



# Preparing for Change in Ausable Bayfield Watersheds

*Building Resilient Watersheds to Prepare for Future Weather Extremes and Climate Change  
through Effective Watershed Resource Management, Planning and Programming*  
An Ausable Bayfield Conservation Authority (ABCA) Position Paper

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## 1.0 Executive Summary

The Ausable Bayfield Conservation Authority (ABCA) has demonstrated its ability to develop and adapt programs to current and emerging environmental issues over more than six decades. This culture of progressive thinking has established the ABCA as a provincial leader in conservation. The ABCA has not accomplished this alone. The conservation goals of this local agency are met through partnerships with individual property owners and residents, municipalities, governments and organizations. Watershed landowners are leaders in adopting Beneficial Management Practices (BMPs) to improve water and soil quality, for example.

The ABCA is dedicated to the development of trained and professional staff people and acquiring current and sound information to guide the local agency in fulfilling its watershed natural resources management role. One of the most significant factors the Conservation Authority must consider in its planning and programming is the reality of extreme weather events that have occurred in the past and are likely to occur with more frequency in the future.

The ABCA has a long history of adapting to change and developing a vision for the future. More than sixty years ago local municipalities envisioned the need for an agency like this one. Minutes of the McGillivray Township Council in 1946 record that: “It is the belief of this council that the ruthless ploughing of flooded grassland together with the uncontrolled cutting of timber is creating a condition which is beyond the power of this and other municipal councils to control. Therefore this council requests the minister to have a survey made of the Ausable River Watershed to determine the conservation measures necessary to ensure proper land use of this area.”<sup>1</sup>

The vision of those municipal pioneers in 1946 created a local conservation agency that has responded to the needs of the day and has helped build a stronger watershed for the future. The ABCA is called upon, once again, to prepare for the future and take some of the steps required to protect life, property and the environmental health of watershed residents.

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<sup>1</sup> Dixon, Andrew, ‘*The Ausable Bayfield Conservation Authority: An Old Man’s View*,’ in *40 Years of Conservation*, ABCA, pp. 7-8, 1986.

The ABCA has become increasingly aware of the documented increase in global temperatures and the scientific evidence that climate change is profoundly affecting our world, our country, and our watersheds. The Conservation Authority joins other environmental organizations in identifying climate change and climate variability as issues of vital concern. These are developments that will affect all areas of watershed programming, management and planning.

Our local understanding of the effects of increasing world temperatures and extreme weather events is still evolving. However, there is consensus that the development and enhancement of existing Conservation Authority programs can better prepare our watersheds for the conditions we will face in the future. Conservation, afforestation and wetland protection are among activities which may help mitigate against future climate extremes. The Ausable Bayfield Conservation Authority and its partners are leaders in these watershed stewardship activities. Therefore, the ABCA's future role may be more important than ever in light of the established trends and projected impacts.

The projected impacts of climate change are sources of discussion and debate but to simply hope that these impacts will not happen would not serve our watershed residents well. We have a professional responsibility to build watershed resiliency now and for generations to come. We do not have the option to close our eyes and hope for the best. We must prepare for the future.

The Conservation Authority has worked in partnership with landowners in the past to address challenges and changes – such as changing lake levels – and has developed new shoreline policies and regulations. The ABCA has worked in partnership with farmers to help in the research and development of conservation tillage techniques to address soil erosion problems and in helping meet the need for alternative conservation practices. This experience in adapting to change helps prepare the organization to meet the difficult challenges ahead. The time has come again to use that ingenuity, and vision, to take successful existing programs and build more resilient watersheds better able to meet the demands of the future.

The ABCA and its partners, through effective watershed programs, can play a role in mitigation – including reduction of greenhouse gases – and adaptation, through a local-level response to climate variability and change.

The ABCA believes that responsible watershed planning must respond to the changes in weather experienced in recent years and the long-term changes in climate projected for the future by the scientific community within Canada and abroad. The ABCA believes that it is prudent and responsible to anticipate and prepare; to learn more about the projected effects of climate change and consider those predicted impacts when undertaking watershed planning and programming.

**KEY POINT:** The prospect of climate change and weather extremes in the future makes it more important than ever for the ABCA to continue progressive projects, conservation education, water quality protection, water quantity conservation and the pursuit of watershed resiliency. The ABCA is particularly qualified to offer the programs needed to build a more resilient watershed which will serve us well to deal with the uncertainties of the future.

## 2.0 What is Climate Change?

Climate change, according to Environment Canada, is “a shift in long-term average weather patterns, which can include changes in temperature and in precipitation amounts.”<sup>2</sup>

Climate change can also be defined as “a change of climate which can be attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods,” according to The United Nations Framework Convention on Climate Change.

Environment Canada<sup>3</sup> reports that while certain greenhouse gases are naturally occurring, human activities release additional greenhouse gases into the atmosphere. The anthropogenic (human-induced) greenhouse gases identified as the major human contributions to climate change are:

- 1) Carbon dioxide (CO<sub>2</sub>) – Carbon dioxide is often released by the burning of fossil fuels (coal, oil, natural gas) for industrial purposes, transportation, and the heating/cooling of residential, commercial and other buildings. Deforestation causes less carbon dioxide to be naturally absorbed by foliage.
- 2) Methane (CH<sub>4</sub>) – Methane is released by landfills, wastewater treatment, agriculture, solid waste incineration, and other sources.
- 3) Nitrous oxide (N<sub>2</sub>O) – Nitrous oxide is released into the atmosphere through practices such as the use of chemical fertilizers and the burning of fossil fuels.

The Intergovernmental Panel on Climate Change has found emissions caused by human activity since the Industrial Revolution have had, and are having, a profound impact on our climate. Human activity may cause only about five per cent of global greenhouse gases (natural processes account for the remainder), but that is enough to “upset the delicate balance of GHGs in the atmosphere and, by extension, the climate . . . The result is the continued warming of the atmosphere and resulting changes in its composition.”<sup>4</sup>

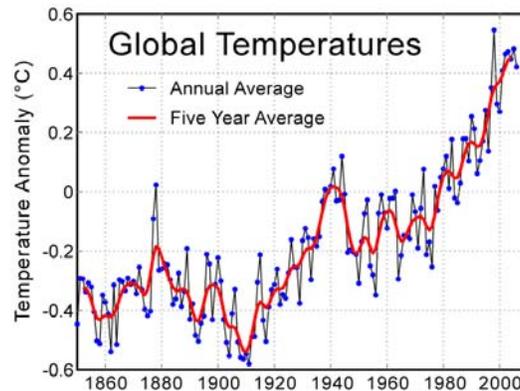


Figure 1 – Global Temperature Changes. SOURCE: United Kingdom Meteorological Office, 2006.

<sup>2</sup> Environment Canada, *Climate Change*, ec.gc.ca, updated 2007-03-20.

<sup>3</sup> Environment Canada, *Canada's Fourth National Report on Climate Change, Actions to Meet Commitments Under the United Nations Framework Convention on Climate Change*, 2006

<sup>4</sup> Environment Canada, *Canada's Fourth National Report on Climate Change*, 2006.

The upward trend in temperatures from the Industrial Revolution onwards has increased above normal, past ranges. Environment Canada reports the twentieth century was the warmest century in one thousand years and the warmest decade of the previous millennium was the 1990s.<sup>5</sup>

“The world’s climate has not been constant,” according to Environment Canada. “We know that nature has caused dramatic past changes, but there is increasing evidence that human activities are altering our climate at an unprecedented rate.”<sup>6</sup>

Conservation Authorities do not directly study greenhouse gas emissions, track long-term global weather trends or make scientific conclusions about changes in climate patterns or projected future extremes in temperatures. Ausable Bayfield Conservation Authority staff members have, however, attended training about climate change and, to do their job effectively, they need to consider the reality of world temperature increases, the scientific evidence behind climate change and its projected implications when undertaking watershed planning and programming for the future.

The climate change issue propels us forward on a learning journey. It forces us to learn more, reflect on what we are doing and ensure we are best equipping our watersheds for the future.

**KEY POINT:** The ABCA has a professional responsibility to consider the best scientific information available. Increasing world temperatures have been demonstrated and projections are that temperatures will continue to increase. The scientific community projects weather extremes. Those weather extremes are likely to affect watershed programming and planning. Therefore, the ABCA must continue to learn about the future challenges which may occur and nurture programs which will prepare the watershed for the changes and extremes that are expected. Staff must also pass on that education to the watershed property owners who can benefit from that knowledge and make a difference in preparing for the future.

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<sup>5</sup> Natural Resources Canada, ‘Temperature rising: Climate change in southwestern British Columbia: Is climate changing?’, Natural Resources Canada website, updated September 11, 2007.

<sup>6</sup> Environment Canada, ‘Temperature and Precipitation: Indications of Climate Change,’ Government of Canada website, updated 2005-05-18.

### 3.0 An Important Conservation Authority Role for the Future

Our world has been getting progressively warmer and temperatures continue to climb. What are the implications of this warmer climate? Our planet and our watersheds are likely to be susceptible to more extremes in the future, facing everything from flooding to drought. We have to acknowledge these trends and change the way we do our work and prepare to take a leadership role with an eye to the future.

Even if climate change were not a concern, watershed stewardship would help us prepare for the future. The scientific evidence before us suggests even more compelling reasons to implement proactive watershed stewardship measures.

The serious challenge faced by those in the conservation field is underlined by a new report prepared by the Soil and Water Conservation Society. “The report, *Planning for Extremes*, warns that more focused conservation planning is needed to minimize the adverse effects anticipated with global warming and associated extreme rainfall events. According to the report, current conservation planning, based largely on long-term average climate data, fails to protect resources and environmental quality during severe storms when most damage occurs.”<sup>7</sup>

The Ausable Bayfield Conservation Authority may have a more important role in the future as a result of climate change.

Increasing temperatures and weather extremes could seriously impact the work of the ABCA. In the area of flood control, the ABCA will need to continue to monitor water levels. The agency should continue to improve strategies related to low-water response and continue to encourage water conservation.

Conservation education, afforestation (planting forests on cleared and abandoned lands), ecosystem restoration, wetland protection and other programs help build resiliency into local watersheds. We need to fulfill our stewardship role now more than ever – to respect and protect our watershed and our planet. The ABCA has set a high standard for positive conservation and stewardship activities in the watershed and will continue to work with partners to achieve a more resilient watershed.

Climate change has the potential to affect all watershed resources: agriculture, forestry, fisheries, water, drinking water, coastal zone, transportation, local economy, human health and the vulnerable sectors of the population.<sup>8</sup> The ABCA does not have responsibility for all these vulnerable sectors but the ABCA can play an important role through preparation for the impacts of climate change through sectors such as watershed stewardship initiatives related to water, agriculture, forestry and coastline.

The ABCA recognizes the important role of wetland preservation and watershed stewardship efforts in the overall health of the watershed as well as the positive effects they have in mitigation against future weather events.

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<sup>7</sup> Soil and Water Conservation Society, Letter to Members, [swcs.org](http://swcs.org), May 8, 2007.

<sup>8</sup> Climate Change Impacts and Adaptation: A Canadian Perspective, [adaptation.nrcan.gc.ca/links\\_e.php](http://adaptation.nrcan.gc.ca/links_e.php)

ABCA staff should also consider the effects of weather and climate extremes on farmers and other watershed residents and educate them about adaptation and mitigation strategies through programs including stewardship, communications and conservation education.

**KEY POINT:** The ABCA will need to work with all watershed residents – farmers, lakeshore residents, rural non-farm residents, urban and small urban residents and others – to move forward with watershed stewardship activities such as those as identified in the ABCA Watershed Report Card. Together we can make a difference in preparing for change.

## 4.0 Impacts on Forestry and Land Stewardship

Forests play a major role in removing atmospheric carbon dioxide. Afforestation is an effective and ecologically-viable means to sequester atmospheric CO<sub>2</sub> and reduce greenhouse-gas warming effects.<sup>9</sup>

The shade provided by trees will become even more important in moderating weather as temperatures rise.

There is growing evidence that environmental changes, attributed to elevated atmospheric carbon dioxide, and its potential effects on global climate, will alter forest ecosystems in Ontario.<sup>10</sup> In our watershed forests, insect pests, diseases, drought, and plant physiological responses may all be affected by a changing environment.

The decrease in the number of freezing days – the lack of sustained below-0° Celcius temperatures – and less extreme cold during the winter may allow insect pests to expand their range. This is already being observed in western Canada with the spread of the mountain pine beetle to the east of the Rocky Mountains. Previously, extreme cold during the winter had limited its northern and eastern spread.

Closer to home, we have observed the damaging effects of the native hickory bark beetle throughout our watershed. This pest is present naturally in our forests, and attacks sick and weakened hickory. Successive years of heat and drought in the late 1990s, and early 2000s, have stressed trees watershed-wide. The hickory bark beetle responded with a population explosion that has nearly eliminated mature bitternut hickory from several area woodlots. Already, ABCA staff members have had to cut down some dead and dying trees along several watershed nature trails because of this pest. The prospect of more heat and drought on the horizon, and less protracted periods of below-0 temperatures, leads us to believe that similar outbreaks can be expected.

Larger forest blocks with greater species diversity and genetic variability may be best-equipped to adapt to a changing climate.

The Forestry and Land Stewardship Specialist should continue to promote tree planting and forest management strategies that enhance woodlot health and diversity in order to help our landscape adapt to changing and uncertain environmental conditions. The ABCA also recognizes the need to continually learn more in order to provide our watershed stewardship partners, through workshops and other means, with the best information possible on how to plant for success and what to plant in light of an uncertain future.

Time and time again it has been demonstrated that it costs more to create environmental areas than to protect existing ones. Therefore, the ABCA should put a priority on the protection of existing resources such as woodlots, wetlands and buffers. The important watchword is to be ‘proactive,’ when possible, and not ‘reactive.’

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<sup>9</sup> McMaster University Climate Change Research Program, Turkey Point Carbon Cycle Research Project

<sup>10</sup> Colombo, S. J. et al., *The Impacts of Climate Change on Ontario's Forests*, Forest Research Information Paper No. 143, Ontario Ministry of Natural Resources and Ontario Forest Research Institute, 1998.

**KEY POINT:** The Ausable Bayfield Conservation Authority can help create watersheds that are resilient and prepared for change through effective Forestry and Land Stewardship programs, riparian zones, erosion protection and other means.

## 5.0 Impacts on Soil Quality and Soil Quantity

The Ausable Bayfield Conservation Authority watersheds contain some of Canada’s best farmland. Soil is one of that land’s most valuable resources. The increased number of growing days predicted to accompany climate change will be of no benefit if soil and moisture are not present to grow the crops.

Greater periods of time without snow cover may result in more wind erosion. That can strip valuable topsoil. Less topsoil results in poorer crop yields and a greater reliance on fertilizers. In addition, intense rainfall events may result in significant loss of soil from fields and river banks. The eroded soil and contaminants pollute watercourses and degrade aquatic habitat. Trends of increased soil loss “are likely to continue in future decades unless significant erosion prevention measures are undertaken.”<sup>11</sup>

The Maitland Valley Conservation Authority’s document, ‘How Will Your Farm Cope with a Changing Climate?’, tells farmers that changing climate conditions could lead to more soil erosion and erosion of stream banks, more problems with sandy and silty soils that have a low moisture capacity, downward pressures on yields and other impacts.

Stream buffer areas are a way landowners can help adapt. ABCA stewardship staff can be a valuable resource for farmers in educating about ways that run-off might be slowed down in light of the trend towards more frequent short-duration, high-intensity rainfall events.

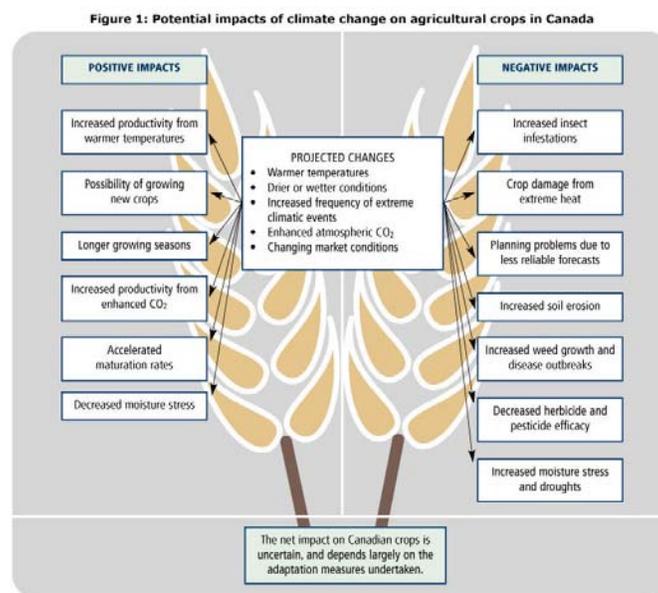


Figure 2 – Projected Positive and Negative Impacts of Climate Change on Agricultural Crops in Canada. SOURCE: Climate Change Impacts and Adaptation: A Canadian Perspective, Natural Resources Canada, 2004.

<sup>11</sup> Ontario Chapter of the Soil and Water Conservation Society, *Planning for Extremes: Adapting to impacts on soil and water from higher intensity rains with climate change in the Great Lakes basin*, Initial Report, 2006.

Environment Canada's report *Adapting to Climate Variability and Change in Ontario* stresses the need to adopt practices in all sectors of the economy that will assist water conservation and foster health and resiliency in our river systems, prime agricultural land and remaining forests.<sup>12</sup> Major recommended adaptations include:

- Conservation tillage practices
- Rotations that include cover crops
- Conversion of agricultural land with low moisture retention capacity to other uses
- Planting of more windbreaks/shelter belts and hedgerows
- Agro forestry (inter planting trees and crops)
- Increasing forest cover in headwater areas, river valleys, floodplains and stream corridors to help retain runoff and summer base flow,
- Limiting irrigation from rivers and streams to protect base flow during the summer and fall periods.

The Ontario Chapter of the Soil and Water Conservation Society, as part of a joint Great Lakes basin study with the U.S. Soil and Water Conservation Society, has created some recommendations in their document, *Planning for Extremes*:

Those recommendations, which can be consulted and considered by staff in their local decision-making and programming, include:

1. Identify and map critical source areas for surface runoff, stream sediments and associated contaminants, with particular attention given to winter and spring runoff conditions.
2. Expand the implementation of nutrient, pesticide and bacteria control measures in all agricultural regions of the province, with particular attention given to those portions of rural watersheds that constitute
  - i) Critical source areas for surface runoff and stream sediments, and;
  - ii) Critical source areas for groundwater recharge, with a primary focus on winter and spring conditions.
3. For all farms, move towards:
  - a. Further reduction of pesticide use by 30 per cent
  - b. Providing for adequate containment of manure and elimination of winter spreading, and minimization of chemical nutrient application, especially in spring;
  - c. Minimized non-growing season chemical and nutrient application;
  - d. Installation of buffer strips or setback zones, where beneficial;
  - e. Expanding wetlands where they can be effective in reducing peak flows.
4. Develop a plan for compensation to farmers for conservation measures to reduce sediment and pollutant transport to waterways, to protect soil and water quality, and sequester greenhouse gases.

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<sup>12</sup> Maitland Valley Conservation Authority, 'How Will Your Farm Cope with a Changing Climate?'

5. Conduct programs to increase areas of forest and wetlands in critical source areas to reduce movement of sediment and contaminants into waterways and the Great Lakes.

6. Monitoring and Assessments to understand trends in the Great Lakes basin related to climate change:

- a. Reinstate systematic sediment transport monitoring on major tributaries to Great Lakes and ensure that large runoff/erosion events are measured;
- b. Provide for a more extensive network of recording rain gauges and keep up-to-date the analyses of intensity-duration-frequency data;
- c. Institute a long-term small watershed study in an agricultural region tributary to the Great Lakes, with instrumentation to determine impacts on sediment transport and runoff with various agricultural practices, and trends of extreme events;
- d. Measure and assess nearshore Great Lakes water quality in late winter and spring each year for chemical composition, turbidity, bacterial contamination and biological production, and;
- e. For the Great Lakes, use satellite imagery to assess sediment transport and dispersion, and analyze water quality from water intakes to assess near shore contamination.

7. Greenhouse Gas Mitigation

Agricultural areas should be managed to increase carbon sequestration in soils, vegetation and products, and everyone should participate at personal, business, municipal, provincial and federal levels to reduce greenhouse gas emissions.

**Key Point:** The ABCA should continue to encourage farmers to use conservation tillage and cropping techniques, plant field and farmstead windbreaks, establish grassed waterways and water and sediment control basins, retire erosion-prone land from farming and protect and enhance watercourse buffers.

## 6.0 Impacts on Hydrology and Water Resources

### - Water Quality and Water Quantity

A warming climate could have impacts on water quantity and quality across Canada. For example, in the Great Lakes basin, climate models predict changes in annual streamflow and lake levels, with the possibility of more frequent flooding. In such cases, current sewage treatment facilities may be unable to cope with increased volumes of stormwater and wastewater runoff. Climate variability has a pronounced impact on the capacity of groundwater systems to maintain water supplies, on in-stream conditions, and on aquatic habitat. Impacts such as these may increase as a result of climate change.<sup>13</sup>

Precipitation may go up but that may be offset by increased evaporation. There may be increased flooding *and* increased incidences of drought. There may be flooding events at non-traditional times. There may be impacts in terms of erosion. There may be “increased uncertainty” about water supply management.

We don’t know all the implications of climate change – but we do know we have to continue to educate staff, to monitor those changes and implement strategies to build resiliency against extremes and be prepared to respond.

What does climate change mean to our watershed? It is projected that it could result in an increase in droughts, a reduction in surface water quantity and quality, an increase in waterborne diseases, more heat waves, more storm surges and a greater frequency of extreme weather events (such as high winds, ice storms and intense rain<sup>14</sup>).

Increasing temperatures have the prospect of negatively impacting species at risk that are already declining in numbers. Drought may impact low-water response actions. Climate change will be a consideration in stormwater management and may affect floodplain limits.

There could be impacts to the coastal zone of Lake Huron which may include reductions in lake levels. This will require more study of shoreline impacts such as erosion. On the one hand, lake levels may decline, followed by landowner requests to build close to the shoreline. On the other hand, erosion may go up in some areas, not down.

These and other issues underline the need for the ABCA to have a role in creation of mitigation measures, program adaptation and education – both internally (e.g., to staff) and externally (e.g., to farmers and other property owners). Multi-partner efforts such the stewardship guides for coastal landowners, farmers and rural non-farm landowners should continue to be promoted in order to facilitate mitigation actions in the watershed. We must continue to ‘put more (water) storage back on the landscape.’<sup>15</sup>

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<sup>13</sup> National Water Research Institute, *Climate Change Effects*, factsheet, 2003.

<sup>14</sup> Ontario Chapter of the Soil and Water Conservation Society, *Planning for Extremes: Adapting to impacts on soil and water from higher intensity rains with climate change in the Great Lakes basin*, Initial Report, 2006.

<sup>15</sup> Boyd, *Building Resilient Watersheds*.

The potential effects of climate change on water supplies should be considered under Drinking Water Source Protection Planning through incorporation of future climate scenarios into existing surface and groundwater models. It is anticipated at this time that climate change is more likely to impact private well supplies than public water supplies as local watersheds get drinking water from relatively abundant Lake Huron and bedrock aquifers. However, technical advisors to the planning process must keep up to date on temperature and weather trends and consider how changes (e.g., lake and water levels) might impact local plans and continue to provide current information to the Source Protection Committee for its consideration.

The ABCA monitors surface water levels and flows and precipitation through its flood forecasting monitoring. The Conservation Authority works with a Volunteer Rain Gauge Network and the new Provincial Groundwater Monitoring Network. The data collected through these and other mechanisms may be helpful in tracking weather patterns and that information can assist watershed planning and outside agencies.

Watershed planning by the CA has to take into account that:

- Total annual precipitation changes could be moderate, but the timing of precipitation during the year may change.
- We may have fewer day-long rains, but more short intense rainfalls.
- If these intense rainfalls occur more often over urban areas, the existing storm sewer systems will not be designed to handle the water and we may have costly flood damages such as the case of events in Exeter during flooding events in 1969, 1996, and 2000.
- There may be more intense rainfall events in the spring and autumn when soil has the least amount of cover. This could greatly increase the amount of erosion on the landscape.
- The ABCA compiles report cards for its watersheds and the identification of the need for more forest cover and better forest conditions can be reinforced by our understanding of climate change's effects.

The ABCA Board of Directors supports the Conservation Authority's efforts to preserve our water supplies including its membership on the (Low Water) Water Response Team, through monitoring programs including the Provincial Groundwater Monitoring Network (PGMN) and through multiple existing Water Quality and Water Quantity programs.

**KEY POINT:** We need to be aware that we do not have an unlimited supply of water and extremes in weather and climate may put increased pressures on our water quantity and quality. Therefore, we need to continue to move from a water-wasting society to a water-conscious and conserving society. ABCA planning and programming has an important role to play in achieving that goal.

**Table 1 – ABCA Mitigation and Adaptation to Climate Change and Climate Variability**

*The following is a table which identifies some of the events, impacts and mitigation measures associated with climate change. Staff should consider and add detail to a table of this type to develop a plan of response for projected impacts.*

<b>ABCA Mitigation and Adaptation to Climate Change and Climate Variability</b>		
<i>[Table in development]</i>		
<i>Extreme event</i>	<i>Impact on watershed features</i>	<i>Prevention, mitigation, adaptation measures and actions</i>
Drought	Low-flow issues Species at risk impacted Biological impacts	Education re: water conservation Water permitting if necessary Increased use of Low Water Response program
Floods	More localized flooding problems	Flood Response Update of floodlines and policies
Higher rainfall intensity	More localized flooding problems More erosion	Identify, address sensitive areas Stormwater management policy updates
Lake level swings	Trend to lower lake levels	Modify lakeshore planning and policies

## 7.0 Summary

The motto of the Ausable Bayfield Conservation Authority is ‘Building Better Environmental Conscience.’ The ABCA has an important role to play educating all stakeholders about the need to build resilient watersheds to be better equipped to deal with future weather extremes.

The Ausable Bayfield Conservation Authority has worked with municipal and other partners for more than sixty years to create resilient watersheds through professional watershed planning and programming for the future. The ABCA’s work takes on new importance in light of increasing world temperatures and projected weather extremes in the future.

The ABCA must work with government and other partners to find funding sources for projects that will help build the watershed resiliency we have identified as a key means of preparing for climate change.

The ABCA is committed to taking a watershed management and conservation education role with landowners to help create a watershed that is prepared for the future. The Conservation Authority has identified the need to use existing programs to their fullest potential and create new programs when required to build a stronger watershed. The ABCA also needs to be a conservation leader and can do so through a self-examination of its own environmental footprint and ways of reducing that impact.

The ABCA supports training of staff to better understand projected impacts of weather extremes, climate variability and climate change. Conservation Authority staff also need to continue to learn how to most effectively engage local landowners and other partners in mitigation and adaptation programs that create a difference on the ground.

The Conservation Authority has a responsibility to consider the impacts a changing climate may have on our local watersheds in terms of forestry, tree species, water quality, water quantity and aquatic species that rely on cold water; on watershed stewardship, conservation education and all other aspects of CA programming.

Many climatic changes are predicted or envisioned for the future: warmer climate and overnight temperatures, more extreme events, severe rainfall events, ice storms, rapid melts, more frequent and prolonged droughts, shifts of storms into spring and fall seasons and changes in snowfall patterns, increased flooding, bank erosion, soil erosion, lower water tables, less baseflow, reduced fisheries, reduced wetlands, reduced marsh habitat, degraded water quality, poorer air quality, vegetative changes and changes to agricultural crops.<sup>16</sup>

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<sup>16</sup> Dwight Boyd, Senior Water Resources Engineer, Grand River Conservation Authority, ‘Making Watersheds More Resilient to Climate Change,’ Multimedia presentation, March 15, 2007, Ironwood Golf Club, Exeter, Ontario.

The ABCA must adapt to a changing world. The Conservation Authority can do so by working with governments, partners and landowners to make watersheds more resilient through efforts including (but not limited to): creating riparian buffer strips, using minimum tillage practices, creating a green filter, making watercourses more resilient against erosion, improving soil structure, reducing soil erosion to keep soil on the landscape and out of watercourses, enhancing and protecting wetlands, afforestation, implementation of strong risk management policies, effective floodplain management and forward-looking subwatershed planning.<sup>17</sup>

The ABCA is not the lead scientific authority on climate change issues but the Conservation Authority may have an important role in collecting precipitation and streamflow data which can be provided to government agencies. The Conservation Authority can also have an important role working with landowners on positive watershed stewardship projects which can help make the land better prepared to stand up to the extremes that are expected with continued temperature increases.

The ABCA can deliver federal, provincial and lower-tier programs on the landscape to the benefit of landowners and the watershed. The ABCA's demonstrated ability to work collaboratively with multiple partners can help facilitate programs with practical environmental benefits.

The Conservation Authority's management of programs and services needs to change in recognition of external factors. Watershed monitoring may need to be adapted to record smaller and more intense weather events, for instance. Tree species and planting recommendations may have to be adapted as more information becomes available.

Preparing for change is the ABCA's responsibility within the context of its watershed resources management role and other conservation-related duties. The ABCA is well-positioned to prepare for change because of its successful history working with landowners and partners to address environmental problems and challenges. The Conservation Authority's role will become more important than ever as it helps lead the way in building watershed resiliency and undertaking the kind of protective mitigation measures which will best position this area for projected weather extremes.

The challenge is real. The challenge is daunting. However, the ABCA and its partners are committed to the nurturing of successful programs which will make local watersheds better prepared for whatever changes may come.

**KEY POINT:** We can prepare for change by working together for a stronger watershed through effective and proactive watershed planning and programming. The ABCA cannot make these positive changes alone. 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. That legacy of working together for a stronger watershed future has been the experience of the ABCA for more than sixty years and we believe it will continue. Together, and with a vision for the future, we can play a positive role in adapting to climate change and the impacts it brings.

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<sup>17</sup> Boyd, 'Making Watersheds More Resilient'

## 8.0 Action Items

1. 'Building a Better Environmental Conscience' – Integrate, to a greater extent, into the Ausable Bayfield Conservation Authority's Conservation Education programming 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 our environmental footprint through self-assessment of internal practices – investigating ways to reduce energy consumption in ABCA buildings and vehicles and reducing the waste that enters and leaves the building.
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 the ABCA can play 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 such as Watershed Report Cards, Provincial Groundwater Monitoring Program, surface water monitoring and temperature and precipitation – in order 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.

## 9.0 Glossary

### **Adaptation**

Adaptation is an adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, public and private adaptation, and autonomous and planned adaptation. [SOURCE: World Health Organization]

### **Afforestation**

Afforestation is planting forests on cleared and abandoned lands and it is an effective and ecologically-viable means to sequester atmospheric CO<sub>2</sub> and reduce greenhouse-gas warming effects.

### **Carbon Dioxide**

Carbon dioxide is a greenhouse gas which is released to the atmosphere by both natural and human activities. Although it is reabsorbed by the biosphere in 50 – 200 years, while in the atmosphere it is an effective radiator of energy and contributes to the greenhouse effect.

### **Climate**

The climate of a place may be defined as a composite of the long-term prevailing weather that occurs at that location. It is the normal weather pattern for that place. [SOURCE: Atlantic Climate Centre.]

### **Climate Change**

Climate change is a shift in long-term average weather patterns, which can include changes in temperature and in precipitation amounts. Human activities are altering the chemical composition of the atmosphere through the build-up of greenhouse gases that trap heat and reflect it back to the earth's surface. This is resulting in changes to our climate, including a rise in global temperatures and more frequent extreme weather events. [SOURCE: Environment Canada]. Climate change is a change of climate which can be attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. [SOURCE: The United Nations Framework Convention on Climate Change].

### **Climate Variability**

Climate variability, or 'climatic variability,' refers to the temporal variations of the atmosphere. Typically, this term is used for timescales longer than those associated with synoptic weather events (i.e., months to millennia and longer). The term 'natural climate variability' is further used to identify climate variations that are not attributable to or influenced by any activity related to humans. [SOURCE: American Meteorological Association]. Climate variability refers to the normal ups and downs (warm periods, cool periods, wet periods, dry periods). Climate variability may be in the form of cycles, major floods (25 year) and major droughts (30 years). Climate Change may amplify these extremes or cause them to occur more frequently.

### **Mitigation**

Mitigation is an effort to minimize or reduce the human-induced emissions of greenhouse gases into the atmosphere and/or to enhance their removal by sinks. [SOURCE: Environment Canada].

### **Watershed Resiliency**

Watershed resiliency is a measure of whether the land and water are protected from damage. A resilient system is one that tends to maintain a given state when subject to disturbance (Holling 1973, Ludwig et al. 1997). [SOURCE: Carpenter, Stephen et al., '*Resilience and Restoration of Lakes*,' Ecology and Society, Vol. 1, No. 1, Art. 2].

### **Weather**

Weather is the state of the atmosphere at a given time and place with regard to temperature, air pressure, humidity, wind, cloudiness, and precipitation. The term weather is used mostly for conditions over short periods of time. [SOURCE: Environment Canada].

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