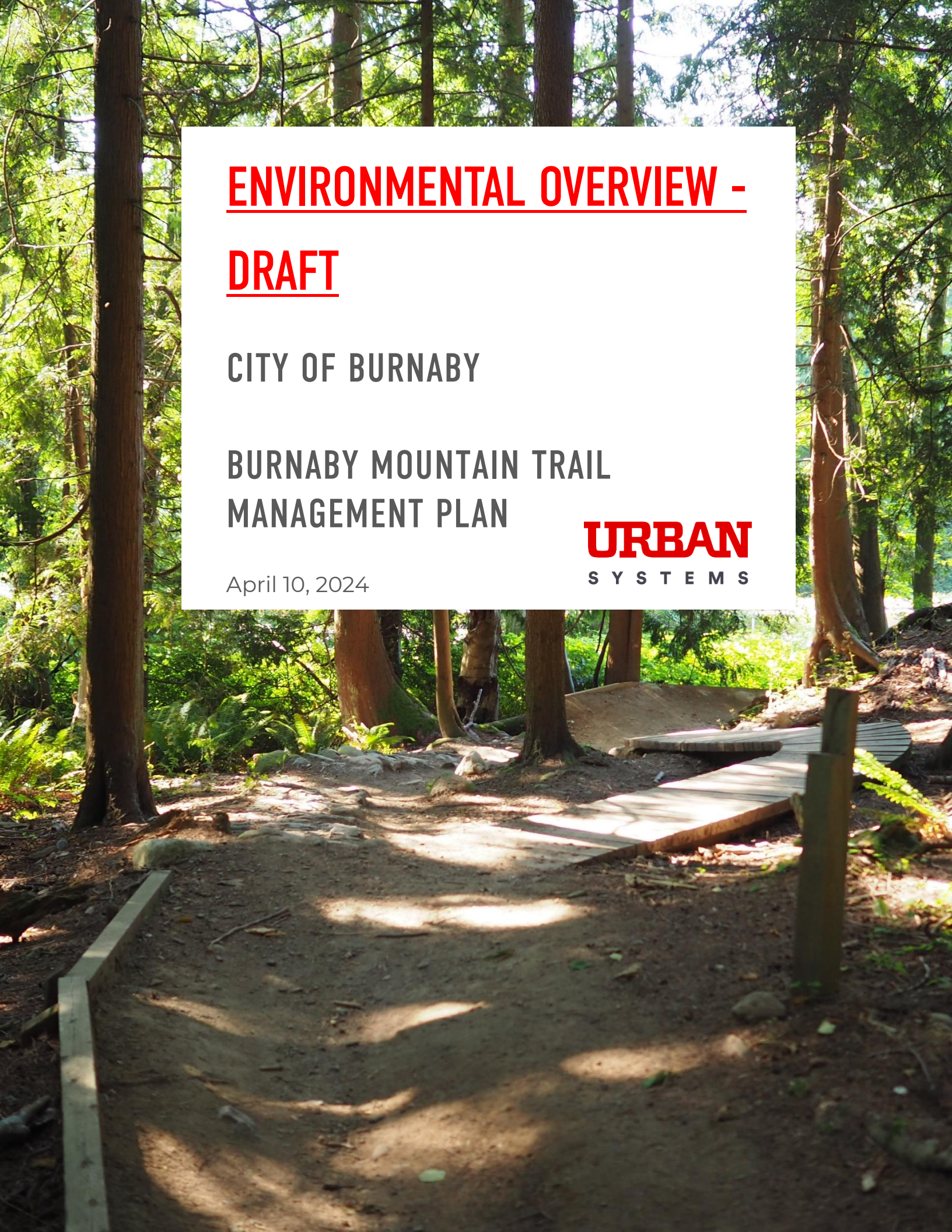


ENVIRONMENTAL OVERVIEW - DRAFT

CITY OF BURNABY

BURNABY MOUNTAIN TRAIL MANAGEMENT PLAN

URBAN SYSTEMS

April 10, 2024

PREPARED FOR:

City of Burnaby, Parks, Recreation and Culture
2301 - 3713 Kensington Avenue
Burnaby, BC,
V5B 0A7

PREPARED BY:

Urban Systems Ltd.
550-1090 Homer Street,
Vancouver, BC
V6B 2W9

Prepared by:
Zoe Tarren BS.c, P.Biol
Environmental Consultant

Reviewed by:
Darren Filipic, RPBio
Environmental Consultant

550 - 1090 Homer Street, Vancouver, BC V6B 2W9 | T: 604.235.1701

Date: April 10, 2024

File: 1228.0060.01

CONTENTS

1.0 INTRODUCTION

1.1 BACKGROUND

Burnaby Mountain is located north of Burnaby City and holds the largest recreation nature space for local residents. Before the mountain became a conservation area, it historically operated as a logging mill in 1903. After the development of Simon Fraser University in the 1960s (SFU), which is still situated at the top of Burnaby Mountain, the 820 acres of land which sits below the campus was transferred to the City of Burnaby (the City). That land is now known as the Burnaby Mountain Conservation Area (BMCA), which is home to a variety of diverse habitats and ecosystems.

The City is responsible for maintaining the natural environment found within BMCA and aims to highlight areas of immediate concern or in need of restoration or protection. However, as the area is used by a wide variety of users (hikers, bikers, dog walkers, etc.), the environmental needs of the park can often conflict with the users' needs. Therefore, the City is preparing a Trail Management Plan to properly inventory the current park use and condition and provide direction for improving and managing authorized trails to meet the needs of various user groups while balancing the need for conservation.

This Environmental Overview will act as an assessment of the valued components and natural assets that make up the BMCA., and help guide how best to protect and manage the natural habitat. Conservation should be prioritized to sustainably manage the natural assets for years to come.

SCOPE OF ENVIRONMENTAL OVERVIEW

This environmental overview is based on a site visit, desktop study and site photos and includes:

- A description of the proposed project site, including geographic setting and site topography;
- Regulatory considerations that include legislation and policies containing environmental direction and potential requirements that may be relevant to the project;
- A description of the environmental setting, including valued ecosystem components such as vegetation, surface water and fisheries resources, groundwater, wildlife, species at risk and critical habitat, if any;
- Research of provincial and federal sources to determine rare element (species) occurrences and known contaminated sites that could arise from past use and pose a risk to human health or the environment;
- A site visit conducted by Zoe Tarren, USL on September 21 2023; and
- Recommendations to avoid and/or mitigate potential adverse impacts. Recommendations will include site-specific recommendations and general best management practices.

1.2 INFORMATION SOURCES

Information gathered for this environmental overview was sourced from the following databases:

- BC Conservation Data Centre;
- BC Habitat Wizard;
- BC iMap;
- BC Online Contaminated Sites Registry;
- BC Species and Ecosystems Explorer;
- COSEWIC Species Status Reports;
- Federal Species at Risk Recovery Strategies and Management Plans;
- Site visit conduced on September 29 2023 by Zoe Tarren, Urban Systems, and
- Treasury Board of Canada Contaminated Sites Inventory website.

2.0 REGULATORY CONSIDERATIONS

BMCA falls under multiple provincial, federal and local legislation and policies. However, the project does not detail any specific activities, which may trigger certain laws. The list below details the main policies, which should be considered when managing the BMCA.

2.1 FEDERAL LEGISLATION AND POLICIES

2.1.1 MIGRATORY BIRDS CONVENTION ACT, 1994 (S.C. 1994, C. 22)

Most migrating birds found in Canada are protected under the Migratory Birds Convention Act (MBCA). This Act and its complementary Regulations ensure the conservation of migratory bird populations by regulating potentially harmful human activities. The Migratory Bird Regulation (2022) prohibits the damage, destruction, removal or disturbance of the nests of all migratory birds when there is a live bird or viable egg or if the nest was built by a species that is listed in Schedule 1. Schedule 1 lists 18 migratory bird species whose nests are known to be reused in subsequent years by migratory birds. The nests of these 18 species are protected year-round until the nest remains unoccupied by a migratory bird for the period of time designated in Schedule 1 (12, 24 or 36 months, depending on the species).

The time clock for this waiting period starts when Environment and Climate Change Canada receives notification via the Abandoned Nest Registry. Nests for which a notification has been received continue to be protected against damage, destruction, disturbance or removal during the designated waiting period.

If the nest of a bird listed on Schedule 1 is not present, impacts to migratory birds, their nests, eggs, and young can be avoided by conducting land clearing activities outside of the nesting season for birds. The nesting season for most bird species in the Lower Mainland is late March to mid-August. Species, including raptors, owls, and great blue heron commence nesting earlier. Should land clearing activities occur during the nesting season, a qualified environmental professional should be engaged to ensure that birds and their nests are not adversely affected.

2.1.2 SPECIES AT RISK ACT (S.C. 2002, C. 29)

The federal Species at Risk Act (SARA) provides protection to endangered or threatened organisms and their habitats. This legislation applies to all federal land, to migratory birds and all aquatic species as defined in the Fisheries Act, wherever they are found. Although SARA prohibitions are automatically imposed on federal lands, the intent of SARA also applies to provincial crown and private lands. SARA encourages provincial and Indigenous governments to cooperate to protect wildlife in Canada.

Critical habitat for two species (Roell's brotherella and western painted turtle) listed on Schedule 1 of the SARA is identified in the project area and the vicinity of the project.

2.1.3 FISHERIES ACT (R.S.C., 1985, C. F-14)

The Fisheries Act provides a framework to manage and control Canada's fisheries, as well as to conserve and protect fish and fish habitat, including pollution prevention. Under the Act, activities other than fishing that result in the death of fish and/or activities that may result in the harmful alteration, disruption or destruction of fish habitat are prohibited.

Projects with the potential to adversely impact fish and/or fish habitat and with a project scope that is not covered under the standards and codes of practice should be reviewed by Fisheries and Oceans Canada (DFO) through the Request for Review process. This applies to work in or near water bodies that are frequented by fish and any other areas which fish depend on directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas, including any waterbody that is connected to fish-bearing waters at any time of the year. The review will determine if the project requires authorization under the Fisheries Act.

Any improvements to infrastructure located near the creeks and tributaries within the BMCA may trigger the Fisheries Act, and a request for review/Fisheries Act Authorization may be required.

2.2 PROVINCIAL LEGISLATION AND POLICIES

2.2.1 BC WATER SUSTAINABILITY ACT AND REGULATIONS (SBC 2014, C 15)

All water in BC, including land below the high-water mark of a waterbody, is owned by the Crown on behalf of the residents of the province. *For any changes in and about a stream, an application under Section 11 of the Water Sustainability Act (WSA) is required.*

2.2.2 BC WILDLIFE ACT (RSBC 1996, C. 488)

The Wildlife Act governs the protection and management of wildlife in BC. The Act defines wildlife as all native and some non-native amphibians, reptiles, birds, mammals and fish. The Wildlife Act protects virtually all vertebrate animals from direct harm, except as allowed by regulations (e.g., hunting or trapping). In BC, 158 wildlife species and sub-species are considered candidates for endangered, threatened or vulnerable status. The Act deals with the protection and maintenance of suitable habitat and the conservation of wild species, in particular, those species that may be at risk of extinction, as well as nesting birds, their nests and their eggs. Section 34 of the Wildlife Act prohibits possessing, taking or

destroying (i) a bird or its egg, (ii) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or (iii) the nest of a bird not mentioned in (ii), when the nest is occupied by a bird or its egg unless authorized under permit. By conducting vegetation and ground disturbance activities outside of the nesting season for birds, a proponent is often able to maintain compliance with respect to Section 34 of this Act. In addition, ensuring construction activities do not harm vertebrate animals will help maintain compliance with this Act.

Any vegetation management or removal of hazardous trees throughout the BMCA may require a nesting bird survey to ensure protected species are not adversely affected.

3.0 THE PROJECT

3.1 SITE DESCRIPTION

Burnaby Mountain provides panoramic views of the surrounding area, including Burrard Inlet, downtown Vancouver, and the North Shore Mountains. The BMCA is located below Simon Fraser University and is made up of sloped trails, forested land, manicured parkland, tributaries, and creeks. The diverse land is managed and owned by the City of Burnaby. The conservation area offers a range of recreational activities for visitors. This may include hiking trails, viewpoints, picnic areas, and opportunities for outdoor sports. The goal is to allow people to enjoy nature while promoting conservation efforts. Burnaby Mountain is home to diverse ecosystems, including forests and wildlife. Conservation initiatives are in place to protect the natural environment and maintain the area's ecological balance.

3.2 PROJECT DESCRIPTION

The Burnaby Mountain Conservation Area (BMCA) is the largest public park and recreation area within the City of Burnaby. It provides a wide resource of recreational activities to both residents of Burnaby and attracts visitors from all over greater Vancouver. The City of Burnaby Parks, Recreation and Cultural Services department has initiated the re-assessment of Burnaby Mountain trail use, hoping to preserve the environment while protecting the natural habitat.

The City, particularly its Parks, Recreation, and Cultural Services department, has been involved in efforts to assess and manage the trail system on Burnaby Mountain. This includes initiatives to preserve the environment for future generations and protect the natural habitat. Urban Systems has been engaged to reassess the natural assets within BMCA and help develop and implement a new Trail Management Plan. This environmental overview assesses the natural assets and highlights areas of concern.

3.3 LAND USE

The project area is located in within the City of Burnaby, on the unceded territories of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh (Squamish), Sel̓íl̓witulh (Tsleil-Waututh), and Kwikwetlem (kwikwəƛ̓əm) Nations. The BMCA is dedicated to the conservation, recreation, and education of Burnaby Mountain. Conservation efforts aim to maintain biodiversity and preserve the ecological integrity of the mountain. The area also holds cultural or historical significance, for example, the Centennial Rose Garden commemorates Canada's centennial in 1967, and the Kamui Mintara (Playground of the Gods) sculpture which were created by Japanese sculptors Nuburi Toko and his son, Shusei; these works of art commemorate the goodwill between Burnaby and its sister city, Kushiro, Japan. These features aim to educate the public and honour the park's history.

Burrard Inlet

BARNET RD

MALIBU DR

SIERRA DR

INLET DR

BRAESIDE DR

RIDGE DR

PANDORA ST

PANDORA DR

RIDGEVIEW DR

Simon Creek

Nichol Creek

Cameron Creek

Cougar Creek

Trans Canada Trail

UNIVERSITY DR W

CENTENNIAL WY

BURNABY MOUNTAIN PY

SOUTH CAMPUS RD

UNIVERSITY HIGH ST

SLOPES MS

TOWER RD

UNIVERSITY DR E

UNIVERSITY CR

AUBREY ST

BURNWOOD DR

GLENABBEY DR

PINEHURST DR

KEYSTONE DR

Transmountain Burnany Terminal

GAGLARDI WY

SHELLMONT ST

ARDEN AV

MEADOWOOD DR

Eagle Creek

Silver Creek

ASH GROVE CR

FOREST GROVE DR

RATHBURN DR

NORTH RD

Stoney Creek

BLAINE AV

BLAINE DR

Legend

- Parks
- Burnaby Mountain Conservation Area
- Rights of Way
- Parking
- Burnaby Mountain Bike Skills Park
- Railway
- Gondola Route
- Transmountain Burnany Terminal
- Trans Canada Trail
- Dual Use Trail (Pedestrian/ Cycling)
- Multi Use Trail (Pedestrian/ Cycling/Equestrian)
- Pedestrian Only Trail
- Urban Trail (Asphalt Multi Use)
- Urban Paths
- Bikeway
- Cycle Road
- Shoulder Bike Lane
- Waterway
- Retention Pond

0 125 250 500 M

Scale: 1:12,000

N

4.0 DESCRIPTION OF THE ENVIRONMENT

4.1 TOPOGRAPHY

Land within BMCA has a diverse topography with elevation ranging from approximately 77 m to 370 m above sea level (Google Earth, 2023). The mountain features include sloping terrain with steep slopes, and drop offs, especially on the northern side. Most of the mountain is comprised of recreational areas such as trails, parkland and playgrounds. Simon Fraser University campus is situated at the top of the mountain and is not a focus point of this investigation.

4.2 CLIMATE

The climate of the area can be generalized using the Biogeoclimatic Ecosystem Classification system. This system is used by natural resource practitioners within the province of British Columbia to describe general terrestrial ecosystem characteristics throughout the province, including regional vegetation, as well as biological, geographical and climatic characteristics. The project area is located in the Coastal Western Hemlock dry maritime biogeoclimatic sub-zone (CWHdm). CWH occurs at low to middle elevations, mostly west of the coastal mountains, along the entire British Columbia coast (Meidinger and Pojar, 1991).

The CWH is, on average, the rainiest biogeoclimatic zone in BC. The mesothermal climate is described by cool summers and mild winters (Meidinger and Pojar, 1991). Climate Normals data from the Burnaby Simon Fraser station show August and July to be the warmest months, with a daily maximum 21.2°C and a daily average of 17.2°C, and December to be the coldest month, with a daily minimum of 0.8°C, and a daily average of 2.9°C. November is the wettest month, receiving an average of 284 mm of precipitation with an annual average of 1,667 mm. Only about 5% of the total precipitation falls as snow (Environment and Climate Change Canada, 2020).

4.3 VEGETATION

The CWH climate provides one of the most productive forest regions in Canada. Common tree species found within the dry-maritime subzone include Douglas-fir, western hemlock, western and red cedar; shrubs within the subzone also include step moss, sword fern, vine maple and bracken fern (Meidinger and Pojar, 1991).

Due to the historical logging of Burnaby Mountain in the 1940's, the natural forest composition has changed, and what was once filled with western hemlock, western red cedar and Douglas fir trees, is now dominated by deciduous species. Tree species found within the park include red alder, western hemlock, vine maple, western dogwood, and bigleaf maple. The understory is compromised of a number of native shrubs, including salmon berry, vine maple, sword fern and red elderberry. However, there is also a high presence of invasive species, which include Himalayan blackberry, Japanese knotweed, bohemian knotweed, spurge laurel, scotch broom and Himalayan balsam.

4.4 GEOLOGY AND SOILS

According to the BC Geological Society, the representative age of the bedrock geology within the project area are from the Eocene period, with the rock type listed as undivided sedimentary rocks (BC Government, MapPlace2). The Soil Order Map of Canada lists the soil order (broadest grouping and which reflects the climate and landscape characteristics associated with the different regions in Canada) as 75% Podzolic, 15% Luvisolic and 10% Gleysolic (SLC Web Map Application, n.d.).

4.5 SURFACE WATER AND FISHERIES RESOURCES

There are several creeks and tributaries which run on both the north and south sides of Burnaby Mountain. The tributaries along the north side are all unmapped watercourses. However, according to the City of Burnaby's open data portal, they are known as Simon Creek, Nichols Creek, Submarines Creek, Crab Creek, and Cougar Creek (Figure 4.1). These creeks and tributaries run down the mountain's northern slope and feed into the Vancouver Harbour. The topography on the north side is extremely steep, with the highest point measuring 360 m asl, dropping to 80 m asl in just 600 m. There are no known fisheries resources pertaining to these waterways. However, the extreme grade of the waterways is likely to cause high water velocity, creating natural fish barriers. There are three main creeks on the south side of BMCA, all of which feed into Burnaby Lake, which is situated 3.6 km south of BMCA (Habitat Wizard, 2023):

4.5.1 STONEY CREEK

Stoney Creek is a first order stream with a total mapped length of 3.02 km and is formally mapped south of the BMCA, within the residential area (IMap BC, 2023). However, it has a number of tributaries which originate within the BMCA. These tributaries begin south of University Drive and intersect with Mel's Trail, Sidewinder South Trail, Pipeline Trail and Jim's Jungle Trail, all within the southeastern portion of the BMCA. The creek is fish-bearing and provides habitat to numerous species, including Coastal cutthroat trout, coho salmon, pacific lamprey, rainbow trout, nooksack dace, threespine stickleback, chinook salmon and signal crayfish (Habitat Wizard, 2023)

4.5.2 SILVER CREEK

Silver Creek is an unmapped creek which originates within the Simon Fraser University Campus, specifically within Naheeno Park. There are no mapped fisheries data for Silver Creek; however, based on the condition of the creek, there is a high potential for it to be fish-bearing (Habita Wizard, 2023). The creek also crosses a number of trails, including Sidewinder and Side Bandit trails.

4.5.3 EAGLE CREEK

Eagle Creek is a first order stream with a mapped length of 3.33 km (IMap BC, 2023). A number of stream surveys have been undertaken on the creek, in which the following fish species were identified: coastal cutthroat trout, threespine stickleback, brassy minnow, chinook salmon, coho, salmon, lamprey, prickly sculpin, rainbow trout and signal crayfish (Habitat Wizard, 2023). Similar to Stoney Creek, the mapped stream originates within Squint Lake Park, southwest of the BMCA. The creek is fed by tributaries which

run within the southwestern corner of BMCA and flow underneath the Centennial Way Road and Nature Trail.

4.6 GROUNDWATER

A search for groundwater wells on IMap BC showed no wells within the project area or within 200 m of the project boundary (IMap BC, 2023).

4.7 CULTURAL RESOURCES AND ARCHAEOLOGY

A search of the Integrated Land and Resource Registry (ILRR) records was conducted on September 5, 2023. The ILRR provides information on various legal interests on provincial Crown land and private land, where available, including tenures, regulated uses, sensitive occurrence records such as archaeological sites, land and resource use restrictions, and reservations. For the purposes of the environmental overview, the search was conducted to determine sensitive records that may indicate cultural resources and archaeological sites.

Due to the large size of the conservation area and its location within the unceded territories of the Musqueam, Squamish, Tsleil-Waututh and Kwikwetlem Nations, the cultural and archaeological history is diverse. The search results indicated sensitive records located within the BMCA. If any significant trail maintenance or excavation activities are planned within the area, an archaeologist should be consulted to ensure known sites are not disturbed.

4.8 WILDLIFE

Wildlife species characteristic of the various habitats within the CWH biogeoclimatic zone are described in Meidinger and Pojar (1991). It notes that wildlife common to urban areas within the Lower Mainland include the rock dove, house sparrow, European starling, crested myna, gray squirrel, roof rat, Norway rat, and house mouse. Native species that have adapted to urban habitats include the black-tailed deer, coyote, striped skunk, raccoon, little brown myotis, herring gull, common nighthawk, barn owl, and barn swallow. These species are more abundant in areas that are interspersed with parks, gardens, and native forests (Meidinger and Pojar, 1991).

Several passerine birds were encountered during the site visit on September 21 2023, including olive-sided flycatcher, American crow, song sparrow, Steller's jay, and various warbler and wren species. A previous site visit with the City of Burnaby staff confirmed that black bears have been recorded within the park and often frequent the trail system.

4.9 SPECIES AT RISK

Species at risk are ranked and listed by both federal and provincial government agencies. The federal and provincial species at risk ranking processes are discussed in the following sections.

4.9.1 FEDERAL SPECIES AT RISK ACT

Under the Species at Risk Act (SARA), species ranking is conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), established under Section 14 of SARA. COSEWIC is a

committee of experts that assesses and designates, under Sections 15 to 21 of the SARA, those wild species of animal, plant or other organisms that are in danger of disappearing from Canada. COSEWIC status categories are Extinct, Extirpated, Endangered, Threatened, Special Concern, Data Deficient, and Not at Risk. COSEWIC species assessments are then reviewed under SARA, and a decision is made on whether to accept the assessment and add the species to the SARA Schedule 1 or not.

Schedule 1 of the SARA is the official list of species that are classified as Extirpated, Endangered, Threatened and of Special concern. To ensure the protection of species at Risk, SARA contains general prohibitions that apply to endangered, threatened or extirpated species listed on Schedule 1. While the prohibitions do not apply to species of special concern, protection may be provided provincially or under regional management plans. Species on Schedules 2 and 3 of the SARA are not protected under the Act but have been assessed by COSEWIC and may eventually be listed under Schedule 1.

Under SARA's general prohibitions, it is an offence to:

- Kill, harm, harass, capture, or take an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated;
- Possess, collect, buy, sell or trade an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated; and
- Damage or destroy the residence (e.g., nest or den) of one or more individuals of a species listed in Schedule 1 of SARA as an endangered or threatened species or as an extirpated species if a recovery strategy has recommended the reintroduction of the extirpated species into the wild in Canada.

4.9.1.1 Critical Habitat

Critical habitat is identified for species listed as Endangered or Threatened under SARA and is defined under section 2 of the Act as: "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species."

Under SARA, it is illegal to destroy any part of the critical habitat of any listed endangered species or of any listed threatened species – or of any extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada if:

- the critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada;
- the listed species is an aquatic species or
- the listed species is a species of migratory birds protected by the Migratory Birds Convention Act.

4.9.2 PROVINCIAL SPECIES AT RISK

The BC Conservation Data Center (CDC) tracks and categorizes species according to their conservation status in BC. Provincially, the CDC assigns a provincial rank or listing of 'Red' or 'Blue' or 'Yellow' to a species based on its status within BC. The rankings or provincial listing categories described below highlight the wildlife and plant species as well as natural plant communities that require special attention. The CDC listing is an advisory and management tool, not a legal designation in the province.

- **Red:** any indigenous species, subspecies or plant community that is extirpated, endangered, or threatened in BC. Extirpated elements no longer exist in the wild in BC but do occur elsewhere.

Endangered elements are facing imminent extirpation or extinction. Threatened elements are likely to become endangered if limiting factors are not reversed.

- **Blue**: any indigenous species, subspecies or community considered vulnerable (special concern) in BC. Vulnerable elements are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed elements are at risk but are not extirpated, endangered or threatened.
- **Yellow**: Indigenous species that are not at risk in British Columbia.

4.9.3 SPECIES AT RISK SEARCH METHODOLOGY

To determine potential species at risk and or wildlife species of management concern that may occur within the project area, the following information review was conducted:

- Three area-based searches were conducted using the BC Conservation Data Centre (CDC) Species and Ecosystems Explorer tool to identify species that may occur within the South Coast NR Region, Chilliwack NR District, and Coastal Western Hemlock Biogeoclimatic Zones.
- All species with legal protection listed under the BC Wildlife Act, Species at Risk Act, the Forest and Range Protection Act, and species without legal protection (species listed on the BC Conservation Data Centre's Red and Blue lists) were considered in this methodology. The list of species was then refined to identify species with the potential to occur within or near the study area based on species' known distribution and if habitat required by a species is available within the study area.
- SARA critical habitat mapping was reviewed to determine species with mapped critical habitat within the study area. Map layers are from DataBC.
- Mapped element occurrences (red and blue-listed species) were reviewed using BC's Conservation Data Centre iMap web application. Species with occurrences within or near the study area were included. Species occurrences are based on sightings that are reported to the provincial database. The BC Conservation Data Center illustrates these occurrences using polygons that reflect locational uncertainty associated with the source data and are represented with varying-sized circles.

Species at Risk and/or wildlife species of management concern are assigned a rank of **high**, **medium**, **low**, or **nil** for the potential to occur in the project area based on occurrence records, known habitat associations and professional experience (i.e., familiarity with habitat requirements and distribution of the species. Presence ratings are based on the following definitions developed by senior technical expert/ biologist J Hobbs Ecological Consulting (Hobbs, 2019):

- **High**: current understanding of the species' range and/or known species habitat associations suggests that the species is expected to occur in the project area regularly and in densities that would be expected to occur in provincial benchmark habitats. (The provincial benchmark is the highest capability habitat for a particular species in the province, against which all other habitats for that species are rated).
- **Medium**: current understanding of the species' range and/or known species habitat associations suggests that the species is expected to occur in the project area on a temporary or regular (i.e., predictable seasonal basis and in densities that facilitate persistence of a functional population within the project area.
- **Low**: current understanding of the species' range and/or known species habitat associations suggests that the species is unlikely occur within the project area with regularity or in adequate density to facilitate a functional population. Several ecological life-requisite stages would be

challenged based on existing habitat conditions in the project area and/or connectivity with larger, more contiguous occurrence of the species.
- **Nil**: current understanding of the species' range and/or known species habitat associations suggests that the species is not expected to occur in the project area. Species occurrence in the project area would be considered accidental.

4.9.4 SPECIES AT RISK SEARCH RESULTS

In total 17 species were identified to be of conservation concern [i.e., listed by either or each of the SARA, the BC Conservation Data Centre (CDC), the BC Forest Range Practices Act (FRPA), or the BC Wildlife Act (WA) with potential to occur within the project area. This includes:

- 5 species with **high** potential to occur,
- 7 species with **medium** potential to occur, and
- 5 species with **low** potential to occur.

There is one documented occurrence of species at risk within the project area for Roell's Brotherella (BC CDC). Publicly available critical habitat and BC CDC species occurrences are illustrated in **Figure 4.1.**

Species at risk that are assigned a rank of high, medium or low are presented in **Table 4.1.**

Critical Habitat

Species with mapped critical habitat within the study area include:

- Roell's Brotherella, and
- Western painted turtle – Pacific Coast population.

Table 4.1: Species at Risk and Wildlife Species of Management Concern Search Results Summary for Burnaby Mountain

COMMON NAME	SCIENTIFIC NAME	TAXON	STATUS UNDER SARA	PROVINCIAL STATUS	PREFERRED HABITAT	POTENTIAL TO OCCUR IN PROJECT AREA[1]
Coastal tailed frog	*Ascaphys truei*	Amphibian	Special Concern	Yellow	Typically occurs in non-fish bearing, permanent, cold, fast flowing mountain streams that flow over rocky substrate.	Inaturalist occurrence along Eagle Creek tributaries. Prefer non-fish bearing creeks, most likely would be found within the fast-flowing tributaries on the northern side of Burnaby Mountain. **Potential to Occur**: **Low**
Western toad	*Anaxyrus boreas*	Amphibian	Schedule 1 – Special Concern	Yellow	Associated with watercourses and wetland habitats for breeding. Often disperse to a variety of terrestrial habitats outside of breeding season.	Lacking breeding habitat, prefer deep pools of slow flowing water. May forage within the forested area. **Potential to Occur**: **Med**
Northern red-legged frog	*Rana aurora*	Amphibian	Schedule 1 – Special Concern	Blue	Terrestrial stages are associated with streams, ponds or marshes. Can also be found far from water, living in moist forests. Breeding habitat includes permanent and ephemeral bodies of water.	Most likely present within the southern tributaries and creeks which are associated with permanent waterways. **Potential to Occur: Med**
Band-tailed pigeon	*Patagioenas fasciata*	Bird	Schedule 1 – Special Concern	Blue	Nests in natural and human-made habitats including edges and openings in mature coniferous, mixed and deciduous forests, city parks, golf courses. Various forest types and structural stages are used, particularly those with Douglas-fir, Sitka spruce, western redcedar, western hemlock and red alder. May prefer mature, closed canopy coniferous forest. Overwinter in both deciduous and coniferous woodlands, favouring open woods where berries and oak acorns occur.	Likely to forage within the project area, with the potential to use trees for nesting. **Potential to Occur: High**
Barn owl	*Tyto alba*	Bird	Schedule 1 - Threatened	Red	Open foraging habitat with an abundance of primary prey (voles and mice) such as agricultural fields, rough pasture, hayfields, and grassy roadsides. Roost in dense conifers, buildings, hollow trees, nest boxes and occasionally on the ground in tall grass. Breeding requires protected cavity nesting sites.	Likely to use cavities with trees as nest sites, may nest within SFU campus and use BMCA to forage due to abundance of prey species. **Potential to Occur: Low**
Barn swallow	*Hirundo rustica*	Bird	Schedule 1 – Threatened	Yellow	Nests in barns or other buildings, under bridges, in caves or cliff crevices. Forages in open areas, frequently near water.	Suitable nesting habitat along ROW/ Utility corridors. Burnaby Mountain Park provides good foraging habitat. **Potential to Occur: Med**
Common nighthawk	*Chordeiles minor*	Bird	Special Concern	Blue	Nests in a wide range of open, vegetation-free habitats including sand dunes, beaches, logged areas, forest clearings, rocky outcrops, rock barrens, prairies and pastures.	May nest in ditches along the ROW / utility corridors. **Potential to Occur: Med**
Evening grosbeak	*Coccothraustes vespertinus*	Bird	Special Concern	Yellow	Open forests dominated by Douglas-fir, bigleaf maple, paper birch, arbutus, red-osier dogwood, vine maple and other species where it forages on berries and seeds. Usually nests in large mature and mixed forest habitats.	Abundance of suitable nesting trees within BMCA. Douglas-fir, Bigleaf maple, and vine maple are all present. **Potential to Occur: High**
Great blue heron, fannini subspecies	*Ardea herodias fannini*	Bird	Special Concern	Blue	Nests colonially, often in forests away from human disturbances. Can use contiguous forest, fragmented forest and solitary trees for nesting. Tree species include red alder, black cottonwood, bigleaf maple, Sitka spruce, and Douglas-fir. Foraging habitat includes aquatic areas such as tidal mudflats, riverbanks, lakeshores and wetlands up to 0.5 m in depth. Estuaries and eel grass beds are important foraging areas. Fallow agricultural fields are used for winter foraging. Require forage within 3-10 km of nest.	Due to the location close to the harbour, herons may use trees within BMCA for perching and nesting. **Potential to Occur: Med**
Olive-sided Flycatcher	*Contopus cooperi*	Bird	Schedule 1 – Special Concern	Yellow	Breed and forage within open forested areas. Prefer the use of tall trees for perching and foraging within a site. Habitats may include, natural forest openings, or logged/burned areas.	Likely to forage and nest within the forested habitat. **Potential to Occur: Med**

[1] Based on the rating system developed by J Hobbs Ecological Consulting Ltd. that is defined in section 3.8.3 of this report.

COMMON NAME	SCIENTIFIC NAME	TAXON	STATUS UNDER SARA	PROVINCIAL STATUS	PREFERRED HABITAT	POTENTIAL TO OCCUR IN PROJECT AREA[1]
Peregrine falcon, anatum subspecies	*Falco peregrinus anatum*	Bird	Special Concern	Red	Nesting typically occurs on rock cliffs and crevices above lakes or river valleys where abundant prey is nearby.	Active hunter within residential areas and resides in river valleys. Could use trees within the northern side, for perching and hunting. **Potential to Occur: Low**
Dun skipper	*Euphyes vestris*	Bird	Schedule 1 – Threatened	Blue	Occupy a variety of habitats including: forest comprised of Douglas-fir, below open, sparsely vegetated cliffs and hillsides comprised of Douglas-fir and bigleaf maple; open moist to dry meadows; open deciduous woods and areas adjacent to swamps and streams. Also, disturbed sites including roadsides, railways, rights-of-ways and ditches. Dun skipper appears to favour nectar plants such as spreading dogbane, and alfalfa. The dun skipper flight/ breeding period in BC is from mid-May to mid-August.	Wide variety of habitat present throughout BMCA, suitable tree species (bigleaf maple/Douglas-fir), meadows and open spaces available. **Potential to Occur: High**
Little brown myotis	*Myotis lucifugus*	Mammal	Schedule 1 – Endangered	Red	Bats overwinter in hibernacula habitat such as a cave or mine. Maternity colonies often exist in warm sites such as attics of buildings and under bridges, in rock crevices, or tree canopy, will use bat boxes. Found in deciduous and coniferous forests, prefers old forests (increased snag availability for roosting). Forages over water on insects.	May utilize snags in the project area for maternal colonies. May use trees or nearby buildings for roosting. However, most likely forage closer to open water. **Potential to Occur: Med**
Pacific water shrew	*Sorex bendirii*	Mammals	Endangered	Red	Riparian areas in coniferous or deciduous forests in the Fraser Valley as far east as the Chilliwack River Valley. Associated with skunk cabbage marshes, red alder riparian habitat and dense, wet forests of western red cedar. Has been captured in non-forested grassy habitats bordering ditches and sloughs.	Low quality habitat. Project area has patches of wetland with suitable forest canopy. Historical occurrences of pacific water shrew. **Potential to Occur**: **Low**
Nooksack dace	*Rhinichthys cataractae - Chehalis lineage*	Ray-finned fish	Schedule 1 – Special Concern	Blue	Require habitat that is cold, clean and connected. Habitat must provide cover for shelter and the right requirements for breeding and rearing young, while connected habitat allows this migratory species to move between the areas it needs to complete its life cycle. Generally restricted to interior drainages.	Recorded population within Stoney Creek. **Potential to Occur: High**
Western painted turtle	*Chrysemys picta pop. 1*	Reptile	Schedule 1 – Threatened	Red	Highly aquatic and are found in shallow waters of ponds, lakes, oxbows, and marshes, in slow-moving stream reaches, and in quiet backwater sloughs of rivers. Habitat contains muddy substrates with emergent aquatic vegetation, exposed vegetation root mats, floating logs, and open banks. Nesting habitats are on land adjacent to aquatic foraging habitat, usually within 200 m of the water body.	Within mapped critical habitat (CDC). No mapped occurrences within the BMCA. However, mapped occurrences are south of the conservation area. **Potential to Occur**: **Low**
Roell's brotherella	Brotherella roellii	Plant	Schedule 1 – Endangered	Red	Cool, humid mixed deciduous and conifer, second growth forests on stream terraces, swampy floodplains, and occasionally in ravines and creeks. The primary substratum include alder, big leaf maple, dogwood trees, rotten logs and stumps.	CDC mapped occurrence south of University Drive East ROW. Suspected to be isolated population. Critical habitat. **Potential to Occur: High**

City of Burnaby

Burnaby Trail Management Plan

Species at Risk

Legend

- Burnaby Mountain Conservation Area
- Parcels
- Railway
- Trails
- Waterway
- Bald Eagle Nest

Critical Habitat

- Roell's Brotherella Moss
- Western Painted Turtle Pacific Coast population

0 100 200 300
Meters

N

Coordinate System:
NAD 1983 UTM Zone 10N

Scale: 1:14,000
(When plotted at 11"x17")

Data Sources:

- Data provided by CDC, NRCan, DataBC, Google Earth

Project #:	1228.0060.01
Author:	LS
Checked:	ZT
Status:	
Revision:	A
Date:	2024 / 1 / 22

URBAN SYSTEMS

FIGURE 4.1

5.0 CONTAMINATED SITES

Known contaminated sites can have various negative impacts on a forest ecosystem. Contaminants, such as pollutants and hazardous substances, can affect soil, water, vegetation and the ecosystem's overall health. With respect to the BMCA, there are a number of negative effects contaminants can have on the environment:

5.1.1 SOIL CONTAMINATION

Soil contaminants can affect its composition and fertility, leading to a decline in the growth of native vegetation and disrupting nutrient cycling.

5.1.2 WATER CONTAMINATION

Contaminated sites have the potential to release pollutants into nearby water bodies through runoff or leaching through groundwater. This water pollution will adversely affect aquatic ecosystems, like wetlands, streams, and creeks, which in turn can negatively impact any organisms that rely on water sources.

5.1.3 VEGETATION DAMAGE

Plants, including trees, can absorb contaminants from the soil, leading to damage or potential death. The contaminants impact photosynthesis and nutrient uptake, which is essential for plant health. This can result in reduced forest canopy cover and a decline in overall vegetation diversity.

5.1.4 IMPACT ON WILDLIFE

Herbivores and omnivores may ingest contaminated plants or water sources, which may lead to health issues and population declines.

5.2 PROVINCIAL CONTAMINATED SITES REGISTRY

A search of the BC Online contaminated sites registry was conducted on July 10, 2023. There are two known provincially registered contaminated sites within the search area. The recorded details of the contamination sites are listed in Table 5.1 below.

Table 5.1 – Contaminated sites listed from west to east within the project boundary.

SITE ID	ENV SITE ID:	LOCATION	NAME	DESCRIPTION
17084	69328132	122° 55' 36.80" 49° 16' 25.80"	Settling Pond	Settling Pond at Gaglardi Way
4942	69325825	122° 55' 23.84" 49° 17' 14.15"	Burnaby Mountain Outdoor Target Range	N/A

Note that 'N/A 'refers to information that is not available from iMapBC.

5.3 FEDERAL CONTAMINATED SITES INVENTORY

A search of the Treasury Board of Canada's Federal Contaminated Sites Inventory website was conducted on July 5, 2023. The search indicated that no known federally registered contaminated sites exist within the project area or within 200 m of the project boundary.

6.0 NATURAL ASSETS EFFECTS ASSESSMENT

6.1 VALUED COMPONENTS

Valued Components (VC) are elements of the natural and human environment that are considered to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance. VCs vary by project to reflect the nature of the project's potential effects. For the purposes of this assessment, the VCs are based on the potential effects of activities associated with the overuse of the trails within the BMCA and their current condition.

The following valued components are identified:

The following valued components are considered in this environmental overview:

- Environment
    - Vegetation
    - Geology and soils
    - Surface water and fisheries resources
    - Groundwater
    - Wildlife
    - Species at Risk
    - Cultural Resources and Archaeology
- Health and Safety
    - Noise

An in-person site visit was conducted on Friday, September 29, 2023, to assess the trail conditions and how these valued components are impacted by the daily use of the trails. The assessment was built upon the conditions assessment conducted by Dillon Consulting Ltd. in 2019. However, since 2019, a number of upgrades have been addressed by both volunteer groups and the City. Before the in-person visit, desktop sources were utilized to assess areas of high concern to of ecological importance. Trail footage captured by bike on September 20 by Jack DeSante, Urban Systems Planner, was also reviewed to eliminate any trails which were not of concern.

The assessment was conducted on foot by Zoe Tarren, Biologist, Urban Systems. The following trails were either walked fully or partially (through connectors):

- Dead Moped Trail
- Gnomes Home Trail
- Jims Jungle Trail
- Upper/ Lower Gear Jammer
- Mel's Trail
- North Road Trail
- Nicoles Trail
- Pandora Trail
- Power Line Trail
- Ridgeview Trail
- Upper Cut
- Lower Snake Trail

Tabel 5.1 describes the current impacts to the valued and diverse habitat found within Burnaby Mountain and the trail systems' effects on the VCs.

Table 5.1: Potential Environmental Effect on Valued Components

VALUED COMPONENT	HIGH TRAIL USE IMPACTS/STRESSORS	TRAILS OF CONCERN	LONG TERM IMPACTS
Vegetation	• Off trail disturbance. • Spread of invasive species. • Erosion from bike/foot/dog use. • Erosion from high rainfall. • Permanent loss of vegetation (grasses, deciduous trees and shrubs) and vegetation potential. • Removal of topsoil.	• Jims Jungle. • North Road Trail (Southern portion). • Upper Cut. • Mel's Trail. • Nicole's trail. • Unauthorized Trails.	• Dogs may create alternate paths, contributing to trail widening and soil erosion. • Uncontrolled dogs may chase wildlife, causing stress and potential harm to vegetation. • Unauthorized trails have a high impact on vegetation. • Dogs, humans, and bikes can inadvertently transport seeds of invasive plants, contributing to their spread. • Trail development can lead to habitat fragmentation, isolating plant populations and affect biodiversity. • Bike tires can compact the soil, negatively affecting root systems and water infiltration.
Geology and Soils	• Erosion and impaction from bike/foot/dog use. • Erosion from high rainfall. • Erosion from detention pond release. • Removal of natural topsoil and ecosystem. • Disturbance of tree root systems.	• Jims Jungle. • North Road Trail (southern portion). • Upper Cut. • Mel's trail. • Nicoles Trail. • Unauthorized Trails.	• Dogs digging or running off-trail can disturb the soil, potentially exposing geological features and affecting soil structure. • Human, animal and bike use can increase the risk of soil erosion, particularly in areas with loose soils or slopes. • Human footsteps can compact the soil, potentially affecting soil structure and reducing its ability to absorb water. • The high erosion can alter natural drainage patterns, potentially impacting the distribution of water across the landscape. • Tree roots are typically covered by soil and organic matter, providing protection and moisture. This layer is crucial for nutrient retention, water absorption, and root growth. As soil erodes, it takes away the essential organic matter and nutrients that trees rely on for proper development and function. This can increase the risk of the tree leaning or falling, especially during adverse weather conditions such as heavy rain or strong winds.
Surface water	• Contamination from erosion. • Introduction and spread of invasive species. • Litter and dog use. • Alteration of creeks and tributaries.	• Poplar Trail. • Mel's Trail.	• Dog waste, if not properly managed, can contribute to water pollution, as fecal matter may introduce bacteria and nutrients to surface water. • Dogs playing in or along the water may contribute to bank erosion, especially in areas with softer soil. • Improper disposal of litter, including plastic bottles and food wrappers, can lead to water pollution. • Foot, bike and dog traffic can increase soil erosion on trails, and sediment from eroded trails may end up in nearby water bodies, impacting water quality. • Trails can alter natural drainage patterns, affecting the flow of water to surface water bodies. • Frequent human and pet presence near water bodies can disrupt aquatic habitats, potentially affecting fish and other aquatic species.
Groundwater	• Contamination from erosion. • Litter and dog use.	• Unauthorized Trails.	• Trails, especially those with impermeable surfaces, can alter the natural infiltration rates of water into the soil, potentially affecting groundwater recharge. • Contaminants from dog waste, human activities, or biking can potentially be transported to groundwater if not managed properly. • Erosion on trails can lead to an increased number of pools in the trail which can be a health and safety risk to users.
Species at risk and wildlife	• Noise Disturbance. • Loss of Vegetation. • Loss of nesting habitat.	• Unauthorized Trails.	• Detailed in table **Section 5.2.**

VALUED COMPONENT	HIGH TRAIL USE IMPACTS/STRESSORS	TRAILS OF CONCERN	LONG TERM IMPACTS
Cultural Resources and Archaeology	• Erosion • Disturbance/removal of heritage archaeological resources due to erosion • Disturbance of significant sites through trail maintenance or unauthorized excavation.	• Unauthorized Trails.	• Dogs digging or trampling in archaeological sites may lead to the disturbance of artifacts, features, or cultural deposits. • Unauthorized digging or exploration by humans may result in the disturbance or removal of archaeological artifacts, structures, or deposits. • Trails passing through or near archaeological sites require special consideration to minimize impacts on cultural resources.
Noise	• Nesting birds and bats • Human safety – bear attractants	• Unauthorized Trails.	• Frequent barking and other vocalizations from dogs can disturb wildlife, potentially causing stress and impacting behavior. • Wildlife may avoid areas with high levels of dog-related noise, altering their habitat use and potentially affecting population distribution. • Noise disturbances during the breeding season can disrupt nesting birds and other wildlife, potentially leading to nest abandonment or reduced reproductive success. • Persistent noise can lead to habituation in some species, while others may experience chronic stress, potentially impacting overall health and survival (specifically in relation to bear behaviour).
Invasive Species	• Spread of invasive species	• All.	• Dogs may transport seeds of invasive plants on their fur, paws, or through feces, contributing to the spread of invasive species. • Humans can carry seeds of invasive plants on their clothing, shoes, or equipment, facilitating the spread of invasive species. • Biking activities can dislodge seeds from invasive plants, potentially facilitating their spread along trails.

6.2 POTENTIAL EFFECTS TO SPECIES AT RISK

Species that were given a potential presence rank of **high**, **med**, or l**ow** in **Table 5.2** are considered in more detail below to assess how trail use may affect the individual wildlife groups.

The species biophysical attribute requirements are described below. The potential for species to experience project-related effects are classified into four categories defined below as per definitions developed by species at risk technical expert/ biologist J Hobbs Ecological Consulting (2019). In this assessment, the 'project-related activities' refer to high trail use by pedestrians, cyclists and dogs.

- **High**: Anticipated activities will permanently damage or destroy habitat (i.e., remove habitat) required by species to meet life requisites OR anticipated activities will result in permanent alienation of habitat as a result of prolonged disturbance (i.e., due to changes in levels of human activity, light or noise).
- **Medium**: Anticipated activities will degrade habitat (i.e., negatively alter habitat) required by species to meet life requisites OR anticipated activities will result in temporary alienation of habitat as a result of short-term disturbance (i.e., due to temporary changes in levels of human activity, light or noise).
- **Low**: Anticipated activities will alter the habitat required by species to meet life requisites. In this case, the effects of habitat alteration may be challenging to quantify but are suspected to be slightly negative or benign. Also rated as Low if anticipated activities may result in temporary alienation of habitat as a result of short-term disturbance (i.e., due to temporary changes in levels of human activity, light or noise).
- **Nil**: Anticipated activities will *not* negatively alter the habitat required by species to fulfill key life requisites. In this case, the effects of habitat alteration or alienation may be challenging to quantify but are suspected to be neutral or positive.

Table 5.2. Potential for Project Related Effects on Species At Risk

SPECIES	POTENTIAL SPECIES	POTENTIAL FOR PROJECT-RELATED EFFECTS	THREAT
Amphibians	Coastal tailed frog Western toad Northern red-legged frog	**High**	• Amphibians are generally sensitive to changes in their environment. Increased sedimentation and changes in water quality caused by erosion can stress amphibian populations, making them more susceptible to diseases and other threats. • Amphibians often rely on specific vegetation types for shelter, breeding, and foraging. Erosion can lead to the loss of vegetation; the loss of these features can directly impact their ability to find suitable habitats. • Compaction can negatively impact the forest floor, disrupting the microhabitats crucial for amphibians, especially those that depend on leaf litter or loose soil for shelter and breeding.
Birds	Band-tailed pigeon Barn owl Barn swallow Common nighthawk Evening grosbeak Great blue heron Peregrine falcon Olive-sided fly catcher	**Med**	• Erosion can alter the landscape and potentially expose bird nests to increased predation or environmental stresses. • Changes in the physical structure of the environment may make nests more vulnerable and affect the breeding success of ground-nesting birds. • Trails can act as pathways for predators or disrupt nesting sites directly. • The presence of humans, pets, or off-road vehicles near nesting areas can lead to abandonment of nests or increased vulnerability of eggs and chicks to predation. Some bird species may avoid areas with high human activity, which can limit their access to essential resources. • Trails can contribute to changes in water runoff patterns, potentially leading to localized flooding or drying of certain areas. This can affect the availability of wetland habitats for birds that depend on them for feeding and breeding.
Bats	Little-brown myotis	**Med**	• Increased erosion can affect the stability of trees and structures used by bats as roosting sites. Soil loss and changes in the structural integrity of trees may lead to the collapse of roosts, displacing bat colonies. • Trails may pass near or through areas where bats roost. Frequent human presence and disturbance along trails can disrupt bats during their roosting periods, potentially leading to abandonment of roost sites. • Trails may be accompanied by increased human activity, including artificial lighting and noise. Bats are sensitive to disturbances during their nocturnal activities, and excessive light and noise along trails can disrupt their echolocation and foraging behaviors. • Erosion can contribute to sedimentation in water bodies, potentially impacting the quality of water sources used by bats for drinking and hunting insects.
Fish	Nooksack dace Federally protected salmonid species	**High**	• Sediment can also carry pollutants, nutrients, and other contaminants that can harm fish and their food sources. • Sediment deposition in streams and rivers can alter the physical structure of aquatic habitats. Fine sediment can fill in gravel beds used by fish for spawning, reducing the suitability of these areas for reproduction. • Trampling of vegetation, soil compaction, and disturbance to streamside vegetation can negatively impact fish habitat, especially for species that rely on specific conditions for breeding and shelter. • Changes in the landscape due to erosion can influence streamflow patterns. Increased runoff and alterations to natural drainage can lead to fluctuations in water levels and velocities, impacting fish migration, spawning, and the availability of suitable habitats. • Trails can serve as pathways for the unintentional introduction of invasive species by bikers, bikers or dogs. Invasive species can disrupt the balance of aquatic ecosystems and have detrimental effects on native fish populations.
Butterfly	Dun skipper	**Low**	• The physical presence of trails may disrupt butterfly movement patterns and contribute to habitat fragmentation. • Erosion can lead to changes in soil composition and affect the types of plants that grow in an area. Butterflies often rely on specific plant species for nectar, food for larvae (caterpillars), and as host plants for egg-laying.
Reptiles	Western Painted Turtle	**Med**	• Erosion can alter the availability and condition of suitable nesting sites for reptiles. Some reptile species, such as turtles, rely on specific soil conditions for nesting, and changes in soil structure can impact their reproductive success. • Trails can disrupt the natural vegetation cover that provides shade and temperature regulation.
Vegetation	Roell's brotherella	**Med**	• Critical habitat falls within BMCA, root exposure through erosion has the potential to impact the survival of Roell's brotherella. • The removal or destruction of natural habitat features (e.g., vegetation, substrates) causes destruction of critical habitat by degrading the suitability of microhabitat conditions (shade, humidity, moisture, local hydrology) and/or the availability of growing surfaces required by the species (trees, logs, stumps) (Government of Canada, 2021).

5.0 NATURAL ASSETS EFFECTS RESULTS

Following the site visit and desktop results, the main valuable components which are under unique stress throughout the mountain have been summarized below. Further site photos can be found in **Appendix A.**

5.1 EROSION

There is a high level of erosion within the park. However, it is especially prevalent within the southeastern trails. Significant improvements were seen throughout the park compared to the Dillon report from 2019. For example, it was previously suggested to improve and maintain Cardiac Hill Trail and the access routes along the north side of University Drive East. However, there were no significant signs of stress on the natural environment. Meanwhile, the southern segment of the conservation area has significant damage. This is suspected to be caused by a mixture of rainfall, bike use and pedestrians.

Alongside degradation and vegetation impacts, erosion poses a significant health and safety risk to park users. Tree roots are heavily exposed within the southern portion of the park, and these create a treacherous environment for hikers and dog walkers and increase the risk of hazardous or fallen trees.

5.1.1 TRAILS OF CONCERN

Figure 6.2 illustrates the main trails of concern throughout the park in relation to habitat degradation and severe signs of erosion leading to habitat loss. The main trails which should be maintained are as follows:

- Jim's Jungle
- Upper Cut
- North Road Trail (the southern portion)
- Mel's Trail
- Nicole's Trail
- Lower Snake Trail
- Upper/Lower Gear Jammer

Nicole's, Jim's, Lower Snake and Mel's Trail are of high concern due to the tributaries intersecting with the trails. High erosion on these trails leads to a significant risk of contamination, reduced water and spawning habitat for fish and altered stream dynamics.

The heat maps created based on the cycling data from Strava and mountain biking data from Trailforks show a strong correlation with the heavily degraded trails within the BMCA (Urban Systems Background Review, 2024). Both heatmaps show a high concentration of use along Gearjammer, Nicole's, Sidewinder, Jim's Jungle, Mel's and the southern portion of North Road Trail. The Trailforks heatmap shows slightly less concentration on Mel's, which would indicate users tend to stick to the southern slopes and less on the connector. This data reinforces the erosion and habitat impact seen throughout the site visit and should indicate the main trails that require frequent maintenance and inspection.

5.2 VEGETATION IMPACTS

As discussed in **Section 5.0**, it is clear that high trail use has a significant impact on the vegetation throughout the BMCA. It is noticeable the forest lacks mid-story vegetation and, in some areas, has very little to no understory. This was often correlated with the presence of unauthorized trails and heavy foot/bike use, causing the trails to widen further than intended.

The utility corridors, such as the Trans-Canada Mountain trail, cause habitat fragmentation and wildlife disruption by disturbing the natural movement of wildlife and seed dispersal. There was also a significant increase of invasive species along the corridors (especially with Himalayan blackberry and English ivy), as invasive species usually thrive within disturbed environments with multiple seed transfer opportunities. Some invasive plant species are adapted to edge habitats, thriving in the transitional zone between open areas and the forest.

Utility Corridor located along Pipeline Trail.

5.3 UNAUTHORIZED TRAILS

In an effort to protect the park, the City has mapped the unauthorized trials throughout the project area. These trails significantly impact the environment as they further degrade the already sensitive habitat. During the site visit, it was evident that the unauthorized trails were often in place to act as 'shortcuts' throughout the park and not as 'new trails.' Therefore, these trails do not provide any significant added value to the park but further degrade the natural habitat. It was noted that an effort has been made to stop users from entering these trails using woody debris piles, fences and signs. However, only fences were seen to have any success in effectively closing a trail. Unfortunately, the woody debris and signage are too easy for park users to ignore or remove.

In order to allow the mountain to maintain its natural environment, the number of unauthorized trails will need to be maintained, as they increase the potential for disturbance to nesting birds, bats and other wildlife found throughout the mountain.

Woody debris used as a deterrent for existing side trails.

5.4 HUMAN PRESENCE

Frequent human presence on trails can disturb amphibians, increasing stress levels. Some species may alter their behaviour, breeding patterns, or feeding habits in response to constant human disturbance, which can have long-term consequences for their populations.

5.5 SURFACE WATER PROTECTION

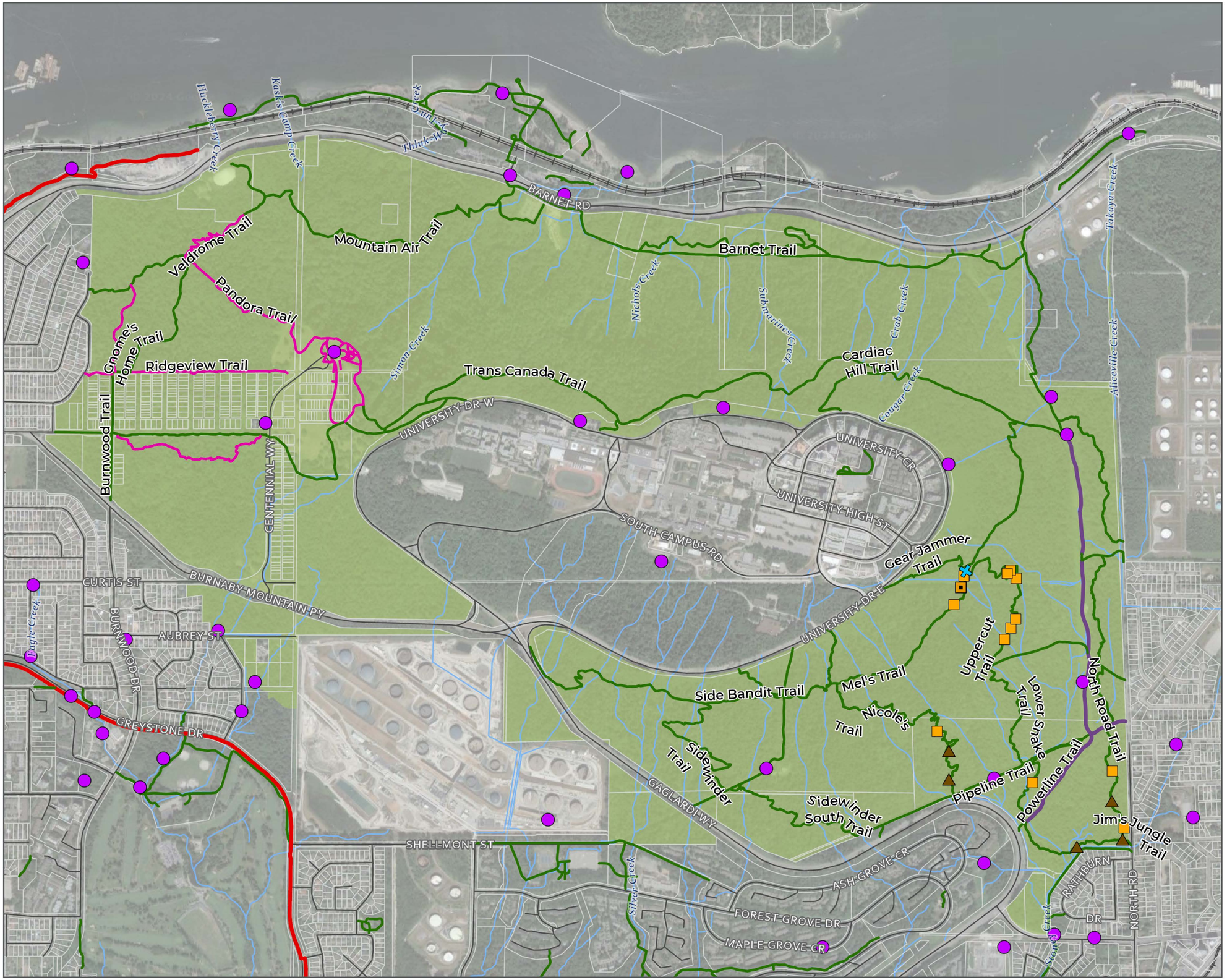
The tributaries and creeks of the BMCA are some of the most valuable assets found throughout the mountain. Creeks create unique aquatic habitats that support a diverse array of plant and animal species, including a number of protected fish species. They are home to various fish, amphibians, insects, and other aquatic organisms, which contribute to the overall biodiversity of the forest ecosystem. Finally, they also facilitate the transportation of nutrients through the forest and act as natural filtration systems by removing impurities and sediments from water.

As the tributaries intersect the trails at a number of cross-sections throughout the mountain (as seen in **Figure 6.1),** it is important they are protected from further degradation or contamination. There were several instances where boardwalks or barriers were placed in an attempt to divert the public. However, they have degraded and no longer serve the same purpose. There were also a number of crossings where culverts or pipes were no longer in working condition and were embedded under the soil or sediment.

It is suspected that a high volume of sediment enters the tributaries throughout the winter. Therefore, we suggested a management plan is derived to ensure the surface water runoff is appropriately filtered. Management strategies may include increased native plants surrounding both trail and creek edges. This is because species of plants, such as grasses and shrubs with deep root systems, can stabilize the soil and prevent erosion.

Stoney Tributary at the intersection of Poplar Trail. Signs of woody debris 'fencing' in place.

Degraded culvert under boardwalk. Signs of vegetation damage surrouding tributary and trail.



City of Burnaby

Burnaby Trail Management Plan

Areas of Concern

Legend

- Burnaby Mountain Conservation Area
- Parcels
- Streets
- Railway
- Waterway
- Severe Erosion
- Unauthorized Trail
- Unauthorized Trail still in use after closure
- Stream Crossing
- Invasive Species

Trails

- Dual Use Trail (Pedestrian/Cycling)
- Multi Use Trail (Pedestrian/Cycling/ Equestrian)
- Pedestrian Only Trail
- Urban Trail (Asphalt Multi Use)

0 100 200 300

Meters

Coordinate System:
NAD 1983 UTM Zone 10N

Scale: 1:14,000
(When plotted at 11"x17")

Data Sources:

- Data provided by NRCan, DataBC, Google Earth

Project #:	1228.0060.01
Author:	LS
Checked:	ZT
Status:	
Revision:	A
Date:	2024 / 1 / 22

URBAN SYSTEMS

FIGURE 6.1

City of Burnaby

Burnaby Trail Management Plan

Environmental Trail Assessment

Legend

- Burnaby Mountain Conservation Area
- Parcels
- Railway
- Waterway

Trails of Environmental Concern

- High
- Medium
- Low
- Other

0 100 200 300
Meters

Coordinate System:
NAD 1983 UTM Zone 10N

Scale: 1:14,000
(When plotted at 11"x17")

Data Sources:

- Data provided by NRCan, DataBC, Google Earth

Project #:	1228.0060.01
Author:	LS
Checked:	ZT
Status:	
Revision:	A
Date:	2024 / 1 / 22

URBAN SYSTEMS

FIGURE 6.2

6.0 SUMMARY AND CONCLUSION

Due to the wide variety of BMCA users, we understand that protecting the natural environmental within the park poses a number of issues. However, through appropriate engagement and education the preservation of the highlighted valuable components in **Table 5.1** should be the main priority for future conservation efforts. BMCA provides unique and diverse habitat to a variety of different ecosystems and animals. There are currently 17 species-at-risk found within the park, all of which could be impacted by the trail systems, if left un-maintained.

The biggest threat the identified species-at-risk and their associated habitats within the park is trail and soil erosion. It has a detrimental knock-on effect to vegetation, wildlife, surface water and public safety. Below is a summary of the main issues found within BMCA and the recommendations which would help preserve the forest health.

6.1 RECOMMENDATIONS

6.1.1 TEMPORARY CLOSURE OF TRAILS

Closing trails is a common conservation and management strategy employed to aid in ecosystem recovery. Trail closures can be implemented for various reasons, including protecting sensitive habitats, promoting natural regeneration, and allowing ecosystems to recover from human impact. Here are some key reasons and benefits of closing trails for ecosystem recovery.

The southeastern portion of the BMCA is of highest concern for several reasons. First, Jim's Jungle Trail and the southern portion of North Road Trail have an extremely high presence of erosion, root disturbance, side tracks and wetland areas. These trails are close to Stoney Creek, a mapped critical habitat for Western Painted Turtle. The extreme erosion on the trail and the number of unauthorized trails in the area has a high chance of impacting the creek's overall health. Closing the trails or portions of the trail temporarily will allow the native vegetation to recover, spread, and naturally regenerate. Suggested closures for this portion of the park could take place during the western painted turtle breeding season to ensure minimal disturbance to the species. A fence surrounding the creek edge could also be a good management tactic to keep pedestrians and dogs from entering the waterways.

Education and engagement will be the key to a successful closure of trails. Users will naturally be impacted by the loss of certain trails. However, closing trails provide an opportunity for educational outreach. Interpretive signage at trailheads or alternative routes can inform visitors about the reasons for closures, the importance of ecosystem recovery, and their role in minimizing their environmental impact.

Nesting and Breeding Protection: Fences can be installed around critical nesting and breeding areas for certain bird species or other wildlife. This protection helps reduce the risk of disturbance and habitat destruction during vulnerable periods of the breeding season.

6.1.2 REGULAR MAINTENANCE

Regular maintenance of trails within the BMCA is crucial for ensuring a safe, enjoyable, and sustainable outdoor experience for visitors while minimizing the impact on the surrounding environment. Below are some key aspects of trail maintenance which should be considered:

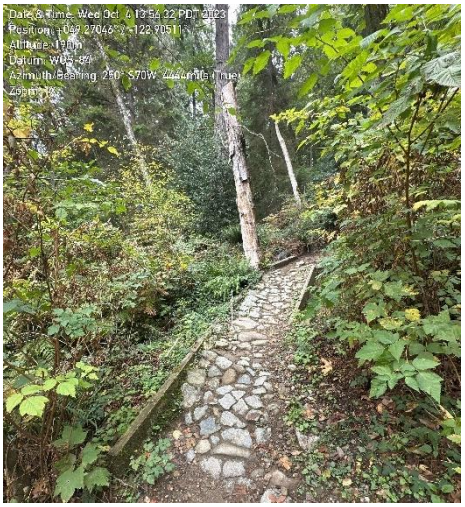
Erosion Control: Implement erosion control measures such as installing water bars or retaining walls where needed to manage water flow and prevent soil erosion. This is particularly important on slopes and in areas with poor drainage.

Vegetation Buffer: Establish and maintain a buffer zone alongside the trails to protect sensitive habitats and prevent unnecessary disturbance to the surrounding vegetation.

Bridges and Boardwalks: Inspect and maintain bridges, boardwalks, and any other elevated structures regularly. Ensure they are structurally sound, free of hazards, and provide safe passage for park users.

Trail Surface Maintenance: Address any erosion issues, repair trail surfaces, and fill in areas where soil erosion has occurred. Proper maintenance of the trail surface helps prevent uneven and hazardous conditions, making the trail safer for users.

Severly degraded culvert in need of repair.



Example of trail restoration, with emphasis on long lasting erosion prevention.

6.1.3 INVASIVE SPECIES MANAGEMENT AND ERADICATION

A long-term plan to control the spread of invasives is required to ensure the protection of the conservation area. The presence of species such as knotweed and Himalayan blackberry causes a huge threat to the natural environment, especially as they can be extremely difficult to remove.

Invasive Species Control: Fencing can be used as a tool to control the spread of invasive plant species. They create a physical barrier and can prevent invasive plants from encroaching on native habitats.

Invasive Species Management Plan: An Invasive Species Management Plan, which identifies all invasive species found within the park should eventually be implemented within the park to help identify and control species of concern.

6.1.4 INCREASED FENCES AND PARK PRESENCE

Fences in managed forest areas are often used as a conservation tool to preserve habitats and protect sensitive ecosystems. Fences are already found throughout the BMCA. However, we understand park users have previously vandalized them. The introduction of fences should come hand in hand with increased park presence to reduce the chance for vandalism and increase understanding.

Regular Inspections: Conduct regular inspections of the entire trail system to identify and address potential hazards, such as fallen trees, unstable rocks, or other safety concerns. Promptly address any issues to ensure user safety. With special attention to recording and closing any new and existing unauthorized goat trails.

Public Outreach and Education: Engage in outreach and educational efforts to inform trail users about responsible and sustainable practices, such as staying on designated trails, leave no trace values, and wildlife needs.

Water Quality Protection: Fencing along water bodies helps protect riparian zones and maintain water quality. By preventing livestock or human access to stream banks, the risk of erosion, sedimentation, and contamination is reduced, benefiting aquatic ecosystems.

Reintroduction Programs: Fences can be used to create enclosed areas for the reintroduction of endangered or locally extirpated species. These enclosed habitats provide a protected environment for reintroduced animals to adapt and establish populations.

Trail Management: Fencing can help direct human traffic along designated trails, preventing off-trail hiking or biking that could damage vegetation and disturb wildlife. This supports sustainable recreation practices and habitat preservation.

Sensitive Habitat Preservation: In areas with fragile or unique ecosystems, fencing can establish boundaries to prevent unintentional human intrusion. This is particularly important for protecting wetlands, riparian zones, and other sensitive habitats from trampling, soil compaction, and other disturbances.

Fencing located on Pandora Trail.

7.0 REFERENCES

BC Government. BC Conservation Data Centre Website. Available : http://maps.gov.bc.ca/ess/hm/cdc/. Accessed July 2023.

BC Government. BC Habitat Wizard Web Application. Available: https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/ecosystems/habitatwizard Accessed July 2023..

BC Government. 2019. BC Species and Ecosystems Explorer website. Accessed December 2019 from: http://a100.gov.bc.ca/pub/eswp/. Accessed July 2023..

BC Government. 2019. BC Water Resources Atlas website. Accessed July 2023. from: https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-science-data/water-data-tools

BC Government. 2019. Fisheries Inventory Data Queries (FIDQ). Accessed December 17, 2023 from: http://a100.gov.bc.ca/pub/fidq/viewSingleWaterbody.do.

BC Government. 2019. Integrated Land and Resource Registry (ILRR). Available: https://www2.gov.bc.ca/gov/content/data/geographic-data-services/land-use/integrated-land-resource-registry. Accessed July 2023.

BC Government. iMapBC Web Application. Available: https://maps.gov.bc.ca/ess/hm/imap4m/ Accessed July 2023.

BC Government. BC Online Contaminated Sites Registry. Available: https://www.bconline.gov.bc.ca/. Accessed July 2023.

COSEWIC. 2016. Western painted turtle (Chrysemys picta bellii): COSEWIC assessment and status report 2016 https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/western-painted-turtle-2016.html#_3_1

COSEWIC 2021. Barn Owl (Tyto alba), western population: recovery strategy, proposed 2021. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/barn-owl-proposed-2021.html#toc4

Environment Canada. Canadian Climate Normals 1981-2010 Station Data: Burnaby A. Available: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnProx&txtRadius=25&optProxType=city&selCity=49%7C15%7C122%7C59%7CBurnaby&selPark=&txtCentralLatDeg=&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongDeg=&txtCentralLongMin=0&txtCentralLongSec=0&txtLatDecDeg=&txtLongDecDeg=&stnID=731&dispBack=0Accessed July 2023.

Inaturalist. https://www.inaturalist.org/ Accessed July 2023.

J Hobbs Ecological Consulting Ltd. 2019. Standard Operating Procedures: A framework to Guide Identification of Species of Management Concern. Informing Project Permitting Requirements in BC. Prepared for Urban Systems.

Meidinger, D. and Pojar, J. (Eds.) (1991). Ecosystems of British Columbia. British Columbia Ministry of Forests: Victoria, BC.

Treasury Board of Canada Secretariat. Federal Contaminated Sites Inventory website. Accessed November 19, 2019 from http://www.tbs-sct.gc.ca/fcsi-rscf/home-accueil-eng.aspx.

Appendix A:

SITE PHOTOGRAPHS

Gear Jammer Trail

Photo 1: Erosion and soil compaction seen on trial, with trail widening on edges.

Gnomes Home Trail

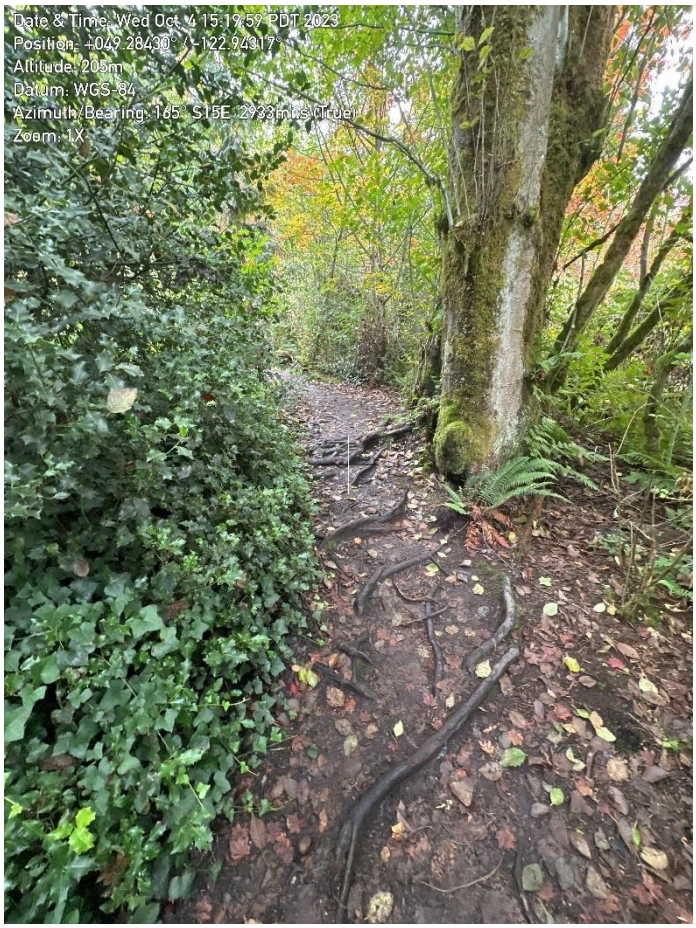


Photo 2: Severe erosion around tree roots

Photo 3: Severe erosion around tree roots

Jims Jungle Trail

Photo 4: Destruction of vegetation and severe erosion on unauthorized trail.

Photo 5: Loss of habitat on unauthorized trail, suspected bike jump. Significant erosion around tree roots

Photo 6: Maintained trail to the left of image and unauthorized trail to the right. Vegeatation damage visible.

Lower Gear Jammer Trail

Photo 7: Erosion and poor trail maintenance. Surface water infrastructure can be seen within the middle of the trail, but fully embedded under the soil on the inlet and outlet.

Photo 8: Mutiple side tracks seen around trees, damage to bark from bikes was visible on the inner tree trunks.

Lower Snake Trail

Photo 9: Severe erosion on trail.Trail widening visible on bottom right hand corner.

Photo 10: Severe erosion on trail, trail widening visible.

Mel's Trail

Photo 11: Severe trail widenening, compaction and erosion from bikes.

Photo 12: Severe trial widening, habitat loss and erosion.

Nicoles Trail

Photo 13: Extreme erosion surrounding tree root system.

Photo 14: Board walk on trail and rocks placed to divert bike/trail users from unauthorized trails.

Photo 15: Erosion and vegetation loss around trail.

North Road Trail

Photo 16: Extreme vegeatation loss due to unauthorized access to forest area surrunding trail. Complete lack of understory vegetation.

Photo 17: Example of lack of understory vegetation caused by erosion.

Ridgeview Trail

Photo 18: Erosion and trail widening.