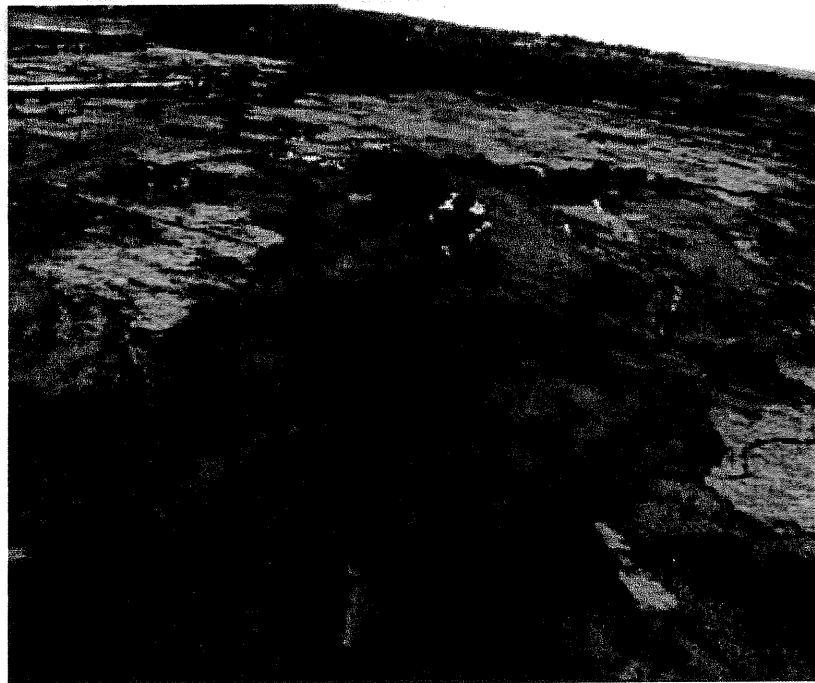


Draft Boundary Bay Regional Park Old-field Management Strategy

October 15, 2009



Aerial view of old-field habitat complex at Boundary Bay Regional Park



**metro
vancouver**

www.metrovancouver.org

This page left intentionally blank

ATTACHMENT A

Page 2 of 18

Table of Contents

1.0	Introduction	3
1.1	Ecological Context	3
1.2	Regional Park Context	4
1.3	Rationale for Strategy	4
2.0	Objectives of Old-field Management	5
3.0	Management Strategy Components	5
3.1	Management Unit Delineation	5
3.2	Management Practices	9
3.2.1	Noxious Weed Management	9
3.2.2	Invasive Species Management	11
3.2.3	Revegetation	13
3.2.4	Maintenance	13
3.3	Monitoring and Evaluation	14
4.0	Communication	14
5.0	Draft Budget	15
6.0	Literature Cited	16

This page left intentionally blank

ATTACHMENT A

Page 4 of 18

1.0 Introduction

1.1 Ecological Context

Boundary Bay is a critically important ecosystem, approximately 11,000 hectares in size. It is a vital component of the internationally significant Pacific Flyway for birds migrating between Asia, North America and South America. Millions of birds use Boundary Bay and the Fraser River delta each year during winter and spring migration periods. Birds are attracted to Boundary Bay because of its undisturbed resting areas, mild climate and abundance of food in inter-tidal areas and neighbouring farmlands.

The high wildlife values present in the area have led to several Provincial, National and International designations. Boundary Bay, Sturgeon Bank, Roberts Bank and surrounding farmlands were officially identified as Canada's most significant Important Bird Area (IBA) in 2000 (<http://www.bsc-eoc.org/iba/site.jsp?siteID=BC017> accessed October 13, 2009). Habitats provided by this ecosystem complex are varied and important to significant concentrations of waterfowl, raptors and shorebirds.

Boundary Bay Regional Park (BBRP) is an important component of the IBA because it includes large blocks of diverse habitats, some of which are contained within designated wildlife management areas.

Waterfowl and raptors that use habitat found in the IBA are partially dependent on natural, semi-natural and agricultural grassland habitats protected from seasonal flooding by a significant dike system. Old-fields are an example of tall-grass habitats that are important to some hawks and owls (and other species) that congregate in the area, particularly during winter months. Diurnal and nocturnal birds of prey are attracted to tall-grass habitats due to the dense populations of Townsend's vole, a relatively large sized native rodent and preferred prey item that grasslands can support. Furthermore, some species roost communally in tall-grass areas during winter months, protected by the cover that the vegetation provides them. Common raptor species using old-field habitat within BBRP and surrounding areas include northern harrier, barn owl, short-eared owl, rough-legged hawk and red-tailed hawk. All of these, with the exception of rough-legged hawk, which breeds in the arctic, have nested in or adjacent to Boundary Bay Regional Park.

Historically, natural marsh grassland habitat and more recently semi-natural and agricultural old-field habitat has supported nesting short-eared owls and northern harriers both of which are ground nesters. Several locally breeding waterfowl species and numerous grassland associated songbird species also nest within the grassland habitat complex. Killdeer may attempt to nest in some areas.

In winter, tall-grass habitats also attract red-winged blackbird, brewer's blackbird and western meadowlark as well as numerous waterfowl species. Great blue herons hunt Townsend's voles in old-field habitats, particularly during winter months. Horned lark and American pipit have been known to occur during spring and fall migration.

A number of species listed as being of conservation concern, both federally under the Species at Risk Act and Provincially by the BC Conservation Data Centre, are known to use old-field and other tall-grass habitats on the lowlands of Delta. The primary threat to short-eared owls and barn owls is loss or degradation of old-field breeding and winter habitat (B.C. Ministry of Water, Land and Air Protection. 2004, Demarchi *et al.* 2005). The availability of suitable tall-grass foraging habitat containing high densities of

Townsend's vole has been significantly reduced on the delta due to urbanization and intensification of agricultural practices. Likewise, nesting habitat for the Short-eared owl and foraging habitat for both owls is subject to pressure from urbanization and intensive agricultural practices. Other listed species affected by old-field habitat loss in the area include American bittern, great blue heron and western meadowlark. Management and enhancement of old-field habitat within BBRP would contribute to the conservation of all these species.

1.2 Regional Park Context

Boundary Bay Regional Park is one of 22 of Metro Vancouver's Regional Parks and is guided by Metro Vancouver Board's Parks and Greenways Plan (RPGP). The park was expanded with the addition of 89 hectares of land between Boundary Bay Road and Centennial Beach as part of the 1995 Lower Mainland Nature Legacy Program and YVR Wildlife Habitat Compensation Program. Compensation funds used to purchase land were to contribute to the goal of "no net loss" of habitat capacity as a result of the conversion of 350 ha of agricultural habitat to accommodate the construction of a third runway at the Vancouver International Airport on Sea Island. As part of the Park expansion process, Metro Vancouver Parks and Environment Canada formed a working partnership to review and update the BBRP Plan in 1996 (Quadra Planning Consultants Ltd. 1996). An important goal of the updated Plan was to integrate outdoor recreation requirements with wildlife habitat management and enhancement objectives.

The primary habitat management goal for BBRP is *to enhance habitats for raptors, great blue herons, passerines, and to a lesser extent, waterfowl*. Specific wildlife habitat management objectives for BBRP include:

- maintenance and enhancement of old-field habitats
- maintenance and establishment of shrubland and woodland habitats
- maintenance and establishment of hedgerows
- maintenance and creation of freshwater wetlands/ditches
- maintenance and enhancement of saltmarsh and tidal flats
- placement and maintenance of raptor perch pole and shrub placement
- establishment of nest boxes

In addition, it was decided in the updated plan that public access would not be permitted within 3 Wildlife Reserves that include large blocks of old-field habitat.

1.3 Rationale for Old-field Management Strategy

The condition of old-field habitat varies across the park. Many areas contain high-value old-field habitat that exhibit diverse species composition and complex structure. Other areas are significantly impaired due to the presence of invasive and/or noxious weed species and encroachment of woody shrubs and trees. Himalayan blackberry and reed canarygrass were identified as invasive plant species that are extensive in old-field sites during a 2008 Terrain Ecosystem Mapping Study in BBRP (Coulthard 2008). Thistle populations are also extensive throughout the park and require annual control.

Given the current lack of agricultural management practices (haying and/or grazing) and other natural ecological drivers (processes and forces that shape ecosystems (e.g. seasonal flooding)) within BBRP, the maintenance of highly valuable old-field conditions will require ongoing park management. Impaired areas will require moderate to intensive management intervention to return them to high quality old-field habitat. Low to moderate intervention will be necessary for less impaired areas.

This report outlines strategies and tactics that will be used to enhance wildlife habitat value found in old-field sites within BBRP.

2.0 Objectives of Old-field Management

The primary objective of the Old-field Management Strategy is to maintain large areas of old-field habitat that is of suitable floristic composition and structural complexity to support:

1. Relatively stable populations of Townsend's vole;
2. Year-round and wintering populations of raptors;
3. A wide range of other grassland associated bird species while respecting non-grassland habitat structures important to other species found within Boundary Bay Regional Park.

In support of this, the following sub-objectives will be achieved within a long-term old-field management program.

- a. Evaluate identified old-field areas within Boundary Bay Regional Park with respect to level of succession and degree of impairment due to invasive species and noxious weed density.
- b. Develop site-specific integrated vegetation management prescriptions to return severely degraded open field grassland sites to high quality old-field habitat.
- c. Maintain and enhance old-field sites within Boundary Bay Regional Park to support healthy populations of Townsend's voles, and provide high-quality habitat for raptors, great blue herons and other grassland associated bird species.
- d. Manage and contain the spread of Himalayan blackberry to field edges, so as not to impede potential trail construction, or selective mid-field thickets that do not reduce open field habitat values or compete with existing hedgerows and woodland margins, which also have high wildlife value.
- e. Control Canada thistle and other thistles in all field areas, recognizing that while thistles have value to certain vertebrate species, overall, the presence and spread of Canada thistle reduces overall amount and value of open field habitats for targeted wildlife species.
- f. Reduce large areas of reed canarygrass monoculture within identified old-field management zones and convert them to higher value old-field habitat species complexes.

3.0 Management Strategy Components

3.1 Management Unit Delineation

Several studies have examined ecosystem classification and old-field condition since the expansion of the park in 1996. Most recently, a Terrestrial Ecosystem Mapping study provided valuable data that was used to stratify the site to coarse grass field types (e.g. dry old-field, wet old-field, Figure 1) and identify areas impacted by non-native invasive plant species (Figure 2) (Coulthard 2008). Ecosystem mapping indicated that wet- and dry-old-field habitat within the park declined by 41% between 1996 and 2008. The

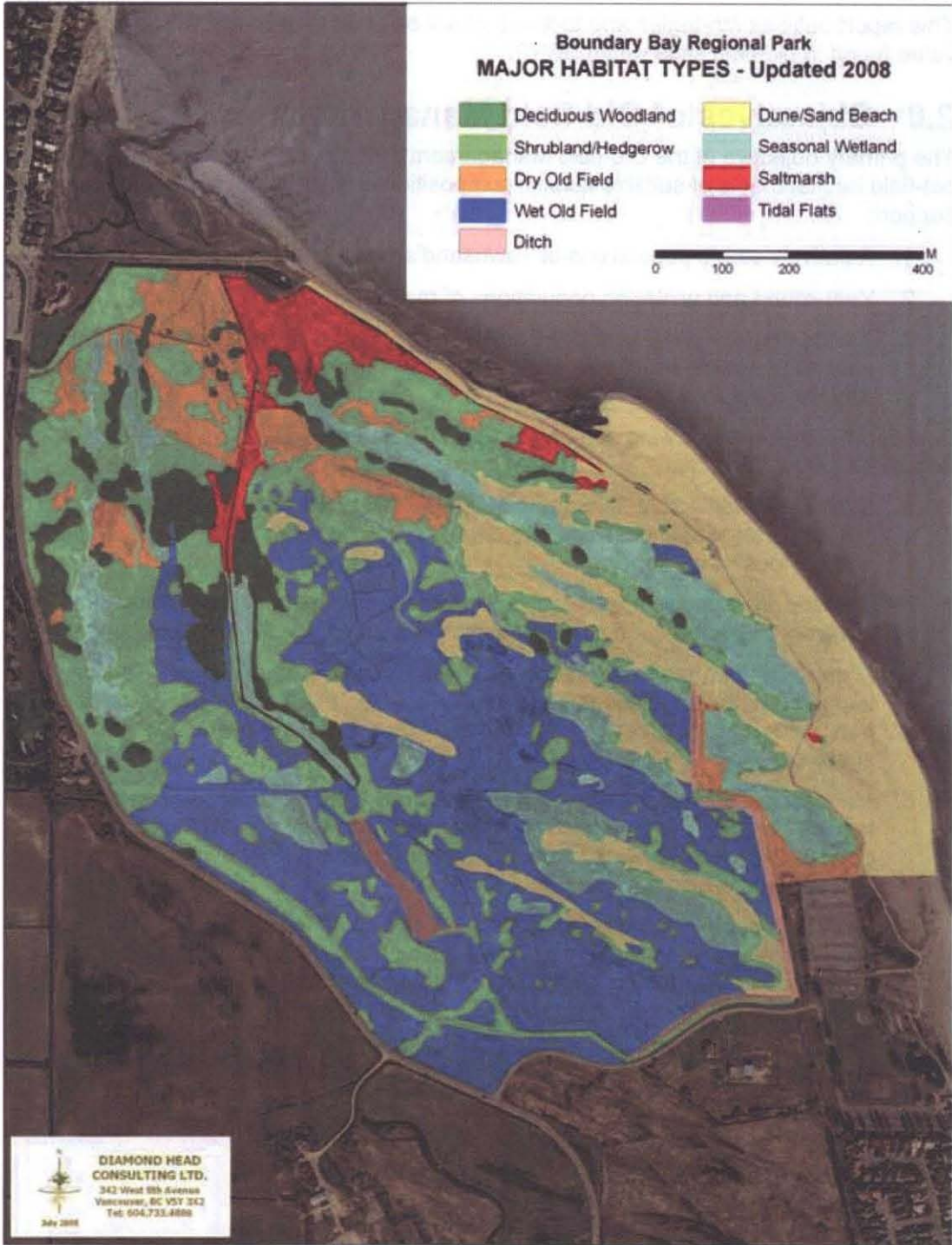


Figure 1. Boundary Bay Regional Park Habitat mapping completed in 2008

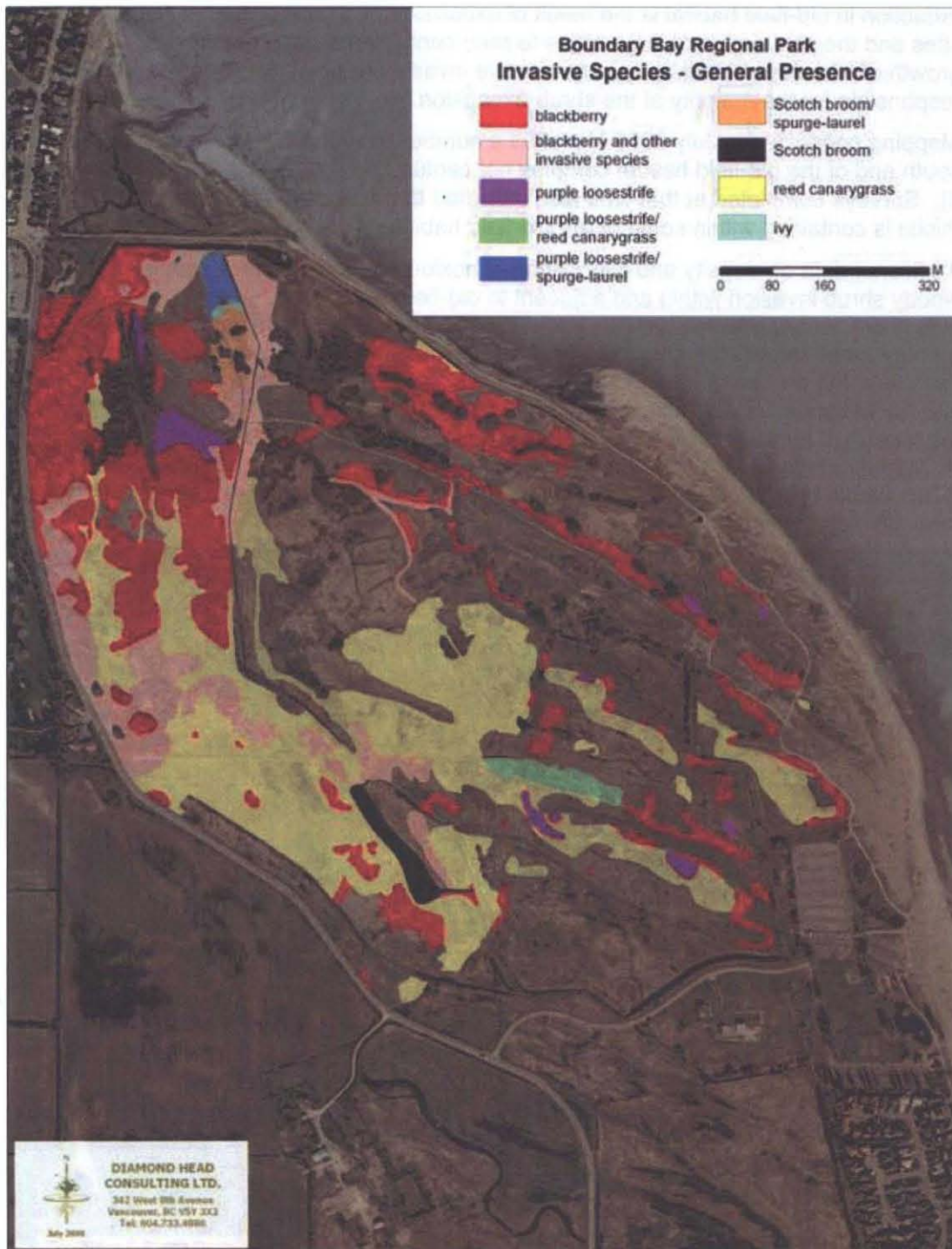


Figure 2. General distribution of invasive plant species in Boundary Bay Regional Park 2008

reduction in old-field habitat is the result of expansion of shrubs and trees into old-field sites and the conversion of large areas to reed canarygrass monocultures. Uncontrolled growth of Himalayan blackberry, a non-native invasive woody shrub species, is responsible for the majority of the shrub expansion.

Mapping conducted in July 2009 identified a number of young blackberry centers at the south end of the old-field habitat complex not captured in Coulthard's 2008 study (Figure 3). Surveys completed at that time also indicated that a significant amount of Canada thistle is contained within some of the old-field habitat areas.

Additional data on density and distribution of noxious weeds, invasive species and woody shrub invasion within and adjacent to old-field habitat areas are required to clearly delineate suitable management units. Site-specific prescriptions for each management unit will then be developed, employing an increasing level of intervention relative to the degree of impairment, nature of invasive and or noxious weed infestation and effectiveness of available control strategies and tactics. This fine-scale management approach will allow for cost-effective, ecologically defensible old-field management while minimizing temporary loss of habitat capacity associated with extensive field renovation. This will also allow for community involvement in the rehabilitation of field areas at lower levels of impairment.

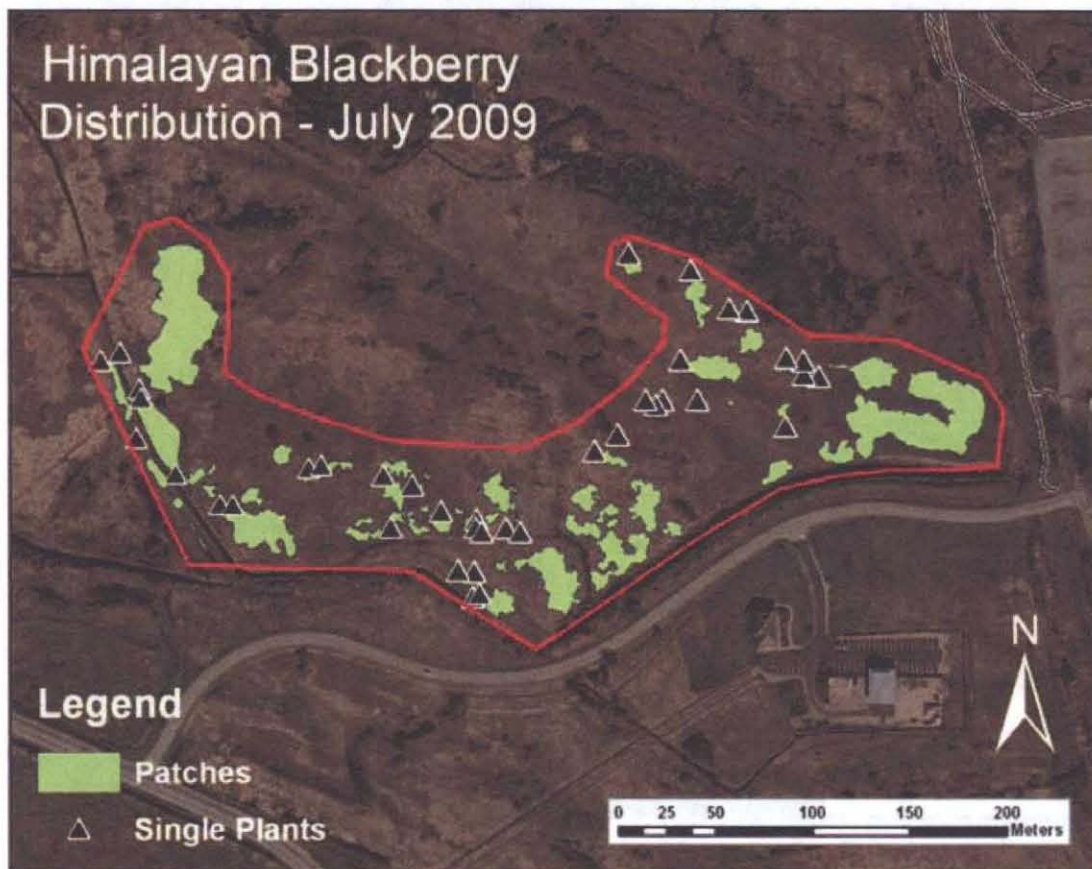


Figure 3. Distribution of Himalayan blackberry in southern old-field management area of Boundary Bay Regional Park, July 2009. Red outline represents approximate extent of area examined.

3.2 Management Practices

As mentioned, not all old-field areas are in need of intensive management to retain old-field conditions. Where vegetation management intervention is necessary, an Integrated Pest Management (IPM) approach will be applied. IPM involves site monitoring, the determination of action thresholds and the selection of effective control methods from a range of possible choices to match the management goals and conditions encountered at each specific site. The presence of multiple challenges at individual sites may require hybrid strategies and tactics to be effective at controlling multiple species.

The extent and timing of field management will be such that no more than 20% of the identified old-field areas will be under intensive renovation at any one time. Early efforts will be focused at old-field sites with low levels of impairment. At this stage volunteer work parties will rehabilitate areas affected by low densities of invasive and noxious weed species. Most work will be by hand tools.

The overall goal will be to return identified old-field areas to a dynamic state that can be maintained with regularly scheduled low to moderately intensive management practices. Management will require dedication over the long term, and will allow for flexibility in methods as the most appropriate ones are identified and new ones are developed.

3.2.1 Noxious Weed Management

Many thistles are classified as noxious weeds and must be controlled under the Provincial Noxious Weed Act and a Corporation of Delta bylaw if they are a problem for agricultural reasons. As a result, park operations at BBRP have been arranging annual thistle mowing to control seed production for a number of years. Although meeting the immediate legal requirements, this practice is not necessarily beneficial in terms of long-term management of thistles within an old-field management framework.

Strategies and tactics developed for thistle control are species specific. Generally, annual and biennial thistles are relatively easier to control than perennial species such as Canada thistle. All thistle species need to be monitored and managed within BBRP, however, Canada thistle is the most difficult to deal with and is the species of most concern. Where Canada thistle has developed into large areas of monoculture, intensive thistle management will be necessary because annual mowing to control thistle seed production is not compatible with old-field management objectives.

Canada thistle spreads primarily by vegetative means, and secondarily by seed dispersal. The root system on Canada thistle clones can be extensive, growing horizontally as much as six meters in one season. Patches are capable of spreading at a rate of one to two meters per year. Canada thistle has two types of roots – vertical and horizontal. Vertical roots store water and nutrients and can reach a depth of 6.8 meters. Horizontal roots produce numerous shoots as they spread outward. Root energy storage in the form of stored carbohydrates is lowest in early June, just before flowering. Root reserves begin to increase in early fall as shoot growth declines. Timing of thistle control is vital and should be focused on the low root nutrient storage phase of growth.

Canada thistle readily propagates from stem and root fragments; plowing or other soil disturbance can increase thistle densities. Seedlings also benefit from disturbance and develop rapidly on exposed soil. Seedlings need strong light and low competition to survive. A healthy vegetation cover is a strong defense against Canada thistle and will be important in controlling thistle in managed areas.

Wildlife Value of Canada Thistle

Canada thistle and other thistle species have some wildlife value, especially to butterflies and birds. Gold finches are noted for their affinity to these plant species, often delaying their nesting until Canada thistle is in bloom. However, this behavior is related more to flowering patterns of all composite plant species in general and is not specific to only Canada thistle. In native grasslands, overall species diversity has been found to be inversely proportional to the abundance of Canada thistle. The greatest value of thistles to wildlife occurs when they are present in low densities and in combination with a more floristically diverse community.

Control of Canada Thistle

Thistle management will be designed to reduce the abundance of established clones since the species spreads primarily by vegetative expansion of the root system. Much of current research has focused on the use of herbicides to control Canada thistle, however, integrated management practices employing cultural, mechanical and chemical methods are considered most effective. Use of herbicides is generally recommended only as a last resort when mechanical and cultural methods are proven to have limited or no effectiveness. It is unlikely that chemical control will be attempted within the first three years of thistle management, if at all.

Mowing and cultivation

Mowing temporarily reduces above-ground biomass, but does not provide long-term control of Canada thistle unless repeated at 7-28 day intervals during the growing season for up to four years. Mowing will be most effective if plants are cut when root reserves are at their lowest in mid June as flowers are beginning to open. In order to prevent seed set, plants will be mowed before flowers open. Mowing just twice a year, in mid June and September may reduce Canada thistle. Mowing only once a year will not control Canada thistle.

Disking (turning the soil) is effective if repeated every 21 days (a minimum of six cultivations per growing season) and conducted over several years. Repeated disking and tillage reduces Canada thistle by preventing root growth and depleting roots and their fragments of nutrient reserves. However, disking affects only the upper part of the root system and new shoots may develop from deeper root systems.

In BBRP, a combination of mowing and cultivation will be used in areas of thistle that are densely populated and greater than 0.05 ha in size. During years when intensive cutting or tilling of thistles is necessary, affected areas will be mowed short as early as possible in the growing season. The reason for this is to reduce the chances of grassland nesting species to establish nests in control areas.

Post Treatment Management

Regardless of whether repeated mowing or disking is used to reduce Canada thistle growth, the affected areas will be reseeded with a grass crop to provide ground cover and contribute to soil conservation over winter months. If seeding of grasses occurs after August 1st, a temporary winter cover crop will be seeded on large bare patches, and a grassland set-aside seed mix (developed for agricultural applications in Delta by Delta Farmland and Wildlife Trust) will be drilled or air-seeded through the cover crop early the following spring. Smaller areas will be seeded with the set-aside mix as early as possible the following spring.

3.2.2 Invasive Species Management

Himalayan Blackberry

Native to Western Europe, Himalayan blackberry is an extremely aggressive member of the rose family. Wildlife spread seeds and once established Himalayan blackberry spreads rapidly to form impenetrable thickets. Upright canes may reach a height of three meters and trailing canes can reach lengths of 15 meters before touching ground. Recumbent canes develop adventitious roots leading to the formation of daughter plants. Individual canes may live two to three years and reach densities of 525 canes per square meter. New growth also develops from adventitious shoots (suckers) along lateral roots.

Wildlife Value of Himalayan Blackberry

Himalayan blackberry does have some value for wildlife and its removal is sometimes controversial. Blackberry provides food and cover for birds, but because of its very aggressive nature, it may out-compete many native species that provide habitat value for a greater range of species. Thickets consisting of only blackberry do not provide as high habitat value as species diverse and structurally complex thickets, hedgerows or woodlots.

Blackberry Control

Studies indicate that mechanical removal and/or repeated cutting may be effective in removing blackberry and allowing restoration of more desirable species.

Cutting

Cutting of established clumps requires heavy machinery to remove the above ground portion of the plant and expose the crown. Given that Himalayan blackberry readily sprouts from stem cuttings, canes must be removed and disposed off site. Mechanical cutting does not encourage the development of suckers along lateral roots; however, it will encourage rapid growth of canes from the root crown. Eliminating blackberry will depend on repeated cuttings to knock back growth and exhaust the roots' reserve food supply. The best time to do this is when plants begin to flower. At this stage the food supply in roots has been nearly exhausted and new seeds have not yet been produced. The process may take up to four years before blackberry can be reduced by 95%.

Removal of Roots

Removal of roots (once cutting is completed) is the most effective way of controlling blackberry. Roots should be hand-dug using a Pulaski and removed from site for disposal. If larger areas are treated cultivation followed by extensive soil preparation including debris raking may be effective. This would need to be proven through research trials.

Chemical Control

Chemical controls have been largely ineffective in controlling blackberry. Use of herbicides may encourage the growth of adventitious roots, and there is some evidence to suggest that repeated spraying may lead to a herbicide-resistant vegetation cover.

Post Treatment Management

Regardless of whether cutting or root removal is used to reduce Himalayan blackberry, the effected areas will be reseeded with a grass crop to provide ground cover and contribute to soil conservation over winter months. If seeding is delayed until after August 1st, a temporary winter cover crop will be seeded on large bare patches, and a grassland set-aside seed mix (developed for old-fields in Delta by Delta Farmland and Wildlife Trust) will be drilled or air-seeded through the cover crop early the following spring if possible. Smaller areas will be seeded with the set-aside mix as early as possible the following spring.

Reed Canarygrass

Reed canarygrass is a long-lived perennial, cool-season rhizomatous grass native to many areas in the Northern hemisphere. There is some debate about its native status in parts of North America, particularly in the Pacific Northwest and surrounding areas. This species is a vigorous, tall-growing plant with an aggressive underground stem (rhizome) system. As a mature plant, reed canarygrass tolerates prolonged soil saturation and ponding, as well as dry soil conditions, but is intolerant of dense shade.

Ecologically, reed canarygrass competitively excludes other native plant species and limits the biological and habitat diversity of moist grasslands, wetlands and riparian habitats. It has the capacity to produce extremely large monotypic stands. This characteristic often results in grassland habitats that are low in diversity and of relatively poor wildlife habitat value (Evely 2008, Taitt 2006). It is one of the earliest grasses to green up in spring. Winter senescence results in tall and dry stands of low nutrient forage.

Control

Reed canary grass is extremely difficult to control. Control measures have included grazing, burning, mowing, cultivation and the use of herbicides. Many researchers and land managers have suggested that glyphosate (a non-selective chemical herbicide) is the most effective way of controlling reed canarygrass. Herbicide application is thought to be most effective when root reserves are low at or near the flowering stage. Like other invasive or weed species, reed canarygrass is likely best controlled through several integrated measures. A combination of intensive and repeated cutting with application of herbicide coinciding with flowering may provide the best control.

Metro Vancouver staff in the Parks Central area has been experimenting with field renovation techniques to improve old-field habitat involving intensive reed canarygrass management at Colony Farm Regional Park (Evely 2008). Their manipulations have included mowing, raking, repeated cultivation, a short fallow period and seeding with a grassland set-aside seed mix. The same approach with minor modifications will initially be applied at BBRP.

Reed canarygrass control will include early season blackberry and reed canarygrass mowing to very low levels. Blackberry stems will be removed from site and canarygrass stems and root fragments will be raked and piled to compost over time. Fields will then be ploughed and tilled several times over a number of weeks. The fields will be left fallow for two months and tilled again in mid-July. In September affected areas will be disked and seeded with a winter cover crop. A grassland set-aside seed mix will be drilled or air-seeded through the cover crop early the following spring if possible. If seed

drilling or air seeding is not possible the field will be ploughed and prepped before broadcasting a set-aside mix.

3.2.3 Re-vegetation

Renovated sites and areas impacted by manual weed or invasive control will be seeded with the Delta Farmland & Wildlife Trust Grassland Set-aside Mix. It consists of

- Orchardgrass (25%),
- Tall Fescue (28%),
- Timothy (15%),
- Chewing's Fescue (15%)
- Creeping Red Fescue (15%) and
- Double Cut Red Clover (2%) by weight.

This seed mixture will be broadcast or drilled at 30 lbs/acre with 10 lbs/acre of annual ryegrass added to the DF&WT Grassland Set-aside Mix to aid in controlling weeds and to enhance wildlife habitat value. Seeding should occur no later than May 15th to ensure good take and growth and allow for weed control before winter. Some renovated field sites or treated patches may need to be mowed to increase its wildlife habitat value and to control early weeds in the first or second year. While mowing larger patches, machine operators will: 1) drive slowly, so that small mammals and other wildlife have some chance of escape; 2) cut from the centre of the area to the edge, so that small mammals and other wildlife do not become trapped; and 3) leave a small uncut field margin, 3-20 ft. wide, around the edges of the field to act as cover for displaced wildlife and beneficial insects. Mowing or harvest should not occur until after July 15 and preferably August 15 to minimize impacts on breeding birds.

3.2.4 Maintenance

Woody vegetation originating from seed dispersal or expanding hedgerows, shrublands or woodlands adjacent to old-field habitats will require periodic control. Maintenance of an established field edge is essential to confine hedgerows, shrublands and woodlands. The margins of old-fields will be mowed more frequently at the interface between grassed areas and adjacent woody plant communities that are required to maintain old-field characteristics. Retention of occasional individual hawthorn or crabapple trees or small to medium sized thickets of shrub species can be desirable within old-field habitats. Trees and thickets provide perching and nesting sites for raptors using the old-field complex and will be tolerated in BBRP to a limited extent. These retention areas will be subject to the same mowed buffer.

Subsequent to the re-establishment of appropriate old-field conditions, an ongoing management regime emulating natural ecological drivers or agricultural practices will be necessary to maintain old-field conditions. Periodic disturbance of old-field sites will be necessary to maintain suitable plant species composition and habitat structure. This will be achieved by mowing or "trampling" old-field sites on a 2- to 4-year rotation. Mowing is a common practice to suppress invading hardwoods in grasslands.

Maintenance of old-field habitats by managed grazing could also be considered as a possible option to mowing. This would require grazing license agreements and the installation of temporary or permanent fence lines to control duration of grazing episodes and area grazed. This approach is contingent on sufficient interest in the local farming or horse owner communities.

Guidelines:

- Mowing will be scheduled outside of the primary bird-nesting season (April 15 to August 15).
- Pattern of mowing will be varied. Mowing may be done in irregular patterns or strips alternating areas mowed from year to year.
- Larger patches (>3ha) should be mowed from the centre outward to allow wildlife to flee instead of being trapped within ever shrinking tall grass areas
- Where edges are adjacent to watercourse they should be left un-mowed to provide areas of food and cover.
- Utilize standard wildlife conservation mowing practices such as raising the mower blades to at least ten inches or more, which permits the grass to recover quickly and still provides cover for resident wildlife.
- Light to moderate grazing can benefit grassland wildlife. Moderate grazing produces a diversity of grass heights. Grazing on fields during the critical nesting period (April 15 to August 15) will not be permitted.
- Grazing will not be permitted after October 1.
- Develop a rotational system that creates a mosaic of plant species and structure, while providing a longer period of time for animals to graze. On fields utilized by grassland nesters, 40% of the vegetation should be maintained at a minimum height of 20 to 30 cm.
- Do not overgraze. This will reduce plant vigor and lead to erosion, reduced invertebrate diversity, increased weed invasions, and decreased wildlife usage.

3.3 Monitoring and Evaluation

A multi-faceted monitoring program will be initiated to assess the effectiveness of prescribed old-field management approach and practices designed to improve old-field habitat. Response of vegetation, small mammal communities, raptors and other grassland bird species will be monitored over the long term and results from studies will be used to guide further old-field management directions. Specific details of the monitoring subprojects will be developed based on annual workplans related to the implementation of the plan.

4.0 Communication

A communication program is necessary to inform the local community about the objectives and components of the Old-field Management Strategy. The program consists of public information meetings, news releases, provision of final old-field management strategy for public reading, presentation to specific interest groups, personal contact with key people and the development of educational signage. The communication program will lay out the old-field management strategy in detail. Park partners, local naturalist and conservation groups, park users, neighbours and the farming community can be targeted to generate understanding and support for the strategy. A related interpretive program can be developed for delivery by Park Interpreters. Display materials can be developed for use at open houses and special events such as Parksfest.

5.0 Draft Budget

In light of additional data requirements, a draft budget outlining costs over 10 years assuming that 20% of the old-field management area will be in a field renovation state every year from Year 2 to Year 10 of the plan is presented (Table 1).

Table 1: Draft Budget for first 10 years of Old-field Management at Boundary Bay Regional Park

Budget Component	Year 1	Year 2	Year 3	Year 4	Year 5
Consulting Fees	5,000	0	0	0	0
Noxious Weed Control	0	5,000	0	5,000	0
Blackberry Management	2,000	12,000	2,000	12,000	2,000
Reed Canarygrass Management	0	10,000	2,000	10,000	2,000
Revegetation	1,000	2,400	1,000	2,400	1,000
Maintenance	4,000	4,000	5,000	5,000	5,000
Monitoring and Evaluation	3,000	3,000	3,000	4,000	4,000
Communication	500	500	500	500	500
Educational Programming	750	750	750	4,750	750
TOTAL	\$16,250	\$37,650	\$14,250	\$43,650	\$15,250

Budget Component	Year 6	Year 7	Year 8	Year 9	Year 10
Consulting Fees	0	0	0	0	0
Noxious Weed Control	5,000	0	0	5,000	0
Blackberry Management	12,000	2,000	2,000	12,000	1,000
Reed Canarygrass Management	10,000	2,000	2,000	10,000	1,000
Revegetation	2,400	1,000	1,000	2,400	1,000
Maintenance	5,000	5,000	5,000	5,000	5,000
Monitoring and Evaluation	4,000	4,000	4,000	4,000	4,000
Communication	1,000	500	500	1,000	500
Educational Programming	750	750	750	750	750
TOTAL	\$4,0150	\$15,250	\$15,250	\$40,150	\$13,250

Estimated costs for intensive renovation are \$3,500 per hectare (\$1,500 per acre) during the first year of renovation. Renovation costs have been divided between noxious weed control, blackberry management, reed canarygrass management and revegetation in the table below. After renovation, the affected fields will be considered in transition for one year post conversion. This would allow for new renovation sites every second year after plan implementation.

Subsequent maintenance work necessary to arrest succession and control invasives/noxious weeds will decline over time as mowing will only be necessary on a 2 to 4 year rotation.

Monitoring and evaluation will consist of minor consulting contracts and a long-term data collection project to be developed in partnership with the BCIT Fish Wildlife and Recreation program and the newly established BCIT Ecological Restoration Bachelor of Technology program. This partnership will result in a significant cost savings as well as an opportunity for BCIT students to gain experience in applied ecosystem management while completing their diploma and/or degree.

Educational Programming may include the development of an interpretive display adjacent to the old-field management area. The display will offer insight into the value of old-field management within BBRP and costs have not yet been estimated.

6.0 Literature Cited

- B.C. Ministry of Water, Land and Air Protection. 2004. [Short-eared Owl (*Asio flammeus flammeus*)] in Accounts and Measures for Managing Identified Wildlife – Accounts V. 2004. B.C. Ministry of Water, Land and Air Protection, Victoria, B.C. Available: <http://www.env.gov.bc.ca/wld/frpa/iwms/accounts.html> (accessed [November 1, 2007]).
- Coulthard, M. 2008. Old-field management/Terrain Ecosystem Mapping – Boundary Bay Regional Park. Prepared for Metro Vancouver Regional Parks – 30 p.
- Demarchi, M.W., M.D. Bentley and L. Sopuck. 2005. Best Management Practices for Raptor Conservation During Urban and Rural Land Development in British Columbia. BC Ministry of Environment, Ecosystem Standards and Planning, Biodiversity Branch.
- Evely, A. 2008. Old-field renovation at Colony Farm Regional Park – report on pilot program to remove invasive reed canarygrass and improve habitat for Townsend's vole. Prepared for Metro Vancouver Parks Central Area – August 2008. 31 p.
- Quadra Planning Consultants Ltd. 1996. Boundary Bay Regional Park Plan – 1996. Report prepared for GVRD Parks and Environment Canada – October 1996. 80 p.
- Taitt, M. 2006. Small mammal study in Colony Farm Regional Park habitats January to March 2006. Prepared for Metro Vancouver Parks Central Area – April 2006. 40 p.