AUSABLE BAYFIELD CONSERVATION

CREATING AWARENESS | TAKING ACTION

# Watershed-Based Resource Management Strategy 2024-2044

Ausable Bayfield Conservation Authority

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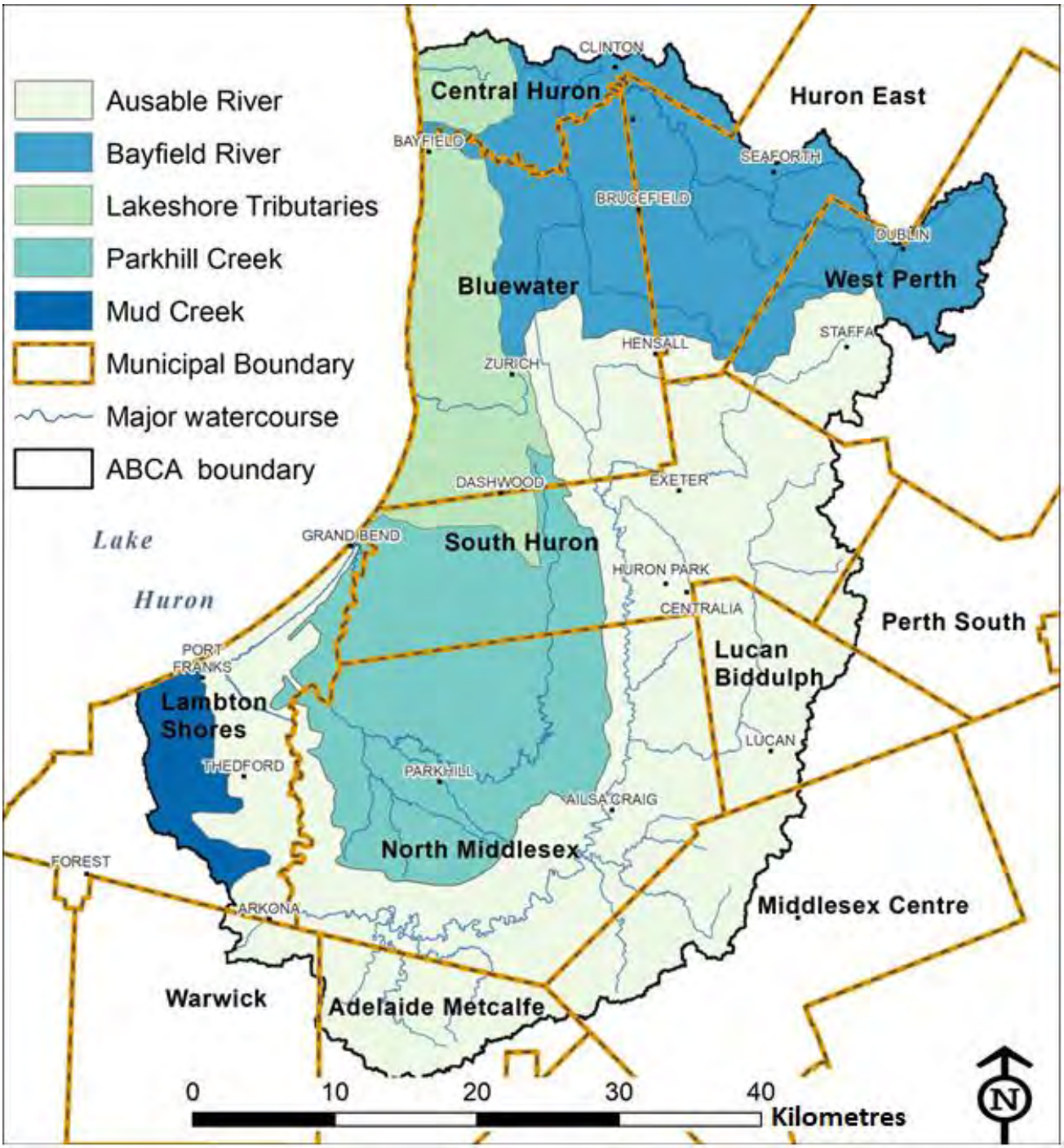
## AUSABLE BAYFIELD CONSERVATION AUTHORITY

## AREA OF JURISDICTION



# INTRODUCTION AND FRAMEWORK

## Introduction

The Watershed Based Resource Management Strategy (WBRMS) is a document to guide the Ausable Bayfield Conservation Authority staff and members. This document will be revised as needed to reflect revisions to the inventory of programs and services, Cost Apportioning Agreements, emerging issues and knowledge, and legislation.

The main body of this document sets the strategic direction. The extensive, background information used to develop the strategic priorities, objectives and programs areas is found in the appendices (legislation, watershed conditions, summary of studies, reports and strategies, and the 2023 Inventory of Programs and Services). The document includes links and references to other important documents.

The purpose of the WBRMS is to assist the ABCA to:

- Conserve the watersheds within its area of jurisdiction through integrated watershed management.
- Deliver programs and services.
- Improve efficiencies and effectiveness in supporting mandatory Category 1 programs as defined by the Province of Ontario.
- Meet the requirements of the *Conservation Authorities Act* (CA Act).
- Meet the needs of the ABCA, municipal partners and watershed residents.

Subsections 12(4)-(7) of Ontario Regulation 686/21 set out the required components to be included in the Watershed-Based Resource Management Strategy. While these components must be included in each Conservation Authority's strategy, the framework and format may be determined by each individual conservation authority.

## Legislative Context: *Conservation Authorities Act*

Ontario Regulation 686/21 sets out the Mandatory Programs and Services which must be delivered by all Conservation Authorities in Ontario. Subsection 12(1)3 of the regulation requires all Conservation Authorities to prepare a "watershed-based resource management strategy" ("the Strategy") in accordance with subsections 12(4) through (9).

Proclaimed provisions within the *Conservation Authorities Act* and accompanying regulations establish a requirement for Transition Plans (including a Program and Service Inventory) and Agreements for Programs and Services (Sections 21.1.1 and 21.1.2 of the Act and Regulation 687/21). The Strategy may include both Category 2 and Category 3 programs and services provided by the CA, where the agreement which provides for the delivery of these programs or services permits the inclusion of these programs or services in the Strategy.

### *Required Components*

Section 12 of the regulation states the document must include:

1. Guiding principles and objectives that inform the design and delivery of a Conservation Authority's mandatory programs and services.
2. A summary of existing technical studies, monitoring programs and other information on the natural resources the authority relies on within its area of jurisdiction or in specific watersheds that directly informs and supports the delivery of the Conservation Authority's mandatory programs and services.
3. A review of the Conservation Authority's mandatory programs and services for the purposes of determining if they comply with the mandatory programs and services regulation. Performing an assessment of the effectiveness of the delivery of Category 1 programs; identifying actions and risk mitigation to address identified issues/risks that limit the effectiveness of delivery. A cost estimate for the implementation of those actions must be included (i.e., supporting Category 1, 2 and/or 3 programs to support mandatory program delivery).
4. The Strategy may include both Category 2 and 3 programs and services provided by the CA, where the agreement which provides for the delivery of these programs or services permits the inclusion of these programs or services in the Strategy.
5. A process for periodic review and updates to the Strategy by the CA, including procedures to consult with stakeholders and the public during these periodic reviews.

The CA is to also consult with stakeholders and the public during the preparation of the strategy in a manner that the authority considers advisable and ensure the document is made publicly available on their websites or by other means the authority considers advisable.

## Conservation Authority Needs

The most recent watershed management strategy was completed in 2015 to implement the recommendations of the Conservation Strategy developed by the community, completed in 2011. While providing important guidance, it does not fully meet the requirements of O. Reg. 686/21.

The 2024 Strategy will meet the future needs of the ABCA by:

- Being a document staff and directors can use in terms of format, content, links to other information, and practical recommendations and action plans. This document can also be a resource for municipalities and other agencies.
- Integrating climate change adaptation and resiliency into watershed management.
- Providing strategic direction by evaluating programs and recommending future programs and services to address watershed and municipal issues.

- Identifying infrastructure needs such as stream gauges, flood forecasting communications, water and erosion control projects, maintenance of existing projects and undertaking new projects.
- Identifying future studies and knowledge needs such as subwatershed studies, inventories, research, stormwater management and subwatershed plans.

## Public Engagement

Staff presented draft sections of the strategy to the board of directors for approval before distributing to the public. The ABCA website was the primary method of public engagement, along with media releases and newsletters. Online surveys were used to solicit feedback. People could receive the survey in alternate formats upon request. Staff communicated directly with Chippewas of Kettle and Stony Point First Nations staff to consider traditional knowledge in the plan.

The Inventory of Programs and Services formed the basis of the future program areas. Municipalities were provided with the inventory early in 2022 during Phase 1 of the Transition Plan and the final inventory was distributed in January 2024.

The final WBRMS will be available on the ABCA website and in alternate formats as requested.

## Strategy Review and Updates

The Watershed-Based Resource Management Strategy is in effect for the 20-year period of 2024-2044.

It is a living reference document that will need to be reviewed and updated periodically based on emerging issues and changes in legislation. At a minimum, the Strategy will be reviewed in conjunction with renewing the Category 2 and 3 municipal agreements.

# INDIGENOUS PEOPLES AND FIRST NATIONS COMMUNITIES

## Introduction

The Ausable Bayfield Conservation Authority acknowledges the original stewards of this land, the Anishinaabeg and the many diverse First Nation and Métis peoples that now call this area home. The ABCA region is part of, and recognizes the Long Woods Treaty (Treaty No. 25) and the Huron Tract Treaty (Treaty No. 29). Reclaiming language and remembering the waters with their proper names, rather than the newcomers' names alone, is important in helping the waters heal and will also help the First Nation people heal as people.

Treaty areas maps and First Nations maps can be accessed at:
https://www.ontario.ca/page/ontario-first-nations-maps

## United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)

***Article 29***

Canada adopted UNDRIP in June 2021, and ABCA is seeking ways to align with UNDRIP, specifically through an understanding of the role that article 29 can play in ABCA's work.

*1. Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources. States shall establish and implement assistance programmes for indigenous peoples for such conservation and protection, without discrimination.*
*2. States shall take effective measures to ensure that no storage or disposal of hazardous materials shall take place in the lands or territories of indigenous peoples without their free, prior and informed consent.*
*3. States shall also take effective measures to ensure, as needed, that programmes for monitoring, maintaining and restoring the health of indigenous peoples, as developed and implemented by the peoples affected by such materials, are duly implemented.*

## Section 35 of The Constitution Act, 1982

***Part II, Rights of the Aboriginal Peoples of Canada***
*35. (1) The existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed.*
*(2) In this Act, "aboriginal peoples of Canada" includes the Indian, Inuit and Métis peoples of Canada.*

In 2021, the Standing Committee on Indigenous and Northern Affairs provided key messages regarding Section 35.

- The Constitution is the supreme law of Canada.
- Canada's Constitution includes the *Constitution Act,* 1867, and the Constitution Act, 1982. It sets out the basic principles of democratic government in Canada, and includes Canada's Charter of Rights and Freedoms.
- Section 35 of the *Constitution Act*, 1982 explicitly recognizes and affirms the existing Aboriginal and treaty rights of the Aboriginal peoples of Canada. Section 35 also indicates that the term "Aboriginal peoples of Canada" includes the First Nation, Inuit and Métis peoples of Canada.
- Further, section 25 of the *Constitution Act,* 1982 protects the Aboriginal and treaty rights that are recognized in section 35 and ensures that no other provision of the Charter can take away or supersede those rights.
- The revised text of the Oath uses wording that aims to mention in a succinct way the broad range of rights applied equally to diverse Indigenous peoples, as described in the *Constitution Act,* 1982.

*Source: https://www.canada.ca/en/immigration-refugees-citizenship/corporate/transparency/committees/inan-jan-28-2021/inan-section-35-consitution-act-1982-background-jan-28-2021.html*

# ABCA MANDATE AND PRIORITIES

## Mandate

The ABCA is an independent, corporate body in Southwestern Ontario on the southeast shores of Lake Huron. Governed by the *Conservation Authorities Act,* the mandate is to ensure the conservation, restoration and responsible management of water, land and natural habitats through programs that balance human, environmental and economic needs.

Conservation authorities operate on a watershed-basis and are formed where the councils of any two or more municipalities in a watershed by resolution request the Minister to call a meeting for the establishment of an authority for the watershed. (R.S.O. 1990, c. C.27, s 2(1). This conservation authority proudly carries the banner of being the first CA formed in Ontario. Municipalities in the Ausable River watershed formed the Ausable River Conservation Authority (ARCA) in 1946 to deal with serious problems of local flooding, soil erosion, habitat loss, water supply, and water quality. The jurisdiction was enlarged to include the Bayfield River drainage basin and Lake Huron shoreline watersheds in 1972 and the organization's name was changed to Ausable Bayfield Conservation Authority. The foresight of these municipalities have benefitted the environment and the community for current and future generations.

The ABCA has 12 member municipalities: Adelaide Metcalfe, Bluewater, Central Huron, Huron East, Lambton Shores, Lucan Biddulph, Middlesex Centre, North Middlesex, Perth South, South Huron, West Perth, and Warwick. These municipalities appoint nine people to the board of directors.

The ABCA's 2,440-square-kilometre area of jurisdiction is largely rural with a population of 45,000 and includes the drainage basins of the Ausable River, Bayfield River, Parkhill Creek, Mud Creek and the gullies between Tower Line in Central Huron and Grand Bend draining directly to Lake Huron.

## *Conservation Authorities Act*

The *Conservation Authorities Act* is administered by the Ministry of Natural Resources and Forestry (MNRF). The Act was originally enacted in 1946, as conservation authorities began to be established, and has undergone amendments since this time. The purpose of the Act is to provide for the organization and delivery of programs and services that further the conservation, restoration, development and management of natural resources in watersheds in Ontario. (2017, c.23, Sched.4, s. 1.) It also outlines the process to establish, fund, dissolve, and amalgamate a conservation authority.

The province made legislative changes in 2019 and 2020 to define the core mandate of conservation authorities, including ABCA:

- Preparing for and managing natural hazards.
- Conserving and managing of lands owned or controlled by a conservation authority, including any interests in land registered on title and maintaining self-directed trails, facilities, and other related amenities.
- Implementing the provincial drinking water source protection program under the *Clean Water Act, 2006.*
- Implementing the provincial stream and groundwater monitoring program.
- Developing a core watershed-based resource management strategy.

The legislation enables the CA to undertake other programs and services on behalf of, or for municipalities through agreements if municipal funding is required. For the ABCA, this includes drinking water risk management official responsibilities, plan review services, subwatershed strategies, research, monitoring, stewardship, restoration, and conservation education.

The ABCA undertakes other environmental programs with the support of user fees, contracts, donations and other sources of funding, without the use of municipal funding.

## Vision and Mission

The vision and mission statements were developed by a diverse group of 34 community members who created the guiding *The Path Forward: Your Community Conservation Strategy for Ausable Bayfield Watersheds (2011)*.

**Mission**: Protect, improve, conserve, and restore the watershed in partnership with the community.

**Vision**: Healthy watersheds where human needs and the needs of the natural environment are in balance.

## Strategic Priorities

Conservation is a shared responsibility and the ABCA has 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.

## Guiding Principles

Guiding principles and objectives inform the design and delivery of the Conservation Authority's mandatory programs and services. (s.12(4) paragraph 1). Guiding principles are intended to be high-level strategic principles or values which establish the fundamental approach to driving the

decision-making for the Authority. These principles will provide the context for the objectives outlined in the Strategy.

1. The conservation, restoration, development, and management of natural resources is best implemented on a watershed basis.
2. The Watershed-Based Resource Management Strategy provides the necessary framework for identifying and assessing resource conditions, trends, risks, and issues and implementing the delivery of programs to manage them.
3. The Watershed-Based Resource Management Strategy informs policy and decision-making by the Conservation Authority, participating municipalities, and other partners.
4. Integrated watershed management is a shared responsibility among Conservation Authorities, municipalities, government agencies and citizens.
5. Integrated watershed management recognizes the cumulative impacts of land use. Actions on the land impact the health and sustainability of natural resources and downstream communities.
6. Integrated watershed management supports sustainable communities by integrating the environment, economy and society issues including health, safety, and sustainability.
7. Resource management decisions are integrated and transparent and take into consideration a broad range of community uses, needs, and values, including ecosystem needs.
8. Water and other natural resources are vital natural assets. They buffer the impacts of climate change, mitigate natural hazards, filter contaminants, assimilate waste, sustain biodiversity, and provide green spaces for recreation, among other community benefits.
9. Climate change has and will continue to have an impact on all aspects of watershed management including floodplain and shoreline management, water quality, aquatic and terrestrial species, development, and human health.
10. Indigenous communities have a unique relationship with the land and its resources. The ABCA recognizes the importance of consulting with Indigenous communities on watershed management initiatives that may affect their Section 35 Aboriginal or treaty rights.

## Objectives

The ABCA promotes an integrated watershed management approach to managing the watersheds based on the cause-effect relationship between human activities and the healthy state of the environment. Climate change effects all objectives.

1. Develop and maintain programs that will protect life and property from natural hazards such as flooding and erosion.

   The ABCA works in partnership with municipalities to protect life and property through programs that minimize or prevent the impact of natural hazards such as flooding and erosion.

2. Ensure rivers, lakes and streams are responsibly managed and restored.

   Based on watersheds, the ABCA has a long history of stewardship of rivers, lakes and streams through watershed-based programs that work with nature to protect, restore and effectively manage water resources.

3. Preserve, protect, and enhance the ecological integrity of the watersheds.

   Water and ecosystems reflect activities that occur on the land. Conservation Authority programs protect, manage and restore woodlands, wetlands and natural habitat and promote watershed stewardship practices. Effective research, monitoring and evaluation will track progress and inform decision-making.

4. Provide opportunities for the public to learn from, enjoy, and respect the watersheds.

   Education programs provide opportunities for citizens to understand and appreciate the value of their local environment as well as the social and economic benefits of conservation. Knowledge of local watersheds and the ways land use activities influence watersheds leads to decision-making and behavior with a conservation lens.

5. Build community partnerships and engagement at all levels.

   Integrated watershed management is a shared responsibility. The ABCA works with the community to enable action leads to protection of life and property, healthy ecosystems, sustainable communities, and a vibrant economy. This includes collaborating with organizations, agencies and various levels of government on projects and services. The ABCA will continue to connect with the Indigenous community on programs, services and projects.

6. Demonstrate organizational excellence and sustainability.

   The ABCA fosters efficient, effective and client-focussed programs and services by engaging employees in a strong culture of collaboration and continuous improvement. The ABCA seeks diverse funding sources and leverages municipal funding with support from other government agencies and self-generated revenue.

7. Mitigate the potential risk to drinking water sources to assist in providing a sustainable and clean water supply for communities and ecosystems.

   Protecting the sources of drinking water is the first barrier to protecting drinking water from contamination. ABCA has special responsibilities as lead source protection authority for delivery of drinking water source protection planning, in the Ausable Bayfield Maitland Valley Source Protection Region, through the *Clean Water Act, 2006*. ABCA has been delegated municipal Risk Management Official duties by several local municipalities.

8. Implement land protection through land acquisition and sound management of lands owned and managed by the ABCA.

   Protecting environmentally important properties through ownership supports integrated watershed management. The lands are important community assets for climate change mitigation, green space, passive recreation, education and overall well-being. Management is guided by the Conservation Lands Strategy, Forest Management Plan and Environmental Farm Plan.

## Relationship with Government and Community

The Ausable River Conservation Authority was formed under the *Conservation Authorities Act* in 1946 through a partnership between the Province of Ontario and local municipalities. It was enlarged to include the Bayfield River watershed and lakeshore tributaries in 1972.

Conserving the watersheds is a shared responsibility. Relationships with government agencies, First Nations communities and stakeholders are essential. The ABCA will look for opportunities to collaborate in a respectful and collegial manner to further its mandate and to assist others to address environmental issues.

The ABCA has responsibilities under two pieces of provincial legislation: *Conservation Authorities Act* and *Clean Water Act.*

Participating municipalities are:

- Township of Adelaide Metcalfe
- Municipality of Bluewater
- Municipality of Central Huron
- Municipality of Huron East
- Municipality of Lambton Shores
- Township of Lucan Biddulph
- Municipality of Middlesex Centre
- Municipality of North Middlesex

- Township of Perth South
- Municipality of South Huron
- Municipality of West Perth
- Township of Warwick

All levels of government may be involved and provide funding to programs that support integrated watershed management. The funding can be for long-standing programs and/or one-off projects such as capital projects. As an established, local organization, the ABCA is a cost-effective way for senior levels of government to meet environmental and community needs.

The portfolios of provincial ministries, such as Ministry of Natural Resources and Forestry (MNRF) and Ministry of Environment, Conservation and Parks (MECP) and federal departments such as Environment and Climate Change, and Fisheries and Oceans, are primarily focussed on the environment. The ABCA has significant partnership agreements to deliver programs that help these senior levels of government achieve their mandates. The agreements can include program delivery, monitoring, research and regulations and can provide significant funding to help undertake work.

Several pieces of provincial and federal legislation have an impact on watershed management and are listed in Appendix 1.

The ABCA is a member of Conservation Ontario and several other environmental organizations. Staff participate in provincial committees and work with other CAs on matters of mutual interest such as the Healthy Lake Huron Regional Initiative. The ABCA partners with several local community-based organizations such as service clubs and agricultural organizations. ABCA also collaborates on research with academic institutions, agri-business, and government.

The Duty to Consult is a statutory and contractual obligation that must be fulfilled by the Crown prior to undertaking actions or making decisions which could adversely affect the rights of Indigenous Peoples in Canada. While the Duty to Consult rests with the Crown, the Crown may delegate the day-to-day procedural aspects of consultations to third parties, such as municipal or CA proponents. The procedural responsibilities may vary from project to project.

Beyond the Duty to Consult process, there are ways for the ABCA and First Nations communities to collaborate with and learn from each other. This may take on different forms based on several factors, such as: community size and capacity, community interests, geography, project scope and funding.

# INTEGRATED WATERSHED MANAGEMENT

## Introduction and Principles

Conservation Authorities rely on an integrated watershed management (IWM) approach to protect water resources and address environmental issues.

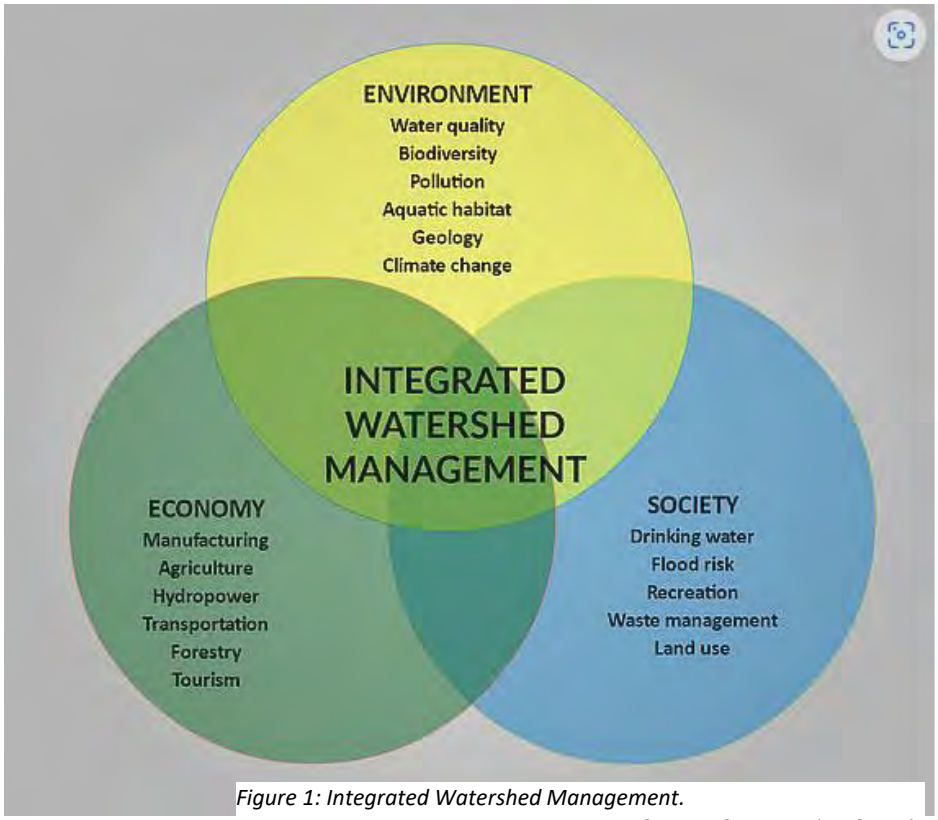



*Figure 1: Integrated Watershed Management.*
*Source: Conservation Ontario*

Everything in a watershed is connected. A watershed is an ecosystem with interacting natural systems such as water, plants, animals, wetlands, moraines and forests. Our actions upstream and on the landscape affect water, soil and people and other living things downstream. Activities on the land impact the health and sustainability of natural resources and how well we can adapt to the impacts of climate change. Upstream activities influence river flows and water quality downstream. Surface and ground water systems have a limited tolerance for stress, and long-term problems can develop that are costly and difficult to fix. Consequently, managing water resources requires a comprehensive approach.

The IWM approach supports sustainable communities by integrating the environment, economy and societal needs, as well as community interests in order to manage water resources sustainably on a watershed basis. Basin managers often need to juggle highly complex interactions between upstream actions and downstream impacts on hydrological and biological processes.

Integrated Watershed Management is based on five principles that align with Conservation Authority watershed plans:

1. Based on a watershed and informed by science.

2. Natural resources and human activities are managed together.
3. The interests and needs of the environment, economy and society are considered. They are connected and impact each other in positive and negative ways.
4. The adaptive management approach establishes a plan, implements the plan, monitors and reports, and then re-evaluates and updates the plan, if necessary.
5. Collaborative governance occurs across many levels for shared decision-making and priority setting.

The IWM approach supports:

- Protecting life and property from natural hazards.
- Protecting and improving water quality and quantity.
- Adapting to climate change, urbanization, and other stressors.
- Protecting drinking water sources.
- Sustainable economic opportunities.
- Resilient biodiversity and habitats.
- Improve quality of life for citizens and communities.

Conservation Authorities have several roles when using an IWM approach:

- Assess local conditions to flag issues and guide strategies through monitoring.
- Facilitators and coordinators who bring diverse multi-stakeholders to the table.
- Source of local science and information.
- Leverage resources.
- Deliver programs locally.
- Provide technical expertise.

## Emerging Concepts in Integrated Watershed Management

Watershed management may be enhanced by applying the following emerging concepts:

- Include the public to increase awareness and foster a conservation ethic, positive behavior, and stewardship activities.
- Improve linkages between ecological health and human health, wellbeing and/or quality of life.
- Improve linkages between hazard land management and the protection of people's financial assets/investments/economic wellbeing.
- Improve people's awareness of their greater watershed communities to associate a relationship with other people in the same drainage system.
- Improve the understanding of linkages between watershed management needs and the impact of individual actions on downstream users.

- Improve coordination between all (or various) management agencies involved in watershed management to better share information, resources and to coordinate activities to pursue comprehensive benefits.
- Improve integration between watershed planning and municipal planning.
- Improve the link between watershed management interests with those expressed by the Province through the Provincial Policy Statement under the Planning Act.

Much of integrated watershed management is about human behaviour. Everyone lives in a watershed. Everyone has an impact on the watershed and the watershed impacts everyone. The result is the public participating in watershed management as valued partners.

## Climate Change Implications

Climate change is overarching and influences life, property, and the watershed resources. Watershed conditions change when hydrologic inputs change. It will be a consideration in all program areas including drinking water source protection, land use planning, natural hazards management, land stewardship actions, watershed planning, and outdoor recreation.

Changes to precipitation patterns, including storm intensity and frequency, temperature patterns (especially as they apply to snow accumulation, winter ice formation, and melt), and wind patterns all influence on-the-ground conditions.

More intense rain events will increase the risk of flash floods. This is particularly true in urban areas where the land is more impervious, and drainage is dependent on local storm sewers and their capacity to handle the event flow and their rate of discharge to local streams. In agricultural areas, the impact of rain events on soil erosion can vary through the year, depending on field residue and crop coverage. More extreme rainfall can lead to increased crop damage. Hydrologic changes can threaten water quality and supply, including drinking water sources. Rising temperatures and changing precipitation patterns reduce river flows, warm surface waters, create more drought conditions and increase the frequency of severe weather.

Less ice cover on Lake Huron can result in greater shoreline erosion at the toe of the bluff which impacts slope stability. This is a threat to life and property.

Changes in watershed conditions can alter ecosystems which will have an impact on habitat. This can result in degraded biodiversity conditions. Everything is inter-connected in an ecosystem and the loss of species can have an impact on other species.

Climate change mitigation and adaptation is integrated into policy, planning, programs, services, and practices. Conservation authority programs assist with climate change adaptation

through actions to manage the risks of climate change impacts. ABCA mitigates climate change with actions to reduce emissions that cause climate change. Nature-based solutions are defined as actions to protect, sustainably manage and restore natural and modified ecosystems. This can be a niche for ABCA in climate mitigation.

The changing climate has global, national, provincial and local implications. The drivers of climate change may be global in nature, and do not recognize political or ecological boundaries, but the impacts effect the local landscape. This requires a collaborative approach at the local level by multiple stakeholders including municipalities and the private sector.

As an organization, the climate will impact ABCA infrastructure, assets, health, safety, resiliency, innovation and growth. The County of Huron Corporate Climate Change Adaptation Plan 2020-2025 provides a template for the ABCA to use.

*Source: https://connectedcountyofhuron.ca/corporate-climate-change-adaptation-plan*

# WATERSHED CONDITIONS

The following is a list of the main watershed conditions that influence local watershed management. Comprehensive information is found in Appendix 2.

The most up-to-date information can be found in Watershed Report Cards, subwatershed plans, annual reports, drinking water source protection watershed characterization documents and other reports as they are produced.

1. A deep layer of sedimentary rock overlaid by unconsolidated material deposited by the Ice Age glaciers forms the foundation of the region.
2. This is a largely rural region with fertile farmland and high livestock density. The majority of the agricultural land has artificial soil drainage. Predominant crops are corn, beans and wheat.
3. The major land uses are 76 percent agriculture, 21 percent natural environment and three percent urban. There are small towns and villages throughout the region with greater development pressure closer to London in the southern part of the region and along the Lake Huron shoreline. The population is about 45,000 people.
4. Ground water flows east to west towards Lake Huron. The shallow aquifer is vulnerable with respect to quality and quantity. The bedrock aquifer has minerals and Sulphur which impact drinking water quality. Lake Huron is the major source of drinking water for the majority of watershed residents.
5. The Lake Huron shoreline is the most actively changing part of the watershed, both the dynamic beaches and bluffs. This ribbon of land is also the area under pressure from residential development and intensification of use.
6. The natural hazards of flooding and erosion are threats to life and property. The total mapped floodplain area is 25,752 hectares. In 2021, 1,640 structures and 225 kilometers of roads were located in the areas identified as floodplain.
7. The local economy and society rely on the natural resources of water and soil. Good quality water and adequate supply (both surface and groundwater) are important for agriculture and humans. Soil health (quality and quantity) is a significant issue for the agricultural industry. Clean water at Lake Huron is important for tourism, commercial fisheries and the economy.
8. Forests are vital to watershed hydrology, stormwater management, water cycle, water quality and low flow augmentation. Current forest cover is about 14 percent. Most watersheds received a poor grade for forest cover in the Watershed Report Card, based on the 2015 aerial photography.
9. Climate change impacts all aspects of watershed management. It is predicted there will be changes in temperature, precipitation, and snow patterns.

10. Provincial policy, official plans, forest conservation bylaws and legislation play important roles in conserving natural resources and protecting life and property from natural hazards.

# CATEGORY 1 PROGRAM REVIEW

## Category 1 programs and services

Category 1 includes mandatory programs and services where the municipal levy could be used without any agreement. The Category 1 review process is a mandatory section of the WBRMS. This was conducted by senior staff using the Inventory of Programs and Services, with the following sections:

- Determine if the program meets the requirements of the CA Act.
- Identify issues and risks that limit program effectiveness.
- Identify actions to address the issues and risks.
- Estimate costs to implement the actions.

The following programs were reviewed:

- Corporate services
- Natural hazards management program
- Provincial water quality and quantity monitoring
- Drain review
- Core watershed-based resource management strategy
- Conservation Authority lands
- Drinking Water Source Protection (Clean Water Act)

## Results

The ABCA is meeting the requirements of the Act and associated regulations. However, issues and risks limit the effectiveness of present and future ABCA programs. Additional details on the future needs are in the Strategy Implementation chapter.

The ABCA has a number of strategic plans and documents to guide the overall watershed management. The 2024 Watershed-Based Resource Management Strategy updates previous documents, integrates new information and provides direction reflecting the changes to the Conservation Authorities Act.

Aging infrastructure will need major maintenance or repairs. This applies to conservation area amenities, flood and erosion control structures, and buildings. All structures are inspected and undergo routine maintenance as required. However, the ABCA needs to be prepared for significant expenses.

Additional stream gauges and an updated hydrology model will aid flood forecasting and warning. Subwatershed plans to address natural hazards will be needed in areas with significant

development. Community-based subwatershed plans will be needed to identify actions to address local environmental issues. Conservation lands need additional funding to restrict prohibited uses through signage, gates and enforcement. The provincial water quality monitoring network measures conditions during baseflow but funding is needed for additional investigations when water quality issues are identified.

Drinking Water Source Protection continues to be an important program to protect drinking water for current and future generations. Provincial funding is critical to provide the capacity to deliver this program.

Funding is a common concern across programs. Costs can increase more than the cost-of-living as new issues, regulations, policies, and projects develop. Provincial and federal investment in Conservation Authorities, (especially natural hazard management), grants, user fees, donations and sponsorships are essential. Reserves will need to be used prudently.

More details on the results of the program review are found in the implementation chapter.

## Financial Forecast

Staff estimated the cost of actions and risk mitigation to specifically address identified issues and risks that limited the effectiveness of delivery. Annual costs are estimated at $374,000. One-time costs are estimated at $885,000.

The ABCA completes a five-year budget forecast each year. The following was approved by the Board of Directors on July 20, 2023.

| **Year** | **2024** | **2025** | **2026** | **2027** | **2028** |
|---|---|---|---|---|---|
| **Revenue** | $5,195,647 | $4,369,941 | $3,781,963 | $3,554,473 | $3,558,190 |
| **Expenses** | $5,359,625 | $4,538,082 | $3,956,685 | $3,739,439 | $3756,737 |
| **Deficit (amortization)** | ($163,978) | ($163,441) | ($174,722) | ($184,966) | (198,547) |

The Board of Directors approves the annual budgets. The Capital Asset Management Plan and Public Section Accounting Board (PSAB) report contains additional information for the authority's assets.

# STRATEGY IMPLEMENTATION

Policies, programs, projects, and services will implement the actions needed to achieve the ABCA mission to protect, improve, conserve and restore the watershed in partnership with the community. Initiatives build on past success and fill the gaps between current programs and what is needed to address the strategic priorities. Effective watershed management requires the ABCA to continuously improve and adapt to emerging issues while being a resilient and vibrant organization.

Watershed management is a shared responsibility. It is important to set priorities within the ABCA's mandate and capacity, which can be carried out in collaboration with government, organizations and the community.

The following four strategic priorities are identified for the ABCA:

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

The programs in this strategy have been identified in the 2023 ABCA Inventory of Programs and Services.

Category 1: Mandatory programs where the municipal levy can be used without an agreement:

- Corporate services
- Natural hazards management program
- Provincial water quality and quantity monitoring
- Drain review
- Core watershed-based resource management strategy
- Conservation Authority lands
- Drinking Water Source Protection (Clean Water Act)

Category 2 and 3 programs are non-mandatory programs that support the Category 1 programs and are important parts of integrated watershed management.

Category 2: Non-mandatory programs and services at the request of a municipality with municipal funding through a Memorandum of Understanding or agreement. The ABCA municipalities with municipal wells have agreements with the ABCA for Risk Management Services.

Category 3: Non-mandatory programs and services that a CA determines are advisable which may use the municipal levy through a Cost Apportioning Agreement (CAA). The CAAs signed with municipalities include:

- Subwatershed plans and projects not related to natural hazards
- Environmental monitoring and research
- Watershed stewardship and restoration
- Conservation education

Category 3 programs that do not require municipal funding support include:

- Lake Huron Regional Initiative
- DWSP Risk Management Officials (Maitland Valley CA municipalities)
- Huron County Sentinel Well Program
- Land acquisition

Program areas have teams of staff and resources charged with implementing the programs and services. Integrated watershed management also requires linkages between program areas to ensure a comprehensive and coordinated approach to conservation.

The following sections provide an overview of the seven program areas for the ABCA.

## Corporate Services – Enabling Services

Corporate services staff provide key assistance to all departments, board of directors, committees, member municipalities and the general public to enable the ABCA to operate in an accountable, efficient and effective manner.

The following services are provided:

- management and direction for the organization
- governance procedures in compliance with the Conservation Authorities Act
- safe and efficient workplace for all staff
- information for the general public
- internal information technology (IT) networking, computer services, data management, records retention
- website and social media management
- details of meetings, agendas and staff reports for board of directors
- administration duties for all board and committee meetings
- overall budget preparation and financial analysis, accounts payable and receivable, administration of reserves and investments, financial reports for funding agencies,

payroll, benefits program administration
- coordinate the Ausable Bayfield Conservation Foundation and the Huron Tract Land Trust Conservancy
- legal expenses related to agreements, contracts and administrative by-law updates
- inform public and municipalities about programs and services
- oversee the development and review of policies, procedures and strategic plans
- meetings with municipalities regarding projects, programs and budgets
- office buildings and workshop to support staff, programs and services
- fleet of vehicles and equipment to support the work of the ABCA including capital purchases, fuel, licenses, repairs and maintenance.

The following actions are needed to address issues and risks.

The ABCA is a dynamic workplace that requires ongoing training for staff to effectively and efficiently offer watershed-based services. An employee recruitment, success and retention strategy will include a plan and funding strategy for training and advancement opportunities for staff.

Building renovations are needed to meet accessibility requirements. The administration centre buildings are approximately 40 years old and may require major maintenance. This will be funded by grants, reserves and municipal funding.

An overall issue is the limited funding available from municipalities because of low population and assessment relative to the size of the watershed and the cost to provide programs and services. Costs can increase more than the cost of living, and new issues, policies and projects can arise, over and above annual programs and services.

## Conservation Lands

The Ausable Bayfield Conservation Authority owns more than 3,600 hectares of land. For the purposes of management, the properties are categorized as conservation areas, wildlife areas, management areas, conservation forests and farmland.

ABCA property is essential to watershed management and environmental protection while providing community greenspace and areas for passive recreation. The natural features of properties owned and managed by ABCA contribute to watershed health. Benefits include forest cover, surface and groundwater protection, low flow augmentation, flood control, fish and wildlife habitat and community well-being. The ABCA owns a significant portion of large woodlots in the watershed.

The land has been purchased for environmental protection but has many community benefits including recreation, education, and scientific research.

Structures include:

- Administration Centre, Annex Office and workshop at Morrison Dam Conservation Area
- a workshop associated with Parkhill Dam
- gatehouse, pavilions, workshop, museum and information centre at Rock Glen Conservation Area
- pavilions, boardwalks, bridges, crossings, and privies at several conservation areas

Conservation land management is guided by the Conservation Lands Strategy (2024). Forest management is guided by a Management Plan. Acquisition and disposition are guided by the Land Acquisition Policy (2022), Land Acquisition Strategy (2022) and Land Disposition Policy (2022).

Property management revenue is generated from user fees, forest health improvement activities, land rent and the Parkhill C.A. campground lease. This revenue contributes towards the cost of property taxes, insurance, risk management inspections and property maintenance. Property management reserves may also be used to support the costs of property management.

Most ABCA land is taxed at a reduced tax rate under the Managed Forest Tax Incentive Program (MFTIP). Taxes are not paid on a small portion of land that qualifies for the Conservation Land Tax Incentive Program (CLTIP). When considering programs that may be applicable to support ABCA's properties, staff assess properties on an individual basis, considering program criteria, the property natural features, and management goals.

The lands owned by ABCA contribute towards watershed conditions, and it proudly offers these lands for passive recreation opportunities for the community. However, a significant amount of financial resources are required for carrying costs which limits the available resources for property management. There is a lack of funding for property stewardship and restoration, passive outdoor recreation opportunities, and effectively restricting prohibited uses through means such as signage, gates and enforcement. There is a minimal amount of infrastructure at conservation areas (pavilions, privies, boardwalks) but these amenities are aging and will require significant funding. Major maintenance is identified in the five-year financial forecast.

The following actions are needed to address the issues and risks:

- Investigate and pursue programs to reduce property taxes (e.g. MFTIP and CLTIP). This will enable funding to support property carrying costs, where properties are eligible, and programs coincide with management goals.

- Dedicate financial resources towards enhanced conservation lands management.
- Re-establish funding towards ABCA agricultural lands stewardship.
- Dedicate resources towards effectively restricting prohibited uses.
- Erect new signage at all properties.
- Erect permanent property markers at regular intervals along property boundaries.
- Install accesses and watercourse crossings to facilitate operations at conservation lands properties.
- Pursue external funding opportunities for enhanced management.

Not completing these actions presents the risk of prohibited uses, trespass, encroachment, and other ecological threats such as invasive species, that may limit the effectiveness of conservation lands to support watershed conditions.

## Drinking Water Source Protection

The *Clean Water Act* was passed in October 2006 with the goal of developing and implementing Source Protection Plans that set out policies for the protection of municipal drinking water supplies. The ABCA is the lead for Source Protection Region that includes the watersheds of the Ausable Bayfield and Maitland Valley Conservation Authorities. The Source Protection Plans created by the local Source Protection Committee (SPC) for the Ausable Bayfield Maitland Valley Region were approved by the Minister of the Environment and Climate Change took effect in 2015.

Support for implementing bodies continues to be provided in the form of regular meetings, training sessions, workshops, videos, data and its management, risk management services, and planning review. Continual outreach is offered to affected landowners or lease holders, consultants, real estate agents, certified crop advisors and implementing bodies to ensure understanding of plan policies.

Annual provincial funding for the project commenced in 2004. The current budget maintains the current levels of staffing. The province has a Transfer Payment arrangement with the lead Source Protection Authority (ABCA) to facilitate the financial aspects of this project. The province has stated a commitment to Source Protection funding. The staffing complement includes DWSP Co-Supervisors, GIS/Data Specialist, Communication Specialist and Planning support.

Drinking Water Source Protection is a Category 1 program. The Risk Management Services is a Category 2 program with three ABCA member municipalities: Huron East, Bluewater, and Central Huron. The Risk Management Service is required under Part IV of the *Clean Water Act, 2006*.

## Education and Outreach

Education and outreach are included in and support all programs. The ABCA provides high quality, local conservation education experiences for local schools, community organizations, special events, public meetings, and open houses. These programs take on many forms including presentations, demonstrations, and field studies.

A variety of communications methods are used, depending on the issue and the audience. Increasingly, social media, webinars, videos, virtual meetings and presentations, and websites are used to reach a wider audience in a cost-effective and timely manner. The website includes information on ABCA programs and services, and local environmental information. News releases and the ABCA newsletter are important methods of reaching the public.

The public is engaged about projects and strategic plans by the means appropriate for the initiative. This process is an opportunity to provide information and receive public feedback.

Staff are involved with community-based committees and work closely with other ABCA departments to deliver watershed-based environmental messaging for on-the-ground projects. The ABCA is the main source of local environmental information.

Funding for education and outreach activities comes from several sources: provincial and federal programs, municipalities, user fees, donations, foundations, and other fundraising initiatives.

## Healthy Watersheds Program

The Healthy Watersheds Program objectives are:

- To improve understanding of the watershed and its response to human and natural environmental stressors and improvements, through community-based monitoring and research. This information will be used to support informed decision-making.
- Support community efforts to be informed and take conservation actions.

The work to improve flooding, erosion, water quality and biodiversity issues is done with the community in a watershed context. The Healthy Watershed program was developed to support the Ausable Bayfield programs by:

- Listening to the community when they have environmental concerns and redirecting their energy to positive and productive actions**.**
- Supporting actions to save and replant (seed) natural areas that generate less water and stewardship efforts that avoid the generation of water, control water movement, and trap and treat water from working and lived-on landscapes. This is the stewardship program at ABCA.

- Monitoring the effectiveness of what we are doing in a tiered approach, including baseline and more comprehensive monitoring to determine if the actions we are taking are helpful.
- Supporting peer-to-peer learning opportunities such as demonstration sites, workshops and other conservation education through children (traditionally education programs) and both formal (e.g., Ask a Biologist Events) and informal (e.g., talking with people as we are water sampling) outreach.
- Continuing to engage the community, take the action, monitor our efforts, etc. in an adaptive management framework.


### *Monitoring*

Watershed monitoring is important. Environmental issues are mostly a result of cumulative effects. It is typically not one practice, or one incident that is causing environmental issues. Individual actions are contributing to the downstream conditions. Cumulative effects of land use and land management decisions may only be noticed in downstream waterways. Monitoring water quality and quantity helps measure the cumulative effects of the natural conditions of the watershed (e.g., soil, topography, climate) and the land use and management decisions. The community-supported Healthy Watershed monitoring program is comprised of baseline monitoring, biodiversity monitoring and research.

Baseline monitoring completed with programs such as the Provincial Water Quality Monitoring Network (PWQMN) helps water management agencies identify emerging issues. A two-pronged approach to monitoring is helpful. Results from the PWQMN can point to an original problem but more comprehensive monitoring, research and data analyses can substantiate the source of the contamination and support recommendations.

The Provincial Groundwater Monitoring Network, Provincial Water Quality Monitoring Network and Integrated Water and Climate Monitoring Station are Category 1 programs.

Groundwater Monitoring

ABCA and the Ministry of the Environment, Conservation and Parks (MECP) established 16 long-term groundwater monitoring stations in 2002. These stations continue to be in place, at which ABCA staff collect water quality and water level data. MECP funded the network installation and first round of water quality analysis. Through recent revisions to the ABCA/MECP agreement, the MECP subsidizes equipment repair costs and water quality analysis costs. The ABCA funds annual microbiology water sampling analysis as well as data collection.

Surface Water Monitoring

The Surface Water Quality Monitoring Program is a joint initiative between the ABCA and the MECP. Through the PWQMN, MECP funds shipping and chemical analyses of approximately 35 indicators at five stations and nine indicators at four stations. The PWQMN was initiated in the 1960's by the MECP and some of the nine stations within the ABCA jurisdiction are original stations.

Integrated Water and Climate Monitoring Station

In 2011, the Parkhill Creek watershed was selected for the installation of an integrated climate and water monitoring station. Provincial partners contributed over $100,000 towards the purchase of meteorological, groundwater, soil, and water quality sensors and the construction of the station. The data has been used by the MECP and University of Guelph and supports the Flood Forecasting and Warning, Low Water Response, and Water Quality Monitoring programs.

The MECP funds water quality samples, repairs and equipment replacements at the site. It is expected MECP will continue to contribute to funding.

Other community supported baseline programs include enhanced monitoring, benthic monitoring program and community lakeshore monitoring.

Enhanced Water Quality Monitoring

The ABCA and MECP fund the PWQMN. In 2002, the ABCA added nine water quality stations where six chemical indicators are analyzed.

The ABCA funds the *Escherichia coli* (*E. coli)* analyses at the nine PWQMN stations and nine enhanced stations. This indicator is an important determinant of contamination. Collecting *E. coli* information enables the ABCA to produce Conservation Ontario Watershed Report Cards. The expanded number of sampling locations means that Watershed Report Cards can be completed for more sub-basins. This is important as a local backyard creek is more manageable to a community or person than the general environment. The additional stations also provide more current information to support other programs such as the Watershed-Based Resource Management Strategy review process.

Data collected through these programs and the analyses provide science-based evaluations of the state of the environment.

Benthic Monitoring

The number and diversity of invertebrate animals living in the stream bed materials is a cost-effective way of assessing stream health and water quality. In 2000, the ABCA established a long-term program whereby 30 sites within the watershed are monitored on a biannual schedule (15 per year). This information for reporting on the status of water quality is according to Conservation Ontario Watershed Report Card protocols.

Lake Huron Monitoring

Water quality monitoring at local beaches is focused on bacterial *E. coli* concentrations in water used for recreational activities such as swimming. *E. coli* are fecal coliform bacteria that normally live in the intestines of healthy people and animals. Most strains of *E. coli* do not cause disease, but there are many potential disease-causing organisms (i.e., pathogens) associated with fecal contamination (https://www.lakehuron.ca/waterquality). It would be nearly impossible to test for every possible pathogen in a water sample, so the presence of *E. coli*, especially at elevated levels, is used as an indicator that disease-causing bacteria may be present (https://www.lakehuron.ca/waterquality). Sources of *E. coli* include faulty septic systems, stormwater runoff from urban or agricultural areas, wild or domestic animals, or discharged sewage.

The Bluewater Shoreline Residents' Association (BSRA) is an umbrella organization for several lakeshore associations in the Municipality of Bluewater. The BSRA and its member associations have been working on solutions to water quality issues in the Municipality of Bluewater and Huron County since 1996. In 2006, the BSRA formed a partnership with the ABCA to undertake water quality monitoring in four ravines that enter Lake Huron from the Municipality of Bluewater. Prior to 2006, the BSRA had conducted water quality testing in some of the ravines along the lakeshore. In 2007, the BSRA requested that the ABCA also monitor water quality in the lake near the outlets of the four ravines. Since 2014, the ABCA has monitored water quality in five ravines and adjacent lake locations, with two of the locations outside of the jurisdiction of the Municipality of Bluewater.

Biodiversity Monitoring

In collaboration with the local community, municipalities, other conservation authorities and provincial and federal agencies, staff monitor biodiversity and research the connections between land use, land management and ecosystem outcomes. The Ausable and Bayfield River Stewardship and Monitoring for Species at Risk program, supported by more regional level organizations, is an example.

It is also important to have site scale information about natural heritage features, particularly from the biodiversity perspective. Biomonitoring for more vulnerable and invasive species leads to making more informed management decisions, such as where to position wastewater treatment outlets. ABCA works with more regional partners to report in a consistent way about natural heritage features such as upland woodlots, floodplain natural areas, groundwater recharge areas as evidenced by Brook Trout populations.

### *Research*

Watersheds are the systems approach that work best for evaluation. Sub-watershed studies conducted north of Bayfield (i.e., Watershed Best Management Practice Evaluation) indicated that some management decisions (i.e., cover crops, minimal tillage) were not easily measured at the edge of a field (https://www.abca.ca/community/cropscreeks/ ). The ABCA partnered with University of Guelph researchers to run ecosystem models. The models help to show the downstream and cumulative effects of management decisions.

Monitoring and evaluation are very important when some practices have contradictory impacts. For instance, a grass filter strip might reduce total suspended solids and phosphorus concentrations but have negligible effects on nitrate concentrations. Over-wintering cover crops might introduce more nitrate into runoff. Or some activities might improve soil conditions and reduce surface runoff, such as tile drainage. However, the shear volume of water leaving a field through the tile drainage system may offset these gains for transporting agricultural nutrients (nitrogen and phosphorous), particularly in the erosion of downstream channels. This leaves little change in the net impact agricultural lands have in contributing to eutrophication of surface water receptors.

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? 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 and 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.

### *Monitoring Gaps*

At 10 to 15 percent of the landscape, it may not be feasible to expect natural areas to mitigate the impacts from the 80 to 90 percent of the landscape that is highly developed for agriculture and urban areas. ABCA monitoring approaches can be enhanced with:

1) Different indicators that:

a. reflect the landscape, such as percentage of over winter conditions (i.e., bare-ground, vegetative cover, ploughed fields, etc.), tile-drained fields, enclosed stream length, urban wastewater treatment plant efficacy, etc.,
b. might be more responsive to subtle landscape changes,
c. might help to separate changes in climate from weather variability, and
d. use soil health as a part of a watershed evaluation framework.

2) Different monitoring approaches and potentially more detailed understanding of some important natural areas, or more understanding of hydrologic indicators, such as changes in runoff conditions over time or having stations where substrate particle size is tracked or channel cross sections as potential indicators.

Healthy Watersheds staff are reviewing existing monitoring programs to address network gaps and develop indicators of landscape resiliency that have more explicit, measurable outcomes to land use and management actions.

### *Community Support*

Staff work with communities along Lake Huron and within watersheds of the Bayfield and Ausable Rivers and Lake Huron tributaries. Staff also partner with other agencies to support education and outreach, community actions and monitoring in the ABCA jurisdiction and beyond.

Initiatives include workshops, tabloids, brochures, postcards, sub-watershed studies and a Watershed Report Card summarizing water quality and forest condition information. An agriculture best management practices verification study has helped to identify important approaches to land management.

Watershed community-based studies guide actions at the micro-scale at Huronview Demonstration Farm, Turnbull Drain, and Zurich Drain to watersheds including Gully Creek, Ausable River Recovery, and the Friends of the Bayfield River which has morphed into various Bayfield-area community groups. Many communities have re-directed their environmental concerns to watershed or mini-watershed community plans. There have been community plans in the Bayfield North, Main Bayfield, Bayfield Headwaters, South Gullies, Little Ausable, Old Ausable Channel, Nairn Creek, and Mud Creek watersheds. There are ongoing relationships and opportunities for watershed improvement in these areas. It can be anticipated that with ongoing development, other communities may want to undertake watershed projects in areas that are currently under-represented.

Healthy Lake Huron and the Lake Huron Georgian Bay Community Action Initiative are examples of provincial and federal level organizations supporting community watershed-based approaches, across the Lake Huron Georgian Bay watershed to address broader scale

ecosystem issues. Staff support other non-governmental organizations with ideas around community-based watershed plans. It is helpful to share lessons learned about watershed conservation with agencies that have broader geographic scopes.

Funds provided to this program support water quality collection and analyses and ecosystem-based partnerships. The program helps the community to work towards maintaining or improving water quality in watercourses and Lake Huron.

### *Outcome*

The ABCA is committed to building relationships with partners and achieving a remarkable balance of agricultural output combined with measured ecosystem resilience across this part of the southeast shores of Lake Huron. This is done by creating more knowledgeable communities that feel connected across the landscape. ABCA works with local community groups, businesses, and governments to publicize the multiple benefits of nature-based solutions. Monitoring, research, and outreach on a watershed basis with community support helps to maintain and improve watercourses and Lake Huron.

## Water and Planning - Natural Hazards Program

Conservation Authorities (CAs) are the lead provincial agencies on natural hazard issues. The goal is to protect life and property from flooding and erosion. This program includes development applications and permits, municipal plan input and review, environmental planning and policy, flood forecast and warning, flood and erosion control infrastructure, technical studies, policy review, ice management, education and public awareness.

Natural hazards messaging can also include other components of integrated watershed management such as stewardship. Education programs inform children and adults about watersheds management and natural hazards.

The total mapped floodplain area is 25,752 hectares. In 2021, there were 1,640 structures located in the areas identified as floodplain, and 225 kilometers of roads.

The total regulated area is 49,566 hectares. The regulation area includes all natural hazards related to flooding, erosion, unstable slopes, unstable soils, sinkholes, wetlands and wetland allowances (30 or 120 m) with already developed areas removed from the allowance in Port Franks area. Along the Lake Huron shoreline, the hazards are flooding, erosion and dynamic beaches.

Several ABCA programs and services contribute to protecting people and property from flooding and erosion. The ABCA works with landowners and municipalities to implement nature-based solutions to protect, sustainably manage, restore natural and modified

ecosystems to provide both human well-being and ecological benefits. Watershed stewardship and restoration projects have a positive impact on stormwater management by reducing peak flows, storing flood waters, reducing erosion, and naturalizing hazardous lands.

Subwatershed plans and projects focus on smaller drainage areas and address natural hazard issues and recommends mitigation impacts from potential future land uses. The ABCA also facilitates community-based solutions to natural hazards using information on current watershed conditions and identifying measures to protect, conserve and restore the watershed.

Conservation Authority properties protect floodplains and erosion-prone lands. This provides benefits at the site and for downstream landowners. When necessary, these areas are restored to future improve their resiliency to flooding and erosion.

### *Flood Plain Management Program*

The program has four main components.

Erosion Control Projects

ABCA was involved in the construction of major erosion control projects in several municipalities and annually inspect and have routine maintenance work completed. Independent contractors are used as required. There are agreements with municipalities for most of the structures for sharing costs and work is eligible for a grant from MNRF. Projects include Bayfield River - Tuckersmith, Grand Bend Areas A, B, C, E, and N1, Nairn Cemetery, Stewart Gully, Port Franks Plan 41, Port Franks River Management, Exeter Dam Gabions, Kingsmere Gully, Pergel Gully, Lucan Benn Drain (inactive), Bayfield Long Hill Road (inactive) and Walker Drain. The following municipalities share in project costs based on a historic cost sharing formula - Lambton Shores, North Middlesex, South Huron, and Huron East.

The current program helps ensure maintenance issues are identified and repaired in timely fashion. However, infrastructure is aging and may pose significant liability in the future. Intensive inspections by an external consultant are recommended. An increase in the reserves is warranted. Funding from the province is limited and there is increased competition for those funds.

Flood Control Projects

Seven flood control projects constructed by or through the ABCA are annually inspected and have routine maintenance work completed by ABCA staff or independent contractors as required. There are agreements with municipalities for most of the structures for sharing of the costs for this program and work is eligible for a grant from MNRF. The main projects include Morrison Dam, Parkhill Dam, Mud Creek Cleanout, Seaforth Flood Control Channel, Cameron-Gillies Flood Relief Channel and Ausable River Cut. The following municipalities share in project

costs based on historic cost sharing formula: Lambton Shores, North Middlesex, South Huron, and Huron East.

Similar to erosion control projects, the flood control projects are aging and may require major maintenance or refurbishment in the future to continue to protect life and property from flooding hazards. Intensive inspections by an external consultant are recommended.

Flood Forecasting and Warning

This program includes:

- Shared maintenance costs on the stream gauge monitoring network. MNRF and Environment Canada directly support the maintenance costs associated with nine of the stations in our watershed at a cost of $10,500 per year per station under the Canada Ontario Cost Share Agreement. The ABCA operates three other stations outside of this agreement.
- Collecting snow accumulation data over the winter.
- River level monitoring during high water events.
- Data collection and archiving.
- Assessing watershed conditions for flood potential.
- Advising local municipalities of flood potential with appropriate messages or warnings.
- Providing technical advice to municipalities on flooding issues.
- Stimulating flood emergency planning.

The ABCA flood forecasting and warning system would benefit from a new gauge station in the Bannockburn River watershed and one in the Nairn Creek watershed. This would increase forecasting abilities in important subwatersheds which have an impact on the Bayfield River watershed and Ausable River watershed respectively.

Studies and projects inform natural hazards management programs and will require updating: mapping, plans such as the Shoreline Management Plan, and watershed hydrology model. ABCA policies will need to be reviewed with updates to the Conservation Authorities Act and the local regulation.

Similar to the flood and erosion control structures, the flood forecasting and warning system gauges, software and technology are aging. Funding is a significant issue which requires a reserve fund for the gauging system, renewed commitment from the province, and increased contributions by the municipalities to ensure the system can continue to protect people from flooding.

Port Franks Ice Management Program

This program creates an annual record of the Ausable River Cut channel configuration in Port Franks.

### *Planning and Regulations*

Conservation Authorities are the lead provincial agencies on natural hazard issues. Revenue for this program is generated through application review fees, a limited provincial grant and through the municipal levy.

Municipal Plan Input and Review Programs

The ABCA has (as have all Conservation Authorities) been delegated by the Province, the responsibility to provide planning and development comments relating to natural hazard matters relating to Section 3.1 of the Provincial Policy Statement, 2020 (PPS). The Authority provides these comments when a Planning Act application is being considered. Municipalities are required to solicit comments from their respective Conservation Authorities when considering such proposals.

Under this program, the Authority also provides a valuable consulting service to watershed residents. At the request of residents, lawyers, etc., the Authority will outline concerns with a property (i.e., regulated areas), any outstanding violations, and history with specific properties, etc. This service is an important vehicle to inform landowners of natural hazard concerns or natural heritage features of their properties.

Ontario Regulation 147/06 Program

The Authority regulates naturally hazardous lands under Ontario Regulation 147/06. This means that a landowner may need ABCA permission to undertake certain activities on the land.

In a regulated area, a proponent may require prior written permission to build a structure, addition, perform general site alterations or work within a watercourse, etc. In addition to issuing permits, the Authority enforces its regulations in those instances where work is performed prior to a permit being issued.

Increased funding is required, especially for enforcing issues of provincial concern. The Act has limitations which limits powers to protect life and property from natural hazards.

Drain Review and Fisheries

Under Ontario Regulation 147/06, staff review the maintenance of municipal drains completed under Section 74 of the *Drainage Act* following the *Drainage Act* and CA Section 28 Regulations Team (DART) Protocol. Standard Compliance Requirements (SCRs) are issued with consideration of the hazards of flooding and erosion for a wide range of maintenance activities. Where a

maintenance activity may not meet the conditions of a SCR, a more formal permit for the work may be required.

For newly constructed drains *(Drainage Act S.4)*, or Improvements to Existing Drains *(Drainage Act S.78)*, staff review and provide clearance letters for the majority of the works. Some activities, such as drain enclosures (stated in policy) will require a permit issued through Ontario Reg. 147/06. Staff review all S.4 and S.78 projects with regards to the primary hazards of flooding and erosion and consider impacts to wetlands, soil conservation, hydrological impacts, and coastal processes on local watershed properties.

Increased funding is needed to implement best practices for maintenance, construction and enclosures. There is a plan to increase communication and outreach with drainage experts. The ABCA will liaise closely with member municipalities.

### *Low Water Response*

The Provincial Low Water Response Program was created as a result of drought conditions and provides guidance for the local response to drought related issues.

The ABCA created a Low Water Response Team (WRT) in accordance with guidelines contained within the Provincial Low Water Response Program. The committee provides direction for the response to drought conditions as they occur. The activity level of the WRT varies by year and is driven by watershed conditions. The committee issues low water advisories when there are higher stresses on water resources, including surface water in watercourses and Lake Huron and groundwater in aquifers.

In addition to ABCA monitoring stations, approximately 20 volunteer rain gauge readers provide valuable information on the extent and amount of precipitation received in the watershed.

Work is also ongoing in relation to better defining the water uses within the watershed area and effective methods of promoting water conservation. This program has historically been funded by both ABCA and through grants from the MNRF but there has been no provincial funding since 2019.

## Watershed Stewardship, Restoration and Forestry

The private land stewardship program is conservation in action with immediate and long-term positive impacts in the watershed for landowners, municipalities, and society. Stewardship helps improve and protect water quality and quantity, forest conditions, biodiversity and makes the watersheds more resilient to climate change.

The nature-based solutions protect, sustainably manage, and restore natural and modified ecosystems to provide both human well-being and ecological benefits. Watershed stewardship

and restoration projects have a positive impact on stormwater management by reducing peak flows, storing flood waters, reducing erosion, and naturalizing hazardous lands.

The program has three key components: one-on-one technical assistance to watershed landowners; connecting landowners with cost-share funding to subsidize project costs; and the tree planting program. Each year more than 100 projects are completed in the watershed with the help of ABCA staff. The watershed benefits from the projects done over the past several decades and continuing the strong presence in the community helps protect the watershed for future generations.

The tree planting program is a significant component of private land stewardship, engaging over 200 landowners across the watershed, planting over 50,000 trees annually. Projects completed through the program include treed windbreaks, watercourse buffers and reforestation. The program provides a wide range of services including technical advice, tree sales, planting and tending. User fees for these services support the program.

The stewardship program and environmental monitoring program work in conjunction with each other to support the needs of the community and the environment. Monitoring helps the understanding of integrated watershed management and best management practices (BMPs), which supports effective project implementation through the stewardship program. Monitoring, such as species at risk fish and mussel surveys, may qualify areas of the watershed for additional stewardship funding, further supporting the needs of the community and the needs of the environment.

An important role of stewardship staff is securing funding from external programs to support projects undertaken by watershed landowners and community groups. This involves preparing funding proposals, providing input and support to local programs, and reporting on success. Some financial incentive programs provide funding to cover program delivery.

Less than ten percent of the stewardship department budget is from the municipal levy. The remainder is from user fees and external sources of program funding such as the provincial federal and municipal governments, foundations and other agencies.

# APPENDIX 1: LEGISLATION

Several pieces of provincial and federal legislation have an impact on watershed management.

## Water-Related Federal Legislation

- Clean Water Act
- Canadian Environmental Protection Act
- Environmental Contaminants Act
- International River Improvement Act
- International Boundary Waters Treaty Act
- Fisheries Act
- Navigable Waters Protection Act

## Water-Related Provincial Legislation

- Ontario Water Resources Act
- Environmental Assessment Act
- Environmental Protection Act
- Conservation Authorities Act
- Lakes and Rivers Improvement Act
- Public Lands Act
- Beds of Navigable Waters Act
- Aggregate Resources Act
- Clean Water Act
- Planning Act
- Municipal Act
- Public Utilities Act
- Drainage Act
- Nutrient Management Act
- Pesticides Act
- Public Lands Act
- Safe Drinking Water Act
- Water Opportunities Act

*Source: Watershed Management Futures for Ontario – Conservation Ontario Whitepaper*

# APPENDIX 2: WATERSHED CONDITIONS

## Geological Setting

*Source: Ausable Bayfield and Maitland Valley Partnership Watershed Characterization*

A deep layer of sedimentary rock overlaid by unconsolidated material deposited by the Ice Age glaciers forms the foundation of the region.

### *Bedrock Geology*

The Palaeozoic sedimentary rock formations underlying the area are approximately one kilometre deep. The bedrock tilts gently southwest from the Dundalk Dome northeast of the region. The tilt exposes the strata at the bedrock surface in sequence from oldest in the northeast to youngest in the southeast with occasional windows revealing the underlying stratum. Water-yielding capacities rate as very good for the Bass Island unit, excellent for the Bois Blanc unit, very good for the Detroit River Group, very good for the Dundee unit, and fair for the Hamilton Group. The Huron Groundwater Study rates the Lucas Formation of the Detroit River Group generally highest yielding (International Water Consultants et al. 2003).

Numerous pre-glacial river valleys interrupt the gentle lakeward slope of the bedrock surface. A rise occurs near Arkona and a valley extends from Parkhill southeast to Lake Erie. Bedrock exposures are few. Occasionally, stream courses have cut through the surficial deposits, e.g., at Rock Glen in the Ausable Gorge. Sinkholes occur in the upper Ausable and Bayfield watersheds. Bedrock also surfaces near Thedford in the Ausable watershed.

### *Quaternary Geology*

The overburden that covers the bedrock is unconsolidated sediments deposited during the Quaternary Period. It includes the Pleistocene (Ice Age) and Holocene (Recent) epochs. In the planning region, the glaciers of the most recent Pleistocene stage, the Wisconsian, largely obliterated effects of earlier stages and shaped today's land surface. They left a fine till base for much of the region and a loamier till in the northeast. Coarse textured ice contact stratified drift is also more common in the north.

Melt waters deposited a web of glacial sand and gravel spillways, a delta under Hay Swamp, as well as several coarse-textured eskers. Glacial lake ancestors of Lake Huron extended across the western and southern parts of the planning region where they deposited beach sands and gravels at shorelines and clay and silt in the deeper areas. More recently, wind-blown fine sands have formed dunes, floodplains collected alluvial sediments and organic soils developed from decomposed plant material.

The overburden thickness generally deepens to the west, exceeding 60 m in the Wyoming Moraine near Bayfield. The depth decreases to less than 10 metres from the Ausable gorge west through Thedford to Port Franks.

Elma Till of silt, sandy silt and clayey silt is the oldest till in the region and surfaces in the east part of the region. The more recent Rannoch Till, a stonier silt to silty clay till, covers the central part. The most recent silt to silty clay St. Joseph Till covers the Rannoch Till near the shore and forms the Wyoming Moraine and shore bluffs. The more resistant Rannoch Till below helps to stabilize much of the shoreline. Fine sediments from eroded bluffs are deposited offshore; sands travel south along the shore to form beaches, dunes and bars. Sand and gravel beaches from the glacial Lake Warren parallel today's shore. Beaches from the later Lakes Nipissing and Algonquin have eroded away at the bluffs to become the sand of the Pinery dunes and beaches.

## Watershed Landscape Before European Contact

Past land uses for society and the economy have permanently altered the landscape so much that re-establishing the original landscape is largely impossible. However, knowing the landscape as it functioned before major human intervention provides a template for ecological restoration work.

The major on-going landscape formation was, as today, the eroding of the Lake Huron bluffs north of Grand Bend and the deposition in the southern beaches. This process over thousands of years created a successional sequence of communities in the dunes area from the beach to the inland extent of the dunes. The climax community on the inland side was dry oak/pine savannah.

Most of the rest of the watershed was thicker forest. Upland forest covered about 80 percent of the watersheds – largely mesic communities of maple/beech forests with subdominant species such as hickory, birch, ironwood, hemlock and white pine. Lowland forests included species such as willow, ash, elm and in some deeper organic soils, tamarack.

The southern half of the watershed is in the Carolinian zone, the most species-rich zone of Canada. The northern portion is in the Great Lakes-St. Lawrence Forest Region.

Open meadow and marsh areas were rare and tended to be small. The major exception was the very large marsh and shallow lake complex inland of the dunes. This area was a flood water retention area for the Ausable River watershed and was probably fertilized by sediment deposited from flood waters. It is also close to the Lake Huron migration corridor and in a region of southern Ontario otherwise very low in marsh area, was likely particularly significant for migratory waterfowl.

In pre-settlement times, the river systems had no dams and likely had more tributaries than today. There was much more cold-water habitat maintained by the effects of the forest cover and pre-dating the extensive artificial drainage of the watershed. The other major difference from the present was the course of the lower Ausable River. It flowed north past the marshes to the present-day community of Grand Bend, made the grand bend to turn abruptly south, flowing in a trough through the dune system to outlet near the current Mud Creek outlet (south of the current Ausable Cut outlet). It was a very deep river mouth with stable banks.

River bank erosion was likely significant in the highly meandering areas of the Ausable and Bayfield Rivers tin order to create the meanders and oxbows evident today. Elsewhere soil erosion was minimal due to the complete ground cover.

Fire and flood were the two main disturbances. Flooding was essential to maintain the marsh community; fire maintained the oak savannah community. For most of the area, however, natural disturbances were likely usually smaller and scarce such as tree falls from snow, sleet and wind which also helped maintain species diversity and ecosystem stability.

*Source: ABCA Watershed Management Strategy, 1995.*

## Current Land Uses

The watersheds are rural in nature, and the landscape provides the foundation for a large part of the economy. Agriculture is the dominant land use with cash crops and livestock operations. Businesses that support agriculture are also an important part of the economy, including cash crop processing, equipment suppliers and crop input suppliers. Tourism is an important part of the economy, especially along the Lake Huron shoreline.

Manufacturing, service business and government are economic drivers but are largely situated in or near urban areas. Small towns and villages are throughout the region with a ribbon of residential development along the Lake Huron shoreline.

The major land uses are: 76 percent agriculture, 21 percent natural environment and three percent urban.

| Watershed | Agriculture | Natural | Urban |
|---|---|---|---|
| **Ausable** | 75 % | 23 % | 3 % |
| **Bayfield** | 80 % | 17 % | 3 % |
| **Parkhill** | 76 % | 22 % | 2 % |
| **Gullies** | 75 % | 20 % | 5 % |
| **Mud** | 65 % | 33 % | 2 % |
| **TOTAL** | 76 % | 21 % | 3 % |

## Hydrology

Physiography, topography and soils are interrelated factors affecting a watershed's surface hydrology. Rainfall easily infiltrates the coarse textured deposits of kame moraines, eskers and spillways and, as groundwater, steadily discharges from these units to maintain stream flows. Rainfall on clay till, both plains and moraines, however, tends to flow over the surface to generate spikes of flow during storms but little on-going base flow. The coarse textured units increase northward in the planning region, as do the base flows and incidence of cold water streams. The discussion uses a watershed-based format to make the links of physiography, topography and soils with surface hydrology. The main watersheds are Ausable River, Bayfield River, and lakeshore streams and gullies. Further information on watershed hydrology is listed in the Conceptual Water Budget for the Ausable Bayfield Maitland Valley Source Protection Region.

### *Ausable River*

The basin includes the watersheds of the Ausable River, Parkhill Creek, Mud Creek and Dune area. The total area is 1233 $km^2$ in the shape of a broad J. The Ausable takes its name from the shifting sands at its mouth. The Ausable River begins near Staffa and flows south to Ailsa Craig where it makes a wide arc to the west. The main tributaries include Black Creek, the Little Ausable River and Nairn Creek.

#### Physiography

The watershed is shaped by J-shaped till moraine ridges flanking plains of fine till. Glacial meltwater deposited the spillway skirting the Seaforth Moraine and formed a large outwash delta under today's Hay Swamp. Glacial lakes accumulated sand and clay plains over till and left linear beach remnants. Lake Huron eroded sand from shore bluffs to the north and deposited it to form the southern sand plain where lake winds shaped the extensive dune system that sheltered a large lagoon. Natural processes of coastal erosion and accretion continue today.

#### Topography

Ausable's till plains are almost level. The moraines are more rolling but rarely more than gently sloping. The steepest slopes occur where streams dissect moraines, most notably the Ausable Gorge. The sand dunes of the Port Franks-Pinery area also have steep slopes.

#### Soils

The clay soils of the till plain and moraines are mainly Huron/Perth/Brookston series, and are high capability soils for agriculture. Imperfectly drained Perth and poorly drained Brookston dominate on more level areas; well drained Huron occurs on the moraine slopes. Soils in some spillway areas have developed on sands. The glacio-lacustrine clays extending up the river

valley form the high capability Brantford/Beverly/Toledo catena. Heavy and wet Blackwell clay with thinning patches of muck sits on the old lagoon bed. The dunes are low fertility and low moisture holding sands. Much of the basin rates a severe water erosion risk given the soils and intensive land use.

Surface Hydrology

The Ausable River is 145 km long. The main stem and its major tributary, the Little Ausable, are both directed by the parallel moraines, both following the spillway pattern of their much larger post-glacial river ancestors, and both generally oriented in a J shape. Most tributaries enter from the outside of the J and tend to form short fan patterns as they flow off the moraine divide. When the Ausable finally breaches the broad Wyoming Moraine, it carves a gorge about 40 meters deep, exposing fossil-bearing deposits. The river emerges first onto the sand plain of glacial Lake Warren, then down the Algonquin beach to the lagoon bed flats.

Before 1872, the river meandered northward through the flats to today's Grand Bend where, within sight of the lake, it made a "grand bend" to flow another 15 km parallel to the shore between the dunes before outletting near today's Port Franks. The sands there were unstable and shifting as was the river mouth. Picturesque small lakes that form part of the Port Franks Forested Dunes and Wetlands Complex are remnants of former channels and Mud Creek likely formed an Ausable tributary.

Even before forest clearance, the large volume of snowmelt and spring rains swelled the river system to much higher flows in the spring than in mid-summer. The flooding replenished the lagoon flats, which acted as a sediment trap and nourished large numbers of migratory waterfowl. By the 1870s, upstream land clearance had aggravated the natural flooding and as interest in settling and farming the lagoon flats grew, techniques to drain them and relieve flooding were sought. Between 1873 and 1875, a channel was excavated to divert the river straight through the dunes (known as 'The Cut') and to drain two of the three lagoon flats' lakes, Lake George and Lake Burwell.

The Parkhill Creek watershed is cupped in the crook of Ausable's J and mirrors the Ausable on a smaller scale. Like the Ausable, other tributaries are predominantly from the outside of the J forming short fan patterns as they flow off the moraine divide. The main such tributary is Ptsebe Creek. The Parkhill was originally a tributary of the Ausable but after The Cut, the severed original lower Ausable channel became the lower extension of Parkhill Creek.

In 1892, another constructed channel diverted Parkhill Creek straight to the lake at Grand Bend, cutting off the reach through the dunes. Today this reach, known as the Old Ausable Channel (OAC), is fed only by adjacent runoff and seepage through the sands as it flows very slowly southward into the modified Ausable outlet. The OAC, no longer part of the Ausable or Parkhill

rivers, is characterized by clear water and dense aquatic vegetation. Due to its lack of flow, the old river channel seems to be converting to a more pond like ecosystem that may eventually become less aquatic and more terrestrial. It has been identified as an important ecosystem in the Recovery for Species at Risk Strategy for the Ausable River. Along the Old Ausable Channel, the tributaries are a set of parallel relatively straight creeks that resemble Shore Gullies and Streams crossing the same physiography.

In 1952 the Conservation Authority straightened, widened and deepened The Cut downstream west of Highway 21 to help deal with on-going flooding. The remaining wetland, Lake Smith, was drained in 1959. Although these measures succeeded in reducing floods, the former wetland still retains some of this natural function; buildings and fields are occasionally inundated. Natural processes of ice jam flooding and unstable sands persist at the mouth.

Morrison Dam was completed in 1959 and supplied the vegetable canning company. A hydro-power dam above Rock Glen operated from 1908-1926 and was later removed to allow fish passage. The Parkhill Dam, built in 1969, reduced downstream flooding and augments low flows to aid farmers and decrease water quality problems. By 1991, 41 dams – some 19th century millponds –interrupted the Ausable and Bayfield systems.

Today's flow patterns show maximums in February to April coinciding with snow melt and heavy rains on frozen ground. Ice jams compound flood problems. A smaller flow peak occurs in November and December after fall rains. High evapotranspiration lowers summer flows. Intense thunderstorms, however, sometimes dump very high amounts of rain and cause localized summer flooding.

Mud Creek is a small watercourse that skirts the southwest boundary of the Ausable watershed. Its level agricultural upper basin has the extensively drained and cleared pattern of the Ausable basin. The lower watershed, however, crosses the heavily forested dune unit. The forest and natural sand filter improves water quality and volumes in the lower reaches. The creek outlets at Port Franks near 'The Cut'; the depositional shoreline is evolving and subject to flooding. Port Franks suffers increased flood risk from ice jams.

The Ausable watershed has a number of sinkholes. These areas are defined as shallow semi-circular depressions where surface waters can access bedrock aquifers. Sinkholes are present in the Hibbert and Tuckersmith, in the headwater areas. The area's stream-feeding shallow aquifers are vulnerable to contamination from surface water. The ABCA conducted two studies to determine the impact of sinkholes on municipal water supplies. Sinkholes in the area were located and mapped, and two boreholes were drilled to classify the geological characteristics of a sinkhole.

### *Bayfield River*

The Bayfield watershed is 497 km$^2$, flowing east to west and entering Lake Huron at Bayfield. The basin has an almost rectangular shape pinched off at both the upper and lower ends.

Physiography

The Bayfield watershed crosses the same till moraines and till plain sequence as the Ausable watershed. It differs, however, in rising from one moraine further east, the Mitchell Moraine, and in having almost no influence of glacial Lakes Warren and Algonquin because of the watershed's very narrow shore plain extent. A major north/south spillway system splits and then flanks the Wyoming Moraine.

Topography

The Bayfield watershed slopes as generally less than two percent with steep slopes limited to the lower Bayfield and Bannockburn River valleys. Upstream banks have some moderate slopes as does the Trick's Creek and the kame area near Clinton.

Soils

Perth clay loam, an imperfectly drained soil on clay till, dominates much of the upper and middle portions of the watershed. On the moraines, the slight roll improves the drainage to develop well-drained Huron clay loam till soils. In the Clinton area, the till soils become siltier, developing Harriston silt loams in the well-drained areas. The kame near Clinton has some steep gravel Donnybrook soils; the spillway associated with Trick's Creek has developed well-drained Burford gravel outwash soils. The agricultural capability is high on most of the clay and silt till soils, slightly lower in poorly drained or more rolling areas.

The sand and gravel soils – Burford, Gilford, and Donnybrook – are lower capability with limitations of low fertility and, in some cases, susceptible to drought. Alluvial soils occur in the lower Bayfield floodplain. Soil erosion likely increases in the more sloping moraine areas.

Surface Hydrology

The Bayfield River is 65 kilometres long, rising near Dublin and outletting at Bayfield with a gradient of 2.3 m/km. It contends with the same three moraines as the Ausable but skirts them northward rather than southward and is more prompt at breaching them. Despite headwaters further inland than the Ausable's, the Bayfield's more direct route results in a river less than half the length and a watershed less than half the area. The river's main tributary is the Bannockburn River. Trick's Creek, another tributary, is a cool/cold water system, which helps to maintain water quality and provides habitat for salmonids.

In the pinched-off upper Bayfield subwatershed, the Liffy, Cook and McGrath Drains meet in a glacial spillway to launch the Bayfield River. The narrow moraine basin divide directs the new

river northwest until it breaks through into the east end of Bayfield valley's rectangle. From there, the general river direction is northwest across clay till plains, barely diverted by the moraine at Egmondville. Near Clinton, both the kame moraine and Wyoming till moraine block its northwest direction. The river turns to intercept and follow the major spillway south for a few kilometres before slicing westward through the Wyoming Moraine, the glacial Lake Warren beaches and coastal plain. There the lower Bayfield forms a wide, deep (as much as 50 m) and forested valley where high level terraces, old oxbows and isolated. Limestone outcrops are exposed in the lower reaches. The rectangular shape of the watershed abruptly narrows to only the width of the deep river valley.

On the till plain, most streams have been converted to municipal drains. For the river and tributaries above Clinton, clearing, draining and low infiltration soils result in spring torrents and very low flows the rest of the year. Many homes in Seaforth sit in the regional floodplain. Only Silver Creek and Hellgramite Creek have a permanent, though small, flow. In each case, flow possibly originates in small pockets of sand and gravel associated with eskers.

The Bayfield River's main flow contributions occur west of Clinton, some from the kame and Wyoming Moraine but most through the major spillway that splits the moraine. Trick's Creek is the main contributor. It flows down the spillway from the north with steady cold base flows. Bannockburn River originates in the Wyoming Moraine and follows the spillway northward, receiving flow from both units. Although permanent, it becomes low in the summer with most of its tributaries dry.

At the Bayfield mouth, which is an active commercial harbour, ice jams or lake storms can cause flooding.

None of the watershed's eight dams, all of which are private, create large reservoirs. The two ponds in Trick's Creek sub-watershed cover 6.2 ha; the remaining six total 2.8 ha. They alter flow, sedimentation patterns, temperature, and fish migration, but also offer recreation options.

### *Lake Huron Shoreline Gullies and Streams*

It includes the basins of all the short streams flowing into Lake Huron from just north of Grand Bend to the boundary with Maitland Valley Conservation Authority between Bayfield and Goderich. Seventy streams flow directly into Lake Huron. The basin of each stream tends to be narrow and most are parallel, flowing westward and carving down to lake level. The unit forms a very long narrow strip along the shore, interrupted only by the narrow outlet valleys of the larger basins.

Physiography

Headwaters originate on the west slopes of the Wyoming Moraine. The physiographic sequence westward to the lake is down the glacial Lake Warren beach and across Lake Warren's bevelled till plain that usually includes a narrow strip of sand plain. As the streams approach the lake, they cut down as much as 20 m to form deep gullies to the shore.

The shore is actively eroding to form shore cliffs. From the Goderich breakwater to Kettle Point is a closed littoral cell for shoreline sand transport as those two extremes trap any sand from the north. Goderich to just north of Grand Bend contributes sediment to the cell's shoreline budget and Grand Bend to Kettle Point receives it. Before the breakwater was constructed at Goderich, the littoral cell extended to Point Clark. This process has eroded away the north bluffs and Lake Algonquin beach. On the other hand, in the accretion area to the south, the Algonquin Beach swings far inland behind the sand deposits and the geologically recent lagoon. Gully erosion of the shore streams between Goderich and Grand Bend also contributes sediment.

The Goderich breakwater shortens the natural cell, reduces sand supply, thereby narrowing accretion beaches from their natural width. On-going bluff erosion is natural as these geologically young landforms evolve and is an essential supply to accretion areas and beaches.

Topography

The watersheds are generally level with gently sloping headwaters off the Wyoming Moraine. The lakeshore is a very steep bluff which ranges from 20-22 metres in the north. As the gullies gouged down to lake level, they too created very steep banks.

Soils

Soils are predominantly the Huron/Perth/Brookston clay tills. Narrow strips of Burford, an outwash gravel, occurs at the Lake Warren beach line; Berrien, shallow sand over clay, marks the narrow sand plain that runs the length of the Lake Warren bevelled till plain. The clay tills are high capability soils; the Burford and Berrien have some low fertility and drought limitations. The Shore Gullies and Streams unit rates high for proportion of poorly and imperfectly drained soils. Besides the gullies themselves, the main erosion issue is the proximity of older cottages to the largely natural shoreline bluff erosion. Field erosion is also a serious problem.

Surface Hydrology

The streams follow the same physiographic sequence as described in the physiography section above, generally flowing straight towards the shore. They are largely agricultural drains.

Some gullies were present at settlement as steep shore ravines stabilized under forest cover. Human activities have extended them. Land clearance, accelerated drainage, tile outlets, channel straightening and cultivation to gully edge all contributed to their growth.

The short narrow streams have very short reaction times to storm events. The lack of forest cover also accentuates the sharp hydrographs. The gullies generally drain so quickly that flooding is not an issue.

Local surface water in the nearshore of Lake Huron has suffered degradation from intensification and shoreline development. Given the movement of water currents, the effects of intensification can have impacts in areas where there is little development.

## Climate

The region's mid-continent location immediately leeward of Lake Huron shapes its climate. In the Canadian context, its southern latitude favours it with a long growing season, surpassed in Ontario only by areas still further south. The lake moderates continental hot summers and cold winters.

The region's location also contributes to precipitation levels rated among the highest in the Great Lakes basin, as rainfall and lake effect snow.

The higher precipitation watersheds are Bayfield River and North Gullies. Sudden spring melts accentuated by rain on frozen ground can bring significant flooding. The area has the average level of drought probability for southern Ontario.

A number of climatological stations have been developed through the years by the conservation authorities, primarily for the purposes of local flood forecasting. Environment Canada climate records include Atmospheric Environment Service (AES) stations at Brucefield, Cromarty, Dashwood, and Exeter. Brucefield and Cromarty have since been closed. The total amount of precipitation received has risen slightly over the past 50 years and is discussed further in the Conceptual Water Budget for the Ausable Bayfield Maitland Valley Source Protection Region.

In addition, there is a network of rain gauges through the watersheds. The stations are located at Seaforth, Varna, Morrison Dam, Exeter, Springbank, Parkhill, Ausable Cut (Thedford), and Port Franks.

Climate change is a long-term shift in weather conditions measured by changes in temperature, precipitation, wind, snow cover, and other indicators. It can involve both changes in average conditions and changes in variability, including, for example, changes in extreme conditions.

https://www.canada.ca/en/environment-climate-change/services/climate-change/frequently-asked-questions.html

Climate change is expected to bring warmer temperatures, higher evapotranspiration, lower lake levels, more flooding, low flows, more droughts, more intense storms and more erosion. Already long, gentle rainfalls are yielding to shorter, more intense thunderstorms. A shorter lake ice season may increase snowfalls and expose the shore to strong winter storms. Climate change effects on water quality could include more runoff, erosion and pollution. Groundwater levels may gradually decrease. In southern Ontario, base flow decreases are projected to be most severe in the spring.

## Groundwater and Hydrogeology

This section is derived from the county groundwater reports (Perth: Waterloo Hydrogeologic 2003b; Huron: International Water Consultants et al. 2003; Lambton and Middlesex: Dillon).

### *Major Aquifers*

Aquifers are formations that provide adequate drinking water when tapped by a well. Good aquifers can include sand, gravel and fractured limestone. Overburden aquifers are aquifers that occur in unconsolidated deposits above the bedrock. Confined overburden aquifers are protected from contamination by an overlying fine textured layer. Shallow unconfined aquifers can be associated with sand plains and spillways and, although less protected than confined aquifers, can be more productive.

The aquifer in the fractured and fissured limestone bedrock is by far the most significant drinking water aquifer in the planning region. Most area wells use the top few meters of the aquifer. The yields from units that occur in the planning region are generally among the best from bedrock in southern Ontario. Only the Hamilton Group in the extreme south fails to make that rating.

Overburden aquifers were tapped historically more than today and are less well documented than bedrock ones. Significant overburden aquifers in the planning region include:

- North Lambton/South Huron unconfined aquifer that exploits the beach and bay-mouth bar deposits of Lake Algonquin and Lake Nipissing as well as the more recent dunes between Grand Bend, Port Franks and Thedford. Wells are shallow, usually less than 15 metres.
- The unconfined glacial Lake Warren beach sand and gravel north and south from Goderich.
- The confined to semi-confined and poorly understood Hensall aquifer.
- The Wyoming and Seaforth Moraines.

- The kames and network of sandy outwash and spillway deposits that becomes more extensive to the north of the ABCA watersheds.

Many smaller locally significant overburden aquifers occur throughout the area. In Lambton clays, some overburden wells acted as cisterns. They were highly susceptible to contamination and most have been replaced with municipal servicing from Lake Huron.

The regional bedrock aquifer flow direction is generally from east to west. A steep hydraulic gradient east of Seaforth indicates karst features. A bedrock rise near Arkona directs groundwater flow northwest toward the Lake. Surface topography controls the flow in overburden aquifers.

### *Recharge and Discharge Areas*

Overburden thickness is an indicator of the bedrock aquifer's protection from contamination. The general trend is for deeper overburden to the west with the exception of the Thedford – Port Franks area. Shallow areas with little protection include the sinkholes in the Ausable and Bayfield headwaters.

Groundwater flow maps indicate that the major bedrock groundwater systems originate east of the watershed. Local recharge areas include sinkhole areas in the upper Ausable and Bayfield watersheds and an area near Lucan with a very low bedrock water table. Till moraines and kames tend to have a moderate rate of recharge to the regional aquifers. Recharge in the Lambton clays is very slow; the area's freshwater aquifer at the bedrock contact is estimated to have been recharged thousands of years ago.

Conservation Authorities used overburden and surface features to rate groundwater recharge potential rates intermediate in the Bayfield and lower in the Ausable, and Lakeshore watersheds. Major exceptions to this trend are high recharge areas along the shore between Bayfield and Goderich and near Hay Swamp.

Discharge is strongest in the Ausable Gorge. Bedrock discharge also occurs in the Port Franks area. Some discharge from deep overburden takes place in the Nairn and Little Ausable sub-watersheds. Shallow overburden discharge occurs along some streams.

## Surface – Groundwater Interactions

Potential for infiltration depends on surface soil porosity, location in the watershed, land use, natural drainage patterns, degree of soil saturation and extent of each of depression storage, agricultural drainage and underlying impervious soils.

The most vulnerable aquifers are shallow unconfined ones that tend to occur in sand plains, spillways and kames, the overburden recharge areas. These poorly understood aquifers often influence streams but their effect on wells is unknown. Their coarser soils tend to have lower agricultural capability and more forest cover with its associated source water protection.

For bedrock aquifers, overburden depth and high clay content provide good protection across much of the planning region. Bedrock aquifer susceptibility tends to rise to the east where overburden thickness is least.

Very high susceptibility occurs in sinkholes, a feature of the Lucas Formation. Dissolution of the limestone creates a network of cavities and channels. If sediments collapse into the cavities, sinkholes form which directly link surface water with groundwater. Sinkholes occur in the Upper Ausable and Bayfield watersheds. Most are less than 5 m deep and 9 m diameter. A large sinkhole is in the bed of the Ausable River and is 46 m wide and 122 m long. A detailed study in Huron East and West Perth found over 50 sinkholes draining over 800 ha. The two largest sinkholes receive water from municipal drains and transmit large amounts of water to the aquifer. Characterization of effects requires longer term monitoring.

Groundwater flow is from north-east to south-west. The following surface-groundwater interactions are organized by watershed.

### *Ausable*

High susceptibility is noted for:

- Sinkholes in the upper Ausable watershed.
- The Dunes unit and extending into the Thedford Marshes.
- A small area in the Nairn Creek headwaters.
- Near Hensall where limited confining material protects the overburden aquifer.
- The spillway associated with the Hay Swamp, while half forested, still exposes a large area to surface-groundwater interactions.
- Staffa, on a susceptible kame.

Other interactions include:

- Base flow interference from Exeter area development and groundwater use by irrigation.
- Possible effects on the Little Ausable from a landfill and gravel pit.
- Possible effects on the Ausable temperature and flow from gravel pits near Arkona.

Exeter's effects were reduced when it switched its water source from groundwater to a surface water intake in Lake Huron. Parkhill rates few susceptibility concerns.

### *Bayfield*

Potential interactions include:

- Sinkholes in the Upper Bannockburn, mid-basin and Clinton.
- Possible well contamination below Clinton from Clinton's sewage treatment plant (STP) effluent.
- Gravel pits and development effects on Trick's Creek.
- The lower Bayfield has a trailer park in the floodplain and potential landfill issues.
- Gravel pits very close to the river affecting temperature and base flows.

### *Shore Gullies and Streams*

Interactions or potential interactions include:

- Septic systems on the highly impervious clay can fail and near Lake Huron bluffs, contamination could seep laterally to emerge at lakeshore and gully slopes.
- Recharge to overburden does happen but no evidence connects it to bedrock aquifers. In a few areas the piezometric elevations are below the bedrock surface and therefore possibly, though not necessarily, unconfined and subject to recharge through the overburden. Its thick depth, however, provides protection.

## Watershed Report Card Grades

The ABCA completes a report on watershed conditions roughly every five years to provide information to landowners and community groups to help protect and enhance the watersheds. The area of jurisdiction is divided into 16 subwatersheds in the report. The Watershed Report Cards include 'grades' for forest cover, wetland cover, overwinter vegetative cover, surface water quality, and groundwater quality. Conservation Ontario provides a standardized set of indicators and evaluation system for reporting on watershed health conditions.

The following information is from the 2023 Watershed Report Card. Please refer to the document for more detailed information.

### *Surface Water Quality*

Surface water quality monitoring began in 1964 for the purpose of recording water quality data downstream of the outflows of municipal sewage treatment facilities. Current programs focus on monitoring, maintaining and improving water quality. For this report, surface water samples were collected at nine sites through the Provincial Water Quality Monitoring Network (PWQMN). However, PWQMN sites are not in every subwatershed. Therefore, the remaining seven watersheds are sampled in the ABCA enhanced (local) monitoring program, plus special monitoring in the Bayfield North subwatershed.

The Old Ausable Channel and Bayfield North watersheds met the Provincial Water Quality Objective (< 0.03 mg/L). Grades ranged from A to D, with most subwatersheds receiving C (0.031-0.060 mg/L) or D (0.061-0.180 mg/L) grades. No watersheds were > 0.180 mg/L.

Analysis of the long-term dataset of the entire ABCA area showed there has not been significant change in total phosphorus concentrations over the past 18 years. On a more local scale, there has been significant long-term improvement of concentrations in the Upper Ausable subwatershed. The Ausable Headwaters, Nairn Creek, Lower Ausable, and Mud Creek subwatersheds have seen significant increasing trends in total phosphorus concentrations.

*Escherichia coli (E. coli)* are fecal coliform bacteria commonly found in the intestines of animals and humans. The presence of *E. coli* in water indicates recent sewage or animal waste contamination, and a potential for other disease-causing organisms to exist. The recreational guideline of a geometric mean concentration is less than or equal to 200 colony forming units (cfu) per 100 millilitres (mL) of water.

Eleven of 16 subwatersheds met the recreational guideline. Grades ranged from A (0-30 cfu/100 mL) to D (301-1,000 cfu/100 mL), with most subwatersheds receiving a C (101-300 cfu/100 mL) grade. Overall, grades suggest concentrations are 'fair' across much of the ABCA area. The Old Ausable Channel (OAC) is the only subwatershed to have less than 30 cfu/100 mL.

Generally, *E. coli* concentrations appear to have improved over the past 15 years. The Bayfield North and Black Creek subwatersheds had significant decreasing trends (improvement) in annual geometric means concentrations.

Benthic macroinvertebrates are commonly used as aquatic environmental quality indicators. The scores for most subwatersheds decreased slightly compared to the 2018 report card scores, which means a minor shift towards better conditions. A score of 1 represents a healthy watershed and a score of 10 represents a degraded watershed. The Main Bayfield, Nairn Creek and Upper Parkhill subwatersheds received the best grades (B grade is 4.26 – 5.00 Modified Family Biotic Index). The Bayfield North saw the greatest change since the 2018 report card, dropping from a B grade to a D. The Mud Creek subwatershed had the highest Family Biotic Index (FBI) value (6.80) and an F grade, suggesting that this site was more degraded than other sites.

## Water Use

### *Drinking Water Sources*

The Lake Huron pipeline is the main source of drinking water in most towns and villages. Clinton and Seaforth are the only towns that still rely on groundwater wells. In rural areas, most sources are individual or communal wells, or the Lake Huron pipeline.

Most individual wells reach bedrock. Overburden wells are concentrated in the central and west Ausable with many shallow wells also at Port Franks and Grand Bend. Perth County uses groundwater sources.

### *Surface Water Intakes*

The majority of residents in the region use water piped from Lake Huron at the Lake Huron Primary Water Supply System (LHPWSS) at Port Blake, just north of Grand Bend. The intake is approximately two kilometres offshore. It supplies much of the population of the southern part of the region: most of the following municipalities of North Middlesex, Lucan, Biddulph Township, Middlesex Centre (Denfield), Lambton Shores (most of Bosanquet Township, Thedford, Grand Bend and Port Franks), South Huron (Huron Park/Centralia, Exeter, Crediton, Dashwood) and Bluewater (Hensall, Zurich and lakeshore residents from Bayfield to Port Blake). The City of London is the major user of water with more than 400,000 people.

### *Municipal Wells*

Three municipalities have municipal residential well systems: Bluewater, Central Huron and Huron East. The Ausable Bayfield Maitland Valley Source Protection Committee has not identified any conditions within vulnerable areas. It is possible for an extreme event to threaten a drinking water source.

Adelaide Metcalfe

About one-third of the municipality is in the ABCA region. There are no municipal residential drinking water sources in this area. There is limited access to the Lake Huron Primary Water Supply pipeline as this area has a dispersed population which is rural in nature. Therefore, the majority of the population relies on individual wells.

As there are no municipal residential drinking water sources and the vulnerability scores for the SGRAs and HVAs are 6 or less, there are no significant drinking water threats, or known conditions or issues.

Bluewater

The entire municipality is in ABCA. Most of the population relies on the LHPWSS, including the communities of Bayfield, Hensall and Zurich and the area along the Lake Huron Shoreline. HVAs occur in irregular patterns at the eastern boundary of the municipality. The largest area lies roughly between Zurich and Hensall. SGRAs run in linear bands of sand plain and spillways parallel to the Lake Huron shoreline. There are no significant risks within these areas.

A municipal residential well is at Varna. The municipal well at Brucefield is situated in Huron East on the east side of Hwy. 4 but a small portion of the Wellhead Protection Area (WHPA) extends into Bluewater and serves properties in Bluewater.

Central Huron

Twenty-four percent of the municipality is in ABCA. Carriage Lane (160 users) and Harbour Lights (125 users) are north of the Bayfield River at Bayfield. Vandewetering Well is west of Hwy. 21, north of Bayfield. One of three municipal wells for Clinton is in the ABCA region. A total of 4,500 users are served by the three wells. The WHPA extends almost 15 km north-eastward into the agricultural area of Maitland Valley CA.

Huron East

Twenty-eight percent of Huron East is in ABCA. The wells for Seaforth are in MVCA but a portion of the WHPA is in ABCA. The Brucefield Well serves 175 users.

Lambton Shores

Fifty-five percent of the land mass is in ABCA. There is access to the LHPWS pipeline throughout the municipality and no municipal wells. However, some of the population continues to use municipal wells.

Lucan Biddulph

Sixty-eight percent of the land mass is in ABCA. There are no municipal residential drinking water sources in this area. There is access to the LHPWS in Lucan and limited access in other hamlets within the municipality.

Middlesex Centre

Twenty-one percent of the municipality is in ABCA. There are no municipal residential drinking water sources in this area. There is very limited access to the LHPWSS as this area has a dispersed population which is rural in character. Therefore, the majority of the population relies on individual wells.

North Middlesex

The entire municipality is in ABCA. There are no residential municipal drinking water sources in this area. Eighty-five percent of the residents in North Middlesex are connected to the LHPWS. This includes Parkhill and Ailsa Craig. The remaining population relies on individual wells.

Perth South

Only two percent of the land area is in ABCA. There are no municipal residential drinking water sources in this area and the population relies on individual wells.

South Huron

Ninety-two percent of the municipality is in ABCA. There is access to the LHPWS in the municipality where there are population nodes, and no municipal wells. Some of the population continues to use individual wells.

Warwick

Only two percent of the municipality is in the ABCA. There are no municipal residential drinking water sources. This area has a dispersed population which is rural in character and the majority of the population relies on individual wells.

West Perth

Approximately one-third of the municipality is in the ABCA. There are no residential municipal drinking water sources in this predominantly rural area. The population relies on individual wells.

### *Ecological Water Use*

*Source: Ausable Bayfield Source Protection Area Updated Assessment Report, 2014*

All ecosystems rely on water. Lake, river, stream, pond and wetland systems are particularly dependent. Lake Huron is one of the largest freshwater ecosystems in the world. There are few little natural ponds and lakes inland. The man-made reservoirs at Morrison Dam and Parkhill Dam offer permanent aquatic habitat. Aggregate areas where extraction has been below the water table as well as other made-made ponds are other areas of open water. Wetlands are seasonally wet.

Groundwater from the surface overburden layer is critical to several important ecosystems. Groundwater provides cold water fish habitat, maintains wetlands, sustains base flow that supports aquatic habitat through droughts and contributes clear water to dilute pollution.

Physiography influences most of the stream habitat quality. Streams flowing through kames and spillways have more access to the permanent and cold flows from near-surface groundwater aquifers than do streams on clay plains. Kames and spillways are also lower capability for agricultural land than clay plains and support more forests which is a form of natural infrastructure that protects water quality and quantity. The majority of wetlands are swamps which provide habitat for aquatic and terrestrial species and augment water supply.

### *Agricultural Water Use*

Agricultural land is 76 percent of the region. Uses of water for agriculture needs includes: drinking water and quality of life, crop production, crop health, farm chemicals, fertilization, livestock production, food and non-food agricultural processing, industrial uses in the agricultural sector, cleaning and waste management. Agriculture is a major net consumer of water and a significant stakeholder in water management.

Rainfall is the main water supply for crops but groundwater is used for all other agricultural needs, particularly livestock operations. Livestock drinking, washing and cooling, rinsing barns, mixing and spraying chemicals, and washing equipment are the main uses of water in livestock

operations. Crop irrigation also uses water, from groundwater and surface water sources. Surface water is used for irrigation in Black Creek subwatershed near the Hay Swamp and in the Klondyke flats. Arkona area fruit operations require irrigation. Greenhouse operations can use large volumes of groundwater, although they often rely on water from the Lake Huron system.

### *Industrial Water Use*

Among industries, aggregate washing operations use large volumes of water, though the vast majority of this water is returned through drainage and infiltration. Golf course operations also rely on water.

## Terrestrial Ecology: Forests

Forests are vital to the watershed hydrology, stormwater management, water cycle, water quality and low flow augmentation. Terrestrial natural areas play important roles in water quality by trapping contaminants to cleanse surface and groundwater. They also rely on clean and adequate water, generally from surface sources but sometimes from seepage areas and springs.

Tree leaves intercept water from rain, snow, and fog. The leaves also release water back to the atmosphere by evapotranspiration. Tree roots extract water from the soil while helping hold the soil in place. Forested land reduces the surface impact of falling rain through interception and delay of water reaching the surface. Forests also decreases the amount and velocity of storm runoff over the land surface. This in turn increases the amount of water that soaks into the ground, a portion of which can ultimately recharge underlying aquifers. Conversely, water from hydraulically connected surficial aquifers may enter streams and wetlands, helping to maintain their water levels during dry periods.

Generally, across Southwestern Ontario after approximately 1850, clearance for agriculture, fuel wood, commercial timber and roads sharply reduced natural area extent. By the early 1900s forest cover had shrunk to below 10 percent of the Ausable watershed. Many natural areas were removed for agriculture. Areas remaining and recovering tend to coincide with soils of lower agricultural capability. The Dunes, Ausable Gorge, and Hay Swamp are prominent examples. Fragmented woodlot remnants are at the back of farms. Historically, almost all woodlots were pastured but there has been a shift from livestock grazing and this has benefitted woodlots. However, seed banks may have been depleted.

Current forest cover is about 14 percent, which is four percent higher than the 10 percent levels found in the 1949 Ausable Valley Conservation Report. That increase is a result of reforestation efforts from the 1950s forward. This has taken place on floodplains and erosion-prone land. The ABCA has contributed significantly to forest cover on the land it has acquired and restored, including large block plantings.

High capability soils dominate the region which limits the amount of ecosystem restoration activities on private land. Municipal forest conservation bylaws have protected woodlots from being removed and have encouraged environmentally-sound timber harvest activities.

Forest diseases and pests impact the area's woodlots, including Hickory Bark Beetle, and Emerald Ash Borer. Other aggressive tree diseases and pests are present or will be present in the future.

The Watershed Report Card includes a section on Forest Conditions. This is determined by three indicators. Forest cover was calculated as the percentage of forest area within a subwatershed. Forest interior was the percentage of forest cover after subtracting a 100-metre zone around the perimeter of each woodland. Streamside forest cover was the amount of forest cover within a 30-metre zone on both sides of an open watercourse.

It is important to note that the Watershed Report Card does not measure tree density, forest health or biodiversity. And any heritage feature that was less than 0.5 hectares, including street trees, small windbreaks or woodland patches was not likely detected during the mapping exercises. The forest quantity focus may overlook important declines in quality. A changing climate presents new challenges such as extreme weather, disease and pests.

Ten of 16 watersheds received D grades for overall forest conditions. Most watersheds received D grades for forest cover, F grades for forest interior, and D grades for streamside cover. These results are based on the 2015 aerial photography. The many F grades for forest interior reflect the fragmented nature and small size of most woodlots in southwestern Ontario.

The Old Ausable Channel and Bayfield North subwatersheds scored highest for overall conditions, receiving A and B grades, respectively. These high grades result from Pinery Provincial Park in the Old Ausable Channel and large swaths of upland forest in Bayfield North.

The following information is from the *Watershed Characterization Document*

### *Ausable*

The Dunes unit is the major forested area. The Dune forests protect overburden recharge, stabilize the soil and support highly significant biological communities. Much of the remainder of the Ausable's natural area buffers the main stem river from the extensive Hay Swamp at the headwaters to the slope protection in the Ausable Gorge. Forest also buffers the deeper part of the Parkhill valley and lower Ptsebe Creek. Few tributaries, however, benefit from riparian woodlands. The woodlot pattern tends to be scattered and perpendicular to the streams. Exceptions are the well-buffered lower Adelaide, lower Nairn and lower Little Ausable as well as the broken woodlot corridor along Parkhill's north/south sand plain.

Highest loss has occurred in the headwaters, southeast tributaries, Hobbs-MacKenzie Drain, Decker Creek and the Klondyke flats. The dunes area dramatically outscores the others in retained functions, followed by Ausable Gorge and Mud Creek. Many sub-watersheds show little natural area function. The flats and the mid reach between Ailsa Craig and Exeter have the least woodland.

### *Bayfield*

Forest cover is low in the upper watershed with much of the forest concentrated along the lower Bayfield valley below Clinton, as well as in the valleys of Trick's Creek and lower Bannockburn River. The vegetation found within the lower valleys helps stabilize slopes, moderate flows and improve water quality. The lack of forest in the mid and upper watershed aggravates an already un-moderated and unnatural drainage system and contributes to the wide gap in water quality and quantity between the two parts of the basin. The 1995 Watershed Management Strategy indicated a high loss of natural area function for the upper and middle Bayfield River reaches and the adjoining Silver Creek sub-watershed, as well as for the Big Drain tributary of Bannockburn River. The rating for quality of remaining features singles out the Lower Bayfield, which includes an ANSI and diverse forest, as clearly the best terrestrial functioning sub-watershed in the basin. Of the remaining sub-watersheds, most have very little natural area function. Only Trick's Creek and the Middle Bayfield indicate even moderate roles.

### *Shore Gullies and Streams*

The highest concentration occurs in the gully basins immediately north of Bayfield which have good riparian cover, surficial recharge area cover, and slope protection.

## Wetlands

Wetlands can play very important hydrological roles: flood control, low flow augmentation, water quality improvement and erosion control. Wetlands also filter water, sequester carbon, provide habitat for wildlife, and provide recreational opportunities such as canoeing, hunting, fishing and birdwatching. Prior to European settlement, wetland coverage for Southern Ontario was approximately 25 percent (Ducks Unlimited 2013).

For the 2023 Watershed Report Card, wetland cover data was extracted from the ABCA natural heritage layer using Geographic Information Systems (GIS) digital mapping. Wetlands were defined as land seasonally or permanently flooded by shallow water, as well as land where the water table is close to the surface. Wetland cover is low at two to three percent of most subwatersheds and just two percent of the entire ABCA areas. Most wetlands are wet woodlands or swamps.

The provincially-significant Hay Swamp wetland complex in the Black Creek subwatershed is the largest wetland. Relative to most subwatersheds, the Old Ausable channel has a large percentage of wetland cover. However, it did not meet the definition used by the Ontario Wetland Evaluation system.

## Areas of Natural and Scientific Interest (ANSIs)

*Source: Watershed Characterization Ausable Bayfield Maitland Valley Planning Region Document*

Areas of Natural and Scientific Interest (ANSIs) are described as areas (land or water) containing natural landscapes or features which possess values related to protection, natural heritage, scientific study or education (Hanna 1984). ANSIs vary in significance (provincially or locally significant).

There are a number of ANSIs within the Ausable River watershed. The Ausable River Valley is a 1,780 ha forested area near Arkona and is significant in its seepage for cold water. It was selected as a provincially significant ANSI for its large size, relative natural condition, and excellent diversity of habitats and landform types. The ANSI crosses two physiographic regions: the Horseshoe Moraines, where the river valley has cut deep through the moraine to the underlying bedrock, and the Huron Slope near Thedford, where there are sand plain deposits. The area is habitat for a number of terrestrial and aquatic Species at Risk.

Other provincially significant ANSIs are the Staffa Kame complex in West Perth, Pinery Provincial Park and the Port Franks Dunes and Wetland Complex in Lambton Shores.

Hay Swamp, a local ANSI and provincially-significant wetland, is 2,150 ha of swamp forests, scrub, and plantations. It is bounded by the Wyoming moraine on the north, west and south sides, till plain to the east, and is a wide, gentle spillway. The predominant tree species includes silver maple, white elm, black ash, cottonwood, white cedar, poplar and tamarack. The Dashwood ANSI is adjacent to Hay Swamp.

The Bayfield River ANSI is 850 hectares of long, narrow, river valley that follows the river for 10 kilometres, upstream of Bayfield. The ANSI is representative of floodplain wetlands with abandoned meander channels, oxbows and floodplain terraces. The Bayfield River harbours a range of vegetation including floodplain, riverbank and valley wall communities. Due to the variation exposures along the valley slopes, there exists a variety of microclimates. The uplands support deciduous forest species while the slopes support some coniferous species. Vascular plants species considered to be rare in Ontario have been found in this ANSI. Special features to this system include a deer yard and a migratory trout and salmon run.

The Bayfield North provincially significant ANSI is comprised of 273 hectares of adjoining woodlots that are bisected by concession roads: Huron County Road 13, Orchard Line and the Bayfield Concession Road. It is located north of the Village of Bayfield, near Lake Huron. The woodlots of the ANSI contain both upland and lowland species, but generally represent upland woods. Stream corridors and small wetlands also make up part of the ANSI and the moist rich organic soils of the bottomlands support extensive meadow marsh-woodland mosaics. The area is mostly undisturbed, but some of the woodlands have been used for fuelwood and commercial timber production. Bayfield South, another locally significant ANSI, is also located within this watershed and runs parallel to Lake Huron.

## Aquatic Ecology

*Source: Fish Habitat Management Plan, Ausable Bayfield Conservation Authority 2001*

Natural characteristics such as sub-surface geology and wetland and woodlot distribution and abundance provide the basis for fish habitat. Land use practices, when superimposed on these natural conditions may promote or degrade the aquatic resources.

The fish community in the ABCA area is diverse. There are 72 confirmed fish species in the Ausable River basin. However, species diversity at any one site is typically much less than 72. In 1999/2000, ABCA surveyed 40 watercourses in the southern part of the watershed. Most sites had less than 10 species. The low species diversity in most sites may indicate poor habitat conditions. Furthermore, the distribution of some of the more sensitive fish species (i.e., warm water tolerant species, such as salmonids, or sediment tolerant species, such as percids) may be limited by land use practices that affect water quality and the physical stream environment and thus, limit the abundance and distribution of sensitive species.

The *Fisheries Act* defines fish habitat as “spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes”. The quality of aquatic habitat depends on: water quantity (i.e., depth and velocity), water quality (most specifically water temperature and dissolved oxygen concentrations and to some extent turbidity, and N and P concentrations), aquatic plants, in-stream substrate type and structure, and benthic invertebrates, an important fish food source. Agricultural activities that alter these characteristics may potentially alter fish habitat.

Land use activities such as the removal of stream side cover and forest from the basin may increase water temperatures. Stream temperature assessments from 1949 compared to 1999/2000 showed a reduced number of cold/cool water streams in the more current survey.

Water temperatures, also in part, determine the concentration of dissolved oxygen (D.O.) in the water (i.e., the solubility of oxygen in water decreases as temperature increases). Oxygen

concentration in water is also related to current/flow and amount of organic matter. Oxygen is critical to all aerobic organisms as it drives metabolic processes.

Nitrogen and phosphorus stimulate plant growth. The addition of N and P might enhance plant and algal abundance, which in turn might increase the abundance of benthic invertebrates, an important fish food, and therefore benefit fish production. However the eventual decay of plant material is also known to result in low D.O. concentrations that might result in fish kills. The inputs of N and P in agricultural areas might result from fertilizer application, animal waste runoff and erosion.

Erosion is a natural process. However, human activities such as livestock access to streams, cultivation of steep slopes or the edge of stream banks, increased size of fields, removal of forest cover, municipal drain construction and maintenance, increased hardened surfaces and overgrazing may cause accelerated erosion. Sedimentation affects the distribution of fish species, which vary in their tolerance for silty conditions.

Agricultural activities may modify the hydrology of running waters. Impoundments, channelization, and tiled areas affect the hydrology of the landscape and therefore, affect the habitat of watercourse. Channelized watercourses or municipal drains may also alter fish habitat.

Agricultural drainage through field tiling is also thought to alter headwater hydrology by rapidly exporting water through tiles, resulting in higher peak flows and reduced summer base flows.

The low fish species diversity at many sites and the limited area for more sensitive species, particularly the cold water salmonid species, suggests that some watercourses have deteriorated fish habitat conditions. Furthermore, as fish habitat is dependent on the larger landscape, the low percentage of wetland area may not provide protection to the intensification of agricultural activities. As a result, further degradation of fish habitat conditions may be expected.

### *Fisheries*

Ausable

Although the 1949 Report mapped a very limited extent of cold water streams and permanent flow, Veliz in 2001 reported even less cold water habitat. Although Veliz (2005) confirmed 83 species – an impressive number for an agricultural watershed – most sites supported less than 10 species, a number suggesting poor water quality (Veliz 2001).

Reports of cold or cool water streams or associated species include the upper part of Black Creek, Nairn Creek, a small tributary north of Ailsa Craig and Staffa headwater flow was

historically cold and is still relatively clear with a gravel bed. It helps Morrison Reservoir support rainbow trout, smallmouth bass and largemouth bass (Veliz 2001).

Migratory trout and walleye are found in the main Ausable below Ailsa Craig. The Pinery's Old Ausable Channel, although warm water, is isolated from upstream water quality concerns and has been habitat for Rainbow Trout, Yellow Perch, Northern Pike and Largemouth Bass.

Water quality problems limit the fisheries in the Parkhill Creek watershed. The reservoir becomes stratified. The upper warm layer concentrates the nutrients from agricultural runoff and encourages algae growth. Any fisheries are warm water only.

Mud Creek is not a major fisheries stream but the small lakes - Bio, Moon and L Lakes - near Port Franks have high significance for aquatic habitat.

A list of fish species found in the Ausable River Basin can be found in the *Fish Habitat Management Plan* for the ABCA (2001). The Ausable also supports 26 species of freshwater mussels: 23 live species and fresh shells were found for three other species. Mussels act as living filters for aquatic environments, filtering up to 40 litres a day. Water is drawn across their inhalant siphon and is then passed across their gills to consume particles such as bacteria, algae and detritus. Unused nutrients are converted and expelled and are used by aquatic plants and benthic organisms.

In 2002, the Ausable River Recovery Team, a multi-agency team, was formed to implement a recovery strategy and ensure the continued survival of species-at-risk. The team has conducted several preliminary mussel surveys to determine mussel abundance and distribution. a.

<u>Bayfield</u>

A gradual deterioration in water quality and decline of less tolerant salmonids has been observed. Lamprey control and introduction of Pacific Salmon by Michigan had restarted spring and fall runs of salmonids but only Trick's Creek showed any spawning success. Trick's Creek rated below-potential because of the dam and a poor fish ladder. Good resident populations of Smallmouth Bass and Northern Pike in the lower Bayfield and Bannockburn have been found. Problems in the river above Clinton included intermittent flows, warm temperatures, eutrophication, erosion and sedimentation.

Thirty-four fish species were found by ABCA staff in 2001. In the upper Bayfield, although mostly silty-clay tills and very low base flows, a few gravely areas had some cold water and others like Silver Creek had potential after riparian improvements. In the Lower Bayfield, gravel deposits – notably Trick's Creek – generated some of best cold water habitat in ABCA. Bannockburn's sands also supported some cold water tributaries.

Low flow, warm temperatures and eutrophication may be limiting Bannockburn Creek's capacity to support sensitive species. The lower Bayfield has much better water quality than the upper watershed with higher base flows, lower temperature and more dissolved oxygen – all greatly helped by Trick's Creek's flow. Trick's Creek continues to support resident Brook and Brown Trout. A comprehensive list of fish species found in the Bayfield River Basin can be found in the *Fish Habitat Management Plan* for the ABCA (2005).

Shore Gullies and Streams

One of the most vegetated gully systems, Gully Creek, has cold water habitat and supports runs of migratory salmonids. Most gullies, however, have poor aquatic habitat; their highly variable flow has problems of erosion, poor water quality and no base flow. Of all of the watercourses, 23 percent are cold/cool, 34 percent are warm water and 43 percent are intermittent. Of the 23 percent cold and cool watercourse, 16 percent have no trout or salmon present and 7 percent do, while of the 34 percent warm watercourses, 29 percent have no top predators and 5 percent do.

Off-shore shallow areas and shoals correspond to fish spawning areas, as does the sand deposition area offshore of the Pinery and Port Franks. Offshore fish include Rainbow, Brown and Lake Trout; Coho, Chinook, and Pink Salmon; Freshwater Cod; Lake Whitefish; Chub; Smelt; and Alewife. Near-shore waters contain Yellow Perch, Walleye, Smallmouth Bass, Northern Pike and various pan fish. Commercial fisheries depend mainly on Whitefish and Yellow Perch with licensed fishermen out of Grand Bend, Bayfield and St. Joseph. Sport fisheries focus on Yellow Perch, Rainbow Trout, Brown Trout and Chinook Salmon in Lake Huron.

### *Aquatic Macroinvertebrates*

Narrow tolerance ranges of certain species of aquatic macroinvertebrates make them a valuable indicator of water quality.

Ausable

A 2000 study of benthic macroinvertebrates found the dominant taxa were chironomids, elmid beetles and aquatic worms typical of agricultural drains that have sediment and nutrient enrichment. In 2001, staff found relatively pollution intolerant Capniidae (Stonefly) along with Chironomidae (Midge Fly) as the dominant species in several sample sites including Mud Creek. Nairn Creek had the best Family-Level Biotic Index but other indicators suggest good rather than excellent water quality. Benthic reports were also completed in 2008 and 2013 and found that the invertebrate community responded negatively to drier years, across all sites.

Bayfield

In 2000, staff found the most diverse site at Helgrammite Creek where clear water and a cobble/gravel substrate supported larvae of Mayflies and Caddisflies. Elsewhere the dominant

taxa of chironomids, elmid beetles and aquatic worms were typical of agricultural drains that have sediment and nutrient enrichment. In 2001, staff found Chironomidae (Midge Fly) dominant in the Bayfield at Clinton; Caenidae (Mayfly) at Bayfield and Capniidae (Stonefly) in the Bannockburn.

Since 2000, ABCA has been sampling six sites. In 2002, diversity was lowest for Silver Creek and highest for Helagrammite, but almost as good at the other four sites. Dominant taxa were: at the poor rated sites - Tubificidae (worms) at Liffey Drain, Hyalellidae (Side Swimmer) at Seaforth; at the fair rated sites - Chironomodidae (Midge Flies) at Silver Creek and Caenidae (Mayflies) at Bannockburn; at the good rated sites - Caenidae (Mayflies) at Varna, lower Bayfield, and Baetidae (Small Mayfly) at Helagrammite.

Shore Gullies and Streams

Twenty-nine percent of the sites were unimpaired (2/7) which reflects the variable flow regime of this area and more clay soils. The streams with better ratings tended to be those ones with headwaters that touch the Wyoming Moraine. In 2001, staff found Capniidae (Stonefly), a relatively pollution intolerant species, dominant in the Gully Creek site and Zurich Drain.

### *Species and Habitats at Risk*

The presence of threatened or rare aquatic species can suggest unique habitat characteristics.

Ausable

The Ausable River, located on the northern fringe of the Carolinian Zone, supports unique aquatic biota and is one of the most biologically diverse basins of its size in Canada (Veliz, 2005). The aquatic community of the Ausable River includes 16 species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC): seven fishes, six mussels, and three aquatic reptiles. Because several of these species at risk are declining within the basin, a recovery team was formed in 2002. The Ausable River Recovery Team has conducted inventories of fish, mussels and reptiles, drafted a strategy and is now undertaking recovery actions to improve conditions for these species in the watershed.

Bayfield

Twenty-one rare species were noted in 2003, including aquatic species, snakes, a turtle, a dragonfly, a bird, and wetland plants.

## Land Use

Agriculture dominates the region with some of Canada's most productive farmland. Small urban areas are scattered throughout the watersheds. Cottage development has spread along the lakeshore, with an increasing number of cottages now used year-round. There are a number of Conservation Areas, private campgrounds, and Pinery Provincial Park.

There are also rural subdivisions. Subdivisions such as Southcott Pines, Huron Woods and Beach O' Pines have greatly altered the dune ecosystem but maintained enough natural cover to minimize erosion and encourage infiltration in the highly pervious sands. The density of cottage development has allowed for more efficient water servicing, but has led to increased risks due to septic system use and failures. Lakeshore residences are connected to the Lake Huron Water Supply System between Port Blake and Bayfield. Lakeshore residences north of Bayfield are on private wells. All properties use septic systems in this area.

Forest concentrations occur in the Dunes, Ausable Gorge, the Lower Bayfield Valley and the major spillway and delta unit that include the Hay Swamp, Lower Bannockburn Creek and Trick's Creek. Several gravel pits occur in the major spillway unit.

### *Industrial / Commercial Sectors Distribution*

Industrial, commercial and agri-business sectors are important contributors to the economy. The largest product categories are food related (farm feed supplies, food products and processing) and fabricated metal. Manufacturing is the other major industrial category. Industries are well distributed in towns and villages throughout the region.

Tourism is a major employment sector and Lake Huron is the main attraction. The lakeside location has generated many businesses and activities for visitors and cottagers. Major tourist centres are Grand Bend, Bayfield and Goderich.

### *Agricultural Sector Distribution*

The Ausable Bayfield watershed was seventh highest livestock manure production/ha (7,610 kg/ha) in Canada, 10 times the national average at just over 4,000 kg/ha. Manure components showed similar patterns: sixth highest nitrogen in Canada with 28 kg/ha. Ausable Bayfield was seventh for Phosphorus with 8 kg/ha.

Cultivated lands include continuous row crops, corn systems, field vegetables, grain systems, hay systems, mixed systems, orchards, and vineyards. There are some permanent pasture lands. Lands which do not fall in one of these two categories include, but are not limited to, built-up urban lands, extraction sites, recreation sites, water, woodlots, and wetlands. Land that is either cultivated or pastured can also be described as prime or marginal; the two sets of categories are not mutually exclusive. Not all land is of either prime or marginal value and can be considered 'Non Marginal or Prime'.

## Lake Huron Shoreline

*Source: Shoreline Management Plan 2019, Ausable Bayfield Conservation Authority.*

The Shoreline Management Plan 2019 has extensive information on the Lake Huron shoreline. Flooding and erosion are shoreline hazards and provides direction for hazard management.

The ABCA shoreline is divided into two sections. The northern section is north of Maple Grove subdivision, between Port Blake and Grand Bend and is characterized by cohesive till bluffs, up to 18 metres in height, fronted by narrow beaches of mixed sand and gravel. The shoreline south of Maple Grove subdivision is characterized by sandy beaches and dune systems. The northern section is typically erosional and supplies sediment to the southern shoreline which is largely depositional. The shoreline hazards along these two stretches of shoreline differ, as do the concerns of property owners and users of the shoreline.

The erosion of the bluffs and nearshore lakebed along the north section of shoreline, as well as erosion of gullies and sediment transported by creeks, provide sediment to the nearshore area. Of particular interest is the coarser material, specifically sands and gravels, which can form beaches and bars along the shoreline and thus provide some protection to the shoreline, as well as recreational benefits. Along the ABCA shoreline north of Maple Grove, it has been estimated (Reinders, 1989) that approximately 72 percent of the supply of sand and gravel to the nearshore area comes from bluff erosion, 10 percent from gully erosion, 17 percent from lakebed erosion, and one percent from creeks and rivers. This material is transported alongshore by wave-induced currents. Due to the wave climate and shoreline orientation in this area, the net transport is from north to south, although reversals do occur during individual storms.

To the south of Maple Grove subdivision, the shoreline orientation changes from north-south to northeast-southwest, and the shoreline characteristics change from cohesive till bluffs to sand dunes. As a result of the change in shoreline orientation, the sediment transport rate decreases significantly, with erosion rates becoming lower moving further south. The shoreline south of Maple Grove has historically been a deposition zone. The stability of this beach-dune system is dependent on the supply of sand provided by updrift erosion processes, in particular bluff erosion between Grand Bend and Goderich. This is an important consideration for shoreline management planning.

The erosion hazard limit is calculated as the sum of the stable slop allowance, plus the 100-year erosion allowance. The stable slope allowance is a horizontal allowance measured landward from the toe of the bluff or bank. It is dependent on soil characteristics and groundwater conditions.

Shoreline flooding is primarily focussed on the low-lying areas around Bayfield and Port Franks, as well as development at the toe of the bluff. The flooding hazard limit is defined as the 100-year flood level plus an allowance for wave uprush and other water-related hazards. When

shorelines are exposed to wave action, wave uprush and overtopping occur, driving water above the 100-year water level. Other water-related hazards may include ship generated waves and ice.

Over thousands of years, the deposition or eroded materials has resulted in an extensive beach-dune system along the Grand Bend/Pinery/Ipperwash shoreline. The dynamic beach hazard recognizes that the land-water interface is a very dynamic environment in the Great Lakes due to wave erosion during storms, the wave and wind processes that lead to rebuilding the beach, and fluctuating lake levels. The dynamic beach hazard limit is defined as the landward limit of the flooding hazard plus a 30-metre dynamic beach allowance or a distance determined by an accepted coastal study, plus 100-year allowance if the shoreline is eroding.

## Development in Regulated Areas

The ABCA administers Section 28 of the Conservation Authorities Act to protect and property from the natural hazards of flooding and erosion.

The total mapped floodplain area is 25,752 hectares. In 2021, there were 1,640 structures located in the areas identified as floodplain, and 225 kilometers of roads. The total regulated area is 49,566 hectares. The regulation area includes all natural hazards related to flooding, erosion, unstable slopes, unstable soils, sinkholes, wetlands and wetland allowances (30 or 120 m) with already developed areas removed from the allowance in Port Franks area. Flooding, erosion and dynamic beaches are the hazards along the Lake Huron shoreline.

### Significant Flood Prone Areas

*Source: ABCA Flood Emergency Plan, January 2023*

The following areas face an annual flood threat due to heavy snowfalls, combined with late or rapid snow melts, excessive rain, or ice jams. The main areas susceptible to flooding are:

Ausable River Watershed

| | |
|---|---|
| Port Franks | Ausable River and Mud Creek (100) |
| | (Also susceptible to erosion damage) |
| The Cut | Lazy Acres and Defore Subdivisions (16) |
| | North and South Walden Subdivisions (100) |
| Lucan | Benn Drain (25) |
| Crediton | Ausable River (30) |
| Exeter | Ausable River and flash-flooding drains (1) |

Bayfield River Watershed

| | |
|---|---|
| Seaforth | Silver creek (95) |

| | |
|---|---|
| Dublin | Liffy Drain (27) |

Parkhill Creek Watershed

| | |
|---|---|
| Klondyke Marsh Area | Low velocity flooding from Parkhill Creek |
| Grand Bend | Development along Walker Drain |
| | Marinas and fishing industry |
| | Dwellings affected by serious ice jams (2) |

Other

| | |
|---|---|
| Zurich | Zurich Drain (28) |
| | Low velocities |

Lake Effect Flooding

During periods of above-normal lake levels on Lake Huron, strong winds from a west or northwesterly direction may create waves and wave uprush action which can effect shoreline area within the ABCA. The major effects from lake-effect flooding normally occur at river mouth areas such as the Ausable River Cut at Port Franks, Mud Creek at Port Franks, Parkhill Creek at Grand Bend and the Bayfield River at Bayfield. However, flooding and erosion from high lake levels and strong winds can occur along the entire shoreline within the ABCA jurisdiction.

When Lake Huron levels are above normal long-term averages, the Ministry of Natural Resources & Forestry provides Conservation Authorities with advisories and warnings of impending lake effect flooding.

Periods of high lake levels and strong winds may also cause increased erosion of the toe of the lake bluff and could lead to failure of sections of the bluff.

# APPENDIX 3: SUMMARY OF STUDIES, REPORTS AND STRATEGIES

The legislation requires each CA to provide a summary of existing technical studies, monitoring programs and other information on the natural resources the authority relies on within its area of jurisdiction or in specific watersheds that directly informs and supports the delivery of the CA's mandatory programs and services. (s. 12(4)).

The following is a summary of the most recent documents. For example, there has been more than one hydrology study, but this chapter contains a summary of the most recent report. Previous documents are referred to within the most recent report or are available as needed. Regarding monitoring, there are many reports dating back decades, but the Watershed Report Card has compiled data into one document.

This summary includes programs beyond Category 1 because they are an important part of integrated watershed management and support Category 1 programs and services.

This chapter cannot include all information and readers are advised to review reports for information and recommendations.

### *The Path Forward: Your Community Conservation Strategy for Ausable Bayfield Watersheds (2011)*

The conservation strategy was developed by people from the watershed community to define the vision, mission, goals and action. The plan was to guide the direction of the ABCA's board of directors and staff in the coming decades and remains relevant.

The vision statement is: Healthy watersheds where our needs and the needs of the natural environment are in balance. The mission statement is: Protect, improve, conserve, and restore the watershed in partnership with the community. The Conservation Strategy goal was to work with others to create awareness and take action to improve watersheds for healthier communities and healthier people. The document listed several actions people, the community and the ABCA could implement to conserve the watersheds.

### *Watershed Management Strategy (2015-2025)*

Staff developed the Watershed Management Strategy to provide direction for the board and staff to implement the 2011 conservation strategy (The Path Forward: Your Community Conservation Strategy for Ausable Bayfield Watersheds). It brought forward relevant information from the 1995 Watershed Management Strategy.

The WMS implemented the Conservation Strategy goal using three goals:

- To preserve, protect, enhance, and restore the ecological function of the Ausable Bayfield Watersheds.

- To contribute to community health, safety, and sustainability.
- To build partnerships, awareness, and engagement at all levels.

Objectives were to: engage people, create awareness and take action, reduce threats, and enhance health/resilience. The WMS included 25 actions for the ABCA to undertake. These goals, objectives and actions remain valid for the ABCA and have been integrated into this document.

***Preparing for Change in Ausable Bayfield Watersheds (Climate Change Position Paper) (2007)***

The key point of the position paper was that ABCA can prepare for climate change by working together for a stronger watershed through effective and proactive watershed planning and programming. A stronger watershed is only possible when landowners and partners join with the Conservation Authority to march confidently towards the future, support one another for a common goal and to work collaboratively to achieve that goal.

The report included the following action plans:
1. Integrate, to a greater extent, into the ABCA conservation education programs the important role afforestation and other positive environmental actions can play in building watershed resiliency to mitigate against future extremes in weather and climate.

2. Communicate to farmers and other landowners, especially through stewardship and communications means, the important role they can play in building more watershed resiliency for the future and educate them on some of the projected future impacts of weather and climate extremes.

3. Reduce the ABCA environmental footprint through self-assessment of internal practices including investigating ways to reduce energy consumption in buildings and vehicles and reducing waste.

4. Continue to support staff training on issues of climate change and effective stakeholder engagement in building watershed resiliency.

5. Consult with different levels of governments, agencies and organizations to help define the positive role of the ABCA in their climate change and watershed resiliency initiatives.

6. Hold, within the next two years, a staff training day to learn more about climate change and consider its impacts in the context of established job descriptions.

7. Hold, within the next two years, a public event educating landowners about their role in adaptation and mitigation.

8. Produce, within the next two years, a factsheet for landowners letting them know about the projects they can initiate or the changes they can make in order to prepare for climate change.

9. Continue watershed monitoring programs to be able to track changes which may occur within our watershed area.

10. Incorporate climate change and climate variability projected impacts, where possible, as considerations in future watershed planning documents.

Note: The ABCA does not have a science-based climate change strategy at this time. However, it relies upon research and strategies produced by other agencies and government.

### *ABCA Watershed Hydrologic Model: Set-up, Validation and Application Technical Report (2017)*

Schroeter & Associates and Water's Edge undertook this study for the ABCA to construct a revised (updated) hydrology model of the three major watersheds comprising the lands within the ABCA's jurisdiction. These watersheds drain 2,454 $km^2$ along the east shore of Lake Huron.

A hydrologic model of the Ausable Bayfield watersheds was developed using the Guelph All-Weather Storm-Event Runoff Model (GAWSER) software package. The operational model for flood forecasting has a total drainage area of 2,215 $km^2$, and consists of 107 subcatchments, 83 channel routing reaches, and two reservoirs. The north and south gully areas add another 207 square kilometres of drainage area comprising 52 subcatchment elements, and an additional three channel routing reaches. About 32 kilometres of gullies were not delineated.

### *ABCA Stormwater Management Policies and Technical Guidelines (2009)*

https://www.abca.ca/assets/files/Stormwater_Management_Policies_and_Technical_Guidelines_ABCA_2009_RE.pdf

This stormwater management policy document was not intended to represent a catch-all resource for all ABCA policies or a synopsis of all requirements of all regulatory agencies.

The 2009 document updated the 1994 set of documents. It identified the roles and responsibilities of the ABCA, outlined the general policies and technical guidelines adopted to achieve its mandate, and provided guidance to all stakeholders involved in works that, if unmitigated, would result in negative impacts on the hydrologic cycles and/or natural environment. The document had a consultation, design, and review process. The principles were applicable to other land use or drainage proposals such as agricultural practice, municipal infrastructure works, drain construction, sewer upgrades, and road construction and reconstruction, etc.

***ABCA Generic Regulation Mapping Project:***

**Phase 1 – Structure Inventory Report (2005)**

**Phase 2 – Floodplain Estimate Report (2006)**

The Phase 1 report provided a procedure for defining the location of the regional flood line for the purposes of identifying regulated areas in the jurisdiction of the Ausable Bayfield Conservation Authority. The Phase 2 report provided a procedure for defining the location of the regional flood line for the purposes of identifying regulated areas in the ABCA jurisdiction.

In both reports, the methodology satisfied the generic regulations and the requirements set forth in the changes to the *Conservation Authority Act* and complied with provincial guidelines developed for identifying regulated areas for the purposes of the Act (Guidelines for Developing Schedules of Regulated Areas, Conservation Ontario and MNR, 2005).

***Ausable Bayfield Source Protection Plan (ABSPP)***

https://www.sourcewaterinfo.on.ca/

The provincial environment ministry oversees the Clean Water Act provincially, and conservation authorities are tasked with administering the program at the local level.

The ABSPP guides the implementation of the programs. It includes policies for residential, agricultural and other land uses. Under the *Clean Water Act,* Section 22 of Ontario Regulation 287/07 lays out the objectives of the source protection plan as follows:
1. To protect existing and future drinking water sources in the source protection area.
2. To ensure that, for every area identified in an assessment report as an area where an activity is or would be a significant drinking water threat,
i. the activity never becomes a significant drinking water threat, or
ii. if the activity is occurring when the source protection plan takes effect, the activity ceases to be a significant drinking water threat.

Policy tools include: education and outreach, land use planning, prescribed instruments, prohibition, risk management plans, incentives, and restricted land uses.

To guide the development of the policies and plan, several significant reports were developed that provide valuable information that is applicable to other conservation program areas:

Watershed Characterization Report, Vulnerability Threats and Risks Report, Water Budget Report, and Assessment Report. Fact sheets and outreach materials have also been produced.

***Shoreline Management Plan (2019)***

https://www.abca.ca/planning/shorelinemanagement/

This report updates the 2000 *Shoreline Management Plan* and builds upon and references previous technical studies prepared for the ABCA. The report was prepared jointly by the ABCA and Baird & Associates. The *Development Guidelines 2019* were developed by the ABCA and the Planning Group.

Provincial and ABCA goals are to minimize risks to life, property damage and social disruption and to encourage an integrated approach to shoreline management.

Since the *Shoreline Management Plan* was last updated in 2000, there have been changes to the *Provincial Policy Statement (PPS)*, last updated in 2014 and to the regulations that stipulate how the hazardous lands are defined. The *Technical Guide for Great Lakes – St. Lawrence River System* (MNR, 2001a), which provides the technical basis and procedures for establishing the hazard limits for flooding, erosion, and dynamic beaches in Ontario as well as options for addressing the hazards was issued after the last *Shoreline Management Plan* was developed. In addition, land use along the shore has changed substantially since the last *Shoreline Management Plan* was developed.

Many residences that were previously used seasonally, are now occupied full time. Housing has also changed substantially. While the option to move houses away from the hazard may have been reasonable at that time, newer houses are often larger and much more difficult to move.

In promoting responsible management of the shoreline, the ABCA will be guided in all its actions to ensure that no new hazards are created, existing hazards are not aggravated and no adverse environmental impacts result.

The overall management approach is to address both existing and future shoreline development along the ABCA shoreline. The overall philosophy and approach is premised on a philosophy and practice of balanced management.

Given the number of existing structures located in the erosion, flooding and dynamic beach hazard limits, the recommended approach advocates for responsible management along the entire ABCA shoreline. This requires a strategic approach that looks to eliminate the risk to human life and property damage over time by ensuring that buildings and structures are located outside of the hazard. This approach is upheld by existing *Provincial Policy*, supported by legislation and the mandate assigned to conservation authorities and confirmed in existing municipal planning documents.

The approach and overall philosophy support:

- A clear science-based approach and commitment to ongoing monitoring and identification of hazards.

- A prevention-first philosophy that will, over time, reduce the risk to natural hazards by encouraging the location of proposed development outside of areas subject to erosion, flooding and dynamic beach hazards.
- A move, over a period of time, towards clearer consistency with the *Provincial Policy*.

ABCA intends to implement this updated *Shoreline Management Plan 2019* with the support of its municipal and provincial partners, and the public.

***ABCA Watershed Report Cards (2023)***
https://www.abca.ca/watersheds/reportcard/

ABCA prepares Watershed Report Cards every five years as a summary of the state of local forests and water resources. The most recent report was published in 2023. Documents were also prepared in 2007, 2013 and 2018. Forest conditions, wetland cover, overwinter vegetative cover, surface water quality and groundwater quality were the watershed evaluation categories. The objectives of the report are to use environmental health indictors for forest, wetland and water and to describe opportunities to improve conditions.

The ABCA region is divided into 16 subwatersheds for this report. Improvements have been seen for some indicators since monitoring began in 2002.

Forest cover remains low across the ABCA region. Although forest cover has shown little to no change from previous report cards, the thousands of trees planted every year indicate that landowners understand and value the benefits of trees and forests.

Wetland cover is very low. As most wetlands are wet woodlands, or swamps, conservation of these areas is key from an ecological perspective, and for maintaining water quality and natural water storage. Additional water storage features will help to reduce soil erosion and mitigate the risk of flooding.

Chloride in surface water was evaluated for the first time in the 2023 report and results exhibited good conditions.

Almost all subwatersheds met the recreational guideline for *E. coli,* but many did not meet the objective for total phosphorus. Low forest and wetland cover, combined with predominantly clay soils and intensive rural and urban land uses, contribute to water quality conditions that need improvement.

Most, but not all, groundwater samples at monitoring wells met the drinking water standard for nitrate and the guideline for chloride. Water quality in private wells may differ from monitoring wells, and landowners with private wells should regularly test their drinking water.

It is recognized that 'A' grades may not be feasible due to both natural conditions of the watershed such as soil and topography as well as land use pressures. The agricultural productivity of this region means it is important for global food production. There is also a need for residential development. It is important to continue to employ best practices for agricultural and urban areas.

***Development of a Rural Stormwater Management Model to Manage Water Quality in the Lake Huron Watersheds (2014)***

https://www.healthylakehuron.ca/docs/Rural_Stormwater_Management_Model_Report_FINAL_RE.pdf

The purpose of the project was to develop a physically-based computer model which would help practitioners choose the location for agricultural Best Management Practices (BMPs) or other stewardship projects in a watershed that will have the most water quantity and water quality benefits at the watershed outlet. In addition, the model should be able to be used as a tool by municipal drainage engineers when designing new municipal drainage works or making improvements to existing municipal drainage works.

The model and the enhancements to the Personalized Computer Stormwater Management Model (PCSWMM) do not represent a final solution. Rather a great many steps have been made toward a better model that can be expended and improved upon to further the goal and to improve water quality in Ontario and globally.

***ABCA Conservation Lands Strategy (2024)***

This document guides the management of properties owned and/or managed by the ABCA. It updates previous master plans to reflect the balance between environmental protection and natural hazards management with providing natural areas for passive recreation, education, research and monitoring. The management goals are as follows.

Conservation lands use: To integrate ABCA properties as part of a sustainable watershed by planning for future development and achieving a balance between the demand for public use and the need for protecting ecological function.

Watershed management: To help fulfill ABCA goals and objectives for effective watershed management.

Natural hazards management: To protect life and property from natural hazards.

Terrestrial resources: To protect, restore and enhance the natural ecosystems and to ensure the health and diversity of native species, habitats, landscapes and ecological functions.

Aquatic resources: To protect and enhance the form and function of the aquatic system.

Stewardship: To implement stewardship practices to improve the environment that are consistent with practices recommended to landowners for their properties.

Nature-based public use: To encourage healthy living and provide opportunities for appropriate and accessible nature-based recreation by providing safe, enjoyable and sustainable trail experiences.

Conservation education and community outreach: To promote knowledge and understanding of the ecological values of the land and water, their protection and management requirements, as well as their significance, sensitivities, and interrelationships within the conservation lands and with surrounding areas.

Cultural heritage resources: To celebrate the diverse cultural heritage of the ABCA region and CA lands by protecting, conserving and interpreting archaeological and historic resources.

Financial management: To manage conservation authority properties in a financially-sustainable manner with a variety of funding mechanisms.

### *ABCA Land Acquisition Plan (2022)*

This plan was based on the ABCA Land Acquisition Policy, approved on April 21, 2022. With the policy setting the framework, the land acquisition plan was a practical, hands-on document with technical information, best management practices and procedures to guide the program. It is a 20-year plan for the period of 2022-2042.

The plan identified: ABCA land ownership; links to ABCA strategic plans and priorities; goals, objectives and priorities for acquisition; methods of land acquisition; procedures for transactions; funding options; environmental protection measures; landowner relationships; education and outreach; working with other agencies to protect environmentally important lands and recommendations for priority areas.

The ABCA Land Disposition Policy (2022) includes the rationale, criteria and recommended procedures for disposing of land.

### *ABCA Forest Management Plan (2018)*

The plan is a guiding document for forest management planning and forestry operations on Authority-owned lands. The current plan includes a detailed 10-year operating plan that outlines forest management objectives and strategies. The management goal is to manage Authority-owned forests in a sustainable manner using an ecosystem approach that conserves

ecological diversity and natural heritage values while providing environmental, educational, social, and cultural benefits while realizing modest economic returns to assist with the costs of property stewardship.

The plan is reviewed annually and updated to reflect changing forest conditions and forestry science. A formal review and update occurs near the end of the 10-year operating plan.

***ABCA Fish Habitat Management Plan* (2001)**
https://www.abca.ca/downloads/Fish_Habitat_Management_Plan-all.pdf

The plan reviewed the status of fish habitat in the ABCA area and outlined possible management strategies to improve the aquatic resource. Natural features, land use, habitat summaries and priority projects were provided for 14 sub-basins in the ABCA area. It recommended stewardship programs, monitoring programs for water quality, benthic invertebrates and fish habitat, and public education to improve aquatic resources.

The 14 sub-basins were further prioritized for protection, maintenance and improvement based on: current habitat potential, current land use stress, sensitivity of the resource, and fishing level. Additional recommendations to protect fish habitat in the priority sub-basins include stewardship programs to improve riparian land use, further examination of riparian land use, detailed fish habitat studies and updates to specific municipal official plans regarding Environmentally Sensitive Areas.

### Subwatershed Plans

The ABCA has developed a number of community-based subwatershed plans in cooperation with landowners, stakeholders and agencies. These plans are focussed on local environmental issues and recognize the important connection between activities on the land and impacts on watercourses and Lake Huron.

The plans identify a community vision for the area, local issues, actions, long-term management direction, education and outreach opportunities. Community members are also involved in implementing the plans.

Most recent subwatershed plans include: *Main Bayfield Watershed Plan* (2013), *A Management Plan for the Old Ausable Channel Watershed* (2008), *Ausable River Recovery Strategy, Action Plan for the Ausable River in Canada: an ecosystem approach, Bayfield North Watersheds Management Plan, Nairn Creek Sub-basin Study* (2003) and *Port Franks Biodiversity Strategy* (2011).

### *Port Franks - Ausable River Ice Management Study* (2010)

This study by AECOM builds on past ice management studies initiated by ABCA in 1999 and documented in two previous reports by Totten Sims Hubicki Associates Ltd. (TSH, now operating as AECOM Canada Ltd.) that developed alternatives for the mitigation of ice-jam related flooding (TSH, 1999 and TSH, 2001). The study area includes the Lower Ausable River in Lambton Shores from the mouth at Lake Huron in Port Franks, extending upstream for nine kilometers to the historic iron bridge north of Bog Line.

The purpose of the study was to develop an ice management plan to reduce the flood risk associated with ice jams. This study was completed because historic ice jams resulted in periodic flooding and concentrated scour points. The overall objectives for this study were to: update the previous studies; identify, evaluate and compare a set of appropriate options available for ice management; and recommend the most cost-effective approach and implementation strategy that is acceptable to environmental permitting agencies.

Given the nature of these conditions, there is no single solution available to provide a significant reduction in the ice jam potential throughout the entire Lower Ausable River. Therefore, the recommended ice management plan featured a combination of measures including measures to: reduce the potential for ice jams (i.e., dredging, ice booms, and maintenance operations); and mitigate the impacts of flooding caused by ice jams (i.e., flood-proofing berms and administrative procedures).

### *Watershed Based Best Management Practices Evaluation (WBBE), Huron* (2013)

A key objective of the project was to evaluate the effects of best management practices (BMPs) at the field scale, particularly in relation to water quality. Many different BMPs have been implemented or identified for future implementation within the WBBE study area. Four BMPs common in this area were chosen for evaluation at the field scale: conservation tillage, cover crop, nutrient management, and water and sediment control basins (WASCoBs). An opportunity to evaluate a fifth BMP – a grass filter strip – arose during the project. These BMPs were assessed for their environmental effectiveness, and in some cases, their economic effectiveness for the producer. The report includes monitoring results, observations and conclusions. The benefits of the WBBE/ONFARM programs are to inform a hierarchical approach to BMP implementation, in particular the importance of overwinter vegetative cover.

### *Sinkhole Investigation for Areas Mainly within the Municipalities of Huron East and West Perth Final Report (2004)*

Drinking water source protection programs can benefit from the findings of this local research.

The sinkhole investigation study was initiated to improve the understanding of local groundwater conditions surrounding sinkholes in Huron East and West Perth, with an emphasis

on sinkholes identified in the former townships of Hibbert and Tuckersmith. The objectives were consistent with protecting the sources of drinking water.

The Study had ten recommendations with the first being to develop and implement a groundwater protection study. Other recommendations were related to data management, public educations, best management practices (stewardship), monitoring, spill contingency planning, groundwater protection planning in official plans, and regulations. Further characterization to understand groundwater travel times, the bedrock, and the locations of other sinkholes beyond the study area was also recommended.

### *Sinkhole Study Phase 2 (2006)*

The main goal of this project was to develop a better understanding of the karst regions within the municipalities of West Perth and Huron East. Several methods were used to achieve this objective, including: field mapping of new sinkholes in the study area, drilling and logging (using standard and geophysical techniques) new monitoring wells, collecting and assessing water quality and groundwater elevation data, and conducting a tracer test at the Chiselhurst Sinkhole.

Further subsurface characterization was recommended. A greater understanding of regional and local groundwater flow directions and a better delineation of the solution-enhanced fracture systems that constitute these bedrock aquifers is essential. Additionally, a greater knowledge of the focal points of groundwater discharge for these karstic systems would also be desirable. This report included the monitoring results and recommendations for further collection and assessment of water quality data.

### *Report for the Ontario Soil and Crop Improvement Association, ONFARM Initiative Priority Subwatershed Project* (2023)

The ONFARM program at ABCA leveraged management practice, soil, and water data to identify practices that are compatible with profitable agriculture while maintaining environmental health. Through ONFARM, the ABCA intended to: summarize water monitoring data to verify the environmental efficacy of agricultural best management practices (BMPs) at the subwatershed and field scales; introduce soil health and profitability indicators; and integrate socio-economic-environmental (watershed/field) scale information.

Many of these objectives were met through years of monitoring at two key sites in the ABCA jurisdiction. Monitoring at the Gully Creek watershed and Huronview Demonstration Farm included edge-of-field agricultural BMPs. The Gully Creek watershed monitoring also included mass loads and flow weighted mean concentration.

Findings of this work indicate that both land management and structural BMPs improve water quality by reducing runoff and preventing excess nutrients and sediment from entering waterways.

Questions surrounding profitability and socio-economic-environmental information were particularly challenging to address. Socio-economic and environmental considerations are complex and intertwined.

### *County Official Plans*

The Official Plan (OP) for a county is a long-range policy document, adopted in accordance with the provisions of the *Planning Act*. It is intended to provide a general framework for land use, economic, natural heritage, social, and cultural decision-making within a county. If the plan is produced through a process of public consultation and input, it can express the interests and priorities of County Council and a wide range of interest groups including the residents and the local municipal councils within the County.

They include strategies, goals, and policies specific to that county, but there may be similarities between the OPs such as conserving natural areas and agricultural lands, directing the location of new development, encouraging economic growth, and high quality of life. The plans can impact watershed conservation.

The Provincial Policy Statement requires natural heritage systems be identified. The province has a recommended approach for identifying natural heritage systems, but municipal approaches that achieve or exceed the same objective may also be used. A natural heritage system is a system made up of natural heritage features and areas, and linkages intended to provide connectivity and support natural processes which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. The studies provide a scientifically based analysis of the landscape. The study can be implemented through various means including land use planning, Forest Conservation By-Law, stewardship programming, education, and monitoring.

# APPENDIX 4: 2023 INVENTORY OF PROGRAMS AND SERVICES – FINAL

| Program/Service and Subservices | Description | Category (1,2,3) | Category Rationale | Average Annual Costs | Funding mechanism and percentage of costs |
|---|---|---|---|---|---|
| **Natural Hazard Management Program**<br>Program Description: Conservation Authorities (CAs) are the lead provincial agencies on Natural Hazard issues. The goal is to protect life and property from flooding and erosion. This watershed-wide, comprehensive program includes: development applications and permits, municipal plan input and review, environmental planning and policy, flood forecast and warning, flood and erosion control infrastructure, technical studies, ice management, education and public awareness. | | | | | |
| Section 28.1 Permit Administration | Reviewing and processing permit applications, associated technical reports, site inspections, communication with applicants, agents, and consultants and legal costs. | 1 | CA Act Sec. 21.1 | $204,750 | Municipal Levy – 50%, Self Generated – 50% |
| Municipal Plan Input and Review | Technical information and advice to municipalities on circulated municipal land use planning applications (Official Plan and Zoning By-law Amendments, Subdivisions, Consents, Minor Variances).<br>Input to municipal land-use planning documents (OP, Comprehensive ZB, Secondary plans) related to natural hazards, on behalf of Ministry of Northern Development, Mines, Natural Resources and Forestry (MNMNRF), delegated to CAs in 1983.<br>Input to the review and approval processes under other applicable law, with comments principally related to natural hazards, wetlands, watercourses and Sec. 28 permit requirements. | 1 | CA Act Sec. 21.1 | $91,000 | Provincial – 2%, Municipal Levy – 68%, Self Generated – 30% |
| Municipal Drain and Fisheries Review | This is a component of CA Act approvals for municipal drainage works. While specific to drain review and | 1 | CA Act Sec. 21.1 | $40,750 | Federal – 13% |

| Program/Service and Subservices | Description | Category (1,2,3) | Category Rationale | Average Annual Costs | Funding mechanism and percentage of costs |
|---|---|---|---|---|---|
| | associated hazards, this also protects headwater function, habitat and ecosystem health. Recognizing this, Fisheries and Oceans Canada and other partners provide funding to ABCA in order to conduct fisheries assessments on their behalf. This includes the municipal drain classification program, which classifies "not rated" drains to help streamline Fisheries Act approvals to the benefit of both Drain Superintendents and landowners. | | | | Municipal Levy – 50%, Self Generated – 37% |
| Flood Forecasting and Warning | Daily data collection and monitoring of weather forecasts, provincial and local water level forecasts, watershed conditions, snow course, flood event forecasting, flood warning, communications and response and equipment maintenance. Annual meeting with municipal flood emergency coordinator. | 1 | CA Act Sec. 21.1 | $136,000 | Provincial - 20%, Municipal Levy – 76%, Self Generated – 4% |
| Flood and Erosion Control Infrastructure Operation and Management | Water and erosion control infrastructure and low flow augmentation. Includes seven flood control projects and 16 erosion control projects that are annually inspected and routine maintenance work completed. New Project: Update asset management plan for these structures. | 1 | CA Act Sec. 21.1 | $104,500 | Provincial – 20%, Municipal Levy – 76%, Self Generated – 4% |
| Flood and Erosion Control Infrastructure Major Maintenance | Major maintenance on flood and erosion control structures as required. Projects are dependent on Water and Erosion Control Infrastructure (WECI) funding from the province. | 1 | CA Act Sec. 21.1 | $50,750 | Provincial – 50% Municipal Levy – 50% |

| Program/Service and Subservices | Description | Category (1,2,3) | Category Rationale | Average Annual Costs | Funding mechanism and percentage of costs |
|---|---|---|---|---|---|
| Ausable River Channel Monitoring | Monitoring Ausable River channel morphology changes at Port Franks due to ice and high flows. | 1 | CA Act Sec. 21.1 | $16,000 | Provincial – 9%, Municipal Levy 91% |
| Low water response | Conditions monitoring and analysis. Technical and administrative support to the Water Response Team representing major water users and decision makers, who recommend drought response actions. | 1 | CA Act Sec. 21.1 | $6,750 | Provincial – 22%, Municipal Levy – 78% |
| Information Management | Data collection, mapping, data sets, watershed photography. Development and use of systems to collect and store data and to provide spatial geographical representations of data. | 1 | CA Act Sec. 21.1 | $8,750 | Municipal Levy 65%, Self Generated – 35% |
| Technical Studies and Policy Review | Studies and projects to inform natural hazards management programs including: floodplain management, watershed hydrology, regulations areas mapping update, flood forecasting system assessment, floodplain policy, Lake Huron shoreline management. These projects often last one to two years and are distributed over time as human resources and funding is available. | 1 | CA Act Sec. 21.1 | $20,500 | Municipal – 100% |
| Natural Hazards Communications, Outreach and Education | Promoting public awareness of natural hazards including flooding, drought, and erosion. Public events, materials. Social media services. Media relations. Educate elementary school students and the public about the danger of floodwaters. | 1 | CA Act Sec. 21.1 | $9,000 | Provincial – 56 % Municipal Levy – 44% |
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| **Provincial Water Quality & Quantity Monitoring**<br>Program Description: The ABCA, in partnership with Ministry of Environment, Climate Change and Parks (MECP), has established long term sites to monitor surface and ground water conditions. | | | | | |

| Program/Service and Subservices | Description | Category (1,2,3) | Category Rationale | Average Annual Costs | Funding mechanism and percentage of costs |
|---|---|---|---|---|---|
| Provincial Water Quality Monitoring Network (PWQMN) | A long-standing (50+ year) CA/MECP partnership for stream water quality monitoring at nine sites. CA takes water samples and MECP does lab analysis and data management. Information is used for watershed report cards and stewardship project prioritization. | 1 | CA Act Sec. 21.1 | $13,750 | Municipal Levy – 95%, Self Generated – 5% |
| Provincial Groundwater Monitoring Network (PGMN) | A long-standing CA/MECP partnership for groundwater level and quality monitoring at 16 stations. Costs include equipment, data collection, analysis, data management and reporting. MECP funded network installation and continues to fund equipment replacements. Data collected supports flood forecast and warning, low water response, and water quality monitoring. | 1 | CA Act Sec. 21.1 | $40,250 | Municipal Levy – 97%, Self Generated – 3% |
| Integrated Water and Climate Station | Water monitoring site at Parkhill Conservation Area at Parkhill Reservoir inlet for groundwater, soil, water quality and meteorological parameters. Data collected support flood forecast and warning, low water response, water quality monitoring and a number of external partners including MECP and academic institutions. | 1 | CA Act Sec. 21.1 | $12,250 | Provincial – 30%, Municipal Levy – 55%, Self Generated – 15% |
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| **Local Water Quality Monitoring**<br>Program Description: The ABCA, in partnership with community organizations, municipalities, and federal and provincial agencies has established sites to monitor surface water quality and quantity. | | | | | |
| Surface Water Quality Monitoring Program | Surface water quality monitoring at nine sites (in addition to PWQMN), Lake Huron nearshore water monitoring at area beaches, edge-of-field monitoring at Huronview Demonstration Farm near Clinton, benthic monitoring at 30 sites across the watersheds. Responding to local spills | 3 | CA Act Sec. 21.1.2 | $203,500 | Federal – 7%, Municipal Levy – 32%, Self Generated – 61% |

| Program/Service and Subservices | Description | Category (1,2,3) | Category Rationale | Average Annual Costs | Funding mechanism and percentage of costs |
|---|---|---|---|---|---|
| | events at the request of MECP. Costs include sampling, analysis and reporting. | | | | |
| Huron County Sentinel Well Program | Long-term monitoring at six drinking water wells to characterize water quality within six major aquifers in Huron County. Through a contract, the wells have been sampled annually since 2004 with reports provided to the county and health unit. | 3 | CA Act Sec. 21.1.2 | $4,500 | Upper Tier Contract - 100% |
| Watershed Report Card | Conservation Authorities report on local watershed conditions every five years. The ABCA watershed is divided into 16 subwatersheds. Measuring increases understanding of the watershed, focuses efforts and tracks progress. | 3 | CA Act Sec. 21.1.2 | $13,500 | Municipal Levy – 86%, Self Generated – 14% |
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| **Drinking Water Source Protection**<br>Program Description: The protection of municipal drinking water supplies in the Ausable Bayfield Maitland Valley Region through the development and implementation of the Source Protection Plans. | | | | | |
| Drinking Water Source Protection Program (DWSP) | Source Protection Area/Region, technical support, Source Protections Committee support, Source Protection Authority reports and meetings. Activities required by the Clean Water Act and regulations. | 1 | CA Act Sec. 21.1 | $243,500 | Provincial – 100% |
| DWSP Risk Management Official | Carrying out Part IV duties of the Clean Water Act on behalf of municipalities through service agreements.<br><u>Category 2: ABCA municipal agreements</u><br>Municipality of Bluewater: 11/29/2023<br>Municipality of Central Huron: 11/02/2023<br>Municipality of Huron East: 11/08/2023<br><u>Category 3: Maitland Valley CA municipal agreements</u><br>Municipality of Morris-Turnberry: 11/21/2023<br>Municipality of North Perth: 11/21/2023 | 2<br>3 | CA Act Sec. 21.1.1 and 2 | $94,250 | Municipal Contracts – 100% |

| Program/Service and Subservices | Description | Category (1,2,3) | Category Rationale | Average Annual Costs | Funding mechanism and percentage of costs |
|---|---|---|---|---|---|
| | Township of Ashfield-Colborne-Wawanosh: 12/06/2023<br>Township of Huron-Kinloss: 12/05/2023<br>Township of North Huron: 11/21/2023 | | | | |
| | | | | | |
| **Core Watershed-based Resource Management Strategy**<br>Program Description: The purpose of a watershed plan is to understand the current conditions of the watershed, and identify measures to protect, enhance, and restore the health of the watershed. Watershed strategies provide a management framework to provide recommendations which consists of goals, objectives, indicators, and management recommendations. This addresses existing issues in the watershed and mitigate impacts from potential future land uses, while recommending appropriate actions to protect, enhance, and restore the watershed. | | | | | |
| Strategy Development | New Project: Collate/compile existing resource management plans, watershed plans, studies and data. Strategy development, implementation and annual reporting. The strategy will be completed in 2024 and there will not be ongoing costs. | 1 | CA Act Sec. 21.1 | $0 | |
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| **Sub-watershed Plans and Projects**<br>Program Description: Watershed strategies provide a management framework to provide recommendations which consists of goals, objectives, indicators, and recommendations. This addresses existing issues in the watershed and mitigate impacts from potential future land uses, while recommending appropriate actions to protect, enhance, and restore the watershed. | | | | | |
| Subwatershed Initiatives not related to natural hazards | The ABCA works with communities to develop and implement subwatershed plans. Plans and initiatives are: Ausable River Recovery Strategy, Old Ausable Channel and Port Franks Management Strategy, Bayfield River, Bayfield River Watershed Plan and Lake Huron Tributaries Watershed Plan. Activities include: community engagement and objective setting, supporting protection, enhancement and restoration activities, and monitoring and evaluating actions. Note: Natural hazard | 3 | CA Act Sec. 21.1.2 | $526,250 | Federal – 20%, Provincial – 25%, Municipal Levy -25%, Self Generated – 30% |

| Program/Service and Subservices | Description | Category (1,2,3) | Category Rationale | Average Annual Costs | Funding mechanism and percentage of costs |
|---|---|---|---|---|---|
| | considerations will be incorporated when the plans are reviewed and updated. | | | | |
| Lake Huron Regional Initiative | Collaborative project of federal and provincial agencies and Lake Huron Southeast Shore Conservation Authorities to develop watershed plans to address broader-scale water quality issues and natural hazard issues in near-shore areas and contributing watersheds. | 3 | CA Act Sec. 21.1.2 | $228,000 | Federal – 9%, Provincial - 83%, Self Generated – 8% |
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| **Conservation Authority Lands and Conservation Areas**<br>Program Description: The ABCA owns 3,616 hectares of land which includes conservation areas, management areas, conservation forests, farmland and flood control structures and surrounding land. ABCA property is essential to watershed management, environmental protection, helps implement the Watershed Management Strategy and provides areas for passive recreation. | | | | | |
| Section 29 Minister's regulation for Conservation Areas | Conservation areas regulations enforcement/compliance. | 1 | CA Act Sec. 21.1 | $20,500 | Self Generated – 100 % |
| Great Canadian Hideaway Campground | Long-term lease with a private party to operate a campground and associated facilities at Parkhill Conservation Area. | 3 | CA Act Sec. 21.1.2 | $250 | Self Generated – 100% |
| ABCA forests and management areas (not Conservation Areas) | Management and maintenance of CA owned lands. Includes forest management, signage, gates, passive recreation, stewardship, restoration, ecological monitoring, carrying costs such as taxes and insurance. | 1 | CA Act Sec. 21.1 | $110,250 | Municipal Levy – 5%, Self Generated – 95% |
| Conservation Areas | Management and maintenance of nine conservation areas and one recreational trail. Includes passive recreation, risk management program, hazard tree management, gates, fencing, signage, brochures, communications, pedestrian bridges, trails, parking lots, pavilions, roadways, stewardship, restoration, ecological monitoring, carrying costs such as taxes and insurance. | 1 | CA Act Sec. 21.1 | $132,250 | Municipal Levy – 10%, Self Generated – 90% |

| Program/Service and Subservices | Description | Category (1,2,3) | Category Rationale | Average Annual Costs | Funding mechanism and percentage of costs |
|---|---|---|---|---|---|
| Conservation Area Major Maintenance | Major maintenance and capital improvements to support public access, safety and environmental protection such as pedestrian bridges, boardwalks, trails. | 1 | CA Act Sec. 21.1 | $50,750 | Municipal Levy – 25% Self Generated – 75% |
| Land acquisition | Strategic acquisition of environmentally-significant properties. | 3 | CA Act Sec. 21.1.2 | TBD | Self Generated – 100% |
| Huron Tract Land Trust Conservancy properties | Management and maintenance of HTLTC owned lands. Includes passive recreation, risk management program, hazard tree management, forest management, signage, trails, parking lots, buildings, roadways, stewardship, restoration, ecological monitoring, carrying costs such as taxes and insurance. | 1 | CA Act Sec. 21.1 | $50,750 | Self Generated – 100% |
| Inventory of Conservation Authority lands | New Project: The land inventory will include the following information: location as well as date, method and purpose of acquisition, land use. One time project with updates as properties are acquired or disposed of. | 1 | CA Act Sec. 21.1 | $0 | |
| Strategy for CA owned or controlled lands and management plans | New Project –A strategy to guide the management and use of CA-owned or controlled properties including: guiding principles, objectives, land use, natural heritage, classifications of lands, mapping, identification of programs and services on the lands, public consultation, publish on website. This project will be completed in 2024 and will not have on-going costs. | 1 | CA Act Sec. 21.1 | $0 | |
| Land Acquisition and Disposition Strategy | A policy to guide the acquisition and disposition of land in order to fulfill the objects of the authority. Completed in 2022. | 1 | CA Act Sec. 21.1 | $0 | |

| **Program/Service and Subservices** | **Description** | **Category (1,2,3)** | **Category Rationale** | **Average Annual Costs** | **Funding mechanism and percentage of costs** |
|---|---|---|---|---|---|
| Species at Risk Inventory | Periodic inventories of terrestrial Species at Risk on ABCA lands, GIS mapping and submission of data to NHIC. Information guides land use activities and restoration projects. | 3 | CA Act Sec. 21.1.2 | $12,250 | Self Generated – 100% |
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