



# turtle tracks

Friends of Misery Bay  
P. O. Box 114  
Gore Bay, Ontario  
POP 1H0  
[info@miserybay.ca](mailto:info@miserybay.ca)

Fall 2016



## From the Chair

Wow! What can I say about summer 2016? It sure flew by. Perhaps it was all that heat!

2016 started out on a sad note with the passing of so many Friends. It made preparing the Centre for visitors harder, as everything that was brought out from storage reminded me of these wonderful people, and all they did for Misery Bay.



We were fortunate this year to secure funding from both the Federal and Provincial governments to hire students for the summer. This funding allowed for us to open 5 days a week through the month of June, and Danielle Patry was hired. Besides the meeting and greeting, Danielle, under the guidance of Marcel and I, was charged with photographing flowering plants in the Park, and creating an album, and slideshow presentation. It was a particularly

## Contents

Message from the chair.....	1
Visitors Report.....	4
Visitors' Comments.....	5
Toronto Bruce Trail Club Visit.....	6
Continuing Saga of Pesky Porky....	7
Who You Gonna Call – Phragbusters!.....	8
What You Can Do.....	10
Who's Who in the Fen?.....	11
Why Owls Stare.....	13
Glacial and Post-Glacial History...	14
Membership Form.....	18
List of Directors.....	19

challenging year in this regard. The extreme heat and dryness shortened the flowering period (bloom and bust), and the shorelines were always breezy, making getting the perfect shot difficult. But, Danielle prevailed. The resulting photo album was thumbed through by many a visitor.



At the AGM in June, 2 new board members, Peter Barnett and David Clark, along with one returning past member, John Diebolt, joined the team. Peter is a retired limestone geologist, who is educating us on the geological features within the Park. Dave is a techy person who has upgraded various electronic and electrical systems in the centre, and will revamp our website through the winter. John is still involved with Special Projects.



The Special Projects team, led by Jay Swain, did an awesome job on the new shelter and replacing the blocks and planks over the vernal pool. Financial contributions to the Universal Access Trail came from Ontario Parks, The Mountain Equipment Co-operative, individual donors, and memorial donations. Although bone dry this year, the new boardwalk protected the mosses from being ripped up by pedestrian traffic. All this work was completed before the Park became busy. From comments left in the guest book in the shelter, visitors have appreciated the efforts the Special Projects team went to on their behalf.



Hayden returned for a second summer, and settled into the familiar routines. Besides keeping the centre neat and tidy, one of his daily chores was

cleaning up after the pesky porcupine. Inadvertently, the picnic table on the deck was made in to a deli delight for our pesky friend, and he defied all attempts to deter him from his mission to annihilate the table. Spraying Tabasco sauce slowed him down some, but made him mad, and his messages of disapproval were loud and clear, and messy. Eric joined the staff for the month of August. He has his chain saw certification and was put to work on the downfalls on both the Red and Yellow trails. Lots of salamander habitat was created. Eric and Hayden continued the work they started last year, collecting tree leaf/needle/seed/nut/cone, and bark samples to add to the Herbarium collection.



In July the Park was invaded by 120 students and staff from Camp Solelim, a Jewish Leadership camp based in Sudbury. Ian Anderson, Will Kershaw, Peter Barnett, and Manitoulin Streams introduced these campers to mammals, biodiversity, geology and all kinds of aquatic creatures, whilst impressing upon them the need to protect the ecosystem. Kudos to John for making this happen.



For the past 2 summers, Donnell Gasbarrini and her field assistants were a familiar sight, as they tracked and recorded the movements of the Blanding's turtles in the Park. Donnell

spent this summer writing up all her findings and defended her thesis in September. Although unable to say for sure what caused the mass mortality in 2013, disease has been ruled out, leaving predation and winter kill as the 2 main suspects. Donnell has entered the real world, and is now working at the Turtle Rehabilitation Centre in Peterborough.



Ontario Parks received funding to upgrade the Sifferd cottage, and bring it one step closer to becoming a research facility with accommodations. Trees have been cut down around the cottage, and it has been thoroughly cleaned. New windows and doors are to be installed. The deck will be replaced, a solar power system installed, along with a composting toilet.



The touch screen trail map interactive, and Park overview videos, that Science North created, were installed in August. These have proved to be popular with visitors. This has opened another can of worms: now the trail map will need to be updated, and signage will need to be erected in the Park to show where these features are located. One lady stated that Misery Bay was the most technologically advanced Park she had visited. Phase 2 of the exhibit plan is underway, and it is hoped that all will be installed by July 1 2017. Mark the date, as the

FOMB will be hosting an opening party to celebrate.



Last year we reported that the parking lot was to receive some attention to create more parking spaces, and that a roadway to the storage building was to be constructed. Before this work could go ahead, an archaeological study needed to be performed. The results of this study indicate that this area may have been of significance to pre-contact peoples, and has advanced from a stage 1 – 2 study to a stage 3 study, to be conducted this fall. The work will involve digging up a larger area in the search for artefacts.



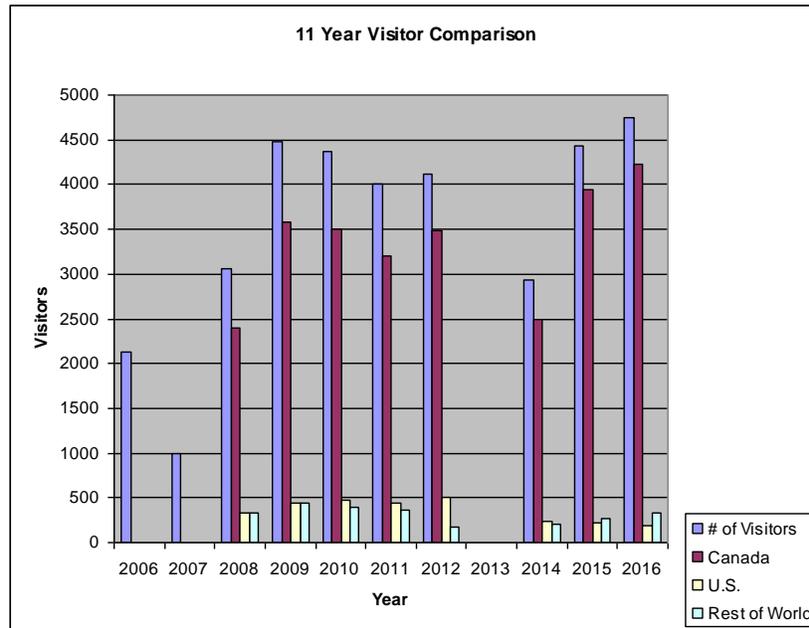
One of my guilty pleasures each year is reading the comments left by visitors in the guest books at the Shelters. I am humbled by all the lovely comments, and impressed by the number of visitors who “get the Misery Bay experience”. I enjoy reading the poems inspired by Misery Bay and have shared some in this newsletter.

At this time, I would like to remind members that membership is based on the calendar year. Your continued support is your endorsement of our initiatives.

Remember: *Misery Loves Company*



## Visitor's Report



In 2016, the Visitors Centre was staffed by volunteers of the FOMB on weekends from Victoria Day to Thanksgiving, and by our grant supported students, Danielle Patry, Hayden Patry, and Eric Harper every weekday in July and August.

difficulty remaining open through the summer months. We are also grateful to the many local businesses and individuals who recommend Misery Bay as a destination to their families, friends and visitors.

The visitor count this year was 4,764, a record number.

The chart and graph show the number of visitors and their point of origin, for most of the last 11 summers.

This summer we hosted visitors from the west to east coasts, and all points in between. The only province missing is P.E.I.

Our American visitors came from 18 different states, and folks from 21 countries around the world discovered Misery Bay this summer.

As always, the FOMB are extremely grateful to our dedicated weekend volunteers, without whose help we would have

### *Misery Loves Company*

Year	# of Visitors	Canada	U.S.	Rest of World
2006	2125	n/a	n/a	n/a
*2007	994	n/a	n/a	n/a
2008	3065	2391	337	337
2009	4484	3587	449	448
2010	4372	3498	481	393
2011	4005	3204	441	360
2012	4115	3490	499	166
2013	no data			
2014	2940	2499	235	206
2015	4437	3949	222	266
2016	4764	4230	190	332

\*In 2007 there wasn't a grant supported student. The Centre was only open weekends.

## Visitor Comments 2016

Quotable quotes from the guest books.

These are just a sample of the many comments left in the guest books. They are written freely, from the heart, by visitors who get the "Misery Bay experience." They are written by people from all walks of life, all parts of the world, first time visitors, and those who keep coming back to this wondrous place.

- Our favourite spot in Ontario is Misery Bay
- First time, can't wait to come back
- 5<sup>th</sup> year in a row. Love this place
- We make it here twice a year to enjoy the beautiful beach, rock side trails. As always it is a pleasure. Thank you. You do such a wonderful job.
- Wonderful spot! Name sort of scared me but worth the walk!! Will come back for sure – so peaceful – had beach to ourselves
- A picture is worth a thousand words, but we are leaving with endless memories of this beautiful hidden gem
- The subtle friendly sounds of the waves are peaceful and relaxing. I enjoy it, and if it were up to me I would rename this, Bliss Bay.
- I have no words to describe this beauty and tranquility, but my soul is singing
- Sunday! This is my church for today. The spirit calls from the land and the water! So wonderful

There is something about Misery Bay that inspires the soul of the poet.



O Great Spirit, light of light, the voice  
I hear from the whispering breeze  
Hear me O Great One for I am  
Young and small and weak.



Sun dappled path  
Free and open breeze  
Hand in hand with love  
We walk between the trees.  
Birds and other sounding,  
Water lapping up ahead  
Pine needles turn to sand.  
It's beautiful here.



I see the sun upon the water.  
I gaze in to the blue  
And whisper just a word of thanks  
To Gitchi Manitou.

One group of visitors "*sailed into Misery Bay yesterday evening. It was very windy – 20 knots. Found a nice sheltered spot to anchor. The sunrise was beautiful.*"

## The Toronto Bruce Trail Club Visit

*Photos courtesy of Lucy Leung*

On the last Saturday in August it was my pleasure to provide a guided hike for 56 members of the Toronto Bruce Trail Club. It was a rather grey day, calm, threatening rain, but that did not dampen the enthusiasm of this group. This is a club that hikes together on a regular basis. Their leader, Lucy, was well organised, and safety conscious. As you can imagine with a group this size, the chances of somebody getting lost or waylaid increases. All hikers carried a whistle, and at trail intersections one person stayed behind to indicate the direction of travel.

Before leaving the centre, the hikers were introduced to the new trail map interactive.



We hiked the old Wolf Den trail to the alvar area,



before crossing the bridge to the Bay. From there we headed south on the Coastal Alvar trail



with about half the group making it as far as The Shelter at Saunder's Cove. We doubled back to where the Coastal and Inland Alvars meet on the south shore, posed for a group photo,



then had to hoof it back to the centre to fit their time frame.

The following day I received the following e mail.

*We had so much fun at Misery Bay yesterday morning & the consensus was the alvars & shoreline in Misery Bay was far more interesting than the Cup & Saucer Trail; without doubt having you with us made a world of difference to our appreciation of the place.*

I requested and received more information about this group, along with the above photos.

*"The Toronto Bruce Trail Club of 56 hikers ranging from ages 20 to 70+ had an amazing weekend on Manitoulin Island and a memorable Saturday morning at Misery Bay. Thank you again for spending time with us and sharing your wealth of knowledge about Misery Bay. It is clear from the happy faces in the enclosed group photo that we all had an awesome time.*

*Toronto Bruce Trail Club is the largest of the nine member clubs of the Bruce Trail Conservancy, a charitable organization committed to establishing a conservation corridor containing a public footpath along the Bruce trail [brucetrail.org]. Our 3,000+ members enjoy the benefits of a full range of hiking, conservation and educational activities. You can read more about TBTC in the following link [www.torontobrucetrailclub.org]*

Many thanks to the Toronto Bruce Trail Club, for an enjoyable morning

### **Misery Loved Your Company!**



### **The continuing saga of the Pesky Porky**



You may remember that last year it was reported in Turtle Tracks, that the handicapped parking signs were under siege by our unofficial greeter, Pesky Porky.

This year, having totally destroyed the sign, he turned his attention back to the building. Inadvertently whilst preparing the picnic table for re-staining, I created a tasty treat for our prickly friend. After noticing the damage a live trap was set, in an attempt to catch the fiend. A couple of snowshoe hares entered the trap, and were released. Then, a raccoon was caught, and being creatures of habit, it was likely that the raccoon would have returned each night for the tempting apple in the trap. A trail camera was set up in the vicinity of the trap. The first night it was up, it was activated by Pesky Porky. The picture above was sent to Ryan Gardner, Park Superintendent, whose comment was "he's a big one". Hardly surprising as he has eaten a fair chunk of picnic table, and a handicapped parking sign!



## **Who Ya Gonna Call? Phrag Busters!!**

Our attention, this summer, was drawn to the large patches of invasive Phragmites growing in the marshy area at the head of the Bay.

Invasive Phragmites (*Phragmites australis subspecies australis*) is an aggressive plant causing damage to Ontario's biodiversity, wetlands and beaches. It is a perennial grass that has been damaging ecosystems in Ontario for decades, and has now invaded Misery Bay.

Plants use many strategies to colonise and dominate an area; quick growth, producing many seeds, sending out runners, easy rooting segments, and releasing toxins from its roots.

Phragmites uses all of these strategies in its effort to dominate the ecosystem, and it is very successful in this endeavour. Invasive Phragmites is an aggressive plant that spreads quickly and out-competes native species for water and nutrients. While it prefers areas of standing water, its roots can grow to extreme lengths, allowing it to survive in relatively dry areas.

In early September, Hayden and I joined Judith Jones and her Phrag busting team

(Rad, Mira and Billy) to remove patches of Phragmites from the west side of the bay.



When it became evident that it was going to take more than a day, Judith decided that the large patch towards the centre of the wetlands (pictured above) should have all flowers and seed heads removed, and that patches closer to shore should be cut down below water level.



Removing this plant is full of challenges. Seed heads and flowers must be bagged and removed from the area, to prevent spread.



Cut stems need to be bundled and removed, since any piece left floating, has the ability to develop a new plant at the stem nodes.



Care must be taken handling all parts of this plant. It needs to be removed to an area where it can be thoroughly dried out. Once dried it can all be gathered up and burned, but as my brother-in-law would say, be careful where you spread the ashes.

Much of the cutting work took place in water that was over my knees.

According to Judith, any day you don't get your underwear wet, is a good day. We had a good day.

The patch closest to the west shoreline had numerous runners, some reaching 10 meters in length. Again, these needed to be carefully bagged up prior to removal. I learned the hard way that this plant fights back. Broken stems shatter leaving razor sharp fragments which can slice unsuspecting fingers.

At the end of the day we had a truck load of bundled stems, and several bags of seed heads and roots.

There is still much work to be done to remove this species from Misery Bay. Next year there will be concentrated effort on the west side. Many hands make light work. Stay tuned for opportunities to become a "*Phrag Buster!*" in 2017.



## **What You Can Do**

- Learn how to identify invasive Phragmites and how to avoid accidentally spreading it through its root fragments and seeds. This is especially important if you are planning to do work in an area which contains invasive Phragmites.
- Do not plant invasive Phragmites. Native Phragmites have the same appearance and do not pose an ecological risk.
- Stay on designated trails. Leaving trails or entering areas containing invasive Phragmites can encourage the spread of this plant. When leaving an area containing invasive Phragmites, brush off clothing and clean equipment onsite to avoid the transfer of seeds to new areas. Remove all visible portions of plants and dispose them in the garbage.
- Do not compost invasive Phragmites. Both seeds and rhizomes (horizontal plant stems growing underground) can survive and grow in compost.
- Join a Phrag busting team.

## **Identifying Invasive Phragmites**

One factor making the identification of invasive Phragmites difficult is the existence of a closely related native subspecies. Generally, native Phragmites does not grow as tall as the invasive plant and does not out-compete other native species. A number of characteristics of the plant can be useful in distinguishing between the native variety and invasive Phragmites. The following

information can help in identifying invasive Phragmites.

### **Invasive Phragmites:**

Grows in stands that can be extremely dense with as many as 200 stems per square metre.

- Can grow so densely that it crowds out other species.
- Can reach heights of up to 5 metres (15 feet).
- Have stems that are tan or beige in colour with blue-green leaves and large, dense seed heads



### **Native Phragmites:**

- Grows in stands that are usually not as dense as the invasive plant;
- Well-established stands are frequently mixed with other plants; and
- Usually have more reddish-brown stems, yellow-green leaves and smaller, sparser seed heads.

## Who's Who in the Fen?

This picture of a Great Horned Owl was taken with a trail camera located in the Fen at Misery Bay



Photo courtesy of D. Gasbarrini

**Description:** The Great Horned Owl *Bubo virginianus* is one of Canada's commonest large birds of prey. The most notable physical attributes are its large size and prominent ear tufts or "horns." A predator that hunts at night, this owl has enormous yellow eyes set in a broad face, a curved beak and claws, and long fluffy feathers. As is the general case with hawks and owls, the female Great Horned Owl is considerably larger than the male, averaging about 2 kg to the male's 1 to 1.5 kg, with a wingspan of about 1.2 m.

**Habitat and Habits:** Adult Great Horned Owls are formidable predators and have few natural enemies, though some may be killed or seriously injured when attacking large-size prey. It is, for instance, common to

find these owls riddled with porcupine quills or reeking of skunk scent.

**Feeding:** Because they are both large and powerful, Great Horned Owls are capable of handling a wide variety of prey, ranging in size from shrews and songbirds to skunks and geese. As a general rule, however, the Great Horned Owl mainly depends upon medium-size mammals and birds, at least in Canada and the United States where its food habits are well documented. Rabbits and hares are a staple part of the diet in many regions, and grouse and ducks are also important prey. When mice or voles are abundant, as they are every three or four years, owls consume large numbers of them.

The Great Horned Owl hunts mostly between dusk and dawn, and its night vision and hearing are acute. Like other owls, it can approach its prey in total silence thanks to specializations of the flight feathers. As well as being a silent hunter, this owl is swift, and its talons are effective weapons.

It swallows small prey whole, but dismembers larger prey before eating them. Fur, feathers, teeth, and bones that are indigestible are compacted in the owl's stomach and later regurgitated, or brought up, as "pellets." One or more of these may be expelled daily, depending upon the volume and type of food eaten. Scientists obtain information on the food habits of owls by identifying the remains of prey animals in such pellets.

**Breeding:** Horned Owls are very early nesters, even in northern latitudes, with egg laying and incubation

underway well before the snow disappears. Laying begins approximately one month before hatching. Nesting occurs earliest during years of peak snowshoe hare populations, suggesting that it is the adequacy of the owls' food supply that determines how early or late the birds will nest in any year.

The number of eggs per nest ranges from one to five, and the size of the average clutch, or set of eggs, differs from place to place and from year to year. Differences in clutch sizes between years seem tied to major changes in availability of food. When meadow voles and snowshoe hares are abundant, the size of the clutch increases.

The young owls are almost fully feathered and capable of short flights around eight weeks of age. However, they remain largely dependent upon their parents for food during most of the summer and likely do not disperse from the territories where they hatched until fall. The period between fledging, or first flight, and dispersal is a critical time for all young birds of prey, because this is when they must develop the hunting skills that will make them self-supporting.

*In most Native American tribes, owls are a symbol of death. Hearing owls' hooting is considered an unlucky omen, and they are the subject of numerous 'bogeyman' stories told to warn children to stay inside at night or not cry too much, otherwise the owl may carry them away. Sometimes owls are said to carry messages from beyond the grave or deliver*

*supernatural warnings to people who have broken tribal taboos.*

Owls appear in many Native legends.

### **The origin of day and night**

One day long ago Rabbit was walking through the forest. He saw Owl sitting on a branch of a tree. There were bits of light coming through the trees but it was hard for Rabbit to see. Rabbit asked Owl why he liked enough it so dark. Rabbit told Owl he didn't like the dark and he was going to make it bright like the daylight. Owl told Rabbit that if he was powerful to do it. Owl told Rabbit that they should have a contest to see who could make it dark or light all the time. Rabbit and Owl called together all of the birds and animals to witness. Rabbit and Owl explained to the animals what they were trying to do. Some of the animals wanted Rabbit to win but didn't know if they wanted it to be light all of the time. Some of the animals wanted Owl to win so it could stay dark all of the time. The contest began. Rabbit repeated "Light, Light" and Owl repeated "Night, Night." The trick was not to repeat the other's words. If they repeated the wrong word they would lose. Rabbit and Owl kept on saying their words. The animals were cheering them on. All of a sudden Owl said "Light" and lost the contest.

Rabbit was the winner and he had his wish for daylight. He decided to let there be night as well for the benefit of all the animals. This made everyone happy.

## Why Owls Stare Native American - Choctaw Story

*Owl and Pigeon were friends. Most mornings they sat in the same tree to talk and watch the sunrise. Sometimes one of them would boast about how fast they could fly, or their relatives could fly, or how far, and how good their eyesight was when they were high above the ground. One morning Owl boasted about something different. "I think there are more owls than pigeons," he said.*



*Pigeon argued this statement, so Owl challenged him to a counting. They agreed that the Big Woods would provide plenty of perching space, and that the count would take place the following week.*

*A week later the owls arrived first, just as the sun was rising. They swooped down on the Big Woods from every direction until there were owls in most of the trees. They hooted and laughed to each other "Toowoo, wah, wah! The pigeons are still asleep!" The hooting and wing flapping died down as they settled on the branches and waited. They were sure there were more of them than the pigeons. After a while they heard a swooshing sound in the*

*distance. Huge grey clouds moved towards them from the east, south and north.*

*The clouds were pigeon wings. Thousands of pigeons swooped down on the Big Woods, blocking out the sky. As the pigeons landed in the trees, the owls had to shuffle closer together. Branches broke when too many pigeons tried to land at once. The owls couldn't believe their eyes or their ears. The noise of flapping wings and scratching feet was deafening. The owls stared, moving their heads from side to side to watch the pigeons land all around them. And still the pigeons kept coming, circling down from the sky looking for landing space. The owls could not believe there were so many pigeons. Their eyes grew wider and wider as they moved their heads from side to side, trying to keep track of the pigeons. More and more of them swooshed in. Some of the owls started to feel nervous. Being surrounded and squashed by so many pigeons was a bit scary. They began to hoot to each other "Toooooooooo, we're being trampled. Let's get out of here!" One by one the owls took off, darting up between branches and diving away from the still incoming pigeons. The owls fled into the sky, their staring eyes flattened even wider open by the wind rushing past them.*

*No-one did any counting. The pigeons settled themselves all over the Big Woods, cooing and calling to each other, celebrating their win.*

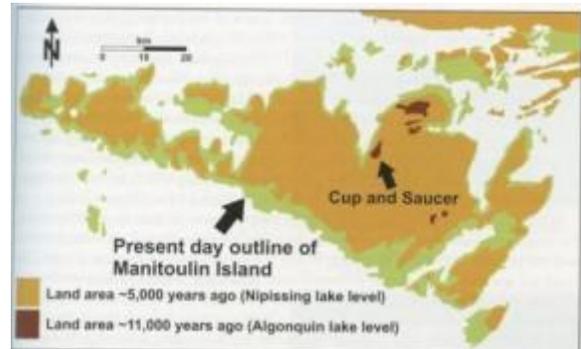
*Since then, owls have always traveled at night when pigeons are asleep. They stare at everything around them, watching out for pigeons.*



# Summary of the glacial and post-glacial history of Misery Bay Provincial Park<sup>12</sup>

Peter J. Barnett

Misery Bay Provincial Park, Manitoulin Island and all of Ontario was covered by the Laurentide Ice Sheet, a large continental glacier, about 20,000 years ago. This ice sheet covered much of Canada and extended into the northern Great Lake states of the United States of America. Manitoulin Island and Misery Bay specifically would have been covered by glacial ice that was about one and one half kilometres thick at this time. Manitoulin Island was deglaciated about 13,000 years ago<sup>3</sup> and became flooded by waters of glacial Lake Algonquin, an ice-contact proglacial lake. Most of Manitoulin Island, except for a few isolated high points in the easternmost part of the Island was flooded by waters of this lake (Figure 1).



**Figure 1.** Land area (in dark brown) exposed during glacial Lake Algonquin approximately 13,000 cal. yr. B.P. and the land exposed (light brown) during the Nipissing Great Lakes approximately 5,700 cal. yr. B.P. (Coniglio *et al.* 2006).

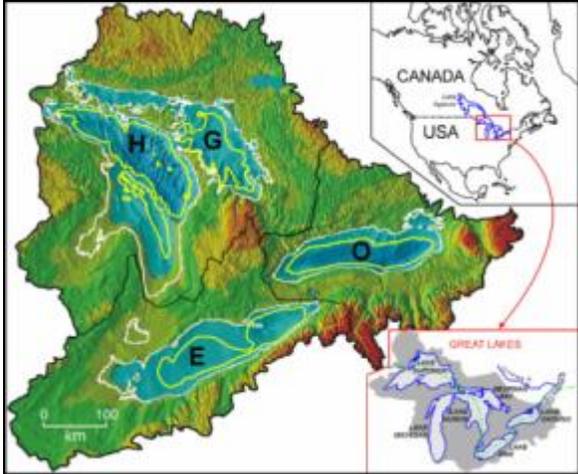
Several phases of glacial Lake Algonquin that occurred at successively lower elevations produced shoreline features across the Island. Misery Bay Provincial Park remained submerged throughout this series of lake phases, only to become an emergent land surface following the uncovering and opening of the North Bay outlet at North Bay, Ontario about 11,500 years ago.

The opening of the North Bay outlet, which at this time was depressed from the weight of the glacier, dropped water levels within the Upper Great Lakes to levels much lower than those of today and all of Manitoulin Island was exposed above lake level (Figure 2).

<sup>1</sup> Excerpts from “Post-glacial Shorelines of Misery Bay Provincial Park” by Peter J. Barnett commissioned by Ontario Parks, 2016.

<sup>2</sup> This article summarizes the work of many different researchers, please see original document for reference material used in this article.

<sup>3</sup> 13,000 cal. yr. B.P. (Lewis *et al.* 2008)



**Figure 2.** Low-strand shorelines approximately 8,770 to 8,290 calibrated years B.P. are shown in yellow and present shorelines in white in this coloured watershed relief map (Lewis *et al.* 2008b). Lake basins: H, Huron; G, Georgian Bay; E, Erie; O, Ontario.

Misery Bay Provincial Park consisted of bedrock-controlled escarpments and plains that likely had a cover, of variable thickness, of till and locally thin sediments of the Algonquin phase lakes. The land surface was available at this time to weathering and erosion, including karst processes for a period of time of about 5,500 years. At Misery Bay Provincial Park, the carbonate bedrock surface exposed above the level of the subsequent Nipissing transgression was exposed for a total of approximately 11,500 years as grikes, clints, pit karren and sinkholes formed locally.

The low-strands in the Lake Huron and Georgian Bay basins were named Lake Stanley and Lake Hough, respectively and it has been suggested that Lake Stanley was at least 122 m (400 feet) below present lake level.

These low-stand lakes formed as a result of the Laurentide Ice Sheet margin receding north of the Continental Divide and its meltwater by-passing the Upper Great Lake basins and when combined with dry, early Holocene climate, a low supply of water was delivered into the Huron and Georgian Bay basins. Low stands of Lake Stanley (Huron) and Lake Hough (Georgian Bay) formed that were closed basin lakes; no rivers draining them towards the sea. Water levels fell, probably 25 to 30 m below the level of the controlling sill, the North Bay outlet. This is supported by the occurrence of tree stumps in growth position now occurring below the present day level of Lake Huron and Georgian Bay. In addition, topographic highs within the Huron basin, like the Alpena-Amberley ridge in the central Lake Huron Basin provided hospitable environments and migration pathways for caribou and other herd animals (Figure 2). Early human inhabitants were opportunistic, setting up blinds and drive lines for hunting caribou along this ridge. Manitoulin Island was joined to the Bruce Peninsula during this time as well as to the “north shore”. With continuing glacial isostatic adjustment, the outlet at North Bay continued to rise relative to other parts of the basin. Water levels within the Huron and Georgian Bay basins began to rise from the low-stand levels from about 8,300 and continued to about 6,000 years ago. River valleys that were eroded down to the low water levels became flooded and

infilled with sediment during the transgression or lake level rise. Water level continued its slow rise until the Nipissing Great Lakes formed about 4 m above the current level of Lake Huron at Port Huron, Ontario or at the base of the shore bluff at Misery Bay Park Visitor Centre, about 20 m (65.6 ft.) above the present-day level of Lake Huron as a result of differential isostatic adjustment.

The Nipissing Great Lakes has been divided into a transgression phase, a peak Nipissing phase and falling level phase. At Misery Bay, in part because of glacial isostatic adjustment the beaches resulting from the transgression phase and peak phase essentially occur at the same elevation creating a Nipissing shore marked by a wave-washed boulder-gravel lags and bedrock platforms, a boulder and cobble gravel beach berm (Figure 3) and contributed to the formation of the escarpment on which the Visitor Centre is located (former shore bluff of the Nipissing Great Lakes).



Figure 3. Nipissing storm berm at southern end of the Park east of Misery Bay (UTM 17 T 366469 5071609) (photo by: Peter J. Barnett, 2015).

The peak phase of this lake drained through three outlets; North Bay, Des Plaines River at Chicago and at Port Huron. The Nipissing Great Lakes beaches "are among the strongest and most spectacular shoreline features of any age in the Great Lakes region"<sup>4</sup>. They appear "remarkably fresh and undissected, but are built on dissected topography in many places"<sup>5</sup>. Eventually, the North Bay outlet was abandoned as a result of differential uplift and waters from this lake drained southward. The Nipissing Great Lakes level ended when down cutting occurred within the Port Huron outlet and the Algoma phase began, about 3,000 years ago.

Four periods of relatively long-lived high water post-glacial lake levels in the Michigan and Huron basins occurred (Figure 4). The first related to the post-glacial Nipissing Great Lakes (6,000 to 3,700 cal. yr. B.P.) and in particular, the peak Nipissing phase (4,500 cal. yr. BP), followed by the Algoma phase (2,300 to 3,300 cal. yr. B.P.) and two unnamed high phases (1,100 to 2,000 cal. yr. B.P. and 0 to 800 cal. yr. B.P.). During the first of the two unnamed phases water level in the Huron basin was higher than during the preceding Algoma phase. At Misery Bay Provincial Park, there exist four belts of shoreline features subparallel to the present day shoreline related to the four periods of relatively long-lived high water post-

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<sup>4</sup> Hough 1958, p.249-250

<sup>5</sup> Hough 1958, p.250

glacial lake levels in the Michigan and Huron basins. A walk down the trails from the Visitor Centre to the shore of Misery Bay crosses each of these four belts of shoreline features with the Park's landscapes getting younger and younger as you approach the shore.

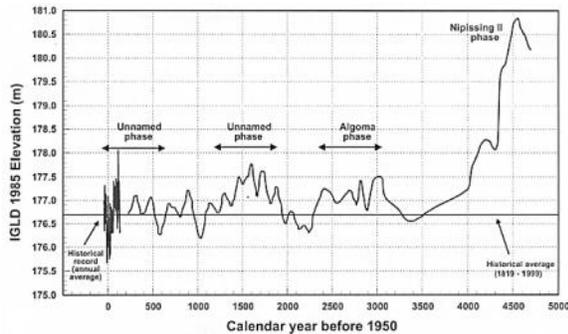


Figure 4. Hydrograph of late Holocene lake level for Lake Michigan at the Port Huron outlet. This graph was generated by removing long-term rates of vertical ground movement from the surveyed data (Baedke *et al.* 2004).

Superimposed on these long term trends are quasi-periodic fluctuations associated with climate variations over periods of 6 and 160 years. These variations are responsible for the multiple sand and gravel ridges seen throughout the park below the Nipissing Great Lakes level. These are well developed at Misery Bay Provincial Park, particularly in the Mac's Bay and Misery Bay embayments where sediment supply is abundant. Elsewhere in the Park, bedrock platforms, and boulder foreshore lags influence the location and development of shoreline features (Figure 5).



Figure 5. Recent shoreline of Lake Huron, west of Misery Bay. The wave washed platform underlain by bedrock (foreground) and a boulder lag resting on till (left center) in front of the sandy and gravelly storm berm (background) in front of the trees (photo by: Peter J. Barnett, 2015).

In conclusion, the parking lot area and the Visitor Centre sit on the oldest landscape present in Misery Bay Provincial Park; exposed for approximately 11,500 years. Below the Visitor Centre an interesting record of post-glacial shoreline features, 18 along the Coastal Alvar Trail, dating back to about 6,000 years ago occur. Shoreline features formed during the Nipissing transgression, a gradual rise in lake level as a result of glacial isostatic adjustment following an episode of closed-basin lakes within the Huron and Georgian Bay basins, is the highest shoreline in the Park. At Misery Bay, in part because of glacial isostatic adjustment, the beaches resulting from the transgression phase and peak phase essentially occur at the same elevation creating strong Nipissing shoreline features marked by bedrock platforms, wave-washed boulder lags, boulder and cobble gravel beach berms and contributed to the formation of the escarpment on which the Visitor Centre is located

(former shore bluff of the Nipissing Great Lakes). North of Misery and Mac's Bay, a strand plain consisting of multiple ridges of sand and gravelly sand and inter-ridge swales were formed during the Nipissing phase. At lower elevations, strand plains associated with Lake Algoma and two, lower-level, unnamed high stands of Lake Huron are present. Along the Coastal Alvar Trail from the Visitor Centre to Misery Bay, alvars, formerly bedrock platforms, occur between, or separate, each of these strand plains of former levels of Lake Huron resulting in a succession of alvar development with the length of exposure decreasing at lower elevations lake-ward. Weathering of the exposed bedrock platforms also decreases lake-ward. For example, marks left by the moving continental glacier (striations, chattermarks and meltwater erosion forms), once likely occurred on all the bedrock surfaces in the Park, can now only be seen on the youngest surfaces, such as at the Alvar Arena and along the present shoreline. One exception to this is beneath the Visitor Centre where the bedrock surface was exposed during excavation for its construction.



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**2016**  
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416-548-6131 (seasonal, when the Centre is open)

[miserybay@explornet.com](mailto:miserybay@explornet.com)

[info@miserybay.ca](mailto:info@miserybay.ca)

**Chairperson/President** Gaynor Orford, 705-282-3035, [orfordfa@vianet.ca](mailto:orfordfa@vianet.ca),  
17029 Hwy 540, RR 1, Evansville, ON POP 1E0 (*2<sup>nd</sup> elected term ends 2017*)

**Vice-Chairperson/V P** Peter Ford, 705-377-5501, [fordp@amtelecom.net](mailto:fordp@amtelecom.net),  
Box 232, Mindemoya ON POP 1S0 (*1<sup>st</sup> elected term ends 2017*)

**Secretary** Jan McQuay, 705-377-4045, [mcquay@amtelecom.net](mailto:mcquay@amtelecom.net),  
Box 333, Mindemoya ON POP 1S0 (*1<sup>st</sup> elected term ends 2016*)

**Treasurer** Geoff Hector, O 416-359-3856, C 647-407-5206, H 519-752-9752,  
Murphy Point 705-282-2058, [geoffhector@rogers.com](mailto:geoffhector@rogers.com),  
14 Webb Avenue, Brantford , ON N3T 6S5 (*1<sup>st</sup> elected term ends 2016*)

**Member** Ted Kilpatrick, 705-282-8876, [cookilburrow@gmail.com](mailto:cookilburrow@gmail.com),  
479 Newburn Road, Kagawong, ON POP 1J0 (*1<sup>st</sup> elected term ends 2017*)

**Member** Cora Hayden, 705-282-3462, [corahayden@vianet.ca](mailto:corahayden@vianet.ca),  
210 Morden-Noakes Road, RR 1, Evansville, ON POP 1E0 (*2<sup>nd</sup> elected term ends 017*)

**Member** Marcel Beneteau, 705-282-8513, [m beneteau@usudbury.ca](mailto:m beneteau@usudbury.ca),  
148 McQuarrie Road, Kagawong, ON POP 1J0 (*1st elected term ends 2018*)

**Member** John Diebolt, 705-377-5165, [rjdiebolt@amtelecom.net](mailto:rjdiebolt@amtelecom.net)  
Site 11, RR1, Mindemoya, On, POP 1S0 (*1<sup>st</sup> elected term ends 2020*)

**Member** David Clark, 705-377-5165, [daclark@amtelecom.net](mailto:daclark@amtelecom.net)  
5 Margaret street, Unit J, Mindemoya, On, POP 1S0 (*1<sup>st</sup> elected erm ends 2020*)

**Member** Peter Barnett, 705-522-8526 [peterbarnett172@gmail.com](mailto:peterbarnett172@gmail.com)  
172 Camp Mary Anne Road, Mindemoya On POP 1S0 (*1<sup>st</sup> elected term ends 2020*)

#### **MISERY BAY PARK SUPERINTENDENT**

Ryan L. Gardner, 705-966-0562, Cell 705-665-2459, FAX 705-966-0565, [ryan.gardner@ontario.ca](mailto:ryan.gardner@ontario.ca), Windy Lake Provincial Park, P.O. Box 560, Levack, ON P0M 2C0 [also Superintendent of Halfway Lake, Fairbank Lake, Wanapitei, Queen Elizabeth the Queen Mother, and Blue Jay Creek Provincial Parks]

Erika Poupore, Assistant Park Superintendent, 705-966-0563, [erika.poupore@ontario.ca](mailto:erika.poupore@ontario.ca)

Robert Fortin, Halfway Lake, 705-966-2315 or -2315, [robert.fortin@ontario.ca](mailto:robert.fortin@ontario.ca)