Mount Artaban Nature Reserve Management Plan
Gambier Island, BC

PREPARED FOR

ISLANDS TRUST CONSERVANCY
Protecting Canada's Islands in the Salish Sea

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APPROVED BY

Islands Trust Conservancy, November 26, 2019, Resolution # ITC-2019-046
Sunshine Coast Conservation Association, January 9, 2020
Gambier Island Conservancy, March 11, 2020

i. Executive Summary [1]

Islands Trust Conservancy acknowledges and respects that Gambier Island is within the traditional territory of multiple Coast Salish peoples, whose historical relationship to the land, culture, and spirit of this place continues to this day. Islands Trust Conservancy is committed to honoring the rich history of Indigenous stewardship in the lands and waters of the Islands Trust Area and to building mutually respectful relationships between Indigenous and non-Indigenous partners in conservation. Therefore, this Management Plan for Brigade Bay Bluffs Nature Reserve is a living document that will evolve as opportunities for knowledge sharing arise and understanding grows.

The Islands Trust Conservancy's Mount Artaban Nature Reserve (MANR) was established in June 2008. The property is 107 hectares (264 acres) in area. Mount Artaban Nature Reserve is located inland on the southeastern arm of Gambier Island, south of Brigade Bay and north of Halkett Bay. It includes the summit of Mount Artaban, which is a significant landmark of Gambier Island and the adjacent area. The property is rugged and steep, spanning an elevation range of approximately 531 metres (1742 feet) from its lowest point at the Northeast corner to the summit of Mount Artaban at 614 metres (2015 feet) elevation.

The reserve is mostly covered in second-growth forest of Douglas-fir, western hemlock, western redcedar, red alder and bigleaf maple, that originated by natural regeneration after logging and/or wildfires approximately 80 years ago, and a smaller area regenerated after logging about 65 years ago. The higher elevation areas are occupied by an un-logged forest, primarily of smaller-diameter shore pine and Douglas-fir trees, ranging in ages up to about 100 years old. There are older veteran trees throughout the reserve. The reserve is part of a large, contiguous natural area within the Coastal Western Hemlock Very Dry Maritime (CWHxm) and Coastal Western Hemlock Dry Maritime (CWHdm) subzones on Gambier Island. There are two ephemeral wetlands near the summit and two seasonal streams that flow in the southern part of the reserve.

The Mount Artaban property was held as Provincial Crown Land for many years, and was transferred in June 2008 through the provincial Free Crown Grant program to the Islands Trust Fund (now the Islands Trust Conservancy) to be managed as a nature reserve. The Gambier Island Conservancy partnered with the Islands Trust Fund to fundraise over $40,000 to cover the costs of the land survey and a management plan.

In 2009, a community consultation process was undertaken for Gambier Island residents and property owners, as well as other interested parties, to participate in setting objectives, identifying issues, and proposing strategies for inclusion in the original Management Plan (Hopwood 2009). The objectives for management of the Mount Artaban Nature Reserve are to:

- conserve the ecosystem values and biodiversity of the reserve;

[1] Updated from Hopwood 2009

- protect the water quality and flow regimes of all streams and wetlands within the reserve;
- support the ongoing inventory, mapping and monitoring that inform management;
- remove invasive plant species throughout the reserve and hazard trees around the trail system;
- allow for low-impact use of the reserve for hiking, nature appreciation and similar activities, provided it does not significantly impair the natural condition of the reserve or its special features; and
- allow natural ecological processes to function without human interference, except in the case of wildfire.

Key management recommendations are to maintain existing trails and signage (including updating wayfinders), remove invasive species as required, develop a wildfire management plan, continue monitoring annually, and investigate partnerships with local organizations to collaboratively manage lands. Additionally, inventories for species at risk would provide a clearer picture of the ecology of the reserve and guide future management.

ii. Tables and Lists

Table of Contents

List of Figures

List of Tables

List of Photos

All photos: L. Matthias

List of Appendixes

iii. Acknowledgements

Table 1. Acknowledgement of thanks

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1.0 Introduction

Gambier Island is situated within the traditional territory of the Coast Salish peoples, who share a rich history of stewardship in the lands and waters of the Islands Trust Area that inspires the work of Islands Trust Conservancy and its partners. Mount Artaban Nature Reserve (MANR) was protected by the Islands Trust Conservancy (ITC) in 2008 after a transfer through the provincial Free Crown Grant program. The reserve is characterized by steep and rugged terrain that covers an elevation range of 531 metres (1742 feet) and includes Gambier Island's landmark summit of Mount Artaban (614 metres/2015 feet). As a result of previous logging and wildfires, the reserve is primarily composed of second growth forests with some interspersed veteran trees, including Douglas-fir, western hemlock, western redcedar, red alder, and bigleaf maple. Small-diameter shore pine and Douglas-fir can be found in the unlogged, higher elevations of the reserve.

The Gambier Island Conservancy and the Sunshine Coast Conservation Association are registered as joint holders of a conservation covenant on MANR (New Westminster Land Title Office 2013). These organizations co-manage the reserve with ITC.

The initial Management Plan for Mount Artaban Nature Reserve was developed by Doug Hopwood in 2009 (Hopwood 2009). This document is an update of that plan.

1.1 Islands Trust Conservancy

Since time immemorial, the lands and waters between Vancouver Island and mainland British Columbia have been home to the Coast Salish people, whose ecological, cultural, and spiritual connections to this place continue to this day. In 1974, the Province of British Columbia recognized this region as a special place within the province where the unique beauty, rural character and diverse ecosystems should be protected for future generations. Through the Islands Trust Act, the province established the Islands Trust, a local government, with the following mandate (known as the Object of the Islands Trust):

> *To preserve and protect the trust area and its unique amenities and environment for the benefit of the residents of the trust area and of British Columbia generally, in cooperation with municipalities, regional districts, improvement districts, other persons and organizations and the government of British Columbia.* (Islands Trust 2018)

In 1990, through the enactment of a section of *Islands Trust Act*, the Islands Trust Conservancy (originally called the Islands Trust Fund) was established as a conservation land trust to assist in carrying out the "preserve and protect" mandate. Part 6 of the *Islands Trust Act* establishes the corporate status, responsibilities, and governance structure of the Islands Trust Conservancy. The Islands Trust Conservancy is one of fifteen corporate entities charged to uphold the Object of the Islands Trust. Since 1990, ITC has protected over 1,267 hectares (3,130 acres) of land as nature reserves, nature sanctuaries and conservation covenants.

The vision of the Islands Trust Conservancy is that the islands and waters of the Strait of Georgia and Howe Sound will be a vibrant tapestry of culture and ecology where humans live and work in harmony with the natural world. This special place will have a network of protected

areas that preserve in perpetuity the native species and natural systems of the islands. Engaged residents and conservation partners will work together to protect large natural areas and key wildlife habitat. Viable ecosystems will flourish alongside healthy island communities.

The mission of the Islands Trust Conservancy is to protect special places by encouraging, undertaking and assisting in voluntary conservation initiatives within the Islands Trust Area. Islands Trust Conservancy nature reserves are managed to maintain, preserve and protect the natural features and values of ecosystems. This level of protection is similar to the International Union for Conservation of Nature (IUCN) protected area Category 1B: Wilderness area:

> *Large area of unmodified or slightly modified land and/or sea; retaining its natural character and influence, without permanent or significant habitation, which is protected and managed in order to preserve its natural condition*. (Lockwood 2006)

1.2 Purpose of Islands Trust Conservancy Management Plans

ITC management plans provide background information and set out the direction of property management as follows:

- Provide general and descriptive information on the property, including location, history, and land use.
- Set out the conservation goals and objectives for the property.
- Identify the property's ecological and/or cultural values and features.
- Describe the management issues associated with the property.
- Provide short, medium and long-term management recommendations (action items or tasks) on issues such as: species at risk protection; ecological restoration; public access; educational and research opportunities; invasive species management; and signage needs.
- Preserve and protect cultural, spiritual, and sacred locations.

Once the management plan process is complete, the ITC will work to carry out the management actions or strategies identified in the plan, as resources allow. Following general practice and as outlined in the conservation covenant and statutory right of way, the ITC will revise the Management Plan every ten years.

1.3 Scope of Islands Trust Conservancy Management Plans

Consistent with the Islands Trust Reconciliation Declaration (Islands Trust 2019), ITC recognizes that its nature reserves may be places of great cultural and spiritual significance to First Nations. Cooperative management of these protected places will provide opportunities to establish and maintain mutually respectful relationships between the Islands Trust Conservancy and First Nations. Relationship-building, knowledge-sharing, healing, and establishment of trust are long-term processes that do not necessarily conform to the timeline required for many management activities (e.g. protecting species at risk, maintaining trails and signage, controlling invasive species, etc.); therefore, Islands Trust Conservancy is committed to developing a

parallel *Management Plan for Areas of Cultural Heritage and Sacred Significance* with a flexible timeline. This parallel Management Plan sets out guiding principles for cooperative collaboration between ITC and those First Nations with historical and cultural interests in the area defined by one or more nature reserves. Moreover, the Management Plan defines the common vision, objectives, policies, and best management practices for the nature reserve(s) to ensure that its natural values and cultural and sacred heritage are maintained for future generations.

1.4 Protected Area Purpose

The purpose of the MANR is to preserve and protect the natural ecosystems and natural values of the site and to maintain the biodiversity of the site for the benefit of the flora and fauna of the reserve, the residents of the island and the province generally. The site is to be protected in accordance with the conservation covenant, the objectives of the Islands Trust Conservancy, and the mandate of the Islands Trust.

1.5 Protected Area Objectives

The objectives of the Mount Artaban Nature Reserve are to:

- conserve the ecosystem values and biodiversity of the reserve;
- protect the water quality and flow regimes of all streams and wetlands within the reserve;
- support ongoing inventory, mapping and monitoring to guide management;
- remove invasive plant species throughout the reserve and hazard trees around the trail system;
- allow for low-impact use of the reserve for hiking, nature appreciation and similar activities, provided it does not significantly impair the natural condition of the reserve or its special features;
- support and enhance continued use of areas of sacred and cultural significance by First Nations where such uses are compatible with protection of ecological values and in compliance with the conservation covenant held by Gambier Island Conservancy and the Sunshine Coast Conservation Association; and
- allow natural ecological processes to function without human interference, except in the case of wildfire.

2.0 Property Information

Mount Artaban Nature Reserve is 107 hectares (264 acres), spanning 531 metres (1742 feet) in elevation to reach the Mount Artaban summit, at an elevation of 614 metres (2015 feet) (survey in Appendix A).

2.1 Location

Gambier Island can be accessed by a passenger ferry that sails between the BC Ferries Langdale Terminal in Gibsons and the New Brighton Dock, located on the west side of Gambier Island. There is no road access to MANR from the dock at New Brighton. There is a Gambier Island trail network but the route to MANR from New Brighton is lengthy, not direct, and the trail is not well marked or signed in places.

MANR is best accessed from three public dock locations on Gambier Island. From the public dock at Camp Artaban, at the head of Long Bay, there is a short public trail that leads through the camp property and then along the Brigade Bay Road easement through the Gambier Island Sea Ranch property to Mount Artaban Road in the Brigade Bay subdivision. This is about a 30 minute hike. It takes another 30 minutes to walk south on the Mount Artaban Road to the trailhead that connects into MANR through Long Bay Wetland Nature Reserve. Alternatively, the MANR trailhead can be reached from the public dock in the Halkett Bay Provincial Marine Park by hiking south on a trail through the park, then walking north along Mount Artaban Road. This route also takes about one hour. The hike from the trailhead south to the peak of Mount Artaban takes just less than two hours.

The south end of MANR, just south of the peak of Mount Artaban, can also be reached in about two hours by hiking from either the public dock in the Halkett Bay Provincial Marine Park or the public dock at Camp Fircom. Part of the route from both docks to the peak of Mount Artaban requires walking on roads in the Fircom Plateau subdivision, which is well signed.

The docks at Camp Artaban, Halkett Bay Provincial Marine Park, and Camp Fircom can be reached by regularly scheduled water taxi runs from Horseshoe Bay on weekends and on Wednesday evenings in the summer.

2.2 Legal description

The legal description of the property is District Lot 8095, Group 1, New Westminster Land District, Gambier Island. The PID number is 027-522-539. A covenant covers the entire property.

The property was surveyed in 2007 by Penonzek Land Surveying Ltd. The Association of British Columbia Land Surveyors exempted the survey from several customary requirements of legal land survey, specifically:

- cutting and blazing of boundary lines,
- marking new bearing trees,
- posting east-west boundaries adjacent to Halkett Bay Provincial Marine Park and unsurveyed provincially-managed land.

In 2009, during field surveys for the initial management plan, Doug Hopwood noted five survey markers (3 capped posts and 2 bronze disks set in the rock). Each marker was marked with flagging tape and the location was recorded using a hand-held GPS (Hopwood 2009).

2.3 Legal Access

Legal road access to MANR is through the northeast corner of the reserve via Mount Artaban Road, which runs north and south of MANR through the Brigade Bay subdivision. A re-routed access trail from the Brigade Bay subdivision road was built through the Long Bay Wetland Nature Reserve in the winter of 2009 to avoid crossing privately-managed land; a new sign was placed at the trailhead. Figure 1 shows the road access to the Nature Reserve and the hiking trail within the Nature Reserve.

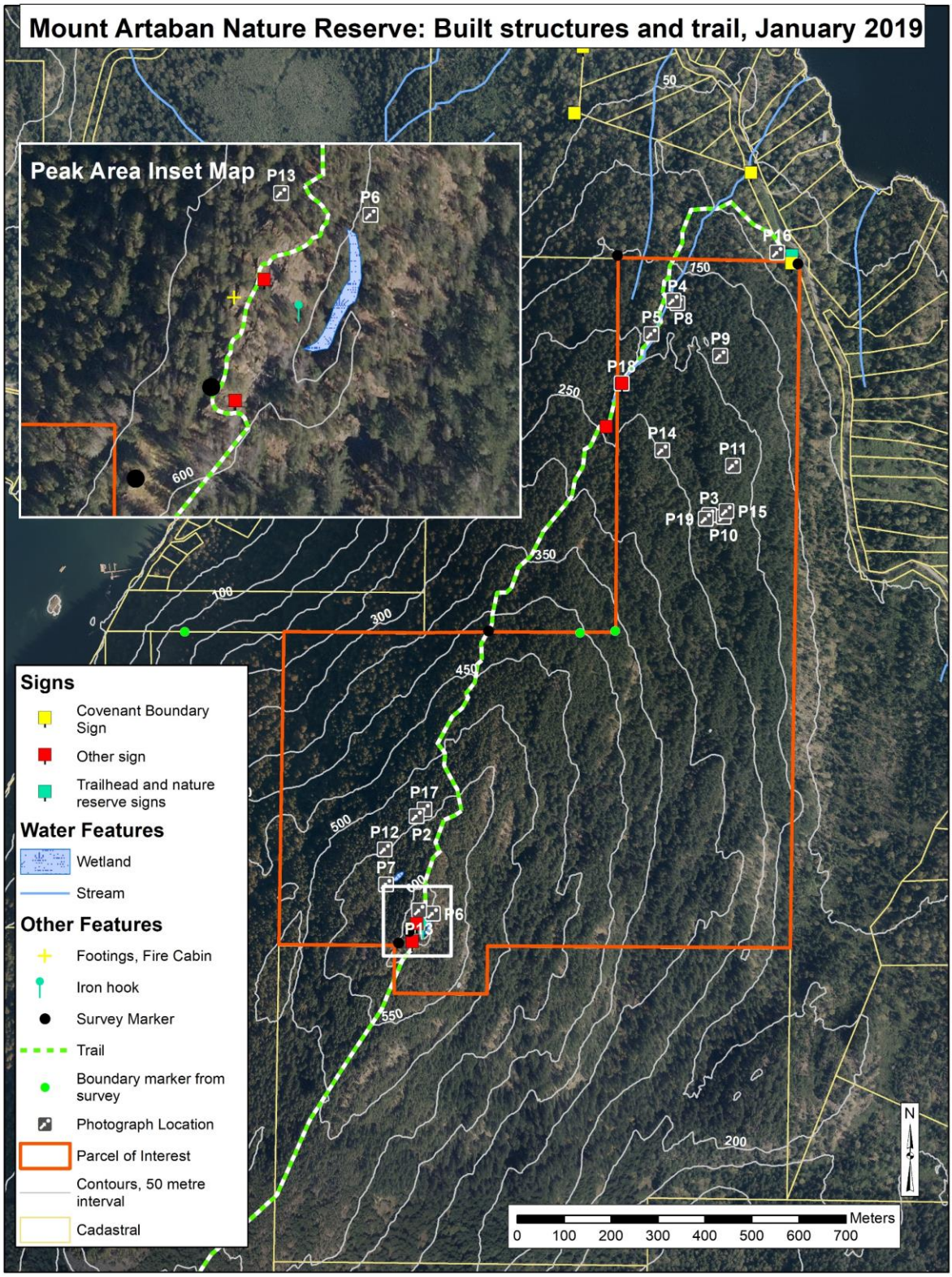

Figure 1. Trail access to MANR off Mount Artaban Road, south of Brigade Bay.

2.4 Landscape Context

Gambier Island is located in Howe Sound. MANR is on the east side of Gambier Island, south of Brigade Bay (see Figure 2 for location and protected area context). To the north of MANR is Long Bay Wetland Nature Reserve (38 ha) and provincially-managed land. To the east is Pete Shields Regional Park (Sunshine Coast Regional District). To the west is a provincially-managed lot. MANR is part of a contiguous protected area of parks and nature reserves (469.12 ha), including Long Bay Wetland Nature Reserve (ITC), Halkett Bay Provincial Marine Park (BC Parks), and Pete Shields Regional Park (Sunshine Coast Regional District), and connects further with provincially-managed lands (171.35 ha) to total 640.47 ha of contiguous natural area. There is a marine portion (149.99 ha) of the Halkett Bay Provincial Marine Park that extends from the shoreline of the land-based portion of the park.

To the north (275 m) is a non-contiguous matrix of protected areas (30.97 ha) that includes Brigade Bay Bluffs Nature Reserve (ITC) and two small community parks (Sunshine Coast Regional District). This connects further to a large network of undeveloped provincially managed parcels and old-growth management areas (3345.83 ha), totaling 3376.81 ha of contiguous protected areas. Because the surrounding area is protected, external threats are minimal; therefore, management concerns are focused within the boundaries of the reserve.

Photo 2. View of Howe Sound and Coast Mountains looking east from summit of Mount Artaban.

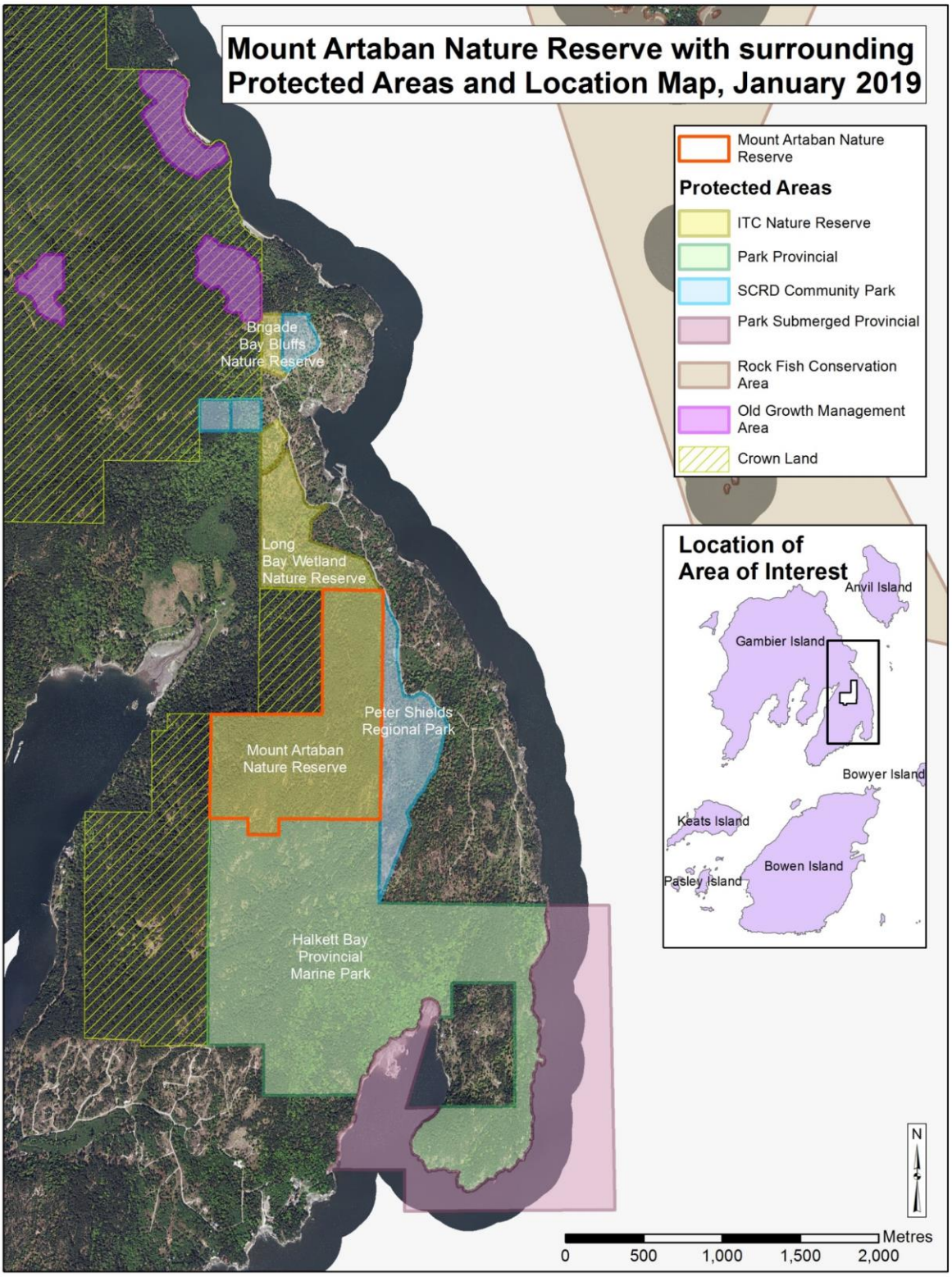

Figure 2. Location of Gambier Island (inset), Mount Artaban Nature Reserve (outlined in orange), and other protected areas. A complimentary map of marine protected area zones is provided in Schedule B of Gambier Island Land Use Bylaw #86 (Islands Trust 2004).

2.5 Site History[2]

Gambier Island is within the traditional territory of several Coast Salish First Nations who have called this place home since time immemorial. The Coast Salish peoples maintained a vital, dynamic, and sustainable connection to their territory and developed rich cultural, spiritual, and traditional ecological knowledge. However, cultural heritage and sacred sites of Gambier Island and the greater Islands Trust Area were negatively impacted by European settlement. Past archeological activities, vandalism, and land use have disturbed sites of cultural and spiritual importance. Nevertheless, the land and the greater territory remains an embodiment of the stories, oral history, and culture of these First Nations.

Two archaeological sites on nearby Brigade Bay are protected under the *Heritage Conservation Act* (Cascade 2005). Consultation between the Squamish Nation and Fisheries and Oceans Canada during the Brigade Bay subdivision development determined that the Brigade Bay Site, Ho-mahmk, and surrounding environs are well known for deer hunting and plant collection, and as a camp site and safe haven for members of the Squamish Nation traveling in Howe Sound (FOC 2003 in Cascade 2005). Therefore, adjacent properties in the Brigade Bay subdivision have covenants that allow "the right of passage by members of the Squamish Nation for the purposes related to continuation of current use of lands or resources for traditional purposes" (FOC 2004 in Cascade 2005).

European settlement began in the mid to late 1800's, primarily in low-elevation coastal areas considered suitable for farming and homesteading. It is likely that prospectors in search of minerals visited and collected samples from the Mount Artaban area (Hopwood 2009).

A BC Forest Service fire history map of the Mount Artaban area (Figure 3) indicates that the entire reserve was burned by a human-caused fire which ignited on July 9, 1922 (shown in pink shaded area as Fire # 459).

Photo 3. Fire scars on western redcedar trees in Ecological Community 3

[2] The Islands Trust Conservancy recognizes that the language commonly used to refer to land may be disrespectful to First Nations. For example, notions of 'private' and 'Crown' land do not appropriately recognize aboriginal title. The words "provincially-managed land" or "federally managed land" will be used in place of "Crown". "Privately managed" will be used in place of "private" and "land holder" instead of "land owner".

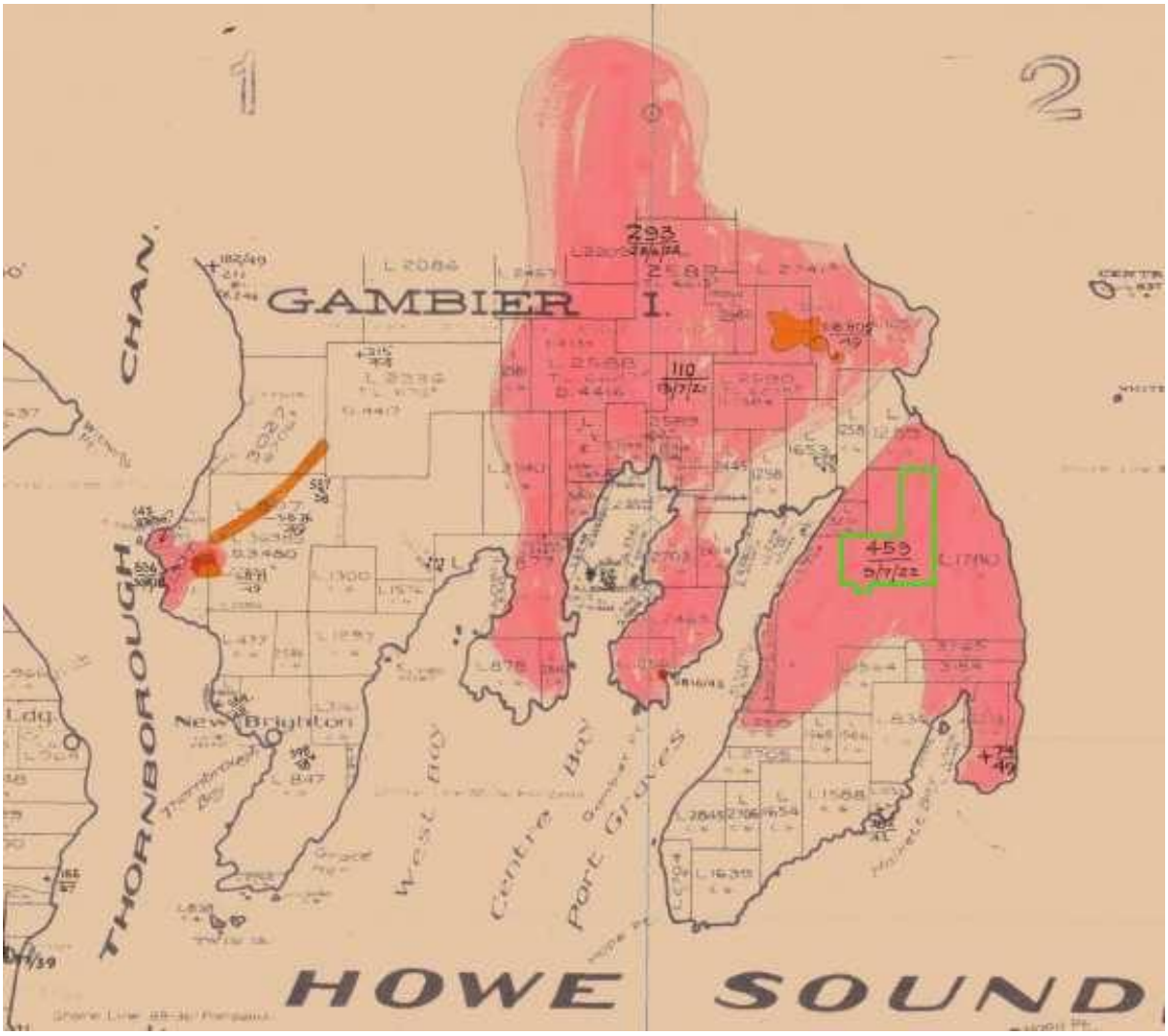

Figure 3. Historic wildfire and burn areas on Gambier Island (Hopwood 2009). Mount Artaban Nature Reserve indicated by green polygon within pink shaded area (labelled Fire # 459).

Stumps with spring-board notches indicate that some of the reserve was logged in the pre-World War II period, perhaps as post-fire salvage logging. Tree core samples indicate that most of the current forests originated between 1938 and 1940, probably as trees that seeded naturally following the fire and logging. Some forest stands in the lower-elevation northern part of the reserve originated around 1953, and stumps cut with chain saws in this area are consistent with early post-War "Cat-logging" methods.

Mount Artaban has long been a popular hiking destination. A tree core sample from a western hemlock tree with a trail blaze indicates that the blaze was cut around 1946 (Hopwood 2009).

The fire lookout tower at the summit of Mount Artaban was established in 1957 (John Parminter, pers. comm. in Hopwood 2009) and was probably one of the first Forest Service fire

towers to be pre-fabricated off-site and lifted to the site by helicopter as pre-assembled panels. The date when the tower was last used is not known but it was probably around 1970 (Hopwood 2009). The tower has fallen down but the footings and iron hook are still in place.

The Mount Artaban property was held as provincially-managed land and was transferred on June 6, 2008 through the provincial Free Crown Grant program to the Islands Trust Conservancy to be held and managed as a nature reserve. To satisfy the province's conditions for the transfer, the Gambier Island Conservancy partnered with the Islands Trust Conservancy to fundraise over $40,000 to cover the costs of the land survey and a management plan. In addition to the support of the Islands Trust Conservancy, the Gambier Island Conservancy and the Sunshine Coast Regional District, over 80 contributions were made by individuals, businesses and community groups.

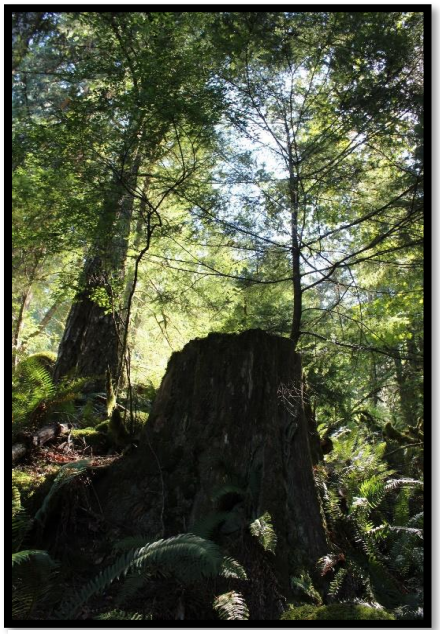

Photo 4. Large stumps in Ecological Community 1

2.6 Anthropogenic Features

There are no buildings or structures within the reserve. An archeological survey has not been completed for MANR.

Table 2. Anthropogenic Features in MANR

Anthropogenic Feature	Description	Condition	Photopoint Location
Trail	Backcountry hiking trail from Long Bay Wetland Nature Reserve in the north to Halkett Bay Provincial Marine Park in the south.	Good	Figure 1. No photo
Entrance, trailhead and covenant boundary signs	Decorative wooden nature reserve entrance sign. Trailhead sign and metal covenant boundary signs located off Mount Artaban Road that indicate access to the Reserve through Long Bay Wetland Nature Reserve.	Good	P16, Figure 1. 10 U 476130; 5480906
Fire cabin footings	Footings remaining from old fire cabin that was removed. Glass and debris noted in previous		Figure 1. No photo 10 U 475335 5479461

	management plan have been removed.		
Directional sign	Directional wooden trail sign on tree.	Fair	P18 Figure 1. 10U 475776; 5480615
Directional sign	Wooden sign on tree along trail.	Fair	Figure 1. No photo 10 U 475743 5480523
Boundary marker (iron pin)	Along border of Crown land.	Good	Figure 1. No photo 10 U 475492 5480088
Boundary marker (iron pin)	Brass monument at northwest corner of reserve (standard capped post set).	Unknown	Figure 1. No photo 10U 475767 5480887
Boundary marker (iron pin)	Brass monument south of summit (standard rock post set).	Unknown	Figure 1. No photo 10 U 475287 5479382
Signs	Decorative wooden nature reserve entrance sign and metal “Respect this Nature Reserve” sign at south of reserve.	Good	Figure 1. No photo 10U 475330 5479428
Summit sign	Summit sign to respect the environment.	Good	P17 475339; 5479467
Iron hooks	Two iron hooks embedded in rocks by summit sign.	Fair	Figure 1. No photo taken 10 U 475341; 5479463

2.7 Undersurface Rights

The undersurface rights are registered in favour of the provincial crown under registration Number BB864259 (dated June 2, 2008).

2.8 Notations, Charges, Liens and Interests

A Section 219 Conservation Covenant (Registration Number: CA3219711) and Section 218 Statutory Right of Way (Registration Number: CA3219712) were registered on the lands in 2013 in favour of Gambier Island Conservancy and Sunshine Coast Conservation Association. The general intent of the agreement is:

a) to protect, preserve, conserve, maintain, enhance and, if applicable from time to time restore, the natural state of the Land and the Amenities as described in the Report (baseline documentation); and

b) to prevent any occupation or use of the Land that will impair or interfere with the natural state of the Land and the Amenities as described in the Report.

2.9 Local Planning Designations

The MANR is within Development Permit Area #3 which protects all mapped and unmapped streams on Gambier Island under the Riparian Areas Regulation (Islands Trust 2017).

The reserve is zoned G1 (Wilderness Conservation) (Islands Trust 2004). Although permitted uses within this zoning include “wilderness camping” and “woodlot use and timber harvesting use,” these uses are not permitted in the reserve.

2.10 Existing Public and Other Use

Mount Artaban Nature Reserve falls within the territory of multiple First Nations, and as such has been a site of cultural activity for thousands of years. There is knowledge and oral history relating to this site that may or may not be shared outside of the membership of a First Nation. As a first step toward strengthening cultural connections to the land that were negatively impacted by European settlement, ITC is exploring the potential of a Management Plan for Areas of Cultural Heritage and Sacred Significance that will support and enhance the continued use of the site by First Nations.

There is light recreational activity on the existing public trail in the reserve. The trailhead is off Mount Artaban Road and accesses the reserve through a portion of Long Bay Wetland Nature Reserve. This trail crosses through a section of adjacent provincially-managed land on route to the summit, and connects to Halkett Bay Provincial Marine Park to the south before continuing on to the docks at Camp Fircom and Halkett Bay (Map 1). For those entering the nature reserve on the trail from the south, there is wooden entrance sign near the MANR boundary just before the peak. There are exceptional views from several viewpoints, including the summit of Mount Artaban (Photo 2). The trailhead and summit are well signed.

3.0 Inventory by Ecological Community

3.1 Ecological Significance

Mount Artaban is a significant landmark on Gambier Island, with a summit of 614 metres (2015 feet). The reserve’s steep trails lead to spectacular views of Howe Sound and the Coast Mountain ranges north of Vancouver. Due to its recent history of logging, the reserve is predominantly composed of second growth mixed forests; however, large veteran trees are still found in many areas on the mountain. The habitat around the summit includes unlogged shore pine and Douglas-fir forests and two high-elevation ephemeral wetlands.

A search of the BC Conservation Data Centre (CDC) data revealed only one species at risk occurrence on Gambier Island: the Northern Red-legged Frog (*Rana aurora*). During site visits in

August 2018, Black Swifts were noted over the summit of Mount Artaban. It is likely that other rare species will be found in the reserve if surveys are completed at appropriate times of the year.

Islands Trust Conservancy acknowledges that there is a wealth of traditional ecological knowledge and a long history of ecosystem stewardship among the First Nations whose territory encompasses Mount Artaban Nature Reserve. ITC will strive to work with First Nations knowledge holders to deepen its understanding, improve its stewardship practices, and, ultimately, support the transfer of traditional ecological knowledge to younger generations within First Nations communities to ensure that it is not lost. At this time, the ecological information presented in this management plan was formed using systems that are based in foundations of Western science.

Table 3. Species at Risk in MANR

Species Name		Status				
English	Scientific	Provincial	BC List	COSEWIC	SARA	Global
Black Swift	*Cypseloides niger*	S2S3B (2015)	Blue	E (2015)		G4 (2015)

Table 4. Ecological Communities in MANR

Ecological Community Name		Status		
English	Scientific	Provincial	BC List	Global
Western hemlock - Douglas-fir / Oregon beaked-moss very dry maritime (CWHxm1/01)	*Tsuga heterophylla - Pseudotsuga menziesii / Eurynchium oreganum*	S2 (2013)	Red	G3G4
Western redcedar / sword fern very dry maritime (CWHxm1/05)	*Thuja plicata / Polystichum munitum*	S2S3 (2009)	Blue	GNR
Western redcedar/ three-leaved foamflower Very Dry Maritime (CWHxm1/07)	*Thuja plicata / Tiarella trifoliata*	S2S3 (2013)	Blue	G3
Western hemlock / flat moss dry maritime (CWHdm/01)	*Tsuga heterophylla / Buckiella undulata*	S3 (2016)	Blue	G3G4
Douglas-fir - lodgepole pine / oceanspray / reindeer lichens dry maritime (CWHdm/02)	*Pseudotsuga menziesii - Pinus contorta / Holodiscus discolor / Cladina* spp.	S2 (2005)	Red	G2G3
Douglas-fir - western hemlock / salal dry maritime (CWHdm/03)	*Pseudotsuga menziesii - Tsuga heterophylla / Gaultheria shallon*	S2S3 (2013)	Blue	G3G4
Western redcedar / sword fern dry maritime (CWHdm/05)	*Thuja plicata / Polystichum munitum*	S2? (2016)	Red	G2G3

western redcedar / three-leaved foamflower dry maritime (CWHdm/07)	*Thuja plicata / Tiarella trifoliata*	S2S3 (2018)	Blue	G3

There are two high-elevation ephemeral wetlands near the summit of Mount Artaban. In August, both wetlands were dry and there was no evidence of amphibians. Depending on their hydroperiod, the ponds may provide frog and salamander breeding habitat. The ponds are likely important foraging habitats for bats and other wildlife in an area with little standing water.

3.2 Climate

The southern Gulf Islands, which include the islands in Howe Sound, have a climate pattern of warm, dry summers and mild, wet winters with little snowfall. The maritime influence moderates the effect of elevation, latitude, and aspect on local temperature and precipitation. The climate is also influenced by the rain shadow effect of the Vancouver Island Ranges, and experiences similar temperatures and precipitation to the North Shore Mountains on the mainland.

Weather statistics from the adjacent Bowen Island station in Howe Sound show that annual precipitation is approximately 1507 mm, mostly falling as rain (The Weather Network 2018). Average daily temperatures peak in the summer months (July and August) at 23°C and are lowest in the winter at 0°C (December and January) (Figure 4). The winter months from November to January have the highest rainfall (averaging 506-420 mm), while July and August are the driest months (58-78 mm) (Meteoblue 2018).

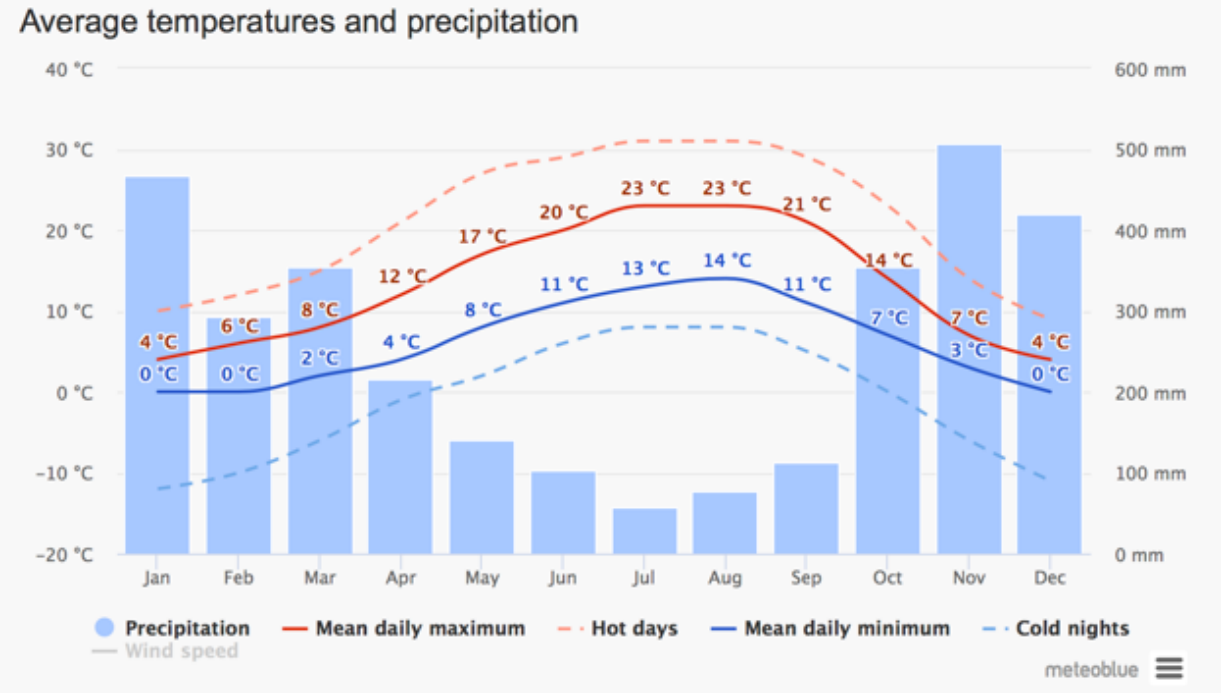

Figure 4. Average temperature and precipitation of Bowen Island (nearest weather station to Gambier Island) from 1985-2018 (Meteoblue 2018)

The future impacts of climate change are unknown, although a summer drying trend and an increase in both frequency and intensity of storm events are predicted (Mauger et. al. 2015). More powerful storms may cause increasing erosion especially in areas with exposed soil, such as trails, and in riparian areas due to increased flows. Dryer summers may impact the wetlands and riparian hydrology causing premature drying. Over time, there may be shifts in the vegetation community away from western redcedar (*Thuja plicata*) to Douglas-fir (*Pseudotsuga menziesii*) and shore pine (*Pinus contorta*). Higher temperatures and less precipitation may lead to localized stress on trees and plants. Maintaining habitat connectivity, biodiversity and ecosystem resilience may assist the flora and fauna in adapting to climate change stresses.

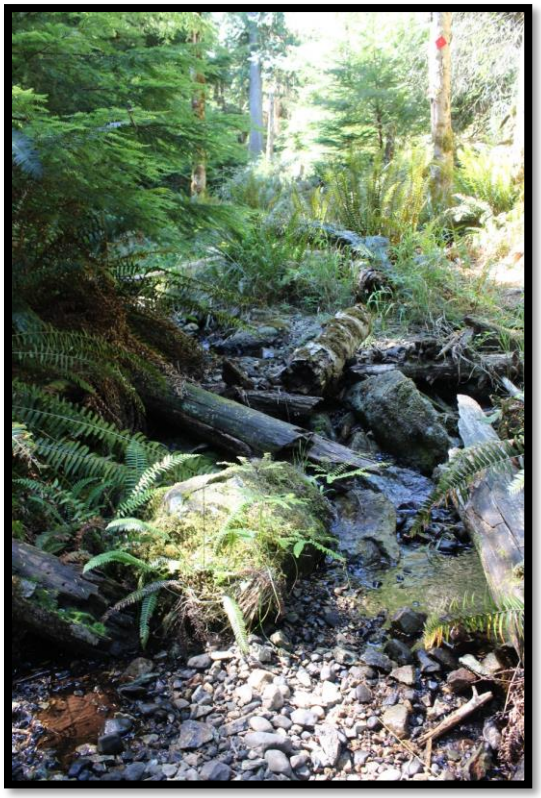

Photo 5. Small stream in lower region of MANR. There was still some flow on August 7, 2018. Note red metal trail wayfinder on tree in background beside trail.

3.3 Geology and Physiology

Geologically, most of Gambier Island is underlain by mafic volcanic strata and associated sediments of

the Lower Cretaceous Gambier Group (approximately 100 million years old). Granitic rocks of the Jurassic to Cretaceous Coast Plutonic Complex (approximately 160 million years old) underlie the southern part of the island. (BC Ministry of Energy, Mines and Petroleum Resources 2009 in Hopwood 2009). According to the map compiled by Armstrong (1965), the boundary between these two rock formations lies just south of the summit of Mount Artaban, indicating that the bedrock geology of the Nature Reserve belongs to the Gambier Group (Hopwood 2009). This complex geological group is primarily of volcanic origin; however, this does not mean that Mount Artaban was originally a volcano. Rather, these rocks originated in an ancient eruption and have since been moved by plate tectonics from their original location. In the process, they have collided with other terrains, undergoing considerable deformation and other changes (Clague and Turner 2003 in Hopwood 2009). The Gambier Group also occurs in the vicinity of Britannia Beach on the mainland shore of Howe Sound, an area with significant mineral deposits that were mined for many years. However, the BC Minerals Title Online website shows no current or historical mineral titles covering any part of the MANR (BC Minerals Titles 2018).

Photo 6. Ephemeral, high elevation pond on east side of summit

The Howe Sound region was covered by glaciers from approximately 29,000 to 12,000 years ago. During glaciation, the weight of the ice depressed the land surface so that some lower-elevation portions of Gambier Island were below sea level. As the glaciers retreated and the land rebounded, marine and coastal processes eroded loose materials from the higher and steeper parts of the island and laid down finer-textured soil parent materials on many of the lower-lying and more gently sloping areas of the island (Hopwood 2009).

3.4 Hydrology

There are two small seasonal streams that originate within the reserve (or on adjacent Crown land) and flow roughly northwards, through the Long Bay Wetland Nature Reserve and Brigade Bay subdivision, entering Howe Sound a short distance south of Brigade Bay (Figure 1). These streams do not support resident or anadromous salmonid populations, probably because the summer and autumn flow levels are low to minimal, and the gradients are too steep for fish (Hopwood 2009). In addition to these two well-defined streams, there are many small ephemeral streams that flow during periods of heavy rainfall (Hopwood 2009). It is likely that a small area at the extreme southern end of MANR drains into Fircom Creek, even though it lies outside the mapped Community Watershed (Hopwood 2009).

Several small streams originating within the reserve are used by local residents as water supply sources for individual residences and run off from Mount Artaban supplies freshwater for Sea Ranch strata. Protecting the water quality and flow regimes of all streams within the reserve is an important objective in this plan. This can be accomplished by maintaining forest cover and not allowing uses that could jeopardize water quality, such as camping, fires or motorized recreation.

There are two ephemeral wetlands near the summit of MANR. The wetland on the east side of the summit is approximately 8 m x 40 m with sparse pockets of sedges. A second pond on the west side of the summit was found within denser forest and is approximately 15 m x 25 m in size, with moderate patches of sedges. Both ponds were dry on August 7, 2018.

Photo 7. Ephemeral forest wetland on west side of summit

3.5 Soils

Mount Artaban Nature Reserve has predominantly rocky and steep landforms with shallow, coarse-textured soils. Colluvial deposits (rocky material that has been moved down-slope by gravity) occur on the steep slopes and at the bases of the many cliffs. Soils on the sides and tops of the hills vary from bare rock to morainal deposits (mixed material deposited by the glaciers), typically shallow, coarse-textured, and rapidly drained. Soils are somewhat deeper in the several narrow stream valleys that dissect the slopes of Mount Artaban. In the gentler terrain of the lower slopes of the mountain, soil deposits are up to several meters deep and consist of morainal material as well as finer-textured material deposited in a marine environment during the retreat of the glaciers (Hopwood 2009).

3.6 Ecological Classifications

Mount Artaban Nature Reserve is within the Very Dry Maritime subzone (xm) and the slightly cooler and moister Dry Maritime subzone (CWHdm) of the Coastal Western Hemlock Zone (CWH) (Green & Klinka, 1994) (see Figure 5 for subzone locations within MANR). Climatic factors, in conjunction with existing soil conditions, result in a productive coastal forest with a long growing season—although water deficits may occur on zonal sites. MANR is within the Pacific Maritime Ecozone and the Georgia Puget Basin Ecoregion.

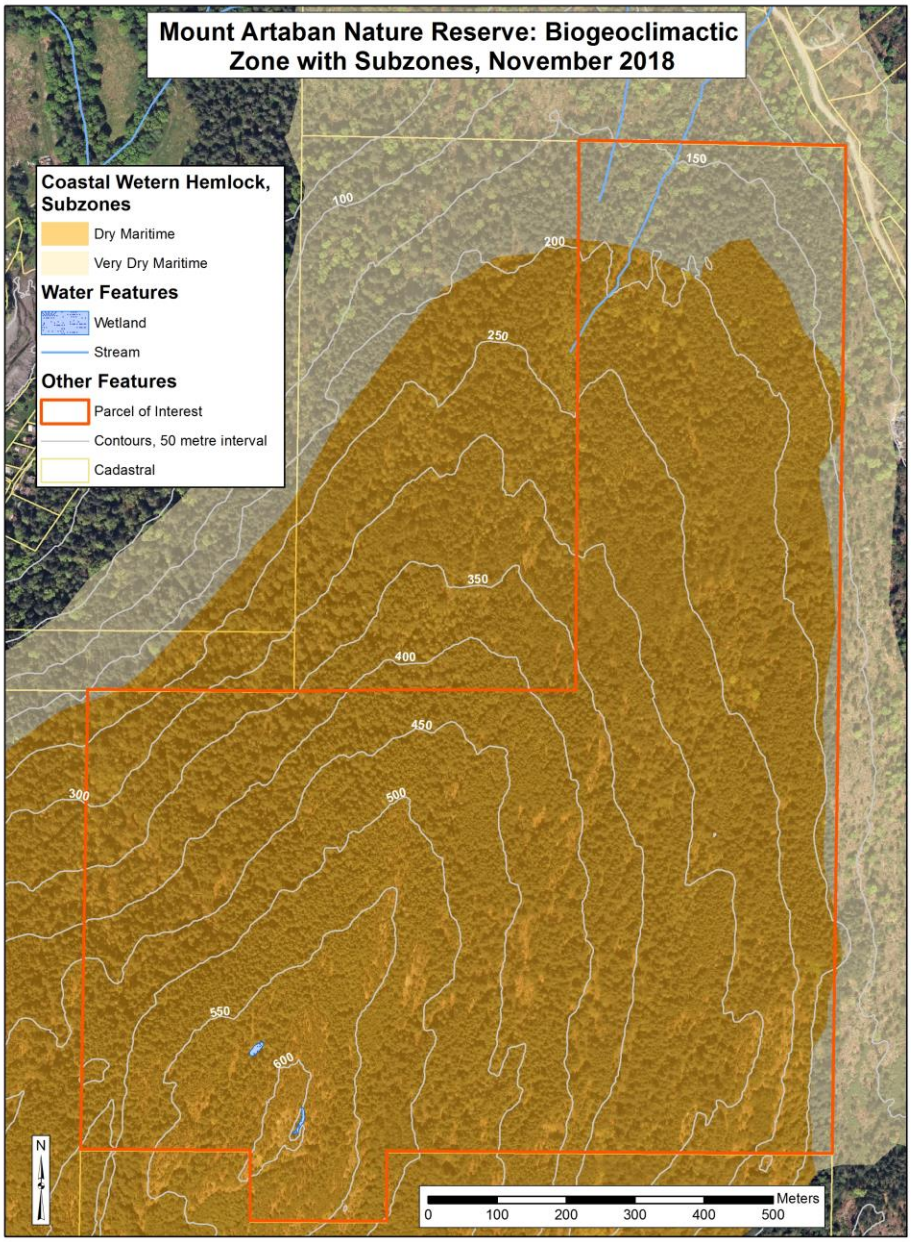

Figure 5. Map of Coastal Western Hemlock biogeoclimatic subzones within MANR (orange boundary)

3.7 Ecological Communities and Site Series

An ecological inventory of biological features was conducted in the reserve on August 7th and 8th, 2018. Site series were identified using *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* (Green and Klinka, 1994) (see Figure 6 for Ecological Community polygons within MANR). Structural stage was defined as per *Standards for Terrestrial Ecosystems Mapping in British Columbia* (RIC 1998).

A list of all plant species observed is included in Appendix B. Locations of photopoints and other photograph locations are given in Appendix C.

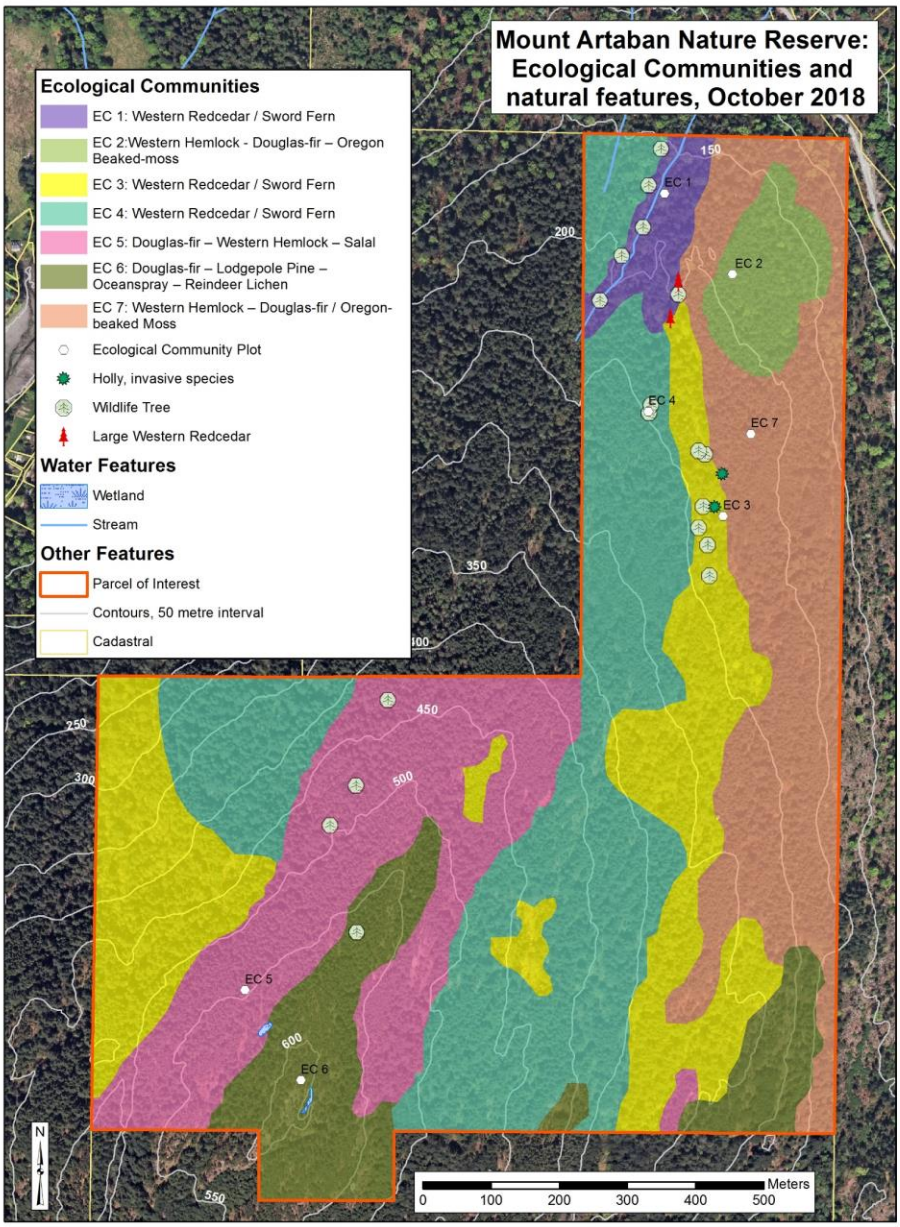

Figure 6. Ecological communities in MANR, including wildlife trees, invasive plants, and vegetation plots

Ecological Community 1. Western Redcedar / Sword Fern (CWHxm1/05); Western Redcedar / Three-leaved Foamflower (CWHxm1/07) Very Dry Maritime to Dry Maritime

Ecological Community 1 is found at lower elevations in the northern portion of the MANR. The soils are rich to very rich and the community includes the riparian areas associated with one of the ephemeral streams. The main canopy trees are Douglas-fir (*Pseudotsuga menziesii*) and western redcedar (*Thuja plicata*) with some red alder (*Alnus rubra*), western hemlock (*Tsuga heterophylla*) and bigleaf maple (*Acer macrophyllum*). The main community is Western Redcedar / Sword Fern Very Dry Maritime, with small pockets of Western Redcedar / Three-leaved Foamflower Very Dry Maritime in slightly drier areas. As the elevation increases above

200 m, the site series changes from Very Dry Maritime to Dry Maritime. Lower slopes are gentle to moderate, with some areas steeply sloping. The understory in some locations is dominated by thick sword fern and in other locations the vegetation is more mixed. The community is in disturbed early to mid-seral stages, recovering from past logging activities.

Photo 8. Western redcedar by creek gully in Ecological Community 1

Table 5. Description of Ecological Community 1

Polygon ID:	Ecological Community 1
Ecological Community:	Western Redcedar / Sword Fern Very Dry Maritime Western Redcedar / Three-leaved Foamflower Very Dry Maritime
Classification:	CWHxm1/05, CWHxm1/07 at lower elevations (transitions to CWHdm/05, CWHdm/07 above 200 m)
Structural Stage:	6-Mature Forest/5-Young Forest
Status (BC List):	Blue-listed/Red-listed
Photopoint(s):	P8
Ecological Community Description:	Mix of young red alder and conifer species on fresh to moist sites and riparian areas. Includes second growth, post-logging riparian ecosystems, adjacent to a small stream in the lower-elevation portion of the Nature Reserve (below 250 m). Many large wildlife trees.
Disturbance Notes:	Infrequent stand replacement by fire and wind disturbance with individual tree death resulting in gap dynamics. Large windthrow over creek.
Anticipated Change/Succession:	Future dying off of red alder will provide more light for understory conifers to grow. In areas with heavy deer browsing, conifers may be impeded and an open stand or gap may result. Slow development of old forest characteristics will occur through tree growth and development of gaps by natural mortality and wind.
Wildlife observations:	Audio: Swainson's Thrush (*Catharus ustulatus*), Chestnut-backed Chickadee (*Poecile rufescens*), Red-breasted Nuthatch (*Sitta canadensis*)

Table 6. Vegetation Species in Ecological Community 1

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy+	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Thuja plicata (western redcedar)	25	1					MC: 80-150 yrs, ht: 20-30 m, DBH: 50-120 cm SC: 10-15 yrs, ht: 3 m, DBH: 10-15 cm
Pseudotsuga menziesii (Douglas-fir)	15						MC: 20-60 yrs, ht: 15-20 m, DBH: 15-50 cm
Tsuga heterophylla (western hemlock)	5	1					MC: 40-60 yrs, ht: 15-20 m, DBH: 40 cm SC: 10-15 yrs, ht: 3 m, DBH: 8-10 cm
Alnus rubra (red alder)	3						MC: 20-40 yrs, ht: 10-15 m, DBH: 20-25 cm
Acer macrophyllum (bigleaf maple)	2						MC: 80-100 yrs, ht: 15 m, DBH: 70 cm
Vaccinium parvifolium (red huckleberry)			5				
Berberis nervosa (dull Oregon-grape)			T				
Rubus spectabilis (salmonberry)			T				
Polystichum munitum (sword fern)				60			
Adiantum aleuticum (maidenhair fern)				T			
Moss Layer							**Total Moss Layer: 5%**
Eurynchium oreganum (Oregon-beaked moss)							
Hylocomium splendens (step moss)							
Plagiothecium undulatum (flat moss)							
Rhytidiadelphus loreus (lanky moss)							
Cover by Layer (%)	**50**	**2**	**5**	**60**	**5**		**Total Canopy Cover: 50%**

Ecological Community 2. Western Hemlock - Douglas-fir / Oregon Beaked-moss (CWHxm1/01) below 200 m; transitions to Western Hemlock / Flat Moss (CWHdm/01) above 200 m.

This community is densely forested and the dominant trees are Douglas-fir and western hemlock with some older western redcedar in the wetter areas. The understory is very open and dominated by bryophytes, with few shrubs present. The community is classified as Western Hemlock - Douglas-fir/Oregon beaked-moss Dry Maritime. It is found on the lower slopes in the northeast corner of the MANR. The slopes are mostly gentle to moderate middle slopes, in some locations quite steeply sloping to the east.

Photo 9. Western hemlock, Douglas-fir with Oregon-beaked moss understory in Ecological Community 2

Table 7. Description of Ecological Community 2

Polygon ID:	Ecological Community 2
Ecological Community:	Western Hemlock - Douglas-fir / Oregon Beaked-moss Transitions to Western Hemlock / Flat Moss above 200 m.
Classification:	CWHxm1/01 (transitions to CWHdm/01).
Structural Stage:	5 – Young Forest (some mature/old forest attributes and scattered veteran trees)
Status (BC List):	Red-listed/Blue-listed
Photopoint(s):	P9
Ecological Community Description:	Young, maturing Douglas-fir forest on slightly dry to fresh sites with eastern aspect. Surface boulders throughout, some smaller windfall and woody debris. One red alder wildlife snag in polygon.
Disturbance Notes:	Infrequent stand replacement by fire and wind disturbance. Logging stumps present, old veteran trees with burn scars in polygon. Gap dynamics. Some smaller windfall. Natural regeneration from past wildfire and logging events.
Anticipated Change/Succession:	Stand self-thinning due to density-related mortality. Slow development of old forest characteristics through tree growth and development of gaps by natural mortality and wind.
Wildlife observations:	Visual: Black-tailed deer (*Odocoileus hemionus*) scat, Douglas' squirrel (*Tamiasciurus douglasii*) Audio: Common Raven (*Corvus corax*), Chestnut-backed Chickadee (*Poecile rufescens*), Red Crossbill (*Loxia curvirostra*), Western Tanager (*Piranga ludoviciana*)

Table 8. Vegetation Species in Ecological Community 2

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy+	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Pseudotsuga menziesii (Douglas-fir)	40						MC: 60-80 yrs, ht: 25-30 m DBH: 30-55 cm
Tsuga heterophylla (western hemlock)	3	T					MC: 60-80 yrs, ht: 25-30 m DBH: 55 cm SC: 15-20 yrs, ht: 8-10 m, DBH: 15 cm
Thuja plicata (western redcedar)	2	T					MC: 80-100 yrs, ht: 25-30 m, DBH: 130 cm SC: 15-20 yrs, ht: 5 m, DBH: 20 cm
Berberis nervosa (dull Oregon-grape)			2				
Vaccinium parvifolium (red huckleberry)			1				
Holodiscus discolor (oceanspray)			T				
Tsuga heterophylla (western hemlock) seedlings			T				
Vaccinium membranaceum (black huckleberry)			T				
Polystichum munitum (sword fern)				5			
Festuca occidentalis (western fescue)				T			
Galium triflorum (sweet-scented bedstraw)				T			
Goodyera oblongifolia (rattlesnake plantain)				T			
Trientalis borealis (broad-leaved starflower)				T			
Mycelis muralis (wall lettuce)						T	
Moss Layer							**Total Moss Layer: 85%**
*Eurynchium oreganum (*Oregon-beaked moss)							
Hylocomium splendens (step moss)							
Plagiothecium undulatum (flat moss)							
Rhytidiadelphus loreus (lanky moss)							
Cover by Layer (%)	**45**	**<1**	**4**	**6**	**85**	**<1**	**Total Canopy Cover: 45%**

Ecological Community 3. Western Redcedar / Sword Fern (CWHdm/05)

This community is a mix of mature forest (red alder component) and young forest (coniferous component), with larger, older veteran trees scattered throughout. It is dominated by early to mid-seral Western Redcedar / Sword Fern Dry Maritime community, with smaller portions of Western Hemlock - Douglas-fir / Oregon-beaked Moss and Western Redcedar / Three-leaved Foamflower communities. The understory is sparse with a small amount of sword fern. The Ecological Community is in moisture-receiving sites at the bottom of a draw. It occurs between 200 and 500 m elevation, mostly on gentle to moderate middle to lower slopes that are east facing.

Photo 10. Western redcedar with fire scars, sword fern, and some large veteran trees in Ecological Community 3

Table 9. Description of Ecological Community 3

Polygon ID:	Ecological Community 3
Ecological Community:	Western Redcedar / Sword Fern (dominant) Western Hemlock - Douglas-fir / Oregon-beaked Moss Western Redcedar / Three-leaved Foamflower
Classification:	CWHdm/05 (CWHdm/01, CWHdm/07)
Structural Stage:	Hybrid of mature forest (6) and young forest (5)
Status (BC List):	Red-listed/Blue-listed
Photopoint(s):	P10
Ecological Community Description:	Mature red alder and young conifer forest on slightly dry to fresh sites that has regenerated after fire and/or logging. There is a seasonal creekbed running through the plot, with many veteran trees and several dead red alder snags.
Disturbance Notes:	Infrequent stand replacement by fire and wind disturbance. Gap dynamics. Fire scars in polygon, no stumps visible.
Anticipated Change/Succession:	Continued dying off of red alder will provide more light for understory conifers to grow. In areas with heavy deer browsing, conifers may be impeded and an open stand or gap may result. Slow development of old forest characteristics through tree growth and gaps created by natural mortality and wind.
Wildlife observations:	Visual: Black-tailed deer (*Odocoileus hemionus*) scat, Chestnut-backed Chickadee (*Poecile rufescens*), Dark-eyed Junco (*Junco hyemalis*), woodpecker sp. feather Audio: Red-tailed Hawk (*Buteo jamacensis*), Cassin's Vireo (*Vireo cassinii*)

Table 10. Vegetation Species in Ecological Community 3

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy+	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Pseudotsuga menziesii (Douglas-fir) - veteran	5						MC: 150+ yrs, ht: 35-40 m, DBH: 130-170 cm (vet)
Pseudotsuga menziesii (Douglas-fir)	15	1					MC: 20-80 yrs, ht: 30-30 m, DBH: 20-70 cm SC: 15-25 yrs, ht: 10-15 m, DBH: 15-20 cm
Thuja plicata (Western redcedar) - veteran	2	1					MC: 150+ yrs, ht:30-35 m, DBH: 180 cm (vet) SC: 10-15 yrs, ht: 5 m, DBH: 20 cm
Alnus rubra (red alder)	5	2					MC: 30-40 yrs, ht: 20 m, DBH: 30-35 cm
Tsuga heterophylla (western hemlock)		2					SC: 15-30 yrs, ht: 5-12 m, DBH: 10-20 cm
Amelanchier alnifolia (Saskatoon)			T				
Berberis nervosa (dull Oregon-grape)			T				
Rosa gymnocarpa (baldhip rose)			T				
Thuja plicata (western redcedar) - seedlings			T				
Tsuga heterophylla (western hemlock) - seedlings			T				
Vaccineum membranaceum (black huckleberry)			T				
Vaccinium parvifolium (red huckleberry)			T				
Polystichum munitum (sword fern)				5			
Bromus pacificus (Pacific brome)				T			
Carex spp. (sedge)				T			
Festuca occidentalis (western fescue)				T			
Galium triflorum (sweet-scented bedstraw)				T			
Pteridium aquilinum (bracken fern)				T			
Rubus ursinus (trailing blackberry)				T			
Trientalis borealis (broad-leaved starflower)				T			
Viola sempervirens (evergreen violet)				T			
Epipactis helleborine (broadleaf helleborine)						T	
Ilex aquifolium (English holly)						T	

Mycelis muralis (wall lettuce)						T	
Moss Layer							Total Moss Layer: 30%
Dicranum spp.							
Eurynchium oreganum (Oregon-beaked moss)							
Hylocomium splendens (step moss)							
Plagiothecium undulatum (flat moss)							
Rhytidiadelphus loreus (lanky moss)							
Cover by Layer (%)	30	6	1	6		<1	Total Canopy Cover: 30%

Ecological Community 4. Western Redcedar / Sword Fern (CWHdm/05); Douglas-fir – Western Hemlock / Salal (CWHdm/03)

The community is a mix of young second-growth Western Redcedar / Sword Fern and young second-growth Douglas-fir - Western Hemlock / Salal site series. The dominant tree species is Douglas-fir and the understory is sparse with a few shrubs and mosses. This community is found along the eastern part of the reserve, mostly on moderate to steep middle to lower slopes, with some cliff bands and rocky outcrops, from 100 to 500 m elevation.

Photo 11. Maturing young forest with Sword Fern and moss understory in Ecological Community 4

Table 11. Description of Ecological Community 4

Polygon ID:	Ecological Community 4
Ecological Community:	This polygon is dominated by Western Redcedar / Sword Fern with Douglas-fir - Western Hemlock / Salal.
Classification:	CWHdm/05 with CWHdm/03 Transitioning to CWHxm1/05 and CWHxm1/03 at lower elevations (<200 m).
Structural Stage:	5 - Young forest to 6 - Mature forest
Status (BC List):	Blue-listed
Photopoint(s):	P11
Ecological Community Description:	Second growth young mixed forest, with veteran trees, on moderately dry to moister sites. Includes some mature/old forest attributes (veteran trees, large snags, canopy gaps). Regeneration after fire or logging. Plot is moderately sloping to east, on overall steeply sloping hillside. Significant woody debris.
Disturbance Notes:	Infrequent stand replacement by fire and wind disturbance. Gap dynamics.
Anticipated Change/Succession:	Stand self-thinning due to density-related mortality. Slow development of old forest characteristics through tree growth and creation of gaps by natural mortality and wind.
Wildlife observations:	Visual: Black-tailed deer (*Odocoileus hemionus*) scat, Lorquin's Admiral (*Limenitis lorquini*), Turkey Vulture (*Cathartes aura*), Chestnut-backed Chickadee (*Poecile rufescens*) Audio: Common Raven (*Corvus corax*), Red Crossbill (*Loxia curvirostra*), Western Tanager (*Piranga ludoviciana*), Red-breasted Nuthatch (*Sitta canadensis*), Red-tailed Hawk (*Buteo jamacensis*)

Table 12. Vegetation Species in Ecological Community 4

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy+	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Pseudotsuga menziesii (Douglas-fir)	48	2					MC: 70-90 yrs, ht: 30-40 m, DBH: 40-80 cm SC: 5-10 yrs, ht: 1-2 m, DBH: 3-5 cm SC: 30-40 yrs, ht: 20-30 m, DBH: 20-30 cm
Pseudotsuga menziesii (Douglas-fir) – veteran	2						MC: 150 yrs, ht: 30-40 m, DBH: 130 cm (vet)
Thuja plicata (Western redcedar)		T					SC: 10-15 yrs, ht: 5 m, DBH: 15 cm
Tsuga heterophylla (western hemlock)		T					SC: 10-15 yrs, ht: 3-5 m, DBH: 8-10 cm
Berberis nervosa (dull Oregon-grape)			30				
Holodiscus discolor (oceanspray)			T				
Vaccinium parvifolium (red huckleberry)			T				
Rosa gymnocarpa (baldhip rose)			T				
Polystichum munitum (sword fern)				5			
Pteridium aquilinum (bracken fern)				1			
Festuca occidentalis (western fescue)				T			
Goodyera oblongifolia (rattlesnake plantain)				T			
Linnaea borealis (twinflower)				T			
Trientalis borealis (broad-leaved starflower)				T			
Moss Layer							**Total Moss Layer: 70%**
Eurynchium oreganum (Oregon-beaked moss)							
Hylocomium splendens (step moss)							
Plagiothecium undulatum (flat moss)							
Rhytidiadelphus loreus (lanky moss)							
Cover by Layer (%)	**50**	**3**	**30**	**7**	**70**		**Total Canopy Cover: 50%**

Ecological Community 5. Douglas-fir – Western Hemlock / Salal (CWHdm/03); Coastal Western Hemlock / Flat Moss (CWHdm/01)

This Ecological Community is a mix of early- to mid-seral Douglas-fir - Western Hemlock / Salal and Coastal Western Hemlock / Flat Moss communities. Dominant trees include Douglas-fir and western hemlock with very little understory development resulting in mainly litter and duff on the ground. It occurs on very dry sites on moderate to steep ridges, middle and upper slopes, some cliff bands and rock outcrops, from 350 m to 600 m elevation. There are many steep, rocky outcrops on west-facing slopes. The forest developed following natural disturbance (fire), resulting in a young, dense stand. It is found at the higher elevation areas of the reserve below the summit.

Table 13. Description of Ecological Community 5

Polygon ID:	Ecological Community 5
Ecological Community:	Douglas-fir - Western Hemlock / Salal Coastal Western Hemlock / Flat Moss
Classification:	CWHdm/03, CWHdm/01
Structural Stage:	5 – Young Forest (some mature/old forest attributes)
Status (BC List):	Red-listed/Blue-listed
Photopoint(s):	P12
Ecological Community Description:	Moderate to steep ridges, middle and upper slopes, some cliff bands and rock outcrops, from 350 m to 600 m elevation. Young Douglas-fir and western hemlock forest on dry to moist sites. Developed following natural disturbance (fire). Many steep rocky outcrops on west-facing slope. Very dry with little ground vegetation, mainly litter and duff on ground with some small woody debris.
Disturbance Notes:	Infrequent stand replacement by fire and wind disturbance. Gap dynamics.
Anticipated Change/Succession:	Stand self-thinning due to density-related mortality. Slow development of old forest characteristics through tree growth and creation of gaps by natural mortality and wind.
Wildlife observations:	None observed

Photo 12. Douglas-fir, western hemlock, with sparse understory in Ecological Community 5

Table 14. Vegetation Species in Ecological Community 5

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Tsuga heterophylla (western hemlock)	35	1					MC: 40-60 yrs, ht: 25-30 m DBH: 25-45 cm SC: 10-15 yrs, ht: 3-5 m, DBH: 7-10 cm
Pseudotsuga menziesii (Douglas-fir)	20						MC: 60-80 yrs, ht: 25-30 m DBH: 20-65 cm
Thuja plicata (western redcedar)	5	1					MC: 60-80 yrs, ht: 20-25 m, DBH: 45 cm. Fire scars on large cedars SC: 30 yrs, ht: 10-15 m, DBH: 10-15 cm
Tsuga heterophylla (western hemlock) seedlings			T				
Vaccinium parviflorium (red huckleberry)			T				
Polystichum munitum (sword fern)				T			
Pteridium aquilinum (bracken fern)				T			
Moss Layer							**Total Moss Layer: 15%**
Hylocomium splendens (step moss)							
Plagiothecium undulatum (flat moss)							
Cover by Layer (%)	**60**	**2**	**1**	**1**	**15**		**Total Canopy Cover: 60%**

Ecological Community 6. Douglas-fir - Lodgepole Pine / Oceanspray / Reindeer Lichens (CWHdm/02); Douglas-fir - Western Hemlock / Salal (CWHdm/03)

This ecological community is a mix of Douglas-fir - Lodgepole Pine / Oceanspray / Reindeer Lichens in mid-seral condition, with some components of the Douglas-fir - Western Hemlock / Salal community occurring in more moisture-receiving sites. The community occurs in unlogged areas at high elevations. This zone includes Mount Artaban summit, open rocky bluffs and two unique high-elevation ephemeral wetlands.

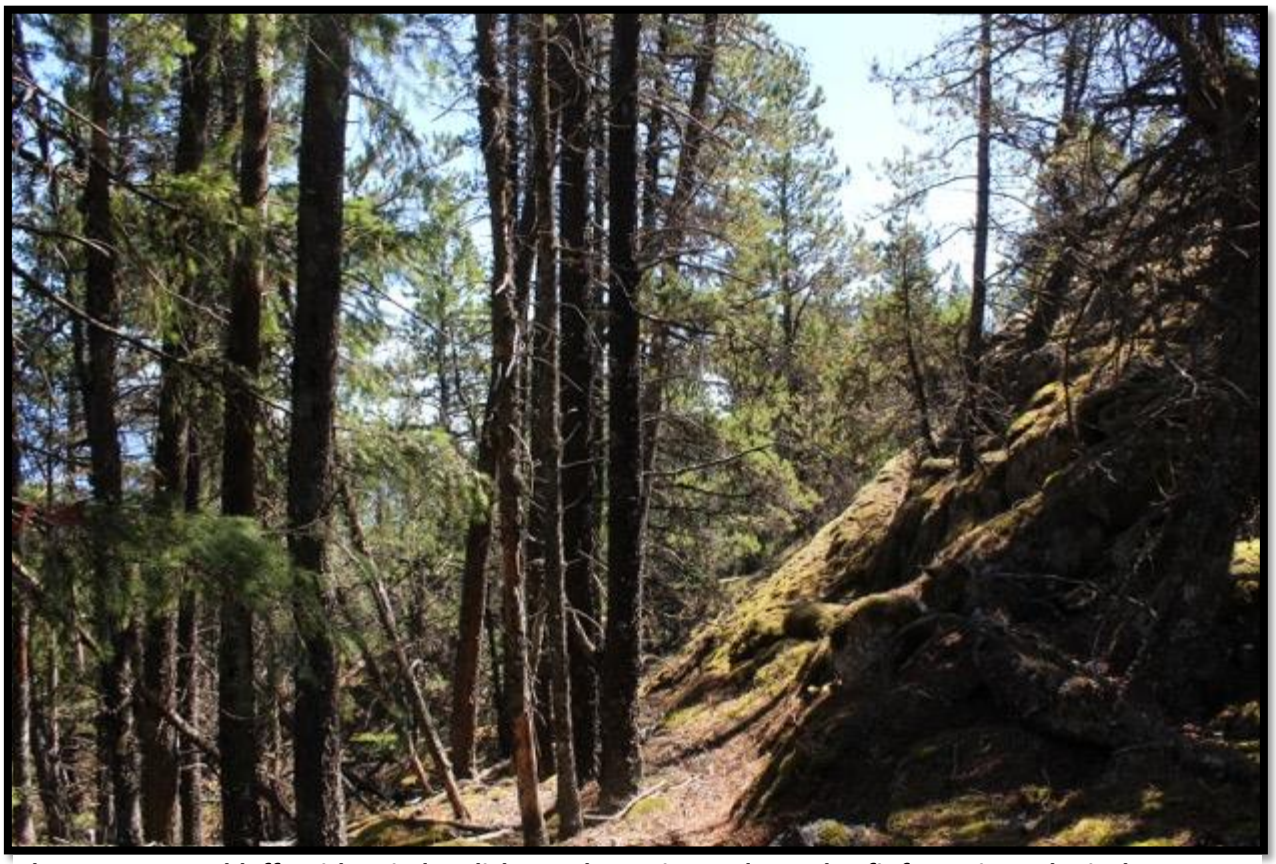

Photo 13. Mossy bluffs with Reindeer lichens, shore pine and Douglas-fir forest in Ecological Community 6

Table 15. Description of Ecological Community 6

Polygon ID:	Ecological Community 6
Ecological Community:	Douglas-fir - Lodgepole Pine / Oceanspray / Reindeer Lichens Douglas-fir - Western Hemlock / Salal
Classification:	CWHdm/02 CWHdm/03
Structural Stage:	4-6 (Uneven to 100 years)
Status (BC List):	Red-listed
Photopoint(s):	P13
Ecological Community Description:	Shore pine and Douglas-fir on dry, rocky ridges. Gentle to steep upper slopes and ridges, some cliff bands and rock outcrops. Mostly above 600 m, but occurs down to 200 m elevation. Bare rocky bluffs (30%) and two ephemeral ponds near the summit.
Disturbance Notes:	The polygon includes the summit of Mount Artaban, which is the site of a fire lookout that has since been removed. The old footing and an iron hook remain.
Anticipated Change/Succession:	Deer grazing may restrict recruitment of pine trees and understory species, as there is very little understory vegetation present currently. Dominant vegetation is likely to continue to be shore pines, except in rocky outcrop areas where well-developed moss and lichen cover will continue to dominate.
Wildlife observations:	Visual: Black-tailed deer (*Odocoileus hemionus*) scat, Black Swift (*Cypseloides niger*) overhead during surveys (COSEWIC endangered), American Robin (*Turdus migratorius*), Chestnut-backed Chickadee (*Poecile rufescens*), and California tortoiseshell (*Nymphalis californica*) butterfly and unidentified dragonfly species near ephemeral wetland to the east of summit.

Table 16. Vegetation Species in Ecological Community 6

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Pinus contorta (shore pine)	25						MC: uneven-aged, 15-30 yrs, ht: 15-20 m DBH: 12-20 cm
Pseudotsuga menziesii (Douglas-fir)	5						MC: uneven-aged, 15-30 yrs, ht: 15-20 m DBH: 12-20 cm
Gaultheria shallon (salal)			T				
Vaccinium parvifolium (red huckleberry)			T				
Bromus pacificus (pacific brome)				T			
Festuca occidentalis (western fescue)				T			
Pyrola picta (white-veined wintergreen)				T			
Moss Layer							**Total Moss Layer: 70%**
Cladonia macilenta (lipstick cladonia)							
Cladina portentosa (reindeer lichen)							
Dicranum spp.							
Hylocomium splendens (step moss)							
Cover by Layer (%)	**30**		**1**	**1**	**70**		**Total Canopy Cover: 30%**

Ecological Community 7. Mix of Western Hemlock - Douglas-fir / Oregon-beaked Moss (CWHdm/01); Douglas-fir - Western Hemlock / Salal (CWHdm/03)

The young mixed second growth forests in this ecological community include the Western Hemlock - Douglas-fir / Oregon-beaked Moss community and areas of the Douglas-fir - Western Hemlock / Salal site series. The forest is dominated by Douglas-fir with some older veteran trees. The community is found on mostly moderate to steep middle to lower slopes, and some cliff bands and rocky outcrops, from 100 to 500 m elevation. The understory is sparse with sword fern in moisture-receiving sites.

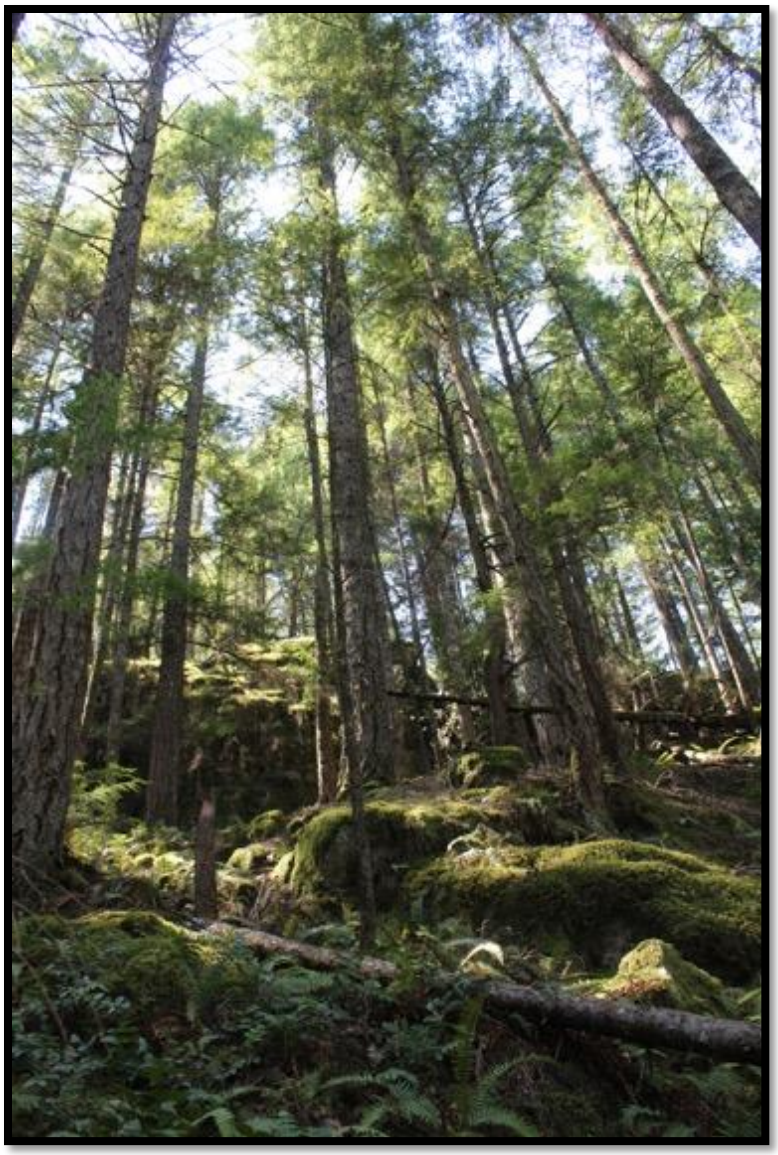

Photo 14. Young maturing Douglas-fir trees with Oregon-beaked moss and Sword Fern understory in Ecological Community 7

Table 17. Description of Ecological Community 7

Polygon ID:	Ecological Community 7
Ecological Community:	Mix of Western Hemlock - Douglas-fir / Oregon-beaked Moss and Douglas-fir - Western Hemlock / Salal.
Classification:	CWHdm/01; CWHdm/03, Transitioning to CWHxm1/01 and CWHxm1/03 at elevations below 200 m.
Structural Stage:	Young forest, with some mature/old forest attributes (veteran trees, large snags, canopy gaps). Regeneration after fire or logging.
Status (BC List):	Blue-listed
Photopoint(s):	P14
Ecological Community Description:	Second growth young mixed forest, with veteran trees, on moderately dry to moist sites. Mostly moderate to steep middle to lower slopes, with some cliff bands and rocky outcrops, from 100 to 500 m elevation. Regeneration after fire (burns on wildlife tree) and logging (stumps). Some woody debris. Mixed tree age class. Large Douglas-fir wildlife tree in polygon.
Disturbance Notes:	Infrequent stand replacement by fire and wind disturbance. Gap dynamics.
Anticipated Change/Succession:	Stand self-thinning due to density-related mortality. Slow development of old forest characteristics through tree growth and creation of gaps by natural mortality and wind.
Wildlife observations:	Visual: Black-tailed deer (*Odocoileus hemionus*) scat, Douglas' squirrel (*Tamiasciurus douglasii*) middens

Table 18. Vegetation Species in Ecological Community 7

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy+	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Pseudotsuga menziesii (Douglas-fir)	48	T					MC: 30-100 yrs, ht: 30-30 m, DBH: 30-70 cm SC: 10-15 yrs, ht: 2-3 m, DBH: 5-10 cm
Tsuga heterophylla (western hemlock)	2	T					MC: 30-40 yrs, ht: 12-25 m, DBH: 25-40 cm SC: 10-25 yrs, ht: 2-15 m, DBH: 8-20 cm
Berberis nervosa (dull Oregon-grape)			5				
Tsuga heterophylla (western hemlock) – young trees and seedlings			T				
Vaccinium membranaceum (black huckleberry)			T				
Vaccinium parvifolium (red huckleberry)			T				
Polystichum munitum (sword fern)				3			
Festuca occidentalis (western fescue)				T			
Goodyera oblongifolia (rattlesnake plantain)				T			
Linnaea borealis (twinflower)				T			
Pteridium aquilinum (bracken fern)				T			
Trientalis borealis (broad-leaved starflower)				T			
Moss Layer							**Total Moss Layer: 80%**
*Eurynchium oreganum (*Oregon-beaked moss)							
Hylocomium splendens (step moss)							
Plagiothecium undulatum (flat moss)							
Rhytidiadelphus loreus (lanky moss)							
Rhytidiopsis spp.							
Cover by Layer (%)	**50**	**1**	**6**	**4**	**80**		**Total Canopy Cover: 50%**

3.8 Wildlife Species

The reserve contains a large number of wildlife trees of many different species. These trees provide important cavity nesting sites for many bird species, as well as potential roost sites for bats. Decaying wood also provides a food source for woodpeckers, as well as habitat for invertebrates, amphibians, reptiles and other wildlife.

The wetland sites are an important source of foraging and potential breeding habitat, as well as drinking water for diversity of wildlife.

Table 19 lists the species that were noted in the reserve during surveys in August 2018. An unidentified dragonfly was also noted around the pond near the summit.

Large carnivores, such as wolves and cougars, are present on Gambier Island. Although no signs were observed during field surveys for this plan, these animals can be expected to roam through the Nature Reserve from time to time and may prey on black-tailed deer and small mammals.

Photo 15. Wildlife tree on right and woody debris in foreground in Ecological Community 3

Table 19. Wildlife Species found in MANR

Common Name	**Latin Name**
Mammals	
Black-tailed deer	*Odocoileus hemionus*
Invertebrates	
Beaded lancetooth	*Ancotrema sportella*
Lorquin's admiral	*Limenitis lorquini*
Pacific bananaslug	*Ariolimax columbianus*
Pacific sideband	*Monadenia fidelis*
Pine white	*Neophasia menapia*
Robust lancetooth	*Haplotrema vancouverense*
Reptiles	
Gartersnake sp.	*Thamnophis sp.*
Birds	
Black Swift	*Cypseloides niger*

Cassin's Vireo	*Vireo cassinii*
Chestnut-backed Chickadee	*Poecile rufescens*
Dark-eyed Junco	*Junco hyemalis*
Pileated Woodpecker	*Dryocopus pileatus*
Red-breasted Nuthatch	*Sitta canadensis*
Red-breasted Sapsucker	*Sphyrapicus ruber*
Red-tailed Hawk	*Buteo jamaicensis*
Swainson's Thrush	*Catharus ustulatus*

3.9 Expected Change Over Time

The upland forests will continue to mature and diversify over time. In areas with early seral stands of red alder, the deciduous trees will die, providing more light for understory conifers to grow. In areas with heavy deer browsing, conifer establishment may be impeded and an open-canopy stand or gap may result. There will be slow development of old forest characteristics as trees mature and gaps are created through natural mortality and wind. In areas with dense growth, there will be self-thinning due to density-related mortality.

4.0 Threats

Table 20. Threats to Mount Artaban Nature Reserve

Threats (examples below)	Mixed Forest	Wetlands & Creeks	Overall Threat Rank
Recreational Activities: Hiking can impact conservation objectives through wildlife disturbance, soil disturbance, vegetation trampling, and erosion. With potential for population growth and development near the protected area, pressure from this threat is expected to increase over time.	Low	Low	Low
Fire (catastrophic wildfire): Fire suppression results in a change of fire regime to lower-frequency and higher-intensity fires. Higher-intensity fires are also generally larger in size. A less frequent, more intense fire would potentially replace the mixed forests. Stand-replacing fires will also have potential impacts on wetlands and riparian areas due to soil erosion. Vegetation recovery post-catastrophic fire is slow and invasive terrestrial species are likely to invade into areas with bare soil.	Medium	Low	Low-Medium

Invasive Non-Native Species: A significant threat to biodiversity, second only to habitat loss (IUCN 2018). The impact on native ecosystems, habitats and species can be severe and often irreversible. MANR is in good condition with few invasive species (scattered English holly, wall lettuce). Monitoring will help ensure control of introductions.	Low	Low	Low
Problematic Native Species: Hyper-abundant black-tailed deer (*Odocoileus hemionus*) can be problematic, dramatically altering understory vegetation structure and composition and adversely affecting songbird populations (Martin et al. 2010). Overgrazing can also impact stand dynamics by limiting regeneration of new trees.	Medium	Low	Low-Medium
Human Disturbance: Increased human activity on adjacent privately managed properties (e.g. Brigade Bay subdivision) may increase the potential of unauthorized human activities, such as camping, firewood removal, land clearing, trail building, construction or other incursions within the Nature Reserve boundaries (Carey et. al. 2000 in Hopwood 2009).	Low	Low	Low
Climate Changes: The trend towards longer, drier summers and droughts in the region may have effects on the vegetation and hydrology of the site in the long term (Erwin 2009).	Unknown	Unknown	Unknown
Overall Threat Status for Protected Area	**Low-Medium**	**Low**	**Low-Medium**

Very High: The threat is likely to destroy or eliminate the biodiversity target.
High: The threat is likely to seriously degrade the biodiversity target.
Medium: The threat is likely to moderately degrade the biodiversity target.
Low: The threat is likely to only slightly impair the biodiversity target

4.1 Expected Change to Threats Over Time

Recreational activities and unauthorized human disturbance and infractions in the reserve are likely to increase over time given the increased development pressure on Gambier Island and spread of human population from the Greater Vancouver region.

The threat of catastrophic, high-intensity wildfire remains high in the region as fire suppression continues and as the climate shifts to increasingly drier summers.

Invasive species spread (predominantly English holly) will likely increase unless actively controlled.

5.0 Community Engagement

5.1 Adjacent Landholders

In preparation for the development of the Management Plan, letters were sent to all landholders and neighbours within a 100 m radius of the reserve. A total of 113 letters were sent by email on November 23rd, 2018 (Appendix D). The letters contained information about Brigade Bay Bluffs, Long Bay Wetland and Mount Artaban Nature Reserves, an invitation to a web conference and a link to an online questionnaire (see Appendix E).

5.2 First Nations

ITC has engaged with the Musqueam, Squamish, and Tsleil-Waututh First Nations regarding management planning on Gambier Island and this communication will continue.

5.3 Conservation Partners and Community Members

The Islands Trust Conservancy held a public web conference on December 14th, 2018. People attending the online conference were asked to provide input on the draft Management Plan and management planning for the reserve. Maps and photographs were presented during a brief slideshow presentation and residents were asked for their input at that time. There were six members of the public who attended online. Notice of the online questionnaire was provided to the public by ITC and partners through social media.

5.4 Engagement Results

The questionnaire was completed by nine people (four online and five mail-in responses). The nine respondents were primarily non-residents, with 78% living in Vancouver and 3 respondents had a second residence on Gambier Island. Most respondents (44%) have visited the reserve a few times and all who have visited the reserve engage in hiking/walking; many visitors brought their dogs (88%). The most important values for respondents were protection of habitat for at-risk species (89%), conservation for the sake of the intrinsic value of nature (78%), ecosystem services (67%), and low-impact recreational opportunities (67%).

6.0 Management Recommendations

The general management direction of the MANR is to allow natural successional processes to continue while allowing low impact recreational use. With the exception of fire, natural disturbances due to wind (windthrow), pest infestation, disease, and wildlife use should proceed without intervention. Only the removal of invasive plant species throughout the reserve and of hazard trees that pose an unacceptable risk to trail users are permitted. Further trail development is not recommended in order to limit fragmentation and reduce the potential future impacts to the reserve associated with additional access points.

6.1 Management Roles

The Islands Trust Conservancy is the sole landholder of the MANR but will rely on its partnership with the Gambier Island Conservancy and Sunshine Coast Conservation Association

to assist with on-the-ground management (Table 21). Since 2009, Islands Trust Conservancy has held a management agreement with the Gambier Island Conservancy (Islands Trust Fund 2009). It specifies that the Reserve should be managed by Gambier Island Conservancy in a manner consistent with the Reserve Purposes, the Management Plan, and the policies of the Board. The Islands Trust Conservancy will monitor the property annually to detect any management issues. Any issues will be reported to the covenant co-holders, Gambier Island Conservancy and Sunshine Coast Conservation Association.

Table 21. Partners involved in management of MANR.

Partner	**Role**
Island Trust Conservancy	Landholder
Gambier Island Conservancy	Covenant Holder and Management Group
Sunshine Coast Conservation Association	Covenant Holder

6.2 Permitted and Prohibited Uses

The reserve is open to the public for backcountry recreational hiking and nature appreciation on existing authorized trails. Visitors are requested to keep dogs on a leash.

The following activities by the public are prohibited:

- Hunting
- Use of motorized vehicles
- Bicycling
- Horseback riding
- Camping
- Fires
- Forestry
- Livestock grazing
- Trail development (outside of established authorized trails)
- Tree cutting
- Collection of plants or animals

6.3 Proposed Monitoring Program

Annual monitoring by Islands Trust Conservancy and the covenant holders is important to detect incidences of trespass or breach and identify management issues within the protected area. The focus of monitoring should be on the existing trail system (Figure 1) at the entry point from the south at Halkett Bay Provincial Marine Park and at the northeast corner from Mt. Artaban Road, since these are the primary access points into the reserve. Monitoring should evaluate trail erosion and determine if any prohibited uses are occurring such as tree cutting, unauthorized trails development, or use of motorized vehicles, etc.

Photo 16. MANR signage at summit

Species at risk surveys and monitoring are encouraged during appropriate times of year to assess which species are present. Acoustic bat monitoring and amphibian surveys at the high-elevation wetland sites would provide insightful data. Monitoring of invasive species spread is advisable over time so that control measures can be taken as required.

Photo 17. Trailhead signage for MANR

6.4 Public Access

There is one public access trail through the reserve, which traverses the north and south slopes of Mount Artaban. The north terminus is located off Mt. Artaban Road and enters the reserve via Long Bay Wetland Nature Reserve. The south terminus is Camp Fircom, via roads in the Fircom Plateau subdivision, or Halkett Bay via Halkett Bay Provincial Marine Park (see Section 2.1 for additional access details). No additional access points or trails should be developed; this will minimize habitat fragmentation and degradation.

Alternative access opportunities for First Nations may be established through a separate Management Plan for Areas of Cultural Heritage and Sacred Significance, which must be in compliance with the conservation covenant on the land.

6.5 Signage

There are nature reserve entrance and boundary signs at the trailhead on Mt. Artaban Road (Photo 17), a sign at the summit (Photo 16), and some directional signage on the trails. Just below the summit at the south end of the trail, there is another decorative wooden nature reserve entrance sign. There are a few places along the trail where red metal markers have been nailed to trees to highlight the trail route. As trees grow, these metal directional finders can grow into the tree bark and be damaging to trees. These should be removed and replaced with painted blazes. Low-toxicity fluorescent paint could be used with a stencil to place trail wayfinders where required. Removing the nails and signs will prevent injury to the trees. Islands Trust Conservancy contact information should be included on all signs so the public knows who to contact with questions and comments about the reserve and its trails.

Photo 18. Directional signage along trail on tree

6.6 Trail Use, Maintenance and Development

The trail through MANR is in good condition as it is periodically maintained by Gambier Island Conservancy members. Ongoing and consistent trail maintenance is necessary to help guide the public and keep them on the designated trails, as well as to minimize the potential for people to become lost.

No other trails should be installed; this will prevent fragmentation within the reserve.

6.7 Protection Initiatives for Sensitive Ecosystems and Species and Ecosystems at Risk

Given the paucity of wetlands throughout the Islands Trust area (ITC 2018), the riparian and wetland habitats within the reserve deserve the highest protection. Wetlands and riparian areas provide important habitat for wildlife and care should be taken to avoid impacts on these sensitive ecosystems. Limiting further trail development and maintaining the existing trail to limit erosion will help protect these sensitive areas.

6.8 Ecological Restoration Options

Minimal ecological restoration is required in the Nature Reserve as there are no current erosion concerns or habitat degradation. The reserve's ecological communities should be allowed to develop into mature forest.

6.9 Scientific Research/Education Opportunities

To date, no scientific research or educational activities have been conducted on the reserve. Future research could include extensive species at risk surveys and monitoring during peak season for a variety of species, such as rare plants, mosses and lichens, bats, birds, gastropods and amphibians.

6.10 Exotic and Invasive Species Management

Invasive English holly (*Ilex aquifolium*) is scattered in places within Ecological Community 3. The plants are small and they are not currently widespread. Efforts should be made to remove these species before they can produce large, long-lasting seedbanks and spread into adjacent habitats.

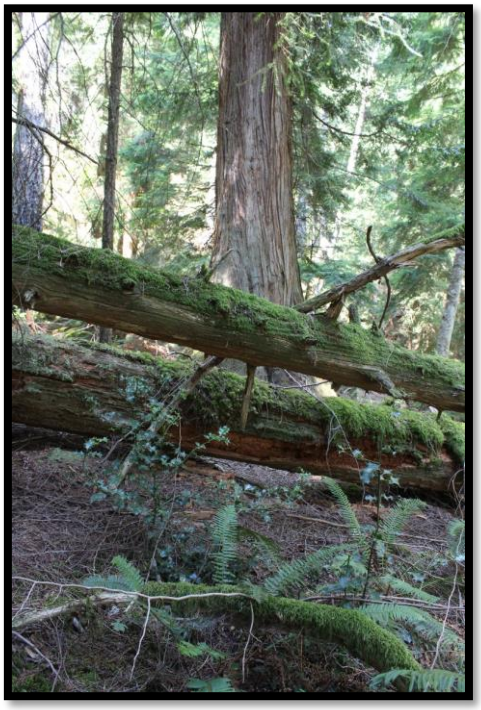

Photo 19. Invasive English holly in foreground (noted in Ecological Community 3)

6.11 Wildfire Risk Management

Wildfire and wildfire suppression can be extremely damaging to sensitive ecosystems. Development of a fire management plan in consultation with the Gambier Fire Equipment Group and BC Wildfire Service to identify optimum suppression techniques is recommended. This information should be provided to the province to be included in their annual fire plan. Salt water and fire retardants should not be used for fire suppression since both can cause ecological damage to sensitive ecosystems. There are two freshwater lakes on Gambier that should be used for bucketing in the event of a wildfire (Gambier Island Community 2018). In addition, road building for fire suppression access and fire breaks needs to be addressed in the fire management plan and avoided.

6.12 Climate Change Impacts and Management

Climate change may alter the distribution of ecosystems across the landscape, vegetation patterns, or hydrology, and may lead to outbreaks of pests. Hotter, drier summers may lead to premature drying of wetlands and altered flow rates in seasonal streams. Trends that may prevail in this region include up-slope migration of the tree line and ecosystem boundaries, and increased fire frequency. Douglas-fir-dominated stands will expand at the cost of Coastal Western Hemlock (CWH) forests, which are expected to shift upslope (Hebda 1997). Ensuring ongoing protection and connectivity between large protected areas will aid the dispersal of species into new habitats and across elevations as vegetation patterns shift with climate change. These protected area matrices will provide potential reservoirs for dispersal into suitable habitats in adjacent areas as climate change shifts the distribution of these ecosystem types (McCloskey et.al. 2009).

7.0 Action Items

Management Plan action items are measurable and achievable tasks that the ITC and partners can complete to ensure that the protected area is managed in the best possible way. The following management action items are based on recommendations made in this Management Plan and listed in priority sequence, subject to available funding resources.

7.1 Immediate Actions (1-2 years)

1. Continue to work with the Gambier Island Conservancy and the Sunshine Coast Conservation Association to complete management activities.
2. Identify opportunities for cooperative management with First Nations.

7.2 Short term Actions (3-5 years)

1. Remove metal wayfinder markers along the trail and replace with spray painted markings to avoid long-term damage to trees while ensuring that the trail is well marked for public safety. Consultation with BC Parks staff may be required to ensure consistent marking over the length of the trail.
2. In consultation with the local fire authorities, prepare a wildfire management plan that considers both forest ecology and prevention of damage to surrounding neighbourhoods.
3. Initiate development of parallel Management Plan for Areas of Cultural Heritage and Sacred Significance documents with First Nations.

7.3 Long term Actions (5+ years)

1. Conduct surveys for species at risk and other wildlife (e.g. amphibians, bats) to provide a better understanding of the natural values of the reserve.

7.4 Ongoing or Annual Action Items

1. Conduct annual monitoring to identify management concerns, including impacts from public use (e.g. trail monitoring) and invasive species.
2. Communicate annually with the Gambier Island Conservancy and Sunshine Coast Conservation Association to provide updates on the reserve, seek approvals for stewardship activities as necessary, and maintain compliance with the conservation covenant.
3. Work with First Nations towards cooperative management of the reserve using a Management Plan for Areas of Cultural Heritage and Sacred Significance as a guide.
4. Conduct ongoing maintenance of trails and signs.
5. Continue to inform the public of the natural values of the site, and the permitted and prohibited uses, through information placed in local publications.

8.0 Conclusion

Mount Artaban Nature Reserve is an important landmark and protected area that spans a large elevation range and connects with a wide network of other protected areas and provincially managed forests on Gambier Island. These features are important for climate change adaptability in a region that will likely face imminent climate change impacts.

Islands Trust Conservancy will act on the management action items identified in this plan to achieve the vision, objectives and purpose of the Nature Reserve. Future management issues may lead to further action items that will be identified in work plans and in future revisions of this plan.

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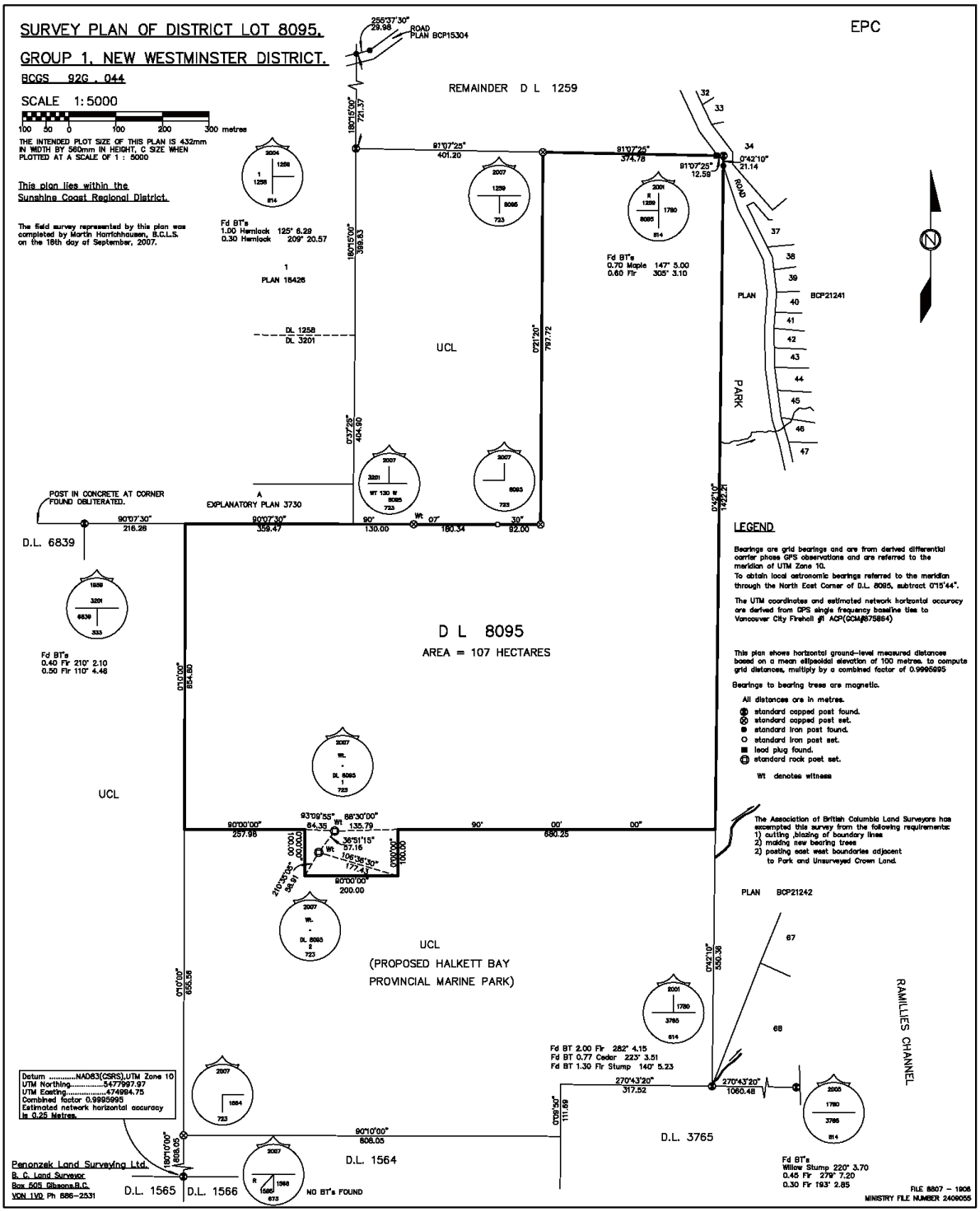
10.0 Appendices

Appendix A. Survey Plan for MANR



Appendix B. Vegetation Found in MANR

Common Name	Latin Name	Status
Acer macrophyllum	Bigleaf maple	
Adiantum aleuticum	Maidenhair fern	
Agrostis spp.	Bentgrass	Introduced
Aira praecox	Early hairgrass	Introduced
Alnus rubra	Red alder	
Amelanchier alnifolia	Saskatoon	
Athyrium filix-femina	Lady fern	
Berberis nervosa	Dull Oregon-grape	
Blechnum spicant	Deer fern	
Bromus pacificus	Pacific brome	
Carex exisiccata	Western inflated sedge	
Carex spp.	Sedge	
Circium vulgare	Bull thistle	Introduced
Cladonia macilenta	Lipstick cladonia	
Cladonia portentosa	Reindeer lichen	
Dactylis glomerata	Orchard grass	Introduced
Dicentra formosa	Bleeding heart	
Dicranum spp.	Dicranum moss	
Digitalis purpurea	Foxglove	Introduced
Dryopteris expansa	Spiny wood fern	
Epilobium ciliatum	Purple-leaved willowherb	
Epipactis helleborine	Broadleaf helleborine	Introduced
Eurynchium oreganum	Oregon-beaked moss	
Festuca occidentalis	Western fescue	
Galium triflorum	Sweet-scented bedstraw	
Gaultheria shallon	Salal	
Goodyera oblongifolia	Rattlesnake plantain	
Holodiscus discolor	Oceanspray	
Hylocomium splendens	Step moss	
Ilex aquifolium	English holly	Introduced

Juncus effusus	Common rush	
Linnaea borealis	Twinflower	
Mycelis muralis	Wall lettuce	Introduced
Penstemon davidsonii	Davidson's penstemon	
Pinus contorta	Lodgepole pine	
Plagiothecium undulatum	Flat moss	
Plantago major	Common plantain	Introduced
Polypodium glycerrhiza	Licorice fern	
Polystichum munitum	Sword fern	
Polytrichum juniperinum	Juniper haircap moss	
Prunella vulgaris	Selfheal	
Pseudotsuga menziesii	Douglas-fir	
Pteridium aquilinum	Bracken fern	
Pyrola picta	White-veined wintergreen	
Ranunculus uncinatus	Little buttercup	
Rhytidiadelphus loreus	Lanky moss	
Rhytidiopsis spp.		
Ribes lobbii	Gummy gooseberry	
Rosa gymnocarpa	Baldhip rose	
Rubus spectabilis	Salmonberry	
Rubus ursinus	Trailing blackberry	
Salix scouleriana	Scouler's willow	
Thuja plicata	Western redcedar	
Tiarella trifoliata	Three-leaved foamflower	
Trientalis borealis	Broad-leaved starflower	
Tsuga heterophylla	Western hemlock	
Vaccinium caespitosum	Dwarf blueberry	
Vaccinium membranaceum	Black huckleberry	
Vaccinium parviflorium	Red huckleberry	
Veronica beccabunga	American speedwell	
Veronica serpyllifolia	Thyme-leaved speedwell	Introduced
Viola sempervirens	Evergreen violet	

Appendix C. Photographic Documentation

PHOTO STATION	LOCATION (UTM Coordinates)	DIRECTION	PHOTO-GRAPHER	DATE YYYY-MM-DD	DESCRIPTION
Anthropogenic Features as noted on Figure 1					
P16	476130; 5480906		LM	2018-08-07	Trailhead and boundary signs.
P17	475339; 5479709	90°	LM	2018-08-07	Summit sign to respect the environment. Two iron hooks embedded in rocks by sign.
P18	475776; 5480615		LM	2018-08-07	Directional wooden trail sign on tree with Carrina Maslovat.
Natural Features as noted on Figure 1					
P1	475430; 5482397	180°	LM	2018-08-09	Howe Sound, view of Mount Artaban and Brigade Bay. Note smoky haze from nearby forest fire in Horseshoe Bay.
P2	475339; 5479709	90°	LM	2018-08-07	View from summit looking east towards Coast Mountains across Howe Sound.
P3	475962; 5480335		LM	2018-08-08	Douglas-fir veteran tree with fire scars, sword fern and some English holly in foreground, within Ecological Community 2 plot.
P4	475886; 5480792	178°	LM	2018-08-08	Ecological Community 1 plot centre – Large western redcedar stump.

P5	475839; 5480720		LM	2018-08-07	Creekbed with maidenhair fern, some water still flowing.
P6	475367; 5479483	180°	LM	2018-08-07	Dried ephemeral wetland just below summit on east side of Mount Artaban, approximately 8 x 40 m.
P7	475301; 5479568	180°	LM	2018-08-07	Dried ephemeral wetland below summit on west side of Mount Artaban in forest. Photo from centre of pond, pond about 25 m x 10 m with some sedges throughout.
P8	475886; 5480792	239°	LM	2018-08-08	Ecological Community 1 plot centre – Upslope western redcedar and gully.
P9	475986; 5480674	260°	LM	2018-08-08	Ecological Community 2 plot centre – Upslope with Douglas-fir, western hemlock, Oregon-beaked moss habitat.
P10	475972; 5480319	270°	LM	2018-08-08	Ecological Community 2 plot centre – Large western redcedar, fire scars in foreground on woody debris and in background on Douglas-fir.
P11	476013; 5480440	168°	LM	2018-08-08	Ecological Community 4 (05/03) plot centre – Western redcedar / sword fern habitat.
P12	475271; 5479624	205°	LM	2018-08-07	Ecological Community 5 plot centre – Note minimal understory.

P13	475353; 5479492	180°	LM	2018-08-07	Centre plot Ecological Community 6 with mossy bluffs, shore pine and Douglas-fir.
P14	475862; 5480473	242°	LM	2018-08-08	Ecological Community 4 (01/03) plot centre – Upslope Douglas-fir, Oregon-beaked moss, sword fern.
P15	475972; 5480319	160°	LM	2018-08-08	Ecological Community 2 plot centre – Red alder wildlife tree on right.
P19	475967; 5480323		LM	2018-08-08	Invasive English holly in foreground, western redcedar veteran tree within Ecological Community 2 plot.

* LM=Laura Matthias

Appendix D. Letter to Neighbours

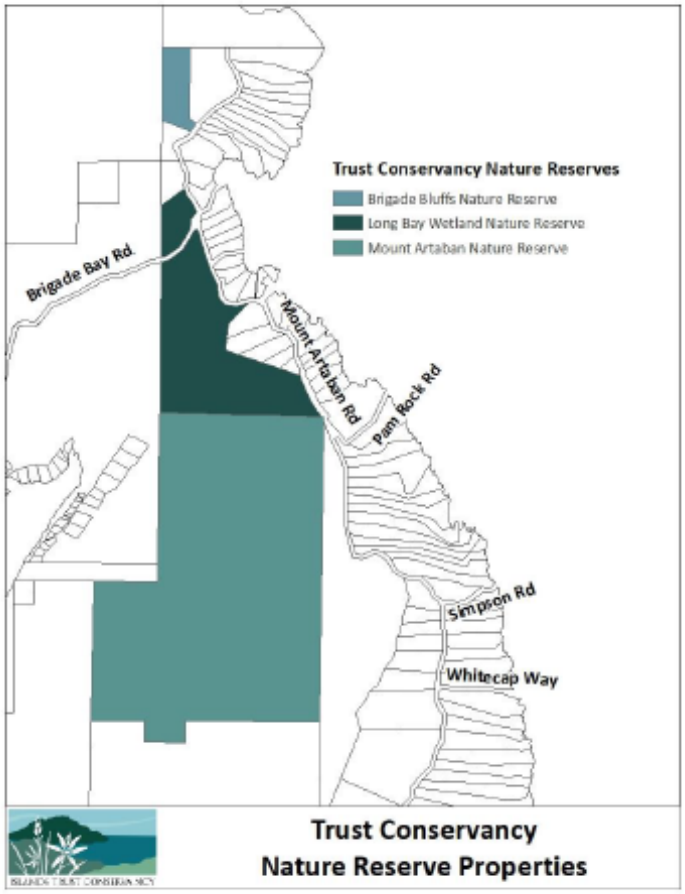
ISLANDS TRUST CONSERVANCY

Protecting Canada's Islands in the Salish Sea

November 23, 2018

Dear Neighbour,

The Islands Trust Conservancy is updating the management plans for three nature reserves on eastern Gambier Island (see map below) and we want to hear from you.



Brigade Bay Bluffs Nature Reserve is a 5.14 hectare (12.70 acre) parcel located northwest of Brigade Bay marina off Mt. Artaban Road.

Long Bay Wetland Nature Reserve is 38 hectares (91 acres) and is located west of Brigade Bay marina and borders Mt. Artaban Road.

Mount Artaban Nature Reserve is 107 hectares (264 acres) and is south of Brigade Bay marina and can be accessed via a trail through Long Bay Wetland Nature Reserve or from the south through Halkett Bay Provincial Marine Park.

The Islands Trust Conservancy manages the nature reserves in partnership with the Gambier Island Conservancy and the Sunshine Coast Conservation Association to protect their unique ecological values. The

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properties contain open bluffs, maturing forests, streams, wetlands and the peak of Mount Artaban. The reserves are important for their connections to other undeveloped and protected lands on the island.

There are restrictions on the use of the properties outlined in conservation covenants that are held by the Gambier Island Conservancy and Sunshine Coast Conservation Association. These covenants were put in place to protect the native plants and animals on the reserve. The previous management plans written in 2005 and 2009 can be found on our website as follows

- Management Plan for Mount Artaban: http://www.islandstrustconservancy.ca/media/10352/itfmgmtplanartaban.pdf
- Management Plan for Brigade Bay Bluffs and Long Bay Wetland: http://www.islandstrustconservancy.ca/media/10346/itfmgmtplanbbay.pdf

How to Participate

1) Fill in our survey: We would like to hear your ideas and concerns regarding the long-term management of these special places. Please complete a questionnaire on our website: http://www.islandstrustconservancy.ca/gambier-survey/ or complete the enclosed questionnaire and send it to me by email or mail.

2) Join our web conference: To learn more about the management of the nature reserves and to share your questions and ideas, join the conference on your computer, tablet or smartphone:
   Gambier Nature Reserves
   Wed, Dec 12, 2018 7:00 PM - 8:00 PM PST
   https://global.gotomeeting.com/join/375421301
   If you contact us, we can also send you the link electronically.

Many thanks for taking the time to consider the management of these three nature reserves. For more information, please contact me at the number or email below.

Yours sincerely,

Nuala Murphy
Property Management Specialist, Islands Trust Conservancy
Phone: 250-405-5193
Email: nmurphy@islandstrust.bc.ca

The Islands Trust Fund has changed its legal name to the Islands Trust Conservancy. Please visit us on our updated website at www.islandstrustconservancy.ca.

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Appendix E. Questionnaire sent to Neighbours and Available Online

Brigade Bay Bluffs, Long Bay Wetland and Mount Artaban Nature Reserves, Gambier Island Questionnaire

Brigade Bay Bluffs (5.14 hectare/12.70 acre), Long Bay Wetland (38 hectares/91 acres) and Mount Artaban (107 hectares/264 acres) Nature Reserves are protected areas on east Gambier Island. They have significant watershed values and contain rare ecosystems which are listed as either threatened or endangered in British Columbia. They are important because of their connectivity to large areas of contiguous protected lands.

Mount Artaban Nature Reserve was protected in 2008 through the Provincial Free Crown Grant Program. Brigade Bay Bluffs and Long Bay Wetland Nature Reserves were donated in 2005 as part of the Brigade Bay subdivision development. All three properties are protected by conservation covenants held by the Gambier Island Conservancy and the Sunshine Coast Conservation Association.

The Islands Trust Conservancy's primary goal is to protect and nurture the sensitive ecosystems on these lands. To do that, we create a management plan, with revisions approximately every 10 years, to guide the management of the property. We are asking you to help us with the update for these three plans. Please share your thoughts on the protection and long-term management of these nature reserves.

1. Where do you live?

- ◯ Gambier Island
- ◯ Sunshine Coast
- ◯ Vancouver
- ◯ Other

2. Have you ever visited Mount Artaban, Brigade Bay Bluffs or Long Bay Wetland Nature Reserve? If so, how often?

- ◯ No, never
- ◯ Once
- ◯ A few times
- ◯ Once a year or less
- ◯ Once a month or more

3. Which reserve do you visit most frequently?

- ◯ Brigade Bay Bluffs Nature Reserve
- ◯ Long Bay Wetland Nature Reserve
- ◯ Mount Artaban Nature Reserve

4. If you have visited the Nature Reserves on Gambier Island, what did you do there?

- ◯ Hiking/walking
- ◯ Dog walking
- ◯ Wildlife viewing
- ◯ Other (please list)

5. Please list any wildlife and unique plant species you have seen at or near any of these Nature Reserves (please indicate which reserve for each species).

6. What do you believe to be the most important values of nature reserves (choose three)?

- ◯ Protection of habitat for at-risk species
- ◯ Ecosystem services (e.g. clean water and air, erosion control, groundwater recharge, etc.)
- ◯ Low impact recreational opportunities
- ◯ Education and research opportunities
- ◯ Tourism
- ◯ Aesthetic appeal
- ◯ Conservation for the intrinsic value of nature
- ◯ Other (please specify):

7. What activities do you believe are incompatible with the protection of natural features, and should not be allowed within any of these nature reserves?

8. What do you feel could be the greatest threat to each of these nature reserves, and should be the highest management priority for the Islands Trust Conservancy?

Brigade Bay Bluffs:

Long Bay Wetland:

Mount Artaban:

9. Please provide any other relevant information that will help us make the best management decisions for any of these nature reserves.

10. Please share with us any history you know about these properties or any knowledge you have about unique cultural or other special features on the properties or nearby (please indicate which reserve).

11. If you would like to receive periodic updates from the Islands Trust Conservancy on this and other conservation projects on the islands, please provide your name and email address or sign up for our latest news at www.islandstrustconservancy.ca:

Thank you for your time spent helping us plan the future of the Brigade Bay Bluffs, Long Bay Wetland, and Mount Artaban Nature Reserves.