Brigade Bay Bluffs Nature Reserve Management Plan
Gambier Island, BC

PREPARED FOR:

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

Brigade Bay Bluffs and Long Bay Wetland Nature Reserves
joint management plan prepared: November 30, 2005

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APPROVED BY:
Islands Trust Conservancy, October 1, 2019: ITC-2019-037
Gambier Island Conservancy, November 13, 2019
Sunshine Coast Conservation Association, October 24, 2019

i. Executive Summary

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.

In January 2005, the Islands Trust Conservancy (then the Islands Trust Fund) protected two parcels of land west of Brigade Bay on eastern Gambier Island. The Brigade Bay Bluffs (5.14 hectares/12.7 acres) and Long Bay Wetland (38 hectares/94 acres) areas were transferred as part of the Brigade Bay subdivision development. Cascade Environmental Resource Group Ltd. prepared the initial joint management plan for the Brigade Bay Bluffs and Long Bay Wetland properties. In 2018, the Management Plans were updated as separate documents for each reserve.

The Brigade Bay Bluffs Nature Reserve (BBNR) is located to the northwest of Brigade Bay. The reserve consists of a steep forested area with rocky bluffs and outcroppings. The elevation ranges from 60 to 240 m. The area has been selectively harvested, resulting in large deciduous species and pole/sapling-sized conifers. Some large veteran trees (bigleaf maple, Douglas-fir, and western hemlock) remain in areas with steeper terrain. Although the forests are young, they will mature into blue- and red-listed ecological communities. Some reforestation and protection of seedlings from deer browsing has been done within the reserve. BBNR is an important part of a large, contiguous natural area within the Coastal Western Hemlock Very Dry Maritime (CWHxm) subzone on Gambier Island.

The management objectives for BBNR are to:

- preserve and protect the natural ecosystems, biological diversity and natural values of the site;
- restore plant and animal communities and ecological process at the site;
- support ongoing inventory, mapping and monitoring to guide management;
- manage invasive plant species throughout the reserve; and
- allow natural forest succession and natural ecological processes and functions to proceed unimpeded without human intervention, except in the case of wildfire or other exceptional situations where remediation is considered imperative.

Key management recommendations are to remove invasive species, continue restoration of areas with slow regeneration, and develop a wildfire management plan. Further inventories for species at risk would provide a clearer picture of the ecology of the reserve and guide future management.

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Name	**Position/Affiliation**	**Professional Accreditation or subject expertise**	**Contribution**
Carrina Maslovat	Botanist/Contractor	R.P. Bio.	Primary author, field data collection
Laura Matthias	Species at Risk Biologist/Subcontractor		Secondary author, field data collection
Nuala Murphy	Property Management Specialist/Islands Trust Conservancy		Background information and mapping, local contacts
Jemma Green	Property Management Specialist/Islands Trust Conservancy		Document review
Doug Hopwood	Biologist	R.P.F.	Provided background history, prepared the baseline report
Peter Scholefield	Volunteer/Gambier Island Conservancy		Background data, assistance with field logistics, document review
Jason Herz	Conservation Committee Chair/Sunshine Coast Conservation Association		Review of document

Ruth Simons	Volunteer/Gambier Island Conservancy		Background data and assistance with field logistics, facilitated access via Brigade Bay Marina
Cascade Environmental Resource Group Ltd.	Consultant		Prepared the original (2005) management plan

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. The Brigade Bay Bluffs Nature Reserve (BBNR), along with Long Bay Wetland Nature Reserve (38 ha), on Gambier Island was protected by the Islands Trust Conservancy (ITC) in 2005. The properties were transferred by Coastland Wood Industries Ltd. and Mike Jenks as part of the Brigade Bay subdivision development (see survey, Appendix A).

Cascade Environmental Resource Group Ltd. developed the initial Management Plan for both the Brigade Bay Bluffs and Long Bay Wetland Nature Reserves in 2005 (Cascade 2005). In 2018/19, the Management Plans for both properties were updated and written as separate documents for each property.

The Gambier Island Conservancy and the Sunshine Coast Conservation Association co-hold the conservation covenant on the land.

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 2018a)

In 1990, through the enactment of a section of the 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 and since 1990 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. As with this plan, the *Management Plan for Areas of Cultural Heritage and Sacred Significance* must be in accordance with the conservation covenant registered on the land.

1.4 Protected Area Purpose

The purpose of the BBNR is to preserve and protect the representative ecosystems and natural values of the site (including any rare and endangered plant and animal species), 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 objectives of the Islands Trust Conservancy and the Islands Trust.

1.5 Protected Area Objectives

The objectives for the BBNR are:

1. Preserve and protect the representative ecosystems, biological diversity and natural values.
2. Restore plant and animal communities and ecological processes where necessary.
3. 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.
4. Support ongoing inventory, mapping and monitoring to guide management.
5. Allow natural forest succession and natural ecological processes and functions to proceed unimpeded without human intervention, except in the case of wildfire or other exceptional situations where remediation is considered imperative.
6. Remove invasive species throughout the reserve where they compromise natural values.

2.0 Property Information

Brigade Bay Bluffs Nature Reserve is 5.14 hectares (12.70 acres) in size.

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 BBNR from the dock at New Brighton. There is a Gambier Island trail network but the route to the BBNR from New Brighton is lengthy, not direct, and the trail is not well marked or signed in places.

BBNR is best accessed from the public dock at Camp Artaban, at the head of Long Bay. There is a short public trail through the camp property, then along the Brigade Bay Road easement through the Gambier Island Sea Ranch property to Mt Artaban Road in the Brigade Bay subdivision. This is about a 30 minute hike. It is another 5 minute walk north on Mt Artaban Road to the Nature Reserve. The public dock at Camp Artaban can be reached by regularly scheduled water taxi runs from Horseshoe Bay on weekends and on Wednesday evenings in the summer. There are two nearby private marinas, one at the Sea Ranch and the other at Brigade Bay. For those who are not property owners at either location, permission is required to access the marinas.

There are currently no designated trails within the reserve.

2.2 Legal description

The BBNR is legally described as PID: 015-940-870, District Lot 1257, Group 1, New Westminster District, Except, Firstly Part in Reference Plan 2829, Secondly Part Subdivided by Plan BCP15304.

2.3 Legal Access

Legal access to the BBNR is off Mt. Artaban Road, 1 km north of Brigade Bay Marina, which goes through the Brigade Bay subdivision (Figure 1). There is no trail.

2.4 Landscape Context

Gambier Island is located in Howe Sound, one of the many islands governed by the Islands Trust (see Figure 1 for location and protected area context). The BBNR is located on the east side of Gambier Island, northwest of Brigade Bay, overlooking Howe Sound. Directly to the north is privately-managed land and directly south is the Brigade Bay subdivision with 68 privately managed lots. To the east is a municipal park (38 ha) and to the west is provincially-managed land (3517 ha). Although it is a small parcel, the BBNR plays an important role in enhancing the habitat values of the area through connectivity and proximity to other undeveloped and protected lands on the island.

Approximately 275 m to the south along Mt. Artaban Road, there is another large, contiguous protected area which includes Long Bay Wetland Nature Reserve (ITC), Mt. Artaban Nature Reserve (ITC), Halkett Bay Provincial Marine Park (BC Parks), Pete Shields Park (Sunshine Coast Regional District), and provincially-managed lands (totaling 790.45 ha).

Photo 2. View of Howe Sound from BBNR, looking south to Mt. Artaban and Brigade Bay.

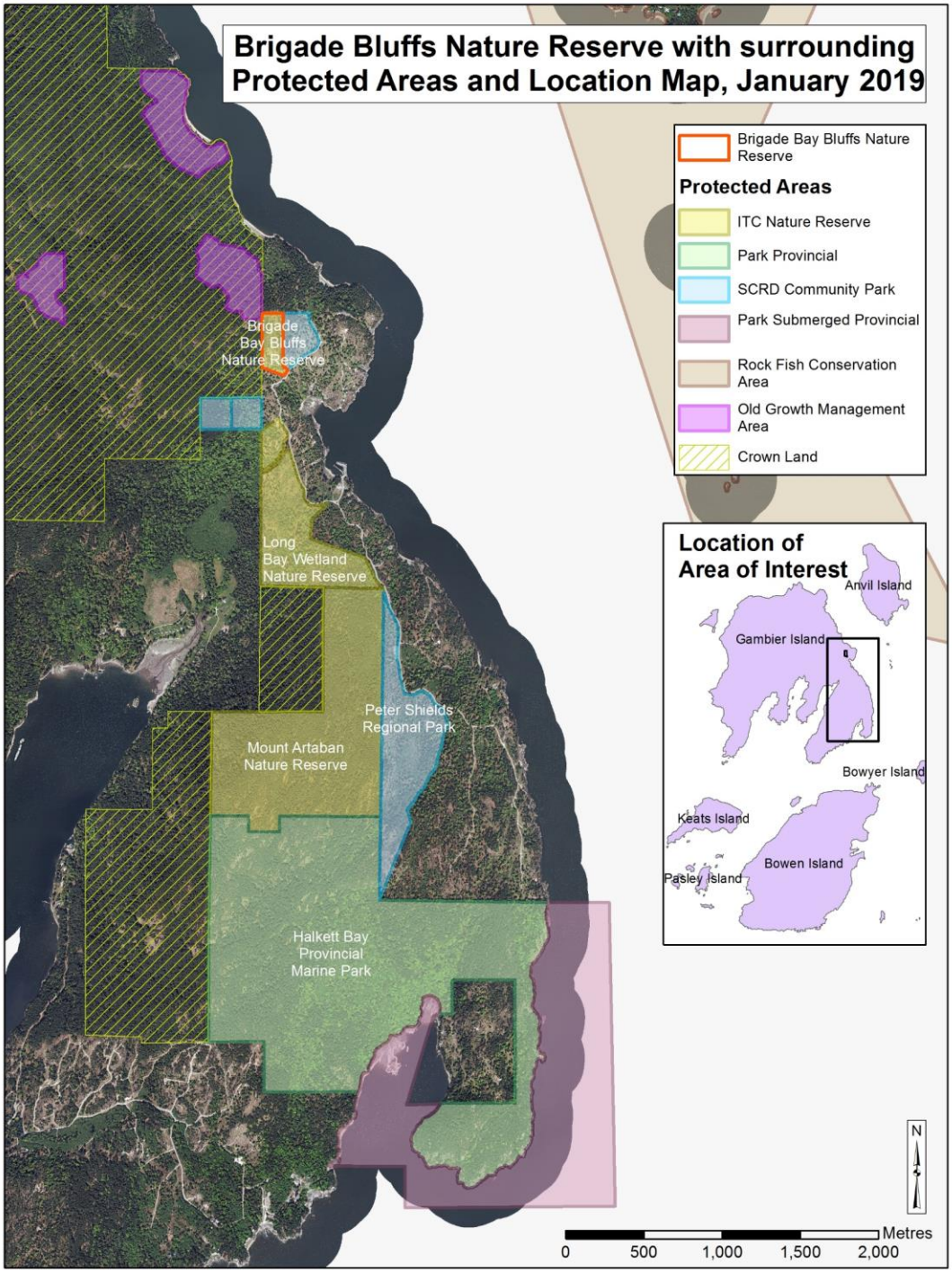

Figure 1. Location of Gambier Island (inset), and protected areas context surrounding the BBNR (reserve boundary outlined in orange). A complimentary map of marine protected area zones is provided in Schedule B of Gambier Island Land Use Bylaw #86 (Islands Trust 2004).

2.5 Site History[1]

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 are located on Brigade Bay, which are protected under the *Heritage Conservation Act* (Cascade 2005). The adjacent properties in 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). Consultation between 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, plant collection, and as a camp site and safe haven for members of the Squamish Nation traveling in Howe Sound (FOC, December 2, 2003 in Cascade 2005).

The Brigade Bay area had a settler homestead, probably during the 1920s, and the buildings remained until the 1980s (Hopwood 2013). A questionnaire respondent noted that there may have been a smelting facility in the Brigade Bay area.

The reserve area was burned by a human-caused fire, which ignited on July 9, 1922 (Parminter pers. comm. in Hopwood 2009).

The reserve was logged, probably in the 1920s (shortly before or after the fires), and regrowth was from natural regeneration (Hopwood 2013). A recent selective harvest in most of the reserve occurred in 2000-2001 (Cascade 2005).

An Environmental Assessment was completed in 2001 for the Brigade Bay subdivision (CERG 2001 in Cascade 2005). Planning for the subdivision began in 2000 and residential lots were put on the market in 2004. The Islands Trust Conservancy acquired the Nature Reserve through a transfer in 2005.

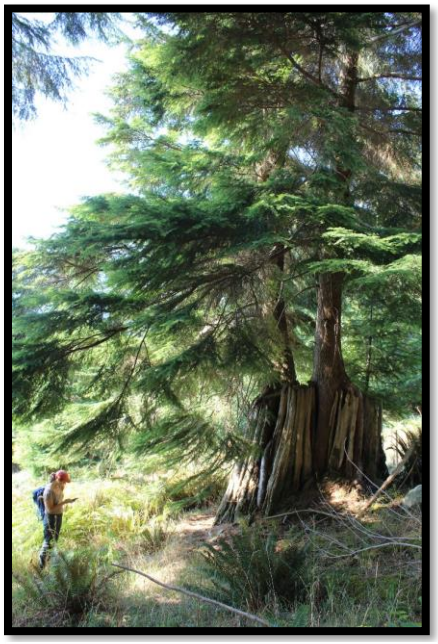

Photo 3. Large stump from logged Western Redcedar with new regrowth.

[1] 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."

2.6 Anthropogenic Features

There are no structures or buildings within the reserve. At this time, no archaeological sites have been identified within BBNR.

Table 2. Anthropogenic features in BBNR.

Anthropogenic Feature	Description	Condition	Photopoint Location
Boundary marker	Small Covenant Boundary sign near Mt. Artaban Road on lower slopes of reserve.	Good	No photo 475522; 5482227
Boundary sign	Boundary sign behind large rock at northern road edge of Nature Reserve.	Good	P9; Figure 3 475548; 5482280
Caging around replanted native trees	Douglas-fir planted and caged during restoration efforts in cleared area below bluffs.	Good	P8, P11; Figure 3 475541; 5482271
Boundary iron pin	Boundary marker along southern boundary of reserve	Good	No photo 475439; 5482267
Corner boundary marker	Iron pin at southwest corner of reserve	Good	No photo 475373; 5482287
Boundary iron pin	Boundary marker along southern boundary of reserve	Good	No photo 475515; 5482236
Corner boundary marker	Boundary marker in northeast corner of reserve	Good	No photo 475502; 5482628

2.7 Undersurface Rights

The title shows no undersurface rights designated for BBNR.

2.8 Notations, Charges, Liens and Interests

A Section 219 Conservation Covenant (Registration Number: CA3219707) and Section 218 Statutory Right of Way (Registration Number: CA3219708) were registered over the lands in 2013 in favour of Gambier Island Conservancy and Sunshine Coast Conservation Association.

The general intent of the covenant 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.

The Statutory Right of Way outlines permitted access and activities for the Covenant Holders.

2.9 Local Planning Designations

BBNR is within Development Permit Area #3 which protects all mapped and unmapped streams on Gambier Island under the Riparian Areas Regulation (Islands Trust 2018b).

The reserve is zoned G2 (Nature Reserve). The purpose of this zone is to maintain and enhance the ecological values, ecosystems and unique areas of nature reserves and sanctuaries. Permitted uses within the zone include ecosystem preservation use, water recharge use, trail use, fish and wildlife habitat protection use, and accessory use including but not limited to fire protection (Islands Trust 2018b).

2.10 Existing Public, First Nations, and Other Use

Brigade Bay Bluffs 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 are no existing public trails in the reserve and public use is minimal. Access to the reserve is from the southeast corner that abuts the Mt. Artaban Road.

3.0 Inventory by Ecological Community

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 BBNR. 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.

3.1 Ecological Significance

The BBNR ranges in elevation from 60-240 m and includes steep rocky outcrops and mossy bluffs. The site has been selectively logged, leaving behind large deciduous trees, a few veteran coniferous trees in steep areas and regenerating pole-sapling conifers in much of the reserve. Most of the reserve is within the Coastal Western Hemlock Very Dry Maritime subzone although at elevations above 200 m the subzone transitions to the dry maritime subzone. There are no significant hydrological features and most surface water flows south to feed Gambier Creek on the adjacent privately-managed property and east to the ocean.

No species at risk have been recorded. Black-tailed deer (*Odocoileus hemionus*) sign was noted throughout the reserve. Turkey Vultures (*Cathartes aura*) were flying over the bluffs and may use the cliff sites for basking or nesting.

Table 3. Ecological Communities in BBNR.

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
Douglas-fir–Lodgepole Pine/Grey Rock-moss Very Dry Maritime (CWHxm1/02)	*Pseudotsuga menziesii–Pinus contorta/Racomitrium canescens*	S2 (2004)	Red	GNR
Douglas-fir–Western Hemlock/Salal Very Dry Maritime (CWHxm1/03)	*Pseudotsuga menziesii–Tsuga heterophylla/Gaultheria shallon*	S2S3 (2013)	Blue	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

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. The maritime influence moderates the effect of elevation, latitude, and aspect on local temperature and precipitation.

The weather statistics for the adjacent Bowen Island station show the annual precipitation is approximately 1507 mm and most of it comes in the form of rain rather than snow (The Weather Network 2018). On Bowen Island, 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 2). The reverse is true for precipitation, with the winter months from November to January having the highest rainfall (averaging 506-420 mm) and July and August being the driest months (58-78 mm) (Meteoblue 2018).

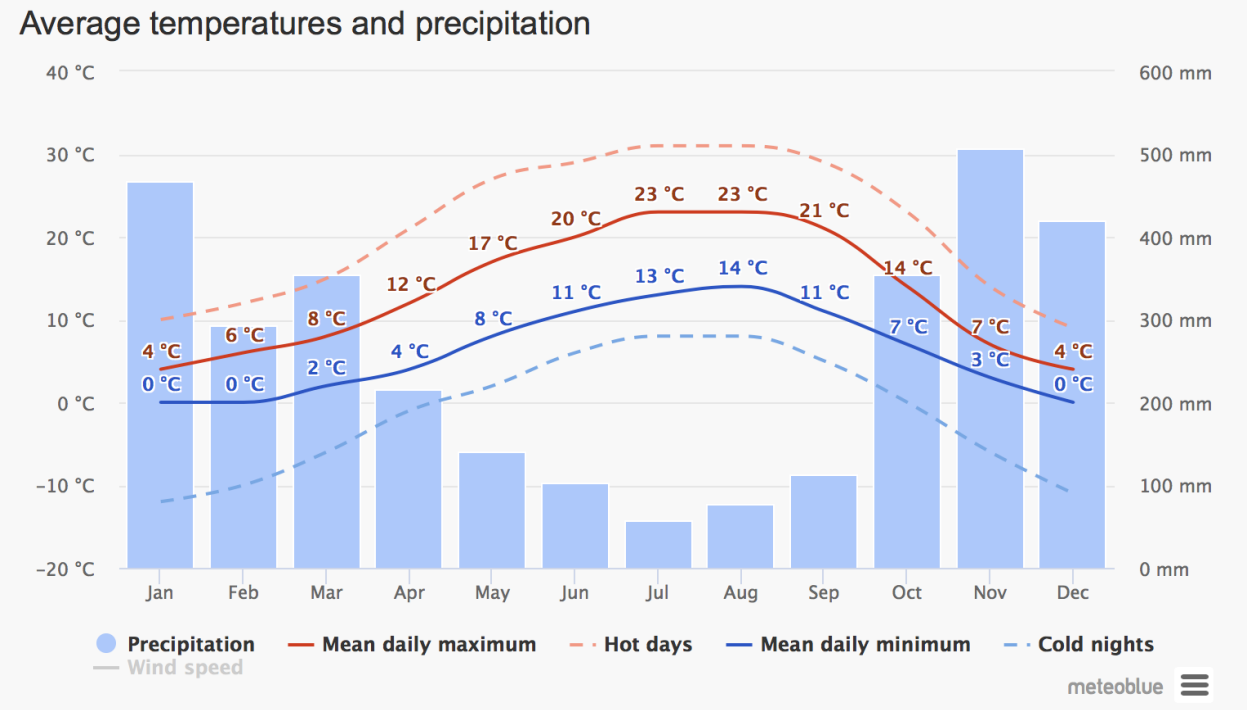

Figure 2. Canadian climate normals for temperature and precipitation at Bowen Island weather station, British Columbia from 1985-2018 (Meteoblue 2018).

The future impacts from climate change are unknown, although a summer drying trend and an increase in storm events are predicted (Mauger et.al. 2015). More powerful storms may cause increasing erosion. Dryer summers may impact the wetlands and riparian hydrology and may shift the vegetation community away from western redcedar (*Thuja plicata*), allowing the spread of Douglas-fir (*Pseudotsuga menziesii*). 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 adapting to climate change stresses.

3.3 Geology and Physiology

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). These stratified rock formations are composed of andesitic to dacitic tuff, breccia agglomerate, andesite, argillite, conglomerate, lesser marble,

greenstone, and phyllite (BC Ministry of Energy and Mines 2005 in Cascade 2005). Intrusive rock of the Coast Plutonic complex, such as quartz diorite and diorite, occur in the vicinity (Cascade 2005). Regional fault systems are predominantly northwest striking.

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).

Within the reserve, the topography is dominated by rocky outcrops and bluffs that are roughly southwest to northeast in direction. Bedrock is overlain by a veneer of colluvium and glacial till, except where glacial processes removed these materials and only a thin organic layer has since accumulated (Cascade 2005).

Photo 5. Rocky bluff habitat in higher elevations of BBNR.

Photo 5. Moisture-shedding steep gully with stumps from previous logging.

3.4 Hydrology

Most of the reserve is upper slope and moisture shedding. There are no wetlands or streams within the reserve. Surface water sheds primarily to the south to Gambier Creek and to the west to the ocean.

3.5 Soils

Humo-Ferric Podzols are the most widely distributed soils of the area, with glacial till overlying bedrock that results in well drained soils. Primary mineral deposits are colluvial and glacial derived. Soil processes that are characteristic of this submaritime forest include Mor humus formation (associated with the accumulation of acid organic matter), leaching, eluviation, and illuviation (Meidinger and Pojar 1991 in Cascade 2005).

3.6 Ecological Classifications

The BBNR area is within the Very Dry Maritime subzone (xm) of the Coastal Western Hemlock Zone (CWH) (Green and Klinka 1994). 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. The Reserve is within the Pacific Maritime Ecozone and the Georgia Puget Basin Ecoregion (Lands Directorate 1986).

3.7 Ecological Communities and Site Series

The previous management plan for BBNR delineated one ecological community based on Terrestrial Ecosystem Mapping (TEM). The baseline inventory for the Reserve identified five units (Hopwood 2013). This updated management plan follows the latter delineation of five types. The ecological descriptions were collected on August 8th, 2018 with supplemental details added from the baseline report (Hopwood 2013).

Site series were identified using *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* (Green and Klinka 1994) (Map 3). Structural stage was as defined in "Standards for Terrestrial Ecosystems Mapping in British Columbia" (RIC 1998).

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

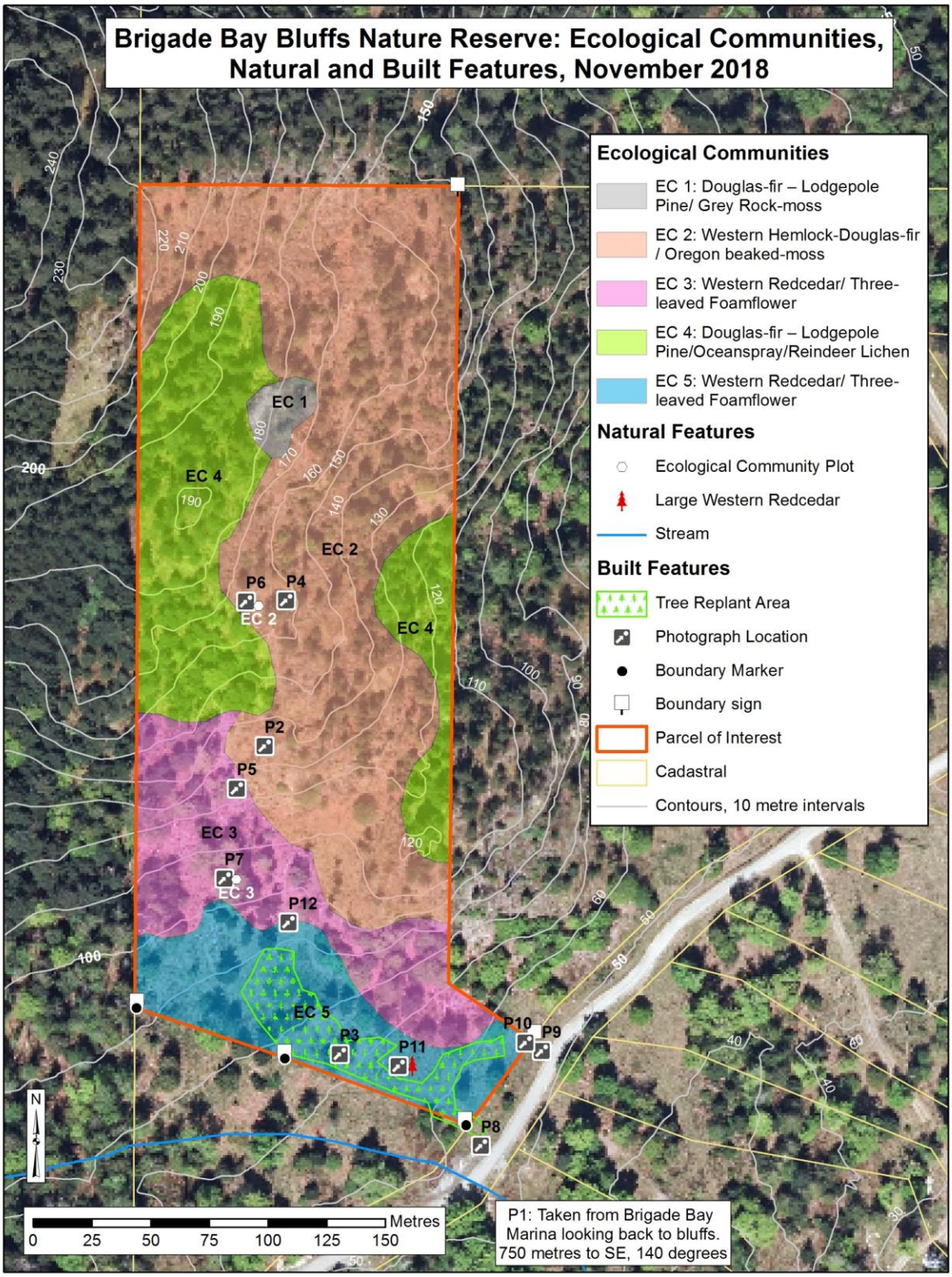

Figure 3. Ecological Communities in BBNR with photopoint locations, vegetation plots, and signage.

Ecological Community 1. Douglas-fir–Lodgepole Pine/Grey Rock Moss

Ecological Community 1 is at the summit of a rocky bluff and is dominated by mosses and lichens. The site is dry and well drained with a small number of shrubs, forbs and grasses growing in small soil pockets. Because of its lack of trees, the community was not disturbed by the logging that occurred in the remainder of the reserve.

Table 4. Description of Ecological Community 1.

Polygon ID:	Ecological Community 1
Ecological Community:	Douglas-fir–Lodgepole Pine/Grey Rock Moss
Classification:	CWHxm1/02
Structural Stage:	Sparse/bryoid
Status (BC List):	Red-list
Photopoint(s):	None
Ecological Community Description:	Dry cliffs and rock outcrops at top of slope. Dominated by moss and lichens with scattered herbs and shrubs in crevices with more soil depth. Tree layer absent due to drought and thin soils. Shrub layer sparse.
Disturbance Notes:	Undisturbed by prior logging since trees are absent. Fires and drought may influence vegetation patterns over time.
Anticipated Change/Succession:	Minor changes expected
Wildlife observations:	Visual: Turkey Vultures soaring over bluffs

Table 5. Vegetation Species in Ecological Community 1.

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Amelanchier alnifolia (saskatoon)			1				
Holodiscus discolor (oceanspray)			1				
Dicentra Formosa (Pacific bleeding heart)				T			
Digitalis purpurea (foxglove)				T			
Polypodium glycyrrhiza (licorice fern)				T			
Grasses				20			
Moss and Lichen Layer							**Total Moss Layer: 40-80 %**
Cladina portentosa (maritime reindeer lichen)							
Dicranum species							
Polytrichum juniperinum (juniper haircap moss)							
Racomitrium canescens (grey rock-moss)							
Selaginella wallacei (Wallace's selaginella)							
Cover by Layer (%)	**0**	**0**	**2**	**20**	**40-80**		**Total Canopy Cover: 0%**

Ecological Community 2. Western Hemlock–Douglas-fir/Oregon beaked-moss

Ecological Community 2 represents early seral forest that is slowly recovering after logging in 2000 or 2001. Soils are very dry and thin with some minor tree re-establishment in soil pockets. Aspect is primarily east to south. Vegetation consists of a regenerating secondary canopy of Douglas-fir, western hemlock, western redcedar and bigleaf maple, with variation depending on microsite moisture, generally dry upper slopes, and moist lower slopes. There are a few scattered residual trees that were not logged.

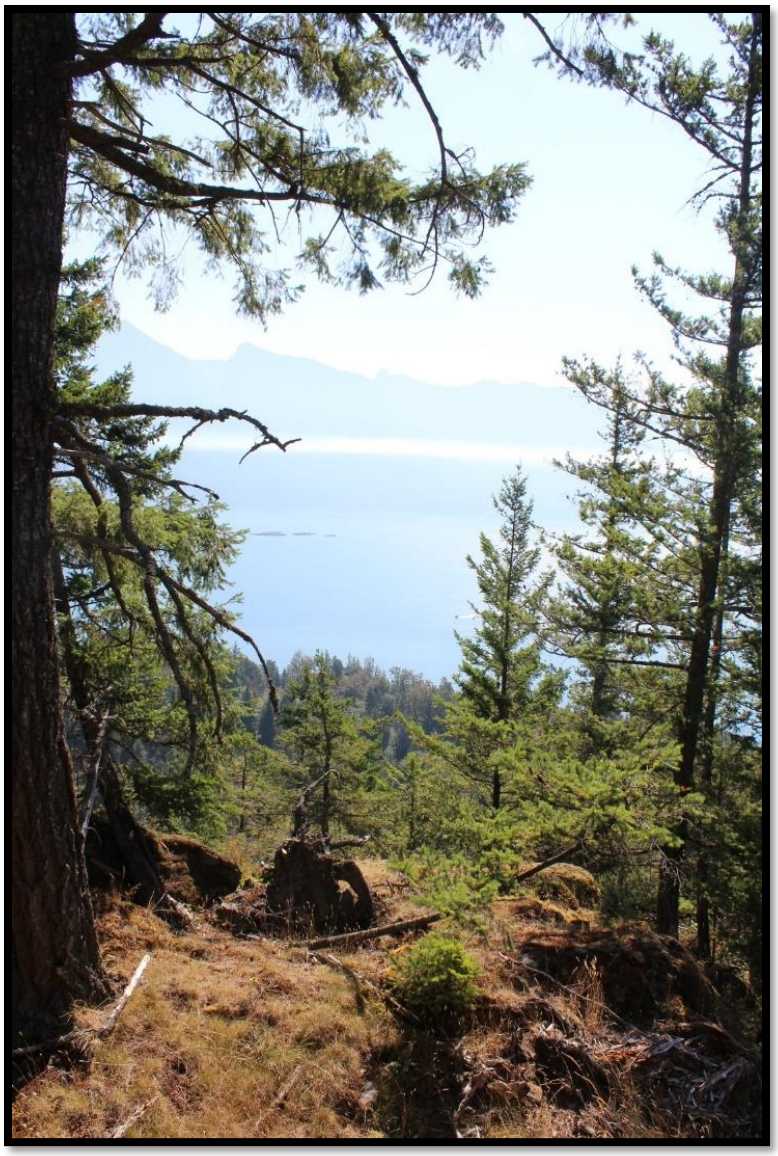

Photo 6. Steeply sloped terrain; note stump in photo from previous logging.

Table 6. Description of Ecological Community 2.

Polygon ID	Ecological Community 2
Ecological Community	Western Hemlock–Douglas-fir/Oregon Beaked-moss; Western Redcedar/ Three-leaved Foamflower; with small portions of Douglas-fir–Western Hemlock/Salal
Classification	CWHxm1/01; CWHxm1/07; (CWHxm1/03)
Structural Stage	Shrub/herb
Status (BC List)	Red-listed/Blue-listed
Photopoint(s)	P6
Ecological Community Description	Shrubs and scattered trees on logged-over dry to moist sites with steep terrain and bluffs. Extremely thin soils with soil pockets in hollows that support sparse regenerating trees and shrubs.
Disturbance Notes	Seventy year-old second growth Douglas-fir stand clear-cut in 2000/2001 with very little subsequent tree regeneration. Fire scars evident on remnant trees. One Douglas-fir stump and one Douglas-fir with fire scar in plot.
Anticipated Change/Succession	Low regeneration due to steep terrain and deer browsing. May be impacted by future wildfire or windthrow. Minor changes expected.
Wildlife observations	Visual: Black-tailed deer (*Odocoileus hemionus*) scat, Turkey Vultures (*Cathartes aura*) flying overhead. There are perching sites for raptors, browse for deer, and seeds for birds and small mammals.

Table 7. 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)	4	2					MC: 30-80yrs, Ht: 7-18m, DBH: 25-80cm. Old Douglas-fir with fire scars in plot. SC: 5-10yrs, Ht: 3-5m, DBH: 5-15cm
Thuja plicata (western redcedar)	1	1					MC: 20-30yrs, Ht: 15-20m, DBH: 30-40cm SC: 10yrs, Ht: 3m, DBH: 8-10cm
Pinus contora (lodgepole pine)		2					SC: 15-20yrs, Ht: 7-8m, DBH: 18cm
Prunus emarginata (bitter cherry)		T					
Achillea millefolium (yarrow)			T				
Berberis nervosa (dull Oregon-grape)			T				
Danthonia spicata (poverty oatgrass)			T				
Gaultheria shallon (salal)			T				
Holodiscus discolor (oceanspray)			T				
Rosa gymnocarpa (baldhip rose)			T				
Rubus ursinus (trailing blackberry)			T				
Salix scouleriana (Scouler's willow)			T				
Elymus glaucus (blue wildrye)				T			
Festuca idahoensis (Idaho fescue)				T			
Goodyera oblongifolia (rattlesnake plantain)				T			
Holcus lanatus (common velvetgrass)				T			
Luzula multiflora (many-flowered wood-rush)				T			
Polystichum munitum (sword fern)				T			
Pteridium aquilinum (bracken fern)				T			

Zigadenus venenosus (death camas)				T			
Digitalis purpurea (foxglove)						T	
Senecio jacobaea (tansy ragwort)						T	
Moss and Lichen Layer							**Total Moss Layer: 80%**
Cladina spp. (reindeer lichen)							
Hylocomium splendens (step moss)							
Rhytidiadelphus triquetrus (electrified cat's-tail moss)							
Cover by Layer (%)	**5**	**4**	**1**	**1**		**1**	**Total Canopy Cover: 5%**

Ecological Community 3. Western Redcedar/Three-leaved Foamflower

This ecological community represents a mixed residual forest on moist mid and lower slopes in the southern portion of the BBNR. The moisture regime supports a relatively dense understory of ferns and other shrubs. There are larger bigleaf maple veteran trees and a mixture of scattered smaller conifer trees. Limited conifer regeneration has occurred due to deer browsing pressure, keeping the forest relatively open.

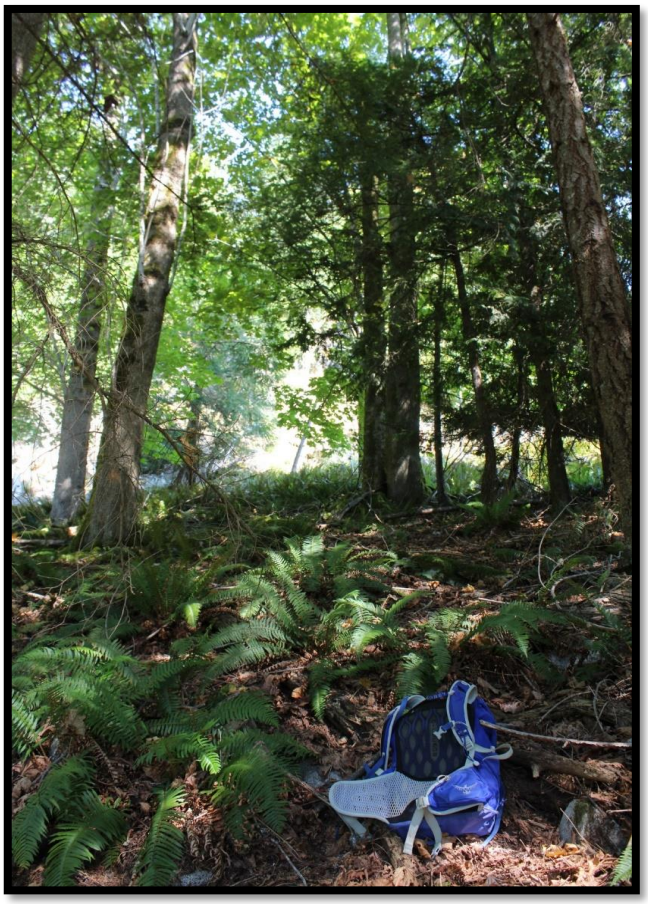

Photo 7. Dense sword fern understory with large bigleaf maple and Douglas-fir trees.

Table 8. Description of Ecological Community 3.

Polygon ID:	Ecological Community 3
Ecological Community:	Western Redcedar/Three-leaved Foamflower; with small portions of Western Redcedar/Sword Fern
Classification:	CWHxm1/07; (CWHSM1/05)
Structural Stage:	Shrub/herb (poor regeneration areas) to Mature Forest (residual deciduous species)
Status (BC List):	Blue-listed
Photopoint(s):	P7
Ecological Community Description:	Disturbed mid-seral mixed residual forest on moist mid and lower slopes. Dominated by residual bigleaf maple with understory composed of sparse vegetation with leaf litter and duff. South-facing, moderate slope at toe of bluffs. Elevation 95 m. One red alder (*Alnus rubra*) snag in plot.
Disturbance Notes:	Small residual patch of forest beside cleared area. Bigleaf maple trees are older but conifers are younger with poor regeneration outside of residual patch.
Anticipated Change/Succession:	Over time, the site will shift to more coniferous species with regeneration and maturing forest.
Wildlife observations:	Aural: Common Raven (*Corvus corax*), Western Tanager (*Piranga ludoviciana*) Visual: Oregon lancetooth (*Ancotrema hybridum*)

Table 9. Vegetation species in Ecological Community 3.

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy	Secondary Canopy	Shrub Layer	Herb Layer	Moss, Lichen Layer	Non-natives	
Acer macrophyllum (bigleaf maple)	55						MC: 80-120yrs, Ht: 15-20m, DBH: 50-75cm
Pseudotsuga menziesii (Douglas-fir)	15	1					MC: 20-40yrs, Ht: 10-15m, DBH: 25-35cm. SC: 15-20yrs, Ht: 10-12m, DBH: 10-15cm
Thuja plicata (western redcedar)	5	1					MC: 50-70yrs, Ht: 15-18m, DBH: 45cm SC: 10-15yrs, Ht: 3-5m, DBH: 10-15cm
Tsuga heterophylla (western hemlock)	5						MC: 30-40yrs, Ht: 15m, DBH: 30cm
Vaccinium parvifolium (red huckleberry)			T				
Polystichum munitum (sword fern)				40			
Bromus pacificus (Pacific brome)				T			
Rubus ursinus (trailing blackberry)				T			
Digitalis purpurea (foxglove)						T	
Mycelis muralis (wall lettuce)						T	
Moss and Lichen Layer							**Total Moss Layer: 0%**
Cover by Layer (%)	**80**	**2**	**<1**	**40**		**< 1**	**Total Canopy Cover: 80%**

Ecological Community 4. Douglas-fir – Lodgepole Pine/Oceanspray/Reindeer Lichen

This ecological community is a complex of steep rugged rock outcrops and bluffs interspersed with narrow, moisture-receiving draws. Most residual trees are immature, but a few patches of mature and older trees were left unlogged. The dominant tree canopy is Douglas-fir with lodgepole pine (*Pinus contorta*) at higher elevations and small amounts of western redcedar and western hemlock in more moisture-receiving sites. There are scattered veteran Douglas-fir trees. The aspect is primarily to the east.

Table 10. Description of Ecological Community 4.

Polygon ID:	Ecological Community 4
Ecological Community:	Douglas-fir–Lodgepole Pine/Oceanspray/Reindeer Lichen; Douglas-fir–Western Hemlock/Salal; Western Hemlock–Douglas-fir/Oregon beaked-moss; Western Redcedar/Sword Fern
Classification:	CWHxm1/02; CWHxm1/03; CWHxm1/01; CWHxm1/05
Structural Stage:	Young Forest
Status (BC List):	Red-listed/blue-listed
Photopoint(s):	None
Ecological Community Description:	Steep rock outcrop and bluffs interspersed with narrow draws.
Disturbance Notes:	Selective logging has led to variable tree cover and age. Most residual trees are immature but a few patches of mature and old trees were left unlogged.
Anticipated Change/Succession:	Over time the forest will mature and diversify.
Wildlife observations:	Veteran Douglas-fir trees will provide perching and possibly nesting habitat for raptors.

Table 11. 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)	30	5					MC: 60-80yrs, Ht:10-25m, DBH: 15-60cm with vets up to 28 m tall and 120 cm DBH. SC: 1-50 years, Ht: 1-10 m; DBH: 0-15 cm
Pinus contorta (lodgepole pine)	10						MC: 60-80yrs, Ht:10-25m, DBH: 15-60cm
Thuja plicata (western redcedar)	1						
Tsuga heterophylla (western hemlock)	1						
Cornus nuttallii (Pacific dogwood)							
Gaultheria shallon (salal)			10				
Holodiscus discolor (oceanspray)			5				
Mahonia nervosa (dull Oregon-grape)			5				
Rosa gymnocarpa (baldhip rose			T				
Rubus ursinus (trailing blackberry)			T				
Vaccinium parvifolium (red huckleberry)			T				
Polystichum munitum (sword fern)				40			
Pteridium aquilinum (bracken fern)				10			
Grasses				2			
Digitalis purpurea (foxglove)						T	
Ilex aquifolium (English holly)						T	
Moss and Lichen Layer							**Total Moss Layer: 20%**
Dicranum sp.							
Eurhynchium oregonum (Oregon beaked moss)							
Hylocomium splendens (step moss)							
Polytricum juniperinum (juniper haircap moss)							

Rhytidiadelphus loreus (lanky moss)							
Cover by Layer (%)	**40**	**5**	**20**	**52**		**<1**	**Total Canopy Cover: 40%**

Ecological Community 5: Western Redcedar/Three-leaved Foamflower

Ecological Community 5 consists of dense non-native grasses with scattered trees and shrubs on moist, rich slopes below the bluffs. The 70-year-old second growth forest was clear cut and forest regeneration is slowed by the dense thatch of the invasive grasses. Trees are isolated but restoration efforts, which include planting and caging conifer seedlings, will help re-establish forest canopy over time.

Photo 8. Previously logged area with planted and caged native tree reforestation.

Table 12. Description of Ecological Community 5.

Polygon ID:	Ecological Community 5
Ecological Community:	Western Redcedar/Three-leaved Foamflower
Classification:	CWHxm1/07
Structural Stage:	Herb
Status (BC List):	Blue-list
Photopoint(s):	P8
Ecological Community Description:	Dense non-native grass community with scattered trees and shrubs on moist, rich lower slopes
Disturbance Notes:	Clear cut in 2000/2001, followed by colonization by primarily non-native grass species (either intentionally sown or seeded in from nearby agricultural areas). The site is capable of supporting a western redcedar/ Three-leaved Foamflower community but the clearcut logging and subsequent colonization by grasses has altered the community to the point that development of a natural ecological community may require ongoing restoration actions.
Anticipated Change/Succession:	With successful restoration, over time the forest will mature and develop the characteristics of a maturing forest. Eventually, the non-native grasses and thistles will be shaded out. Infrequent fires may replace the stand.
Wildlife observations:	Pine white (*Neophasia menapia*) and woodland skipper (*Ochlodes sylvanoides*) butterflies observed nectaring on tansy ragwort (*Jacobaea vulgaris*) and thistles (*Cirsium* spp.) just outside of the ecological community plot.

Table 13. 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)		1					SC:50-70 years; Ht: 2-10 m; DBH: 20-50cm
Pseudotsuga menziesii (Douglas-fir)		1					
Alnus rubra (red alder)		1					
Thuja plicata (western redcedar)		1					
Gaultheria shallon (salal)			3				
Ilex aquifolium (English holly)						T	
Mahonia nervosa (dull Oregon-grape)			2				
Sambucus racemosa (red elderberry)			T				
Vaccinium parvifolium (red huckleberry)			T				
Digitalis purpurea (foxglove)						T	
Polystichum munitum (sword fern)				1			
Pteridium aquilinum (bracken fern)				4			
Grasses				80			
Urtica dioica (stinging nettle)				T			
Moss and Lichen Layer							**Total Moss Layer: 5-15%**
Atrichum selwynii							
Eurhynchium oreganum (Oregon beaked-moss)							
Plagiomnium insigne (badge moss)							
Cover by Layer (%)		**4**	**5**	**90**	**5**		**Total Canopy Cover: %**

3.8 Wildlife Species

The open rocky bluffs and outcrops provide excellent habitat for reptiles such as the northern alligator lizard. Black-tailed deer scat was noted in the lower slopes of the reserve. Turkey vultures were soaring over the bluffs and likely use the area for basking and they may have nest sites in the rocky outcrops. The reserve likely provides habitat for a wide range of birds but the field surveys were not done at an ideal time for assessing bird activity. An anonymous questionnaire respondent noted that Bald Eagles (*Haliaeetus leucocephalus*) nest in the reserve. A few butterfly species were noted in the lower open slopes of the reserve.

Table 14. Wildlife Species Observed in BBNR in 2018.

Common Name	**Latin Name**
Mammals	
Black-tailed deer	*Odocoileus hemionus*
Invertebrates	
Lorquin's admiral	*Limenitis lorquini*
Oregon lancetooth	*Ancotrema hybridum*
Pine white	*Neophasia menapia*
Woodland skipper	*Ochlodes sylvanoides*
Reptiles	
Northern alligator lizard	*Elgaria coerulea*
Birds	
Common Raven	*Corvus corax*
Northern Flicker	*Colaptes auratus*
Turkey Vulture	*Cathartes aura*
Western Tanager	*Piranga ludoviciana*

3.9 Expected Change over Time

There may be ongoing regeneration of forest trees over time in areas previously logged, although regeneration is limited by the thick grasses coupled with high herbivory pressure. Additional reforestation efforts and protection of tree seedlings from browse would assist in regeneration. Remnant forested areas and new conifer growth will continue to mature and diversify over time.

4.0 Threats

Table 15. Threats to Natural Values in BBNR.

Threats (examples below)	Mixed Bluff Forest	Rocky Bluffs	Mixed Lower Forests	Overall Threat Rank
Recreational Activities: Hiking can impact conservation targets through wildlife disturbance, soil disturbance, vegetation trampling, and erosion. With potential for increasing population and development near the protected area, this threat to conservation targets is expected to increase in severity over time. There are no hiking trails in the reserve; however, off-trail pedestrian activity is a concern, particularly in sensitive rocky bluff habitat near Mt. Artaban Road.	Low	Medium	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. Vegetation recovery post-catastrophic fire is slow and invasive terrestrial species are likely to invade into areas with bare soil.	Medium	Low	Low	Low
Lack of Tree Regeneration: After logging in 2000-2001, there has been little regeneration of native trees in some areas of the reserve due to deer browsing pressure. The lack of regeneration in Vegetation Types 2, 3 and 4 presents a risk of increasing colonization by invasive non-native plant species, such as English holly (*Ilex aquifolium*), Scotch broom (*Cytisus scoparius*), foxglove (*Digitalis purpurea*) and non-native grasses.	Medium	N/A	Medium	Medium
Invasive Non-Native Species: Invasive non-native species are 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. Invasive non-native English holly is established in Vegetation Types 3, 4 and 5, and foxglove is established in Vegetation Types 1, 2, and 4.	Low	Low	High	Low

Ecological Community 5 is dominated by non-native grasses.				
Problematic Native Species: Hyper-abundant black-tailed deer (*Odocoileus hemionus*) can be problematic, limiting natural regeneration, dramatically altering understory vegetation structure and composition, and adversely affecting songbird populations (Martin et al. 2011).	Medium	Low	Medium	Medium
Human Disturbance: Increased human activity in adjacent private land lots (e.g. Brigade Bay subdivision) may increase the potential risk of unauthorized human activities such as land clearing, trail building, construction, or other incursions into the Nature Reserve boundaries (Carey et. al. 2000).	Low	Low	Low	Low
Climate Changes: The trend towards longer, drier summers and droughts in the region may impact the survival of tree seedlings over time.	Unknown	Unknown	Unknown	Unknown
Overall Threat Status for Protected Area	**Low-Medium**	**Low**	**Low**	**Low**

4.1 Expected Change to Threats over Time

Recreational activities and unauthorized human disturbance and infractions into 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 climate appears to be shifting to increasingly drier summers and fire suppression remains active in the region.

Lack of native tree regeneration will likely remain consistent given the ongoing threat of herbivory and landscape changes from logging in 2000-2001. Ongoing replanting of native trees will help restore areas with poor regeneration and may shade out some invasive species in the long-term.

Invasive species spread will likely increase without a concerted effort at control. Ongoing removal and control efforts will be required because these invasive species form large, persistent seed banks.

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

At this time ITC staff have and will be engaging with Musqueam, Squamish, and Tsleil-waututh First Nations regarding management planning on Gambier Island.

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 given to the general public by ITC and its 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 three respondents having 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 BBNR is to allow natural successional processes. With the exception of fire, natural disturbance factors due to wind (windthrow), pest infestation, disease, and wildlife use should proceed without intervention. Only the removal of invasive plant species is permitted. Trails will not be developed and public use will not be encouraged in order to limit fragmentation and reduce potential future infractions into the reserve from additional access points. The terrain in the reserve makes it impossible to create safe trails that will not jeopardize public safety. Restoration is recommended to help re-establish trees in areas with low recruitment.

6.1 Management Roles

The Islands Trust Conservancy is the sole landholder of the BBNR but will rely on its partnership with the Gambier Island Conservancy and the Sunshine Coast Conservation Association to assist with on-the-ground management (Table 16). 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 16. Conservation Partners in BBNR.

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 hiking and nature appreciation; however, there are no existing trails in the reserve as a strategy to discourage use due to the steep terrain and sensitive rocky bluff habitat.

The following activities by the public are prohibited:

- Hunting
- Use of motorized vehicles
- Bicycling
- Horseback riding
- Camping
- Fires
- Forestry
- Livestock grazing
- Trail development
- Tree cutting
- Collection of plants or animals

6.3 Proposed Monitoring Program

Annual monitoring by the covenant holders and by managers of the Reserve is important to ensure that there are no infractions or management issues occurring within the protected area. The main focus of monitoring should be along Mt. Artaban Road since this is the primary access into the reserve. Monitoring should determine if any prohibited uses are occurring, such as tree

cutting, unauthorized trail development, use of motorized vehicles, etc., and inspect for any damage to sensitive habitats by hikers. The proposed monitoring route (roadside monitoring from Mt. Artaban Road, as there is no trail access and terrain is very challenging) is in agreement with the route used by previous monitors (Figure 3).

Species at risk surveys and monitoring are encouraged during appropriate times of year to assess which species are present. Monitoring of invasive species spread is advisable over time so that control measures can be taken as required. The regrowth of planted trees should be monitored and the protective cones removed as needed.

Photo 9. BBNR boundary signage along Mt Artaban Rd.

6.4 Public Access

There are no existing public trails in the reserve. Access is located off Mt. Artaban Road (see Section 2.1 for additional details).

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 is one roadside boundary sign. See Map 2 for locations. Signage is sufficient and should be maintained. When signs are updated, it is recommended that general contact information for the Islands Trust Conservancy be included on signs. If more adjacent development occurs bordering the Nature Reserve, additional signage should be considered. Trail counters could be installed in likely high-traffic access areas to determine how many people are accessing the bluffs. If public access becomes a concern, an interpretive sign identifying the sensitivity of the area and directing or discouraging pedestrian use of the rocky bluff habitat could be added at the road access point.

6.6 Trail Use, Maintenance and Development

There are no trails within the Nature Reserve due to the steep terrain and limited access. Development of trails is not recommended; this is to ensure public safety and avoid habitat fragmentation and degradation, particularly in the sensitive rocky bluff areas.

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

Trails should not be developed in the Reserve to avoid impacts or degradation and erosion to sensitive steep rocky bluff habitat.

6.8 Ecological Restoration Options

In 2017, a 0.25-ha area of the lower slopes adjacent to the Mt. Artaban Road access received the following restoration: planting of nursery seedlings (22 Douglas-fir), protecting natural seedlings in situ (3 Douglas-fir, 17 western redcedar), and transplanting and protecting natural seedlings from nearby areas (14 western redcedar) (Hopwood 2017). Trees that have been planted in restoration efforts should be monitored annually and cages removed once the trees have grown to a suitable size to be able to withstand some browsing by deer. Further restoration efforts may be required in other areas with poor regeneration and native shrubs could be planted to increase diversity. Species chosen for restoration should be those currently found within the reserve (Appendix A). Site-specific planting recommendations should be made by a biologist because differences in microsite will support different vegetation.

Photo 11. Uncaged western redcedar seedling heavily browsed by deer.

Photo 11. Caged Douglas-fir seedling.

6.9 Scientific Research/Education Opportunities

No research has been conducted to date on the property. Possible future research could include 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 tansy ragwort has established in Vegetation Types 2 and 5 and foxglove has established in Vegetation Types 2 and 3. Efforts should be made to remove these species because they produce large, long-lasting seedbanks and will continue to spread into adjacent habitats.

Photo 12. Invasive species including Tansy Ragwort, Foxglove, and Bull Thistle in logged area (Ecological Community 5) of BBNR.

6.11 Wildfire Risk Management

Wildfire and wildfire suppression can be extremely damaging to sensitive ecosystems. Developing a fire management plan in consultation with the Gambier Fire Equipment Group and BC Wildfire Service to identify optimum (i.e. least damaging) fire suppression techniques is recommended. This information should be provided to the province to be included in their annual fire plan. If possible, it is preferred that salt water or fire retardants are not 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 case of a wildfire (Gambier Island Community 2018).

6.12 Climate Change Impacts and Management

Climate change may impact the distribution of ecosystems across the landscape, affecting vegetation patterns, hydrology, and 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 upslope migration of tree lines 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 areas of protected ecosystems will aid the dispersal of species into new habitats and across elevations as vegetation patterns shift. 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

7.1 Immediate Actions (1-2 years)

1. Continue to work with the Gambier Island Conservancy and Sunshine Coast Conservation Association to complete management activities as funds allow.
2. Monitor planted trees for survival and remove cages as necessary.

3. Identify opportunities for cooperative management with First Nations.

7.2 Short Term Actions (3-5 years)

1. Prepare a wildfire management plan that considers both forest ecology and prevention of damage to surrounding neighbourhoods in consultation with the local fire authorities.
2. Plant and cage native shrubs and trees in areas with poor natural regeneration.
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 off-trail public use 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. Conduct ongoing maintenance of signs.
4. Continue to inform the general public of the natural values of the site and the permitted and prohibited uses through information placed in local publications.
5. 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.

8.0 Conclusion

Brigade Bay Bluffs Nature Reserve is an important protected area on eastern Gambier Island. Although impacted by logging, over time the land will develop into a young forest and reforestation efforts can help enhance degraded habitats. The Reserve provides important connectivity and wildlife habitat across a large, significant network of protected areas on Gambier Island.

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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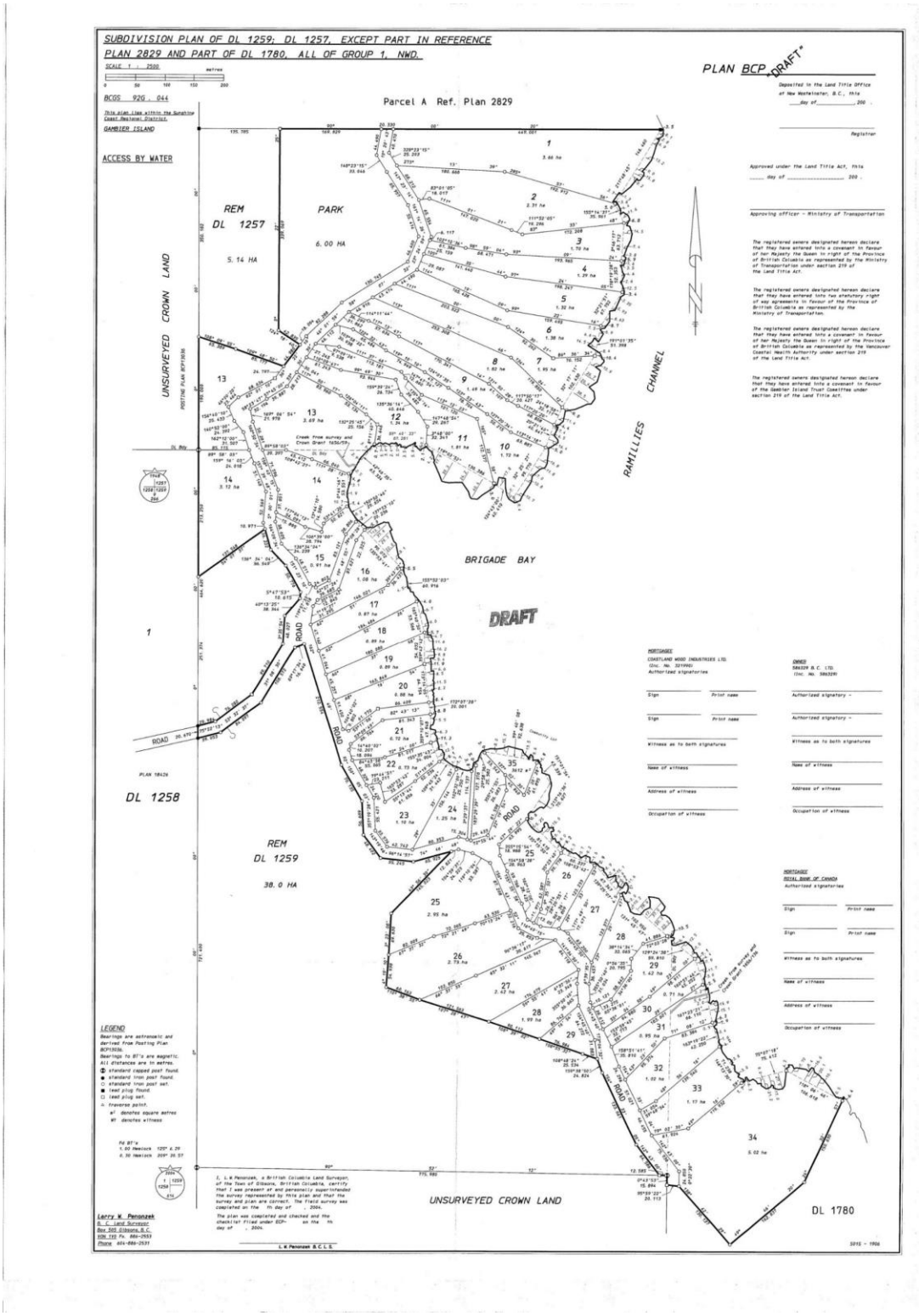
10.0 Appendices

Appendix A. Subdivision Plan for Brigade Bay Bluffs Nature Reserve.



Appendix B. Vegetation found in Brigade Bay Bluffs Nature Reserve.

Common Name	Latin Name	Status
Acer macrophyllum	Bigleaf maple	
Achillea millefolium	Yarrow	
Agrostis capillaris	Colonial bentgrass	Introduced
Aira praecox	Early hairgrass	Introduced
Amelanchier alnifolia	Saskatoon	
Anaphalis margaritacea	Pearly everlasting	
Anthoxanthum odoratum	Sweet vernalgrass	Introduced
Asplenium trichomanes	Maidenhair spleenwort	
Berberis nervosa	Dull Oregon-grape	
Circium arvense	Canada thistle	Introduced
Circium vulgare	Bull thistle	Introduced
Cladonia portentosa	Reindeer lichen	
Dactylis glomerata	Orchard grass	Introduced
Danthonia spicata	Poverty oatgrass	
Dicranum spp.		
Digitalis purpurea	Foxglove	Introduced
Elymus glaucus	Blue wildrye	
Festuca idahoensis	Idaho fescue	
Gaultheria shallon	Salal	
Goodyera oblongifolia	Rattlesnake plantain	
Hieracium albiflorum	White-flowered hawkweed	
Holcus lanatus	Common velvet-grass	Introduced
Holodiscus discolor	Oceanspray	
Hylocomium splendens	Step moss	
Hypochaeris radicata	Hairy cat's-ear	Introduced
Ilex aquifolium	English holly	Introduced
Juncus effusus	Common rush	
Luzula multiflora	Many-flowered wood-rush	
Mycelis muralis	Wall lettuce	Introduced
Phleum pratense	Timothy	Introduced

Pinus contorta	Lodgepole pine	
Plagiomnium insigne	Badge moss	
Polystichum munitum	Sword fern	
Prunus emarginata	Bitter cherry	
Pseudotsuga menziesii	Douglas-fir	
Pteridium aquilinum	Bracken fern	
Racomitrium spp.		
Rhytidiadelphus triquetrus	Electrified cat's-tail moss	
Ribes lacustre	Black gooseberry	
Rubus leucodermis	Black raspberry	
Rubus spectabilis	Salmonberry	
Rubus ursinus	Trailing blackberry	
Salix scouleriana	Scouler's willow	
Senecio jacobaea	Tansy ragwort	Introduced
Thuja plicata	Western redcedar	
Tsuga heterophylla	Western hemlock	
Urtica dioica	Stinging nettle	
Vaccinium parviflolium	Red huckleberry	
Zigadenus venenosus	Death camas	

Appendix C. Photographic Documentation.

PHOTO STATION	LOCATION (UTM Coordinates)	DIRECTION	PHOTO-GRAPHER	DATE YYYY-MM-DD	DESCRIPTION
Anthropogenic Features as noted on Figure 3					
P8	475522; 5482227	360°	LM	2018-08-09	Looking upslope from road to bluffs in background. Carrina Maslovat in photo with small Covenant Boundary sign in foreground and caged trees from replanting efforts visible.
P9	475548; 5482280	270°	LM	2018-08-09	Boundary sign behind large rock at northern road edge of Nature Reserve.
P10	475541; 5482271		LM	2018-08-09	Douglas-fir planted and caged during restoration efforts in cleared area of lower bluffs.
Natural Features as noted on Figure 3					
P1	475894; 5481513	320°	LM	2018-08-09	Looking from Brigade Bay (marina) towards Brigade Bay Bluffs in the background.
P2	475430; 5482397	140°	LM	2018-08-09	Howe Sound, lower slopes of Mt. Artaban and Brigade Bay. Note smoky haze from nearby forest fire in Horseshoe Bay.
P3	475462; 5482266	270°	LM	2018-08-09	Western Redcedar stump with Douglas-fir and Western Hemlock trees growing out of it. Botanist Carrina Maslovat in photo.
P4	475439; 5482459	0°	LM	2018-08-09	Turkey Vulture flying over bluffs.

P5	475418; 5482379	350°	LM	2018-08-09	Looking upslope onto bluff habitat, small draw/gully with boulders and woody debris.
P6	475428; 5482457	110°	LM	2018-08-09	Centre of Ecological Community 2 plot, with view of Howe Sound in background.
P7	475418; 5482340	350°	LM	2018-08-09	Centre of Bigleaf Maple plot, looking upslope.
P11	475493; 5482261		LM	2018-08-09	Browsed Western Redcedar in cleared area where tree-planting efforts occurred near roadside.
P12	475440; 5482322	135°	LM	2018-08-09	Canada Thistle and Tansy Ragwort

* LM=Laura Matthias

Appendix D. Letter to Neighbours.

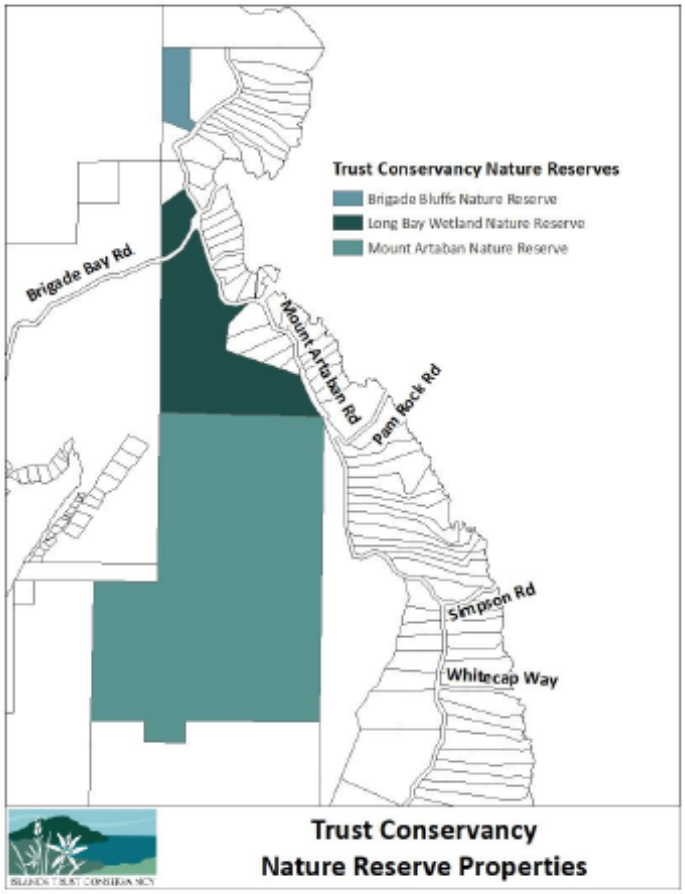
ISLANDS TRUST CONSERVANCY

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,

N. Murphy

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.