

**Morrison Marsh Nature Reserve
Management Plan
Denman Island, British Columbia**



Prepared for:



ISLANDS TRUST CONSERVANCY

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i. Executive Summary

Morrison Marsh Nature Reserve is a 51.73 hectare (127.77 acre) property which includes the southern portion of Denman Island's largest marsh and the headwaters to Boyle Creek. The marsh is surrounded by third growth Douglas-fir forests with rocky outcrops and there are several smaller wetlands within the forested areas. The land was most recently logged in 1979.

The land was donated to the Islands Trust Conservancy (ITC) (previously the Islands Trust Fund) in 2005 by the former land holder. The land is protected by a conservation covenant which was registered to the Denman Conservancy Association (DCA) in 2006. The ITC manages the Reserve in cooperation with the DCA guided by the management plan which was written in 2007 and revised in 2018. The Reserve was established to protect the marsh, the wetlands, the rocky outcrops and the upland forests for the benefit of the flora, fungi and fauna of the Reserve and the residents of Denman Island.

There are hiking trails along the old logging roads that are used by the public. The trails connect with Boyle Point Provincial Park to the south and east of the Reserve. The low impact hiking trails will continue to be open to the public. There are seven confirmed rare species noted in the Reserve including one dragonfly, one frog, four birds and two bats. There are also two ecological communities which are ranked as rare by the BC Conservation Data Centre. The marsh is important habitat for waterfowl and the eight species of bat which have been detected.

Threats to the property include invasive non-native woody plants. There has been disturbance from recreational use, primarily in areas where the trails have been routed through wetlands or wet areas, and from occasional mountain bike use. There are concerns related to disturbance of waterfowl, with the biggest impact during the breeding season. Impacts associated with fluctuations in water levels and water quality as well as over-grazing by native Black-tailed Deer may also threaten the Reserve.

In cooperation with DCA, invasive species removal should continue. Removal efforts should focus on woody invasive species such as spurge-laurel (*Daphne*), English holly and Scotch broom. Trail maintenance/re-routing is recommended to address disturbance in wet areas. A volunteer warden program would be useful to conduct regular monitoring of the property and provide early detection of management concerns such as dogs off leash, mountain biking, disturbance to waterfowl and other issues.

ii. Tables and Lists

Table of Contents

i. Executive Summary	2
ii. Tables and Lists	3
1 Introduction	7
1.1 Islands Trust Conservancy (ITC)	7
1.2 Purpose of Islands Trust Conservancy Management Plans	8
1.3 Protected Area Purpose	8
1.4 Protected Area Objectives	9
2 Property Information	9
2.1 Location	9
2.2 Legal Description	9
2.3 Legal Access	9
2.4 Local and Regional Context	10
2.5 Adjacent Land Use and Connectivity	10
2.6 Site History	12
2.7 Undersurface Rights	12
2.8 Notations, Charges, Liens and Interests	12
2.9 Local Planning Designations	13
2.10 Existing Public and Other Use	14
3.0 Ecological Inventory	16
3.1 Ecological Significance	16
3.2 Climate	16
3.2.1 Impacts from Climate Change	17
3.3 Geology and Physiography	17
3.4 Hydrology	18
3.5 Soils	18
3.6 Ecological Classifications	18
3.7 Map of the Protected Area	19
3.8 Ecological Communities and Site Series	21
3.8.1 Ecological Community 1: 80% Douglas-fir/Dull Oregon-grape (CDFmm01): 20% Red Alder/Sword Fern	21
3.8.2 Ecological Community 2: Unclassified Marsh	23
3.8.3 Ecological Community 3: Beaked Sedge/Water Sedge	24
3.8.4 Ecological Community 4: Red Alder/Slough Sedge (CDFmm14)	25
3.8.5 Ecological Community 5. Disclimax Wetlands	26
3.8.6 Ecological Community 6: Rock Outcrop (Herbaceous Terrestrial)	27
3.9 Vegetation Type Differences from the ITC Terrestrial Ecosystem Mapping	28
3.10 Red and Blue Listed Communities	29
3.11 Red and Blue Listed Species	29

3.12 Wildlife Species.....	31
3.13 Expected Change over Time.....	33
4.0 Threats.....	33
4.1 Invasive non-native species.....	33
4.2 Trail Use and Erosion.....	36
4.3 Disturbance of Waterfowl.....	37
4.4 Water Quality and Quantity.....	37
4.5 Mountain Bikes.....	37
4.6 Cannabis Growing.....	38
4.7 Wood and Salal Harvest.....	38
4.8 Overgrazing.....	38
4.9 Risk of Wildfire.....	38
5.0 Stakeholder Consultation.....	38
5.1 Adjacent Land holders.....	38
5.2 First Nations.....	38
5.3 Conservation Partners and Community Members.....	39
5.4 Consultation Results.....	39
6.0 Management Plan.....	40
6.1 Discussion.....	40
6.2 Management Roles.....	40
6.3 Permitted and Prohibited Uses.....	40
6.4 Public Access.....	40
6.5 Signage.....	41
6.6 Trail Maintenance.....	42
6.7 Protection Initiatives for Sensitive Ecosystems and Species at Risk.....	44
6.8 Ecological Restoration Options.....	44
6.9 Scientific Research/Education.....	44
6.10 Exotic and Invasive Species Removal.....	45
6.11 Wildfire Planning.....	45
7.0 Action Items.....	45
7.1 Immediate Actions (1-2 years).....	45
7.2 Short term Actions (3-5 years).....	46
7.3 Long term Actions (5+ years).....	47
7.4 Ongoing or Annual Action Items.....	47
8.0 Conclusion.....	47
9.0 References.....	48
10.0 Appendices.....	51

List of Figures

Figure 1. Map of Protected Areas Near Morrison Marsh Nature Reserve	11
Figure 2. Development Permit Areas in Morrison Marsh Nature Reserve	14
Figure 3. Map of Trails and Other Features	15
Figure 4. Canadian Climate Normals for Mud Bay, British Columbia (Environment and Climate Change Canada 2018)	17
Figure 5. Map of Ecological Communities, Species at Risk and Invasive Species	20

List of Tables

Table 1. Red and Blue Listed Ecological Communities in Morrison Marsh Nature Reserve	29
Table 2. Red and Blue Listed Species found in Morrison Marsh Nature Reserve	29
Table 3. Wildlife Species (Excluding Birds) Observed in Morrison Marsh Nature Reserve	31

List of Photos and Credits

Photo 1. Wood Post and Wire Fence along Northern Boundary	16
Photo 2. Pole/sapling aged stand of Douglas-fir/Dull Oregon-grape forest (170°)	21
Photo 3. Red Alder and Sword Fern in wetter portions of Ecological Community 1 (0°)	22
Photo 4. Morrison Marsh showing an area of open water with sedges and shrubs in shallower areas (30°).....	23
Photo 5. Beaked Sedge/Water Sedge Marsh showing dense stand of Beaked Sedge and Slough Sedge with small Sitka Spruce in the center of the photo (320°). White flowers are Water parsley.....	24
Photo 6. Red Alder/Slough Sedge wetland with Grape Fern (100°)	25
Photo 7. Grape Fern (<i>Botrychium multifidum</i>) in Red Alder/Slough Sedge wetland.....	25
Photo 8. Trembling Aspen wetland which has been invaded by Reed Canarygrass (320°).....	26
Photo 9. Dry rocky outcrop with thin soils and dominated by the non-native Sweet Vernalgrass (180°).	27
Photo 10. Northern Red-legged Frog in Morrison Marsh Nature Reserve	30
Photo 11. Blue Dasher dragonfly in Grape Fern Marsh (Photo: L. Matthias)	30
Photo 14. Great Horned Owl in Douglas-fir Forest in Morrison Marsh Nature Reserve (Photo: Ren Ferguson)	32
Photo 12. Jenny Balke of the Denman Conservancy Association deploys a minnow trap to determine presence of fish and amphibian species in Morrison Marsh	32
Photo 13. Northwestern Salamander in Morrison Marsh Nature Reserve	33
Photo 15. Evergreen Spurge-laurel with flowers in the northern portion of the Reserve	34
Photo 16. English holly cut above ground level and branches left on the ground in place.....	35
Photo 17. “Froggy Ponds” area of the trail showing trail widening and bike tracks through the wet soil (location in Figure 3: Map of Trails and other features)	36
Photo 18. Kiosk near trailhead off Greenhill Road.....	41
Photo 19. Signs showing prohibited activities and boundary of the Reserve.....	42
Photo 20. Caution Sign next to Steep Cliffs.....	42

Photo 21. Culvert under trail at Boyle Creek. Culvert is perched and currently blocked with wood.....	43
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List of Appendices

Appendix A. Legal Easement for Access off Greenhill Road.....	51
Appendix B. Ecological Community Descriptions.....	52
Appendix C. Plant Species Observed in Morrison Marsh, July 2017.....	65
Appendix D. Avian Species Observed in Morrison Marsh Nature Reserve.....	69
Appendix E. Bat Acoustic Survey Summary Report for Morrison Marsh Nature Reserve.....	71
Appendix F. Locations of Photographic Documentation	72
Appendix G. Locations of Species at Risk and Species of Interest Observed in Morrison Marsh Nature Reserve.....	74
Appendix H. Letter to Neighbours.....	75
Appendix I. Letter to First Nations	77
Appendix J. Questionnaire.....	80

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1 Introduction

Morrison Marsh Nature Reserve is a 51.73 hectare (127.77 acre) property located on the southern end of Denman Island. The property includes the southern portion of Denman Island's largest marsh and the headwaters to the marsh including Boyle Creek. The marsh is surrounded by third growth Douglas-fir forests with rocky outcrops with several smaller wetlands throughout the property. The marsh is home to over 80 bird species and is a key over-wintering area for waterfowl (ITC 2018).

The land has been logged repeatedly, most recently in 1979. Old logging roads cross the property and these are used for hiking and nature appreciation by the public. The trails connect to Boyle Point Provincial Park to the south and east of the Reserve.

There is much more to learn about the First Nations use of the property. It is likely that the area was used for hunting and plant gathering.

The land was given to the Islands Trust Conservancy (ITC) in 2005 by the former land holder who chose to remain anonymous and a conservation covenant was registered in favour of the Denman Conservancy Association (DCA) in 2006. The DCA remains committed to the long-term management of the Nature Reserve and works in partnership and under contract to the Islands Trust Conservancy to carry out management activities in accordance with the management plan. The original management plan was approved in 2007 and revised in 2018.

1.1 Islands Trust Conservancy (ITC)

In 1974, the Province of British Columbia recognized the islands between Vancouver Island and the mainland as a special place within the province where the unique beauty, rural character and diverse ecosystems should be protected for future generations. Through the *Islands Trust Act*, the province established the Islands Trust, a local government, with the following mandate (known as the Object of the Islands Trust):

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

In 1990, through the enactment of a section of *Islands Trust Act*, the Islands Trust Conservancy was established as a conservation land trust to assist in carrying out the “preserve and protect” mandate. Part 6 of the *Islands Trust Act* establishes the corporate status, responsibilities, and governance structure of the Islands Trust Conservancy. The Islands Trust Conservancy is one of fifteen corporate entities¹ charged to uphold the Object

¹ The corporate entities charged to uphold the Object of the Islands Trust include the Trust Council, the Executive Committee, thirteen local trust committees and the Islands Trust Conservancy.

of the Islands Trust and since 1990 has protected over 1,267 hectares (3,130 acres) of land as nature reserves, nature sanctuaries and conservation covenants.

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

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

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

1.2 Purpose of Islands Trust Conservancy Management Plans

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

- Provide general and descriptive information on the property, including location, history, and land use;
- Set out the conservation goals and objectives for the property;
- Identify the property's ecological and/or cultural values and features;
- Describe the management issues associated with the property; and,
- 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.

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

1.3 Protected Area Purpose

The purpose of Morrison Marsh Nature Reserve is to protect, in perpetuity, the marsh, upland forest, rocky outcrops and wetlands for the benefit of the flora, fungi and fauna of the Reserve, the residents of Denman Island, and the province generally. The property will

be protected as a nature reserve in accordance with the objectives of the Islands Trust and the ITC.

1.4 Protected Area Objectives

The objectives for Morrison Marsh Nature Reserve are:

1. Preserve the Morrison Marsh and adjacent forested areas as an undisturbed natural area and nature reserve;
2. Protect the distinct ecological communities and the Species at Risk that depend on them;
3. Protect and, where necessary and feasible, restore the plant and animal communities and ecological processes at the site;
4. Allow for continued low impact public access and enjoyment of the site in areas where such uses are compatible with protection of ecological values;
5. Support ongoing inventory, mapping and monitoring to guide management provided it does not interfere with Species at Risk protection; and,
6. Allow the natural ecological processes and functions of the site to proceed unimpeded without human intervention, except in the case of wildfire or other exceptional situations where remediation is considered imperative.

2 Property Information

Morrison Marsh Nature Reserve is 51.73 hectares (127.77 acres) in size and includes the southern portion of the marsh and surrounding upland areas with the southern headwaters to Morrison Marsh including Boyle Creek.

2.1 Location

Morrison Marsh Nature Reserve is located in the southern portion of Denman Island, north of Boyle Point Provincial Park (Figure 1). From the BC Ferries Terminal at Denman West, travel east for 0.5 km on Denman Road. Turn right at the junction of Northwest Road and continue east on Denman Road for another 0.5 km. Turn right on Lacon Road and travel south for 5.4 km then turn left on McFarlane Road and travel east for 2 km. Turn right on Greenhill Road and travel 2 km southeast until the end of the road. Access to the property is from the cul-de-sac at the southern end of Greenhill Road.

The Reserve can also be accessed by hiking trails that enter the property from Boyle Point Provincial Park to the south and east.

2.2 Legal Description

Parcel Identifier No. (PID): 026-532-913. The property is defined as Lot A, Section 7, Denman Island, Nanaimo District, Plan VIP80177.

2.3 Legal Access

Legal access to the property is over a short easement from the cul-de-sac at the end of Greenhill Road (Appendix A).

2.4 Local and Regional Context

Denman Island is located between Hornby Island and the central east coast of Vancouver Island in the Strait of Georgia. The nearest urban centers are Courtney, Comox and Nanaimo. Parcels surrounding the Reserve are a mix of residential lots and provincially managed lands. To the southwest, west and north are privately managed residential lots that vary in size and provincial parkland is to the south and east.

Morrison Marsh Nature Reserve is next to Boyle Point Provincial Park which is to the south and east of the Reserve. Boyle Point Protected Area and Bill Mee Community Recreation Park and Boat Ramp extend the protected area to the ocean on the east side of Denman Island. Two other small protected areas are found in the southern portion of Denman Island: Stanehill Park, 0.7 km northwest of the Reserve and Valens Brook Nature Reserve, 1.6 km west of the Reserve. The northern portion of the marsh was identified as a potential provincial park during the creation of Denman Island Provincial Park and Protected Area but was ultimately determined not ideal so was left out when it was created in 2013. It was felt that it should remain protected and is currently provincially managed by Ministry of Forests, Lands and Natural Resource Operations and Rural Development (Moore pers. comm. 2018) and is zoned for Conservation (Figure 1).

There are other properties on Denman Island protected by ITC and DCA. ITC protects Inner Island Nature Reserve, Lindsay Dickson Nature Reserve, and Valens Brook Nature Reserve. DCA protects Central Park, Winter Wren Wood, and the Settlement Lands, as well as several covenant areas.

2.5 Adjacent Land Use and Connectivity

The lands adjoining Morrison Marsh Nature Reserve are zoned for a mixture of uses including Rural Residential (RR), Residential (R2), Agriculture (A), Conservation (CN) and Park (PK) (Islands Trust 2018b).

To the south and east of the Reserve is Boyle Point Provincial Park which includes 4 parcels totaling 188 hectares (465 acres) of provincial park plus 9.3 hectares (23 acres) Boyle Point Protected Area (BC Parks 2018). The provincial park contains some of Denman Island's oldest and largest Douglas-fir (*Pseudotsuga menziesii*), Hemlock (*Tsuga heterophylla*) and Western Redcedar trees (*Thuja plicata*) (BC Parks 2018).

Residential lots surround the remainder of the Reserve. To the southwest, is the 12 hectares (29 acre) parcel that was previously part of the parent lot that is zoned Forestry. There has been some residential development on this lot. To the southwest are small lots (2 hectares/5 acre) that are zoned Rural Residential and to the west is a 7 hectares (16 acre) lot zoned Rural Residential /Agriculture. To the north is a 25 hectares (63 acre) parcel zoned Rural Residential/ Residential/Agriculture (Islands Trust 2018b).

The northern portion of Morrison Marsh is zoned CN for Conservation and is provincially managed (Islands Trust 2018b).

Ducks Unlimited Canada holds a water license as well as several flooding consent agreements on lands surrounding Morrison Marsh. In 2015, DUC approached the ITC to enter into a flooding agreement. The agreement remains unsigned as of the approval of this Management Plan.

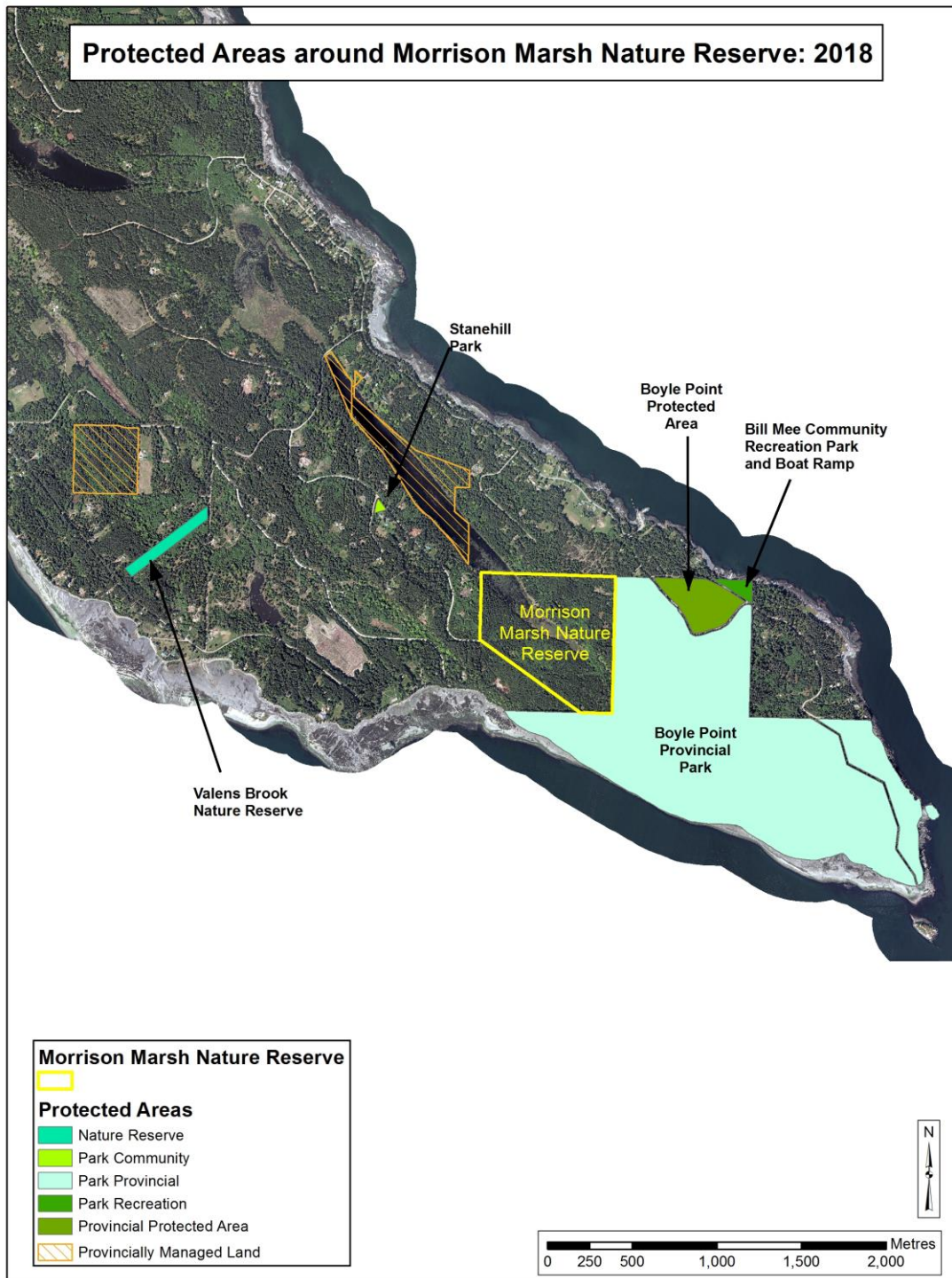


Figure 1. Map of Protected Areas Near Morrison Marsh Nature Reserve

2.6 Site History²

Denman Island was used seasonally by the Pentlatch Peoples and K'omoks Peoples of Vancouver Island for summer fishing and there is evidence of year-round populations. First Nations archaeological artifacts dated from 3000BC have been found in a midden at Deep Bay, just across Baynes Sound from the property. An ancient Pentlatch village site is located on the west side of Denman Island and Morrison Marsh was likely used by First Nations people for hunting waterfowl and deer and for harvesting plants (Balke 2006).

Morrison Marsh was previously part of a larger wetland that was bisected by the construction of McFarlane Road to form McFarlane or Windy Marsh north of the road and Morrison Marsh south of the road (Balke 2006). There is no apparent surface connection between the two wetlands (Mimulus Biological Consultants 2012). After European settlement, the marsh was farmed, probably for Reed Canarygrass (ITC 2018) and for root crops such as potatoes and turnips. The forests in the upland areas were logged several times. Most recently the Reserve was logged in 1979 and replanted in 1980 by Weldwood of Canada (Balke 2006).

In 1985, Ducks Unlimited Canada, the BC provincial government and residents installed a crest weir and outlet channel to control the water level of the marsh (Balke 2006). A beaver dam downstream of the weir also alters water depth in the marsh (ITC 2018). Material from the top of the dam is removed to keep the water level within 0.5 m of the weir height to limit extreme fluctuations in water levels (Marshall pers. comm. 2018).

The property was part of the original landholdings of 4064 Investments Ltd. and the parcel which included the Reserve was the first block sold by the company (DCA 2018). In 2000, the land was purchased by a land holder with the intent to protect the marsh. With financial support from the DCA, the land holder subdivided the property under Section 99 of the Land Title Act and donated the majority portion to the ITC to hold and steward (ITC 2018). The DCA holds a conservation covenant on the land and since March 2008 has been contracted to perform the management activities on the Reserve (DCA 2018).

2.7 Undersurface Rights

Undersurface rights for Morrison Marsh Nature Reserve are currently held in favour of the Crown in Right of the Province of British Columbia.

2.8 Notations, Charges, Liens and Interests

A Section 219 Covenant and Section 218 Statutory Right of Way were registered on the land September 26, 2006 in favour of the Denman Conservancy Association. The general intent of the covenant is to:

² The Islands Trust Conservancy recognizes that the language commonly used to refer to land may be disrespectful to First Nations. For example, notions of 'private' and 'Crown' land do not appropriately recognize aboriginal title and imply a belief in the concept of terra nullius, the idea that land was not owned prior to the assertion of European sovereignty. The ITC acknowledges that terra nullius is a concept that doesn't apply to the Islands Trust Area. The words "provincially-managed land or federally managed land" will be used in place of "Crown". "Privately managed" will be used in place of "private" and "land holder" instead of "land owner".

- 1) protect, preserve, conserve, maintain, enhance or restore the Land and the Amenities, in a natural state; and
- 2) to prevent any occupation or use of the Land that will impair or interfere with the natural state of the Land or the Amenities.

There are also two Statutory Way of Way in favour of Compliance Holdings Ltd. (EJ49176 and EJ49177).

2.9 Local Planning Designations

Under Denman Island Land Use Bylaw 186, the marsh is zoned for Agriculture (A) and is within the Agricultural Land Reserve. The remainder of the property is zoned Conservation (CN) (Islands Trust 2017a). Under Denman Island Official Community Plan Bylaw 185 the marsh is designated Sustainable Resources (SR) and the remainder of the lot is designated Conservation/Recreation (CR) (Islands Trust 2017b).

There are two Development Permit Areas (DPA) that affect land use within the Reserve: DPA 4 and DPA 2 (Figure 2).

The marsh and streams which feed into it are protected by the Riparian Areas Regulation and DPA 4. Works undertaken by a local government or a body established by a local government are exempt from any requirement for a development permit in DPA 4 (Islands Trust 2017b).

The steep slopes in the eastern portion of the property are protected by DPA 2 which limits activities in areas with slopes of greater than 60% (Islands Trust 2017a). Within DPA2, a permit is required for the following:

- “1. Alteration of land by the cutting or removing of trees:
 - i. on land that:
 - Is not classified as managed forest land under the *Assessment Act*; and
 - Is not the subject of a valid and subsisting woodlot license or tree farm license under the *Forest Act*; and
 - ii. where the quantity cut or removed from the land is to exceed four trees smaller than 30 cm dbh and one tree equal to or larger than 30 cm dbh per parcel in any period of five consecutive calendar years.
2. Development of any impervious surfaces.
3. Construction of buildings or structures.

All other land alteration or development is exempt from the requirements of this development permit area” (Islands Trust 2017b). Ongoing trail maintenance should not require a development permit.

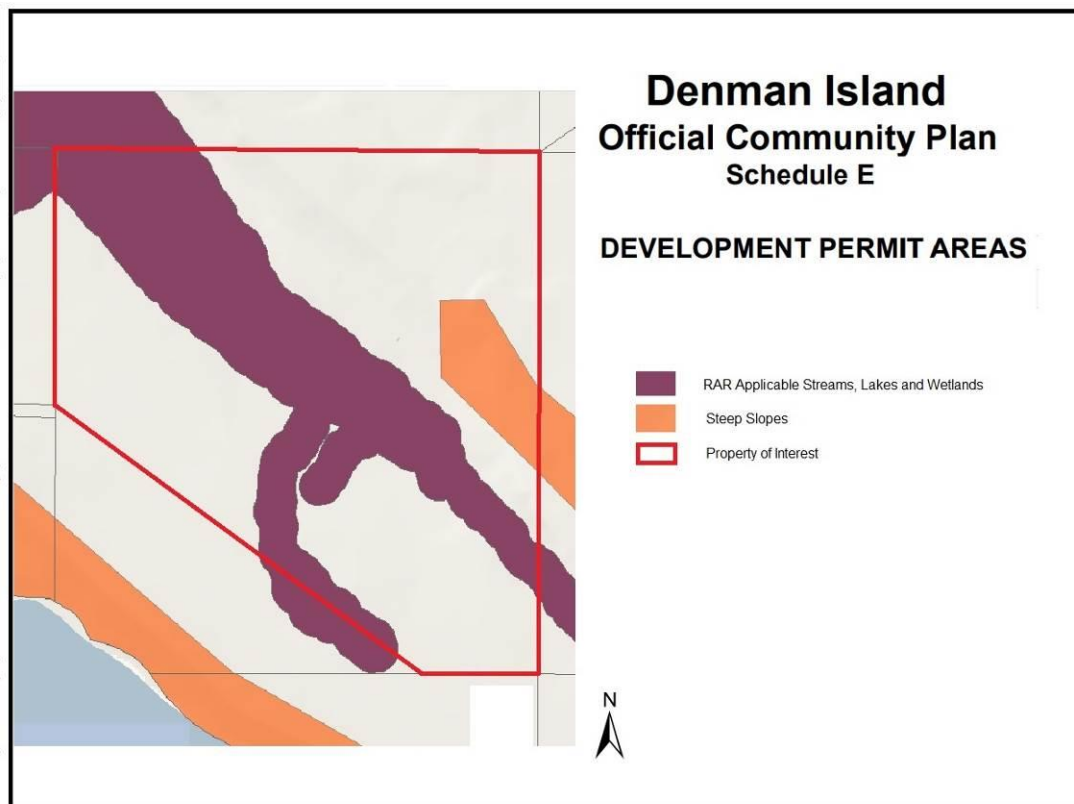


Figure 2. Development Permit Areas in Morrison Marsh Nature Reserve

2.10 Existing Public and Other Use

The property is used by the local community for walking and nature appreciation. The existing hiking trails on the property are the remains of the skid roads from the 1979 logging operations (Balke 2006). The main trail begins at the end of Greenhill Road and travels south east with a minor trail branching south to Boyle Point Provincial Park and through the park to the west shore of Denman Island (Figure 3). The main trail continues east across Morrison Creek then heads north with two spur trails which are “seasonally closed” and lead toward the northern edge of the property. The neighbour has installed a fence to prevent trespass onto their property (Photo 1) although there is evidence of a path around the edge of the fence so some foot traffic occurs. The main trail goes east up the ridge to connect with Boyle Point Provincial Park in two locations on the east side of the Reserve.

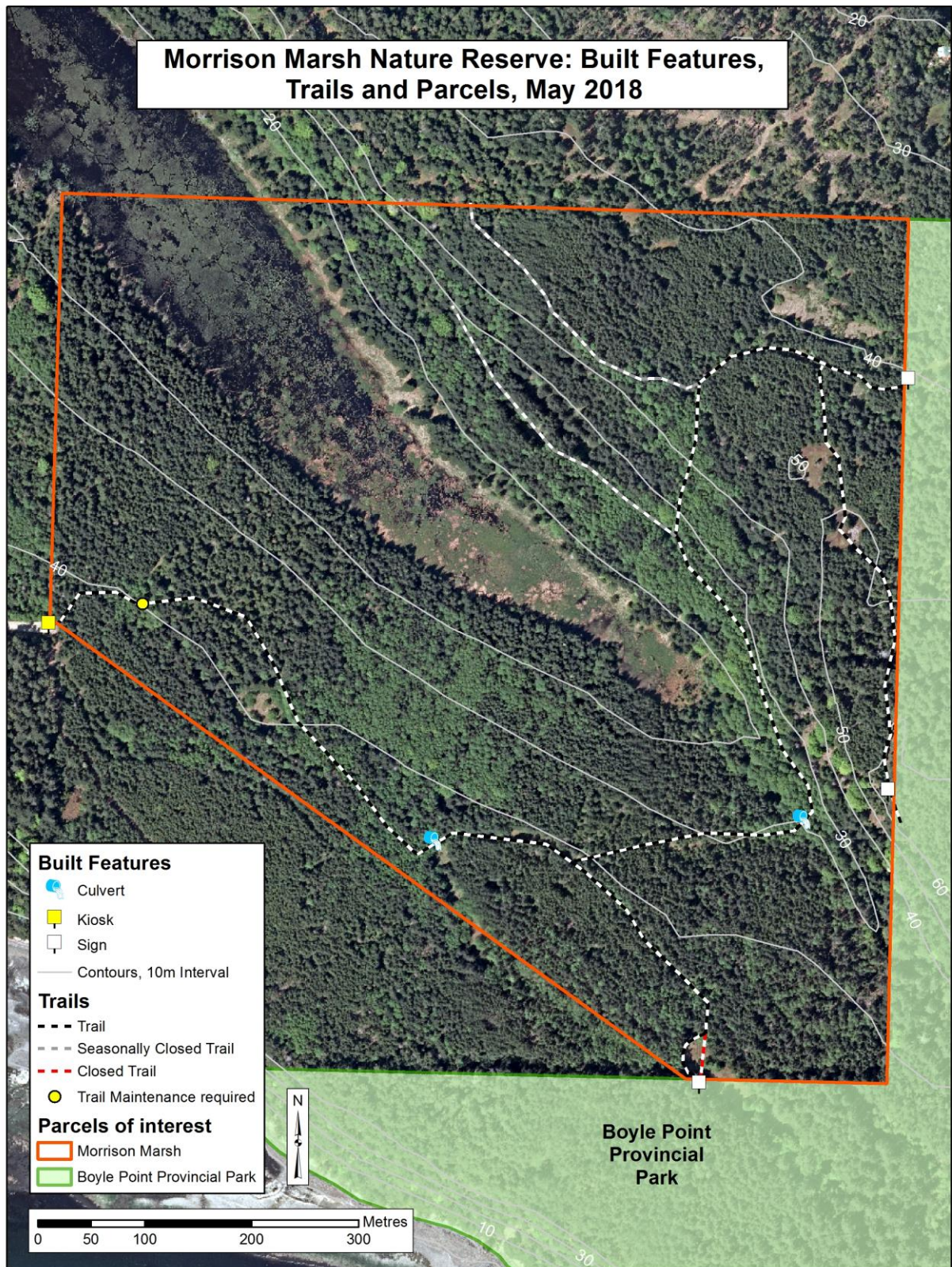


Figure 3. Map of Trails and Other Features



Photo 1. Wood Post and Wire Fence along Northern Boundary

3.0 Ecological Inventory

3.1 Ecological Significance

Morrison Marsh Nature Reserve is a 51.7 hectare (127.8 acre) area that protects the southern portion of Denman Island's largest marsh. The Reserve also contains the upland forests surrounding the marsh, which includes the headwaters of the marsh including Boyle Creek (a.k.a. Upper Morrison Creek). There are open rocky outcrops, a steep bluff, riparian areas and several smaller wetlands in the Reserve. The Reserve is home to a diverse number of bird species and Morrison Marsh is a key waterfowl over-wintering area, with as many as hundreds of individuals from over ten species using the marsh (Balke 2006). The Reserve is adjacent to Boyle Point Provincial Park and provides important connectivity between the ocean and the freshwater marsh.

3.2 Climate

The closest Environment and Climate Change Canada weather station to Denman Island is in Mud Bay on Vancouver Island, which is 7 km from Morrison Marsh (Environment Canada, 2018). Like the other Gulf Islands, precipitation is heaviest in the winter months from October to March and remains at low levels throughout the spring and summer. November has the highest average precipitation at 290 mm with July and August ranging from 26-38 mm. Temperature is highest from June through September and lowest in November through March. At Mud Bay, average daily temperatures peak in July and August at 17°C and are lowest in December and January at 3.0-3.5°C. (Figure 4) (Environment and Climate Change Canada 2018).

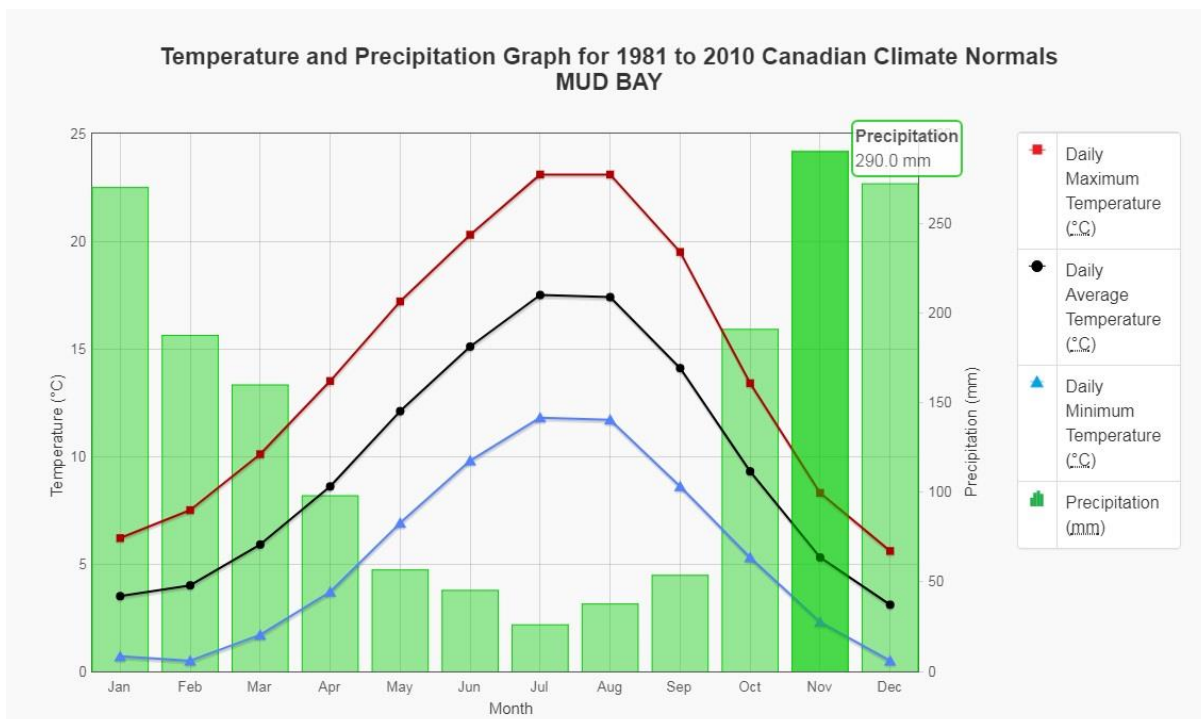


Figure 4. Canadian Climate Normals for Mud Bay, British Columbia (Environment and Climate Change Canada 2018)

3.2.1 Impacts from Climate Change

Long-term impacts from climate change may affect moisture levels in the creeks which feed the marsh and may alter the water table. The overall height of water is determined by an outlet weir so changes to the elevation of the marsh are expected to be minimal, provided the weir remains in place (refer to Section 3.4). The smaller marshes throughout the Reserve may be impacted by changes in creek flow. Climate change may impact the regeneration of the forest, especially Western Redcedar, which is showing dieback associated with unseasonably hot dry summers in other locations. Hot, dry conditions can also lead to an increase in wildfires.

3.3 Geology and Physiography

Denman Island is underlain by sediments of the Nanaimo Group, deposited approximately 87 to 60 million years ago (Durand and Durand 2007). The property is underlain by fossiliferous shale which is part of the upper Cedar District Formation and is exposed along the shores of Baynes Sound, south of the Reserve. The fossiliferous shale is overlain by thick sandstone of the De Courcy Formation. Conglomerate from the De Courcy Formation is also found underlying the reserve in scattered small outcrops and in larger exposures to the northeast of Morrison Marsh (Trueman 2001 in Durand and Durand 2007).

Glacial striations oriented in a south-easterly direction were observed in two locations on the property. The striations were left from glaciers that filled the Georgia Strait to a depth of greater than one kilometer as recently as 14,000 years ago. These glaciers also left some

scattered erratic boulders, several of which are found on the property (Trueman 2001 in Durand and Durand 2007).

The topography and drainage of the reserve is characterized by a gentle dip from the western boundary toward the center of the reserve to a rise in the eastern boundary resulting in two major aspects: northeast and southwest (Balke 2006). The eastern portion of the property slopes upward to a ridge that overlooks the reserve to the west. Slopes vary from nearly flat to 38 degrees (78%) and in places shear sandstone or conglomerate boulders are exposed (Balke 2006). The rise is defined by a ridge system where the line of demarcation between the conglomerates underlying the northeast of the property meets the sandstone underlying the remainder of the property (Trueman 2001 in Durand and Durand 2007).

3.4 Hydrology

In 1985, Ducks Unlimited Canada and the former Ministry of Environment, Lands and Parks installed a variable crest weir and outlet channel next to McFarlane Road at the north end of Morrison Marsh. The weir was designed to maintain the water levels in the marsh at a depth of 0.8-0.9 meters. A beaver dam downstream of the weir previously kept the water levels higher than originally intended (Balke 2006; Durand and Durand 2007). Beavers continue to maintain a dam approximately 10 meters downstream of the weir and a small amount of material from the surface of the dam is removed to keep water above the top of the weir to prevent beavers from damming the weir itself. Removing the top of the dam maintains marsh water levels to within 0.5 m fluctuation and prevents major flooding events (Marshall pers. comm. 2018).

The headwaters of Boyle Creek are within Morrison Marsh Nature Reserve and Boyle Point Provincial Park as are smaller seasonal creeks that feed the marsh. There are several smaller wetlands throughout the reserve that are formed by water collecting in shallow depressions with impermeable surface layers (Balke 2006).

3.5 Soils

Surficial materials within the reserve consist primarily of a thin layer of silty- sandy soils with bedrock close to the surface. Thicker layers of soil are found in the wetland depressions (Durand and Durand 2007).

Soils in the southeast end of the marsh are considered 'peatland' and consist of fibrous peat up to 50 cm thick (Denman Conservancy Association 2006 in Durand and Durand 2007). Soil mapping for the property is incomplete but soils associated with Morrison Marsh are mapped as Arrowsmith which is a peat soil group that is poorly drained and comprised of undecomposed moss and woody accumulations over 36 inches deep (Experimental Farms Service 1958).

3.6 Ecological Classifications

Denman Island is in the northern extent of the Coastal Douglas-fir Biogeoclimatic Zone in the moist maritime subzone (CDFmm). This zone is found only on the Gulf Islands and

southeastern Vancouver Island. Adjacent land on Vancouver Island is classified as Coastal Western Hemlock very dry maritime (CWHxm1) and there is evidence of transition between the two zones on Denman Island. Denman Island is within the Pacific Maritime Ecozone and the Georgia Puget Basin Ecozone.

3.7 Map of the Protected Area

A map of Morrison Marsh Nature Reserve showing the property lines, contours, trails and built structures is included in Figure 3. A map showing natural features, ecological communities, rare species and invasive plants is included in Figure 5.

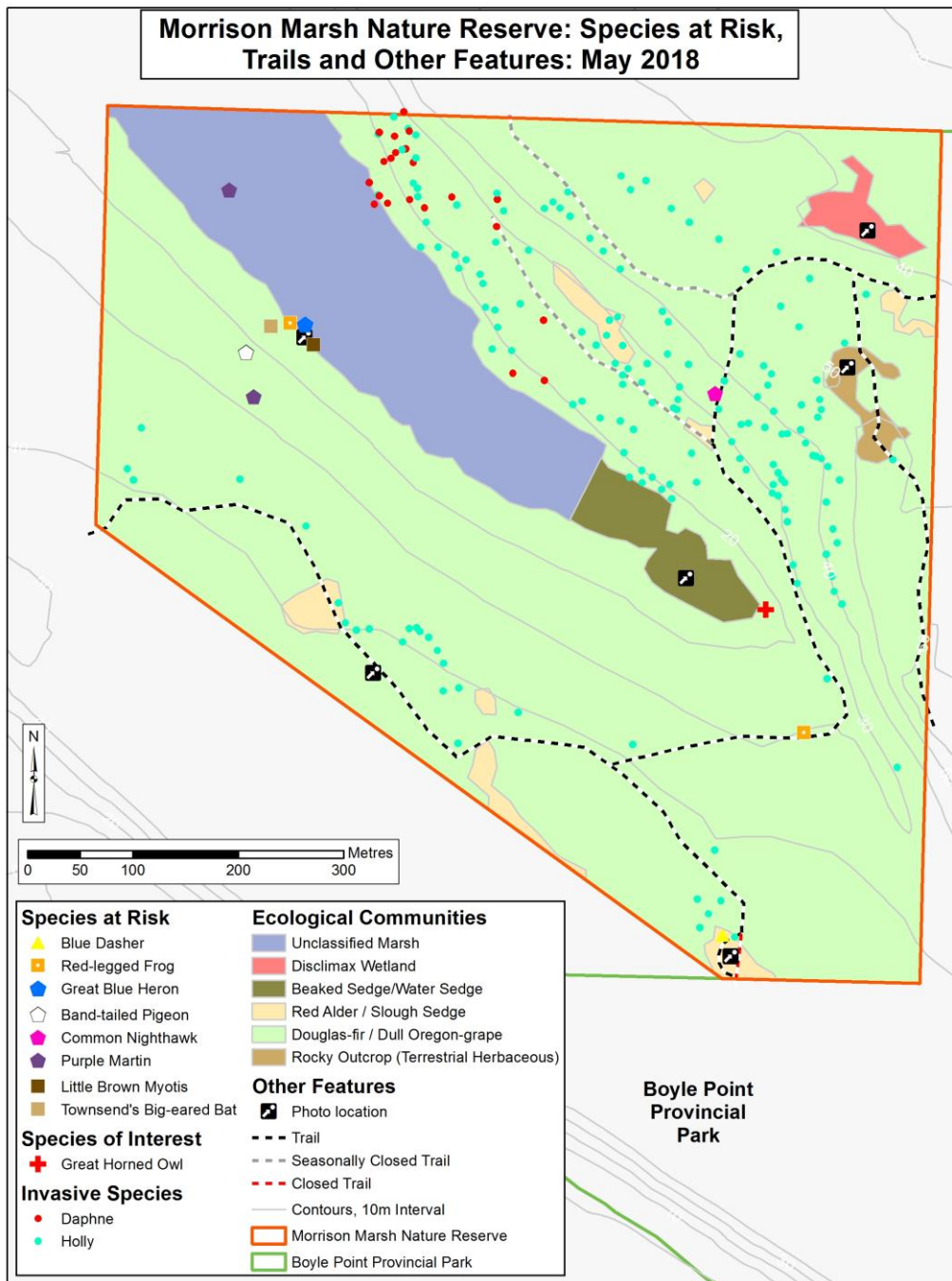


Figure 5. Map of Ecological Communities, Species at Risk and Invasive Species

3.8 Ecological Communities and Site Series

An inventory of the biological features of the Reserve was conducted on July 14 and 15th, 2017 by three consulting biologists, Carrina Maslovat, Ren Ferguson and Laura Matthias. One site series was identified using *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* (Green and Klinka, 1994) and three wetland ecological communities as described by McKenzie and Moran (2004). One site remains unclassified. These site series and the corresponding ecological communities were compared to previous terrestrial ecosystem mapping (Islands Trust 2018b) and to previous mapping done during the baseline report and management planning.

Tables of species and descriptions of ecological communities are included in Appendix B. A list of all plant species observed is included in Appendix C. A list of bird species observed during the July 2017 survey can be found in Appendix D and details of the bat acoustic survey are included in Appendix E. The locations of photographic documentation of ecological communities and species are included in Appendix F.

3.8.1 Ecological Community 1: 80% Douglas-fir/Dull Oregon-grape (CDFmm01): 20% Red Alder/Sword Fern



Photo 2. Pole/sapling aged stand of Douglas-fir/Dull Oregon-grape forest (170°)

Description: Ecological Community 1 is a Douglas-fir/Dull Oregon-grape ecological community, which on this site corresponds to the Douglas-fir/ Salal site series (CDFmm01) (Photo 2). The dominant tree species is Douglas-fir (*Pseudotsuga menziesii*) in the age class pole/sapling although there are some slightly older trees mapped as young forest in the eastern part of the reserve next to Boyle Point Provincial Park. In flatter areas and on the

lower slopes, there is a secondary canopy of Western Redcedar (*Thuja plicata*), Western Hemlock (*Tsuga heterophylla*) and Grand Fir (*Abies grandis*).

Dominant shrub species include Salal (*Gaultheria shallon*) and Dull Oregon-grape (*Berberis nervosa*). In the drier areas, there is more Oceanspray (*Holodiscus discolor*) and in the wetter areas, the understory has more Sword Fern (*Polystichum munitum*). The invasive non-native shrub English holly (*Ilex aquifolium*) is found throughout the reserve, in higher densities to the east and north of the marsh.

Due to previous logging, the stand is even aged with stumps and old skid roads throughout. In many areas conifer regeneration has been suppressed due to thin soils and compaction from logging activities. As the forest matures, it will develop into different ecological communities which reflect variation in soil depth and moisture.

In wetter areas at the bottom of depressions, next to streams and other areas with higher moisture, there are pockets of Red Alder (*Alnus rubra*) with an understory that is dominated by Western Sword Fern (*Polystichum munitum*) (Photo 3). These sites may develop into Western Redcedar/Sword Fern/Skunk Cabbage, Red Alder/Skunk Cabbage, Western Redcedar/ Sword Fern or possibly into Sitka Spruce/Sword Fern communities (although the latter is not found in the CWHxm) but they do not currently have the characteristics of these communities.



Photo 3. Red Alder and Sword Fern in wetter portions of Ecological Community 1 (0°)

In the baseline report, this ecological community was separated into several different vegetative areas. Two of these (Type 3: Boyle Creek Riparian Community and Type 4: Red Alder Wet Communities) correspond to the Red Alder/Sword Fern assemblage found in wetter portions of the property. The Vegetation Type 5: Early Douglas-fir/Salal Forest and Vegetation Type 9: Delayed Regeneration/Douglas-fir are consistent with the Douglas-fir/Dull Oregon-grape ecological community described above.

3.8.2 Ecological Community 2: Unclassified Marsh



Photo 4. Morrison Marsh showing an area of open water with sedges and shrubs in shallower areas (30°)

The southern 1/3 of the marsh is within the Reserve and receives moisture from the rest of the property, including three seasonal creeks draining into it. There is standing water throughout the year with open water at the north end of the Reserve. However, most of the marsh within the Reserve has diverse emergent vegetation dominated by sedges and forbs with scattered shrubs growing out of the tussocks (Photo 4). There are large areas that are dominated by the non-native invasive Reed Canarygrass (*Phalaris arundinacea*).

The water level in the marsh is regulated by a variable crest weir installed in 1985. Since the installation of the weir, there have been significant changes in vegetation including a large die off of Hardhack (Balke 2006). No change in the amount of standing water could be detected from historical air photos from 2002-2014 (Islands Trust 2018b).

The standing water supports aquatic insect populations which in turn support avian and mammal insectivores (McKenzie and Moran 2004). The marsh is important habitat for a wide range of waterfowl and other birds, as well as the eight species of bat which were recorded.

3.8.3 Ecological Community 3: Beaked Sedge/Water Sedge



Photo 5. Beaked Sedge/Water Sedge Marsh showing dense stand of Beaked Sedge and Slough Sedge with small Sitka Spruce in the center of the photo (320°). White flowers are Water parsley.

This ecological community is found at southern end of Morrison Marsh and is dominated by a dense cover of sedges, primarily Beaked Sedge (*Carex utriculata*) and Slough Sedge (*Carex obnupta*) (Photo 5). There are a small number of forbs including Water Parsley (*Oenanthe sarmentosa*) and Skunk Cabbage (*Lysichiton americanus*). There are several stunted Sitka Spruce trees in the middle of the marsh and there are Western Redcedar, Western Hemlock and Red Alder in the transitional areas to riparian forests. There is no standing water during the dry season.

3.8.4 Ecological Community 4: Red Alder/Slough Sedge (CDFmm14)



Photo 6. Red Alder/Slough Sedge wetland with Grape Fern (100°)

There are several small wetlands in the Reserve. The most ecologically intact is locally known as Grape Fern Marsh or Boyle Marsh and is found along the southern boundary of the reserve and extends into Boyle Point Provincial Park (Photo 6). Several of the other small wetlands in the upland portions of the reserve have a mix of native sedges and non-native species, primarily the invasive Reed Canarygrass (*Phalaris arundinacea*).



One small wetland in the northeast corner of the reserve is dominated by Reed Canarygrass and is classified as a disclimax wetland (Ecological Community 5).

The water table fluctuates over the year: soils are fully saturated in the winter due to a combination of flat topography and poorly draining soils. During the growing season, the water table drops, leaving rooting zones of varying depth related to microtopography.

The vegetation is dominated by Slough Sedge with a mix of forbs and ferns including Grape Fern (*Botrychium multifidum*) in the southern wetland (Photo 7). Trees surrounding the wetland at the edges include Sitka Spruce (*Picea sitchensis*), Douglas-fir (*Pseudotsuga menziesii*), Western Hemlock (*Tsuga heterophylla*) and Red Alder (*Alnus rubra*).

Photo 7. Grape Fern (*Botrychium multifidum*) in Red Alder/Slough Sedge wetland

The main trail to Boyle Point Provincial Park has recently been rerouted since it previously went through the center of the wetland and became impassible due to flooding during the wet season.

3.8.5 Ecological Community 5. Disclimax Wetlands



Photo 8. Trembling Aspen wetland which has been invaded by Reed Canarygrass (320°)

One of the small upland wetlands, referred to in the baseline as “Aspen” (Balke 2006), is found in the northeast corner of the reserve and is highly degraded (Photo 8). The site has a strongly fluctuating water table with soils that are fully saturated in the winter and the water drops during the growing season.

The plant community is dominated by the non-native Reed Canarygrass (*Phalaris arundinacea*) but there are pockets of Salal on higher mounds. Trees are sparse but there is a small stand of Trembling Aspen in this wetland only. In wetter portions of the wetland there is Musk Monkeyflower (*Mimulus moschatus*), Field Mint (*Mentha arvensis*) and other native wetland species. The edges of the wetland have thick growth of Hardhack (*Spirea douglasii*), Douglas-fir (*Pseudotsuga menziesii*) and Western Redcedar (*Thuja plicata*).

There is only one Ecological Community listed by the BC CDC which includes Trembling Aspen: Trembling Aspen/Pacific Crab Apple/Slough Sedge (CDFmm00) which is red-listed and ranked S1S2 (BC CDC 2017). Green and Klinka (1994), classify this site series as a special site with a strongly fluctuating water table that aligns most closely with C2- Black Twinberry

(summer moist/winter wet) although none of the characteristic species are present because of previous disturbance. Black Twinberry is uncommon on Denman Island, but is present further north in an isolated parcel of provincially managed land on the east edge of Morrison Marsh (Bland pers. comm. 2018). The Aspen wetland may develop into either of these communities over time: however, without restoration the presence of Reed Canarygrass will inhibit the establishment of native species. Reed Canarygrass represents a disclimax community that establishes in cleared swamps or low-bench sites (McKenzie and Moran 2004).

3.8.6 Ecological Community 6: Rock Outcrop (Herbaceous Terrestrial)



Photo 9. Dry rocky outcrop with thin soils and dominated by the non-native Sweet Vernalgrass (180°).

There are small open rocky outcrops towards the northeastern portion of the reserve at the crest of the slope where bedrock is close to the surface (Photo 9). The site has thin, discontinuous soil with a high cover of exposed rock. Heavy browsing by deer, especially in the winter, is a factor in maintaining these open areas. The vegetation is dominated by drought-tolerant cryptogams and limited cover of vascular vegetation placing it in the Rock Group (R) and the Rock Outcrop site class (Ro) (McKenzie 2012). There is no ecological community listed by the BC CDC that fits this site.

The community is dominated by mosses, lichens and non-native grasses. There are a few patches of Douglas-fir, Dull Oregon-grape and Salal in small patches where the soil is deeper. Because of the prior disturbance, it can be considered a disclimax community. There is a

small vernal pool which holds water for much of the year. The open areas are good habitat for reptiles. The site has potential nesting habitat for Common Nighthawk, although the disturbance caused by the trail would likely act as a deterrent.

An old logging road passes through the middle of the rock outcrops and in the past, there has been disturbance caused by mountain bikes. There is a small amount of erosion next to the trail.

3.9 Vegetation Type Differences from the ITC Terrestrial Ecosystem Mapping

Islands Trust Terrestrial Ecosystem Mapping (TEM) identifies 9 mapped polygons containing 5 different ecosystem types. There are 5 different mapcodes: Douglas-fir Salal (CDFmm/01), Open Water, Western Redcedar – Grand Fir – Foamflower (CDFmm/06), Sitka Willow – Pacific Willow – Skunk Cabbage (Ws51), and Rock Outcrop. Some of the Fd-Salal are in different structural stages (pole/sapling and young forest). Four of the units extend only a very small distance into the reserve (Islands Trust 2018b). Ground truthing in 2017 determined that some of the ecosystems are different from what had been previously mapped.

In the TEM, Morrison Marsh was classified as Wetland - Shallow Water with the primary unit of classification as shallow, open water (<2m deep) (Islands Trust 2018b). According to McKenzie and Moran (2004), sites with this classification should have less than 10% emergent cover but within the reserve, emergent vegetation is much higher with open water averaging only 25-30% depending on the location. It is possible conditions have changed since the terrestrial ecosystem mapping because of changes associated with the variable crest weir or previous beaver dams. Alternatively, this may be because the polygon extends beyond the boundaries of the Nature Reserve and may be a product of mapping scale.

The four other polygons with significant portions in the reserve all have a primary unit classification of Douglas-fir/Salal (CDFmm01) pole/sapling. Secondary and tertiary classification includes: Douglas-fir/Salal pole/sapling; Douglas-fir/Salal Young Forest; Rural Residential; and Rock Outcrop. None of these are classified as SEI (Islands Trust 2018b). The BC CDC maps a polygon in the eastern portion of the reserve as Douglas-fir/Dull Oregon-grape ecological community but the area on the ground is not distinctive from the rest of the reserve.

This report separates the small wetlands and rocky outcrops from the surrounding forest. These polygons are too small for the mapping scale of TEM.

3.10 Red and Blue Listed Communities

The following ecological communities found in Morrison Marsh Nature Reserve have been red and blue listed by the BC Conservation Data Center (BC CDC 2018).

Table 1. Red and Blue Listed Ecological Communities in Morrison Marsh Nature Reserve

Ecological Community	Biogeoclimatic Unit	Provincial Rank
Douglas-fir / Dull Oregon-grape (<i>Pseudotsuga menziesii</i> / <i>Berberis nervosa</i>)	CDFmm/01	Red List S2 (2010)
Red Alder/Slough Sedge [Black Cottonwood] (<i>Alnus rubra</i> / <i>Carex obnupta</i> [<i>Populus trichocarpa</i>])	CDFmm/14	Red List S1 (2006)

3.11 Red and Blue Listed Species

The following Species at Risk have been found on the Morrison Marsh Nature Reserve (Table 2). These species are listed as rare either provincially by the BC Conservation Data Centre or federally by the Committee on the Status of Endangered Wildlife in Canada. Except where otherwise noted, these species were identified during surveys for Islands Trust Conservancy in 2017 (Maslovat *et al.* 2017). The locations of Species at Risk are included in Appendix G. Eight species of bat, including two Species at Risk, were detected using an acoustic bat detector set up over the marsh (Table 2) (survey report in Appendix E).

Table 2. Red and Blue Listed Species found in Morrison Marsh Nature Reserve

Species Common Name	Latin Name	Provincial Status ³	COSEWIC Status ⁴	SARA Schedule 1 Status	Notes
Blue Dasher Dragonfly	<i>Pachydiplax longipennis</i>	Blue-list (S3S4)	Not listed	Not listed	Two adults observed in Grape Fern marsh
Northern Red-legged Frog	<i>Rana aurora</i>	Blue-list (S3)	Special Concern (2015)	Special Concern (2005)	Two adults observed
Band-tailed Pigeon	<i>Patagioenas fasciata</i>	Blue-list (S3S4B)	Special Concern (2008)	Special Concern (2011)	One adult heard calling
Common Nighthawk	<i>Chordeiles minor</i>	Yellow-list (S4B)	Threatened (2007)	Threatened (2010)	Heard at dusk calling and feeding over property
Great Blue Heron <i>fannini</i> subspecies	<i>Ardea herodias fannini</i>	Blue-list (S2S3B, S4N)	Special Concern (2008)	Special Concern (2010)	Observed flying over Morrison Marsh
Purple Martin	<i>Progne subis</i>	Blue-list (S3B)	Not listed	Not listed	Eight individuals observed aerial

³ BC Conservation Data Centre (BC CDC 2018)

⁴ Committee on the Status of Endangered Wildlife in Canada (Government of Canada 2017)

					feeding over marsh and surrounding forest
Western Screech-Owl, <i>kennicotti</i> subspecies*	<i>Megascops kennicotti kennicottii</i>	Blue-list (S2S3)	Threatened (2012)	Special Concern (2005)	Noted in previous management plan
Little Brown Myotis**	<i>Myotis lucifugus</i>	Yellow-list (S4)	Endangered (2013)	Endangered (2014)	Acoustic detection
Townsend's Big-eared Bat**	<i>Corynorhinus townsendii</i>	Blue-list (S3S4)	Not listed	Not listed	Acoustic detection

*It is unclear from the description in the management plan if Western Screech-owl was confirmed in the Reserve. It was not observed or heard during 2017 surveys.

* Bat species were detected using an Anabat Express bat detector mounted above the ground attached to a tree next to the marsh located at 10 U 375496 5483210. It was left on site for eight nights from July 14th-22th. Examination of acoustic spectrograms was done by Peter Ommundsen (report in Appendix E).



The previous management plan noted that Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*) may also be present in the marsh or Boyle Creek. This has not been confirmed.

Photo 10. Northern Red-legged Frog in Morrison Marsh Nature Reserve

Adult Northern Red-legged Frogs were observed in the upland forest during 2017 surveys (Photo 10). They require wetlands for breeding and likely use Morrison Marsh as their primary breeding site since some of the smaller wetlands may dry too quickly to support the development of tadpoles.



Photo 11. Blue Dasher dragonfly in Grape Fern Marsh (Photo: L. Matthias)

The blue-listed Blue Dasher dragonfly was observed in the small wetland next to Boyle Point Provincial Park in the

southern portion of the Reserve (Photo 11). This is the least degraded of the small wetlands in the upland areas.

3.12 Wildlife Species

Wildlife species excluding birds are listed in Table 3. A list of birds observed during 2017 surveys is included in Appendix D.

Table 3. Wildlife Species (Excluding Birds) Observed in Morrison Marsh Nature Reserve

Species Common Name	Latin Name	Provincial Status	COSEWIC Status
European Wall Lizard	<i>Podarcis muralis</i>	Introduced	Not listed
Northern Red-legged Frog	<i>Rana aurora</i>	Blue-list S3 (2016)	Special Concern (2015)
Northwestern Gartersnake	<i>Thamnophis ordinoides</i>	Native	Not listed
Northwestern Salamander	<i>Ambystoma gracile</i>	Native	Not listed
Pacific Chorus Frog	<i>Pseudacris regilla</i>	Native	Not listed
Rough-skinned Newt	<i>Taricha granulosa</i>	Native	Not listed
American Beaver***	<i>Castor canadensis</i>		
North American River Otter***	<i>Lontra canadensis</i>		
American Mink	<i>Vison vison</i>	Native	Not listed
Black-tailed Deer	<i>Odocoileus hemionus</i>	Native	Not listed
Raccoon	<i>Procyon lotor</i>	Native	Not listed
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	Native	Not listed
Townsend's Big-eared Bat*	<i>Corynorhinus townsendii</i>	Blue-list S3S4 (2015)	Not listed
Big Brown Bat*	<i>Eptesicus fuscus</i>	Native	Not listed
Hoary Bat*	<i>Lasiurus cinereus</i>	Native	Not listed
Silver-haired Bat*	<i>Lasionycteris noctivagans</i>	Native	Not listed
California Myotis*	<i>Myotis californicus</i>	Native	Not listed
Western Long-eared Myotis*	<i>Myotis evotis</i>	Native	Not listed
Little Brown Myotis*	<i>Myotis lucifugus</i>	Yellow-list S4 (2015)	Endangered (2013)
Yuma Myotis*	<i>Myotis yumanensis</i>	Native	Not listed
Beaded Lancetooth	<i>Ancotrema sportella</i>	Native	Not listed
Blue Dasher	<i>Pachydiplax longipennis</i>	Blue-list S3S4 (2015)	Not listed
Giant Sawfly Larva	<i>Tridchiosoma triangulum</i>	Native	Not listed
Pacific Bananaslug	<i>Ariolimax columbianus</i>	Native	Not listed
Pacific Sideband	<i>Monadenia fidelis</i>	Native	Not listed
Giant Water Bug**	<i>Lethocerus americanus</i>	Native	Not listed
	<i>Vertigo spp.</i>	Native	Not listed

* Bat detector deployed on Southwest side of marsh at 10U 375495 5483210 in July 2017 (refer to Appendix E for summary report).

**Caught in amphibian/minnow traps. Four traps were deployed at 375509 5483209 along downed wood in open water of marsh area (Maslovat *et al.* 2017).

***American Beaver (*Castor canadensis*) and North American River Otter (*Lontra canadensis*) were noted in the previous management plan and on public questionnaires. Beaver activity has been noted at the culvert where the trail crosses Boyle Creek (Bland 2018). Questionnaires also noted the presence of Turtles (possibly Painted), Marten, Shrew, Mouse, Alligator Lizard, Muskrat and Rat.



No information could be found on the type or history of fish presence in the marsh or its associated drainages. For anadromous fish to access the marsh, they would need to swim up Lower Morrison Creek which has a moderately steep gradient (20%) which would prove challenging for fish (Mimulus Biological Consultants 2012). The downstream sections of Boyle Creek (a.k.a. Upper Morrison Creek) have only small patches of small gravels which would provide poor spawning fish habitat (Mimulus Biological Consultants 2012). Further surveys are required to determine if landlocked fish, including Coastal Cutthroat Trout, are present.

Photo 12. Great Horned Owl in Douglas-fir Forest in Morrison Marsh Nature Reserve (Photo: Ren Ferguson)



One of the questionnaire respondents noted a perched culvert in a stream at the south end of the marsh which could potentially block fish passage. No fish were caught in minnow traps deployed in 2017 (Maslovat *et al.* 2017) (Photo 12).

The Reserve has moist forests which provide excellent habitat for salamanders and other amphibians (Photo 13).

Photo 13. Jenny Balke of the Denman Conservancy Association deploys a minnow trap to determine presence of fish and amphibian species in Morrison Marsh



Photo 14. Northwestern Salamander in Morrison Marsh Nature Reserve

3.13 Expected Change over Time

The composition of the marsh may change over time depending on beaver activity and weir management downstream and the associated fluctuating water levels. The small upland wetlands may shrink in size over time as the forests along the edges mature and soils build up over time or if the amount of moisture in the creeks changes with climate fluctuations.

The third growth forests in the upland portions of the Reserve are in good condition and will continue to mature and diversify over time.

4.0 Threats

The following threats were identified in previous versions of the management plan or noted during 2017 field surveys. The threat, status in 2005, current conditions and expected changes are described.

4.1 Invasive non-native species

Non-native invasive species are present throughout the Reserve. Their presence was noted in the 2005 baseline and although DCA has been working to manage them, invasive species are still a management concern.

Mature plants and seedlings of spurge-laurel (*Daphne laureola*) were present along the east side of the marsh and along the northern property line (Figure 2) (Photo 15). The DCA has pulled small seedlings and controlled larger, mature plants by either digging them out or cutting with pruning shears near ground level (Fyson 2011a; 2012). However, spurge-laurel persists in the northern section of the Reserve and should be considered a high priority for removal.



Photo 15. Evergreen Spurge-laurel with flowers in the northern portion of the Reserve

English holly (*Ilex aquifolium*) is ubiquitous on the property (Figure 2) (Photo 16). Plants varying in size from seedlings to trees over 8 m tall are found in all vegetation types, except within Morrison Marsh itself. Beavers have previously cut English holly along the marsh and DCA has cut a few large plants right at the edge of the shoreline (Balke 2006; Fyson 2014). Holly berries are spread by birds and the plants are difficult to control because they may re-sprout from cut stems and re-root from cut branches.

The DCA has been manually cutting holly for over 5 years. Cutting the larger trees at ground level and pulling the layered suckers up by their roots and stacking/composting in piles to decompose and create wildlife habitat has been successful (Laing pers. comm. 2018). Because of the distance and lack of vehicle access, it is unreasonable to remove vegetation for off-site composting.

Some of the holly in the Reserve has been cut approximately 0.5 m above ground level which is not an effective method of control. The cut stems were left in place in contact with the ground and may produce new roots. The trunks will produce new shoots and continue growing.



Photo 16. English holly cut above ground level and branches left on the ground in place

In the baseline report, Scotch Broom (*Cytisus scoparius*) was noted in two sites: on a skid road in the Bench complex, and on a rock outcrop, along the main trail west of Boyle Creek. The plants were cut prior to 2006 but some had re-sprouted (Balke 2006) and were removed again in 2011 and 2012 (Fyson 2011a; 2012). Scotch Broom produces persistent seed banks and ongoing monitoring and removal of new plants will be required. It is best cut while blooming (May and June) to limit re-sprouting of cut stems. No Scotch Broom was noted during 2017 monitoring.

Non-native grasses are present in the Reserve: Sweet Vernalgrass (*Anthoxanthum odoratum*) is dominant in the rock outcrops and Reed Canarygrass (*Phalaris arundinacea*) is dominant in most forested wetlands except for Grape Fern marsh. Reed Canarygrass also occurs along the edge of Morrison Marsh in some locations. An ornamental Aster sp., which was introduced to the north end of Grape Fern wetland has persisted.

Non-native forbs are found throughout the Reserve in disturbed areas and include Oxeye Daisy (*Leucanthemum vulgare*), Hairy Cat's-ear (*Hypochaeris radiata*), Canada Thistle (*Cirsium arvense*), Herb-robert (*Geranium robertianum*), Ribwort Plantain (*Plantago lanceolata*) and Common Tansy (*Tanacetum vulgare*) (Durand and Durand 2007). Most of these species will be shaded out as the forests mature.

There has been recent confirmation of one incidental American Bullfrog found in the north of Denman Island (DCA 2018). If Bullfrogs expand into Morrison Marsh, there would be a real threat to the native frogs including the Northern Red-legged Frog and Pacific Chorus Frog.

4.2 Trail Use and Erosion

Most of the trails in the Reserve are on old skid roads which are largely resilient to the current level of recreational use they receive.

There are some large wet areas, locally called “Froggy Ponds” along the trail near Greenhill Road (Photo 17). The trail has become wider as people look for dry footing in wet conditions and there is trail damage from bikes as they attempt to skirt the wet areas. Trail work is recommended to allow the trail to be passable in all seasons and limit widening.



Photo 17. “Froggy Ponds” area of the trail showing trail widening and bike tracks through the wet soil (location in Figure 3: Map of Trails and other features)

The trail that connects to Boyle Point Provincial Park, south of the Reserve, cuts through Grape Fern wetland (a.k.a. Boyle wetland) and has been an area of concern since the previous baseline report (Balke 2006). The trail floods during wet periods and an unofficial trail has been created to the northwest to avoid the wet area which trespasses over adjacent property. The DCA Lands Committee, with support from the ITC, recently created a new trail section close to the property line that skirts the marsh area which keeps the trail off privately managed property and away from the marsh. The old trail should be decommissioned or signed as closed.

There is still some limited use of the spur trail to the north. An infrequently used trail was noted that skirts the fence installed along the property line. It is advised that these trails be removed from the map at the entrance kiosk to discourage their use.

Infrequent horseback use was noted in the previous management plan (Durand and Durand 2007) but there is no evidence of recent horse use.

There was some interest from the public for additional trails to access the marsh along the

edge of the marsh or to access the property from Thomas Road. Trails next to the marsh will disturb waterfowl, cause increased habitat fragmentation, and may increase the spread/introduction of non-native invasive species. Further trail development next to the marsh is not recommended.

4.3 Disturbance of Waterfowl

Disturbance to waterfowl nesting and breeding was noted as a management concern in the previous management plan (Durand and Durand 2007). Hunting has occurred to the north of the property and may also occur within the Reserve (Durand and Durand 2007).

Canoeing and kayaking in the marsh was noted as a source of disturbance (Durand and Durand 2007). During the 2017 summer survey, there was very little open water within the Reserve portion of the marsh but canoeing or kayaking on the marsh outside of the Reserve will disturb waterfowl within the Reserve and may spread aquatic invasive species.

Although there are no hiking trails next to the marsh, people who hike off trail and off-leash dogs can access the wetland and may cause disturbance during sensitive times.

4.4 Water Quality and Quantity

Within Morrison Marsh, water levels fluctuate because of the weir installed at the outlet by Ducks Unlimited Canada and beaver dam activity (Durand and Durand 2007). Changes to water elevation will alter the plant composition of the marsh and affect use by wildlife.

A decrease in marsh water quality from nutrients or pathogens released by flooded septic systems associated with the rise in water levels from the weir and dam was listed as a concern in the previous management plan (Durand and Durand 2007). This concern was from a single resident that was unrelated to the weir installation and appears to be resolved (Marshall pers. comm. 2018). Further studies of water quality would be beneficial.

4.5 Mountain Bikes

Mountain bike tracks have been observed occasionally through the rock outcrops next to the trail. Prior to 2006, tire tracks and damage were noted on the rock outcrop near the trail where mosses and lichens were dislodged and damage to wetlands was also observed (Balke 2006). There was evidence that the bikes were accessing the Reserve from the parcel to the east which at the time was provincially managed and is now part of Boyle Point Provincial Park (Durand and Durand 2007).

Mountain bikes continue to be a problem: one of the questionnaire respondents said that was his primary use of the Reserve and bike tracks were observed in wet parts of the trail. Disturbance from mountain bikes can expose soils to non-native invasive species, alter hydrology and damage bryophytes which are slow growing and take many years to recover.

4.6 Cannabis Growing

Prior to 2006, evidence of planting was noticed in the isolated wetlands of the Reserve and along the edge of Morrison Marsh. It was assumed that the disturbance was from planting of cannabis plants. The sites had open patches of disturbed soil with introduced plants or large bucket-sized holes (Balke 2006). The bucket holes were damaging because they functioned as pit fall traps, trapping amphibians, invertebrates and possibly shrews which are exposed to predators or are trapped and die (Balke 2006). The holes have been filled in and there is no evidence of recent planting within the Reserve, though during a monitoring visit in 2016 some broken pots were removed from the western edge of the marsh (Bland 2018).

4.7 Wood and Salal Harvest

Prior to the 2007 management plan, local residents reported wood and salal harvest in the Reserve (Durand and Durand 2007). There is no recent evidence of recent wood or salal harvest in the Reserve.

4.8 Overgrazing

In the previous management plan damage to wetlands from grazing cattle was noted. The cattle accessed the wetlands in the northeastern corner of the Reserve from East Road (Durand and Durand 2007). Cattle are not kept on this property anymore and grazing has not been a concern since the neighbouring land use has changed.

Overgrazing by native Black-tailed Deer (*Odocoileus hemionus*) limits the diversity of the site and affects forest regeneration.

4.9 Risk of Wildfire

As with any forested area in the region, there is a risk of wildfire which may impact the upland forests, rocky outcrops and small wetlands throughout the Reserve. Fire suppression techniques including the use of fire retardants or salt water can also damage the habitat in the Reserve.

5.0 Stakeholder Consultation

5.1 Adjacent Land holders

Letters were sent to all adjacent land holders and neighbours (see Appendix H). A total of 9 letters were sent by mail on December 21, 2017 to residents on Greenhill Road, East Road, Pond Place, and Reginald Road. The letters contained information about Morrison Marsh Nature Reserve, a link to the 2007 management plan and a link to the online survey (see Appendix J).

In addition, P. Marshall was contacted by phone on February 28, 2018 to clarify questions related to the weir and beaver dam management on his property.

5.2 First Nations

Letters via email were sent to the following 13 First Nations on December 22, 2017 and can be found in Appendix I:

- Cowichan Tribes
- Halalt First Nation
- Homalco First Nation
- K'omoks First Nation
- Lake Cowichan First Nation
- Lyackson First Nation
- Penelakut Tribe
- Qualicum First Nation
- Snaw-naw-as (Nanoose) First Nation
- Stz'uminus (Chemainus) First Nation
- Tla'amin (Sliammon) First Nation
- We Wai Kai (Cape Mudge First Nation)
- Wei Wai Kum (Campbell River First Nation)

The letters asked how the Islands Trust Conservancy's management planning and actions for this protected areas on Denman Island can acknowledge and respect the cultural significance and traditional use of this area. The letters contained information on the Morrison Marsh Nature Reserve, a link to the 2007 Management Plan and a link to the online survey (see Appendix J). To date, there has been no response from any of the First Nations.

5.3 Conservation Partners and Community Members

A public open house and walk were held on Denman Island on January 27, 2018 to discuss management planning for the Reserve. Maps and photographs were on display at the open house and residents were asked for their input at that time. There were 12 people who signed the check in list for the open house though a few more were present. An online survey was completed by 15 people.

The previous management plan noted that during the public information session, community members expressed a desire for more comprehensive management planning for Morrison Marsh as a whole. Management of the entire marsh would require collaboration with Ducks Unlimited Canada, the Nanaimo Water District, the BC Ministry of Environment, and the Ministry of Forests, Lands, Natural Resource Operations and Rural Development. A more extensive management plan for the area has not been developed.

5.4 Consultation Results

An online survey was also made available to all Denman Island residents and respondents were primarily Denman Island residents with 20% having an off-island residence. Most respondents (80%) have visited the marsh a few times and most engage in hiking/walking (87%) and wildlife viewing (40%). The most important values were conservation for the intrinsic value of nature (80%), protection of habitat for species at risk (73%) and ecosystem services (60%), with recreational opportunities valued by only 20% of respondents.

6.0 Management Plan

6.1 Discussion

The purpose of the Morrison Marsh Nature Reserve is to protect, in perpetuity, the marsh, the wetlands, the rocky outcrops and the upland forests for the benefit of the flora and fauna of the Reserve, the residents of the island and the province generally. Ongoing monitoring and management is required to ensure the ecosystems and species continue to remain protected from threats and to ensure public safety during use of the Reserve. All management activities within the protected area must consider the specific sensitivities of the Species at Risk and their habitat on the property.

6.2 Management Roles

The ITC is the sole land holder of the Reserve but will rely on its partnership with DCA to assist with on the ground management. The DCA is also the covenant holder and is responsible for monitoring the property to ensure compliance with the conservation covenant.

6.3 Permitted and Prohibited Uses

The Reserve is open to the public for hiking and nature appreciation. Visitors are requested to keep dogs under control.

The following activities by the public are prohibited:

- Use of motorized vehicles
- Bicycling
- Canoeing or kayaking in the marsh
- Horseback riding
- Camping
- Fires
- Forestry
- Livestock grazing
- Hunting
- Smoking
- Trail development (outside of established trails)
- Tree cutting
- Collection of plants or animals

6.4 Public Access

There is a well-developed hiking trail from the cul-de-sac at the end of Greenhill Road that connects to hiking trails in Boyle Point Provincial Park on the south and east sides of the Reserve.

To the north, an adjacent private land holder has installed a wire fence with wooden posts to limit trespassing from Morrison Marsh Nature Reserve. The trail leading to the fence still appears to be used and a trail skirting the fence line appears to be used infrequently.

There are currently no trails next to the marsh and no new trails should be developed to limit disturbance to sensitive waterfowl. The trail through Grape Fern (aka Boyle) wetland has been re-routed to avoid the wetland and the old trail should be decommissioned or signed as closed to encourage use of the new trail.

6.5 Signage

There is a kiosk with signs and contact information for the DCA at the main entrance to the Reserve off Greenhill Road (Photo 18). There are signs at all main entrance points to Morrison Marsh Nature Reserve which outline prohibited activities and identify the Reserve as an ITC Reserve (map in Figure 3) (Photo 19). There is also a cautionary sign next to the steep cliffs for public safety (Photo 20). The signs appear in good condition.



Photo 18. Kiosk near trailhead off Greenhill Road

Future signage could include further public education on the sensitivity of marsh, waterfowl and wetland habitats which could be installed on the kiosk. Boundary signs could be installed at Greenhill Road (similar to existing signs along the northern property line). It may be useful to include contact information for the DCA and/or the ITC on all signs.



Photo 19. Signs showing prohibited activities and boundary of the Reserve



Photo 20. Caution Sign next to Steep Cliffs.

6.6 Trail Maintenance

There are low-maintenance hiking trails that lead from the cul-de-sac at Greenhill Road and connect to trails in Boyle Point Provincial Park to the south and east of the Reserve (map in Figure 3). The trails follow old logging roads which are, for the most part, in good condition. There are two culverts under the trail which require ongoing maintenance to remove debris when they become plugged. The culvert is regularly inspected by the DCA and the trail has not flooded in many years. A secondary skid road leading to the marsh which dead ends off the southern trail (referred to in Durand and Durand 2007 page 25) has been decommissioned and has grown over with vegetation.



Photo 21. Culvert under trail at Boyle Creek. Culvert is perched and currently blocked with wood.

The original trail from Greenhill Road trespassed over privately managed property (Durand and Durand 2007). The trail was re-routed so that it is now within the Reserve but the new trail passes through some large, wet areas (“Froggy Ponds”) near Greenhill Road that become impassable in wet conditions. The DCA directors and members of the DCA Lands Committee recently looked at the area and regular users of the Reserve have offered to help with trail work to make the trail passable in all weather.

The section of trail in the south of the Reserve through Boyle wetland (a.k.a. Grape Fern wetland) becomes impassable in the winter and an unauthorized trail had been built around the wetland on adjacent non-Reserve property. The official trail has been re-rerouted to avoid privately managed property and the wetland. The former trail should be decommissioned and signed as closed.

One small trail spur in the eastern portion of the Reserve leads to the top of a steep cliff face. This trail does not appear to receive much use since the trees have grown taller and the view has been obscured. The trail has been well signed to indicate the danger and no further work is required (photo 20).

Trails are monitored regularly by the DCA Land Manager and require ongoing maintenance. Tree blow down occurs regularly and volunteers or the DCA clear the trails. When blow down occurs, it is recommended that only the portion of the tree blocking the path be removed and the remainder of the wood left on site as woody debris. Vegetation ingrowth is also cleared along trails, as needed.

6.7 Protection Initiatives for Sensitive Ecosystems and Species at Risk

Maintaining the marsh and wetland areas should be sufficient to support the Little Brown Myotis (*Myotis lucifugus*), Townsend's Big-eared Bat (*Corynorhinus townsendii*), Blue Dasher (*Pachydiplax longipennis*), Northern Red-legged Frog (*Rana aurora*) and will also benefit three at risk bird species (Great Blue Heron, Common Nighthawk and Purple Martin) by providing foraging opportunities.

Further monitoring should be done for Western Screech-owl to determine if it can be found in either Morrison Marsh Nature Reserve or in Boyle Point Provincial Park. There are very few suitable nest cavities for this species which may improve over time as the forest matures and woodpeckers excavate more cavities. Installing nest boxes would help improve the habitat for this species.

Increasing the connectivity of protected areas, in particular wetlands would help ensure the persistence of sensitive ecosystems and Species at Risk. There are small wetlands along the southern boundary of the Reserve that straddle the property line that was created during the subdivision of the parent parcel. The new property holder should be encouraged to covenant the wetlands or a boundary adjustment could be investigated provided it does not compromise access off Greenhill Road. The wetlands are protected within the Development Permit Area.

Monitoring the water elevation and water quality of Morrison Marsh would help protect the rare ecosystem of the marsh and the species that depend on it.

6.8 Ecological Restoration Options

Although ecological restoration would be beneficial to the degraded wetlands in the interior of the Reserve, accessing the sites with heavy equipment would cause significant damage to the trails and adjacent upland forest. Less intensive techniques such as smothering the vegetation with cardboard and mulch could be tried to reduce the Reed Canarygrass (*Phalaris arundinacea*) and increase the diversity of native wetland plants.

6.9 Scientific Research/Education

Scientific research plays a critical role in understanding natural processes and shaping potential management options. All research in the Reserve should be approved by the ITC and should ensure there is no associated harm to Species at Risk and their habitat.

Ducks Unlimited Canada and the Ministry of Forests, Lands, Natural Resource Operations and Rural Development have been monitoring duck boxes, conducting waterfowl census and observing marsh flora and fauna in Morrison Marsh since 1985 when the weir was installed. The citizen science Christmas Bird Count has taken place within the Reserve since it was established.

As recommended in the previous management plan (Durand and Durand 2007), a floristic inventory of the marsh was conducted to search for potential rare plant species (Fyson 2011).

If funding is available, monitoring of water quality and water level in the marsh is recommended. Ongoing Species at Risk surveys for Western Screech-owl would be beneficial.

6.10 Exotic and Invasive Species Removal

There has been ongoing woody invasive species removal from the Reserve by the DCA (e.g. Fyson 2011a, 2012). These efforts have been effective at controlling the spread of Scotch broom and should be continued.

Spurge-laurel (*Daphne*) should be considered a high priority for removal. Small plants can be pulled and larger plants cut below the soil surface to limit re-sprouting. Spurge-laurel is in the early stages of infestation and will be most easily controlled if removed soon.

English holly is present in large numbers throughout the Reserve and eradication is unlikely. The DCA found that if cut branches are placed in small piles in open, sunny areas they do not regenerate (Fyson 2011a). A manual removal technique used for larger plants/trees is falling the plants/trees, removing and densely piling layers of branches, and weighing down the piles with cut lengths of the trunk. This method appears promising. However, Holly can also form new sprouts from underground stems and roots. Ongoing control efforts should continue with monitoring to determine if cut branches are re-rooting and cut trunks are re-sprouting. The amount of holly in the steep southwestern facing bluff directly above Boyle Creek has increased over time (Bland pers. comm. 2018).

New regeneration of Scotch broom should continue to be removed. If funding and time is available, invasive species removal efforts could focus on additional measures to control Reed Canarygrass.

6.11 Wildfire Planning

Wildfire and wildfire suppression can be extremely damaging to sensitive ecosystems. Developing a fire management plan in consultation with the Denman Island Volunteer Fire Department is recommended.

7.0 Action Items

Management Plan action items are measurable and achievable tasks that the ITC and partners can complete to ensure that the protected area is managed in the best possible way. The following management action items are based on 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. Continue to remove invasive, non-native species through cooperation between the DCA and the ITC and conduct regular monitoring to assess effectiveness of management.
2. Monitor re-routed trail that leads south to Boyle Point Provincial Park to ensure the former trail through the wetland is not being used. The former trail could be

decommissioned by piling woody debris on it or a barrier such as a split rail fence could be placed with interpretive information to limit use of the former trail.

3. Maintain kiosk, signs and trails (including culvert monitoring) and continue to remove garbage as necessary.
4. Install reserve boundary signs at Greenhill Road if deemed necessary.
5. Consider developing educational signage that describes the sensitivity of breeding waterfowl. Signage could be installed at the kiosk.
6. Ensure trail is closed to the north to avoid trespass onto neighbouring property and remove “seasonally closed” trails from map in kiosk. If trespassing continues, consider further restoration of the spur trail.
7. Consider an additional survey for Western Screech-owl to determine if they are present in the Reserve.
8. Prepare a wildfire management plan that considers both forest ecology and prevention of damage to surrounding neighbourhoods in consultation with the Denman Island Volunteer Fire Department and the BC Wildfire Service.

7.2 Short term Actions (3-5 years)

1. If Western Screech-owls are found on the property, install and monitor nest boxes in the Reserve. Consider installing boxes even if Screech-owls are not found since the lack of nest cavities may be the limiting factor.
2. Engage with the K’omoks First Nation as potential educators for residents to learn about ecological and bicultural history, traditional ethnobotanical use and ecological management.
3. Work with the DCA to develop a land holder contact program to contact land holders within 1 km of Morrison Marsh to:
 - a. Establish a volunteer warden program or Friends of Morrison Marsh group to support the DCA Land Manager to monitor the property and identify management concerns such as disturbance of wildlife, mountain biking, salal and wood harvest, maintenance needs and other issues that arise.
 - b. Encourage long-term conservation and protection of nearby properties within the watershed;
 - c. Provide information to land holders related to protecting water quality;
 - d. Provide information related to disturbance of waterfowl and other wildlife associated with dogs, canoeing/kayaking and other human impacts.
4. Remain in contact with other land holders adjacent to the marsh, Ducks Unlimited Canada and the Nanaimo Water District to influence management of the water levels in the marsh, including weir management and removal of beaver dams downstream of the Reserve. Keep informed of any water quality and water level monitoring programs in the area.
5. Keep informed of any studies completed to determine which fish species are found in the marsh. If fish are found to be present at any time, evaluate perched culvert south of marsh and consider replacement with a foot bridge to allow fish passage.
6. If resources permit, survey for other Species at Risk over a range of seasons to more fully document the biodiversity of the Reserve.

7.3 Long term Actions (5+ years)

1. Develop strategies to control non-woody invasive plants, in particular Reed Canarygrass.
2. Continue to work with the DCA and any land holders of adjacent land who would like to achieve protection mechanisms (such as covenants) to create a buffer zone on neighbouring properties to protect the quality and quantity of water flowing to the Reserve and increase connectivity of protected areas.

7.4 Ongoing or Annual Action Items

1. Conduct annual monitoring to monitor covenant compliance and identify and address management concerns.
2. Continue ongoing invasive species removal and management. Monitor effectiveness of management and monitor to identify new locations of invasive species that can be targeted for removal.
3. Conduct annual trail monitoring to evaluate erosion and impacts to adjacent areas.
4. Conduct ongoing maintenance of kiosk, signs and trails and continue to remove garbage as required.
5. Continue to work with the DCA and perhaps a Friends of Morrison Marsh group to identify any concerns on the Reserve on an ongoing basis.
6. Continue to inform the general public of the natural values of the site and the permitted and prohibited uses through information placed in local publications from time to time by the DCA.

8.0 Conclusion

Morrison Marsh Nature Reserve provides important habitat for seven confirmed rare species and a range of other native species.

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

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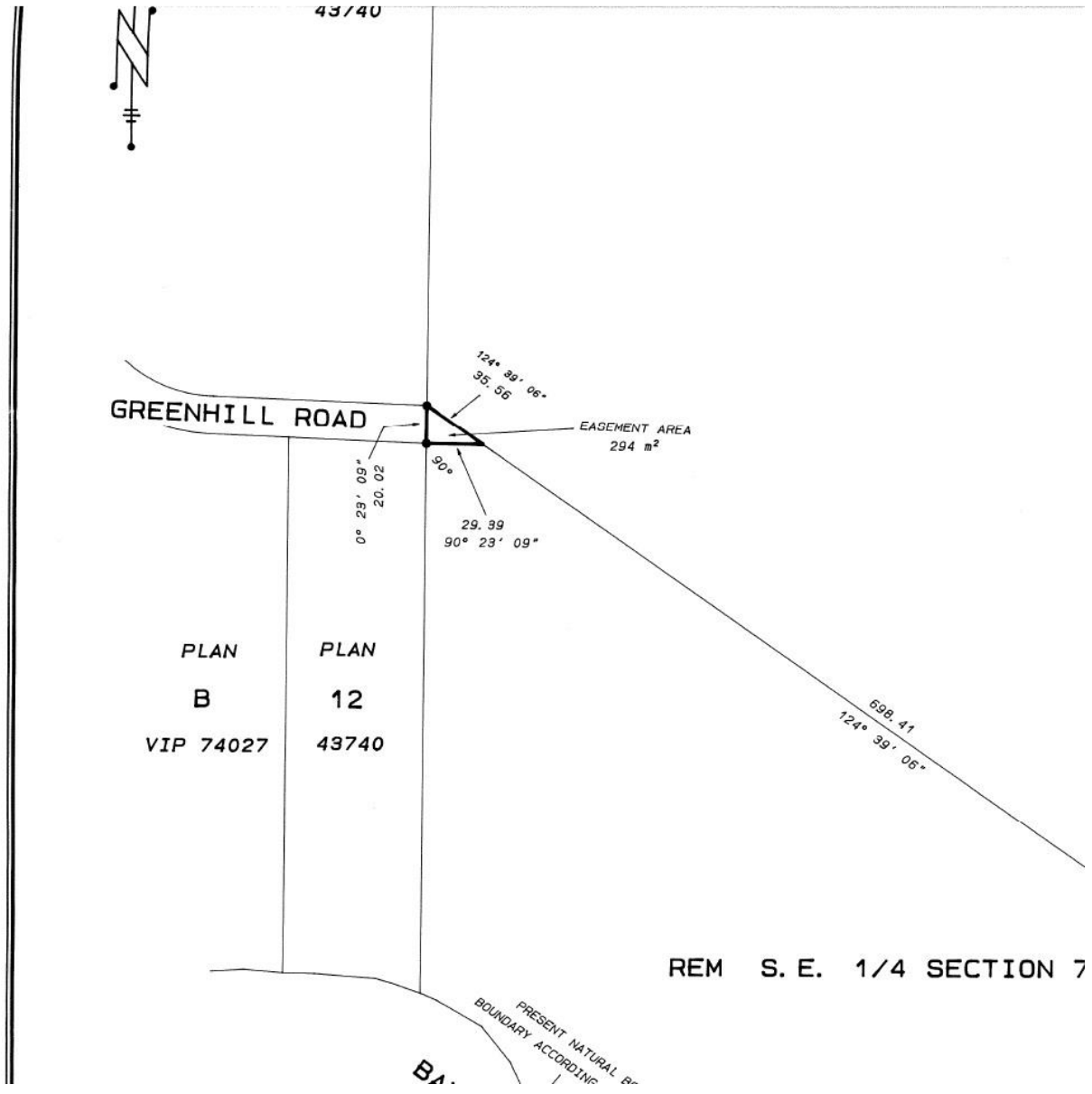
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10.0 Appendices

Appendix A. Legal Easement for Access off Greenhill Road



ANNEXED EASEMENT FA134146 OVER THE SOUTH EAST 1/4, SECTION 7
DENMAN ISLAND, NANAIMO DISTRICT EXCEPT PLAN VIP80177 AS SHOWN ON
PLAN VIP82101

Appendix B. Ecological Community Descriptions

Ecological Community 1. 80% Douglas-fir/ Dull Oregon-grape: 20% Red Alder/Sword Fern

Ecological Community 1 is dominated by a Douglas-fir – Dull Oregon-grape ecological community, which on this site corresponds to the Douglas-fir/ Salal site series (CDFmm01) described by Green and Klinka (1994). Most of the site is poor due to shallow soils and prominent bedrock (Balke 2006).

The dominant tree species is Douglas-fir (*Pseudotsuga menziesii*) primarily in the age class pole/sapling. This ecological community encompasses most of the Reserve. There is relatively thick canopy closure with a moderately well-developed shrub layer. In flatter areas and on the lower slopes, there is a secondary canopy of Western Redcedar (*Thuja plicata*), Western Hemlock (*Tsuga heterophylla*) and Grand Fir (*Abies grandis*). In wetter areas at the bottom of depressions and areas with higher moisture, there are pockets of Red alder (*Alnus rubra*) with an understory of Sword Fern.

Dominant shrub species include Salal (*Gaultheria shallon*) and Dull Oregon-grape (*Berberis nervosa*). In the drier areas, there is more Oceanspray (*Holodiscus discolor*) and in the wetter areas, the understory has more Sword Fern (*Polystichum munitum*). The invasive non-native shrub English holly (*Ilex aquifolium*) is found throughout the Reserve and is found in higher densities to the east and north of the marsh.

There are small pockets of different ecological communities within the Douglas-fir – Dull Oregon-grape. There is a small patch of Douglas-fir – Oniongrass measuring approximately 50 m x 20 m along the trail in the northern portion of the Reserve, which because of its small size was not listed as a separate community. There is a small steep (>30 degree) southwestern facing bluff in the eastern part of the property above Boyle Creek. There are also patches of Evergreen Huckleberry (*Vaccinium ovatum*).

The forest was logged in 1979 by Weldwood of Canada and replanted in 1980, resulting in a young, even aged stand with stumps and old logging roads throughout. The ecological communities will mature into different ecosystem types associated with differences in soil depth and moisture. Trees are subject to considerable windthrow / blowdown from the prevailing southeast winds off the ocean (Balke 2006).

At the point the plot was taken, the slope was gradual (5%) with an east aspect. The slope within this ecological community varies considerably throughout the property: in the southwestern portion the slopes are moderate (15 degrees) and ranges from nearly flat to 75%. The aspect is either northeast or southwest sloping down toward Morrison Marsh.

FLORA

Main Canopy Species & percent cover Age (estimated) Height DBH	40% Douglas-fir (<i>Pseudotsuga menziesii</i>), 10% Red Alder (<i>Alnus rubra</i>) Young, third growth 20-40 years 15-20 m 20-40 cm
Secondary Canopy Species & percent cover Age (estimated) Height DBH	2% Western Redcedar (<i>Thuja plicata</i>), 1% Grand Fir (<i>Abies grandis</i>) 5-20 yrs 3-12 m 5-15 cm
Total Canopy Cover	50%
Understory (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	40% Salal (<i>Gaultheria shallon</i>), 10% Sword fern (<i>Polystichum munitum</i>), 2% Dull Oregon-grape (<i>Berberis nervosa</i>), <1% Cleavers (<i>Galium aparine</i>), <1% California Blackberry (<i>Rubus ursinus</i>), <1% Slough Sedge (<i>Carex obnupta</i>), <1% Vanilla-leaf (<i>Achyls triphylla</i>), <1% Brome (<i>Bromus</i> sp.), <1% *English holly (<i>Ilex aquifolium</i>), <1% Starwort (<i>Stellaria</i> sp.), <1% Little Buttercup (<i>Ranunculus uncinatus</i>), <1% Dewey's Sedge (<i>Carex deweyana</i>), <1% Deer Fern (<i>Blechnum spicant</i>), <1% Red Huckleberry (<i>Vaccinium parvifolium</i>), <1% Alaska Oniongrass (<i>Melica subulata</i>) 20% Mosses include: Oregon Beaked-moss (<i>Eurhynchium oregonum</i>)
Observed rare/threatened species & locally uncommon species	None observed
Special Features	Large parcel of forested area provides an excellent buffer area for the marsh.
Expected Changes	Over time, the stand will self-thin and become more diverse as gaps open and the site becomes more diverse vertically. The understory will continue to develop although this will be limited by high levels of deer browse. Trees may be subject to windthrow/blowdown from prevailing southeast winds off the ocean (Balke 2006).
Disturbance History	Site was logged in 1979 and re-planted with Douglas-fir in 1980 (Balke 2006). The old logging roads form the trail network through the Reserve.

* Indicates non-native species

FAUNA

Wildlife Habitat / Features	<p>As forest matures, cavity nests and suitable perching sites will develop.</p> <p>Southwest facing slopes may provide habitat for snakes & lizards.</p> <p>Many berry producing plants available including Salal and Evergreen Huckleberry.</p> <p>Forest provides important upland overwintering habitat for Northern Red-legged Frog, providing connectivity with breeding wetland habitat.</p>
Observed Species	<p>BIRDS- Refer to bird list for the entire Reserve in Appendix D.</p> <p>MAMMALS</p> <p>Black-tailed Deer (<i>Odocoileus hemionus</i>) (scat)</p> <p>American Mink (<i>Vison vison</i>)</p> <p>Red Squirrel (<i>Tamiasciurus hudsonicus</i>)</p> <p>*European Wall Lizard (<i>Podarcis muralis</i>)</p> <p>INVERTEBRATES</p> <p>Pacific Bananaslug (<i>Ariolimax columbianus</i>)</p>
Rare/threatened species & locally uncommon species	<p>Northern Red-legged Frog (<i>Rana aurora</i>)</p>

* Indicates non-native species

Ecological Community 2. Unclassified Marsh

The southern 1/3 of Morrison Marsh is within the Reserve. Moisture from the rest of the property drains into the marsh and in the northern portion of the marsh there is standing water throughout the year. The emergent vegetation is dominated by sedges and forbs with scattered shrubs growing out of the tussocks. The non-native, invasive Reed Canarygrass (*Phalaris arundinacea*) is present.

The classification of the marsh is challenging. In the baseline, the northern portion was classified as open water and the southern portion was classed as fen (Balke 2006). According to McKenzie and Moran (2004), only sites with <10% emergent vegetation are described as unclassified aquatic ecosystems. The presence of peat moss and organic soils suggests the community should be classified as a fen. Further classification was not possible because the vegetation present did not match the edatopic grids in the guide. It is possible that the vegetation is still adapting to the change in water level associated with the weir.

The water level in the marsh is regulated by a variable crest weir installed in 1985. Water in the marsh is held at an average depth of 0.8 m and after the installation of the weir, there have been significant changes in vegetation including a large die off of Hardhack (Balke 2006). The water level may be slightly higher due to the beaver dam downstream of the weir.

The standing water supports aquatic insect populations which in turn support avian and mammal insectivores (McKenzie and Moran 2004). The marsh is important habitat for waterfowl and the eight species of bats which were recorded. The baseline also notes 65% open water (Balke 2006) but the amount of open water observed in 2017 was much less.

Marshes are the most heavily used wetland type for most wildlife species because they support palatable vegetation, plankton and aquatic invertebrates that support larger animals. They are a focal point for terrestrial animals as a source of drinking water, structural diversity and cover, forage, high prey densities, and unique habitat (McKenzie and Moran 2004).

FLORA

Total Canopy Cover	0%
Understory (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	15% Slough Sedge (<i>Carex obnupta</i>), 4% Common Bladderwort (<i>Utricularia vulgaris</i> ssp. <i>macrorhiza</i>), 3% Tufted Loosestrife (<i>Lysimachia thysiflora</i>), 2% Hardhack (<i>Spirea douglasii</i>), Northern Water Horehound (<i>Lycopus uniflorus</i>), 1% European Bur-reed (<i>Sparganium emersum</i>), 1% Common Rush (<i>Juncus effusus</i>), <1% Rocky Mountain Pond-lily (<i>Nuphar polysepala</i>), <1% Bay Forget-me-not (<i>Myosotis laxa</i>), <1% Bog St. John's Wort (<i>Hypericum anagalloides</i>), <1% Common Duckweed (<i>Lemna minor</i>), <1% Western Inflated Sedge (<i>Carex exsicatta</i>), <1% Star Sedge (<i>Carex echinata</i>), <1% Beaked Sedge (<i>Carex</i>

	<p><i>utriculata</i>), <1% Small Bedstraw (<i>Galium trifidum</i>), <1% *Reed Canarygrass (<i>Phalaris arundinacea</i>)</p> <p>On mounds within the marsh: <1% Red Huckleberry (<i>Vaccinium parvifolium</i>), <1% Hardhack (<i>Spirea douglasii</i>), <1%, Salal (<i>Gaultheria shallon</i>), <1% Deer Fern (<i>Blechnum spicant</i>), <1% Marsh Skullcap (<i>Skutellaria galericulata</i>) <1% Purple Marshlocks (<i>Comarum palustre</i>)</p> <p>Moss: <i>Sphagnum</i> sp. Open water: 25-30% but highly variable depending on location.</p>
Observed rare/threatened species & locally uncommon species	None observed
Special Features	Diverse wetland which is rich in plant and animal life.
Expected Changes	Previous reports (baseline/management plan) described dense Hardhack (<i>Spirea douglasii</i>) growth which was no longer present by 2006. There is currently very little Hardhack (2%) and what does occur is restricted to higher mounds. Change in vegetation structure may be due to changes in water level associated with the weir downstream. Vegetation composition may continue to change over time. Beaver activity downstream may influence water levels and thereby marsh vegetation.
Disturbance History	Water levels changed with construction of Ducks Unlimited Canada weir in 1985 and marsh vegetation has changed dramatically since that time.

* Indicates non-native species

FAUNA

Wildlife Habitat / Features	Open water with submerged palatable vegetation provides rich habitat for birds, fish, reptiles, amphibians and mammals. Winter open water is important for overwintering waterfowl.
Observed Species	<p>BIRDS (next to or over marsh) Refer to Appendix D for a complete list of birds observed in the Reserve.</p> <p>Bald Eagle (<i>Haliaeetus leucocephalus</i>) Common Raven (<i>Corvus corax</i>) Pileated Woodpecker (<i>Dryocopus pileatus</i>) Turkey Vulture (<i>Cathartes aura</i>)</p> <p>REPTILES/AMPHIBIANS</p> <p>Northwestern Gartersnake (<i>Thamnophis ordinoides</i>) (swimming in marsh)</p>

	Rough-skinned Newt (<i>Taricha granulosa</i>) MAMMALS Black-tailed Deer (<i>Odocoileus hemionus</i>) INVERTEBRATES Giant Water Bug (<i>Lethocerus americanus</i>)
Rare/threatened species & locally uncommon species	Great Blue Heron (<i>Ardea herodias fannini</i>) observed flying overhead Purple Martin (<i>Progne subis</i>) Northern Red-legged Frog (<i>Rana aurora</i>) Little Brown Myotis (<i>Myotis lucifugus</i>)

* Indicates non-native species

Ecological Community 3. Beaked Sedge/Water Sedge (*Carex utriculata*/*Carex aquatilis*)

This ecological community is found at southern end of Morrison Marsh and is dominated by a dense cover of sedges, primarily Beaked Sedge (*Carex utriculata*) and Slough Sedge (*Carex obnupta*). There are a small number of forbs including Water Parsley (*Oenanthe sarmentosa*) and Skunk Cabbage (*Lysichiton americanus*). There are several stunted Sitka Spruce trees in the middle of the marsh and there are Western Redcedar, Western Hemlock and Red Alder in the transitional areas to riparian forests. There is no standing water during the dry season.

According to McKenzie and Moran, this ecological community is classified as a Beaked Sedge/Water Sedge marsh (*Carex utriculata*/*Carex aquatilis*) but the BC CDC does not include this community in the CDFmm. These communities are characterized by low energy floodwaters with some late season drawdown. They provide important habitat for wildlife.

FLORA

Main Canopy Species & percent cover	3% Sitka Spruce (<i>Picea sitchensis</i>)
Age (estimated)	10-30 yrs
Height	7-12 m
DBH	7-30 cm
Total Canopy Cover	3%
Understory (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	80% Beaked Sedge (<i>Carex utriculata</i>) + Slough Sedge (<i>Carex obnupta</i>), 5% Skunkcabbage (<i>Lysichiton americanus</i>), 5% Water Parsley (<i>Oenanthe sarmentosa</i>), 3% Bay Forget-me-not (<i>Myosotis laxa</i>), 2% *Reed Canarygrass (<i>Phalaris arundinacea</i>), 1% Twinberry Honeysuckle (<i>Lonicera involucrata</i>), <1% Marsh Skullcap (<i>Skutellaria galericulata</i>), <1% Ladyfern (<i>Athyrium filix-femina</i>), <1% Common Rush (<i>Juncus effusus</i>), <1% Small Bedstraw (<i>Galium trifidum</i>), <1% Hairy Willowherb (<i>Epilobium ciliatum</i>)

Observed rare/threatened species & locally uncommon species	Sitka Spruce (<i>Picea sitchensis</i>) is uncommon on Denman Island and the Gulf Islands.
Special Features	Open wetland dominated by sedges with diverse forbs. No standing water. Very little Reed Canarygrass present.
Expected Changes	The baseline report prepared in 2006 noted 5% Hardhack (<i>Spirea douglasii</i>) in this area and currently none was observed. Beaver activity downstream may influence water levels and thereby marsh vegetation.
Disturbance History	Water levels changed with construction of Ducks Unlimited Canada weir in 1985 and marsh vegetation has changed dramatically since that time. The baseline report notes the shoreline of the marsh was recently used to grow a crop and bare bucket shaped holes were observed. No evidence of this was observed in 2017.

* Indicates non-native species

FAUNA

Wildlife Habitat / Features	Open sedge wetland provides good foraging for aerial insectivorous birds and bats.
Observed Species	Virginia Rail (<i>Rallus limicola</i>) Mink (<i>Vison vison</i>)
Rare/threatened species & locally uncommon species	None observed

Ecological community 4. Red Alder/Slough Sedge (*Alnus rubra*/*Carex obnupta*)

This small wetland, locally known as Grape Fern Marsh or Boyle Marsh, is found along the southern boundary of the Reserve and extends into Boyle Point Provincial Park. This is the only small wetland in the upland portions of the Reserve that is not dominated by the invasive Reed Canarygrass. The wetland is open, with little tree cover and is found at the bottom of the slope. The vegetation is dominated by Slough Sedge with a mix of forbs and ferns including Grape Fern (*Botrychium multifidum*).

Trees surrounding the wetland at the edges include Sitka Spruce (*Picea sitchensis*), Douglas-fir (*Pseudotsuga menziesii*), and Western Hemlock (*Tsuga heterophylla*). There is a dead Grand Fir (*Abies grandis*) in the middle of the wetland and the wetland has Red Alder (*Alnus rubra*) at its margins and in the middle of the wetland.

The main trail to Boyle Point Provincial Park leads through the center of the wetland although the trail becomes impassible due to flooding during the wet season. This trail should be re-routed.

FLORA

Main Canopy Species & percent cover	5% Red Alder (<i>Alnus rubra</i>)
Age (estimated)	40-60 yrs
Height	15 m
DBH	30 cm
Total Canopy Cover	5%
Understory (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	90% Slough Sedge (<i>Carex obnupta</i>), 7% Marsh Skullcap (<i>Skutellaria galericulata</i>), <1% Ladyfern (<i>Athyrium filix-femina</i>), <1% *Sweet Vernalgrass (<i>Anthoxanthum odoratum</i>), <1% California Blackberry (<i>Rubus ursinus</i>), <1% Violet (<i>Viola</i> sp.), <1% Common Horsetail (<i>Equisetum arvense</i>), <1% Starwort (<i>Stellaria</i> sp.), <1% Cleavers (<i>Galium</i> sp.), <1% Leathery Grape Fern (<i>Botrychium multifidum</i>), <1% *Hairy Cat's-ear (<i>Hypochaeris radicata</i>), <1% Red Alder seedlings (<i>Alnus rubra</i>), <1% California Oatgrass (<i>Danthonia californica</i>), <1% Sitka Spruce seedlings (<i>Picea sitchensis</i>) Mosses include : <i>Dicranum</i> sp.
Observed rare/threatened species & locally uncommon species	Leathery Grape Fern (<i>Botrychium multifidum</i>)
Special Features	Small pocket wetland dominated by native sedges, forbs

	and ferns
Expected Changes	The wetland is currently free from Reed Canarygrass. With the disturbance of building the boardwalk through the path, it is possible although unlikely this invasive grass may expand into this wetland.
Disturbance History	Surrounding forest was logged in 1979 and re-planted in 1980. There is a well-used hiking trail that bisects the wetland. During the winter months, the trail is very wet and hikers were trespassing onto privately managed land on a side trail. The DCA in coordination with ITC has created a new section of trail to avoid the wetland.

* Indicates non-native species

FAUNA

Wildlife Habitat / Features	Open sedge wetland provides good foraging for aerial insectivores and other birds.
Observed Species	<p>BIRDS</p> <p>Spotted Towhee (<i>Pipilo maculatus</i>)</p> <p>Turkey Vulture (overhead) (<i>Cathartes aura</i>)</p> <p>Pacific-slope Flycatcher</p> <p>Purple Finch</p> <p>MAMMALS</p> <p>Red Squirrel (<i>Tamiasciurus hudsonicus</i>) (heard at edge)</p> <p>REPTILES</p> <p>Common Gartersnake (<i>Thamnophis sirtalis</i>)</p>
Rare/threatened species & locally uncommon species	None observed

Ecological Community 5. Disclimax Wetland

There are several small wetlands throughout the Reserve which were referred to in the baseline as “Circle, Curve, Bench, Aspen and Gate”. All of these sites have a strongly fluctuating water table with soils that are fully saturated in the winter with a lowered water table drops during the growing season.

The least disturbed wetland is Aspen wetland which is found in the northeast corner of the Reserve. The fauna table and photo of the ecological community was described from a drier portion of Aspen wetland. The plant community is dominated by the non-native Reed Canarygrass (*Phalaris arundinacea*) but there are pockets of Salal on higher mounds. Trees are sparse but there is a small stand of Trembling Aspen in this wetland only. In wetter portions of the wetland there is Musk Monkeyflower (*Mimulus moschatus*), Field Mint (*Mentha arvensis*) and other wetland species. The edges of the wetland have thick growth of Hardhack (*Spirea douglasii*), Douglas-fir (*Pseudotsuga menziesii*) and Western Redcedar (*Thuja plicata*).

There is only one Ecological Community listed by the BC CDC which includes Trembling Aspen: Trembling Aspen/Pacific Crab Apple/Slough Sedge (CDFmm00) which is red-listed and ranked S1S2 (BC CDC 2017). Green and Klinka (1994), classify this site series as a special site with a strongly fluctuating water table that aligns most closely with C2- Black Twinberry (summer moist/winter wet) although none of the characteristic species are present because of previous disturbance. The Aspen wetland may develop into either of these communities over time: however, without restoration the presence of Reed Canarygrass will inhibit the establishment of native species. Reed Canarygrass represents a disclimax community that establishes in cleared swamps or low-bench sites (McKenzie and Moran 2004).

FLORA

Main Canopy Species & percent cover	30% Trembling Aspen (<i>Populus tremuloides</i>) 1% Red Alder (<i>Alnus rubra</i>) 1% Western Redcedar (<i>Thuja plicata</i>) 2% Douglas-fir (<i>Pseudotsuga menziesii</i>)
Age (estimated)	Uneven-aged, 10-40 yrs
Height	10-15 m
DBH	10-40 cm
Total Canopy Cover	25%
Understory (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	40% *Reed Canarygrass (<i>Phalaris arundinacea</i>) 50%, Salal (<i>Gaultheria shallon</i>), 4% Red Huckleberry (<i>Vaccinium parvifolium</i>), 1% Slough Sedge (<i>Carex obnupta</i>)
Observed rare/threatened species & locally uncommon species	None observed
Special Features	Fungal growth on Aspen
Expected Changes	Western Redcedar plants are yellowing and

	chlorotic and may not survive long-term. The Trembling Aspen have fungal growths on many of the trees and it is unclear if this will harm their growth and survival. Reed Canarygrass will continue to expand into any habitat suitable for this species. Hydrology of site may be changing because of infilling with Reed Canarygrass and build up over time of organic material. This may lead to infilling by tree species.
Disturbance History	Surrounding forest was logged in 1979 and replanted in 1980. The wetlands were likely damaged by the logging and resulted in the invasion of Reed Canarygrass. The baseline suggests that several of these wetlands were used to grow domestic crops (Balke 2006) although it is unclear if this is the case (Balke 2017).

* Indicates non-native species

FAUNA

Wildlife Habitat / Features	Wetlands are important aquatic breeding habitat for amphibians and invertebrates. Avian species also select breeding sites near water and the open areas provide important habitat for aerial insectivores.
Observed Species	MAMMALS Black-tailed Deer (<i>Odocoileus hemionus</i>) (deer scat)
Rare/threatened species & locally uncommon species	None observed

Ecological Community 6: Rock Outcrop (Herbaceous Terrestrial)

There are small open rocky outcrops towards the northeastern portion of the Reserve at the crest of the slope where bedrock is close to the surface. The community is dominated by mosses, lichens and non-native grasses. There are a few patches of Douglas-fir, Dull Oregon-grape and Salal in small patches where the soil is deeper. There is a small vernal pool which holds water for much of the year.

The rock outcrops are primarily on northeastern facing slopes that range from 0-5% with a western aspect. The slope position is top of slope. There is a small amount (1%) of scattered woody debris.

An old logging road passes through the middle of the rock outcrops and there has been ongoing disturbance caused by mountain bikes. The open areas are good habitat for reptiles and Common Nighthawk may be attracted to nesting here although disturbance by trail users would be a deterrent.

FLORA

Main Canopy Species & percent cover	2% Douglas-fir (<i>Pseudotsuga menziesii</i>) (Primarily at edges of rock outcrop with a few small stunted trees in the centre of the ecological community- description below refers to Douglas-fir in the middle of the ecological community)
Age (estimated)	15-25 years
Height	10m
DBH	8-15cm
Total Canopy Cover	0%
Understory (species & percent cover) Shrubs, including trees <10 m Herbs, ferns, grasses, mosses, etc.	30% *Sweet Vernalgrass (<i>Anthoxanthum odoratum</i>), 5% California Oatgrass (<i>Danthonia californica</i>), 3% Dull Oregon-grape, 3% *Hairy Cat’s-ear (<i>Hypochaeris radicata</i>), 1% *Sheep Sorrel (<i>Rumex acetosella</i>), 1% Salal (<i>Gaultheria shallon</i>), <1% Small-flowered Blue-eyed Mary (<i>Collinsia parviflora</i>), <1% *Early Hairgrass (<i>Aira praecox</i>), <1% California Blackberry (<i>Rubus ursinus</i>), <1% Willowherb (<i>Epilobium</i> sp.), <1% Fescue (<i>Festuca</i> sp.), <1% Bentgrass (<i>Agrostis</i> sp.), <1% Marsh Cudweed (<i>Gnaphalium palustre</i>), <1% Toad Rush (<i>Juncus bufonius</i>), <1% Sedge (<i>Carex</i> sp.), <1% Douglas-fir seedlings
Observed rare/threatened species & locally uncommon species	None observed

Special Features	Pocket grassland/rock outcrop
Expected Changes	Recruitment of wildflowers common on similar sites on Denman Island is unlikely due to high deer browse pressure and the high level of invasive grasses (i.e. Sweet Vernalgrass) already established. Over the long-term, the soil will gradually deepen which may allow recruitment of tree species.
Disturbance History	Surrounding forest was logged in 1979 and re-planted in 1980. Dirt bike/mountain bike trails have been observed through the vernal pool and rock outcrops (Balke pers. comm. 2017).

* Indicates non-native species

FAUNA

Wildlife Habitat / Features	Open grassy rock outcrops provide food for aerial insectivores. May provide nesting site for Common Nighthawk.
Observed Species	BIRDS Dark-eyed Junco (<i>Junco hyemalis</i>) (feather) MAMMALS Black-tailed Deer (<i>Odocoileus hemionus</i>) (deer scat)
Rare/threatened species & locally uncommon species	None observed

Appendix C. Plant Species Observed in Morrison Marsh, July 2017

The following species were observed during surveys in July 2017 by Carrina Maslovat. Additional species noted in a plant inventory of the marsh are included (Fyson 2011b) with the notation “+”.

Latin Name	Common Name	Status
<i>Abies grandis</i> (Douglas ex D. Don) Lindl.	Grand Fir	
<i>Acer macrophyllum</i> Pursh	Bigleaf Maple	
<i>Achlys triphylla</i> (Sm.) DC.	Vanilla-leaf	
<i>Agrostis stolonifera</i> L.	Bentgrass	Introduced
<i>Aira praecox</i> L.	Early Hairgrass	Introduced
<i>Alnus rubra</i> Bong.	Red Alder	
<i>Anthoxanthum odoratum</i> L.	Sweet Vernalgrass	Introduced
<i>Arbutus menziesii</i> Pursh	Arbutus	
<i>Aster</i> sp.	Aster	Introduced
<i>Athyrium filix-femina</i> (L.) Roth	Ladyfern	
<i>Berberis nervosa</i> Pursh	Dull Oregon-grape	
<i>Blechnum spicant</i> (L.) Sm.	Deer Fern	
<i>Botrychium multifidum</i> (S.G. Gmel.) Rupr.	Leathery Grape Fern	
<i>Brasenia schreberi</i> J. F. Gmel.	Schreber's Watershield	
<i>Bromus vulgaris</i> (Hook.) Shear	Columbia Brome	
<i>Cardamine</i> sp. L.	Bittercress	
+ <i>Carex cusickii</i>	Cusick's Sedge	
<i>Carex deweyana</i> Schwein.	Dewey's Sedge	
<i>Carex echinata</i> Murray	Star Sedge	
<i>Carex exsuccata</i> L. H. Bailey	Western Inflated Sedge	
+ <i>Carex lasiocarpa</i>	Slender Sedge	
+ <i>Carex leptalea</i>	Bristle-stalked Sedge	
<i>Carex obnupta</i> L. H. Bailey	Slough Sedge	
+ <i>Carex sitchensis</i>	Sitka Sedge	
+ <i>Carex viridula</i>	Green Sedge	
<i>Carex utriculata</i> Boott	Beaked Sedge	
<i>Chimaphila umbellata</i> (L.) W.P.C. Barton	Pipsissewa	
<i>Cirsium arvense</i> (L.) Scop.	Canada Thistle	Introduced
+ <i>Cirsium brevistylum</i>	Short-styled Thistle	
<i>Cirsium vulgare</i> (Savi) Ten.	Bull Thistle	Introduced
<i>Claytonia sibirica</i>	Siberian Miner's-lettuce	
<i>Collinsia parviflora</i> Lindl.	Small-flower Blue-eyed Mary	
<i>Comarum palustre</i> L.	Purple Marshlocks	
<i>Corallorhiza maculata</i> var. <i>maculata</i> (Raf.) Raf.	Western Coralroot	
<i>Cornus nuttallii</i> Audubon	Pacific Dogwood	
<i>Dactylis glomerata</i> L.	Orchardgrass	Introduced

<i>Danthonia californica</i> Bol.	California Oatgrass	
<i>Dryopteris expansa</i> (C. Presl) Fraser-Jenk. & Jermy	Spiny Woodfern	
<i>Elymus glaucus</i> Buckley	Blue Wildrye	
+ <i>Epilobium angustifolium</i>	Fireweed	
<i>Epilobium ciliatum</i> Raf.	Hairy Willowherb	
+ <i>Epilobium minutum</i>	Small-flowered Willowherb	
<i>Equisetum arvense</i> L.	Common Horsetail	
+ <i>Equisetum telmateia</i>	Giant Horsetail	
<i>Eurhynchium oreganum</i> (Sull.) Jaeg.	Oregon Beaked-moss	
<i>Festuca occidentalis</i> Hook.	Western Fescue	
<i>Festuca (idahoensis?)</i> Elmer	Idaho Fescue	
<i>Frangula purshiana</i> (DC.) A. Gray (<i>Rhamnus purshiana</i> DC.)	Cascara	
<i>Galium aparine</i> L.	Cleavers	
<i>Galium trifidum</i> L.	Small Bedstraw	
+ <i>Galium triflorum</i>	Sweet-scented Bedstraw	
<i>Gaultheria shallon</i> Pursh	Salal	
<i>Geranium robertianum</i> L.	Herb-robert	
<i>Geum macrophyllum</i> Willd.	Large-leaved Avens	
<i>Goodyera oblongifolia</i> Raf.	Rattlesnake Plantain	
<i>Gnaphalium palustre</i> Nutt.	Marsh Cudweed	
<i>Holcus lanatus</i> L.	Velvetgrass	Introduced
<i>Holodiscus discolor</i> (Pursh) Maxim.	Oceanspray	
<i>Hylocomium splendens</i> (Hedw.) Schimp in B.S.G.	Step Moss	
<i>Hypericum anagalloides</i> Cham. & Scgktdk,	Bog St. John's Wort	
<i>Hypochaeris radicata</i> L.	Hairy Cat's-ear	Introduced
<i>Ilex aquifolium</i> L.	English holly	Introduced
+ <i>Juncus articulatus</i>	Jointed Rush	
<i>Juncus bufonius</i> L.	Toad Rush	
<i>Juncus effusus</i> L.	Common Rush	
+ <i>Juncus ensifolius</i>	Dagger-leaf Rush	
<i>Lemna minor</i> L.	Common Duckweed	
<i>Leucanthemum vulgare</i> Lam.	Oxeye Daisy	Introduced
<i>Linnaea borealis</i> L.	Twinflower	
<i>Lonicera involucrata</i> (Richardson) Banks ex Spreng.	Twinberry Honeysuckle	
<i>Ludwigia palustris</i> (L.) Elliot	Water Purslane	
+ <i>Luzula multiflora</i>	Small-flowered Woodrush	
<i>Lycichiton americanus</i> Hulten & H. St. John	Skunk Cabbage	
<i>Lycopus uniflorus</i> Michx.	Northern Water Horehound	
<i>Lysimachia thyrsoflora</i> L.	Tufted Loosestrife	
<i>Malus fusca</i> (Raf.) C.K. Schneid.	Oregon Crabapple	

<i>Melica subulata</i> (Griseb.) Farw.	Alaska Oniongrass	
<i>Mentha arvensis</i> L.	Field Mint	
<i>Micromeria douglasii</i> (Benth.) Benth.	Yerba Buena	
<i>Mimulus moschatus</i> Douglas ex Lindl.	Musk Monkeyflower	
<i>Monotropa uniflora</i> L.	Indian Pipe	
<i>Mycelis muralis</i> (L.) Dumort.	Wall-lettuce	
<i>Myosotis laxa</i> Lehm.	Bay Forget-me-not	
<i>Nemophila parviflora</i> var. <i>Parviflora</i> Douglas ex Benth	Small-flowered Nemophila	
<i>Nuphar polysepala</i> Engelm.	Rocky Mountain Pond-lily	
<i>Oenanthe sarmentosa</i> C. Presl ex DC.	Water Parsley	
<i>Phalaris arundinacea</i> L.	Reed Canarygrass	Introduced
<i>Picea sitchensis</i> (Bong.) Carriere	Sitka Spruce	
<i>Plagiothecium undulatum</i> (Hedw.) Schimp. in B.S.G.	Wavy-leaved Cotton Moss	
<i>Plantago lanceolata</i> L.	Ribwort Plantain	Introduced
<i>Platanthera transversa</i> (Suksd.) R.M. Bateman	Royal Rein Orchid	
<i>Poa palustris</i> L.	Fowl Bluegrass	
<i>Polystichum munitum</i> (Kaulf.) C. Presl	Western Swordfern	
<i>Polytrichum juniperinum</i> Hedw.	Juniper Haircap Moss	
<i>Populus tremuloides</i> Michx.	Quaking Aspen	
<i>Potamogeton natans</i> L.	Floating-leaved Pondweed	
+ <i>Polypodium glycyrrhiza</i>	Licorice Fern	
<i>Prunella vulgaris</i> L.	Selfheal	
<i>Prunus emarginata</i> (Douglas) Eaton	Bitter Cherry	
+ <i>Prunus laurocerasus</i>	Cherry Laurel	Introduced
<i>Pseudotsuga menziesii</i> (Mirb.) Franco	Douglas-fir	
<i>Pteridium aquilinum</i> (L.) Kuhn	Bracken Fern	
<i>Ranunculus uncinatus</i> D. Don ex G. Don	Little Buttercup	
<i>Rosa gymnocarpa</i> Nutt.	Baldhip Rose	
<i>Rosa nutkana</i> C. Presl	Nootka Rose	
<i>Rubus laciniatus</i> Willd.	Cutleaf Blackberry	Introduced
+ <i>Rubus spectabilis</i>	Salmonberry	
<i>Rubus ursinus</i> Cham. & Schltl.	California Blackberry	
<i>Rumex acetosella</i> L.	Sheep Sorrel	Introduced
+ <i>Salix</i> sp. (narrow leaved)	Shining Willow	
<i>Salix scouleriana</i> Barratt ex Hook.	Scouler's Willow	
<i>Sambucus racemosa</i> L.	Red Elderberry	
<i>Schoenoplectus tabernaemontani</i> (C.C. Gmel.) Palla	Softstem Bullrush	
+ <i>Scirpus microcarpus</i>	Small-flowered Bulrush	
<i>Skutellaria galericulata</i> L.	Marsh Skullcap	
+ <i>Smilacina stellata</i>	Star-flowered False	

	Solomon's Seal	
+ <i>Sparganium angustifolium</i>	Narrow-leaved Bur-reed	
<i>Sparganium emersum</i> Rehmman	European Bur-reed	
<i>Spirea douglasii</i> Hook.	Hardhack	
<i>Sphagnum</i> L. sp.	Sphagnum Moss	
<i>Stachys chamissonis</i> var. <i>cooleyae</i> (A. Heller) G.A. Mulligan & D.B. Munroe	Cooley's Hedge-nettle	
<i>Stellaria crispa</i> Cham. & Schltldl.	Crisp Starwort	
<i>Stellaria (longifolia?)</i> Muhl. ex Willd.	Long-leaved Starwort	
<i>Taraxacum officinale</i> F. H. Wigg.	Common Dandelion	
<i>Thuja plicata</i> Donn ex D. Don	Western Redcedar	
<i>Toxicoscordion venenosum</i> (S. Watson) Rydb.	Meadow Deathcamas	
<i>Trientalis latifolia</i> Hook.	Northern Starflower	
<i>Tsuga heterophylla</i> (Raf.) Sarg	Western Hemlock	
<i>Typha latifolia</i> L.	Cattail	
<i>Urtica dioica</i> L.	Stinging Nettle	
<i>Utricularia vulgaris</i> ssp. <i>macrorhiza</i> (Leconte) R. T. Clausen	Common Bladderwort	
<i>Vaccinium ovatum</i> Pursh	Evergreen Huckleberry	
<i>Vaccinium parvifolium</i> Sm.	Red Huckleberry	
<i>Veronica beccabunga</i> L.	American Brooklime	
<i>Veronica officinalis</i> L.	Common Gypsyweed	
+ <i>Veronica scutellata</i>	Marsh Speedwell	
<i>Viola</i> sp.	Violet	

Appendix D. Avian Species Observed in Morrison Marsh Nature Reserve

Ren Ferguson surveyed Morrison Marsh to compile a bird species list including Species at Risk. Surveys were done during the day on July 14th and 15th and began at dawn on July 15th. An evening survey on July 14th confirmed the presence of crepuscular species, including Common Nighthawk. Survey time was not optimal as the breeding season was ending.

List Order: Species names and order follows the American Ornithologist Union Checklist of Birds of North America, Seventh Edition, 1998 and supplements to July 2017.

Common Name	Scientific Name	Status (BC/COSEWIC)
Canada Goose*	<i>Branta canadensis</i>	
++ Trumpeter Swan	<i>Cygnus buccinator</i>	
Mallard*	<i>Anas platyrhynchos</i>	
++ Ring-necked Duck	<i>Aythya collaris</i>	
+ Bufflehead	<i>Bucephala albeola</i>	
Band-tailed Pigeon*	<i>Patagioenas fasciata</i>	Blue List/Special Concern
Common Nighthawk*	<i>Chordeiles minor</i>	Yellow List/Threatened
Rufous Hummingbird*	<i>Selasphorus rufus</i>	
Virginia Rail**	<i>Rallus limicola</i>	
Great Blue Heron	<i>Ardea herodias fannini</i>	Blue List/Special Concern
Turkey Vulture	<i>Cathartes aura</i>	
Osprey	<i>Pandion haliaetus</i>	
Bald Eagle	<i>Haliaeetus leucocephalus</i>	
Cooper's Hawk*	<i>Accipiter cooperii</i>	
Great Horned Owl*	<i>Bubo virginianus</i>	
Downy Woodpecker*	<i>Picoides pubescens</i>	
Hairy Woodpecker*	<i>Picoides villosus</i>	
Northern Flicker*	<i>Colaptes auratus</i>	
Pileated Woodpecker*	<i>Dryocopus pileatus</i>	
Pacific-slope Flycatcher*	<i>Empidonax difficilis</i>	
Hutton's Vireo*	<i>Vireo huttoni</i>	
Cassin's Vireo*	<i>Vireo cassinii</i>	
Warbling Vireo**	<i>Vireo gilvus</i>	
Common Raven*	<i>Corvus corax</i>	
Purple Martin	<i>Progne subis</i>	Blue List
Chestnut-backed Chickadee**	<i>Poecile rufescens</i>	
Red-breasted Nuthatch*	<i>Sitta canadensis</i>	
Brown Creeper*	<i>Certhia americana</i>	
Pacific Wren*	<i>Troglodytes pacificus</i>	
Marsh Wren*	<i>Cistothorus palustris</i>	

Golden-crowned Kinglet*	<i>Regulus satrapa</i>	
Swainson's Thrush*	<i>Catharus ustulatus</i>	
American Robin**	<i>Turdus migratorius</i>	
Purple Finch*	<i>Carpodacus purpureus</i>	
Spotted Towhee*	<i>Pipilo maculatus</i>	
Song Sparrow*	<i>Melospiza melodia</i>	
Dark-eyed Junco**	<i>Junco hyemalis oreganus</i>	
Red-winged Blackbird*	<i>Agelaius phoeniceus</i>	
Orange-crowned Warbler*	<i>Oreothlypis celata</i>	
Common Yellowthroat**	<i>Geothlypis trichas</i>	
Yellow-rumped Warbler*	<i>Setophaga coronata</i>	
Townsend's Warbler*	<i>Setophaga townsendi</i>	
Wilson's Warbler*	<i>Cardellina pusilla</i>	
Western Tanager*	<i>Piranga ludoviciana</i>	

“+” sign indicates the species was noted as part of the Christmas Bird Count in Morrison Marsh, December 14, 2017.

“++” sign indicates the species was noted at the north end of the marsh near McFarlane Road as part of the Christmas Bird Count, December 14, 2017.

**Confirmed Breeding– Observed nest building, distraction display, used nest, recently fledged young, adults leaving or entering confirmed nest site, adult carrying faecal sac, adult carrying food for young, nest with eggs, and/or nest with young.

*Possible Breeding – Species observed during its breeding season in suitable nesting habitat, singing male present, or breeding calls heard during breeding season in suitable nesting habitat.

Residents and the public questionnaires also noted the presence of Wood Duck, Crested Grebe, Bushtit, Pheasant, Barred Owl, Sharp-shinned Hawk, Falcon, Crow, Sapsucker, Pine Siskin, Finch, Golden Sparrow and White-crowned Sparrow. Common Goldeneyes have been seen on the open marsh.

Appendix E. Bat Acoustic Survey Summary Report for Morrison Marsh Nature Reserve

Report and Analysis Prepared by Peter Ommundsen

BAT ACOUSTIC SURVEY MORRISON MARSH NATURE RESERVE JULY 2017

Summary:

Eight nights were sampled using an Anabat Express bat detector (serial number 314197, microphone number 314386) with a sensitivity setting of 115 and set for “night only” recording.

6,589 recordings (digital files) were triggered by bats, each file containing one or more passing bats. The presence of the following species was inferred from examination of the acoustic spectrograms:

Townsend’s Big-eared Bat (*Corynorhinus townsendii*)
Big Brown Bat (*Eptesicus fuscus*)
Hoary Bat (*Lasiurus cinereus*)
Silver-haired Bat (*Lasionycteris noctivagans*)
California Myotis (*Myotis californicus*)
Western Long-eared Myotis (*Myotis evotis*)
Little Brown Myotis (*Myotis lucifugus*)
Yuma Myotis (*Myotis yumanensis*)

One recording is consistent with the call of the Brazilian Free-tailed Bat, *Tadarida brasiliensis*, but is of inadequate clarity for definitive identification.

Number of bat files by date.

Night	Number of bat files	Temperature degrees C evening/morning	Time of first/last bat pass
2017 07 14/15	1,304	20.5 / 13.0	2141 / 0449
2017 07 15/16	706	19.0 / 12.5	2142 / 0448
2017 07 16/17	927	19.0 / 11.0	2136 / 0442
2017 07 17/18	550	19.75 / 11.25	2138 / 0439
2017 07 18/19	749	21.75 / 13.0	2137 / 0455
2017 07 19/20	1,142	21.0 / 16.5	2127 / 0501
2017 07 20/21	567	20.0 / 14.5	2136 / 0504
2017 07 21/22	644	17.25 / 16.25	2118 / 0514

Appendix F. Locations of Photographic Documentation

All coordinates taken at NAD 83 and at 10U.

Photo Number	Direction of Photo	UTM East	UTM North	Date	Comments
1	360°	375691	5483406	July 15, 2017	Post and wire fence along northern boundary
2	170°	375578	5482882	July 15, 2017	Douglas-fir/Dull Oregon-grape ecological community
3	0°	375899	5483057	March 1, 2018	Red Alder/Sword Fern in wetter parts of Ecological Community 1
4	30°	375509	5483209	July 15, 2017	Morrison Marsh ecological community
5	320°	375886	5482979	July 15, 2017	Marsh with dense Beaked Sedge/Slough Sedge with small Sitka Spruce ecological community
6	100°	375917	5482613	July 15, 2017	Red Alder/Slough Sedge ecological community. Small wetland along trail at the boundary of Boyle Point Provincial Park
7		375917	5482613	July 15, 2017	Grape Fern in Red Alder/Slough Sedge wetland
8	320°	376047	5483302	July 14, 2017	Disclimax Wetland ecological community invaded by Reed Canarygrass (aka Aspen wetland)
9	180°	376028	5483172	July 14, 2017	Rock Outcrop (Terrestrial herbaceous) ecological community
10		375987	5482825	July 14, 2017	Northern Red-legged Frog
11		375916	5482614	July 14, 2017	Blue Dasher
12	45°	375509	5483209	July 14, 2017	Jenny Balke of DCA deploying a minnow trap in Morrison Marsh
13		375986	5482873	July 15, 2017	Northwestern Salamander
14		375949	5482943	July 15, 2017	Great Horned Owl
15		375740	5483217	March 1, 20178	Evergreen Spurge-laurel
16		375867	5483132	March 1, 20178	English holly
17		375400	5483037	March 1, 20178	"Froggy Ponds" wet portion in trail
18		375314	5483018	March 1,	Kiosk with map and sign for

				20178	Morrison Marsh Nature Reserve
19	270°	376117	5483247	July 14, 2017	Sign on northern trail to Boyle Point Park on eastern property line showing prohibited activities and boundary
20	360°	376098	5482863	July 14, 2017	Signs (4): Boundary sign, No hunting, ITC Permitted Uses and "Danger Steep Cliff" on southern trail to Boyle Point Park east
21		375684	5482793	March 1, 20178	Culvert Under main trail at Boyle Creek

Appendix G. Locations of Species at Risk and Species of Interest Observed in Morrison Marsh Nature Reserve

All coordinates taken at NAD 83 and at 10U.

Species Common Name	Species Latin Name	UTM Easting	UTM Northing	Number Observed	Comments
Great Horned Owl	<i>Bubo virginianus</i>	375951	5482942	1	Observed perching
Purple Martin	<i>Progne subis</i>	375465	5483144	8	Minimum of eight aerial feeding in the evening
Purple Martin	<i>Progne subis</i>	375442	5483340		Aerial feeding over the marsh in the morning
Common Nighthawk	<i>Chordeiles minor</i>	375903	5483147	1	Calling and displaying over property - location estimated
Band-tailed Pigeon	<i>Patagioenas fasciata</i>	375458	5483186	1	Calling - location estimated
Great Blue Heron	<i>Ardea herodias fannini</i>	375509	5483208	1	Flying over marsh during dawn survey
Blue Dasher	<i>Pachidiplax longipennis</i>	375916	5482614	2	In small wetland with Leathery Grape Fern. Two adults.
Northern Red-legged Frog	<i>Rana aurora</i>	375498	5483207	1	Next to open water in main marsh
Northern Red-legged Frog	<i>Rana aurora</i>	375987	5482825	1	Next to trail

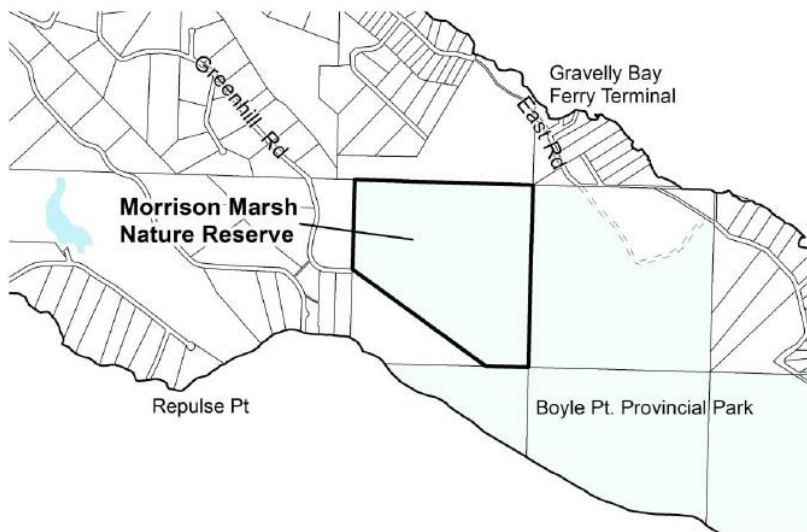
Appendix H. Letter to Neighbours



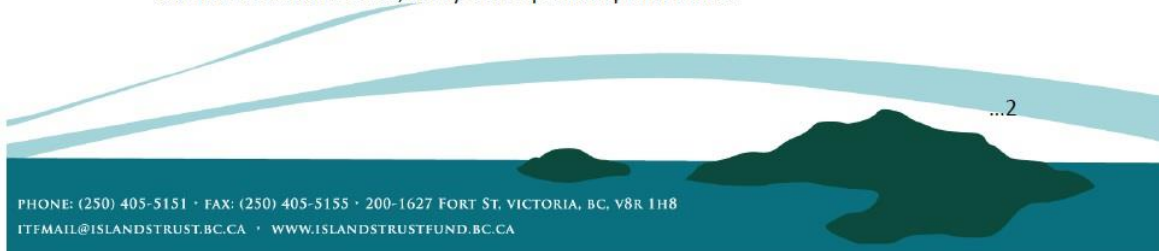
December 21, 2017

Dear Neighbour,

The Islands Trust Fund is updating the management plan for the Morrison Marsh Nature Reserve on Denman Island and we are interested in hearing from you.



Morrison Marsh Nature Reserve (PID 026-532-913, LOT A SECTION 7 DENMAN ISLAND NANAIMO DISTRICT PLAN VIP80177) is a 52 hectare (128 acre) protected area on the southern portion of Denman Island, adjacent to Boyle Point Provincial Park. The Islands Trust Fund works with the Denman Conservancy Association to manage the property in order to protect its unique ecological values. This property contains the southern headwaters of Morrison Marsh and Boyle Creek, as well as an extensive network of additional wetland areas, rocky outcrops and upland forest.





The management for the nature reserve focuses on protecting the natural values of the property. Development of any kind, including disturbance to native vegetation, soils, and water flow, is prohibited. The updated plan may support ongoing restoration activities such as removing non-native invasive species and enhancing habitat for protecting the native plants and animals. The original management plan was written in 2007 and it can be found on our website:

<http://www.islandstrustfund.bc.ca/media/10382/itfmgmtplanmarsh.pdf>

In order to update the plan, your input is requested. We would like to hear from the neighbours of the Morrison Marsh Nature Reserve with your ideas and concerns regarding the long-term management of this special place. Please complete a questionnaire on our website: <http://www.islandstrustfund.bc.ca/survey.aspx> or complete the enclosed questionnaire and return it to the DCA folder in the Free Post at Abraxas Bookstore, or scan and send it to me by email. There will be an Open House on January 27, 2018 at 10:00 am at the Marcus Isbister Old School Centre (5901 Denman Road) with a walk on the Nature Reserve at 1:30 pm.

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

Yours sincerely,

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

Enclosure: Morrison Marsh Nature Reserve Questionnaire



Appendix I. Letter to First Nations



December 22, 2017

Cowichan Tribes
Halalt First Nation
Homalco First Nation
K'omoks First Nation
Lake Cowichan First Nation
Lyackson First Nation
Penelakut Tribe

Qualicum First Nation
Snaw-naw-as (Nanoose) First Nation
Stz'uminus (Chemainus) First Nation
Tla'amin (Sliammon) First Nation
We Wai Kai (Cape Mudge First Nation)
Wei Wai Kum (Campbell River First Nation)

Dear Chief and Council,

The Islands Trust Fund is updating the management plan for the Morrison Marsh Nature Reserve on Denman Island. We would like to better understand the historical and current connection First Nations have with this area of Denman Island. We would be very interested in learning from you how the Islands Trust Fund's management planning and actions for this protected area on Denman Island can acknowledge and respect the cultural significance and traditional use of this area.

Morrison Marsh Nature Reserve (PID 026-532-913, LOT A SECTION 7 DENMAN ISLAND NANAIMO DISTRICT PLAN VIP80177) is a 52 hectare (128 acres) protected area on the southern portion of Denman Island, adjacent to Boyle Point Provincial Park. The Islands Trust Fund works with the Denman Conservancy Association to manage the property in order to protect its unique ecological values. This property contains the southern headwaters of Morrison Marsh and Boyle Creek, as well as an extensive network of additional wetland areas, rocky outcrops and upland forest. There are also three other nature reserves managed by the Islands Trust Fund on Denman (please see map below) and we invite you to share any information to help us better understand and manage these protected areas as well.

The management for the nature reserve focuses on protecting the natural values of the property. Development of any kind, including disturbance to native vegetation, soils, and water flow, is prohibited. An updated plan may support ongoing restoration, removing non-native invasive species and enhancing habitat for native plants and animals. Please consider filling out a questionnaire available on our website to assist us in gathering information: <http://www.islandstrustfund.bc.ca/survey.aspx>





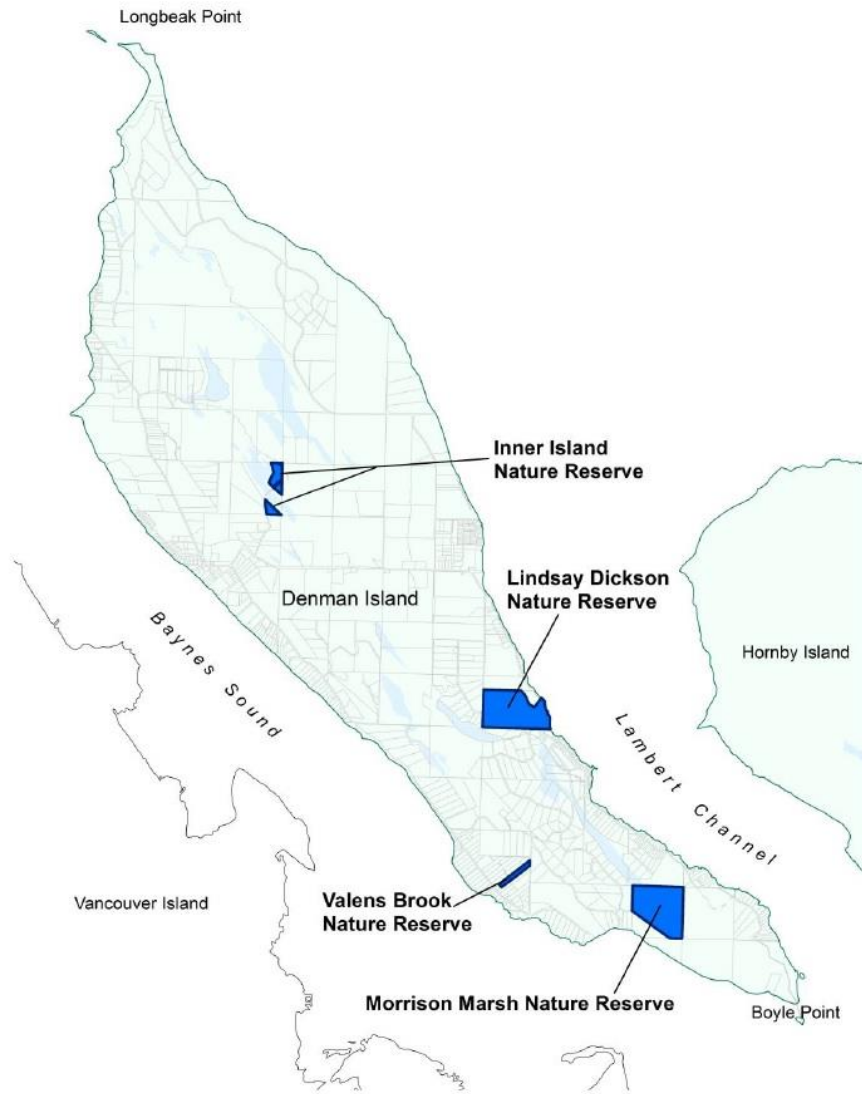
There will be an Open House on January 27, 2018 at 10 am at the Marcus Isbister Old School Centre (5901 Denman Road), with a walk on the Nature Reserve at 1:30pm. If you would like to have more information or to meet to discuss, please contact me at the email or number below.

Thank you for your consideration.

Yours sincerely,

A handwritten signature in black ink that reads 'N. Murphy'. The signature is written in a cursive style with a large, looped 'M'.

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



Morrison Marsh Nature Reserve Questionnaire

Morrison Marsh Nature Reserve is a 52 hectare protected area located in the southern portion of Denman Island and adjacent to Boyle Point Provincial Park. It contains the southern headwaters of Morrison Marsh and Boyle Creek, as well as an extensive network of additional wetland areas, rocky outcrops and upland forest.

The Islands Trust Fund received the land as a donation in 2005 and the first management plan for the Morrison Marsh Nature Reserve was written in 2007. The Islands Trust Fund's primary goal is to protect and nurture the sensitive ecosystems on this land. To do that, we revise our management plans approximately every 10 years to guide the management of the property. We are asking you to help us develop this plan. Please share your thoughts on the protection and long-term management of the Morrison Marsh Nature Reserve.

1. Where do you live?

- North Denman
- Mid Denman
- South Denman
- Off-island

2. Have you ever visited Morrison Marsh Nature Reserve? If so, how often?

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

3. If you have visited Morrison Marsh Nature Reserve, what did you do there?

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

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

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

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

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

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

Thank you for your time spent helping us plan the future of the Morrison Marsh Nature Reserve.