Moore Hill Nature Reserve Management Plan Thetis Island, BC

Photo 1. Large moss covered boulders next to shoreline in Moore Hill Nature Reserve.

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Islands Trust Conservancy Board on January 25, 2022, Resolution #ITC-2022-004

Cowichan Community Land Trust on February 16, 2022

Thetis Island Nature Conservancy on February 12, 2022

i. Executive Summary

Islands Trust Conservancy acknowledges and respects that Thetis Island is within the traditional territory of Coast Salish Peoples, the Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, SEMYOME (Semiahmoo) First Nation, Snuneymuxw First Nation, Stz'uminus (Chemainus) First Nation, and Ts'uubaa-asatx (Lake Cowichan) First Nation. The historical relationship to the land, culture, and spirit of this place continues to this day. Islands Trust Conservancy is committed to honouring the rich history of Indigenous stewardship in the lands and waters of the Islands Trust Area and to building mutually respectful relationships between Indigenous and non-Indigenous partners in conservation. Therefore, this Management Plan for Moore Hill Nature Reserve is a living document that will evolve as opportunities for knowledge sharing arise and understanding grows[1].

The Moore Hill Nature Reserve (MHNR) is 21.04 hectares (52.0 acres) in size and was acquired by the ITC in February 2017 after an extensive, collaborative acquisition campaign by ITC, Thetis Island Nature Conservancy (ThINC) and Cowichan Community Land Trust (CCLT). It is the largest protected area on Thetis Island. A Section 219 conservation covenant and a Section 2018 Statutory Right of Way were registered in 2017 naming CCLT as the covenant holder.

MHNR is located on the east side of Thetis Island and is adjacent to the Nature Trust of British Columbia's Thetis Island Bat Cave Nature Reserve on the north, east and west sides. MHNR spans 425 metres (1,394 feet) of marine shoreline along its eastern boundary including sea cliffs and low rock shoreline and ranges in elevation from sea level to the summit of Moore Hill at 178m (585 ft). Two rare ecological communities are found within MHNR as well as a range of habitats including coniferous and mixed forests, open Garry Oak stands and numerous crevasses, caves and cliffs that are important habitat for wildlife. Five federally-listed Species at Risk have been documented in MHNR including the Endangered Little Brown Myotis (*Myotis lucifugus*), and four Special Concern species: Northern Red-legged Frog (*Rana aurora*), Great Blue Heron (*Ardea herodias*), Threaded Vertigo (*Nearctula* sp. 1) and Band-tailed Pigeon (*Patagioenas fasciata*).

This management plan is intended to guide long-term management of Moore Hill Nature Reserve based on site history and ecological features, in accordance with the goals, policies and objectives of ITC. The management objectives for Moore Hill Nature Reserve are to:

- Preserve and protect the natural ecosystems, biological diversity and natural values of Moore Hill Nature Reserve, including the distinct ecological communities and the Species at Risk that depend on them;
- Support and protect continued use of areas of sacred and cultural significance by First Nations as per Section 35 of the Constitution Act[2] and UNDRIP;

[1] First Nations/reconciliation content written by Lisa Wilcox, Islands Trust

[2] Section 35 of the Constitution Act, 1982 recognizes and affirms the existing aboriginal and treaty rights of the aboriginal peoples of Canada and the courts have stated that aboriginal rights include aboriginal title.

- Restore plant and animal communities and ecological process where necessary and feasible;
- Support ongoing inventory, mapping and monitoring to guide management provided these activities do not interfere with Species at Risk protection;
- Allow natural forest succession and natural ecological processes and functions to proceed unimpeded without human intervention, except in the case of wildfire or other exceptional situations where remediation is considered imperative;
- Remove invasive species throughout MHNR where they compromise natural values; and
- Maintain no public access due to Species at Risk habitat, cultural values, steep cliffs and treacherous terrain.

Management recommendations for MHNR include supporting partners, contractors and volunteers to complete cultural competency training, engaging with First Nations to ensure the management plan is reflective of treaty, inherent rights, and the traditional territories and working to develop a *Management Plan for Areas of Cultural Heritage, gathering and harvesting, and Sacred Significance.* Short-term recommendations include installing signage along the ocean and maintaining existing signage to inform the public that there is no public access and deter unauthorized use of MHNR; addressing any unauthorized use of MHNR as it arises; monitoring and implementing invasive species removal as required; and conducting additional Species at Risk surveys and monitoring to guide future management. Other key management recommendations include continuing to work with the Penelakut Tribe towards cooperative management of MHNR, developing a wildfire management plan, and establishing a volunteer warden program for MHNR.

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***Table 1**. Acknowledgements table (primary author and other contributors, contributions, affiliations, and professional qualifications).*

Name	Position/Affiliation	Professional Accreditation or subject expertise	Contribution
Carrina Maslovat	Botanist/Contractor	R.P. Bio.	Primary Author, field data collection
Nuala Murphy	Property Management Specialist/Islands Trust Conservancy		Background information and mapping, local contacts
Ann Eriksson	Founding Director	Thetis Island Nature Conservancy (THINC)	Assisted with field surveys, provided historical information and current biological information.

1 Introduction

Thetis Island is situated within the territory of the Coast Salish Peoples, who share a rich history of stewardship in the lands and waters of the Islands Trust Area that inspires the work of Islands Trust Conservancy (ITC) and its partners. Moore Hill Nature Reserve (MHNR) was protected in February 2017 after two years of active fundraising effort by Thetis Island Nature Conservancy (ThINC), Cowichan Community Land Trust (CCLT), and ITC. The protection of MHNR could not have happened without the vision and generosity of the former land holder, generous support from a local donor family, and funding support from the federal Habitat Stewardship Program for Species at Risk (Islands Trust Conservancy 2020).

The CCLT holds the conservation covenant for MHNR. MHNR is certified as an Ecological Gift under Environment and Climate Change Canada's Ecological Gifts Program to protect the important ecosystems of the site in perpetuity (Islands Trust Conservancy 2020).

1.1 Islands Trust Conservancy

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

> *To preserve and protect the trust area and its unique amenities and environment for the benefit of the residents of the Trust Area and of British Columbia generally, in cooperation with municipalities, regional districts, improvement districts, other persons and organizations and the government of British Columbia*. (Islands Trust 2020a) Reference: *http://www.islandstrust.bc.ca/connect/about-us/*

In 1990, through the enactment of a section of the Islands Trust Act, the Province established the Islands Trust Fund, now called the Islands Trust Conservancy (ITC), as a conservation land trust to assist in carrying out the "preserve and protect" mandate. Part 6 of the Islands Trust Act establishes the corporate status, responsibilities, and governance structure of the Islands Trust Conservancy. The Board of the ITC is one of the sixteen corporate entities[3] charged to uphold the Object of the Islands Trust. Since 1990, the ITC has protected over 1,300 hectares (3,220 acres) of land as nature reserves and conservation covenants.

[3] The corporate entities charged to uphold the Object of the Islands Trust are the Trust Council, the Executive Committee, twelve local trust committees, one island municipality, and the Islands Trust Conservancy Board.

The vision of the ITC is that the islands and waters of the Salish Sea will be a vibrant place of culture and ecology where humans live and work in harmony with the natural world. This special place will have a network of protected areas that preserve in perpetuity the native species and natural systems of the islands. Engaged residents and conservation partners will work together to protect large natural areas and key wildlife habitat. Viable ecosystems will flourish alongside healthy island communities.

The mission of the ITC is to protect special places by encouraging, undertaking, and assisting in voluntary conservation initiatives within the Islands Trust Area. ITC nature reserves are managed to maintain, preserve, and protect the natural features and values of ecosystems.

1.2 Purpose of Islands Trust Conservancy Management Plans

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

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

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

1.3 The Scope of Islands Trust Conservancy Management Plans

Consistent with the Islands Trust Reconciliation Declaration (Islands Trust 2020b) Reference http://www.islandstrust.bc.ca/trust-council/first-nations-reconciliation/, ITC recognizes that nature reserves may be places of great cultural and spiritual significance to First Nations. Cooperative management of these protected places will provide opportunities to establish and maintain mutually respectful relationships between Islands Trust Conservancy and First Nations, as well as upholding the guiding principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)[4] and the Truth and Reconciliation (TRC) Calls to Action. Relationship-building, knowledge-sharing, healing, and establishment of trust take time.

[4] The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) is an international instrument adopted by the United Nations on September 13, 2007, to enshrine (according to Article 43) the rights that "constitute the minimum standards for the survival, dignity and well-being of the indigenous peoples of the world." The UNDRIP protects collective rights that may not be addressed in other human rights charters that emphasize individual rights, and it also safeguards the individual rights of Indigenous people. Canada signed in 2010.

Islands Trust Conservancy is committed to developing a parallel *Management Plan for Areas of Cultural Heritage and Sacred Significance*. This parallel Management Plan sets out guiding principles for cooperative collaboration between ITC and First Nations with traditional and treaty territories and cultural interests in the area defined by one or more nature reserves. Moreover, the Management Plan defines the common vision, objectives, policies, and best management practices for the nature reserves to ensure that its natural values and cultural heritage and sacred significance are maintained for future generations.

1.4 Protected Area Purpose

The purpose of the Moore Hill Nature Reserve is to preserve and protect the representative natural ecosystems and natural values of the site (including rare and endangered plant and animal species), to preserve the cultural and archaeological features and importance of the site, and to maintain the biodiversity of the site for the benefit of the flora and fauna of MHNR, the residents of the island, the local First Nations, and the province generally. The site is to be protected in accordance with the objectives of the ITC and the Islands Trust.

MHNR is certified as an Ecological Gift under Environment and Climate Change Canada's Ecological Gifts Program to protect the important ecosystems of the site in perpetuity (Islands Trust Conservancy 2020).

1.5 Protected Area Objectives

The objectives for the Moore Hill Nature Reserve are as follows:

- Preserve and protect the natural ecosystems, biological diversity and natural values;
- Support and protect continued use of areas of sacred and cultural significance by First Nations as per Section 35 of the Constitution Act[5] and UNDRIP;
- Restore plant and animal communities and ecological process where necessary and feasible;
- Support ongoing inventory, mapping and monitoring to guide management provided these activities do not interfere with Species at Risk protection;
- Allow natural forest succession and natural ecological processes and functions to proceed unimpeded without human intervention, except in the case of wildfire or other exceptional situations where remediation is considered imperative;
- Remove invasive species throughout MHNR where they compromise natural values; and
- Maintain no public access due to steep cliffs, treacherous terrain, Species at Risk habitat and cultural values.

[5] Section 35 of the Constitution Act, 1982 recognizes and affirms the existing aboriginal and treaty rights of the aboriginal peoples of Canada and the courts have stated that aboriginal rights include aboriginal title.

2 Property Information

The Moore Hill Nature Reserve is 21.04 hectares (52.0 acres) in size and shares 755 m of boundary with the Nature Trust of British Columbia's Thetis Island Bat Caves. MHNR protects approximately 425 m (1,394 feet) of marine shoreline along its eastern boundary including sea cliffs, rocky shoreline and a small islet which is accessible at low tide. MHNR extends to the summit of Moore Hill (178m/585 feet), which is the highest point along the ridge on the east side of the island.

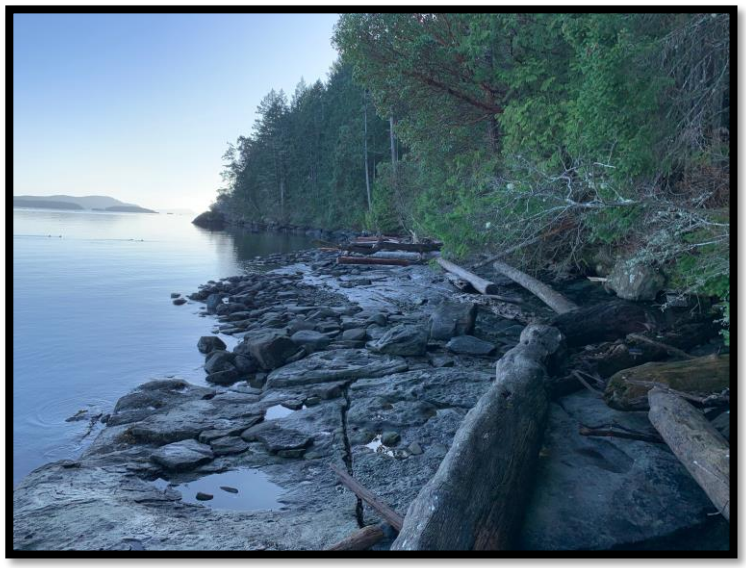

Photo 2. Shoreline of Moore Hill Nature Reserve looking south.

2.1 Location

MHNR is located on the east side of Thetis Island. To reach MHNR from the Thetis Island ferry dock at Foster Point, travel up the ferry ramp for 80m and turn left (north) onto Foster Point Road and travel 230m. Turn right (east) onto Pilkey Point Road and travel 4.6 km along the road as it winds east and north. MHNR is on the right (east side of the road) and stretches from Pilkey Point Road to the ocean (refer to Figure 1).

Photo 3. Small islet off the shore of MHNR (Photo: 2017).

2.2 Legal description

Moore Hill Nature Reserve includes the entire lot described as Lot 9, District Lot 23, Thetis Island, Cowichan District, Plan 35106, except part in Plan 39716 (PID 000-324-671).

2.3 Legal Access

Legal access to Moore Hill Nature Reserve is off Pilkey Point Road which runs along the western boundary of MHNR. Pilkey Point Road is designated as a minor rural road under Thetis Island Official Community Plan Schedule D Road Classifications (Islands Trust 2020e). There is no public access to MHNR.

2.4 Landscape Context

Thetis Island is within the traditional and treaty territories of Coast Salish Peoples, the Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, SEMYOME (Semiahmoo) First Nation, Snuneymuxw First Nation, Stz'uminus (Chemainus) First Nation,

and Ts'uubaa-asatx (Lake Cowichan) First Nation. The closest First Nation community is the Penelakut Tribe, which has a long history of use with territory in and around the land known as the Moore Hill Nature Reserve.

Thetis Island is a southern Gulf islands located in the Strait of Georgia, approximately 4-8 km east of Vancouver Island across Stuart Channel and 6 km west of the northern tip of Galiano Island separated by Trincomali Channel. It is located midway between Salt Spring Island to the south, and Gabriola Island to the north (Islands Trust 2011). Penelakut Island (previously Kuper Island) is located directly to the south and is separated by a narrow shallow body of water commonly known as Telegraph Harbour. Thetis Island is a small (1,129 hectares/2,789 acres) island approximately 3 km wide (east to west) and less than 7 km long (north to south) (Islands Trust 2011). It is governed by the Islands Trust and falls within the Cowichan Valley Regional District (see Figure 1 for location and protected area context).

MHNR is located on the eastern side of the island and is the largest of six protected areas on Thetis Island (3 of which are privately-managed covenanted lands) (Figure 1). The western boundary is Pilkey Point Road and the eastern boundary of MHNR is marine shoreline. Along a portion of the southern boundary, MHNR borders the Nature Trust of British Columbia's Thetis Island Bat Caves protected area (2.7 hectares/6.7 acres), established in 1983 for the protection of a Townsend's Big-eared Bat (*Corynorhinus towsendii*) cave hibernaculum (The Nature Trust of British Columbia 2020). The remainder of the south and western boundaries (across Pilkey Point Road) are privately-managed lots that are predominantly forested. To the north of MHNR are privately-managed shoreline lots which are predominantly forested.

There are three areas protected by Conservation Covenants on Thetis Island: one 1.42 ha (3.5 acres) protected by ITC and The Land Conservancy (TLC) west of MHNR along Pilkey Point Road and two protected by ITC measuring 5.66 ha (13.98 acres) and 1.6 ha (3.94 acres). The ITC's Fairyslipper Forest Nature Reserve (16 hectares/40 acres) on lower Burchell Hill to the south was protected in 2018 and is the only publicly accessible nature reserve on Thetis Island (Figure 1).

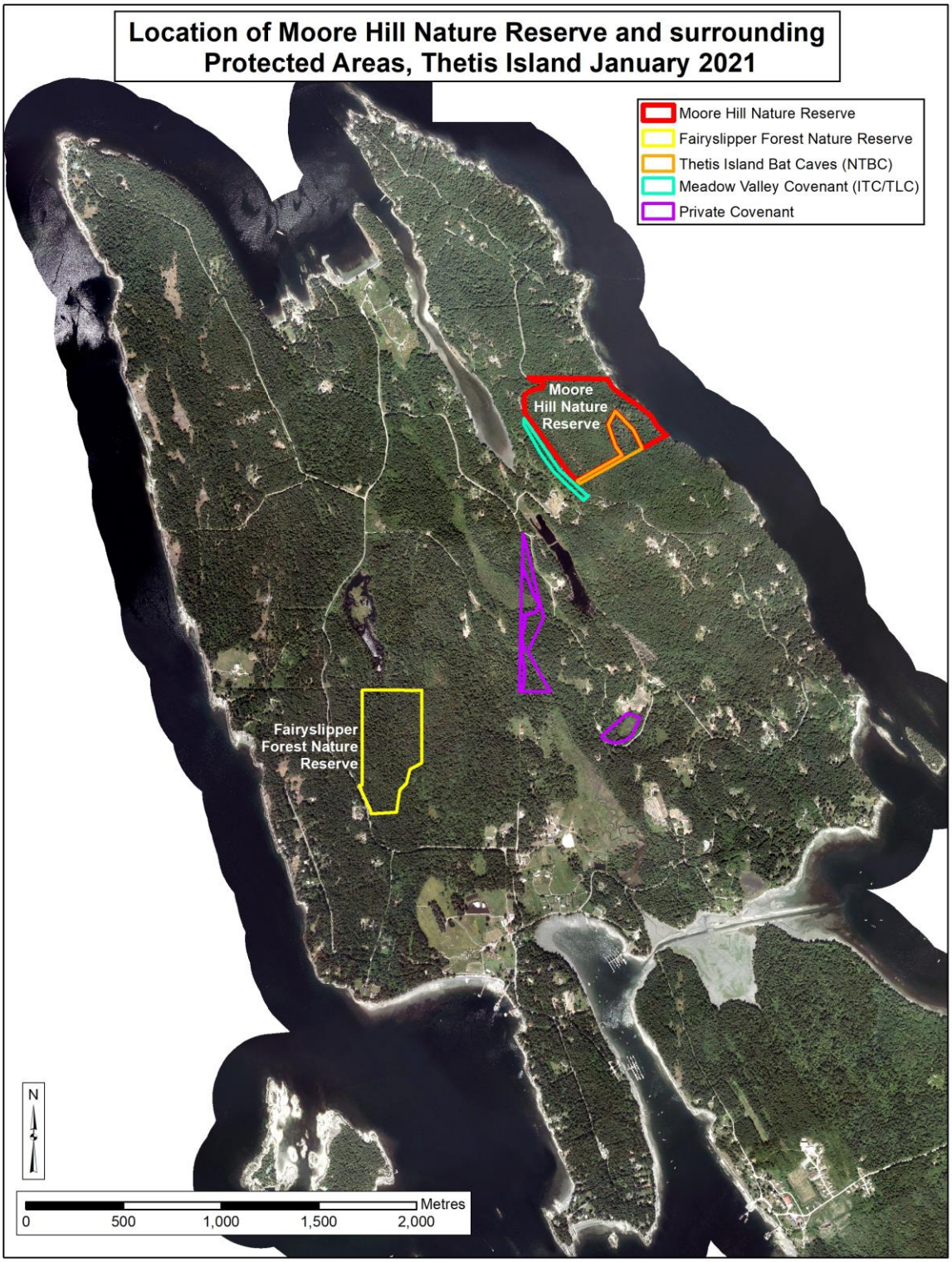

Figure 1. Moore Hill Nature Reserve and other protected areas on Thetis Island.

2.5 Site History

Moore Hill Nature Reserve is an important cultural site located within the core traditional territory of several Coast Salish First Nations in the Southern Gulf Islands and southeastern Vancouver Island, including Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, SEMYOME (Semiahmoo) First Nation, Snuneymuxw First Nation, Stz'uminus (Chemainus) First Nation, and Ts'uubaa-asatx (Lake Cowichan) First Nation. The closest First Nation communities are Penelakut Tribe and Lyackson First Nation, who, along with their neighbours, have a long history with territory in and around MHNR. The Coast Salish peoples maintained a vital, dynamic, and sustainable connection to their territory and developed rich cultural, spiritual, and traditional ecological knowledge. However, cultural heritage and sacred sites of Thetis Island and the greater Islands Trust Area were severely impacted by European settlement. Past archeological activities, vandalism, and land use have disturbed sites of cultural and spiritual importance. Nevertheless, the land and the greater territory remains an embodiment of the stories, oral history, and culture of these First Nations. Moore Hill in particular is known to be an important cultural site.

Thetis Island was named after the Royal Navy frigate H.M.S. Thetis which surveyed the area from 1851-1853 and was captained by Augustus Leopold Kuper (Akrigg and Akrigg 1988; Wikipedia 2020). Penelakut Island is directly south of Thetis Island and was formerly known as Kuper Island, named after Captain Kuper. George Moore was a master on the ship (Akrigg and Akrigg 1988) and Moore Hill is likely named after him. Europeans first settled on Thetis Island in 1873 and the early settlers built the roads and homesteads that delineate the island today (Islands Trust 2011).

Judging from the current age of trees and the decay of stumps, it is estimated that MHNR was logged approximately 40-60 years ago. There are some compacted overgrown skid rows that are slowly revegetating.

There are fire scars on many of the older stumps that were cut with springboards and on some of larger veteran trees suggesting a fire occurred prior to logging.

There are no buildings on MHNR. There is a well head from a previously drilled well that consists of a rusting pipe. There is no other infrastructure associated with the well.

Photo 4. Old skid road that has re-vegetated with salal and young Douglas-fir trees.

2.6 Anthropogenic Features

At this time ITC has had only limited archaeological reviews in cooperation with First Nations to complete Traditional Use Studies (TUS), or a Traditional Ecological Knowledge study (TEK), or worked with Cultural Knowledge Holders (CKH) on MHNR. ITC has met with the Elders Council of the Penelakut Tribe to discuss management of Moore Hill.

Moore Hill was an important site for watching for raiding First Nations, there was a watchman at the site at all times, and there is a ceremonial bowl near the summit of MHNR.The area is of great cultural importance and ITC will continue to work with First Nations to understand the cultural significance of the area and the ecology.

Photo 5. Old well head in Moore Hill Nature Reserve.

There are no buildings or structures within Moore Hill Nature Reserve. There are two sections of old overgrown skid roads. There are three Western Screech-owl nesting/roosting boxes installed near the summit of Moore Hill to provide habitat for owls (installed in 2015), as well as 14 Artificial Cover Objects (ACOs) installed in 2015 along the top of the ridgeline which are used to survey for endangered Sharp-tailed Snake. 14 more ACOs were installed in 2021 to pair the original 14 for a total of 28 ACOs or 14 pairs. A total of 4 boundary signs have been installed at potential access points along Pilkey Point Road (Map in Figure 2 and details in Tables 2 and 3).

Table 2. Anthropogenic features (structures) in Moore Hill Nature Reserve

Anthropogenic Feature	Description	Condition	Photopoint Location
Western Screech-owl box (total 3 boxes)	Wooden nest box installed on tree	Good. Installed in 2015 near summit of Moore Hill. Monitored annually by ThINC	P27, Map Figure 2

Table 3. Anthropogenic features (land modifications) in Moore Hill Nature Reserve

Anthropogenic Feature	Description	Condition	Photopoint Location
Boundary Sign, Islands Trust Conservancy (Total 4)	Metal boundary signs on wooden 4x4 post next to Pilkey Point Road	Good. Signs were recently installed and have not been damaged by weather or vandals.	P23, Map Figure 2

Boundary Sign, Ministry of Environment (3 metal, 2 plastic)	Three metal signs on metal posts at boundaries with Thetis Island Bat Caves (TIBC)- one at boundary near Pilkey Point Road, and one at either end of the TIBC piece protruding into MHNR. There are two plastic signs attached to a tree along the southern boundary of MHNR	Metal signs in good condition. Plastic signs showing weathering and are in fair condition. One plastic sign found in pieces on adjacent neighbour's property.	P25, Map Figure 2
Well head	Well head with rusted pipe	Fair.	P5, Map Figure 2
Sharp-tailed Snake Artificial Cover Object (ACO) (total 14)	Asphalt roofing shingles used as monitoring board used to survey for snakes.	Good. Boards replaced with new shingles in 2021.	P28, Map Figure 2
Old skid road	Overgrown and compacted skid road from previous logging in northwest corner of MHNR	Overgrown with young Douglas-fir trees.	P4, Map Figure 2
Old skid road	Overgrown and compacted skid road from previous logging in northern part of MHNR starting at the hairpin corner	Overgrown with young Douglas-fir trees.	P6, Map Figure 2

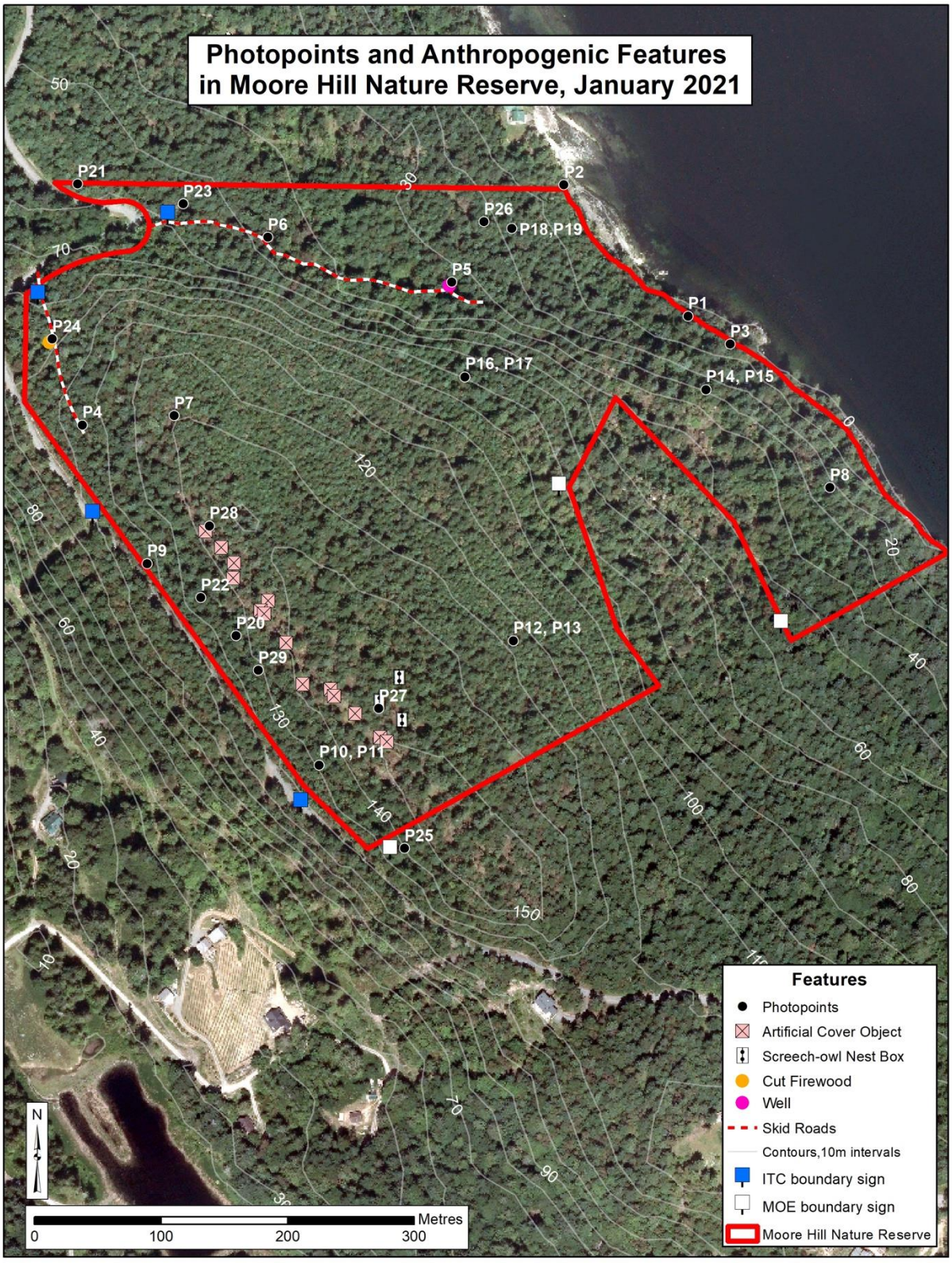

Figure 2. Map of anthropogenic features in Moore Hill Nature Reserve.

2.7 Undersurface Rights

The undersurface rights are held by Her Majesty the Queen in Right of the Province of British Columbia under registration number (M76301).

2.8 Notations, Charges, Liens and Interests

A Section 219 Conservation Covenant (Registration Number: CA5898626) and a Section 218 Statutory Right of Way (Registration Number: CA5898627) were registered over MHNR on March 13, 2017 in favour of Cowichan Community Land Trust.

The general intent of the covenant agreement is:

> (a) to protect, preserve, conserve, maintain, enhance and, if applicable from time to time restore, the natural state of the Land and the Amenities as described in the Report (baseline documentation); and
> (b) to prevent any occupation or use of the Land that will impair or interfere with the natural state of the Land and the Amenities as described in the Report.

The Statutory Right of Way outlines access and activities permitted by the Covenant Holders. There are no water licenses, tenancies or other agreements on MHNR.

2.9 Local Planning Designations

The local Land Use Planning on Thetis Island is governed by the Thetis Island Local Trust Committee and less than 5% of sensitive ecosystems are protected within this local trust area (Islands Trust 2019a). Moore Hill Nature Reserve is zoned as R-2 (Rural) in the Land Use Bylaw No. 98 Schedule C (Islands Trust 2020d). A portion of MHNR, primarily along the eastern shoreline, falls within the Thetis Island Official Community Plan Bylaw No. 88 Schedule E as Wildlife Escarpment (Islands Trust 2020c).

Photo 6. Old skid road that leads from the hairpin turn on Pilkey Point Road and is slowly re-vegetating.

2.10 Existing Public and Other Use

There are no buildings or structures within MHNR. There is no authorized public access due to the steep slopes, treacherous terrain, sensitive Species at Risk habitat and cultural importance for First Nations. There are no existing trails but there are two segments of old skid road (map in Figure 2). There are some rough unofficial trails that appear to be used by adjacent landowners to the north and that lead from the hairpin turn on Pilkey Point Road to the shoreline.

3 Inventory by Ecological Community

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

3.1 Ecological Significance

As one of few protected areas on Thetis Island, Moore Hill Nature Reserve contains a diversity of habitats from marine shorelines to maturing forests and open rocky cliffs with crevasses and caves. It includes the summit of Moore Hill (178m/585ft), the highest point along Thetis Island's eastern ridge. Five Species at Risk have been identified in MHNR, including two birds, one bat, one amphibian and one gastropod (Table 4).

Photo 7. Hill that forms part of the summit of Moore Hill.

Table 4. Species at Risk in Moore Hill Nature Reserve

Species Name		Status*				
English	Scientific	Provincial	BC List	COSEWIC	SARA	Global
Band-tailed Pigeon	*Patagioenas fasciata*	S3S4 (2015)	Blue	SC (2018)	1-SC (2011)	G4 (2016)
Great Blue Heron, *fanninni* subspecies	*Ardea herodias fanninni*	S2S3B, S4N (2018)	Blue	SC (2008)	1-SC (2010)	G5T4 (2016)
Little Brown Myotis	*Myotis lucifugus*	S4 (2015)	Yellow	E (2013)	1-E (2014)	G3 (2016)
Northern Red-legged Frog	*Rana aurora*	S3 (2016)	Blue	SC (2015)	1-SC (2005)	G4 (2015)
Threaded Vertigo	*Nearctula* sp. 1	S3 (2015)	Blue	SC (2010)	1-SC (2012)	G3G5 (2006)

* Status ranks from the BC Conservation Data Centre (BC CDC 2020)

Moore Hill Nature Reserve is located in the Coastal Douglas-fir Biogeoclimatic Zone (CDFmm), one of the most biologically diverse and threatened ecosystems in British Columbia. Historically, there was about 250,000 hectares which would have been classified

as CDFmm (Ministry of Natural Resource Operations 2011). Unfortunately, much of this habitat has been destroyed by urban development, agriculture or logging: there are estimates that there is only one-half of one percent of undisturbed old forest remaining in the CDFmm(Flynn 1999). Two red-listed ecological communities have been documented in MHNR (Table 5).

Douglas-fir (*Pseudotsuga menziesii*) and arbutus (*Arbutus menziesii*) are the dominant tree species, and MHNR includes a diversity of other trees including western redcedar (*Thuja plicata*), Garry oak (*Quercus garryana*), bigleaf maple (*Acer macrophyllum*), western hemlock (Tsuga heterophylla), western yew (*Taxus brevifolia*) red alder (*Alnus rubra*), grand fir (*Abies grandis*), Douglas maple (*Acer galbrum*) and bitter cherry (*Prunus emarginata*).

There are no surface hydrological features on MHNR.

Table 5. Ecological Communities in Moore Hill Nature Reserve.

Ecological Community Name		Status		
English	Scientific	Provincial	BC List	Global
Douglas-fir – Arbutus	*Pseudotsuga menziesii – Arbutus menziesii*	S2 (2004)	Red	GNR
Douglas-fir – Dull Oregon-grape	*Pseudotsuga menziesii – Berberis nervosa*	S1 (2018)	Red	G2

3.2 Climate

The southern Gulf Islands have a climate pattern of warm, dry summers and mild, wet winters with little snowfall. The maritime influence moderates the effect of elevation, latitude, and aspect on local temperature and precipitation.

The weather statistics for Nanaimo A (the closest weather station), show that the annual precipitation from 1981-2010 averaged 1165 mm/year and most of it comes in the form of rain rather than snow (Environment Canada 2020). Precipitation is highest in the winter months from November to January (averaging 190 mm/month) with July and August being the driest months (averaging 27 mm/month). Average daily temperatures peak in the summer months (July and August), with an average daily temperature of 18°C, and are lowest in the winter at 3°C (December and January) (Environment Canada 2020; Figure 3).

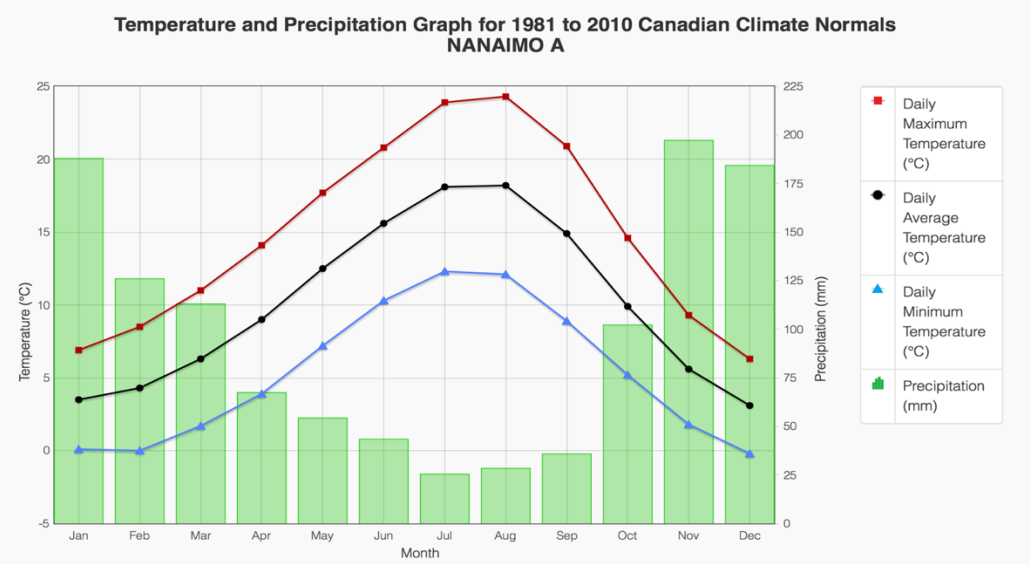

Figure 3. Average temperature and precipitation at Nanaimo A (nearest weather station to Thetis Island).

The future impacts from climate change are unknown although a summer drying trend and an increase in storm events are predicted (Mauger et al. 2015). More powerful storms may cause increasing erosion, especially in areas with exposed soil, such as trails (including deer trails), and along shorelines. Dryer summers may impact hydrology causing premature drying and over time, there may be shifts in vegetation community away from western redcedar (*Thuja plicata*) and towards the spread of Douglas-fir (*Pseudotsuga menziesii*). Higher temperatures and less precipitation may lead to localized stress on trees and understory plants. Maintaining habitat connectivity, biodiversity and ecosystem resilience may assist flora and fauna adaptation to climate change stresses.

3.3 Geology and Physiology

Thetis Island was formed 42 to 55 million years ago as plate tectonic movement pushed the seabed sediments towards the mainland, resulting in the island's characteristic horseshoe shape. The island is composed of sedimentary rock in the Nanaimo Group that ranges from sandstone to shale. The island was glaciated 11,000 to 13,000 years ago (Islands Trust 2011). The geomorphology indicates a NW - SE alignment of glacial scouring and the broken boulders on the SE suggest the direction of glacial progression (Wiles pers. comm. 2021).

Photo 8. Ann Eriksson (ThINC) with large surface boulders in the southeast portion of MHNR.

There are numerous small caves and crevices in the southern part of MHNR caused by shifting and weathering of the rock. There are a large number of loose surface boulders in the southeast part of MHNR. There are also surface boulders of varying size in the western part of MHNR between the cliff and Pilkey Point Road.

Photo 9. Large boulder with Licorice Fern in front of steep cliff face next to Pilkey Point Road.

3.4 Hydrology

There are no surface hydrologic features within Moore Hill Nature Reserve. MHNR falls within the watershed non-basin zone on eastern Thetis Island (Islands Trust 2020f). The fractures, faults and fissures created by seismic activity that formed Thetis Island (55 to 42 million years ago) influence the rapid movement of water through and across the island's underground aquifers (Islands Trust 2011).

3.5 Soils

The soils throughout MHNR are very shallow, lithic Saturna soils consisting of channery sandy-loam to loamy-sand which is less than 50cm deep over sandstone bedrock. In Vegetation Type 3, the soils are Rock-Saturna which is sandstone bedrock exposed or covered by moss or mineral soil less than 10cm deep (Van Vliet *et al.* 1989).

3.6 Ecological Classifications

Moore Hill Nature Reserve is within the Moist Maritime subzone (mm) of the Coastal Douglas-fir Biogeoclimatic Zone (CDF) (Green and Klinka 1994). It lies within the Pacific Maritime Ecozone and the Georgia Puget Basin Ecoregion (Government of Canada 2021). Climatic factors, in conjunction with soil conditions and herbivory, result in limited tree regeneration and sparse shrub or forb understory.

3.7 Ecological Communities and Site Series

Five ecological communities are delineated based on Terrestrial Ecosystem Mapping (TEM) (Islands Trust 2020b) including two red-listed ecological communities. The ecological descriptions were collected from February 17-18th, 2017 and sites were revisited on January 16, 2021, with new photos taken and updates on any new species present in each Ecological Community plot. Site series were identified using *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* (Green and Klinka 1994; Figure 4). Structural stage was defined using *Standards for Terrestrial Ecosystems Mapping in British Columbia* (RIC 1998). The ecological communities are described below, mapped in Figure 4, and summarized in Tables 6-15.

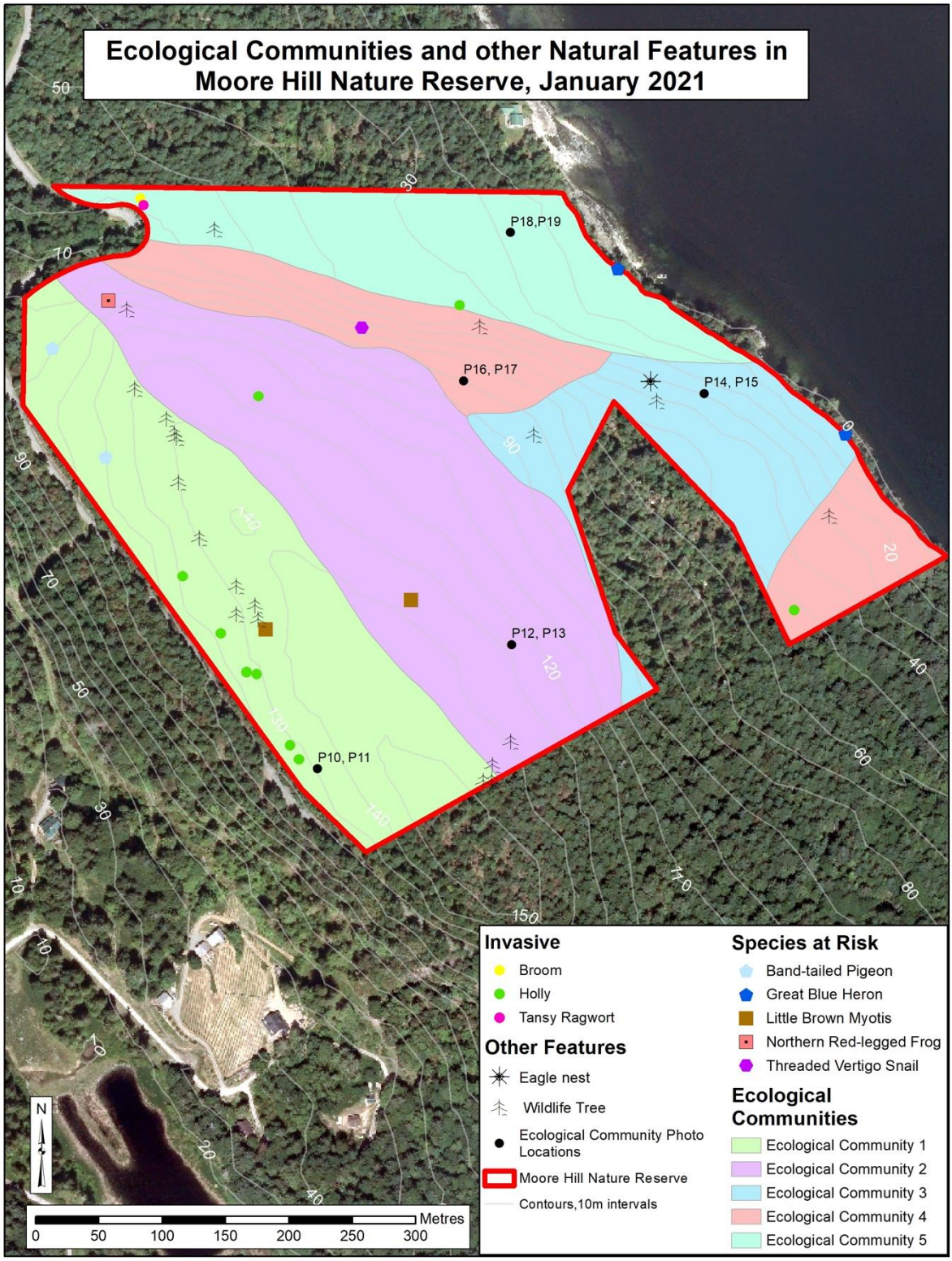

Figure 4. Map showing rare species, ecological communities, wildlife trees and other features of Moore Hill Nature Reserve.

Plots were chosen in locations that were representative of the Vegetation Type and care was taken to avoid transitional areas between different ecosystem types, slope changes or moisture regimes. All herbaceous vegetation was noted within an area of 400m^2 (circular plot with a radius of 11.3 metres) and estimates of percent cover, canopy closure, tree age, diameter at breast height (DBH) and height were made within this area.

Only species that were observed within the plot were included in the tables below. All tree ages were estimates made from a visual assessment taking into consideration varying growth rates in different soil nutrient and moisture regimes. Core samples were not taken to determine tree age and soil pits were not excavated to limit unnecessary soil disturbance.

Locations of photopoints and other photograph locations are given in Appendix A, and Figure 2 identifies the locations of all photopoints. A list of all plant species observed during preparation of the baseline, management plan and previous survey is included in Appendix C.

Animal species observed during preparation of the baseline, management plan and previous surveys are provided in Table 16.

3.7.1 Ecological Community 1

Douglas-fir/Arbutus
10WD:coDA4 (CDFmm02)
100% Woodland: conifer Douglas-fir/Arbutus Structural Stage 4 (Pole/sapling)
This vegetation type is in the southwest portion of MHNR from the top of the ridge sloping down to Pilkey Point Road. The area contains young Douglas-fir (*Pseudotsuga menziesii*) and arbutus (*Arbutus menziesii*) trees with a few Garry oak (*Quercus garryana*) trees at higher elevations. The dominant understory vegetation is salal (*Gaultheria shallon*) which is dense in areas with deeper soil and sparse in areas with shallow soil. There are a number of wildlife trees in the Vegetation Type (Tables 6 and 7).

The Vegetation Type includes the height of land along the top of the ridge with Moore Hill at its peak. There are steep cliffs along the southwest side of the ridge and the aspect is primarily southwest. The substrate is sandstone and is extremely fast draining. Soils are shallow and poorly developed. In many areas, the cliff faces are extremely steep and there are small cavities and holes in the rock. There are a number of wildlife trees.

The Ecological Community Douglas-fir/Arbutus (CDFmm02) was ranked in 2004 by the BC Conservation Data Centre as S2 and it is a Red-listed ecological community (BC CDC 2020). Terrestrial Ecosystem Mapping mapped the Vegetation Type as site series Douglas-fir/Shore Pine/Arbutus (CDFmm02) and it is part of the Sensitive Ecosystem Inventory as a Woodland Ecosystem (Islands Trust Fund 2007).

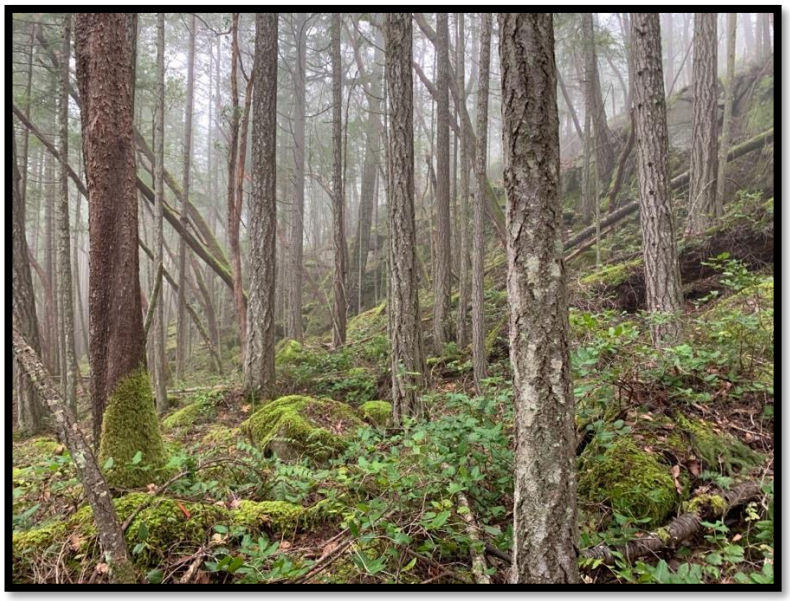

Photo 10. Vegetation Type 1 (360°) showing mixed young Douglas-fir and arbutus forest with understory of salal, dull Oregon-grape and mosses next to Pilkey Point Road.

Photo 11. Vegetation Type 1 (90°) showing mixed young Douglas-fir and arbutus forest with understory of salal, dull Oregon-grape and mosses at base of steeply sloping cliff face.

Table 6. Description of Ecological Community 1.

Polygon ID:	Ecological Community 1
Ecological Community:	Douglas-fir/Arbutus
Classification:	CDFmm02
Structural Stage:	4-Pole sapling
Status (BC List):	Red-listed
Photopoint(s):	P10, P11
Ecological Community Description:	Steep cliff faces, quicky-draining, shallow soil site. Predominantly young Douglas-fir (*Pseudotsuga menziesii*) and arbutus (*Arbutus menziesii*) trees, with few Garry Oak (Quercus garryana) along the top of the ridge, and dense patches of Licorice Fern (*Polypodium glycyrrhiza*). Southwest-facing, aspect 240°, slope 45°, elevation 123m. Many wildlife trees with cavities that could provide excellent habitat for cavity nesters and bats.
Disturbance Notes:	Has been logged (stumps, old skid road present), fire scars on older trees and stumps.
Anticipated Change/Succession:	Forest will gradually mature and become more complex as gaps open and trees age. Some conifer encroachment next to Garry Oaks occurring although thin soils will limit the ability of Douglas-fir to establish.
Wildlife observations:	Black-tailed Deer (*Odocoileus hemionus*) – scat Red Squirrel (*Tamiasciurus hudsonicus*) – cache American Robin (*Turdus migratorius*)- seen Red-breasted Nuthatch (*Sitta canadensis*)- seen Pacific Wren (*Troglodytes pacificus*)- seen Varied Thrush (*Ixoreus naevius*)- seen Northern Pacific Treefrog (*Pseudacris regilla*)– heard Alligator Lizard (*Elgaria coerulea*) - observed under Artificial Cover Object by Ann Eriksson Northwestern Garter Snake (*Thamnophis ordinoides*) -observed by Ann Eriksson on west facing cliff/cave area Little Brown Myotis (*Myotis lucifugus*) – identified by Peter Ommundsen from sonogram recordings 2015 Band-tailed Pigeon (*Patagioenas fasciata*) – heard by Ren Ferguson 2017

Table 7. Vegetation Species in Ecological Community 1.

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy*	Secondary Canopy+	Shrub Layer**	Herb Layer++	Moss, Lichen Layer*+	Non-natives ^	
Pseudotsuga menziesii (Douglas-fir)	35	2					MC: 25-60yrs, Ht: 16-25m, DBH: 25-70cm SC: 10-20yrs, Ht: 10-15m, DBH: 5-10cm
Arbutus menziesii (arbutus)	15						MC: 25-60yrs, Ht: 13-20m, DBH: 15-70cm
Thuja plicata (western redcedar)	1						MC: 20-25yrs, Ht: 13m, DBH: 20cm
Acer macrophyllum (bigleaf maple)	1						MC: 15-25yrs, Ht: 13m, DBH: 20cm
Gaultheria shallon (salal)			15				
Berberis nervosa (dull Oregon-grape)			8				
Lonicera ciliosa (orange honeysuckle)			T				
Lonicera hispidula (hairy honeysuckle)			T				
Prunus emarginatus (bitter cherry)			T				
Calypso bulbosa (fairyslipper)				T			
Festuca occidentalis (western fescue)				T			
Festuca sp.				T			
Eurhynchium oreganum (Oregon beaked-moss)					60		
Fuscopannaria pacifica (silver-rimmed crackers)					T		
Cover by Layer (%)	**52**	**2**	**23+**	**<1**	**60+**		**Total Canopy Cover: 52%**

*Codominant trees, main layer of tree cover. Make note of any dominant trees
+Trees greater than 10m that do not reach the main canopy
**All woody plants less than 10m tall
++All herbaceous species, regardless of height and some low woody plants less than 15cm tall
*+ All bryophytes, terrestrial lichens and liverworts
T stands for Trace or less than 1%

3.7.2 Ecological Community 2

Douglas-fir/Arbutus
10WD:coDA4 (CDFmm02)
Woodland: conifer Douglas-fir/Arbutus Structural Stage 4 (Pole/sapling)
Vegetation Type 2 extends from the height of land along the ridge and slopes to the northwest across the length of MHNR. There are some cliffs and exposed rock along the ridge primarily in the northern part of the vegetation type on the northwest edge of the cliff. It is a mixed forest dominated by young Douglas-fir and arbutus. The understory vegetation lacks diversity with salal growing in areas with deeper soils and mosses dominating in areas with thinner soil. There are a few scattered wildlife trees.

The substrate is sandstone and is extremely fast draining. Soils are shallow and poorly developed. In many areas, the cliff faces are extremely steep and there are small cavities and holes in the rock which may provide habitat for birds, bats and other small mammals.

The aspect of Vegetation Type 2 is northwest and the land is more gently sloping compared to Vegetation Type 1 which has a southeast aspect and steeper cliff faces. The two Vegetation Types are very similar but are listed separately in the management plan because they were mapped as separate polygons by existing Terrestrial Ecosystem Mapping.

Terrestrial Ecosystem mapping describes the Vegetation Type as site series 100% Douglas-fir/Salal (CDFmm01), pole/sapling stage (Islands Trust 2020b). The Vegetation Type aligns more closely with Douglas-fir/Arbutus due to the very dry, rapidly draining, poorly developed soils, which support a substantial cover of arbutus but not the characteristic Western Redcedar and Grand Fir (Green and Klinka 1994). The Ecological Community Douglas-fir/Arbutus (CDFmm02) was ranked in 2004 by the BC Conservation Data Centre as S2 and it is a Red-listed Ecological Community (BC CDC 2020). This Vegetation Type was mapped as not SEI in the Sensitive Ecosystem Inventory (Islands Trust 2007).

Photo 12. Vegetation Type 2 (135°) higher elevation with young Douglas-fir and arbutus forest with open moss-covered understory.

Photo 13. Vegetation Type 2 (270°) young Douglas-fir and arbutus with sparse Salal. Note uneven terrain from loose surface rock.

Table 8. Description of Ecological Community 2.

Polygon ID:	Ecological Community 2
Ecological Community:	Douglas-fir/Arbutus
Classification:	CDFmm02
Structural Stage:	4-Pole sapling
Status (BC List):	Red-listed
Photopoint(s):	P12, P13
Ecological Community Description:	Steep, dry, rapidly-draining, shallow soil site with some cliffs and exposed rocks extending along the top of the ridge and sloping to the northwest. Predominantly young Douglas-fir (*Pseudotsuga menziesii*) and arbutus (*Arbutus menziesii*) trees with patches of salal. Northwest-facing, aspect 35°, slope 25°, elevation 117m. Small cavities in rocky slopes could provide habitat for birds and bats. Large number of arbutus trees provide fruit for birds including Band-tailed Pigeon. Wildlife trees, some with well-developed cavities, that may serve as nest sites.
Disturbance Notes:	Stumps indicate the area was previously logged. Some large trees were felled but the wood was left in place. Burn scars on stumps indicate past wildfire.
Anticipated Change/Succession:	Forest will gradually mature and become more complex as gaps open and trees age. Douglas-fir may shade out arbutus trees over time.
Wildlife observations:	Black-tailed Deer (*Odocoileus hemionus*) – scat Northern Pacific Treefrog (*Pseudacris regilla*) -heard Red-breasted Nuthatch (*Sitta canadensis*) - heard Little Brown Myotis (*Myotis lucifugus*)- identified by Peter Ommundsen from sonogram recordings in 2015 Northern Red-legged Frog (*Rana aurora*)- observed by Ann Eriksson

Table 9. Vegetation Species in Ecological Community 2.

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy*	Secondary Canopy+	Shrub Layer**	Herb Layer++	Moss, Lichen Layer*+	Non-natives ^	
Pseudotsuga menziesii (Douglas-fir)	35						MC: 15-45yrs, Ht: 13-20m, DBH: 10-50cm
Arbutus menziesii (arbutus)	15						MC: 20-50yrs, Ht: 12-17m, DBH: 15-50cm
Gaultheria shallon (salal)			5				
Berberis nervosa (dull Oregon-grape)			1				
Lonicera ciliosa (Western trumpet)			T				
Goodyera oblongifera (rattlesnake plantain)				T			
Festuca occidentalis (Western fescue)				T			
Festuca sp.				T			
Polystichum munitum (sword fern)				T			
Eurhynchium oreganum Oregon beaked-moss					70		
Fuscopannaria pacifica (silver-rimmed crackers)					T		
Hylocomium splendens (step moss)							
Polytrichum sp. (haircap moss)							
Rhytidiadelphus triquetrus (electrified cat's-tail moss)							
Cover by Layer (%)	**50**		**6+**	**<1**	**70**		**Total Canopy Cover: 50%**

*Codominant trees, main layer of tree cover. Make note of any dominant trees
+Trees greater than 10m that do not reach the main canopy
**All woody plants less than 10m tall
++All herbaceous species, regardless of height and some low woody plants less than 15cm tall
*+ All bryophytes, terrestrial lichens and liverworts
T stands for Trace or less than 1%

3.7.3 Ecological Community 3

Douglas-fir/Arbutus
9WD:coDA5:1CL:ccRO1 (CDFmm02)
90% Woodland: conifer Douglas-fir/Arbutus Structural Stage 5 (young forest): 10% Cliff coastal cliffs Rock Outcrop (rock)
This vegetation type is in the southeastern portion of MHNR. The area contains maturing Douglas-fir and arbutus trees with steep cliffs both along the shoreline and in upland areas. The area is difficult to survey because of the many deep cracks and crevasses, some of which lead to underground caves of varying sizes. The terrain is extremely uneven with loose, jumbled, moss-covered rocks (Tables 10 and 11). Due to safety concerns associated with extremely slippery wet conditions and dangerous terrain, the area was not re-surveyed in 2021.

The cliffs are influenced by the marine environment and in places they are near vertical bedrock with soil accumulation limited to ledges or fissures. MHNR slopes, in some places extremely steeply, to the northeast to the ocean. The soils are extremely thin (in most places <10cm) and rapidly draining.

The Ecological Community Douglas-fir/Arbutus (CDFmm02) was ranked in 2004 by the BC Conservation Data Centre as S2 and it is a Red-listed Ecological Community (BC CDC 2020). On the Islands Trust MapIT, the Vegetation Type is mapped as site series Douglas-fir/Shore Pine/Arbutus (Islands Trust 2020b). This Vegetation Type is mapped as Woodland in the Sensitive Ecosystem Inventory (Islands Trust 2020b).

Photo 14. Vegetation Type 3 (45°) with young Douglas-fir and arbutus in middle of steeply sloping terrain with many loose surface rocks (Photo: 2017).

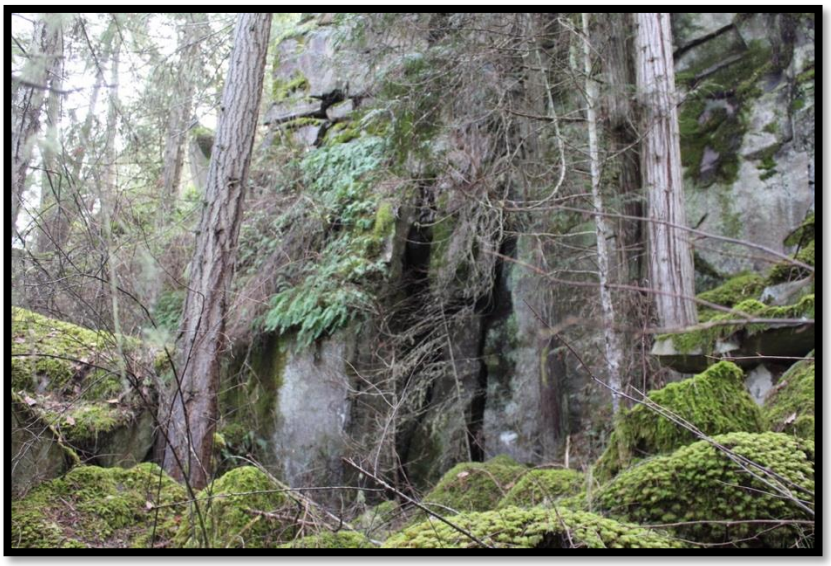

Photo 15. Vegetation Type 3 (225°) with young western redcedar and Douglas-fir showing steep cliff face typical in the vegetation type (Photo 2017).

Table 10. Description of Ecological Community 3.

Polygon ID:	Ecological Community 3
Ecological Community:	Douglas-fir/Arbutus
Classification:	CDFmm02
Structural Stage:	5- Young forest
Status (BC List):	Red-listed
Photopoint(s):	P14, P15
Ecological Community Description:	Steeply sloped, dry, rapidly-draining, shallow soil site with crevasses leading to underground caves, numerous loose rocks, and steep cliffs along the shoreline and upland. Contains maturing Douglas-fir (*Pseudotsuga menziesii*) and arbutus (*Arbutus menziesii*) trees. Northeast-facing, aspect 35°, slope 60°, with marine shoreline and some wildlife trees. Many small cliffs, crevasses and caves provide good habitat for birds, small mammals, and bats. Possible larger cave that may be habitat for bats.
Disturbance Notes:	Trees previously logged. Stumps present.
Anticipated Change/Succession:	Forest will gradually mature and become more complex as gaps open and trees age.
Wildlife observations:	Black-tailed Deer (*Odocoileus hemionus*) – scat River Otter (*Lontra canadensis*) Bald Eagle (*Haliaeetus leucocephalus*) Great Blue Heron (*Ardea herodias fannini*) along shoreline- observed by Ann Eriksson (no Universal Transverse Mercators (UTMs))

Table 11. Vegetation Species in Ecological Community 3.

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy*	Secondary Canopy+	Shrub Layer**	Herb Layer++	Moss, Lichen Layer*+	Non-natives ^	
Pseudotsuga menziesii (Douglas-fir)	30	1					MC: 40-60yrs, Ht: 13-25m, DBH: 40-70cm SC: 10-15yrs, Ht: 5-7m, DBH: 10-15cm
Arbutus menziesii (arbutus)	10						MC: 40-60yrs, Ht: 13-17m, DBH: 40-80cm
Thuja plicata (Western redcedar)	5	1					MC: 40-50yrs, Ht: 13-17m, DBH: 40-50cm SC: 15-20yrs, Ht: 8m, DBH: 15-20cm
Gaultheria shallon (salal)			20				
Holodiscus discolor (oceanspray)			15				
Berberis nervosa (dull Oregon-grape)			1				
Lonicera ciliosa (western trumpet)			T				
Lonicera hispidula (hairy honeysuckle)			T				
Prunus emarginata (bitter cherry)			T				
Vaccinium parviflorum (red huckleberry)			T				
Polypodiun glycyrrhiza (licorice fern)				5			
Festuca sp.				T			
Galium aparine (cleavers)				T			
Goodyera ablongifera (rattlesnake plantain)				T			
Polystichum munitum (sword fern)				T			
Sedum spathifolium (broadleaf stonecrop)				T			
Eurhynchium oreganum (Oregon beaked-moss)							
Hylocomium splendens (step moss)					35		
Polytrichum sp. (haircap moss)					2		
Rhytidiadelphus triquetrus (electrified cat's-tail moss)					3		
Cover by Layer (%)	**45**	**2**	**36+**	**5+**	**40**		**Total Canopy Cover: 45%**

*Codominant trees, main layer of tree cover. Make note of any dominant trees
+Trees greater than 10m that do not reach the main canopy
**All woody plants less than 10m tall
++All herbaceous species, regardless of height and some low woody plants less than 15cm tall

*+ All bryophytes, terrestrial lichens and liverworts
T stands for Trace or less than 1%

3.7.4 Ecological Community 4

Douglas-fir/Salal
10coDS5 (CDFmm01)
100% conifer Douglas-fir/Salal Structural Stage 5 (Young Forest)
Vegetation Type 4 is found in the northern portion of MHNR and slopes steeply to the northeast toward the ocean. In some areas, the trees are larger than in other parts of MHNR and in other areas there are small pockets of very young trees which are too small a component to be included as a secondary ecosystem (Tables 12 and 13).

The main canopy is dominated by Douglas-fir, western redcedar, arbutus and some scattered western hemlock (*Tsuga heterophylla*) with the distribution appearing to be dependent on subsurface moisture. The area is dry and very rapidly drained. The dominant understory shrub is salal with other shrubs growing in the steep areas that are inaccessible to deer browse.

This Vegetation Type classifies as Douglas-fir/Salal (CDFmm01) site series according to Green and Klinka (1994). The BC Conservation Data Centre has a mapped occurrence of the Douglas-fir/Dull Oregon-grape Ecological Community in this Vegetation Type (BC CDC 2020). Douglas-fir Dull Oregon-grape Ecological Community was ranked as S2 in 2010 and is Red-listed (BC CDC 2020).

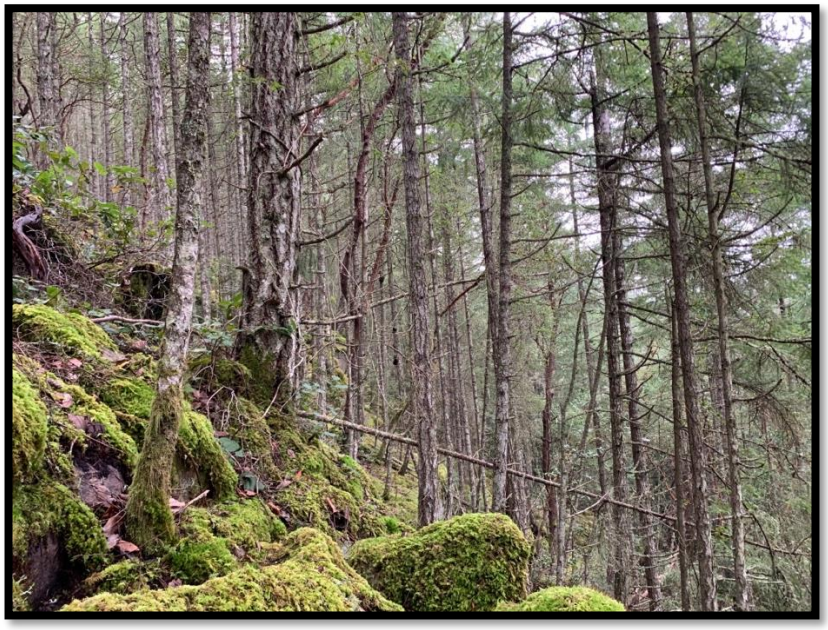

Photo 16. Vegetation Type 4. Vegetation Type 4 (300°) steeply sloping Douglas-fir forest.

Photo 17. Vegetation Type 4 (105°) with young arbutus and Douglas-fir with loose moss covered rock.

Table 12. Description of Ecological Community 4.

Polygon ID:	Ecological Community 4
Ecological Community:	Douglas-fir/Salal
Classification:	CDFmm/01
Structural Stage:	5 - Young forest
Status (BC List):	Red-listed
Photopoint(s):	P16; P17
Ecological Community Description:	Canopy dominated by Douglas-fir (*Pseudotsuga menziesii*) and arbutus (*Arbutus menziesii*) with scattered western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*) in lower moister areas. The dominant understory is salal (*Gaultheria shallon*). Steeply sloped, dry, rapidly-draining, shallow soil site. Northeast-facing sloping towards shoreline, aspect 40°, slope 25°, elevation 75 m. No wildlife trees noted.
Disturbance Notes:	Stumps indicate the area was previously logged. Burn scars on older stumps indicate past wildfire.
Anticipated Change/Succession:	Forest will gradually mature and become more complex as gaps open and trees age. As trees mature, they will provide more wildlife habitat. Douglas-fir may shade out arbutus trees over time.
Wildlife observations:	Black-tailed Deer (*Odocoileus hemionus*) – browse and scat Red Squirrel (*Tamiasciurus hudsonicus*) - heard Bald Eagle (*Haliaeetus leucocephalus*)- heard Chestnut-backed Chickadee (*Poecile rufescens*) - heard Red-breasted Nuthatch (*Sitta canadensis*) - heard Threaded Vertigo (*Nearctula* sp. 1*)* (Special Concern) (noted in 2017)

Table 13. Vegetation Species in Ecological Community 4.

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy*	Secondary Canopy+	Shrub Layer**	Herb Layer++	Moss, Lichen Layer*+	Non-natives ^	
Pseudotsuga menziesii (Douglas-fir)	30						MC: 30-60yrs, Ht: 17-23m, DBH: 50-80cm
Arbutus menziesii (arbutus)	5						MC: 30-50yrs, Ht: 13-17m, DBH: 30-40cm
Gaultheria shallon (salal)			1				
Berberis nervosa (dull Oregon-grape)			T				
Lonicera ciliosa (western trumpet)			T				
Paxistima myrsinites (falsebox)			T				
Polypodiun glycyrrhiza (licorice fern)				T			
Polystichum munitum (sword fern)				T			
Hylocomium splendens (step moss)					80		
Rhytidiadelphus triquetrus (electrified cat's-tail moss)					10		
Eurhynchium oreganum (Oregon beaked-moss)					5		
Cover by Layer (%)	**35**		**1+**	**<1**	**95**		**Total Canopy Cover: 35%**

*Codominant trees, main layer of tree cover. Make note of any dominant trees
+Trees greater than 10m that do not reach the main canopy
**All woody plants less than 10m tall
++All herbaceous species, regardless of height and some low woody plants less than 15cm tall
*+ All bryophytes, terrestrial lichens and liverworts
T stands for Trace or less than 1%

3.7.5 Ecological Community 5

Douglas-fir/Arbutus
10WD:coDA4 (CDFmm02)
Woodland: conifer Douglas-fir/Arbutus Structural Stage 4 (Pole/sapling)
Vegetation Type 5 is found in the northern portion of MHNR along the northern property line and along the ocean shoreline in the northern portion of MHNR. There are steep to moderate slopes to the east/southeast toward the ocean (Tables 14 and 15).

The main canopy is dominated by Douglas-fir and arbutus which grow in areas where soil has accumulated over time. The site is extremely dry and well-drained. There is an old logging road through the Vegetation Type which has re-vegetated with young Douglas-fir, whose growth is slowed by the former compaction, and dense salal. There are some wildlife trees in the area.

MapIT describes this Vegetation Type as site series 70% Douglas-fir/Salal (CDFmm01) young forest with 20% Douglas-fir/Shore Pine/Arbutus (CDFmm02) and 10% road surface and it extends to the northern tip of Thetis Island (Islands Trust 2020b). The Vegetation Type aligns more closely with Douglas-fir/Arbutus due to the very dry, rapidly draining, poorly developed soils, which support a substantial cover of arbutus but are lacking the characteristic western redcedar or grand fir (Green and Klinka 1994). The entire polygon for this Vegetation Type includes Pilkey Point Road and two side roads which are not included on MHNR, therefore the tertiary ecosystem is not included.

In the Sensitive Ecosystem Inventory, this Vegetation Type was mapped as having a secondary Woodland (Islands Trust 2007). The BC Conservation Data Centre has a mapped occurrence of the Douglas-fir/Dull Oregon-grape Ecological Community (BC CDC 2020) but this was not observed in the field. Douglas-fir Dull Oregon-grape Ecological Community was ranked as S2 in 2010 and is a Red-listed ecosystem (BC CDC 2020). The Ecological Community Douglas-fir/Arbutus (CDFmm02), which was observed, was ranked in 2004 by the BC Conservation Data Centre as S2 and it is a Red-listed Ecological Community (BC CDC 2020).

Photo 18. Vegetation Type 5 (135°) with young Douglas-fir and arbutus and sparse cover of salal in the understory.

Photo 19. Vegetation Type 5 (270°) with young Douglas-fir and salal understory.

Table 14. Description of Ecological Community 5.

Polygon ID:	Ecological Community 5
Ecological Community:	Douglas-fir/Arbutus
Classification:	CDFmm/02
Structural Stage:	4 – Pole sapling
Status (BC List):	Red-listed
Photopoint(s):	P18, P19
Ecological Community Description:	Steep-moderately sloping site along marine shoreline, with very dry, rapidly-draining, shallow soils. Canopy dominated by Douglas-fir (*Pseudotsuga menziesii*) and arbutus (*Arbutus menziesii*) where soils have accumulated, dense salal (*Gaultheria shallon*) understory. Northeast-facing sloping towards shoreline, aspect 55°, slope 30°, elevation 29m. Low bank sandstone marine shoreline provides excellent habitat for marine mammals and shorebirds. Wildlife trees with cavities for cavity nesters and loose bark for bat species.
Disturbance Notes:	Stumps indicate the site was previously logged. Compacted old logging road has re-vegetated with young Douglas-fir trees.
Anticipated Change/Succession:	Forest will gradually mature and become more complex as gaps open and trees age. Douglas-fir may shade out arbutus trees over time.
Wildlife observations:	Black-tailed Deer (*Odocoileus hemionus*) – browse and scat River Otter (*Lontra canadensis*) - scat Great Blue Heron (*Ardea herodias fannini*) along shoreline- observed by Ann Eriksson (no UTMs)

Table 15. Vegetation Species in Ecological Community 5.

VEGETATION SPECIES	PERCENT COVER (%)						NOTES
	Main Canopy*	Secondary Canopy+	Shrub Layer**	Herb Layer++	Moss, Lichen Layer*+	Non-natives ^	
Pseudotsuga menziesii (Douglas-fir)	50	5					MC: 20-50yrs, Ht: 13-20m, DBH: 20-60cm SC: 10-15yrs, Ht: 5-7m, DBH: 5-15cm
Arbutus menziesii (arbutus)	10						MC: 20-60yrs, Ht: 6-13m, DBH: 15-50cm
Thuja plicata (Western redcedar)		2					SC: 10-15yrs, Ht: 7-9m, DBH: 5-15cm
Gaultheria shallon (salal)			35				
Berberis nervosa (dull Oregon-grape)			1				
Lonicera ciliosa (western trumpet)			1				
Calypso bulbosa (fairy-slipper)				T			
Goodyera oblongifolia (rattlesnake plantain)				T			
Polypodiun glycyrrhiza (licorice fern)				T			
Polystichum munitum (sword fern)				T			
Eurhynchium oreganum (Oregon beaked-moss)					35		
Hylocomium splendens (step moss)					25		
Rhytidiadelphus loreus (lanky moss)					6		
Rhytidiadelphus triquetrus (electrified cat's-tail moss)					3		
Polytrichum sp. (haircap moss)					1		
Fuscopannaria pacifica (silver-rimmed crackers)					T		
Cover by Layer (%)	**60**	**7**	**37**	**<1**	**70+**		**Total Canopy Cover: 60%**

*Codominant trees, main layer of tree cover. Make note of any dominant trees
+Trees greater than 10m that do not reach the main canopy
**All woody plants less than 10m tall
++All herbaceous species, regardless of height and some low woody plants less than 15cm tall
*+ All bryophytes, terrestrial lichens and liverworts
T stands for Trace or less than 1%

Wildlife Species

Wildlife species observed in MHNR are listed in Table 16. The marine-influenced shoreline provides an ecological interface that supports a diversity of marine and terrestrial wildlife. The low bank sandstone provides habitat for shorebirds, such as Black Oystercatcher (*Haematopus bachmani*) and marine mammals, such as North American River Otter (*Lontra canadensis*).

Photo 20. Cliff face with small caves and crevices that provide excellent habitat for birds and reptiles.

The open rocky slopes contain cliffs, crevasses and caves, providing excellent habitat for reptiles including Northern Alligator Lizard (*Elgaria coerulea*) and Northwestern Gartersnake (*Thamnophis ordinoides*).

The cliffs and wildlife trees provide habitat for seven species of bats which were detected at Moore Hill Nature Reserve using an acoustic bat detector (Table 16). MHNR borders the 2.7 ha (6.7 acres) Nature Trust of British Columbia property acquired in 1983 for the protection of provincially blue-listed Townsend's Big-eared Bat (*Corynorhinus townsendii*) cave hibernaculum.

Photo 21. Red Squirrel (Tamiasciurus hudsonicus) in MHNR.

The Douglas-fir and arbutus forests provide excellent habitat for wildlife. The arbutus and Garry oak trees provide an important food source for Band-tailed Pigeon (*Patageoenas fasciata,* Special Concern). The site provides many wildlife trees with cavities for cavity nesters and excavators such as woodpeckers, as well as bats. Mature trees provide a diverse canopy structure for perching sites for birds. Numerous Red Squirrel (*Tamiasciurus hudsonicus*) caches were noted in MHNR. Heavy moss coverage in some areas provide moist microsites for amphibians such as Northern Red-legged Frog (*Rana aurora*, Special Concern) and Northern Pacific Treefrog (*Pseudacris regilla*), as well as a diversity of gastropods. One questionnaire respondent noted it was an important wintering area for buck deer.

About 40 species of birds have been noted in and next to MHNR and many species of birds utilize both MHNR and the marine environment, such as Great Blue Heron (*Ardea herodias fanninni*, Special Concern). There is a Bald Eagles (*Haliaeetus leucocephalus*) nest in MHNR and birds were heard frequently calling close to the nest in January 2021. A questionnaire respondent had observed a Turkey Vulture (*Cathartes aura*) nest and chicks in MHNR. Browse pressure from native Black-tailed Deer (*Odocoileus hemionus*) limit shrub and forb understory and can in turn impact wildlife by limiting songbird nesting sites (Martin et al. 2011), food sources, and pollinator diversity.

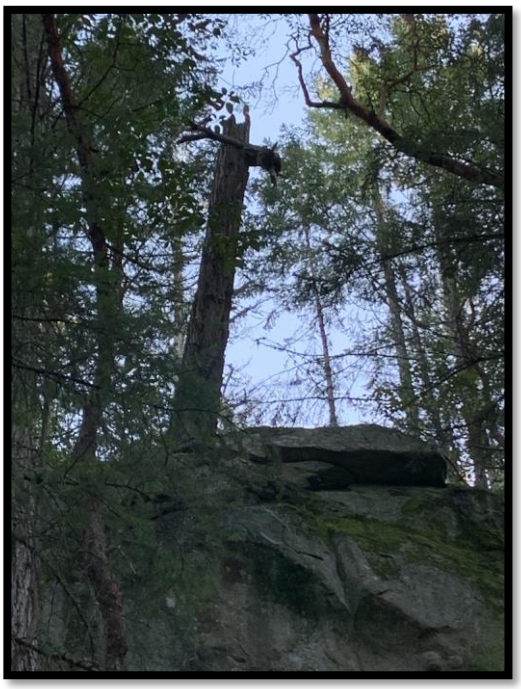

Photo 22. Wildlife Tree at top of cliff facing Pilkey Point Road.

There is the potential for a number of other Species at Risk and wildlife species to be identified on MHNR including Sharp-tailed Snake (*Contia tenuis*, Endangered), Common Nighthawk (*Chordeiles minor*, Threatened), and Western Screech-owl (*Megascops kennicottii kennicottii,* Threatened). Future surveys and monitoring will help inform what species occupy the site and guide management actions.

Table 16. Wildlife Species Observed in Moore Hill Nature Reserve.

Common Name	**Latin Name**
Mammals	
Big Brown Bat*	*Eptesicus fuscus*
Black-tailed Deer	*Odocoileus hemionus*
California Myotis*	*Myotis californicus*
Hoary Bat*	*Lasiurus cinereus*
Little Brown Myotis*	*Myotis lucifugus*
Long-eared Myotis*	*Myotis evotis*
North American River Otter	*Lontra canadensis*
Red Squirrel (visual, auditory and cache)	*Tamiasciurus hudsonicus*
River Otter (scat)	*Lontra canadensis*
Silver-haired Bat*	*Lasionycteris noctivagans*
Yuma Myotis*	*Myotis yumanensis*
Invertebrates	
Lancetooth sp. [LM]	*Ancotrema* sp.
Northwest Hesperian [LM]	*Vespericola columbianus*
Northwest Striate [LM]	*Striatura pugetensis*
Pacific Sideband [LM]	*Monadenia fidelis*
Robust Lancetooth [LM]	*Haplotrema vancouverense*
Threaded Vertigo [LM]	*Nearctula* sp. 1
Tightcoil sp. [LM]	*Pristiloma* sp.

Reptiles	
Northern Alligator Lizard [AE]	*Elgaria coerulea*
Northwestern Gartersnake [AE]	*Thamnophis ordinoides*
Amphibians	
Northern Pacific Treefrog [LM]	*Pseudacris regilla*
Northern Red-legged Frog [AE]	*Rana aurora*
Birds	
American Robin [JC, RF]	*Turdus migratorius*
Bald Eagle [JC, RF] - Nest tree and visual	*Haliaeetus leucocephalus*
Band-tailed Pigeon [JC, RF]	*Patagioenas fasciata*
Black Oystercatcher [RF]	*Haematopus bachmani*
Brown Creeper [JC, RF]	*Certhia americana*
Cassin's Vireo [JC]	*Vireo cassinii*
Chestnut-backed Chickadee [JC, RF]	*Poecile rufescens*
Chipping Sparrow [JC]	*Spizella passerina*
(Common Goldeneye) [RF]	*Bucephala clangula*
(Common Loon) [RF]	*Gavia immer*
Common Raven [JC, RF]	*Corvus corax*
Dark-eyed Junco [JC, RF]	*Junco hyemalis oreganus*
Downy Woodpecker [JC]	*Picoides pubescens*
(Glaucous-winged Gull) [RF]	*Larus glaucescens*
Golden-crowned Kinglet [JC, RF]	*Regulus satrapa*
Great Blue Heron [JC]	*Ardea herodias fannini*
(Hairy Woodpecker) [RF]	*Picoides villosus*
Hammond's Flycatcher [JC]	*Empidonax hammondii*
Hutton's Vireo [JC, RF]	*Vireo huttoni*
(Marbled Murrelet) [JC] - Observed in ocean off Pilkey Point	*Brachyramphus marmoratus*
Orange-crowned Warbler [JC]	*Oreothlypis celata*
Pacific-slope Flycatcher [JC]	*Empidonax difficilis*
Pacific Wren [JC, RF]	*Troglodytes pacificus*
Pileated Woodpecker [AE]	*Dryocopus pileatus*
Pine Siskin [JC, RF]	*Spinus pinus*
Purple Finch [JC]	*Carpodacus purpureus*
Purple Martin [JC] - Observed flying overhead	*Progne subis*
(Red-breasted Merganser) [RF]	*Mergus serrator*
Red-breasted Nuthatch [JC, RF]	*Sitta canadensis*
Red Crossbill [RF]	*Loxia curvirostra*
Rufous Hummingbird [JC]	*Selasphorus rufus*
Sharp-shinned Hawk [RF]	*Accipiter striatus*
Song Sparrow [JC]	*Melospiza melodia*
Spotted Towhee [JC]	*Pipiolo maculatus*
Townsend's Warbler [JC]	*Setophaga townsendi*
Turkey Vulture [JC]	*Cathartes aura*
Varied Thrush [JC, RF]	*Ixoreus naevius*
Western Tanager [JC]	*Piranga ludoviciana*

Yellow-rumped Warbler [JC]	*Setophaga coronata*

* Bat identification was inferred by Peter Ommundsen from the examination of 185 sonograms collected in August 2015 (Eriksson and Ommundsen 2015).
Other mammal species were observed during baseline inventory (February 17, 2017).
AE = Incidental species observation by Ann Eriksson, Thetis Island Nature Conservancy
LM = Species observed by Laura Matthias during baseline inventory (February 18, 2017). Threaded Vertigo was collected by Carrina Maslovat and Ryan Batten in April 2015 and identification confirmed by Laura Matthias.
For Birds: Information is compiled from Clowater who surveyed the Land from June 3rd -June 19th, 2015 and included incidental observations by Ann Eriksson in his report (Clowater 2015). Ren Ferguson surveyed the Land on February 17-18th, 2017 (Ferguson 2017).
Source of the observation in the table is noted as follows:
JC = James Clowater
AE = Ann Eriksson
RF = Ren Ferguson
Brackets around the (Common Name) means the species was observed on adjacent property or on the ocean.

3.8 Expected Change Over Time

Over time, natural succession is expected to continue in MHNR and in areas with deeper soils, the number of shade-intolerant arbutus may decline. Conifer encroachment into areas with Garry Oak may occur although the thin soils will limit encroachment to a large degree. Younger conifer and mixed forests will continue to mature and diversify over time, providing habitat for wildlife. Forest and understory vegetation regeneration is limited by high herbivory pressure. Barring any land use changes upslope, there is no expected increase in the number of invasive species or erosion over time, though the site should be monitored and invasive species controlled if there is incursion into MHNR in future. The site is remarkably free of invasive species, with only small numbers of invasive shrubs present.

4 Threats

Threat severity to the Moore Hill Nature Reserve are described by ecological feature in Table 17.

Table 17. Threats to the Moore Hill Nature Reserve.

Threats (examples below)	Coastal Douglas-fir Forest	Garry Oak bluffs	Cliffs, caves, and crevasses	Marine shoreline	Overall Threat Rank
Fire: Catastrophic wildfire: Naturally occurring fires have been actively suppressed for about a century on Thetis Island. Fire suppression results in elevated fuel levels and a change of fire regime from low intensity, high frequency fires to higher intensity, low frequency fires. Higher intensity fires are also generally larger in scale. An intense fire could result in stand replacement, destruction of herbaceous vegetation, loss of nutrients and erosion. Vegetation recovery following catastrophic fire can be slow and invasive	Medium	Medium	Low	Low	Medium-Low

non-native species are likely to establish in areas with disturbed soil.					
Fire Suppression: Coastal Douglas-fir ecosystems were adapted to low-intensity fires that historically occurred every 100-300 years which maintained Garry oak (*Quercus garryana*) and Douglas-fir stands by controlling the growth of competing species. Fire suppression allows conifer encroachment into Garry oak communities although the thin soils in MHNR will largely restrict encroachment.	High	Medium	Low	Low	Medium
Problematic Native Species: Hyper-abundant Mule Deer (*Odocoileus hemionus*) can alter understory vegetation structure and composition and adversely affect songbird populations (Martin et al. 2010)	Medium	Medium	N/A	N/A	Medium
Invasive Non-Native Species: There are currently very few invasive non-native shrubs in MHNR and small numbers of non-native grasses and forbs. In 2021, two Scotch Broom (*Cytisus scoparius*) seedlings were observed next to Pilkey Point Road and a small number of Holly (*Ilex aquifolium*) plants were noted throughout. A single Tansy Ragwort (*Senecio jacobea*) plant was found in MHNR close to the hairpin turn. Future soil disturbance (e.g. from erosion, fire) could cause increased invasion of non-native species. Invasive species are a significant threat to biodiversity. According to the International Union for Conservation of Nature (IUCN 2018), it is second only to habitat loss. The impact on native ecosystems, habitats and species can be severe and often irreversible.	Low	Low	Low	Low	Low
Recreational Activities/Dumping: Although there is no public access or trails within MHNR due to steep terrain, unauthorized recreational use may occur and could create soil disturbance or erosion in some areas as population pressures rise on Thetis Island. There are some infrequently used, unauthorized trails from the hairpin corner on Pilkey Point Road to the shoreline and from the northern boundary to the south into	Low	Low	Low	Low	Low

MHNR. There has been some dumping of cut branches and a pile of oyster shells, both close to the hairpin turn on Pilkey Point Road. All vegetation was native and so will not cause new invasion by non-native species.					
Firewood Cutting: There has been firewood cutting of blowdown wood following the winter storm of 2018. Both ThINC and ITC communicated with the person responsible, and the cut wood was left on site. New boundary signs will hopefully prevent future unauthorized wood cutting.	Low	Low	Low	Low	Low
Erosion and Flooding: MHNR is exceptionally well drained due to the loose sandstone. It is unlikely that flooding could cause harm. There may be some limited erosion associated with infrequently used trails in the steep areas of MHNR.	Low	Low	Low	Low	Low
Climate Change: The impacts of changing climate are difficult to predict and are likely to impact every ecosystem type differently. An increase in storm events with high rainfall may cause increased erosion. Prolonged summer droughts may cause shifts in species composition, such as the declining western redcedar trees noted in other protected areas on the Gulf Islands. Rising sea levels may impact shoreline.	Low-Medium ?	Low-Medium ?	N/A	Low - Medium?	Low - Medium
Overall Threat Status for Protected Area	**Medium**	**Low**	**Low**	**Low**	**Medium -Low**

* Example column headings. These will be property specific and may be types of ecosystems, ecological communities (corresponding to polygons) or geographical areas of the property.

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

4.1 Expected Change to Threats Over Time

The threat of catastrophic high-intensity wildfire remains high in the region as predicted climate shifts to drier summers and active fire suppression increases fuel loads in the region. Catastrophic stand-reducing wildfires could result in erosion events.

The lack of native tree and understory vegetation regeneration will likely remain consistent given the ongoing high levels of herbivory from native Black-tailed Deer.

The spread of Invasive species may increase over time. Ongoing monitoring, removal and control efforts should be implemented as required.

The human population on Thetis Island is growing slowly, from a total population of 340 in 2011 to 389 in 2016 (Statistics Canada 2016). This increase is compounded by visitors to the island, especially over the summer months. Recreational activities and unauthorized human disturbance in MHNR may increase over time with increased development and human pressures on Thetis Island.

The risks associated with climate change, including vegetation shifts, increased erosion associated with more extreme storm events, and sea level rise are likely to increase in the future.

5 Community Engagement

5.1 Adjacent Landholders

In preparation for the development of the Management Plan, letters were sent to all landholders and neighbours within a 100 metre radius of MHNR. A total of 16 letters were mailed on January 29, 2021 (Appendix B). The letters contained information about Moore Hill Nature Reserve, an invitation to a public seminar on Zoom, and both a paper copy of the questionnaire and a link to a digital version (see Appendix B).

5.2 First Nations

Letters were mailed to the Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, SEMYOME (Semiahmoo) First Nation, Snuneymuxw First Nation, Stz'uminus (Chemainus) First Nation, and Ts'uubaa-asatx (Lake Cowichan) First Nation on February 5, 2021 (Appendix B). The letters contained information about Moore Hill Nature Reserve, an invitation to a public seminar on Zoom, and the questionnaire (see Appendix B). To date there has been no response.

5.3 Conservation Partners and Community Members

The Islands Trust Conservancy presented a public zoom seminar on February 10, 2021 from 7:00-8:00 pm. A total of 11 members of the public attended the meeting. Harold Joe, cultural knowledge keeper gave a welcome and acknowledgement. Consultant, Carrina Maslovat, gave a brief slide show outlining management goals, objectives, ecological features and management issues which included maps and photographs of MHNR. The public was given

the opportunity to ask questions and provide input on general management planning for MHNR.

An online questionnaire was made available from January 29, 2021 – March 15, 2021.

5.4 Engagement Results

The questionnaire was completed by 30 people and 71% of respondents were full-time Thetis Island residents, with 26% living on northern Thetis, 29% living on the mid-island and 16% living on southern Thetis. A further 13% of respondents were not full-time residents but owned property on Thetis and 16% were visitors. Many respondents (40%) have visited MHNR a few times, some (17%) had been to MHNR only once, some (13%) have visited MHNR a few times per year, many had never been to MHNR (27%), and only one person had been to MHNR once a month or more (3%). Most who have visited MHNR engaged in hiking/walking (79%), some engaged in wildlife viewing (38%) and one engaged in dog walking (4%). Other activities engaged in by 33% of respondents included guided walks, photography, rescue efforts and contemplation. The most important values for respondents were conservation for the sake of the intrinsic value of nature (84%), protection of habitat for at-risk species (71%), and ecosystem services (52%). Recreational opportunities (29%), educational and research opportunities (52%), aesthetic appeal (16%) and other values (13%) including a place of peace were also noted as important values by respondents.

6 Management Recommendations

This document is the first management plan developed for MHNR. The general management direction for the Moore Hill Nature Reserve is to maintain and protect habitat for Species at Risk and wildlife, and to allow natural successional processes to proceed without interference. With the exception of fire, natural disturbance factors such as wind (windthrow), pest infestation, and diseases use should proceed without intervention. The removal of invasive plant species is recommended as required. No trails will be developed within MHNR and there will be no public access due to unstable, steep terrain as well as sensitive habitat and cultural importance of the site. New signage should be installed along the ocean and existing signage at the boundary that states MHNR is closed to the public should be maintained.

MHNR is in good ecological condition with maturing conifer and mixed forests and a diversity of habitat types and understory vegetation. There are a number of features that are important for wildlife including open bluff habitats, wildlife trees, crevasses, caves, cliffs, and

marine shoreline. The threats to MHNR are assessed as low since there are very few anthropogenic features (i.e., two segments of old overgrown skid roads and a well head) and few invasive species to impact ecological function. The most serious threats are associated with potential catastrophic wildfire, hyper-abundant black-tailed deer browse, and impacts associated with unauthorized public use.

Photo 23. One of four boundary signs installed along Pilkey Point Road.

Ongoing monitoring and management are required to ensure that ecosystems and species continue to remain protected from threats. Key management issues include limiting unauthorized access and controlling the spread of invasive species. Communication and planning to reduce the risk of future wildfires is also recommended. Monitoring and surveys for Species at Risk should occur if possible to better understand what species are present on MHNR and guide future management activities. Any management activities within MHNR should take into consideration the sensitive ecosystems and the habitat requirements of Species at Risk.

6.1 Management Roles

The Islands Trust Conservancy is the sole landholder of Moore Hill Nature Reserve and will rely on its partnership with the Thetis Island Nature Conservancy (ThINC) to assist with on-the-ground management. ITC will monitor the property annually to detect any management issues and Cowichan Community Land Trust (CCLT) will monitor MHNR to ensure covenant compliance (Table 18). We look forward to ongoing dialogue and collaborative reviews of conservation management with local First Nations.

Table 18. Management partners and roles for Moore Hill Nature Reserve.

Partner	**Role**
Island Trust Conservancy (ITC)	Landholder
Thetis Island Nature Conservancy (ThINC)	Management Partner
Cowichan Community Land Trust (CCLT)	Covenant Holder

6.2 Permitted and Prohibited Uses

MHNR is not open to the public due to safety concerns associated with steep slopes and uneven terrain, protection of Species at Risk habitat and cultural sensitivities.

The following activities by the public are prohibited:

- Hiking
- Hunting
- Use of motorized vehicles
- Bicycling
- Horseback riding
- Dogs
- Camping
- Fires
- Forestry
- Livestock grazing
- Tree cutting or gathering
- Collection of plants, animals, or fungi

Photo 24. Unauthorized firewood cutting which occurred in MHNR following the wind storm of 2018.

Species at Risk surveys and monitoring are permitted by species experts with permission from ITC.

6.3 Proposed Monitoring Program

Annual covenant monitoring is important to ensure there are no infractions or management issues occurring within MHNR. The main focus of covenant monitoring should be along the boundary perimeters, in particular along Pilkey Point Road and if possible along the northern boundary of MHNR. Monitoring along the southern boundary is challenging given the difficulty in accessing the southeast corner from within MHNR. Monitoring should determine if any prohibited uses are occurring, such as tree cutting, unauthorized trails development, and use of motorized vehicles, etc.

The proposed monitoring route is along Pilkey Point Road, giving special attention to access points next to the two old skid roads at the hairpin curve and along the northern boundary to the shoreline (Appendix D).

Species at risk surveys and ecological monitoring are encouraged during appropriate times of year to assess presence of rare species. Monitoring of invasive species spread is advisable over time so that control measures can be taken as required.

6.4 Public Access

There is no public access to MHNR due to treacherous terrain, protection of Species at Risk habitat (Islands Trust Conservancy 2020) and cultural sensitivity.

Access for First Nations will be established through a separate *Management Plan for Areas of Cultural Heritage and Sacred Significance.*

Following the 2018 winter storm, an individual was cutting blowdown for firewood in MHNR. He was approached by a ThINC board member and asked to stop, and ITC followed up with

communication. The cut wood was left on site. It is hoped that subsequent installation of signage will prevent future firewood collection in MHNR.

6.5 Signage

A total of 4 signs were installed in 2019 at potential access points along the boundary of MHNR on Pilkey Point Road. The signs state MHNR is closed to the public due to the significant ecological values and that only authorized access is permitted. Additional boundary signs should be installed along the ocean to limit public access from the water. There are three Ministry of Environment, Parks and Protected Areas metal signs along the boundary of The Nature Trust of BC (NTBC) property that define the "Thetis Island Conservation Area" boundary and state "Access by permit Only" with a phone number for more information. One of these signs is next to Pilkey Point Road and the second is at the end of an old logging road near the shoreline. In addition, there are two plastic signs nailed to a tree at one of the northern corners of the NTBC property. A third degraded plastic sign was observed on the ground.

Photo 25. Ministry of Environment boundary sign along property line of The Nature Trust of BC property.

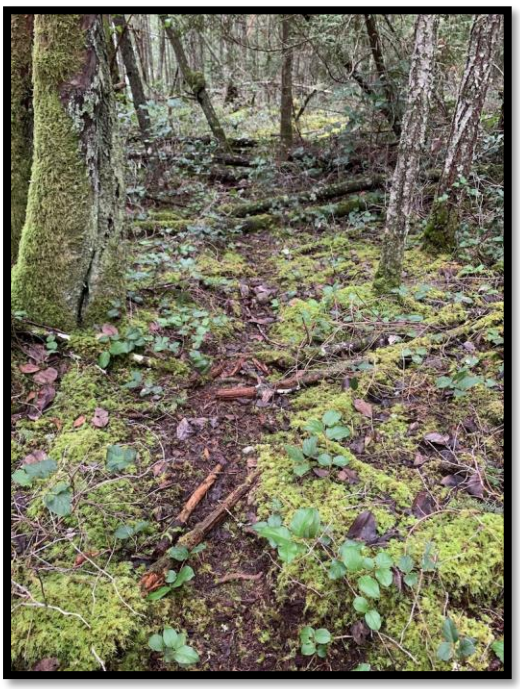

Photo 26. Unauthorized trail in Moore Hill Nature Reserve.

6.6 Trail Use, Maintenance and Development

There are currently no official trails within MHNR. No trails should be developed in the future to protect Species at Risk habitat, cultural values and limit liability associated with public safety concerns. Although some Thetis Island residents have requested a trail along Pilkey Point Road, other residents do not agree and feel there should be no public access. Creating a trail is not recommended since it will encourage the public to visit MHNR and it will be extremely difficult to control further access into other more sensitive and hazardous parts of MHNR.

There are some rough unofficial trails that appear to be used by adjacent landowners to the north and that lead from the hairpin turn on Pilkey Point Road to the shoreline.

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

Maintaining no public access will be the strongest safeguard in protecting sensitive ecosystems and Species at Risk. Maintaining the existing forest cover and understory vegetation will support Species at Risk and their current use of MHNR. Monitoring and removing any newly established invasive species will be important for maintaining the ecological integrity of MHNR in the long-term. Increasing habitat connectivity between the Moore Hill Nature Reserve and other protected areas would help ensure the persistence of species at risk and their habitats.

Photo 27. One of three Screech-owl nest boxes in Moore Hill Nature Reserve.

6.8 Ecological Restoration Options

There is currently no need for ecological restoration in MHNR except for a small amount of invasive species removal.

6.9 Scientific Research/Education Opportunities

During the development of the baseline documentation report in 2017, a plant list for the protected area was developed, a gastropod, reptile, and amphibian survey was completed, an acoustic bat survey was implemented (seven species were identified and inferred from sonograms), an avian species list (39 species) was developed, and a list of wildlife present in MHNR was compiled (Maslovat 2017).

In 2015, three Western Screech-owl boxes were installed to enhance habitat for owls. The nest boxes are being monitored by ThINC to assess whether owls are using the boxes and they are cleaned out annually in the late summer.

In 2015, nine Sharp-tailed Snake Artificial Cover Objects (ACOs) were installed to monitor for the presence of this endangered species. Another five ACOs were added in subsequent years bringing the total to 14. Each ACO was twinned in 2021 bringing the total to 28. These ACOs should continue to be regularly monitored seasonally (spring and fall monitoring during active snake season).

Photo 28. Ann Eriksson (ThINC) with one of fourteen Artificial Cover Objects used to monitor for Sharp-tailed Snakes in the MHNR.

Future research could include further surveys and monitoring during peak season for specific species of interest. For example, given that MHNR shares a border with the NTBC's Thetis Island Bat Caves to protect a cave hibernaculum for a population of the Townsend's Big-eared Bat, ongoing acoustic bat monitoring at Moore Hill would help provide baseline information about bat numbers and diversity within MHNR. Scientific research can play an important role in understanding natural processes and shaping potential management options. All research in MHNR should be approved by ITC and should ensure there is no associated harm to species at risk and/or their habitat.

6.10 Exotic and Invasive Species Management

MHNR currently has few invasive woody species. In 2021, there was a small number of Scotch Broom seedlings next to the hairpin corner on Pilkey Point Road which were pulled at the time. A small number of young English Holly plants (none flowering) were scattered throughout MHNR (Maslovat 2021). These few plants are best removed as soon as possible to limit future establishment in other parts of MHNR. Many of the Holly plants are small and can be pulled out which is an effective means of preventing resprouting. Prompt and consistent removal will reduce maintenance efforts in future. Annual invasive species monitoring should be done to quickly detect and remove any new satellite populations arise.

Photo 29. Young English Holly plant found in Moore Hill Nature Reserve.

6.11 Wildfire Risk Management

Wildfire and wildfire suppression can be extremely damaging to sensitive ecosystems. Developing a fire management plan in consultation with the Thetis Island Volunteer Fire Department and the BC Wildfire Service to identify optimum fire suppression techniques is recommended. The location of MHNR and recommendations for fire suppression preferences should be provided to the province to be included in their annual fire plan. If possible, saltwater and fire retardants should not be used for fire suppression since both can damage sensitive ecosystems.

6.12 Climate Change Impacts and Management

Climate change may impact the distribution of ecosystems across the landscape and may alter vegetation patterns, hydrology, biodiversity and the frequency of pest outbreaks. There may be increased risk from natural hazards such as windstorms, storm surges and droughts (Islands Trust 2019b).

Hotter, drier summers coupled with more extreme winter rain events may lead to changes in groundwater recharge rates, altered water table depths and altered flow rates. There may

be an increased risk of drought or flooding and changes to water quality (Islands Trust 2019b). Hotter summers may lead to an increased risk of forest fire (Islands Trust 2019b).

Biodiversity will also be impacted. Trends that may prevail in this region include up-slope migration of tree lines and ecosystem boundaries. There may be a loss of species that are unable to adapt to changing climate conditions and an increase in competition from invasive species. Climate change may lead to a loss of habitat (Islands Trust 2019b), and climate change predictions suggest that stands dominated by Douglas-fir will likely expand, while western redcedar stands will likely diminish (Hebda 1997). Ongoing monitoring is important to determine if climate change is impacting the ecosystems in MHNR.

Ensuring ongoing protection and connectivity between large, protected areas will aid the dispersal of species into new habitats and across elevations as vegetation patterns shift. These protected area matrices may act as reservoirs for species dispersal into suitable habitats in adjacent areas as climate change shifts the distribution of these ecosystem types (McCloskey et al. 2009).

7 Action Items

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

7.1 Immediate Actions (1-2 years):

1. Support all partners, contractors and volunteers to complete cultural competency training in regard to reconciliation, knowledge and history of Coast Salish and Indigenous Peoples.
2. Engage with First Nations to ensure that the management plan is reflective of treaty, inherent rights, and the traditional territories of each Nation.
3. Work in collaboration towards a Management Plan for Areas of Cultural Heritage, gathering and harvesting, and Sacred Significance with First Nations.
4. Install new boundary signage along the ocean to limit public access to MHNR from the ocean.
5. Maintain previously installed signage to inform public that there is no public access to MHNR.
6. Monitor and remove all invasive, non-native woody species that are found in MHNR through cooperation with ThINC and ITC. Prompt removal will make future management more cost effective. Establish a regular monitoring schedule to assess effectiveness of invasive species removal.
7. Establish a volunteer warden program and designate a warden to visit the site regularly and work with ThINC to monitor the property and identify management concerns.

7.2 Short term Actions (3-5 years):

1. Develop a parallel *Management Plan for Areas of Cultural Heritage and Sacred Significance* document with First Nations.
2. Consult with the Thetis Island Fire Department and the provincial BC Wildfire Service to communicate best management practices in case of a wildfire.

7.3 Long term Actions (5+ years)

1. If funding is available, conduct more intensive wildlife surveys, with a focus on species at risk, over a range of seasons to more fully document the biodiversity of MHNR and guide future management actions.

7.4 Ongoing or Annual Action Items

1. Work with local First Nations towards cooperative management of MHNR using the *Management Plan for Areas of Cultural Heritage and Sacred Significance*.
2. Maintain boundary signs to limit unauthorized public use of MHNR.
3. Conduct annual covenant monitoring to identify and address any management concerns that may arise.
4. Monitor and remove invasive species as required.

8 Conclusion

Moore Hill Nature Reserve is an important protected area on Thetis Island, where only 4% of the land base is protected for conservation. Although impacted by historic logging and heavy browse pressure from native Black-tailed Deer, MHNR is remarkably void of invasive species and provides important and diverse habitats for wildlife and Species at Risk, including coniferous and mixed forests, marine shorelines, cliffs, caves and crevasses, and open Garry oak habitat. As the largest protected area on Thetis Island, MHNR provides a significant contribution to the small but growing network of protected areas on the island, enhancing habitat connectivity for wildlife and species of conservation concern.

Key action items for MHNR include collaborating with First Nations to manage MHNR, removing invasive non-native woody plants to prevent further spread into MHNR, installing boundary signs along the ocean, and ongoing sign maintenance. Establishing a wildfire management plan and conducting further surveys and monitoring for Species at Risk are also recommended.

The ITC will pursue the management action items identified in this plan to achieve the vision, objectives and purpose of the Moore Hill Nature Reserve. Future management issues may lead to further action items that will be identified in work plans and in future revisions of this Management Plan.

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10 Appendices

Appendix A. Photographic Documentation

PHOTO STATION	LOCATION (UTM Coordinates)	DIRECTION	PHOTO-GRAPHER	DATE YYYY-MM-DD	DESCRIPTION
Anthropogenic Features as noted on Figure 3					
P4	450514 5428501	340°	CM*	2021-01-16	Old skid road that is re-vegetating with salal and young Douglas-fir trees
P5	450804 5428611	310°	CM	2021-01-16	Old well head
P6	450660 5428649	310 °	CM	2021-01-16	Old skid road
P23	450582 5428669	100°	CM	2021-01-16	Boundary sign
P24	450488 5428566	220 °	CM	2021-01-16	Unauthorized cut firewood
P25	450757 5428169	60°	CM	2021-01-16	MOE boundary sign
P26	450831 5428662	120°	CM	2021-01-16	Unauthorized trail
P27	450748 5428278	0 °	CM	2021-01-16	Screech-owl nest box
P28	450611 5428417	60°	CM	2021-01-16	Artificial Cover Object (ACO) used to monitor for Sharp-tailed Snakes
Natural Features as noted on Figure 4					
P1	450992 5428587	110°	CM	2021-01-16	Large moss-covered boulder next to shoreline
P2	450894 5428691	150°	CM	2021-01-16	Shoreline looking south
P3	451025 5428565	135°	CM	2017	Small islet attached to MHNR at low tide
P7	450587 5428509	180°	CM	2021-01-16	Hill that forms part of the summit of Mill Hill
P8	451104 5428452	310°	CM	2021-01-16	Large surface boulders in southeast portion of MHNR

P9	450565 5428392	30°	CM	2021-01-16	Large surface boulder next to Pilkey Point Road
P10	450701 5428233	360°	CM	2021-01-16	Vegetation Type 1. Mixed young Douglas-fir and arbutus with understory of salal, dull Oregon-grape and mosses next to Pilkey Point Road
P11	450701 5428233	90°	CM	2021-01-16	Vegetation Type 1. Mixed young Douglas-fir and arbutus forest with salal, dull Oregon-grape and mosses with steeply sloping cliff in background
P12	450854 5428331	135°	CM	2021-01-16	Vegetation Type 2. Higher elevation forest with young Douglas-fir and arbutus and open moss-covered understory
P13	450854 5428331	270°	CM	2021-01-16	Vegetation Type 2. Young Douglas-fir and arbutus and loose surface rock
P14	451006 5428529	45°	CM	2021-01-16	Vegetation Type 3. Young Douglas-fir and arbutus in steeply sloping terrain
P15	451006 5428529	225°	CM	2021-01-16	Vegetation Type 3. Young western redcedar and Douglas-fir with steep cliff.
P16	450816 5428539	300°	CM	2021-01-16	Vegetation Type 4. Steeply sloping Douglas-fir forest
P17	450816 5428539	105°	CM	2021-01-16	Vegetation Type 4. Young Douglas-fir and arbutus with loose moss-covered rocks.
P18	450853 5428656	135°	CM	2021-01-16	Vegetation Type 5. Young Douglas-fir and arbutus forest with sparse salal understory.
P19	450853 5428656	270°	CM	2021-01-16	Vegetation Type 5. Young Douglas-fir forest with salal understory.
P20	450636 5428335	30°	CM	2021-01-16	Cliff face with small caves and crevices

P21	450511 5428691	90°	CM	2021-01-16	Red squirrel
P22	450608 5428365	0°	CM	2021-01-16	Wildlife tree at top of cliff facing Pilkey Point Road
P29	450653 5428308	0°	CM	2021-01-16	Invasive English Holly plant

* CM = Carrina Maslovat

Appendix B. Record of Public Consultation

ISLANDS TRUST CONSERVANCY
Protecting Islands in the Salish Sea

January 29, 2021

RE: Moore Hill Nature Reserve, Thetis Island, Management Plan Survey & Zoom Webinar

Dear Neighbour,

The Islands Trust Conservancy is working on the first management plan to guide management of the Moore Hill Nature Reserve for the next 10 years and we are interested in hearing from you.

Islands Trust Conservancy acknowledges and respects that Thetis Island is within the territory of Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, SEMYOME (Semiahmoo) First Nation, Snuneymuxw First Nation, Stz'uminus (Chemainus) First Nation, Ts'uubaa-asatx (Lake Cowichan) First Nation. The Moore Hill Nature Reserve (PID: 000-324-671, Lot 9, District Lot 23, Thetis Island, Cowichan District, Plan 35106, Except Part In Plan 39716) is a 21-hectare protected area on the east side of Thetis Island (see Figure 1).

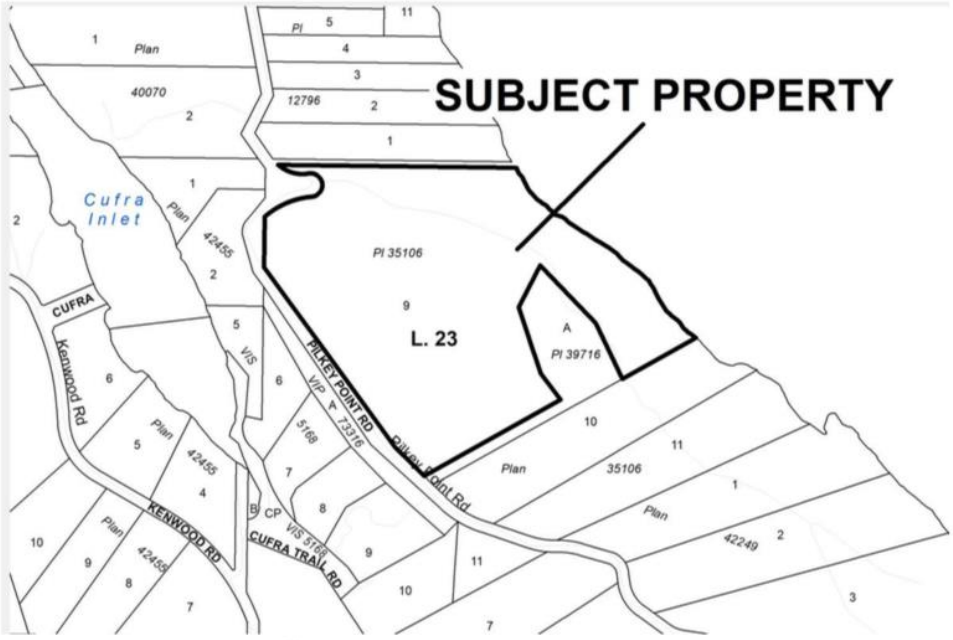

Figure 1. Moore Hill Nature Reserve Location map

Over...

PHONE: (250) 405-5151 · FAX: (250) 405-5155 · 200-1627 FORT ST, VICTORIA, BC, V8R 1H8
ITCMAIL@ISLANDSTRUST.BC.CA · WWW.ISLANDSTRUSTCONSERVANCY.CA

Two rare ecological communities are found within the Reserve as well as a range of habitats including coniferous and mixed forests, open Garry Oak stands and numerous crevasses, caves and cliffs that are important habitat for wildlife. Five federally-listed Species at Risk have been documented in the Reserve including the Endangered Little Brown Myotis (*Myotis lucifugus*), and four Special Concern species: Northern Red-legged Frog (*Rana aurora*), Great Blue Heron (*Ardea herodias*), Threaded Vertigo (*Nearctula* sp. 1) and Band-tailed Pigeon (*Patagioenas fasciata*). Moore Hill is of great cultural importance and ITC will continue to work with First Nations to support and protect continued use of areas of sacred and cultural significance by First Nations. There is no unauthorized public access due to the steep slopes, treacherous terrain, sensitive Species at Risk habitat and cultural importance for First Nations.

The Islands Trust Conservancy will work in partnership with Cowichan Community Land Trust (CCLT) who hold a conservation covenant on the Nature Reserve and with on-island partner Thetis Island Nature Conservancy (ThINC). There are restrictions on the use of the property, outlined in the covenant, that have been put in place to protect the native plants and animals within the reserve.

Your input is requested for the development of the new Moore Hill Nature Reserve Management Plan. As a neighbour of the nature reserve, we would like to hear your ideas and concerns regarding the long-term management of this special place.

The enclosed questionnaire can be:

- returned by mail to the Victoria office at 200 – 1627 Fort Street, Victoria, BC V8R 1H8;
- completed online at https://www.surveymonkey.com/r/MooreHill;
- or returned by email to: nmurphy@islandstrust.bc.ca

The deadline to complete the survey is March 15, 2021.

There will be a Zoom webinar with information about the Moore Hill Nature Reserve on Wednesday, February 10, 2021 at 7:00 p.m. To join the webinar, type the following link into your browser: https://islandstrust.zoom.us/j/62220488294

Webinar ID: 622 2048 8294

Thank you for taking the time to share your ideas regarding management of the Moore Hill Nature Reserve. For more information, please contact me at the phone number or email listed below.

Sincerely,

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

PHONE: (250) 405-5151 · FAX: (250) 405-5155 · 200-1627 FORT ST, VICTORIA, BC, V8R 1H8
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ISLANDS TRUST CONSERVANCY
Protecting Islands in the Salish Sea

February 5, 2021

Dear Chief and Council,

Re: Moore Hill Nature Reserve Management Plan

The Islands Trust Conservancy, through its work as a land trust, is drafting a management plan for the Moore Hill Nature Reserve on Thetis Island.

The nature reserves are within your First Nations treaty and/or territorial lands and waters and we want to ensure that the direction of the management plans is reflective of both reconciliation and conservation goals. At this time, ITC would like to work with you to understand the cultural significance and use of the area so that these values can also be preserved and protected—now and into the future. We understand that the cultural significance of this land may be confidential and we would work with you to ensure that the management plan reflects this significance appropriately. Acknowledging the importance of naming and recognition, if there is signage, names, or place names that should be used for these areas please let us know.

Moore Hill Nature Reserve (PID 000-324-671, Lot 9, District Lot 23, Thetis Island, Cowichan District, Plan 35106, Except Part In Plan 39716) is a 21-hectare protected area on the east side of Thetis Island (see Figure 1). Two rare ecological communities are found within the Reserve as well as a range of habitats including coniferous and mixed forests, open Garry Oak stands and numerous crevasses, caves and cliffs that are important habitat for wildlife. Five federally-listed Species at Risk have been documented in the Reserve including the Endangered Little Brown Myotis (Myotis lucifugus), and four Special Concern species: Northern Red-legged Frog (Rana aurora), Great Blue Heron (Ardea herodias), Threaded Vertigo (Nearctula sp. 1) and Band-tailed Pigeon (Patagioenas fasciata).

Islands Trust Conservancy would like to undertake an archaeological review or traditional use study in collaboration with you. Islands Trust Conservancy passed a Reconciliation Declaration, committing to building relationships to work with your Nation to protect and manage the area and any cultural heritage sites in these nature reserves in a way that is reflective of treaty, inherent rights, and the territorial lands of your Nation.

PHONE: (250) 405-5151 · FAX: (250) 405-5155 · 200-1627 FORT ST, VICTORIA, BC, V8R 1H8
ITCMAIL@ISLANDSTRUST.BC.CA · WWW.ISLANDSTRUSTCONSERVANCY.CA

Figure 1. Thetis Island ITC Nature Reserves

You may also be interested to know that Islands Trust Conservancy has developed a draft management plan template that includes cultural heritage and spiritual significance. I would be pleased to provide it to you, as a starting point if you would like to comment on it.

A questionnaire can be completed online at https://www.surveymonkey.com/r/MooreHill
The survey will remain online until March 15, 2021, and I can also be contacted at any time using the contact details below.

There will be a webinar with information about the Moore Hill Nature Reserve on February 10, 2021 at 7:00 pm at the flowing link: https://islandstrust.zoom.us/j/62220488294

Thank you for considering our request to work together. Please contact me at the number or email listed below. Thank you for your kind consideration.

Sincerely,

N. Murphy

Nuala Murphy
Property Management Specialist
Islands Trust Conservancy
250-405-5193 | nmurphy@islandstrust.bc.ca

Islands Trust Conservancy's Victoria office is located in Coast Salish territory and we acknowledge with respect the the BOḰEĆEN, Cowichan Tribes, Halalt, Homalco, K'ómoks, Klahoose, Ts'uubaa-asatx, Lək̓ʷəŋən (SXIMEŁEŁ, Songhees, T'Sou-ke), Lyackson, MÁLEXEŁ, Penelakut, Qualicum, Scia'new, səl̓ilwətaʔɬ, SEMYOME, shíshálh, Snaw-naw-as, Snuneymuxw, Sḵwx̱wú7mesh, SȾÁUTW̱, Stz'uminus, Tla'amin, scəẃaθən məsteyəxʷ, We Wai Kai, Wei Wai Kum, W̱JOŁEŁP, W̱SIḴEM, and xʷməθkʷəy̓əm territories in which we live and work.

Moore Hill Nature Reserve Questionnaire

Islands Trust Conservancy acknowledges and respects that Thetis Island is within the territory of Coast Salish Peoples, including Cowichan Tribes, Halalt First Nation, Lyackson First Nation, Penelakut Tribe, SEMYOME (Semiahmoo) First Nation, Snuneymuxw First Nation, Stz'uminus (Chemainus) First Nation, and Ts'uubaa-asatx (Lake Cowichan) First Nation.

Moore Hill Nature Reserve is a 21-hectare nature reserve located on the east side of Thetis Island and was acquired in 2017 as the result of two years of active fundraising by the Thetis Island Nature Conservancy, the Cowichan Community Land Trust and the Islands Trust Conservancy. MHNR includes Moore Hill which is 585 metres above sea level and is the highest point of the ridge on the east side of Thetis Island. MHNR has approximately 425 metres of shoreline with sea cliffs and rock boulder terrain near sea level. Numerous caves, cliffs and crevices provide excellent habitat for bats and other species that require these features as part of their habitat needs.

The Islands Trust Conservancy's primary goal is to protect and nurture the sensitive ecosystems and natural values on this land. The information and actions required to achieve this goal and guide the management of the property are set out in a management plan that is updated every 10 years. We welcome community input and ask you to share your thoughts on the protection and long-term management of the Moore Hill Nature Reserve.

1. Are you a resident of Thetis Island?

- ◯ Yes, I live on north Thetis Island
- ◯ Yes, I live mid-island
- ◯ Yes, I live on south Thetis Island
- ◯ No, but I own property on Thetis Island
- ◯ No, I'm a visitor

2. Have you ever visited the land that is now Moore Hill Nature Reserve? If so, how often?

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

3. If you have visited Moore Hill Nature Reserve before, what did you do there?

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

4. Please list any wildlife and unique plant species you have seen in or near Moore Hill 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 Moore Hill 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 Conservancy?

8. Due to the cultural and ecological importance of MHNR and the difficulty of the terrain, it has been recommended that there be no public trails. Do you have any thoughts on public access?

9. Please provide any other relevant information that will help us make the best management decisions for Moore Hill Nature Reserve.

10. Please share with us any history you know about this property or any knowledge you have about unique cultural or other special features on the property or in the area.

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

Observations were made by the following:
Roemer, Woodward & Adolf and Oluna Ceska May 31, 1995
Maslovat, Batten and Eriksson April 15, 2015
Maslovat, February 17th and 18th, 2017
List compiled by R. Batten (2015) with common names and status added by C. Maslovat.

Vascular Plants

Species Name	Common Name	Provincial Status
Abies grandis (Douglas ex D. Don) Lindl.	Grand Fir	
Acer glabrum Torr.	Douglas Maple	
Acer macrophyllum Pursh	Bigleaf Maple	
Achillea millefolium L.	Yarrow	
Achlys triphylla (Sm.) DC	Vanilla-leaf	
Acmispon parviflorus (Benth.) D.D. Sokoloff	Short-flower Bird's-foot-trefoil	
Adenocaulon bicolor Hook.	Pathfinder	
Aira caryophyllea L.	Silver Hairgrass	Introduced
*Aira praeco*x L.	Early Hairgrass	Introduced
Allium cernuum Roth	Nodding Onion	
Alnus rubra Bong.	Red Alder	
Amelanchier alnifolia var. *semiintegrifolia* (Hook.) C.L. Hitchc.	Saskatoon	
Anisocarpus madioides Nutt.	Woodland Tarweed	
Anthoxanthum odoratum L	Sweet Vernalgrass	Introduced
Aphanes occidentalis (Nutt.) Rydb.	Field Parsley Piert	Introduced
Arbutus menziesii Pursh	Arbutus	
Asplenium trichomanes L.	Maidenhair Spleenwort	
Bellis perennis L.	English Daisy	Introduced
Berberis aquifolium Pursh	Tall Oregon-grape	
Berberis nervosa Pursh	Dull Oregon-grape	
Brodiaea coronaria (Salisb.) Engl	Crown Brodiaea	
Bromus carinatus Hook. & Arn.	California Brome	
Bromus hordeaceus L.	Soft Brome	Introduced
Bromus sitchensis Trin.	Alaska Brome	
Bromus vulgaris (Hook.) Shear	Columbia Brome	
Calypso bulbosa (L.) Oakes	Fairy-slipper	
Camassia leichtlinii (Baker) S. Watson	Great Camas	
Cardamine oligosperma Nutt.	Little Western Bitter-cress	
Carex brevicaulis Mack.	Short-stemmed Sedge	
Carex deweyana Schwein.	Dewey's Sedge	
Carex inops ssp. inops L.H. Bailey	Long-stoloned Sedge	

Cerastium arvense L.	Field Chickweed	
Cerastium fontanum ssp. *vulgare* (Hartm.) Greuter & Burdet	Common Chickweed	Introduced
Claytonia exigua Torr. & A. Gray	Pale Springbeauty	
Claytonia parviflora Douglas ex Hook.	Streambank Spring Beauty	
Collinsia parviflora Lindl.	Small-flowered Blue-eyed Mary	
Corallorhiza maculata var. maculata (Raf.) Raf.	Summer Coralroot	
Corallorhiza maculata var. occidentalis (Lindl.) Ames	Summer Coralroot	
Cornus nuttallii Audubon	Western Flowering Dogwood	
Dactylis glomerata L.	Orchard-grass	Introduced
Danthonia californica Bol.	California Oatgrass	
Danthonia intermedia Vasey	Timber Oatgrass	
Daucus pusillus Michx.	American Wild Carrot	
Elymus glaucus Buckley	Blue Wildrye	
Epilobium ciliatum ssp. *glandulosum* Raf. (Lehm.) Hoch & P.H. Raven	Purple-leaved Willowherb	
Erythranthe alsinoides (Douglas ex Benth.) Nesom & Fraga	Wingstem Monkey-flower	
Festuca occidentalis Hook.	Western Fescue	
Festuca roemeri (Pavlick) Alexeev	Roemer's Fescue	
Fritillaria affinis (Schult.) Sealy	Chocolate Lily	
Galium aparine L.	Cleavers	
Galium triflorum Michx.	Sweet-scented Bedstraw	
Gaultheria shallon Pursh	Salal	
Geranium bicknellii Britton	Bicknell's Geranium	
Geum macrophyllum Willd.	Large-leaved Avens	
Goodyera oblongifolia Raf.	Rattlesnake-plantain	
Heuchera micrantha Douglas ex Lindl.	Small-flowered Alumroot	
Hieracium albiflorum Hook.	White Hawkweed	
Holcus lanatus L.	Common Velvet-grass	Introduced
Holodiscus discolor (Pursh) Maxim.	Oceanspray	
Hypochaeris glabra L.	Smooth Cat's-ear	Introduced
Hypochaeris radicata L.	Hairy Cat's-ear	Introduced
Ilex aquifolium L.	English Holly	Introduced
Jacobaea vulgaris Gaertn.	Ragwort	Introduced
Juncus effusus L.	Common Rush	
Juniperus maritima R.P. Adams [2 dead trees]	Seaside Juniper	Blue-list (S3)
Lapsana communis L.	Nipplewort	Introduced
Lathyrus nevadensis S. Watson	Purple Peavine	
Leucanthemum vulgare Lam.	Oxeye Daisy	Introduced

Ligustrum vulgare L.	Common Privet	Introduced
Linnaea borealis L.	Twinflower	
Lonicera ciliosa (Pursh) Poir. ex DC	Western Trumpet	
Lonicera hispidula (Lindl.) Douglas ex Torr. & A. Gray	Hairy Honeysuckle	
Luzula subsessilis (S. Watson) Buchenau	Short-stalked Wood-rush	
Malus fusca (Raf.) C.K. Schneid.	Pacific Crab Apple	
Melica subulata (Griseb.) Scribn.	Alaska Oniongrass	
Micromeria douglasii (Benth.) Benth.	Yerba Buena	
Moehringia macrophylla (Hook.) Fenzl	Big-leaved Sandwort	
Monotropa uniflora L.	Indian-pipe	
Montia parvifolia (Moc. ex DC.) Greene	Small-leaved Montia	
Mycelis muralis (L.) Dumort.	Wall Lettuce	Introduced
Myosotis discolor Pers.	Common Forget-me-not	Introduced
Nemophila parviflora Douglas ex Benth.	Small-flowered Nemophila	
Orobanche uniflora L.	Naked Broomrape	
Paxistima myrsinites (Pursh) Raf	Falsebox	
Pentagramma triangularis (Kaulf.) Yatsk., Windham & E. Wollenw.	Goldenback Fern	
Piperia transversa Suksd.	Royal Rein Orchid	
Plantago lanceolata L.	Ribwort Plantain	Introduced
Plantago major L.	Common Plantain	Introduced
Platanthera unalascensis (Spreng.) Kurtz	Alaska Rein Orchid	
Plectritis congesta (Lindl.) DC.	Sea Blush	
Polypodium glycyrrhiza D.C. Eaton	Licorice Fern	
Polystichum munitum (Kaulf.) C. Presl	Sword Fern	
Prunella vulgaris L.	Self-heal	
Prunus emarginata (Douglas ex Hook.) D. Dietr	Bitter Cherry	
Pseudotsuga menziesii (Mirb.) Franco	Douglas-fir	
Pteridium aquilinum (L.) Kuhn	Bracken Fern	
Quercus garryana Douglas ex Hook.	Garry Oak	
Ranunculus occidentalis Nutt.	Western Buttercup	
Ranunculus repens L.	Creeping Buttercup	Introduced
Ranunculus uncinatus D. Don ex G. Don	Little Buttercup	
Rhamnus purshiana DC.	Cascara	
Rosa gymnocarpa Nutt.	Baldhip Rose	
Rubus spectabilis Pursh	Salmonberry	
Rubus ursinus Cham. & Schltdl.	California Blackberry	
Rumex acetosella L.	Sheep Sorrel	Introduced
Salix scouleriana Barratt ex Hook.	Scouler's Willow	
Sanicula crassicaulis Poepp. ex DC.	Pacific Sanicle	
Sedum spathulifolium Hook.	Broad-leaved Stonecrop	
Selaginella wallacei Hieron.	Wallace's Selaginella	

Shepherdia canadensis (L.) Nutt.	Soopolallie	
Stellaria crispa Cham. & Schltdl.	Crisp Starwort	
Symphoricarpos albus (L.) S.F. Blake	Common Snowberry	
Symphoricarpos mollis Nutt.	Trailing Snowberry	
Taraxacum officinale F.H. Wigg.	Common Dandelion	Introduced
Taxus brevifolia Nutt.	Western Yew	
Thuja plicata Donn ex D. Don	Western Redcedar	
Toxicoscordion venenosum var. *venenosum* (S. Watson) Rydb.	Death Camas	
Trientalis latifolia Hook.	Northern Starflower	
Trifolium microcephalum Pursh	Small-headed Clover	
Trifolium oliganthum Steud.	Few-flowered Clover	
Trifolium repens L.	White Clover	Introduced
Trifolium willdenovii Spreng.	Tomcat Clover	
Triteleia hyacinthina (Lindl.) Greene	White Triteleia	
Tsuga heterophylla (Raf.) Sarg.	Western Hemlock	
Vaccinium ovatum Pursh	Evergreen Huckleberry	
Vaccinium parvifolium Sm.	Red Huckleberry	
Veronica officinalis L.	Common Speedwell	Introduced
Veronica serpyllifolia L.	Thyme-leaved Speedwell	
Vicia americana Muhl. ex Willd.	American Vetch	
Vulpia bromoides (L.) Gray	Barren Fescue	Introduced
Vulpia microstachys var. *pauciflora* (Scribn. ex Beal) Lonard & Gould	Small Fescue	
Vulpia myuros (L.) C.C. Gmel.	Rattail Fescue	Introduced

Mosses

Species Name	**Common Name**	**Provincial Status**
Amphidium californicum (Hampe ex C. Müll.) Broth.	California Yoke-moss	
Anacolia menziesii (Turn.) Par	Menzies' Anacolia Moss	
Atrichum selwynii Aust.	Crane's-bill Moss	
Aulacomnium androgynum (Hedw.) Schwaegr.	Lover's Moss	
Buckiella undulata (Hedw.) Irel.	Wavy Cotton Moss	
Claopodium crispifolium (Hook.) Ren. & Card.	Rough-moss	
Dicranoweisia cirrata (Hedw.) Lind.	Curly Thatch-moss	
Dicranum fuscescens Turn.	Curly Heron's-bill Moss	
Dicranum scoparium Hedw.	Broom-moss	
Dicranum tauricum Sapjegin	Broken-leaf Moss	
Epipterygium tozeri (Grev.) Lindb.	Tozer's Thread-moss	
Eurhynchium oreganum (Sull.) Jaeg.	Oregon Beaked-moss	

Grimmia pulvinata (Hedw.) Sm.	Grey-cushioned Grimmia	
Homalothecium nuttallii (Wils.) Jaeg.	Nuttall's Homalothecium Moss	
Hylocomium splendens (Hedw.) Schimp.	Step Moss	
Hypnum circinale Hook.	Coiled-leaf Claw-moss	
Hypnum cupressiforme Hedw.	Cypress-leaved Claw-moss	
Hypnum subimponens Lesq.	Curly Claw-moss	
Isothecium cristatum (Hampe) Robins.	Isothecium Moss	
Isothecium myosuroides Brid.	Variable Moss	
Leucolepis acanthoneuron (Schwaegr.) Lindb.	Palm Tree Moss	
Metaneckera menziesii (Hook.) Steere	Menzies' Neckera	
Neckera douglasii Hook.	Douglas' Neckera	
Plagiomnium insigne (Mitt.) T. Kop.	Coastal Leafy Moss	
Plagiomnium venustum (Mitt.) T. Kop.	Magnificient Leafy Moss	
Plagiothecium undulatum (Hedw.) Schimp.	Flat Moss	
Pleurozium schreberi (Brid.) Mitt.	Red-stemmed Feathermoss	
Polytrichum juniperinum Hedw.	Juniper Haircap Moss	
Polytrichum piliferum Hedw.	Awned Haircap Moss	
Porotrichum bigelovii (Sull.) Kindb.	Bigelow's Porotrichum Moss	
Racomitrium canescens (Hedw.) Brid.	Grey Rock-moss	
Racomitrium elongatum Ehrh. ex Frisv.	Long Rock-moss	
Rhizomnium glabrescens (Kindb.) T. Kop.	Large Leafy moss	
Rhytidiadelphus loreus (Hedw.) Warnst.	Lanky Moss	
Rhytidiadelphus triquetrus (Hedw.) Warnst.	Electrified Cat's-tail Moss	
Schistidium maritimum (Turn.) Bruch & Schimp.	Seaside Grimmia	
Scleropodium touretii (Brid.) L. Koch	Touret's Scleropodium Moss	
Timmia austriaca Hedw.	False-polytrichum	
Zygodon viridissimus (Dicks.) Brid.	Green Yoke-moss	

Lichens

Species Name	**Common Name**	**Provincial Status**
Aspicilia caesiocinerea (Nyl. ex Malbr.) Arnold	No common name	
Buellia muriformis A. Nordin & Tønsberg	Coastal Buttons	
Buellia punctata (Hoffm.) A.Massal.	Common Buttons	
Caloplaca flavogranulosa Arup	Jumbled Firedot	
Caloplaca holocarpa (Hoffm. ex Ach.) A.E.Wade	Hard-rock Firedot	
Caloplaca marina (Wedd.) Zahlbr.	Crowded Surf Firedot	
Caloplaca rosei Hasse	Paint-spill Firedot	
Candelariella vitellina (Hoffm.) Müll.Arg.	Common Peeps	

Chaenotheca ferruginea (Turner ex Sm.) Mig.	Blood Whiskers	
Chrysothrix granulosa G.Thor.	Uplifted Gold Dust	
Cladina arbuscula (Wallr.) Hale & W.L.Culb.	Mesomorphic Reindeer	
Cladina portentosa (Dufour) Follman	Maritime Reindeer	
Cladonia bellidiflora (Ach.) Schaerer	Floral Pixie	
Cladonia coniocraea (Flörke) Spreng.	Mama Littlehorn Pixie	
Cladonia fimbriata (L.) Fr.	Trumpeting Pixie	
Cladonia macilenta Hoffm.	Lipstick Pixie	
Cladonia scabriuscula (Delise) Nyl.	Card-carrying Pixie	
Cladonia transcendens (Vainio) Vainio	Graduated Pixie	
Cliostomum griffithii (Sm.) Coppins	Common Meringue	
Evernia prunastri (L.) Ach.	Valley Oakmoss	
Fuscopannaria mediterranea (Tav.) P.M.Jørg.	Midnight Crackers	
Fuscopannaria pacifica P.M.Jørg.	Silver-rimmed Crackers	
Hertelidea botryosa (Fr) Printzen & Kantvilas	No common name	
Hypocenomyce anthracophila (Nyl.) P.James & Gotth. Schneider	Two-toned Turtleback	
Hypocenomyce scalaris (Ach. ex Lilj.) M.Choisy	Charcoal Clamshell	
Hypogymnia apinnata Goward & McCune	Beaded Bone	
Hypogymnia enteromorpha (Ach.) Nyl.	Inflatable Bone	
Hypogymnia inactiva Krog	Wish Bone	
Hypogymnia physodes (L.) Nyl.	Monk's Hood	
Hypogymnia tubulosa (Schaer.) Hav.	Dog Bone	
Lecanora farinaria Borrer		
Lecanora muralis (Schreb.) Rabenh.	Bird-splat Lichen	
Lecanora pacifica Tuck.	Pacific Rim	
Lecidea atrobrunnea (Lam. & DC.) Schaerer	Brown Tiles Dot	
Lepraria torii Pérez---Ortega & T. Sprib.	No common name	
Leptogium palmatum (Hudson) Mont.	Antlered Vinyl	
Leptogium polycarpum P.M.Jørg. & Goward (on adjacent property)	Peacock Vinyl	Yellow-list (S4) COSEWIC Special Concern (2011)
Lobaria pulmonaria (L.) Hoffm.	Lungwort	
Massalongia carnosa (Dickson) Körber	Moss Liver	
Melanelixia subaurifera (Nyl.) O.Blanco et al.	Abrading Camoflage	
Nephroma laevigatum Ach.	Mustard Paw	
Ochrolechia farinacea Howard	Oak Donuts	
Ochrolechia oregonensis H.Magn.	King-sized Donuts	
Parmelia hygrophila Goward & Ahti	Granulating Crottle	
Parmelia saxatilis (L.) Ach.	Pebbled Crottle	
Parmelia sulcata Taylor	Hammered Crottle	

Peltigera britannica (Gyeln.) Holt.---Hartw. & Tønsberg	Deciduous Pelt	
Peltigera collina (Ach.) Schrad.	Tree pelt	
Peltigera membranacea (Ach.) Nyl.	Diamond Pelt	
Peltigera pacifica Vitik.	Fringed Pelt	
Pertusaria ophthalmiza (Nyl.) Nyl.	Inactive Pert	
Phlyctis argena (Spreng.) Flotow	Sporulating Whitewash	
Physcia adscendens (Fr.) Olivier	Hooded Rosette	
Physcia caesia (Hoffm.) Lettau	Blue-headed Rosette	
Physcia tenella Moberg	Hoodless Rosette	
Platismatia glauca (L.) W.L.Culb. & C.F.Culb.	Ragbag	
Platismatia herrei (Imshaug) W.L.Culb. & C.F.Culb.	Tattered Rag	
Protoparmelia ochrococca (Nyl.) P.M.Jørg, Rambold & Hertel	Honey Curds	
Pyrrhospora quernea (Dickson) Körber	Tree porridge	
Ramalina farinacea (L.) Ach.	Hyphenated Ribbon	
Ramalina menziesii Taylor	Canopy Fishnet	
Sphaerophorus tuckermanii Räsänen	Fragmenting Coral	
Sticta fuliginosa (Hoffm) Ach.	Peppered Moon	
Tuckermannopsis chlorophylla (Willd.) Hale	Silver-lined Wrinkle	
Usnea filipendula Stirton	Herringbone Beard	
Usnea scabrata Nyl.	Scarecrow's Beard	
Xanthoparmelia coloradoensis (Gyeln.) Hale	Colorado Rockfrog	

Appendix D. Recommended Monitoring Route for Moore Hill Nature Reserve.