Beach Stewardship Guide

For the

Township of Huron-Kinloss

Prepared by

the Lake Huron Centre for Coastal Conservation

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October, 2007

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Executive Summary

This Beach Stewardship Guidefor Huron-Kinloss describes the main issues identifiedby residents and the municipality at a public meeting in August 2006. Following a description of each issue are recommended stewardship practices for reducing impacts to the coastal environment. The guide is intended for both the municipality and its residents to implement.

Beach and dune grasslands are relatively rare coastal landforms along the Great Lakes. Dune grasslands make up only 1.5 percent of Canada's Great Lakes shoreline. On Lake Huron, dune grasslands comprise about 3 percent of its 6,000 kilometre shoreline. The Township of Huron-Kinloss and its residents are fortunate to be situated where the shoreline almost entirely consists of beach and dune grasslands.

Beach and dune systems in Bruce County are, for the most part, considered to be relic sand deposits, meaning that the geomorphic conditions that created them are no longer present. They have achieved a natural balance. The dunes act as reservoirs of sand that the lake 'borrows' during high lake levels and storm events. Dune vegetation builds dunes and stabilizes wind blown sand. Beach erosion and deposition is a constant part of the give-and-take of the beach system.

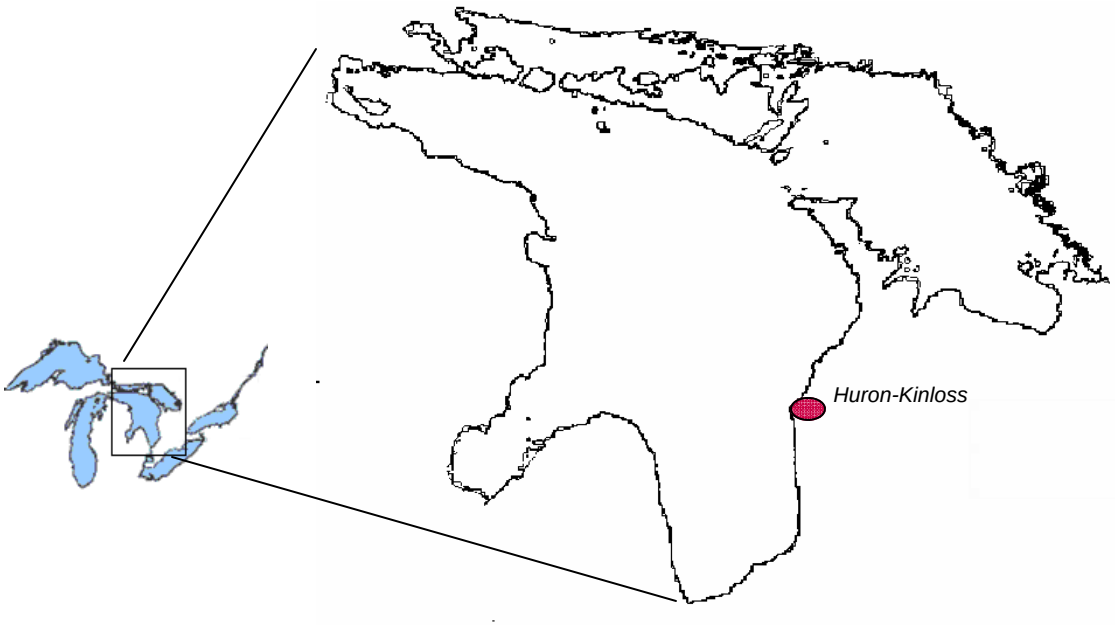
The primary threat to dune grasslands is through human impacts. Activities that damage or destroy the anchoring vegetation, or alters the dune itself, can lead to wind erosion in the short term, and beach degradation in the longer term. A balance must be struck between human activity and people's enjoyment of the beach, with the conservation of our beach-dune system, which aims to preserve the integrity of the beach for the benefit of future generations.

Invasive species, in water and on land, are becoming a serious concern on Lake Huron. This guide discusses three invasive plant species that are currently threatening local ecosystems in the Huon-Kinloss lakeshore area. Coomn Reed is a new invader to beaches in the Township. Control methods are identified, but optimum control methods are still being studied by the Coastal Centre.

Nearshore water quality has been a concern in Huron-Kinloss for a number of years. Pollution sources include agriculture, lakeshore development, animal waste (wildlife and domestic) and sources brought in from outside of municipal boundaries from longshore currents. Threats to water quality conditions include intensive agriculture, intensive development and increases in waterfowl populations taking residency along the Huron-Kinloss coast. The guide recommends stewardship practices intended to reduce impacts to local water quality in the lakeshore area of the Township. This guide is not intended to address agricultural impacts. Locally, the Pine River Watershed Improvement Network, a committee of Council is developing farm-related stewardship projects in the Pine River system. As well, government programs like the federal Environmental Farm Plan, and Adopt-a-Watershed program are specifically targeted to farm operators to assist them in making environmental improvements to their farm operations.

Education and communication will be fundamental to successful beach stewardship and environmental improvement. Information in this document provides a science-based background to assist the municipality and residents to make informed choices and decisions about coastal conservation issues. Recommendations are made with respect to education and communications strategies to help promote awareness about the conservation of coastal ecosystems.

Along the Lake Huron coast, there are layers of jurisdictions at the federal, provincial and municipal levels. A number of agencies at all levels have a part to play in the protection of our coastal environment. A brief description of each agency and contact information for each is provided to aid the reader in better understanding the roles of each.



Location Map

Introduction

Huron-Kinloss has been blessed with a beautiful coastline composed mainly of sandy beaches backed by sand dunes. Sandy beaches and dunes make up a very small portion of our coastline. On the Canadian side of the Great Lakes, dune systems make up only 1.5% of the total coastline. Along Lake Huron, these ecosystems make up about 3% of its coast. In fact, dune ecosystems are considered to be Provincially rare.

Beaches and dunes are interdependent. Beaches 'borrow' sand from dunes when under attack by storm waves, and beaches in turn re-build sand dunes through wind processes. Crucial to this re-building is the presence of dune vegetation which enables the sand to stabilize along the waterfront, and not continue blowing inland.

The quality of our beaches, the role beaches play during high lake levels and storm conditions, and the rare habitat they provide are important reasons for the care and stewardship of our lakeshore. These coastal features are vulnerable to human destruction, but by understanding how the beach "works", we can avoid practices that can have long lasting impacts on Huron-Kinloss' beaches. In other areas of the coast, communities have made choices that have lead to beach deterioration, loss of rare dune habitat, and increased exposure to bacterial pollution. In Huron-Kinloss, we risk going down the same path unless we take stewardship measures aimed at protecting the very beaches we enjoy for future generations.

The Township of Huron-Kinloss has expressed concern in recent years about its beaches and their long-term health. The Lake Huron Centre for Coastal Conservation began a process in 2006 of developing guidelines to assist the Huron-Kinloss community with lakeshore issues that were important to the community. With funding from Environment Canada's Habitat Stewardship Program, the Centre, in partnership with the Township of Huron-Kinloss, began the process with a community public meeting. Attended by over one hundred lakeshore residents, including municipal officials, the meeting provided an opportunity to present key environmental concerns related to their beaches. Most of the concerns could be categorized into one of five priorities:

1. Beach and dune conservation
2. Nearshore Water Quality

3. Invasive species on area beaches
4. Education and awareness
5. Rules and regulations along the lakeshore.

With the information from the public meeting, a Beach Stewardship Committee was struck, with representations from the municipality, each of Huron-Kinloss' four Beach Associations, and some lakeshore community members-at-large. Meetings were facilitated by the Coastal Centre, and were held during the fall, winter and spring of 2006-07. The result has been the development of a locally derived beach stewardship guide.

The Beach Stewardship Guide for Huron-Kinloss provides a science-based approach to understanding and protecting the beaches and dunes of Huron-Kinloss.

This guide provides, in some detail,

- how the beach-dune ecosystem functions,
- how it can be impacted by people's activities,
- how people can individually and collectively, improve local water quality conditions, and,
- practices intended to conserve our beaches while continuing to enjoy them.

This guide will assist the Township of Huron-Kinloss in developing policies based on sound coastal science. It is also intended to assist beach communities and local landowners in becoming better environmental stewards of our lakeshore. Adopting best practices for the stewardship of our beaches will help to ensure that Huron-Kinloss remains one of the highest quality lakeshores on Lake Huron.

(A) Beach and Dune Conservation

The Beaches of Huron-Kinloss

The physical geography of Lake Huron's coast has been shaped by a succession of post-glacial lakes, most notably Lakes Algonquin, Nipissing and Algoma, which formed what is known as the Huron Fringe. The Huron Fringe is defined as the narrow fringe of land along Lake Huron from Sarnia to Tobermory that is distinct from the clay plain adjacent and above it. It is composed mainly of post-glacial lake deposits of sand dunes and gravel bars (Chapman and Putnam, 1973). In Huron-Kinloss, the Algonquin bluff is evident as the hill one drives down to enter the lakeshore area. Lakeward of this bluff are the sands deposited by post-glacial lakes Nipissing (around 6000 years ago) and Algoma (around 3000 years ago). Sands deposited by Lake Huron are limited to the immediate shoreline area. Most of Huron-Kinloss' fifteen kilometre shore is composed of sand beach and dunes.

These dunes owe their existence to the geology of the area, and the headland feature at Point Clark. The point is a major bedrock extension into the lake overlain by lag deposits (large stones and boulders). The effect of this point has been to act as a barrier that has stopped the movement of sand downshore. Therefore, massive amounts of sand have collected historically to the north of the point.

What are Dunes?

A dune may be simply defined as a mound or ridge formed by the deposition of wind-borne sand. These geologic landforms develop when an abundance of sand combines with wind, vegetation and geography. Dune deposits in Huron-Kinloss Township have formed over the last 3000 to 6000 years, since post-glacial Lakes Nipissing and Algoma began to recede. The current beach and foredune are reworked sands from the past, with modest additions of 'new' sand added to the system from the Pine and Penetangore Rivers. The rivers provide an annual supply of less than 450 metres of sand per year to the Huron-Kinloss and Kincardine shorelines. South of Point Clark, researchers have concluded that no sand is contributed from the north. In other words, the point is a barrier to the flow of sand south of the point. The sand supply in this area south of the point to the Amberley Line comes from the erosion of glacial till bluffs in northern Huron County (Reinders, 1989).

Since the composition of dunes is of fine sands, they are particularly vulnerable to erosion—from storm waves and from wind. People's indiscriminate use of dunes can damage or destroy dunes that have no long term sustainable supply of sand. The dunes are a finite resource for which proper care is needed. The future quality of our

beach and dune systems in Huron-Kinloss will depend on their stewardship.

Special points of interest:

- Dune grasslands represent only 1.5% of all of Canada's Great Lakes shoreline.
- Ontario's Great Lakes dunes, due to their rarity and ecological fragility, are of national and global significance.

Why Beaches and Dunes?

When we talk about dunes, we're really talking about beaches and dunes as a system. Dunes are reliant on the beach for their ongoing sand supply. Likewise, the beach relies on the dune's sand reservoir during periods of high lake levels and storm events. The sand supplied by the dune helps to maintain its form and function. Waterfront management needs to respect beaches and dunes as a system. Understanding that system will help municipal managers and property owners in the lakeshore area, make decisions that avoid compromising the beach and dune resources in Huron-Kinloss.

Dunes in the broader context

Coastal Dune systems are considered to be among the most fragile ecological features in North America. Great Lakes dune systems in Ontario, due to their rarity and ecological fragility, are of national and global significance. Lake Huron's dunes are found along a small fraction (about 2 to 3%) of the lake's 6,000 kilometre shoreline. What starts to become clear is that in the 'big picture', Lake Huron's dune systems represent an extremely small land mass. Yet these are the areas of the lakeshore that attract thousands of people each summer. Huron-Kinloss is fortunate to have over 95% of its shoreline consist of beach-dune systems. A small segment of shoreline directly south of Point Clark is not a beach-dune system, but more characteristic of a coastal wetland.

All ecosystems have a certain threshold for being able to absorb human impacts. Dunes, in particular, have a very low threshold. Research has demonstrated that dune vegetation is sensitive to damage by human disturbance (Trowell, 1987). Dunes are vulnerable to wind erosion once the anchoring vegetation on them is damaged or destroyed. Without effective conservation measures, we stand to lose an already limited resource.

Why Conserve Dunes?

Dunes are enormously rich in biological diversity, and usually contain plant communities and species that are rare. As habitat, dunes are unlike any other ecological feature in Ontario, and so they are special places, to plants, animals and people. Aside from the ecological imperative to protect dunes as critical coastal features and habitats, there are economic reasons to protect dunes. During the high

water levels of 1985-86, millions of dollars were spent to protect coastal properties and municipal waterfronts along Lake Huron and the other Great Lakes. The average cost of an armourstone revetment, for example, was about $2000 per linear metre.

Sand dunes have long been known by scientists and resource managers to be nature's shore protection. They outperform their structural counterpart by their ability to give and take with the dynamic processes at work along the shoreline. It is important to recognize that it is this dynamic give and take that make dunes important protection features.

Special points of interest:

- The Pine and Penetangore rivers provide an annual supply of less than 450 cubic metres of sand per year to the Huron-Kinloss and Kincardine shorelines.
- In contrast, the shoreline between Amberley and Goderich produces an annual sand supply of 29,000 m^3, and the shoreline between Goderich and Kettle Point produces 30,000 m^3.

Using $2000/m as the amount that would be required to replace dunes with conventional shore protection, it becomes apparent that the value of dunes to a community can be great. For example, in Huron-Kinloss, the beach and dune system which extends about fifteen kilometres in length, would have a value of about $30 million simply as shore protection. This does not include the aesthetic value of the dunes, important to tourism, or the ecological value of the dunes, important to naturalists and educators. By conserving its dunes, the Township of Huron-Kinloss and its residents are protecting a multi-million dollar asset.

In addition to their value as shore protection, recent research on Lake Huron has concluded that degraded dune areas can actually create the conditions that lead to elevated bacterial pollution in the groundwater below beaches. Removal of beach sand, dunes and beach grass, leads to a shallow depth to the water table, which in turn promotes wet or damp sand on the beach, the invasion and growth of non-native beach plants and a higher exposure risk to *E. coli* (Crowe, personal communication, 2007).

What makes the Dunes in Huron-Kinloss so Special?

The bulk of the sand that makes up the beaches and dunes in Huron-Kinloss is relic material. That means it was deposited by waves and winds in historical times. Based on a review of the coastal processes of the area, only about 450 cubic metres of sand is added to Huron Kinloss beaches annually, originating primarily from the Pine and Penetangore Rivers. Compare this with the 29,000 cubic metres of sand added to the shoreline from Amberley to Goderich, or 30,000 cubic metres added between Goderich and Grand Bend (Reinders, 1989).

On a net basis, the movement of sand along the Lake Huron shoreline is from north to

south. Point Clark has been one of the key physical features that has been responsible for the beaches and dunes developing along the shores of Huron-Kinloss. The extensive amounts of sand deposited updrift (on the north side) of Point Clark is the result of the Point acting as a barrier to sand movement to the south. The geologic conditions that lead to the deposition of large amounts of sand are no longer present. The beach-dune system should be regarded as a finite, irreplaceable resource. The amount of new sand being added to the beaches of Huron-Kinloss is simply not sufficient to replace what could be lost due to poor stewardship practices. Without proper care, this resource in its present quantity and quality could be lost to future generations.

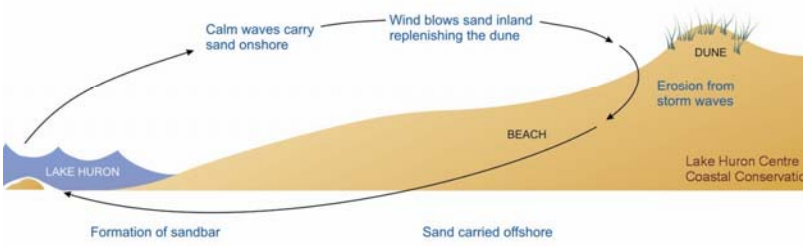
Besides the unique physical attributes of the coast, Huron-Kinloss' dune grasslands have an extraordinary ecology. Some of the plants that grow in the dunes are rare dune species. For example, Great Lakes Wheat Grass is endemic to Great Lakes dune systems. It grows nowhere else in the world. Other dune plants, like American Beachgrass (a.k.a. Marram grass), while more common, is still considered a Provincially rare plant species.

Beach and Dune Processes and Functions

Sand is continually being eroded and deposited on the shore by waves. Storm waves will erode the beach, taking the sand offshore, and forming a sand bar. The sand bar acts as a temporary protective berm, absorbing wave energy that would otherwise reach the shore causing even more erosion. Once the storm subsides, gentle waves will gradually bring the sand from the sand bar back to the shore and re-deposit it on the beach.

Once onshore, the sand is then prone to movement by wind.

Dunes form when sand is carried by the wind from the beach towards the land. The wind transports the sand in three ways: in ***suspension***, by lifting the smaller, lighter



Self-sustaining dune ecosystem. Dune reservoir is eroded during high lake levels and storm events. Sand is taken offshore to form sandbars. Gentle waves will eventually move sand back to the beach. Wind carries sand back to the dune to complete the cycle..

Special points of interest:

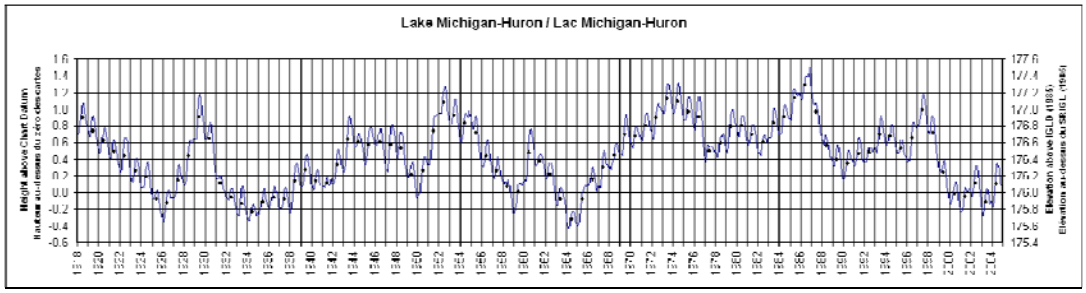
- Dune vegetation traps wind blown sand.
- A vegetated dune provides an important reservoir of sand that circulates between the first dune (foredune), the beach, the surf zone and the lake bed, according to lake and wind conditions.

fractions into the airstream and carrying them for long distances; by ***saltation***, as heavier grains are moved in a series of 'hops' and 'jumps' along the beach surface; and as ***surface creep***, in which sand particles are rolled along the surface as a result of wind forces or the impact of descending saltating particles. Although most sand particles are moved by saltation, surface creep may account for 20-25% of the moved sand (Bagnold, 1954). Most of the sand is carried within 0.15 m (6 inches) of the ground surface. The very fine sands light enough to be carried by suspension are usually carried well outside of the active dune system.

A significant amount of sand movement will take place when the wind speed, measured at a height of 1 m (3 ft) above ground level, exceeds 12 knots (6 m per sec). Initiation of sand movement occurs at wind speeds of 5m per second. Onshore winds will dry the sand and selectively pick up the smaller grains of sand (0.08 - 0.5 mm) and move them towards the land. Sand grain sizes in dunes are therefore finer than those on beaches. This is important because fine sand deposits have greater water retention capacity than coarse sands and are therefore more suitable for vegetation growth. Moist sand is moved less easily by the wind than dry sand since moisture promotes surface adhesion. The threshold shear velocity (the wind strength needed to initiate movement) is higher for moist sand.

While wind strength is important, the quantity of sand moved is also influenced by how long the wind is blowing from a particular direction. Wind duration is an important consideration, and knowing the prevailing wind directions at certain times of the year can help with determining management strategies for dune conservation and restoration efforts. Winds from the west and southwest are perhaps the most influential in the movement of sand in Huron-Kinloss.

As well as wind speeds and duration, water levels play a significant role in how much sand transportation will take place. During high water levels, more of the beach is submerged and the width of dry beach is less. As a result, less beach is exposed to wind erosion. Conversely, during lower water levels, more beach is exposed and greater wind erosion of the beach is possible. Therefore, periods of dune building tend



Lake Huron hydrograph showing lake levels from 1918 to 2004. Levels have been quite variable historically. The highest recorded levels occurred in 1985 -86, while the lowest recorded levels were in 1964.

to occur during lower water levels. Periods of natural dune erosion tend to occur during high lake levels when storm waves erode the base of the dune and carry that sand to offshore bars. What is fundamental is that sand dunes and beaches must be managed as one system. Dunes depend on beach sand for their formation, particularly during low water level periods, and beaches need the sand reserve held in the dunes during high lake levels and storm events.

Special points of interest:

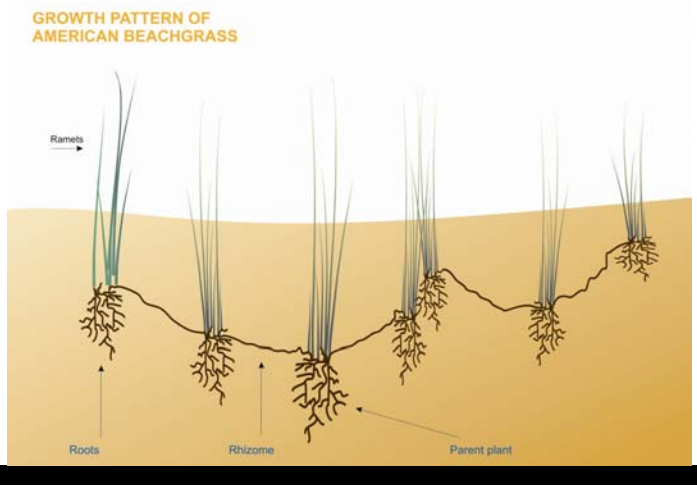
- All dune plants, whether they are grasses, shrubs or trees, growing either singly or in groups, have a role in the development of vegetative cover and together they bring about dune stabilization.
- The massive underground root systems that dune plants develop provide the dune with structure, giving them substantial durability during periods of wave erosion.

Role of Dune Vegetation

When the wind encounters an obstacle such as a clump of vegetation, the wind speed is reduced and the sand grains fall out under gravity, resulting in sand deposition. As the sand accumulation continues, a dune is formed. Dunes form when there is an adequate sand supply and onshore winds of sufficient velocity to move the sand. As the dune builds, it becomes a major obstacle to the landward movement of windblown sand. Thus, the dune serves to conserve sand in close proximity to the beach system.

Dune vegetation promotes the large scale trapping of sand. The stems of dune grasses reduce the wind velocity near the surface, causing the deposition of sand. Plant roots also serve to bind and consolidate the sand. Dune grasses thrive on incoming sand and accelerate their growth to keep up with the increasing height of the dune (Broome *et al,* 1982). The vegetation cover represents the difference between a mobile pile of sand and a stabilized dune (Salmon *et al*, 1982).

A vegetated dune provides an important reservoir of sand that circulates between the first dune (foredune), the beach, the surf zone and the lake bed, according to lake and



Marram grass spreads through underground roots (rhizomes). The plant is stimulated by sand burial. The root network provides structure to the dune.

wind conditions.

Coastal vegetation is itself dynamic. Earlier, simpler plant communities pave the way for a series of future, more complex communities. This process is known as succession and is reflected in the formation of distinct plant communities over time. These communities are usually quite visible to the observer, yet the transition between plant communities can sometimes be difficult to distinguish. Huron-Kinloss has an excellent public park where dune succession can be observed. The Blair's Grove Nature Trail at Lurgan Beach is a 25 acre parcel where different stages of ecological succession, from the early pioneer grasses stage at the beach, to an oak savannah and to the climax forest stage can be experienced within a few hundred metres.

Pioneer plants trap and hold windblown sand in the foredune and help create conditions which encourage the establishment and growth of other plant communities. All plants, whether they are grasses, herbs, shrubs or trees, growing either singly or in groups, have a role in the development of vegetative cover and together they bring about dune stabilization. Windblown sand trapped in the foredune by vegetation serves as a reservoir of sand for the beach during periods of wave erosion. In the absence of sand-trapping dune vegetation, windblown sand from the beach moves inland and is lost from the beach/dune system. Wind erosion of the beach and unvegetated foredunes results in coastline recession. Over the long term, a receding shoreline (gradually moving landward) could impact residences (stationary structures) along the lakefront.

The importance of dune vegetation to dunes is straightforward. The above-ground parts of dune plants act as obstructions, increase surface roughness and reduce the surface speed of sand-carrying wind. The reduction in wind movement results in the deposition of sand on and around the plant. There is actually a boundary layer where wind velocity equals zero and it is in this zone that sand is deposited. Bare sand has a small boundary layer, whereas research has shown that when an area is planted with American Beachgrass *(Ammophila breviligulata)* this boundary layer is 30 times higher than the bare surface.

American Beachgrass (also known as Marram grass) is the most successful sand-trapping plant colonizing dunes along most of the Lake Huron coastline. It has the ability to grow through substantial accumulations of windblown sand. Cycles of sand deposition and plant growth result in dune formation and build-up.

The development of vegetative cover on newly formed dunes, if not disturbed or trampled, will create conditions which support the colonization and growth of a wider range of plant species. The shade produced by plants keeps surface temperatures lower than on bare sand and, together with reduced wind movement, helps to lower the

Special points of interest:

- The foredune is the most critical part of the dune system, as far as coastal processes are concerned, and is the area least able to tolerate any human disturbance or development.
- Dunes are fragile systems and trampling by beach goers destroys the vegetation and results in deterioration of the dune.

evaporation rate from the sand surface. Increasing vegetative cover further reduces wind movement, which results in a lower rate of water loss from plant leaves. Dead plants and leaf litter add humus to the sand and acts as mulch. The accumulation of humus results in improved moisture and nutrient-holding capacity of developing dune soils. With lower surface temperatures and increased moisture and nutrient content, the sand can support a greater variety of plants. Thus, the vegetative cover on the dune increases and movement of sand by wind is further decreased.

Pioneer plants make up the initial dune vegetation. They are found on the dune nearest the lake, where their survival depends on their ability to establish, grow and reproduce. They must also tolerate strong winds, sandblasting, temperature extremes and occasional inundation by water. Plants with these characteristics are ideally suited as agents for initial stabilization of dunes.

Sand dune grasses are plants which have specifically adapted to the dune environment. The structure of these grasses can resist sand abrasion, wind breakage and water loss. They have adapted to extreme heat (dunes can reach temperatures of 60C in summer!) as well as nutrient deficient soil. Confronted by high winds capable of blowing seeds many kilometres away, these plants have evolved a dual system of reproduction. In addition to the conventional seed production, they send out horizontal stems called ‘rhizomes’ under the surface to push up new growth short distances away. The massive underground root systems that develop provide the dune with structure, giving them a substantial amount of durability during periods of wave erosion..

American Beachgrass is a common pioneer plant in Huron-Kinloss but the globally rare Great Lakes Wheatgrass (*Agropyron psammophilum*), and Long Leaved Reed Grass (*Calamovilfa longifolia*) are other key dune stabilizers. Where American Beachgrass can tolerate substantial burial by wind generated sand deposition, both the Long-leaved Reedgrass and Wheatgrass are less tolerant and therefore tend to develop in areas where sand deposition is less. Many dune plants require specific conditions to thrive, and so they tend to grow in more or less predictable, shore-parallel zones within the dunes. *(Note to Reader: Long-leaved Reedgrass, which is an important endemic dune species, should not be confused with Common Reed, which is an alien, invasive plant species. The names Reedgrass and Reed may sound similar, but the two plants are very different plants).*

The foredune is the most critical part of the dune system, as far as coastal processes

Special points of interest:

- The beach and dune sands along the waterfront are mainly relic materials and geomorphic conditions that created the large dune deposits in Huron-Kinloss are no longer present—they are therefore unable to be replaced naturally.

are concerned, and is the area least able to tolerate any human disturbance or development. Vegetation on the foredune builds up the dunes by trapping wind-blown sand, preventing it from being blown inland and lost from the beach system. The sand-binding plants that grow on the foredune and perform this vital function are highly susceptible to damage through human disturbance, like trampling.

Beach and sand dune vegetation both bind the soil and lower wind velocities causing fine sands to be deposited. This can be observed in beach areas occupied by vegetation and in bare areas caused by human disturbance. Fine sands collect around dune vegetation, while in areas devoid of vegetation, fine sands are eroded away, leaving coarse sands behind.

Some beach and dune plants found along the shores of Huron-Kinloss are illustrated in Appendix A.

Human Impacts to Dunes

Vegetation is absolutely critical to the stability of the dune. Without it the dune is vulnerable to erosion by either wind or waves, or both. Research has demonstrated that dune vegetation is fragile to human disturbance and can be killed by fewer than 200 dune crossings (Bowles and Maun, 1982). Pioneer vegetation may be killed by far fewer passages.

Dunes are fragile systems and trampling by beach goers destroys the vegetation and results in deterioration of the dune. Destruction of vegetation makes the dunes unstable, increases wind erosion and causes the coastline to recede. As trails are established along frequently used routes through the dunes, the vegetation is destroyed and the wind begins to carry sand from the exposed area. The continual loss of sand deepens the trail. Sloughing away of sand from the trail's sides widens it. As a greater area is exposed to wind erosion, a blowout or washout may develop. As blowouts develop, sand blows inland, often outside of the active beach-dune system. When it does this, it represents a loss to the system. This is of great concern because, as discussed earlier, the beach and dune sands along the waterfront are mainly relic materials and geomorphic conditions that created the large dune deposits in Huron-Kinloss are no longer present, and therefore unable to be replaced naturally. This inland migration of sand can also result in substantial maintenance costs to the

Special points of interest:

- The lakeward expansion of beach vegetation during low lake levels helps the beach to retain sand (reducing wind erosion).
- This lakeward expansion of vegetation also prevents increases in dune height.

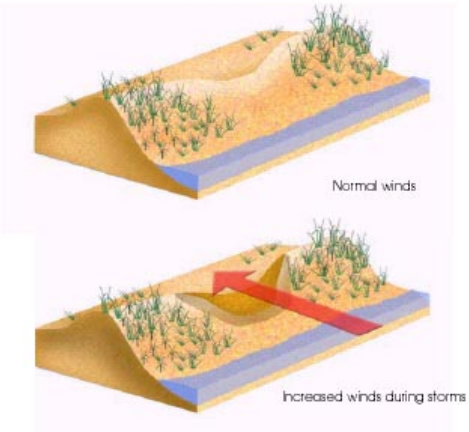
Township as it forms drifts along roads and beach accessways. A blowout can also represent a reduction of the dune's shore protection capability. This gap in the dunes can allow storm waves to erode much larger segments of the shore than would otherwise be the case.

Private landowners who have modified the landscape on their properties can have an impact on beaches and dunes. While many lakeshore landowners historically retained the native plants on their lots, it is becoming more frequent to see native vegetation converted into more a more urbanized landscape, with turf grass, and other non-native plants. One of the threats to dunes is the encroachment of non-native plants which can displace native plants and alter the ecology of the area. This has become a concern in some urbanizing coastlines along Georgian Bay and Lake Huron where non-native vegetation is contributing to degraded beaches. In addition, Waterbirds like Canada Geese are attracted to non-native vegetation, like turf grass, and populations of these birds have colonized a beach area, leaving their waste behind.

Landowners are encouraged to landscape with native vegetation endemic to the area. Native plants require less maintenance, are easier to grow, need no pesticides, are more disease resistant and provide no threat to local plant populations.

Beach Vegetation

In recent years we have experienced a period of lower than average water levels on Lake Huron. This has resulted in much wider beaches, particularly in areas with a shallow nearshore profile (eg. Lurgan Beach, Bruce Beach). This period of low lake



Damage or destruction of dune vegetation makes the dune vulnerable to wind erosion. This can lead to large bowl shaped erosional depressions referred to as 'blowouts.'

levels has given rise to the migration of dune vegetation (particularly Marram grass) toward the lake. This is a natural process which should not be disturbed. This plant migration allows the dune to develop outward and build the sand reserve. When plants are removed or damaged, the dune tends to build upwards, often obstructing views of the lake.

The development of beach vegetation has been of concern to some who, being unable to recall vegetation of any great extent on the beach in the past, have contemplated its removal. However, one would have to go back a substantial period of time to recall a similar period of low lake levels of a prolonged duration. Since the late 1960s until 1997, Lake Huron has experienced above average lake levels. To many, that thirty year period would have represented what they consider to be 'normal' lake levels. During this thirty year period when beaches were narrower and frequently inundated, beach vegetation of this nature would have been confined to a much smaller area.

The Lakeward expansion of beach vegetation during low lake levels helps the beach to retain sand (reducing wind erosion). As a result, the dune builds horizontally (Lakeward), rather than vertically in height.

The return of higher lake levels will again alter the plant communities found on the beach.

Climate Change

How might climate change affect our beaches? Researchers project a decline in Great Lakes water levels by as much as one to two metres lower than present. This is not to say that we will not experience higher water and erosion of dunes under climate change scenarios. It means the current range of lake levels (from the record high of

Bruce Beach—1985
(high lake levels)

Bruce Beach—2005
(below average lake levels)

Bruce Beach during two extreme water levels periods. Note the leading edge of the dune relative to the tree line. Photographs illustrate how sand is borrowed from dunes during periods of high water and storms, only to be replaced with sand during dune building periods. Dune vegetation migrates shoreward enhancing dune development and sand stabilization.

1985 to the record low of 1964), will shift downward. So lake levels will still fluctuate, but within a different range than to what we have been accustomed.

In general, the lower levels will expose more sand along Huron-Kinloss beaches, creating wider beaches. Wider sand beaches will lead to more wind transported sand. If the necessary dune vegetation is not present to intercept this blown sand, both the quantity and quality of beaches will deteriorate as the fine sands migrate outside of the active beach system.

Lower lake levels may influence the quality of nearshore waters. As experienced already in the early part of this century, lower levels created a shallower nearshore. Current issues related to nutrient loading of the lake, and pathogenic pollution have been worsened by lower lake levels, creating conditions for the accelerated production of algae, and increased incidences of beach postings for unsafe swimming.

Lower levels may also make it easier for invasive plant species to take advantage of disturbed or unpopulated parts of the beach. More efforts may be necessary to identify invasive plants and establish control programs. Plants like Common Reed, Spotted Knapweed and Sweet White Clover are some of the invasive plants currently taking an aggressive hold on some beach and dune areas. Management of these plants has been costly in both time and resources. Invasive plants may be an issue that will require ongoing monitoring, and appropriate control measures, in the future.

Beach and Dune Stewardship

What Can I Do?

Beach and dune systems are best managed by not interfering with the natural processes. As discussed earlier, wave induced erosion will occur during periods of high lake levels, and wind induced sand deposition will be more prevalent during low lake levels. Working with natural lake processes, rather than at odds with them, provides a wide range of benefits, including a healthy beach from ecological, economic and public health standpoints. Beaches and dunes are dynamic environments and physical change occurs normally and with regularity.

Dune Stewardship

Dune stewardship is essentially taking care of our beach and dune resources for current and future generations. In the end, our stewardship efforts will not only help to achieve a healthy coastal environment, but help the socio-economic value of the lakefront along Huron-Kinloss.

The Township of Huron-Kinloss has an important leadership role in dune stewardship. Effective policies, control of public works activities, the measured implementation of dune conservation strategies, and the day-to-day commitment to excellence in dune conservation are all part of the successful stewardship of our beaches in Huron-Kinloss.

The citizens of the community and visitors to the lake also have key roles. People need to be sensitive to the importance of the beach-dune ecosystem and its value (economically, socially and environmentally) to Huron-Kinloss and to Lake Huron. Local Beach Associations (Point Clark, Lurgan, Bruce, Boiler) have an important role in dune conservation by helping to inform their members about waterfront care, and by leading the community by example. The Associations, with their waterfront mandates, are logical players in the sustainable future of our beaches.

With private landowners, efforts can be made to protect or restore dunes on their respective properties, and the beach and dunes adjacent to their properties. Development plans should respect dune integrity and landowners should work within the community's rules and guidelines for beach and dune conservation.

Special points of interest:

- Small amounts of organic material usually forms a “strand line” on the beach.
- The strand line is important to the ecology of the beach, providing habitat for various invertebrates, and nutrients for beach and dune plants, and so it should **not** be disturbed.

Beaches and dunes are a very dynamic environment, meaning that they change constantly as a result of waves and wind. Waves tend to erode the dune during storms and high lake levels. Wind, on the other hand, builds up the dune to form a reserve of sand that acts as a protective buffer against future storm waves. This give and take is all part of the normal function of a dune ecosystem. Great Lakes dunes are among the most vulnerable ecosystems in Canada. Their vulnerability lies in how much people interfere with the natural processes and functions of the dune system. This interference can be as simple as damaging the anchoring dune vegetation, to extensive damage by vehicles or heavy equipment. Dune stewardship is about having a more gentle, less intrusive relationship with the coast.

Beach Cleaning

Most local beach associations in Huron-Kinloss undertake to clean their beach each spring, after the storm season and the contributions to the shore from snowmelt and runoff. It is important to undertake such cleanups with sensitivity to the coastal environment. It is recommended that cleanups be limited to hand raking. Some municipalities have opted to use mechanized forms of beach cleaning which can be very destructive to the beach in the long term. Mechanical grooming is not considered to be an ecologically sound practice.

Spring debris can sometimes be extensive. While most local beach communities use people power to rake up the material, it may be deemed necessary to bring in heavy equipment to haul material away. In these instances, it is important for contractors to

Strand line, left after a recent storm. Primarily made up of organic debris, the strand line can be important to the ecology of the beach.

Special points of interest:

- Pathways (including private pathways to the beach) should take an 'S' shaped curve to help prevent scouring winds from developing blowouts.

minimize their contact time on the beach, and avoid any contact with vulnerable coastal ecosystems (e,g, dunes, wetlands, bluffs, alvars, and cobble beaches).

Aside from spring cleaning, there should be no need for additional grooming over the course of the summer season. Small amounts of organic material usually forms a "strand line" on the beach, particularly after a storm. The material in the strand line is important to the ecology of the beach, providing habitat for various invertebrates, and nutrients for beach and dune plants. The strand line should **not** be disturbed.

The exception would be massive wash-ups of algae onto a beach. Sometimes the sight and smell may necessitate the material being cleaned up. The material can be bagged and arrangements should be made with the municipality to pick up the material for compost where possible,

Vehicle Access

The use of vehicles, including heavy equipment, all-terrain vehicles and snowmobiles, can have a profound negative impact on both beaches and dunes.

Impacts to Beaches

Research has identified that vehicle traffic on beaches tended to compact beach sand at depth, but loosened the surface of the beach, thus making it more susceptible to wind and/or swash activity. The shearing and compressional effects of vehicle passage extended to a depth of approximately 20 cm. The shear stresses of turning wheels loosened the sand and broke underground rhizomes as well as crushing seedlings of annuals and young plants of perennials such as American Beachgrass. Vehicle impact also decreased the rate of decay of organic material. The normal bacterial content associated with the organic drift were normally very high, but were markedly reduced when vehicles pulverized the deposits (Stephenson, 1999).

Impacts to Dunes

The fragile nature of dunes and the destructiveness of vehicles and even pedestrian traffic on dunes is well documented. Since the dunes in Huron-Kinloss are a finite resource, it is critical to manage people's interaction with these features so that negative impacts are kept to a minimum. Beaches are inextricably linked to dunes and so management of dunes must necessarily include the proper management of

Special points of interest:

- Landowners can prevent waterfowl grazing by replacing turf grass with native shoreline vegetation.
- Replacing turf lawns with dune vegetation is ideal, as geese are not attracted to dune grasses and other dune plants.

beaches (Peach, 2004). Vehicle impacts to dunes can cause structural alterations that lead to increased erosion by wind. These alterations disrupt the delicate balance of physical conditions found in the beach – dune region. In addition, sand compaction by vehicles in the backshore area can negatively impact dune plants that would otherwise reduce wind erosion of the beach.

Recreational vehicles, like ATVs and snowmobiles, should be prohibited from operating along the waterfront of Huron-Kinoss. Community education about the use of ATV equipment only within designated areas of the Township should be considered. In addition, the municipality may wish to consider posting notices throughout the lakeshore area about the prohibition of ATVs and snowmobiles and work in cooperation with the Ontario Provincial Police to enforce their restricted operation within the municipality.

Local contractors have in the past had unfettered access to the beach in order to access beachfront properties for development purposes. In an effort to control impacts to sensitive beach areas, the Township should require permission from anyone proposing to access the beach by public access way with a vehicle. It is important that workers are aware of the sensitivities of the dunes and its vegetation, and take measures to avoid damage to the dune, and where damage has occurred, to restore the site to pre-disturbance conditions. Workers should strive to ensure that their vehicles have minimal contact time with the beach, and during clean-up and maintenance activities, impact as little of the beach-dune area as possible. Depending on the activity being undertaken, a permit may also be required from the Saugeen Valley Conservation Authority under their shoreline regulations. Work undertaken near or in the water may require permission from the federal Department of Fisheries and Oceans and/or Ontario Ministry of Natural Resources.

Garbage/recycling

Beach garbage is an important management issue from the standpoint of debris that is not only aesthetically offensive, but could choke, poison or entangle wildlife. The Township of Huron-Kinloss and local beach associations advocate for personal responsibility in dealing with garbage. “If you bring it to the beach, take it away from the beach” is the expectation of residents and visitors alike.

The Township will continue to provide waste bins at their major beach access points along the waterfront. It is suggested that a “Code of Conduct be placed at all public

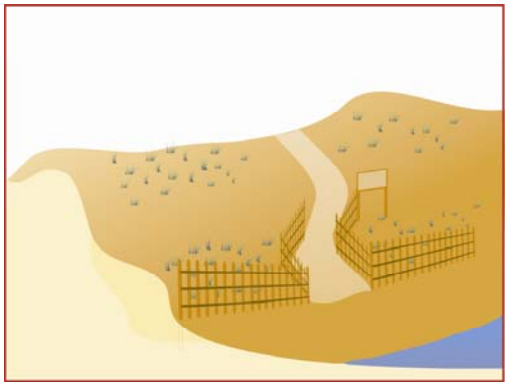
beach access points to promote appropriate behaviour at the beach. A sample is provided in Appendix B.

Beach Access

Sufficient access to beaches is important to people using the beach. How an access is designed and maintained can influence the quality of a beach. Access pathways that approach the shoreline at a right angle can be prone to wind erosion, and a loss of sand from the active shore system. Pathways (including private pathways to the beach) should take an 'S' shaped curve to help prevent scouring winds from developing blowouts. The width of a pathway should be kept to a minimum (single pathway is ideal). Structural accesses (like boardwalks) are often not necessary, unless the pathway is a major public access that receives a substantial amount of traffic where impacts to dunes have occurred and where the access is maintained by the municipality.

Waterfowl Control

Waterbirds, like gulls, play an important role in lakeshore ecology. Gulls play an important role in cleaning the beach of dead fish. They tend not to become a nuisance, unless they are fed by people, either directly by providing bread crumbs or other food, or through scavenging garbage left where it is accessible. In some areas of the coast however, Canada Geese have found ideal habitat to breed and raise their young. Canada Geese are grazers and are particularly attracted to turf grass lawns. Landowners can prevent this grazing by replacing turf grass with native shoreline



Beach access pathways should be as narrow as possible to minimize the surface area exposed to wind. By making the pathway and "S" shape,, exposure of the path to wind scour and erosion is greatly reduced.

vegetation.

Replacing turf lawns with dune vegetation is ideal, as geese are not attracted to dune grasses and other dune plants. In other coastal areas, planting native trees and shrubs can help act as a deterrent by disrupting take-off and landing opportunities. In more problematic areas, other options, like overhead netting, may be a solution, but this would need to be discussed with officials with the Canadian Wildlife Service.

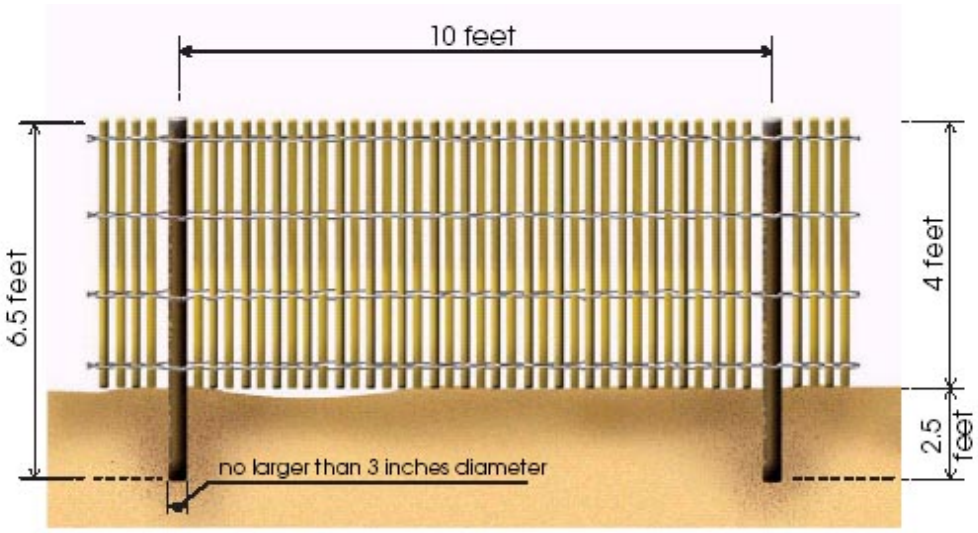
Special points of interest:

- In most cases of beach and dune restoration and erosion control, sand fencing is used in combination with planting dune vegetation.
- Dune vegetation is able to regenerate naturally, providing a permanent cover and requiring no ongoing maintenance.

Dune Stabilization or Restoration Measures

Over the last several years, the Coastal Centre has had success in managing sand drifting at many dune systems along the lake. In the late 1980s Centre staff initiated a restoration project at Poplar Beach in Huron-Kinloss. One of the objectives of this project was to stop the loss of sand from the beach, which was resulting in substantial drifting across the Shore Road. Through a combination of using sand fencing and beachgrass planting, sand loss was stopped and the dunes have been restored to collect sand and function as a sand reservoir. Since then, a number of successful restoration projects have been undertaken along the shores of Lake Huron using these same techniques.

Use of Sand Fencing



Sand fences are used worldwide in beach and dune erosion control efforts. The fencing ideally requires 40% to 50% porosity for optimum sand accumulation. Typically, wood slat snow fencing is used. Plastic snow

fencing has also been used, but it tends to be more prone to vandalism, and decays more readily due to ultraviolet radiation, wind and wave damage.

The basic premise behind the use of sand fencing is that it slows onshore wind velocities, thus allowing sand to collect behind the fence. The general "rule of thumb" is that all significant sand deposition will occur in an area behind the fence measuring about eight times the height of the fence (Carter, 1993—see diagram). For a typical one metre high fence, then, one should expect sand accumulations as far back as eight metres behind (or leeward of) the fence.

Special points of interest:

- Plants used for dune restoration should be harvested locally from existing dunes and transplanted to the area being restored.
- Harvesting and planting should be done in late fall, once the dune grasses are dormant.

The wood slat fence should be installed with 7 foot long "T" rails, or similar post, driven approximately 3' into the sand. The posts should stand about the same height as the fencing. The fence is fastened to the windward side of the posts with galvanized wire. Posts are spaced in 3 metre spacings.

Sand fencing can be left up year round, but where it becomes an obstruction during the summer season, it is probably desirable to remove the fencing during this time. This is quite acceptable since the high winds, and sand erosion, usually occur in the off-season. It is important, though, that the fencing be re-established by early-autumn. If sand fencing is used, it should be installed no later than the Thanksgiving Day weekend in mid-October, prior to the fall storm season. It should not be removed prior to the Victoria weekend as lake winds in April and early May can be quite strong and

Sand fencing is very useful for the short-term control of wind blown sand. Wood slat fencing can be obtained from local Co-ops. For effective erosion control and sand stabilization, fencing is usually used in combination with dune grass planting.

move a lot of sand.

Sand fencing can be quite effective at controlling sand accumulations and keeping sand on the beach. To minimize the depth of accumulations at one location, fencing can be gradually moved shoreward as accumulations develop. In doing this, one must be cognizant of the fact that lake level fluctuations like storm surge will occur and the location and placement of fencing must anticipate how far wave action will advance up the beach (towards the dunes), dictating where the fencing should be placed.

Special points of interest:

- Dune grass can be carefully harvested locally to restore dunes.
- Harvest in fall for best success.
- Maram grass builds and stabilizes dunes, regenerates naturally and provides a long term solution to controlling blowing sand.

While sand fencing is useful initially for accumulating sand, the accumulations are loose sand particles still vulnerable to wind erosion. In most cases of beach and dune restoration and erosion control, sand fencing is used in combination with planting dune vegetation. Fencing acts as a temporary barrier for accumulating sand, but it is the dune vegetation that provides the structure and stability of the dune over time. Generally, sand fencing is used in the first two to three years of a restoration project, until the dune vegetation has become well enough established to function as the primary sand trapping mechanism. In a planting program, the fence also aids with keeping people off the planted area.

Beachgrass Planting

Dune vegetation offers longer term beach-dune 'stabilization' than sand fencing. It functions in the same capacity as sand fencing in slowing wind velocities and allowing wind borne sand particles to collect. Their growth produces a surface roughness which decreases the wind velocity near the ground, and reduces wind erosion at the sand surface. The plant stems and leaves above the sand surface greatly interfere with sand movement by saltation and surface creep (Woodhouse, 1978). It also, by its massive root structure, gives the developing dune some structure. Dune vegetation is also able to regenerate naturally, providing a permanent cover and requiring no ongoing maintenance.

American Beachgrass (Marram grass) is the most commonly used dune species in dune restoration in North America, but its applicability is limited to areas where relatively large amounts of sand accumulation are expected (e.g. beach and foredune). The Beachgrass

cover will continue to trap sand even as it gets buried with sand, as the plants are stimulated to grow by the deposition of sand around them.

Plants used for dune restoration should be harvested locally from existing dunes and transplanted to the area being restored. Instructions on how to harvest and transplant are in Appendix C. Harvesting and planting should be done during fall. Harvesting along the foredune of adjacent dunes should be targeted to obtain source material needed for site restoration. Plant harvesting should be done with care. Plants should be harvested randomly and sporadically through the source population, so that the issue of over-harvesting leading to a wind erosion situation is avoided.

Plants should be dug up, separated and placed in garbage bags. The plants should be kept in a cool, dark location until they are required for transplanting. Dug plants should be stored no longer than 5 days.

When planting, spacing should be 30 centimetres apart.

Dune restoration planting is typically recommended for late autumn, once the plants are in their dormant state. Fall planting increases the survival of these plants dramatically because they are planted into cool, moist sand, have the following moisture-rich spring to begin establishing roots, and are in a much better state to withstand the rigours of the hot, dry summer ahead. Spring planting is possible, but the success rate drops by 25% or more.

It typically takes a species like Marram grass about three to four years to become fully established and begin to fill in the planted area.

American Beachgrass or "Marram" grass is one of the key dune plants on the Great Lakes. It is used in restoration and sand management projects.

(B) Invasive Species

Open beaches and dunes can be affected by alien invasive plant species that can pose a real problem for local ecosystems and overall beach health. Invasive species tend to intrude into natural areas and overtake native plant populations. Invasive species are opportunistic and usually move in when an opening has been made available. Often a human disturbance, like the removal of large amounts of native vegetation (e.g. during construction, landscape alteration), can provide the opening necessary for an invasive plant to take hold. One of the characteristics that make these species such a problem is their high capacity to reproduce. This helps the plant to overtake native populations and eventually form a monoculture of the invasive plant. Invasive species like Garlic Mustard has the capacity to emit a chemical toxin from its roots that acts to stunt the growth of trees and other plants. This helps it to expand its range, but can be very destructive to the ecosystems it is overtaking.

Control of invasive plants can be difficult, but the effort usually pays off. Taking no action could jeopardize the very environment we enjoy. Since coastal dune plant communities are often high in diversity, and contain a number of rare plant species, keeping vigilance over invasive species is important. Control measures are often different for different invasive plants. It is important to use tested and proven techniques to ensure that control efforts are successful and not made worse by poor information, or a lack of understanding of the plant's ecology.

Common Reed (*Phragmites australis*)

The recent invasion of Common Reed (*Phragmites australis*) on area beaches has posed concerns. The reed, which can grow up to three metres or more in height, first appeared on Huron-Kinloss beaches between 2003-2005. It began growing in wet swales between the foredune and the lake. Below average lake levels helped produce the conditions that made this environment open and attractive for this plant to invade.

The decaying plant material, especially roots, will reduce the pore structure of the sand and reduce the ability of beach sand

to transmit groundwater. As a result the flow of shallow groundwater below the beach will be impeded and the water table will rise. As the water table moves closer to the ground surface, the beach becomes wetter, and enables other invasive species to take root.

Contaminants from septic systems will flow towards the shoreline. The reduced permeability of the sand and corresponding rising water table will increase the risk of contaminants discharging onto the beach. The wet beaches can be affected by pollution from geese, gulls or nearby septic systems. So, expansive invasions by alien plants like Common Reed are not only a concern to local ecology, but their potential to contribute to beach impairment by pathogens.

In controlling invasive plants, it is important to be able to distinguish the invasive non-native plant from the native plants that are important to the health of our coastal ecosystem. A plant species identification guide to help people identify the invasive plants from the beneficial ones, is located in Appendix D. The plant identification guide lists a few plant species. If you are unsure if a plant is native or an invasive non-native, it is best to leave it alone until it can be accurately identified. Three key invasive plants are a problem in Huron-Kinloss' dunes and interior woodlands at the present time. The list of invasive plants may grow over time, so this section should be updated periodically to assist Township staff and residents to deal with these plants. Rapid response is important and the knowledge of how to deal with invasive species is crucial. Each plant has its own ecological characteristics which need to be understood before a control program is undertaken. Invasive species control methods for Common Reed, Garlic Mustard and Spotted Knapweed are provided in Appendix A.

Common Reed

Nearshore Water Quality

Nearshore water quality has become a concern along the shores of Huron-Kinloss in recent years. Water testing data have shown that nutrients and pathogens periodically show up in high numbers. The Grey Bruce Health Unit tests beaches for public health purposes. Until 2005, the Grey Bruce Health Unit had only one sample point in Huron-Kinloss. Sample records are available for the Lighthouse Beach at Point Clark since the early 1990s. In 2005, the Township paid the Health Unit to expand its beach testing to include Lurgan and Boiler Beaches. In the summers of 2005 and 2006, Lurgan and Boiler Beach were posted for high *E. coli*. Lighthouse Beach was also posted for a two week period in the summer of 2006. It became apparent that increased testing was identifying periods of potential risk to swimmers.

Local residents had suspected poor water quality prior to the enhanced testing. In Lurgan Beach, for example, observations of decaying masses of algae and discoloured water raised concerns about the quality of nearshore waters. In 2000, the Ontarioo Ministry of the Environment investigated concerns related to algae masses and a suspected fish kill in Clark's Creek.

In addition to the Health Unit testing, the Township of Huron-Kinloss has two surface water quality monitoring programs in place. The Pine River water quality monitoring program was initiated in June 2001 at twenty-six locations throughout the Pine River watershed. Six lake sites were included in this program. The second program, the Point Clark Water Quality Monitoring Program, was initiated

in 1998. The purpose of this program is to build a database of information that can be used to detect long-term trends in water quality, in relation to development using septic systems in the lakeshore area. These two testing programs are not intended for public health purposes. The data is intended for noting trends in the quality of local surface waters.

To date, the data indicate that bacterial pollution along Huron-Kinloss beaches is variable, while nitrate and phosphorous are trending upward. It is unusual for a municipality to undertake a surface water testing program of this kind, however, Huron-Kinloss has taken a proactive role in gaining a better understanding of the scope and magnitude of surface water impairments within the municipality.

There are several causes of water impairments in Huron-Kinloss. In summary, these include

- Intensive cottage development along the lakeshore;
- Intensive agriculture;
- Waterfowl resting on area beaches;
- Impaired water coming in from outside of the township through alongshore currents.

(i) Development

The large expanses of sand deposits have given rise to an extensive cottage community along the shores of Huron-Kinloss. These relatively flat, well drained sandy soils with a shallow water table provide ideal conditions for the transport of nitrate and bacteria to groundwater, and in turn, enhance the preservation of nitrate once it reaches the groundwater (McLellan, 2000). Development in the lakeshore area handles human waste exclusively through the use of private sewage disposal systems. While such systems can be very effective at treating sewage, they are notoriously under-managed by their owners, sometimes leading to system failure. Some owners wait for signs of failure before they react to a system failure. However, systems in sandy soil environments, such as those along the lakeshore, do not typically produce the clues that systems in other soils may provide.

Since sewage disposal systems are underground, they are often forgotten. Systems typically have a life span of about 25 years, depending on the amount of use. Regular maintenance is necessary to reach the full life expectancy. Many systems along the lakeshore of Huron-Kinloss are older than 25 years and may be approaching the end of their lifespan.

In a study conducted by the Township in the mid 1990s, the lakeshore area was determined to have a population of 3041, with 680 of those being permanent residents. There were 2271 lots on record, with 1811 built on (80%), and 460 lots vacant. With 1,027 septic systems installed since 1971, that leaves a total of 784 properties with septic systems older than 25 years old (B.M. Ross, 1997). This study makes it apparent that faulty sewage disposal systems may be a source of pollutants getting to the nearshore through shallow groundwater. Septic systems maintenance will be critical to minimizing local sources of pollution to our nearshore waters.

Another source of nutrients associated with lakeshore development can come from the application of lawn and garden fertilizers, which in a sand environment, has ready access to the shallow groundwater table. Reducing or eliminating the use of fertilizers,

and encouraging the establishment of native species would be beneficial to the health of the lake. As discussed earlier, human activities that degrade the beach and dune system can impact public health.

Special points of interest:

- Only 6% of Huron township is forested. Our remaining water purifying woodlands are gradually being lost to development.
- The sandy soiled lakeshore area is vulnerable to polluted runoff (fertilizers and pesticides) and discharges (faulty septic systems).

(ii) Agriculture

The landscape of Huron-Kinloss is dominated by agriculture. The amount of forest cleared for agricultural production exceeds 90%. The surrounding Saugeen River watershed has a forest cover of around 30%, while the Pine River watershed has a forest cover of about 6%. The relative lack of forest cover corresponds with a relative lack of buffering capacity, or natural ability to filter pollutants from surface water runoff.

Similar in function to wetlands as water purifiers, woodlands play a significant role in keeping our waters clean. These woodlands are essential in filtering out nutrients from farmland and development runoff, pesticides, pathogens and excessive sedimentation. At the landscape level, Huron-Kinloss is particularly vulnerable to surface water impairments due to this lack of filtering capacity. The only remaining forested lands of size are those along the lakeshore.

In addition to landscape change, agriculture has become more industrialized, with Intensive Livestock Operations (ILOs) forming within the township. Modest efforts are being undertaken by the Pine River Watershed Improvement Network to encourage conservation farm practices and the development of vegetated buffers around watercourses. Greater adoption of such measures will help to attenuate the contributions of water impairments by the agricultural sector.

(iii) Waterfowl

Gulls are a common sight along our beaches, and on occasion they arrive in numbers where they may contribute to water impairments. However, they probably play a more important role in cleaning our beaches of rotting fish and other animals that wash ashore from time to time. They become a nuisance when people feed these birds food that is not typically in their diet. In some areas of Lake Huron, the birds have become dependent on feeding on human food. Aside from the health issues affecting the birds themselves, large numbers of these birds attracted by human activity can also pose a public health risk to humans through excessive amounts of excrement within the beach area.

More problematic in Huron-Kinloss has been large numbers of Canada Geese congregating along beaches. Small colonies have been reported to have taken residence just to the south of Point Clark. The temperate-breeding Canada Goose population in Ontario has been growing by about 12% annually since the early 1970s. Starting from a few small centers of population in southwestern and southeastern Ontario, these geese have expanded their breeding range and can now be found throughout southern Ontario. The total population size this spring is estimated at 550,000 geese. This figure does not include the northern migrant Canada geese that pass through in spring and fall.

It appears that the Lake Huron region is an area in which local breeding populations have recently become established and are increasing rapidly. If the local population at Point Clark is growing at a rate of 12% per year, the number of geese can be expected to double every 6-7 years. The Canadian Wildlife Service encourages all municipalities to begin taking action to control population growth. Possible actions include: modify habitats (in parks etc.) to make them less attractive to geese; and, discourage feeding of geese among other things (Hughes, J., CWS, personal communication, 2007).

Canada Geese are grazers and are particularly attracted to turfgrass lawns. Landowners can prevent this grazing by replacing turf grass with native shoreline vegetation. In sandy shore areas like Huron-Kinloss, replacing turf lawns with dune vegetation is ideal, as geese are not attracted to dune grasses and other dune plants. In other coastal areas, planting native trees and shrubs can help act as a deterrent by disrupting take-off and landing opportunities. In more problematic areas, other options, like overhead netting, may be a solution, but this would need to be discussed with officials with the Canadian Wildlife Service.

(iv) Lake Conditions

Special points of interest:

- E. coli bacteria can remain dormant in nearshore sands for up to one year.
- Storm waves can churn up the sand and re-suspend the bacteria into the water column.
- Health Units typically advise not to swim when nearshore waters have been stirred by a recent storm.

A beach study, undertaken by the Ontario Ministry of the Environment in 1984 along Lake Huron, found a high correlation between beach bacterial levels and lake roughness. On rough days when the beach waters were turbid, bacterial levels tended to be elevated. Under calm-water conditions, bacterial levels were normally low.

Besides water turbidity, runoff was another important factor in elevated bacterial levels as the bacterial load to Lake Huron increased significantly during major rainfall events (MOE, 1984).

Other factors included: winds, which can result in the re-suspension of bacteria-rich bottom sediments; wind direction can direct contaminated river water onto beaches; sunlight can be significant as ultraviolet light can reduce bacterial levels — at times when bacterial levels were decreasing, daily hours of direct sunlight tended to be greater; and water temperature can affect the survival rates of various types of bacteria, as well as affect beach usage. Warmer water can enhance survival rates and the amount of beach usage by people. Cold water has the opposite effects.

The local health unit is promoting greater awareness of how certain lake conditions can pose a risk to public health. The nearshore waters under rough conditions, or after heavy rains, can have elevated bacteria levels. They advise swimming when the lake is relatively calm and the water is clear. People most at risk to swimming in impaired water are children, the elderly and those with compromised immune systems.

(v) Algae

Concerns of nutrient enrichment and algal growth in the Great Lakes have

been high for the past three decades. Between 1978 and 1981, the Ministry of Environment undertook a baseline investigation of *Cladophora* growth in the nearshore waters of Lake Huron to gain a better understanding of the sensitivity of Lake Huron to *Cladophora* in the presence of phosphorous inputs. The investigation focused on Goderich, south of the Maitland River mouth, and the Bruce Nuclear Power Development (BNPD) area, including Inverhuron. Another study area included the nearshore waters of southern Georgian Bay (Nottawasaga Bay). Much of the area was characterized by the presence of a rocky lakebed, which is considered to be good substrate for the growth of the potentially nuisance aquatic algae, *Cladophora.* It was

roughly estimated that over 70% of the nearshore area (within the 10 meter contour) of Lake Huron, from Sarnia to Tobermory, provides suitable substrate for *Cladophora* growth (MOE, 1982).

On one occasion in 1978, sloughed *Cladophora* fouled approximately 10 kilometers of Lake Huron shoreline in the vicinity of Goderich. During this time, average total phosphorous concentrations at 9 stations along the southeastern shores of Lake Huron were averaging 0.022 mg/L, slightly higher than the Provincial Water Quality Objectives of 0.02 mg/L (MOE, 1982). In more recent years, the Town of Goderich has been faced with removing truck loads of algae from its beaches. In 2001 and 2002 in particular, the Town would routinely remove 4 to 6 gravel truck loads of algae 2 to 3 days a week for the entire summer period (June to September). Prior to 2001, algae on the beach had been a modest problem with removal of light amounts once per month or once every two weeks.

In 2000, an incident was reported to the Ministry of the Environment involving Clark's Creek in Huron-Kinloss. In that incident, floating black masses of rotting algae were observed at the creek mouth, along with dead fish. This suggested that the oxygen levels at the creek mouth at that time were sufficiently low in oxygen to harm aquatic life.

Nutrients like phosphorous and nitrogen, along with suitable lakeshore conditions can lead to excessive algal growth and ultimately algal fouling of beaches. Efforts to minimize the amount of these nutrients from entering into local waterways and to the lake will help to mitigate this problem in Huron-Kinloss (Lake Huron Centre for Coastal

Lurgan Beach 2007

The Kincardine INDEPENDENT HURON-KINLOSS THIS WEEK

Page 8 Wednesday, September 21, 2005

Algae problem along the shore continues to grow

By Darrell Ziegler

Cottagers from Grand Bend to Kincardine are concerned over an increase in algae in Lake Huron.

John Welwood, a property owner in Huron-Kinloss says, "without question, the algae is getting worse."

Welwood, interviewed recently, says that since 1994, he has seen the amount of rotting algae increase. "Sand that was once pristine and firm now has soft, rotting algae mixed in with it," he says.

He sees a "reluctance by the provincial ministries in charge to mention agriculture as part of the problem. Cottagers take the blame while factory farming gets little focus."

He also sees a reluctance by the Ontario ministry of the environment to even admit there is a trend toward more algae in the area. "The ministry and various levels of government say it's not getting worse. They say there are merely spikes in nutrient levels, causing an increase in algae growth."

Another concern is with testing times. Welwood says testing of bacteria levels in near shore water is done only during the summer months, not during the spring and fall when farm run-off is high, leaving inaccurate data as to potential sources of the nutrients.

In an interview, Geoff Peach of the Lake Huron Centre for Coastal Conservation says excess nutrients often come from agricultural run-off and poorly-operating septic systems.

The two things affecting near-shore water quality are nutrient enrichment and the presence of pathogens. Pathogens are small micro-organisms, including E. coli.

Excess nutrients result in elevated algae growth. This growth, or algae blooms, can result in fish kills from a lack of oxygen and can cause a bad taste and odour problems.

The centre's web site says manure is a major concern to water quality in the area; "Manure is a source of nutrients and is useful as fertilizer, but if improperly applied, few of those nutrients will be retained by the crops. Instead they will end up being washed off the field by rain and end up in the lake. Manure is a source of bacteria and pathogens that can have a negative effect on human health."

Peach says the health risks associated with swimming in water with high levels of coliforms are usually limited to minor skin, ear, eye, nose and throat infections and stomach disorders. The risks increase for those with under-developed or suppressed immune systems, (small children and the elderly).

Huron-Kinloss sees three beaches closed

ELYSE DeBRUYN
KINCARDINE NEWS STAFF

Decomposing algae is not something beach goers want to see - or smell - but low water levels have made this problem unavoidable.

Three beaches in Huron-Kinloss Township were closed last week after Grey Bruce Public Health did routine sampling and surveying. Staff observed "rotting algae-like substances" near the shores.

As a result, the near shore water is cloudy, murky and has a foul odour. The Ministry of the Environment (MOE) has inspected the shorelines and has confirmed the cause is due to lake algae.

The Point Clark beach, Lurgan Beach and Conc. 6 beach were all closed with an unsafe bathing sign immediately posted.

Health protection manager Lou D'Alessandro said three combined factors are the cause of the problem.

The first being an invasive species known as zebra mussels. These creatures are filters for Lake Huron, as they eat plankton then redistribute nutrients to algae. This makes the water clearer. Add in the lower water levels and sunlight is allowed to penetrate deeper into the water, raising the temperature. This helps algae grow.

D'Alessandro said Cladophora and Chara are two distinct substances and their presence can be a cause, among others, to the low water levels.

Cladophora blooms in high phosphorous levels in the water. High phosphorous levels result from an increase in fertilizer from many sources including birds, agricultural run off or poorly treated septic systems.

"Add phosphorous to the fertilizers and you have a perfect garden for the lake," D'Alessandro said.

See 'Closures' on Page 3

Bruce Beach 2007

Conservation, 2004).

Different types of algae known as *Charophytes* have begun showing up on beaches in recent years. *Charophytes* have a different ecology than *Chladophora*, and why this type of algae is becoming more prevalent is currently not known to researchers. More research is needed to understand this issue better, in order to have an effective understanding of how to manage the problem.

(vi) Effects of Local Shoreline Modifications

Modifications made to the lakeshore that alter shore processes can affect the health of beaches and the nearshore. In the early 1960s, when Lake Huron experienced the lowest levels on record, the nearshore area was much shallower. Some cottagers south of the lighthouse at Point Clark, and at Boiler Beach found the nearshore stony and endeavoured to clear the rocks to one side in order to have better swimming or boating access. The result was the development of a succession of rock groynes reaching perpendicular into the water from the shoreline. Subsequent lake levels, during the 1970s, 80s and 90s were above average, and so the groynes became all or partly submerged. When levels dropped in the late 1990s, local residents began to notice algae and other organic material collecting between the groynes, particularly during the summer season when storms were less and algae growth was more prevalent.

The prolonged period of below average lake levels since 1999 have exposed the groynes. This has created a series of small embayments between the groynes where water can stagnate and collect organic material which, in turn, decomposes. The rotting organic material can produce unpleasant odours.

These conditions have led local residents to request that the groynes be removed, or modified to allow water circulation. Government agencies regulating nearshore activities require a study by a coastal engineer or geomorphologist. While these groynes should never have been permitted, they serve to show what negative effects lakeshore modifications can have on the quality of our beaches.

(vii) External Influences

The movement of pollutants does not stop at the township boundaries. Water impairments from areas outside of the municipality can influence our local beaches. Nearshore currents can carry pollutants originating north or south of the township's

borders.

The predominant wave direction on Lake Huron is from the northwest (Reinders, 1989). This sets up an alongshore current that moves nearshore sands, on a net basis, from north to south. During summer months, when winds and waves tend to come from the southwest, the alongshore current can move sand northward. Alongshore currents and the resulting sand movement will have an influence on the movement of pollutants entering the nearshore waters of the lake, particularly those pollutants that become attached to sand particles and move along the shoreline with the longshore drift. These alongshore currents can also form barrier beaches across the mouths of creeks and small watercourses causing a temporary damming and stagnation of the creek or river mouth (estuary).

Nearshore pollution issues extend beyond the direct control of Huron-Kinloss. The Township and its residents have an important role in safeguarding our nearshore waters. However, due to the nature of the lakeshore, and external sources of pollutants that can contribute to beach impairment, it is important that higher levels of government participate in funding clean up and stewardship efforts that help to improve the quality of Lake Huron's beaches.

Map shows the major watersheds along the southeastern shore of Lake Huron. Waters draining from these watersheds can influence the quality of nearshore waters.

What Can Be Done?

Best Stewardship Practices

To help improve local beach and nearshore water quality

(a) Waterfowl

Waterbirds like gulls and Canada Geese can become a nuisance if they have access to human garbage, or are fed by people tossing bread, or other food inappropriate to the birds' diet. It is important that people DO NOT feed these birds, and that garbage be managed appropriately to ensure the birds do not have access.

While these are key first steps to controlling waterbird populations, there may be a need to consider additional solutions to discourage Canada Geese from a lakeside property. Timely and careful attention to deterrent techniques may be enough to encourage geese to nest elsewhere. Take the time to identify potential nesting and rearing sites on the property, and prepare to discourage the

birds as soon as they arrive – as early as February. Monitor potential sites for newly arriving birds and act immediately. The birds are extremely reluctant to move on once they have begun moulting their flight feathers, in early June.

In the long term, attractive nesting and rearing habitat will continue to draw geese each year. Habitat modification may be necessary, along with seasonal deterrence, to discourage the geese more effectively over time.

The Canadian Wildlife Service advises that if geese successfully establish a nest, do not destroy the nest. Not only is it is illegal to do so, the geese will very likely rebuild another nearby.

Reduce the attractiveness of the site for breeding Canada Geese. Expanses of turf grass near the water provide ideal goose habitat. Canada Geese are grazers and eat mainly short grasses such as those found in lawns, parks and golf courses. They do not graze on native dune grasses, so re-establishing dune grasses and other native plants would eliminate a food source for the geese, and enhance the health of the beach.

Geese also prefer good visibility to detect predators. They feed in open areas with clear flight access to ponds, lakes or marshes. More information on the series of

techniques available to deter geese can be found in the Canadian Wildlife Service brochure entitled "*Canada Geese in Southern Ontario – seasonal deterrent techniques for lakeside home and cottage owners."*

(b) Septic System maintenance

Faulty septic systems can contribute both nutrients and pathogens to the shallow groundwater table which flows toward the lake. Therefore local systems can, and likely are, contributing to local water quality impairment in the lake. Not only can septic system failure be highly polluting, it can be expensive to fix. In addition, new regulations and higher standards may mean that the system may have to be replaced instead of repaired or upgraded.

- Make sure your septic system is large enough to meet your needs. Look for ways to reduce the amount of wastewater that enters the septic system.
- Protect your health and the quality of Lake Huron's nearshore waters water by disposing of contaminants properly. Do not put toxic chemicals into your septic tank. Never flush pharmaceuticals into your septic system. Scientists are finding trace amounts of pharmaceuticals in the Great Lakes.
- Keep your septic system in good repair. Pump the septic tank out regularly (every 3-5 years minimum). Repair leaks to your plumbing so that excessive amounts of water are not overtaxing your septic system.
- Keep an up-to-date maintenance record of your system.

For more information on septic systems, contact the Grey Bruce Health Unit in Owen Sound at (519) 376-9420.

(c) Algae Management

While algae is a normal, natural occurrence along Great Lakes beaches, excessive amounts are not. Large outbreaks of algae should be reported to the Ontario Ministry of the Environment in Owen Sound (1-800-265-3783). The massive wash-ups of algae onto a beach can impair the sight and smell of the beach and may necessitate the material being cleaned up. The material can be bagged and arrangements should be made with the municipality to pick up the material for compost. Care should be taken when removing the algae to ensure that as little sand is removed as possible. If mechanized removal is approved, the same protocol for the use of vehicles on the beach, as discussed earlier in this guide, should be used.

No attempt should be made to remove algae from the lake bottom without consulting the Ministry of Natural Resources, Owen Sound at (519) 376-3860.

Longer term solutions will require substantial efforts to reduce the amounts of nutrients getting to the nearshore and contributing to algae outbreaks. Watershed efforts will be needed to address land management issues comprehensively.

Small amounts of algae can occur from time to time, but should not typically pose a problem, and should disappear following a storm. As well, small amounts of organic material usually form a strand line on the beach, particularly after a storm. The material in the strand line is important to the ecology of the beach, providing habitat for various invertebrates, and nutrients for beach and dune plants. The strand line should not be disturbed.

(d) Fish and Bird Die-offs

Since 1999, incidences of fish and bird die-offs have occurred, where large numbers of fish and water birds, like gulls, loons and ducks have appeared dead, or dying, on area beaches. This has not only occurred on Lake Huron, but the other Great Lakes as well.

Typically beginning in late summer and extending through the fall, these deaths have been attributed to “Avian Botulism”. The botulism poison works its way up the food chain. The bacterium *Clostridium botulinum* Type E, is found in bottom mud, in aquatic invertebrates, and in the digestive systems of fish taken from Lakes Michigan and Huron. Fish ingest the bacterium, either directly from bottom mud, or from eating invertebrates that live in the mud. The carcasses of dead fish provide a perfect medium for the growth of the bacterium which produces the toxin. Birds and mammals become poisoned by feeding from these dead fish.

Animals affected by botulism exhibit a loss of strength due to muscular paralysis. The degree of paralysis is related to the amount of toxin consumed, and time of exposure. Death is attributed to paralysis of respiratory muscles, or in the case of birds on the water, to drowning from not being able to hold their heads above water.

Zebra Mussels and Round Goby are suspects in this die-off phenomenon. It appears that the Zebra Mussels accumulate the botulism bacteria by filtering it, and the Gobies eat the mussels. Eighty percent of the Goby diet is Zebra Mussels. Since their introduction into Lake Huron in the late 1990s, Gobies have displaced some species of native prey fish, and water birds are now feeding on the Gobies.

While Type E botulism can pose a serious threat to water bird populations, it poses

little public health concern, since fish-eating birds are not normally eaten by people, and thorough cooking destroys the toxin.

If you find dead fish or birds along your shoreline, the Ministry of Natural Resources is advising that they be buried. Gloves should be worn if you intend to handle the carcass. Hands should be washed thoroughly with soap and water after handling the carcasses.

Reporting dead or dying birds should be made to the Canadian Wildlife Service, the lead agency regarding migratory water birds, at (519) 472-6695. Calls may also be made to MNR's Upper Great Lakes Management Unit at (519) 371-0420.

(e) Landscaping

As more development occurs along the lakeshore, more of our natural woodland setting and native species are being lost. Endemic (native) plants are being replaced with lawns and gardens, comprised primarily of non-native species. This ‘urbanization’ of the shoreline is occurring with significant costs to the coastal ecosystem. These non-native plants are “high maintenance” and usually require substantial support systems to keep them alive. These support systems, in the form of fertilizers, pesticides and large additions of water, place considerable strain on the environment. These problems can be avoided entirely if we adopt native plants into our landscaping.

Native, or endemic, plants are plants that have evolved in a particular region over many thousands of years. Therefore, they have adapted to the climate, geography and animal populations of the region. Native plants provide habitat to and are a source of food for animals, such as songbirds, butterflies and mammals.

Native landscaping is an effort to re-establish native plant populations to a certain area, whether it be as small as your backyard or as large as a nature trail or park. Some benefits of planting native plants include:

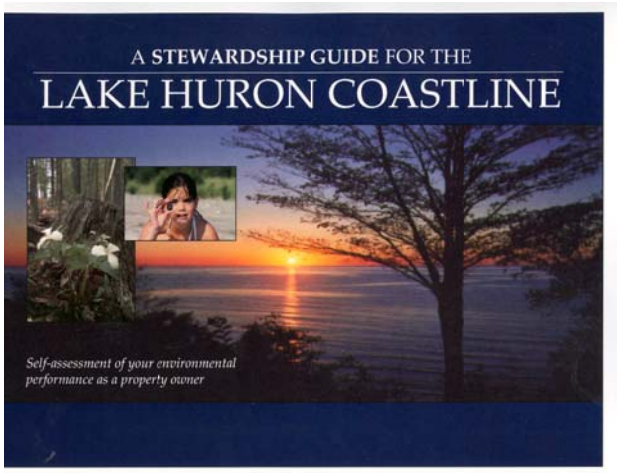
- Native plants do not need fertilizer or irrigation.
- They attract beneficial insects which prey upon pests, eliminating the need for pesticides.
- Native plants reduce air pollution, improve water quality and reduce soil erosion.
- Native vegetation, unlike cultivated landscapes, does not require the use. of lawn maintenance equipment (a major contributor to air pollution and another source of climate change gases.

- They improve water quality by filtering contaminated runoff, and reduce soil erosion by stabilizing soils with their deep root systems.

Naturalization and the use of native dune species is a very important consideration for lakefront landowners. Non-native plants can migrate from gardens and properties and end up invading beach and dune systems, sometimes altering their ecology and changing the nature of the beach. Lakefront landowners should consider establishing a naturalized buffer between the beach-dune system and their managed landscape.

(f) Stewardship Guide for the Lake Huron Coastline

A tool for use by individual cottagers is the "*Stewardship Guide for the Lake Huron Coastline*". This self-assessment workbook helps individual cottagers identify how well they protect the local environment, and where they could make improvements. The manual also encourages the landowner to develop an "action plan" that sets out personal targets that they propose to meet. Resource contacts are provided in this guide for specific topics, if more information or assistance is required. The guide is distributed at workshops organized for groups or organizations who request them. If you would like to have a workshop set up in your area, or would like to participate in one, contact the Lake Huron Centre for Coastal Conservation at (519) 523-4478.



A self-assessment guide for lakeshore residents has been developed to help land owners to conduct a self-guided evaluation to see how well they carry out environmental stewardship. Contact the Coastal Centre for more information (519) 523-4478.

Communicating the Importance of Beach Stewardship

The long-term success of any beach-dune conservation initiative involves a concerted effort to educate and build awareness of the importance and vulnerability of beach-dune systems. Beach stewardship is not solely the responsibility of the Township, but rather, is the combined responsibility of the Township, lakeshore residents, as well as visitors to this area. The health of our beaches, and their ability to provide the ecosystem services described in this guide, are elements that our community needs to protect for future generations.

Our beach and dune ecosystems are part of our common heritage. A co-operative community–based approach to beach stewardship will be necessary if we wish to maintain the ecological benefits currently provided by Huron-Kinloss' lakeshore. To do this, an informed and engaged lakeshore community is needed. Creating awareness and encouraging involvement is accomplished through education.

Education comes in many forms, and involves every aspect of the community (not just local residents but all those who visit Huron-Kinloss' beaches). A variety of approaches are provided here. No single approach is sufficient, but rather, using a number of approaches is best when trying to engage as many people as possible.

Some key messages for use in public communication and awareness:

- Our beach and dune systems are a common heritage.
- Great Lakes dunes are rare, and vulnerable to human disturbances.
- Our beaches and dunes provide important ecological services, including: (i) habitat for rare species, (ii) a repository of sand that preserves beaches during high lake and storm events, (iii) preventing the degradation of beaches leading to increased exposure to organisms that can make people sick.
- With a focus on stewardship and a knowledge of how the beach ecosystem works, people can live in harmony with beaches and dunes.

Communication is a first step toward making the necessary changes in attitudes and behaviour that will ensure that Huron-Kinloss' lakeshore community takes the path towards an ecologically healthy beach system into the future. The lakeshore community is changing. Lakeshore development is intensifying; there are many more

first-time cottagers who may not be as familiar with the nature of the lake and its ecology. Stewardship communication and education will be increasingly important, and will need to be a sustained effort well into the future.

Youth Education

Formal education in local schools can help a new generation understand and appreciate the lakeshore from an environmental perspective. The Coastal Centre has developed an educational resources kit for elementary schools on Lake Huron's beach and dune ecosystems that contains resources and activities for learning about this coastal environment. It emphasizes field experience where students utilize the dunes as a "living laboratory", learning about species identification, ecological succession and the sensitivities of the dune environment. Involving students in beachgrass planting is a good way to enrich their learning experience outside of the classroom.

Locally, the Blair's Grove Nature Trail in the Lurgan-Blair's Grove area, is an excellent outdoor classroom for learning about dune ecology. This 25 acre Township park was developed as a nature trail in the 1990s. The vegetation communities are particularly rare and significant. In addition to rare dune grasses and flowers, the park has an oak savannah, which is more typical of a southern plant range. This treasure in Huron-Kinloss should be managed with care, and promoted to local schools as an outdoor education opportunity.

In a less formal educational setting, parents and grandparents have a critical responsibility to educate younger family members on how to become coastal stewards and care for the beach. They can start by educating about the environmental care of their own cottage property, and continue with educating about the best practices for beach stewardship.

General Education

Huron-Kinloss has been entrusted with a beautiful and unique coastline. Its coastal ecosystem is also vulnerable to human related activities. Building a greater understanding and awareness of the local lakeshore environment, in the context of the broader Lake Huron coastline, will be important to the long term health of our beaches. Educational literature is an effective way to get information out to the public. While this guide serves as an educational tool, the detailed content may not appeal to some.

Tabloids, brochures and factsheets are important, user-friendly methods of distributing key messages to the public. Circulation of this information should not be considered a one time proposition, but rather an ongoing commitment by the municipality and local Beach Associations.

Public **workshops and presentations** are also effective methods of getting relevant information to local residents, and local Beach Associations have a long history of organizing events like this. Local Beach Associations in Huron-Kinloss work cooperatively with each other, and the Township, to discuss issues of common interest and disseminate information among members and the general community.

The Coastal Centre also organizes a one day conference on the coastal environment every even year. At this event, the Centre draws scientists and managers to present current information on the state of the environment and current management approaches to address the issues.

The **internet** is an important way to share information. The municipality and local Beach Associations are encouraged to post beach stewardship information on their websites. The Coastal Centre's website (www.lakehuron.on.ca) is devoted to coastal conservation and stewardship information. The Centre endeavours to communicate the most current, science-based information to the Lake Huron community.

Signs

Educational signs are a useful approach to promote a general awareness of beach and dune processes and the public's role in their conservation. Different types of signs can be used for different purposes. For instance, *information signs* can inform beach users about the fragile nature of the dunes. The Coastal Centre has signs available for use, by the municipality or individual cottage resident, that caution people about the sensitive nature of the dunes, and to take special care not to disturb them. These types of signs are typically placed along the leading edge of a sand dune, or at beach access points.

Interpretive signs provide an excellent educational tool, particularly for visitors to Huron -Kinloss. Interpretive signs provide beach users and other interested people with detailed information about the dunes. These types of signs should describe a unique feature or aspect of the Huron-Kinloss coast, and ask for cooperation in preserving this special environment. Key messages should include:

- The finite nature of the dunes; rare, nationally significant features; fragility and

vulnerability to human disturbances.

- The ecology and rarity of dune plants; sensitivities to human disturbance.
- The need for conservation; take action now to preserve Huron-Kinloss' dunes; healthy beaches = healthy people.

Samples are provided in Appendix E. These types of signs should be placed at primary municipal beach access areas which are typically used by the most people. Vandalism and theft of signs can be a problem in some areas. The Township shoud consider a contingency fund for repair and replacement.

Municipal beach access routes should be clearly marked, both on the beach side, where people walking along the beach have a clearly identified pathway to the interior, and interior markers that identify to users where designated beach access pathways are located.

Interpretive Walks

Interpretive walks can be an effective communications tool, and has been used successfully by community groups in other parts of Lake Huron. Promoting the conservation efforts of Huron-Kinloss beaches could be enhanced by organizing interpretive walks led by knowledgeable individuals within the community. Local volunteers could be trained in conducting educational walks at local beaches to talk to people about the natural attributes of the dunes, their significance locally, regionally and provincially.

Municipal Information

The Township of Huron-Kinloss circulates a newsletter in its tax notices. Beach and dune conservation can be promoted through small articles, or "Did you know?" information segments. In addition, the municipal website would be a useful location for township residents to be able to access pertinent beach and dune conservation information, and link to coast related sites. For example, the Coastal Centre's website contains relevant, up-to-date information on coastal issues and information relevant to Lake Huron.

Summary

Stewardship communication and education needs to be a sustained effort over the long term. The future health of Huron-Kinloss' beaches depend on how well they are cared for. Waterfront users come from a wide spectrum of the community. They include permanent, seasonal and rural residents, as well as visitors from outside of Huron-Kinloss. Communication and education efforts will require a multi-dimensional approach, as discussed in this section. Leadership should come from the municipality and local beach associations to provide opportunities for communication and education on beach stewardship. The Coastal Centre can assist as a resource for information on coastal science and management.

Rules & Regulations along the Lakeshore

A number of agencies administer various rules and regulations that are intended to help protect the Lake Huron shoreline. A list of some of the key agencies is provided in this section, including a brief description and contact information. It is important to contact the appropriate organization(s) prior to undertaking activities which would fall under current rules.

i. Township of Huron Kinloss

Land Use Policies - Zoning Protection for Dunes

"Dynamic Beaches"

In the mid 1990s the Province of Ontario instituted the Provincial Policy Statement (PPS) under the provincial *Planning Act* which included restricting development from areas defined along the Great Lakes as "Dynamic Beach". The PPS was updated in 2005. It recognized that beaches and dunes play important functions, both ecologically and in terms of protecting the shore during high water levels. Municipal Plans and Bylaws have to be consistent with the Provincial Policy Statement.

New development along the shoreline of Huron-Kinloss, under Provincial Policy, have to be located landward of the front dune or "foredune". In addition, development and site alteration are not permitted in areas of significant habitat of endangered species and threatened species. Huron-Kinloss has adopted zoning setbacks in its Comprehensive Zoning By-law that is consistent with the Provincial Policy Statement.

The PPS restricts 'new' development, and is not designed to address dune stewardship, or best management practices, *per se*. The 'dynamic beach' setback is intended to be a hazard setback to protect development from lake effect flooding, erosion and changes to the beach profile. It is not necessarily intended to protect the ecosystem from human disturbances. The stewardship practices outlined in this guide are designed to protect the health of the beach ecosystem and help people adopt practices that protect the lakeshore while permitting the continued enjoyment of our beaches.

The Township manages public walkways to the beach, as well as municipal lands that

form part of a shore road allowance along portions of the waterfront. It also enforces by -laws and policies along the lakeshore, meant to protect the environment and public order. In 2007, the Township signed an agreement with the Ministry of Natural Resources to assume management and enforcement responsibilities over portions of the beach considered to be Crown land. The intent is to reduce jurisdictional overlap, provide timely enforcement of shoreline laws and policies, and implement consistent policy and management approaches.

Township of Huron-Kinloss

P.O. Box 130

Ripley, Ontario

N0G2R0

Phone: (519) 395-3735

Website: www.huronkinloss.com

ii. Saugeen Valley Conservation Authority

Conservation Authority Shoreline Regulations

Ontario's Conservation Authorities were provided new regulations by the Provincial Government in 2006 that extended their regulatory authority to include Great Lakes shorelines. The landward extend of the regulated area will vary depending on the characteristics of the shoreline. For instance, in Huron-Kinloss about 95% of its coastline is considered to be "Dynamic Beach", which simply means that the material that make up the beaches is mainly sands that form beaches and dunes. Along the coast of much of Huron County, the shoreline is composed of clay bluffs, and so an erosion setback is part of the criteria used to establish the regulatory setback there (Along the Huron County coast, this setback can vary from 30m to nearly 100 m, depending on the specific rate of erosion at the site). In parts of Georgian Bay where the shore may be resistant bedrock, a standard flood setback is used (15 m). The setback distance will vary for each of these types of shoreline.

Along dynamic beach shorelines, the setback is based on a combined set of criteria. First the 100 year flood elevation is determined. For the SVCA shoreline, 177.6 m above sea level is the provincially defined 100 year flood elevation. This water elevation does not include wave conditions; in other words, it's under still water conditions as if the lake were dead calm. That forms a contour on the beach that is drawn on the SVCA's mapping from which additional setbacks are measured. From the 100 year flood contour, a 15 metre setback for wave conditions is measured inland. This 15 m is a universally applied standard across the great Lakes. In beach-dune areas where the movement of sand and the beach profile is constantly changing by wind and waves, an additional 30 metres setback is included to compensate for those changes and include a measure of protection to development behind it. (see diagram)

The regulation restricts activities that include development within the regulated area, addition or removal of fill, and any site alteration. This would include dune removal or alteration. If the activity occurred on regulated private lands, the authority could take action. If it occurred on Municipal land or Crown land, the authority would defer action to the municipality and MNR respectively. The matter would be dealt with in Provincial Offences Court.

One can appeal a decision of the authority regarding regulations. It would involve a formal hearing and would be based on the technical merits of the case only.

The regulatory limit extends 5 kilometres offshore, so a permit would be required for nearshore activities like dredging, developing or maintaining a boat slip, building groynes, etc.The regulated area in Huron-Kinloss corresponds with the Dynamic Beach setback identified by the Provincial Policy Statement. The regulations apply to private lands along the waterfront. The setback lines are available for review at the conservation authority or municipal offices. If you are uncertain about whether or not a specific area is regulated, contact Saugeen Conservation. They can conduct a site visit to establish if the regulations apply.

Saugeen Conservation

R.R. 4

Hanover, ON

Phone (519) 364-1255

Website: www.svca.on.ca

iii. Department of Fisheries and Oceans (DFO)

The federal *Fisheries Act* provides for the protection of fish habitat. Under this Act, no one may carry out any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat, unless authorized by the Minister of Fisheries and Oceans Canada. The Act also states that no one is permitted to deposit a deleterious (harmful) substance into water containing fish. Violations to the Fisheries Act can result in substantial fines.

Although water levels on Lake Huron fluctuate, the boundaries of fish habitat, as defined in the *Fisheries Act* within a body of water, do not change. DFO determines the boundary of fish habitat using historical long-term water levels, linking the habitat to the requirements of fish populations throughout their life cycles. This means that the extent of fish habitat is not determined by short-period water level fluctuations. For example, in low gradient shoreline areas (e.g. sand beaches and wetlands) small decreases in water level sustained over a long period of time may result in large distances created between the current water level and the levels that are more indicative of an average year. In low-water years, beaches grow significantly larger and wetland areas flourish with vegetation. The nearshore areas once covered with water will be exposed as "dry" land. As a result, waterfront property owners sometimes propose to fill or excavate within these areas (e.g. shoreline protection works, additions to existing structures, berms, dredging). Although these areas appear to be dry and may have been for a year or more, historical data shows that water levels will rise again and nearshore areas will be re-submerged, providing important spawning, nursery and adult fish habitat. DFO considers these areas to be fish habitat, and they therefore fall under the requirements of the *Fisheries Act*.

Burlington Office
3027 Harvester Road, Suite 304 PO Box 85060
Burlington, ON L7R 4K3

Phone: (905) 639-0188

Website: www.dfo-mpo.gc.ca/regions/central/

iv. Canadian Wildlife Service (CWS)

The Canadian Wildlife Service is responsible for the protection of migratory birds in Canada. Permits are usually required for any control programs involving migratory birds, including gulls and Canada Geese.

P.O. Box 490 Lambeth Station

465 Gideon Dr.

London, ON

N6P 1R1

Website: www.on.ec.gc.ca/wildlife_e.html

v. Ontario Ministry of Natural Resources (MNR)

The *Public Lands Act*

The beds of most lakes, rivers and streams are legally public land in Ontario. A work permit is usually needed before proceeding with any work project involving these areas. Even activities such as dredging and filling, that may occur in nearshore areas of either public or private land, may require a work permit.

The Lakes and Rivers Improvement Act

The Lakes and Rivers Improvement Act gives the Ministry of Natural Resources the mandate to manage water-related activities, particularly in the areas outside the jurisdiction of Conservation Authorities. The purpose of the Act is to manage the use of the waters of the lakes and rivers of Ontario, to regulate improvements in them, and to provide for:

- preserving public rights in or over water;
- protecting the interests of riparian owners;
- management of fish, wildlife and other natural resources dependent on such waters;
- preserving natural amenities; and
- ensuring the suitability of the location and nature of improvements.

1450 7th Ave E.

Owen Sound

N4K 2Z1

Phone: (519) 376-3860

Website: www.mnr.gov.on.ca/MNR

vi. Ontario Ministry of the Environment (MOE)

MOE is responsible for the quality of surface and groundwater in Ontario. Enforcement officers respond to spills or other acute impairments to our surface water. The Ministry also carries out research from time to time to determine the current state of water quality along Lake Huron. A major study on nearshore water quality was completed by the Ministry in 2005 and is available on the Ministry's website.

1580-20th St. E.

Owen Sound, ON

N4K 6H6

Phone: 1-800-265-3783

SPILLS ACTION CENTRE: **1-800-268-6060** (*for environmental emergencies – 24 hour line –this is for severe water impairment problems where a clean-up or investigation may be required. A designated first responder will be sent on-site typically within an hour to confirm the incident. MOE investigators will be called on scene as warranted*)

Website: www.ene.gov.on.ca

vii. Grey Bruce Health Unit

Injury and illness can result from bathing in recreational waters. Provincial regulations and guidelines set out minimum standards to provide clear, clean water and safe conditions for bathers in beach areas. Public health units are responsible for testing public beaches as defined under Ontario's Beach Management Protocol.

Ontario Beaches are posted with warnings of possible health risks when elevated *Escherichia coli* (*E.coli*) densities are present. The recreational water quality guideline of 100 *E.Coli* per 100 ml of water is set jointly by the provincial ministries of

Environment and Health.

E.Coli are bacteria present in the droppings of virtually all warm-blooded animals and are the indicator bacteria for fecal contamination of surface waters.

Generally, it is up to the Medical Officer of Health for the local Health Unit to decide when a beach should be posted. Once a beach has been posted for elevated *E.coli* levels, more frequent water samples are taken by the Health Unit. Beach Postings are removed after *E.coli* levels decrease to acceptable levels.

Water at several beaches in Huron-Kinloss is sampled during the summer months to monitor bacterial levels. Beaches are posted by the Health Unit with warning signs when bacterial levels exceed standards set out by the Ministry of Health or where a risk to health is expected.

Grey Bruce Health Unit

920 - First Ave West

Owen Sound, ON

N4K 4K5

Phone: 1-800-263-3456

Website: www.publichealthgreybruce.on.ca

Sample Location in Huron-Kinloss *(note: contact Health Unit for specific locations or changes to sampling locations)*	**Sampling Frequency**
Boiler Huronville Beach	1X/week
Boiler Concession 12 Beach	1X /week
Poplar Beach	1X /week
Bruce Concession 8 Beach	1X /week
Lurgan Beach	1X/week
Point Clark	1X /week

Conclusion

The Beach Stewardship Guide for Huron-Kinloss provides the essentials for learning about local beach ecology and adopting stewardship practices that will maintain or improve beach health now and into the future.

The Township of Huron-Kinloss has been providing leadership in efforts to address water quality within its jurisdiction. While there is much to do, it has demonstrated commitment to water quality improvement. As discussed in the guide, the Township has been active in collecting water quality information along its beaches and watercourses to better understand the extent of the problem in order to identify sources and target solutions. The Pine River Watershed Improvement Network (Pine River WIN), a group of local citizens representing various interests within the Township, were made a Committee of Council in 2005 to plan strategies for water improvement and work towards implementing programs. In 2007 the municipality began a mandatory septic system inspection program, with the aim of inspecting every septic system in the Township.

The same level of commitment will be needed in pursuing beach stewardship. However, this needs to be a shared responsibility with all Beach Associations and lakeshore residents. The opportunity to make positive environmental progress along the Huron-Kinloss lakeshore is up to those who benefit most from its beaches. This stewardship guide can help make the Huron-Kinloss community an example around Ontario's Great Lakes in taking proactive measures toward securing a positive environmental future for its lakeshore. Healthy beaches also provide an attractive economic setting, particularly where real estate is concerned.

The Township of Huron-Kinloss is encouraged to use this guide as a resource to base policy and operational decisions on coastal science principles. The guide should be used by both Council and staff, and brought forward as Council and Township personnel changes. The Township is also encouraged to make the promotion of waterfront conservation an ongoing, long-term initiative.

Glossary

Aeolian: pertaining to wind.

Alien plants: Exotic plants which are not endemic to the local ecosystem.

Beach Health: term used to describe the ecological condition of a beach and dune system. A 'healthy beach' is one that retains its bio-physical form and function, allowing the beach to respond to changing wind and wave conditions.

Biodiversity: an array of different animals, fish, waterfowl and plants in nature.

Blow-out: a term used to describe that portion of a dune which has become mobile, or active, due to the absence of vegetation to stabilize it. It can be induced by natural processes, but commonly is a result of human impacts.

Climax community: the community of plants which is the last stage in a succession of plant communities from pioneer stage through a number of intermediate stages. The climax community may be a woodland or herbaceous (grassland) community depending upon available water.

Coastal Ecosystem: an ecosystem which is found specifically within the coast or shoreline region.

Coastal Processes: Natural processes (e.g. Littoral drift, dune accretion, erosion) which occur within the coastal environment.

Dune: ridges or mounds of loose, wind-blown material, usually sand held together by specially adapted vegetation.

Dune Stranding: refers to the ongoing process of aeolian sand migration outside of the natural shore system. Sand becomes stranded outside of the shore system such that waves are no longer able to reclaim the material. Stranding can occur in areas of relic beach and dune deposits where there is no sufficient source of sand to replace what is lost.

Dynamic beach: that portion of a shoreline where accumulated unconsolidated sediment (eg. sand, gravel, cobbles) continuously moves as a result of naturally occurring processes associated with wind and waves and changes in the rate of sediment supply. Dynamic beaches are associated with dune systems which, if left unaltered, provide habitat for unique and rare species, provide a protective function from storm waves, and are linked to improving local water quality. Dunes are

considered to be one of the Great Lakes most vulnerable ecosystems.

Endangered: a wildlife species that is facing imminent extirpation or extinction.

Endemic species: a species native and confined to a certain region; having comparatively restricted distribution.

Foredune: the first dune feature landward of the beach, which exhibits some stabilization due to vegetation growth. Storm wave action may reach inland far enough to erode some, or all of, this feature.

Headland: an erosion resistant point of land, either man-made or natural, extending into the lake; Sand deposits often form on the updrift side of the headland (e.g. Point Clark, Kettle Point).

Invasive plants: species which possess aggressive reproductive qualities that enable them to displace endemic plant species. Examples: Garlic Mustard, Purple Loosestrife, Common Reed (also see Alien Plants).

Lake Algonquin: post glacial lake which existed about 11,000 years ago. The remnant bluff of Lake Algonquin is a prominent feature from Point Clark to Saugeen Shores.

Lake Nipissing: post glacial lake which existed about 6,000 years ago. The remnant beach ridges left by Lake Nipissing are still evident landward of the Algonquin bluff. A large portion of the cottage development in Huron-Kinloss has been built on the Nipissing sand deposits.

Littoral zone: of or pertaining to the bio-geographic region between the nearshore zone (generally to 4 metre depth on the Great Lakes) and the high-water line and sometimes including the supralittoral zone above the high-water line.

Nearshore: an indefinite zone extending from the shoreline to just beyond the breaker zone. This is the area where wave energy has a profound influence on the lakebed. This is in contrast to the Offshore, where waves do not impact the lakebed.

Reach: a length of shoreline with fairly uniform onshore and offshore physical features and subject to the same level of wave energy.

Relic deposit: sand deposits which are remnants of a post-glacial lake (e.g. Nipissing or Algoma).

Rhizome: a horizontal stem, either on or just below ground, especially one that forms roots at the nodes to produce new plants. Many plants spread with rhizomes, since

they can send up new stems and leaves as they grow. This way, a colony of plants may start with many of the same species in an area.

Secondary dune: the dune landward of the foredune. It has, through succession, developed a more diverse plant community, more advanced soil structure and generally has a more sheltered climate than the foredune.

Shoals: offshore areas which are more shallow than the surrounding depths.

Species at Risk: According to the Committee on the Status of Endangered Wildlife in Canada, there are currently 487 plant and animal species at risk in Canada. Species at Risk are wild species that are in some danger of disappearing from Canada. The dune species Pitcher's Thistle is a Species at Risk in Canada.

Stewardship: care of the heritage of our natural spaces and species in such a way that it can be passed on to future Canadians intact.

Strandline: the line of organic matter that is deposited by wave action along the upper part of the beach. (Also called the 'debris line').

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Appendix A

Control of Invasive Plant Species

Appendix A

Control of Selected Invasive Plant Species Prevalent in Huron-Kinloss

BEST MANAGEMENT PRACTICES

Applicability

The following document contains acceptable practices for control of the following terrestrial invasive species: Common Reed *(Phragmites australis* ssp*. australis)*, Garlic Mustard *(Alliaria petiolata) and Spotted Knapweed (Centaurea maculosa).*

The following management options, should be selected with consideration for the location and size of the infestations, the age of the plants, past control methods used at the site, time of year, weather conditions and adjoining and nearby land uses.

Other management approaches not identified here may be appropriate, but should be carefully researched before implementation. *(Note: the Coastal Centre is developing a manual for the control of Phragmites. Its recommendations will supersede the ones identified here).*

GENERAL PRACTICES

1. **Erosion Control** - Some of the methods described below require actual digging or pulling of plants from the sand/soil. In all cases they require removal of vegetation whether or not there is actual soil disturbance. Each situation must be studied to determine if the proposed control method and extent of the action will destabilize sand/soils to the point where erosion is threatened. Generally in beach and dune areas, sand fencing is recommended to prevent wind erosion of open sand. Fencing should be installed no later than mid-October, and should remain up through fall, winter and spring. It may be removed during summer, but until native plants stabilize the area, sand fencing should be replaced each fall.

2. **Re-vegetation** - Although not a specific condition, replanting with native species is highly desired. All of the control methods below are aimed at reducing or eliminating invasive species so that natives are encouraged to grow and re-establish stable conditions that are not conducive to invasive colonization. In most cases removal or reduction of invasive populations will be enough to release native species and re-establish their dominance on a site.

3. **Herbicide Use** - In the beach environment, the use of herbicides is discouraged. It should only be used by a licensed applicator under the authority of the Township, and should be a registered product specified for use in environmentally sensitve areas. Only spot treatment to individual plants should be done using a wick applicator, cloth glove applicator, stem injection or herbicide clippers. **No broadcast herbicide applications should be used.** The only herbicides contemplated for use is glyphosate. It may be used only in situations where there is no standing water including wetlands, and beach swales. **In all cases herbicides should only be used by a licensed applicator or Technician under the direction and authority of the municipality.** All herbicide spot treatments require follow-up inspection later in the growing season or the following year to re-treat any individuals that were missed. Note that in sandy soil environments like Huron-Kinloss lakeshore area, pesticides can end up in shallow groundwater, waterways and the lake.

4. **Equipment Sanitation** - All equipment used for invasive species control, whether it be hand or power driven, must be cleaned prior to entering onto a control site and prior to leaving the site. This is an effort to reduce transport of invasive plant seeds or plant propagules and reduce the potential for new invasive introductions. Use steam or hot water to clean equipment.

5. **Material Collection and Transportation** – While on the control site place all cut plant material in heavy duty, 3 mil or thicker, black contractor quality plastic clean-up bags. Securely tie the bags and transport from the site in a covered vehicle in order to prevent spread or loss of the plant material during transport from the control work site to the appropriate staging or disposal location. The main root structure, root fragments and/or horizontal rhizomes from harvested controlled infestation should be bagged only to facilitate transport to an appropriate staging area.

6. **Composting** - Because of the extremely robust nature of invasive species, composting in a typical backyard compost pile or composting bin is not appropriate. However, methods can be used whereby sun-generated heat can be used to destroy the harvested plant materials. For instance, storage in a sealed 3 mil thickness (minimum) black plastic garbage bags on blacktop in the sun until the plant materials liquefy is effective. If a larger section of blacktop is available, make a black plastic (4 mil thickness minimum) envelope sealed on the edges with sand bags. The plant material left exposed to the sun will liquefy in the sealed envelope without danger of dispersal by wind. The bags or envelopes must be monitored to make sure the plants do not escape through rips, tears or seams in the plastic. **When composting is suggested later in the text it is understood that liquefying the plant material in or under plastic is the desired action; not disposal in backyard composters or open landfill composting piles.**

CONTROL METHODS FOR COMMON REED (Phragmites australis ssp. australis)

PLANT DESCRIPTION

Phragmites is a perennial grass that can grow to 4 metres in height. Flowering and seed set occur between July and September, resulting in a large feathery inflorescence, purple-hued turning to tan. Phragmites is capable of vigorous vegetative reproduction and often forms dense, virtually monospecific stands. It is unclear what proportion of the many seeds that Phragmites produces are viable. **Please note that proper identification of Phragmites is crucial prior to treatment**. If you are uncertain about distinguishing native and non-native plants, consult a coastal specialist or botanist. Great care should be taken to avoid damaging any native dune plants.


Common Reed

MANAGEMENT OPTIONS

1. Cutting

Effectiveness:

Need to repeat annually for several years to reduce spread of plants. Hand-pulling, though labour intensive, is an effective technique for controlling Common Reed in small areas with sandy soils.

Can be effective in small stands i.e.<100 plants, low-med density (1-75%area) & <1 hectare The cutting of larger stands having high stem densities is not an effective control method unless coupled with an immediate application of glyphosate to the freshly-cut, stem cross sections or with a cut-stem injection of glyphosate.

Methods:

The best time to cut Common Reed is when most of the food reserves are in aerial portion of plant when close to tassel stage, e.g.: at end of July/early August to decrease plant's vigour. Some patches may be too large to cut by hand, but repeated cutting of the perimeter of a stand can prevent vegetative expansion. Common reed stems should be cut below the lowest leaf, leaving a 10 cm or shorter stump.

Hand-held cutters and gas-powered hedge trimmers work well.

Repeat in second year and then every subsequent year until the plant is under control.

Cautions:

Since Common Reed is a grass, cutting several times during a season, at the wrong times, may increase stand density. However, if cut in late July/early August, most of the food reserves produced that season are removed with the aerial portion of the plant, reducing the plant's vigour. This cutting regime may eliminate smaller colonies if carried out annually for several years. Manual or mechanical cuttings of larger, high density, monospecific Common Reed stands can be difficult from a control standpoint and may require the hand application of glyphosate by a licensed technician approved by the municipality.

Disposal:

Cut material should be removed from the site and composted or allowed to decay in an area inland to prevent sprouting and formation of rhizomes. Do not attempt to compost rhizomes.

Sanitation:

Clean all clothing, boots, & equipment to prevent spread of seed.

MNR Stewardship Rangers helping to cut an area of Common Red at Lurgan Beach.

2. Herbicide

Effectiveness:

Herbicide use is a 2 year, 2 step process because the plants may need a "touch-up" application, especially in dense stands since subdominant plants are protected by thick canopy and may not receive adequate herbicide in the first application.

Methods:

Licensed applicator only under the authority of the Township. Use glyphosate formulations only. Apply after tasseling stage when nutrients going back to rhizome and will translocate herbicide into roots. After 2 to 3 weeks following application of glyphosate, cut or mow down the stalks to stimulate the emergence and growth of other plants previously suppressed. If the plants are too tall to spray, cut back in mid summer and apply glyphosate using a spot spray bottle for individual foliar spot treatments or swab, syringe w/large gauge needle or Nalgene wide-mouth, Unitary wash bottle to apply 1-2 drops of 50% glyphosate solution directly into each cut stem.

Cautions:

This herbicide is not selective (kills both monocots & dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants.

Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast w/in 12 hours because herbicide will be washed away into the lake before it can act. Choose Rodeo® formulation for applications in standing water or along the shoreline.

3. Black Plastic

Effectiveness:

Can be effective in small stands i.e.:<100 plants, low-med density(1-75%area). Plants die off w/in 3-10 days, depending on sun exposure.

Methods:

Cut plants first to less than 10 cm. Gas powered hedge trimmers are very effective for cutting After cutting a stand of Common Reed, anchor a sheet of black plastic, geotextile or dark tarp over the cut area using sand bags, logs or rocks. High temperatures under the plastic will eventually kill off the plants. This technique works best when the treated area is in direct sunlight. Plastic should be at least 6 millimeters thick. Hold plastic in place with sandbags, rocks, biodegradable stakes, etc. Can treat runners along the plastic edges with a spot application of Rodeo®. The plastic can be removed the following year when the covered plants have been killed. A few common reed shoots may return. These can be cut

or hand-pulled.

Cautions:

Must monitor to determine if shoots are extending out from under the plastic.

Disposal:

Can leave cut material under plastic or bag all plant parts & remove from site (compost at municipal facility, dispose of in approved landfill or incinerate with appropriate municipal permits.

Sanitation:

Clean all clothing, boots, & equipment to prevent spread of seed.

4. Pulling

Effectiveness:

Can be effective in small stands i.e. <100 plants. Very labour intensive control method, best results when infestation occurs in sandy soils.

Methods:

Hand-pull plants <2 years old. Use shovel for plants >2 years old-dig up plant, then replace sand.

Disposal:

Bag all plant parts and remove from site (compost at municipal facility, dispose of in approved landfill or incinerate with appropriate municipal permits).

Sanitation:

Clean all clothing, boots, & equipment to prevent spread of seed.

CONTROL METHODS FOR GARLIC MUSTARD (Alliaria petiolata)


Garlic Mustard

PLANT DESCRIPTION

Garlic mustard is a naturalized European biennial herb that typically invades partially shaded forested and roadside areas. It is capable of dominating the ground layer and excluding other herbaceous species. Its roots also emit a toxin which inhibits the growth of trees, ultimately limiting the capacity of a woodland to regenerate. Its seeds germinate in early spring and develop a basal rosette of leaves during the first year. Garlic mustard produces white, cross-shaped flowers between late April and June of the following spring. Plants die after producing seeds, which typically mature and disperse in August. Normally its seeds are dormant for 20 months and germinate the second spring after being formed. Seeds remain viable for up to 7 years.

MANAGEMENT OPTIONS

1. Pulling.

Effectiveness:

Hand pulling is an effective method for removing small populations of Garlic Mustard, since plants pull up easily in most forested habitats. It is best to pull plants when seed pods are not yet mature, but they can be pulled during most of the year.

Methods:

Soil should be tamped down firmly after removing the plant. Soil disturbance can bring existing Garlic Mustard seed bank to the surface, thus creating a favourable environment for additional germination within the control site.

Cautions:

Care should be taken to minimize soil disturbance but to remove all root tissues. Re-sprouting may occur from mature plants root systems if not entirely removed. Cutting is preferred to pulling when Garlic Mustard infestations are interspersed amongst native grasses/forbs or other sensitive or rare flora.

Disposal:

Bag all plant parts and remove from site (compost at municipal facility, dispose of in approved landfill or incinerate with appropriate municipal permits).

Sanitation:

Clean all clothing, boots, & equipment to prevent spread of seed.

2. Cutting

Effectiveness:

Cutting is effective for medium-to large-sized populations depending on available time and labour resources. Dormant seeds in the soil seed bank are unaffected by this technique due to minimal disturbance of the soil.

Methods:

Cut stems when in flower (late spring/early summer) at ground level either manually (with clippers or a scythe) or with a motorized string trimmer. This technique will result in almost total mortality of existing plants and will minimize re-sprouting.

Cautions:

Cuttings should be conducted annually for 5 to 7 years or until the seed bank is depleted.

Disposal:

Cut stems should be removed from the site since they may produce viable seed even when cut. Bag all plant parts and remove from site (compost at municipal facility, dispose in approved landfill or incinerate with appropriate municipal permits).

Sanitation:

Clean all clothing, boots, & equipment to prevent spread of seed.

3. Herbicide

Effectiveness:

Roundup will not affect subsequent seedling emergence of garlic mustard or other plants. Herbicide is only used as a last resort. Note that in sandy soil environments like Huron-Kinloss lakeshore area, pesticides can end up in shallow groundwater, waterways and the lake.

Methods:

Use glyphosate formulations only. Should be applied after seedlings have emerged, but prior to flowering of second-year plants. Application should be by spot spray bottle or wick applicator for individual spot treatments.

Cautions:

This herbicide is not selective (kills both monocots & dicots), thus should be applied carefully to prevent killing of non-target species. Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast w/in 12 hours because herbicide will be washed away before it can act. Choose Rodeo® formulation for applications in standing water or along the shoreline or a watercourse or the lake.

CONTROL METHODS FOR Spotted Knapweed (Centaurea maculosa)

PLANT DESCRIPTION

Appearance: Biennial or short-lived perennial herbaceous plant, 2 - 3' high. Basal leaves form a rosette the first year from which grow 1- 20 wiry, hoary, branched stems during the second year.

Leaves: Alternate, grayish, hoary, and divided into lance-shaped lobes decreasing in size at the top.

Flowers: Thistle-like pink to purple flowers sit at the tips of terminal and axillary stems, bloom from July through September.

Seeds: Brownish, 1/4" long with small tuft of bristles, dispersed by rodents, livestock and commercial hay. Seed viable in the soil for 7 years.

Roots: Stout taproot. Lateral shoots form new rosettes near the parent plant.

Caution: Wear long sleeves and gloves, can be a skin irritant to some people.

Spotted Knapweed

Ecological Threat:

Especially threatens dry prairie, oak and pine barrens, dunes and sandy ridges.

Spotted knapweed is poisonous to other plants (phytotoxic).

Spreads rapidly in artificial corridors (roadways, laneways or disturbed paths)..

A native of Europe and Asia it has become a serious problem in natural dune areas

MANAGEMENT OPTIONS

1. Early Detection and Prevention

Survey for flowering and pre-flowering knapweed from **May to July** along roadsides,streambanks and dunes. Isolated small populations can be dug up but the site should be monitored for several years to look for plants growing from root fragments and from the seed bank.

2. Pulling.

Effectiveness:

Pulling is most appropriate in dune areas. Pull or dig up small infestations including the entire root **if possible. Plants in sandy soil pull easily but those in hard-packed soil will require a shovel or stout trowel. Plants are most susceptible to hand pulling if the soil is still moist and uncompacted. Roots still tend to break off 10 to 15 cm beneath the ground. A small percentage of these root fragments will re-sprout. Sites where weeds are pulled need to be watched closely for new rosettes and re-sprouts throughout the**

growing season. The disturbed soil from pulling and digging aids in germination of any seeds present. Soil should be tamped down firmly after removing the plant. Soil disturbance can bring existing Spotted Knapweed seed bank to the surface, thus creating a favourable environment for additional germination within the control site.

Cautions:

Prevent plants from spreading from existing populations by washing vehicles, boots and animals that have been in infested areas. Seeds are small and are easily carried in mud and in animal fur.

Disposal:

Bag all plant parts and remove from site (compost at municipal facility, dispose of in approved landfill or incinerate with appropriate municipal permits).

Sanitation:

Clean all clothing, boots, & equipment to prevent spread of seed.

2. Cutting

Effectiveness:

Cutting is effective for medium-to large-sized populations in non-dune areas depending on available time and labour resources. In non-dune areas, plants that are periodically mowed will generally continue to flower and produce seed on shorter plants below the mower blade height. Cultivation can bury seeds and plant parts under the soil surface and repeated cultivation can be effective if combined with monitoring for and controlling re-sprouts.

Re-establish a cover of dune vegetation to help prevent knapweed from re-establishing in dune areas.

Methods:

Cut stems when in flower (late spring/early summer) at ground level either manually (with clippers or a scythe) or with a motorized string trimmer. This technique will result in almost total mortality of existing plants and will minimize re-sprouting.

Cautions:

Cuttings should be conducted annually for 5 to 7 years or until the seed bank is depleted.

Disposal:

Cut stems should be removed from the site since they may produce viable seed even when cut. Bag all plant parts and remove from site (compost at municipal facility, dispose in approved landfill or incinerate with appropriate municipal permits).

Sanitation:

Clean all clothing, boots, & equipment to prevent spread of seed.

Sources:

The Nature Conservancy, Element Stewardship Abstracts for Common Reed, Garlic Mustard and Spotted Knapweed, 2005. (see http://tncweeds.ucdavis.edu/esadocs.html)

Minnesota Department of Natural Resources, 2007.
http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/spottedknapweed.html

Appendix B

How To Harvest and Plant Marram Grass

Appendix C

Selected Native Coastal Plants Identification Guide

Appendix D

Code of Conduct

Appendix E

Sign Samples for Public Awareness