

Report from 2021 Survey at Providence Bay Beach with analyses of results of activity and enhancement work

Prepared for Municipality of Central Manitoulin

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Background

This report discusses survey work done in 2021 to fulfill requirements of the overall benefit permit #SU-C-002-15 issued in 2016 to the Municipality of Central Manitoulin. The permit allows the municipality to do maintenance work on the Providence Bay beach that could potentially damage some individuals of Pitcher's Thistle (*Cirsium pitcheri*) or alter its habitat. The Activity (maintenance) Area contains the playground, the land directly behind (lake-ward) of the Harbour Centre, the beach area that formerly had a volley ball court, and the east side of the river mouth going east roughly half way to the first staircase. It also includes a strip a few metres wide running parallel along both sides of the boardwalk. The benefit or Enhancement Area, in which actions must be done to improve the situation for Pitcher's Thistle, consists of all of the beach area to the east of the Activity Area and lake-ward of the boardwalk.

The purpose of the survey discussed in this report was to provide data to be compared to 2017 baseline data to show that a benefit is occurring, and to ensure that work being done causes as little harm to Pitcher's Thistle as possible.

Conditions of the permit require the following:

- 1) Training for all personnel who will be working on the beach as part of the permit activities.
- 2) Surveys to fulfill sections 13.1, 13.2, and 13.3 of the overall benefit permit, including: evaluation of any impacts to Pitcher's Thistle from activity work and benefits to the species from enhancement work.

Methods

1) Training

Training was not needed in 2021 as no work was done. As well, all staff had been trained previously.

2) Survey Work

The permit calls for surveys to document or include:

- The abundance of thistles by life form;
- Georeferencing (GPS) and mapping patches of thistles;
- Vegetation cover by percent in each section including a list of all plant species and their prevalence;
- In the enhancement area, an evaluation of the effectiveness of the actions done;

- In the enhancement area, an assessment of the amount of exposed sand available as suitable habitat for Pitcher's Thistle;
- Invasive species control results and continued control needs, quantified when possible (also include photos of results/needs).
- Photo documentation of each section;

Survey work was conducted at Providence Bay on August 5, 2021 by Judith Jones. Documentation was done in defined, georeferenced areas (Figures 1 and 2). These were:

- Polygon 1: the playground and sand running west to an access trail;
- Polygon 2: land directly lake-ward of the Harbour Centre;
- Polygon 3: former volleyball court area;
- Polygon 4: bench area on the east side of the river mouth;
- Polygon 5 from the eastern boundary of the activity area to staircase 3-4;
- Polygon 6 from staircase 3-4 to a georeferenced point halfway between staircases 5 and 6;
- Polygon 7 from the eastern side of Polygon 6 to the eastern end of the beach.



Figure 1. Activity Area polygons.

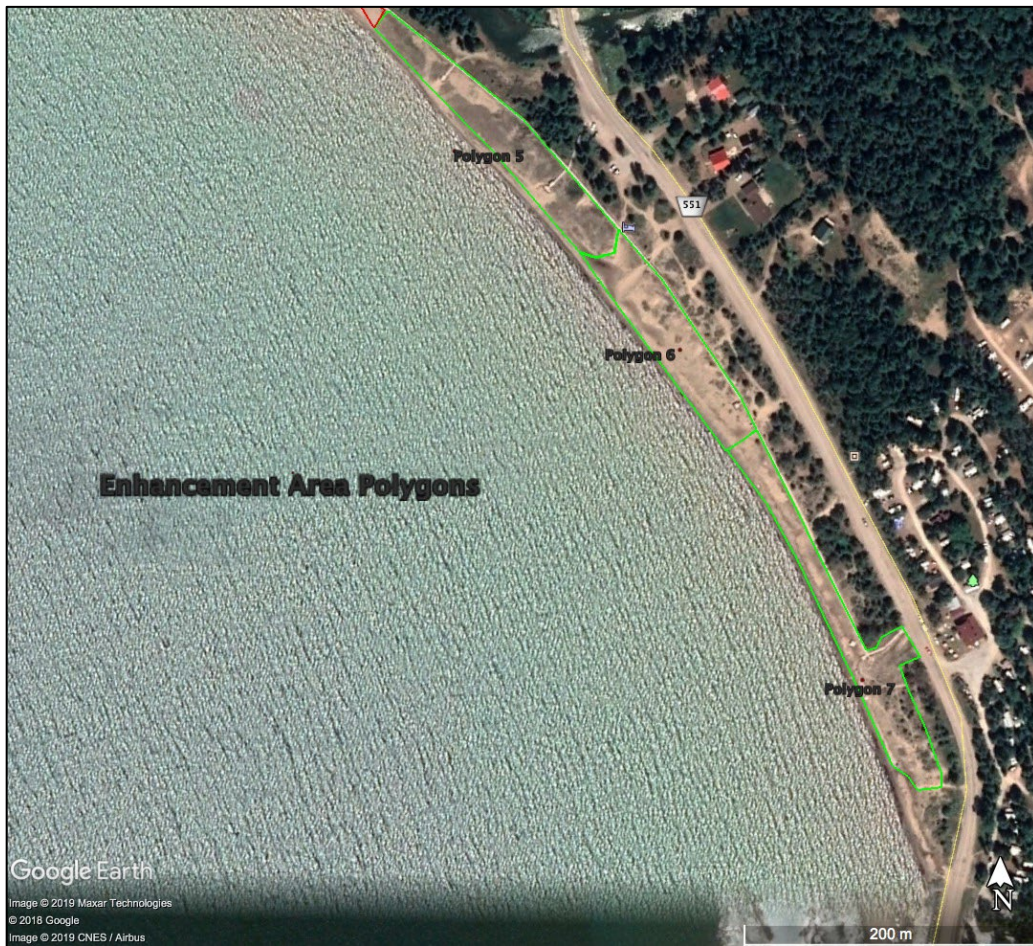


Figure 2. Enhancement area polygons.

Abundance Census and Georeferencing of Patches

In each polygon, Pitcher's Thistle plants were counted by life form (rosettes, mature (flowering/fruited) plants, seedlings). Patches of high numbers of mature plants were georeferenced so in future years these spots can be checked for establishment of new thistles. Patches with high densities of rosettes were georeferenced so they can be checked for numbers surviving to maturity.

Vegetation Cover and Photo Documentation

A list of all plant species present in each polygon was created, and the vegetation composition was documented by estimating the percent cover of each layer and each prevalent species within each layer. For example, layers included trees >5 m tall, saplings 2-5 m tall, shrubs (or any woody species) 0 – 2 m tall, herbaceous species, mosses and lichens, and duff, woody debris, rocks and/or bare sand or soil. Species that were noticeable but did not make up at least 1% cover were noted as P for present. Photos were taken of each polygon.

Invasive Species Control Results and Assessment of Future Needs

The presence and location of invasive species was documented during vegetation surveys and their impact on Pitcher's Thistle was assessed based on their proximity to the thistles and on the degree to which they were covering up available open sand.

Evaluation of the Effectiveness of Enhancement and Amount of Open Sand

Criteria to be used to judge the effectiveness include:

1. An increase in the number or percentage of maturing plants over previous years;
2. An increase in the amount of open sand (as documented during vegetation surveys);
3. Presence of maturing plants in enhanced areas and patches of dense maturation;
4. Presence of seedlings (documented sometime after mid-summer) to show new establishment in the enhancement area.
5. Continued presence of all dominant native dune species; a good diversity of dune species in both activity and enhancement areas;
6. A reduction in the number of and cover of invasive plant species.

Results

Detailed survey data including lists of plant species and vegetation in each polygon are given in Appendix A. Captions for photos (submitted separately) are in Appendix B. The number of thistles of each life form in each polygon in 2019 is shown in Table 1. Baseline data collected in early 2017 on thistle distribution in the Enhancement Area concentrated only on specific spots such as around each staircase, while the 2021 results look at larger polygons (which include the staircases and intervening areas) to see broader trends.

Table 1. Numbers of thistles of each life form in each polygon in 2021.

Polygon #	Rosettes	Mature (fruiting)	Seedlings	Amount of open sand
Activity Area				
1 Playground	6	0	0	30%
2 Behind building	0	1	0	<5%
3 Volleyball court	15	8	0	25%
4 Benches	3	7	0	45%
Total	24	16	0	
Enhancement Area				
5 Western	232	39	2	10%
6 Centre	138	47	1	70%
7 Eastern	144	23	12	10%
TOTAL	514	109	15	

Note: no Pitcher's Thistles were required to be removed or transplanted in the course of the work since 2017.

Discussion

Health of the Pitcher's Thistle population, including impacts from activity work and benefits from enhancement work

In the Activity Area there were:

2017 81 rosettes and 10 mature plants (91 total)
2019 39 rosettes and 20 mature plants (59 total)
2021 24 rosettes and 16 mature plants (40 total)

(The exact numbers of seedlings are not considered in the analysis because their numbers vary greatly depending on when they are counted. There are more in late summer, but a great majority of them do not survive the first winter.)

The numbers in the Activity Area appear to show an on-going loss, but it should be remembered that mature plants die after setting seed. The rosettes of any one year go on to form the total population of the next year. The numbers above reflect a particular type of loss. Between 2017 and 2019, there was a net loss of 22 rosettes that did not flower ($81 - 59 = 22$). See the 2019 report which discusses this loss which was most likely mainly from the loss of the front of the beach due to high lake levels as well as from impacts from beach use. Between 2019 and 2021 there was no loss ($39 - 40 = \text{increase of } +1$).

The 2021 stats show a lack of establishment of new rosettes, which should develop from seeds of mature plants from the previous year. Without new establishment, the population will eventually dwindle in the Activity Area. A lack of establishment is not surprising in the Activity Area given the high degree of usage and foot traffic on the sand, which probably disrupts seed germination and seedling establishment. No seedlings were found during the survey (although it was an early date for finding them). This is not an impact from the activity, and there is probably not much that can be done about it other than to ensure the population in the enhancement area remains healthy to offset this loss.

Early August is not a good time to document seedlings. At this time, first year plants from the previous year's seed have already grown beyond the seedling stage and would be rosettes. First year plants from the current year's seed usually show up towards the end of August. This means the magnitude of the lack of seedling establishment is not known. It only shows up because of the slight loss of rosettes from year to year.

In the Enhancement Area there were:

2017 161 rosettes and 15 mature plants (176 total)
2019 571 rosettes and 574 mature plants (1145 total)
2021 514 rosettes and 109 mature plants (623 total)

Between 2017 and 2019 there was a great increase in the population, probably due to the enhancement work, good weather for flowering, and good seedling establishment. Between 2019 and 2021 there was a small loss in the population despite a slight increase in the number of rosettes (571 – 623 = increase of 52 rosettes). There should have been a bigger increase from the seeds of the 574 mature plants. This could be due to poor establishment but is also likely a result of the much smaller beach from the higher lake level.

As a result of the higher water level, the beach is narrower, which pushes the beach users (and their blankets and foot traffic) back into the zone of dune vegetation. This and the simple lack of habitat space may be having an effect. However, on the whole, the population appears to be holding its own and some of the increase and loss is probably part of the natural dune dynamic. In Polygons 6 and 7, there are some patches with high densities of rosettes and abundant maturing plants. This is another sign of the good health of the population. On the whole, the population appears very healthy, with a good amount of maturing plants, rosettes of all sizes, and very few rosettes showing any type of damage.

Open Sand

The amount of open sand in each polygon is summarized in Table 1, above.

Activity Area

There is a large amount of open sand in the Activity Area, but much of it is not suitable habitat because of the high degree of human usage and foot traffic. However, Polygons 1, 3, and 4 (all with some natural dune vegetation) all have intact areas of suitable habitat that are occupied by thistles. In polygons 3 and 4 there are both rosettes and maturing plants, a sign of good health.

Polygon 1 (playground): In 2017, the amount of bare sand in Polygon 1 was ~80%, which was reported to be the same in 2019. In 2021, open sand was assessed excluding the playground because that area is not really suitable habitat because of the foot traffic. The amount of open sand in the vegetated part of this polygon was 30%, which is a very good proportion.

Polygon 2 (behind building): In 2017, Polygon 3 was fully vegetated with non-dune native and Eurasian species, appearing somewhat like an old field. In 2019, this area was cleared and the sand exposed. At that time, approximately 80% of the area was open sand. In 2021, this area has fully grown in with vegetation, and there is very little open sand. Some of the vegetation is native dune species, but the area does not appear to receive much natural dune disturbance (which creates open sand). There was one thistle found in this polygon in 2021, but in general, this area isn't very suitable habitat.

Polygon 3 (former volleyball area): In 2017, before the activity this area had 20 – 40% open sand, and afterwards it increased to 40 – 60%. In 2019, the front of

the beach became submerged and approximately 45% was open sand. In 2021 through further submersion, approximately 25% of the area was open sand, which is still a good proportion.

Polygon 4 (benches east of river): In 2017, before the activity this area had 40-60% open sand and afterwards it increased to 60-80%. In 2019, after submersion, ~45% was open. The vegetation behind the benches has remained intact, but farther back near the boardwalk it is becoming too dense for Pitcher's Thistle.

Enhancement Area

Baseline documentation in 2017 divided the area into areas in front of the staircases and areas between the staircases. In 2017, most of the enhancement area contained 40-60% open sand. After enhancement in 2017, open sand was increased to 80 – 100% around the staircases.

In 2019, the enhancement area was divided up into polygons to create well-defined areas for data collection (Figure 2).

Polygon 5: This polygon contained only 10% open sand, a reduction from 18% in 2019. Much of the sand in this polygon is covered by a thatch of dead leaves, showing a lack of disturbance. Thistles are concentrated where there is available open sand. This polygon may still require more enhancement.

Polygon 6: Open sand in the polygon increased to 70% after enhancement in 2017. It still contained approximately the same proportion in 2021. This polygon had the highest number of plants maturing in 2019 and 2021.

Polygon 7: The beach has become very narrow in this polygon, and much open sand became submerged here. The polygon contained ~50% open sand in 2019, which was the same or an increase from 2017, but currently contains only about 10% open sand. There are almost no thistles in the skinny part, and most are concentrated in the wide area at the eastern end beyond the boardwalk.

In general, most of the available open sand is in the centre of the Enhancement Area in the area where the work was done, especially in the eastern end of Polygon 5, most of Polygon 6, and then also the eastern end of Polygon 7 (where no work was done). Thistles are concentrated along the areas cleared around the stairways and on foot trails, as well as in open, cleared patches. This clearly shows the benefit from the work as the thistles are dispersing and getting established successfully in the work areas.

Maturing Plants & Seedlings

In the Enhancement Area all polygons have at least 10% of the individuals maturing to set seed (Table 1), evidence that enhancement has not harmed reproduction. Areas documented in 2019 as having high concentrations of maturing plants (Table 2) still contained high concentrations of both large

rosettes and maturing plants (Table 3), showing that the benefits of enhancement are still on-going.

Table 2. Locations of patches of high numbers of maturing plants in 2019 in the Enhancement Area.

Polygon #	Number of mature (fruiting) plants	Easting	Northing	Comments
Enhancement Area				
5 enhancement west	13	401290	5057714	Just west of staircase 2
5 enhancement west	10	401342	5057680	
6 enhancement centre (largest)	25 +32 rosettes some very large	401366	5057643	Spot was improved in 2017
7 enhancement east	63	401531	5057367	E of end of boardwalk & W of copse of trees

Table 3. Locations of patches of high numbers of rosettes or maturing plants in 2021 in the Enhancement Area, corresponding to those in Table 2.

Polygon #	Number of plants	Easting	Northing	Comments
Enhancement Area				
5 enhancement west	7 very large rosettes	401286	5057729	Just west of staircase 2
5 enhancement west	9 rosettes	401323	5057693	
6 enhancement centre (largest)	Many flowering	401375	5057628	Spot was improved in 2017
7 enhancement east	Huge density of rosettes	401536	5057341	E of end of boardwalk & W of copse of trees

Vegetation

Lists of plant species present and the species composition of all polygons is given in Appendix A. Dominant dune species remain present in all seven polygons, and the dominant species (having >1% cover) also remain nearly the same. No non-native species has $\geq 1\%$ cover anywhere at Providence Bay Beach, so not in the Activity or Enhancement areas.

Activity Area

A total of 45 plant species were found: 30 native; 15 non-native including 2 that are invasive on dunes. Since 2019, this is an increase of 7 weed species (mainly in

polygon 2 behind the building) and an increase of 7 native species, mostly non-dune generalists. Still, the increase in diversity is a good sign that natural ecology in the area is still functioning.

Vegetation composition has changed somewhat compared to before the activity in 2017. As noted in the 2019 report, in the activity area, some native species are no longer present. Most are tree and shrub species. Some missing species were shrubs on the foredune or were plants in the damp area near the water, and these areas have been submerged by the lake. Some species (especially tree species) were in the vegetation that was cleared behind the building (Polygon 2). Some of the missing native species are generalist, non-dune species (such as Canada Goldenrod and Blue Iris), so their lack of presence should not have any negative impact. On the whole, the missing species seem perhaps beneficial since they are mostly woody plants. One dune species, Lyre-leaved Rock Cress, is missing. It is out in early spring and not visible during a July survey.

A few new generalist native species have gotten established in the activity area since 2019. They include Flat-topped White Aster, Heart-leaved Aster, Silverweed, Wild Red Raspberry, and Meadow Rue. Although these are generalists, most are not weedy, and the increase in diversity, again, would appear to be a sign of functioning natural ecology.

Pitcher's Thistle and all dominant dune species remain present somewhere within each Activity Area polygon except in Polygon 2 which was not dunes and was not occupied previously. Almost all of the dune species found in the Enhancement Area also occur in the activity area, showing that the dune ecosystem is still fairly functional even with the amount of human usage.

Enhancement Area

There are 31 species present, 24 native; 7 non-native weeds of which 2 are invasive on dunes. The Activity Area has more species, but it has 11 weed species that are not found in the Enhancement Area. There are some slight changes here since 2019, mainly the loss of some weed species and presence of new ones. Two native dune species were not found this year: Little Bluestem and Hairy Goldenrod. The reason for this is not known, but both species are usually found in more stabilized parts of the dunes, and with the higher lake levels, there is more natural disturbance in the narrow parts of the Enhancement Area. It is also possible that these species have suffered from human usage of the dunes. However, it is not related to the Activity or Enhancement work.

No non-native species has $\geq 1\%$ cover anywhere in the Enhancement Area.

Invasive Species

No invasive species has $\geq 1\%$ cover anywhere at Providence Bay beach. Phragmites (*Phragmites australis* ssp. *australis*) has been completely eradicated. The beach was checked by the Manitoulin Phragmites Project and none was

present in 2021. Scotch Pine (*Pinus sylvestris*) has been greatly reduced by the work of municipal staff. White Sweet Clover (*Melilotus alba*) was greatly reduced during Beach Action Day in 2016 and 2017, and Bladder Campion was targeted during Beach Action Day in 2019. Both species now have <1% cover, but both are still frequent to abundant in some areas and still require some on-going management. In the enhancement area, both species are still found in proximity to Pitcher's Thistle. In Polygon 5, there is a patch of Dalmatian Toad Flax, a large yellow snapdragon-like flower. This patch has been increasing each year, and removal should be done. Crown Vetch was also present at the back of Polygon 5 and should be monitored to see if it spreads.

Evaluation of Success of Enhancement Actions

Six measures of success were shown on page 4.

- 1) Reproduction: At least 10% of thistle individuals matured in each polygon, which shows a healthy level of reproduction. There is a great increase of maturing plants since 2017. There is a net increase in total number of thistles (rosettes and mature) since 2017.
- 2) Open sand: Despite loss of beach from submersion, open sand is present in all polygons. In Polygon 5, enhancement was only done at the eastern end, which now has the polygon's the greatest concentration of thistles. This shows very directly the success of enhancement. In Polygon 7, there is little open sand because the beach is so narrow. The greatest amount of open sand is in eastern Polygon 5 and all of Polygon 6 (this is the centre of the Enhancement Area). The presence of the greatest number of thistles, especially maturing ones, here shows the success of enhancement.
- 3) All three polygons have spots documented with high numbers of mature plants.
- 4) Seedlings are present in all polygons but not many. The date of survey is a factor in this. Unfortunately, an early August survey does not allow this measure to be very accurate. It is possible that seedling establishment is currently low due to a narrow beach and high degree of human usage.
- 5) Native vegetation: Dominant dune species are present in all polygons and dominant species composition has not changed in any polygon since before the work in 2017. Native species composition is stable in the Enhancement Area, showing that the work to open sand has not harmed vegetation. Weed cover has not increased. Dune dynamics, with natural disturbance from wind, wave-wash, and ice scour, appear to be functioning.
- 6) No non-native species has $\geq 1\%$ cover anywhere at Providence Bay Beach, so not in the Activity or Enhancement areas. Presence of all invasive species has been greatly reduced. Phragmites has been eradicated.

Photo Documentation

Photos of each polygon, enhancement patches, and dense mature plants have been submitted separately. Captions are in Appendix B.

Recommendations

The western part of Polygon 5 needs further enhancement to remove dead thatch and open up more sand. When there is a chance to do additional work (perhaps concurrent with boardwalk upgrades), this should be planned.

Polygon 2 behind the building needs better management planning. Decisions should be made about the goals for this area. Should it return to being dunes? Should it become a landscaped area? Should it become something else—perhaps a butterfly garden? Currently it is none of these things and is filling back in with weeds, which will return it back to its previous state. Once some thought goes into the goals, management planning should be done to create a space that will either maintain itself naturally without harming the dunes (e.g. not sending weed seeds outward) or brings a benefit to the site and the municipality at low cost.

Additional work needs to be done to remove White Sweet Clover, Bladder Champion, and Scotch Pine. Depending on the situation with Covid-19, some work could possibly be done if it is possible to host Beach Action Day in the summer of 2022.

APPENDIX A

Detailed data from Survey of Providence Bay Beach, August 2021.

Polygon boundaries are shown in Figure 1 in the main body of this report.

ACTIVITY AREA

Plant species found in the Activity Area (Polygons 1, 2, 3, and 4).

* indicates a non-native species. ** indicates a species that is invasive on dunes.

Prevalence:

abundant	present throughout the dunes or in spots with high densities
common	present throughout the dunes
frequent	present in most parts of the dunes but not as widespread
occasional	present here and there, but not everywhere
localized	present in certain areas but not throughout the dunes

<u>Latin Name</u>	<u>Common Name</u>	<u>Prevalence</u>
<i>Acer negundo</i>	Manitoba Maple	localized
<i>Achillea millefolium*</i>	Yarrow*	common
<i>Ammophila breviligulata</i>	Marram Grass	frequent
<i>Arctium minus*</i>	Burdock*	localized
<i>Artemisia campestris</i>	Wormwood	abundant
<i>Asclepias syriaca</i>	Common Milkweed	abundant
<i>Cirsium pitcheri</i>	Pitcher's Thistle	occasional
<i>Cirsium arvense*</i>	Canada Thistle*	localized
<i>Daucus carota*</i>	Wild Carrot*	occasional
<i>Doellingeria umbellata</i>	Flat-topped White Aster	occasional
<i>Echium vulgare*</i>	Bugloss*	localized
<i>Elymus canadensis</i>	Canada Wild Rye	common
<i>Elymus lanceolatus ssp. psammophilus</i>	Great Lakes Wheat Grass	localized
<i>Elymus trachycaulus</i>	Slender Wild Rye	localized
<i>Epilobium angustifolium</i>	Fireweed	abundant
<i>Equisetum hyemale</i>	Common Horsetail	frequent
<i>Equisetum variegatum</i>	Variiegated Horsetail	occasional
<i>Erigeron canadensis</i>	Sneezeweed	localized
<i>Euthamia graminifolia</i>	Grass-leaved Goldenrod	occasional
<i>Juncus balticus</i>	Baltic Rush	frequent
<i>Lathyrus japonicus</i>	Beach Pea	occasional
<i>Medicago lupulina*</i>	Black Medic*	localized
<i>Melilotus alba**</i>	White Sweet Clover**	frequent
<i>Oenothera biennis</i>	Evening Primrose	frequent
<i>Phalaris arundinacea</i>	Reed Canary Grass	localized
<i>Picea glauca</i>	White Spruce	occasional
<i>Pinus sylvestris**</i>	Scotch Pine**	occasional
<i>Poa compressa*</i>	Canada Bluegrass*	localized
<i>Populus balsamifera</i>	Balsam Poplar	common
<i>Populus tremuloides</i>	Trembling Aspen	common
<i>Potentilla anserina</i>	Silverweed	common

<i>Prunus pumila</i>	Sand Cherry	abundant
<i>Rubus strigosus</i>	Wild Red Raspberry	frequent
<i>Salix candida</i>	Hoary Willow	common
<i>Salix exigua</i>	Sand Bar Willow	common
<i>Silene alba</i> *	White Cockle*	occasional
<i>Silene vulgaris</i> *	Bladder Campion*	frequent
<i>Solidago altissima</i>	Tall Goldenrod	common
<i>Sporobolus cryptandrus</i>	Sand Dropseed	common
<i>Symphotrichum cordifolium</i>	Heart-leaved Aster	occasional
<i>Taraxacum erythrospermum</i> *	Red-seeded Dandelion*	occasional
<i>Thalictrum pubescens</i>	Meadow Rue	localized
<i>Tragopogon dubius</i> *	Goat's Beard*	frequent
<i>Verbascum thapsus</i> *	Mullein*	localized
<i>Vicia cracca</i> *	Tufted Vetch*	localized

Total 45 species: 30 native; 15 non-native including 2 that are invasive on dunes. Since 2019, this is an increase of 7 weed species (mainly in polygon 2 behind the building) and an increase of 7 native species, mostly non-dune generalists. Still, the increase in diversity is a good sign that natural ecology in the area is still functioning.

Plant species found in the Enhancement Area (Polygons 5, 6 and 7):

<u>Latin Name</u>	<u>Common Name</u>	<u>Prevalence</u>
<i>Acer negundo</i>	Manitoba Maple	localized
<i>Achillea millefolium</i> *	Yarrow*	common
<i>Agrostis gigantea</i> *	Red Top Grass*	localized
<i>Ammophila breviligulata</i>	Marram Grass	frequent
<i>Artemisia campestris</i>	Wormwood	abundant
<i>Asclepias syriaca</i>	Common Milkweed	abundant
<i>Centaurea stoebe</i> **	Crown Vetch*	localized
<i>Cirsium pitcheri</i>	Pitcher's Thistle	occasional
<i>Corispermum pallasii</i>	Bugseed	occasional
<i>Cornus sericea</i>	Red Osier Dogwood	frequent
<i>Elymus canadensis</i>	Canada Wild Rye	common
<i>Elymus lanceolatus ssp. psammophilus</i>	Great Lakes Wheat Grass	localized
<i>Epipactis helleborine</i> *	Hellborine*	occasional
<i>Equisetum hyemale</i>	Common Horsetail	frequent
<i>Equisetum variegatum</i>	Variegated Horsetail	occasional
<i>Juniperus communis</i>	Common Juniper	frequent
<i>Lathyrus japonicus</i>	Beach Pea	occasional
<i>Linaria dalmatica</i> *	Dalmatian Toad Flax*	localized
<i>Maianthemum stellatum</i>	Starry False Solomon's Seal	localized
<i>Melilotus alba</i> **	White Sweet Clover**	frequent
<i>Oenothera biennis</i>	Evening Primrose	frequent
<i>Physocarpus opulifolius</i>	Ninebark	occasional
<i>Pinus sylvestris</i> **	Scotch Pine**	occasional
<i>Populus balsamifera</i>	Balsam Poplar	common
<i>Prunus pumila</i>	Sand Cherry	abundant

<i>Rosa acicularis</i>	Bristle Rose	occasional
<i>Rubus strigosus</i>	Wild Red Raspberry	frequent
<i>Salix candida</i>	Hoary Willow	common
<i>Silene vulgaris*</i>	Bladder Campion*	frequent
<i>Sporobolus cryptandrus</i>	Sand Dropseed	common
<i>Thuja occidentalis</i>	Eastern White Cedar	occasional

There are 31 species present, 24 native; 7 non-native weeds of which 2 are invasive on dunes.

Polygon 1 Playground west side plus outside of boundary

Photos: 2

UTM 401045 5057965

Rosettes 6

Flowering 0

Seedlings 0

Thistles were present only on the outside of the grassy triangle not inside the vegetation. There was also one thistle on the western side of the trail (western boundary of polygon), and one at the edge of the boardwalk on the eastern side of the playground (UTM 401096 5057949). No thistles were in the parking lot or in the playground.

Adult Monarchs: none seen. Milkweeds are semi-shaded.

Trembling Aspen >5m Present (P; <1%)

Balsam Poplar 4-5 m 40% overtop of other species

Manitoba Maple <4 m <5%

Common Milkweed 20%

Grasses 30% (Canada Wild Rye, Canada Bluegrass, Marram Grass)

Wormwood 8%

Balsam Poplar (small; <1m) 7%

Dead thatch of old leaves 5%

Open sand 30% in vegetated area (not counting playground, etc.)

Manitoba Maple has died back since 2019. Vegetation here looks like it's getting a lot of foot trampling.

Polygon 2 Area behind the building: previously cleared area

Photos: 2

UTM 401119 5057916 (thistle flowered at this location)

Rosettes 0

Flowering 1

Seedlings 0

Adult Monarchs: 6

Sand-bar Willow	40%
Tall Goldenrod	22%
Common Horsetail	10%
Common Milkweed	10%
Wormwood	8%
Grass-leaved Goldenrod	5%
Evening Primrose	3%
Reed Canary Grass	2%

Open sand: very little that is not overtopped by some type of vegetation.

The western end of the polygon has become revegetated with dune vegetation. It has become suitable thistle habitat. One thistle must have been here unseen for a few years as a rosette because it flowered this year. The rest of the polygon is fully vegetated with generalist native species like willows and goldenrods.

Polygon 3 Former volleyball area

Photos: 2

UTM 401101 5057912

Rosettes 15

Flowering 8

Seedlings 0

Thistles are present in the western half of the polygon, mainly on the slope. This polygon is mainly one dune hump between polygon 2 and the wet, flat sand.

Adult Monarchs: 6

Marram Grass 60%

Common Milkweed 10%

Balsam Poplar (<2m) 2%

Sand Bar Willow (<2m) 3%

Beach Pea P

Common Horsetail P

Wormwood P

Sand 25%

Polygon 4 Benches south of creek

Photos: 2

UTM 401185 5057848

Rosettes 3

Flowering 7

Seedlings 0

Thistles are right behind bench, except for one at 401175 5057856.

Adult Monarchs: 12

Balsam Poplar and Hoary Willow 2%

Sand Cherry 25%

Common Milkweed 20%

Grasses 8% (Canada Wild Rye, Canada Bluegrass, Baltic Rush)

Sand 45%

ENHANCEMENT AREA

Polygon 5 boundary to Stairway 3 (UTM 401360 5057671)

Photos: 3

Most thistles are in the front area between the two staircases, with only a handful on either side, mainly in foot trails.

Total for polygon:

Rosettes 232

Flowering 39

Seedlings 2

1 flowered at UTM 401236 5057795

1 rosette at UTM 401256 5057761

7 big rosettes at UTM 401286 5057729 (this was a major flowering area in 2019)

9 rosettes at UTM 401323 5057693 (this was a major flowering area in 2019)

Adult Monarchs: 7. Most milkweed is buried in other vegetation.

Wormwood 23%

Marram Grass 20%

Common Milkweed 18%

Canada Wild Rye 5%

Sand Cherry 7%

Balsam Poplar (<2m) 5%

Common Juniper 2%

Dead thatch 10%

Sand 10%

Open sand is very limited at the west end—sand is covered with thatch of dead leaves. There are more than 100 thistles at the eastern end between stairs and curved access trail, mostly at the front of the dunes and in disturbed spots.

This polygon contains a patch of Dalmatian Toad Flax, a Eurasian plant, that seems to be spreading. It needs to be removed.

Polygon 6 Stairway 3 (UTM 401360 5057671 to 401448 5057525)

Photos: 3

Thistles are dense in the western half of the polygon, but not many in the eastern half.

Rosettes	138
Flowering	47
Seedlings	1

Lots of rosettes at UTM 401389 5057619
Lots of flowering thistles at UTM 401375 5057628
Adult Monarchs: none seen

Balsam Poplar and Hoary Willow (<2m)	15%
Marram Grass	7%
Great Lakes Wheat Grass	5%
Sand Cherry	3%
Common Juniper	P
Sand	70%

There has been an increase in willow and poplar growth here since 2019. They are just scattered small shrubs, not big patches as were there before the enhancement, but they may need management at some future time.

Polygon 7 southeastern end of beach (UTM 401448 5057525 to the end)

Photos: 5

Rosettes	144
Flowering	23
Seedlings	12

Lots of rosettes at UTM 401536 5057341 (was a major flowering area in 2019).
Lots of rosettes at UTM 401544 5057332.

Marram Grass	65%
Balsam Poplar <2m	10%
Scotch Pine (<2m)	10%
Wormwood	5%
Great Lakes Wheat Grass	1%
Sand	10%

There are no thistles from the blue bins to the end of the boardwalk. Beach is very narrow right now, so human use has moved into the vegetation and cleared some areas in the Marram Grass.

There is an increase in grass growth since 2019, but it could be an artifact of having less beach altogether so grass now covered a greater percentage.

APPENDIX B

Photo Captions to Accompany 2021 Survey Report for Providence Bay Beach

Activity Area

Polygon 1_#1

Shows vegetation in this area. Only a small triangle is left here. The rest was lost to higher lake levels, with the loss now maintained by foot traffic.

Polygon 1_#2

Close up view of vegetation.

Polygon 2_#1

This area was cleared completely and has now revegetated. Foreground (western side) has revegetated with natural dune species. Middle ground and eastern side are fully vegetated with generalist native and weedy species.

Polygon 2_#2

Eastern side of polygon at river. This area was cleared of trees. It is covered with generalist native and weedy species. Pink flower is Fireweed (native). White flowers are mostly Queen Anne's Lace (non-native).

Polygon 3_#1

This polygon is both sides of a low dune ridge (back and front slopes). Red pole shows where volley ball court used to be. Front dune vegetation was lost to high water level, loss now maintained by foot traffic.

Polygon 3_#2

View from top of dune ridge looking east towards river mouth.

Polygon 4_#1

Vegetation is mainly behind the benches.

Polygon 4_#2

Shows area behind benches.

Polygon 5_#1

Looking east from western boundary. Shows dense vegetation and ground thatch in this polygon.

Polygon 5_#2

Looking west from eastern side.

Polygon 5_#3

Shows one of only few patches with a little open sand.

Polygon 6_#1

Looking east from western boundary. Enhancement was done around all the stairs.

Polygon 6_#2

Enhancement was done here to remove large patches of willow. Shows a lot of available open sand and a high concentration of mature thistles (stalks with dried thistle heads appear as brown blobs).

Polygon 6_#3

Looking west from eastern boundary.

Polygon 7_#1

Looking east from western boundary. Shows how narrow the beach is in most of this polygon.

Polygon 7_#2

Narrowness of the beach has pushed users back into the vegetation, which has caused them to want to clear out patches of it.

Polygon 7_#3

Centre of polygon. Shows available open sand in natural vegetation.

Polygon 7_#4

Shows invasives Scotch Pint and White Sweet Clover still in need of management.

Polygon 7_#5

Shows eastern end of polygon. There is much open sand in the distance near the blue umbrella.