



Whistler Recreational Trails Strategy

Topic: Environmentally Responsible Trail Planning

This topic area focuses on the development of a framework to enable more environmentally responsible trail planning and building.

Initial Directions

These 'initial directions' are being considered for implementation as next steps after the development of the RTS. They were developed based on the force field analysis and the background information below in this document, and with input from staff and these RMOW committees: the Trails Planning Working Group, the Whistler Bear Advisory Committee, the Forests and Wildlands Advisory Committee, and the Recreation and Leisure Advisory Committee.

Tool Development

1. Develop an environmentally responsible trail planning tool (the E RTP tool) based on the environmentally sensitive area rankings and mitigation strategies outlined in this document and corresponding mapping.

Communication and Promotion

2. Promote the use of the E RTP tool to advocacy groups.
3. Raise public awareness of the use of the E RTP tool in trail development.

Implementation and Monitoring

4. Update the Whistler Trail Standards (RMOW, 2003) to include the E RTP tool, in addition to current and emerging environmental and trail construction best practices.
5. Include relevant E RTP tool details in trail authorization process that includes formalizing the mitigation strategies to ensure they are understood, considered, and implemented during trail planning, construction, and maintenance.
6. Develop a strategy/protocol for applying the E RTP tool for effective trail development planning, including process to update data within the GIS online mapping.
7. Train appropriate RMOW staff and other trail crew on use of the E RTP tool for planning.
8. Maintain up to date spatial information on ESAs and continually review the ESA list and ranking to ensure any new ESAs are identified and ranking amended as required. Future studies and strategies, such as Priority Habitat Management Strategy or input from the public and/or professionals, may identify new environmental values that should be considered.

Future improvements/enhancements

9. Develop Mitigation Strategies for invasive species in future trails planning best practices for inclusion in the strategy/protocol for applying the E RTP tool for effective trails development planning.
10. Complete an assessment of the trail network against the E RTP tool to inform restoration, mitigation and/or enhanced management systems.



11. Consider undertaking further additional grizzly bear habitat mapping study beyond the existing spatial extents where appropriate.
12. Consider undertaking a wildlife connectivity study to identify locations and analyze connectivity within the valley to help develop mitigation strategies for inclusion in the ERTTP tool.
13. Develop a monitoring program for alignment with ERTTP tool and potential future Limits of Acceptable Change process. This should consider how maintenance and management tasks should be triggered by monitoring indicators, providing a staged approach to management. This is outside of the scope of the ERTTP tool but is recommended for consideration as part of a future master planning process.

Force Field Analysis

Helping Forces

Helping forces are the positive factors affecting this topic area, including internal strengths/assets and external opportunities/levers.

- Strong knowledge of many species and habitats in the valley due to previous studies, institutional knowledge, and ongoing research through projects such as the Whistler Biodiversity Project and Bioblitz which identify and document vegetation and wildlife species in the valley, and which support ERTTP tool development and relevancy (Grey Owl Consulting 2019, MacHutchon, 2020, Brett, 2020).
- Development of monitoring program, with Mitigation Strategies as recommended in the Human-Grizzly Bear Conflict Mitigation Strategy, has been effective in managing users and protecting wildlife and the sensitive environment in the Sproatt and Rainbow alpine areas.
- Most existing Whistler trails and new sanctioned trails adhere to the Whistler Trail Standards and are maintained for long term sustainability. They adhere to best practices including sound design, layout and effective building techniques to mitigate and manage for potential environmental impacts.
- Areas such as Gin and Tonic Lakes Basin, the South Flank Area and Beverly Lake have been precluded from future trail development consideration based on previous studies to protect important and sensitive habitat.
- Professional guidance from Qualified Environmental Professionals during trail planning, including field studies, will determine potential impacts on ESA's.
- The development of the ERTTP tool spatial planning data for assessment of proposed trail development significantly improves project planning and protection of environmentally valuable resources.
- Ability to continually add and update geospatial data of confirmed species, including invasive species, when identified as part of existing projects such as Whistler Biodiversity Project, Sea to Sky Invasive Species Council programs and Bioblitz

Hindering Forces

Hindering forces are the negative internal and external factors affecting this topic area, including internal weaknesses/gaps and external threats.

- Increased cost and time implications for some trail development activities and proposals as they could require extensive investigations and field studies by a QEP expected to analyze impacts on these ESA's.



- Spatial data limitations for many species and habitat types could potentially misinform trail planning and construction. A process for reviewing the age of data layers and updates, would be important.
- Plant and invertebrate species at risk also have confirmed occurrences within the RMOW but are difficult to delineate habitat characteristics at a landscape planning level and could require further studies and cost prohibitive surveys.
- Trail builders may not be aware of environmentally sensitive species and habitats and as such may not mitigate potential impacts that could unknowingly affect important environmental values.
- Irresponsible recreational use, and more specifically human and animal waste, represents a real risk to watersheds water quality.
- Climate change and the potential impacts in regard to drought, fire and flood, and other extreme weather events affecting wildlife, vegetation and trail sustainability.
- Increasing use levels could potentially impact trails and environmental values.

Background Information

This background information has informed the Force Field and Initial Directions. It has been reviewed by staff and the four RMOW committees (listed above) and refined based on their input.

Introduction

A tool for environmentally responsible trail development is needed to inform more responsible trail planning. As such this section has been developed that classifies natural areas and habitat types according to sensitivity rankings and then identifies mitigation strategies to reduce the impacts of trail planning and construction. The Resort Municipality of Whistler's (RMOW) Official Community Plan (OCP) recognizes the natural environment as one of the community's greatest assets. Protecting the environment while accommodating tourism, housing, recreation, and infrastructure development, is a priority for the community (RMOW 2019).

The basis for this tool has been developed and is presented in this document. The approach consists of ranked environmentally sensitive areas and recommended mitigation strategies for each ranking. This content is presented in summary and detailed format in the sections below.

Refer to the methodology section at the end for information about how this approach was developed and the studies that were used.



Table 1: Summary overview of ESA Sensitivity Ratings and Mitigation Strategies

| Sensitivity rating | Environmental Sensitivity Areas/Habitat Types | Summary Mitigation Strategies |
|--|---|--|
| High ESA* Greatest potential impact from recreation trail activities | <ul style="list-style-type: none">• High (class 1) forage grizzly habitat (all seasons)• Wetlands• Mountain goat ungulate winter range• Species At risk confirmed occurrences• Community watersheds - drinking water supply• Raptor nesting sites | <ul style="list-style-type: none">• Avoid new trails wherever possible• If trails are proposed in these areas extensive field studies by Qualified Environmental Professionals or suitable specialist are expected to analyze potential impacts and provide recommendations on these features.• Existing trail maintenance and modifications in these areas must follow strict Mitigation Strategies |
| Medium ESA potential environmental impacts if appropriate studies and careful trails planning and Mitigation Strategies are not implemented in these areas | <ul style="list-style-type: none">• Moderately high (Class 2) forage grizzly bear habitat polygons all seasons*• Riparian areas*• Forested floodplains*• Species at risk potential habitat*• Topography- slope angle over 45°• Community watersheds - other supply | <ul style="list-style-type: none">• Proposed trails will require field verification to determine alignment and potential impacts on these areas.• Commitments to Mitigation Strategies and trail design for each user must be adhered to during trail authorizations |
| Low ESA- Trail planning and Mitigation Strategies can minimize the impact of trail construction and recreation activities on this feature | <ul style="list-style-type: none">• Unlogged core forest• Coastal western hemlock old forest• Large and old cottonwoods• Tree preservation covenants• OGMA's• Cheakamus Community Forest - Ecosystem-based management reserves | <ul style="list-style-type: none">• Commitments to Mitigation Strategies for each user must be adhered to during trail authorizations |

This is designed as an overview and should not be used without consulting the detail in each section.

*ESA areas with asterisks will require QEP verification; other field verifications can be conducted by trail construction professionals.



Mitigation Strategies

ESAs that will be identified with the ERTTP tool that overlap proposed trail alignments or existing trail maintenance activities will be cross-referenced to associated Mitigation Strategies for the protection of these areas. Details of relevant commitments by the proponent can then be detailed in the authorization of the trail or trail activities.

A description is provided for each ESA on its ecological importance, potential impacts, relevant Mitigation Strategies and suggested monitoring components.

1 High Ranked ESA

High ESA has been assessed to have the greatest potential impact from recreation trail activities. Trail activities should be avoided from these areas wherever possible. Trail activities and proposals in these areas will require extensive field studies by a QEP and studies will be expected to analyze impacts on these ESA's.

1.1 High (Class 1) Grizzly Bear Forage Habitat Areas

High class (class 1) grizzly bear habitat was delineated by the *Grizzly Bear Habitat Mapping around the Mount Sproatt/ Rainbow Mountain Trail Network and Implications for Trail Management* plan. Class 1 is the highest ranking out of six and the habitat polygon. Certain recommendations have been provided if trails are considered in high (class 1) grizzly bear habitat polygons.

1.1.1 Potential Impacts

- Physiological and behavioral disruption to grizzly bears from recreation trail activity.
- Displacement of grizzly bear from preferred habitat.
- Habituation/sensitization of grizzly bear to human trail recreation activities leading to an increase in bear-human interactions.

1.1.2 Mitigation Strategies

Location

- Future trails, campsites and other amenities must avoid high-value Class 1 grizzly bear habitats for foraging where possible. (Grey Owl Consulting 2019)
- Field analysis of vegetation and habitat mapping should be conducted to determine high-value grizzly bear habitat. Plans must be developed by proponents using bear risk assessments and ecosystem/forage mapping to avoid high-value habitats.

Construction and Modifications

- Avoid trail modifications and planning activities in the high-value class 1 habitat polygons where possible.
- If existing trails must be modified and maintained in these areas the following will be required:
 - Existing trails that are within dense vegetation that require sightline modification, sightline should be increased to above 50 m, if there are no other alternatives and habitat quality is high, thinning trees and shrubs may be required. Specific tree and shrub vegetation known to provide important grizzly food sources must be retained in trail sightline thinning including whitebark pine (*Pinus albicaulis*), black huckleberry (*Vaccinium membranaceum*), oval-leaved blueberry (*Vaccinium ovafolium*) and red huckleberry (*Vaccinium parvifolium*).



- Signage should be installed if approaching low sightline areas and within Class 1 habitat (Grey Owl Consulting 2019). Signage should warn users to make noise/yell and/or indicate no stopping zone. Additional signage should only be incorporated where active impacts have been observed.
- Avoid trail design with blind corners and switchbacks where possible.
- Trail users should be educated that bear spray should be carried if using trails within Class 1 bear habitat. Education programs will be carried out by the RMOW parks and recreation program.
- Type IV & V trails only should be considered (RMOW, 2003).

Monitoring

- If trail activities are being conducted in these areas, annual monitoring programs must be conducted to assess impacts and modify trails as required as recommended in the Human-Grizzly Bear Conflict Mitigation Strategy (Grey Owl Consulting, 2019). Monitoring program details include:
 - Encouraging public users to report aggressive bear behaviour to provincial Report All Poachers and Polluters (RAPP) line.
 - Utilize RMOW Alpine Rangers to collect info on signs of bear activity in vicinity of trails within high (class 1) grizzly bear forage habitat and record point location with photos and geospatial data.
 - Develop a consolidating a reporting system based on RAPP line, Alpine Ranger Reports and incidental data with a geospatial information component to analyze bear behaviour and activity within existing trails within high class 1 grizzly bear habitat areas.
 - The monitoring program should have a component of acceptable change related to bear behaviour and recreation human interaction within high (class 1) grizzly bear forage habitat informed by data collected.

Monitor by

Annual Alpine Ranger program, RAPP data and incidental reports.

- Monitoring data collected should be reviewed with provincial grizzly bear biologists/specialists during a recommended timeframe (e.g. 2-3 years) to analyze any behavioral changes or impacts from recreational trails within high (class 1) grizzly bear forage habitat.

Maintenance

- Maintenance should be conducted in line with Construction and Modification Mitigation Strategies, considering sightline maintenance if necessary and retaining grizzly bear food sources ensuring sightline thinning as discussed above.
- Seasonal to permanent closures may be considered if continued human-bear interactions occur.

1.1.3 General Considerations

Season of Use

High (Class 1) grizzly bear forage habitat areas are based on the seasonal forage requirements of grizzly bears. Polygons change given ranking during spring, summer, fall and winter grizzly habitat requirements. Through further field investigations by QEP's, trail activities or proposals should avoid certain seasons of use to prevent trail use in these polygons during the most sensitive season(s).



Grizzly Bear Travel Connectivity Corridors

If trails are designed and planned in and around high class 1 grizzly bear forage habitat, bear travel corridors (e.g. drainages, basins, ridgelines) between these class 1 polygons should be delineated during the QEP additional investigations to inform trail design and minimize trail density in these areas. Trails should cross these potential travel corridors at the shortest point and minimize trail density in these areas.

1.1.4 Site Specific Considerations

Grizzly Bear Habitat Mapping around the Mount Sproatt/ Rainbow Mountain Trail Network and Implications for Trail Management Mitigation Strategies

Gin and Tonics Lakes Basin

Trails or any other recreational infrastructure are not recommended to be developed in this tributary drainage from Gin and Tonics Lake to Twenty-One Mile Creek. (MacHutchon, 2020). As listed in section 1.5 below the Gin and Tonics Basin is also within the High rated ESA Community Watershed Boundary which has restrictions on trail and recreation activities. (RMOW, 2015)

South Flank Area

High-value spring and summer habitats exist on the south-facing slope above Highway 99 and the Cheakamus River, which is on the ridge nose between the Cheakamus River and Callaghan Creek. Initially trails were proposed in this area however the MacHutchon study (2020) recommends to not complete trail activities in this area or to explore alternative route options on lower elevations of the slope (MacHutchon, 2020). Planning for these trails has not advanced since receipt of the MacHutchon study.

Beverley Lake Area

Trails beyond the Ninja Lake Loop are not recommended to be developed due to the high-value grizzly habitat in the area (MacHutchon, 2020).

1.2 Wetlands

Wetlands are considered a high ESA area as:

- As they are susceptible to trail damage from recreational activities.
- Wetland habitat areas have been reduced within BC and the Whistler Valley specifically from development activities.
- Wetlands host a wide range of habitats for plants and wildlife including species at risk.

Trail activities must be avoided below the top of the bank of wetlands and immediate riparian areas.

1.2.1 Potential Impacts

Wetlands are areas where soils are water-saturated for a sufficient length of time such that excess water and resulting low soil oxygen levels are determinants in soils and vegetation development (MacKenzie 2004). Wetlands can include ecosystem sites permanently flooded by shallow water or forested sites with wet soils (Mackenzie, 2004). Trail activities in wetlands can lead to trenching of the trail surface and trail braiding and impact wetland vegetation and wildlife species (WSP, 2009).



1.2.2 Mitigation Strategies

Location

- Avoid new trails planning in wetlands wherever possible.
- If trails cannot avoid wetland areas due to safety restrictions in terrain, a natural wood boardwalk should be used as a trail surface. Boardwalks over wetlands, if required, should be kept to a minimum as the area under the boardwalk receives less light and impacts habitat qualities and provides an additional human presence within the area (WSP 2009).
- The wetland mapping was provided by GIS interpretation and will require a detailed field verification to analyze wetland boundaries.

Construction and Modification Mitigation

- Considerations for boardwalk designs should include smooth transitions between trail and boardwalk, width of boardwalk to ensure all trail users will utilize the boardwalk, plank spacing to ensure drainage and encourage dog use of boardwalk, railings or raised edges to contain users onto the boardwalk and be free of technical features.
- Type IV and V trails only should be considered (RMOW, 2003)

Monitoring

Trail factors to monitor if trails overlap or adjacent to a wetland:

- Loss of wetland vegetation
- Increased soil exposure
- Evidence of bank erosion and downstream siltation (cloudy sediment-laden water)
- Signs of Concentrated run off and accumulated debris

Monitor by:

- Annual maintenance inspections
- Record of public comments on trail databases e.g. Trail Forks trail reports and user group social media comments

Maintenance

- Maintenance should be conducted in line with Construction and Modification Mitigation Strategies

1.2.3 General Considerations

The wetland mapping was provided by GIS interpretation and will require a detailed field verification to analyze wetland boundaries. The E RTP tool spatial data will be used as a guide to aid trails planning. Commitment to Mitigation Strategies for wetlands should be adhered to during trail construction if observed.



1.3 Mountain Goat Ungulate Winter Range Habitat

Mountain goat winter range UWR areas have been designated as high sensitivity due to the important habitat requirements it provides the provincial blue listed species at risk.

Ungulate winter range habitat provides important winter habitat requirements to ungulates that are not adapted to deep snow. Winter is the most critical period for mountain goats, primarily due to nutritional stress as a result of reduced food availability. Ungulate winter range typically consists of south and southwest aspect slopes which experience more sun and less snow accumulation than north-facing slopes. Winter diets tend to shift to greater conifer browse and litterfall including lichen and branches. (MOE 2010).

1.3.1 Potential Impacts

- Impacts and disturbance from non-motorized trail use to mountain goats are thought to be minor but could increase stress and increase energy costs in wintering animals and may be more important during sensitive life stages (MOE 2010).
- Displacement of a mountain goat from preferred habitat (MOE 2010).

1.3.2 Mitigation Strategies

Location

- Avoid new trails planning in Mountain Goat Winter Range areas wherever possible
- Trails that are planned within or adjacent to mountain goat UWR should field verify the polygon for active use and consult appropriate provincial wildlife biologists and adhere to recommended best practices.
- During the designated winter (1 Nov. – 30 April) and kidding/early rearing sensitive mountain goat periods (1 May – 15 July), ground access should be restricted a 100m distance from UWR polygons or designated habitat by non-motorized activities (MOE 2010).
- Non-motorized recreation activities must be restricted to a 100m distance from UWR polygons or designated habitat during the designated winter (1 Nov. – 30 April) and kidding/early rearing sensitive mountain goat periods (1 May – 15 July).

Construction and Modification Mitigation

- Route trails and recreational facilities away from mountain goat winter range wherever possible (MOE 2010).
- Type IV and V trails only should be considered (RMOW, 2003)

Monitoring

- If trail activities are being conducted in these areas annual monitoring programs must be conducted to assess impacts and modify trails as required. Monitoring commitments would be the responsibility of the group proposing the trail. The monitoring program would include recording occurrences of mountain goats in the area and specific behavior in response to recreation users. An acceptable limit of change would be developed as part of the monitoring program to inform adaptive management.

Maintenance

- Seasonal opening and closures maybe necessary for non-motorized recreation activities in the restricted 100m buffer distance from UWR polygons or designated habitat during the designated winter (1 Nov. – 30 April) and kidding/early rearing sensitive mountain goat periods (1 May – 15 July).



1.3.3 General Considerations

Mountain goat UWRs within the province of BC have been designated by GIS interpretation of habitat requirements. Mountain goat polygon areas are not set delineated boundaries and the use of mountain goat UWR polygons is not always field verified or documented by the province as occupied or not. Trails that are planned with or adjacent to mountain goat UWR should field verify the polygon for active use and consult appropriate provincial wildlife biologists.

A UWR for mule deer is located north of Green Lake by the entrance to Cougar Mountain, although recreational and trail activity is not known to cause as high stress from recreational activity as mountain goat for mule deer. There are currently no provincial restrictions for this species regarding recreational use. However, winter use trails e.g. snowshoeing should be avoided in this area to protect the habitat.

1.4 Forested Floodplain

Forested floodplain is a non-wetland ecosystem that occurs on regularly flooded riparian sites usually on the floodplains of rivers (MacKenzie, 2004). A flood ecosystem can be low, medium or high bench sites based on topography and landscape position. Flood ecosystems are usually inundated during the spring freshet with low bench experience longer (20-40 days) and more powerful flooding than middle benches (<25 days) (MacKenzie, 2004). Sites can be deeply flooded during the first few weeks of the growing season but are situated well above normal summer flows.

Flood ecosystems are intensively used by many wildlife species. They are lush habitats with structural elements not found in adjacent uplands. These ecosystems are usually red and blue listed ecological communities as they have been highly modified by flood control structures (e.g. dykes) in valley community settings (MacKenzie, 2004).

1.4.1 Potential Impacts

- Disturbance of environment by trail users during flooded events leading to braiding of trail and trampling of vegetation.

1.4.2 Mitigation Strategies

Location

- Avoid new trails planning in designated forested floodplain areas wherever possible.

Construction and Modification

- Route trails away from floodplain areas where possible if the trail is affected by annual flooding.

Monitoring

- If trails exist in forested floodplain areas trails should be monitored for flooding during spring freshets.

Monitor by:

- Annual maintenance inspections of trail surface during freshet
- Record of public comments on trail databases e.g. Trail Forks trail reports and user group social media comments

Maintenance

- Use seasonal trail closure signs if flooding occurs on trail.



1.5 Community Watersheds-Drinking Source

Community watersheds play an important part in protecting water quality for communities and private water users that rely on surface water sources. A community watershed is defined under the *Forest & Range Practices Act* (FRPA) as all or part of the drainage area that is upslope of the lowest point from which water is diverted for human consumption by a licensed waterworks. Community watersheds must also be designated under the Government Actions Regulation.

There are seven Community Watersheds designated within the RTS boundary. Two of these are designated for drinking water sources including Twentyone Mile (Rainbow and Sproatt Mountains) and Brew (Brandywine) watersheds. The other five watersheds are used for other sources and discussed in the medium ESA's in section 0.

- Twentyone Mile (Rainbow and Sproatt Mountains)
- Brew (Brandywine)

With regard to the 21 Mile watershed, this area supplies between 45-55% of Whistler's drinking water supply. While this water is treated prior to public distribution the existing treatment system does not include filtration. The cost to add filtration to the treatment system was projected to cost between \$20 to \$50M in 2015 dollars. Recreational use and more specifically human and animal waste represents a real risk to the watershed. For these reasons it is critical that the RMOW closely control, restrict and monitor recreational use within the watershed in order to protect the public and taxpayers. (21 Mile Source Water Protection Plan, RMOW, 2015)

The Brew Creek Community Watershed is listed as the primary water source for the Brew Creek Lodge.

1.5.1 Potential Impacts

- Potential impacts from recreational trails to community watersheds are associated with potential bank erosion and siltation of watercourses and pollution of water quality from human and animal waste from recreation activities.
- Increased wildfire risk through public use which could contribute to a major turbidity event in the watershed and possible slope failures affecting source of water supply (RMOW, 2015).

1.5.2 Mitigation Strategies

Location

- Avoid new trails in community watersheds for drinking water sources wherever possible.

Construction and Modification

- Existing trails within community watersheds should receive maintenance and trail modifications to avoid riparian areas and minimize any proposed crossings.
- Mitigation Strategies must be adhered to in section 0 if trail modifications or maintenance activities are proposed in riparian areas.

Monitoring

Follow monitoring signs listed in section 0 for slope instability and potential erosion sources with trails in and around watercourses in community watersheds listed for other uses.

Monitor by:

- Annual maintenance inspections



- Record of public comments on trail databases e.g. Trail Forks trail reports and user group social media comments

Maintenance

Maintenance should be conducted to ensure continued compliance with the planning and trails modification Mitigation Strategies.

1.6 Raptor Nest Sites

Raptors occur in nearly all terrestrial habitats of British Columbia. They are recognized as an integral part of B.C.'s ecosystems and are legally protected.

1.6.1 Potential Impacts

In British Columbia, conflicts between habitat requirements of raptors and urban and rural developments have been frequent because the valleys and shorelines that are ideal for settlement are also important raptor habitat.

1.6.2 Mitigation Strategies

- Known raptor nest occurrences must be avoided where possible by trail development and maintenance/rerouting activities:
 - New trail development must include a raptor survey conducted by a QEP to identify any potential raptors nests that may be in the proposed area.
 - If a raptors nest is found within a proposed trail area appropriate protective buffer must be applied in trail design to avoid these areas as per Table 6 in the Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (MOE, 2013)

Monitoring

Factors to monitor if existing or proposed trails are adjacent to protective raptors nest buffers and known occurrences.

- Continued use of raptors nest during adjacent trail activities

Monitor by:

- Annual inspections by land manager maintain that maintain the trail.

1.7 Confirmed Species at Risk Occurrences

The B.C. Conservation Data Centre (CDC) maps known element occurrences of red and blue listed species at risk. The ERTTP tool will display these listed occurrences for analysis for trail planning and maintenance activities in the associated mapping.

1.7.1 Potential Impacts

The development of a trail and recreational activities could disturb required habitat features during development or directly disturb an individual species causing physiological stress.



1.7.2 Mitigation Strategies

Location

- Avoid new trails planning in known occurrences of species at risk wherever possible and be given a protective buffer dependent on the species. Develop with care document has a table of buffers for species dependent on activity (MOE, 2014).
- If a species of risk occurrence cannot be avoided in trail design a QEP must be contacted to provide a study of the proposed area and provide applicable Mitigation Strategies to that species.

Construction and Modification

- Trails should be routed or modified to avoid known species at risk occurrences.

Monitoring

- If trail activities are conducted near a known species at risk occurrence the land manager maintaining the trail should know of its location and monitoring should be considered to ensure that adjacent trail activities are not causing disturbance or impact.

Maintenance

Maintenance should be conducted in line with Mitigation Strategies.

2 Medium Ranked ESA

Medium ESA's have the potential to mitigate most potential environmental impacts if appropriate studies are completed in conjunction with careful trails planning.

2.1 Moderately High (Class 2) Grizzly Bear Habitat

Moderately high class (class 2) grizzly bear habitat was delineated by the *Grizzly Bear Habitat Mapping around the Mount Sproatt/ Rainbow Mountain Trail Network and Implications for Trail Management* plan. Class 2 is the second highest ranking out of six and the habitat polygon provides slightly fewer habitat attributes than Class 1 habitat. Mitigation Strategies are recommended be committed to if trails are considered in moderately high (class 2) grizzly bear habitat polygons.

2.1.1 Potential Impacts

- See section 1.1.1 for potential impacts.

2.1.2 Mitigation Strategies

Location

- Proposed trails will require ground truthing study, which will require QEP verification to determine alignment and potential impacts on these areas.

Construction and Modification

In order to avoid or minimize surprise encounters between human and bears, it is important to design human-use areas that make human activity predictable for bears and help to make it easy for humans and bears to detect each other (Grey Owl Consulting 2019).



- Dense vegetation should be avoided in proposed trails within moderately high (class2) habitat polygons to retain a preferred 50 m sightline and avoid vegetation management after trail construction that may contain grizzly bear food sources.
- If existing trails are within moderately high (class2) habitat with dense vegetation, sightlines should be increased above 50 m, if there are no other alternatives, thinning trees and shrubs may be required (Grey Owl Consulting 2019). Specific tree and shrub vegetation known to provide important grizzly food sources must be retained in trail sightline thinning including whitebark pine, black huckleberry, Oval-leaved blueberry and red huckleberry.
- Signage should be installed if approaching low sightline areas and within Class 2 habitat (Grey Owl Consulting 2019). Signage should warn users to make noise/yell or indicate no stopping zone.
- Avoid trail design with blind corners and switchbacks in Class 2 habitat areas wherever possible.
- Trail users should be educated that bear spray should be carried if using trails within Class 2 bear habitat.
- Type III, IV & V trails only should be considered (RMOW, 2003)

Monitoring

- If trail activities are being conducted in these areas, annual monitoring programs must be conducted to assess impacts and modify trails as required as recommended in the Human-Grizzly Bear Conflict Mitigation Strategy (Grey Owl Consulting, 2019). Monitoring program details include:
 - Encouraging public users to report aggressive bear behaviour to provincial Report All Poachers and Polluters (RAPP) line.
 - Utilize RMOW Alpine Rangers to collect info on signs of bear activity in vicinity of trails within high (class 1) grizzly bear forage habitat and recording points with photos and geospatial data.
 - Develop consolidating reporting system based on RAPP line, Alpine Ranger Reports and incidental data with a geospatial information component to analyze bear behaviour and activity within existing trails within high class 1 grizzly bear habitat areas.
 - The monitoring program should have a component of acceptable change related to bear behaviour and recreation human interaction within high (class 1) grizzly bear forage habitat informed by data collected.

Monitor by

Annual Alpine Ranger program, RAPP data and incidental reports.

- Monitoring data collected should be reviewed with provincial grizzly bear biologists/specialists during a recommended timeframe (e.g. 2-3 years) . to analyze any behavioral changes or impacts from recreational trails within high (class 1) grizzly bear forage habitat.

Maintenance

- Maintenance should be conducted in line with Construction and Modification Mitigation Strategies, considering sightline maintenance if necessary and retaining grizzly bear food sources during sightline thinning as discussed above.
- Seasonal closures may be considered if continued human-bear interactions occur.



2.2 Riparian Areas

Riparian areas include the riparian areas listed in Schedule J of the RMOW OCP. Riparian areas are the areas bordering on streams, lakes, and wetlands that link water to land. The blend of streambed, water, trees, shrubs and grasses directly influences and provides fish habitat and are also important areas for terrestrial species.

2.2.1 Potential Impacts

- Loss of riparian vegetation can reduce the quality of fish habitat (shade, nutrient inputs: leaf fall and insect drop).
- Trampling of stream/lake banks can cause erosion, decrease water quality, and harm fish.
- Soil compaction and vegetation removal will encourage the introduction of invasive plants.

2.2.2 Mitigation Strategies

Location

- Minimize trail density within riparian areas during trail development design. Trails should be designed to minimize crossings of riparian areas.
- Use existing trails where possible within riparian areas to reduce developing additional trail density in riparian areas.

Construction and Modification

- Avoid trail layout parallel to streams where possible.
- Cross riparian areas at right angles to streams. Bridge crossings over watercourses should follow [Requirements and Best Management Practices for Making Changes In and About a Stream](#) in BC regulated by the provincial *Water Sustainability Act*. Reduced risk timing windows for fish and fish habitat should be incorporated based on species presence. An environmental monitor should be used to monitor any trail works required to for changes in and about a stream.
- Reduction of trail corridor, pre and post riparian areas, e.g. logs at grade level to prevent stopping a bridge before and after
- Type I, II III, IV & V trails should be considered (RMOW, 2003)

Monitoring

Trail factors to monitor if trails overlap riparian areas

- Loss of riparian vegetation
- Increased soil exposure
- Evidence of bank erosion and downstream siltation (cloudy sediment-laden water)
- Signs of concentrated run off and accumulated debris

Monitor by:

- Annual maintenance inspections
- Record of public comments on trail databases e.g. Trail Forks trail reports and user group social media comments

Maintenance

- Maintenance should be conducted in line with Mitigation Strategies.
- Use seasonal trail closure signs if wet conditions increase impact



2.2.3 General Considerations

The ESA spatial data is used as a guide to aid trails planning, commitment to Mitigation Strategies for riparian and areas should be adhered to during trail construction if observed.

There are exemptions for trail designs from permits under Schedule J riparian areas as described below (RMOW, 2019)

“(g) Construction of trails for non-motorized use consistent with the Whistler Trail Standards, provided they are located further than 10 metres from the high water mark of a stream, do not exceed 1.0 metre in width, are constructed of pervious natural material with no concrete, asphalt or pavers and no creosoted or otherwise treated wood, and require no removal of vegetation.”

2.3 Species at Risk Habitat

Species at risk habitat searches should be conducted at a site level for proposed trail development or reroute activities. The ERTTP tool will focus on the larger keystone species including amphibians, birds, fish and mammals (Table 2) which have a confirmed occurrence in the RMOW. A full list of likely and possible species at risk in the Whistler Valley can be viewed in the Brett 2020 document.

Plant and invertebrate species at risk also have confirmed occurrences within the RMOW but are difficult to delineate habitat characteristics at a landscape planning level. As a detailed plant species at risk mapping was not conducted for this report, land managers should retain a QEP to research confirmed plant species at risk as per the Appendix A table and confirm if the proposed area could provide habitat and be potentially impacted. Whitebark pine has been included in Table 2 as it is a species that is easily identifiable and has known recorded occurrences in the Whistler area.

2.3.1 Species at Risk Search

The proposed trail alignment analysis produced from the ERTTP tool will be utilized to determine what habitat characteristics are within the trail alignment and which species at risk could potentially use this habitat based on its habitat preferences.

A step-by-step process to search potential species at risk habitat within the trail alignment area is described below:

- 1) List the different habitat types that overlap with the proposed trail alignment
- 2) Compare listed habitat types and ESA layers to confirmed species at risk wildlife species in Table 2 and make a list of potential species that could be impacted by the trail alignment.
- 3) Compare types of habitat listed to confirmed and possible species of plant and wildlife in Appendix A and make list of species that could be impacted.



Table 2: Confirmed Wildlife species at risk within the RMOW

| Wildlife Class | Species | BC Status | Habitat Preferences and occurrences in the RMOW | Habitat layer |
|----------------|--|-----------|--|--|
| Amphibian | Coastal tailed frog <i>Ascaphus truei</i> | Yellow | Mountainside creeks >6 °C water temperatures, mainly between 700 and 122 m, especially rounded cobbles confirmed presence in 15 RMOW creeks | Coastal tailed frog habitat layer |
| Amphibian | Western toad <i>Anaxyrus boreas</i> | Yellow | Various upland habitats around ponds, lakes, reservoirs, and slow-moving rivers and streams. Known continuous breeding site is Lost Lake. | Watercourse lines, Lost Lake |
| Amphibian | Northern red-legged frog <i>Rana aurora</i> | Blue | Lakes and small ponds in warm sites at the south end of the RMOW, especially Brandywine; also confirmed on n. side of Callaghan Road on Calcheck FSR. | Northern red- legged frog habitat layer |
| Bird | Common Nighthawk <i>Chordeiles minor</i> | yellow | Mountains and plains in open coniferous forest, savanna, grassland, and towns. Nesting occurs on the ground on a bare site in an open area. | Unlogged Core Forest, Tree Preservation Covenants, OGMA's, CCF-EBM's |
| Bird | Evening Grosbeak <i>Coccothraustes vespertinus</i> | yellow | Coniferous (primarily spruce and fir) and mixed coniferous-deciduous woodland, second growth, and occasionally parks; in migration and winter in a variety of forest and woodland habitats, and around human habitation. | Unlogged Core Forest, Tree Preservation Covenants, OGMA's, CCF-EBM's |
| Bird | Band-tailed pigeon <i>Patagioenas fasciata</i> | Blue | Seen in CWH and MH forest , riparian and urban areas. Can breed in urban and edges and forest | Riparian layer |
| Bird | Barn swallow <i>Hirundo rustica</i> | Blue | Wetlands, grassy areas, riparian, urban areas. Historical nesting at float plane wharf | Wetland layer Riparian layer Green Lake float plane dock |
| Bird | Black swift <i>Cypseloides niger</i> | Blue | Alpine CWH and MH forests nests in cliff/steep bluffs known nests in Brandywine Canyon and potentially Soo Bluffs | n/a |
| Bird | Great blue heron <i>Ardea herodias ssp. fannini</i> | Blue | Foraging mainly in valley bottom lakes, wetlands and riparian areas. No known breeding sites nearby. | Wetlands Lakes Streams Heron habitat layer |



| | | | | |
|--------|---|--------|---|---|
| Bird | Green heron <i>Butorides virescens</i> | Blue | Rivers and streams, wetlands, riparian adjacent to shrub or small tree cover. | Wetlands Stream alignment Heron habitat layer |
| Bird | Northern goshawk <i>Accipiter gentilis ssp. laingi</i> | Red | Alpine, CWH and MH forest and wetlands. Nest sites in old growth montane forest at Wedge Creek and Whistler. | Wetlands CWH Old forest |
| Bird | Olive-sided fly-catcher <i>Contopus cooperi</i> | Blue | CWH and MH forests, riparian habitats breeding requires snags adjacent to openings/wetlands. | Riparian wetlands |
| Fish | Bull trout <i>Salvelinus confluentus</i> pop. 28 | Blue | Green Lake, Fitzsimmons Creek | Green Lake Fitzsimmons Creek watercourse alignments |
| Mammal | Grizzly bear <i>Ursus arctos</i> | Blue | Callaghan Brandywine and Sproatt areas. Non-forested or partially forested sites with a wide range of foraging opportunities and choice of habitats. | Grizzly bear class 1 and Class 2 habitat forage polygons |
| Mammal | Mountain goat <i>Oreamnos americanus</i> | Blue | Historically breeding and habitat use, possible use on Sproatt winter range. | Mountain goat ungulate winter range polygons |
| Mammal | Wolverine <i>Gulo gulo luscus</i> | Blue | Potential breeding and habitat use specifically Brandywine, Callaghan, Fitzsimmons and Cheakamus River. | n/a-home ranges are so large habitat features difficult to delineate |
| Mammal | Little Brown Myotis <i>Myotis lucifugus</i> | Yellow | Summer roosts are in buildings and other man-made structures, tree cavities, rock crevices, caves and under the bark of trees. Uses underground habitat such as caves for hibernacula | Bat habitat layer |
| Plants | Whitebark pine <i>Pinus albicaulis</i> | Blue | Common on warm aspect sites near treeline | Whitebark pine known species at risk occurrences |

Brett, 2020

2.3.2 Potential Impacts

- Disturbance of species at risk habitat leading to a reduction in habitat quality.

2.3.3 Mitigation Strategies

Location

- Follow the guidelines of a Species at Risk Search (Section 2.3.1) to identify possible species at risk.



- Create Mitigation Strategies for species at risk potentially utilizing habitat within the proposed trail alignment through trail design and construction. A QEP or suitable specialist are expected to analyze potential impacts and provide recommendations on these features.

Construction and Modification

- Reduced risk timing windows should be incorporated for trail construction in areas identified to contain possible wildlife species at risk and general wildlife species.
 - Migratory bird species reduced risk timing window is usually outside of their breeding and nesting period of April 1st to September 1st. Activities including vegetation clearing for trail alignments outside of the reduced risk window would need rationale and appropriate Mitigation Strategies including bird nest surveys conducted by QEPs.
 - Amphibians, reptiles, fish, and mammals also have specific reduced risk timing windows that should be considered for trail construction in their potential habitat. If activities cannot be performed in these reduced-risk timing windows justification and Mitigation Strategies will be required.
- Type III, IV & V trails only should be considered (RMOW, 2003)

Monitoring

- Record wildlife encounters, actions taken, and responses of animals

Monitor by:

- Record of public comments on trail databases regarding observed species at risk e.g. Trail Forks trail reports and user group social media comments

Maintenance

- Maintenance should be conducted in line with Mitigation Strategies.

2.4 Topography and Slope Angle

Steep slope angles for trail construction has been considered as above 45%. Whistler Trail Standards (RMOW, 2003) suggest a maximum trail gradient of 10% for green circle trails (easy), and 35% for blue square trails (more difficult) on non-rock surfaces; with no maximum grades recommended for black diamond (most difficult) or double black diamond (expert) trails.

The International Mountain Bike Association (IMBA, 2004) considers five essential elements for sustainable trails involving gradients.

2.4.1 Potential Impacts

- Poorly designed trails on steep ground can change drainage patterns and cause erosion.
- Erosion will remove organic material from soil and expose roots damaging native vegetation.
- Erosion causing sedimentation of streams will decrease water quality and harm fish and fish habitat.

2.4.2 Mitigation Strategies

Location

- Where possible, trails should be designed to meet the Whistler Trail Standards and IMBA trail sustainability standards to reduce erosion potential.



Construction and Modification

- The half rule – the gradient of a hillside or sideslope trail should be half of the fall line gradient.
- Maximum Sustained Grade – is generally governed by the half rule, however this can be exceeded depending on soil type, and provision for drainage control and maintenance. For example, the Whistler Trail Standards (RMOW, 2003) suggests a maximum trail gradient of 10% for green circle trails (easy), and 35% for blue square trails (more difficult) on non-rock surfaces; with no maximum grades recommended for black diamond (most difficult) or double black diamond (expert) trails.
- Grade Reversals – frequent grade reversals are necessary on sloping trails to limit the slope length of the trail, and thereby shed water at shorter intervals.
- Outslope – IMBA encourages outslowing of trails to shed water off the tread. An alternative is to provide insloping trails with frequent grade reversals and culvert the water across the trail to the downslope side.
- Large rocks and stones can be keyed into the ground on steep descents to minimize trail erosion.
- Steep slopes can be included in trail designs but not used for long sustained sections. Steep trail sections should include grade reversals to prevent trail erosion.
- Type III, IV & V trails should only be considered (RMOW, 2003)

Monitoring

Monitor trail conditions for:

- Erosion of trail bed
- Scoured ruts
- Deposition of soil and debris at switchbacks or change in slope
- Sediment-laden water below erosion sites
- Loose stones and gravel left on trail
- Signs of slumps and tension fractures in trail surface

Monitor by:

- Annual maintenance inspections
- Record of public comments on trail databases e.g. trail forks trail reports and user group social media comments

Maintenance

- Maintenance should be conducted to ensure continued compliance with the planning and trails modification Mitigation Strategies.

2.4.2.1 General Considerations

The ESA spatial data is used as a guide to aid trails planning, commitment to Mitigation Strategies for slope angle over 45° areas should be adhered to during trail construction if observed.



2.5 Community Watersheds-Other Supply

Community watershed areas in the Whistler Valley designated for uses other than providing drinking water sources are listed below. These watershed areas are currently used for firefighting but have a potential to be reactivated for periods of drought or as required for potential growth.

- Blackcomb Creek
- Whistler Creek
- Alpha Creek
- Agnew Creek
- Rideau Creek

2.5.1 Potential Impacts

- Potential impacts from recreational trails to community watersheds are associated with potential bank erosion and siltation of watercourses and pollution of water quality from human and animal waste from recreation activities.
- Increased wildfire risk through public use which could contribute to a major turbidity event in the watershed and possible slope failures affecting source of water supply (RMOW, 2015).

As these community watersheds are currently used for firefighting, recreational impacts are not as high-risk as a drinking source use.

2.5.2 Mitigation Strategies

Location

- Proposed trails within community watersheds used for other sources should minimize trail design within riparian areas and minimize crossings of watercourses,

Construction and Modification

- Mitigation Strategies must be adhered to in section 0 if trails are proposed are proposed in riparian areas.

Monitoring

Follow monitoring signs listed in section 0 for slope instability and potential erosion sources with trails in and around watercourses in community watersheds listed for other uses.

Monitor by:

- Annual maintenance inspections
- Record of public comments on trail databases e.g. trail forks trail reports and user group social media comments

Maintenance

Maintenance should be conducted to ensure continued compliance with the planning and trails modification Mitigation Strategies



3 Low Ranked ESA

ESA's ranked as low for trail planning mitigation strategies can minimize the impact of trail construction and recreation activities on this feature.

3.1.1 Sensitive Forested Areas

Relevant sensitive forest ESA's have been grouped under one heading as the ESA layers all aim to protect certain forest ecosystems. Defined as:

- Unlogged Core Forest,
- Tree Preservation Covenants,
- OGMA's,
- CCF-EBM's,
- Ecosystems at Risk)

Unlogged Core Forest Habitat: Unlogged core forest areas are large swaths of land made of contiguous areas of unlogged forest that provide interior forest habitat that sustains the viability of the plant and animal communities that depend on its stable environmental conditions (RMOW 2019).

CWH Old Forest: CWH forests are unmanaged lower elevation CWH forests largely greater than 300 years old (RMOW, 2019).

OGMA's: Old Growth Management Areas (OGMA) are provincially protected old-growth forests protected from harvesting operations in BC.

Tree Preservation Covenants: The RMOW tree preservation covenants are covenants secured under section 219 of the *Land Title Act* on land title parcels. These covenants typically establish tree preservation zones within properties, where trees and vegetation cannot be removed to accommodate development. Also, they often include replanting guides to rehabilitate areas disturbed by natural hazards or permitted development (RMOW 2022).

CCF -Ecosystem-based management reserves: An Ecosystem-Based Management (EBM) Reserve is a designated voluntary area of protection designated by the CCF to protect forests from harvesting practices for ecological, cultural or recreation reasons (CCF, 2015). Trail activities or proposals in these areas will not have the same degree of impact on these designated environmental areas as harvesting activities. However, protection of these designated ecosystems should be considered within trail planning and appropriate planning and Mitigation Strategies applied. EBM's are designated either for environmental or recreational designations. The ERTF tool will focus on the environmental EBM's. However, recreation EBM's should be considered for impacts on existing recreation values during trail planning.

Trail building and recreational activities must consider the forested ecosystem within these areas and follow the Mitigation Strategies provided.

Ecological Communities at Risk: The CDC also tracks rare and endangered plant communities for the province of British Columbia. The term "ecological" is a direct reference to the integration of non-biological features such as soil, landform, climate and disturbance factors. The term "community" reflects the interactions of living organisms (plants, animals, fungi, bacteria, etc.), and the relationships that exist between the living and non-living components of the "community". Currently, the most common ecological communities that are known in BC are based on the Vegetation Classification component of the Ministry of Forests and Range Biogeoclimatic Ecosystem Classification, which focuses on the terrestrial plant associations of BC's native plants.

Known ecological occurrences at risk are mapped by CDC and are presented in the associated mapping field studies to confirm if these ecological communities at risk are present in the study area. As trail



development and activities will cause minimal impact to the surrounding ecological plant communities if the following Mitigation Strategies are implemented, they have been rated low as an ESA.

3.1.2 Potential Impacts

- Removal of trees for trail construction and activities
- Trampling of forest vegetation from trail activities
- Disturbance of plant species at risk.
- Habitat Fragmentation

3.1.3 Mitigation Strategies

Location

- Avoid the removal of live trees with careful trail planning and routing
- Coarse wooded debris should be left in an undisturbed state wherever possible in trail design
- Avoid shallow rooted trees with high windthrow potential and snags in trail placement to reduce the need for danger tree removal once the trail is constructed.

Construction and Modification

- Avoid trail routing that encourages users to take shortcuts where an easier route or interesting feature is visible wherever possible. If an interesting feature exists, locate the trail to provide the desired access to the trail user. Use landforms or vegetation to block potential shortcut routes.
- Avoid routing a trail too close to another trail section to prevent trail proliferation or shortcuts between the two trails wherever possible.
- Trail width standards should be reduced in these areas wherever possible to reduce tread impact within the forested area.
- Type I, II, III, IV & V trails only should be considered (RMOW, 2003)

Monitoring

- Annual monitoring to ensure compliance with mitigation.

Maintenance

- Maintenance should be conducted in line with Construction and Modification Mitigation Strategies.

3.1.4 General Considerations

The ESA spatial data is used as a guide to aid trails planning, commitment to mitigation areas should be adhered to during trail construction if observed.

3.2 Large and Old Cottonwoods

Large and old cottonwoods indicate the presence of riparian habitats and provide habitat for associated species (RMOW 2019). Black cottonwoods are ecologically significant as they are fast-growing riparian species that seed and restore riparian waterways on sand and gravel bars and floodplains risk (Nature Conservancy Canada, 2022). Large and old cottonwoods provide standing snags and are prone to heart rot making them excellent cavity habitat for wildlife including the western screech owl and other plant species at risk (Nature Conservancy Canada, 2022). Trails planning and activities should consider these important habitat factors in design and activities.



3.2.1 Potential Impacts

- Removal of large cottonwood trees for trails
- Removal of cottonwood tree's adjacent to recreation features and trails due to the susceptibility to rot and classification of danger tree. Cottonwood provides excellent cavity habit and wildlife trees but can become a hazard to trail users.

3.2.2 Mitigation Strategies

Location

- If trails are within the large and old black cottonwood areas, trail routing should avoid stands of old cottonwood trees and large or old trees, black cottonwood should be identified in trails planning where possible. Avoiding stands of old cottonwoods will reduce the chance of removal due to the tree's being classified as danger trees to recreation users on said trails.
- Black cottonwoods are susceptible to heart rot and could become danger trees to trail users if trail planning does not consider this in planning and routing resulting in their removal.

Construction and Modification

- Type I, II, III, IV & V trails should only be considered (RMOW, 2003)

Monitoring

- Annual monitoring to ensure compliance with mitigation.

Maintenance

- Maintenance should be conducted in line with Mitigation Strategies.

3.2.3 General Considerations

The ESA spatial data is used as a guide to aid trails planning, commitment to Mitigation Strategies for slope angle over 45° areas should be adhered to during trail construction if observed.

General Recommendations

General recommendations are presented here as best practices and possible future considerations considered from stakeholder input and review.

In Field ESA Observations

The ERTF tool will be designed to guide trails route planning, however avoiding spatial data locations on the map does not guarantee avoiding ESAs. High, Medium and Low ESA's may still be observed during on ground assessment/construction. Commitment to Mitigation Strategies for each ESA must be adhered to during trail construction if observed. If this is a high-level ESA (e.g. Wetland) a QEP or suitable specialist are expected to analyze potential impacts and provide recommendations on these features. As per the grizzly bear management strategy the ERTF tool will acknowledge that a individual grizzly bear observation does not necessarily define the area as Class1 or 2 habitat.

Additional Data Layers-Trails Planning Tool

Land ownership, First Nations culturally sensitive areas, provincial designated land use areas and regional land use plan (Sea to Sky Land and Resource Management Plan) objectives exist within the planning boundaries and are important for trails planning. These layers will be outside of the scope of the



ERTP tool, however, could create an encompassing trail planning tool that includes the ERTP tool and other guidelines. Further work to include these land use areas within an encompassing document is recommended to inform trail planning and design.

An updated set of trail building guidelines/best management practices should be created as part of the trails master plan to address protection of these ESA's.

Future studies and strategies, such as Priority Habitat Management Strategy, may identify additional environmental constraints that should be considered.

Grizzly Bear Forage Habitat Areas

It is recommended that further studies be conducted on grizzly bear forage habitat areas to be expanded to cover the whole of the recreational trails boundary. This would enable better planning for avoiding class 1 and class 2 grizzly bear forage habitat during trail planning processes.

Invasive Species Reporting

Invasive species are plants, animals and insect species that are non-native and out compete native species and possibly threatening ESAs. Invasive species should be considered during trails planning and construction, when observed during planning and construction they should be disposed of following current best practices to avoid dispersal too sensitive ecosystems (SSISC, 2022). All equipment should be cleaned before and after construction to avoid unintentional displacement of invasive species and local construction materials should be considered where possible (SSISC, 2022). The location of invasive species should be reported to the province online when possible and trail guidelines updated to include best management practices to avoid invasive species dispersal. Invasive species occurrences should be mapped in the study area and identified in the future master plan process focusing on high priority species.

Public Information Implementation

The proposed ERTP tools general mitigations recognizes that public information is important to reducing impacts. However, this is not part of the planning tool. Education, communication and awareness strategies that support public/users initiatives should be developed during the master plan process.

Movement/ Wildlife Corridors Research

Information currently available on movement and wildlife corridors are limited within Whistler. It is beyond the scope of the proposed ERTP tool and recommendations to be able to provide more guidance in this area. It is recommended that a connectivity corridor study be conducted to identify locations and analyze connectivity within the valley to help develop Mitigation Strategies for this ESA.

Management actions

The preventative maintenance and management actions should be triggered by monitoring indicators, allowing for a staged approach to ensure management strategies are taken for each ESA. This is outside of the scope of the proposed ERTP tool but is recommended for consideration as part of the management plan.



Methodology

Cascade Environmental Resource Group Ltd. (Cascade) GIS staff utilized the following environmental GIS layers for use within the ERTTP tool for trail planning consideration as defined by the project description.

RMOW Data Layers

- Protection of sensitive ecosystems Schedule K OCP development permit area and priority habitat listed below
 - Species at Risk Habitat
 - Ecosystems at Risk
 - Raptor's Nesting Sites
 - Unlogged Core Forest
 - Large and Old Cottonwoods
 - CWH forest
 - Forested Floodplain
- Protection of riparian ecosystems development permit area-Schedule J OCP areas
- Tree preservation covenants
- Grizzly bear high (Class 1) and medium high (Class 2) forage habitat (MacHutchon, 2020)
- Species at risk habitat layer
- Cheakamus Community Forest (CCF) Ecosystem-Based Management (EBM) Reserves

Provincial Data Layers

- Ungulate Winter Range (UWR) and other identified wildlife habitat areas
- Old-growth management areas (OGMA)
- Hydrography and Topography
- Confirmed occurrences of Species at Risk
- Community Watershed Areas

Grizzly Bear Forage Habitat Areas

Recommendations for trail activities has been amalgamated from the two RMOW grizzly bear management documents including *Human-Grizzly Bear Conflict Mitigation Strategy* (Grey Owl Consulting 2019) and *Grizzly Bear Habitat Mapping* around the Mount Sproatt/ Rainbow Mountain Trail Network and *Implications for Trail Management* (MacHutchon, 2020), see the documents for further descriptions on habitat classification.

Grizzly bears use a variety of habitats throughout the year from valley bottoms to alpine meadows. Grizzly bear forage habitat areas were delineated by Terrestrial Ecosystem Mapping (TEM) based on expected soil characteristics and plant community associations. A rating class was designated to each TEM site series unit polygon for grizzly bear life cycle activity in spring, summer, fall active seasons and winter denning (MacHutchon, 2020). Ratings were derived from the availability of vegetative grizzly bear forage associated with each TEM site series or winter denning habitat qualities e.g. A TEM polygon site series associated with swamp vegetation association would receive a high class 1 ranking in spring as grizzly bears forage on emerging green vegetation (MacHutchon, 2020). Class 1 of a 6-class system is the highest rank of suitability/capability to provide seasonal specific grizzly forage habitat (MacHutchon, 2020). The ranking of the 6 class habitat system is described as below (MacHutchon, 2020).

- Class 1: High grizzly bear habitat rating
- Class 2: Moderately high grizzly bear habitat rating
- Class 3: Moderate grizzly bear habitat rating
- Class 4: Low grizzly bear habitat rating



- Class 5: Very low grizzly bear habitat rating
- Class 6: Nil

Data Limitations

High (Class 1) grizzly bear forage habitat polygons boundaries are defined by a combination of field and GIS interpretation. Grizzly bear habitat polygons within the Sproatt/Rainbow Mountain area were not all ground-truthed during the MacHutchon project. Further detailed field surveys of these areas should be considered if trail planning occurs within or adjacent to these polygons to define polygon boundaries and suitability if required.

The grizzly bear habitat mapping study completed by MacHutchon, and to be used within the ERTTP tool mapping data layers, was limited to the Rainbow and Sproatt alpine areas. Grizzly bear habitat mapping data has not been produced throughout the entire Whistler Recreational Trails Strategy study area. New trails proposed outside of the Rainbow/Sproatt area that meet the general habitat requirements of grizzly bear as described in Table 2 should investigate potential Class 1 and 2 habitat for avoidance through appropriate studies.

Mountain Goat Ungulate Winter Range - Data Limitations

Mountain goat UWRs within the province of BC have been designated by GIS interpretation of habitat requirements. Mountain goat polygon areas are not set delineated boundaries and the use of mountain goat UWR polygons is not always field verified or documented by the province as occupied. Trails that are planned within or adjacent to mountain goat UWR should field verify the polygon for active use. Trail planners must consult appropriate provincial wildlife biologists and adhere to best practices as recommended by such provincial biologists.

Species at Risk Habitat – Data Limitations

Species at risk habitat determination and designation within the Whistler area would require a detailed habitat evaluation outside of the scope of this report as species and habitat preferences can vary between seasons and the various ecosystems. This report utilizes the RMOW species and ecosystems at risk document for confirmed species at risk within the RMOW with identified habitats and known observed locations included for consideration in trail use planning. The RMOW confirmed wildlife species at risk is based on the most recent work completed by the Whistler Biodiversity Project and results from the annual Bioblitz which was last compiled in 2020 (Brett 2020). Confirmed occurrence mapping data was also utilized from the provincial Conservation Data Centre (CDC).

Trail Type

Trail type design has been considered to reduce impacts on ESAs based on the dimensions of trail tread width, surface type and clearing for trail height. The specified trail type criteria is based on the Whistler Trail Standards (RMOW, 2003). The trail types referred to in the report are:

- 1) Type I –paved double-track trail, clear height to 3m, clear width 2-3 m tread plus 0.6 m gravel
- 2) Type II –machine-built gravel or natural surfaced double-track or single-track trail, clear width to 5.0 m for double-track and 1.6 m for single-track trails clear height to 2.4 m
- 3) Type III –unsurfaced single-track trail, clear width to 1.1-1.3 m, clear height to 2.4 m
- 4) Type IV –unsurfaced single-track trail, clear width to 1 m, clear height to 2.4 m
- 5) Type V –low-impact nature trail or lightly used wilderness trail, clear height to 2.4 m, provide 30-50 cm tread maximum

For more detailed information refer to Whistler Trail Standards (RMOW, 2003)



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3.3



3.4 Appendices

Appendix A: Confirmed Plant and Ivertebrate Species in th RMOW

| Wildlife Class | Species | BC Status |
|----------------|---|-----------|
| Lichen | spiny witch's hair <i>Alectoria imshaugii</i> | Blue |
| Lichen | alpine redhead <i>Nodobryoria subdivergens</i> | Blue |
| Lichen | electric rocktripe <i>Umbilicaria decussata</i> | Blue |
| Moss | Olympic brachydontium moss <i>Brachydontium olympicum</i> | Red |
| Moss | Holzinger's brachythecium moss <i>Brachythecium holzingeri</i> | Blue |
| Moss | tall-clustered thread-moss <i>Bryum pallescens</i> | Blue |
| Moss | grimmia moss <i>Grimmia caespiticia</i> | Blue |
| Moss | Donn's grimmia <i>Grimmia donniana</i> | Blue |
| Moss | black grimmia <i>Grimmia incurva</i> | Blue |
| Moss | Nevada homalothecium moss <i>Homalothecium nevadense</i> | Blue |
| Moss | alpine hygrohypnum moss <i>Hygrohypnum alpinum</i> | Blue |
| Moss | Cardot's pohlia moss <i>Pohlia cardotii</i> | Blue |
| Moss | pseudoleskea moss <i>Pseudoleskea radicata</i> var. <i>pallida</i> | Blue |
| Moss | pygmy racomitrium moss <i>Racomitrium pygmaeum</i> | Blue |
| Moss | thickpoint grimmia <i>Schistidium crassipilum</i> | Blue |



| | | |
|-----------|--|------|
| Moss | tripterocladium moss <i>Tripterocladium leucocladulum</i> | Blue |
| Liverwort | Haplomitrium hookeri | Blue |
| Liverwort | Jungermannia atrovirens | Blue |
| Liverwort | Nardia breidlerii | Blue |
| Liverwort | Nardia compressa | Blue |
| Liverwort | Nardia geoscyphus | Blue |
| Liverwort | Scapania curta var. curta | Blue |
| Liverwort | Scapania obscura | Blue |
| Liverwort | Scapania scandica var. scandica | Blue |
| Liverwort | Solenostoma confertissimum | Red |
| | | |
| Bee | Fernald's Cuckoo Bumblebee <i>Bombus flavidus</i> | Blue |
| Butterfly | Western Pine Elfin, sheltonensis ssp. <i>Callophrys eryphon ssp. sheltonensis</i> | Blue |
| Butterfly | Dun Skipper <i>Euphyes vestris</i> | Blue |
| Butterfly | Clodius Parnassian, pseudogallatinus ssp. <i>Parnassius clodius ssp. pseudogallatinus</i> | Blue |