Garibaldi Protected Area Complex Conservation Assessment

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Garibaldi Protected Area Complex Conservation Assessment

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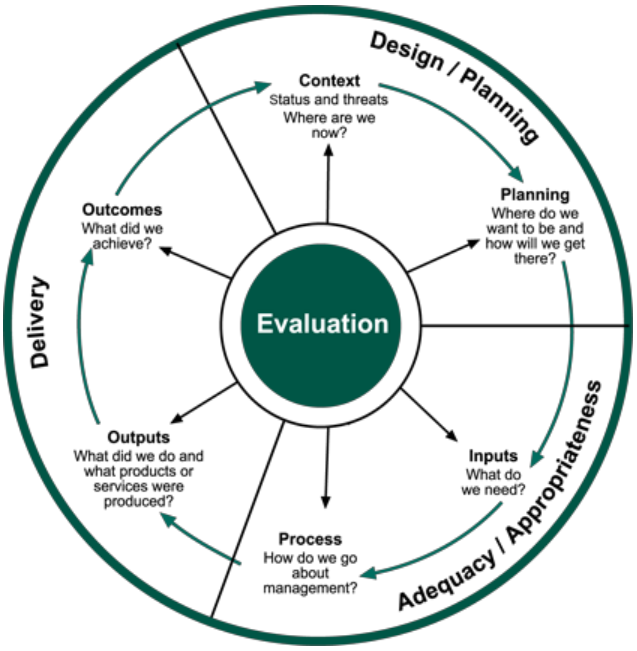
Why assess the conservation status of protected areas?

Parks and protected areas are designed to protect the ecological values of Canada's terrestrial, aquatic, marine and cultural sites while providing incredible opportunities for recreation. In British Columbia, there are more than 1000 areas designated as Provincial Parks, Protected Areas, Conservancies or Ecological Reserves. Across Canada, there are a number of initiatives aimed at enhancing and developing networks of protected areas. While increases in quantity of area protected is important, the scientific literature shows that it is the quality of protected areas that matters more than quantity[1].

Growing concern about the effectiveness of protected areas in meeting objectives such as biodiversity conservation[2–5] has led to initiatives to examine protected areas management effectiveness (PAME) internationally. PAME is defined as an "assessment of how well protected areas are being managed – primarily the extent to which management is protecting values and achieving goals and objectives"[6] (Figure 1). Recent global analyses of protected area ecological values indicate that ecologically healthy protected areas are most strongly correlated with external support and constraints, management inputs and processes including research and monitoring, staff numbers and training, effectiveness of administration, natural resource management, and communication[3,7]. In other words, good governance and management are most strongly linked to positive conservation outcomes.

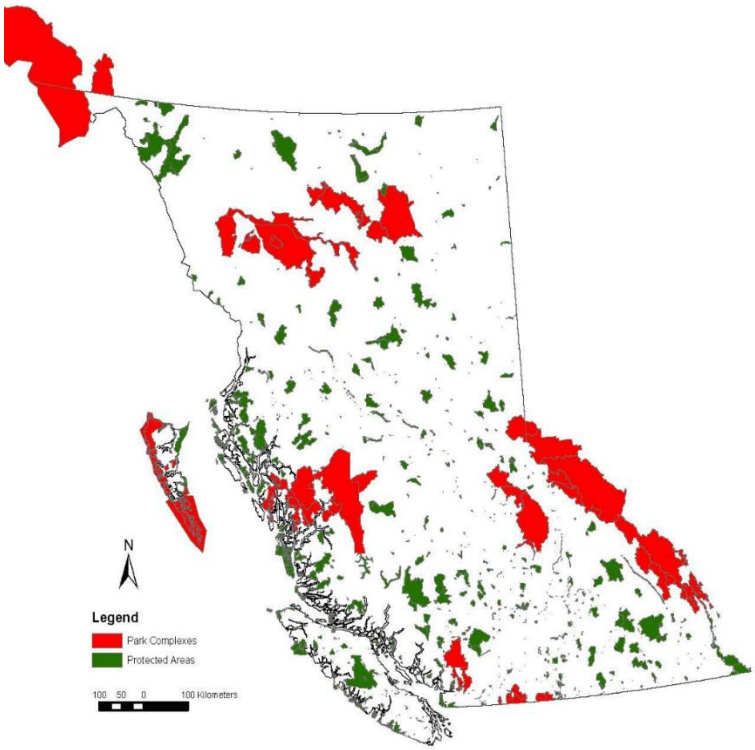
The global Convention on Biodiversity commits signatories (including Canada) to not only significantly increase designation of terrestrial and marine protected areas by 2020 but to ensure these areas are "*effectively and equitably managed*"[8]. More specifically, it commits signatories to evaluate and improve the effectiveness of protected areas management. In 2018, the Canadian National Advisory Panel on achieving Canada's conservation vision recommended that all Canadian protected areas jurisdictions complete management effectiveness evaluations for 100% of their areas by 2030. In 2018, BC Parks made a commitment to begin this initiative through the Ministry of Environment and Climate Change Canada Service Plan starting with a conservation assessment of the Garibaldi Complex.

Figure 1. Protected Areas Management Effectiveness Framework



Why Start with Complexes?

A protected area complex refers to a cluster of adjoining protected areas that are more likely to be of sufficient size to enable natural processes and species movement than smaller individual isolated protected areas. For example, the comparably large size of protected area complexes in B.C. may make them more capable of maintaining populations of disturbance-sensitive mammals, supporting ecological processes and ecosystem services, and be more resilient to large landscape scale impacts such as climate change and the threat of invasive species. Approximately 56% of the area of BC's terrestrial protected network consists of protected area complexes (defined in BC as clusters of protected areas larger than 2700km^2 in size[9]) (Map 1).



Map 1. Park Complexes in British Columbia

Photo Credit: Iain Reid

Methods

The Conservation Assessment for the Garibaldi Complex is a modification of a Canadian Protected Areas Management Effectiveness suite of tools (CAN-PAME) developed and applied with Alberta Parks and Ontario protected areas. This suite of tools consists of a Conservation Risk Assessment (CRA) tool (an updated version of the BC CRA that has been used since 2005); a protected areas threat assessment tool adapted from NatureServe's *Conservation Status Assessment*[10]; and an adaptation of the *Management Effectiveness Tracking Tool (*METT): the premier management effectiveness evaluation tool used around the world[11,12]. The METT tool was enhanced with components from the Australian NSW *State of Parks* tool[13], and the UNESCO *Enhancing our Heritage* tool[14].

To conduct the Conservation Assessment, spatial and non-spatial data were assembled from a number of sources including park files, park management plans, the BC Species and Ecosystems Explorer application, the B.C. Invasive Alien Plant Program, iNaturalist, TrailForks, the BC Data Catalogue, Data Basin, GeoGratis Canada and the Government of Canada's Open Government portal.

These data, supplemented with conversations with key park staff, were used to develop a set of base maps and draft a conservation and threats assessment evaluation (see Appendix B). In January of 2019, a team of BC Parks staff who work within the Garibaldi Complex and from headquarters then met to review and revise the conservation values and threat assessment matrix for each of the four protected areas within the Complex. In February 2019, this information was compiled and a second workshop was held with the same team to complete the management effectiveness portion of the evaluation.

This Conservation Assessment starts with a description of the Garibaldi Complex as a whole and assesses the design of these protected areas and the context within which they exist. Following this are summaries of the assessment in three areas: key conservation values; threats; and management effectiveness evaluations conducted for each of the four protected areas within the complex.

Photo Credit: Iain Reid

The Garibaldi Complex

The Garibaldi Complex consists of four adjoining protected areas: Garibaldi, Golden Ears and Pinecone Burke Provincial Parks and Mkwal'ts Conservancy. These protected areas are part of the rugged mountains of the south coast of British Columbia and protect the iconic landscapes of old coastal forests, jagged peaks and glacier capped mountains. Plentiful rain and snow feed fast flowing mountain streams and at lower elevations support salmon and old growth cedar forests. Widgeon Slough provides nesting and resting places for abundant resident and migrant waterfowl. In these protected areas, mountain goats scamper up steep, high mountain cliffs and the elusive wolverine leaves silent tracks across the snow pack. Grizzly and black bear, wolves, and cougars hunt through these areas while deer, grouse and varied thrush forage for lush vegetation, seeds and berries below the forest canopy. Alpine fireweed, lupines, and phlox carpet the high meadows and salmonberry, salal, and sword fern paint a palette of green in the forests below.

Photo Credit: Iain Reid

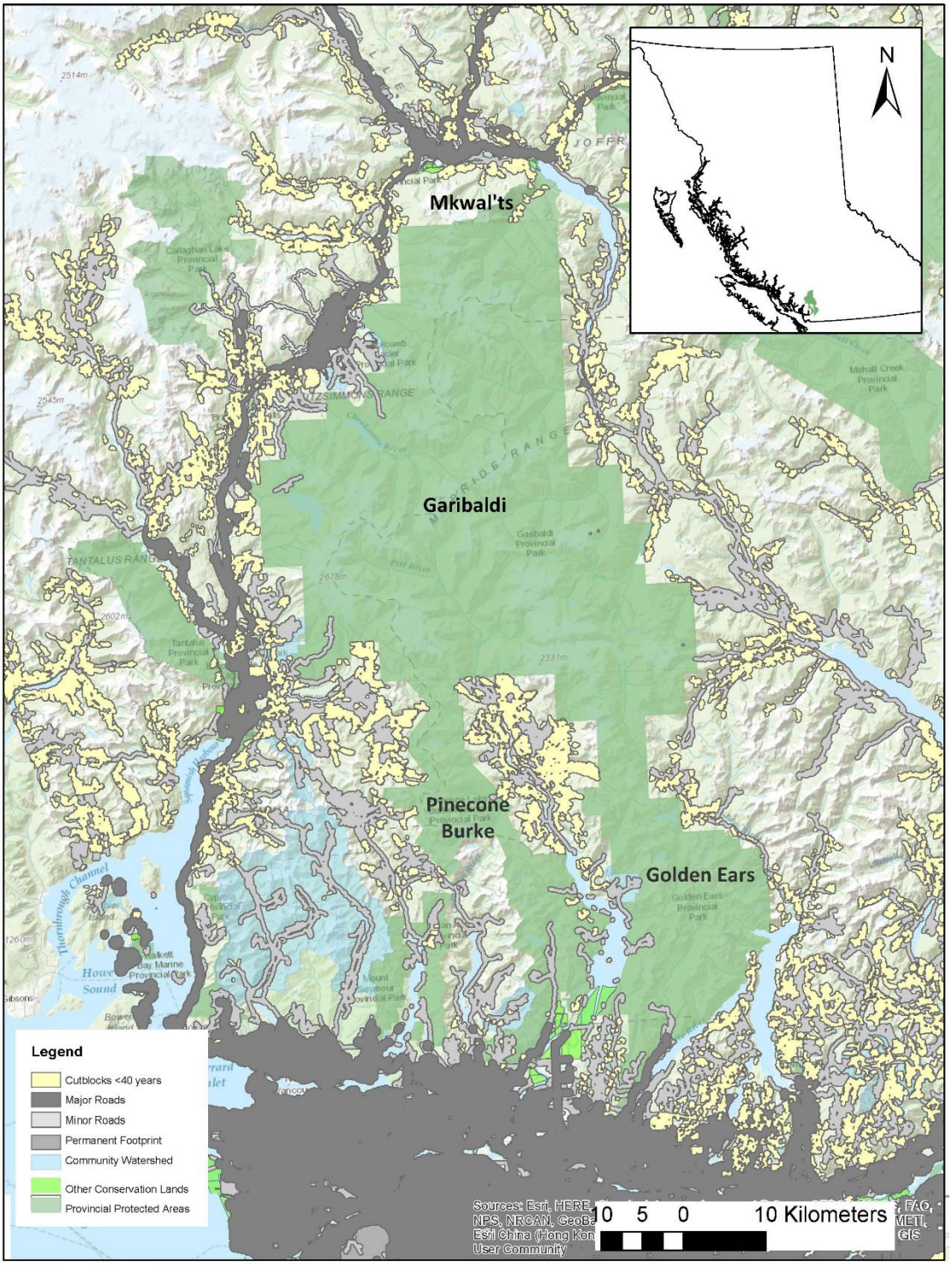
These areas are part of the traditional territories of Indigenous peoples as they have been for millennia. They are sacred places that sustain indigenous cultures and economies where indigenous peoples gather food and medicines; collect cedar bark for basket making and mountain goat wool for weaving.

These protected areas are also spaces that attract hundreds of thousands of visitors a year. Visitors come to the complex seeking a campsite in the forests of Golden Ears (the most popular campground in the BC protected area system), mountain biking trails in Pinecone Burke and hiking in the wilderness of Garibaldi's alpine.

While Garibaldi Provincial Park was established in 1920, the other protected areas in the Complex have a more recent past that has included forestry and mining, along with a wide assortment of recreational uses. Although the smallest of the provincial protected area complexes, the Garibaldi complex is surrounded by a number of other protected areas, protected watersheds, and conservation lands in the immediate area that contribute to conserving the ecology of the south coast.

Today, the Garibaldi Complex exists within a very populated and busy landscape. A population of more than 3 million people live within a one-hour drive of the Complex and more than 10 million tourists visit Vancouver annually – all enjoying the scenic backdrop of the North Shore mountains and many choosing to venture further into the Complex. The result is that the Complex is surrounded by a significant human footprint from roads, urbanization and from resource extraction (Map 2).

Map 2. Garibaldi Complex in Context



State of the Complex

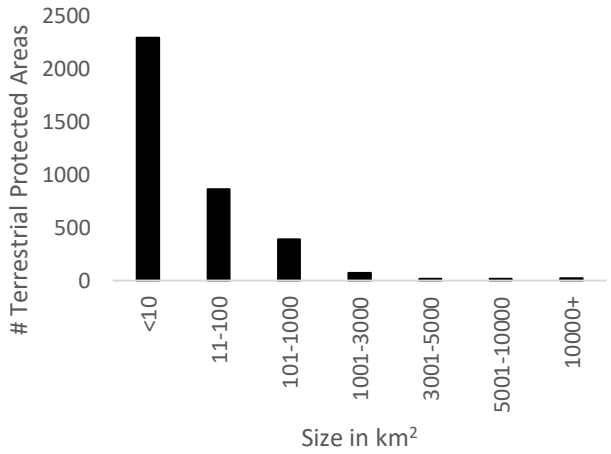
Context, Design and Connectivity

Historic land use, current resource development, urbanization, and global issues like climate change affect the ecological health of the Garibaldi complex.

Size: How big is big enough?

Most protected areas in Canada (federal, provincial, territorial, Indigenous and municipal) are theoretically too small to sustain populations of wide ranging species and the ecological processes that support them[15] (Figure 2). Considering adjoining protected areas as a single complex is therefore valuable for protected area management as complexes can be large enough to support the values they were set out to protect. Researchers examining the minimum and ideal size of protected areas within a Canadian context have identified minimum conservation area sizes that range from approximately 5000 square kilometres[16] to approximately 15,000 square kilometres[17] to sustain cohorts of large mammals such as black and grizzly bear and wolves. The Garibaldi Complex at 2900 km^2 in size - while larger than the majority of Canadian protected areas - is smaller than the minimum conservation area size recommended to sustain these large mammals.

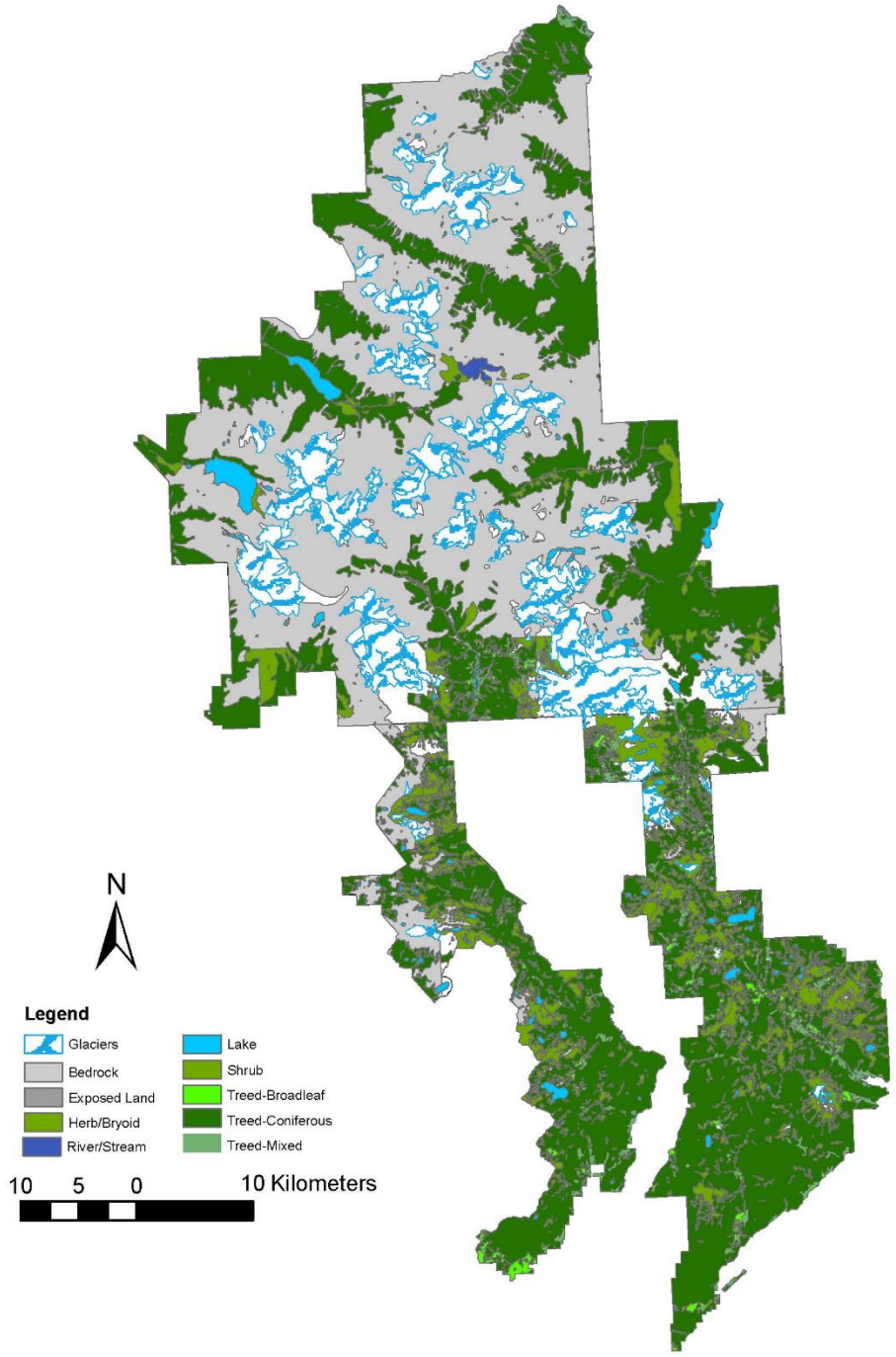
Figure 2. Canadian Protected Areas Are Small



Effective Habitat Size

Size alone, however, is not sufficient as the protected area must contain effective habitat[18]. The jagged mountain spires and glaciers of the Garibaldi Complex are culturally important and scenically beautiful but they mean that for most species, there are large areas of the Complex that are less hospitable for most individuals. Removing steep slopes (e.g., steep slopes that are only useful as escape terrain for Mountain Goats), and land covers that don't support productive vegetation, the effective size of the Garibaldi Complex is reduced to 1500km^2 or just 52% of its actual size (Map 3). The effective habitat areas (in greens) are concentrated in the lower valley bottoms and in particular in Pinecone Burke and Golden Ears Provincial Parks and Mkwal'ts Conservancy.

Map 3. Effective Habitat in the Garibaldi Protected Area Complex



Shape: Avoid Edges

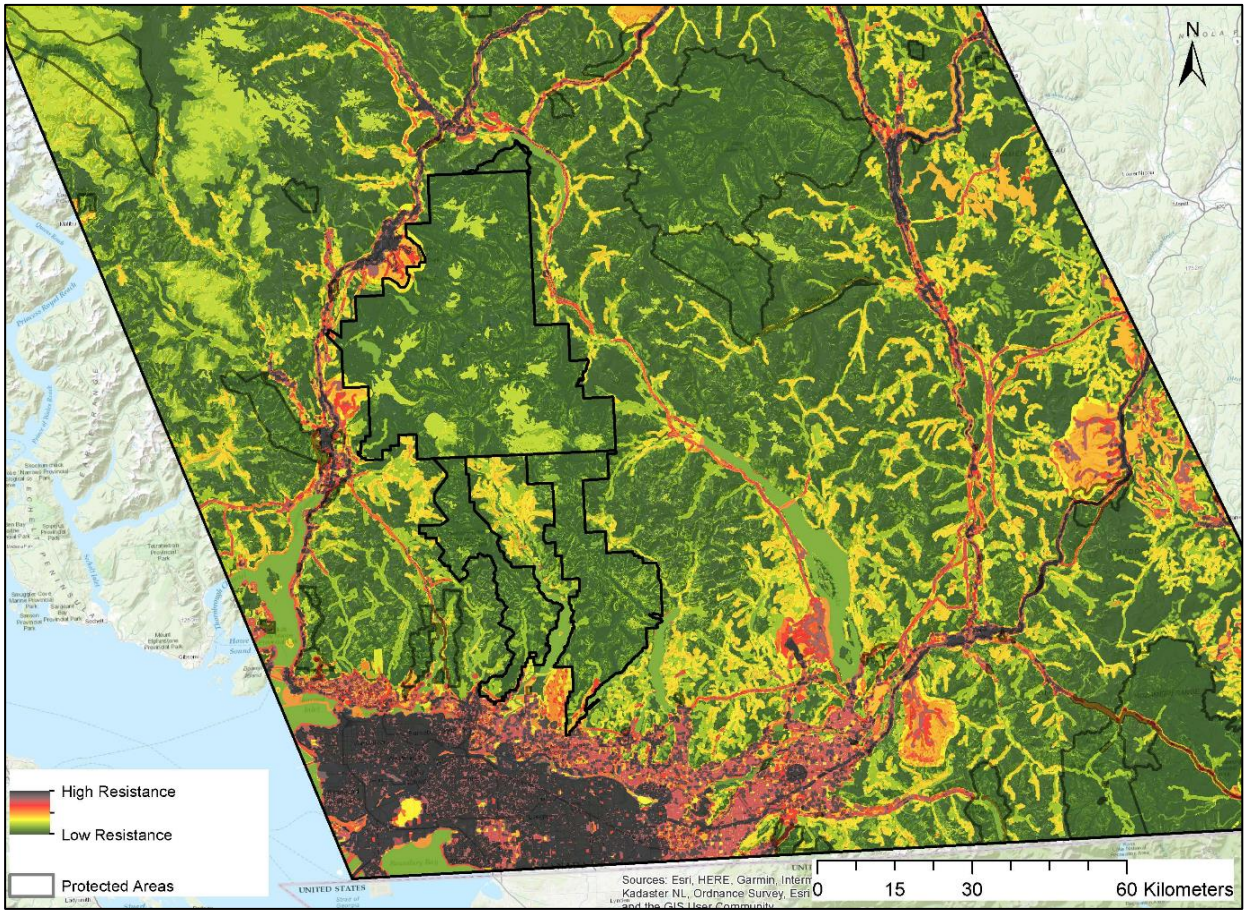
In addition to being of sufficient, effective habitat size, the shape of protected areas matters too. Compact, more circular, shapes like Garibaldi Provincial Park and Mkwal'ts Conservancy that have a low edge to interior ratio will have less area exposed to external threats. Longer, skinnier shapes like Pinecone Burke and Golden Ears have more edge areas, and effective habitat within the protected areas is more likely to be affected by external land uses.

Permeability and Connectivity

Most protected areas and complexes, particularly when they are small, need to be connected to suitable habitat in surrounding areas and potential refugia in other regional protected areas. This is important to ensure that there is enough effective habitat for wildlife for daily requirements, seasonal movements and breeding. Connectivity is also particularly important when we consider climate change, as plants and animals need the opportunity to be able to move through the landscape to keep up with changing environments.

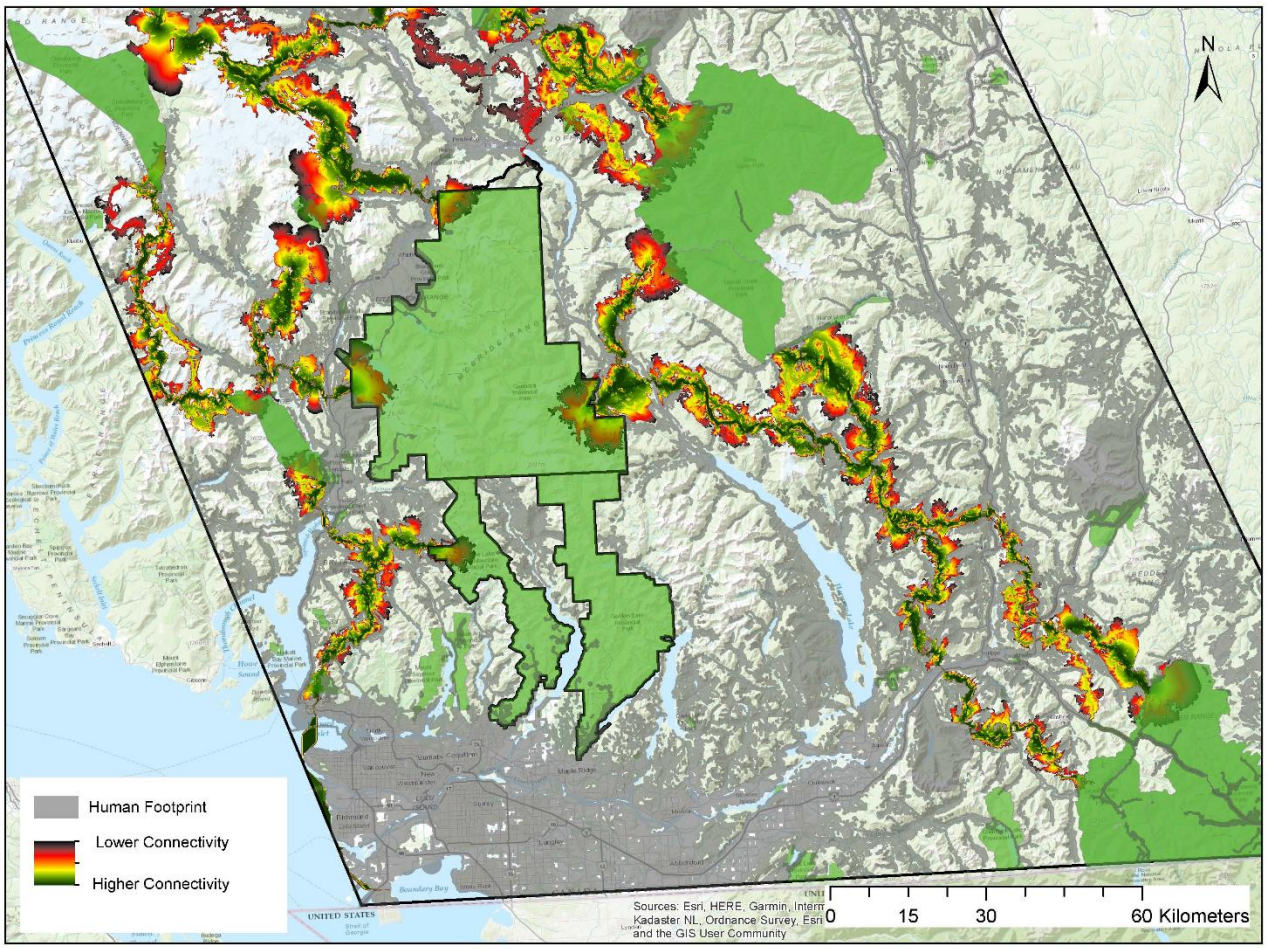
Permeability, or its converse resistance, demonstrates the potential for species and ecological process to move across the landscape. Highly resistant landscapes are those that have permanent human footprints, land covers like glaciers that are not suitable for most species, or very steep slopes that are difficult to move across. Map 4 shows landscape resistance around the Garibaldi Complex area where yellows to deep wine-coloured reds are the most resistant and darker greens are the least resistant.

Map 4. Regional Landscape Resistance



Based on the permeability of the landscape, potential corridors for connectivity were modelled to examine potential pathways between protected areas adjacent to the Garibaldi Complex (Map 5). These potential connectivity corridors show how species and ecological processes may be able to move between protected areas (dark greens represent the strongest corridor networks and deep reds lower value as potential corridors). Within the Garibaldi Complex region, there are few and very narrow potential connectivity corridors between protected areas. In some places there are significant barriers including major highway crossings along the pathway of these connectivity corridors. All protected areas within the Garibaldi Complex face a very high threat rating due to climate change because of the relatively small amount of effective habitat, the relative small size of the complex, and the lack of connectivity between the Complex and adjacent protected areas.

Map 5. Connectivity Corridors to Adjacent Protected Areas



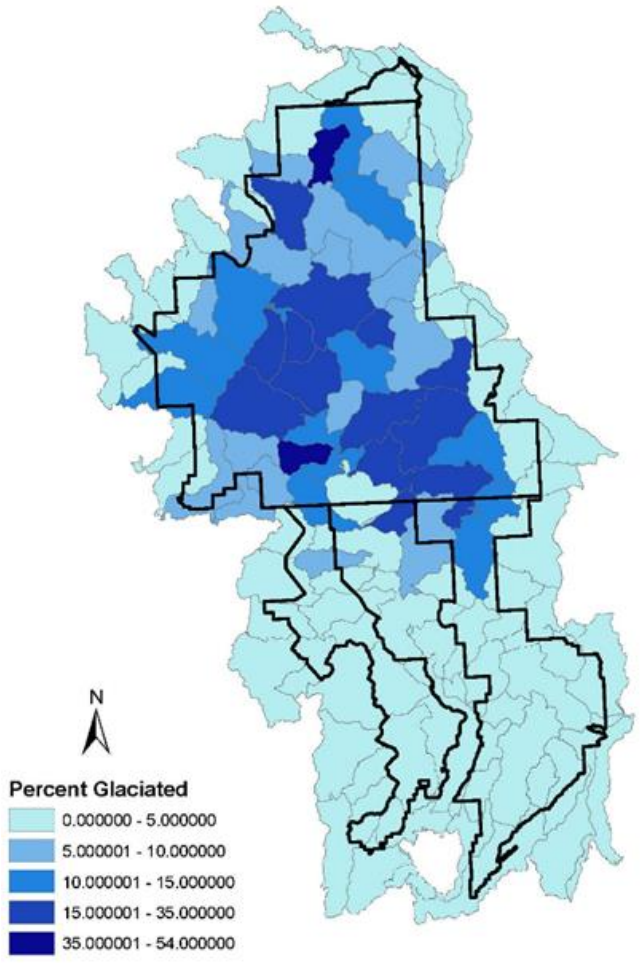
Changing Climates means Further Challenges

As climates continue to warm, there will be dramatic changes to the Garibaldi Complex. Climate projection data developed to examine climate change impacts on ecosystem conservation[19–21] identifies that the Garibaldi Complex will be both significantly negatively affected by the changing climate but will also provide some regional resilience to this change.

Melting Glaciers = Changing Hydrology

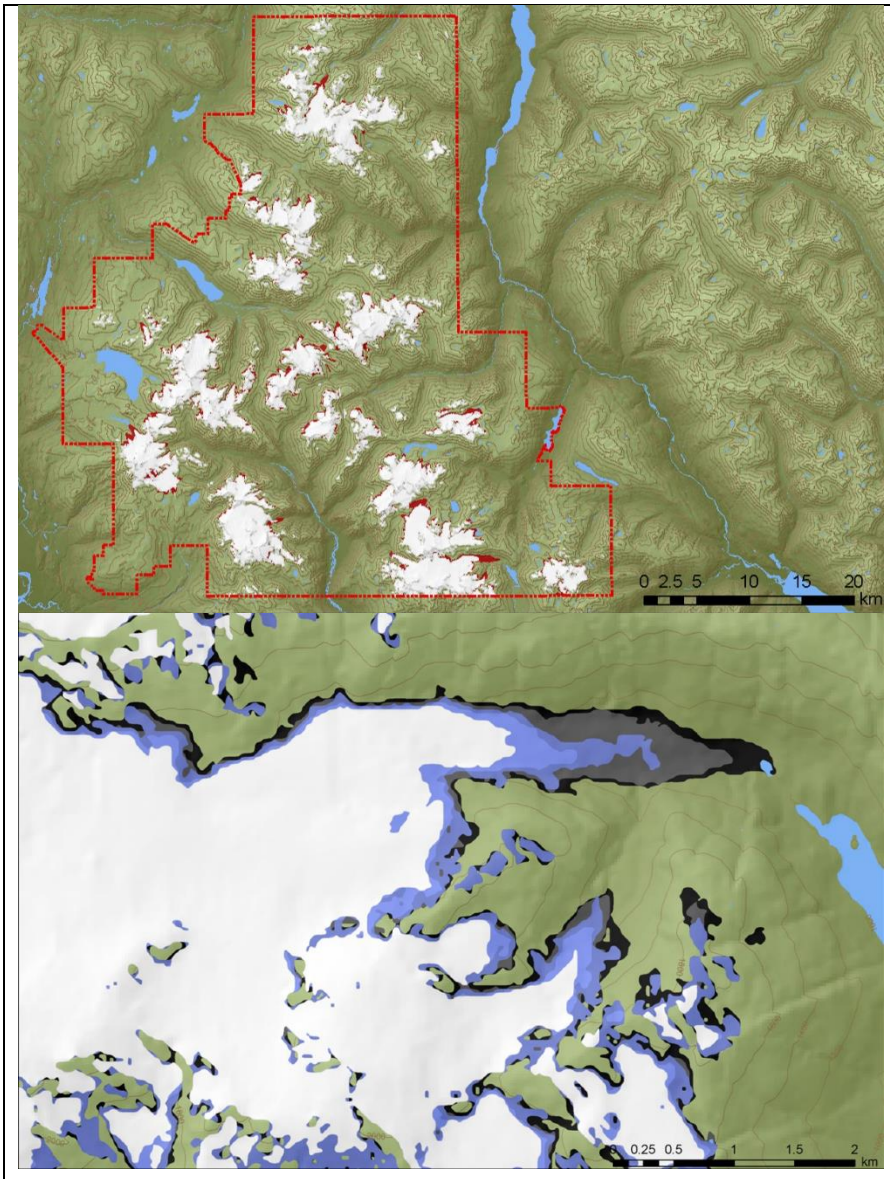
Melting glaciers are one of the most obvious and visible signs of climate change. They can have a profound impact on hydrology, affecting everything from stream flows for fish to available moisture for plant growth. Thirty-six percent of watersheds within the Complex, concentrated primarily in Garibaldi Park, have more than 5% glacial coverage (Figure 3 and Map 6). The higher the percent glaciated, the more susceptible the hydrology of the watershed is to glacial melt. As map 6 illustrates, much of the core of Garibaldi Provincial Park is dominated by watersheds with significant amounts of glacial cover.

Fluctuations of glaciers in Garibaldi Provincial Park during the 20th century have been reconstructed using archival materials. While 26% of the park (505 km^2) was covered in glaciers at the beginning of the 18th century it had decreased by almost 50% by 2005 [22].



Map 6. Percent of Glaciated Watersheds

Figure 3. Glacial Retreat in Garibaldi Provincial Park and Stave Glacier



The upper map illustrates glacial retreat in Garibaldi from 1985 (374 km^2) to 2015 (258 km^2) resulting in an area of 116 km^2, or 1.05% area lost(indicated by the red shading). The rate of loss in the last decade (1.76%) is accelerating and almost double the rate of loss in the previous 20 years.[23]

The lower map illustrates glacial retreat in Stave Glacier – a glacier located in the southeast corner of Garibaldi. The area of retreat and loss is mapped in 1985 (black), 1990, 2001, 2005 and 2015 (white).

Source: B. Kulla and R. Wheate.

Shifting Vegetative Communities

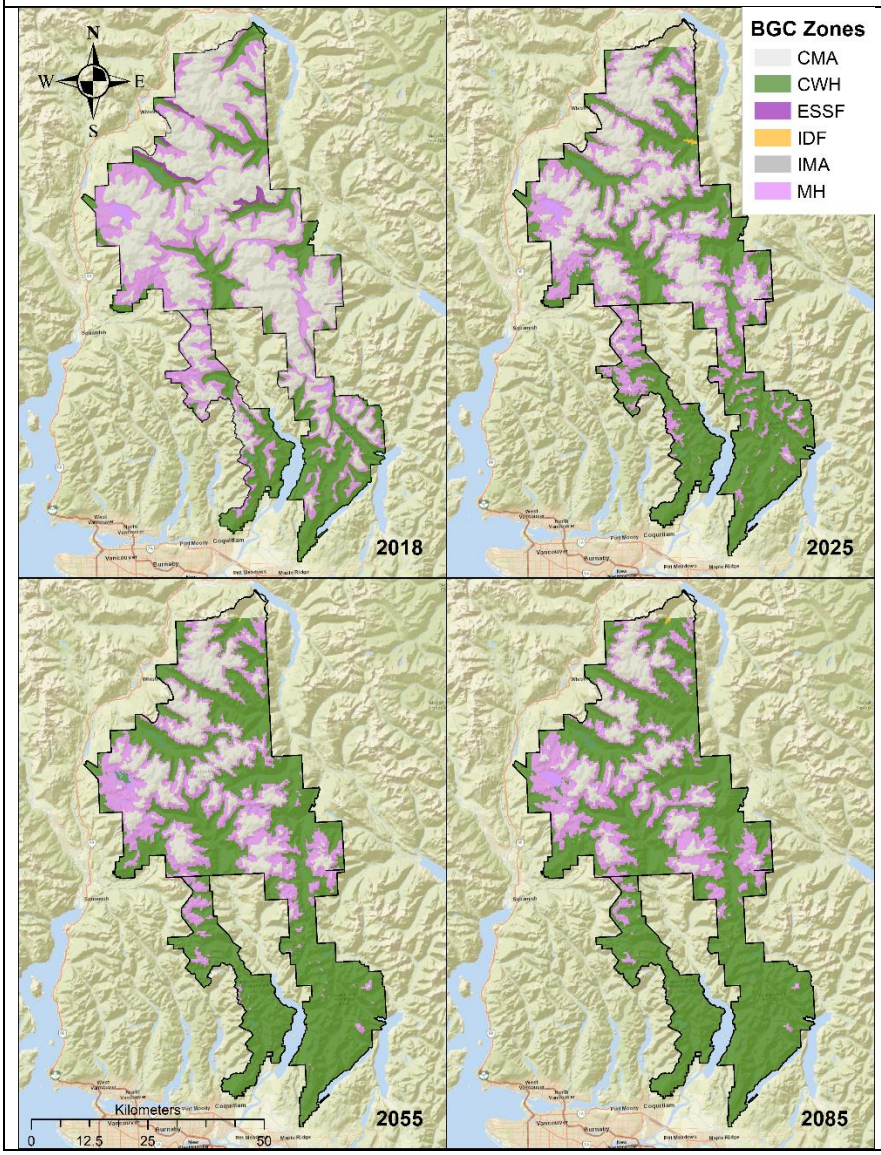
At a broad level, changes in temperature and precipitation will drive shifts in vegetative communities either northward or up slopes. For mountainous environments like the Garibaldi Complex, alpine environments are shrinking as trees colonize further up mountains (Figure 4).

Not only will current vegetative communities shift, but there will be new, or novel, ecosystems that will emerge (Figure 5).[a] However, where there is insufficient soil development, as is the case on what is now or what has recently been glaciated landscapes, these areas will not be able to support vegetative shifts upward. Species that are adapted to these ecosystems will either need to move to keep up or will be out of sync with the habitats that they need to survive. However, the rate of climate change is likely to be significantly faster than many plants and animals can move. To maintain the climate conditions that species are adapted for, modeling showed that only between 40% and 10% (RCP 4.5 and 8.5[b] respectively) of similar climate environments will be found within 100 km of the complex by 2085. This means that most species will need to make dramatic changes in their distribution over only a few generations in order to keep up with their biophysical niche.

[a] *Data and analysis provided by C. Mahoney[20]

[b] RCP, or Representative Concentration Pathway, is a group of greenhouse gas concentration trajectories identified for the Intergovernmental Panel on Climate Change to model potential changes. RCP 4.5 is based on models that have emissions peaking in 2040 and then declining and presumes that humans will act quickly to respond to changing climates. RCP 8.5 is based on continued increasing emissions through the 21st century.

Figure 4. Biogeoclimatic (BGC) Zone Projections

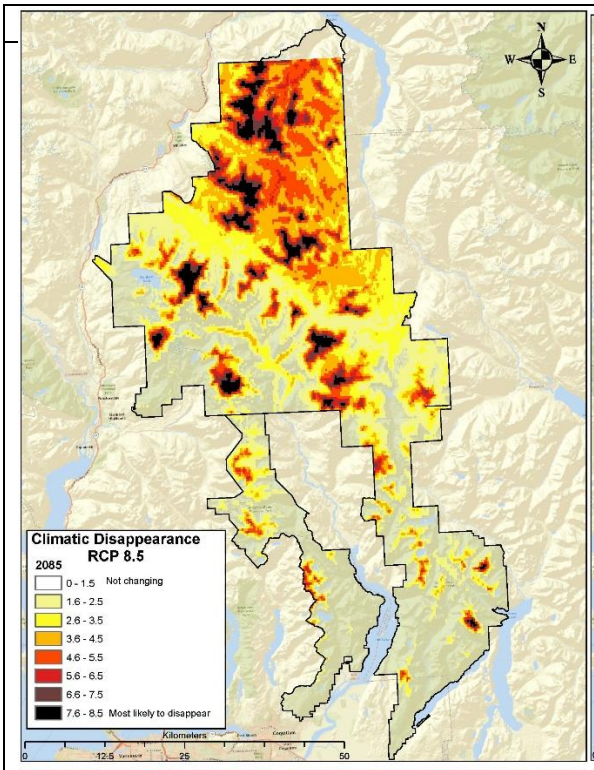


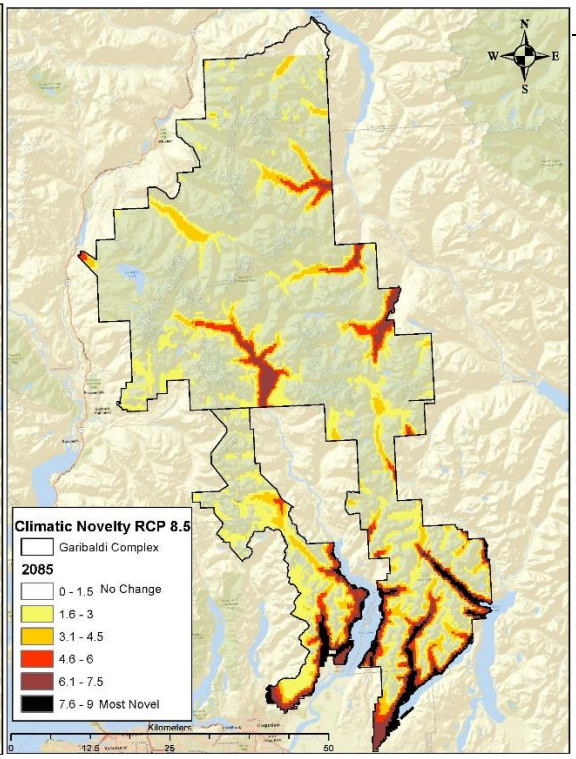
This map shows current (2018) BGC Zone distributions alongside projected BGC zone distributions in 2025, 2055 and 2085 under RCP 4.5.

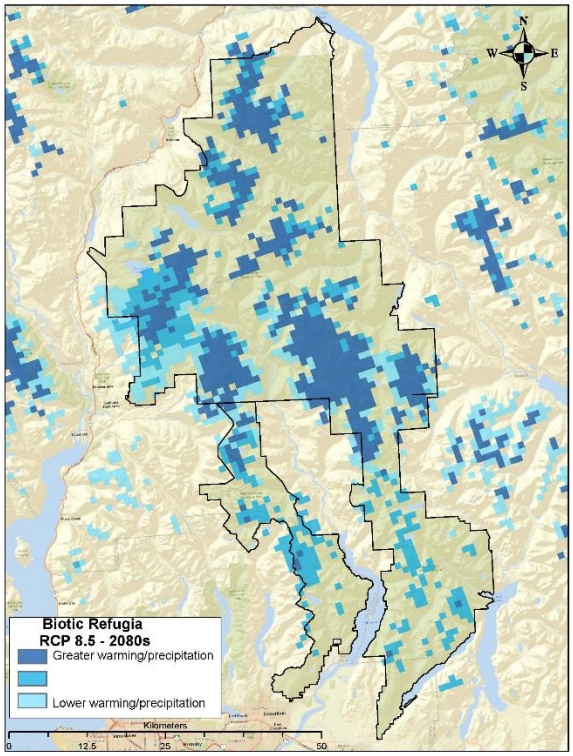
BGC Zone	Change in ha from 2018 to 2085
CWH	116314
CMA	95101
ESSF	3048
IDF	115
IMA	0
MH	16244

*In the table, green depicts area gained, blue depicts area lost and white is no change.

Figure 5. Disappearing Climates, Novel Climates and Potential Biotic Refugia `







The top left figure shows how much of the Complex will have climates that have disappeared (compared to the 1980s) by 2085 under scenario RCP8.5. There is a strong association between elevation and local climatic disappearance with the greatest disappearance (darker colours) occurring in the northern portions of the Complex and at higher elevations that cannot migrate further upwards.

The top right figure shows where there will be potential novel climates (compared to 1980s) by 2085. Novel climates conversely are most likely to emerge at lower elevations.

The bottom left figure shows potential refugia (compared to 1980s) by the 2080s. Refugia are defined as locations with increasingly rare climatic conditions for at least one species. Not all of these refugia may be realized as some are located in currently glaciated areas that will likely have insufficient soils to be effective habitat. Darker colours will experience greater warming/precipitation.

Garibaldi Provincial Park

Garibaldi Provincial Park covers about 194,000 hectares of the Coastal Mountains. This landscape is characterized by high, jagged, ice-covered peaks above steep-sided forested mountain slopes which plunge to u-shaped valleys at relatively low elevations. Less than one hour from Vancouver, Garibaldi is one of the most easily accessible wilderness areas in the world and it offers a wide array of hiking/backpacking, rock climbing and ski touring recreational opportunities that range from short day trips to multi-day wilderness excursions. The park is the most heavily used backcountry area in the BC Parks System[24].

The main conservation roles of Garibaldi Park are:

- to represent the Rugged Pacific Ranges Regional Landscape;
- to preserve the landscape's special and representative features[24].

Ecological/Natural Heritage Values

Garibaldi Provincial Park protects a landscape that is a contrasting mix of high elevation, glacial covered peaks and low elevation forests and riparian systems containing rich, old-growth red cedar stands along many turbulent rivers and creeks. Old forests – some of which are delineated within Old Growth Management Areas – along the west side of the park typically coincide with heavy levels of recreation use. The management of danger tree hazards can conflict with natural processes of disturbance and complex structural forest diversity.

Garibaldi fully contains over 25 complete watersheds and the upper components of numerous other watersheds. Aquatic connectivity within the park is very high with few obstructions – all of which are natural. Given the high proportion of the park that is covered by glaciers, there will be significant changes to stream hydrology in the future as glaciers recede at a rapid pace.

Geologically, Garibaldi represents a rare and diverse number of spectacular features from the volcanic peaks of Black Tusk to cinder cones, historic lava flows and ice caves. These special features, although subject to the pressures of weathering and risks associated with changing hydrology from glacial melt, are intact.

Photo Credit: BC Parks

While there are no recorded formal comprehensive inventories for Garibaldi, the long history of the park and its high use levels have resulted in some good mapping of ecosystems and species at risk. However, with few exceptions there are no studies of the ecological condition of these values and thus, for this assessment, ecological conditions were informed primarily by maps evaluated by Park staff and contain a great deal of uncertainty (Table 1). With the exception of species like Mountain Goat, most of the critical species and habitat occurrences that are mapped are located in the valley bottoms or along the forested mountain slopes (Map 7). Those on the western edge of the park co-occur with the higher human use areas of the park, while those in the centre or eastern side of the park are subject to very little human pressure except from aircraft overflights.

Aerial surveys of Mountain Goats have occurred irregularly between 1978 and 2019 in several

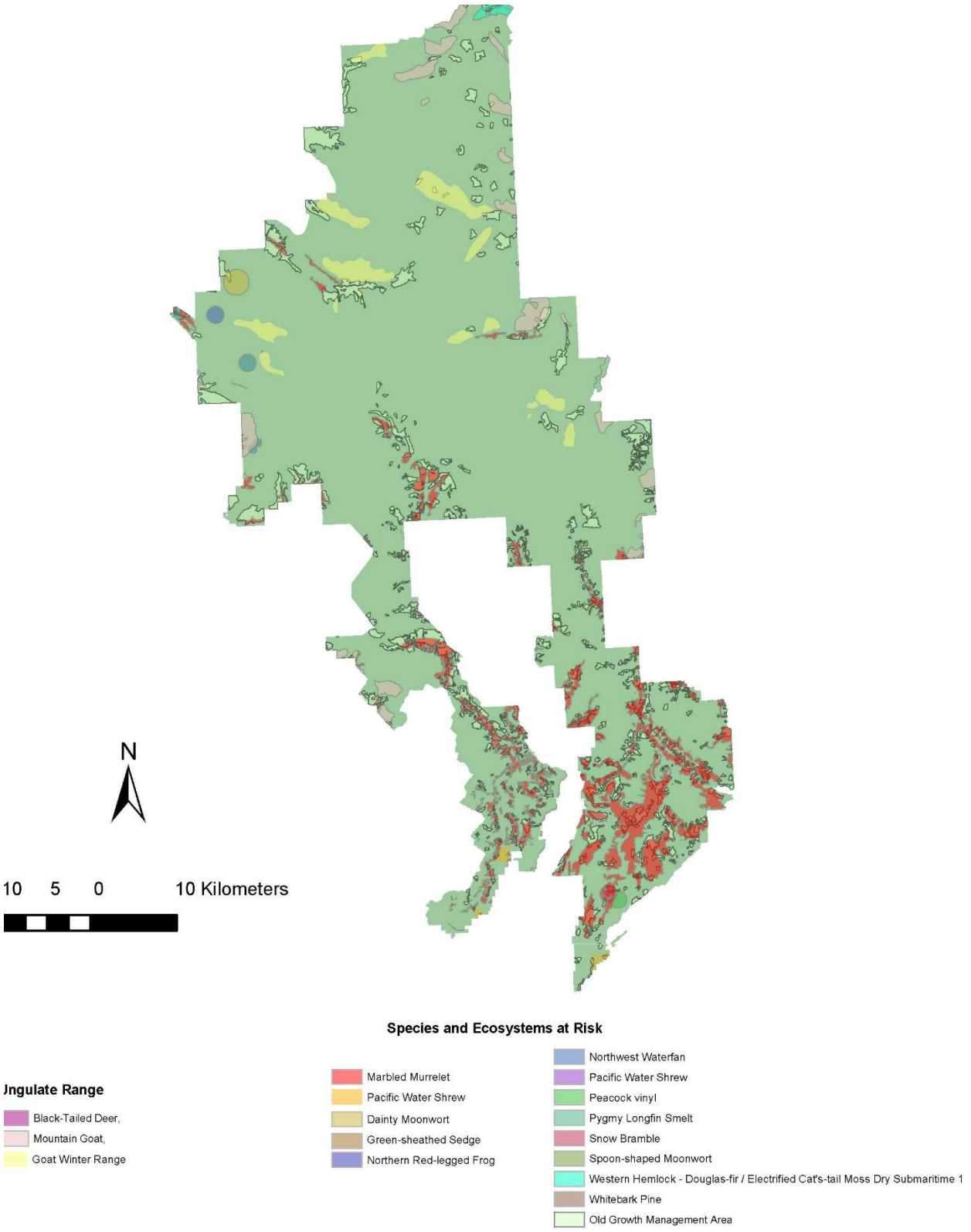
areas of Garibaldi Park. Most often the surveys have occurred in winter on identified goat winter ranges. The data suggest Mountain Goat populations persist and are reproducing in many areas of the park, but the status and trends of these populations are not well understood.

Table 1. Conservation Value and Ecological Condition in Garibaldi Park

	Standardized Conservation Value	Ecological Condition
Ecosystem Representation		
Rarity and Diversity of Terrestrial Ecosystems	100	Excellent
Species of Concern		
Rare/Tracked Species	100	Unknown
Degree of Endemism (Uniqueness)	25	Unknown
Species at edge of range	Unknown	Unknown
Remnant Species or Communities	Unknown	Unknown
Species Loss	1 recorded	
Keystone Species	50	Unknown
Apex Predators	100	Unknown
Special or Unique Habitats		
Rare Habitats/Ecological Communities	75	Moderately high/Uncertain
Legally Defined Critical ('Essential') Habitat	50	Unknown
Wildlife Habitat Features/Focal Habitats	75	Unknown
Special Features		
Special Landforms/Features	100	Excellent
Ecological Function		
Movement Corridors	100	Low/Uncertain
Source/Sink	75	Low
Hydrologic Function		
Watershed Completeness	100	Excellent
Lotic Connectivity	100	Excellent

*Conservation values are scored in the CRA tool on different scales and are standardized here out of 100. A high score indicates an important conservation value is contained within this protected area.

Map 7. Garibaldi Complex Habitat and Occurrence Records for Species and Ecosystems of Conservation Concern



Threats Assessment

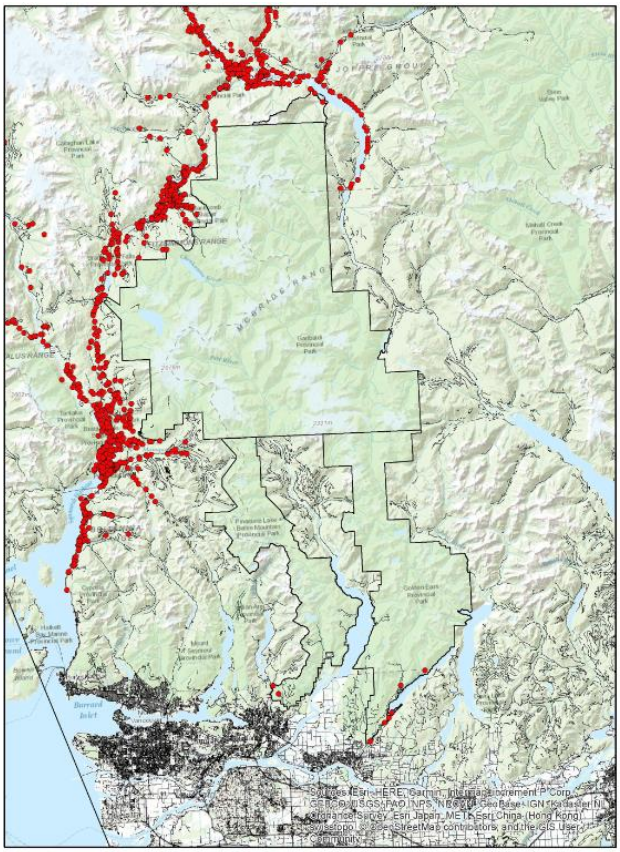
Access to Garibaldi is concentrated along the western edge consisting of a few trailheads. An extensive trail network of more than 90km of trails exists within the park. The topography and limited access to Garibaldi mean that much of the park (the central and eastern portions) maintain the wilderness conditions for which they are zoned. In these areas, the only significant threats are climate change, aircraft use/disturbance of wildlife populations, and the potential for future access caused by increased fragmentations from resource roads and development (forestry, mineral development and utility corridors) in the upper Pitt River valley to the south and all along the eastern edge of the park (Table 2).

Recreation pressures are intense, not only from Vancouver and the Lower Mainland, but also the highly developed Sea to Sky corridor. Garibaldi is an internationally known destination and visitation to this area will likely only increase. Within the park itself, there are approximately 30 commercial backcountry recreation permits and a number of backcountry huts. A heli-ski permit and frequent aircraft overflights may disturb sensitive species such as Mountain Goat and Wolverine. Ski resorts located adjacent to the boundary facilitate easy, alpine access.

For the western edge of the park, where human use and access is concentrated, the primary threats to ecological values are climate change and the volume of recreational users. Trails bisect every low elevation valley on this western edge and these trails, along with trails originating at higher elevations outside of the park provide easy access to sensitive alpine ecosystems and lakes. There are pressures to increase trail access to the park, and illegal trail construction was noted in some areas. There are low but consistent occurrences of illegal access into the park by motorized vehicles (snowmobiles and motorbikes) along access routes serving communications and utility towers. In addition, the growth of mountain biking outside of the park, particularly in ski resorts, has a spillover effect into the park resulting in unauthorized mountain bike use within the park.

Invasive plants, which abound in the Sea-to-Sky corridor, have been recorded at the major access points/trailheads in the park and past fish stocking in park lakes competes with native fish (Map 8).

Map 8. Invasive plant reports (indicated by red dots) in and adjacent to the Garibaldi Complex according to the Invasive Alien Plant Program Database.



All camping within Garibaldi Provincial Park is under an online reservation system. Despite the reservation system, along with concentrated enforcement efforts, unauthorized camping still occurs regularly due to the high visitation in the park.

During the early fall, all established backcountry campgrounds, along with wilderness camping areas, tend to receive high use from school groups and are often over capacity even on weekdays. Staff provided examples of localized impacts on vegetation, soil compaction, improper disposal of human waste and garbage, unauthorized trail construction and species disturbance. There are a number of unauthorized campsites within the park, some in sensitive areas like Battleship Islands in Garibaldi Lake. High camping and day use numbers also lead to increased demands on staff to manage human waste.

There is some illegal harvesting of plants (e.g., floral greens like salal along with mushrooms and berries), and staff suspect unmonitored hunting pressures outside of the park in the Upper Pitt watershed and/or along the eastern edge of the park (Map 9).

Map 9. Human Footprint Adjacent to Garibaldi Provincial Park

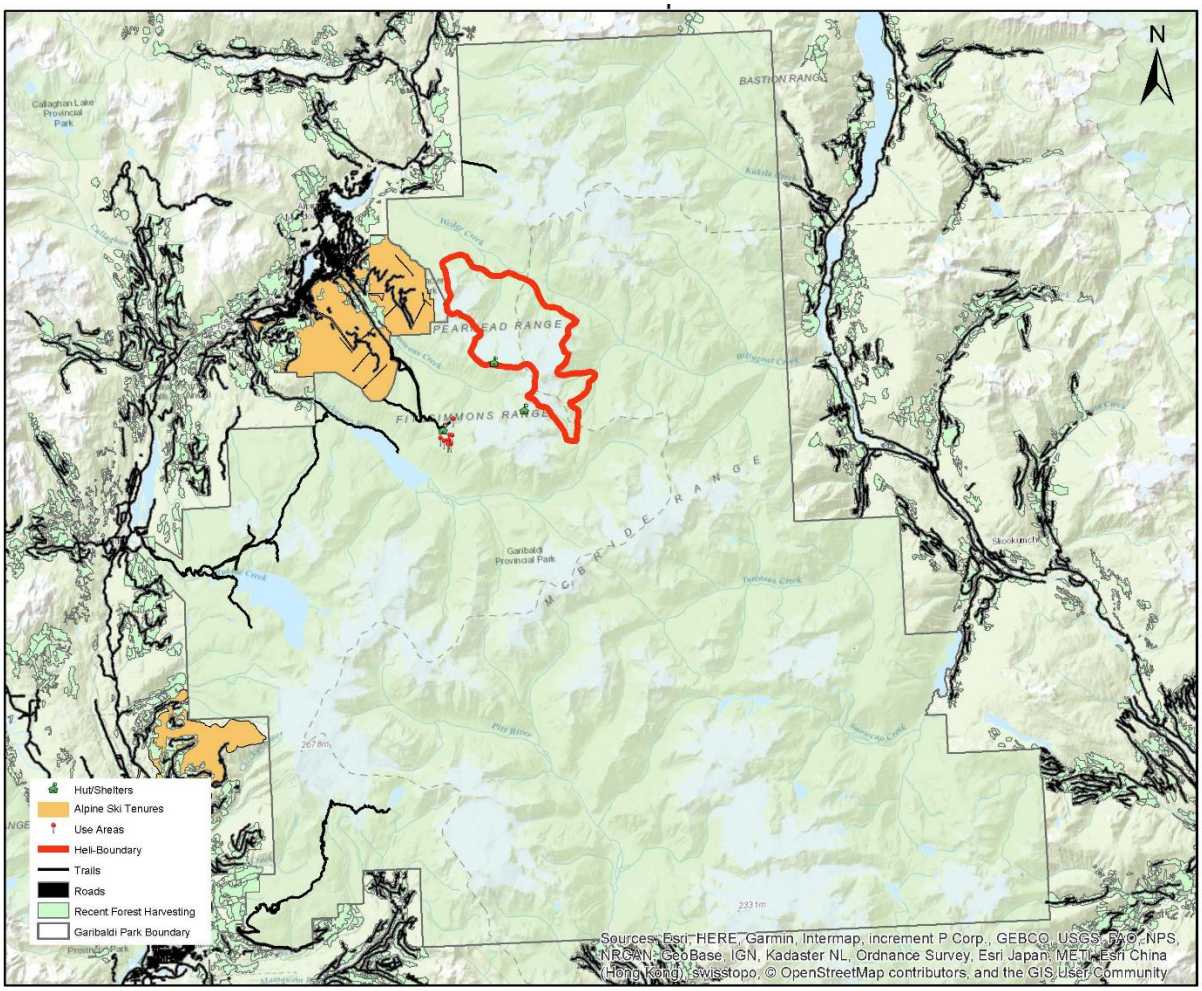


Table 2. Garibaldi Provincial Park Internal and External Threats

Threat Categories	Internal (Within park boundary)	External (Outside park boundary)
Residential & Commercial Development		
• Housing and urban areas	Nil	High
•Tourism & recreation areas	High	Very High
Energy Production & Mining		
• Renewable energy (independent power)	Nil	High
Transportation & Service Corridors		
• Roads	Medium	High
• Utility and service lines	Medium	High
• Flight Paths	High	Unknown
Biological Resource Use		
• Logging and wood harvesting	Nil	High
• Gathering terrestrial plants	Medium	Unknown
Human Intrusions & Disturbance		
• Recreational activities: camping, foot traffic, bicycling, motorized terrestrial vehicles	Very High**	Very High
Natural System Modifications		
• Tree thinning/danger tree removal	Medium	Medium
Invasive Species		
• Terrestrial invasive / non-native	Medium	High
Pollution		
• Garbage and solid waste • Excess energy (lights) • Sewage, urban waste water	Medium	Medium
Climate Change		
• Habitat shifting and alteration • Severe weather • Glacial melt	Very High	Very High
Calculated Overall Threat Impact	**Very High**	**Very High**

*Threat category and overall threat category scores are calculated according to IUCN standard procedures.[25]

** In certain parts of the park, recreational use is high but this is concentrated within the Natural Environment Zone as described in the Master Plan for Garibaldi Provincial Park.

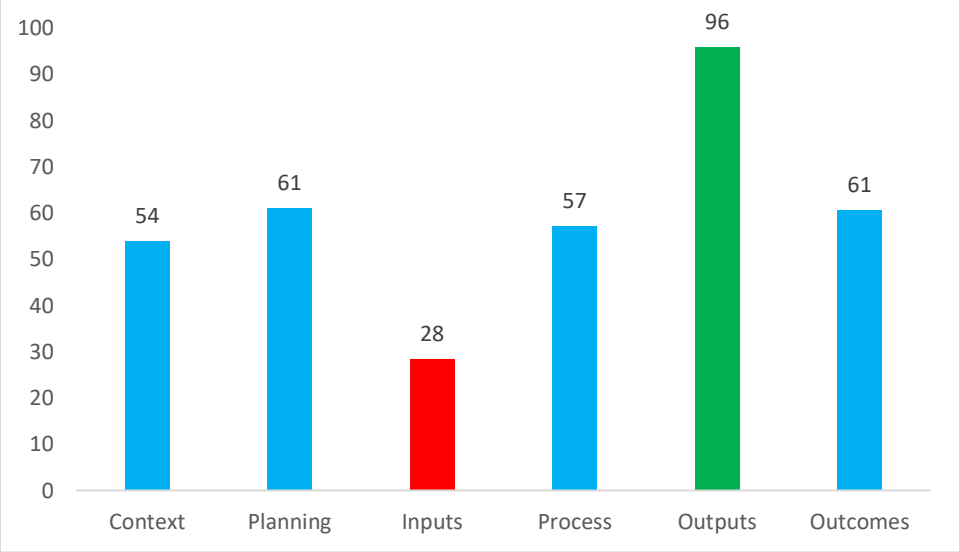
Management Effectiveness Evaluation of Conservation Values

A team of BC Parks' staff conducted a management evaluation using a Canadian adaptation of the METT tool in February 2019. For this application, the focus was only those questions related to the

conservation/ecological values within Garibaldi Park (Figure 6). Cultural and recreational values, including evaluative questions focused on consultation and shared management, were not included at this time.

The Management Evaluation findings do not necessarily reflect past or current protected area management. Many factors that affect resource conditions are a result of both human and natural influences over long periods of time, and the context in which the park is situated. The intent of this process is to document the present status of Garibaldi to help inform actions that can be taken to protect these areas into the future. See Appendix 1 for definitions of the key components of the tool.

Figure 6. Garibaldi Management Effectiveness Evaluation of Conservation Values



Scoring Standard: Sound (67%-100%), Basic (51%-66%), Basic with Significant Deficiencies (34%-50%), Inadequate (0-33%)

Context: Where are we now?[c]

Comprehensive conservation values and threats assessments were completed as part of the Garibaldi Conservation Assessment. The relatively recent management plan amendment identified many of these same values and threats for the Spearhead area of the park, although the remainder of the park has not benefited from this more detailed analysis.

Planning: Where do we want to be and how will we get there?

Garibaldi Park is currently served by two major planning documents: a 1990 Management Plan (assessed as valid but inadequate); and a 2014 Management Plan amendment for the Spearhead area of the park – the area adjacent to Whistler/Blackcomb Glacier where human use is concentrated. However, there are significant ecological values in the remainder of the park that could be better addressed in an updated management plan. The overall approach to managing day use is limited and is not well supported by an overarching regulatory structure to guide it. Although there are good objectives in the plan

[c] Definitions for each of the key management attributes can be found in the appendices

linked to site values, the general management approach is to attempt to balance this extreme recreation demand with conservation impact. Some staff suggest that not enough emphasis is placed on the cumulative impacts of seemingly small, individual decisions.

There is limited monitoring and research data available or accessible for management planning and decision making. While there has been some initial thinking about the impacts of climate change on the park, management is focussing more on the immediate challenges of high visitor use. As a result, implications and strategic actions in response to climate change are not yet well advanced.

The relatively large size and limited edge-to-interior ratio of the park even without adjoining protected areas aids in the protection of the park's conservation values. The high elevation nature of much of the park means that headwaters and full watersheds are protected, although this high elevation also means that there is less effective habitat area than the overall size of the park would suggest.

Inputs: What do we need?

Garibaldi is the anchor park in the Complex and with high wilderness recreation values, it receives a great deal of user pressure. Some proactive visitor management actions (e.g., required camping permits year-round) along with other rules and regulations (e.g., no dogs permitted) mean that there are fairly good tools and systems in place, although further work is needed.

Enforcement capacity is generally limited, and this reduces the effectiveness of existing tools and approaches. Park staff note that their efforts to manage visitor use help mitigate impacts to some degree but these efforts are unable to match the size of the challenge.

Park staff note that the time they devote specifically to conservation issues, such as ecosystem management outside of efforts to manage park visitors, is insufficient. Staff don't feel they have time or skills to access and integrate datasets and research on the ecological values available from universities, government agencies and other sources.

Recent budget increases for conservation have focussed more on project funds, rather than new hires. This is an improvement, supporting some contracting and partnerships, but there are limitations to how this money can be used, and its utility is subject to the capacity of staff to take on projects. While field gear and maintenance of that gear within Garibaldi is fairly good, the major constraint is having sufficient personnel to do conservation work.

Processes: How do we go about it?

The management focus of day-to-day activities is limited to addressing urgent and often emerging issues associated with visitor use and thus rarely allows for any consideration of other ecological threats and longer-term conservation management. Planning for visitor use has more recently considered how visitor use affects ecological values, but there's generally inadequate research and monitoring data available to support management. Some good examples of managing for conservation includes the

Photo Credit: Iain Reid

relocation of the Diamond Head campground out of bear habitat and the removal of invasive species. However, in other areas of high visitor use, it has been difficult to make conservation of biodiversity a management priority. Information delivered to park visitors about ecological values in person through ranger contacts appears effective to staff (although not formally evaluated) but those contacts take time and are limited. Other information available to the visiting public is limited and generally out of date.

There is some effective coordination and cooperation with adjacent land users such as Recreation Sites and Trails BC, but there is opportunity for significantly more and more proactive engagement. Coordination with adjacent protected areas is limited but facilitated by the conservation specialist and park planner. The park normally does receive referrals for impacts outside of its boundaries. Referral processes are also in place with Whistler Blackcomb and the regional districts. Logging can, and does, occur adjacent to the park boundary. Contact with the numerous commercial operators permitted to operate in the park is largely administrative in nature and not focused on shared actions or partnerships focused on conservation.

Outputs: What were the results?

Annual work planning is conducted regularly with many high priority activities implemented including long term ecological monitoring and goat monitoring. The annual work planning process to pursue proactive conservation management has been limited. Although some proactive decisions have been made to ensure that visitor facilities are in keeping with the ecological concerns, there is limited assessment of cumulative visitor use pressures on conservation values.

Outcomes: What did we achieve?

BC Parks staff suspect that the ecological condition in the majority of the park remains relatively intact due to the size and remoteness of Garibaldi and the fact that visitors are confined to the west of the park. However, populations of wide-ranging species (e.g., Grizzly Bears) and other species of special concern (e.g., Wolverine, Mountain Goats) are known (in the case of Grizzly Bears), or may be, small in size and/or limited in distribution. This could be attributed to the high levels of development surrounding the Complex and limiting movement among populations which may put the long-term viability of these species at risk. In addition, climate change will have a significant effect on effective habitat within Garibaldi and its internal and external connectivity. Along the western edge, despite the lack of historic baseline or current monitoring data, staff suspect that ecological values are being degraded from human use in this area.

Mkwal'ts Conservancy

The Mkwal'ts Conservancy is located within the Lil'wat Nation Traditional Territory approximately 20 kilometres southeast of Pemberton on the western shore of Lillooet Lake. The conservancy is approximately 3,874 hectares in size and protects the lower portion of the Ure Creek watershed, while the upper part of the watershed is located within Garibaldi Park.[26]

The Mkwal'ts Conservancy (the conservancy) is one area of central focus to Lil'wat Nation culture. It contains many significant cultural sites and spiritual places. The Lil'wat Nation has named the area Mkwal'ts, which translates as "smooth rocks on the beach", in the Ucwalmicwts language.

The Mkwal'ts Conservancy's significance to the protected areas system is identified in the management plan[26] as:

- protecting the entire Mkwal'ts Nt'akmen Area[d] including the cultural and ecological features of the land that support the needs of the Lil'wat people; and,
- along with Garibaldi Park, protecting an entire watershed with a full range of elevations to accommodate the possible migration of species associated with climate change. Species resilience to climate change is aided by the conservancy's proximity to other protected areas.

The critical cultural values of Mkwal'ts are intricately connected to the ecological features and intactness of the landscape. This conservation assessment, focusing on the ecological condition of the landscape, can inform richer discussions on the condition of the cultural values within the conservancy.

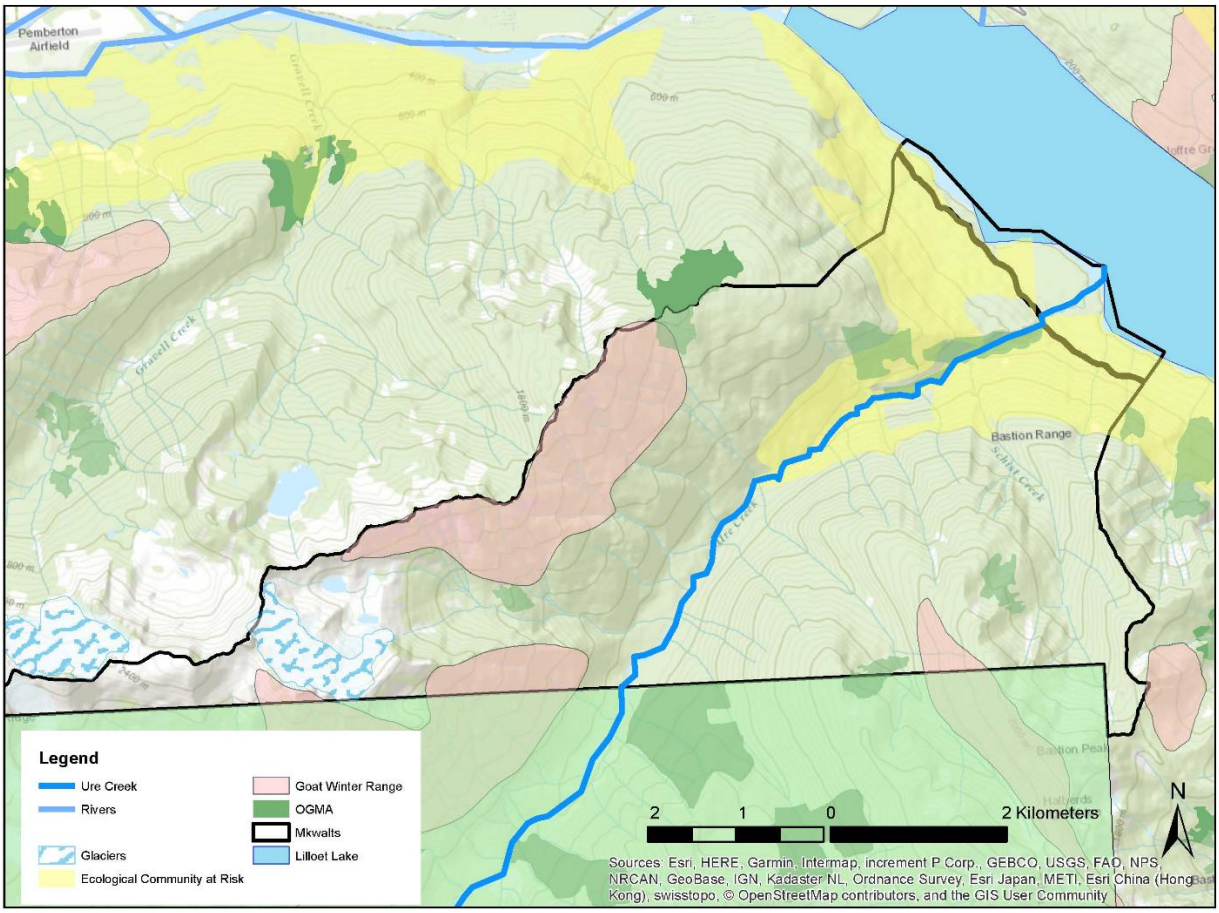
Ecological/Natural Heritage Values

Mkwal'ts protects the Ure Creek watershed including the associated alluvial fan that extends into Lillooet Lake and contains important ecological fisheries values and important cultural values.

Ecological communities in the conservancy range from alpine parkland in upper parts of the watershed to large coastal western hemlock (CWHds1) and western red cedar stands in the lower reaches. Although a small protected area, it protects a significant amount of the Coastal Western Hemlock, Southern Dry Sub-maritime subzone relative to the amount protected elsewhere in the province. Seven Old Growth Management Areas (OGMAs), five within the Conservancy and two on the border, were identified prior to Mkwal'ts designation and likely contain significant stands of old forest. In addition, 17% of the Conservancy in lower elevations is composed of a blue-listed ecological community (Western Hemlock-Douglas Fir/Electrified Cat's tail moss) (Map 10).

[d] The Lil'wat Nt'akmen (Our Way) Areas were identified in the Lil'wat Land Use Plan.[27]

Map 10. Mkwal'ts Conservancy Conservation Features



In upland portions of Mkwal'ts, ungulate winter range (UWR) has been identified for Mountain Goat and Black-tailed Deer. Critical wildlife habitat has also been identified for the red-listed Spotted Owl. Mkwal'ts represents habitat for both the Black-tailed Deer and Spotted Owl at the edges of their distribution suggesting that these populations might be particularly important as ecological conditions and climates shift. There have also been occasional sightings of red-listed Northern Goshawk. Grizzly bears and Cougars are likely inhabitants of the larger Garibaldi complex including Mkwal'ts. Juvenile Sockeye and Dolly Varden Char were observed in the Ure creek alluvial fan.

There are no formal ecological inventories for this Conservancy, and only anecdotal sightings are found in government records for some species; thus the ecological condition of plant communities and species for Mkwal'ts is not well documented (Table 3). Indigenous traditional knowledge of the state and condition of the ecological values of the Conservancy could provide additional insights into the historical and current condition of these values.

Table 3. Mkwal'ts Conservation Values and Ecological Condition

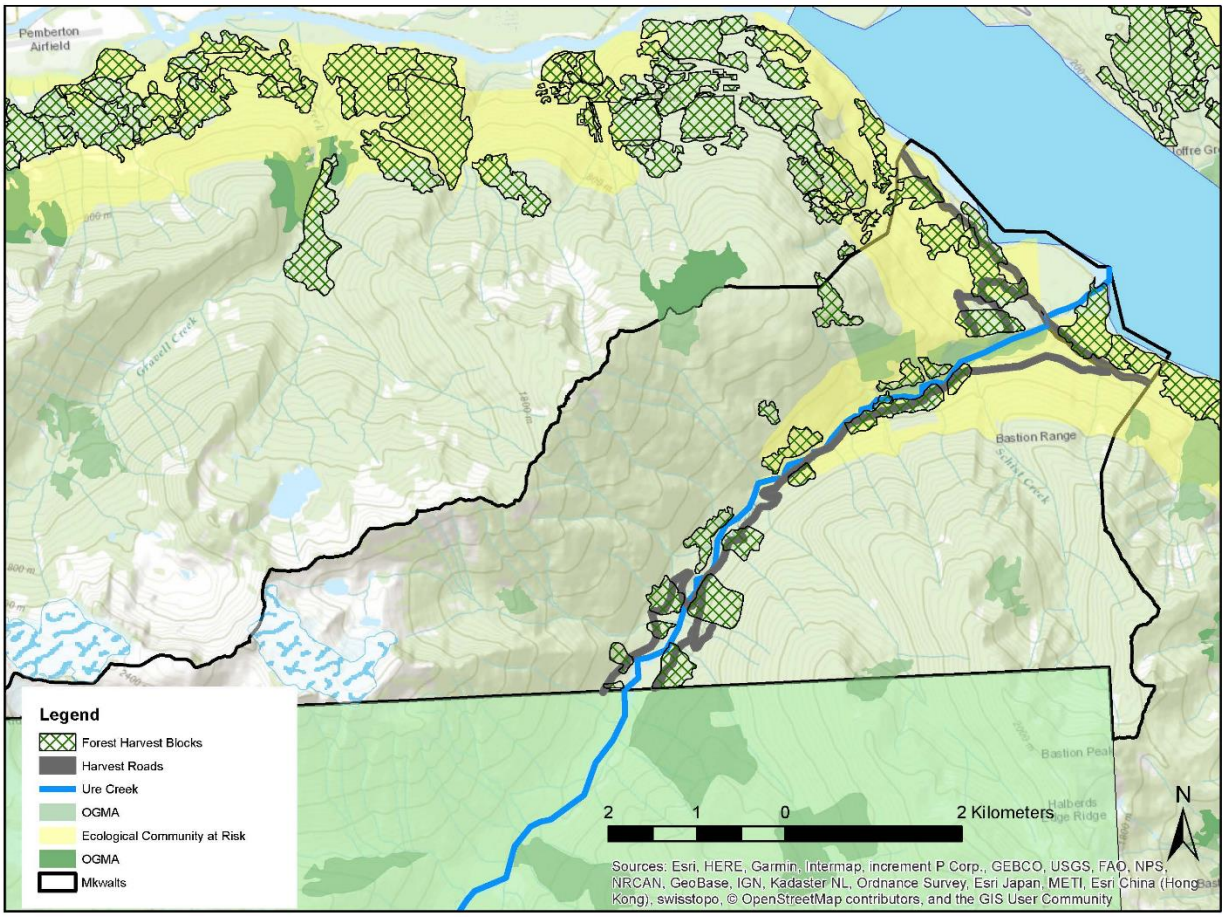
	Standardized Conservation Value*	Ecological Condition
Ecosystem Representation		
Rarity and Diversity of Terrestrial Ecosystems	100	Moderate
Species of Concern		
Rare/Tracked Species	100	Unknown
Degree of Endemism (Uniqueness)	Unknown	Low
Range Extension Species	Unknown	Unknown
Remnant Species or Communities	Unknown	Unknown
Species Loss	Unknown	Unknown
Keystone Species	Unknown	Unknown
Apex Predators	50	Low
Special or Unique Habitats		
Rare Habitats/Ecological Communities	75	Moderately high
Legally Defined Critical ('Essential') Habitat	Unknown	Unknown
Wildlife Habitat Features/Focal Habitats	75	Moderate
Special Features		
Special Landforms/Features	75	Unknown
Ecological Function		
Movement Corridors	50	Unknown
Source/Sink	0	Unknown
Hydrologic Function		
Watershed Completeness	25	Moderate
Lotic Connectivity	100	Moderate

*Conservation values are scored in the CRA tool on different scales and are standardized here out of 100.
A high score indicates an important conservation value is contained within this protected area.

Threats Assessment

Mkwal'ts Conservancy is a relatively recent addition to the protected areas system. Established in 2010 resulting from an *Agreement Regarding the Mkwal'ts Nt'akmen (Ure Creek Area) between the Lil'wat Nation and the Province of British Columbia*[28], the Conservancy has a recent history of forest harvesting and associated road building. The Conservancy is bisected at the northern end adjacent to Lillooet Lake by the Green River Forest Service Road (FSR) (Map 11).

Map 11. Forest Harvesting and Road History within Mkwal'ts Conservancy



The specific threat assessment for Mkwal'ts examined the range of issues that are perceived to be compromising conservation values within the Conservancy. Potentially occurring or anticipated future threats were not considered. Past forest harvesting and road building, described below, compromise the ecological and cultural integrity of aquatic and terrestrial resources within the Conservancy (Table 4).

Table 4. Mkwalt's Conservancy Internal and External Threats based on the Conservation Features Threat Assessment Matrix

Threat Categories	Internal (Within park boundary)	External (Outside park boundary)
Residential & Commercial Development		
• Housing and urban areas	Low	Low
• Commercial and industrial areas	Nil	Nil
• Tourism & recreation areas	Low	Low
Transportation & Service Corridors		
• Roads	High**	Medium
•Flight paths	Medium	Medium
Biological Resource Use		
• Hunting and Trapping	Medium	Unknown
• Logging and wood harvesting	High**	High
• Fishing and aquatic resource harvesting	Unknown	Unknown
Human Intrusions & Disturbance		
• Recreational activities	Low	Medium
Invasive Species		
• Terrestrial invasive / non-native	Medium	Medium
Geological Events		
• Avalanches/landslides (natural)	Low	Low
• Mass wasting (human caused)	Very High	Unknown
Climate Change		
• Habitat shifting and alteration • Severe weather • Glacial melt	Very High	Very High
Calculated Overall Threat Impact*	**Very High**	**Very High**

*Threat category and overall threat category scores are calculated according to IUCN standard procedures.[25]
** Logging and associated logging road development pre-existed conservancy establishment.

From 1948 to 2002 - prior to creation of the Conservancy - 25 forest blocks were harvested within Mkwal'ts ranging in size from 1 – 36 ha, for a total of 286 ha harvested or 7.41% of the Conservancy. These harvest blocks are concentrated along Green River FSR and up the Ure Creek FSR paralleling the creek itself.

In addition to the change or loss of potentially critical habitat in the lower elevations and adjacent to riparian areas, the Ure Creek FSR and associated forest harvest blocks bisect the Conservancy from its southern border to the boundary with Garibaldi Park. Coarse resolution satellite imagery suggests there are multiple points of mass wasting/slippage adjacent to, or associated with, roads, crossings, or harvest blocks within the Conservancy. Detailed assessments by qualified professionals are needed to determine deactivation and possible restoration strategies. Discussions about the potential need for road deactivation are reflected in park records and are echoed in the Mkwal'ts management plan, but road deactivation and restoration has not been initiated.

In addition to the aforementioned habitat fragmentation and loss, there are other risks associated with these unrestored areas, including increased sedimentation resulting from mass wasting that may result in stream blockages or sediment deposition on critical fisheries habitat in the alluvial fan. Although the past forest harvest blocks are in various stages of regrowth given their age (1948-2002), the

condition of those stands (including species mix and stand structure) are likely unrepresentative of natural forest conditions and they should be evaluated for ecological restoration. In addition, a number of these forest harvest blocks appear to be located in areas containing blue-listed plant communities. As this community also appears to have been associated with logging activity outside of the Conservancy, there may be opportunities within the Conservancy for targeted plant community restoration. Finally, the Mkwalt's Conservancy management plan indicates that no mechanized or motorized access will be permitted within the Conservancy. Roads that have not been deactivated and restored, and are not monitored for use, represent further potential risk.

In addition to historic threats, the Mkwal'ts Conservancy appears to face threats associated with stressors originating both inside and outside of the Conservancy. There are some documented[29] invasive plants along the Green River FSR that may also occur on the Ure Creek FSR. Occasional recreational boating/picnicking at the Ure Creek alluvial fan may have an impact on fisheries values along with cultural values. An existing heli-ski operation in the higher elevations and a guide outfitting territory has potential to disturb sensitive species like Mountain Goat.

Figure 6. Mass wasting event in M'kwalts

Photo Credit: BC Parks

Management Effectiveness Evaluation of Conservation Values

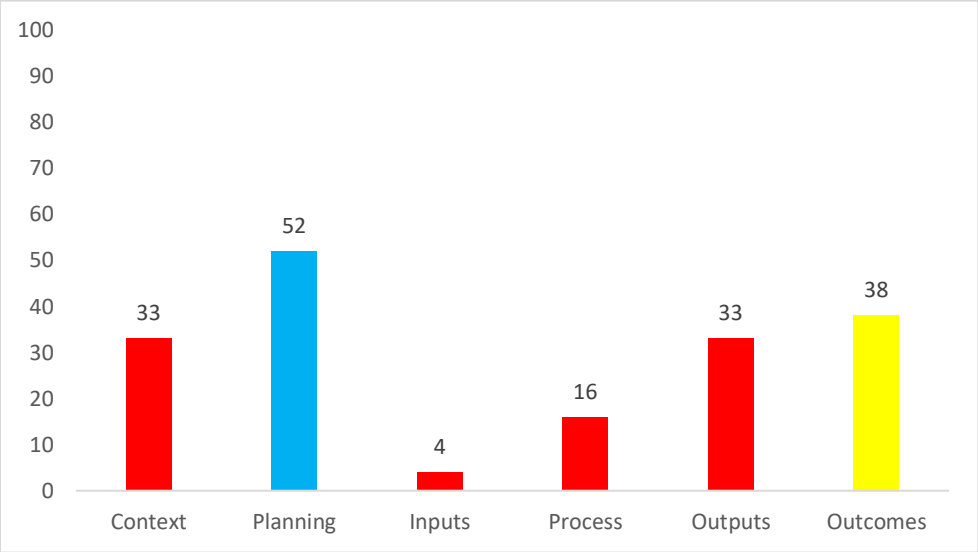
A team of BC Parks staff conducted a management evaluation using the Canadian version of the METT tool in February 2019. For this application, the focus was only those questions related to the conservation/ecological values within the Conservancy (Figure 7). Cultural and recreational values- including evaluative questions focused on consultation and shared management- were not included at this time.

The Mkwal'ts Conservancy is a relatively recent addition to the protected areas system, with a management plan developed jointly with Lil'wat First Nation. The intent of management within the Conservancy focuses on the cultural and ecological values of the area, while minimizing recreational use. As the smallest of the four protected areas in the Garibaldi Complex, and as one of a number of recently designated Conservancies in the region, there is limited information to inform management and competition with the other busy protected areas in the complex for resources. Consequently, in most categories of management effectiveness, there are significant opportunities for improvement with additional inputs of resources.

The Management Evaluation findings do not necessarily reflect past or current protected area management. Many factors that affect resource conditions are a result of both human and natural influences over long periods of time, in many cases before the Conservancy was established. The intent

of this process is to document the present status of the Conservancy to help inform actions that can be taken to protect them into the future.

Figure 7. Mkwal'ts Management Effectiveness Evaluation of Conservation Values



Scoring Standard: Sound (67%-100%), Basic (51%-66%), Basic with Significant Deficiencies (34%-50%), Inadequate (0-33%)

Context: Where are we now?

Comprehensive conservation values and threats assessments were completed as part of the Mkwal'ts evaluation. The recent management plan identified many of these same values and threats, but their importance was elevated through the Conservation Assessment process.

Planning: Where do we want to be and how will we get there?

The Conservancy has a recently completed management plan developed jointly with Lil'wat First Nation. The management plan is guided by higher level direction from the Sea to Sky LRMP. While Mkwal'ts is a small protected area, it does contain an entire watershed and because it adjoins Garibaldi Provincial Park it achieves high scores for design despite being divided by the Green River FSR. New resources will be required to implement the plan, conduct annual management planning activities and monitor the effectiveness of the plan.

Inputs: What do we need?

Limited resources and competing parks with high visitor use have meant that little budget or staff time have recently been allocated to this Conservancy. On-site staff presence has been limited to the occasional planning-related activities. There is no staff presence, patrol or enforcement in the area. Lil'wat Nation likely has presence in this area but this has not been confirmed with the Nation. There is also a critical lack of information about the ecological values on-site apart from broad summaries in the management plan. Park staff note that members of the Lil'wat Nation have valuable ecological knowledge that could be used to aid management. In addition, Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) and Ministry of

Environment and Climate Change Strategy staff may have important ecological information about the area (e.g., OGMA assessments, TEM mapping) from before the Conservancy was established.

Process: How do we go about it?

Limited work has been done in implementing management actions. There are opportunities to educate incidental park visitors (e.g., boaters/visitors to the alluvial fan) about sensitive park values.

Continued cooperation with the Lil'wat Nation could be particularly beneficial given their more regular presence in area. There are opportunities for coordination with Garibaldi Provincial Park (given that they are the same staff), and with the adjoining region containing the Stein Valley Nlaka'pamux Heritage Park given the wildlife connectivity corridor linking the two areas.

In this application of the management evaluation process, we did not evaluate processes designed to engage with Indigenous communities and stakeholders. Given the collaborative nature of the designation of the Conservancy and the development of the management plan, there is likely to be significant improvement in the scores.

Outputs: What were the results?

Management strategies to limit visitor use and facility development in this culturally and ecologically sensitive protected area results in high management scores. Work planning to direct land management activities and operations on this site has however, not yet been conducted for this protected area; the output score is low due to lack of implementation of strategies.

Outcomes: What did we achieve?

The forestry activities that occurred in the Conservancy prior to designation carry a legacy of impact on biodiversity outcomes on the site. These are principally associated with forest road construction in the Ure Creek drainage and harvest impacts on plant communities and forest structure. As there is no available data assessing ecosystem condition and no direct ecosystem/restoration management on site, it is difficult to clearly assess the state of biodiversity within the Conservancy. Staff review as part of this Conservation Assessment suggests that outside the zone of influence from forestry/road activities, much of the Conservancy is intact and faces minimal threats.

Golden Ears Provincial Park

Golden Ears Provincial Park is located on the north side of the Fraser River in the Lower Mainland and represents the southeastern portion of the Garibaldi Complex. First established in 1967 with subsequent additions through 1997, the park is 62,539 ha in size and the second largest in the South Coast Region, after Garibaldi Park. The park represents typical Coast Mountain natural and recreation opportunities bounded by Pitt Lake to the west and Alouette and Stave Lakes to the east. It is bounded to the north by Garibaldi Park, Pitt-Addington Marsh Wildlife Management Area (WMA), Pitt-Polder Ecological Reserve, and the Malcolm Knapp Research Forest to the southwest and the District of Maple Ridge to the south. Access is primarily through roads on the southern tip of the park with access by boat the only means of accessing the west and east sides of the park. Apart from these areas, Golden Ears Park is surrounded predominantly by forested lands managed by the Chilliwack Forest District including a 400 ha woodlot licence on Blue Mountain and the hydro-electric reservoir of Alouette Lake. Golden Ears is the fourth most-visited provincial park. It is located just 50 kilometres east of Vancouver with the core of the recreation area concentrated in the southern end providing a wide range of recreation opportunities. The central and northern parts of the park are dominated by rough mountain peaks with little human access. The park also contains important archaeological and cultural sites, as it is situated within the traditional territories of a number of Indigenous groups.

Ecological/Natural Heritage Values

Ecologically, Golden Ears provides protection for over 4,000 hectares of the Coastal Western Hemlock dry maritime biogeoclimatic (BEC) subzone, which represents 15% of this subzone within the protected areas system. Along Moyer and Gold Creeks, there are old growth forests, and old growth yellow cedar can be found on Alouette Mountain. It is likely that the rare red-listed Douglas-fir lodgepole pine/oceanspray/reindeer lichen plant community occurs in the lower elevations at the southern end of the park (Table 5).

This park provides habitat for the threatened (Blue listed) Grizzly Bear, winter range for Mountain Goat and probably range for Wolverine and Wolf. The park also contains designated critical habitat for Marbled Murrelet and Pacific Water Shrew. It also provides habitat for other at-risk species including: the threatened Garibaldi-Pitt Grizzly Bear population unit, the Red-listed Johnson's Hairstreak butterfly, Grappletail dragonfly, Snowshoe Hare (*Lepus americanus washingtoni*), Red-legged Frog, Northern Goshawk (*laingi* subspecies) and Pygmy Longfin Smelt. In 2013 and 2014, Spotted skunks, thought to have been extirpated from the Lower Mainland and possibly all of BC, were observed within the park.

Damming of the Alouette River in 1928 led to the extirpation of runs of Sockeye, Chinook, Pink, Coho, Chum, Steelhead and possibly sea-run Cutthroat Trout. There is some passage of fish over the spillway, but as there is no ladder, fish must be transported by truck around the barrier. Beavers, extirpated in the past from southern areas of the park, were reintroduced to Mike Lake with limited success.

The park contains the headwaters of the Stave, Alouette and Upper Pitt rivers. Special features of geologic and cultural importance include not only the twin peaks for which Golden Ears was named but also ice caves and alpine tarns and lakes.

Table 5. Golden Ears Conservation Values and Ecological Condition

	Standardized Conservation Value*	Ecological Condition
Ecosystem Representation		
Rarity and Diversity of Terrestrial Ecosystems	75	Moderately high
Species of Concern		
Rare/Tracked Species	100	Low
Degree of Endemism (Uniqueness)	0	Unknown
Range Extension Species	Unknown	Unknown
Remnant Species or Communities	75	Unknown
Species Loss	Unknown	Unknown
Keystone Species	50	Unknown
Apex Predators	50	Low
Special or Unique Habitats		
Rare Habitats/Ecological Communities	Unknown	Unknown
Legally Defined Critical ('Essential') Habitat	100	Unknown
Wildlife Habitat Features/Focal Habitats	75	Moderately high/Uncertain
Special Features		
Special Landforms/Features	100	Moderate
Ecological Function		
Movement Corridors	50	Low/Uncertain
Source/Sink	75	Moderate/Uncertain
Hydrologic Function		
Watershed Completeness	100	Excellent
Lotic Connectivity	100	Excellent

*Conservation values are scored in the CRA tool on different scales and are standardized here out of 100.
A high score indicates an important conservation value is contained within this protected area.

Threats Assessment

Established in 1967, Golden Ears Park had a history of logging prior to designation and is currently surrounded by forest harvesting activities and urban development. While the Park is heavily visited, much of the use is concentrated in the southern tip of the park.

The specific threat assessment for Golden Ears looked at the range of currently occurring activities or issues that are perceived to be compromising conservation values within the Park. Potentially occurring or anticipated future threats are not included. Golden Ears received an overall VERY HIGH risk assessment using the standardized Conservation Features Threat Assessment Matrix[25] (Table 6).

Table 6. Golden Ears Internal and External Threats based on the Conservation Features Threat Assessment Matrix

Threat Categories	Internal (Within park boundary)	External (Outside park boundary)
Residential & Commercial Development		
• Housing and urban areas	Nil	High
• Tourism & recreation areas	Medium	Medium
Agriculture		
Wood and pulp plantations	Low**	Nil
Energy Production & Mining		
• Mining and quarrying	Medium**	Unknown
Transportation & Service Corridors		
• Roads	Medium	Medium
• Utility and service lines	High	High
Biological Resource Use		
• Hunting and trapping	Low	Low
• Logging and wood harvesting	Low	High
• Fishing and aquatic resource harvesting	Low	Unknown
Human Intrusions & Disturbance		
• Recreational activities: camping, foot traffic, motorized terrestrial vehicles	High	High
Natural System Modifications		
• Dams/Water management • Fire and fire suppression	Medium	High
Invasive Species		
• Terrestrial invasive / non-native • Aquatic invasive/non-native	Medium	Medium
Pollution		
• Garbage and solid waste • Air-borne pollutants • Excess energy (lights) • Sewage, urban waste water	High	High
Climate Change		
• Habitat shifting and alteration • Severe weather • Glacial melt	Very High	Very High
Calculated Overall Threat Impact*	**Very High**	**Very High**

*Threat category and overall threat category scores are calculated according to IUCN standard procedures.[25]

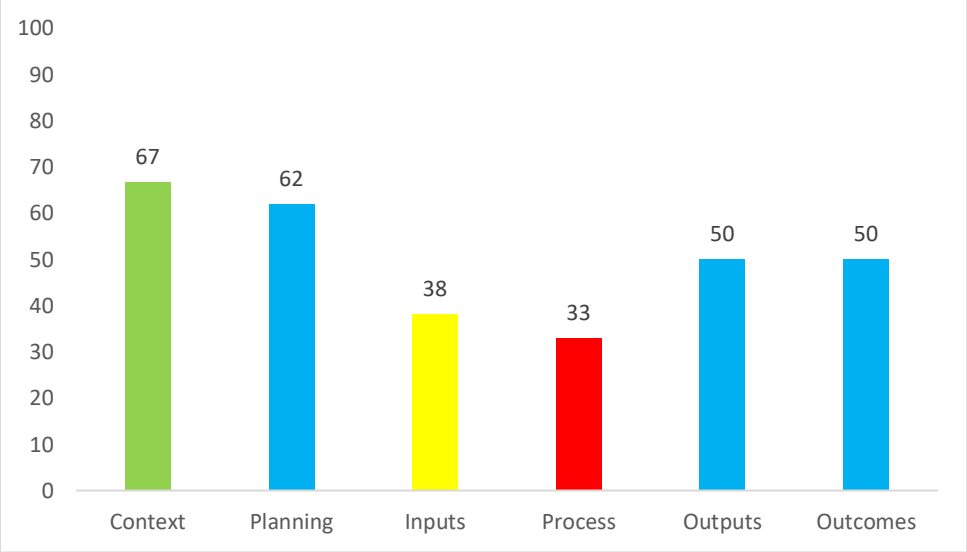
**Refers to human activity that pre-existed park establishment and where there are still remnant impacts.

Management Effectiveness Evaluation of Conservation Values

A team of BC Parks staff conducted a management evaluation using the Canadian version of the METT tool in February 2019. For this application, the focus was only those questions related to the conservation/ecological values within the Conservancy. Cultural and recreational values, including evaluative questions focused on consultation and shared management, were not included at this time.

The Management Evaluation findings do not necessarily reflect past or current protected area management. Many factors that affect resource conditions are a result of both human and natural influences over long periods of time, some from prior to the Park's establishment and others the result of surrounding land use context or the valuable recreational role that the park fulfills (Figure 8). Golden Ears is the second largest protected area in the south coast region and is heavily visited by day users and overnight users. While in addition to BC Park staff, a Park Operator provides critical management functions within the heavily used front-country environment, resourcing limitations mean that there are fewer people on the ground in both areas than are needed to address usage pressures. The intent of this process is to document the present status of the Park to help inform actions that can be taken to protect them into the future.

Figure 8. Golden Ears Management Effectiveness Evaluation of Conservation Values



Scoring Standard: Sound (67%-100%), Basic (51%-66%), Basic with Significant Deficiencies (34%-50%), Inadequate (0-33%)

Context: Where are we now?

Comprehensive conservation values and threats assessments were completed as part of the Golden Ears evaluation. The 2013 management plan identified many of these same values and threats, but a subset of these were highlighted through the Conservation Assessment process. Lack of information on biodiversity outcomes is a barrier to understanding the current condition of Golden Ears.

Planning: Where do we want to be and how will we get there?

While park status and gazetting are sound, there are still weaknesses in regulations and policies. For example, there is no aviation management plan. There is a new policy on drones, but staff are challenged to find time to enforce compliance. There are also differing policies between the park and adjacent lands regarding motorized vehicle use, thus resulting in conflicts and difficulty in enforcement.

Staff noted that while many elements in the existing park management plan are sound, park user numbers have drastically increased only five years into the plan's lifecycle. As a result, some of the ideas and objectives within the plan are not suitable for the current level of human use in the park. Other, still relevant objectives, and planned activities, have not yet been addressed.

Some management work has begun to address climate change in the park with respect to fuel management, but much more work is needed. Coordination with adjacent land use is variable. There is good coordination with the UBC Research Forest but limited consideration by other adjacent land managers of park values including visual landscape issues and access issues into the park.

Inputs: What do we need?

The evaluation noted a lack of resources. Due to high visitation, park staff note that they spend the majority of their time on enforcement and only have limited time to do basic maintenance functions leaving them unable to tackle other pressing park management issues. Two full-time ranger staff and two seasonal rangers are responsible for an area of multiple provincial parks that includes Golden Ears. Park staff indicated that they lack the time to undertake conservation training or development.

In the last few years, project resources have become more available, but visitor use has also increased. As a result, any new resources have been focussed almost exclusively on managing growing visitor pressures and their cascading ecological impacts. Park management is also limited by a lack of basic information on park values and threats.

Processes: How do we go about it?

Under the British Columbia *Park Act*, there are generally systems in place for the protection of resources; the Act is hampered mostly by lack of enforcement capabilities on the ground. However, the Act and associated legislation is considered by some to be outdated, cumbersome and at times difficult to apply. There are some boundary incursions (e.g., cedar shake harvesting, gold panning), but they appear to be isolated occurrences and not systemic problems.

Much of the park is difficult to access and is intentionally managed as wilderness. However, ecological values are concentrated in the south[e] where most visitation occurs with limited active management of ecological values. Relationships with permitted commercial operators are largely administrative in nature and there is limited staff capacity for monitoring and compliance of those currently tenured but also with unregistered/tenured groups.

Educational/interpretive material regarding conservation values was developed largely in the 1970s and is now outdated.

[e] It is possible that there are higher conservation values/sensitive areas in the more remote parts of the park that are unknown.

Outputs: What were the results?

Annual work planning, while undertaken and guided by the management plan and conservation values and risks, is subject to competing priorities, and tends to be more reactive in nature given urgent problems resulting from growing visitor use.

Golden Ears has an abundance of high recreational values and corresponding visitor use. While park facilities are an important tool for constraining visitor use, they have also been concentrated in the most ecologically rich areas and in the critical habitat of species like Red-listed Pacific Water Shrew. Public demand for increased facilities continues to be high, resulting in a pressure to further compromise ecological values. The alternative to expansion of recreational infrastructure would be the implementation of visitor management strategies. There are currently no assessments of the cumulative impact of visitor use on ecological values.

Outcomes: What did we achieve?

There is one long term ecological monitoring plot in the forest biome and one planned in the alpine biome in the summer of 2019. The remote nature of much of Golden Ears means that much of the park is likely still in a relatively intact state; however, the park is narrow and faces pressures from adjacent land uses (particularly forest harvesting and associated road use) along with remote access by aircraft that may conflict with Mountain Goats and other species. In the southern part of the park, staff have indicated that significant ecological recovery from the park's previous forest harvesting history has occurred, although this area zoned for intensive recreation also has the highest use levels.

Pinecone Burke Provincial Park

Photo Credit: Iain Reid

Pinecone Burke Park is situated northeast of Vancouver and Coquitlam, and east of Squamish, British Columbia (BC). This 38,000-hectare park extends from Burke Mountain in the south to Pinecone Lake in the north. The park's northern boundary meets the southern boundary of Garibaldi Park. Although not contiguous with Pinecone Burke, Mount Seymour and Say Nuth Khaw Yum (a.k.a. Indian Arm) Parks provide an additional 10,198 hectares of protected area nearby. The park includes western portions of the Pitt River watershed, with Pitt Lake to the east and the height of land that bounds the Coquitlam watershed to the west.

In addition to its value to First Nations and for recreational use, Pinecone Burke Park is significant in the protected areas system because it:

- Contributes significantly to the protection of the headwaters of Pitt River and other significant intact watersheds in the area. Includes significant areas of old growth forest.
- Protects habitat for a number of species at risk including rare plants, and red and blue listed insects, amphibians, mammals and fish.
- Protects habitat for Mountain Goats, populations of Roosevelt Elk, and other ungulate species.
- Provides marshes, swamps and other wetland habitats important for amphibians, waterfowl and other aquatic and riparian species.

Ecological/Natural Heritage Values

Pinecone Burke Park protects significant natural features, including portions of the western shoreline of Pitt Lake, the largest fresh water tidal lake in North America. Widgeon Slough is the largest freshwater marsh in southwestern BC, and Widgeon Lake is the largest hanging lake in the North Shore Mountains. These unique special features create spectacular habitat for numerous species.

The park contains a significant amount of provincially protected ecosystems, notably the Fraser River Lowlands and the Coastal Western Hemlock dry maritime (CWHdm) biogeoclimactic subzone variant. Although some parts of the park contain traces of recent forestry activity, other parts contain extensive old-growth forests, some of which are contained within designated Old Growth Management Areas. The northern segment of the park straddles the mountains between Pitt River and the headwaters of the Mamquam and Indian Rivers. Much of the central and northern parts of the park including rough mountain peaks capped in places by glacial ice, has relatively little human access and is intact.

The central and southern part of the park contains designated critical habitat for red-listed Marbled Murrelet and Pacific Water Shrew along with containing key areas for Mountain Goats, Spotted Owl and Grizzly Bears

among others. In total there are more than 25 species at risk listed as confirmed or potentially occurring within this park. Many of these have been sighted in the adjacent Widgeon Slough lands of Metro Vancouver Parks or the federal Widgeon Valley National Wildlife Area making it likely that they also occur within adjacent areas of Pinecone Burke.

Compared to many other BC protected areas, there is relatively good inventory data available for some areas of the park, including ecological inventories conducted in the 1990s[30,31] that were used to inform park designation. Additionally, research and inventory work conducted associated with the Metro Vancouver Widgeon Marsh Regional Park Reserve and the Widgeon Valley National Wildlife Area informs much of the understanding of the ecological values within the Widgeon Slough portion of Pinecone Burke. Within Pinecone Burke however, there is limited assessment or research available on the current ecological condition of vegetative communities and species within the park (Table 7).

Table 7. Pinecone Burke Conservation Values and Ecological Condition

	Standardized Conservation Value	Ecological Condition
Ecosystem Representation		
Rarity and Diversity of Terrestrial Ecosystems	75	Moderate
Species of Concern		
Rare/Tracked Species	100	Unknown
Degree of Endemism (Uniqueness)	25	Moderate
Range Extension Species	50	Unknown
Remnant Species or Communities	Unknown	Unknown
Species Loss	Unknown	Unknown
Keystone Species	50	Low
Apex Predators	50	Moderate/Uncertain
Special or Unique Habitats		
Rare Habitats/Ecological Communities	100	Moderate
Legally Defined Critical ('Essential') Habitat	100	Moderate/ Uncertain
Wildlife Habitat Features/Focal Habitats	100	Moderate/ Uncertain
Special Features		
Special Landforms/Features	100	Moderately high/ Uncertain
Ecological Function		
Movement Corridors	100	Unknown
Source/Sink	75	Low/ Uncertain
Hydrologic Function		
Watershed Completeness	100	Moderately high
Lotic Connectivity	100	Excellent

*Conservation values are scored in the CRA tool on different scales and are standardized here out of 100.
A high score indicates an important conservation value is contained within this protected area.

Threats Assessment

The specific threat assessment for Pinecone Burke looked at the range of currently occurring activities or issues that are perceived to be compromising conservation values within the park. Potentially occurring or anticipated future threats are not included. Pinecone Burke received an overall VERY HIGH risk assessment using the standardized Conservation Features Threat Assessment Matrix[25] (Table 8).

Table 8. Pinecone Burke Park Internal and External Threats

Threat Categories	Internal (Within park boundary)	External (Outside park boundary)
Residential & Commercial Development		
• Housing and urban areas	High**	High
• Tourism & recreation areas	Medium	Medium
Energy Production & Mining • Mining and quarrying	Nil	Low
Transportation & Service Corridors • Roads • Utility and service lines • Flight Paths	Medium	High
Biological Resource Use • Logging and wood harvesting	High***	High
Human Intrusions & Disturbance • Recreational activities: camping, foot traffic, bicycling, motorized terrestrial vehicles	High	High
Natural System Modifications • Water management/licenses/dam	Low	Nil
Invasive Species • Terrestrial invasive / non-native • Aquatic invasive/non-native	Medium	Medium
Pollution • Garbage and solid waste • Air-borne pollutants • Excess energy (lights) • Sewage, urban waste water	Medium	Medium
Geological Events • Mass wasting (human caused)	Low	Nil
Climate Change • Habitat shifting and alteration • Severe weather • Glacial melt	Very High	Very High
Calculated Overall Threat Impact	**Very High**	**Very High**

*Threat category and overall threat category scores are calculated according to IUCN standard procedures.[25]

**There are 19 park use permits for occupational use and 21 privately-owned cabins situated within the park.

***Logging activity preceded park establishment and remnant impacts are present.

Threats originating within the park include both legacy impacts prior to park establishment and current and growing pressures from park visitation. Historically, the Burke Mountain cabin community and past logging preceded park establishment, with effects that continue today. In addition, unauthorized aircraft landing and aircraft flying at low altitudes, and increased mountain biking, hiking and illegal use of motorized vehicles in the Burke Mountain Area are among the human use pressures facing the park. The areas of highest concentration of human use also coincide with high value habitat for many species.

Although joined with Garibaldi Park along its northern edge, Pinecone Burke Park is long and narrow in shape and while buffered to some extent in the east by the necessity of boat access up Pitt Lake, it faces increasing pressures externally from surrounding land uses including forested crown lands managed as part of the Chilliwack and Squamish Forest Districts, and associated road access and a growing residential community along the southern edge. In addition, parcels of private land and Crown land recreational property licenses and leases are located along the eastern boundary of the park and along the western shoreline of Pitt Lake. Threats originating from outside the park result primarily from residential growth and resource harvesting in the immediate area.

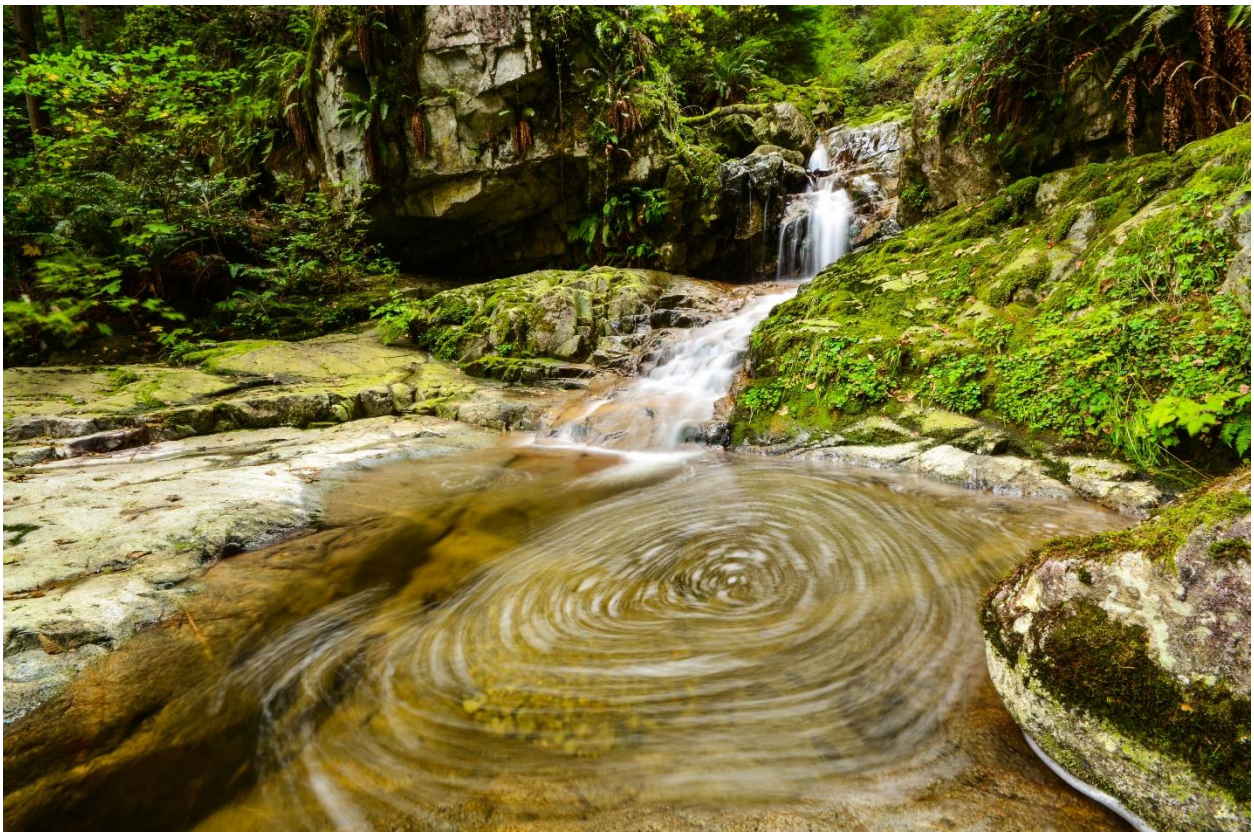


Photo Credit: Iain Reid

Management Effectiveness Evaluation of Conservation Values

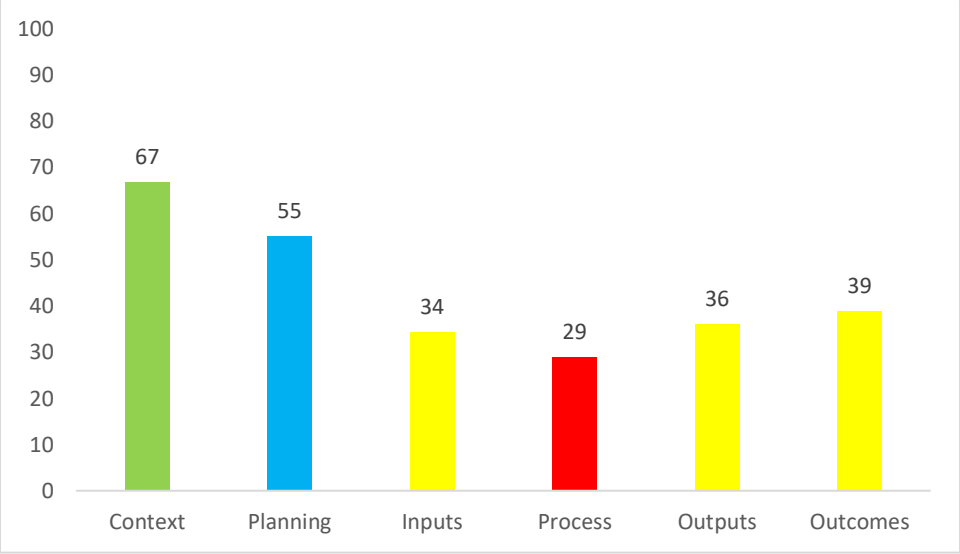
A team of BC Parks staff conducted a management evaluation using the Canadian version of the METT tool in February 2019 (Figure 9). For this application, the focus was on the conservation/ecological values within the park. Cultural and recreational values, including evaluative questions focused on consultation and shared management, were not included at this time.

Pinecone Burke Provincial Park is a relatively new protected area that is undergoing management planning and as such, many of the management elements and systems in place to guide management are just being initiated. Given this, there are limitations regarding resource allocation. Consequently, in most categories of management effectiveness, there are significant opportunities for improvement once a management plan is finalized and steps are taken to begin implementation.

There is a long history of volunteer involvement in the park area from ecological inventory work of the Burke Mountain Naturalists to trail construction by groups like the Tri-Cities Offroad Cycling Association (TORCA), and future management performance will be aided by maintaining and building strong relationships with groups like these along with adjacent land managers.

The Management Evaluation findings do not necessarily reflect past or current protected area management. Many factors that affect resource conditions are a result of both human and natural influences over long periods of time, in many cases before the Park was established. The intent of this process is to document the present status of the Park to help inform actions that can be taken to protect them into the future.

Figure 9. Pinecone Burke Management Effectiveness Evaluation of Conservation Values



Scoring Standard: Sound (67%-100%), Basic (51%-66%), Basic with Significant Deficiencies (34%-50%), Inadequate (0-33%)

Context: Where are we now?

Comprehensive conservation values and threats assessments were completed as part of the Pinecone Burke evaluation. The draft management plan currently under development identified many of these same values and threats, but their importance was prioritized through the Conservation Assessment process. In particular, the identification of the limited connectivity to adjacent protected areas and the climate risk the park is facing were key issues that have not yet been identified fully in the management plan.

Planning: Where do we want to be and how will we get there?

Pinecone Burke Park was established as a Class A park in 1995 and has been without a management plan for 24 years. The draft plan currently under development identifies a number of important steps and tools to coordinate with some of the adjacent land users. Coordination is already occurring around the Widgeon Slough area and forthcoming collaborative work concerning the Pitt River drainage with the Katzie First Nation and others will be very important.

From a design perspective, Pinecone Burke is relatively narrow, exposing much of the park to pressures from resource and community development. In addition, there are legacy resource uses in the park, including the cabin community on Burke Mountain, forest-harvesting, and an extensive trail network that have an impact on the ecological values of the park. More proactive planning, including developing a detailed trail plan, were identified as needed activities.

Inputs: What do we need?

The lack of an approved management plan, scarce resources and other higher regional priorities have meant that both the budget and staff devoted to this park are very limited. On-site staff presence is limited to part-time ranger staff with some support from a park operator agreement with the Katzie First Nation. Pinecone Burke has been a park "in waiting" because of the lack of approved management plan. Although not counted in this current assessment, volunteer time from naturalists and the outdoor recreation sector are significant contributions to the park. While there is a reasonable supply of tools and equipment for management, h much of the park is remote, and the limited staff numbers mean minimal presence in the backcountry.

The management planning process has generated the need for new information, some of which has been provided by adjacent land managers (e.g., Metro Vancouver Parks) who have conducted more detailed assessments and inventories and shared them with BC Parks.

Processes: How do we go about it?

The central and northern parts of Pinecone Burke are managed as a wilderness zone, and the limited public access to those areas currently aids in protecting the ecological values of the area. However, there is critical habitat for Red-listed (and Blue-listed) species in the southern parts of the park. In the heavier use areas, proactive planning and enforcement is limited because of financial resources and because of a lack of research and monitoring.

Cooperation with adjacent land users is strong and opportunities exist to further engage in discussions about critical connectivity issues under current and future climate scenarios.

Outputs: What were the results?

Pinecone Burke has valuable and important recreational opportunities, but due to legacy structures/trails and the lack of proactive planning and consideration of cumulative planning, visitor facilities are not always compatible with the site's ecological values. Some trails are unsanctioned and others are located in sensitive wetlands. Some facilities have been constructed without authorization and trespasses occur. Finally, the growth in recreation demand is out of step with staff presence resulting in people camping in undesignated and ecologically sensitive areas.

Outcomes: What did we achieve?

At the time of writing this report, there is little documented information regarding the overall condition of the conservation values of the park. Professional assessment suggests that while there is some ecological rebound from previous forest harvesting, there is likely degradation in the Burke Mountain area because of increased use from recreational use and surrounding residential development. The upper two thirds of the park is relatively inaccessible, suggesting biodiversity outcomes remain similar to the time of designation. The narrow design of the park and the increasing forestry and forest road pressures from outside of the park are more intense, suggesting the potential for significant edge effects in the future.

Photo Credit: Iain Reid

Recommendations

Special places with critical values

Each of the four protected areas within the Garibaldi Complex contain unique and important ecological values from special habitats, rare species, to unique geology. Individually, each protected area makes an important contribution to the conservation of biodiversity. Together, however, this complex of protected areas – and other conservation lands that are in the adjacent area – provide a place of refuge for biodiversity right on the doorstep of a growing urban landscape. Consequently, much is demanded of these protected areas to also provide a place for recreation; for escape; for solitude; for mental, physical and spiritual health; and for cultural sustenance.

Photo Credit. Iain Reid

Pressures from all sides

The Garibaldi Complex faces a number of outside pressures being situated in close proximity to urban areas and surrounded by urban expansion and industrial activity. At the same time, the Complex faces internal pressures from burgeoning recreation use. Climate change amplifies these existing threats and the impact of climate change on park values is expected to significantly worsen with time. Since much less can be done to influence the pressures from outside of the Complex, this requires some careful decisions about visitor use including when, and where, uses can happen inside the Complex while still trying to provide high quality recreation opportunities.

The need for active management

Given the pressures facing the Complex, and the design and condition of the resources there is a need for conservation-based actions. In Mkwal'ts Conservancy, road deactivation and restoration are critical activities required. Forest cutblocks should be assessed for species mix and structural diversity and active ecological restoration considered. In Garibaldi Park, managing visitor use to achieve quality visitor experiences and minimize impacts is critical. BC Parks has some experience with successful ecological restoration of alpine sites in Garibaldi and the evaluation of other opportunities for restoration should be explored. Staff presence is necessary to prevent unauthorized trail building, illegal ORV use and to support and manage appropriate backcountry recreation activities. The long, narrow design of the Pinecone-Burke and Golden Ears park boundaries makes them susceptible to impacts from external pressures along the edges. These parks serve as important corridors for north south connectivity with Garibaldi and Mkwal'ts, which will be increasingly important with climate change forcing species to move north or redistribute elsewhere. Maintaining the intact and wilderness areas of Pinecone Burke and Golden Ears by keeping them free of recreational developments, permitted activities and other pressures would help protect and maintain this connectivity for the long-term.

Filling information gaps

While we know of some of the key values within these protected areas a significant finding from this Conservation Assessment is the identification of what we don't know: about both the presence of biodiversity values and about their condition. Tables 1, 3, 5, and 7 summarize the extent of this lack of knowledge. There are limited ecological inventories for any of these protected areas and most critical species or habitat mapping that has been done on the larger crown land base does not extend into the protected areas. Even basic habitat mapping, such as vegetation resource inventories (VRI) has significant gaps of coverage within the Complex. This is perhaps in part due to a presumption that inventories are not needed within protected areas because they are, theoretically, already protected. However, the recreation pressures that these protected areas are under means that for planning alone there is a need to understand what and where key habitats and species are located. In addition, associated with a general lack of information about these protected areas there are also problems with sharing data: data collected by or for other agencies or organizations infrequently makes it way into park managers' hands. Additionally, park staff don't always have the capacity, training or data management infrastructure to search out, organize and access this information. There is a concerted need to fill information gaps for the Garibaldi complex both by addressing data gaps and the resources with which to manage and use this information. Specific recommendations include:

- Work with other government agencies and partners to extend basic inventories across protected areas;
- Develop a system to store and manage research results that is spatially explicit, and searchable;
- Ensure BC Parks research permittees are in compliance with reporting their findings with BC Parks and the public;
- Develop park/Complex specific inventory and monitoring priorities to address information gaps;
- Ensure that staff have some time for inventory, monitoring and other conservation work, including time to implement recommendations listed in this report; and
- Encourage citizen science programs to help survey natural values in the Complex.

A move towards outcomes monitoring

The Conservation Assessment tools we used in this PAME process are based on the premise that focusing on the key management functions that are determinants of positive biodiversity outcomes will lead to improved outcomes. This Conservation Assessment was evaluated using a mix of empirical data and professional assessments. As noted previously, BC Parks lacks basic inventory information for protected area values as well as status assessments of the conservation condition of those values. Rarely were studies of the condition of a value (e.g., Mountain Goat population monitoring) available and when they were the data was typically limited in time and space. Expecting protected areas to help safeguard biodiversity requires us to measure and monitor the condition of biodiversity values. This means there is an expressed need to develop protected area-based biodiversity outcomes monitoring or to extend outcomes monitoring initiatives occurring outside of protected areas to include protected areas.[f]

[f] Note: There is an important distinction to be made here between biodiversity outcomes monitoring at the scale of a protected area/complex from BC Parks province-wide Long Term Ecological Monitoring (LTEM) program. Both are critical but they fulfill very different needs with the latter providing understanding of long-term, large scale ecological change.

Bringing resources in step with visitor demand

All four protected areas in the Garibaldi Complex are rated *Very High* on the threat assessment tool. These threats come from both internal and external stressors and from things that are within the scope of potential management actions (e.g., internal threats from recreation use) to the significant impacts resulting from warming climates and the surrounding (and increasing) urbanization and resource development further islanding these protected areas. Looking at the pattern of management effectiveness ratings (Table 9) across the four protected areas identifies some patterns worth noting.

At the time of writing this report, approximately 30% of one planner's time was spread across all four protected areas (Table 10). Inputs, as discussed below, of staff time and resources are consistently inadequate which contributes in part to poorer results for outputs and outcomes.

Table 9. Summarized Rankings from Management Effectiveness Evaluations

	Context	Planning	Inputs	Process	Outputs	Outcomes
Garibaldi Park	Basic	Basic	Inadequate	Basic	Sound	Basic
Golden Ears Park	Sound	Basic	Basic with Deficiencies	Inadequate	Basic	Basic
Mkwal'ts Conservancy	Inadequate	Basic	Inadequate	Inadequate	Inadequate	Inadequate
Pinecone Burke Park	Sound	Basic	Basic with Deficiencies	Inadequate	Basic with Deficiencies	Basic with Deficiencies

Scoring Standard: Sound (67%-100%), Basic (51%-66%), Basic with Significant Deficiencies (34%-50%), Inadequate (0-33%)

Examining staff and budget numbers for the Garibaldi Complex illustrates the extent of the challenges that BC Parks staff face.[g] Twenty years ago the IUCN World Conservation Monitoring Centre conducted a global review of protected areas budgets and staffing. [32]At that time, the average number of staff per 1000 km^2 for developing countries was 27 and just slightly below that (26.9) for developed countries. Comparing 2019 staff numbers for the Garibaldi Complex the ratio of staff is 2.8/1000 km^2 (or 9.18/1000km^2 when Park Operator staff are included) – these staff ratios are below IUCN averages from twenty years ago. Protected-Area-system-wide, Canada, has under-resourced staffing for protected areas. The 1991 figures reported nation-wide showed Canadian protected areas had on average 13 staff/1000km^2. These numbers, while half of the international ratios are still significantly higher than the staff ratios for Garibaldi.

A critical component of the capacity story is the fact that the Garibaldi Complex has undergone steady and significant increases in visitation and other recreational pressures in recent years. From 2017 to 2018, day use attendance in all South Coast parks climbed 9%, and from 2012 to 2018, a staggering

[g] Full-time equivalent (FTE) staff range from 0.015 staff for Mkwal'ts Conservancy to a maximum of 4.4 staff at Garibaldi. Park Operators, contractors who provide some services such as campground operations and maintenance in front country environments have limited roles in the protected area complex with the exception of Golden Ears. However, due to human use pressures, conservation needs are not adequately being met in Golden Ears Provincial Park, despite Park Operator staff to assist with front country management of popular camping and day use areas.

38%.[h] Golden Ears alone had a camping increase of 10% and a day user increase of 15% from 2017 to 2018. It is not surprising that scoring for inputs and outcomes is low. Visitors from the heavily populated South Coast are showing increased interest in outdoor recreation. This interest has outstripped BC Parks' resources to ensure conservation, cultural and recreational values are protected. The effects of social media are likely to be a major factor expanding the user base to include those seeking an iconic photo versus the traditional experience of solitude in nature. Increased visitation further impacts sensitive wildlife species, and creates challenges with road safety, parking, access to trails/sites, human waste management and garbage in what were once pristine wilderness areas. Each of these impacts to operations, also has impacts to staff capacity and budget. Given the importance of the protected areas within the Garibaldi Complex to meeting ecological, cultural and recreational needs there is a need to find new resources to support the management of these critical issues. This will require:

- Providing a staffing contingent that is more aligned with the size and complexity of the area;
- A clear understanding of the cumulative impact of current visitation and permitted activities in the Complex;
- Reconciling visitor use and permitted activities with staffing capacity so that conservation goals can be realized;
- Providing for both staff and conservation project resources;
- Increasing access to training as well as tools (e.g., guidelines, best management practices); and
- Deepening the culture of conservation within all staff at BC Parks.

Table 10. Staffing Estimates for Garibaldi Complex

	BC Parks FTE	Planner	Conservation Specialist	Area Supervisor /RSO	Senior Ranger (Full Time)	Park Ranger (Seasonal)	Section Head	TOTAL
Garibaldi	FTE	1	1	1	2	2.26	1	
	%	10	10	70	60	100	5	
	Actual FTE	0.1	0.1	0.7	1.2	2.26	0.05	**4.4**
Pinecone Burke	FTE	1	1	1	2	0.74	2	
	%	15	5	20	40	30	2	
	Actual FTE	0.15	0.05	0.2	0.8	0.222	0.04	**1.5**
Golden Ears	FTE	1	1	2	1	0.79	1	
	%	5	5	60	60	60	15	
	Actual FTE	0.05	0.05	1.2	0.6	0.474	0.15	**2.5**
M'kwalts	FTE	1	1	1	1	1	1	
	%	0.5	0	0.5	0.5	0	0	
	Actual FTE	0.005	0	0.005	0.005	0	0	**0.015**

Note: FTE= Full-time equivalent. In addition, Park Operator staff provided some limited coverage for maintenance of frontcountry environments including: Garibaldi 1.5 FTE, Pinecone Burke .4 FTE, Mkwal'ts 0 FTE, and Golden Ears 17 FTE

[h] BC Parks 2017/18 Statistics Report. Available at: http://www.env.gov.bc.ca/bcparks/research/.

The need for repeat assessments

Protected Areas Management Effectiveness evaluations, such as this Conservation Assessment, are intended to serve as evaluative tools to help summarize the state of a protected areas values, to identify strengths and to highlight areas for improvement. They serve as one tool in an adaptive management process and, as such, are intended to be both living documents that inform daily management activities but are also intended to be repeated periodically. Repeat assessment can be triggered by a simple schedule (e.g., every 5 years) or by significant changes in the state of the protected area: the need for a new management plan for example.

Conclusions

The Garibaldi Complex protects important natural features along with outstanding cultural and recreational values; however, its landscape context means that the species and ecosystems within these protected areas are vulnerable to threats, including resource development outside the park and heavy use by visitors inside the park. Increased visitation over the years has outpaced BC Parks' current staff capacities to manage for the associated ecological impacts. For some species with small habitat ranges, the protected areas may provide safe and effective long-term protection. For others, the Garibaldi Complex and adjacent protected areas will struggle to provide refuge for species and ecosystems now, and even more so as climate change stresses compound.

Managing the Garibaldi Complex to protect conservation values will require research and monitoring of ecological conditions and change; even more careful choices about where, when and how humans can continue to enjoy these incredible areas; a culture of conservation amongst protected areas users; cooperation of adjacent land owners and managers to sensitively manage border lands to protect protected areas values; restoration and active management of the protected areas themselves; and additional resources in terms of investment in staff, equipment, money and training to carry out these changes.

Photo Credit. Iain Reid

Appendix A

Definition of Management Effectiveness Evaluation Components

Context: Where are we now?

Context evaluates the importance of protected areas according to its values and the threats to those values, as well as the governance environment. Context includes an evaluation of design risks, policy and legislative contexts.

Planning: Where do we want to be and how will we get there?

The planning component evaluates the design features of a protected area or system including the physical, legal and institutional factors which determine whether its management will be relatively straightforward or complicated. Assesses regulations, policies, objectives, design, management plan and broader land and water planning objectives.

Inputs: What do we need?

Assessments of protected area effectiveness repeatedly suggest that the level of resources available for management often has a major impact on effectiveness. This component attempts to evaluate inputs by developing a clear and unbiased picture of the inputs available and to identify gaps and shortfalls. Assesses law enforcement, resources, staff numbers and training, budget, management equipment and facilities and fees.

Processes: How do we go about it?

This component evaluates the processes that are in place to guide management. Assess the protection system, research and monitoring, resource management and education associated with conservation.

Outputs: What were the results?

This component evaluates whether protected area managers achieved what they set out to do. Assesses whether work planning has been completed, on-the ground conservation management actions (e.g., invasive species removal) has been conducted, and the nature/condition of visitor facilities.

Outcomes: What did we achieve?

This component evaluates whether management is maintaining the core values for which the protected area was established. Assesses the condition of identified conservation values and management actions to achieve identified values and mitigate threats. Has there been an evaluation of e.g., species at risk and are conditions improving?

Table 11. Summary of Management Effectiveness Evaluation Components

Elements of evaluation	Explanation	Criteria that are assessed	Focus of evaluation
Context	***Where are we now?*** Assessment of importance, threats and policy environment	- Significance - Threats - Vulnerability - Provincial context - Partners	Status
Planning	***Where do we want to be?*** Assessment of protected area design and planning	- Protected area legislation and policy - Protected area system design - Reserve design - Management planning	Appropriateness
Inputs	***What do we need?*** Assessment of resources needed to carry out management	- Resourcing of agency - Resourcing of site	Resources
Processes	***How do we go about it?*** Assessment of the way in which management is conducted	- Suitability of management processes	Efficiency and appropriateness
Outputs	***What were the results?*** Assessment of the implementation of management programs and actions; delivery of products and services	- Results of management actions - Services and products	Effectiveness
Outcomes	***What did we achieve?*** Assessment of the outcomes and the extent to which they achieved objectives	- Impacts: effects of management in relation to objectives	Effectiveness and appropriateness

Appendix B - Conservation Threat Assessments Calculator

BC Parks/Conservation Assessments

Based on the NatureServe Conservation Status Assessments

Rank Calculator Version 3.16 Revised Edition (Sept. 2014)

OVERVIEW

The Conservation Features Threat Assessment Matrix is used to conduct an examination of threats that protected areas/complexes face to help assess the conservation status of the protected areas.

The tool is derived from the NatureServe Conservation Status Assessment and based on ranking and assessment approaches proposed by Master et al. 2012. The threats categories and definitions were developed by Salafsky et al (2008).

The worksheet was modified by P. Wright for application in Canadian Conservation Risk Assessment/Protected Areas Management Effectiveness Projects.

THREAT CALCULATOR

Threats to conservation values are assessed using the standardized and defined list of threats from NatureServe. Each threat is assessed as to whether it originates INSIDE the protected area or OUTSIDE the protected area. For example, a threat from a park road would be an INSIDE threat. A threat from roads surrounding the park would be an *outside* threat. Threats can be pre-existing (e.g., prior to protected area designation) such as some past forestry or mining activity that may have existed in the protected area before it was designated.

The Threat Impact is automatically calculated and is a result of three variables:

- Scope/spatial extent (scored from pervasive to negligible)
- Severity/Significance (scored from Extreme to Neutral/Potential Benefit)
- Permanence (scored from Permanent/Unrestorable to Easiest to Restore)

The Overall Threat Impact that results from the combination of these ranges from A (Very High) to D (Very Low). There is an Unknown option for each individual variable and overall.

Threat Scope/Spatial Scale *- spatial scale of threat e.g., how pervasive is it?*
Pervasive = Affects all or most (71-100%) of the PA
Large = Affects much (31-70%) of the PA
Restricted = Affects some (11-30%) of the PA
Small = Affects a small proportion (1-10%) of the PA
Negligible = Affects a negligible proportion (<1%) of the PA
Unknown

Threat Severity/Significance – *the degree of impact on values*
Within the scope, the threat is:
Extreme = Likely to destroy effected conservation values
Serious = Likely to seriously degrade/reduce effect on one or more conservation values

Moderate = Likely to moderately degrade/reduce effect on one or more conservation values
Slight = Likely to only slightly degrade/reduce effect on one or more conservation values
Negligible = Likely to have only negligible negative effect on one or more conservation values
Neutral or Benefit Potential = Not a threat
Unknown

Permanence – *Recovery or restoration potential*

Unrestorable= Permanent or hard impact exceptionally difficult/impossible to restore
Difficult to restore = Permanent or hard impact difficult/costly to restore
Moderately difficult to restore = Semi-permanent/soft impact can be restored
Relatively easy to restore = Relatively easy/inexpensive to restore
Negligible = Removal of threat should be sufficient to restore system
Unknown

Overall Threat Impact
A = Very High
B = High
C = Medium
D = Low
U = Unknown

Rolling up from Level 2 threats to Level 1 threat:

Impact Values of Level 1 Threat Categories	Overall Threat Impact
≥1 Very High, *OR* ≥2 High, *OR* 1 High + ≥2 Medium	**Very High**
1 High, *OR* ≥3 Medium, *OR* 2 Medium + 2 Low, *OR* 1 Medium + ≥3 Low	**High**
1 Medium, *OR* ≥4 Low	**Medium**
1-3 Low	**Low**

a) If there is only one level-2 threat recorded within the level-1 threat, assign the level-2 scope, severity, and timing values to the level-1 threat.

b) If there are multiple level 2-threats recorded within the level-1 threat, evaluate their degree of overlap:

- if the level-2 threats overlap, assign the scope and severity values of the highest impact level-2 threat;
- if the level-2 threats are substantially non-overlapping, then best professional judgment should be used to assign scope, severity, and timing values; higher scope and severity values may be justified.

Appendix A References:

Faber-Langendoen, D., J. Nichols, L. Master, K. Snow, A. Tomaino, R. Bittman, G. Hammerson, B. Heidel, L. Ramsay, A. Teucher, and B. Young. 2012. NatureServe Conservation Status Assessments: Methodology for Assigning Ranks. NatureServe, Arlington, VA. Online at: http://www.natureserve.org/publications/ConsStatusAssess_StatusFactors.jsp

Salafsky, N., D. Salzer, A.J. Stattersfield, C. Hilton-Taylor, R. Neugarten, S.H.M. Butchart, B. Collen, N. Cox, L.L. Master, S. O'Connor, and D. Wilkie. 2008. A standard lexicon for biodiversity conservation: unified classifications of threats and actions. Conservation Biology 22:897– 911. Classification online at: http://conservationmeasures.org/CMP/IUCN/browse.cfm?TaxID=DirectThreats

Sources

1. Steiner, A. Are protected areas failing us? *New Scientist* (2003).
2. Hayes, T. M. Parks, people, and forest protection: an institutional assessment of the effectiveness of protected areas. *World Development* **34**, 2064–2075 (2006).
3. Leverington, F. *et al. Management effectiveness evaluation in protected areas - a global study*. (2010).
4. Rodrigues, A. S. *et al.* Effectiveness of the global protected area network in representing species diversity. *Nature* **428**, 640–643 (2004).
5. Watson, J. E., Dudley, N., Segan, D. B. & Hockings, M. The performance and potential of protected areas. *Nature* **515**, 67–73 (2014).
6. Hockings, M. *Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas*. (IUCN, 2006).
7. Woodley, S. Assessing Effective Biodiversity Conservation in Protected Areas - what do we really know? (2017).
8. Secretariat of the Convention on Biological Diversity. *Convention on Biological Diversity*. (2004).
9. Gurd, D. B., Nudds, T. D. & Rivard, D. H. Conservation of mammals in eastern North American wildlife reserves: how small is too small? *Conservation Biology* **15**, 1355–1363 (2001).
10. Faber-Langendoen, D. *et al. NatureServe Conservation Status Assessment: Methodology for Assessing Ranks.* (NatureServe, 2009).
11. Stolton, S. & Dudley, N. METT Handbook: A guide to using the Management Effectiveness Tracking Tool (METT). *Woking: WWF-UK* (2016).
12. Stolton, S. *et al.* Management effectiveness tracking tool: reporting progress at protected area sites. *World Wide Fund for Nature (WWF), Gland* (2007).
13. Hockings, M., Cook, C. N., Carter, R. W. & James, R. Accountability, reporting, or management improvement? Development of a State of the Parks assessment system in New South Wales, Australia. *Environmental Management* **43**, 1013–1025 (2009).
14. Hockings, M. *et al.* Enhancing our Heritage Toolkit: Assessing management effectiveness of natural World Heritage sites. (2008).
15. Wright, P. A. *Protection and Persistence in the Canadian Protected Areas System: A Review of Conservation Science Research and Approaches*. (Canadian Parks Summit, 2016).
16. Gurd, D. B. & Nudds, T. D. Insular biogeography of mammals in Canadian parks: a re-analysis. *Journal of Biogeography* **26**, 973–982 (1999).
17. Landry, M., Thomas, V. G. & Nudds, T. D. Sizes of Canadian national parks and the viability of large mammal populations: Policy implications. in *The George Wright Forum* **18**, 13–23 (2001).
18. Wiersma, Y. F., Nudds, T. D. & Rivard, D. H. Models to distinguish effects of landscape patterns and human population pressures associated with species loss in Canadian national parks. *Landscape Ecology* **19**, 773–786 (2004).
19. AdaptWest. AdaptWest Climate Adaptation Data Portal. *AdaptWest- A CLimate Adaptation Conservation Planning Database for North America* Available at: adaptwest.databasin.org. (Accessed: 19th October 2018)
20. Mahoney, C. Climate Maps for Garibaldi Complex. (2018).
21. Mahoney, C. *Shifting, Novel and Disappearing Climates: The BC Parks system and the projected climates of the 21st Century*. (UBC Dept. of Forest and Conservation Sciences, 2018).
22. Koch, J., Menounos, B. & Clague, J. J. Glacier change in Garibaldi Provincial Park, southern Coast Mountains, British Columbia, since the Little Ice Age. *Global and Planetary Change* **66**, 161–178 (2009).

23. Kulla, B. & Wheate, R. *Glacial Retreat in Garibaldi Provincial Park*. (University of Northern British Columbia, 2019).
24. South Coast Region. *Garibaldi Provincial Park Master Plan*. (BC Parks, 1990).
25. Salafsky, N. *et al.* A standard lexicon for biodiversity conservation: unified classifications of threats and actions. *Conservation Biology* **22**, 897–911 (2008).
26. BC Parks. *Mkwalt's Conservancy Management Plan*. (2012).
27. Lil'wat Nation. *Lil'wat Land Use Plan Phase 1: The Vision and Plan for the Land and Resources of Lil'wat Nation Traditional Territory*. (2006).
28. Province of British Columbia & Lil'wat Nation. Agreement Regarding the Mkwal'ts Nt'Akmen (Ure Creek Area). (2008).
29. BC Forest, Lands and Natural Resource Operations. *Invasive Alien Plant Program (IAPP) Application*. (2019).
30. Burke Mountain Naturalists. *Our Backyard Wilderness*.
31. Plath, T. *Ecological Inventory of the Pinecone/Burke Protected Area Strategy Study Area*. (BC Environment, 1993).
32. James, A., Green, M. & Paine, J. *A global review of protected area budgets and staff*. (World conservation Monitoring Centre, 1999).