Coast Watchers

2018 Annual Report

THE LAKE HURON CENTRE FOR COASTAL CONSERVATION

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INTRODUCTION

Lake Huron is a culturally, biologically and economically important source of fresh water in Ontario. As growing populations take up residence along the shoreline, changes to the diversity of ecosystem are inevitable. With concerns for beach closures, algae fouling, and incidences of dead birds and fish washing up from the water, changes to Lake Huron's coastal environment may impacting the Great Lakes negatively. Many agencies collect data on a large scale meant to provide information for an entire region. This data is valuable, but provides only a 'snapshot' in time. With Lake Huron's variability, changes can happen on a much smaller-scale and details that may point to larger lake-wide issues may be overlooked.

Coast Watchers (CW) is an initiative designed to engage members of the community to take an active role in both observing and helping to improve the quality of our nearshore waters. Community volunteers are trained to observe the shoreline, collect qualitative and quantitative data about current local environmental conditions, and contribute their observations to a long-term dataset. Volunteers are provided with a 1-hour mandatory training seminar and a set of tools and resources to be used to collect data between May and October of every year. They are the eyes and ears of the shoreline, providing the Coastal Centre and many partnering organizations with consistent shoreline environmental data. With Coast Watcher volunteers collecting information methodically and consistently for Lake Huron, it will be possible to track conditions and trends to inform a more effective approach to protection and conservation efforts.
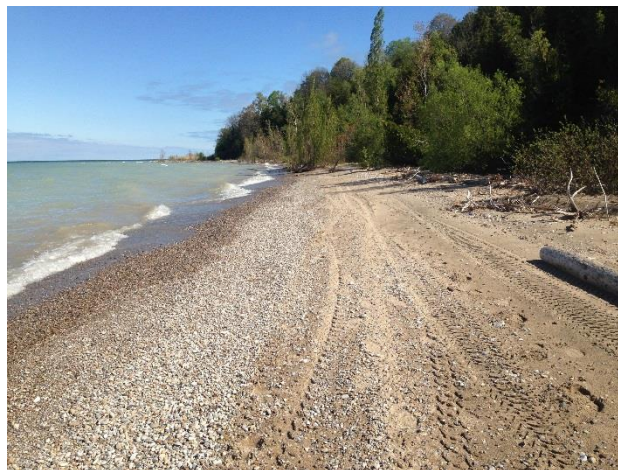
Coast Watchers has been a core program of The Lake Huron Centre for Coastal Conservation (The Coastal Centre) since 2005, and has grown in size and scope in the past few years. Throughout the 14 years of the programs, volunteer numbers have increased dramatically from 2 in 2005 to nearly 100 individuals in 2018. This increase in volunteers along the shoreline has secured data collection from Sarnia to Tobermory and as far east as Midland.

Figure 1 - Photo by Coast Watcher 29, May 22, 2017

The 2018 Coast Watchers initiative was funded by Bruce Power and amounted to a total of $8,500.00.

METHODS

TRAINING

The official monitoring season for CW spans from May 1 to October 31, however, this season is flexible depending on the availability of the volunteer. All new volunteers are required to take part in a 1-hour training session. This training ensures that all participants are given the same basic level of knowledge and understanding on the different measurements and metrics used for coastal observations. These training sessions were offered in six different locations in 2018: Sarnia, Grand Bend, Goderich, Kincardine, Lion's

Head and Wasaga Beach; as well as online as a 1-hour webinar. Equipment required for monitoring was supplied at the training sessions.

Participants were asked to collect data once per week, preferably on the same day at the same time every week. Participants were supplied with data sheets to record their observations and asked to submit their observations at the end of each month via mail or email. All collected data was input into a master Excel spreadsheet.

VOLUNTEER RECRUITMENT AND ENGAGEMENT

Volunteers were recruited to be Coast Watchers through a number of different avenues including social media and traditional news stories in the local papers. Media releases were sent out to news outlets along the shoreline in early January to maximize engagement reach in small communities. This method of recruiting volunteers has been successful throughout the life of the program, however, in 2018 the program witnessed a huge growth in program interest with over 100 volunteers reaching out to the Coastal Centre to become involved as a Coast Watchers.

Throughout the monitoring season, volunteers received a monthly newsletter specific to the program including "housekeeping items", reminders to submit their reports and a section highlighting the efforts of one volunteer each month.

EQUIPMENT

New volunteers were issued a Coast Watchers kit containing equipment necessary to complete weekly shoreline monitoring. Due to the drastic increase in program participation in 2018, some volunteers received a modified Coast Watchers kit (Basic CW Kit) that emphasized more of the qualitative metrics in the program. These kits included the following materials:

Item	Description	Included in Advanced CW Kit	Included in Basic CW Kit
Kestrel 2000 Anemometer	Used to measure current, average and maximum windspeed as well as ambient temperature.	*	
Pool Thermometer	Used to measure water temperature.	*	
Laminated Compass Rose	Used to identify wind/wave direction.	*	*
Laminated Beaufort Scale	Used to identify wave height and water turbidity.	*	*
Coastal Centre Resources	Used to enhance knowledge of coastal processes, risks, stewardship and species.	*	*
Printed Protocol	A comprehensive guide to being a Coast Watcher.	*	*
Digital Volunteer Package	The volunteer manual, plus a digital spreadsheet used to submit observations each month.	*	*

Emails were sent to existing volunteers to inquire about equipment in their possession in January. This allowed us to inventory equipment in good working condition and redistribute and replace items as needed. In some cases, more equipment such as field sheets, or batteries for the Kestrel had to be redistributed to ensure they had necessary materials to complete their monitoring for the season. Each advanced CW Kit cost approximately $160, while the basic CW cost approximately $20. Each volunteer is required to complete a waiver before receiving equipment that outlines their responsibilities as a participant in taking care of the equipment and using it for the purposes of monitoring. In total, the Coastal Centre has 23 advanced kits that are currently in use, and 10 additional advanced kits are ready for distribution in 2019. The rest of the 2018 participants were given a basic CW kit to complete monitoring.

PROGRAM DEMOGRAPHICS

Coast Watchers had 107 participants registered in the program in 2018. Throughout the monitoring season, 12 volunteers resigned from their monitoring duties, totalling 95 Coast Watcher volunteers across the Southeastern Shoreline of Lake Huron and Georgian Bay.

Figure 2 illustrates the locations of Coast Watcher volunteers along the shoreline in 2018. By accommodating the increase in participants, sections of the shoreline that had been previously identified as data deficient in the program were more effectively monitored in 2018. Areas that saw significant participant increase included the entire eastern side of the Bruce Peninsula (Lion's Head, Wiarton), around Wasaga Beach and in and around Sarnia.
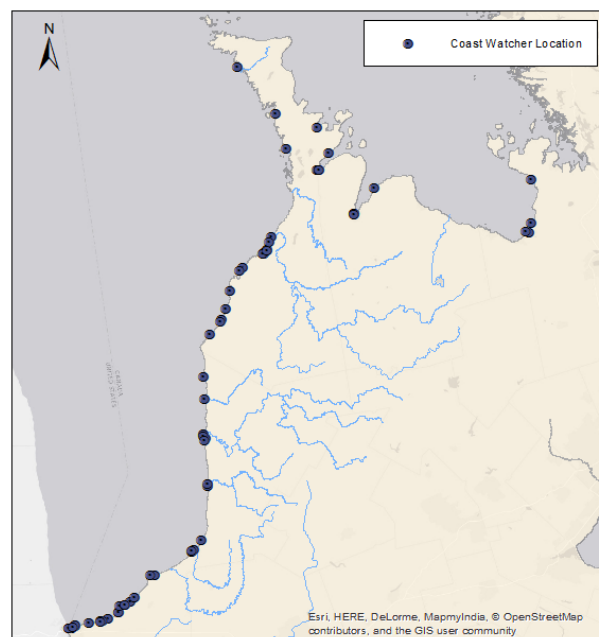

Figure 2. Map of Coast Watcher volunteers in 2018.

POST SEASON SURVEY

New to the program in 2018 was the addition of a Post Season Survey provided to all Coast Watcher volunteers. The survey helped to identify the demographics of participants in the program as well as to gauge their attitude towards the different elements of the program, which will be used to make improvements in future years. The survey, which collected responses from 56 volunteers, displayed information about how the volunteers were recruited, why they were interested in the program, age, whether or not they had any education or training relevant to the program and whether or not their understanding of different coastal topics had improved. Some of the more interesting pieces of information received from the survey included the following:
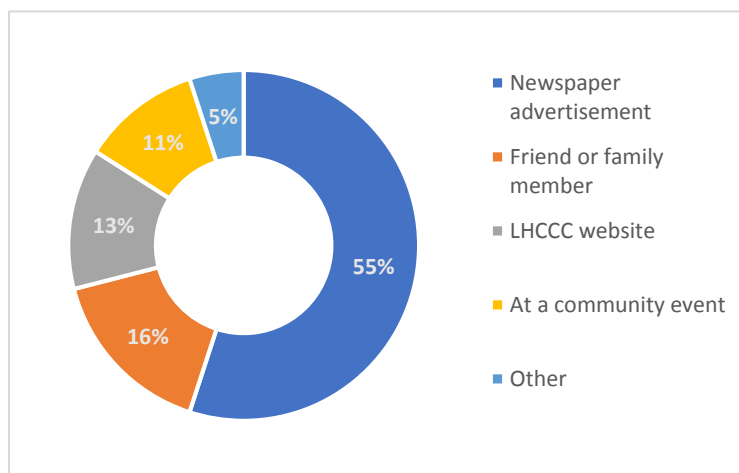

Figure 3. Results of Q1. "How did you learn about the Coast Watchers program?" from 2018 Post Season Survey.

- Coast Watchers indicated that they were interested in the program because of their interest in protecting the lake (75%) and their interest in conservation and nature (80%).
- 76% of Coast Watchers in 2018 were retired.
- 100% of participants completed monitoring with their spouse, family or friends.
- 59% of volunteers indicated they had training or education relevant to the collection of Coast Watchers data.
- 60% of volunteers indicated that they would be in favour of a mobile application; 20% indicated that they were unsure pending further information.
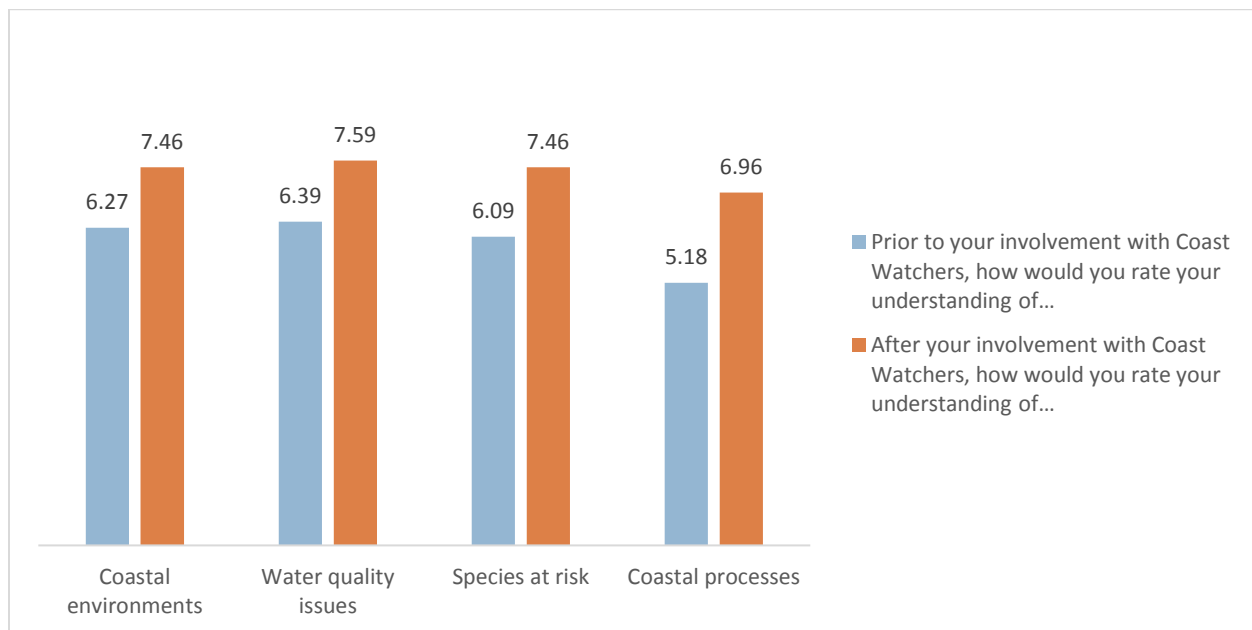

Figure 4. A comparison of knowledge in different coastal topics before and after participation in the Coast Watchers program in 2018.

By better understanding the demographics of this program, the Lake Huron Centre for Coastal Conservation will be able to target different audiences to maximize the messaging encompassed by the Coast Watchers program.

OUTREACH AND EDUCATION

The Coast Watchers program provides a unique opportunity for volunteers to engage in key coastal topics pertinent to the information collected on weekly surveys. This year, the Coastal Centre combined the key messaging of Coast Watchers with the growing threat of plastic pollution to target a larger audience. 13 events were attended along the shoreline promoting the message of diverting waste and focusing on sustainable use of plastics to minimize the long-term impact to shoreline ecosystems, species and water quality. This reached an estimated 2,178 people, 1.900 of which were students and children. Coast Watchers were also invited to join events targeting actionable items like diverting shoreline waste at 8 shoreline cleanups along Lake Huron, which assisted in cleaning up over 1,300 pounds of garbage in 2018.

In 2018, 68 out of the 95 registered Coast Watchers submitted observations for the section of shoreline they monitored. In total, 1216 unique observations of local coastal conditions were recorded between May 1st and October 31st, 2018. An additional 14 records were recorded outside of this time frame by Coast Watchers that indicated that they would like to continue limited monitoring throughout the rest of the year. There was at least one observation recorded along the shoreline for 183 days of the 184-day monitoring season. The total value of in-kind time provided by Coast Watchers volunteering was estimated at over $9,000 for 2018.

SPECIFIC FINDINGS

AIR TEMPERATURE

Temperature is a standard measurement taken by many environmental monitoring programs. Recording temperatures helps to create a complete picture of conditions at the sampling site at the time of monitoring and to document climatic conditions over an extended period of time.

While temperature may be one of the easiest measurements to perform, it is also one of the most important parameters examined in the program because it dramatically affects the rates of chemical and biological reactions within the water. Ambient temperature was recorded only 59 times in 2018 between May and October. Figure 5 illustrates the patterns in ambient air temperature from April to November.
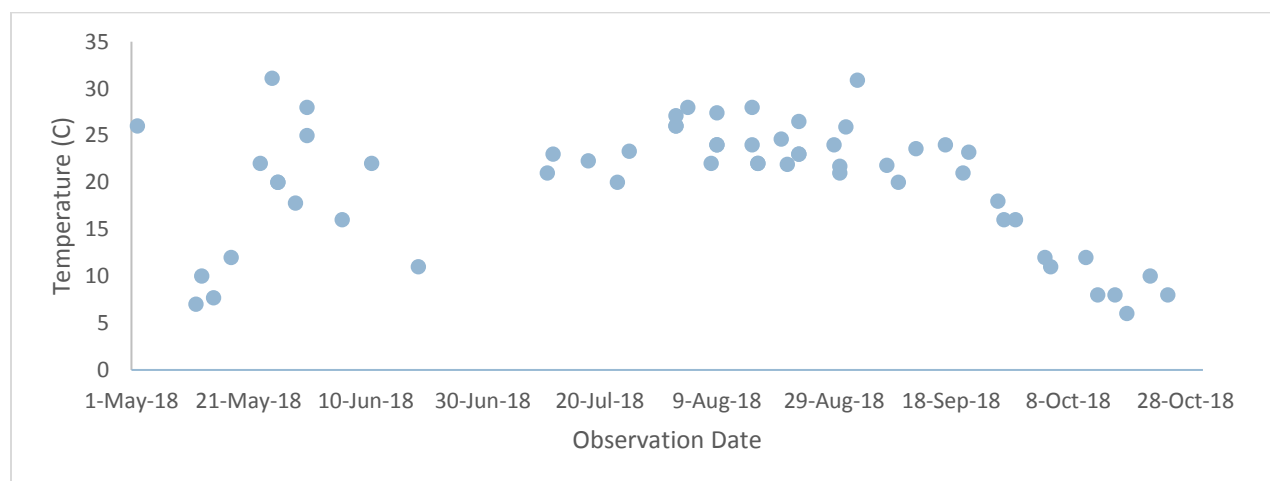

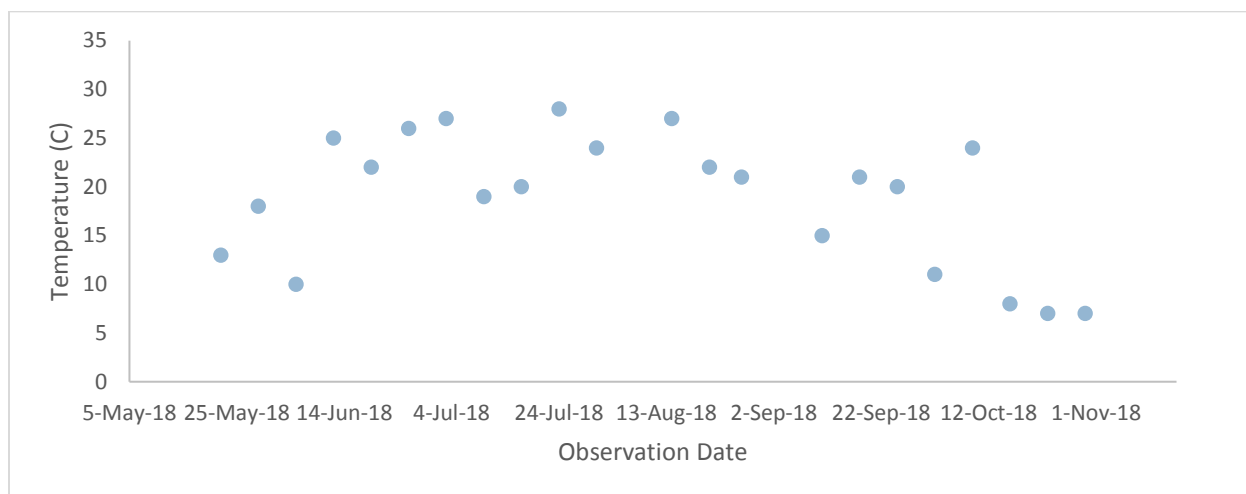**Figure 5. Ambient temperature recorded by Coast Watchers in 2018.**

Figure 6. Ambient temperature data recorded by CW003; a consistent representation of collected temperature readings.

Figures 5 and 6 show examples of the detail of data collected for one monitoring metric over 2018. As shown in the charts, there is a definite trend in atmospheric temperature throughout the year, with the highest temperatures peaking between June and August. Although years are often considered a "hot" or "cold", 2018 appears to have average temperatures for a Canadian summer, hovering around 20-30 degrees Celsius.

WATER TEMPERATURE

Water temperature data was not taken by all Coast Watchers due to physical limitations or because they did not have access to a pool thermometer. 37 Coast Watchers collected water temperature data in 2018. Measurements were taken using a pool thermometer at approximately 1m below the water's surface, halfway through the water column. Contrary to atmospheric temperature readings, water temperature on Lake Huron typically is much slower to increase throughout the year as it requires solar heating. However, at the nearshore, water temperatures do tend to have a warmer stratification in these shallow areas. The chart below compares the consistent measurements of two Coast Watchers water temperature observations between May and October. Although there was variability in local temperature readings, the general trends of these observations stayed consistent, allowing for more confidence in the integrity of the data.
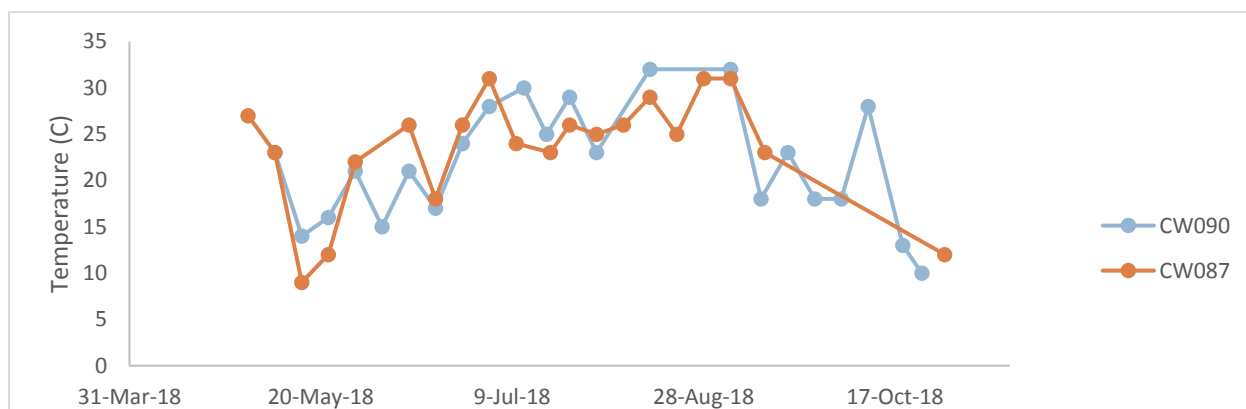

Figure 7. Figure 7. Water temperatures recorded by CW087 and CW090 in 2018.

WIND SPEED AND DIRECTION

Wind direction reports were mostly evenly divided with the most significant portion of observations indicating a western wind. Figure 8 shows that winds from the Southwest are most common across the shoreline, with Northwest being the second most common wind direction. Figure 9 shows the average wind speed observations recorded by Coast Watchers using a Kestrel 2000 Anemometer. Over 50% of these observations recorded wind speeds between 1 to 5 kilometers per hour. Although the program noticed a large increase in participants, funding to acquire Kestrels to record wind speed data remained to be one of Coast Watchers largest financial limitations. This resulted in a smaller than expected increase in wind speed observation from 2017 (243) to 2018 (333).
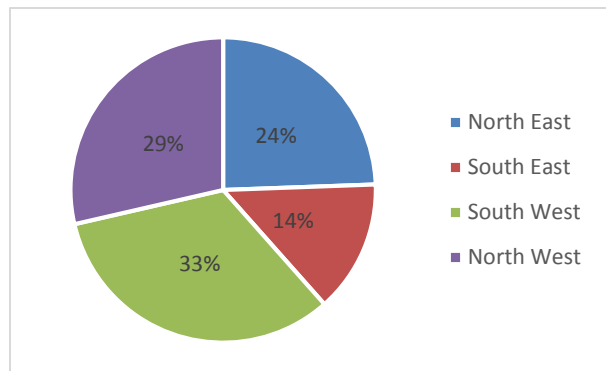

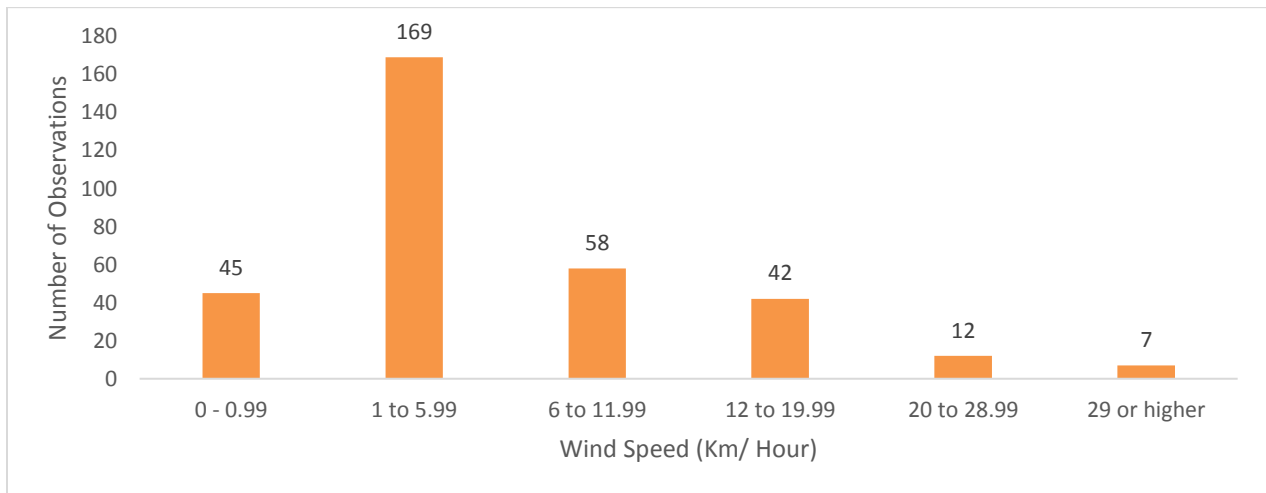Figure 8 - Wind direction data recorded by Coast Watchers in 2018.

Figure 9. Average wind speed recorded by Coast Watchers in 2018 using a Kestrel 2000 Anemometer.

WAVE ACTIVITY

Wave height is described qualitatively using the Beaufort scale and a compass. This scale describes wave height using descriptive columns. The Beaufort Scale is used by mariners and the Canadian Coast Guard as a consistent quantitative descriptor to inform individuals living near or on the water about wave conditions. Determining wave height can provide insight into the conditions on the water for nutrient and sediment transport, erosion events, recreation types employed that day, and even potential for spills on or around water. In Figure 10, the results of three Coast Watchers seasonal monitoring is compared throughout the 2018 season.

Figure 10. Comparison of observations for wave height by Coast Watchers in 2018.
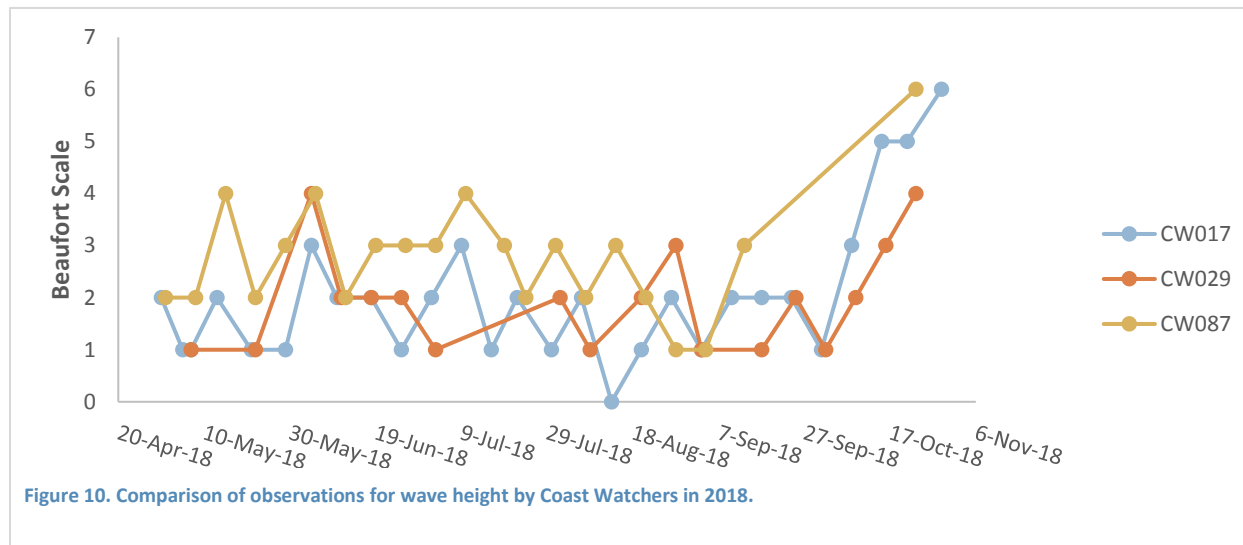
Many of the observations using the Beaufort Scales were comparable to other observations made on the same day by different Coast Watchers. In the above comparison, there are some fluctuations in observations, however, this may account for local changes along the shoreline including areas with higher wind exposure. Between the beginning of May and mid September, observation remained relatively consistent. Higher wave heights were recorded near the end of the Coast Watcher season in late September and the month of October. This is typically when the Lake experiences a season shift, producing higher waves and more storm activity.

VISIBILITY

Horizon visibility is a qualitative metric that can be used to assess trends in atmospheric conditions over time. Moisture and environmental pollutants can affect visibility, causing potential issues for boat and road traffic, aviation, and recreational activities. Coast Watchers record visibility by examining whether or not the horizon line of Lake Huron is visible.

10% of reports indicated that there was no visibility at the time of their survey. This statistic is an increase from the 2017 reports of 5.5%, indicating that there may have been more days with reduced air quality along Lake Huron in 2018. This however, is improved significantly from observations in 2015 of 34% of observations indicating no horizon visibility.
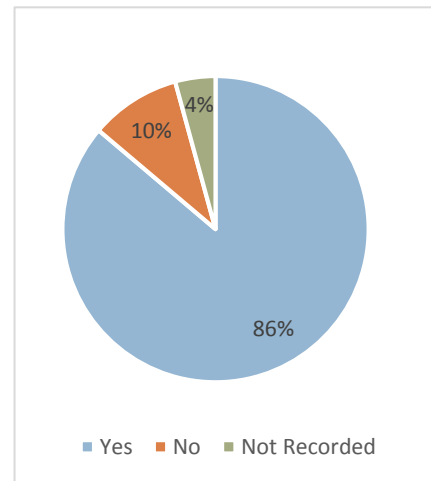

Figure 11. Results of horizon visibility observations from Coast Watcher volunteers in 2018.

WILDLIFE REPORTS

The Lake Huron shoreline is home to an abundance of birds, reptiles and mammals. Coast Watchers provided a small snapshot of the abundance by recording wildlife observations in 2018. In the past, Coast Watchers were asked to record only dead wildlife to use as an indicators of water quality and urgent environmental conditions, however, many volunteers were excited to record their observations of active wildlife encountered in their surveys. This allowed for an additional opportunity for engagement with volunteers, and the LHCCC would often receive photos with questions about what type of species volunteers were seeing on their shoreline.

Figure 12. Dead bird recorded by a Coast Watcher in 2018.

There were 267 separate reports of wildlife in 2018. Out of the reported findings below, 11 fish, 7 birds, 2 mammals (skunk, opossum), two reptiles, and 3 amphibians were found dead on shore. Volunteers commonly reported gulls, cormorants and geese as the most common bird species along their section of shoreline, however, many reported species of warblers, cowbirds, osprey, bald eagles and ducks. Monarch butterflies and caterpillars were the most commonly reported species at risk, in addition to two sightings of a Bald Eagle. There was one observation that recorded a Piping Plover, however, this was unable to be confirmed. Many of our Coast Watchers have noted that they are not confident in their species identification abilities therefore there may be some species at risk that were seen that went un-recorded due to an inability to identify the species. Although this could create a large gap in Species at Risk data, our volunteers are provided with a short identification guide in their protocol handbook to reference.

Table 1. Wildlife reported by Coast Watchers in 2018.

	April	May	June	July	Aug	Sept	Oct
Fish	2	2	1	7	5	0	0
Birds	0	465	353	650	631	768	1055
Reptiles	0	5	12	7	3	1	0
Mammals	0	6	7	3	0	0	0
Other	0	1	5	19	23	0	0
Species at Risk	0	0	2	5	30	4	0

ALGAE REPORTS

Abnormal algae blooms have become a chronic issue in recent years, with nearshore or beach areas becoming fouled with large piles of rotting plants. There are three main types of algae that grow in Lake Huron: *Chara*, *Cladophora*, and *Periphyton*. These types of algae grow on the lake bottom, and are brought to the surface during storm events through wave energy. When large amounts of algae pile up on beaches, it typically indicates that algae growth has increased in previous weeks nearshore. By collecting information on where and when abnormal algae blooms occur along shorelines, occurrences can be compared to the weather data collected and the frequency throughout years.

Figure 13 - Photo of Algae on Beach. Taken by LHCCC Staff

In 2018, algae blooms were not reported frequently. None of these algae blooms were reported as containing Cyanobacteria or "Blue-Green Algae" which is extremely harmful to human health. Comparing these reports to those taken in 2015, there were 15 instances of algae blooms along the shoreline. Therefore, this data shows a slight decrease in algae bloom reports in the past 2 years. Table 4 describes when algae blooms were recorded during the 2018 monitoring season.

Table 2. Algal bloom presence reported by Coast Watchers in 2018.

	April	May	June	July	August	September	October
Number of Algae Blooms in Water	0	2	2	3	1	0	0
Number of Algae Blooms on Beach	0	2	2	2	0	0	0

BEACH LITTER AND MICROPLASTIC SAMPLING

Plastic pollution on the shores of Lake Huron is increasing every year. While many items are visible with our eyes, plastic pollution also exists at the micro-scale as fragments that result from the breakdown of larger plastic items. Raw, premanufactured plastic pellets called "nurdles" can be found floating in the lake and washing onto shorelines. Plastic pollution is a threat to the health of Lake

Huron. While impacts of plastic pollution have been well studied in marine environments, little is known about impacts to freshwater lakes. Plastic Watch is included in the Coast Watchers program because Coast Watchers are likely to be the first witnesses to a large wash-up of plastic pollution and can notify the Coastal Centre if a beach clean-up event is required for their area. Six pellet events were recorded by Coast Watchers this year and only one mention of a requirement for a beach clean-up was recorded. In most cases, Coast Watchers note that they take it upon themselves to be stewards of their beach and end up cleaning up the waste found themselves.

Figure 14. Litter collected during a Coast Watcher survey in 2018.

Table 3. Plastic and litter reported by Coast Watchers in 2018.

	Pellet Events	Beach Cleanups Required
Total	6	1

Coast Watchers were given the option to take part in a microplastic analysis on Lake Huron as part of their monitoring efforts for the first time in 2018. Each volunteer was provided with a 1-Litre sample bottle and given instructions to collect a sample from the surface of the water at their monitoring location. This analysis utilized the methodology used by Florida Sea Grant, which employed volunteer citizen scientists to monitor the abundance of microplastics in the ocean. Since many types of plastic are buoyant, they often collect on the surface of the water on calm days, therefore, collecting a sample at the surface of the water can provide an indication of whether or not plastic is present. In this study, we looked for evidence of four different types of plastic in the water samples: microfibres - a type of microplastic often shed from synthetic clothing, fragments – microscopic chunks of hard plastics 68 samples were collected by volunteers in 2018. These samples were analysed by staff at the Coastal Centre, volunteers looking to be engaged in scientific research, and students from three local high schools. 466 microfibres were
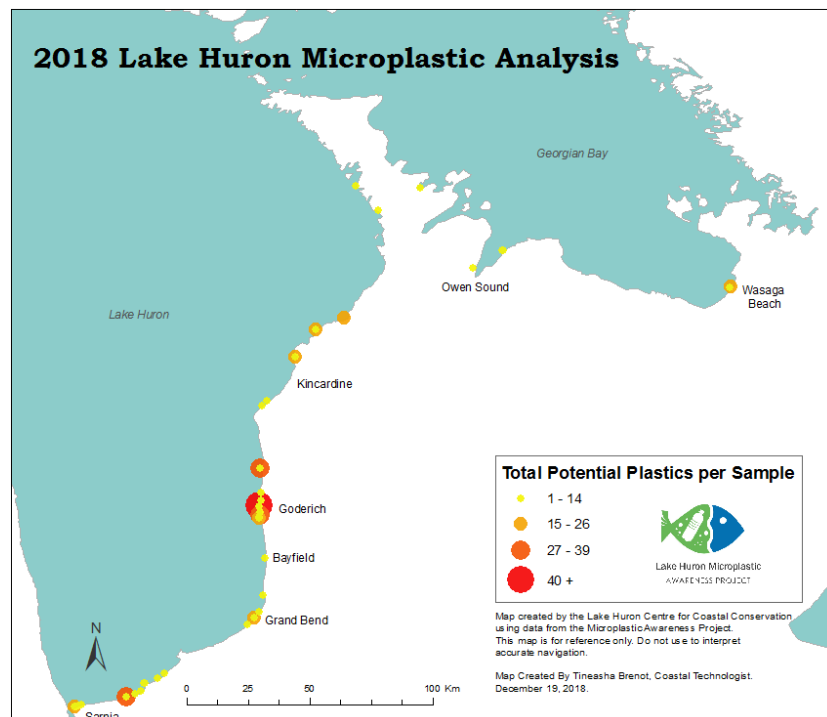

Figure 15. Map of microplastic samples according to abundance of potential plastics per sample.

found in this analysis in addition to 22 fragments and 10 films. Over 90% of collected samples were found to have evidence of microplastic pollution.

Coast Watchers collect 20 data parameters every week that directly influences how the Coastal Centre monitors changes within the lake and the conditions of the shoreline. Air temperature, water temperature, wind speed and direction are general measurements that Coast Watchers collect to assist with building an understanding of the changes happening at a local scale. These measurements can provide a more accurate look into the environmental conditions that are happening on different, specific sections of the coast. Quantitative data monitoring can be used to compare the difference in trends occurring at a larger scale and to monitor smaller changes that may not be observed at a regional level.

It is difficult to make comparisons on a day-to-day basis between Coast Watcher's reports on wave action due to the regional differences and the subjectivity of the data. Wave action can be affected by wind strength, temperature, the accumulation of sandbars, and man-made structures (jetties, groins, docks, etc.), making each section of the coast highly variable. By gathering information from multiple points along the shoreline, the Coastal Centre will have a better representation of the variation between different observed areas. When comparing Coast Watcher data with atmospheric data gathered by government organizations like Environment Canada, predictors of the effects of wave action (like erosion or algae bloom events) could be identified at a small-scale. This could influence recommendations to improve coastal health such as the removal of hardened shorelines.

Only 36 observations were recorded having no visible horizon for 2018. Having an absent horizon line can indicate poor air quality caused by humidity or pollution. A lower percentage of poor visibility does not indicate that the air quality was poor on those days, but it could be used to look at general trends in air quality in the future. Seeing such low reports of no-visibility indicates that air quality was high this year, especially when these numbers are compared across many years.

Wildlife reports were emphasized this year after being identified as an area on the Coast Watchers report that was often missed. Waterfowl are typically the most commonly reported wildlife, with most participants being able to indicate whether it is a goose, duck or gull. There are knowledge gaps from the public involved with this program not knowing how to identify species at risk. Species identification is part of the Coast Watchers protocol, however, if participants aren't confident with their identification skills, they may report it as a general wildlife observation, leading to lack of species at risk data. In 2019, Coast Watchers will be partnering with Bird Studies Canada to provide a better training protocol for specific species at risk birds such as the Piping Plover which nests on sections of the Lake Huron shoreline.

The 2018 report for beach quality has not yet been released by the Huron County Health Unit for comparison of the timelines that algae blooms were reported by Coast Watchers. The reported blooms were infrequent, but large blooms could indicate potential persistent threats. These results will be investigated further upon the release of the Health Unit's report.

Plastic pellet wash-ups were reported several times to the Coastal Centre in 2018 from concerned shoreline residents and Coast Watchers. These events can occur in some areas more frequently than others based on wave and wind direction and strength and protection from sedimentation from coves,

groins and jetties. Alternatively, pellet washup could be under reported due to increased biomass washup making it difficult to see the small pieces of plastic on the beach. There were many reports of garbage wash up on beaches, particularly construction material like foam and plastic siding. In most cases, Coast Watcher volunteers take it upon themselves to collect and dispose of this garbage.

Moving forward, information from more locations along the coast could allow for a better representation of local trends. This collected data gives the Centre some insight to coastal health by involving the public to be the "eyes of the lake" and gather scientific knowledge about an ecosystem that they are passionate about.

RECOMMENDATIONS

The Coast Watchers program has been running for nearly 14 year with the Lake Huron Centre for Coastal Conservation. In the past, recruitment has remained relatively low with the program maximum of 22 volunteers being reached in 2017. In 2018, the program experienced a significant increase in participants, which by association, meant a great increase in collected data. This improved some of the existing data gaps in the program along the shoreline. Georgian Bay and Manitoulin Islands still remains to be the programs biggest data gap with the majority of volunteers in these areas centred in larger communities like Wasaga Beach and Owen Sound. To improve recruitment in these areas, it may be beneficial to create posters and have them distributed to local businesses to reach smaller communities that may not have an independent media contact. If program interest continues to increase, it will be more important to create partnerships with local organizations along the shoreline to create "regional contacts" for volunteers to reach out to.

A significant challenge faced with the drastic increase in interest was data management and validation. Coast Watchers can submit data in a variety of ways, including mailing in hard copy sheets, emailing scanned data sheets, and sending in a digital data sheets on a monthly basis. This required a significant amount of time to coordinate, organize and enter data on a monthly basis. The long-term stability of data entry and management is dependant on funding for staff time and administration, which can change on an annual basis. A mobile application and proper database system have been considered as a platform to resolve time inefficiencies and data validation issues such as required data fields being filled in with incorrect values or not being filled in at all. Discussions with a student from the University of Waterloo are currently underway to understand the costs and regular maintenance required for the development of a Coast Watchers application.

The Coastal Centre is looking to diversify the volunteer demographics by advertising the Coast Watchers program to high school and college/university students. They will be able to acquire volunteer hours while gaining useful environmental knowledge and experience that could benefit them in future career prospects. This option may include a certificate recognizing their contribution to the Coast Watchers program at the end of each season.

As the Coast Watcher program grows, there is a demonstrated need to increase the number of kits provided to volunteers. The Coastal Centre is hoping to purchase 20 new kits for the program in 2019, totalling roughly $3,600.

There was a significant emphasis on education and outreach in 2018, specifically in regards to plastic pollution. This resulted in staff attending water festivals, Speaker Series events, public presentations and beach cleanups with an emphasis on promoting information on coastal conservation and environmental topics relevant to shoreline health. It would be beneficial to provide Coast Watchers an opportunity to learn more about their shoreline in a free interactive webinar series. Topics could include water quality issues, climate change, invasive species, species at risk, plastic pollution and coastal processes and be offered once a month during the 6 months of monitoring. This would be a great way to engage a large audience across all locations of the program in topics relevant to the monitoring they complete with the Coast Watchers program.

Future directions of this program may look at more approaches to use the collected data. Long term and annual trends of collected environmental data could reveal patterns in coastal conditions and help create stronger and better-informed recommendations for property owners. The Coastal Centre hopes to examine some of this long-term data to identify changes in reported data (ie. Date of first reported algal bloom, what time of year has the most dead animal wash-ups, etc.). This data could also be looked at as a 15-year review from the start of the program to 2019 to analyze long-term trends compared to regional data collected by local health units and buoys.

CONCLUSIONS

With the increase in general interest from the public, the Coast Watchers program shows strong potential for growth in the upcoming years. With a proper infrastructure to support the sustainable growth of this program and by creating strong partnerships along the shoreline, Coast Watchers will continue to develop in a great citizen science project answering the call for more local data.

The importance of citizen science is often not highlighted enough for its invaluable contributions to long-term monitoring. The volunteers in this program show an outstanding commitment to the health and preservation of their lake and work hard to learn more about how they can make sustainable changes to make a positive impact for future generations.

Coast Watchers will continue to serve as a program collecting high quality scientific data about local conditions as well as being a great platform to engage passionate groups of individuals wanting to keep a Great Lake, Great.

coast watchers
COMMUNITY VOLUNTEER PROGRAM