

PROVIDENCE BAY

Summer 2005

Sand Dune Conservation

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Special points of interest:

- Dunes on the shores of Manitoulin Island are relic sand deposits, left here thousands of years ago.
- Dunes are a non-renewable natural resource.
- Dunes are vulnerable to human impacts.
- Dunes at Providence Bay contain the endangered plant "Pitcher's Thistle".

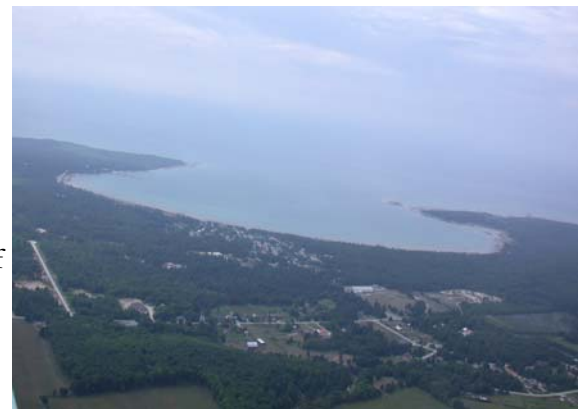
A dune may be simply defined as a mound or ridge formed by the deposition of sand. These geologic landforms develop when an abundance of sand combines with wind, vegetation and geography. Dunes along the southern shores of Manitoulin have formed over the last 3000 to 4000 years, since post-glacial Lake Nipissing began to recede. These dunes are formed from post-glacial lake deposits which preceded the present Lake Huron shoreline. The sand deposits at Providence Bay are contained between two headlands. This is a closed system, which means that alongshore currents do not bring sand in from other parts of the coastline.

The dunes of Providence Bay are comprised of fine sands, and as a result, they are particularly vulnerable to erosion—from stormwaves and from wind. People's indiscriminate use of dunes can damage or destroy thousands of years of geologic processes in one instant.

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. All ecosystems have a certain threshold for being able to tolerate human impacts. Dunes, in particular, have a very low threshold.

Research has demonstrated that dune vegetation is sensitive to damage by human disturbance. 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. To protect these fragile ecosystems, we need to become more aware, and sensitive to the vulnerability of these important coastal features and their importance to Lake Huron's shores.



Dunes at Providence Bay—a closed beach system

Providence Bay's dunes are not only important to conserve because they are an irreplaceable resource, but also because they provide important habitat for a wide array of rare plants and animals. Pitcher's Thistle and Great Lakes Wheat Grass are two examples of globally rare dune species at Providence Bay.

If we manage our activities correctly, we can ensure that the beaches and dunes at Providence Bay remain for future generations, and the special habitat they provide for Pitcher's Thistle can continue to sustain this important dune species.

Beach and Dune Processes

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.

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-attach it to the beach.

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

While wind *strength* is a key factor in sand movement, 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 with the greatest intensity and duration on the north and eastern shores of Lake Huron tend to be during the late fall, winter and early spring

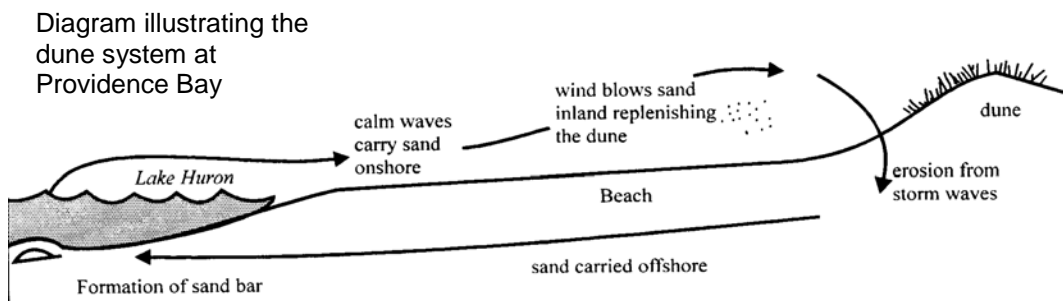
months. As well as wind speeds and duration, the prevailing water level plays a significant role in how much sand transportation will take place. During high water levels, more of the beach is submerged and the width of dry beach is reduced. As a result, a smaller beach area may be exposed to wind erosion. Conversely, during lower water levels, more beach is exposed and greater wind erosion of the beach is possible. Therefore, periods of dune building tend 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 back to offshore bars.

What is fundamental to understand 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.

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 with enough velocity to move the sand. As the dune builds, it becomes a major obstacle to the landward movement of wind-blown sand. In other words, the dune keeps sand in close proximity to the beach system.

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, some of these plants have evolved a dual system of reproduction. In addition to seed production, they send out horizontal root 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, making them far more durable than they would be otherwise.



Impacts to Dunes

Beach and dune vegetation are important for capturing and anchoring wind blown sand. While beach and dune vegetation have adapted to a harsh, demanding environment, they are quite fragile to human disturbances.

Activities that damage or destroy beach and dune vegetation can initiate dune erosion. Large gaps in the dunes, called 'blowouts', can occur as a result.

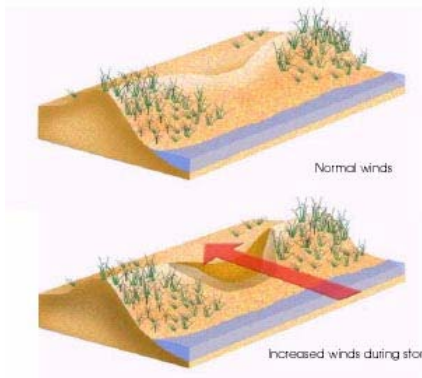
The post-glacial conditions

that led to the development of Providence Bay's beach and dune system are no longer present. Since Providence Bay is comprised of primarily relict (ancient) sand deposits, erosion of the sand represents a permanent, irreplaceable loss to the shore system.

As with other relict beach-dune systems on the Great Lakes, sand erosion can lead to deterioration in both beach quantity and quality.

The beach-dune system at Providence Bay has reached a balanced equilibrium. Vegetation damage and the resulting erosion of sand will upset that balance.

You can help by protecting coastal vegetation and using the boardwalk and designated access routes to the beach. Remember that dunes provide natural shore protection and are habitat for unique flora and fauna.



Formation of a blowout. Destruction of dune vegetation exposes the dune to wind erosion.

Pitcher's Thistle—a Species at Risk

The coastal plant "Pitcher's Thistle" (*Cirsium pitcheri*) is a rare plant species in Canada, and has the status of being globally rare. Pitcher's Thistle is native to Manitoulin Island.

Although it is related to other thistles found in fields or roadsides, Pitcher's Thistle is a separate species that is found only on the open sand dunes and low beach ridges of Great Lakes shores. Less prickly than other thistles, Pitcher's Thistle has distinctive blue-green leaves covered with fine white hairs that give the plant a downy appearance.

Its range is restricted to the Great Lakes, primarily along the shores of Lakes Huron and Michigan. The plant's life cycle includes a long 5 to 8 year growth period, and once its seeds form and disperse, the entire plant dies. The plant's thick cuticle and pale, fine hairs help to protect

it against water loss and the sun's intense rays, while deep tap roots help them find water and sparse soil nutrients. By extending their stems and leaves above the shifting sands, the thistle can tolerate burial and help to stabilize the dune.

At Providence Bay, Pitcher's Thistle grows on the lake-ward side of the dunes, and even on the upper parts of the beach. This thistle has very particular habitat requirements and Providence Bay has the special physical conditions available for this endangered plant to survive.

The main threat to this plant is human disturbance, including trampling, destruction from ATV's, and habitat alteration from development and building structures in dune areas.



"Pitcher's Thistle has very particular habitat requirements and Providence Bay has the special physical conditions available for this endangered plant to survive"





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Le Programme d'intendance de l'habitat pour les espèces en péril

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What Can You Do?



Cottagers should establish single path trails from their cottage to the beach.



**Pitcher's Thistle—
Be on the Look Out!**

If you're a visitor to Providence Bay:

- Make sure you use the boardwalk and the appropriate beach access points from the boardwalk to the beach.
- Take special care not to damage any beach or dune vegetation.
- Learn to recognize Pitcher's Thistle. Don't disturb the plant, and don't pick its flowers.
- Recreational activity should be focused on the open, unvegetated parts of the beach. High impact activities should occur within the playground area.
- Learn more about the many plants and animals that are specialized to live in dunes.

Cottagers at Providence Bay play an important role in dune conservation too:

- Establish single path trails from your cottage to the beach. Wind erosion of the dunes will be less likely to occur.
- Keep your waterfront in a natural state. Nature has created a balanced equilibrium. Do not remove beach or dune vegetation or alter sand dunes.
- Do not bring motorized vehicles onto the beach-dune system. Vehicles can destroy vegetation and the habitat of numerous plants and animals that call the beach and dune their home.
- Taking care of your coastal environment benefits you and future generations.



Stay on the boardwalks and use the designated beach access points provided.