

Ecological Assessment of the Harrop Portion of Sunshine Bay Regional Park

Prepared for

**Sunshine Bay Regional Park Commission
Harrop, BC**

by

**Evan McKenzie Ecological Research
P.O. Box 905
Nelson BC
V1L 6A5**

and

**Jakob Dulisse
410 Second St
Nelson BC
V1L 2L3**

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Executive Summary

An ecological assessment of the Harrop portion of Sunshine Bay Park and the adjacent Harrop Point foreshore was conducted in 2010. Field sampling to identify plant and wildlife species and important natural features was focused in the Natural Environment Zone of the park.

Reconnaissance surveys were conducted in the Limited Recreation Zone portion of the park and the foreshore area.

The park protects important and under-represented riparian habitat that is become rare along the west arm of Kootenay Lake due to increased foreshore development. A number of important natural features were identified in the project area during field sampling including beaches, shallow ponds, mudflats, marshes and other riparian habitats, large old hawthorn trees and old growth black cottonwood stands.

A total of 158 plant and 45 vertebrate species were identified during the inventory. The high diversity of plant species corresponds to the diversity of sites and associated plant communities that occur in the riparian zone along the west arm of Kootenay Lake. Due to disturbance from past land use activities, almost one third of the total number of plant species are introduced (non-native) and 18 of those are designated as noxious and/or invasive in B.C. The noxious species Canada thistle, common hound's-tongue and quackgrass and the wetland invasive species reed canarygrass are well established in the park. Both native and introduced plant species with toxicity to humans, horses and livestock also occur in the project area.

A total of 20 habitat classes were mapped, corresponding to the variety of floodplain sites with unique combinations of micro topography, soil characteristics and site moisture and the plant communities adapted to those sites. Habitat types impacted by weeds and those that are environmentally sensitivity to disturbance were also identified. Other types that were considered potential candidates for habitat restoration were identified and methods for restoring the areas are discussed in the report.

The majority of the habitat types in the project area are in early seral stages of succession with sites dominated by herb (graminoid & forb) plant communities or hawthorn and willow shrub thickets. Within the park, succession will proceed slowly from herb to shrub-dominated communities due to unfavorable conditions for shrub establishment and growth on the open sites. Most habitats in the foreshore area will also remain in early herb and shrub stages of development due to annual flooding and saturated soils that result in unfavorable conditions for tree growth. Aggressive invasive species that prefer open sites will continue to spread in the early seral herb communities of the project area unless controlled by management treatments.

The park and adjacent foreshore area supports a variety of high value wildlife habitat. The mature black cottonwood stands are important for cavity nesting birds and raptors and the shrub habitat (especially the large hawthorns) is important for songbirds. The foreshore area is used extensively by waterfowl and is also likely used by shorebirds, herons, raptors and mammals. Species at risk found within the park include western toads which breed in the seasonally flooded foreshore area and great blue herons which forage in the foreshore area.

Potential threats and negative impacts to the natural values of the park and foreshore include wildlife disturbance through increased recreation, the continuing proliferation invasive plants, all terrain vehicle use and adjacent private property land use conflicts. We recommend protecting the natural values of the park and foreshore area, controlling invasive and toxic plant species, restoring disturbed habitats and environmental education of park visitors.

Acknowledgements

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1.0 Introduction

1.1 Background Information

This report describes a base-level ecological assessment of Harrop Portion of the Sunshine Bay Regional Park, located in Harrop on the West Arm of Kootenay Lake (Figure 1). Sunshine Bay Regional Park consists of two distinct properties—the Harrop portion to west and the Sunshine Bay portion to the east. Our assessment was limited to the Harrop portion of the park. This project focused on the Natural Environment Zone but also included the Limited Recreation Zone and adjacent shoreline habitat along Kootenay Lake (Figure 1). This inventory was suggested in the Sunshine Bay Regional Park Management Plan (RDCK 2010):

“The RDCK is encouraged to facilitate the completion of a full assessment and inventory of wildlife and plant communities in the Harrop Natural Environment Zone.”

1.2 Purpose and Objectives

The purpose of the project was to complete an inventory and assessment of the natural resources of the area and to provide recommendations for resource management and recreational use as part of the environmental management plan for the park.

The objectives of the assessment were as follows:

- 1) Identify important natural features and values in the park and foreshore area
- 2) Provide baseline inventories of the plant and wildlife species found in the project area
- 3) Identify threatened, endangered or vulnerable plant and wildlife species
- 4) Identify invasive and toxic plant species
- 5) Identify, describe and map habitat types that are characterized by site features, plant communities and associated wildlife species
- 6) Describe vegetation successional trends
- 7) Identify conservation concerns and potential threats to habitats and wildlife
- 8) Provide recommendations for the environmental management plan
- 9) Identify any habitat restoration or enhancement opportunities in the park
- 10) Provide recommendations with respect to recreational use in the area

1.3 Project Area:

The project area is located in Harrop, B.C. and includes the Harrop section of Sunshine Bay Regional Park and the Harrop Point foreshore situated along the south side of the west arm of Kootenay Lake (Figure 1). The Harrop portion of the park is 10.3 ha (25.4 ac) in area and is located between the foreshore area and Erindale Road. It is a piece of crown land managed by the RDCK and the Sunshine Bay Park Commission and the southwest portion of the area is leased to the Sunshine Bay Riding Club. The main access to the park is from Erindale Road at the Sunshine Bay Riding Club gate entrance.

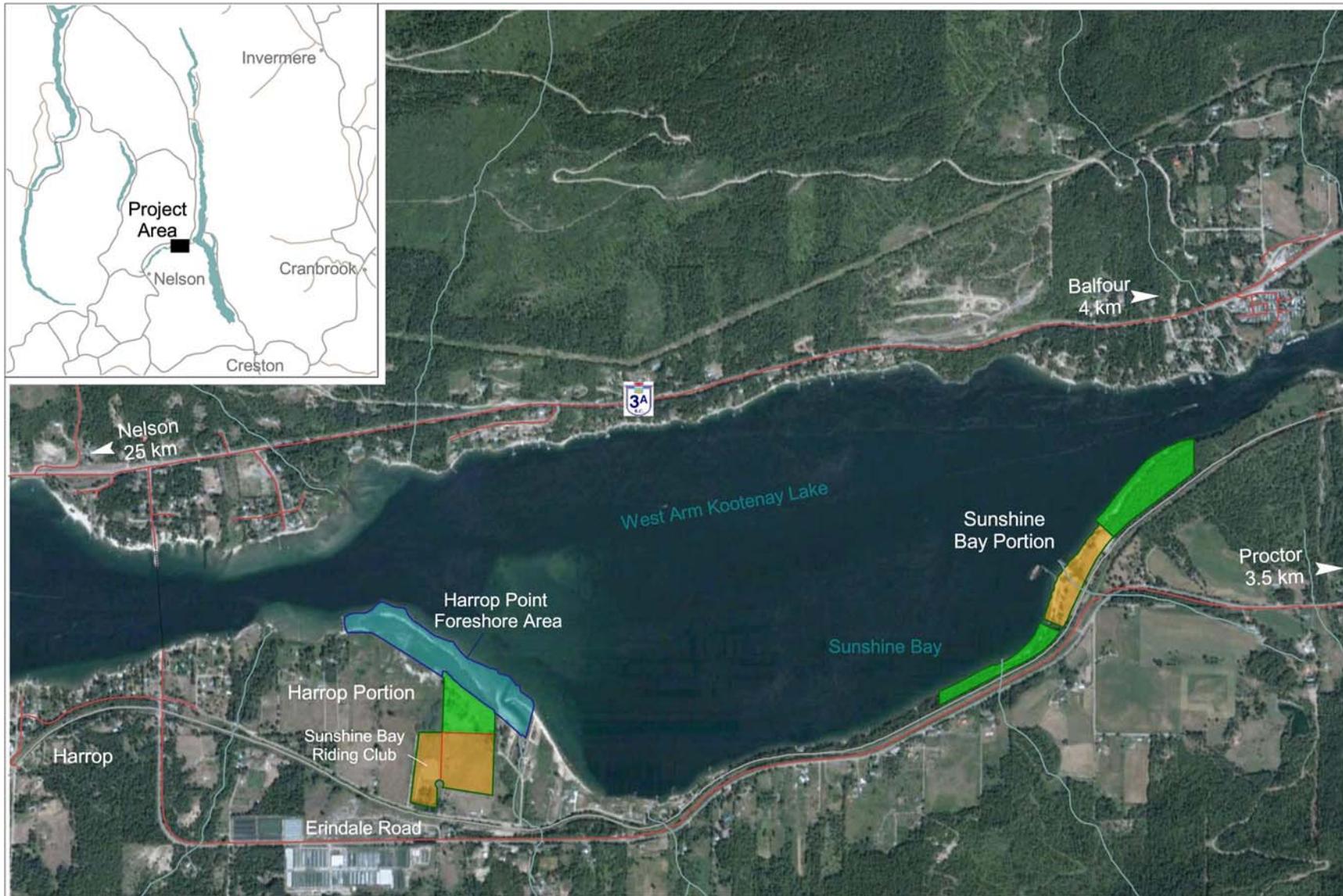


Figure 1. Map of the project area showing the Harrop Portion of Sunshine Bay Park and the Harrop Point Foreshore Area. The Natural Environment Zone (NEZ) is shown in green and the Limited Recreation Zone (LRZ) is shown in orange.

The project area is located within the southern Selkirk Mountain Range. Following the ecological land classification hierarchy set forth by Demarchi (1995 & 1996) and updated by Demarchi and Button in 2002 (Button 2009), the area occurs within the Southern Columbia Mountains (SCM) Ecoregion in the south part of the Northern Columbia Mountains (NCM) Ecoregion. With respect to biogeoclimatic ecosystem classification in the province, the project area is classified as the West Kootenay variant of the Dry Warm Interior Cedar – Hemlock subzone (ICHdw1) (Braumandl and Curran 1992; MacKillop 2009 & 2010).

Both the park and adjacent foreshore area occur on the low-lying floodplain of the West Arm of Kootenay Lake. The foreshore area and the gentle depressions in the north part of the park typically flood every year during spring run-off. Many of the other sites in the park have saturated soils during spring melt.

Historically, the park area was likely dominated by black cottonwood stands and hawthorn thickets. Since human settlement in the Harrop area, the park has undergone a series of disturbances including clearing of the cottonwood and shrub thickets, seeding with agronomic grass mixes, cattle grazing, development of a horse riding arena and facilities, fencing, introduction and spread of exotic plants and recreational use. Cattle grazing in the park was discontinued in 2009. Currently, the park consists mainly of grass-dominated fields and moist to wet meadows with remnant patches of cottonwood and hawthorn thickets. As a result of the disturbance history, the area supports a large number of non-native plant species and many of those are designated as invasive in B.C.

The Harrop Point foreshore zone is not part of the park and is situated between the north boundary of the park and the shoreline of the West Arm. It contains a variety of riparian habitats including beaches, shallow ponds, mudflats, shrub thickets, shallow marshes and moist to wet meadows. The foreshore area is in a more natural condition than the park but it has also been disturbed by exotic plant species, clearing of native vegetation on beaches, dredging of one of the ponds and site degradation by All Terrain Vehicle (ATV) use.

2.0 Methods

The project area was located in Google Earth and the color orthophoto imagery covering the area was printed to facilitate field sampling. Through interpretation of the orthophoto map, the area was stratified into distinct vegetated and non-vegetated types, type boundaries were located on the ground and sample points were located within those types.

In the Sunshine Bay Park management plan, the Harrop portion of the park is divided into two main management areas including the Natural Environment Zone (NEZ) and the Limited Recreation Zone (LRZ). The LRZ includes the fenced old pasture property in the east and the Sunshine Bay Riding Club property in the west part of the zone. The main focus of the natural resources inventory was the NEZ, so that area of the park received a higher intensity of sampling with more detailed ecosystem plots compared to the LRZ zone and adjacent foreshore area.

2.1 Plants

Two types of plots, including visuals and ground inspections, were used at sample points to collect vegetation and site information. Visual plots provide basic information about vegetation composition and abundance and site characteristics and are useful for collecting ecosystem data quickly. Ground inspection plots provide more detailed vegetation data and typically more soil data than visuals and as a result, take more time to complete. Both ground inspection and visual plots were used to sample vegetation and site features in the NEZ. The LRZ and

adjacent foreshore area were sampled using only visual plots in conjunction with quick reconnaissance surveys.

For sample points located within graminoid (grass, sedge, reed or rush) dominated plant communities, a 100m² (10 X 10 m) plot size was used to collect ecosystem data. For sampling cottonwood, hawthorn and willow plant communities, the plot size was 400 m² (20 X 20 m).

For ground inspection plots, the actual % cover estimates for each plant species identified in the plot were recorded on the field forms. For visual plots, only % cover classes were recorded for each species. Percent cover classes and corresponding letter codes used on visual plot forms are as follows: Dominant species (D) = > 7% cover, Associate species (A) = 1-7% cover and Minor species (M) = <1% cover. The total % cover values for each vegetation layer, including tree (A layer), shrub (B), herb (C) and moss & lichen (D), were also recorded for both ground inspections and visuals. Information on site characteristics collected at each plot included topographic features, soil texture and drainage, site moisture and terrain classification. All sample plots were recorded on GPS.

Data collected for both ground inspections and visuals were recorded on the provincial government FS212-2 field form. Vegetation data was collected between June 28 and August 11, 2011. Frank Lomer of Richmond, B.C. identified unknown plant specimens collected during sampling.

Special natural features and values of the area were also noted during the vegetation inventory. Wildlife sightings and signs observed during the plant survey were also recorded. A species list was compiled for all plants identified. This species summary was used to identify any threatened or vulnerable plants as well as invasive and toxic species. Separate tables were generated for invasive plant species and toxic species found in the project area.

2.2 Habitat Mapping

During vegetation sampling, plant communities were identified using vegetation composition that includes the unique combinations of species and the relative abundance or dominance of those species. Vegetated habitat types were then identified as the plant communities and their associated physical sites characterized by topography and soil texture, site moisture and drainage. Those habitat types were named using the first letters of the dominant or co-dominant species in the plant community and where possible, types were correlated to previously identified site associations described in "Wetlands of British Columbia" (MacKenzie and Moran, 2004). Non-vegetated habitat types (i.e. mudflats, beaches and sandbars) were identified and named according to the landform or type of physical site.

Each habitat type was assigned a specific color and color-coded habitat maps were generated to display the distribution of types by polygon within the park and foreshore areas. The habitat types were combined into broad habitat groups (classes) based on site features and/or lifeforms (i.e. trees, shrubs, grasses & sedges, forbs) to reduce the number of habitat units to be described and mapped in the project area. A habitat class map was generated to display the distribution of the broader groupings.

Color-themed maps were also generated to display areas where invasive plants are dominant or associate species within plant communities and to show the distribution of habitat classes that are ecologically sensitive to disturbance by recreational activities due to high water tables and saturated soils.

2.3 Wildlife

Wildlife inventory was conducted on June 09, June 16 and August 05, 2010. Field surveys consisted of foot encounter surveys conducted in early morning hours in order to record the presence of breeding birds on site. It should be noted that these species lists and observations are not comprehensive due to the preliminary nature of this assessment. Wildlife sign, important habitat features, wildlife trees etc. were noted during all field work.

Local naturalists Jennifer and Kurt Dehnel were consulted regarding historic wildlife sightings of note and conservation concerns within the park.

Species in Canada are evaluated and ranked provincially by the B.C. Conservation Data Centre (CDC) and nationally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The CDC identifies species and ecosystems of conservation concern and assigns them a conservation status ranking by means of Red and Blue lists. The rankings highlight species and ecological communities that have particular threats, declining population trends, or restricted distribution that indicate that they require special attention. The Red list includes any ecological community, indigenous species or subspecies that is extirpated, endangered or threatened in B.C. The Blue list includes any ecosystem, indigenous species and subspecies considered to be of special concern (formerly vulnerable) in B.C. (Ministry of Labour and Citizen's Services 2010).

COSEWIC also maintains a regularly updated list of Canadian species at risk at the national level (COSEWIC 2011) which are designated 'Special Concern,' 'Threatened,' 'Endangered,' 'Extirpated,' or 'Extinct' according to the level of threat facing the species.

For both lists, ranking is applied to taxa at the species, subspecies, populations, and ecotype level.

3.0 Results

3.1 Plants

The vegetation resources of the Harrop portion of Sunshine Bay Park and the Harrop Point foreshore area were sampled within plant communities at a number of sites. The locations of sample plots in the project area are shown on the maps in Appendix 1.

A total of 158 plant species were identified in the project area and almost one third of those are exotic (non-native) species that have been introduced from outside North America. The complete plant species list for the project area is included in Appendix 2. The plants in the list are stratified by vegetation layer including trees, shrubs, herbs and mosses. The list includes the provincial species codes, scientific and common names and codes for selected plant attributes. Exotic species in the list are highlighted with yellow and exotic species that are also designated as invasive weeds in B.C. are highlighted with orange. Definitions of attribute codes used in the species list are provided in Appendix 3.

No plant species or ecosystems at risk were identified in the project area.

3.2 Habitat Mapping

The area was mapped based on the identification of distinct plant communities. The vegetation composition of plant communities and/or physical site features were used to identify and describe 20 vegetated and non-vegetated habitat classes in the area (Table 1, Figures 2a & 2b).

The 20 mapped habitat classes were broken down further into 44 habitat types which are summarized in Table 2.

Table 1. Habitat Class Map Legend for Figures 2a & b

Habitat Class Code	Habitat Class Name	Habitat Class Color & Opacity
BE	Beach	White-100
CO	Cottonwood	Chartreuse-100
CS	Cottonwood Shrubs	Green-100
DF	Disturbed Field	Firebrick Red-100
FI	Field	Dark Goldenrod1-100
HA	Hawthorn	Chartreuse4-100
LA	Lake	Cornflower Blue-100
MA	Marsh	Cyan4-100
ME	Moist Meadow	Yellow-100
MF	Mowed Field	Magenta-50
MU	Mudflat	Coral3-100
PD	Pond	Blue-100
PI	Pine	Dark Green-100
RA	Riding Area	Cadet Blue3-100
RO	Rose	Light Pink-100
SB	Sandbar	Coral3-50
TM	Treed Mixed	Medium Orchid1-100
TR	Trench	Firebrick-100
WI	Willow	Green-100
WM	Wet Meadow	Light Green1-100

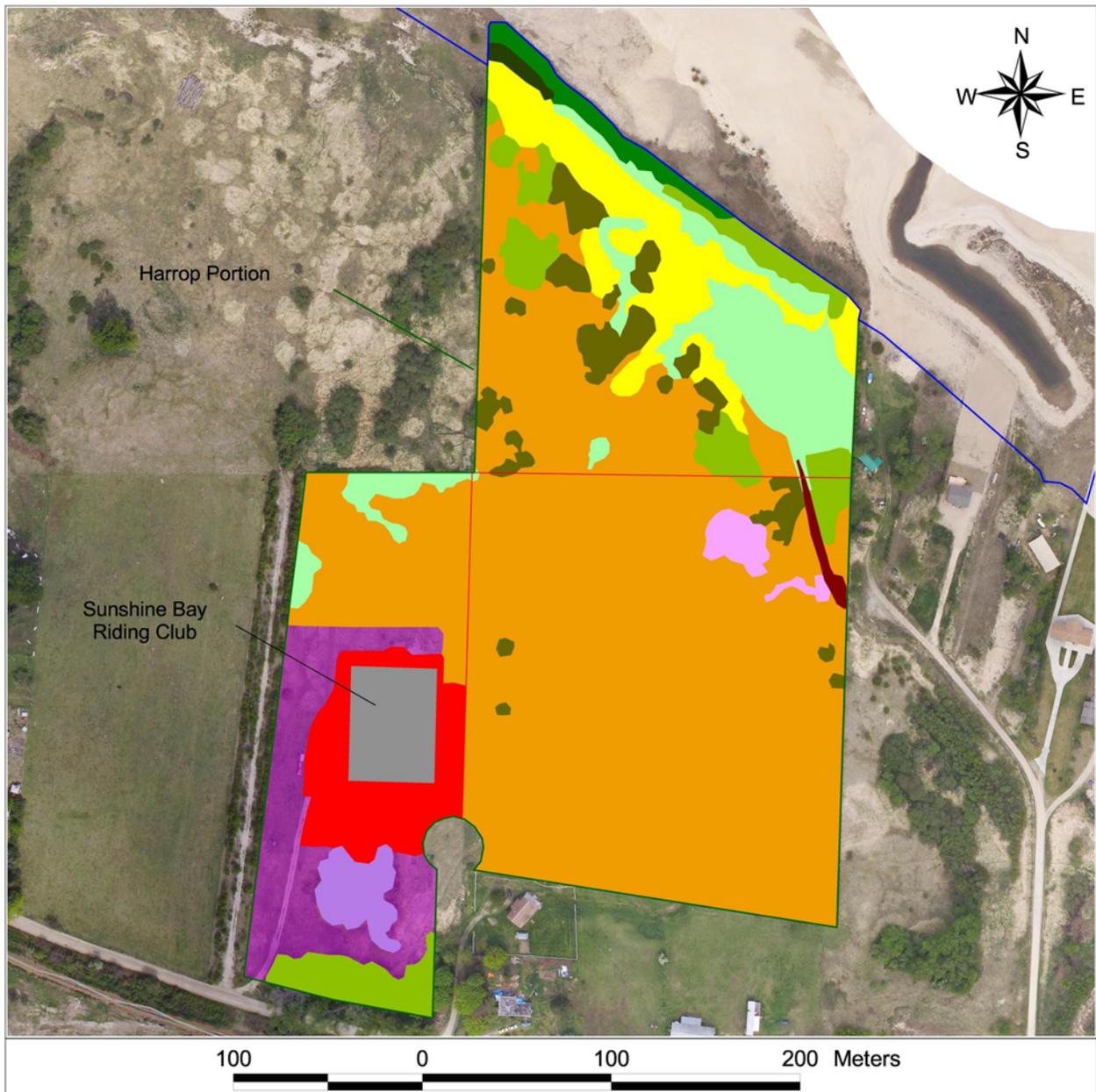


Figure 2a. Habitat class map of the Natural Environment Zone (NEZ) and Limited Recreation Zone (LRZ).

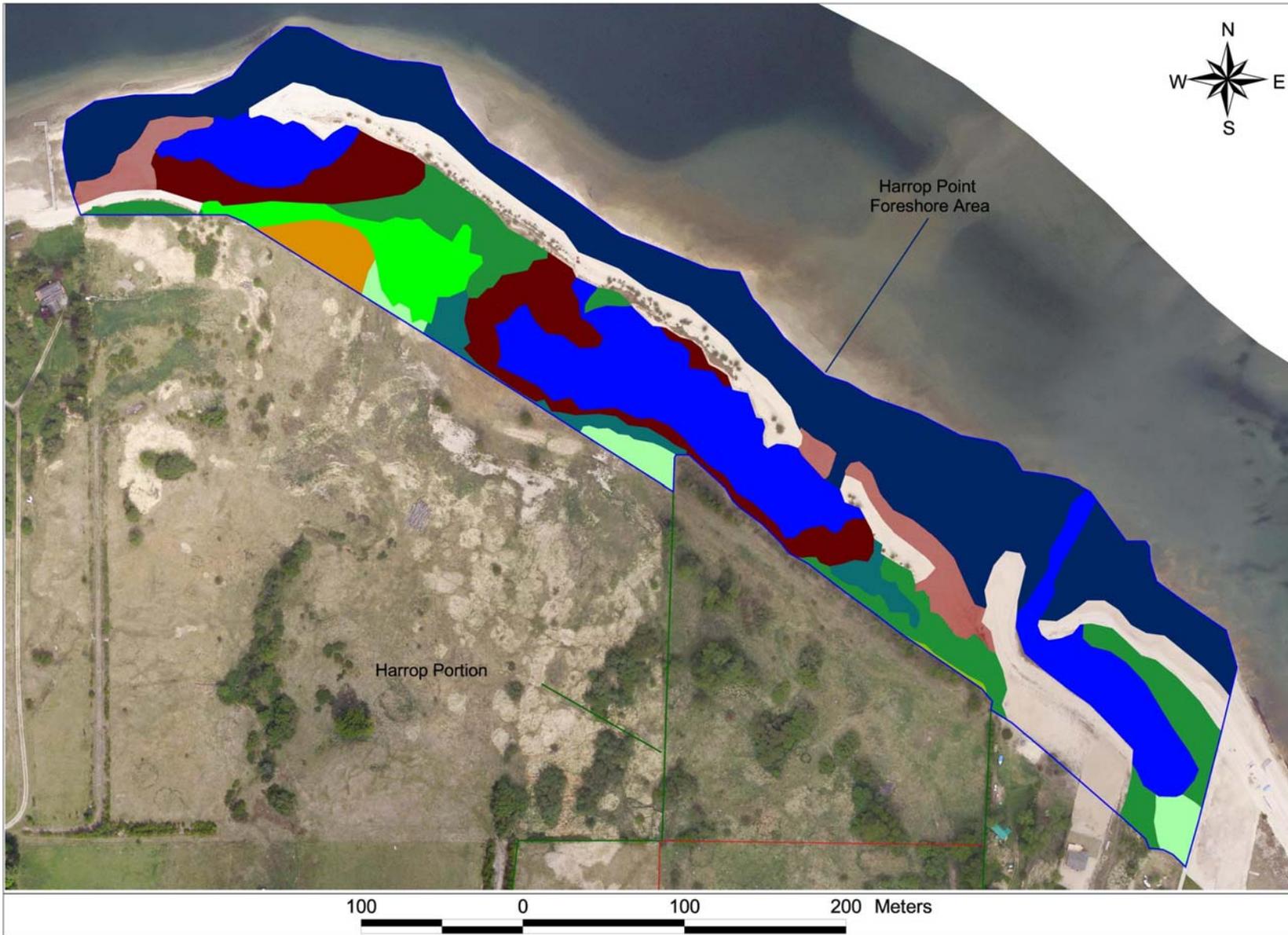


Figure 2b. Habitat class map of the Harrop Point Foreshore Area.

Table 2. Summary of Habitat Classes and Habitat Types in the Harrop Portion of Sunshine Bay Park and Harrop Point Foreshore Area

Habitat Class Code	Habitat Class Name	Habitat Type Code	Habitat Type Name	Site Moisture	Soil Drainage
BE	Beach	BE-N	Non-vegetated Beach	dry	rapid
		BE-V	Vegetated Beach	dry	rapid
CO	Cottonwood	CA	Cottonwood - Alder stand	moist - very moist	imperfect - poor
		CH	Cottonwood - Hawthorn stand	moist	imperfect - moderately well
		CS	Cottonwood - Snowberry stand	moist	imperfect
CS	Cottonwood Shrubs	CR	Cottonwood - Redtop open shrubland	very moist	imperfect
DF	Disturbed Field	CK	Clover - Knapweed disturbed field	moist	imperfect
		ML	Mowed Lawn	moist	imperfect
FI	Field	FK1	Fescue - Kentucky bluegrass field - 1	moist	imperfect
		FK2	Fescue - Kentucky bluegrass field - 2	moist	imperfect
		KO	Kentucky bluegrass - Orchard grass field	moist	imperfect
		KQ	Kentucky bluegrass - Quackgrass field	moist	imperfect
		KT	Kentucky bluegrass - Timothy field	moist	imperfect
		QF	Quackgrass - Fescue field	moist - (very moist)	imperfect
HA	Hawthorn	HA	Hawthorn thicket	moist - very moist	imperfect
		HR	Hawthorn-Rose thicket	moist	imperfect
LA	Lake	LA	Lake		
MA	Marsh	SE	Sedge shallow marsh	very wet - wet	very poor - poor
		SH	Sedge - Hairgrass shallow marsh	very wet - wet	very poor - poor
ME	Moist Meadow	FE	Fescue moist meadow	moist - very moist	imperfect
		FR	Fescue - Redtop moist meadow	very moist - moist	imperfect
MF	Mowed Field	MF1	Mowed Field - 1	moist	imperfect
		MF2	Mowed Field - 2	moist	imperfect
MU	Mudflat	MU	Mudflat	very wet	very poor
PD	Pond	PD	Pond		
PI	Pine	PA	Pine - Alder stand	moist	imperfect
RA	Riding Area	RA	Riding Area		

Table 2. Summary of Habitat Classes and Habitat Types in the Harrop Portion of Sunshine Bay Park and Harrop Point Foreshore Area

Habitat Class Code	Habitat Class Name	Habitat Type Code	Habitat Type Name	Site Moisture	Soil Drainage
RO	Rose	RF	Rose - Fescue patch	moist	imperfect
SB	Sandbar	SB	Sandbar	very wet - wet	very poor - poor
TM	Treed Mixed	TM	Mixed Tree patch	moist	imperfect
TR	Trench	TR	Trench	very moist	imperfect
WI	Willow	WA	Willow - Alder thicket	very moist	poor
		WI-L	Low Willow thicket	very moist	poor
		WI-O	Low Willow open shrubland	very moist	poor
		WI-T	Tall Willow thicket	very moist	poor
WM	Wet Meadow	BR	Baltic rush wet meadow	very moist - wet	imperfect - poor
		FB	Fowl Bluegrass wet meadow	wet - very moist	poor - imperfect
		FM	Fowl bluegrass - Marshpepper smartweed shallow marsh	wet	poor
		RB	Reed canarygrass - Baltic rush moist meadow	very moist - (wet)	imperfect - poor
		RC	Reed canarygrass moist meadow	very moist	imperfect - poor
		RM	Reed canarygrass - Marsh bedstraw moist meadow	very moist	imperfect - poor
		RS	Redtop - Slender rush moist meadow	very moist	imperfect - poor
		RT	Redtop - Timothy moist meadow	very moist	imperfect - poor

3.3 Special Natural Features

A number of special natural features were identified in the project area during field sampling. Within the Natural Environment Zone (NEZ), the following special features were observed:

- Shallow marsh/ephemeral pond and surrounding moist to wet meadows
- Large, old black cottonwood trees and snags in remnant riparian stands
- Hawthorn thickets with large old trees (A hawthorn thicket and a cottonwood stand with large old trees and snags also occur in the Limited Recreation Zone (LRZ).)

Within the Harrop Point foreshore area, the following important natural features were identified:

- Shallow ponds and associated mudflats
- Willow thickets
- Sedge marshes
- Beaches

3.4 Invasive Plants

A total of 23 species of invasive plants were found in the park and foreshore area (Table 3). Codes used in the table for selected species attributes are defined in Appendix 3. Comments include notes about invasive weed status and plant toxicity.

Of the 49 exotic plant species identified in the project area, 18 are designated as invasive weeds in the province. Of those 18 species, three are considered provincially noxious (P) – noxious weeds in all regions of B.C. and five are regionally noxious (R) – noxious weeds in some regions of B.C., as designated in the B.C. Weed Control Act (1999). The other ten species are designated as invasive/nuisance species (I) that are not currently legislated as noxious weeds. Other species included in the table are two introduced grasses that are considered minor and moderate upland invasive plants by the Canadian Wildlife Service (CWS) and one non-native forb designated as a nuisance species by the Ministry of Agriculture and Lands (MoAL) (Perzoff 2009). There are also two native plant species that are considered to be invasive in wetland and/or upland sites.

3.5 Toxic Plants

A number of both exotic and native plants found in the project area are considered to be toxic to humans and/or livestock, horses and wildlife. Table 4 summarizes toxic species stratified by vegetation layer.

The comments in the table include notes on the species affected by the toxic plants, the effects of toxins on different species, mode of action of the toxins, chemicals causing toxicity, degree of toxicity of the poisonous plants, plant parts containing the toxin(s) and the most dangerous season for the toxic plant species.

Table 3. Invasive Plant Species in the Harrop portion of Sunshine Bay Park and Harrop Point Foreshore Area

Code ¹	Species Code ²	Scientific Name	Lifeform ³	Common Name	Native/ Exotic ⁴	Weed Status ⁵	Wetland _Ind ⁶	Comments
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Herbs

ARCTMIN	ARCTMIN	<i>Arctium minus</i>	7	common burdock	E	R		
BERTINC	BERTINC	<i>Berteroa incana</i>	7	hoary alyssum	E	I		
BROMINE1	BROMINE	<i>Bromus inermis ssp. inermis</i>	6	smooth brome	E	*		* considered a moderate upland invasive by the Canadian Wildlife Service (CWS)
CENTBIE	CENTBIE	<i>Centaurea biebersteinii</i>	7	spotted knapweed	E	P		releases allelopathic chemicals that inhibit the growth of nearby plants
CIRSARV1	CIRSARV	<i>Cirsium arvense var. horridum</i>	7	Canada thistle	E	P		nitrates in ingested leaves are toxic to cattle; degree of toxicity unknown
CIRSVUL	CIRSVUL	<i>Cirsium vulgare</i>	7	bull thistle	E	I		
CYNOOFF	CYNOOFF	<i>Cynoglossum officinale</i>	7	common hound's-tongue	E	P		alkaloids in ingested leaves can cause fatal poisoning in cattle and horses
ELYMREP	ELYMREP	<i>Elymus repens</i>	6	quackgrass	E	R		
EQUIARV	EQUIARV	<i>Equisetum arvense</i>	5	common horsetail	N	I	4	leaves, stems & spores ingested in spring are non-fatally toxic to cattle, horses & sheep
GNAPULI	GNAPULI	<i>Gnaphalium uliginosum</i>	7	marsh cudweed	E	I		
HIERAUR	HIERAUR	<i>Hieracium aurantiacum</i>	7	orange-red king devil	E	R		
HIERGLO	HIERGLO	<i>Hieracium glomeratum</i>	7	yellowdevil hawkweek	E	I		
IRISPSE	IRISPSE	<i>Iris pseudacorus</i>	7	yellow flag	E	I	2	wetland invasive species; contact with roots causes dermatitis in humans, ingestion of roots can kill cattle & pigs
LEUCVUL	LEUCVUL	<i>Leucanthemum vulgare</i>	7	oxeye daisy	E	R		

Table 3. Invasive Plant Species in the Harrop portion of Sunshine Bay Park and Harrop Point Foreshore Area

Code ¹	Species Code ²	Scientific Name	Lifeform ³	Common Name	Native/ Exotic ⁴	Weed Status ⁵	Wetland _Ind ⁶	Comments
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Herbs (cont)

PHALARU	PHALARU	<i>Phalaris arundinacea</i>	6	reed canarygrass	M	*	3	* spreads aggressively in wet meadows, riparian areas & wetlands, particularly where disturbed; alkaloid toxins in ingested leaves can cause fatal poisoning in cattle and sheep
PLANLAN	PLANLAN	<i>Plantago lanceolata</i>	7	ribwort plantain	E	*		* considered a nuisance species by the Ministry of Agriculture & Lands (MoAL)
PLANMAJ	PLANMAJ	<i>Plantago major</i>	7	common plantain	U	I		
POA COM	POA COM	<i>Poa compressa</i>	6	Canada bluegrass	E	*		* considered a minor upland invasive species by the Canadian Wildlife Service (CWS)
POA PRA	POA PRA	<i>Poa pratensis</i>	6	Kentucky bluegrass	N	*	4	* considered a minor upland invasive species by the Canadian Wildlife Service (CWS)
RUMECT	RUMECT	<i>Rumex acetosella</i>	7	sheep sorrel	E	I		oxalates in ingested leaves & stems can cause fatal poisoning in sheep
RUMECRI	RUMECRI	<i>Rumex crispus</i>	7	curled dock	E	I		oxalates in ingested leaves & stems are toxic to sheep; degree of toxicity unknown
TANAVUL	TANAVUL	<i>Tanacetum vulgare</i>	7	common tansy	E	R		thujone in all parts of plants can be fatally poisonous to humans if ingested; potentially poisonous to livestock as well but usually avoided
VERBTHA	VERBTHA	<i>Verbascum thapsus</i>	7	great mullein	E	I		

Table 4. Toxic Plant Species in the Harrop portion of Sunshine Bay Park and Harrop Point Foreshore

Code ¹	Species Code ²	Scientific Name	Lifeform ³	English Name	Native/ Exotic ⁴	Weed Status ⁵	Wetland Ind ⁶	Comments
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Trees

PRUNAVI	PRUNAVI	<i>Prunus avium</i>	2	sweet cherry	E			wilted leaves, twigs & seeds may be fatally toxic if ingested by humans & livestock
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Shrubs

AMELALN	AMELALN	<i>Amelanchier alnifolia</i>	4	Saskatoon	N			prunasin in the flowers, foliage and stems may cause fatal poisoning in cattle and mule deer; most dangerous in the spring
LIGUVUL	LIGUVUL	<i>Ligustrum vulgare</i>	4	common privet	E			ingested fruit is poisonous to humans; degree of toxicity unknown
RHAMPUR	RHAMPUR	<i>Rhamnus purshiana</i>	2	casacara	N		4	glycosides in ingested foliage toxic to livestock; degree of toxicity unknown
SYMPALB	SYMPALB	<i>Symphoricarpos albus</i>	4	common snowberry	N			alkaloids in ingested fruit cause non-fatal poisoning in humans including dermatitis (inflammation of the skin) and phytophotosensitivity

Herbs

CALLPAL	CALLPAL	<i>Calla palustris</i>	7	wild calla	N		1	oxalates in leaves, roots & stems are rarely or potentially poisonous when ingested by humans & cows
CENTBIE	CENTBIE	<i>Centaurea biebersteinii</i>	7	spotted knapweed	E	P		releases allelopathic chemicals that inhibit the growth of nearby plants
CIRSARV1	CIRSARV	<i>Cirsium arvense var. horridum</i>	7	Canada thistle	E	P		nitrites in ingested leaves are toxic to cattle; degree of toxicity unknown
CYNOOFF	CYNOOFF	<i>Cynoglossum officinale</i>	7	common hound's-tongue	E	P		alkaloids in ingested leaves can cause fatal poisoning in cattle and horses
EQUIARV	EQUIARV	<i>Equisetum arvense</i>	5	common horsetail	N	I	4	thiaminase in leaves, stems & spores ingested in the spring are non-fatally toxic to cattle, horses & sheep
EQUIHYE	EQUIHYE	<i>Equisetum hyemale</i>	5	scouring-rush	N			toxic to livestock when ingested; degree of toxicity unknown
EQUIPAL	EQUIPAL	<i>Equisetum palustre</i>	5	marsh horsetail	N		3	leaves & stems ingested in the spring cause non-fatal poisoning in cattle, horses & sheep due to the presence of thiaminase and the alkaloid palustrine
EQUIPRA	EQUIPRA	<i>Equisetum pratense</i>	5	meadow horsetail	N		4	toxic to livestock when ingested; degree of toxicity unknown
IRISPSE	IRISPSE	<i>Iris pseudacorus</i>	7	yellow flag	E		2	contact with plant juices in roots causes dermatitis in humans;

Table 4. Toxic Plant Species in the Harrop portion of Sunshine Bay Park and Harrop Point Foreshore

Code ¹	Species Code ²	Scientific Name	Lifeform ³	English Name	Native/ Exotic ⁴	Weed Status ⁵	Wetland Ind ⁶	Comments
								glycosides in ingested leaves & roots can cause fatal poisoning in cattle & pigs
LUIPOY1	LUIPOY	<i>Lupinus polyphyllus ssp. polyphyllus</i>	7	large-leaved lupine	N			anagyrene in leaves & stems can cause non-fatal poisoning in cattle
PHALARU	PHALARU	<i>Phalaris arundinacea</i>	6	reed canarygrass	M		3	alkaloids in ingested leaves can cause fatal poisoning in cattle and sheep
RANUACR	RANUACR	<i>Ranunculus acris</i>	7	meadow buttercup	E			contact with skin causes dermatitis in humans; toxic to cattle when ingested but degree of toxicity unknown
RANUFLM	RANUFLM	<i>Ranunculus flammula</i>	7	lesser spearwort	N		3	as above
RUMEACT	RUMEACT	<i>Rumex acetosella</i>	7	sheep sorrel	E	I		oxalates in ingested leaves & stems can cause fatal poisoning in sheep
RUMECRI	RUMECRI	<i>Rumex crispus</i>	7	curled dock	E	I		oxalates in ingested leaves & stems are toxic to sheep; degree of toxicity unknown
SYMPSPA	SYMPSPA	<i>Symphotrichum spathulatum</i>	7	western mountain aster	N			humans and livestock are poisoned by selenium in ingested plant; degree of toxicity unknown
TANAVUL	TANAVUL	<i>Tanacetum vulgare</i>	7	common tansy	E	R		thujone in all parts of plants can be fatally poisonous to humans if ingested; potentially poisonous to livestock as well but usually avoided
TRIFARV	TRIFARV	<i>Trifolium arvense</i>	7	hare's-foot clover	E			nitrate in all parts of plant cause non-fatal poisoning to horses & cattle; ingested toxins cause photosensitization, liver damage & nitrate poisoning
TRIFPRA	TRIFPRA	<i>Trifolium pratense</i>	7	red clover	E			glycosides in all parts of plant cause non-fatal poisoning in cattle; ingested toxins cause infertility and teratogenesis (development of defects in embryo or fetus) in calves
TRIFREP	TRIFREP	<i>Trifolium repens</i>	7	white clover	E			glycosides in all parts of plant cause non-fatal poisoning in cattle and horses; ingested toxins cause bloating, laminitis (inflammation of the sensitive laminated tissue structure of the hoof) and cyanogenic poisoning
URTIDIO1	URTIDIO	<i>Urtica dioica ssp. gracilis</i>	7	stinging nettle	N			dermatitis in humans caused by contact with hairs on stems & leaves of plant

3.6 Vegetation Succession

The majority of the Harrop portion of Sunshine Bay Park is in an early or young seral stage of vegetation succession. The park is dominated by agronomic grasses, introduced and native forbs and to a lesser extent sedges and rushes in the *Field*, *Moist Meadow* and *Wet Meadow* habitat classes. Plant communities of those classes are in the “herb” structural stage of development. The hawthorn thickets that mainly occur in the NEZ portion of the park are in the “tall shrub” structural stage of development that is also considered an early successional stage. However, some of the thickets with large old individuals of tree status (> 10 m tall) could be classified as being in a “maturing seral” or even an “overmature seral” stage of development.

The remnant cottonwood stands occurring in the park are considered to be in the late “maturing climax” seral stage of succession. They have a “mature” to “old growth” structural stage as indicated by the large live trees and snags in the stands. Most of the cottonwood stands are also in the NEZ with the exception of the stand in the LRZ adjacent Erindale Road.

The *Pine* habitat class in the northwest corner of the park is in a mid seral stage of succession. It has a “maturing seral” successional status and is in the “young forest” structural stage of development. The Cottonwood – Alder habitat type along the north boundary of the park is also considered to be a mid seral stand with a “young forest” structural stage. It is classified as being in a “young climax” stage of succession because as it develops into the “maturing climax” stage, the immature cottonwood will become the dominant climax trees on the site.

The Harrop Point foreshore area is also dominated by vegetation in early seral stages of succession. The *Willow*, *Cottonwood Shrubs* and vegetated *Beach* habitat classes are in the “low shrub” and “tall shrub” structural stages while the remaining vegetated types dominated by graminoid (grasses, sedges & rushes) and forb species are in the “herb” structural stage of plant community development.

3.7 Wildlife

A total of 45 vertebrate species were recorded during surveys or confirmed through background research including one amphibian, five mammals and 39 birds (Appendix 4). Please note, this is not a complete species list due to the limited field surveys.

We consulted the CDC and COSEWIC to create a list of terrestrial vertebrate species at risk for the area (Table 5). Potential occurrence of these species within the project area was then determined during field surveys, professional knowledge of the area and by consulting relevant literature and local biologists.

Two species at risk, the western toad and barn swallow, are known to occur within the park and one other, the great blue heron, is known to forage in the area and likely occurs within the park (Table 5). The western toad is the only species that is known to breed regularly within the foreshore *Pond* habitat class (Figure 2b). The habitat requirements and management concerns associated with these species are outlined in the discussion.

Table 5. Local (Kootenay Lake Forest District) terrestrial vertebrate species at risk and their potential occurrence at Sunshine Bay Park. Species which are known or likely to occur are shaded.

Species	BC Status	Federal Status	Potential occurrence	Species notes/concern within the park
Amphibians				
Rocky Mountain Tailed Frog <i>Ascaphus montanus</i>	Red	Endangered	Unlikely	Species range not known to occur in the area. Restricted to swiftly flowing streams in several watersheds in the East Kootenay region.
Western Toad <i>Anaxyrus boreas</i>		Special Concern	Occurs	Adults are terrestrial but require clean standing water for breeding. Species is known to breed foreshore <i>Pond</i> habitat class (Figure 2b) habitat created seasonally by receding water levels. (Jenny & Kurt Dehnel, pers. comm.).
Northern Leopard Frog <i>Rana pipiens</i>	Red	Endangered	Unlikely	Species range not known to occur near the park and there is no suitable habitat. Highly aquatic species restricted to the Creston Valley.
Coeur d'Alene Salamander <i>Plethodon idahoensis</i>		Special Concern	Unlikely	No suitable habitat on site. Associated with small seeps, waterfall splash zones and riparian areas of streams, especially in areas with fissured bedrock. Nearest records are from the east shore of Kootenay Lake.
Reptiles				
Western Painted Turtle Intermountain - Rocky Mountain Population <i>Chrysemys picta pop. 2</i>	Blue	Special Concern	Possible	Highly aquatic and occurs in slow-moving, shallow lakes, ponds, and streams. Adults likely occur within the park intermittently, especially in foreshore <i>Pond</i> habitat class (Figure 2b) habitat created seasonally by receding water levels.
Western Skink <i>Plestiodon skiltonianus</i>	Blue	Special Concern	Unlikely	No suitable habitat on site. Found in open, rocky areas with sandy soil and good sun exposure. Species not known to occur on the south shore of the West Arm of Kootenay Lake.
Rubber Boa <i>Charina bottae</i>		Special Concern	Possible	Habitat quality for this species is low on site. Often occurs in open, shrubby, rocky habitat with good sun exposure. Requires rocks and/or coarse woody debris for cover.
Birds				
Western Grebe <i>Aechmophorus occidentalis</i>	Red		Possible	May intermittently occur on lake off shore of park. Only known local breeding site is within the Creston Valley Wildlife Management Area.
Double-crested Cormorant <i>Phalacrocorax auritus</i>	Blue		Possible	May intermittently occur on lake off shore of park. Only known local breeding site is within the Creston Valley Wildlife Management Area.

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Species	BC Status	Federal Status	Potential occurrence	Species notes/concern within the park
Great Blue Heron <i>Ardea herodias herodias</i>	Blue		Likely	Colonial breeder. Forages in shallow areas along lakes and rivers. Nearest known breeding sites are at Proctor and Balfour (Marlene Machmer, pers. comm.). Likely forages along foreshore area. Very sensitive to disturbance.
American Bittern <i>Botaurus lentiginosus</i>	Blue		Unlikely	Requires wetland habitat with abundant emergent vegetation such as reeds and cattails. No suitable habitat within the park. Occurs in the Creston Valley.
Prairie Falcon <i>Falco mexicanus</i>	Red		Unlikely	Associated with cliff habitat near grasslands. Very rare in our area.
Long-billed Curlew <i>Numenius americanus</i>	Blue	Special Concern	Unlikely	Associated with grassland habitat. Occurs in the East Kootenay trench.
Forster's Tern <i>Sterna forsteri</i>	Red		Unlikely	No known to occur in near the park. Nearest known breeding site is within the Creston Valley Wildlife Management Area.
Short-eared Owl <i>Asio flammeus</i>	Blue	Special Concern	Possible	Grassland, ground-nesting species. May forage within the open meadow habitat of the park occasionally. Occurs in the Creston Valley.
Western Screech-Owl <i>Megascops kennicottii macfarlanei</i>	Red	Endangered	Possible	Secondary cavity nester; requires riparian habitat dominated by large-diameter old (wildlife trees decay class 2 to 6) trees, preferably cottonwood and trembling aspen. Breeds in the Creston Valley. The most suitable habitat within the park is within the <i>Cottonwood</i> habitat class near the park entrance.
Flammulated Owl <i>Otus flammeolus</i>	Blue	Special Concern	Unlikely	Associated with dry western larch and ponderosa pine forests with grassy openings. Requires large woodpecker cavities for nesting. No suitable nesting habitat noted on site. Nearest occurrence record is from the Creston area.
Common Nighthawk <i>Chordeiles minor</i>		Threatened	Possible	Associated with dry, open habitat. Wide ranging aerial forager. Ground nester in forest openings with exposes soil, gravel or rock—often located on a promontory. May forage over park.
Lewis's Woodpecker <i>Melanerpes lewis</i>	Red	Threatened	Possible	Associated with open, fire-maintained mature ponderosa pine forests or riparian cottonwood habitat. Although this is a rare species in the West Kootenay, there is good habitat for this species within the Cottonwood and Cottonwood Shrubs habitat classes (Figure 2a). May rarely use black cottonwood wildlife trees for perching or nesting.
Olive-sided Flycatcher <i>Contopus cooperi</i>	Blue	Threatened	Possible	Mainly associated with coniferous forest habitat. Usually occurs at higher elevations in our area.
Barn Swallow <i>Hirundo rustica</i>	Blue		Occurs	Forages widely over a variety of habitat types. Breeds in barns and out buildings with open access. Individuals were observed foraging over park. No suitable breeding habitat occurs in the park.
Yellow-breasted Chat <i>Icteria virens</i>	Red	Endangered	Possible	Rare species in the West Kootenay. Associated with dense riparian shrub thickets. May occur on site within the <i>Hawthorn</i> and <i>Cottonwood Shrub</i> habitat classes (Figure 2a).
Bobolink <i>Dolichonyx oryzivorus</i>	Blue	Threatened	Possible	Breeds in unmowed, tall grass fields. Rare breeder in our areas. May occur in Field habitat class (Figure 2a).

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Species	BC Status	Federal Status	Potential occurrence	Species notes/concern within the park
Mammals				
Red-tailed Chipmunk <i>Neotamias ruficaudus simulans</i>	Blue		Unlikely	Known from several locations in the south Selkirk Mountains between Trail and Creston. Impossible to identify in the field. Associated with mixed coniferous forests with complex ground structure such as rock, downed wood, and low woody vegetation for cover. Habitat quality within the park is estimated to be low.
Northern Pocket Gopher <i>Thomomys talpoides segregatus</i>	Red		Unlikely	Not known to occur near park. Subspecies is restricted to valley bottom habitat near Creston.
Townsend's Big-eared Bat <i>Corynorhinus townsendii</i>	Blue		Possible	Foraging habitat includes wetlands; often roosts and hibernates in mines and caves, usually in drier habitat. Occurs in the Creston Valley.
Fringed Myotis <i>Myotis thysanodes</i>	Blue		Possible	Associated with caves, rock crevices, buildings and other such structures for roosting and hibernating. Has been recorded in the Creston Valley.
Wolverine <i>Gulo gulo luscus</i>	Blue	Special Concern	Unlikely	Occurs predominately in subalpine and alpine habitat; avoids human settlement and highly disturbed environments.
Fisher <i>Martes pennanti</i>	Blue		Unlikely	Believed extirpated from areas of southeast British Columbia. Prefers older forests and riparian areas.
American Badger <i>Taxidea taxus</i>	Red	Endangered	Unlikely	Generally considered extirpated in the West Kootenay. Associated with grassland habitat in the East Kootenay trench and Okanagan Valley. Extremely rare visitor to the Creston Valley.
Grizzly Bear <i>Ursus arctos</i>	Blue	Special Concern	Possible	Wide-ranging species; generally avoids human settlement and highly disturbed environments. Individuals may occasionally pass through the area.
Caribou (southern population) <i>Rangifer tarandus</i>	Red	Threatened	Possible	This species occurs mainly in higher elevation conifer forest habitat but individuals have been recorded in the area.
Bighorn Sheep <i>Ovis canadensis</i>	Blue		Unlikely	The park is outside of known range of this species. Associated with south-facing, rocky terrain systems.

4.0 Discussion

4.1 Plants

A large number of plant species (158 in total) were identified in the park and foreshore areas. The high diversity of plants corresponds to the diversity of sites and associated plant communities in the riparian area along the West Arm in combination with the land use history of the area.

Due to the proximity of the project area to the West Arm and the Harrop Creek delta, past lake and creek flooding events have resulted in the deposition of a variety of clayey to sandy substrates and the formation of wet to dry microsites with very poor to rapid drainage. The combinations of substrate/soil texture, soil drainage and site moisture are reflected in a variety of different sites and a diversity of plant communities and species that have adapted to those sites.

Historic land use including clearing, seeding of cleared land and cattle grazing has also had a significant influence on the vegetation of the project area. Land clearing and seeding to create pasture has introduced a number of agronomic grass species to the area and cattle grazing has resulted in the introduction of a variety of exotic (non-native) plants including a number of invasive weeds. Other weedy species have also been introduced in the vicinity of the horse riding arena.

4.2 Special Natural Features

Within the NEZ of the park, the shallow marsh/ephemeral pond and surrounding wet meadow area flood during the spring freshet and provide habitat for waterfowl. Large old growth cottonwood trees and snags with the *Cottonwood* habitat class provide perching sites for bald eagles and nesting sites for cavity-nesting birds. Both the cottonwood stands and dense hawthorn thickets provide hiding, resting and thermal cover areas for deer as well as nesting and feeding habitat for birds. Figure 3 shows the ephemeral pond surrounded by moist to wet meadows with a cottonwood stand and hawthorn thicket in the background.



Figure 3. The ephemeral pond and surrounding wet meadow in the NEZ of the park are important to mallard ducks rearing their young in the late spring to mid summer.

Within the foreshore area, special natural features include the shallow ponds and associated mudflats, willow thickets, marshes and beaches. The ponds and mudflats provide important habitat for shorebirds such as great blue herons, dabbling ducks, juvenile fish and amphibians. These areas have provided breeding habitat for the western toad. Willow thickets provide nesting and feeding habitat for a variety of birds and the sedge marshes provide important wetland habitat. Figure 4 shows some of the important natural features of the foreshore.

The Harrop Point foreshore contains a diversity of habitats that are representative of dwindling riparian ecosystems along the west arm of Kootenay Lake. The area is significant because much of the shoreline habitat adjacent to the West Arm has already been lost or alienated due to private land development. Harrop Point foreshore habitats are relatively undisturbed at this time however they are highly sensitive to disturbance by ATV use and vulnerable to further negative impacts by development activities. As a result, this area would be a good candidate for protection.



Figure 4. Important natural features of the Harrop Point foreshore area include the shallow pond, mudflat, willow thickets bordering the mudflat and the beach in the background. Western toads have been recorded breeding in this area.

4.3 Invasive Plants

An "invasive plant" is defined as any invasive alien plant species that has the potential to pose undesirable or detrimental impacts on humans, animals or ecosystems. Invasive plants have the capacity to establish quickly and easily on both disturbed and undisturbed sites, and can cause widespread negative economic, social and environmental impacts (Invasive Plant Council of B.C. 2011).

Eight of the 18 invasive species are also legislated as provincially or regionally noxious under the B.C. Weed Control Act of 1999 (Ralph et al, 2007). A noxious weed is defined as an invasive plant species that has been designated by a government agency as one that is injurious to agricultural and/or horticultural crops, natural habitats and/or ecosystems, and humans and/or livestock.

Most of the invasive plant species identified in Table 3 were found to be dominant (> 7% cover) or associate (1-7% cover) species in at least one habitat type. The most significant infestations occur mainly in the park portion of the project area. Figure 5 shows the distribution of habitat types in the area that have invasive plants as dominants or associates in the plant communities.

Widespread Invasive Plants

Four invasive species that were observed to be dominant or associated in numerous habitat types of the park area are Canada thistle, common hound's-tongue, quackgrass and reed canarygrass. Each species is discussed below.

Canada thistle is designated as a noxious weed in all parts of B.C. and is the most widespread invasive plant in the park. It typically occurs in disturbed areas such as overgrazed pastures

and old fields and can invade natural meadows from disturbed sites. The plant is capable of crowding out and replacing native grasses and forbs, in part by releasing toxic chemicals into the soil that inhibit the growth of nearby plants, thereby decreasing species diversity in an area. The species thrives in open moist sites with fertile, fine-textured soils and has spread throughout the fenced old pasture area in the LRZ and NEZ portions of the park where past cattle grazing has caused site disturbance. The species is a dominant or associate species in habitat types grouped into the *Field* habitat class. Moderate to heavy infestations occur in the *Kentucky bluegrass-Timothy field*, the *Kentucky bluegrass – Quackgrass field* and the *Trench* habitat types where site conditions are most favourable for growth. The heaviest infestations are in the north end of the *Kentucky bluegrass – Quackgrass field* type that extends into the NEZ portion of the park and in the southeast corner of the LRZ. Figure 6 shows a heavy infestation near the southern boundary of the NEZ area. The thistle is currently not a problem in the riding cub portion of the LRZ where cattle were excluded.

Canada thistle invades areas mostly by laterally spreading rhizomes and can rapidly take over productive pastureland. It is very difficult to control due to its deep root stock that can penetrate the substrate to a depth of 2-3 m (Polster 2009). The plant also has the ability to survive mowing and herbicide treatments and it has no effective biological control. The most effective control of the weed includes the integrated use of mowing, fertilization with nitrogen, intensive cultivation, herbicides and seeding of competitive species to deplete the aggressive root system (Ministry of Agriculture, Food and Fisheries 2002). The use of herbicides to control the plant may be severely restricted in the project area due to the proximity of infested areas to sensitive wet sites and wetlands as well as recreational use in the park.



Figure 5. Areas within the project area with invasive plants as dominant or associate species in the plant communities.



Figure 6. A heavy infestation of Canada thistle in flower in the *Kentucky bluegrass – Quackgrass field* habitat type that extends into the southern part of the NEZ.

Common hound's-tongue is another provincially noxious weed species that decreases forage availability to grazing animals on rangelands and pastures. On disturbed sites, it colonizes easily and can quickly form dense monocultures. The plant reproduces and is spread by barbed seeds that readily attach to clothing and the hair of livestock, horses, dogs and wildlife. It can be toxic to livestock and horses and therefore can be a problem in infested hay, but standing plants are seldom grazed (Ministry of Agriculture, Food and Fisheries 2002). The species is tolerant of some shade and was observed to be an associate species in habitat types of the *Hawthorn* and *Cottonwood* habitat classes (Figure 7). It is also an associate species in the disturbed *Trench* habitat type.



Figure 7. The noxious weed common hound's-tongue thriving in a small opening within a hawthorn thicket

The moderate infestations of hound's-tongue in the park could be controlled by using a variety of management techniques. Hand pulling can be an effective treatment for small populations. The rosettes of first year plants can be treated with herbicides and mowing will reduce seed production and may level mature plants. By repeating the treatments of hand pulling, herbicide application and mowing, the seed bank will be exhausted (Ministry of Agriculture, Food and Fisheries 2002). Biological control may also have some potential for controlling hound's-tongue. It is also important to clean clothing, dogs and horses after travelling through infested areas to prevent the spread of seeds.

Quackgrass is an invasive species designated as noxious in the Peace River region of B.C. It reduces production in crops, rangeland and pasture. The plant is found on disturbed, open or partially shaded sites and prefers moist to wet, fertile soils. It is an aggressive species that quickly invades and can take over suitable sites when it is introduced into an area either as a contaminant of agronomic seed mixes or in livestock feed. It spreads mainly by underground rhizomes and can form thick mats of vegetation that exclude other species. Quackgrass was found to be a dominant to associate species in the moist habitat types of the *Field* habitat class and in the *Wet Meadow* habitat class. Dense patches of the species were observed in the *Kentucky bluegrass – Quackgrass field*, *Fescue – Kentucky bluegrass field-2*, *Quackgrass – Fescue field* and the *Fowl bluegrass wet meadow* habitat types.

Once quackgrass is established in an area, it is difficult to control as broken rhizome segments are able to quickly regenerate and produce new plants. The entire root stock mass must be killed in order to eradicate an infestation so elimination is unlikely. The main strategy for controlling quackgrass is to exhaust the root reserves by repeated mowing that also eliminates seed production (Polster 2009). Combining mowing or burning to reduce plant vigour with herbicide application may be the most effective way to control the species (Ministry of Agriculture, Food and Fisheries 2002). After depleting the root reserves, other perennial species can be seeded early in the spring to compete with the quackgrass.

Reed canarygrass is an invasive species of wet habitats including wetlands, moist to wet meadows and seasonally wet sites. Almost any moist, fertile habitat is suitable for the species. It is a long-lived, sod-forming, deep-rooted perennial that reproduced by both seed and underground rhizomes. Both native and introduced populations occur in B.C. but the introduced Eurasian variety is considered more aggressive. It is believed that the vast majority of reed canarygrass in North America is derived from the Eurasian ecotype that has become naturalized in temperate regions of the continent (Wisconsin Department of Natural Resources, 2009). The plant spreads within sites by creeping rhizomes and forms dense mats of vegetation that displace native species. Infestations are usually associated with disturbances such as land clearing, ditching or progressive flooding of wet sites. The plants often invade sites by producing an abundance of fertile seeds that can be dispersed and deposited by floodwaters. The grass has also been widely planted for forage and erosion control.

Reed canarygrass is well established in moist to wet habitat types of the *Wet Meadow* habitat class. It is also an associate species in habitat types of the *Field*, *Hawthorn*, *Cottonwood* and *Trench* habitat classes. Figure 8 shows reed canarygrass as a dominant species in the *Fowl Bluegrass wet meadow* type surrounding the ephemeral pond in the NEZ.



Figure 8. A patch of reed canarygrass in the *Fowl Bluegrass wet meadow* type forms a dense mat of vegetation that excludes other species from the site.

The invasive grass is sensitive to regular cutting. Therefore, regular frequent cutting is the most effective way to control the species and three cuts a year (early June, late July and late September) have shown the best results (Polster 2009). Late spring or late autumn burning can also weaken reed canarygrass stands. Attempts to control this species could be time consuming and costly due to the aggressive and resilient nature of the introduced variety.

Common horsetail and Kentucky bluegrass are two native plants that are considered to be invasive in the province due to their ability to aggressively spread in disturbed areas. The two species are widespread in the project area and no management treatments are considered for the native plants. The nuisance species ribwort plantain occurs in the habitat types of the *Moist*

Meadow, *Wet Meadow* and *Field* habitat classes. It does not outcompete perennial grasses and forbs on the infested sites, so controlling the species is considered a low priority.

Limited Extent Invasive Plants

Other noxious weeds that were observed to be either associate or dominant species in habitat types include spotted knapweed, orange-red king devil, oxeye daisy and common tansy. These species also have the potential to spread rapidly throughout the project area. Currently, the four species are restricted in distribution to only a few habitat classes including the *Disturbed Field*, *Trench* and *Fescue moist meadow*. Weed infestations and potential treatments of the invasive plants in those types will be discussed in the following section. Common burdock is another regionally noxious weed identified in the park area but it was found in only very small amounts.

Other invasive weeds not designated as noxious that were found in the park include bull thistle, curled dock and yellow hawkweed. Bull thistle could be controlled by using a biological control agent and/or by mowing at the same time as when treatments are implemented to control Canada thistle and common hound's-tongue. Curled dock and yellow hawkweed are limited in extent and could be controlled by hand-pulling and digging techniques.

Smooth brome and Canada bluegrass, considered moderate and minor upland invasive species, were only found in small amounts in isolated areas and currently are not considered a problem in the area.

Weed Hotspots in the Harrop Portion

Within the *Disturbed Field* habitat class the *Clover – Knapweed disturbed field* habitat type is the highly disturbed area surrounding the horse riding arena. The type includes a number of invasive and other exotic plant species. Spotted knapweed, a provincially noxious weed, is an associate to dominant species in the type. The area also contains minor amounts of the regionally noxious species oxeye daisy and common tansy and the invasive species common plantain, great mullein and hoary alyssum.

Due to the past disturbance associated with the construction of the riding arena, the area has become favorable for the proliferation of weeds and is a major source for the spread of invasive species throughout the park. The area requires immediate attention to control the weeds and is a good candidate for habitat restoration to prevent further weed infestations. At the very least, the invasive plants should be eradicated from the site. The spotted knapweed and other invasive plants could likely be removed by hand-pulling and digging treatments due to the small size of the area.

The *Mowed Lawn* habitat type is the other disturbed site within the *Disturbed Field* habitat class and includes the area of lawn south of the riding arena. Four exotic weeds are associate species within the type including the noxious weed common tansy, the two invasive species hoary alyssum and great mullein and the weedy species hare's-foot clover. Due to the limited extent of the area, the invasive weeds could also be controlled by hand-pulling and digging followed by seeding of perennial grasses on the disturbed areas and continued mowing.

The *Trench* habitat type is another highly disturbed area with exposed mineral soil that provides favorable conditions for the establishment and spread of invasive plant species. Canada thistle and common hound's-tongue are two noxious weeds that have invaded the site. Other invasive species that are common in the trench are reed canarygrass, curled dock, common plantain and marsh cudweed. This site could be mechanically cleared of weeds using hand-pulling and digging techniques and then seeded with perennial grasses and forbs to establish cover on the bare mineral soil and compete with the seed bank of invasive species still in the soil.

The *Fescue moist meadow* type within the *Moist Meadow* habitat class contains an area in the northwest part of the NEZ that is infested with two noxious weeds including orange-red king devil and oxeye daisy. The two species occur in the FE2 polygon (17) and oxeye daisy is the more abundant of the two. The weeds could be eradicated in this area by hand-pulling and digging. Oxeye daisy was also observed to be abundant on the private land adjacent to the northwest corner of the NEZ.

Weed Hotspots in the Harrop Point Foreshore Area

Weed infestations in the foreshore area are much more restricted in distribution than in the Harrop portion of Sunshine Bay Park. Quackgrass and the nuisance species ribwort plantain are the two dominant species in the *Quackgrass – Fescue field* habitat type within the *Field* habitat class. Canada thistle, reed canarygrass and the invasive plant sheep sorrel are also associate species in this type.

Methods for controlling quackgrass and Canada thistle were described previously for the park area. For managing sheep sorrel, there are two potential strategies. If the infestation is limited in extent, the plants can be controlled by hand-pulling young plants, applying herbicides to mature plants and seeding disturbed area to perennial grasses and forbs to provide cover and competition against the weed (Ministry of Agriculture, Food and Fisheries 2002). However, herbicide treatment would likely not be acceptable in the type due to its close proximity to the West Arm. If the weed is distributed throughout the plant community, repeated and frequent removal of the above ground growth for one or more seasons by cultivation to eventually starve the roots can be effective in controlling the larger infestations.

The *Quackgrass – Fescue field* habitat type is only a small portion of the much larger field area located on the private property to the south of the foreshore area. Any attempt at controlling quackgrass, reed canarygrass and/or Canada thistle in the type may not be successful in the long term unless the entire open field area to the south is also treated to control those invasive species.

Reed canarygrass is the dominant species in the *Reed canarygrass moist meadow* habitat type within the *Wet Meadow* habitat class. The type occurs in polygon RC4 (21) in the northwest part of the foreshore area. As was mentioned before, attempts to control reed canarygrass in the project area may not be worth the effort.

Yellow flag is a wetland invasive species that was found in the *Sedge – Hairgrass shallow marsh* type (Figure 9). Only one small clump of the plant was identified in the type but the species has the potential to form dense stands that can displace native wetland vegetation. It propagates by rhizomes, vegetative fragments and seeds which all can be dispersed by water, so it has the potential to spread rapidly. Once large dense stands are established, the species is difficult to eradicate. The best management strategy is to identify yellow flag patches early when they are small and eliminate them by pulling the roots (Polster 2009).

Minor amounts of Canada thistle were also observed in a mudflat type, a shallow marsh type and the *Cottonwood shrubs* habitat type. This is a concern because the noxious weed is tolerant of a wide range of soil moisture conditions so it has the potential to spread in those types and invade other surrounding habitats in the foreshore area.

Other weed species that were observed in minor amounts in habitat types of the foreshore include the regionally noxious species oxeye daisy and the invasive species curled dock, bull thistle and marsh cudweed. Plants of those species could be removed by hand-pulling and digging as part of a weed control program for the project area.



Figure 9. One clump of the wetland invasive species yellow flag was found in the *Sedge – Hairgrass shallow marsh* type located east of the central pond in the foreshore area.

4.4 Toxic Plants

Toxic plant species identified in the project area are both native and exotic species (Table 4). Many of the toxic species cause poisoning only in livestock (cattle, sheep, pigs) so those species are no longer an issue since cattle grazing was discontinued in the park area in 2009. Some of the species are also toxic to horses which is more of a concern due to the horse riding activities in the park and foreshore area.

The provincially noxious weed comon hound's-tongue can cause fatal poisoning if ingested by horses, however standing plants are rarely grazed. The weed is more of a problem in contaminated hay.

Common horsetail is a widespread native species growing on moist to wet sites in the park and foreshore area. It can cause non-fatal poisoning in horses when ingested but live plants are usually not grazed. The native species marsh horsetail is also non-fatally toxic to horses. It is uncommon in the area and the lives stems would also be avoided.

Hare's-foot clover is a weedy introduced species that can cause photosensitivity, liver damage and nitrate poisoning in horses if ingested. The plant is an associate species in the *Disturbed Field* habitat type surrounding the riding arena and therefore is a concern due to its close proximity to the area heavily used by horses. The weed could be removed at the same time as when the invasive weeds on the site are treated.

White clover is an introduced species that is well established in the moist meadows surrounding the shallow marsh/ephemeral pond and along the north part of the NEZ. Overconsumption of this plant by horses can cause bloating, hoof disease and non-fatal poisoning by cyanogenic compounds. Grazing in the vicinity of the shallow marsh/ephemeral pond and in the moist meadow areas to the northeast can be avoided by restricting horseback riding to the designated trail through the NEZ.

There are plant species in the park that are also toxic to humans. The seeds of the sweet cherry fruit may be fatally toxic if ingested and there are sweet cherry trees scattered throughout the park. The main concern is children unknowingly ingesting the seeds and this can be avoided through education. A small patch of the introduced shrub common privet occurs in the *Cottonwood* type. The fruit of the plant is poisonous if ingested however no fruit were observed and the low shrubs will likely not produce fruit in the shade under the cottonwood canopy in addition to browsing by wildlife. Ingested fruit of the native snowberry shrub can cause non-fatal poisoning in humans including dermatitis and phytophotosensitivity. Common snowberry is an associate to dominant species in the plant communities of the *Hawthorn* and *Cottonwood* habitat classes so the possibility of an accidental poisoning exists but can be avoided by educating the public.

Common tansy is a regionally noxious weed that can be fatally poisonous to humans if any part of the plant is ingested. The weed is restricted to the two *Disturbed Field* habitat types in the vicinity of the riding arena. This species is of concern because of its proximity to where people may congregate around the riding arena and shed. It would be removed from the area during treatment of invasive plants in the types.

Meadow buttercup is a widespread introduced species that is common to dominant in numerous habitat types of the *Field*, *Moist Meadow*, and *Wet Meadow* habitat classes. Contacting the plant can cause dermatitis in humans. Once again, education is the best solution for avoiding this mildly toxic plant. Lesser spearwort is a native species in the buttercup family that also causes dermatitis. It is less conspicuous than meadow buttercup and is an associate to minor species in the *Marsh*, *Willow*, and *Wet Meadow* habitats in the foreshore area. Contact with the plant would probably occur very infrequently.

Stinging nettle is another native species that causes dermatitis when skin comes in contact with hairs on the stems and leaves of the plants. Very minor amounts of the plant were found in the *Cottonwood – Snowberry stand* near Erindale Road and in a *Hawthorn thicket* type. Due to the small number of plants observed, contact is unlikely and so the species is not really a concern to people using the park and foreshore area.

The wetland invasive species yellow flag, found in the *Sedge – Hairgrass shallow marsh* type, causes dermatitis in humans when skin comes in contact with the plant juices of the roots. Exposure to the toxic juices would only occur during digging of the roots to eradicate the plant and this can be avoided by wearing gloves while handling the roots.

Two other native species observed in the foreshore area that are potentially toxic if ingested by humans are western mountain aster, common in the *Marsh*, *Wet Meadow* and *Willow thicket* habitat types, and wild calla that was observed growing along the perimeter of the ponds. It is unlikely that either species would be eaten by park visitors.

4.5 Vegetation Succession

Harrop Portion

The majority of the park area, dominated by graminoids (grasses, sedges, rushes) and forbs, will likely remain in an early successional stage of development for at least several generations or possibly longer. The moist and fertile cleared land in the park supports lush growth of those species resulting in dense mats of vegetation that inhibit the germination of shrubs on the open sites. Also the cottonwood, hawthorn, rose, and other shrubs that do manage to get established are browsed by deer and other wildlife and were observed to have poor vigour. The

unfavorable conditions for shrub growth on the sites impede succession resulting in a slow advancement from the “herb” stage to the “shrub/herb” stage of structural development.

Aggressive invasive plant species that prefer open site conditions will likely continue to spread in the early successional plant communities of the park. Unless a vegetation management strategy is developed and implemented to control the weeds, Canada thistle and bull thistle infestations will continue to expand in the old pastures of the *Field* habitat class and reed canarygrass and quackgrass may continue to spread in moist to wet meadow types. The provincially noxious weed common hound's-tongue will also spread where it can get established on disturbed soils in open field sites as well as in partially shaded openings of hawthorn and cottonwood stands. Weed infestations in the *Disturbed Field* and *Trench* habitat classes will continue to expand and spread to other types until those disturbed sites are treated for weeds and revegetated. Other minor invasive plant infestations could also expand in the park if not controlled.

Hawthorn thickets and cottonwood stands in the park may slowly expand outward from the perimeters of the habitat classes, but once again, dense graminoid and forb vegetation in the surrounding *Field* and *Moist Meadow* types will inhibit germination and expansion of the shrubs and trees. The dense canopy of the hawthorn thickets also inhibits germination of cottonwood trees in the shaded understory and impedes the succession from the “tall shrub” structural stage to a cottonwood “young forest” stage in a mid seral stage of succession. Cottonwood trees would only likely germinate and get established when a large hawthorn shrub dies and creates a canopy opening. Therefore, succession will proceed very slowly in the park area from old pasture to hawthorn shrub thickets, to young cottonwood stands and eventually to late seral “maturing climax” cottonwood stands.

Old trees and snags within the remnant cottonwood stands will slowly continue to fall down due to blowdown, decay or both, creating canopy openings. Hawthorn and cottonwood shrubs and young trees will fill in the canopy openings and the process of succession will continue. In time, scattered conifers such as western red cedar and hybrid white spruce may eventually become established in the understory of the old cottonwood stands.

Harrop Point Foreshore

Most habitat types in the foreshore area will continue to remain in early stages of succession due to the effects of flooding and unfavorable conditions for tree growth. The mudflats, shallow marshes, willow thickets and wet meadows flood annually resulting in saturated soils that are too wet for trees to become established. *Wet Meadow* habitat classes may eventually succeed from the “herb” to the “shrub/herb” structural stage of development as one wet meadow site was observed to have Sitka willow as an associate species and minor amounts of four other shrub and tree species in the low shrub (<2 m) height class.

The *Cottonwood shrubs* habitat class may eventually develop into a young seral stand of even-aged cottonwood trees >10 m tall in the “pole/sapling” structural stage of development. Succession to that stage may be slow due to the sandy soils with low nutrient availability. The habitat type might develop to the mid seral “young forest” structural stage, but it's doubtful that the wet sandy soils could support large cottonwood trees of later successional forests.

As for similar habitat types in the park area, the *Field* and *Reed canarygrass* types in the northwest part of the foreshore area have dense graminoid vegetation that inhibits the establishment of shrubs. Minor amounts of Sitka willow, hawthorn and sweetbriar rose in the low shrub stage of development were observed in the *Field* class, so succession to the “shrub/herb” structural stage and then to mid seral riparian forests is proceeding very slowly. Invasive species in the *Field* habitat class will continue to increase in dominance, altering the vegetation composition and crowding out less competitive agronomic and native species on the

site. Weed species may also spread from the *Field* class and adjacent private land into the nearby *Cottonwood shrubs*, *shallow marshes* and *wet meadow* habitat classes.

Beach habitat classes will remain in non-vegetated or pioneer to young seral stages of succession with herb and shrub vegetation due to the annual disturbances of flooding and wave action in combination with droughty, rapidly drained sands when the flood waters recede. Succession on the beach in the southeast part of the foreshore area has been temporarily arrested due to clearing of vegetation by disk harrowing. The same scenario is occurring in the open shrub and wet meadow habitat types to the east of the disturbed beach.

4.6 Species at Risk

The western toad, barn swallow and great blue heron are the only species at risk known to occur within the park. The biology, habitat requirements and management considerations for two of these species are discussed below. The barn swallow is not included in this discussion because the species' association with the park is limited to aerial foraging and is not likely to be impacted by management activities within the park.

Western Toad

The western toad occurs in forested habitat over a wide range of elevations. The species is known to breed in the foreshore area of Sunshine Bay Park. The species is predominantly terrestrial but requires standing or slowly moving water less than 50cm deep for breeding (Corkran and Thoms 1996). Adults spend most of their time under cover and important terrestrial habitat features include coarse woody debris and mammal burrows. During dry periods, adults may be found near streams or wetlands. Individuals tend to be active nocturnally, especially during rainy periods and breeding occurs in ephemeral and permanent wetlands including lakes, ponds and flooded meadows. In our area, breeding occurs in April and May, tadpoles may be present in ponds from June to August and metamorphs disperse from the wetland from late June through August.

Management Considerations

- Protect foreshore and ponds habitat.
- Protect shallow water and associated vegetation from disturbance. These features provide habitat for breeding and cover.
- Avoid altering hydrology patterns which may affect water levels in permanent and ephemeral bodies of water.
- If breeding locations are found, do not disturb during breeding season (April through August).

Great Blue Heron

This species usually forages for aquatic prey in shallow water (edges) of lakes, rivers, streams, marshes, ponds etc. but may also hunt in open meadow habitat (MWLAP 2004), often taking small mammals. Great blue heron pairs may nest singly or colonies of up to 400 nests. Nests are located in mature stands of broadleaf, coniferous or mixed forest (Campbell et al. 1990). Large colonies are relatively easy to detect but smaller colonies and single nesting pairs are much more difficult to find. Colonies may be occupied year after year. In B.C., breeding occurs April through August (Campbell et al. 1990). Foraging and nesting birds are very sensitive to

disturbance and harassment. Occurrence of this species within the park is limited to individuals foraging along the lake foreshore habitat (Marlene Machmer).

Management Considerations

- Protect foreshore wetland habitat which is used for foraging.
- Prevent disturbance of foraging individuals by recreation activities and domestic dogs. This will also benefit other wildlife species using the area.

4.7 Sensitive Habitats

Habitat types that are environmentally sensitive to disturbance in the area are those types with fine textured soils and/or excess soil moisture. Wet sites with high water tables and saturated soils are sensitive to rutting by ATVs and horses. On wet sites that also have fine clayey soils, the compaction of clays by horse and ATV traffic would result in reduced soil porosity, water ponding and reduced productivity. Wet habitats sensitive to disturbance in the NEZ include the shallow marsh/ephemeral pond, the surrounding moist to wet meadows, the reed canarygrass types and the *Baltic rush* type. Within the foreshore area, the ponds, mudflats, shallow marshes, wet meadows, willow types, *Cottonwood – Alder* stand and *Cottonwood Shrubs* type are all ecologically sensitive to disturbance. Figure 10 shows the distribution of habitat types in the park and foreshore area that are sensitive to disturbance by compaction and/or rutting.

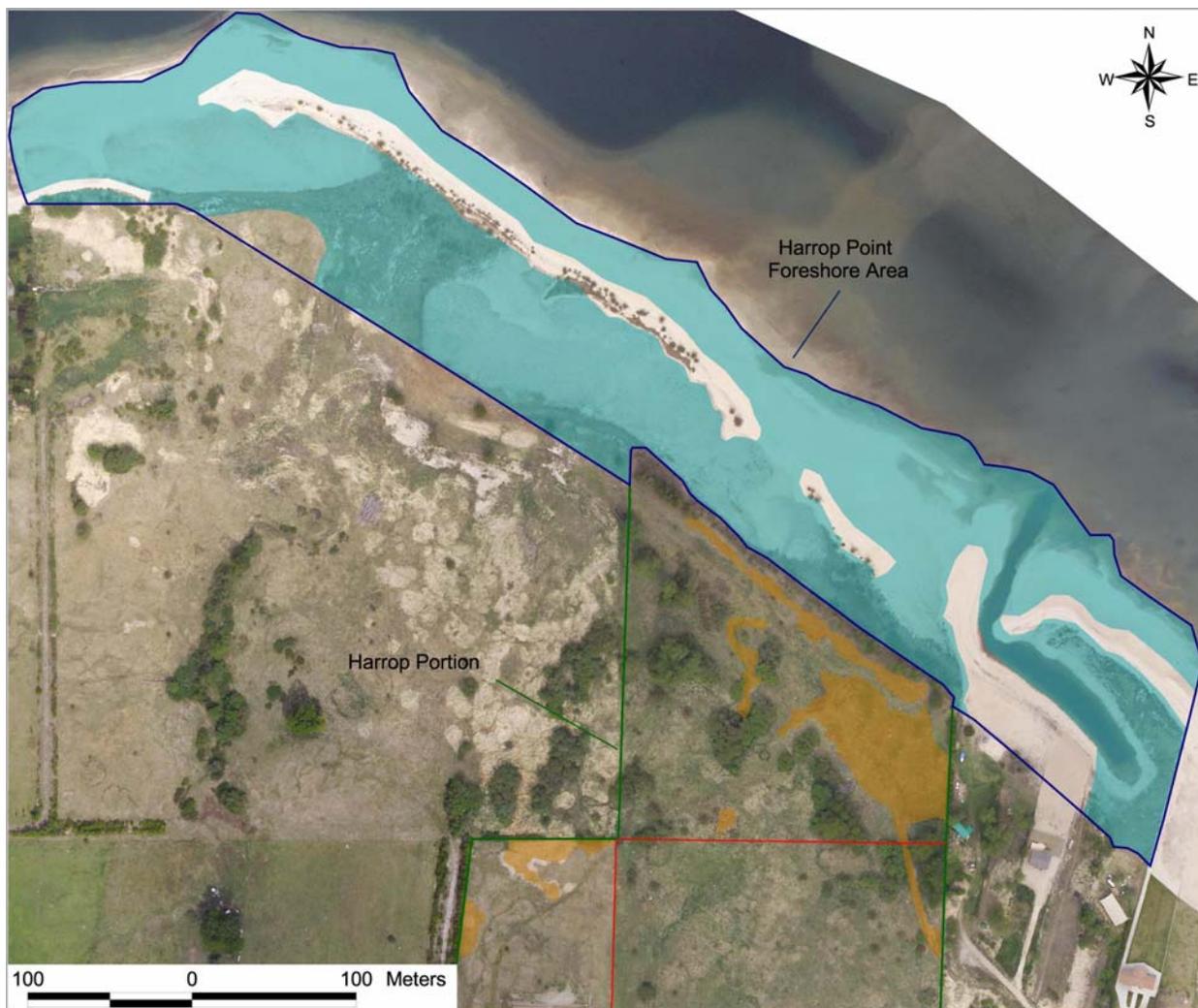


Figure 10. Habitat types in the park and foreshore area that are environmentally sensitive to disturbance by recreational activities due to compaction and/or rutting on fine textured and/or saturated soils of wet sites.

4.8 Restoration and Enhancement

Habitat classes in the project area that may be candidates for restoration include the *Disturbed Field* class that surrounds the horse riding arena, the *Trench* class in the northeast corner of the LRZ and the *Moist & Wet Meadow* classes surrounding the shallow marsh/ephemeral pond area in the NEZ part of the park (Figures 2a & b).

Disturbed Field Habitat Class

The first step in restoring the *Clover – Knapweed disturbed field* type is to rid the area of noxious weeds and other introduced species that account for most of the vegetation cover on the site. The exotic species could be removed by manual hand-pulling and digging or by a mechanical treatment. Due to the limited size of the area, it may be feasible to scrape the site to remove the top layer of gravelly soil that is contaminated with seeds of the weedy plant species. The area could then be covered with a layer of clean topsoil and seeded immediately with an agronomic mix of perennial grasses to revegetate the site. The new crop would provide competition for exotic species that may continue to colonize the area surrounding the horse arena. After restoring the site, monitoring and manual removal of exotic species could be continued on an annual basis.

Trench Habitat Class

After manual or mechanical removal of the numerous invasive and other introduced plant species from the trench area, the site could be seeded with perennial grasses and forbs to compete with the exotic plant seeds that are still in the soil. The site may have to be treated by hand pulling and digging weeds for consecutive years in order to eventually exhaust the seed bank.

Wet Meadow Habitat Classes in the NEZ

The plant communities of the moist to wet meadows surrounding the small marsh/ephemeral pond area in the NEZ are highly altered by exotic species due to past disturbances. The fence that was recently extended along the south boundary of the NEZ redirects pedestrian and horse traffic to the southeast corner of the zone and eliminates further disturbance to the area thereby facilitating the natural recovery of native vegetation in the meadows. Currently, the *Fowl bluegrass wet meadow* contains significant patches of the invasive weeds quackgrass and reed canarygrass. The slightly drier *Redtop – Timothy moist meadow* type has high covers of the introduced species white clover and meadow buttercup and the native invasive species Kentucky bluegrass (Figure 11). Reed canarygrass and the nuisance species ribwort plantain are also associate species in the moist meadow.

Unfortunately, the introduced species in both meadow types as well as the native invasive species Kentucky bluegrass are well established on the sites and will not be easy to control in any attempt to restore the habitats to native plant communities. As a result, restoration initiatives to facilitate the recovery of the disturbed meadow habitats have a lower priority than those for the other two candidate areas.

In the *Fowl bluegrass wet meadow*, quackgrass and reed canarygrass could be controlled by repeated mowing but this treatment could only be carried out in the late summer and fall due to the ecological sensitivity of the site with fine-textured and saturated soils. Another option that could be investigated for restoring the both the wet and moist meadows to native vegetation is planting the areas with native grass, sedge and forb seedlings grown in greenhouses from collected seed. Research would be required to identify native species in the region that are most suited for growing on the moist to wet meadow sites. If planted seedlings could survive and compete with the introduced species, this approach would facilitate the restoration of habitats to native graminoid and forb species. If the management goal is to facilitate restoration of the area to later stages of succession, then native shrub and cottonwood plugs or cuttings could be planted to advance succession. This might be the best approach to outcompete the introduced grasses and forbs that are dominant in the early seral stages of the open meadows and it might also enhance the habitat for other species.

Nest Boxes

A nest box program would increase the habitat quality for cavity nesting wildlife, including owls, woodpeckers and ducks.



Figure 11. The Redtop – Timothy moist meadow habitat type to the southeast of the ephemeral pond in the NEZ is dominated by the introduced species white clover and meadow buttercup.

4.9 Recreation

The Harrop Portion of Sunshine Bay Park and the adjacent foreshore area provide good opportunities for park visitors to enjoy the special features in the park. However, the area contains many sites that are sensitive to disturbance by recreational users. Wet sites are sensitive to rutting as well as compaction of fine-textured soils by horse and ATV traffic. Figure 12 shows some of the wet foreshore habitat types that are easily disturbed by park visitors. There is also the potential for horses, ATVs, pedestrians and dogs to spread the seeds of invasive plants into areas that currently are free of weed infestations.



Figure 12. Wet foreshore habitats that are ecologically sensitive to disturbance by recreational activities include the shallow pond, mudflat, shallow marsh & wet meadow types bordering the mudflat, and the tall willow thicket adjacent to the pine in the background.

Visitors to the park can disturb wildlife such as waterfowl and other birds that are nesting and feeding in the area. For example, in the Natural Environment Zone (NEZ), mallard ducks that use the flooded shallow marsh and surrounding wet meadows to raise their young in the early summer are sensitive to disturbance by people during that time of year. Blue-listed great blue herons are known to forage in the foreshore area (Marlene Machmer, pers. comm.) and are quite sensitive to disturbance. Perching bald eagles and cavity-nesting birds such as flickers may also be disturbed by park visitors recreating in the NEZ. Free roaming dogs that chase wildlife and waterfowl are also a concern in the area.

Recreational activities can also disturb waterfowl, shorebirds, juvenile fish, amphibians and other wildlife that use the pond, mudflat and shallow marsh habitats of the foreshore area. One of the main issues with respect to protecting the natural environment in the foreshore area is motorized vehicle use. ATV tracks observed in the mudflat and pond habitats indicate that the machines are being used irresponsibly in the sensitive areas (Figure 13) and this is a regular occurrence (Kurt Dehnel, pers. comm.).



Figure 13. Rutting soil disturbance caused by ATV use on saturated soils of the mudflat

4.10 Potential Threats to Natural Values

In summary, the potential threats to natural values in the park and foreshore area include the following:

- Rutting and compaction soil disturbance on saturated soils of wet riparian habitats caused by ATV and horse traffic
- Disturbance to wildlife by park visitors recreating in sensitive habitats or at times of the year when wildlife species are particularly sensitive to human presence
- Continued rapid spread of invasive weeds throughout the area
- Spread of exotic and invasive plant species into relatively undisturbed habitats by horses, ATVs, pedestrians and dogs
- Disturbance and loss of native riparian vegetation due to the practice of clearing vegetation on beaches and in other shoreline habitat types

Private property land use issues that threaten the natural values of the project area are summarized below.

- The large open field on private property south of the northwest part of the foreshore area may be a source of invasive plants that can continue to spread into both the park and foreshore habitats. For example, an infestation of the regionally noxious weed oxeye daisy was observed on the private land adjacent to the northwest corner of the NEZ. In order to control invasive plant species in the project area, it may be necessary to also treat weeds on the adjacent private land. The BC Weed Control Act imposes a duty on all land occupiers to control designated noxious plants (Ralph et al 2007).

- Clearing of native shrub and herb vegetation on beaches and in open shrub and wet meadow habitats is being carried out by landowners on adjacent private properties in the southeast part of the foreshore area for aesthetics, to improve access to the waterfront and for recreational use. This practice is resulting in a loss of native riparian habitat along the West Arm and is probably not legal on the crown land below the high water line.
- ATV riders that are operating vehicles in sensitive foreshore habitats are entering the area from adjacent private properties.

5.0 Recommendations

A number of environmental management recommendations based on the findings of the vegetation and wildlife assessment are described below in order of priority. The recommendations reflect the management objectives, goals, criteria and policies presented in the Sunshine Bay Park Management Plan (RDCK 2010).

5.1 Protection of Natural Values

To ensure protection of natural heritage values, the goal is to minimize disturbance to sensitive habitats, special natural features and wildlife. This can be accomplished by restricting public access and recreational use in environmentally sensitive areas and through education of park users. The management recommendation to only permit low impact, non-motorized uses such as walking, nature appreciation & interpretation, wildlife viewing, recreational horseback riding and beach activities in the project area will go a long way to ensure protection of the natural values.

To protect special features in the Natural Environment Zone (NEZ), the recently constructed fence and gate along the south boundary of the zone limit public access to the eastern part of the area and prevent pedestrians and horses from making numerous trails through the NEZ from the south. From the gate, public access to the beach is provided by a trail located along the east boundary of the zone. It is recommended that pedestrian and horse traffic be confined to this short section of trail through the NEZ and that no other trails are constructed within the area. Signs could be posted at the gate and where the trail meets the beach to encourage pedestrians and horseback riders to stay on the designated trail, avoid the sensitive marsh and surrounding wet meadow habitats and to respect wildlife in the area. By staying on the designated trail, site disturbance and the spread of invasive weeds would be minimized. The signage could also articulate the importance of not disturbing waterfowl and other birds. Dogs be kept on a leash in the park and adjacent foreshore area to prevent the harassing of wildlife.

It is highly recommended that tenure to manage the ecologically significant foreshore be negotiated with the provincial government to give the Sunshine Bay Park Commission some control over recreational use in the area. This would probably be the most effective way to protect the wet riparian habitats that are highly sensitive to disturbance. Other recommendations to protect the natural heritage values of the foreshore area include the following:

- Restrict public access and recreational use to the beach and sandbar areas to minimize disturbance to the ponds, mudflats, shallow marshes, wet meadows and willow types located behind the beaches. This could be accomplished by posting signs along the beach to educate park users about the significance and ecological sensitivity of those riparian ecosystems and to discourage access into those habitat types. Also the

elevated beach sites are the best areas for viewing wildlife in the ponds and mudflats and in the tall cottonwood trees to the south.

- The Sunshine Bay Park Commission could work in cooperation with the Ministry of Forests Compliance and Enforcement Officer to educate ATV operators that it is against the law to cause environmental damage to the sensitive wet pond and mudflat habitats. This could be emphasized with signage.
- Post signs to request that park visitors do not dam or obstruct pond inlet/outlet channels to the lake due to the potential negative impacts on juvenile fish and amphibians that use the shallow ponds.
- Inform private land owners about the negative impacts and legalities of clearing native vegetation from the beach and adjacent riparian habitats that are located on crown land within the foreshore area. The Sunshine Bay Park Commission could also request the Department of Fisheries and Oceans to consult with the land owners regarding this practice. Education and outreach activities should be directed at neighboring landowners.

5.2 Vegetation Management

The second priority in the Environmental Management Plan for the Harrop portion of the park and foreshore area is to develop and implement a vegetation management plan to 1) control invasive and toxic plant species and 2) restore disturbed habitats.

Control Invasive and Toxic Plant Species

Control of invasive and toxic plant species is the most important part of a vegetation management plan for the project area. It is recommended that the Sunshine Bay Park Commission work in cooperation with the Ministry of Natural Operations through the Invasive Alien Plant Program, the Central Kootenay Invasive Plant Committee (CKIPC) and the Invasive Plant Council of B.C. (IPCBC) to develop and implement an invasive species control program. The IPCBC may also be able to provide assistance through a local weed crew that can help with invasive plant inventories, site monitoring and chemical & manual/mechanical treatments.

A program to control invasive and toxic plants in the project area would include the following steps. Methods for treating disturbed habitats and specific noxious & invasive weeds are described in more detail in the discussion section of the report.

- Remove invasive and toxic species in the disturbed field type surrounding the horse riding arena and the mowed lawn area to prevent the spread of those weeds to other areas of the park. The weed species could be eradicated using manual/mechanical treatments.
- Remove invasive species in the disturbed trench habitat type in the northeast corner of the LRZ by hand-pulling and digging
- Use integrated management approaches to control the provincially noxious species Canada thistle and common hound's-tongue that are spreading throughout the park area
- Repeated mowing to control Canada thistle and common hound's-tongue in the *Field* habitats will also control quackgrass and reed canarygrass. Monitor other habitat types with infestations of the grass species to determine if the invasive plants are spreading out from dense patches into surrounding areas. Control the grasses by repeated

mowing where feasible if monitoring indicates that the species are continuing to displace native plants. It may not be possible to do repeated mowing treatments for quackgrass or reed canarygrass in wet meadow habitats that are sensitive to disturbance by rutting and compaction

- Eliminate the small patch of yellow flag that occurs in the *Marsh* habitat class in the foreshore area
- Control other minor or isolated occurrences of invasive plants within the project area by hand pulling and digging techniques where feasible. Treating small weed infestations early will save time and money to control invasive species in the long term
- Continue to monitor the park and foreshore area for new occurrences of exotic plants and eradicate the weeds as soon as possible. This step would include monitoring and removing any weeds found along the trail from the riding club parking area through the NEZ to the beach
- Investigate the abundance and distribution of exotic plant species on the private land south of the northwest part of the foreshore area and if necessary, inform the land owners of their duty to control any noxious weeds on their lands
- Educate park visitors and the horse riding club members about plant species in the area that have toxicity to people and horses either through ingestion or contact with the skin. It is recommended that horses be kept away from any areas that are mowed for invasive weed control to ensure that they don't accidentally ingest the cut weed common hound's-tongue that can cause fatal poisoning. Educate people and particularly children about the potential for poisoning from eating the seeds of fruit from the sweet cherry trees or the white berries of the native snowberry shrub. The noxious weed common tansy, that is fatally poisonous to humans if ingested, will be eradicated from the disturbed field habitat type when the area is treated for invasive weeds. Also alert park users about plant species found in the area that can cause skin irritation. Those species include meadow buttercup that is widespread in the area and stinging nettle that occurs in minor amounts in the cottonwood and hawthorn stands.

Restore Disturbed Habitats

The three areas in the park property that are candidates for habitat restoration include the *Disturbed Field* area surrounding the riding arena, the *Trench* feature in the northeast corner of the LRZ and the *Moist & Wet Meadow* types surrounding the shallow marsh/ephemeral pond in the NEZ. Recommendations for restoring those habitats include the following:

- Restore the small area of the *Disturbed Field* habitat type by eradicating invasive and exotic species, removing the top layer of soil contaminated by weed seeds, covering the area with clean topsoil and revegetating the site with perennial grasses.
- After removal of the invasive and other weedy plant species from the *Trench* area, revegetate the site with perennial grasses and forbs and continue to manually treat the area for consecutive years until the seed bank of exotic species is exhausted.
- The best approach for restoring the highly disturbed *Moist & Wet Meadow* habitat types in the NEZ to native vegetation might be to plant native shrub and cottonwood seedlings or cuttings to advance succession on the sites. By advancing succession to later seral stages of development, the shrubs and trees will overtop and out-compete the introduced grasses and forbs that prefer open site conditions of the early seral stages of

succession. This approach and other initiatives to restore the moist to wet meadows in the NEZ could be further investigated



Figure 14. The *Cottonwood – Snowberry* habitat type near the Sunshine Bay Riding Club gate entrance has large cottonwood trees and snags that provide important habitat for cavity-nesting birds but also may be unstable and pose a hazard to park visitors and riding club users.

5.3 Education

The third main priority of an environmental management plan for the park and foreshore area is to educate park visitors about the natural values in the project area including significant natural features, habitat diversity and wildlife species. Recommendations for accomplishing this goal include the following:

- Erect signs to promote park objectives of protecting natural values and minimizing negative impacts to those values by human use
- Post signage along the southern fence of the Natural Environment Zone (NEZ), at the gate and at the beach access point articulating the intent of the NEZ designation and the values that are being protected
- Signs could also be posted at the trail entrances to the NEZ and along the elevated beaches to inform park visitors about nature interpretation and wildlife viewing opportunities including bird watching for waterfowl and shorebirds in the ponds and mudflats, perching birds in the shrub thickets and raptors in the large cottonwood trees just south of the foreshore.

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Appendix 1. Locations of Plant Sample Plots.



Appendix 2. Plant Species List for Sunshine Bay Park

Code ¹	Species Code ²	Scientific Name	Lifeform ³	Common Name	Native/ Exotic ⁴	Weed Status ⁵	Wetland _Ind ⁶	Comments
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Trees

ABIEGRA	ABIEGRA	Abies grandis	1	grand fir	N			
ACERPLA	ACERPLA	Acer platanoides	2	Norway maple	E			
AESCHIP	AESCHIP	Aesculus hippocastanum	2	horse chestnut	E			
BETUPAP	BETUPAP	Betula papyrifera	2	paper birch	N		4	
PINUCON2	PINUCON	Pinus contorta var. latifolia	1	lodgepole pine	N		4	
POPUBAL2	POPUBAL	Populus balsamifera ssp. trichocarpa	2	black cottonwood	N		4	
PRUNAVI	PRUNAVI	Prunus avium	2	sweet cherry	E			wilted leaves, twigs & seeds may be fatally toxic if ingested by humans & livestock
PRUNDOM	PRUNDOM	Prunus domestica	2	cultivated plum	E			
THUJPLI	THUJPLI	Thuja plicata	1	western redcedar	N		4	

Shrubs

ACERGLA1	ACERGLA	Acer glabrum var. douglasii	4	Douglas maple	N			
ALNUINC2	ALNUINC	Alnus incana ssp. tenuifolia	2	mountain alder	N			flowers, foliage and stems toxic to cattle and mule deer; most dangerous in spring
AMELALN	AMELALN	Amelanchier alnifolia	4	saskatoon	N			
CORNSTO	CORNSTO	Cornus stolonifera	4	red-osier dogwood	N		3	
CRATDOU	CRATDOU	Crataegus douglasii	4	black hawthorn	N		4	
LIGUVUL	LIGUVUL	Ligustrum vulgare	4	common privet	E			ingested fruit poisonous to humans; degree of toxicity unknown
MAHOAQU	MAHOAQU	Mahonia aquifolium	3	tall Oregon-grape	N			
MAHOREP	MAHOREP	Mahonia repens	3	creeping Oregon-grape	N			
PRUNUS	PRUNUS	Prunus sp.	2	cherry	N			
RHAMPUR	RHAMPUR	Rhamnus purshiana	2	casacara	N		4	glycosides in ingested foliage toxic to livestock; degree of toxicity unknown
ROSA	ROSA	Rosa sp.	4	rose	N			
ROSAEGL	ROSAEGL	Rosa eglanteria	4	sweetbrier	E			

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ROSAGYM	ROSAGYM	Rosa gymnocarpa	4	baldhip rose	N			
ROSANUT1	ROSANUT	Rosa nutkana var. hispida	4	Nootka rose	N			
ROSAWOO1	ROSAWOO	Rosa woodsii ssp. ultramontana	4	prairie rose	N			
RUBUIDA	RUBUIDA	Rubus idaeus	4	red raspberry	N			
RUBUPAR	RUBUPAR	Rubus parviflorus	4	thimbleberry	N		4	
SALILUC2	SALILUC	Salix lucida ssp. lasiandra	2	Pacific willow	N		3	
SALISCO	SALISCO	Salix scouleriana	2	Scouler's willow	N			
SALISIT	SALISIT	Salix sitchensis	2	Sitka willow	N		4	
SORBSCO	SORBSCO	Sorbus scopulina	4	western mountain-ash	N			
SYMPALB	SYMPALB	Symphoricarpos albus	4	common snowberry	N			alkaloids in ingested fruit cause non-fatal poisoning in humans

Herbs

AGROGIG	AGROGIG	Agrostis gigantea	6	redtop	E			
AGROSCA	AGROSCA	Agrostis scabra	6	hair bentgrass	N		3	
AGROSTO	AGROSTO	Agrostis stolonifera	6	creeping bentgrass	E			
ALOPAEQ	ALOPAEQ	Alopecurus aequalis	6	little meadow-foxtail	N		3	
ALOPPRA	ALOPPRA	Alopecurus pratensis	6	meadow-foxtail	E			
ARCTMIN	ARCTMIN	Arctium minus	7	common burdock	E	R		
ARNICHA1	ARNICHA	Arnica chamissonis ssp. chamissonis	7	meadow arnica	N			
ARTEUD4	ARTEUD	Artemisia ludoviciana var. latiloba	7	western mugwort	N			
ATHYFIL	ATHYFIL	Athyrium filix-femina	5	lady fern	N		4	
BERTINC	BERTINC	Berteroa incana	7	hoary alyssum	E	I		
BOTRMUL	BOTRMUL	Botrychium multifidum	5	leathery grape fern	N		4	
BROMINE1	BROMINE	Bromus inermis ssp. inermis	6	smooth brome	E	*		*considered a moderate upland invasive species by the Canadian Wildlife Service (CWS)
CALACAN	CALACAN	Calamagrostis canadensis	6	bluejoint reedgrass	N		4	
CALLPAL	CALLPAL	Calla palustris	7	wild calla	N		1	oxalates in leaves, roots & stems potentially poisonous if ingested by humans & cows
CAMPRAP	CAMPRAP	Campanula rapunculoides	7	creeping bellflower	E			
CAREAPE	CAREAPE	Carex aperta	6	Columbia sedge	N		4	
CAREARC	CAREARC	Carex arcta	6	northern clustered sedge	N		3	
CAREATR	CAREATR	Carex athrostachya	6	slender-beaked sedge	N		3	
CAREBEB	CAREBEB	Carex bebbii	6	Bebb's sedge	N		4	

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CAREDEW	CAREDEW	Carex deweyana	6	Dewey's sedge	N			
CAREEXS	CAREEXS	Carex exsiccata	6	inflated sedge	N		2	
CARELEN5	CARELEN	Carex lenticularis var. lipocarpa	6	Kellogg's sedge	N		3	
CAREVIR	CAREVIR	Carex viridula	6	green sedge	N		2	
CAREX	CAREX	Carex sp.	6	sedge	N			
CENTBIE	CENTBIE	Centaurea biebersteinii	7	spotted knapweed	E	P		releases allelopathic chemicals that inhibit the growth of nearby plants
CERANUT	CERANUT	Cerastium nutans	7	nodding chickweed	N			
CHIMUMB	CHIMUMB	Chimaphila umbellata	12	prince's pine	N			
CIRSARV1	CIRSARV	Cirsium arvense var. horridum	7	Canada thistle	E	P		nitrates in ingested leaves are toxic to cattle; degree of toxicity unknown
CIRSVUL	CIRSVUL	Cirsium vulgare	7	bull thistle	E	I		
CLINUNI	CLINUNI	Clintonia uniflora	7	queen's cup	N			
COMAPAU	COMAPAU	Comarum palustre	7	marsh cinquefoil	N		2	
CRASAQU	CRASAQU	Crassula aquatica	7	pigmyweed	N		1	
CYNOOFF	CYNOOFF	Cynoglossum officinale	7	common hound's-tongue	E	P		alkaloids in ingested leaves can cause fatal poisoning in cattle and horses
DACTGLO	DACTGLO	Dactylis glomerata	6	orchard-grass	E			
DESCCES2	DESCCES	Deschampsia cespitosa ssp. cespitosa	6	tufted hairgrass	N			
ELEOBT	ELEOBT	Eleocharis obtusa	6	blunt spike-rush	N		2	
ELEOPAL	ELEOPAL	Eleocharis palustris	6	common spike-rush	N		2	
ELYMGLA	ELYMGLA	Elymus glaucus	6	blue wildrye	N			
ELYMREP	ELYMREP	Elymus repens	6	quackgrass	E	R		
EPIPHL	EPIPHL	Epipactis helleborine	7	helleborine	E		4	
EQUIARV	EQUIARV	Equisetum arvense	5	common horsetail	N	I	4	leaves, stems & spores ingested in spring are non-fatally toxic to cattle, horses & sheep
EQUIHYE	EQUIHYE	Equisetum hyemale	5	scouring-rush	N			toxic to livestock when ingested; degree of toxicity unknown
EQUIPAL	EQUIPAL	Equisetum palustre	5	marsh horsetail	N		3	leaves & stems ingested in spring cause non-fatal poisoning in cattle, horses & sheep
EQUIPRA	EQUIPRA	Equisetum pratense	5	meadow horsetail	N		4	toxic to livestock when ingested; degree of toxicity unknown
FESTRUB3	FESTRUB	Festuca rubra ssp. rubra	6	red fescue	N			
FRAGVES	FRAGVES	Fragaria vesca	7	wood strawberry	N			
GALIPAL	GALIPAL	Galium palustre	7	marsh bedstraw	N		2	
GALITRF	GALITRF	Galium triflorum	7	sweet-scented bedstraw	N		4	
GEUMMAC	GEUMMAC	Geum macrophyllum	7	large-leaved avens	N		4	
GNAPULI	GNAPULI	Gnaphalium uliginosum	7	marsh cudweed	E	I		

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GRATNEG	GRATNEG	Gratiola neglecta	7	American hedge-hyssop	N			
HIERAUR	HIERAUR	Hieracium aurantiacum	7	orange-red king devil	E	R		
HIERGLO	HIERGLO	Hieracium glomeratum	7	yellowdevil hawkweek	E	I		
HIPPVUL	HIPPVUL	Hippuris vulgaris	7	common mare's-tail	N		1	
IRISPSE	IRISPSE	Iris pseudacorus	7	yellow flag	E		2	contact with roots causes dermatitis in humans, ingestion of roots can kill cattle & pigs
JUNCART	JUNCART	Juncus articulatus	6	jointed rush	N			
JUNCBAL	JUNCBAL	Juncus balticus	6	Baltic rush	N		4	
JUNCBUF	JUNCBUF	Juncus bufonius	6	toad rush	N		4	
JUNCEFF7	JUNCEFF	Juncus effusus var. effusus	6	European rush	E			
JUNCENS	JUNCENS	Juncus ensifolius	6	dagger-leaf rush	N		3	
JUNCFIL	JUNCFIL	Juncus filiformis	6	thread rush	N			
JUNCTEN	JUNCTEN	Juncus tenuis	6	slender rush	N			
JUNCUS	JUNCUS	Juncus sp.	6	rush	N			
LACTMUR	LACTMUR	Lactuca muralis	7	wall lettuce	E			
LEUCVUL	LEUCVUL	Leucanthemum vulgare	7	oxeye daisy	E	R		
LIMOAQU	LIMOAQU	Limosella aquatica	7	water mudwort	N		1	
LINNBOR2	LINNBOR	Linnaea borealis ssp. longiflora	12	twinline	N			
LUPIPOY1	LUPIPOY	Lupinus polyphyllus ssp. polyphyllus	7	large-leaved lupine	N			anagyrene in leaves & stems can cause non-fatal poisoning in cattle
LYCOUNI	LYCOUNI	Lycopus uniflorus	7	northern water horehound	N		2	
MAIARAC	MAIARAC	Maianthemum racemosum	7	false Solomon's-seal	N			
MAIASTE	MAIASTE	Maianthemum stellatum	7	star-flowered false Solomon's-seal	N		4	
MEDILUP	MEDILUP	Medicago lupulina	7	black medic	E			
MENTARV	MENTARV	Mentha arvensis	7	field mint	N		4	
MYOSLAX	MYOSLAX	Myosotis laxa	7	small-flowered forget-me-not	N		3	
NEPECAT	NEPECAT	Nepeta cataria	7	catnip	E			
OSMOBER	OSMOBER	Osmorhiza berteroi	7	mountain sweet-cicely	N			
PACKPAP	SENEPAP	Packera pauperculus	7	Canadian butterweed	N		4	
PERSHYD	PERSHYD	Persicaria hydropiper	7	marshpepper smartweed	E		4	
PHALARU	PHALARU	Phalaris arundinacea	6	reed canarygrass	M		3	alkaloids in ingested leaves can cause fatal poisoning in cattle and sheep
PHLEPRA	PHLEPRA	Phleum pratense	6	common timothy	E			
PLAGSCO	PLAGSCO	Plagiobothrys scouleri	7	Scouler's popcornflower	N			
PLANLAN	PLANLAN	Plantago lanceolata	7	ribwort plantain	E	*		*considered nuisance species by Ministry of Agriculture & Lands (MoAL)

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PLANMAJ	PLANMAJ	Plantago major	7	common plantain	U	I		
POA COM	POA COM	Poa compressa	6	Canada bluegrass	E	*		* considered a minor upland invasive species by Canadian Wildlife Service (CWS)
POA PAL	POA PAL	Poa palustris	6	fowl bluegrass	N		4	
POA PRA	POA PRA	Poa pratensis	6	Kentucky bluegrass	N	*	4	* considered a minor upland invasive species by Canadian Wildlife Service (CWS)
POLYAMP	POLYAMP	Polygonum amphibium	7	water smartweed	N		2	
POTAGRA	POTAGRA	Potamogeton gramineus	7	grass-leaved pondweed	N		1	
POTARIC	POTARIC	Potamogeton richardsonii	7	Richardson's pondweed	N		1	
POTEARG	POTEARG	Potentilla argentea	7	silvery cinquefoil	E			
PRUNVUL1	PRUNVUL	Prunella vulgaris ssp. lanceolata	7	self-heal	N			
RANUACR	RANUACR	Ranunculus acris	7	meadow buttercup	E			contact with skin causes dermatitis in humans, toxic to cattle when ingested
RANUFLM	RANUFLM	Ranunculus flammula	7	lesser spearwort	N		3	contact with skin causes dermatitis in humans, toxic to cattle when ingested
RORIPAL	RORIPAL	Rorippa palustris	7	marsh yellow cress	N		3	
RUMEACT	RUMEACT	Rumex acetosella	7	sheep sorrel	E	I		oxalates in ingested leaves & stems can cause fatal poisoning in sheep
RUMECRI	RUMECRI	Rumex crispus	7	curled dock	E	I		oxalates in ingested leaves & stems are toxic to sheep; degree of toxicity unknown
SAGICUN	SAGICUN	Sagittaria cuneata	7	arrow-leaved arrowhead	N		2	
SCUTGAL	SCUTGAL	Scutellaria galericulata	7	marsh skullcap	N		2	
SPIRRROM	SPIRRROM	Spiranthes romanzoffiana	7	hooded ladies' tresses	N		4	
STELLOG7	STELLOG	Stellaria longipes var. longipes	7	long-stalked starwort	N			
STUCPEC	STUCPEC	Stuckenia pectinata	7	fennel-leaved pondweed	N		1	
SYMPSPA	SYMPSPA	Symphotrichum spathulatum	7	western mountain aster	N			humans and livestock poisoned by selenium in ingested plant; degree of toxicity unknown
TANAVUL	TANAVUL	Tanacetum vulgare	7	common tansy	E	R		thujone in all parts of plants can be fatally poisonous to humans & livestock if ingested
TARAOFF	TARAOFF	Taraxacum officinale	7	common dandelion	E			
TRIFARV	TRIFARV	Trifolium arvense	7	hare's-foot clover	E			nitrates in all parts of plant cause non-fatal poisoning to horses & cattle when ingested
TRIFAUR	TRIFAUR	Trifolium aureum	7	yellow clover	E			
TRIFPRA	TRIFPRA	Trifolium pratense	7	red clover	E			glycosides in all parts of plant cause non-fatal poisoning in cattle if ingested
TRIFREP	TRIFREP	Trifolium repens	7	white clover	E			glycosides in all parts of plant cause non-fatal poisoning in cattle and horses if ingested
TRIFHYB	TRIFHYB	Trifolium hybridum	7	alsike clover	E			
URTIDIO1	URTIDIO	Urtica dioica ssp. gracilis	7	stinging nettle	N			dermatitis in humans caused by the skin contacting hairs on stems & leaves of plant
VERBTHA	VERBTHA	Verbascum thapsus	7	great mullein	E	I		

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VEROCHA	VEROCHA	Veronica chamaedrys	7	germander speedwell	E			
VEROOFF	VEROOFF	Veronica officinalis	7	common speedwell	E			
VEROPER2	VEROPER	Veronica peregrina var. xalapensis	7	purslane speedwell	N			
VEROSER1	VEROSER	Veronica serpyllifolia var. humifusa	7	thyme-leaved speedwell	N			
VEROSCU	VEROSCU	Veronica scutellata	7	marsh speedwell	N		3	
VICICRA	VICICRA	Vicia cracca	7	tufted vetch	E			
VIOLPAL	VIOLPAL	Viola palustris	7	marsh violet	N		2	

Mosses

BRACHYT	BRACHYT	Brachythecium sp.	9	ragged-moss	N			
CERAPUR	CERAPUR	Ceratodon purpureus	9	fire-moss	N		3	
CLIMDEN	CLIMDEN	Climacium dendroides	9	tree-moss	N		4	
POHLNUT	POHLNUT	Pohlia nutans	9	nodding thread-moss	N		3	
PLAGIOM	PLAGIOM	Plagiomnium sp.	9	leafy moss	N			
PLAGMED	PLAGMED	Plagiomnium medium	9	common leafy moss	N		3	
POLYJUN	POLYJUN	Polytrichum juniperinum	9	juniper haircap moss	N		4	
RACOERI	RACOERI	Racomitrium ericoides	9	shaggy rock-moss	N			
TORTRUA	TORTRUA	Tortula ruralis	9	sidewalk moss	N			
UNKNOWN	UNKNOWN	Unknown sp.	9	"thread moss"	N		?	

Appendix 3. Attribute Code Definitions for Plant Species Lists

Field	Potential Entries	Definition
1 Code		code for species ; includes distinctions between ssp. and var.; synonyms are coded with the code of the valid taxa
2 Species Code		code of plants to the species level ; no distinction between ssp. or var.
Scientific Name		scientific name of genus, species, subspecies and variety
3 Lifeform		growth form of the species
Lifeform	1	coniferous tree
Lifeform	2	broad-leaved tree
Lifeform	3	evergreen shrub
Lifeform	4	deciduous shrub
Lifeform	5	fern or fern-ally
Lifeform	6	graminoid
Lifeform	7	forb
Lifeform	8	parasite or saprophyte
Lifeform	9	moss
Lifeform	10	Hepatic (liverworts)
Lifeform	11	lichen
Lifeform	12	dwarf woody plant
English Name		recommended English vernacular name
4 Native/Exotic		status of species in B.C.
Native/Exotic	N	species native to B.C.
Native/Exotic	E	exotic or introduced species/naturalized in B.C.
Native/Exotic	M	mixed - native and exotic populations within species in B.C.
Native/Exotic	U	species of unknown origin
5 Weed Status		species considered invasive plants
Weed Status	P	species considered noxious weeds in all regions of B.C. as indicated in the B.C. Weed Control Act (1999)
Weed Status	R	species indicated as noxious weeds within some regions of B.C. as indicated in the B.C. Weed Control Act (1999)
Weed Status	I	invasive/nuisance species that are not currently legislated as noxious weeds; based on Cranston et al. (1999)
6 Wetland_Ind		wetland and riparian indicator status of species
Wetland_Ind	1	Aquatic - species that usually occur in standing water as a floating or submerged aquatic. Species is a Forest Practices Code (FPC) obligate <u>hydrophyte</u> (a plant adapted to grow in water or on permanently saturated soils deficient in oxygen).
Wetland_Ind	2	Obligate - species that almost always occur as emergents in standing water or on saturated organic or mineral soils. Species is a FPC obligate hydrophyte.
Wetland_Ind	3	Indicative - species that are most commonly associated and best adapted to wetland soils conditions but also occur in moist and very moist upland habitats. Species is not considered an obligate hydrophyte in the FPC.
Wetland_Ind	4	Facultative - species that commonly occur in both upland and wetland habitats. May be strongly associated with transitional sites between wetland and upland ecosystems. Species is not considered to be an obligate hydrophyte in the FPC.
Wetland_Ind	5	Occasional - species that occur, predominantly, in upland habitats but may have scattered occurrences in wetlands or may be prevalent in certain kinds of wetlands.
Wetland_Ind	6	None – species that are rarely or never found in wetlands.

from: Meidinger, Del; Lee, Tina; Douglas, George W.; Britton, Greg; MacKenzie, Will; Qian, Hong. 2009. British Columbia plant species codes and selected attributes. Version 6 Database. Research Branch. B.C. Ministry of Forests.

Appendix 4. Wildlife Species Confirmed for Sunshine Bay Park.

Species	BC Status	Federal Status	Species notes/concern within the park
Amphibians			
Western Toad <i>Anaxyrus boreas</i>		Special Concern	Adults are terrestrial but require clean standing water for breeding. Species is known to breed foreshore <i>Pond</i> habitat class (Figure 2b) habitat created seasonally by receding water levels. (K. Dehnel, pers. comm.).
Birds			
Bald Eagle <i>Haliaeetus leucocephalus</i>			Likely uses large black cottonwood trees for perching.
Osprey <i>Pandion haliaetus</i>			Likely uses large black cottonwood trees for perching.
Northern Harrier <i>Circus cyaneus</i>			
Red-tailed Hawk <i>Buteo jamaicensis</i>			
Killdeer <i>Charadrius vociferus</i>			
Black-billed Magpie <i>Pica hudsonia</i>			Uncommon in our area. Likely nests in hawthorn shrubs.
American Crow <i>Corvus brachyrhynchos</i>			Likely uses large black cottonwood trees for perching. May nest in hawthorn shrubs.
Northern Flicker <i>Colaptes auratus</i>			Cavity nester. Likely nests on site in black cottonwood trees.
Yellow Warbler <i>Dendroica petechia</i>			
Common Yellowthroat <i>Geothlypis trichas</i>			
Yellow-rumped Warbler <i>Dendroica coronata</i>			
American Redstart <i>Setophaga ruticilla</i>			
Common Loon <i>Gavia immer</i>			Observed off shore in Kootenay Lake.
Canada Goose <i>Branta canadensis</i>			
Mallard <i>Anas platyrhynchos</i>			Observed with brood in wetland and pond habitats.
Hooded Merganser <i>Lophodytes cucullatus</i>			

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Species	BC Status	Federal Status	Species notes/concern within the park
Brown-headed Cowbird <i>Molothrus ater</i>			Nest parasite.
Eastern Kingbird <i>Tyrannus tyrannus</i>			
Western Kingbird <i>Tyrannus verticalis</i>			
Song Sparrow <i>Melospiza melodia</i>			
Western Meadowlark <i>Sturnella neglecta</i>			
Red-winged Blackbird <i>Agelaius phoeniceus</i>			
Brewer's Blackbird <i>Euphagus cyanocephalus</i>			
Black-capped Chickadee <i>Poecile atricapillus</i>			
Violet-green Swallow <i>Tachycineta thalassina</i>			Likely uses large black cottonwood trees for perching.
Northern Rough-winged Swallow <i>Stelgidopteryx serripennis</i>			
Barn Swallow <i>Hirundo rustica</i>	Blue		Forages widely over a variety of habitat types. Breeds in barns and out buildings with open access. Individuals were observed foraging over park. No suitable breeding habitat occurs in the park.
Western Wood-pewee <i>Contopus sordidulu</i>			
Cedar Waxwing <i>Bombycilla cedrorum</i>			
Warbling Vireo <i>Vireo gilvus</i>			
Gray Catbird <i>Dumetella carolinensis</i>			
American Robin <i>Turdus migratorius</i>			
Willow Flycatcher <i>Empidonax traillii</i>			
Alder Flycatcher <i>Empidonax alnorum</i>			
Rufous Hummingbird <i>Selasphorus rufus</i>			

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Species	BC Status	Federal Status	Species notes/concern within the park
European Starling <i>Sturnus vulgaris</i>			Introduced species.
Ring-billed Gull <i>Larus delawarensis</i>			
Pine Siskin <i>Spinus pinus</i>			
Western Tanager <i>Piranga ludoviciana</i>			
Mammals			
Columbian Ground Squirrel <i>Spermophilus columbianus</i>			
White-tailed Deer <i>Odocoileus virginianus</i>			Bedding areas throughout park.
Elk <i>Cervus canadensis</i>			Sign only.
Black Bear <i>Ursus americanus</i>			Sign only.
American Beaver <i>Castor canadensis</i>			Fresh sign. This species may impact large black cottonwood trees near the lake. Consider wrapping these trees with chicken wire for protection.