ONTARIO PARKS

Presqu'ile

Beach & Dune Resource Management Plan

Draft

Ontario

February 2008

Dear Sir/Madam,

I am pleased to present the draft Presqu'ile Provincial Park Beach and Dune Resource Management Plan.

The draft resource management plan outlines the preferred management approach for beach and dune areas in specific zones within the park, specifically for continuation of recreation opportunities and migratory shorebird habitat. The policies in the draft plan are in keeping with the objectives in the Presqu'ile Provincial Park Management Plan (2000). The draft plan meets specific zone NE1, NR2 and NR3 resource management plan commitments in the park management plan.

You are invited to review and comment on the draft resource management plan for a period of 45 days following its release, ending April 18, 2008. All comments should be submitted to:

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Ministry of Natural Resources (MNR), Ontario Parks is collecting your personal information and comments under the authority of Ontario's *Provincial Parks and Conservation Reserves Act*. Any personal information you provide (address, name, telephone, etc.) will be protected in accordance with the *Freedom of Information and Protection of Privacy Act*, however your comments will become part of the record of consultation and may be shared with the general public. Your personal information may be used by the MNR to send you information about future MNR planning initiatives in the park area. If you have questions about use of your personal information, please contact Susan Grigg, Park Planner, Ontario Parks Southeast Zone, at (613) 531-5722.

Your participation in planning for this provincial park is appreciated. All comments received will be considered during the preparation of the final Presqu'ile Provincial Park Beach and Dune Resource Management Plan.

Yours truly,

Bruce Bateman
Southeast Zone Manager
Ontario Parks

Feb. 20/08
Date

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1 INTRODUCTION

Presqu'ile Provincial Park is an approximately 970 hectare (ha) natural environment class provincial park located along the north shore of Lake Ontario, within the Municipality of Brighton (Figure 1, insert). The park is a popular destination, with about 200,000 visitors for the 2006 operating season. Recreational uses related to the beach and dune system include swimming and other water sports, sunning, beach sports, birdwatching and walking.

Presqu'ile is one of several protected areas along the north shore of Lake Ontario, including Sandbanks and North Beach Provincial Parks and Crown and Municipal lands. The park, including the beach and dune system, is a highly significant landform known as a "tombolo" (a barrier beach linking a former island with mainland). The sand beach at the park is one of the outstanding recreational beaches on Lake Ontario's north shore, and is a strongly valued recreational facility. The beach area is utilized by migrating and resident shorebirds and landbirds.

Approximately half of the beach within the park has been actively managed to some degree for more than 30 years. There has also been active management within the foredunes and the dunes. Both the recreational opportunities and habitat for shorebirds that exist today are at least in part the result of past and current management of the system. Some on-going natural processes are still occurring and overlie human management.

This plan is intended to provide direction for beach and dune management and stewardship activities at Presqu'ile Provincial Park. It begins with the planning context for beach and dune stewardship and a description of the beach and dune system. An overview of general policies is provided before detailed policies are described.

1.1 Park Management Plan Direction

The Presqu'ile Provincial Park Management Plan was released in 2000. During the planning process, extensive public consultation confirmed that the beach area is highly valued by a diverse group of users. The management plan acknowledges that the park's beach is highly significant for shorebirds.

Through the park management plan, the park's lands and waters are organized into distinct zones for management purposes. Portions of the beach and dune system are found in three separate zones (Figure 1, insert):

- Natural Environment Zone 1 (NE1) : Beach – Foredunes;
- Nature Reserve Zone 2 (NR2) : Owen Point – Islands; and
- Nature Reserve Zone 3 (NR3): North Beach – Foredunes.

The park management plan descriptions for these three zones are included in Appendix "A".

The central objective for natural environment zone NE1 as stated in the park management plan is “to optimize conditions for migrating birds, while seeking to maintain quality beach recreation opportunities in the times and places where those opportunities are most in demand”. It also states “Specific principles to be adhered to in preparing this zone resource management plan will include the following:

- The park's current commitment to foredune protection and revegetation will be continued.
- Disturbance to shorebirds will be minimized.
- Natural processes will be used wherever possible.
- Experimentation with various management approaches and techniques will be encouraged, and their effects monitored.
- One experimental approach may be to restrict access to limited parts of the beach for limited times, where and when critical to bird migration. Another may be to erect snow fences at points where they would promote sand deposition.
- The beach managed for recreation will be fully open to the public year round, except for:
  - emergency closures
  - access restrictions as described above, outside the management seasons only.
- The focus on a high standard of management of the beach managed for recreation during the management seasons should not prevent more limited management actions from being undertaken as needed during the rest of the year.”

1.2 Beach and Dune Management Plan Preparation

In 1988 a Beach Management Strategy was drafted to address the needs of migrating shorebirds and human beach users. In 2002 this draft strategy was updated and has provided guidance to staff in the interim.

A Beach Management Advisory Committee was established in 2005 to provide insight and input during preparation of a formal plan. The committee includes a balance of expertise from Ministry of Natural Resources (MNR), other government agencies, universities, the broader birding community and local residents. The role of the Advisory Committee is to discuss previous and current management practices, identify any other appropriate management practices, evaluate the effectiveness of these practices in optimizing conditions for migrating birds and maintaining quality beaches for recreation, and to prepare recommendations on future management activities.

This 2008 resource management plan is proposed as the approved plan for the park. It is subject to public and Aboriginal consultation.

- This plan focuses primarily on zone NE1, the portion of the beach and dune where the majority of active management and recreation occurs.
- The park management plan calls for individual resource management plans to be written for each of the zones found within Presqu’ile. This plan contains the beach and dune management component of the required resource management plans for zones NE1, NR2 and NR3.

2 GOALS AND OBJECTIVES OF BEACH AND DUNE MANAGEMENT

The goal of beach and dune management at Presqu'ile, as recommended by the Advisory Committee following review and discussion of policy in the park management plan, is:

to provide quality beach recreational opportunities and habitat for migrating and resident birds, and educate park users on the values of the beach and dune system.

This goal will be achieved through various management techniques and the natural heritage education program within the park. Based on studies on shorebird habitat use in the park over the years, the factors in the goal are not in conflict, but can be realistically met.

The specific objectives of management are to:

Zone NE1

- maintain portions of the beach area as appropriate for permitted recreational day use activities (e.g. swimming, sunbathing, beach sports)
- minimize effects of recreational use on the dune and beach system
- minimize disturbance to shorebirds during migration periods
- educate park users on the significance of the resource
- protect and revegetate the foredune
- allow or mimic natural processes where possible

Zones NR2 and NR3

- protect shorebirds and minimize disturbance to them
- allow for natural system dynamics by using natural processes
- control invasive species and restore areas where necessary (e.g. areas dominated by *Phragmites* sp.)
- optimize natural/cultural heritage interpretation wherever possible (e.g. birding at Owen Point)

3 BEACH AND DUNE SYSTEM DESCRIPTION

Beaches and dunes are interdependent, and are best managed as a system. There are biological, social and economic benefits resulting from the proper management and protection of beach and dune systems. Linkages and interactions between the environmental, social and economic components of these systems should be recognized and utilized in management activities (MNR 1996).

A sand dune is a mound or ridge formed by the deposition of sand, as a result of the forces of wind and water and modified by vegetation and geography. In a natural dune system, the foredune is the first dune feature landward of the beach, and exhibits some stabilization due to vegetation growth. Storm wave action may reach inland far enough to erode some, or all, of this feature (Peach 2003).

The depressed areas between dune ridges are referred to as dune slacks. These areas are typically hollows or valleys between ridges that indicate periods of time between

successive ridge development. The continuous scour of sand from within the hollow lessens the depth to the water table in these areas and provides moist conditions, which if left undisturbed can support a variety of shrubs, grasses and tree species that typically inhabit the slack regions (MNR 1996). Where these habitats occur along the shores of the Great Lakes they are called “pannes” or coastal meadow marshes, and are globally significant communities. They often support rare plant species.

The beach and dune system at Presqu’ile is approximately 2.5 km in length. Presqu'ile Provincial Park has both sand and pebble beaches. The park's sand beach is undergoing a constant widening, or progradation, process. Dominant "carrying winds" from the northwest during the fall, winter and early spring are responsible for most of the sand deposition on the beach. There are seasonal, annual and long term (i.e., > 10 years) fluctuations in water levels on Lake Ontario that have important effects on the dynamics of the park’s beach and dune system. Also, due to the vastness of the lake there are powerful erosive forces acting during storm events (MNR 1996).

Figure 2. Zone NE1 beach after raking

3.1 Presqu’ile Beach Area Terminology and Management History

The beaches within the three park zones have been named, as described below and illustrated in Figure 1 (insert). Roughly half of the system is within natural environment zone NE1, with the other half within nature reserve zones NR2 and NR3.

Zone NE1extends between zones NR3 and NR2 and contains the most actively managed and maintained beach and dune areas, which include the areas most used for beach recreation. For management purposes, the beach within zone NE1 is divided into

four areas: Beach 1, the northernmost section; Beaches 2 and 3 in the middle; and Beach 4, the southernmost beach. Beach 4 is not managed for recreation.

The park management plan defines beach "management seasons" as:
- June 8 – Labour Day for Beaches 1-3; and
- June 8 – mid August for Beach 4.

Much of the foredune within zone NE1 has been actively managed by raking to prevent establishment of vegetation. In some areas the dune to the landward side of the managed beach has undergone revegetation and sand fencing has been installed to trap and stabilize sand and limit / focus pedestrian traffic between the parking areas and beaches.

Over time, management activities within Beach 4 have been reduced, and Beach 4 is now considered a buffer area for the zone NR2 beach.

The beach area within zone NR2 extends south from Beach 4 in zone NE1 to Owen Point. Little active beach and dune maintenance has been practiced within this beach area, and this is limited to trail management. Recreational use of this beach is mainly limited to the interpretive trail (Owen Point Trail). Because it is relatively natural compared to the beach in zone NE1, this beach has been termed the "Natural Beach".

Zone NR3 consists entirely of the northernmost beach and foredunes in the park, and is referred to as the "North Beach". No active beach or dune maintenance has been practiced within the North Beach since the early 1990s. This area is naturally vegetated and there is no recreational use.

The entire beach has a gradient of organic material with the highest concentrations to the south and lowest to the north. The size and rate of dune growth suggest that sand input into the Presqu'ile system is greatest at the north end of the beach (zone NR3) and lowest at the south end (zone NR2).

Each year one or more "beach pools" form in depressions found between the beach and the dunes. The number and location of these pools each year depends upon lake level and precipitation levels. These pools typically hold standing water until summer and after every major rainfall. Seeps have also been observed flowing from the vegetated dune areas to the beach.

Historically, the beaches in zone NE1 have been raked in an effort to improve recreational opportunities. As a result, the pools within Beaches 1, 2 and 3 have been unvegetated. Because the water table is close to the surface, beach pools remain damp for most of the summer despite attempts within zone NE1 to dry the sand by turning it over daily with a beach harrow (Section 4.1). Other attempts have been made to dry the beach pools on the managed beach. These efforts include creating drainage channels that allow the pools to drain in addition to natural drainage. Varying degrees of short-term success have resulted. After each winter the beach depressions reform and require management on an annual basis.

Algae accumulation along the shoreline is a significant management issue. Algae is continuously deposited, but is most noticeable in large amounts after severe weather causing increased wave action on the lake. The large accumulations of algae are a

concern for recreational users, for odour and aesthetic reasons. Significant staff resources are required to collect and remove algae from along the shoreline of Beaches 1, 2 and 3 during the management season.

3.2 Beach Profile Surveys

Beaches are products of erosion and the recovery of sand as shorelines adjust to the forces shaping them (Rogers and Nash 2003).

To successfully interpret and manage beach and dune areas, it is important to first understand the physical aspects/processes that influence these systems. In order to improve beach management practices park staff have been consulting with Dr. Mary-Louise Byrne from the Department of Geography and Environmental Studies, Wilfrid Laurier University since 2000.

Beach profile surveys were completed in 2000, 2002 and 2005.

Dr. Byrne surveyed the beach on four occasions from 2000-2002 (Dec. 18, 2000, May 02, 2001, July 25, 2001 and November 9, 2002) and developed elevation profiles. With the goal of developing a drier beach as the desired outcome for Beaches 1 and 2, a list of recommendations was also provided.

Follow-up surveys were completed in 2005 on four occasions from spring to late fall. The spring dates were chosen to include periods prior to and immediately following reapplication of sand to the managed beach. These studies have shown that the orientation of the beach and the vegetation changes from Beach 1 to Beach 3, such that the profile is less natural moving from Beaches 1 to 3 (Figures 3 and 4).

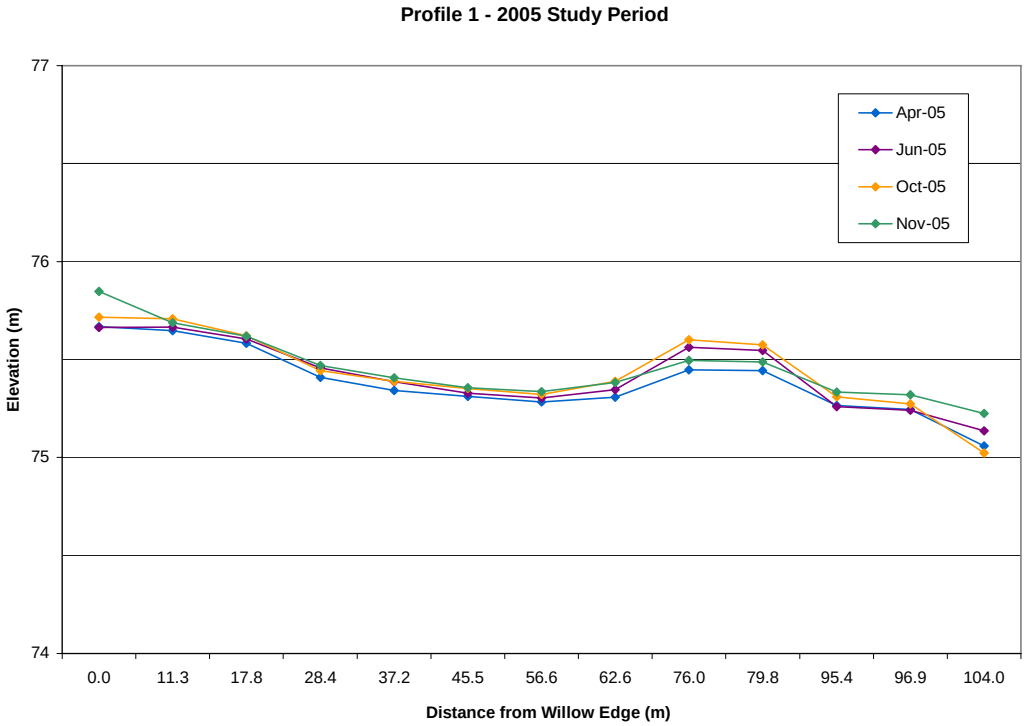

Figure 3. Beach 1 profile sketch

Figure 4. Beach 3 profile sketch

The formation of depressions is identified as part of a natural process, and seeps have also been noticed in the vegetated area. Earlier recommendations have since been updated based on these further studies, and have been adapted as policies in Section 4.8. There is a need for more surveys of microtopography and hydrogeology to fully understand the natural drainage system of the beach, and how best to manage and work with nature.

3.3 Ecological Significance of the Presqu'ile Staging Area

Canadian Wildlife Service staff have noted that Presqu'ile is consistently one of the best shorebird stopover areas on the Great Lakes. Ken Ross, coordinator of the Ontario Shorebird Survey for the Canadian Wildlife Service, describes Presqu'ile as "the shoreline site which routinely supports the most migrant shorebirds along the Canadian Great Lakes" (Ross 2002).

Presqu'ile's beach has also been identified as a potential Regional Site within the Western Hemisphere Shorebird Reserve Network (WHSRN). The WHSRN is a partnership among parties interested in shorebird conservation including Federal governments (Canada and United States), non-government organizations (NGOs) and private citizens. In the 2000 Presqu'ile Provincial Park Management Plan, Ontario Parks stated it "will support designation of Presqu'ile Provincial Park under any international conservation initiative that will recognize the park's natural and cultural heritage,

provided that designation does not have any implications with continued ownership and operation of the park by the Province".

In 2000, the park was also recognized as a globally significant Important Bird Area (IBA) within the North American Important Bird Areas Program. A number of criteria must be met for a site to receive this recognition. One of these criteria is that the site must be used by 1% or more of the continental or national population of a species within its yearly life cycle. This criterion is met for two shorebird species: Dunlin (*Calidris alpine)* and Whimbrel (*Numenius phaeopus)*.

The major periods for shorebird stopover at Presqu'ile are from mid May to early June, and from early August to mid-September. Springtime numbers rarely exceed 500 birds at a time but the peak of autumn migration (late-August and early-September) routinely tops 500 or more individuals. Early autumn migrants (late-July and early-August) are adults, followed by juveniles. A list of migratory shorebirds birds observed at Presqu'ile is included in Table 1. Species at risk status[1] as assigned provincially by the Committee on the Status of Species at Risk in Ontario (COSSARO) and federally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and S-ranks[2] of provincially significant species as assigned and tracked by the Natural Heritage Information Centre (NHIC) are included where appropriate.

An unusual phenomenon known to occur at Presqu'ile is the "grounding" of northbound migrants. Groundings periodically occur between May 20 and June 5 when weather systems force birds to discontinue their migration flights. On these occurrences, many thousands of shorebirds have been seen on the beach at one time. These flocks appear to be especially sensitive to disturbance. Groundings at Presqu'ile are known to occur from time to time but are not an annual occurrence (Section 4.6).

3.4 Preferred Shorebird Habitat

Although a number of generalizations regarding preferred shorebird habitat at Presqu'ile have been proposed, this topic was not examined scientifically until 1999 and 2000, when studies focussed on this topic. A further study occurred in 2005. The objective of these studies was to determine if shorebird distributions on beach habitats at Presqu'ile can be explained by attributes associated with abundance of invertebrate prey, their main food source. These studies have demonstrated that the relationship between shorebirds and their habitat depends on many factors.

Summary of 1999 Research
Studies in 1999, a relatively low lake level year, indicated that Owen Point was the most heavily utilized stopover area at Presqu'ile (Pomeroy 1999). In 2000, a relatively high lake level year, the Natural Beach buffer (i.e. Beach 4) was the most heavily utilized area (Pomeroy 2000). In both studies, Pomeroy found a strong correlation between the density of shorebirds and the availability of algae. When algae was available the majority of birds foraged in the algae.

[1] COSSARO/COSEWIC: SC=Special Concern, THR=Threatened, END-R=Endangered (Regulated),
[2] S-Rank: S1=critically imperilled, S2=imperilled, S3=vulnerable, SZN=non-breeding migrants/vagrants

Table 1. Shorebird Species Observed Along the Beach at Presqu'ile

Shorebird Species (Sorted by Family) +			
CHARADRIIDAE Black-bellied Plover *Pluvialis squatarola*	RECURVIROSTRIDAE American Avocet* *Recurvirostra americana*	SCOLOPACIDAE (continued) Ruddy Turnstone *Arenaria interpres*	SCOLOPACIDAE (continued) Stilt Sandpiper (S2S3B, SZN) *Calidris himantopus*
American Golden-plover (S1B, SZN) *Pluvialis dominica*		Red Knot *Calidris canutus*	Buff-breasted Sandpiper *Tryngites subruficollis*
Lesser Sand Plover* *Charadrius mongolus*	SCOLOPACIDAE	Sanderling *Calidris alba*	Ruff* *Philomachus pugnax*
Snowy Plover* *Charadrius alexandrinus*	Spotted Sandpiper *Actitis macularius*	Semipalmated Sandpiper *Calidris pusilla*	Short-billed Dowitcher (S2S3B, SZN) *Limnodromus griseus*
Wilson's Plover* *Charadrius wilsonia*	Solitary Sandpiper *Tringa solitaria*	Western Sandpiper* *Calidris mauri*	Long-billed Dowitcher* *Limnodromus scolopaceus*
Semipalmated Plover *Charadrius semipalmatus*	Greater Yellowlegs *Tringa melanoleuca*	Least Sandpiper *Calidris minutilla*	Wilson's Snipe *Gallinago delicata*
Piping Plover* (END-R; S1B, SZN) *Charadrius melodus*	Willet* *Tringa semipalmata*	White-rumped Sandpiper *Calidris fuscicollis*	American Woodcock *Scolopax minor*
Killdeer *Charadrius vociferus*	Lesser Yellowlegs *Tringa flavipes*	Baird's Sandpiper *Calidris bairdii*	
	Upland Sandpiper* *Bartramia longicauda*	Pectoral Sandpiper (SHB, SZN) *Calidris melanotos*	PHALAROPODINAE
HAEMATOPODIDAE	Whimbrel (S2B, SZN) *Numenius phaeopus*	Purple Sandpiper *Calidris maritima*	Wilson's Phalarope* (S3B, SZN) *Phalaropus tricolor*
American Oystercatcher * *Haematopus palliatus*	Hudsonian Godwit* (S2S3B, SZN) *Limosa haemastica*	Dunlin (S3B, SZN) *Calidris alpina*	Red-necked Phalarope* (S3B, SZN) *Phalaropus lobatus*
	Marbled Godwit* (S2B, SZN) *Limosa fedoa*	Curlew Sandpiper* *Calidris ferruginea*	Red Phalarope* *Phalaropus fulicarius*

+ taxonomy follows the American Ornithological Union checklist 7th ed.

* less than annual in occurrence at Presqu'ile

A factor highlighted by Pomeroy's work is the importance of the relative openness of the feeding area. During the high water summer of 2000, Pomeroy found that shorebirds preferred Beach 4 as a feeding area even though higher densities of invertebrates occurred in algae on the Natural Beach in zone NR2. The Natural Beach was much more vegetated and so less open than Beach 4. In the autumn, when water levels dropped, exposing broader mudflats, shorebird concentrations shifted to the Natural Beach. It is likely that shorebirds prefer open feeding areas where they can spot and avoid aerial predators such as falcons.

A third factor that Pomeroy examined was the relationship between relative densities of people and shorebirds. Pomeroy's data show that when open, quality feeding grounds are available, shorebirds will favour those with lower densities of people. However if the habitat is too closed (the space is narrow between the shoreline and vegetation) then shorebirds will choose to feed in areas with higher human densities. It appears that shorebirds must balance the quality of the feeding opportunities, safety from predators and the degree of human disturbance when selecting areas in which to feed and rest.

Summary of 2005 Research

The 2005 study compared shorebird behaviour among beaches and beach microhabitats (wet, dry, shore). 2005 was an average lake level year during which few beach pools formed. A total of 23 shorebird species was observed throughout the course of this study. The most commonly observed behaviour was foraging. More birds were observed using the park's beaches in the fall than spring, although diversity was similar between both seasons. The spring migration, as expected, was brief and intermittent, while the fall migration was longer and more consistent (Rose 2005).

Figure 5. Shorebird foraging at Presqu'ile (M. Rose)

In 2005, the Natural Beach was a heavily used foraging area in the fall, while Beaches 2 and 3 were heavily used for foraging during spring migration. The Natural Beach may have been used less in the spring because it was too narrow as a result of water levels. Shore areas were preferred for foraging – areas of dry and wet sand in the spring and old or new algae in the fall. Some species seemed to prefer one particular type of area during both migratory seasons. Because of the range of areas used by different species of migratory shorebirds, it may be preferable to maintain both dry and wet areas within the park beaches (Rose 2005).

As found in studies in previous years, Rose (2005) found that the algae had a higher invertebrate concentration and also found that it was heavily used by shorebirds. The number and biomass of invertebrates differed among beach sites. In both spring and fall, total numbers and biomass were highest at the Natural Beach. The amount of invertebrates changed among the other sites from spring to fall, with generally more invertebrates found in spring. No invertebrates were found on the beach at the north end (zone NR3).

3.5 Preferred Recreational Areas

Most recreational day users interested in swimming, sunbathing and beach sports (beach volleyball, Frisbee) prefer sandy, dry, flat beach areas, and primarily use Beaches 1 and 2 where most active management occurs. Some walking and bird watching occurs along the entire length of the beach, other than periodic restrictions as outlined in Section 4.7 (e.g. during shorebird migration).

Studies on foraging shorebirds in 2005 indicated that while there was some disturbance to shorebirds from recreational use, it was not significant and was limited in scope. There was more disturbance from avian predators from August to September (hawk migration period) than in the spring, and avian predator disturbance was observed more than human induced disturbance. Human induced disturbance was highest for kite flying and dog walking (dogs off leash); both caused flushing behaviour in shorebirds (Rose 2005).

Figure 6 a, b. Recreational day use at zone NE1 beach.

4 BEACH & DUNE MANAGEMENT POLICIES

Since the completion of the initial Draft Presqu'ile Beach Management Strategy in 1988, the major elements of beach management at Presqu'ile have been as listed below.

Experience has shown that beach management at Presqu'ile (and elsewhere) is an evolving science. Algae accumulation along the shoreline has had implications for management of the beach for recreation (DeJong 2000). Significant changes in beach management have occurred at Presqu'ile in the past ten years. These include: the development of the Owen Point Trail; the planting of marram grass (*Ammophila breviligulata*) on previously disturbed areas; and the redistribution of algae/sand collected during the summer. Increased public awareness of the value of the beach as a shorebird staging area has also been accomplished through signage and interpretive programs.

Despite management efforts, some desired recreational outcomes for the beach have not been met. From a recreational perspective the beach is often wetter than desired. This is especially true in the early summer and after rainfall events. The degree of wetness increases towards the southern end of the beach.

An adaptive management approach will be applied to management activities. Adaptive management allows for modification of management strategies in response to monitoring and analyzing the results of past actions and experiences. Figure 7 shows adaptive management as a systematic, practical approach to improving resource management. This is in keeping with the park management plan direction for zone NE1, which states: "Experimentation with various management approaches and techniques will be encouraged, and their effects monitored."

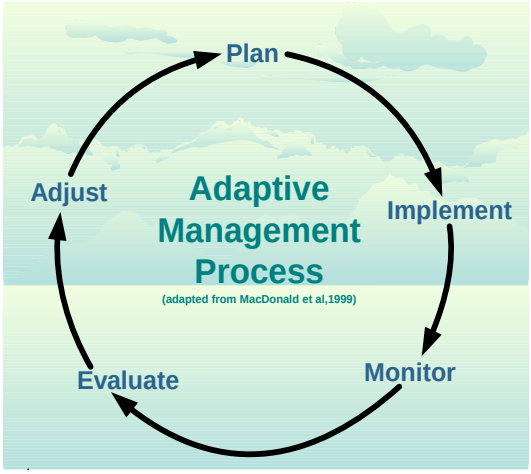

Figure 7: Adaptive management process

The following techniques have been considered and are recommended for use at Presqu'ile Provincial Park, in accordance with the proposed policies described below. Annual timing of the techniques will follow that outlined in Appendix B.

4.1 Raking

Purpose

- collect algae that accumulates along the beach shoreline as a result of wave action and remove it to an alternate location to make the beach suitable for certain types of recreation (for aesthetics and odour control)
- collect litter and carcasses (e.g. birds, fish) that also wash up along the shoreline (for public health and safety)
- control vegetation growth to protect sightlines for shorebirds

- maintain a minimum width of beach area and depressions for both recreational use and shorebird habitat.
- direct recreational users to appropriate sites

Method

Beach raking at Presqu'ile is carried out in much the same manner as at other recreational shoreline areas. Both mechanical and hand methods are used to rake sand and collect algae and detritus along the shoreline. With each method, sand is collected along with algae to varying degrees.

Hand raking has been used since the late 1990s, and while it results in less sand being removed (i.e. a better sand to algae ratio), hand raking alone cannot keep up with the rate of algae deposition. This method can be used for freshly deposited algae.

The "Algae Blade" is the primary mechanical beach maintenance tool (Table 2). The mounds of sand and algae created by raking are trucked to a storage area located elsewhere on the beach. The material collected is approximately 95% sand (by weight); the remainder is algae, fish and other associated vegetation and litter. Raked material is redeposited on the beach, usually in a berm parallel to the shoreline, the following spring after much of the organic matter has decomposed.

In some circumstances (e.g. during events of botulism on the lake) large numbers of carcasses of dead fish and birds wash up along the shoreline and cannot be adequately collected manually, so are collected twice a day using an all terrain vehicle (ATV) and trailer.

Table 2. Mechanical Raking Equipment

Equipment	Description	Comments
Algae Blade	A blade on a tractor used to scoop algae from the water along the shoreline and pull it onto shore. The algae is then collected by mechanical or hand methods.	Primary raking equipment used at the park.
Beach Harrow	An agricultural harrow pulled behind a tractor, used to loosen hard-packed sand to initiate evaporation and loosen sand and control vegetation growth.	Works well to redistribute accumulated sand near sand fences and to dry out depressions/pools.
York Rake	A rake with recurved tines and adjustable depth pulled behind a tractor to collect algae and other detritus	Keeps up with algae deposition but poor sand to algae ratio. Used on a limited basis.
Cultivator	Pulled behind a tractor, and used to loosen soil to a depth of 6 to 8 inches and remove woody vegetation and roots.	



Figure 8 a, b. Algae sand trucked to storage site

Until 1996, the collected algae/sand material was trucked to the algae-dump adjacent to the Group Campground. Since 1996, algae/sand has been stored on the north-eastern corner of Beach 4 throughout the summer and re-spread at the water's edge in October or November or the following spring, prior to migration. This returns raked sand to the beach and dune system. Location and dimensions (height and width) of the berm have been designed to prevent loss of sightlines for spring migrating shorebirds. In 2004 raked sand was not returned to the beach in the fall, but was stored over the winter on site and returned to the beach in the spring. Re-application occurred in the spring of 2005, 2006 and 2007 at a timing and location recommended by the Advisory Committee, and was found to be successful in returning the sand to the recreational beach without noticeable negative effects to spring migrants.

Frequency

Until the late 1990s, raking took place daily during the peak season on Beaches 2 and 3. Beaches 1 and 4 were raked, but not as frequently as Beaches 2 and 3. In mid-August raking operations on Beach 4 ceased, to allow for algae accumulation for shorebird foraging.

In the late 1990s raking of Beaches 1 to 4 became a regular daily occurrence from July until mid-August. Raking occurred periodically on beaches 1 to 3 after mid-August. Raking did not occur on Beach 4 after mid-August to allow for algae accumulation for shorebird foraging. From 2001 to 2007, Beach 4 was raked only a few times and effort was focused on Beaches 1, 2 and 3. This approach has been observed to provide sufficient areas for intense recreational day use.

The beach and dunes within zones NR2 and NR3 have been left unmanaged other than observation stations along Owen Point Trail.

Proposed Policies:

- Continue current beach management areas within zone NE1 and limit raking to certain areas – end goal is to use a variety of techniques along the beach, with intensity decreasing as one moves from Beaches 1 to 4.
- Continue focusing management efforts on Beaches 1 2, and 3, which are naturally more attractive to human visitors but not as heavily utilized by shorebirds.
- Continue raking Beaches 1 and 2 daily during June 8th to Labour Day to collect algae and to improve sand for recreational use, and rake as required outside of these dates.

The desired result of this action is a net drying of the remaining managed beach.

- Rake Beach 3 as required between June 8th to Labour Day (i.e., may not be daily) to allow spring and fall migrants to utilize the algae food source.
- Limit raking of beaches 1, 2 and 3 to within a maximum of 70 m of the high water mark, and permit the beach beyond this limit to be modified by natural processes. This will allow the beach to return to a more natural gradient. The width of raked area may vary based on water levels (i.e. may be less than 70 m).
- Prior to June and after Labour Day avoid raking on windy days (to prevent net loss of sand) and rake only when necessary.
- Stockpile raked sand and algae at a designated location along the beach to permit algae to dry.
- Each spring, prior to spring migration, reapply sand raked from the previous year along the shoreline of Beaches 1, 2 and 3, ensuring that the dune height does not obstruct shorebird view points (if material cannot be deposited in spring it will occur in the autumn). Method will follow that determined in 2005, which involved placing material in a berm from Beaches 1 -2 approximately 15 – 20 m from the shoreline. Height of the berm of deposited sand will be no more than 30 cm so as not to obstruct sightlines for migrating shorebirds (based on observations from previous years, once deposited, the berm height will be reduced naturally through wind and water action as the season progresses).
- Continue to protect or enhance shorebird foraging and roosting habitat within Beach 4, which will require a minimal amount of regular management effort. Open feeding areas will be maintained by vegetation management (cultivating, raking or cutting); the size of the open areas may be modified based upon results of monitoring of shorebird use. Algae will be left along the shoreline as it is deposited naturally.
- Use defined paths (e.g. fence lined paths) to direct users to raked areas.
- Dispose of dead birds, fish etc. collected during raking through the local landfill.
- Minimize the use of mechanized beach management equipment to reduce soil compaction and disturbance to shorebirds and human visitors. Park vehicles will travel on defined pathways whenever possible.

4.2 Beach and Dune Restoration

There are several methods for retaining or trapping sand to stabilize sand dunes. Management of the beaches and dunes at Presqu'ile has involved a balance between installation of fencing and establishment of vegetation.

Fencing

Sand fences can be useful for trapping sand, where vegetation alone is inadequate, and for control of pedestrian traffic. Sand fences slow the wind velocity near the surface to reduce sand movement. This results in sand accumulation at the base of the fence (Rogers and Nash 2003). There are many different opinions in the literature concerning orientation of fencing, ranging from parallel to the shoreline to perpendicular to the wind to meandering.

In the past at Presqu'ile, sand fence was installed each autumn and removed the following spring. Originally, sand fences were erected in a continuous line parallel to the water's edge roughly 30 m inland. In the mid-1990's this single fence parallel to the water was discontinued and replaced by several, shorter parallel fences that run

perpendicular to the prevailing north-west winter winds. Fencing was not installed in 2004, 2005 or 2006. Based on beach profile research, sand accumulation would naturally occur on Beach 1 and the northern section of Beach 2; these areas are where beaches and dunes would be expected to occur naturally.

Beach walkways are defined with snowfence. These routes lie perpendicular to the winter winds. This approach has been effective in funnelling pedestrian traffic to and from the beach.

Figure 9. Beach walkway at Presqu'ile Provincial Park

Revegetation

Very few species of plants can adapt to dune habitats, and those that do tolerate burial of stems and roots. Vegetation plays an important role in the dune system by trapping blowing sand (Rogers and Nash 2003).

In the early 1990s, a 20 m stretch of open beach at Presqu'ile was fenced at the eastern edge of the entire length of zone NE1. This strip was planted with marram grass and the fences were left in place to protect the grass. With great difficulty, a portion of the now-buried fence was removed from Beach 1. However, because of the damage this caused to the now-established dune vegetation, it was decided to leave the remaining fences in place.

Proposed Policies:

- Allow vegetation to grow towards the lake in zones NR2 and NR3 as the beach itself grows, through natural succession.
- Replace snow fencing along the eastern edge of Beach 4 with a screen of native vegetation (e.g. marram grass, eastern cottonwood, sandbar willow) to create a visual

barrier that discourages encroachment into Beach 4 by park users. A vegetation barrier would also provide insect habitat. A trail would be maintained along this route allowing pedestrian access from the Owen Point Trail access point to the more intensely managed Beaches 1 to 3.
- Design walkways with a meandering pattern to prevent sand build-up and sand-scouring.
- Keep fencing in good repair to ensure respect by park users.
- Where necessary native dune species may be re-established (e.g. marram grass). This may occur via planting or natural succession.
- Increase the beach slope on Beaches 1 and 2 to allow a dry back beach area. This can be achieved by replacing the sand and algae that was scraped off during the summer (Section 4.1). Wind and waves should redistribute the sand over the beach surface (first implemented in 2001).
- Sand fencing may be installed at Beach 1 and Beach 2 to encourage dune growth in areas where it would be most likely to have developed naturally. Fencing will act to capture sediment available from re-deposition of sand and algae (Section 4.1). Fencing would be placed in locations that do not result in infill of beach pools/depressions.

4.3 Invasive Species Control

Common reed grass (*Phragmites* sp.) is an aggressive invasive grass species that has flourished along the shoreline of Owen Point and is encroaching on Beach 4 in zone NE1. This species has created a tall, dense visual obstruction along the shoreline resulting in reduced habitat for shorebirds. It has also reduced sightlines for birders, and reduced the effectiveness of viewing stations. There is a native and non-native form of this species, and the one found at Presqu'ile is non-native.

The park management plan provides for control of invasive species: "If established non-native plant species threaten natural heritage values, a program for their eradication will be developed, subject to specific policies elsewhere in this plan." It also allows for chemical herbicide use to eradicate non-native species where it has been demonstrated that other methods are not feasible (MNR 2000).

Proposed Policies:
- The established population of common reed grass along Owen Point up to Beach 4 may be managed. Techniques used will draw upon lessons learned from management in other areas and documented in literature. Control may be through chemical herbicide application or through mechanical cutting where feasible and effective. Manual cutting may be appropriate in areas adjacent to the shoreline, and would occur in the spring and summer prior to seeding following which cut vegetation would be maintained at an appropriate height. Staff will monitor effectiveness of techniques and develop a control plan, to be adapted based on results of monitoring. It is acknowledged that native vegetation may be incidentally affected at the same time where it is coexisting with the common reed grass.
- Small pockets of invasive species becoming established in other areas of the beach may be controlled by chemical herbicide application or manual cutting where feasible and effective.

- The entire beach will be monitored regularly to track common reed grass and other invasive species and ensure control occurs as soon as possible after new areas are detected, while it is still manageable.

4.4 Habitat Enhancement

Shorebirds have been observed to use beach pools for foraging (Pomeroy 2000; Rose 2005). These beach pools are generally found within Beaches 1, 2, and 3 but are not generally present within Beach 4. A beach pool was observed to naturally occur within Beach 4 under extreme weather events in 2005. There is an opportunity to create a beach pool, or wader scrape, with monitoring of bird behaviour prior and post pool formation to determine its effectiveness in improving habitat. Such a pool may also provide habitat for other species (e.g. dragonflies and damselflies).

Proposed Policies:

- Establish one scrape or pool within Beach 4, subject to appropriate monitoring of shorebird activity prior to and following scrape establishment to allow for assessment of effectiveness of this measure in providing increased habitat for shorebirds (adaptive management approach).
- Based on a review of beach profile survey mapping, the scrape will be located along natural drainage channels to collect runoff from the foredune.
- The scrape will be created through use of mechanical raking equipment and should be of sufficient depth to create a shallow pool, preferably with fine ridges in the bed of the scrape to result in areas of shallow water and wet mud as water levels decrease.
- Shorebird use of the area in spring / summer / fall will be monitored, following the methods used by Rose (2005), during the year the scrape is established.
- Inventory and monitor insect species within the pool (prior to and following project establishment).
- Based on monitoring, the effectiveness of the scrape(s) will be assessed to determine whether to continue maintaining the scrape and /or create more scrapes.

4.5 Education

Further understanding among beach users about habitat conservation for shorebird migration can be promoted through education in the park. Bird migration is one of the principle themes of park interpretation and is addressed through the park's natural heritage education program. The park management plan calls for increased emphasis on interpreting the implementation of zone resource management plans, such as this plan. Providing educational tools in areas that are commonly used by shorebirds in the spring and fall may help to prevent unnecessary disturbance events and promote conservation.

One elevated sand viewing station has been created within Beach 4. There are also viewing stations along the Owen Point Trail. Access to these observation areas for migrating shorebirds provides an excellent learning opportunity for the public. To improve sightlines reduced by the increased area of common reed grass along the shoreline, the station within Beach 4 was moved closer to the lakeshore in 2006.

Proposed Policies:

- As resources permit, create interpretive signage for the viewing stations, Owen PointTrail and along beach access walkways to educate park users on the varied values of the beach and dune system (e.g. images for shorebird identification, shorebird biology / behaviour, other wildlife (dragonflies and damselflies), invasive species, dune and beach importance and habitat, cultural resources).
- Maintain existing viewing stations and consider adding visual screening (e.g. burlap curtain) to create a blind to minimize human disturbance to shorebirds. Relocation of viewing stations will require prior assessment and review by an advisory committee.
- Include in communications materials information about the importance of the beach for both recreation and shorebird habitat, and how timing and location of beach management is important to providing for both values.

4.6 Groundings and Species at Risk

As noted in Section 3.3, as a result of weather events, large numbers of shorebirds sometimes become grounded at the park. Also, on occasion, a shorebird species at risk (e.g. Piping Plover) is observed within the beach and dune area. During those events, additional operational requirements may be required to minimize disturbance to these species.

Proposed Policies:

- A shorebird grounding plan will guide operational approaches in the event that a grounding of greater than 500 shorebirds occurs. The plan will include direction for closing of beach areas and park user education.
- A species at risk plan will be developed to address operational requirements in the event that a shorebird assessed as a species at risk is observed at the beach, in accordance with any provincial direction for that species.

4.7 Recreational Activities

Most of the beach recreational use (e.g. swimming, relaxing, picnicking) occurs during the summer months, outside of shorebird migration periods. The Presqu'ile Provincial Park Management Plan (2000) policies for zone NE1 refer to the beach in this zone as the "beach managed for recreation". The zone NE1 policies include a commitment for continued maintenance of quality beach recreation opportunities where most in demand, through raking daily or as needed during the management seasons (Section 1.1, 3.1).

Some activities are not as weather dependent and have been observed to cause increased disturbance to shorebirds. Kite flying is perceived as a threat by shorebirds, who may view the kite as a raptor or other bird of prey (Section 3.5, Rose 2005). Kite flying is permitted in the park's day use area. Prohibition or discouragement of these activities on the beach through education and enforcement will assist in meeting the goal of this plan.

Proposed Policies:

- Beach 1 will be open year round for recreational use, other than for temporary closures for public safety, or as a result of shorebird groundings or species at risk (section 4.6).
- Beaches 2 and 3 will be open during the management season (June 8th to Labour Day), other than for temporary closures as noted above.
- Recreational use of Beach 4 other than for viewing at designated stations will be discouraged through signage and access restriction.
- Activities that are known to cause a high level of disturbance will be prohibited on the beach, including kite flying, bicycling, and wind-powered beach buggies.
- Walking, jogging and other activities along the shoreline of Beaches 1, 2 and 3 will be discouraged during shorebird migration through education on the effects of disturbance on shorebirds; to minimize effects, users could be directed to areas at the rear of the beach.
- Launching and landing for kite board sailing on the lake will be permitted in a designated area to the north of Beach 1, except during the peak shorebird migration period (i.e. prohibited between May 1st and the second Monday in June annually).
- Conduct a survey of recreational users regarding timing of use of the beach and types of activities engaged in on the park beaches, to provide information to support reassessment of the policies of this plan in 10 years.
- Trail management, including maintaining viewing station sightlines, will continue.

4.8 Inventory, Monitoring and Research

There are many inventory, monitoring and research needs related to beach and dune management in the park and these are needed to enable adaptive management. Partners will be an important resource for meeting these needs.

Proposed Policies:

- Systematically monitor shorebird use of various beach habitats and incorporate this information into annual operational plans.
- Encourage additional research on the various values of the beach to expand on existing knowledge.
- Promote research to answer some of the unknowns such as Popham Bay current patterns and ground water hydrology.
- Monitor sediment transport over the summer and fall to determine the volumes coming to the back beach area and to determine the volumes trapped in the dunes.
- Encourage research to analyze the groundwater flows to determine beach hydrology and the locations of water tables, seeps, etc.
- Encourage research to examine the current and wave regime of the bay. This information will lead to the understanding of the transport of algae which is deposited on the beach and may allow a method to be developed to prevent this deposition.
- At least every 5 years, map the beach/dune area seasonally to monitor elevation changes, and modify management accordingly.
- Use adaptive management strategies based on this information, modifying operational details where needed to encourage optimal shorebird and recreational opportunities.

5 IMPLEMENTATION

- Implementation of the policies in this plan will be dependent upon the availability of funding and unforeseeable changes in priorities or policy.
- Implementation of the plan will meet the requirements of the *Environmental Assessment Act*, *Environmental Bill of Rights*, *Provincial Parks and Conservation Reserves Act*, *Endangered Species Act* and other pertinent legislation.
- All aspects of beach and dune management will be undertaken in accordance with the requirements of A Class Environmental Assessment for Provincial Parks and Conservation Reserves (Class EA PPCR). The projects described within this plan (i.e., maintain existing beaches; control invasive vegetation; install fence or other barrier; creation of scrapes or pools) are pre-screened Category "A" projects under the Class EA PPCR, and may proceed without further screening (i.e. there are no Class EA PPCR consultation requirements for implementation of these projects).
- Beach management operations will be reviewed each spring to determine whether operational changes (e.g. timing or location of sand reapplication) are required for that particular year.
- Beach and dune management will be phased in as follows over a 10 year period:

5.1 Stage One

- Beach raking, Beaches 1, 2, 3 (policies in Section 4.1)
- Maintain sand fencing, Beaches 1 and 2 (Section 4.2)
- Complete recreational beach user survey (Section 4.7)
- Monitor proposed site for wader scrape, Beach 4 (Section 4.4)
- Prepare species at risk plan (Section 4.6)

5.2 Stage Two

- Replace snowfence with native vegetation, Beach 4 (Section 4.2)
- Enhance communications material content on beach values (Section 4.4)
- Establish wader scrape, Beach 4, and monitor (Section 4.4)
- Map beach and dune areas to monitor elevation changes (Section 4.8)

6 PLAN AMENDMENT AND REVIEW

- This plan may be reviewed or amended to address changing issues or conditions. At 10 year intervals, this plan will be assessed for the need for a review or amendment.

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8 APPENDICES

Appendix A. Park Zone Descriptions – NR2, NR3 and NE1

The following information is from Section 5 of the Presqu'ile Provincial Park Management Plan (2000), and provides descriptions of the park zones that include each of the beach areas of the park.

"5.2.2 Zone NR2 - Owen Point-Islands
(200 ha)
This zone protects:
- a representative site for landform interpretation of Owen Point and Gull Island,
- the Owen Point and islands portions of the provincially significant Presqu'ile Area of Natural and Scientific Interest,
- the Owen Point portions of the provincially significant Presqu'ile Bay Marsh wetland,
- significant, very highly sensitive water bird nesting habitat,
- potentially significant, sensitive land bird nesting habitat; two species regulated under the *Endangered Species Act* nested here in the past,
- significant monarch butterfly migration areas,
- very highly significant shorebird and water and land bird migration areas.

This zone includes the waters of Lake Ontario within 200 m of shore.
The prohibition of public access to Gull and High Bluff islands from March 10 to September 10 will be continued, unless and until varied by an approved Zone NR2 resource management plan.

The Zone NR2 resource management plan may include the cormorant management strategy for the park (see Section 6.5)."

"5.2.3 Zone NR3 - North Beach-Foredunes (13 ha)
This zone protects:
- representative sites for landform interpretation of the beach and foredunes,
- significant beach and foredune vegetation,
- potentially significant, sensitive land bird nesting habitat; one species regulated under the *Endangered Species Act* nested here in the past,
- a highly significant shorebird and water and land bird migration area."

"5.4.1 Zone NE1 - Beach-Foredunes (49 ha)
This zone includes the 1.2 km of sand beach that is currently managed, the foredunes behind it, and beach parking and access roads. The beach is both an outstanding recreational resource and a highly significant shorebird and water and land bird migration area. The windward foredunes are highly sensitive landforms.

This zone includes the waters of Lake Ontario within 100 m of shore, including the waters off Zone NR3.

In this plan, "beach managed for recreation means:
- the entire length of beach in Zone NE1,
- from the water's edge to about 10 m in front of the dunes,
- for Beach 4 (the southernmost 200 m of the beach), from June 8 to August 15, and for the rest of the beach, from June 8 to Labour Day (the "management seasons").

On the beach managed for recreation, algae, fish, litter, etc. and associated sand will be raked and the raked material removed, daily or as needed to maintain optimal recreational conditions during the management seasons.

Appendix B. Dates for Beach Management (subject to staff availability)

DATE	Specific Date (Year)*	ACTIVITY	CONSIDERATIONS
April until the end of the 2nd week of May		Removal of Snowfence if required.	This should not be left later to avoid potential disturbance to shorebirds by predators.
Mid April (timing based on advice of committee)		Redistribute the previous summer's algae-sand along Beaches 1-3.	
April until the end of the 2nd week of May		Removal of Woody Debris and Litter within Beaches 1-3, one beach per day.	Biodiversity Specialist should be consulted to ensure not disturbing any unusual concentrations or rare species before management proceeds.
Monday of the 2nd full week of June (start date range of June 7th to 14th) until end of June		Beaches 1-3 raked, one per day.	**Late-May and early-June is the most likely period for a grounding to occur.** If a grounding should occur all management activity will cease until the birds have left of their own accord. Enforcement personnel will be informed of the grounding and asked to pay special attention to problems such as dog-walking on the beach. All beach access roads will be closed
Last Friday in June		Removal of Shorebird Migration signs at all Beach Roads.	
Week preceding the Canada Day Holiday Weekend until August 15th.		Beaches 1 – 3 raked daily as required. Temporary drainage channels may be dug to drain beach pools.	
Monday of the week containing August 15th until Labour Day weekend.		Beaches 1 and 2 raked daily as required. Temporary drainage channels may be dug to drain beach pools. Beach 3 raked once per week as required. Beach 4 not raked	
Post-Labour Day Weekend until mid-October		All beach management practices cease with the exception of litter pick-up and repair to facilities.	
Mid-October to mid-November		Snowfences are installed if required.	
Thanksgiving until the start of 2nd week of June.		Beach 1, 2 and 3 access roads closed.	
Thanksgiving until the Monday of the 2nd week of April.		Beach 4 to be closed and locked.	

*Specific date will be entered by park staff each year.