

# Restoration Case Study of Selected Habitats at Iona Beach Regional Park

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*Abstract.* This paper looks at two selected habitats at Iona Beach Regional Park in the city of Richmond, British Columbia – sand dune and estuarine dune meadow – that are regionally rare and are each home to a provincially red-listed plant community. One of the habitat types – sand dune – is also habitat for a federally endangered species: the horned lark.

By determining the factors that have negative impacts on the health of these habitats, remedial and restorative actions can be taken to return these habitats to self-sustaining systems. Scotch broom is a known negative impact on sand dune habitat, disrupting dune succession processes and preventing establishment of native dune plant species. Large amounts of woody debris are also likely affecting dune succession, and might be affecting vegetation and invertebrate communities in the estuarine dune meadow.

Using existing information and evidence, some immediate actions can be taken to remediate and restore these regionally rare habitats. Removal of Scotch broom can be undertaken, and supplemental planting of native dune species can be done immediately in the sand dune areas. Removal of common brass buttons can be done immediately in the estuarine dune meadow.

Additional information and field trials are still needed in order to develop a comprehensive approach to ensure the long-term health of these rare habitats. More information is needed about species composition (and the specific requirements of those species) and about the extent of impacts associated with the large amounts of woody debris.

## 1. Introduction

Iona Beach Regional Park lies within the City of Richmond, but is a regional park under the jurisdiction of the Greater Vancouver Regional District. (Fig.1) It measures 30 hectares and is comprised of a number of habitat types including wetland, field, riverine marsh and deciduous woodland. Two of the habitat types at Iona are regionally rare: sand dune and estuarine dune meadow (Klinkenberg, 2007).

Sand dune ecosystems have been identified by the BC Ministry of Environment as “at risk”, because there are so few occurrences in the province and because of threats they face. (Flynn et al., 2006) In southwestern mainland BC, there are only two known occurrences – Iona Beach Regional Park and Boundary Bay Regional Park (in Delta).

A number of factors present at Iona may be negatively affecting these two habitats. Invasive plant species such as Scotch broom hinder the succession processes in sand dune habitat and negatively affect establishment and growth of native plant species (Isaacson, 2000). Significant amounts of woody debris can affect succession processes in sand dune habitats (Isaacson, 2000) and may affect vegetation and invertebrates in the estuarine dune meadow (Colnett, 1997).

This report presents information and suggestions for further investigations and recommendations for actions to improve the ecological intergrity of the two ecosystems.

## 2. Habitat introduction

### 2.1 Site Descriptions

#### a. Sand dune (Fig. 2)

Sand dune habitat at Iona Beach Regional Park occupies

about six hectares of land along the park’s western perimeter. (Another 25 hectares of sand dune habitat lies outside the park’s boundaries, on the south side of the North Arm Jetty.) (Fig. 3) Precipitation provides the only source of fresh water. The site receives strong winds on a regular basis, with maximum hourly speeds ranging from 48 to 89 km/h and maximum gust speeds of 70 to 129 km/h. (Environment Canada, 2004).

The topography includes embryo dunes, foredunes, dune slacks and fixed dunes, typical of sand dune habitat, although their depth appears to be significantly affected by the large amounts of woody debris throughout.

#### b. Estuarine dune meadow (Fig. 4)

The estuarine dune meadow sits in a depression behind the foredune at the northwestern margin of the park boundary. It is occasionally inundated by salt water by way of a tidal channel during higher tides. Sources refer to this area either as “brackish marsh” (Summers, 1996), as “estuarine marsh” (Perry, 1989) or as “saline dune meadow” (Klinkenberg, 2007). No information is available as to how many days per year the area is inundated or dry. Through personal observations, I have seen the area completely inundated in March, partially inundated in April and water-free in August and September.

The area measures about 1.25 ha in size. (Fig. 5) It sits in a dune slack about one to two metres lower than the surrounding dunes. Because of its position in the dunes and because of the vegetation present (see below), this

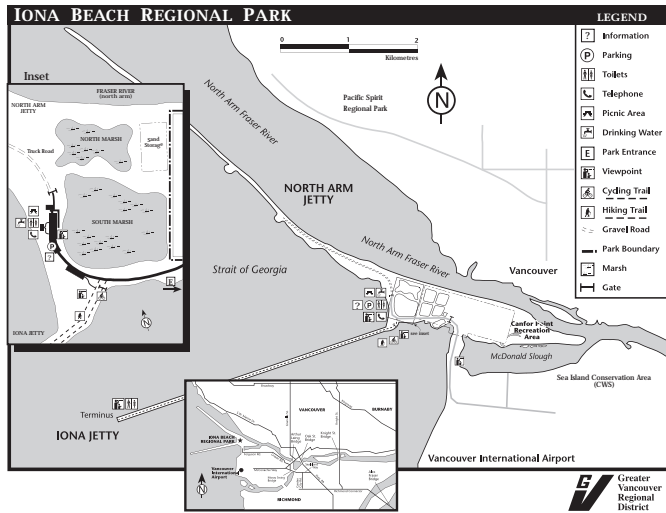


Fig. 1 Map of Iona Beach Regional Park



Fig. 2 Typical sand dune at Iona Beach Regional Park (August)



Fig. 3 Extent of sand dune habitat at Iona Beach Regional Park



Fig. 4 Typical estuarine dune meadow (March)



Fig. 5 Extent of estuarine dune meadow

## 2.2 Vegetation

### a. Sand dune

In March and early April, the only vegetation in evidence was dune grass (*Elymus mollis*), big headed sedge (*Carex macrocephala*) (Fig. 6) and Scotch broom (*Cytisus scoparius*). Because most of the sand dune vegetation is present from late spring to fall, it was not possible to do quadrats that would give a good sense of species abundance, vigour and distribution. Using existing plant lists, however, I was able to compile a list of known sand dune plant species at Iona; it is included as Appendix 1. The site contains a red-listed plant association: *Carex macrocephala* herbaceous vegetation (BC Conservation Data Centre, 2007).

### b. Estuarine dune meadow

The only vegetation in evidence in March and April was seashore saltgrass (*Distichlis spicata* var. *spicata*) (Fig. 7) and most of it was dead aboveground material from the previous year. It seems obvious that it is the dominant plant species, which would put this area in the estuarine marsh (Em03) classification of wetland sites (Mackenzie, 2004). However, the area is not subject to regular inundation year-round and there are a number of species that appear during the summer months that are not associated with Em03; in fact, some are not wetland species at all. The area appears to be a hybrid of estuarine marsh and dune meadow, thus in this document it is called the estuarine dune meadow.

The site contains a red-listed plant association: *Distichlis spicata* var. *spicata* herbaceous vegetation (BC Conservation Data Centre, 2007).

Again, since most of the estuarine dune meadow vegetation is present from late spring to fall, it was not possible to do quadrats that would give a better sense of species abundance, vigour and distribution. However, a list of known estuarine dune meadow plant species at Iona is included as Appendix 2.

## 2.3 Soil

### a. Sand dune

A soil pit was dug in a spot typical of the foredune section of the sand dune habitat (N49° 13.271', W 123°12.962'). There was no true top layer of soil (horizon A), although sprouts of *Elymus mollis* (dune grass) were visible. At the 19 cm depth, significant amounts of rhizomes were visible. Rootlets extended down to the 70 cm depth, where a large amount of impenetrable woody debris was encountered. The soil itself was fine sand, medium grey in colour and uniform in texture throughout. Moisture in the sand occurred at about three cm depth and increased gradually to the 70 cm depth, but there was no detectable water table. Fig. 8 shows a soil profile.



Fig. 6 *Carex macrocephala* (large-headed sedge)



Fig. 7 *Distichlis spicata* var. *spicata* (seashore saltgrass)

### b. Estuarine dune meadow

A soil pit was dug on the western margin of the area, about midpoint along its length. (N 49° 13.337', W 123° 13.065'). The top five cm of soil (horizon A) contained living and partly decomposed plant materials. The soil was browner than the soil below. The next 22 cm of soil (horizon B) was composed of fine sand, medium grey in colour; roots were visible throughout. At 27 cm depth, water was encountered. Further digging to the 46 cm depth produced no more visual information, but tactile investigations confirmed more sandy soil and the presence of roots. Fig. 9 shows a soil profile.

## 2.4 Wildlife

### a. Sand dune

A number of bird species are known to use the sand dunes, including the horned lark (*Eremophila alpestris* ssp. *strigata*), a federally endangered species (COSEWIC, 2003). Other species include nesting shorebirds, gulls and terns, as well as regional rarities such as savannah sparrow (*Passerculus sandwichensis*),

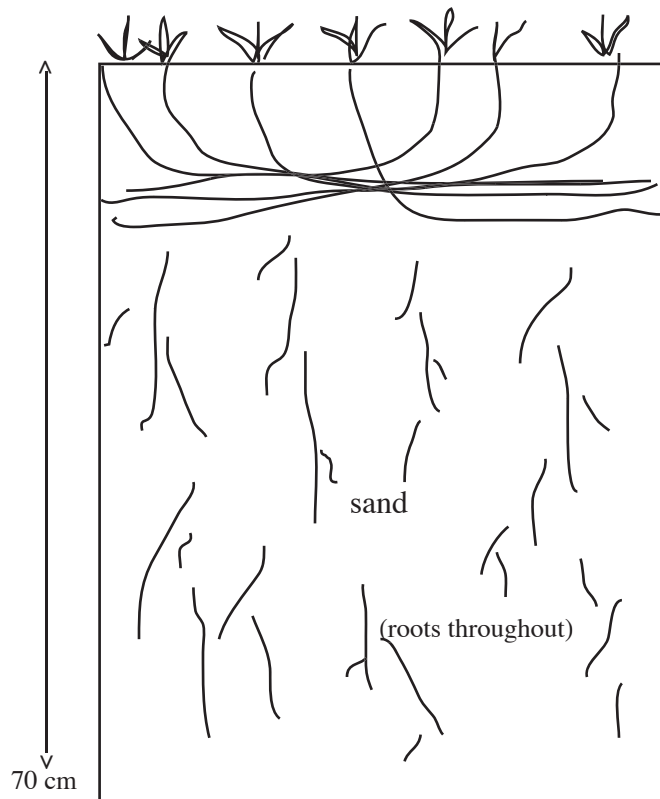


Fig. 8 Soil profile for sand dune

snow bunting (*Plectrophenax nivalis*) and Lapland longspur (*Calcarius lapponicus*) (Summers and Gebauer, 1996). A list of bird species known to use the sand dune habitat at Iona is included in Appendix 3.

Although no comprehensive inventories have been done of other wildlife species, mammals including Townsend's vole, coyote, deer mouse, mink, coast mole and river otters have been observed and are known to use dune or beach habitat. Two reptile species are also known to occur: the northwestern garter snake and the common garter snake (Summers and Gebauer, 1996). No note of invertebrate species present appears in existing literature.

On a recent visit, small burrows were noted under larger logs. Nearby vegetation showed evidence of chewing.

**b. Estuarine dune meadow**

No detailed information could be found regarding wildlife in the estuarine dune meadow area. But Perry (1989) notes that the estuarine dune meadow provides a place "for shorebirds and waterfowl to congregate when the foreshore flats are inundated during high tide." It is also likely that invertebrate populations exist here, but again there is no recorded information. During a recent visit, I noted the remnants of a duck carcass at the southern end of the meadow and the

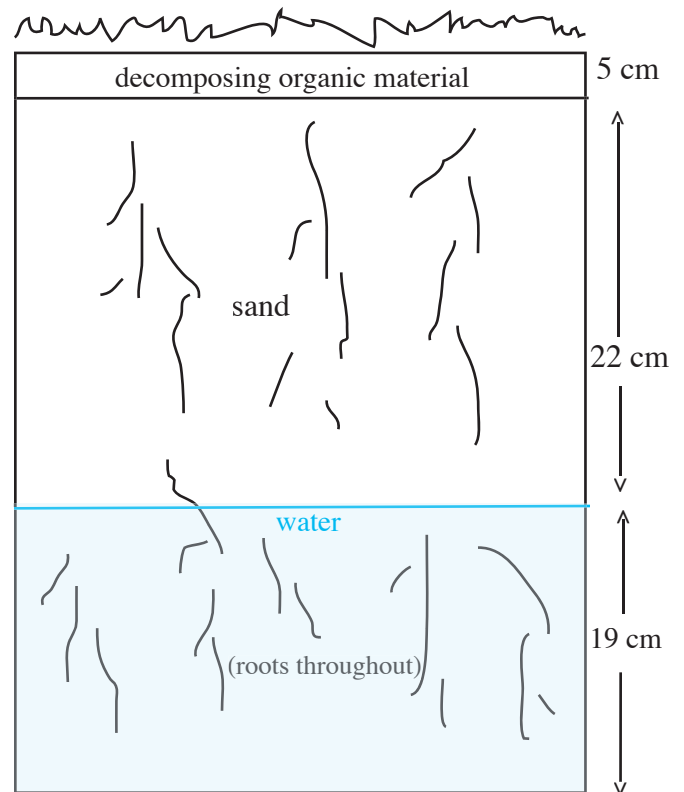


Fig. 9 Soil profile for estuarine dune meadow

remnants of a songbird on a stump in the meadow, evidence of predation by raptors and/or coyotes.

**2.5 Woody debris**

**a. Sand dune**

Significant amounts of woody debris, ranging in size from small to large are present in sand dune habitat at Iona. (Fig. 10) Some debris may come directly from the log sort operation on the North Arm Jetty, but most is brought in with the tide. (Should the Fraser River Debris Trap ever be decommissioned, the situation would become even worse.) Although the debris helps stabilize the sand and thus provides refugia for dune plant species to establish, the sheer amount of debris likely interferes with the mobile processes needed for dune succession.

**b. Estuarine dune meadow**

Significant amounts of wood debris, ranging in size from small to large are present in the estuarine dune meadow area. (Fig. 11) Colnett (1997) suggested that this debris might negatively affect vegetation and invertebrate populations.

**2.6 Human use of the site**

**a. Sand dune**

The sand dune habitat is a popular place for walkers,



Fig. 10 Woody debris in sand dune habitat.

naturalists, picnickers, sunbathers and kite flyers. Through discussions with parks staff, public meetings and questionnaires, park users ranked the following activities as most important at Iona: 1) strolling, 2) birding, 3) picnicking, 4) nature study, and 5) bicycling. (Perry, 1989).

**b. Estuarine dune meadow**

The estuarine dune meadow area is popular with naturalists as it contains regionally rare plant species. No other specific recreational activities are noted as being associated with the estuarine dune meadow.

A log debris sorting operation is active at the north end of the dune meadow.

**3. Discussion**

Because the nature of sand dune ecosystems is based on a balance between sand stabilization and sand movement (Flynn et al, 2006), any restoration effort must first focus on restoring the natural processes of dune ecology.

At Iona, the sand dune habitat is being especially affected by Scotch broom (*Cytisus scoparius*), which predominates in large areas of the semi-fixed and fixed dune portions of the sand dune habitat. In the semi-fixed dune areas, the Scotch broom has a negative impact as a stabilizing agent, when semi-fixed dunes are by definition somewhat mobile (Isaacson, 2000). In the fixed dune areas, Scotch broom prevents the establishment of native vascular plants (Isaacson, 2000). As well, Scotch broom is considered to have little wildlife value as its seeds contain alkaloids that are toxic to most wildlife. Ants, however, do ingest the eliasomes. (Bossard, 1991).

There is also a question as to whether the amount of woody debris on the dunes is a hindrance to dune succession processes. On City of Vancouver beaches, there is an active program of removing woody debris from the shoreline, both because of its hazard potential for swimmers, but also because “otherwise the beaches would be buried in wood”



Fig. 11 Woody debris in estuarine dune meadow

(Vancouver Park Board supervisor Mike Mackintosh, personal communication, 2007). However, sand dune habitat per se, does not really exist on those beaches because they are also mechanically groomed.

The estuarine dune meadow does not appear to be affected by invasive plant species at this time. However, because of the log sorting operation situated about 50 metres from the northern end of the estuarine dune meadow, there are significant amounts of woody debris present. Previous management strategies have suggested that the dune foreshore areas (including the estuarine dune meadow) are being highly disturbed by the log sorting activities (Summers, 1996). As well, previous documents have cited the need for investigation as to whether the woody debris is negatively affecting vegetation and invertebrates (Colnett, 1997).

Current recreation activities do not appear to negatively affect sand dune or estuarine dune meadow habitat. However, an increase in the number of park users might do so in future. That said, the GVRD is committed to managing recreational use “for activities that are compatible with environment and wildlife habitat enhancement and protection” Perry (1989).

**4. Recommendations**

**a. Sand dune habitat**

Action should be taken immediately to remove the large amounts of Scotch broom from the sand dune habitat. Monitoring and yearly or bi-yearly maintenance will be required to remove seedlings as they sprout up from the seedbank.

Once further investigations are done to determine plant species abundance, distribution and vigour, supplementary planting with sand dune plant species should also likely be done to increase biodiversity. Numerous dune species known to occur in BC do not occur at Iona or occur in small populations.

Also, further investigation is needed to document the

presence of wildlife species and their use of the habitat.

Lastly, experimental trials should be established to determine the effects of woody debris on sand dune mobility, monitoring and comparing quadrants where woody debris is removed with quadrants where woody debris is present (at differing densities).

#### **b. Estuarine dune meadow**

Action should be taken to remove any *Cotula coronopifolia* (brass buttons) in the meadow. Although not considered invasive, it is considered a weed in other jurisdictions and is thought to negatively affect establishment of native plant species (Alaska Natural Heritage Program, 2005).

Although the flora of the estuarine dune has been documented, not much other information about its ecology has, including such things as presence of invertebrate species (number, density and distribution) and use of the estuarine dune meadow by birds and mammals. Such information needs to be gathered and documented. Also, basic information about the presence and depth of water in the area needs to be documented.

Experimental trials should be established to determine the effects of woody debris on species abundance, distribution and vigour. Later trials could determine the effects on invertebrate abundance, distribution and vigour (once the baseline information has been documented).

Monitoring of the estuarine dune meadow needs to be ongoing in order to detect invasive plant species that might negatively affect the estuarine dune meadow.

#### **Acknowledgments**

I want to thank Mitch Sokalski and Jane Porter of the West Area office of Greater Vancouver Regional District Parks, who provided access to a variety of materials on Iona Beach Regional Park and who provided support and encouragement throughout. I would also like to thank Erik Andersen, the park operator at Iona Beach for his assistance (and his shovel) and Lesley Douglas, resource management specialist at GVRD, for her support and assistance.

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## Appendix 1:

### List of known vascular plant species in beach and dune areas of Iona Beach Regional Park

Scientific name	common name	plant type	native or introduced
<i>Achillea millefolium</i>	common yarrow	perennial herb	native
<i>Agrostis alba</i>	redtop	perennial grass	Introduced, also known as <i>A. gigantea</i>
<i>Agrostis palustris</i>	creeping bentgrass	perennial grass	Introduced, also known as <i>A. stolonifera</i>
<i>Ambrosia chamissonis</i>	silver burweed		native
<i>Anaphalis margaritacea</i>	pearly everlasting	perennial herb	native
<i>Aster subspicatus</i>	Douglas' aster	perennial herb	native
<i>Aster chilensis</i>	common aster	perennial herb	native
<i>Atriplex patula</i>	common orache	biennial herb	native
<i>Cakile edentula</i>	American searocket	annual herb	native
<i>Carex macrocephala</i>	large-headed sedge	perennial herb	native
<i>Cytisus scoparius</i>	Scotch broom	evergreen shrub	introduced, invasive
<i>Elymus mollis</i>	dune grass	perennial grass	native
<i>Galium aparine</i>	cleavers	annual herb	native
<i>Glaux maritima</i>	sea milkwort	perennial herb	native
<i>Honkenya peploides</i>	seabeach sandwort	succulent perennial herb	native
<i>Lathyrus japonicus</i>	beach pea	perennial herb	native
<i>Lathyrus palustris</i>	marsh peavine	perennial herb	native
<i>Lupinus polyphyllus</i>	large-leaved lupine	perennial herb	native
<i>Plantago maritimus</i>	Sea plantain	perennial herb	native
<i>Spergularia canadensis</i>	Canadian sand-spurry	annual herb	native
<i>Vicia gigantea</i>	giant vetch	somewhat succulent perennial herb	native, also known as <i>V. nigricans</i> ssp. <i>gigantea</i>

Compiled from:

- personal observation
- Lomer, F. and R. Klinkenberg and B. Klinkenberg. 2002. Checklist of Vascular Plants of the Islands of Richmond, British Columbia. Published on The Natural History of Richmond, British Columbia. University of British Columbia, Department of Geography. <http://www.geog.ubc.ca/richmond/city/plantlist.htm>
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## Appendix 2:

### List of known vascular plant species in estuarine dune meadow area of Iona Beach Regional Park

Scientific name	Common name	Plant type	Native or introduced	Wetland site classification
<i>Bolboschoenus maritimus</i>	seacoast bulrush	perennial grass	native, also known as <i>Scirpus maritimus</i>	Not listed for estuarine sites
<i>Chenopodium rubrum</i>	red goosefoot	perennial herb	native	Not listed for estuarine sites
<i>Cotula coronopifolia</i>	brass buttons	perennial herb	introduced	n/a
<i>Distichlis spicata</i> var. <i>borealis</i>	seashore saltgrass	perennial grass	native	Em03
<i>Eleocharis palustris</i>	common spike rush	perennial herb	native	Ed02, Ed03
<i>Glaux maritima</i>	sea milkwort	perennial herb	native	Em03, Ed02, Ed03
<i>Lathyrus palustris</i>	marsh peavine	perennial herb	native	Ed02, Ed03
<i>Lilaeopsis occidentalis</i>	western grasswort	perennial herb	native	Ed01
<i>Plantago maritimus</i>	sea plantain	perennial herb	native	Em04, Ed01, Ed02
<i>Schoenoplectus americanus</i> var. <i>monophyllus</i>	American bulrush	perennial herb	native, also known as <i>Scirpus americanus</i> var. <i>monophyllus</i>	Not identified with a particular site association
<i>Scirpus cyperinus</i>	woolgrass	perennial herb	native, also known as <i>S. atrocinctus</i>	Not listed for estuarine sites
<i>Schoenoplectus tabernaemontani</i>	soft-stemmed bulrush	perennial herb	native, also known as <i>Scirpus lacustris</i> ssp. <i>glaucus</i> and <i>S. validus</i>	Not identified with a particular site association
<i>Spergularia canadensis</i>	Canadian sand-spurry	annual herb	native	Em03

Compiled from:

- personal observation
- Lomer, F. and R. Klinkenberg and B. Klinkenberg. 2002. Checklist of Vascular Plants of the Islands of Richmond, British Columbia. Published on The Natural History of Richmond, British Columbia. University of British Columbia, Department of Geography. <http://www.geog.ubc.ca/richmond/city/plantlist.htm>
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### **Appendix 3:**

#### **List of bird species known to use beach and dune habitat at Iona Beach Regional Park**

bald eagle	Lapland longspur
peregrine falcon	Savannah sparrow
black-bellied plover	snow bunting
lesser golden-plover	European starling
semipalmated plover	water pipit
killdeer	common raven
spotted sandpiper	northwestern crow
whimbrel	horned lark
sanderling	belted kingfisher
western sandpiper	snowy owl
least sandpiper	common tern
dunlin	Caspian tern
red-necked phalarope	glaucous-winged gull
parasitic jaeger	Thayer's gull
Franklin's gull	herring gull
Bonaparte's gull	California gull
mew gull	ring-billed gull

• from Perry, G. and Associates. 1989. Iona Beach Regional Park: A long range recreation and conservation master plan. Prepared for the Greater Vancouver Regional District.