BLUEWATER BEACH ENVIRONMENTAL RESTORATION PLAN
PHASE 1 REPORT

Submitted to:

The Corporation of the Township of Tiny
130 Balm Beach Road West
Perkinsfield, Ontario
L0L 2J0

Submitted by:

AMEC Earth & Environmental
a division of AMEC Americas Limited
160 Traders Blvd. East, Suite 110
Mississauga, Ontario
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TC 61406
October 2006

October 2, 2006

Mr. Henk Blom
Township of Tiny
130 Balm Beach Road
Perkinsfield, Ontario
L0L 2J0

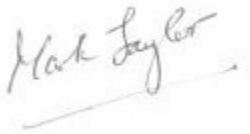
Dear Mr. Blom:

Re: Bluewater Beach Restoration Plan – Phase 1 Report

We would like to submit three copies of our Phase 1 report for the Bluewater Beach Restoration Plan that we completed this summer. It includes a description of the plant communities as requested and suggestions for fencing to begin the process of dune stabilization. We appreciate the feedback you were able to provide us on our first draft and are pleased that you were able to install fencing and signage so promptly.

If you have any further questions regarding this report, please do not hesitate to contact me or Ms. Megan Hazell. We look forward to developing the detailed plan for restoration of this significant stretch of dune system as part of Phase 2.

Yours sincerely,
AMEC Earth & Environmental
a division of AMEC Americas Limited



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1.0 INTRODUCTION

Bluewater Beach is located in the Township of Tiny on the southeast shore of Georgian Bay (Figure 1). The 7.1 ha park is owned by the municipality and is the most intact dune landscape in public ownership within the township. The park provides an access point to the waterfront for residents.

In 2005, Meridian Planning, together with Planning Partnerships and AMEC Earth & Environmental, undertook the development of a Management Plan in conjunction with township residents (Meridian Planning et al. 2005). This Plan was submitted and approved by Council on January 30, 2006.

The Management Plan proposes that the land identified as Bluewater Beach be restored as a natural area and that a proper biological survey be undertaken prior to the development of specific restoration initiatives.

A Request for Proposal PW001/06 was prepared by the township and selected firms invited to bid on the project. AMEC Earth & Environmental, in conjunction with Planning Partnership, submitted a proposal on March 28, 2006 and was awarded the project. This Phase 1 report fulfils the requirement to undertake a biological survey of the site and to suggest methods by which the dune system could be protected. The final report will outline a strategy for long-term stabilization and restoration of the dune system at the Bluewater Beach site.

2.0 DUNE RESTORATION

2.1 Ecological Principles

Colonization

The invasion and stabilization of inorganic substrates such as rocks and sand by plants is called colonization. Because of the harsh environmental climate of these substrates with major fluctuations in temperature and moisture and a low nutrient status, only certain plants are able to do this. In the unstable conditions found on sand beaches, several grasses have developed an ability to colonize this environment. They are generally called dune grasses and the commonest species at Bluewater Beach is the American Beach Grass. A characteristic of this species is that its main reproductive method is to spread by stolons. It can also be buried by sand and grow up through successive layers of sand; this characteristic acts to stabilize sand movement.

Other grasses that are found on Lake Huron dune systems include Little Bluestem, Canadian Wild Rye, and Sand Dropseed.

Succession

Succession is the replacement of one plant community by another as the physical and biological conditions change. The classic example of succession in North American was described by Shelford (1913), in which he described the seral stages (succession) in Lake Michigan sand dunes from the waters edge to the forested landscape behind. As colonizing species stabilize the sand dunes, the physical conditions of the soil are changed which allows other species to become established. As succession proceeds, humus accumulates on the surface, moisture is retained longer, nitrogen fixing plants become established and slowly the whole plant community changes. If one examines the topography in the region of Bluewater Beach one can see the changes from fore dunes through stabilized dunes to dry forest and then some two to three kilometers inland, relatively mesic beech-maple forests.

Biodiversity

Biodiversity refers to the number of species that occur in a particular community. One may refer to plant or animal biodiversity. In dune seral stages, biodiversity increases as the dune system becomes older or more stable.

Aeolian Sand Transport

Wind blown sand is the mechanism by which dunes are formed. The rate of dune formation depends upon a number of factors. There has to be a source of particles of sufficient size that they can be picked up by the wind. Factors which affect the Aeolian transport of sand are:

- Particle size and density;
- Moisture content;
- Wind speed;
- Topography ;
- Compaction of surface;
- Vegetative cover; and,
- Surface obstructions causing turbulent flow.

Dune Restoration

Dune stabilization is a natural process that may be disrupted by mechanical damage to the vegetation. The various dune grasses are sensitive to physical trampling that may be caused by pedestrians, wild animals, wheeled vehicles or sand removal. Once the vegetation is removed, the sand becomes mobile and blowouts occur. Such blowouts occur along the highest dune ridge, resulting in sand blowing into the back dune forest and onto roads and buildings. Dune restoration is usually accomplished by reducing wind speed with snow fencing and protecting the existing vegetation so that it can recolonize bare areas. In cases where there is no remnant vegetation, replanting with typical dune grasses is recommended.

2.2 Methods

Literature Review

A literature review relating to the protection and restoration of sand dune systems was undertaken. The emphasis is on Great Lakes dune systems though examples from maritime systems are comparable. A number of standard ecological texts (Kendeigh 1974, Odum 1971) were referred to. A considerable amount of recent information is available on line at sites such as the Lake Huron Centre for Coastal Conservation.

Field Work

Field visits were undertaken to the site to map the plant communities according to the Ecological Land Classification system (Lee et al. 1998). Plant communities were identified and mapped with a GPS unit. Plant species were identified to determine whether there were any rare species present. Dune systems are rare in southern Ontario. Observations regarding dune stability and instability were noted and recommendations for restoration prepared.

Consultation

Discussions were undertaken between team members, the township staff and members of the Advisory Committee.

A preliminary meeting was held with the Advisory Committee on June 16, 2006 and a site visit to identify immediate restoration objectives occurred on July 5, 2006. Field visits for plant and community identification were undertaken through the summer.

2.3 Implementation

A phased implementation plan is proposed in this document. This report represents Phase 1 with a biological description of the area together with recommendations for protection in 2006. Further discussions will be undertaken prior to submission of a final report and recommendations for long-term management of Bluewater Beach.

3.0 SITE DESCRIPTION

3.1 Bio-physical Conditions

The vegetation communities as they were in the spring and summer of 2006 are described following the methods laid out in the Ecological Land Classification (Lee et al. 1998) and are illustrated in Figure 2. The detailed vegetation descriptions of the site are provided in Appendix 1.

Beach

The beach has a shallow slope and the littoral zone is gently sloped such that there are a number of exposed boulders. The beach is composed of approximately 10% small cobbles and stones and the rest is sand. It is classified as an open mineral beach.

There is little flotsam and jetsam on the upper beach and it is generally devoid of organic matter. Beaches normally have a strand line where branches, tree trunks and other material are left during winter storms. On parts of the Great Lakes there may be a build up of algae later in the year, but it does not look as if this is a common occurrence at Bluewater Beach.

Fore Dune

The fore dune system is fragmented and while there are still some patches of vegetation, it is in serious need of protection. This is evident in the photograph of the fore and mid dune area shown as Little Bluestem-Switchgrass-Beachgrass Open Dune (Appendix 1). Numerous tracks lead through the fore dunes and an instability in this area results in instability further landward. The commonest grass is American Beach Grass but there are also other species of grass, wormwood, balsam poplar and sedges.

Mid-Dune

The mid-dune system is patchy and is identified as the shrub sand dune ecosite. The mid-dune is generally heavily eroded and trampling and wheeled vehicles have destabilized the system. There are remnant patches of vegetation in this area with the characteristic plants but normally this area would have higher dunes, well vegetated with dune grasses but with other herbaceous plants and shrubs such as silverweed, wild pea, sand cherry, and shrubby cinquefoil.

Depending on the local wind conditions, sand source and water table, wetland areas may form between dunes in the mid-dune area, and they are called dune swales (Sjogren and Sjogren undated). There is no evidence in 2006 that the water table or moisture conditions would allow for the development of swales at this time.

Back Dune

The back dunes are the treed high dunes on the east side of the property and they are covered with a variety of deciduous and coniferous trees and shrub such as Basswood, White Pine, Red Oak, Black Oak and Red Maple. The transition from the mid-dune area to the back dune is for the most part very steep due to the absence of a functional mid-dune system. As a result of this lack of protection, wind is able to erode the windward surface of these dunes, causing blowouts in places and allowing sand to carry over the back dune. In places, these blowout conditions are exacerbated by the presence of paths, particularly the one from the pump house to the beach with its median handrail, parallel to prevailing winds.

3.2 Rare Plants and Plant Communities

There are two provincially rare grass species located at Bluewater beach: Porcupine Grass (*Stipa spartea*) and American Beachgrass (*Ammophilia breviligulata*) (Appendix 2). Both of these plants are S3 species, meaning that they are rare to uncommon in Ontario with only between 20 and 100 occurrences in the entire province.

There are two rare, provincially ranked plant communities at Bluewater Beach:

- Sand Cherry Shrub Dune Type; and,
- Little Bluestem-Switchgrass-Beachgrass Open Dune Type.

Both of these communities are ranked as S2 level communities, meaning that they are very rare in Ontario; usually between 5 and 20 occurrences in the province, or remaining hectares. The Sand Cherry shrub dune communities are in polygons 4, 5, and 11 (Figure 2). The Little Bluestem-Switchgrass-Beachgrass open dune type is in polygon 3 (Figure 2).

A complete list of plants found at Bluewater Beach is found in Appendix 3. It is recommended that the town develop some information packages and signage to ensure protection of these rare community types and explain why protective fencing is installed. The design for such interpretive signage is illustrated in Figure 3.

3.3 Buildings, Facilities, Roads and Paths

Building

The pump house on Nicole Boulevard is owned and maintained by the township. It is subject to sand blowing in from the beach and may require periodic sand removal. A major blowout to the south of the pump house threatens to swamp the building and also is allowing sand to blow onto the driveway of one of the houses on Nicole Boulevard. Stabilizing this sand movement is essential.

Toilets

Portable toilets are provided at the entrance to the park at the end of Trew Avenue. They are installed in May and removed at the end of September.

Garbage Containers

Garbage containers are provided at the end of Trew Avenue and on Nicole Boulevard. They are emptied weekly.

Road

The only road within the park area is Trew Avenue. There is a certain amount of garden refuse disposed of on the south side of Trew Avenue and this should be discouraged. Parking by permit and open parking is currently permitted along this stretch of road as was proposed in the Management Plan.

Paths

The major paths to the beach are from Trew Avenue, Nicole Boulevard and Glen Avenue North. These provide the main access routes. There are one or two private paths that have been constructed between residential properties and the beach but these do not appear to be in use and have a major impact on the dune dynamics.

3.4 Provincial Regulations

Provincial Policy Statement

The Provincial Policy Statement (MAH 2005) requires the protection of significant natural heritage areas and dynamic beach areas. Dune systems are rare in Ontario and should be considered significant.

The Natural Heritage Reference Manual (OMNR 1998) suggests some mitigation methods for damaged earth and life science features such as sand dunes. The manual recommends diverting people away from sensitive areas and educating the public about the sensitive nature of dune ecosystems.

There should be no development in the dynamic beach zone. It is recommended that there be a 30 m setback from high water mark. Existing houses along the waterfront may not conform to this setback.

Conservation Authorities Act

The Township of Tiny is not part of any conservation authority.

Bluewater Beach Advisory Committee

The Bluewater Beach Advisory Committee was established by the mayor and council to assist the township with regard to Bluewater Beach. It includes representation from some local resident and interest groups.

4.0 DUNE RESTORATION

The sand dunes at Bluewater Beach will in all likelihood restore themselves if protected from trampling and vehicles (bicycles, ATVs and snowmobiles). The natural dune vegetation does

not tolerate disturbance very well and we recommend fencing off the most vulnerable areas with wooden slatted snow fencing (Figures 4 and 5). The major impacts are caused by two and four-wheeled vehicles, snowmobiles, and people playing on the dune face. Sand is normally stabilized by specialized dune vegetation to create a series of parallel dune system oriented parallel to the beach and perpendicular to the prevailing wind direction. The majority of sand is blown during the spring and fall equinoctial gales, particularly in the fall when lake water levels are lower, although it may be blown at any time when wind speeds reach approximately 7 /sec and the sand is dry (Vanhee et al. 2002).

There are three general areas to deal with:

1. Beach dune interface - this is where the stone/sand beach trends into the fore dune area. It may be reached by waves during storms under high water conditions.

2. Mid-dune area - this area has some large patches totally devoid of vegetation.

3. Blowout areas - there are several areas along the back dunes with blowouts, in which sand is blowing back onto properties behind Bluewater Beach.

4.1 Fore Dune

A major problem with dune systems and peoples use of them, are the multiple paths that develop across the dunes. This is very evident at places like Sauble Beach where access from parked cars along the roads tends to be directly over the dunes to the beach (Anon 2003). Sauble Beach has successfully instituted boardwalk crossover points at several locations to reduce this impact. Parks such as Presqu'ile Provincial Park and Pelee National Park have found that having a few dedicated access points to the beach that are easy to use, results in a reduction of the number of multiple paths that may develop. We recommend two access points to the beach (Figure 4) and snow fencing installed along the beach front and has now been completed.

In the long term we suggest that a stout fence is installed along the beach dune interface area constructed of eight foot cedar poles at approximately eight foot centres with two or three rails be nailed horizontally to the posts (Figure 6). On the dune side of the rail fence, wooden slatted snow fencing should be attached. The fencing with two access points to paths leading to the streets will protect the fore dune area and will start the process of trapping sand blowing down the beach.

The effectiveness of this fence will depend upon the availability of sand that can come from the beach area. This is a function of the sand source, particle size, wind direction and speed, moisture content. It is expected that sand will start to accumulate around the fence during the first fall (2006) and spring (2007) period, though the fencing will prevent trampling and allow vegetation to start recovering. There are already several patches of dune grasses that will probably start expanding during the summer.

4.2 Mid-Dune Area

Access Areas

The access area from Trew Avenue is exposed to drifting sand and we recommend installing a boardwalk through this area when monies are available. A design is suggested so that the boardwalk can be lifted up as sand is deposited beneath it and the dune system restored in this area.

4.3 Back Dune Area

The back-dune area is the largely treed area on the east side of the study area. It is well vegetated with trees, shrubs and herbaceous plants. There are two or three areas where the blowout areas extend into the back dunes and blowing sand is serving to bury and kill some of the plants and potentially impact infrastructure such as buildings and roads. Protection of the fore and mid dunes will result in protection of the back dunes.

4.4 Blowout Areas

The major blowout areas indicated in Figure 4 should be dealt with immediately. It is recommended that two parallel lengths of snow fencing be installed across slope approximately half way up the slope separated by some 10 feet. Between the two lengths of fencing we recommend laying small (6 to 8 feet) cut conifers (native species only - Red or White Pine) horizontally to further act as sand traps (Figure 7). These conifers should be tied down with rope so that they do not get blown out. Scots Pine (*Pinus sylvestris*) should not be used (White et al. 1993).

The path from Nicole Avenue runs past the pump house and directly down slope towards the Lake. The roots of the trees and shrubs along the top are badly exposed by trampling and wind and sand are funneled through this path. The path to the beach has a median handrail that serves to direct people directly down the slope. We recommend changing the angle of approach so the path goes diagonally down the slope between snow fencing on both sides (Frid and Evans 1995) or as a zigzag path with some hand rails. Wind fences have been found to be effective up to 22.5 degrees from perpendicular to the wind and this should therefore be a guiding design parameter in designing approach paths.

4.5 Public Access

Trampling

Dune vegetation is very sensitive to trampling by people and animals and will not recover unless this pressure is removed. We agree with providing three proposed access points (Trew Avenue, Nicole Boulevard and Glen Avenue North) that are identified in the Bluewater Beach

Management Plan (Meridian Planning *et al*. 2005) We suggest there are two access points to the beach.

Board walks provide a comfortable surface for people to walk on and will reduce the impact of pedestrians on dune areas. Boardwalks in dune systems are not often recommended as there is a tendency for them to be buried under drifting sand. However, where we are trying to build up a depleted dune system, a board walk can be elevated to allow wind and sand to blow underneath. This has been undertaken at Sauble Beach to allow people to cross the dunes from the street parking. Boardwalks should be wide enough to allow wheel chairs, strollers etc. to move safely and allow passing of other pedestrians, recommended width (0.9 to 1.2 m).

We would like to suggest that a length of boardwalk that extends the length of the cut area in the sand dune be constructed from Trew Avenue towards the beach for approximately 15 m. We suggest that the boardwalk be approximately 0.5 m above the ground and built in sections. Each 8 feet section would rest on movable pads that can be raised up, as the dune beneath builds up (Figure 5). Lifting of the sections would be undertaken when necessary in the spring.

Access from Nicole Boulevard

The access down the slope from Nicole Boulevard is steep and unstable and if left in its current orientation will continue to funnel sand. Paths are recommended to be oriented diagonally to the prevailing wind to prevent further erosion. We suggest that a zigzag route down slope is preferred with a hand rail on one side and snow fencing on the other (Figure 8). A gradient of no more than 7 degrees is recommended.

Access from Glen Road North

At present there are a series of large boulders defining the southerly edge of the park property and access is across a rough area. According to residents, this access route is frequently used. The gullying or blowout area is not bad along this path.

Beach Access

We recommend two access points between the paths and the beach. These could well be gateways providing a visual indication of the approved pathways across the dune system. We recommend that a post and rail fence be installed along the beach at a similar distance from the water to the property boundaries on either side of the beach (Figure 6). Such a fence would connect to the fences of the adjacent properties. On the landward side of the fence, snow fencing would be attached to provide sand trapment and a build-up of the fore dunes. It is expected that in three to five years this fence may well be buried, though this will depend on Lake Huron water levels, wind events and the sand supply from along the coast.

4.6 Vehicular Control

The most damage to the dune system is caused by wheeled vehicles and it is imperative that all wheeled vehicles be prohibited from the beach. This includes non-motorized dirt bikes, as well as any motorized vehicles. The best way to undertake this control is by signage, informing all the local residents that it is unacceptable behaviour, if they wish to preserve the dune system and prevent sand from blowing onto their properties. It is therefore in their best interests to educate and discuss this with the offenders. Signage has been erected by the township (Figure 8).

The preferred method of control is through making it difficult to access the area and we suggest the use of large boulders as already exists at Trew Avenue and Glen Avenue North, but that these be flanked by chain link fencing adjacent to private properties. While it will be advisable to install chain link fencing round the whole perimeter of the park in the long-term, the most vulnerable area currently is from the end of Trew Avenue.

5.0 CONCLUSIONS

5.1 Dune Protection

The primary goal of the project is to initially protect the dune and beach system from any further degradation. This will be accomplished by the installation of various types of fencing that will limit access to wheeled vehicles, and reduce the number of paths that are made within the dune system.

5.2 Signage

Some basic signage has already been erected to explain to people why fencing is being installed and how they can help to protect the fragile dune ecosystem. Further signage will be developed during Phase 2 of the project to address the educational aspect of dune protection and why this is important.

5.3 Education

The majority of damage to the dune system is a result of human activities. To protect the system and restore it requires education of all visitors. Information will be prepared which can be used by the Township of Tiny and the Bluewater Beach Conservation Group. This will be an ongoing task.

It is recommended that the local schools also become involved, for although many of the visitors do not attend local schools, an improved awareness of the ecology of the system will be transmitted to all visitors and acceptable behaviour encouraged.

5.4 Phase 2

Phase 2 will commence once Phase 1 has been approved and will involve detailed design and programs for Bluewater Beach. It is expected to be conducted during the following six months and to involve staff from the township offices. It is also expected that representatives from the Advisory Committee will be involved in discussions, dissemination of information and keeping eyes of the beach and dunes.

6.0 REFERENCES

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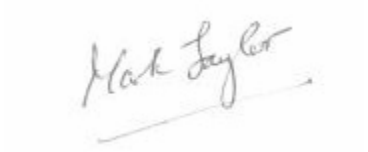

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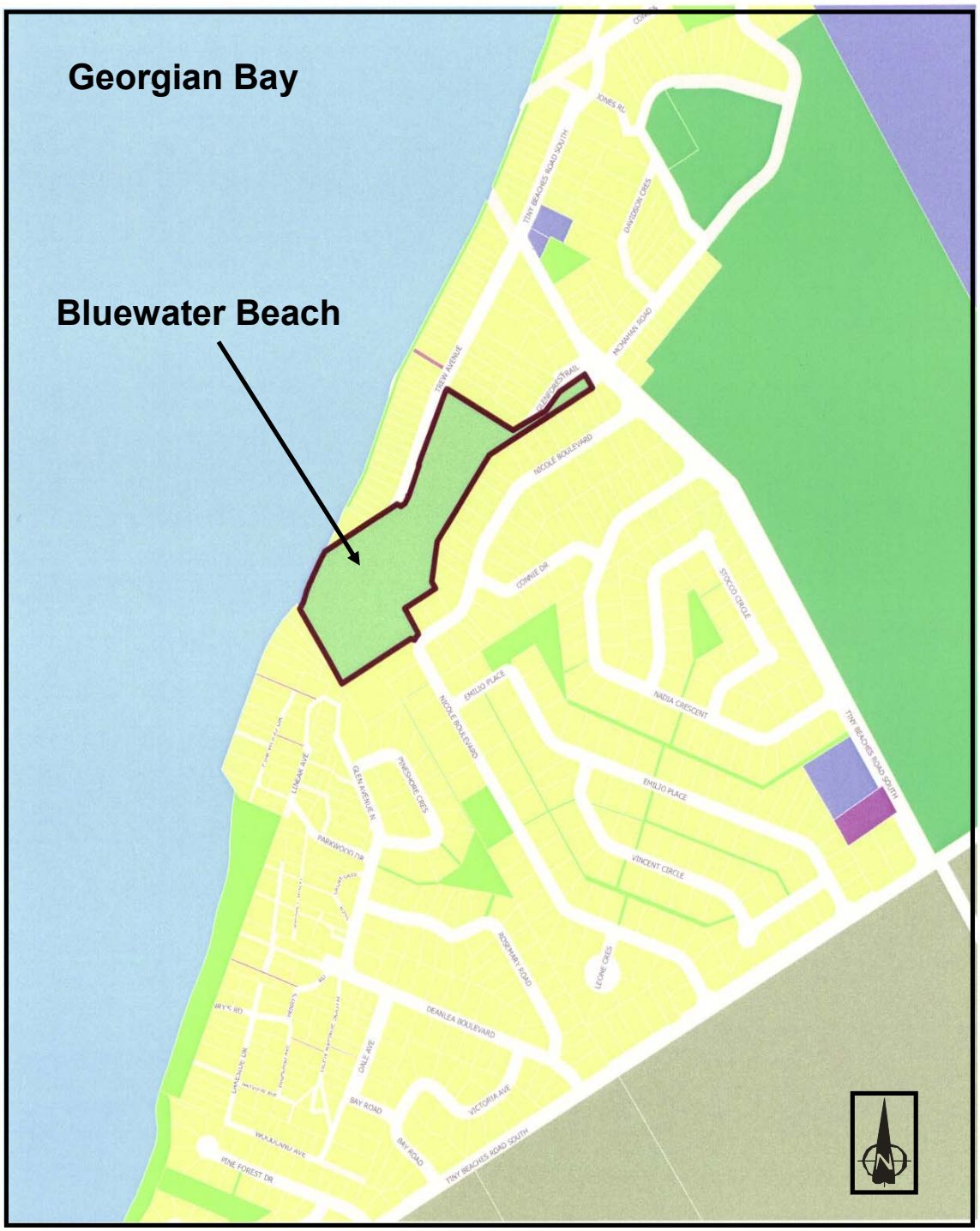

Figure 1: Location Map for Bluewater Beach

Polygon No.	ELC Plant Community Type	ELC Code
1	Open Water	OAO
2	Open Mineral Beach	BBO-1
3	Little Bluestem-Switchgrass-Beachgrass Open Dune Type	SD01-1
4	Sand Cherry Shrub Dune Type	SDS1-1
5	Sand Cherry Shrub Dune Type	SDS1-1
6	Shrub Sand Dune Ecosite	SDS1
7	Shrub Sand Dune Ecosite	SDS1
8	Shrub Sand Dune Ecosite	SDS1
9	Treed Sand Dune Ecosite	SDT1
10	Treed Sand Dune Ecosite	SDT1

Figure 2: Vegetation community polygons

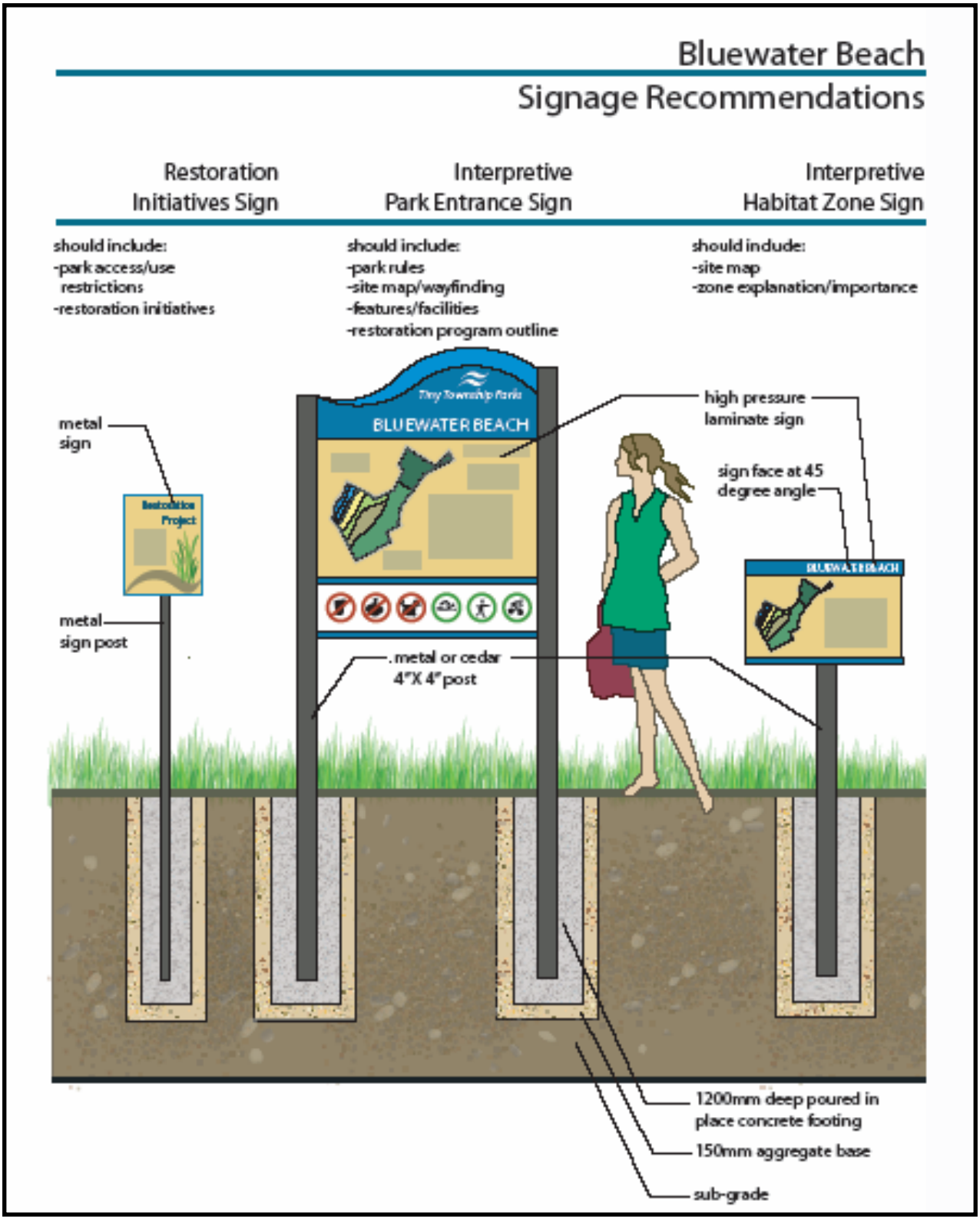

Figure 3: Interpretive Signage for Bluewater Beach

Figure 4. Restoration areas map showing fencing locations

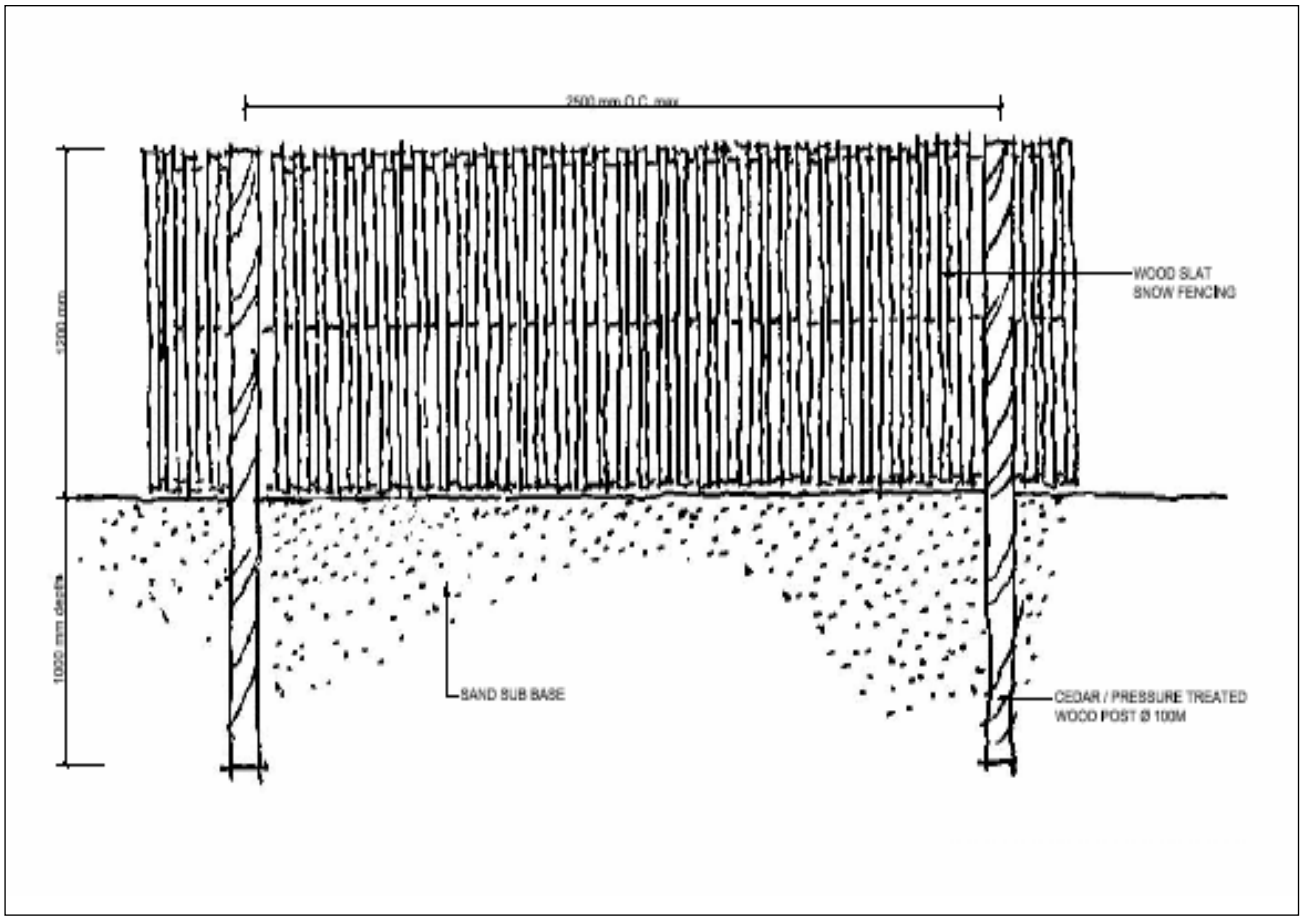

Figure 5. Detail of snow fencing

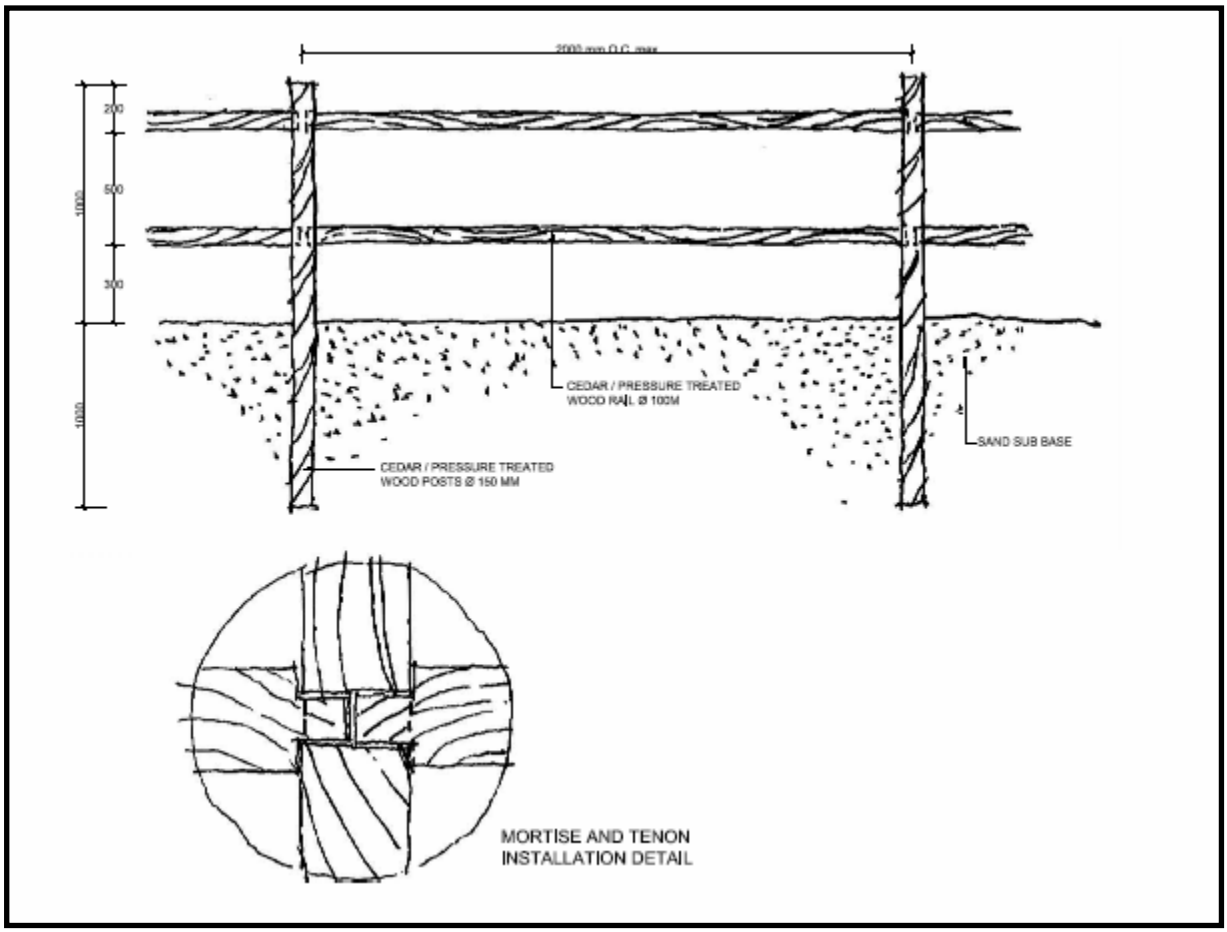

Figure 6. Farm fencing detail between beach and dune system and for the end of Trew Avenue

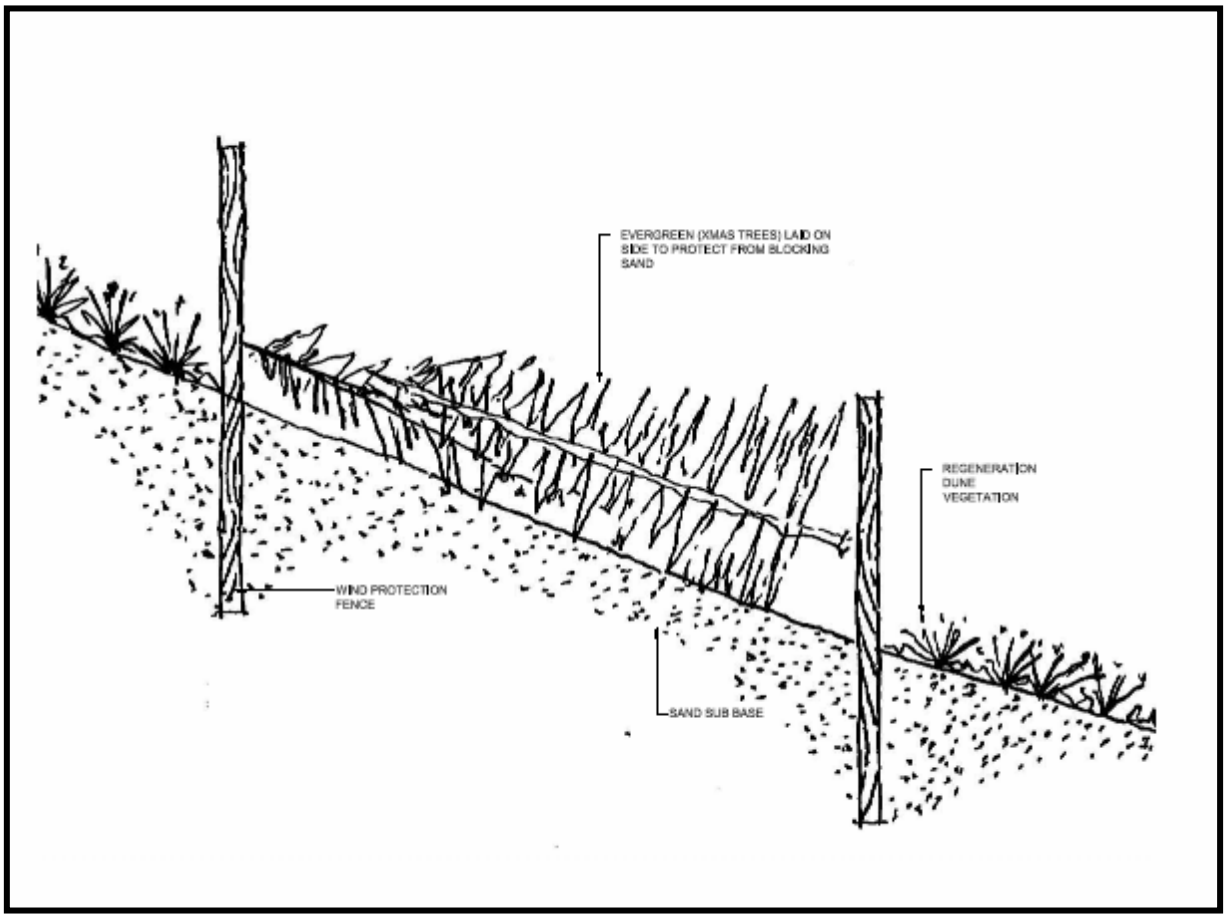

Figure 7. Detail of fencing for blow out areas

Figure 8. Signage of Bluewater Beach

APPENDIX 1

PLANT COMMUNITY DESCRIPTIONS FOR BLUEWATER BEACH

APPENDIX 1

PLANT COMMUNITY DESCRIPTIONS FOR BLUEWATER BEACH

Bluewater Beach

Polygon: 1

Community Type: Open Water - OAO

Description:
The open water of Lake Huron.

Bluewater Beach

Polygon: 2

Community Type: Open Mineral Beach – BB01

Description:
An open mineral beach along the edge of Georgian Bay. This beach is distinctive in that it has a strip of cobblestones running parallel to the Lake.

Bluewater Beach

Polygon: 3

Community Type: Little Bluestem-Switchgrass-Beachgrass Open Dune Type-SD01-1

Description:
An open sand dune system comprised of American Beach Grass (*Ammophilia breviligulata)* Spotted Knapweed (*Centaurea maculosa*), Lance-leaved Coreopsis (*Coreopsis lanceolata*), Poverty Oat Grass (*Danthonia spicata*), Little Bluestem (*Schizachyrium scoparium*), Mossy Stonecrop (*Sedum acre*), Canada Goldenrod (*Solidago canadensis*), Goat's beard (*Tragopogon dubius*), Tufted Vetch (*Vicia cracca*), Riverbank Grape (*Vitis riparia*).Canadian Wild Rye (*Elymus canadensis*), Eastern Bracken Fern (*Pteridium aquilinum*), Poison Ivy (*Rhus radicans*), Helleborine (*Epipactis helleborine*), Scouring rush (*Equisetum hyemale*), Star-flowered Solomon's-seal (*Maianthemum stellatum*), White Sweet Clover (*Melilotus alba*), Balsam poplar (*Populus balsamifera*), Choke Cherry (*Prunus virginiana*), Staghorn Sumac (*Rhus typhina*).

Bluewater Beach

Polygon: 4, 5, and 11

Community Type: Sand Cherry Shrub Sand Dune – SDS1-1

Description:
A shrubby sand dune community dominated by Northern Dwarf Cherry (*Prunus pumila*). Other species include; American Beach Grass (*Ammophilia breviligulata),* Hairy Puccoon (*Lithospermum caroliniense*), Tall Wormwood (*Artemisia campestris*), Common Milkweed (*Asclepias syriaca*), Bebb's Sedge (*Carex bebbii*), Spotted knapweed (*Centaurea maculosa*), Seaside Spurge (*Chamaescyce polygonifolia*), Canadian Wild-rye (*Elymus canadensis*), Quack Grass (*Elymus repens*), Field Horsetail (*Equisetum helleborine*), Rocky Mountain Fescue (*Festuca saximontana*), Baltic Rush (*Juncus balticus*), Common Gromwell (*Lithospermum officinale*), Peppermint (*Mentha x piperita*), Common Evening-primrose (*Oenothera biennis*), Silverweed (*Potentilla anserina*), Shrubby Cinquefoil (*Potentilla fruticosa*), Little Bluestem (*Schizachyrium scoparium*), Canada Goldenrod (*Solidago canadensis*), Perennial Sowthistle (*Sonchus arvensis*), Sand Dropseed (*Sporobolus cryptandrus*), Colts foot (*Tussilago farfara*), Riverbank grape (*Vitis riparia*).Manitoba maple (*Acer negundo*), Green Ash (*Fraxinus pennsylvanica*), Scots Pine (*Pinus sylvestris*), Balsam poplar (*Populus balsamifera*), Carolina Poplar (*Populus x canadensis*), Shining Willow (*Salix lucida*).

Bluewater Beach

Polygon: 6, 7, and 8

Vegetation Type: Shrub Sand Dune - SDT1

Description:

A shrubby dune system on a steep embankment that divides the treed dune system from the open dune system. Species include; Smooth rose (*Rosa blanda*), Little Bluestem (*Schizachyrium scoparium*), Canada Soapberry (*Sheperdia canadensis*), Sand Dropseed (*Sporobolus cryptandrus*), Porcupine Grass (*Stipa spartea*), Riverbank Grape (*Vitis riparia*), Tall Wormwood (*Artemisia campestris*), Canadian Wild-rye (*Elymus Canadensis*), Star-flowered Solomon's-seal(*Maianthemum stellatum*), Common Evening-primrose (*Oenothera biennis*), Shrubby cinquefoil (*Potentilla fruticosa*),Red Osier Dogwood (*Cornus stolonifera*), Common Juniper (*Juniperus communis*), White Spruce (*Picea glauca*), Eastern White Pine (*Pinus strobus*), Balsam poplar (*Populus balsamifera*), Sand Cherry (*Prunus pumilla*), Choke cherry (*Prunus virginiana*).

Bluewater Beach

Polygon: 9, 10

Vegetation Type: Treed Sand Dune- SDT1

Description:
A treed sand dune system largely dominated by a heterogenous mix of conifer and deciduous tree species. Species include; Bracken fern (*Pteridium aquilinum*), Wild pea (*Lathyrus japonicus*), Starry Solomons Seal (*Maianthemum stellatum*), Wild grape (*Vitis sp*), Milkweed (*Asclepias syriaca*), Buffaloberry (*Shepherdia canadensis*), Smooth Wild Rose (*Rosa blanda*), Poison Ivy (*Rhus radicans*), Wormwood (*Artemisia caudata*), Basswood (*Tilia americana*), White pine (*Pinus strobus*), White spruce (*Picea glauca*), Pin cherry (*Prunus pensylvanica*), Green ash (*Fraxinus pennsylvanica*), Mountain maple (*Acer spicatum*), Round- leaved dogwood (*Cornus rugosa*), Red oak (*Quercus rubra*), Paper birch (*Betula papyiferous*), Black oak (*Quercus velutina*), Cedar (*Thuja occidentalis*), Red maple (*Acer rubrum*), Beaked hazel (*Corylus cornuta*), Red Osier dogwood (*Cornus stolonifera*), Serviceberry (*Amelanchier sp).*

APPENDIX 2

NATURAL HERITAGE INFORMATION CENTRE (NHIC) RANKING OF PLANT COMMUNITIES AND PLANT SPECIES

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NATURAL HERITAGE INFORMATION CENTRE (NHIC) RANKING OF PLANT COMMUNITIES AND PLANT SPECIES

Provincial Rank (SRANK)

These ranks are based on rarity and are used for both the species and community scale. The provincial ranks are based on; the estimated number of occurrences, the estimated community and aerial extent and the estimated range of the community within the province.

The provincial ranks are defined as follows:

- **S1**- Extremely rare in Ontario; usually 5 or fewer occurrences in the province, or very few remaining hectares.
- **S2**- Very rare in Ontario; usually between 5 and 20 occurrences in the province, or remaining hectares.
- **S3**- Rare to uncommon in Ontario; usually between 20 and 100 occurrences in the province; may have fewer occurrences, but with some extensive examples remaining.
- **S4/S5**- These communities are considered provincially secure.

Global Community Ranks (GRANK)

These global ranks are based on the U.S Nature Conservancy system that has been adopted by the Ontario Ministry of Natural Resources (OMNR). These ranks are used for ranking the rarity of communities. The two major criteria used in determining a community rank are the total number of occurrences and the total aerial extent of the community wide range. Secondary factors that are considered include; trends in status (such as expanding or shrinking range), trends in condition (e.g., declining condition of the remaining extent), threats and fragility (Grossman et al. 1994). The global ranks are based on The Nature Conservancy (U.S) (Natural Heritage Information Centre accessed July 25, 2006; www. http://nhic.mnr.gov.on.ca/nhic_.cfm).

Global ranks are defined as follows:

- **G1**– Critically imperiled globally because of extreme rarity (5 or fewer occurrences very few remaining hectares) or because of some factors making this community particularly vulnerable to extinction.
- **G2**- Imperiled globally because of extreme rarity (6 to 20 occurrences or few remaining hectares) or because of some factor (s) making it very vulnerable to extinction throughout the range.
- **G3**- Either very rare and local throughout the range or found locally (even abundant in some locations) in a restricted range. In terms of occurrences
- **GQ**- Communities where there is uncertainty as to the validity of the global community rank.
- **G?-** An interim rank given until more information on the community becomes available.
- **G2Q-** A temporary assignment of G2 (some uncertainty surrounding this assignment.
- **G4/G5-** These communities are considered globally secure.

Provincially Ranked species at Bluewater Beach

There are three provincially rare grass species located at Bluewater beach; Porcupine Grass (*Stipa spartea*), American Beachgrass (*Ammophilia breviligulata*) and Hairy Puccoon

(2) American Beachgrass (*Ammophilia breviligulata*)

(Photo E.R Degginger)

(3) Hairy Puccoon (***Lithospermum caroliniense***)

(Photo Mark Taylor)

Provincially Ranked Communities at Bluewater Beach

There are two rare, provincially ranked plant communities at Bluewater Beach:

- Sand Cherry Shrub Dune Type (Natural Heritage Information Centre accessed July 25, 2006; http://nhic.mnr.gov.on.ca/nhic_.cfm)

- Little Bluestem-Switchgrass-Beachgrass Open Dune Type (Natural Heritage Information Centre accessed July 25th 2006; http://nhic.mnr.gov.on.ca/nhic_.cfm).

Both of these communities are ranked as S2 level communities, meaning that they are very rare in Ontario; usually between 5 and 20 occurrences in the province, or remaining hectares (Natural Heritage Information Centre accessed July 25, 2006; http://nhic.mnr.gov.on.ca/nhic_.cfm). The Sand Cherry shrub dune communities are in polygons 4, 5, and 11 (Figure 1). The Little Bluestem-Switchgrass-Beachgrass open dune type is in polygon 3 (Figure 1).

(*Lithospermum caroliniense)*. All of these plants are S3 species, meaning that they are rare to uncommon in Ontario with only between 20 and 100 occurrences in the entire province (Natural Heritage Information Centre accessed July 25th 2006; http://nhic.mnr.gov.on.ca/nhic_.cfm)

(1) Porcupine Grass (*Stipa spartea*)

(Photo: US environmental protection agency)

APPENDIX 3

PLANT LIST FOR BLUEWATER BEACH

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PLANT LIST FOR BLUEWATER BEACH

Bluewater Beach Complete Plant Species List and Rarity Rankings

Family	Scientific Name	Common Name	GRANK	SRANK
Aceraceae	*Acer negundo*	Manitoba Maple	G5	S5
Aceraceae	*Acer rubrum*	Red Maple	G5	S5
Rosaceae	*Amelanchier* sp.	Serviceberry sp.		
Poaceae	*Ammophilia breviligulata*	American Beachgrass	G5	S3
Ericaceae	*Arctostaphyllus uva-ursi*	Evergreen Bearberry	G5	S5
Asteraceae	*Artemisia campestris*	Tall Wormwood	G5T5	S4S5
Asclepiadaceae	*Asclepias syriaca*	Common Milkweed	G5	S5
Betulaceae	*Betula papyrifera*	Paper Birch	G5	S5
Poaceae	*Bromus inermis*	Awnless Brome	G5T?	SE5
Cyperaceae	*Carex bebbii*	Bebb's Sedge	G5	S5
Celastraceae	*Celastrus scandens*	Climbing Bittersweet	G5	S5
Asteraceae	*Centaurea maculosa*	Spotted Knapweed	G?	SE5
Euphorbiaceae	*Chamaescyce polygonifolia*	Seaside Spurge	G5?	S4
Asteraceae	*Coreopsis lanceolata*	Lance-leaved Coreopsis	G5	S4
Cornaceae	*Cornus rugosa*	Round-leaved Dogwood	G5	S5
Cornaceae	*Cornus stolonifera*	Red Osier Dogwood	G5	S5
Poaceae	*Danthonia spicata*	Poverty Oat Grass	G5	S5
Poaceae	*Elymus canadensis*	Canadian Wild-rye	G5	S4S5
Poaceae	*Elymus repens*	Quack Grass	G5	SE5
Orchidaceae	*Epipactis helleborine*	Helleborine	G?	SE5
Equisetaceae	*Equisetum arvense*	Field Horsetail	G5	S5
Equisetaceae	*Equisetum hyemale*	Scouring-rush	G5T5	S5
Asteraceae	*Erigeron annuus*	Annual Fleabane	G5	S5
Poaceae	*Festuca saximontana*	Rocky Mountain Fescue	G5	S4
Rosaceae	*Fragaria virginiana*	Wild Strawberry	G5	S5
Oleaceae	*Fraxinus americana*	White Ash	G5	S5
Oleaceae	*Fraxinus pennsylvanica*	Green Ash	G5	S5
Juncaceae	*Juncus balticus*	Baltic Rush	G5	S5
Cupressaceae	*Juniperus communis*	Common Juniper	G5	S5
Leguminoseae	*Lathyrus japonicus*	Beach Pea	G5	S4
Boraginaceae	*Lithospermum officinale*	Common Gromwell	G?	SE5
Boraginaceae	*Lithospermum caroliniense*	Hairy Puccoon	G4/G5	S3
Liliaceae	*Maianthemum stellatum*	Star-flowered Solomon's-seal	G5	S5
Leguminoseae	*Melilotus alba* Medikus	White Sweet Clover	G5	SE5
Lamiaceae	*Mentha* x *piperita*	Peppermint	HYB	SE4
Onagraceae	*Oenothera biennis*	Common Evening-primrose	G5	S5
Betulaceae	*Ostrya virginiana*	Ironwood	G5	S5
Pinaceae	*Picea glauca*	White Spruce	G5	S5
Pinaceae	*Pinus strobus*	Eastern White Pine	G5	S5
Pinaceae	*Pinus sylvestris*	Scots Pine	G?	SE5
Salicaceae	*Populus balsamifera*	Balsam Poplar	G5	S5
Salicaceae	*Populus deltoides*	Eastern Cottonwood	G5T5	SU
Salicaceae	*Populus* x *canadensis*	Carolina Poplar	HYB	SE1
Rosaceae	*Potentilla anserina*	Silverweed	G5	S5

Bluewater Beach Complete Plant Species List and Rarity Rankings

Family	Scientific Name	Common Name	GRANK	SRANK
Rosaceae	*Potentilla fruticosa*	Shrubby Cinquefoil	G5	S5
Rosaceae	*Prunus pumila*	Sand Cherry	G5T?	S4?
Rosaceae	*Prunus virginiana*	Choke Cherry	G5	S5
Dennstaedtiaceae	*Pteridium aquilinum*	Eastern Bracken-fern	G5	S5
Fagaceae	*Quercus rubra*	Red Oak	G5	S5
Anacardaceae	*Rhus radicans*	Poison Ivy	G5T5	S5
Anacardaceae	*Rhus typhina*	Staghorn Sumac	G5	S5
Rosaceae	*Rosa blanda*	Smooth Rose	G5	S5
Polygonaceae	*Rumex triangulivalvis*	Willow-leaved Dock	G5	S4
Salicaceae	*Salix eriocephala*	Missouri Willow	G5	S5
Salicaceae	*Salix lucida*	Shining Willow	G5	S5
Poaceae	*Schizachyrium scoparium*	Little Bluestem	G5	S4
Cyperaceae	*Schoenoplectus pungens*	Common Three-square	G5	S5
Crassulaceae	*Sedum acre*	Mossy Stonecrop	G?	SE5
Eleagnaceae	*Sheperdia canadensis*	Canada Soapberry	G5	S5
Asteraceae	*Solidago canadensis*	Canada Goldenrod	G5T?	S5
Asteraceae	*Solidago juncea*	Early Goldenrod	G5	S5
Asteraceae	*Solidago nemoralis*	Gray Goldenrod	G5T?	S5
Asteraceae	*Sonchus arvensis*	Perennial Sowthistle	G?T?	SE5
Poaceae	*Sporobolus cryptandrus*	Sand Dropseed	G5	S4
Poaceae	*Stipa spartea*	Porcupine Grass	G5	S3
Asteraceae	*Symphyotrichum lanceolatum*	Panicled Aster	G5T5?	S5
Cupressaceae	*Symphyotrichum* sp	Aster sp.		
Cupressaceae	*Thuja occidentalis*	Eastern White Cedar	G5	S5
Tiliaceae	*Tilia americana*	American Basswood	G5	S5
Asteraceae	*Tragopogon dubius*	Goat's-beard	G?	SE5
Asteraceae	*Tussilago farfara*	Colt's-foot	G?	SE5
Ulmaceae	*Ulmus americana*	American Elm	G5?	S5
Scrophulariaceae	*Verbascum thapsus*	Common Mullein	G?	SE5
Leguminoseae	*Vicia cracca*	Tufted Vetch	G?	SE5
Vitaceae	*Vitis riparia*	Riverbank Grape	G5	S5