bank erosion at crossing and downstream siltation (cloudy sediment-laden water). Loss of riparian vegetation. Increase of invasive plants.	No evidence that bridge or culvert is restricting stream flow and creating debris jam. No evidence of bank erosion at crossing. No loss of native riparian vegetation (understory shrubs) from trampling. No increase in abundance and distribution of invasive plants.	Increase user education efforts (e.g. Stay on Trail!). Seasonal trail closures. Remove or relocate stream crossing. Invasive plant removal. Create rehabilitation plan that presets criteria that are required re-open trail.
	Sensitive wetlands	Wetland soils are sensitive to compaction and erosion. Many red and blue listed plants are wetland plants. Damage to native wetland plants creates opportunities for introduction of invasive plants.	Redirect trail to avoid wetlands. Conduct sensitive plant inventory (Red/Blue list) and avoid areas where these plants are present. Conduct invasive plant inventory to use as baseline information.	E-Flora BC: http://www.geog.ubc.ca/biodiversity/eflora/ . Invasive Species Council of BC: http://www.bcinvases.ca/	Annual maintenance inspections. Trail user forms. Record of public complaints.	Loss of wetland vegetation. Increased soil exposure. Increase of invasive plants.	No evidence of soil compaction or loss of wetland vegetation outside of trail bed.	Increase user education efforts (e.g. Stay on Trail!). Seasonal trail closures. Remove or relocate trail outside of riparian area surrounding wetland. Invasive plant removal. Create rehabilitation plan that presets criteria that are required re-open trail.
Plants	Red/Blue listed Plants	Soil compaction can damage native plants and create conditions for introduction of invasive plants.	Conduct inventory within trail area for rare and endangered plants, avoid rare plant habitats, conduct baseline inventory of invasive plants	E-Flora BC: http://www.geog.ubc.ca/biodiversity/eflora/ . Invasive Species Council of BC: http://www.bcinvases.ca/	Annual maintenance inspections. Trail user forms. Record of public complaints.	Decrease in abundance or distribution of red/blue listed plants. Increased soil exposure. Increase presence of invasive plants.	No decrease in abundance or distribution of red/blue listed plants. No increase of invasive plants in sensitive sites.	Increase user education efforts (e.g. Identify red/blue listed plants). Seasonal trail closures. Remove or relocate trail away from red/blue listed plant location. Invasive plant removal. Create rehabilitation plan that presets criteria that are required re-open trail.
	Native plants on sensitive sites (grasslands, meadows, open forests)	Soil compaction and erosion can damage native plants and create prime conditions for the introduction of invasive plants. Removing standing dead trees along trails for safety concerns removes valuable wildlife habitat (e.g., cavity nesting birds).	Use existing trails where possible. Learn to identify invasive plants. Inspect clothing, equipment, pack animals and pets for plant parts before and after activity. Incinerate or bag and dispose of collected plant parts. Obey all signs and trail closures. Leave gates as you found them. Restrict use of areas with invasive plants to times of the year when spread is unlikely (e.g., the period from flowering to seed dispersal). Invasive plants should generally be cut at the ground rather than pulled if pulling is likely to result in dispersal of seed. Pack-in invasive plant-free seed for pack animals. Avoid grazing pack animals in infested areas. User education through signage ("Stay on Trail", remove all garbage); user education through Leave No Trace information (print, sign, and web); trail corridor design anticipates user movement by directing attention to focused destination points ("anchors" and "edges") such as view points, rest area, signs, transitional "gateways" into new landscape, resilient natural features including cliff bands, old growth trees, and rock placement; intensive use trailhead and gathering areas with washroom and garbage facilities	E-Flora BC: http://www.geog.ubc.ca/biodiversity/eflora/ . Invasive Species Council of BC: http://www.bcinvases.ca/	Annual maintenance inspection plus ongoing user "trail watch", quarterly field inspections, and ongoing intensive use trailhead maintenance resulting in repair, rehabilitation, signage, user education through media/print/web, and trail closure if compliance is not maintained.	Evidence of unnecessary trail widening/braiding. Increased areas of exposed soil and native plant damage outside of trail bed (especially at view points). Increased soil exposure. Increase presence of invasive plants.	No unnecessary trail widening or development of unauthorized trails. No increase in soil exposure outside of the trail bed. No increase abundance and distribution of invasive plants.	Increase user education efforts (e.g. signage, web, print media). Seasonal or complete trail closures. Create structures at viewpoints to limit trampling/expansion (e.g., benches, railings). Invasive plant removal. Create rehabilitation plan that presets criteria that are required re-open trail.
	Hillsides, difficult or technical terrain	Poorly designed trails on steep ground can change drainage patterns and cause erosion. Erosion will cause trail widening and rutting. Erosion will remove organic material from soil and expose roots damaging native vegetation. Erosion causing sedimentation of streams will decrease water quality and harm fish.	Follow appropriate trail design and construction standards for slopes (e.g., 8-10% grade average). Create alternate arounds designed for less-skilled and/or higher impact trail users. Design trail to avoid stormwater runoff down trail. Half rule (trail slope does not exceed half the grade of the hill), regular grade reversals (prevents water flow down trail tread). 5-8% outslope on trail tread, 35-45% backslope above trail tread (facilitates water sheeting over tread), full bench tread construction on side slopes, and use of gabion rock basket tread reinforcements on steep switch backs.	Recreation Sites and Trails BC - Chapter 10: http://www.for.gov.bc.ca/hfp/publications/00201/chap10/chap10.htm . International Mountain Bike Association: http://www.imbacanada.com/resources/trail-building . Whistler trail standards: www.orcb.ca/research_pub.htm	Annual maintenance inspections. Trail user forms. Record of public complaints.	Erosion of trail bed. Scoured rutting and compaction increasing depth of trail. Deposition of soil and debris at switchbacks or change in slope. Sediment-laden water below erosion sites.	No sediment-laden water as a result of trail erosion. Minimal increase in trail width and depth from erosion.	Construct rock armouring, stormwater control structures. Seasonal trail closures. Realign or relocate trail to avoid steep slopes where erosion is occurring. Create rehabilitation plan that presets criteria that are required re-open trail.

Environmental Category	Environmental Feature	Potential Environmental Effects	Mitigation Measures	Links to Legislation and Guidelines	Monitoring	Indicators of Negative Effects	Limits of Indicators	Corrective Actions
Wildlife	Red/Blue listed Wildlife	Physiological and behavioural disruption to wildlife from increased human (and dog) presence.	Record wildlife encounters, actions taken, and responses of animals. Remain on established trails. Obey all signs and area closures. Do not harass wildlife. Do not handle wildlife. Do not allow dogs to be at large and harass wildlife. Pack out all garbage. Yield to wildlife on trails and roads. Focus activities in areas and at times of the year when wildlife are least likely to be disturbed. Remain still or retreat when animals are encountered and react to human presence. Stay at distances sufficient to prevent changes to the behaviour of animals (at least 100 m in open areas is the default for large mammals). For alpine trails in high-quality wildlife habitat, develop these guidelines specifically for large mammal species such as caribou, grizzly bear and mountain goat. Review list of potential wildlife using area and their critical/high-value habitats. Conduct cursory wildlife habitat assessment. Avoid disturbing wildlife habitat features and trail layout in high quality wildlife habitat.	Wildlife guidelines for backcountry tourism/commercial recreation: http://www.env.gov.bc.ca/wild/twg/index.html . Identified wildlife management strategy: http://www.env.gov.bc.ca/wild/frpa/iwms/index.html	Record Record wildlife encounters, actions taken, and responses of animals. Consider use of remote trail cameras to monitor changes in wildlife behaviour. Annual maintenance inspections. Trail user forms. Record of public complaints.	Increased proportion of encounters resulting in an alarm response (movement by animals to safer locations). Declining wildlife inventory trends in trail area.	No increase in rate of alarm responses of wildlife over time. No abandonment of habitats by wildlife. Consult with regional biologists through Ministry of Environment offices to determine acceptable limits of change, especially for species such as Grizzly bear.	Trail closures. Trail relocation outside of prime habitat. Consult with species specialists to determine specific thresholds for trail closures ahead of time.
	Nesting Birds	Tree removal (including dead/dying trees) can have lethal impact on nesting birds. There are 364 federally protected species of birds that breed in Canada.	Avoid tree removal during general nesting period (mid-March - late August). Conduct Danger Tree Assessment and protect Wildlife Trees wherever possible. Nest surveys may be appropriate when conducted by an experienced observer, using appropriate methods, and in a specific area. Nesting periods vary with bird species, climate, elevation, and habitat type. If tree removal is unavoidable during nesting periods, determine whether nests are present prior to tree removal. Nest surveys should also be considered when looking for conspicuous nest structures, and cavity nests in snags. If nests are discovered, halt all disruptive activities in the nesting area, avoid disturbing surrounding vegetation until the young have naturally left the vicinity, and protect the nest with a buffer zone. Nests of migratory birds are protected all year. It is prohibited to damage, destroy, or remove a non-active nest without a permit or authorization.	Migratory Birds Convention Act: https://laws-lois.justice.gc.ca/eng/acts/M-7.01/ . Guidelines to reduce risk to migratory birds: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html	Monitoring may be implemented to avoid engaging in potentially destructive or disruptive activities at key locations during nesting periods.			
Interfaces	Forestry Harvest areas, interface with motorized roads and tracks	Unanticipated consequences of use of non-motorized trails by motorized users can cause trail tread displacement, erosion, trail width and depth impacts	Sign non-motorized trails; utilize stiles and trailhead design (pinches, grade, doglegged starts) to filter for intended use; collaborative planning, monitoring, and education with motorized trail stewardship orgs	Forest and Range Protection Act 46 (1.1). Protection of the environment.	Annual maintenance inspection plus ongoing user "trail watch".	Observations of motorized use of non-motorized trails. Evidence of erosion and soil compaction, tread displacement from unintended motorized use of non-motorized trails	No sediment-laden water as a result of trail erosion. Minimal increase in trail width and depth from erosion. Minimal tread displacement.	Warning signage. Construct fencing, stiles, or barriers if appropriate. Increase user education through media/print/web, increased patrol and monitoring by stewardship organizations, and trail closure if compliance is not maintained.

References

B.C. Conservation Data Centre. 2020. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed Mar 4, 2020).

Wiedmann, B.P., V.C. Bleich. 2014. Demographic responses of bighorn sheep to recreational activities: A trial of a trail. *Wildlife Society Bulletin*.38(4): 773-782.