LAKE HURON
COASTAL CENTRE

2021 | ANNUAL COAST WATCHERS REPORT

PREPARED BY
Lake Huron Coastal Centre

coast watchers
COMMUNITY VOLUNTEER PROGRAM

This program would not have been possible without generous funding from sponsors and program partners. Thank you for continuing to support the Lake Huron Coastal Centre and its core mandates of educating members of coastal communities in the topics of; water quality, biodiversity, climate change, and coastal processes.

The 2021 year of the Coast Watchers program was generously sponsored by:

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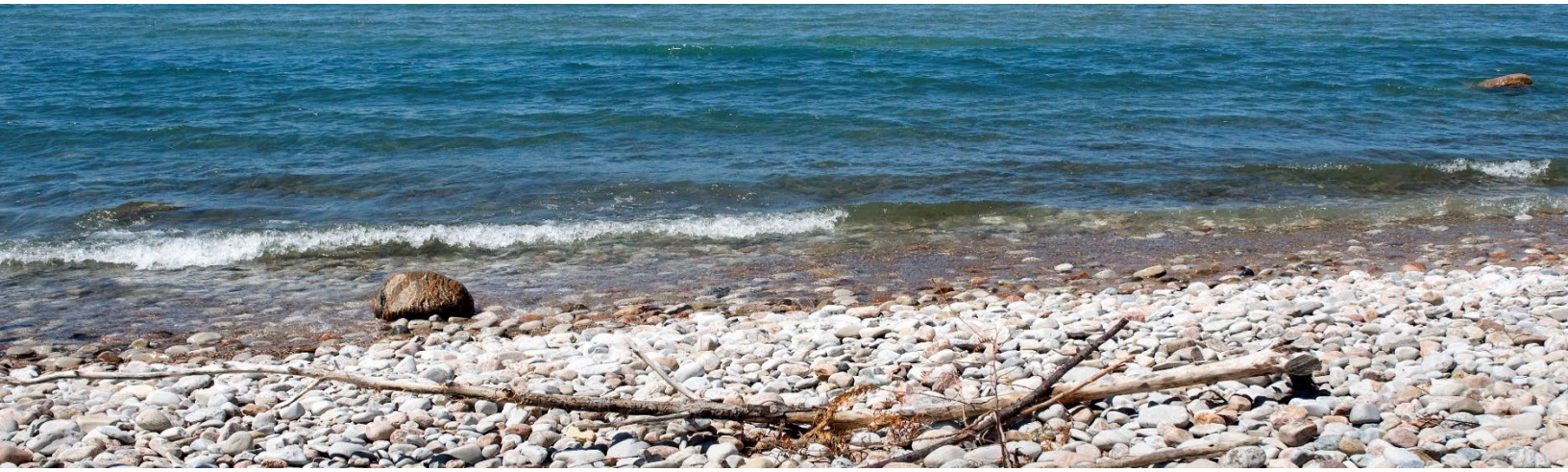
Introduction

Coast Watchers volunteers have become the “eyes and ears” of Lake Huron’s coast. With Coast Watchers volunteers collecting information systematically and consistently along Lake Huron, it is possible to track long-term trends in shoreline conditions and take action towards resiliency and sustainability in the short-term.

The quality of Lake Huron’s water and shoreline has come into question in recent years as plastic pollution, shoreline erosion and climate change cause concern for the coastal environment. Various agencies have collected segments of information related to environmental quality concerns along the coast, but the data collected is often limited to ‘snapshots’ in time. The difficulty is that local conditions can change quickly. Lake Huron’s immense 6,170 km of shoreline is the longest of all the Great Lakes, and therefore cannot feasibly be monitored in detail by any one agency; This is where the role of citizen scientists or *community scientists* becomes crucial in recording changes along the coast. The Coast Watchers program has a grass roots approach to data collection where community champions monitor changes to the shoreline. The Coast Watchers Program Coordinator works to analyze and share the data with environmental organizations, government agencies, corporate partners, and the public.

The Coast Watchers program is designed to engage members of the community to take an active part in observing and improving the quality of nearshore waters and beaches. Community volunteers are trained to observe environmental stressors when monitoring the shoreline. This involves learning how to record data on atmospheric conditions, wildlife, plastic pollution, algae blooms, erosion, storm damage, and human activity. In addition to Coast Watchers training sessions, volunteers have access to educational resources on coastal related topics (e.g., Species at Risk, invasive species, plastic pollution, etc.) provided by the Lake Huron Coastal Centre (LHCC). The Microplastic Awareness Project has also been integrated into the Coast Watchers program to test specifically for microplastics found in Lake Huron water samples.



Methods

Coast Watchers Program

Since the program's conception in 2005, the methodology has remained mostly consistent, with the addition of monitoring new threats and stressors which have become more apparent in recent years. The major factor defining Coast Watchers is its basis of coastal community scientist volunteers, sometimes also referred to as "citizen scientists". Community science is becoming a significant contributor and a valued source of data collection. "A community scientist is an individual who voluntarily contributes their time, effort, and resources toward scientific research in collaboration with professional scientists or alone. These individuals do not necessarily have a formal science background" (SciStarter.org, 2020). The success of the Coast Watchers program relies on dedicated and reliable volunteer community scientists to remain successful in providing a valuable long-term data set.

Data is collected once per week between May 1st and October 31st every year. However, the data collection season is reasonably flexible depending on public access to beaches based on COVID-19 provincial health guidelines. Participants are asked to collect data preferably on the same day at the same time every week. Participants are 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 is inputted into a long-term dataset for future analysis. Coast Watchers are given a personalized number (i.e., CW001) to respect the privacy of all volunteers. Their number is referred to when writing about specific volunteers in all public reports.

Microplastic Awareness Project

Lake water samples were tested for the presence of microplastics in 2021 through the LHCC's Microplastic Awareness project. Volunteers were chosen based on their monitoring location to ensure that a broad area of the Canadian Lake Huron shoreline was represented. Volunteers were given two 1 L water sampling bottles and were asked to collect one lake water sample at the beginning and end of the 2021 Coast Watchers season using the following simple steps:

1. Rinse Sample Bottle: Fill up the bottle three times with lake water to rinse anything that could contaminate the sample.
2. Collect Samples: Walk 5 steps into the lake and away from where the bottle was rinsed. Fill the bottle with water from the surface of the Lake. Seal the bottle.
3. Label & store samples. Ensure the labels are correct. Samples are to be sealed tight and stored at room temperature.

Water samples are then tested using a dissecting microscope to identify fibers, microbeads, fragments, foam, and nurdles present in the water.

Volunteer Recruitment

Volunteer recruitment begins early in the new year, with many returning volunteers from previous years of the program. New volunteers are typically recruited through several avenues including social media, newsletters, radio interviews, local newspapers, and word of mouth. Coast Watchers is often highlighted in other LHCC programs, presentations, and webinars which can lead to registrants. This year, volunteer recruitment also occurred through contacting wait-listed volunteers from previous seasons.

In 2021, 70 volunteers were adopted into the program, with another 19 added to the waitlist. Although not ideal, this number of individuals placed on the waitlist shows an outstanding desire for program expansion by the coastal communities across Lake Huron and a need for more funding to increase the program's capacity.

Demographics

The demographics of the volunteers in 2021 included individuals from across the shoreline of various ages, from children to retirees, and of different socio-economic backgrounds. Some volunteers have participated in the program since 2014, while others were new in 2021.

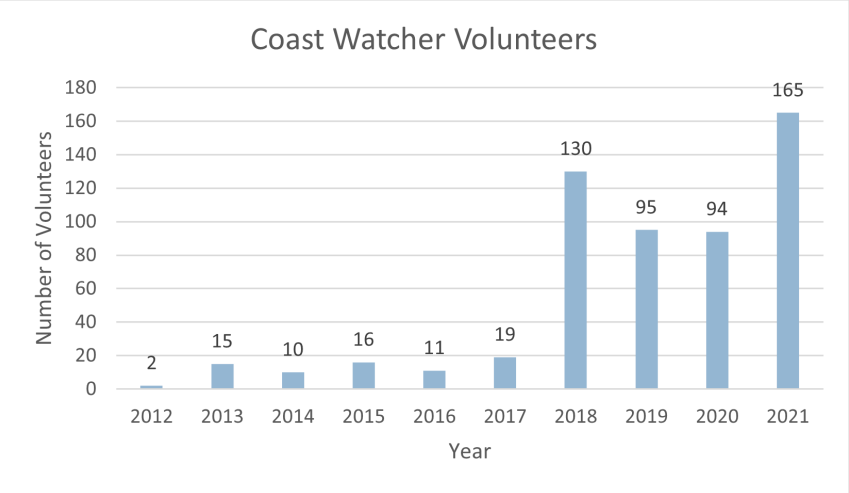


Figure 1: *Number of program volunteers from 2006-2021.*

Volunteer Training

With any community science program, training is very important to produce consistent results in the data collection. However, some aspects of Coast Watchers monitoring are qualitative and will have some form of variation from person to person. The training provided to participants in the Coast Watchers program equips volunteers with the necessary knowledge and experience to complete each monitoring session. Volunteers are trained on the use of equipment required to complete the reports.

Volunteers are provided a 1-hour mandatory online training seminar in the spring of their first year. Returning volunteers are welcome to re-attend training sessions over time if they wish. If a volunteer is unable to attend the live training session, the recording is posted to the LHCC website to be viewed at their convenience.

Equipment

Equipment inventory: Existing volunteers were contacted in January to inquire about equipment in their possession. Other inventory in LHCC's possession were inventoried and their condition inspected to ensure good working condition.

Equipment distribution: When equipment was in poor working order, or when volunteers needed new equipment, replacements or new equipment were distributed as needed. Field sheets, batteries, and thermometers were the

items requiring the highest rate of replacement. New volunteers are asked to print the Beaufort Scale, Compass Rose and field sheets from the Coast Watchers training page of the LHCC website. Considering the increase of registrations LHCC is unable to equip every Coast Watchers with a sensitive impeller used to report wind speed, air and water temperature called a Kestrel.

Equipment costs: Each Kestrel costs $130 and each water thermometer costs 10$. New volunteers that are interested in using a Kestrel pay a $25 equipment deposit fee through the LHCC website. Once the equipment is returned in good condition the deposit is fully refunded back to the volunteer.

Results

The findings from the 2021 monitoring season range in quality from qualitative to quantitative measurements. The specific findings enable us to compare 2021 data to previous years in order to determine altered trend lines or common nuances over long-term data collections.

Coastal Temperature (Air and Water)

Atmospheric temperatures are taken using a pool thermometer or Kestrel, depending on the equipment supplied to the volunteer. There were 2,343 data points recorded by volunteers for both air and water temperatures in 2021. Figure 2 shows the comparison of air and water temperature recordings from May 1st to October 21st, 2021. Temperatures are lower in both the spring and fall and peaked in the summer, with the maximum air and water temperature readings recorded in August. The maximum water temperature was 28°C and the maximum air temperature was 35°C (without the humidex). It is important to note that there are air temperature outliers in Figure 2 recorded late May. These can be attributed to human error, time of day, microclimate conditions experienced in some cove and shaded bluff bottom environments, or location of Coast Watchers participants sampling (i.e., Georgian Bay with steep nearshore decline vs. Southern basin with gradual nearshore decline).

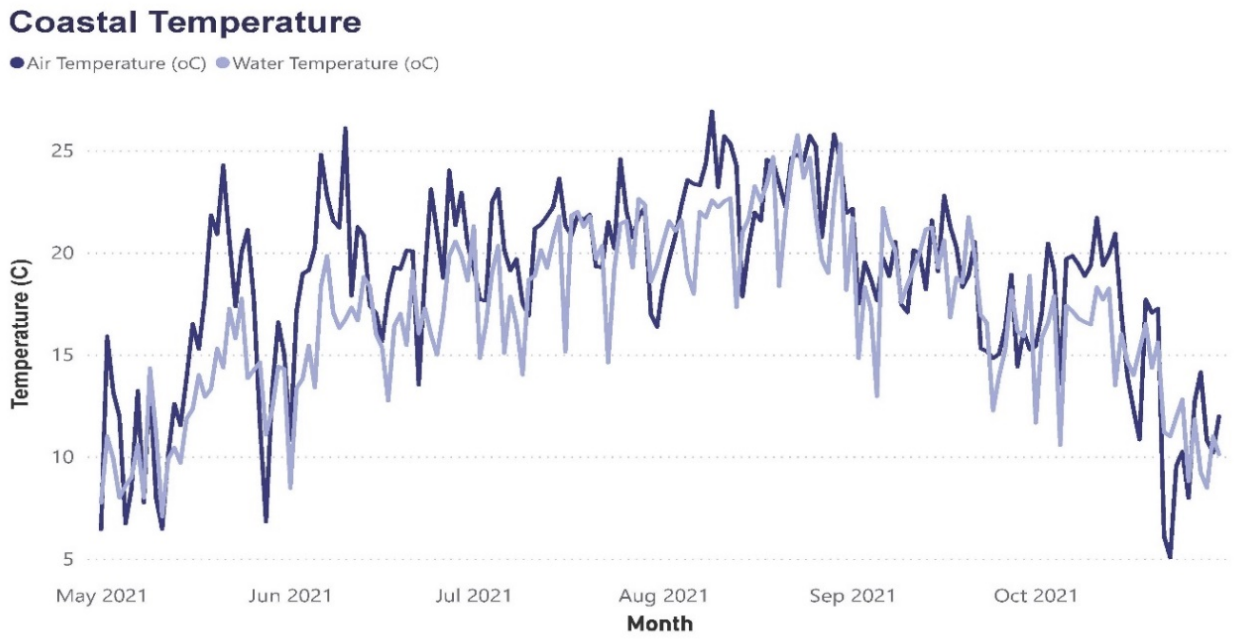


Figure 2: *Comparison of air and water temperature (degrees Celsius) measurements recorded by volunteers from May 1st, 2021 to October 31st, 2021.*

Wind Speed

Wind speed was measured for current wind speed, maximum wind gust, and average wind speed using a device called a Kestrel Wind Meter. The sensitive impeller in the device takes these readings by the operator holding it out in front of themselves at their monitoring location.

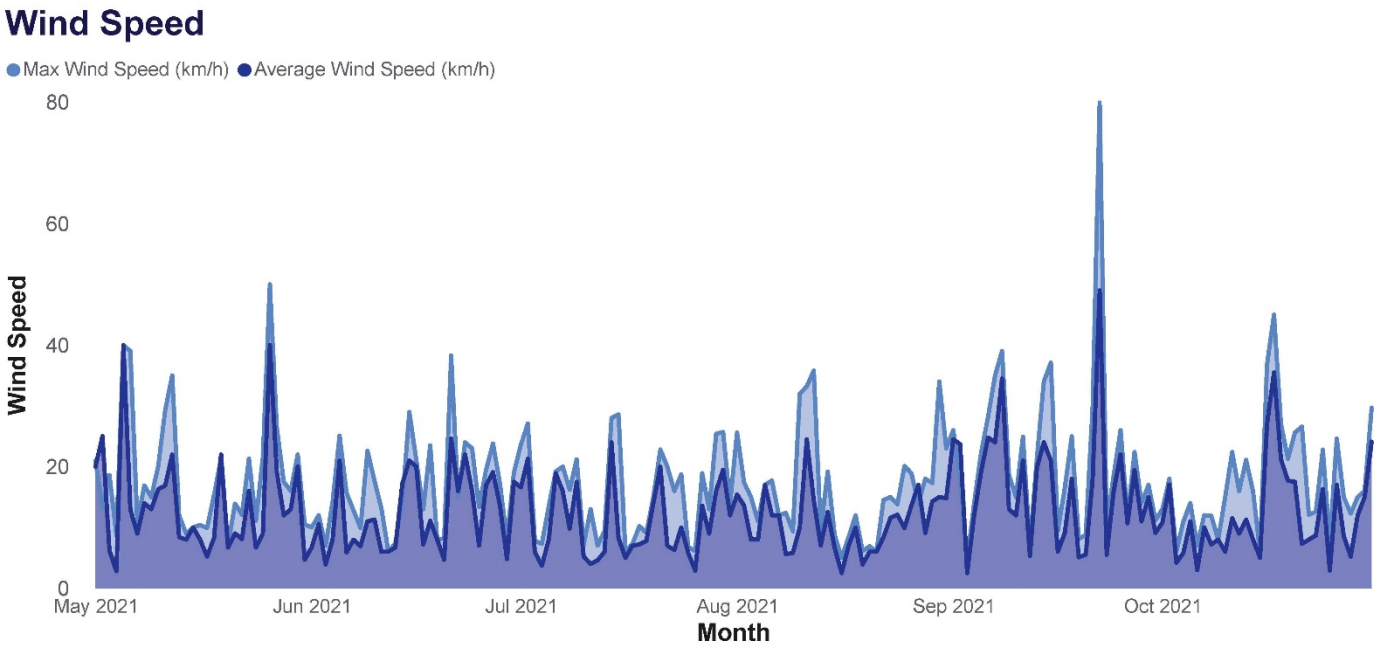
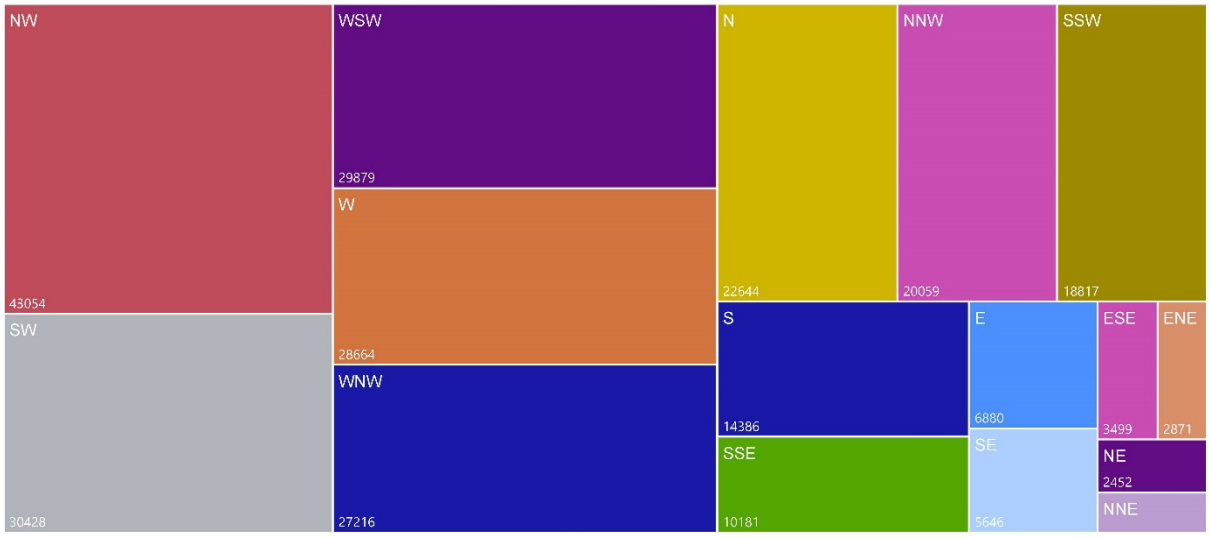


Figure 3: *Comparison of average wind speed (km/h) and maximum wind speed (km/h) recorded by volunteers from May 1st, 2021 to October 31st, 2021.*

Figure 3 provides a comparison of maximum wind speed and average wind speeds (km/h). This graph shows that there were slight peaks in maximum and average wind speeds at the beginning and end of the season, yet recordings varied day to day. Average wind speed started trending up on Wednesday, October 13, 2021, rising by 56.64% in 6 days with a maximum wind speed reading of 80 km/h. This outlier could be attributed to human error or an inclement weather event. Although wind speed readings are accurate and have been recorded by the participant using the proper methodologies, there is some bias in the data. For example, if there was extreme inclement weather such as a thunderstorm or snowstorm, the participant may not have been able to record data during the weather event, excluding this reading from the data. This bias is attributed to human error. However, volunteers are encouraged to follow safety protocols during such weather events (i.e. avoiding collecting data during storms).

Wind and Wave Direction

Wind Direction



Wave Direction

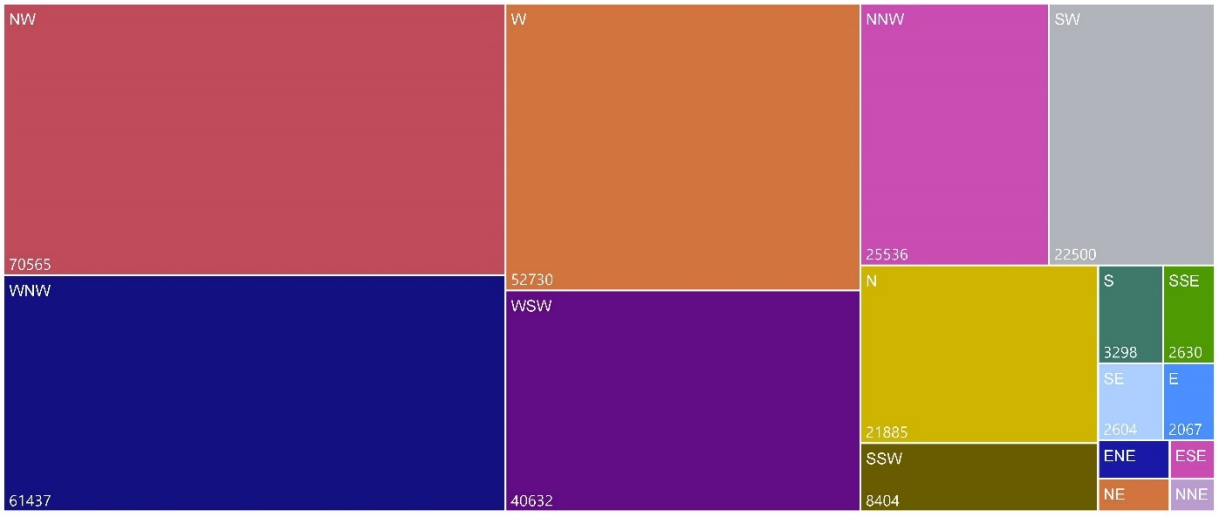


Figure 4 & 5: *Wave Direction represented by a tree map. The larger the box, the higher the number of recorded data points for the corresponding wind and wave direction. Data was collected by volunteers from May 1st, 2021 to October 31st, 2021.*

Figures 4 and 5 showing wind and wave direction are also variable depending on the time of year and location of the participant. Participants complete this section of the monitoring data using a device called a 'Compass Rose'. During the 2021 season, the most common wind directions occurred from the Northwest and West direction with some Southern impact, wave directions follow the same pattern. These recordings hold true to the typical conditions for Lake Huron's southeastern shores. The majority of winds come from across Lake Huron's waters, originating 'state-side', flushing across the Lake, proceeding across Southwestern Ontario.

Wave Activity

Wave heights are monitored and quantified using the Beaufort Scale. The Beaufort Wind Scale, developed in 1805 by Sir Francis Beaufort of the U.K. Royal Navy, is a standardized method for mariners to measure and communicate wave heights and wind speeds. This method is used by Coast Watchers volunteers to monitor and record wave

heights along the Lake Huron coastline. Although somewhat subjective to each participant's experience and opinion, the Beaufort Scale employs wind speed to also indicate which Beaufort Scale number is appropriate. The Chart titled, '*Beaufort Wave Heights*' illustrates how many records of each Beaufort scale number were made by participants throughout the study period. Figure 6 shows the time series of wave height using the Beaufort scale.

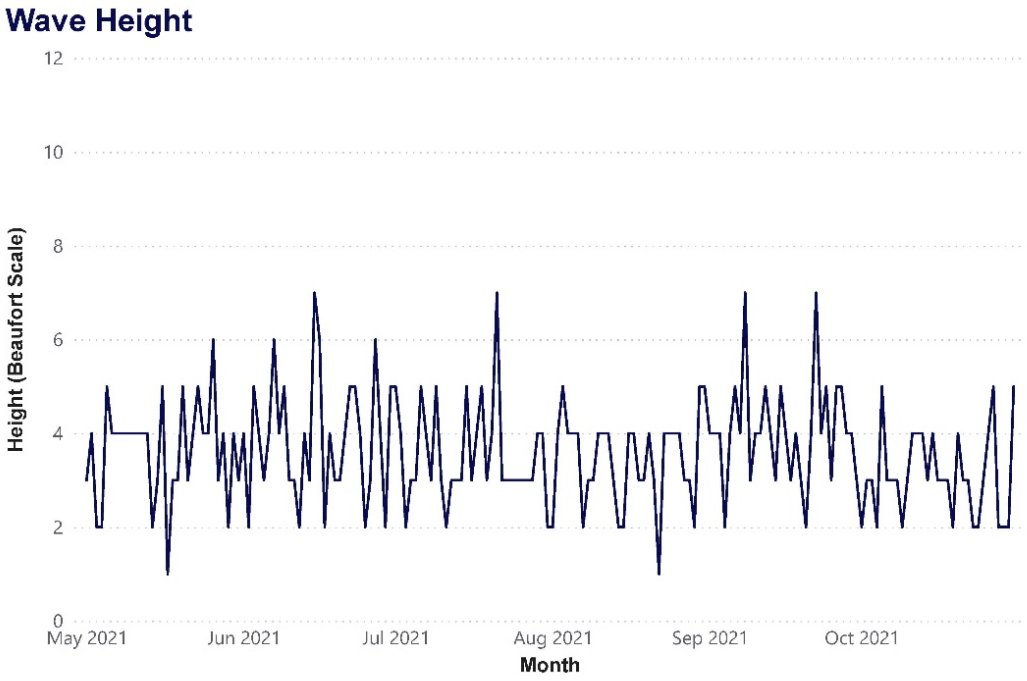


Figure 6: *Time series of wave height (Beaufort Scale) by volunteers from May 1st, 2021 to October 31st, 2021.*

Visibility

Visibility is defined as a measure of the distance at which an object can be clearly discerned, affecting boating, and daily activities on the shoreline. Visibility recorded over time can be used to assess trends in atmospheric conditions and qualitative air quality. If the horizon is apparent and clearly visible, the observant notes that 'Yes' the horizon is visible. If the horizon is clouded by fog, or if the cloud and sky blurred together 'No" is recorded. Figure 7 shows the division of observations of visibility. 1,428 observations were made over the 2021 season and 90.5% of observations stated that the horizon was visible.

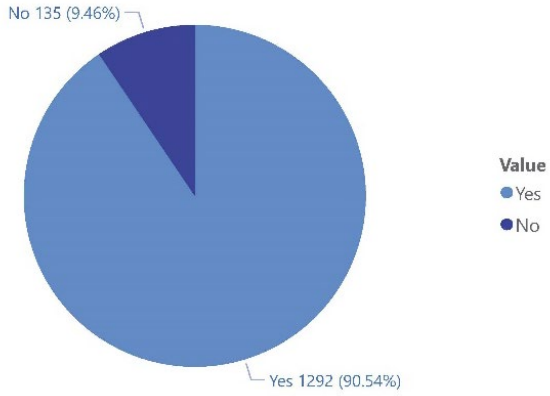


Figure 7: *Results depicting percentage of data recordings for the horizon visibility (Yes or No).*

Wildlife Reports

Coast Watchers volunteers identified 67 species at the Lake Huron shoreline during the 2021 season. This is exceptionally higher than the 25 species identified in 2020. This spike could be attributed to the increase of volunteer numbers, stronger species identification skills, or more wildlife present on the shoreline. The most

common observations were birds including Gulls (Ring-Billed), Canada Geese, Ducks (Mallard and Mergansers), Cormorants, and Crows, but also included Kingfishers, Northern Flickers, and many more (see Figures 8 & 9).


Figure 8 & 9: *Red Breasted Merganser floating in nearshore water (left). Canada Geese and goslings walking along shoreline (right). Photos provided by Coast Watchers participants CW175 & CW054.*

Die-off Events

Two major wildlife die-offs of Zebra Mussels and Round Gobies occurred in 2021. Both are common invasive species found in Lake Huron. 100-200 Zebra Mussel shells were reported in early October and over 400 Round Gobies were washed onto beaches between June 17th, 2021 and June 23rd, 2021, at 4 different monitoring locations (see Figures 10 & 11). Round Gobies feed on invasive mussels as their primary food source. A die-off event of invasive species at this scale could be evidence of an unbalanced lake ecosystem.


Figure 10 & 11: *Round Goby wash-up on beach (left). Zebra Mussel shells within natural debris (right). Photos provided by Coast Watchers participants CW106 and CW077.*

Species at Risk

Observations of Species at Risk were minimal this year, with 26 observations including sightings of the Monarch butterfly (in all life stages), Piping Plover, and Bald Eagle (see Figures 12 & 13). The margin of error on Species at Risk recordings is larger than general wildlife reports because differentiating between these species and look-a-

like counterparts can be difficult for community scientists. However, participants in the Coast Watchers program receive training and identification guides to learn how to identify the most common Species at Risk observed on Lake Huron shorelines.

Figures 12 & 13: *Monarch butterfly in sand (left), Piping Plover on beach (right). Figure 12 provided by Coast Watchers participant CW054.*

Algae Reports

Algae occurs naturally in aquatic ecosystems and is a vital part of the food chain for benthic invertebrates. Large quantities of algae can be indicative of excessive nutrients like nitrogen and phosphorous entering the water from runoff. Algae fouling along beaches is an example of an ecological imbalance due to excessive nutrients in the water.

Algae blooms are popularly known to cause a poor-quality swimming environment, a "rotten" smell when washed up on beaches, and generally a displeasing aesthetic. Some algae are also known to contain toxic qualities such as cyanobacteria which can make humans and animals ill if consumed. Algae is also problematic in nearshore waters because of its effect on the Dissolved Oxygen (DO) content of the water column. Fish and aquatic species rely on DO in water, and when DO is being consumed by algae either in its growth or decomposition stage, there is less for fish to utilize, which may lead to fish die-off events. The presence of algae blooms is important to monitor to detect changes in nearshore water quality that may trigger negative impacts to the health of nearshore ecosystems and aquatic wildlife habitat.

During the 2021 monitoring season, Coast Watchers documented 36 algae sightings along the shoreline, with 25 sightings in the water and 11 sightings on the beach. A total of 386 linear metres of algae blooms were observed in water and 162 linear metres of algae blooms were observed along the shoreline. The number of sightings in 2021 remained relatively consistent with the 35 recorded algae sightings during the previous (2020) season.


Figures 14 & 15: *Algae present on sand beach (left) and algae wash-up on cobble beach (right). Photos provided by Coast Watchers participants CW003 & CW004.*

Beach Litter

Plastic debris and litter on beaches are not only aesthetically displeasing but also poses a health and safety risk to humans and animals using the shoreline. Litter on shorelines becomes an entanglement hazard for wildlife and can be consumed by birds and fish, leading to choking, starvation, bioaccumulation or biomagnification. In many public beach areas, municipalities groom beaches using mechanical methods such as tractor-towed surf rakes and algae harvesters. This form of beach grooming can pose environmental stress by also removing natural habitat that wildlife depends on. Landowners that live along areas of the shoreline that do not have public access are responsible for cleaning up inorganic matter that washes onto the shore.

Coast Watchers participants are asked to monitor and record inorganic litter (e.g., plastic, metal, glass, etc.) that is present on the shoreline during the time of their monitoring. 790 total recordings of litter and microplastics were made in 2021. The most common type of litter found was cigarette butts, food wrappers, plastic bags, and plastic bottles. There was an increase of personal protective equipment (PPE), such as face masks, on the shoreline with 11 sightings recorded. A total of 88,5 kg (195 lbs) of litter was removed by Coast Watchers this season.


Figure 16 & 17: *Examples of litter collected by a Coast Watchers (left). Decomposing can (right). Photos provided by Coast Watchers participant CW033.*

Microplastic Sampling

Microplastic was found in 83.3% percent of the 24 samples collected at the beginning and end of the Coast Watchers season. When lake water samples were tested in 2018, 95.7% of the samples contained microplastic. Microfibers was the most common microplastic found in both 2018 and 2021. This was expected since microfibers are commonly released from clothing in washing machines and if the washing machine does not have a microfiber filter, they are released into municipal wastewater systems. Since microfibers are 100 times finer than a human hair, they are not filtered at most wastewater treatment facilities before they are released into Lake Huron. This poses a risk to humans through contamination of drinking water. More research needs to be conducted to better understand how ingestion of microplastics can impact the health of humans and wildlife.

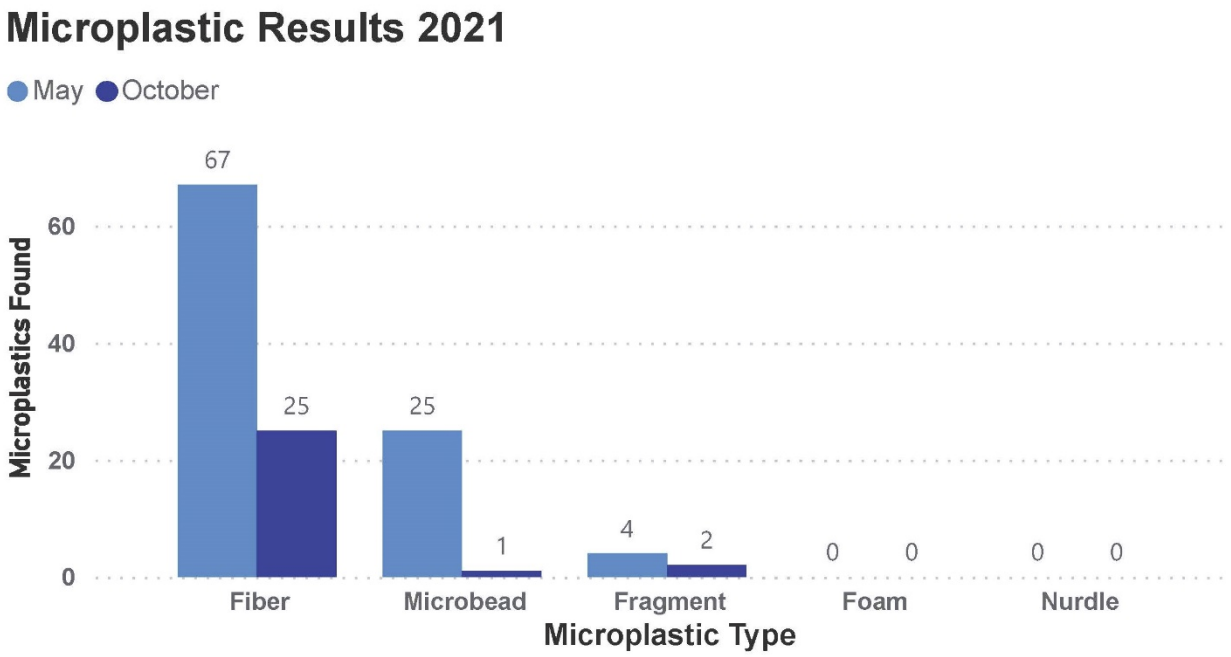


Figure 18: Results from the Microplastic Awareness project. Samples were collected in May 2021 & October 2021.

Storm Damage & Erosion Reports

Lake Huron experienced its peak water level for the year in January of 2021, at 177.07 metres above sea level. This followed the near-record high water level of 177.45 m in July 2020. Water levels decreased at an above average rate throughout the rest of 2021, yet even with the steady decline, above average water levels were recorded at the end of 2021. High lake levels caused erosion events through increased wave action causing concern for lakeshore property owners. In 2021, 141 observations were reported of erosion including beach terracing, precipitation erosion such as washouts, and exposed roots in dune areas (see Figures 19 & 20).

Although shoreline erosion is a natural process, areas experiencing washouts from surface runoff and intense precipitation events should be monitored as this may indicate improper rainwater catchment and infiltration. Incorporating Low Impact Development (LID) principles to reduce this phenomenon can include rainwater catchment systems attached to structures, infiltration gardens such as rain gardens, more permeable, natural and vegetated cover, and increased buffer zones between built areas and the high-water mark.

Storm events often cause powerful waves resulting in wash-ups of large natural debris. This often causes concern from residents who have narrow shorelines with nowhere to take the natural debris to properly remove it from the shoreline if it is causing a hazard or impediment to recreational activities. While natural material is important to

feed nutrients into shorelines, it is recognized that excessive amounts of natural debris are not typically compatible with human demands for recreation on shorelines. 179 reports of large natural debris, such as driftwood, logs, clumps of natural material such as root balls, and rocks were recorded throughout the season.

72 observations of large, human-made debris were recorded, including large concrete blocks, metal, fire pit rings, plastic furniture, barrels, tires, and asphalt chunks. These large, inorganic materials are necessary to remove to protect the ecological integrity of the beach, along with removing the safety hazard for humans and wildlife. Often, landowners do not know how to properly dispose of these materials, therefore causing concern and confusion.

Figures 19 & 20: *Difference of water level over 13 months near Wasaga Beach. Photos were taken in April 2020 (left) and May 2021 (right). Use the wooden staircase as a reference point. Photo provided by Coast Watchers participant CW003.*

Human Activity on Shoreline

Human activity is recorded to gain insight into the influence recreation has on Lake Huron's coastal environment. In 2021, the number of people on beaches was the highest recorded human activity, with an estimated total count to be 5,532 people. Observations of watercraft without motors such as kayaks, canoes, stand up paddleboards, sailboats, and wind surfers were recorded as 568, whereas 474 watercrafts with motors were recorded. 72 motorized vehicles were recorded in these observations which included ATV's, tractors and trucks on the shoreline; Other observations around vehicle use included observations of tracks but no vehicle, implying a vehicle had recently been along the shore. Aside from noting human activity, participants also recorded dogs seen on the beach since off leash dogs can cause mortality to wildlife on beach. In total, 441 dogs were recorded along the shoreline.

Understanding how and why people are using the shoreline directs shoreline management strategies and assists with the proper education and outreach techniques to prevent excessive pollution, habitat destruction, and exceeded ecological carrying capacities of shoreline ecosystems.

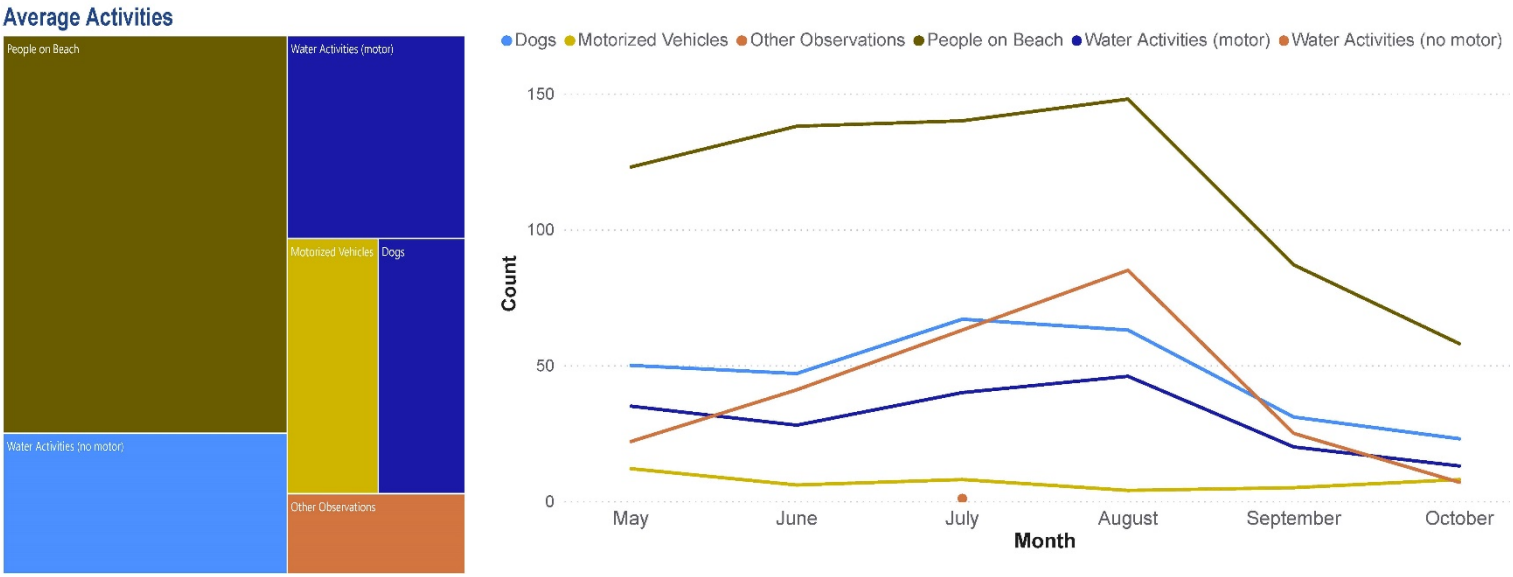


Figure 21: *Time series of human activities recorded along the Lake Huron and Georgian Bay shoreline from May 2021 to October 2021.*

Webinar Series

Through the generous sponsorship of Bruce Power and RBC Tech for Nature the LHCC was able to execute a series of 6 webinars attended by 225 people that focused on improving the awareness of coastal ecosystems, processes, and threats to Lake Huron. LHCC staff presented on a variety of topics including Species at Risk, plastic pollution, shoreline birds, coastal plants, coastal processes, and shoreline development.

Lessons Learned

As the program increases in data collected and number of participants, the LHCC is creating a mobile application that will feed data directly to an online data portal to eliminate the onerous task of manually inputting data from submitted (emailed or paper) data sheets. This will significantly reduce the margin of human error and increase the efficiency of data sharing and analysis. A mobile application will allow for the geographic expansion of the program to cover more areas of the shoreline, increasing the number of participants and reducing the number of waiting list applicants. The Coast Watchers mobile app will be launched and active for the 2022 Coast Watchers season. The development of this new mobile application would not have been possible without the generous support of the Rotary Club of Goderich, RBC Tech for Nature, and Bruce Power.

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2021

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