Chapter 1

An Overview of Environmental Issues in Ontario

1.0 The Auditor General's Expanded Environmental Role

On April 1, 2019, the government of Ontario made the Office of the Auditor General of Ontario (Office) responsible for reporting on environmental issues under the *Environmental Bill of Rights, 1993* (EBR). The Auditor General established two teams of environmental auditors and subsequently appointed an Assistant Auditor General, an employee of the Office, as Commissioner of the Environment to manage the Office's expanded environmental responsibilities and audit portfolios.

The EBR gives Ontarians the ability to comment on environmental issues, and hold prescribed ministries accountable for environmental decision-making. The EBR ensures that the public can obtain information and participate in decisions that affect the environment. These rights exist to protect, conserve and restore the natural environment for the benefit of all Ontarians – present and future generations (see **Figure 1**).

The abilities of the Office under the *Auditor General Act*, including access to government information and records needed to complete audits, now extend to the Office's oversight of the EBR.

The Office will continue to carry out value-for-money audits, also known as performance audits, of the government's environmental programs. Since the Auditor General began conducting value-for-money audits in 1978, the Office has completed 35 environmental audits. Recent topics have included source water protection (2014), management of contaminated sites (2015), climate change (2016), environmental approvals (2016), environmental assessments (2016) and the Niagara Peninsula Conservation Authority (2018).

The Office will integrate information obtained from its work on assessing compliance with the EBR into its environmental audit selection process. Audits could focus on environmental protection, sustainability, pollution prevention, biodiversity

Figure 1: The Preamble of Ontario's Environmental Bill of Rights

Source: *Environmental Bill of Rights, 1993*

The people of Ontario recognize the inherent value of the natural environment.
The people of Ontario have a right to a healthful environment.
The people of Ontario have as a common goal the protection, conservation and restoration of the natural environment for the benefit of present and future generations.
While the government has the primary responsibility for achieving this goal, the people should have means to ensure that it is achieved in an effective, timely, open and fair manner.
*For more about the Environmental Bill of Rights, see **Chapter 2**.

conservation, natural resource management and protecting ecologically sensitive areas and processes. Environmental audits typically examine the effectiveness of government programs measured against objectives set out in provincial legislation and policy, as well as best practices in the field of environmental management. Once tabled in the Legislature, our reports are referred to the Standing Committee on Public Accounts.

This Chapter describes the key features and challenges of Ontario's environment, and the provincial legislation and policies intended to protect it. **Chapter 2** of this volume sets out this Office's first EBR compliance review for the 2018/19 fiscal year. The Office can also report on energy conservation, greenhouse gas emission reduction activities (see **Chapter 3**) or any other environmental matter.

2.0 Ontario's Environment

With about 11% of Canada's total area, Ontario is the second largest province. Ontario is an ecologically diverse region, stretching from the tundra on the shores of Hudson Bay to the predominantly deciduous forests bordering the southern Great Lakes. Ontario's wide range of landforms and climates has created habitat for thousands of species of plants, fish, amphibians, reptiles, insects, birds and mammals. Ontario is home to Canada's largest human population and has an economy based on services, industry and agriculture.

The map in **Figure 2** illustrates some of Ontario's natural features.

Ontario can be divided into four ecozones based on ecology, climate and topography, as presented in **Figure 3**.

2.1 Environmental Challenges

Increases in human population and resource consumption have, like in other parts of the world, put pressure on the natural environment in Ontario. People are eating more food, and using more energy and resources than at any other time in history. This makes it hard for natural systems to regenerate and results in environmental change (see **Figure 4**).

Key drivers that can negatively impact the environment include:

- land development for agriculture, urban expansion, and infrastructure expansion;
- unsustainable use or overexploitation of animals, plants and natural materials (resource extraction, forestry, hunting, fishing, etc.);
- pollution in the air, water and soil, including greenhouse gases, plastics, waste, industrial pollutants, oil spills;
- invasive plant and animal species that cause harm in new environments; and
- climate change, caused primarily by burning of fossil fuels, which increases the adverse environmental impacts of other key drivers.

Many of the benefits that natural ecosystems provide to people cannot be replaced by technology. Changes in nature are often irreparable, and can undermine nature's ability to provide the ecosystem services that people depend on for their health and a good quality of life.

2.2 Nature's Benefits

Many people feel a strong connection to nature, and it has intrinsic value. Nature is also essential for humans to exist and have good quality of life. Our natural systems supply Ontarians with essential "ecosystem services" providing water, energy, resources and medicines. Through ecological processes and cycles, nature distributes water, produces the oxygen we breathe, regulates climate, provides pollination, controls pests, produces

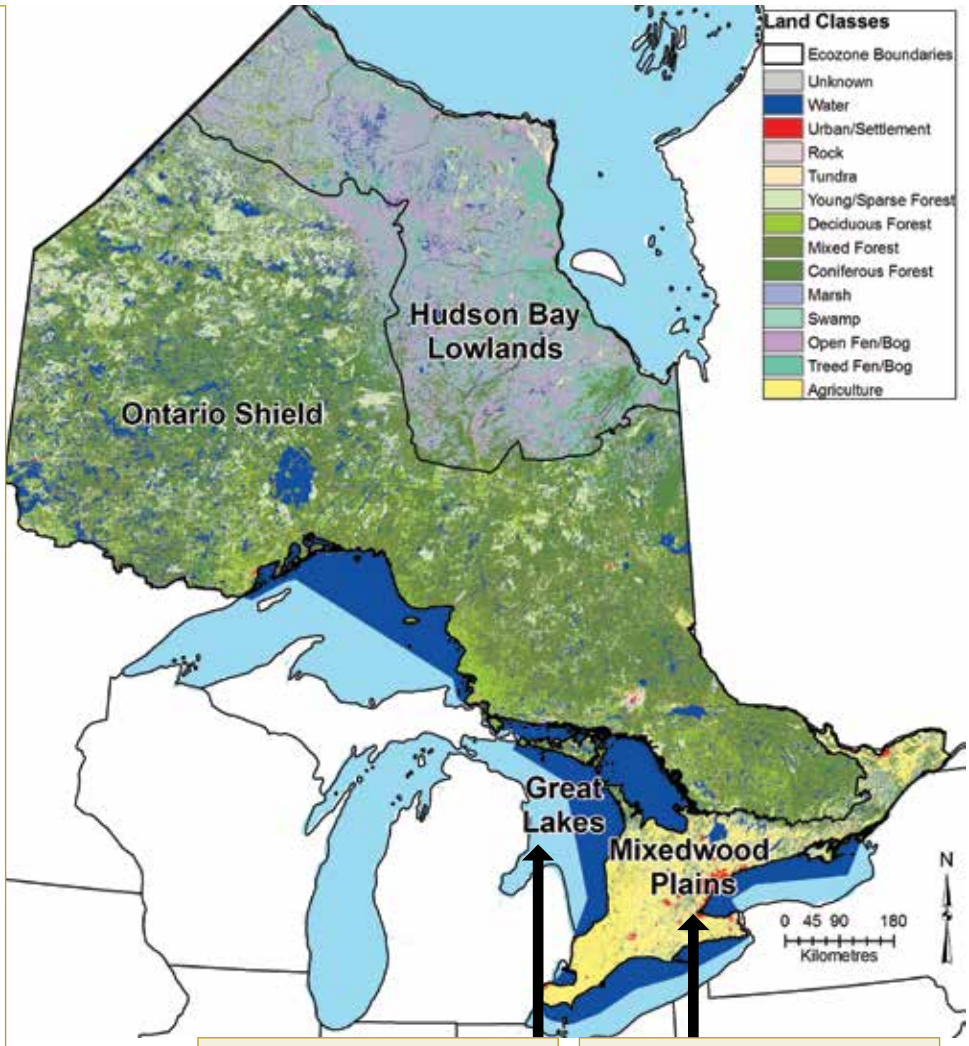
Figure 2: Map of Ontario with Environmental Features

Prepared by the Office of the Auditor General of Ontario with data from State of Ontario's Biodiversity (2010) and the Ontario Biodiversity Council

Ontario is a vast province that covers more than 1,000,000 km^2 of the Earth's surface. Despite its large human population, much of the landscape remains dominated by natural systems.

From north to south, Ontario's four ecozones are: Hudson Bay Lowlands, Ontario Shield, Great Lakes and Mixedwood Plains. Its physical features vary greatly from the tundra in the north to the boreal forests in the Shield to the temperate deciduous forest in the south.

- More than 30,000 species are known to reside in Ontario.
- Crown lands and waters make up 87% of the province.
- 10.7% of Ontario is protected within parks.
- Ontario has just over 50% of Canada's best agricultural land. Nearly all of it lies south of the Ontario Shield.
- Almost two-thirds of Ontario is covered by forests.
- Ontario is home to over 250,000 lakes—including four of the five Great Lakes—as well as countless rivers, streams and creeks. Ontario has almost 20% of the fresh surface water on the planet.



The Great Lakes Basin, shared with the US, is home for over 40 million people, including around 98% of Ontarians and 40% of Canadians.

The Niagara Escarpment has been recognized as a UNESCO World Biosphere Reserve, with 725 km of cliffs, hills and waterfalls.

resources and decomposes waste. Overall, it sustains the quality of air, water, and soils. Forests and wetlands, for example, filter pollutants from our air, absorb and filter stormwater, prevent erosion and mitigate drought.

These processes have value because they contribute to human welfare, but they are unpriced, and therefore are typically missing from economic accounting. Ecosystems also provide value to and sustain other species. Examples of ecosystem services are presented in **Figure 5**. Several studies have made attempts to quantify the value of Ontario's ecosystem services and estimate that healthy ecosystems provide tens of billions of

Figure 3: Ontario's Ecozones

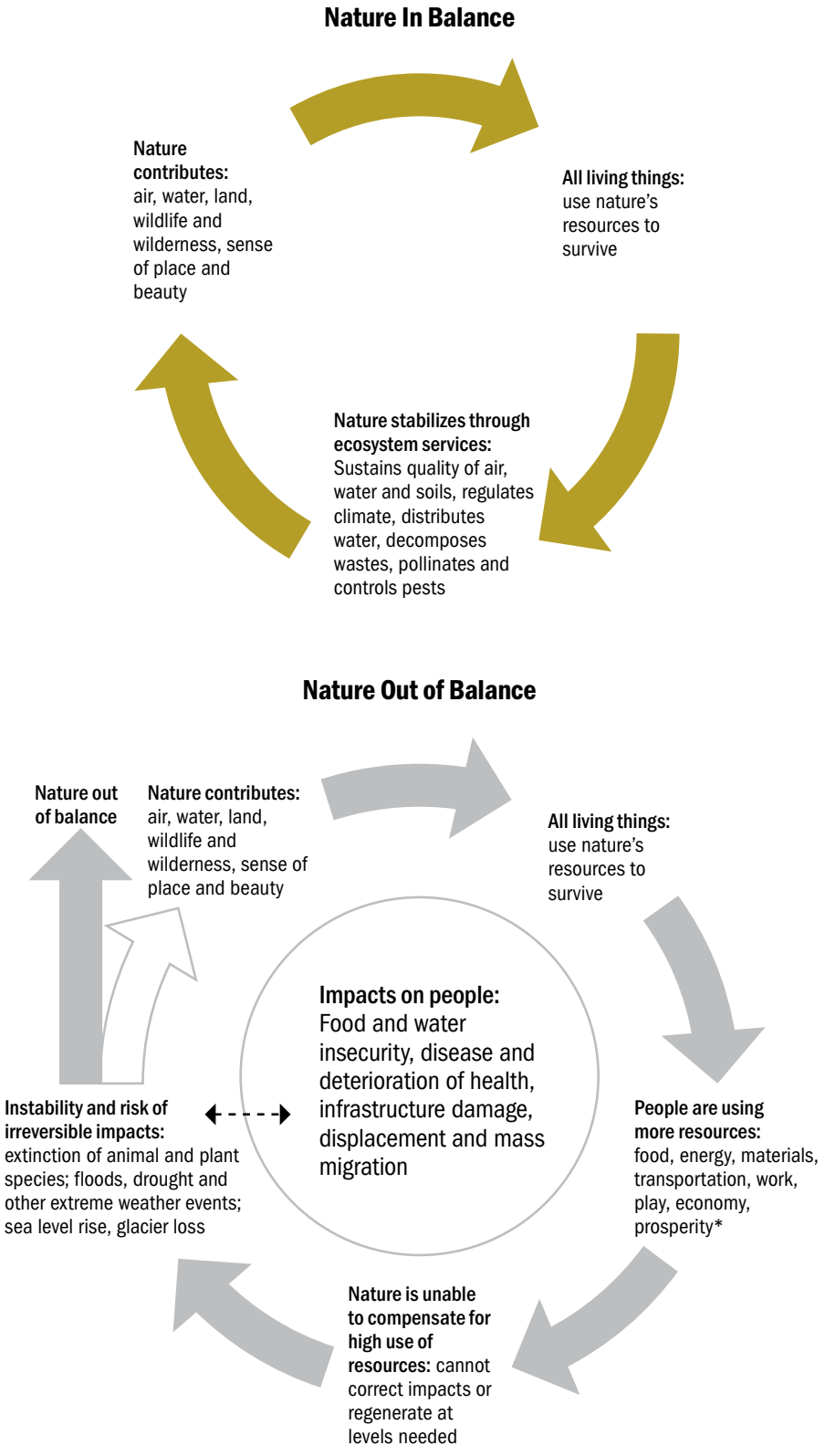
Prepared by the Office of the Auditor General of Ontario with data from State of Ontario's Biodiversity (2010)

Ecozone	% of Ontario Area	% of Ontario Population	Landforms	Examples of Species	Human Land Use
Hudson Bay Lowlands	23	0.03	Mostly wetlands, which are habitat and carbon sinks; also supports boreal and subarctic forests, tundra, tidal marshes and numerous rivers and lakes	Snow Goose, Polar Bear, Lake Sturgeon, Gray Wolf, Caribou (Boreal Population) and Wolverine	Many First Nations communities; much of the land is undeveloped
Ontario Shield	61	8	68% forests (coniferous in north, mixed and deciduous in south); 23% lakes, ponds and wetlands	White and Black Spruce, Jack and Eastern White Pine, Moose, American Black Bear, Beaver, Common Loon and Lake Trout	Many First Nations communities; small towns and cities
Mixedwood Plains	8	92	Formerly extensive forests, wetlands, prairies	Sugar Maple, White Trillium, Monarch Butterfly and White-tailed Deer	Dominated by settlement; high concentration of industry, agriculture (25% of Canada's agricultural production), and urban areas
Great Lakes	8	n/a	Four of the five Great Lakes partially in Ontario, and connecting waterways, contain nearly 20% of the world's surface fresh water; cold deep-water habitats, shallower nearshore habitats, islands and coastal wetlands	Lake Whitefish, Yellow Perch and Walleye	Supplies more than 70% of Ontario's drinking water; used for transportation, fishing, recreation, agriculture and industries

dollars annually in economic benefits to humans. Value that nature provides in other ways, in social and cultural services for example, is even harder to quantify and is generally excluded from these studies. When functioning ecosystems are damaged through pollution, climate change or habitat loss, our economy's productivity and our quality of life can be negatively impacted, now and in the future. Ontario has a range of laws, policies and programs that recognize the benefits of healthy ecosystems to human populations, as do other levels of government and jurisdictions around the world. Environmental issues are interconnected locally and globally, as natural systems extend beyond provincial and national boundaries. Ontario's legislation and related regulations, policies and programs are meant to protect against environmental degradation, and support better health and quality of life for future generations.

Figure 4: How Human Consumption is Driving Environmental Change

Prepared by the Office of the Auditor General of Ontario with data from the United Nations Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services



* Globally, people have severely altered 75% of land and 66% of oceans; 85% of wetlands, which filter and clean water, have been lost.

Figure 5: Examples of Ecosystems Services

Prepared by the Office of the Auditor General of Ontario with data from Ontario.ca

Ecosystem Service Type	Examples
Provisioning	• Food • Water supply • Raw materials • Wood products • Medicinal resources • Energy
Regulating	• Climate regulation • Air filtration • Water filtration • Flood control • Erosion control • Waste treatment
Supporting	• Soil formation • Water cycling • Nutrient cycling • Habitat • Biodiversity
Social/Cultural	• Wilderness • Cultural heritage and identity • Spiritual • Recreation • Aesthetics • Mental health

3.0 Provincial Responsibility for Protecting the Environment

Provincial responsibility for protecting Ontario's environment falls primarily to the **Ministry of the Environment, Conservation and Parks**. It is responsible for "protecting clean air, land, water, species at risk and their habitat, tackling climate change and managing Ontario's parks and conservation reserves for present and future generations of Ontarians."

Several other ministries also have programs or activities intended to protect Ontario's environment, for example:

- The **Ministry of Natural Resources and Forestry** is responsible for "the management and preservation of Ontario's natural resources, including forests, fisheries, wildlife, mineral aggregates, petroleum resources and Crown lands," and also "for promoting economic opportunities in the resource sector and supporting outdoor recreation opportunities."
- The **Ministry of Energy, Northern Development and Mines** sets goals for the province's energy plans, including conservation and fuel standards, and runs programs to promote energy conservation and energy efficiency.
- The **Ministry of Agriculture, Food and Rural Affairs** is responsible for growing Ontario's agri-food sector and supporting rural communities. It runs Environmental Stewardship Programming, which is tasked with addressing priorities related to water quality and soil health.
- The **Ministry of Municipal Affairs and Housing** sets provincial planning requirements, including land use planning and growth plans that include rules for farmland and natural heritage.
- The **Ministry of Indigenous Affairs** is responsible for delivering programs that benefit and support Indigenous communities as well as overseeing land claims and other land-related issues.
- The **Ministry of Health** funds Public Health Ontario and municipal public health authorities, which are responsible for protecting the health of Ontarians, preventing illness and restoring health. This includes how air, water, food and our physical environment can affect our health.
- The **Ministry of Transportation** develops policies and plans to support a more sustainable, safe, and efficient transportation network in the province.
- The **Ministry of Economic Development, Job Creation and Trade** is responsible for funding research and innovation.

- The **Ministry of Education** is responsible for environmental education.
- The **Treasury Board Secretariat** and the **Ministry of Government and Consumer Services** are responsible for procurement and ensuring that environmental considerations are taken into account in procurement decisions, as specified in the procurement directives.

The *Environmental Bill of Rights, 1993* requires a Statement of Environmental Values from all prescribed ministries (see **Chapter 2**) describing how each ministry views its environmental responsibilities and how it "will integrate environmental values with social, economic and scientific considerations when making a decision." As recommended in **Chapter 2**, these statements need to be updated. The government's November 2018 draft Made-in-Ontario Environment Plan contains a commitment to update ministries' statements to reflect Ontario's environment plan, including to improve government's ability to consider climate change when making decisions and "make climate change a cross-government priority."

Responsibilities for addressing the impacts of environmental degradation, such as repairing infrastructure, increasing health-care services, and adapting communities, are broadly distributed. Other provincial ministries, government organizations and agencies have responsibilities, as does the broader public sector through various plans, policies, processes and programs.

Canada's federal government and municipalities also have important roles to play in environmental protection. **Figure 6** describes how different levels of government share jurisdiction for environmental issues.

The following sections provide examples of the challenges facing Ontario in four separate areas—air, water, land and wildlife—while recognizing that many environmental problems can affect more than one of these areas at the same time. The fifth section looks at climate change, which is a prime example of an interconnected environmental issue. Each section includes an overview of provincial commitments intended to reduce environmental impacts in the four areas.

Figure 6: Governments Share Responsibilities for the Environment

Prepared by the Office of the Auditor General of Ontario

The **Canadian Constitution** (Constitution Acts, 1867 and 1982) does not assign specific responsibilities for the environment to either the federal government or provincial governments. Environmental responsibility is shared. In addition, while municipalities exist under provincial legislation and have no constitutional powers, powers delegated to them by the province enable them to improve environmental stewardship at the local level. Because jurisdiction over the environment is shared, multiple levels of government are often involved in the management of a specific environmental matter.

- **Federal government**: plays a role in fisheries and waters, Indigenous lands, federal land (like national parks and military bases), national industries (like railways and airlines), as well as an approval role in projects that require federal environmental assessments.
- **First Nations' and Indigenous Peoples' governments**: play a role in land management.
- **Provincial governments**: make decisions about non-renewable resources, mines, forestry, electricity, provincial public lands, and local works within the province as well as setting planning and transportation policy frameworks for municipalities to follow.
- **Municipal governments**: make decisions and bylaws on local matters, such as waste management and land use planning.
- **Multi-jurisdictional responsibilities**: Federal and provincial governments both have taxation and other fiscal tools at their disposal to properly price and reduce environmental pollution. Another example is waste management, which falls under municipal, provincial and federal mandates. Municipalities are responsible for collecting and managing waste from homes for recycling, composting and disposal. Provincial authorities are responsible for the approval, licensing and monitoring of waste management operations. Finally, the federal government is responsible for transboundary movements of hazardous waste, in addition to international agreements related to chemicals and waste. Other cross-jurisdiction issues that extend across international boundaries include climate change, air pollution and the Great Lakes.

3.1 Air

Air quality has significant impacts on public health, the environment and the economy. Air pollution contributes to illnesses such as heart disease, stroke, asthma, lung disease, and lung cancer. According to Health Canada, exposure to air pollution in Ontario results in increased hospitalizations, as well as 6,700 premature deaths, every year. Cancer Care Ontario reports that exposure to fine particles in outdoor air causes between 290 and 900 new cancer cases in Ontario every year.

Air pollution can also contaminate soil and water resources, harm plants and animals, and disrupt ecological processes. Greenhouse gases emitted into the air cause climate change, which can exacerbate other environmental impacts. Examples of goals the province has set out to improve air quality are found in **Figure 7**.

Trends

Ontario's air quality improved steadily since 1988 due to decreased air emissions of a number of harmful pollutants such as nitrogen dioxide, sulphur dioxide, carbon monoxide and particulate matter. Smog days, when smog and air health advisories are issued due to high levels of ozone or other air pollutants, also dropped from 53 days in 2005 to zero in 2017. These decreases are due in part to:

- closure of all coal-fired power plants in Ontario between 2005 and 2014. Coal power plants were sources of emissions of nitrogen oxides, sulphur dioxide, particulate matter, mercury and lead, as well as the greenhouse gas carbon dioxide;
- changes to Ontario's regulatory framework in 2005, which included tougher rules for industrial emitters, and stricter air standards for individual pollutants;
- mandatory emissions testing for older heavy-duty diesel vehicles;
- past programs aimed at lowering emissions from vehicles such as the Drive Clean passenger vehicle program from 1999 to 2019 and the Green Commercial Vehicle Program from 2008 to 2010, and from 2017 to 2018; and
- nitrogen oxides and sulphur dioxide emissions cap and trade regulations in Ontario, as well as reductions in the United States as part of the 1991 Canada-US Air Quality Agreement to reduce acid rain.

Figure 7: Examples of Ontario's Air Protection Goals

Prepared by the Office of the Auditor General of Ontario

Existing Provincial Objectives	Provincial Legislation, Plan or Policy
"We are committed to protecting our air, ensuring we have strong environmental standards that are protective of human health and the environment, and taking action to enforce local air quality standards;" To "improve air quality in communities by creating unique solutions to their individual challenges;" "Improve understanding of different sources of air pollution and their impact;" and "Strengthen collaboration on addressing air pollution that comes from outside of Ontario's borders"	Made-in-Ontario Environment Plan, 2018
"To provide for the protection and conservation of the natural environment," which includes "the air ... of the Province of Ontario"	*Environmental Protection Act*
"The betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment," where "environment" means "air, land or water, plant and animal life, including human life ..."	*Environmental Assessment Act*

Main Challenges

Despite the positive trend in air quality, air pollution is still a major environmental issue in Ontario:

- **Air pollution from the transportation sector** affects air quality and public health in Ontario's cities. Traffic-related air pollution has been linked to numerous illnesses and diseases, including asthma, heart disease, respiratory symptoms, decreased lung function and lung cancer. Traffic-related air pollution is a major public health concern for the 28% of Ontarians who live near major roads and highways, and for commuters. Over 40% of Ontario commuters spend more than 30 minutes on roads and highways every day.
- **Air pollution "hotspots,"** which are areas located close to heavy industrial emitters, experience disproportionate health and environmental impacts from air pollution. For example, some of the worst air pollution in Canada is found in Sarnia's "Chemical Valley," home to the Aamjiwnaang First Nation. This community has experienced higher-than-average hospital admissions for respiratory and cardiovascular illnesses from 1996 to 2000, higher-than-average cancer rates from 1986 to 1992, and a decline in the sex ratio of babies, with two girls born for every boy from 1999 to 2003. The province is working on a project to study "the links between the environment and health in the community," expected to be completed in late 2021 or early 2022. Since 2018, industrial facilities in air pollution hotspots have started to be required to account for other nearby sources of emissions (i.e., cumulative effects) when seeking approvals to emit more contaminants to air, but the new requirements are limited to only new or expanding facilities in the hotspots, and to two types of toxic emissions.
- **Greenhouse gas emissions** are discussed in **Section 3.5** on climate change.

3.2 Water

Ontario's lakes, rivers, streams, wetlands and groundwater sustain human and ecosystem health and wellbeing. Ontarians rely on clean water to drink, to irrigate farmland, to provide habitat, and to support many industries including manufacturing, energy generation, recreation and tourism. Healthy watersheds (areas of land that catch rain and snow, and drain into a water body like a river or lake) provide drinking water, filter pollutants, improve air quality, help prevent flooding and erosion, and provide opportunities for recreation.

Water can be contaminated by industrial wastewater, urban stormwater, agricultural runoff, thermal pollution from industries, wastewater from sewage treatment facilities and power plants, and airborne pollution. Water pollution can contaminate drinking water, close beaches, poison fish and harm aquatic ecosystems.

Quantity is also important. Too much water can cause flooding, while too little can cause water shortages and droughts. Examples of Ontario goals for water protection are found in **Figure 8**.

Trends

Overall, Ontario's watersheds have seen some positive trends, but continue to show signs of stress as well, mainly in southern Ontario where there is less green space and more people, industry, and development. More paved surfaces makes it more difficult for stormwater to infiltrate the soil, and increases the likelihood of runoff and flooding.

- **Pollution from lawn care pesticides has significantly decreased** in urban streams since Ontario legislated a ban on residential use of cosmetic pesticides in 2009.
- **Efforts to clean up several highly contaminated areas have been successful.** In Lake Ontario, polychlorinated biphenyls (PCBs) and mercury have been reduced. In 2018, Ontario committed to remediating the decades-long mercury contamination in the

Figure 8: Examples of Ontario's Water Protection Goals

Prepared by the Office of the Auditor General of Ontario

Existing Provincial Objectives	Provincial Legislation, Plan or Policy
"Continue work to restore and protect our Great Lakes;" "Continue to protect and identify vulnerable waterways and inland waters;" "Ensure sustainable water use and water security for future generations;" "Help people conserve water and save money;" and "Improve municipal wastewater and stormwater management and reporting"	Made-in-Ontario Environment Plan, 2018
"To protect human health and well-being through the protection and restoration of water quality, hydrologic functions and the ecological health of the Great Lakes-St. Lawrence River Basin, including through the elimination or reduction of harmful pollutants"	*Great Lakes Protection Act, 2015*
"To protect and restore the ecological health of the Lake Simcoe watershed"	*Lake Simcoe Protection Act, 2008*
"To protect existing and future sources of drinking water"	*Clean Water Act, 2006*
"To provide for the management of materials containing nutrients in ways that will enhance protection of the natural environment and provide a sustainable future for agricultural operations and rural development," where "natural environment means the air, land and water of the Province of Ontario"	*Nutrient Management Act, 2002*
"To recognize that the people of Ontario are entitled to expect their drinking water to be safe;" and "To provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing"	*Safe Drinking Water Act, 2002*
"To provide for the conservation, protection and management of Ontario's waters and for their efficient and sustainable use, in order to promote Ontario's long-term environmental, social and economic well-being"	*Ontario Water Resources Act*
"To provide for the protection and conservation of the natural environment," which includes "the water ... of the Province of Ontario"	*Environmental Protection Act*
"The betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment," where "environment" means "air, land or water, plant and animal life, including human life ..."	*Environmental Assessment Act*
"No person ... shall discharge or cause or permit the discharge of a pesticide or of any substance or thing containing a pesticide into the environment that, causes or is likely to cause impairment of the quality of the environment ..."	*Pesticides Act*
"To provide for the management, protection, preservation and use of the waters of the lakes and rivers of Ontario ..."	*Lakes and Rivers Improvement Act*

English and Wabigoon rivers, and established an $85 million trust to fund remediation activities.

- **Mercury levels in fish from the Great Lakes are declining at a slower rate.** After a long period of steady decline, mercury levels now are declining very slowly, not changing, or even increasing slightly in some areas such as Lake Erie.
- **Concentrations of phosphorus declined from the 1970s to 1990s due mainly to improvements in sewage treatment plants.** Sources of phosphorus include mainly agricultural and urban run-off. High nutrient levels in Lake Erie, and some other parts of the Great Lakes, are contributing to increases in toxic cyanobacteria and beach fouling by

nuisance algae. In parts of Lake Erie, they have actually increased slightly since the mid-1990s, increasing the frequency and severity of harmful algal blooms. Reports of algal blooms have also increased in inland lakes across the province.

- **Chloride levels have been increasing in streams, rivers and lakes in areas with relatively high human population and road density,** due largely to increased urbanization and the use of road salt on roads, parking lots and sidewalks. The high salt levels are damaging aquatic ecosystems in some urban areas and making some water sources undrinkable.
- **While municipal drinking water sources are becoming better protected, water sources for Indigenous communities, areas outside Conservation Authority boundaries (primarily in northern Ontario) and private wells are not.** In response to the 2000 Walkerton tragedy, when contaminated drinking water killed seven people and sickened thousands more, the government passed the *Clean Water Act, 2006*. In implementing this law, Ontario has identified pollution threats to sources of municipal drinking water and implemented measures to reduce the risks from activities that may pollute municipal drinking water. However, significant risks remain for drinking water sources for Indigenous communities and areas outside Conservation Authority boundaries, as well as private wells, which in total serve about 18% of Ontario's population. Additionally, 22 First Nation communities are subject to long-term drinking water advisories in Ontario due to a variety of treatment plant and distribution system issues.
- **Water temperatures in many Ontario lakes are increasing** due to climate change. Increases in water temperature are more noticeable in northern lakes. For example, Lake Superior has the highest upward trend, with summer surface water temperatures increasing 2.5°C from 1979 to 2006. Healthy water bodies depend on seasonal processes to keep their ecosystems functioning. The warmer climate can have negative impacts on these processes. For example, warming lakes mean a longer growing season for algae, which may cause more toxic algal blooms. The average annual lake ice cover in Lake Ontario has decreased by 2.3% per year from 1973 to 2010. Ice cover protects fish habitat by maintaining deep water temperatures near 4 °C. Many cold water fish like lake trout deposit their eggs in the fall so they can incubate slowly through the winter. Winter fisheries rely on ice cover, and winter ice roads connect 31 remote First Nation communities to a permanent highway or railway systems. Another benefit of colder lake water temperature is more efficient nuclear energy generation, because nuclear power plants use cool water to condense the steam that drives their turbines. Lake water is also used to cool spent nuclear fuel safely.

Main Challenges

Urban development, industry, agriculture, climate change and invasive species continue to increase the stress on Ontario's water bodies:

- **Population growth and urban development** have also contributed to higher volumes of sewage and stormwater runoff. Stormwater flows over roads and sidewalks and carries contaminants like pesticides, road salt, litter and potentially dangerous pathogens like E. coli. Higher volumes of stormwater can overwhelm sewer systems and discharge a mix of raw sewage and contaminated stormwater directly into nearby lakes and waterways.
- **Nutrient pollution** has contributed to more frequent and severe toxic algae blooms in many lakes across Ontario since the mid-1990s. Harmful algal blooms can produce toxins (poisons) that can cause serious illness

or death in people, animals and fish. They also threaten biodiversity by degrading wildlife habitat and interfere with recreational activities such as swimming, boating and fishing. Pollution from manure, fertilizers and septic waste, primarily from urban and agricultural runoff, is made worse by warming lake water temperatures in some areas. In Ontario, phosphorus tends to be the key nutrient that influences the growth of algae.

- **Toxic chemicals** in municipal sewage and industrial wastewater continue to be discharged into Ontario water bodies. Sewage treatment plants are not designed to remove contaminants like flame retardants (e.g., chemicals found in clothing, carpets, paints and glues), cleaning products, degreasers and heavy metals (e.g., lead and mercury) that come from homes and businesses. This results in the release of these chemicals into waterways.
- **Pharmaceuticals and microplastics** are also increasingly showing up in Ontario's lakes and rivers. Pharmaceuticals can be flushed down toilets directly, or indirectly through human waste. Microplastics are present in many personal care products and clothing. The full risks and effects of these contaminants in the environment are not yet known. There are concerns about chemical breakdown, as well as ingestion by animals and humans.
- **Invasive species continue to cause substantial ecological and economic impacts to the Great Lakes,** for example species such as sea lamprey, zebra and quagga mussels, and Phragmites (a perennial grass). Invasive species are discussed in **Section 3.4** on nature and wildlife.

3.3 Land, Resources and Waste

Ontario depends on many land-based resources: soil, minerals, metals, and energy resources such as oil and natural gas. Land is necessary to grow food, build homes, develop industries, transport goods and people, provide nature and habitat (see **Section 3.4**), provide recreational opportunities and secure food supply for present and future generations. Indigenous peoples have a right to self-government and traditional ways of managing and protecting the land.

Human use of land and resources leads to many different environmental impacts. For example, habitat for plants and animals can be destroyed, fertile agricultural soil can be paved for roads or become less nutritious for crops, and poor waste management can emit air pollutants, generate greenhouse gases, and leak toxins into the soil. Examples of goals Ontario has set out for land, resources and waste are found in **Figure 9**.

Trends

Pressures on Ontario's land and resources continue:

- **Ontario's population continues to grow, mostly in urban areas, using more land and more resources.** The population has grown from 7.8 million in 1971 to 14.5 million in 2019. By 2046, Ontario's population is forecast to be 19.8 million. Populations in lower-density suburban areas are increasing five times faster than core urban areas. From 1996-2016, the suburbs became home to 2.4 million more people, compared to an additional 0.5 million in urban areas.
- **Soil health and resistance to erosion is not improving, despite efforts.** Healthy soil is full of organisms that decompose organic matter, providing nutrients that plants need to grow. As plants die or are eaten by animals and become manure, organic matter is fed into the carbon cycle. Globally, the top metre of soil contains three times as much carbon as the entire atmosphere. Human activities like deforestation, ploughing and slash-and-burn agriculture can harm soil health in two ways:
  - By exposing soil to oxygen and speeding up decomposition rates, soil organic

Figure 9: Examples of Ontario's Land and Resource Protection Goals

Prepared by the Office of the Auditor General of Ontario

Existing Provincial Objectives	Provincial Legislation, Plan or Policy
Land Use	
"To plan for growth and development in a way that supports economic prosperity, protects the environment, and helps communities achieve a high quality of life"	Growth Plan for the Greater Golden Horseshoe, 2019
"Increase the redevelopment and clean-up of contaminated lands in Ontario to put land back into good use"	Made-in-Ontario Environment Plan, 2018
"Land use must be carefully managed to accommodate appropriate development to meet the full range of current and future needs, while achieving efficient development patterns and avoiding significant or sensitive resources and areas which may pose a risk to public health and safety"	Provincial Policy Statement, 2014 under the *Planning Act*
"To enable decisions about growth to be made in ways that sustain a robust economy, build strong communities and promote a healthy environment and a culture of conservation"	*Places to Grow Act, 2005*
"To provide for the protection and conservation of the natural environment," which includes "the land ... of the Province of Ontario"	*Environmental Protection Act*
"The betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment," where "environment" means "air, land or water, plant and animal life, including human life"	*Environmental Assessment Act*
Resources	
"Soil management practices" to sustain and enhance "soil health and productivity for economic, environmental and societal needs"	New Horizons: Ontario's Agricultural Soil Health and Conservation Strategy, 2018
"To prioritize the highest and best use of our food resources in Ontario ... in order to move towards a sustainable model of waste reduction and resource recovery"	Food and Organic Waste Policy Statement, 2018
"Explore opportunities to recover the value of resources in waste"	Made-in-Ontario Environment Plan, 2018
"To minimize the impact of these activities on public health and safety and the environment"	*Mining Act*
"To minimize adverse impact on the environment in respect of aggregate operations"	*Aggregate Resources Act*
Waste	
"Reduce and divert food and organic waste from households and businesses;" "Reduce plastic waste;" and "Make producers responsible for the waste generated from their products and packaging"	Made-in-Ontario Environment Plan, 2018
"Waste reduction and resource recovery through preventing and reducing food waste, effectively and efficiently collecting and processing food and organic waste, and reintegrating recovered resources back into the economy"	Food and Organic Waste Policy Statement, 2018
"To move toward zero waste and zero greenhouse gas emissions from waste sector;" and To "increase food and organic waste diversion ... Potential targets could include 40 per cent of organic wastes diverted by 2025 and 60 percent by 2035"	Strategy for a Waste Free Ontario: Building the Circular Economy, 2017
Existing Provincial Objectives	**Provincial Legislation, Plan or Policy**
"To minimize the generation of waste, including waste from products and packaging;" "To minimize the environmental impacts that result from resource recovery activities and waste reduction activities, including from waste disposal;" "To provide efficient, effective, convenient and reliable services related to resource recovery and waste reduction, including waste management services;" and "To increase the reuse and recycling of waste across all sectors of the economy"	*Resource Recovery and Circular Economy Act, 2016*
"To promote the reduction, reuse and recycling of waste;" and "To provide for the operation of waste diversion programs"	*Waste Diversion Transition Act, 2016*

carbon is released as carbon dioxide at a faster rate than it is stored back into the soil. Over 80% of Ontario farmland has been losing its stores of soil organic carbon every year. This is primarily due to land-use changes, most notably a shift toward annual crops with less diverse rotations, such as cereals, and away from perennial crops such as pastures.

- By exposing soil to the weather, soil can be eroded, transported and degraded in quality, which negatively impacts soil health and agricultural productivity. Over 68% of farmland is at a high risk of erosion. This is due to more tillage, fewer windbreaks, and the shift toward annual crops.

- **Ontario continues to generate over 12 million metric tonnes of municipal solid waste per year, even with ongoing waste reduction efforts.** Since 2008, Ontario has generated over 900 kilograms (kg) of municipal solid waste per person each year. Municipal solid waste is defined as "any material for which the generator has no further use, and which is managed at waste disposal, recycling or composting sites," including residential and most industrial waste. About 700 kg of that is sent to landfills or incinerators, which emit dioxins (highly toxic chemicals that can affect reproduction, development, and the immune system) and other harmful pollutants. Other countries with similarly high household incomes dispose of an average of 580 kg per capita, while Japan disposes of just 377 kg per capita. Resource scarcity, a rapid rise in disposal costs due to scarce landfill space, and associated hazards pushed Japan to minimize consumption and reduce environmental impact.
- **Rates of diverting municipal solid waste stagnated at about 25% from 2008 to 2016.** Diversion methods include recycling and composting organic waste. If disposal and diversion rates do not change, the Ontario Waste Management Association estimates that the province's landfill capacity will be fully exhausted in nine to 13 years (depending on how much waste is exported to the United States). Due to international bans on imports of contaminated recycling in 2018, diversion rates are expected to decrease, which would direct more waste to landfills, depleting landfill capacity more quickly.
- **Ontario produces approximately 500,000 tonnes of hazardous waste annually—**about 450,000 tonnes from industries and manufacturing and about 30,000 tonnes of municipal hazardous or special waste. Municipal hazardous waste includes batteries, paints, fertilizers, pharmaceuticals and used hypodermic needles (sharps). Ontario also produces about 50,000 tonnes of electronic waste.
- **Nuclear waste continues to accumulate in a temporary, above-ground holding container.** Ontario's used nuclear fuel from power generation is highly radioactive and will be dangerous for hundreds of thousands of years. Currently, it is stored at nuclear generating stations with water as shielding, then transferred to dry storage using steel and concrete that protects from radioactivity. Ontario Power Generation has plans to eventually transfer all nuclear waste to a proposed Deep Geologic Repository site for permanent disposal, but the plans have not received all approvals. No long-term repository for used nuclear reactor fuel yet exists anywhere in the world.

Main Challenges

Urban expansion and increasing consumption continue to challenge Ontario's land-based resources:

- **Urban expansion,** particularly low-density outward growth, has a number of negative impacts. These include loss of natural habitats and agricultural areas, reduced resilience to

flooding and extreme weather, and increased greenhouse gas emissions from greater use of personal vehicles. Between 1971 and 2011, cities and suburbs across Ontario grew by an average of 220%, converting 570,200 hectares of agricultural and natural land to urban development. Most of this expansion (72%) replaced high-quality farmland. From 1996 to 2016, the total farm area dropped 11% to 5.0 million hectares.

- **Businesses, industry and institutions such as schools and hospitals produce over half of Ontario's municipal solid waste.** Only about 17% of total waste from the industrial, commercial and institutional sector is diverted from landfill compared to households, which recycle or compost about 37% of their total waste.
- **Ontario diverts less than 40% of the province's total food and other organic waste,** mostly through composting; the remainder is sent to landfill. Organic waste in landfills releases greenhouse gases as it decomposes, contributing to climate change.
- **Much of the plastic we put in blue bins is not easily recyclable** or not recyclable at all because of increasingly complex mixes of material in plastic packaging, or contamination from non-recyclable material. Stewardship Ontario also reports that contamination in Blue Boxes is an ongoing and increasing problem.
- **Many recycling export markets are no longer accepting Ontario's recycling** and Ontario does not have enough local capacity or infrastructure to manage the amount of recyclables we generate. China used to import over half of the world's recycling but banned imports of contaminated recycling in January 2018. The ban has disrupted global waste management and increased recycling costs by as much as 40%. Recyclable materials that used to be diverted are accumulating in some local Ontario recycling yards, and may now be going to landfill. This recent development has not yet been captured in diversion rates, because the latest available rates are from 2016.
- **Potential mining of industrial metals with toxic by-products.** Mining requires access roads, transmission lines, mines, smelters and tailings ponds, which typically require land use changes and can result in habitat destruction. Ontario's remote northern "Ring of Fire" has been considered to be one of the most promising mineral development opportunities in Ontario, with over 13,000 active mining claim units held by 18 companies and individuals, covering approximately 2,127 square kilometres (km2). This area is in one of the world's largest wetlands, which provides important wildlife habitat and carbon storage. Mining operations can pose risks to air, water and wildlife.
- **Ontario has many contaminated sites, on private and public land.** Land can be contaminated by chemicals that are hazardous to the environment or to human health. In some cases, the province is responsible because it owns the site or directly caused the contamination of the land through its own activities. As reported in the 2018/19 Public Accounts, the province's liability for remediating its known contaminated sites was estimated to be $1.8 billion on March 31, 2019. Properties contaminated from prior industrial or commercial use are often known as brownfields. They can be located in areas desirable for redevelopment, but can be left vacant or underutilized.

3.4 Nature and Wildlife

Biodiversity is the variety of life on earth. It is the variability of native species and the wealth of ecological systems that form the layer of life around our planet. The more variety that is present in a population or ecosystem, the more capable that

system is to withstand changes to the environment and to continue to provide the ecosystem services that support our quality of life, such as clean drinking water and fresh air. Loss of biodiversity can negatively affect the quality of the air we breathe, the water we drink, the soils we depend on for our food, and the lands and waters we depend on for our natural resources and livelihoods. Ontario's wildlife species and their habitats are affected by habitat loss and degradation, pollution, overharvesting, invasive species and climate change. Examples of goals Ontario has set out to protect nature and wildlife are found in **Figure 10**.

Figure 10: Examples of Ontario's Nature and Wildlife Protection Goals

Prepared by the Office of the Auditor General of Ontario

Existing Provincial Objectives	Provincial Legislation, Plan or Policy
"Improve the resilience of natural ecosystems;" "Support conservation and environmental planning;" "Promote parks and increase recreational opportunities;" "Sustainable Forest Management;" and "Protect species at risk and respond to invasive species"	Made-in-Ontario Environment Plan, 2018
"To protect and restore the natural habitats and biodiversity of the Great Lakes-St. Lawrence River Basin"	*Great Lakes Protection Act, 2015*
To "prohibit any activity that is likely to increase the threat of the invasive species to the natural environment in Ontario"	*Invasive Species Act, 2015*
To maintain, restore or, where possible, improve "the diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, ... recognizing linkages between and among natural heritage features and areas, surface water features and ground water features"	Provincial Policy Statement, 2014 under the *Planning Act*
"To expand the system of protected areas and conservation lands, protect species diversity, and integrate biodiversity into land use and resource management planning"	Ontario Government Plan to Conserve Biodiversity, 2012–2020
To protect "areas of cultural value ... and ecological systems ... by including at least 225,000 square kilometres of the Far North in an interconnected network of protected areas"	*Far North Act, 2010*
"To protect species that are at risk and their habitats, and to promote the recovery of species that are at risk"	*Endangered Species Act, 2007*
"To permanently protect a system of provincial parks and conservation reserves that includes ecosystems that are representative of all of Ontario's natural regions, protects provincially significant elements of Ontario's natural and cultural heritage, maintains biodiversity and provides opportunities for compatible, ecologically sustainable recreation"	*Provincial Parks and Conservation Reserves Act, 2006*
To protect "the ecological and hydrological integrity of the Oak Ridges Moraine Area;" and To ensure "that the Oak Ridges Moraine Area is maintained as a continuous natural landform and environment for the benefit of present and future generations"	*Oak Ridges Moraine Conservation Act, 2001*
To provide for the "long-term health" of Crown forests "to meet social, economic and environmental needs of present and future generations"	*Crown Forest Sustainability Act, 1994*
"To provide for the protection and conservation of the natural environment"	*Environmental Protection Act*
"The betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment," where "environment" means "air, land or water, plant and animal life, including human life"	*Environmental Assessment Act*

Trends

- **The world's species and the ecosystems on which they depend are deteriorating rapidly.** The UN Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has determined that the world is now experiencing a global species extinction event. The IPBES found that on average 25% of assessed animal and plant species are threatened globally, suggesting that around 1 million species already face extinction, many within decades. The rate of species extinction is already 1,000 times higher than the natural background rate estimated to be around one per ten million species per year. Without action, the rate will continue to accelerate and is likely to reach 10,000 times higher.
- **Wildlife populations are shrinking globally.** The IPBES has determined that average abundance of native species in most major land ecosystems has fallen by at least 20%. More than a third of all marine mammals, 40% of amphibians, about 33% of reef-forming corals, and an estimated 10% of insects are threatened globally. North America has lost over 3 billion or 29% of its total bird population, including common abundant birds. For example, Canada has rapidly lost about 40% to 60% of the populations of grassland birds, shorebirds, and aerial insectivores such as barn swallows and common nighthawks. Birds are important in the ecosystem because they contribute to pest control, seed dispersal and pollination. They are good indicators of the health of our water, air and land. Another example is the decline of about 20% in Ontario's moose populations in the last ten years.
- **The number of Species at Risk in Ontario is increasing.** At-risk species range from the threatened polar bear in southern Hudson Bay to the Canada warbler, a species of special concern. Species at risk include all types of species including mammals, birds, plants, insects, reptiles, amphibians, and fish. "At risk" means these species are no longer present in Ontario, or are endangered, threatened or of special concern. Ontario has listed a total of 243 Species at Risk in Ontario. There have been 65 newly listed and 29 uplisted (i.e., at increased risk) species compared to 19 species downlisted and nine delisted (i.e., removed from the Species at Risk in Ontario List) since 2009. For example, of the 88 known mammals in Ontario, 16 are on the Species at Risk in Ontario List (18%). There are many species whose status has not yet been assessed but may also be at risk or in decline, especially very small or rare organisms.
- **Invasive species are steadily increasing in Ontario.** Invasive species can be any type of non-native organism that harms ecosystems, including plants, animals, insects or fungi. Invasive species can cause harm in many ways including preying on native species, outcompeting for food, water or habitat, spreading diseases, preventing native species from reproducing, killing eggs or young, and by providing little food value to other wildlife. If there are no natural predators or controls, invasive species can breed and spread quickly, crowding out native species. In 2017, 183 invasive species were known to be established in the Great Lakes basin. Invasive species were detected in 46% of Ontario's inland lakes sampled between 2008 and 2012. Around 66% of Ontario's Species at Risk are threatened by plant invaders such as garlic mustard (an herbaceous plant) and Phragmites, and fish like the round goby.

Main Challenges

- **Ontario has not met national and international commitments** to designate 17% of its land as protected area by 2020. Currently

10.7% of the province is protected. Protected areas are permanently set aside and managed to conserve nature, where nature can function largely unimpaired by human activities. Examples in Ontario include provincial parks, conservation reserves, wilderness areas, dedicated protected areas and national parks. Protected areas are a very important tool for safeguarding nature. Ontario needs to add 68,000 km^2 of protected area to meet 17% coverage by 2020.

- **Climate change will change Ontario's nature and wildlife.** The province's ecosystems are changing in response to warming air and water temperatures as well as changing patterns of rain, snow and ice. While some native species may be able to adapt to these changing conditions, the Intergovernmental Panel on Climate Change has found that most plant species will not be able to naturally shift their ranges fast enough to keep up with current rates of climate change and many small mammals will not be able to keep up at projected future rates. Species that previously did not live in Ontario, for example the blacklegged tick, are already starting to expand their ranges into the province. These ecosystem changes will have serious implications for our communities and economy.
- **Invasive species are one of the biggest threats to biodiversity globally.** Ontario is the province with the highest risk of invasion by non-native species because large amounts of goods and people move within the province and across borders. Invasive species can also have economic consequences. For example, zebra mussels feed rapidly on tiny plankton, reducing the amount of food for other aquatic species, clearing the water, and allowing more vegetation to grow. They also clog infrastructure and equipment. The Ministry of Natural Resources and Forestry estimated in 2010 that the total annual economic impact of invasive zebra mussels in Ontario is between $75 million and $91 million.
- **Southern Ontario has lost nearly three-quarters of its wetlands in the last two centuries.** About 14,700 km^2 of wetlands have been drained for agriculture or settlement. Wetlands are lands that are often covered by shallow water or where the water table is close to the soil surface, providing transitional habitat where land and aquatic ecosystems are connected. Ontario is home to 6% of the world's remaining wetlands and about 25% of Canada's total, mostly located in Northern Ontario. Wetlands provide vital wildlife habitat for many species and important ecosystem services for people, including resilience to floods and other effects of climate change. For example, over 20% of Ontario's species at risk are directly dependent on wetland habitats. Wetlands continue to be lost for infrastructure and development—an additional 61.5 km^2 of wetlands were drained in southern Ontario between 2000 and 2011.
- **Southern Ontario's forest cover is less than required for healthy ecosystems.** Environment and Climate Change Canada defines 50% forest cover as the threshold for watersheds to be likely to support most of the potential species and healthy aquatic systems. More than half of southern Ontario watersheds have less than 30% forest cover, the high-risk threshold for only marginally functional ecosystems. Some municipalities in southwestern Ontario have less than 10% forest cover, and one, Essex County, has as little as 3% left and has lost 40% of its forest birds. Forest cover is also needed to keep the ecosystems that clean our drinking water healthy.
- **Wildlife diseases can have devastating impacts on plants, animals, our economy and our own health.** For example, there have been catastrophic declines in Ontario's species of bats from white-nose syndrome, a rapidly-spreading disease that is almost always fatal. Bat colonies decline by 99%

within two years of exposure. There are eight species of bat that are native to Ontario—four of the five hibernating species have been listed as endangered due to this disease. From 5.6 to 6.7 million bats in the northeastern United States and Canada have died since the disease was first discovered in 2006. Bats control insect populations and pollinate many different plants, including some agricultural crops. A study in 2011 placed the estimated agricultural losses in the United States due to bat population declines at more than $3.7 billion per year. The loss of biodiversity poses a serious risk to global food security by decreasing the resilience of many agricultural systems, making them more vulnerable to threats like pests, diseases and climate change.

- **Wildlife health and our own health are inextricably linked.** Researchers estimate that over 60% of existing infectious diseases are passed from animals to people. For example Severe Acute Respiratory Syndrome (SARS), Lyme disease and at least 75% of emerging infectious diseases have animal origins.

3.5 Climate Change

Ontario is experiencing higher average annual and seasonal temperatures as well as heat waves and increased storm events. These impacts are projected to become more severe as greenhouse gas levels in the atmosphere continue to rise, mainly due to worldwide human activities such as burning fossil fuels.

Climate change also acts as an amplifier of other drivers of environmental change by increasing pressure on already-stressed natural systems. Examples of goals the Ontario government has set out to mitigate and adapt to climate change are found in **Figure 11**.

Trends

- **World temperatures are expected to increase more than 3°C by 2100,** even if all countries achieve the emission reductions promised in their current policies, according to the Intergovernmental Panel on Climate Change (IPCC). Without these policies, the IPCC expects the world will warm by more than 4°C. These levels of warming are associated with "severe, pervasive and in some cases irreversible detrimental impacts," according to the IPCC.
- **Ontario is heating up faster than the global average.** According to Environment and Climate Change Canada, Ontario's average annual temperature increased by 1.3°C, while the global average warmed 0.8°C between 1948 and 2016. Ontario's summers are more often hotter: the average number of days over

Figure 11: Examples of Ontario's Climate Change Mitigation and Adaptation Goals

Prepared by the Office of the Auditor General of Ontario

Existing Provincial Objectives	Provincial Legislation, Plan or Policy
"Make climate change a cross-government priority;" "To do our share to address climate change and protect our environment;" "Ontario will reduce its emissions by 30% below 2005 levels by 2030;" and To prepare "families and communities for the costs and impacts of climate change"	Made-in-Ontario Environment Plan, 2018
"The Government shall establish targets for the reduction of greenhouse gas emissions in Ontario and may revise the targets from time to time"	*Cap and Trade Cancellation Act, 2018*
To "minimize greenhouse gas emissions resulting from resource recovery activities and waste reduction activities"	*Resource Recovery and Circular Economy Act, 2016*
"To protect and improve the capacity of the Great Lakes-St. Lawrence River Basin to respond to the impacts and causes of climate change"	*Great Lakes Protection Act, 2015*

30°C increased 500% between 1950 and 2013 (from an average across Ontario of 0.6 days to 3.6 days). Ontario's winters are more often milder, recording an increase of 2°C between 1948 and 2016. This may bring more winter floods and variable freeze-thaw cycles. By the end of this century, the rate of warming in Ontario is expected to be almost double that of the global average. For example, if average global warming hits 2.2°C, Ontario is expected to warm an average of 3.9°C.

- **Ontario's greenhouse gas emissions per capita are high by global standards.** At 11 tonnes of emissions per person per year in 2017, Ontarians emit almost double the world per-person average of around 6 tonnes. This rate is higher than all but six G20 countries. If the greenhouse gas emissions from international air travel and the net imports of goods and services were included, Ontario's per capita emissions would be higher.
- **Ontario has made some progress in reducing greenhouse gas emissions.** However, Ontario still needs to reduce its greenhouse gas emissions. The Ministry projects that emissions in 2030 will be 160.9 Mt. To reach the target of 30% below 2005 levels (or 143.3 Mt), over 17 Mt of reductions would be required. Ontario's target is stated to align with Canada's 2030 target (30% below 2005 levels by 2030). However, the Intergovernmental Panel on Climate Change has recently determined that global emissions must be reduced 45% below 2010 levels by 2030 to limit global warming by 1.5°C and avoid some of the more severe impacts associated with higher global temperatures. This would mean reducing Canada's emissions by at least 39% below 2005 levels by 2030 and reaching net zero emissions by 2050. Canada has not committed to a revised reduction target.
- **Emissions from transportation increased from 42 million tonnes in 1990 to 56 million tonnes in 2017.** Ontario's freight sector has more than doubled its emissions since 1990. Any improvements in vehicle fuel efficiency and biofuel requirements have been offset by the increase in passenger and freight travel.
- **Emissions from buildings in Ontario, mainly from natural gas used for heating,—increased by 26% between 1990 and 2017, accounting for 22% of Ontario's total emissions in 2017.** These emissions are increasing due to growth in both population and floor space per person.
- **Emissions from industry are still high.** While they have been decreasing since the 1990s, industry still accounted for 30% of Ontario's total greenhouse gas emissions in 2017. More than half of industrial reductions since 1990 are due to the closure in 2009 of a single chemical manufacturing operation at the Invista Canada facility in Maitland, Ontario.
- **Extreme weather, such as heat waves, droughts, severe cold, heavy rainfall and storms, are all becoming more frequent and intense.** Such extreme weather events have resulted in environmental, economic and social impacts across the province. Examples of impacts exacerbated by climate change in Ontario include infrastructure damage, forest fires, agricultural losses, and an increase in the reported prevalence of Lyme disease.
- **Disaster relief and insurance costs are increasing in Canada.** Overall, federal government disaster relief spending has risen from an average of $40 million a year in the 1970s to an average of $100 million a year in the 1990s, hitting a record of $1.4 billion in 2013. According to the Insurance Bureau of Canada, large catastrophic events are those that exceed $25 million in insured damages. In 2018, such events reached almost $1.4 billion across Ontario. One of Canada's largest property insurers has raised premiums by as

much as 15% to 20% in response to increasing costs of weather-related property damage.

Main Challenges

Ontario needs to reduce greenhouse gas emissions and adapt to climate change at the same time:

- **Reducing carbon emissions requires systemic changes** to shift current high-carbon habits to low-carbon options. While there are some simple lifestyle shifts, technical solutions, like electric vehicles, come with upfront replacement costs.
- **Climate change will have accelerating costs.** The National Round Table on the Environment and the Economy expected the impacts of climate change to cost Canada from about $5 billion per year in 2020 to about $21 billion to $43 billion per year by 2050. This is roughly 0.8% to 1% of Canada's future gross domestic product (GDP) every year. However, if global emission rates remain high, climate change could cost over $150 billion per year in Canada by 2050.
- **Climate change will impact certain regions of Ontario more severely.** While climate change is a global phenomenon, impacts are felt locally. Impacts can vary due to conditions unique to an area, such as proximity to lakes and rivers, landforms, level of urbanization and micro-climates. Some regions may experience more adverse effects than others, such as places already prone to flooding in severe storms.
- **Land degradation like deforestation is amplifying climate change.** Trees and plants naturally remove carbon from the atmosphere through photosynthesis. This carbon is stored in living plant tissue (roots, trunk/stem, branches and leaves/needles), dead plant material on the soil surface, as well as in the soil itself. Globally, billions of tonnes of carbon are stored in forests and wetlands, including about 4.3 billion tonnes stored in Ontario-managed Crown forest. Disturbing these ecosystems through activities such as permanent deforestation can cause this stored carbon to be emitted to the atmosphere and contribute to climate change.
- **Lack of detailed climate change risk assessment and planning.** The 2018 collaborative report on climate change action from the Auditors General across Canada found that most provincial and territorial governments had not fully assessed climate change risks and had not developed detailed adaptation plans.
- **Ontario's overall state of readiness to respond to emergencies needs significant improvement.** Improvements are needed in the resiliency of infrastructure, the protection of natural systems and the safety and well-being of Ontarians in floods, severe weather events, and public health crises, for example. In our audit of Emergency Management in Ontario in our *2017 Annual Report*, we noted that risk identification and assessment processes were not sufficient because they were based on emergencies before 2009 and the Provincial Emergency Response Plan had not been updated since 2008.

See **Chapter 3** for our review of Ontario's current plan to reach climate change targets.

4.0 Establishing Annual, Consolidated Environmental Reporting in Ontario

In researching material for this report, our Office noted that the Ministry of the Environment, Conservation and Parks (Ministry) does not issue a comprehensive annual report on environmental indicators covering areas like air quality, water quality, and biodiversity conservation. Such "state of the environment" reports are produced in other

jurisdictions in Canada, collecting data from numerous sources to show the overall environmental state of affairs and changes over time. Aside from reporting on environmental indicators, it is also important for the Ministry to publicly report on the government's success in meeting its environmental commitments. Ontario does not yet issue such progress reports. The Ministry does publish regular progress reports on some environmental topics as required by various laws. Much of this information could be used in producing a more comprehensive annual environment report.

In November 2018, as part of its new Environment Plan, the Ministry committed to developing key progress indicators and reporting regularly on progress implementing the plan.

There is not yet the same level of standardization in environmental reporting as there is in financial reporting in Canada. Ontario could nonetheless implement current best practices in environmental reporting. Making environmental information available to the public in a more comprehensive and understandable manner would increase transparency and the likelihood that Ontario's commitments to environmental protection will be successfully implemented.

It is very difficult to determine Ontario's total annual environment-related expenditures because expenditures are distributed throughout ministries, agencies, government organizations and the broader public sector.

RECOMMENDATIONS

In order to meet its commitment to report publicly on its progress in further developing and implementing the 2018 Made-in-Ontario Environment Plan, we recommend that the Ministry of the Environment, Conservation and Parks:

- develop key quantitative and qualitative indicators and related targets;
- establish an annual reporting timeline;
- report publicly in accordance with this timeline; and
- incorporate reporting on environmental expenditures as part of annual reporting.

MINISTRY RESPONSE

As outlined in the draft Made-in-Ontario Environment Plan, the Ministry proposes to report regularly on the progress against its plan and to develop key indicators of progress. The Ministry appreciates the Auditor General's recommendations and will consider these recommendations as it develops its approach to public reporting, monitoring and evaluating progress against the commitments in its plan.