State of Ontario's Natural Resources

(SONR) Report

Ontario

2021

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Executive summary

The Ministry of Northern Development, Mines, Natural Resources and Forestry is releasing the State of Ontario's Natural Resources (SONR) Report on the status and health of Ontario's forests, fisheries, Crown land, and terrestrial and aquatic ecosystems. Much of this information is already made available through other public government reports, but the SONR report provides this information in a convenient consolidated resource for Ontarians to access online.

The report analyzes 48 key indicators, including forest regeneration, fish populations, and terrestrial invasive plants across different parts of the province. The majority of these indicators show Ontario's natural resources to be in a healthy and productive state. Natural resources are often concentrated in particular geographic areas across the province resulting in many indicators focusing on specific regions rather than the entire province. Some indicators require additional data collection and analysis before a trend can be established, and a few indicators reflect impacts which require long term solutions.

This ministry is taking action to address these indicators, including the development and implementation of stronger policies and legislation that will help better manage our natural resources and conserve our biodiversity. We are also working with over 30 organizations on the Ontario Biodiversity Council – the organization responsible for implementing Ontario's Biodiversity Strategy – and our partners including other partner provincial ministries, other levels of government, non-government organizations and industry to deliver innovative policy approaches and programs.

Providing the public with current information on the state of our province's natural resources is important because we all play a role in protecting our natural environment. The ministry uses this information to inform our monitoring activities and in the development of programs and policies that help us manage our natural resources for recreational, social, ecological and economic benefits in a responsible way.

The ministry draws on best practices in public reporting to build transparency, accountability and awareness of our natural resources. The report is based on input from subject matter

experts and the best available information collected through our research and monitoring programs, partnerships with universities, and other publicly available sources of data, such as Statistics Canada. This report will continue to be updated as more current data become available.

Ontarians are encouraged to further their understanding of the province's vast natural resources, and the positive contributions they make to our way of life and our economy.

Introduction

Natural resources are a cornerstone of Ontario's economy. They are vital to our wellbeing and to our economic prosperity.

In this report, you can learn more about how Ontario's natural resources are doing and how we are responding to ensure their continued benefits for generations to come.

About the report

Ontario's natural resources are an integral part of our province's heritage and economy. We are committed to promoting our natural resources and the opportunities they provide, including forestry, hunting and fishing, and to sustainably managing Ontario's natural environment for generations to come.

Many factors influence the state of our natural resources. Assessing the status and trends of our natural resources helps us to identify and address issues early, so we can continue to enjoy the economic and social benefits of these resources - now and in the future. It also helps us to assess how well we are implementing legislation and policies, such as the Made-in-Ontario Environment Plan.

How we assess our natural resources

This report is organized into four sections, each containing a set of indicator reports. These indicator reports:

- use monitoring or research to detect changes and trends, such as the amount of forest area in Ontario or the economic value of commercial fisheries
- measure progress over time on specific topics

As new data becomes available, these indicator reports will be updated and new reports will be added. Information from multiple indicator reports can provide a broader perspective on how specific natural resources, such as forests and fish, are doing. Short summaries will be published periodically on these topics.

Theme – Our natural resources

Ontario is fortunate to be rich in natural resources. They include:

- forests, wetlands and lakes
- different species of fish and wildlife
- Crown lands

Our natural resources are important to our wellbeing and our economic prosperity for future generations. That's why we need to develop and manage our natural resources for years to come. This section describes the resources we have, how they are doing and their diversity.

Ecosystems

Ontario contains a wide range of ecosystems, from the Carolinian forests in the southernmost part of the province to the tundra of the Hudson Bay lowlands in the north. These ecosystems provide a range of benefits including:

- clean air and water
- productive soils
- flood control
- food
- timber
- economic opportunities
- recreation opportunities

Indicator reports

- Aquatic ecosystems
- Forest composition
- Forest growth
- Habitat for Wildlife
- Wetland area

Species

Ontario has more than 30,000 species including a variety of fish, wildlife, plants and insects - one of the highest numbers of any province in Canada.

These species contribute to our foods, clothing and medicine, and are important contributors to ecosystem health and sustainable economic and social development.

Indicator reports

- Fish community diversity
- Fish populations
- Moose populations
- Species of conservation concern

Crown lands

Ontario covers an area of approximately 1.075 million square kilometres. Almost 87 per cent of this area is Crown land and water. These public lands and related infrastructure are managed to provide economic, social and environmental benefits to Ontarians.

Indicator report

- Crown land infrastructure

Aquatic ecosystems

Description

This ecosystems indicator report is about food webs (who eats whom) in Ontario lakes.

Status


Status: Mixed


Trend: Undetermined


Geographic extent: Northern Ontario; Southern Ontario

Why it's important

Ontario sustainably manages fisheries and protects aquatic biodiversity while promoting economic and outdoor recreational opportunities. With approximately 250,000 lakes and 490,000 kilometres of rivers, Ontario has an abundance of aquatic resources. Sustaining these resources relies on understanding the aquatic ecosystems and how well they are functioning. This information helps us manage our aquatic resources using:

- legislation
- regulations
- policies
- monitoring
- adaptive management

How we monitor

In aquatic ecosystems, prey are more abundant than the predators that feed on them, whether they are zooplankton that feed on phytoplankton, or predatory fishes such as Walleye and Lake Trout that feed on minnows or cisco.

Disturbances to aquatic ecosystems such as losing top predators due to pressures like habitat changes, overfishing or introducing an invasive species, can:

- disrupt the balance within the aquatic community
- negatively impact native species biodiversity
- impact the quality of fishing opportunities

The size and abundance of organisms in an aquatic community can be used to assess the health of the ecosystem.

Since 2008, we have monitored fisheries using the Broad-scale Monitoring Program for Inland Lakes. Water quality, invertebrates, and fishes in a selection of lakes are sampled annually, and the data are analyzed to report on the status of lake ecosystems every 5 years. Fish are sampled using nets. The species, number of fish caught, lengths and weights are recorded.

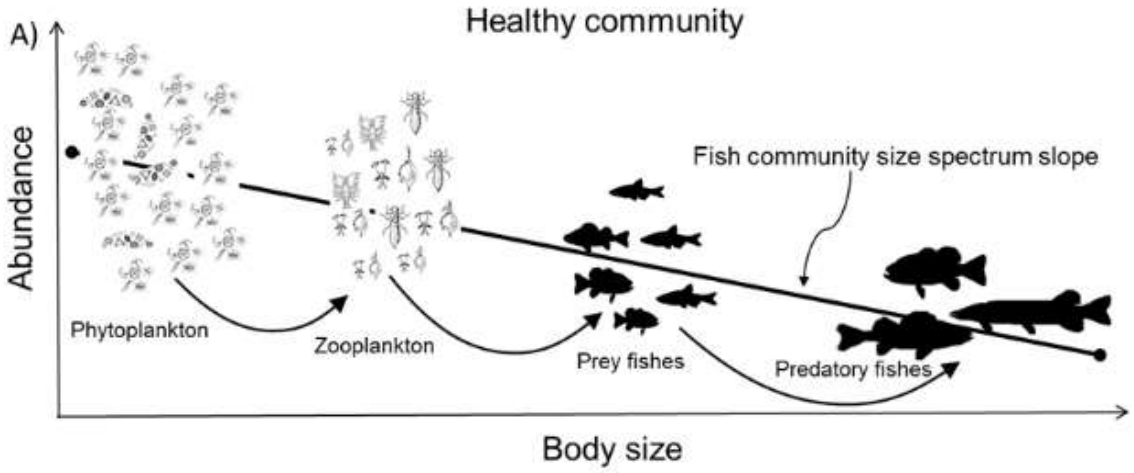
This monitoring information is used to create a “size spectrum slope” for each lake. The slope is a line that reflects the relationship between fish length (mm) and abundance (number of fishes of each length) of prey species versus predator species.

This provides us with information on how energy moves within a lake and can be compared among lakes to tell us how well the aquatic ecosystem is doing. Lakes with steep (more negative) slopes are not as healthy as lakes with shallow (less negative) slopes.

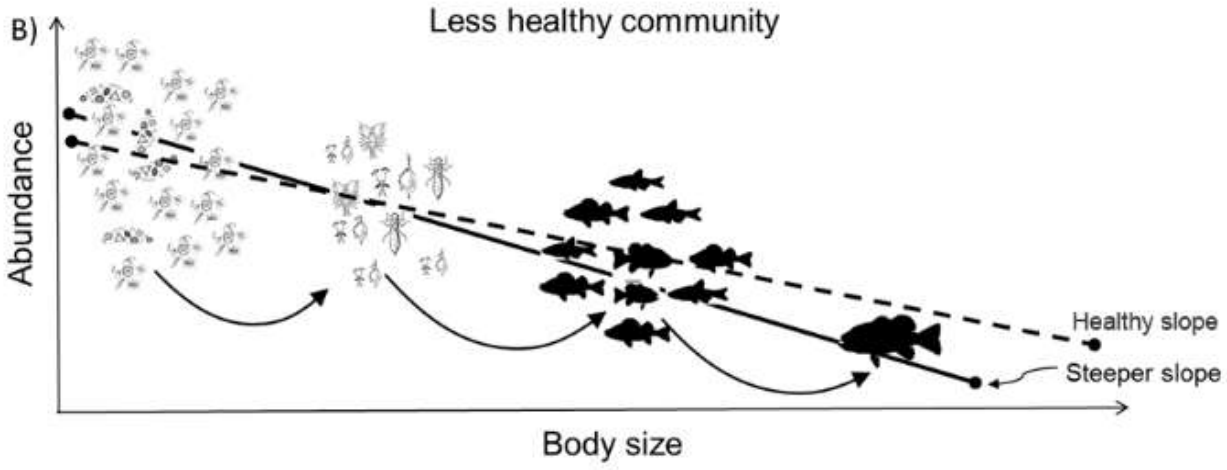
Results from all lakes sampled in each fisheries management zone are averaged together.

Examples of community size spectrum slopes

Example A represents a healthy aquatic community.



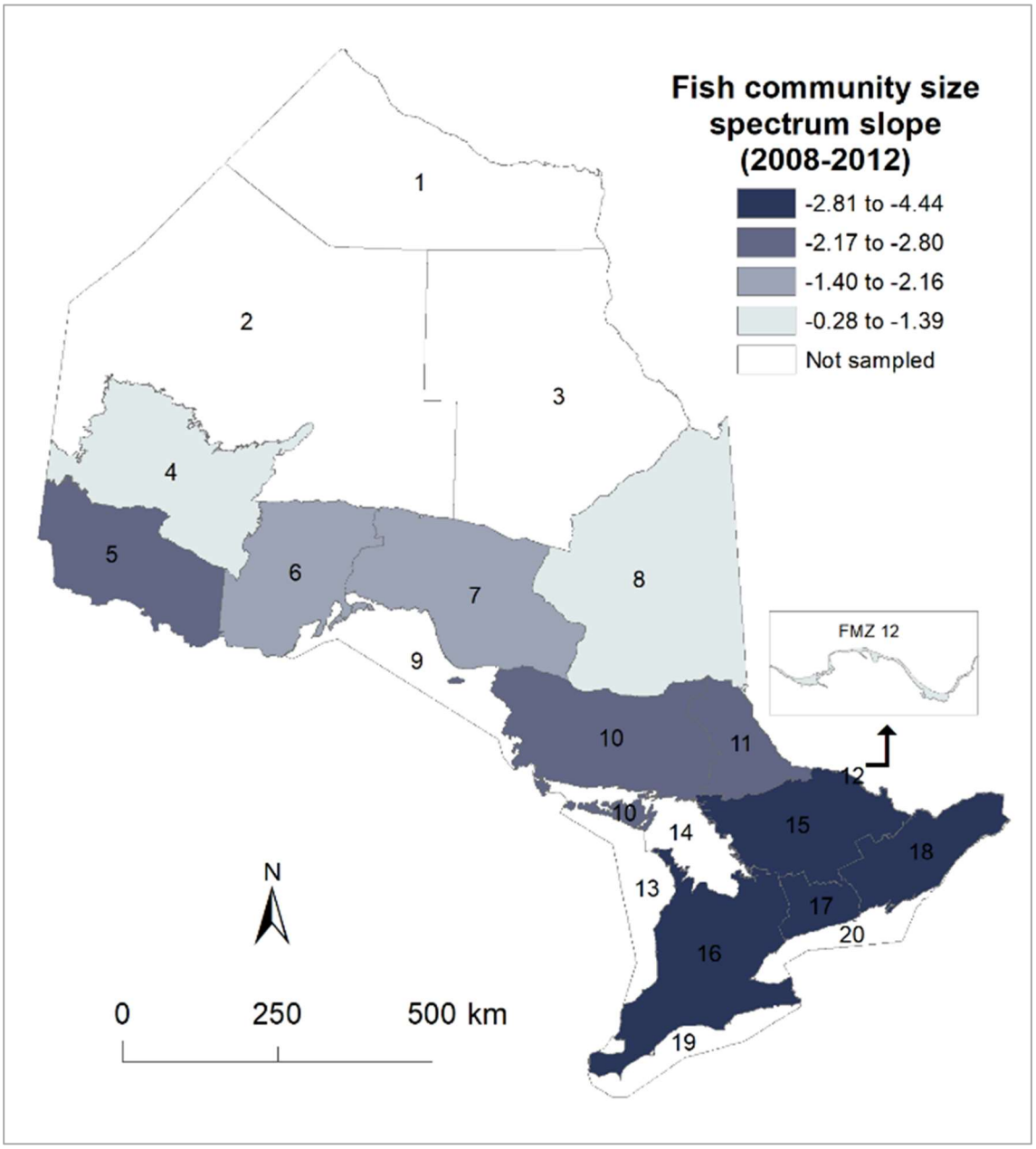
Example B represents a less healthy aquatic community where too many large predators have been removed or reduced by factors such as water quality degradation, overfishing or invasive species.

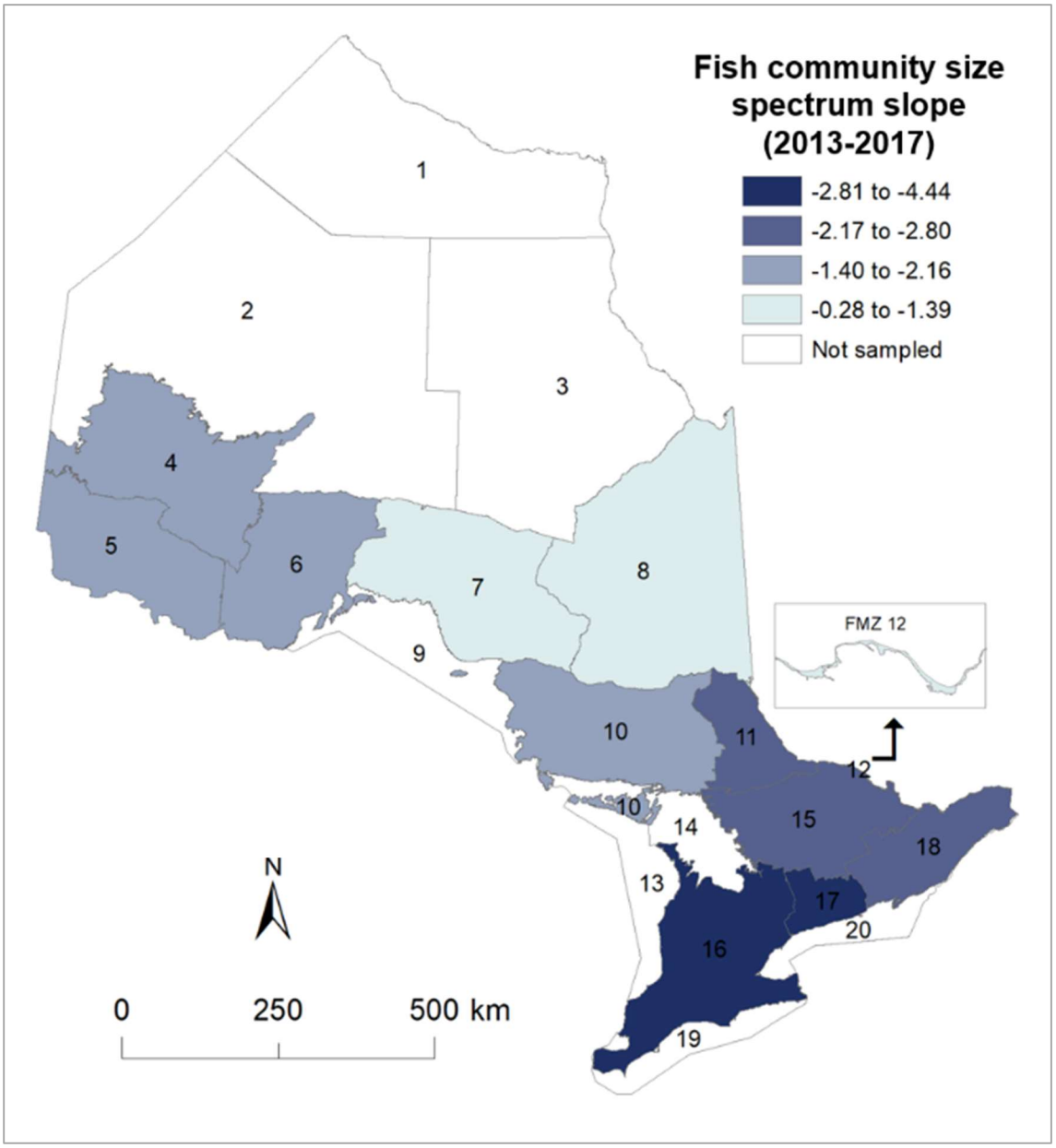


Results

This map shows the average fish community size spectrum slopes in each fisheries management zone. More negative slopes suggest that the balance between predators and prey may be disturbed compared to lakes with less negative slopes.

Fish community size spectrum slopes





Fish community size spectrum slopes are steeper (more negative) in lakes in southwestern compared to northern Ontario.

This suggests that fish communities in northern lakes:

- are healthier than southern lakes
- have a better predator-prey balance
- have more efficient energy transfer through their food webs

There was no significant change in this indicator between Cycle 1 and Cycle 2. The status of this indicator is mixed, with the predator-prey balance in aquatic ecosystems more disturbed in southern Ontario when compared to northern Ontario.

These results allow us to make general comparisons among fisheries management zones. Further research is needed to determine how these results differ from what would be expected in less disturbed lakes within each fisheries management zone.

Future progress

A better understanding of the trends in the size and abundance of organisms in aquatic communities will be possible after Cycle 3 (2018 to 2023) of the Broad-scale Monitoring Program for Inland Lakes.

Fisheries management zone 12

This zone is not comparable to the other inland zones because it is a chain of lakes that has more riverine rather than lake properties. It is also connected to the Great Lakes-St. Lawrence River system, which has a more diverse fish community than other inland fisheries management zones. Information on this fisheries management zone will allow us to make comparisons over time as new data is available.

Fisheries Management Zone	Number of inland lakes sampled (2008-2012)	Average community size spectrum slope (2008-2012)	Number of inland lakes sampled (2013-2017)	Average community size spectrum slope (2013-2017)
4	95	-1.33	102	-1.41
5	129	-2.22	105	-1.92
6	71	-1.62	57	-1.57
7	49	-2.02	71	-1.39
8	46	-1.38	63	-1.14
10	121	-2.28	120	-2.12
11	30	-2.42	36	-2.27
12	10	-0.6	10	-0.28
15	51	-2.86	50	-2.54
16	21	-3.59	19	-3.1
17	22	-4.44	21	-3.78
18	39	-2.95	33	-2.66

Indicator last updated

- February 2021

Data source(s)

- Broad-scale Monitoring Program for Inland Lakes
- Land Information Ontario

Forest composition

Description

This ecosystem indicator tracks changes to the amount, type and age of Ontario forests.

Status


Status: Good


Trend: No change


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Forests cover nearly two-thirds of Ontario and provide important ecosystem services such as carbon storage and biodiversity.

Ontario's public forests are managed to maintain a diversity of forest types and ages to provide conditions required for the long-term health of forest ecosystems.

How we monitor

To monitor the composition of Ontario's forests we track:

- eight forest types with common tree species and ecological characteristics
- five age groupings or seral stages

We use Forest Resources Inventory data for the Managed Forest to determine forest type and age. We do not include southern Ontario or the Far North as we lack forest inventory data in these areas.

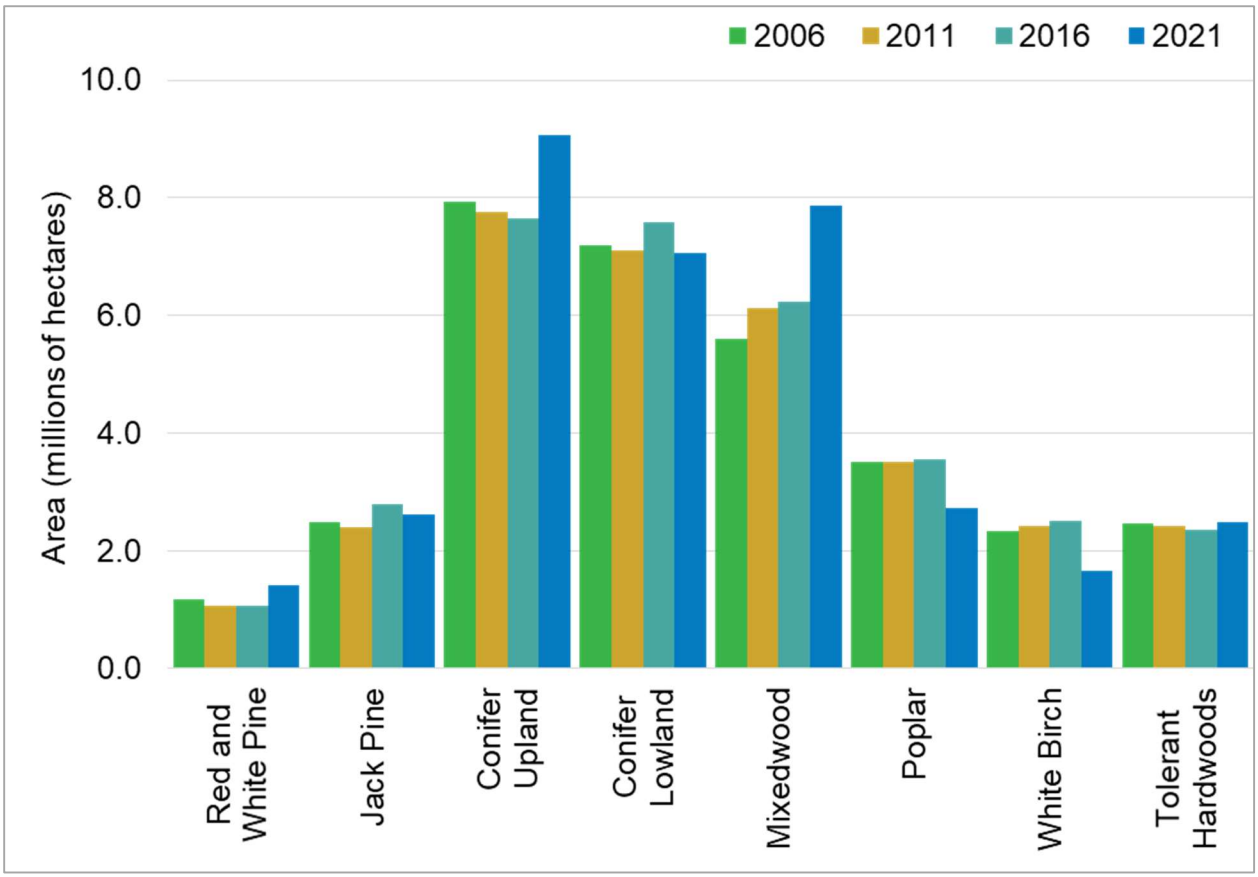
The age and duration of seral stages varies by forest type depending on how fast the trees grow and how long they live. For example, short-lived poplar reaches the late successional stage at 95 years old. For long-lived lowland conifer, like black spruce, this stage is reached at 135 years old.

Forest types and seral stages are further described in the Forest Resources of Ontario report.

Results

The status of this indicator is considered good because a diversity of forest types and ages continue to be maintained across Ontario. There is no change to the trend of this indicator. Like previous reports, small changes in the abundance of forest types and ages were observed.

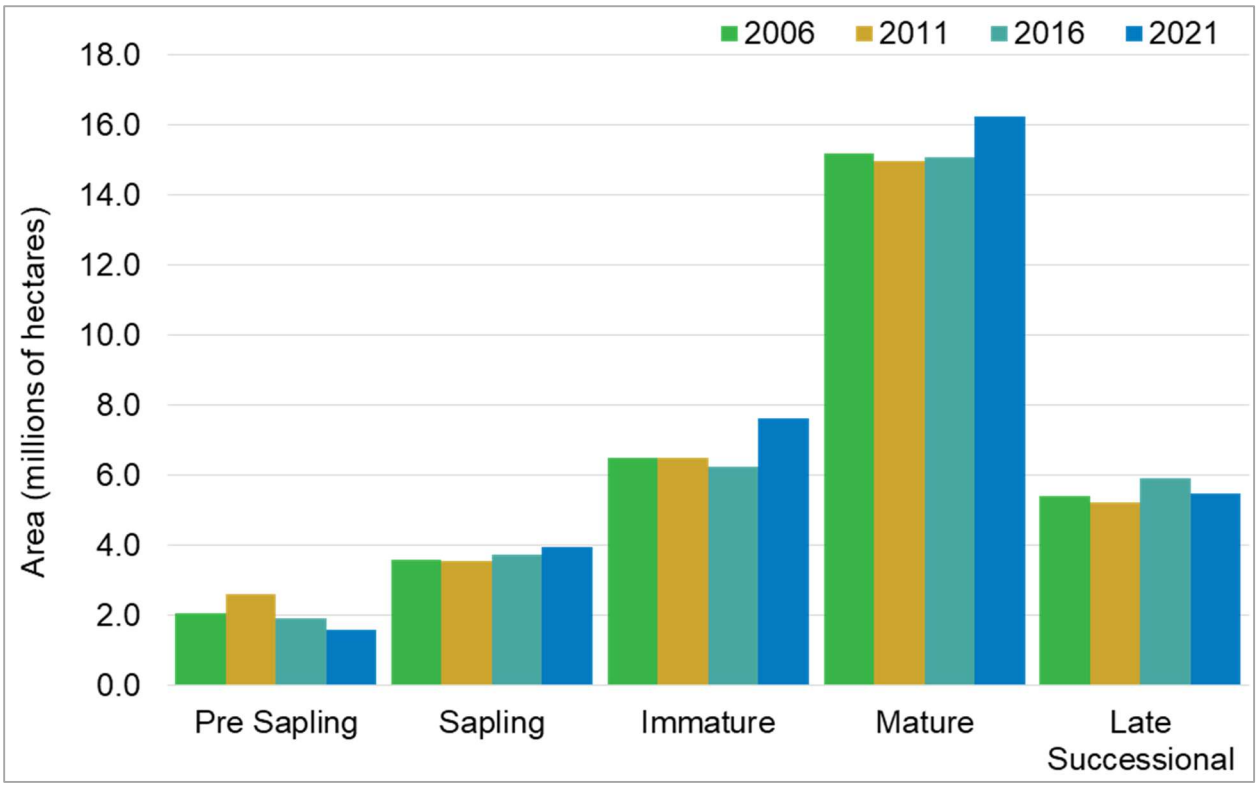
Area by forest type



From 2006 to 2021, there were small changes in the area of most forest types. Since 2016 there was:

- an increase in the area of red and white pine, conifer upland, and mixedwood forest
- a decrease in the amount of poplar and white birch forest

Area of forest by seral stage



From 2006 to 2021, there was little change in the area of forest by seral stage. Since 2016, there was:

- a decrease in the amount of pre-sapling forest
- an increase in the amount of immature and mature forest

Small changes in forest type and seral stage are a normal characteristic of forest ecosystems. Natural disturbances can result in short-term fluctuations in the amount and age of forest types.

Forest management guides are applied during forest management planning to maintain a diversity of forest types and ages on the landscape that would emulate natural forest conditions.

Advancements in data collection also contribute to observed changes. New forest inventories use higher quality digital imagery and describe the forest more accurately. This can cause forest composition results to shift even when there have been no actual changes to the forest.

In addition, since 2016, another management unit was added to the reporting data, likely contributing to some of the observed change.

Indicator last updated

- February 2021

Data source(s)

- Forest resources inventory analysis results

Forest growth

Description

This ecosystem indicator report measures the current volume and rate of forest growth.

Status


Status: Good


Trend: No change


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Forests cover nearly two-thirds of Ontario and provide important ecosystem services such as carbon storage and biodiversity. Forests also provide a sustainable source of timber to support a forest industry that creates jobs and the forest products that society needs.

We manage Ontario's public forests to maintain forest productivity for the long-term health of forest ecosystems. We track changes in the volume and growth rate of Ontario's forests to monitor forest productivity.

How we monitor

We monitor forest growth and volume using two measures:

- gross total volume which is the total biomass of living trees

- annual growth which is the volume each year

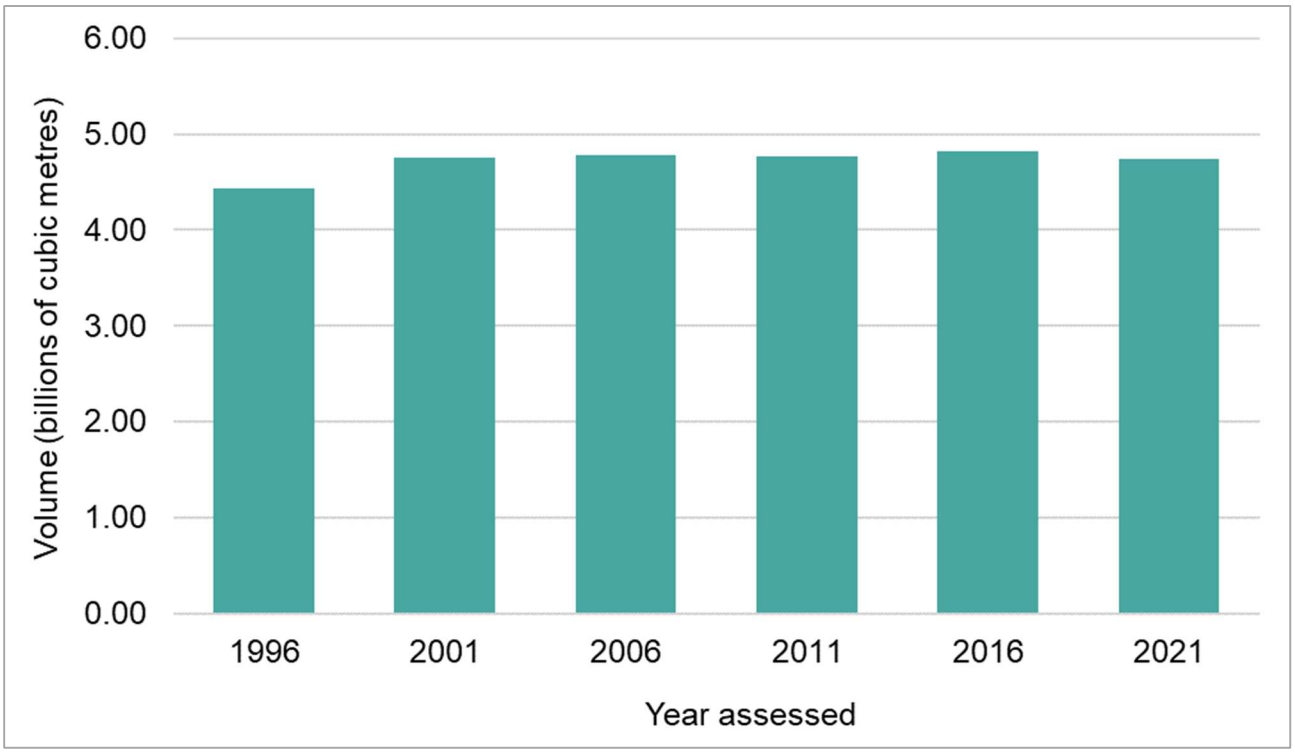
These measures are estimated using growth and yield models and Forest Resources Inventory data for the Managed Forest. We do not estimate forest growth for southern Ontario or the Far North as we lack forest inventory data in these areas.

Forest growth and volume are further described in the Forest Resources of Ontario report.

Results

The status of this indicator is considered good because gross total volume and current annual increment have remained relatively stable. No significant patterns are emerging, so there is no change to the trend.

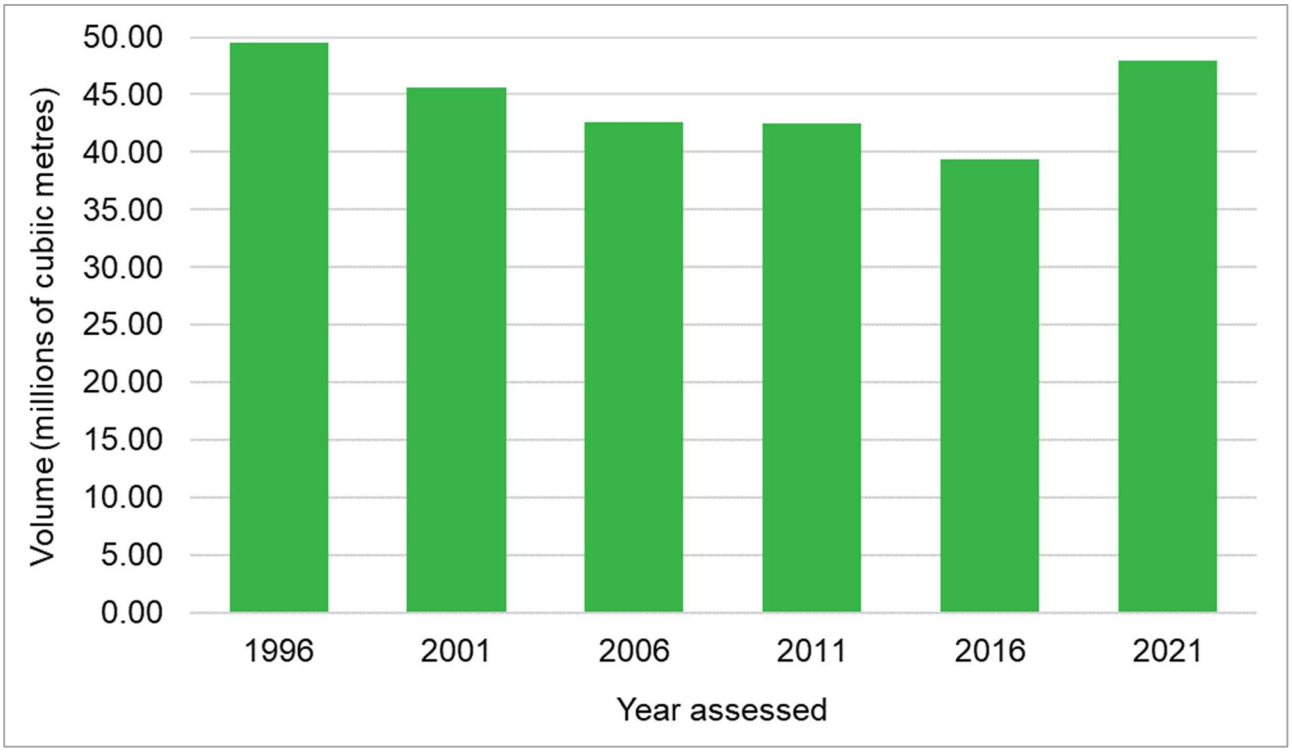
Gross total volume



Gross total volume in the forest has remained relatively constant ranging from 4.4 to 4.8 billion cubic metres.

Wood volume should remain relatively stable if growth is keeping pace with depletions from harvesting and natural disturbances, such as insect infestations, diseases and forest fires.

Average annual growth



Annual growth has ranged from 39 to 49 million cubic metres per year.

Some natural fluctuation in forest volume and growth is expected as the type and age of forests change. As forests age, their growth fluctuates. In general, younger trees grow more quickly than older trees. While increasing forest age is neither positive nor negative, it can lead to declines in productivity.

Advancements in data collection also contribute to observed changes. New forest inventories use higher quality digital imagery and describe the forest more accurately. This can cause volume and growth results to shift even when there have been no actual changes to the forest.

A productive forest may not equate to a healthy diverse forest. A productive forest could lack entire species or age classes. Forest management guides are applied during forest management planning to maintain a diversity of forest types and ages on the landscape that would emulate natural forest conditions.

This indicator combined with the Forest composition indicator demonstrates that Ontario forests are both productive and diverse.

Indicator last updated

- February 2021

Data source(s)

- Forest Resources Inventory

Habitat for wildlife

Description

This indicator assesses habitat availability for select wildlife species in Ontario

Status


Status: Good


Trend: Undetermined


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Providing an abundant supply of suitable habitat helps to support robust wildlife populations. Maintaining or enhancing wildlife habitat is an objective of sustainable forest management in Ontario.

Forest management guides are used to develop forest management plans. They direct the amount and arrangement of different types and ages of forest on the landscape. This helps forest managers balance habitat for all wildlife, including species at risk. They also provide direction on modifying forest operations to retain specific habitat features like decaying trees, and protect sensitive features like bird nests, lakes, streams, and wetlands.

We assess the availability of wildlife habitat for a variety of species to see how our managed forests are supporting wildlife.

How we monitor

We compare current habitat availability to the range of natural variation for six wildlife species: moose, marten, snowshoe hare, least flycatcher, white-throated sparrow, and ovenbird.

These six species require a broad range of forest types and ages to meet their habitat needs:

- Moose prefer a mosaic of wetlands, young forest, and old forest to provide food and cover throughout the year.
- Marten prefer mature conifer forest.
- Snowshoe hares prefer a mix of young forest with a dense understory and old forest with canopy openings.
- Least flycatchers prefer hardwood and mixedwood forest with dense understory vegetation.
- White-throated sparrows inhabit young forest after disturbances and prefer edge habitats.
- Ovenbirds prefer large patches of mature hardwood or mixedwood forest.

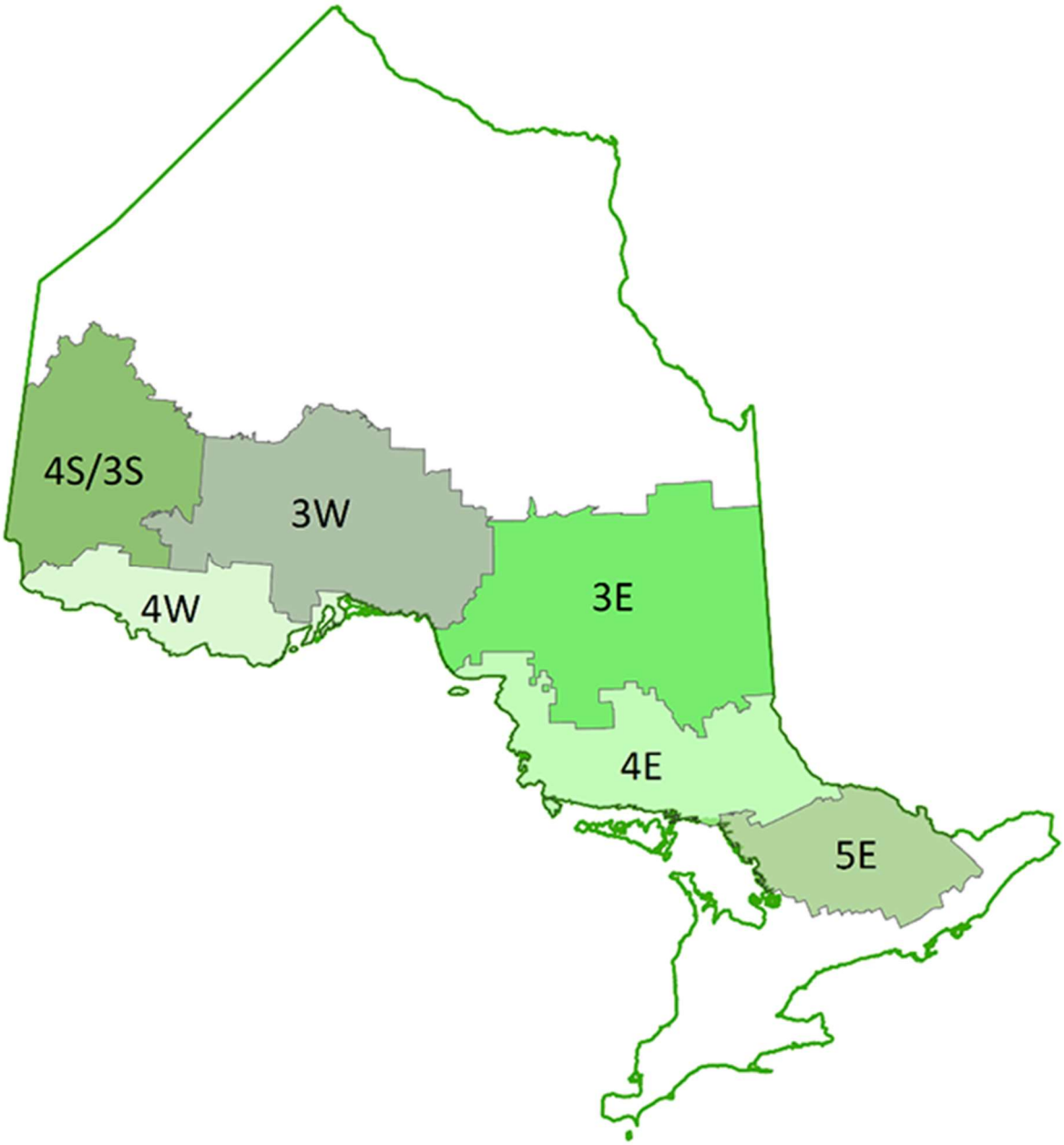
We estimate habitat availability using Ontario's Landscape Tool and Forest Resources Inventory data for the Managed Forest. We do not estimate habitat availability for southern Ontario or the Far North as we lack forest inventory data in these areas.

The Ontario Landscape Tool analyzes how current forest conditions meet habitat needs. It also simulates natural disturbances and forest development to determine ranges of natural variation. Ranges of natural variation estimate the habitat availability we would expect in a natural forest. It is used as a benchmark to assess the current status of wildlife habitat.

The habitat preferences of the six species change depending on their location in the province, therefore we estimate habitat availability within distinct geographic areas known as Landscape Guide Regions. Landscape Guide Regions are like ecoregions and are characterized by common climate and ecosystem conditions. There are six Landscape Guide Regions that are

commonly grouped into the boreal northwest (3S/4S, 3W, 4W), the boreal northeast (3E) and the Great Lakes-St. Lawrence (4E, 5E).

Ontario's Landscape Guide Regions



This indicator cannot be readily compared to previous reports because of the revised data and modelling used. Instead this is a point in time assessment relative to benchmark values.

Results

The status of this indicator is considered good because current habitat availability falls within the range of natural variation for most selected species. The trend is undetermined as this is a point in time assessment relative to benchmark values.

Current habitat availability relative to the range of natural variation for six wildlife species by Landscape Guide Region

Species	Boreal Northeast 3E	Boreal Northwest 3S/4S	Boreal Northwest 3W	Boreal Northwest 4W	Great Lakes-St. Lawrence 4E/5E
Moose	Above	Above	Above	Above	Below
Marten	Within	Within	Within	Within	Below
Snowshoe hare	Below	Within	Within	Within	Below
Least flycatcher	Within	Within	Within	Above	N/A
White-throated sparrow	Above	Within	Within	Within	N/A
Ovenbird	Within	Within	Within	Within	N/A

When current habitat availability falls within the range of natural variation, this shows that it is similar to what we would expect under natural conditions.

Current habitat availability is:

- within the range of natural variation for most species
- above the range of natural variation in a few cases, such as for moose in the boreal northeast and boreal northwest
- below the range of natural variation for species in the Great Lakes-St. Lawrence

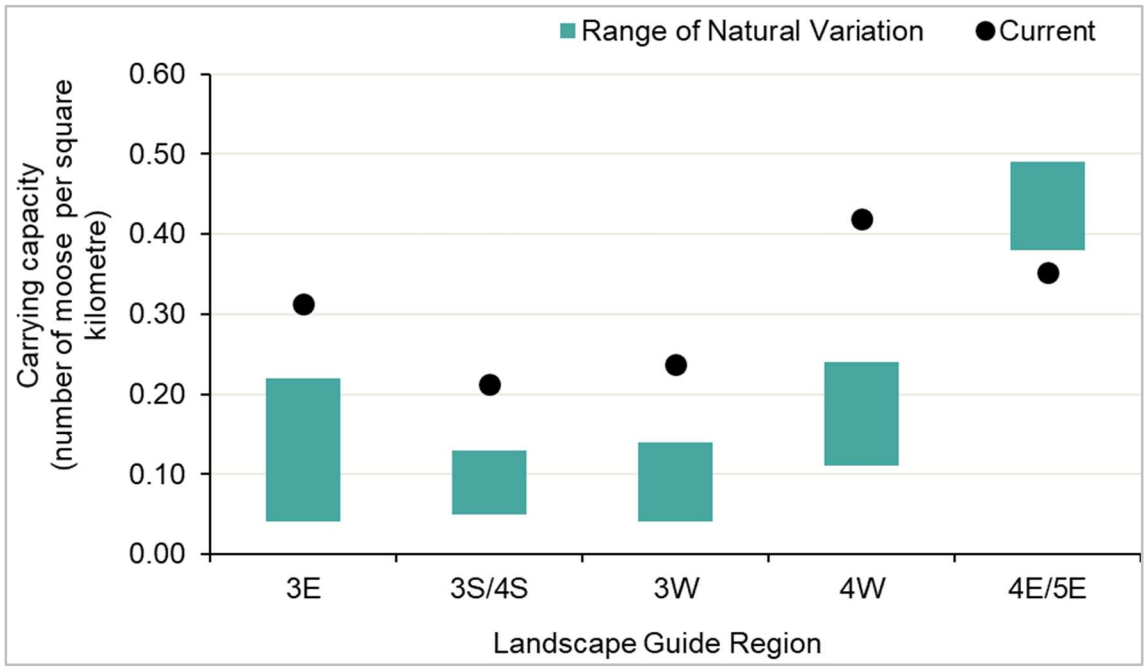
The Great Lakes-St. Lawrence region has been settled and developed for over 150 years and the forest is not as close to natural levels when compared to the boreal regions. Consequently, levels of habitat for indicator species are below the range of natural variation.

When outside of the natural range of variation, planning teams may consider strategies to move towards the range of natural variation while balancing a unique set of objectives in the forest management plan.

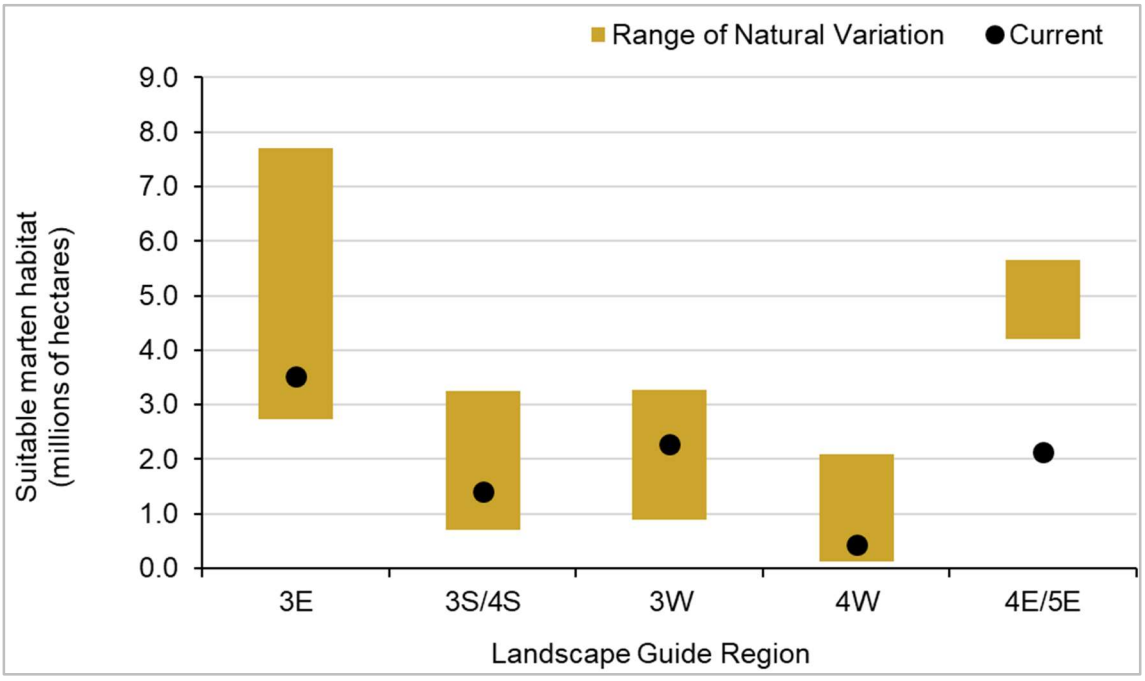
The charts below provide an example of how we compare current habitat availability to the range of natural variation. The black dot represents the current amount of suitable habitat and the coloured bar represents the range of natural variation. Habitat availability is measured as:

- carrying capacity for moose which is the number of moose per square kilometre that could be supported by the available habitat
- amount of suitable habitat for marten and snowshoe hare
- mean probability of habitat occupancy for least flycatcher, white-throated sparrow, and ovenbird

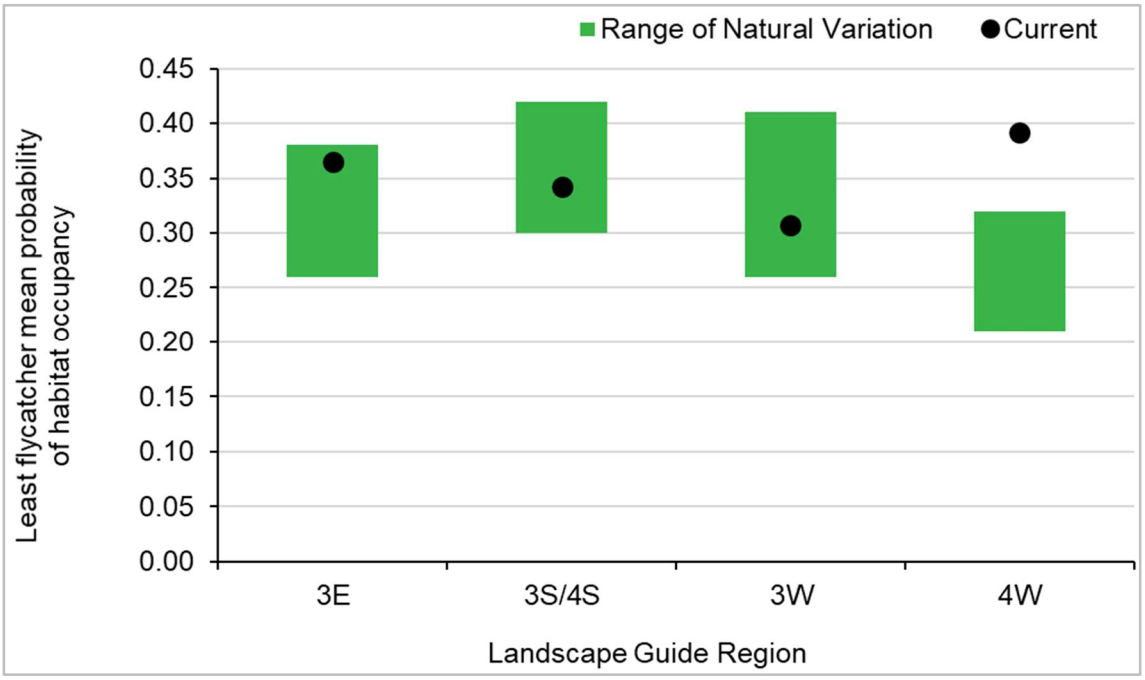
Moose habitat availability



Marten habitat availability



Least flycatcher habitat availability



Indicator last updated

- February 2021

Data source(s)

- Administrative data – Ontario's Landscape Tool modeled results

Wetland area

Description

This ecosystem indicator reports on the area of wetlands across Ontario and tracks changes to the area of southern Ontario's wetlands.

Status


Status: Needs Improvement


Trend: Deteriorating


Geographic extent: southern Ontario

Why it's important

Ontario's wetlands provide important habitat for a large variety of plants and animals.

Wetlands also provide us with valuable ecosystem services including:

- clean water
- flood and erosion control
- climate moderation
- recreational opportunities

Ontario has about 25 per cent of all the wetlands in Canada and six per cent of the world's wetlands. Most of these are found in northern Ontario. Unfortunately, we have lost more than two thirds of the wetlands originally found in southern Ontario to accommodate different land uses (for example, agriculture, development).

How we monitor

The indicator reports and tracks changes to the area of southern Ontario's wetlands where the most rapid change in land use is occurring.

We determine the area of wetlands using land cover information based on time-series satellite imagery. The process includes:

- obtaining cloud-free imagery
- compiling data
- analyzing and validating all changes to update land cover

We use landcover mapping for southern Ontario that is updated every five years which allows us to track trends and changes. The indicator does not currently track changes to wetland area in northern Ontario.

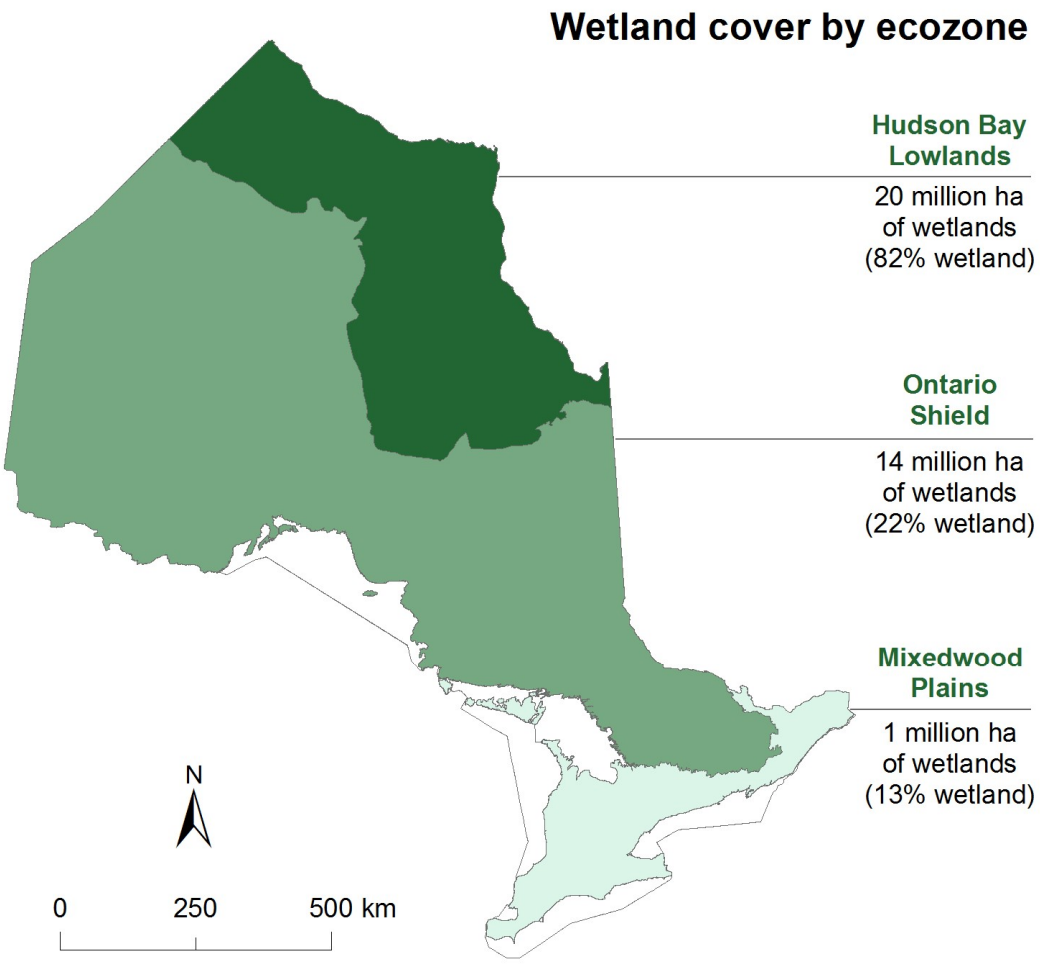
The change in wetland area in southern Ontario is provided for each ecodistrict. An ecodistrict is defined by a characteristic set of geologic, topographic and climate features that influence the types of plants and animals that are found there. Ontario is divided into 71 ecodistricts, 21 of which were assessed in southern Ontario

Results

Wetlands in Ontario

Ontario has more than 35 million hectares of wetland habitat. Wetlands dominate the landscape in the Hudson Bay Lowlands in Ontario's far north, accounting for 57 per cent of the landscape. The rocky landscapes of the Ontario Shield have less wetland cover. Many of the original wetlands in southern Ontario's Mixedwood Plains have been lost.

Area of wetland by ecozone



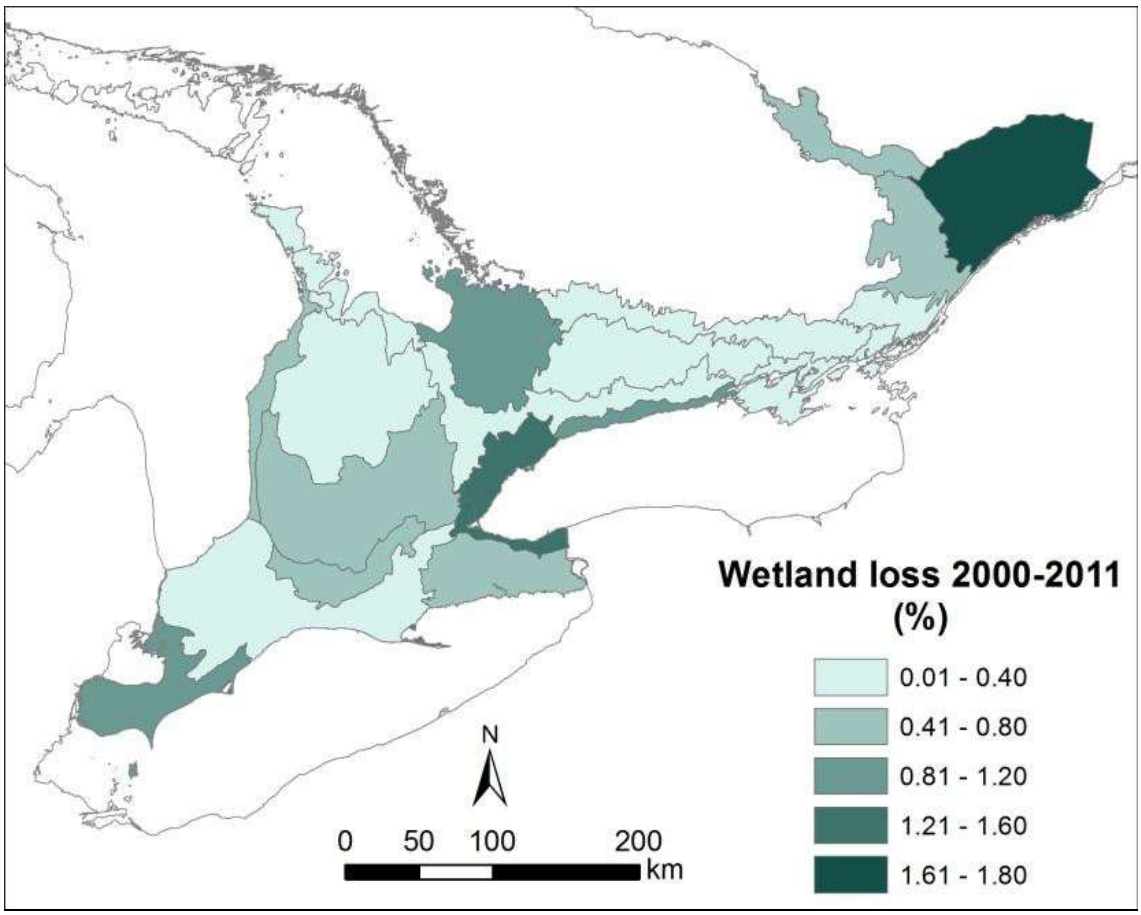
Wetland loss

Between 2011 and 2015, 7,303 hectares of southern Ontario wetlands were lost. This total is higher than the previously reported 6,152 ha lost between 2000 and 2011. This loss represents 0.7 per cent of the wetland area in southern Ontario. Kemptville Ecodistrict (6E-12) had the most wetland losses with 3 per cent loss within its ecodistrict and accounting for fifty-three per cent of the losses (3,913 hectares) in southern Ontario.

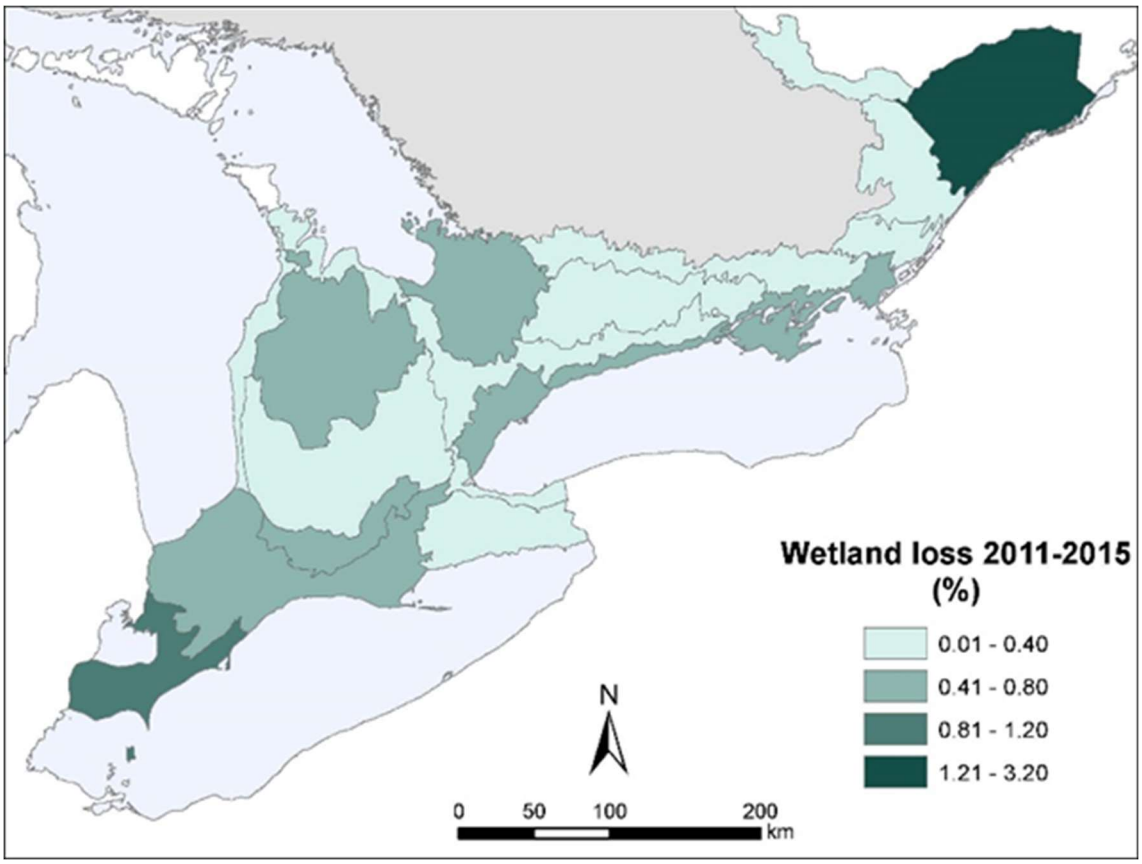
The rate of wetland loss between 2011 and 2015 (1,825 hectares per year) is considerably higher than the rate of wetland loss previously assessed for the decade between 2000-2002 and 2011 (615 hectares per year).

Although the rates of wetland loss from previous assessments (1982-2002) cannot be directly compared due to different land classification and change detection methods, it appears the rate of wetland loss may have increased in this most recent 4-year period.

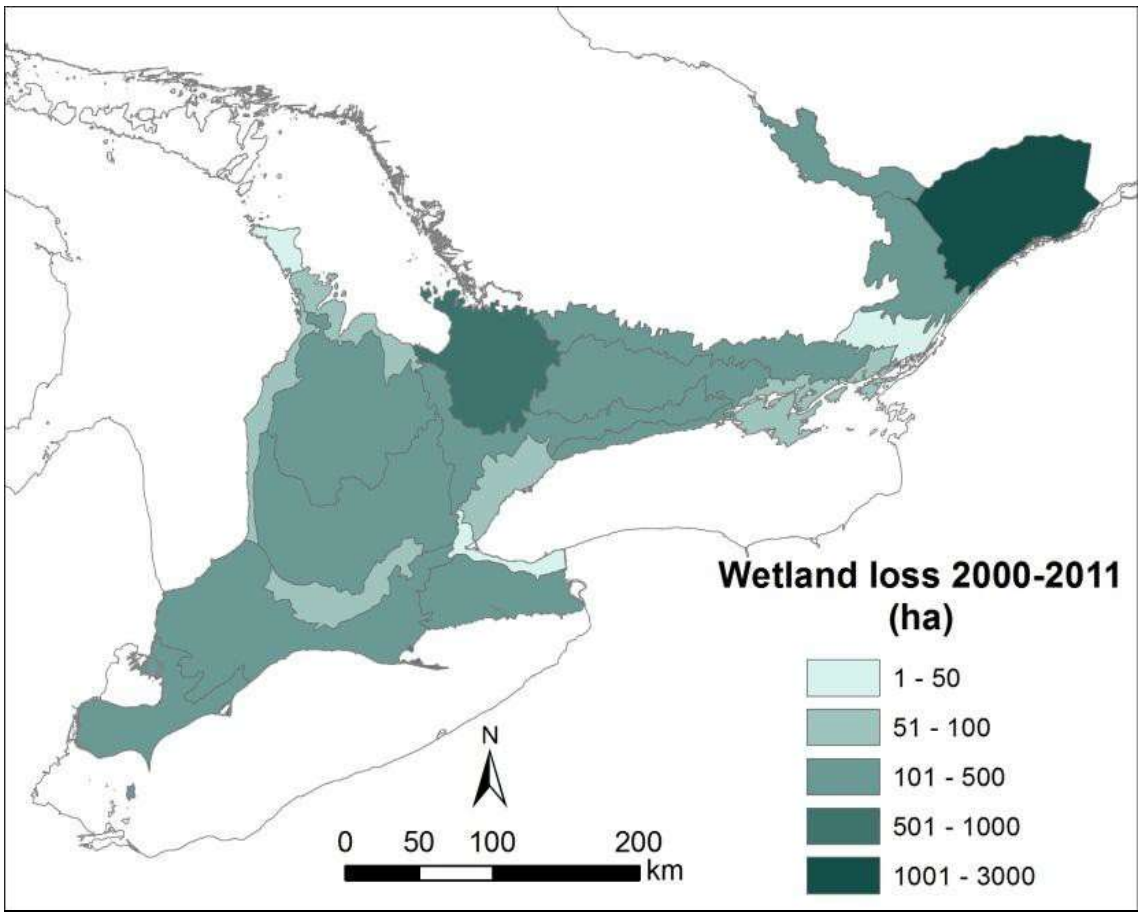
Percentage of wetland lost 2000 to 2011



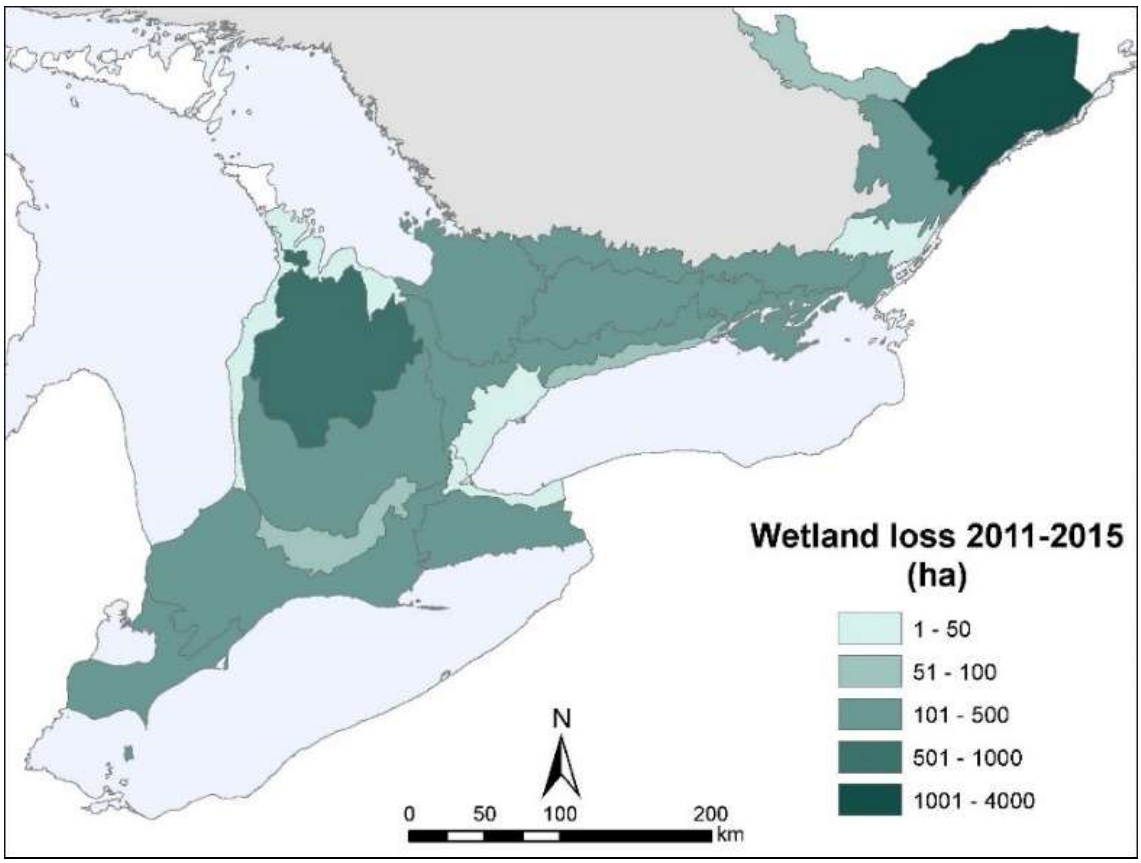
Percentage of wetland lost 2011 to 2015



Area of wetlands lost 2000 to 2011



Area of wetlands lost 2011 to 2015



Indicator last updated

- May 2021

Data source(s)

- Southern Ontario Land Resource Information System (SOLRIS) Version 3 (OMNRF 2019)
- Ontario Land Cover Compilation (OLCC) Version 2.0 (OMNR 2015)

Fish community diversity

Description

This species indicator report tracks the diversity of fish communities in Ontario lakes

Status


Status: Good


Trend: Undetermined


Geographic extent: Northern Ontario; Southern Ontario

Why it's important

Ontario sustainably manages fisheries and protects aquatic biodiversity while promoting economic and outdoor recreational opportunities. With approximately 250,000 lakes and 490,000 kilometres of rivers, Ontario has an abundance of aquatic resources and has the greatest diversity of freshwater fish species in Canada.

Many of Ontario's native fish species support recreational, commercial and Indigenous fisheries. The sustainability of these resources depends on maintaining native fish species diversity and fish abundances. Naturally diverse communities make aquatic ecosystems more resilient and better able to withstand disturbances.

This information helps us manage our aquatic resources using:

- legislation

- regulations
- policies
- monitoring
- adaptive management

How we monitor

Since 2008, we have monitored fisheries using the Broad-scale Monitoring Program for Inland Lakes. Water quality, invertebrates, and fish are sampled annually in a selection of lakes, and the data are analyzed to report on the status of lake ecosystems every 5 years. Fish are sampled using two different types of nets to target:

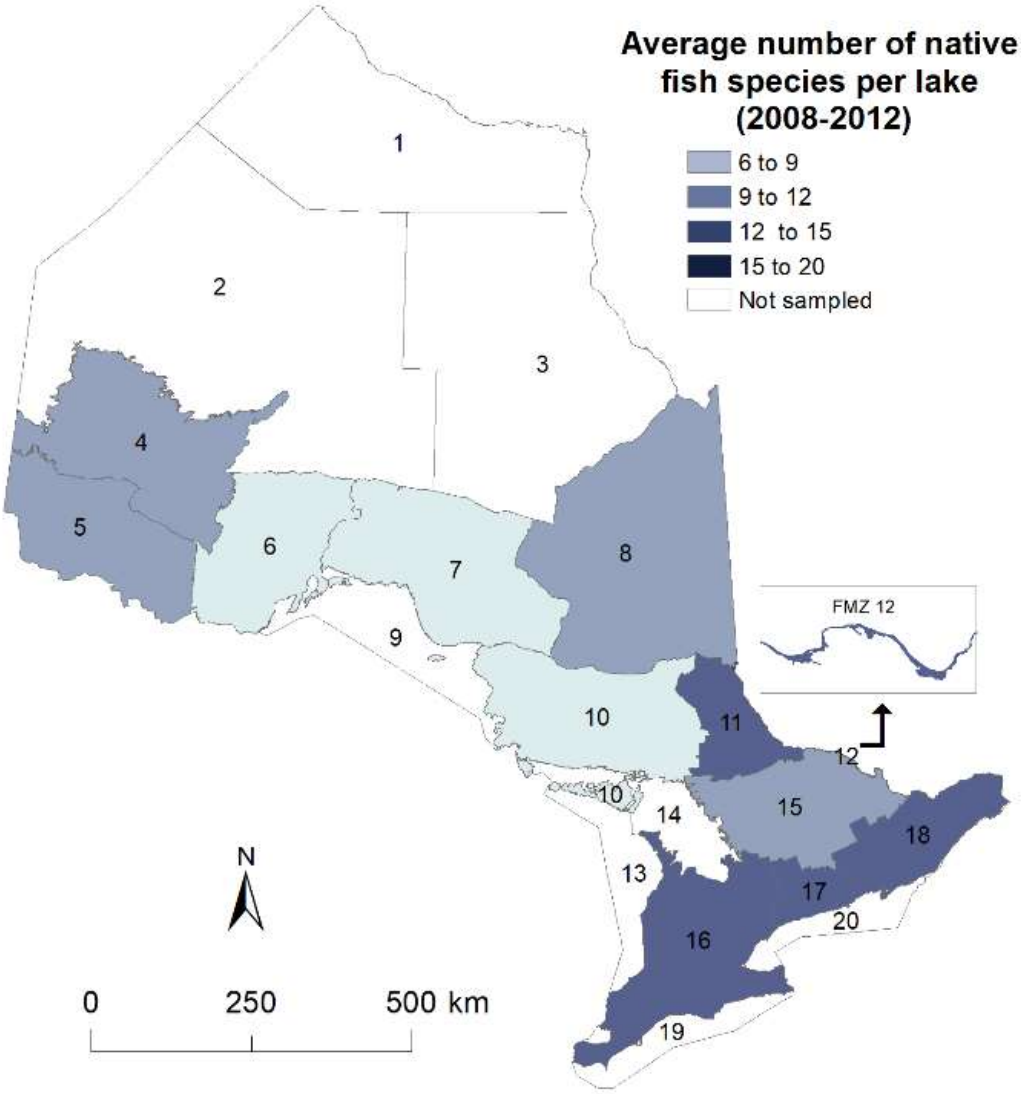
- large-bodied fish species such as Walleye or Lake Trout
- small-bodied fish species such as minnows and other young fish

The species, number of fish caught, lengths and weights are recorded.

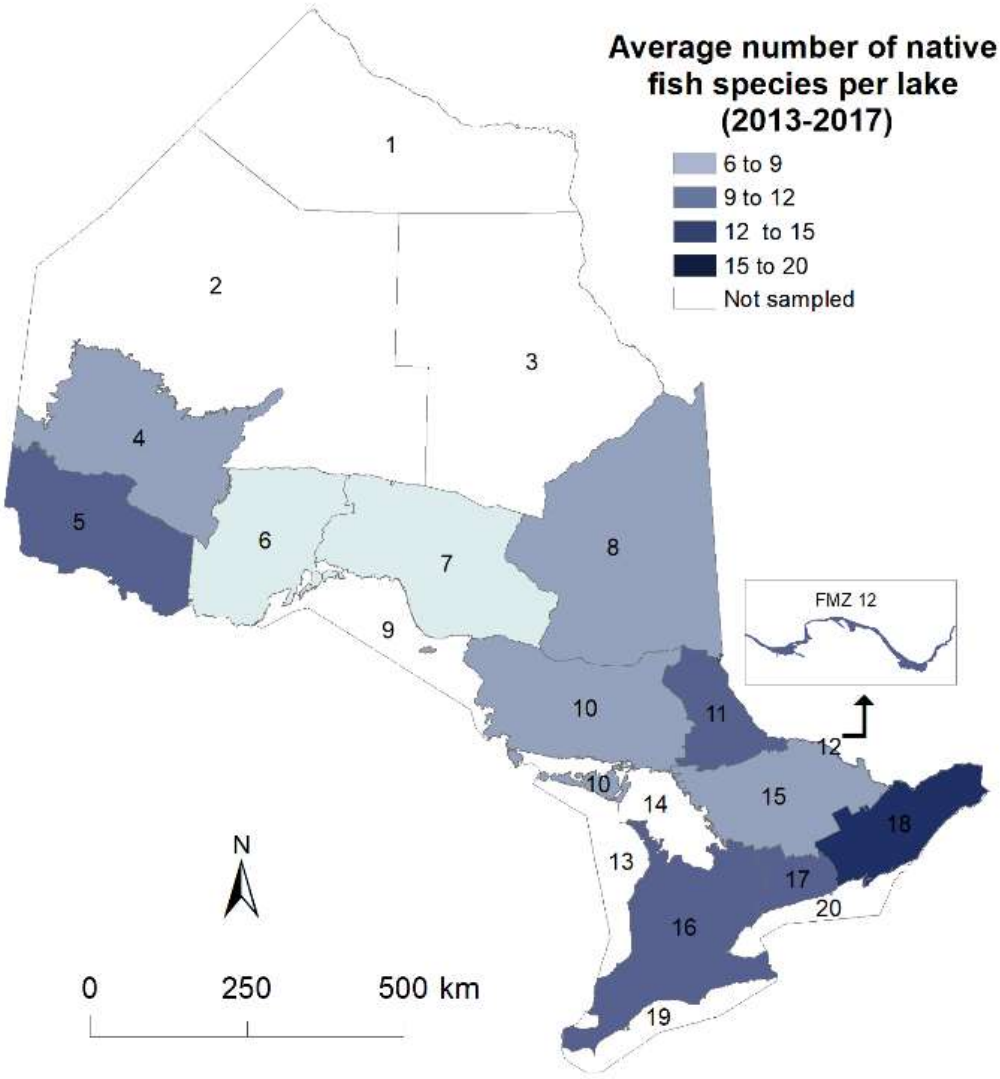
This monitoring information is used to assess the species richness and the relative abundance of large fish in each fisheries management zone. Species richness is based on the average number of native fish species caught in both types of nets. These estimates may not represent every fish species living in the lakes but can be used to make comparisons between zones and look for changes over time. The relative abundance of large-bodied fish in each zone is based on the number of fish caught and their weight per net. This measure is based only on the data from the nets that target large-bodied fish species.

Results

Average number of native fish species per lake 2008-2012



Average number of native fish species per lake 2013-2017

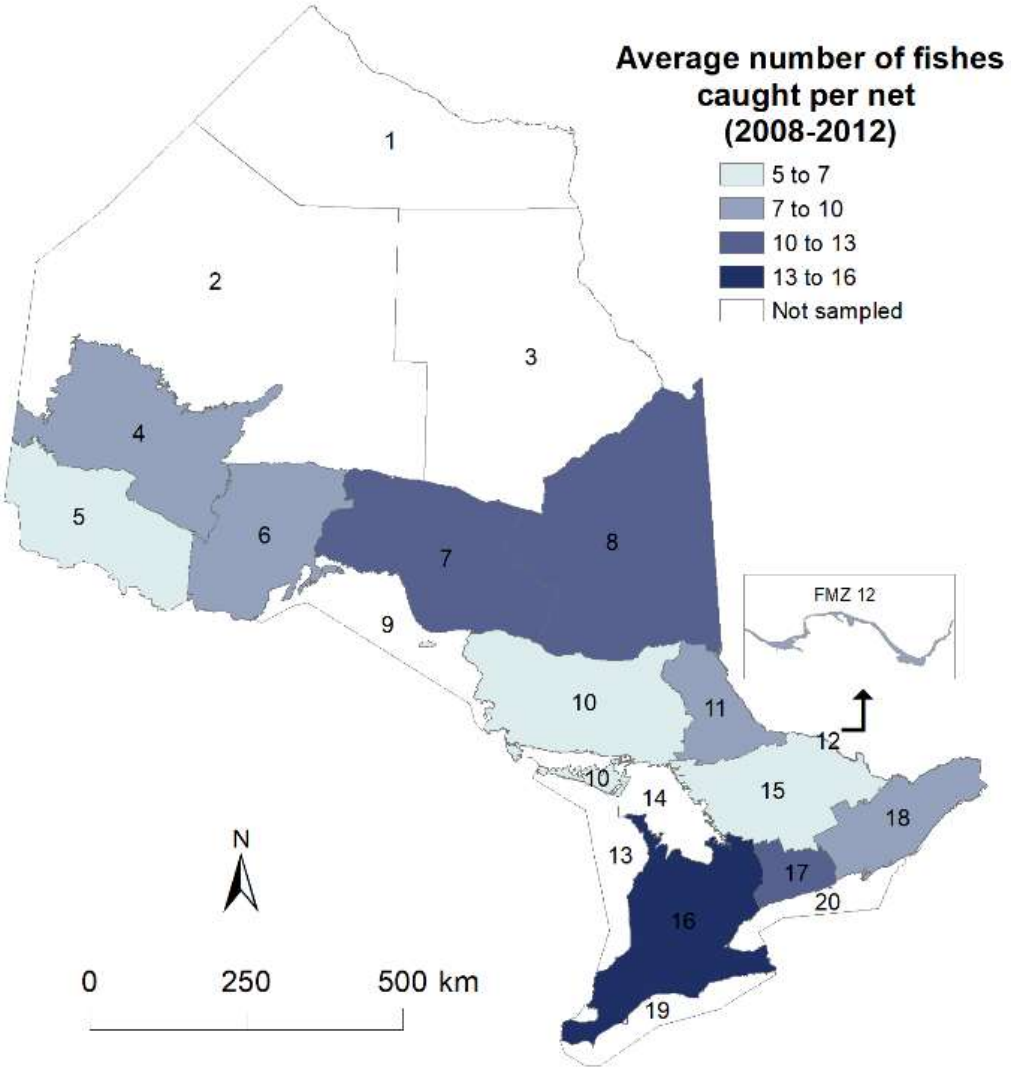


The data reflects the geographic variation in native fish species richness and fish abundances across Ontario. There are more native fish species found in lakes in southern Ontario than northern Ontario. Greater species diversity in southern Ontario and the west end of northwestern Ontario (FMZ 5) reflects the pattern of fish recolonization after the glaciers receded. There are more species in the south because the warmer climate provides habitat for fish species that prefer cold or warm water. The status of this indicator is good because the

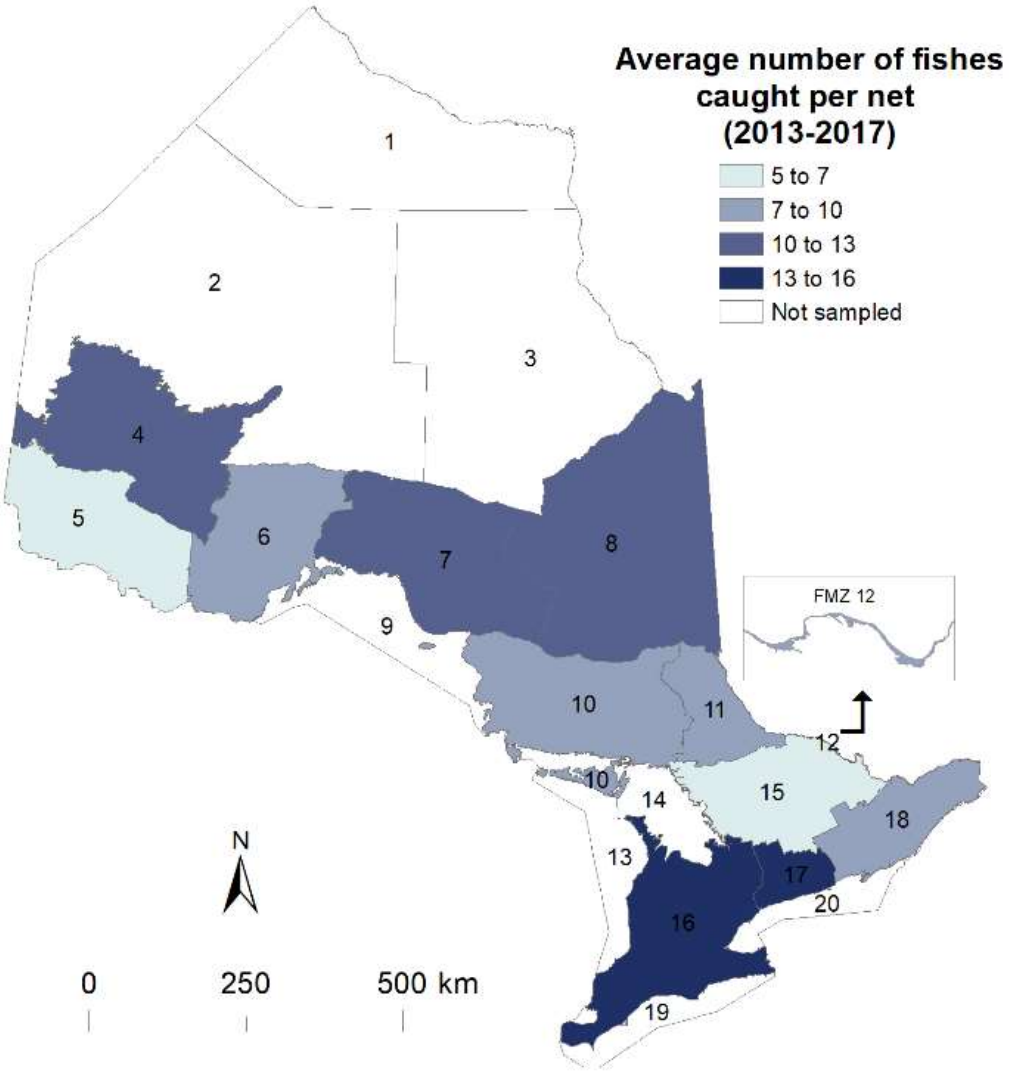
patterns of native species richness are as we expect them. However, the Aquatic Invasive Species indicator shows that some southern Ontario lakes also have invasive species.

There was no significant change in native fish species richness between Cycle 1 (2008-2012) and Cycle 2 (2013-2017) of the Broad-scale Monitoring Program.

Average number of large-bodied fish caught per net 2008-2012



Average number of large-bodied fish caught per net 2013-2017



The average number of fish caught in the nets varied among fisheries management zones with zones 4, 7, 8, 16 and 17 having the greatest catches. These zones and zone 4 had the greatest catches in Cycle 2. There was no significant change between cycles.

The biomass (kilograms) of fish caught also varied among zones and was greatest in fisheries management zones 4, 6, 7 8 and 12 in northern Ontario. There was no significant difference between cycles. These patterns are related to variations in climate, lake habitats and recreational angling activity across the province.

Future progress

A better understanding of the trends in native fish species richness and abundances will be possible after Cycle 3 (2018 to 2023) of the Broad-scale Monitoring Program for Inland Lakes.

Fisheries Management Zone 12

Fisheries Management Zone 12 is not comparable to the other inland zones because it is a chain of lakes that have more riverine rather than lake properties. It is also connected to the Great Lakes-St. Lawrence River system, which has a more diverse fish community than other inland zones. Information on this fisheries management zone will allow us to make comparisons over time within the zone.

Indicator last updated

- February 2021

Data source(s)

- Broad-scale Monitoring Program for Inland Lakes
- Land Information Ontario

Fish Populations

Description

This species indicator report tracks the amount and characteristics of some key sport fish in Ontario lakes.

Status


Status: Mixed


Trend: Undetermined


Geographic extent: Northern Ontario; Southern Ontario

Why it's important

Ontario sustainably manages fisheries to promote economic and outdoor recreational opportunities. The most sought-after fish species for Ontario anglers are:

- Walleye
- Lake Trout
- Brook Trout
- Northern Pike
- Smallmouth Bass

How we monitor

Since 2008, we have monitored fisheries using the Broad-scale Monitoring Program for Inland Lakes. Water quality, invertebrates, and fishes in a selection of lakes are sampled annually, and the data are analyzed to report on the status of lake ecosystems every 5 years. Fish are sampled using nets. The species, numbers of fish caught, lengths and weights are recorded.

This information is used to assess the health of Walleye, Lake Trout, Brook Trout, Northern Pike and Smallmouth Bass populations. Fish greater than or equal to the minimum size harvested by anglers are assessed. For each fisheries management zone, we assess:

- Average number of fish caught per net
- Average length of largest fish caught in each lake
- Average length of fish caught in each lake
- Average weight of fish per net

Results

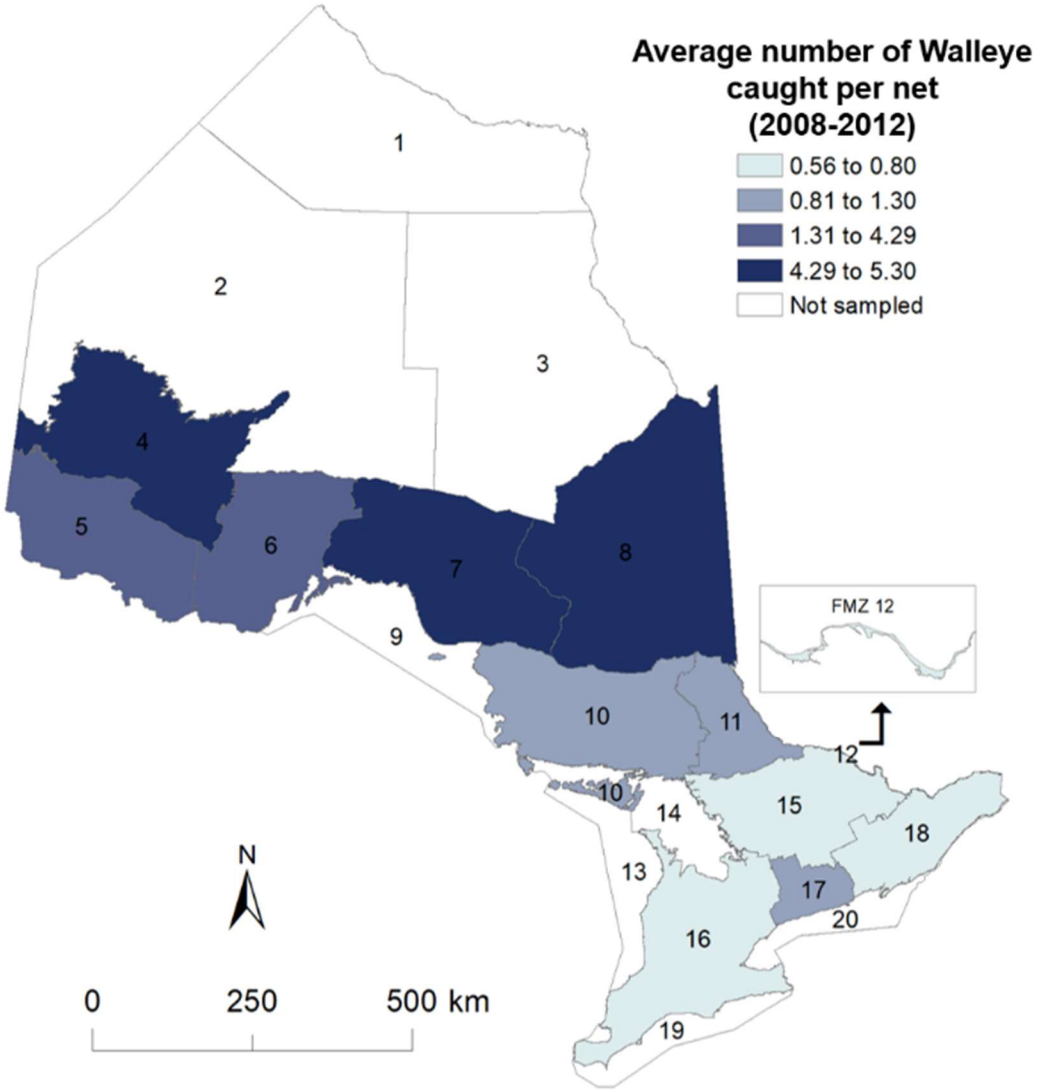
The size, abundance and weight of fish populations vary in different parts of Ontario.

The status of Walleye, Lake Trout, Brook Trout, Northern Pike and Smallmouth Bass populations is mixed with most species showing greater abundances and larger sizes in northern Ontario, suggesting populations are healthier than in southern Ontario.

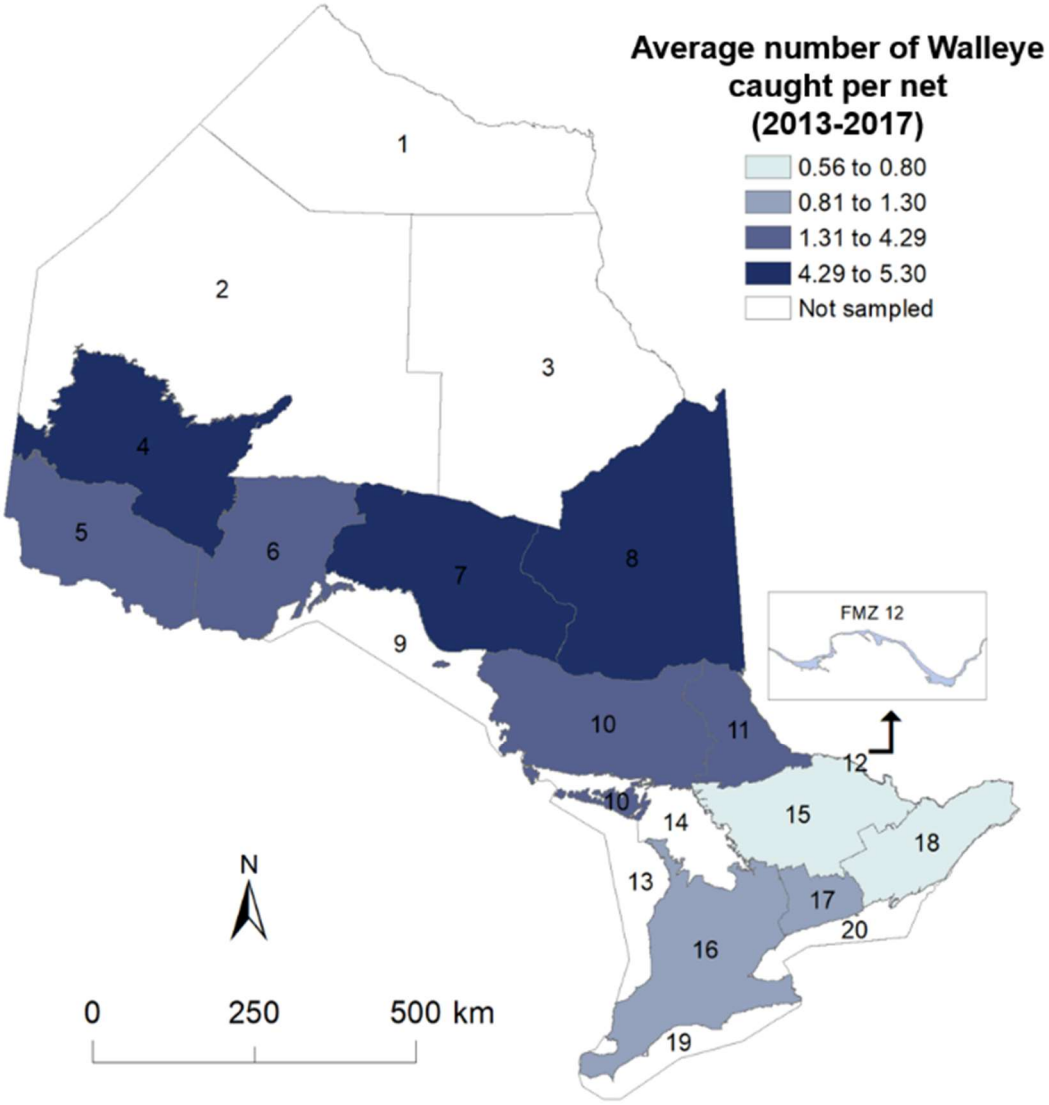
- Walleye sizes varied among fisheries management zones whereas the number and weight of fish caught were greater in northern Ontario compared to central and southern Ontario.
- Lake Trout were generally larger and more abundant in northern zones compared to southern zones. They are not present in zone 12 and 17.
- Brook Trout populations were assessed in zones 6, 7, 10 and 15 (excluding Algonquin Park). They were larger and more abundant in the northern zones.
- Northern Pike sizes varied among zones, but their abundances were greater in northern Ontario.

Smallmouth Bass were more abundant and had smaller average lengths in southern Ontario but there was no provincial pattern in weight or size of the largest Smallmouth Bass. There were differences in lengths and abundances between Cycle 1 (2008-2012) and Cycle 2 (2013-2017).Any significant changes in the health of these fish populations will be possible to determine after analysis of Cycle 3 (2018 to 2023) of the Broad-scale Monitoring Program for Inland Lakes.

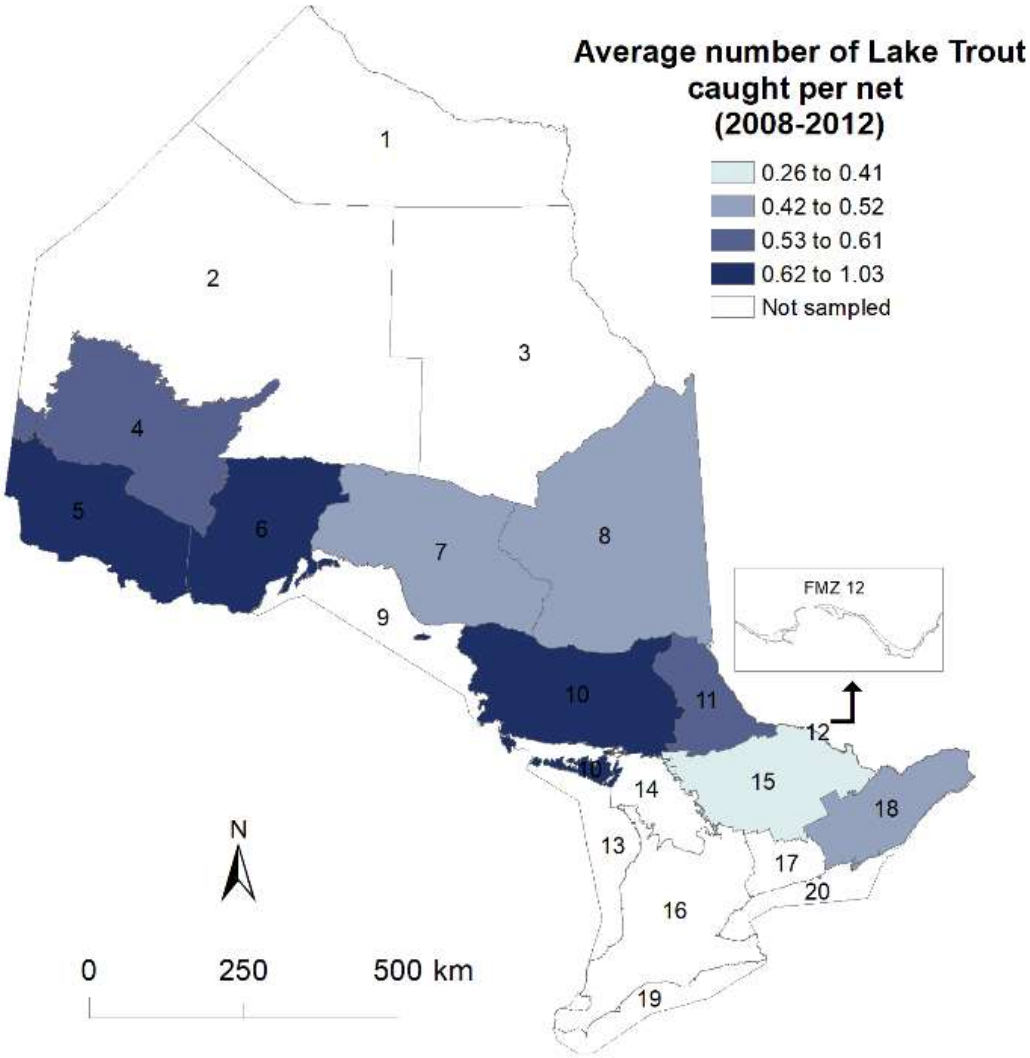
Average number of Walleye per net by fisheries management zone 2008-2012



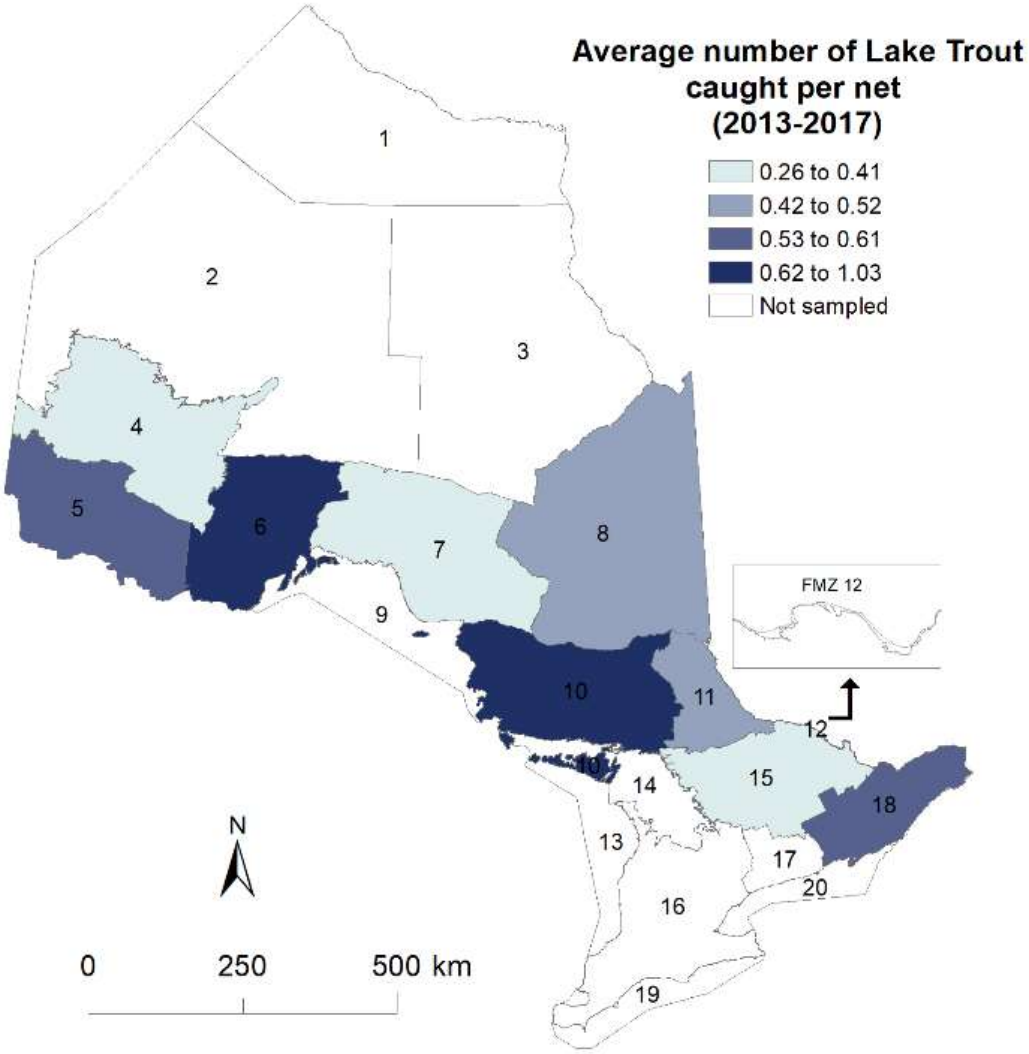
Average number of Walleye per net by fisheries management zone 2013-2017



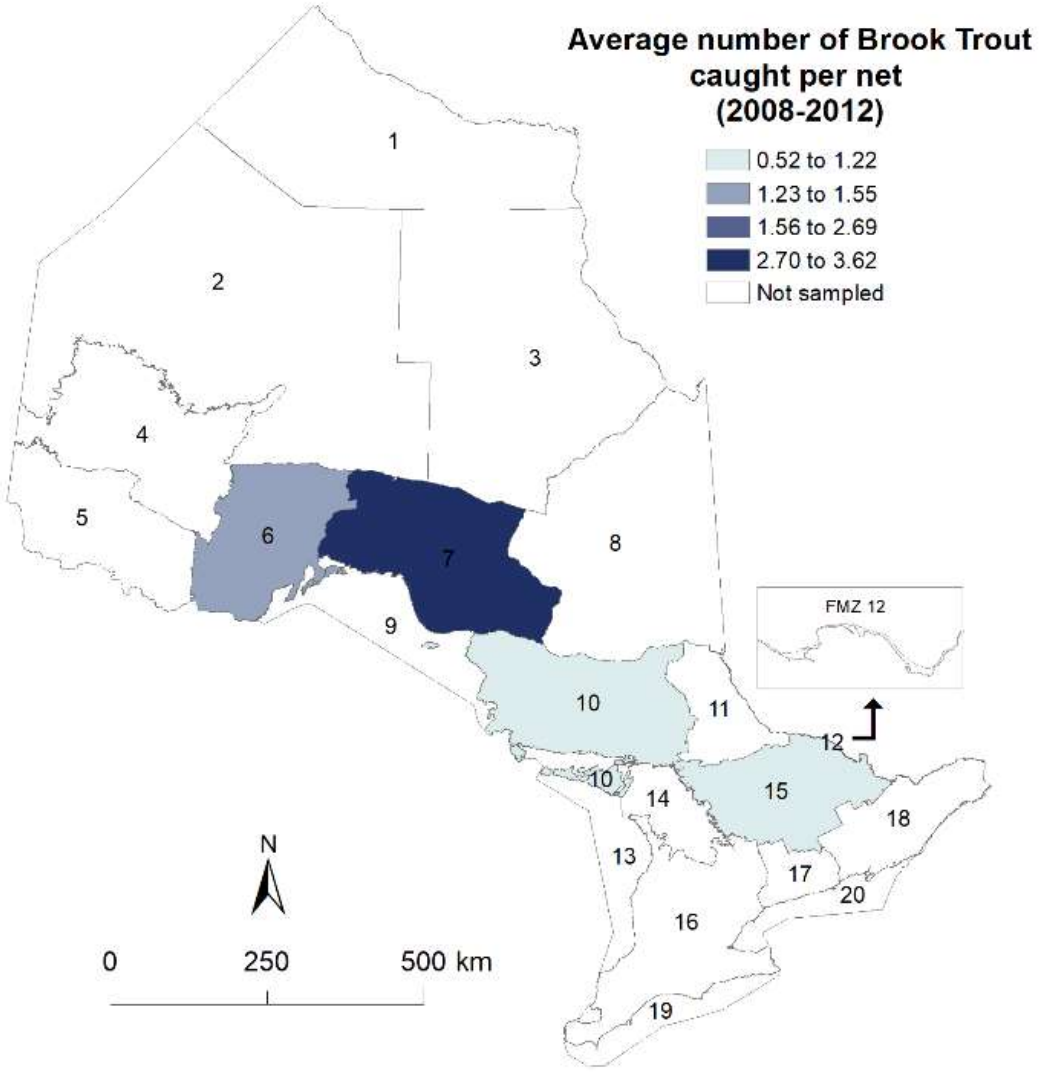
Average number of Lake Trout per net per fisheries management zone 2008-2012 Lake Trout were not assessed in FMZ 12, 16, and 17.



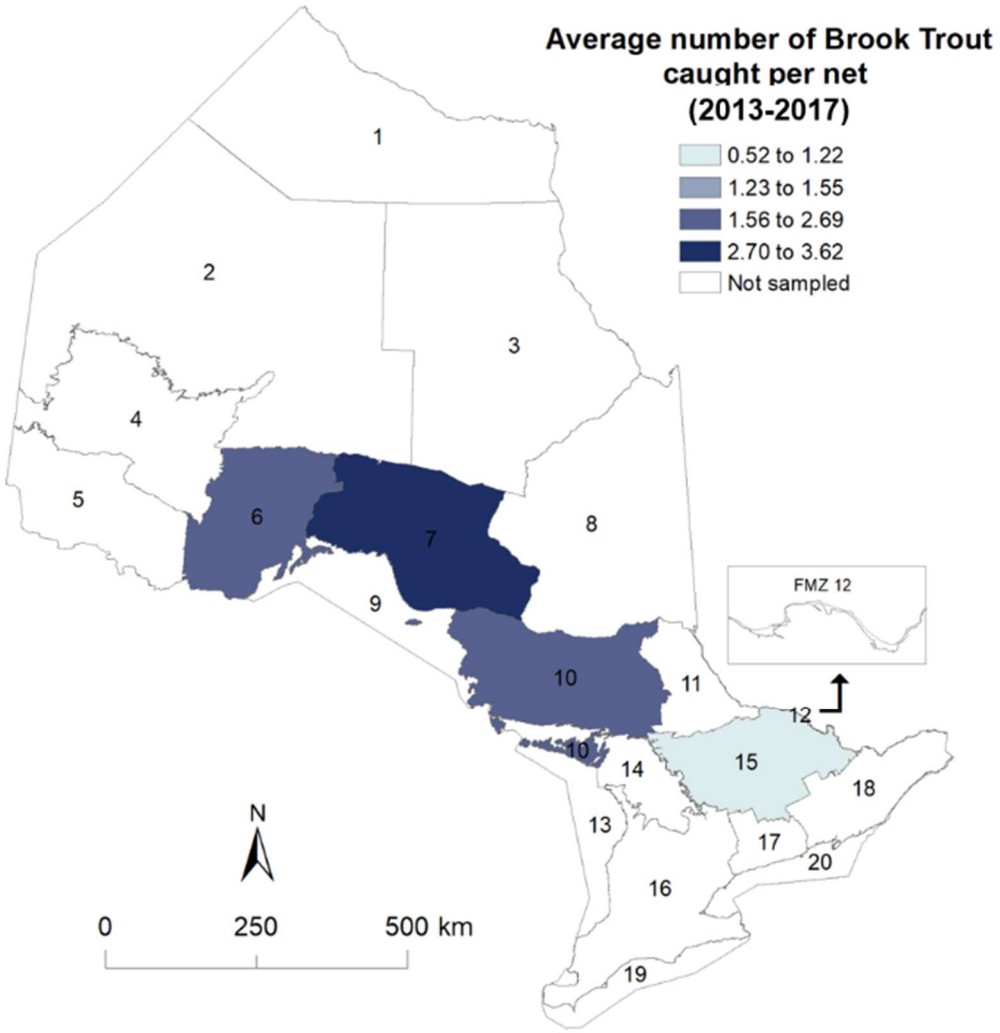
Average number of Lake Trout per net per fisheries management zone 2013-2017 Lake Trout were not assessed in FMZ 12, 16, and 17.



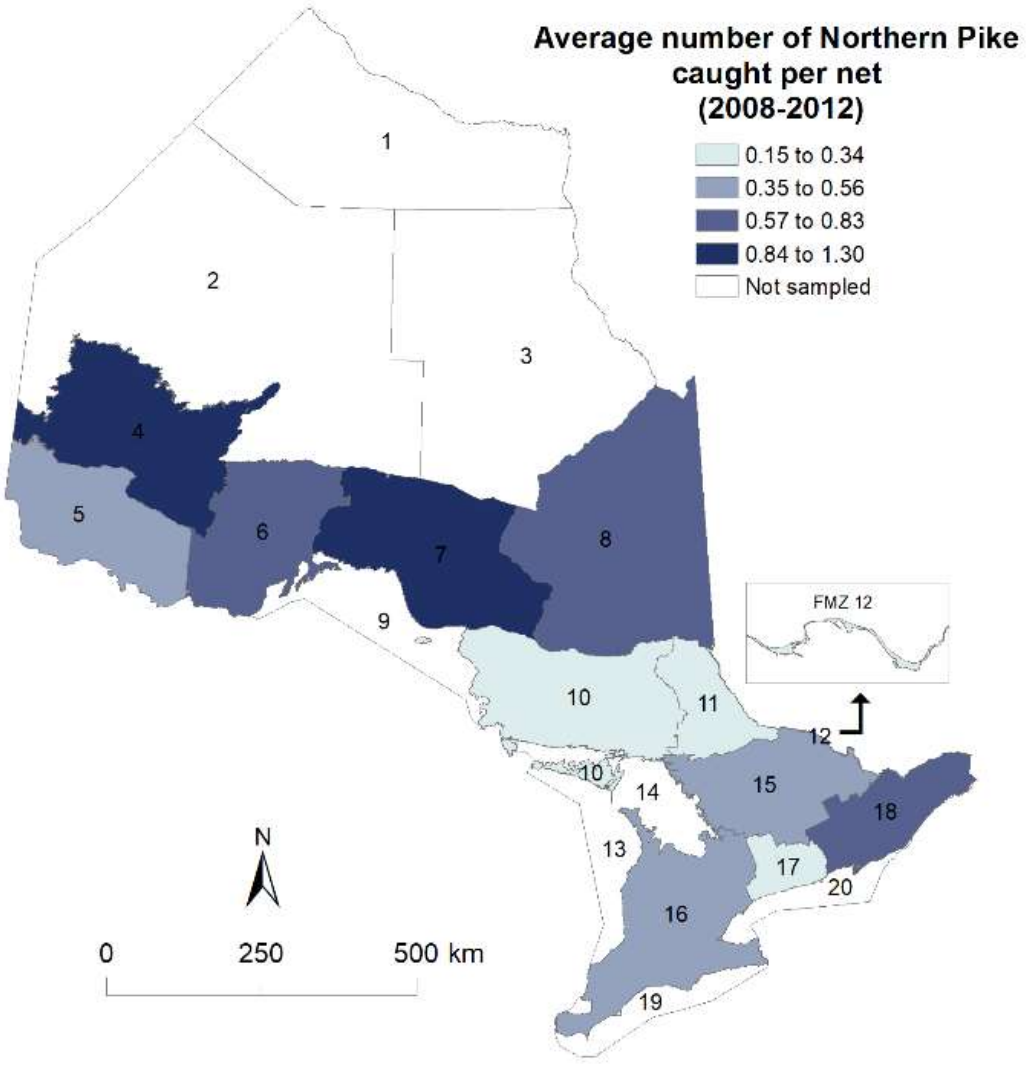
Average number of Brook Trout per net by fisheries management zone 2008-2012 Brook Trout populations were only assessed in FMZ 6, 7, 10 and 15.



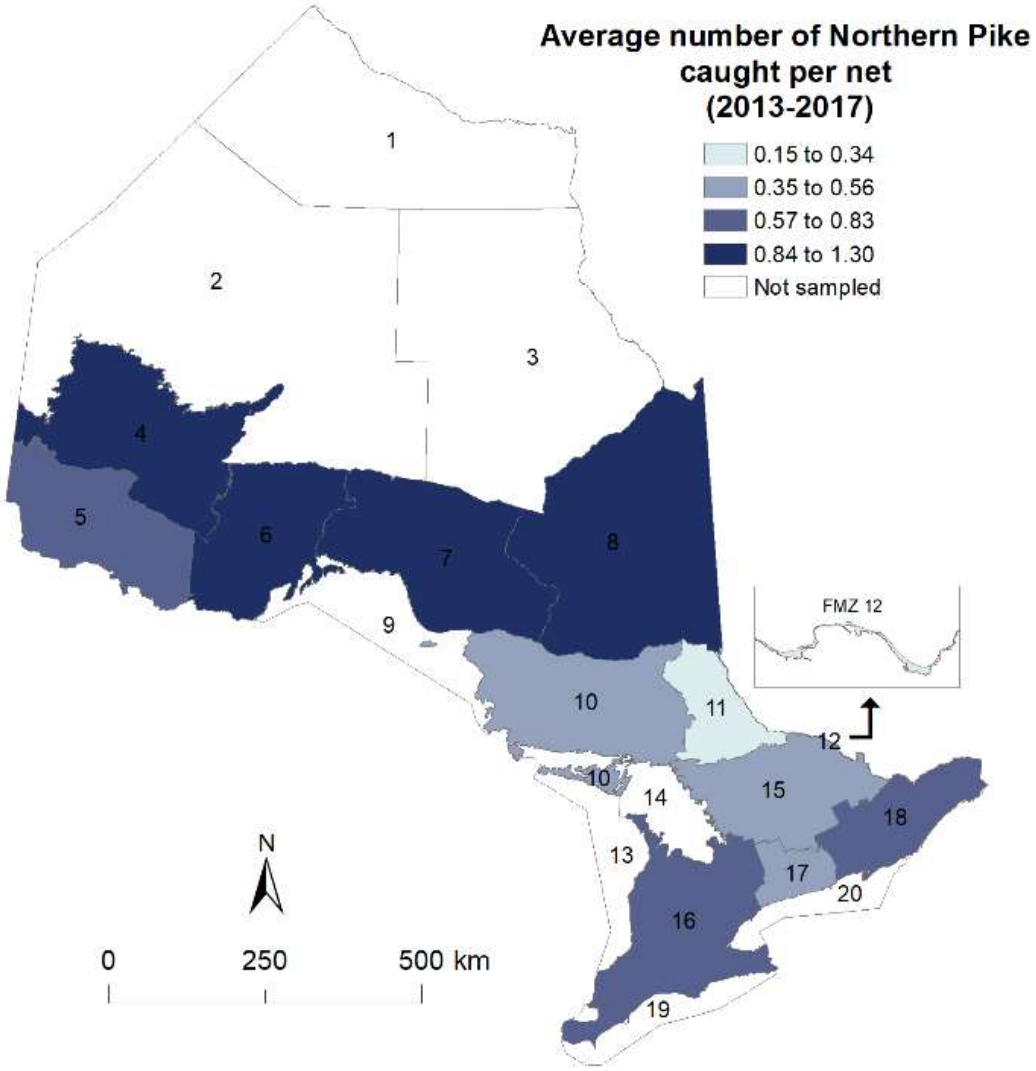
Average number of Brook Trout per net by fisheries management zone 2013-2017. Brook Trout populations were only assessed in FMZ 6, 7, 10 and 15.



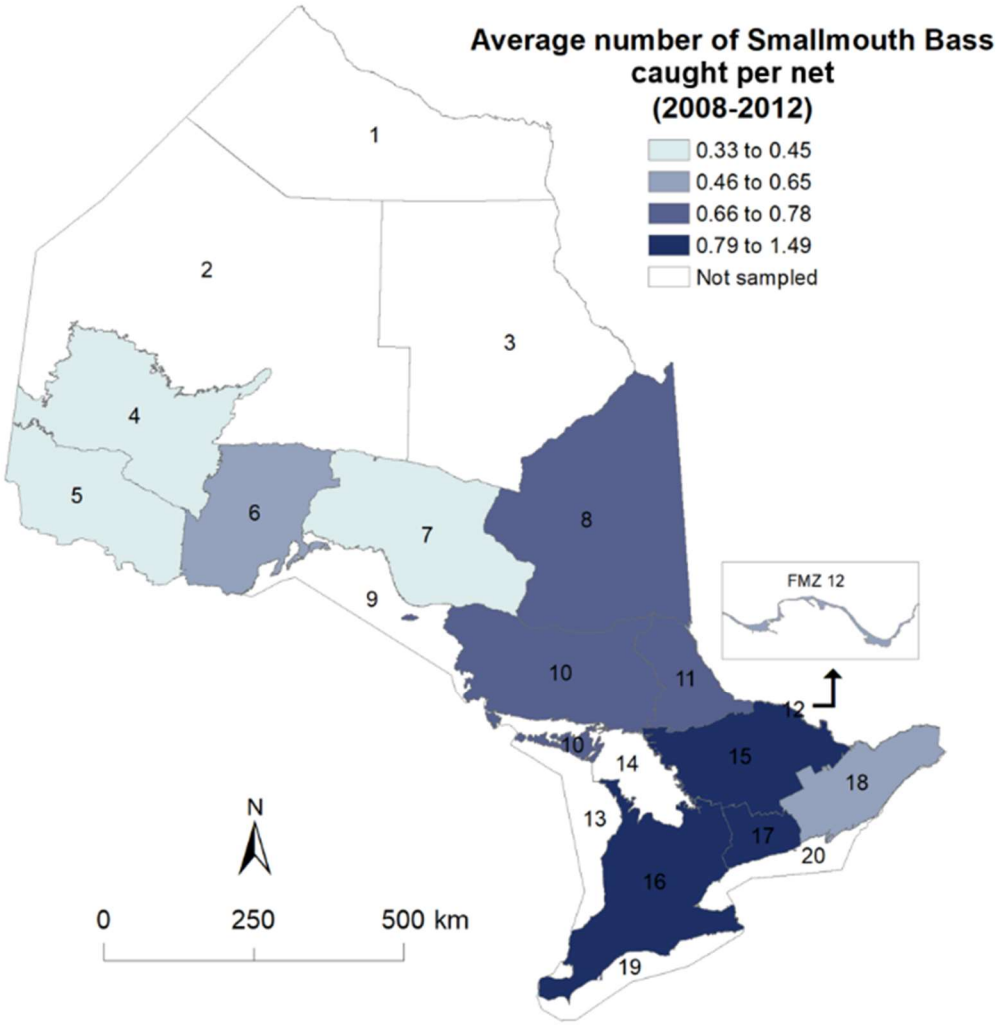
Average number of Northern Pike per net by fisheries management zone 2008-2012



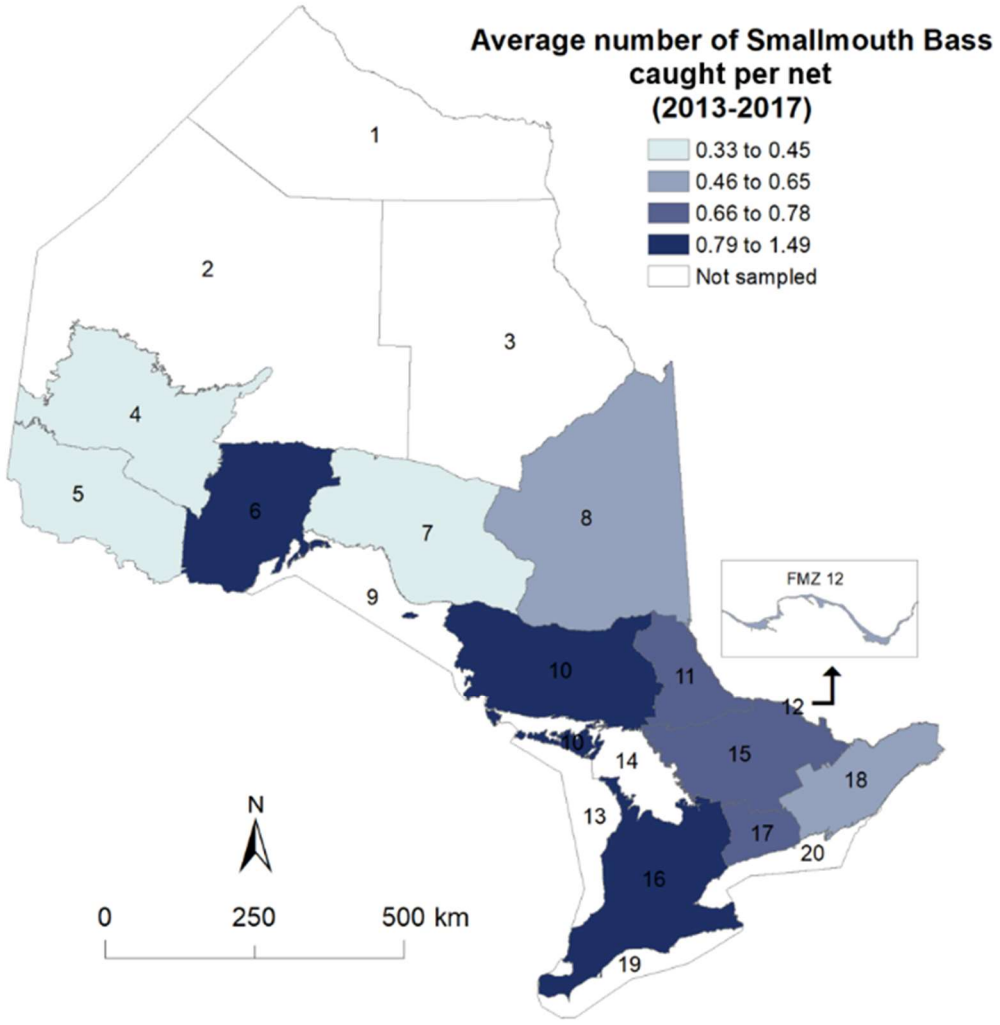
Average number of Northern Pike per net by fisheries management zone 2013-2017



Average number of Smallmouth Bass per net by fisheries management zone 2008-2012.



Average number of Smallmouth Bass per net by fisheries management zone 2013-2017



Future progress

A better understanding of whether there are any significant changes in the health of these fish populations will be possible after analysis of Cycle 3 (2018 to 2023) of the Broad-scale Monitoring Program for Inland Lakes. This indicator tracks the abundance of recreationally important fishes in Ontario, fisheries planning and management decisions are based on more detailed information than what is presented here.

Fisheries management zone 12

Fisheries management zone 12 is not comparable to the other inland zones because it is a chain of lakes that have more riverine rather than lake properties. It is also connected to the Great Lakes-St. Lawrence River system, which has a more diverse fish community than other inland Fisheries Management Zones. Information on this fisheries management zone will allow us to make comparisons over time within the zone.

Indicator last updated

- February 2021

Data source(s)

- Broad-scale Monitoring Program for Inland Lakes
- Land Information Ontario

Moose populations

Description

This species indicator report tracks changes in Ontario's moose population

Status


Status: Mixed


Trend: Mixed


Geographic extent: Province-wide

Why it's important

Moose are important to Ontario's biodiversity and have ecological, social, cultural, economic, and recreational importance. Moose populations are affected by several factors including:

- changing climate
- habitat
- hunting
- predators
- parasites

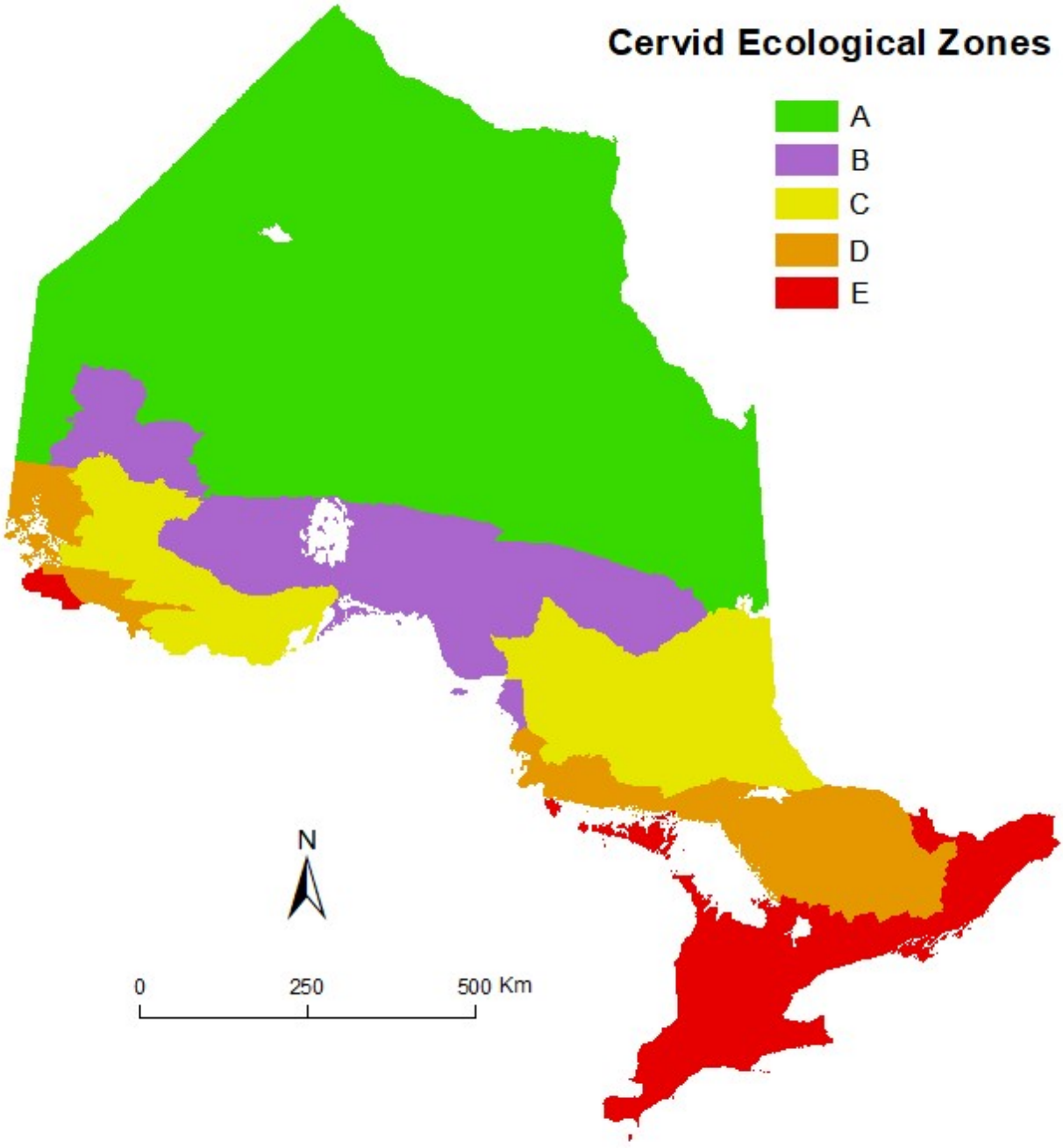
Ontario identified moose population objectives for 2016-2030 in Wildlife Management Units that are actively managed for moose. The objectives include upper and lower population levels for these Wildlife Management Units. These objectives are summarized into five larger Cervid Ecological Zones (CEZ). CEVs are broad landscapes with similar habitat and climate

conditions used for the general management of Ontario's four Cervid species or members of the deer family i.e. moose, white tailed deer, elk and caribou. Our goal is to maintain moose populations within these population objective ranges.

Moose population objectives by Cervid Ecological Zone

Cervid Ecological Zones	Population Objective Lower	Population Objective Upper
CEZ A	15,100	28,550
CEZ B	21,850	29,850
CEZ C	30,050	40,850
CEZ D	11,375	21,350
CEZ E	85	175
Total (Provincial Objective)	**78,460**	**120,775**

Cervid Ecological Zones



How we monitor

Moose monitoring allows us to manage moose and moose habitats to ensure their sustainability. We monitor using standardized aerial surveys that estimate the number, age and sex composition of moose.

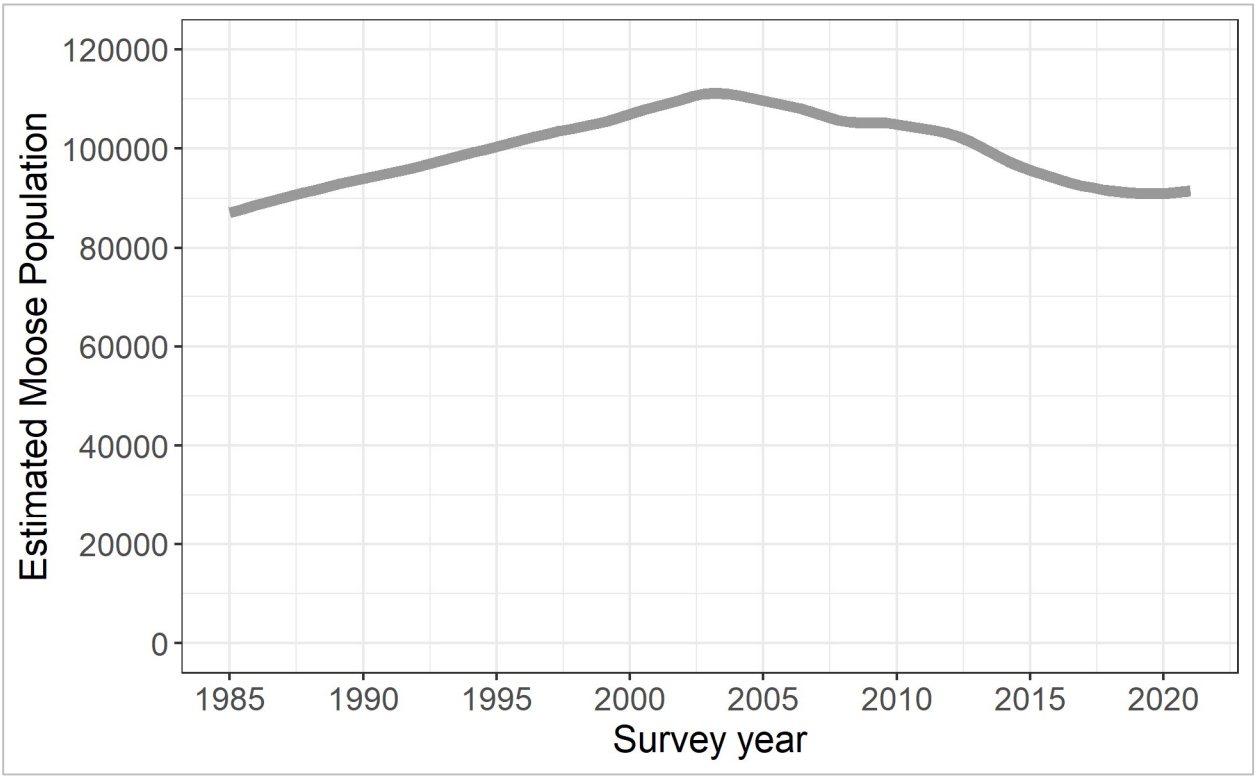
Surveys are flown in mid-winter, when moose are in early and mid-winter habitat where they are most easily seen. We conduct surveys within 12 to 72 hours of a fresh snowfall, when snow is more than 30 cm deep, and fresh moose tracks and individual moose are most visible. These guidelines help to keep survey results comparable across Wildlife Management Units and over time.

The survey data is summarized to assess trends in Ontario's moose population relative to population objectives, and to support wildlife management activities.

Results

Historically, the number of moose in Ontario has varied over time. Moose declined across much of the province beginning in the 1970s, reaching a low of roughly 80,000 in the early 1980s before increasing to a high of around 115,000 in 2004. Ontario's moose population declined from 2004 to 2015; since 2015 it has averaged about 91,000 moose.

Total smoothed estimated moose population (1985-2021)



Moose Population estimates by Cervid Ecological Zone (2015-2020)

Cervid Ecological Zones	2015	2016	2017	2018	2019	2020	2021
CEZ A	23,300	24,600	24,600	24,600	23,600	25,300	25,300
CEZ B	25,500	25,100	25,600	26,100	27,800	25,700	25,700
CEZ C	26,300	25,900	27,300	26,700	28,400	28,400	29,000
CEZ D	14,600	14,100	13,000	12,700	12,700	11,600	11,800
CEZ E	400	400	400	400	400	400	400
Total Provincial Estimate	**90,100**	**90,100**	**90,900**	**90,500**	**92,900**	**91,400**	**92,200**

Moose population sizes and trends vary across Cervid Ecological Zones. The past six years of data show the following about moose population trends

- Stable and within objective in Zones A and B
- Stable and below objective in Zone C
- Declining and within objective in Zone D
- Within objective in Zone E

Moose populations in Zone E are considered within objective even though the population exceeds the upper limit.

Indicator last updated

- February 2021

Data source(s)

- Moose aerial inventories

Species of Conservation Concern

Description

This species of conservation concern indicator report looks at the rankings of wild species groups in Ontario and the changes to those rankings over time.

Status


Status: Mixed


Trend: Undetermined


Geographic extent: Province-wide

Why it's important

Diverse populations of species are important to Ontario's biodiversity because they ensure that ecosystem functions are balanced. Healthy species populations help with ecosystem resilience and productivity. Understanding the status of species of conservation concern in Ontario is an important measure of biodiversity health and sustainability. This indicator assesses changes over time in the number, distribution and status of species of conservation concern.

Establishing a baseline and comparing the rankings between and among species groups over time is useful for determining patterns of threats that may be affecting these groups of species to help inform and adapt conservation practices.

Improving the status of these species in Ontario is also a target of Ontario's Biodiversity Strategy. To help meet this target, Ontario is supporting science, research and information management to inform biodiversity conservation.

How we monitor

Ontario's Natural Heritage Information Centre is responsible for maintaining the provincial species list of plants and animals as well as for assigning subnational conservation status ranks (S-Ranks) to each species. The S-Ranks are reviewed and updated on a continual basis using NatureServe's rounding ranking system but are also reported every five years in Canada's Wild Species reports produced by the National General Status Working Group.

S-Ranks are generated using the best available information and by considering factors such as abundance, distribution, population trends and threats. Species are assigned one of 10 basic ranks based on these factors. Species with the following S-Ranks are generally defined as species of conservation concern:

- SX Presumed extirpated
- SH Possibly extirpated
- S1 Critically imperiled
- S2 Imperiled
- S3 Vulnerable

Definitions of NatureServe subnational conservation status ranks (Canadian Endangered Species Conservation Council, 2016)

Rank	Definition
Presumed extirpated SX	Not located in the jurisdiction despite intensive searches and virtually no likelihood of rediscovery.
Possibly extirpated SH	Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.
Critically imperiled S1	At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
Imperiled S2	At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
Vulnerable S3	At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
Apparently secure S4	At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
Secure	At very low or no risk of extirpation in the jurisdiction due to a very

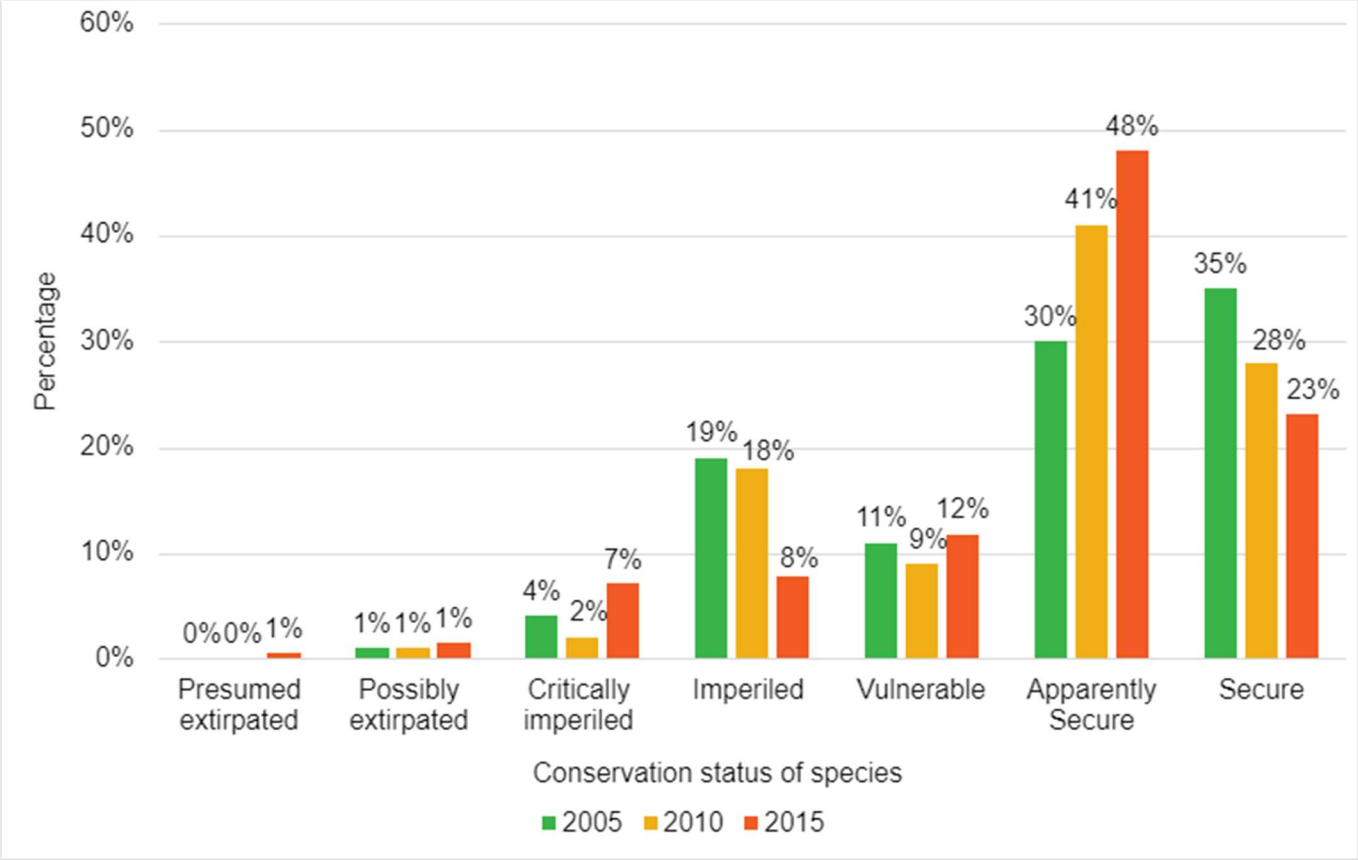
Rank	Definition
S5	extensive range, abundant populations or occurrences, with little to no concern from declines or threats.
Unrankable SU	Currently unrankable due to lack of information or due to substantially. conflicting information about status or trends.
Unranked SNR	National or subnational conservation status not yet assessed.
Not Applicable SNA	A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities (e.g., long distance aerial and aquatic migrants, hybrids without conservation value, and non-native species or ecosystems (see Master et al. 2012, Appendix A, pg. 70 for further details). Note: When the Element Global Rank is GNA (Globally the species is ranked as Not Applicable), the Element National Rank should be entered as NNA (Nationally, the species is ranked as Not Applicable) and Element Subnation Rank should be entered as SNA for all national and subnational records associated with it.

Results

Data from the 2015 Wild Species Report was used to assess the S-Ranks of 15,858 Ontario species. This is a significant increase from the 2010 report, which assessed 6,995 species and the 2005 report which assessed 4,052 species. Each report has included new taxonomic groups not assessed in previous reports, thus the increase over time. The 2015 report, for example, included new taxonomic groups such as sponges, fungi, and terrestrial and freshwater snails and slugs. This summary does not include species that do not have enough information to be assessed (rank of SU), those that have not yet been assessed (rank of SNR), or those where their conservation rank is not applicable because they may be exotic, accidental, or the species is not a suitable target for conservation activities, e.g. long distance aerial and aquatic migrants, hybrids without conservation value, non-native species, etc. (rank of SNA).

Conservation status of Ontario's species in 2005, 2010 and 2015.

A comparison of the conservation status of native Ontario Species assessed in 2005 (n = 2,854), 2010 (n = 4,758) and 2015 (n=7,739).



This summary does not include those species ranked SU, SNR or SNA

Species ranks for Ontario species assessed in 2015

Taxonomic Group	Presumed extirpated	Possibly extirpated	Critically Imperiled	Imperiled	Vulnerable	Apparently Secure	Secure	Unrankable	Unranked	Not Applicable	Total
Fungi	0	0	0	0	2	14	0	31	0	0	47
Lichens	0	23	50	47	33	128	92	53	0	1	427
Mosses	3	2	51	141	167	98	68	148	0	2	680
Vascular Plants	24	44	253	212	139	591	726	49	0	1,080	3,118
Freshwater Mussels	0	0	14	7	14	16	20	1	0	7	79
Spiders	0	0	0	18	22	229	99	355	0	34	757
Insects	2	36	151	125	460	2,375	591	3,707	1,598	690	9,735
Decapods	0	0	0	0	2	5	0	1	0	4	12
Freshwater fishes	3	1	6	13	14	43	46	8	0	20	154
Amphibians	3	0	3	2	0	8	10	0	0	0	26
Reptiles	2	0	1	5	11	3	4	0	0	1	27
Birds	3	3	12	11	22	150	81	3	1	201	487
Mammals	0	1	4	6	5	15	37	2	0	13	83
Sponges	0	0	0	0	0	0	1	5	0	0	6

Source: Canadian Endangered Species Conservation Council 2016).

Insects groups assessed include: mayflies, dragonflies and damselflies, stoneflies, grasshoppers and relatives, lacewings, beetles, ants, bees, yellowjacket wasps, caddisflies, moths and butterflies, scorpion flies, black flies, mosquitoes, horse flies, bee flies, flower flies.

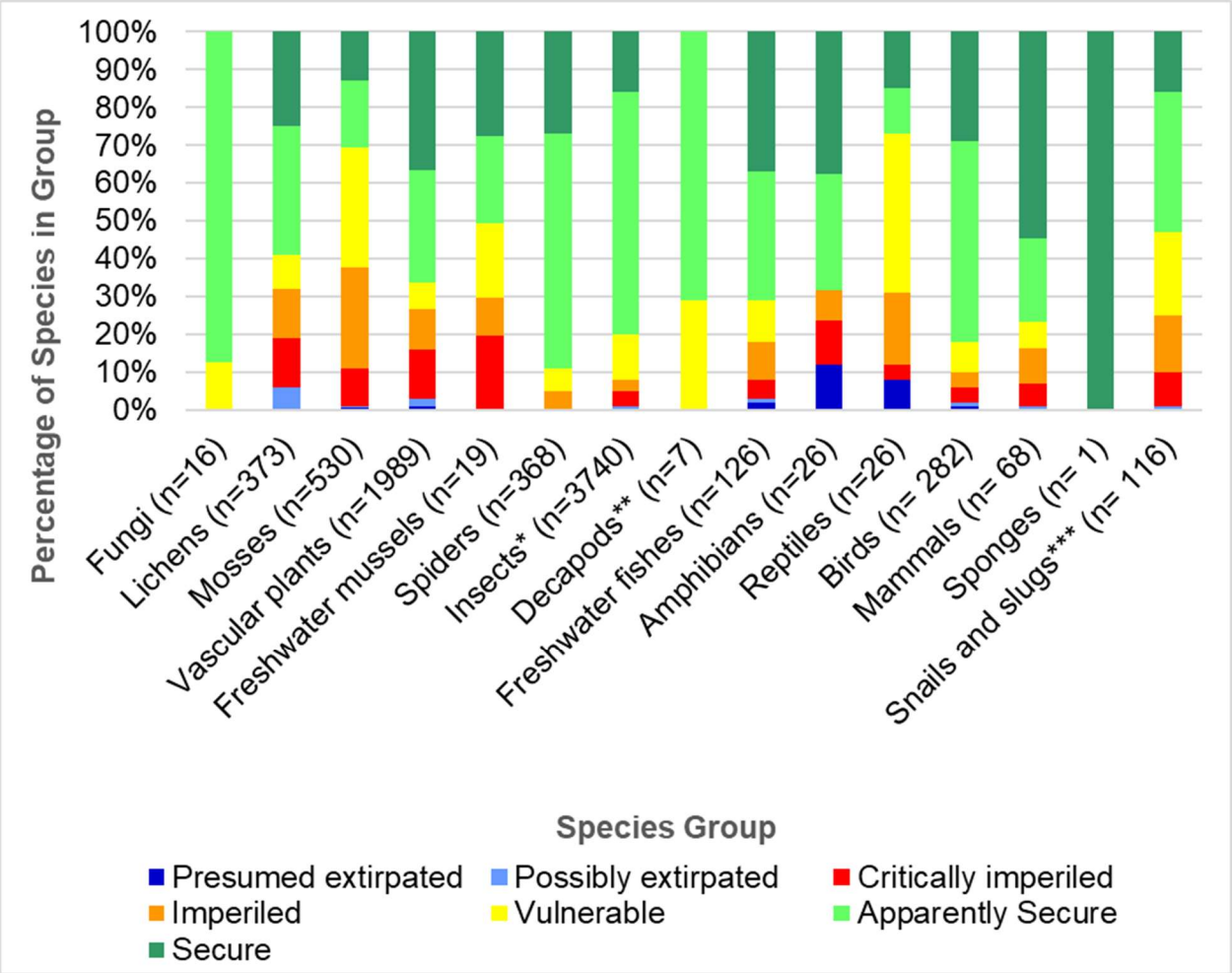
Conservation status by taxonomic group

This summary presents the proportion of native species in each conservation status category for each taxonomic group based on 2015 data. It excludes species in the unranked, unrankable, and not assessed categories. In 2015, 29 per cent of the native species assessed were in the species of conservation concern categories.

Reptiles and freshwater mussels were shown to be some of the most vulnerable species groups. The 2015 assessment showed that 73 per cent (n=26) of reptiles and 49 per cent (n=71) of freshwater mussels were categorized as species of conservation concern.

Some of the groups with the highest percentage of secure species includes spiders at 89 per cent, birds at 82 per cent and mammals at 76 per cent down. Although spiders were listed as the most secure group, just over half (51 per cent) of spiders were ranked as unrankable or not applicable, indicating that overall, we know very little about their conservation status and many may be quite rare.

Conservation status by taxonomic group in 2015



Footnote: Proportion of Ontario native wild species in each conservation status category (n = total number of species assessed in each group).

* Insect groups assessed include mayflies, dragonflies and damselflies, stoneflies, grasshoppers and relatives, lacewings, beetles, ants, bees, yellowjacket wasps, caddisflies, moths and butterflies, scorpion flies, black flies, mosquitoes, horse flies, bee flies and flower flies.

** decapods: include freshwater crayfish, shrimp and crab.

*** includes terrestrial and freshwater snails and slugs.

For the 4,063 species that were assessed in both 2005 and 2010 and for the 6,989 species assessed in both 2010 and 2015, the number of species with changes in conservation ranks and the reasons for changes were examined. As more species are assessed and more information is made available, we are able to review the changes in percentage of species over time. Species in the apparently secure and secure category have gone up slightly — 65 per cent in 2005, 69 per cent in 2010, and 71 per cent in 2015. Species in the conservation concern category have shifted between categories, with an increase in the critically imperiled, possibly extirpated, and presumed extirpated statuses.

Understanding the trend

The reasons for changes in status are important and help to guide Ontario's conservation and research efforts into the future. Species assessed in both 2005 and 2010 (4,063 species) and those assessed in both 2010 and 2015 (6,989 species) were examined for changes in the S-Ranks from one year to the other.

Some changes occurred as a result of a real change in one of more of the following factors: the abundance, distribution, population trends or threats to the species leading to either an increase or a decrease in risk. Many of the changes were, however, due to improved information about the species, but do not represent real changes in the distribution and abundance of the species (e.g., new survey data providing a more accurate assessment of the status of the species). Other changes occurred due to taxonomic changes – a formerly recognized species is combined with another species or a single species is divided into two or more species. Procedural changes and rectifying errors from the previous report also resulted in some changes to the S-Ranks.

Summary of changes in S-Ranks for Ontario species from 2005 to 2010 and from 2010 to 2015 and the reason for the changes.

Rank Change	Total 05-10	Total 10-15	Better Information 05-10	Better Information 10-15	Increasing Risk 05-10	Increasing Risk 10-15	Decreasing Risk 05-10	Decreasing Risk 10-15
Species in Lower Risk Rank	134	203	128	92	n/a	n/a	6	11
Species in Higher Risk Rank	45	628	32	359	13	5	n/a	n/a
Into accidental or exotic (labelled as Not Applicable in 2015)	16	49	16	24	n/a	n/a	n/a	n/a
Into undetermined	18	135	18	n/a	n/a	n/a	n/a	n/a
From undetermined to another rank	22	154	22	21	n/a	n/s	n/a	n/a
Total Number of Changes*	235	1169	216	496	13	5	6	11
No Change	3,759	5,820						

Indicator last updated

- March 2021

Data source(s)

- General Status of Species in Canada
- Natural Heritage Information Centre. 2016. Biotics 5 database. Natural Heritage Information Centre, Ministry of Northern Development, Mines, Natural Resources and Forestry, Peterborough, ON.
- https://www.natureserve.org/conservation-tools/conservation-status-assessment
- Ontario Biodiversity Council. 2015. State of Ontario's biodiversity 2015. A report of the Ontario Biodiversity Council, Peterborough, ON.
- WWF (2020) Living Planet Report 2020. Bending the curve of biodiversity loss: a deep dive into the Living Planet Index. Marconi, V., McRae, L., Deinet, S., Ledger, S. and Freeman, F. in Almond, R.E.A., Grooten M. and Petersen, T. (Eds). WWF, Gland, Switzerland. https://livingplanet.panda.org/

Crown land infrastructure

Description

This lands indicator report tracks the roads, dams and waste management sites on Crown land.

Status


Status: Fair


Trend: Undetermined


Geographic extent: Province-wide

Why it's important

Most Crown land in Ontario is in the northern part of the province. Well managed Crown land contributes to the economic, social and environmental well-being of the province by providing for orderly use and sustainable development of the land. In support of these broad objectives, we develop and maintain infrastructure on Crown land that provides a variety of benefits to Ontarians. This infrastructure includes:

- dams
- roads
- waste disposal sites

We monitor and invest in this infrastructure to ensure that it is in good condition and safe. We also actively pursue opportunities to decommission infrastructure when it is no longer needed or transfer the infrastructure to other partners or agencies.

How we monitor

The responsibility for managing roads on Crown land is divided between the provincial government, forest industry and other groups or organizations. We monitor roads by driving them and inspecting the associated infrastructure. High-use and priority roads and water and rail crossings (for example, bridges) are monitored regularly to ensure they remain in safe condition. Road data is continually updated and may vary from year to year based on data collection and reporting timelines.

Information that we collect allows us to classify roads based on whether they are passable, and what motorized vehicular use restrictions are in place. This information is summarized by who is responsible for managing the roads.

Classification	Description
Passable	A conventional four-wheel drive vehicle can drive on the road (for example, truck or SUV)
Non-passable	A conventional four-wheel drive vehicle cannot drive on the road (for example, truck or SUV)
Open	Road available for motorized vehicular use with no restrictions
Closed	Road use is not permitted - motorized vehicle access control mechanisms may be in place including barriers or signs
Restricted Access	Roads use may be restricted for specific purposes - restrictions are identified by signs

We also keep an inventory of the number of dams on Crown land and their condition as well as keep track of the number of waste disposal sites receiving waste and the number of sites that have been closed.

Results

Roads

In Ontario, over 285,000 kilometres of roads on Crown land support:

- sustainable forest management
- mineral exploration and development

- tourism opportunities
- outdoor recreation

We are responsible for approximately 50 per cent of roads on Crown land and actively maintain about 13,000 kilometres and associated infrastructure. During times of emergency, these roads are used by police, ambulances and fire vehicles. It is imperative that primary and priority routes are safe and reliable.

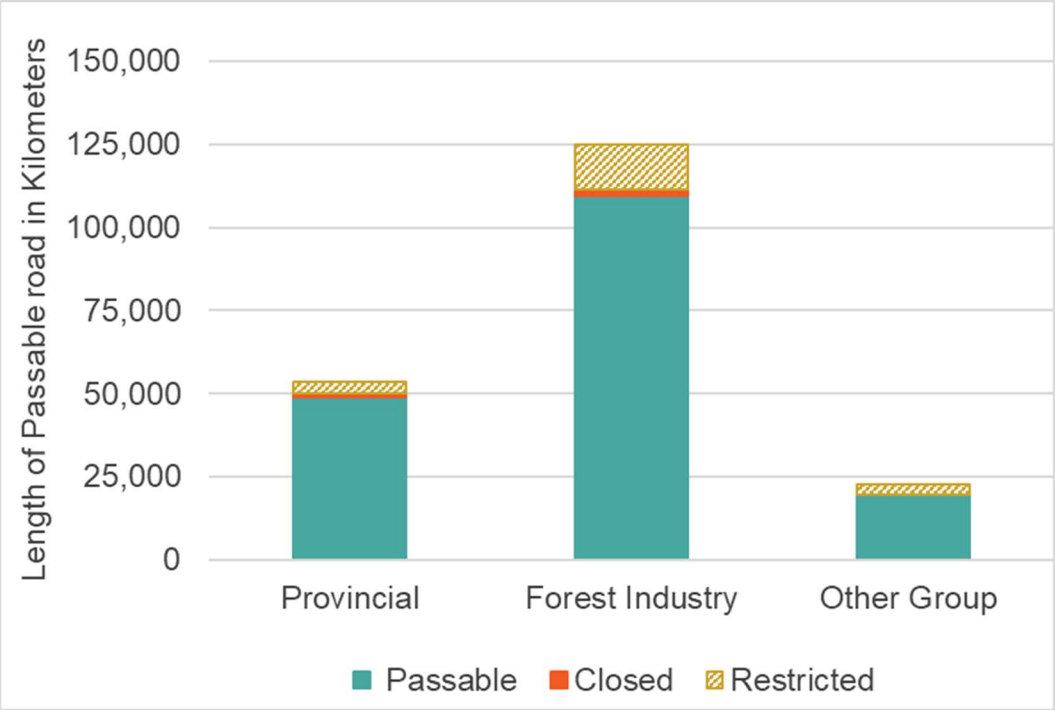
Most roads and water crossings on Crown land were built by the forest industry. When a road is no longer needed for forestry purposes:

- we may take over maintenance of the road
- the road may become the responsibility of another group
- the road may be closed

A limited number of roads on Crown land may have motorized vehicular access restrictions to protect public safety, maintain a sense of remoteness, or to protect sensitive fish and wildlife populations. Approximately 10 per cent of the roads on Crown land have motorized vehicle access restrictions.

Roads on Crown land (2020)

In 2020, there was a total of 178,091 kilometers of passable roads on Crown land. Some were closed (2 per cent) and restricted (11 per cent) due to conditions and operations.



Provincial Government Responsible	Total Length (km)	Length of 1 lane (km)	Length of 1.5 lane (km)	Length of 2 lane (km)	Length of open roads (km)	Length of closed roads (km)	Length of restricted access roads (km)
Passable - Maintained	13,718	7,113	1,423	5,182	12,030	773	915
Passable - Not Maintained	35,298	32,822	479	1,997	32,422	404	2,472
Total Passable	49,016	39,935	1,902	7,179	44,452	1,177	3,387
Not Passable	86,240	83,787	1,159	1,294	24,340	58,317	3,583
Total	**135,256**	**123,722**	**3,061**	**8,473**	**68,792**	**59,494**	**6,970**
Forest Industry Responsible	**Total Length (km)**	**Length of 1 lane (km)**	**Length of 1.5 lane (km)**	**Length of 2 lane (km)**	**Length of open roads (km)**	**Length of closed roads (km)**	**Length of restricted access roads (km)**
Passable	109,668	75,646	5,288	28,734	94,254	1,761	13,653
Not Passable	15,306	14,169	643	494	9,280	5,050	976
Total	**124,974**	**89,815**	**5,931**	**29,228**	**103,534**	**6,811**	**14,629**
Other Group/Organization Responsible	**Total Length (km)**	**Length of 1 lane (km)**	**Length of 1.5 lane (km)**	**Length of 2 lane (km)**	**Length of open roads (km)**	**Length of closed roads (km)**	**Length of restricted access roads (km)**
Passable	19,407	14,866	596	3,945	15,987	33	3,387
Not Passable	6,805	6,638	54	113	1,398	5,211	197
Total	**26,213**	**21,503**	**651**	**4,059**	**17,385**	**5,244**	**3,584**
Cumulative Totals	**286,443**	**235,040**	**9,643**	**41,760**	**189,712**	**71,549**	**25,182**

Dams

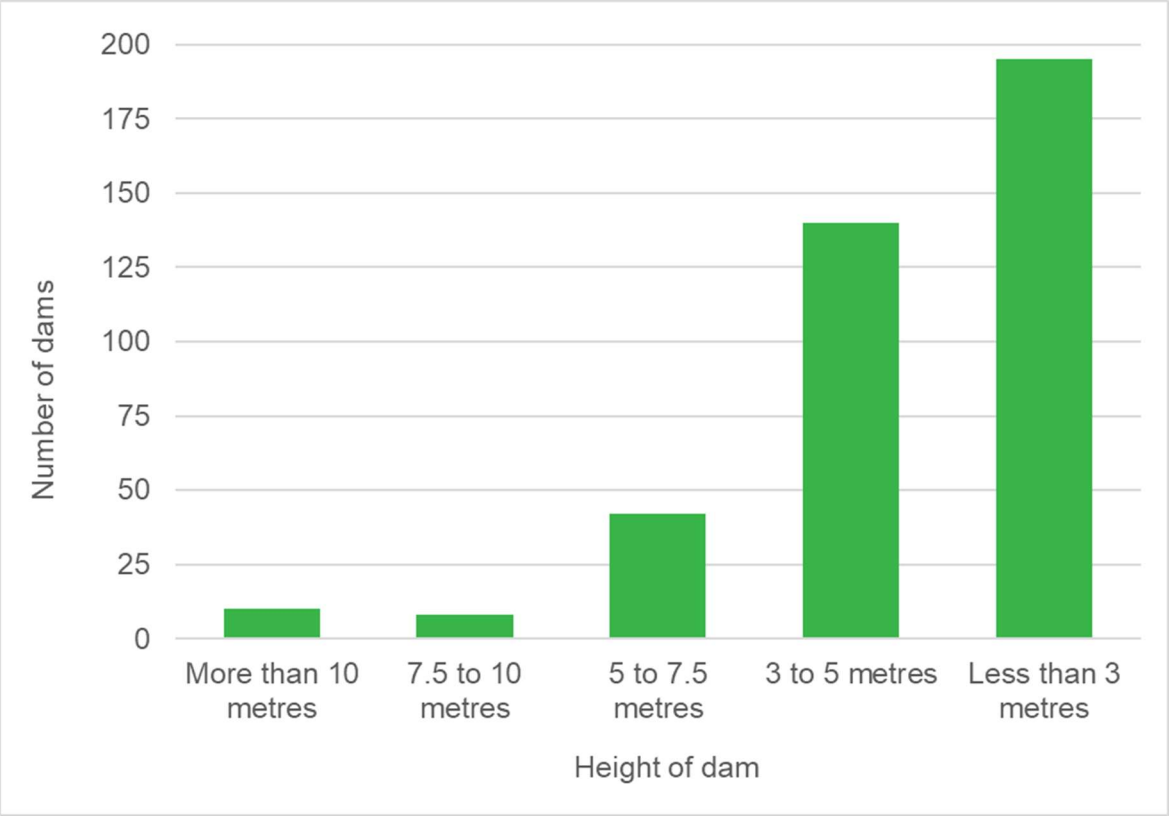
There are over 3,300 dams in Ontario owned by government, industry and private landowners. We manage 395 of these dams, including 85 dams located in provincial parks and conservation reserves, making us the second largest dam owner in the province. Most of our dams are relatively small, typically less than 7.5 metres tall. This includes:

- concrete dams
- earth and rock-fill dams
- steel sheet pile dams
- timber crib dams

Approximately half of our dams are in populated areas in southern Ontario.

Our monitoring program includes dam inspections and safety reviews and helps ensure that we are operating and maintaining these dams in a safe condition. Public safety and emergency preparedness plans ensure that contingencies are in place should an issue arise. We actively pursue opportunities to devolve or transfer responsibility for dams to other owners (for example, the waterpower industry) or to decommission dams where they are no longer needed.

Dams on Crown land (2020)



In 2019, 40 dam inspections were completed. We plan to inspect about 20% of the dams per fiscal year. Targets and schedule take into consideration inspection frequency, condition and dam hazard ratings. In addition, 6 dam safety reviews were completed. A dam is required to have an updated safety review every 10 years.

Waste disposal sites

In municipally incorporated areas, waste management is a municipal responsibility. In the early 1970s, the Ontario government assumed the management of waste in unorganized territories to address public health and safety issues and to control unauthorized garbage dumping. We now manage waste disposal sites on Crown land to support safe waste disposal in those unorganized territories. We currently have 146 sites that are receiving waste and all of them are inspected on a regular basis. We are working to ensure that all sites have monitoring plans in place. We actively pursue opportunities to devolve or transfer responsibility for waste disposal sites to other agencies such as municipalities.

Waste disposal sites on Crown land (2020)

Type of site	Number in Ontario
Active waste disposal sites	133
Historical or closed waste disposal sites	569

Indicator last updated

- February 2021

Data source(s)

- Internal asset management data

Theme – Influences on our natural resources

Natural resources and biodiversity in Ontario face several pressures, including habitat loss, invasive species, population growth, pollution, and climate change.

Our resources are also influenced by natural disturbances such as fire and drought. This section assesses the effects to our resources from some of these influences. This information allows us to identify and address issues, as necessary, so we may continue to enjoy the economic and social benefits of our natural resources.

Invasive species

Invasive species are a growing threat to our economy, our environment and our health. Impacts of invasive species on Ontario's economy have recently been estimated at $3.6 billion annually. Once established, invasive species are extremely difficult and costly to control and eradicate, and their ecological effects are often irreversible.

Indicator reports

- Aquatic invasive species
- Invasive insects and disease
- Terrestrial invasive plants

Ecosystem disturbance

Loss of habitat is the biggest threat to biodiversity. Certain activities can change or disturb the ecosystems that species rely on and the ability of fish or wildlife to move between different areas. Habitat loss is most serious in southern Ontario, where the human population and related pressures on ecosystems are greatest.

Some ecosystem disturbances are natural, such as wildfires that help forests regenerate and stay healthy. We monitor changes in these disturbances to determine what effect they may have on sustainable resource management.

Indicator reports

- Aquatic stress
- Stream flows and connectivity
- Terrestrial connectivity
- Natural forest disturbance

Climate change

Climate change affects weather patterns making severe rain, prolonged heat waves and milder winters more common. Forests, waters and wildlife continue to be significantly impacted by these changes.

Indicator reports

- Growing season
- Ice cover
- Forest carbon

Pollution

Pollution in our air and water affects the enjoyment of our outdoors and contributes to lost economic opportunity. Pollutants can:

- cause human health impacts
- kill plants, fish and wildlife
- cause long-term impacts that affect their reproduction or other life processes (for example growth and migration)
- result in changes that degrade habitats
- negatively impact ecosystem services

Indicator report

- Water quality

Learn about the current status of air quality in Ontario.

Aquatic invasive species

Description

This invasive species indicator report tracks the introduction and spread of alien species in Ontario lakes, including the Great Lakes.

Status


Status: Mixed


Trend: Mixed


Geographic extent: Northern Ontario, Southern Ontario, Great Lakes

Why it's important

Invasive species, along with other stressors such as habitat loss and climate change, accelerate biodiversity loss and are an economic and environmental threat to waters in Ontario. Our lakes and rivers have been hit particularly hard by invasive species. Well-known examples of aquatic invasive species include:

- Round Goby
- Zebra Mussel
- Purple Loosestrife
- Phragmites

Monitoring and reporting on aquatic invasive species helps us assess the success of efforts to prevent the arrival and spread of invasive species and reduce their harmful impacts.

How we monitor

Alien species are plants, animals and micro-organisms introduced outside their natural range by human action. Invasive species are alien species that threaten our economy, environment and health. They can include species native to Ontario that have been introduced beyond their natural range. It is not known how many of the aquatic alien species in Ontario are also invasive. As a result, we have assessed the presence of aquatic alien species to better understand the threats from invasive species.

We track the number of alien aquatic bacteria/viruses, plants, invertebrates, fishes and protists. Protists are comprised of mainly single-celled organisms such as algae and protozoans.

Great Lakes

To assess the Great Lakes, we use data from the Great Lakes Aquatic Nonindigenous Species Information System. This data lists species that have become established and the year they were first discovered in the Great Lakes. We use this information to track the cumulative number of alien species established in the Great Lakes by decade. This analysis focuses on species that are new to the Great Lakes. It does not look at the transfer of species within the Great Lakes.

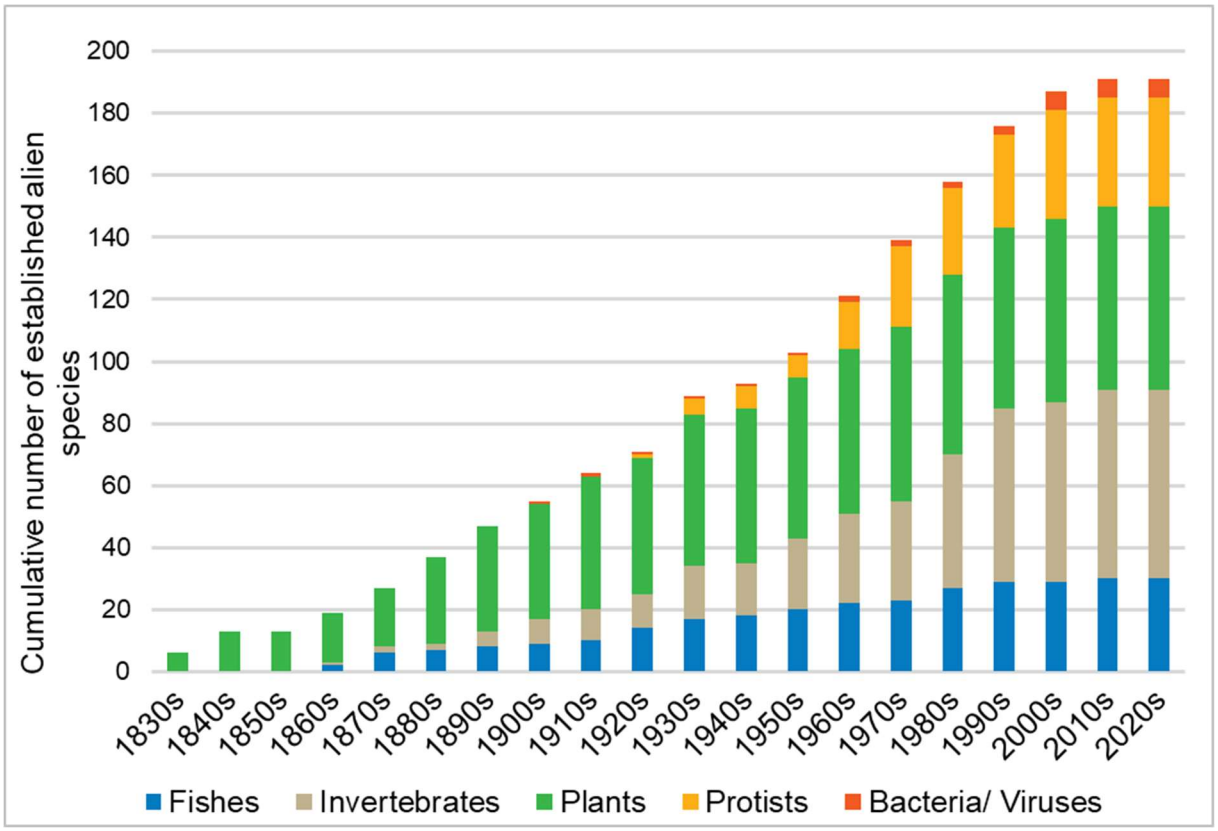
Inland Lakes

To assess inland lakes, we use data from the Broad-scale Monitoring Program for Inland Lakes. We have monitored lakes using this program since 2008. Water quality, invertebrates, and fishes in a selection of lakes are sampled annually, and the data are analyzed to report on the status of lake ecosystems every 5 years. We use data from the first two five-year cycles (2008-2012 and 2013-2017) to look at the percentage of lakes with alien species and the average number of alien species per lake in each fisheries management zone.

Results

Great Lakes

Cumulative number of alien species established in the Great Lakes



The number of aquatic alien species in the Great Lakes has steadily increased since the first species was documented in the 1830s. As of December 2020, 191 alien species were established including:

- alien plants (59 species)
- invertebrate species (61 species)
- protists (35 species)
- fishes (30 species)
- bacteria/viruses (6 species)

The average rate of new alien species becoming established is just under 10 species per decade with the highest rates occurring from the 1960s to the 1990s (18 to 19 established species/decade). This coincides with the opening of the St. Lawrence Seaway in 1959. The higher rate during this period may also be a result of increased detection efforts.

The rate of newly established species appears to have declined dramatically in the current decade. Only three alien species, two small crustaceans and one fish species, have been

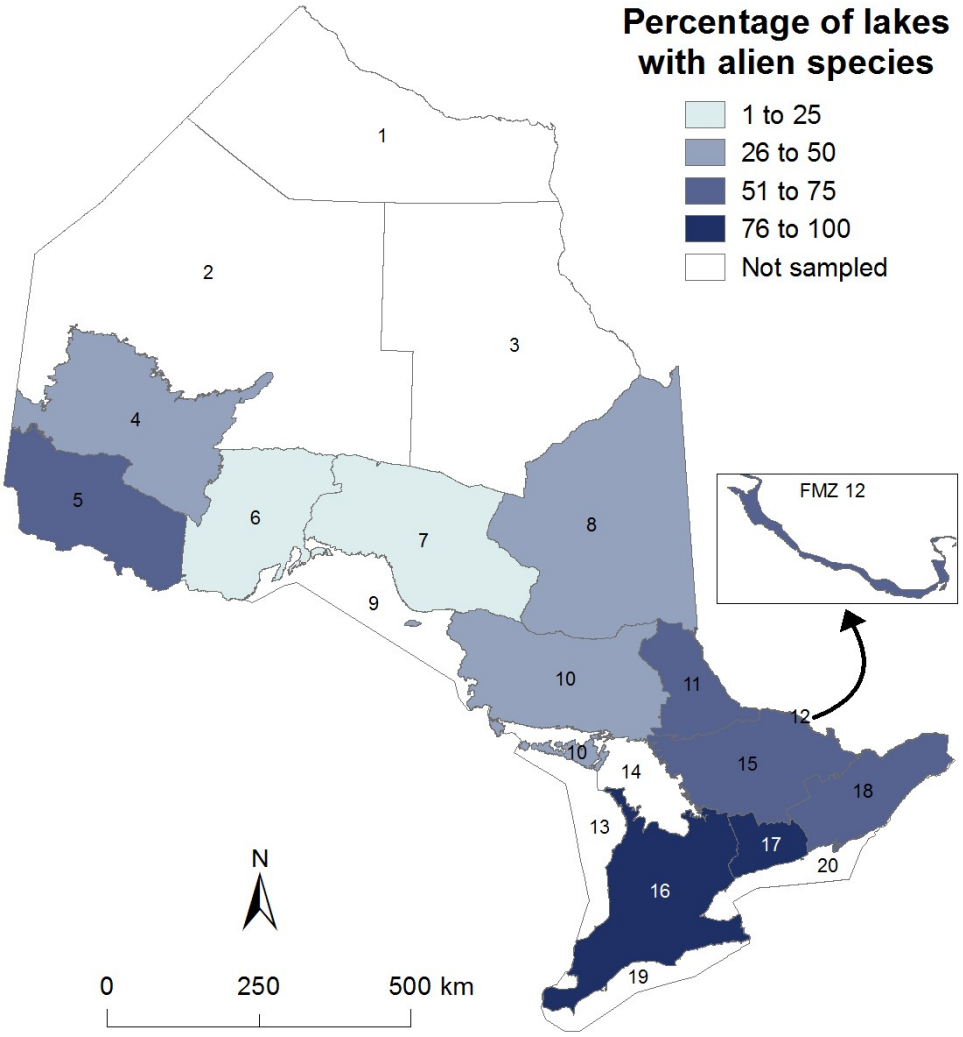
discovered since 2010. This decade currently has the second lowest rate of the 19 decades in the data set (no new alien species were detected in the 1850s). The reduced rate is particularly positive given:

- increased awareness of invasive species issues
- increased monitoring
- improvements in the tools available to identify invasive species

A possible reason for this improvement could be the introduction and implementation of more comprehensive ballast water regulations in 2006 by Transport Canada.

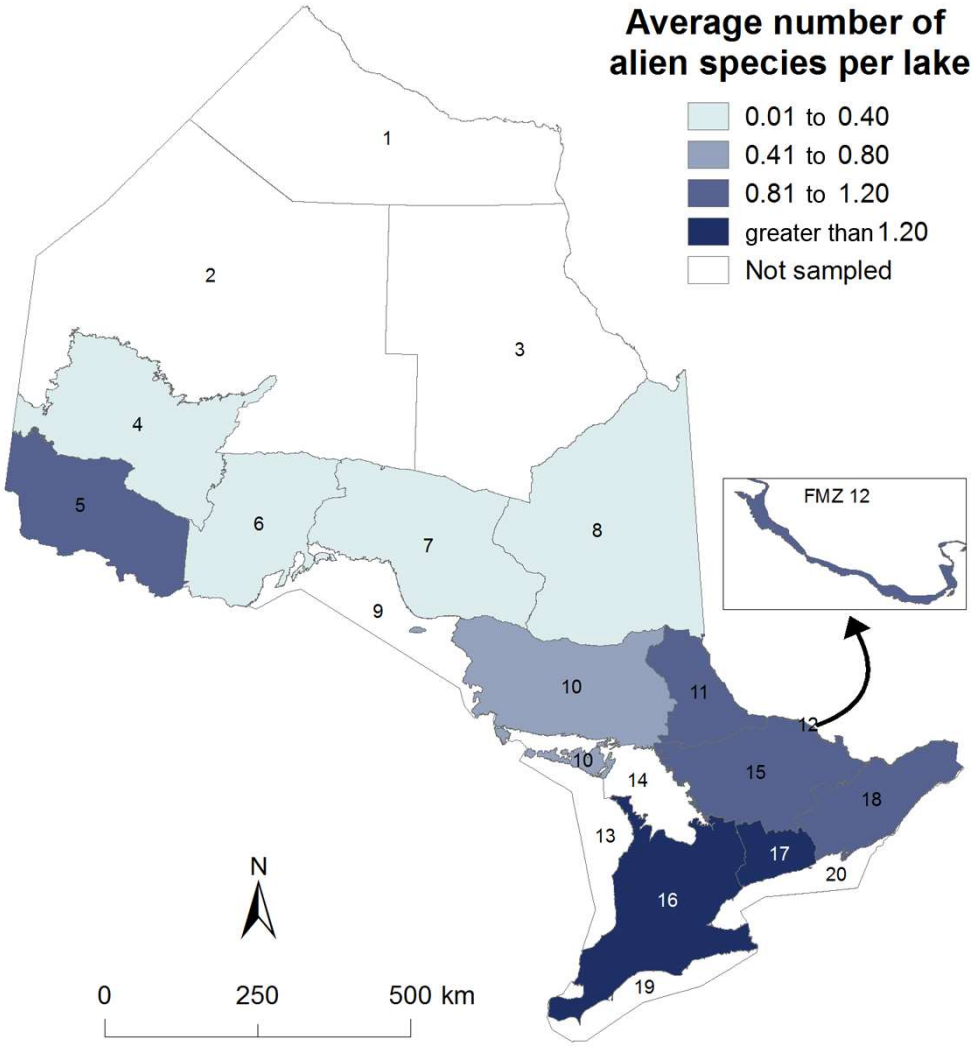
Despite the reduction in the rate of introductions of new alien species to the Great Lakes, the ongoing spread of established alien species to new lakes within the system continues to be a major concern.

Percentage of lakes with alien species in each fisheries management zone (2013 to 2017)



Alien species were found in 48 per cent of the 689 lakes sampled in 2013 to 2017. Alien species were not found in most lakes in northern Ontario, while most lakes in southern Ontario had one or more alien species.

Average number of alien species per lake in each fisheries management zone (2013 to 2017)



The average number of alien species per lake in each fisheries management zone ranged from 0.3 to 2.3 species per lake and increased from north to south.

Twelve alien fish species were detected, the most common of which were Smallmouth Bass (in 204 lakes) and Rainbow Smelt (in 65 lakes). Four alien invertebrate species were detected,

the most common of which were Zebra Mussel (in 61 lakes) and Spiny Water Flea (in 57 lakes).

For the sampled lakes, there was a slight increase in the percentage of lakes with alien species and the average number of alien species per lake between the two monitoring cycles. The total number of aquatic alien species remained the same. Assessing the trend in this information will be possible after analysis of Cycle 3 (2018 to 2023) of the Broad-scale Monitoring Program for Inland Lakes. Implementation of Ontario's Invasive Species Strategic Plan and the Invasive Species Act is helping to address the threats of invasive species across the province.

Indicator last updated:

- February 2021

Data source(s):

- Great Lakes Aquatic Nonindigenous Species Information System
- Broad-scale Monitoring Program for Inland Lakes

Invasive insects and diseases

Description

This invasive species indicator report tracks the introduction and spread of terrestrial invasive insects and diseases in Ontario.

Status


Status: Needs improvement


Trend: Deteriorating


Geographic extent: Province-wide

Why it's important

Invasive insects and diseases that are introduced outside their natural range threaten Ontario's economy, environment and/or society, and in some cases human health.

The arrival and spread of invasive insects and diseases affect the health of our forests and wildlife, the functioning of our ecosystems and our natural biodiversity. Once established, they are difficult and expensive to control and eradicate.

Monitoring and reporting on invasive insects and diseases helps us determine the success of efforts to prevent their arrival and spread and reduce their harmful impacts.

How we monitor

This indicator currently focuses on invasive forest insects and diseases.

We annually track:

- arrival of invasive forest insects and diseases
- spread of invasive forest insects and diseases

This includes data on the Emerald Ash Borer and describes the impacts of other invasive forest insects and diseases. We use data from the Ontario Forest Health Monitoring Program's forest insect and disease survey and the Canadian Food Inspection Agency.

We monitor and manage invasive forest insects and diseases by working closely with partners like the Canadian Food Inspection Agency and Natural Resources Canada - Canadian Forest Service.

Monitoring methods include ground surveys, plot assessments, extension calls, enhanced monitoring tools, and aerial mapping of spread and damage. All forested areas are included:

- provincial Crown Land
- federal lands
- First Nation territories
- parks
- private lands
- urban areas

The data are considered representative and continue to be refined through new and improved detection and monitoring programs and tools.

Results

The status of this indicator is ‘needs improvement’. The trend for this indicator is deteriorating, given the introduction of new insects and disease and the continued spread and impact of those that are established.

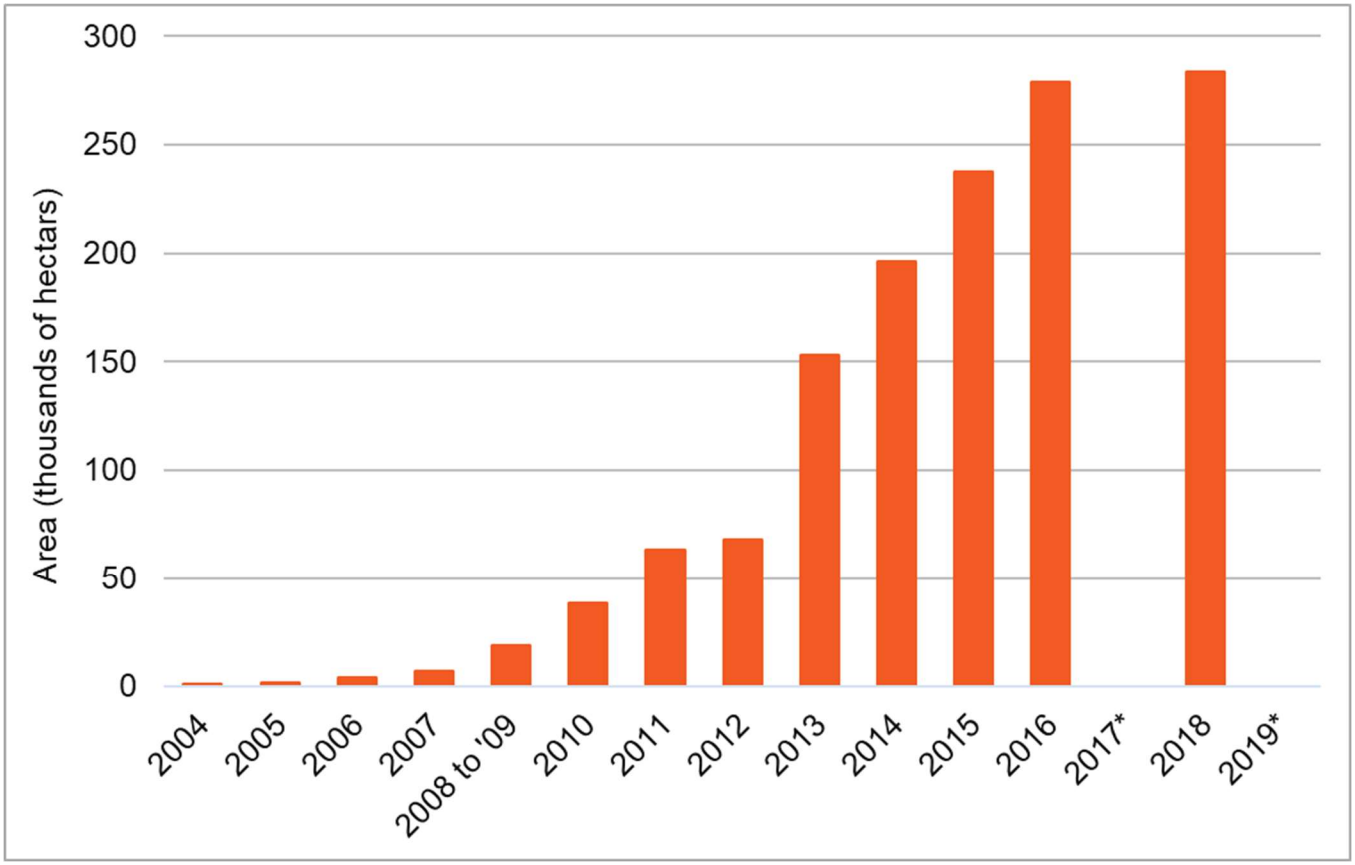
Invasive insects and disease continue to arrive in Ontario. Most recently Beech leaf disease was first reported in southwestern Ontario in 2017. The leaf disease of beech trees involves a worm-like parasite nematode. The discovery and spread has prompted work with partners,

including the US, to investigate causes and impact of the disease. In 2012 the Hemlock Woolly Adelgid was first detected in Etobicoke and Niagara Falls. Two other small populations have been detected since. Oak Wilt which was found on an island in the St. Clair river in Michigan is being monitored with the St. Clair Region Conservation Authority. Starting in 2017, as an early detection measure, traps were installed to monitor *nitulid* beetles which carries the oak wilt disease. Research is continuing in this area.

Emerald Ash Borer

The Emerald Ash Borer, first found in Ontario in 2002, continues to decimate ash populations as it rapidly spreads across Ontario and North America.

Cumulative spread of Emerald Ash Borer

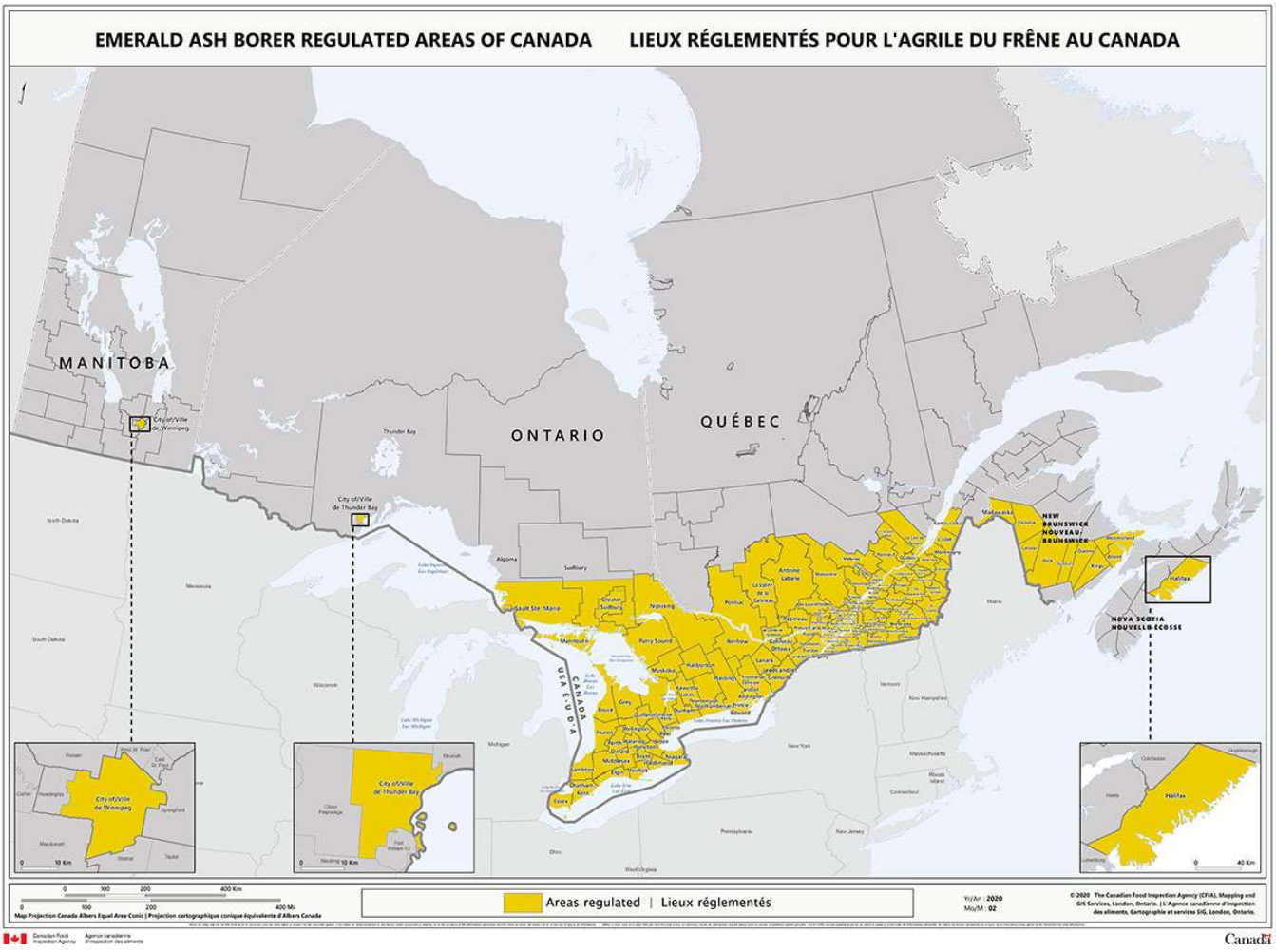


* no aerial mapping conducted

In attempts to slow the spread, the Canadian Food Inspection Agency has prohibited the movement of potentially infested ash tree materials, including all species of firewood out of regulated areas. As of June 2016, the area regulated to control emerald ash borer in Ontario includes all of Southern Region and the southern part of Northeast Region, ending at the northern end of Sault Ste. Marie District. The City of Thunder Bay in Northwestern Ontario was regulated in 2019. As of January 2021, the United States has removed federal domestic emerald ash borer quarantine regulations.

The range of the Emerald Ash Borer continues to increase despite the Agency's efforts and its work with partners including the Ministry of Northern Development, Mines, Natural Resources and Forestry, Natural Resources Canada and municipalities.

Emerald Ash Borer regulated areas of Canada



Map: [Canadian Food Inspection Agency, 2020]

In 2013, as part of a long-term strategy to reduce the effects of emerald ash borer biocontrol agents were released by the Canadian Forest Service. In 2019, the Canadian Forestry Service along with the ministry forest health staff and several other agencies released 3 species of parasitoid wasps to help reduce emerald ash borer populations. The goal is to have these parasitoid wasp populations become established in infested areas.

The biological control program for emerald ash borer is still in the early stages in Canada and monitoring is ongoing to determine the effectiveness of the wasps.

Other invasive insects and diseases

The Canadian Food Inspection Agency declared Asian Long-horned Beetle eradicated from the cities of Mississauga and Toronto in 2020. This is the only known population of this pest in Canada. The Asian Long-horned Beetle was initially found in one location in Ontario and was thought to have been nearly eradicated. It was found again in 2013 just outside the established regulated area. It is believed that the 2013 find is a remnant of the 2003 infestation. After 5 years of surveys with no detection, the Asian Long-horned Beetle Infested place order was repealed by the Canadian Food Inspection Agency, effective June 9, 2020.

Beech Bark Disease has been confirmed across the range of beech trees in Ontario and is now as far north as St. Joseph Island, Sault Ste. Marie District.

Butternut, American Chestnut (listed prior to 2008) and Eastern Flowering Dogwood (2009) have been listed as endangered species due to invasive pathogens. Blue Ash has been listed as threatened in 2016 due to a combination of white-tailed deer browsing and emerald ash borer.

Approaching invasive insects and diseases

Invasive insects and diseases that are not yet in Ontario but are approaching include:

- Mountain pine beetle
- Southern pine beetle
- Walnut twig beetle
- Brown spruce longhorn beetle
- Thousand canker disease of black walnut
- Oak wilt disease
- Spotted lanternfly

The Invasive Species Centre in Sault Ste. Marie continues to work with partners, including the ministry to address invasive species through a broad range of initiatives and scientific research. To support these efforts, the centre has created Forest Invasives Canada to provide information on invasive insects, plants and pathogens that threaten Canada's forests.

The Canadian Food Inspection Agency has primary responsibility for preventing the introduction and spread of invasive forest insects and diseases in Ontario.

The *Invasive Species Act, 2015* provides legislative and regulatory tools which improve Ontario's ability to prevent and respond to the introduction and spread of invasive species in collaboration with the Canadian Food Inspection Agency.

Indicator last updated

- February 2021

Data source(s)

- Ontario forest health monitoring program
- Canadian Food Inspection Agency

Terrestrial invasive plants

Description

This invasive species indicator report tracks the presence of terrestrial alien and invasive plants in forested habitats in Ontario.

Status


Status: Needs improvement


Trend: Undetermined


Geographic extent: Province-wide

Why it's important

Invasive species are one of the main threats to biodiversity and natural resources and are a growing economic and environmental concern. Together, the threats of invasive species, habitat loss and climate change combine to accelerate biodiversity loss.

Forests in Ontario are increasingly threatened by alien and invasive plant species that can:

- impede tree regeneration
- reduce native tree, shrub and herb diversity
- change ecosystem and community dynamics within the forest
- affect forest industry, recreation and aesthetic values

Monitoring and reporting on alien and invasive plant species helps us assess the success of efforts to prevent their arrival and spread and reduce their harmful impacts.

How we monitor

We report on the distribution of alien and invasive forest plants. Alien species are plants, animals and micro-organisms introduced by human action outside their natural range. Invasive species are alien species whose introduction or spread threatens our economy, environment and/or society, including our health.

Various data sets contribute to our understanding of alien and invasive plant species distributions. We used data from:

- vegetation plot data records for 9,312 forested ecological land classification plots collected from 1980 to 2005
- 205 national forest inventory plots sampled from 2004 to 2010
- the Early Detection and Distribution Mapping System (EDDMapS Ontario) database with occurrence records from 1903 to 2015

The percentage of monitoring plots that contain alien and invasive forest plants is provided for each ecoregion. An ecoregion is defined by a characteristic set of geologic, topographic and climate features that influence the types of plants and animals that are found there. Ontario is divided into 14 ecoregions.

The ecological land classification vegetation plots give us the best coverage of the province. However, these plots were last sampled in 2005.

National forest inventory plots provide more recent information (2004 to 2010) regarding the spread of documented invasive species and the introduction of new species. However, there are few plots and they cover a relatively small portion of Ontario.

EDDMapS Ontario allows Ontarians to document sightings of invasive species online. Reports are submitted voluntarily and most of the information we get comes from southern Ontario. We reviewed data from EDDMapS Ontario to gain a broader understanding of the presence of invasive forest plants across Ontario as reported by citizens and natural resource agencies and organizations.

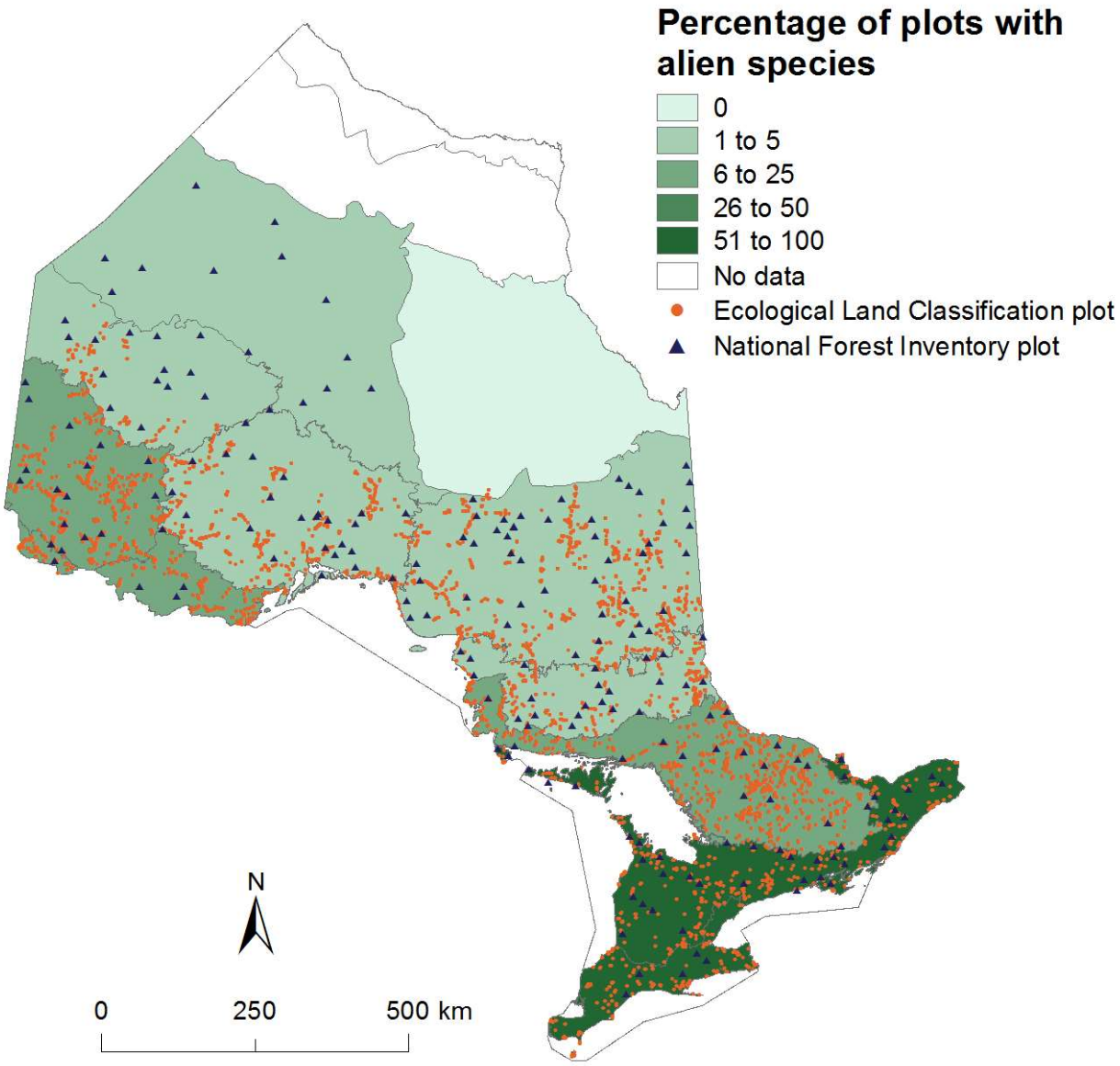
More current and province-wide vegetation plot data is required from a variety of habitat types to fully monitor trends in the numbers and spread of terrestrial invasive plant species.

Results

About 1,200 alien plant species are found in Ontario. A portion of these are found in Ontario forests.

The status of this indicator is ‘needs improvement’ because of the large number of alien forest plant species present and their widespread distribution in the province. We were not able to assess trends over time because each plot has only been sampled once and the data for the 30-year period are combined.

Percentage of monitoring plots with alien species by ecoregion



We identified 157 alien plant species from 9,517 forest vegetation plots sampled between 1980 and 2010 across all forested ecoregions. Alien plants were most often found in vegetation plots

in southern Ontario ecoregions. Relatively few occurrences were seen in ecoregions farther north.

Of the alien plant species we found, 121 are considered invasive species (as described in Invasive Alien Plants in Canada Technical Report). Some of the most common invasive plants found in the vegetation plots were:

- Broad-leaved Helleborine
- European Buckthorn
- Bittersweet Nightshade
- Garlic Mustard

As of February 2015, EDDMapS Ontario contained 7,316 records documenting 78 invasive forest plant species. The most commonly reported invasive forest plants were European Buckthorn, Garlic Mustard and Dog-strangling Vine. All represent a threat to our forests.

Implementation of Ontario's Invasive Species Strategic Plan and the Invasive Species Act is helping to address the threats of invasive species across the province.

Impact of the top three invasive plant species and number of reports in EDDMapS Ontario

Common Name	Plant Form	Impacts	Number of reports 2004-2009	Number of reports 2010-2014	Total number of reports to February 2015
European Buckthorn	shrub	Forms dense thickets, crowds and shades native plants, and prevents forest regeneration	365	1,103	1,622
Garlic Mustard	herb	Invades undisturbed forests, quickly dominates forest understory, displaces native wildflowers and forest groundcover plants, and slows or prevents forest regeneration	114	1,258	1,492
Dog-strangling Vine (European Swallowwort)	vine	Forms dense stands that overwhelm and crowd out native plants and young trees, preventing forest regeneration	231	225	702

Indicator last updated

- June 2019

Data source(s)

- Ecological Land Classification

- National Forest Inventory
- Early Detection and Distribution Mapping System (EDDMapS Ontario) database

Aquatic stress

Description

This ecosystem disturbance indicator report assesses the intensity and density of threats to aquatic habitats in Ontario.

Status


Status: Mixed


Trend: Undetermined


Geographic extent: Province-wide

Why it's important

The loss and degradation of aquatic habitat is a major threat to fisheries and aquatic biodiversity and is the main factor negatively impacting the social, economic and ecological benefits they provide.

Assessing changes in the stresses facing aquatic habitat allows us to take an adaptive management approach to support the sustainability of our fisheries.

How we monitor

The aquatic stress index represents the relative intensity and distribution of threats affecting aquatic habitats in Ontario watersheds. The distribution of stressors was assessed using

census and business pattern data from Statistics Canada. This includes information on the density (number per 1000 square kilometres of watershed area) of:

- crop farms
- forestry activities
- waste management
- petroleum refining facilities
- human dwellings
- discharge sites (e.g. industrial chimneys and outlets)
- road density (kilometres per 1000 square kilometres)

An overall stress index was calculated (on a scale of 0 to 1) as the average of all the agricultural, industrial and population stress values in each tertiary watershed. Higher stress index scores represent a higher level of stress to aquatic ecosystems.

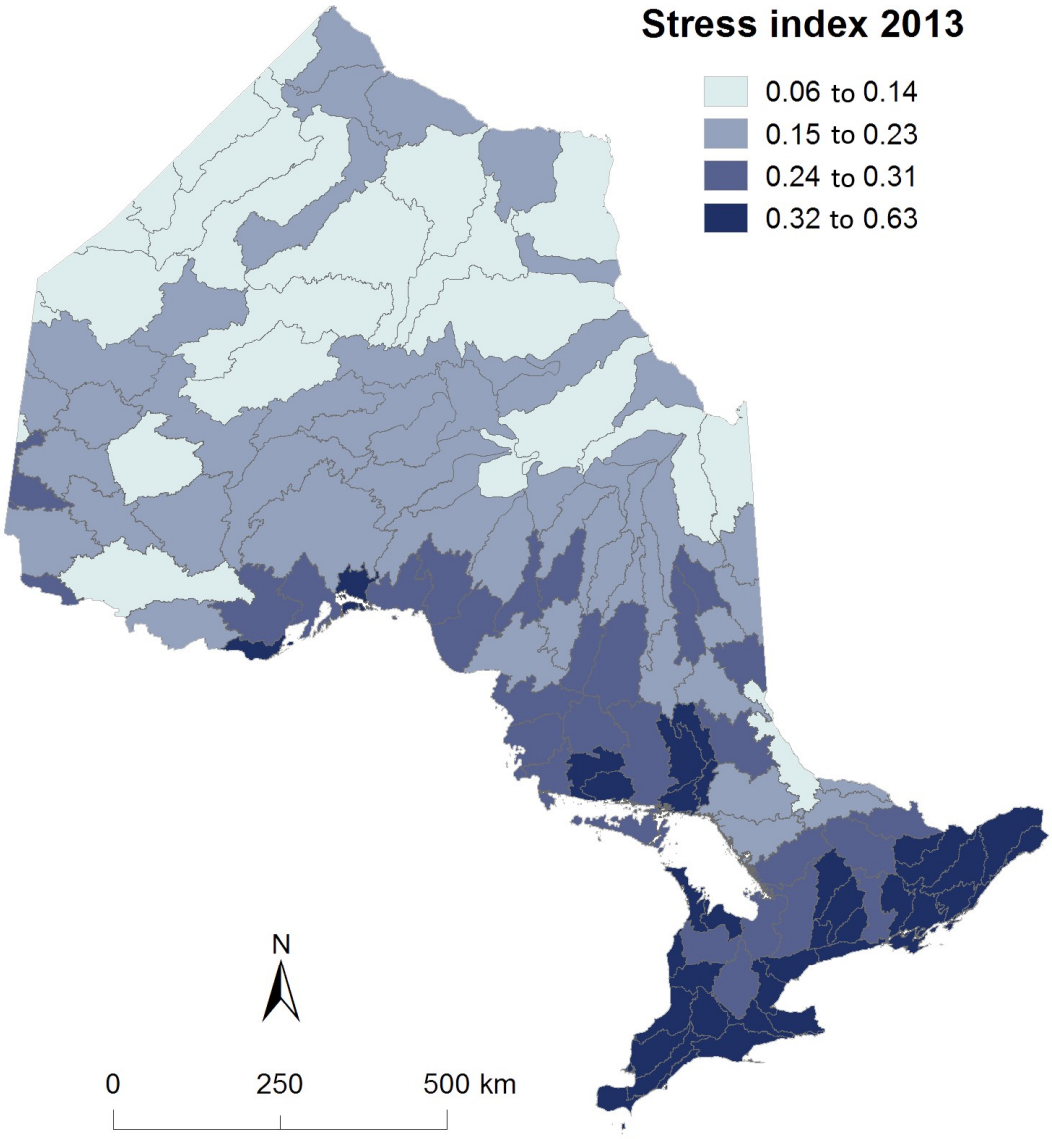
Results were also assessed by ecozone. Ecozones are very large areas defined by a distinctive type of bedrock. The three ecozones in Ontario are the Mixedwood Plains (southern Ontario), Ontario Shield (central and northern Ontario) and Hudson Bay Lowlands (Far North).

The change in the stress index between the time periods was calculated as the difference between the 2013 and 2003 values for each watershed. Negative values indicate reduced stress whereas positive values indicate increased stress.

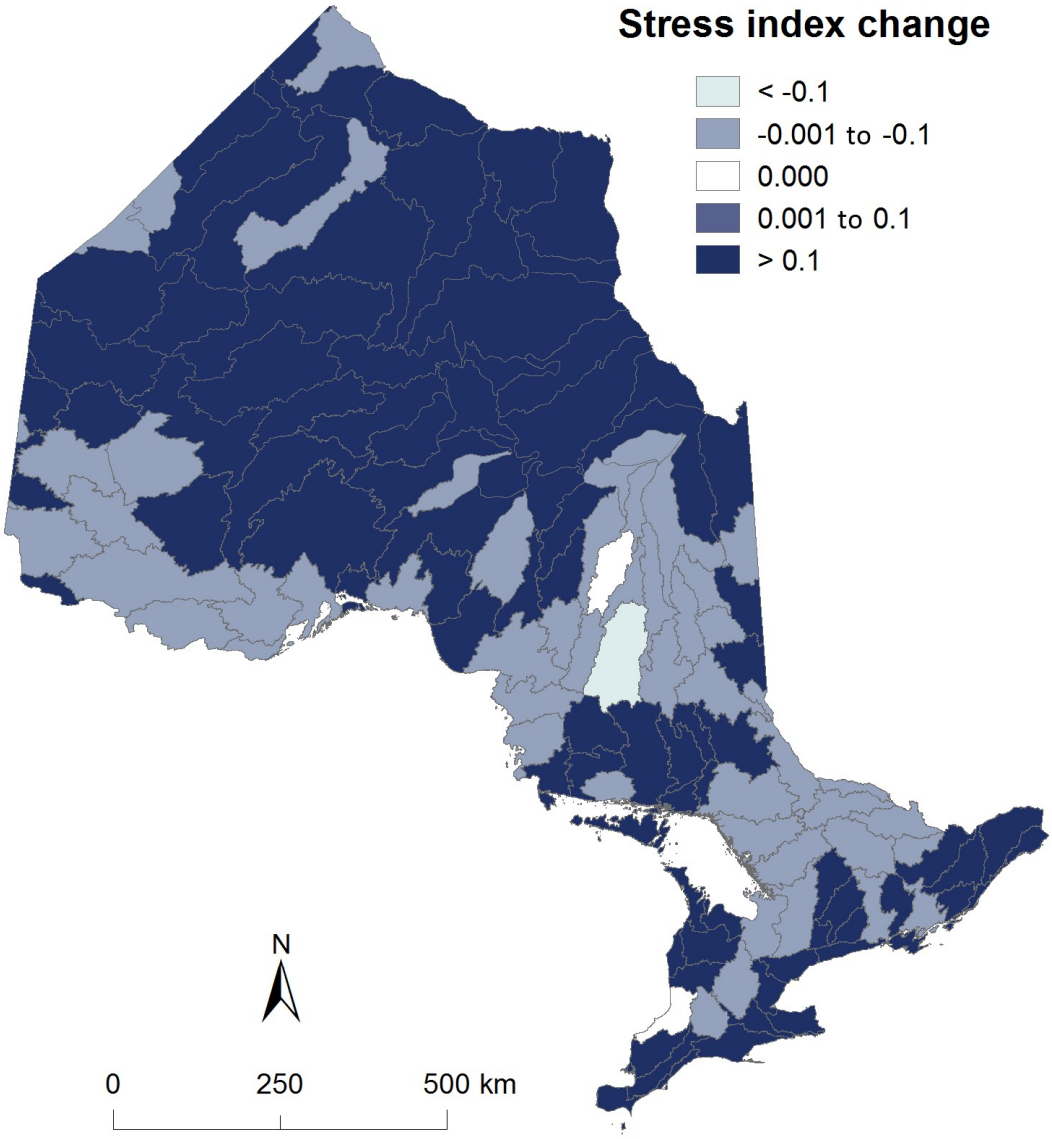
Results

Overall, the average stress index for Ontario tertiary watersheds increased by 7.5 per cent between 2003 and 2013. It increased for 90 watersheds (62 per cent) and decreased for 53 watersheds (37 per cent). The remaining two watersheds (1 per cent) showed no significant change between time periods.

Aquatic stress index for tertiary watersheds in Ontario (2013)



Changes in aquatic stress index scores between 2003 and 2013



Negative values indicate the watersheds where stresses have decreased whereas positive values indicate watersheds where the stresses have increased.

Mixedwood Plains

Watersheds of Lake Ontario, Lake Erie and the southern part of Lake Huron in the Mixedwood Plains ecozone have the highest stress index values, suggesting that aquatic habitat loss and degradation is highest in this part of the province. We have seen the stress index increase in 73 per cent of watersheds in this ecozone since 2003.

Ontario Shield

Watersheds in the southern part of the Ontario Shield ecozone have high stress index values as do watersheds near population centres elsewhere within the ecozone. Values are low in the northwestern portion of the ecozone.

Changes in the stress index have been variable between 2003 and 2013. There are increases in some watersheds, mainly in the north of the ecozone and decreases in others, mainly in the south-central areas of the ecozone. Increases in the north are a result of an increasing density of roads and human dwellings. There were no clear patterns for the decreases seen in south-central areas. In some watersheds the number of forestry operations declined, in others, there were declines in agriculture and/or discharge sites (industrial and domestic stacks).

Hudson Bay Lowlands

Watersheds in the Hudson Bay Lowlands ecozone have low stress index values compared to the rest of Ontario. Similar to watersheds in the northern part of the Ontario Shield Ecozone, the stress index in most of these watersheds (76 per cent) has increased since 2003 due to higher road and human dwelling densities.

Great Lakes

Although the waters of the Great Lakes are not assessed through our stress index, the 2017 State of Great Lakes Report tracks a similar watershed stress indicator. They reported similar results, with coastal habitats and nearshore areas impacted by stresses in adjacent watersheds, especially in the lower Great Lakes.

Indicator last updated

- June 2019

Data source(s)

- Statistics Canada, 2006 and 2011 Census Datasets
- An updated assessment of human activities, the environment, and freshwater fish biodiversity in Canada

Stream flows and connectivity

Description

This ecosystem disturbance indicator report tracks flows and barriers in Ontario streams.

Status


Status: Mixed


Trend: Mixed


Geographic extent: Province-wide

Why it's important

Flow is the most important variable influencing the habitat and aquatic life (for example, fish) found in rivers and streams. Species are adapted to the amount, duration, timing, frequency and variability of flows in their ecosystems. For example, some species may prefer to live in streams where flows are relatively stable while others may live in flashy streams where flows increase and decrease weekly or daily.

Dams can provide several benefits, including:

- renewable hydroelectric power generation
- flood control
- the creation of wetlands
- recreational opportunities associated with reservoirs

However, dams and other barriers such as road crossings can interrupt the flow of streams and negatively affect aquatic ecosystems, fisheries and biodiversity.

This indicator assesses patterns in stream flow and disruptions to stream connectivity in Ontario.

How we monitor

The amount, duration, timing, frequency and variability of flows can be described using different measures. We analyzed daily stream flow data from 1981-2010 and 274 Water Survey of Canada monitoring stations to understand trends in flow patterns across Ontario. Five measures were calculated from the data to assess long-term trends in the amount, timing and variability of stream flows. These measures are known to affect the availability of water resources and stream ecosystems.

Flow characteristics and measures used to assess long-term trends in stream flow.

Type	Measure	Description	Why important
Amount	3-day maximum	Annual highest average flow over 3 consecutive days	High flows where habitat may be abundant
Amount	7-day minimum	Annual lowest average flow over 7 consecutive days	Time when habitat may be abundant, for example, spring melt
Timing	3-day maximum date	Annual calendar day for 3-day maximum flow	Low flows where habitat may be limited
Timing	7-day minimum date	Annual calendar day for 7-day minimum flow	Critical time when habitat may be limited

Type	Measure	Description	Why important
Variability	Richards-Baker Flashiness Index (RB Index)	Annual index of changes in flow from one day to the next	Species are adapted to different levels of flashiness

Information on the number and location of medium and large dams comes from the Ontario Dam Inventory. The density of dams within tertiary watersheds in Ontario were calculated to better understand the degree of stream fragmentation and potential alterations to stream flow. The Ontario Dam Inventory does not include:

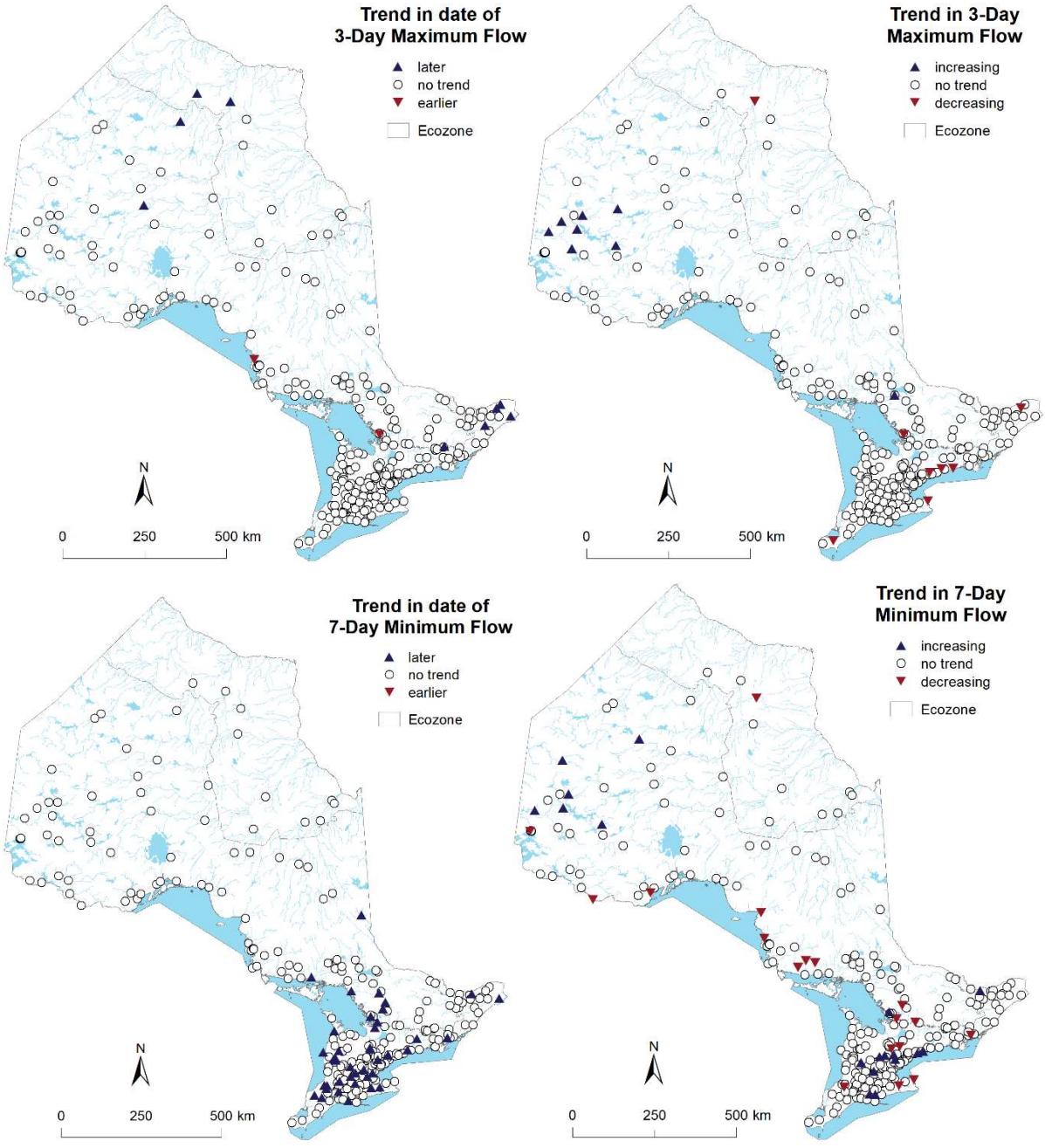
- small dams or water control structures
- beaver dams
- water crossings
- road embankments
- locks
- falls and rapids
- culverts found in rivers and streams in Ontario

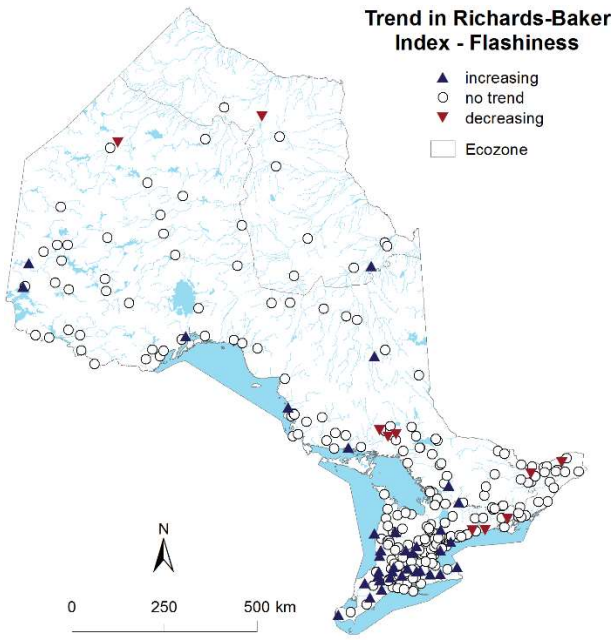
Road crossings can become potential barriers to fish movement if culverts that are installed to maintain connectivity and flow become perched or otherwise impassable. This is when the outlet of the culvert is not in line with the stream and creates a waterfall that may prevent fish from swimming upstream. We overlapped the map of roads onto the map of streams in Ontario to calculate the density of crossings for each tertiary watershed.

The density of dams and road crossing are also assessed by ecozone. Ecozones are very large areas defined by a distinctive type of bedrock. The three ecozones in Ontario are the Mixedwood Plains (southern Ontario), Ontario Shield (central and northern Ontario) and Hudson Bay Lowlands (Far North).

Stream flow

Trends in the amount and timing of maximum and minimum flows and flashiness for 274 Ontario stream flow stations (1981 to 2010)





Between 1981 and 2010, 116 of 274 (42 per cent) of the water monitoring stations showed significant trends in at least one of the five ecological flow measures. Maximum flows and the timing of those flows remained steady at the majority of stations across Ontario. Minimum flows varied more than maximum flows with the timing of those minimums appearing later in 2010 than in 1981 at many stations throughout southern Ontario. Stream flashiness increased in southwestern Ontario and decreased in southeastern Ontario.

Changes to stream flow patterns are related to climate but can also be brought about through the construction of dams, water withdrawals for agriculture or human consumption and watershed development. The increased minimum flows and flashiness, and later timing of those minimum flows in many of the southwestern Ontario streams suggests that overall, more habitat is available during low flow periods, but species will have to adjust to more variable (flashy) conditions.

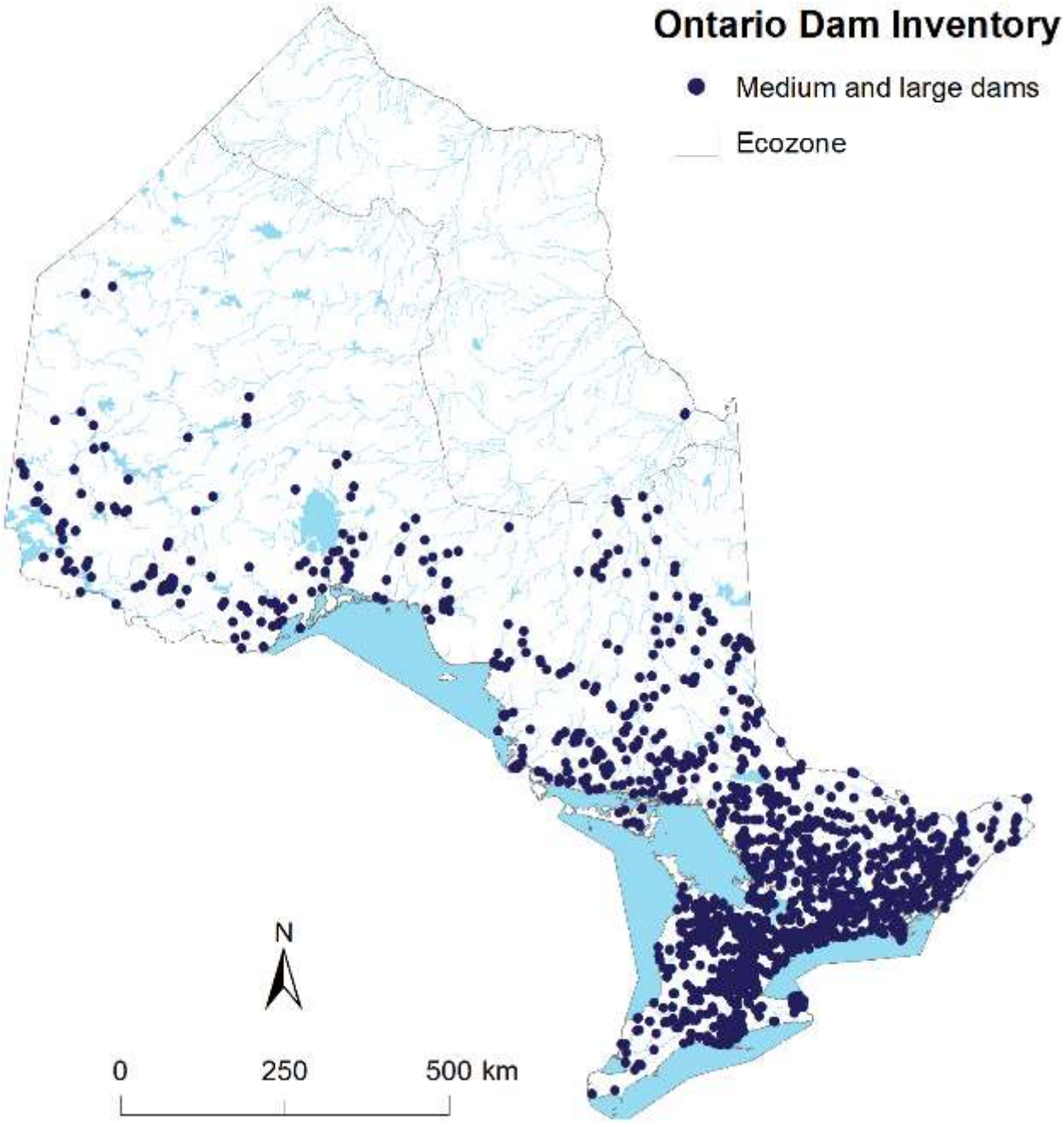
Dams

There are 1,596 medium and large dams in Ontario. The density of medium and large dams is highest in the watersheds of the Mixedwood Plains ecozone and the southern Ontario Shield ecozone. There are no medium and large dams in most tertiary watersheds in the Hudson Bay

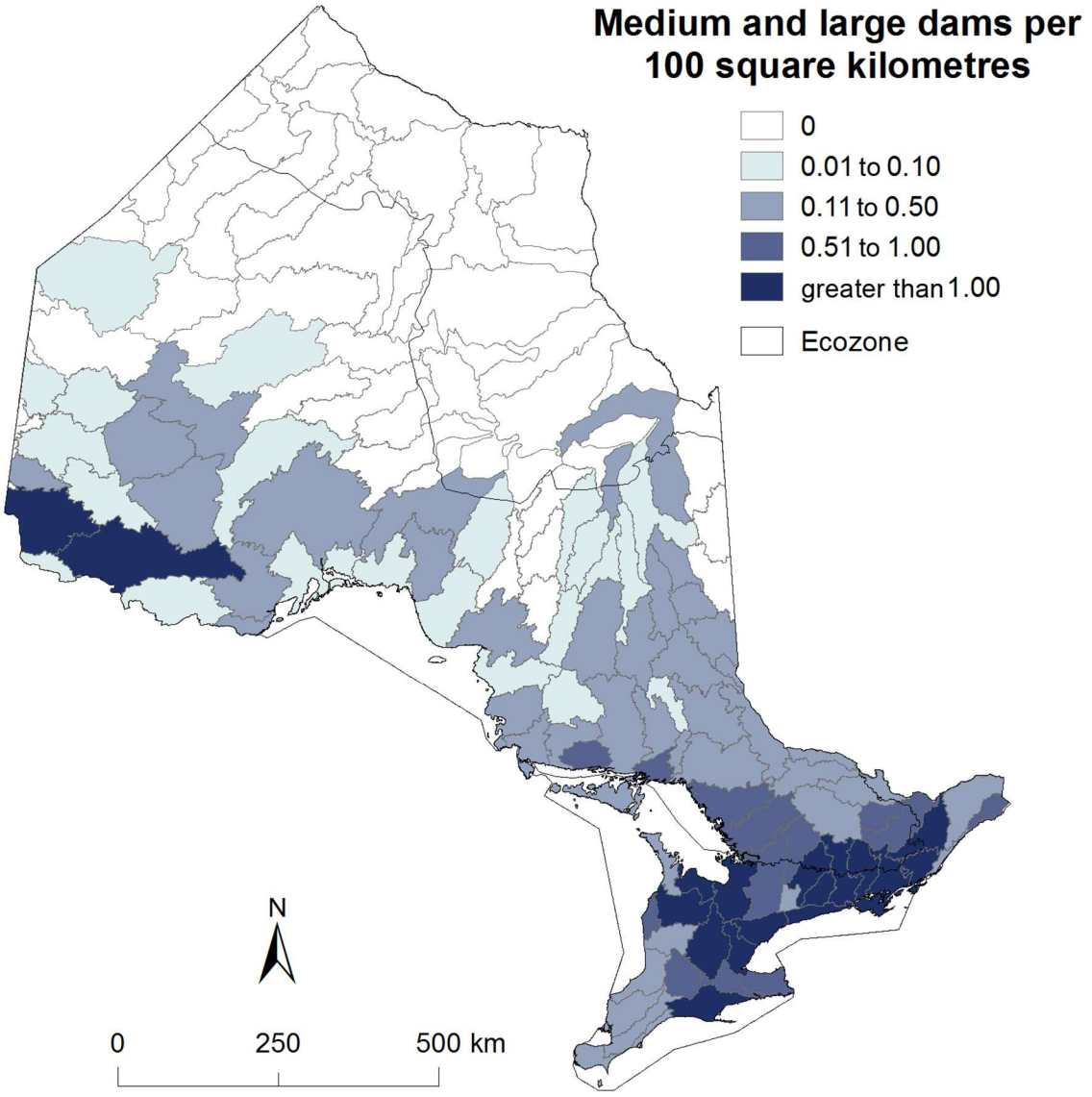
Lowlands ecozone and some watersheds in the northern portion of the Ontario Shield ecozone.

Forty of the medium and large dams have a fishway designed to allow the upstream movement of some fish species. Although dams and barriers often have negative impacts by disrupting stream flows and affecting species movement, sometimes they can positively affect ecosystems by preventing the movement of invasive aquatic species and by mitigating extreme flow events.

Location of medium and large dams in Ontario



Number of medium and large dams per 100 km2 by tertiary watershed in Ontario

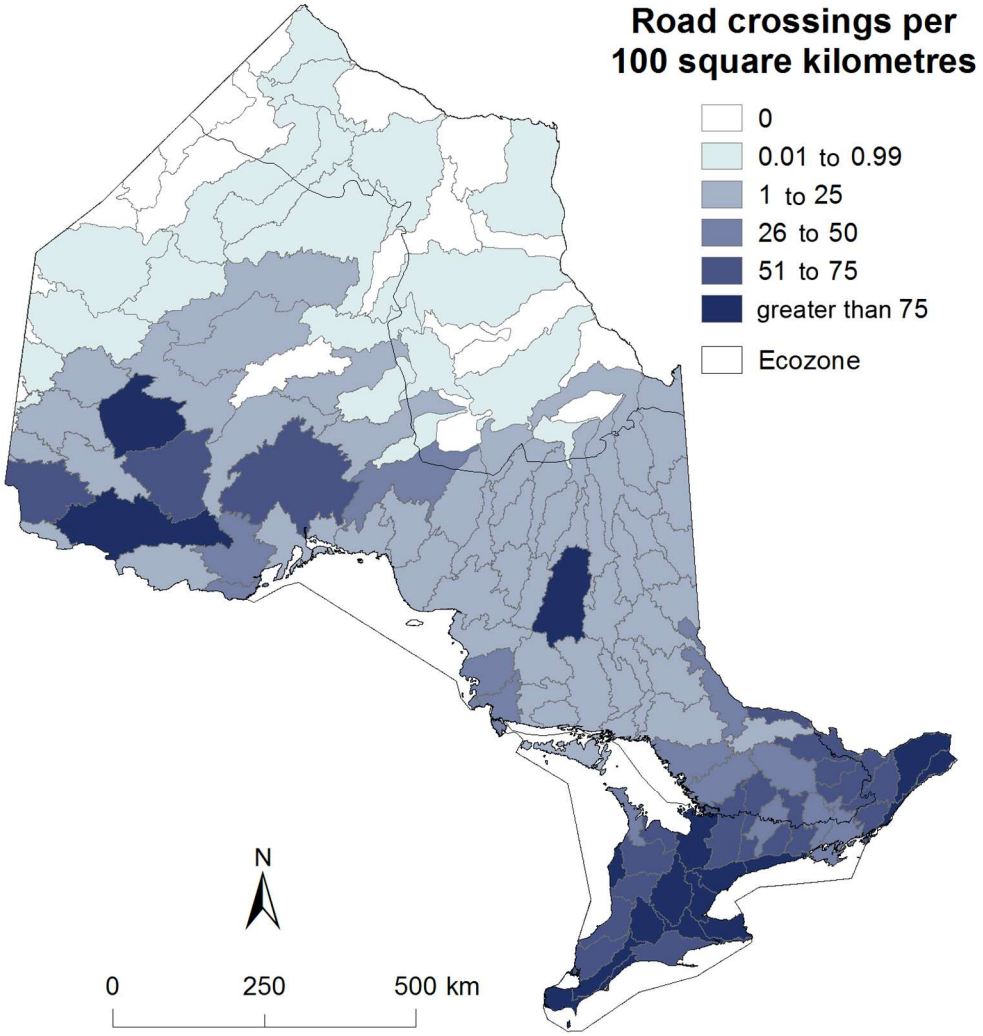


Road crossings

While the number and location of small dams on Ontario streams are not available, we do know that there are more than 120,000 road crossings of streams. The highest densities of

crossings tend to be in the largely developed Mixedwood Plains ecozone in southern Ontario. Most of the Ontario Shield ecozone in northern and central Ontario also has significant densities of stream crossings, related to forestry and other development.

Number of road crossings per 100 km2 by tertiary watershed



Indicator last updated

- June 2019

Data source(s)

- Ontario Dam Inventory
- Ontario Road Network
- Ontario Hydro Network
- watershed tertiary boundaries
- Water Survey of Canada – historical hydrometric data

Terrestrial connectivity

Description

This ecosystem disturbance indicator report assesses the degree to which terrestrial habitat in Ontario is fragmented, or broken up, over time by human activities and natural processes.

Status


Status: Needs improvement


Trend: Undetermined


Geographic extent: southern Ontario

Why it's important

Many species depend on connected patches of habitat to carry out their life processes (for example, reproduction, feeding) and maintain the species' gene pools.

Fragmentation is the process by which large, continuous habitats become broken up into smaller, more isolated habitat patches over time. This can result in declines in the number and diversity of individuals in an area and alter:

- community composition
- interactions between species
- ecosystem functioning

Species living in fragmented landscapes are also less able to move in order to adapt to changing climate conditions.

Assessing the degree to which habitats in Ontario are fragmented helps us better understand the health and potential resilience of species' populations.

How we monitor

To assess the degree to which terrestrial habitats in Ontario are fragmented, we use something called the "effective mesh size" to measure the size of habitat patches. This method was developed by a professor from Concordia University. It assesses the probability that two points chosen at random in a region will be connected (found in the same habitat patch). This probability is multiplied by the size of the region being assessed to determine the area of the effective mesh size in square kilometres. A high effective mesh size indicates:

- a low level of fragmentation
- good connectivity within that region

We have assessed the level of ecosystem fragmentation for each ecodistrict in the Mixedwood Plains ecozone of southern Ontario. An ecodistrict is defined by a characteristic set of geologic, topographic and climate features that influence the types of plants and animals that are found there.

To determine whether areas are connected, we assessed land cover information from the Southern Ontario Land Resource and Information System (SOLRIS v 3.0, OMNRF 2015). The following were considered to be barriers to movement:

- roads
- other infrastructure
- agricultural lands
- urban areas
- resource extraction areas

For the purposes of this analysis, all barriers were treated equally. However, for most species, the nature of the barrier placed in their path (volume of traffic, barrier width, animal exclusion fences, etc.) is important in determining whether they will move through an area.

Results

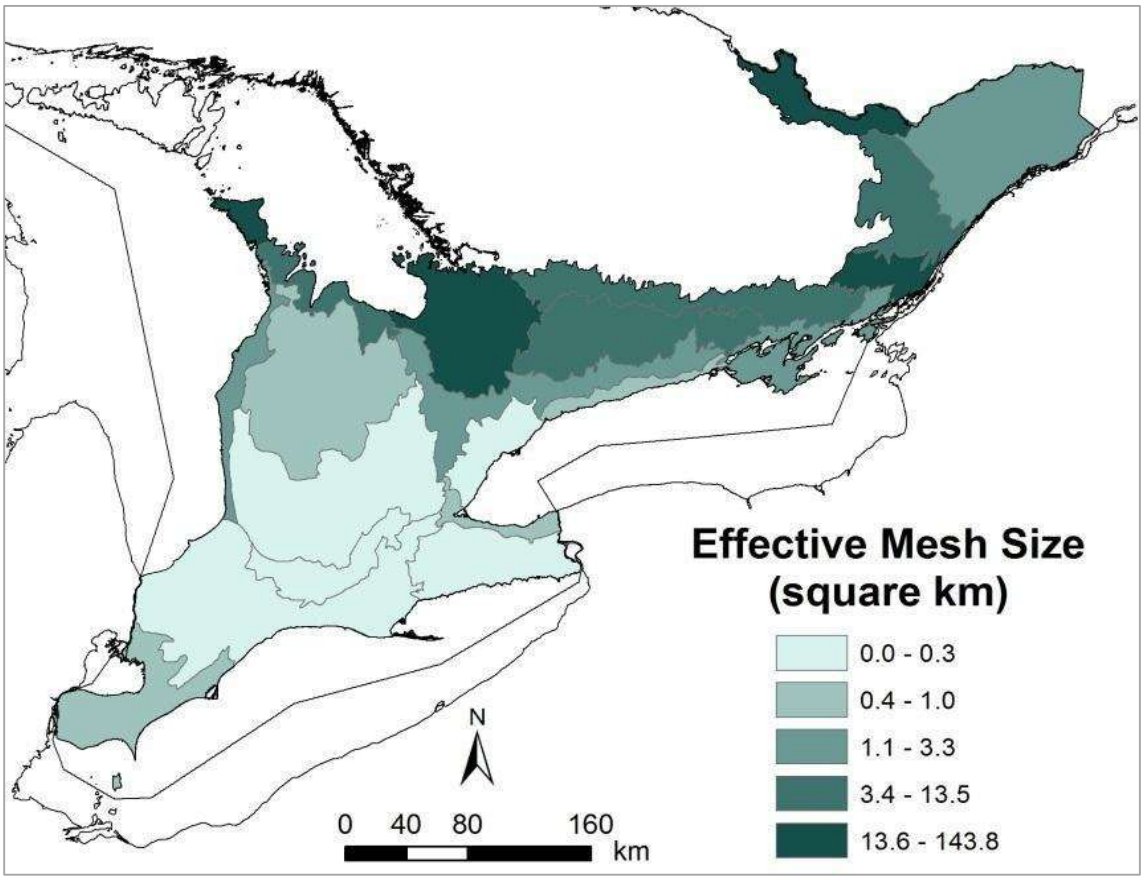
In 2015, the effective mesh size of southern Ontario's Mixedwood Plain ecozone ranged from a low of 0.03 square kilometres in Toronto ecodistrict to a high of 56 square kilometres in the Charleston Lake ecodistrict. This is similar to the 2011 results.

The average effective mesh size for the Mixedwood Plains Ecozone in 2015 was 7.4km². All seven ecodistricts in the southwestern portion of the Mixedwood Plains ecozone were less than the average value.

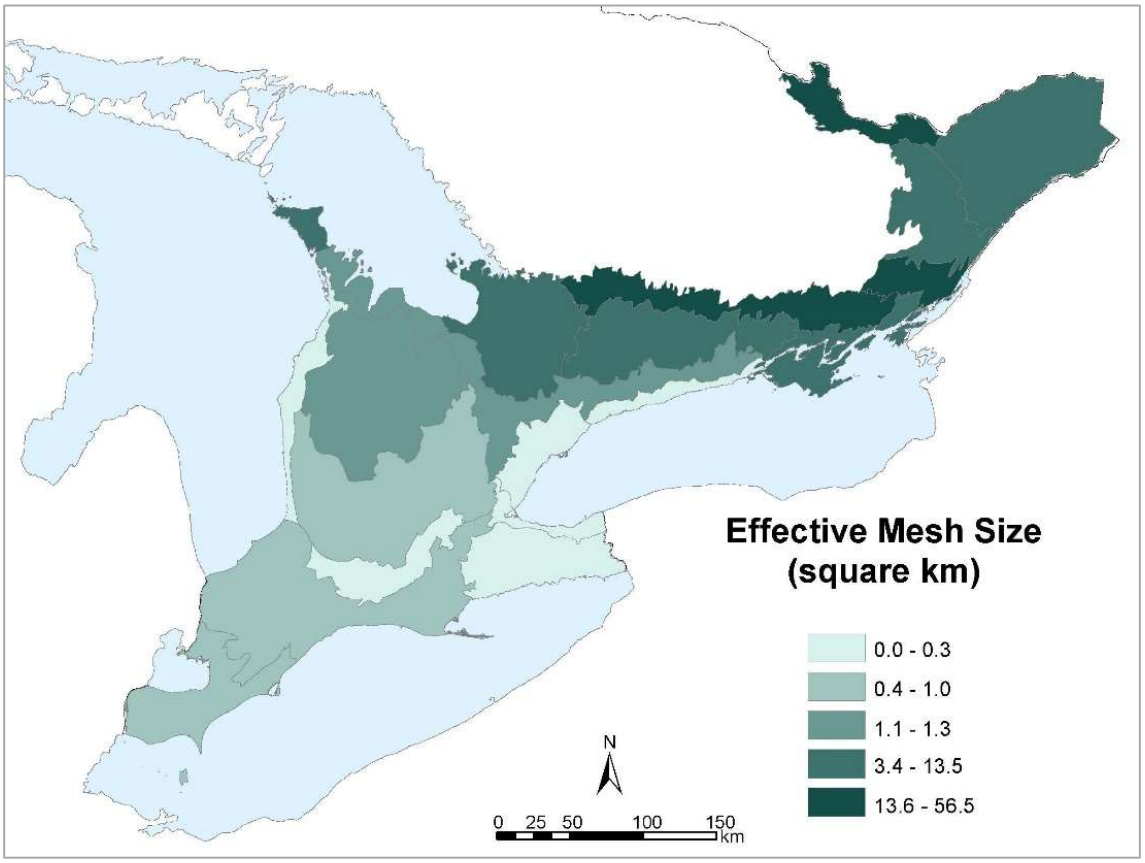
To report on this indicator, we rely on analysis of spatial data and examination of changes between time periods. Currently, this analysis doesn't allow us to directly determine the cause of changes; however, observed increases or decreases in effective mesh size can likely be attributed to both real changes in anthropogenic cover, along with improved data methodology. Because of this challenge, direct comparisons between 2011 and 2015 were not made.

Effective mesh size for ecodistricts in southern Ontario (2011)

The lower values (light coloured) indicate highly fragmented areas while higher values (dark coloured) indicate low fragmentation.



Effective mesh size for ecodistricts in southern Ontario (2015)



There is high degree of fragmentation in the Toronto area and along the Lake Huron area, as well as throughout most of southwestern Ontario. Lower levels of biodiversity may be expected in these areas and species not well-adapted to urban and agricultural areas will find it difficult to move between habitat patches and persevere, in these environments. In contrast, areas in eastern Ontario and in the central and northern parts of the area have much higher habitat connectivity.

Landscape fragmentation is most evident in intensively used and highly populated regions, where the habitat is divided by:

- urbanization
- agriculture
- roads
- other human developments

Indicator last updated

- June 2021

Data source(s)

- Southern Ontario Land Resource Information System (SOLRIS) Version 3

Natural forest disturbance

Description

This indicator report tracks the amount of forest affected by fire, insects and disease and extreme weather.

Status


Status: Good


Trend: Mixed


Geographic extent: Northern Ontario, Far North

Why it's important

A natural forest disturbance is when trees are killed or damaged from wildland fire, insects, disease, or weather. Natural disturbances occur throughout the life cycle of a forest.

Measuring the area of these disturbances allows us to estimate impacts on forest health and productivity.

How we monitor

Annual surveys under the forest health monitoring program determine the general area of insect, disease and weather related disturbance. Yearly fire data is collected by our wildland fire management program. We use information from the forest resources inventory to estimate volume losses.

Each year we monitor:

- the amount of area disturbed by insects, disease, weather, and wildland fire
- the number of, and area burned by wildland fires
- volume loss within management units

The area disturbed is the gross area within which disturbances occurred including all forest and ownership categories and all severities of disturbance.

Not all disturbances have the same effect. Tree mortality and volume loss vary depending on the type of disturbance and the type of forest where the disturbance occurs.

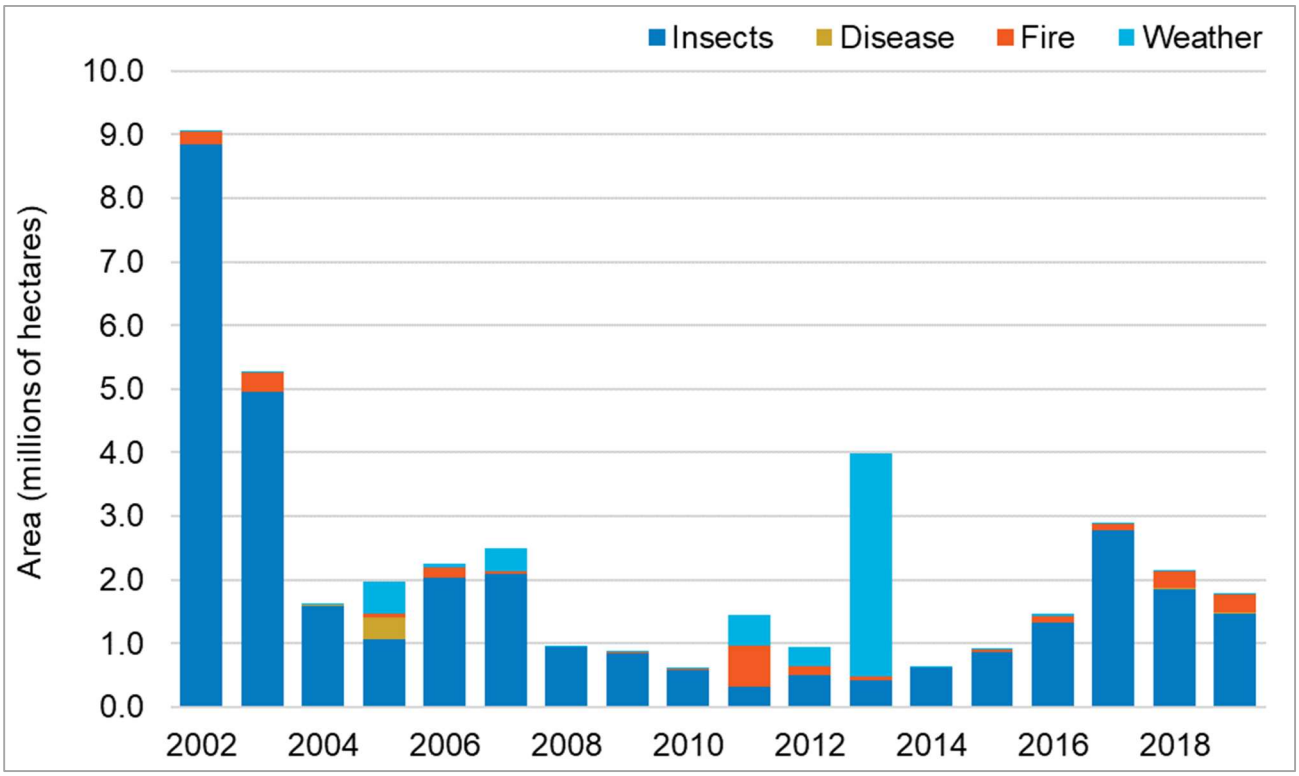
Wildland fire and extreme weather can destroy trees and cause higher tree mortality and volume loss. Insects and disease damage trees and reduce their growth, however, it may not result in significant mortality or volume loss. If insect or disease infestations recur over several years, it can affect tree survival. Wildland fires in areas with young forest or minimal forest cover result in low volume loss.

Most disturbances are a natural part of forest ecosystems, however non-native insects and diseases can be detrimental.

Results

The status is assessed as good as recent disturbance levels fall within ranges observed since 2002. Different types of disturbances affect large amounts of forest in some years and little in others. This variability creates a mixed trend.

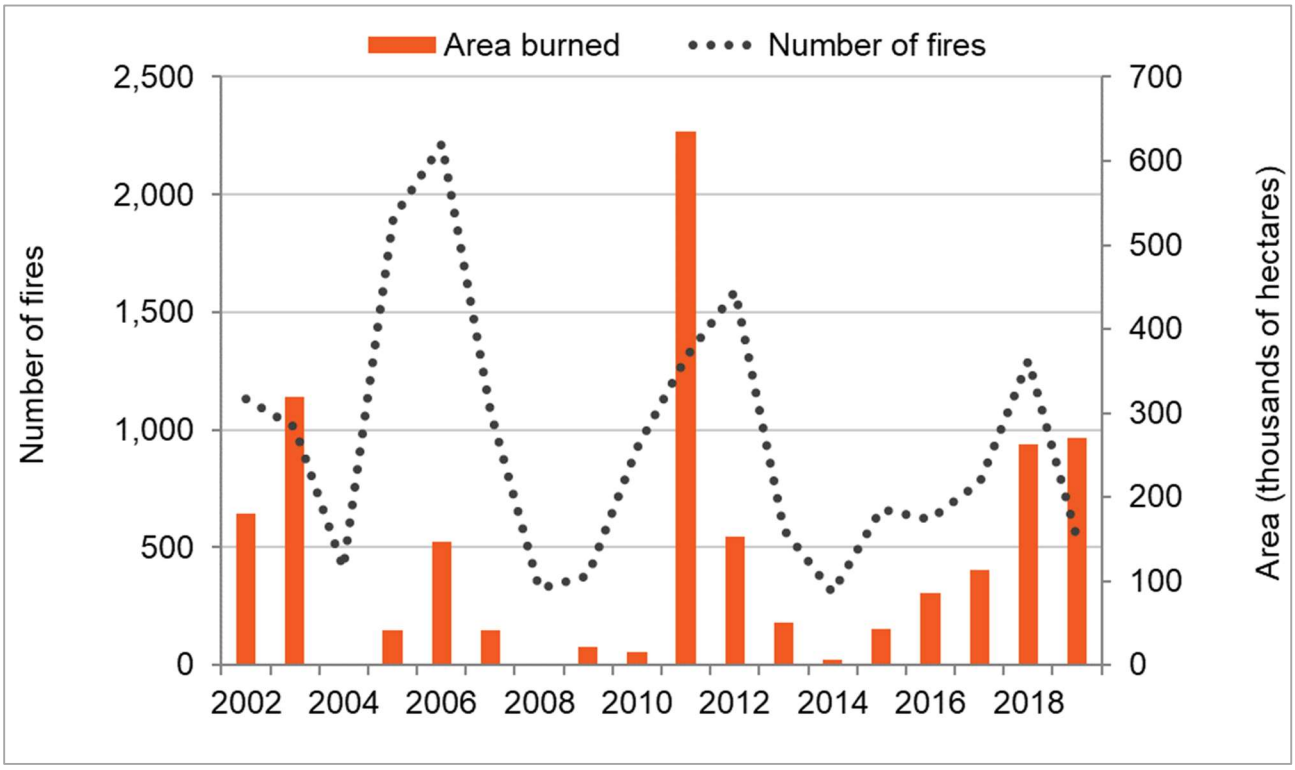
Area disturbed by insects and disease, weather and wildland fire



Insects continue to be the predominant type of natural forest disturbance. From 2015-2019:

- there was an increase in the area disturbed by insects; however, this is not unexpected given their naturally recurring cycles
- the overall area disturbed was 9.2 million hectares which is approximately 13% of the province's total forest area
- insect infestations included forest tent caterpillar at 5.2 million hectares, jack pine budworm at 1.7 million hectares, and spruce budworm at just under 900,000 hectares
- where tree mortality occurred within the Managed Forest, total volume losses were approximately 4.1 million cubic metres from all types of disturbance including 1 million cubic metres from these three insects
- weather, specifically snow damage, affected a significant area in 2013

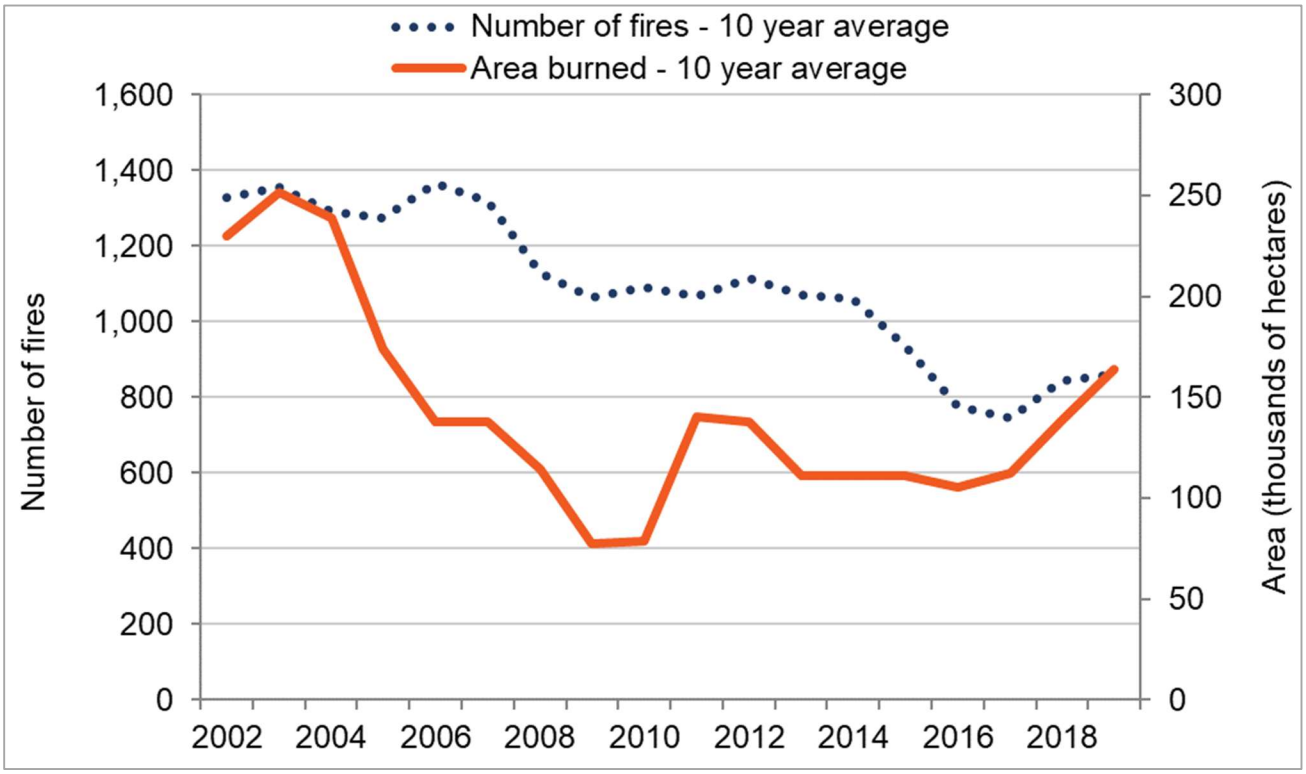
Area burned and number of fires



The number of wildland fires is highly variable from year to year. Between 2015 to 2019 there was a steady increase in the area of forest burned annually by wildfire:

- a total of 3,889 fires burned approximately 774,279 hectares
- the volume loss from wildland fire was approximately 2.3 million cubic metres

Number of fires and area burned 10-year average



Because the number and extent of wildland fires is highly variable year to year, a 10-year average is used to show a trend in the number of fires and area burned. Since 2002, this shows:

- an overall declining trend in the number of fires
- the area burned declined until 2011 when significant fires caused it to increase, then it was steady from 2013-17 before beginning to increase again in 2018

Although most fires occur within the Managed Forest, they account for only 19% per cent of the area burned. There are fewer fires in the Far North, however they account for 81% of the area burned.

In Ontario, forest management plans are updated every 10 years. Updates account for the impacts of natural disturbances and volume losses.

Many forests depend on periodic fires. Without wildland fires, forests can become more susceptible to disease and insect infestation. Ontario's wildland fire management program seeks to balance the ecological role of wildland fire in maintaining healthy forests with ensuring public safety and protecting infrastructure.

Every wildland fire is assessed to determine the appropriate response according to the circumstances and condition of the fire. Under this approach, wildland fires that occur in areas with a low density of values (e.g. communities and infrastructure) or resources, may receive a modified response and the fire may burn. This allows the fire to fulfill its role in a natural environment to renew the forest. However, if a wildland fire is an immediate threat to assets or resources, a full response may be needed to minimize damages and disruption.

Indicator last updated

- February 2021

Data source(s)

- spatial data from the Forest Health program and Ontario's wildland fire management program
- forest resources inventory to estimate volume in the Managed Forest

Growing season

Description

This climate change indicator report tracks changes in the start and duration of the growing season in different areas of the province.

Status


Status: Needs improvement


Status: Deteriorating


Geographic extent: Province-wide

Why it's important

The growing season is the part of each year when the weather and temperature allow plants and crops to grow successfully. The length of growing seasons varies across the province.

Longer growing seasons, because of changes in climate, allow trees and plants to be more productive, create new planting opportunities in our forestry and agricultural sectors and can benefit the health and success of ecosystems and species. However, changes in climate and growing season can also have negative impacts on productivity and survival. These include impacts from invasive species, drought, flooding or fire.

Changes in weather and temperature influence where plants and animals live and when they reproduce. For example, some southern-based species may move further north and plants

may flower earlier due to warmer temperatures. Important ecological interactions may also be affected. These include interactions between:

- predators and prey
- insects and host plants
- parasites and host insects
- insect pollinators and flowering plants

Increasing temperatures can cause the timing of important life cycle events to become out-of-sync and impact the survival and productivity of plants and wildlife.

Assessing changes in the growing season helps inform our understanding of how climate change is affecting our natural resources.

How we monitor

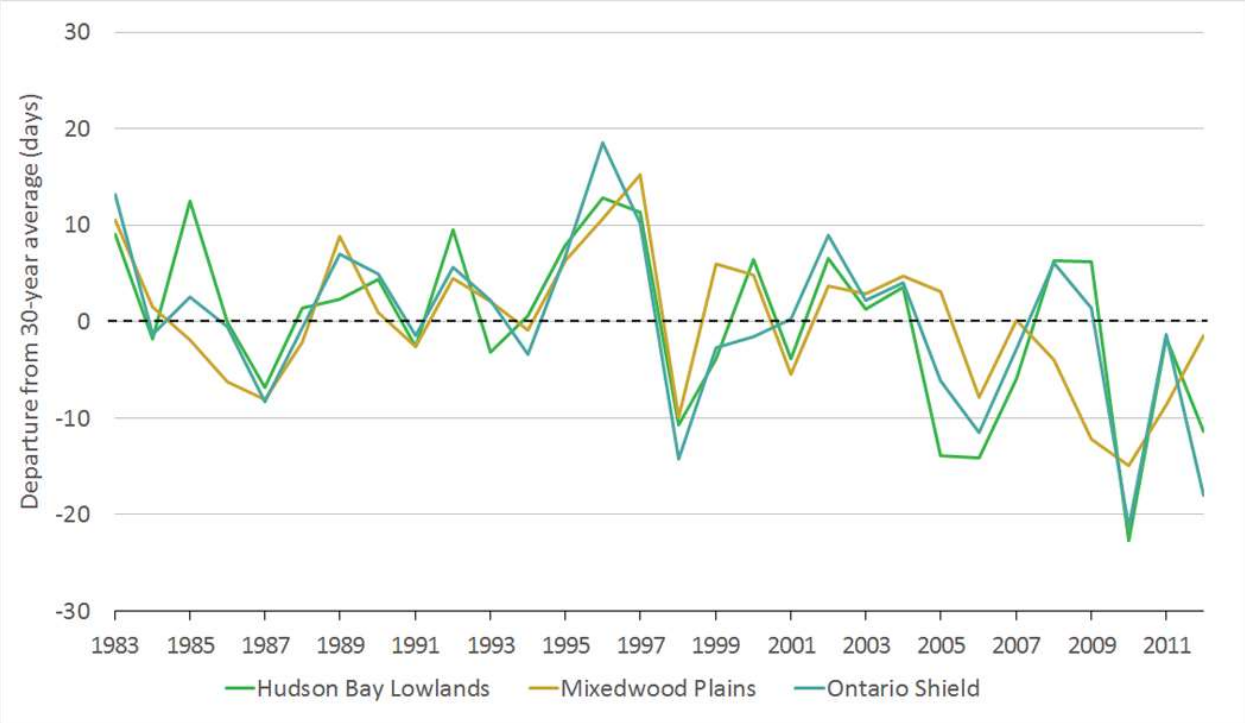
We examined trends in growing season in Ontario from 1983 to 2012 to assess impacts of climate change on the survival of plants and wildlife. We used satellite imagery to create a Normalized Differential Vegetation Index. This index measures the amount of greenness on the landscape and can be used to detect changes in when leaves first appear or plants flower. We use this information to determine the start and duration of the growing season for each of the terrestrial ecozones in Ontario.

Over the 30-year period examined, annual summaries were used to calculate average values for the start and duration of the growing season for each ecozone. We assessed the trend based on the differences between yearly estimates and the 30-year average.

Results

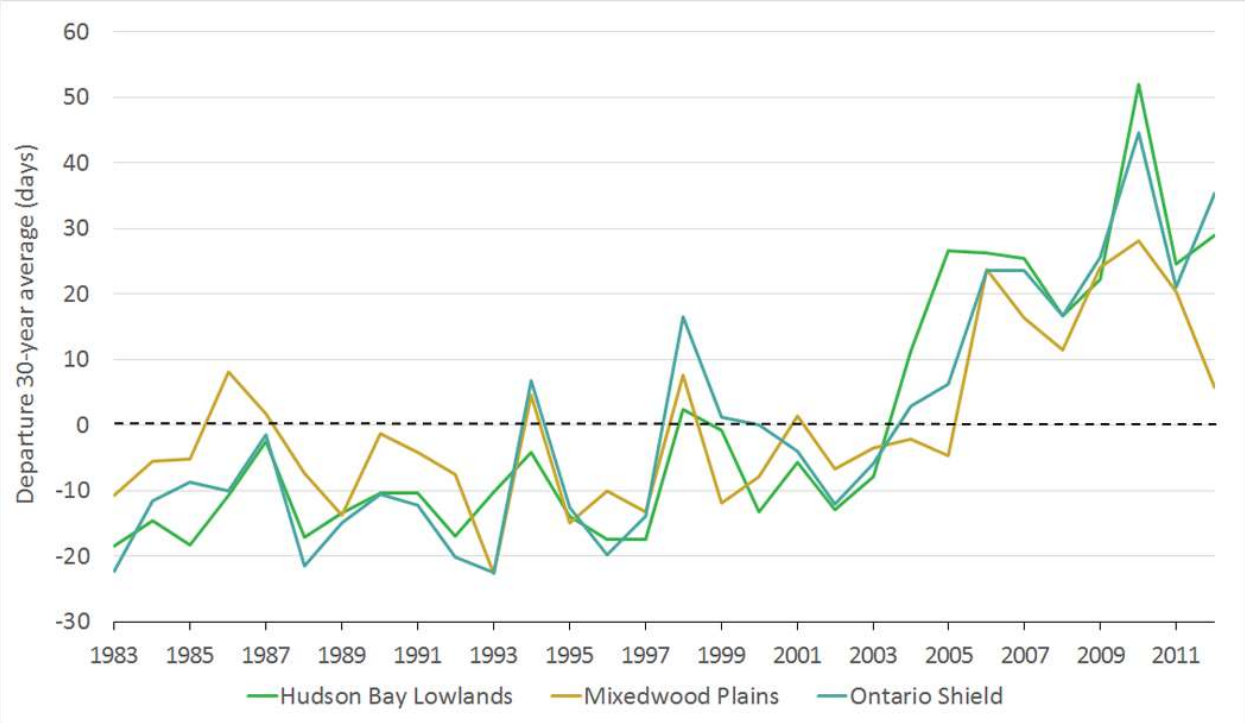
Throughout the province over the last decade, we saw an earlier start to the growing season and a longer growing season. These changes are associated with higher spring temperatures and increased growing degree days. Growing degree days are a weather-based indicator to help estimate the growth and development of plants during the growing season and indicate which plants or trees will grow best in a specific area.

Change in the start of the growing season for each ecozone (1983 to 2012)



Earlier starts to growing seasons may create timing conflicts between plant food availability and animal activity. If these become out of sync, the productivity and survival of plants and animals may be threatened.

Change in the duration of the growing season for each ecozone (1983 to 2012)



Longer growing seasons can have positive or negative effects. Increased forest productivity is possible, but earlier growth in the spring has the potential to cause frost and ice damage to trees. A longer growing season could also lead to longer fire or forest pest seasons.

Indicator last updated

- June 2019

Data source(s)

- USGS – remote sensing phenology

Ice cover

Description

This climate change indicator report tracks changes in ice cover on the Great Lakes.

Status


Status: Needs Improvement


Trend: Deteriorating


Geographic extent: Great Lakes

Why it's important

Lake ecosystems are vital resources for humans and fish and wildlife. Lake ecosystems in Ontario are being affected by increases in greenhouse gases from human activities.

Ice cover is a measure of the proportion of the lake surface that is covered in ice. Climate change is affecting when lakes freeze and how long they stay frozen, with a trend towards later freeze-up and earlier break-ups than historical averages.

Changes in ice cover on the Great Lakes can:

- change the food supply for aquatic life
- alter fish behaviours and spawning timing
- cause birds to change migration patterns
- affect lake water temperatures
- erode coast lines due to waves from winter storms

These impacts are likely to increase in the future.

Assessing ice cover on the Great Lakes helps us understand how climate change is affecting our natural resources. This indicator assesses trends in ice cover on the Great Lakes to understand the impacts of climate change on water resources and aquatic ecosystems.

How we monitor

Ice cover on the Great Lakes is assessed collectively and by individual lake.

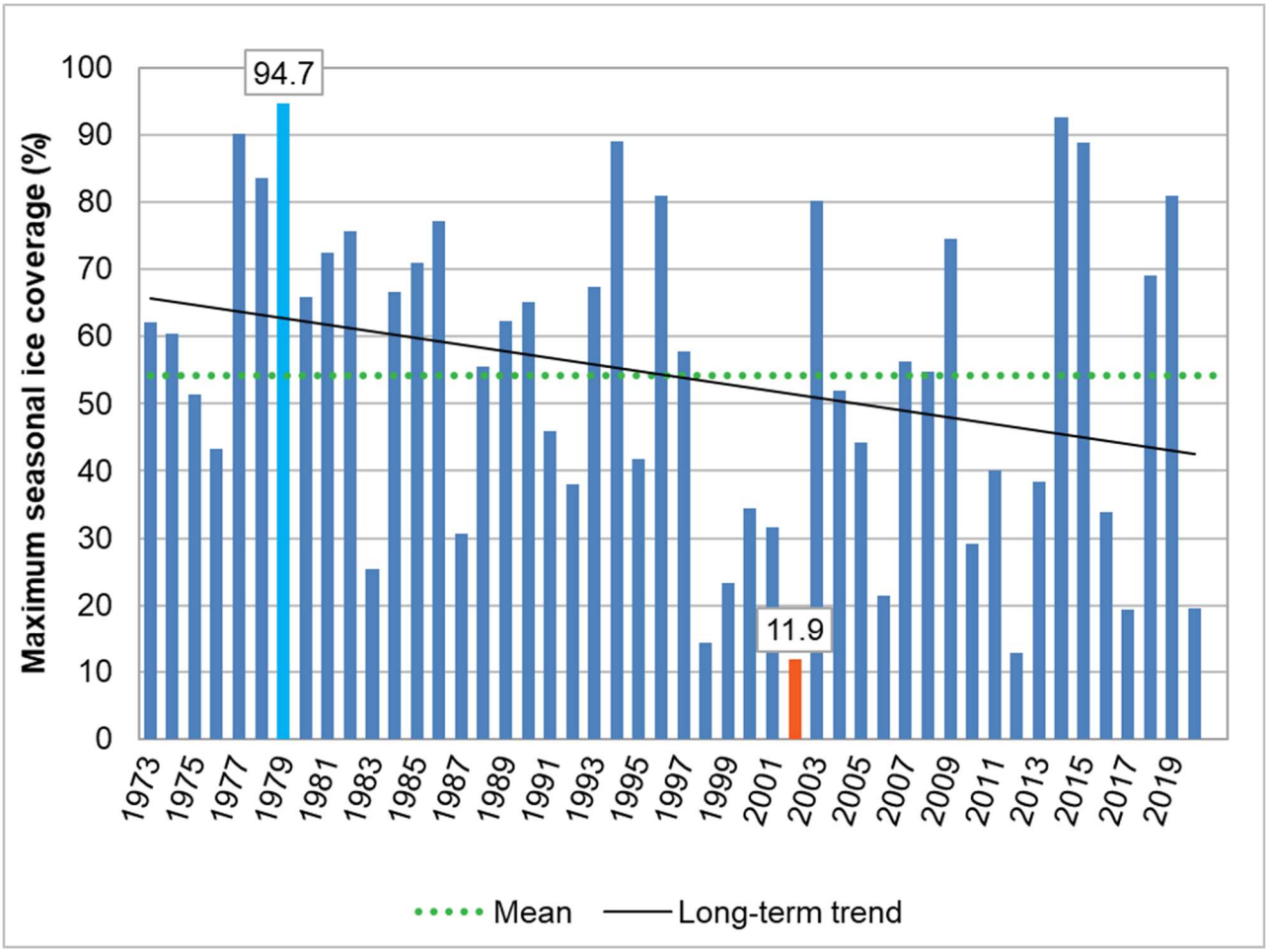
We use information on observed changes in the seasonal maximum ice cover for the Great Lakes. The data comes from the National Oceanic and Atmospheric Administration/ Great Lakes Environmental Research Laboratory which has been monitoring and documenting Great Lakes ice cover since the early 1970s using ice products (i.e. bulletins, charts, images, etc.) developed by the US National Ice Centre and the Canadian Ice Service. This database includes annual maximum ice cover average for all the Great Lakes as well as each individual Great Lake.

The average maximum ice coverage was calculated for each ten-year period (or portion of) between 1972/73 and 2020 (note: the average for the first time period only includes data starting from the 1972/73 season—which represents the first year data was available). The per cent change in average maximum ice coverage from 1972/73 to 2020 was also calculated for each lake.

Results

Seasonal maximum ice cover on the Great Lakes (1973 to 2020)

Between 1973 and 2020, overall ice coverage for the Great Lakes declined, despite some variation from year to year. The maximum ice cover was greatest in 1979, at 94.7 per cent and lowest in 2002 at 11.9 per cent.



Mean maximum ice coverage by Great Lake (1970 to 2015)

Between 1970 and 2020, the average maximum ice cover declined most on lakes Superior (33 per cent) and Ontario (32 per cent), followed by lakes Erie (25 per cent), Michigan (22 per cent) and Huron (17 per cent).

Lake	1971-1980	1981-1990	1991-2000	2001-2010	2011-2020	% Change (1973-2020)
Erie	94.1	86.4	78.0	79.0	70.3	-25.3
Huron	74.2	71.1	59.9	57.7	61.9	-16.5
Michigan	51.9	39.6	36.2	31.8	40.4	-22.1
Ontario	42.3	30.8	24.9	23.5	29.0	-31.5
Superior	75.3	69.3	60.5	51.5	50.3	-33.2

Lake Superior has experienced the highest decline in maximum lake ice coverage due to its size. The less ice cover there is on a lake, the more radiation from the sun can be absorbed in the water. The heat from this radiation further reduces the ice cover, resulting in a positive feedback loop. The size of this effect is greater for larger lakes.

Long-term trend shows that between 1973-2020 the mean maximum ice cover continues to decline for all the Great Lakes, and on average is 20% lower than it was almost 50 years ago.

Comparing changes in ice cover and thermal properties of the Great Lakes also reveals the impacts of climate change on seasonal and multi-year lake temperature and related physical changes to lakes.

Indicator last updated

- June 2019

Data source(s)

- National Oceanic and Atmospheric Administration – Great Lakes Ice Cover
- Canadian Ice Service

Forest carbon

Description

This indicator estimates the carbon stored in forests and wood products

Status


Status: Good


Trend: Improving


Extent: Province-wide

Why it's important

Forests and wood products contain carbon. Much of this carbon is stored and kept out of the atmosphere, helping to reduce the effects of climate change. In the long term, maintaining or increasing the amount of carbon stored in forests and in wood products can provide for important greenhouse gas emission mitigation benefits while also maintaining other environmental, social and economic services.

How we monitor

Forest carbon can be estimated using parameters like forest age, tree species, dead organic matter, soils and conversion into wood products. The amount of carbon stored in forests and wood products is called a carbon stock.

We estimate carbon stocks in productive forests in Ontario, including the Managed Forest, private forests, forests in large parks and productive forests north of the Managed Forest (northern productive forests).

Confidence in forest carbon estimates is greatest for the Managed Forest due to the availability of data and information to support forest carbon analyses. Less data is available for other forest areas in Ontario (e.g., forests on private land, in parks, and northern productive forests), resulting in greater estimate uncertainty. As data and methods are refined over time, estimates are revised.

We assess how the Managed Forest and wood products from the Managed Forest may help keep more carbon out of the atmosphere during 2020-2100 using two measures:

- projected carbon stocks for each decade, and
- projected change in carbon stocks per decade (a rate that tracks how forest carbon changes through time)

Projections of carbon stocks in the Managed Forest and in wood products from the Managed Forest are estimated using the Ontario forest carbon budget model FORCARB-ON2 (Chen *et al.* 2018). Projected estimates are based on simulations of future forest condition documented in approved forest management plans and calculated using historical harvest rates.

Wood product carbon stocks are projected using Life Cycle Analysis. Since our 2016 report, we have extended our analysis and reporting to include the following components:

- carbon stocks in wood products in use and in landfills
- energy and emissions from manufacturing these products
- emissions from decomposition of wood products in landfills
- substitution of non-wood products with wood products

Estimates of emission reductions from substituting wood products for more emission-intensive materials in construction are presented as potential substitution benefits, separately, from estimates of net carbon stocks for all other wood product components.

Results

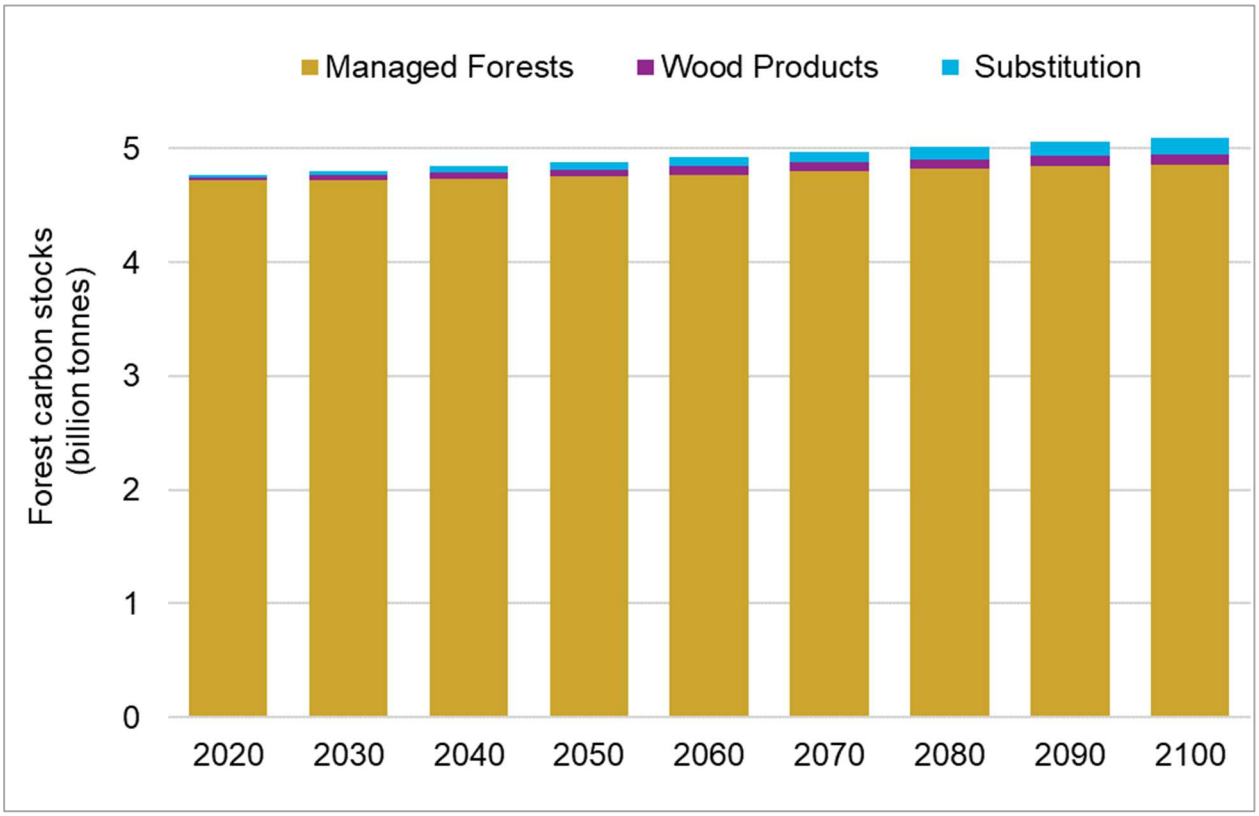
The status of the forest carbon indicator is good, as our Managed Forest carbon stocks are projected to be maintained or increase during the 21st century, helping to reduce the effects of climate change. Since our 2016 report, projected Managed Forest carbon stocks have increased, in part due to updated information and methodologies. As Managed Forest carbon stocks are predicted to grow during most of 2020-2100, the overall trend was rated as improving.

2020 Productive forest carbon stocks in Ontario

Metric	Total Productive Forest	Managed Forests	Northern Productive Forest	Private Land	Large Parks
Area (million hectares)	44.7	29.4	8.3	5.3	1.7
Carbon stocks (million tonnes)	7,229	4,719	1,376	857	277

In 2020, productive forests in Ontario stored an estimated 7.2 billion tonnes of carbon and Managed Forests stored the largest portion at 4.7 billion tonnes of carbon. Wood products from the Managed Forest stored an additional 25.5 million tonnes of carbon, while substitution was estimated to account for 19.3 million tonnes of carbon.

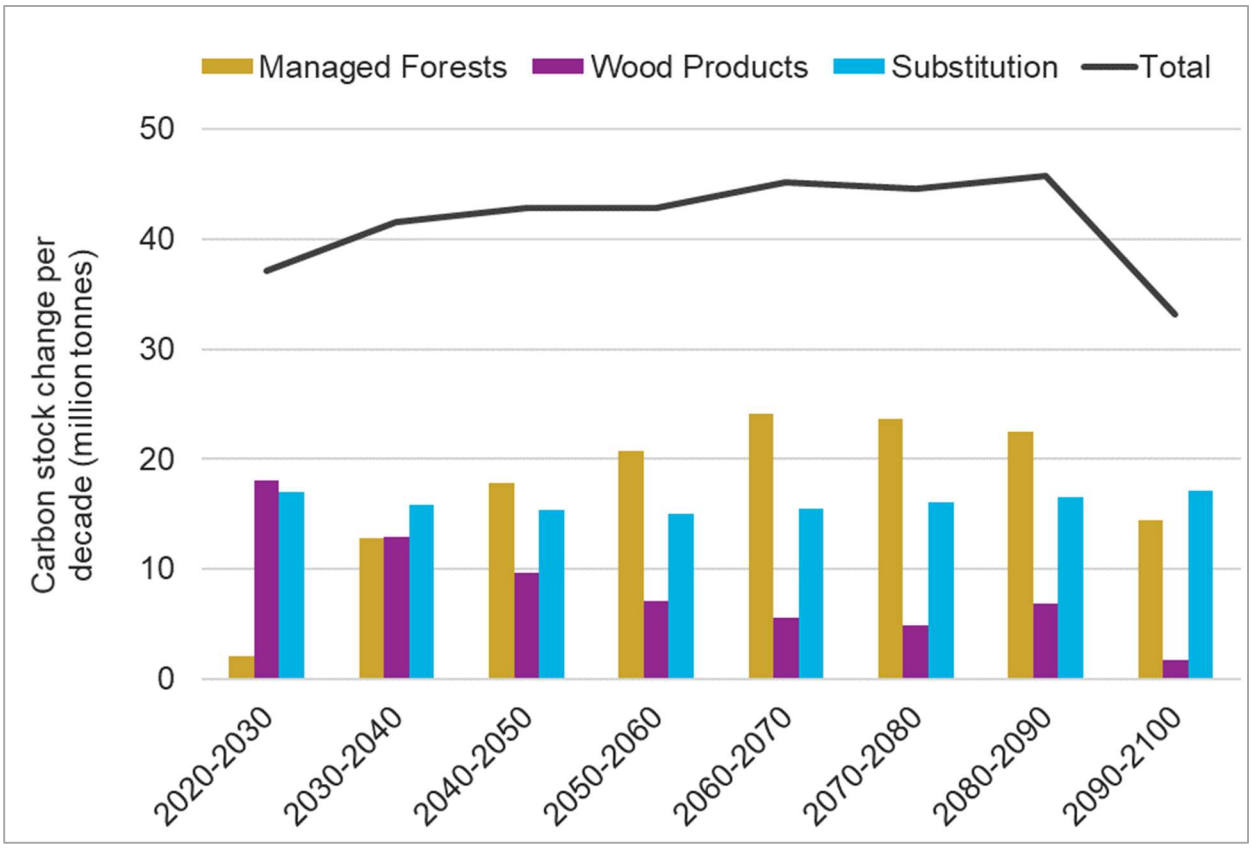
Projected carbon stocks in forests and wood products



For the period 2020-2100, predicted carbon stocks increase by 138 million tonnes in Managed Forests and by 67 million tonnes of carbon in wood products from the Managed Forest. Wood product substitution for more emission-intensive construction materials, if realized, can provide greenhouse gas emission mitigation benefits up to 128 million tonnes of carbon.

Combined, these estimates suggest that the Managed Forest in Ontario could contribute up to an average 4.1 million tonnes of carbon per year toward emissions reductions, if historical harvest rates and historical trends in wood product use and manufacturing continue over the next 80 years.

Projected changes in forest carbon stocks per decade



Managed Forests are predicted to store more carbon per decade during most of the current century due to changes in natural factors and forest management. For example, Managed Forest carbon stocks are predicted to increase by 2.1 million tonnes during 2020-2030 and then by 12.8 million tonnes during 2030-2040. Total carbon stocks for forests and wood products from the Managed Forest are predicted to grow by 33 to 48 million tonnes of carbon per decade.

Fluctuations in forest carbon are expected given the dynamic nature of forests and forest management. Over the next 80 years, Ontario's Managed Forest is predicted to store more carbon in forests and wood products, keeping carbon out of the atmosphere and helping to reduce the effects of climate change.

Indicator last updated

- February 2021

Data source(s)

- 41 Forest Management Plans; 10-year plan start ranges from 2005-2013

Water Quality

Description

Although the Ministry of Environment, Conservation and Parks (MECP) monitors and manages water quality in the streams, rivers, and lakes of Ontario, this indicator tracks and reports on specific water quality parameters that affect biodiversity and fisheries resources that are managed by the Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF) in Ontario.

Status


Status: Fair


Trend: Undetermined


Geographic extent: Province-wide

Why it's important

Lakes, rivers and streams have an important role in sustaining fisheries and biodiversity. Many aquatic species like fish, birds, amphibians and invertebrates depend on freshwater at some point in their life-cycle. Preserving the quality of our water will ensure aquatic ecosystems will provide habitat for species like fish to survive, grow and reproduce and provide environmental, cultural, social and economic benefits, like fishing into the future.

The water chemistry of aquatic systems reflects conditions in the climate, geology, water flows and surrounding landscapes. Pollution alters the water quality of lakes and streams, sources of pollution include:

- industrial waste and storm water from urban settlement
- run off from agricultural and urban areas
- airborne pollution deposits

Polluted water can negatively affect the occurrence, abundance and health of species dependent on aquatic ecosystems.

How we monitor

We assess different chemical characteristics of water that are known to have a strong influence on aquatic biodiversity in lakes and streams.

Levels of chloride, nitrates and phosphorus are measured in streams. In lakes, we measure phosphorus, calcium and pH. We compare our measurements to known thresholds (levels) that can have impacts on aquatic life.

Water quality measures

Measure	Thresholds	Where measured
Chloride	• Concentrations greater than 120 mg chloride ions in one litre of freshwater are toxic to aquatic life.	Streams
Nitrates	• Excessive concentrations of greater than 3.0 mg of nitrate ions in one litre of freshwater can be toxic to aquatic life and can promote algal blooms.	Streams
Total Phosphorus	• Concentrations less than 0.03 milligrams of phosphorus per litre measured in streams prevent excessive algae and plant growth. • Excessive levels can lead to algal blooms and excessive plant growth that reduces oxygen levels in lakes. Generally avoided when levels are below 20 micrograms per litre.	Streams and lakes
pH	• Acidic water below pH 6.5 and basic water above 8.5 can cause problems for aquatic life.	Lakes

Measure	Thresholds	Where measured
Calcium	• Low levels (less than 1.5 milligrams per litre) can cause problems for small planktonic crustaceans and affect the food chain. • Concentrations of 0.5 milligrams per litre and between 1 and 2.5 milligrams per litre are the survival thresholds for daphniids and crayfish, respectively. • Calcium rich lakes (greater than 20 milligrams per litre) with high pH (greater than 7.4) are also most vulnerable to invasion by Zebra Mussel.	Lakes

Water quality results for streams came from the Provincial Water Quality Monitoring Network (PWQMN) over two five-year periods (2003 to 2007 and 2008 to 2012). This data was collected in partnership with Ontario conservation authorities and municipalities and managed by MECP. Water samples from inland lakes were collected as part of our Provincial fisheries monitoring program over two five-year periods (2008-2012 and 2013-2017) through our Broad-scale Monitoring Program for Inland Lakes.

Results were also assessed by ecozone. Ecozones are very large areas defined by a distinctive type of bedrock. The three ecozones in Ontario are the Mixedwood Plains (southern Ontario), Ontario Shield (central and northern Ontario) and Hudson Bay Lowlands (Far North).

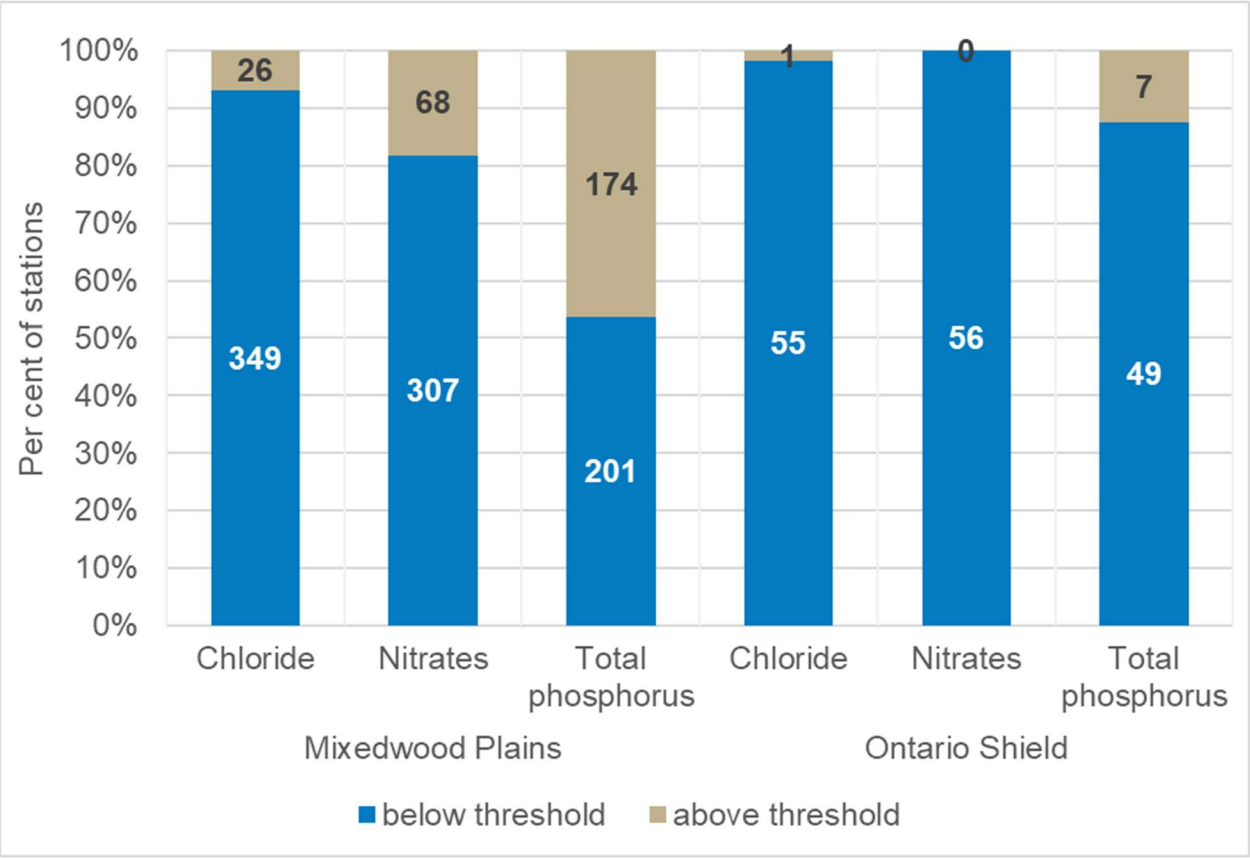
Results

Streams

Water quality in streams in the Ontario Shield ecozone was consistently better than in the Mixedwood Plains ecozone where land is used more for urban and agricultural purposes.

Proportion of water quality stations above thresholds for Ontario streams by ecozone (2008 to 2012)

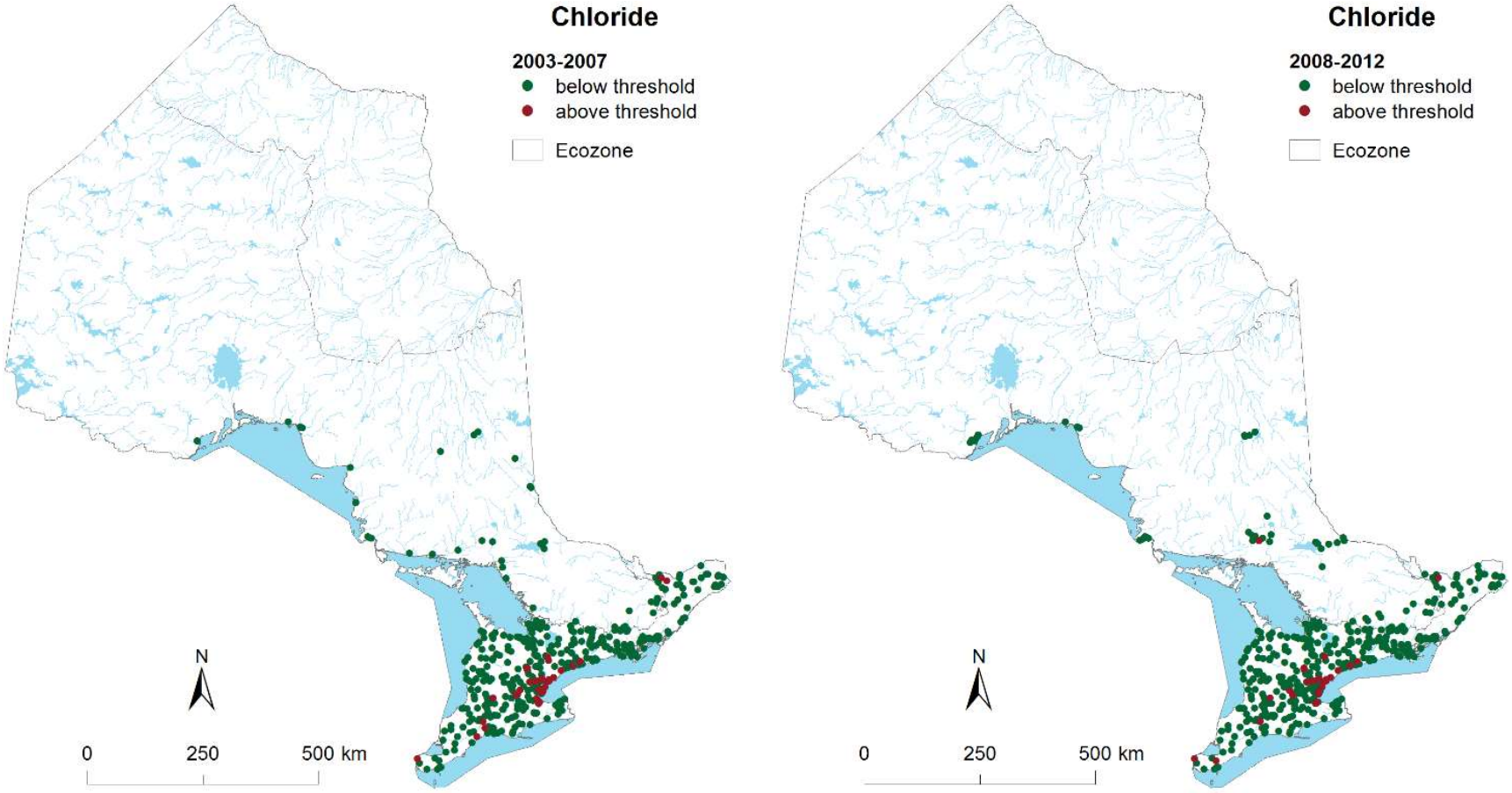
Numbers on bars are the number of stations below or above each threshold.



Chloride

High chloride levels in streams can result from the use of de-icing salts and dust suppressants on roads and parking lots. Median chloride levels were below thresholds at more than 90 per cent of stream stations during both time periods and there was a small decrease between time periods. Most stations with chloride levels above long-term exposure thresholds are in or adjacent to urban areas.

Assessment of chloride levels against thresholds for supporting aquatic life for Ontario streams



Nitrogen and phosphorus

Nitrogen and phosphorus are natural parts of aquatic ecosystems that support the growth of algae and aquatic plants, which provide food and habitat for fish and smaller organisms. Too many nutrients in the water cause algae and aquatic plants to grow unchecked and results in:

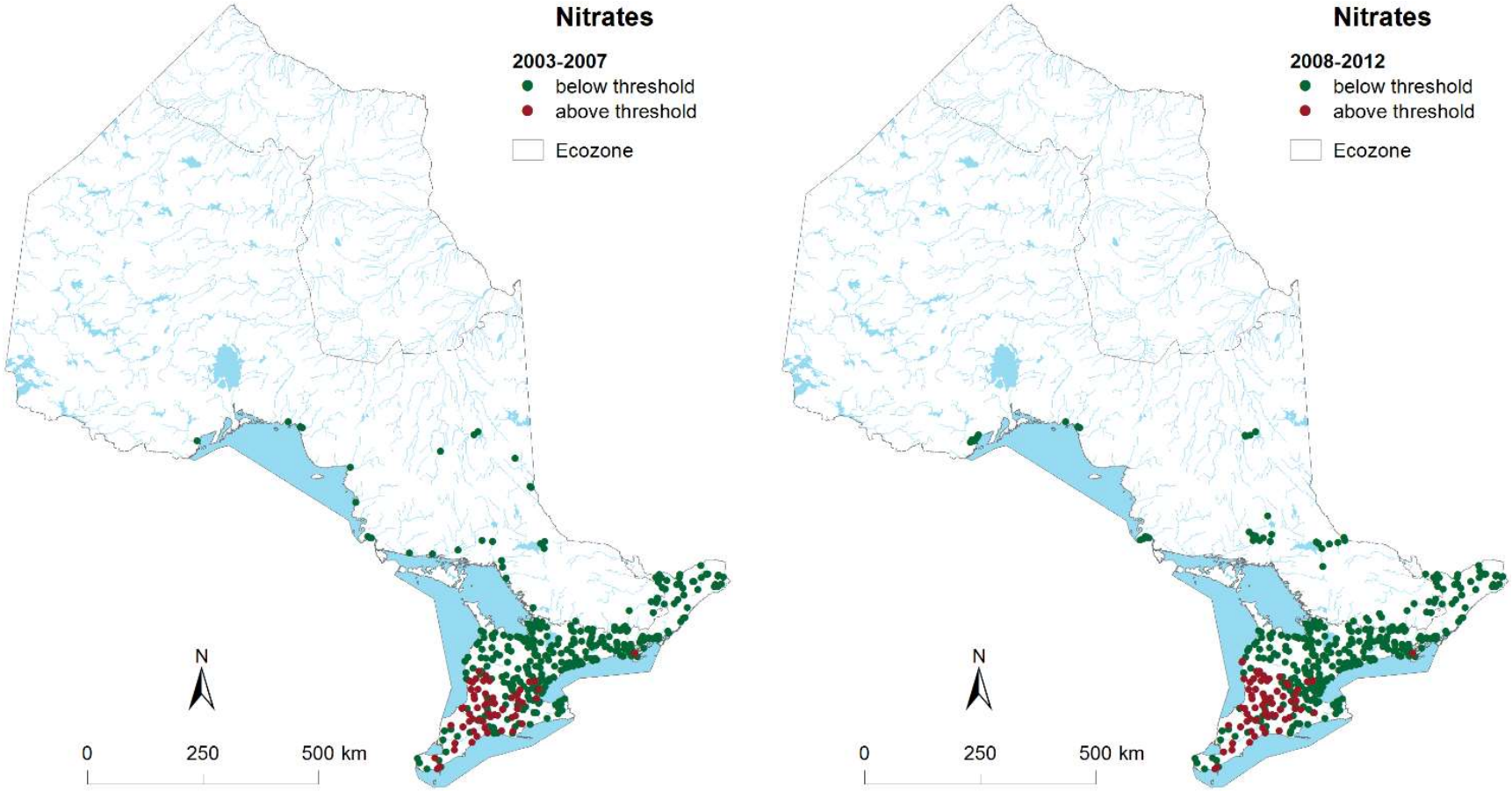
- harm to water quality, food resources, and habitats
- the decomposition of an abundance of algae and aquatic plants absorbs oxygen from the water that fish and other aquatic life need to survive especially species such as Lake Trout and Lake Whitefish that inhabit deeper habitats in lakes

Too much nitrogen in streams can be caused by industrial and municipal wastewater and urban and agricultural runoff.

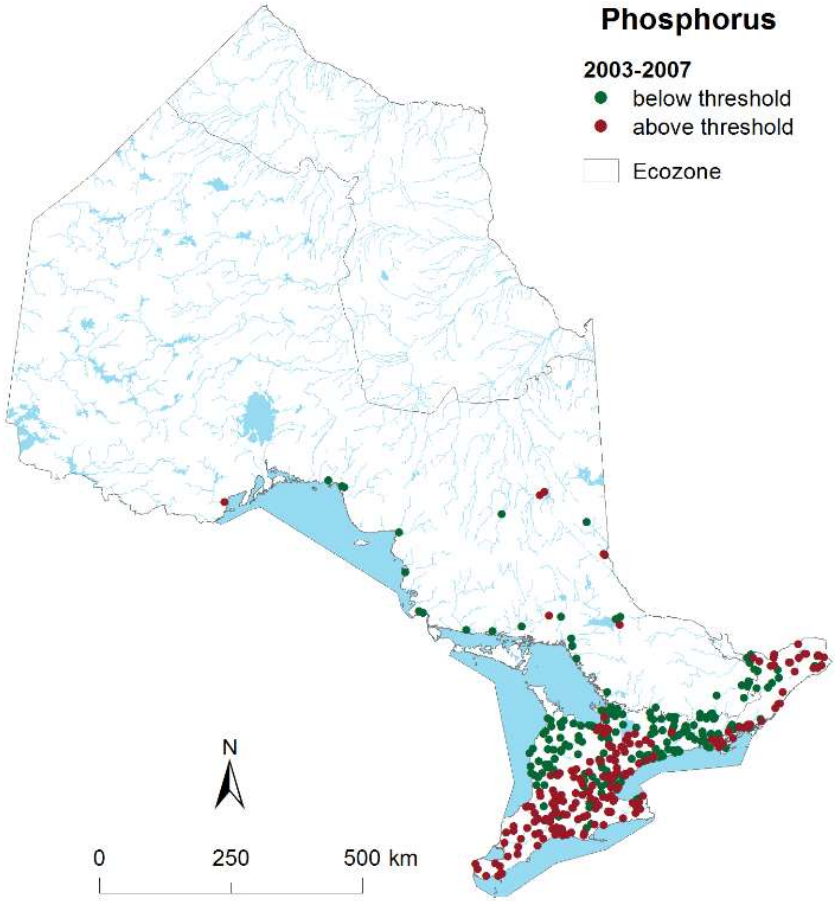
Median nitrate levels were above thresholds at 15 to 16 per cent of stations with a slight increase between time periods. Stations above threshold levels are concentrated in southwestern Ontario.

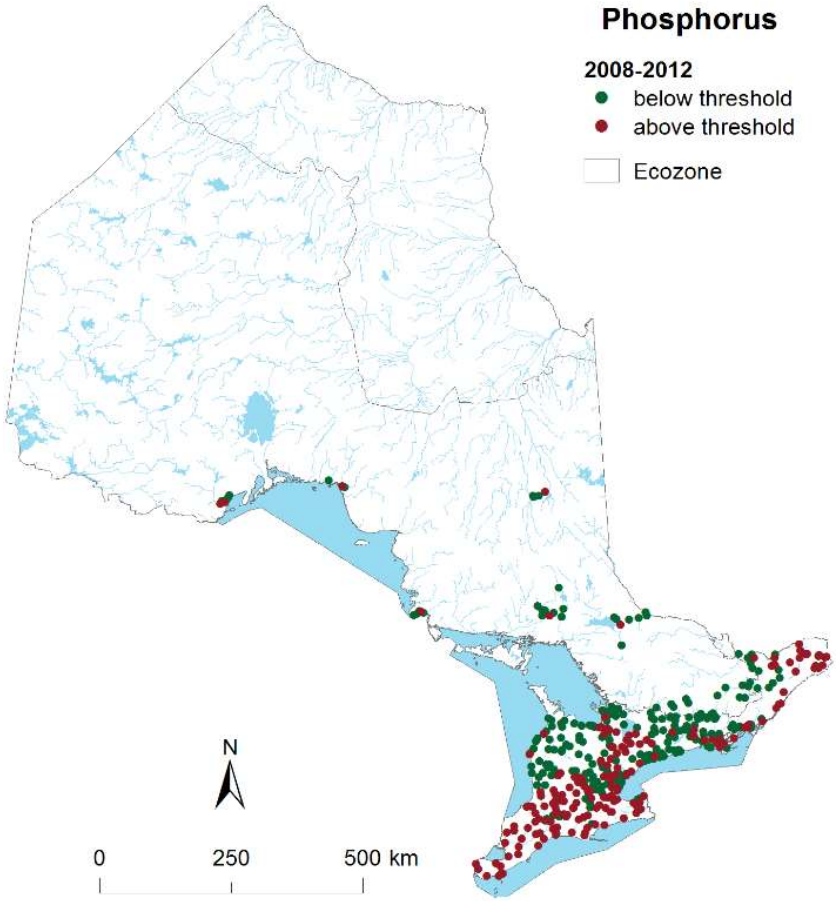
Median total phosphorus levels were above thresholds at almost half of stations (42 to 47 per cent) with a slight decrease between time periods. Stations with excessive phosphorus were distributed across the sampled area.

Assessment of nitrate levels against thresholds for supporting aquatic life for Ontario streams



Assessment of total phosphorus levels against thresholds for supporting aquatic life for Ontario streams



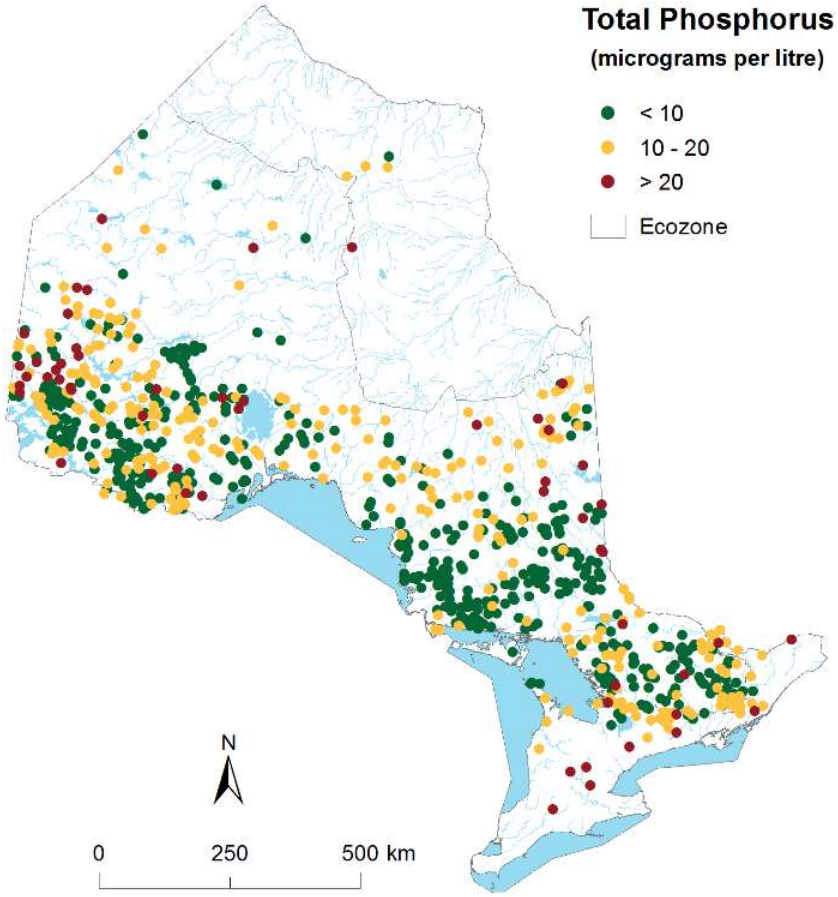


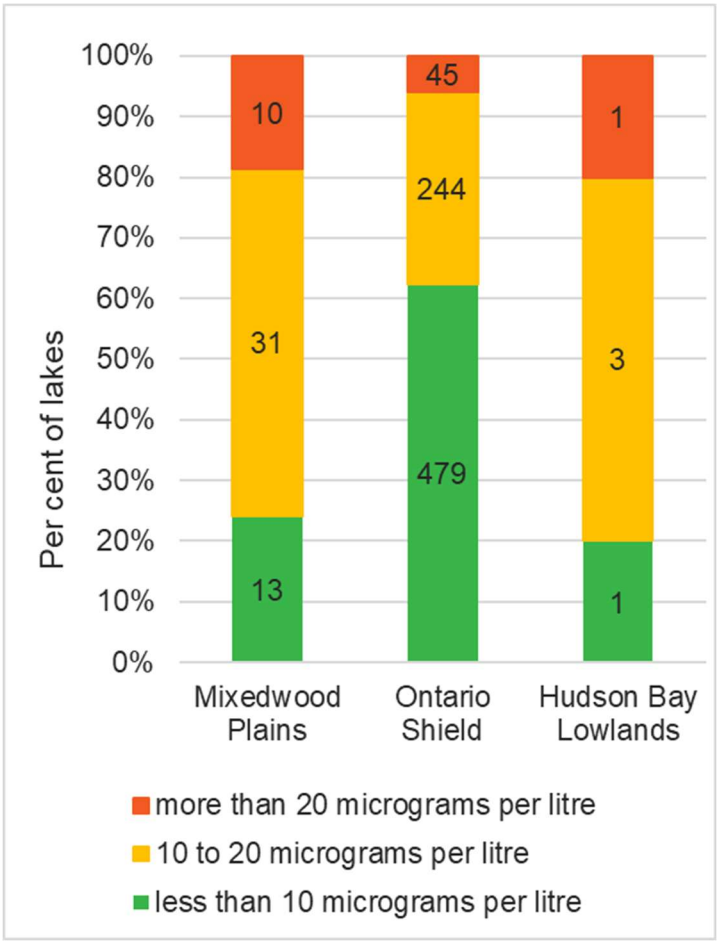
Lakes

Phosphorus

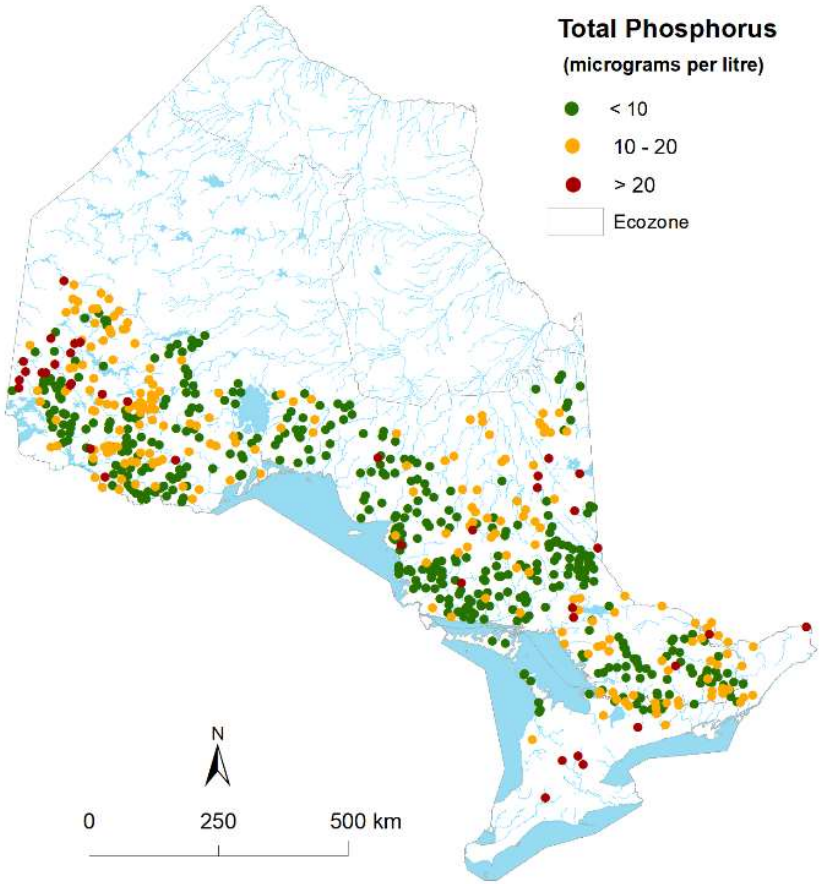
More than 90 per cent of lakes that we sampled had total phosphorus levels below 20 micrograms per litre, indicating that there is an acceptable level of nutrients. The majority of lakes sampled between 2008 and 2012 in the Ontario Shield ecozone (62 per cent) have low levels of total phosphorus (less than 10 micrograms per litre). Between 2013 and 2017, 64 per cent had less than 10 micrograms per litre, which indicated that there was no significant change in phosphorus concentration.

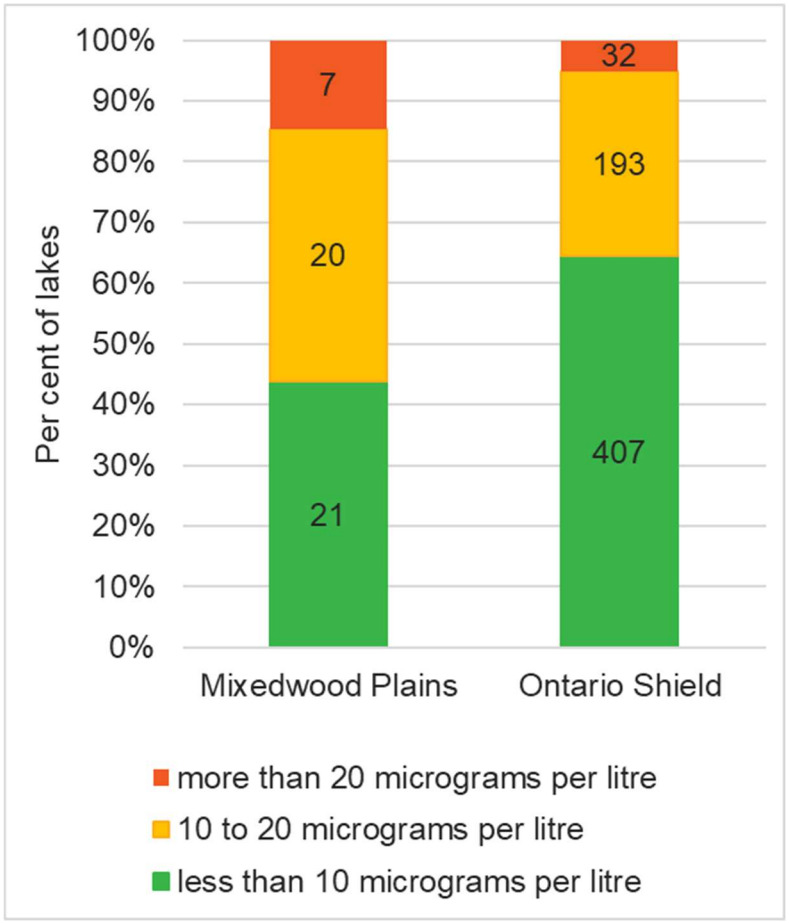
Assessment of total phosphorus levels in Ontario lakes from 2008 to 2012





Assessment of total phosphorus levels in Ontario lakes from 2013 to 2017

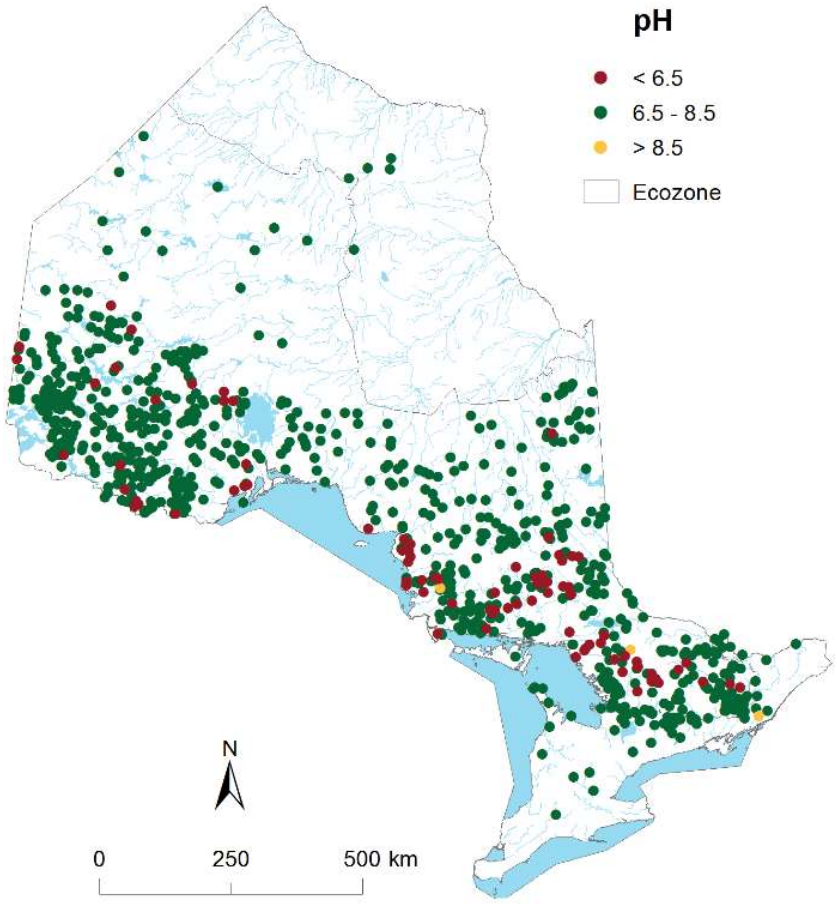


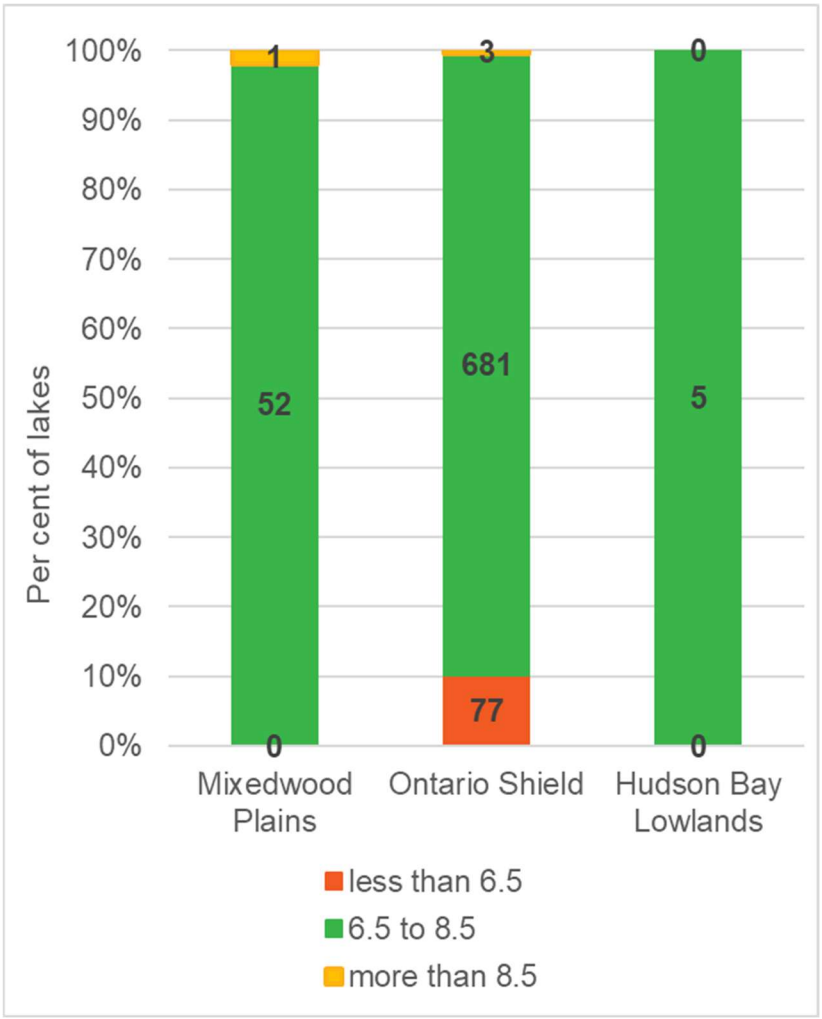


pH level

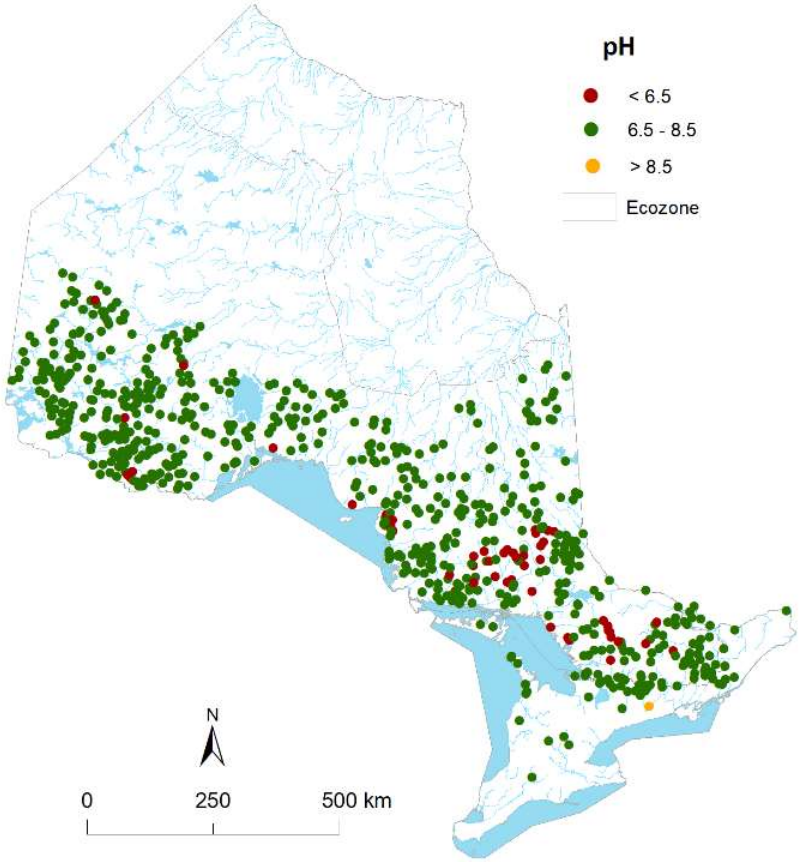
pH levels can be affected by industrial waste and runoff or acid rain. More than 90 per cent of sampled lakes had pH values within the 6.5 to 8.5 range recommended for the protection of aquatic life. All lakes with an acidic pH (less than 6.5) are found in the Ontario Shield ecozone. The lakes sampled between 2013 and 2017, showed the same pattern; most lakes had pH ranging from 6.5 to 8.5 with some on the Shield having pH values less than 6.5.

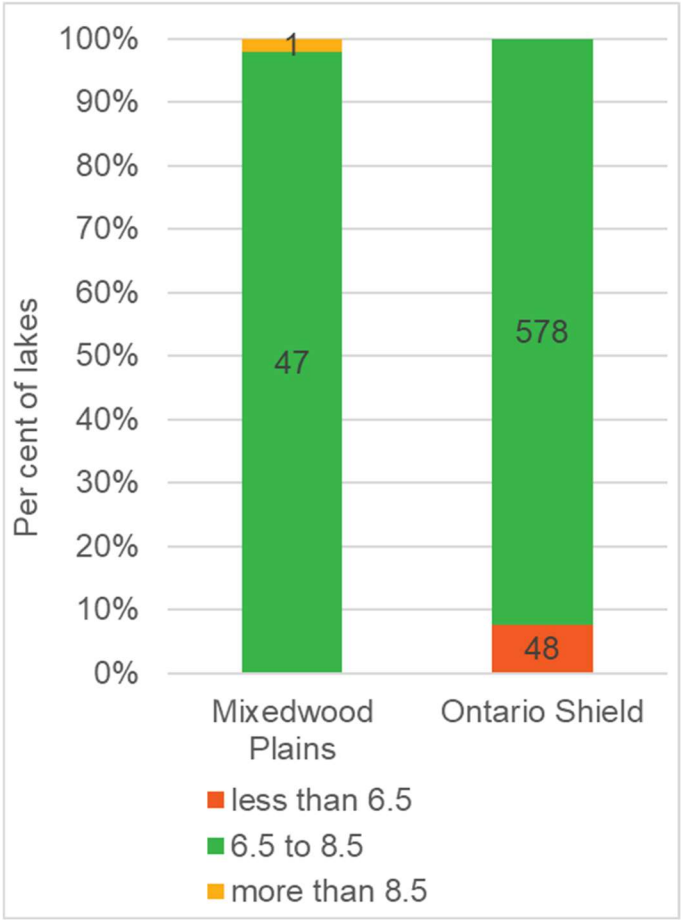
Assessment of pH levels in Ontario lakes from 2008 to 2012





Assessment of pH levels in Ontario lakes from 2013 to 2017



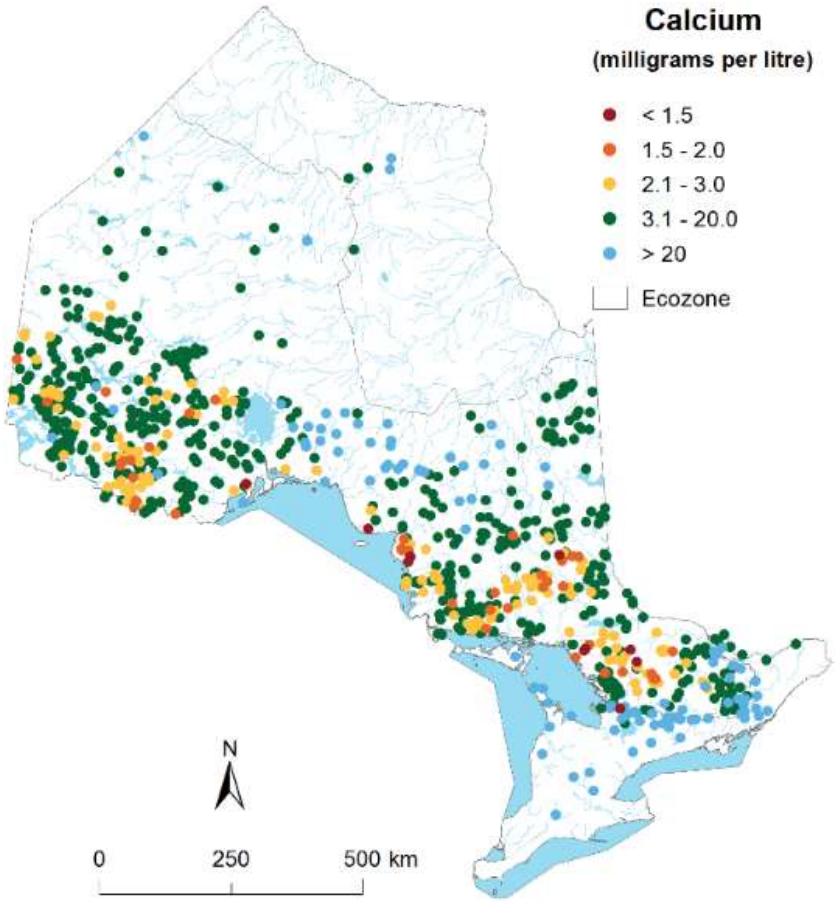


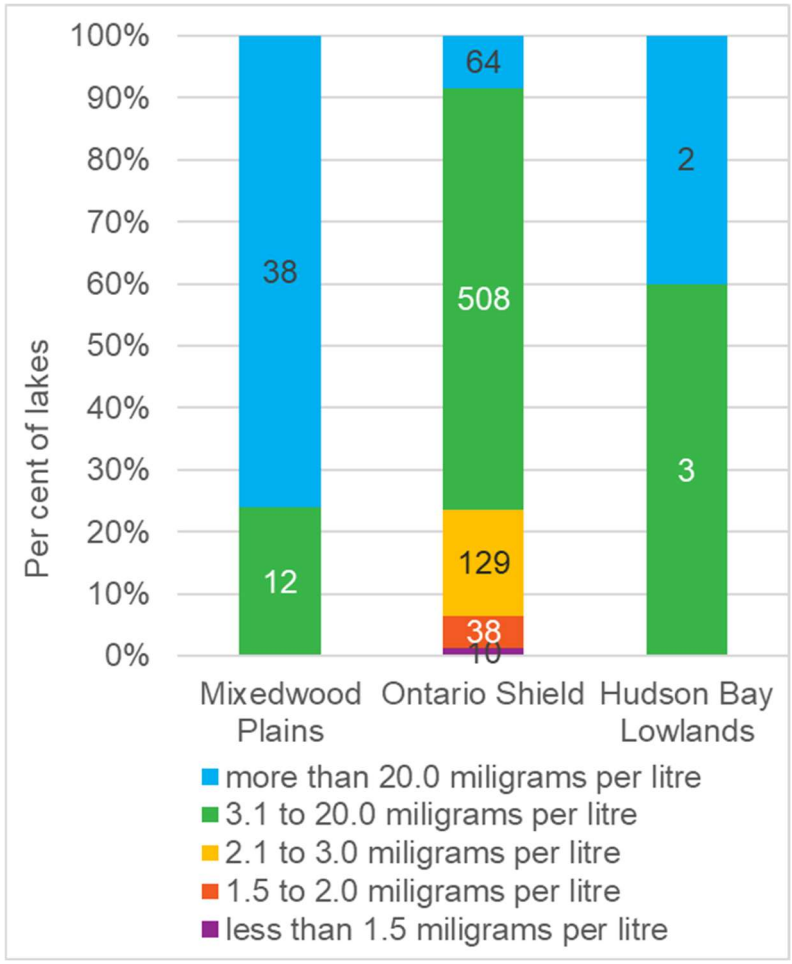
Calcium

Many aquatic animals need calcium to survive and concentrations of this important mineral can affect the food chain. There is recent evidence of widespread calcium declines in many lakes, primarily resulting from acid rain and timber harvesting. Of the lakes sampled between 2008 and 2012, only 10 lakes (1 per cent) had critically low calcium levels (less than 1.5 milligrams per litre), but 21 per cent had calcium levels close to this threshold (1.5 – 3.0 milligrams per litre). All of these lakes are in the Ontario Shield ecozone where calcium levels are naturally low in most areas and there is a concern because of declining calcium levels in soils and aquatic ecosystems. Of the lakes sampled between 2013 and 2017, 19 lakes (3 per cent) had critically low calcium values and 158 lakes (23 per cent) had calcium levels between 1.5 and 3.0 milligrams per litre. None of the lakes in the Hudson Bay Lowlands were sampled between 2013 and 2017.

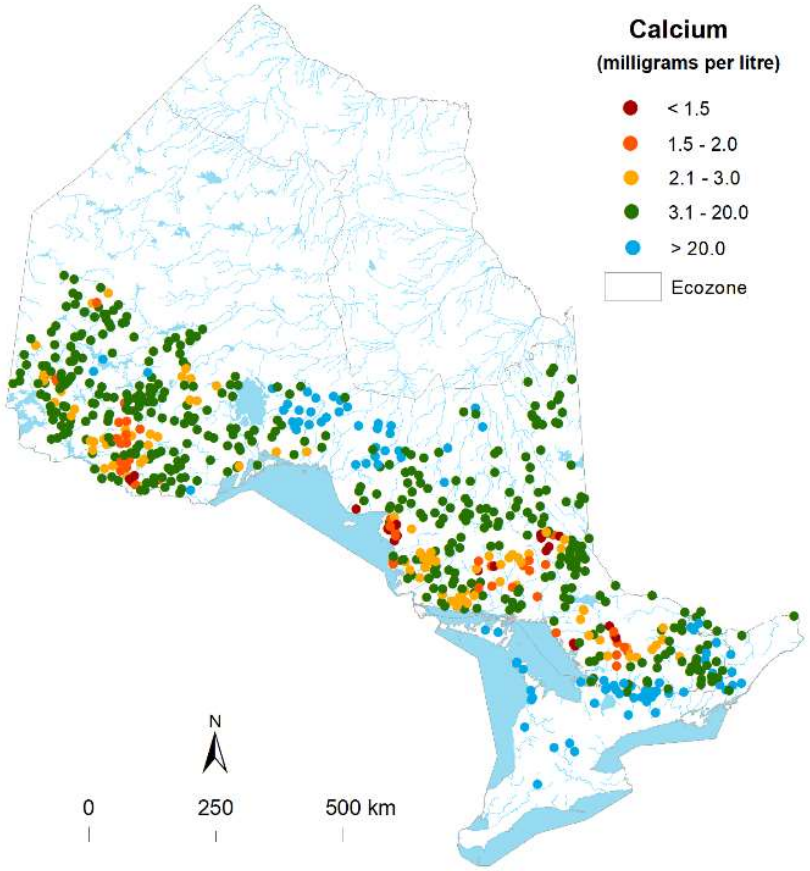
Most lakes in the Mixedwood Plains ecozone (76 per cent in 2008-2012 and 79 per cent in 2013-2017) had naturally high levels of calcium (greater than 20 milligrams per litre) which makes them more vulnerable to Zebra Mussel invasion. Zebra mussels are an invasive species that negatively impact aquatic ecosystems because they compete with native mussels and degrade fish habitat. Calcium rich lakes also occur in the northern part of the Ontario Shield ecozone and the Hudson Bay Lowlands ecozone.

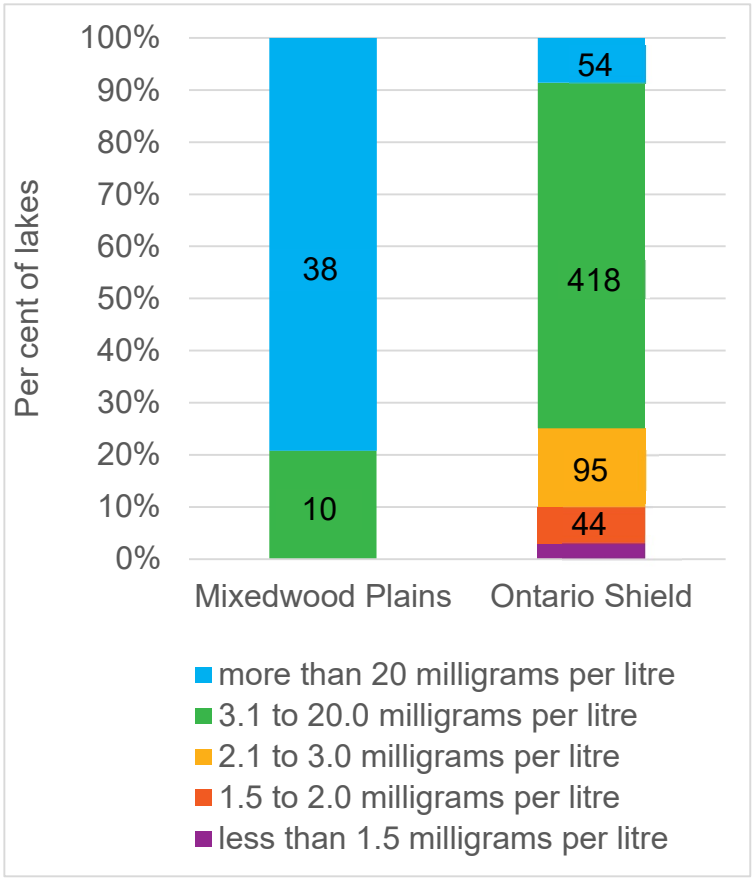
Assessment of calcium levels in Ontario lakes from 2008 to 2012





Assessment of calcium levels in Ontario lakes from 2013 to 2017





Future progress

Some lakes may naturally have water quality values exceeding threshold levels which can impact biodiversity. A better understanding of whether there are any significant changes in water quality will be possible after analysis of successive five year cycles of the Broad-scale Monitoring Program for Inland Lakes.

Indicator last updated

- February 2021

Data source(s)

- Broad-scale monitoring program
- Provincial Water Quality Monitoring Network

Theme – Management of our natural resources

Developing and managing our natural resources in a sustainable way helps ensure their use and enjoyment for future generations. This section assesses our:

- policy and planning processes
- harvest and extraction of natural resources
- stewardship efforts to protect and conserve natural resources

Policy and planning

Ontario is a leader in managing our natural resources. Natural resource policies and plans guide the development and management of our natural resources for generations to come. Public participation in these policies and plans helps inform decisions on how our natural resources are best managed.

Indicator reports

- Resource management and land use planning
- Public engagement in natural resource management
- Indigenous involvement in natural resource management planning

Harvest management

We need to manage our natural resources in a sustainable way so that we can continue to derive the social and economic benefits they offer. We work to ensure that where possible, natural resources, such as fish and forests, are regenerated after they are harvested and that areas of extraction are rehabilitated. Examples include forest regeneration or restocking fish. This ensures the availability of natural resources in the future and helps address potential environmental impacts.

Indicator reports

- Fisheries harvest
- Fish stocking

- Forest harvest
- Forest regeneration
- Independent forest audits
- Aggregates production

Stewardship

Conserving Ontario's biodiversity and natural resources is a shared responsibility. Stewardship activities help:

- protect and rehabilitate natural areas
- build public awareness
- encourage individual actions

Indicator reports

- Forest certification
- Tax incentive programs
- Protected area system
- Public awareness of natural resource management

Resource management and land use planning

Description

This policy and planning indicator report assesses the number and extent of natural resources management and land use plans in Ontario.

Status


Status: Good


Trend: No-change


Geographic extent: Province-wide

Why it's important

Approved resource management and land use plans establish direction on how we intend to manage natural resources in Ontario.

These plans consider the diverse interests of the people of Ontario. In the Far North, we have worked collaboratively with First Nation communities in certain areas to create community based land use plans. Together with First Nation communities, we are managing resources and planning for land use to provide economic, social and environmental benefits - now and in the future.

Tracking these plans helps us to assess what plans exist and which need to be updated or developed to meet our natural resource management needs.

How we monitor

Resource management plans document our objectives for managing resources and set out the activities that will help us meet those objectives. We annually track:

- forest management plans
- fisheries management zone plans
- water management plans
- community based land use plans

These plans cover the vast majority of the diverse and unique natural landscapes of Ontario.

In the Far North, approved community based land use plans provide direction on what areas are open for opportunities in sustainable economic development and what areas are protected.

Results

As of March 2020, 121 resource management and community-based land use plans are being implemented. This includes seven fisheries management zone plans, 40 forest management plans, 70 water management plans and four approved community based land use plans.

Number of Resource Plans 2018 to 2020

Type of plan	Number in place As of March 2018	Number in place As of March 2019	Number in place As of March 2020
Forest management plans	40	40	40
Fisheries management zone plans	6	6	7
Water management plans	70	70	70
Community based land use plans			
Terms of Reference	9	9	9
Draft Plan	0	1	1
Final Plan	4	4	4

Fisheries management plans

Fisheries management plans help to manage Ontario's fisheries management zones.

For inland zones (i.e., not the Great Lakes), these plans customize recreational catch limits and seasons to allow more fishing in thriving fisheries, protect vulnerable fisheries, re-establish fish populations and allows us to adjust fishing seasons for different climates across the province.

Plans are complete for 7 of the 20 zones. This involves engaging with fisheries management zone advisory councils to:

- share ideas and expertise
- help develop and implement management strategies
- communicate with local angling communities

Fisheries management plans continue to be developed on a prioritized basis in coordination with advisory councils.

Ontario waters of the Great Lakes make up five zones each one with a Great Lakes fisheries management zone advisory council. These councils contribute to the development of bi-national fish community objectives that reflect the unique nature of each Great Lake and serve as the primary fisheries management planning document for each lake.

Forest management plans

Managed Crown forests support a continuous and predictable flow of economic, social and environmental benefits. They are divided into administrative areas known as forest management units. Forest management activities on each unit are planned and approved through forest management plans. Ontario collaborates with industry, Indigenous peoples and local communities to prepare forest management plans.

There are currently 40 plans covering all the forest management units in the province.

Water management plans

Water management plans in Ontario are our primary tool for ensuring that operations of waterpower facilities and their associated water control structures provide for the purposes of the *Lakes and Rivers Improvement Act* and that there is a long-term mechanism in place for adaptive management. These plans are adaptively managed through:

- ongoing public and Indigenous community engagement
- monitoring
- implementation
- reporting
- amendments as required

There are currently 70 water management plans in place.

Community-based land use plans

In the Far North of Ontario, approved community-based land use plans identify which lands are protected and which are available for economic development opportunities , including forestry, tourism, mining, renewable energy and other sectors in the Far North of the province. The joint-planning process is built on discussions with First Nations and the government of Ontario and ongoing dialogue with nearby communities.

There are currently 4 community-based land use plans.

Together, these resource management plans and community-based land use plans paint a picture of what natural resource management looks like in Ontario. Through continued adaptive management and ongoing collaboration with the people of Ontario, we can ensure the availability of natural resources well into the future.

Indicator last updated

- February 2021

Data source(s)

- administrative files

Public engagement in natural resource management

Description

This policy and planning indicator report assesses opportunities for the public to get involved in natural resources management in Ontario.

Status


Status: Good


Trend: Undetermined


Geographic extent: Province-wide

Why it's important

As stewards of natural resources in Ontario, we seek public input before making decisions about natural resource policies. Engaging the public provides Ontarians opportunities to input on resource management plans, land use policies, licences and permits, and informs decisions being made. It also helps improve public knowledge about our natural resources, how they are managed and how they can be used sustainably.

Monitoring our public engagement opportunities helps us assess how often we are engaging the public.

How we monitor

We track the number of engagements, held each year including:

- presentations
- workshops
- meetings
- open houses
- conferences
- training sessions
- mail-outs
- notices published to the Environmental Registry

This information has been broken out by:

- aggregates and petroleum
- fish and wildlife (including invasive species)
- forestry
- lands and water
- general (events or postings that address multiple business areas)

These numbers do not reflect single client inquiries, internal consultation, or sessions with other ministries, agencies, or the federal government. They also do not include engagement activities with Indigenous communities, which are reported on separately, or engagement activities led by industry (for example, aggregates).

Results

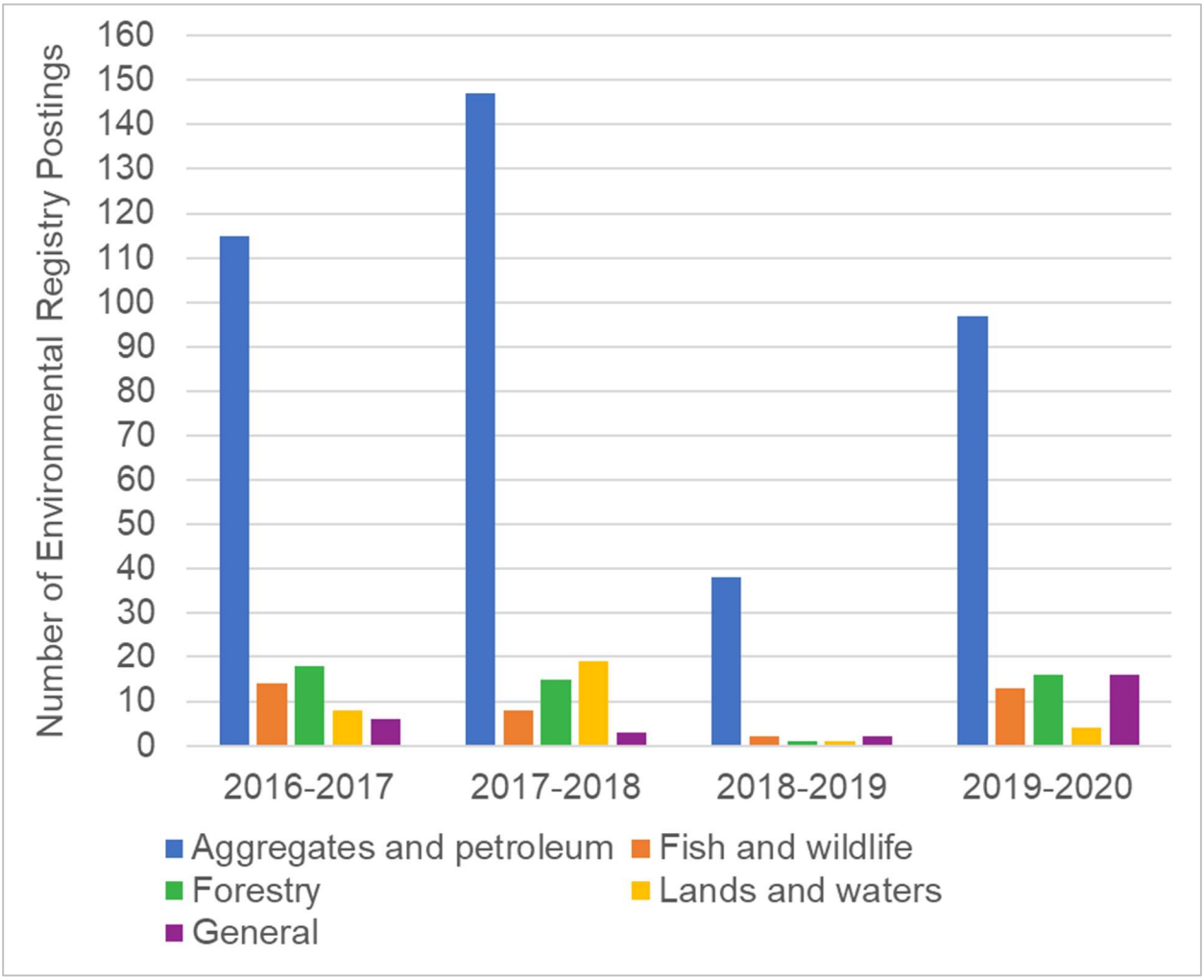
Number of engagement sessions by business area

Business Area	(April 2016 – March 2017)	(April 2017 – March 2018)	(April 2018 – March 2019)	(April 2019 – March 2020)
Aggregates and petroleum	35	32	45	71
Fish and wildlife	162	240	178	162
Forestry	182	170	235	242
Lands and water	79	101	42	70
General	56	37	64	46
Total	**514**	**580**	**564**	**591**

In 2019-20, we engaged the public 591 times. This is 27 more opportunities than the previous year. The number of annual engagement opportunities are expected to vary depending on policy priorities, where policies are in their development process, level of public interest and resource planning efforts.

Under the *Environmental Bill of Rights*, the public has the right to comment on activities that might affect the environment. Notices of activities are posted to the Environmental Registry of Ontario so the public can review and share comments on actions that could affect the environment.

Number of Environmental Registry postings by business area



In 2019-20, there were 146 notices posted to the Environmental Registry for public comment. This is an increase of 102 from the previous year. In 2018-19 the number of postings were lower due in part to the provincial election. In an election year it is common for the number of postings to be lower due to the writ period, and transition to a new government. There has been an average of 135 postings per year from 2016 to 2020.

Since 2016-17, Ontarians had over 2,792 opportunities to provide input on how we manage our natural resources.

This shows a consistent commitment to providing Ontarians with opportunities to provide input on how natural resource management policies are developed and implemented.

Indicator last updated

- February 2021

Data source(s)

- Administrative files

Indigenous involvement in forest management planning

Description

This indicator tracks the involvement of Indigenous communities in forest management planning.

Status


Status: Good


Trend: Mixed


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

The province of Ontario is a world leader in sustainable forest management. To be sustainable, forests must be maintained in a healthy state and the value of the forest to all users must be considered.

There is a significant role for Ontarians, Indigenous communities, and stakeholders in the forest management planning process. Involving these parties helps balance the economic, social and environmental objectives for managing our forests.

The Forest Management Planning Manual describes the approach for working with Indigenous communities to support their involvement in the forest management planning process in a manner that respects Aboriginal and treaty rights, and that assists the Crown in addressing its duty to consult obligations.

How we monitor

There is a diverse approach to involving Indigenous communities in forest management planning.

Forest management plans are prepared by a plan author (registered professional forester) who is assisted by a planning team and a local citizens' committee.

A planning team is a group of people with different areas of expertise that participate directly in preparing the plan. A local citizens' committee is an advisory team representing a range of interests that assists the plan author, the planning team and the ministry with preparing and implementing the plan.

When a forest management plan is prepared, Indigenous communities within or near the management unit are invited to participate in the planning process. Invited communities are generally those that have interests in, or traditionally use forests and may be affected by management activities.

Opportunities for Indigenous communities to participate in forest management planning include:

- having a representative on the planning team and the local citizens' committee
- working with the ministry and the plan author to develop a customized approach to consultation
- participating in the desired forest and benefits meeting to share their interest in the management of the forest
- identifying values for protection and participating in the development and review of related reports

- reviewing and commenting on components of a plan during its preparation and implementation

During the planning process, the ministry and planning teams work with Indigenous communities to identify current and traditional uses, values (social, cultural and spiritual), and forest management related concerns within the management unit. This information is documented in an Indigenous background information report.

This information informs planning and helps determine how to prevent or lessen the impact on these values when forest operations are conducted. A report on protection of identified Indigenous values describes and documents how values will be protected during forest operations.

For each forest management plan prepared, objectives are developed for the sustainability of the forest, including objectives for indigenous community participation and involvement. To determine how these objectives are achieved, we measure participation through:

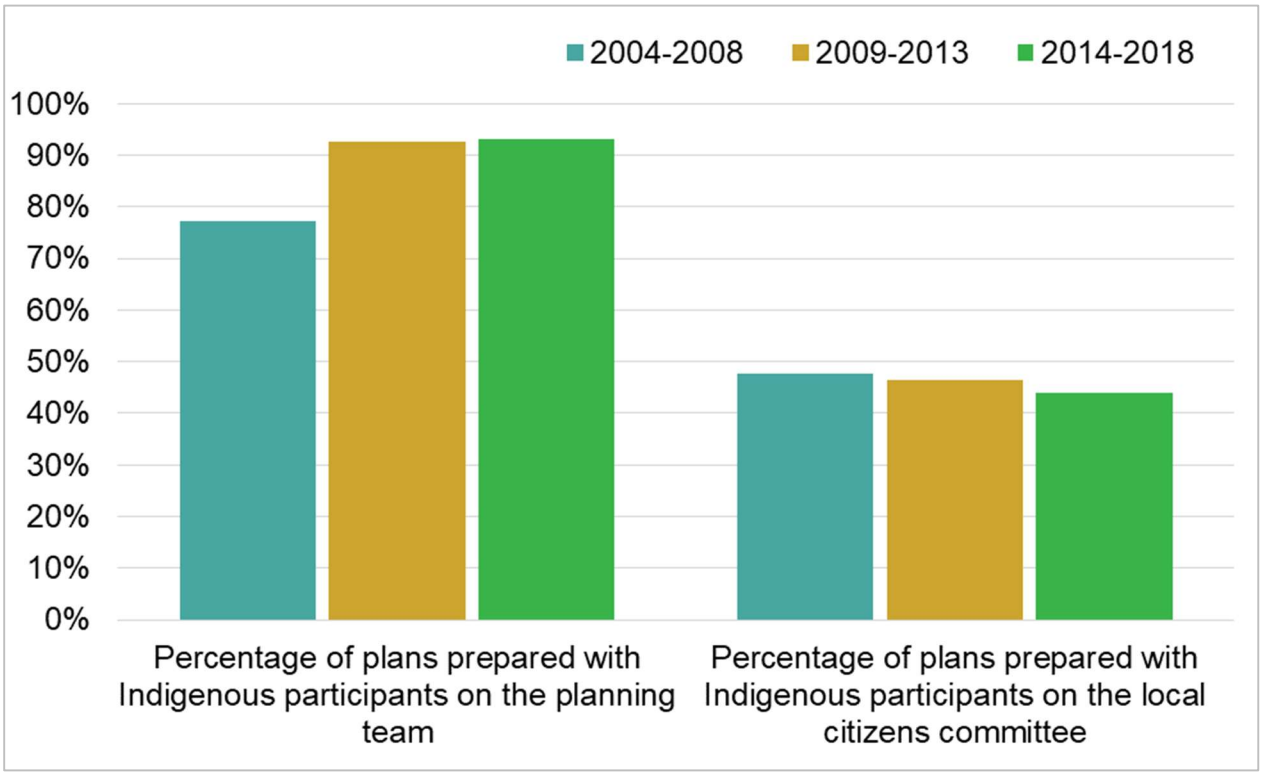
- Participation on the planning team and local citizens' committee
- Input into reports on values identification and protection

In our results, participation is considered to be achieved when at least one community participated or provided input in the process.

Results

Representatives of Indigenous communities participated on planning teams for most of the forest management plans that were prepared.

Proportion of plans with Indigenous participants on local citizens' committees and planning teams



For the 43 forest management plans prepared from 2014-2018, communities within or near these management units were invited to participate in the forest management planning process. The number of communities invited to participate ranged from 1–18 per plan. Some communities were invited to participate in more than one forest management plan as their traditional areas overlap multiple management units.

Compared to previous years, participation on planning teams was steady and participation on local citizens committees declined slightly.

- 93% of plans had Indigenous community participants on the planning team
- 44% of plans had Indigenous community participants on the local citizens' committee

Reports on Indigenous background information and on protection of identified Indigenous values were produced for all 43 plans. Indigenous communities provided input on:

- 33 or 77% of the background reports
- 16 or 37% of values reports

The planning team encourages involvement at any time during the development or implementation of a forest management plan. If communities did not provide input into reports, or participate on planning teams or local citizens' committees, they may have participated in the planning process in other ways including:

- working with the ministry to develop a customized consultation approach
- identifying values or important ecological features they want protected
- reviewing and commenting on the plan while it is being prepared
- reviewing and commenting on annual work schedules to identify any new values
- that are of importance to the Indigenous communities that may be affected by forest operations

Indigenous communities may have different views about the level and quality of involvement.

We continue to work with Indigenous communities to improve how we incorporate values and traditional knowledge into forest management planning.

Indicator last updated

- February 2021

Data source(s)

- Forest management planning survey

Resource Revenue Sharing - Forestry

Description

This indicator measures the number of First Nation communities participating in resource revenue sharing and the amount of forestry revenue that is shared annually.

Status


Status: Good


Trend: Improving


Geographic extent: Northern Ontario

Why it's important

Resource revenue sharing represents one of Ontario's commitments to advance reconciliation, improve socio-economic conditions and support economic development opportunities for Indigenous communities to build healthy and prosperous communities across Ontario's north.

Resource revenue sharing agreements share the economic benefits of forestry operations that occur in forests near First Nation communities.

In April 2018, Ontario negotiated and signed three Resource Revenue Sharing Agreements with First Nations organizations - Grand Council Treaty #3, Wabun Tribal Council, and Mushkegowuk Council. The agreements commit Ontario to annual sharing of 45 per cent of net forestry stumpage revenues from eligible forest management units. Although the

agreements also share mining tax and royalties, this indicator only reports on the amount of shared forestry revenue.

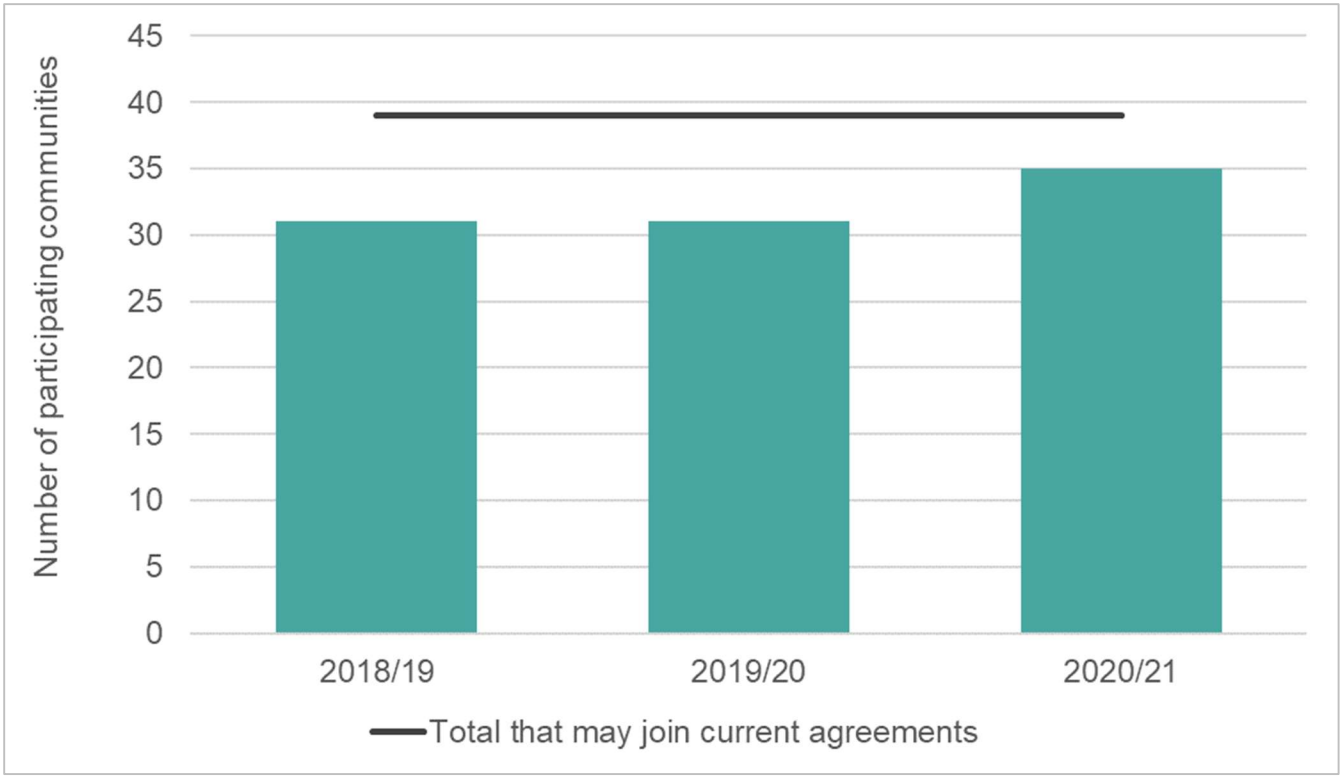
How we monitor

Under the current agreements, there are 39 First Nation communities that are currently eligible to receive a share of forestry revenues. We monitor by tracking the participation rate in Resource Revenue Sharing Agreements. We use the annual amount of eligible forestry revenue to calculate the amount to be shared with First Nations.

Results

In 2018, 31 First Nation communities in Northern Ontario had Resource Revenue Sharing Agreements. Participation in resource revenue sharing increased in 2020 by about 13 per cent with the addition of four First Nation communities. As of 2020, 35 First Nation communities are sharing in forestry revenue. Overall, 90 percent of the 39 communities that are currently able to share revenue under the existing agreements are receiving revenue.

Number of First Nation communities (out of 39) participating in resource revenue sharing from 2018/19 to 2020/21



Amount of forestry stumpage revenue shared with First Nations

Under the Agreements, 31 participating communities have received a total of $19.8 million in shared forestry revenue (since signing the agreement in 2018). First Nations that joined in 2020 will be a part of the third revenue sharing payment, scheduled to be made before December 31, 2021.

The amount of annual forestry revenue shared with First Nations varies yearly due to fluctuations in the eligible revenue the government receives, which is based on forestry activities. The total amount of forestry revenue shared will also vary depending on the number of participating First Nation communities.

Forestry revenue shared (2019 to 2020) (as indicated in Public Accounts)

Date	Amount Shared	Based on Revenue from Fiscal Year
December 2019	$11,169,588.43	2018/19
December 2020	$8,693,152.76	2019/20

Indicator last updated

- February 2021

Data source(s)

- Administrative data

Fisheries harvest

Description

This harvest management indicator report assesses the sustainability of recreational fishing in Ontario.

Status


Status: Mixed


Trend: Undetermined


Geographic extent: Province-wide

Why it's important

Ontario supports an active recreational fishery that contributes to our economy and provides recreational opportunities. To sustain these benefits, it is important to effectively manage fish populations and aquatic ecosystems.

Walleye are widespread in Ontario and are the most targeted, frequently caught and harvested species by anglers. Ongoing monitoring of fishing activity and Walleye mortality allow us to effectively respond to changes and take an adaptive management approach to support the sustainability of fisheries.

How we monitor

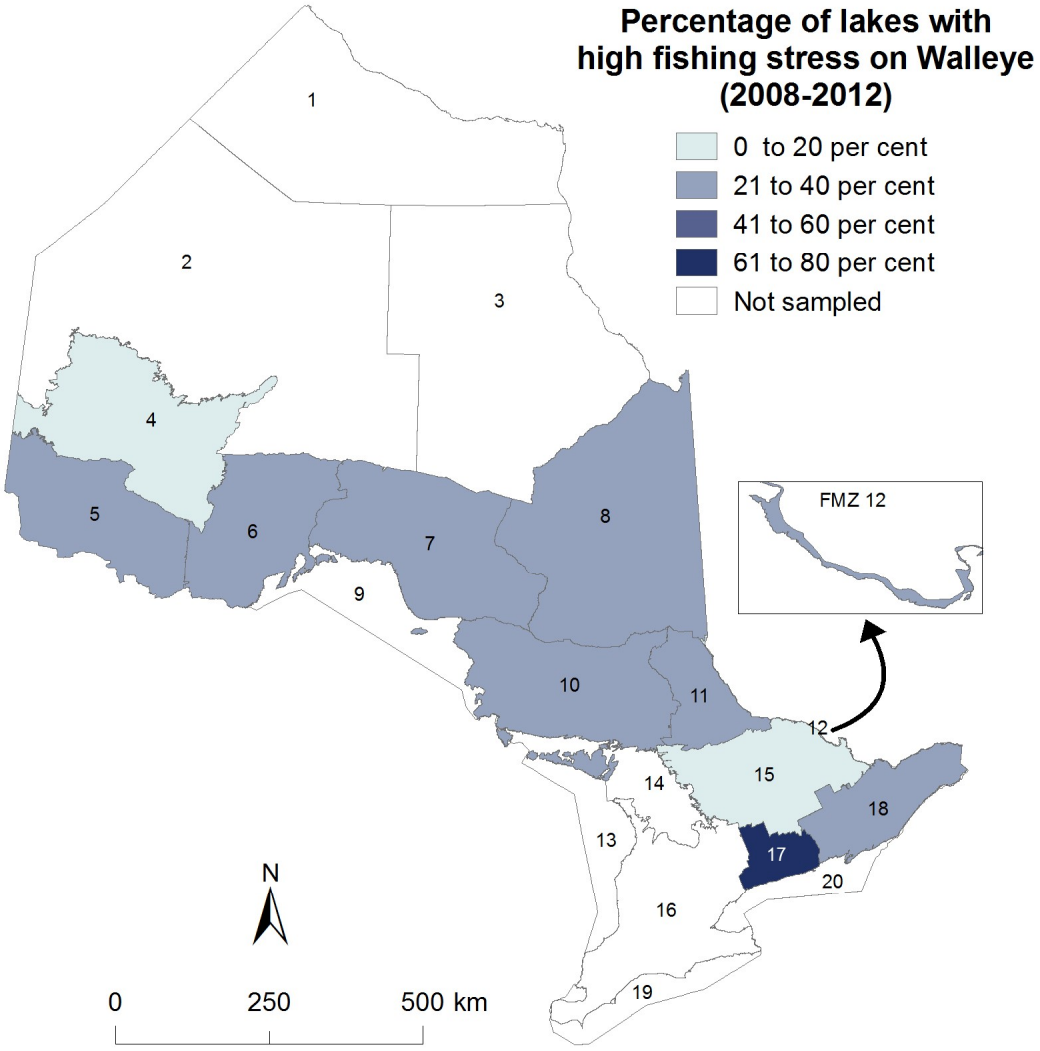
Since 2008, we have monitored walleye fishing in Ontario's fisheries management zones using the Broad-scale Monitoring Program for Inland Lakes. Water quality, invertebrates, and fishes in a selection of lakes are sampled annually, and the data are analyzed to report on the status of lake ecosystems every 5 years. Through this program, we sampled 374 of the 4242 lakes that are known to have Walleye populations.

This information is used to assess fishing stress on Walleye populations in each fisheries management zone. Lakes with estimated Walleye fishing mortality equal to or greater than natural mortality were assessed as having high fishing stress on Walleye.

We also assessed data from the 2010 Survey of Recreational Fishing in Canada to estimate recreational Walleye harvest and recreational fishing intensity. The level of harvest was measured as the number of kilograms of Walleye harvested per hectare of lake. Fishing intensity was measured as the number of hours spent angling per hectare of lake for all species of fish.

Results

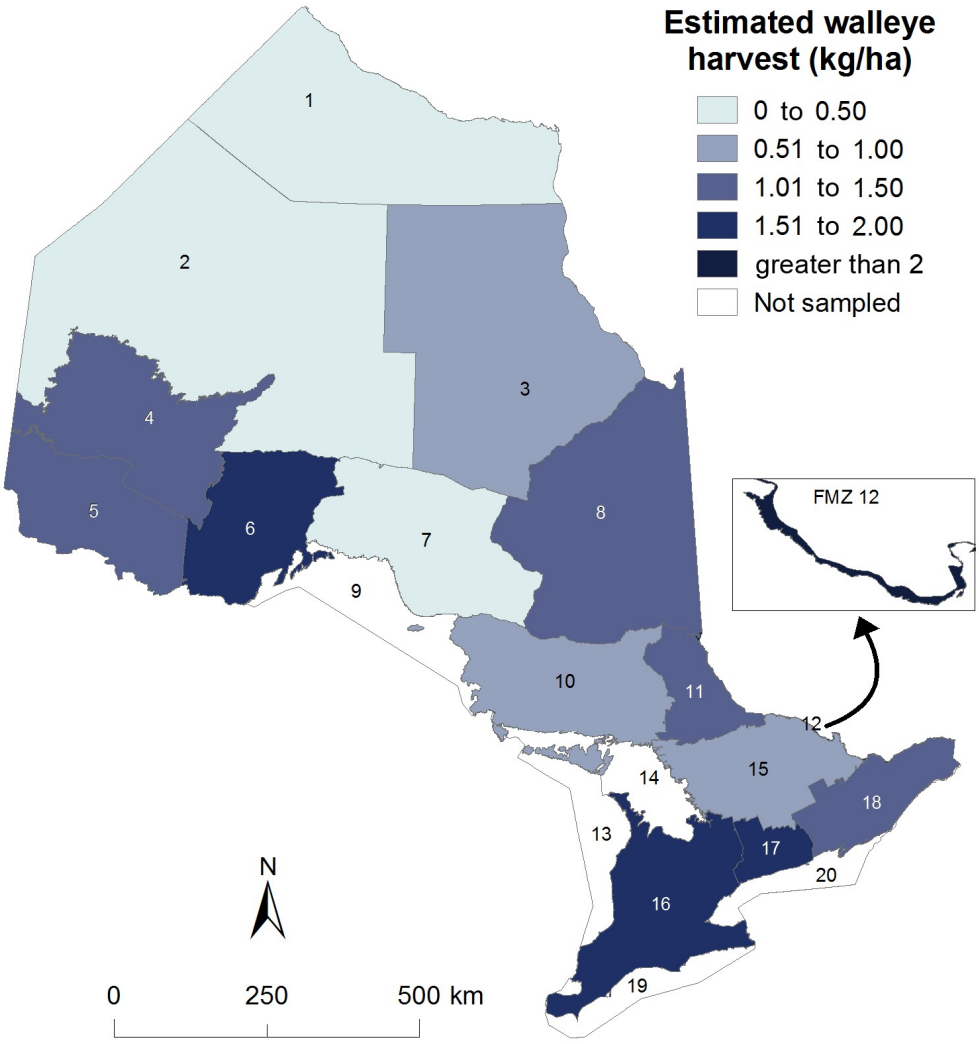
Percentage of lakes with high fishing stress on Walleye by fisheries management zone (2008 to 2012)



Overall, 74 per cent of assessed Walleye populations were experiencing acceptable levels of fishing stress. The remaining populations (26 per cent) showed high fishing stress on Walleye. More than half of those populations with high fishing stress (63 per cent) are located near

Peterborough and the Kawartha Lakes (zone 17). There are fewer lakes with high fishing stress on Walleye populations in northern Ontario. None of the sampled lakes in the Far North (zone 1 and 2) and the Ottawa River (zone 12) had high fishing stress.

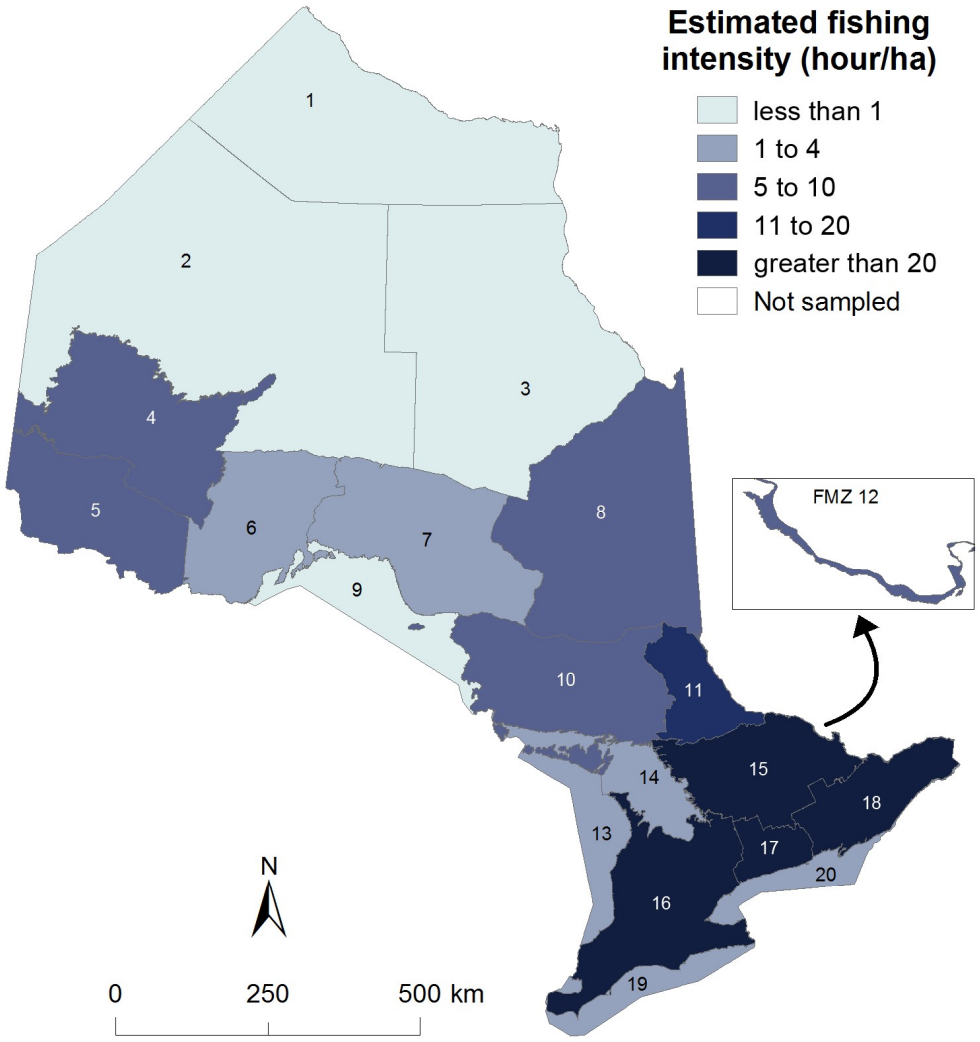
Walleye harvest by fisheries management zone (2010)



The estimated Walleye harvest by lake area is highest (> 2.0 kilograms per hectare) in the Ottawa river (zone 12). Harvest is also relatively high (1.68 – 1.82 kilograms per hectare) around:

- Thunder Bay (zone 6)
- southern Ontario (zones 16 and 17)

Recreational fishing intensity by fisheries management zone (2010)



The intensity of recreational fishing is highest (> 20 fishing hours per hectare) in southern Ontario (zones 15, 16, 17 and 18). Fishing intensity decreased moving northward with less than an hour spent angling per hectare of lake in the Far North (zones 1, 2 and 3). Anglers

primarily target walleye in northern fisheries management zones with a greater proportion of fishing effort in southern zones directed at species other than Walleye.

Adaptive management

We manage our fisheries through an adaptive management process to ensure the sustainability of fisheries in Ontario. Fisheries plans are developed in consultation with fisheries management zone advisory councils and include objectives and actions to maintain or increase sustainable angling and harvesting opportunities. Broad-scale monitoring of fish populations and fisheries are critical in assessing the effectiveness of our management actions in meeting these objectives and help guide future actions to achieve sustainability.

Indicator last updated

- June 2019

Data source(s)

- Broad-scale Monitoring Program for Inland Lakes
- 2010 Survey of Recreational Fishing in Canada

Fish stocking

Description

This fish stocking indicator report tracks hatchery production and stocking of fish in Ontario.

Status


Status: Good


Trend: No-change


Geographic extent: Province-wide

Why it's important

Fish stocking is an important fisheries management tool to:

- create recreational fishing opportunities
- rehabilitate degraded fish communities

Put-Grow-Take fisheries are an example of how Ontario creates new fishing opportunities, especially near urban areas, while alleviating fishing pressure on more sensitive species and locations. Fish stocking also plays an important role in native species restoration, such as Lake Trout in the Great Lakes.

Ontario operates nine fish culture stations. Fish raised at these facilities support fisheries management initiatives in the Great Lakes and inland waters. Information on hatchery

production and fish stocking from these stations contributes to our knowledge of how well we are achieving our fisheries management objectives.

How we monitor

We begin fish stocking projects by identifying the species, number and size of fish to be stocked in each waterbody. We obtain eggs from captive brood stock, wild collections or other means. Eggs are fertilized and incubated until they hatch. After hatching, fish are transferred into areas of the hatchery where rearing continues.

Fish remain in the hatchery until they reach the desired size for stocking. This depends on the species and local fisheries management objectives. Fish may be stocked as fry shortly after hatching or raised to summer or fall fingerling sizes (ages 3-9 months). Many fish, particularly trout species, are stocked as one-year old fish after spending more than a year in the hatchery after hatching. The advantages of raising fish to a larger size is they are more likely to survive after stocking. This is balanced against other factors to determine the optimal size and number of fish stocked for each stocking location.

Fish stocking involves:

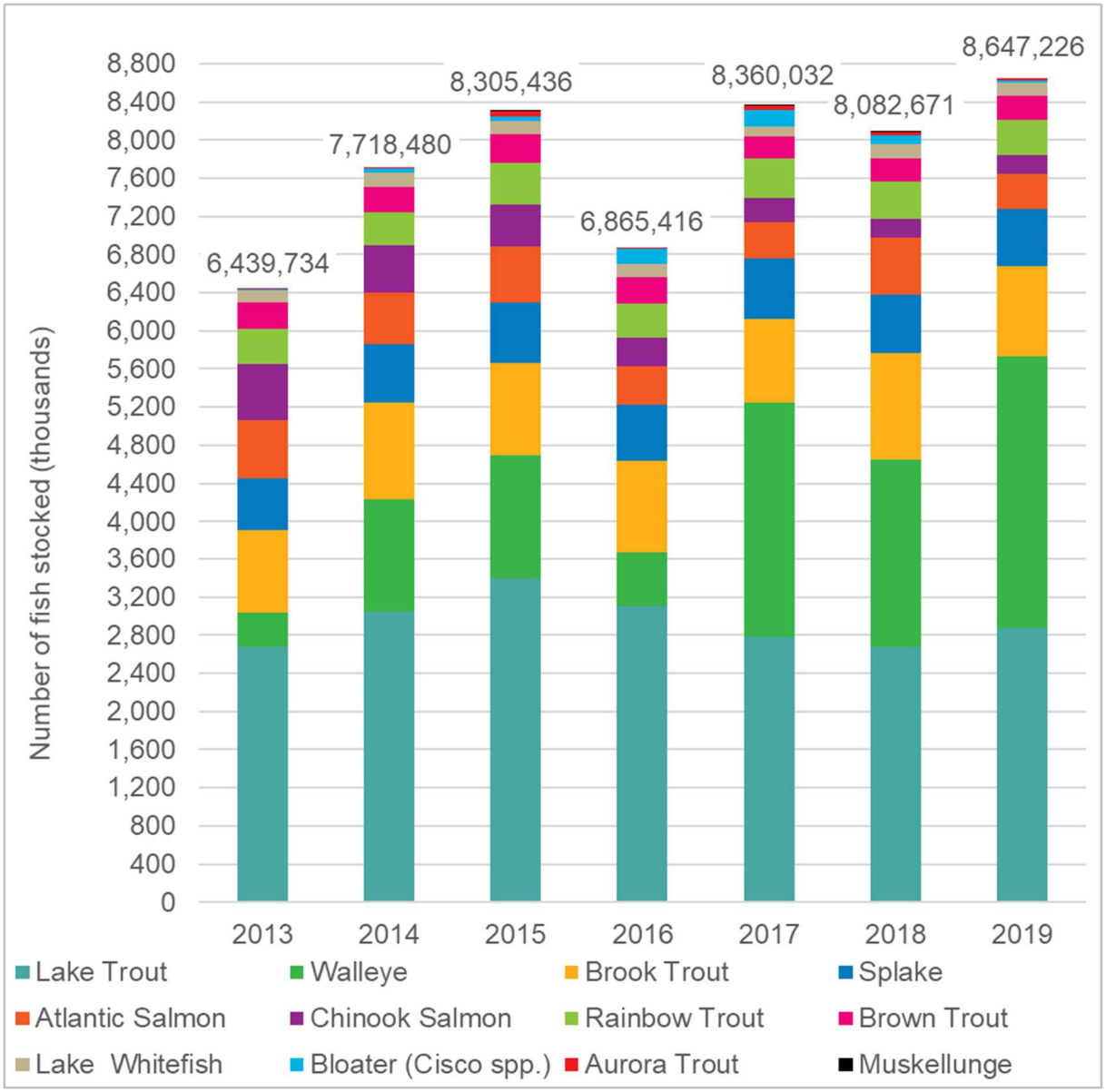
- transferring the fish from the tanks in the fish culture station into stocking trucks
- transporting them to the stocking site
- releasing them into a lake or river

Each fish culture station records information on the weight and number of fish stocked each year as well as the specific water bodies that are stocked. The numbers below do not include any partner or community hatchery stocking events that may also happen.

Results

In 2019, we stocked a total of 8.65 million fish into the Great Lakes and inland waters. The status of this indicator is good as we have achieved our overall production target.

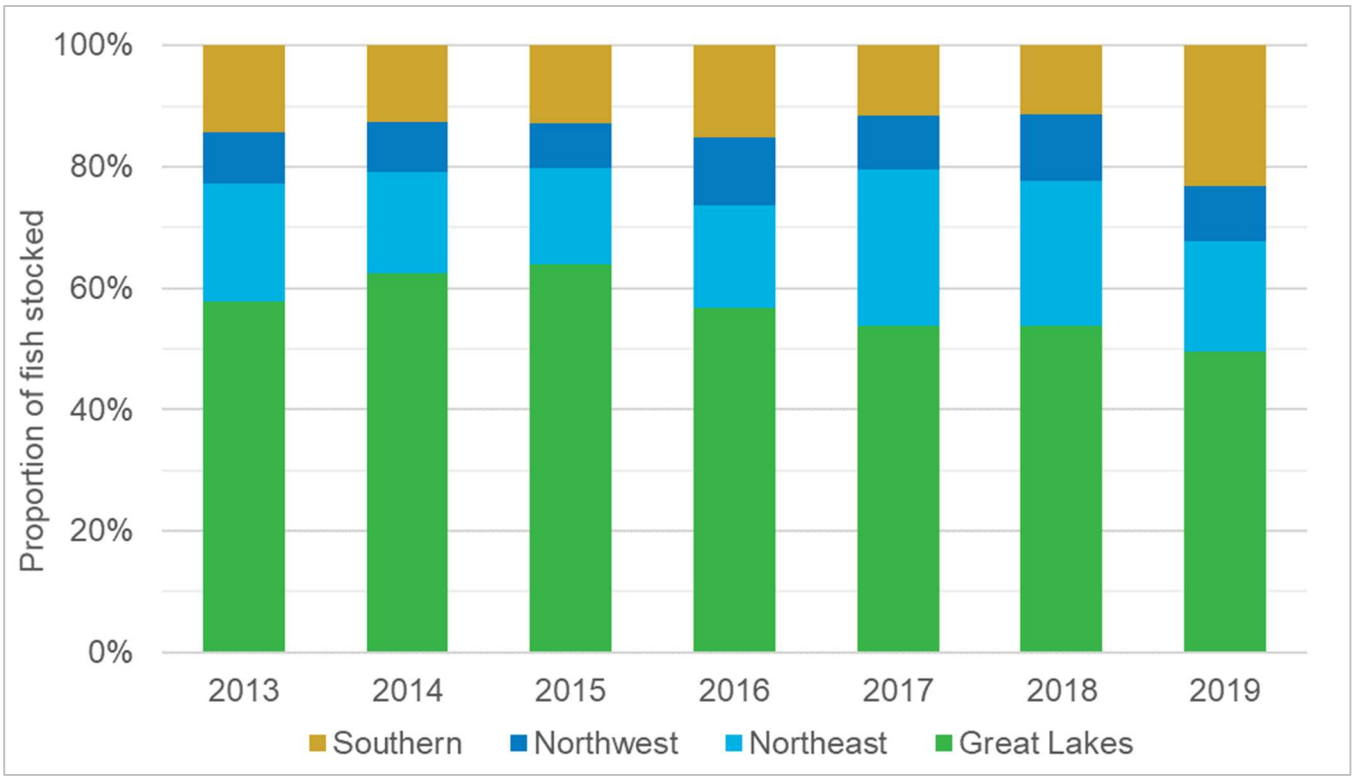
Number of fish stocked by species (2013 to 2019)



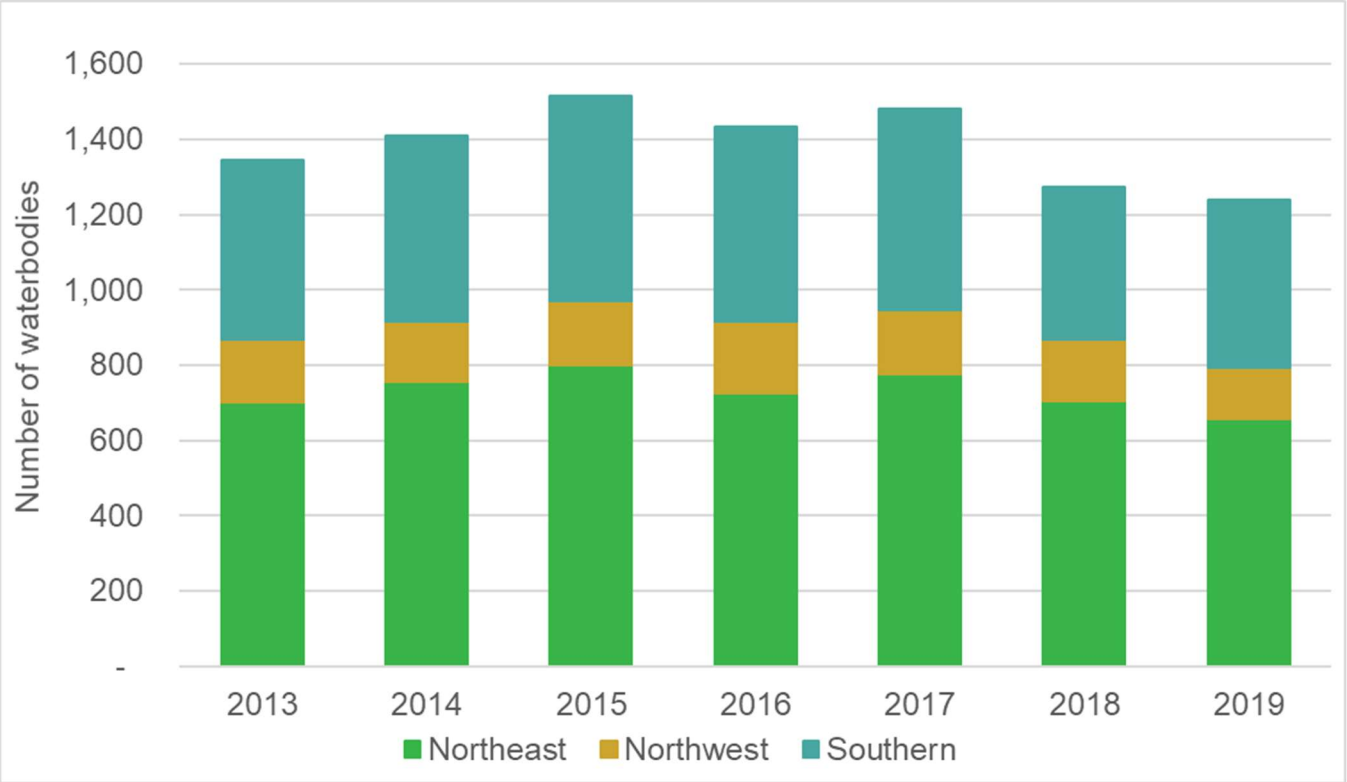
Since 2013, the number of fish that we have stocked has increased. This is mainly the result of an increase in the number of Walleye stocked, many of which were stocked as fry, shortly after hatching. This means Walleye account for a high number of fish stocked each year, but a relatively low proportion of the weight produced by our fish culture stations. The overall weight of fish stocked was higher in 2015 to 2019 than 2013 and 2014.

Lake Trout were the most frequently stocked fish in Ontario averaging approximately three million fish annually, with the majority stocked as one-year old fish. Brook Trout stocking averages close to one million fish annually.

Proportion of fish stocked by region (2013 to 2019)



Number of Inland Waterbodies stocked (2013 to 2019)



The majority of fish (50 to 64 per cent) are stocked annually into the Great Lakes. The remaining fish are stocked in inland waters.

- northeast Ontario (16 to 26 per cent)
- southern Ontario (11 to 23 percent)
- northwest Ontario (7 to 11 per cent)

On average, over 1200 lakes and rivers are stocked each year. The greatest number of waterbodies are stocked in northeast Ontario, followed by southern Ontario and then northwest Ontario.

Indicator last updated

- February 2021

Data source(s)

- Fish Stocking Information System

Forest harvest

Description

This indicator tracks how much public forest is harvested relative to the approved levels.

Status


Status: Good


Trend: No Change


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Forests in Ontario are vast and provide many benefits to our society including biodiversity, wildlife habitat, and recreational opportunities. Forests store carbon and regulate air, soil, and water quality.

Through sustainable harvesting, our public forests also support a forest industry that provides jobs and forest products.

Harvesting within the approved level shows we are sustainably managing our forest resources. Low levels of harvesting could indicate that we are not realizing the economic value of our forests and could impact forest sustainability over the long term.

How we monitor

In Ontario, we use responsible forestry practices and a forest management planning system to sustainably manage public forests. Forest management plans determine an approved level of harvesting by considering objectives for wildlife habitat and biodiversity as well as for the supply of wood.

We monitor:

- available harvest area and volume
- area and volume harvested

The available harvest area and the associated volumes are the approved levels from forest management plans.

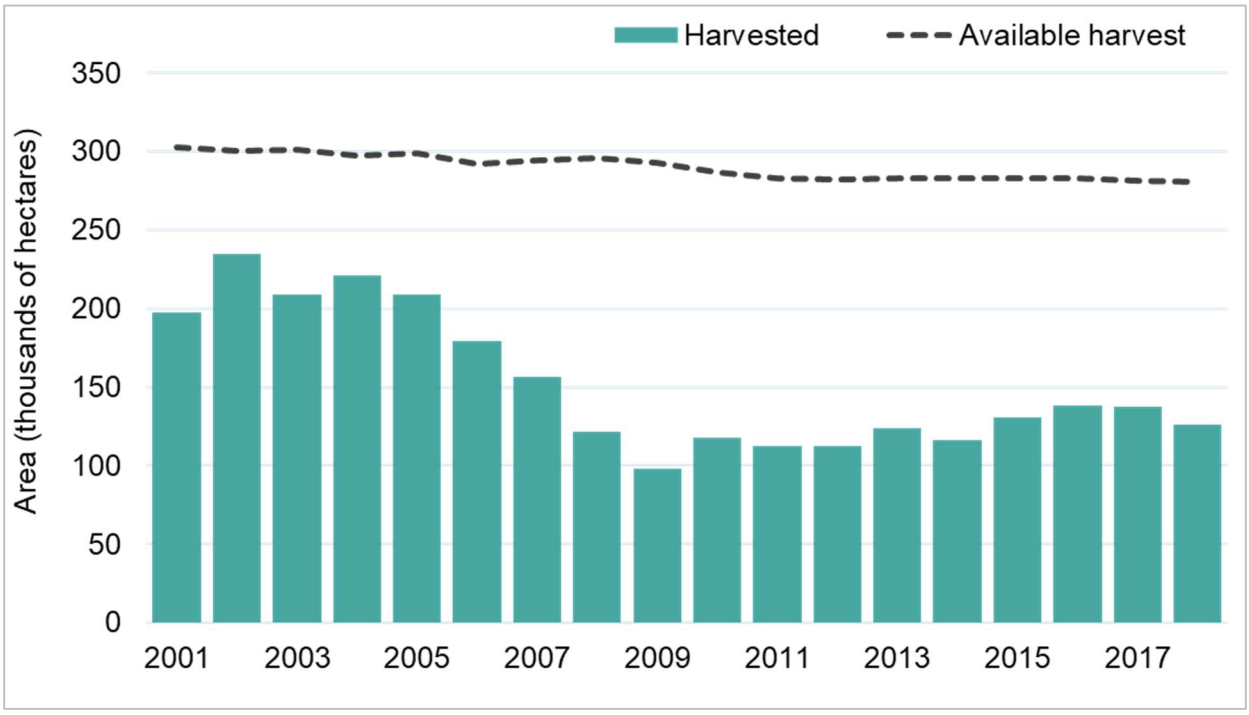
The area harvested is compiled from management unit annual reports. Each year, forest managers submit these reports summarizing operations on each management unit.

The volume harvested is tracked through Ontario's wood measurement system. This system measures the amount of wood entering a mill and uses this information to determine how much to charge for the wood.

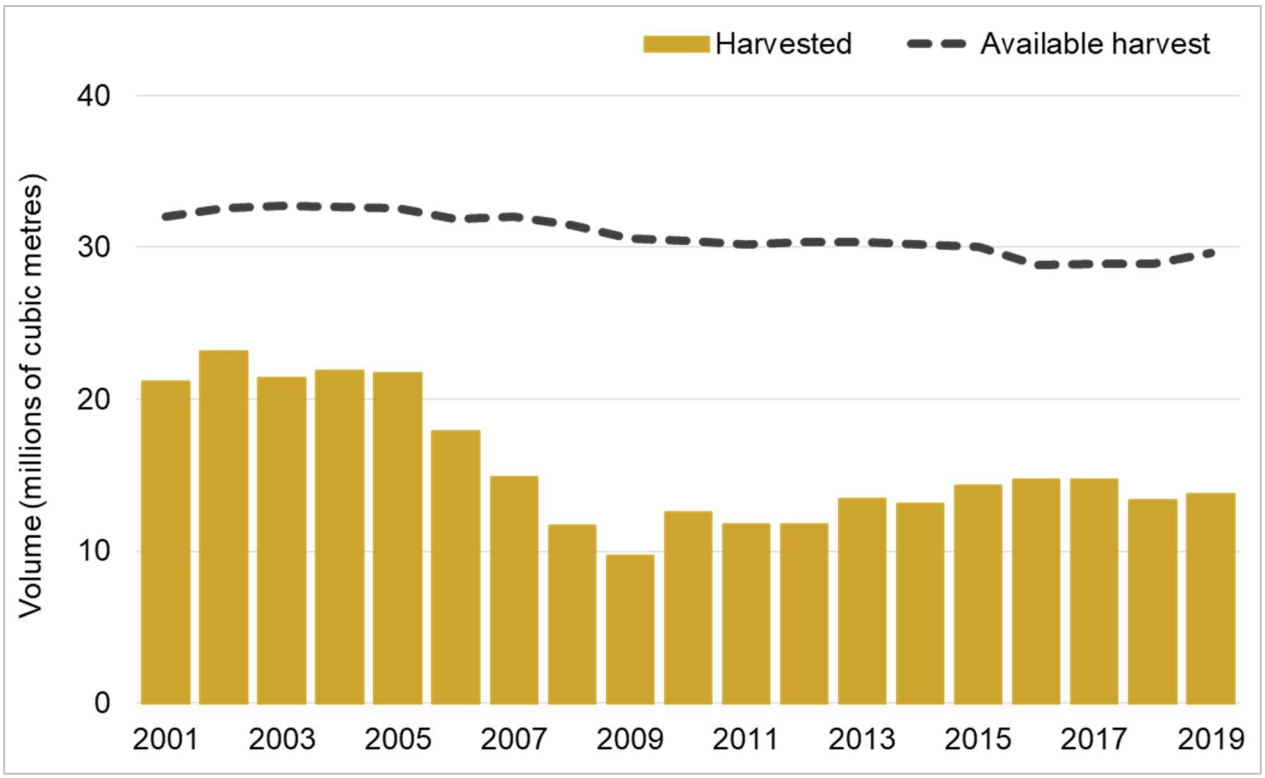
Results

The status is good as results show we are harvesting within approved levels. The trend in recent harvest levels has been steady although levels remain lower than they have been historically.

Forest area available and harvested



Forest volume available and harvested



Since 2009 we have harvested an average of:

- 44% of the available area and volume per year
- 121,000 hectares and 13 million cubic metres per year

Forest management planning is conducted in an adaptive management cycle. Every 10 years a new forest management plan is prepared to account for:

- actual levels of activities
- changes in the forest condition
- updates to science and policy

Through this recurring cycle, forest managers continually re-establish harvest levels and consider any impacts of under-harvesting.

Forest harvesting fluctuates with market conditions and demand for wood fibre. Sustainable Growth: Ontario's Forest Sector Strategy is part of the government's plan to create jobs, reduce administrative burden, and promote economic growth and prosperity across the province, while ensuring responsible stewardship of our natural resources for future generations.

Indicator last updated

- February 2021

Data source(s)

- Management unit annual reporting
- Timber Resource Evaluation System (TREES)

Forest regeneration

Description

This indicator tracks the amount of public forest regenerated and the success of regeneration.

Status


Status: Good


Trend: Undetermined


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Forest regeneration means growing back the forest after harvesting trees. Forests also regenerate following natural disturbances, such as fire, insect infestation, disease outbreaks and weather events.

The amount of forest regenerated, and the success of that regeneration, tells us how well the forest is being renewed and is an indication of forest sustainability.

How we monitor

Each year, forest managers submit management unit annual reports summarizing the previous year's operations on each management unit. We compile the data from these reports to provide a provincial overview of:

- area of renewal activities (site preparation, regeneration, and tending)
- the number of trees planted and seeds spread
- the results of regeneration surveys
- the status of regeneration by harvest year

Regeneration can be done through seeding and tree planting, or through natural methods like natural seeding or sprouting. Tending activities may be required to improve the survival, growth and quality of a regenerating forest.

Forest managers monitor the status of regenerating forest areas by surveying them and reporting results in management unit annual reports. The ministry then verifies a sample of the assessed areas.

Once an area has regenerated, it is classified as established (previously called free-to-grow). This means the regenerating trees meet standards (species composition, height and site occupancy) and are healthy and free from competing vegetation. The results also show if the area met its targeted forest type or the standards for a different forest type.

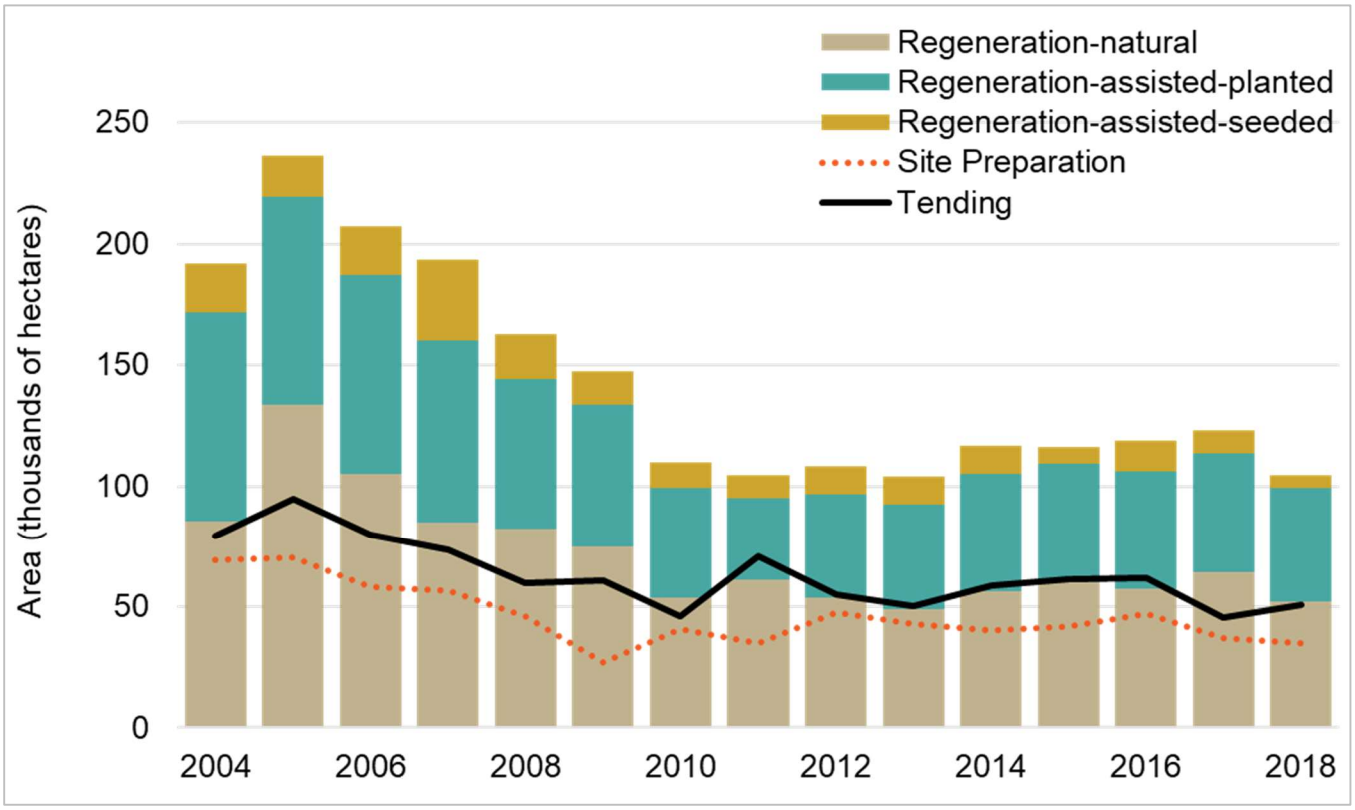
The status of regeneration by harvest year is a new measure. It analyses and reconciles several years of spatial harvest, renewal and assessment data. It shows us how much of the area that was harvested each year has regenerated, or if it is still regenerating. It categorizes the area into:

- Regenerated - established
- Regenerating - treatment complete - ready for regeneration survey
- Regenerating - treatment required

Results

The status of this indicator is good. Overall, regeneration activities are keeping pace with harvesting. Standards for successful regeneration are being achieved as demonstrated by regeneration assessments. The trend in the status of regenerating area is as expected.

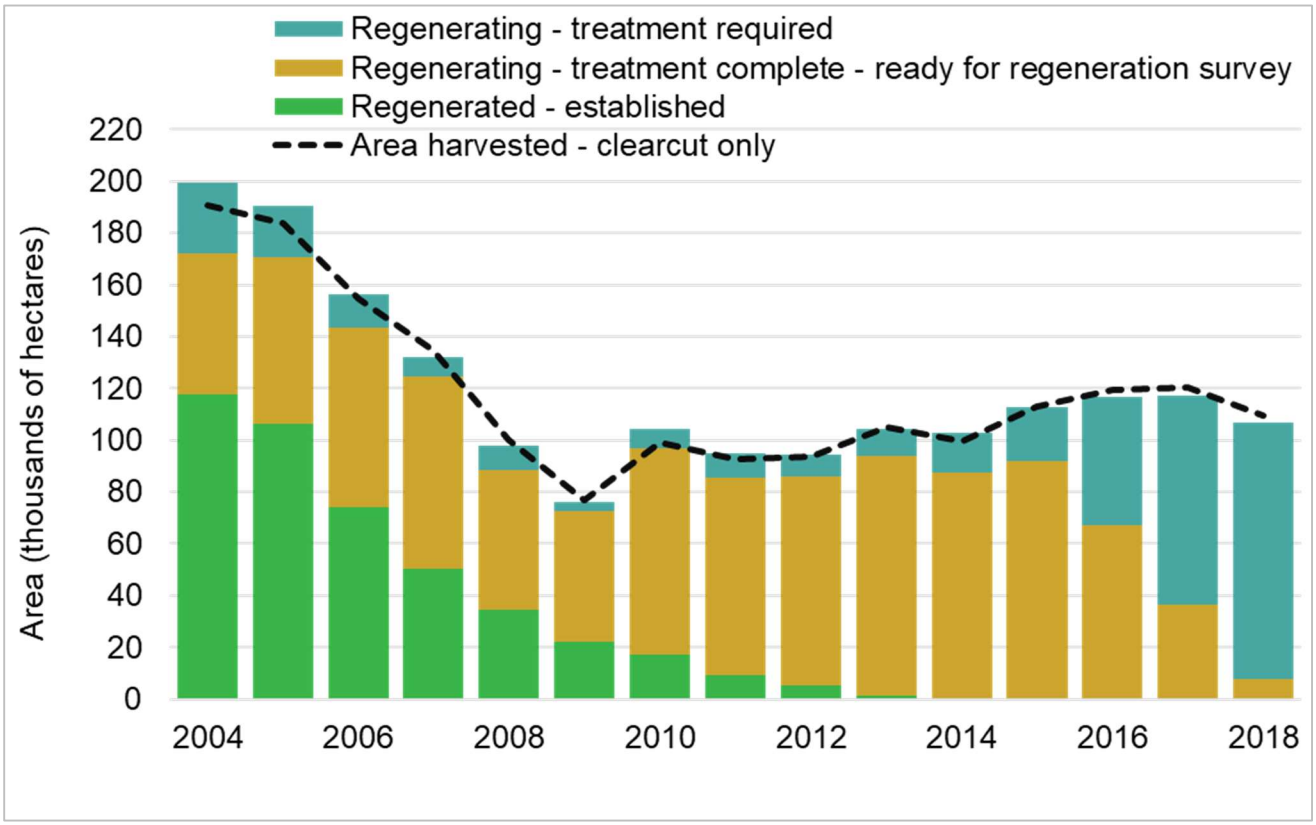
Area of renewal activities



The area of renewal activities varies from year to year because it is based on how much area is harvested. From 2014-2018 the level of renewal activity was stable.

- Natural regeneration was used for 50% of the area renewed which is consistent with historic levels.
- Tree planting was the main method of assisted regeneration. On average we planted 53% spruce and 38% jack pine.

Status of regenerating area by year harvested



Following harvest, forest regeneration and renewal activities are ongoing. It can take 15 years or more after harvest for regenerating areas to be established.

The time required to establish new forest is reflected in the pattern we see. As we would expect, there is more established area in earlier harvest years and more area requiring treatment in recent harvest years. The area that is regenerating with treatment complete is ready to be surveyed to determine its status.

As regeneration surveys continue and more years of data are added, we expect to see an increase in the amount of regenerated area and a decrease in the areas ready for survey.

Regeneration survey results from 2004 to 2018 show that on average

- 90% of the area surveyed annually was classified as established

- 67% of the established area also meets the target forest type

When an area is classified as not yet established, forest managers determine why it hasn't reached targeted standards and if it requires retreatment. This also informs future decisions on regeneration treatments. These areas are reassessed in the future.

Regeneration assessment results

Year of assessment	Area that is established (hectares)	Area not yet established (hectares)	Total area assessed (hectares)	Proportion of regenerating area assessed that is established	Proportion of established area meeting the target forest type
2004	171,258	23,554	194,812	88%	52%
2005	195,795	31,372	227,167	86%	55%
2006	140,042	17,063	157,105	89%	64%
2007	150,503	15,079	165,582	91%	78%
2008	138,504	11,086	149,590	93%	64%
2009	126,753	9,996	136,749	93%	68%
2010	171,773	18,656	190,429	90%	71%
2011	135,561	22,317	157,877	86%	65%
2012	120,191	8,768	128,959	93%	68%
2013	159,548	9,877	169,425	94%	69%
2014	74,189	8,216	82,405	91%	70%
2015	111,357	13,470	124,827	89%	73%
2016	150,859	24,559	175,418	86%	72%
2017	84,838	17,410	102,248	83%	65%
2018	138,392	8,086	146,478	94%	67%

Indicator last updated

- February 2021

Data source(s)

- Management unit annual reports

Independent forest audits

Description

This indicator tracks the results of independent forest audits.

Status


Status: Good


Trend: No Change


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Independent forest audits are an important part of sustainable forest management in Ontario. They provide an independent assessment of whether public forests are being managed sustainably.

Independent forest audits contribute to improving the management of Ontario public forests through adaptive management.

How we monitor

Independent forest audits are required by the *Crown Forest Sustainability Act* and by sustainable forest licences. They are conducted on each of the province's management units, at least once every 10-12 years, to assess whether the forest is being sustainably managed in

compliance with legislation, regulations and policies, and with the terms and conditions of the sustainable forest licence.

Audits examine the performance of the sustainable forest licence holder and the Ministry of Northern Development, Mines, Natural Resources and Forestry in meeting their forest management responsibilities. They assess a broad range of activities on each management unit including:

- forest management planning
- operational activities like harvesting, renewal and road construction
- achievement of desired outcomes
- responses to previous audits
- compliance with licence conditions

We track the number of independent forest audits conducted and their results. Auditors conclude whether a forest is being managed:

- in compliance
- in compliance but with exceptions or conditions
- not in compliance

Forests identified as ‘in compliance’ and ‘in compliance with exceptions’ are considered managed sustainably.

The conclusions and findings are documented in audit reports, and the licensee and/or the ministry create action plans to specify how they will address audit findings.

Results

The status of this indicator is good as most audits showed that forests were managed in compliance. The trend is unchanged because the level of audits in compliance remained high and steady.

Independent forest audit results for 1999 to 2019

Year	Number of audits	In compliance	In compliance with exceptions	Not in compliance
1999	11	8	2	1
2000	16	11	5	0
2001	19	18	0	1
2002	9	6	1	2
2003	6	6	0	0
2004	8	6	2	0
2005	11	8	0	3
2006	15	14	1	0
2007	9	9	0	0
2008	5	4	1	0
2009	7	6	1	0
2010	11	8	2	1
2011	12	9	1	2
2012	9	8	1	0
2013	3	3	0	0
2014	5	3	1	1
2015	6	4	2	0
2016	12	8	2	2
2017	12	11	1	0
2018	4	4	0	0
2019	5	5	0	0

Proportion of audits in compliance

The compliance rates include forests that were found in compliance and in compliance with exceptions.

- From 2015-2019, two of the 39 forests audited were found not in compliance.
- From 1999-2019, the proportion of forests audits in compliance averaged 94%.

Forest managers address any exceptions or conditions to bring management of the forest into full compliance with all requirements.

Indicator last updated

- February 2021

Data source(s)

- Independent forest audit reports

Forest operations compliance

Description

This indicator tracks the inspection and compliance rates for forest operations.

Status


Status: Good


Trend: No change


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Ontario's public forests are sustainably managed under Ontario's forest policy framework. Forest operations compliance is a key component of forest monitoring.

Forest operations are regularly inspected to verify that management activities follow approved forest management plans and operational prescriptions.

Forest management guides give direction on conducting forest operations to retain special features, protect sensitive habitats such as bird nests and woodland pools, and ensure the conservation of water and soil resources.

The level of monitoring and compliance provides an indication of how well we are implementing sustainable forest operations.

How we monitor

In Ontario, compliance monitoring occurs in partnership between the Ministry of Northern Development, Mines, Natural Resources and Forestry and the forest industry. Forest operations monitored for compliance include timber harvesting, road construction, water crossings and forest renewal.

Certified forest compliance inspectors perform the inspections and record results in inspection reports. These reports are entered into the provincial Forest Operations Information Program database.

We track the number of inspections, analyze trends, and calculate compliance rates for all types of forest operations. Here we summarize:

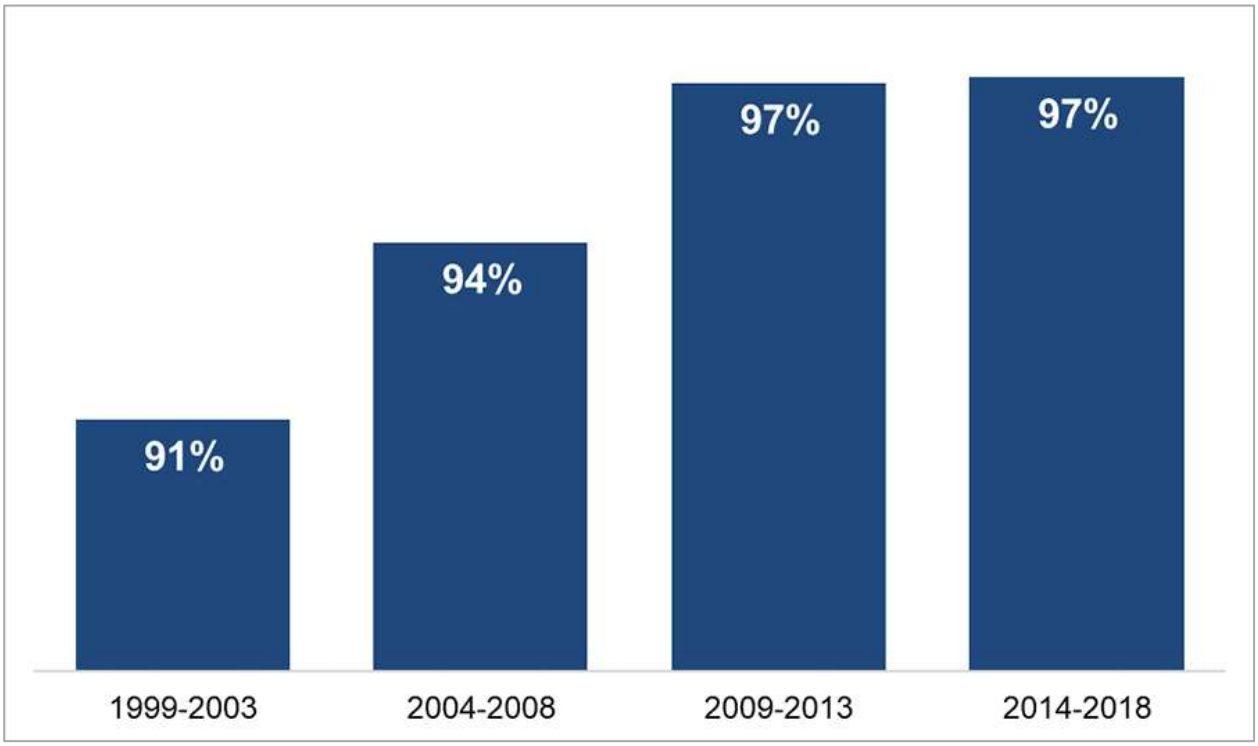
- the number of inspections
- inspections relative to harvest area
- the average rate of compliance

If an operation is found to be non-compliant, warnings, orders, administrative penalties and offence charges may be applied. Activities such as education, communication, planning, inspecting and reporting encourage appropriate operating and compliance.

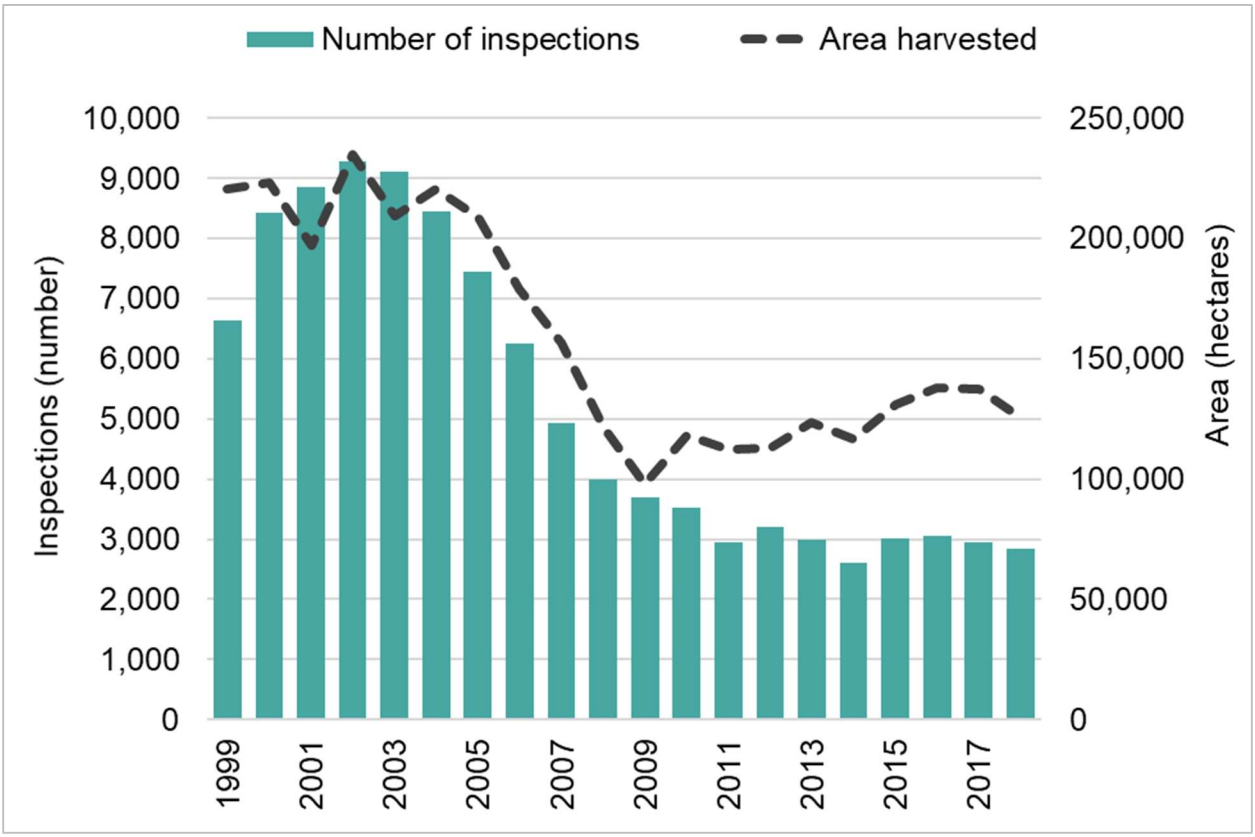
Results

The status of this indicator is good, and the trend is no change because compliance rates were high and stable.

Compliance rate



Number of inspections and total harvest area



Results show that forest operations are complying with the rules and standards designed to protect the forest ecosystem. From 2014-2018:

- Approximately 14,456 inspections of forest operations were conducted by ministry and industry compliance inspectors, averaging 2,891 inspections annually.
- There was an average of 22 inspections per 1,000 hectares.
- The compliance rate remained steady averaging 97%.

The number of inspections generally varies with the total harvest area. As harvest levels decrease so do the number of inspections. The forest compliance program has also evolved to focus inspection efforts on operations that are higher risk (e.g. water crossings). This contributes to a decrease in inspections relative to harvest area.

Indicator last updated

- February 2021

Data source(s)

- Forest Operations Information Program database

Aggregate resource production

Description

This production indicator report tracks how much aggregate (e.g., bedrock, sand and gravel) is produced in Ontario.

Status


Status: Active


Trend: No change


Geographic extent: Province-wide

Why it's important

Aggregate resources are sand, gravel, clay, earth and bedrock. These resources are important to the everyday lives of all Ontarians. They make up our roads, sidewalks, sewers, subway tunnels, airports, homes, offices, hospitals, schools, and shopping centres. Aggregate resources are non-renewable.

Aggregate resource production indicates the annual consumption demand for aggregate resources.

How we monitor

The province's total production of aggregate resources is reported annually by The Ontario Aggregate Resources Corporation based on information provided by aggregate operators. All

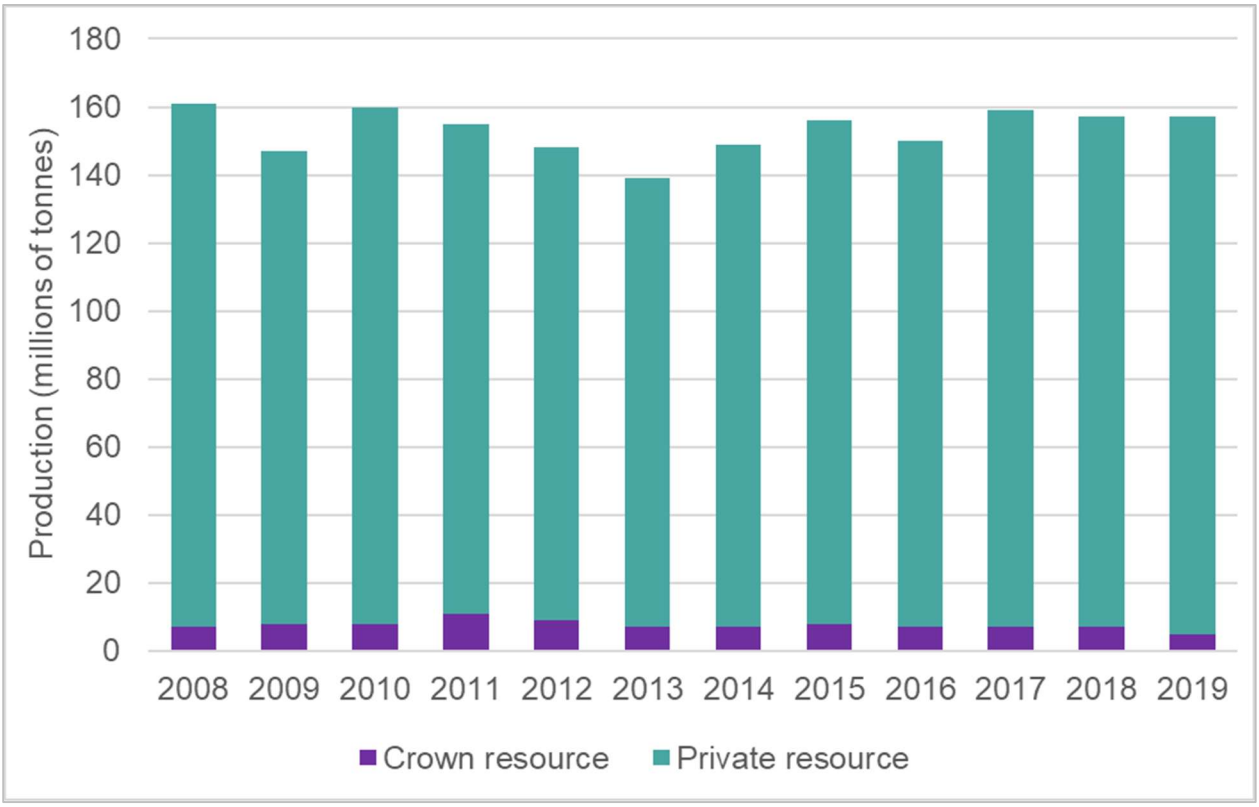
aggregate materials that leave a licensed or permitted site are counted as production. Production is measured in millions of tonnes and is categorized by whether it is from Crown or private land.

Results

Most aggregate production (95 per cent) in the province is from private land, where the resource belongs to the landowner. The remaining 5 per cent is from Crown owned material[1].

[1] There is additional production from forestry aggregate pits and non-designated private lands, neither of which is regulated under the Aggregate Resources Act. It may be included in the future if data becomes available.

Annual production of aggregate resources



Total production of aggregate resources has not varied significantly over the last 10 years, suggesting that demand for aggregate material has been relatively constant over the same 10-year period.

From 2010 to 2019, the annual production of aggregate resources has ranged from 139 to 161 million tonnes. Average production was 153 million tonnes.

Indicator last updated

- February 2021

Data source(s)

- The Ontario Aggregate Resources Corporation (TOARC)

Oil and natural gas production

Description

This production indicator report tracks how much oil and gas is produced in Ontario.

Status

Status: Active

Trend: Declining

Geographic extent: southern Ontario

Why it's important

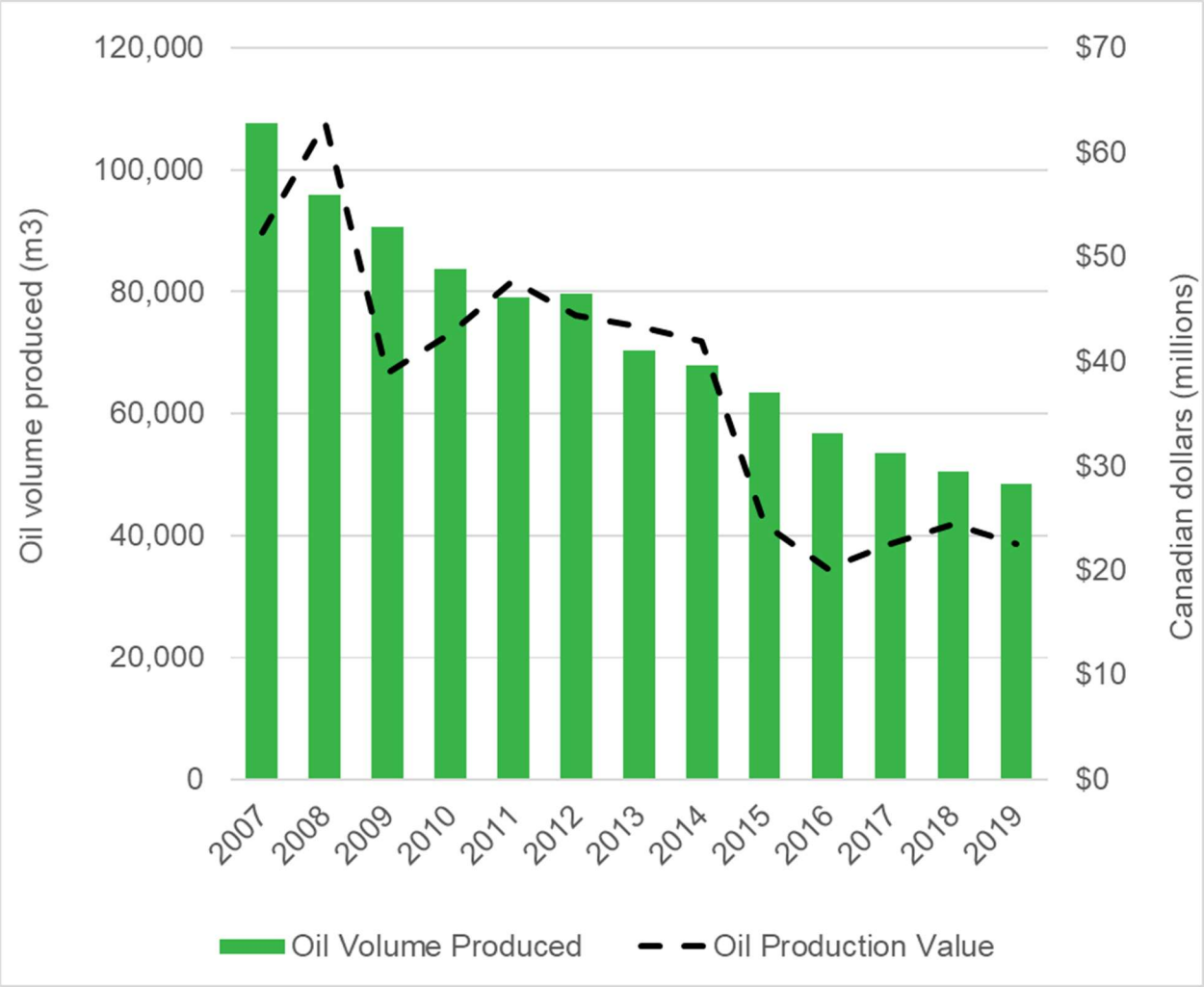
Oil and gas resources have long been an important part of Ontario's economy. We regulate the exploration and production of oil and gas in Ontario to ensure that it is done in a safe, environmentally responsible and efficient manner.

How we monitor

Under the *Oil, Gas and Salt Resources Act*, oil and gas producers are required to submit an annual report with monthly oil and gas production. We track annually how much oil and gas is produced and the value of the oil and gas sold.

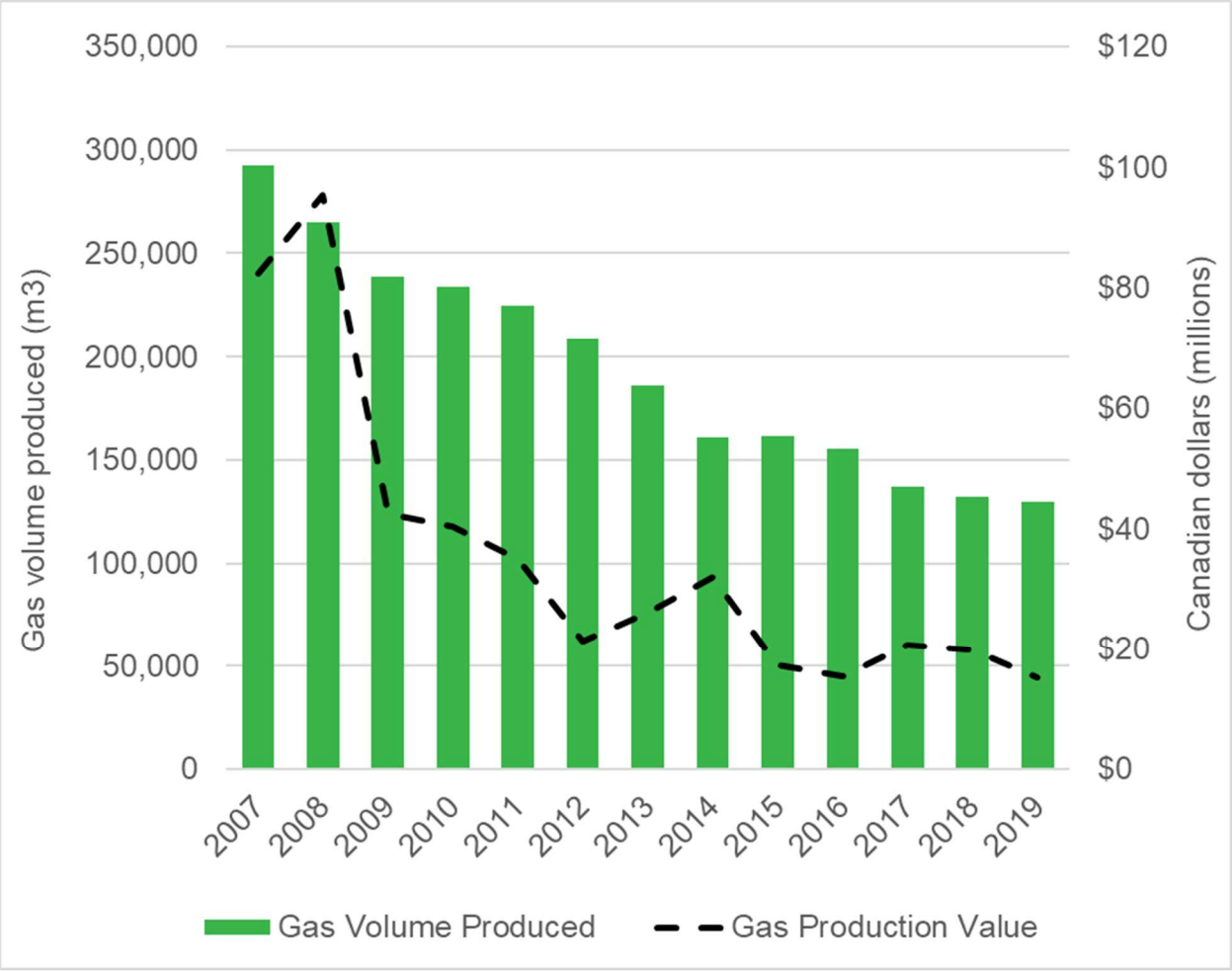
Results

Oil production in Ontario



Oil production has been declining at an average rate of 6.4 per cent per year since 2007. Between 2007 and 2019, oil production decreased by 55 per cent overall. As oil and gas are non-renewable resources, production will continue to decline from existing oil and gas pools unless new oil and gas plays are discovered and produced from.

Natural gas production in Ontario



Gas production has been declining at an average rate of 6.5 per cent per year since 2007 with one-year (2015) recording volumes that were consistent with the previous year. Between 2007 and 2019, gas production in Ontario decreased by 55.7 per cent overall.

The value of the oil and gas produced in Ontario has fluctuated significantly from year to year based on various market conditions. From 2007 to 2019:

- the total value of oil sales has declined by 56.8 per cent
- the total value of gas sales has declined by 81.6 per cent

The long-term decline in value of the total oil and gas production can be attributed to a consistent decline in production of oil and gas in Ontario and several changing market conditions. An increase in shale oil and gas production in the United States in 2008 resulted in

an abundance of supply on the market and in a decrease in oil and gas prices. The decline in value of oil and gas has also been influenced by price fluctuations which are affected by national and global financial and political activities.

Indicator last updated

- February 2021

Data source(s)

- Annual production reports submitted by operators

Forest certification

Description

This indicator tracks the certification status of Ontario's public forests

Status


Status: Good


Trend: No change


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

The forest industry may certify their managed forests to an independent certification system to help market their products domestically and internationally. Forest certification recognizes that forest management practices have met standards set by an independent certification organization.

Regardless of the choice to certify to an independent standard, Ontario's Public forests are sustainably managed using Ontario's forest policy framework.

How we monitor

We track the amount of the forest area certified under each certification system using provincial forest inventory data. The area certified calculation includes all public land and

water. Non-forested area is included as it contributes to sustainable forest management objectives and to meeting the forest certification standards.

The forest certification systems in Ontario include:

- the Canadian Standards Association
- the Forest Stewardship Council
- the Sustainable Forestry Initiative

Each system has its own standards. Some forests may be certified to more than one system.

Forest certification organizations are independent of government and the forest industry and their websites provide information about the companies and lands they have certified. We use this information to determine the certification status for each management unit.

Results

The status of this indicator is considered good because many of the management units in the province continue to be certified to an internationally recognized standard. Although the trend in the area certified shows slight annual fluctuation, it has remained steady over the longer term.

Area certified by certification system

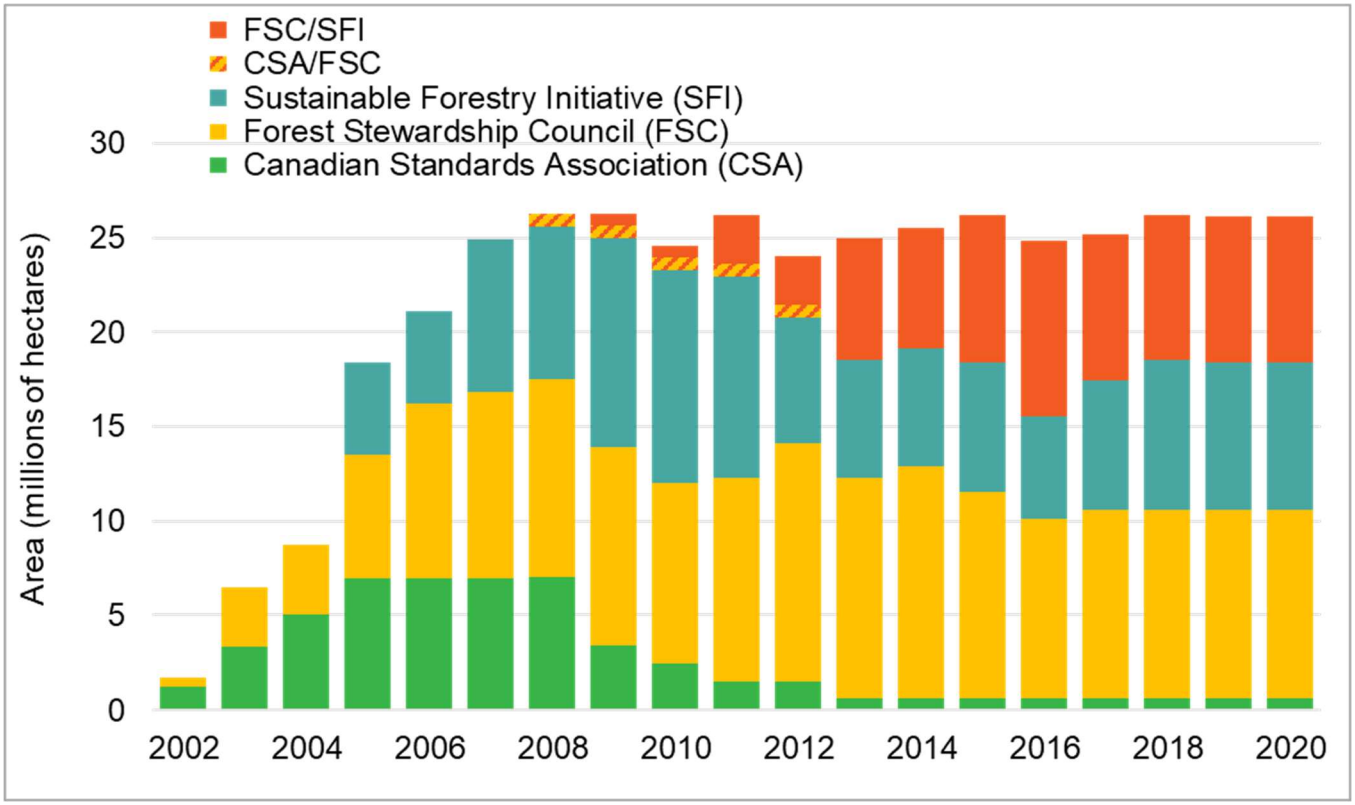


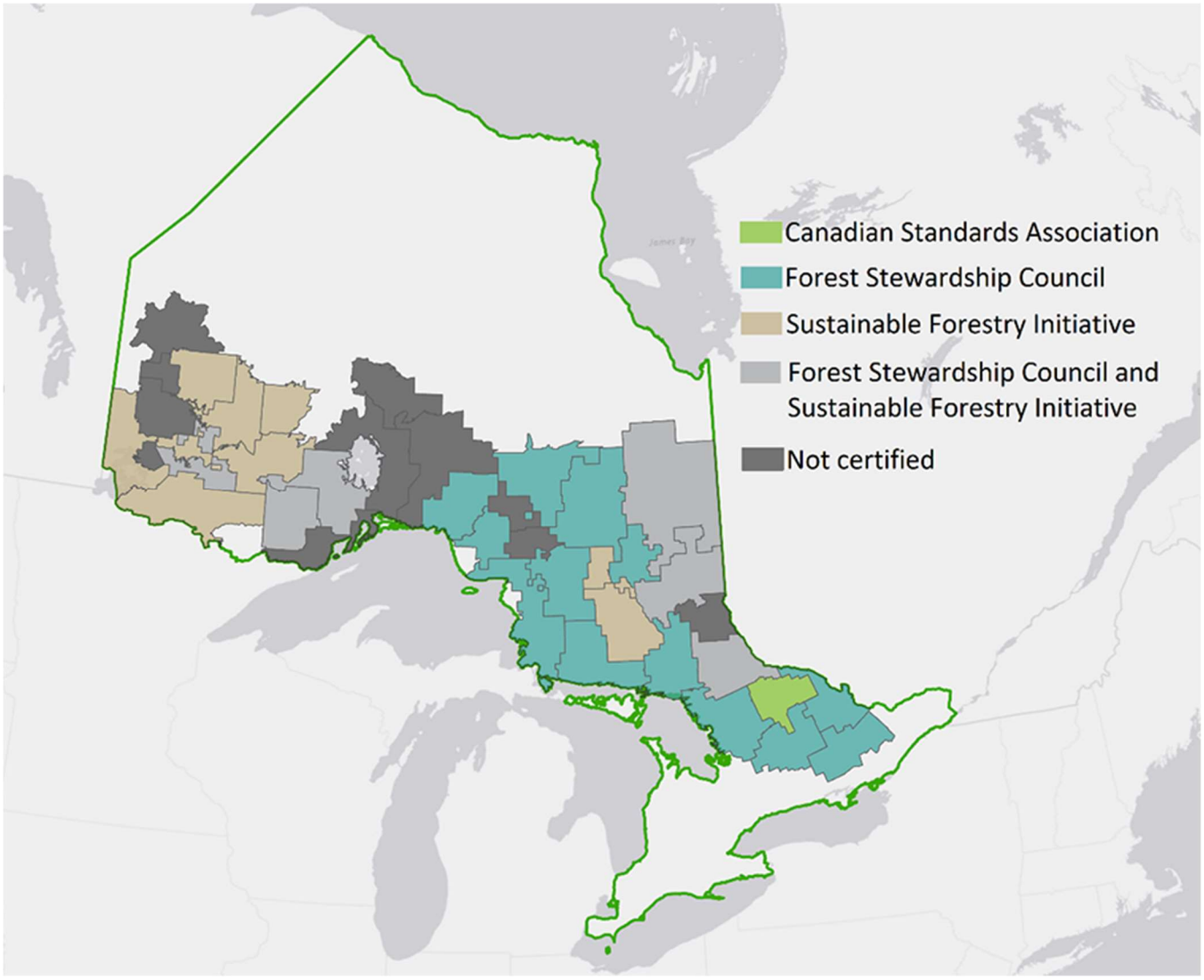
Chart showing the area of management units certified and the related certification system from 2002 to 2020.

Because Ontario requires public forests to be managed sustainably, forest industry in Ontario is well positioned to meet the standards required by independent forest certification systems.

Changes in market demand may influence whether forest companies seek certification.

The chart shows the history of forest certification in Ontario and how the area certified under the different systems has changed over time. The area certified increased substantially from 2002 to 2008 because the Forest Products Association of Canada required their members to become certified. Since then levels have remained steady.

Certification status of management units in 2020



As of December 2020, 29 out of 39 management units in the province were certified covering a total of 26.1 million hectares. This equates to 77 per cent of the public lands and waters within management units.

- 13 are certified to the Forest Stewardship Council system
- 9 are certified to Sustainable Forestry Initiative
- 6 have dual Forest Stewardship Council / Sustainable Forestry Initiative certification
- 1 is certified to Canadian Standards Association

Indicator last updated

- February 2021

Data source(s)

- Forest Stewardship Council
- Sustainable Forestry Initiative
- Canadian Standards Association

Afforestation and Deforestation

Description

This indicator estimates the amount of afforestation and deforestation in Ontario.

Status


Status: Mixed


Trend: Mixed


Geographic extent: southern Ontario, Northern Ontario

Why it's important

Forests provide many benefits such as carbon storage, wildlife habitat, and regulating air, soil, and water quality.

Minimizing forest loss from deforestation and establishing new forests through afforestation can help maintain the values from our forests and mitigate climate change.

How we monitor

Deforestation is the permanent conversion of forest to other land uses such as agriculture and mining. Afforestation is the establishment of forest on land that has been unforested for at least 50 years.

Forest harvesting and renewal are not considered deforestation or afforestation because there is no change in land use. As part of sustainable forest management, the trees are re-established.

We estimate afforestation on private lands using tree planting records from Forests Ontario. Afforestation occurs primarily in southern Ontario. Forest gained from natural sources, such as the transition of old fields to forest, is not included.

We estimate the area of deforestation by analyzing:

- data from Canada's National Deforestation Monitoring System that uses satellite imagery to identify conversion of forest to other land uses
- Ministry of Northern Development, Mines, Natural Resources and Forestry data of forest cleared to construct permanent forest access roads

We supplement data from the National Deforestation Monitoring System with provincial data to better capture the extent of permanent forest access roads narrower than 20 meters.

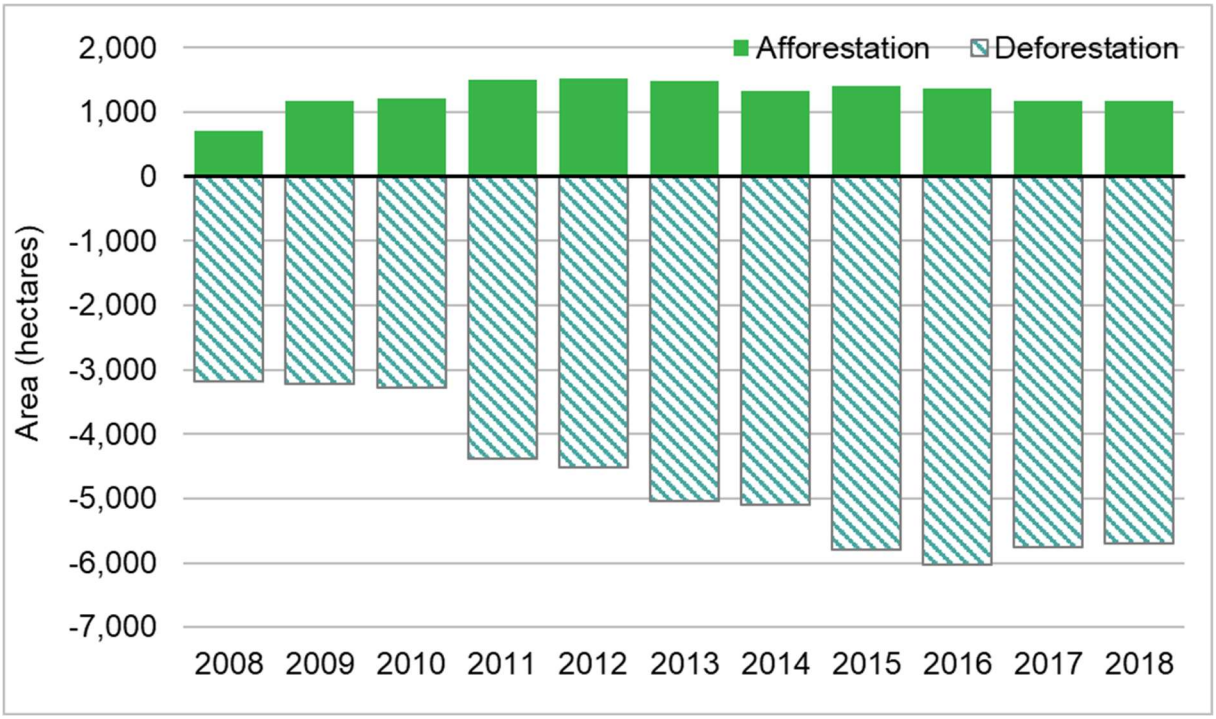
Permanent forest access roads include primary and branch roads. Primary roads provide principal access to an area where forest management takes place. Branch roads provide access to, through or between areas of forest management operations. Temporary forest access roads, called operational roads, are not included in the estimate of deforestation.

Estimates of afforestation and deforestation do not include the Far North as we lack data for this area. This indicator cannot be readily compared to previous reports because of the revised data sources and methods used.

Results

The status and trend of this indicator are classified as mixed. Afforestation rates have remained stable over the last 10 years. Although the annual area deforested in the province is small relative to the total amount of forest, overall deforestation has been increasing, driven largely by agriculture in southern Ontario.

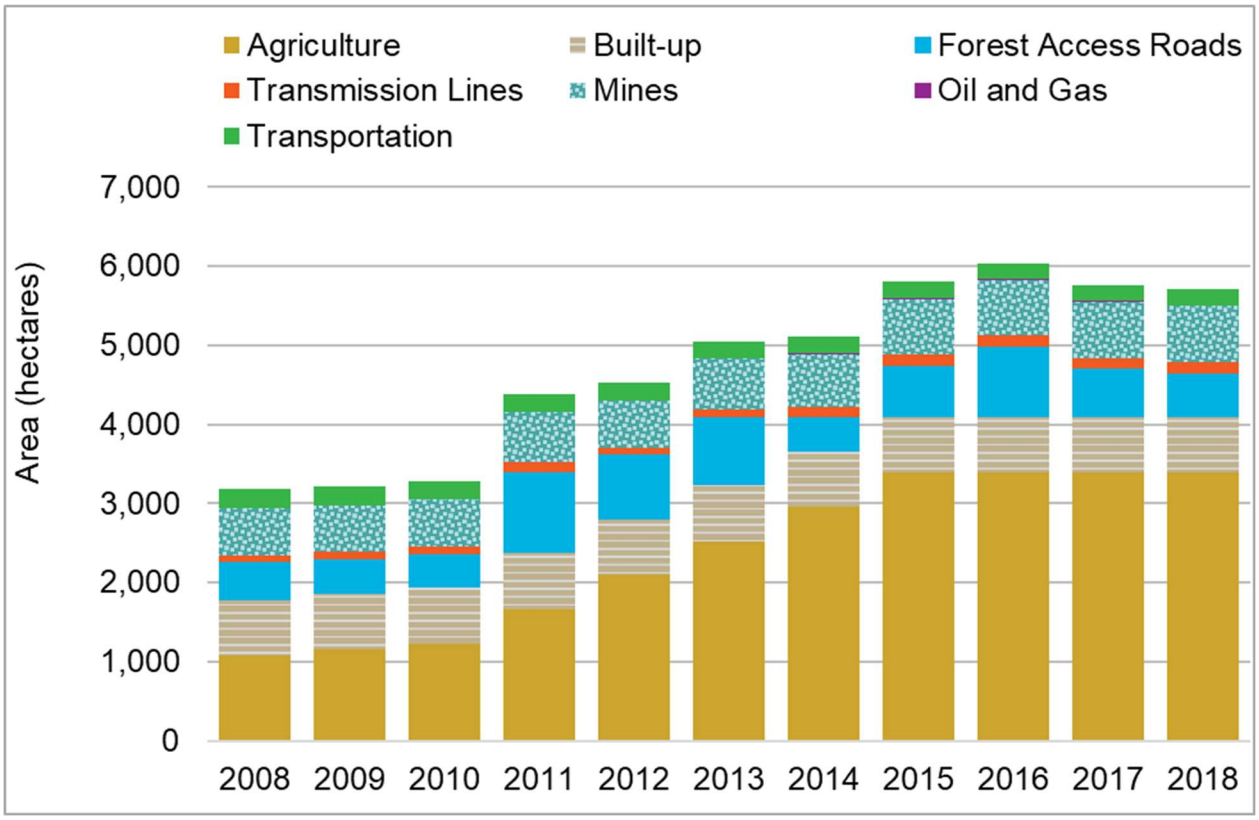
Area afforested/deforested 2008-2018



The annual area afforested has remained relatively constant from 2008 to 2018, whereas deforestation has increased.

- An average of 1,276 hectares of forest was gained per year through afforestation compared to an average of 4,731 ha per year lost to deforestation.
- A total of 14,038 hectares of new forest was established through afforestation while 52,041 ha was lost through deforestation.
- There was a net loss of 38,003 hectares of forest or 0.05% of Ontario's total forest area.

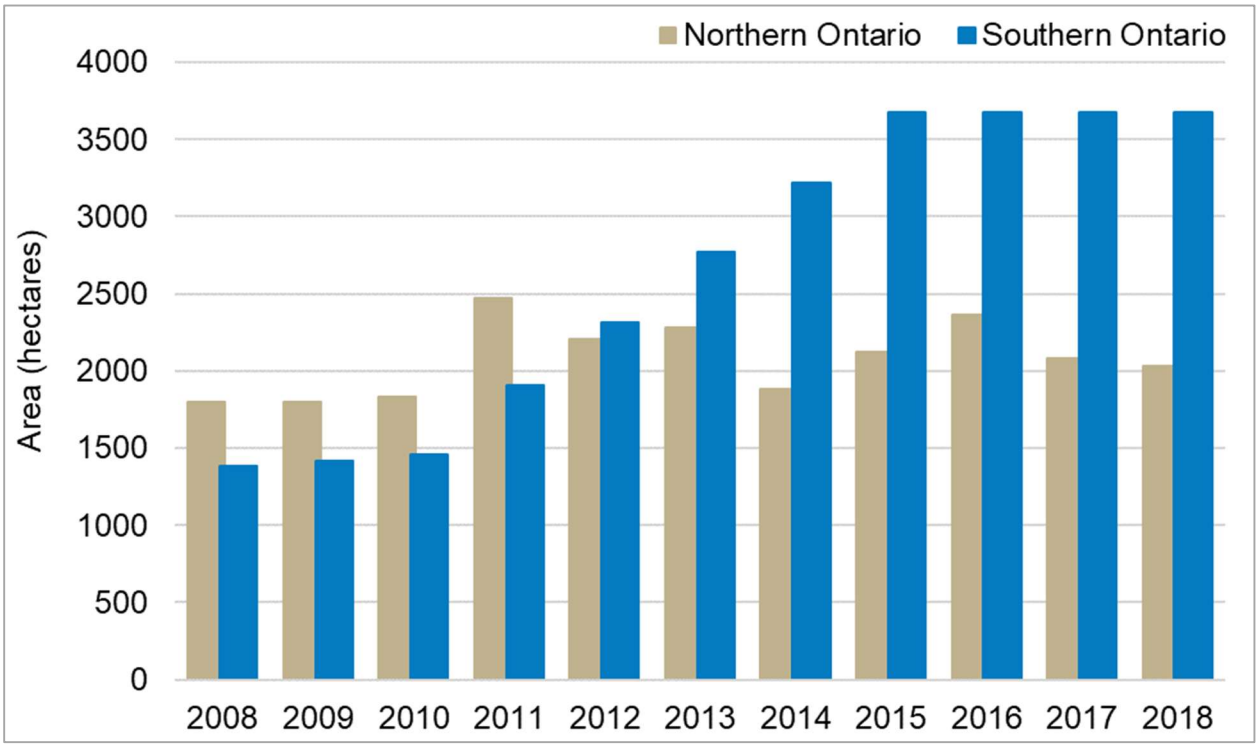
Area deforested by industrial sector 2008-2018



The increase in deforestation since 2008 was driven primarily by agriculture.

Deforestation was relatively stable across other industrial sectors.

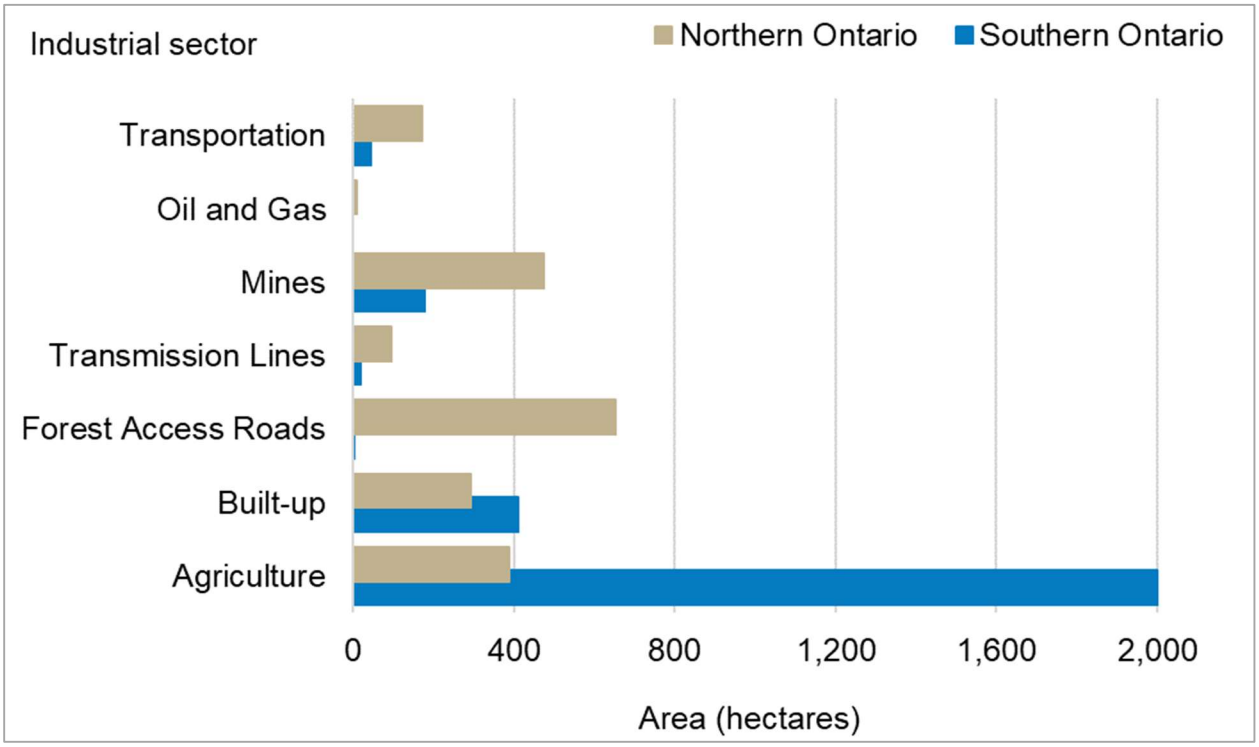
Area deforested in northern and southern Ontario 2008-2018



From 2008 to 2018, the annual area deforested in northern Ontario remained relatively constant, while deforestation in southern Ontario increased.

- Northern Ontario averaged 2,079 hectares of deforestation per year
- Southern Ontario averaged 2,652 hectares of deforestation per year, an increase from 1,382 hectares in 2008 to 3,674 in 2018

Average annual area deforested from 2008–2018 in northern and southern Ontario by industrial sector



From 2008 to 2018, forest access roads and mines together accounted for 54% of deforestation in northern Ontario and agriculture accounted for 75% of deforestation in southern Ontario.

Indicator last updated

- February 2021

Data source(s)

- Forests Ontario
- Natural Resources Canada, Canadian Forest Service, National Deforestation Monitoring System, special tabulation of data from NDMS: DD2021–R05f. December 16, 2020.

Forest Governance

Description

This indicator tracks the status of forest tenure across Ontario's managed forests.

Status

 Status: Good

 Trend: Undetermined

 Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Public forests in Ontario provide recreation, biodiversity, and habitat for wildlife. They also support the forest industry, which creates jobs and forest products. Ontario's forest industry is critical to the provincial economy and to many northern and rural communities.

Forest tenure directs who manages and has access to the wood fibre from public forests. It is the allocation and licensing of timber through legal arrangements that define the rights and responsibilities assigned to forestry companies and other resource users. Forest tenures support a strong and diverse forest industry while maintaining a healthy and productive forest.

Forest tenure evolves to fit local circumstances. The variety of forest tenures and tenure holders (licensees) across management units reflects this.

How we monitor

We track the type of tenure in place for each management unit.

The primary type of forest tenure is a Sustainable Forest Licence. A sustainable forest licence holder is assigned responsibility for managing the forest and has the right to harvest. They must prepare forest management plans, gather forest information, monitor and report on compliance and conduct forest operations.

Sustainable Forest Licences are long-term licences granted for up to 20 years that are established under the authority of the *Crown Forest Sustainability Act*. Each one is reviewed every 5 years and may be extended.

If no Sustainable Forest Licence is in place, the Ministry of Northern Development, Mines, Natural Resources and Forestry is directly responsible for managing the forest. The ministry may issue licences to harvest for up to 10 years and enter into agreements with service providers or licensees to carry out forest management responsibilities.

Sustainable Forest Licences are held by different types of companies including:

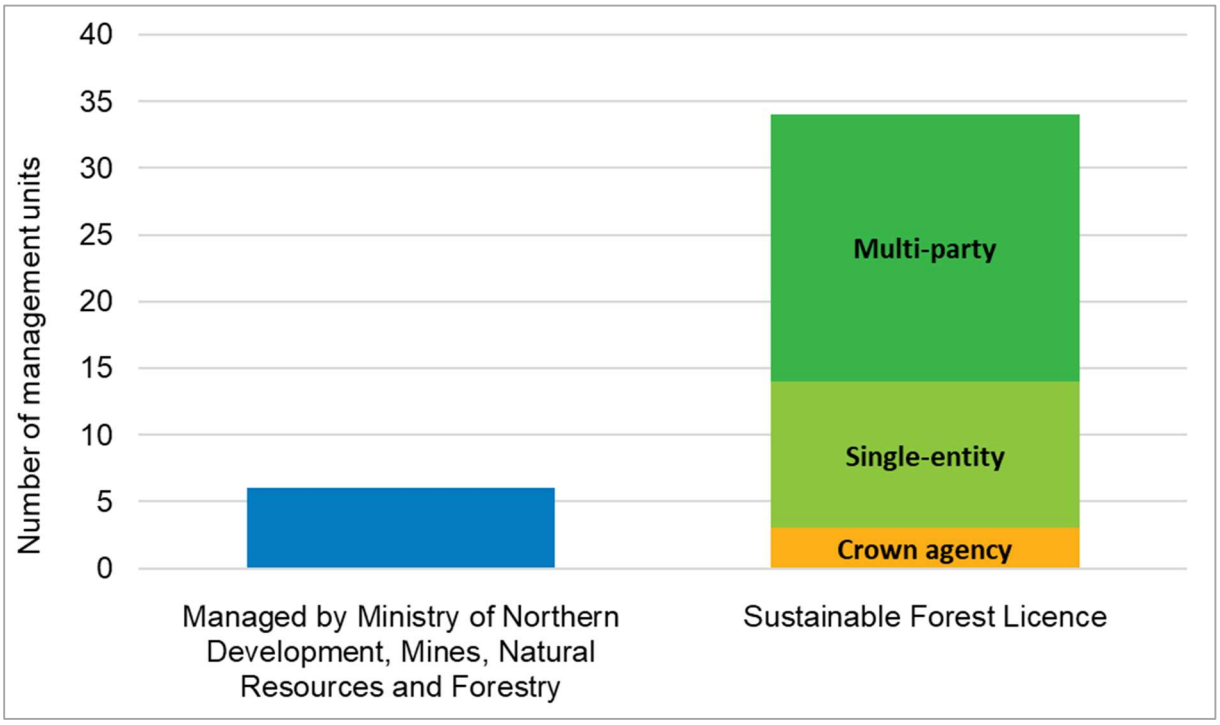
- Multi-party company – a company with two or more interests such as a combination of community, Indigenous, and/or forest industry who govern the company together, such as on a board of directors.
- Single-entity company – a company representing single business interest, often a forest sector company or an Indigenous company.
- Agency – a corporation, established in unique circumstances with the authority of the Ontario Forest Tenure Modernization Act or the Algonquin Forestry Authority Act.

Although it is not technically a sustainable forest license, we include the Algonquin Forestry Authority because it is a long-term agreement to carry out forest management responsibilities including the right to harvest.

Results

The status is good. Most management units are managed under long term sustainable forest licences and there is a diversity in the types of companies holding this tenure. This is the first time reporting on this indicator, so a trend is not available.

Status of forest tenure in 2020



- 85% or 34 of 40 management units are managed under a Sustainable Forest Licence
- 15% or 6 of 40 management units are managed directly by the Ministry of Northern Development, Mines, Natural Resources and Forestry, but not under a Sustainable Forest Licence

Indicator last updated

- February 2021

Data source(s)

- Ministry of Northern Development, Mines, Natural Resources and Forestry administrative data

Tax incentive programs

Description

This stewardship indicator report tracks the number of properties enrolled and the eligible area of properties enrolled in the Managed Forest Tax Incentive Program and Conservation Land Tax Incentive Programs.

Status


Status: Good


Trend: Improving


Geographic extent: Province-wide

Why it's important

Many natural areas are located on private property, particularly in southern Ontario. Economic incentives encourage landowners to responsibly manage forests, maintain biodiversity and protect natural heritage features on their properties. These incentive programs recognize the importance of private land in maintaining healthy ecosystems. Participation in these programs helps demonstrate the level of forest, biodiversity and natural heritage stewardship occurring on private land within the province.

We currently offer two voluntary tax incentive programs to eligible private landowners:

- the Managed Forest Tax Incentive Program
- the Conservation Land Tax Incentive Program

Under the Managed Forest Tax Incentive Program, landowners prepare and follow managed forest plans. Once their forests are classified as ‘Managed Forest’, they pay reduced property taxes.

Under the Conservation Land Tax Incentive Program, portions of private property that have eligible provincially important natural heritage features may qualify for a 100 per cent property tax exemption. In addition, lands owned by conservation authorities or eligible charitable conservation organizations that have a primary objective of natural heritage conservation, may also qualify for a property tax exemption under the Community Conservation Lands category.

How we monitor

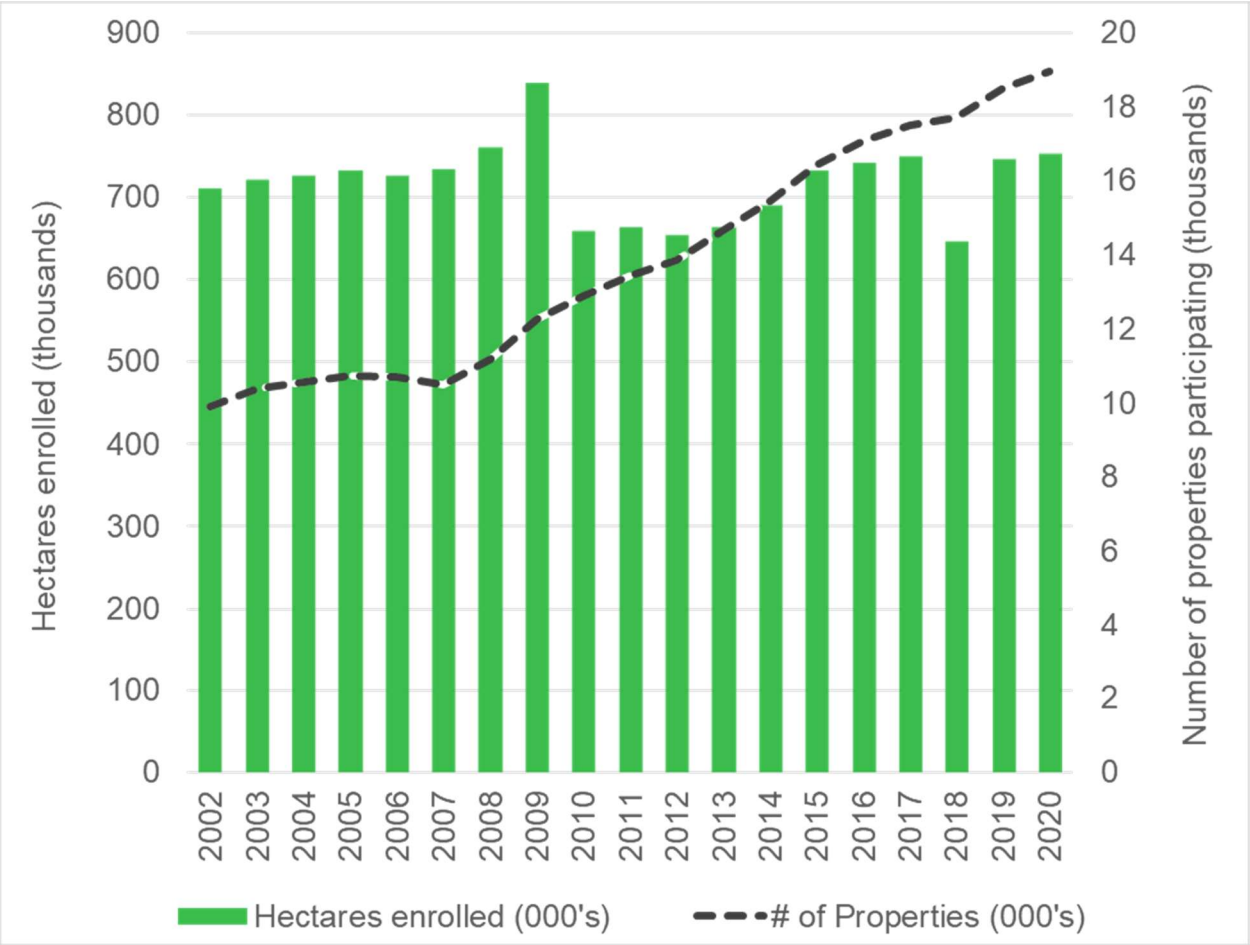
We compile administrative data annually from the Managed Forest and the Conservation Land Tax Incentive Programs, namely the number of properties enrolled and the total eligible area enrolled in each program. This allows us to identify trends in participation and the total eligible area of private lands that may contribute to sustainable forest management, the conservation of biodiversity and the protection of eligible natural heritage features (including community conservation lands). Note that program data is approximate as data management and collection processes have evolved over the history of the program.

Results

Our tax incentive programs are showing an increasing trend in participation rates.

Between 2002 and 2020, the number of properties participating in the Managed Forest and the Conservation Land Tax Incentive Programs increased over time starting with 23,714 properties to a current total of 43,850 properties.

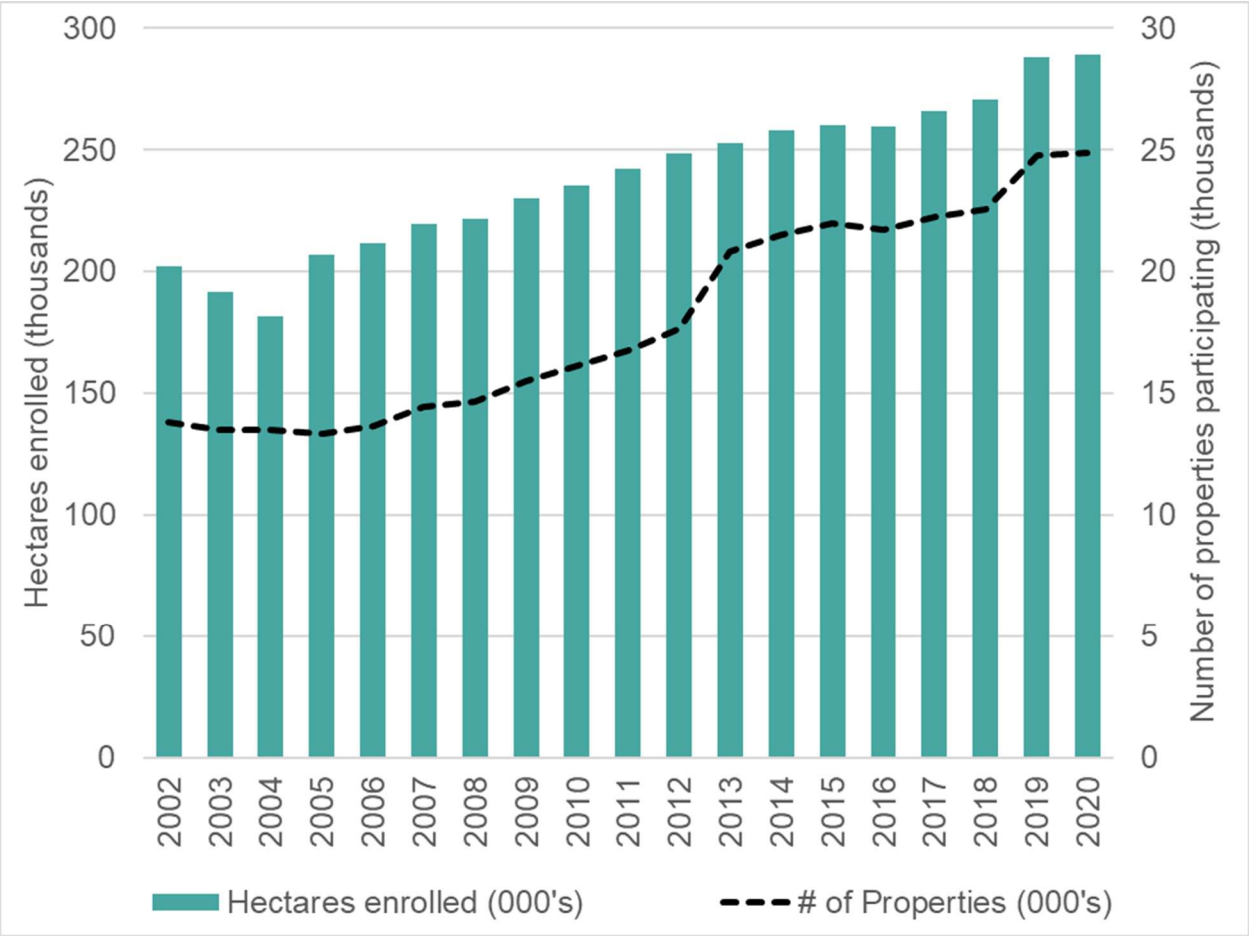
Land area and participation in the Managed Forest Tax Incentive Program (2002 to 2020)



Between 2002 and 2020, the area of the properties enrolled in the program fluctuated, with an overall increase of about 6 per cent (from 708,900 hectares in 2002 to 751,100 hectares in 2020). The decreases seen in 2010 and 2018 were largely due to the sale of large land holdings which may have no longer met program eligibility, making the overall increase smaller. In years such as 2009, there was a general upward trend in the total enrolled eligible area.

Enrollment also fluctuates year to year under this voluntary program. Overall, enrollment increased from 9,899 participating properties in 2002 to 18,950 participating properties in 2020.

Land area and participation in the Conservation Land Tax Incentive Program (2002 to 2020)



Between 2002 and 2020, the area enrolled in the Conservation Land Tax Incentive Program increased by 43 per cent (from 201,980 hectares in 2002 to 289,200 hectares in 2020). Data for 2002 and 2003 included some properties that were subsequently deemed ineligible, artificially inflating the data.

Enrollment also fluctuates year to year under this voluntary program. Overall, enrollment increased from 13,800 participating properties in 2002 to 24,900 participating properties in 2020.

For the 2020 tax year, approximately 18 per cent (52,000 hectares of the lands enrolled in the Conservation Land Tax Incentive Program) are protected as Community Conservation Lands. This enrollment represents a one per cent increase in enrollment from 2018.

Indicator last updated

- February 2021

Data source(s)

- Managed Forest Tax Incentive Program and Conservation Land Tax Incentive Program administrative data

Protected area system

Refer to the MECP Protected Areas indicator report on the Ontario Parks webpage.

Public awareness of natural resource management

Description

This stewardship indicator report assesses the level of public awareness or value placed on various aspects of natural resource management.

Status


Status: Mixed


Trend: Undetermined


Geographic extent: Province-wide

Why it's important

To effectively manage our natural resources, the public needs to understand and agree with what we are trying to accomplish. If they do, Ontarians may be more likely to participate in natural resource decision making or outdoor recreational activities and be stewards of our natural resources.

Assessing public awareness on topics such as forest management, biodiversity and fish and wildlife helps us to better understand how effective our communication efforts are and identify other opportunities to raise awareness.

How we monitor

A series of public surveys were conducted to provide insight on Ontarians' awareness and understanding of forest management, biodiversity and on the perceived importance of certain aspects of fish and wildlife management.

Forest management

We conducted an online survey on forest management. Respondents were required to rent or own a property in the province. At least 50 per cent of respondents identified themselves as wood buyers. Wood buyers are defined as individuals who have undertaken within the last 12 months, or intend to undertake within the next 12 months, internal or external home renovations involving wood or the purchase of furniture incorporating wood. Survey participants were asked how familiar they are with how Ontario manages forests. Answer options ranged from strongly agree to strongly disagree, including an option for "don't know/not sure."

Biodiversity

A phone survey was conducted by Environmental Communication Options and Oracle Poll Research in 2016 on biodiversity. Over1,000 people, 18 years of age or older, were asked whether they were familiar with the term biodiversity. If they responded yes, they were asked to select the definition they believed best fit the term. The survey further asked to what degree they agreed with the statement "biodiversity plays an important role in maintaining my health and well-being." Options ranged from strongly agree to strongly disagree, including an option for "don't know."

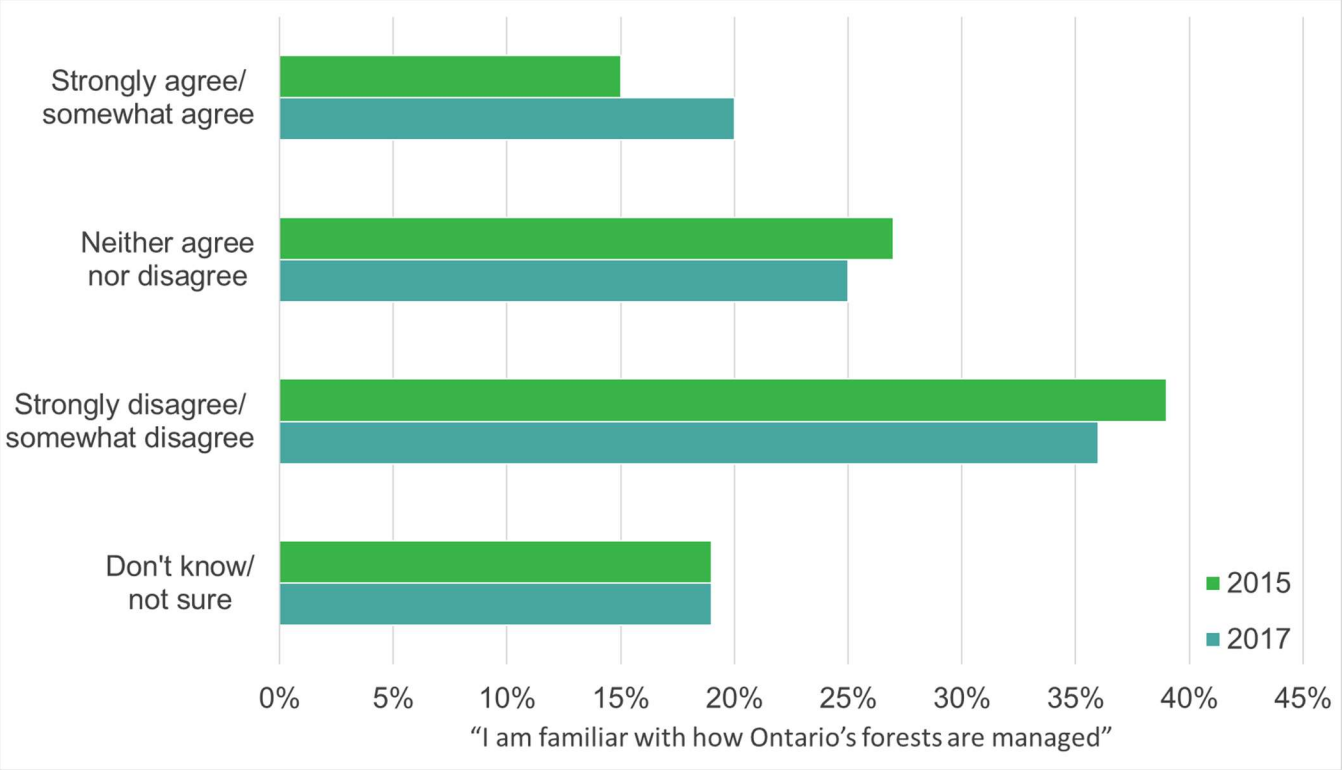
Fish and wildlife

We conducted consumer research surveys on fish and wildlife. Participants included the general public and licensed anglers and hunters. Participants were asked about the importance they place on different aspects of fish and wildlife management. The respondents rated each item on a scale from 1 to 5 with 1 being 'not at all important' and 5 being 'extremely important'. We used this ranking to develop an importance index based on the average stated importance.

Results

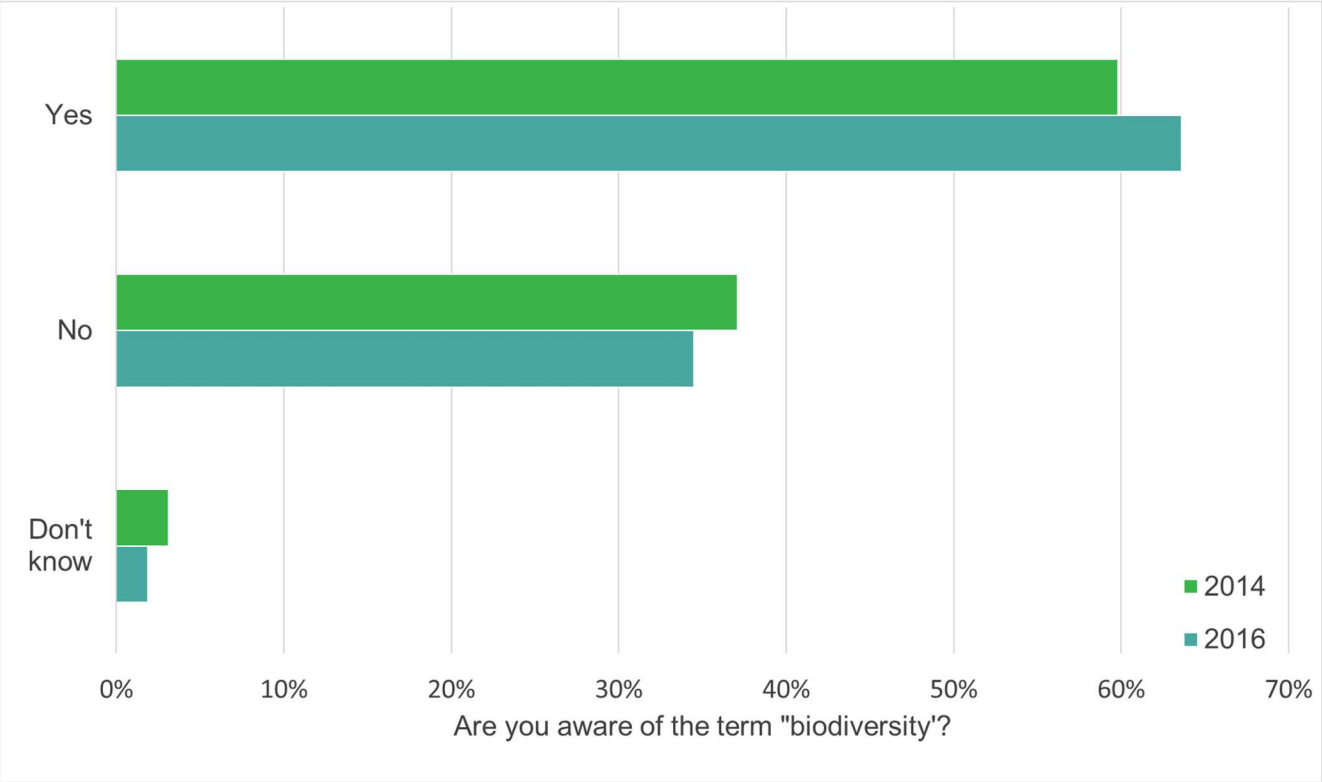
Responses varied across the different surveys, but in general, there has been an increase in awareness across the repeated surveys. Continuing these surveys will help us to better understand potential trends in awareness.

Survey results on familiarity with forest management

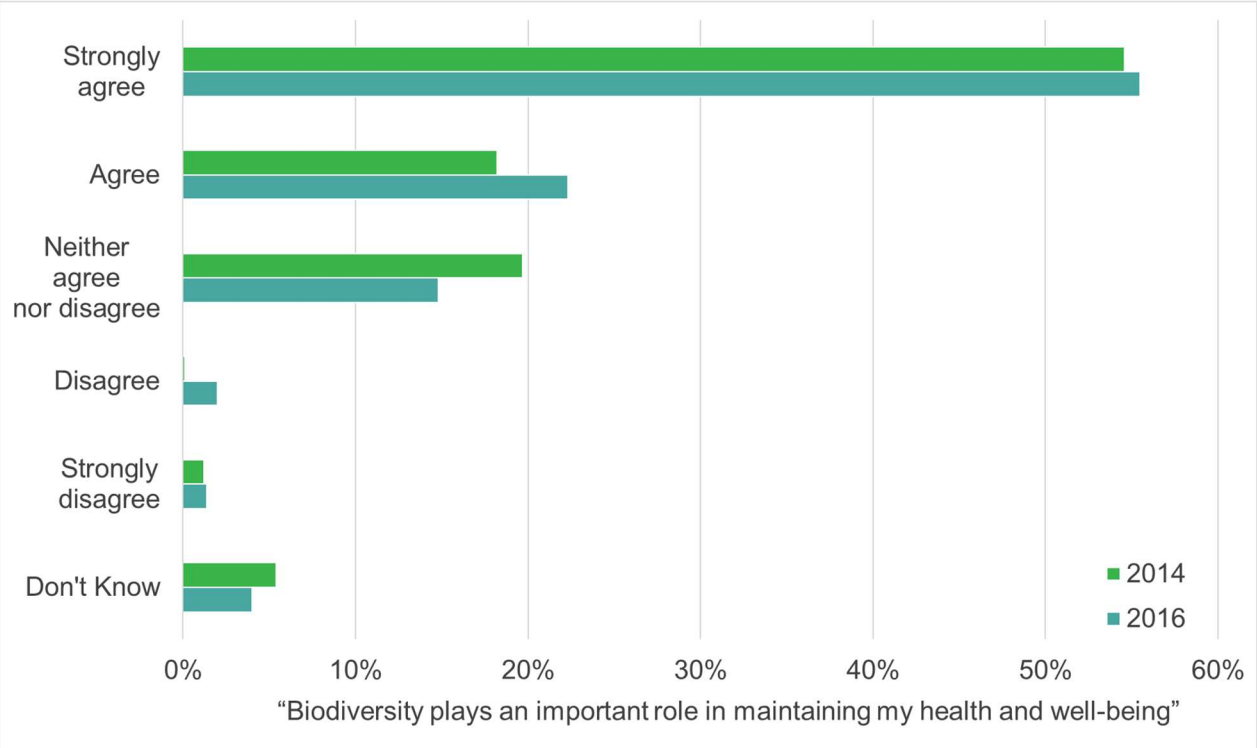


Awareness of how forests are managed in Ontario increased by 5 percentage points from 2015 to 2017 to a total of 20 per cent. Some of the increase in awareness could possibly be attributed to our outreach efforts through the Ontario Wood brand and Forests Ontario's new "It Takes a Forest" marketing campaign. This campaign highlights the sustainability of forest management in Ontario, ensuring we have a thriving forest economy that contributes directly to the people and communities of Ontario.

Survey results on awareness of biodiversity



Survey responses on the importance of biodiversity to health and well-being



Awareness of the term biodiversity increased by 4 percentage points from 2014 to 2016 to a total of 64 per cent. Of those who responded in 2016 that they were aware of the term, 58 per cent defined it correctly as "the variety of life on earth" while 33 per cent chose a partial definition. In the same survey, 78 per cent of respondents agreed (22 per cent) or strongly agreed (56 per cent) that biodiversity plays an important role in maintaining their health and well-being, representing an increase of 5 percentage points over 2014.

Importance Ontarians place on different aspects of fish and wildlife management

Aspects of fish and wildlife management	**2016 Average Rating (out of 5)**
Protecting/sustaining fish and wildlife populations through programs like fish stocking	4.1
Enforcing the rules and regulations of hunting and fishing	4.1
Manage the sales of more than 2 million Outdoors Cards, fishing and hunting licences each year.	3.5

Aspects of fish and wildlife management	2016 Average Rating (out of 5)
Marketing and education programs that drive licence sales and increase public awareness and safety	3.5
Conduct research to understand the state of fish and wildlife populations	4.0
Determine where, when and how hunting and fishing can be conducted based on the best available information.	3.7
Importance index	**3.8**

The importance of different aspects of fish and wildlife management were ranked between 3.5 and 4.1 on a 5-point importance index scale. Respondents generally placed a higher importance on managing and sustaining populations of fish and wildlife, enforcing rules and regulations and conducting research. Less importance was placed on selling and marketing licences and educating the public.

These results will help to inform future marketing campaigns and communication with Ontarians.

Indicator last updated

- June 2019

Data source(s)

- survey data
- Biodiversity awareness survey report

Theme – Economic and social benefits of our natural resources

Natural resource industries in Ontario, such as forestry, fisheries, hunting, and oil and gas, play an important role in our economy by supporting jobs and communities and providing recreation and tourism opportunities.

Economic contribution

Our natural resource sectors contribute to the provincial economy and help deliver jobs, prosperity and growth to Ontario and Canada through such industries as forestry, commercial fishing, aquaculture, recreational fishing, hunting, and oil and gas.

Indicator reports

- Aquaculture economics
- Commercial fishing value
- Recreational fishing and hunting expenditures
- Forest sector Gross Domestic Product (GDP)
- Forest products
- Forest sector exports
- Oil and gas industry

Employment

Sustainably managing our natural resources can help to create employment opportunities and support communities across the province.

Indicator report

- Natural resource employment

Outdoor recreation

Natural resources in Ontario provide many opportunities for recreation and social interaction through hunting, fishing, camping and biking.

Indicator report

- Recreational opportunities

Aquaculture economics

Description

This economic contribution indicator assesses the value of the aquaculture (cultivation of fish) industry in Ontario.

Status


Status: Good


Trend: Improving


Geographic extent: Province-wide

Why it's important

The aquaculture industry in Ontario provides high-quality, safe and affordable food items to consumers, while being recognized as an important contributor to Ontario's agri-food economy.

Aquaculture involves the farming of many different species of fish, crustaceans, molluscs and aquatic plants. It can be done in tanks on land, in ponds, or in net-pens moored in open water. Aquaculture operations require various licences and authorizations to operate and sell their products.

We monitor the activity of the aquaculture industry to better understand its benefits to Ontarians and minimize the risks of potential environmental impacts.

How we monitor

Aquaculture production in Ontario is mostly lake-based, net-pen production of Rainbow Trout in the North Channel and Georgian Bay of Lake Huron. There is also land-based production of Arctic Char, Tilapia and Shrimp at a limited number of facilities in southern and north-central Ontario.

We track annual aquaculture production by measuring:

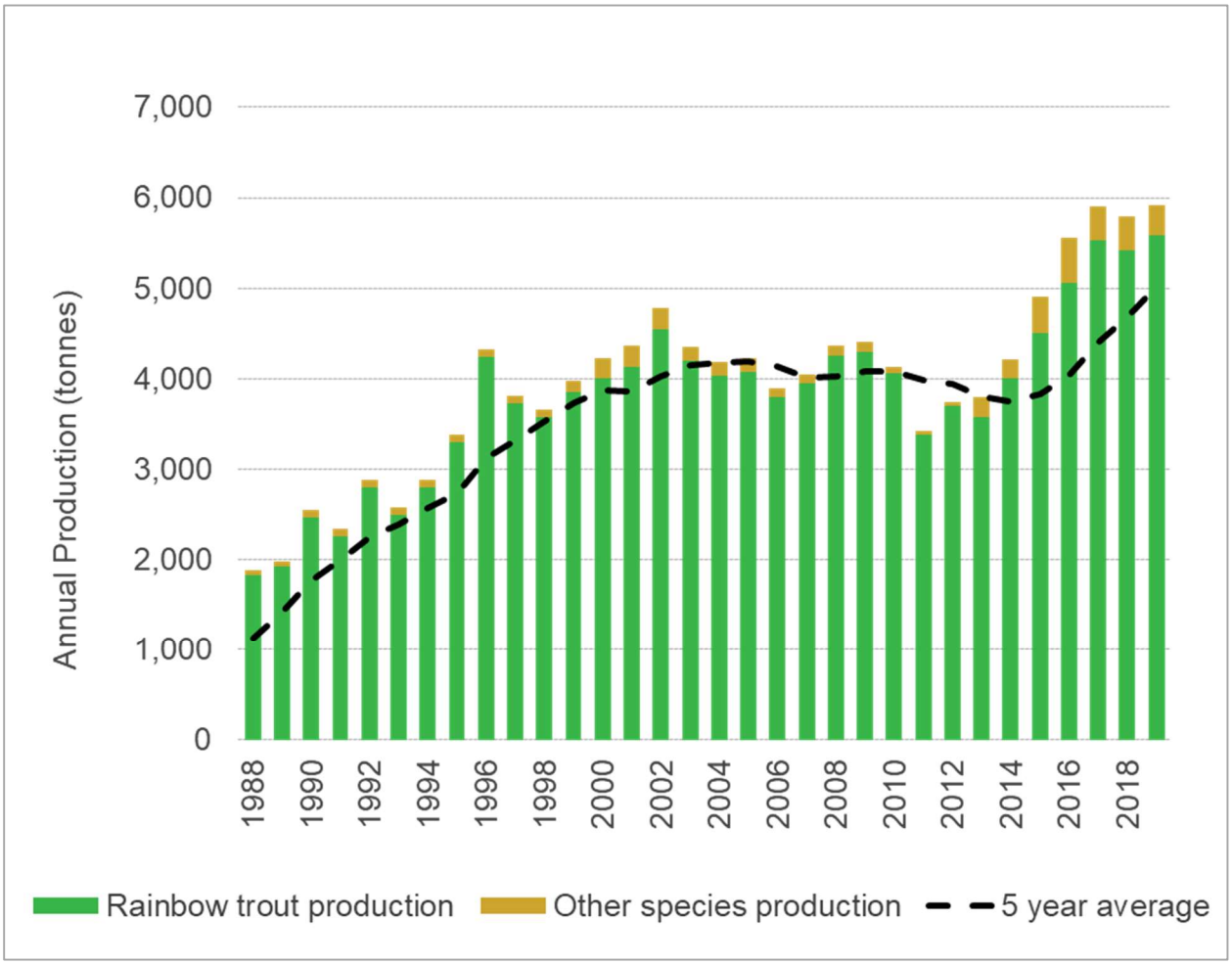
- the farm-gate value of total sales. The farm-gate value is the total dollar value of what is produced, at the first point of sale.
- the total economic contribution of the aquaculture industry and jobs

Aquaculture data is collected by the University of Guelph; through a partnership arrangement they obtain data from industry and publicly report the results on our behalf.

Results

In 2019, aquaculture farms produced approximately 5,923 tonnes of fish and shrimp. The net-pen production of Rainbow Trout in the North Channel and Georgian Bay of Lake Huron accounted for 96 per cent (5,583 tonnes) of total output. The farm-gate value of Rainbow Trout was $31.2 million with other fish valued at $2.6 million. Aquaculture in Ontario is estimated to annually contribute more than $126 million to the Ontario economy. Aquaculture production also provides 177 jobs in direct employment.

Ontario Aquaculture Production between 1988 and 2019



Production has increased in recent years from a five-year average of 3,859 tonnes from 2010-2014 to 5,614 tonnes from 2015-2019 amounting to a 45 per cent increase. 2019 production continued that trend with 5,923 tonnes annual production, a dramatic turnaround from the most recent low in 2011 when production was less than 3,500.

The aquaculture sector in Ontario is experiencing steady production. There was significant consolidation, with mergers and acquisitions, in the industry. Somewhat atypical weather conditions resulted in a modest decline of farmed trout production.

The industry is moving towards fewer, larger companies, controlling the majority share of grow-out production. Expansion plans continue within First Nations communities led by Indigenous

entrepreneurs. There is renewed interest by the investment community in enabling construction and development of new facilities. This is helping the industry meet the demands from Ontarians and reduce reliance on imported fish.

The uncertainty of the pandemic, and the rapidly changing dynamics of the provincial and national marketplaces, make for challenging near-term impacts on the sector. In the medium to longer-term (i.e. two to five years), the industry will continue to look for opportunities to expand production in Ontario.

Indicator last updated

- February 2021

Data source(s)

- ‘AQUASTATS’ Ontario Aquacultural Production In 2019

Commercial fishing value

Description

This economic contribution indicator report measures the value of commercial fishing in Ontario.

Status


Status: Fair


Trend: Mixed


Geographic extent: Great Lakes

Why it's important

This indicator measures the economic value of commercial fishing in Ontario's Great Lakes and St. Lawrence River. Monitoring the harvest and value of commercial fishing ensures that freshwater commercial fisheries in Ontario continue to provide sustainable economic benefits and opportunities.

We are fortunate to have one of the largest freshwater fisheries in North America. Commercial fishing operations in the province range from traditional small-scale fisheries to modern industrial fisheries. The Great Lakes support the province's largest commercial fisheries, while other commercial fisheries operate on the large inland lakes (such as Lake Nipigon and Lake Nipissing), and a number of smaller lakes found mostly in the northwestern part of the province.

Commercially harvested fish in Ontario are a high-quality, valuable food source. Fish caught by the commercial fishing industry are sold in Ontario and to international markets.

Ontario commercial fisheries contribute millions of dollars to the province's economy every year.

How we monitor

Data on available commercial fish harvest and landed value data comes from commercial fishing daily catch reports. Where necessary, this data also comes from records of fish purchased by wholesalers. The harvest amounts and landed values shown in this indicator are for the Great Lakes and St. Lawrence River area only. Almost all commercial fishing in Ontario occurs in these areas.

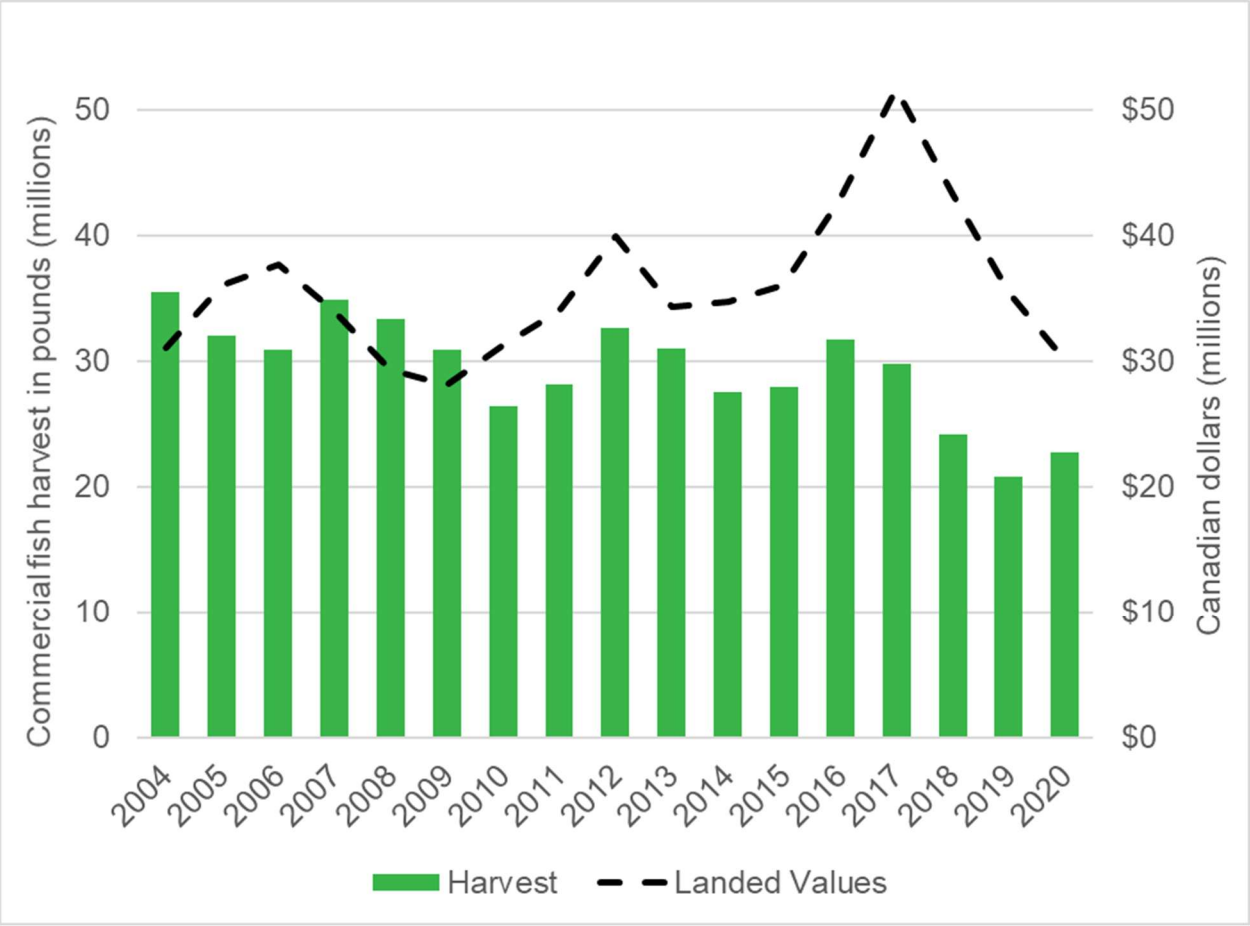
Harvest is measured by the total weight of all fish that are landed (i.e., caught and brought into the dock). Harvest weights are derived from commercial fishing daily catch reports filed by commercial fishers and processing plants/buyers.

Landed value is the estimated wholesale dollar value of fish, assigned by a buyer to a fisherman at the first point of sale. It is the first value off the boat, where reported.

Results

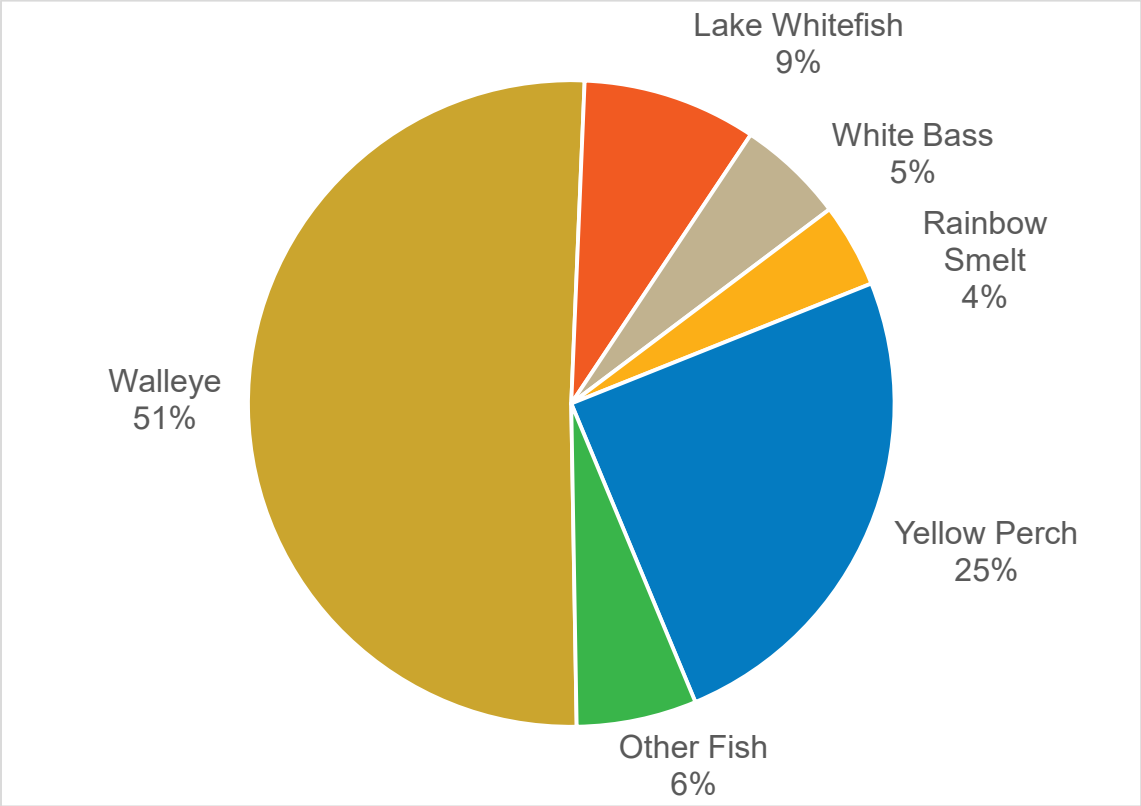
There are nearly 650 active commercial fishing licenses in Ontario. Since 1983, there have been no new licences. However, there have been several new Aboriginal commercial fishing licences and fishing agreements, all of which are quota holders. Quotas are a form of fishery regulation, governing size and quantity of a fish that may be taken and allows the licence holder access to a share of the resource.

Commercial fish harvest and landed values (2004 to 2020)



The commercial fishing industry harvested 22.8 million pounds of fish in 2020. Of this amount, 20.0 million pounds were harvested from Lake Erie. Lake Erie has consistently provided between 74 per cent to 88 per cent of the total fish harvested from 2004 to 2020. In 2020, commercial fish landings in Ontario were valued at $30.0 million. $25.9 million of this came from Lake Erie, the warmest and most productive of the Great Lakes.

Proportion of landed value by fish species (2020)



Walleye (51 per cent), Yellow Perch (25 per cent) and Lake Whitefish (9 per cent) together represented 85 per cent of the landed value of all commercial fish in 2020. While some fish (such as Walleye) are harvested for their high financial value, species of lower value (such as Rainbow Smelt) are still sought due to their abundance.

The value of commercial fish is influenced by several factors including:

- exchange rates
- the size and quality of fish products
- global markets
- competition from other freshwater fisheries.

The commercial fishing industry, like many other industries, was impacted by the COVID-19 pandemic in 2020. Prior to 2020, the main purchaser of Ontario commercial fish was the food

services (restaurant distribution) sector in the USA. Restrictions on restaurant dining throughout the COVID-19 pandemic cut off this market and subsequently impacted both:

- Volume of fish able to be sold
- The wholesale price of fish, which was reduced dramatically during the pandemic.

Indicator last updated

- July 2021

Data source(s)

- Administrative records

Recreational fishing and hunting expenditures

Description

This economic contribution indicator report assesses expenditures on recreational fishing and hunting activities in Ontario.

Status


Status: Good


Trend: Mixed


Geographic extent: Province-wide

Why it's important

With more than 250,000 lakes and countless rivers and streams, Ontario has vast aquatic resources that provide anglers with a wide range of fishing opportunities. Angling opportunities range from fishing from shorelines in the city to fly-in fishing trips in remote areas of the province.

Ontario also boasts a variety of habitats that support a wide range of healthy wildlife populations, including:

- white-tailed deer
- moose
- black bear
- wild turkey

- small game

This indicator measures how much individuals spend in Ontario to participate in recreational fishing and hunting activities. The amount that people spend on fishing and hunting demonstrates the importance these activities have to anglers and hunters. The expenditures also help determine the economic impact and contribution of this spending to both the local and provincial economies.

How we monitor

Expenditures by hunters and anglers are the amounts of money spent on:

- goods and services, such as equipment, travel, food, accommodation, licences and tourism services
- capital expenses such as boats, land and vehicles that are used primarily to support hunting and fishing activities

We estimate hunting expenditures as part of Ontario's hunter socioeconomic survey along with information on sales of hunting licences. Expenditure estimates include data on resident and non-resident hunter spending. This data is adjusted for inflation and the number of hunting licence purchasers that actually hunted in that year. Hunter numbers are estimates based on survey replies received from a sample of hunters. The impact of the COVID-19 pandemic travel and health restrictions in 2020, particularly in preventing participation of non-resident hunters from outside of Canada, altered hunter behavior and related pre-pandemic hunting trends.

Recreational fishing expenditures are estimated from the Survey of Recreational Fishing in Canada, which is conducted every five years. The survey is a coordinated initiative between Fisheries and Oceans Canada and the provincial and territorial recreational fisheries licensing agencies. The numbers reported here only include the portion of the reported large purchases (e.g., ATVs, land and buildings) that were used for fishing.

Estimated hunting and fishing expenditures are collected through periodic surveys of licensed hunters and fishers and adjusted for inflation to reflect current (i.e. 2020) dollar values.

Expenditure values across fish and wildlife species are not fully comparable because of differences in survey methodologies, response rates, and the year the surveys are conducted (e.g. wild turkey (2006), moose (2012), black bear (2017), and white-tailed deer (2019)). We continue to improve and standardize survey approaches to minimize these differences.

Results

Hunting

Estimated hunting expenditures in Ontario

Species Hunted	Expenditures (adjusted to 2020)
White-tailed Deer	$328.3 million
Moose	$191.5 million
Black Bear	$41.2 million
Wild Turkey	$26.8 million
Total	**$587.9 million**

Hunters spent the most to go deer and moose hunting. These activities accounted for an estimated $328.3 million and $191.5 million respectively in 2020, highlighting the economic importance of deer and moose hunting in Ontario. Hunters spent less on bear hunting ($41.2 million) and wild turkey hunting ($26.8 million). Total hunting expenditures for these four species alone totaled an estimated $587.9 million. This total does not include hunter expenditures on small game (such as rabbits, grouse and squirrels), wolves/coyotes, or elk as updated information is currently unavailable.

Fishing

Estimated recreational fishing expenditures in Ontario

Year	Expenditures
2010	$1.6 billion
2015	$1.75 billion

Anglers spent $1.75 billion to recreationally fish in Ontario in 2015 including:

- $980 million on trip expenditures such as accommodations, food, travel, guide fees and fishing packages from a lodge or outfitter.

- $770 million on investments wholly attributable to recreational fishing such as fishing, camping and boating equipment, special vehicles, and land and buildings.

The majority (96%) of trip expenditures and investments were made to fish in the open water season, with only 4% spent to fish during the ice fishing season.

In 2015, 1.5 million anglers fished in Ontario, including 1.2 million adult anglers over the age of 18 years and 324,000 children.

Indicator last updated

- July 2021

Data source(s)

- administrative files
- Survey of Recreational Fishing in Canada

Forest sector Gross Domestic Product (GDP)

Description

This economic contribution indicator report measures the value of forest products and services produced annually by the forest sector.

Status


Status: Fair


Trend: No change


Geographic extent: Province-wide

Why it's important

Forests in Ontario provide a wide variety of products and services. Timber, which is one of the key products provided by forests, is used by the forest sector to produce:

- lumber
- pulp and paper
- structural panels
- other wood products

Healthy and sustainably managed forests help support a strong and competitive forest sector that supports Ontario's economy, through jobs and income.

The forest sector contributes billions of dollars to Ontario's economy annually, measured by gross domestic product (GDP).

How we monitor

Gross Domestic Product (GDP) refers to the total dollar value of recorded economic production within a geographic region. It measures the final value of all goods and services produced. The GDP of a sector is the value that it has added to the economy. This is based on its sales minus the costs of goods or services purchased from other industries.

We use Statistics Canada data on real GDP in what are called chained (2012) dollars. This data is based on a method of adjusting current dollar amounts for inflation. Adjusting for inflation allows us to more effectively compare results from different years and assess trends over time.

The forest sector includes establishments in four subsectors:

- forestry and logging
- support activities for forestry
- wood product manufacturing (for example, lumber, structural panels)
- paper manufacturing (includes pulp manufacturing)

Results

In 2019, Ontario's forest sector GDP totaled $4.2 billion, representing 0.6 per cent of total provincial GDP. Of the total forest sector GDP:

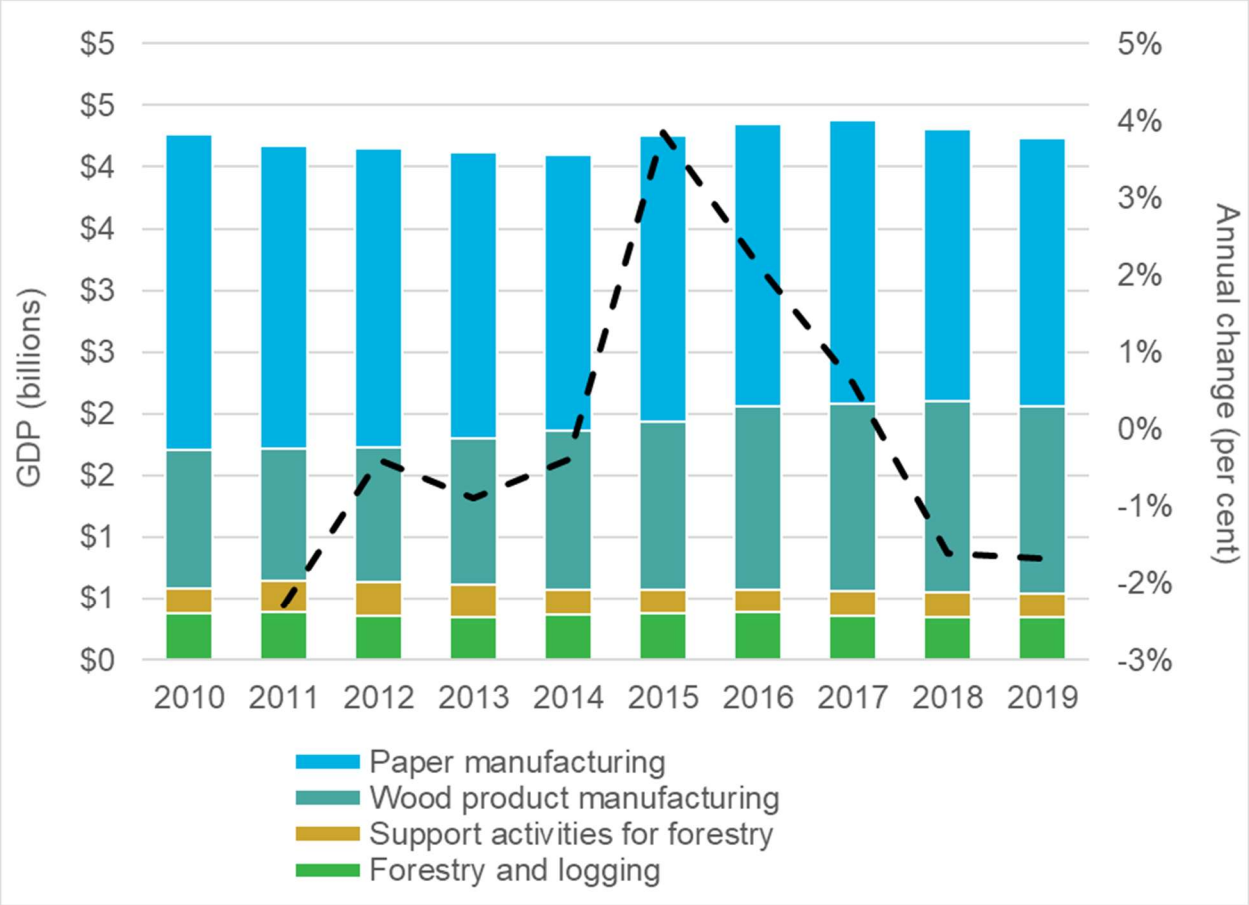
- paper manufacturing subsector accounted for 51.3 per cent
- wood product manufacturing accounted for 35.9 per cent
- forestry and logging accounted for 8.2 per cent
- support activities for forestry accounted for 4.7 per cent

During the period from 2010 to 2019, the forest sector GDP stayed relatively stable with some minor fluctuations:

- saw a slight decrease for four years from 2011 to 2014

- grew steadily from 2015 to 2017
- decreased slightly from 2018 to 2019

GDP by subsector (billions of chained [2012] dollars)



Wood product manufacturing subsector

Within the forest sector, the wood product manufacturing subsector was the only subsector that experienced significant growth (34 per cent) in GDP between 2010 and 2019. This subsector includes:

- lumber
- structural panels
- millwork
- engineered wood products

The demand for wood products is mostly driven by the housing markets in the United States and Canada. The growing housing market in both the United States and Canada in recent years benefited the wood product manufacturing subsector.

Paper manufacturing subsector

The paper manufacturing subsector GDP decreased by 15 per cent between 2010 and 2019. The paper manufacturing subsector is mostly affected by changing demands for different paper products.

- The demand for newsprint has been on the steady decline due to the rise of electronic media.
- The demand for paperboard and paperboard containers has increased due to the growing need of packaging material in North America, mainly driven by the expanding online retail economy.
- Overall, the paper manufacturing sector has been on a downward trajectory during the last ten years.

Other subsectors

The support activities for forestry subsectors, which is a relatively small subsector, decreased by 3 per cent, while the forestry and logging subsector had the same GDP in 2019 as 2010.

Indicator last updated

- February 2021

Data source(s)

- Statistics Canada

Forest products

Description

This indicator report tracks how the wood harvested from public forests contributes to various forest product sectors.

Status


Status: Fair


Trend: Mixed


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Forests in Ontario are vast and provide many benefits to our society including biodiversity, wildlife habitat, and recreational opportunities. Forests store carbon and regulate air, soil, and water quality.

Wood is the only major building material that grows naturally and comes from a renewable source. Through sustainable harvesting, our public forests also support a forest industry that provides jobs and forest products like lumber and paper.

Monitoring the flow of harvested wood volume helps us assess how public forests are supplying the industry and various product sectors.

How we monitor

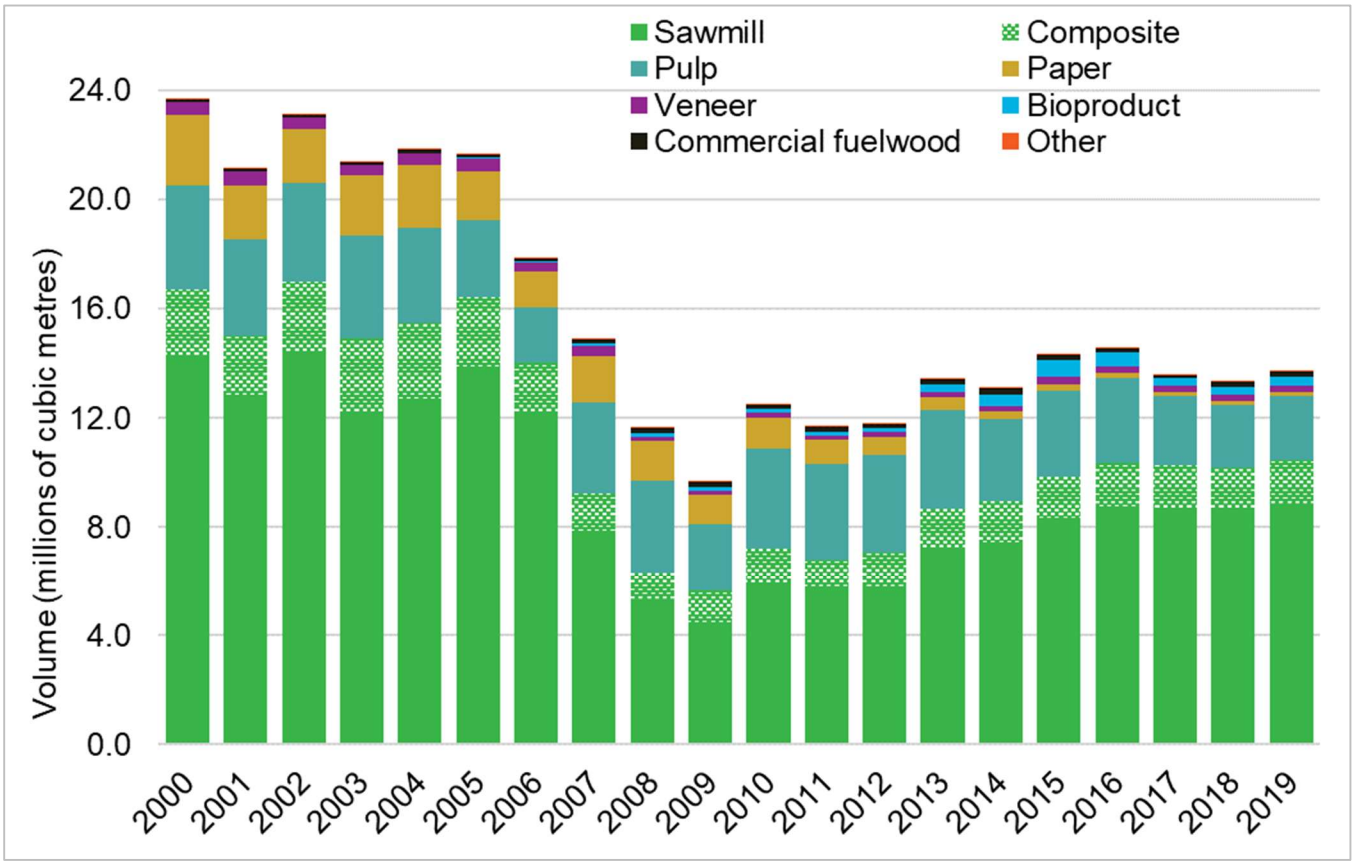
The amount of wood that enters a wood processing facility (mill) is tracked through Ontario's wood measurement system. Each mill manufactures different types of forest products. We track the volume of wood going to the following eight forest product sectors:

- Pulp: hardwood and/or softwood market pulp, containerboard and kraft paper
- Veneer: production of veneer, plywood and/or Laminated Veneer Lumber
- Sawmill: hardwood and/or softwood dimensional lumber, posts, beams, poles and log home construction timber
- Composite: panels such as particleboard, Medium Density Fibreboard, Oriented Strand Board and/or engineered wood products other than Laminated Veneer Lumber
- Paper: newsprint, supercalendered, coated and uncoated free sheet or rolled paper and bleached bristol board
- Commercial Fuelwood: cut to length hardwoods and softwoods in round or split form for domestic and commercial retail markets
- Bioproduct: chemicals and materials, energy from the combustion of wood or biogas, liquid fuels and solid fuels for commercial or industrial use. For example, cellulose, food/feed additives, lignin, methanol, pharmaceuticals and plastics, methane, ethanol, bio-diesel and lubricants, wood pellets, briquettes and hog fuel
- Other: product that does not fit into other product definitions such as bedding for animals, landscape materials, commercial Christmas trees

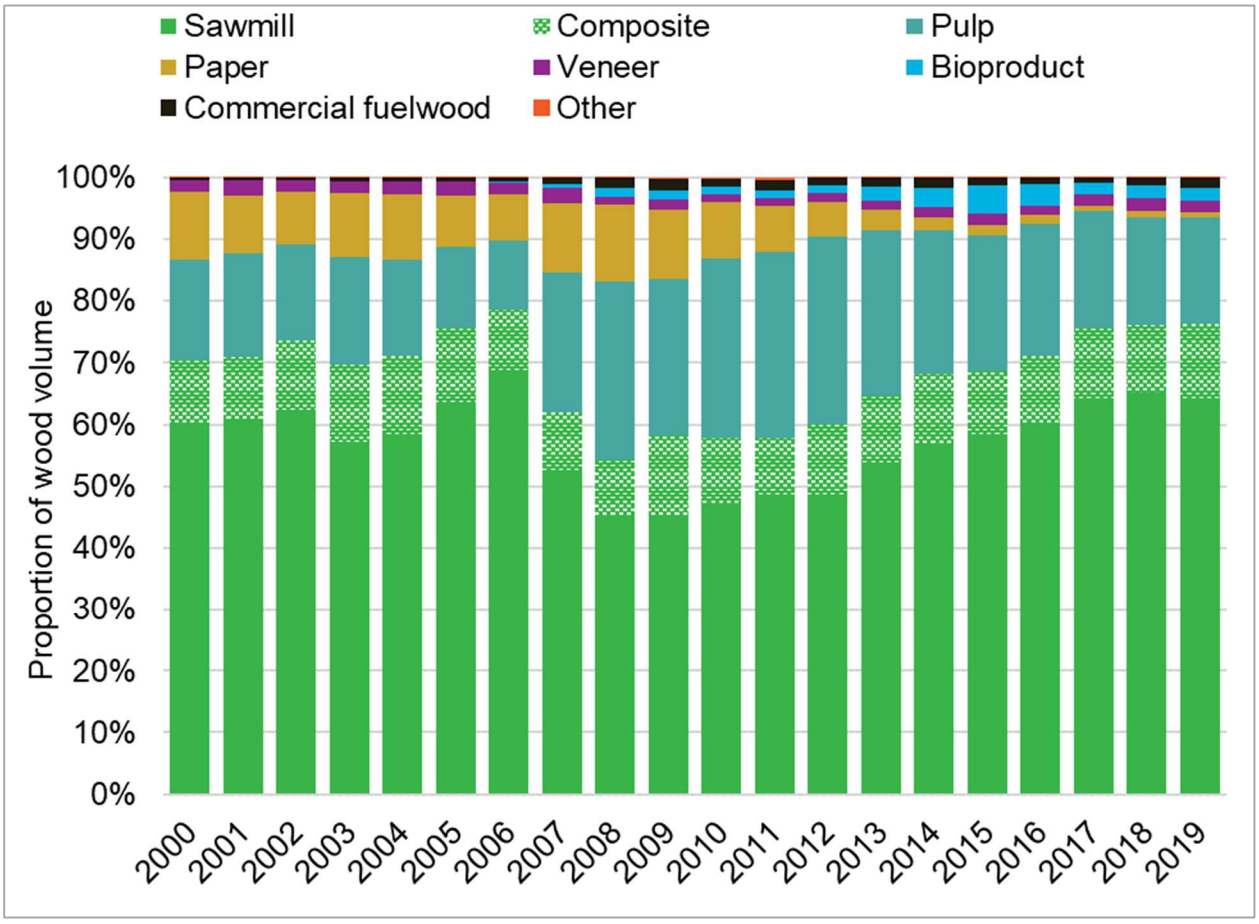
Results

The status of this indicator is considered fair given that the volume of harvested wood flowing into the forest product sectors remains lower than it has been historically. The trend is mixed given that the proportion of wood volume going to the province's most significant sectors shows a general increase but there have also been declines in some sectors.

Wood volume by product sector



Proportion of wood volume by product sector



The market demand for forest products influences how much wood is harvested from year to year and how that wood flows to the various forest product sectors.

Recent results show:

- Sawmill, composite, and pulp are the most significant forest product sectors in Ontario, consuming over 90 per cent of the total harvested wood.
- The sawmill sector is the largest forest product sector in Ontario, representing approximately 60% of the wood harvested in the province.
- Bioproduct is an emerging sector. This sector provides a renewable energy alternative and helps sawmills in Ontario stay competitive by using sawmill residues.

The demand for lumber from the sawmill sector is mainly driven by housing construction in the United States. Since its decline in 2008, the sawmill sector has been steadily recovering given the growing demand for lumber.

Since 2013 the share of total volume going to the pulp sector has declined. This reflects the interdependence of the pulp and sawmill sectors. With the sawmill sector's recovery, pulp and paper mills take advantage of cost-effective sawmill residues (wood chips, sawdust, shavings) to supply their mills.

The wood volume going to the paper sector declined over the past 10 years as the sector has been impacted by the decline in demand for newsprint.

Indicator last updated

- February 2021

Data source(s)

- Timber Resource Evaluation System (TREES)

Forest sector exports

Description

This economic contribution indicator report tracks the value of domestic export of Ontario's forest products.

Status


Status: Fair


Trend: Improving


Geographic extent: Province-wide

Why it's important

Ontario has a vast area of forests that are sustainably managed and provide a wide range of forest products and services. Timber harvested from Ontario forests is used to produce lumber, pulp and paper, panel boards and several other wood products.

The market for these products in Ontario is relatively small. Therefore, exporting is crucial for the development of the forest sector and sustainable forest management in the province. By exporting forest products, the forest sector in Ontario meets the needs of consumers, mainly in North America, while also contributing significantly to Ontario's economy. Understanding exports helps us assess the sustainability of the forest sector.

How we monitor

We track the value of domestic and total exports of forest products by each forest subsector in Ontario.

Domestic exports are the products grown, produced or manufactured in Ontario that are sold to other countries. They include products imported from other countries that have been significantly changed or enhanced in value before being exported.

We also look at the total exports which include domestic exports and re-exports. Re-exports are products that entered Ontario from other countries that are exported in the same condition without substantially adding any value. The value of total exports signifies the strength and importance of forest sector industries in the province's economy.

The value of domestic exports is a better measure of the economic benefits derived from the managed forests in Ontario because it excludes goods and services produced outside the province.

We use Industry Canada trade data on exports of forest products collected for each industry. Exports of forest products are reported in four subsectors. Wood furniture manufacturing is also included when assessing exports. In other economic indicators such as Forest Gross Domestic Products (GDP) it is not included as Statistics Canada does not provide GDP data for wood furniture manufacturing.

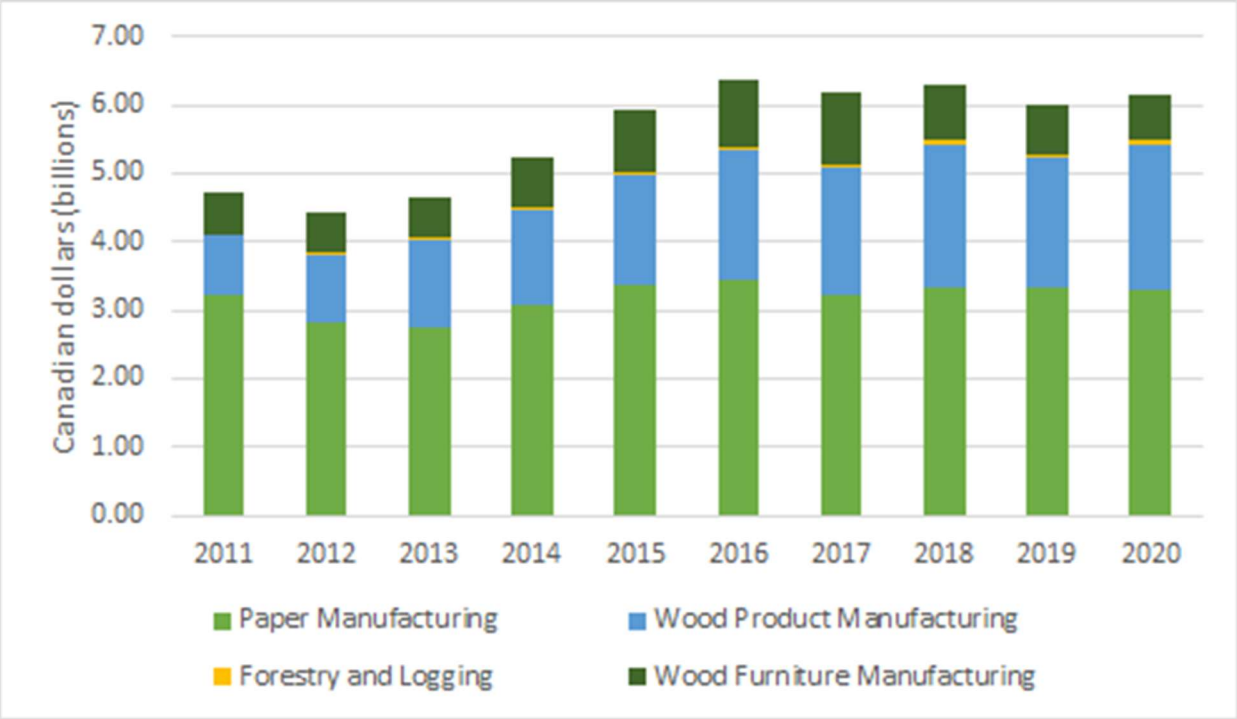
Subsector	**Related North American Industry Classification System industries and codes**
Forestry and logging	• Timber tract operations [1131] • Forest nurseries and gathering of forest products [1132] • Logging [1133]

Subsector	Related North American Industry Classification System industries and codes
Wood product manufacturing	• Sawmills and wood preservation manufacturing [3211] • Veneer, plywood and engineered wood product manufacturing [3212] • Other wood product manufacturing [3219]
Paper manufacturing	• Pulp, paper and paperboard mills [3221] • Converted paper product manufacturing [3222]
Wood furniture manufacturing	• Wood kitchen cabinet and countertop manufacturing [337110] • Other wood household furniture manufacturing [337123] • Wood office furniture manufacturing [337213]

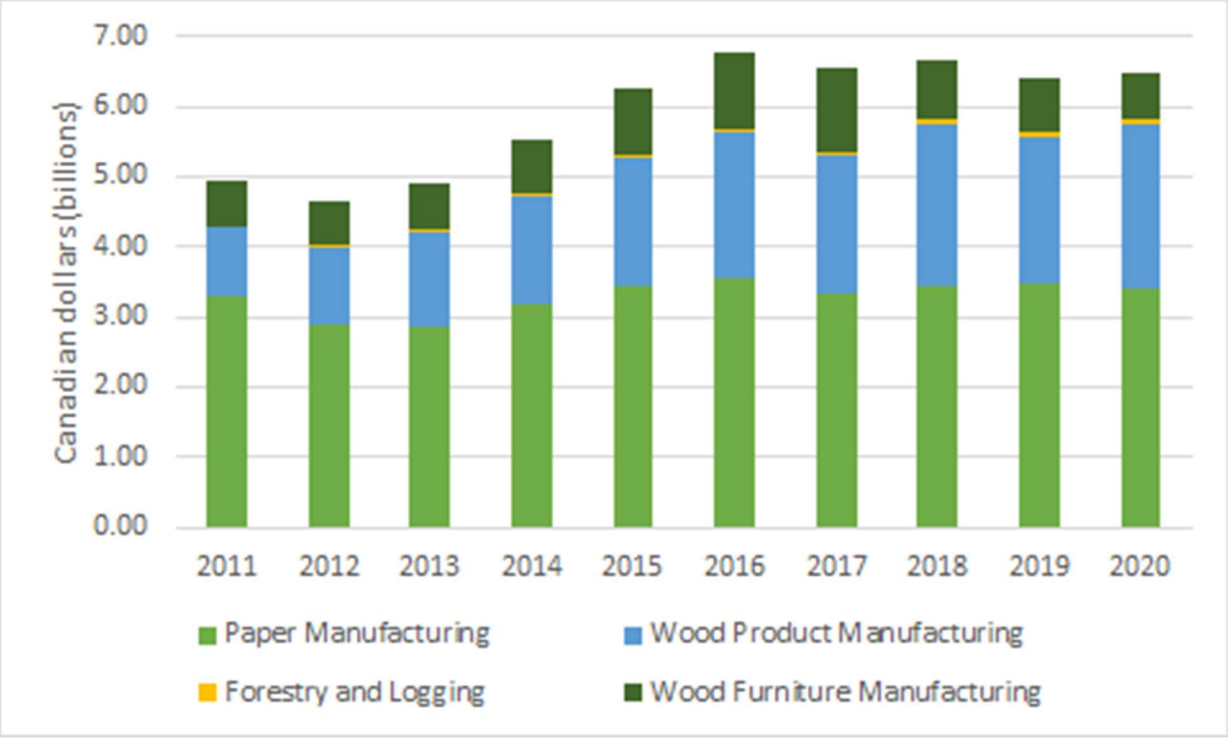
Results

Overall, the status of this indicator is considered fair with the trend improving in the last few years.

Value of domestic exports of Ontario's forest products in billions of Canadian dollars



Value of total exports of Ontario's forest products in billions of Canadian dollars



The value of domestic exports has consistently been around 95 per cent of the total exports of Ontario's forest sector with re-exports representing about 5 per cent. Paper manufacturing makes up about 50 per cent of the Ontario forest sector total exports with about 97 per cent based on domestic exports. Domestic exports make up about 90 per cent of wood product manufacturing, forestry and logging have about 90 per cent and wood furniture manufacturing has about 95 per cent. Thus, Ontario forest sector exports are mainly driven by the domestic exports. The re-exports result from a highly integrated North American market and geographic location of the province.

The value of total exports started to increase in 2013 rising to $6.49 billion in 2020. There has been a consistent recovery since the low of $4.64 billion in 2012. After reaching $6.76 billion in 2016, the value of total exports has been stable except for some minor fluctuations due to the fluctuation in commodity prices and currency exchange rates.

In 2020 forest product subsectors contributed the following to the total export value:

- pulp and paper products (53 per cent)
- wood products (36 per cent)
- Wood furniture (10 per cent)
- forestry and logging (1 per cent)

The export value of Ontario wood product manufacturing has been increasing since 2012 and reached $2.33 billion in 2020. The value of Ontario wood product exports is primarily driven by the demand in the United States housing market. The improved housing market in the United States has helped Ontario wood product exports maintain a sustained increase since 2012 despite trade-related restrictions on Canadian softwood lumber export to the U.S.

The export value of Ontario pulp and paper products declined from $3.31 billion in 2011 and bottomed at $2.85 billion in 2013. The value of pulp and paper exports has increased from 2013 to 2016 as a result of high pulp and paper prices and a depreciating Canadian dollar. In 2020, the value of pulp and paper product exports reached $3.42 billion.

The export value of wood furniture has increased consistently from $0.62 billion in 2012 to $1.21 billion in 2017. In 2020, the value of wood furniture was $0.68 billion. In recent years, the

share of off-shore imports in the U.S. furniture market has increased. Since the U.S. is the main export destination for Ontario wood furniture, Ontario manufacturers may have lost some of their share. The value of forestry and logging has steadily risen from $0.03 billion in 2012 to $0.06 billion in 2020.

Most of Ontario's forest product exports (96 per cent) are to the United States. As exports are sold in U.S. dollars, the export value is significantly affected by the exchange rate. Similarly, since the values of exports are measured in current dollars, the values are also affected by the forest product prices in a year. The continuous depreciation of the Canadian dollar against the U.S. dollar from 2010 to 2020 helped improve the competitiveness of Canadian forest products in the United States and increased the value of exports in Canadian dollars.

Indicator last updated

- April 2021

Data source(s)

- Industry Canada Search by Industry (NAICS codes) – Trade Data Online

Natural resource employment

Description

This employment indicator tracks employment in several natural resource sectors including forestry, aggregates, oil and gas, aquaculture, fishing, hunting and trapping.

Status


Status: Mixed


Trend: Mixed


Geographic extent: Province-wide

Why it's important

Ontario's natural resource sectors provide employment in many communities across Ontario, especially in northern and rural communities where the natural resources sector is one of the largest employers. Small changes to employment in many northern and rural communities can often result in a dramatic shift in the well-being of these communities.

We monitor employment in the natural resource sectors to better understand the:

- sustainability of our natural resource management, and
- well-being of remote and rural communities.

How we monitor

We track the annual employment in the extraction and processing of natural resources for each major sector including:

- forestry
- aggregates (including related processing subsectors)
- aquaculture, fishing, hunting and trapping (commercial operations only)
- oil and gas

We use data from labour statistics that are consistent with the System of National Accounts of Statistics Canada. This system includes full-time, part-time and self-employment jobs.

The System of National Accounts is preferred over other employment data (e.g. Labour Force Survey and Survey of Employment, Payroll and Hours) because it has greater accuracy and less year over year fluctuation. It also allows easier comparisons with other statistics generated from the System of National Accounts, such as industry output or gross domestic product (GDP).

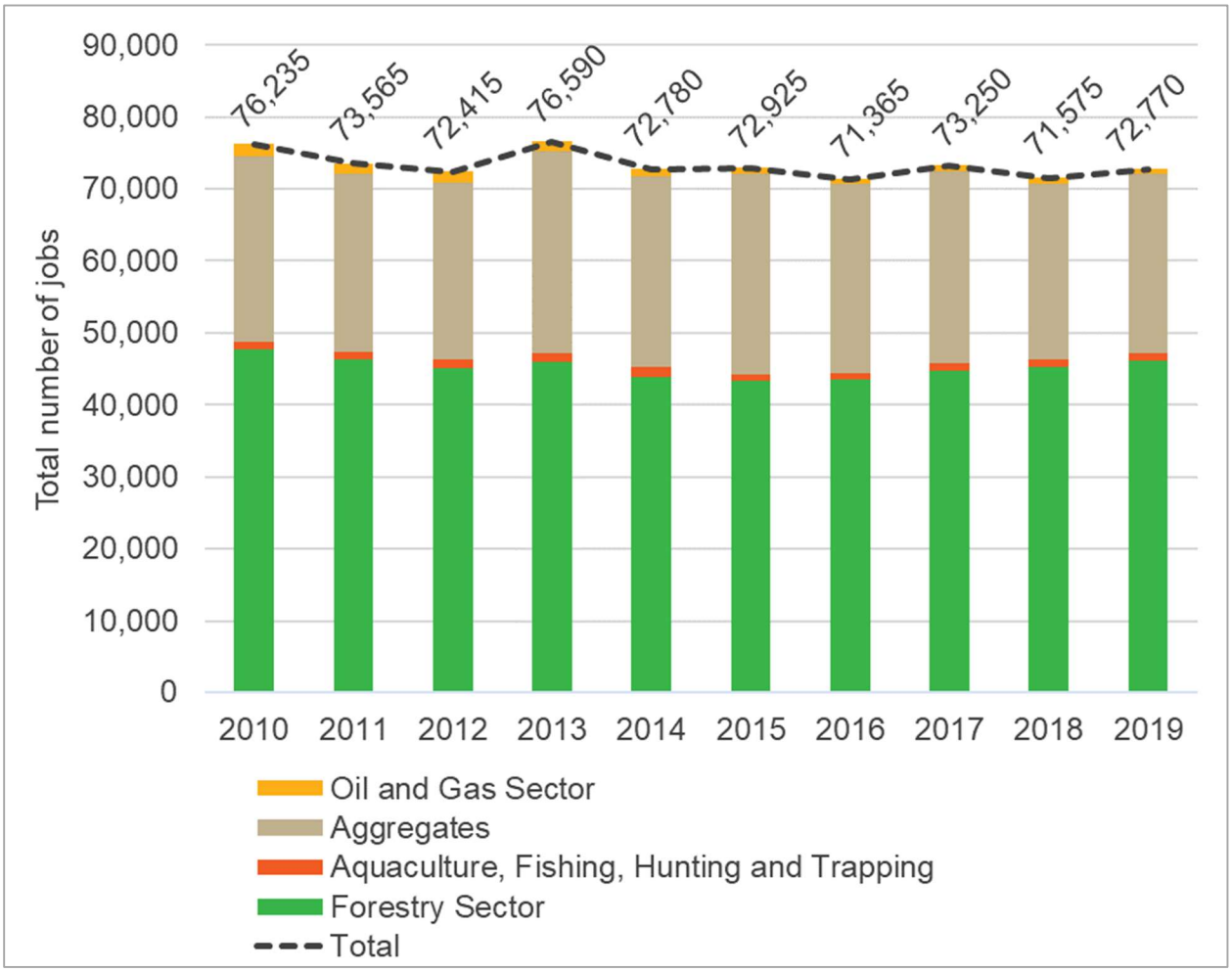
Sector	**Related North American Industry Classification System industries and codes**
Forest	• logging and forestry [113] • support activities for forestry [1153] • wood product manufacturing [321] • paper manufacturing [322]
Aggregates	• stone mining and quarrying [21231] • sand, gravel, clay and ceramic refractory minerals mining and quarrying [21232] • cement and concrete product manufacturing [3273] • non-metallic mineral product manufacturing (except cement and concrete products) [327A]

Sector	Related North American Industry Classification System industries and codes
Aquaculture, fishing, hunting and trapping	• aquaculture [1125] • fishing, hunting and trapping [114]
Oil and gas	• oil and gas extraction [211] • support activities for oil and gas extraction [21311].

Results

The status of this indicator is mixed, with a mixed trend over the longer term. Forest sector employment has been relatively stable since 2009 despite an increase in the harvest volume. This is due to an increase in productivity. Similarly, employment in aggregates and aquaculture, fishing, hunting and trapping sectors have largely remained stable, while the oil and gas sector has declined. In 2019, there were 72,770 jobs in Ontario's natural resource sectors. This is a 5 per cent decrease from 2010 when there were 76,235, but about the same as 2015 employment.

Natural resources employment (2010 to 2019)



Aggregates sector

Aggregates sector employment has been relatively stable. Aggregate resources (e.g., stone, sand and gravel) are necessary for the construction of roads, bridges, buildings and other infrastructure. The average number of jobs from 2010 to 2014 in aggregates-related sectors was 25,911 and the average number of jobs from 2015 to 2019 was 26,012.

Oil and gas sector

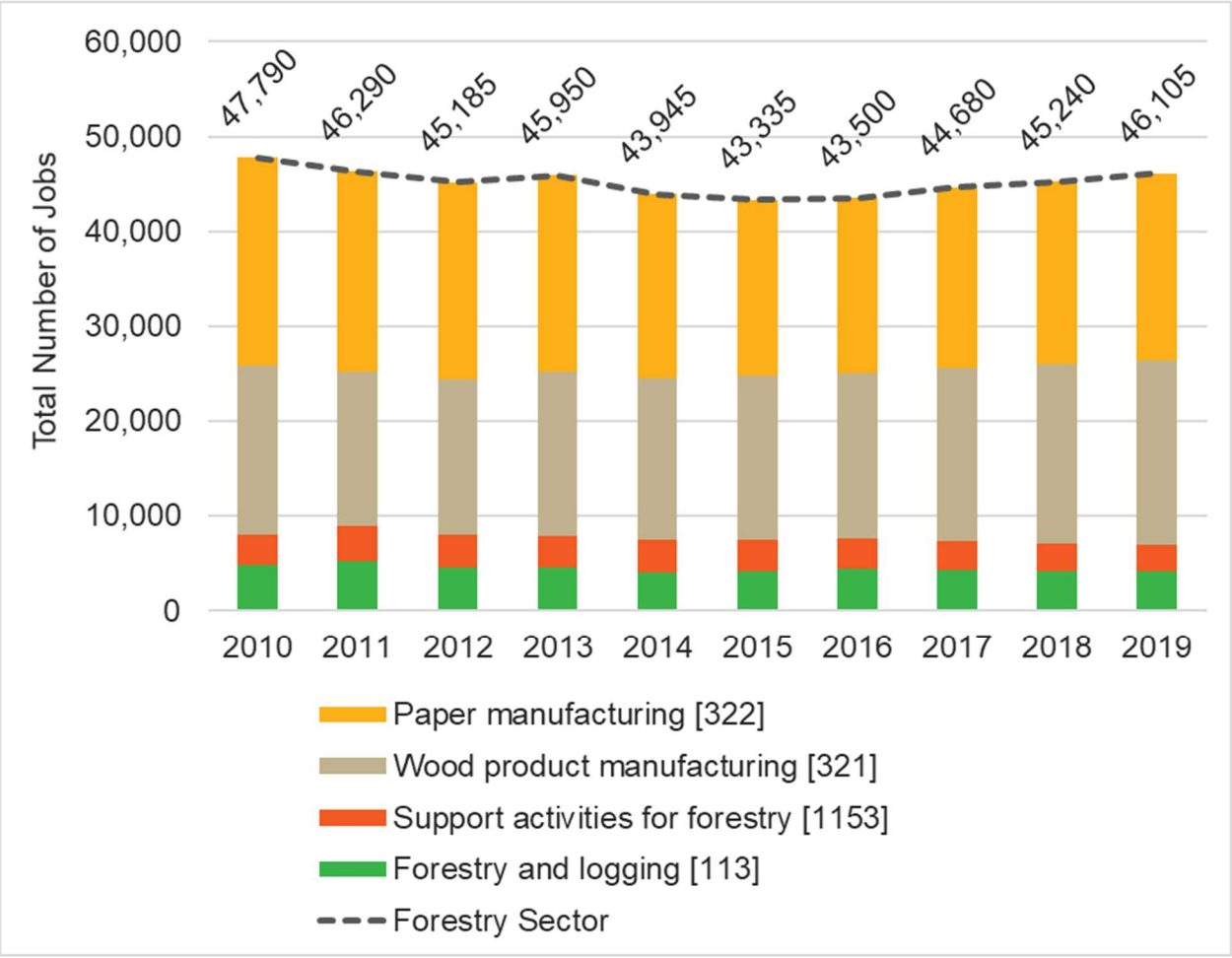
Employment in the oil and gas-related sector has stabilized from 2010 to a 2014 average of 1,410 jobs to a 2015-2019 average of 752 jobs. This reflects lower production in the province.

Aquaculture, fishing, hunting and trapping sector

Aquaculture, fishing, hunting and trapping employment has been relatively stable, with aquaculture employment averaging 297 jobs annually, while fishing, hunting and trapping have averaged 806. These fishing, hunting and trapping statistics are for commercial operations only and do not include related jobs in tourism (e.g. northern tourism outfitters).

Forest sector

Forest sector employment (2010 to 2019)



The forest sector has been quite stable, with total wood harvested from Crown forests increasing from a low of 9.7 million cubic metres in 2009 to 13.7 million cubic metres in 2019.

The average number of jobs from 2010 to 2014 was 45,832. This is slightly more than 2015 to 2019 when there was an average of 44,572 jobs.

This slight decrease is likely related to increased automation. Automation increases labour productivity and impacts primary and secondary processing industries. In addition, some facilities in the pulp and paper industry in northern Ontario have moved the production of value-added products to the United States. As such, employment has not kept pace with increases in output or forest sector GDP.

Indicator last updated

- April 2021

Data source(s)

- Labour statistics consistent with the System of National Accounts (SNA), by job category and industry

Forest stumpage revenue

Description

This indicator tracks the revenue generated from Ontario's timber charges (often referred to collectively as stumpage).

Status


Status: Good


Trend: Improving


Geographic extent: Managed Forest (central and northern Ontario from Kemptville to Red Lake)

Why it's important

Fees are paid to the government for every cubic metre of timber harvested from public land. Timber charges are calculated to ensure that the province receives a fair return for the resource and can fund sustainable forest management.

How we monitor

We monitor revenue from Ontario's timber charges. These charges have 3 main components:

- stumpage price (made up of a minimum price and a residual value price)
- forest renewal trust charge
- forestry futures trust charge

The minimum price component generates a secure and stable level of revenue to the province regardless of market conditions. This price is adjusted for inflation annually.

The residual value price component ensures that the government shares in the financial rewards when industry profits are good. The residual value price increases or decreases as market prices change. When forest product prices are low, the residual value price can drop to zero. In times of strong market prices for forest products, the pricing system triggers higher fees. This price is adjusted monthly.

Funds received from stumpage (minimum price and residual value price) flow to the province's Consolidated Revenue Fund.

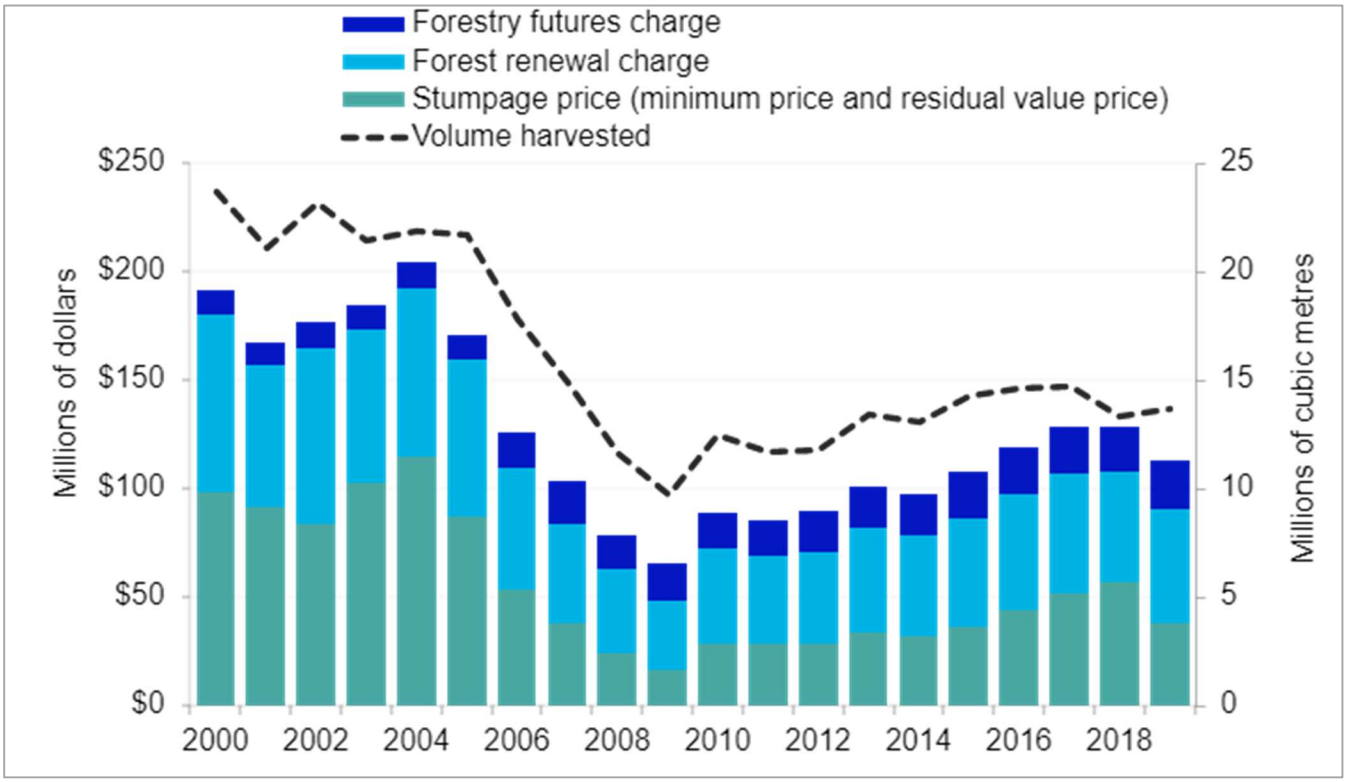
The Forest Renewal Trust charge provides dedicated funding for forest renewal. This charge, which is set annually, varies depending upon anticipated renewal costs. These funds flow to a dedicated Forest Renewal Trust account.

The Forestry Futures Trust charge provides funding to renew forest areas affected by natural disasters like fire, blowdown or disease, or in the event that a licensee becomes insolvent. These funds flow to the Forestry Futures Trust account.

Results

The status is good as the government is generating revenue and can fund sustainable forest management. The trend is improving since revenue from timber charges has recovered to levels seen before the economic downturn of 2008.

Revenue from timber charges



Ontario's forest industry is mainly dependent on the demand for forest products from the United States' housing sector. Low demand reduces the amount of timber harvested and results in lower revenues.

- In 2009, revenue reached a low of $65.9 million then steadily increased until 2019.
- In 2019 revenue was $112.9 million. Although the volume harvested increased by 4% in 2019, stumpage revenue decreased because lower market prices for forest products reduced residual value price contributions.

Indicator last updated

- February 2021

Data source(s)

- Timber Resource Evaluation System (TREES)

Recreational opportunities

Description

This outdoor recreation indicator report monitors recreational opportunities for fishing, hunting and Crown land use in Ontario.

Status


Status: Good


Trend: Mixed


Geographic extent: Province-wide

Why it's important

Our rich natural resources provide Ontarians with many recreational opportunities. Ontarians can camp on provincial Crown land (excluding provincial parks) for free for up to 21 days on any one site in a calendar year. They can also use Crown land to:

- hunt and fish
- hike
- canoe
- bike
- boat
- cross-country ski
- swim

- bird watch
- horseback ride

Spending time outdoors is important in connecting people with nature and improving our physical, mental, and social wellbeing. Ontario manages these resources sustainably by requiring authorizations and licences for some activities. Information about authorizations and licence sales helps us to understand how these recreational opportunities are being used.

How we monitor

We track the number of Outdoors Cards, fishing licences and hunting licences sold each fiscal year using data from the Fish and Wildlife Licensing Service. This helps us to determine how many Ontarians paid to fish and hunt and indicates preferences for the various licence products.

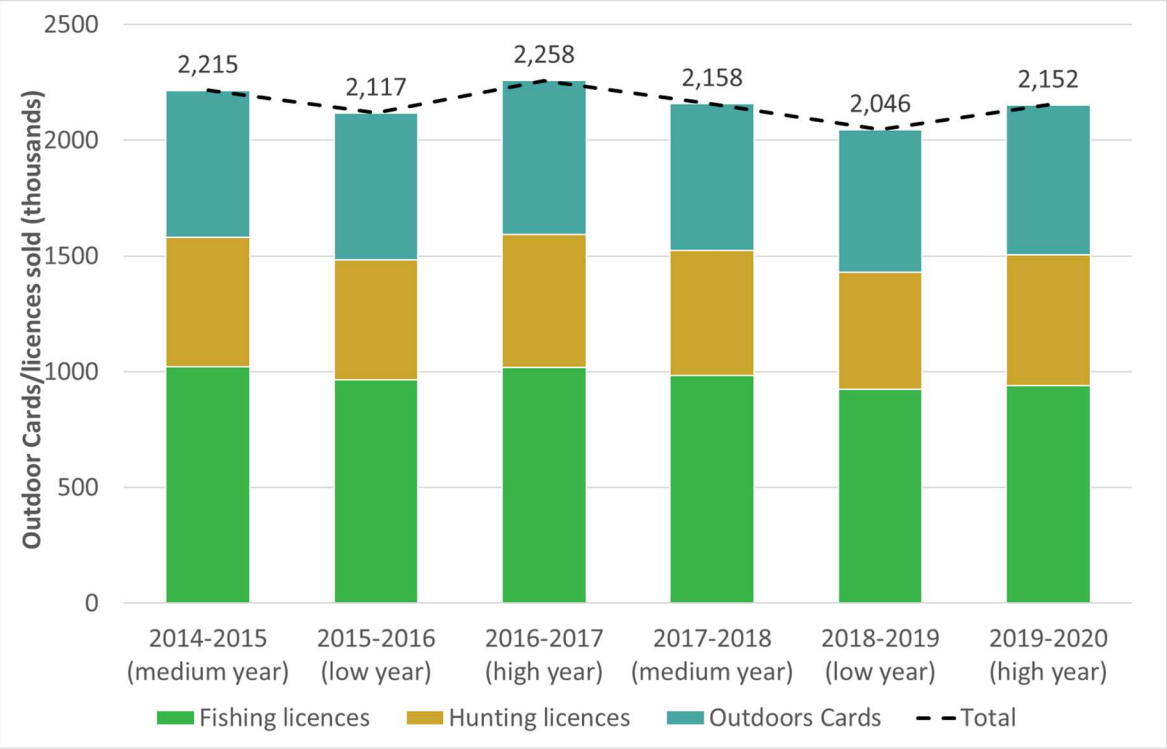
We also track the number of rental documents (for example, land use permits, leases, licences of occupation, easements) under the *Public Lands Act* to understand how Crown land is being used for a variety of purposes. For monitoring recreation activities, we also use the number of Crown land occupational authority documents.

Results

The status of this indicator is good as annual sales have met targets of between 2 million and 2.3 million Outdoors Cards and licences sold.

Almost 1 million fishing licences and over 500,000 hunting licences were sold in fiscal year 2019-20. In the same period, 73 per cent of fishing and hunting licences were sold to anglers and hunters that live in Ontario and 27 per cent were sold to people residing outside of Ontario (non-residents). These numbers reflect the total licences sold, regardless of the term of the licence.

Number of Outdoors Cards, Fishing and Hunting Licences sold



The sale of Outdoors Cards and licences is cyclical. It follows a high, medium and low sales pattern because Outdoors Cards and some licences can be purchased for a three-year term. As a result, sales are not directly comparable between adjacent years. Outdoors Cards and licence sales between the two consecutive three-year periods of 2014-15, 2015-16 and 2016-17 versus 2017-18, 2018-19 and 2019-20 declined by about 4 per cent. The trend suggests volumes of licence and Outdoor Card sales may continue to decline in the future due to changing demographics and decreasing paid participation.

To help offset the decline, Ontario is being promoted as a tourist destination for fishing. In addition, Ontario resident recreational fishing and hunting licence fees have not increased this year. To promote fishing, Canadian residents can take part in free fishing events to try out the sport. These free events include the Mother's Day and Father's Day weekends, the Family Day weekend in February and Family Fishing Week in July. There is also a Learn to Fish program for new anglers which teaches the basics from fish identification and tying on a hook, to taking

a first cast. It is anticipated that these changes will encourage families and other members of the public to continue or increase participation in recreational fishing.

Number of Crown land recreational occupational authority documents issued

Type of land use	2018-19
Recreation camps	2,293
Resource-based tourism outpost camps	975
Two-storey boathouses	600
Docks and other small structures	500
Commercial marinas	250
Trails and bridges for skiing, snowmobiling, ATV, and horseback riding	50
Parks (camping, day use or playground)	20
Ranges (rifle/handgun)	8
Total	**4696**

In 2018-19, there were 4,696 authorizations for occupation of Crown land for recreational purposes demonstrating a wide range of activities. In addition to these, many recreational activities on Crown land can occur without a permit if the conditions of Regulation 161/17: Occupation of Public Lands under the *Public Lands Act* are followed. These activities include construction of waterfront structures such as:

- docks
- single storey boathouses
- ice fishing huts
- hunting stands

Indicator last updated

- February 2021

Data source(s)

- Fish and Wildlife Licensing Service
- Land Use Permit System

- Land Index System

Acknowledgements

The development of this report has been informed by past efforts to report on the state of forests and the state of biodiversity in Ontario. In some cases, measures were previously published in the 2015 State of Biodiversity Report, prepared in partnership with the Ontario Biodiversity Council.