Watershed Monitoring Strategy

2026 - 2030

AUSABLE BAYFIELD CONSERVATION

CREATING AWARENESS | TAKING ACTION

Traditional Territory Acknowledgement

Ausable Bayfield Conservation Authority (ABCA) acknowledges the original stewards of this land, the Haudenosaunee and Anishinaabe.

We recognize the Huron Tract Treaty signed in 1827. We recognize that this territory was subject to the Dish with One Spoon wampum, under which multiple nations agreed to care for the land and resources including plants and animals, in peace.

As shared stewards of this land and water, the ABCA is grateful to have the opportunity to meet and work in this territory.

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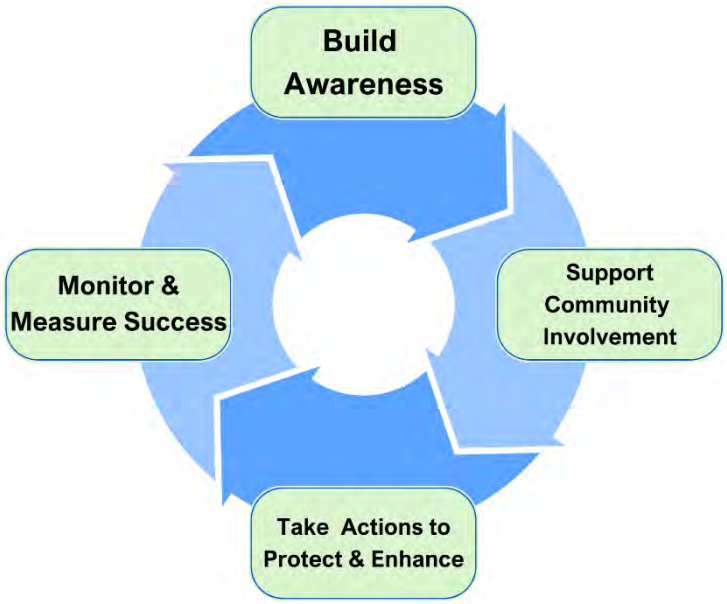
INTRODUCTION

In 1946, the municipalities drained by the Ausable River formed the Ausable River Conservation Authority (ARCA) to address serious local flooding, soil erosion, water quality and supply issues. The Bayfield watershed was added to the ARCA's area of jurisdiction in 1971, and ARCA grew to become the Ausable Bayfield Conservation Authority (ABCA). Water quality has been a focus of ARCA since its inception nearly 80 years ago. Monitoring programs have grown and adapted over the years as new science and knowledge have been applied to watershed management and planning. Throughout this long history, monitoring has remained a key part of ABCA's mission to 'protect, improve, conserve, and restore the watershed in partnership with the community'.

ABCA's Conservation Strategy (2011) and Watershed-Based Resource Management Strategy (2024) both use monitoring and research as a means of ensuring that we are meeting our mission and vision.

Rationale and Scope of this Strategy

There are many indicators of environmental quality. The physical terrain, chemical and biological systems are connected; but water is the ultimate tell-tale sign. It runs over and through the land, absorbing everything it touches which makes it a **cumulative indicator of the health of our watershed**.



Getting an accurate picture of our water requires **a team effort**. Field technicians collect the samples, while GIS specialists and data analysts turn raw data into information. We don't collect data for the sake of it; we use it to make **informed management decisions.**

This strategy outlines ABCA's monitoring programs and explains how we use long-term data to measure our progress and adapt our practices. There is also a recommended path forward with the community and more regional partners to continue to **evaluate conservation efforts.**

This strategy describes the history, focus, and study design of current water monitoring programs, including some rationale for site selection and study design. Integration of programs is described. This document does not elaborate on data collection or analytical methods. Detailed protocols for data collection may be found in other technical documents.

Goals of the Current Programs

The goals of current water monitoring programs are to:

- Detect imminent threats of flooding and erosion
- Provide spatial and temporal conditions of water quantity and quality, watershed or ecosystem health (e.g., species diversity, species-at-risk, and habitat conditions)
- Identify long-term changes in our environment
- Determine the effectiveness of our land use and management practices including Best Management Practices (BMPs) at both field and watershed scale

There is more to monitoring than sampling. The collected data needs to be sorted and analysed to tell a story.

Recommendations

This strategy outlines ABCA's monitoring programs and explains how we use long-term data to measure our progress and adapt our practices. It is also a recommended path forward to inform our local community and more regional partners of the important monitoring and data management program that currently exists and is necessary for healthy watersheds. Healthy watersheds meet our human needs in balance with the needs of the natural world.

The following suggestions would enhance our robust monitoring program.

1. Understand soil and water linkages

Our lands and our waters are fundamentally connected. The health of our rivers depends entirely on the forests, wetlands, the soil and fields that surround them. How we manage these landscapes directly impacts water quality, controls erosion, and builds climate resilience. While there are some projects that link land management practices to water (The Old Ausable Channel Management Plan, The Huronview Demonstration Farm, the integrated monitoring station at Parkhill), more effort to understand forest, wetland and soil conditions in more locations would help to inform decisions about important natural assets. There is an exceptional volume of data generated at the Parkhill and Huronview sites. More effort to: 1) understand how climate variability and land management on different land topographies affect water; and 2) conduct cost benefit analyses that may be required for best management practice uptake.

2. Maintain strategic relationships

There is more to monitoring than sampling. The collected data needs to be sorted and analysed to tell a story. Data analyses at ABCA requires ongoing strategic relationships.

Strictly collecting monitoring data will not provide us with important insights on management. Data can be analysed and perhaps show trends over time; however, ecosystem models are needed to play with different scenarios to address the question of why we see (or do not see) trends. What happens if best management practices are not on the landscape, or are on the landscape in the most strategic locations? The models need good water and land management monitoring data.

Monitoring and modelling are expensive. Society cannot do the evaluation everywhere, but it needs to be done somewhere. For Healthy Lake Huron, the five study watersheds along the southeast shore of Lake Huron (one in the St Clair Region, two in Ausable Bayfield, one in the Maitland Valley and one in

the Saugeen Valley) make up just 0.7 percent of the landscape. Even though it was a small area, lessons learned in these small areas were applied more regionally with resounding success. For example, current thinking is that storm events move water, and sediment and nutrients. Monitoring is needed during storm events and there is a hierarchy of best practices to help manage stormwater. Soil health needs to be improved, and the landscape needs to grow more cover crops. These lessons have been reinforced in the local watershed studies.

Complex issues require complex relationships. There can be polarization for some issues, and it is important for studies to have multiple stakeholders involved in the study. Some studies are discounted because people feel the research is too one-sided. For example, coming only from ag-industry or alternatively only from the conservation perspective. Watershed based evaluation programs, such as ONFARM provide a forum for discussion and data sharing so that society can better understand the interconnected challenge.

Another consideration is that some of the downstream consequences of past land use and economic development decisions are beginning to have real costs for more individuals. Flooding is a concern in Canada for approximately 1.5 million homes Ten percent of the Canadian residential housing market are in high-risk flood zones and are ineligible for flood insurance. A recent Canadian Standards Association (CSA) Group report, authored by the Intact Centre on Climate Adaptation provides recommendations for federal, provincial, local, and Indigenous governments, to address river flooding through watershed nature-based solutions. https://www.csagroup.org/article/research/managing-flooding-and-erosion-at-the-watershed-scale/

Past evaluation work has already highlighted that socio-economic factors are considerations in the uptake of best practices and further understanding of measuring the costs and benefits at the individual and society level scale will be helpful to support more stewardship across the landscape.

Finally, society wants responsibility and accountability for environmental issues. From a scientific and pragmatic perspective, evaluating watersheds with a multi-disciplinary team of people is only going to be more important as more extreme weather events are addressed. In the past, local watershed agencies might have been one of the few organizations undertaking integrated, adaptive management within an ecosystem context. More sectors in society are taking leadership roles to address environmental degradation. In fact, this will be critical as society moves to address the interconnected agricultural and urban development environmental issues. The watershed context helps to keep a systems approach to addressing the complex issues.

3. Fill gaps in our monitoring network

    a. CoCoRaHS (Community Collaborative Rain, Hail and Snow Network)

Encourage greater citizen participation in monitoring climate conditions, particularly rain and snowmelt. This network of volunteers measure precipitation, including rain, hail, and snow. Using low-cost tools, training, education, and an interactive website, the network provides high-quality spatial data for natural resource management, education, and research.

    b. Groundwater

Future sampling for groundwater should focus on seasonal and/or event-based sampling of the areas affected by karst geology, or other susceptible geological formations.

c. Stream gauge

The existing hydrometric network at the Ausable Bayfield Conservation Authority is comprehensive. Additional water information from the Nairn Creek subwatershed would help to improve flood forecasting and water quality and habitat information for the Ausable River.

d. Biomonitoring

Due to our species at risk program, with funding from Fisheries and Oceans Canada, we have very good information about the biology in the Ausable and Bayfield Rivers and some of our shoreline tributaries. There is a paucity of information for the Parkhill Creek that outlets in Grand Bend. Resourcing biomonitoring in this watershed may not be forthcoming from more regional partners. Some initial investment from the Ausable Bayfield organization is recommended.

The fisheries assessment information collected for the Municipal Drain Program should be used to inform the need for best management practices and natural infrastructure to reduce the burden on Municipal Drainage infrastructure.

e. Shoreline

Consider partnering with innovative, community-based monitoring programs that track shoreline changes. For example, Coastie is a photographic monitoring program whereby individuals place their cell phone on a stand at participating locations. The ensuing photographs are of a consistent location and provide coastal managers and researchers at the University of Waterloo with data. Analyses of the landscape feature provide an understanding the rates of change and resiliency of our coastlines in response to climate variations.

Regularly review and update the shoreline recession rates and the Shoreline Management Plan to ensure that its policies address changes in more regional agencies priorities.

f. Natural Assessment Management Planning

Asset management planning is a process that enables organizations to account for services provided by their assets and invest in the management of the assets to ensure that they provide services cost-effectively while managing risks such as asset failure. While assets may mean anything that delivers value to an organization and their constituents, we can think of infrastructure that reduces the risk of flooding and erosion. Traditionally, flood and erosion risk management has relied on “grey” built infrastructure such as flood walls, dikes, and river channel modifications. Nature-based solutions such as restoring wetlands or upland forests, can be used to manage river flooding and erosion in a way that is less costly and provides benefits for both people and nature.

Asset management planning is a process with key components:

1. Inventory and valuation
2. Level of service
3. Life Cycle Costing and Plan
4. Financial Strategy

It is recommended that the Ausable Bayfield initiate a process to provide an inventory of the natural areas that we own or manage.

4. Move beyond baseline monitoring

Monitoring long-term baseline conditions allows us to evaluate current conditions, track environmental shifts over time, and measure the true effectiveness of local stewardship programs. If an unexpected environmental issue arises, having an historical baseline is what allows for the detection and actions to address the emerging issue.

While our baseline data are robust, environmental monitoring must constantly evolve. We recognize the need to improve information sharing and expand beyond routine schedules. While routine monitoring tells us the "everyday" story; targeted, event-based sampling (such as after intense rainstorms) and site-specific evaluations are critical to understanding watershed processes.

Ultimately, diagnosing a water quality issue may be simpler than implementing the landscape-scale solution to fix it. Ongoing management will require continued collaboration with local and regional partners. The analysed data will help to guide important landscape level decisions.

5. Ongoing staff development and training

The evolution of the monitoring technologies will mean that staff will need to make opportunities for training and development. This is particularly the case for the use of models to predict flooding and erosion risks.

Municipally led and community-driven, we must continue to translate our science into clear, shared knowledge. It is only in partnership with our local communities, and with the continued support of our municipal, provincial, and federal governments, that we can confidently protect and improve our watersheds.

Current Monitoring Program Summary

Maintaining healthy watersheds is a collective responsibility. By leveraging community and more regional interests, the ABCA maintains a robust monitoring program for the Ausable, Bayfield and shoreline tributaries. Admittedly, a reliance on partnership funding has meant that some of the monitoring has been opportunity-based. This strategy provides a summary of our exceptionally comprehensive monitoring program.

The watershed-based resource management plan (2024) outlined four strategic priorities for watershed management.

- Protecting life and minimizing property damage from flooding and erosion.
- Improving the health of the Ausable Bayfield Conservation Authority watersheds.
- Managing land holdings in a responsible and sustainable way.
- Protecting sources of drinking water for current and future generations.

Except for managing land holdings that is under the purview of the Land Management Strategies being developed, our current monitoring program (Table 1) addresses monitoring for flooding, erosion, improved watershed health and protecting sources of drinking water.

Table 1: Current Monitoring Program Summary at the Ausable Bayfield Conservation Authority

Focus	Programs	Purpose of Information Collection
Surface water quantity	Hydrometric Network Snow Course Meteorological and Level Logger Stations Volunteer Rain Gauge Network	Watershed Management - Flow Regimes - Low Water Response - Flood Forecasting - Water Budgets - Planning and Regulations; preventing flooding, erosion and property damage Climate Change Evaluations
Surface water quality	Provincial Water Quality Monitoring Network (PWQMN) Enhanced Monitoring Rural Stormwater Management *E. coli* sampling at Lake Huron beaches	Watershed Management - Information about Water Pollution (mostly nutrients, bacteria, metals) - Evaluation of land management practices - Recreational water quality Addressing Community Interests Climate Change Evaluations
Groundwater quantity	Provincial Groundwater Monitoring Network (PGMN)	Groundwater Levels Watershed Management - Water Budgets - Inform groundwater recharge requirements under development review Climate Change Evaluations
Groundwater quality	PGMN Huron Sentinel Wells	Watershed Management - Information about Water Pollution (mostly nutrients, bacteria, metals) Drinking Water Source Protection Planning
Biomonitoring	Fish community sampling and Municipal Drain Classification Benthic invertebrate surveys Mussel surveys	Watershed Management - Habitat conservation Addressing Community Interests Climate Change Evaluations

WATER AND CLIMATE

Climate and water are fundamentally connected. Longer-term changes to our climate will affect both the availability and quality of freshwater and intensify floods, droughts, and other water-related issues for freshwater plants and animals.

Water data are valuable. Long-term datasets allow us to detect subtle, long-term shifts in weather patterns, water availability, and habitat health. By tracking these indicators over decades, ABCA can help our communities adapt to a changing landscape and protect our shared resources. Since 2012, ABCA has operated an integrated water and climate monitoring station near Parkhill. The Parkhill station is the most complex in Ontario, with 29 sensors measuring 33 different indicators, including meteorological conditions, water quantity and quality, and soil properties.

Table 2. Surface water and climate monitoring at the Ausable Bayfield Conservation Authority.

Focus	Program	Goals	Location Rationale	Sampling Frequency	Indicators
Surface water quality Climate monitoring	Integrated water and climate monitoring	Climate change detection and adaptation	Determined to be one of the most sensitive watersheds to climate change in Ontario, according to the 'Climate Change Monitoring Networks Review Project (2009)'	Water quality monitoring: one sample once per month April through November Additional samples throughout year during storm events and spring melt	E. coli, nutrients, metals, suspended solids Wind speed Air and water temperature Precipitation

Meteorological Monitoring

In addition to the Parkhill integrated water-climate monitoring station, Ausable Bayfield staff currently operate three weather monitoring stations including one in the Gully Creek subwatershed, one along the Old Ausable Channel, and one at the Morrison Dam Conservation Area in the Upper Ausable subwatershed. These stations collect climate-related information including precipitation, moisture, temperature, and wind data.

Ausable Bayfield staff also help manage a volunteer rain gauge network of over 20 locations across the ABCA area. Volunteers in this network report on rainfall amounts based on rain gauges located on their properties. Soil moisture probes are also located in three locations across the watershed. These probes link precipitation data to soil moisture, which may reflect environmental conditions such as drought.

During the winter months snow accumulations across the landscape are monitored. Our region typically sees the highest water levels in spring from melting snow that may be increased by rainfall (e.g., rain on snow events). Snow depth measurements and springtime water quantity measurements contribute to flood forecasting models to protect people and property.

SURFACE WATER QUANTITY

Collecting water quantity data is a top priority to ABCA. We collect water level data at hydrometric gauge stations and with water level data loggers. The gauge stations are located at hydrologically important points across the watershed due to their important role in flood forecasting. Gauge stations allow staff to see water levels in real time. Historically, these connections were linked to the ABCA office through telephone lines, but they are being transitioned to satellite connections while keeping phones lines as a back-up. This real time data is important for flood forecasting where rain and melt events can rise rapidly and real time data can be crucial in decision making scenarios.

The water level data loggers are a cost-effective alternative to gauge stations. In many places we do not need real time data at research sites or in water systems that do not pose high flood risks and instead download logged data on a schedule (e.g., every two months). The loggers use atmospheric pressure to record water levels at intervals set to reflect project needs. For instance, a logger in a drainage tile for best management practice research may log every five minutes to capture the flash water rise of rain.

Water level data are converted to stream discharge values with rating curves developed for each site. The real time level data combined with snowmelt and precipitation data from the climate and meteorological stations are used to forecast stream flows and potential flooding and erosion risks.

Water quantity measurements contribute to several other ABCA programs including water quality monitoring, and biomonitoring. For instance, discharge data combined with water quality data determine nutrient and sediment loading.

Hydrometric Network

With support from the Ministry of Natural Resources (MNR) and the Canada Water Agency (CWA, Water Survey Canada), the ABCA maintains and operates 13 gauging stations. Monitoring precipitation and water quantity ensures that we have early indications of any potential flooding (or low water conditions) so that Flood Messages or Low Water Advisories can be provided to our watershed municipalities in a timely manner.

Table 3: Hydrometric Network at the Ausable Bayfield Conservation Authority.

Goals	Location Rationale	Sampling Frequency	Indicators
Flood forecasting & warning, climate change evaluation, relate flow to water quality	10 Water Survey of Canada network locations related to Flood Damage Centres and the Ontario Low Water Response program 2 additional stations: Port Franks and Parkhill Dam 1 additional station in North Gullies linked to Rural Stormwater Management Model (RSWMM) project	Data logged every 5 to 15 minutes at 13 monitoring stations Water Level - 13 locations Flow - 11 locations Precipitation - 10 stations Air Temperature - 9 stations ~20 rain gauge readers (volunteer rain gauge network)	Precipitation, temperature, water level, meteorological conditions

Ontario Low Water Response

The Ontario Low Water Response Program was created in response to drought conditions experienced in 1998 and 1999 in various parts of the province and provided guidance for local response to drought related issues. This program relies on flow and precipitation to indicate the severity of low water or drought conditions to water managers. If comparisons with historic data indicate that low water conditions are severe enough, water conservation advisories and restrictions may be put in place by the Water Response Team. Over-consumption of water may have serious consequences should dry conditions persist. Management of water consumption can reduce overall impacts to people and ecosystems.

Table 4. Ontario Low Water Response in the Ausable Bayfield area.

Goals	Location Rationale	Sampling Frequency	Indicators
Ensure preparedness & prevent over-consumption of water during drought conditions (water budget)	Indicator stations in the Ontario Low Water Response Program	Monthly averages at 3 sites: Springbank (Lower Ausable), Exeter (Upper Ausable), and Varna (Bayfield River)	Flow, precipitation

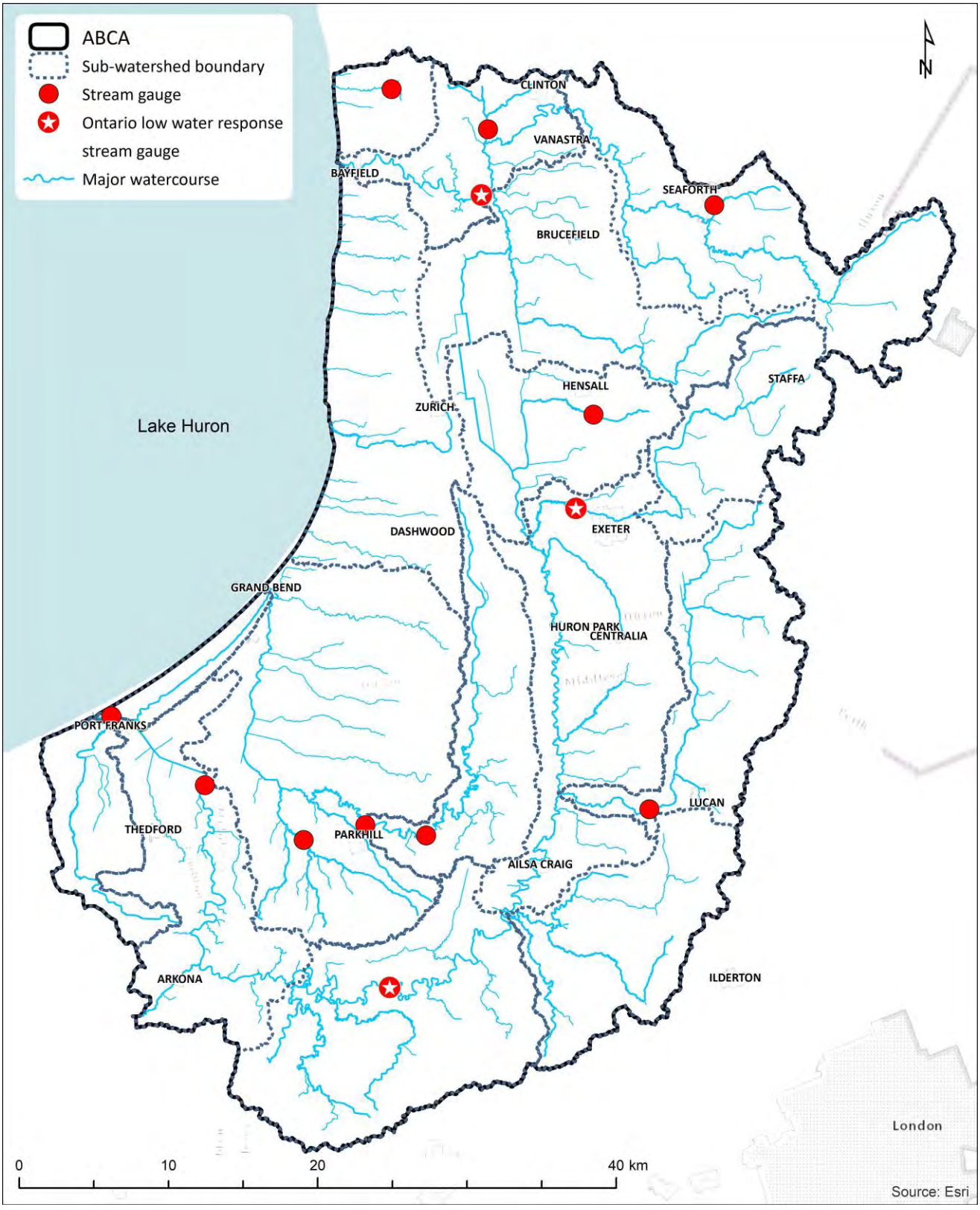


Figure 1. Map of stream gauge locations within the jurisdiction of the Ausable Bayfield Conservation Authority.

SURFACE WATER QUALITY

There have been many surface water quality initiatives at ABCA to help fulfill the mission and vision of healthy watersheds. Early research at ABCA in the 1980s and 90s focused on manure and nutrient management storage and handling practices, E. coli survival and detection, manure application practices and tile drains, and pollution source identification.

We are now entering a fourth decade of conducting research, collecting data, and participating in programs that help local communities understand and manage water quality. Currently, ABCA programs have expanded beyond a focus on nutrient management to include surface water sampling at over twenty stream sites, E. coli sampling at Lake Huron beaches, and subwatershed-based evaluations that help us understand that there can be site-scale effects of some practices and a different watershed response from the same practice. Whenever possible, efforts have been made to integrate monitoring with other disciplines to know as much as possible about multiple aspects of a site. Efforts have also been made to incorporate new science and research questions, such as monitoring indicators that relate to climate. Adaptive decision-making about the focus of programs allows ABCA's monitoring to remain relevant and at the forefront of new science and issues that affect the watershed and community.

Baseline Water Quality Monitoring: Advantages and Limitations

Monitoring of baseline conditions allows us to determine current conditions, track change relative to this baseline, and identify emerging water quality issues. ABCA staff monitor baseline water quality through the Provincial Water Quality Monitoring Network (PWQMN), according to standard protocols followed throughout the province. In our region, PWQMN sampling tends to occur in downstream sections of large rivers and streams. Watersheds created by these rivers and their tributaries can cover a very large land area. Monitoring at these sites therefore reflects land management across a large upstream land base. Data from these programs are also used in our *Watershed Report Card*, which is produced every five years and summarizes water quality across ABCA's sixteen subwatersheds. Knowledge of baseline conditions allows us to track our progress as we work toward improving water quality in local watersheds. Should new issues arise, baseline data can help us detect and identify any emerging concerns.

Baseline monitoring does have some notable limitations. Water sampling for baseline programs occurs on scheduled dates, which are often free of precipitation in the summer months. Sampling during dry weather periods may underestimate the impacts of surface runoff and erosion events that occur during storms, snowmelt, and high flows. Most examples of water quality issues in our area are due to the cumulative impacts of many non-point sources, such as rainfall or snowmelt moving across the ground to local waterways. Best land management practices help to reduce these sources, but the impacts of individual actions–such as the use of BMPs to control surface runoff–can be difficult to detect through baseline programs that operate at a coarse scale. Water monitoring that incorporates multiple perspectives and different geographic scales (e.g., edge-of-field, or subwatershed studies) are needed to fully evaluate water quality and understand human impacts on ecosystem health.

Water Quality Monitoring at Multiple Scales

Water issues like flooding, erosion, and habitat loss don't occur only once, in one location. They spread across the landscape, creating challenges that can't be solved by individual properties or projects alone.

That's why we monitor water at multiple scales, from individual fields and local ravines to the entire Lake Huron shoreline. By linking local data with watershed-wide monitoring, we can identify effective solutions, apply them more broadly, and improve the health of the entire watershed. Example locations of a field to watershed scale examination include the stormwater management study in the Gully Creek watershed, and water quality monitoring at the Huronview Demonstration farm. Monitoring at a more local scale with a higher frequency of data collection can help us to detect changes that may be missed if only conducting baseline monitoring.

Provincial Water Quality Monitoring Network

Since the 1960's, the ABCA has partnered with the Ontario Ministry of the Environment (currently Ministry of the Environment, Conservation and Parks; MECP) to take surface water samples through the PWQMN. This network consists of 433 sites across Ontario Map: Provincial (Stream) Water Quality Monitoring Network | ontario.ca , nine of which are currently in the ABCA area. Valuable long-term information is now known about many of these sites, with several integrated with other monitoring programs such as stream gauges, climate monitoring, or benthic biomonitoring. Approximately 35 indicators are measured at five stations, and nine indicators at the remaining four stations.

Table 5. Provincial Water Quality Monitoring Network program at the Ausable Bayfield Conservation Authority.

Goals	Location Rationale	Sampling Frequency	Indicators
Determine baseline conditions, identify trends, inform Ministry compliance, assessments, policy and decision-making	Length of record, type of water quality being monitored (point source vs. non-point), collection of other data (e.g., benthic, stream gauge), location in subwatershed (e.g., located downstream in watershed)	Nine watercourses sampled on the third Tuesday of each month March to November Winter sampling following rain events: January to February	Nutrients, metals (at select sites), chloride, *E. coli*, suspended solids; full suite in Table 8

Enhanced Monthly Stream Monitoring

Eight surface water monitoring sites were added under an 'Enhanced' program in 2003, with a ninth site added in 2007. These sites were added because many areas of the ABCA jurisdiction were under-sampled with the PWQMN network alone. Details about site selection may be found in the 'Ausable Bayfield Conservation Authority Water Quality Network Design' report (2007).

Table 6. Enhanced stream monitoring program at the Ausable Bayfield Conservation Authority.

Goals	Location Rationale	Sampling Frequency	Indicators
Determine baseline conditions, identify trends, inform watershed management	Fill gaps in PWQMN site network, evaluate agricultural BMPs, fill knowledge gaps about small tributaries, plus criteria for PWQMN site selection	Nine watercourses sampled on the third Tuesday of each month	*E. coli*, nutrients, suspended solids; full suite in Table 8.

Pesticide Initiatives

Pesticide sampling at ABCA first began in 2007 through a partnership with Environment Canada. Sampling took place at four stations already part of the PWQMN (Little Ausable River [MALIT2], Parkhill Creek [MPMCIN1], Ausable River [MAEXE1], Bayfield River [MBVAR1]). An assay was designed to detect four commonly used pesticides (2,4-D, Atrazine, Glyphosate, and Metolachlor).

In 2011, the MECP and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) partnered with ABCA to measure pesticide concentrations in Decker Creek; one of nineteen stream sites selected across Ontario for monitoring at the time. Decker Creek has been a PWQMN site since 2000. While the program initially screened approximately 30 pesticides (with samples analyzed by the University of Guelph), the modern screen has expanded to detect over 500 different pesticides.

The program expanded further in 2018 when ABCA partnered with Agriculture and Agri-Food Canada (AAFC) to collect monthly sediment and surface water samples at four specific locations: two PWQMN stations, one enhanced station, and one climate station ([MABLA2], [MBVAR1], [HBSTEEN1], and [MPMCGUF1]).

Most recently, in 2025, ABCA partnered with Health Canada's Pesticide Management Regulatory Agency (PMRA) to launch a high-frequency monitoring program. This intensive effort included twice-weekly surface water sampling, multi-week passive cartridge (O-DGT) deployments, and targeted rainfall event sampling at the Huronview tiled fields for eight months during 2025. The twice-weekly surface water program continues through 2026, screening for over 200 pesticides to inform national priorities.

Table 7. Pesticide monitoring program at the Ausable Bayfield Conservation Authority.

Goals	Location Rationale	Sampling Frequency	Indicators
Determining trends of pesticides in surface water, detecting emerging issues with pesticide use including potential impacts on aquatic life	Site selected with input from OMAFRA, ABCA, and MECP. Criteria included: a site already monitored for PWQMN, small watershed, highly agricultural, within Lambton County (a previously under-sampled County)	1 sample once / month April to November in Decker Creek	Pesticides
Inform Health Canada sustainable agriculture decisions	Core climate/PWQMN sites for broad tracking, paired with specific edge-of-field tracking at Huronview tile drains	2025: Twice-weekly surface water (8 months), 4 month-long passive sampler deployments, and wet-weather tile runoff events. 2026: Ongoing twice-weekly surface water samples.	Over 200 pesticides, Glyphosate; passive accumulation via o-DGT cartridges.

Table 8. Summary table of surface water monitoring sites and indicators.

Stream Site Name (active stations)	Watercourse Name	Subwatershed	First Year Sampled	Conductivity	Chloride	Total Suspended Solids	pH	Alkalinity	Phosphorous	Nitrogen	Metals	Dissolved Carbon	YSI Field Measurements	*Escherichia coli (E. coli)*	Benthic Invertebrates	Pesticides	Stream Gauge (HYDAT #)	Water Level Data Logger
MAEXE1	Ausable River	Upper Ausable	1975	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MABLA2	Black Creek	Black Creek	1966	●	●	●	●	●	●	●		●	●	●	●		●	
HASTAF1	Staffa Drain	Ausable Headwaters	2003			●			●	●		●	●	●	●			
HBLIF1	Liffey Drain	Bayfield Headwaters	2003			●			●	●		●	●	●				
MBSEA1	Bayfield River	Bayfield Headwaters	1964	●	●	●	●	●	●	●		●	●	●	●		●	
MBBAN1	Bannockburn River	Bannockburn	2002			●			●	●		●	●	●	●			
B8-1 (Tricks)	Trick's Creek	Main Bayfield	2011			●			●	●			●	●			●	
HBSTEEN1	Steenstra Drain	Main Bayfield	2003			●			●	●		●	●	●				
HBSTEEN2	Steenstra Drain	Main Bayfield	2003			●							●	●				
GULGUL5	Gully Creek	Bayfield North	2007			●			●	●			●	●	●		●	●
MBVAR1	Bayfield River	Main Bayfield	1975	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
GULZUR8	Pergel Gully	South Gullies	2003			●			●	●			●	●	●			●
HPDESJ1	Desjardin Drain	Lower Parkhill	2003			●			●	●			●	●	●			
MMOUTER1	Mud Creek	Mud Creek	2002			●			●	●			●	●				
MADECK2	Decker Creek	Lower Ausable	2000	●	●	●	●	●	●	●	●	●	●	●	●	●		
MABOG1	The Cut (Ausable River)	Lower Ausable	1980	●	●	●	●	●	●	●	●	●	●	●			●	
MPMCIN1	Parkhill Creek	Lower Parkhill	2003	●	●	●	●	●	●	●	●	●	●	●				
MPMCGUF1	Parkhill Creek	Upper Parkhill	2012	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MALIT2	Little Ausable River	Little Ausable	1969	●	●	●	●	●	●	●		●	●	●	●		●	
MANAIRN1	Nairn Creek	Nairn Creek	2003			●			●	●			●	●				
MASPR1	Ausable River	Middle Ausable	2003	●	●	●	●	●	●	●		●	●	●	●		●	
GULGUL2	Gully Creek	Bayfield North	2010												●			●
Port Franks	Ausable River	Lower Ausable	1992														●	
South Parkhill Creek	Parkhill Creek	Lower Parkhill	1955														●	
Parkhill Dam	Parkhill Creek	Upper Parkhill	1987														●	

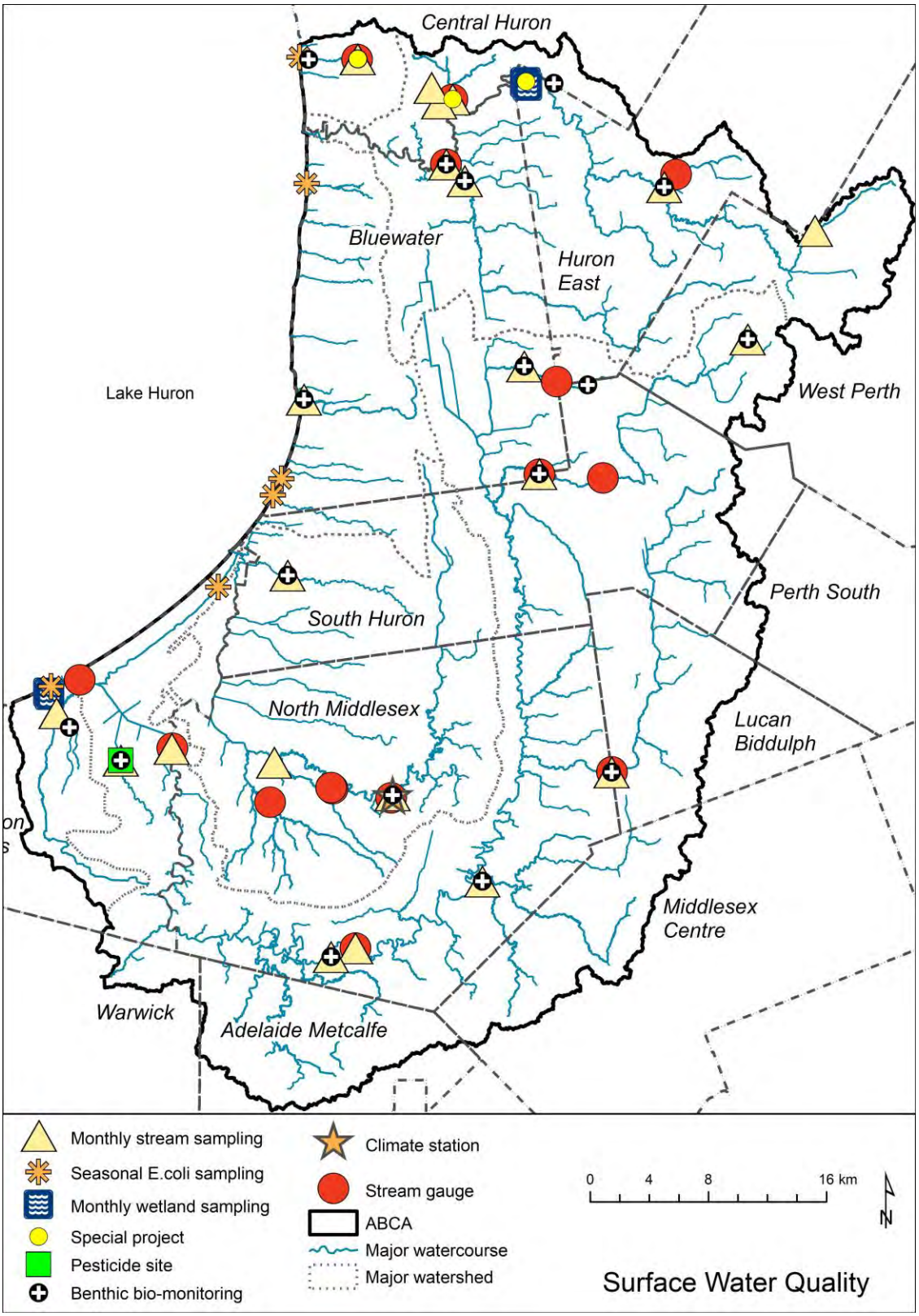


Figure 2. Map of surface water quality monitoring sites in the Ausable Bayfield Conservation Authority jurisdiction.

GROUNDWATER

ABCA has been monitoring groundwater quantity and quality for over two decades to support the protection and sustainable management of groundwater resources across the watershed. Through partnerships with provincial and county programs, monitoring efforts have focused on establishing baseline groundwater conditions, identifying long-term trends, and improving understanding of how natural features and land-use activities influence groundwater systems.

ABCA currently participates in several groundwater monitoring initiatives, including the Provincial Groundwater Monitoring Network (PGMN), monitoring in sinkhole-prone areas, and the Huron County Sentinel Well program. These programs collect groundwater level and quality data from a network of monitoring wells and private wells across the region.

Together, these efforts help improve understanding of groundwater systems, provide early warning of potential water quality concerns, and support decision-making related to groundwater protection, drinking water safety, and watershed management. As new questions and priorities emerge, ABCA continues to adapt its monitoring programs to ensure groundwater data remains relevant for understanding environmental change and supporting healthy watersheds.

Provincial Groundwater Monitoring Network

The Ontario Ministry of the Environment, Conservation and Parks (MECP) have been partnering with conservation authorities and their member municipalities on a provincial groundwater monitoring network (PGMN) since 2000.

The PGMN has been established to collect and maintain ambient (baseline) groundwater level and quality information from more than 450 wells, representing major aquifers across the province. Data from the monitoring network provides an early indicator for potential emerging issues such as climate change, water usage demand changes, and changes to water quality from both human-made and natural causes.

Ausable Bayfield Conservation Authority (ABCA) currently monitors water levels and quality at 16 locations across the ABCA watersheds. Five of these wells are bedrock and 11 are overburden wells. Groundwater quality has been monitored since 2003. Exceedance notices are issued to the landowner, Municipality, and local health unit when water quality parameters exceed the Provincial guidelines.

Groundwater quality and quantity data are uploaded to the MECP's public website and are freely available Map: Provincial Groundwater Monitoring Network | ontario.ca.

Table 9. Summary of groundwater quality and quantity monitoring at the Ausable Bayfield Conservation Authority.

Program	Goals	Location Rationale	Sampling Frequency	Indicators
Provincial Groundwater Monitoring Network	Determining baseline conditions and long-term trends, comparison with Provincial guidelines	Significant aquifers in watershed (selected by ABCA, MECP, consultants) Sampling of shallow overburden and deep bedrock aquifers	Minimum once per year at 16 wells Additional samples collected at 3 sites in spring and 1 site in summer Water levels logged hourly	Metals, nutrients, bacteria, additional parameters (see website), water level
Sinkhole Study	Monitor water quality, determine baseline conditions and trends, investigate sinkhole impacts on water quality	Sampling sites are identified in the "Sinkhole investigation study for areas mainly within the municipalities of Huron East and West Perth (2004)"	Historically: monthly sampling of 5 private wells (4 near Chislehurst Sinkhole clusters, 2 near Tuckersmith Sinkhole clusters), surface water samples from 2 drains that outlet into sinkholes	Fecal coliform, chloride, fluoride, nitrogen, sulphate, alkalinity, phosphorus, metals, turbidity
Huron Sentinel Wells	Determining baseline conditions and long-term trends, comparison with Provincial guidelines	Significant aquifers in watershed (selected by ABCA, MECP, consultants) Sampling of shallow overburden and deep bedrock aquifers	Annual sampling at 6 wells in August	Metals, fluoride, nutrients, bacteria

Sinkhole Study

The ABCA landscape includes several sinkholes, particularly in the southwest corner of West Perth, and the southwest corner of Huron East. Between 2001 and 2004 water quality issues were investigated at the Chiselhurst and Tuckersmith sinkholes.

The well near the Chislehurst sinkhole has become a Provincial Groundwater Monitoring Network (PGMN) monitoring well, and occasional surface and groundwater sampling takes place at both sinkholes. It is recommended that future sampling focuses on seasonal and/or event-based sampling as there remain many questions regarding water quality in this area.

Huron Sentinel Wells

The Huron County Sentinel Well program was initiated following recommendations from the *Groundwater Quality Assessment* carried out for Huron County in 2001 (Golder, 2001). This is an innovative program developed to sample rural well properties to monitor drinking water quality in areas without detailed study. As a result of this preliminary study, representative wells, called "sentinel wells" from six (6) clusters were chosen for long-term monitoring.

AQUATIC BIOMONITORING

Biomonitoring programs for aquatic species (fish, mussels, and benthic invertebrates) track the abundance and diversity of species, and the presence or absence of at-risk or sensitive species. This information informs management decisions and helps to evaluate stewardship efforts in alleviating threats. Nutrient enrichment, sediment loads, low oxygen concentrations, and invasive species are some of the factors that can threaten local aquatic populations. Fish, mussels and benthics can act as bio indicators to provide information about aquatic ecosystem health.

Fish and Mussel Biomonitoring

Currently biomonitoring programs for fish and mussels focus on identifying locations of species at risk, tracking changes in fish and mussel communities over time, and classifying watercourses based on the aquatic community. Mussels require fish species as a host for the completion of their reproductive cycle and therefore freshwater fish and mussel studies can complement each other.

Some of the fish and mussel species found in the Ausable Bayfield watersheds are rare and have been assessed by the Committee on the Status of Endangered Wildlife in Canada as Endangered, Threatened or Special Concern, with some protected under the federal Species at Risk Act (SARA). The Ausable River supports one of the most diverse and unique assemblages of aquatic fauna for a watershed of its size in Canada. Due to its rich biodiversity the Ausable River watershed has been monitored more extensively than other watersheds within our jurisdiction. At least 28 species of freshwater mussels are known in the Ausable River watershed. Freshwater mussels are among the most endangered organisms in North America. They play an important role in aquatic ecosystems by acting as a living filter improving water quality and providing food for other wildlife. They are threatened by habitat degradation and invasive species. Freshwater fish species diversity within Canada is the highest in Ontario and this includes the Ausable River where at least 90 known species have been found. Fish species presence and diversity can indicate changes in the health of aquatic ecosystems.

Benthic Biomonitoring

Benthic macroinvertebrates are living organisms that inhabit the bottom substrates of watercourses. These insects are good indicators of aquatic ecosystem health since they are sensitive to the effects of their chemical and physical environment. In 2000, the ABCA established a long-term program whereby 30 sites within the watershed were monitored on a biannual schedule (15 per year).

Currently, 18 sites are monitored every year. Additional sites were monitored in the past, and new sites may be added if needs and priorities change. The current 18 sites were selected to provide long-term knowledge about at least one monitoring stream site per subwatershed.

Table 10. Summary of freshwater animal monitoring program at Ausable Bayfield Conservation Authority.

Program	Goals	Location Rationale	Sampling Frequency	Indicators
Fish Index Sites	Track changes in the aquatic community over time to evaluate recovery efforts (e.g. stewardship) in alleviating habitat threats, provide information for management decisions	Representative locations for subwatersheds and habitat (cold vs warm water)	Once index stations are established, ideally, they would be revisited every 4-5 years. Certain areas of the ABCA watersheds are targeted based on schedule	Abundance of common species and species at risk Diversity of species
Drain Classification (Fish)	Classify "not rated" drains based on DFO categories. Drain classifications will help guide and streamline drain maintenance activities.	Not rated or unclassified drains are sampled to classify all drains	Once to determine classification, may be resampled on a case-by-case project basis for re class	Presence of species, in particular sensitive species
Mussel Index Sites	Track changes in the aquatic community over time which will help to evaluate recovery efforts (e.g. stewardship) in alleviating habitat threats, provide information for management decisions	Representative locations for subwatersheds	Once index stations are established – ideally revisited every 4-5 years. Certain areas of the ABCA watersheds are targeted based on schedule	Abundance of common species and species at risk Diversity of species
Benthic Biomonitoring	Baseline conditions and trends in water quality, species community composition	Minimum of one site per subwatershed, collection of other data (e.g., PWQMN site), location related to land use (e.g., landfill site)	One sample once per year at 18 sites; sampled in October	Species assemblage

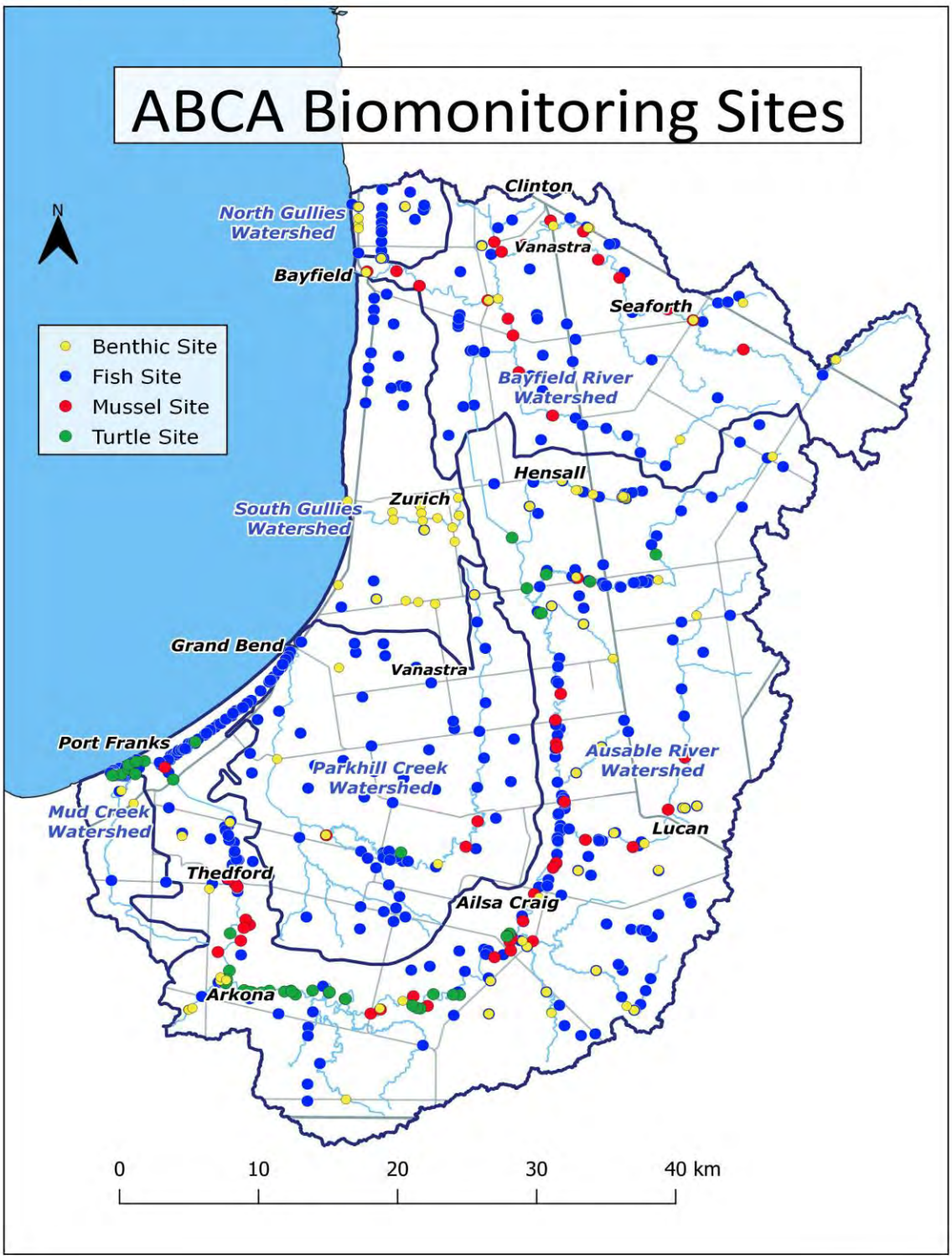


Figure 3. Map of biomonitoring sites within the jurisdiction of the Ausable Bayfield Conservation Authority.

MONITORING TO MANAGE

Environmental issues are always multi-faceted. Some projects allow us to investigate local concerns from multiple perspectives. Many of these projects relate to environmental sustainability, as they consider the balance between the environment and economy. Agriculture is the dominant land use across our watershed, so studies that consider both economic and ecological perspectives are especially relevant to our local environment and community.

Measuring water quantity and quality indicators at the site and small watershed scale, along with comprehensive soil, topography, and land management information give us insight to the effects of some land use and management decisions. Further, when environmental costs and benefits are unequally distributed in time, space and between individuals and society, it is also helpful to collect costs associated with different practices. Environmental and economic costs and benefits of Best Management Practice (BMP) are necessary to understand the trade-offs.

Huronview Demonstration Farm

Water quality, quantity, and soil health are monitored intensively at the Huronview Demonstration site, just south of Clinton, ON. This project is a partnership between the Huron Soil and Crop Improvement Association (HSCIA), County of Huron, and ABCA. The 47-acre property had been experiencing low soil fertility, soil erosion, and water quality issues after many years of intensive farming on its rolling hills. In 2015, the property was rented to HSCIA from the County of Huron for a 10-year lease at a dollar a year. The purpose was to use Huronview as a demonstration site for sustainability.

Innovative subsurface tile drainage was installed in 2019, including contour tiling, control gates, pattern tiling, and diversion terraces. Other best management practices include wetlands, vegetative buffer strips, cover crops, and reduced tillage. Water monitoring takes place monthly and after rain events to evaluate the effectiveness of these practices. Water quality sampling includes water from field-runoff, subsurface tile drainage, and water stored in wetlands connected to drainage systems. Groundwater monitoring wells were installed in February 2023 to better understand groundwater quantity and quantity at an agricultural site with tile drainage.

Through a partnership with the more regional Ontario Soil and Crop Improvement Association (OSCIA), a focus for this site is on understanding links between soil properties and water quality.

Table 11. Overview of Huronview Demonstration Farm Monitoring.

Goals	Location Rationale	Sampling Frequency	Indicators
Evaluate agricultural best management practices in partnership with Huron County and the Huron Soil and Crop Improvement Association	Two sites to sample subsurface tile drainage water (contour vs. pattern) Two weirs in agricultural fields to sample surface runoff Additional sites to monitor flow or water quality including wetlands and edge of forest	Rain events Baseline monthly samples from wetland, forest, and subsurface tile systems (as water levels permit)	E. coli, nutrients, suspended solids

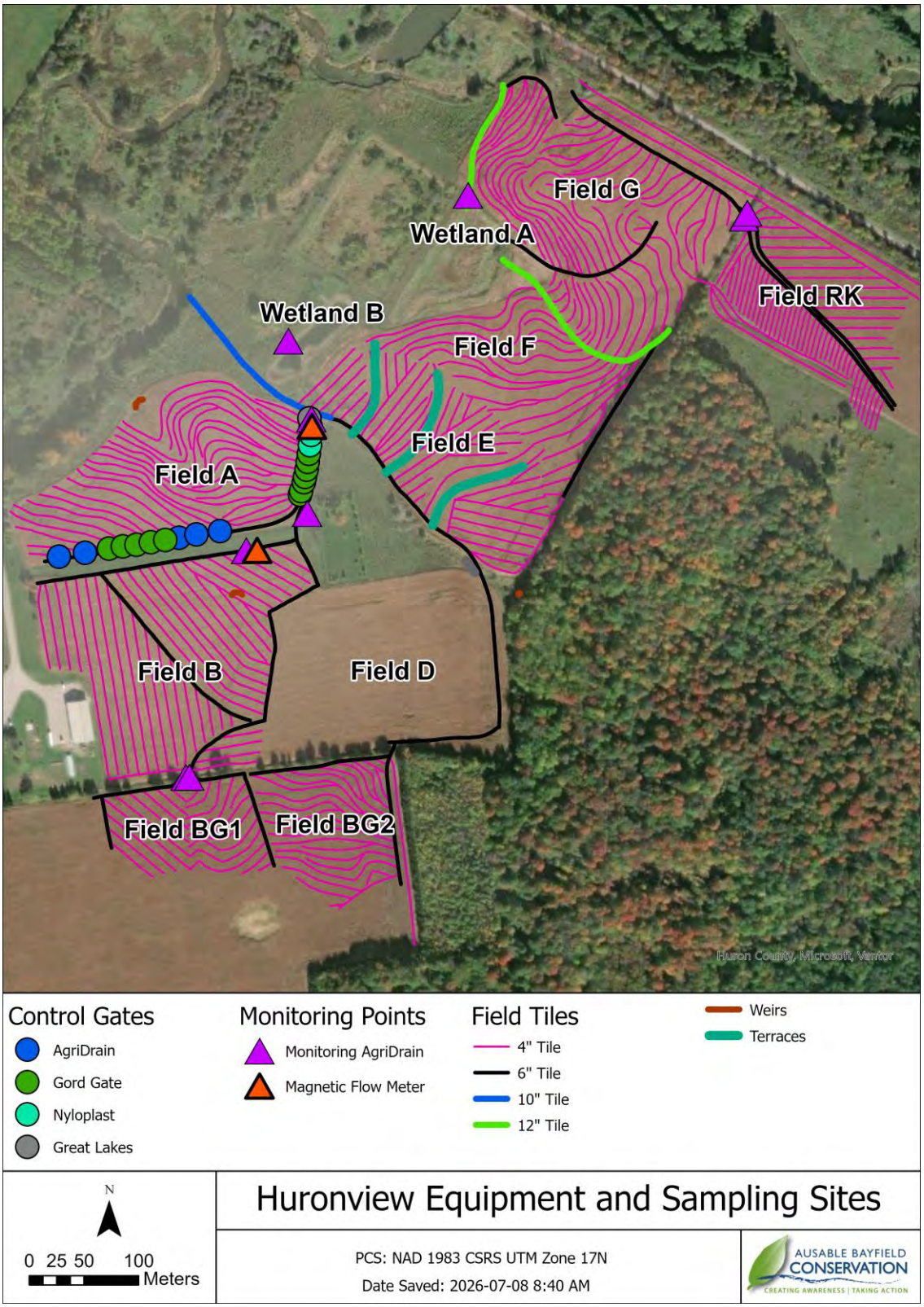


Figure 4. Map of monitoring sites at the Huronview Demonstration Farm.

Rural Stormwater Management

As a result of the Healthy Lake Huron Initiative, comprehensive water quality and land management practices are monitored at Gully Creek and Trick's Creek. The initiation of this data collection process was under the Rural Stormwater Management Model (RSWMM) Project. With continued support from the OSCIA, Gully Creek has an extensive BMP implementation and evaluation program. In partnership with the University of Guelph, the water quality benefits of BMPs such as conservation tillage, cover crops, nutrient management, and water and sediment control basins have been studied at the field and larger watershed scales.

Table 12. Rural Stormwater Management.

Goals	Location Rationale	Sampling Frequency	Indicators
Determine baseline conditions, identify trends, inform watershed management	Evaluate agricultural BMPs, type of water quality being monitored (point source vs. non-point), collection of other data (e.g., benthic, stream gauge), location in subwatershed (e.g., located downstream in watershed)	2 watercourses (Trick's Creek, Gully Creek) sampled once per month Rain events	E. coli, nutrients, suspended solids

Old Ausable Channel

The Old Ausable Channel (OAC) is a disconnected portion of the Ausable River and is recognized as an ecosystem gem (Figure 4). It is no longer part of a flowing river and consequently is characterized by clear water and dense aquatic vegetation. The OAC provides Critical Habitat to two Species at Risk (SAR) fishes listed under the federal Species at Risk Act (SARA): Pugnose Shiner and Lake Chubsucker. The OAC is undergoing natural succession (from a riverine habitat to more wetland like conditions) that may be accelerated by anthropogenic activities in the watershed. The northern portion of the OAC is bordered by subdivisions, however most of it falls within Pinery Provincial Park boundaries. Documented winter fish kills, nutrient inputs, aquatic vegetation growth, low dissolved oxygen concentrations and low water levels over recent years have negatively impacted SAR fish populations and their habitat in some areas of the OAC. To evaluate the status of SAR fish habitat and provide information for future management decisions data is collected including - nutrient concentrations through water sampling, and the use of data loggers to record dissolved oxygen concentrations and water levels. With the sensitive fish present and ongoing management options being tested, continuous dissolved oxygen, water level and water quality records are necessary.

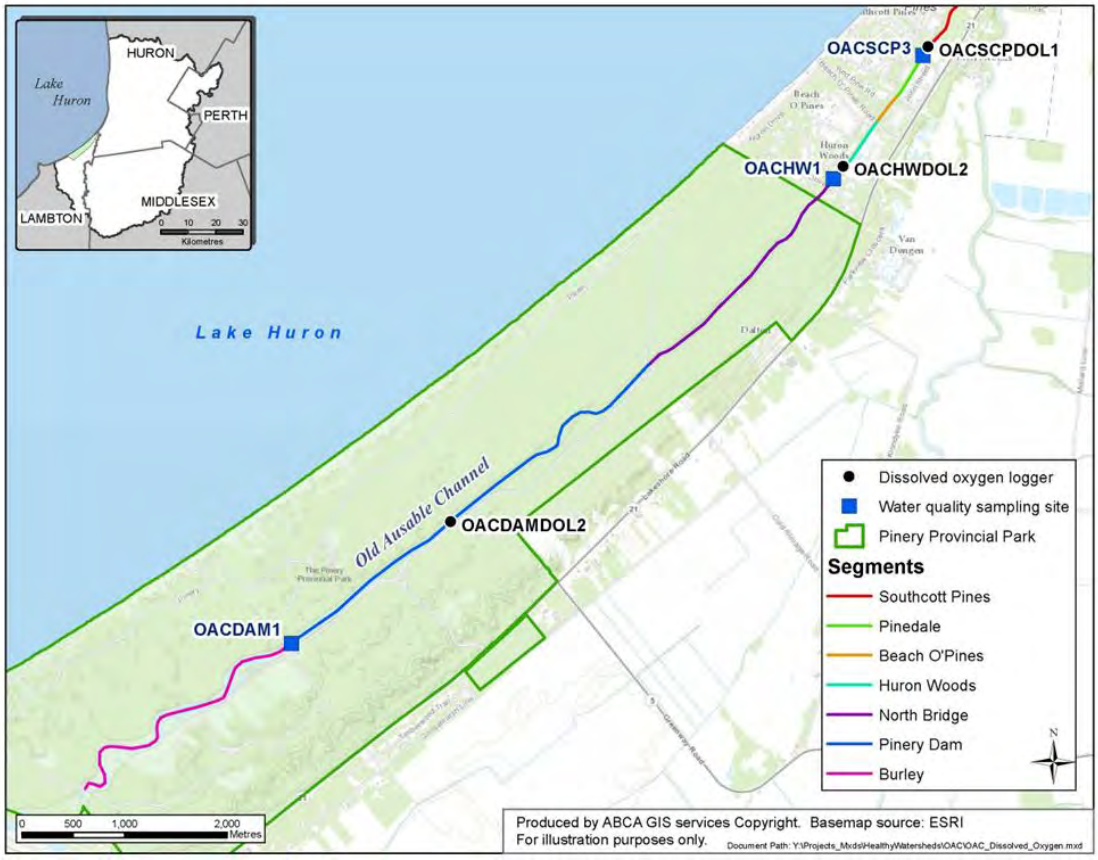


Figure 5. Map of water monitoring sites in the Old Ausable Channel.

Beach Sampling for Escherichia Coli (*E. coli*)

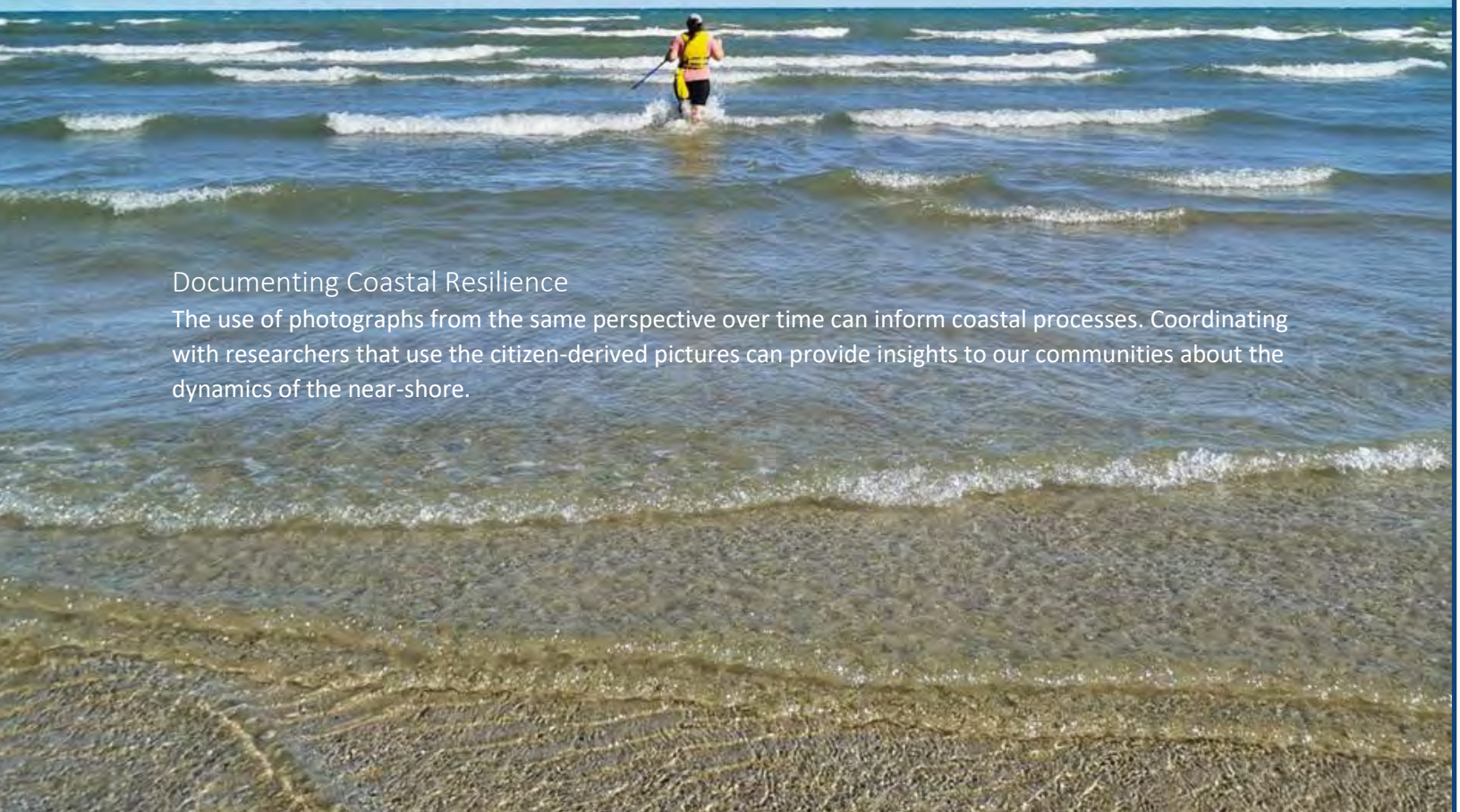
Water testing for *E. coli* counts in Lake Huron track concentrations of fecal bacteria that may be harmful while swimming.

Sampling for *E. coli* takes places near five Ontario lakeshore communities: Pork Franks (Mud Creek), Turnbull's Grove, Ridgeway, Wildwood, and Bayfield (Gully Creek) through a partnership with the Bluewater Shoreline Residents' Association (BSRA). Several other beaches in the area are monitored regularly by Huron Perth Public Health or Lambton Public Health.

Opportunities to support Microbial Source Tracking with the University of Guelph have been coordinated since 2025.

Table 13. Beach sampling program along the south east shore of Lake Huron.

Program	Goals	Location Rationale	Sampling Frequency
Beach sampling for *E. coli*	Determine baseline conditions, identify trends, identify opportunities for water quality improvement, compare against recreational water quality guidelines	Recreational standards for swimming Ravine watercourses	One day per week from mid-June to late August Six samples per day at five sites (in lake at ravine mouth, two north, two south), one within each ravine All beaches and ravines are sampled on the same day on a weekly basis during swimming season



Documenting Coastal Resilience

The use of photographs from the same perspective over time can inform coastal processes. Coordinating with researchers that use the citizen-derived pictures can provide insights to our communities about the dynamics of the near-shore.

Water Monitoring with Data Loggers

An important distinction in our monitoring program is the use of data loggers. In some places, some indicators are continuously measured. Data loggers enable collection of continuous time-series data allows for monitoring of conditions when staff are not directly on-site.

As mentioned, water level monitoring is conducted using automatic dataloggers at several groundwater, stream, wetland, and agricultural sites. Data from loggers can be used to produce hydrographs of stream or drain levels, which shows the water level over time. By knowing the volumes of water moving though the water system, we can begin to move beyond concentrations at a given moment and calculate mass loads of environmental pollutants (e.g., kg of phosphate per year moving through a drain or river). Estimating sediment and nutrient loads is an important part of a comprehensive water quality assessment. Data collected from continuously monitored locations can be used in combination with our other data that is more temporally limited. The comprehensive and more simple data provides a cost-effective approach to monitoring.

Other indicators that are monitored more continuously at some locations in our watersheds include soil moisture, temperature and dissolved oxygen.

GIS and Data Analysis

Effective data management is the backbone of our monitoring program, ensuring the hundreds of thousands of records generated annually remain accurate, accessible, and actionable. We maintain strict quality assurance and quality control protocols to ensure every sample, measure, observation, and spatial record is verified and reliable. By centralizing this data into secure, organized databases, we protect baseline data from decades past. This careful management ensures our data remains trustworthy, allowing analysts to confidently identify long-term trends and create information to share with our partners and our community.

Data tells us what is happening at a single point in time. GIS allows us to see the bigger picture. By mapping our landscape features such as topography, soil characteristics, and land use, water quantity and quality data can be transformed into visual, actionable information.

The use of continuous data with spatial analyses allows us to 1) predict and model active hazards such as flooding and erosion and 2) map pollution pathways. To ensure our digital models match reality we verify data with field observations. Spatial modeling helps to identify prime locations for conservation practices, such as wetland enhancements. This mapping can also identify other projects that will have the greatest impact on water quality and help reduce flooding and erosion.

Information belongs in the hands of the community, not hidden in databases or spreadsheets. We translate technical monitoring data into clear meaningful information. This information can be delivered in flood messages, occur in reports on our website, or be presented at public events. By sharing our watershed's story transparently, we build local trust, celebrate conservation successes, and inspire residents to become involved in stewardship on the landscape.

CONCLUSION

The health and long-term resilience of the Ausable, Bayfield, and shoreline watersheds depends on a collective, multi-jurisdictional commitment to robust environmental monitoring. Through resourceful navigation of diverse funding streams and strategic leverage of regional partnerships, the Ausable Bayfield Conservation Authority has established an exceptionally comprehensive monitoring program.

Our current operational framework successfully integrates continuous surface water quantity and in some locations water quality sampling, and seasonal snow course measurements with advanced GIS and data analytics. By collaborating with universities, municipalities, and local communities, the ABCA maintains biological indices, monitoring fish, freshwater mussels, benthic invertebrates, and vulnerable turtle populations. While our reliance on external partnership funding has necessitated an opportunities-based approach to expanding these initiatives, it has ultimately formed an agile, adaptive organization capable of aligning available funding with immediate community and ecological needs.

Moving forward, the ABCA must strategically focus on clear communication, relationship management, and workforce adaptability. Because our programming relies on an evolving network of collaborators, the ABCA must excel at articulating the value of data (and information) to ensure existing partnerships remain strong while adapting as specific partners, funding priorities, and community interests naturally shift over time.

Capitalizing on new, unexpected funding requires a team that is ready to act. Therefore, we must commit to the continuous training of our staff. By ensuring our personnel are highly capable and well-versed in emerging field technologies, automated data collection systems, and modern analytical tools, the ABCA will remain positioned as a lead watershed management organization.

Through open communication, resilient partnerships, and a forward-thinking, technically skilled workforce, we will ensure our watershed monitoring remains uninterrupted, scientifically rigorous, and fully prepared for whatever opportunities arise next. More importantly, the people in the Ausable Bayfield jurisdiction will have a watershed with a “story to tell”. This information will help decision makers continue to protect, improve, conserve, and restore the watershed in partnership with the community.