



Effects of Climate Change on Biodiversity within Conservation Halton's Watersheds – Executive Summary

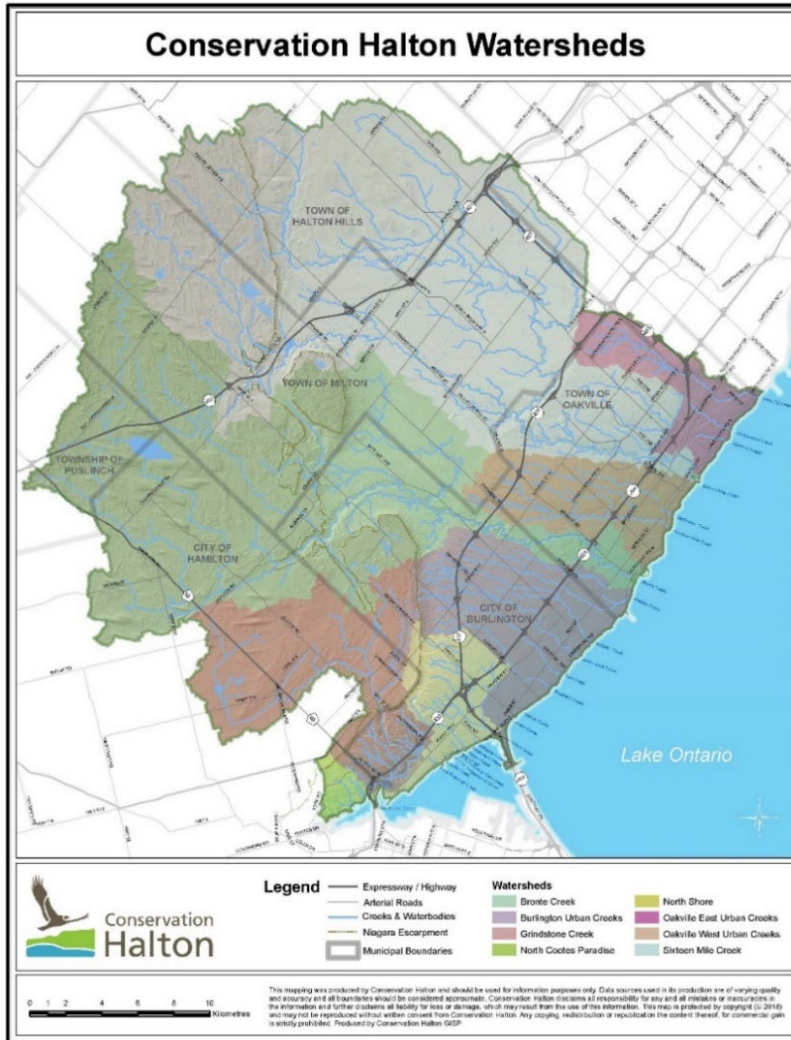


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OBJECTIVE	<p>The purpose of the Effects of Climate Change on Biodiversity within Conservation Halton's Watersheds is to:</p> <ul style="list-style-type: none"> • Identify the effects of climate change on the habitats, animals, and plants that inhabit Conservation Halton's watersheds. • Recommend mitigation and adaptation measures for Conservation Halton and others that can be undertaken to sustain biodiversity.
APPLICATION & USE	<p>This report has been developed for:</p> <ul style="list-style-type: none"> • Decision makers and program managers at Conservation Halton. • Municipalities and managers of ecologically significant and biodiverse properties. • Property owners, businesses, individuals and others who are want to undertake or promote actions, big or small, to sustain biodiversity.
ADDITIONAL REFERENCE MATERIALS ON BIODIVERSITY	<ul style="list-style-type: none"> • Celebrating a Diverse Colonial Waterbird Community https://storymaps.arcgis.com/stories/d5c39c8f3ae3481c97ede4374ae5541b • How Much Habitat is Enough? https://storymaps.arcgis.com/stories/449373496c20412c8dcc2d2f9ac8f75a • Monitoring Watershed Health https://camaps.maps.arcgis.com/apps/MapSeries/index.html?appid=ad0c736957fb401794b5d5b1ab4d7eb5 • Watershed Report Card 2023 https://www.conservationhalton.ca/watershed-report-card/ • Aquatic Monitoring https://gis.conservationhalton.net/AquaticMonitoring/ • Terrestrial Monitoring https://camaps.maps.arcgis.com/apps/MapJournal/index.html?appid=5c5b47db21fb4d6dbd2e348fc14d93e3 • Marsh Monitoring https://camaps.maps.arcgis.com/apps/MapJournal/index.html?appid=2efe2c3ba26d42cabbfe1cc096db262f
VERSION	<p>Version 1.0</p> <p>This version of the Effects of Climate Change on Biodiversity within Conservation Halton's Watersheds was endorsed by the CH Board of Directors in September 2023. The full report is available on CH's website.</p> <p>This report may be updated from time to time.</p>

Executive Summary

Conservation Halton was established as a conservation authority more than 60 years ago to protect our communities from natural hazards such as flooding and erosion and to manage and restore the natural resources of the watershed on behalf of its municipalities.



Conservation Halton's jurisdiction of more than 1000 square kilometres is watershed-based. It includes the Grindstone, Bronte, and Sixteen Mile Creek watersheds and 18 smaller urban watersheds that enter Lake Ontario (herein referred to as Conservation Halton's watersheds).

Introduction

The report entitled "*Effects of Climate Change on Biodiversity within Conservation Halton's Watersheds*", dated September 2023, explores how local biodiversity is and will continue to be affected by climate change and provides local examples.

It describes what actions Conservation Halton is currently undertaking to address the impacts of climate change on biodiversity and provides eight recommendations for additional action.

The report acknowledges the efforts of others, including local municipalities, to address climate change implications and offers suggestions for action.

This report was prepared by Conservation Halton with input from municipalities and is based on available scientific research, technical reports and ecological monitoring data collected by Conservation Halton and others.

Biodiversity and Climate Change

Declining biodiversity and the effects of climate change are interrelated crises at a global scale. Up to one million species are under threat of extinction and climate change plays an increasingly important role in their decline.

There is evidence that ecosystem changes due to climate change have already occurred in Canada and we are witnessing some of the effects within our local watersheds. We are now experiencing conditions that are on average warmer, wetter, and wilder than what we have experienced historically in Conservation Halton's watersheds. Together with the loss of biodiversity through degraded habitats, declining species due to impacts of climate change is a critical issue in Conservation Halton's watersheds. Local examples of species that were formerly present but are no longer found include Loggerhead Shrike, Passenger Pigeon, and Timber Rattlesnake.

When biodiversity is impaired, the services provided by nature that benefit society are also impaired. These services include:

- filtering contaminants from surface and groundwater;
- absorbing rainwater during severe weather events to prevent flooding, erosion, and drought;
- reducing air temperature during heat waves; and
- capturing and storing carbon to mitigate the impacts of climate change.

Climate change is often referred to as a 'threat multiplier' because it exacerbates other issues. For biodiversity in Conservation Halton's watersheds, climate change is one of many other stressors (including invasive species) acting on an already degraded habitat network.

- Habitat is highly fragmented, and few large habitat patches remain. Many remaining natural corridors between terrestrial habitat patches are associated with watercourses.
- Wetland and forest cover are unevenly distributed across the watersheds and are concentrated above the Niagara Escarpment. These areas also generally coincide with subwatersheds with the best water quality.
- Except for wetland cover in Grindstone and Bronte Creek watersheds, forest, wetland, and riparian cover are generally below recommended thresholds for ecological health.

Climate change already affects species such as the endangered Redside Dace in Conservation Halton's watersheds. Current climate projections suggest these effects will continue.

Climate Change Impacts on Biodiversity

Several general conclusions can be drawn about how climate change is impacting biodiversity in Conservation Halton's watersheds.

- **Climate Change is Impacting Biodiversity**— The impacts of climate change cause shifts and changes to the status, health, and range of many species.
- **Winners and Losers**— Climate change affects every species differently. Some species will increase in population size and/or expand their distribution, while others will experience the opposite effect. In general, species with highly specialized requirements (dietary, reproductive, habitat, etc.) such as Redside Dace are most vulnerable to the effects of climate change.
- **Dependence on Other Species**— All species interact with others, but some rely directly and specifically on other ecosystem species to complete their life cycles. Changes to other species because of climate change amplifies these interactions. Examples include

mussels that rely on certain fish for their larval life stage and butterflies whose larvae feed only on a specific host plant, like Mottled Duskywing.

- **Use of More than One Habitat Type** - All local amphibians except Red-backed Salamanders rely on aquatic habitat during their tadpole/larval stage, with most moving to terrestrial habitat for the adult portion of their life cycle. This is also the case for many insects, such as dragonflies. This augments exposure to climate change effects and can amplify species vulnerabilities because of differing effects on different habitat types.
- **Migratory Species** – Long-distance migrant species, like the Bobolink, spend part of each year in areas like South America that may experience climate effects differently than our local conditions. As such, temperature cues for migration may result in a mismatch with conditions at their destination. For example, birds triggered to migrate too soon may face inhospitable temperatures or lack of available food once they arrive resulting in increased mortality rates.
- **Cold-blooded Species** - The physiological processes of cold-blooded species (reptiles, amphibians, freshwater mussels, fish, insects, and benthic macroinvertebrates) are affected by their ambient (i.e., surrounding) temperature. These species may actively move around to select warmer or colder microhabitats to suit physiological needs. However, their inability to internally regulate their body temperature increases their vulnerability to climate change, specifically, temperature increases.
- **Fragmented Habitat** - All species inhabit a landscape that is highly fragmented. Roads, buildings, and certain land uses are barriers to wildlife movement and can prevent plants (through seed dispersal) and animals from moving to more suitable habitat. This can result in reduced gene flow and thus reduced diversity at the genetic level. Lower genetic diversity is generally unfavourable for plant and wildlife populations because it reduces the probability of outliers that might be better equipped to handle changing conditions.
- **Mobility** - Mobility is related to all the above factors. Plants with animal or wind-dispersed seed can shift their range more quickly than species with gravity-dispersed seed that simply drops to the ground beneath the parent plant. Cold-blooded species like snakes and fish are better able to move to favourable micro-climates than more sedentary species like freshwater mussels.
- **Highest Climate Change Vulnerability** - Redside Dace is the only species identified in the highest category of Extremely Vulnerable. As such, this species will continue to be a focus of ongoing work by Conservation Halton as it serves as an umbrella or indicator species for climate change effects on other species.



General Principles Supporting Biodiversity

Despite the variability of the biodiversity in Conservation Halton's watersheds, there are four general principles for action that will benefit all species.

- **Guiding Principle #1: Keep what you have.** Protect and restore specialized habitats and ecosystem functions.
- **Guiding Principle #2: Allow for adaptation.** Maintain and enhance connectivity of the natural heritage system.
- **Guiding Principle #3: Multiply the value.** Use nature-based approaches that benefit both biodiversity and climate change resilience.
- **Guiding Principle #4: Monitor and adjust.** Natural systems are dynamic and constantly changing.

Recommendations for Strengthening Conservation Halton's Programs and Services

Conservation Halton plays a central role at the watershed level in protecting local biodiversity from the effects of a changing climate, with many programs and services related to climate change, biodiversity, or both. For example, the size, location, and quality of natural features in the watershed influences how the system responds during storm events, thus connecting biodiversity and ecosystem health to flood forecasting and operations of our water management infrastructure such as dams, reservoirs, and channelization works.

Key projects being implemented include:

- studying and reporting on the value of ecosystem goods and services such as carbon storage and sequestration to emphasize the value of nature-based approaches that both benefit biodiversity and address climate change;
- advancing the implementation of Grindstone Creek Municipal Natural Assets Initiative (MNAI) report recommendations;
- completing a Watershed-Based Resource Management Strategy (Watershed Strategy);
- undertaking a Climate Change Vulnerability and Risk Assessment and Climate Resiliency Strategy for Conservation Halton's watersheds;
- mitigating Conservation Halton's corporate emissions to reduce the magnitude of climate change on our ecosystems, through projects targeting fleet electrification, building efficiencies and sustainable procurement practices; and
- completing installation of low impact development improvements to stormwater management at Conservation Halton's Administrative Office that provide habitat for pollinators.

While Conservation Halton currently implements many programs and services that help to sustain biodiversity and moderate climate change impacts, available science and data show that additional efforts at the watershed-scale are needed. Based on this review, the following recommendations to enhance programs and services are made.

- 1) Assess the watershed monitoring program to determine whether it adequately represents biophysical functions and sensitive sentinel species that can provide early

detection of climate change impacts and, if required, adjust the monitoring program to include those that are most susceptible to the effects of climate change.

- 2) Provide additional data analysis, through a climate change lens, that connects physical (hydrometric, meteorologic, and hydrologic) data and observed biological responses to better understand biodiversity conditions, trends, and risks linked with climate change.
- 3) Establish a regular cycle to report on climate change conditions, trends, risks, and management outcomes to inform watershed planning and management actions.
- 4) Partner with researchers from post-secondary institutions to advance scientific research on climate change impacts relevant to Conservation Halton's watersheds and guide management actions which promote climate change mitigation and adaptation through nature-based solutions.
- 5) Develop a Seed Strategy for Conservation Halton's tree planting program to ensure that planting stock is adapted to future climate conditions.
- 6) Assess and implement new technologies and best approaches that can provide insight into the connection between changes in the biophysical environment and biological responses (e.g., application of NatureServe's Climate Change Vulnerability Index to additional species, use of updated or more localized climate projections, predictive modeling, etc.).
- 7) Develop species-specific monitoring and restoration strategies for target species at risk and climate-vulnerable species on Conservation Halton lands.
- 8) Develop a restoration prioritization tool to support watershed planning and allow for more strategic selection and identification of restoration opportunities to address specific goals related to climate change and other watershed stressors.

Other Actions Suggested for Municipal Partners, Property Owners, and Individuals

Municipalities

Municipalities play a complementary role in addressing climate change and biodiversity conservation. Examples of municipal projects that support biodiversity include development of biodiversity strategies and plans, assessment of natural capital, establishment of Natural Heritage Systems, achieving designations as bee- and bird-friendly municipalities, development of innovative large-scale restoration approaches, regular assessment of natural areas, tree planting, tree strategies, municipal bylaws, invasive species management plans, and programs to assist farmers with improved practices that benefit biodiversity.

The following suggestions are offered to municipalities for consideration, if not already implemented.

- Maintain a robust, connected Natural Heritage System to allow plants and animals to disperse and migrate safely to new areas.
- Include biodiversity as an important component of a new or updated Climate Change Strategy.
- Combine innovative stormwater management pond design with proactive and regular inspection and maintenance of stormwater management ponds to ensure optimal storage and treatment capabilities are maintained.

- Use a diverse assemblage of native species for all tree planting and landscaping on municipal lands, with an emphasis on Carolinian species.
- Integrate nature-based solutions and natural infrastructure into asset management plans to the extent possible for multiple co-benefits, including biodiversity support.
- Design and maintain designated trail networks through public natural areas to direct human use to areas that are less sensitive to disturbance.

Property Owners

Property owners, including businesses, can play an important role in promoting biodiversity by undertaking actions that promote good land stewardship and habitat improvement.

The following actions are suggested.

- Use local native species for gardening and landscaping rather than ornamental species that originate elsewhere.
- Manage stormwater by disconnecting downspouts (where appropriate), installing and using a rain barrel, planting a rain garden or installing a permeable driveway.
- Restore or disconnect online ponds which cause water temperature increases in streams because of surface exposure to sunlight.

Individuals

There are many actions, large and small, that individuals can take to support biodiversity protection and climate change mitigation and adaptation.

- Learn more about how climate change affects biodiversity and support or join groups or organizations that promote actions to protect and enhance local biodiversity and mitigate or adapt to climate change.
- Keep your cat indoors. Cats are estimated to kill between 100-350 million birds each year in Canada, in addition to small mammals, reptiles, amphibians and insects.
- Be a conscious consumer. Choose products and services that help mitigate against climate change.