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COAST WATCHERS

COMMUNITY SCIENCE PROGRAM

ANNUAL REPORT 2024

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 Coast Watchers program is generously sponsored by:

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Table of Contents

About Coast Watchers

Coast Watchers volunteers serve as the “eyes and ears” of Lake Huron’s coastline. By systematically and consistently collecting data along the shoreline, they make it possible to track long-term trends in shoreline conditions and contribute to both short-term sustainability efforts and long-term resiliency goals of the Lake Huron Coastal Centre (LHCC).

In recent years, concerns about Lake Huron’s water quality and shoreline health have grown, with plastic pollution, shoreline erosion, and climate change threatening the shoreline environment. While various agencies have gathered data related to environmental concerns, the information often provides only isolated ‘snapshots’ of conditions at a given time. Local conditions can change quickly, making it difficult to capture a complete picture. Given Lake Huron’s vast 6,170 km shoreline—the longest of any Great Lake—monitoring it in detail is a challenge for any single agency. This is where community scientists play a critical role in tracking and documenting changes along the coast.

The Coast Watchers program takes a grassroots approach to data collection, empowering local volunteers to monitor shoreline conditions. The Coast Watchers Program Coordinator analyzes and shares the collected data with environmental organizations, government agencies, corporate partners, and the public.

Designed to engage community members, the Coast Watchers program encourages volunteers to actively contribute to improving the quality of nearshore waters and beaches. Volunteers are trained to observe and record data on atmospheric conditions, wildlife, plastic pollution, algae blooms, erosion, storm damage, and human activity. In addition, they gain access to educational resources provided by the LHCC, covering a variety of coastal topics such as species at risk, invasive species, and plastic pollution.

Methods

Coast Watchers Program

The Coast Watchers program is defined by its foundation of dedicated coastal community scientist volunteers. Community science has become an invaluable and significant source of data collection. As defined by SciStarter.org (2020), "A community scientist is an individual who voluntarily contributes their time, effort, and resources toward scientific research, either in collaboration with professional scientists or independently. These individuals do not necessarily have a formal science background." The success of the Coast Watchers program depends on the commitment of these reliable community scientists, whose efforts provide a valuable, long-term data set.

Data is typically collected once a week from May 1st to October 31st each year. Volunteers are encouraged to record their observations on the same day and time each week to maintain consistency. If a volunteer is unable to collect data, they are encouraged to share the responsibility with a trusted friend or family member. Seasonal residents may be granted exceptions as needed. Participants submit their data through an online mobile application, which is then integrated into a long-term dataset for future analysis. To ensure privacy, each Coast Watcher is assigned a personalized number (e.g., CW001), which is used when referencing specific volunteers in public reports.

Demographics

The demographics of the volunteers in 2024 included individuals from across the shoreline of various ages, from children to retirees, and of different socio-economic backgrounds and levels of experience. Based on a survey taken in 2023, 87% of volunteers felt that Coast Watchers has made them feel more connected to nature, 69% felt more motivated to act on environmental issues and 72% said that they learned more about the Lake Huron environment through this program. Some volunteers have participated in the program since 2014, while others were new in 2024.

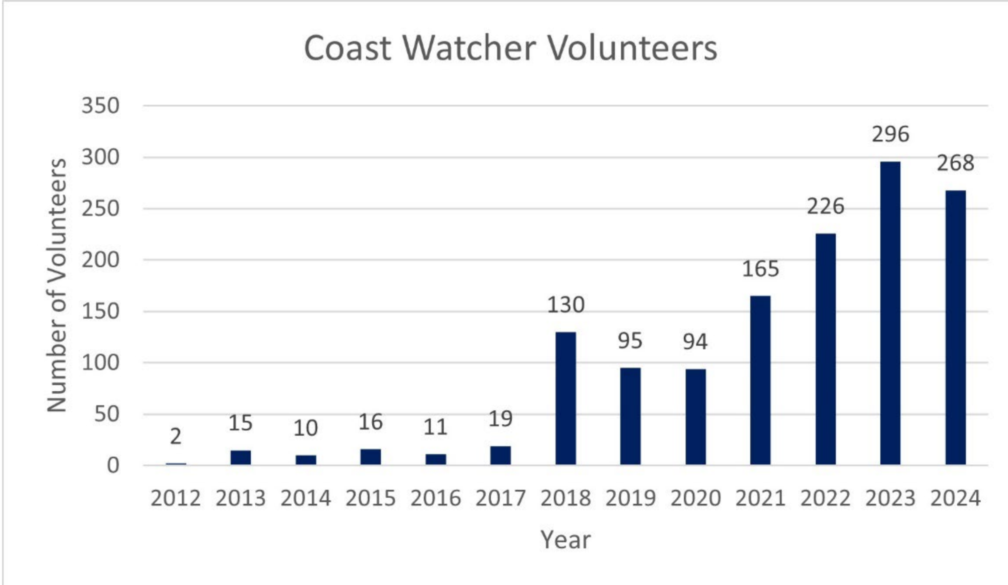


Figure 1: Number of program volunteers from 2012-2024.

Volunteer Training

Community volunteers are trained to observe environmental stressors when monitoring the shoreline through online resources including Coast Watchers protocol and recorded video training.

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

Results

The findings from the 2024 monitoring season range in quality from qualitative to quantitative measurements. The specific findings enable us to compare 2024 data to previous years 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 744 data points recorded by volunteers for both air and water temperatures in 2024. Figures 2 and 3 show the comparison of air and water temperature recordings from May 1st to October 31st, 2024. Temperatures are lower in both the spring and fall and peak in the summer, with the maximum air temperature was recorded in late May and the maximum water temperature was recorded at the beginning of August. The maximum water temperature was 27°C and the maximum air temperature was 34°C (without the humidex). It is important to note that there are outliers in Figures 2 & 3. 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).

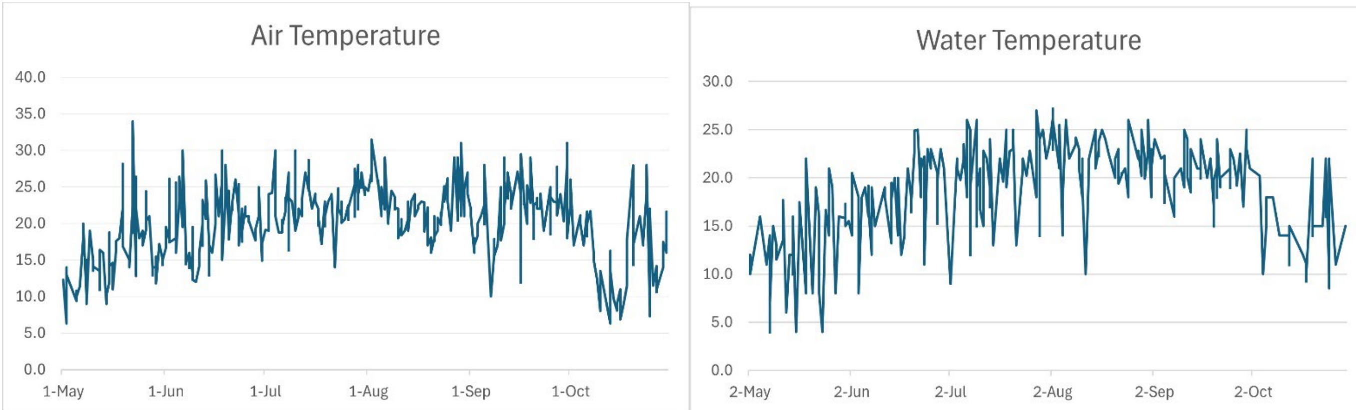


Figure Figures 2 & 3: Comparison of air and water temperature (degrees Celsius) measurements recorded by volunteers from May 1st to October 31st, 2024.

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.

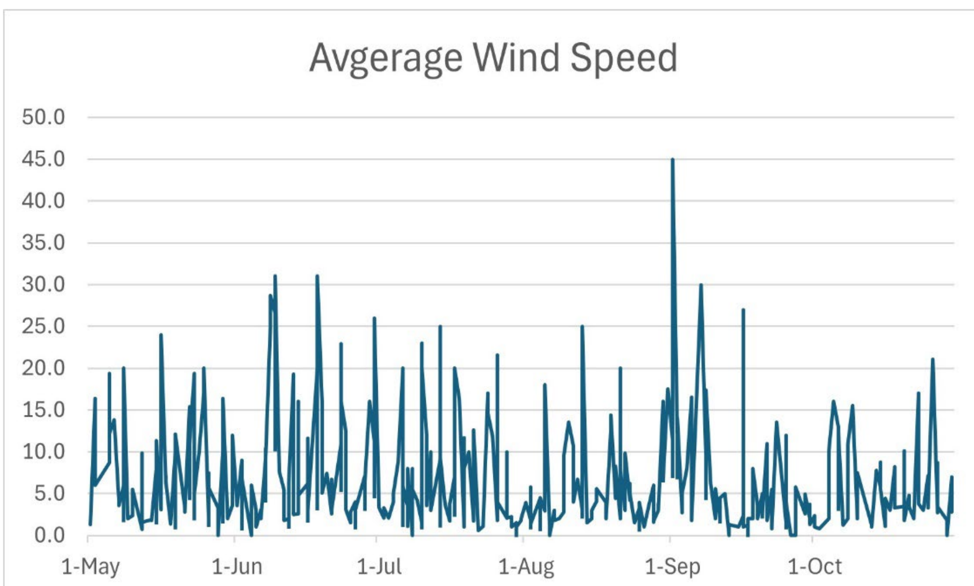
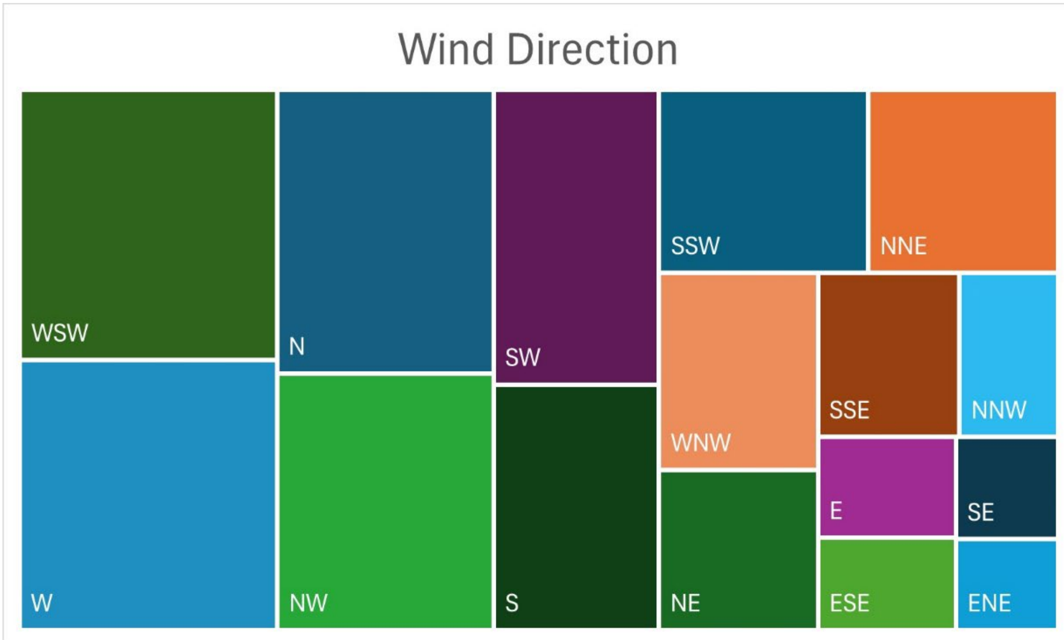


Figure 4: Average wind speed (km/h) recorded by volunteers from May 1st, 2024 to October 30th, 2024.

This graph shows that the peak in average wind speed was at the beginning of September with a reading of 45 km/h, yet recordings varied day to day. Outliers 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. avoid collecting data during storms).

Wind and Wave Direction



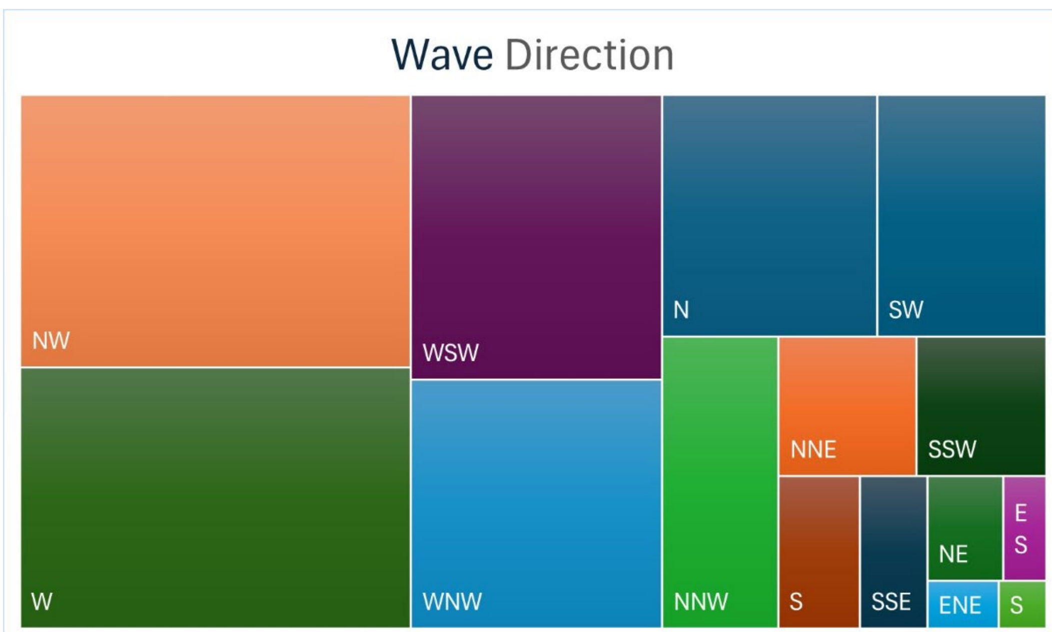


Figure 5 & 6: Wind and Wave Direction represented by a tree map. The larger the box, the higher the number of recorded data points for the corresponding wind and wave direction. Data was collected by volunteers from May 1st, 2024 to October 31st, 2024.

Figures 5 and 6 show that wind and wave direction are also variable depending on the time of year and location of the participant. Participants complete this section of monitoring data using a device called a 'Compass Rose'. During the 2024 season, the most common wind directions occurred from the West Southwest and North direction. The most common recorded wave directions were Northwest and West. 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, and 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. Figure 7 shows the time series of wave height using the Beaufort scale.

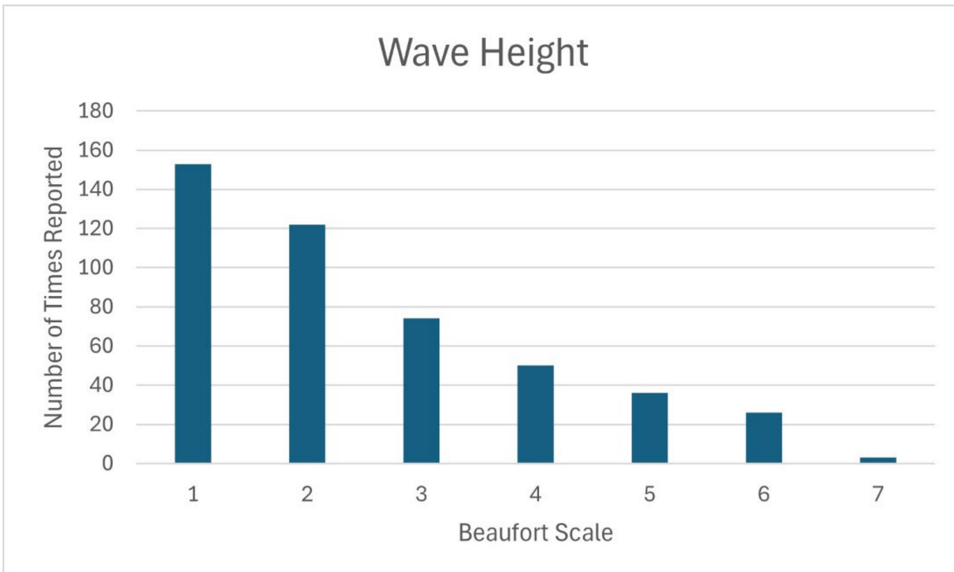


Figure 7: Time series of wave height (Beaufort Scale) by volunteers from May 1st, 2024, to October 31st, 2024.

The wave height varied between 1 (ripples) and 7 (large to very large waves). The maximum wave height of 7 was reported 3 times between May and June, and the minimum wave height was recorded 20 times throughout the season. The most commonly reported wave height ranged between 1-2 on the Beaufort Scale.

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 observer 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 8 shows the division of observations of visibility. 484 observations were made over the 2024 season and 86% of observations stated that the horizon was visible.

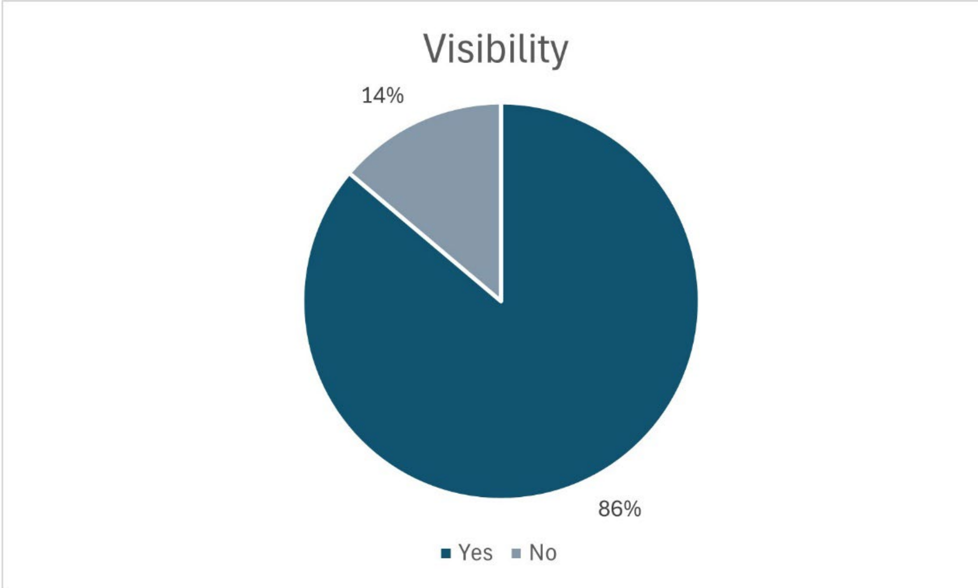


Figure 8: Results depicting percentage of data recordings for the horizon visibility (Yes or No).

Wildlife Reports

The most common observations made by Coast Watchers in 2024 were birds including Gulls (Ring-Billed), Canada Geese, Crows, and Ducks (Mallard and Mergansers). The most common species at risk that were sighted included the Monarch Butterfly, Bald Eagle, Snapping Turtle and the Piping Plover. No significant die-off events were reported.

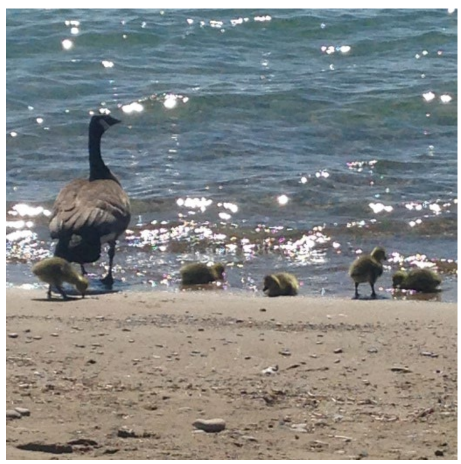


Figure 9 & 10: Piping Plover (left). Canada geese with goslings (right).

Algae Reports

Algae occurs naturally in aquatic ecosystems and is a vital part of the food chain for benthic invertebrates and fish species. 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 wash-ups from the lakebed can also occur due to storm action.

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 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 near-shore water quality that may trigger negative impacts to the health of nearshore ecosystems and aquatic wildlife habitat.

During the 2024 monitoring season, Coast Watchers documented 105 algae sightings. Shoreline was the most common environment where algae was found; most of the algae was reported to have no odor, and the most common colour noted was olive and dark green. Based on qualitative characteristics volunteers determined that the most common algae type was Filamentous.

Beach Litter

Plastic debris and litter on beaches are not only aesthetically displeasing but it 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. Coast Watchers report on plastic pollution and microplastic seen on the shoreline. Microplastic is defined as any plastic item or fragment less than 5 millimeters in size. The most common microplastics are microbeads, fibers, fragments, nurdles, and foam.

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. 77 total recordings of litter and microplastics were made in 2024. The most common type of litter found was cigarette butts, food wrappers, plastic bottles. The most common microplastic recorded was foam and plastic fragments. A total of 175 pounds of litter was removed by Coast Watchers this season.

Storm Damage & Erosion Reports

Water Levels

Lake Huron experienced its peak water level for the year in July of 2024 at 176.73 metres above sea level. Water levels decreased throughout the rest of the year, matching long-term average levels by December 2024 at 176.12 meters. Lake levels are projected to continue to decline until the spring of 2024, followed by an increase as we approach the summer season (NOAA, 2023). High lake levels can contribute to erosion events through increased wave action causing concern for lakeshore property owners.

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.

Natural and Human Made Debris Wash-up

Storm events often cause powerful waves resulting in wash-ups of large natural debris. This often causes concern among 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 onto shorelines, it is recognized that excessive amounts of natural debris are not typically compatible with human demands for recreation on shorelines. 23 reports of large natural debris, such as driftwood, logs, clumps of natural material such as root balls, and rocks were recorded throughout the season.

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

Figure 11: Example of natural debris wash-up on shoreline.

Human Activity on Shoreline

Human activity is recorded to gain insight into the influence recreation has on Lake Huron’s coastal environment. In 2024, the number of people on beaches was the highest recorded human activity, with an estimated total count to be 2,008 people observed by Coast Watchers. Observations of watercraft without motors such as kayaks, canoes, stand up paddleboards, sailboats, and wind surfers were recorded as 309, whereas 83 watercrafts with motors were recorded. 64 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, 151 dogs were recorded along the shoreline (see figure 12).

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.

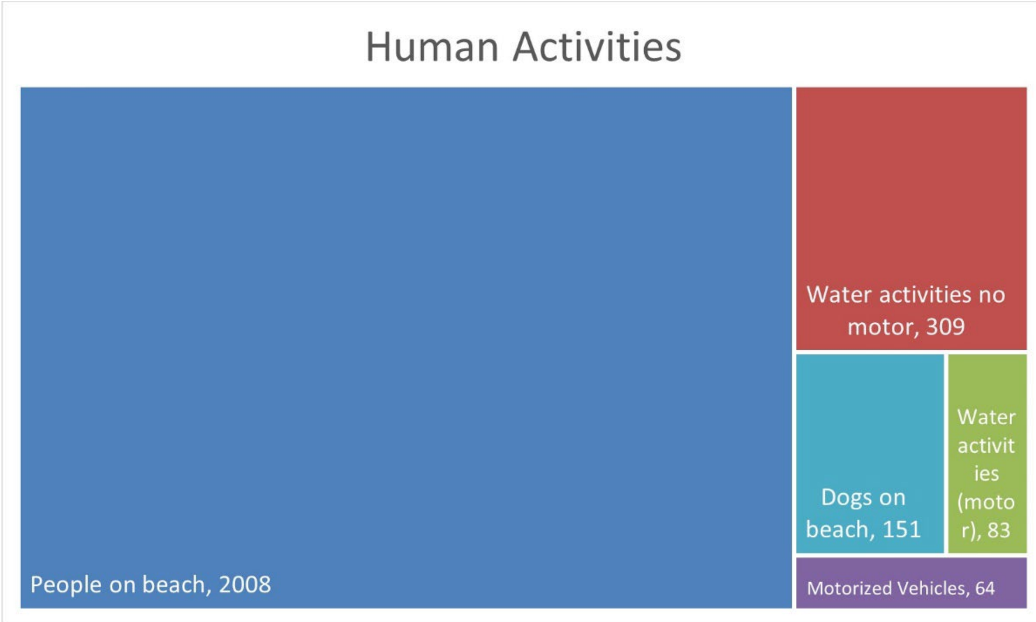


Figure 12: represented by a tree map of human activities recorded along the Lake Huron and Georgian Bay shoreline from May 2024 to October 2024. The larger the box, the higher the number of recorded data points for the corresponding activity.

Lessons Learned

The community science program has revealed several valuable lessons. First, the importance of reducing human error through technology was clear, as the Coast Watchers mobile app significantly improved data accuracy and efficiency. However, we learned that while technology enhances data collection, ongoing training for volunteers is essential to ensure consistent and correct use of the app. Another key lesson is the challenge of scaling the program to cover a larger geographic area. As the program expanded, we realized the need for better coordination and communication among volunteers to manage the increased workload. Additionally, the partnership with Huron Pines and the Michigan-based Coast Watchers highlighted the importance of strong, cross-border collaboration to provide a more comprehensive understanding of Lake Huron. Finally, continuous feedback is crucial—annual surveys helped us identify bugs, address issues, and make necessary improvements to the app, ensuring it evolves with the program's needs. These lessons are helping us refine our approach and improve the overall effectiveness of the program.

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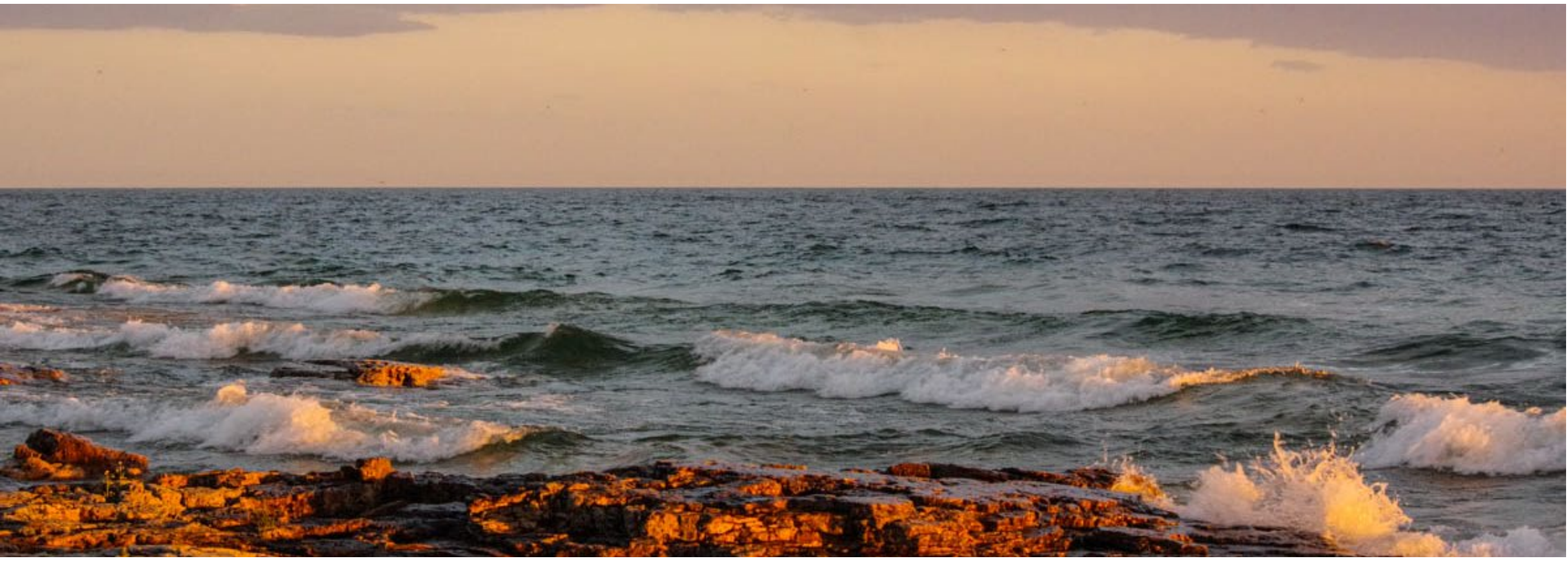

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