Management Plan for Singing Woods Nature Reserve Bowen Island, BC

Prepared for

ISLANDS TRUST FUND

by

CLAUDIA SCHAEFER
RAINCOAST APPLIED ECOLOGY

Approved by
the Trust Fund Board, May 30, 2017
Resolution # TFB-2017-017

Table of Contents

Tables, Figures and Appendices 3

Executive Summary 5

1.0 Introduction 7
1.1 Purpose of Islands Trust Fund Management Plans 7
1.2 Nature Reserve Purpose 7
1.3 Nature Reserve Objectives 7

2.0 Property Information 8
2.1 Location 8
2.2 Legal Description 9
2.3 Local and Regional Context 9
2.4 Adjacent Land Use and Connectivity 9
2.5 Site History 10
2.6 Undersurface Rights 11
2.7 Charges, Liens and Interests 11

3.0 Ecological Inventory 12
3.1 Climate 12
3.2 Geology and Physiology 12
3.3 Hydrology 12
3.4 Soils 14
3.5 Ecosystems 14
3.6 Wildlife Species 33
3.7 Fish and Fish Habitat 36
3.8 Red- and Blue-Listed Species and SARA-listed Species 36
3.9 Red and Blue-Listed Ecological Communities 37
3.10 Invasive Species 38

4.0 Stakeholder Consultation 38
4.1 **Adjacent Landowners 38**
4.2 **First Nations Communications 38**
4.3 Community Members 39
4.4 Cultural Significance 39

5.0 Management Plan 40
5.1 Discussion 40
5.2 Trail Use and Location 40
5.3 Trail Maintenance 42
5.4 Permitted Uses 43
5.5 Exotic and Invasive Species 43
5.6 Ecological Restoration 44
5.7 Protection of Sensitive Ecosystems and Species at Risk 44
5.8 Public Access 45
5.9 Scientific Research/Education 46

6.0 Action Items 46

6.1 Immediate Actions 46
6.2 Short-term Actions 47
6.3 Medium-term Actions 47
6.4 Long-term Actions 47
6.5 Summary Action Item List 47

7.0 Conclusion 48

REFERENCES 48

APPENDICES 50

Tables, Figures and Appendices

LIST OF TABLES

Table 1. Soil types of Singing Woods Nature Reserve 14
Table 2. Mammals of the Reserve 34
Table 3. Birds of the Reserve 34
Table 4. Invertebrates of the Reserve 35
Table 5. Red- and Blue-listed Ecological Communities of the Reserve 38

LIST OF FIGURES

Figure 1. Map of the location of the Singing Woods Nature Reserve. 8
Figure 2. Map of the Properties adjacent to Singing Woods Nature Reserve 10
Figure 3. Map of Freshwater Streams and Topography 13
Figure 4. Map of the Ecosystems of Singing Woods Nature Reserve 15
Figure 5. Map of selected Wildlife Features of Singing Woods Nature Reserve 33
Figure 6. Map of Grafton Lake Lands Development Proposal 42
Figure 7. Map of Properties adjacent to Singing Woods (Fig. 2 copied for reference) 45

LIST OF APPENDICES

Appendix 1. Property Survey for the Singing Woods Nature Reserve 50
Appendix 2. Title Search of Singing Woods Nature Reserve Property 51
Appendix 3. Climate BC Summary Statistics for Singing Woods Nature Reserve 53
Appendix 4. Biogeoclimatic Subzone CWHdm Vegetation Table and Edatopic Grid 55
Appendix 5. Letter to First Nations 57
Appendix 6. Letter to Neighbours of the Reserve 58
Appendix 7. Questionnaire for Neighbours and Community Members 60
Appendix 8. Map of Invasive Plants observed in Singing Woods Nature Reserve 62
Appendix 9. Map of the Monitoring Route and Photo Stations 63
Appendix 8. Co-ordinates of the Monitoring Route Photo Stations 64
Appendix 9. Photographs from the Monitoring Route Photo Stations 65

Executive Summary

The Islands Trust Fund (ITF) is a conservation land trust that encompasses Howe Sound and the Gulf Islands of the Strait of Georgia. The Singing Woods Nature Reserve is within the asserted traditional territory of eight First Nations. Coast Salish First Nations have had a presence on these lands for thousands of years[1]. In 1999, ITF established the Singing Woods Nature Reserve, located on the eastern side of Bowen Island, BC, in Howe Sound. The Bowen Island Conservancy has been completing management activities on the reserve since 2010. The property is approximately 9 hectares (22 acres) in area. The original management plan for the reserve was created in 2000 (Pottinger Gaherty Environmental Consultants Ltd., 2000). In 2016, ITF requested an update to the management plan.

The majority of the Singing Woods Nature Reserve is a steep north-facing slope covered in second-growth forest of Douglas-fir, western hemlock, western redcedar, and bigleaf maple that originated by natural regeneration after logging and/or wildfires approximately 100 years ago. There are also older 'veteran' trees scattered through the reserve that escaped early logging and fire. Along the base of the slope is a narrow bench dominated by forested skunk cabbage swamp, including the headwaters for two creeks, a small open marsh and level second-growth forest. The reserve is almost entirely comprised of rare ecological communities tracked by the BC Conservation Data Centre. At least one species listed in the Species at Risk Act (SARA), Northern Red-legged Frog (*Rana aurora*), occurs within the Singing Woods Nature Reserve.

As part of the community consultation process, Bowen Island residents, nearby property owners, First Nations, as well as other interested parties were invited to participate in setting objectives, identifying issues, and proposing strategies for inclusion in this Management Plan.

The key conservation values of the Singing Woods Nature Reserve are associated with the following features within the reserve:

- The headwaters of two streams flowing into separate drainages
- The presence of five different rare ecological communities in BC
- Northern Red-legged Frog occurrence (SARA-listed)
- Swamp and marsh wetlands (Sensitive Ecosystems)
- Fisheries values (resident cutthroat trout)
- Important habitat for migrating songbirds, waterfowl and raptors, amphibians, large and small mammals and invertebrates
- A significant wildlife corridor in the central valley of Bowen Island in combination with neighbouring properties
- Use by Band-tailed Pigeon, Great Blue Heron and Hutton's Vireo, all considered Vulnerable species in the province.

[1] The Trust Fund Board 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, and imply a belief in the concept of terra nullius, the idea that land was not owned prior to the assertion of European sovereignty. The Trust Fund Board acknowledges that terra nullius is a concept that does not apply to the Islands Trust Area. The words "provincially-managed public land" will be used in place of "Crown".

The objectives for management of the Singing Woods Nature Reserve are to:

- Conserve the key natural ecosystem values of the reserve;
- Permit only uses that do not significantly impair the natural condition of the reserve or its special features;
- Protect the water quality and flow regimes of all streams and wetlands within the reserve;
- Accommodate, but not promote, low-impact use of the reserve for hiking, nature appreciation and similar activities; and
- Allow natural ecological processes to function without human interference, except in the case of wildfire.

The management issues identified for Singing Woods Nature Reserve include:

- Reserve access through private property
- Trail extension or trail decommissioning
- Acceptable and unacceptable activities
- Monitoring Program

Recommended management actions and strategies are provided with respect to these issues. Key actions recommended immediately or in the short term (0–5 years) include:

- Investigate initiation of a trail use agreement between a private landowner and the Bowen Island Conservancy
- Decommission a trail along a logging/skid road
- Refrain from extending or creating more trails at present
- Continue monitoring by ITF and the Bowen Island Conservancy
- Discharge redundant municipal covenants

Long-term actions (5+ years):

- Re-visit trail extension possibilities
- Evaluate if signage of prohibited activities within the reserve is required

CONTACT INFORMATION

Inquiries, comments or reports of damage or vandalism concerning the Singing Woods Nature Reserve can be addressed to:

Islands Trust Fund
Suite 200 - 1627 Fort Street
Victoria BC V8R 1H8
Ph: (250) 405-5151
Fax: (250) 405-5155
Email: itfmail@islandstrust.bc.ca

1.0 Introduction

1.1 Purpose of Islands Trust Fund Management Plans

Islands Trust Fund property management plans are used to provide direction and guidance for the management, maintenance and protection of its Nature Reserves and Nature Sanctuaries. A management plan:

- Provides general and descriptive information on the property, including location, history, and land use;
- Sets out the conservation goals and objectives for the property;
- Identifies the property's ecological and/or cultural values and features;
- Describes the management issues associated with the property; and,
- Provides short, medium and long-term management recommendations (action items or tasks) on issues such as: invasive species management; species at risk protection; public access and safety; educational and research opportunities; and signage needs.

1.2 Nature Reserve Purpose

The purpose of the Singing Woods Nature Reserve is to conserve and protect the following features and values:

- The population and habitat of Northern Red-legged Frog (*Rana aurora*)
- Sensitive Ecosystems (swamp, marsh, rock outcrops)
- Headwater areas of two streams
- Significant link in a greenway and wildlife corridor stretching from the eastern shore of Bowen Island to Josephine Lake (southwest portion of the island)
- Diversity of ecosystem types near one another (e.g. open and treed wetlands, young and mature forest)
- Excellent wildlife habitat
- Use by several bird species (Great Blue Heron, Hutton's Vireo, Band-tailed Pigeon) whose populations are considered vulnerable in the province (blue-listed by the BC Conservation Data Centre (CDC))

1.3 Nature Reserve Objectives

The objectives for management of the Singing Woods Nature Reserve are to:

- Conserve the key natural ecosystem values of the reserve;
- Only permit uses that do not significantly impair the natural condition of the reserve or its special features;
- Protect the water quality and flow regimes of all streams within the reserve;
- Accommodate, but not promote, low-impact use of the reserve for hiking, nature appreciation and similar activities; and

- Allow natural ecological processes to function without human interference, except in the case of wildfire.

2.0 Property Information

2.1 Location

Singing Woods Nature Reserve is located on the central east side of Bowen Island, at 49.372' North and 123.352' West, just over a kilometre west of Snug Cove (Figure 1). Portions of the reserve abut Cates Hill Road and Minnows Lane. Bowen Island lies within Howe Sound.

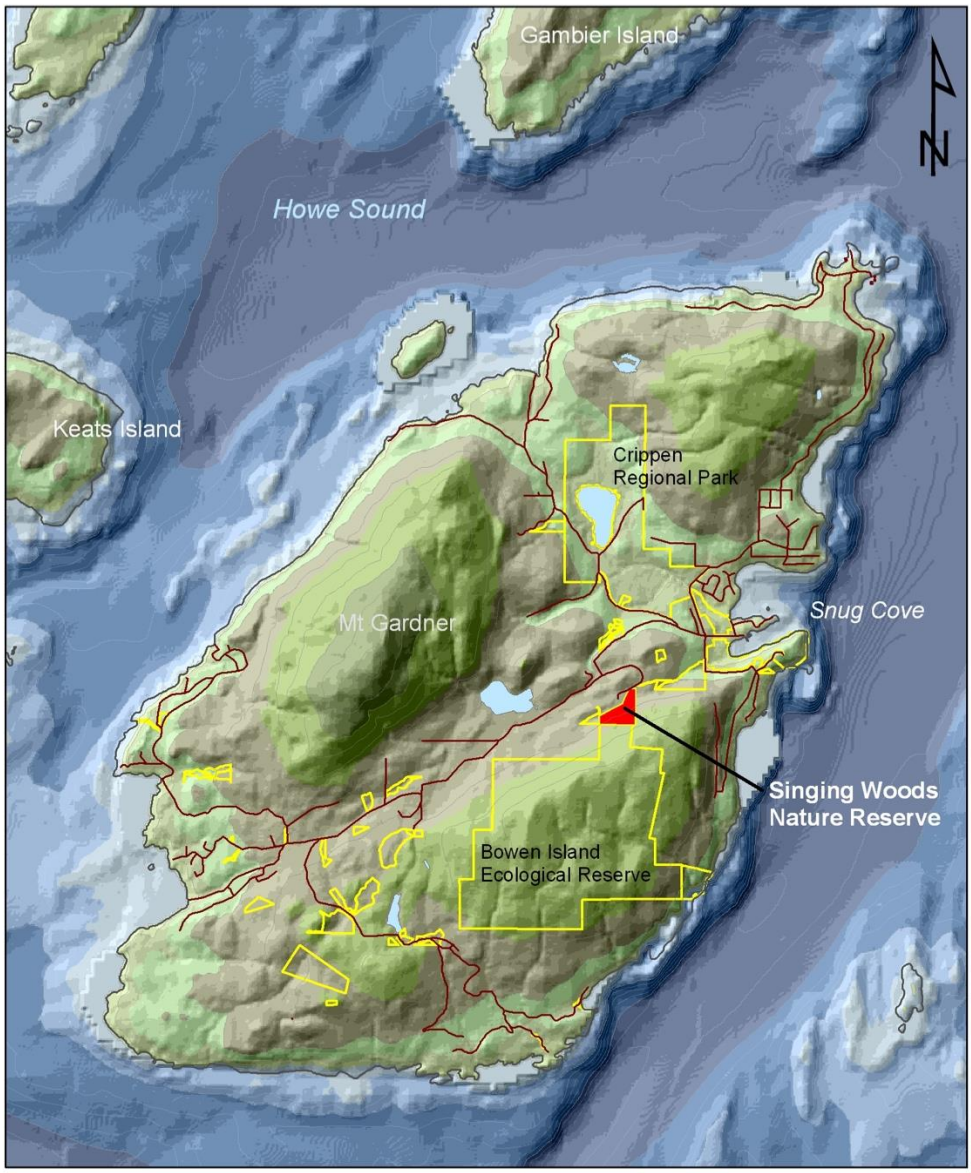


Figure 1. Map showing the location of the Singing Woods Nature Reserve on Bowen Island.

2.2 Legal Description

The legal description of the subject property is: Lot 3, Plan 2230, District Lot 1347, New Westminster Group 1 Land District, Except part in LMP7833 & LMP 10622. PID – 010-931-422. The property survey (Reference Plan LMP 44194) including the Statutory Right-Of-Way is found in Appendix 1.

2.3 Local and Regional Context

Singing Woods Nature Reserve is an important site for nature conservation on Bowen Island because it is:

- A headwater area for two creeks flowing into separate drainages: Davies Creek to the east and Dorothy Creek (tributary to Terminal Creek) to the west, both fish-bearing streams;
- Habitat for an existing population of the Northern Red-legged Frog (SARA-listed);
- An area with a significant wetland component, containing both forested swamp and a small open marsh, both Sensitive Ecosystems;
- Important habitat for migrating songbirds, waterfowl and raptors, large and small mammals, amphibians and invertebrates;
- A site with fish habitat values;
- A relatively continuous forested landscape, bordered on most sides by other forested land;
- Providing a significant contribution to the preservation of a major greenway and wildlife corridor extending from Crippen Park on the eastern shores of Bowen Island to Josephine Lake in the southwest portion of the island;
- An important buffer between Ecological Reserve #48 and a residential area.

2.4 Adjacent Land Use and Connectivity

Singing Woods Nature Reserve benefits by sharing significant borders with other parcels of forested, undeveloped land (Figure 2):

- South of Singing Woods is the Provincial Ecological Reserve #48, which encompasses 397 hectares of second-growth Douglas-fir dominated forest. The purpose of the reserve is preservation of dry subzone forest ecosystems in the Coastal Western Hemlock Zone at a location convenient for research.
- Eastern edges of the reserve share property boundaries with forested provincially-managed public land and a privately-owned lot with a conservation covenant.
- The western edge of the reserve abuts an undeveloped, forested municipal park.
- West of the Municipal Park and south are the Rennison properties or Grafton Lake Lands, comprising 141 hectares (350 acres) of forest, clearings, Grafton Lake and its associated wetlands. A current development proposal for those lands would conserve the area surrounding the lake, and trails are proposed that would connect through the Municipal Park to Singing Woods Nature Reserve. This trail is proposed as a route for future Grafton Lake Lands' residents to walk to Snug Cove and the ferry.
- North of the reserve is rural residential, with a high degree of tree retention, and

conservation covenants south of Minnows Lane and adjacent to the reserve.

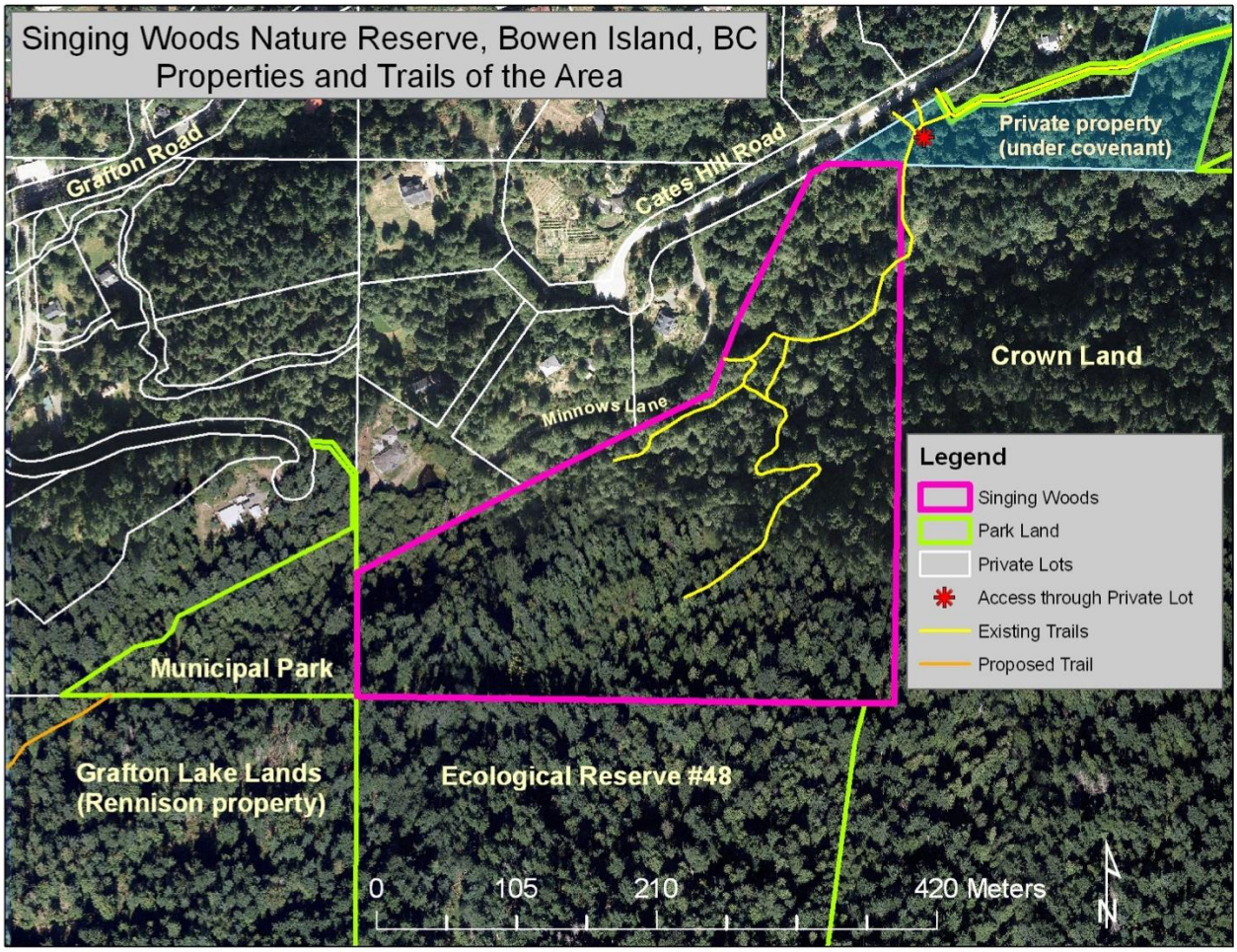


Figure 2. Map of the properties adjacent to Singing Woods Nature Reserve. Existing and proposed trails are shown.

Given the largely protected and contiguous forests east, west and south of Singing Woods, the reserve contributes to, and is an important part of a wildlife corridor and greenway that extends across the island from the eastern shores to the southwest corner. The reserve's role would become even more vital if clearing or development were to occur on the provincially-managed public land east of the property.

2.5 Site History

For over 10,000 years, local First Nations have had an integral connection to the islands in the Trust area and the surrounding waters. "When the tide is out, the table is set" is an expression found in several of the local Indigenous languages that refers to one of many ways in which these resource-rich islands were used to feed and sustain their communities. There were places known for deer hunting, places for duck hunting, clam gardens that belonged to certain families, reef net fishing sites, special places for spiritual ceremonies, and so much more. The Island Trust Fund is

committed to better understanding the First Nations' connection to the land and water of the islands. Even though we are just beginning to understand the historical and current connection First Nations have with these islands, we are doing so with a sense of humility and sincerity in honouring those connections.

According to the BC Provincial Consultative Areas Database, Singing Woods Nature Reserve is located within the asserted traditional territories of the following eight First Nations:

- Cowichan Tribes
- Halalt First Nation
- Lake Cowichan First Nation
- Lyackson First Nation
- Penelakut Tribe
- Squamish First Nation
- Stz'uminus First Nation (Chemainus)
- Tsleil-Waututh Nation

Further communication is needed to better understand the traditional First Nation's use of the reserve and surrounding area.

The reserve has a history of logging and fires and the original forest was removed in the last century. Most recently (approximately 1985) a roughly three-hectare portion along the southern boundary of the property was logged (Polygon G, Figure 4). Historical aerial photography indicates that parts of the lower flat portion of the property (in particular Polygon D) was logged during the 1960s. The remaining areas were most likely logged in the early 1900s.

Wildfire and/or fire associated with logging practices have occurred in most or all of the reserve. A major fire occurred on portions of Singing Woods and the adjacent ecological reserve in about 1920. There is evidence of fire pre- and post-logging for portions of the area.

2.6 Undersurface Rights

Undersurface rights for Singing Woods Nature Reserve are not mentioned in the title.

2.7 Charges, Liens and Interests

BN320955 Statutory Right of Way in favour of Greater Vancouver Regional District.

Section 219 Covenant BG250180, registered on the land in 1993, and BN 320918 registered on the land in 1999, were to ensure the developer and landowner of the property at the time fulfilled all the requirements of subdivision. These covenants can now be discharged as the actions outlined in them have taken place. An action item of this management plan will be to request that the Bowen Island Municipality discharge these covenants. The Islands Trust Fund Board will then explore the potential for a conservation covenant with an appropriate agency.

3.0 Ecological Inventory

3.1 Climate

Bowen Island lies with the Coastal Western Hemlock (CWH) biogeoclimatic zone, a broad ecological zone encompassing most of the coastal temperate rainforest of the BC coast (Green and Klinka, 1994). Singing Woods Nature Reserve falls within the Dry Maritime subzone (CWHdm), which occurs at low elevations on the mainland and immediately adjacent islands. It extends from Hardwicke Island in the north to the Chilliwack River in the southeast. The climate of the CWHdm is somewhat influenced by the rain shadow effect of the Vancouver Island Ranges, and experiences similar temperatures and precipitation to the North Shore of Vancouver. The CWHdm has warm, relatively dry summers where periods of drought and high temperatures over four weeks long are common. Winters are typically mild, with significant precipitation but little as snowfall (Green and Klinka, 1994).

Detailed climate data is found in Appendix 3. Data was derived using models provided by Climate BC (Wang et al., 2016) based on the location of the reserve at an elevation of 163 m asl.

Due to global climate change, the local climate on Bowen Island is predicted to become warmer during coming decades (modeled by Climate BC software). The key predicted changes are an increase in temperature of about two (2) degrees Celsius throughout the year, an increase in winter precipitation (though with less snow) and a decrease in summer precipitation.
The combination of higher temperature with less rain in summer is expected to cause increased moisture stress for plants and may lead to death of some trees and other plants, as well as an increased risk of wildfire, plant diseases and epidemics of insects that attack plants. The precise course of such changes is unpredictable, and as such is not easily amenable to specific management strategies to reduce the risks. A more general management strategy to reduce the risks associated with climate change is to maintain the overall diversity and integrity of ecosystems.

3.2 Geology and Physiology

The reserve area is underlain by pre-Jurassic meta-volcanics of the Bowen Island Group (Roddick, 1965). A variably thick mantle of moraine and localized colluvial deposits (slope deposits) cover the bedrock over most of the nature reserve. Site topography consists predominantly of a north to northwest facing slope having an average slope of approximately 60%. Along the northern boundary, a 20m to 100m wide strip is nearly level to undulating in the low-lying areas. The site elevation ranges from approximately 150m to 300m. The majority of the site is covered with glacial and colluvial deposits (which are rapidly drained) with some exposed bedrock, while the areas adjacent to the streams and pond are covered with alluvial and glacio-marine deposits that tend to be imperfectly drained.

3.3 Hydrology

The freshwater resources of the nature reserve are a significant reason why the reserve was initially established and why it is of significant environmental value. The property is part of the headwaters area for two creeks flowing into separate drainages:

- Davies Creek which flows to the east and reaches the ocean at Snug Harbour; and,
- Minnow Creek (or Dorothy Creek) which flows to the west then north, joining Terminal Creek which flows east until reaching Howe Sound at the lagoon of Deep Bay.

There are also two ponds along Minnows Lane, one lying half on the reserve and half on the adjacent private property, and the other pond further west is on private property with forested swamp between it and the reserve lands. Both ponds were created by excavation during subdivision of the Cates Hill area.

Freshwater streams and topography are shown on in Figure 3. The pronounced topographic difference between the slope and the narrow bench on the northern edge of the reserve are clearly visible.

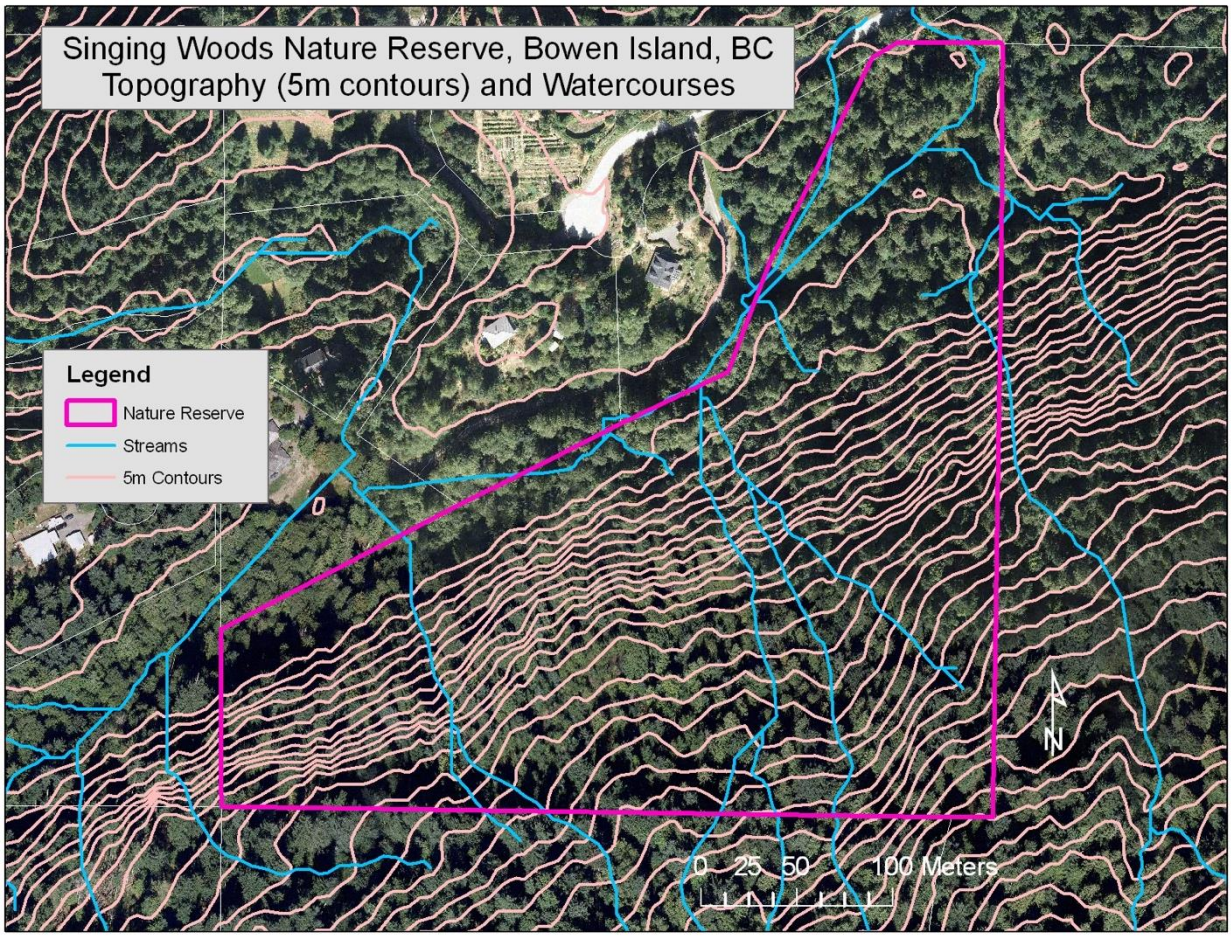


Figure 3. Map of freshwater streams and topography (5 m contours) of Singing Woods Nature Reserve.

3.4 Soils

The soils of Singing Woods Nature Reserve are the result of complex events and processes that have occurred throughout geologic time. However, recent periods of glacial and interglacial erosion and deposition have given the region much of its distinctive character. Unconsolidated surficial materials of relatively recent age occupy the majority of the area. Surface material depths range from over 100cm to 10cm with areas of exposed bedrock. These sediments and soils were primarily deposited by glacial and colluvial processes during the last 10,000 years.

The three main soil types in the area are Cannel, Kenworthy, and Murrayville (Luttmerding, 1980). In terms of drainage, the Cannel and Kenworthy soils are classified as well to rapid draining with the Murrayville soil being imperfectly drained, with a perched water table. The Cannel and Kenworthy soils make up 90% of the total area situated on the north-facing slope. The Murrayville soil occupies 10% of the total area on lower slopes and flat areas. A description of the three soil types is shown in Table 1.

Table 1. Soil Types and Descriptions for Singing Woods Nature Reserve.

Soil Name	**Symbol**	**Soil Material[1]**	**Drainage**	**Soil Classification**
Cannell	CE	10cm to 100cm of moderately coarse – textured, glacial till or colluvium over bedrock.	Well to rapid	Duric Humo- Ferric Podzol
Kenworthy	KW	Moderately coarse – textured colluvium.	Well	Orthic Humo- Ferric Podzol
Murrayville	MY	20cm – 100cm of moderately coarse to medium-textured littoral deposits over fine-textured marine deposits.	Imperfect; perched water table	Gleyed Ferro-Humic Podzol

[1] Fine texture = clays; Moderately fine = silty clay loams to sandy clay loams; Medium = silts to loam; Moderately coarse = sandy loams; Coarse = sands.

3.5 Ecosystems

Ecosystem mapping delineates polygons by site series according to the Biogeoclimatic Classification system for BC and structural stage (e.g. young or mature forest). When possible, a polygon only includes one site series at a given structural stage, such as a mature Western redcedar – sword fern / skunk cabbage swamp (site series CWHdm/12). In more complex areas, a polygon may contain more than one site series and/or structural stage. For the current update to the management plan, the reserve was surveyed in 2016 and ecosystems were mapped (Figure 4).

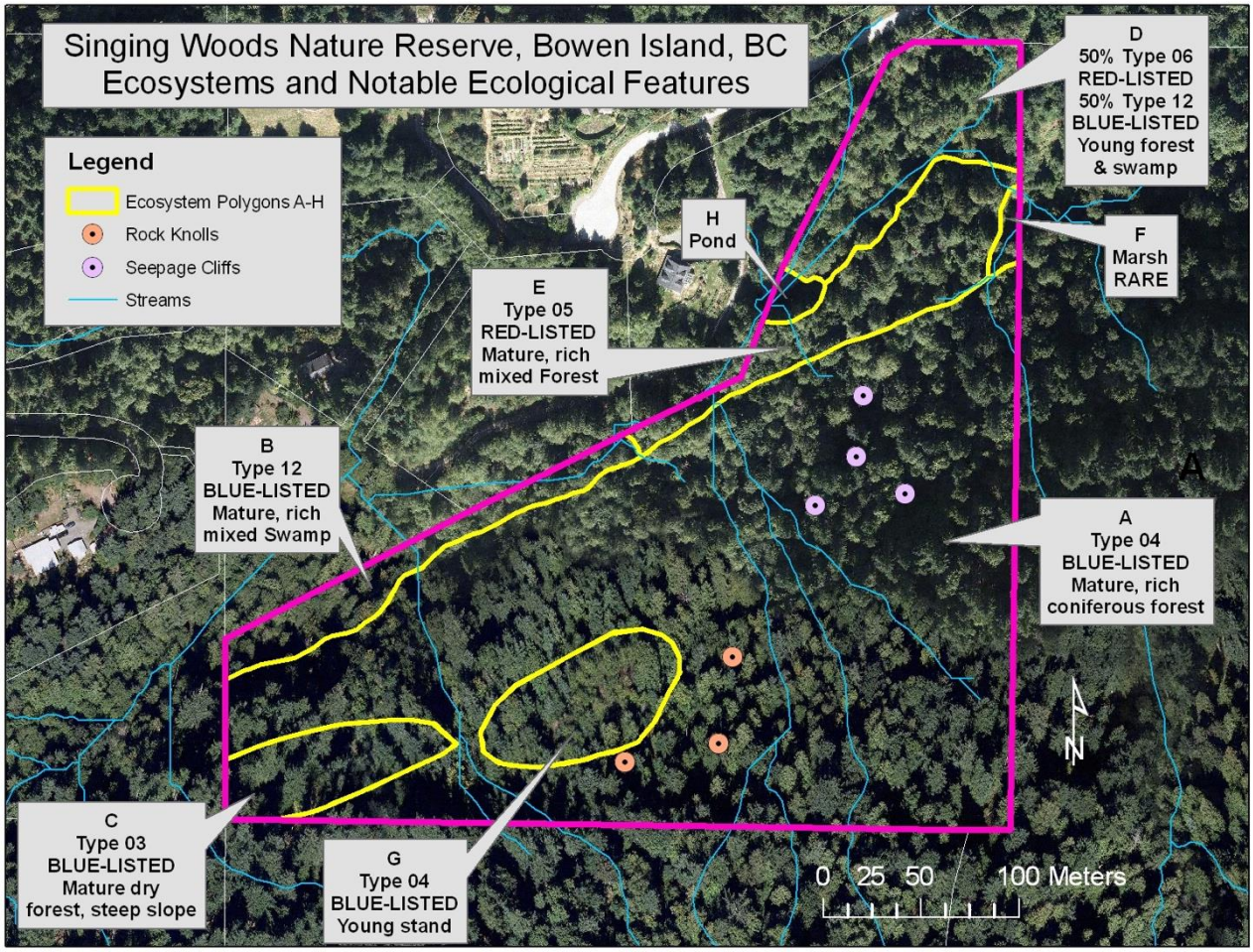


Figure 4. Map of the ecosystems, red and blue-listed ecological communities and notable ecological features of Singing Woods Nature Reserve.

The vegetation on the slope, comprising most of the reserve area, is dominated by mature second growth Douglas-fir (*Pseudotsuga menziesii*), with smaller amounts of western redcedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), bigleaf maple (*Acer macrophyllum*), and some red alder (*Alnus rubra*). Occasional old-growth veteran Douglas-fir trees are also present, having escaped mortality from logging and fire. The main understorey species is sword fern (*Polystichum munitum*).

The flat or undulating bench at the base of the slope receives moisture and nutrients from the slope above. Where drainage is imperfect or poor, swamp vegetation dominates. Swamps are forested wetlands, rich in organic material. The main tree species are western redcedar, western hemlock, bigleaf maple and red alder. Skunk cabbage (*Lyschiton americanum*) is abundant in the understorey.

Where drainage on the bench is better, rich forests of western redcedar and western hemlock are found. Sword fern dominates in these areas.

ECOSYSTEM: **Douglas-fir / sword fern (CWHdm/04)**
Blue-listed Ecological Community
Nutrient-rich forest on a steep NW-facing slope
Polygons A and G

FLORA

Main Canopy Species & percent cover: POLYGON A Douglas-fir (25%) (*Pseudotsuga menziesii*) Bigleaf maple (5%) (*Acer macrophyllum*) Western Hemlock (5%) (*Tsuga heterophylla*)	 Age (estimated): 75-95 years Height (estimated): 40-50 m DBH: 30-60 cm Age (estimated): 75-95 years Height (estimated): 35-40 m DBH: 30-60 cm Age (estimated): 75-95 years Height (estimated): 35-45 m DBH: 30-60 cm
Secondary Canopy POLYGON A Western Hemlock (1%) (*Tsuga heterophylla*)	 Age (estimated): 50 years Height (estimated): 15-20 m DBH: 15-30 cm
Total Canopy Cover	35%
Structural Stage	Polygon A – mature forest; Polygon G – young forest
Moisture Regime	Moist
Nutrient Regime	Rich
Understorey POLYGON A (mature forest) (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	• Sword fern (*Polystichum munitum*) 95% • Salal (*Gaulteria shallon*) 1% • Dull Oregon-grape (*Mahonia nervosa*) 0.5% • Red huckleberry (*Vaccinium parviflorum*) 0.2% • Licorice fern (*Blechnum spicant*) 0.1% • Knight's plume (*Ptilium crista-castrensis*) 2% • Juniper haircap moss (*Polystichum juniperinum*) 0.1% Some scattered English holly* (*Ilex aquifolium*) Species on rocky knolls within the forest include: • *Dicranum* species (35%) • Step moss (*Hylocomnium splendens*) 4%

	• Foxglove (*Digitalis purpurea*) 0.1% • *Cladonia* spp. (0.2%) • Other mosses and liverworts
Observed rare/threatened species & locally uncommon species	No rare or threatened species were observed. Maidenhair spleenwort (*Asplenium trichomanes*) is locally uncommon and found on seepage cliffs in mature forests of this ecosystem.
Potential Other Species at Risk	None likely
Special Features	• Seepage cliffs (5-10 m in height) in mature forest with a different diversity of mosses and liverworts as well as maidenhair spleenwort • Rocky knolls under a canopy of Douglas-fir • Several ephemeral streams
Expected Changes	Douglas-fir is expected to continue to dominate as these forests age; cover of bigleaf maple may decrease over time
Disturbance History	This slope was logged in the last century. Polygon G was clearcut approximately 30 years ago. Fire scars indicate a history of fire on the site.

*Indicates a non-native species

FAUNA (Scientific names can be found in Table 5)

Wildlife Habitat / Features	Wildlife trees are numerous in mature sections of this ecosystem, many with evidence of use by Pileated Woodpecker; coarse woody debris in mature stands provides habitat for amphibians and invertebrates.
Observed Species (mature forest)	Northern Red-legged Frog Black-tailed Deer (scat) Douglas' Squirrel American Eagle American Robin Barred Owl Canada Warbler Common Raven Golden-crowned Kinglet Pacific Wren Pine Siskin Wilson's Warbler
Observed rare/threatened species (mature forest, Polygon A)	Northern Red-legged Frog (at the edge of the swamp wetland, Polygon B)
Potential Other Species at Risk	Band-tailed Pigeon Western Screech Owl (*Megascops kennicottii kennicottii*)

Douglas-fir / sword fern ecosystem

ECOSYSTEM: **Western redcedar – Sitka spruce / skunk cabbage (CWHdm/12)**
Blue-listed Ecological Community
Mature Swamp Wetland
Polygon B

FLORA

Main Canopy Species & percent cover: Western redcedar (30%) (*Thuja plicata*) Bigleaf maple (10%) (*Acer macrophyllum*)	 Age (estimated): 75-95 years Height (estimated): 35-45 m DBH: 30-60 cm Age (estimated): 75-95 years Height (estimated): 35-40 m DBH: 30-50 cm
Secondary Canopy Red alder (10%) (*Alnus rubra*)	 Age (estimated): 75-95 years Height (estimated): 20-30 m DBH: 10-35 cm
Total Canopy Cover	50%
Structural Stage	Mature mixed forest
Moisture Regime	Wet; areas of standing water much of the year
Nutrient Regime	Rich to very rich
Understorey (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	• Skunk cabbage (*Lysichitin americanum*) 75% • Giant horsetail (*Equisetum telmateia*) 1% (in patches) • Lady fern (*Athyrium felix-femina*) 1% • Red huckleberry (*Vaccinium parviflorum*) 0.5% • Small-flowered bulrush (*Scirpus microcarpus*) 0.1% (in patches)
Observed rare/threatened species & locally uncommon species	No rare or threatened plant species were observed.
Potential Other Species at Risk	None likely
Special Features	• Streams run through this ecosystem • Rich organic mucks
Expected Changes	Bigleaf maple and red alder will likely decrease in abundance as western redcedar trees mature. This ecosystem type can be co-dominated by Sitka spruce at the climax stage, but the lack of spruce at this time indicates that cedar will predominate.
Disturbance History	This wetland forest was logged in the last century.

FAUNA (Scientific names can be found in Tables 2 and 3)

Wildlife Habitat / Features	This swamp wetland has excellent wildlife habitat qualities, providing shelter, abundant foraging material and a water source. Skunk cabbage is heavily browsed by mammals, especially deer. Wildlife trees are numerous in this ecosystem, many with evidence of use by Pileated Woodpecker. Coarse woody debris on site provides excellent habitat for amphibians and invertebrates.
Observed Species	Northern Red-legged Frog Black-tailed Deer (scat) Douglas' Squirrel American Mink Black Bear River Otter American Robin Golden-crowned Kinglet Pacific Wren Pileated Woodpecker Red-breasted Nuthatch Spotted Towhee Steller's Jay
Observed rare/threatened species	Northern Red-legged Frog
Potential Other Species at Risk	Band-tailed Pigeon Western Screech Owl (*Megascops kennicottii kennicottii*)

Western redcedar – Sitka spruce / skunk cabbage swamp

ECOSYSTEM: **Western red-cedar / sword fern (CWHdm/05)**
Rich, level mature forest
Polygon E

FLORA

Main Canopy Species & percent cover: Western red-cedar (30%) (*Thuja plicata*) Western Hemlock (5%) (*Tsuga heterophylla*) Bigleaf maple (15%) (*Acer macrophyllum*) Red alder (10%) (*Alnus rubra*)	 Age (estimated): 75-95 years Height (estimated): 35-45 m DBH: 30-60 cm Age (estimated): 75-95 years Height (estimated): 35-45 m DBH: 30-60 cm Age (estimated): 75-95 years Height (estimated): 30-40 m DBH: 30-45 cm Age (estimated): 20-35 years Height (estimated): 30-40 m DBH: 25-35 cm
Secondary Canopy Western Hemlock (5%) (*Tsuga heterophylla*)	 Age (estimated): 20-40 years Height (estimated): 15-20 m DBH: 15-30 cm
Total Canopy Cover	60%
Structural Stage	Mature forest
Moisture Regime	Moist
Nutrient Regime	Rich
Understorey (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	• Sword fern (*Polystichum munitum*) 70% • Dull Oregon-grape (*Mahonia nervosa*) 1% • Red huckleberry (*Vaccinium parviflorum*) 0.1% • Trailing blackberry (*Rubus ursinus*) 0.01% • English holly* (*Ilex aquilifolium*) 0.01%
Observed rare/threatened species & locally uncommon species	None observed
Potential Other Species at Risk	None likely
Special Features	Several ephemeral and permanent streams

Expected Changes	Currently a mixed forest that is likely to change through succession to a conifer-dominated stand of cedar and hemlock.
Disturbance History	This ecosystem was logged in the last century. There are also fire scars indicating past fire history.

*Indicates a non-native species

FAUNA (Scientific names can be found in Tables 2 and 3)

Wildlife Habitat / Features	Wildlife trees are numerous in this ecosystem, many with evidence of use by Pileated Woodpecker; abundant coarse woody debris on site provides habitat for amphibians and invertebrates.
Observed Species	Black-tailed Deer (scat) Douglas' Squirrel American Robin Brown Creeper Golden-crowned Kinglet Hairy Woodpecker Pacific-slope Flycatcher Pacific Wren Pileated Woodpecker (foraging sign) Red-breasted Nuthatch Spotted Towhee Steller's Jay
Observed rare/threatened species	None seen
Potential Other Species at Risk	Northern Red-legged Frog (observed in adjacent ecosystems) Band-tailed Pigeon (observed in adjacent ecosystems)

Western red-cedar / sword fern ecosystem, with stream

ECOSYSTEM: **Western hemlock - Western red-cedar / deer fern (CWHdm/06)**
Red-listed Ecological Community
Young forest on level terrain
Polygon D (50%)

FLORA

Main Canopy Species & percent cover: Western red-cedar (35%) (*Thuja plicata*) Western Hemlock (35%) (*Tsuga heterophylla*) Red alder (2%) (*Alnus rubra*)	 Age (estimated): 35-55 years Height (estimated): 35-40 m DBH: 15-35 cm, occasionally to 70 cm Age (estimated): 35-55 years Height (estimated): 35-40 m DBH: 15-35 cm Age (estimated): 20-30 years Height (estimated): 30-35 m DBH: 20-25 cm
Secondary Canopy Western Hemlock (10%) (*Tsuga heterophylla*) Sitka spruce (2%) (*Picea sitchensis*) Red alder (1%) (*Alnus rubra*)	 Age (estimated): 20-35 years Height (estimated): 15-20 m DBH: 15-30 cm Age (estimated): 20-40 years Height (estimated): 15-20 m DBH: 15-30 cm Age (estimated): 20-30 years Height (estimated): 15-20 m DBH: 15-30 cm
Total Canopy Cover	75%
Structural Stage	Young forest (with some mature trees)
Moisture Regime	Moist to wet
Nutrient Regime	Medium to rich
Understorey (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	• Deer fern (*Blechnum spicant*) 20% • Sword fern (*Polystichum munitum*) 10% • Skunk cabbage (*Lysichitum americanum*) 3% • Red huckleberry (Vaccinium parviflorum) 0.5% • Bracken fern (*Pteridium aquilinum*) 0.5%

	• False azalea (*Menziesia ferruginea*) 0.3% • Spiny wood fern (*Dryopteris expansa*) 0.1% • English holly* (*Ilex aquilifolium*) 0.01% • Various mosses 15%
Observed rare/threatened species & locally uncommon species	False azalea is very uncommon on Bowen Island
Potential Other Species at Risk	None likely
Special Features	This ecosystem type is very uncommon and may not occur elsewhere on Bowen Island.
Expected Changes	Currently a very densely treed young forest that will thin out over time as the larger of the trees shade out others. The dense canopy limits light to the forest floor resulting in a sparse understorey; with expected thinning of the canopy the understorey is predicted to become less sparse.
Disturbance History	This ecosystem was logged in the last century. There are also fire scars indicating past fire history.

*Indicates a non-native species

FAUNA (Scientific names can be found in Tables 2 and 3)

Wildlife Habitat / Features	Wildlife values and occurrences are currently lower in this ecosystem as compared to the older, more open forests elsewhere in the reserve. Two wildlife trees were observed and a significant amount of woody debris (less coarse than in adjacent sites) provides habitat for amphibians and invertebrates.
Observed Species	American Robin Spotted Towhee
Observed rare/threatened species	None seen
Potential Other Species at Risk	Northern Red-legged Frog (observed in nearby ecosystems)

Western hemlock - Western red-cedar / deer fern ecosystem

ECOSYSTEM: **Douglas-fir – western hemlock / salal Dry Maritime (CWHdm/03)**
Blue-listed Ecological Community
Dry, mature forest on extremely steep NW-facing slope
Polygon C

FLORA

Main Canopy Species & percent cover: Douglas-fir (40%) (*Pseudotsuga menziesii*)	 Age (estimated): 75-95 years Height (estimated): 40-45 m DBH: 20-40 cm, occasionally over 100 cm
Secondary Canopy Western red-cedar (2%) (*Thuja plicata*)	 Age (estimated): 75-95 years Height (estimated): 35-40 m DBH: 20-35 cm
Total Canopy Cover	42%
Structural Stage	Young forest
Moisture Regime	Dry
Understorey (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	• Step moss (*Hylocomnium splendens*) 50% • Salal (*Gaultheria shallon*) 3% • Sword fern (*Polystichum munitum*) 3% • *Dicranum* spp. (moss) 3%
Observed rare/threatened species & locally uncommon species	None observed
Potential Other Species at Risk	None likely
Special Features	At least two old-growth trees (veterans from the previous forest that was logged) occur in this ecosystem on the reserve; the slope is extreme at 120% in places.
Expected Changes	Douglas-fir is the climax species for this ecosystem type and already dominates the site, so little change is predicted other than maturation of the forest.
Disturbance History	This ecosystem was logged in the last century. There are also fire scars indicating past fire history.

*Indicates a non-native species

FAUNA (Scientific names can be found in Tables 2 and 3)

Wildlife Habitat / Features	This ecosystem occurs on an extreme slope and accessibility for wildlife observations was not possible.
Observed Species	Likely species using the drier, forested steep slope: Columbian Black-tailed Deer, Douglas' Squirrel, bird species similar to those found in the Douglas-fir – sword fern ecosystem (CWHdm/04)
Observed rare/threatened species	None seen
Potential Other Species at Risk	Band-tailed Pigeon (occurs in nearby habitats)

Douglas-fir – western hemlock / salal Dry Maritime ecosystem

ECOSYSTEM: **Small-flowered bulrush Marsh (CWHdm/00)**
Wetland; may be rare but currently unclassified by the CDC

FLORA

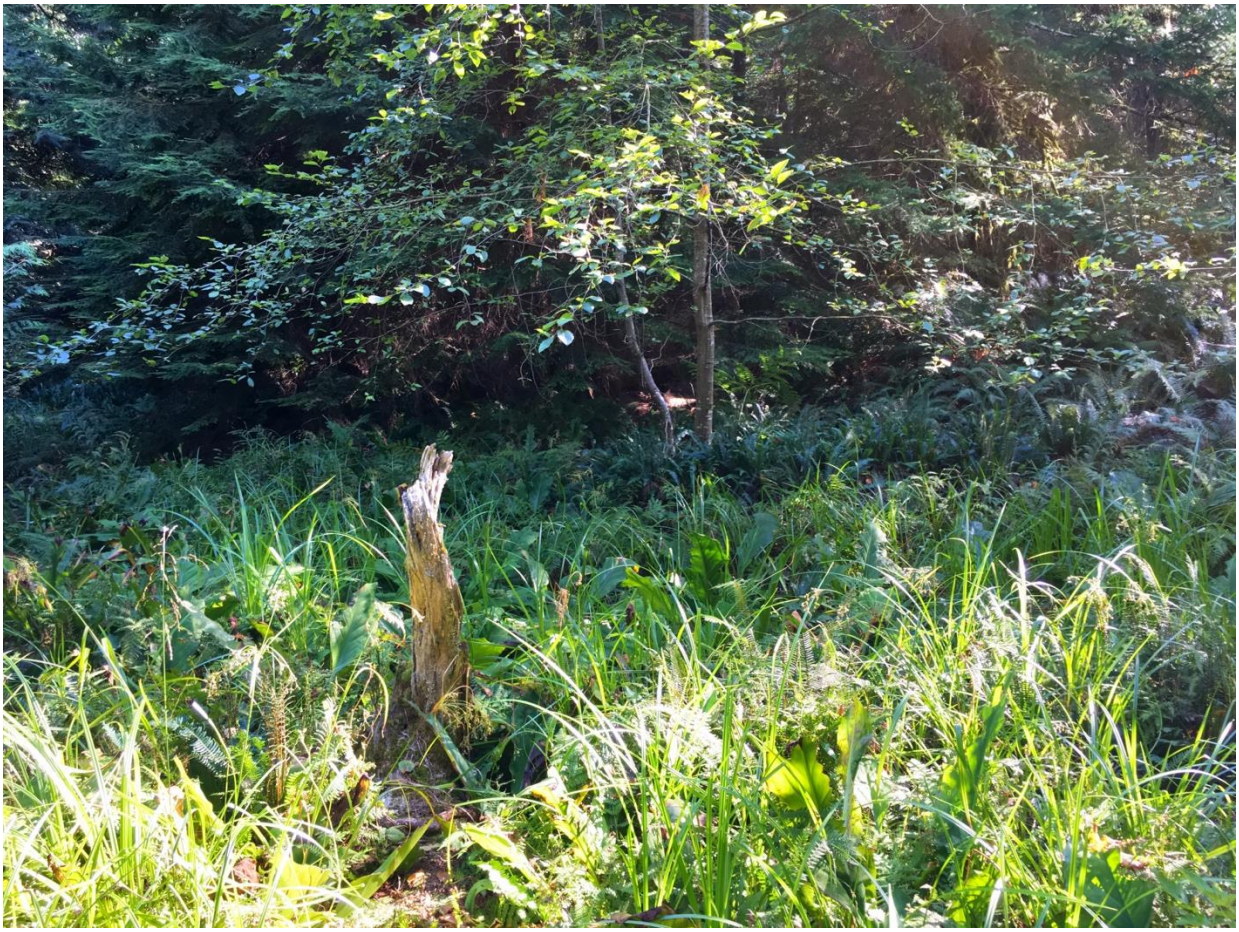
Structural Stage	Herbaceous; graminoid-dominated
Moisture Regime	Wet
Nutrient Regime	Rich to very rich
Species & percent cover Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	• Small-flowered bulrush (*Scirpus microcarpus*) 40% • Pacific water-parsley (*Oenanthe sarmentosa*) 4% • Skunk cabbage (Lysichitum americanum) 5% • Common cattail (*Typha latifolia*) 1% • Common horsetail (*Equisetum arvense*) 1% • Bluejoint reedgrass (*Calamgrostis canadensis*) 1% • American speedwell *(Veronica beccabunga* spp. *americana*) 0.5% • False lily-of-the-valley (*Maianthemum dilatum*) 0.5% • Jointed rush (*Juncus articulatus*) <1% • Purple-leaved willow-herb (*Epilobium ciliatum*) <1% • Small-flowered forget-me-not (*Myosotis laxa*) <1% • Dagger-leaf rush (*Juncus ensifolius*) <1% • Stink currant (*Ribes bracteosum*) <1% • Nodding trisetum (*Trisetum cernuum*) <1% • Common rush (*Juncus effusus)* <1% • Timothy* (*Phleum pratense*) <1%
Observed rare/threatened species & locally uncommon species	None observed
Potential Other Species at Risk	Unknown likelihood
Special Features	Marsh habitat increases the biodiversity of the reserve with plants and invertebrates not found elsewhere. Excellent wildlife habitat.
Expected Changes	Since the marsh is small in size, the area may become shaded by surrounding trees as they mature and the marsh may become part of the adjacent cedar – skunk cabbage swamp east of the reserve.
Disturbance History	The surrounding forests were logged during the last century.

*Indicates a non-native species

FAUNA (Scientific names can be found in Tables 2 and 3)

Wildlife Habitat / Features	Open wetland habitat provides high quality wildlife habitat. Habitat for red-legged frog eggs and tadpoles and other amphibians. Invertebrate diversity and quantity is higher than in surrounding forests, and dragonflies and butterflies were seen here and not

	within other ecosystems of the property. The increased invertebrate populations provide foraging opportunities for birds. Plants in the wetland provide a food source for mammals.
Observed Species	Northern Red-legged frog Columbian Black-tailed Deer Lorquin's Admiral Western Tiger Swallowtail Pacific Spiketail Eight-spotted Skimmer
Observed rare/threatened species	Northern Red-legged Frog
Potential Other Species at Risk	Blue Dasher



Small-flowered bulrush Marsh

ECOSYSTEM: Shallow Pond (CWHdm/Pond)
Polygon E

Special Features	The pond provides good quality wildlife habitat.
Disturbance History	The pond was excavated during the development of the subdivision.

FAUNA (Scientific names can be found in Tables 2 and 3)

Wildlife Habitat / Features	Water source and foraging opportunities for birds (insects and underwater food sources) and mammals at the edges.
Observed Species	Great Blue Heron Common Mallard Bufflehead
Observed rare/threatened species	Great Blue Heron
Potential Other Species at Risk	Band-tailed Pigeon (occurs in nearby habitats)

3.6 Wildlife Species

Wildlife presence in the reserve and wildlife habitat attributes were compiled from existing data and additional field visits in 2016. Background sources included the original Management Plan (Pottinger Gaherty Environmental Consultants Ltd, 2000), as well as observations from reserve neighbours and naturalists on Bowen Island.

The following wildlife and habitat features were observed in the reserve:

- The SARA and blue-listed Northern Red-legged Frog is associated with the reserve's marsh and swamp ecosystems
- Potential raptor nest trees (old-growth Douglas-fir trees)
- Good quality Barred Owl (*Strix varia*) habitat, especially in wetland areas
- Garter Snake (species unknown)
- Wildlife trees including significant standing snags, veteran Douglas-fir trees, and trees with broken tops
- Snags with evidence of Pileated Woodpecker (*Dryocopus pileatus*) activity

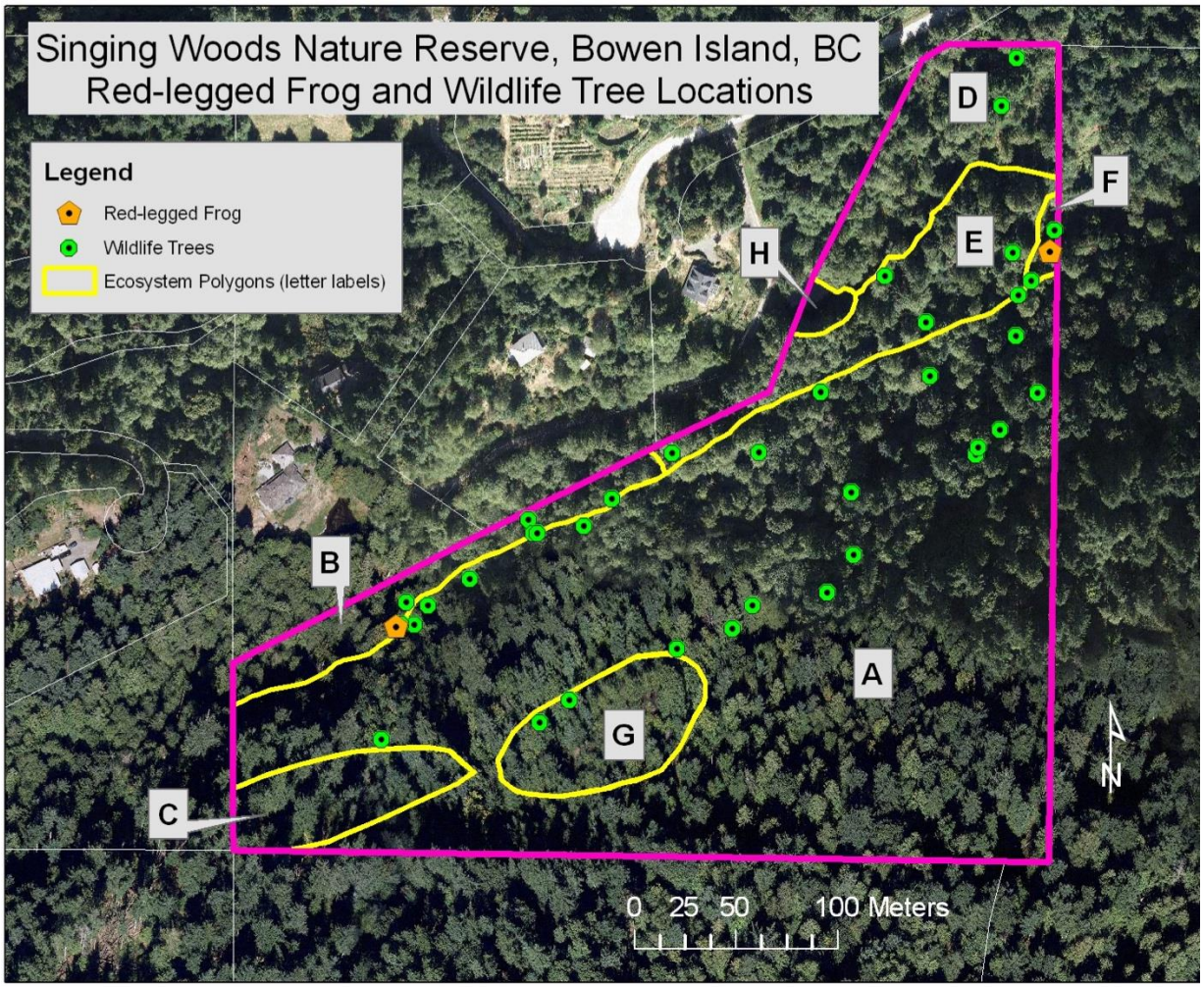


Figure 5. Map of observed wildlife trees and Northern Red-legged Frog only; more features exist.

Wildlife tree locations were recorded when observed during site visits, but as a full inventory of all wildlife trees was not conducted, there are additional trees present that do not appear on the map (Figure 5). Figure 5 also indicates the location of the adult Northern Red-legged Frog observed in 2016.

Five species of mammal (Table 2) have been found in Singing Woods Nature Reserve, confirmed by sightings and/or evidence. Bowen Island does not have a Black Bear population but individuals do come to the island on occasion.

Table 2. Mammals identified within the Singing Woods Nature Reserve during field visits in 2000 (Pottinger Gaherty Environmental Consultants Ltd., 2000) and 2016, and additional observations by Bowen Island residents (dates unknown).

Common Name	Latin Name	May 2000	July 2016	Date Unknown	Ecosystem Polygon
American Mink	*Neovison vison*			**X**	**B**
Black Bear	*Ursus americanus*			**X**	**B**
Columbian Black-tailed Deer (by evidence)	*Odocoileus hemionus columbianus*	**X**	**X**		**A, B, E**
Douglas' Squirrel	*Tamiasciurus douglasii*	**X**	**X**		**A, B, E**
River Otter	*Lontra canadensis*			**X**	**B**

The variety of habitats within the reserve attracts a significant number of bird species. Veteran and mature Douglas-fir, bigleaf maple, and red alder provide nesting opportunities for cavity-nesting bird species. A list of birds identified during the site visits is presented in Table 3. Three species are blue-listed (see Section 3.10 for a definition) in the province: Hutton's Vireo, Great Blue Heron and Band-tailed Pigeon.

Table 3. Birds identified within the Singing Woods Nature Reserve during field visits in 2000 (Pottinger Gaherty Environmental Consultants Ltd., 2000) and 2016, and additional observations by Bowen Island residents (dates unknown).

Common Name	Latin Name	May 2000	July 2016	Date Unknown
American Robin	*Turdus migratorius*	**X**	**X**	
Bald Eagle	*Haliaeetus leucocephalus*	**X**		
Band-tailed Pigeon*	*Columbia fasciata*	**X**		
Barred Owl	*Strix varia*			**X**
Brown Creeper	*Certhia americana*	**X**	**X**	
Bufflehead	*Bucephala albeola*			**X**
Chestnut-backed Chickadee	*Para rufescens*	**X**		
Common Raven	*Corvus corax*	**X**	**X**	
Dark-eyed Junco	*Junco hyemalis*	**X**		
Golden-crowned Kinglet	*Regulus satrapa*	**X**	**X**	
Great Blue Heron*	*Ardea herodias fannini*			**X**
Hairy Woodpecker	*Picoides villosus*	**X**	**X**	

Hutton's Vireo*	*Vireo huttoni*	**X**		
Mallard	*Anas platyrhynchos*	**X**		
Northern Flicker	*Colaptes auratus*	**X**		
Pacific-slope Flycatcher	*Empidonax difficilis*		**X**	
Pacific Wren	*Troglodytes pacificus*		**X**	
Pileated Woodpecker	*Dryocopus pileatus*	**X**	**X**	
Pine Siskin	*Spinus pinus*		**X**	
Red-breasted Nuthatch	*Sitta canadensis*	**X**	**X**	
Red-tailed Hawk	*Buteo jamaicensis*	**X**		
Spotted Towhee	*Pipilo maculatus*		**X**	
Steller's Jay	*Cyanocitta stelleri*	**X**	**X**	
Swainson's Thrush	*Catharus ustulatus*		**X**	
Wilson's Warbler	*Cardellina pusilla*		**X**	

*CDC blue-listed species.

An inventory of invertebrates in the reserve has not be conducted, however incidental observations were made during 2000 (Golinski, 2002) and 2016 surveys (Table 4).

Table 4. List of invertebrates observed in Singing Woods Nature Reserve during field surveys in 2000 (Golinski, 2002) and 2016.

Common Name	Latin Name	Type	1998	2016
Lorquin's Admiral	*Limentis lorquini*	Butterfly	**X**	
Western Tiger Swallowtail	*Papilio rutulus*	Butterfly	**X**	
Pacific Spiketail	*Cordulegaster dorsalis*	Dragonfly	**X**	
Eight-spotted Skimmer	*Libellula forensic*	Dragonfly	**X**	
Pacific Banana Slug	*Ariolimax columbianus*	Slug		**X**

The following blue-listed wildlife species were not observed on the reserve during the 2000 and 2016 site visits, but are known to occur elsewhere on Bowen Island and are mobile:

- Blue Dasher (*Pachydiplax longipennis*).
- Townsend's Big-Eared Bat (*Plecotus townsendii*).

In summary, significant wildlife-related findings of the 2016 assessment were:

- High wildlife values are present on and adjacent to the site, including the presence of large and small mammals, invertebrates, reptiles, amphibians, songbirds, and raptors.
- The reserve provides a variety of habitats including open and treed wetlands, riparian areas, mixed deciduous/coniferous forests, mature coniferous forests, and maturing seral stage stands.
- Other significant features include veteran old-growth Douglas-fir trees, a pond, and several small cliffs.
- Numerous active game trails were observed throughout the site.
- Northern Red-legged Frog, listed under the *Species at Risk Act* and blue-listed in the province by the CDC, was confirmed to occur within wet habitats of the study area.

- Three blue-listed bird species (Great Blue Heron, Hutton's Vireo and Band-tailed Pigeon) have been observed using the reserve.
- The connectivity between the reserve and neighbouring properties identified in 2000 is still intact and provides a substantial and significant greenway and wildlife corridor between Crippen Park and Josephine Lake.

3.7 Fish and Fish Habitat

Portions of the reserve provide fisheries values.

Fish-bearing watercourses:

- Cutthroat trout were observed in the pond and stream in Polygon B (Figure 4) (Pottinger Gaherty Environmental Consultants Ltd., 2000) but their continued presence was not confirmed during the 2016 assessment.

Fish habitat:

- Watercourses traversing the reserve (fish bearing and non-fish bearing) contribute significant food and nutrients to downstream fish populations, including Coho Salmon in Terminal Creek.

The wetland areas are of importance to fish due to the diversity of habitat they include (e.g., large woody debris, deep pools, and abundant cover). The deep pools were excavated in the mid 1980s as part of the subdivision project.

3.8 Red- and Blue-Listed Species and SARA-listed Species

The **Species at Risk Act (SARA)** is a piece of Canadian federal legislation which became law in Canada in 2002. It is designed to meet one of Canada's key commitments under the International Convention on Biological Diversity. The goal of the Act is to protect endangered or threatened organisms and their habitats. It also manages species which are not yet threatened, but whose existence or habitat is in jeopardy.

The British Columbia Conservation Data Centre (CDC) uses a North America wide system to rank the conservation concern of native species (or subspecies) occurring within the province. The CDC maintains red and blue lists of rare species.

Red-listed: Species that have been legally designated as **Endangered** or **Threatened** under the *Wildlife Act of British Columbia*, are **Extirpated**, or are candidates for such designation.

Blue-listed: Species considered to be **Vulnerable** in BC, with characteristics that make them particularly sensitive to human activities or natural events.

Rare Plant Species of Singing Woods Nature Reserve

No endangered or vulnerable plant species were noted during the site visits in 1999 (Golinski, 2002), 2000 (Pottinger Gaherty Ltd, 2000) or 2016. The BCCDC has no records of red- or blue-listed plant species occurrences on the property. This should not be considered conclusive,

however, as vernal species may have been past identification during field surveys, and further inventory may provide new findings.

The following blue-listed plant species, though not observed on the nature reserve, do occur elsewhere on Bowen Island: winged water-starwort (*Callitriche marginata*) and beaked spike-rush (*Eleocharis rostella*).

Rare Wildlife Species

Northern Red-legged Frog (SARA-listed as a Species of Concern in Canada and blue-listed in the province of BC) has been observed on the property numerous times over the past 17 years. Golinski noted tadpoles in pools of standing water in 1999 (Golinski, 2002) and an adult was found during site visits in 2016 on the edge of the swamp, on the slope near the northwest corner of the reserve (Figure 5). Neighbouring residents have also observed Northern Red-legged Frog in the reserve over the intervening years. It appears to be a healthy and sustaining population.

Great Blue Heron, listed as a taxon of 'Special Concern' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and blue-listed in BC is a regular visitor to the reserve, often observed fishing in the pond by adjacent residents (O. Plowman, pers. comm., 2016). It not known to nest in the reserve.

Hutton's Vireo has been observed in the reserve forests. It is a small songbird of the Pacific Coast, reaching its northern limit in BC. The reserve provides foraging and possible nesting habitat for this blue-listed species.

Band-tailed Pigeon has often been observed at the edges of the reserve's forests, and they frequent a neighbour's feeder (O. Plowman, pers.comm.). This blue-listed species only occurs in Canada during the summer breeding season. It typically nests in mature conifer forest at higher elevations.

3.9 Red and Blue-Listed Ecological Communities

The British Columbia Conservation Data Centre uses a North America wide system to rank the conservation concern of native ecological communities occurring within the province. The CDC maintains a red and blue list of ecological communities, depending on their rarity.

Red-listed: Ecological communities that have been legally designated as **Endangered** or **Threatened** under the *Wildlife Act of British Columbia*, are **Extirpated**, or are candidates for such designation.

Blue-listed: Ecological communities considered to be **Vulnerable** in BC, with characteristics that make them particularly sensitive to human activities or natural events.

Almost all the reserve is comprised of red or blue-listed ecological communities (Table 5). Most are also at a mature forest structural stage (polygons A, B, C and E) which makes them significant occurrences. The lack of disturbance and excellent landscape context (surrounded on most sides by protected greenways) also adds to their ranking and importance.

Table 5. Red- and blue-listed ecological communities represented in the Singing Woods Nature Reserve, their related site series, and the ecosystem polygons in which they occur.

English Name	BC Status	BEC Subzone and Site Series	Ecosystem Polygons
Western redcedar – sword fern Dry Maritime	Red	CWHdm/05	E
Western hemlock – western redcedar / deer fern	Red	CWHdm/06	D
Douglas-fir / sword fern	Blue	CWHdm/04	A, G
Douglas-fir – western hemlock / salal	Blue	CWHdm/03	C
Western redcedar – sword fern / skunk cabbage	Blue	CWHdm/12	B

3.10 Invasive Species

Singing Woods Nature Reserve has only a minor incidence of non-native invasive species. As with many other Bowen Island forests, English holly (*Ilex aquifolia*) is present, although not in significant numbers compared to other sites such as Crippen Park. A small patch of common burdock (*Arctium minus*), approximately 10m x 10m, was found at the base of the slope where rock and gravel were deposited after erosion of the skid trail above. Observed locations of invasive plants were mapped (Appendix 8).

4.0 Stakeholder Consultation

Islands Trust is cognizant of the important role that adjacent landowners, First Nations, community members and organizations can play in the management of its nature reserves. These stakeholders in Singing Woods property were invited to participate in setting objectives, identifying issues, and proposing strategies for inclusion in this Management Plan.

4.1 Adjacent Landowners

There are currently five landowners whose property is directly adjacent to Singing Woods Nature Reserve. Each was contacted in person during the management plan update process to discuss the nature reserve and plan, request local observations and information, as well as input regarding maintenance and goals for the property. Landowners were also sent a letter (Appendix 6) and questionnaire (Appendix 7) from ITF. All landowners, including those not adjacent to but near the reserve, were personally invited to a Community Open House on November 30, 2016, to hear about the reserve and the management plan update, and allow for their knowledge, opinions and suggestions to be incorporated in the process. Landowner input was found to be especially helpful in shaping and informing the update to the Management Plan.

4.2 First Nations Communications

Islands Trust Fund sent letters to representatives of the eight First Nations with potential interest in lands on Bowen Island (Appendix 5), apprising them of the initiative to update the management plan for Singing Woods and asking them for their input in the process. At the date of the plan

approval there has been no response from any of the First Nations, but the Islands Trust Fund remains open to communication throughout the life of this management plan.

4.3 Community Members

A Community Open House was held on November 30, 2016, on Bowen Island. Community members were invited via a notice in the local paper, on the community's electronic forum and several Bowen Island Facebook group pages. Local organizations likely to have an interest in conservation/trails/recreation, including Bowen Island Conservancy, were asked to attend to learn about the reserve, the management update process, and to provide input such as local knowledge (e.g. nature observations, cultural/spiritual significance, witness of unacceptable activities), thoughts on use while maintaining preservation goals and ideas for best management practices.

The site history, environmental values and management plan update process were presented and explained, aided by presentation materials such as maps of the plant, ecosystem and wildlife values of the reserve. A dynamic discussion followed where participants asked questions, shared thoughts and provided some new information about the reserve. Much of the discussion focused on what uses would be appropriate within the reserve. There was a general consensus among those present that only low-impact non-motorized recreational uses should be permitted. Hunting, mountain-biking, camping, campfires, horseback riding, and motorized access of any kind were all considered inappropriate. Questionnaires were distributed to all attendees (Appendix 5).

4.4 Cultural Significance

"Cultural and spiritual bonds with nature are among the strongest personal drives and motivators for nature conservation yet they are not often taken into account in the governance and management of protected areas" is a quote from the International Union for the Conservation of Nature (IUCN). Co-chair of the Cultural and Spiritual Values of Protected Areas of the IUCN World Commission, Edwin Bernbaum states "We have to include cultural, spiritual, aesthetic, and historical importance that nature has for people in in nearly all societies, from traditional to modern" (IUCN website homepage, accessed January 2017).

Most Bowen Island residents have chosen to live on the island in part for its natural surroundings. Having greenways and natural areas protected from development is extremely important to many community members. Being close to and surrounded by natural areas is culturally and/or spiritually significant to many, especially in this technological and development-minded age. Nature's benefits to human health and mental well-being are well documented.

It is unknown if the reserve property is culturally significant to First Nations. No specific information on the cultural significance was received from First Nations in response to the letters including background information and a request for input from Islands Trust.

5.0 Management Plan

5.1 Discussion

The Islands Trust Fund is a conservation land trust established in 1990 to preserve and protect unique ecological or cultural properties in the Islands Trust Area. As one of British Columbia's leading conservation trusts, the ITF works with the community to protect special places in perpetuity through voluntary land donations, conservation covenants, land acquisition and public education. The mission of the ITF, as an active regional land trust, is to protect special places by encouraging, undertaking and assisting in the voluntary conservation initiatives within the Islands Trust Area. More information on the Islands Trust Fund is available at www.islandstrustfund.bc.ca.

As part of the ITF mandate, management plans for each reserve property are created to assess the environmental values of the reserve, identify management issues, and outline actions to support the objectives of preservation and conservation. It is ITF's goal to update each management plan every 10 years.

ITF works together with local groups to manage its reserve properties. The Bowen Island Conservancy has been designated by the Islands Trust Fund to manage Singing Woods Nature Reserve on its behalf. The Conservancy has planted trees in the reserve as suggested in the first management plan (Pottinger Gaherty Environmental Consultants Ltd., 2000), conducted periodic surveys of the property and maintained alert to any inappropriate activities. It is recommended that ITF continue their beneficial relationship with the Bowen Island Conservancy and keep them informed of timing and results of the yearly monitoring that ITF conducts.

5.2 Trail Use and Location

The main existing trail in Singing Woods Nature Reserve enters the property near the northeast corner of the site. This trail is a continuation from a hiking path that originates on Village Drive and follows a municipal trail easement up the eastern slope of Cates Hill, crossing through a private property with a conservation easement to meet the boundary of Singing Woods Nature Reserve. The trail continues west along the northern portion of the reserve and is well evident until it reaches the first pond at Minnows Lane (Figure 2). There is no obvious continuation of the trail further west, as a previous path that partly traversed the swamp has grown over. The issue of accessing the reserve via a private property is further discussed in Public Access (Section 5.8).

The only other existing trail within the reserve follows an old logging skid road up the north-facing slope; it is mostly grown over. There was significant erosion along the skid road prior to the nature reserve being established, with gravel deposits being washed down in periods of high precipitation. Bowen Island Conservancy members planted over sixty (>60) saplings Douglas-fir and western redcedar seedlings and saplings along the skid trail in an effort to reduce further erosion. Community members agreed at the Open House that the trail should not be re-established, since it leads to the Ecological Reserve #48 where access is restricted, and increases the chance of erosion.

The existing Trail Right-of-Way (Appendix 1) was to allow placement of a foot trail across the

reserve in an east-west direction, however the current survey locates the trail directly through a sensitive swamp ecosystem. Any new trail should be designed to avoid the wetland areas by positioning them on the slope west of the pond.

A development proposal for the Rennison or Grafton Lake Lands (Figure 6) is at the community discussion stages, and if accepted by the Bowen Island Municipality, may have consequences for trail access through the Singing Woods Nature Reserve. The Rennison lands are west and north of the reserve, encompassing 141 hectares (350 acres) including Grafton Lake. Between the Rennison lands and Singing Woods is a Municipal Park. In the current development proposal, a walking trail from the southeast section of the Rennison lands to Snug Cove village is proposed. The developer has indicated that this trail could pass through the Municipal Park and Singing Woods Nature Reserve. As described earlier, there is no useable trail that crosses the western half of the reserve, so currently it is not possible for this walking path to link the Rennison lands to Snug Cove.

If ITF decide that a trail be created on the western half of the reserve, there is a significant likelihood that in the future it would connect with the Grafton Lake Lands development and its residents. Human use of the reserve would increase, although it is difficult to estimate to what degree, as the development proposal does not indicate the number of residents expected. Given that a main conservation strategy of the management of the reserve is to 'accommodate but not encourage' recreational use, it is recommended that the ITF and Bowen Island Conservancy together seriously consider whether a trail should be built to reach the western boundary of the reserve. This issue was discussed at the Community Open House. Initially, attendees indicated their support for the idea of a longer trail in the reserve to allow increased nature appreciation and enjoyment of the reserve; however, support waned once the potential ramifications of opening the route to a larger number of people was considered. Suggestions around foot traffic only and restricting dogs was discussed if a trail linked to the Grafton Lake Lands. It should be noted that community support for a trail linkage from Grafton Lake to Snug Cove is likely to be high.

If ITF decides to build the trail on the western half of the reserve, there are additional environmental concerns that should be addressed before trail construction begins. A trail just upslope from the wetland and stream wetlands and/or streams could negatively impact fish habitat and water quality in the reserve, as well as degrade the ecosystems themselves through increased human use. It is recommended that the trail be positioned as far upslope as possible. Extreme care should be taken during trail construction in these environmentally sensitive areas to prevent:

- Sediment movement into streams or the wetland
- Loss of overhanging vegetation (of stream or wetland)
- Loss of wetland edge and streambank stability.

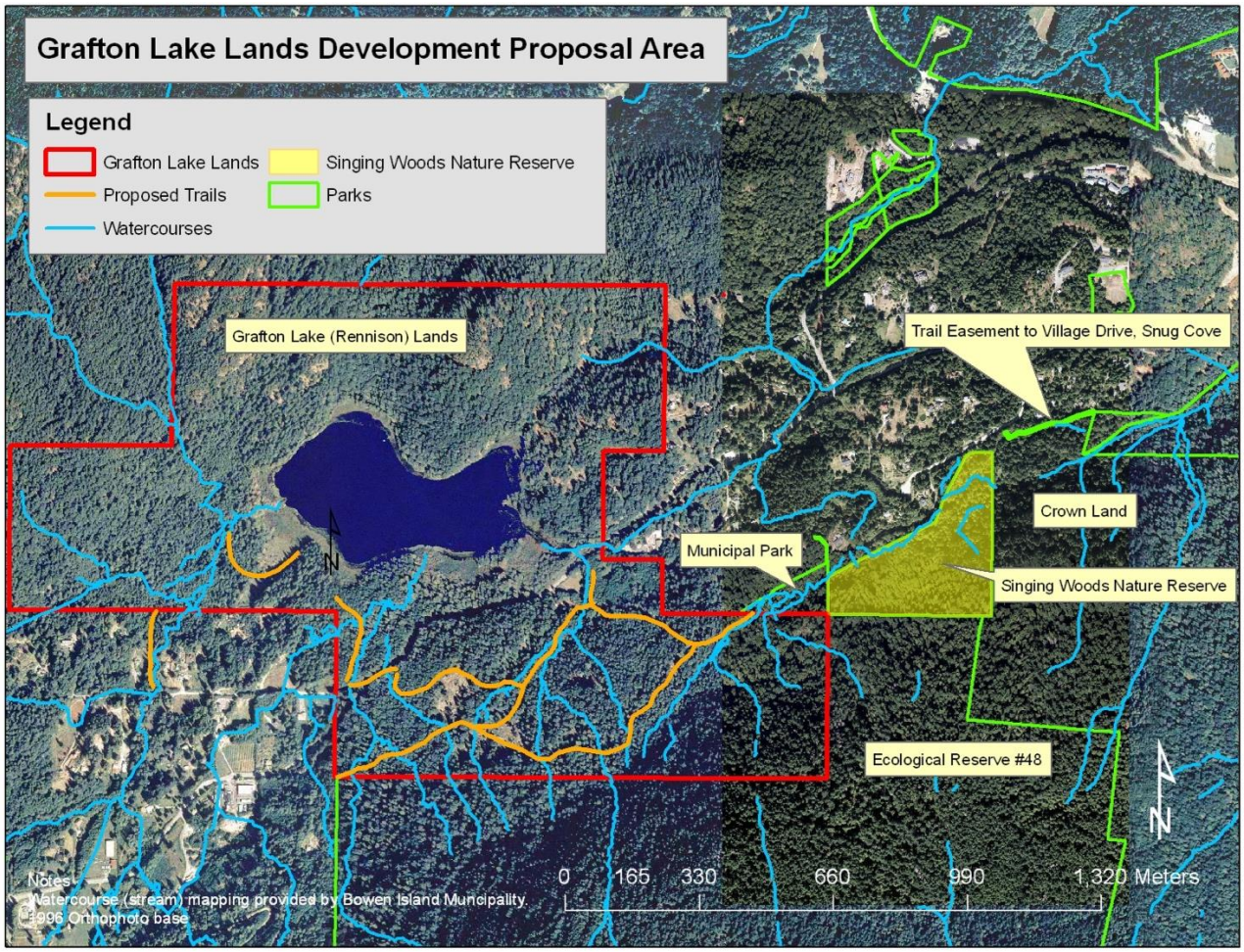


Figure 6. Grafton Lake Lands (Rennison Properties) proposed development area, showing proposed trail locations (orange lines) that are expected in the developer's proposal to link through the adjacent municipal park and Singing Woods Nature Reserve and join with the trail easement to Village Drive and Snug Cove.

The layout of the route should be planned by a Registered Professional Biologist who can make location decisions that minimize impacts to sensitive ecosystems, habitat and wildlife, as well as recognize any red- or blue-listed species to be avoided. If the removal of trees is deemed necessary, a bird nest survey should be conducted prior to their removal, and should occur outside the bird nesting season of March 1 to August 15). The actual trail should be minimal in scope to only encourage and support pedestrian traffic. It is recommended that dogs be restricted from using the trail.

5.3 Trail Maintenance

There is currently no active maintenance on the existing trail. Regular users may cut back overhanging vegetation or clear debris on occasion, and along with the foot traffic of sporadic trail users, this has kept the eastern half of the trail clear. The western half of the trail that at one time existed has grown over due to lack of maintenance. This is fortunate, as the route was through

sensitive swamp wetlands.

If a new trail is constructed to reach the western edge of the reserve, and the proposed development for the Rennison properties (Grafton Lake Lands) comes to fruition, the issue of trail maintenance will have to be revisited. Occasional fallen branches or trees may have to be cleared.

5.4 Permitted Uses

ITF policy states that nature reserves are for day use and foot traffic only. Acceptable uses within the Singing Woods Nature Reserve include:

- Walking
- Quiet appreciation of nature (e.g. photography).

Unacceptable and prohibited uses include:

- Biking
- Horseback riding
- Camping
- Partying
- Fishing
- Hunting
- Tree cutting
- and any use that could reasonably pose a threat to wildlife, wildlife habitat, fish and fish habitat.

Existing signage at the reserve does not indicate prohibited uses. It is not considered necessary at this time to post additional signage at the property as there has been no known mis-use to date. If mis-use becomes an issue at the reserve, additional signage indicating prohibited activities should be considered.

Annual monitoring will continue to be completed by ITF contractors and supported by the Bowen Island Conservancy to check the property and ensure only acceptable activities are occurring in the nature reserve.

5.5 Exotic and Invasive Species

Singing Woods Nature Reserve has only a minor incidence of invasive species. As with many other Bowen Island forests, English holly (*Ilex aquifolia*) is present, although not in significant numbers compared to other sites, e.g. Crippen Park. A small patch of common burdock (*Arctium minus*), approximately 10m x 10m, was found at the base of the slope where rock and gravel were deposited after erosion of the skid trail above. It is recommended that both holly and burdock be removed from the site.

There were no thickets of the aggressive Himalayan blackberry (*Rubus armeniacus*) seen, and Japanese knotweed (*Fallopia japonica*), also an aggressive invasive, was not noted on the property.

While the occurrence of invasive species in the reserve is minimal, this should be monitored so that newly arriving invasives or the spread of existing ones can be removed before the environmental values of the reserve are negatively affected.

5.6 Ecological Restoration

The reserve is in good ecological condition overall. The main concern when ITF acquired the property was the erosion along the old logging/skid road up the north-facing slope. A large number (>60) of native coniferous saplings (Douglas-fir and western redcedar) have been planted by Bowen Island Conservancy volunteers, and natural re-vegetation is occurring. During 2016 field assessments, it was noted that many saplings were being shaded out by pioneering vegetation, causing a failure to thrive in the planted individuals. No further plantings are recommended. Natural regeneration is occurring. Invasives are not expected to succeed in these areas as native vegetation in the understorey is currently abundant.

As noted in Section 5.2, a trail does exist following the route of the skid road, although it is overgrown in parts and the start of it at the toe of the slope is difficult to see. Participants at the Community Open House agreed that public use of this trail should be eliminated as it allows for access into Ecological Reserve #48 where public access is prohibited, and portions of the road have been eroded at ephemeral stream crossings. Continued use of the trail could result in additional erosion, with sediment being deposited in the sensitive wetlands at the bottom of the slope, potentially causing unacceptable environmental degradation.

The 30-year old clear cut area in the southwest portion of the reserve is regenerating naturally to a young coniferous forest. No restoration activities are recommended for the site.

5.7 Protection of Sensitive Ecosystems and Species at Risk

Protection of the Sensitive Ecosystems within the reserve is best accomplished by ensuring that unacceptable and prohibited uses do not occur within its boundaries (see 5.4, Permitted Uses). In addition, trails should not be located in, or at the very edge of the wetland areas. Portions of an old trail have been found to cross through parts of the skunk cabbage swamp in the northwest section of the reserve. The trail is becoming overgrown, and should be allowed to continue to grow over. The small pocket marsh near the eastern edge of the reserve is not currently accessible by a trail and should remain so.

The Northern Red-legged Frog population is best protected by preventing disturbance in the wetland areas and pond of the reserve, as well as the pond on private property just outside the reserve at its northwest corner. Both pond landowners attended the Community Open House, and were extremely supportive of the preservation of the Northern Red-legged Frog population. To follow up on discussions at the open house, it is recommended that Bowen Island Conservancy Board members contact these landowners to encourage them to leave the pond and pond edges unaltered and undisturbed; if land ownership changes, new residents should be contacted to be informed about the SARA species occurrence and ways they can help to ensure its preservation.

5.8 Public Access

Only a very narrow section (15 m) of the reserve boundary abuts public land. It is found in the northeast portion of the reserve along Cates Hill Road. This access is used very little, since only a few metres away a well-worn trail is visible from the road; it occurs on private land (with a conservation easement) but is likely thought by most visitors to be part of the reserve, provincially-managed public land or trail easement, as no house or dwelling is evident. This short access from the road (approximately 12 m in length) joins with a well-used trail that begins lower down the east side of Cates Hill at Village Drive, following the top of the north bank of Davies Creek along a trail easement that terminates at Cates Hill Road. However, the trail continues for approximately 53 m, without an easement and over a private property before reaching the eastern edge of the reserve and ITF signage (Figure 7).

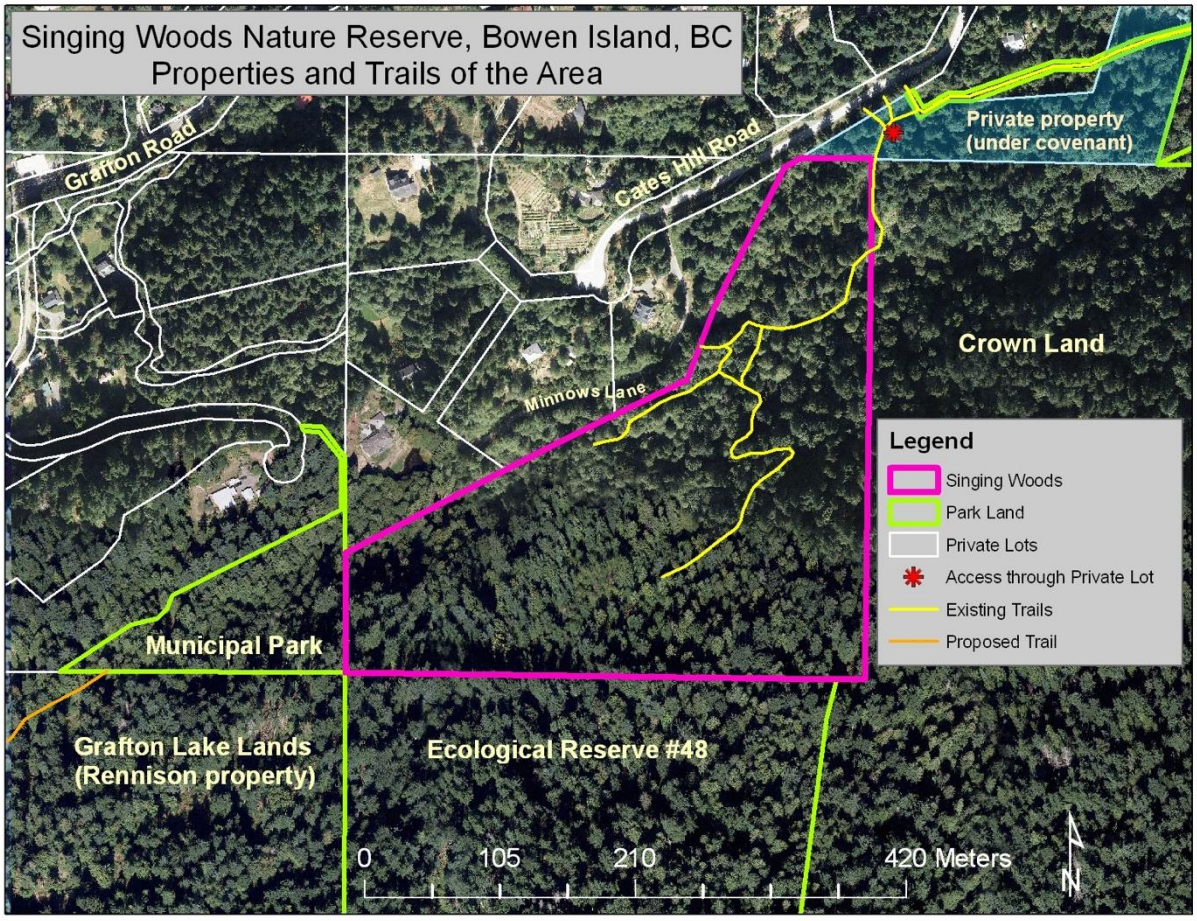


Figure 7. Properties and trails in and near Singing Woods Nature Reserve, Bowen Island, BC. Note the main access to the reserve is across private property (shown in light blue, upper right corner).

During the management plan update process, Raincoast Applied Ecology contacted the private landowner and had a walkabout on the property with him and a discussion regarding access to the reserve. The landowner is very amenable to allowing walkers to use the portion of trail that crosses

over his property, linking the trail easement with the nature reserve, however, he has concerns regarding his liability should an accident occur on his property. He is open to the possibility of establishing a Trail Use Agreement with the Bowen Island Conservancy whereby the Conservancy's insurance would cover users of the trail while on his property. It is recommended that a member of the Conservancy Board contact him to investigate this option. This was discussed with Board members during the plan process.

A development proposal for the Grafton Lake Lands (Rennison properties) is at the community discussion stages, and if accepted by the Bowen Island Municipality, may have consequences for the Singing Woods Nature Reserve. The Grafton Lake Lands are west and north of the reserve, encompassing 141 hectares including Grafton Lake (Figure 6). Between the Grafton Lake Lands and Singing Woods is a Municipal Park. In the current development proposal, a walking trail from the southeast section of the Grafton Lake Lands to Snug Cove village is proposed. The developer has indicated that this trail could pass through the Municipal Park and Singing Woods Nature Reserve. As described earlier, there is no useable trail that crosses the western half of the reserve, so currently it is not possible for this walking path to link the Grafton Lake Lands to Snug Cove.

If ITF and the Bowen Island Conservancy decide that a trail on the western half of the reserve should be created (on the slope to avoid the sensitive wetland), there is a significant likelihood that in the future it would connect with the Rennison development and its residents. Human use of the reserve would increase, although it is difficult to estimate numbers, as the development proposal does not indicate the number of residents expected. Given that a main conservation strategy of the management of the reserve is to 'accommodate but not encourage' recreational use, it is recommended that the ITF and Bowen Island Conservancy together seriously consider whether a trail should be built to reach the western boundary of the reserve. This issue was discussed at the Community Open House. Initially, attendees suggested and there was support for the idea of a longer trail in the reserve to allow increased nature appreciation and enjoyment of the property; however, support waned once the potential ramifications of opening the route to a larger number of people was considered. It was suggested that the developer should investigate an alternate route that does not cross the reserve.

5.9 Scientific Research/Education

There currently is no agenda for scientific research or education involving Singing Woods Nature Reserve.

6.0 Action Items

6.1 Immediate Actions

<u>Investigate a Trail Use Agreement for Private Landowner</u>
As described in Public Access (Section 5.8), the main trail into the reserve crosses private property. It is recommended that ITF discuss with the Bowen Island Conservancy the possibility of a Trail Use Agreement for the landowner, whereby public access is allowed under the umbrella of the Conservancy's liability insurance.

Postpone Extension of the Existing Trail

As noted in Sections 5.2 and 5.8, there are advantages (e.g., increased ability for people to enjoy the reserve) but potential disadvantages to extending the existing trail to the reserve's western boundary (i.e., possible significant increase in human use of the reserve if Grafton Lake lands are developed). It is the recommendation of this Management Plan that no trail construction be initiated within the reserve at this time; this can be re-evaluated during the next plan update, or when needed. As a courtesy to the local developer, it is suggested that ITF staff request that the Bowen Island Conservancy contact the Grafton Lake developer to suggest that an alternate route be investigated for the proposed pedestrian through-way from Grafton Lake to Snug Cove. If an alternate route is not found, more assessment is needed to understand the impacts of such a trail through the reserve.

6.2 Short-term Actions

Monitoring – Annually (ITF) and Ongoing (Bowen Island Conservancy)

The annual monitoring process which the ITF undertakes on all properties (which includes the taking of photographs and notes regarding any impacts and changes occurring on the land) along with periodic visitations by Bowen Island Conservancy members will likely detect any unacceptable activities that have occurred on the reserve. Members of the Bowen Island community are also encouraged to report observations of any unacceptable activities to the ITF or the Bowen Island Conservancy.

6.3 Medium-term Actions

Discharge Covenants

Request that the Bowen Island Municipality discharge the Section 219 Covenant (BN 320918) and BG250180 registered on the land. The ITF Board will explore the potential for a conservation covenant with an appropriate agency.

6.4 Long-term Actions

Increasing the Trail System

While it is recommended that no trail additions are made within the reserve at this time, it is suggested that this be reviewed at a later date. An extended trail system has support from the community and would increase the quiet enjoyment of the reserve, but taking into consideration the potential negative effects of access to the reserve from its western edge, a trail upslope from the wetland that forms a circular loop back to the existing trail may be a measured solution.

6.5 Summary Action Item List

Immediate or Short-term Actions Summary

- Discuss a Trail Use Agreement for the private property from which most people access the reserve.
- Do not initiate new trails.

Medium-term Actions Summary

- Discharge municipal covenants.

Long-term Actions Summary

- Revisit the concept of an increased trail network (a circular loop on the slope in the western half of the reserve, but not in proximity to Ecological Reserve #48, or a link for the community from the Grafton Lake lands to the cove) above the swamp wetlands that does not jeopardize the natural features of the reserve.

7.0 Conclusion

Singing Woods Nature Reserve is an important protected area which is surrounded on most sides by protected greenspace or undeveloped provincially-managed public land, creating a network of natural areas on Bowen Island and providing wildlife habitat connections. It provides important habitat for rare species such as the Northern Red-legged Frog, Hutton's Vireo, Band-tailed Pigeon and Great Blue Heron. The reserve is almost entirely comprised of rare, red and blue-listed ecological communities, from coniferous swamps to dry forests. The headwaters of two significant streams occur within the reserve. The parcel of land is part of a large and significant greenway across the island.

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

REFERENCES

B.C. Conservation Data Centre. 2017. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Jan 13, 2017).

Fast, S. Municipal Councilor. Personal communication, 2016 & 2017.

Golinski, K. 2002. Bowen Island Wetland Inventory. Report prepared for the Bowen Island Conservancy, Bowen Island, BC. 54 pp and appendices.

Green, R.N. and K. Klinka. 1994. *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region, Land Management Handbook Number 28*, BC Ministry of Forests.

International Union for the Conservation of Nature. www.iucn.org homepage, accessed January 5, 2017.

Islands Trust Fund (ITF). 2016. Islands Trust MapIT online mapping tool. http://mapit.islandstrust.bc.ca/Html5Viewer/Index.html?configBase=http://mapit.islandstrust.bc.ca/Geocortex/Essentials/REST/sites/MapIT/viewers/MapIT/virtualdirectory/Resources/Config/Default. [Accessed November 4, 2016].

Luttmerding, H.A.. 1980. *Soils of the Langley-Vancouver Map Area, Volume 1, Report No. 15*, British Columbia Soil Survey RAB Bulletin 18.

Plowman, O. Bowen Island Conservancy President and Singing Woods Nature Reserve neighbor. Personal communication, 2016 & 2017.

Pottinger Gaherty Environmental Consultants Ltd. 2000. Management Plan for Singing Woods Nature Reserve, Bowen Island, BC. Unpublished report prepared for the Islands Trust Fund, Victoria, BC. 31pp.

Roddick, J.A. 1965. Geological Survey of Canada, Memoir 335, Vancouver North Coquitlam, and Pitt Lake Map-Areas, British Columbia, Crown Copyrights.

Shoji, M., S. Lemmon and C. Clay. 2000. Bowen Island Sustainability Project Report. Also known as 'SFU State of Bowen Island GIS Atlas'. Prepared for the Bowen Island Municipality, Geological Survey of Canada, Capilano College and Real Estate Foundation. 31pp and Appendices.

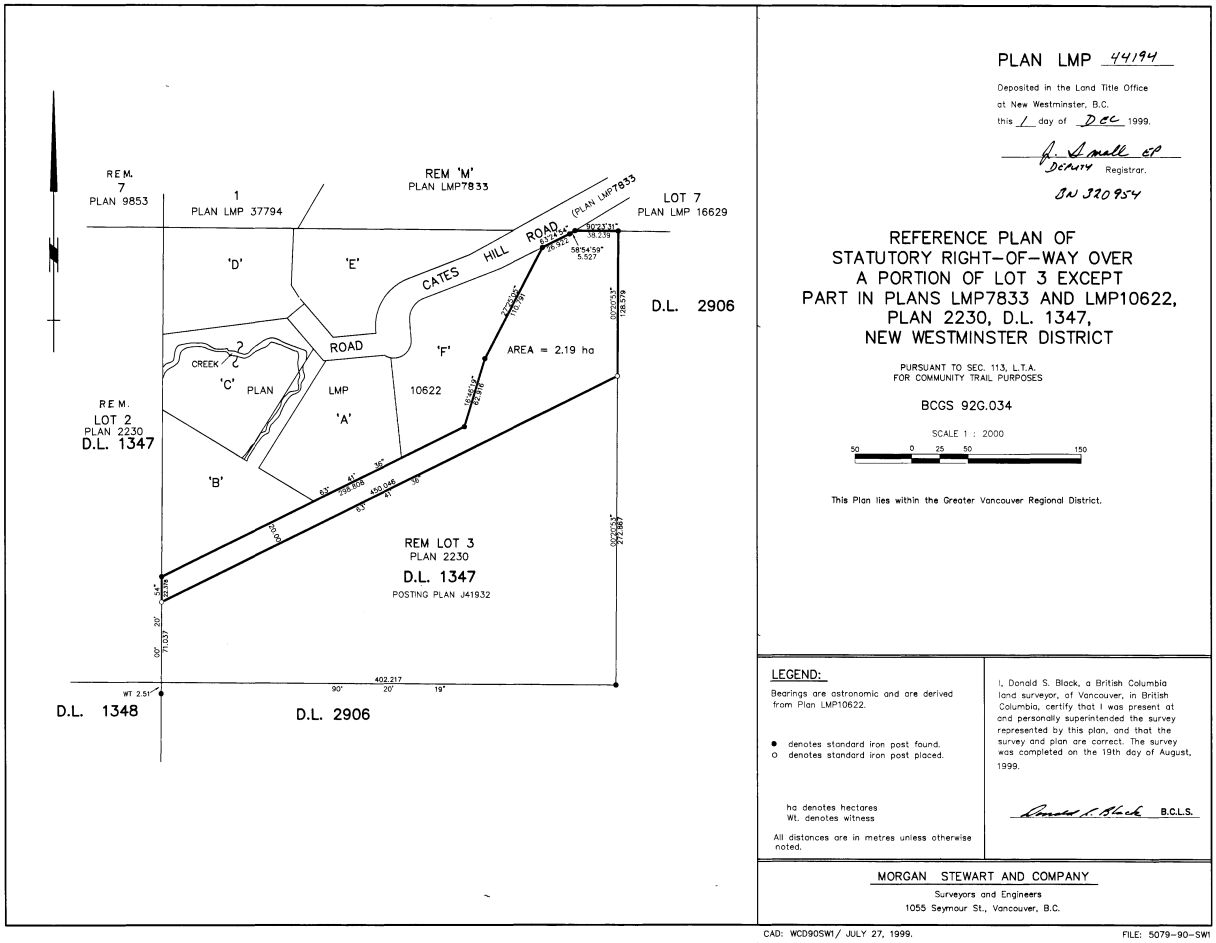
Turner, B. Geologist and Singing Woods Nature Reserve neighbour. Personal communication, 2016 & 2017.

Van Lidthe de Jeude, E. Bowen Island Conservancy Board Member. Personal communication, 2016.

Wang, T., A. Hamann, D. Spittlehouse and C. Carroll. 2016. Locally Downscaled and Spatially Customizable Climate Data for Historical and Future Periods for North America. PLoS ONE 11(6): e0156720. Doi:10.1371/journal.pone.0156720.

Whitehead, A. Warden of Ecological Reserve #48, Bowen Island. Personal communication, 2016 & 2017.

Appendix 1. Property Survey of Singing Woods Nature Reserve (Reference Plan LMP 44194) with Statutory Right-of-Way.



Appendix 2. Title Search of Singing Woods Nature Reserve Property.

TITLE SEARCH PRINT 2014-05-13, 08:47:39

Requestor: bdashwood@islandstrust.bc.ca

Folio/File Reference:

CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN

Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	BN320979
From Title Number	BJ388619
Application Received	1999-12-01
Application Entered	2000-01-13
Registered Owner in Fee Simple	
Registered Owner/Mailing Address:	TRUST FUND BOARD 200 - 1627 FORT STREET VICTORIA, BC V8R 1H8
Taxation Authority	MUNICIPALITY OF BOWEN ISLAND

Description of Land

Parcel Identifier: 010-931-422

Legal Description:

LOT 3, EXCEPT PART IN PLANS LMP7833 AND LMP10622, DISTRICT LOT 1347
PLAN 2230

Legal Notations NONE

Charges, Liens and Interests

Nature:	COVENANT
Registration Number:	BG250180
Registration Date and Time:	1993-07-15 09:45
Registered Owner:	BOWEN ISLAND LOCAL TRUST COMMITTEE
Remarks:	SECTION 215, LAND LITLE ACT
Nature:	COVENANT
Registration Number:	BN320918
Registration Date and Time:	1999-12-01 13:17
Registered Owner:	BOWEN ISLAND LOCAL TRUST COMMITTEE
Remarks:	INTER ALIA

TITLE SEARCH PRINT 2014-05-13, 08:47:39

Requestor: bdashwood@islandstrust.bc.ca

Folio/File Reference:

Nature:	STATUTORY RIGHT OF WAY
Registration Number:	BN320955
Registration Date and Time:	1999-12-01 13:24
Registered Owner:	BOWEN ISLAND MUNICIPALITY
Transfer Number:	BP307839

Duplicate Indefeasible Title	NONE OUTSTANDING
Transfers	NONE
Pending Applications	NONE

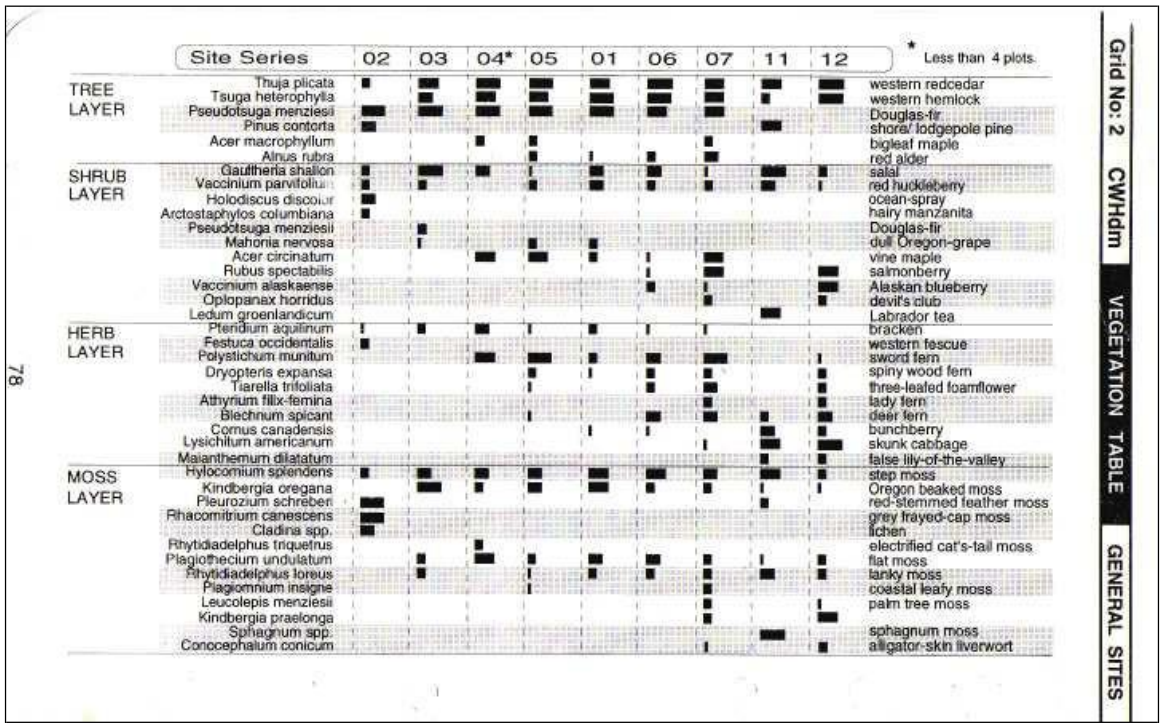
Appendix 3. Climate BC Summary Statistics for Singing Woods, Bowen Island, BC (49.372 x -123.352, elevation 163m).

Reference: Wang T, Hamann A, Spittlehouse D, Carroll C (2016) Locally Downscaled and Spatially Customizable Climate Data for Historical and Future Periods for North America. PLoS ONE 11(6): e0156720. doi:10.1371/journal.pone.0156720			
Code	**Value**		**Variable Description**
MAT	9.5		MAT mean annual temperature (°C),
MWMT	17.1		MWMT mean warmest month temperature (°C),
MCMT	2.6		MCMT mean coldest month temperature (°C),
TD	14.5		TD temperature difference between MWMT and MCMT, or continentality (°C),
MAP	1533		MAP mean annual precipitation (mm),
MSP	314		MSP May to September precipitation (mm),
AHM	12.7		AHM annual heat-moisture index (MAT+10)/(MAP/1000))
SHM	54.3		SHM summer heat-moisture index ((MWMT)/(MSP/1000))
DD<0	118		DD<0 degree-days below 0°C, chilling degree-days
DD>5	1952		DD>5 degree-days above 5°C, growing degree-days
DD<18	3190		DD<18 degree-days below 18°C, heating degree-days
DD>18	88		DD>18 degree-days above 18°C, cooling degree-days
NFFD	300		NFFD the number of frost-free days
bFFP	88		FFP frost-free period
eFFP	313		bFFP the day of the year on which FFP begins
FFP	225		eFFP the day of the year on which FFP ends
PAS	68		PAS precipitation as snow (mm) between August in previous year and July in current year
EMT	-17.1		EMT extreme minimum temperature over 30 years
EXT	34.0		EXT extreme maximum temperature over 30 years
MAR	11.4		MAR mean annual solar radiation (MJ m-2 d-1)
Eref	606		Eref Hargreaves reference evaporation (mm)
CMD	138		CMD Hargreaves climatic moisture deficit (mm)
RH	77		RH mean annual relative humidity (%)
Tmax_wt	5.9		Tmax_wt winter mean maximum temperature (°C)
Tmax_sp	12.4		Tmax_sp spring mean maximum temperature (°C)
Tmax_sm	20.6		Tmax_sm summer mean maximum temperature (°C)
Tmax_at	13.1		Tmax_at autumn mean maximum temperature (°C)
Tmin_wt	0.8		Tmin_wt winter mean minimum temperature (°C)
Tmin_sp	4.7		Tmin_sp spring mean minimum temperature (°C)
Tmin_sm	11.7		Tmin_sm summer mean minimum temperature (°C)
Tmin_at	6.5		Tmin_at autumn mean minimum temperature (°C)
Tave_wt	3.3		Tave_wt winter mean temperature (°C)
Tave_sp	8.5		Tave_sp spring mean temperature (°C)
Tave_sm	16.1		Tave_sm summer mean temperature (°C)
Tave_at	9.8		Tave_at autumn mean temperature (°C)
PPT_wt	588		PPT_wt winter precipitation (mm)
PPT_sp	317		PPT_sp spring precipitation (mm)
PPT_sm	160		PPT_sm summer precipitation (mm)
PPT_at	468		PPT_at autumn precipitation (mm)
Rad_wt	3.8		RAD_wt winter solar radiation (MJ m-2 d-1)
Rad_sp	14.3		RAD_sp spring solar radiation (MJ m-2 d-1)
Rad_sm	19.9		RAD_sm summer solar radiation (MJ m-2 d-1)
Rad_at	7.7		RAD_at autumn solar radiation (MJ m-2 d-1)
DD<0_wt	88		DD_0_wt winter degree-days below 0°C
DD<0_sp	17		DD_0_sp spring degree-days below 0°C
DD<0_sm	0		DD_0_sm summer degree-days below 0°C
DD<0_at	13		DD_0_at autumn degree-days below 0°C
DD>5_wt	70		DD5_wt winter degree-days below 5°C
DD>5_sp	368		DD5_sp spring degree-days above 5°C
DD>5_sm	1027		DD5_sm summer degree-days above 5°C
DD>5_at	487		DD5_at autumn degree-days above 5°C
DD<18_wt	1320		DD_18_wt winter degree-days below 18°C
DD<18_sp	880		DD_18_sp spring degree-days below 18°C
DD<18_sm	230		DD_18_sm summer degree-days below 18°C
DD<18_at	760		DD_18_at autumn degree-days below 18°C
DD>18_wt	1		DD18_wt winter degree-days below 18°C

Code	Value		Variable Description	
DD>18_sp	11		DD18_sp	spring degree-days above 18°C
DD>18_sm	59		DD18_sm	summer degree-days above 18°C
DD>18_at	17		DD18_at	autumn degree-days above 18°C
NFFD_wt	50		NFFD_wt	winter number of frost-free days
NFFD_sp	77		NFFD_sp	spring number of frost-free days
NFFD_sm	92		NFFD_sm	summer number of frost-free days
NFFD_at	81		NFFD_at	autumn number of frost-free days
PAS_wt	44		PAS_wt	winter precipitation as snow (mm)
PAS_sp	8		PAS_sp	spring precipitation as snow (mm)
PAS_sm	0		PAS_sm	summer precipitation as snow (mm)
PAS_at	15		PAS_at	autumn precipitation as snow (mm)
Eref_wt	38		Eref_wt	winter Hargreaves reference evaporation (mm)
Eref_sp	176		Eref_sp	spring Hargreaves reference evaporation (mm)
Eref_sm	291		Eref_sm	summer Hargreaves reference evaporation (mm)
Eref_at	101		Eref_at	autumn Hargreaves reference evaporation (mm)
CMD_wt	0		CMD_wt	winter Hargreaves climatic moisture deficit (mm)
CMD_sp	6		CMD_sp	spring Hargreaves climatic moisture deficit (mm)
CMD_sm	132		CMD_sm	summer Hargreaves climatic moisture deficit (mm)
CMD_at	0		CMD_at	autumn Hargreaves climatic moisture deficit (mm)
RH_wt	82		RH_wt	winter relative humidity (%)
RH_sp	74		RH_sp	winter relative humidity (%)
RH_sm	72		RH_sm	winter relative humidity (%)
RH_at	78		RH_at	winter relative humidity (%)

Appendix 4. CWHdm Site Series Composition, soil moisture and nutrient regimes.

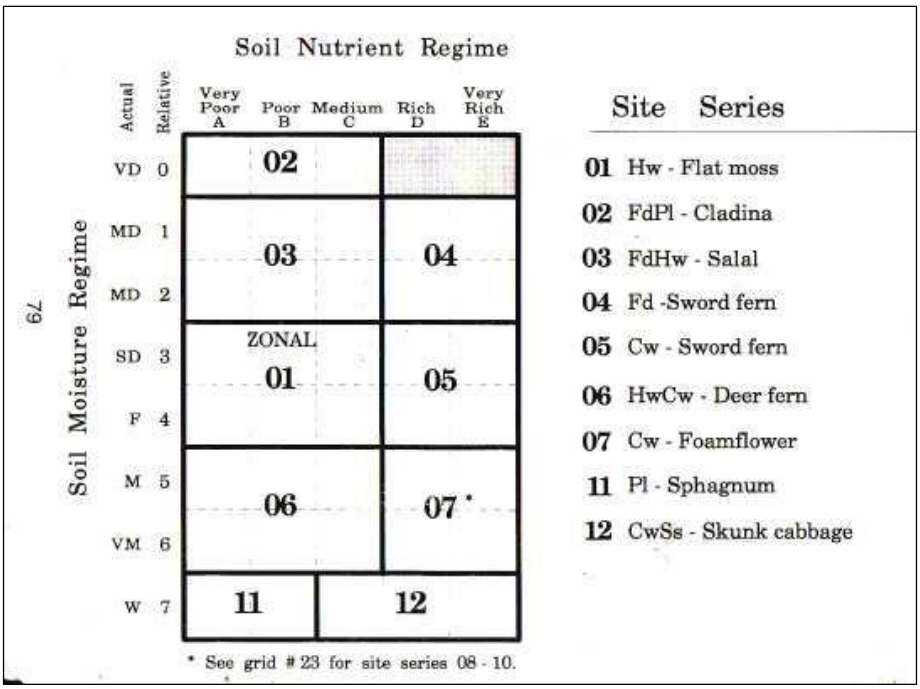
The vegetation table below lists the main plant species likely present and their relative abundance (indicated by black bars) in the climax plant community expected to occur for a given site series within the CWHdm subzone. There is variation between stands so individual sites may vary. In particular, earlier successional stages of a forest may have a composition of species quite different than shown in the table, e.g. pole/sapling stands may be dominated by red alder and have none of the coniferous tree species expected to dominate in a climax or old-growth forest on that site. Only forested sites are included in the table (i.e. non-treed wetlands and other open habitats at climax are not described in this format).



Vegetation table for CWHdm subzone forests.

Edatopic Grid

A terrestrial ecosystem is composed of vegetation, animals, microorganisms, and their physical environment. The physical environment (the site) can be conceptually simplified into three main elements: climate, soil moisture regime, and soil nutrient regime. Within a subzone, climate is relatively uniform. Therefore, the two main variables that describe local differences in forest sites within a particular subzone are soil moisture regime and soil nutrient regime. An edatopic grid depicts the relation between these two variables, and the likely site series associated with soil moisture and nutrient combinations. Only forested sites are included in the grid (i.e. non-treed wetlands and other open habitats at climax are not described in this format).



Edatopic Grid for the CWHdm subzone.

Appendix 5. Letter from the Islands Trust Fund to eight First Nations groups (named in Section 2.5) that may have interest in the Singing Woods Nature Reserve.

November 24, 2016

Dear [First Nations Representative],

The Islands Trust Fund is updating the management plan for the Singing Woods Nature Reserve on Bowen Island. We are reaching out to the [name] as a First Nation with asserted Aboriginal rights and title over core Traditional Territory, and in the treaty process as a member of the [name] Treaty Group, with interests on Bowen Island. We would like to better understand the historical and current connection the [name] have with Bowen Island. We would be very interested in learning from you how the Islands Trust Fund's management of and subsequent activities on protected areas on Bowen Island can acknowledge and respect the cultural significance and traditional use of this area.

Singing Woods Nature Reserve (PID 010-931-422, Lot 3, Except Part in Plans LMP7833 and LMP10622, District Lot 1347 Plan 2230) is a 9 hectare (22 acres) protected area of forested land at the end, and to the south, of Cates Hill Road. The Islands Trust Fund works with the management group, the Bowen Island Conservancy, to manage the property in order to protect its unique ecological values. This reserve is in the headwater area of two creeks and is a Coastal Western Hemlock forest with some old growth trees. There are also two other nature reserves managed by the Islands Trust Fund on Bowen (please see map enclosed) and we invite you to share any information to help us better understand and manage these protected areas.

The management for the nature reserve focuses on protecting the natural values of the property. Development of any kind, including disturbance to native vegetation, soils, and water flow, is prohibited. As well, public use and access are not encouraged. An updated plan may support ongoing restoration of tree planting on areas that were disturbed in the past, removing non-native invasive species and protecting all of the native plants and animals on the reserve.

If you have any comments or questions, or would like to meet to discuss, please contact me at the email or number below.

Thank you for your consideration.

Yours sincerely,

N. Murphy

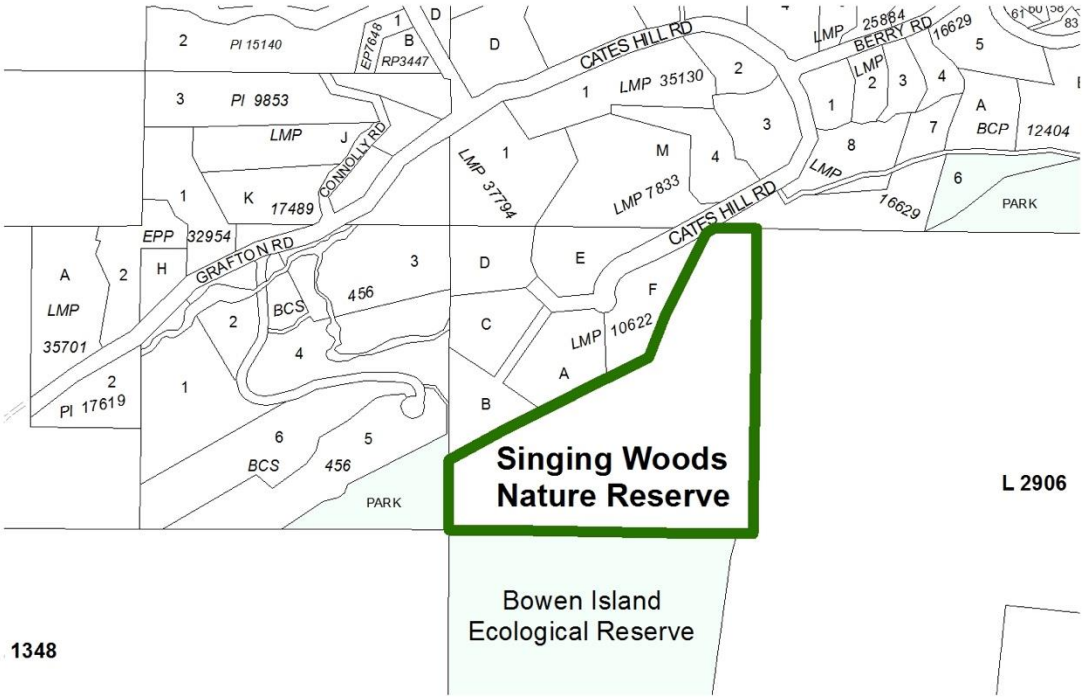
Nuala Murphy
Property Management Specialist, Islands Trust Fund
Phone 250-405-5193
Email: nmurphy@islandstrust.bc.ca

Appendix 6. Letter sent to nearby residents of Singing Woods Nature Reserve.

November 24, 2016

Dear [Neighbour],

The Islands Trust Fund is updating the management plan for the Singing Woods Nature Reserve on Bowen Island and we are interested in hearing from you.



Singing Woods Nature Reserve (PID 010-931-422, Lot 3, Except Part in Plans LMP7833 and LMP10622, District Lot 1347 Plan 2230) is a 9 hectare (22 acre) protected area at the end, and to the south, of Cates Hill Road. The Islands Trust Fund works with the Bowen Island Conservancy, the management group, to manage the property in order to protect its unique ecological values. This property is in the headwater area of two creeks and is a Coastal Western Hemlock forest with some old growth trees.

The management for the nature reserve focuses on protecting the natural values of the property. Development of any kind, including disturbance to native vegetation, soils, and water flow, is prohibited. As well, public use and access are not encouraged. The updated plan will support ongoing restoration of tree planting on areas that were disturbed in the past, removing non-native invasive species and protecting all of the native plants and animals on the reserve. The original management plan was written in 2000 and it can be found on our website: http://www.islandstrustfund.bc.ca/media/10397/itfmgmtplanswoods.pdf

In order to update the plan, your input is requested. We would like to hear from the neighbours of the Singing Woods Nature Reserve with your ideas and concerns regarding the long-term management of this special place. Please find enclosed a questionnaire that can be completed and either mailed or scanned and sent to me by email. There will also be an Open House on November 30, 2016 from 7-9pm at The Snug Café (445 Bowen Island Trunk Rd, Bowen Island, BC V0N 1G0) with Claudia Schaefer and Nick Page, who have been contracted to revise this management plan.

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

Yours sincerely,

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

Appendix 7. Questionnaire sent by the Islands Trust Fund to neighbours of Singing Woods Nature Reserve and available at the Community Open House.

Singing Woods Nature Reserve Questionnaire

Singing Woods Nature Reserve is 9 hectares of protected area at the end of Cates Hill Road and adjacent to the Bowen Island Ecological Reserve. It includes the headwaters of 2 creeks, Davies Creek flowing east and Dorothy Creek (tributary to Terminal Creek) flowing west.
The Islands Trust Fund received the land as a donation in 1999 and the first management plan for the Singing Woods Nature Reserve was written in 2000. The Islands Trust Fund's primary goal is to protect and nurture the sensitive ecosystems on this land. To do that, we revise our management plans approximately every 10 years to guide the management of the property. We are asking you to help us develop this plan. Please share your thoughts on the protection and long-term management of the Singing Woods Nature Reserve.

1. Where do you live?

- ◯ North Bowen
- ◯ South Bowen
- ◯ Mid Bowen
- ◯ Off-island

2. Have you ever visited Singing Woods Nature Reserve? If so, how often?

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

3. If you have visited Singing Woods Nature Reserve, what did you do there?

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

4. Please list any wildlife and unique plant species you have seen at or near Singing Woods Nature Reserve?

5. 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.)
- ◯ Recreational opportunities
- ◯ Education and research opportunities
- ◯ Tourism
- ◯ Aesthetic appeal
- ◯ Conservation for the sake of the intrinsic value of nature
- ◯ Other (please specify):

6. What activities do you believe are incompatible with the protection of natural features, and should not be allowed within the Singing Woods Nature Reserve?

7. What do you feel could be the greatest threat to the health of this nature reserve, and should be the highest management priority for the Islands Trust Fund?

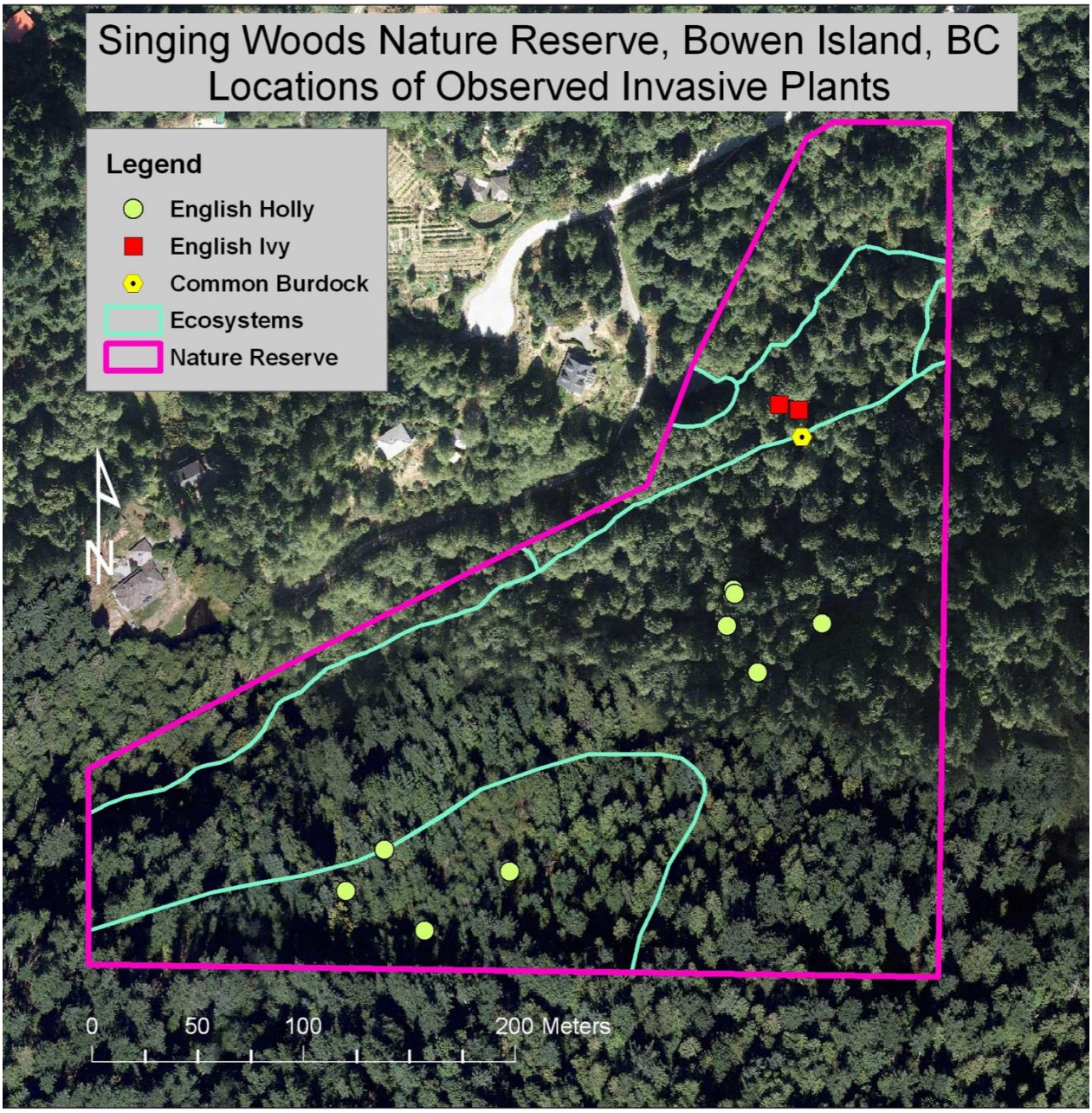
8. Please provide any other relevant information that will help us make the best management decisions for Singing Woods Nature Reserve.

9. Please share with us any history you know about this property (or mid Bowen Island) or any knowledge you have about unique cultural or other special features on the property.

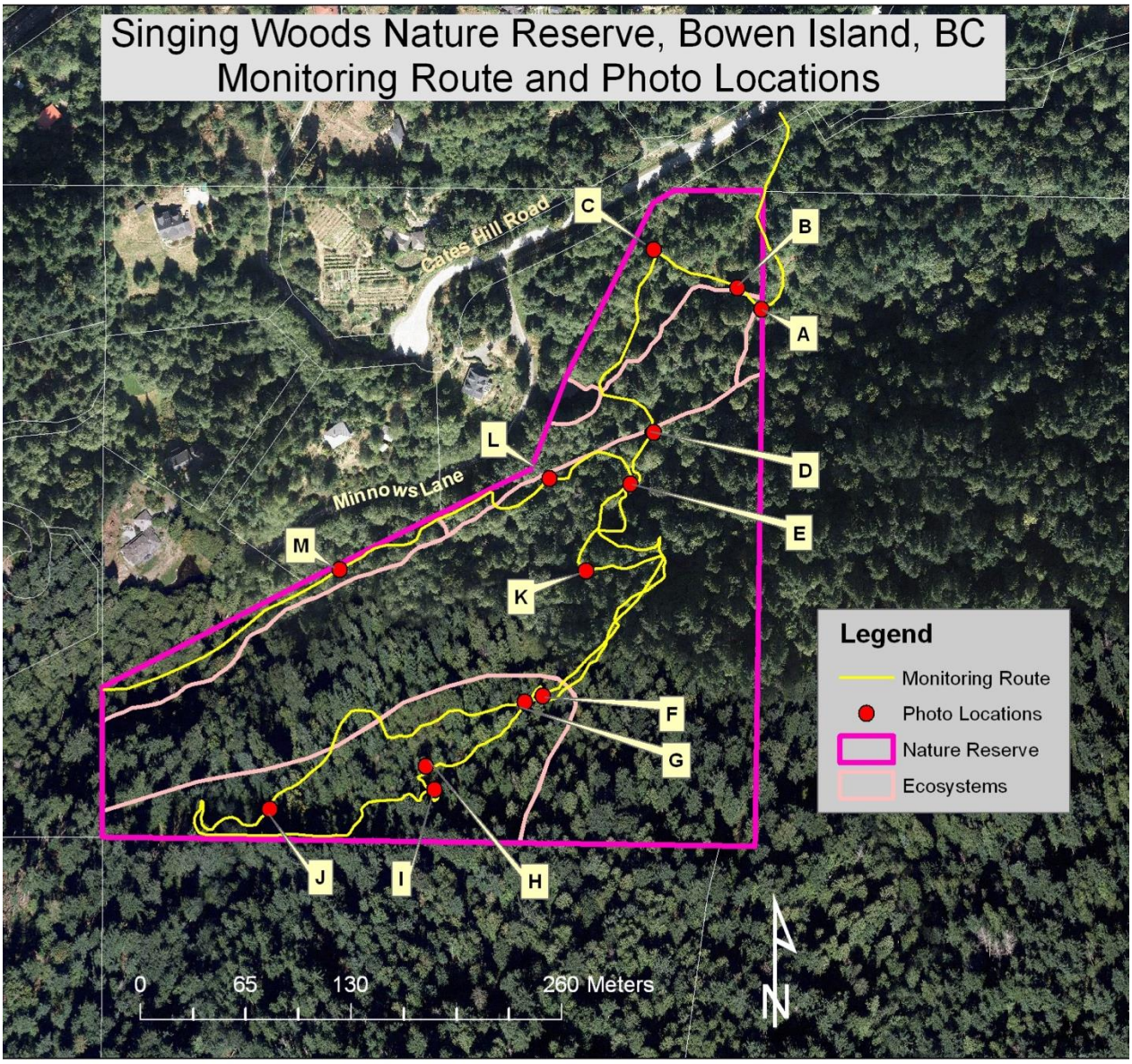
10. If you would like to receive updates from the Islands Trust Fund on this and other conservation projects on the islands, please provide your name and email address:

Thank you for your time spent helping us plan the future of the Singing Woods Nature Reserve.

Appendix 8. Map of observed invasive plants in Singing Woods Nature Reserve.



Appendix 9. Map of Monitoring Route and Photo Stations (letter labels) in Singing Woods Nature Reserve.



Appendix 10. Coordinates of Photo Stations along Monitoring Route in Singing Woods Nature Reserve.

Photo Location	Ecosystem Type	UTM Easting	UTM Northing	Photo Aspect	Date	Comment
Stn. A	F	10U 474665	5469042	135º	25-MAR-17	Bridge with swamp behind
Stn. B	D	10U 474650	5469056	305º	25-MAR-17	Property post
Stn. C	D	10U 474599	5469079	342º	25-MAR-17	Mix of ecosystems
Stn. D	A	10U 474599	5468967	135º	25-MAR-17	Washout
Stn. E	A	10U 474584	5468935	145º	25-MAR-17	Seepage cliffs
Stn. F	C	10U 474531	5468804	30 º	25-MAR-17	Restoration area
Stn. G	C	10U 474519	5468800	140º	25-MAR-17	Rocky knoll
Stn. H	C	10U 474458	5468760	3º	25-MAR-17	Regenerating clearcut
Stn. I	C	10U 474464	5468746	85º	25-MAR-17	Rocky knoll
Stn. J	C	10U 474362	5468734	0º	25-MAR-17	View to Killarney Lake
Stn. K	A	10U 474557	5468881	292º	25-MAR-17	Terrace on slope
Stn. L	A	10U 474535	5468938	314º	25-MAR-17	Gently sloping section
Stn. M	B	10U 474405	5468882	186º	25-MAR-17	Swamp

Appendix 11. Photos taken at stations (indicated to the left of each photo) along monitoring route in Singing Woods Nature Reserve. Photo details are found in Appendix 10.

A

B

C

D

E

F

G

H

I

J

K

L

M