Forest Health Conditions in Ontario 2019

Ministry of Natural Resources and Forestry

Ontario

Forest Health Conditions in Ontario 2019

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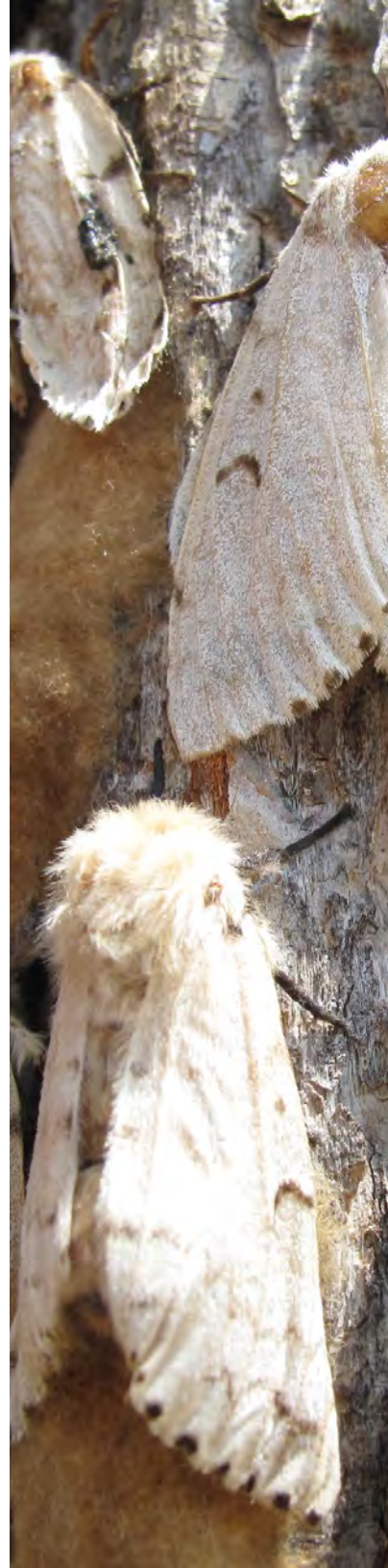

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État de santé des forêts en 2019

Les températures étaient normales en 2019, mais quelques événements importants ont affecté l'état de santé des forêts.

Des feuilles ou aiguilles d'arbres ont été attaquées dans diverses régions : la tordeuse de pin gris a été plus présente dans le nord-ouest; la tordeuse des bourgeons de l'épinette a fait plus de ravages que l'année précédente, surtout dans le nord-est; la livrée des forêts a poursuivi son déclin; la spongieuse a accru sa présence dans le sud. Il est à noter que, pour une troisième année consécutive, l'aire où des trembles ont été attaqués par la tordeuse a diminué.

Les conditions étaient idéales pour la brûlure en bandes brunes des aiguilles : un printemps frais et humide ainsi qu'un été marqué par des températures chaudes, en début et en milieu de saison. Les dommages se sont étendus sur plus de 6 000 ha – une hausse record à l'échelle de la province – principalement dans le sud.

En 2019, la maladie foliaire du hêtre, que l'on croit désormais liée à un nématode, a été confirmée dans les districts d'Aurora et de Guelph. Des travaux ont donc été lancés pour surveiller et comprendre les répercussions de cette maladie sur des forêts déjà atteintes par la maladie corticale du hêtre.

La maladie corticale du hêtre, qui résulte de la combinaison d'un insecte envahissant (la cochenille du hêtre) et d'un champignon envahissant qui s'attaque aux tiges, a continué d'être surveillée à de nouveaux endroits dans la région du Sud.

On a observé l'agrile du frêne, une espèce envahissante, dans trois districts du Centre de l'Ontario. Aucun nouveau signalement du longicorne asiatique n'a été fait en 2019. Plusieurs autres insectes et maladies ont nui à des forêts partout dans la province, mais les dommages étaient localisés.

Introduction

Forest health monitoring in Ontario is conducted by the Ontario Ministry of Natural Resources and Forestry (MNRF).

The annual forest health monitoring program has five components:

- Aerial mapping to quantify the extent and severity of major forest disturbances (e.g., insect outbreaks, weather events, decline, and disease damage)
- Biomonitoring through the collection of insect and disease samples to track occurrence, changes in range or host species attacked, or changes in abundance
- Conducting special surveys for pests of interests, particularly invasive species, or pests affecting high value trees, such as plantations or seed orchards
- Conducting or supporting research projects in forest entomology, pathology, or weather effects
- Establishing and surveying temporary and permanent sample plots to monitor health of select forest ecosystems

Forest health monitoring in Ontario includes the occurrence of biotic (e.g., insects, disease) and abiotic (e.g., snow and drought damage) disturbances and events. All forested area in the province, regardless of ownership, is monitored and reported on each year.

In 2019, insect diagnostics were executed through a partnership among MNRF, the Canadian Forest Service (CFS), and the Invasive Species Centre (ISC). Samples collected by provincial forest health staff were identified by the ISC. The CFS provided laboratory space and access to its historical insect reference collection. Disease samples were identified at the Ontario Forest Research Institute (OFRI). Insect and disease collection results were entered into a national database managed by CFS.

Maps, tables, and graphs were produced from aerial surveys of major forest disturbances.

Results of the annual monitoring program were reported provincially at the Ontario Forest Health Review and nationally at the Forest Pest Management Forum and are described in this report.

Weather patterns

Weather affects the growth, phenology (timing of different life cycle stages), dispersal, and survival of forest insects. Forest pathogens, especially leaf diseases and needle cast fungi, can be more common during wet or humid periods. Also, extreme weather events such as drought, snowfall, flooding, tornadoes, microbursts, frost, freezing, scorch, and rapid temperature fluctuations can affect tree health, causing foliage or twig death, or tree decline and mortality.

In 2019, January temperatures were below normal with a cold stretch in mid-January and another during the last week of the month. Precipitation was below normal in the north and above normal in parts of southern and eastern Ontario. In early January, southern Ontario had a mix of freezing rain and snow.

In February, colder than normal temperatures continued in the northwest part of the province with closer to normal temperatures in the northeast, while the south hit some record high temperatures in early February with temperatures above 10 °C. Most of the province had above normal precipitation, particularly in the north. Areas northeast of Lake Superior to the Quebec border received 75–100 cm of snow. A low pressure system tracked across the province from Feb 23–25, bringing heavy snow, freezing rain, and strong winds across the province.

In March temperatures started out below normal but then fluctuated from mild to cold for the remainder of the month. Precipitation varied across the province with the northwest and northeast having below normal precipitation while in the south it was above normal due to a late March low pressure system. The system brought rain, freezing rain, and some snow to southern areas

In April temperatures were slightly below normal and precipitation was higher than normal except in the northwest. At the start of the month, snow was still evident but except in a few northern areas was gone by the end. Flooding occurred in central and eastern parts of the province.

In May temperatures were below normal for most of province except the southwest. Precipitation was below normal in the north and above normal in the south, particularly in central and southeastern Ontario. The end of May brought damaging winds across southern parts of the province as well as flash floods. In the latter part of May, fires started within a few kilometres of Pikangikum First Nation in the northwest requiring community evacuation.

Temperatures in June were close to normal, starting out cool with a warming trend in the latter part of the month. Precipitation was low in the northwest but above normal in the northeast and southwest, and normal in the central and eastern parts of the province. In early June a tornado tracked from Orleans eastward along the Ottawa River and dissipated over the Quebec border. Fires continued to burn in the northwest.

In July some warmer above normal temperatures arrived with short heat episodes throughout the month. Rain arrived in the northwest, and in some areas was double the normal precipitation. The remainder of the province was dry with a few single days of heavy rainfall, particularly in the south.

In August temperatures were close to normal and drier than normal conditions continued in most of the province except for some areas in the northwest, north of Lake Superior, and parts of the southwest. At the beginning of August, a downburst with winds up to 130 km per hour were reported west of Caledonia causing some trees to be blown over.

In September temperatures were also close to normal for the month; cooler at the beginning, normal in the middle, and warmer than normal at the end of the month. Precipitation was higher than normal in the central and northwestern parts of the province while well below normal levels of rainfall were reported in the south. In the early part of September, a small tornado was observed in the southwest near Petrolia that uprooted trees. Damaging winds were also reported in the northwest around Red Lake in mid-September.

Overall, October temperatures were within the normal range. Precipitation was above normal for most of the province except for the Lake Superior area extending up to James Bay. In some cases, the amount of precipitation was double the normal for October. The first snowfall occurred in late October in the Sudbury area with 17 cm accumulating.

November was colder than normal across the province. Precipitation was below normal: slightly below normal for the southern, northern, and eastern parts of the province but extremely below normal in the northwest and the extreme southwest. Most of the province was covered in snow after Remembrance Day, but by the end of the month the south was mostly snow-free. Near the end of November, a winter storm brought rain and high winds to the south and snow squalls and accumulation up to 29 cm in the northeast.

In December temperatures were close to normal, with higher than normal temperatures in the central and southern parts of the province and a little cooler in the north. Near the beginning of the month to the mid part of December wind chill warnings were in effect for most days in northern Ontario, making it feel colder than it actual was. For the remainder of the month it was warmer than normal and on the second last day of the year maximum high temperature records were set at Toronto and Hamilton airports. Close to normal amounts of precipitation were documented across most of the province. Above normal snowfall was observed in the northwest, but overall precipitation for the month in the northwest was drier than normal. These drier conditions were also evident in central and southwest parts of the province. A good part of southern Ontario had a green Christmas in 2019.

Extreme weather and abiotic events

Frost damage was reported in Southern Region in a park in Ottawa. Temperatures in April dipped down to -3.6°C affecting silver maple in the park. Leaves were curled with dark staining along the leaves' veins.

In 2019, 537 forest fires were recorded in the province compared to 1,324 fires in 2018. Many of the fires in 2019 were in areas where blowdown, snow damage, insect infestations, or disease had killed or damaged trees in recent years.

In 2019, ice damage was recorded in localized areas in the Northeast and Southern regions. In all cases, damage was not extensive but appeared along roadsides where trees could not support the weight of ice-laden branches. This ice damage may have resulted from a freezing rain event in early January 2019. Another freezing rain event happened December 30 in Sault Ste. Marie District. The resulting damage will be quantified in 2020.

In 2019, snow damage was recorded in Northwest Region but was not aerially mapped. Damage was noted in four districts in localized areas and was light to moderate in severity. In most cases, affected trees were along the roadside in short stretches. Snow damage affected aspen, cherry, white birch, and spruce, causing bent trees.

In 2019, the area of blowdown in Ontario increased (by 4,651 ha) over that in 2018. Each region had some areas of blowdown, with most (6,020 ha) recorded in Northwest Region, followed by Northeast Region (1,748 ha), and the least (722 ha) in Southern Region. In all cases, blowdown areas were small and scattered. In Northwest Region, blowdown occurred in two districts (Sioux Lookout and Red Lake) with almost the same amount of area affected in each. In July, extreme heat followed by cooling caused severe thunderstorms, with associated winds resulting in blowdown. In Southern Region, blowdown was mapped in only two districts, most of it in the southeast corner of Pembroke District and the remainder in Kemptville District. In both cases, the blowdown event happened September 21, 2018 when a tornado touched down. Much of the blowdown mapped in Northeast Region was also from a storm in 2018, in this case on September 5. Two tornados occurred in 2019, both in Southern Region, one near Petrolia and the other close to the Ottawa River.

Insect infestations

Moderate to severe defoliation by jack pine budworm increased from 627,455 ha in 2018 to 1,001,269 ha in 2019. All the defoliation was in Northwest Region, with 77% in Red Lake District and smaller areas in Dryden, Sioux Lookout, Kenora, Fort Frances, and Thunder Bay districts. Defoliation was mapped in about two thirds of Red Lake District but was not evident in the northern part. The area of moderate to severe defoliation increased greatly in Dryden District, with a smaller increase in Kenora District, and new areas of infestation recorded in Sioux Lookout, Fort Frances, and Thunder Bay districts. Light jack pine budworm defoliation was also mapped in 2019, but only 439 ha, all of which was in Northwest Region in Red Lake and Sioux Lookout districts. In 2019, 32,208 ha of jack pine mortality caused by jack pine budworm was mapped in Northwest Region, with 88% of it mapped in Red Lake District, where moderate to severe defoliation occurred in jack pine stands for three consecutive years. Most of this mortality was northwest of Trout Lake to the northern end of Caribou Woodlands Provincial Park. In Northeast Region, the area of mortality caused by previous jack pine budworm defoliation increased by 26 ha. The infestation in Sault Ste. Marie District collapsed in 2017 but jack pine mortality expanded slightly in the infested area from defoliation damage in the previous two years. Combined with moderate to severe defoliation mapped in 2015 and 2016, as well as drought-like conditions on a poor site (shallow soil to bare rock) in 2017 and 2018, jack pine mortality was mapped on the east side of Matinenda Lake in 2019. In October 2019, jack pine budworm defoliation was forecast based on surveys of the number of overwintering jack pine budworm larvae on tree branches in Northwest Region. A total of 52 locations were surveyed, mostly in Red Lake and Dryden districts. Results indicate that in 2020 the infestation is likely to persist in the southern part of Red Lake District and central part of Dryden District and continue to expand in the central parts of Sioux Lookout and Kenora districts.

The area of moderate to severe spruce budworm defoliation increased from 137,082 ha in 2018 to 339,580 ha in 2019. Most of this increase was in Northeast Region. In Southern Region, new areas of spruce budworm defoliation were observed and light defoliation persisted in a small area that was defoliated the previous three years. In Northeast Region, spruce budworm defoliation was aerially mapped in all but one district (Wawa) in 2019. Large increases of moderate to severe defoliation were noted in the northern districts (Chapleau, Cochrane, Hearst, Timmins), a moderate increase in Sudbury District, new areas of defoliation in Sault Ste. Marie and Kirkland Lake districts, and a decline in area affected in North Bay District. A total of 216 ha of light defoliation was mapped in Northeast Region, most of it in Chapleau District. In 2019, the area of tree mortality caused by spruce budworm reached 2,427 ha in Northeast Region, most of it in Chapleau District. In Southern Region, moderate to severe defoliation was only recorded in Parry Sound District in 2019. In Peterborough District, 268 ha of light defoliation was mapped in the same general area as moderate to severe defoliation was mapped in the previous three years. Branch dieback and whole tree mortality is beginning in this area. Across much of northern Ontario, susceptible forests of spruce and balsam fir are beginning to reach age classes preferred by spruce budworm (i.e., >40 years). Spruce budworm pheromone trapping and aerial surveys will be continued to monitor population trends.

In 2019, the forest tent caterpillar infestation in Ontario collapsed, with the area of moderate to severe defoliation dropping from 992,207 ha in 2018 to 33,488 ha in 2019. All but 95 ha of the moderate to severe defoliation was in Northeast Region, with most of it recorded in the northern districts and Hearst District having the most (22,470 ha). Some light forest tent caterpillar defoliation (1,732 ha) was mapped in the province in 2019, all of it in Northeast Region and almost evenly split between Sault Ste. Marie and Sudbury districts with a small amount in North Bay District (61 ha). In 2019, only 95 ha of moderate to severe defoliation was recorded in Southern Region, all in Parry Sound District. No defoliation was recorded in Northwest Region in 2019. In 2018, large flesh flies, viruses, and fungi were observed affecting forest tent caterpillar and a cold damp spring in 2019 may have delayed foliage from flushing causing the initial emergence of forest tent caterpillar larvae to starve. All of these factors may have contributed to the extensive decrease in the forest tent caterpillar infestation.

For the third consecutive year, moderate to severe defoliation by large aspen tortrix decreased in Ontario. The area of moderate to severe defoliation decreased from 39,206 ha in 2018 to 16,548 ha in 2019. All the defoliation was recorded in Northeast Region, mostly in Timmins District, with new areas of defoliation mapped in Cochrane and Kirkland Lake districts and only a small area persisting in Chapleau District. A total of 1,400 ha of light defoliation was also mapped in Northeast Region, most of it (1,330 ha) in Kirkland Lake District.

The area of moderate to severe gypsy moth defoliation increased from 14,937 ha in 2018 to 43,158 ha in 2019. Most of this defoliation was aerially mapped in Southern Region, only 93 ha were mapped in Northeast Region. In Southern Region, most of the moderate to severe defoliation was recorded in Guelph and Aylmer districts (37,551 ha), with a slight increase in Midhurst District, a decline in Aurora District, and new areas of infestation in Parry Sound and Peterborough districts. In Southern Region, light gypsy moth defoliation (4,046 ha) was also recorded, most of it in Aylmer and Guelph districts and smaller areas in Midhurst and Aurora districts. In Northeast Region,

93 ha of moderate to severe gypsy moth defoliation was recorded in Sudbury District. The most recent occurrence in the district was in 2014, in and around the City of Greater Sudbury, but in 2019 it was recorded on the southwest side of the district near Massey. Gypsy moth egg masses were found in the fall north of Blind River in Sault Ste. Marie District. Defoliation is expected in 2020.

Several other insects caused localized defoliation or damage across Ontario. These occurrences did not develop into provincially significant areas of defoliation but do contribute to overall forest health concerns.

Forest pathogens and tree decline

Most tree pathogens do not cause symptoms over areas large enough to be aerially mapped, except when the damage is severe. In 2019, foliar diseases such as brown spot needle blight, anthracnose, septoria leaf spot, and armillaria root rot were mapped in 6,550 ha across Southern and Northeast regions. The mapped area of brown spot needle blight (6,132 ha) was the highest ever recorded in the province. This may be the result of the cool damp spring followed by hot temperatures in late June and July. Numerous other forest diseases reported during ground surveys included white pine blister rust, western gall rust, spruce needle rust, beech bark disease, Dutch elm disease, and verticillum wilt.

Beech leaf disease was first reported in Ohio in 2012 and in 2017 symptoms were confirmed in Aylmer District. During 2018 and 2019, provincial forest health experts worked with AgCanada and U.S. researchers to describe the nematode found in symptomatic leaves and reproduce symptoms in beech using solutions containing the nematode. Experts also determined how the nematode overwinters and the types of tissues that are infected during the growing season. Knowing the causal agent, they plan to investigate how the nematode is being spread locally and regionally. In 2019, beech leaf disease was confirmed in Aurora and Guelph districts and MNRF partnered with conservation authorities and other organizations to set up plots to monitor and understand the effects of beech leaf disease in forests already affected by beech bark disease.

Invasive species

Emerald ash borer is an invasive insect that is regulated by the Canadian Food Inspection Agency (CFIA). As of June 30, 2016, the area regulated to control emerald ash borer in Ontario includes all of Southern Region and the southern part of Northeast Region, south of Montreal River, which is at the northern end of Sault Ste. Marie District. The City of Thunder Bay in Northwest Region is also regulated for this borer.

In 2019, MNRF deployed 29 emerald ash borer traps in the Northwest Region in Kenora and Fort Frances districts. No beetles were found. In 2019, during ground surveys, new finds were confirmed in the quarantined area in the Northeast and Southern regions. In Northeast Region, emerald ash borer was found in Sudbury District at four locations and in North Bay District in the City of North Bay. In Southern Region, new finds of emerald ash borer were confirmed in four locations in Parry Sound District.

In 2013, as part of a long-term strategy to reduce the effects of emerald ash borer, biocontrol agents were released by CFS. In 2019, parasitoid wasp releases were conducted at four sites in Ontario, all in Southern Region: two in Peterborough District, one near the Kingston airport, the other on the southwest side of Belleville; one in Midhurst District on the west side of Owen Sound; and one in Parry Sound District east of Honey Harbour.

On April 5, 2013, the CFIA declared Asian long-horned beetle eradicated from Toronto and Vaughan. The declaration resulted following a program aimed at eliminating the pest after it was initially found in the area in 2003. This program involved cutting and chipping infested trees and all potential host trees within 400 m of an infested tree, followed by surveys to determine if any beetles remained. After five consecutive years in which detection surveys found no beetles or infested trees, the CFIA declared the pest eradicated.

In August 2013, a new infestation of Asian long-horned beetle was found in Mississauga, following the discovery of a beetle on a car. Subsequent surveys by the CFIA; the cities of Toronto, Mississauga, and Brampton; and MNRF found about 25 infested Norway and Manitoba maple trees. Infested trees were near Lester B. Pearson International Airport, except for one tree found in an adjacent area in the City of Toronto. This infestation has undergone an aggressive eradication program led by the CFIA, the agency that continues to lead the federal detection survey. No new finds of Asian long-horned beetle were reported in 2019.

Beech bark disease, which is a combination of an invasive insect (beech scale) and an invasive stem fungus, has continued to spread in Ontario. In 2019, new locations of beech bark disease were recorded in Southern Region.

Pest index — Major forest disturbances

Major forest disturbances occur when an insect, disease, or weather event affects a very large area, is not specific to a region, or has affected more than one region in the past. These disturbances, listed below, are considered of provincial significance.

Common name	Scientific name	Type	Page
Anthracnose	Anthracnose spp.	Disease	21
Armillaria root rot	*Armillaria* spp.	Disease	24
Asian long-horned beetle	*Anoplohora glabripennis Motschulsky*	Insect	27
Balsam fir sawfly	*Neodiprion abietis* (Harr.)	Insect	29
Beech bark disease	*Neonectria faginata*	Disease	32
Beech leaf disease	*Litylenchus crenatae* ssp. *mccannii*	Disease	35
Blowdown	Not applicable	Abiotic	38
Brown spot needle blight	*Lecanosticta acicula*	Disease	46
Cedar leafminer complex	Various species	Insect	53
Emerald ash borer	*Agrilus planipennis* Fairmaire	Insect	57
Forest tent caterpillar	*Malacosoma disstria* Hubner	Insect	61
Gypsy moth	*Lymantria dispar* (L.)	Insect	69
Hemlock woolly adelgid	*Adelges tsugae* (Annand)	Insect	78
Imported willow leaf beetle	*Plagiodera versicolora* (Laich.)	Insect	79
Ips species	*Ips grandicollis* (Eichhoff), *Ips pini* (Say), *Ips calligraphus* (Germar)	Insect	82
Jack pine budworm	*Choristoneura pinus pinus* Freeman	Insect	84
Large aspen tortrix	*Choristoneura conflictana* (Wlk.)	Insect	95
Oak wilt	*Bretziella fagacearum* (Bretz)	Disease	99
Septoria leaf spot	*Sphaerulina* spp.	Disease	102
Spruce budworm	*Choristoneura fumiferana* Clemens	Insect	105

Pest index — Minor forest disturbances

Minor forest disturbances are identified regionally using forest health surveys. These disturbances, listed below, could have local or regional significance to forest health conditions.

Pest index — Invasive forest species

Invasive forest species are insects or diseases that are not native to Ontario. Invasive species have the potential or proven ability to have deleterious effects on forest health, tree health, ecosystem functioning, or social and economic values. Invasive species found or surveyed for during forest health monitoring field work in Ontario in 2019 are listed below.

Host index

Tree and shrub species mentioned in this report and their scientific names.

Common name	Scientific name
American beech	*Fagus grandifolia* Ehrh.
American elm/white elm	*Ulmus americana* L.
Balsam fir	*Abies balsamea* (L.) Mill.
Balsam poplar	*Populus balsamifera* L.
Basswood	*Tilia americana* L.
Bitternut hickory	*Carya cordiformis* (Wangenh.) K Koch
Black ash	*Fraxinus nigra* Marsh.
Black cherry	*Prunus serotina* Ehrh.
Black spruce	*Picea mariana* (Mill.) BSP
Black walnut	*Juglans nigra* L.
Bur oak	*Quercus macrocarpa* Michx.
Carolina poplar	*Populus x canadensis* Moench cv. Eugenei
Choke cherry	*Prunus virginiana* L.
Eastern cottonwood	*Populus deltoides* Bartr. ex Marsh.
Eastern hemlock	*Tsuga canadensis* (L.) Carrière
Eastern red cedar	*Juniperus virginiana* L.
Eastern white cedar	*Thuja occidentalis* L.
Eastern white pine	*Pinus strobus* L.
European larch	*Larix decidua* Mill.
European white poplar	*Populus alba* L.
Green ash	*Fraxinus pennsylvanica* Marshall
Jack pine	*Pinus banksiana* Lamb.
Largetooth aspen	*Populus grandidentata* Michx.
Lombardy poplar	*Populus nigra* L.
Manitoba maple	*Acer negundo* L.
Pin cherry	*Prunus pensylvanica* L. f.
Red maple	*Acer rubrum* L.

Host index (*continued*)

Common name	Scientific name
Red oak	*Quercus rubra* L.
Red pine	*Pinus resinosa* Ait.
Red spruce	*Picea rubens* Sarg.
Scots pine	*Pinus sylvestris* L.
Silver maple	*Acer saccharinum* L.
Speckled alder	*Alnus incana* spp. rugosa (Du Roi) J. Clausen
Sugar maple	*Acer saccharum* Marsh.
Tamarack/larch	*Larix laricina* (Du Roi) K. Koch
Trembling aspen	*Populus tremuloides* Michx.
White ash	*Fraxinus americana* L.
White birch	*Betula papyrifera* Marsh.
White oak	*Quercus alba* L.
White spruce	*Picea glauca* (Moench) Voss
Willow species	*Salix* spp.

Major forest disturbances

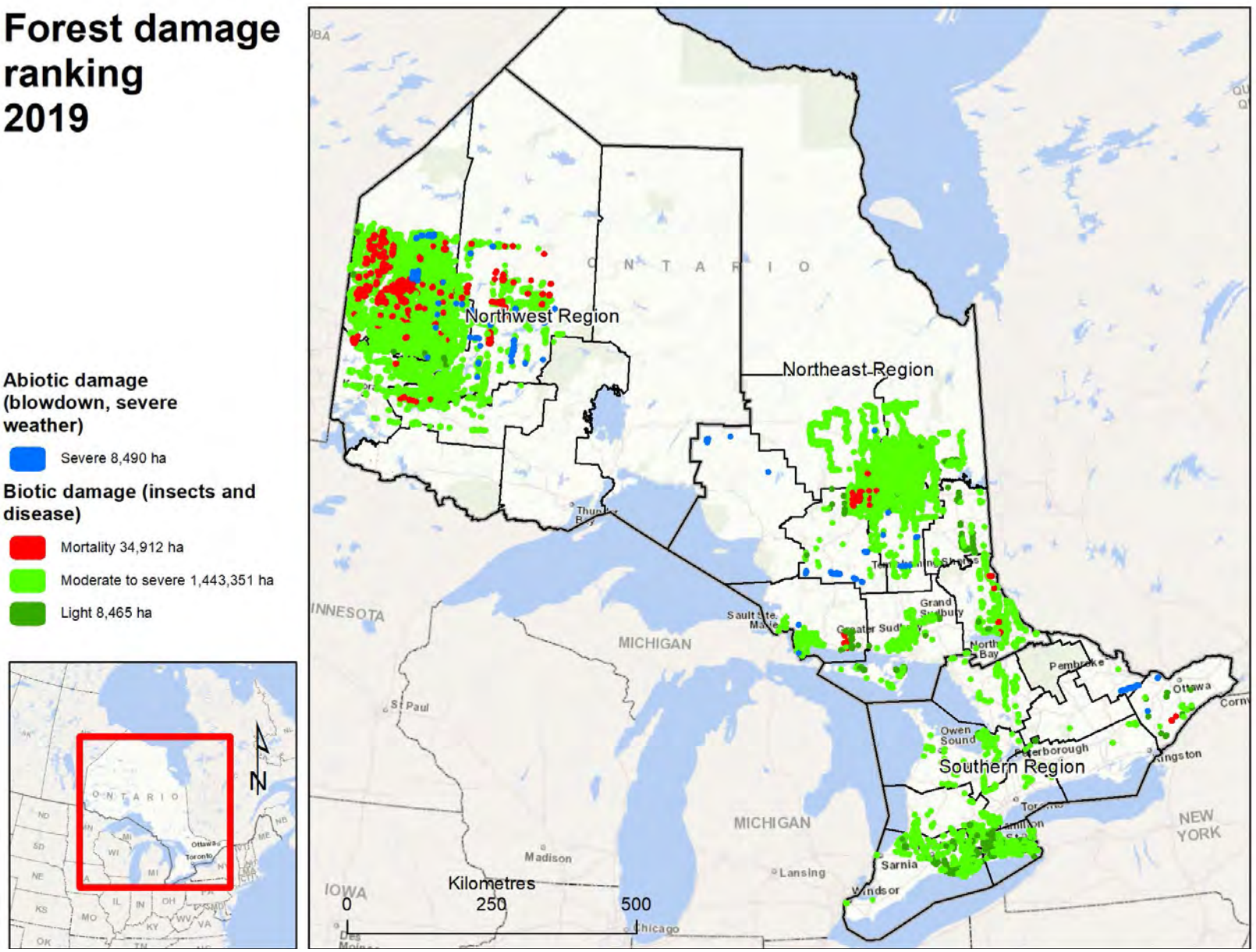
Mapped area

Major forest disturbances are mapped to quantify annual status and support trend analysis. The following table outlines area (in hectares) of mapped defoliation/damage by severity class for major disturbances in 2019. Light damage/defoliation is <25% and moderate to severe is 25–100%. (NM=not mapped)

Common name	Light	Moderate to severe	Tree mortality	Total
Anthracnose	15	NM	NM	15
Armillaria root rot	NM	NM	135	135
Balsam fir sawfly	15	9	NM	24
Blowdown	NM	8,490	NM	8,490
Brown spot needle blight	NM	6,132	106	6,238
Cedar leafminer	91	344	NM	435
Forest tent caterpillar	1,732	33,438	NM	35,220
Gypsy moth	4,046	43,157	NM	47,203
Imported willow leaf beetle	NM	45	NM	45
Jack pine budworm	439	1,001,269	32,234	1,033,942
Large aspen tortrix	1,400	16,548	NM	17,948
Pine engraver	NM	NM	10	10
Septoria leaf spot	243	25	NM	1,986
Spruce budworm	484	342,333	2,427	345,244

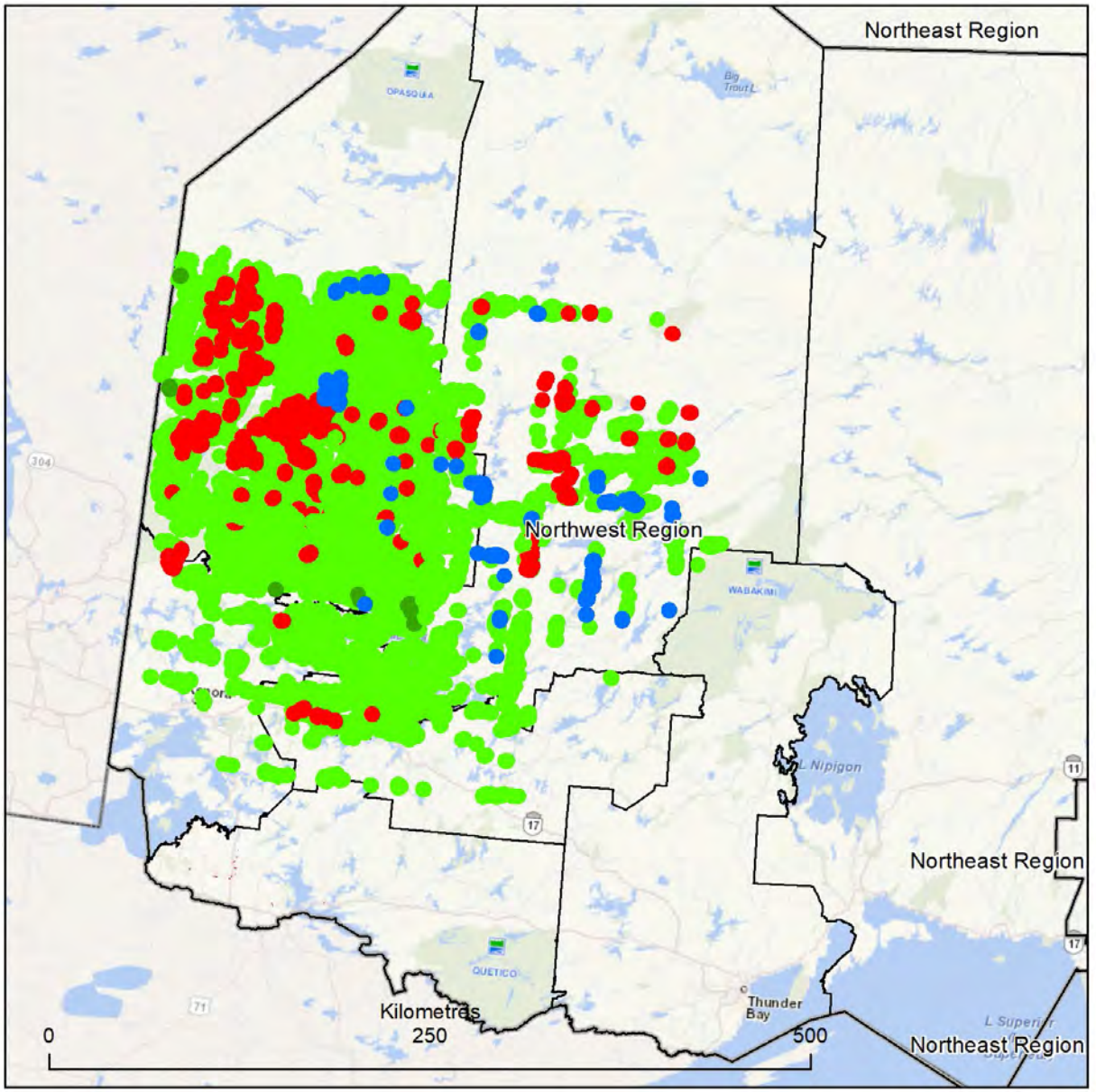
Major forest disturbances maps

Provincial overview



Northwest overview

Northwest Region Forest damage ranking 2019



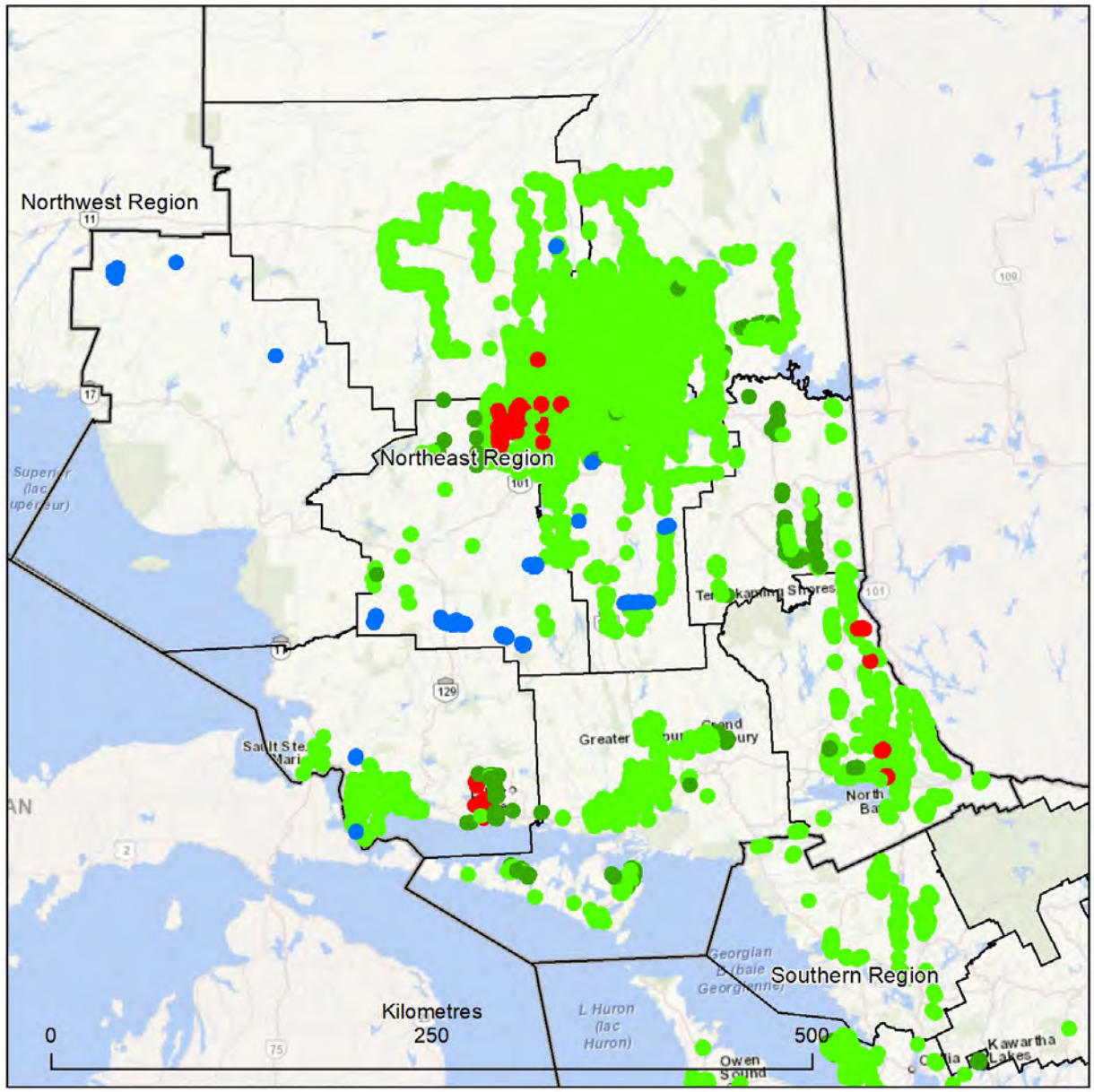
Abiotic damage (blowdown, severe weather)

- Severe 6,020 ha

Biotic damage (insects and disease)

- Mortality 32,208 ha
- Moderate to severe 1,001,269 ha
- Light 439 ha

Northeast Region Forest damage ranking 2019



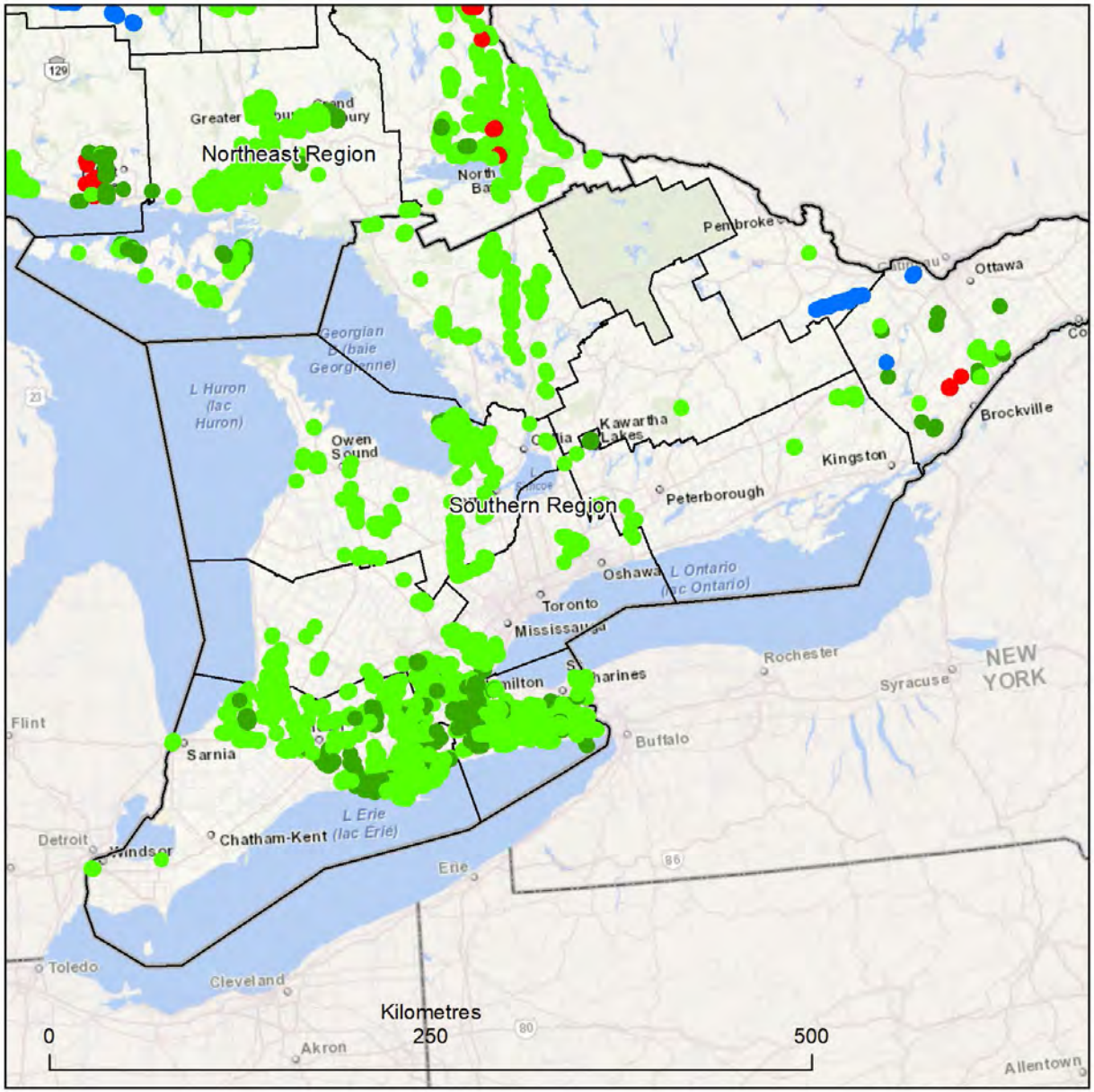
Abiotic damage (blowdown, severe weather)

- Severe 1,748 ha

Biotic damage (insects and disease)

- Mortality 2,598 ha
- Moderate to severe 389,902 ha
- Light 3,348 ha

Southern Region Forest damage ranking 2019

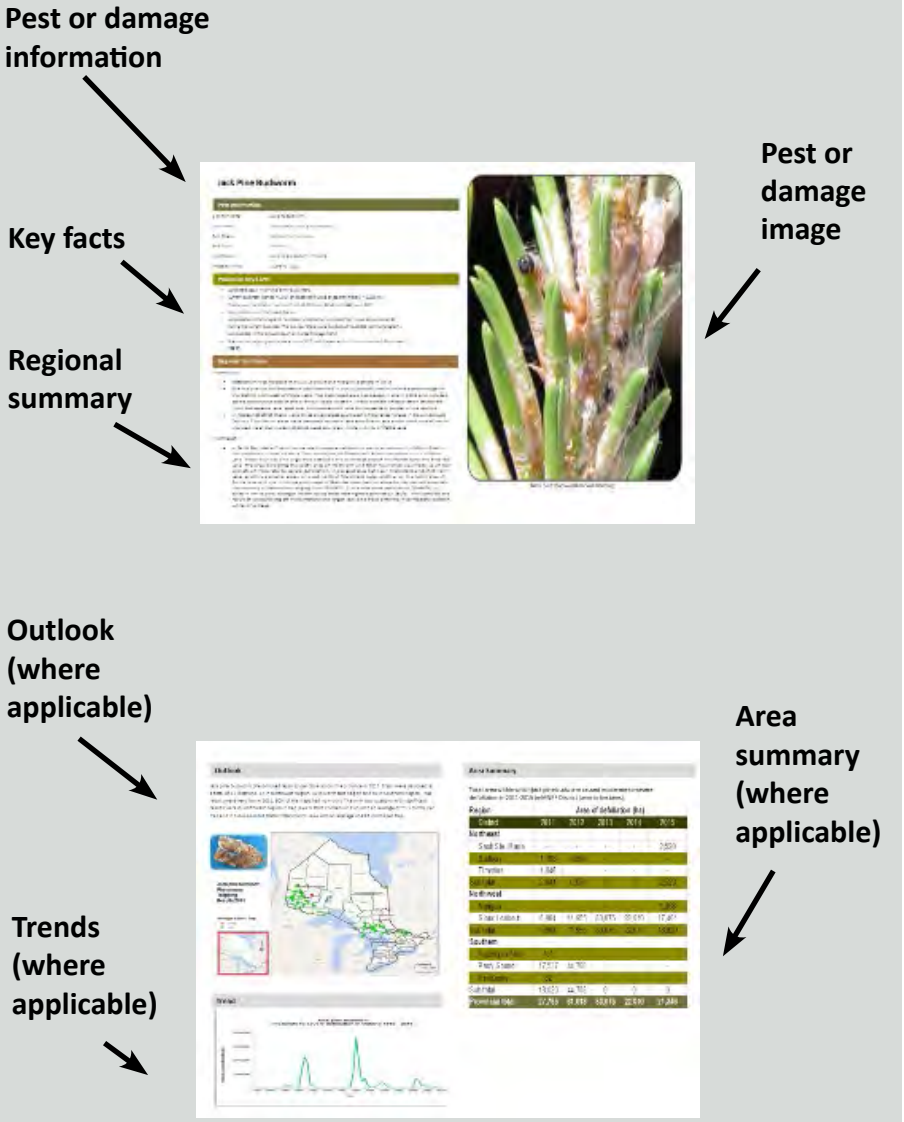


Example report

How to read a major disturbance report

Each report summarizes information about an event or disturbance affecting the health of Ontario's forests, including some or all of:

- **Pest/damage information** – basic information about the disturbance, including the type, origin, host species, and area affected that year
- **Key facts** – overview of the disturbance, including provincial scale information about the disturbance, possible effects, and annual activity
- **Regional summary** – regional summaries, outlining more specific information by MNRF administrative region (Northwest, Northeast, Southern)
- **Image** – a photo of the disturbance or pest
- **Outlook** – where applicable, an overview of potential future implications and developments for the disturbance
- **Trends** – where applicable, additional information about possible trends
- **Area summary** – where applicable, information about the total area in which the disturbance caused moderate to severe damage from 2015 to 2019 by MNRF region and district.

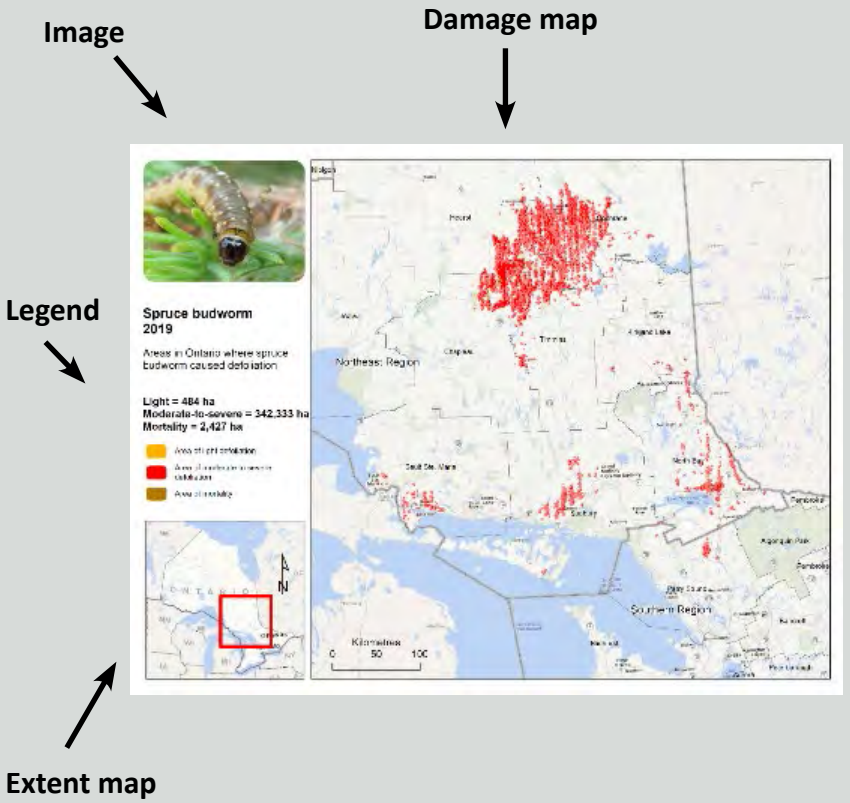


Example map

How to read the maps in this report

For major disturbances, the following spatial information is provided:

- **Damage map** – shows the areas of infestation or damage. Light damage is typically represented in orange, moderate to severe damage in red, and mortality in yellow. Smaller areas are outlined in pink to make them stand out.
- **Legend** – describes map features
- **Extent map** – map of Ontario with the focal area outlined in deep red
- **Image** – a photo of the disturbance or pest



Anthracnose

Pest information

Common name:	Anthracnose
Scientific name:	*Cercospora microsora Sacc., Discula sp., Glomerella cingulata (Stoneman)* Spauld. & H. Shrenk, *Stegophora ulmea* (Fr.) Syd. & P. Syd.
Pest origin:	Native to North America
Pest type:	Foliar disease
Host species:	American beech, ash, basswood, elm, hawthorn, maple, sycamore
Infestation area:	15 ha light damage

Provincial key facts

- Fungal foliar diseases such as anthracnose are known to flourish during years with cool, wet conditions in spring followed by hot, humid weather in summer.
- Generally, anthracnose is not considered a serious problem, but early leaf drop can be a nuisance for home-owners.
- Removal and destruction of fallen leaves can limit re-infection the following spring.
- Infection may weaken tree and predispose affected trees to other disturbance agents.
- Various pathogens that cause this disease were found in Southern Region in 2019.

Regional summary

Southern:

- In Aylmer District, severe foliar and branch symptoms were observed on open-grown and riparian sycamore trees during ground surveys in various areas through Catfish Creek and Kettle Creek watersheds in Elgin County, Long Point Region watershed in Norfolk County, and Lower Thames River watershed through London west to Wardsville in southwest Middlesex County. In addition, open-grown sycamore and London planetrees were affected by anthracnose along Hwy 401 from London west to Windsor. Symptoms included very thin and transparent crowns, aborted buds, twig dieback, and cankers. By mid-summer, affected trees appeared

to recover, producing new healthy green leaves. Moderate levels of anthracnose leaf spots were observed affecting understory and lower crowns of American beech, sugar maple, oaks, elm, and basswood in southern Elgin County and western Norfolk County. High levels of leaf spot and early leaf drop caused by a combination of anthracnose and other types of leaf spot were observed affecting open-grown and woodlot fringe hawthorns at McAuliffe Woods in Windsor.

- In Guelph District, several mature, open-grown sycamore trees with severe foliar and twig damage caused by sycamore anthracnose were observed during ground surveys along the Niagara Parkway between Niagara-on-the-Lake and Queenstown, Niagara Region.
- In Kemptville District, light anthracnose of ash (15 ha) was detected during aerial surveys in July on Marionville Road, North Dundas Twp. Ninety percent of white ash trees had light levels of leaf spot damage in a semi-mature white ash/sugar maple forest.

Northeast:

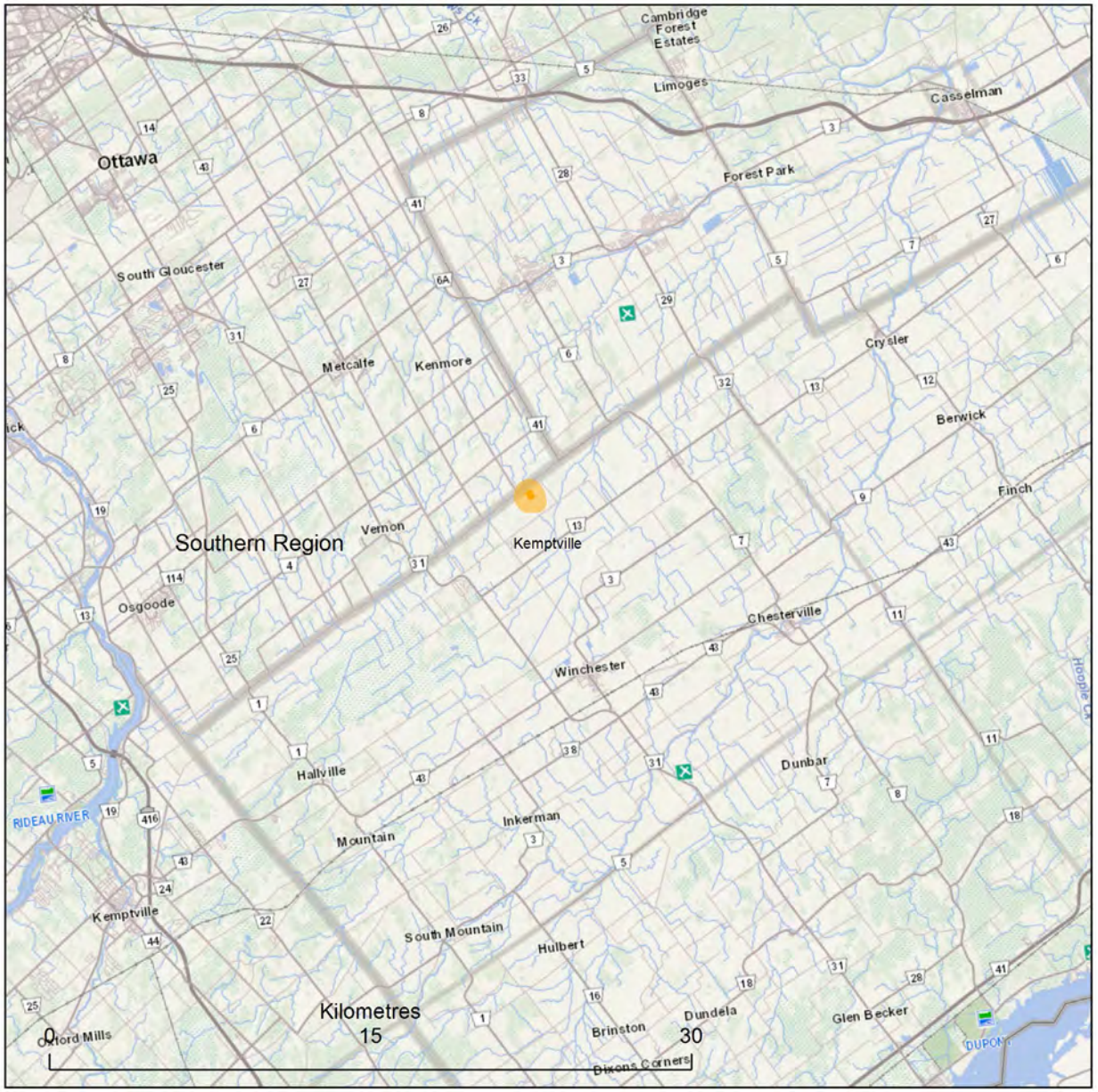
- In Sault Ste. Marie District, armillaria root rot was detected in a jack pine stand south of Elliot Lake in the northwest corner of Esten Twp. Several stressors, including insect defoliation, drought, and poor site condition, may have contributed to the decline. Of the trees surveyed, 45% were live and healthy, 17% had dead tops, and 38% were dead.

Sp. Anthracnose 2019

Areas in Southern Region where sp. anthracnose caused damage

Light = 15 ha

Area of light damage



Armillaria root rot

Pest information

Common name:	Armillaria root rot
Scientific name:	*Armillaria* spp.
Pest origin:	Native to North America
Pest type:	Root disease
Host species:	Red oak, jack pine
Infestation area:	135 ha (on red oak)

Provincial key facts

- Found throughout North America, armillaria root rot is a serious fungal disease that causes tree mortality and contributes to substantial wood volume losses in both hardwood and softwood stands.
- This fungus is common in forest soil and affects trees that are stressed by other biotic and abiotic factors. Trees can be infected for many years before they succumb to the disease.
- In forest stands, individual trees or groups of trees decline and die in a circular pattern. New trees are infected when they root graft with diseased trees or when shoestring-like filaments produced by the fungus reach nearby hosts.
- In 2019, armillaria root rot was reported in the Northwest and Northeast regions, occurring on both softwoods and hardwoods.

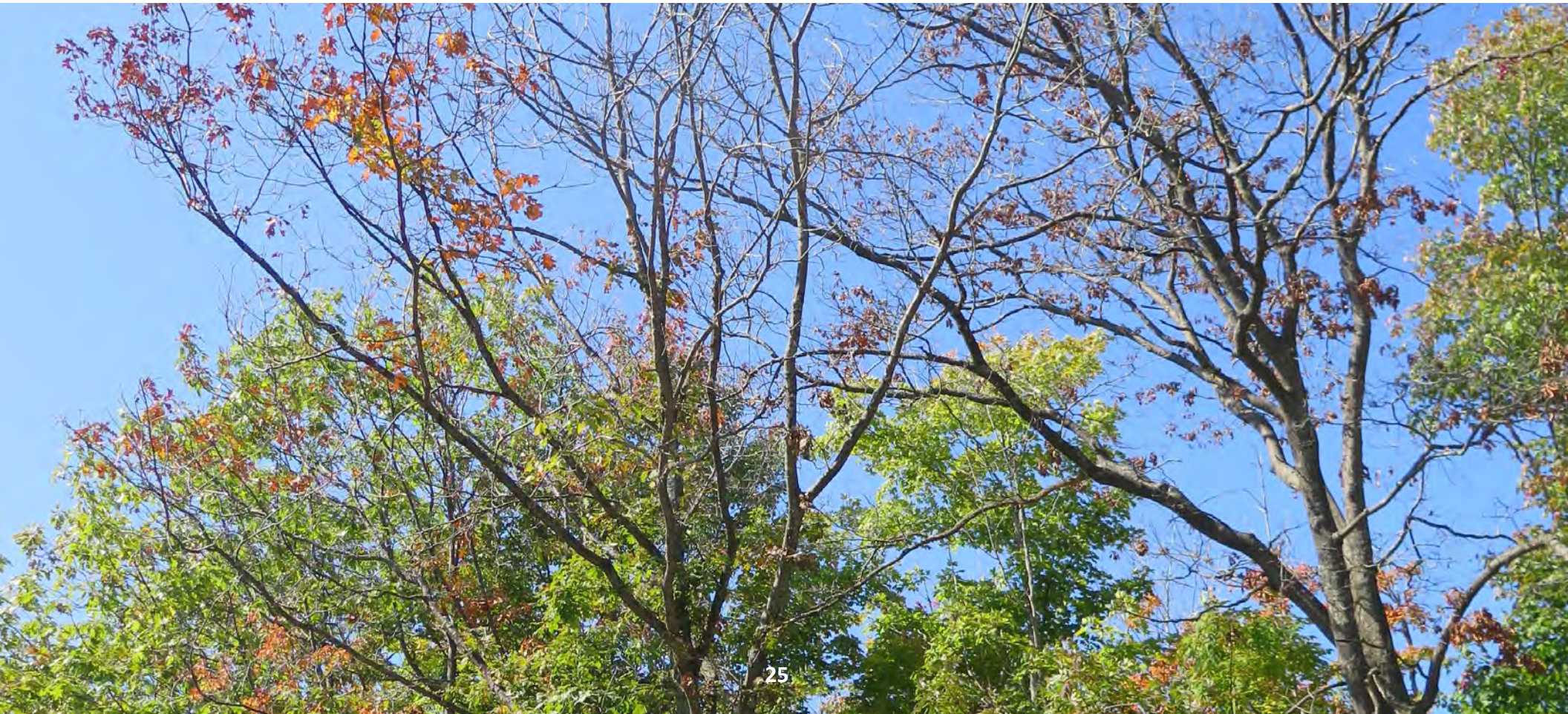
Regional summary

Northwest:

- Armillaria root rot was observed in Thunder Bay District in a plantation east of Kakabeka Falls in Oliver Paipoonge Twp. Five recently dead semi-mature red pine were identified and, on further investigation, evidence of the fungus (mycelial fans) was found under the bark at the base of the trees.

Northeast:

- Red oak mortality was aerially mapped in the eastern part of Sault Ste. Marie District north of the town of Blind River. An area of 135 ha was recorded in the vicinity of Lake Duborne, Granary Lake, Bearhead Lake, and north of Matinenda Lake. The larger areas of defoliation were north of Matinenda Lake near Duck and Boundary lakes in the northeast corner of Juillette Twp. Smaller areas were mapped on the south side of Bearhead Lake in Scarfe Twp, while small scattered areas of mortality were observed along Granary Lake Road stretching from Duborne Lake to the southwest end of Granary Lake. Low levels of two-lined chestnut borer were also recorded in the areas along Granary Lake Road. In June, the Sault Ste. Marie District office reported jack pine mortality in a recently cut area on Labertson Road, east of Hwy 129 in Gilbertson Twp. Jack pine trees on the edge of the residual jack pine stands had armillaria root rot, which is not unusual after disturbance events such as harvesting, fire, or blowdown. Whitespotted sawyer beetle damage was also observed in these trees but was not the primary cause of mortality. This wood borer is commonly found on stressed trees.

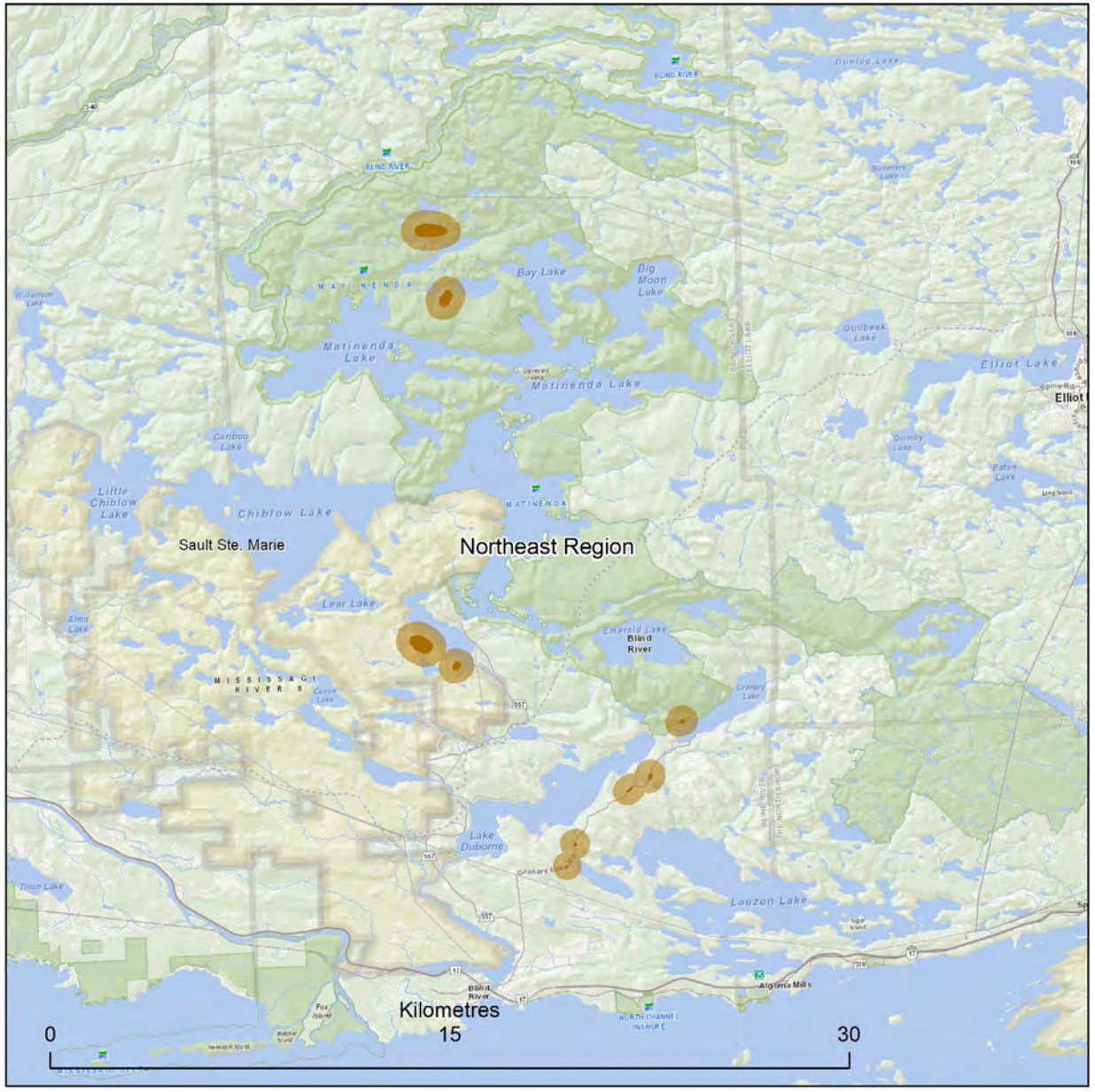


Armillaria root rot 2019

Areas in the Northeast Region where armillaria disease caused damage

Mortality = 135 ha

Area of mortality



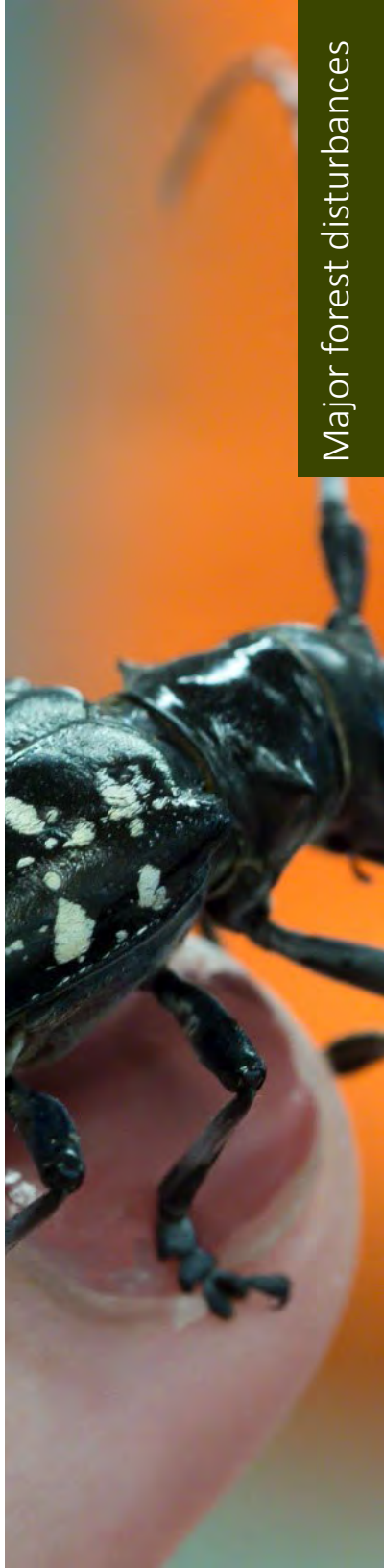
Asian long-horned beetle

Pest information

Common name:	Asian long-horned beetle
Scientific name:	*Anaplophora glabripennis* (Motschulsky)
Pest origin:	Invasive – Native to Asia
Pest type:	Wood borer
Host species:	Birch, elm, hackberry, horse chestnut, Katsura, maple, mountain ash, poplar, silk tree, sycamore or London planetree, and willow
Infestation area:	No new finds

Provincial key facts

- The Asian long-horned beetle was first found in 2003 in an industrial park bordering Toronto and the city of Vaughan.
- It was possibly introduced to North America by way of wooden pallets, crates, or packaging materials used in shipping.
- The Canadian Food Inspection Agency (CFIA), which is the lead agency responsible for preventing the entry and spread of invasive insect species, joined with MNRF, the Canadian Forest Service (CFS), City of Toronto, City of Vaughan, York Region, Toronto and Region Conservation Authority, and the U.S. Department of Agriculture to create a task force focused on controlling this beetle.
- After several rounds of host tree removals and surveys, the Toronto-Vaughan infestation was thought to be eradicated in 2003.
- On September 20, 2013, the CFIA confirmed the presence of Asian long-horned beetle in an industrial area near Pearson International Airport, Mississauga, with about 25 trees identified as infested and subsequently destroyed.
- In early 2014, host trees within 800 m of infested trees were removed from parks, ravines, and industrial and residential areas of Mississauga and west Toronto.
- As part of eradication efforts, the CFIA established a regulated area in Mississauga and Toronto to prevent the spread of the insect. This area is about 20 square kilometres, bordered by Finch Avenue (north), Martin Grove Road (east), Hwy 401 (south), and Dixie Road (west).



- Restrictions on moving nursery stock, trees, logs, lumber, wood, wood chips, and bark chips from certain deciduous trees identified as hosts of the beetle are in place for the regulated area.
- Agencies currently working collaboratively to monitor this insect are the CFIA, CFS, MNRF, and cities of Toronto, Mississauga, and Brampton.
- No new detections were reported in 2019.
- More information is available on the CFIA website at: http://www.inspection.gc.ca/plants/plant-protection/insects/asian-longhorned-beetle/eng/1337792721926/1337792820836

Regional summary

Southern:

- In early 2019, the CFIA carried out surveys in the regulated area with the assistance of the City of Toronto. No new detections of the beetle were reported. Surveys are expected to continue through 2020.

Balsam fir sawfly

Pest information

Common name:	Balsam fir sawfly
Scientific name:	*Neodiprion abietis* (Harr.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Balsam fir
Infestation area:	24 ha

Provincial key facts

- Infestations of balsam fir sawfly are common in eastern Canada (Newfoundland and Labrador) and less frequent in Ontario.
- Outbreaks occurred in southeastern Ontario in the Ottawa Valley in the early 1940s and 50s and again in the late 1960s and early 70s.
- More than five or six consecutive years of defoliation can cause some mortality, but since spruce budworm often occurs simultaneously it is difficult to distinguish which insect is causing the most damage.
- In 2019, balsam fir sawfly defoliation was aerially mapped in two small areas in Southern Region and was detected in other localized areas during ground surveys.

Regional summary

Southern:

- In Pembroke District, 9 ha of moderate to severe defoliation was mapped during aerial surveys on Cobden Road, Bromley Twp, in a young, balsam fir/white ash forest.
- In Kemptville District, 15 ha of light balsam fir sawfly defoliation was aerially mapped along Bathurst Concession Road 2, Tay Valley Twp, west of Perth. Balsam fir sawfly defoliation was also observed during ground surveys in various locations across Lanark County. Symptoms consisted of discoloration of old needles, especially in the

top third of the trees. Moderate to severe defoliation was observed along Hwy 36 from Kingston Line to Elphin, Lanark Highlands. Moderate to severe defoliation was also observed in a mixed forest on Hwy 9 near Clayton. In Tay Valley Twp, moderate to severe defoliation was observed on balsam fir and white spruce in a young mixed forest on Keays Road near Balderson, and nearby on Bathurst Concession Road 6. Further east in Kemptville District, in Prescott-Russel County, an isolated occurrence of balsam fir sawfly was observed in East Hawkesbury. Balsam fir sawfly eggs were collected in a large stand of mature balsam fir and eastern hemlock near Voyageur Provincial Park. The population was high, with eggs found on 90% of the trees assessed.

- In the northwest corner of Peterborough District, moderate to severe balsam fir sawfly defoliation was reported along McKelvey Beach Road, south of Canal Lake, Eldon Twp. Forest stands, and open-grown trees were both affected in this area. A high population of larvae were observed feeding on old and new needles of balsam fir.
- In Northumberland County, moderate to severe defoliation was reported south of Burnley along County Road 29, Haldimand Twp. In a mixed conifer stand, about 25 balsam fir trees were affected; defoliation was concentrated in the upper canopy of the trees.

Total area (in hectares) in which balsam fir sawfly caused moderate to severe defoliation from 2015 to 2019 by MNRF district.

Region	Area of defoliation (ha)				
District	2015	2016	2017	2018	2019
Southern					
Algonquin Park	-	-	-	-	-
Aurora	-	-	-	-	-
Aylmer	-	-	-	-	-
Bancroft	-	-	-	-	-
Guelph	-	-	-	-	-
Kemptville	-	-	-	-	-
Midhurst	-	-	-	-	-
Parry Sound	-	-	-	-	-
Pembroke	-	591	135	31	9
Peterborough	-	-	-	-	-
Sub total	0	591	135	31	9
Provincial total	0	591	135	31	9

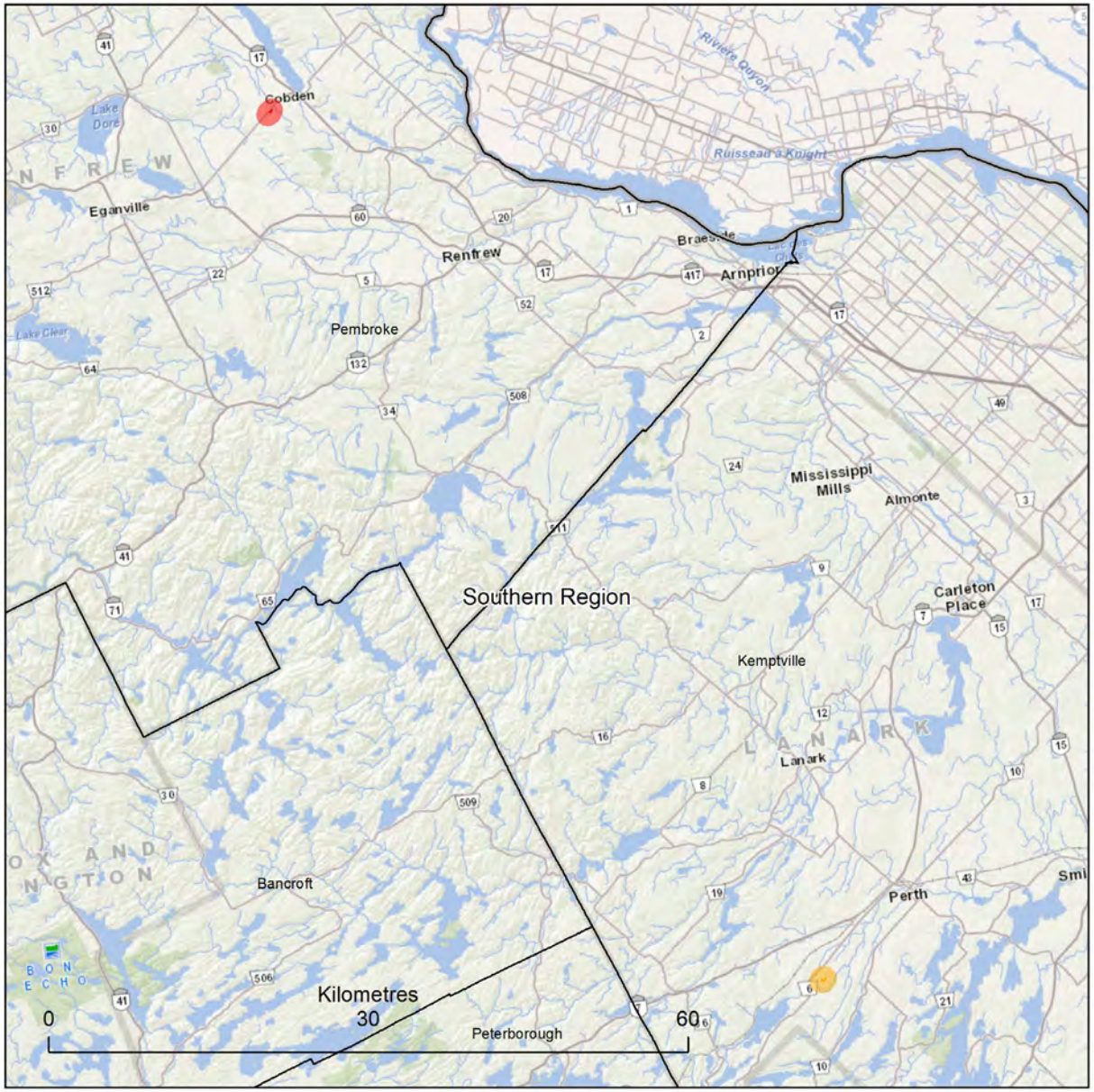
Balsam fir sawfly 2019

Areas in the Southern Region where balsam fir sawfly caused defoliation

Light = 15 ha
Moderate to servere = 9 ha

Area of light defoliation

Area of moderate to severe defoliation



Beech bark disease

Pest information

Common name:	Beech bark disease
Scientific name:	Fungus – *Neonectria faginata* (Lohman et al.) Castl. Rossman
	Insect – *Cryptococcus fagisuga* Lind.
Pest origin:	Invasive — native to Europe
Pest type:	Insect-disease complex
Host species:	American Beech
Infestation area:	Localized

Provincial key facts

- Beech bark disease is the result of an insect-fungal pathogen complex initiated by the infestation of beech scale on American beech.
- As the insect and fungus become established in a stand they reduce growth, deform trees, decrease wood quality and mast production, and cause premature mortality.
- Beech bark disease has been identified across the range of beech in Ontario, as far north as St. Joseph Island, Sault Ste. Marie District.
- Three distinct phases of beech bark disease development are evident in Ontario:
    - Advancing front: beech scale populations have recently colonized unaffected beech trees. Scale infestations combined with other stressors can contribute to beech decline.
    - Killing front: scale populations build rapidly, and the fungus colonizes trees. The killing front is characterized by high tree mortality.
    - Aftermath forest: disease has passed through and remains endemic. Large remnant trees continue to decline and young trees become infected, disfigured, and gradually decline.
- Forest health staff continue to monitor and collect information on new occurrences of beech bark disease during general surveys. In 2019, new locations were added to an existing database of confirmed infections in Southern Region.

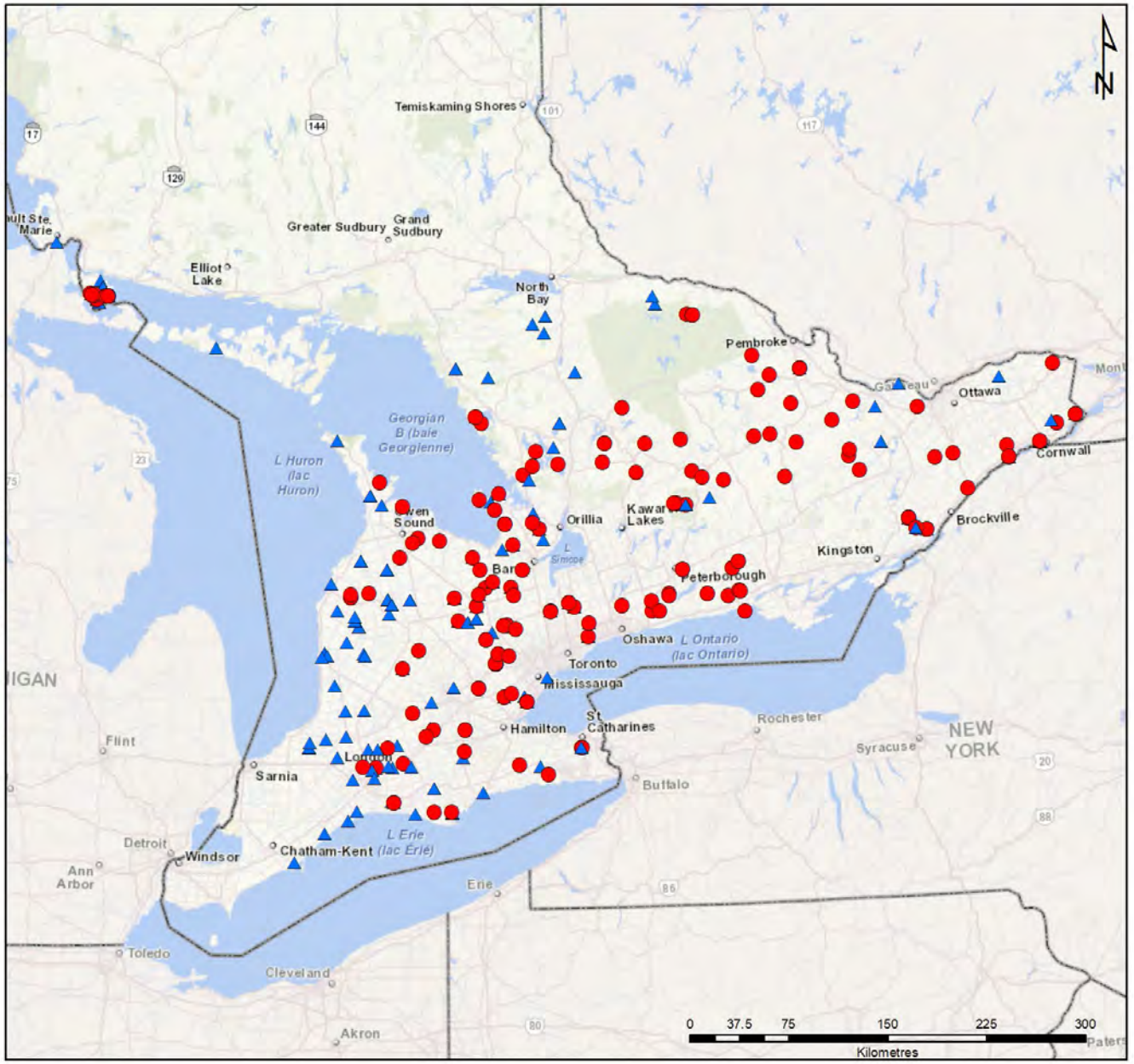
Regional summary

Southern:

- In Aylmer District, a new collection of beech bark disease was made in a natural forested area at W. Leslie Dickson Arboretum near Innerkip, Oxford County. In previous years, fungal fruiting was observed high into the crowns of mature beech trees, therefore were difficult to confirm with a sample.
- In Kemptville District, beech bark disease was collected in a mature, mixed stand of sugar maple and largetooth aspen on County Road 16, Lavant, Lanark County. The population was moderate and caused trace damage to host trees. Most beech trees also had trace levels of scale.
- In Pembroke District, beech bark disease was confirmed in various locations in Renfrew County. In Madawaska Valley Twp, beech bark disease was confirmed in a mature mixed beech stand on Sunny Hill Road near Bark Lake. Affected trees had pre-mature colour change, crown dieback, and were heavily infested with beech scale. Mature trees in the stand were in decline or dying but only 20% of examined trees had noticeable cankers or fruiting. Nematogonum ferrugineum, a parasite of the beech bark disease fungus, was also present in the sample that was submitted. Beech bark disease was also collected in a mature, mixed, stand of managed sugar maple and beech on Stone Church Road in Killaloe, Haggarty Twp. Damage to host trees was 40% on average and levels of beech scale were high. In Richards Twp, beech bark disease was collected on Beechnut Lake Road slightly south of Algonquin Provincial Park in a mature hardwood stand that was primarily American beech. Damage in the stand was high, with some mortality observed. Thirty per cent of host trees were infected. Local reports were made by the Renfrew County forester of new occurrences of beech bark disease in the Centennial Lake and Carswell Mountain Tracts of the Renfrew County Forest off Matawatchan Road, Matawatchan Twp but were not confirmed with a sample collection.
- In the south end of Algonquin Provincial Park, beech bark disease was collected in a mature, mixed stand of sugar maple and eastern hemlock on Kingscote Lake Road. All beech trees had scale and crown dieback but only one tree was severely affected by beech bark disease.
- In Bancroft District, general surveys were conducted in early fall in beech stands when fruiting bodies were visible from cankers on the bark. Beech bark disease was observed along Gull River, east of Minden, Haliburton County. In a mixed maple-beech stand, 40% of trees were affected; semi-mature beech trees were severely affected but younger trees showed no signs of disease even though scale insects were present. Similarly, beech bark disease was observed along Growler Lake Road, West Guilford, and along Hwy 118 west of Tory Hill. At Silent Lake Provincial Park, beech bark disease continues to affect mature beech stands causing severe dieback and whole tree mortality. Further south in the district, cankers caused by beech bark disease were confirmed in Wollaston Twp, along Sportsman Lane north of Coe Hill; light to moderate damage was observed, with beech scale insect present on all trees.

Beech Bark Disease and Beech Scale in Ontario 1999 - 2019

- Beech bark disease detected
- Beech scale detected



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Ministry of Natural Resources and Forestry

Sources:
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Projection: Transverse Mercator
Datum: NAD 83

Published Nov 2019

Ontario

Beech leaf disease

Pest information

Common name:	NA
Scientific name:	*Litylenchus crenatae* (Kazaki et al. 2019) ssp. *mccannii*
Pest origin:	Unknown
Pest type:	NA
Host species:	American beech, European beech
Infestation area:	Localized

Provincial key facts

- Beech leaf disease was first identified in the United States in Lake County, Ohio, in 2012 and has since been detected from northcentral Ohio to Connecticut. In Ontario, it occurs along the shores of Lake Erie and in the municipality of Toronto.
- Symptoms of beech leaf disease were first confirmed in southern Ontario in 2017 in Aylmer District.
- Symptoms of beech leaf disease include the presence of aborted buds and striping or banding caused by the thickening of leaf tissue between veins. As the growing season progresses, foliage of affected trees becomes thin, shrivelled, and discoloured.
- Symptomatic trees are host to other foliage-affecting insects and pathogens including erineum patches caused by eriophyid mites, woolly beech aphids, and foliar fungi such as anthracnose, and powdery mildew.
- In 2019, new detections of beech leaf disease symptoms were made outside of locations confirmed in previous years.

Regional summary

Southern:

- Symptoms of beech leaf disease have only been found in Southern Region to date in Aylmer and Guelph districts, and at one location in Aurora District.
- In Aylmer District, symptoms of beech leaf disease have now been confirmed in Elgin, Middlesex, Oxford, Norfolk, and Chatham-Kent counties with a new find in Lambton County.

- In Guelph District, symptoms of beech leaf disease have now been confirmed in Haldimand County and Niagara Region.
- In Aurora District, beech leaf disease has been confirmed in Toronto.

Trend analysis/outlook/issues

During 2018 and 2019, staff with the forest health program worked with AgCanada and U.S. researchers to describe the nematode found in symptomatic leaves and reproduce symptoms in beech using solutions containing the nematode. Staff also determined how the nematode overwinters and the types of tissues infected during the growing season.

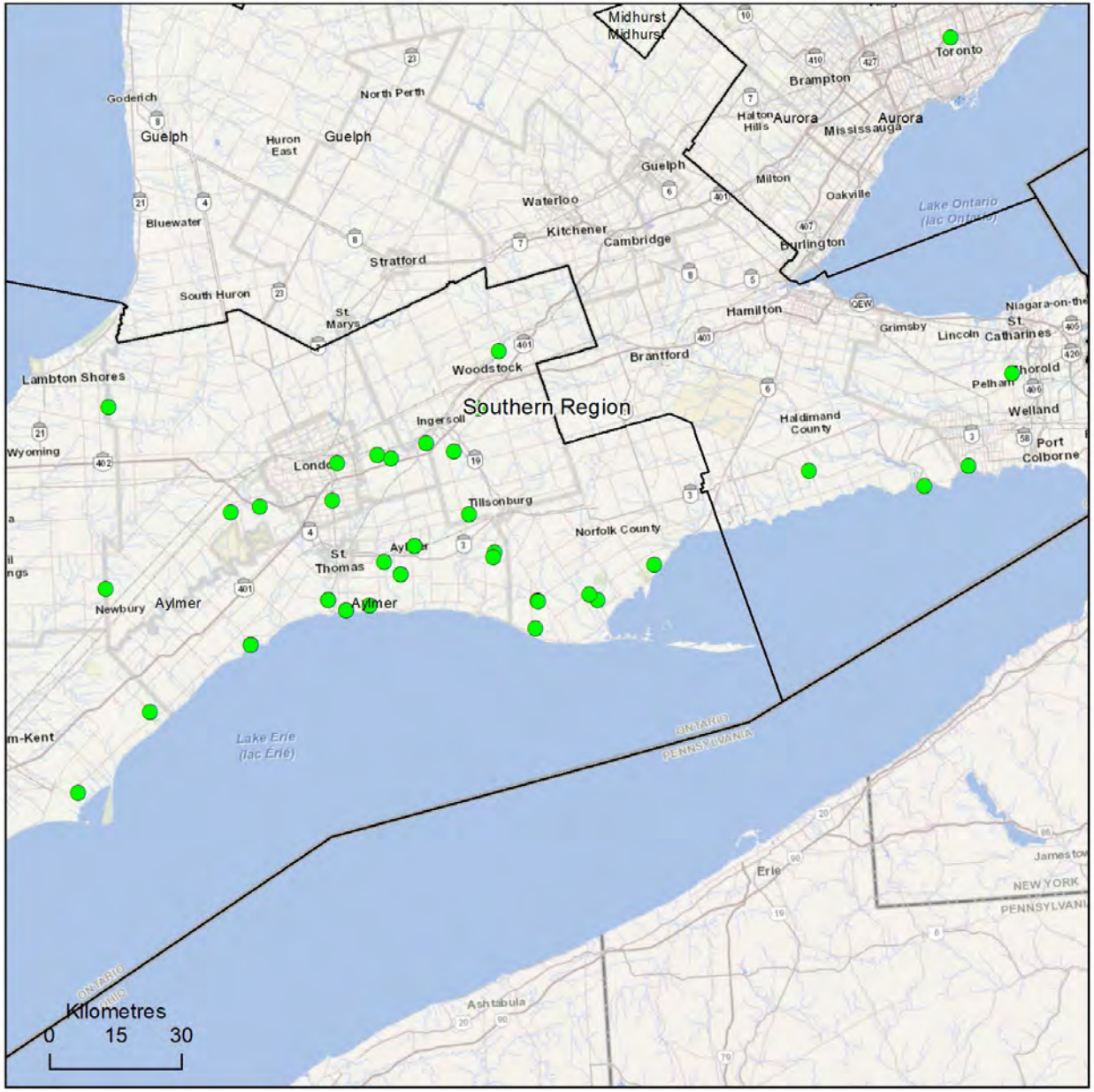
In 2019, Scientists at the Ontario Forest Research Institute documented the development of populations of this nematode in beech buds and leaves to better understand the infection process.

The forest health program partnered with MNRF research staff to help deliver two beech leaf disease monitoring projects. The first involved establishing long-term beech health monitoring plots in Aylmer and Guelph districts to determine the effects of beech leaf disease, beech scale, and beech bark disease on the health of beech trees and beech forests in Ontario. The second is a continuation of the beech leaf disease sample plot network established in 2018. This year, sample plots were established in new locations at sites with symptomatic trees in Aylmer District to monitor changes in nematode population over time. In addition, control plots were established in asymptomatic locations in Guelph, Midhurst, and Peterborough districts to better understand the cause of beech leaf disease. Monthly leaf and bud samples from beech trees were collected and submitted for laboratory analysis.

Work on beech leaf disease is ongoing and involves numerous partners. Now that a causal agent has been identified, MNRF plans to investigate how the nematode is being spread locally and regionally.

Beech leaf disease presence in Ontario 2019

locations where beech leaf disease has been confirmed in Ontario



Blowdown

Pest information

Common name:	Blowdown
Scientific name:	NA
Pest origin:	NA
Pest type:	Abiotic
Host species:	Variable
Infestation area:	8,490 ha

Provincial key facts

- Blowdown, damage to trees caused by high winds or extreme weather events, is a natural disturbance process in forests. The extent and frequency of such damage is sporadic.
- More blowdown was recorded in 2019 (8,490 ha) than in 2018 (3,839 ha).
- Scattered areas of blowdown were found in all three regions in 2019, with most in the Northwest Region (6,020 ha).

Regional summary

Northwest:

- In 2019, just over half the blowdown aerially mapped in Northwest Region was in Sioux Lookout District (3,188 ha). Most of this blowdown was in scattered areas in the southcentral part of the district with small areas in the north. The most concentrated areas of blowdown on the west side of the southcentral part of the district were south of Gull Lake near the Red Lake District boundary, from the north end of Miniss Lake to Hooker Lake area and, a little further north, scattered areas of blowdown were noted from Wright Lake southeast to the north end of Osnaburgh Lake. In the north end of the district, two small areas of blowdown were detected south of Windigo Lake towards the Red Lake District boundary, one at the south end of Bournette Lake and the other at the north end of Nabimina Lake.
- In 2019, 2,832 ha of blowdown were aerially mapped in Red Lake District. Larger areas of blowdown were noted in the northcentral part of the district and smaller scattered areas were recorded on the east side of the

district. In the northcentral part of the district, areas were mapped between the south ends of Margot and Hornby lakes and north of Frame Lake. Further south, areas of blowdown were observed between Berens and Silcox lakes, along the Berens River, and near Murfitt Lake. On the east side of the district, several small areas of blowdown were aerially mapped from the northwest side of Southwest Lake to Fredart Lake in Belanger Twp. Further east, two small areas of blowdown were observed on islands in Birch and Springpole lakes and a line of blowdown was observed near the Sioux Lookout border west of Gull Lake to Skingle Lake and south of Gull Lake to Sausage Lake.

- During ground surveys in Fort Frances District, blowdown was observed at homeowners' properties and Quetico College School and Conference Centre on the shorelines of Eva Lake. The Fort Frances District office also reported blowdown in the Lake Despair area. Tree damage ranged from snapped and twisted stems to complete uprooting.
- In Thunder Bay District, about 30 large spruce trees along Hwy 17, east of Kakabeka Falls, were blown over from a severe thunderstorm on August 2.

Northeast:

- In 2019, just over 70% of the blowdown aerially mapped in Northeast Region was in Chapleau District (1,238 ha). The blowdown across the southern part of the district was from a wind storm event in September 2018. The most concentrated area of blowdown was a swath starting below Wehaygo Lake in Hutcheon Twp, heading southeast through the northeast corner of Bernier Twp, then heading east through the top of Birch and Bounsall townships, on both sides of Wenebegon Lake. Other less concentrated areas of blowdown were mapped in the northeast corner of Eaton Twp, heading into the northwest corner of Edighoffer Twp and the southwest corner of Hubbard Twp just west of Bardney Lake. Farther west, not far from the Wawa District boundary, four small areas of blowdown were recorded between Mutt Lake and Montreal River in the southwest corner of Hancock Twp and the northwest corner of Moggy Twp. Northeast of that, two small areas of blowdown were recorded in the central part of Benton Twp along the Wakami River.
- In 2019, 254 ha of blowdown were mapped in the northern part of Wawa District. Most of this blowdown was in the northwest corner of the district about 14 km south of Caramat in the Kaboosa Lake area. Small areas of blowdown were also found east and southeast of this location, one north of White Otter Lake and another southeast on the east side of Hwy 631 on the south side of Beaton River in the central part of Beaton Twp between Marten and Lynx roads.
- In Timmins District, 207 ha of blowdown were aerially mapped, most of it in the southcentral part of the district. A significant weather event on September 5, 2018 caused severe damage along Hwy 560 between the communities of Morin Village and Ostrom. Most of the blowdown was flattened and uprooted semi-mature to mature jack pine stands, with smaller areas of deciduous trees affected. Three smaller areas of blowdown were seen in the northern part of the district. A small narrow band of blowdown was recorded between Kapiskong

Lake and Grassy River Conservation Reserve in the northeast corner of Sothman Twp, another small area was in the Katagi Lake area in the southwest corner of Reagan Twp, and a third was west of Timmins in Dana Jowsey Lakes Provincial Park (Natural Environment) on the west side of Opishing Lake, northeast corner of Sewell Twp.

- In Hearst District, 24 ha of blowdown were aerially mapped northeast of Gurney Lake in the southeast corner of Torrance Twp, north of Moonbeam.
- In 2019, four small areas of blowdown (25 ha) were recorded in the southern part of Sault Ste. Marie District. Three of the small areas were north of Echo Lake on the southwest side of Kehoe Twp. It looked as though this small area was missed in 2018 as it looked like older blowdown (no foliage on trees). Most of the trees affected were hardwoods including hard and soft maple. The other area of blowdown, which also looked to be from a previous year, was on the southwest side of St. Joseph Island. This small area was south of Otter Lake and on the west side of A Line. Hardwoods including hard and soft maple as well as red oak were affected.

Southern:

- In the northeast corner of Pembroke District, 645 ha of blowdown from a tornado that occurred on September 21, 2018 was mapped in 2019. The damage was from a severe thunderstorm that produced a downburst in Calabogie then developed into an EF-1 tornado, which tracked to White Lake. Winds estimated up to 175 km/h caused blowdown spanning about 35 km across Greater Madawaska Twp from Kennelly Mountain Road (East of Calabogie) to White Lake.
- In Kemptville District, 77 ha of blowdown was aerially mapped in 2019. Most of this blowdown was reported on the northwest side of Ottawa north of Carp in the Dunrobin area. A tornado had touch downed in this area on September 21, 2018. The area of damage was just southwest of the community of Dunrobin between Woodkilton Road and Stonecrest Road in Dunrobin Heights. A small area of blowdown was also mapped west of Perth between Keays Road and 7th Concession Road, near the community of Harper, Bathurst Twp. In 2019, a tornado with a strength of EF-1 (winds 135 km/h) was reported in Orleans and Cumberland, in the City of Ottawa on June 2, 2019. A corridor along Jeanne D'Arc Boulevard and the Queensway from Champlain Street eastward to Cameron Street was most severely affected. Severe damage included uprooted and shorn mature trees on private urban properties and in municipal parks.

Total area (in hectares) in which blowdown caused moderate to severe damage from 2015 to 2019 by MNRF district.

Region	Area of damage (ha)				
District	2015	2016	2017	2018	2019
Northeast					
Chapleau	4	275	697	653	1,238
Cochrane	-	67	84	-	-

District	2015	2016	2017	2018	2019
Hearst	-	3	25	36	24
Kirkland Lake	-	-	140	123	-
North Bay	-	-	-	-	-
Sault Ste. Marie	-	-	10	-	25
Sudbury	67	-	326	11	-
Timmins	-	5	83	-	207
Wawa	-	-	-	133	254
Sub total	71	350	1,365	956	1,748
Northwest					
Dryden	31	884	31	497	-
Fort Frances	991	-	319	113	-
Kenora	488	73	30	-	-
Nipigon	277	180	-	-	-
Red Lake	-	6,761	227	1,120	2,832
Sioux Lookout	72	3,080	468	1,032	3,188
Thunder Bay	117	120	-	9	-
Sub total	1,976	11,098	1,075	2,771	6,020
Southern					
Algonquin Park	-	-	-	-	-
Aurora	-	-	-	-	-
Aylmer	-	-	-	-	-
Bancroft	-	-	-	-	-
Guelph	-	-	-	-	-
Kemptville	-	-	-	-	77
Midhurst	-	-	-	-	-
Parry Sound	-	-	-	14	-
Pembroke	-	-	-	98	645
Peterborough	-	-	-	-	-
Sub total	0	0	0	112	722
Provincial total	2,047	11,448	2,439	3,839	8,490

Blowdown 2019

Areas in Ontario where blowdown caused damage

Moderate to severe = 8,490 ha

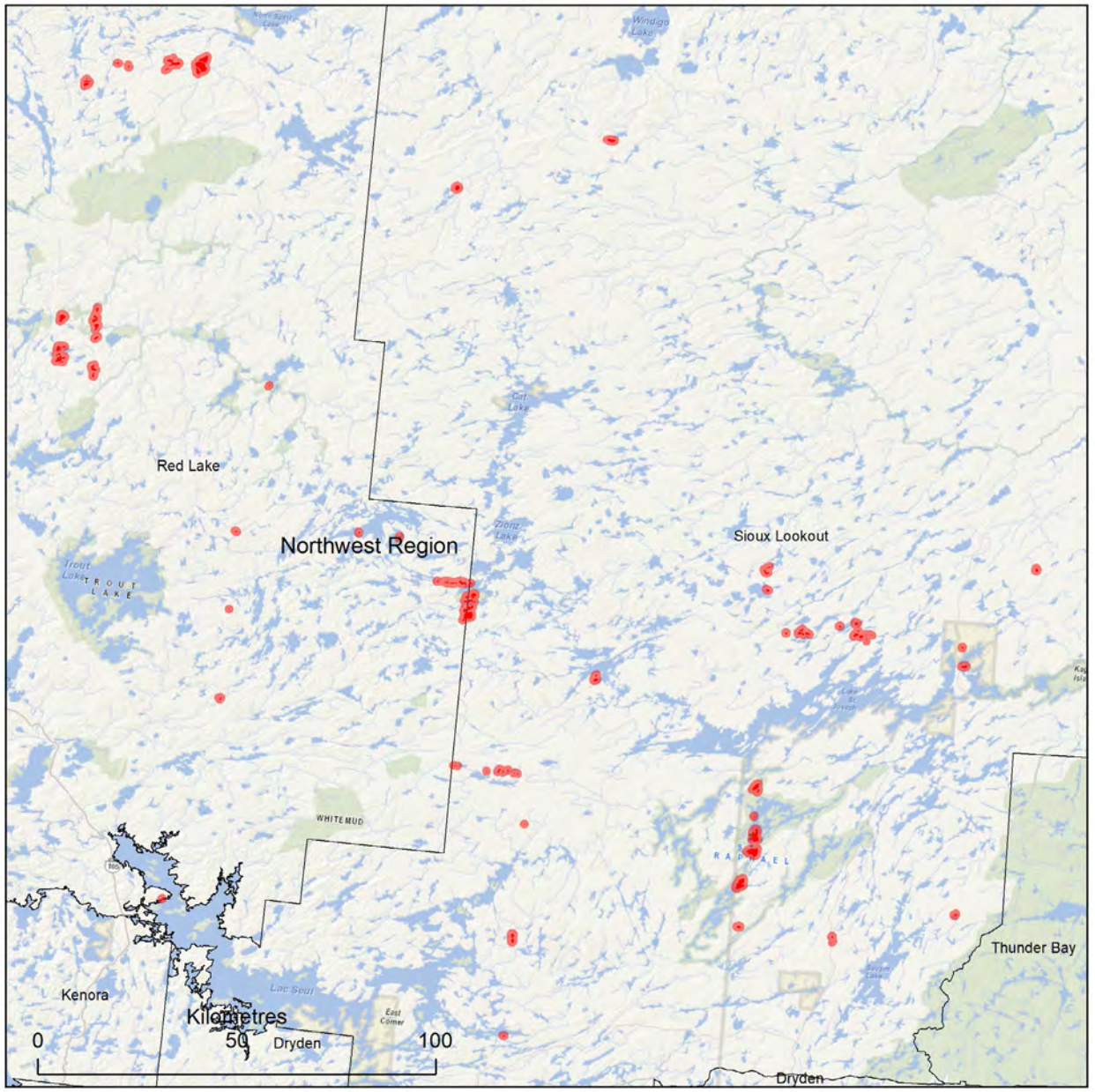
Area of moderate to severe damage

Blowdown 2019

Areas in Northwest Region where blowdown caused damage

Moderate to severe = 6,020 ha

Area of moderate to severe damage



Blowdown 2019

Areas in Northeast Region where blowdown caused damage

Moderate to severe = 1,748 ha

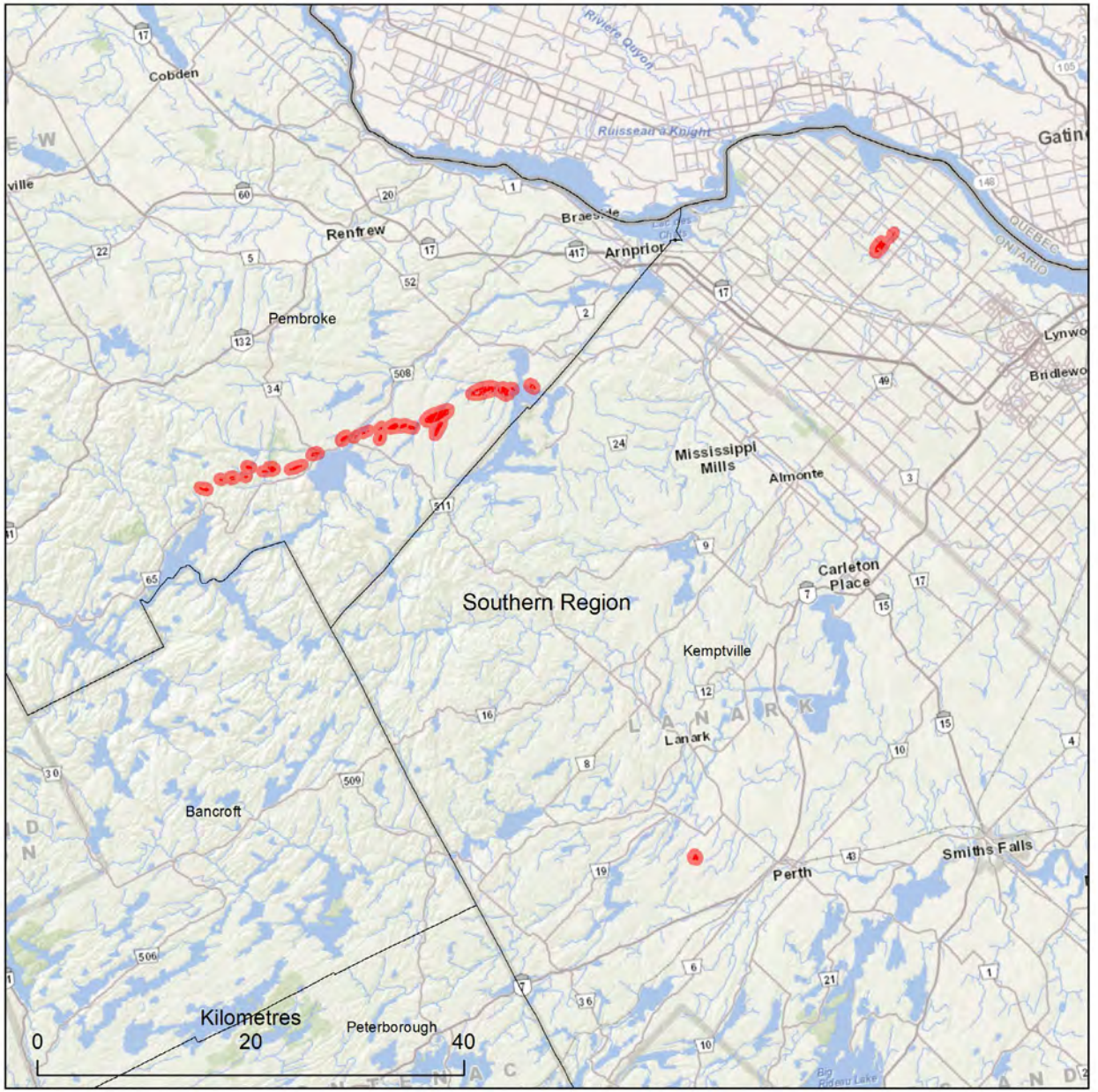
Area of moderate to severe damage

Blowdown 2019

Areas in Southern Region where blowdown caused damage

Moderate to severe = 722 ha

Area of moderate to severe damage



Brown spot needle blight

Pest information

Common name:	Brown spot needle blight
Scientific name:	*Lecanosticta acicola*
Pest origin:	Native
Pest type:	Needle blight
Host species:	Scots pine, eastern white pine, red pine, Austrian pine
Infestation area:	6,132 ha (2019)

Provincial key facts

- This disease affects Scots and Austrian pine of all ages but is most damaging to seedlings and smaller trees.
- Several years of infection by brown spot needle blight causes reduced tree growth. Coupled with other factors, such as drought and secondary insect attack, it may result in branch and tree mortality.
- In some locations previous years' needles were brown and dropping in June, leaving only current years' shoots on trees.
- In 2019, brown spot needle blight damage was observed and mapped across the Southern and Northeast regions.

Regional summary

Northeast:

- In Sault Ste. Marie District, 154 ha of brown spot needle blight damage on Scots pine was aerially mapped on the western side of the district, mostly on St. Joseph Island, as well as small areas north and southeast of Sault Ste. Marie. Small stands of Scots pine, mostly on the southwest side of St. Joseph Island, were affected. Several infected stands in the Tenby Bay area near the junction of 5th Sideroad and 2nd Concession Line were mapped in mid-July. Three small areas on the island were also mapped close to the western side of the border of St. Joseph and Jocelyn townships in the Richardson Creek area. A small stand of Scots pine was damaged at the north end of the island at the north end of 20th Sideroad. In addition, two small areas of infected Scots pine were observed southeast of the town of Echo Bay in Macdonald Twp, and north of Sault Ste. Marie near Kirby Road, east of the village of Goulais River in Vankoughnet Twp.

- In North Bay District, two small areas of moderate to severe brown spot needle blight damage were mapped in Chisholm Twp, east of Chiswick. Another small area was mapped in Bonfield Twp, southeast of Bonfield. These two areas totalled 76 ha.

- In Sudbury District, three small areas of moderate to severe brown spot needle blight damage were mapped on Manitoulin Island. Two of these areas were in the southern part of the island, one northwest of Tehkummah near the junction of Concession Road 2 and Sideroad 15, and another small area southeast of Wolsey Lake near Portage Bay of Lake Huron. The third area of damage was in a stand of Scots pine damaged in previous years southeast of Meldrum Bay on the northside of Hwy 540 east of Lily Lake. In all, 58 ha of damage were aerially mapped.

Southern:

- In 2019, almost half the brown spot needle damage in Southern Region was in Midhurst District (2,796 ha). Small areas of brown spot needle blight were mapped in Innisfil south and west of Barrie. Small stands of Scots pine were also mapped in Mulmur Twp, Tiny Twp, Tay Twp, and Oro Medonte. In Simcoe County, brown spot needle blight was collected at Cedar Point Tract, Simcoe County Forest. In Grey County, several small stands of affected Scots pine were observed east of Owen Sound along Hwy 26, south of Owen Sound along Hwy 6 from Chatsworth Township to Durham (West Grey), and in the Mount Forest area (Southgate) south along Hwy 10 in the Markdale-Flesherton area (Grey Highlands). In Bruce County, areas affected included near Arran Lake (Arran-Elderslie), through Allenford, Sauble Beach and Oliphant area, and north of the town of Wiarton (South Bruce Peninsula). Damage ranged from 10 to 90%, causing early needle drop of the previous year's needles, with no third year needles present as they had fallen in 2018. This resulted in many trees having only the current year's needles.

- In Parry Sound District, numerous stands of Scots pine were mapped with moderate to severe brown spot needle blight damage on the east side of the district between Sundridge and Gravenhurst, with most occurring between Burk's Falls and Huntsville. Another location was mapped east of Hayes Corners, along Hwy 141. In all, 1,527 ha of brown spot needle blight damage were recorded in the district.

- In Aylmer District, 678 ha of moderate to severe damage of Scots pine and red pine was detected in various small plantations in areas of Norfolk County. Moderate to severe damage of open-grown Austrian pine trees was observed through areas of both Norfolk and Lambton counties.

- In Aurora District, several stands of Scots pine were affected in the area east of Guelph (Halton Region), through the north of Peel Region south of Hwy 9. Several small areas were mapped in Aurora District, east of Newmarket, in York Region. The above areas accounted for 557 ha of damage.

- In Guelph District, brown spot needle blight damage was detected during ground surveys in the Hay Swamp

wetland complex near Exeter in Huron County. It was observed causing mature white pine in several plantations to shed needles by mid-July with the crowns of affected trees appearing thin and chlorotic. During aerial surveys, brown spot needle blight was recorded as causing damage to Scots pine and red pine in various plantations in the Regional Municipality of Waterloo and Flamborough, Hamilton. This area totalled 207 ha.

- In Peterborough District, 67 ha of brown spot needle blight damage was aerially mapped in the west end of the district. In Manvers Twp, two small stands of Scots pine were affected along Solanum Way and one stand along Fleetwood Road. Similarly, a small stand with damage was mapped along Valentia Road in neighbouring Mariposa Twp and to the north along Portage Road in Kirkfield, Eldon Twp.

- In Bancroft District, 13 ha of brown spot needle blight damage to Scots pine were mapped along Hwy 28, north of Apsley, Anstruther Twp. West of the City of Bancroft, scattered trees and stands of Scots pine and red pine were affected along Chemaushgon Road, Faraday Twp.

- In Kemptville District, brown spot needle blight was found throughout the central parts of Leeds and Grenville counties, and southeast of Ottawa from Carlsbad Springs to Bourget. Damage was severe throughout most of the area with mortality in some locations. Damage consisted of bottom-up browning of the foliage and brown spots with black margins on the needles. In Leeds-Grenville County, 106 ha of brown spot needle blight-caused mortality was mapped in a large stand of young Scots pines on Land O' Nod Road (North Augusta Twp), Charleville Road (Augusta Twp.), and Miller Road (Elizabethtown-Kitley Twp). During ground surveys, moderate to severe brown spot needle blight was observed on Scots pine at the fringe of a red pine plantation on Read Street in Merrickville. In Prescott-Russell County, widespread damage to Scots pine by brown spot needle blight was observed along Russell Road from Bourget to Hwy 417 causing bottom-up browning of needles as well as in a Scots pine plantation in Cheney, Clarence Twp where light damage affected 67% of the trees.

Total area (in hectares) in which brown spot needle blight caused moderate to severe damage from 2015 to 2019 by MNRF district.

Region	Area of damage (ha)				
District	2015	2016	2017	2018	2019
Northeast					
Chapleau	-	-	-	-	-
Cochrane	-	-	-	-	-
Hearst	-	-	-	-	-
Kirkland Lake	-	-	-	-	-
North Bay	-	-	-	-	76
Sault Ste. Marie	15	-	-	-	154
Sudbury	11	100	-	67	58
Timmins	-	-	-	-	-
Wawa	-	-	-	-	-
Sub total	26	100	-	67	288
Southern					
Algonquin Park	-	-	-	-	-
Aurora	-	-	-	121	557
Aylmer	-	-	-	68	678
Bancroft	-	-	-	-	13
Guelph	-	-	-	-	207
Kemptville	-	-	-	-	8
Midhurst	-	-	-	1,569	2,796
Parry Sound	-	-	-	-	1,527
Pembroke	-	-	-	-	-
Peterborough	-	-	-	3	67
Sub total	0	0	-	1,760	5,852
Provincial total	26	100	0	1,827	6,140

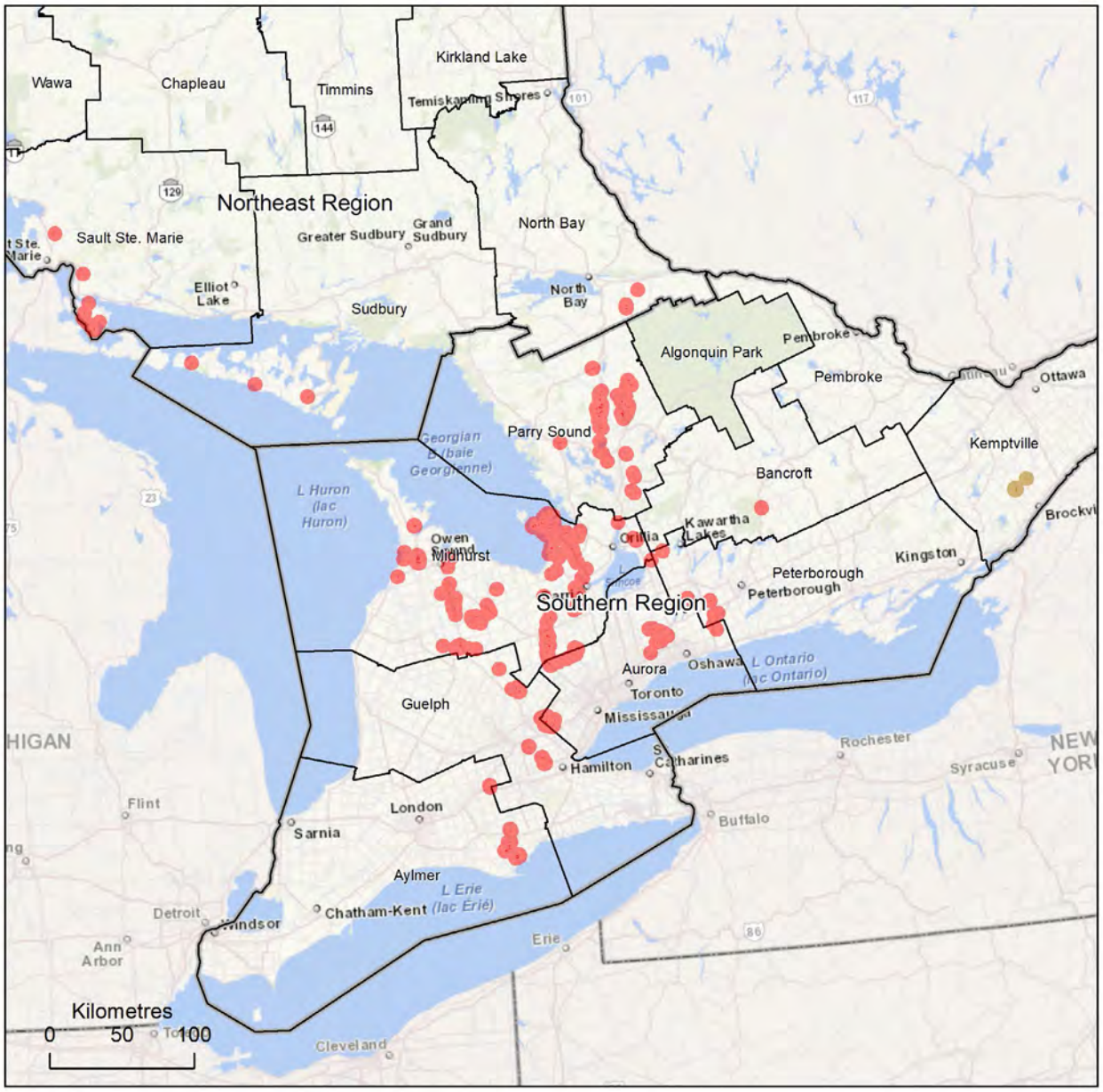
Brown spot needle blight 2019

Areas in Ontario where brown spot needle blight caused defoliation

Moderate to severe = 6,132 ha
Mortality = 106 ha

Area of moderate to severe defoliation

Area of mortality



Brown spot needle blight 2019

Areas in Northeast Region where brown spot needle blight caused defoliation

Moderate to severe = 288 ha

Area of moderate to severe defoliation

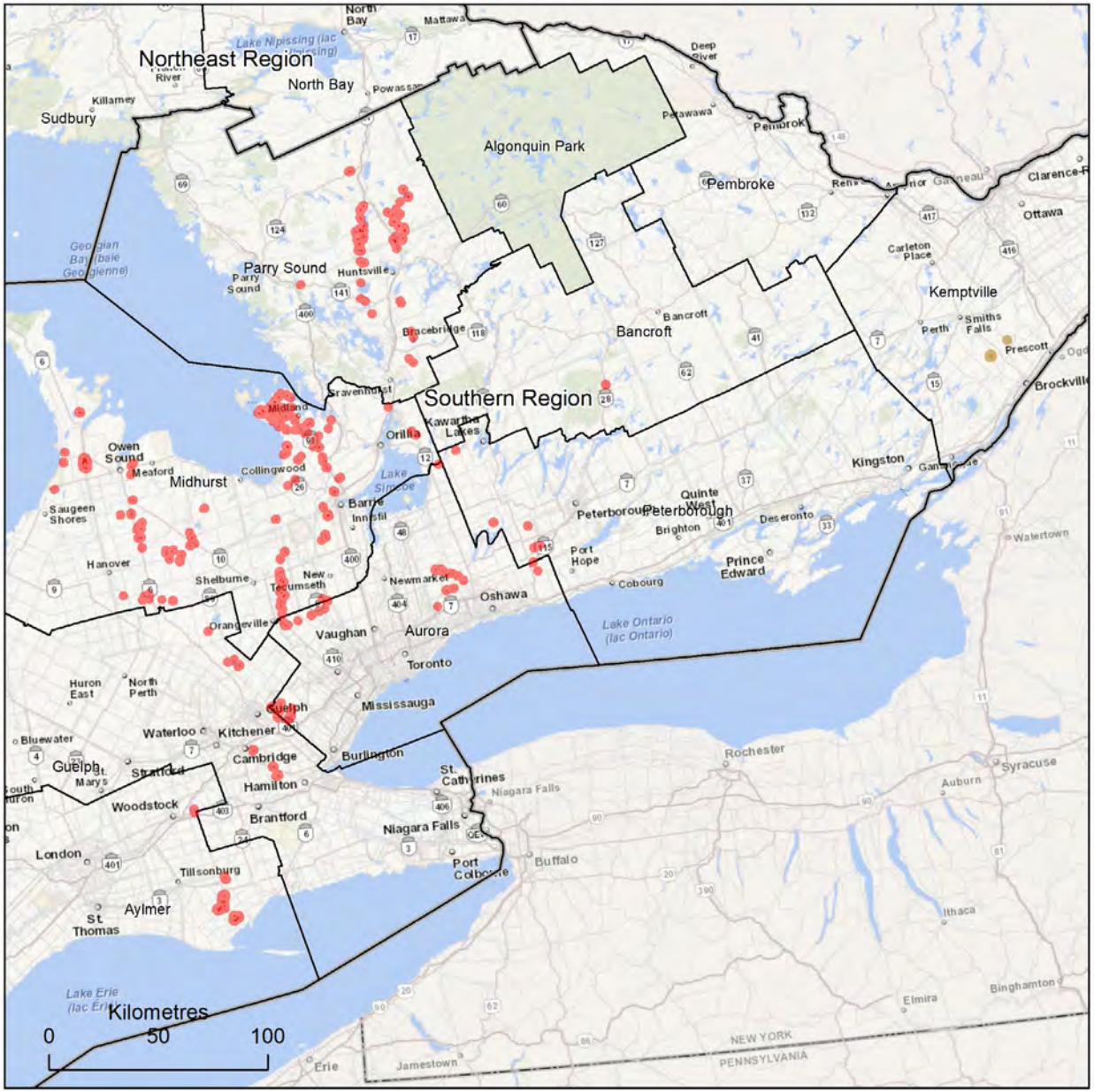
Brown spot needle blight 2019

Areas in Southern Region where brown spot needle blight caused defoliation

Moderate to severe = 5,844 ha
Mortality = 106 ha

Area of moderate to severe defoliation

Area of mortality



Cedar leafminer complex

Pest information

Common name:	Cedar leafminer complex
Scientific name:	*Argyresthia aureoargentella* Brower, *Argyresthia canadensis* Freeman, *Argyresthia thuiella* (Peck), *Coleotechnites thujaella* (kft.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Eastern white cedar
Infestation area:	344 ha moderate to severe defoliation, 91 ha light defoliation (2019)

Provincial key facts

- Cedar leafminer complex is a group of similar insects that mine cedar foliage, including:
  - *Argyresthia aereoargentella* Brower
  - *Argyresthia canadensis* Freeman
  - *Argyresthia thuiella* (Pack)
  - *Coletechnites thujaella* (Kft.)
- The last large-scale cedar leafminer outbreak occurred in Kemptville District from 2002 to 2007, resulting in high amounts of crown dieback and whole tree mortality.
- In 2019, moderate to severe cedar leafminer defoliation decreased dramatically from 26,448 ha in Northwest and Southern regions in 2018 to 344 ha in Southern Region.

Regional summary

Southern:

- In Kemptville District, a total of 317 ha of cedar leafminer defoliation was aerially mapped, 226 ha of moderate to severe defoliation and 91 ha of light defoliation. All moderate to severe defoliation was south of Kemptville in Oxford and Edwardsburgh/Cardinal townships. In the southeast part of

Oxford Twp, cedar leafminer defoliation was mapped on the west side of Hwy 416 near Oxford Station between Hwy 20 and Totem Ranch Road west. In the central part of Edwardsburg/Cardinal Twp, two relatively small areas of moderate to severe defoliation were recorded on the east side of Hwy 416 along Hwy 21 west of the community of Shanly. Small areas of light cedar leafminer defoliation were recorded in central Augusta Twp north and south of the community of Roebuck, as well as in the southern end of Goulbourn Twp between Carleton Place and Kemptville.

- In Peterborough District, a total of 118 ha of moderate to severe cedar leafminer defoliation was aerially mapped, a decrease from 2018. The largest stand mapped was along East Hungerford Road, east of Tweed, Hungerford Twp. In the west part of the district, a hedgerow of eastern white cedar was affected along Ramsey Road, in Fingerboard, Mariposa Twp. Light cedar leaf miner defoliation was observed but not mapped during ground surveys along Digby Laxton Boundary Road, west of Head Lake, Kawartha Lakes. Similarly, light defoliation was observed near Cowan's Bay, along Peace Road, Emily Twp. Moderate to severe defoliation was also observed during ground surveys in a small stretch of cedar on the south side of Canal Lake along McKelvey Road, in north Eldon Twp near Bancroft District boundary.

Total area (in hectares) in which cedar leafminer caused moderate to severe defoliation in 2015-2019 by MNRF District.

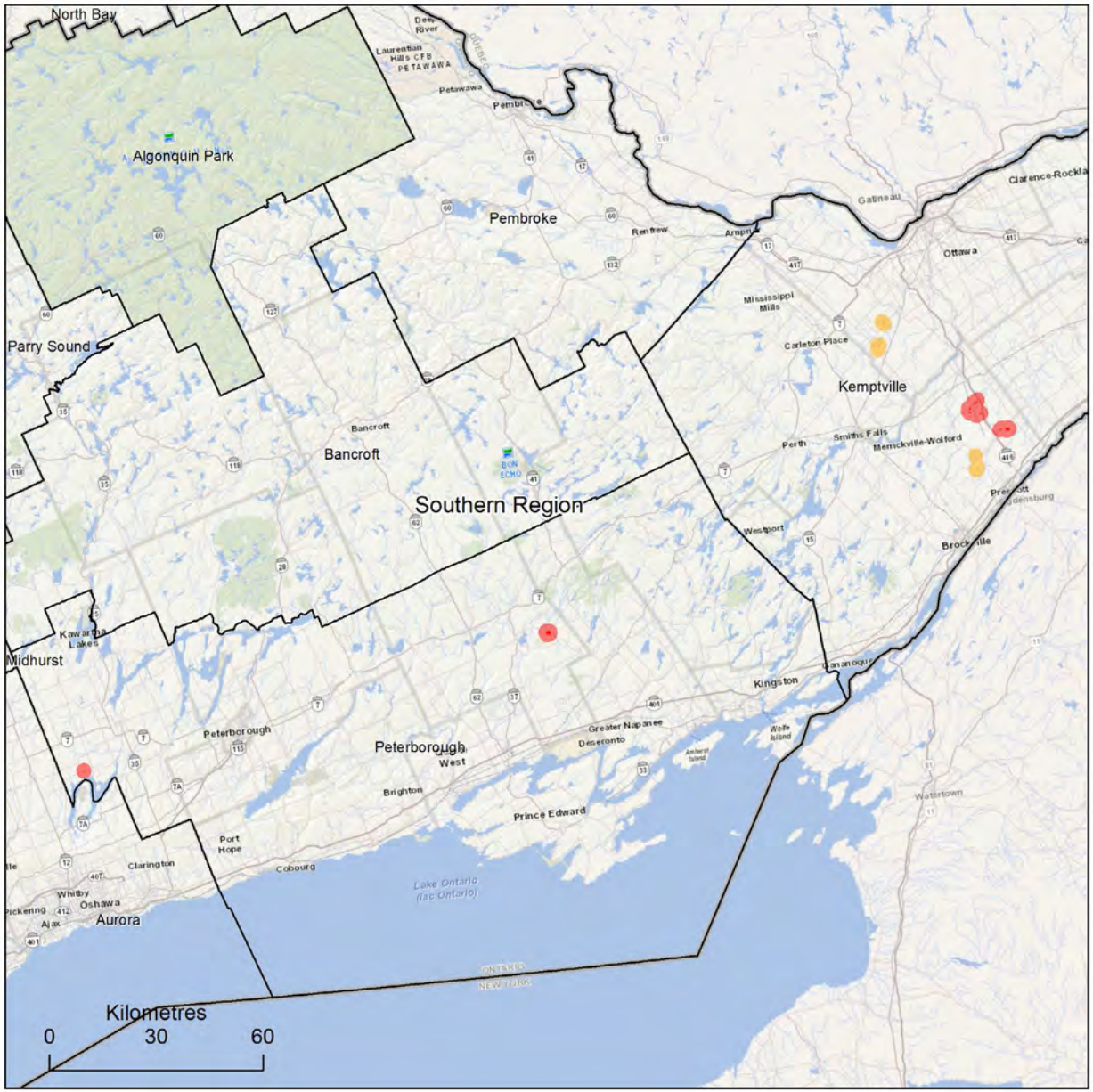
Region	Area of moderate to severe defoliation (ha)				
District	2015	2016	2017	2018	2019
Northwest					
Dryden	-	-	-	-	-
Fort Frances	-	-	924	366	-
Kenora	-	-	-	-	-
Nipigon	-	-	-	-	-
Red Lake	-	-	-	-	-
Sioux Lookout	-	-	-	-	-
Thunder Bay	-	-	-	-	-
Sub total	0	0	924	366	0
Southern					
Algonquin Park	44	-	-	-	-
Aurora	-	-	184	2,709	-
Aylmer	-	-	-	-	-
Bancroft	9	-	130	98	-
Guelph	-	-	602	4,396	-
Kemptville	82	14	1,822	500	226
Midhurst	56	-	1,124	17,852	-
Parry Sound	-	-	44	-	-
Pembroke	200	-	-	-	-
Peterborough	120	-	1,073	527	118
Sub total	511	0	4,979	26,082	344
Provincial total	511	14	5,903	26,448	344

Cedar leafminer 2019

Areas in Southern Region where cedar leafminer caused defoliation

Light = 91 ha
Moderate to severe = 344 ha

- Area of light defoliation
- Area of moderate to severe defoliation



Emerald ash borer

Pest information

Common name:	Emerald ash borer
Scientific name:	*Agrilus planipennis* (Fairmaire)
Pest origin:	Invasive - native to Asia
Pest type:	Wood borer
Host species:	Ash species
Infestation area:	NA

Provincial key facts

- Since it was discovered in Windsor in 2002, emerald ash borer has been a significant threat to ash in Ontario.
- Since 2002, emerald ash borer has spread east to Ottawa and north to Sault Ste. Marie and Thunder Bay.
- This beetle is expected to spread across the entire range of ash, causing widespread mortality in Ontario.
- Aerial surveys for emerald ash borer are planned to be carried out next in 2020.
- In 2019, new finds of emerald ash borer in the quarantined area were collected and verified in Northeast and Southern regions.

Regional summary

Northwest:

- In Northwest Region, 29 emerald ash borer pheromone traps were deployed in Kenora, Dryden, and Fort Frances districts. No beetles were found.

Northeast:

- In North Bay District, four dead ash trees were reported in North Bay, by Victoria Street and Wyld Street, with signs of emerald ash borer. Neighbouring ash trees had crown dieback, epicormic shoots, and woodpecker damage. Specimens obtained through branch sampling at Lee Park were confirmed to be emerald ash borer.

- In Sudbury District, emerald ash borer was confirmed in Sudbury near Lasalle Boulevard and Barrydowne Road. Other locations borer damage was found were along Hwy 6 from Espanola to Little Current, and on Manitoulin Island towards the west side near Meldrum Bay and north of South Baymouth.

Southern:

- In Parry Sound District, emerald ash borer was confirmed on the west side of the district, in Parry Sound off Bowes Road, Parry Island, Bala, and Port Severn. In all locations, ash trees had sunstantial crown dieback and mortality.
- In Bancroft District, new emerald ash borer locations were found in the southwest near the Midhurst-Bancroft district borders near Kirkfield, Centennial Park Road, Eldon Twp, and Baddow, Sommerville Twp.
- In Peterborough District, ash decline and larval galleries were present in the east near Tweed along Hwy 37.
- In Kemptville District, emerald ash borer was collected in the far north east of the district near Hawkesbury at Voyageur Provincial Park and discovered on the west side of the district at Murphy's Point Provincial park by park staff.
- In Pembroke District, emerald ash borer was collected west of Burnstown in Greater Madawaska Twp, Renfrew County, with decline occurring to Calabogie. Moderate damage was also seen on the north shore of Golden Lake, North Algona-Wilberforce Twp, Renfrew County. Ash decline was evident around the entire lake. Emerald ash borer larval galleries and severe ash decline were observed on Germanicus Road at Lac Doré, North Algona-Wilberforce Twp, Renfrew County. Two emerald ash borer adults were also found near Lac Doré on traps set by Renfrew County staff. Severe symptoms of emerald ash borer were observed along the south and east shores of Lac Doré.
- In Midhurst District, emerald ash borer was discovered throughout Owen Sound and eastward towards Meaford along Hwy 26. Ash mortality is increasing in Bruce Peninsula National Park where dead trees are present on the trail to the Grotto. In Simcoe County, an infested tree was discovered just east of the north entry to Awenda Provincial Park.

Trend analysis/outlook/issues

In 2019, the Canadian Forest Service (CFS) collaborated with MNRF forest health staff and several other agencies to continue the release of three species of parasitoid wasps that help to reduce emerald ash borer populations in the hopes of establishing populations in the infested areas. Originally from China and Russia, these wasps are highly specific to the ash borer with high parasitism levels in their native range. The first, *Tetrastichus planipennisi*, is a larval parasitoid whereas *Oobius agrili* is an egg parasitoid, with two generations per year. The third species, *Spathius galinae*, is a larval parasitoid originally found in Russia causing high levels of parasitism to the borer on green ash.

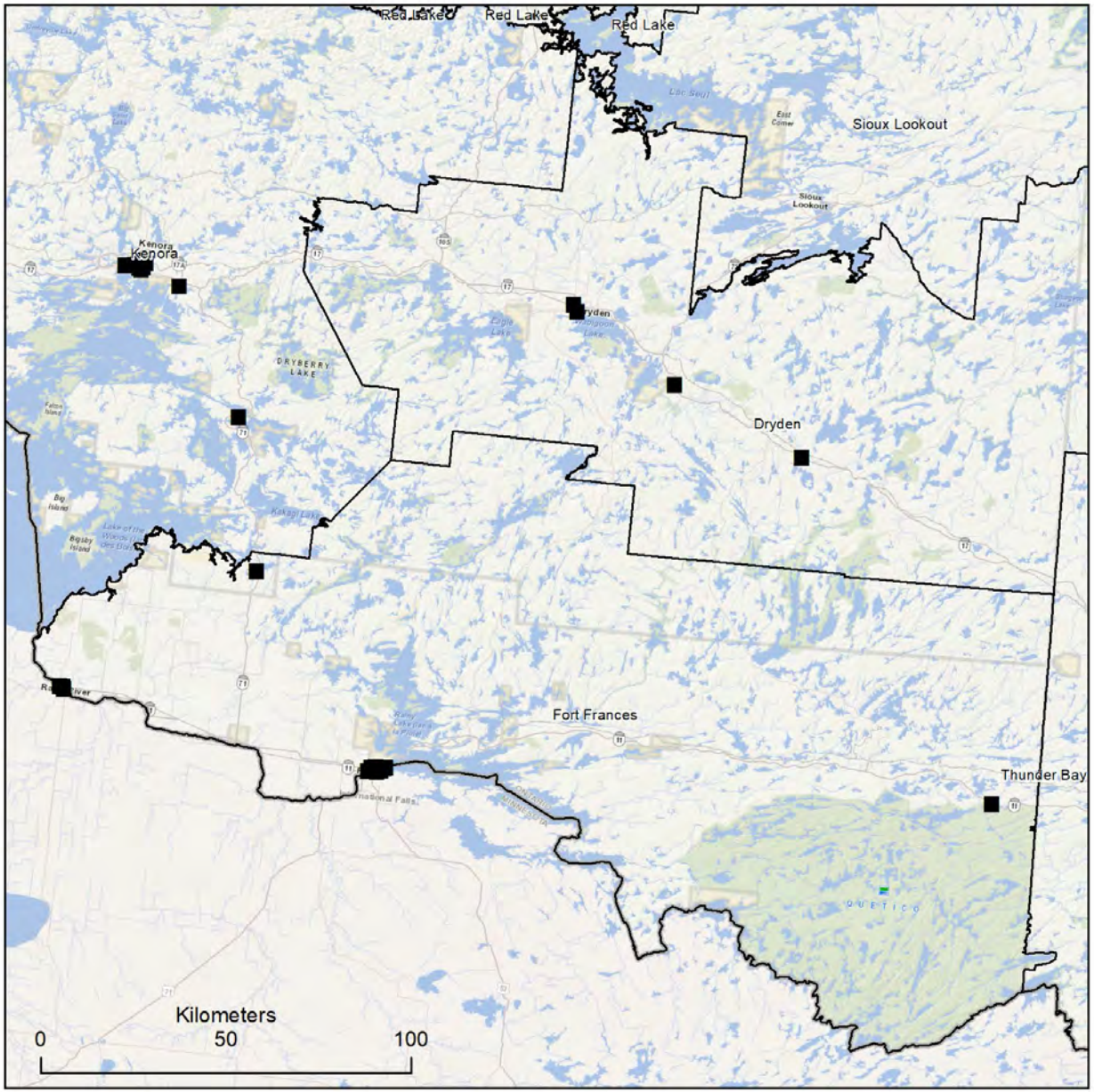
In 2019, six new release sites were established in Ontario, Quebec, and New Brunswick. Over 47,000 *Tetrastichus planipennisi* were released at these sites. The CFS collected log bolts in the fall from trees at eight of the completed sites to evaluate recovery of T. *planipennisi;* rearing of log bolts began in December 2019 and will continue through May 2020 to see if the parasitoid can be recovered. Additional sampling to recover *O. agrili* began in fall 2019 with sample processing ongoing.

Rearing of T. *planipennisi* and *O. agrili* at the Insect Production and Quarantine Laboratory, Great Lakes Forestry Centre in Sault Ste. Marie, has been ongoing since December 2016. More than 18,000 *made in Canada Tetrastichus* and 5,600 *Oobius* were released at four sites from 2017 to 2019. This rearing initiative is intended to augment parasitoids provided by the U.S. Department of Agriculture.

The biological control program for ash borer is in the early stages of development in Canada; no results on the effects of the parasitoids are yet available. This work, led by CFS is ongoing, with several additional research projects started that will hopefully address related questions.

Emerald ash borer trap locations 2019

■ Trap location



Forest tent caterpillar

Pest information

Common name:	Forest tent caterpillar
Scientific name:	*Malacosma disstria* Hbn.
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Various deciduous species
Infestation area:	33,488 ha moderate to severe defoliation, 1,732 ha light defoliation

Provincial key facts

- On average in Ontario, forest tent caterpillar outbreaks have occurred every ten to 12 years, with each outbreak continuing for three to five years.
- In the south forest tent caterpillar feed primarily on sugar maple and oak, and in the north this pest is found mostly on trembling aspen but also feeds on several other deciduous species.
- The area of moderate to severe defoliation in the province decreased considerably in 2019 (33,488 ha) compared to 2018 (992,207). The infestation collapsed completely in Northwest Region and decreased notably in Northeast and Southern regions.
- Friendly flies (Sarcophaga aldrichi), a native parasite of forest tent caterpillar, as well as bacterial, fungal, and viral diseases and a cool spring that delayed the flushing of foliage contributed to the almost complete collapse of forest tent caterpillar in 2019.

Regional summary

Northeast:

- In 2019, five of the nine districts in Northeast Region had moderate to severe and light forest tent caterpillar defoliation. Only 33,393 ha of moderate to severe defoliation were aerially mapped, a substantial decrease from 518,833 ha mapped in 2018.

- In Hearst District, populations of forest tent caterpillar decreased substantially with 22,470 ha of moderate to severe defoliation mapped in 2019 compared to 237,395 ha in 2018. The heaviest areas of defoliation

were observed on the shores of Missinaibi River north of Mattice, south of Mattice in Orkney and Magladery townships, north and south of Kapuskasing, and southwest of Little Long Rapids, predominantly in Mowbray and Harmon townships. Smaller areas of forest tent caterpillar defoliation were recorded south of Hearst in Kendal and Shetland townships, and in Sweet Twp between Wanzatika and Hillmer Lakes where forest tent caterpillar was first detected in 2014.

- In Cochrane District, 7,732 ha of moderate to severe defoliation were aerially mapped compared to 33,428 ha in 2018. Most of the defoliation was north of Fraserdale in Sheldon, Pinard, and Mewhinney townships. Small scattered areas of defoliation were recorded along the Abitibi River south of Fraserdale.

- In Sudbury District, the infested area of forest tent caterpillar decreased as well. In all, 3,073 ha of moderate to severe defoliation and 955 ha of light defoliation were mapped in the district. Moderate to severe defoliation was observed around Hamner and Val Therese, east of Wanapitei Lake. On Manitoulin Island, a mix of moderate to severe and light defoliation was mapped on the east side of Manitoulin Island around Wikwemikong and on Barrie Island west of Gore Bay.

- In the southern part of North Bay District, small areas of moderate to severe defoliation were mapped south of Bonfield on the east side of Wasi Lake and Lake Nosbonsing in Bonfield and Chisolm townships. This area totalled 64 ha. Light defoliation was recorded north and northeast of Sturgeon Falls. North of Sturgeon Falls two small areas of light defoliation were aerially mapped in the northeast corner of Bastedo Twp and northeast of Sturgeon Falls two areas were observed along the Little Sturgeon River in Beaucage Twp. Total light defoliation was 61 ha.

- In Sault Ste. Marie District, 50 ha of moderate to severe forest tent caterpillar defoliation were found in four small areas; two areas between Bruce Mines and Desbarats, north of Blind River on the southwest side of Lake Duborne, and northwest of Elliot Lake between Pathfinder and Rodge Lakes in Jogues Twp. Small areas of light defoliation were observed west of Elliot Lake from the east side of Matinenda Lake to the north end of Lauzon Lake. Other small areas of light defoliation included areas west of Blind River in Cobden Twp on the south side of the Mississagi River, on the south side of Turtle Lake in the northwest corner of Spragge Twp, and northwest of Spanish on the east side of Shedden Lake. These areas of light defoliation totalled 716 ha.

Southern:

- In Southern Region, the area of moderate to severe defoliation decreased substantially from 473,337 ha mapped in 2018 to 95 ha mapped in 2019. Parry Sound was the only district in the region with mappable forest tent caterpillar defoliation.

- In Parry Sound District, a few small areas of moderate to severe forest tent caterpillar defoliation were mapped north and south of Parry Sound. The defoliation farthest north of Parry Sound was recorded close to the

Sudbury District boundary along the Pickerel River just north of Grundy Lake Provincial Park. Farther south, one small area of moderate to severe defoliation was mapped east of Pointe au Baril in the southwest corner of Burton Twp near the southeast end of Miskokway Lake. Close but still north of Parry Sound, three areas of moderate to severe defoliation were observed: one at the north end of Mill Lake in McDougall Twp and two on the east side of Hwy 124 north of Bell Lake, also in McDougall Twp. South of Parry Sound, one small area of moderate to severe defoliation was aerially mapped between Hwy 400 and the south side of Back Lake, Foley twp. Together, these areas totalled 95 ha.

- In Bancroft District, lightly defoliated areas were observed but not aerially mapped in Harlowe along Gull Lake Road in Barrie Twp on trembling aspen, at the west access to Kawartha Highlands Provincial Park near Mississauga Lake on red oak and trembling aspen, and on Upper Paudash Road, north of Silent Lake Provincial Park in Cardiff Twp, on sugar maple.

- In Peterborough District, larvae were detected on white birch along Desert Lake Road in Loughborough Twp. Populations were light with no defoliation was observed.

- In Kemptville District, small areas of moderate populations of forest tent caterpillar were observed in Tay Valley Twp at Silver Lake Provincial Park, Bennett Lake, and Murphy's Point Provincial Park. Low populations were found at Christie Lake and Herrons Mills. In the town of Perth, light defoliation was found on various deciduous species. In Leeds-Grenville, light defoliation was observed on Davis Lock Road, Rideau Lakes Twp, and in Black Rapids, Leeds Twp.

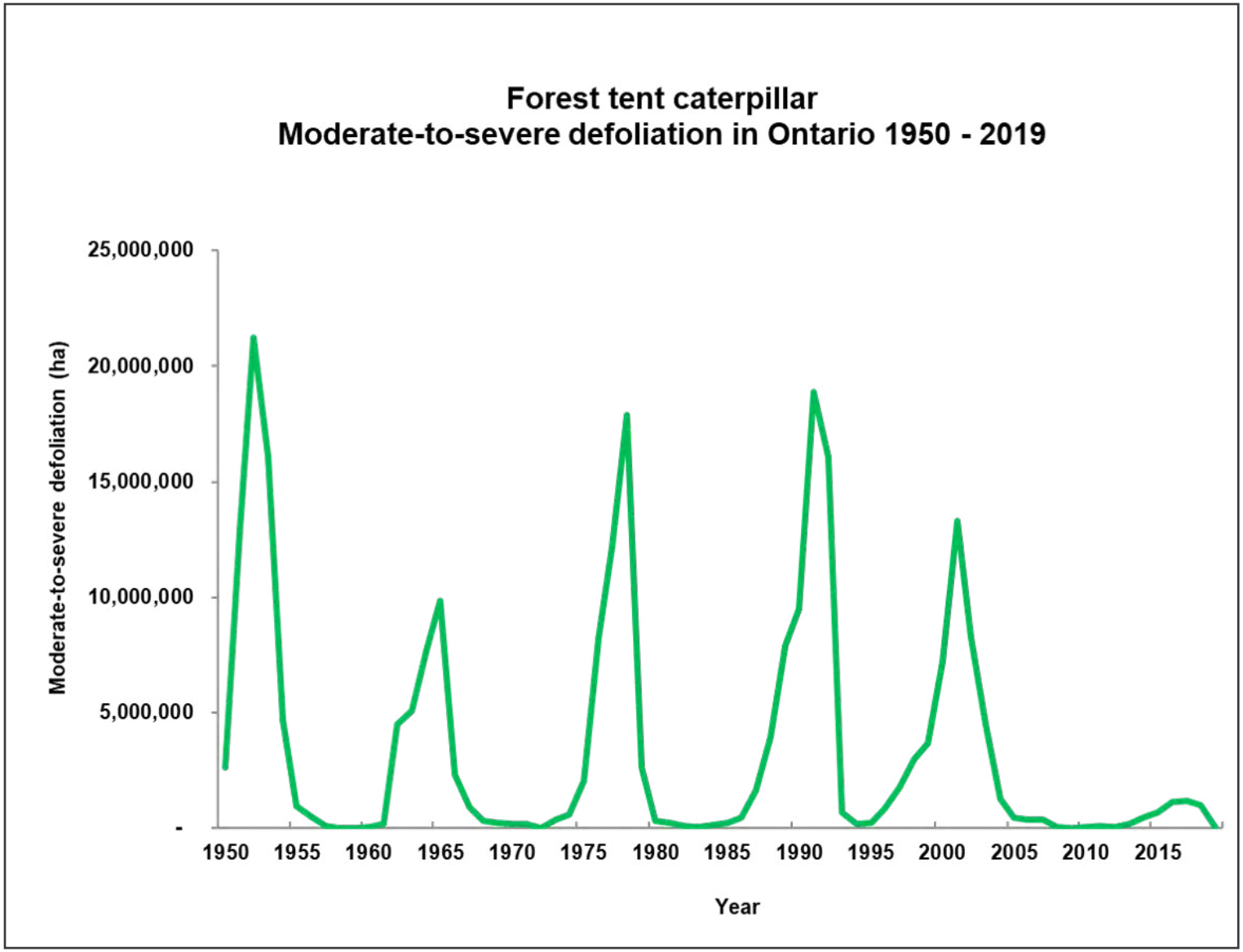
- In Midhurst District, forest tent caterpillar was found on a couple sugar maple trees in the City of Owen Sound, with trace defoliation.

Total area (in hectares) in which forest tent caterpillar caused moderate to severe defoliation from 2015 to 2019 by MNRF District.

Region	Area of defoliation (ha)				
District	2015	2016	2017	2018	2019
Northeast					
Chapleau	132	-	-	-	-
Cochrane	29	1,188	26,385	33,428	7,732
Hearst	36,444	100,990	590,451	237,395	22,470
Kirkland Lake	-	5,845	600	521	-
North Bay	-	5,778	33,907	25,724	69

District	2015	2016	2017	2018	2019
Sault Ste. Marie	-	3,468	95,087	148,442	50
Sudbury	25	10,539	52,063	72,435	3,073
Timmins	443	4,327	10,966	888	-
Wawa	1,239	-	-	-	-
Sub total	38,312	132,135	809,459	518,833	33,393
Northwest					
Dryden	169,564	386,518	9,803	-	-
Fort Frances	**8,693**	**20,980**	**11,465**	**-**	**-**
Kenora	53,974	197,292	67,620	9	-
Nipigon	147,945	1,504	814	-	-
Red Lake	38,036	139,046	1,003	-	-
Sioux Lookout	87,316	186,838	513	-	-
Thunder Bay	116,466	8,221	-	29	-
Sub total	621,994	940,399	91,218	38	0
Southern					
Algonquin Park	-	18	369	-	-
Aurora	-	-	-	-	-
Aylmer	-	-	-	-	-
Bancroft	-	37,577	138,664	235,831	-
Guelph	-	-	-	-	-
Kemptville	-	2,007	58,782	126,179	-
Midhurst	21,339	2,150	-	434	-
Parry Sound	-	-	14,472	11,618	95
Pembroke	-	2,560	25,276	27,731	-
Peterborough	-	6,594	35,330	71,543	-
Sub total	21,339	50,906	272,893	473,337	95
Provincial total	681,645	1,123,440	1,173,570	992,207	33,488

Area (in hectares) in which forest tent caterpillar caused moderate to severe defoliation in Ontario, 1950 to 2019.

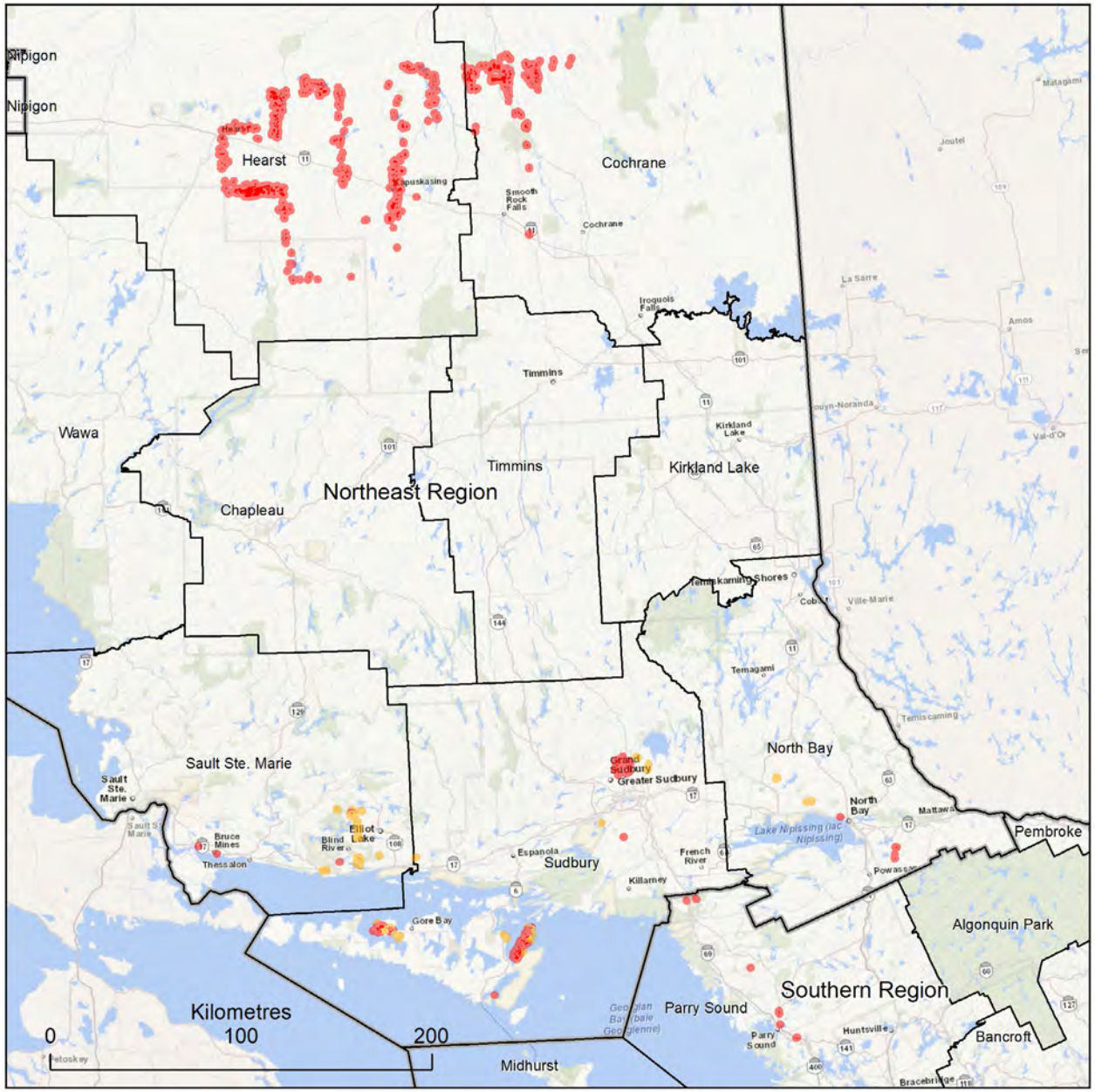


Forest tent caterpillar 2019

Areas in Ontario where forest tent caterpillar caused defoliation

Light = 1,732 ha
Moderate to severe = 33,488 ha

- Area of light defoliation
- Area of moderate to severe defoliation



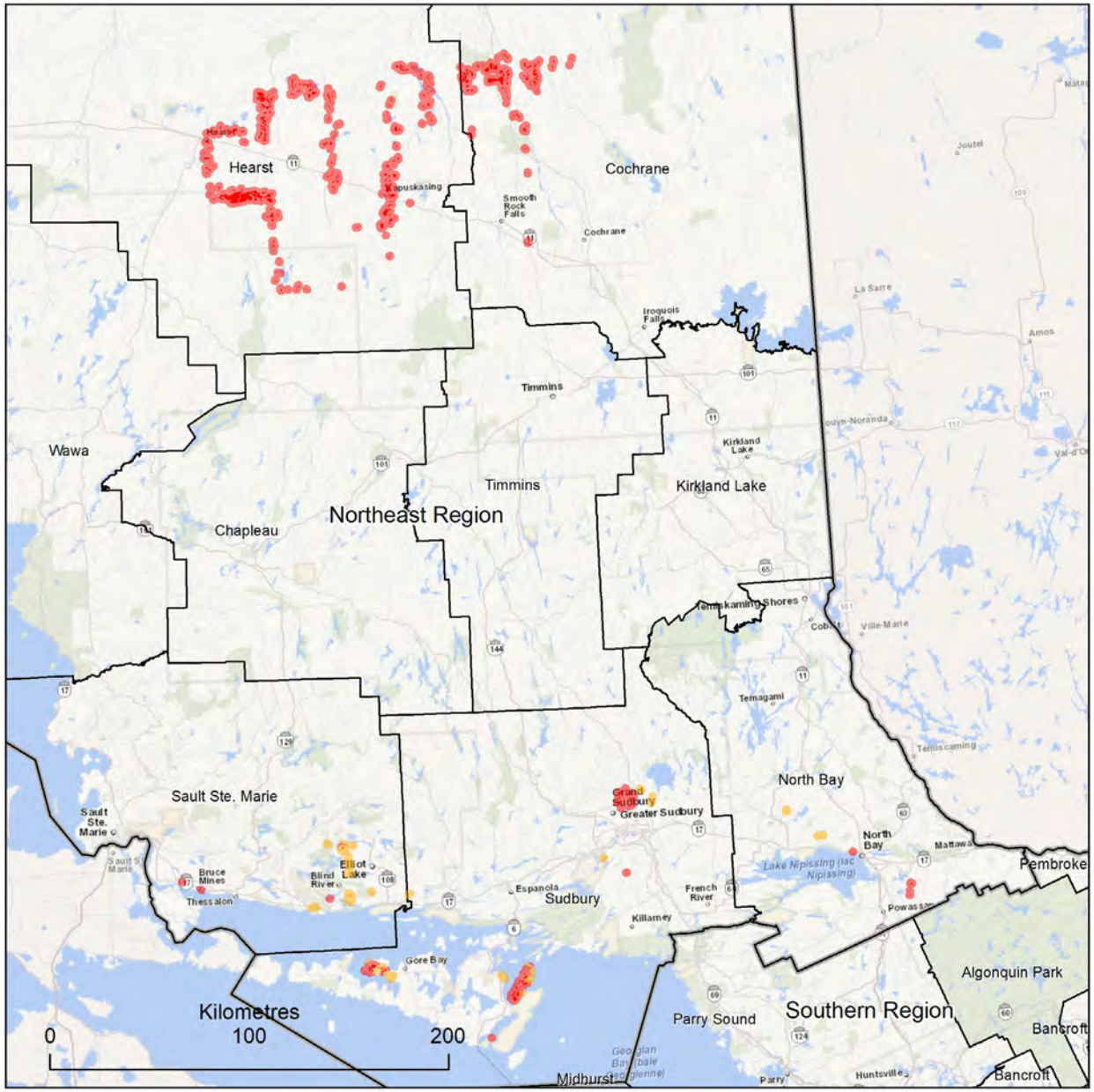
Forest tent caterpillar 2019

Areas in Northeast Region where forest tent caterpillar caused defoliation

Light = 1,732 ha
Moderate to severe = 33,393 ha

Area of light defoliation

Area of moderate to severe defoliation



Forest tent caterpillar 2019

Areas in Southern Region where forest tent caterpillar caused defoliation

Moderate to severe = 95 ha

Area of moderate to severe defoliation

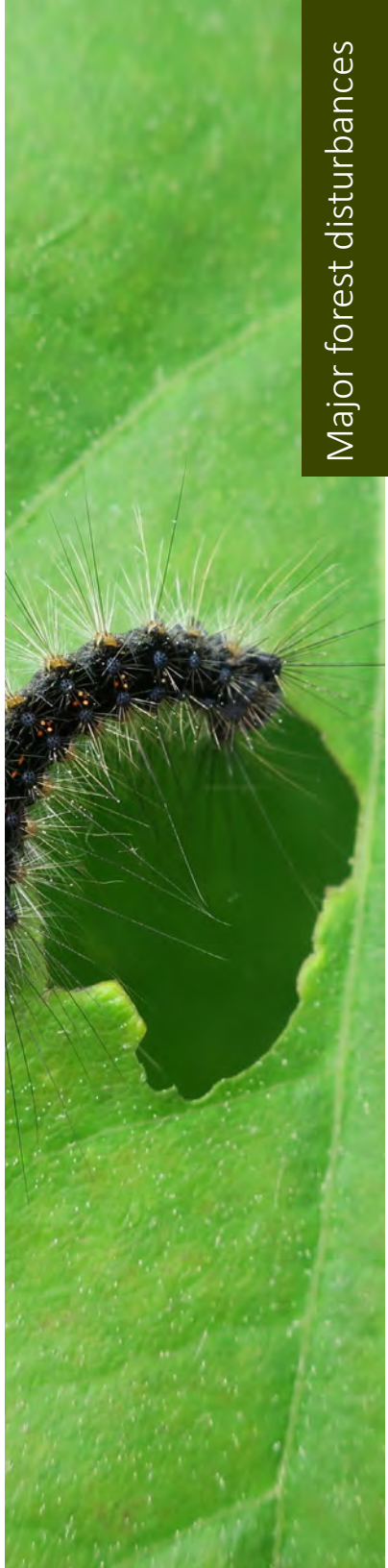
Gypsy moth

Pest information

Common name:	Gypsy moth
Scientific name:	*Lymantria dispar* (L.)
Pest origin:	Invasive — native to Europe
Pest type:	Defoliator
Host species:	Most hardwood species
Infestation area:	47, 203 ha

Provincial key facts

- Gypsy moth was discovered in Ontario in 1969, with the first incidence of severe defoliation recorded in Kemptville District in 1981.
- Gypsy moth outbreaks are cyclical, typically occurring every seven to 10 years. In Ontario, major outbreaks have peaked in 1985, 1991, and 2002. The most recent outbreak, which peaked in 2008, was much less severe than previous ones.
- Gypsy moth hosts range from oak, birch, and aspen in the north to hardwoods such as oak, sugar maple, and American beech and softwoods such as eastern white pine and Colorado blue spruce in southern Ontario.
- Cool, wet conditions provide an ideal environment for the proliferation of Entomophaga maimaiga, a fungus known to cause gypsy moth populations to collapse. Nuclear polyhedrosis virus (NPV) is a viral infection that is also known to kill gypsy moth larvae.
- Monitoring for gypsy moth was carried out through a collaborative trapping program led by the Canadian Food Inspection Agency in Northwestern Ontario. This work was completed outside the regulated area of known gypsy moth populations.
- Defoliation caused by gypsy moth in Ontario increased from 14,937 ha in 2018 to 47,203 ha in 2019, with both light and moderate to severe defoliation mapped during aerial surveys.
- In 2019, defoliation was mapped in Southern and Northeast regions.



Regional summary

Southern:

- In Aylmer District, 19,994 ha of moderate to severe defoliation and 2,141 ha of light defoliation was mapped during aerial and ground surveys. All the moderate to severe defoliation was on the east side of the district, concentrated in the southwest part of Norfolk County, with scattered areas of defoliation in Elgin, Oxford, Middlesex, and Lambton counties. In Norfolk County, the bulk of the moderate to severe defoliation was between Tilsonburg and Turkey Point stretching east to the town of Simcoe and west to the county border. Smaller areas of moderate to severe defoliation were mapped in the northeast part of the county on the north side of Hwy 4 near Teeterville. A few small areas were also observed on the southeast side of the county, north of Woodhouse Acres, north of Springvale, west of Balmoral, and northeast of Sandusk. Light defoliation was scattered throughout the county between Kinlake and Glen Meyer on the west side of the county, southwest of Simcoe and north of Windham Centre in the central part of the county, and on the east side of the county north of Port Dover between Hagersville and Erie. In Elgin County, moderate to severe defoliation was recorded on the east side southwest of Tilsonburg to Vienna and south of Aylmer. Small scattered areas of light defoliation were also north of St. Thomas, north and southeast of Aylmer, and west and north of Port Burwell in the Vienna area. In Oxford County, most of the moderate to severe defoliation was concentrated in the central part, with small scattered areas of defoliation in the north and south. In the central part of the county, most of the moderate to severe defoliation was mapped east of Woodstock to Perry's Corners around the Nith River and west of Woodstock between Embro and Beachville and north of Thamesford along the Thames River. In the northern part of Oxford County, small areas of moderate to severe defoliation were mapped at the south end of Wildwood Lake near Harrington and farther northeast north and south of the municipality of Cassel. Light gypsy moth defoliation was observed west of Woodstock along the Thames River and some smaller areas were noted southwest of Woodstock between the municipalities of Foldens and Sweaburg. In Middlesex County, moderate to severe defoliation was seen west of London to Hwy 402 and east of London just north of Dorchester. Smaller areas of moderate to severe gypsy moth defoliation in the northern part of the county were observed near the municipalities of Lieury, Brins ley, Denfield, Vanneck, Clandeboye and between Parkhill and Nairn. Farther east, small areas of defoliation were seen north and northwest of Plover Mills as well as around the north end of Fanshawe Lake and between Cobble Hill and Evelyn. Small areas of light defoliation were also seen west of London, with a larger area of light defoliation along the western county border north of Arkona along the Ausable River. In Lambton County, most of the moderate to severe defoliation was in the northwest corner around Pinery Provincial Park over to the Port Franks area. Farther south, small areas of scattered moderate to severe defoliation were south of Ravenwood to Thomson Line (County Road 6) as well as south of Forest along Hwy 21 and east of Forest on Townsend Line (County Road 12). Farther southeast, woodlots on Hwy 402 between County Road 6 and County Road 9 had moderate to severe gypsy moth defoliation. A small area of defoliation was also noted in the City of Sarnia close to the international bridge in the Canatara Park

area. Moderate to severe defoliation was mapped in the western half of Ojibway Tom Joy Woods and Black Oak Prairie Heritage Park, in the City of Windsor. In late May, early instar gypsy moth larvae were observed feeding alongside oak leafshredder larvae at this location, but gypsy moth was the primary defoliator. Gypsy moth caused moderate to severe defoliation of about 50 mature, open-grown black oak trees along Ojibway Parkway adjacent to Tom Joy Woods.

- In Guelph District, 17,557 ha of moderate to severe defoliation and 1,578 ha of light defoliation were mapped during aerial and ground surveys. Most areas of moderate to severe defoliation of hardwood forests were detected and aerially mapped through the southeast part of the district, with small scattered areas of defoliation on the southwest side. In the southeast, areas of moderate to severe gypsy moth defoliation went from Hamilton to south of Niagara Falls to Fort Erie with small scattered areas of defoliation north of Niagara Falls close to Niagara-on-the-Lake. Small areas of defoliation were observed northwest of Hamilton to Cambridge and just west of Brantford predominantly on the south side of Hwy 403. On the southwest side of the district, moderate to severe defoliation was recorded from the southwest district boundary at Huron Park heading north along the west side of Hwy 4 to Brucefield near the junction of London Road and Mill Road East. Most of the light gypsy moth defoliation was in small scattered stands between Hamilton and Cranston near the Grand River as well as a bit further east near the municipality of Winslow where a moderate sized hardwood stand had light defoliation north of Silver Street (County Road 65). Some light defoliation occurred between Cambridge and Kitchener on the north side of Hwy 401 along the Grand River.
- In Midhurst District, 2,978 ha of moderate to severe defoliation and 314 ha of light defoliation were mapped in the northeast part of the district in Simcoe and Dufferin counties. Most of the moderate to severe defoliation in Simcoe County was inhardwood forests between Awenda Provincial Park south through Penetanguishene and Midland, to Wyebridge in Tiny Twp, with the most severe defoliation noted along Hwy 93. Moderate to severe defoliation of hardwood forests was also mapped through Tiny Beaches in western Tiny Twp, with areas of light defoliation interspersed from Cedar Point south to Wyevale. Later in the season, populations of gypsy moth and banded tussock moth larvae were observed causing 40 to 50% defoliation at Wildman Tract near Wyevale, on Simcoe County Road 6. In addition, an area of moderate to severe defoliation was mapped in a county forest north of Mansfield in Mulmur Twp, Dufferin County.
- In the southwest corner of Aurora District, 1,949 ha of moderate to severe defoliation and 14 ha of light defoliation were mapped during aerial surveys in July. Defoliated hardwood forests were mapped along the boundary of Aurora and Guelph districts, through Campbellville to Milton, and in woodlots to the south through the communities of Kelso, Mount Nemo, Lowville, Cedar Springs, and areas of Bronte Creek Provincial Park. Moderate to severe defoliation was also mapped south of Hwy 407 into Oakville. Aerial surveys did not cover urban areas through Oakville to Toronto due to air traffic restrictions. During ground verifications, a cluster of severely defoliated willows were detected along the road leading to Kelso Conservation Area. In the conservation area, larvae were observed with symptoms of a virus (NPV) infection. A small amount of light gypsy moth defoliation was observed near Waterdown along County Road 5.

- In northeastern Peterborough District, 409 ha of moderate to severe defoliation was mapped in central Frontenac County. One larger area of defoliation was mapped north of Bass Lake in Olden Twp. During ground verification, signs of disease and dead larvae were present on main boles of trees. Small areas of moderate to severe defoliation were mapped south of Sharbot Lake along Hwy 38 at the boundary of Olden Twp and Oso Twp. This location had been severely affected by forest tent caterpillar over the past three years, but the population collapsed this season. During ground surveys, gypsy moth was detected causing 80% defoliation of elm trees along Knight's Road in Kennebec Twp, which is west of the defoliation mapped during aerial surveys. In late season, gypsy moth egg masses were observed on oak species along Hwy 7 to Arden Road in Kennebec Twp. Members of the public and partners in the area reported large numbers of male moths in flight during late August.
- In Parry Sound District, 177 ha of moderate to severe defoliation was aerially mapped north and south of the town of Parry Sound. The largest area north of Parry Sound was at the junction of Hwy 124 and Hwy 400 on the west side of Mill Lake, with a small area on the west side of Darlingto's Lake. Oaks in these stands were heavily defoliated at the time of ground verification. South of Parry Sound, two small areas of moderate to severe gypsy moth defoliation were mapped, one on the north side of Whitefish Lake (Humphery Twp) the other on the north side of Rankin Lake (Foley Twp).
- In Kemptville District, gypsy moth populations were detected during ground surveys in various locations in Lanark County. High populations of larvae were found causing light defoliation of a variety of broadleaf tree species and white pines on several privately-owned properties in Perth. Intermittent areas of defoliation ranging from light to severe were reported in forested areas containing red oak and ash between Perth and the communities of Christie Lake and Maberly in Tay Valley Twp. Larvae with symptoms of virus damage were observed clinging to the bole of host trees in areas of light defoliation near Maberly along Hwy 7.

Northeast:

- In Sudbury District, 93 ha of moderate to severe defoliation caused by gypsy moth were aerially mapped in the southwest part of the district. Defoliation was detected southeast of Massey along Lee Valley Road and north of Long Lake, and near Walford along Hwy 17 and Sugar Lake Road. Severe defoliation of a few red oaks was reported at the Serpent River and Walford Road. Light defoliation was observed by Chutes Provincial Park along Hwy 553 and along Cutler Lake Road, southeast of Massey.
- In Sault Ste. Marie District, low levels of gypsy moth larvae were recorded causing trace defoliation at one location north of Blind River along Granary Lake Road. By September, large new gypsy moth egg masses were found along the bole of red oak trees. Defoliation is expected in 2020 at this site, as it is a hardwood stand comprising sugar maple and red oak.

Northwest:

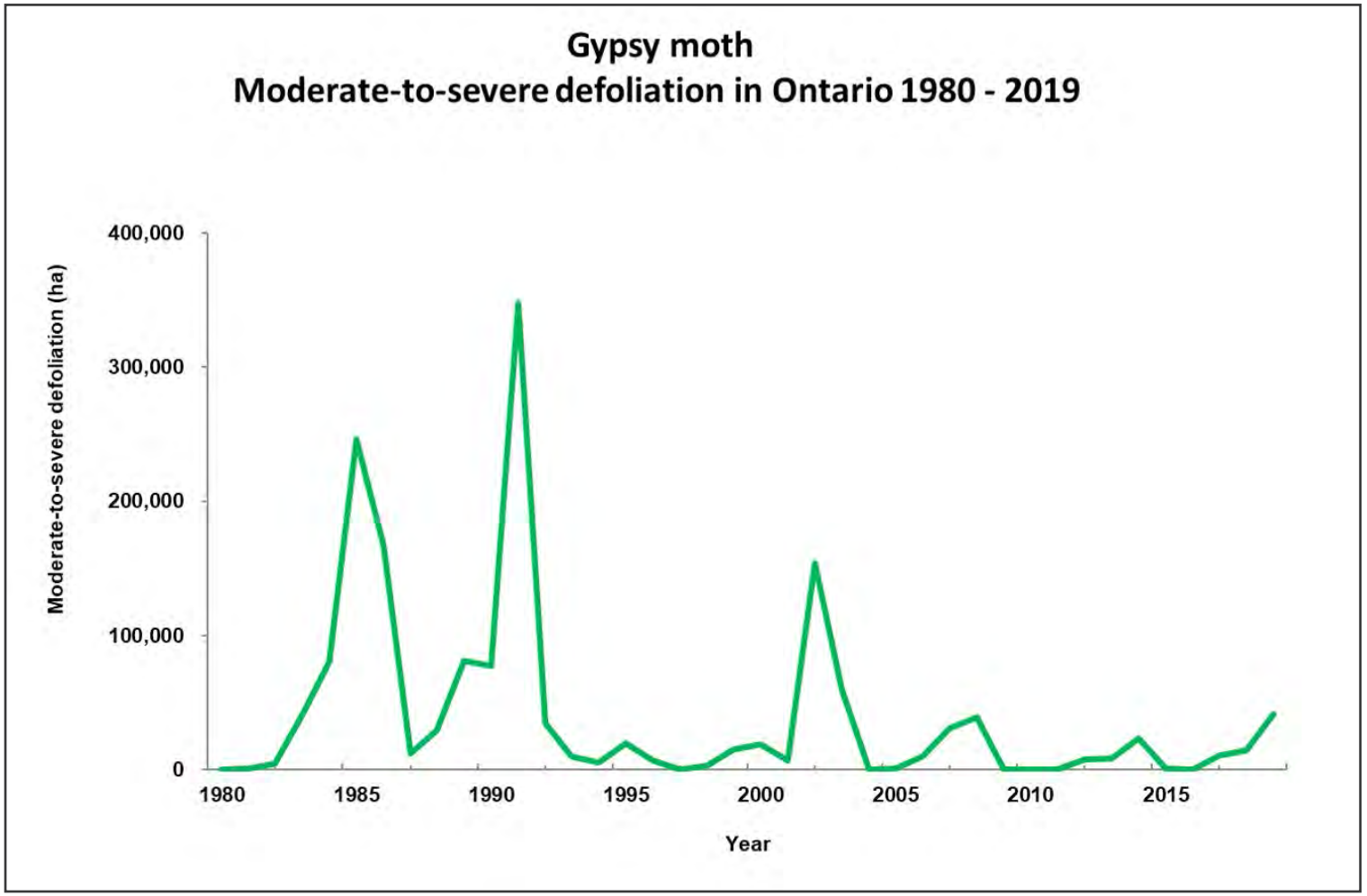
- In collaboration with the Canadian Food Inspection Agency, the MNRF carried out a gypsy moth monitoring program. A total of 25 delta pheromone traps were deployed in Kenora, Fort Frances, and Dryden districts,

outside of the gypsy moth regulated area. Traps were deployed in June in hardwood stands at high priority areas. The traps were retrieved at the end of August. All traps were negative for gypsy moth.

Total area (in hectares) in which gypsy moth caused moderate to severe defoliation from 2015 to 2019 by MNRF district.

Region	Area of defoliation (ha)				
District	2015	2016	2017	2018	2019
Northeast					
Chapleau	-	-	-	-	-
Cochrane	-	-	-	-	-
Hearst	-	-	-	-	-
Kirkland Lake	-	-	-	-	-
North Bay	-	-	-	-	-
Sault Ste. Marie	-	-	-	-	-
Sudbury	-	-	-	-	93
Timmins	-	-	-	-	-
Wawa	-	-	-	-	-
Sub total	0	0	0	0	93
Southern					
Algonquin Park	-	-	-	-	-
Aurora	-	-	-	2,764	1,949
Aylmer	757	-	627	983	19,994
Bancroft	-	-	-	-	-
Guelph	-	-	8,768	11,154	17,557
Kemptville	-	-	-	-	-
Midhurst	-	-	-	36	2,978
Parry Sound	-	-	-	-	177
Pembroke	-	-	-	-	-
Peterborough	-	-	1,461	-	409
Sub total	757	0	10,856	14,937	43,065
Provincial total	757	0	10,856	14,937	43,158

Area (in hectares) in which gypsy moth caused moderate to severe defoliation in Ontario, 1980 to 2019.



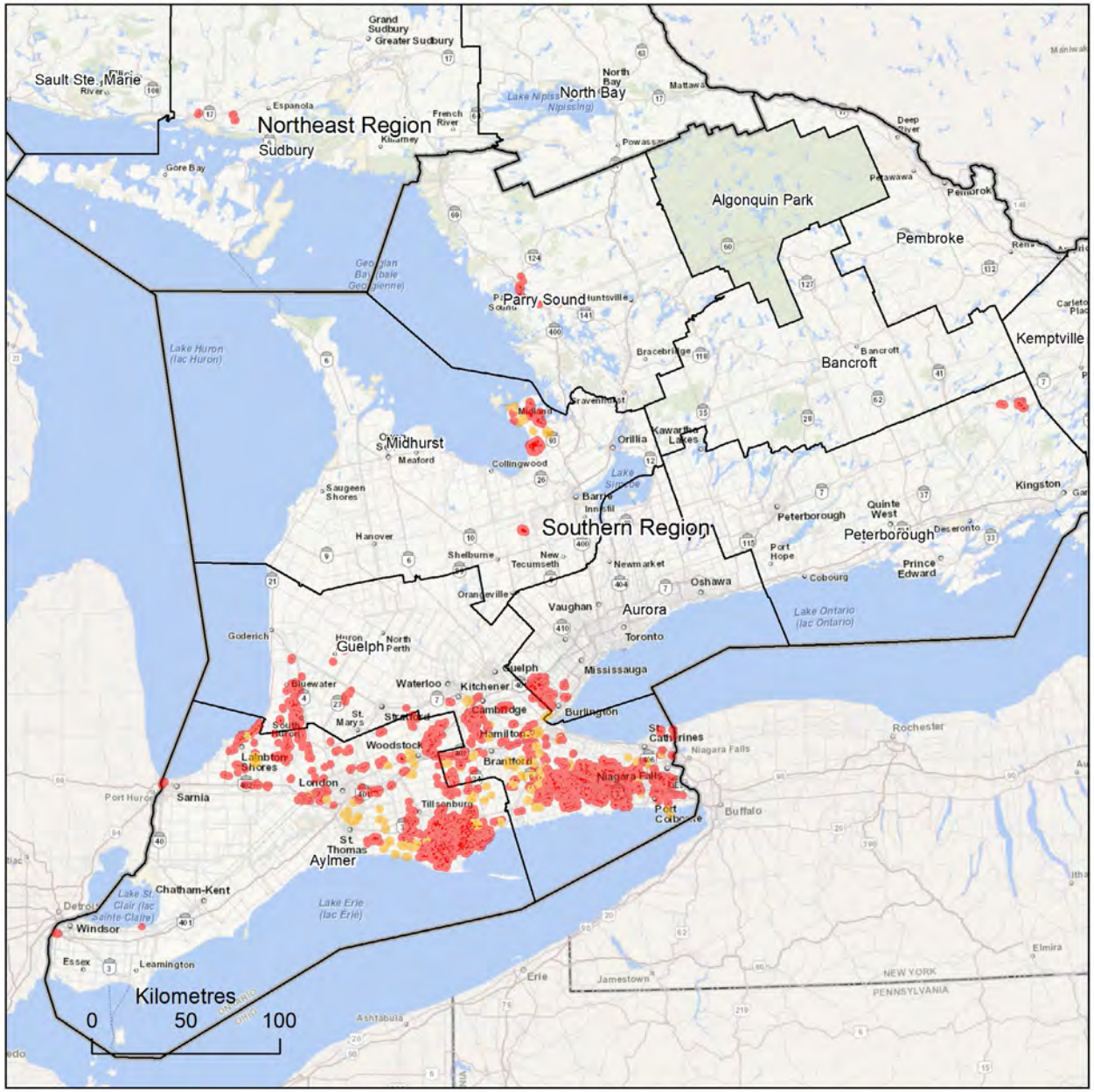
Gypsy moth 2019

Areas in the Ontario where gypsy moth caused defoliation

Light = 4,046 ha
Moderate to severe = 43,157 ha

Area of light defoliation

Area of moderate to severe defoliation



Gypsy moth 2019

Areas in the Northeast Region where gypsy moth caused defoliation

Moderate to severe = 93 ha

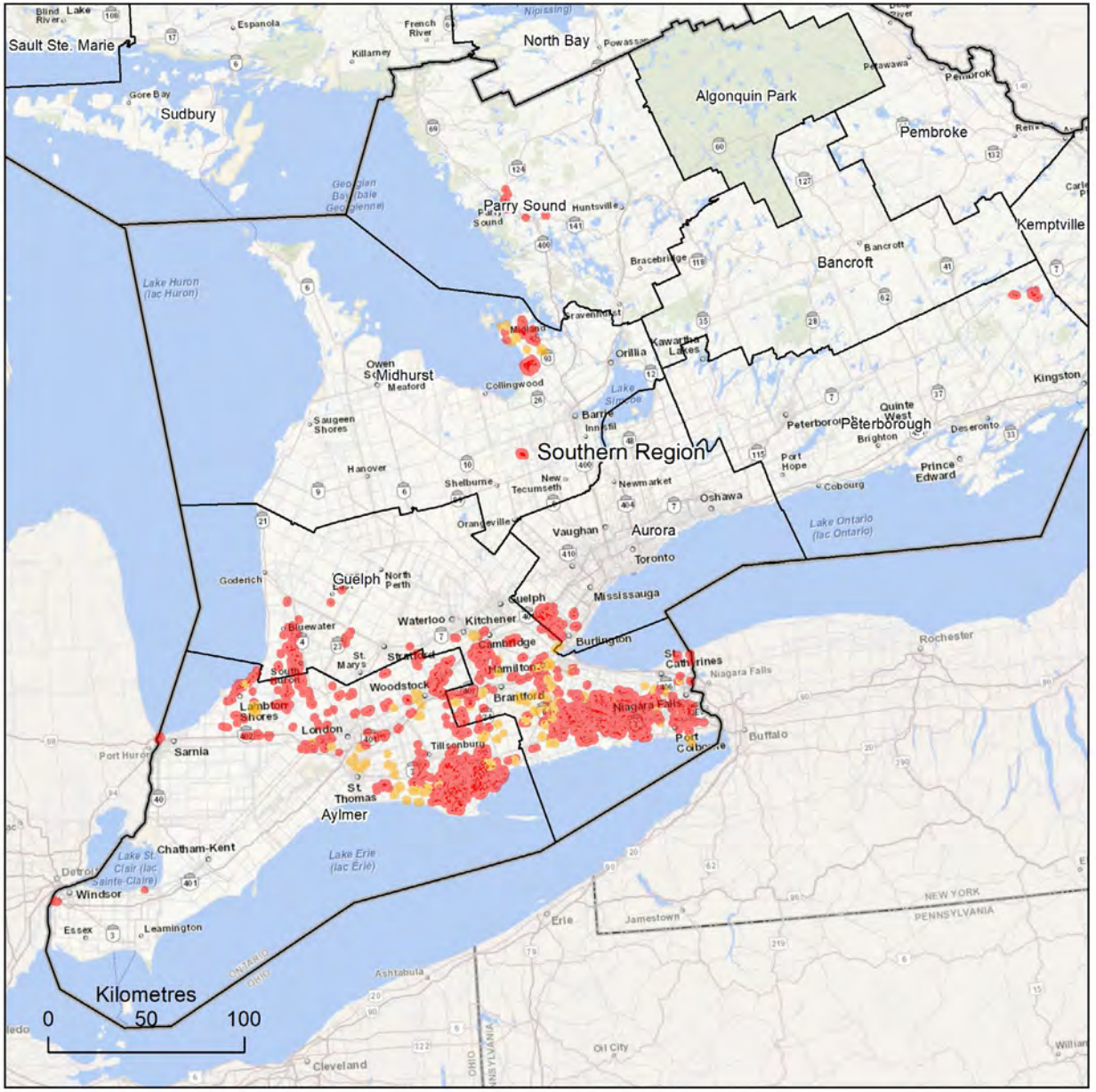
Area of moderate to severe defoliation

Gypsy moth 2019

Areas in the Southern Region where gypsy moth caused defoliation

Light = 4,046 ha
Moderate to severe = 43,064 ha

- Area of light defoliation
- Area of moderate to severe defoliation



Hemlock woolly adelgid

Pest information

Common name:	Hemlock woolly adelgid
Scientific name:	*Adelges tsugae* Annand
Pest origin:	Invasive — native to Asia
Pest type:	Defoliator
Host species:	Eastern hemlock spp.
Infestation area:	Localized

Provincial key facts

- In Canada, populations of hemlock woolly adelgid are established in British Columbia and Nova Scotia.
- In Ontario, hemlock woolly adelgid was first found in Etobicoke, near Toronto, in 2012 on five ornamental trees. In 2013, the Canadian Food Inspection Agency (CFIA) detected an infestation during pest-specific surveys in the Niagara Gorge near Niagara Falls. In both cases, infested trees were cut and incinerated.
- The insect has two generations per year in Canada, and is dispersed naturally by wind, birds, and mammals. It can also be spread by human movement of nursery stock and other wood products such as firewood.
- Feeding damage causes branch, twig, bud and shoot dieback, and leads to premature needle loss and eventual tree mortality.
- In 2019, this pest was detected in one area of Southern Region.

Regional summary

Southern:

- In Guelph District, the pest was detected by CFIA during surveys in the Niagara Gorge and in a forested area near Wainfleet, Niagara Region.

Trend analysis/outlook/issues

MNRF forest health field staff have been trained in survey protocols and procedures for detection of hemlock woolly adelgid.

MNRF will continue to collaborate with federal counterparts in both the CFIA and Natural Resources Canada-Canadian Forest Service to support survey and scientific initiatives.

Imported willow leaf beetle

Pest information

Common name:	Imported willow leaf beetle
Scientific name:	*Plagiodera versicolora* (Laich.)
Pest origin:	Invasive — native to Europe
Pest type:	Defoliator
Host species:	Willow spp.
Infestation area:	45 ha

Provincial key facts

- Imported willow leaf beetle was introduced to North America in 1915 and is now widely distributed across the range of willow in Ontario.
- Up to three generations of this insect can occur in a year.
- This pest has the potential to cause severe defoliation; however, damage to trees is not serious unless defoliation occurs in several consecutive years.
- In 2019, imported willow leaf beetle defoliation was reported in a few localized areas in Southern Region.

Regional summary

Southern:

- In Kemptville District, moderate to severe defoliation (44.7 ha) by imported willow leaf beetle was mapped in a large willow swamp on the South Nation River in Charleville, Augusta Twp. During ground surveys, the disturbance was observed over a 1 km stretch on either side of Skakum Road. Leaves were severely skeletonized by larvae feeding, causing crown discoloration. Numerous adult beetles were also observed during surveys. A mature ornamental willow hedgerow (0.3 ha) was severely defoliated in Phillipsville, Rideau Lakes Twp, Leeds-Grenville County. Adult beetles were actively feeding.
- In Guelph District, moderate to severe imported willow leaf beetle defoliation was noted during ground surveys on riparian willows of all age classes along the Nith River through New Hamburg in Wilmot Twp, Waterloo Region, to Platsville in Blandford-Blenheim Twp, Oxford County. Moderate to severe defoliation was also reported on mature willows along the Grand River from Brantford to Caledonia through Brant and Haldimand counties. Both adult beetles and larvae caused defoliation and crown discoloration at the time of ground

surveys. Moderate to severe defoliation of about 25 open-grown willows in a windbreak was also detected during ground surveys along Spragues Road at Shouldice Sideroad, south of Cambridge in North Dumfries Twp, Waterloo Region.

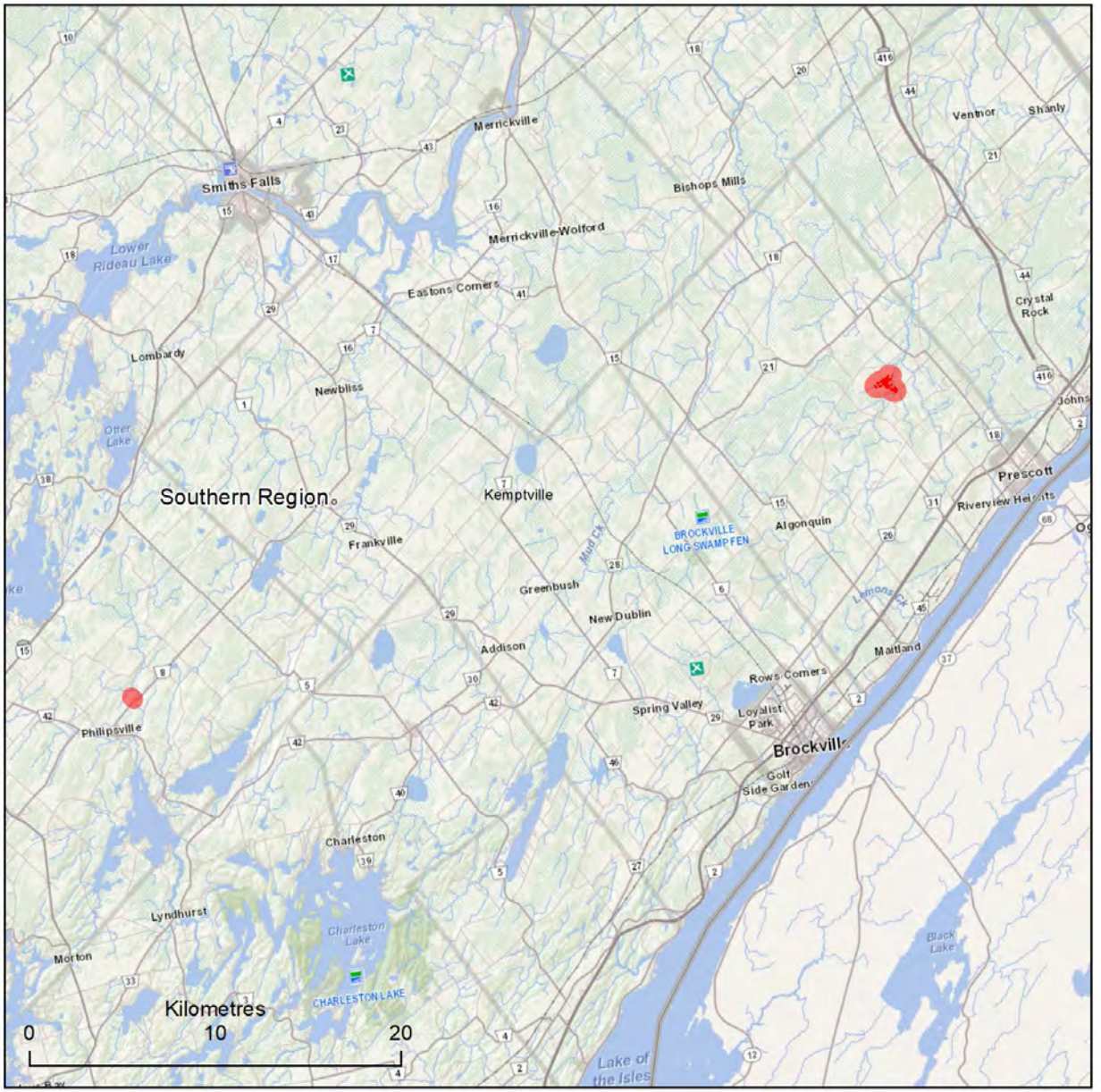
- In Peterborough District, moderate to severe imported willow leaf beetle defoliation was reported on mature willow during ground surveys in a municipal woodlot in Kirkfield along Portage Road, Eldon Twp. This is the second consecutive year of defoliation reported in this area.
- In Aylmer District, moderate to severe imported willow leaf beetle defoliation was observed on willows in a riparian area during ground surveys in August at the intersection of Amiens Road and Avro Drive in Strathroy-Caradoc, Middlesex County.

Imported willow leaf beetle 2019

Areas in Southern Region where imported willow leaf beetle caused defoliation

Moderate-to-severe = 45 ha

Area of moderate to severe defoliation



Ips species

Pest information

Common name:	Ips species
Scientific name:	*Ips grandicollis* (Eichhoff), *Ips pini* (Say), *Ips calligraphus* (Germar)
Pest origin:	Native to North America
Pest type:	Bark beetle
Host species:	Various pine species
Infestation area:	10 ha

Provincial key facts

- All pine species are attacked by pine beetles, referred to as Ips species.
- Adult beetles are attracted to recently dead or dying trees, particularly smaller diameter pine.
- These beetles spend most of their life cycle under the bark, causing branch dieback or tree death.
- Evidence of bark beetle damage includes wood dust in bark crevices or around the base of the tree, as well as numerous small round holes in the bark.
- Two generations of these bark beetles can occur in one year.
- In 2019, Ips caused mortality was mapped in Northeast Region and damage was detected in Southern Region.

Regional summary

Northeast:

- In Timmins District, 10 ha of jack pine mortality was mapped near the Eacom Gogama Mill along Hwy 560 in a semi-mature jack pine plantation in Westbrook Twp. Damage after a 2012 wildfire and 2014 whitespotted sawyer beetle feeding may have predisposed the trees to an infestation of pine engraver (Ips pini (Say)) and subsequent mortality.

Southern:

- In Peterborough District, three different pine beetles were found south of Petroglyphs Provincial Park in a few stressed and moribund mature eastern white pine trees on Pine Island on the southeast side Stony Lake. These beetles were southern pine engraver (Ips grandicollis (Eichhoff)) pine engraver (Ips pini (Say)), and six-spined engraver (Ips calligraphus (Germar)). The primary cause of decline was uncertain, but it appeared the bark beetles were secondary.

Pine engraver beetle 2019

Areas in the Northeast Region where pine engraver beetle caused damage

Mortality = 10 ha

Area of mortality

Jack pine budworm

Pest information

Common name:	Jack pine budworm
Scientific name:	*Choristoneura pinus pinus* Freeman
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Jack pine
Infestation area:	1,001,269 ha

Provincial key facts

- Jack pine budworm outbreaks occur in Ontario about every eight to 10 years.
- In the past, large-scale control programs have been undertaken to protect high value jack pine stands during an outbreak, with the most recent carried out in 2019 in Northwest Region.
- In 2019, 1,001,269 ha of moderate to severe jack pine budworm defoliation were aerially mapped, all in Northwest Region.
- In 2019, 32,234 ha of jack pine budworm-caused tree mortality was mapped in the province, with 32,208 ha in Northwest Region and 26 ha in Northeast Region.
- During ground surveys, larvae were collected from historically infested areas in Northwest and Northeast regions.

Regional summary

Northwest:

- In Red Lake District, jack pine budworm defoliation was mapped for the third consecutive year. A total of 771,404 ha of moderate to severe defoliation was mapped in about two thirds of the district, with no defoliation recorded in the far northern part of the district. Large areas of moderate to severe defoliation were mapped on the southeast side of the Whitefeather Forest north of Trout Lake and continued northwest of Cat Lake and Birch Lake beyond the Area of Undertaking (managed forest area). On the west side of the Whitefeather Forest, areas of moderate to severe defoliation were mapped around Stout Lake moving south

into the northern areas of Woodland Caribou Provincial Park. Beyond the Area of the Undertaking, moderate to severe defoliation was evident from Donald Lake to Hobbs Lake near the Manitoba border. On the east side of the district, defoliation in the Trout Lake Forest was observed on the west and east side of Trout Lake where it continued south to Lac Seul. Smaller scattered areas of moderate to severe defoliation were also mapped farther east in the management unit north and south of Jeanette Lake near the Sioux Lookout District border. Scattered areas of light defoliation were also mapped on the edges of the infested area, but only totalled 272 ha. A total of 27,766 ha of jack pine budworm-caused mortality was mapped in the central part of Red Lake District where moderate to severe defoliation occurred in jack pine stands for three consecutive years. Most of this mortality was northwest of Trout Lake to the northern end of Caribou Woodlands Provincial Park.

- In Dryden District, 105,209 ha of moderate to severe defoliation was mapped. Most of this defoliation was in the northwest corner of the district. The largest areas of defoliation were between Lac Seul and Wabigoon Lake and near Rugby Lake west to the Kenora District boundary. Smaller scattered areas of moderate to severe defoliation were recorded from the west side to the central part of the district. On the west side, these smaller areas were near Eagle Lake, Bunyan Lake near the Fort Frances District border, and on the east side of Boyer and Long lakes. In the central part of the district, small areas of defoliation were recorded north of Ignace north to Barrel, Square, and Basket lakes as well as a small group of defoliated jack pine stands between Flying Loon and Loggers lakes near the Sioux Lookout District boundary. A total of 315 ha of jack pine budworm-caused mortality was recorded in the Vermillion Bay area at the north end of Eagle.

- New areas of moderate to severe jack pine defoliation were aerially mapped in Sioux Lookout District totalling 73,381 ha. The defoliation was spread throughout the district from north of Pickle Lake in the Kinasao Lake area to Zarn Lake in the southern part of the district, near the Dryden District boundary. The largest area of defoliation was in the north from Pickle Lake to Slate Falls in scattered small to moderate sized areas. The larger areas of defoliation were around Meen Lake, between Upturnedroot and DeLucia lakes, as well as east of Littleford Lake to the Meen River. Small areas of moderate to severe defoliation were also recorded on the northwest side of the district from Quintosh Lake to Carillon Lake near the Red Lake District boundary. Scattered areas of defoliation in the middle of the district were observed north, south, and east of Lake St. Joseph and south of Bamaji Lake. In the southern part of the district, small areas of defoliation were aerially mapped north and east of Lac Seul from Tully Lake to Pepperbell Lake southeast of the town of Sioux Lookout. Jack pine budworm-caused mortality totalled 3,439 ha in Sioux Lookout District. Most of this mortality was west of Pickle Lake between Meen and Fry lakes. Small areas of mortality were also observed north of Morris Lake, between Cat and Shearstone lakes, and southeast of Root Lake to Lynxpaw Lake.

- In Kenora District, 51,126 ha of moderate to severe jack pine budworm defoliation were aerially mapped. Defoliation was concentrated in the northeast corner of the district with smaller areas of defoliation in the central part of the district and scattered areas of defoliation in the southeast. Areas of defoliation in the northeast were extensive stretching from Anishinabi Lake along the Red Lake District boundary to Ord Lake

along the Dryden District boundary. Defoliation was also evident along the Red Lake/Kenora district boundary north of Rex Lake and west of Rowdy Lake. In the central part of the district, moderate to severe defoliation was mapped north of Kenora between Separation Lake and the southwest side of The Big Stretch Winnipeg River. In the southeast part of the district, defoliation was recorded in small areas north of Sioux Narrows, at the north end of Point Lake, and in a band from Flora Lake to the east side of Atikwa Lake. A total of 688 ha of jack pine budworm-caused mortality was also mapped in the northern part of Kenora District. Almost all if it was near the Red Lake District boundary southeast of Eagle Lake near Woodland Caribou Provincial Park. One small area of mortality was mapped between Maynard and Portal Lakes west of Perrault Falls.

- A small area of moderate to severe defoliation was recorded in Fort Frances District totalling 139 ha. In the northern part of the district, jack pine budworm defoliation was mapped along the Dryden District boundary south of Bunyan Lake, the north end of Upper Manitou Lake, and southeast of Queer Rock Lake.

- A small amount of moderate to severe jack pine budworm defoliation (10 ha) was mapped in the northwest corner of Thunder Bay District. The defoliation was on the southwest end on Rockcliff Lake in Wabakimi Provincial Park.

Northeast:

- For the third consecutive year in Sault Ste. Marie District, jack pine mortality was recorded in an area of moderate to severe jack pine budworm defoliation that occurred in 2015 and 2016. The trees were stressed by other contributing factors such as poor site quality and drought-like conditions between 2016 and 2018. Only two areas of mortality totalling 26 ha on the east side of Matinenda Lake were recorded in 2019. Both areas were near those where mortality was recorded in previous years in Mack Twp.

- In Sudbury District, light jack pine budworm defoliation (5%) was observed near Espanola in Merritt Twp along Jacklin Road where jack pine budworm has historically been found. Pine needle sheathminer (*Zelleria haimbachi* Bsk.) was also present.

Trend analysis/outlook/issues

Jack pine budworm spray program

In 2019, the ministry undertook an insect pest management program for jack pine budworm affected stands in Red Lake, Kenora, and Dryden districts. The bacterial insecticide B.t.k. (Foray 76B) was applied at 1.5 L/ha to 100,360 ha of jack pine stands. An efficacy assessment confirmed that the foliage protection program was successful in meeting its objective of keeping defoliation below 40% in 40+ year old jack pine stands.

To assess efficacy, 35 plots were established in areas that had been sprayed and 18 plots were established in untreated areas. Treated areas were divided into 5 blocks, with each block having both sprayed and untreated control plots. Unfortunately, Block 4 burned after it had been treated and could not be assessed. Of the 9,724 ha sprayed in Block 4, 5,928 ha were lost to fire and access to the remaining area was restricted. The block furthest south, Block 1, encompassed 4,247 ha. Defoliation in the sprayed plots averaged 23% while that in the control plots averaged 40%. Block 2 in the Ear Falls area was 2,696 ha with average defoliation at 18% in sprayed plots 43% defoliation in control plots. Sprayed jack pine stands in Block 3 totalled 21,447 ha. Post spray assessment plots averaged 18% defoliation while control plots averaged 51%. The largest block, Block 5 had 62,230 ha sprayed, with 12,578 ha subsequently lost to wildfire. Block 5 was a bit of an anomaly as sprayed plots averaged 9% defoliation while control plots averaged 11%. This was the third consecutive year of defoliation in this area and it appeared that the natural collapse of the infestation was beginning.

Jack pine budworm pheromone trapping

Jack pine budworm pheromone trapping was carried out across the province in 2019. Traps were deployed at 82 locations: 37 in Northwest Region, 36 in Northeast Region, and nine in Southern Region. Trap catches decreased slightly in all three regions in 2019. The change in the Northwest Region was a decrease from an average of 49 moths per trap in 2018 to 38 moths per trap in 2019. The highest average numbers of moths per trap was in Kenora District in Jaffray Twp, north of Kenora, with an average of 75 male moth captures.

Southern Region had the biggest decrease in the average number of moth catches from 44 in 2018 to 23 in 2019. The highest average number of moths per plot was near Petawawa in Pembroke District with an average of 35 moths per trap.

In Northeast Region, the decrease in average number of moths per trap was minimal as catches went from 23 moths per trap in 2018 to 19 in 2019. The area with the highest average number of moths per trap (48) was in Latchford Twp, North Bay District.

Jack pine budworm defoliation forecast survey

In Ontario, jack pine budworm defoliation forecasting is based on surveys of the number of overwintering larvae on tree branches. Jack pine budworm spend the winter as second instar larvae (L2) by encapsulating themselves in silken shelters (hibernacula) under branch scales and bark cracks. These larvae typically spend the winter in shelters from late August until the following spring. This overwintering stage of the lifecycle provides an opportunity to collect branches and extract and count larvae to forecast the potential severity of defoliation the following spring and summer. Defoliation forecasts are used to determine which stands should be considered for protection. Locations for L2 surveys are selected based on defoliation mapped during the current infestation, and are generally in or near the current defoliation. Areas historically prone to jack pine budworm defoliation were selected as well, as

were high value jack pine stands near infestations. From each location, 10 trees were selected, and a 1 m branch was sampled from the mid- to upper crown of each tree. Branches were sent to a laboratory to be processed in a sodium hydroxide washing procedure that extracts the second instar larvae from their hibernacula. Extracted larvae were collected and counted under a microscope to determine the average number of larvae per branch for each sample location. This average was used to forecast expected jack pine budworm defoliation in 2020. An average of more than 54 larvae per branch indicates potential for severe defoliation. Moderate defoliation is forecasted when 16 to 54 larvae are found per branch. Light defoliation can be expected when 15 or fewer larvae are found on each branch.

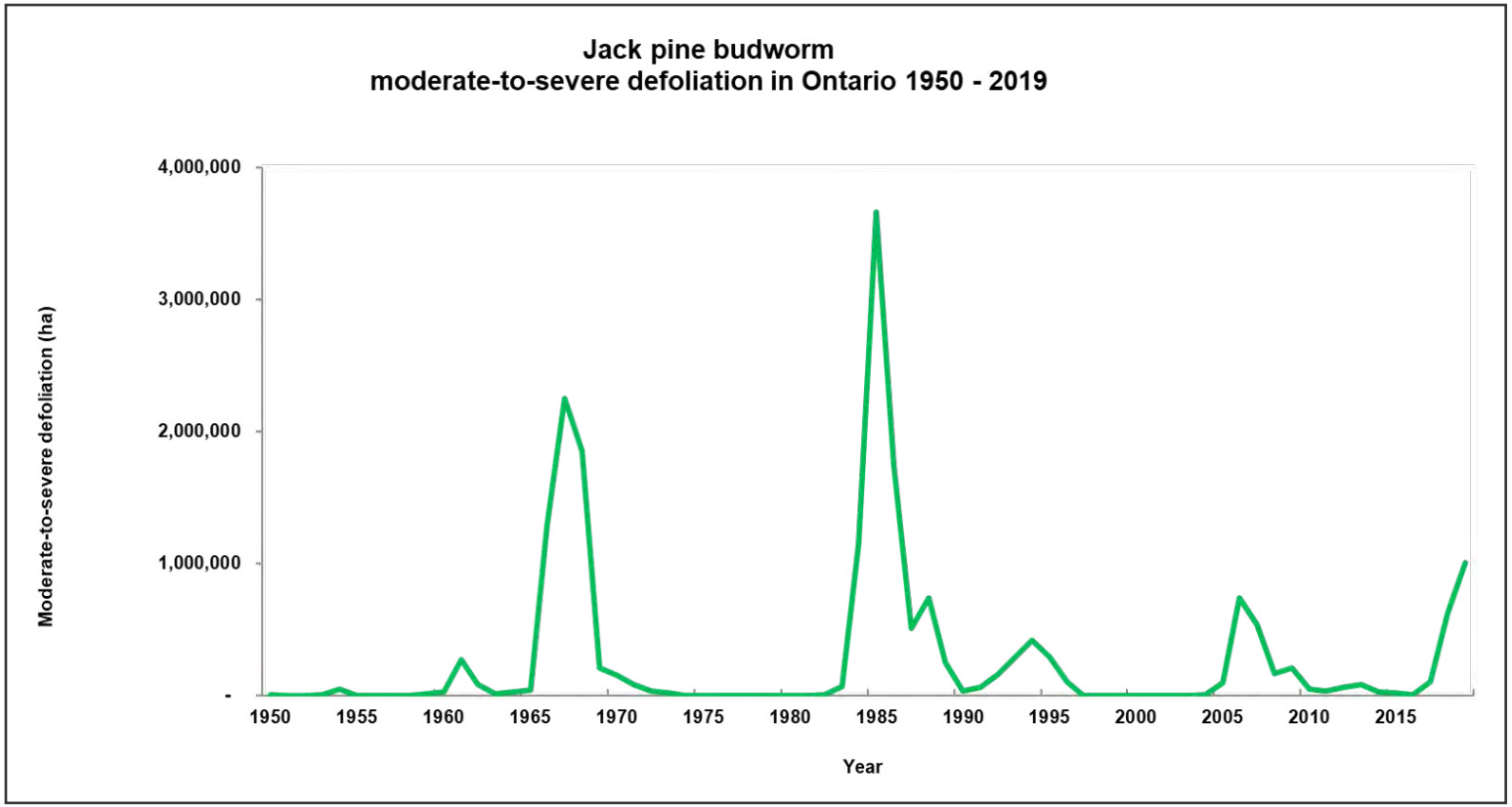
In Northwest Region, 52 locations (520 trees) were sampled in 2019. Most of these locations were in Dryden and Red Lake districts. A total of 16 locations in Dryden District were sampled, with three indicating potential for severe defoliation, eight indicating moderate, and five indicating light for 2020. In Red Lake District, 15 locations were sampled 10 of which indicated severe defoliation is forecast for 2020 while the remaining 5 forecasted moderate defoliation. In Kenora District, seven of the 11 locations sampled in fall 2019 forecasted moderate defoliation for 2020. The remaining locations had two light forecasts, one severe forecast, and one forecast for no defoliation in 2020. In Sioux Lookout District, five of the 10 locations sampled forecasted moderate defoliation and the other five indicated four light and one severe defoliation forecast for 2020.

Total area (in hectares) in which jack pine budworm caused moderate to severe defoliation from 2015 to 2019, by MNRF district.

Region	Area of defoliation (ha)				
District	2015	2016	2017	2018	2019
Northeast					
Chapleau	-	-	-	-	-
Cochrane	-	-	-	-	-
Hearst	-	-	-	-	-
Kirkland Lake	-	-	-	-	-
North Bay	-	-	-	-	-
Sault Ste. Marie	2,520	2,403	-	-	-
Sudbury	-	-	-	-	-
Timmins	-	-	-	-	-
Wawa	-	-	-	-	-
Sub total	2,520	2,403	0	0	0

District	2015	2016	2017	2018	2019
Northwest					
Dryden	-	-	-	3,603	105,209
Fort Frances	-	-	-	-	139
Kenora	-	-	-	10,278	51,126
Nipigon	1,368	2,020	-	-	-
Red Lake	-	-	100,187	613,574	771,404
Sioux Lookout	17,461	662	-	-	73,381
Thunder Bay	-	-	-	-	10
Sub total	18,829	2,682	100,187	627,455	1,001,269
Provincial total	21,349	5,085	100,187	627,455	1,001,269

Area (in hectares) of moderate to severe defoliation caused by jack pine budworm in Ontario, 1950–2019.

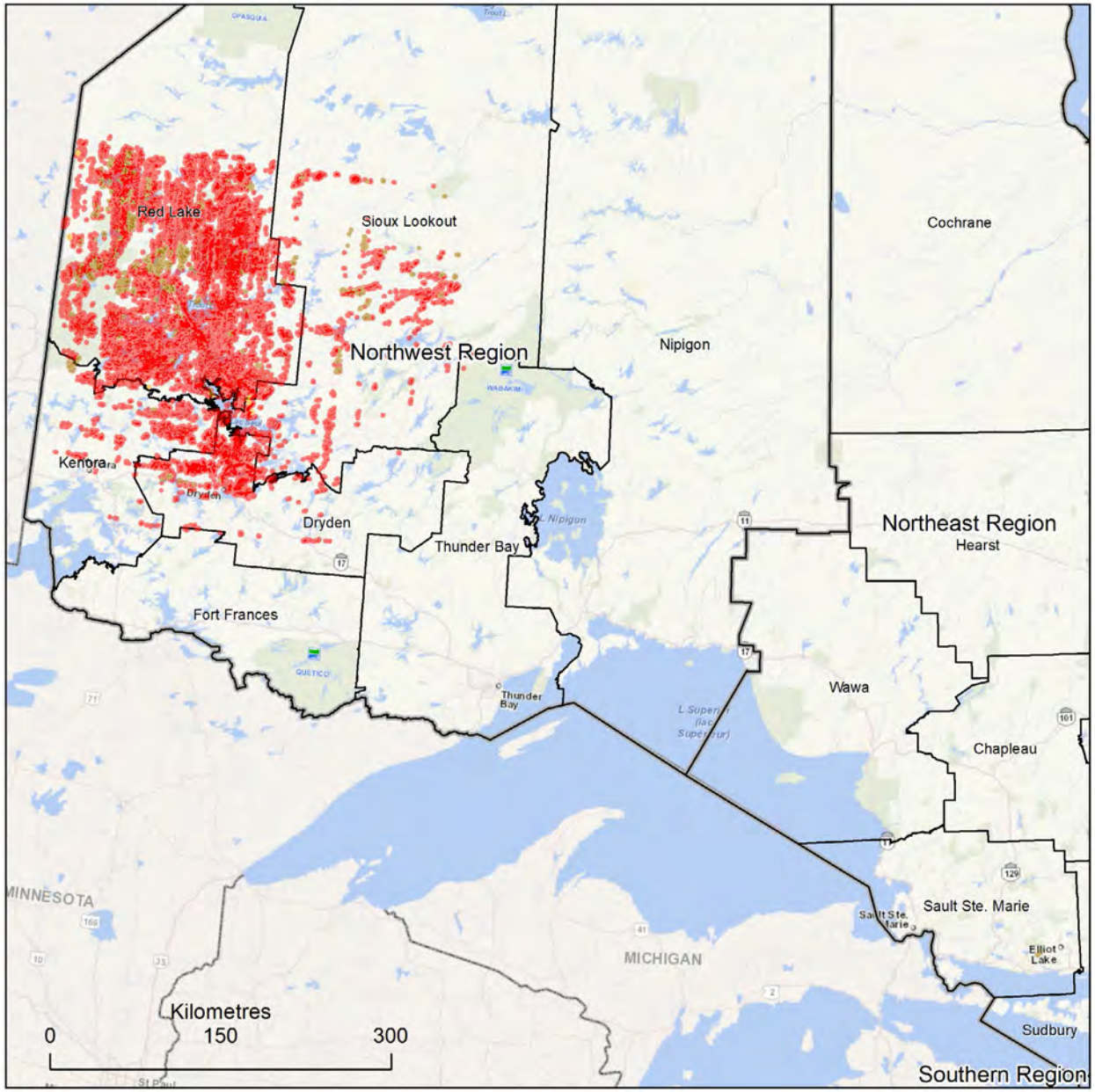


Jack pine budworm 2019

Areas in Ontario where jack pine budworm caused defoliation

Light = 439 ha
Moderate to severe = 1,001,269 ha
Mortality = 32,234 ha

- Area of light defoliation
- Area of moderate to severe defoliation
- Area of mortality

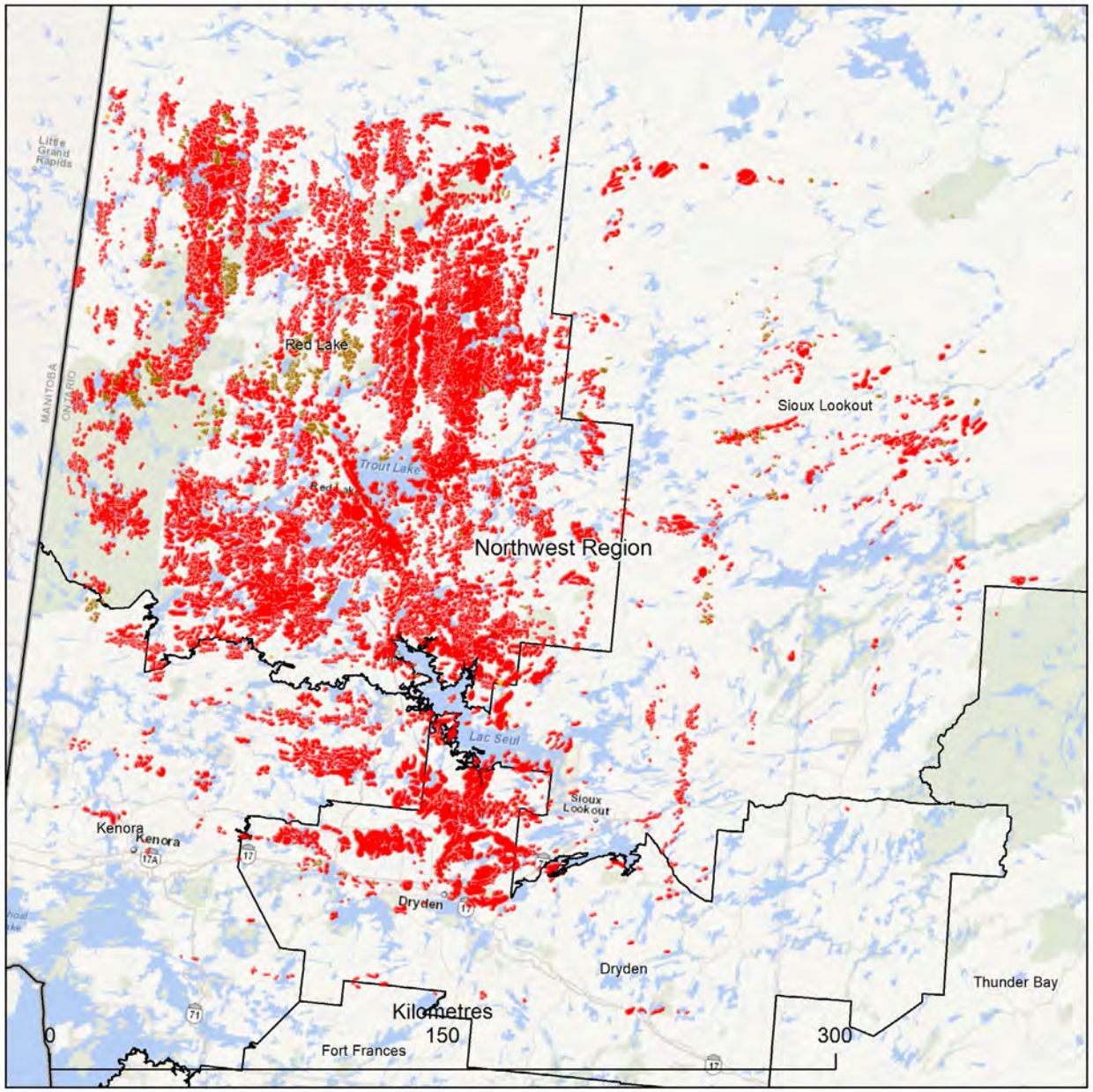


Jack pine budworm 2019

Areas in Northwest Region where jack pine budworm caused defoliation

Light = 439 ha
Moderate to severe = 1,001,269 ha
Mortality = 32,208 ha

- Area of light defoliation
- Area of moderate to severe defoliation
- Area of mortality



Jack pine budworm 2019

Areas in Northeast Region where jack pine budworm caused defoliation

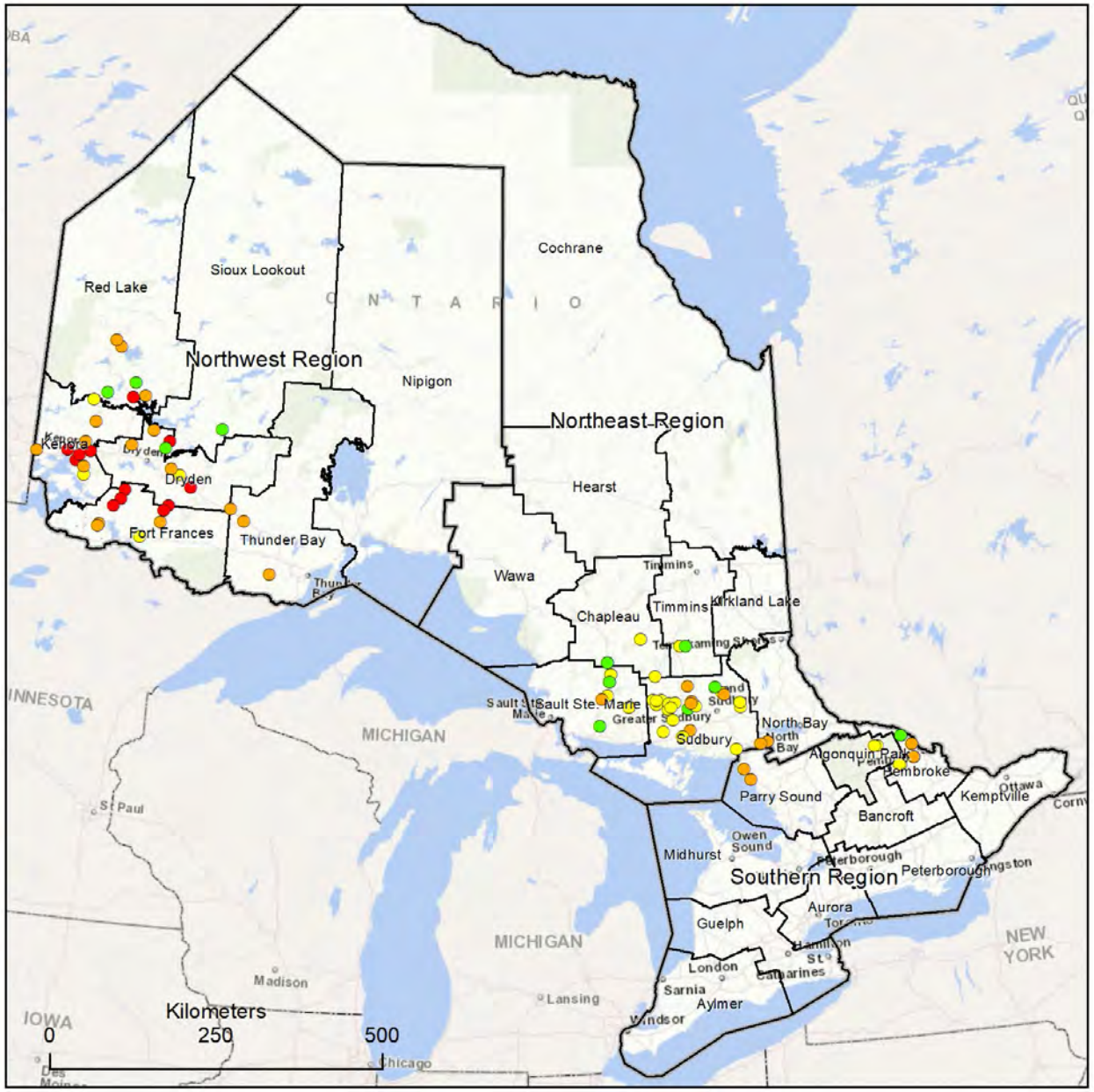
Mortality = 26 ha

Area of mortality

Jack pine budworm Pheromone Trapping Results 2019

Average Number of Moths per Trap

- 0
- < 10
- 10 - 25
- 25 - 50
- > 50



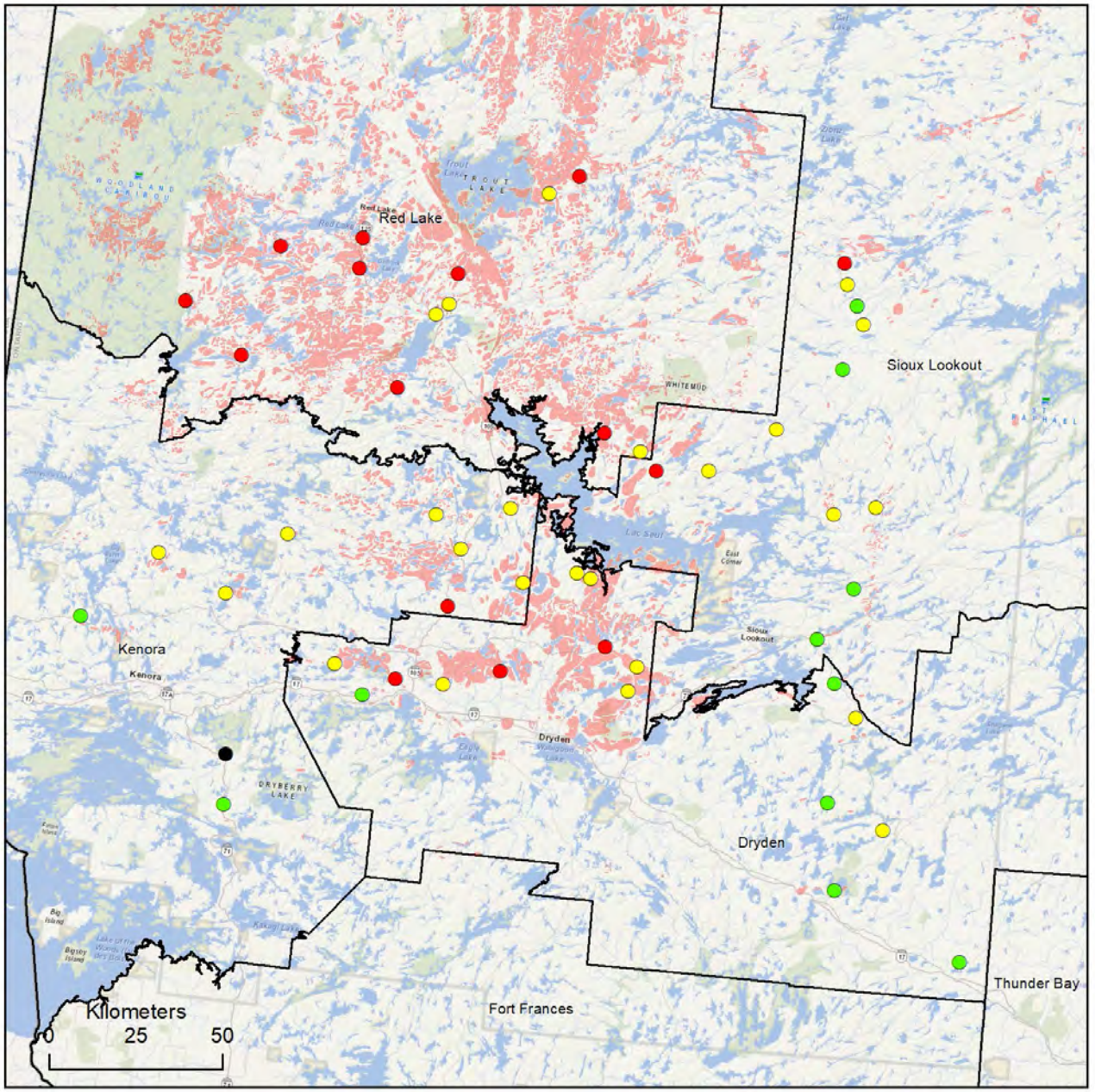
Jack pine budworm second instar larvae survey results

Defoliation Forecast 2020

- Severe
- Moderate
- Light
- No defoliation

Jack Pine Budworm Defoliation 2019

- Area of moderate to severe defoliation
- Area of light defoliation



Large aspen tortrix

Pest information

Common name:	Large aspen tortrix
Scientific name:	*Choristoneura conflictana* (Wlk.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Trembling aspen
Infestation area:	16,548 ha moderate to severe defoliation, 1,400 ha light defoliation

Provincial key facts

- Large aspen tortrix is second only to forest tent caterpillar as an aspen defoliator.
- It is an early season defoliator that prefers trembling aspen but if aspen are completely defoliated before larvae finish feeding it will feed on other trees and shrubs (e.g., birches, alder, and choke cherry).
- This pest has periodic outbreaks, with sharp increases and quick decreases after two to three years of moderate to severe defoliation.
- In 2019, light and moderate to severe defoliation were aerially mapped in Northeast Region.

Regional summary

Northeast:

- In Timmins District, 9,641 ha of moderate to severe defoliation were aerially mapped, mostly in the northern and central part of the district. The heaviest areas of defoliation in the northern part of the district were observed north and south of Hwy 101 from Hwy 144 to the Community of Shillington, along Pine Street South from the City of Timmins to Kenogamissi Lake and west of Nighthawk Lake adjacent to Gibson Lake Road. In the central part of the district, moderate to severe tortrix defoliation was recorded from Sinclair Lake to Shining Tree, on the shores of Mesomikenda Lake, and in and around the community of Westree. A total of 14 ha of light defoliation were also mapped in the northern part of the district north of Kamiskotia Lake near the south end of Halfmoon Lake.
- In the southcentral part of Cochrane District, 6,171 ha of moderate to severe tortrix defoliation were aerially mapped. The largest areas of defoliation were mapped northwest of Lake Abitibi, on the shores of Abitibi River just north of Iroquois Falls, north of the Cochrane airport, and northeast of Little Abitibi Lake. A small area of

light defoliation (37 ha) was observed in the northern part of the district north of Lake Abitibi in three small areas along the Translimit Road, south and east of Mistango Lake in Freele and Challies townships.

- In Kirkland Lake District, moderate to severe (379 ha) defoliation by large aspen tortrix was mapped in scattered locations including north of Watabeag Lake on the northwest side of the district, east of Ramore, northeast of Esker Lakes Provincial Park on the north end of Webster Lake (Tannahill Twp) and south of Lake Abititbi in Frecheville Twp. Farther south, small areas of moderate to severe defoliation were mapped south of Kenogami Lake on the east side of Round Lake, south of Larder Lake and east of Elk Lake. Four small areas of defoliation were mapped south of Gowganda in Leith, Charters, and Donovan townships. Most of the large aspen tortrix defoliation in the district was light defoliation concentrated between Kirkland Lake and Englehart and west to Elk Lake. In the northern part of the district, light defoliation was also recorded east and northeast of Holtyre. These areas of light defoliation totalled 1,330 ha.
- In Chapleau District, small scattered areas of moderate to severe defoliation were mapped in all four corners of the district. In the northwest corner of the district, moderate to severe defoliation was recorded east of Missinabi Lake just north of Sharp Hoof and Makonie lakes. A total of 18 ha of light defoliation was also mapped in this area closer to Lloyd Lake. In the northeast corner of the district, three small areas of moderate to severe defoliation were observed northwest of Foleyt and, closer to the Hearst/Timmins district boundary, two small areas of defoliation were recorded west of Bromley Lake and another one on the west side of the Ivanhoe River. On the southeast side of the district, four small areas of moderate to severe defoliation were observed between First Lake and Ramsey and a little larger area was noted to the west at the south end of Rock Lake in the northwest corner of Edighoffer Twp. In the southwest corner of the district, scattered areas of moderate to severe defoliation were observed southwest of Chapleau at the northeast end of Nagasin Lake, between Border and Sea Horse lakes in Crepieul and Blackburn townships. A small area of light defoliation was also noted in this area. Two small areas of moderate to severe defoliation were mapped in the north and south ends of Green Twp, which is closer to the central part of the district. One small area of moderate to severe defoliation was found near the centre of the district north of Howson Lake along the north boundary of Halcrow Twp.
- In the northern end of Sault Ste. Marie District, the large aspen tortrix infestation collapsed in 2019. Low numbers of larvae were encountered in early June in the area defoliated in 2018, but no new defoliation, not even light, was recorded in 2019. The cooler weather in May slowed leaf development, which may have caused this early season defoliator to starve.

Total area (in hectares) in which large aspen tortrix caused moderate to severe defoliation from 2015 to 2019 by MNRF district.

Region	Area of defoliation (ha)				
District	2015	2016	2017	2018	2019
Northeast					
Chapleau	-	19,521	34,084	27,701	357
Cochrane	-	-	-	-	6,171
Hearst	-	86	-	36	-
Kirkland Lake	-	-	-	-	379
North Bay	-	-	-	-	-
Sault Ste. Marie	-	-	-	1,375	-
Sudbury	-	-	-	-	-
Timmins	-	2,980	12,355	9,716	9,641
Wawa	-	-	1,858	379	-
Sub total	0	22,587	48,297	39,206	16,548
Provincial total	0	22,587	48,297	39,206	16,548

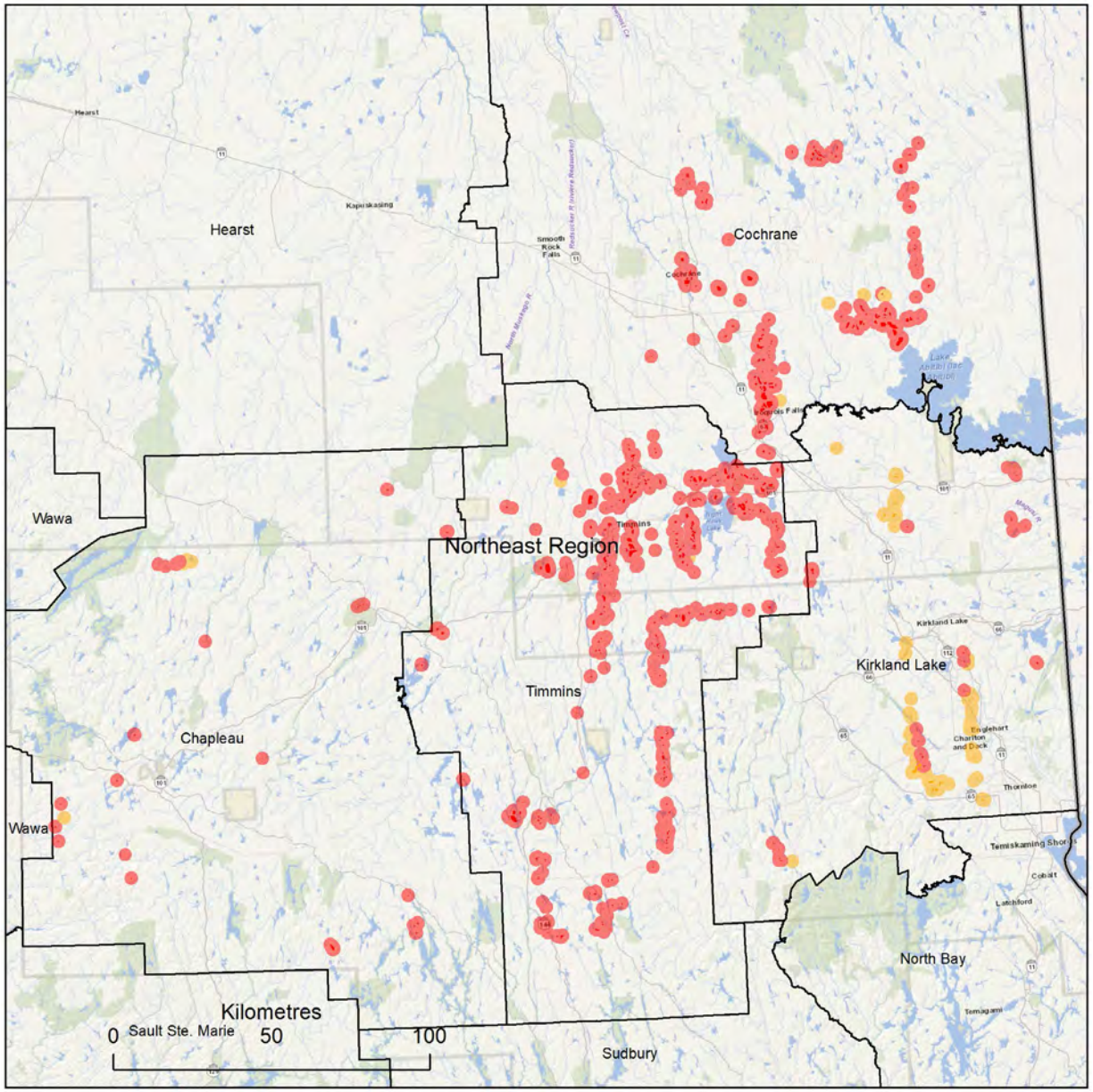
Large aspen tortrix 2019

Areas in the Northeast Region where large aspen tortrix caused defoliation

Light = 1,400 ha
Moderate to severe = 16,548 ha

Area of light defoliation

Area of moderate to severe defoliation



Oak wilt

Pest information

Common name:	Oak wilt
Scientific name:	*Bretziella fagacearum* (Bretz)
Pest origin:	Unknown
Pest type:	Vascular disease
Host species:	All oak species
Infestation area:	NA

Provincial key facts

- Oak wilt is a disease that is caused by an invasive forest pathogen, newly named Bretziella fagacearum. The disease is currently present in the northern United States, near the Ontario/Canadian border, posing a high risk of introduction. Locally, the disease is spread by insect vectors such as sap beetles (Coleoptera: Nitidulidae) and root grafting. Long distance movement is often the result of people moving oak wilt infected wood.
- Oak wilt poses a risk to all species of oaks in eastern Canada, especially those in the red oak section (Quercus section Lobatae). Oak wilt has not been detected in Canada but is present on Belle Island, Michigan, between Detroit and Windsor.
- Sweet smelling, fungal pressure pads develop on stems and large branches of newly killed trees and cause the bark to crack. Nitidulid beetles, attracted to the fungus, crawl through the cracks to feed on the fungus. New infections of oak wilt occur when nitidulid beetles transfer fungal spores on their bodies from the pressure pads on infected trees to fresh wounds on uninfected oak trees. Oak wilt pockets develop when the fungus spreads through root grafts from infected to nearby uninfected trees.
- Of the hundreds of species of sap beetles, only a subset of these beetles have behaviours (flight timing, host preference) that result in oak wilt transmission. Current species of interest are Carpophilus sayi and Colopterus truncatus, since they are known vectors for oak wilt in the United States.
- Current efforts are focused on early detection and preventing the establishment of oak wilt by developing best management practices and pruning guidelines.

Regional summary

Southern and Northeast:

- In 2019, MNRF continued to investigate flight behaviour, degree day models, and identify potential nitidulid beetle species that could be vectors of oak wilt in Ontario, where this species is along its northern range in Canada. Forest health program staff worked alongside local conservation authorities and partners to maintain beetle traps and collect specimens.
- Flight traps to capture beetles and equipment to monitor temperature were established at six locations in central and southern Ontario and left out from April to October. In addition, bur and red oak trees were wounded twice during this period at nearby locations, to collect beetles attracted to oak wounds.
- Identification of collected beetles is ongoing. From collections made during 2019, 20 nitidulid species (from 6200 specimens) have been sorted and identified, including *Carpophilus say*i and *Colopterus truncatus*.

Nitidulid beetle flight trap locations 2019

■ Flight trap location

Septoria leaf spot

Pest information

Common name:	Septoria leaf spot
Scientific name:	*Sphaerulina populicola(Peck)* Quaedvl., Verkley & Crous*, Sphaerulina aceris, Septoria fraxinicola*
Pest origin:	Native to North America
Pest type:	Foliar disease
Host species:	Balsam poplar, ash sp., sugar maple
Infestation area:	25 ha moderate to severe defoliation, 243 ha of light defoliation

Provincial key facts

- Septoria leaf spot is a common fungal disease of poplar and birch.
- This disease commonly infects leaves, but can also cause branch and main stem cankers, particularly on hybrid poplar.
- Septoria leaf spot is normally prevalent in wet and humid weather conditions. Fallen leaves re-infect new leaves the following year.
- Trees may lose vigour after repeated severe infections, causing them to be more susceptible to other pests and pathogens
- In 2019, scattered areas with various species of septoria leaf spot were reported in Northeast and Southern regions.

Regional summary

Northeast:

- In Kirkland Lake, moderate to heavy levels of septoria were observed on balsam poplar, alongside aspen leaf blotch miner, on Hwy 11 south of Matheson to Hwy 66, along Hwy 66 from Hwy 11 to King Kirkland and south of Larder Lake along Hwy 624.

Southern:

- In Kemptville District, scattered areas of light and moderate to severe damage by septoria leaf spot totalling

268 ha were mapped predominantly in the southern part of the district. Moderate to severe septoria leaf damage was mapped north of Iroquois on Gilmour Road, South Dundas Twp, where it affected balsam poplar in a semi-mature hardwood forest. Light damage was also mapped nearby on Chess Road. Moderate to severe septoria leaf spot of maple was mapped west of Almonte between Taylor and MacKay lakes on Galbraith Road, Middleville, Lanark Highlands. A little further south, light septoria leaf spot of maple was mapped on Wolfe Grove Road, southwest of Harding Lake. Two other areas of light septoria leaf spot damage were recorded between Lower Beverly and Charleston lakes in Leeds-Grenville. During ground surveys it was observed that 50 to 60% of sugar maples were affected in a mature mixed forest. Symptoms consisted of numerous small spots on leaves. Light septoria leaf spot of ash was observed on red ash in a young mixed forest on Ritchie Sideroad, near Bollingbroke, Lanark County. Symptoms included small to large round brown spots on leaves, with the larger spots coalescing, and light chlorosis near leaf tips. This area was not aerially mapped.

- In Pembroke District and Algonquin Park, light damage by septoria leaf spot of poplar was observed in a few areas during ground surveys. Observations were made on Hwy 60 in Algonquin Park and on Chenaux Road from Hwy 17 to County Road 4. Light damage was also observed on a young balsam poplar hedgerow in Haley Station, White Water Region, Renfrew County.

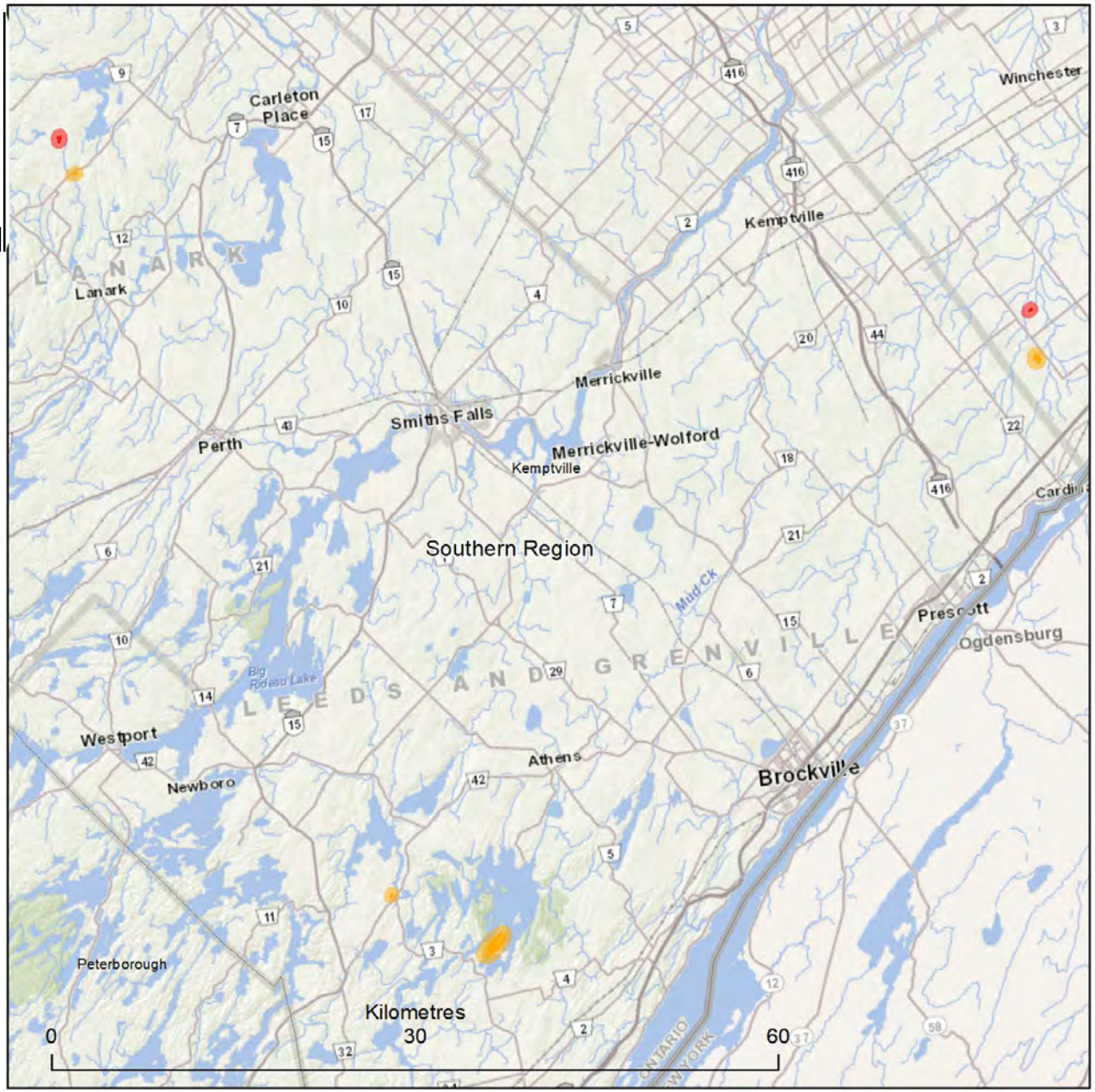
Septoria leaf spot 2019

Areas in Southern Region where septoria leaf spot caused damage

Light = 243 ha
Moderate-to-severe = 25 ha

Area of light damage

Area of moderate to severe damage



Spruce budworm

Pest information

Common name:	Spruce budworm
Scientific name:	*Choristoneura fumiferana* Clemens
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	White spruce, balsam fir
Infestation area:	484 ha light defoliation 342,333 ha moderate to severe defoliation and 2,427 ha mortality

Provincial key facts

- Spruce budworm is one of the most damaging native insects affecting fir and spruce in Ontario.
- Spruce budworm outbreaks occur periodically when the primary host, balsam fir, reaches 40 years of age.
- Outbreaks can last several decades and can result in extensive mortality to balsam fir and spruce.
- In 2019, most of recorded defoliation was mapped in Northeast Region, and some in the Southern Region, with minimal spruce budworm activity in the Northwest.
- The area of moderate to severe spruce budworm defoliation in Northeast Region increased in 2019 to 339,580 ha from 137,008 ha in 2018.

Regional summary

Northwest:

- In Red Lake District, light to moderate defoliation from spruce budworm was observed on understory black and white spruce crowns on Nungessor Lake. Jack pine stands in this area were also severely defoliated by jack pine budworm, with only a few spruce budworm larvae collected and confirmed by diagnostics.

Northeast:

- In Cochrane District, a marked increase of moderate to severe defoliation on white spruce and balsam fir was mapped in the southwest corner of the district. Moderate to severe defoliation went from 31,841 ha in 2018 to 109,026 ha in 2019, and represented almost a third of all spruce budworm defoliation in Northeast Region. The most concentrated areas of moderate to severe defoliation stretched from the Hearst/Cochrane district

boundary just west of Smooth Rock Falls south to the Timmins District boundary, east to Iroquois Falls, and north to the Zinger and Potter lakes area in the northeast corner of Potter Twp. Smaller areas of moderate to severe defoliation were evident northeast of Iroquois Falls on the northwest side of Lake Abitibi in Pliny and Henley townships. Small areas of light defoliation were mixed into the edge of the moderate to severe defoliation east of Cochrane along Hwy 662 in Freele Twp. A few other small areas of light defoliation were mixed with areas of moderate to severe defoliation but, in all, light defoliation totalled only 47 ha.

- In Hearst District, the area of moderate to severe spruce budworm defoliation increased from 16,522 ha in 2018 to 72,338 ha in 2019. of the moderate to severe defoliation was mapped in the southeast corner of the district along the Groundhog River south of Fauquier down to the Timmins/Chapleau district boundary. Moderate to severe defoliation was also mapped north of Fauquier on the west side of the Groundhog River to just north of Rene Brunelle Provincial Park in Torrance, Gurney, and Beardmore townships. A small area (32 ha) of mortality was observed in the northern part of Griffin Twp, northeast of Griffin Lake.
- A total of 67,918 ha of moderate to severe defoliation, 2,164 ha of light defoliation, and 154 ha of mortality were mapped in Chapleau District. Most of the moderate to severe defoliation was mapped in the northeast corner of the district from the Hearst District boundary to the east side of Foleyet close to the south end of the Groundhog River at Groundhog Lake. This area stretched east to the Timmins District boundary. Smaller areas of defoliation were mapped farther south around Rush Lake, mostly in Genoa Twp. Light spruce budworm defoliation was mapped on the west side of the infestation starting at the northern border of Lincoln Twp, north to the south end of Amundsen Twp, east of Kapuskasing Lake. Light defoliation was also recorded south of Hwy 101, in Ivanhoe Provincial Park, and on Foleyet Timber Road to Sultan Industrial Road. In the northeast part of Chapleau District, mortality from spruce budworm was mapped north of Foleyet at the north end of Shenango Twp, north into Lougheed Twp, northeast into Ossin Twp, and north into Wadsworth Twp. Spruce decline, caused by consecutive years of moderate to severe spruce budworm defoliation, was observed in southwest Shenango Twp on Oates Road. Mortality was also found on balsam fir, but not enough to be aerially mapped.
- Moderate to severe spruce budworm defoliation increased by almost 37,000 ha in Timmins District with 60,175 ha of defoliation tallied. Much of the defoliation was observed in the northern part of the district above Hwy 101. Small areas of defoliation were observed south of Hwy 101 south of Timmins, west and east of Night Hawk Lake, and near Horwood Lake. One small area of light defoliation (13 ha) was mapped in Timmins District southwest of Timmins on the north side of Opishing Lake in Dana Jowsey Lakes Provincial Park. During ground surveys, a black spruce stand with light defoliation was observed along Malette Lumber Road.
- In North Bay District, moderate to severe spruce budworm defoliation decreased from 33,933 ha in 2018 to 15,154 ha in 2019. Most of the moderate to severe defoliation was north of North Bay stretching up to Brute Lake in the south end of Burnaby Twp and east to the provincial border by Temiscaming. At the northern end of the district, small areas of defoliation were recorded south of Latchford to the east side of Friday Lake, and north and south of both Cobalt and New Liskeard near Lake Timiskaming. Another small area of defoliation was aerially mapped north of Marten River Provincial Park from the junction of Hwy 64 and Hwy 11 north to the

junction of Hwy 11 and Wilson Lake Road. Small scattered areas of defoliation were also mapped in several areas south of North Bay including near Dokis, northeast of Nipissing, north and south of Callander, south of Bonfield and Mattawa, and north of Samuel de Champlain Provincial Park. West of North Bay, areas of defoliation were mapped along the Hwy 17 corridor to north of Sturgeon Falls at the south end of Tomiko and Chebogomog lakes. White spruce and balsam fir mortality (231 ha) was mapped north of North Bay on the southwest side of the airport and south of Little Tomiko Lake. Further north, five small areas of mortality were mapped between Latour Lake and Montreal River southeast of Latchford in the southwest corner of Lorrain Twp.

- After three years of little or no spruce budworm defoliation in Sudbury District, 9,635 ha was recorded in 2019. Most of the moderate to severe defoliation was in the southcentral part of the district, which included areas northwest of Sudbury along Hwy 144 to Geneva Lake, along Hwy 17 west of Sudbury to Massey, going as far north as Vermillion Lake and stopping just north of the La Cloche Ridge. On Manitoulin Island, five small areas of defoliation were mapped north of South Baymouth. South of Sudbury, small areas of defoliation were recorded on the northwest side of Killarney Provincial Park and farther southeast, near the Parry Sound District boundary, three small areas of defoliation were observed south of Wolseley Bay.
- In Sault Ste. Marie District, moderate to severe spruce budworm defoliation (4,363 ha) was aerially mapped in the southcentral and southwest parts of the district. Most of the defoliation was in the southcentral part of the district north of Thessalon and northwest of Bruce Mines as well as on the northern part of St. Joseph Island. North of Thessalon, moderate to severe defoliation was recorded between Basswood and Rock lakes stretching from Aberdeen Twp in the north to Thessalon Twp in the south. Defoliation northwest of Bruce Mines was primarily in Aberdeen Additional and Johnson townships near McCarrell and Gordon lakes including several areas of defoliation northwest of Desbarats in Laird, Tarbutt, and Tarbutt Additional townships. On the northern part of St. Joseph Island, moderate to severe defoliation was observed south of Richards Landing, northwest of Hilton Beach between V Line and 20th Sideroad, and in the Kentvale area between I line and P Line. Two small areas of defoliation were recorded on the southeast side of the island, one on the west side of Moffatt Bay between X Line and Old Moffat Bay Road, the other at the junction of W Line, Garside Road, and Hwy 548. Moderate to severe spruce budworm defoliation, to a lesser extent, was mapped on the southwest side of the district north of the city of Sault Ste. Marie. Most of this defoliation was in the Heyden area between Trout Lake and West Root River in Aweres and Pennefather townships. Three smaller areas were recorded closer to the City of Sault Ste. Marie. One between 4th Line and Landslide Road along the Root River, another off the north end of Allen Sideroad near Allard Lake, and a third towards the airport near Carpin Beach along Big Carp River in Awenge Twp. Most of the hosts were white spruce but balsam fir had the most severe defoliation.
- In Kirkland Lake District, 972 ha of moderate to severe spruce budworm defoliation were mapped in the southern part of the district. The area included locations just west of Gowganda, north of Dymond, northeast and west of Thornloe, and southeast of Elk Lake.

Southern:

- In the northeast part of Parry Sound District, moderate to severe defoliation was mapped north of Magnetawan to Eagle Lake, north of Burk's Falls, and east of Grundy Lake Provincial Park. These three areas totalled 2,753 ha.
- In Peterborough District, light defoliation (268 ha) was aerially mapped in and around Balsam Lake Provincial Park, Bexley Twp. Large stands of mature white spruce were affected. This is the fourth consecutive year that defoliation was mapped in the park. Branch dieback and whole tree mortality has also been observed in affected stands.

Trend analysis/outlook/issues

Spruce budworm pheromone trapping

In 2019, pheromone traps were deployed in 61 locations across the province. Northeast Region had an average of 306 moths per trap, which was an increase from the 2018 average of 192 moths per trap. Both the Northwest and Southern region averages increased slightly with 27 and 230 moths per trap, respectively.

Spruce budworm defoliation forecast survey

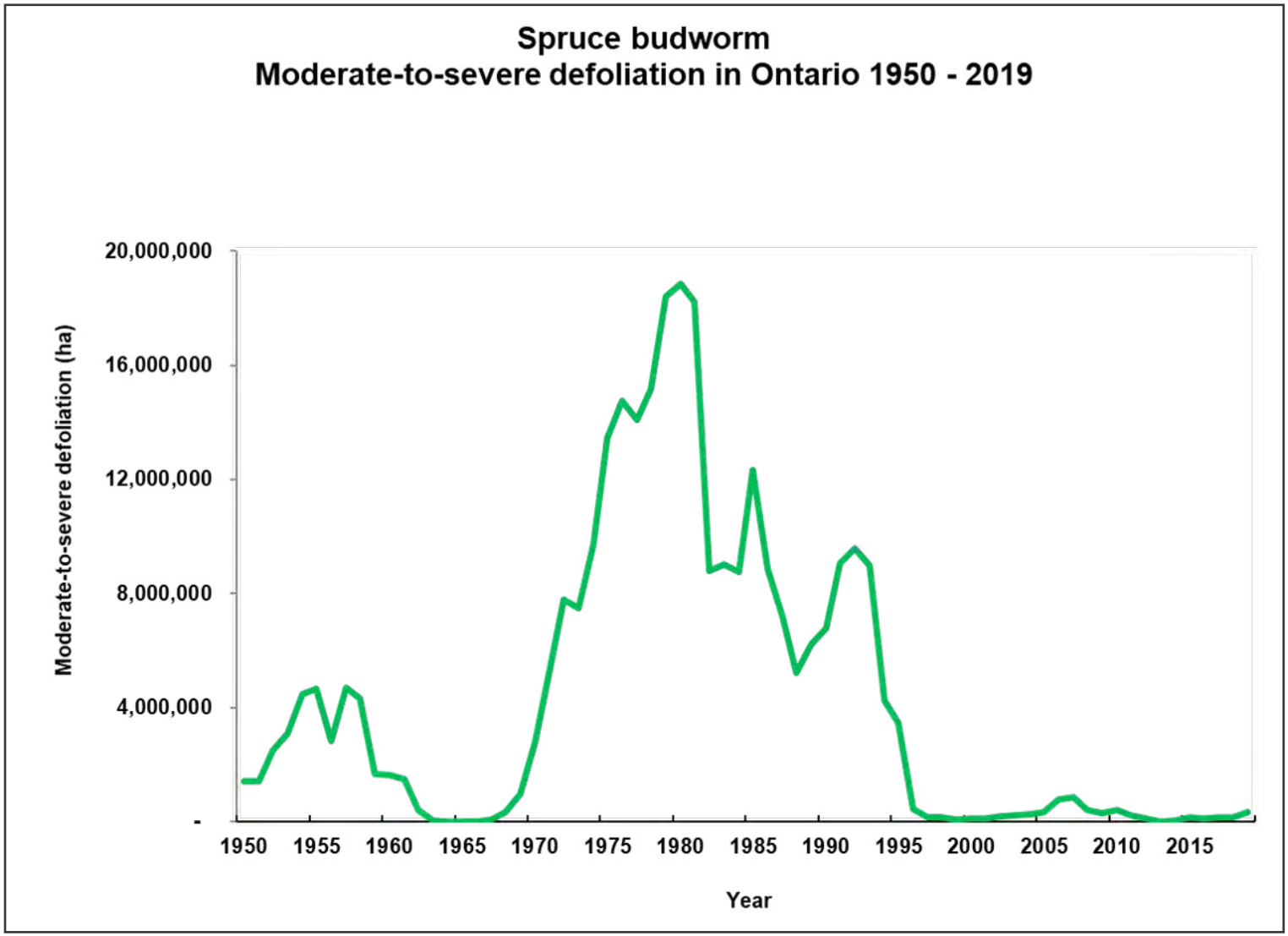
In Ontario, spruce budworm defoliation forecasting is based on surveys of the number of overwintering larvae (L2) on tree branches. Locations for L2 surveys are selected based on defoliation mapped during the current infestation, generally in or near the current defoliation. From each location, 10 trees were selected, and a 1 m branch was sampled from the mid- to upper crown of each tree. Branches were sent to a laboratory to be processed in a sodium hydroxide washing procedure that extracts the second instar larvae from their hibernacula. Extracted larvae were collected and counted under a microscope to determine the average number of larvae per branch for each sample location. This average was used to forecast the expected spruce budworm defoliation in 2020. An average of more than 65 larvae per branch indicates potential for severe defoliation. Moderate defoliation is forecasted when 26 to 65 larvae are found per branch. Light defoliation can be expected when 25 or fewer larvae are found on each branch.

In Northeast Region, a total of 10 locations (100 trees) were sampled in 2019. Half of these locations were in Cochrane District, two in Timmins District, two in Chapleau District, and one in Hearst District. Defoliation is forecast to be severe in four of the 10 locations, with the highest average number of L2 per branch (160) in Hearst District. Five locations have a moderate defoliation forecast for 2020 and only one location has a light defoliation forecast, although the average number of L2 per branch (21) is approaching the moderate forecast level.

Total area (in hectares) in which spruce budworm caused moderate to severe defoliation from 2015 to 2019 by MNRF district.

Region	Area of defoliation (ha)				
District	2015	2016	2017	2018	2019
Northeast					
Chapleau	21,167	78,629	22,429	30,680	67,918
Cochrane	-	3,025	53,967	31,841	109,026
Hearst	1,134	15,761	22,168	16,522	72,338
Kirkland Lake	-	-	132	-	972
North Bay	119,184	8,995	4,058	33,933	15,154
Sault Ste. Marie	3,952	-	-	-	4,363
Sudbury	2,368	549	-	803	9,635
Timmins	736	8,918	43,772	23,230	60,175
Wawa	-	-	-	-	-
Sub total	148,542	115,877	146,525	137,008	339,580
Southern					
Algonquin Park	-	-	-	-	-
Aurora	-	-	-	-	-
Aylmer	-	-	-	-	-
Bancroft	-	-	55	-	-
Guelph	-	-	-	-	-
Kemptville	-	-	-	-	-
Midhurst	-	-	-	-	-
Parry Sound	-	-	-	-	2,753
Pembroke	-	-	-	-	-
Peterborough	-	146	492	74	-
Sub total	0	146	547	74	2,753
Provincial total	148,542	116,023	147,072	137,082	342,333

Area (in hectares) in which spruce budworm caused moderate to severe defoliation in Ontario, 1950 to 2019.

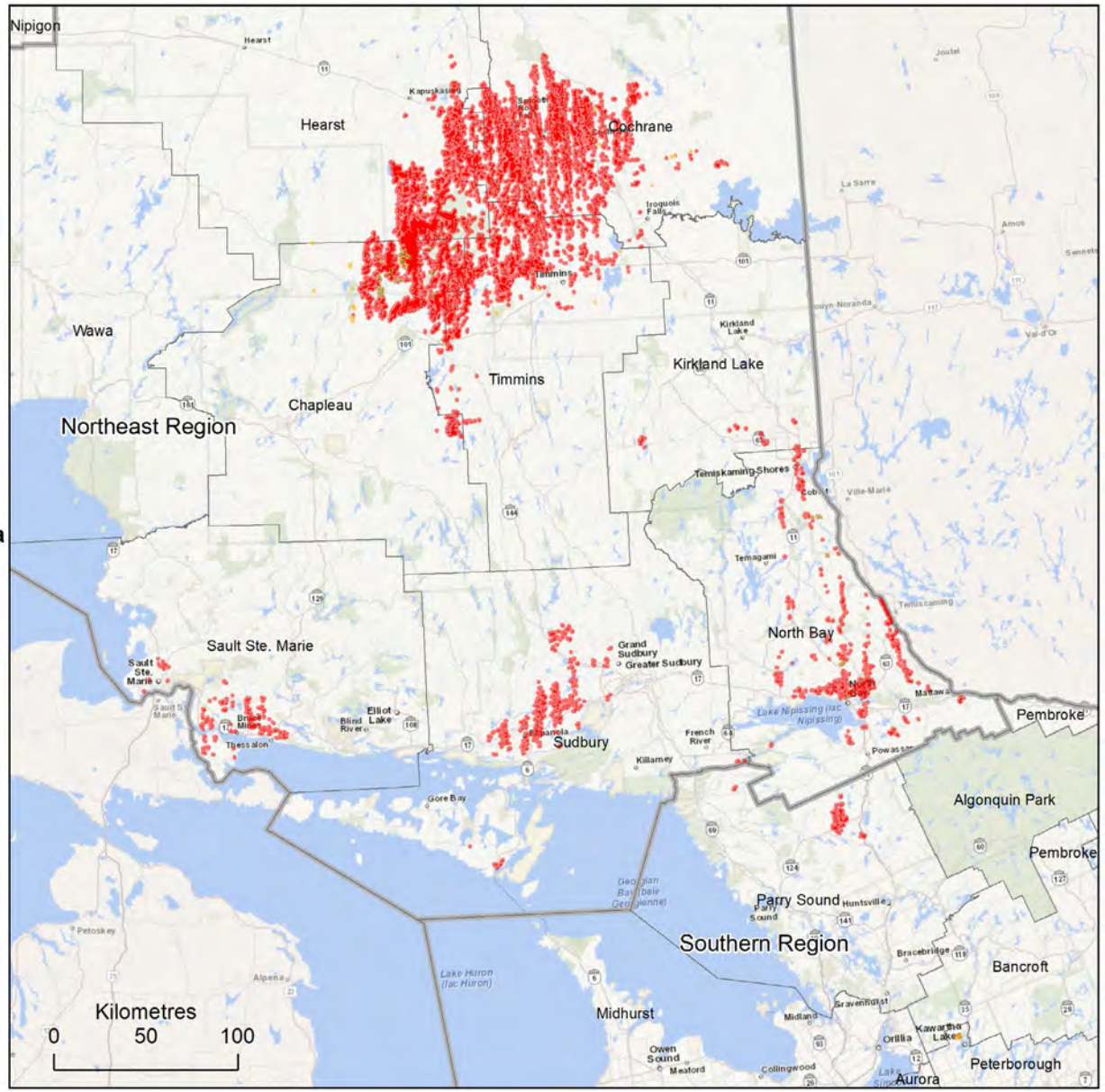


Spruce budworm 2019

Areas in Ontario where spruce budworm caused defoliation

Light = 484 ha
Moderate-to-severe = 342,333 ha
Mortality = 2,427 ha

- Area of light defoliation
- Area of moderate to severe defoliation
- Area of mortality

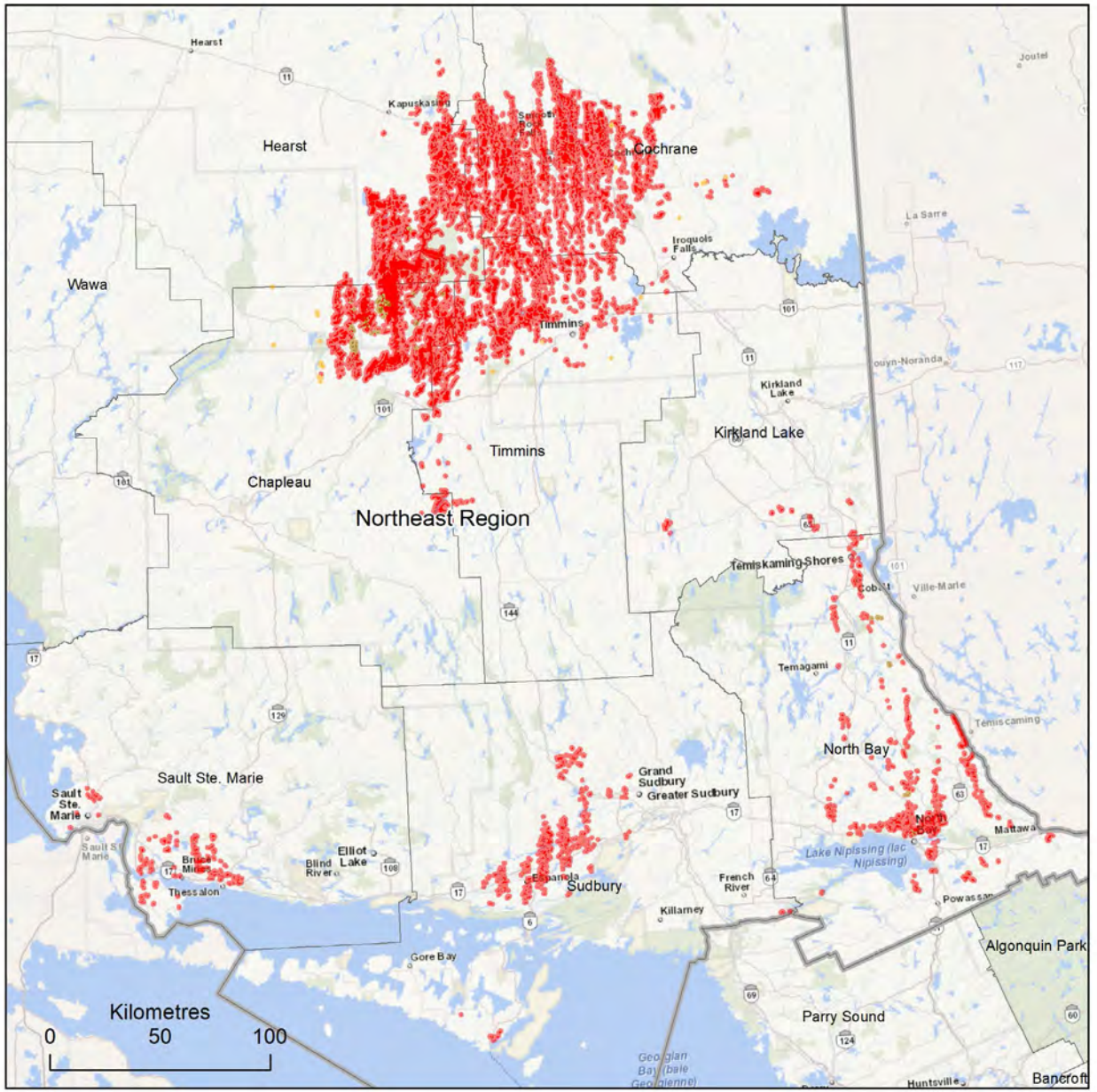


Spruce budworm 2019

Areas in Northeast Region where spruce budworm caused defoliation

Light = 216 ha
Moderate-to-severe = 339,580 ha
Mortality = 2,427 ha

- Area of light defoliation
- Area of moderate to severe defoliation
- Area of mortality



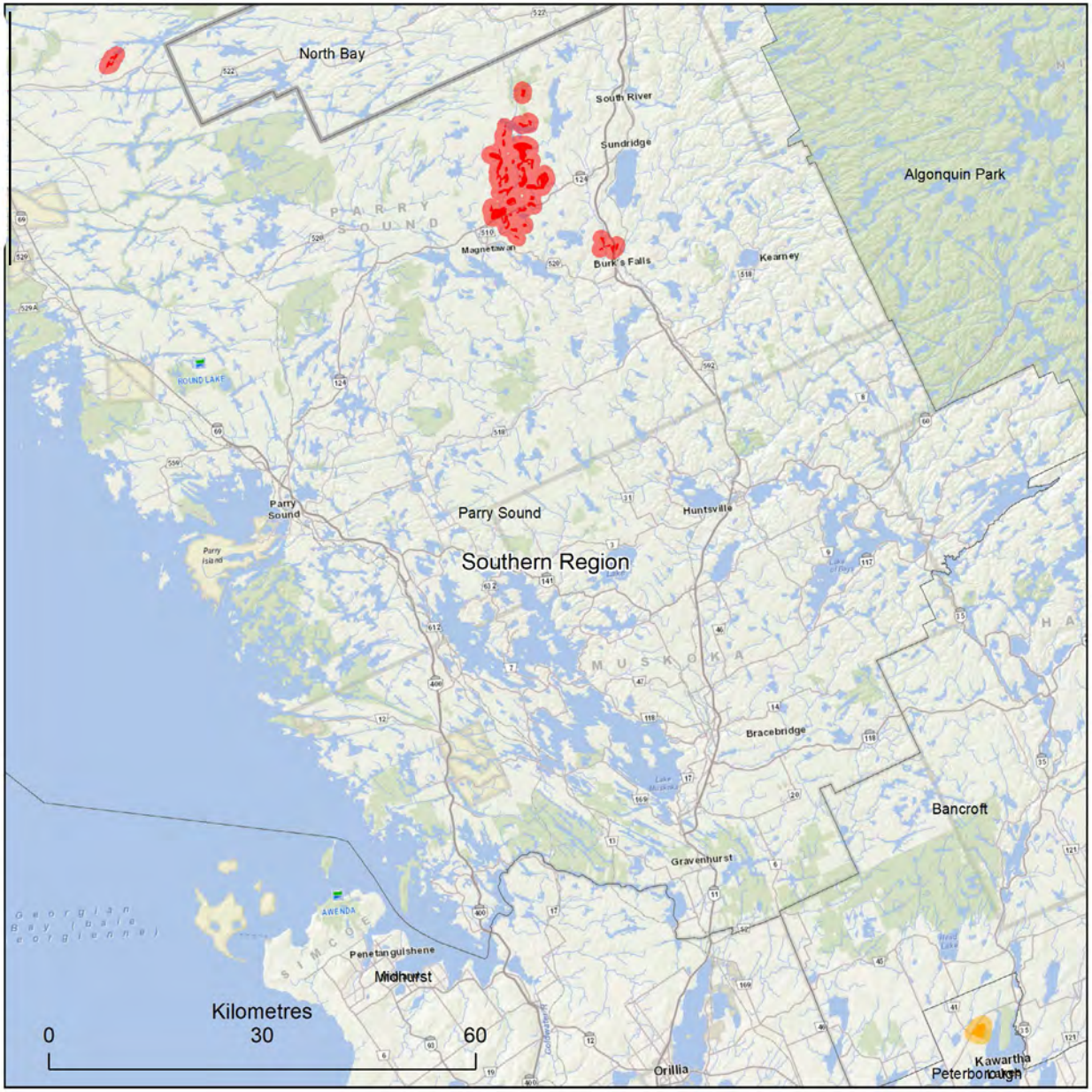
Spruce budworm 2019

Areas in Southern Region where spruce budworm caused defoliation

Light = 268 ha
Moderate-to-severe = 2753 ha

Area of light defoliation

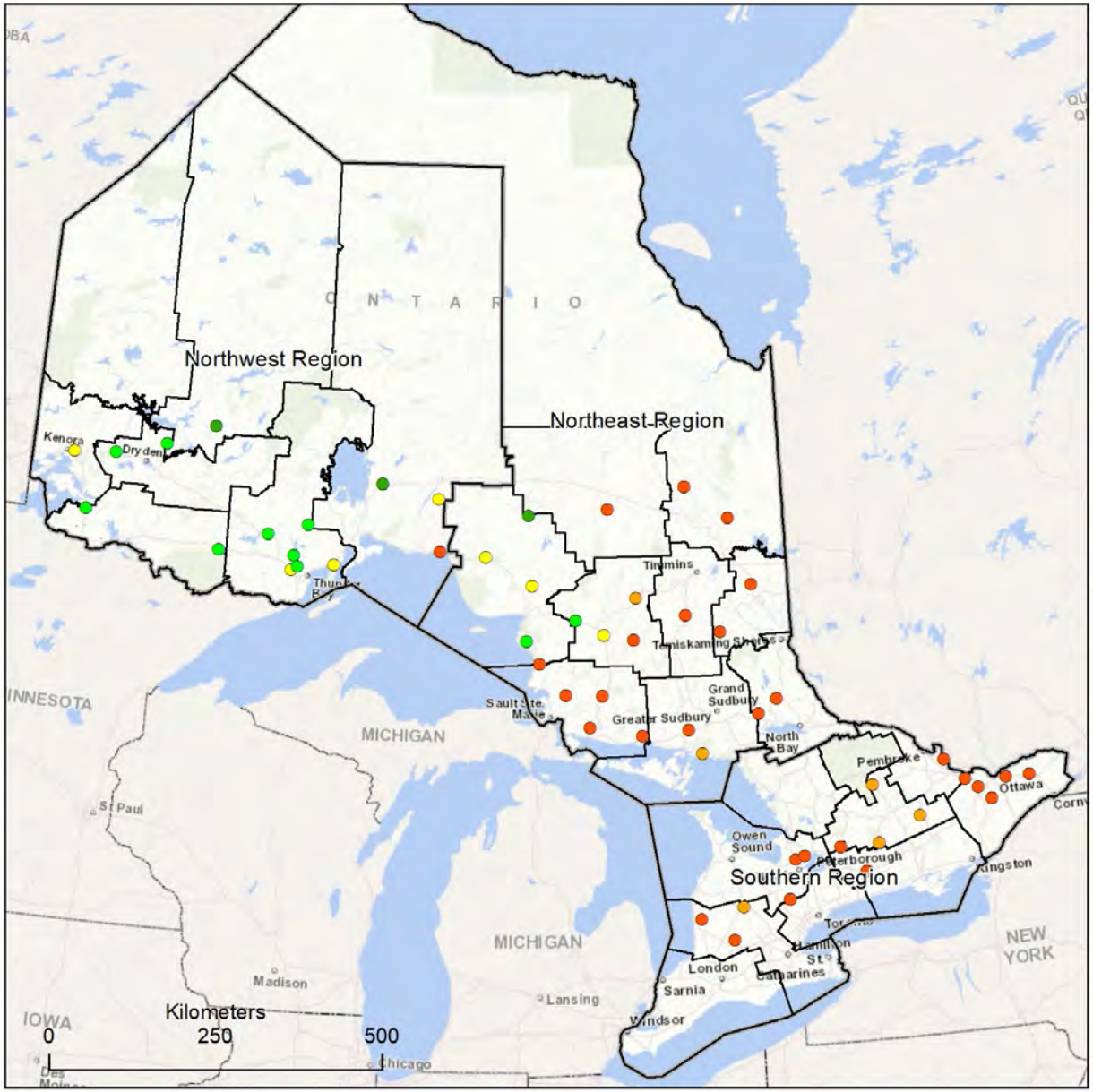
Area of moderate to severe defoliation



Spruce budworm Pheromone Trapping Results 2019

Average Number of Moths per Trap

- < 10
- 10 - 25
- 25 - 50
- 50 - 100
- > 100



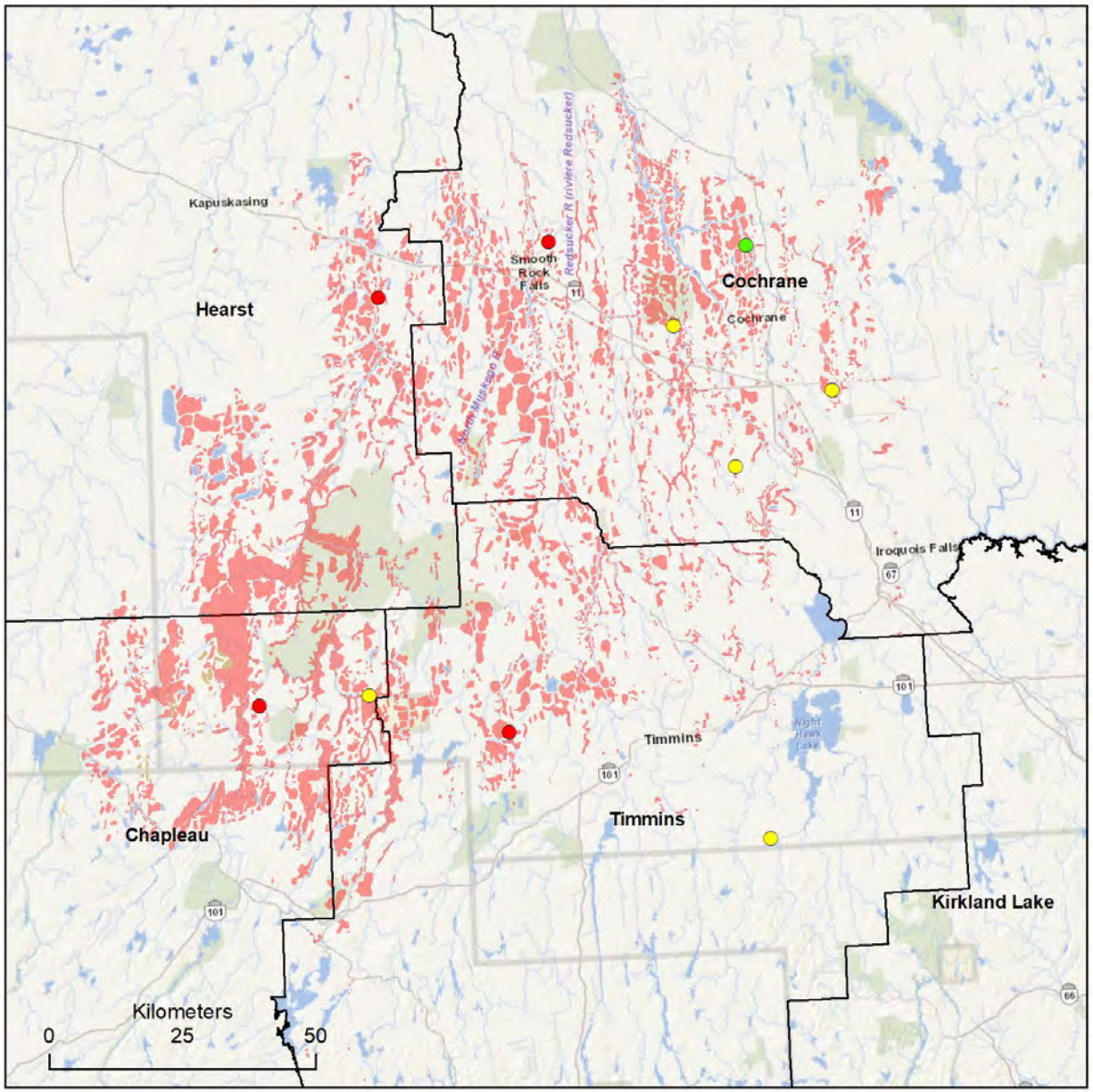
Spruce budworm second instar larvae survey results

Defoliation Forecast 2020

- Severe
- Moderate
- Light

Spruce Budworm Defoliation 2019

- Area of moderate to severe defoliation
- Area of light defoliation
- Area of mortality



Minor forest disturbances

Aspen leafblotch miner

Pest information

Common name:	Aspen leafblotch miner
Scientific name:	*Phyllonorycter ontario* (Free)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Trembling and largetooth aspen
Infestation area:	Localized

Provincial key facts

- Aspen leafblotch miner is the most common leafminer in Ontario.
- It prefers young trembling and largetooth aspen.
- Larvae mine between the upper and lower surface of leaves giving them a blotched appearance.
- When larvae first develop, blotches are not always visible on the top side of the leaf.
- Tree mortality is rare, but repeated infestations may reduce tree health and growth rate.
- In 2019, this insect was only reported in Northeast Region.

Regional summary

Northeast:

- In Wawa District, moderate to severe aspen leafblotch miner defoliation was recorded north of Manitouwadge along Lunam Road, off Caramat Industrial Road. Defoliation was also observed on understory trembling aspen in White Lake Provincial Park with about 65% of the aspen having 80 to 90% defoliation.
- In Chapleau District, just northeast of the town of Sultan, understory trembling aspen had moderate to severe defoliation from aspen leafblotch miner.

- In Timmins District, early in the field season, high populations of overwintering aspen leafblotch miner moths were detected in mature jack pine stands. As the season progressed, light to moderate populations were found mining leaves in areas around the City of Timmins. In the remainder of the district, small areas with 30 to 50% defoliation were recorded.
- In Cochrane District, aspen leafblotch miner moths were observed in mature jack pine stands. Light to moderate populations were found mining trembling aspen leaves in the southern portion of the district. Observations throughout the district indicated that 25-45% of young to semi-mature trembling aspen were affected with 30 to 65% defoliation.
- In Sault Ste. Marie District in late summer, aspen leafblotch miner defoliation was observed in the north central part of Sault Ste. Marie District. Defoliation was most severe on understory and intermediate trembling aspen along the Hwy 129 corridor near Aubrey Lake and further north near the Chapleau District boundary at Pine Lake. Severe defoliation gave the trembling aspen stands a silvery grey appearance in late August.
- In North Bay and Sudbury districts, moderate aspen leafblotch miner defoliation was observed on trembling aspen along the southern part of Hwy 64 from Alban to Dokis.

Aspen twoleaf tier

Pest information

Common name:	Aspen twoleaf tier
Scientific name:	*Enargia decolor* (Wlk.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Trembling aspen
Infestation area:	Localized

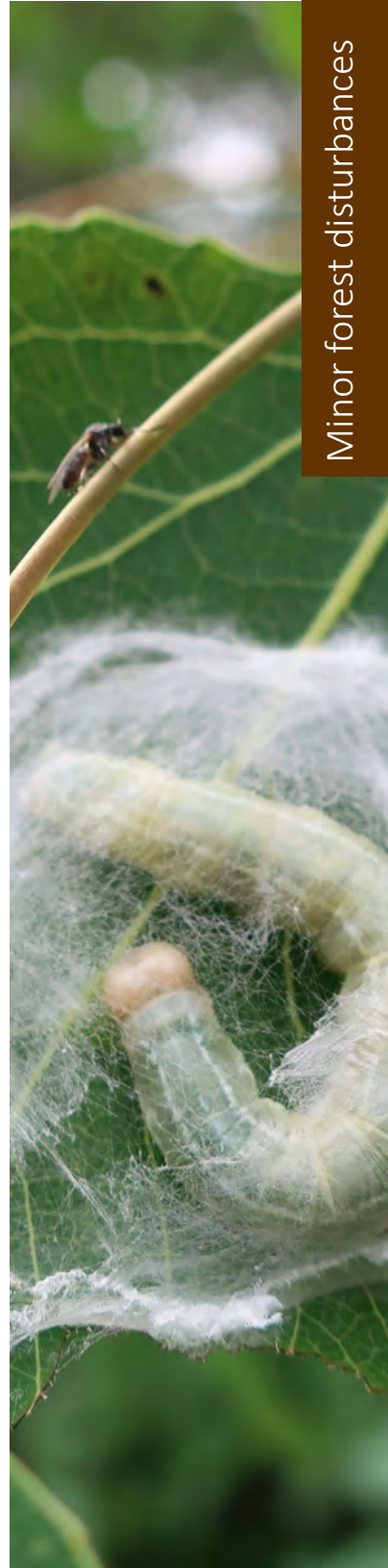
Provincial key facts

- Periodic outbreaks of aspen twoleaf tier have occurred frequently since the 1950s.
- Defoliation can be severe during outbreaks.
- Effects of aspen twoleaf tier on tree health are usually minimal, unless other stressors are present.
- Outbreaks of this pest often occur with other defoliators such as large aspen tortrix.
- The most recent large-scale outbreak occurred in the 1990s, peaking at 3,008,502 ha of moderate to severe defoliation across Northeast Region.
- In 2019, aspen twoleaf tier was observed in the same areas as large aspen tortrix in Chapleau and Wawa districts, however, large aspen tortrix was the main defoliator in these areas.

Regional summary

Northeast:

- In Chapleau District, in stands of trembling aspen at Ivanhoe Provincial Park, aspen twoleaf tier was found in conjunction with large aspen tortrix defoliation. One area of defoliation was at the corner of Hwy 101 and the park access road, and the other was on top of an esker running through the park. The main defoliator in these stands was large aspen tortrix.
- In Wawa District, aspen twoleaf tier was collected off Ripple Lake Road, on the southeast side of Sampson Twp. Light defoliation was observed on large trembling aspen trees in the area.



Balsam poplar leafblotch miner

Pest information

Common name:	Balsam poplar leafblotch miner
Scientific name:	*Phyllonorycter nipigion* (Free.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Balsam poplar
Infestation area:	Localized

Provincial key facts

- Balsam leafblotch miner occurs occasionally in large numbers in Ontario and infestations are short lived.
- This pest of balsam polar is more common north and west of Lake Superior.
- The balsam leafblotch miner is closely related to the aspen leafblotch miner.
- In 2019, this insect was reported in the Northeast region.

Regional summary

Northeast:

- In Kirkland Lake District, moderate to severe defoliation of balsam poplar was observed, alongside septoria leaf disease, on Hwy 11 south of Matheson to Hwy 66, along Hwy 66 from Hwy 11 to King Kirkland and south of Larder Lake along Hwy 624.

Balsam twig aphid

Pest information

Common name:	Balsam twig aphid
Scientific name:	*Mindarus abietinus* Koch
Pest origin:	Native to North America
Pest type:	Sap feeder
Host species:	Balsam fir, white spruce
Infestation area:	Localized

Provincial key facts

- Balsam twig aphids feed primarily on new foliage and have between three and four generations between May and June.
- Feeding by this aphid twists and curls the needles and in severe cases may cause needle drop.
- The aphids excrete large amounts of honeydew causing saturated needles to stick together that may form a sooty mold.
- Damage can impede tree growth and lower the quality of balsam fir and spruce in Christmas tree farms.
- This minor pest was report in Northwest and Northeast regions in 2019.

Regional summary

Northeast:

- In Thunder Bay District, varying levels of balsam twig aphid damage were noted in the south-central part of the district. Moderate to severe balsam twig aphid damage was recorded on fringe mature balsam fir trees along the Hwy 17 corridor northeast of Thunder Bay from the Hodder Avenue exit to the Lakeshore Drive exit. Moderate to severe damage was also found on fringe balsam fir west of Thunder Bay at the junction of Auto Road and Hwy 17, as well as roadside balsam fir on Carlson Road between Thunder Bay and the community of Lappe and a little further north in Silver Falls Provincial Park, southwest of Dog Lake. Moderate damage was recorded along the Sleeping Giant Provincial Park emergency road adjacent to Pass Lake Campground as well as along Pass Lake Road to Hwy 17. Light to moderate balsam twig aphid damage was also evident in the City of Thunder Bay along walking trails at Boulevard Lake and throughout Centennial Park.

Northeast:

- In Wawa District, light balsam twig aphid damage was observed on mature white spruce in two mixedwood stands. Areas included the east end of Wawa Lake north of Wawa and the south end of Tremblay Flats Road, south of Wawa.

Banded tussock moth

Pest information

Common name:	Banded tussock moth
Scientific name:	*Halysidota tessellaris* (J.E. Smith)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Basswood, oak, maple, cherry, birch, willow
Infestation area:	Localized

Provincial key facts

- Banded tussock moth, also referred to as pale tussock moth, is distributed throughout southern Canada and the eastern United States.
- The adults fly from June to August and overwinter as a cocoon.
- No serious damage from this pest has been reported in Ontario.
- In 2019, banded tussock moth was recorded in two districts in Southern Region.

Regional summary

Southern:

- In Midhurst District, banded tussock moth was collected in the northeast part of Simcoe County in Tiny Twp, along North Shore Drive, east of the community of Cedar Point. Defoliation ranged from 5 to 50% on fringe basswood trees next to a stand of red oak and white ash. Larvae were also discovered at the Wildman Tract on overstory red oak, sugar maple, basswood, and cherry. Half eaten leaves were falling, with the worn edge of gypsy moth feeding from earlier in the season and new feeding of tussock moth larvae both visible. Defoliation totalled 50% between the two insects at the Wildman Tract. Reports from forestry staff placed tussock moth throughout Grey, Bruce, Simcoe, and Dufferin counties.
- In Parry Sound District along the border of Midhurst District, banded tussock moth was feeding on a young red oak along South Beach Road. This lone tree was 60% defoliated.

Basswood leafminer

Pest information

Common name:	Basswood leafminer
Scientific name:	*Baliosus nervosus* (Panz.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Basswood
Infestation area:	Localized

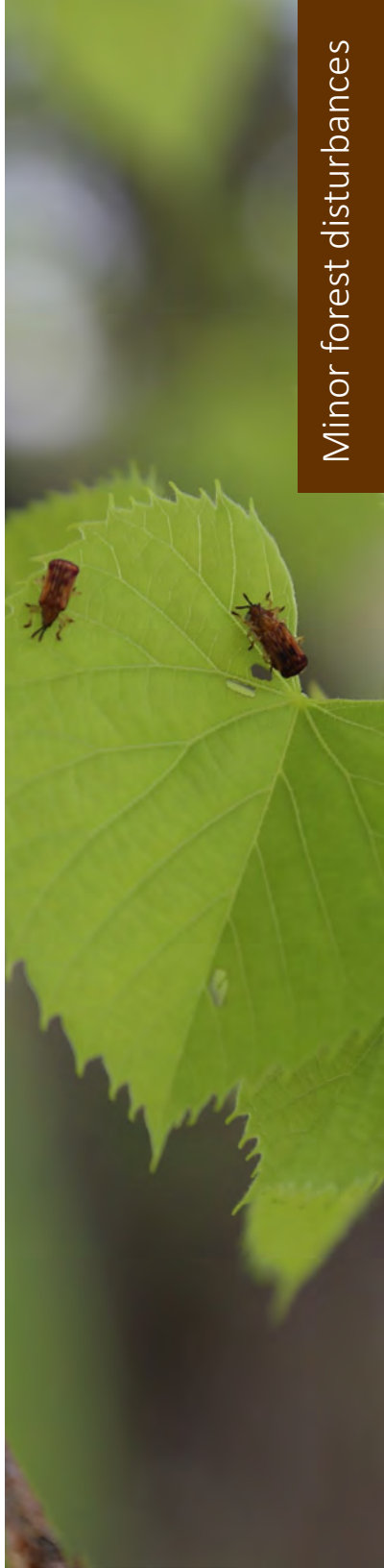
Provincial key facts

- Basswood leafminer is distributed through the range of basswood in Ontario.
- The adults skeletonize the upper layer of the leaf and the larvae mine the leaves.
- Basswood leafminer are often found throughout southern Ontario, with minor feeding damage on edge and understory trees. During periodic outbreaks, mature trees can be defoliated to the upper crown.
- In 2019, basswood leafminer was recorded in two districts in Southern Region.

Regional summary

Southern:

- In June in Aylmer District, basswood leafminer adults were feeding on woodlot trees of all ages causing severe defoliation and early leaf drop (August). Areas most affected were near Rodney and West Lorne in West Elgin, Elgin County; Ridgetown and Bothwell in eastern Chatham-Kent County; Alvinston in Brooke-Alvinston, Lambton County; and around Wardsville and Newbury in Southwest Middlesex, Middlesex County.
- In Midhurst District, basswood leafminer adults were present causing moderate defoliation on young basswood trees near Ferndale in North Bruce Peninsula, Bruce County.



Beech scale

Pest information

Common name:	Beech scale
Scientific name:	*Cryptococcus fagisuga Linding.*
Pest origin:	Invasive – native to Europe
Pest type:	Sucking insect
Host species:	American beech
Infestation area:	Localized

Provincial key facts

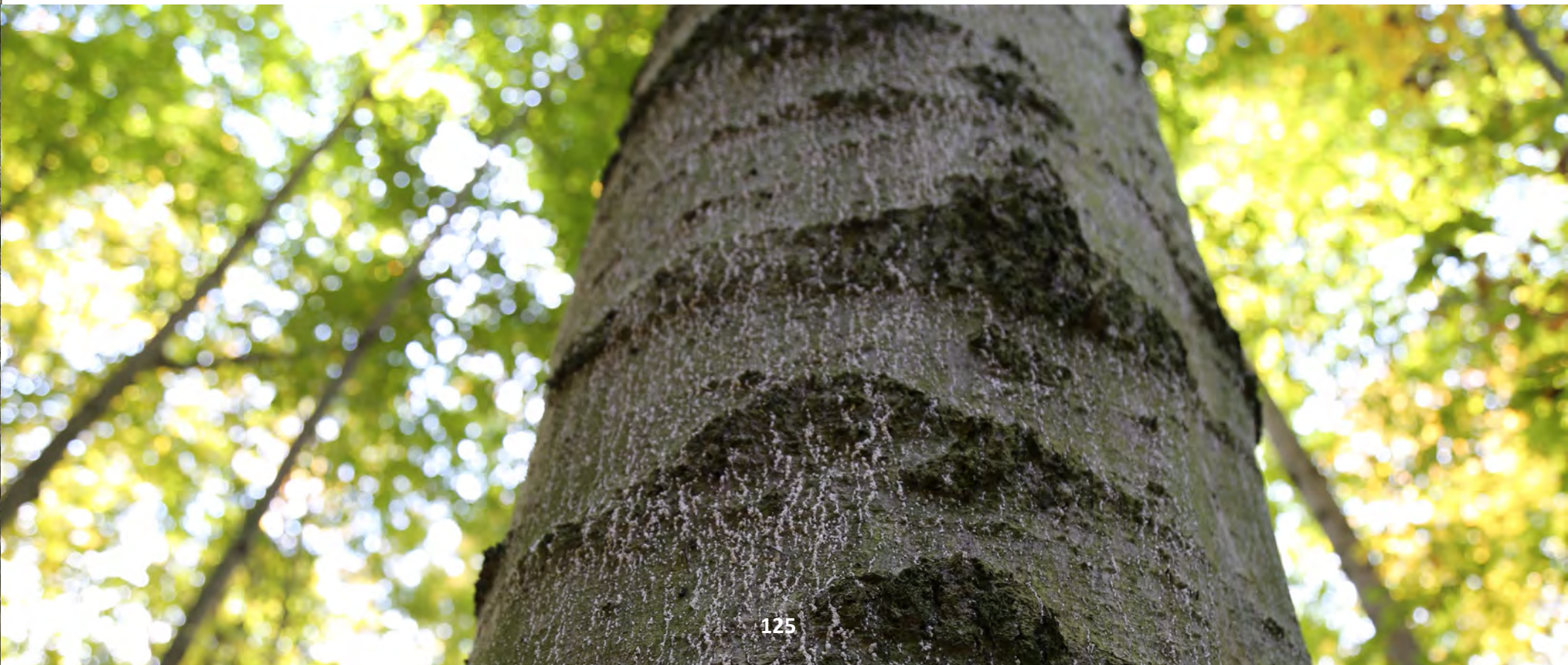
- Beech scale was first found in Canada in the 1890s in Halifax, Nova Scotia.
- In Ontario, it was first found in 1966 in Elgin County along the north shore of Lake Erie.
- This insect is now found across the range of beech in Ontario.
- Infestation with scale predisposes beech trees to beech bark disease, which greatly reduces beech tree vigour and causes mortality.
- In 2019, new detections and collections of beech scale were only made in Southern Region.

Regional summary

Southern:

- In Kemptville District, heavy beech scale was observed in a mature stand of managed sugar maple and eastern hemlock on Lanark 10th Concession B, in the Lanark Highlands, Lanark County. Ninety-five percent of beech trees were affected.
- In Midhurst District, populations of beech scale were detected at four locations in Bruce County. Moderate scale levels were observed at Stoney Island Conservation Area north of Kincardine on Lake Huron in the Municipality of Kincardine. In Northern Bruce Peninsula, low levels of beech scale were detected on larger diameter beech trees in a forest south of Cameron Lake along Dorcas Bay Road in Bruce Peninsula National Park. Populations of beech scale were also detected in two locations in the eastern boundary of Huron Kinloss Twp. Moderate scale levels were detected in a maple and beech stand along Kairshea Road., and moderate to heavy levels of scale were detected in a woodlot along Culross Townline.

- In Aylmer District, trace to heavy scale populations were observed on large diameter beech trees along a main trail at Parkhill Conservation Area, east of Parkhill in North Middlesex, Middlesex County. Trace to light scale populations were also detected on large diameter beech trees along the Ausable River Valley from Elm Tree Lane north to Elginfield Road (County Road 7) at the boundary of Middlesex and Lambton counties. In Elgin County, light scale populations were observed on larger diameter beech in a woodlot south of Rodney in Aldborough Twp. In Chatham-Kent County, trace scale populations were reported on larger diameter beech trees at a conservation area south of Blenheim in Chatham-Kent County. This represents the furthest point west that beech scale has been collected in Aylmer District.
- In Bancroft District, trace beech scale populations were detected in a mixed sugar maple and beech forest on Paterson Road near Maynooth, Herschel Twp in Hastings County. All trees at this location appeared healthy, with no signs of beech bark disease observed.
- In Guelph District, beech scale was collected at two locations in Huron County. Scale populations ranging from light to heavy were observed on large diameter beech trees in the western section of a conservation area in Exeter. Trace to light scale populations were observed on larger diameter beech trees in a forest on the south edge of Goderich. No beech bark disease was observed at either location.



Dutch elm disease

Pest information

Common name:	Dutch elm disease
Scientific name:	*Ophiostoma ulmi* (Buisman) Nannf.
Pest origin:	Invasive – native to Asia
Pest type:	Vascular disease
Host species:	Elm species
Infestation area:	Localized

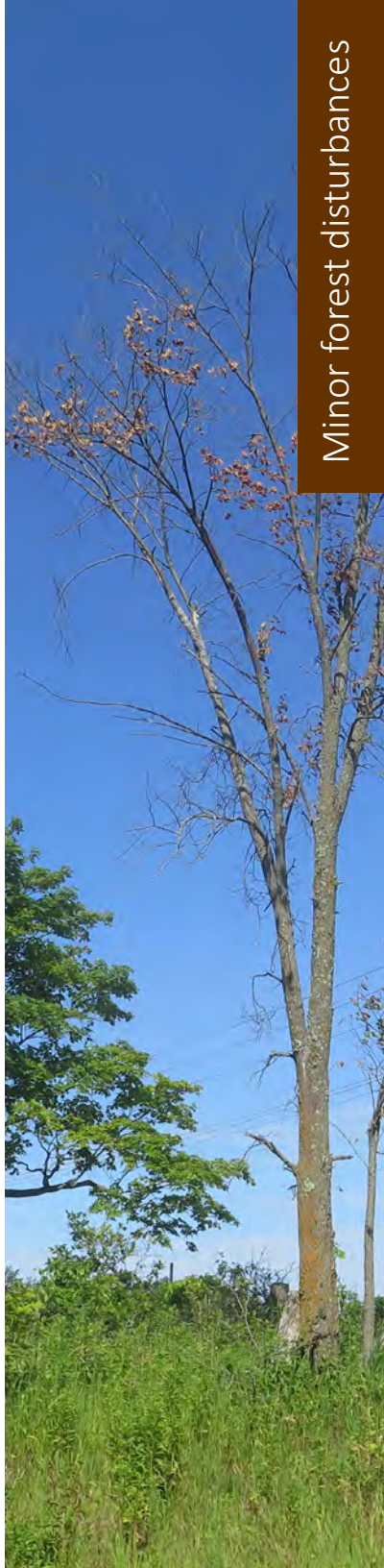
Provincial key facts

- Dutch elm disease was first introduced to North America in the early 1930s and quickly spread across eastern North America and into Ontario in the mid 1940s.
- European elm bark beetle and the native elm bark beetle are the main vectors of Dutch elm disease. Root grafting is another way the disease spreads. The banded elm bark beetle is also a vector of Dutch elm disease, but this beetle is not as abundant in Ontario.
- Dutch elm disease is now found throughout the natural range of elm in Ontario. In 2019, symptoms of the disease were observed in Northeast and Southern regions, in areas where elms were reportedly healthy in previous years.

Regional summary

Northeast:

- In Kirkland Lake District, discolouration of foliage on branches (flagging) caused by Dutch elm disease was observed on white elm trees, particularly along the Wabi River near New Liskeard.
- In North Bay District, west of North Bay to Sturgeon Falls, large diameter white elm trees had infected branches. In some cases, branches throughout the entire crowns had severe flagging.
- In Sudbury District, Dutch elm disease on white elm trees was recorded along the Veuve River and continued between Markstay-Warren and Markstay along Hwy 17.



Southern:

- During late season ground surveys, Dutch elm disease was observed in scattered areas in both Peterborough and Bancroft districts. Symptoms included discolouration (yellow and brown) and wilting of leaves of affected branches on young and semi-mature white elm trees. Collections were made to confirm disease on an open-grown white elm in Cavan Twp, west of the City of Peterborough.

- In Bancroft District, Dutch elm disease was reported in Minden along Rice Road in Haliburton County. Symptoms were also observed along Ursa Road south of Glamor Lake, Glamorgan Twp.

Eastern larch beetle

Pest information

Common name:	Eastern larch beetle
Scientific name:	*Dendroctonus simplex* LeC.
Pest origin:	Native to North America
Pest type:	Bark beetle
Host species:	Larch (tamarack)
Infestation area:	Localized

Provincial key facts

- Eastern larch beetles bore into and feed on the inner bark and sapwood portions of the larch trunk.
- This beetle can produce two complete generations annually.
- Large portions of larch stands may die following an eastern larch beetle outbreak.
- Larch beetle damage is frequently observed in areas where trees are already stressed from other insect or abiotic disturbances.
- In 2019, eastern larch beetle damage was not mapped but areas that had damage in Northwest Region in 2018 increased slightly, with a new area of mortality in a previously unaffected area.

Regional summary

Northwest:

- In the southern part of Fort Frances District, eastern larch beetle damage increased slightly near Spruce Islands Provincial Nature Reserve (Nelles Twp) as well as Chapple Twp west of Fort Frances but was not aerially mapped in 2019.
- In Sioux Lookout District, eastern larch beetle damage was recorded adjacent to a cutover east of Sioux Lookout on Stanzhikimi Lake Road, south of Hwy 516. About 30 to 40 mature larch trees had severe larch beetle damage and over 75% of the trees were dead. Trees had little to no needles, galleries under the bark, and adult beetles were found in the galleries.

Eastern tent caterpillar

Pest information

Common name:	Eastern tent caterpillar
Scientific name:	*Malacosoma americanum* (F.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Cherry species and service berry
Infestation area:	Localized

Provincial key facts

- Eastern tent caterpillar populations fluctuate year to year.
- Larvae usually defoliate roadside cherry and apple trees and occasionally mature black cherry.
- It is not considered a major pest, though nests can be unsightly.
- Defoliation by eastern tent caterpillar causes little permanent damage to the host tree.
- In 2019, localized eastern tent caterpillar populations were reported in Southern Region.

Regional summary

Southern:

- In Kemptville District, low to moderate populations of eastern tent caterpillar were observed on the forest fringe. In Lanark County, two eastern tent caterpillar nests were found in a trembling aspen-sugar maple mixed forest on Bollingbrook Road, Tay Valley Twp. Defoliation of trembling aspen was light. Light defoliation was also observed along French Line. Several nests were found in a young mixed forest, affecting 50% of chokecherry shrubs. Light defoliation of choke cherry was observed at the edge of an open field adjacent to a mature mixed forest on Concession Road 7a, Lanark Highlands.
- In Peterborough District, collections of eastern tent caterpillar nests on understory chokecherry shrubs were made south of Buckhorn, along Elim Lodge Road, Harvey Twp. Eastern tent caterpillar nests were also observed on young ash trees, along Alison Road, Big Island, Prince Edward County, with low populations and moderate defoliation.
- In Kawartha Highlands Provincial Park, Bancroft District, eastern tent caterpillar was collected on roadside cherry species off Anstruther Lake Road, causing 80% defoliation of shrubs.
- In Parry Sound District, heavy defoliation caused by eastern tent caterpillar was reported on roadside cherry shrubs south of Parry Sound to South Gibson Lake Road along Hwy 400.

Fall cankerworm

Pest information

Common name:	Fall cankerworm
Scientific name:	*Alsophila pometaria* (Harris)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Basswood, Manitoba maple, black walnut, white ash, elm, and oak
Infestation area:	Localized

Provincial key facts

- Fall cankerworm is an early season defoliator of hardwood trees that can reach epidemic levels throughout its range in North America.
- The distribution of this native pest is believed to coincide with the range of basswood in Ontario.
- It has one generation per year.
- In North America, fall cankerworm has an outbreak cycle with large populations present for two to three years followed by sharp population declines for five to eight years.
- Fall cankerworm was aerially mapped in Southern Region in rural woodlots as well as urban settings in 2016, 2017, and 2018.
- In Ontario, the area defoliated by fall cankerworm decreased from 11,764 ha in 2017 to 831 ha in 2018 to not being aerially mapped in 2019. This reduction indicates that populations are collapsing across Southern Region.
- As in 2018, fall cankerworm was often found feeding alongside gypsy moth in 2019.

Regional summary

Southern:

- In Peterborough District, populations of fall cankerworm have been reported since 2017, mostly concentrated in the southern part of the district and in Prince Edward County. In 2019, during early season ground surveys, fall cankerworm was reported on Big Island in Prince Edward County. Defoliation remained light and no areas were aerially mapped this season. Light defoliation was observed on various hardwood species (basswood, Manitoba maple, black walnut, white ash, elm, and oak) along Alison Road and Caughey Road, Sophiasburgh Twp, in the northeast region of Prince Edward County.

Fall webworm

Pest information

Common name:	Fall webworm
Scientific name:	*Hyphantria cunea* (Drury)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Variety of deciduous trees and shrubs
Infestation area:	Localized

Provincial key facts

- Fall webworm is one of the few native North American insects accidently introduced into Europe and Asia.
- Its effect on tree health is usually limited because defoliation occurs late in the growing season but persistent infestation can cause branch and crown dieback.
- In Canada only one generation of fall webworm will occur per year, compared to two in warmer climates.
- High populations of this pest often last only two to three years, making associated tree mortality unlikely.
- In 2019, fall webworm was reported in Northeast and Southern regions.

Regional summary

Northeast:

- In Sault Ste. Marie District, fall webworm populations were almost non-existent. Only two webs were found, one at the south end of Ranger Lake Road and the other near Aubrey Falls along Hwy 129.

Southern:

- In Parry Sound District, fall webworm was observed causing moderate defoliation along Regional Rd 117 by Baysville, Aspdin Road and Muskoka Rd 3 between Huntsville and Rosseau, and Hwy 632 and Peninsula Road between Rosseau and Port Stanfield. There was an abundance of fall webworm around Parry Sound causing moderate to severe defoliation, especially along Nobel Road between Parry Sound and Nobel with some trees being fully defoliated. Some trees had more than 10 fall webworm nests in the crown.

- In Midhurst District, populations were lower than in the recent past with many nests drying up, probably due to predators or viruses, and surviving nests were relatively small. A collection was made in July near Rocklyn in Grey Highlands, on young roadside balsam poplar, with egg masses still visible. Fall webworm was observed through Tiny Twp, Simcoe County, on mature ash and birch trees with frequent larger nests up to 1 m long.
- In Algonquin Park, fall webworm nests and trace levels of defoliation were observed intermittently along Barron Canyon Road from Petawawa to Lac Travers in Algonquin Park. Larvae were collected in a stand of red maple and black ash.
- In Pembroke District, fall webworm larvae were collected in Greater Madawaska Twp early in the feeding season. Larvae were feeding on speckled alder in an alder-black ash swamp on Silver Maple Road near Cormac. Higher populations were observed along Grant's Settlement Road, Powers Road, and Greenwood Road in the area surrounding Beachburg and Foresters Falls, in Whitewater Region, Renfrew County.
- In Kemptville District, fall webworm nests were observed intermittently in medium sized populations from Rideau Lakes to Kemptville across the north of Leeds-Grenville County. Fall webworm larvae were collected on Hwy 15 near Lombardy, Rideau Lakes Twp, where light defoliation was observed on 50% of elm trees in an agricultural hedgerow.
- In Peterborough District, small single nests of fall webworm were causing light defoliation to white ash and Manitoba maple on Bowmanton Road, Alnick/Haldimand Twp.
- Guelph District had moderate defoliation and webbing reported on open-grown and woodlot fringe black walnut and willows in areas of the Regional Municipality of Waterloo and across Brant and Haldimand counties. Low incidence and light levels of defoliation were observed on black walnut and green ash in areas across Huron, Perth, and Wellington counties.
- Aylmer District had moderate defoliation and webbed nests in all counties, with moderate levels of defoliation and incidence of nests observed throughout areas of Norfolk, Elgin, Essex, and Chatham-Kent counties, particularly on woodlot fringe and open-grown black walnut, black cherry, and bitternut hickory. Defoliation and webbing caused by fall webworm was also observed in Middlesex, Oxford and Lambton counties, but with lower incidence and less defoliation.

Frost damage

Pest information

Common name:	Frost damage
Scientific name:	NA
Pest origin:	NA
Pest type:	Abiotic
Host species:	Silver maple and balsam fir
Infestation area:	Localized

Provincial key facts

- Frost can be damaging to new shoots of conifers and emerging or flushed out leaves of hardwoods.
- Heavier frost damage is encountered in low lying areas causing newly emerged conifer shoots to droop and turn red and hardwood leaves to curl up and turn black.
- Frost damage was reported in Southern Region in 2019.

Regional summary

Southern:

- Frost damage was observed in the Ottawa area as minimum temperatures in the latter part of April dipped below zero for two consecutive days. Temperatures got as low as -3.6 °C.
- In Kemptville District, frost caused moderate damage to silver maples in David-Bartlett Park in Barhaven, Ottawa. Affected trees were open grown in a low, wet riparian area. Symptoms included curled leaves with dark staining along leaf veins. All silver maples in the park were affected. Balsam fir trees in a Christmas tree plantation in Carlsbad Springs, Ottawa, Kemptville District, suffered frost damage. The damage affected young trees eight to 10 years old. Younger and older trees were unaffected. Symptoms included limp, underdeveloped shoots which then turned brown. About 15% of the trees were affected.

Greenstriped mapleworm

Pest information

Common name:	Greenstriped mapleworm
Scientific name:	*Dryocampa rubicunda* (F.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Sugar maple
Infestation area:	Localized

Provincial key facts

- Greenstriped mapleworm feeds primarily on red maple and sometimes on sugar maple.
- Early stage larvae feed in groups, whereas late stage larvae feed independently.
- Both early and late instars feed on the underside of leaves and consume most of the leaf tissue other than the mid rib and larger veins.
- Severe infestations may reduce growth and cause crown dieback.
- Severe defoliation can greatly reduce sap quality affecting sugar maple production.
- For several years, localized populations have been observed in Northeast Region with minimal effects on trees.

Regional summary

Northeast:

- In the southern area of Timmins District, light defoliation was recorded on understory red maple in mature jack pine stands in Vrooman and Westbrook townships. After three consecutive years (2015–2017) of seeing greenstriped mapleworm in this area, it was not found in 2018 but reappeared at low levels in 2019.

Hawthorn leaf spots

Pest information

Common name:	Hawthorn leaf spots
Scientific name:	*Sphaerulina sp., Seimatosporium pestalozziodies* (Sacc.) B. Sutton
Pest origin:	Native to North America
Pest type:	Fungi associated with leaf spots
Host species:	Hawthorns
Infestation area:	Localized

Provincial key facts

- Leaves severely infected by hawthorn leaf spots turn yellow and drop prematurely.
- Collecting and disposing of infected leaves will reduce inoculum load.
- Cool, wet conditions in the spring create an ideal environment for many fungal leaf diseases that affect broadleaf tree species.
- Fungi caused foliar damage of hawthorns in the form of leaf spots in one district in Southern Region in 2019.

Regional summary

Southern:

- In Aylmer District, fungal pathogens *Sphaerulina* sp. and *Seimatosporium pestalozziodies* associated with leaf spots were detected during ground surveys on open-grown and forest fringe hawthorns in various rural areas across Lambton, Middlesex, Essex, Chatham-Kent, and Elgin counties. Affected trees exhibited moderate to severe symptoms including necrotic leaf spots and premature leaf drop.

Hemlock looper

Pest information

Common name:	Hemlock looper
Scientific name:	*Lambdina fiscellaria fiscelleria* (Guenée)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Eastern hemlock
Infestation area:	NA

Provincial key facts

- Hemlock looper is a native defoliator of eastern hemlock, balsam fir, and white spruce. It is found in Canada from Newfoundland to Alberta and in the United States.
- Repeated periodic outbreaks have occurred over wide areas in eastern Canada, especially in Newfoundland.
- Hemlock looper was last reported in Ontario from 2001 to 2005 in Southern Region, causing moderate to severe defoliation to eastern hemlock and balsam fir. In 2003, defoliation peaked at about 8,500 ha, concentrated in Sudbury and Parry Sound districts. Repeated areas of defoliation resulted in considerable tree mortality totalling 4,000 ha in 2005.
- In 2019, during ground surveys, hemlock looper defoliation was detected in a small number of trees in Peterborough District, Southern Region.

Regional summary

Southern:

- In Peterborough District, hemlock looper was identified in a mixed forest stand along Hwy 29 south of Burnley, Haldimand Twp, Northumberland County. On the affected trees, premature needle drop was observed as well as discoloured foliage. The native hemlock scale, *Abgrallaspis ithacae*, was also found on the needles of the affected hemlock. In late season, hemlock looper moths were observed on the main stems of mature hemlock in Silent Lake Provincial Park. No defoliation was observed.

Ice damage

Pest information

Common name:	Ice damage
Scientific name:	NA
Pest origin:	NA
Pest type:	Abiotic
Host species:	Trembling aspen, white birch
Infestation area:	Localized

Provincial key facts

- Ice damage, which is any damage to trees from freezing rain or extreme cold weather events, is part of natural processes in forests. The frequency of these events continues to be sporadic and the extent of damage is highly variable.
- In 2019, ice damage was observed in the Northeast and Southern regions, mostly on smaller trembling aspen and white birch along the roadside.

Regional summary

Northeast:

- In Kirkland Lake District, a group of more than 20 young trembling aspen were bent over just east of Gowganda along Hwy 560.
- In North Bay District, damage to more than 50 young trembling aspen and white birch was observed along Hwy 533 for about 5 km by Alexander Lake Forest Provincial Park. Damage was also observed on several groups of trembling aspen along Hwy 522 west of Port Loring. Young trembling aspen and white birch were also bent over the road to the boat launch in Restoule Provincial Park.
- In Sudbury District, ice damage was observed on trembling aspen and white birch along Hwy 6 on Birch Island, north of Little Current and along River Road, west of Massey.

Southern:

- In Parry Sound District, trembling aspen were bent over consistently along Eagle Lake Road and Spring Lake Road, west of South River and Chemical Road, east of South River.

Introduced pine sawfly

Pest information

Common name:	Introduced pine sawfly
Scientific name:	*Diprion similis* (Htg.)
Pest origin:	Invasive – native to Europe
Pest type:	Defoliator
Host species:	White pine
Infestation area:	Localized

Provincial key facts

- Introduced pine sawfly was first found in Ontario, near Oakville, in 1931.
- This sawfly causes severe defoliation that has resulted in widespread tree mortality in affected areas.
- Natural control factors help keep populations low.
- Introduced pine sawfly has two generations per year, with the second generation usually more abundant in August and September.
- In 2019, introduced pine sawfly caused light defoliation in Northeast and Southern regions.

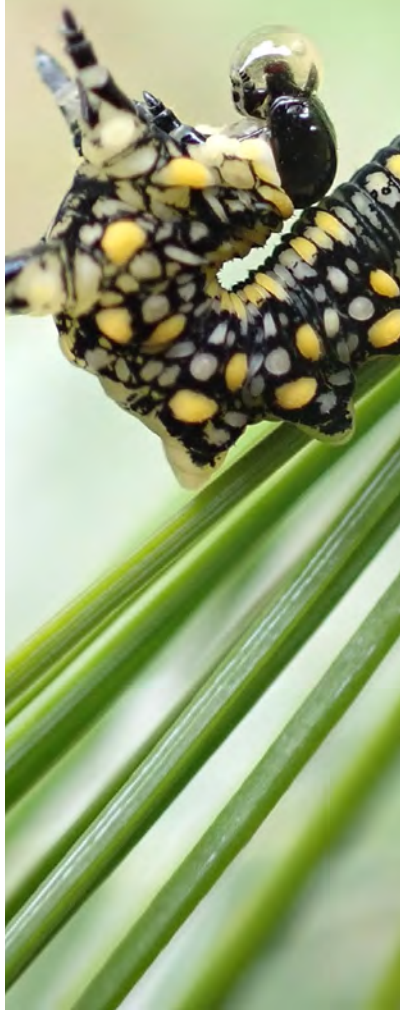
Regional summary

Northeast:

- In Sudbury District, a high population of introduced pine sawfly south of Espanola was causing light defoliation of eastern white pine trees south of Whitefish Falls on Gravelle Road. East of Whitefish Falls, light defoliation was observed on eastern white pine trees at Walser's Landing. Populations were light to moderate in this area.

Southern:

- In Parry Sound District, light to moderate introduced pine sawfly defoliation was observed during ground surveys in mid-August on a few eastern white pine trees at Moon River Marine, west of MacTier, Conger Twp.



Larch casebearer

Pest information

Common name:	Larch casebearer
Scientific name:	*Coleophora laricella* (Hubner)
Pest origin:	Invasive — native to Europe
Pest type:	Defoliator
Host species:	Larch species
Infestation area:	Localized

Provincial key facts

- Larch casebearer was introduced to North America in Massachusetts in 1886 and was detected in Ontario in 1905. This pest is now found across the range of tamarack and throughout European larch plantations in Ontario.
- Larch casebearer is a serious defoliator of tamarack. In Southern Region defoliation has been mapped annually since 2001.
- Larch casebearer defoliation was not detected through aerial surveys in 2019, a substantial decrease from the 1,986 ha documented in 2018. Small occurrences of moderate to severe defoliation were detected via ground surveys in Northeast and Southern regions.

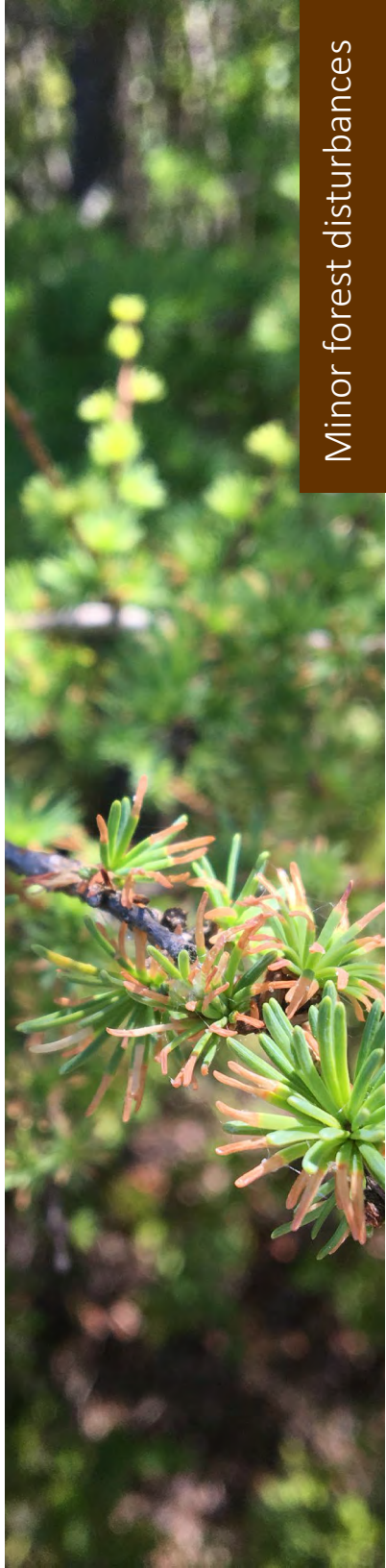
Regional summary

Northeast:

- In the southwest part of Sudbury District, moderate to severe defoliation caused by larch casebearer was observed from Bayshore Drive to Honora Bay along Hwy 540, Sheguiandah, Manitoulin Island.

Southern:

- In Guelph District, an area of moderate defoliation caused by larch casebearer was detected during early season surveys in a treed swamp south of Luther Lake on the boundary of Wellington and Dufferin counties. Larch casebearer has been present and causing defoliation here annually for over 10 years.



- In Kemptville District, light defoliation and low levels of larch casebearer larvae were detected on young larch trees near Burritt's Rapids, west of Kemptville, Marlborough Twp. In the southcentral part of the district, a large population of larch casebearer was observed early in the season along Rooney Road between Johnstown and Cardinal, Edwardsburgh Twp, Leeds-Grenville. The larvae were beginning to feed in a young stand of tamarack and red foliage was beginning to show.
- In Northumberland County, Peterborough District, moderate to severe defoliation was reported along Beagle Club Road south of Rice Lake. A large stand of mature tamarack was defoliated; crowns were 80 to 100% defoliated and discoloured.

Oak leafshredder

Pest information

Common name:	Oak leafshredder (also known as oak leaftier)
Scientific name:	*Acleris semipurpurana* (Kearfott)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Red oak, black oak
Infestation area:	Localized

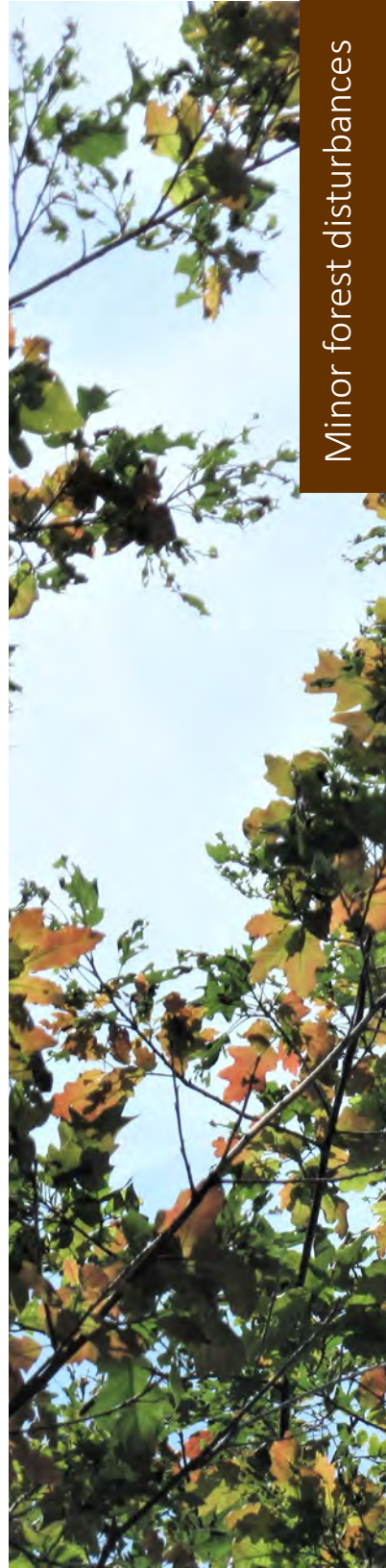
Provincial key facts

- Outbreaks of oak leafshredder occur occasionally throughout the range of red oak in eastern North America.
- This leafshredder is primarily a pest of mature oak stands.
- This pest is an early season defoliator.
- Oak leafshredder was first recorded in eastern Canada in 1944, and between 1957 and 1975 caused severe defoliation in red oak stands in Ontario. The pest was most recently aerially mapped causing moderate to severe defoliation in Southern Region from 1998 to 2000.
- Consecutive years of severe defoliation by this pest may reduce growth and can lead to tree mortality.
- In 2019, this pest was found only in Aylmer District in Southern Region. No damage was aerially mapped.

Regional summary

Southern:

- In Aylmer District, oak leafshredder larvae were detected in several locations during ground surveys. Populations were observed feeding alongside smaller populations of gypsy moth larvae in forested areas along Kerwood Road at Melwood Drive in Strathroy-Caradoc, Middlesex County. Oak leafshredder was the primary defoliator, causing moderate to severe defoliation of woodlot fringe and understory red oak in a forest stand. In Lambton County, defoliation and webbing of red oaks of all age and canopy classes were observed in a woodlot along Tecumseh Road near Oil Springs Road in western St. Clair Twp. In Windsor, high populations of larvae were observed causing trace defoliation of red and black oak at the end of May in Ojibway Tom Joy Woods, part of the Ojibway Prairie Complex. Gypsy moth larvae were also observed in high numbers and were determined to be the primary pest causing moderate to severe defoliation of oaks at this location by mid-summer.



Redheaded pine sawfly

Pest information

Common name:	Redheaded pine sawfly
Scientific name:	*Neodiprion lecontei* (Fitch)
Pest origins:	Native to North America
Pest type:	Defoliator
Host species:	Red pine, jack pine
Infestation area:	Localized

Provincial key facts

- Redheaded pine sawfly is considered a serious pests of red pine plantations in Ontario.
- It can kill branches, reduce diameter growth, and eventually kills young trees.
- Trees less than three metres tall are most susceptible.
- This pest was reported in Southern Region in 2019.

Regional summary

Northwest:

- In Pembroke District, redheaded pine sawfly larvae caused moderate defoliation to young red pine trees in a red and jack pine plantation on Olmstead-Jeffrey Lake Road, Haley Station, Whitewater Region in Renfrew County. Red pine trees up to 3.5 m tall were affected. About 90% of the trees were affected and averaged 40% defoliation.

Snow damage

Pest information

Common name:	Snow damage
Scientific name:	NA
Pest origin:	Abiotic
Pest type:	Abiotic
Host species:	All species
Infestation area:	Localized

Provincial key facts

- Damage consists of trees of all ages and sizes being uprooted, snapped off, bent over, or showing various amounts of crown damage.
- Snow damage in Ontario can be significant but events are sporadic and effects vary considerably.
- In 2019, snow damage was only recorded in Northwest Region.

Regional summary

Northwest:

- In Dryden District, small pockets of snow damage were observed on fringe conifer trees along Hwy 17 west of Ignace and on trembling aspen along Hwy 601, northeast of Dryden.
- In Fort Frances District, low levels of snow damage were detected in a small area along Hwy 502.
- In Nipigon District, light to moderate snow damage was observed on roadside poplar and spruce along Hwy 17 corridors in scattered areas from Heron Bay to Nipigon.
- In Thunder Bay District, light snow damage was found on less than 10 white birch and cherry trees in Rosslyn.

Spruce needle rust

Pest information

Common name:	Spruce needle rust
Scientific name:	*Chrysomyxa nagodhii P.E. Crane and Chrysomyxa ledicola* Lagerh.
Pest origin:	Native to North America
Pest type:	Needle rust
Host species:	Black spruce and white spruce
Infestation area:	Localized

Provincial key facts

- Spruce needle rust is a fungus that causes current year needles to dry out, turn red, and drop off.
- This disease can be identified by the presence of white blisters with bright orange spores.
- Alternate hosts of spruce needle rust are Labrador tea and leather leaf.
- Normally spruce needle rust is not a serious problem and more than two consecutive years of infection rarely occur.
- Consecutive years of severe infection can kill young trees and reduce the growth of older trees.
- In 2019, low to moderate levels of spruce needle rust were recorded in Northwest and Northeast regions.

Regional summary

Northwest:

- In Sioux Lookout District, spruce needle rust was sampled along the shoreline of Meen Lake where infection rates were moderate on understory white spruce.
- In Red Lake District, low levels of needle rust were recorded at a forest health plot near the north end of McKenzie Bay Road in the Ear Falls area. Species affected were white and black spruce but needle rust did not appear to be affecting the growth of the trees.
- In Dryden, Sioux Lookout, Thunder Bay, and Fort Frances districts, low levels of spruce needle rust were observed in August during forest health plot assessments.

Northeast:

- In Wawa District, light to moderate spruce needle rust was recorded along Hwy 614, about 15 km south of the municipality of Manitouwadge. Needle rust was also observed on white spruce along Ripple Lake Road, on the mid-west side of Saunders Twp. About half the white spruce trees were infected with this rust.
- In Chapleau District, spruce needle rust was observed on black spruce on the corner of Metagama and Westbranch roads.

Striped alder sawfly

Pest information

Common name:	Striped alder sawfly
Scientific name:	*Hemichroa crocea* (Geoff.)
Pest origin:	Invasive – Native to Europe
Pest type:	Defoliator
Host species:	White birch, alder
Infestation area:	Localized

Provincial key facts

- Striped alder sawfly feed gregariously (as a group) on soft leaf tissue, leaving the leaf margins and midribs, until they drop to the ground to overwinter as pre-pupae in the soil.
- In Ontario, alder is the main host but they occasionally feed on birch and willow.
- In 2019, moderate populations of striped alder sawfly were observed affecting white birch and alder trees in Northeast Region.

Regional summary

Northeast:

- In North Bay District, striped alder sawfly was causing moderate to severe defoliation on over 50 mature and young white birch trees and alder shrubs in Laurier Woods in the City of North Bay. Several white birch trees were also moderately defoliated in Lee Park. At both locations, defoliation was heaviest in the lower crown and tapered off towards the top of the trees. Frass (excrement) could be heard dropping on the understory vegetation at the time of observation (late summer).

Twolined chestnut borer

Pest information

Common name:	Twolined chestnut borer
Scientific name:	*Agrilus bilineatus* (Weber)
Pest origin:	Native to North America
Pest type:	Wood borer
Host species:	Red oak
Infestation area:	Localized

Provincial key facts

- Twolined chestnut borer occurs in southern Canada and eastern United States on chestnut and oak.
- Branch mortality can occur after one year and whole tree mortality occurs after two to three successive years of an infestation.
- This borer can be confused with emerald ash borer as it makes similar D-shaped exit holes and serpentine galleries, but it is grey rather than green.
- The twolined chestnut borer attacks trees in decline or under stress from other insects, diseases, or abiotic events such as drought.
- This borer was only reported in Northeast Region in 2019, where it was contributing to the decline of red oak.

Regional summary

Northeast:

- In Sault Ste. Marie District, low levels of twolined chestnut borer were found in red oak north of Blind River on the north end of Granary Lake Road (Striker Twp). Several small areas of red oak mortality were observed with armillaria root rot being the main cause but low levels of twolined chestnut borer were also evident in some trees. This area was severely defoliated by forest tent caterpillar in 2017 and 2018 and subjected to drought-like conditions in late summer 2018, which in combination would have stressed the trees enough to be susceptible to this opportunistic wood borer.

Verticillium wilt

Pest information

Common name:	Verticillium wilt
Scientific name:	*Verticillium dahlia* Kleb.
Pest origin:	Native to North America
Pest type:	Root disease
Host species:	Red maple
Infestation area:	Localized

Provincial key facts

- This disease mostly affects maples but can be found on catalpa, sour and sweet cherry, peach, and Canada plum trees.
- The fungus lives in the soil and infection occurs through the roots.
- The disease causes branches to wilt and is identified by submitting branches for diagnostics.
- Verticillium wilt can cause tree mortality and is more common in urban settings.
- This disease was found for the first time in one district in Northwest Region in 2019.

Regional summary

Northwest:

- In Fort Frances District, severe verticillium wilt damage was recorded on young planted red maple trees along the waterfront walkways in downtown Emo. By June, the row of six to eight trees had dropped some leaves while the remaining leaves had black outlines and blotches. The bark on some branches was peeled back and brown staining was visible. Branches were sent to diagnostics to verify the cause of damage.

Western gall rust

Pest information

Common name:	Western gall rust
Scientific name:	*Peridermium harknessli* J.P. Moore
Pest origin:	Native to North America
Pest type:	Fungal disease
Host species:	Jack pine
Infestation area:	Localized

Provincial key facts

- This rust disease is common across Ontario.
- It typically causes malformations, stunting, and aesthetic degradation of infected trees.
- It can be a significant pest in nurseries and plantations.
- Branch galls can kill branches and galls on the main stem of trees less than 10 years old can kill the tree.
- This rust can infect pine to pine and does not require an alternate host to complete its life cycle.
- In 2019, western gall rust was found in both Northwest and Northeast regions.

Regional summary

Northwest:

- In Dryden district, light to moderate western gall rust damage was observed in jack pine along Hwy 601, Hwy 602 and Mafeking Road.
- In Sioux Lookout District, moderate western gall rust damage was observed along roadways in June with trees having red needles. Moderate damage was recorded along the Vermillion River Road from Hwy 516 to the 20 km marker, northeast of Expanse Lake. Moderate damage was observed on Goodie Lake Road, east of Hudson.

Northeast:

- In Wawa District, red needles were observed on semi-mature jack pine trees south of Caramat, along the Industrial Road. Western gall rust was also reported along Phillip Creek Road, northeast of Hillsport, west of Frances Twp.
- In Timmins District, low levels of western gall rust were observed during ground surveys. One collection was made along Hwy 101 in Denton Twp, where 65% of trees were affected with 10% damage. Old galls were not found at this location.

White pine blister rust

Pest information

Common name:	White pine blister rust
Scientific name:	*Cronartium ribicola* J. C. Fisch.
Pest origin:	Invasive – Native to Asia and Europe
Pest type:	Rust disease
Host species:	White pine
Infestation area:	Localized

Provincial key facts

- This disease is relatively common throughout Ontario where Ribes spp. (the alternate host) occur near five needle pine.
- It causes branch dieback, reduces growth, and, if infection reaches the stem, eventually kills the tree.
- Porcupine damage can be present on trees with white pine blister rust since they are attracted to the sweet sap at the canker.
- In 2019, white pine blister rust was monitored at white pine plantations in Northeast Region.

Regional summary

Northeast:

- In Kirkland Lake District, annual white pine blister rust plantation surveys were completed at Evanturel, Eby, and Ingram townships. Trees at the Evanturel Twp site had the highest occurrence of white pine blister rust (23%) compared to those in Eby Twp (0%) and Ingram Twp (17%), with 17% on the main stem (severe). Trees at the Evanturel Twp site also had plenty of porcupine damage (35%) with no porcupine damage recorded on trees in Eby or Ingram townships.
- In North Bay District, the annual white pine blister rust plantation survey in Gurd Twp revealed 11% of the white pine trees were infected with white pine blister rust. Porcupine damage at this plantation affected only 1% of the trees.

Whitespotted sawyer beetle

Pest information

Common name:	Whitespotted sawyer beetle
Scientific name:	*Monochamus s. scutellatus* (Say)
Pest origin:	Native to North America
Pest type:	Wood borer
Host species:	Balsam fir, spruce spp., pine spp.
Infestation area:	Sporadic

Provincial key facts

- Whitespotted sawyer beetle is one of the most widely distributed and common wood borers in North America.
- This pest is mainly found on recently dead or dying trees.
- Larva tunnelling damage severely downgrades lumber value.
- Larger populations often occur near other forest disturbances, such as blowdown, drought, multiple years of defoliation, fire, and harvests.
- This beetle is often confused with the invasive Asian long-horned beetle.
- In 2019, whitespotted sawyer beetle damage was observed during ground surveys in the Northeast and Northwest regions.

Regional summary

Northwest:

- In Kenora District, whitespotted sawyer beetle damage was observed in several stands that had been damaged by snow loading during winter 2018. North of Sioux Narrows, along Hwy 71 to the junction of Hwy 17, snow damage was heavy in 2018 and extensive whitespotted sawyer beetle activity was observed in 2019. North of Nestor Falls, fringe balsam fir branches were red due to maturation feeding by the adult whitespotted sawyer beetle.
- In Red Lake District, whitespotted sawyer beetle activity, including larval galleries, egg laying sites and maturation feeding damage, was observed west of Balmertown along Hwy 125. Overmature jack pine, spruce, and balsam fir on a wet site may have had enough stress to predispose the trees to beetle attack.

Northeast:

- In Kirkland Lake District, along Hwy 560, west of Beauty Lake Road, a jack pine was full of whitespotted sawyer beetle larvae. Most of the outer bark was on the ground around the tree, and it was full of woodpecker holes. Several other trees in the stand had noticeable woodpecker damage and red foliage.
- In Sault Ste. Marie District, jack pine mortality was reported in a recently cut area on Labertson Road on the east side of Hwy 129 in Gilbertson Twp in early June. Dead jack pine trees on the edge of jack pine stands were infested with whitespotted sawyer beetle larvae but also had armillaria root rot, which was the primary disturbance agent affecting the trees.
- In Sudbury District, several reports of dying red pine were received over the summer. South of Sudbury, a landowner reported having several large red pines die, with others showing signs of decline. Another homeowner was concerned about dead and dying red pine and balsam fir trees in their yard. Red foliage, woodpecker damage, and the sound of chewing larvae were clear signs of whitespotted sawyer beetle. Larvae were found in the affected trees. Some of this decline was likely related to drought conditions in the area the previous summer.

Willow lace bug

Pest information

Common name:	Willow lace bug
Scientific name:	*Corythucha elegans* Drake *and Corythucha pergandei* Heid.
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Willow and alder
Infestation area:	Localized

Provincial key facts

- Adults and nymphs damage leaves by piecing lower leaf surfaces with needle-like mouthparts that suck out plant tissue.
- Feeding damage appears as white stippling on the upper surface of leaves.
- Severe infestations can cause leaf discoloration and premature leaf drop.
- In 2019, willow lace bug was only recorded in Northeast Region.

Regional summary

Northeast:

- In Wawa District, moderate damage to willow and alder caused by willow and alder lace bug was observed along the road into White Lake Provincial Park. Only lace bug nymphs were found on alder, but the nymphs and adults were found on the willows.

Willow leafblotch miner

Pest information

Common name:	Willow leafblotch miner
Scientific name:	*Phyllonorycter salicifoliella* (Cham.)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Various willow species
Infestation area:	Localized

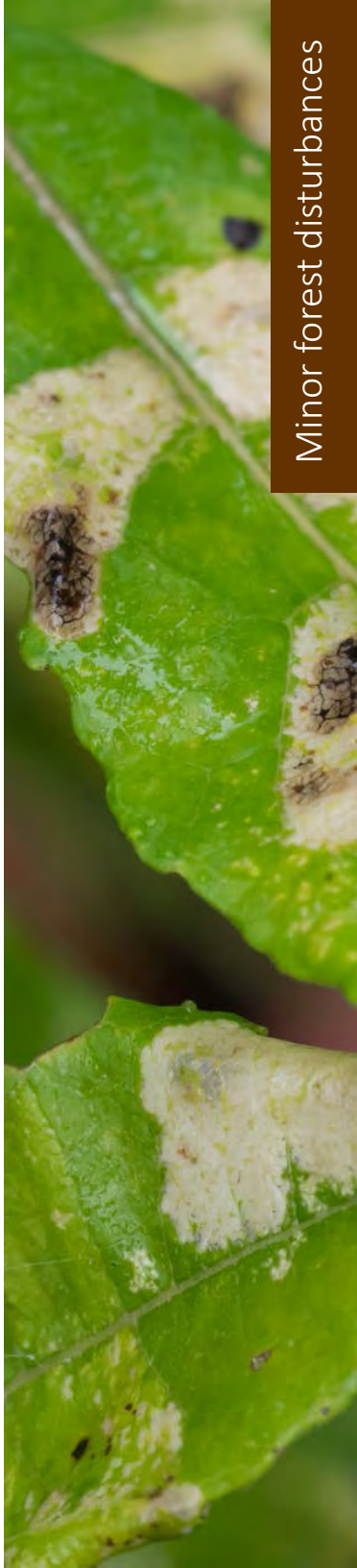
Provincial key facts

- Most species of willow are susceptible.
- Leaves may be defoliated, but mortality is rare.
- Early instar larvae feed on the upper surface of leaves, while mature larvae mine between the upper and lower surface, giving leaves a blotched appearance.
- Necrotic, pale blotches appear on the upper surfaces of leaves in mid-summer but later appear reddish-brown.
- In 2019, this insect was only reported in Northeast Region.

Regional summary

Northeast:

- In Timmins District, moderate to severe defoliation appeared in mid-summer throughout the district. Defoliation ranged from 25 to 75% with 30 to 50% of the willow in the district affected.
- In Wawa District, moderate to severe defoliation was observed between Manitouwadge and Caramat along Industrial Road. Roughly 60% of the willow were affected along this roadway with 80% defoliation.



Yellowheaded spruce sawfly

Pest information

Common name:	Yellowheaded spruce sawfly
Scientific name:	*Pikonema alaskensis* (Rohwer)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Spruce spp.
Infestation area:	Localized

Provincial key facts

- Yellowheaded spruce sawfly is a common pest in Ontario.
- This sawfly is a serious pest of Christmas tree plantations, open-grown trees, and plantations.
- This sawfly generally feeds on younger open-grown or roadside trees.
- Severe infections by this sawfly can kill branches or the entire tree; less severe defoliation can impede growth.
- In 2019, yellowheaded spruce sawfly was reported in three districts in Northwest Region.

Regional summary

Northwest:

- In Fort Frances District, light sawfly damage was observed in Fort Frances District along Hwy 11 on many young roadside white spruce trees.
- Moderate levels of yellowheaded sawfly defoliation were observed on Meen Lake in Sioux Lookout District on understory white spruce along the shoreline.
- In Thunder Bay District, roadside white spruce had moderate sawfly damage to outer branches along Hwy 17 in Shabaqua and Raith townships. Planted white spruce on the MNRF property in Rosslyn Twp had light defoliation for the second consecutive year and ornamental white and blue spruce in Thunder Bay city limits had signs of yellowheaded spruce sawfly defoliation.

Yellownecked caterpillar

Pest information

Common name:	Yellownecked caterpillar
Scientific name:	*Datana ministra* (Drury)
Pest origin:	Native to North America
Pest type:	Defoliator
Host species:	Basswood, birch, elm, honey-locust, oak, maple, mountain-ash, walnut, blueberry, apple, and other fruit trees
Infestation area:	Localized

Provincial key facts

- This insect is found in southern Canada and the United States.
- Larvae feed gregariously and mature larvae consume all the tissues of infested leaves, except the larger veins.
- On mature trees, periphery foliage is consumed causing little harm to the tree, but younger trees can be completely stripped of leaves, which if repeated could result in twig dieback as feeding takes place in mid- to late summer.
- When disturbed, larvae assume a threatening posture. Usually they lift both the head and posterior tip of their bodies, making a distinctive U shape.
- In 2019, yellownecked caterpillar was recorded in one district in Southern Region.

Regional summary

Southern:

- In Midhurst District, this colourful insect was causing light defoliation on two white birch trees at Gilles Lake in North Bruce Peninsula, Bruce County.