

# **Blackie Spit Park: Wildlife Habitat Enhancement Plan**

Prepared for:

**City of Surrey  
Parks, Recreation & Culture**

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## Executive Summary

The process of designating Blackie Spit as a park and the development of management direction has taken place over several decades. Through a process of public consultation, the Blackie Spit Park Master Plan (Catherine Berris and Associates and Dillon Consulting, 1999) provided overall direction for the park, that being ‘to protect the long-term environmental integrity of Blackie Spit while providing opportunities for community and nature-based uses’. Subsequently, this wildlife habitat enhancement plan was commissioned to address the specific wildlife habitat management opportunities in the context of a park that has a long history of passive recreational use.

Blackie Spit Park is the product of a haphazard management history. Originally forming part of the Nicomekl River estuary, parts of it were dyked for farming. Subsequently, three dredging episodes resulted in sandy dredgate being dumped on the former marshes and parts of the farmland. Currently the park consists of dyked farmland, old and new dykes and drainage ditches, varying ages of dredgate, the sandy spit and relatively natural estuary in which old pilings provide evidence of a former oyster cannery. The current vegetation patterns, therefore, reflect that history and the substrates, mostly of dredgate origin in the north and of estuarine origin in the south, are the most influential determinant of the habitat potential.

Development of the plan began by examining the existing and potential habitat potential of the park in conjunction with staff of Surrey Parks, Recreation & Culture and members of the White Rock and Surrey Naturalists. The park was then divided into 19 Management Units that reflected existing patterns of land form, habitat development, or land use. Individual habitat management plans were developed that consisted of the establishment of wildlife species goals, habitat management objectives, and detailed management activities. The development of the management prescriptions for each unit were also influenced by the nature of adjacent units, thus recognizing the integrated complex of habitats in the park.

Part 1 of the report provides an overview of the wildlife and habitat values of the park and explains the management approach and outlines the methods by which the plan was developed. It also summarizes the Management Unit goals, costs, and habitat monitoring and maintenance requirements. Wildlife monitoring goals and methods are also outlined so that baseline information can be collected and the success of the management prescriptions measured.

Part 2 of the report consists of management plans for each of the 19 Management Units. Each plan comprises the following elements:

- 1.0 Existing Conditions
- 2.0 Goals and Objectives
- 3.0 Management Prescriptions
  - 3.1 Initial Enhancement Requirements
  - 3.2 Ongoing Maintenance Requirements
  - 3.3 Initial Enhancement Costs
  - 3.4 Monitoring Schedule

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## **PART 1: ENHANCEMENT PLAN BACKGROUND AND SUMMARY**

### **1.0 Background**

The purpose of this Wildlife Enhancement Plan is to provide guidance for Surrey Parks, Recreation and Culture to enhance and manage wildlife habitat at Blackie Spit to support the following vision as articulated in the Blackie Spit Master Plan:

‘to protect the long-term environmental integrity of Blackie Spit while providing opportunities for community and nature-based uses’.

Its intent is to provide specific habitat management direction to enhance wildlife habitats in the Park by sectioning the Park into integrated wildlife management units and making detailed and specific enhancement recommendations.

### **1.1 Master Plan**

The Blackie Spit Park Master Plan (1999), as approved by the Parks, Recreation and Culture Commission, sets out the following objectives for the Park:

1. provide a park with the predominant character of a nature park;
2. protect environmentally sensitive resources such as special habitats; unique vegetation; birds, other wildlife and fish species and heritage and cultural resources;
3. provide opportunities for passive recreational use, interpretation and education;
4. support community uses within the park, including the swimming club, sailing club and community gardening activities; and
5. organize facilities to better define use patterns and to minimize the potential for conflicts between facilities/activities and natural resources.

The Master Plan provided for broad vegetation enhancement recommendations for various areas and vegetation types within the Park. Many areas of the park have considerable alien and invasive plant species that are not compatible with providing for indigenous wildlife. Some areas of the park require further planting of native species, or other enhancements, to provide for wildlife.

As a follow up to the Master Plan, this document provides a detailed Wildlife Habitat Enhancement Plan for Blackie Spit to guide the City in the development and continued management of habitats suitable for the wide variety of fauna that occur in the park.

### **1.2 Earlier Enhancement Plan**

A wildlife habitat enhancement plan was done for Blackie Spit in 1997. Its purpose was to provide a habitat management plan to manage for wildlife species affected by habitat lost on Sea Island due to the construction of the third runway. The wildlife species of interest were great blue herons,

passerines, and to a much lesser extent, waterfowl. It sought to address opportunities to replace several Sea Island habitat types that were lost: agricultural fields (hay fields and old-fields); hedgerows; mixed, scrubby woodlots; ditches; and to a small extent, wetlands and seasonally flooded fields.

Some of the management recommendations from that plan are still valid, but the scope of the present plan encompasses a much broader range of wildlife management interests and its habitat management units and management prescriptions are much more detailed.

### **1.3 Acknowledgements**

Several people have provided helpful comments and ideas that contributed to this report. In particular, I would like to acknowledge the input of the steering committee members, who included Greg Ward, Wayne Sakmoto, Shawn Gurney, and Martha Norman of Surrey Parks, Recreation & Culture, and Rene Savenye, Eilene Verheuil, and Margaret Cuthbert of the White Rock and Surrey Naturalists. Shawn Gruney was also very helpful in providing the Blackie Spit map information in electronic format.

## **2.0 Blackie Spit Habitats in Context**

### **2.1 Global**

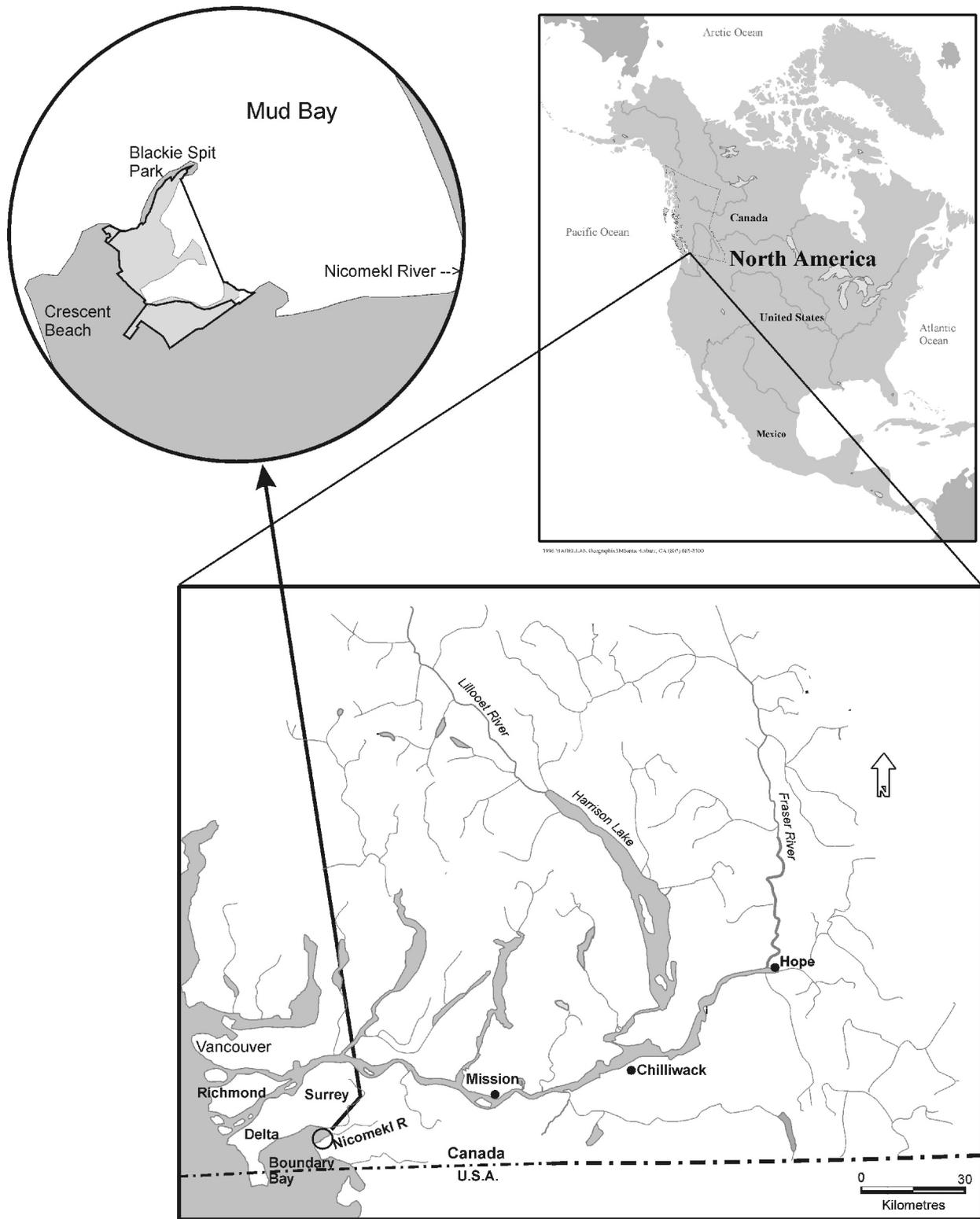
Blackie Spit is located within the Fraser Delta (Figure 1), the largest estuary on the Pacific coast of Canada and supports the highest densities of waterbirds, shorebirds, and raptors in Canada in winter. It also forms a link in a series of estuaries used by migrating birds, from the Copper River delta in Alaska to the estuaries and wetlands of the west coast of Washington, Oregon, and California in the U.S. (Butler and Campbell 1987).

Besides waterfowl, unnumbered passerine birds migrate along the coast and through the delta between their arctic breeding grounds and tropical and subtropical wintering areas. Often, points of land such as Blackie Spit attract such birds, and become places to which people flock hoping to catch a glimpse of species that occur only on migration and rarities that frequently show up in such locations.

### **2.2 Regional**

In some years, as many as 1.4 million birds (waterfowl, shorebirds, and gulls) migrate through the Fraser River delta. In winter, about 135,000 waterbirds use the delta due to its mild winter climate, extensive marshes and mud flats, and abundance of food associated with intertidal and agricultural habitats (Butler and Campbell 1987).

Figure 1: Location of Blackie Spit Park on the west coast of North America.



## **2.3 Local**

Blackie Spit, situated in Mud Bay, is part of the Nicomekl River estuary. During migration and winter more than a thousand ducks can be found on the estuarine mudflats just off Blackie Spit, and several hundred more may occur in the bays within the park. Shorebirds are also common throughout the same areas and can be found in the park at all times of the year, although they are most abundant during the nonbreeding season. The estuarine flats off the park also support local species, such as crows, gulls, and several dozen harbour seals.

## **3.0 Management Plan**

### **3.1 Blackie Spit Habitat Overview**

The variety of habitats at Blackie Spit reflect the site disturbance history. The entire park area was once tidal except for a portion of the spit, which was above the normal highwater and supported vegetation. A central portion and southern area now known as Dunsmuir Farm were dyked early in the century. The remainder of the park was created by the deposition of sand and fine silt dredge spoil in 1963, 1970, and 1978 during dredging of the lower reaches of the Nicomekl River (Bates pers. comm.).

The current vegetation is a reflection of several factors, including:

- local climate
- tidal influence
- salinity
- dyking
- soils
- time since the last dumping of dredgate (for non tidal areas north of the dyke)
- topography (slope, relative elevation, aspect)
- hydrology (rainfall, runoff, ponding, percolation, drainage, seepage)
- vehicular use
- human use (trails, dogs)
- agricultural history (south of the dyke)
- soil seed bank (a seed bank source of vegetation is not likely a significant factor in dredgate)
- plant introductions and seed source inputs (wind, transport by people and animals, encroachment from adjacent areas).

The habitat management plan is limited by those factors, many of which are not economically within reasonable control of habitat managers. Therefore, as limiting factors they help to define the general character of the habitat management goals, objectives, activities, and plant species composition. In particular, soils and soil moisture are difficult to manage in upland areas, so existing conditions, as reflected in the plant species composition, are used to define the habitat management potential of a site.

### 3.1.1 Wildlife Species Management Goals for Park

A goal of the Master Plan is to protect the long-term environmental integrity of Blackie Spit while providing opportunities for community and nature-based uses. Those nature-based uses are dependent on the habitats that occur in the park. In general, the habitats (excluding areas primarily used by people) include intertidal; dyked, former agriculture; dry dredgate; moist dredgate; managed dykes; and ditches.

Within the context of the general habitat complexes occurring at Blackie Spit Park, and in order of priority, the wildlife species management goals are for species adapted to

- Intertidal habitats (e.g., migratory birds)
- Open, dry, sparsely vegetated habitats (e.g., migratory and wintering passerines, breeding birds)
- Old-field habitats (e.g. small mammals, avian and mammalian predators)
- Transitional habitats – interspersions of shrubs, small trees and grasslands (e.g., sparrows, small roaming passerines, medium-sized mammals)
- Deciduous or mixed, deciduous-dominated woodlot and hedgerow (e.g., foraging, roosting and nesting raptors, especially buteos and accipiters; resident woodpeckers and sparrows; breeding migratory flycatchers, thrushes, vireos, and warblers)
- Mixed, coniferous-dominated woodlot (e.g. foraging raptors including accipiter hawks and small owls; resident woodpeckers, small roaming passerines, thrushes, and sparrows; breeding migratory passerines)
- Ditches and intensively managed dyke sides (insects, insectivorous birds, seed-eating birds, piscivorous birds, aquatic birds and mammals).

### 3.1.2 Habitat Management Objectives for Park

Habitat management objectives fall into one of three categories: enhancement activities (generally, vegetation management), invasive plant species management, and people management.

#### *3.1.2.1 Habitat Enhancement Objectives*

Habitat management activities for a Management Unit (MU) (Figure 2) frequently entail vegetation enhancements such as planting species of shrubs and trees, but may involve soil enhancement, periodic vegetation control, the placement of coarse woody debris, drainage, agricultural field renovation, or other activities.

#### *3.1.2.2 Invasive Plant Species Management*

Several non native plant species have become established in Blackie Spit Park that tend to spread and become dominant at the expense of native species and at the expense of habitat diversity. Such species may never be eliminated, and doing so is not necessarily an objective because they usually do provide some wildlife habitat value or have some human interest value in themselves. Ongoing control efforts are, however, necessary in order to realize optimum habitat and wildlife value. Such

species include Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus discolor*), an oriental knotweed species (*Polygonum* sp.), and the horticultural shrub, spurge-laurel (*Daphne laureola*).

In some cases native species are also the subject of control, such as when managing habitat for a particular seral stage. Thus, alder (*Alnus rubra*) or black cottonwood (*Populus balsamifera*) may be controlled to prevent walling in a part of the estuary, or to prevent the overgrowth of an area designated as shrub habitat.

### 3.1.2.3 *Integration of Habitats*

Enhancement activities are integrated with activities in adjacent MUs in different ways. For example, the use of intertidal areas by migratory waterbirds is a higher priority than planting or promotion of large trees in a woodlot; therefore, such plantings are not recommended for areas such as MU 12 where they might obstruct flight paths or contribute to the “enclosure” of an intertidal area. Other types of integration occur, such as: ensuring connectivity of woody vegetation between MUs (e.g. between MU 8 and MU 13); managing a transitional zone between grasslands and woodlots (e.g. between MU 10 and MU 8); and managing habitat complexes such as ditches and adjacent dykes and hedgerows (MU 6–MU 7), or old-field and woodlot or hedgerow, to form habitat complexes providing both food and shelter or perches (MU 2–MU 4– MU 5).

### 3.1.2.4 *People Management*

In this plan, people management focuses on managing factors that benefit wildlife use, rather than on ones that enhance the enjoyment of the public. For example, a viewing platform may be proposed because it will provide a focal point as a substitute for an intrusion into an area, rather than because of its public benefit *per se*. For that reason, the design of such structures, other than comments on appropriate macro design features, is not of concern to this habitat enhancement plan. Other kinds of people management issues include the placement of trails (Figure 3), access control, and dog control.

## 3.2 **Methods**

The enhancement plan was developed through a process of interaction with the steering committee, reference to previous recent management plans, and field investigation. Following the gathering and review of information from those sources, the plans were written for each MU.

The Steering Committee, comprising members of the City of Surrey Parks, Recreation and Culture Department and of the White Rock and Surrey Naturalists, spent two morning on site at the start of the project to view all parts of the park and provide ideas on the value of the park’s habitat features and on suitable management activities. Discussions focussed mainly on vegetation management and on people and dog management, including human use features and facilities. The Steering Committee also provided feedback at critical stages of the plan development, including a review of the Management Units (MU) map and MU goals and objectives developed before the individual MU management plans were written.

Figure 2: Blackie Spit Wildlife Management Units.

Figure 3: Blackie Spit Trails: Existing and Proposed.

Two documents used as reference material were discussed in Sections 1.1 and 1.2. The Blackie Spit Master Plan (Berris et al 1999) contained goals and objectives for the park which became guidelines within which the MU plans were developed. It also contained direction regarding the specific management of certain features or areas. The second document referred to was the Blackie Spit Regional Park Wildlife Habitat Management Plan (Summers 1997). It provided useful information and enhancement activities for several areas that were adopted or adapted for MUs to which that information could be applied.

Field visits were done on July 30, August 10 and August 14, 2001. During those visits all parts of the park were visited to record existing vegetation, the presence of invasive species, soil characteristics, moisture regime, topography, and the presence of trails and other use features. MU boundaries were modified as necessary from the preliminary map, and photographs were taken of each MU.

### 3.3 Management Units

Blackie Spit has been subdivided into 19 Management Units based on physiographic, vegetation, and park use features (Figure 2). Most MU boundaries are reasonably intuitive, but occasionally, where changes in use are proposed, some portions of MU boundaries are drawn to expand or shrink the size of current features.

#### 3.3.1 Management Unit Goals and Objectives

##### Management Unit Goals and objectives

MANAGEMENT UNIT	WILDLIFE/HABITAT GOALS	HABITAT MANAGEMENT OBJECTIVES
1. Intertidal	Aquatic migratory birds and shorebirds	<ul style="list-style-type: none"> <li>• On Cannery Spit and the central dyke, prevent vegetation from growing taller than 3 m to avoid discouraging bird access to the tidal areas;</li> <li>• Eliminate all trails within the management unit and allow intertidal area to remain undisturbed;</li> <li>• Support the nest box program for the red-listed purple martin (<i>Progne subis</i>) on the pilings just outside the park;</li> <li>• Maintain pilings within the MU as perching structures for marine associated birds and for possible purple martin nest box attachment.</li> </ul>
2. Rail Side	Mixed coniferous-deciduous forest to provide habitat for a wide diversity of species groups (e.g. salamanders, woodpeckers, owls, bats (eventually), furbearers)	<ul style="list-style-type: none"> <li>• Plant trees and shrubs that will develop into a coniferous dominated mixed coniferous-deciduous forest;</li> <li>• Remove invasive species (e.g. blackberry, broom);</li> <li>• Continue to provide access only via the road along the southeast side and via the trail connecting to trails east of the park.</li> </ul>

MANAGEMENT UNIT	WILDLIFE/HABITAT GOALS	HABITAT MANAGEMENT OBJECTIVES
3. Community Gardens	Where desirable and practical, plant species with wildlife benefits (e.g. flowers for hummingbird)	<ul style="list-style-type: none"> <li>• Maintain as a community garden;</li> <li>• Work with community gardeners to ensure that composting and plant disposal methods are used that minimize the escape of non native plants into the surrounding areas;</li> <li>• Encourage gardeners to maintain a native deciduous shrub/small tree hedgerow along the north border.</li> </ul>
4. Dunsmuir Old-field	Grassland species of small mammals and their predators (e.g., herons, raptors, coyotes), and grassland passerines (breeding savannah sparrows and other wintering sparrows).	<ul style="list-style-type: none"> <li>• Renovate fields, as necessary, to maintain the grass species mix and old-field structure necessary for the target and other associated wildlife species;</li> <li>• Mow fields, annually or as required, to maintain the desired grass height and to control undesired shrubs and blackberries (this applies especially to the north portion);</li> <li>• Remove invasive species (e.g. reed canarygrass (<i>Phalaris arundinacea</i>), blackberries, escaped garden plants);</li> <li>• Maintain a hedgerow along the west side and south of MU 3;</li> <li>• Public viewing will continue to be from adjacent roads and dykes, with no access to the interior.</li> </ul>
5. Dunsmuir Meadow	<ul style="list-style-type: none"> <li>• Migratory and breeding grassland and field-edge passerines.</li> <li>• Small mammals and their predators.</li> </ul>	<ul style="list-style-type: none"> <li>• Renovate field centre and hay or rough cut annually;</li> <li>• Allow field edges to continue to grow as hedgerows with blackberries, salmonberry (<i>Rubus spectabilis</i>) and small trees within predefined boundaries.</li> </ul>
6. Dyke & Ditches	<p>Dyke: Sparrows, finches, &amp; butterflies</p> <p>Ditches: Aquatic insects and other invertebrates, swallows, flycatchers, waterfowl, and wetland birds (and amphibians if not too saline)</p>	<ul style="list-style-type: none"> <li>• Maintain wildlife flowers and low-growing grasses along both dyke sides;</li> <li>• Allow the natural occurrence of aquatic vegetation to the extent that it does not impede drainage or cause flooding;</li> <li>• In the north ditch, determine the reason for the shrub die-off. Allow dead shrubs to remain for perches for swallows, flycatchers, and other birds. Plant sparsely spaced, low-growing, slow-spreading shrubs above the waterline, if possible.</li> </ul>
7. Dyke Hedge	Breeding and migrating passerines and woodpeckers	<ul style="list-style-type: none"> <li>• Maintain existing plant species and community structure (i.e. no trees over 8 m);</li> <li>• Manage access and/or vegetation so as to minimize disturbance to estuarine birds;</li> <li>• Create destination feature/low viewing structure/-benches at east end, overlooking estuary to north, to replace existing access onto Cannery Spit in MU 1.</li> </ul>

<b>MANAGEMENT UNIT</b>	<b>WILDLIFE/HABITAT GOALS</b>	<b>HABITAT MANAGEMENT OBJECTIVES</b>
8. Deciduous Forest	Diversity of species associated with mixed deciduous-coniferous forest: terrestrial amphibians; raptors, woodpeckers, flycatchers, wrens, thrushes, vireos, warblers, grosbeaks, sparrows; small mammals; cottontails, raccoons.	<ul style="list-style-type: none"> <li>• Maintain existing deciduous forest development and plant additional trees along west side and in area south of current grove;</li> <li>• Plant small number of coniferous trees (10) for winter and nesting cover;</li> <li>• Do amphibian inventory to determine whether present in forest or whether introductions are appropriate;</li> <li>• Manage forest for amphibian habitat features (e.g. coarse woody debris), if required;</li> <li>• Control invasive species (e.g., blackberry, broom, tansey) in peripheral areas between forest edge and grasslands of MUs 10, 11, and 12, at the south end, and in the northwest where wetland and meadow are to be maintained (next bullet);</li> <li>• maintain cattail wetland and open meadow in vicinity of wetland through removal of all woody vegetation.</li> <li>• Decommission all unofficial trails;</li> <li>• Construct one main trail through the site.</li> </ul>
9. Seral Grassland	Woodpeckers, passerines, small mammals	<ul style="list-style-type: none"> <li>• Remove all broom and blackberry;</li> <li>• Maintain a ground cover ratio of 30% native shrubs and trees interspersed among the grasses and forbs by controlling of natural succession of woody vegetation;</li> <li>• As part of the above, plant native trees and shrubs to create a connectivity of woody vegetation between MU9 and MU14.</li> </ul>
10. Dune, Grassland, Seral Shrub	<p>Dune and grassland vegetation as cover for cottontails, sparrows, finches, and other wildlife</p> <p>Seral shrub land as habitat for sparrows, and small resident passerines (e.g downy woodpeckers, chickadees, bushtits)</p>	<ul style="list-style-type: none"> <li>• Permit dune vegetation community of existing introduced grass species to remain;</li> <li>• Plant native dune vegetation species wherever/- whenever revegetation is required;</li> <li>• Continue to remove invasive woody vegetation, both introduced (e.g. broom, blackberry, knotweed) and native in dune areas;</li> <li>• Include information on dune vegetation and ecosystems, and dune management in Blackie Spit literature;</li> <li>• Manage invasive species areas between dune and forest as a transitional seral habitat by controlling invasive species and planting native shrubs and small trees;</li> <li>• Exclude this MU from dog-off-leash area.</li> </ul>

MANAGEMENT UNIT	WILDLIFE/HABITAT GOALS	HABITAT MANAGEMENT OBJECTIVES
11. Dog-off-leash	<ul style="list-style-type: none"> <li>• Sparse grass and wild flowers</li> <li>• Shrub/tree borders</li> <li>• Passerine bird species associated with the shrubby edges</li> <li>• Insects associated with wildflowers</li> <li>• Occasional use by grassland and opportunistic bird species.</li> </ul>	<ul style="list-style-type: none"> <li>• Continue to experiment with topsoil and short-growing grass &amp; wildflower mixes (native species not necessary but avoid species that spread &amp; become weedy);</li> <li>• Continue invasive species removal (e.g., broom, knotweed, blackberries);</li> <li>• Maintain existing extent of shrub/tree border to east;</li> <li>• Plant suitable native shrub and small tree species along and south of fence on south side and in place of the invasive species by the trail on the west side;</li> <li>• Fence access to the south estuary as required;</li> <li>• Maintain view of estuary from all purpose trail at the west end; build low off-trail viewing structure.</li> </ul>
12. East Pod	<ul style="list-style-type: none"> <li>• Dry habitat: White-crowned sparrow nesting; sparrow wintering and migration</li> <li>• Treed areas: accipiters, passerines (warblers, sparrows, thrushes), eventual perches for bald eagles and red-tailed hawks in isolated cottonwoods or alders.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain free flyways into the estuarine bays of MUI by controlling spread of invasive woody vegetation in both open sandy areas and understorey of treed areas (e.g. alder, cottonwood, exotic elm (<i>Ulmus crassifolia?</i>));</li> <li>• Remove all woody vegetation in the open, central area (except the existing clump of cottonwoods);</li> <li>• Permit only native shrubs to grow beneath the trees in the central and perimeter areas;</li> <li>• Control daphne, broom and any other invasive species as part of the above two points;</li> <li>• Restrict trails to perimeter;</li> <li>• Exclude dogs (to prevent disturbance to ground-nesting birds and estuarine birds);</li> <li>• Fence viewing area at south tip to discourage access to estuary.</li> </ul>
13. Deciduous Complex	Terrestrial amphibians; raptors, woodpeckers, flycatchers, wrens, thrushes, warblers, grosbeaks, sparrows; small mammals, cottontails	<ul style="list-style-type: none"> <li>• Plant a small number of suitable coniferous species for winter cover in area between trail and estuary;</li> <li>• Plant native shrubs and trees in currently grass-forb areas east of trail;</li> <li>• Plant small native deciduous trees and shrubs north of blackberries and south of sail club/tennis court (avoid planting trees next to fence to avoid damage to boats and tennis courts from shade, leaf fall and windfall).</li> <li>• Control invasive species (e.g. remove common tansey east of trail, limit growth of blackberry west of trail);</li> <li>• Build boardwalk on segment of trail connecting MUs 12 &amp; 15 along east shore and establish as the only route through that area (i.e. remove any other trails).</li> </ul>

MANAGEMENT UNIT	WILDLIFE/HABITAT GOALS	HABITAT MANAGEMENT OBJECTIVES
14. Sandy Spit	Migratory open-habitat passerines (e.g. horned larks, snow buntings, Lapland longspurs, pipits, sparrows, finches)	<ul style="list-style-type: none"> <li>• Maintain existing open nature of spit with herbaceous vegetation: <ul style="list-style-type: none"> <li>• Establish islands of low-growing native shrubs and trees in pre-established locations to provide escape cover for sparrows and finches using the site;</li> <li>• Control invasive species (non native and all other unwanted woody species);</li> </ul> </li> <li>• To avoid unnecessary disturbance to birds using estuary and spit, and in accordance with the master plan: <ul style="list-style-type: none"> <li>• confine people to 2 trails: a major central trail and a minor south trail. The existing south trail should be moved 2 m above the high tide line and provide an optional route for people without dogs;</li> <li>• Establish destination feature and viewing area at new trail end;</li> <li>• Move existing north-facing benches to the central trail edge.</li> </ul> </li> <li>• Establish islands of low-growing native shrubs and trees in pre-established locations;</li> <li>• Control invasive species (non native and all other unwanted woody species).</li> </ul>
15. Intertidal Bay	Intertidal benthos (marine invertebrates).	<ul style="list-style-type: none"> <li>• Remove existing parking lot and create tidal gradient so that highest (south) extent is flooded by the tide at least once per month in every lunar month;</li> <li>• Maintain existing spit access trail along south side.</li> </ul>
16. Coastal Beach	Coastal beach vegetation and associated birds and invertebrates.	<ul style="list-style-type: none"> <li>• Place a mixture of gravelly and sandy substrates (with high shell content) over entire area to enable duplication of natural open coastal beach vegetation;</li> <li>• Plant appropriate native plants (e.g. dunegrass (<i>Elymus mollis</i>), beach pea (<i>Lathyrus japonicus</i>));</li> <li>• Maintain spit access trail along south side.</li> </ul>
17. Wickson Property	<ul style="list-style-type: none"> <li>• Park facilities</li> <li>• Nature Scape Garden</li> </ul>	<ul style="list-style-type: none"> <li>• Consult with Nature Scape BC to design a native species demonstration garden. Any future facilities should be on the upland side of existing trail; gardens may be in both upland and beach-side areas.</li> <li>• Plant 2 or 3 spruce trees along the upland side of the existing trail (location dependent on facilities locations) to provide eventual eagle perches.</li> </ul>
18. Parking	Parking lot	<ul style="list-style-type: none"> <li>• Create more efficient parking.</li> <li>• Extend parking lot, if necessary after above, to replace number of parking spaces decommissioned in MUs 16 and 17.</li> </ul>
19. Sailing/-Swim'g club	Sailing/swimming club use	<ul style="list-style-type: none"> <li>• Plant low-growing native shrubs around unused perimeter areas.</li> </ul>

### 3.3.2 Management Unit Cost Summary

The following costs are summarized from the individual management unit plans in Part 2. See the plans for more details.

Summary of Initial Activities	MU1	MU2	MU3	MU4	MU5	MU6	MU7	MU8	MU9	MU10	MU11	MU12	MU13	MU14	MU15	MU16	MU17	MU18	MU19	TOTAL
Remove invasive plant species.		incl.						incl.	volntrs	incl.	staff/vol.	vol/staff	incl.	volntrs						0
Plant trees &/or shrubs (may include preparations)		3,900				3,523		9,296	1,050	3,825	6,159		16,980	75					1,204	46,012
Renovate all or some of the fields				2,500	4,700															7,200
Plant wildflower mix (may include preparations)						1,250														1,250
Plant aquatic plants						3,270														3,270
Plant dune vegetation species (may include preparations)										235						685				920
Trail management: close or create trails as required	staff							staff		staff		staff	1,000	staff/vol						1,000
Investigate the suitability of the pilings to support nesting structures for purple martins or cliff swallows.	0																			0
Install nest boxes	200					100														300
Construct viewing platform							5,000							5,000						10,000
Conduct wildlife and/or user survey							staff?	2,500												2,500
Introduce logs (Large Woody Debris)								staff								0				0
<ul style="list-style-type: none"> <li>Discuss wildlife goals and habitat management objectives with tenants.</li> <li>Take required steps, if required, to install facilities or enact procedures to meet second objective.</li> </ul>			0																	0
Construct fencing for access control												250								250
<ul style="list-style-type: none"> <li>Install signs</li> <li>Move park benches</li> </ul>														200						200
Create intertidal beach															28,400	*2,370				30,770
Work with Naturescape BC to create native plant wildlife garden																	5,000			5,000
Construct parking areas																		4,740		4,740
<b>TOTAL</b>	200	3,900	0	2,500	4,700	8,143	5,000	11,796	1,050	4,060	6,159	250	17,980	5,275	28,400	3,055	5,000	4,740	1,204	113,412

\* If MU 16 were done in conjunction with MU 15, overall trucking costs would be reduced by \$5,500.

Costs were derived from a variety of sources. Plant costs were obtained from three nurseries and a medium to low price was chosen from the range of prices provided for each species. Costs related to machine time and excavation were derived with the help of an excavation contractor. Costs for fences, viewing platforms, and trails were somewhat arbitrary and could be refined by those who have done such work. All assumptions regarding unit costs, and estimated time requirements are provided so that amounts can be easily recalculated if others should decide that different values are more appropriate.

Some activities are already being done by volunteers and/or staff, particularly broom pulling. Other activities were thought to be very straightforward and likely could be carried out by staff or volunteers. No costs were provided for those activities. No attempt was made to estimate administration costs that would be born by Surrey Parks, Culture and Recreation to carry out the habitat enhancement activities.

### Plant Sources and Costs

The following are the nurseries that provided plant costs, and through which most of the plant materials could be obtained:

B.C.'s Wild Heritage Plants, Chilliwack, B.C. (604) 858-5141  
Linnaea Nurseries, Langley, B.C. (604) 533-8281  
Peel's Nurseries, Mission, B.C. (604) 820-7382

All of these nurseries stressed that plant prices charged depend on a variety of factors and that prices supplied are list prices. Better prices can be obtained by ordering well in advance so the nursery can grow or obtain the material for the desired date. Large, multi year orders can realize the greatest cost savings.

The before tax plant prices used for this report were as follows:

Snowberry, 1 gal size, \$3.00 ea  
All other shrubs, 2 gal size, \$6.00 ea  
Deciduous trees, 3/5 gal size, 12.50 ea  
Coniferous trees, 5 gal size, \$13.00 ea  
Dune plants, plant, \$0.85 ea  
Aquatic plants, plugs, \$0.65 ea  
Seed costs, arbitrary estimates

In the report, after tax prices (+14%) are used, sometimes rounded up a few cents.

### Excavation and Machinery Costs

Excavation and machinery costs were derived by a telephone conversation with Ken Smith of Ken Smith and Son Excavating in Langley ((604) 888-7611), based on the volumes and other site conditions provided to him. Once again, actual costs are better estimated in the field.

A single machine time (costs/hour) was used for brush cutting and soil tilling; actual costs may vary depending on the machine, the operator, and any contract agreement that may be reached.

### 3.3.3 Management Priorities

First priority: management units whose management goals will be most affected by lack of action because of the growth of invasive species, or from encroachment by native species.

This priority may apply to only portions of these MUs, or it may apply in addition to other priorities; therefore, an MU may appear in two categories. Because invasive species removal has been undertaken recently, this priority may not be as high as it once was in some MUs, but as the long-term effectiveness of the broom (*Cytisus scoparius*) removal programs is as yet unknown, MUs that had a recent problem are included.

MU 8, MU 9, MU 10, MU 11, MU 12, MU 14

Second priority: management units whose management goals will not be realized until habitat management activities are completed.

MU 2, MU 4 (north part), MU 5, MU 15, MU 16, MU 17, MU 19

Third priority: management units whose management goals are currently being realized, at least in part, but will be enhanced through management activities (in addition to any required invasive species removal).

MU 6, MU 8, MU 9, MU 10, MU 11, MU 12, MU 13, MU 14,

Fourth priority: management units that require little or no action.

MU 1, MU 3, MU 7, MU 18

### 3.3.4 Wildlife Use Monitoring for Blackie Spit

Establish baseline wildlife use data for birds, voles (in MU 4 old-field), larger diurnal mammals (coyotes, deer), and amphibians (in MUs 6 and 8). To be most useful, the data should be collected in a systematic manner so summary statistics can be calculated for comparison with future surveys. There is also value in recording incidental observations of wildlife occurrences.

#### *3.3.4.1 Incidental Records and Surveys*

Incidental observations need only record date, observer, MU, habitat (from a predetermined list of options), species, and number of individuals. Park employees and visitors could be provided with cards for completing incidental records, which could be in the form of a single observation of interest, or of a day's birding. A sample survey card (below) could form the basis of a card design. Data entry, preferably into a dBase compatible program such as dBase V, Paradox, or Access, (or in a database accessible format in a spreadsheet such as Lotus 123, Quatro Pro, or Excell), would facilitate the use and summarization of the data. Perhaps a volunteer group, such as the White Rock and Surrey Naturalists could be custodians of the database.

Sample Wildlife Survey Form (3" x 5" card)

FRONT

Blackie Spit Wildlife Records			City of Surrey, Parks, Recreation & Culture					
MU:		Date: Year    Month    Day			Observer(s):			
Weather:								
Species	Number	Habitat	Species	Number	Habitat	Species	Number	Habitat

BACK

MU Map	<b>Habitat types</b>
	1 Intertidal water
	2 Intertidal mud/sand
	3 Intertidal gravel
	4 Intertidal vegetation
	5 Fresh water/ditch
	6 Old-field
	7 Grassland
	8 Grassland/shrub
	9 Hedgerow/shrub
	10 Woodlot/trees
	11 Dune vegetation
	12 Unvegetated grnd.
	13 Building
14 Other (e.g. pilings)	

### 3.3.4.2 *Systematic Surveys*

All systematic surveys should, in addition to the data being recorded, collect standard information about the survey, including: date; time; observer; weather conditions; identification of survey unit for which the data is being collected (e.g. plot number and/or MU number); the title or description of the survey and for whom it is being collected (e.g. Surrey Parks, Recreation & Culture Terrestrial Bird Survey).

For systematic surveys, each survey unit should also have a description form that records the following information: identification of survey unit; mapped record and written description of survey unit location; GPS-derived location (optional, but may be useful if there is no permanent marker in the field or if the location is ambiguous); habitat description; photographic record of survey unit taken during the survey period (summer and winter photographs may be useful information for year-long surveys), in part for comparison with the habitat during future surveys of that unit.

#### Multi-species Bird and Mammal Surveys

**Frequency:** The larger the number of survey, the more useful the data. Conduct weekly surveys for a year if possible.

**Personnel:** For consistency, the number of different people conducting the surveys should be small and constant. Personnel should regularly rotate between days or between sample sites. With a large enough sample size, it may be possible to include “between observer” variability into the calculation when comparing with future surveys.

**Weather:** As much as possible, avoid inclement weather conditions. Do not do surveys in the rain or if steady rain is in the forecast. Do not survey on windy days (>10 km/hr).

**Time of Day:** During the breeding season (mid March through mid July), surveys should be completed by 10 a.m. During cold winter days, surveys during the warmest part of the day (11 a.m. to 3 p.m.) may yield the best results.

#### **Sampling Strategy:**

Establish fixed sampling sites within each Management Unit to be surveyed. Ideally, each sample site should consist of a single habitat type. Because of the small park size and large number of habitat units, sampling sites will have to be small. Establish as many non overlapping sample sites in each MU as time and budget will allow.

#### **Survey Method:**

##### Terrestrial birds and mammals

Two sampling methods are commonly used: line and point surveys. Circular point survey plots are usually favoured by surveyors, but they may not be as effective for narrow linear habitats.

I suggest using small-diameter circular plots (about 25 m radius), located, where possible, so that the entire plot encompasses the same habitat type or habitat complex. When sampling hedgerows, or where more than one distinct habitat patch occurs in a plot (count circle), map and measure the habitat types within each count circle; during surveys indicate the habitat occupied for each animal recorded.

Record the number of individuals of each species detected and indicate whether the detection was audible only or whether the animal was sighted. During the breeding season, indicate whether a bird was singing. Record habitat if applicable (see previous point).

### Marine Birds

Determine which shorelines are to be surveyed and set survey boundaries. Within each shoreline segment surveyed, record bird use of the estuary within zones of different distances from shore (e.g. closer or farther than 50 m from the shoreline being surveyed). Record the following information:

- Total count of each species in each zone at the time of the survey
- Tidal tendency (rising or falling).
- The percentage of the zone that is flooded by the tide (<5%, 5-25%, 25-75%, 75-95%, >95%).

### Vole Surveys

Methods of determining vole abundance often require intensive survey effort involving trapping and marking animals. An easier method is to measure vole activity as indicated by the abundance of runways and burrows. Both methods have their assumptions and limitations. The runway count method is recommended here.

In the area to be surveyed, conduct a minimum of 5, 5-metre transects or more if the results are highly variable. Ensure that the locations chosen for the transects are all similar and representative of some aspect of the area being surveyed (e.g., same habitat type; all away from the field edge or all near it, etc.). If necessary, create a set of samples for each identifiable field variable.

The survey method entails marking a 5-m length on the ground, then, starting at one end, part the grass down to the ground for the length of the transect and count each runway or burrow crossed.

### Amphibian Surveys

Several amphibian survey methods exist, depending on the species being surveyed and the time of year. Encounter surveys are the simplest method that can be used for frogs and for both terrestrial and aquatic salamanders. Encounter surveys are, therefore, recommended. This method is used in the early spring (mid February through April) when animals are most active.

The method entails searching along transects chosen to follow shorelines of water bodies or roads and trails through terrestrial areas. Surveys are done at night, preferably during or following rain, using a flashlight to spot the animals. Record the length and location of the transect surveyed, the amount of time spent searching, and the species and number of animals encountered. Repeat the survey at weekly intervals during the survey period.

When doing encounter surveys near water bodies, vocalization information can also be collected for frogs. Record the species vocalizing and the number of individuals heard. This can be challenging during choruses of Pacific treefrogs, both because of the difficulty of detecting individual animals, and because the chorus can mask the calls of other species.

### 3.3.5 Habitat Maintenance Requirements Monitoring Schedule Summary

The following habitat monitoring information is summarized from the individual management plans. Initial monitoring associated with proposed enhancements are not included here. Most maintenance activities are associated with the control of undesirable plant growth, including both invasive species and plant succession beyond the stage desired for the management unit.

Management Unit	Monitoring Frequency			
	Annually	2 year intervals	3 year intervals	5 year intervals
MU 1			Check tree growth and remove tall-growing species	
MU 2	Control invasive species until planted conifers are well established (at least 6 m high).			
MU 3	Routine maintenance by community gardeners of any facilities installed to combat the spread of invasive species.			

Management Unit	Monitoring Frequency			
	Annually	2 year intervals	3 year intervals	5 year intervals
MU 4	<ul style="list-style-type: none"> <li>• Check, and as required: -mow grass in fall to a height of 30-50 cm.</li> <li>-thin shrubs.</li> <li>• Maintain the west hedgerow at 5 m wide.</li> </ul>		Maintain the hedgerow south of MU 3 at its existing width by cutting back as required.	Evaluate old-field condition and renovate when necessary.
MU 5	<ul style="list-style-type: none"> <li>• Cut and remove hay in late August.</li> <li>• Ensure that the hedgerow borders are maintained within their desired limits.</li> </ul>			
MU 6	<ul style="list-style-type: none"> <li>• Remove all blackberry or other volunteer shrubs and trees (as per plan) in the areas designated for grass and wildflowers on both sides of dyke.</li> <li>• Clean and repair swallow boxes.</li> </ul>			
MU 7	<ul style="list-style-type: none"> <li>• Manage existing trail for continued accessibility and public use.</li> <li>• Cut tansy near Cannery Point before it flowers. See management plan for cautions.</li> </ul>		Monitor tree species and height and cut or top any trees growing taller than baseline (year 2001) height of hedgerow.	

Management Unit	Monitoring Frequency			
	Annually	2 year intervals	3 year intervals	5 year intervals
MU 8	<ul style="list-style-type: none"> <li>As required, remove all blackberry and broom from areas northwest of woodlot</li> <li>Cut areas with tansy in habitat units east of the multi purpose trail before the tansy flowers. Note cautions in management plan.</li> </ul>			If tansy persists after several years of cutting, rototill (5-8 cm deep) the infested area and plant with a grass/clover mixture as per the management plan.
MU 9		Control of broom and blackberry.	As necessary, remove shrubs and trees, including all large-growing trees, to maintain the desired ratio of woody vegetation to grass/forb.	
MU 10		<p>As required:</p> <ul style="list-style-type: none"> <li>Remove invasive species.</li> <li>Remove native shrubs from the grass/forb area when they exceed 5% coverage.</li> <li>Plant additional large-head sedge on bare sites in dune area.</li> </ul>		

Management Unit	Monitoring Frequency			
	Annually	2 year intervals	3 year intervals	5 year intervals
MU 11	Cut blackberries south of the east-west fence back to a maximum 3-metre wide border along the all purpose trail.	When required, remove invasive species from all other areas.		
MU 12			Remove invasive species as required.	
MU 13	Cut blackberries back along the bordering train in MU 10		Remove other invasive species as required.	
MU 14				Remove invasive species as required.
MU 15			This unit should be self maintaining through tidal inundation. Occasional clearing of trail side vegetation may be required.	
MU 16		Remove undesirable species.		
MU 17	None at this time.			
MU 18	None.			
MU 19				Remove any growth of planted species that is expanding beyond a desirable width.

## PART 2: DETAILED MANAGEMENT UNIT MANAGEMENT PLANS

### Management Unit 1: Intertidal

#### 1.0 Existing Conditions

Management Unit 1 comprises all the intertidal areas of the park, including old dykes and the cannery spit. It is subdivided into three sections: MU1 north, MU1 central, and MU1 south (Drawing 1).

- MU1-north includes the “outside” areas, including those adjacent to Blackie Spit, the area outside the breached dykes, and the area east of MU 13;
- MU1-central is the salt marsh behind the old breached dyke, north of MUs 12 and 13;
- MU1-south is the bay, the mouth of which is demarcated by the cannery spit and MU 13.

MU1-north is largely intertidal flats on which species of green algae occur during the growing season (Drawing 1). Contiguous mudflat areas outside the park are of a similar nature. Toward the head of this area, west of the central area dyke, brackish estuarine high marsh grasses grade to backshore grasses, forbs and woody plants. The intertidal vegetation is composed largely of halophytic (salt-loving) species including sea arrowgrass (*Triglochin maritimum*) with saltgrass (*Distichlis spicata*) or American glasswort (*Salicornia virginica*), and orache (*Atriplex patula*) (Figure 4). Gumweed (*Grindelia intergrifolia*) is common in higher areas. A trail on Blackie Spit occurs along the upper edge of MU 1 along the border with MU 15.

MU1-central is a salt marsh characterized by saltwort and salt grass. Two tide channels through the area branch from a breach in the dyke (Figure 5). The vegetation of the lower slopes of the dyke is a mixture of halophytic species such as glasswort, arrowgrass, saltgrass, and seaside plantain (*Plantago maritima*). The dyke top supports grasses, forbs such as hairy cats-ear (*Hypochaeris radicata*), thistles (*Cirsium* spp.), and yarrow (*Achillea millefolium*), and woody species including Pacific crabapple (*Malus fusca*), domestic apple (*Malus* sp.), rose (*Rosa* sp.), broom (*Cytisus scoparius*), and daphne. Groves of mature birch (*Betula papyrifera*) trees grow along the west end of this MU and on the adjacent dyke.

Two trails occur along the dyke, one on the top and one along the upper intertidal at the dyke toe. Other trails access the dyke through the backshore and upper intertidal marsh areas west of the dyke.

UM 1-south is a bay containing both mudflat and brackish estuarine marsh vegetation. Patches of marsh vegetation occur along the south border, but most of the marsh habitat occupies the north half of the bay (Figure 6). Species in the lower marsh include glasswort, salt grass, and seaside plantain, either mixed or in patches in which one species predominates. The upper part of the salt marsh supports grass and mud rush (*Juncus gerardii*), seaside plantain, gumweed, and other species. At higher elevations, sea-watch (*Angelica lucida*), goldenrod (*Solidago canadensis*), yarrow, sweet clover (*Melilotus alba*), and some broom and alder (*Alnus rubra*) occur (Figure 7).

The salt marsh at Cannery Point is characterized by saltwort, salt grass, gumweed, orache, and other species. Some shrubs, blackberry (*Rubus discolor*), common tansy (*Tanacetum vulgare*), yarrow, and upland grasses grow on two higher patches (Figure 8).

A small number (10 plants) of seaside fiddleneck (*Amsinckia spectabilis*), listed in the Rare Vascular Plants of British Columbia, were discovered in the intertidal saltmarsh (unspecified location) in 1994 (Taylor, unpub.)

This area also contains recently installed enhancement works entailing an intertidal pond and connecting channels created in the sandy dredgate along the north side of the bay. Associated shrub plantings occur along the north side in MU 12 (Figure 9).

The southeast entrance to the bay is a spit (“Cannery Point”) that once was part of an oyster plant. A row of old pilings associated with the old cannery cross the gap between the spit and MU 13 (Figure 10). A short unofficial public trail runs the length of the spit. Pilings to the east, outside the park, have had purple martin (*Progne subis*) nest boxes attached.

## **2.0 Goals and Objectives**

### Species Management Goal

Aquatic migratory birds and shorebirds

### Habitat Management Objectives

- On Cannery Spit and the central dyke, prevent vegetation from growing taller than 3 m to avoid discouraging bird access to the tidal areas;
- Eliminate all trails within the management unit and allow intertidal area to remain undisturbed;
- Support the nest box program for the red-listed purple martin on the pilings just outside the park;
- Maintain pilings within the MU as perching structures for marine associated birds and for possible purple martin nest box attachment.

## **3.0 Management Prescriptions**

- The chief management prescription for this area is to leave it untouched.
- Areas of current use (trails) are to be abandoned, with alternate public facilities provided in adjacent MUs. (See plans for MUs 7, 12, 13, 14, and 15 for discussions relating to alternate trail and viewing options.)

### **3.1 Initial Enhancement Requirements**

- In association with the management of adjacent MUs (see previous section), close trails to the public.
- Investigate the suitability of the pilings to support nesting structures for purple martins or cliff swallows.

### **3.2 Ongoing Maintenance Requirements**

Every three years monitor the height of vegetation on the central dykes and Cannery Spit. Either remove species that germinate, such as alder, or top tall-growing trees at a maximum height of 5 m. Low-growing plants, such as Pacific crabapple that may occasionally exceed 5 m, can be left.

### **3.3 Initial Enhancement Costs**

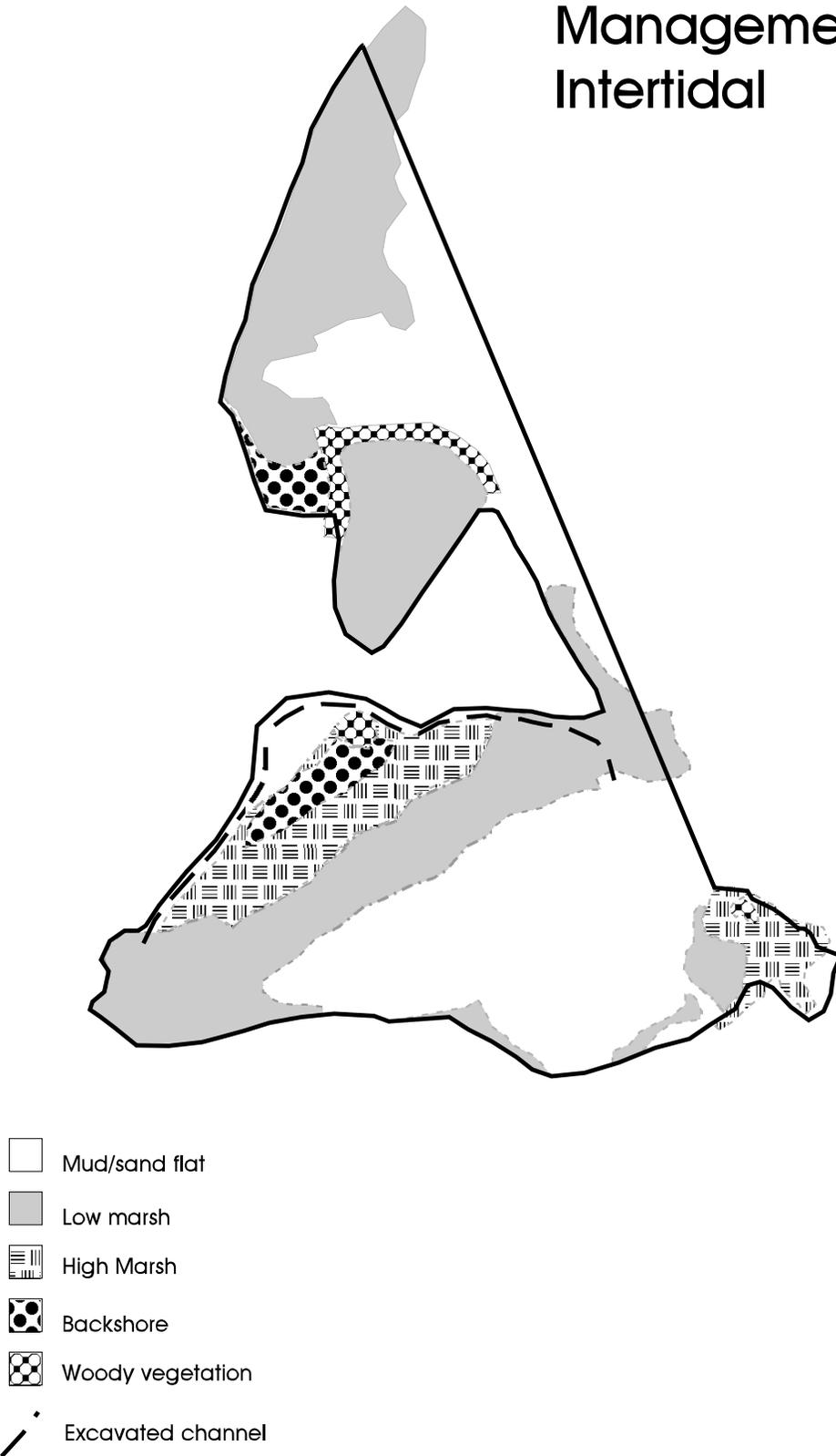
- Staff time may be required to consult with local naturalists about the desirability and feasibility of providing nesting structures on pilings within the park and for assessing nesting structure needs for pilings outside the park. A volunteer group should provide structure designs and a materials cost estimate.
- Capital costs may be incurred for providing materials to a volunteer group to build and install nesting structures. For this item, a fixed budget can be established that will determine the number of structures that can be constructed. There is no required budget for this management activity, but a suggested amount is \$200.

### **3.4 Monitoring Schedule**

- Monitor tree growth once per year, ideally at the end of the growing season, and take any necessary action.
- Consult with naturalists annually to determine whether any capital costs need to be incurred to maintain nesting structures.

Drawing 1:

# Blackie Spit Management Unit 1: Intertidal



## Management Unit 2: Rail Side

### 1.0 Existing Conditions

Management Unit 2 west of the dyke access road is a variable mixture of volunteer and planted, native and introduced shrubs, and brambles encroaching into an area of grasses and forbes, and a grove of birch (*Betula papyrifera*) trees (Drawing 2). East of the dyke access road vegetation is a mixture of largely invasive (blackberry) and native shrubs with a central grass/forb area.

#### West of dyke access road

At the east end of this section, just west of the dyke access road, vegetation is primarily woody, comprising birch, one Douglas fir (*Pseudotsuga menziesii*), and a row of Lombardy poplars () along the road side, with an undergrowth of dense Himalayan blackberry. The west end is vegetated with about 10 planted lodgepole pines (*Pinus contorta*) and volunteer deciduous trees, shrubs, and brambles.

The remainder of the area is largely long, uncut pasture grasses, in some places mixed with Canada thistle (*Cirsium arvense*), reeds *Juncus* sp., or stinging nettle (*Urtica dioica*), and in some places replaced by patches of reed canarygrass (*Phalaris arundinacea*). An area of policeman's helmet (*Impatiens glandulifera*) grows near the intersection of the road and the access road to the gardens. About half of the area is also occupied by woody vegetation (Figure 11). Woody species include blackberry (scattered, plus one large patch), red elderberry (*Sambucus racemosa*) (mostly stressed and dying or dead), broom (near the west end), or planted trees (up to about 5 m high), including oak (*Quercus* sp.), rowan (European ash) (*Sorbus aucuparia*), 1 walnut (*Juglans* sp.), 1 blue spruce (*Picea pungens*), 2 Douglas fir, and about 10 lodge-pole pine (in the western half). (A total of about 20 pines are planted in the MU.)

The soils consist of more than 90 cm of organic topsoil, often with lenses of grey clay. During the late July field visit, the moisture content of the upper 30 to 60 cm decreased toward the west end of the central area and the vegetation, particularly the condition of the elderberry, reflected the change in available moisture. At the west end of the central area, the upper 30 cm was completely dry.

#### East of dyke access road

The plant species growing east of the dyke access road include blackberry, rose, broom, elderberry, with some individual alder, Pacific crabapple and a domestic cherry (*Prunus* sp.) (Figure 12). The central area, is kept open by people seeking access to the water's edge, or a place to build a fire and perhaps to party. The central vegetation is low grasses surrounded by tall grasses including reed canarygrass and forbs such as yarrow, tansy, goldenrod, thistle, morning glory (*Convolvulus arvensis*), and hairy cat's ear. A trail through the MU connects the dyke access road with trails east of the park, including to the aeroplane museum.

Soils in the clearing are up to two inches or so of firm (impenetrable to soil prob) sandy, gravelly loam. Mole activity suggests sand occurs beneath the surface layer.

## 2.0 Goals and Objectives

### Species Management Goal

A wide variety of species typical of mixed coniferous-deciduous forest such as salamanders, woodpeckers, owls, bats (eventually), and furbearers.

### Habitat Management Objectives

- Plant trees and shrubs to supplement existing trees to create a coniferous-dominated mixed coniferous-deciduous forest;
- Remove invasive species, in particular, blackberry and broom;
- Continue to provide access only via the road along the southeast side and via the trail connecting to trails east of the park.

## 3.0 Management Prescriptions

This area will be managed as a coniferous-dominated mixed forest. Some of the species of trees already planted may not be the best suited for this site as some appear to be growing poorly. Those plants should be left and additional trees planted that will be better suited to the site.

### 3.1 Initial Enhancement Requirements

- Remove blackberry and broom where practical, particularly from open areas. In open areas, it may be possible to cut the blackberry with a machine rather than by hand.
- Mow the grass and blackberry areas twice a year, in June and September, for two years to help retard the growth of invasive species, in preparation for tree planting.
- Plant trees throughout site, except not in birch grove or in shrub/pine area northeast of MU 3, as follows:

West half of grass area	–	20 Douglas firs in the south half of this area 10 red alder 10 Douglas maple ( <i>Acer glabrum</i> var. <i>douglasii</i> ) 10 cascara ( <i>Rhamnus purshiana</i> )
East half of grass area	–	10 western red cedar ( <i>Thuja plicata</i> ) 10 western hemlock ( <i>Tsuga heterophylla</i> ) 5 black cottonwood ( <i>Populus balsamifera</i> ) in south half of this area 5 vine maple ( <i>Acer circinatum</i> ) in south half of this area 10 paper birch in north half of this area
East of dyke access	–	15 Sitka spruce ( <i>Picea sitchensis</i> )

Plant coniferous trees and cottonwoods in a clumped distribution (Drawing 2) so that some views of the water are preserved for residents living south of the park.

### 3.2 Ongoing Maintenance Requirements

- Remove broom and cut blackberries (by hand or machine) as required until trees are well established (conifers at least 6 m high).
- As required, water trees regularly during the summer for the first two years, or longer if required, until well established. The amount of watering required will depend on soil moisture.
- Within the first two years, replace any trees that die with appropriate species after determining cause of failure.

### 3.3 Initial Enhancement Costs

The following costs assume that the work will be contracted out. Much of the labour and the plants costs can be reduced through volunteer help and donation of materials.

Labour to prepare site	
invasive species initial removal	\$600. for 1 day of machine* time
periodic mowing/brushing for 2 yrs	\$1,200. for 4 half-days of machine time
Labour to plant trees	\$525. to plant 105 trees @ \$5/tree
Cost of trees	<u>\$1,575.</u> @ \$15/tree (taxes included)
TOTAL	\$3,900

\*assuming \$75/hour for a side-arm brush cutter

### 3.4 Monitoring Schedule

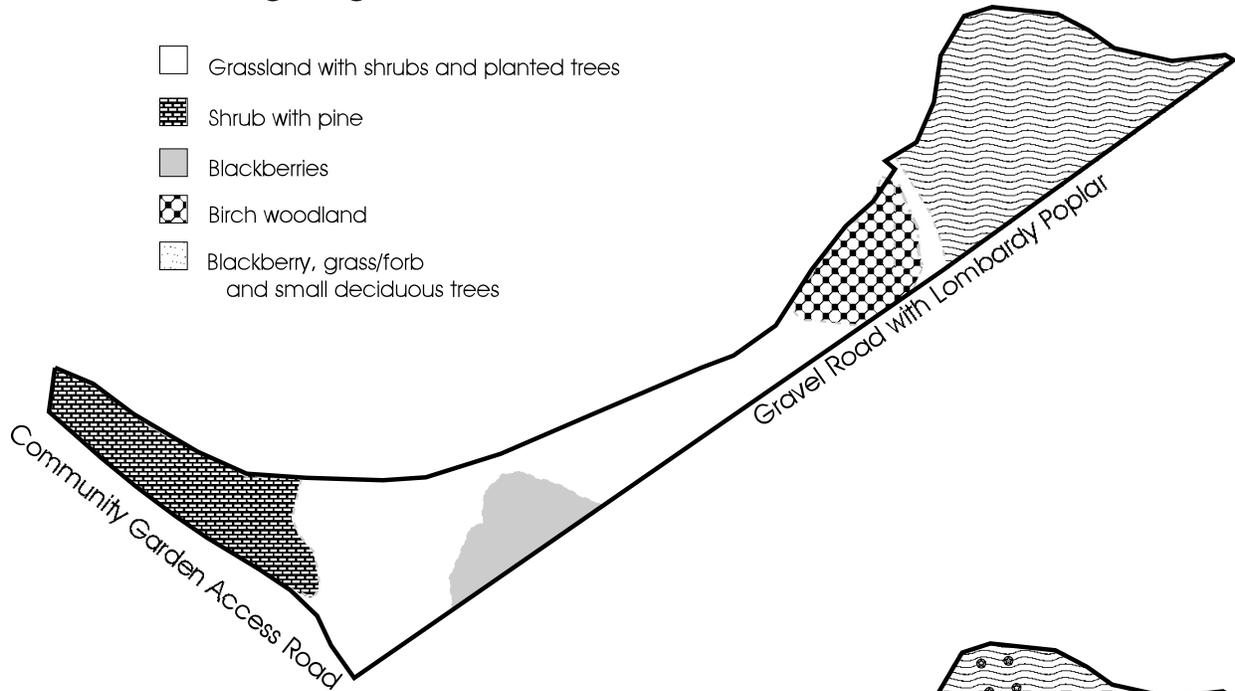
- Evaluate the success of the plantings every five years after the initial 2-year period. If after 10 years woodlot conditions are developing slowly, additional plantings may be desirable.
- After 20-30 years, under-plant with similar conifer species to create a lower coniferous canopy. Plant additional deciduous species as required to maintain the woodlot as a mixed forest.

Drawing 2:

# Blackie Spit Management Unit 2: Rail Side

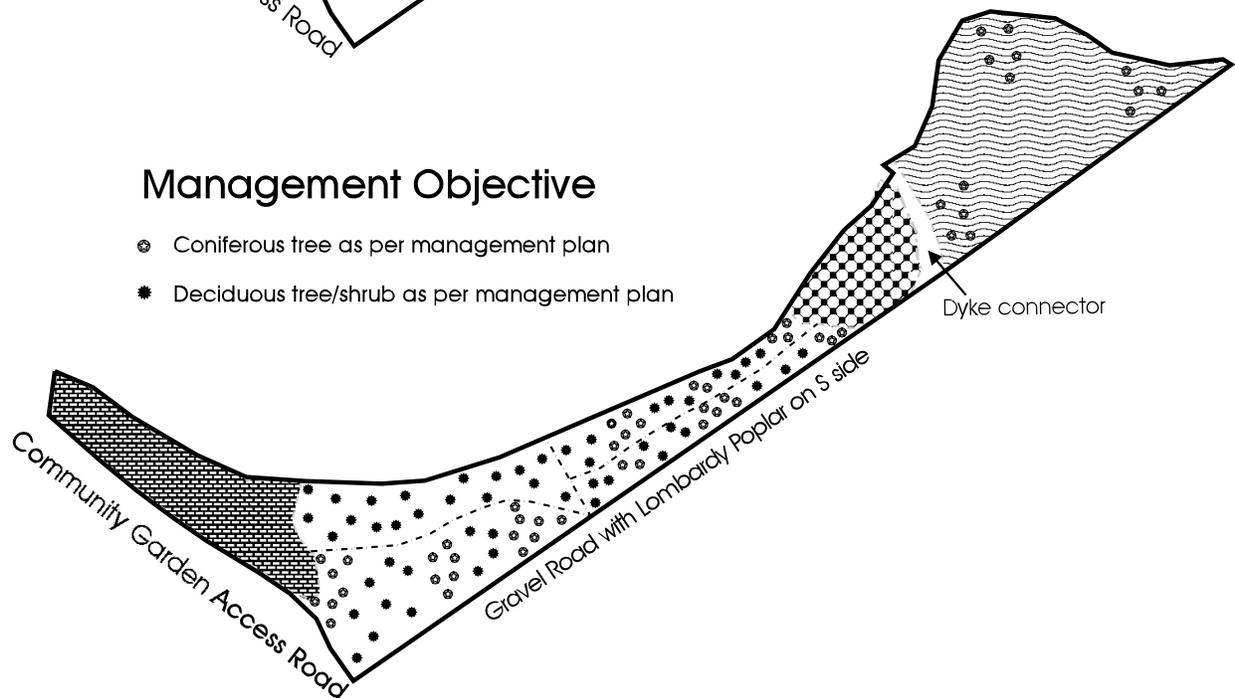
## Existing vegetation

-  Grassland with shrubs and planted trees
-  Shrub with pine
-  Blackberries
-  Birch woodland
-  Blackberry, grass/forb and small deciduous trees



## Management Objective

-  Coniferous tree as per management plan
-  Deciduous tree/shrub as per management plan



## Management Unit 3: Community Gardens

### 1.0 Existing Conditions

Management Unit 3 (Drawing 3) comprises community garden plots growing annual vegetable crops, and shrubs and small trees such as fruit trees. Horticultural plants from this area are volunteering in adjacent Management Units.

### 2.0 Goals and Objectives

Maintain as community garden, using organic gardening methods.

#### Species Management Goal

Where desirable and practical, plant species with wildlife benefits (e.g. flowers for hummingbirds).

#### Habitat Management Objectives

- Maintain as a community garden.
- Work with community gardeners to ensure that composting and plant disposal methods are used that minimize the escape of non native plants into the surrounding areas.
- Encourage gardeners to maintain a native deciduous shrub/small tree hedgerow along the north border.

### 3.0 Management Prescriptions

#### 3.1 Initial Enhancement Requirements

- Discuss wildlife goals and habitat management objectives with tenants.
- Take required steps, if required, to install facilities or enact procedures to meet second objective.

#### 3.2 Ongoing Maintenance Requirements

Routine maintenance by community gardeners of any facilities installed to combat the spread of invasive species

#### 3.3 Initial Enhancement Costs

No costs are anticipated, potential costs include

- Staff time to meet with community gardeners.
- Capital costs for the installation of any facilities that may be required.

### 3.4 Monitoring Schedule

Monitor the success (in surrounding MUs) of invasive species management activities, making adjustments to procedures, as necessary.

## Management Unit 4: Dunsmuir Farm Old-field

### 1.0 Existing Conditions

Management Unit 4 is primarily an old-field with areas of shrub border (Drawing 3). The shrub border occurs mostly south of the community garden (Figure 13) and along the west side. South of the community garden, the well established and structurally diverse border contains a large variety of plant species. Some of the predominant species are blackberry (both *Rubus discolor* and *R. laciniatus*), elderberry, and black twinberry (*Lonicera involucrata*), with one to three individuals of birch, black hawthorne (*Crataegus douglasii*), lodgepole pine, and blue spruce. The escaped herbaceous policeman's helmet is also abundant in the hedge. The west border of MU 4 is composed of blackberry with elderberry and other shrubs.

The fields are characterized by three predominant cover types. The east end exhibits the influence of the community gardens and grasses are dominated by herbaceous plants, including Canada thistle, bedstraw (*Galium* sp.), and various horticultural plants (Figure 13).

The southern region is largely short pasture grasses, with significant intrusions of thistles, willowherb (*Epilobium ciliatum*), Canada goldenrod, hairy cat's-ear, silverweed (*Potentilla anserina*), stinging nettle, common rush (*Juncus effusus*), and some elderberry (Figure 14).

The north part of the field is dominated by reed canarygrass and has approximately a 5% coverage of mature elderberry bushes (Drawing 3) (Figure 14). Many of the elderberry bushes are dead or dying, perhaps from dessication (Figure 14). Lodgepole pines have also been planted in this area. A shallow drainage ditch runs through the area into the main ditch in MU 6 that drains the adjacent subdivision.

The extreme north end is becoming overgrown with blackberries. There is a remaining open patch of grass in which some elderberry and planted lodgepole pine are growing, but these, too, are becoming overtaken by blackberries (Figure 15).

The eastern and southern areas had about 35-60 cm of organic topsoil over lenses or mixtures of grey clay and organics. The northern area had 15-30 cm of organic and/or mineral soil, which was dry in late July, over a variable clayey/sandy/gravelly/woody (though largely sandy/gravelly) substrate that was impenetrable to the soil probe.

## 2.0 Goals and Objectives

### Species Management Goal

Grassland-dwelling species of small mammals and their predators (e.g., herons, raptors, coyotes), and grassland passerines (breeding savannah sparrows and other wintering sparrows).

### Habitat Management Objectives

- Renovate fields, as necessary, to maintain the grass species mix and old-field structure necessary for the target and other associated wildlife species. The planted pines could be left as perches.
- Mow fields as required (at the most annually), to maintain the desired grass height and to control undesired shrubs and blackberries (this applies especially to the north portion).
- Remove invasive species (e.g. reed canarygrass, blackberries, escaped garden plants).
- Maintain a hedgerow along the west side and south of MU 3.
- Public viewing will continue to be from adjacent roads and dykes, with no access to the interior.

## 3.0 Management Prescriptions

Most of Dunsmuir Farm will be maintained as an old-field. The habitat characteristics of the southern part are currently suitable and no management is recommended in the short term. The reed canarygrass of the northern field is usually indicative of wet conditions, and is tall, making predator access to prey impossible, and is expected to support a lower abundance of voles and other small mammals than the more plant species-rich old-field to the south. Much of the canarygrass area needs to be renovated. The extensive areas of blackberry in the north also need to be renovated.

### 3.1 Initial Enhancement Requirements

- Renovate the parts of the field that are in canarygrass and plant with a DF&WT<sup>1</sup> set-aside seed mix. Renovation will entail cutting the grass and tilling the soil before planting the new seed. Tilling will entail ploughing and discing, or rototilling. Eliminating the reed canarygrass may require special procedures and a multi-year effort; consult the Ministry of Agriculture in Cloverdale or Abbotsford.
- While renovating the north area, ensure that the land is graded, sloped and ditched so that it will drain freely during heavy rains.
- Cut and till the east end to eliminate invasive species, and when the regeneration of undesirable species is under control, plant with DF&WT set-aside mix.

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<sup>1</sup> The Delta Farmland and Wildlife Trust uses a seed mix designed to benefit both wildlife and soil development. For the currently used mix, call Dawsons' Seeds (Bill Awmack) or the DF&WT.

### 3.2 Ongoing Maintenance Requirements

- Annually or as required, either:
  - mow grass to a height of 30-50 cm (if necessary as per section 3.4) and mulch the cut grass on-site, or
  - thin shrubs so that plants or clusters are at least 25 m apart.
- Evaluate old-field condition every five years and renovate whenever succession advances (less than 50% grasses compared to forbs) and vole use diminishes. Fields usually require renovation every 5-25 years.
- Allow hedgerows to continue to grow voluntarily; maintain the west hedgerow at 5 m wide (check annually) and the hedgerow south of MU 3 at its existing width by cutting back as required (check every three years).

### 3.3 Initial Enhancement Costs

Grass cutting (priced for 1.2 ha for 2 years at 2x/year)	\$1000. @ \$250/cut
Tilling (priced for doing 2 times to control canarygrass)	\$1000. @ \$500/event
Planting (including seed cost)	<u>\$500.</u>
Total	\$2500

### 3.4 Monitoring Schedule

- Annually, check the field in late August to evaluate grass height and consequent accessibility of voles to predators; schedule mowing for September if grass is dense (ground not visible from above) and height (excluding fruiting stems) exceeds 1 m.
- Every five years, evaluate the amount of shrub growth and the condition of the pasture grasses to determine the need for shrub cutting (in field interior or along hedgerows) or field renovation.
- Conduct vole runway surveys (runways/m) in September (see Part I Section 3.3.4 for methods):
  - for the first two years after renovation, or after the implementation of this plan in areas where renovation does not occur, to use as a baseline for helping to evaluate when the fields require renovation,
  - every fifth year thereafter to evaluate vole use compared to the baseline. The decision to renovate will be subjective, but if use falls to some predetermined density, such as 20% of the base line, or below some other expectation, consider renovating. Before a decision is made to renovate, the results should be verified by repeating the survey the following year.

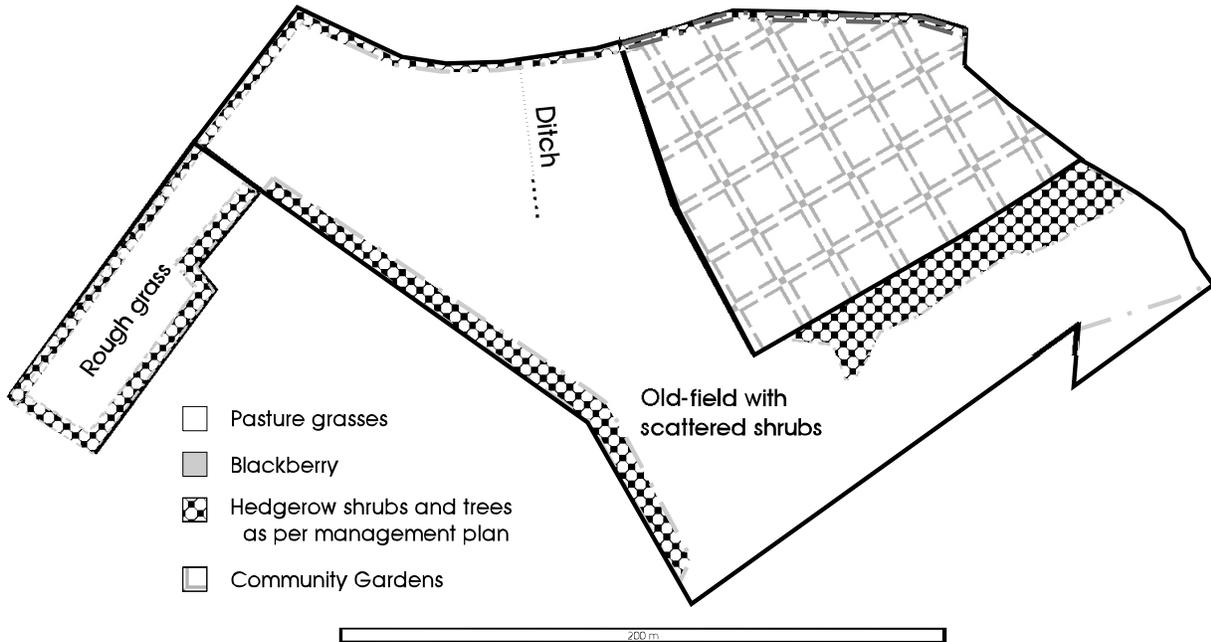
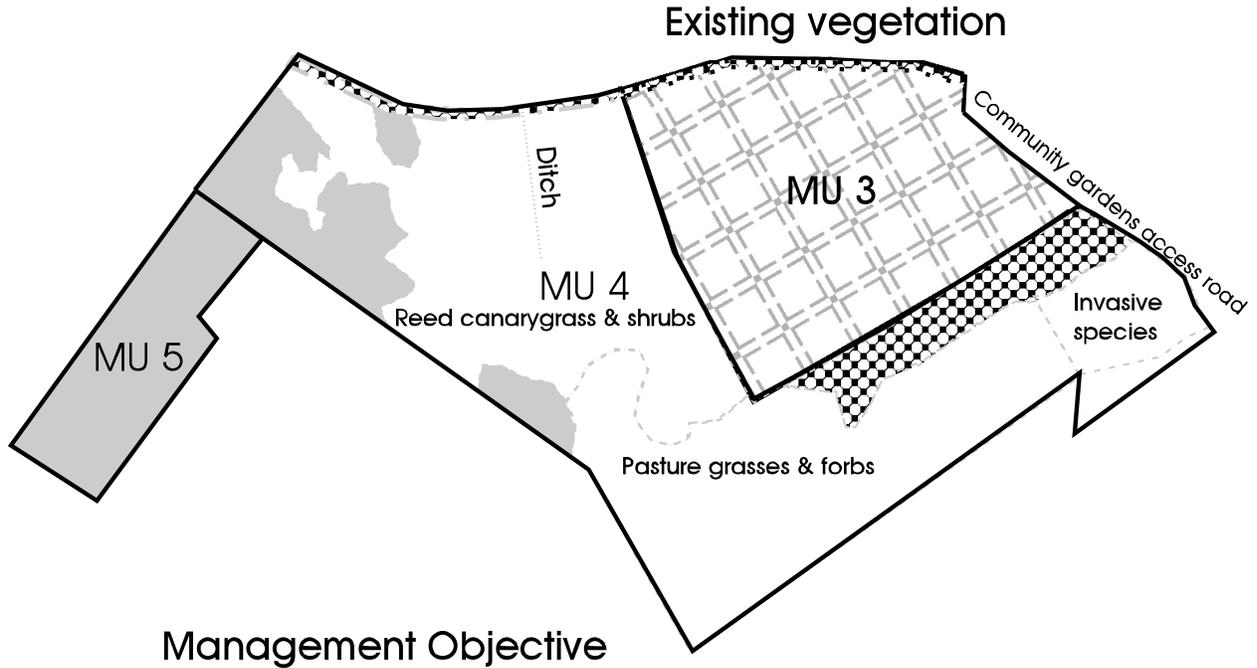
Drawing 3:

# Blackie Spit Management Units 3-5:

3 Community Garden

4 Dunsmuir Old-field

5 Dunsmuir Meadow



## Management Unit 5: Dunsmuir Meadow

### 1.0 Existing Conditions

Management Unit 5 is completely overgrown with blackberries (Drawing 3). The few elderberries growing there are becoming covered with blackberries. Salmonberry (*Rubus spectabilis*) grows in areas along the northwest side (Figure 16).

### 2.0 Goals and Objectives

#### Species Management Goal

- Migratory and breeding grassland and field-edge passerines.
- Small mammals and their predators.

#### Habitat Management Objectives

- Renovate 0.6 ha field centre and hay or rough cut annually.
- Allow field edges to continue to grow as hedgerows with blackberries, salmonberry, and small trees within predefined boundaries.

### 3.0 Management Prescriptions

Maintain as a rough hayfield with a hedgerow border.

#### 3.1 Initial Enhancement Requirements

- Mow centre of field to remove all blackberry, shrubs and trees except for a 5 m wide border for a hedgerow.
- Till the field for two years and mow twice annually to retard the growth of blackberries.
- Between years, plant a winter crop such as fall rye (*Lolium*) or winter wheat () to provide nutrients and compete with the invasive species.
- In the spring of the third year, seed with a pasture mix such as the DF&WT's set-aside mix, or other mix suited to the local conditions.

(Or, use other tried procedures to eliminate the blackberry and prepare the soil.)

#### 3.2 Ongoing Maintenance Requirements

- Cut and remove hay annually in late August. When the opportunity occurs, cut in conjunction with MU 4.
- When cutting, ensure that the hedgerow borders are maintained within their desired limits.

### 3.3 Initial Enhancement Costs

Cutting (brushing) blackberry	\$1,200. for 2 days (8 hr x \$75/hr)
Mowing 2x annually	\$1,200. @ \$300 each for 4, half-day events
Tilling field	\$1,200. @ \$600 each for 2, 1-day events
Planting and cutting fall rye	\$600. @ \$300 for each of 2 half-day events
Planting pasture, including labour & seed cost	<u>\$500.</u>
Total	\$4,700

### 3.4 Monitoring Schedule

Ensure that hedgerow is maintained within its pre described boundaries.

## Management Unit 6: Dyke and Ditches

### 1.0 Existing Conditions

Management Unit 6 consists of the dyke on the north side of the subdivision drainage ditch, and the ditches on each side of it (Drawing 4). The upper dyke sides are mowed annually. The vegetation is largely grasses, but several other species also occur.

On the south side of the dyke, Arctic lupin (*Lubinus arcticus*), tansy, morning glory, thistles, and a variety of planted wildflowers occur. Patches of blackberry grow, and the occasional shrub or small tree occurs (broom, black hawthorne) (Figure 17). The vegetation at the east end of the dyke is predominantly woody, including species such as elderberry, blackberry (2 species), oak (1), birch, broom, a native cherry (*Prunus* sp.) (1), and, at the very east end of the ditch, a patch of salmonberry.

The vegetation of the north side of the dyke is quite different from the south. The dominant species of grasses are reed canarygrass and some pasture species such as ryegrass (*Lolium* sp.). Some creeping bentgrass (*Agrostis stolonifera*) and areas of saltgrass occur at lower elevations that flood during the wet season (Figure 18). Other common species occurring on the north side include tansy, lupin, stinging nettle, common horsetail (*Equisitum arvense*), thistles, silverweed, and rush.

The north ditch is shallow and apparently salty and is separated from the estuary by an old, narrow, shrub covered dyke (MU 7). The lower summer water level exposed the muddy bottom on which green algae grew. Elderberry, some hawthorne and a band of reed canarygrass that once grew in the seasonally flooded edges of the ditch have died, possibly due to increased salinity or inundation resulting from failure of the flap gate to shut, or to other adjustments to the water control structure draining the ditch (Figure 18).

An algal bloom in the south ditch draining the subdivision was the only aquatic vegetation evident. No other aquatic vegetation grew in the ditch or on its banks.

## 2.0 Goals and Objectives

### Species Management Goal

- Dyke: Sparrows, finches, & butterflies
- Ditches: Aquatic insects and other invertebrates, swallows, flycatchers, waterfowl, and wetland birds (and amphibians if not too saline).

### Habitat Management Objectives

- Maintain wildflowers and low-growing grasses along both dyke sides
- Allow the natural occurrence of aquatic vegetation to the extent that it does not impede drainage or cause flooding
- In the north ditch, determine the reason for the shrub die-off. Allow dead shrubs to remain to provide perches for swallows, flycatchers, and other birds. Plant sparsely spaced, low-growing, slow-spreading shrubs above the waterline, if water conditions allow.

## 3.0 Management Prescriptions

The dyke and ditches will be managed as two different habitat types; however, the association of the two types will enhance the unit's attractiveness to some species, in particular, to insectivorous birds that feed in flight (swallows and flycatchers).

### 3.1 Initial Enhancement Requirements

#### Dyke

- Remove blackberry and broom from south side of dyke in area near east end as indicated with arrows in Drawing 4. Leave blackberry patch at the west end and blackberry and broom occurring in shrub area at the east end.
- Remove blackberry and broom occurring in six patches along central region of the south side of the dyke (Drawing 4) and replace with native shrubs; plant the 830 m<sup>2</sup> total of the 6 areas with plants at a 1.5 m spacing for a total of 370 shrubs (or fewer depending on the number of existing shrubs in the areas to be planted) in the following proportions:

Nootka rose ( <i>Rosa nutkana</i> )	50%	(185)
Snowberry ( <i>Symphoricarpos albus</i> )	25%	(193)
Tall Oregon grape ( <i>Mahonia aquifolium</i> )	15%	(55)
Red-flowering currant ( <i>Ribes sanguineum</i> )	10%	(37)

Plant in late fall. Shrubs will need watering for at least the first two summers, until established. If success is less than 80% after two years, replant unsuccessful shrubs.

- Remove unmapped blackberry and broom but leave other existing unmapped shrubs and small trees on both sides of dyke (Drawing 4).

- Plant wildflower mix:
  - mow grass/forb vegetation short on both dyke sides in the spring, remove previous years' growth, and scarify the ground, or
  - where reed canarygrass is growing, rototill (5-8 cm deep) and plant low-growing grasses, such as Chewing's fescue (*Festuca rubra commutata*) and creeping red fescue (*Festuca rubra rubra*), then
  - plant with a native coastal wild flower mix; ensure that some perennial species are included (e.g. lupin, paintbrush (*Castilleja miniata*), suitable members of the lily family (*Fritillaria* spp., *Lilium* spp. and other genera). Wildflower mixes can be tailored to site conditions. Dawsons' Seeds and Richardson's Seeds are two of several Vancouver companies who can provide advice and appropriate seed mixes.

### Ditches

For the following emergent and submergent species, space plants at 0.5 m intervals.

- Introduce hardstem bulrush (*Scirpus lacustris*, also known as *S. acutus*) along the waterline of the south ditch at the inside of each bend (Drawing 4), planting two rows 0.5 m apart for a total of about 100 m of shoreline.
- Introduce hardstem and/or American bulrush (*S. americanus*) to the north ditch drawdown areas if salinity permits (Drawing 4), for a total of about 800 m<sup>2</sup>.
- Introduce either a small-leaved species of pondweed (*Potamogeton* spp.) or widgeongrass (*Rubia maritima*) to the north ditch, depending on salinity. First plant a test area, and if successful, plant 10 areas 2m x 2m square distributed in the main channel of the ditch.
- If the problem causing the shrub die off in the north ditch can be corrected, replant 15 elderberry among the dead plants. In either case, leave the dead plants standing as perches for aerial-feeding insectivorous birds.
- Install 10 swallow nest boxes on poles along the north ditch edge; supply materials to a volunteer organization to build and install.

### **3.2 Ongoing Maintenance Requirements**

- Annually, remove all blackberry or other new shrubs and trees (except allow replacements for previously established ones that die) in the areas designated for grass and wildflowers on both sides of dyke.
- Annually, clean and repair swallow boxes (using volunteers).

### **3.3 Initial Enhancement Costs**

Invasive shrub (blackberry, broom) removal (1000m <sup>2</sup> )	\$225. @\$75/hr x 0.5hr/patch x 6 patches
370 Shrubs: material costs	\$2558. @\$3.42 & 6.85 ea incl. taxes
and planting	\$740. @\$2 ea
Dyke mowing and scarification (ca 3000m <sup>2</sup> )	\$500
Wildflower and grass seed mix and planting	\$750
Cost of 3560 aquatic plants	\$2670. @0.75 ea incl taxes
and labour	\$600. @\$15/hr (assuming 40sec./plant)
Materials for swallow boxes	<u>\$100.</u>
Total	\$8143.

### **3.4 Monitoring Schedule**

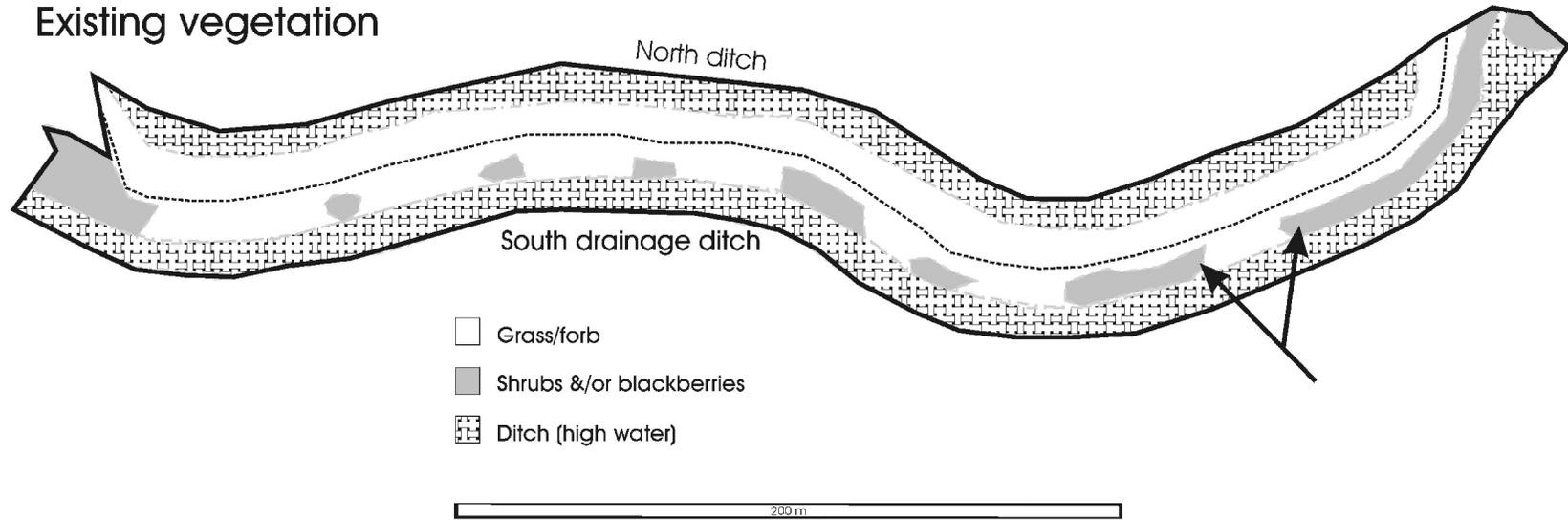
- Monitor the success of wildflower growth. Most wildflowers are annuals (lupin and most lilies are perennial) that grow best on disturbed sites, so periodic disturbance, such as scarifying, every 2 to 4 years, may be required. Also add new seed, as required.
- If the wildflowers do poorly because grasses are too aggressive, try shallow rototilling and planting low-growing grasses, such as Chewing's fescue and creeping red fescue.
- Monitor aquatic plant growth annually until established, then every 5 years. If extent of growth becomes a problem, impeding water flow in the south ditch, or obscuring open water in the north ditch, remove some areas of plants, as required.

Drawing 4:

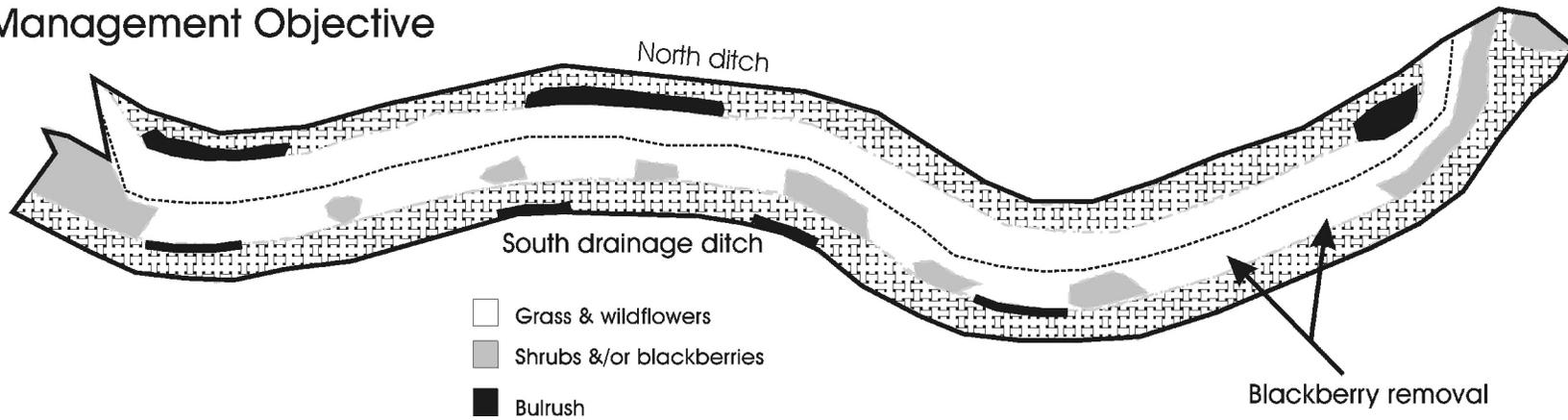
# Blackie Spit

## Management Unit 6: Dyke and ditches

Existing vegetation



Management Objective



## Management Unit 7: Dyke Hedge

### 1.0 Existing Conditions

Management Unit 7 is an old dyke, north of the MU 6 dyke, built to create the Dunsmuir farm (Figure 2). Its dyke function is no longer required to keep out the tide since the construction of the MU 6 dyke, and it currently functions as wildlife habitat and as a nature trail. The dyke has become overgrown with shrubs and small trees typical of the south coast (Figure 19, across bay; also seen on the left of Figure 18 and the mid left of Figure 20). The more common species in the hedge include birch, thimbleberry (*Rubus parviflorus*), snowberry (*Symphoricarpos albus*), rose, spirea (*Spiraea douglasii*), tall Oregon grape (*Mahonia aquifolium*), bitter cherry (*Prunus emarginata*), tansy, maple (*Acer* sp.), Himalayan blackberry, English hawthorne (*Crataegus monogyna*), black hawthorne, goldenrod, ocean spray (*Holodiscus discolor*), and bracken fern (*Pteridium aquilinum*).

A trail running along the length of the dyke is well used by walkers and naturalists. During the summer, the trail is screened from the estuary on one side and the adjacent ditch on the other except for a small number of openings. At one opening, a bench overlooks the estuary.

East of the hedge, above Cannery Point, vegetation is predominantly tansy, blackberry, and grasses (Figure 20).

### 2.0 Goals and Objectives

#### Species Management Goal

Breeding and migrating passerines, and woodpeckers.

#### Habitat Management Objectives

- Maintain existing plant species and community structure (i.e. no trees over 8 m);
- Manage access and/or vegetation so as to minimize disturbance to estuarine birds;
- Create destination feature/low viewing structure/benches at east end, overlooking estuary to north, to replace existing access onto Cannery Spit in MU 1.

### 3.0 Management Prescriptions

#### 3.1 Initial Enhancement Requirements

- No habitat management activities required.
- Create a viewing platform at the east end of the trail at the top of the existing unofficial trail access to Cannery Spit in MU 1 south. This structure would be level with the dyke where MU 6 and MU 7 join. It would begin on the dyke and would project northward into MU 1.
- Conduct a survey to determine whether pedestrian use of the dyke is causing disturbance to birds using the estuary during the non breeding season (see Section 3.4, Monitoring Schedule).

### 3.2 Ongoing Maintenance Requirements

- Manage existing trail for continued accessibility and public use.
- Annually, cut tansy near Cannery Point before it flowers. The timing and height of the cut will depend on the timing of plant growth and of the bird nesting season; if cutting during the nesting season, do not cut lower than 30 cm from the ground and remove cut material as it is cut.

### 3.3 Initial Enhancement Costs

Viewing platform      \$5000

### 3.4 Monitoring Plan and Schedule

#### Determining effect of visitor use of dyke on birds

- Conduct a study between October and March to determine the nature and amount of visitor use of the dyke and whether it is negatively affecting bird use of the estuary. Such a study should record the following information:
  - Party size;
  - Primary activity;
  - Presence of dogs and whether leashed;
  - Day of week, date, and time of party visit;
  - Duration of party visit;
  - Tidal stage during visit;
  - Any obvious bird response to visitors (e.g. alert behaviour, swimming away, flying away) and distance of birds from the disturbance source at onset of response.

As part of the study, conduct a simultaneous survey of bird use of the estuary within zones of different distances from shore (e.g. closer or farther than 50 m from dyke or other shore). Record the following information:

- Total count of each species in each zone during each 15 minute interval;
  - Tidal tendency (rising or falling).
  - The percentage of the zone that is flooded by the tide during the interval (<5%, 5-25%, 25-75%, 75-95%, >95%).
  - The day of week, date, and time of each survey interval.
- Depending on the results of the survey (i.e. any correlation between visitor use and significant negative effects on birds), take measures to reduce or eliminate impacts on bird use. Possible options may include:
    - Do not allow dogs, if dogs are causing disturbance.
    - Block access to the dyke at times when disturbance occurs (e.g. seasonal use only, or allow only weekend use during the winter.
    - Vegetation management (i.e. planting for screening purposes) is an option that would require further assessment as the dyke is old and narrow and may not be able to tolerate disturbance to its substrate.

### Monitoring vegetation structure

- Take the following measures to ensure that vegetation does not damage the dyke: measure current vegetation height; monitor vegetation species and height every three years; and top or remove any plants growing, or likely to grow, higher than existing trees.

## Management Unit 8: Deciduous Woodlot.

### 1.0 Existing Conditions

Management Unit 8 (Drawing 5) is a deciduous forest that reflects the poor drainage and sandy nature of the soil. The primary tree species are cottonwood, birch, alder, and willow (*Salix* spp.) (Figure 21). The understory canopy species of small trees and shrubs include black hawthorne, and blackberry. The ground layer consists of dense common horsetail more than one metre high, tansy, and fireweed (*Epilobium angustifolium*) (Figure 22).

Non treed peripheral areas are also included in this Management Unit. These areas are in different stages of vegetative succession, reflecting both the time since the last deposition of dredge spoil and soil moisture.

Northwest of the trees the following habitat complexes occur, often with indistinct boundaries (Drawing 5):

- scouring rush (*Equisetum hyemale*), tansy, horsetail, and other forbs, and grasses;
- shrub (black hawthorne)/broom/blackberry/grass (Figure 23);
- areas of predominantly blackberry (“A” in Drawing 5), or of blackberry/broom/shrub (“B” in Drawing 5) (Figure 24);
- meadow-like area dominated with grasses into which blackberry and shrubs are encroaching (Figure 25);
- moist area in which a stand of cattail (*Typha latifolia*) occurs, surrounded by reed canarygrass (Figure 25); and
- residential lawns and clearings encroaching into the park.

Southeast of the treed area a forb/grass/blackberry border occurs between the trees and the multi use trail. The vegetation of the southeast is largely common horsetail, tansy, and grasses with encroaching blackberry along the edge of the woodlot (Figure 26).

South of the woodlot is a triangular area bordered on the west by a subdivision, the east by the multipurpose trail, the south by the access trail from Dunsmuir Road, and the north side by the woodlot. Four vegetation types occur (Drawing 5) (Figure 27):

- at the south end, just north of the access trail from Dunsmuir Road, the vegetation is grasses and forbs, including reed canarygrass, tansy, horsetail, and morning glory (Figure 27 foreground).
- on the north side of the above area small trees predominate, particularly black hawthorne, with some knotweed on the subdivision side (Figure 28).
- trail-side vegetation is largely grasses and tansy (Figure 27, background along left side of trail), and
- an area of blackberry occurs between the shrub area and the woodlot to the north, (Drawing 5).

Soils throughout the site consist of more than a metre of sand. The “wetland” area also consisted of damp sand more than a metre deep, with no standing water.

## 2.0 Goals and Objectives

### Species Management Goal

- Diversity of species associated with mixed deciduous-coniferous forest: terrestrial amphibians; raptors, woodpeckers, flycatchers, wrens, thrushes, vireos, warblers, grosbeaks, sparrows; small mammals; raccoons.

### Habitat Management Objectives

- Maintain existing deciduous forest development and plant additional trees along west side and in area south of current grove;
- Plant small number of coniferous trees (10) for winter and nesting cover;
- Do amphibian inventory/habitat quality study to determine whether terrestrial salamanders or other species are present in forest or whether introductions are appropriate;
- Manage forest for amphibian habitat features (e.g. coarse woody debris), if required;
- Control invasive species (e.g., blackberry, broom, tansy) in peripheral areas between forest edge and grasslands of MUs 9, 10, and 11, at the south end, and in the northwest where wetland and meadow are to be maintained (next bullet);
- Maintain cattail wetland and open meadow in vicinity of wetland through removal of all woody vegetation.
- Decommission all unofficial trails;
- Construct one main trail through the site.

## 3.0 Management Prescriptions

### 3.1 Initial Enhancement Requirements

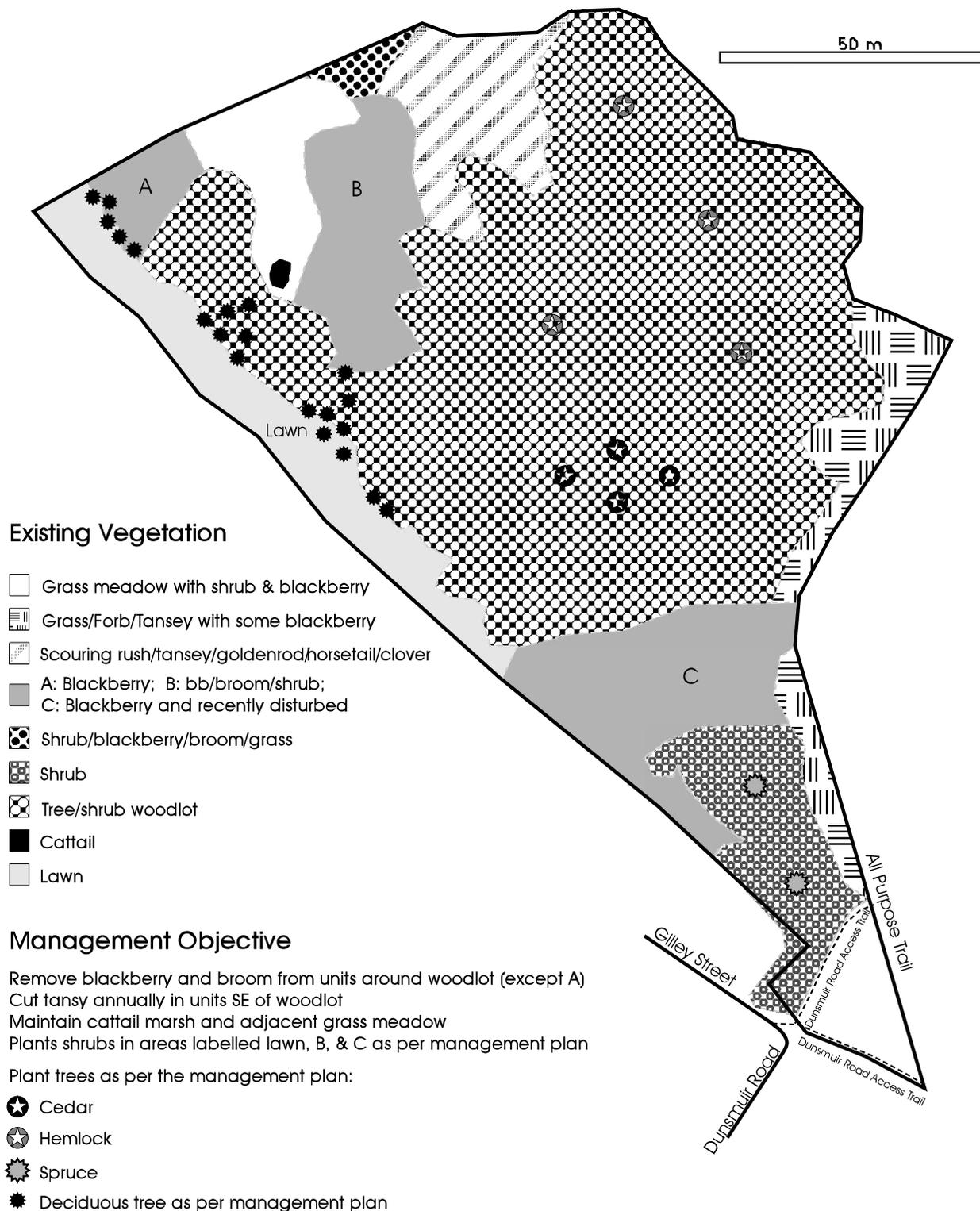
- Remove blackberry and broom in all habitat units northwest and south of the deciduous woodlot (except for the blackberry area labelled “A.”)
- In areas “B” and “C”
  - Remove blackberry and broom by cutting and shallow rototilling.
  - If necessary, mow/cut areas twice annually for two years to retard the growth of blackberries and other species.
  - Between years, plant a winter crop such as fall rye or winter wheat to provide nutrients, and compete with the invasive species.
  - In the spring of the third year,
    - Rototill the cover crop into the soil (5-8 cm deep), if possible while it is still < 30 cm tall.
    - seed with a pasture mix of low-growing grasses and clover such as a modified version of the DF&WT’s set-aside mix, or other mix suited to the local conditions.
  - In the fall, plant native shrubs and small trees as follows.
- Plant the following shrubs:

		“Lawn” (1800m <sup>2</sup> )	B (1000m <sup>2</sup> )	C (1150m <sup>2</sup> )
Black hawthorne	5%	23	13	14
Cascara	5%	22	12	14
Red-osier dogwood ( <i>Cornus stolonifera</i> )	20%	90	50	58



Drawing 5:

# Blackie Spit Management Unit 8: Deciduous forest



## Management Unit 9: Seral Grassland

### 1.0 Existing Conditions

Management Unit 9 is predominantly a grass/forb habitat with encroaching shrubs (Drawing 6). Forbs include hairy cat's-ear, tansy, vetch, and goldenrod. Shrub species include English hawthorne, black hawthorne (most abundant shrub), Pacific crabapple, snowberry, rowan (1), and blackberry (along northeast and west edges). Most of the shrub growth is in the western and southern portions of the MU (Figure 29). Broom is also starting to grow, mostly in the eastern and southern areas (Figure 30). The vegetation is growing on more than one metre depth of sand with little topsoil development.

### 2.0 Goals and Objectives

#### Species Management Goal

Woodpeckers, passerines, small mammals.

#### Habitat Management Objectives

- Remove all broom and blackberry.
- Maintain a ground cover ratio of 30% native shrubs and trees interspersed among the grasses and forbs by controlling the natural succession of woody vegetation.
- As part of the above, plant native trees and shrubs to create a connectivity of woody vegetation between MU8 and MU13.

### 3.0 Management Prescriptions

#### 3.1 Initial Enhancement Requirements

- Remove existing blackberry and broom.
- Plant native shrubs in 900 m<sup>2</sup> area to form connectivity between MU 8 and MU 10 (Drawing 6):

Saskatoon	16
Oceanspray	16
Baldhip rose( <i>Rosa gymnocarpa</i> )	40
Snowberry	75

Plant in late fall. Newly planted shrubs and trees will need watering for at least the first two summers, until established. If success is less than 80% after two years, replace unsuccessful plants.

#### 3.2 Ongoing Maintenance Requirements

- Check every three years and as necessary remove shrubs and trees, including all large-growing trees, to maintain the desired ratio of woody vegetation to grass/forb.
- Every other year, control of broom and blackberry.

### 3.3 Initial Enhancement Costs

Broom and blackberry removal	Volunteers and staff (hand removal)
Shrub planting costs	
147 plants	\$750. @ \$3.42 for snowberry, 6.85 for others (including taxes)
Labour	\$300. @ \$2.00/plant

### 3.4 Monitoring Schedule

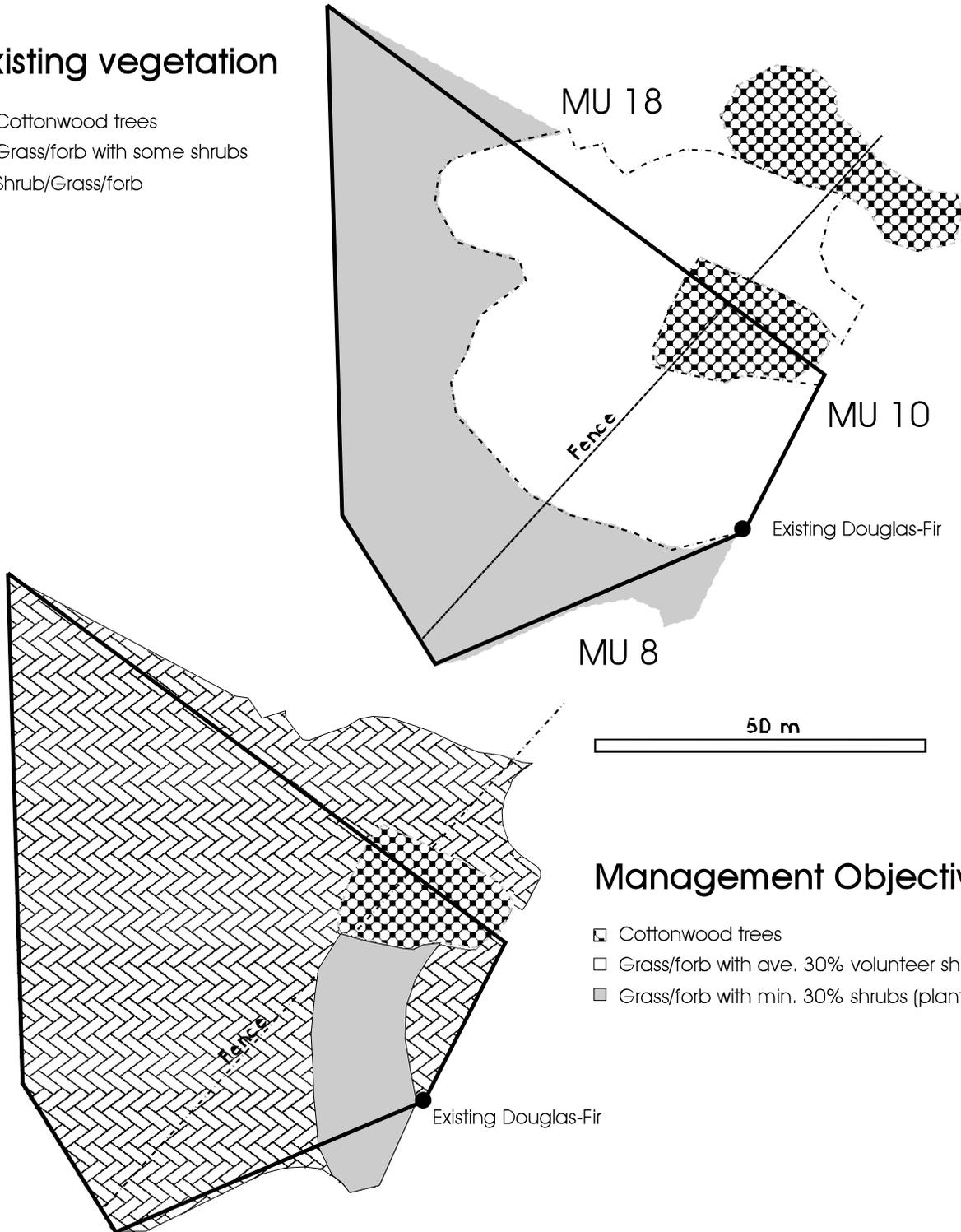
Every three years evaluate the need to do maintenance activities.

Drawing 6:

# Blackie Spit Management Unit 9: Seral Grassland

## Existing vegetation

- ☐ Cottonwood trees
- ☐ Grass/forb with some shrubs
- ☐ Shrub/Grass/forb



## Management Unit 10: Dune, Grassland, Seral Shrub

### 1.0 Existing Conditions

Management Unit 10 (Drawing 7) is a dry area that supports vegetation species able to grow under dry, sandy conditions. Several plant associations occur, forming a progression from the grasses of the central, drier area to the forest of MU 8. The predominant species in the driest, central areas is European beachgrass (*Ammophila arenaria*), with some sweet clover, seedling broom, and introduced species (Figure 31, across trail, on right).

The second vegetation “zone” is largely introduced European lawn and pasture grasses, and forbs, including plantain (*Plantago lanceolata*, *P. major*), tansy, and tansy ragwort (*Senecio jacobaea*) (Figure 31, across trail, on left). Invading woody plants include alder, some blackberry, and especially Scotch broom.

The third vegetation “zone,” lying between the grasses and woodlot consists primarily of blackberries and knotweed with a few shrubs, such as elderberry or small trees, such as alder, willow, oak, black hawthorne, and birch (Figure 31, between grass and trees).

### 2.0 Goals and Objectives

#### Species Management Goal

Dune and grassland vegetation as cover for cottontails, sparrows, finches, and other wildlife.

Seral shrub land as habitat for sparrows, and small resident passerines (e.g downy woodpeckers, chickadees, bushtits).

#### Habitat Management Objectives

- Permit dune vegetation community of existing introduced grass species to remain;
- Plant native dune vegetation species wherever/whenever revegetation is required;
- Continue to remove invasive woody vegetation, both introduced (e.g. broom, blackberry, knotweed) and native in dune areas;
- Include information on dune vegetation and ecosystems, and dune management in Blackie Spit literature;
- Manage invasive species areas between dune and forest as a transitional seral habitat by controlling invasive species and planting native shrubs and small trees;
- Exclude this MU from dog-off-leash area.
- Reduce trails to one connecting the multi use trail with the west parking lot.

### 3.0 Management Prescriptions

This unit contains both grass habitats (dune and grass/forb) and a seral shrub habitat. Ecologically, the seral shrub provides transition zones between the grassland and shrub and between the shrub and adjacent woodlot. Thus wildlife species common to both transition zones will occur, as well as species that prefer the shrub. For example, downy woodpeckers and black-capped chickadees will use the forest and shrub, bushtits will occur most commonly in the shrub, and species of sparrows will take shelter in the shrubs while foraging into the grassland. The integration of these habitats will

potentially result in a higher wildlife diversity within the area than if, for example, the grassland lay between the woodlot and the shrubs. The irregular configuration of the patches of shrubs will also create a physical complexity and increased edge, further enhancing its value to wildlife.

### 3.1 Initial Enhancement Requirements

#### Dune zone

- In disturbed areas of bare sand, plant native large-head sedge (*Carex macrocephala*), depending on availability of a source of plant material (commercial; transplants; collected seed; etc.). Plant estimated 50 m<sup>2</sup> at 0.5 m spacing.
- Remove any broom, blackberry or other woody species becoming established.
- Remove all trails and restore habitats along trails passing through the dune and grass/forb habitats, except for the trail along the north side (next to MU13) that connects the multi use trail with the west parking lot.

#### Grass/forb zone

- Remove broom, blackberry, and any tree species. Leave only scattered small shrubs that may occur.

#### Seral Shrub

- Remove broom, knotweed, and blackberry by cutting and shallow rototilling.
- If necessary, mow/cut areas twice annually for two years to retard the growth of blackberries and other species.
- Between years, plant a winter crop such as fall rye or winter wheat to provide nutrients, and compete with the invasive species.
- In the spring of the third year,
  - Rototill the cover crop into the soil (5-8 cm deep), preferably while it is still < 30 cm tall.
  - Seed with a pasture mix of low-growing grasses and clover such as a modified version of the DF&WT's set-aside mix, or other mix suited to the local conditions.
- In the fall, plant native shrubs and small trees as indicated below,

#### *Shrub/tree planting specifications*

Plant 0.1 ha at a 2 m spacing between plants, for a total of 250 plants. Plant in late fall. Newly planted shrubs and trees will need watering for at least the first two summers, until established. If success is less than 80% after two years, replace unsuccessful plants.

Plant the following species in the proportions indicated:

Douglas maple ( <i>Acer glabrum</i> var. <i>douglasii</i> )	5%	(12)
Choke cherry ( <i>Prunus virginiana</i> )	5%	(12)
Saskatoon	10%	(25)
Red-osier dogwood	20%	(50)
Nootka rose ( <i>Rosa nutkana</i> )	30%	(75)
Snowberry	30%	(75)

### 3.2 Ongoing Maintenance Requirements

Check every other year, and as required:

- Remove invasive species from all areas.
- Remove native shrubs from the grass/forb area when they exceed 5% coverage.
- Plant additional large-head sedge on bare sites in dune area. (The European dune grass may eventually begin to die out; it does not grow as well on stable dunes, such as occur in this area.)

### 3.3 Initial Enhancement Costs

• Invasive species removal, incl renovation	\$1700. for 5, 4-hr events @75/hr + seed
• Tree and shrub planting –249 plants	\$1625. variable 3.42, 6.85, 14.25 ea incl. taxes
–labour	\$500. @ 2.00 ea
• Plant 200 large-headed sedge	
( <i>Carex macrocephala</i> )	\$200. @\$1 incl. taxes
labour	\$35. @\$15/hr (assuming 40sec./plant)
Total	\$4060

### 3.4 Monitoring Schedule

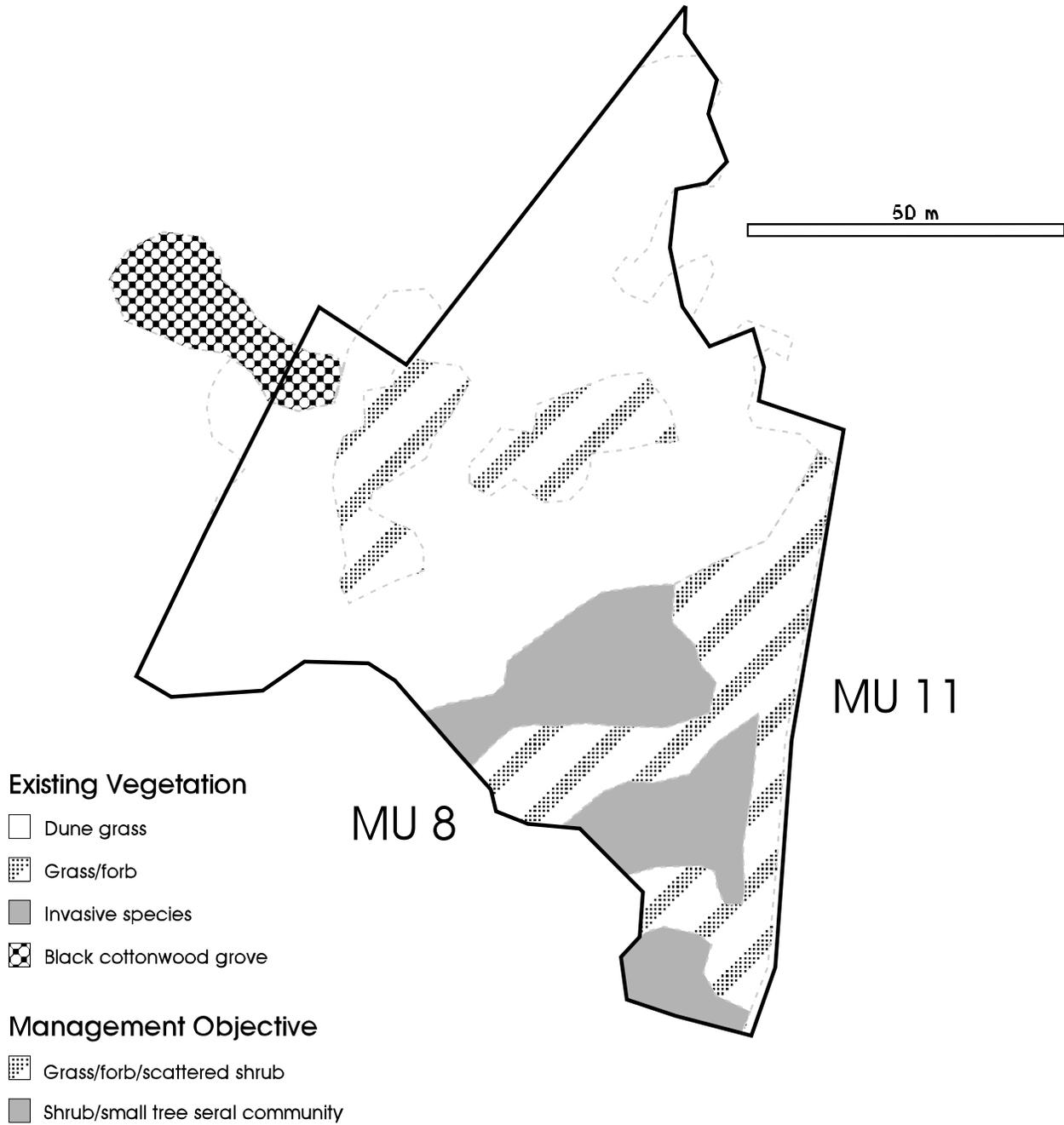
Every two years evaluate the need to do maintenance activities

Drawing 7:

# Blackie Spit

Management Unit 10:

Dune, Grassland, Seral Shrub



## Management Unit 11: Dog-off-leash Area

### 1.0 Existing Conditions

Management Unit 11 is primarily an open, sparsely vegetated dredge spoil area (Drawing 8) (Figure 32). Recent management activities have included removal of much of the broom and blackberry that grew along the west side, the creation of a knoll, the addition of an organic veneer, and revegetation with grasses. Most of the organic veneer has dried on the surface and become fragmented. The grasses are short, covering about 50% of the ground, and were still green and growing at the time of the site visit on August 10, 2001.

Along the west side, a thicket of blackberry and knotweed remains (Figure 32, mid right side). Along the east side, between the fence and the birch-covered dyke of MUs 1 and 12 are some rowan trees, and blackberry is beginning to fill in the area.

In the south west corner, south of the new fence along the canal, blackberry grows between the multi use trail to the west and a more open area to the east where a variety of small trees, shrubs, and forbs grow. The most abundant species in the more open area is tansy. Goldenrod, plantain, and common horsetail are also common. Woody vegetation consists of a domestic apple tree, three black hawthornes, three rowan trees, and two Pacific crabapples (Figure 33).

A few native trees have been planted along the north side of the south fence and along the trail (Figure 32). Patches of trees and shrubs have been planted in MU 1 on the south side of the fence and around the new channel (Figure 9).

### 2.0 Goals and Objectives

#### Species Management Goal

- Sparse grass and wild flowers.
- Shrub/tree borders.
- Passerine bird species associated with the shrubby edges.
- Insects associated with wildflowers.
- Occasional use by grassland and opportunistic bird species.

#### Habitat Management Objectives

- Continue to experiment with topsoil and short-growing grass & wildflower mixes (native species not necessary but avoid species that spread & become weedy).
- Continue invasive species removal of central open areas (e.g., broom, knotweed, blackberries);
- Maintain existing extent of shrub/tree border east of the north-west fence.
- In the southwest of this unit, south of the east-west fence, maintain the blackberry border along the all purpose trail for both habitat and access control purposes.
- Along the west side of this unit, plant suitable native shrub and small tree species along and south of the east-west fence (east of the blackberries) and in place of the invasive species currently growing by the trail north of the fence.
- Increase fencing to prevent access to the south estuary, as required.

- Maintain view of estuary from all purpose trail at the southwest end; build low off-trail viewing structure.

### 3.0 Management Prescriptions

#### 3.1 Initial Enhancement Requirements

- On the west side of the unit in the area by the trail north of the fence:
  - Remove broom, knotweed, and blackberry by cutting and shallow rototilling.
  - If necessary, mow/cut areas twice annually for two years to retard the growth of blackberries and other species.
  - Between years, plant a winter cover crop such as fall rye or winter wheat to provide nutrients, and compete with the invasive species.
  - In the spring of the third year:
    - Rototill cover crop into soil (5-8 cm deep).
    - seed with a pasture mix of low-growing grasses and clover such as a modified version of the DF&WT's set-aside mix, or other mix suited to the local conditions.
  - Plant native shrubs and small trees as indicated below.
- In the southwest corner, south of the east-west fence:
  - cut blackberries back along the trail to a maximum width of 3 metres.
  - plant native trees and shrubs in the currently vegetated area between the blackberries and the new channel.

#### *Shrub/tree planting specifications*

Plant 0.19 ha (1650 m<sup>2</sup> south and 250 m<sup>2</sup> north of fence) at a 2 m spacing between plants, for a total of 475 plants. Plant in late fall. Newly planted shrubs and trees will need watering for at least the first two summers, until established. If success is less than 80% after two years, replace unsuccessful plants.

Plant the following species in the proportions indicated:

Douglas maple	5%	(24)
Choke cherry	5%	(24)
Rowan	5%	(24)
Saskatoon	10%	(47)
Red-osier dogwood	15%	(71)
Nootka rose	30%	(142)
Snowberry	30%	(142)

#### 3.2 Ongoing Maintenance Requirements

- Annually, cut blackberries south of the east-west fence back to a maximum 3-metre wide border along the all purpose trail;
- Annually, cut blackberry and any other invasive species by hand on the east side, east of the north-south fence to prevent encroachment into new areas or domination of other shrubs;
- Check every other year, and when required remove invasive species from all other areas.

### 3.3 Initial Enhancement Costs

- Invasive species removal and soil preparation \$1700. for 5, 4-hr events @75/hr + seed
- Tree and shrub planting costs
  - plants \$3293. @ 3.42, 6.85, 14.25 incl. taxes.
  - labour \$1166. @ \$2/shrub and \$5/tree
  - Total \$6159

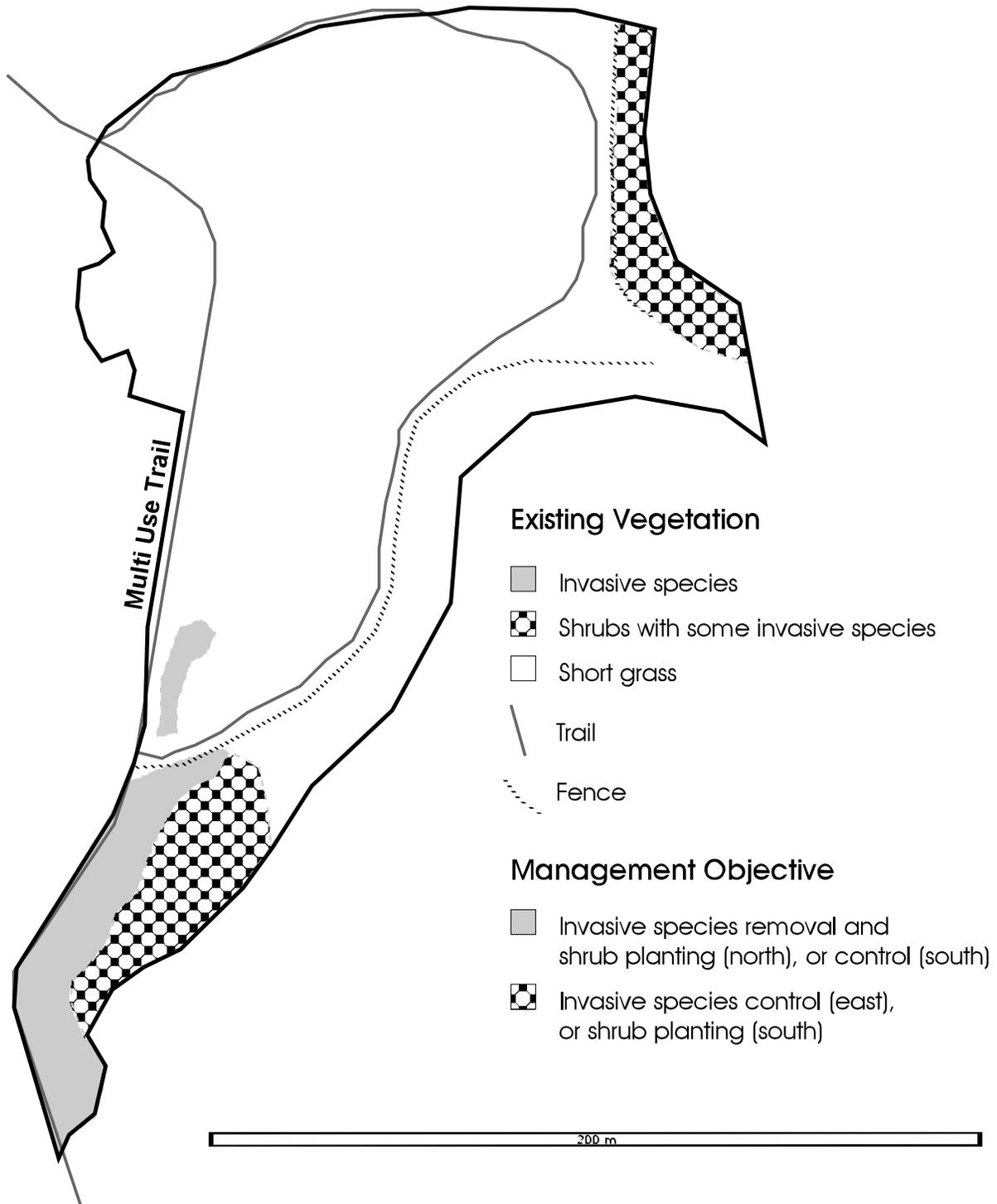
### 3.4 Monitoring Schedule

Every two years evaluate the need to do maintenance activities

Drawing 8:

# Blackie Spit

## Management Unit 11: Dog-off-leash Area



### 1.0 Existing Conditions

Management Unit 12 is a roughly triangular unit consisting of a central, open sandy area surrounded with a tree/shrub border (Drawing 9) (Figure 34). The vegetation of the central area is sparse grasses and forbs, including plantain, goldenrod, hairy cat's ear, sweet clover and some invasive species, including broom. Also in the centre is a single, 21 m high, multi stemmed cottonwood, beneath which seedling cottonwoods and the invasive species, daphne, are growing (Figure 34, left side). The centre of the south tip has denser vegetation with, in addition to the foregoing species, cow parsnip (*Heracleum lanatum*), two species of thistle, blackberry, and black cottonwood.

Along the south perimeter the major tree species are Pacific crabapple and birch, with one large willow (Figure 34, left background). Smaller trees and shrubs include red elderberry, red-osier dogwood, black hawthorne, salmonberry, and blackberry. The most abundant forb is goldenrod.

An introduced tree species, possibly cedar elm (*Ulmus crassifolia*), grows to a height of 9 m along the northeast perimeter, from where it is encroaching into the central open area (Figure 35). That species is also the main tree species along the northwest border, where it grows to 14 m high. Other species along the northwest side, mostly toward the west end, are Pacific crabapple, a species of cherry, black hawthorne, and shrubs, such as snowberry and daphne.

### 2.0 Goals and Objectives

#### Species Management Goal

- Dry habitat: White-crowned sparrow nesting; sparrow wintering and migration
- Treed areas: accipiters, passerines (warblers, sparrows, thrushes), eventual perches for bald eagles and red-tailed hawks in isolated cottonwoods or alders.

#### Habitat Management Objectives

- Maintain free flyways into the estuarine bays of MU1 by controlling the spread of invasive woody vegetation in both open sandy areas and understory of treed areas (e.g. alder, cottonwood, exotic elm);
- Remove all woody vegetation in the open, central area (except the existing clump of cottonwoods);
- Permit only native shrubs to grow beneath the trees in the central and perimeter areas;
- Control daphne, broom and any other invasive species as part of the above two points;
- Restrict trails to perimeter;
- Exclude dogs (to prevent disturbance to ground-nesting birds and estuarine birds);
- Fence viewing area at south tip to discourage access to estuary.

### 3.0 Management Prescriptions

#### 3.1 Initial Enhancement Requirements

- Construct a fence and erect signs to block access to the estuary at the south tip of the pod.

- Confine trail use to the perimeter trail through signage and the use of logs or other obstacles to block major access points to the centre.
- Continue to remove invasive vegetation species (broom, daphne, blackberry).

### 3.2 Ongoing Maintenance Requirements

Check every third year and remove invasive species as required.

### 3.3 Initial Enhancement Costs

Fencing	\$250. for 25 m @ \$10/m
Invasive species removal:	\$0

- Use volunteer help to remove vegetation.
- Use staff time and vehicle to remove and dispose of cut vegetation.

### 3.4 Monitoring Schedule

Every three years evaluate the need to do additional invasive species control.

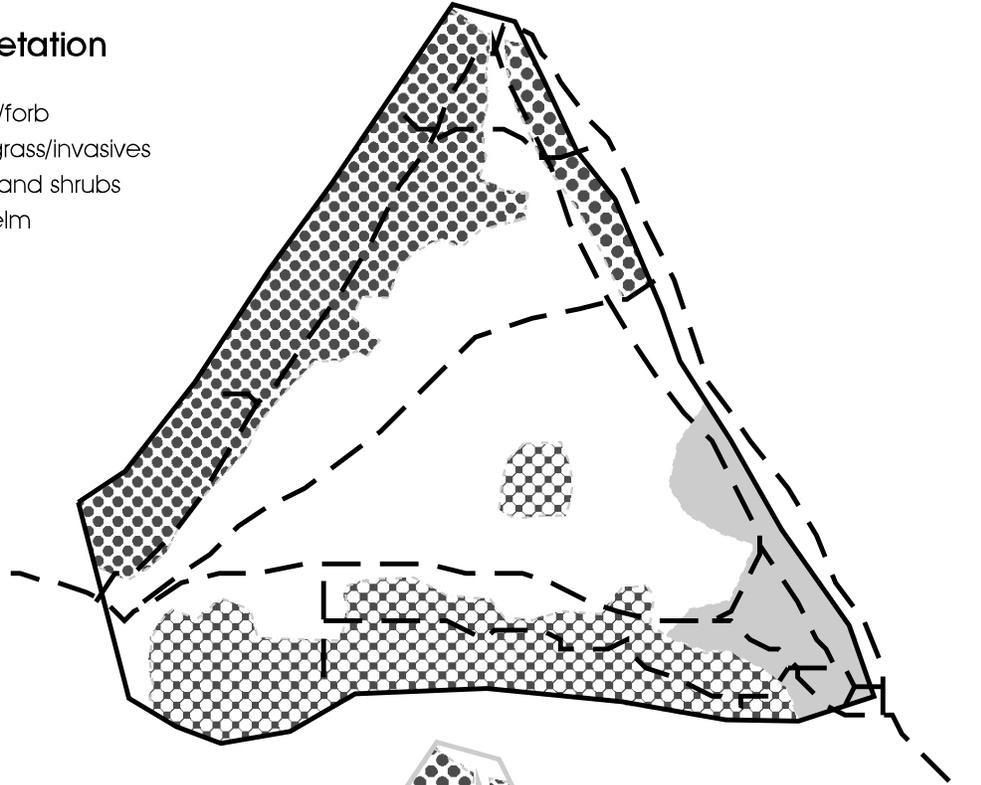
Drawing 9:

# Blackie Spit

## Management Unit 12: East Pod

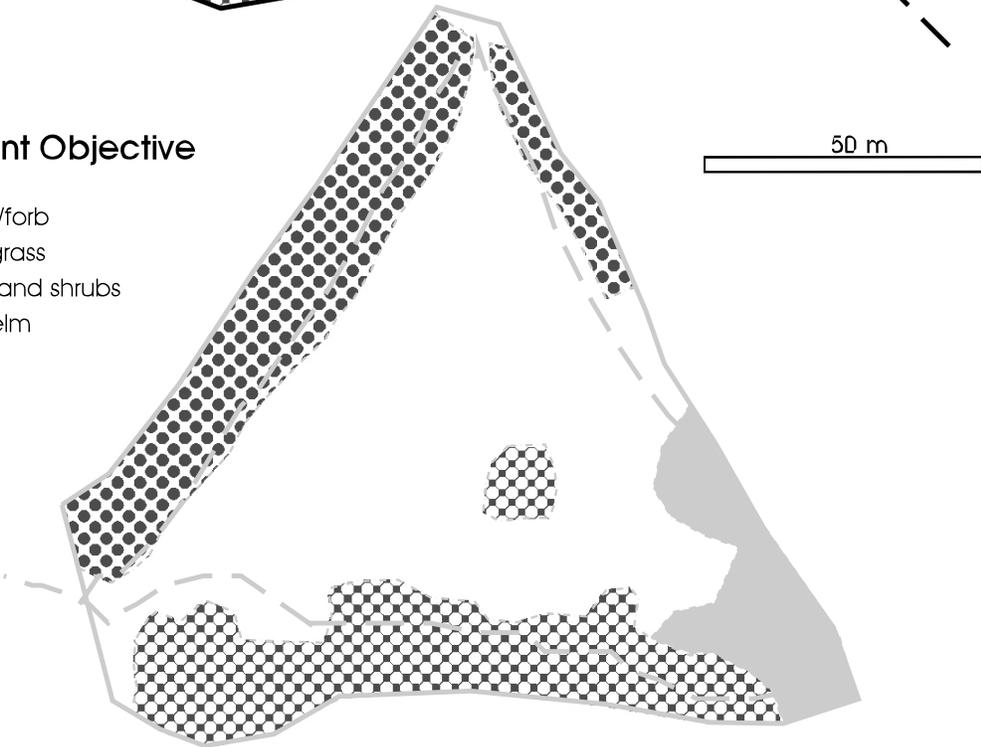
### Existing Vegetation

- Sparse grass/forb
- Dense forb/grass/invasives
- Native trees and shrubs
- Introduced elm
-  Trail



### Management Objective

- Sparse grass/forb
- Dense forb/grass
- Native trees and shrubs
- Introduced elm
-  Trail



## Management Unit 13: Deciduous Complex

### 1.0 Existing Conditions

Management Unit 13 extends from the estuary north of MU 11, eastward to the cottonwood grove at the southwest end of the south tennis court fence (Drawing 10). The unit has a variety of vegetation cover types. Woody species at the east end south of the ditch include Pacific crabapple, birch, elderberry, and blackberry with reed canarygrass growing between (Figure 36). Farther west, reed canarygrass is the predominant vegetation, with some elderberry and Pacific crabapple. Just east of the all purpose trail, tansy is the predominant species, and one cottonwood occurs (Drawing 10) (Figure 37).

North of the ditch, tansy and reed canarygrass are predominant in the east half, and those species with goldenrod and blackberry are predominant in the west half. Some introduced shrubs and trees occur in that area, including broom, several laburnums (*Laburnum*) and one oak.

West of the trail, the north half of this management unit is largely dense reed canarygrass. One sappling oak grows along the fence line, and blackberry or elderberry grow among the grasses in some places (Figure 38). The south half is largely tall, dense blackberry.

The soils vary with location. In the ditch bottom 30 cm of silty, sandy clay overlies sand. South of the ditch in the reed canarygrass about 15 cm of topsoil occurred over gravelly sand. All areas north of the ditch, and in the tansy area south of the ditch, the gravelly, sandy, hard-packed soil was difficult to probe beyond 3 cm. West of the trail in the reed canarygrass, 5 to 10 cm of topsoil occurred over gravelly sand that could not be probed beyond a total depth of 25 cm.

### 2.0 Goals and Objectives

#### Species Management Goal

Terrestrial amphibians; raptors, woodpeckers, flycatchers, wrens, thrushes, warblers, grosbeaks, sparrows; small mammals, cottontails

#### Habitat Management Objectives

- Plant a small number of suitable coniferous species for winter cover in area between trail and estuary;
- Plant native shrubs and trees in currently grass-forb areas east of trail;
- Plant small native deciduous trees and shrubs north of blackberries and south of sail club/tennis court (avoid planting trees next to fence to avoid damage to boats and tennis courts from shade, leaf fall, and windfall).
- Control invasive species (e.g. remove common tansy east of trail, limit growth of blackberry west of trail);
- Build boardwalk on segment of trail connecting MUs 11 & 14 along east shore and establish as the only route through that area (i.e. remove any other trails).
- Allow extension of parking lot and visitor use facilities into the north side of this MU, to within 5 m of the ditch, if necessary.

### 3.0 Management Prescriptions

#### 3.1 Initial Enhancement Requirements

##### Tree and Shrub Planting

###### *Invasive Species Control*

- East of multi use trail: remove invasive blackberry, tansy, and reed canarygrass by mowing and shallow rototilling in the early summer, and mowing again in the fall if necessary.
- West of multi use trail: remove reed canarygrass and blackberry from the north half of the unit by mowing and shallow rototilling in the early summer, and mowing again in the fall if necessary.

###### *Soil Preparation*

- In the above invasive species control areas:
  - Plant fall rye to provide winter ground cover and to add nutrients and organic matter,
  - then rototill shallowly again the following spring (preferably when the fall rye is still short enough to rototill easily (<30 cm)) and
  - seed with DF&WT set-aside mix, watering as required during the first summer to help establish a dense cover.

###### *Shrub and Tree Planting*

- In the late fall, plant native deciduous shrubs and trees in above invasive species control areas as follows:

Plant trees and shrubs in the 0.81 ha area at a 2 m spacing between plants, for a total of 2025 plants (or fewer if this MU is used for visitor facilities). Plant in late fall. Newly planted shrubs and trees will need watering for at least the first two summers, until established. If success is less than 80% after two years, replace unsuccessful plants.

Plant the following species of shrubs and small trees in the proportions indicated:

Black hawthorne (in current canarygrass areas)	1%	(20)
Douglas maple	1%	(20)
Choke cherry	1%	(20)
Paper birch ( <i>Betula papyrifera</i> var. <i>commutata</i> ) (in current canarygrass areas)	1%	(20)
Rowan	1%	(20)
Scouler's willow ( <i>Salix scouleriana</i> ) (along ditch)	1%	(20)
Ocean Spray	4%	(80)
Red-flowering currant (along edges)	5%	(100)
Saskatoon	5%	(100)
Red-osier dogwood	15%	(305)
Red elderberry (in current canarygrass areas)	15%	(305)
Snowberry	20%	(405)
Nootka rose	30%	(610)

Plant trees as follows:

- Plant 2 western red cedar and 1 Sitka spruce near the east end, as shown in Drawing 10.

## Trail Management

- Construct boardwalk as shown in Figure 2 to provide the only access through the east side of MU 13 between the dog-off-leash area (MU 11) and the spit (MU 14) and parking lot (MU 18).
- Decommission excess trails as shown in Drawing 10.

### **3.2 Ongoing Maintenance Requirements**

- Annually cut blackberries back along the bordering train in MU 10
- Check every three years and remove other invasive species as required.

### **3.3 Initial Enhancement Costs**

- Cutting and rototilling of invasive species areas (years 1 and 2) & fall rye planting \$1,600. @52/day for 3 events + seed
- Tree and shrub planting costs
  - 2025 plants \$11,330. @3.42, 6.85, 14.25
  - labour \$4,050. @\$2/plant
- Board walk construction \$1,000. for 40 m @ \$25/m
- Total \$17,980

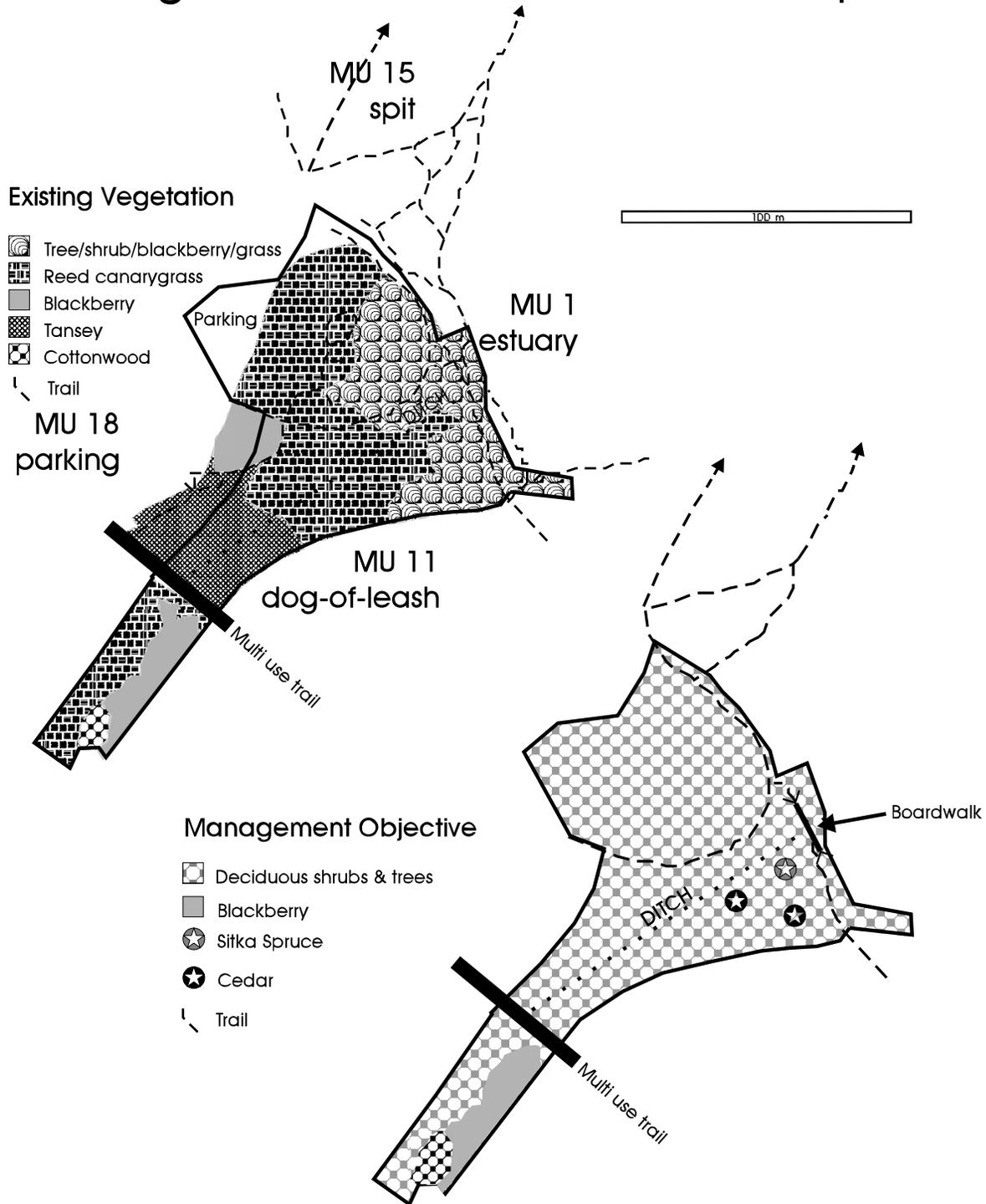
### **3.4 Monitoring Schedule**

After establishment of shrubs, monitor every third year to evaluate need to control invasive species.

Drawing 10:

# Blackie Spit

## Management Unit 13: Deciduous Complex



### 1.0 Existing Conditions

The spit, Management Unit 14, has four main habitat types, three of which are mapped in Drawing 11. Those types include a dense forb/shrub community at the base; the sparse short grass/forb community comprising about half the spit and located on the inner half; a denser forb community located primarily on the outer and south parts of the spit; and the bare sand beach areas with an upper intermittent fringe of dunegrass (*Elymus mollis*) at the tip of the spit and around parts of the north and south sides (Figure 39).

The dense forb/shrub community at the south east base of the spit, consists of goldenrod, sweet pea (*Lathyrus* sp.), reed canarygrass, tansy, two thistle species, American searocket (*Cakile edentula*), and woody vegetation such as snowberry and small introduced fruit trees. It also has the invasive, daphne.

The drier grass/forb community of the inner half of the spit consists of low-growing grasses, plantain, and yarrow, with American searocket in some areas. Occasional broom plants occur in that area, and individual small trees (alder or Pacific crabapple) and small blackberry clumps occur (Figure 40).

The denser vegetation community of the outer half of the spit (Figure 41) contains species such as American searocket (Figure 42), silver burweed (*Ambrosia chamissionis*) (Figure 43), orache, yarrow, sweet clover, a species of vetch (*Vicia* sp.) and other species.

### 2.0 Goals and Objectives

#### Species Management Goal

- Migratory open-habitat passerines (e.g. horned larks, snow buntings, Lapland longspurs, pipits, sparrows, finches).

#### Habitat Management Objectives

- Maintain existing open nature of spit with herbaceous vegetation:
  - Establish islands of low-growing native shrubs and trees in pre-established locations to provide escape cover for sparrows and finches using the site;
  - Control invasive species (non native and all other unwanted woody species);
- To avoid unnecessary disturbance to birds using estuary and spit, and in accordance with the master plan:
  - confine people to 2 trails: a major central trail and a minor south trail. The existing south trail should be moved 2 m above the high tide line and provide an optional route for people without dogs;
  - Establish destination feature and viewing area at new trail end;
  - Move existing north-facing benches to the central trail edge.

### 3.0 Management Prescriptions

#### 3.1 Initial Enhancement Requirements

- Remove broom, blackberry, daphne or any other invasive shrubs that become established.
- Plant two black hawthorne trees in each of the two areas where blackberry clumps were removed.
- Decommission all unwanted trails (Drawing 11) by loosening trail substrate and seeding with seed from plants growing nearby. For some trails, measures may also have to be taken to prevent use after reseeding by blocking, or using signs.
- Re create the south trail three metres above the highest area of direct tidal influence.
- Construct a low viewing platform complete with short fences on each side to help reinforce the idea that people are not to proceed beyond the platform.
- Erect signs informing people that dogs (on leash only) are permitted on the central trail only, and that no dogs are allowed on the new south trail.
- Move existing benches on the north side to the central trail edge.

#### 3.2 Ongoing Maintenance Requirements

Removal of invasive species, as required.

#### 3.3 Initial Enhancement Costs

• Invasive species removal	Volunteer labour
• Black hawthorne (4, 3-5-gallon plants)	\$75. for plants & labour
• Trail decommissioning and construction	2 person-days (?) for staff and volunteers
• Viewing platform and area	\$5,000
• Signs re dogs (4)	\$200
• Bench moving (6 ? benches)	<u>In-house</u>
Total	\$5,275

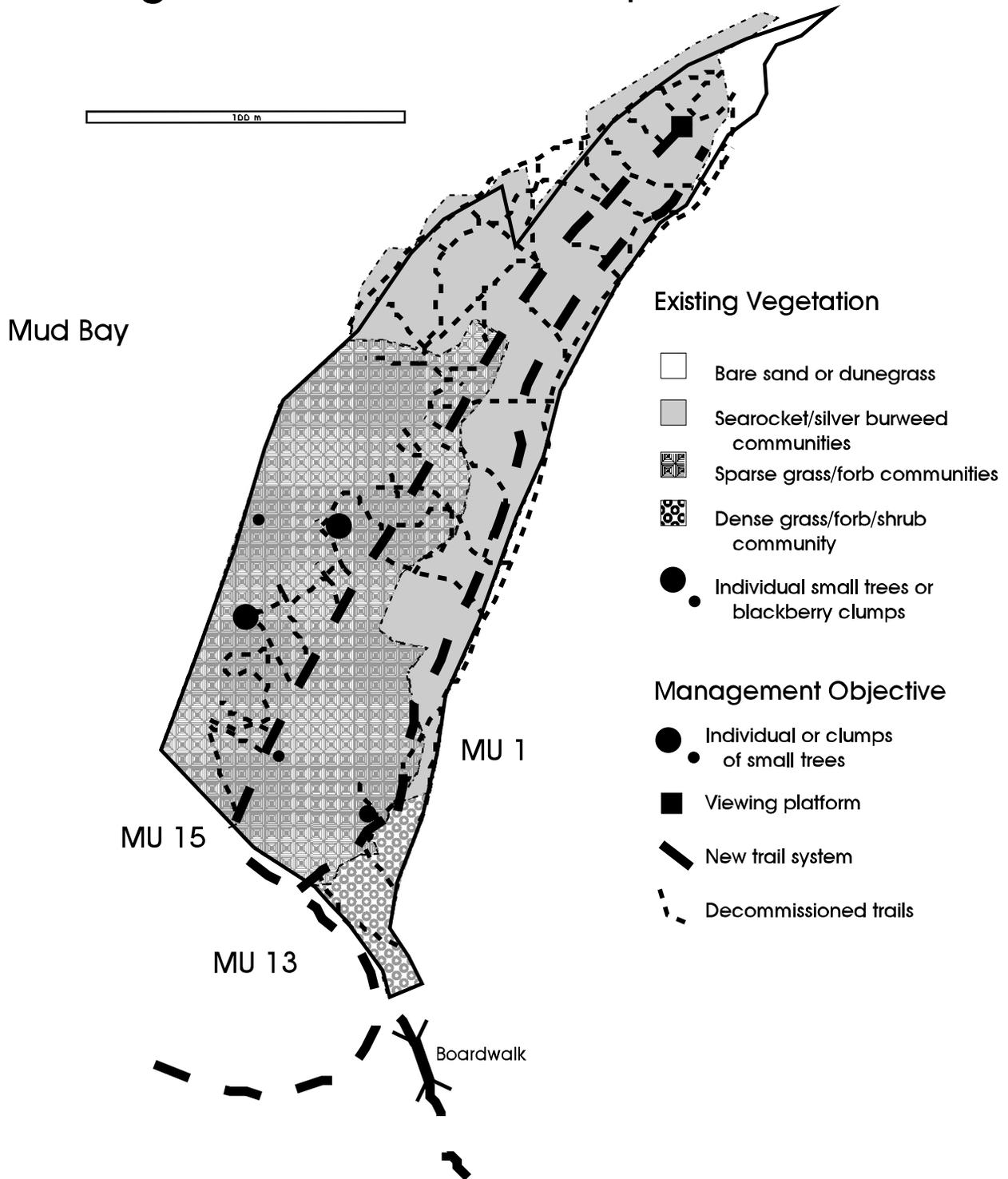
#### 3.4 Monitoring Schedule

Every five years (or more frequently if required), evaluate the need to remove invasive species.

Drawing 11:

# Blackie Spit

## Management Unit 14: Sand Spit



## Management Unit 15: Intertidal Bay

### 1.0 Existing Conditions

Management unit 15 (Drawing 12) is currently a gravel area used for parking (Figure 44).

### 2.0 Goals and Objectives

This unit will provide a function similar to that of the intertidal gravel beach to which it is connected. The development of this unit is to enable visitors to view the more visible intertidal life at a moderately close range without having to go out onto the beach.

Depending on the elevation of the existing intertidal slope, it may be necessary, and desirable, to create tide pools near the bottom of this unit where it meets the current intertidal grade. Such a feature may also provide the opportunity to create a board walk to view the tide pools. However, it is also possible that the intertidal area would resort itself, filling in any pools and creating its own contours.

#### Species Management Goal

Intertidal benthos (marine invertebrates).

#### Habitat Management Objectives

- Remove existing parking lot and create tidal gradient so that highest (south) extent is flooded by the tide at least once in every lunar month;
- Maintain existing spit access trail along south side.

### 3.0 Management Prescriptions

#### 3.1 Initial Enhancement Requirements

- Remove gravel from parking lot (estimated 2700 m<sup>3</sup>). (Use gravel for new parking area in park, if required, or for MU 16 (below)). Grade the site to allow monthly tidal inundation, as described above;
- Place 10 or more large rocks (between .3 and 1 m diameter) at various elevations as substrate for sessile organisms such as barnacles.

#### 3.2 Ongoing Maintenance Requirements

This unit should be self maintaining through tidal inundation. Occasional clearing of trail side vegetation may be required so that views of the intertidal are not hindered.

### 3.3 Initial Enhancement Costs

Removal of about 3000 m <sup>3</sup> of existing substrates excavation, grading and loading	\$3,000. @ \$1/m <sup>3</sup>
trucking (assuming an off-site location)	\$19,000. assuming: 9.5 m <sup>3</sup> /load, 1 hr turn around, \$60/hr.
dumping fee if required	\$6,400. @ \$20/load
Total	\$28,400.

Placing of larger rocks

It may be possible to use rocks turned up during clearing of the site, or some of the rocks currently bordering MU 16 to 18.

### 3.4 Monitoring Schedule

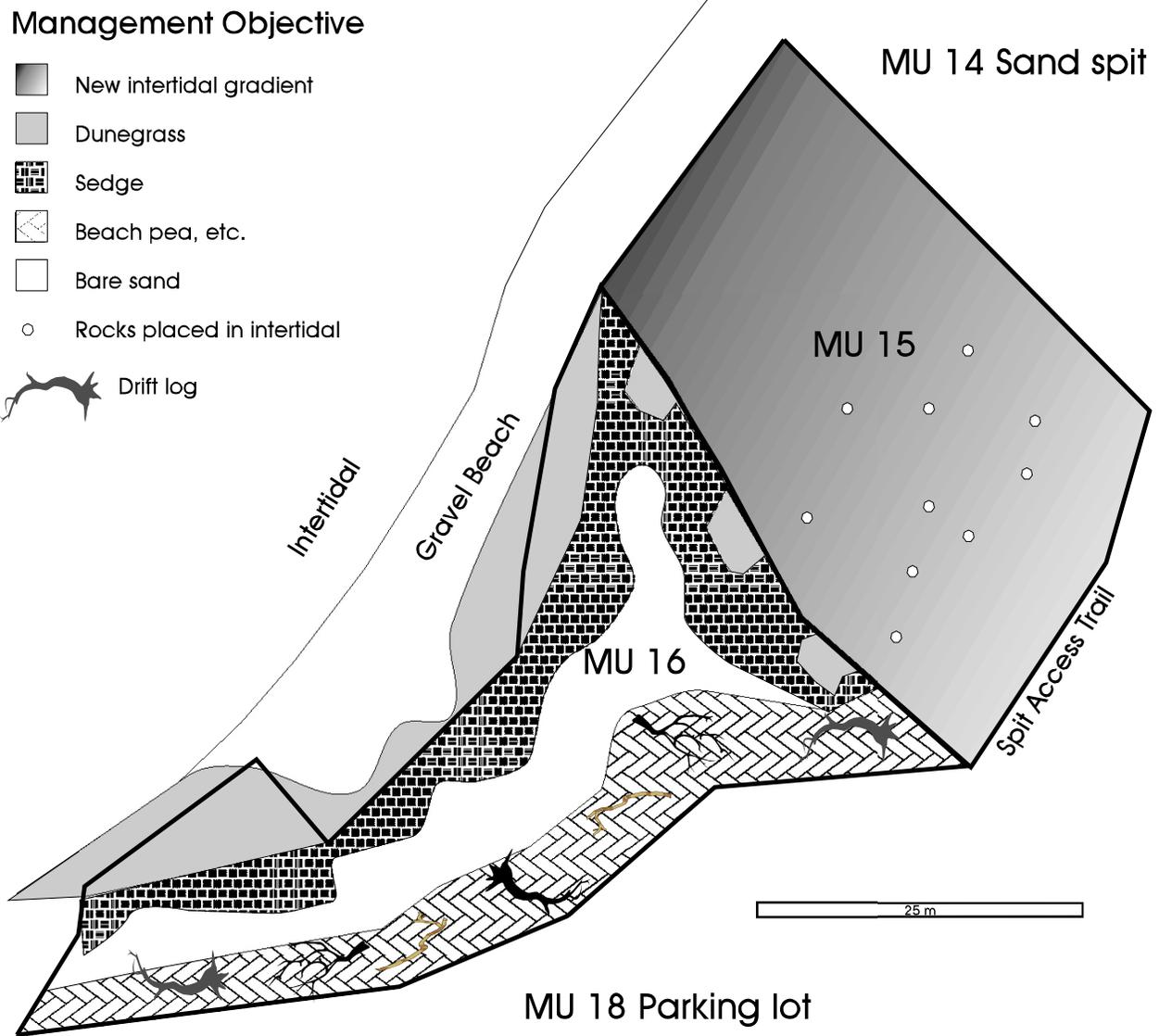
Every 5 years evaluate the need to control vegetation at the highest elevations, as per Section 3.2.

Drawing 12:

# Blackie Spit

## Management Unit 15 and 16: Intertidal bay and coastal beach

### Intertidal bay and coastal beach



## Management Unit 16: Coastal Beach

### 1.0 Existing Conditions

Management Unit 16 (Drawing 12) is a small, roughly mowed area (Figure 45). The current vegetation consists of grass species, yarrow, plantain, hairy cat's ear, dandelion, cinquefoil, sweet clover, beach rye and other species. The soil is sand with an organic veneer.

### 2.0 Goals and Objectives

This unit would be managed as a continuation of the existing adjacent beach and the MU 15 intertidal area.

#### Species Management Goal

Coastal beach vegetation and associated birds and invertebrates.

#### Habitat Management Objectives

- Place a mixture of gravelly and sandy substrates (with high shell content) over entire area to enable duplication of natural open coastal beach vegetation;
- Plant appropriate native plants (e.g. dunegrass, beach pea (*Lathyrus japonicus*), large-headed sedge, and beach morning-glory (*Convolvulus soldanella*) (not to be confused with the weedy species of morning glory growing elsewhere in the park);
- Maintain spit access trail along south side.

### 3.0 Management Prescriptions

This unit will duplicate the sand/gravel/shell pocket beaches found along the coast, likely also occurring at one time in the vicinity of Crescent Beach-White Rock.

#### 3.1 Initial Enhancement Requirements

- Skim off the existing vegetation and organic veneer, although leave the dunegrass in place. Because the soil contains seeds of the species currently growing there, it will not be reused on site.
- Place about 50 cm of sandy and gravelly substrate (about 650 m<sup>3</sup>), if possible using screened material (with fine and coarse material removed) from MU 15. If a source of fragmented shells can be found, mixing this into the surface layers, especially on the leading (seaward) edge, will duplicate the shell content appearance of beaches in many areas (such as occurs on the outside of Cannery Spit).
- Convert the “corner” of the parking area between MU 15 and MU 16 (Drawing 12) to become part of MU 16 by removing the hard-packed gravel surface to a depth of about 0.5 m and replacing with sand/gravel.
- Place driftwood (preferably not commercially cut for aesthetic reasons) along the upper edge.
- Plant the following species. If commercial sources of plant material cannot be found, it may be possible to collect seeds or plants locally.

- Along the outer edge, facing the existing bay, and in patches facing MU 16 (325 m<sup>2</sup>): dunegrass.
- Behind and between the areas of dunegrass (500 m<sup>2</sup>):
  - Sand-dune sedge (*Carex pansa*, also known as *C. arenicola*): plant if a source can be found for this wide-spread but uncommon species: otherwise, plant large-headed sedge, a similar-looking more common native species.
- Among the drift logs at the back of the beach (400 m<sup>2</sup>):
  - beach pea (*Lathyrus japonicus*), also known as *L. maritimus*) and/or grey beach peavine (*L. littoralis*), and
  - beach morning-glory.

### 3.2 Ongoing Maintenance Requirements

Check every other year and remove undesirable species that invade. Some of the low-growing grasses, searocket, and silver burweed, as found on the spit, can remain if they volunteer.

### 3.3 Initial Enhancement Costs

Vegetation excavation and removal of topsoil (estimate 260 m <sup>3</sup> )	\$2,370.	based on total cost of \$9.50/m <sup>3</sup> as per MU 15
Gravel lot removal (60 m <sup>3</sup> )	\$0.	included in MU 15 work
650 m <sup>3</sup> of sand/gravel	\$-0.	if available from MU 15 would reduce MU 15 trucking and dumping costs by \$5500.
Subtotal	\$2,370 - \$5,500 =	\$-3,110
Drift logs	\$0.	
Plant material		
500 sedge plants	\$500.	@\$1/plant incl. taxes
seed for peas and morning-glory	\$100.	cost arbitrary; planting by staff or volunteers
labour to plant sedge	\$85.	assuming 40 sec/plant and \$15/hr
Subtotal	\$685.	

### 3.4 Monitoring Schedule

Monitor annually to assess the need to remove unwanted species.

## Management Unit 17: Wickson Property

### 1.0 Existing Conditions

Management Unit 17 (Figure 2), former residential property, consists primarily of a mowed lawn (Figure 46). Gravelly soil is evident on the surface. A trail exists around the perimeter and five park benches overlook the water. Three trees (two laburnum and one English hawthorne) occur along the trail edge. To the north, on the outside of the trail and below it, boulders have been placed for erosion control. Between the boulders and the water, is an open, sandy beach. Tansy grows along

the concrete abutments beside the trail, while grasses, sweet clover, and tansy, with one broom plant and one seedling maple grow among the boulder and in sandy beach area.

## **2.0 Goals and Objectives**

### Species Management Goal

- Park facilities
- Nature Scape Garden

### Habitat Management Objectives

- Consult with Nature Scape BC to design a native species demonstration garden. Any future facilities should be on the upland side of existing trail; gardens may be in both upland and beach-side areas.
- Plant 2 or 3 spruce trees along the upland side of the existing trail (location dependent on facilities locations) to provide eventual eagle perches.

## **3.0 Management Prescriptions**

Maintain the existing management (mowing) until such time as Surrey begins to plan for the use of this area.

### **3.1 Initial Enhancement Requirements**

Consult with Nature Scape BC at the time Surrey Parks is making plans to construct facilities here.

### **3.2 Ongoing Maintenance Requirements**

Mowing, currently.

### **3.3 Initial Enhancement Costs**

Landscaping and plant costs, as well as possible costs associated with consultation with Nature Scape BC. \$5000 (arbitrary).

### **3.4 Monitoring Schedule**

None at present.

## Management Unit 18: Parking Lot

### 1.0 Existing Conditions

Management Unit 18 is a gravel parking lot (Drawing 13) (Figure 47). Part of the MU, the south end of the area southwest of the swimming club/tennis club, is mostly grass/forb, with two small groves of large cotton trees. Washrooms are also located there.

### 2.0 Goals and Objectives

#### Species Management Goal

None, this area is a parking lot.

#### Habitat Management Objectives

- Create more efficient parking.
- Extend parking lot, if necessary after above, to replace number of parking spaces decommissioned in MUs 15 and 16.

### 3.0 Management Prescriptions

The Master Plan calls for expansion of the portion of the parking lot south of the tennis court, into an area adjacent to MUs 9 and 10. However, this wildlife habitat management plan proposes instead to expand the portion of the parking lot that is north of the sailing club into an area that would otherwise be part of MU 13. The reason for the difference is that much of MU 13 appears to have been once used for parking or some similar purpose. The substrate of MU 13 (on both sides of the ditch) is a mixture of small gravel and sand, is very compacted, and the vegetation volunteering there is largely non native species (tansy, blackberry, reed canarygrass, laburnum and other introduced trees). On the other hand, the substrate of MU 9 and adjacent non parking parts of MU 18, like all upland areas northwest of the MU 7 dyke, is sand more than a metre deep, and the vegetation volunteering there, with the exception of some blackberry along the parking lot edge, comprises a number of desirable grass, forb and, woody species.

There appears to be no compelling ecological reason to make the part of MU 13 adjacent to MU 18 a habitat area at the expense of the grass/forb habitat along the northeast side of MU 9 or of the treed parts of southeast MU 18 and adjacent portions of MU 10. Management inputs would likely be much higher and success rates lower in MU 13 where elimination of undesirable species is a major factor, compared with MU 9 and southeast MU 18 where it is not.

#### 3.1 Initial Enhancement Requirements

- Expand the parking east of the sailing club lot southeastward as much as necessary to allow a maximum amount of parking in the central area of the lot. This may entail as little as moving the boulders that delineate the parking lot boundary, and cutting or otherwise removing and controlling the largely herbaceous vegetation.

- Install concrete abutment(s) in central areas to create pair(s) of rows of parking (as space permits).

### **3.2 Ongoing Maintenance Requirements**

None.

### **3.3 Initial Enhancement Costs**

Concrete curbs                      \$4740. for 65, 1.4 m abutments (90 m length) @ \$74 ea incl. taxes

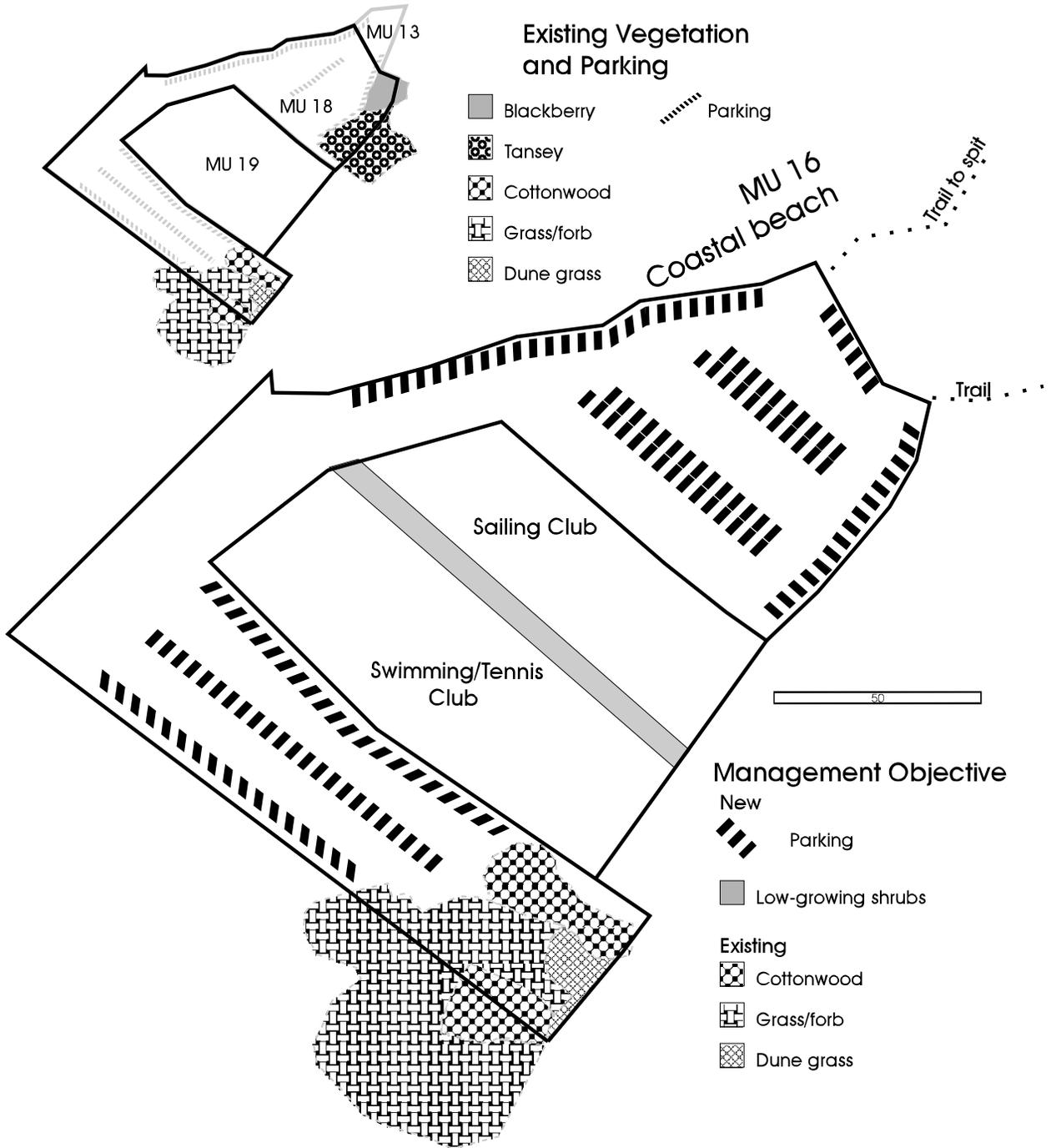
### **3.4 Monitoring Schedule**

None required.

Drawing 13:

# Blackie Spit

## Management Units 18 and 19: Parking Lot and Clubs



## Management Unit 19: Sailing, Swimming, and Tennis Clubs

### 1.0 Existing Conditions

Management Unit 19 comprises two fenced areas, one belonging to a sail club, and a pool and tennis court belonging to a swimming club (Drawing 13). An unfenced 6 m wide area between them consists of mowed grasses and bare ground (Figure 48). The sailing club has a low cedar hedge on the inside of its northeast fence (Figure 49), while some small alders grow around the pool.

### 2.0 Goals and Objectives

#### Species Management Goal

Sailing/swimming club use.

#### Habitat Management Objectives

Plant low-growing native shrubs around unused perimeter areas.

### 3.0 Management Prescriptions

The following recommendations would require the agreement of the clubs who use the property.

#### 3.1 Initial Enhancement Requirements

Plant a row of low-growing shrubs along the outside of the fences between the two clubs (100 m on the NE side and 70 m on the SW side), at a 1 m spacing:

Dwarf (baldhip) Rose	25%	42
Red-flowering Current	25%	42
Snowberry	50%	85

Plant in the fall (October) when plants are dormant. Alternate four snowberry with two rose and two currant plants. Plant the currants on the south side of the roses. Water, as required for the first two years, until established. After two years, if survival is less than 90%, replace dead plants.

#### 3.2 Ongoing Maintenance Requirements

Check every five years and remove any growth of planted species that is expanding beyond a desirable width.

### 3.3 Initial Enhancement Costs

Plant shrubs

169 plants	\$866. @ 3.42 (snowberry) and \$6.85 ea incl. taxes
labour	\$338. @ \$2 ea.
Total	\$1204

### 3.4 Monitoring Schedule

Check plants every four years, and replace any that have died.



Figure 4: Intertidal vegetation of MU 1-north, along the south side of Blackie Spit.



Figure 5: Intertidal marsh of MU 1-central through breach in old dyke.



Figure 6: Intertidal marsh vegetation of MU 1-south, along the north side of the bay.



Figure 7: High marsh and back shore vegetation on the north side of MU 1-south.



Figure 8: Cannery Point, MU 1, showing high intertidal marsh and backshore vegetation.



Figure 9: New intertidal channel on the north side of MU 1-south. Note shrubs planted between the fence and the waterline.



Figure 10: Historic pilings crossing the mouth of the MU1-south bay are now frequently used by roosting birds.



Figure 11: MU 2 is characterized by a variety of grasses, shrubs and planted trees, such as the lodgepole pines shown here.



Figure 12: The east portion of MU 2 is vegetated largely by grasses, forbs, and shrubs. A few alders also occur.



Figure 13: East end of hedgerow in MU 4 between community garden (right) and Dunsmuir old-field (left).



Figure 14: North part of the Dunsmuir old-field (MU 4) is characterized by reed canarygrass and elderberry.



Figure 15: The north end of the Dunsmuir old-field (MU 4) is overgrowing with blackberries. Note planted lodgepole pines.



Figure 16: The Dunsmuir meadow (MU 5) is densely overgrown with blackberries. Salmonberry grows along the ditch edge.



Figure 17: Main drainage ditch south of the dyke (MU 6) and north of MUs 2 to 4.



Figure 18: Old ditch between main dyke (MU 6) and old dyke (MU7).

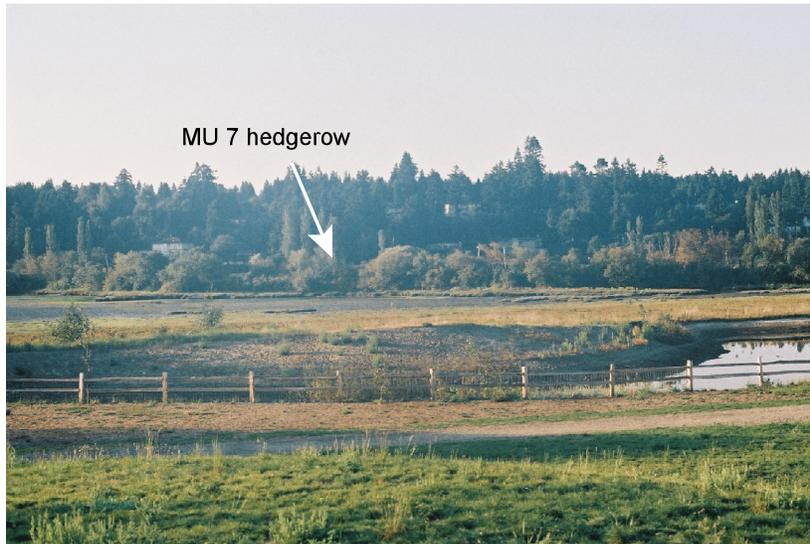


Figure 19: Hedgerow growing on the old dyke (MU 7) as seen from across the south bay. A trail runs the length of the dyke.



Figure 20: East end of old dyke hedgerow (MU 7) where it merges with the new dyke. Tansey is abundant east of the end of the hedgerow. A viewing platform proposed for the right foreground will provide views into the south bay of MU1.



Figure 21: The deciduous woodlot (MU 8) consists of cottonwood, alder, birch, willow and other tree species.



Figure 22: Interior of MU 8 woodlot. Horsetail is the predominant ground cover.



Figure 23: Black hawthorne/broom/blackberry/grass complex northwest of the MU 8 woodlot.



Figure 24: Blackberry/broom/shrub complex (area B in Drawing 5) northwest of the MU 8 woodlot.



Figure 25: Grassy meadow and cattail stand (rear) surrounded by blackberries, shrubs, and trees in MU 8, NW of woodlot.



Figure 26: The vegetation of the E edge of MU 8 (rt) is largely horsetail, tansy, and grasses with invading blackberry.



Figure 27: The shrubby southern section of MU 8 is bordered by grasses (south end) and tansy (east side along trail).



Figure 28: The south end of MU 8 consists of black hawthorne and other shrubs. The invasive knotweed is also present (lt).



Figure 29: Most of the shrub growth is in the western and southern portions of MU 9.



Figure 30: The predominantly grassy eastern half of MU 9 is being invaded by broom.



Figure 31: MU 10 (far side of trail) comprises European beachgrass (right), pasture grass (centre), and shrub (left) habitats.



Figure 32: The dog-off-leash area (MU 11) has recently been cleared of most invasive shrubs and planted with grasses.



Figure 33: The south tip of MU 11 consists primarily of invasive species and a few black hawthornes.



Figure 34: Looking northwest through centre of MU 12. The dry grass/forb site is bordered by hedgerows.



Figure 35: An introduced elm growing along the southeast and northeast sides of MU 12 is encroaching on the central grassland.



Figure 36: Woody species at the southeast end of MU 13 include Pacific crabapple, birch, elderberry, and blackberry.



Figure 37: Reed canarygrass (right) and tansey (between tree and trail) characterize much of MU 13 northeast of the multi use trail.



Figure 38: MU 13: Reed canarygrass and blackberry predominate SW of the multi use trail, SE of the sailing club fence.



Figure 39: Dunegrass grows above the intertidal beach at the outer end of Blackie Spit (MU 14).



Figure 40: Short grasses and scattered shrubs characterized the inner half of Blackie spit (MU 14).



Figure 41: A lush grass/ forb community grows on the outer half of Blackie Spit (MU 14).



Figure 42: American searocket is one of the most abundant species on the outer half of Blackie Spit (MU 14).



Figure 43: Silver burweed is one of the two most characteristic species of the plant community on the outer half of Blackie Spit (MU 14).



Figure 44: Currently used for parking, MU 15 is proposed to be excavated and turned into a gravel intertidal gradient. The boulders seen in this photograph will be placed as rock intrusions onto which sessile marine organisms can be come attached.



Figure 45: In MU 16, this rough-cut grass area and a portion of the adjacent parking area are proposed to become a sandy coastal beach. The area proposed as intertidal habitat (MU 15) is in the foreground.



Figure 46: The Wickson Property (MU 17) may become the site of future park facilities and a Naturescape garden.



Figure 47: Southwest parking lot of MU 18. The large cottonwoods in the back are part of MUs 9 & 13. The more distant trees to the right are in MU 8. MU 9 is to the right.



Figure 48: Native shrubs are proposed to be planted along these fences in MU 19.



Figure 49: A row of cedars screens the sailing club (MU 19) from the multi use trail and parking lot to the NE in MU18.