LAKE HURON CENTRE FOR COASTAL CONSERVATION

Coast Watchers

Annual Report

2019

coast watchers

COMMUNITY VOLUNTEER PROGRAM

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 dedication to and resources for local health and land management agencies to monitor water quality along the coast, we are seeing grass roots movements for community leaders to monitor changes to their shoreline and take steps to improve water quality. 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 methodically 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.

The Coast Watchers program has grown exponentially in the past 2 years, growing from a meager 24 dedicated coastal citizens, to 95 volunteers, with 90 more on a waiting list. This 400% increase in monitoring and action is a testament to the increasing interest in the health of Lake Huron and an insurgence in grass roots movement to take action into our own communities to ensure our shores are healthy and resilient for future generations. The 2019 Coast Watchers program was generously funded by Bruce Power and Royal Bank of Canada to a total amount of $18,500.00 CAD.

Methodology

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 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

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 2019, 95 volunteers were

adopted into the program, with another 90 put onto a waitlist. A waitlist was needed due to constrains of data processing as part of this program. 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 2019 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 2019. Table 1 shows when this year's volunteers began participating in the program.

Table 1 - Volunteers participating in 2019 and year of participation	
Year Volunteer started	**# Volunteers**
2014	2
2015	0
2016	1
2017	3
2018	35
2019	54

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 2019 training sessions occurred in person in, April 2nd, 2019 (Sarnia, Grand Bend), April 3rd, 2019 (Goderich, Kincardine), April 4th, 2019 (Wiarton). A 1-hour webinar also occurred to accommodate those who could not make an in-person training session April 11th, 2019 at 6:00-7:30pm. Equipment required for monitoring was supplied at the training sessions.

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:

Table 2 - Coast Watchers Equipment			
Item	**Description**	**Advanced CW Kit**	**Basic CW Kit**
Kestrel 2000 Anemometer	Measures current, average and maximum windspeed and atmospheric 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.	*	*

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. LHCCC had 33 advanced kits and 62 basic kits in participant possession.

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 2019 monitoring season range in quality from qualitative to quantitative measurements. The specific findings enable us to compare 2019 data to previous years in order to determine altered trend lines or common nuances over long-term data collections.

Air Temperature

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. 555 records of atmospheric air temperature were taken between May 2, 2019 and October 31, 2019. The orange polynomial trend line shown in the chart, *'2019 Lake Huron Coastal Air Temperature'*, summarizes the average temperature seen throughout the year on Lake Huron's coast. In some cases, there are slight outliers shown on this chart. These can be attributed to microclimate conditions experienced in some cove and shaded bluff bottom environments, or human error. We see in the chart, *2019 Lake Huron Coastal Air Temperature*, atmospheric temperature peaks in early August.

2019 Lake Huron Coastal Air Temperature
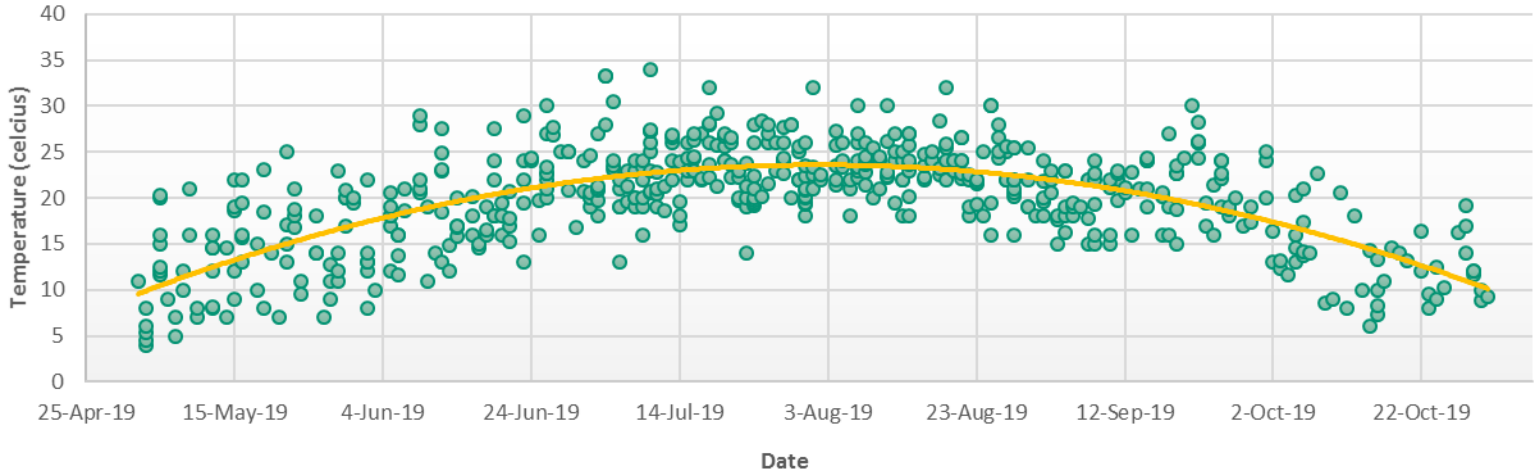
Water Temperature

Temperature of nearshore waters is part of the coast watchers monitoring program, however, not all volunteers are comfortable with, or physically able to take these measurements. Therefore, this metric is encouraged when possible. 343 records of water temperature were taken during the 2019 season.

Similar to the atmospheric temperature curve, nearshore water temperature also peaks in summer months, with data containing some outliers. 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.
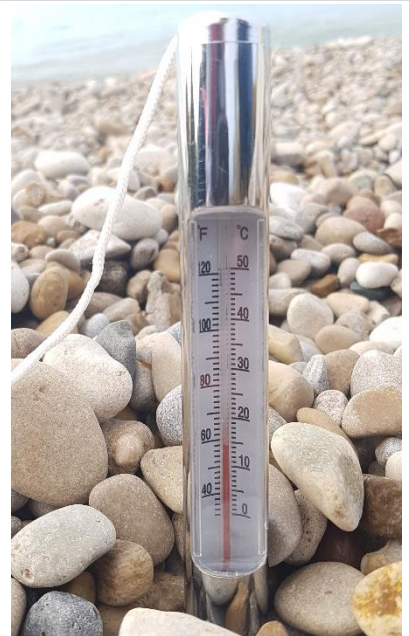

2019 Nearshore Water Temperature
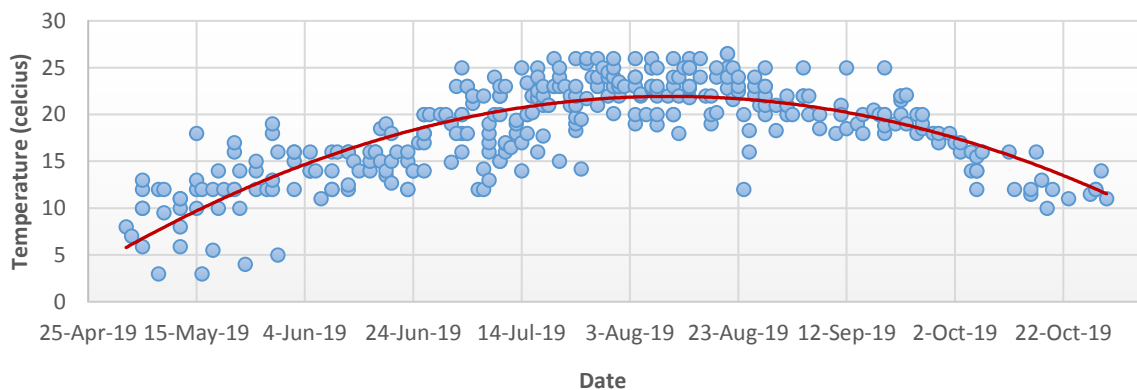
We see through the polynomial trendline and the scatter plot data in the chart, *'2019 Nearshore Water Temperature',* the water temperature of Lake Huron's nearshore waters peaks in early to mid-August at approximately 23-25°C.

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.


2019 'Current Wind Speed'
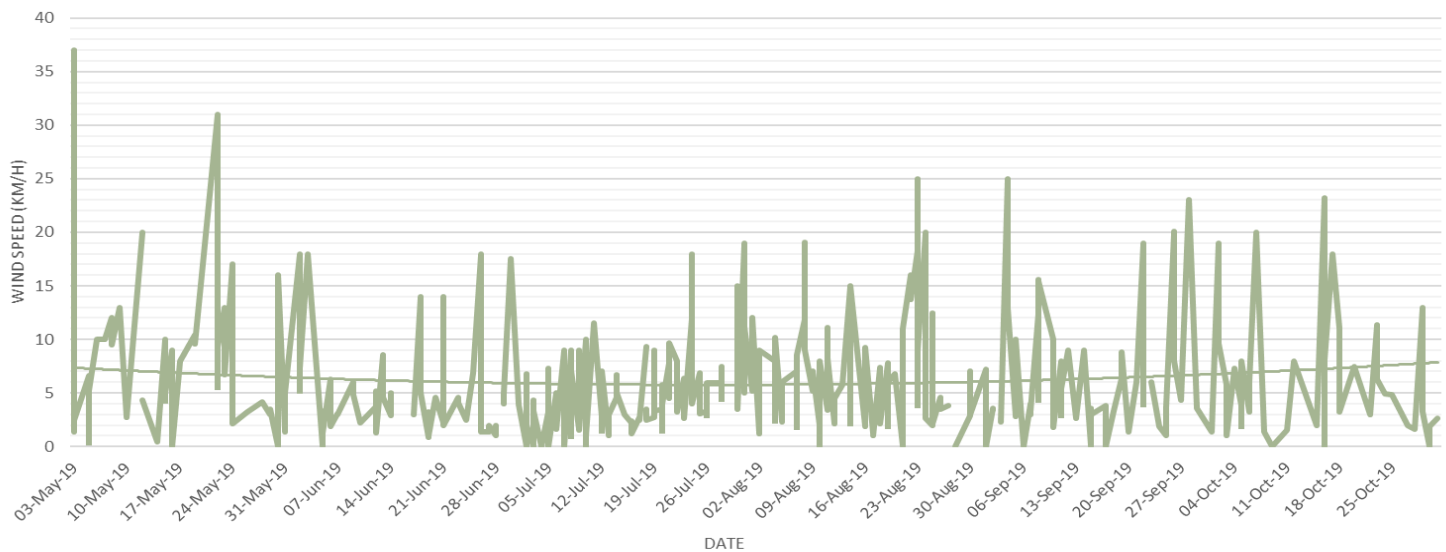
As seen in the graph, *2019 Current Wind Speed*, wind speed is variable across the monitoring season and varies day to day. However, through the use of a Polynomial trendline, we can see that wind speed 'peaks' at the beginning and end of the season, averaging at 7km/hr. Although these readings are accurate 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
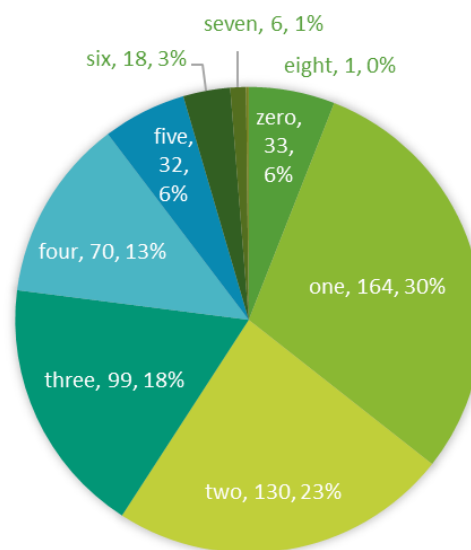

2019 Wind Direction
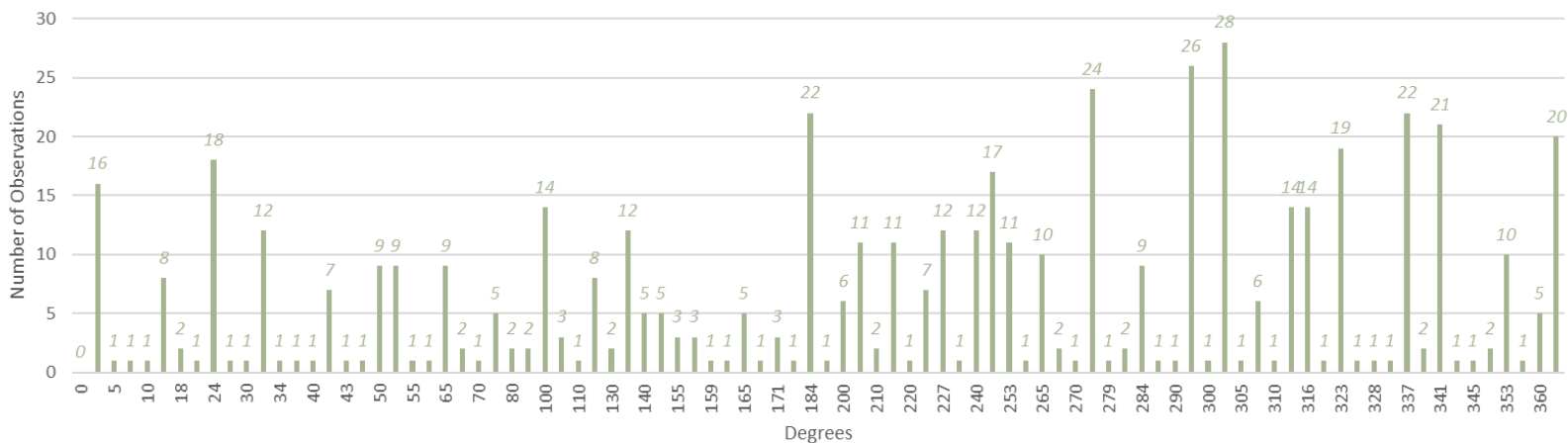
snow storm, the participant may not have been out to record data during the weather event, excluding this reading from the data. This bias is attributed to human error.

Wind direction is also variable depending on time of year and location of participant. During the 548 recordings for wind speed were made over the 2019 season. Luckily, participants can complete this section of the monitoring data using a simple piece of equipment called a 'Compass Rose'. 2019 season, the most common wind directions recorded occurred coming from the Southwest (180-275 degrees), to Northwesterly (275 to 360 degrees) direction. 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. 553 recordings were made in total.

BEAUFORT WAVE HEIGHTS

seven, 6, 1%
eight, 1, 0%
six, 18, 3%
five, 32, 6%
zero, 33, 6%
four, 70, 13%
one, 164, 30%
three, 99, 18%
two, 130, 23%

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
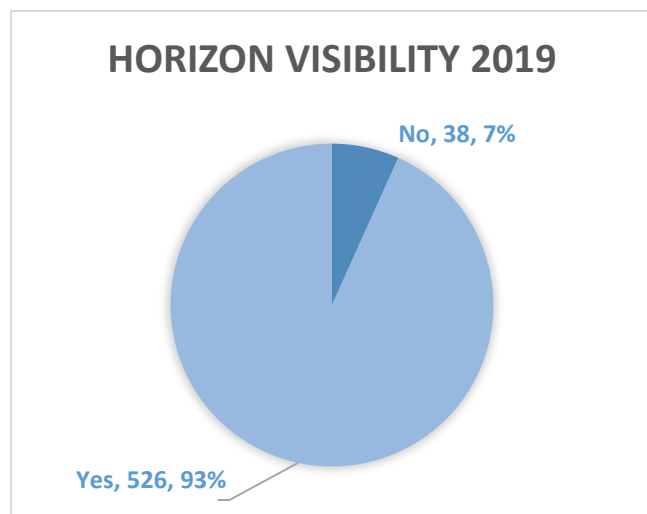
HORIZON VISIBILITY 2019

No, 38, 7%
Yes, 526, 93%

Figure 1 - Photo by Anonymous Coast Watcher

blurred together. The chart titled '*Horizon Visibility, 2019*' shows the division of observations of visibility Yes/No. 564 observations were made over the 2019 season, 93% of where the horizon was visible. This metric indicates that air quality in 2019 was good.

Wildlife Reports

185 individual wildlife observations were recorded over the 2019 season. 3,309 alive animals, 18 deceased animals, and 25 decomposing animals ranging from birds, fish, and mammals. Invasive species included Purple Loosestrife, Giant Hogweed, Spotted Knapweed, Sweet White Clover, Soapwort, and Phragmites australis. The majority of the observations were water birds including gulls, swans, duck species, Canada Geese, Blue Jays and cormorants.

Figure 2 - Photo by Anonymous Coast Watcher

Figure 3 - Photo by CW128

Figure 4 - Photo by Anonymous Coast Watcher

Species at Risk records were few this year, at 28 observations. These included Piping Plover (20), Monarch Butterfly (76), and a Bald Eagle (1). 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.
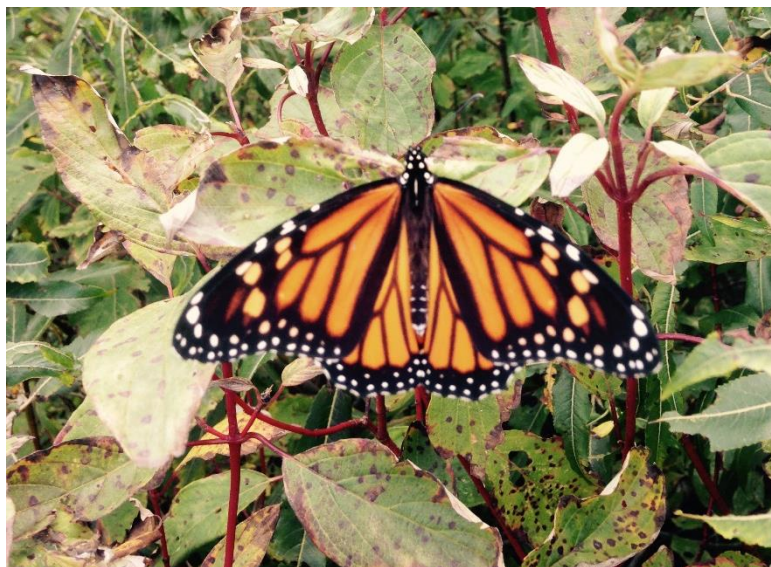

Figure 5 - Photo by CW046

Algae Reports

Algae occurs naturally in aquatic ecosystems and is a vital part of the food chain for benthic invertebrates. However, amounts of algae production are often enhanced by synthetic fertilizers entering water bodies through human-caused sources. Warmer water, more sunlight permeating the water column, and less turbidity all enhance algae's ability to thrive in nearshore waters. 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 is 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.

Figure 6 - Photo by CW091

In 2019, 15 instances of algae were documented across Lake Huron's shore, 10-on beach, and 5-in water. These instances were recorded earliest on June 19th, 2019, and continued throughout the season with the last one being recorded October 30th, 2019. 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.

YEAR	AREA	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
2019	**Beach**	0	0	0	2	1	5	2
	Water	0	0	2	3	0	0	0

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 comes with its own slew of environmental stressors, 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. 487 total records were made in the beach litter and microplastic section, of which, 272 indicated plastic presence during the 2019 season. The earliest record of beach litter was made on May 1st, 2019, the first day of the monitoring season, and the last record was made on October 28th, 2019, 3 days before the end of the 2019 monitoring season. Through this analysis, we have seen that there were:

- 48 records of plastic on the beach;
- 46 records that a beach cleanup was required;
- 178 records that there was litter on the beach documented in the 'Notes' column.

The formatting of the field data sheet specifies whether plastic is on the beach (yes/no), whether a beach cleanup is required (yes/no) and then requests notes. Some participants will record other litter that is not plastic in the notes section, but will signify (no) in the plastic on the beach section, skewing the results slightly. Most of the litter that was documented in the notes section included Styrofoam, aluminum cans, cigarette butts, plastic bags, ribbon, balloons, and beer bottles. Through this analysis we have determined that this section of the data sheet should be adjusted to accommodate all litter recordings, not just plastic. This should also be reflected in the training manual for the 2020 season.

Figure 7 - Photo by CW91

Figure 8 - Photo by CW056

Storm Damage & Erosion Reports

2019 was a year of high lake levels for Lake Huron. This year, the lake level peaked at 177.32, only 18cm below the all-time high set in 1986. This high lake level caused many erosion events through storms and generally concerned all lakeshore property owners across the coastal corridor. 108 observations of erosion were recorded throughout the 2019 season, 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.
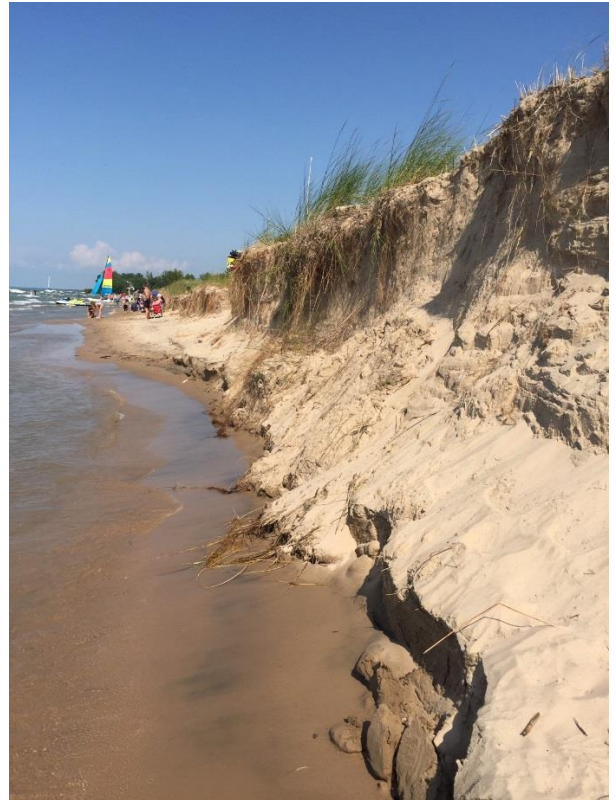
Figure 10 - Photo by CW59

Figure 9 - Photo by Anonymous Coast Watcher

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,

Figure 11 - Photo by CW017

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 2019, 335 observations were recorded for humans on the beach, with an estimated total human count to be 3,840. Observations of watercraft without motors such as kayaks, canoes, stand up paddleboards, sailboats, and wind surfers were recorded as 277, whereas 231 watercrafts with motors were recorded. 17 motorized

Figure 12 - Photo by Anonymous Coast Watcher

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, 205 dogs were recorded on shorelines. Dogs on the shoreline are fine, as long as they are not scaring wildlife, most importantly nesting shorebirds, reptiles or amphibians, as these can often be endangered species, and as long as their feces is being removed, which contribute to reduced water quality of the nearshore waters. A few records of horse tracks were also made throughout the season, implying that the shoreline is being used by a wide variety of recreation styles.

Figure 13 - Photo by CW003

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.

Webinar Series

Through the generous sponsorship of Bruce Power and Royal Bank of Canada 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

Figure 14 - Photo by Anonymous Coast Watcher

Conservation ranging from a coastal intern, to the Executive Director, to a Centre Founder, and were as follows:

Webinar Theme	Date	Webinar Title	Attendance
Plastic Pollution	Wed July 31, 2019, 7-8pm	Plastic Pollution Solution	35
Coastal Processes	Thurs Aug 8, 2019, 1-2pm	Coastal Changes: A 'shore thing'	34
Invasive Species	Wed Aug 14, 2019, 7-8pm	Space Invaders: Wipe-out invasive alien species	13
Species at Risk	Wed Aug 21, 2019, 1-2pm	Risky Business for our Species	13
Water Quality	Wed Aug 28, 2019, 7-8pm	Water Some Ways to Improve Water Quality?	13
Climate Change	Wed Sept 11, 2019, 7-8pm	Climate Ch-ch-ch-ch-changes	40

Advertising for these webinars was prominent throughout the Coast Watchers monitoring season and across our social media platforms and monthly newsletter. These webinars were well received and through feedback from attendees. They were recorded at the time of 'filming' and are now available through the LHCCC website and are on the LHCCC YouTube page. We were told by many to continue to produce webinars as they provide valuable information to reference at the convenience of landowners, and can be distributed easily by cottage associations and special interest groups. We hope to do webinars during the 2020 season as well.

Recommendations

We noticed a few nuances with the new field data sheets that could be improved, such as the beach litter section that would make processing the data easier. The field data sheets will be updated with the suggested changes and

THE COASTAL CENTRE PRESENTS:

COAST WATCHERS WEBINAR SERIES

ENHANCE YOUR KNOWLEDGE OF OUR COASTAL ECOSYSTEM

- **Wednesday, July 31, 7:00 – 8:00pm**
  Plastic Pollution
- **Thursday, August 8, 1:00 – 2:00pm**
  Coastal Processes
- **Wednesday, August 14, 7:00 – 8:00pm**
  Invasive Species
- **Wednesday, August 21, 1:00 – 2:00pm**
  Species at Risk
- **Wednesday, August 28, 7:00 – 8:00pm**
  Water Quality
- **Wednesday, September 11, 7:00 – 8:00pm**
  Climate Change

employed for the 2020 season. 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. 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.

More funding could also allow program to expand through the deployment of more Kestrel Wind Meters to allow more accurate and quantitative data collection to occur. Funding sources to increase capacity for the program are being sought for the 2020 season.

Conclusions

Records from 2019 remain consistent with the trends seen over the long-term data set. More records of plastic pollution on shorelines, along with similar trends in wind and temperature provide insight into changes coastal communities will need to make, and the resources they will need, to ensure the coastal corridor is healthy and resilient into the future.

Continuing to employ citizen science data using a multi-pronged approach will allow more data to be collected, and therefore more trends to be analyzed, which may be able to alert us to ecological thresholds which are being surpassed, or areas that are most at risk for irreversible change from pollution, invasive species, or reduction of critical species at risk habitat.

The Lake Huron Centre for Coastal Conservation hopes to continue to contribute to the 14-year, long-term data set in order to meet these goals, while creating a coast of eco-conscious citizens along the way.

coast watchers
COMMUNITY VOLUNTEER PROGRAM

2019

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