GIANT'S HEAD MOUNTAIN

TRAILS RE-DEVELOPMENT PLAN

SEPTEMBER 2017

DISTRICT OF SUMMERLAND

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Cover photo: View of Giant's Head Mountain from the west. (Credit: Kyle Pearce)

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EXECUTIVE SUMMARY

Giant's Head Mountain Park is a beautiful 87-hectare park with historical, ecological, and recreational importance in the District of Summerland, BC. Operated since 1967, the park is predominantly known for its network of hiking trails that offer views of Okanagan Lake and the surrounding agricultural and natural landscapes.

This trails re-development plan process included consultation with District staff and council, community groups, and residents, as well as field exploration and analysis. Key issues include identifying recreational needs among user groups, recognizing sensitive and valuable ecosystems, and respecting historic values.

The plan balances recreation opportunities and desires with important natural conservation activities that are presented as a series of challenges, goals, and actions. In this way, trail users are offered a variety of experiences through a consolidated trails system with clear wayfinding, interpretive information, and support infrastructure and amenities. With ongoing growth in Summerland and the Okanagan Valley, the District will need to maintain a balancing act to endorse Giant's Head Mountain Park trails as a valuable recreational amenity while at the same time protecting ecosystem values and sustaining infrastructure and maintenance activities for an increasingly-used trails system. The goals and actions presented here are intended to provide the foundation for addressing future challenges and demands with a complete and holistic trails re-development plan.

Just as Giant's Head Mountain Park was formed through a formidable community, business, and government effort, its future will also benefit from partnerships, volunteerism, and community engagement. Recommendations for phasing and potential partnerships have been identified so that the improvements outlined in this plan can be implemented as resources become available.

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Above: View of Giant's Head Mountain from the north, ca. 1911. (Credit: Summerland Museum & Archives)

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1 INTRODUCTION

1.1 PURPOSE

Since Giant's Head Mountain Park was created in 1967, its original two apex trails have expanded into a 12 km network of dozens of trails. The unplanned and unconstructed nature of these trails has given rise to a series of concerns over the accommodation of all user groups, the health and integrity of the sensitive ecosystems on the mountain, and ever-increasing usership.

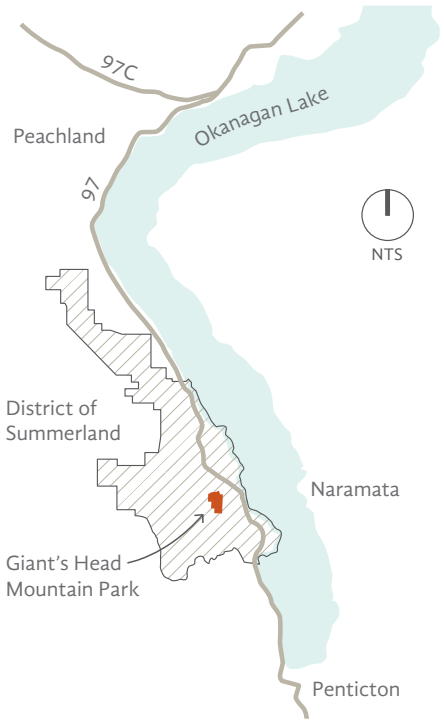
The purpose of this Trails Re-Development Plan is to assess current trail conditions and uses within the park, and to provide a guiding framework for improvements and priorities over the next 10? years. It is important to note that this is a trails re-development plan, not a parks master plan. While a snapshot of the park's ecosystem health has been provided, this is not a complete environmental assessment nor is it a comprehensive management plan. This document is intended to give an understanding of the current state of park trails and to advise on future work to the trail and trail infrastructure system in order to meet both recreational and environmental needs.

It is anticipated that, over the life of the plan, the proposed enhancements will be implemented through District of Summerland capital funding, grant programs, partnerships, and volunteer activities.

1.2 LOCATION AND CONTEXT

REGIONAL CONTEXT

Giant's Head Mountain Park is located in the District of Summerland, within the Regional District of Okanagan Similkameen. The park is part of the municipal parks system and is the District of Summerland's largest park. The mountain is approximately 1km west of Okanagan Lake and is bordered by agricultural lands to the south and southeast, industrial lands to the southwest, and residential lands to the west, north, and east.



Summerland and Giant's Head Mountain Park Regional Context

Top: View to west
Bottom: Viewtubes, a well-loved feature at the mountain summit

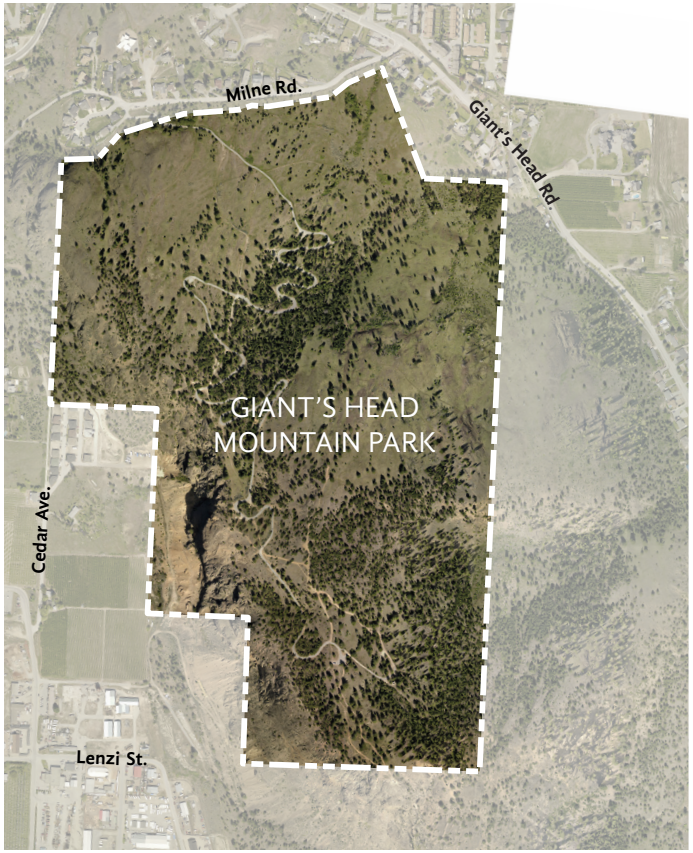
The surrounding community of Summerland has a population of 11,615 (2016) and is 74.08 square kilometers in area. The community maintains a rural/agricultural character and relies on agriculture, light industry, health care, and tourism as primary industries.

Giant's Head Mountain Park is within the Thompson-Okanagan Plateau ecoregion, one of the warmest and driest ecoregions in Canada. The mountain itself is an extinct volcano that dominates the Summerland landscape.

POLICY CONTEXT

There is currently no park management plan, biophysical inventory, or other planning documents that relate specifically to Giant's Head Mountain Park. The District's 2001 Parks & Recreation Master Plan identified key maintenance priorities for Giant's Head Mountain Park, but noted that infrastructural development beyond basic improvements to trails, rest areas, the road, and parking areas was not desirable at the time. The Parks & Recreation Master Plan is being updated in 2017.

The District has a Community Wildfire Protection Plan, which contains recommendations specific to Giant's Head Mountain Park to reduce wildfire risk.



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2 PARK & TRAIL OVERVIEW

2.1 SITE DESCRIPTION

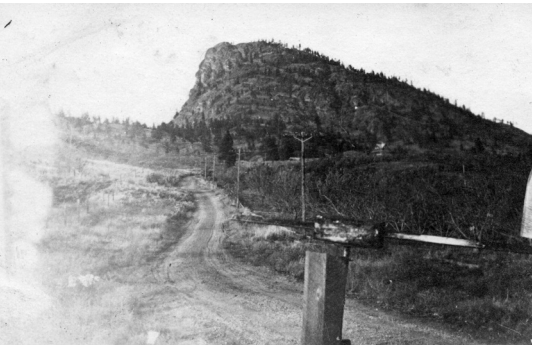
Giant's Head Mountain has an elevation of 845m above sea level and is 350m in height. It is characterized by moderate to steep slopes. The mountain ecosystem is classified as Okanagan, Very Dry Hot Ponderosa Pine variant (PPxh1) (Lloyd et al, 1990) within the provincial Biogeoclimatic Ecosystem Classification (BEC) System. PPxh1 is typified by mature stands of Ponderosa pine (*Pinus ponderosa*) with a dominant understory of bluebunch wheatgrass (*Pseudoreogneria spicata*), rough fescue (*Festuca campestris*), and arrow-leaved balsamroot (*Balsamorhiza sagittata*).

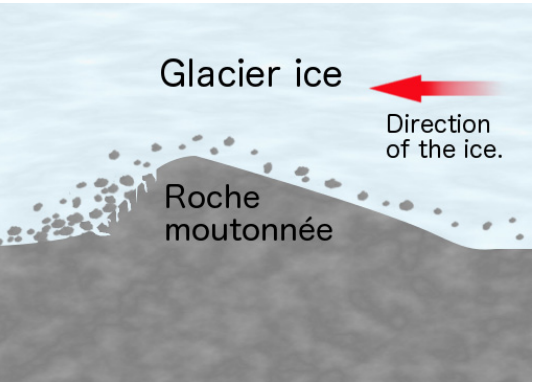
Broadly, the landscape types present in the park can be grouped into steppe/grassland, open coniferous woodland, and rocky or cliff areas with sparse to no vegetation. Sensitivity to disturbance has been identified as moderate to very high for the park, with several of the steppe/grassland areas being of particularly high quality and sensitivity.

These ecosystems support diverse wildlife, and it is not uncommon to encounter species such as white-tailed deer, gopher snake, California quail, northern flicker, owl, and sharp-shinned hawk. Refer to the Site Analysis section for a more in-depth inventory and discussion of plant and animal species present and potentially present within the park.

The mountain is an Eocene-aged (between 55 and 34 million years) composite volcanic dome. The 'giant's head' formation on the south side was molded by the movement of several-kilometer thick glacial ice. The mountain is an excellent example of a glaciological feature called a *rôche moutonnée* (Roed & Fulton, 2011), or sheepback rock formation. The smoother north side of the mountain was formed by abrasion as glacial ice moved southwards, with the rough and steep south side formed by frost shattering as the glacier's forward progress plucked rocks from the formation.

Excellent views of Prairie Valley, Okanagan Lake, Trout Creek, and surrounding vineyards





Top: The giant's profile from Gartrell Road, ca. 1918 (Credit: Summerland Museum & Archives)
Bottom: Rôche moutonnée feature (Credit: Jasmin Ros)

Top: Entry gate at Milne Road, 1970. (Credit: Summerland Museum & Archives)
Bottom: Unveiling of time capsule at the centennial celebration, July 1, 1967. (Credit: Summerland Museum & Archives)

and orchards are available from the summit and many other trails and secondary viewpoints on the mountain.

2.2 PARK HISTORY

The original inhabitants of the region containing the present day park were the Sqilxw/Syilx, or Okanagan Nation (Okanagan Indian Band, 2017). First Nations archaeological history within the Summerland area is significant but poorly studied. Several native burial sites have been documented in the area, some located to overlook Okanagan Lake and others oriented towards Giant's Head Mountain. Numerous arrowheads have been found on nearby Trout Creek Point, suggesting that this was a popular native gathering area (Foster, 2006), but specific uses of Giant's Head Mountain are undocumented.

First European contact occurred in the 1820s as the fur trade established routes through the Okanagan Valley. These European traders originally referred to the Summerland region as Nicola's Valley, after Chief Nkwala, an important Okanagan Nation Chief (Okanagan Indian Band, 2017).

Permanent European settlement began in the 1880s in response to the burgeoning orcharding industry, and Summerland was incorporated in 1906. From this moment, Giant's Head Mountain, especially the rock profile for which it is named, contributed significantly to the identity of the surrounding Summerland settlement, lending it's name and famous profile to numerous local businesses, logos, and events. So locally iconic is the landform that it features prominently in the District of Summerland's coat of arms, created in anticipation of Canada's 1967 Centennial celebrations.

Giant's Head Mountain Park was created as a direct result of these celebrations and was opened on July 1, 1967. The idea of a park with an access road had been proposed decades before the Centennial, but cost had prevented its implementation. When federal financial assistance became available for Centennial projects, the Giant's Head Mountain Park project was made official, with additional funds contributed by individuals, 30 local organizations, municipal council, and the provincial government. A wrought iron entry gate was placed between stone columns at the Milne Road entrance, and a road was built to an upper parking area. The summit featured a bronze plaque, flag pole, sundial, and a commemorative cairn of local granite containing a time capsule (Foster, 1998), all of which remain today with the exception of the sundial. The park was hailed as "one of Canada's

most imaginative Centennial Year projects" (Marshall, 1968) and has remained a popular Summerland landmark.

Originally, there were only two official trails. Both connected the upper parking area to the summit, the steeper trail called Confederation Trail and the more gradual called Centennial Trail.

2.2 EXISTING FACILITIES & PARK USE

Giant's Head Mountain Park has been relatively unchanged since its creation, with most of the original commemorative features still present albeit showing age and wear. The road has been repaved but otherwise maintains the original route and width; a washroom has been added near the upper parking area. In the 1990s, the Summerland Rotary Club contributed trees, tables, and benches to the summit and, more recently, a native planting initiative was undertaken at the Milne Road entrance.

The most significant change to the park has been the creation of unsanctioned and unplanned trails that weave across most of the mountain north of the summit. The park is popular with residents and visitors, primarily hikers, who have created these trails to take advantage of the varied terrain and views available on the mountain.

While hikers form the largest user group in the park, other uses include road walking, road cycling, downhill mountain biking, and road longboarding. Some of the activities in which park users participate include dog walking, bird-watching, and driving to the upper parking lot to access the summit viewpoint.

While the majority of park use is unprogrammed, there are several notable events including the Giant's Head Freeride (a privately sponsored weekend downhill skateboarding race) and the Giant's Head Grind/Christopher Walker Memorial Race, which has been sponsored by the Rotary Club of Summerland since 2014. Both are considered social and economic contributers to the community and will likely continue to garner support and participation.

District of Summerland Coat of Arms (Credit: Summerland Museum & Archives)

2.3 SITE ANALYSIS

ECOLOGICAL

A biophysical site investigation was completed in November 2016 by Mountain Pacific Environmental Consultants (see Appendix A for the complete report). The purpose of the investigation was to identify ecological communities, rare vegetation, noxious weeds, wildlife and wildlife habitat, and to analyze trail disturbance conditions and establish recommendations for the trail re-development plan.

As previously noted, a large portion of Giant's Head Mountain Park is a grassland ecosystem, an ecosystem considered extremely rare in British Columbia and Canada. Much of the grasslands in the Okanagan have been lost to residential and agricultural development or are compromised by introduced plants, habitat fragmentation, fire supression, climate change, and grazing.

The British Columbia Conservation Data Centre (CDC) assigns ecological communities to one of four provincial lists to reflect importance for conservation (see sidebar). The biophysical site investigation found that the park contains several areas of important blue- and red-listed ecological communities that potentially support a range of at-risk plant and animal species.

Overall, invasive plant species percentage cover ranged from 5-15%, with the highest incidence of invasive species occurring adjacent to the road and trails. Trees within the park vary in age, from 35-100 years old at lower elevations to 180-200 years old at higher elevations. The most disturbance within the park occurs near the summit and adjacent to the roadway.

The west and southwest faces of the park are primarily categorized as Sparsely Vegetated, as

BC Conservation Status Rankings for Ecological Communities & Species

BC CONSERVATION DATA CENTRE (CDC)

Extinct: Ecological communities that no longer exist.

Red: Includes any ecological community that is Extirpated, Endangered, or Threatened in British Columbia. Extirpated ecological communities no longer exist in British Columbia, but do occur elsewhere. Endangered ecological communities are facing imminent extirpation or elimination. Threatened ecological communities are likely to become endangered if limiting factors are not reversed. Placing ecological communities on these lists flags them as being at risk and requiring investigation.

Blue: Includes any ecological community considered to be of Special Concern in British Columbia. Ecological communities of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed ecological communities are at risk, but are not Extirpated, Endangered or Threatened.

Yellow: Includes ecological communities that are apparently secure and not at risk of extinction.

No Status: Includes ecological communities that have not been ranked.

Upper Right: Red-listed grassland community , Giant's Head Mountain Park (Credit: Mountain Pacific Environmental Consultants)

Top: Blue-listed Ponderosa pine / Douglas fir woodland (Credit: Mountain Pacific Environmental Consultants)
Bottom: Typical sparsely-vegetated rock bluff (Credit: Mountain Pacific Environmental Consultants)
Right: Rock cliffs on west side of mountain (Credit: Mountain Pacific Environmental Consultants)

they consist of bedrock outcrops and steep cliff areas. The remainder of the park contains both Grasslands and Conifer Woodlands areas.

The grassland on the lower north portion of the mountain is of the poorest condition in the park, with a number of invasive weed species and existing trails. The large grassland area on the east side of the mountain has little disturbance and is in good condition, with minimal invasive weed cover (2-5%) and few trails. This area is dominated by rough fescue and bluebunch wheatgrass, which is considered a red-listed ecological community by the CDC.

The woodland area in the northern portion of the park consists of a mixed Ponderosa pine and Douglas fir stand that is also red-listed by the CDC. However, a number of existing trails have caused significant disturbance. The woodland areas in the southern portion of the park are likewise affected by human use; while consisting of blue-listed areas, the highest amount of disturbance occurs near the summit where numerous trails, road access, and invasive plant species occur. Nevertheless, the oldest trees in the park grow in this area and stand health is good.

Increased trail densities contribute to increased habitat fragmentation and sensory disturbance; as this is a trails re-development plan, it should be unsurprising that the physical form and distribution of the trails themselves are of primary concern to the ecological health of the park.

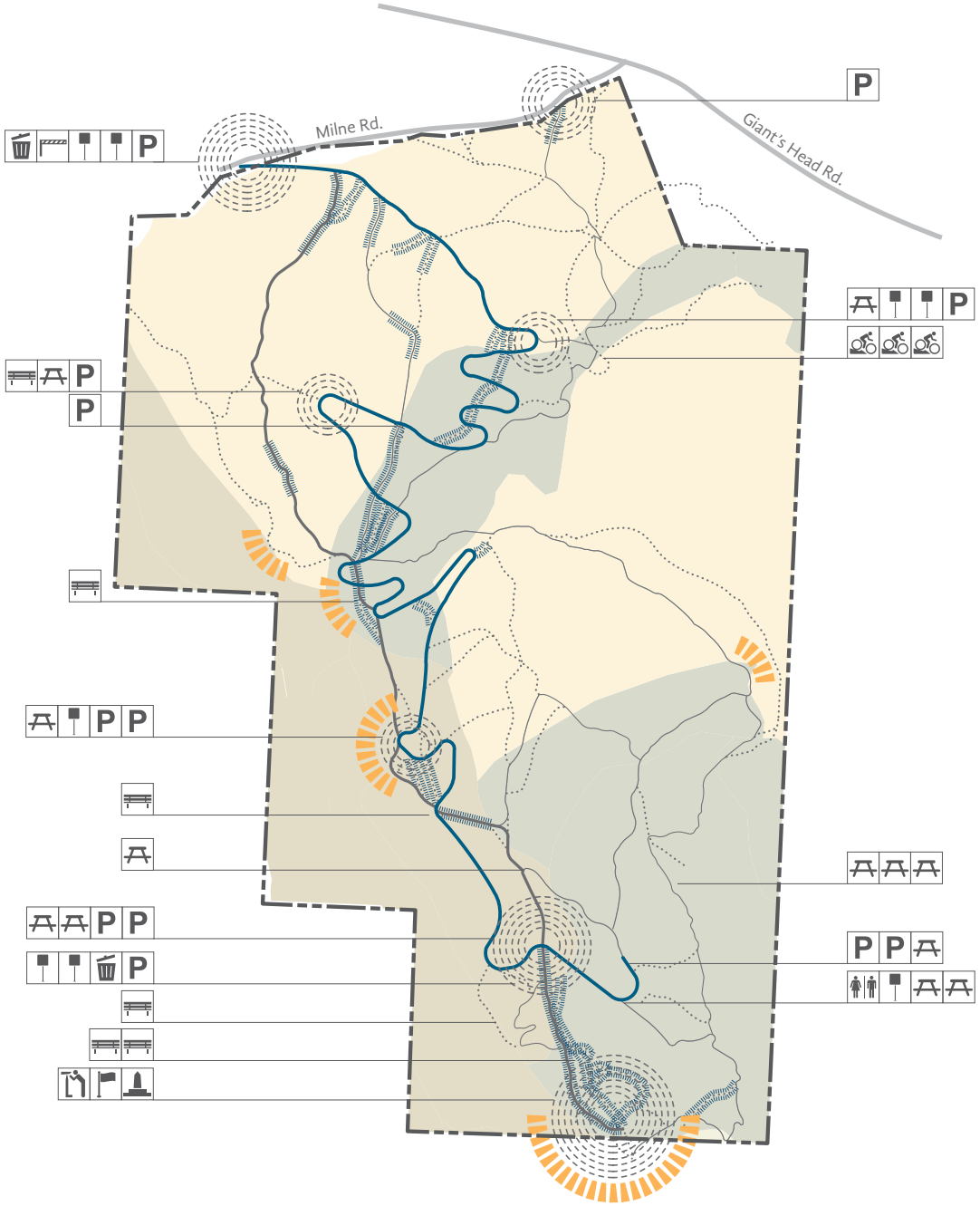
Trail creation is particularly damaging to grassland areas, which are characterized by slow plant growth and soils that are slow-forming, coarse in texture, and prone to erosion. Arid and semi-arid ecosystems, such as grasslands, rely on a microbiotic crust, or community of living organisms (lichen, fungi, cyanobacteria, bryophtes, and algae) on the soil surface (BC Min. of Sust. Res. Mgmnt, 2004). This crust is critical to soil

SITE ANALYSIS

GIANT'S HEAD MOUNTAIN PARK

SENSITIVE ECOSYSTEM CLASSES:

- SPARSELY VEGETATED/CLIFF
- GRASSLAND
- CONIFEROUS WOODLAND



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Top: Trail erosion and cross-cutting near summit (Credit: Mountain Pacific Environmental Consultants)
Bottom: Eroding hiking trail
Right: Soil crust with lichens, fungi, and grasses

stabilization, nutrient provision, plant germination, and thermal regulation. When disturbed, as occurs with trails and roads, it can take decades, or even centuries, to re-form this crust and re-establish plant and animal communities.

WILDLIFE & WILDLIFE HABITAT

The South Okanagan has one of the highest levels of biodiversity and concentrations of species at risk in Canada; more than half (31 out of 57) of the red- and blue-listed species in the South Okanagan and Lower Similkameen are associated with grasslands (BC Min. of Env. Lands and Parks, 1998). The integrity of the at-risk ecological communities identified in Giant's Head Mountain Park indicates that the park provides important habitat within the area. The purpose of Mountain Pacific Environmental Consultants' biophysical investigation was not to assess or document individual species, but to give a broader picture of ecosystem health, habitat, and potential range of plant and animal species, including blue- and red-listed species, within the park. The investigation suggests that the diverse array of ecological communities in the park provides a relatively complex wildlife habitat assemblage within a limited spatial boundary, and that the park represents a unique ecological island within the constraints of the District's agricultural, residential, and commercial developments.

Forty-eight at-risk bird, bat, mammal, herptile, and insect species have the potential to occur within the park (see Appendix A for a complete list). Rock outcrops and bluffs, especially along the south edge of the park, offer hibernacula, burrow, and cliff nesting opportunities. In particular, the cliff face along the southwest portion of the park was identified as offering critical wildlife habitat for a number of at-risk species, including peregrine falcon, barn swallow, and canyon wren. Wildlife trees and snags were identified within the park which provide habitat

Top: Giant's Head Mountain Park road
Bottom: Summit parking area with unsanctioned expansion onto adjacent grassland area (Credit: Google Maps)
Right: Existing parking conditions at Milne Rd. entry

for avian cavity nesters such as woodpeckers, sapsuckers, owls, creepers, and chickadees.

Additionally, two areas were identified as potential habitat for American badger, a provincially red-listed species, although no den sites or signs of badger activity were identified during field investigations. These areas include the largely-intact grassland area on the northwest side of the park, and the southwestern portion of polygon 1423.

With the exception of white-tailed deer, it is unlikely that large mammal species (such as coyote and bear) are commonly present within the park because of spatial constraints and sensory disturbance. White-tailed deer, bald eagle, common raven, dark-eyed junco, and northern flicker were observed during the site assessment.

PHYSICAL & CULTURAL

Site analyses to assess risk and to identify trail locations and conditions, recreational uses, and park features were completed by BENCH Site Design and Cabin Forestry in October and November 2016. These analyses were performed with GPS to map trail locations both on foot and on mountain bike. In addition, the District of Summerland hosted an open house on June 15, 2017 to present these site analyses and to solicit feedback about existing and future trail uses and issues in the park. The feedback collected at this open house is included in Appendix D.

In addition to its high value ecosystems and ecological communities, Giant's Head Mountain Park has many strengths that contribute to its value as a recreational amenity. Its central location within the community allows easy access by both road and trail, and it is a well-loved and well-used park that is valued by residents. Its

Trail with erosion, widened by use over time

SUMMARY OF EXISTING TRAIL SYSTEM STRENGTHS AND WEAKNESSES

STRENGTHS

- *Abundance of existing trails means that no or minimal new trail building is required*
- *Multiple scenic views*
- *Varied terrain and geography supports a range of trail recreation (e.g. walking, hiking, mountain biking, viewing)*
- *Central location within the community with access via road and trail*
- *Presence of intact high value ecosystems*
- *Locally-known recreation destination*
- *Established user base that cares about the park*

WEAKNESSES

- *Lack of designated trails has encouraged unsanctioned trail creation*
- *Unconstructed and unmaintained trails on steep grades are experiencing erosion and damage*
- *Vehicle parking is scattered throughout park; lack of designated parking areas*
- *Overflow parking spills along Milne Rd., creating conflict between park users and adjacent residents*
- *Several existing trails bisect sensitive habitat zones*
- *Lack of trail wayfinding signage*
- *Safety concerns at park road and trail intersections*
- *Safety concerns at steep slopes & cliff*
- *Unsanctioned 4x4 access has caused erosion and habitat damage in multiple locations*
- *Trail furniture is inconsistent and nearing end of life span*
- *Trail signage and furnishings lack coherent identity*

Existing Milne Rd. entry with plant restoration project

SUMMARY OF EXISTING TRAIL SYSTEM OPPORTUNITIES AND THREATS

OPPORTUNITIES

- *Consolidate parking at trailheads and destinations*
- *Improve access points, possibly with a new entry and consolidated parking area*
- *Erosion control to improve trail usability and protect habitat*
- *Habitat enhancement through trail consolidation and decommissioning*
- *Wayfinding enhancement through trail consolidation and decommissioning*
- *Enhance trails to suit needs of different user groups*
- *Improve safety by providing clear trail routes and transitions, and guardrails in required locations*
- *Wayfinding and regulatory signage to improve user experience and discourage unsanctioned trail use*
- *Improve branding and identity through consistent site furnishings and wayfinding signage*
- *Designate viewpoint locations & consolidate with parking or rest areas*

THREATS

- *Increased future usership could increase user conflict, habitat degradation, and trail maintenance requirements*
- *Wildfire*
- *Climate change (e.g. pine beetle kill, invasive species)*

Top: Existing cable guardrail at summit
Bottom: Example of existing weathered furniture

varied terrain and geography support several recreational opportunities, predominantly hiking, and there are abundant existing trails that provide access to much of the park.

However, there are several key areas suggested by the site analyses that warrant attention for the long-term use and management of the park's trails and related amenities. The trail inventory found that there are over 12 km of predominantly user-created trails within the park. These trails vary in slope, width, and use, from heavily-used hiking trails to minimally-used and narrow mountain bike tracks. The trails have not been constructed but worn into native substrate through repeated use. This, combined with steep slopes, has caused extensive erosive damage, damage which continues to occur as trail users attempt to cut wider and safer trails around the eroded areas.

A narrow two-way asphalt road switchbacks up the mountain to an area near the summit. This road is used by vehicles, road cyclists, longboarders, and walkers, and is a key component of the overall trail and access system within the park. However, limited visibility at switchbacks, trail and road intersections, downhill speeds, and multiple user groups make the road a priority for safety and wayfinding improvements.

The primary trail users are hikers of varying ages and abilities who use the trails for recreational activities including fitness, bird-watching, dog-walking, and viewpoint access. Other trail and road user groups include, to a much lesser frequency, downhill mountain bikers, road cyclists, and road longboarders.

The main destination of both road and trails is the summit viewpoint, the location of the time capsule and view tubes. However, there are numerous other excellent viewing opportunities along the north, west and east slopes on the

upper half of the mountain as well. With steep slopes and cliff faces present in several areas of the park, there are opportunities for safety improvements with the use of guardrails and signage.

Vehicle parking, both adjacent to the park entrance and within the park itself, is a significant issue. Parking at the base of the mountain is limited to parallel parking on the gravel road shoulder along Milne Road, which is both limited in quantity and a potential nuisance or hazard to the adjacent residential development. Unsanctioned parking occurs all along the park road (particularly at switchbacks and viewpoints), some of which is causing further erosion, de-vegetation, and encroachment into former picnic or viewpoint areas. A small parking area near the summit has approximately 6 official parking spaces, but the absence of parking lot delineation has seen additional parking encroachment onto the adjacent grassland.

Community and park user input suggests that there is currently minimal conflict between trail users (e.g. hikers and downhill mountain bikers). If park use increases, there is potential for this to become an issue in the future. However, at this time it is not recommended that trail separation by user group occur.

Site furnishings in the park include a washroom building at the top of the road near the upper parking area, numerous benches and picnic tables of varying vintages, regulatory signage, trash receptacles, and the centennial monuments and view tubes at the summit. Much of the site furniture is weathered and in need of replacement. The addition of wayfinding and trail signage will facilitate ease of use for many user groups.

3 TRAILS RE-DEVELOPMENT PLAN

View to north

3.1 VISION

The vision establishes overall direction for the planning and design of park trails and amenities. It is based on stakeholder, community, and local government input.

Giant's Head Mountain Park is a unique place of significant community and ecological importance, both in the District of Summerland and in the South Okanagan region, where people can access a well-developed trail network to experience passive recreation activities, natural and cultural heritage, and outstanding views of the surrounding valley.

3.2 MANAGEMENT CHALLENGES, GOALS, & ACTIONS

Broadly, the trails re-development plan addresses the following key areas: trails enhancement and decommissioning; vehicle and pedestrian access, including parking; ecological sensitivity; and wayfinding, safety, and comfort. These have been framed as a series of **challenges**.

Goals for the park trail system identify the overall intentions of the re-development plan as they relate to the identified challenges.

The **actions** then elaborate on the goals, providing direction on how the goals may be accomplished.

The following pages present these challenges, goals, and actions in table format, and are organized under topic headings.

ENVIRONMENT & CONSERVATION

Challenge	Goal	Action
Unsanctioned trail creation has caused extensive erosion and damage to the sensitive grassland ecosystem	Mitigate user impacts to sensitive park ecosystems	1. Establish park trail network that favours the use of existing trails and anticipates trail user desire lines 2. Decommission redundant trails through a combination of restoration, educational signage, and natural physical barriers 3. Restore eroded trail sections and prevent future erosion on the steepest sections with the use of crib stairs and switchbacks 4. Prevent vehicle access of off-road areas with natural physical barriers
Maintain healthy grassland ecosystems free of invasive plant and animal species	Prevent dispersal of invasive plants in park	4. Develop standards or create education program for local landscaping that to prevent the use of invasive plant species 5. Minimize bare soil conditions and revegetate disturbed park areas with site-appropriate native species 6. Restrict future road development within the park
Protect and enhance rare and endangered species within the park, as identified in the 2016 Environmental Investigation (see Appendix A)	Minimize impacts to sensitive habitats Monitor occurrences of rare and endangered species	7. Locate park trails and amenities to reduce impacts on known sensitive habitat 8. Develop a system for monitoring rare and endangered species and their habitats within the park? 9. Encourage park users and community groups to participate in the Conservation Data Centre's program for recording and monitoring rare and endangered species
Insufficient quantity of parking and lack of designated parking has causing unsanctioned parking along the roadway and at lookout/feature areas	Consolidate and formalize parking at park trailheads and destinations Minimize environmental impacts of parking areas and trailheads	10. Provide regulatory signage or physical barriers as needed to decommission unsanctioned parking areas 11. Provide garbage and recycling containers 12. Limit impervious surfaces 13. Intercept and infiltrate in planted areas any runoff generated by impervious surfaces 14. Use native and drought-tolerant species in planted areas
Climate change	Maintain trails and infrastructure that are climate change resilient	15. Implement recommendations within the Community Wildfire Protection Plan, including forest thinning and fuel management 16. Maintain and strengthen habitat connectivity and wildlife corridors within the park and with surrounding lands

RECREATION & ACCESS

Challenge	Goal	Action
A variety of users with varying needs, desires, and abilities use the park trails	Offer a range of trail types and difficulties Minimize potential user group conflicts Prioritize safety improvements	17. Use best practices in trail construction and renovation (e.g. maximum slopes, drainage rills) 18. Provide signage on shared hiking/mountain bike downtrack trails to minimize user conflict 19. Create 'The Grind', a hallmark hiking trail 20. Identify and improve a network of hiking and walking trails 21. Include vehicle/pedestrian pulloffs on the main road to minimize conflicts and improve safety 22. Provide separate trailhead and parking area for mountain bikers 23. Provide guardrails and signage in high-traffic areas near steep drop-offs 24. Implement a schedule for road closure that accommodates all park users 25. Add roadside mileage markers to assist emergency responders
Vehicular access and parking is limited	Improve vehicle parking areas Improve pedestrian linkages to the community	26. Improve parking at Milne Road entrance by providing a designated parking area outside of the road right-of-way 27. Improve parking at the upper viewpoint access by expanding the existing parking area and consolidating with the trailhead 28. Relocate vehicular gate at Milne Road entrance to improve visibilty and prevent conflicts with adjacent residents 29. Consider future land acquisition at the base of the park if usership increases to necessitate additional parking 30. In the context of the larger community parks and trail system, consider improved pedestrian routes that connect to the downtown area and surrounding neighbourhoods
Viewpoints are, and will continue to be, intensively used	Improve access to and usability of viewpoints	31. Designate viewpoint locations along trail system 32. Provide seating opportunities at key viewpoints 33. Improve access to upper viewpoint with parking lot improvements and the institution of a one-way road loop at the upper parking area
Meet auxiliary recreation needs of park trail users	Facilitate a pleasant user experience by providing key amenities and information on trail and park use Respect historical features within park	34. Provide a second washroom facility at Milne Rd. entry 35. Upgrade site furnishings (e.g. benches and picnic tables) throughout park 36. Install kiosks at lower and upper trailheads to consolidate useful information (e.g. regulatory, interpretive, trail maps, etc.) 37. Preserve flagpole and time capsule monument at peak 38. Refurbish existing view tubes and, if necessary, relocate to a safe distance back from steep slopes and drop-offs 39. Incorporate park trails and amenities into an operations maintenance plan

Potential for conflict between dogs and trail users	Minimize human/dog and dog/dog conflict Prevent dog feces and plastic dog bags from littering the landscape Prevent dogs from disturbing sensitive habitat	40. Require that dogs within the park be on-leash 41. Include clear regulatory signs regarding dogs in the park and on trails 42. Prepare and implement a dog waste management strategy

INTERPRETATION & AWARENESS

Challenge	Goal	Action
Some visitors are unaware of the significance of park ecosystems	Increase awareness and appreciation of the park's ecology	43. Educate park users on the importance of trail decommissioning and rehabilitation in sensitive areas through signage 44. Provide interpretive information at key locations on the uniqueness and quality of the Giant's Head grasslands ecosystem, including information on restoration efforts and rare and endangered plant and animal species that are found in the park 45. Promote the uniqueness of the grasslands through promotional materials (e.g. District of Summerland website)
Giant's Head Mountain Park is unique in the District's park and recreation system	Increase awareness of the park and its recreational opportunities	46. Install sign at Milne Rd. park entry and to improve branding and identity 47. Improve park branding with consistent, durable, and attractive site furnishings, constructed items (e.g. retaining walls), signage, and graphics

STEWARDSHIP

Challenge	Goal	Action
Increased usership has potential to increase user conflicts or impacts on neighbouring properties	Maintain good relationships and communication with neighbouring property owners	48. Correspond and meet with neighbours regarding trail upgrade phasing & projects 49. Correspond and meet with neighbours as required to monitor concerns (e.g. increased traffic on Milne Rd.) 50. Monitor user groups use of park facilities to ensure needs are being met; adopt management actions as required
Increased usership has potential to increase habitat degradation	Engage community groups and stakeholders in park stewardship activities	51. Identify and engage community groups (e.g. schools, Rotary Club, naturalist groups, outdoor recreation groups) that may wish to have ongoing involvement in park stewardship and programs

Top: Trail near summit
Bottom: Mountain bike and hiking trail on east side of mountain

3.3 PROPOSED TRAILS PLAN

The proposed trails plan is an attempt to balance park users' recreational requirements with ecological and management needs. A preliminary version of this plan was presented at the June 15, 2017 open house; the final version included here has been modified to reflect the community feedback generated from this open house.

The following principles guided the preparation of the proposed trails plan:

- Use and restore existing trails where possible to minimize new trail work
- Reduce the overall number of trails in the park to facilitate habitat restoration activities and to protect sensitive ecosystems
- Emphasize a variety of trail experiences for various user groups (e.g., vary trail difficulty, facilitate viewing opportunities, emphasize looping trails)
- Prioritize hikers as the largest park user group
- Reduce conflict between vehicular and pedestrian uses
- Respect historic values of the park

The proposed trails plan includes the reuse and improvement of 5,600m of existing trails, the decommissioning and restoration of 6,600m of existing trails, and the addition of 400m of new trails.

Trail Type	Length (m)
Existing Total	**12,200**
Improved existing	5,600
Decommissioned	6,600
New	400
Proposed Total	**6,000**

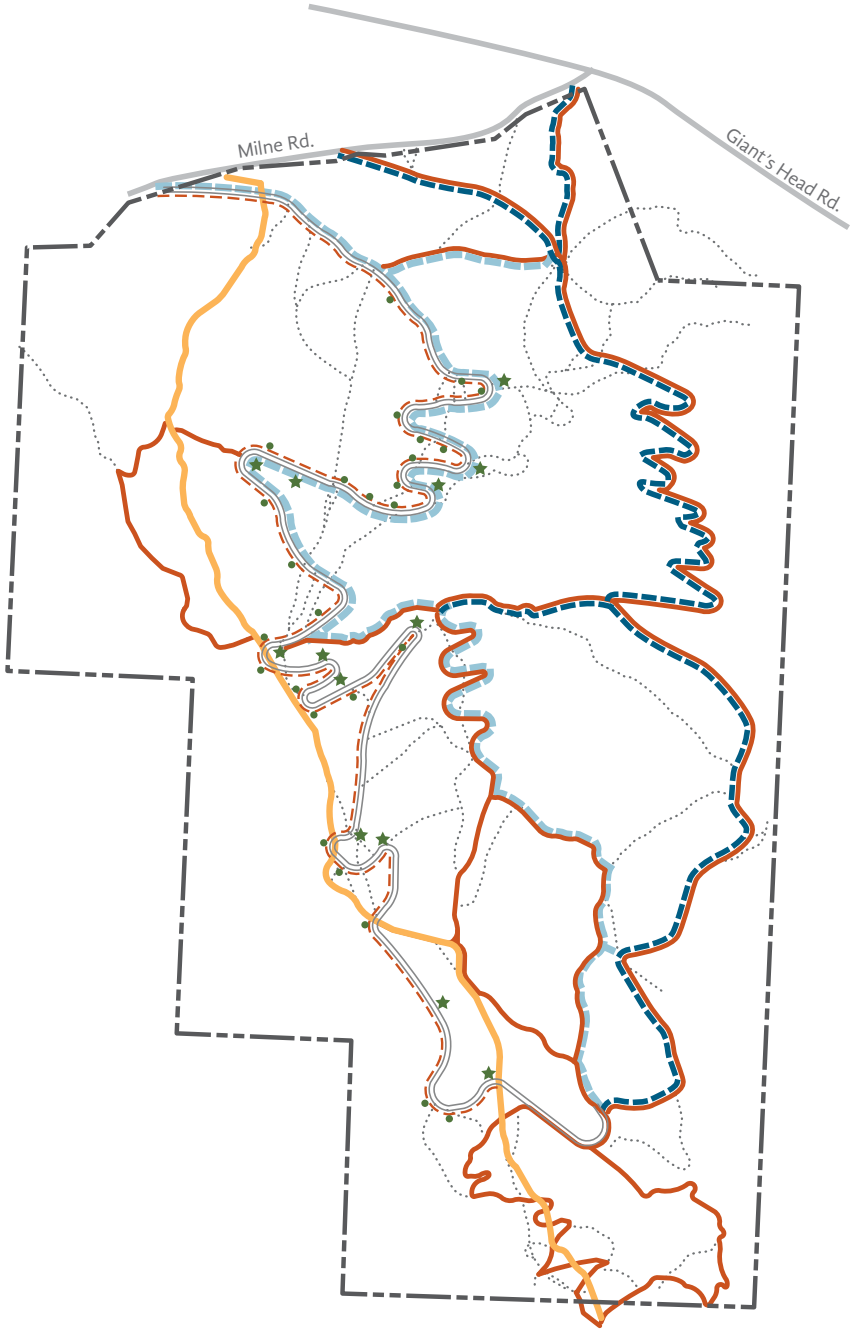
Many trails are redundant and have been created as shortcuts or as bypasses around difficult or eroded areas. By decommissioning these trails, these areas can be restored so that financial and maintenance resources can be concentrated onto a reduced number of trails. The decommissioning is not expected to detract significantly from the available terrain and trail experiences available to hikers in the park. Decommissioning activities will rely on a combination of passive trail closure (e.g. the strategic placement of boulders and logs to prevent access), active trail closure (e.g. addition of guardrails and/or signage), restoration activities (such as reseeding, planting, and mulching), and public education

PROPOSED TRAILS

GIANT'S HEAD MOUNTAIN PARK

NTS

- EXISTING ROADWAY
- THE GRIND TRAIL
- HIKING TRAIL
- ROAD WALKING ROUTE
- MOUNTAIN BIKE UP TRACK
- MOUNTAIN BIKE DOWN TRACK
- DECOMMISSIONED TRAIL
- VEHICLE PULL-OFF
- MOUNTAIN BIKE / PEDESTRIAN PULL-OFF



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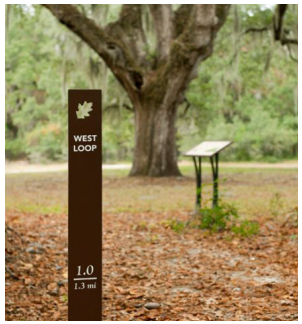


Above: Durable and distinctive trail markers and trail intersection signs
Right: Gabion basket benches

(including information at trailheads or on-trail signage explaining restoration activities).

Trail restoration activities take time and dedicated effort, but are important as fragmentation is one of the greatest threats to ecological integrity. Because restoration activities will require ongoing work and monitoring, this could be an good partnership opportunity with schools or volunteer organizations.

Hiking trails have been located to offer variation in difficulty and experience. The Grind offers both the quickest and the most difficult hike to the top of the mountain, while the other hiking trails are varied in slope and may have crib steps and stairs in steep terrain to accommodate users of varying abilities.

While mountain bike trail use is restricted to the east side of the park, the trails are multi-use and will accommodate hikers. This is the only area with proposed new trails; the preferred location for mountain bike use is in isolated areas to prevent cross-cutting onto adjacent trails. The layout of the trail is inclusive of the mountain bike experience, with provisions for descent speed, corners, and features specific to the activity. However, trail signage to outline trail etiquette should be provided to minimize conflicts and ensure that hikers, too, can enjoy a safe and enjoyable trail experience on the east side of the mountain.

The roadway is to be maintained as both a vehicular road and a walking and cycling route. Key points have been identified for the creation of pedestrian and vehicle pull-off shoulders to enhance safety. These areas are not intended for parking and will require natural barriers and signage to prevent such activity.

A programmatic element to note is the inclusion of vehicular restrictions on the roadway, which is heavily used by vehicular and pedestrian users alike. It is recommended that District staff explore potential closure times where the road will be closed to vehicles but remain open to all other park users, thereby improving safety conditions for walkers, cyclists, and longboarders.

Trail and road improvements at the existing upper parking area will both address parking issues

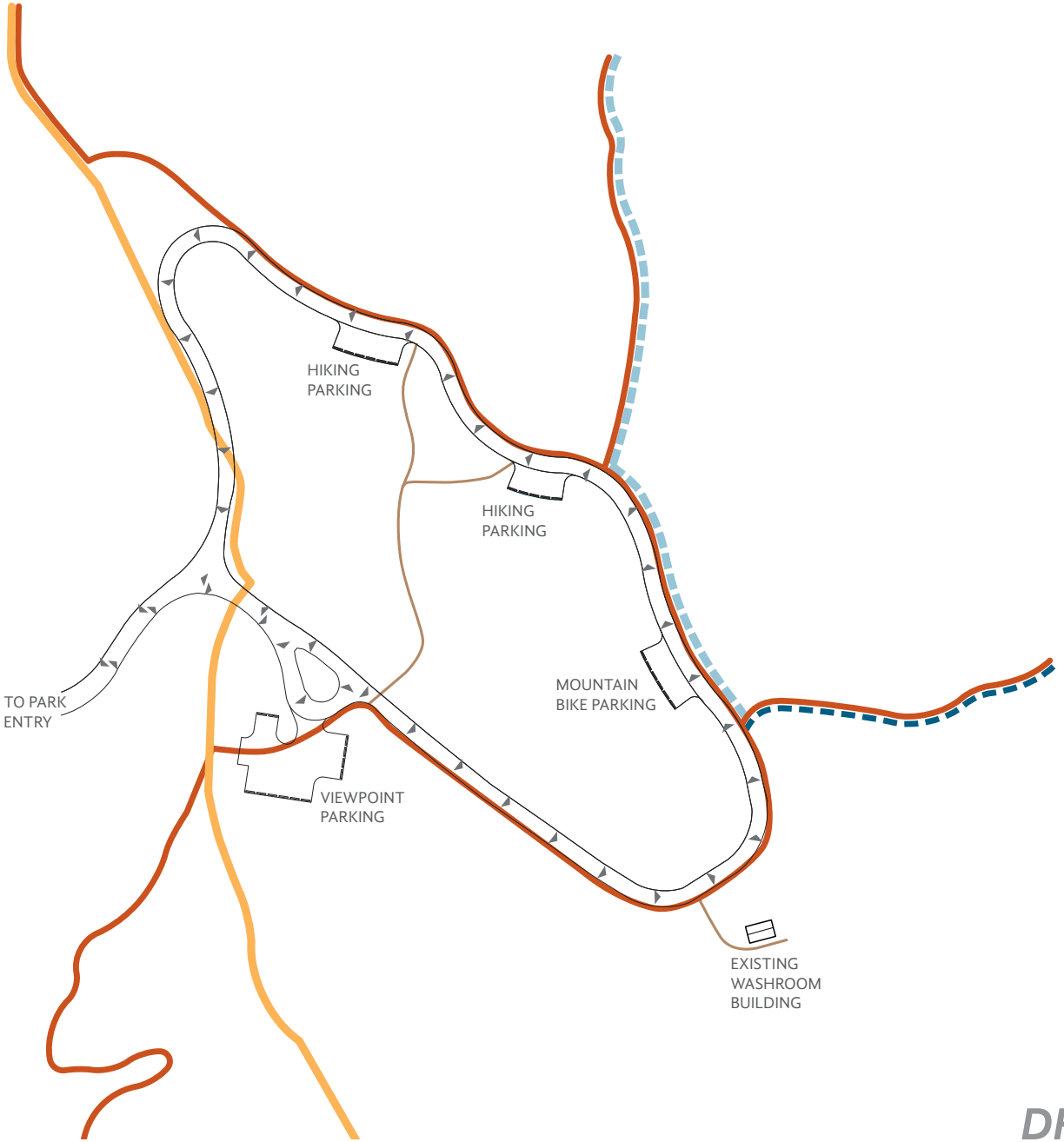
UPPER CIRCULATION

GIANT'S HEAD MOUNTAIN PARK

NTS

- ASPHALT ROADWAY
- THE GRIND TRAIL
- HIKING TRAIL
- MOUNTAIN BIKE UP TRACK
- MOUNTAIN BIKE DOWN TRACK
- CONNECTING TRAIL

- VEHICLE TWO-WAY CIRCULATION
- VEHICLE ONE-WAY CIRCULATION



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and maintain safe and free-flowing circulation. The existing parking area is both small and poorly-defined, and would benefit from modest expansion, granular resurfacing, and the inclusion of parking barriers to prevent parking on the adjacent grassland. See Section 3.4 for a more detailed plan of this area. The re-surfacing of an existing service road will provide one-way counter-clockwise vehicle circulation, and includes the addition of small parking areas that can function as overflow parking or be used by mountain bikers or hikers who use trails other than those connecting directly to the upper viewpoint.

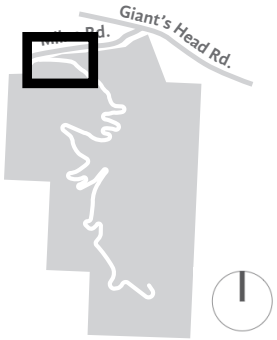
3.4 DETAILED PLANS

Three areas were identified as activity nodes with confluences of user groups and higher concentrations of trails and trail intersections, which warrant detailed plans for trail works and associated infrastructure. These are the Milne Rd. entry at the north base of the mountain, the upper parking area, and the upper viewpoint at the southern tip of the park.

MILNE RD. ENTRY

As the primary entry point to the park for all vehicular traffic and the majority of pedestrian traffic, the Milne Rd. entry is important both functionally and symbolically. The Milne Rd. entry plan focusses on improvements that improve parking and access conditions, emphasize the visual identity of the park entrance, and enhance user experience with key trail and amenity improvements.

Currently, the Milne Rd. shoulder is commonly used for parallel parking, but there are concerns with blocking access for emergency vehicles and residents of the surrounding neighbourhood. A long-term parking solution would address these issues as well as parking quantity. The plan proposes the creation of an expanded parking area



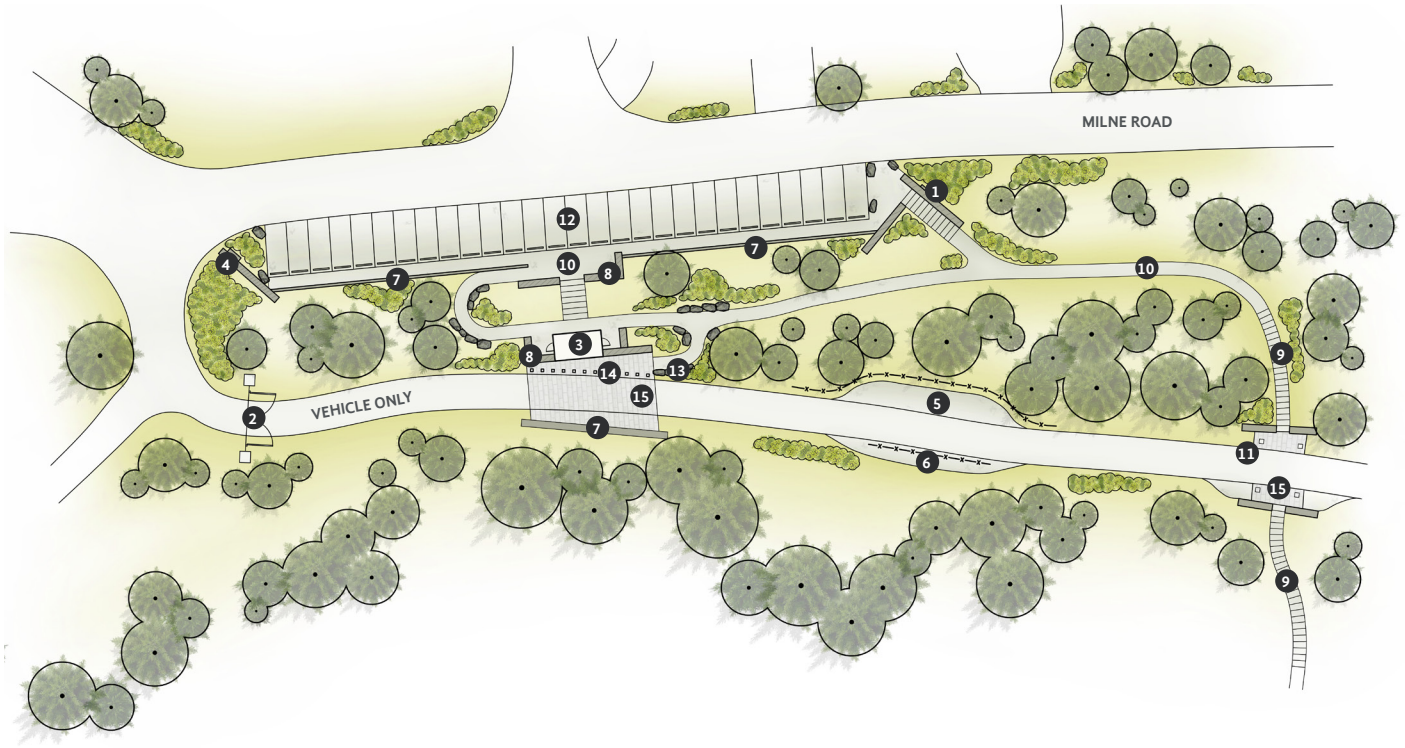
Top: Milne Rd. Entry location plan
Right: Washroom building precedent

MILNE RD. ENTRY

GIANT'S HEAD MOUNTAIN PARK

NTS

1. PARK ENTRY SIGN & GRIND ENTRY
2. VEHICLE GATE
3. WASHROOM BUILDING
4. PARK HOURS SIGN
5. VEHICLE YIELD PULL-OFF
6. ROAD WALKER / MOUNTAIN BIKE UPTRACK PULL-OFF
7. GABION BASKET RETAINING WALL
8. CONCRETE RETAINING WALL
9. CRIB STAIRS / TIMBER STAIRCASE
10. GRANULAR TRAIL
11. INTERSECTION MARKERS
12. GRAVEL PARKING LOT (28 STALLS)
13. BOULDERS
14. WOOD BOLLARDS
15. THRESHOLD PAVING



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to accommodate approximately 20-30 parking stalls perpendicular to Milne Rd. with a retaining wall to keep all parking within the park boundary and outside of the Milne Rd. right-of-way.

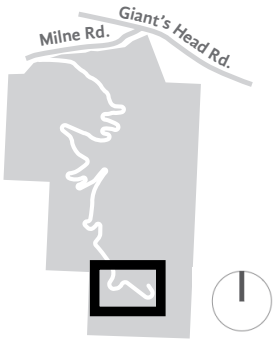
A new Giant's Head Mountain Park sign, placed at the front of the new parking area, will make the park entrance clear and welcoming, as well as assisting with park visual identity and branding.

The current gate is well within the park in a low-visibility location that does not allow for vehicle turnaround if the gate is closed. Moving the gate and its stone piers west will preserve this historic feature while making it more visible to vehicles approaching on Milne Rd. Maintaining a regulatory sign with park hours and gate closure information at the junction of the Giant's Head Mountain access road and Milne Rd. will further help with vehicle approach and access.

A key component of trail improvements in this area is the addition of crib steps and (if necessary) timber stairs. The trails in this region of the park are particularly steep. Combined with trail stabilization, steps and stairs will offer a more accessible entry point for all hikers whether they continue up the more difficult Grind trail or branch off onto easier trails.

The park currently has one washroom facility at the upper parking lot. The addition of a second washroom building at the Milne Rd. entry will be a useful user amentity and can double as a trailhead 'kiosk,' with regulatory signage and trail maps built into the side of the new building to help orient visitors and provide park information.

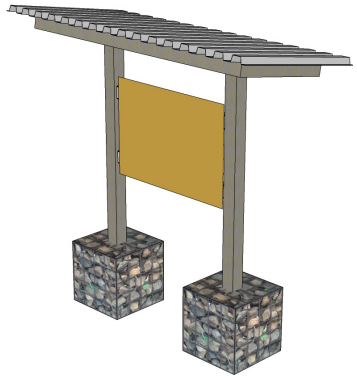
Top: Park entry sign & 'The Grind' wall precedent
Bottom: Gabion basket retaining wall



UPPER PARKING AREA

The expanded upper parking lot will include 12 stalls in a re-surfaced granular area with wheel stops and strategically-placed boulders to prevent parking outside of the lot. With improvements to the existing maintenance road creating a one-way vehicle access route, circulation will be well-marked and further delineated with guardrails to protect grassland areas and, where necessary, separate pedestrian trails and roadway. There will also be approximately 16 overflow parking stalls added on this one-way vehicle route.

As the main access point to the upper viewpoint, the intersection of The Grind trail and the parking lot will be marked with a small kiosk providing regulatory and wayfinding information. Minor improvements, such as concrete and gabion retaining walls, will also be included.



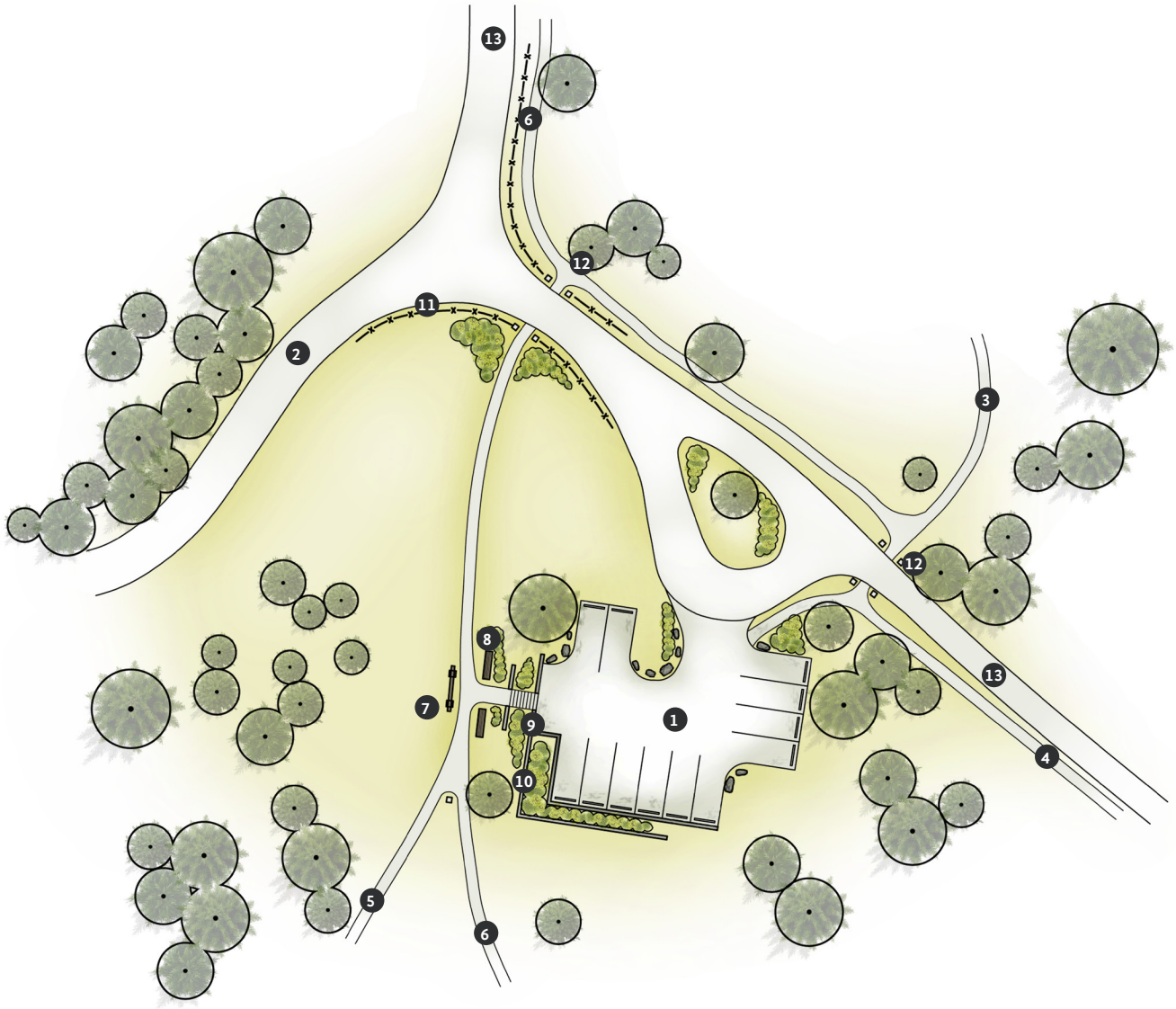
Top: Upper Parking Area location plan
Middle: Use of guardrails to mark trailheads
Bottom: Gravel parking lot
Upper right: Park kiosk precedent
Middle right: Boulders for vehicle control
Lower right: Gabion and concrete retaining walls

UPPER PARKING

GIANT'S HEAD MOUNTAIN PARK

NTS

1. GRAVEL PARKING LOT (12 STALLS)
2. MAIN ROAD (TWO-WAY)
3. PATHWAY FROM OVERFLOW PARKING
4. PATHWAY TO WASHROOMS
5. PASSIVE HIKING TRAIL TO VIEWPOINT
6. "THE GRIND" TRAIL
7. PARK KIOSK
8. PARK BENCH
9. CONCRETE RETAINING WALL
10. GABION BASKET RETAINING WALL
11. GUARDRAIL
12. INTERSECTION MARKERS
13. LOOP ROAD (ONE-WAY)

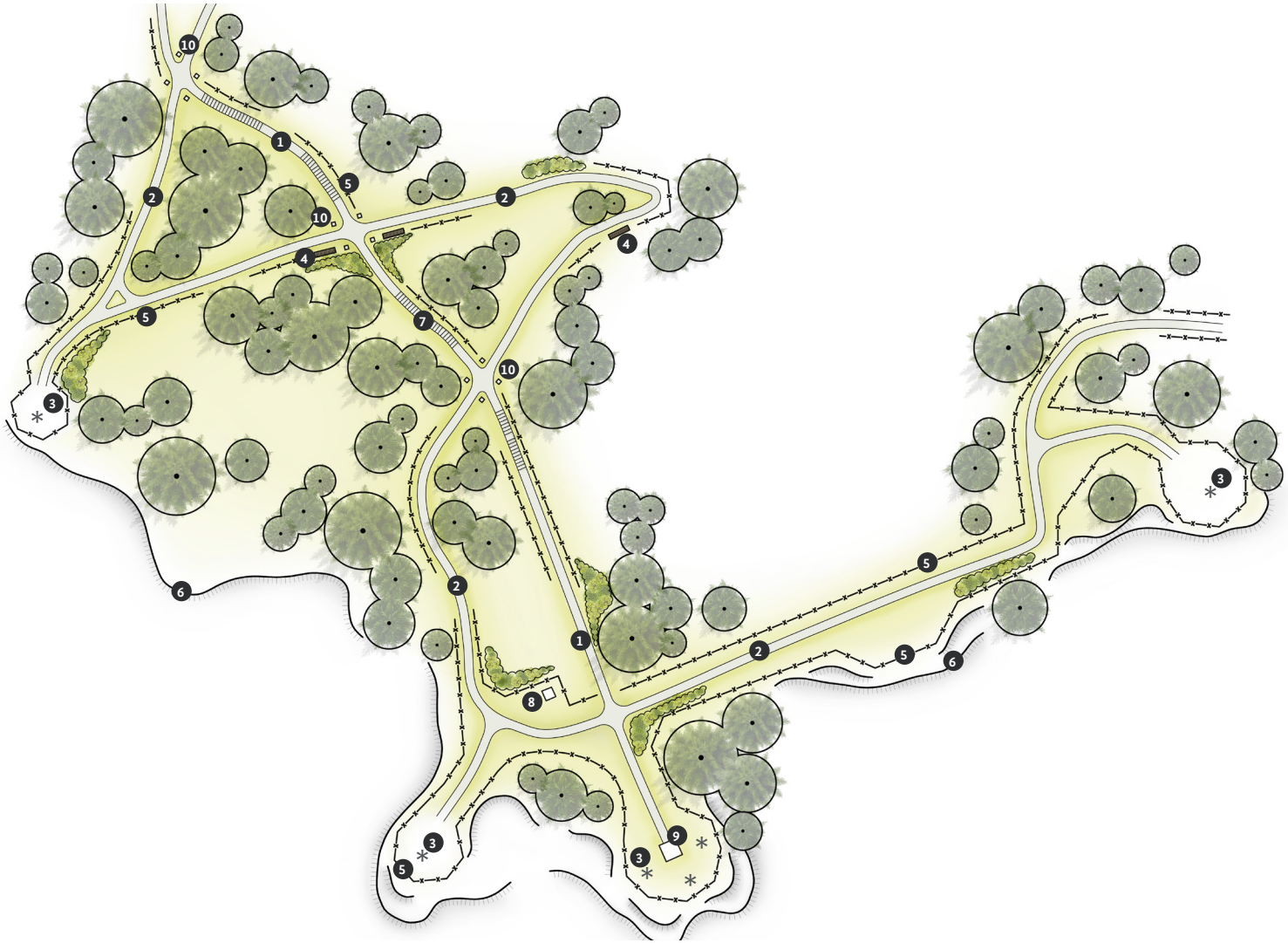


UPPER VIEWPOINT

GIANT'S HEAD MOUNTAIN PARK

NTS

1. "THE GRIND" TRAIL
2. PASSIVE HIKING TRAIL TO VIEWPOINT
3. VIEWPOINT W/ VIEWTUBE FEATURE
4. PARK BENCH
5. GUARDRAIL
6. ROCK FACE
7. CRIB STAIRS / TIMBER STAIRCASE
8. EXISTING TIME CAPSULE
9. EXISTING MONUMENT & FLAGPOLE
10. INTERSECTION MARKERS



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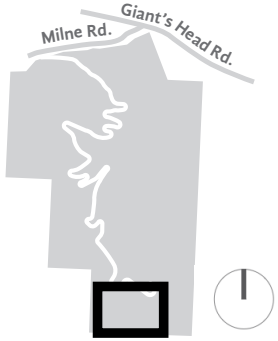
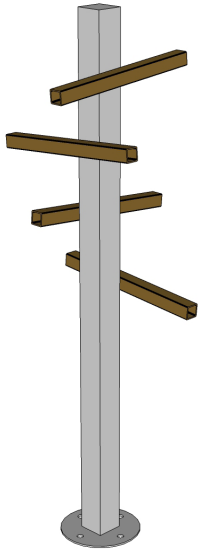


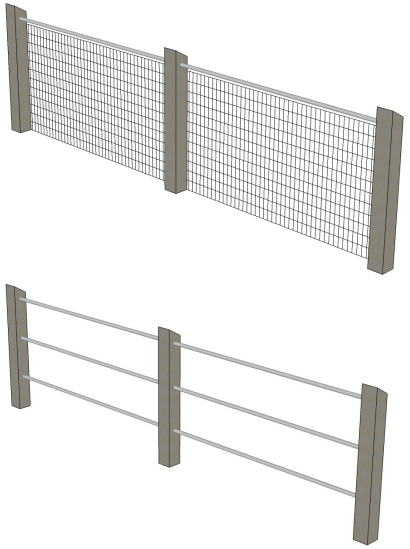


UPPER VIEWPOINT

The upper viewpoint is one of the most highly-used and, subsequently, most damaged areas of the park. While the primary work will consist of extensive trail decommissioning, concurrent works will be necessary to encourage sustainable trail user habits, protect grassland and woodland undergoing restoration efforts, and address safety issues.

The Grind will continue to be the most direct route to the upper viewpoint. Because of the steep grade and severe erosion, crib steps and timber stairs will be necessary in certain locations to maintain restored trail conditions and provide a consistent surface for trail hikers.

A less steep secondary trail will wind its way to the summit and will offer a more leisurely and easier trail experience. The use of wayfinding devices, such as trail intersection markers, will be important to differentiate the trails and to discourage people from cutting their own trails to the summit. Likewise, the use of guardrails will be an important part of the trail work in this area to discourage people from deviating from the two main trails, as well as to improve safety conditions at steep locations along trails and at viewpoints.



Top: Upper Viewpoint location plan
Bottom: Proposed viewtube refurbishment
Right: Guardrail types for safety and habitat protection

Improvements for subsequent phases include replacing benches and refurbishing the view tubes at the upper viewpoint, a historic and well-loved feature that frames named viewpoints of Summerland and the surrounding valley.

Summit view of Trout Creek

4 IMPLEMENTATION STRATEGY

Park projects are often advanced in partnership with volunteers, agencies, insitutions, and through grant programs to supplement core District budgeting. A planning-level cost estimate based on existing information is provided below, with suggested phasing to help prioritize works over several years.

4.1 COST ESTIMATE & PHASING

The work and associated costs identified on the following pages should be evaluated by staff and council relative to resource and budget requirements. Costs suggested here may vary depending on design and construction prices. The phases are ordered by priority, but this is subject to change dependent on available funding and funding conditions.

Phase 1 includes priority improvements to address immediate needs relating to trail usability, safety, and ecological sensitivity throughout the entire park. These include trail refurbishment and decommissioning to establish the overall park trail network, viewpoint improvements relating to safety and durability, and regulatory and wayfinding signage throughout the trail system.

Summary of Estimate of Probable Costs	
Phase 1	$306,113
Phase 2	$298,910
Phase 3	$281,315
Phase 4	$260,000

Subtotal	$1,146,338
15% Consultant Fees	$171,951
20% Contingency	$229,268
Total	**$1,547,557**

Phase 2 and 3 improvements build upon the Phase 1 work to further enhance functionality and user experience at key trail network locations. These include Milne Rd. entrance im-

provements, road upgrades, upper parking area upgrades, and furnishing upgrades.

Phase 4 improvements relate to the second washroom facility at the Milne Rd. entrance. This phase could be implemented at any time as it relates to user comfort and convenience and does not reflect an urgency in relation to trails restoration or user safety.

CLASS D COST ESTIMATE: PHASE 1

1.0 Park Trails				
1.1 New Trails	**Units**	**Qty.**	**Price**	**Item Total**
1.1.1 Multi-use Trails	l.m.	1205	$15.00	$18,075.00
			1.1 Total	***$18,075.00***
1.2 Existing Upgraded Trails				
1.2.1 The Grind	l.m.	1512	$12.50	$18,900.00
1.2.2 Hiking Trails	l.m.	2308	$12.50	$28,850.00
1.2.3 Multi-use Trails	l.m.	1825	$12.50	$22,812.50
			1.2 Total	***$70,562.50***
1.3 Decommissioned Trails				
1.3.1 Trail Decommissioning (Restoration & Erosion Control)	l.m.	6620	$5.00	$33,100.00
			1.3 Total	***$33,100.00***
1.4 Additional Trail Work				
1.4.2 Crib Steps c/w Handrail on One Side	ea.	58	$300.00	$17,400.00
1.4.3 Timber Staircase c/w Handrail	ea.	64	$500.00	$32,000.00
			1.4 Total	***$49,400.00***
			1.0 Total	***$171,137.50***
2.0 Viewpoint				
2.1 Road and Trail Work				
2.1.1 Viewpoint Regrading & Surfacing w/ Compacted Granular	m^2	430	$45.00	$19,350.00
			2.1 Total	***$19,350.00***
2.2 Furnishings and Features				
2.2.1 Guardrail Type 1	l.m.	145	$175.00	$25,375.00
2.2.2 Guardrail Type 2	l.m.	420	$125.00	$52,500.00
2.2.3 Restoration Planting	m^2	450	$15.00	$6,750.00
			2.2 Total	***$84,625.00***
			2.0 Total	***$103,975.00***
3.0 Signage				
3.1 Signage Types				
3.1.1 Regulatory (1 sign per 350 l.m. trail)	ea.	20	$500.00	$10,000.00
3.1.2 Intersection Markers	ea.	22	$750.00	$16,500.00
3.1.3 Trailhead Signs	ea.	3	$1,500.00	$4,500.00
			3.1 Total	***$31,000.00***
			3.0 Total	***$31,000.00***
			Subtotal	***$306,112.50***
			15% Consulting Fees	***$45,916.88***
			20% Contingency	***$61,222.50***
			Total	***$413,251.88***

CLASS D COST ESTIMATE: PHASE 2

1.0	**Road Upgrades**				
1.1	**Entry to Upper Parking Area**				
1.1.1	Vehicle Pull-offs (Incl. grading, surfacing, guardrail)	ea.	13	$5,000.00	$65,000.00
1.1.2	Pedestrian/Cyclist Pull-offs (Incl. grading, surfacing, guardrail)	ea.	26	$3,000.00	$78,000.00
				1.1 Total	***$143,000.00***
				1.0 Total	***$143,000.00***
2.0	**Park Entrance**				
2.1	**Road and Trail Work**				
2.1.1	Existing Entry Gate Removal	l.s.	1	$1,000.00	$1,000.00
2.1.2	Road Upgrades	l.s.	1	$20,000.00	$20,000.00
2.1.3	Crushed Granular Parking	m^2	421	$45.00	$18,945.00
2.1.4	Crushed Granular Trails	m^2	338	$45.00	$15,210.00
2.1.5	Crib Steps c/w Handrail on Two Sides	ea.	11	$350.00	$3,850.00
2.1.6	New Entry Gate	l.s.	1	$3,500.00	$3,500.00
				2.1 Total	***$62,505.00***
2.2	**Furnishings and Features**				
2.2.1	Main Park Entry Feature / The Grind Entry	l.s.	1	$12,500.00	$12,500.00
2.2.2	Secondary Park Entry Sign	l.s.	1	$7,500.00	$7,500.00
2.2.3	Park Hours Sign	l.s.	1	$3,000.00	$3,000.00
2.2.4	Gabion Retaining Walls (1.2m Ht.)	face m.	108	$300.00	$32,400.00
2.2.5	Board Form Concrete Retaining Walls (1.2m Ht.)	face m.	38	$450.00	$17,280.00
2.2.6	Boulders	ea.	23	$75.00	$1,725.00
2.2.7	Restoration Planting	m^2	300	$15.00	$4,500.00
				2.2 Total	***$78,905.00***
				2.0 Total	***$141,410.00***
3.0	**Viewpoint**				
3.1	**Furnishings and Features**				
3.1.1	Benches	ea.	7	$1,000.00	$7,000.00
3.1.2	Viewtube Features	l.s.	1	$7,500.00	$7,500.00
				3.1 Total	***$14,500.00***
				3.0 Total	***$14,500.00***
				Subtotal	***$298,910.00***
				15% Consulting Fees	***$44,836.50***
				20% Contingency	***$59,782.00***
				Total	***$403,528.50***

CLASS D COST ESTIMATE: PHASE 3

1.0	**Upper Circulation**				
1.1	**Paving and Trails**				
1.1.1	Asphalt Paving	m^2	1340	$75.00	$100,500.00
1.1.2	Compacted Granular Paving (For Parking)	m^2	250	$45.00	$11,250.00
1.1.3	Connecting Pedestrian Trails	l.m.	170	$15.00	$2,550.00
				1.1 Total	***$114,300.00***
1.2	**Furnishings and Features**				
1.2.1	Kiosk	ea.	1	$3,000.00	$3,000.00
1.2.2	Upgrade Existing Washroom	ea.	1	$5,000.00	$5,000.00
				1.2 Total	***$8,000.00***
				1.0 Total	***$122,300.00***
2.0	**Upper Parking Area**				
2.1	**Road and Trail Work**				
2.1.1	Asphalt removal	l.s.	1	$1,250.00	$1,250.00
2.1.2	Compacted Granular Paving	m^2	327	$45.00	$14,715.00
2.1.3	Crib Steps c/w Handrail on Two Sides	ea.	9	$350.00	$3,150.00
				2.1 Total	***$19,115.00***
2.2	**Furnishings and Features**				
2.2.1	Kiosk	l.s.	1	$2,500.00	$2,500.00
2.2.2	Benches	ea.	2	$1,000.00	$2,000.00
2.2.3	Gabion Retaining Walls (1.2m Ht.)	face m.	56	$350.00	$19,600.00
2.2.4	Boulders	ea.	10	$75.00	$750.00
2.2.5	Restoration Planting	m^2	50	$15.00	$750.00
				2.2 Total	***$25,600.00***
				2.0 Total	***$44,715.00***
				Subtotal	***$281,315.00***
				15% Consulting Fees	***$42,197.25***
				20% Contingency	***$56,263.00***
				Total	***$379,775.25***

CLASS D COST ESTIMATE: PHASE 4

1.0 Park Entrance

1.1 Furnishings and Features

1.1.1	Washroom Building	l.s.	1	$225,000.00	$225,000.00
1.1.2	Washroom Servicing (Water, Elec., San.)	l.s.	1	$35,000.00	$35,000.00
				1.1 Total	***$260,000.00***
				1.0 Total	***$260,000.00***

Subtotal	***$260,000.00***
15% Consulting Fees	***$39,000.00***
20% Contingency	***$52,000.00***
Total	***$351,000.00***

APPENDIX A: ENVIRONMENTAL INVESTIGATION REPORT

APPENDIX B: OPEN HOUSE FEEDBACK

APPENDIX C: RESOURCES & REFERENCES

British Columbia Ministry of Environment, Lands and Parks. 1998. Habitat Atlas for Wildlife at Risk: South Okanagan and Lower Similkameen.

British Columbia Ministry of Sustainable Resource Management. 2004. Grasslands of the Southern Interior.

District of Summerland. 2001. Parks & Recreation Master Plan.

Foster, Sherril. 1998. According to the Giant. Summerland: Okanagan Annie Productions.

Foster, Sherril, ed. 2006. Summerland: In Celebration of 100 Years. Summerland: New Horizon Printing.

Lloyd, D., K. Angove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 23. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh23.htm

Marshall, James. 1968. "Summerland's Centennial Year" in the Thirty-Second Report of the Okanagan Historical Society pp 151-157

Nicholson, A. et al. 1994. Bunchgrass Zone. *In* Ecosystems of British Columbia, D. Meidinger and J. Pojar (eds). Victoria: B.C. Ministry of Forests, Research Branch.

Okanagan Historical Society. 1967. The thirty-first report of the Okanagan Historical Society 1967. Vancouver : University of British Columbia Library.

Okanagan Indian Band. 2017. History. https://okib.ca

Roed, Murray A. & Robert J. Fulton, eds. 2011. Okanagan Geology South. Kelowna: Okanagan Geology Committee.