LAKE HURON CENTRE FOR COASTAL CONSERVATION

# Coast Watchers

Annual Report

**2020**

coast watchers

COMMUNITY VOLUNTEER PROGRAM

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

The 2020 year of the Coast Watchers program was generously sponsored by:

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the Coastal Centre

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# Introduction

The quality of Lake Huron water and beaches has come into question in recent years. Beach postings, algae fouling, and incidences of dead birds and fish washing onto the beach are some of the concerns regarding Lake Huron's coastal environment. Government 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. As a small not for profit we ae seeing grass roots movements of community leaders monitoring changes to the shoreline and taking steps to improve water quality. We are dedicated to and provide resources for local health and land management agencies to monitor water quality along the coast. 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 becomes crucial in recording changes to our coast.

Since 2005, Coast Watchers has been a major program through the Lake Huron Centre for Coastal Conservation, designed to engage members of the community to take an active part in observing and improving the quality of our nearshore waters through individual actions. Community volunteers are trained to observe the coast, record qualitative and quantitative shoreline conditions, and take steps to initiate action when necessary, including beach clean-ups and habitat preservation.

Coast Watchers volunteers have become the eyes and ears of Lake Huron's coast. With Coast Watcher volunteers collecting information systematically and consistently along the lakeshore, it will be possible to track conditions and trends long-term, and complete actions towards resiliency and sustainability in the short-term.

# Methods

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 citizen scientist volunteers. Citizen science is becoming a significant contributor and a more valued and legitimized source of data collection as funding for programs wains. "A citizen scientist is an individual who voluntarily contributes his or her time, effort, and resources toward scientific research in collaboration with professional scientists or alone. These individuals don't necessarily have a formal science background" (SciStarter.org, 2020). The success of the Coast Watchers program relies on these dedicated and reliable volunteer citizen scientists to remain successful and provide a valuable long-term data set.

Data is collected once per week between May 1st and October 31st of every year. However, this season is reasonably flexible depending on the availability of the volunteer. Participants are asked to collect data once per week, 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 our long-term dataset.

## Volunteer Recruitment

Volunteer recruitment begins in the early new year every season, with many carry-over volunteers from previous years remaining part of the program. Volunteers are typically recruited through a number of avenues including social media, traditional news sources such as local papers, and word of mouth or association in other programs put on by the LHCCC. This year, volunteer recruitment also occurs through accessing the wait listed volunteers from previous seasons.

Media releases about the program's existence and previous results, along with a call for volunteers were sent to news outlets along Lake Huron's coastline in early January to maximize engagement reach in small communities. Throughout the previous season, volunteers also receive a monthly newsletter specific to the Coast Watchers program which encourages volunteers to communicate their participation and findings to fellow members of their communities. In 2020, 94 volunteers were adopted into the program, with another 20 put onto a 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 increasing the program's capacity.

## Demographics

The demographics of the volunteers in 2020 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 for 2020.

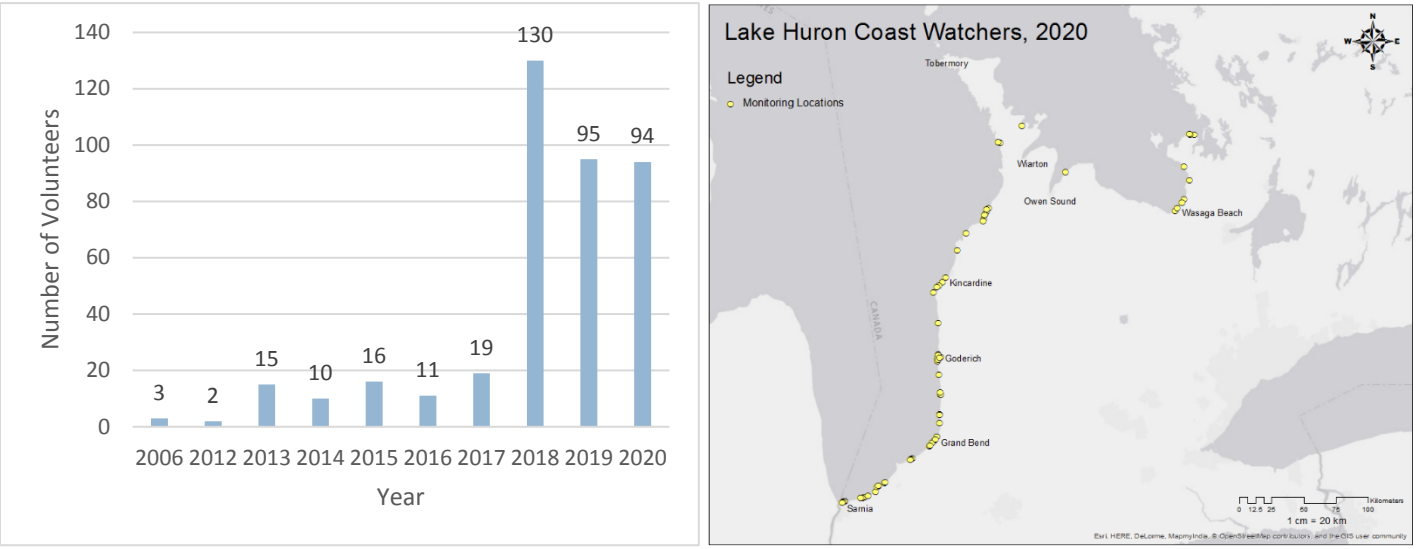


***Figure 1:*** *Number of program volunteers from 2005-2020, along with 2020 program participants locations.*

## Volunteer Training

With any citizen science program, training becomes very important to produce consistent results in the data collection. Although some aspects of Coast Watcher monitoring are quantitative and will have some form of variation from person to person. The training provided to participants in the Coast Watchers program equip volunteers with the necessary knowledge and experience to complete each site visit. Volunteers are trained on the use of tools and equipment required as part of the program.

Volunteers are provided with a 1-hour mandatory training seminar in the spring of their first year. Veteran volunteers are welcome to re-attend other local training sessions over time as well. The 2020 training sessions occurred online due to COVID-19 regulations prohibiting in-person training.

## 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:

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

**Equipment distribution:** Equipment that was in poor working order, or volunteers in need of equipment were sent replacements or new equipment as needed. Field sheets, kestrel batteries, and thermometers were the items requiring the highest rate of replacement.

**Equipment costs:** Each advanced CW Kit costs approximately $160, while the basic CW cost approximately $20. Each volunteer is required to complete a waiver before receiving equipment outlining their responsibilities as a participant in taking care of the equipment and using it for the purposes of monitoring.

# Results

The findings from the 2020 monitoring season range in quality from qualitative to quantitative measurements. The specific findings enable us to compare 2020 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 simple method of using a pool thermometer, or using the Kestrel device, depending on the CW kit supplied to the volunteer. There were over 7500 data points recorded by volunteers for both air and water temperatures. Figure 2 shows the comparison of air and water temperature recordings from May 1st to October 21, 2020. Temperatures are lower in both the spring and fall and peaking in the summer, with a maximum water temperature at 27 in July and maximum air temperature 32.4 in July (without the humidex). It is important to note, there are outliers in Figure 2. These can be attributed to microclimate conditions experienced in some cove and shaded bluff bottom environments, or human error. These outliers could occur because of location of coast watcher sampling (e.g. Georgian Bay with steep nearshore decline vs. Southern basin with gradual nearshore decline), time of day of sampling, or human error.

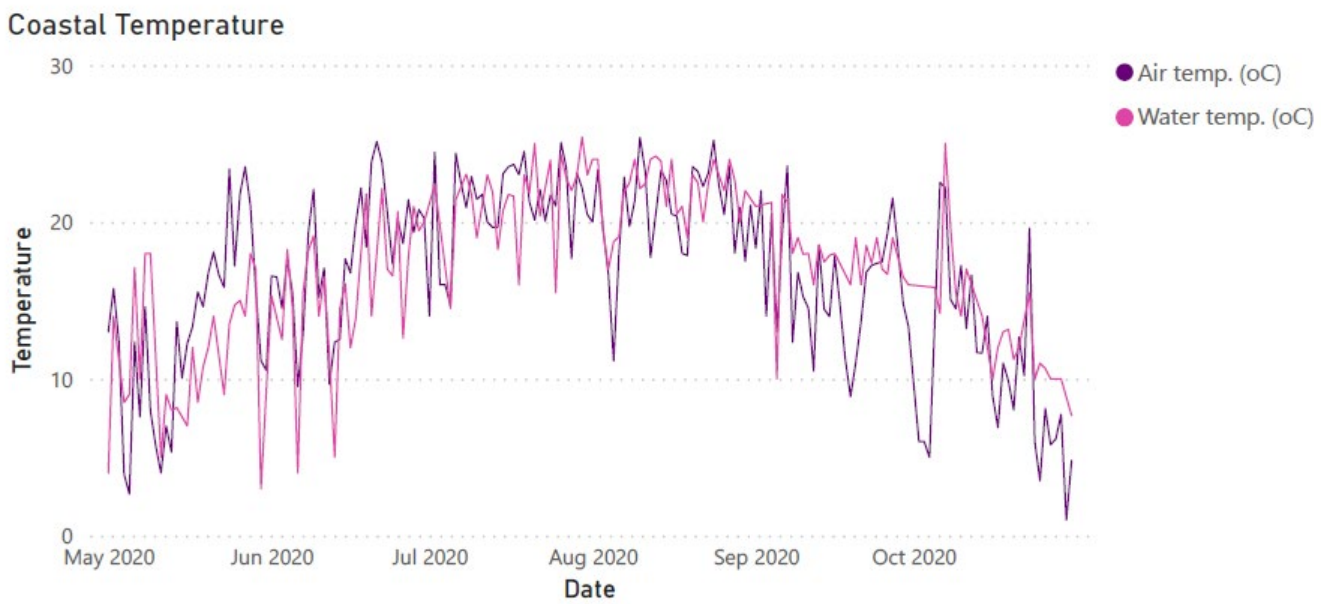


*Figure 2: Comparison of air and water temperature (degree Celsius) measurements recorded by volunteers from May 1, 2020 to October 31st, 2020.*

## Wind Speed and Direction

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 provides a comparison of maximum wind speed and average wind speeds (km/h). We can see maximum wind speeds are variable across the monitoring season and varies day to day. Maximum wind speeds shows us

that wind speed 'peaks' at the beginning and end of the season. Although these readings are accurate and have been recorded by the participant using the proper methodologies, there is some bias to the data. For example, if there was extreme inclement weather such as a thunder storm or snow storm, the participant may not have been out to record data during the weather event, excluding this reading from the data. This bias is attributed to human error.

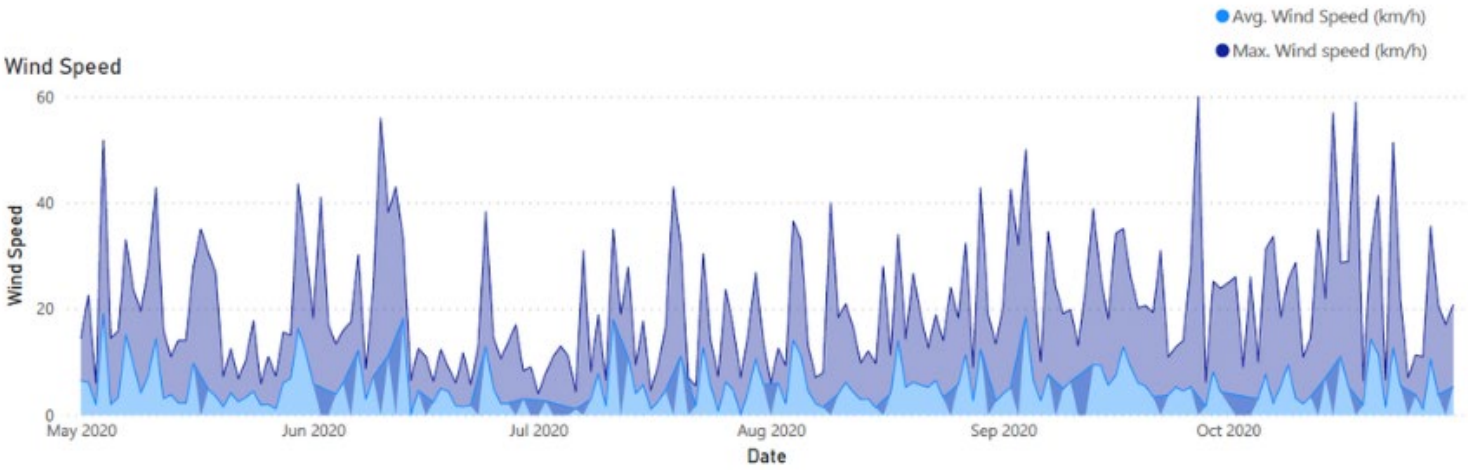


*Figure 3: Comparison of average wind speed (km/h) and maximum wind speed (km/h) recorded by volunteers from May 1s, 2020 to October 31st, 2020.*

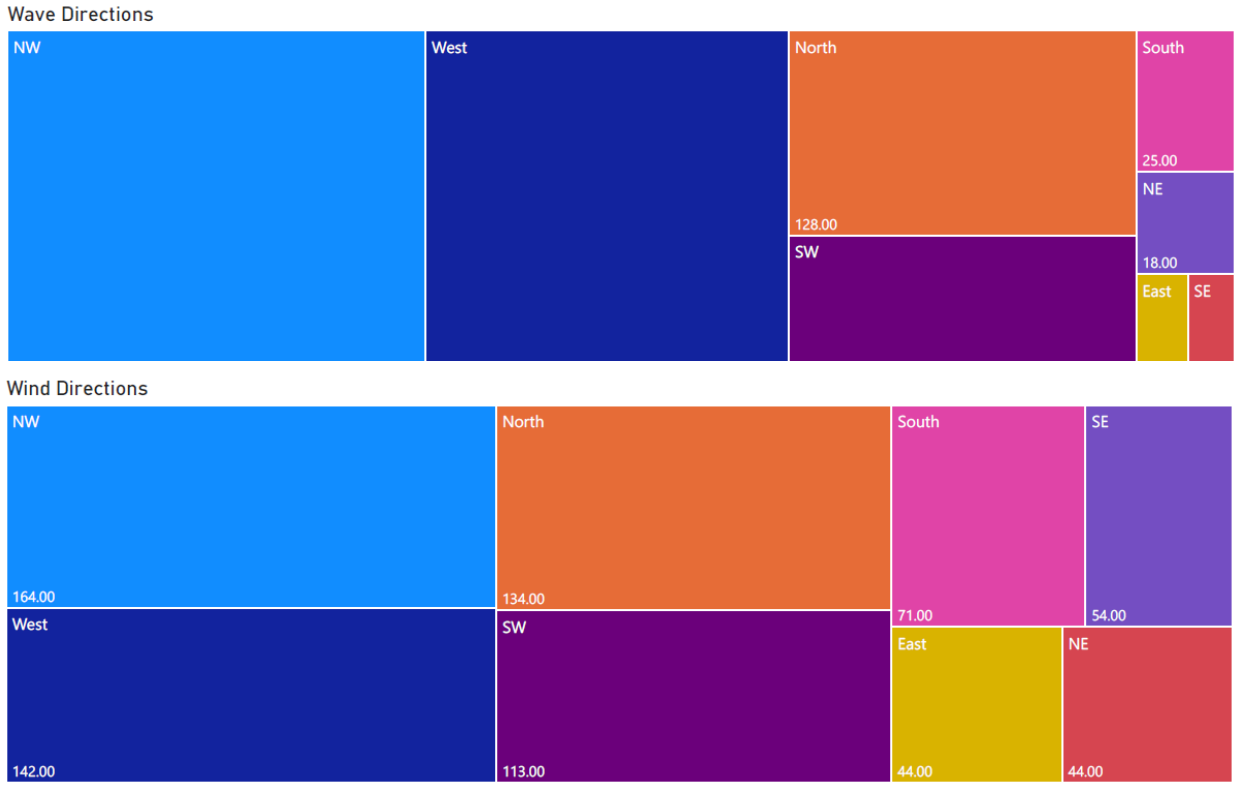


*Figure 4: Wave Direction represented by a tree map. The larger the "box" the higher the number of recorded data point for the corresponding wind and wave direction. Data collected by volunteers from May 1, 2020 to October 31st 2020.*

Figure 4 shows wind and wave direction are also variable depending on time of year and location of participant. Participants complete this section of the monitoring data using a simple piece of equipment called a 'Compass Rose'. During the 2020 season, the most common wind directions recorded occurred coming from the Northwest and West direction, 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, 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 Watcher volunteers to monitor and record wave heights along the Lake Huron coastline. Although somewhat subjective to each participants experience, and personal 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 5 shows the time series of wave height using the Beaufort scale.

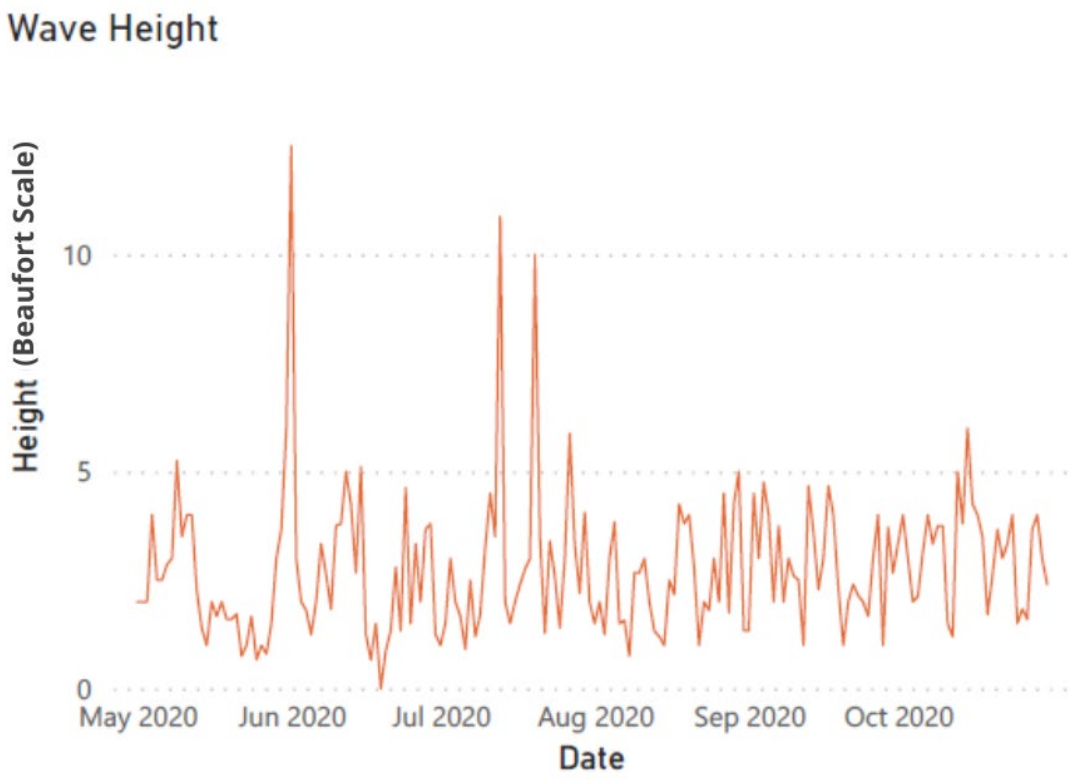


***Figure 5:*** *Time series of wave height (Beaufort Scale) by volunteers from May 1, 2020 to October 31, 2020.*

## 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. Figure 6 shows the division of observations of visibility Yes/No. 875 observations were made over the 2020 season, 90.6% of where the horizon was visible. This metric indicates that air quality in 2020 was good.


***Figure 6:*** *Results depicting percentage of data recordings for the horizon visibility (Yes or No).*

## Wildlife Reports

Coast watcher volunteers identified 25 species at the Lake Huron shoreline during the 2020 season. Most common observations were birds including Gulls (Ring-Billed), Canada Geese, Ducks (Mallard and Mergansers), Cormorants, Crows, but also included Kingfishers, Northern Flicker, Swans and many more. There were no major wildlife die-offs observed, however small events were recorded, Figure 7 is an example of this.

Species at Risk records were few this year, at 44 observations, and included only viewings of the Monarch Butterfly. The margin of error on these recordings is larger than general wildlife reports because identifying these species from look-a-like counterparts can be finite. However, participants in the Coast Watchers program receive identification guides to learn how to spot the most common species at risk they can find along the shoreline.

***Figure 7:*** *Red Necked grebe deceased at shore. Photo provided by CW165.*

## Algae Reports

Algae occurs naturally in aquatic ecosystems and is a vital part of the food chain for benthic invertebrates. Large amounts of algae are usually indicative of excessive nutrients like nitrogen and phosphorous entering the water from runoff. Algae fouling along our beaches are an obvious 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 very sick if consumed. Algae is also problematic in nearshore waters because of its effect on the Dissolved Oxygen ($DO_2$) content of the water column. Fish and aquatic species rely on $DO_2$ in water to breathe, and when $DO_2$ is being consumed by algae either in its growth or decomposition, there is less for fish to consume, often leading to fish die-offs. Algae blooms and the presence of algae, and when it is occurring are important to monitor to detect changes in nearshore water quality and may trigger other impacts to the health of nearshore ecosystems such as fish habitat.

During the 2020 monitoring season, Coast watchers documented 35 algae sightings along the Lake Huron's shore, 13-on beach, and 5-in water. A total of 317.4m were estimated in water and 22.4m on the shoreline. These results seem consistent with previous years, as 2018 had 14 recorded algae reports and only 8 reports in 2017. We can attribute this to a reduction in atmospheric temperature in the region over the summer months, with heavy precipitation in the spring and fall, with a very dry summer season.


***Figure 8:*** *Natural debris with some algae presence (left), algae wash-up on beach (right). Photos provided by CW 147 and CW147.*

## Beach Litter and Microplastic Sampling

Plastic debris and litter on beaches are not only aesthetically displeasing, but is also a health and safety risk to humans and animals using the shoreline. Many times, litter on shorelines becomes an entanglement hazard for wildlife or gets consumed by birds and fish, leading to bioaccumulation of litter in their systems, leading to death. 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, but in areas along the shoreline that are 'privately owned' many landowners are responsible for cleaning up any inorganic matter that washes up onto their shore.

Coast Watcher participants are asked to monitor and record inorganic litter including plastic that is on the shoreline during the time of their monitoring. 575 total records were made in the beach litter and microplastic

section, of which, 195 indicated plastic presence during the 2020 season (approximately 34% of records had plastic).

A total of 61.2lbs of litter was removed by Coast Watcher Volunteers. The most common type of litter found small to medium sized Styrofoam and broken plastic pieces. There was a high than average record of balloon garbage along the shoreline at 11 sightings with plastic strings.

***Figure 9:*** *Examples of balloons and small plastic pieces that were collected by a Coast Watcher volunteer. Photos provided by CW017 and CW004.*

## Storm Damage & Erosion Reports

2020 was another year of high lake level for Lake Huron. This year, the lake level peaked at 177.45, reaching a record high for Lake Huron. This high lake level caused many erosion events through storms and generally concerned lakeshore property owners across the coastal corridor. Of our 284 observations 187 (66%) reported erosion such as beach terracing, precipitation erosion such as washouts, and exposed roots in dune areas.

Although shoreline erosion is a natural process, areas receiving washouts and precipitation events from inland sources should be monitored as this indicates improper rainwater catchment, infiltration, and increase surface water runoff from storms. Actions to reduce this phenomenon include rainwater catchment systems attached to structures, infiltration gardens such as rain gardens, more natural and vegetated cover, and increase buffer zones between built areas and the water line.

***Figure 10:*** *Before (May 2020 and after (October 2020) impacts of lake lakes, wind and waves on the erosion of a staircase structure on the shores of Lake Huron. Photo provided by CW128.*

Storm events often cause wash-ups of large natural debris through the powerful waves. This often causes concern to 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 recreation 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's demands for recreation on shorelines. 65 reports of large natural debris, such as tree stumps, logs, clumps of natural material such as root balls, and rocks were recorded throughout the season.

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.

28 observances of large, human-made debris were recorded, including large concrete blocks, wood with plastic attached, fire pit rings, plastic furniture, barrels, tires, and asphalt chunks were all included in these observations.

## Human Activity on Shoreline

In the past few years of the Coast Watchers program, we have requested participants record the human activity along the stretch of shoreline in order to gain some insight into the influence of recreation on the shore. In 2020, observations were recorded for humans on the beach, with an estimated total human count to be 4,200. Observations of watercraft without motors such as kayaks, canoes, stand up paddleboards, sailboats, and wind surfers were recorded as 322, whereas 195 watercrafts with motors were recorded. 22 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. In total, 100 dogs were recorded on shorelines.

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.

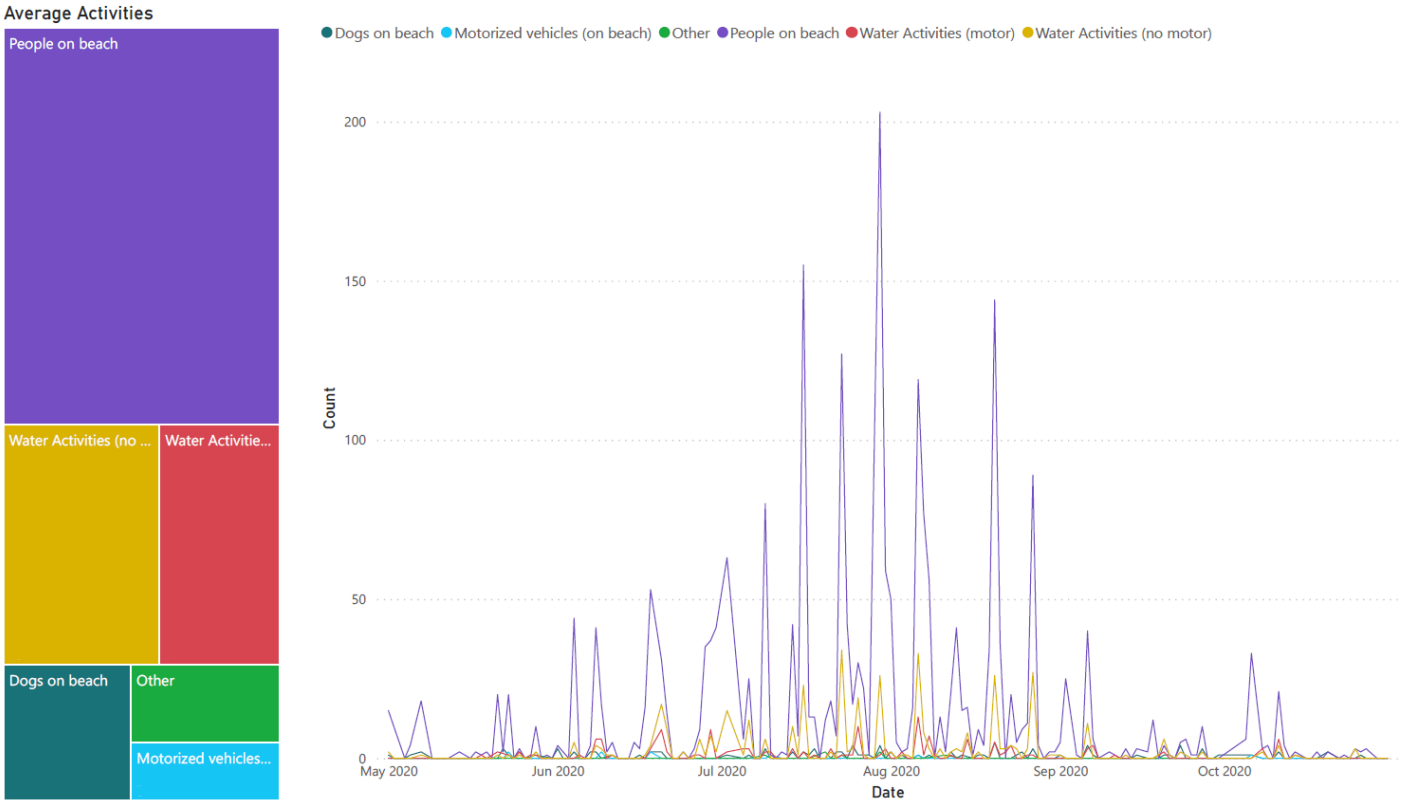


***Figure 11:*** *Time series of human activities recorded along the Lake Huron and Georgian Bay shoreline from May - October 2020.*

## Webinar Series

Through the generous sponsorship of Bruce Power and TD Friends of the environment in the Coast Watchers program, we were able to execute a series of 6 webinars focusing on improving the awareness of coastal ecosystems, processes, and threats to Lake Huron. These webinars were presented by a variety of staff from the Lake Huron Centre for Coastal.

# Lessons Learned

As the program increases in data and participants, a mobile application that could feed data directly to an online data portal would eliminate the onerous task of manually inputting data from submitted (emailed or paper) data sheets. This will significantly reduce the margin of error and increase data analysis efficancy. A mobile application would allow program expansion to cover more of the shoreline, increase participants and reduce waiting list applicants. Funding needs to be acquired in order to create a mobile application.

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# 2020

## Thank you to all of our dedicated Coast Watcher volunteer citizen science participants!

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