



Forest Health Update

Developed for the Regional Forest Health Network

November 23, 2018

Provincial Forest Health Program

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Presentation Overview

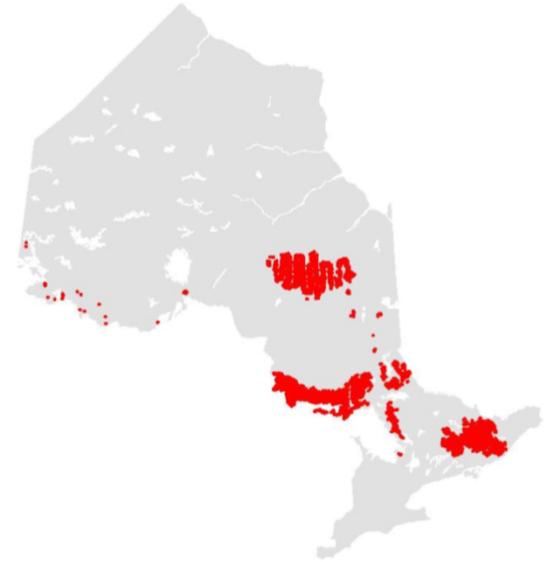
- Provincial update on 2018 major forest disturbances and monitoring data
- 2018 Projects
 - ✓ Beech leaf disease
 - ✓ Nitidulid Beetle Trapping
 - ✓ Walnut Twig Beetle Trapping
 - ✓ EAB Parasitoid Release
 - ✓ Asian Longhorned Beetle



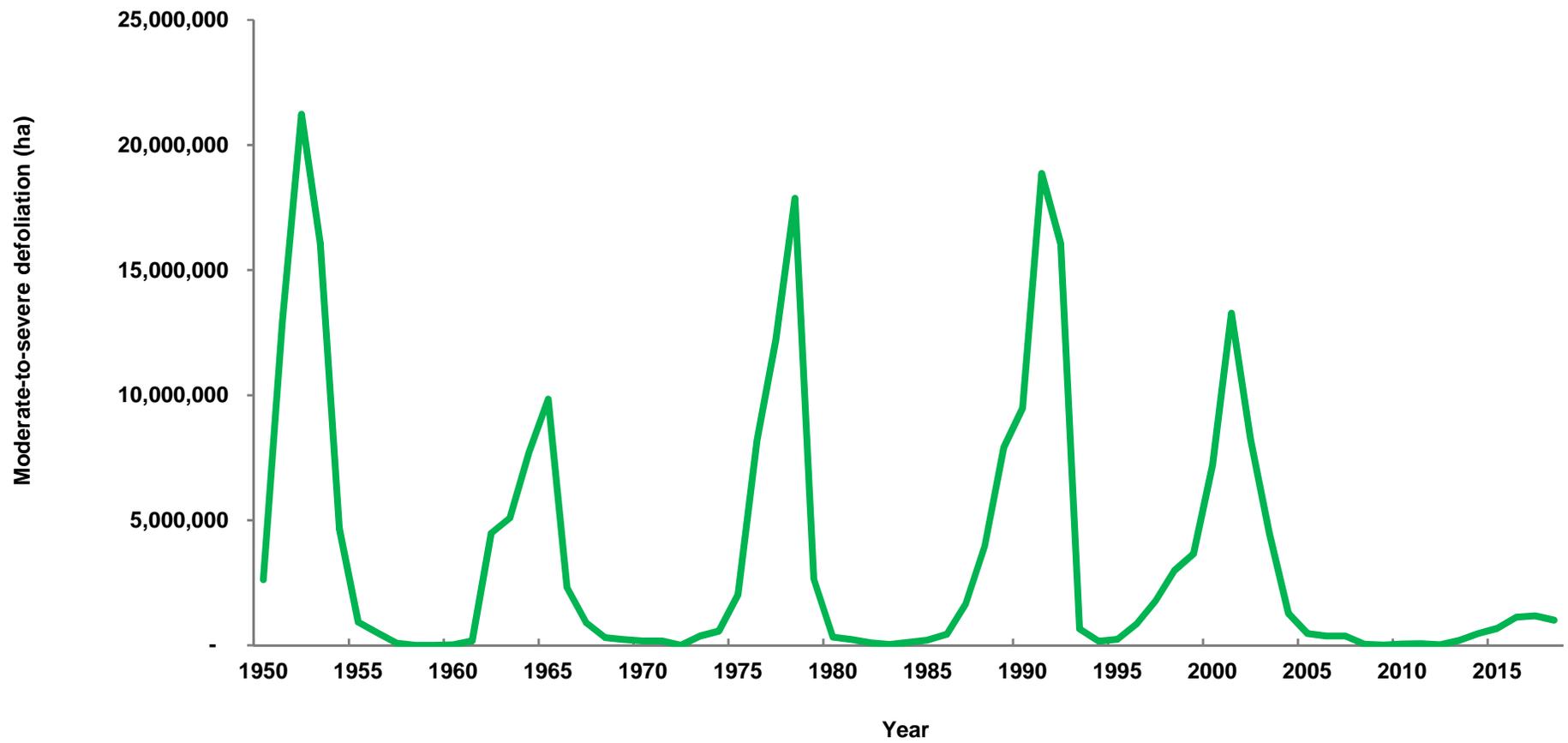
Forest Tent Caterpillar (*Malcosoma disstria* Hubner)

Pest Information

| | |
|-------------------|-------------------------|
| Pest Origins: | Native to North America |
| Pest Type: | Defoliator |
| Host Species: | Hardwoods |
| Infestation Area: | 1,006,013 ha (2018) |



Forest tent caterpillar Moderate-to-severe defoliation in Ontario 1950 - 2018



Forest Tent Caterpillar (*Malcosoma disstria* Hubner)

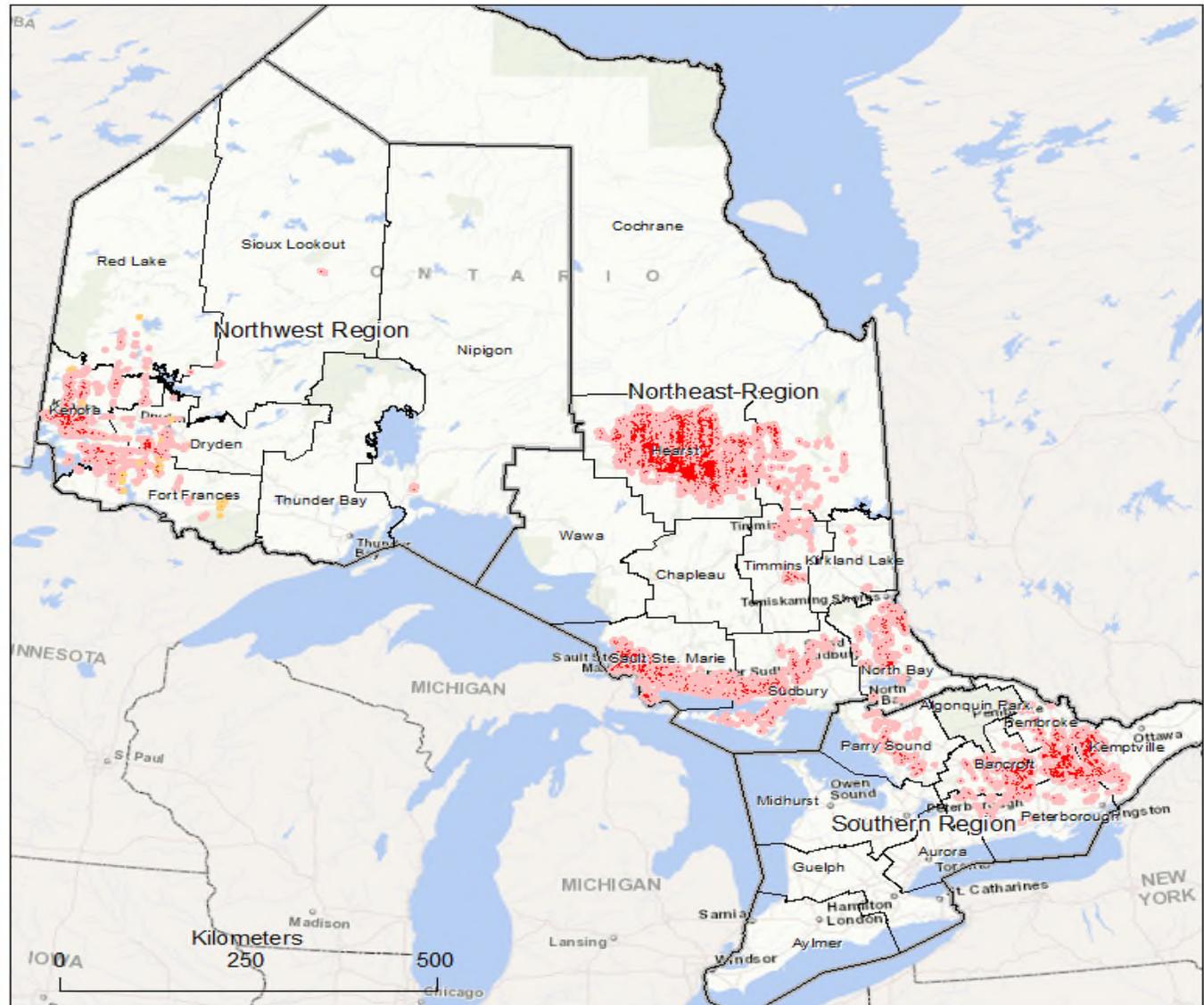


Forest Tent Caterpillar 2017

Ontario
Areas within which forest tent caterpillar caused defoliation

Light = 2,335 ha
Moderate-to-severe = 1,173,570 ha

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



Forest Tent Caterpillar (*Malcosoma disstria* Hubner)



Forest tent caterpillar 2018

Ontario
Areas within which forest tent
caterpillar caused defoliation

Light = 13,806 ha
Moderate-to-severe = 992,207 ha

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



Forest Tent Caterpillar (*Malcosoma disstria* Hubner)

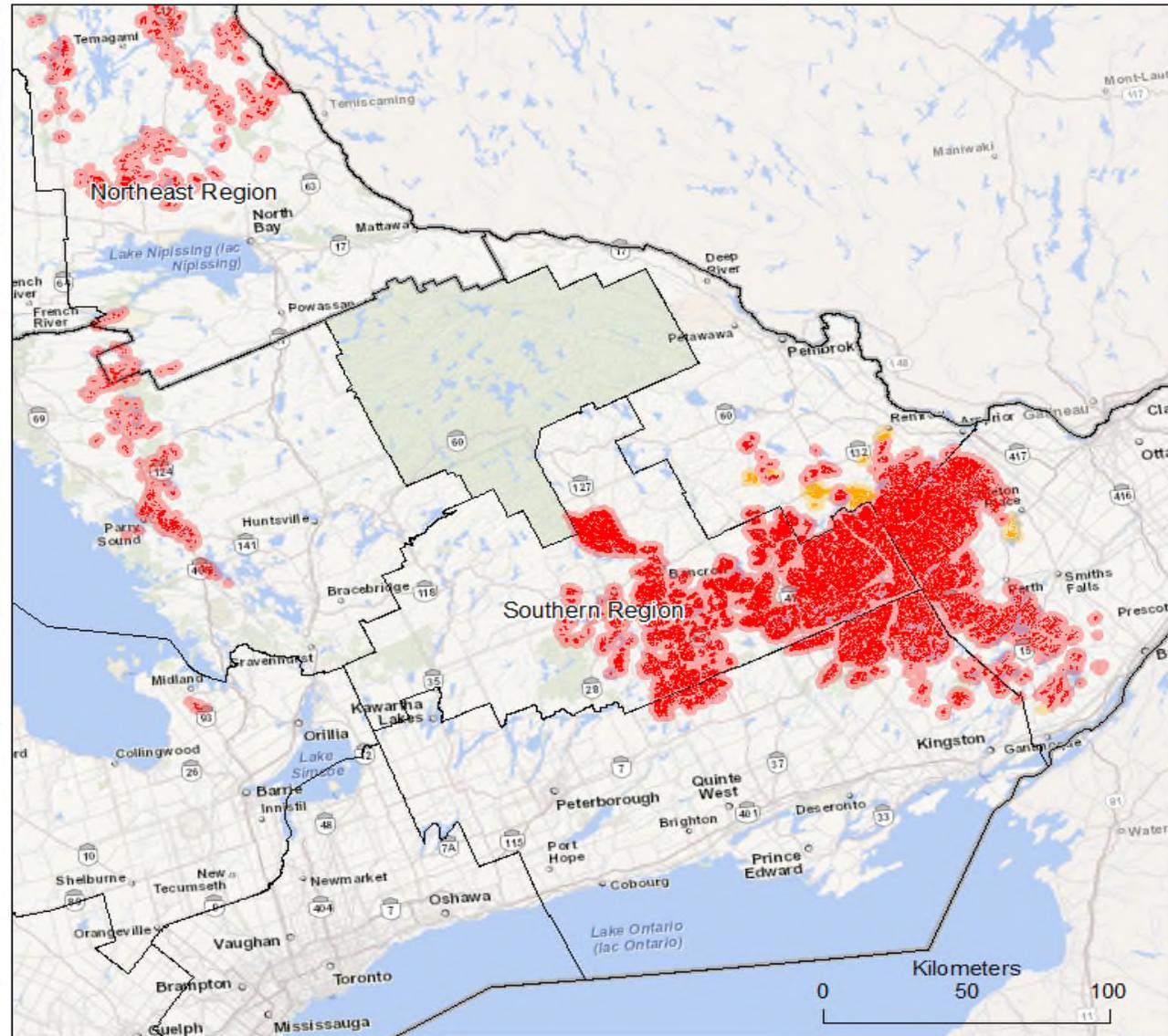


Forest tent caterpillar 2018

Southern Region
Areas within which forest tent caterpillar caused defoliation

Light = 10,337 ha
Moderate-to-severe = 473,337 ha

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



Forest Tent Caterpillar

Weather, parasites, predators, and pathogens:

- Weather; heavy frost in the spring; cooler spring temperatures or late spring frosts can also delay leaf development or damage host tree leaves
- Large flesh fly (*Sarcophaga aldrichi*) “friendly fly”
- Insect, birds, and small mammals
- NPV (nucleopolyhedrosis) virus

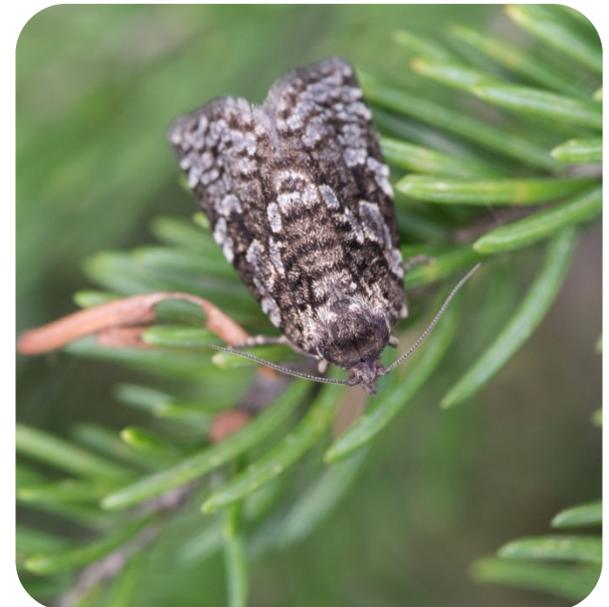


Spruce Budworm (*Choristoneura fumiferana*, Clemens)

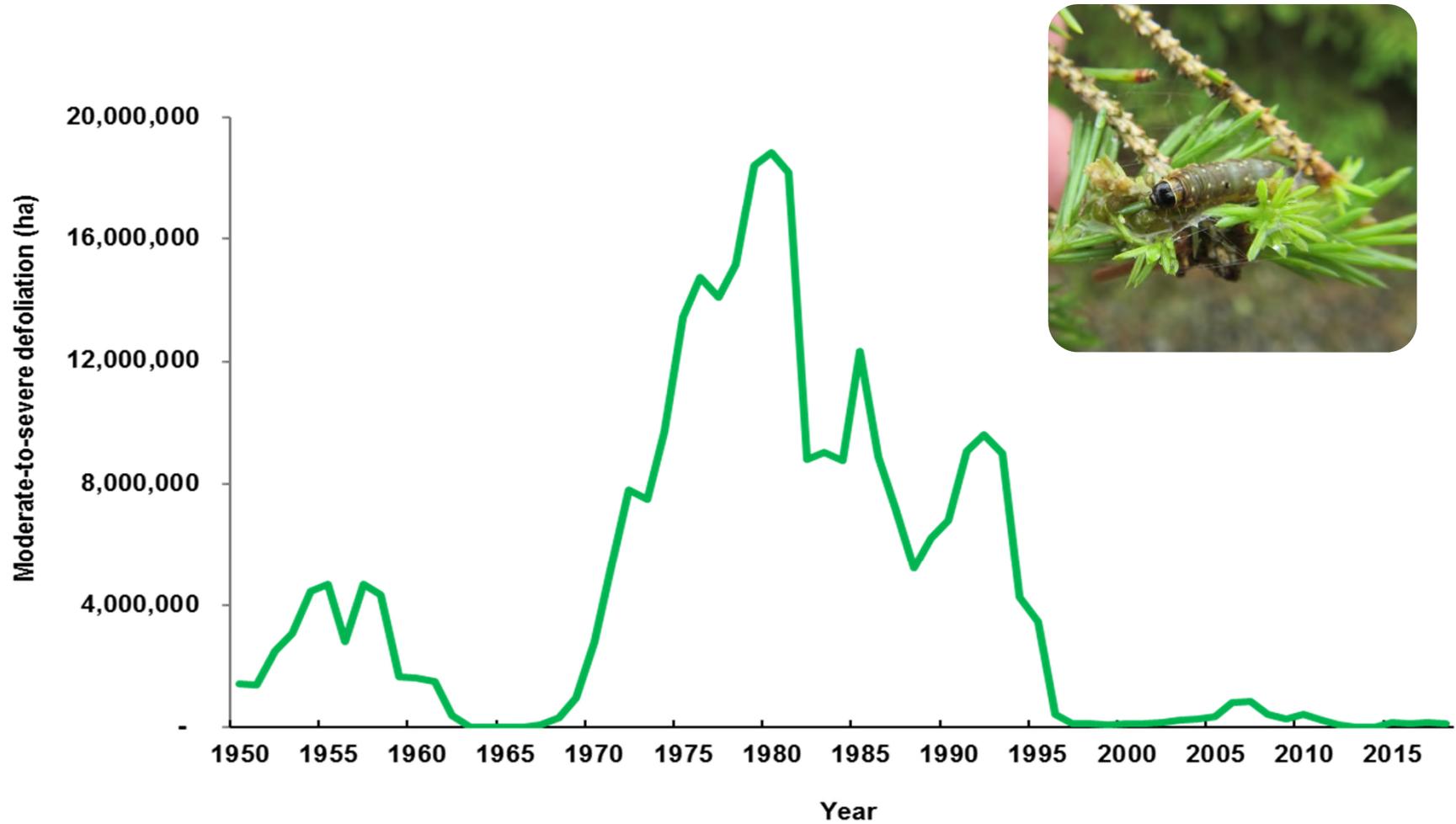


Pest Information

| | |
|-------------------|--|
| Pest Origins: | Native to North America |
| Pest Type: | Defoliator |
| Host Species: | Balsam fir, white spruce, black spruce, red spruce |
| Infestation Area: | Defoliation– 137,086 ha, Mortality- 14 ha (2018) |



Spruce budworm Moderate-to-severe defoliation in Ontario 1950 - 2018



Spruce Budworm (*Choristoneura fumiferana*, Clemens)

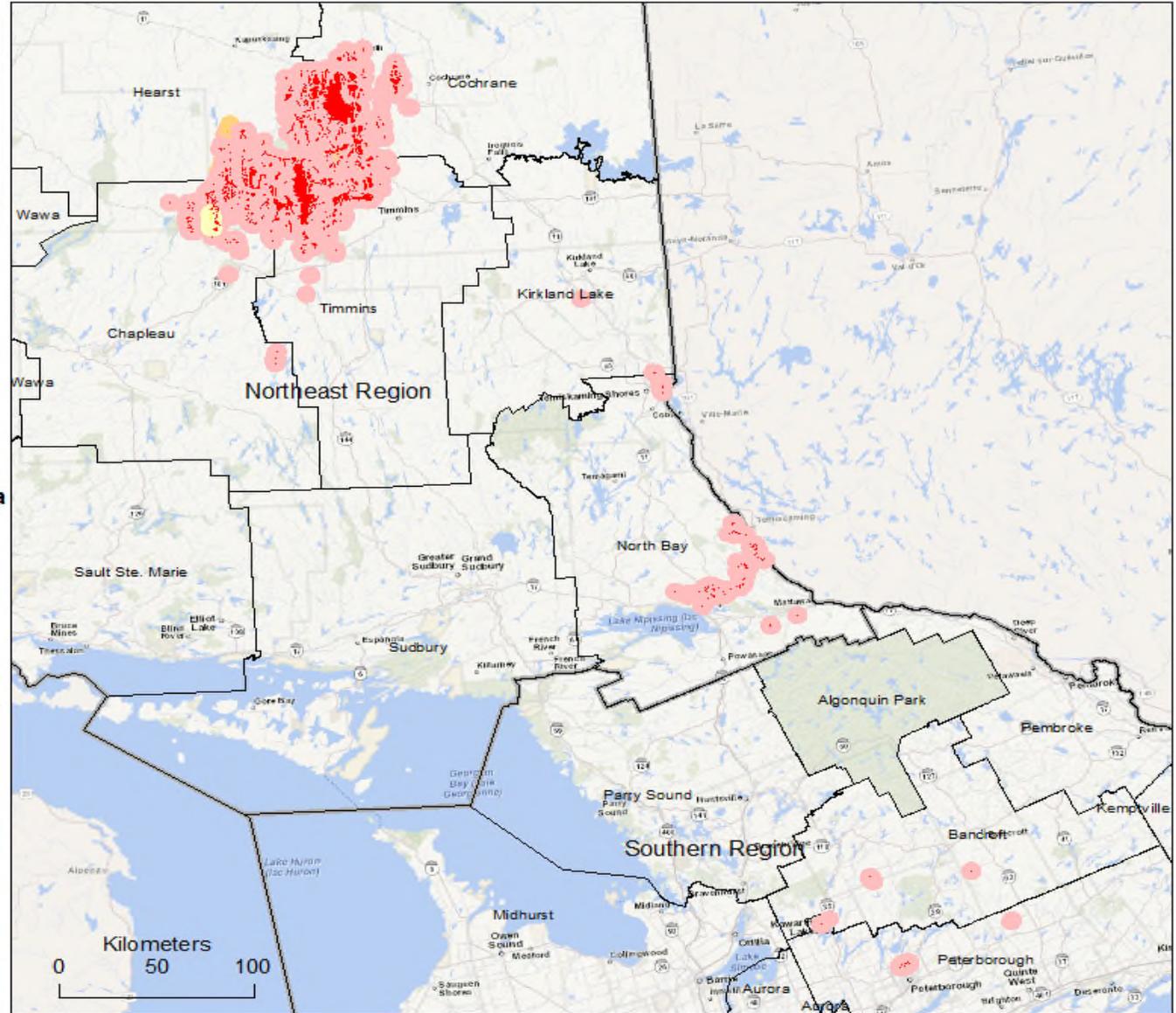


Spruce Budworm 2017

Ontario
Areas within which spruce budworm caused defoliation

Light = 158 ha
Moderate-to-severe = 147,072 ha
Mortality = 317 ha

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



Spruce Budworm

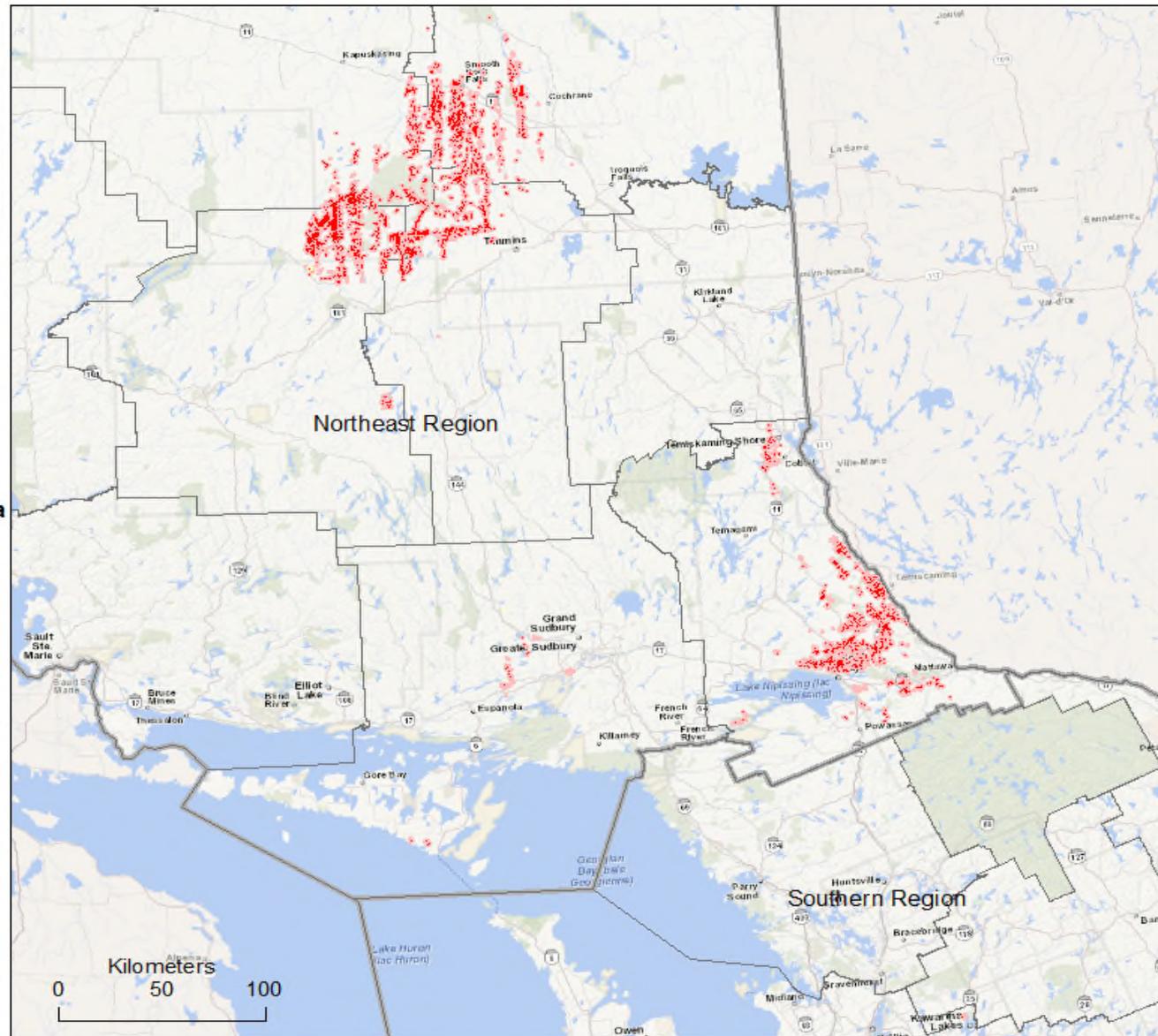


Spruce budworm 2018

Ontario
Areas within which spruce budworm caused defoliation

Light = 6 ha
Moderate-to-severe = 137,082 ha
Mortality = 14 ha

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



Spruce Budworm

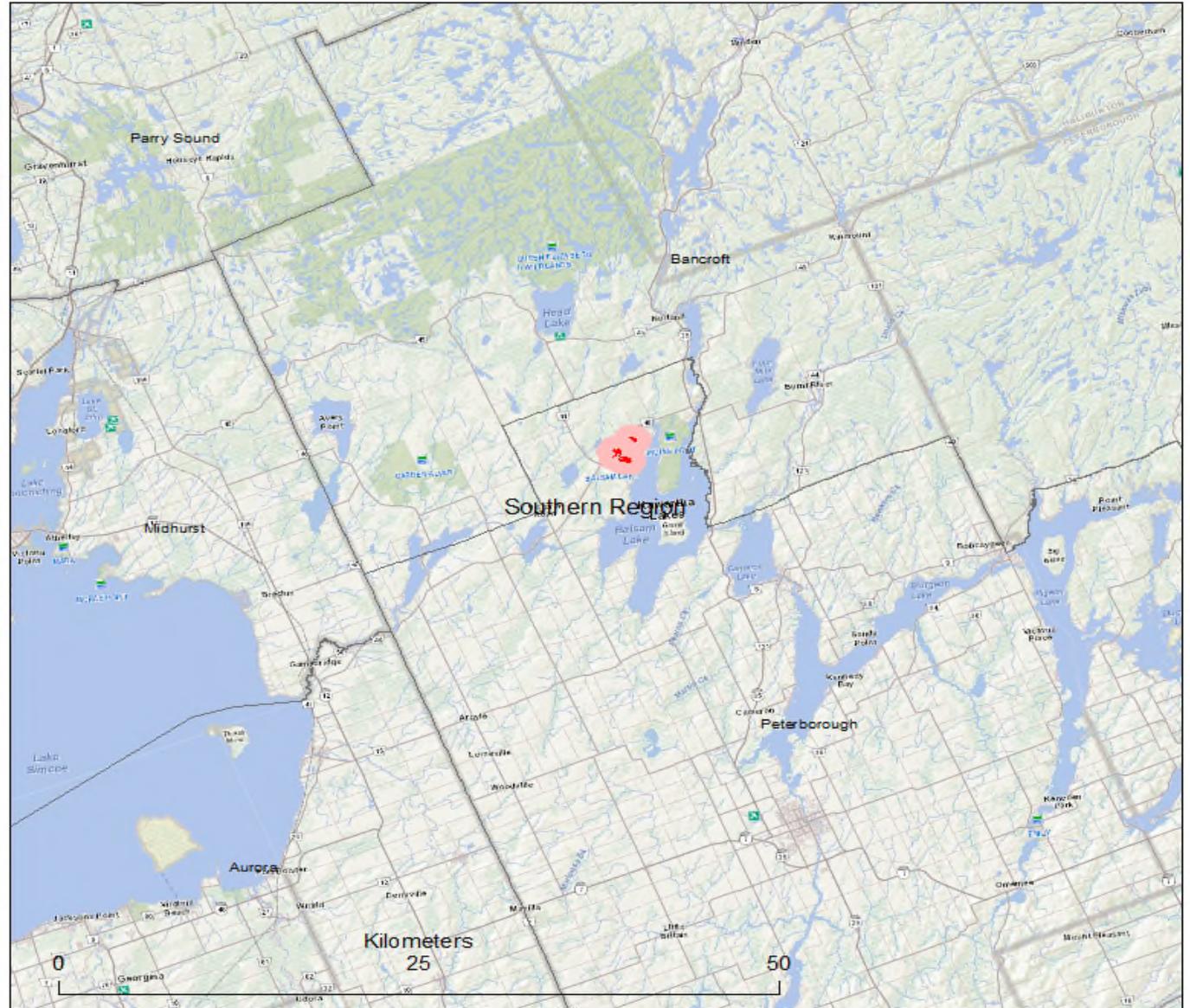


Spruce budworm 2018

Southern Region
Areas within which spruce budworm caused defoliation

Moderate-to-severe = 74 ha

 Area of moderate-to-severe defoliation



Spruce Budworm Pheromone Trapping Results 2018

Highlights:

- Traps were deployed in 63 locations (NE–28 NW-18, S-17) in 2018. Highest numbers in Southern Region.
- NE Region had an average of 192 moths/trap. Blyth Twp, North Bay District had the highest 630 moths/trap.
- NW Region had an average of 11 moths/trap. Haycock Twp, Kenora District had the highest.
- Southern Region had an average of 222 moths/trap. Balsam Lk PP Peterborough District had the highest 607 moths/trap



Spruce Budworm Pheromone Trapping Program

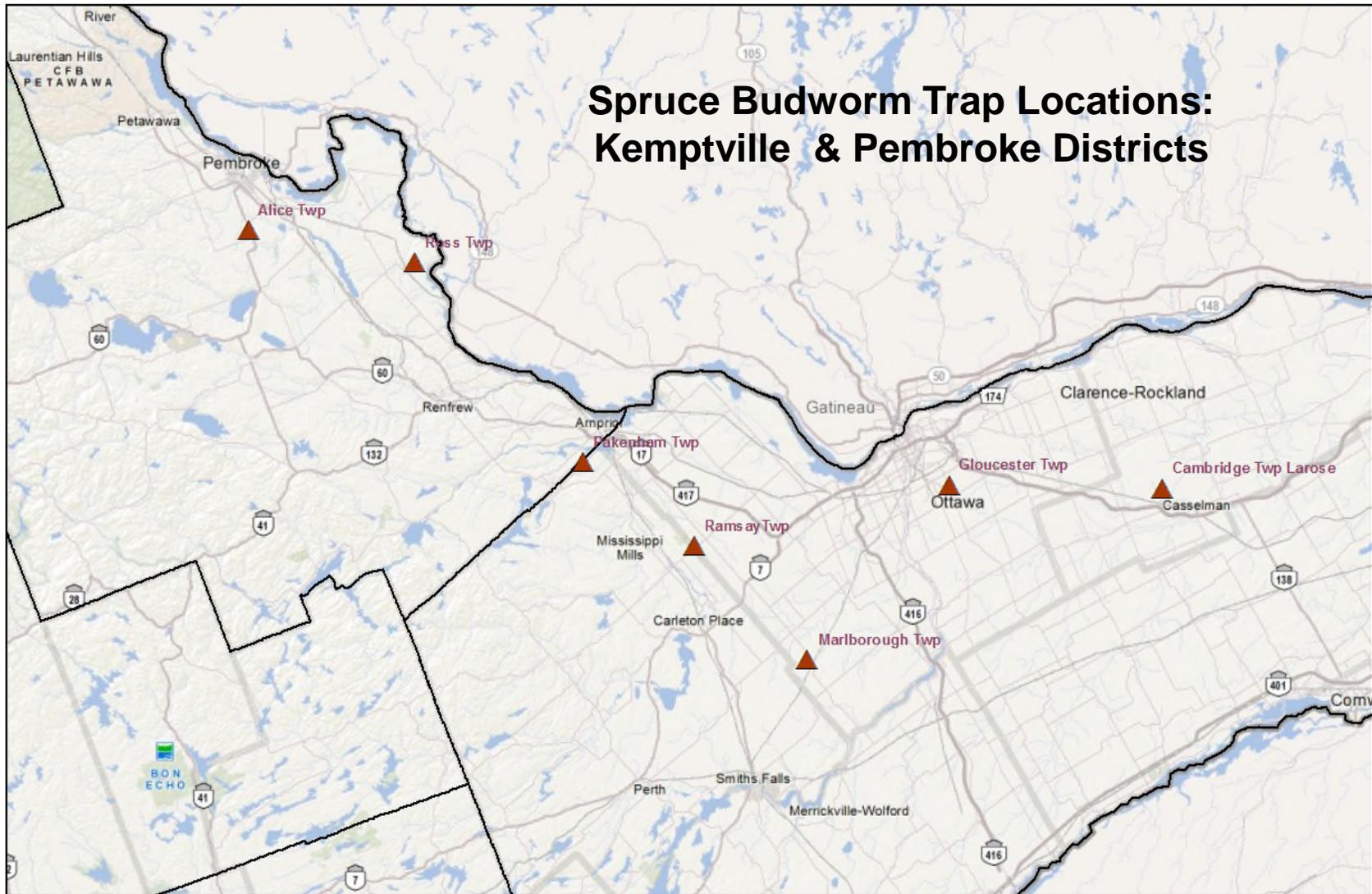


Spruce budworm Pheromone Trapping Results 2018

Average Number of
Moths per Trap

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





Jack Pine Budworm (*Choristoneura pinus pinus* Freeman)

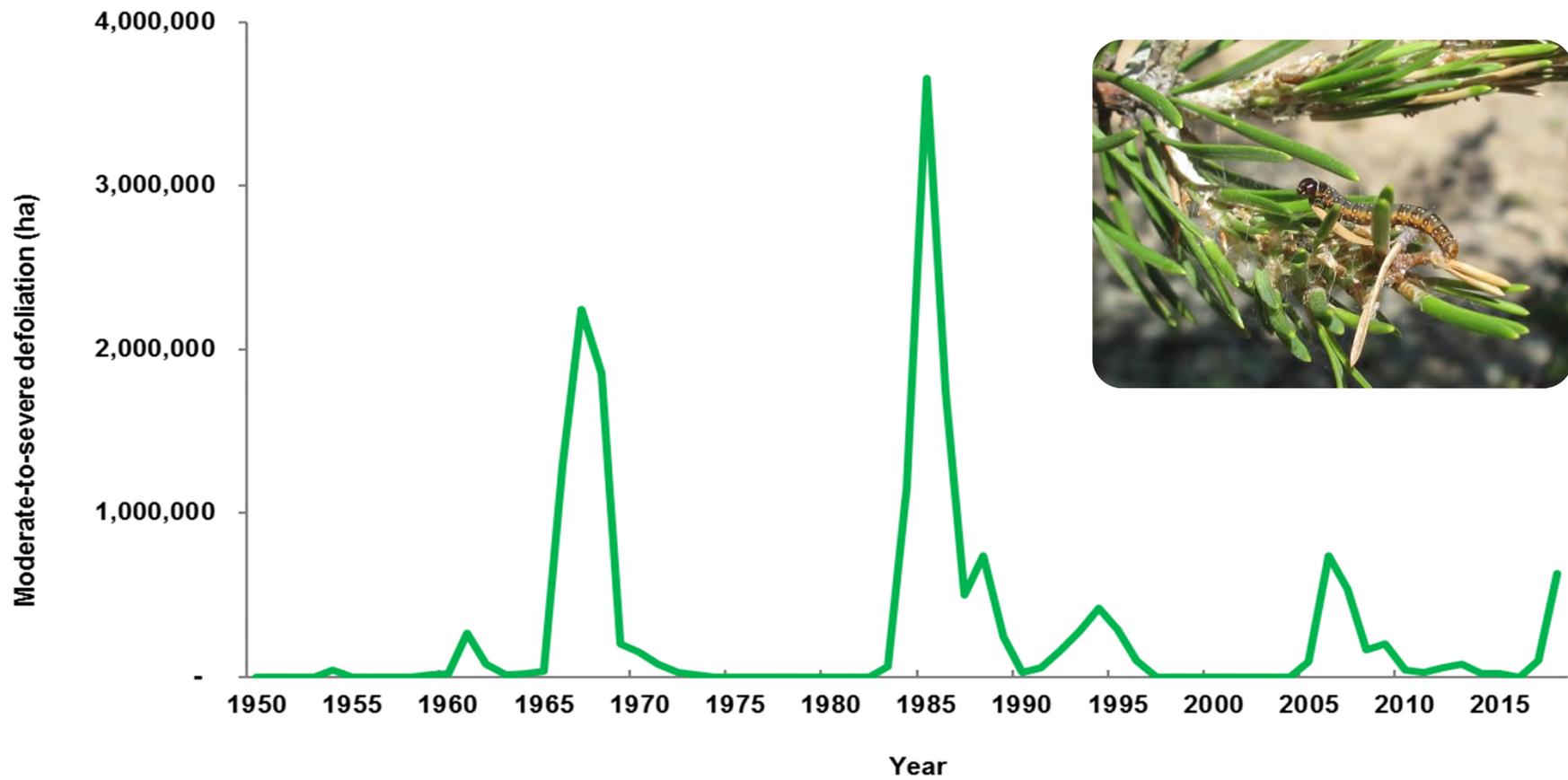
Pest Information

| | |
|-------------------|--|
| Pest Origins: | Native to North America |
| Pest Type: | Defoliator |
| Host Species: | Jack pine, red pine, Scots pine, white pine |
| Infestation Area: | Moderate-to-severe defoliation – 627,455 ha (2018) Mortality- 870 ha (2018) |



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Jack pine budworm moderate-to-severe defoliation in Ontario 1950 - 2018



Jack Pine Budworm (*Choristoneura pinus pinus* Freeman)



Jack Pine Budworm 2017

Ontario
Areas within which jack pine budworm caused defoliation

Moderate-to-severe = 100,187 ha
Mortality = 323

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



Jack Pine Budworm (*Choristoneura pinus pinus* Freeman)

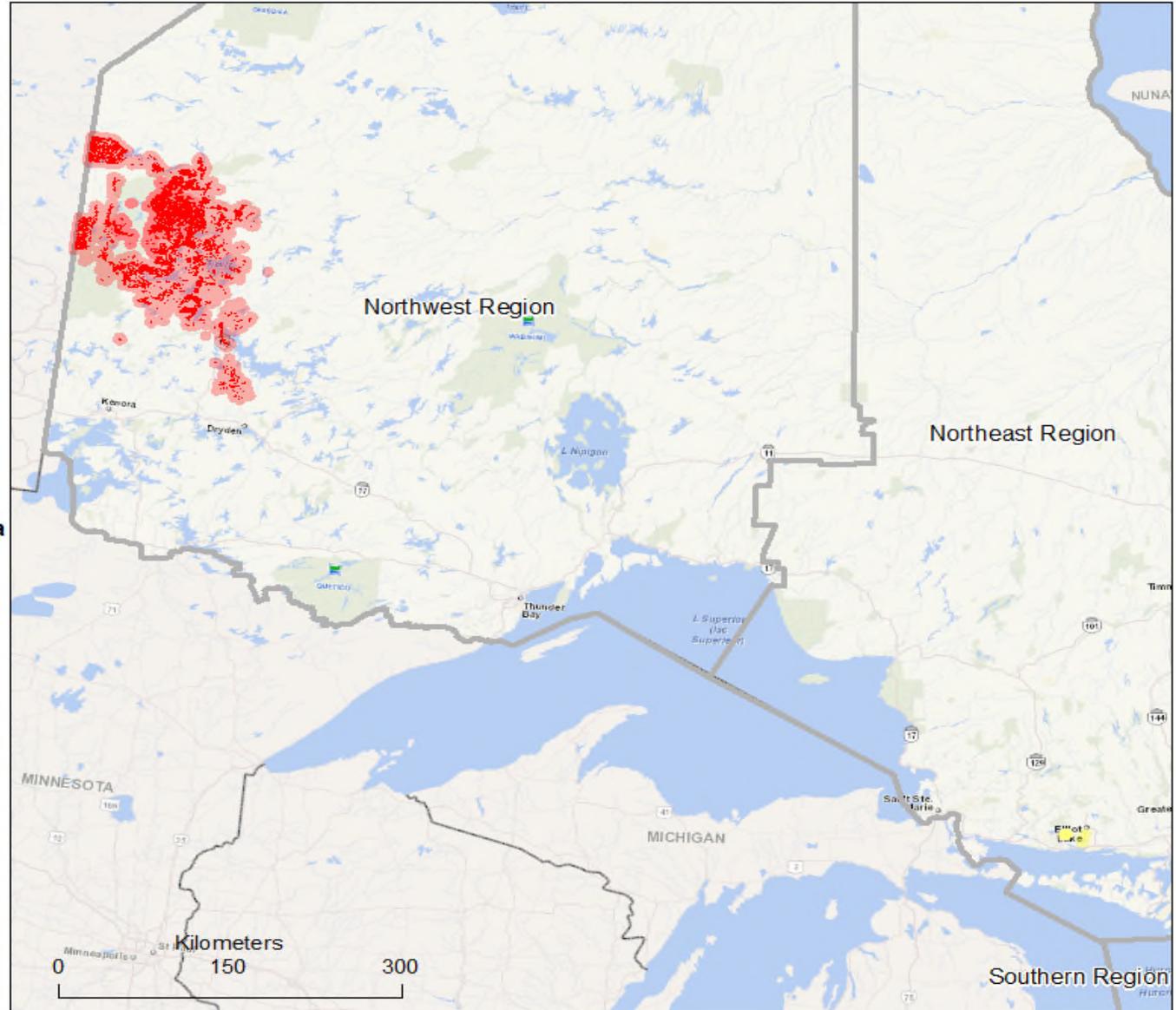


Jack pine budworm 2018

Ontario
Areas-within-which jack pine budworm caused defoliation

Moderate-to-severe = 627,455 ha
Mortality = 870 ha

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



Jack Pine Budworm (*Choristoneura pinus pinus* Freeman)

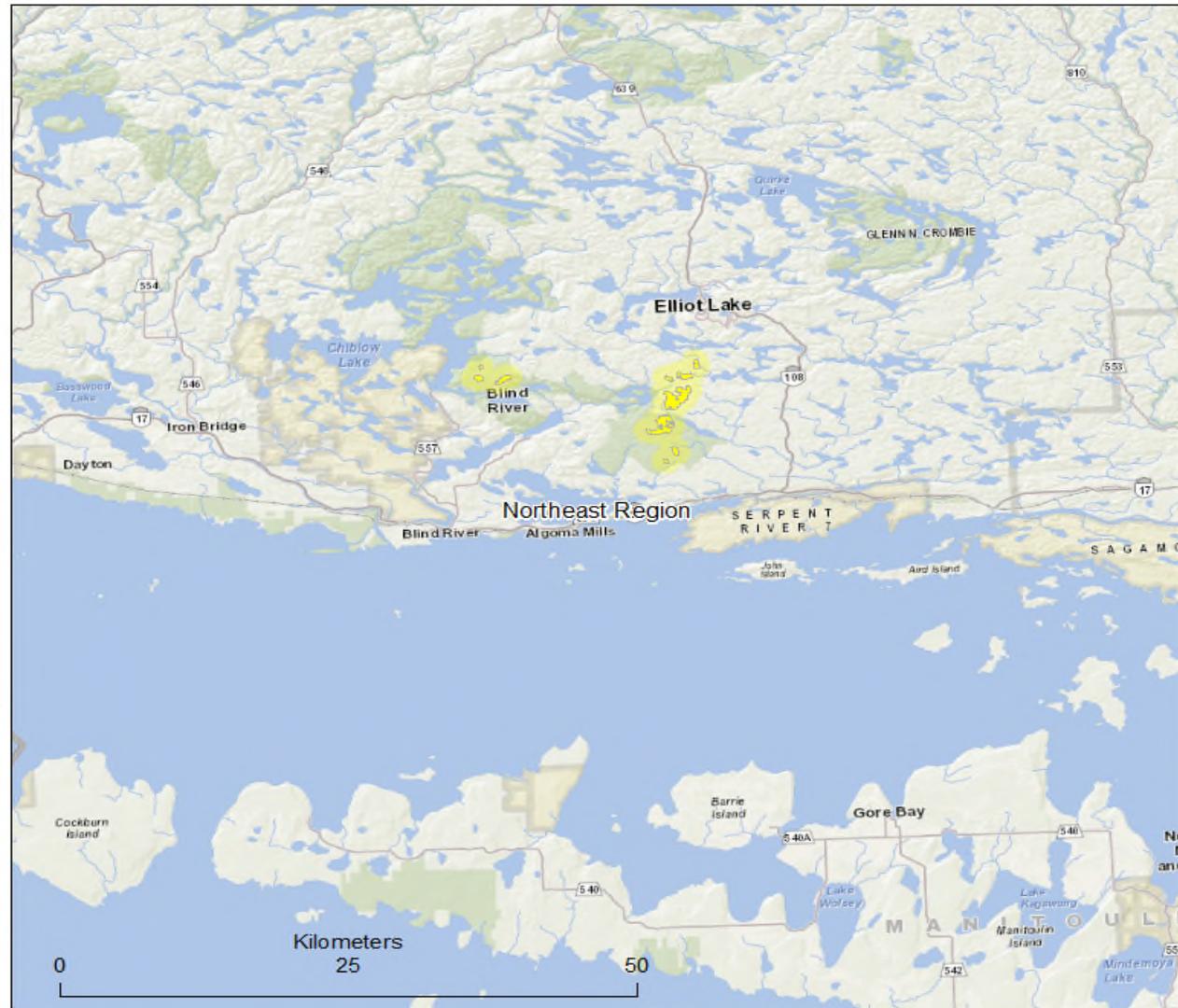


Jack pine budworm 2018

Northeast Region
Areas-within-which jack pine budworm caused mortality

Mortality = 870 ha

 Area of mortality



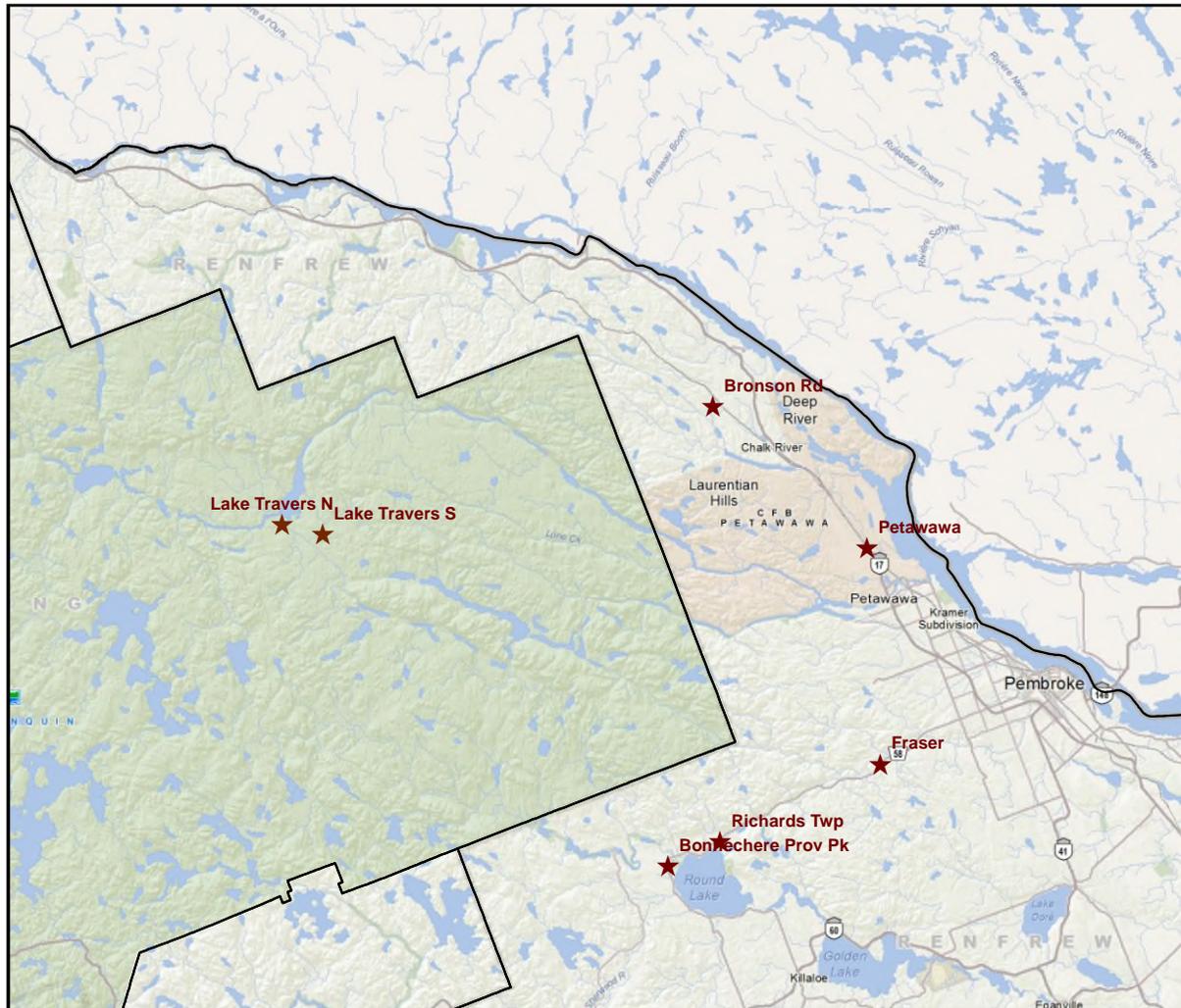
Jack Pine Budworm Pheromone Trapping Results 2018

Highlights:

- Traps deployed in 81 locations (NE-37, NW-35, S-9) in 2018. Highest numbers in Northwest Region.
- Northeast Region had an average of 23 moths/trap. High of 77 moths/trap in Nairn Twp in Sudbury District.
- Northwest Region had an average of 49 moth/trap. High of 133 moths/trap in Lac Seul area in Dryden District & Coyle Twp Kenora District.
- Southern Region had an average of 44 moths/trap. High of 76 moths/trap in Lake Travers in Algonquin Park.



Jack Pine Budworm – Traps Locations in Southern Region



Large Aspen Tortrix

Pest Information

| | |
|-------------------|-------------------------|
| Pest Origins: | Native to North America |
| Pest Type: | Defoliator |
| Host Species: | Trembling aspen |
| Infestation Area: | 39,270 ha (2018) |



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Large Aspen Tortrix (*Choristoneura conflictana* Wlk.)

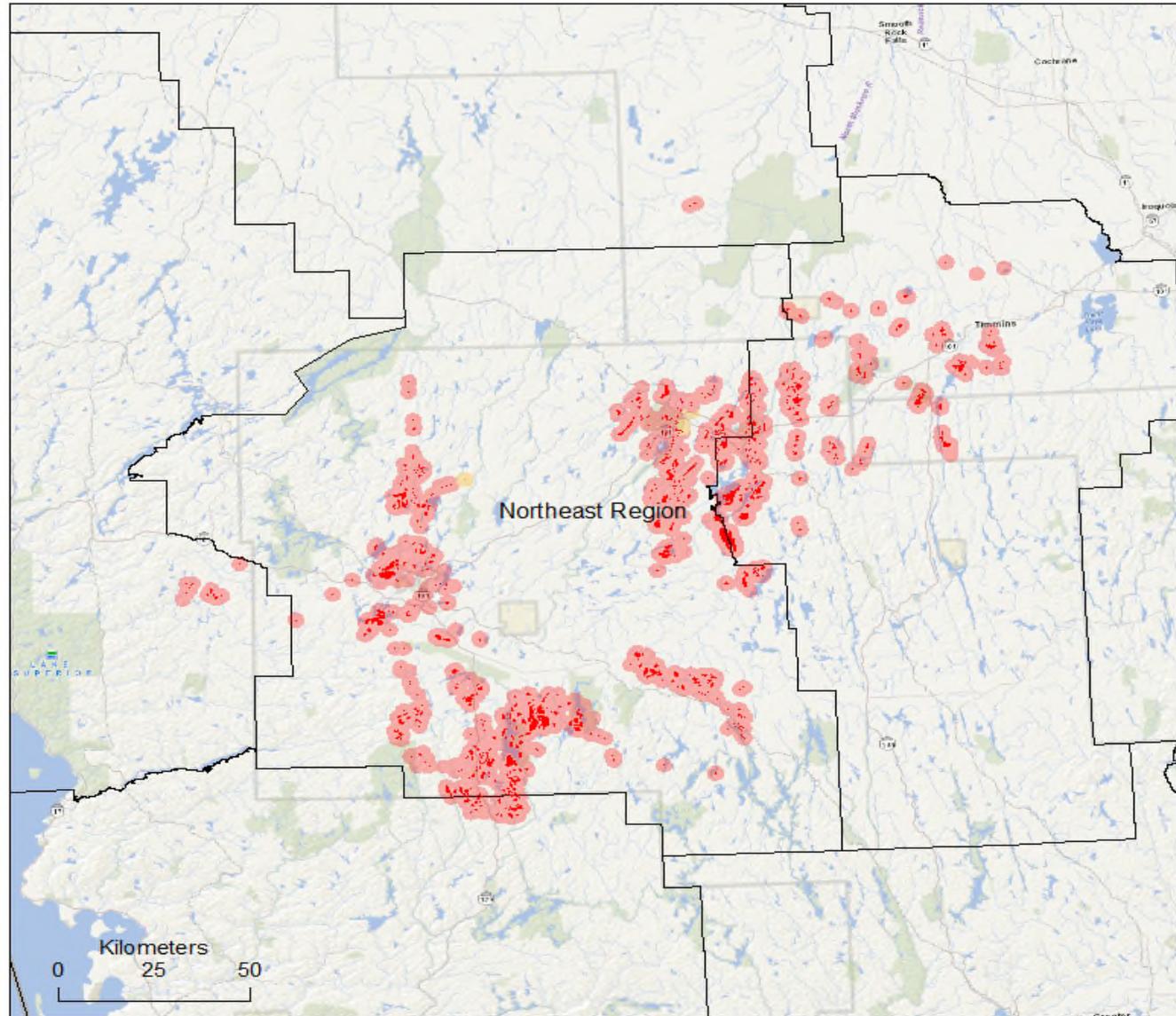


Large aspen tortrix 2018

Northeast Region
Areas-within-which large aspen tortrix caused defoliation

Light = 64 ha
Moderate-to-severe = 39,206 ha

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



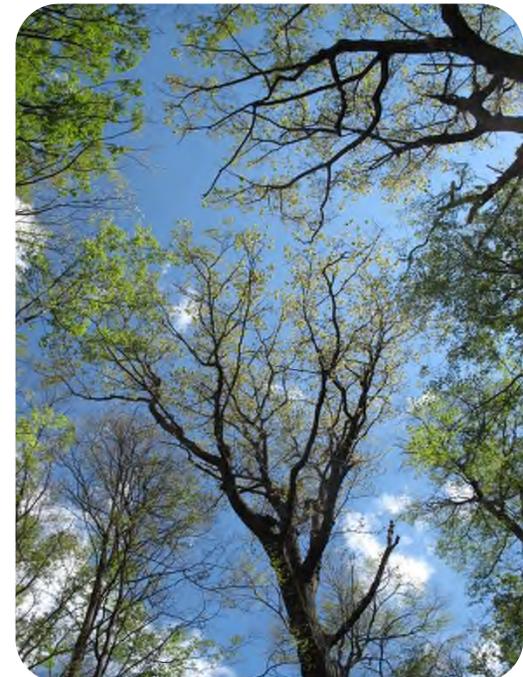
Fall Cankerworm (*Alsophila pometaria* (Harr.))

Pest Information

| | |
|-------------------|--|
| Pest Origins: | Native to North America |
| Pest Type: | Defoliator |
| Host Species: | Manitoba maple, other maples, oak, ash and elm |
| Infestation Area: | 831 ha (2018) |



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Fall Cankerworm (*Alsophila pometaria* (Harr.))

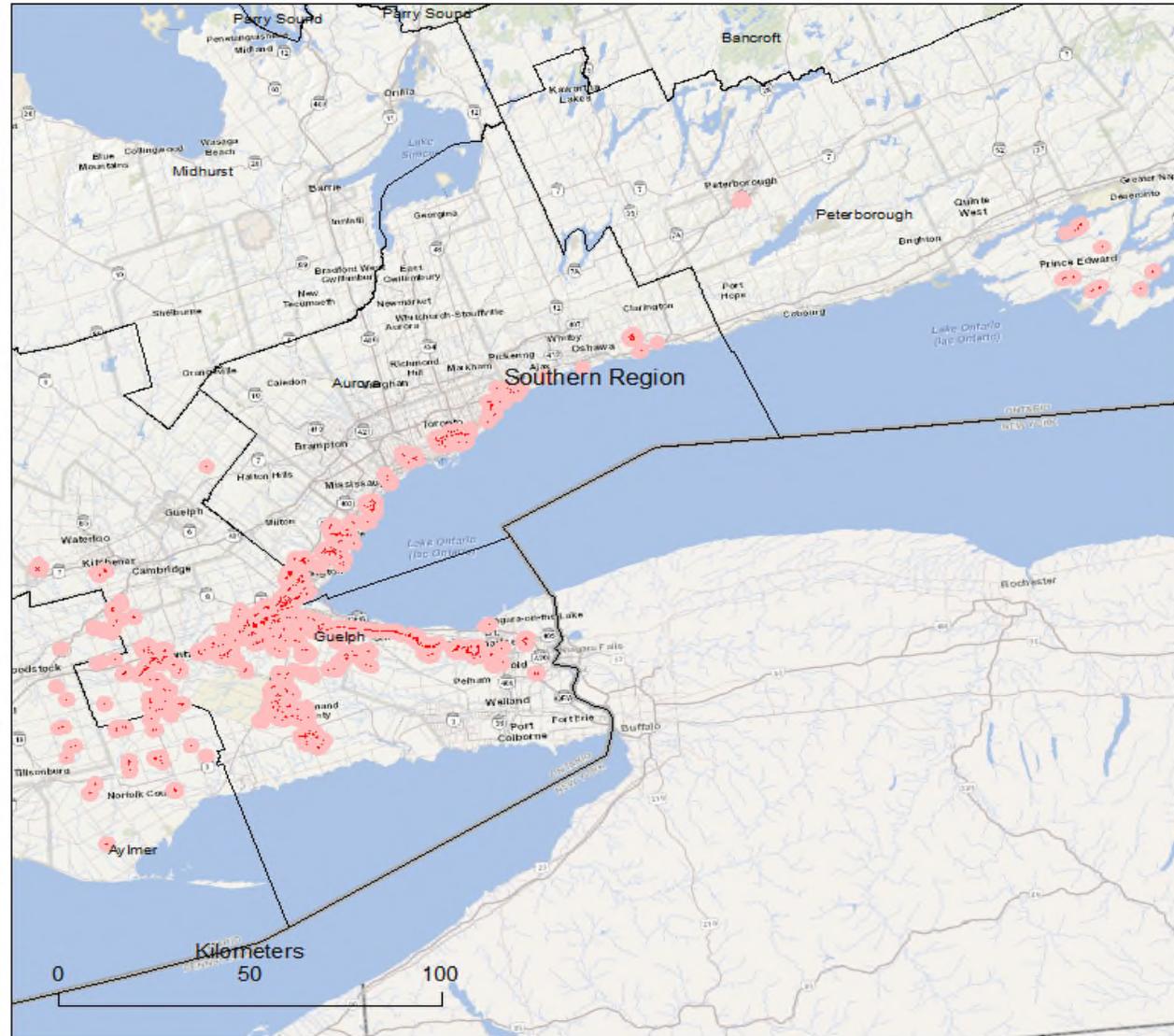


Fall Cankerworm 2017

Southern Region
Areas-within-which fall
cankerworm caused defoliation

Moderate-to-severe = 11,764 ha

 Area of moderate-to-severe
defoliation



Fall Cankerworm

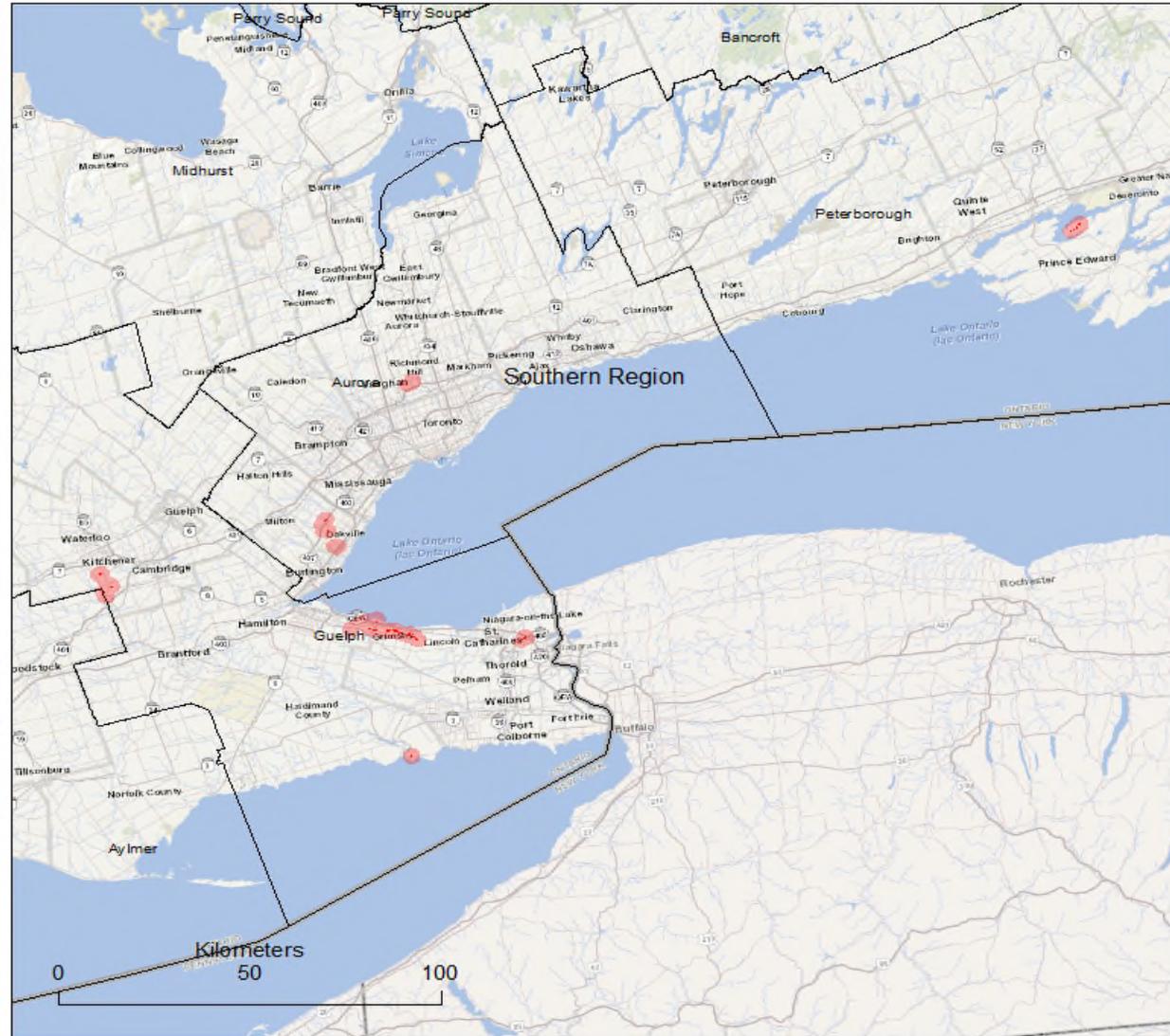


Fall cankerworm 2018

Southern Region
Areas within which fall
cankerworm caused defoliation

Moderate-to-severe = 831 ha

 Area of moderate-to-severe
defoliation



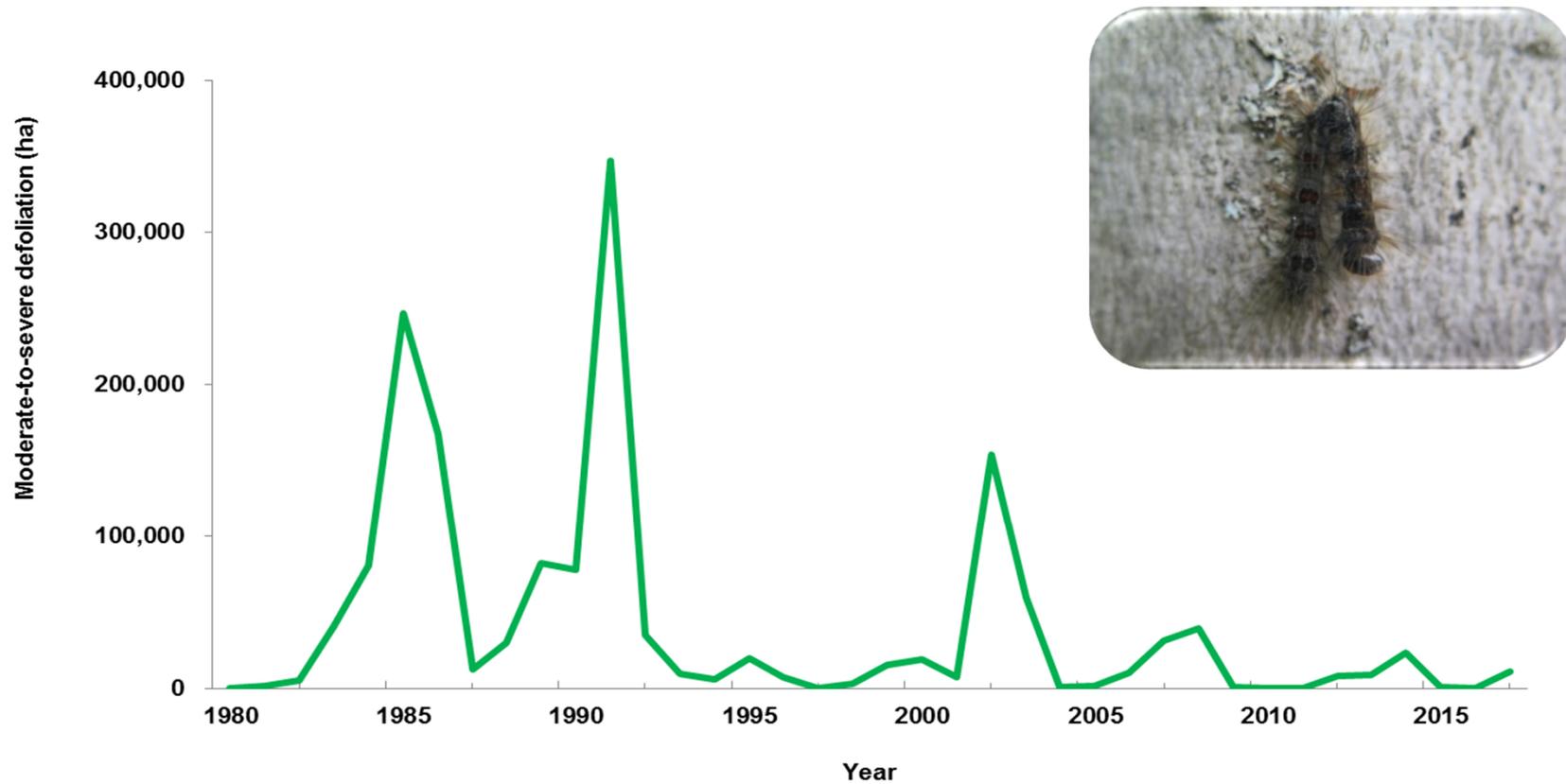
Gypsy Moth

Pest Information

Pest Origins: **Invasive** - Native to Europe
Pest Type: Defoliator
Host Species: Oak, birch, aspen and various hardwoods
Infestation Area: 14, 937 ha (2018)



Gypsy moth Moderate-to-severe defoliation in Ontario 1980 - 2017



Gypsy Moth

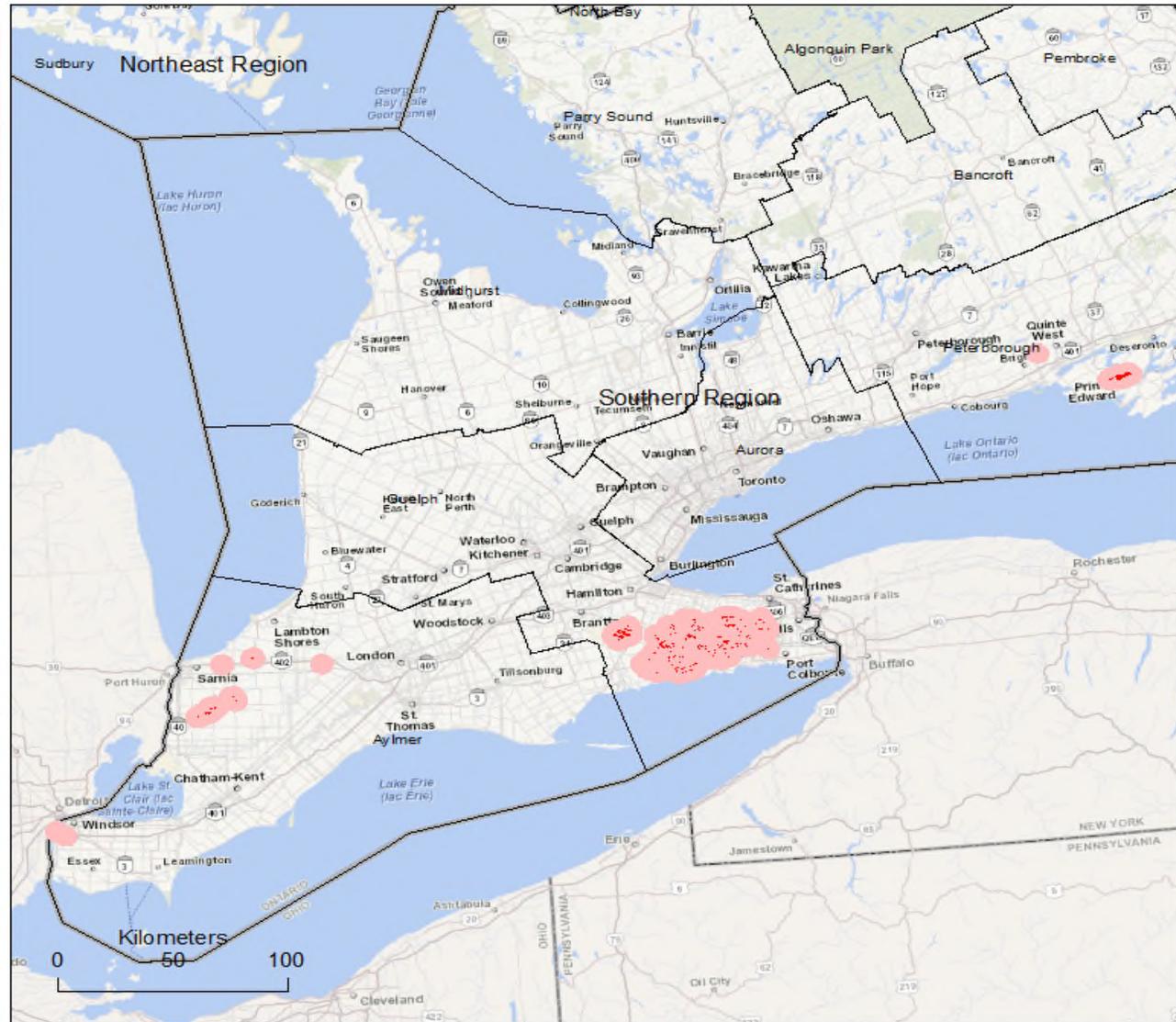


Gypsy Moth 2017

Southern Region
Areas within which gypsy moth caused defoliation

Moderate-to-severe = 10,856 ha

 Area of moderate-to-severe defoliation



Gypsy Moth

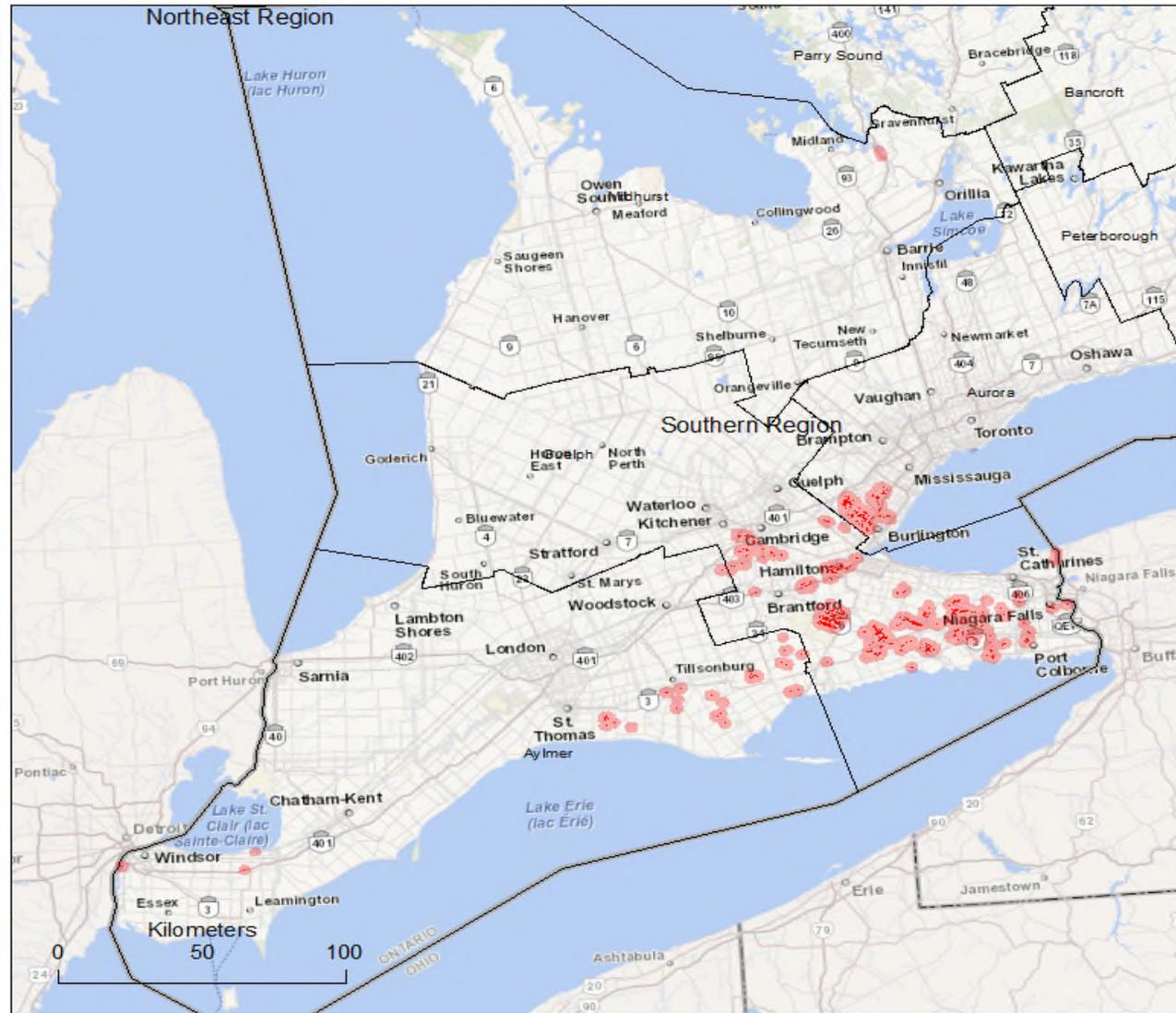


Gypsy moth 2018

Southern Region
Areas within which gypsy moth caused defoliation

Moderate-to-severe = 14,937 ha

 Area of moderate-to-severe defoliation



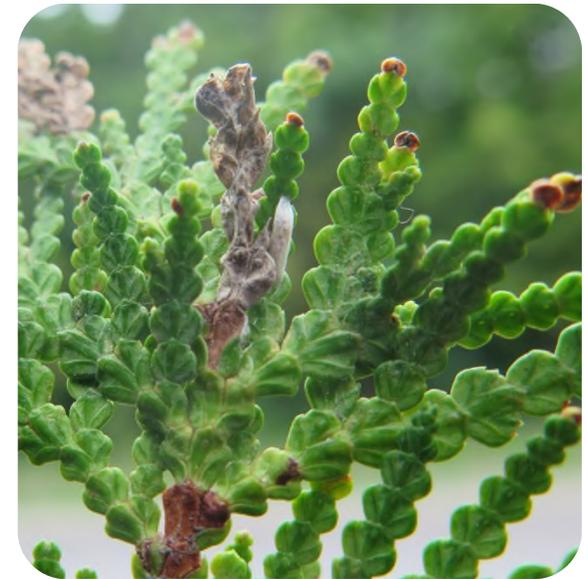
Cedar leafminers (various species)

Pest Information

| | |
|-------------------|-------------------------|
| Pest Origins: | Native to North America |
| Pest Type: | Defoliator |
| Host Species: | Eastern white cedar |
| Infestation Area: | 5,919 ha (2018) |



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Cedar leafminer



Cedar Leafminer 2017

Ontario
Areas within which cedar leafminer caused defoliation

Light = 16 ha
Moderate-to-severe = 5,903 ha

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



Cedar leafminer



Cedar leafminer 2018

Ontario
Areas within which cedar leafminer caused defoliation

Light = 2,628 ha
Moderate-to-severe = 26,448 ha

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



Cedar leafminer

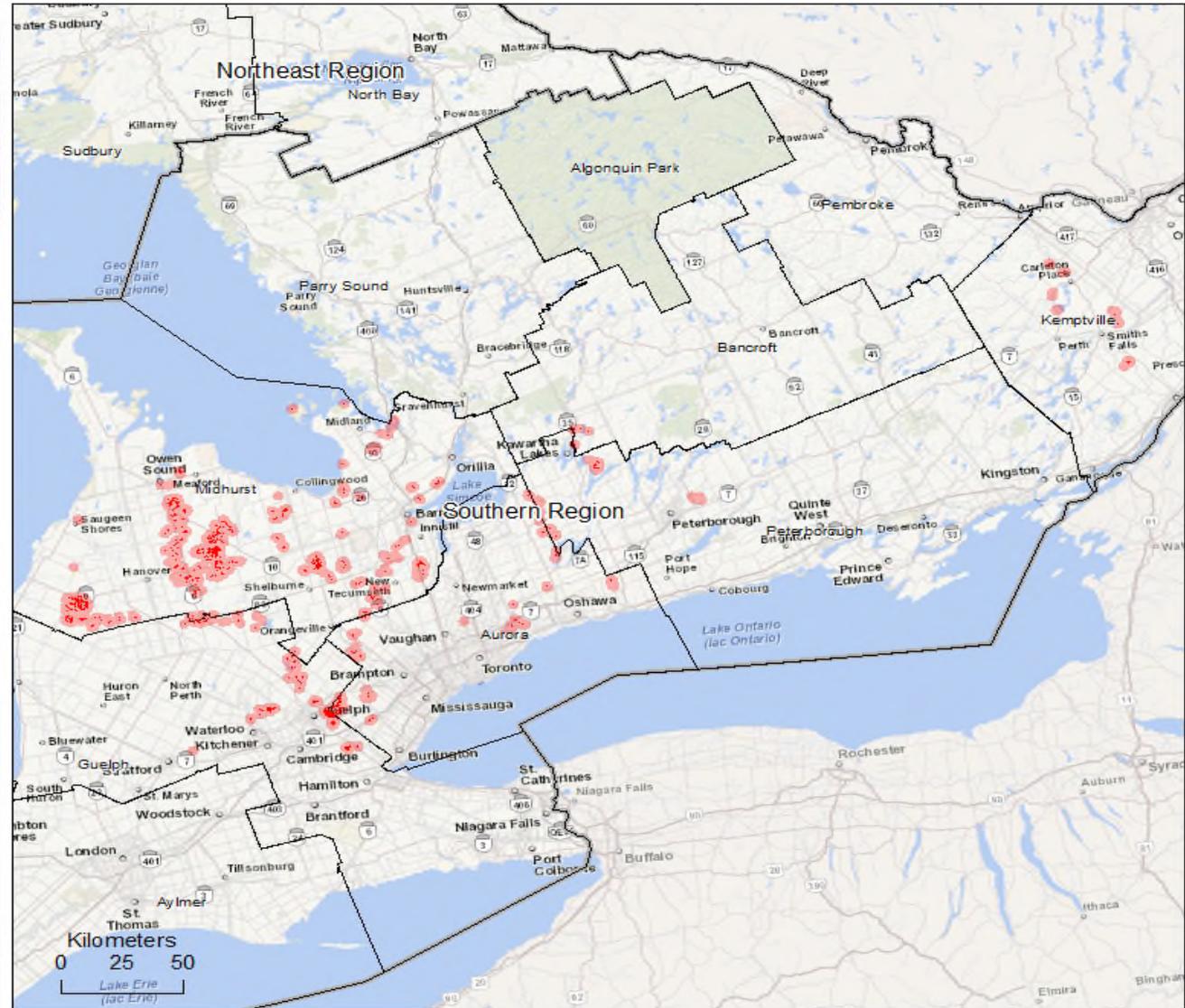


Cedar leafminer 2018

Southern Region
Areas within which cedar
leafminer caused defoliation

Moderate-to-severe = 26,082 ha

 Area of moderate-to-severe
defoliation



Larch Casebearer

Pest Information

Pest Origins: **Invasive** - Native to Europe
Pest Type: Defoliator
Host Species: Larch (Tamarack)
Infestation Area: 1,986 ha (2018)



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Larch Casebearer

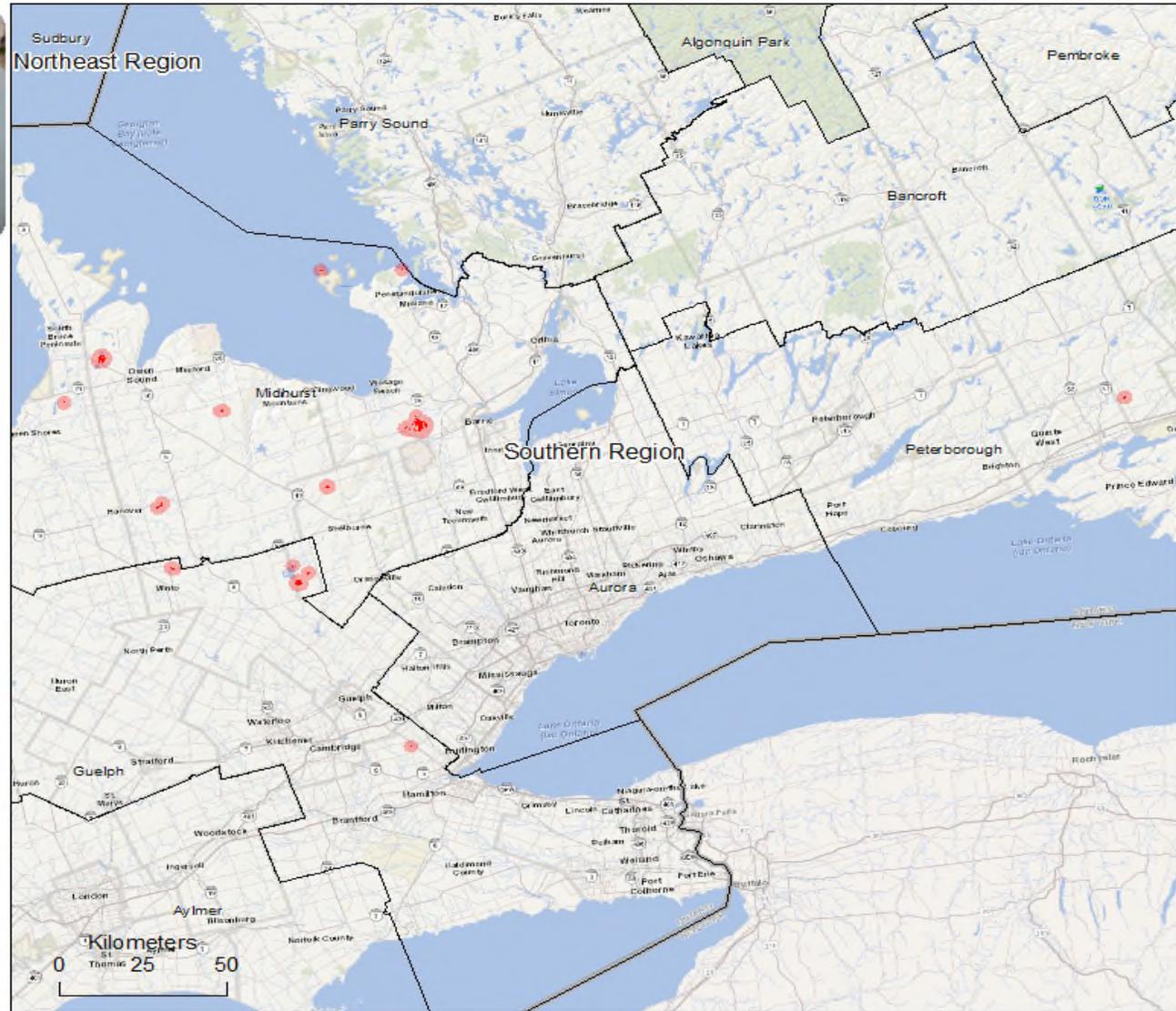


Larch casebearer 2018

Southern Region
Areas within which larch casebearer caused defoliation

Moderate-to-severe = 1,986 ha

 Area of moderate-to-severe defoliation



Eastern Larch Beetle

Pest Information

| | |
|-------------------|-------------------------|
| Pest Origins: | Native to North America |
| Pest Type: | Borer |
| Host Species: | Larch (Tamarack) |
| Infestation Area: | 1,125 ha (2018) |



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Eastern Larch Beetle

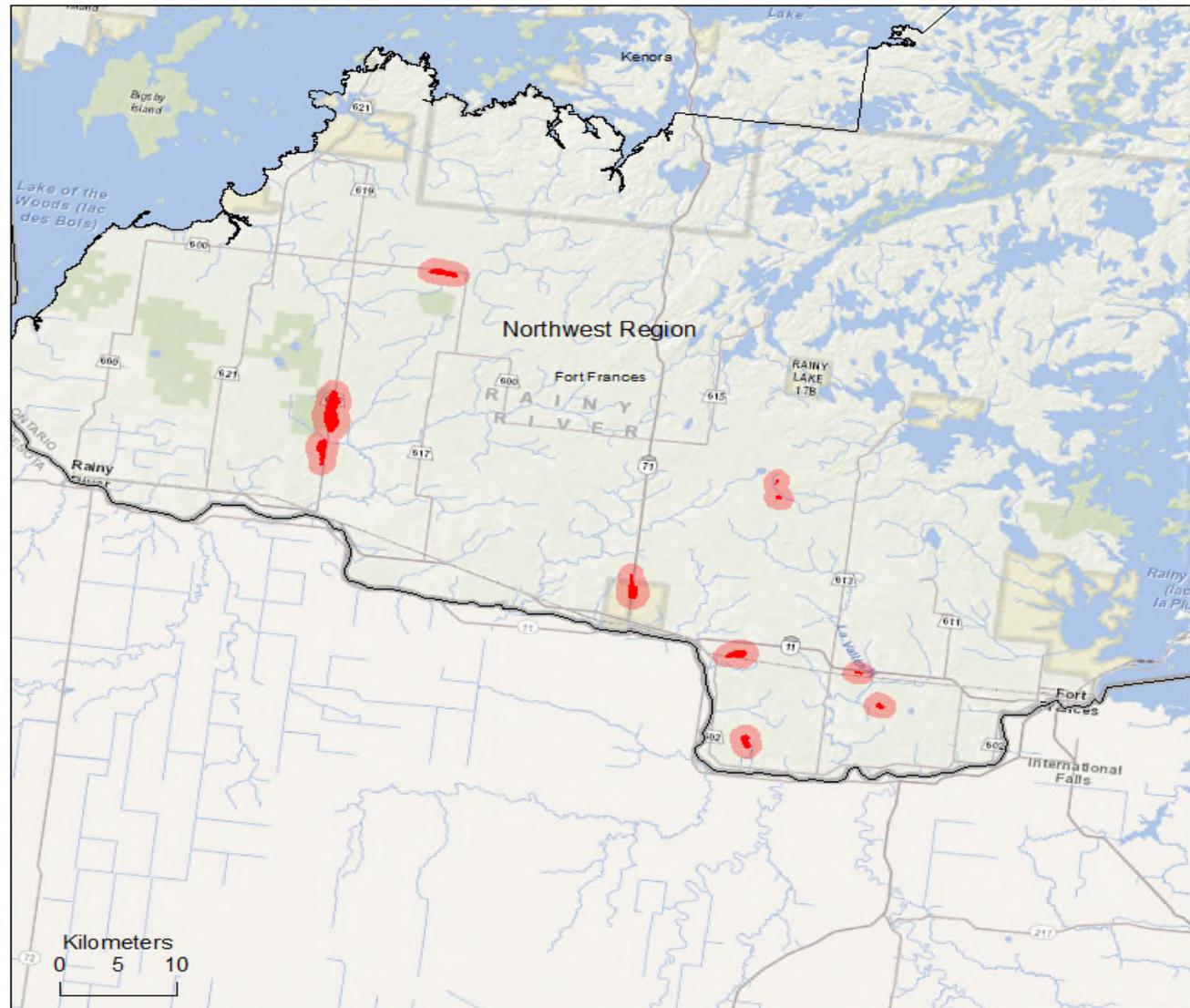


Eastern larch beetle 2018

Northwest region
Areas-within-which eastern larch beetle caused damage

Moderate-to-severe = 1,125 ha

 Area of moderate-to-severe damage



Larch Decline



Balsam Fir Sawfly (*Neodiprion abietis* (Harr.))

Pest Information

| | |
|-------------------|-------------------------|
| Pest Origins: | Native to North America |
| Pest Type: | Defoliator |
| Host Species: | Balsam fir |
| Infestation Area: | 31 ha (2018) |



Balsam Fir Sawfly

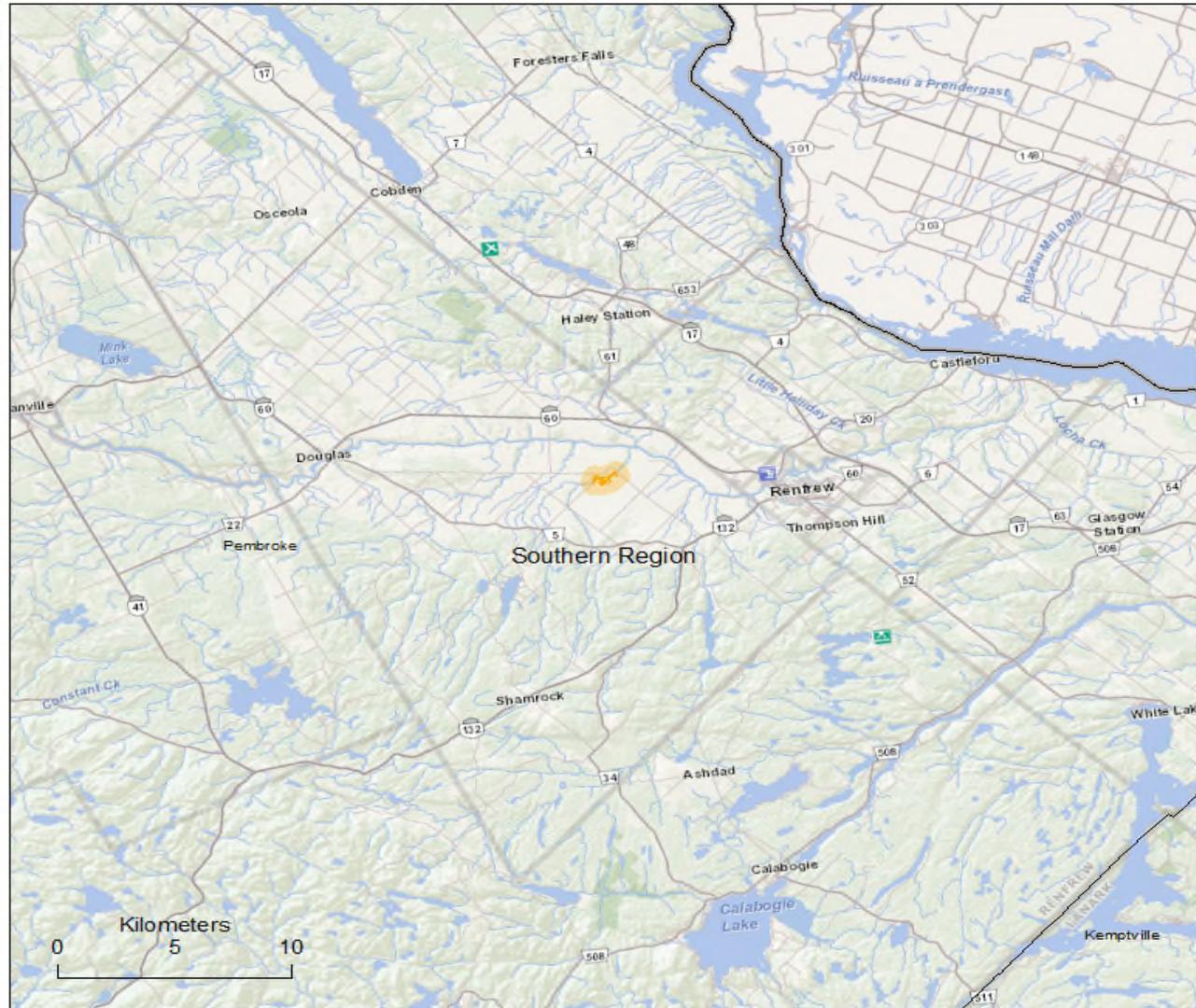


Balsam fir sawfly 2018

Southern Region
Areas within which balsam
fir sawfly caused defoliation

Light defoliation = 31 ha

 Area of light defoliation



Satin moth (*Leucoma salicis* (L.))

Pest Information

Pest Origins: **Invasive** – Native to Europe and Asia
Pest Type: Defoliator
Host Species: Poplar spp.
Infestation Area: 61 ha (2018)



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Satin moth (*Leucoma salicis* (L.))

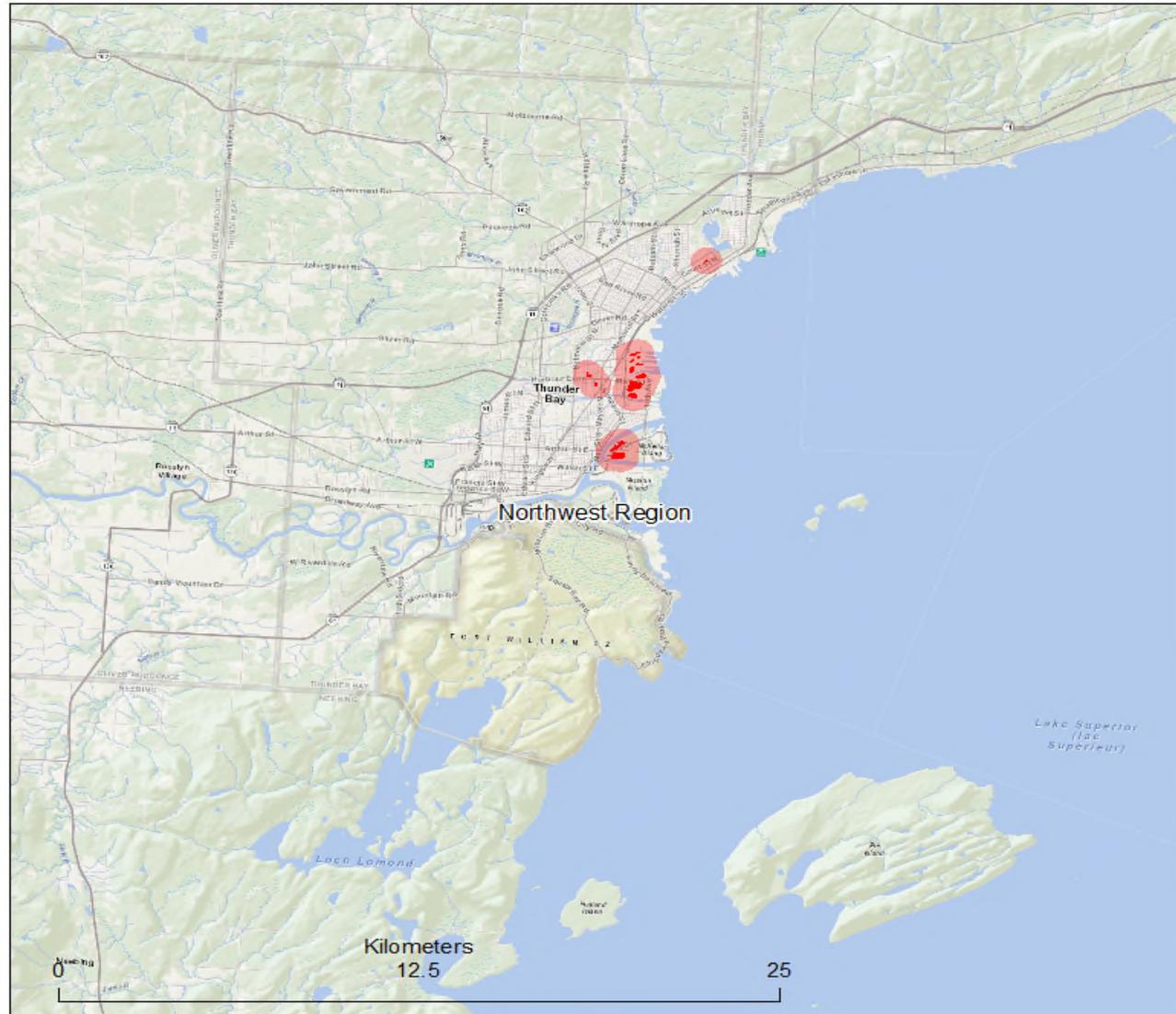


Satin moth 2018

Northwest Region
Areas-within-which satin
moth caused defoliation

Moderate-to-severe = 61 ha

 Area of moderate-to-severe
defoliation



Emerald Ash Borer

Pest Information

| | |
|------------------------|----------------------------------|
| Pest Origins: | Invasive – Native to Asia |
| Pest Type: | Wood Borer |
| Host Species: Ash spp. | |
| Infestation Area: | 4,580 ha (2018) |

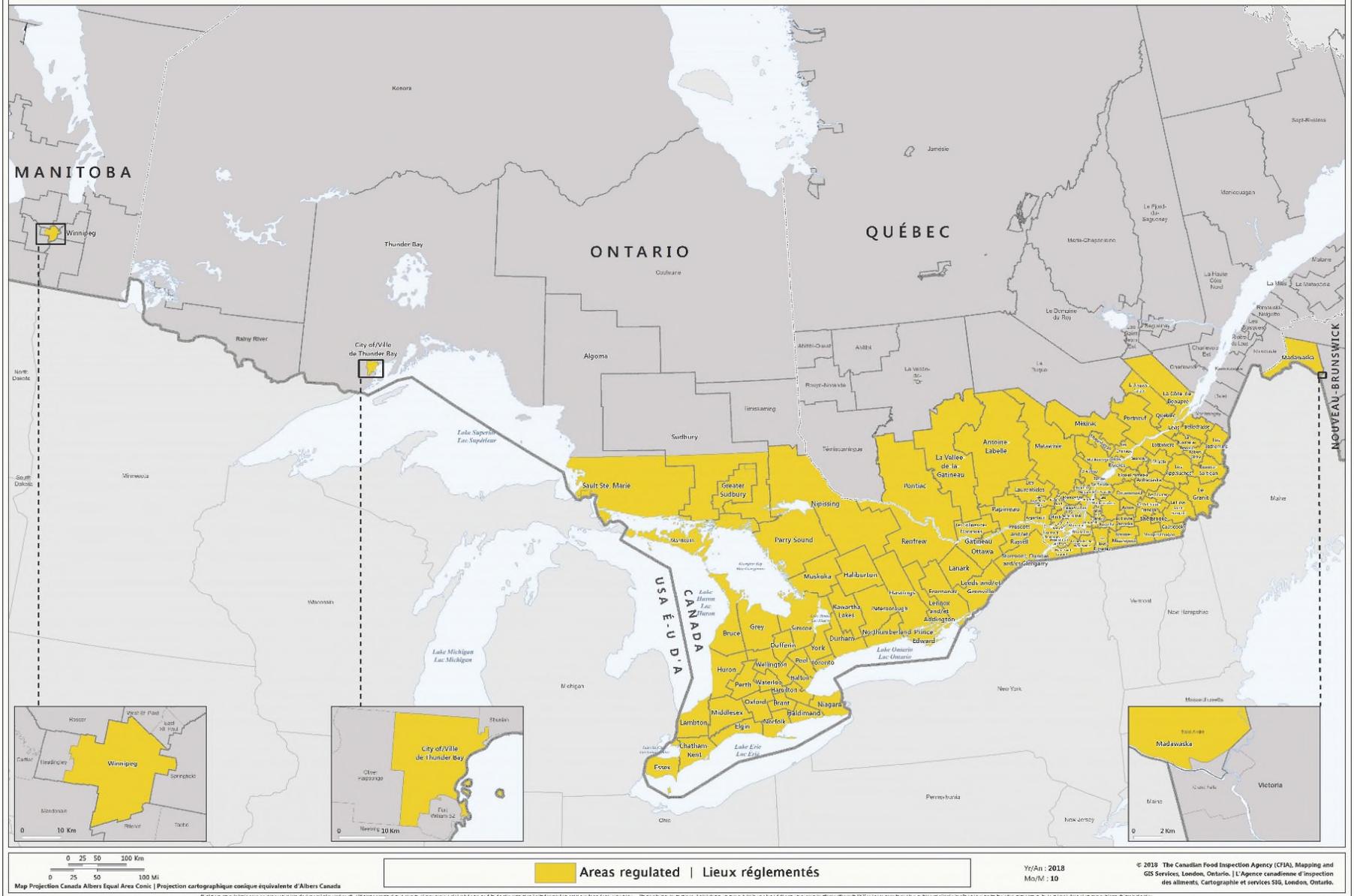


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EMERALD ASH BORER REGULATED AREAS OF CANADA

LIEUX RÉGLEMENTÉS POUR L'AGRILE DU FRÊNE AU CANADA



Emerald Ash Borer



Emerald ash borer 2004-2015 and 2016

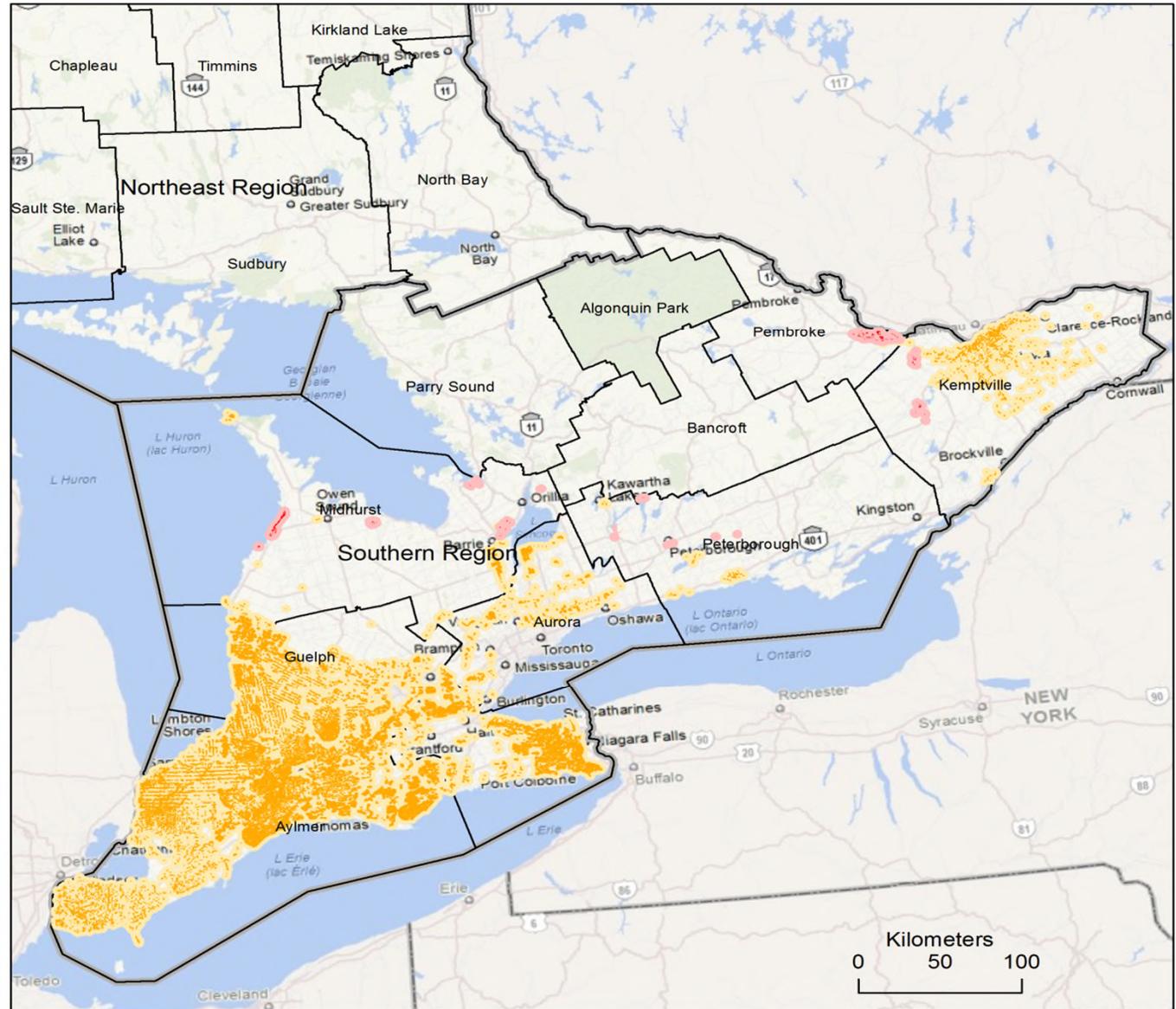
Overview

Areas within which emerald ash borer caused decline and mortality to ash species.

237,595 ha (2004-2015 cumulative)

4,688 ha 2016

-  Area of moderate-to-severe decline and mortality 2004-2015
-  Area of moderate-to-severe decline and mortality 2016



Emerald Ash Borer

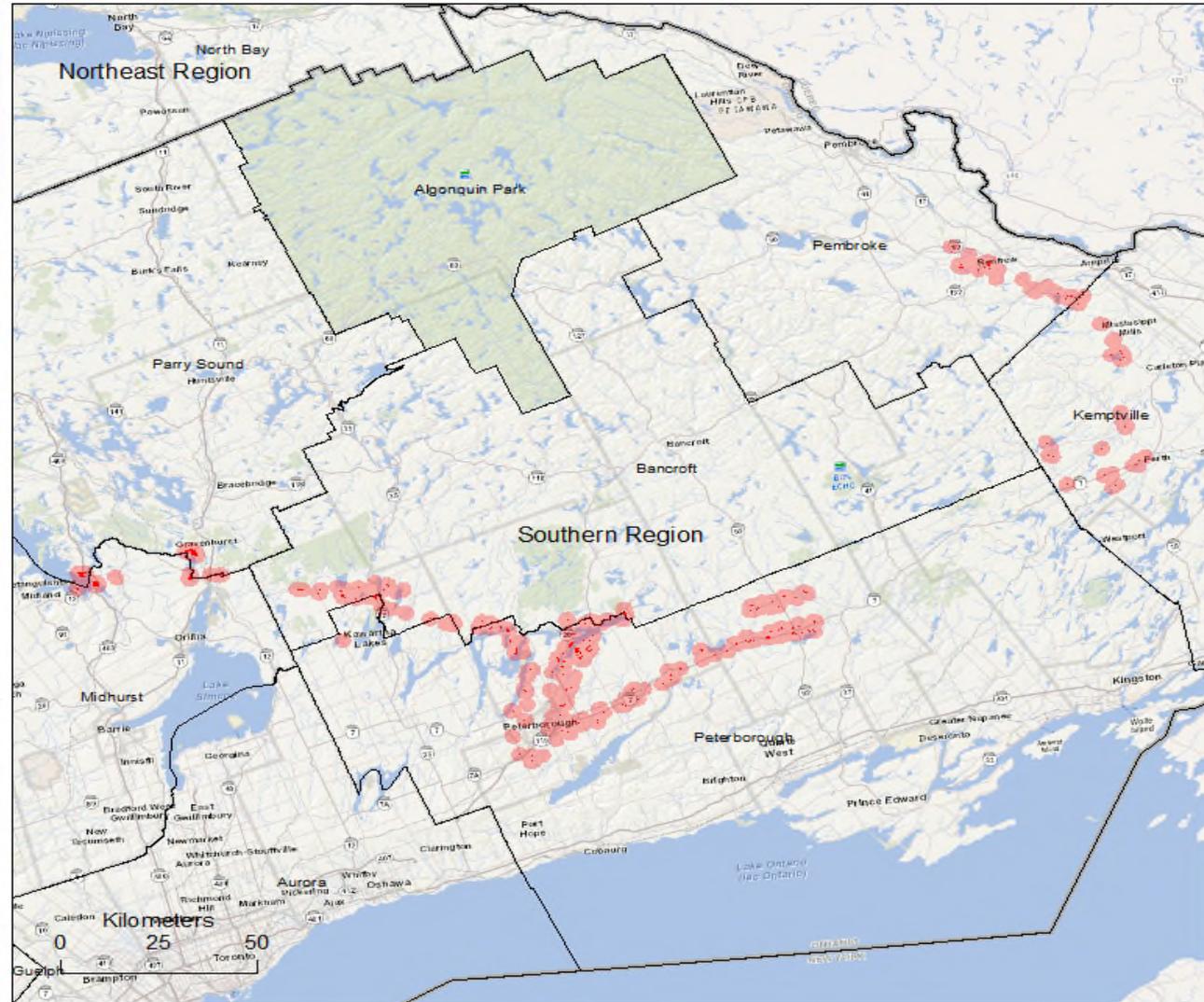


Emerald ash borer 2018

Southern Region
Areas within which emerald ash borer caused defoliation

Moderate-to-severe = 4,580 ha

 Area of moderate-to-severe defoliation

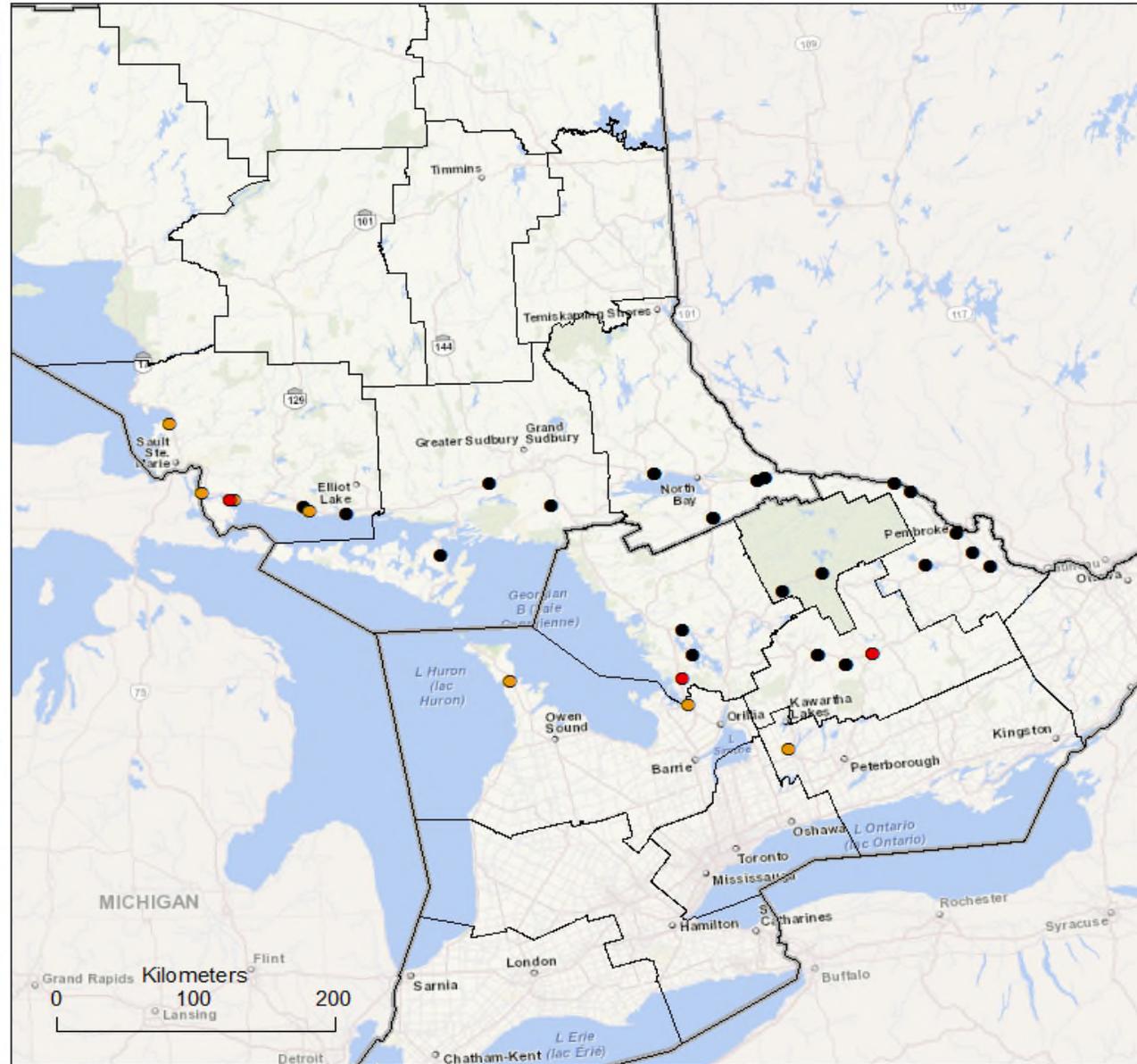


Emerald Ash Borer



Emerald Ash Borer Traps & Ground Surveys 2017

- Trap - positive
- Trap - negative
- Ground Survey - positive



Brown Spot Needle Blight (*Lecanosticta acicola*)

Pest Information

| | |
|-------------------|-------------------------|
| Pest Origins: | Native to North America |
| Pest Type: | Needle blight |
| Host Species: | Scots pine |
| Infestation Area: | 1,827 ha (2018) |



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Brown spot needle blight (*Lecanosticta acicola*)

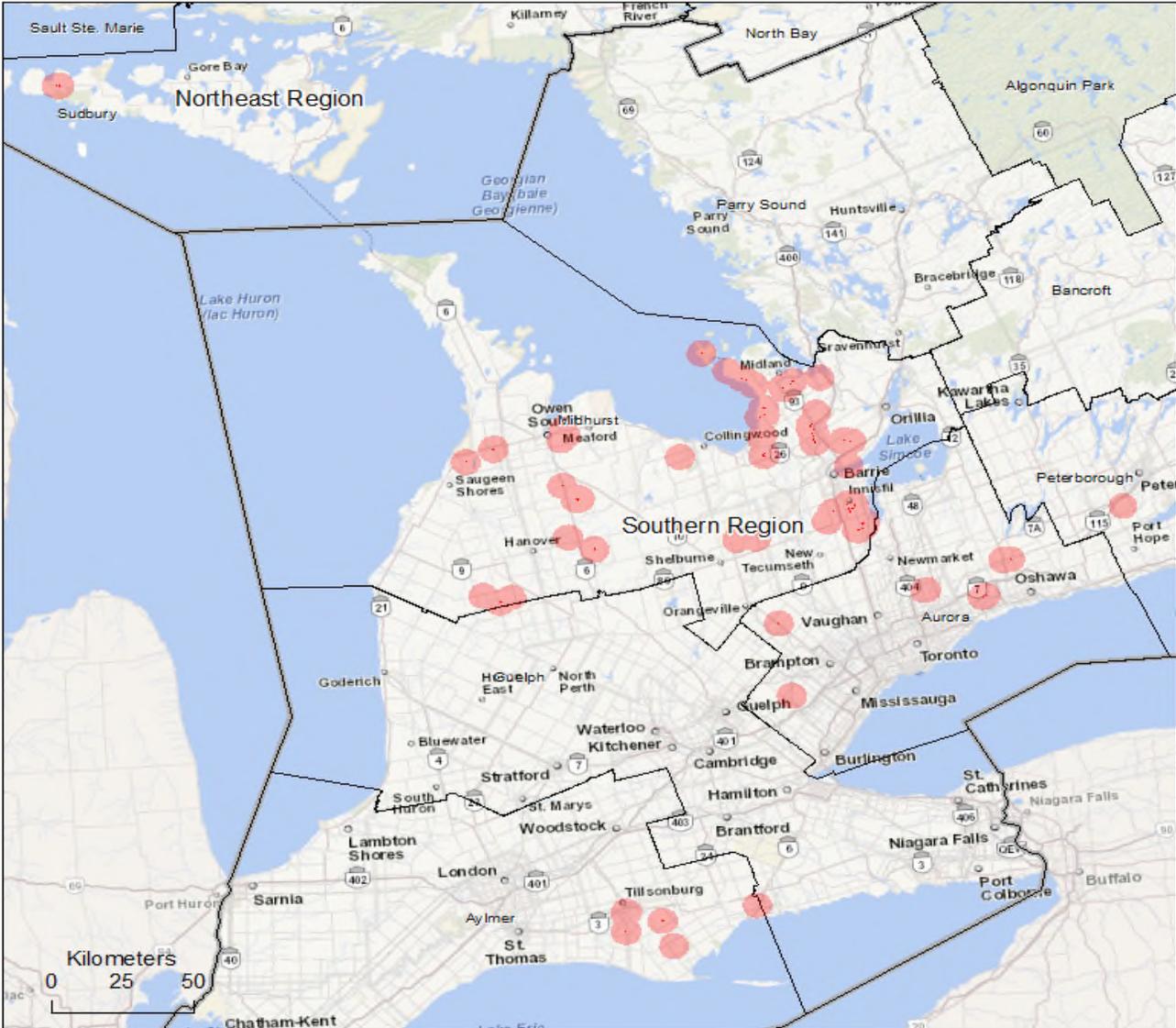


Brown spot needle blight 2018

Ontario
Areas within which brown spot needle blight caused defoliation

Moderate-to-severe = 1,827 ha

 Area of moderate-to-severe defoliation



Blow down

Pest Information

Damage Type: Abiotic Damage – Weather Event
Damage Area: 3, 839 ha (2018)



Blowdown



Blowdown 2018

Ontario
Areas-within-which blowdown caused damage

Moderate-to-severe = 3,839 ha

 Area of moderate-to-severe damage



Blowdown

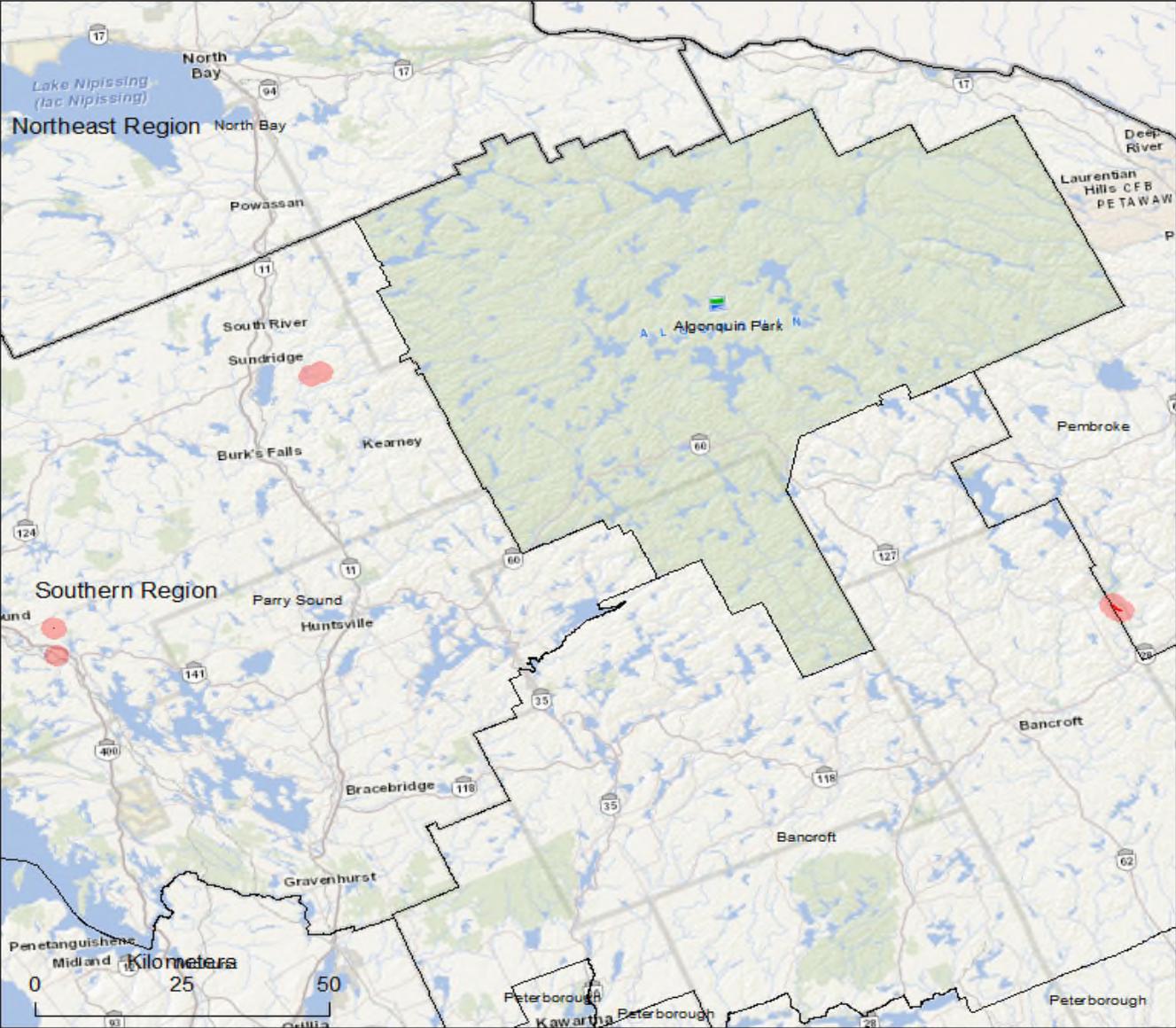


Blowdown 2018

Southern Region
Areas within which blowdown caused damage

Moderate-to-severe = 112 ha

 Area of moderate-to-severe damage



Tornado damage



Arlington Woods



Bruce Pit



Craig Henry



Dunrobin

Beech Bark Disease

Pest Information

Pest Origins: **Invasive** – Native to Europe - Halifax in the 1920s
Pest Type: Insect – Disease Complex
Host Species: American Beech
Infestation Area: point locations in 2017



Beech Bark Disease

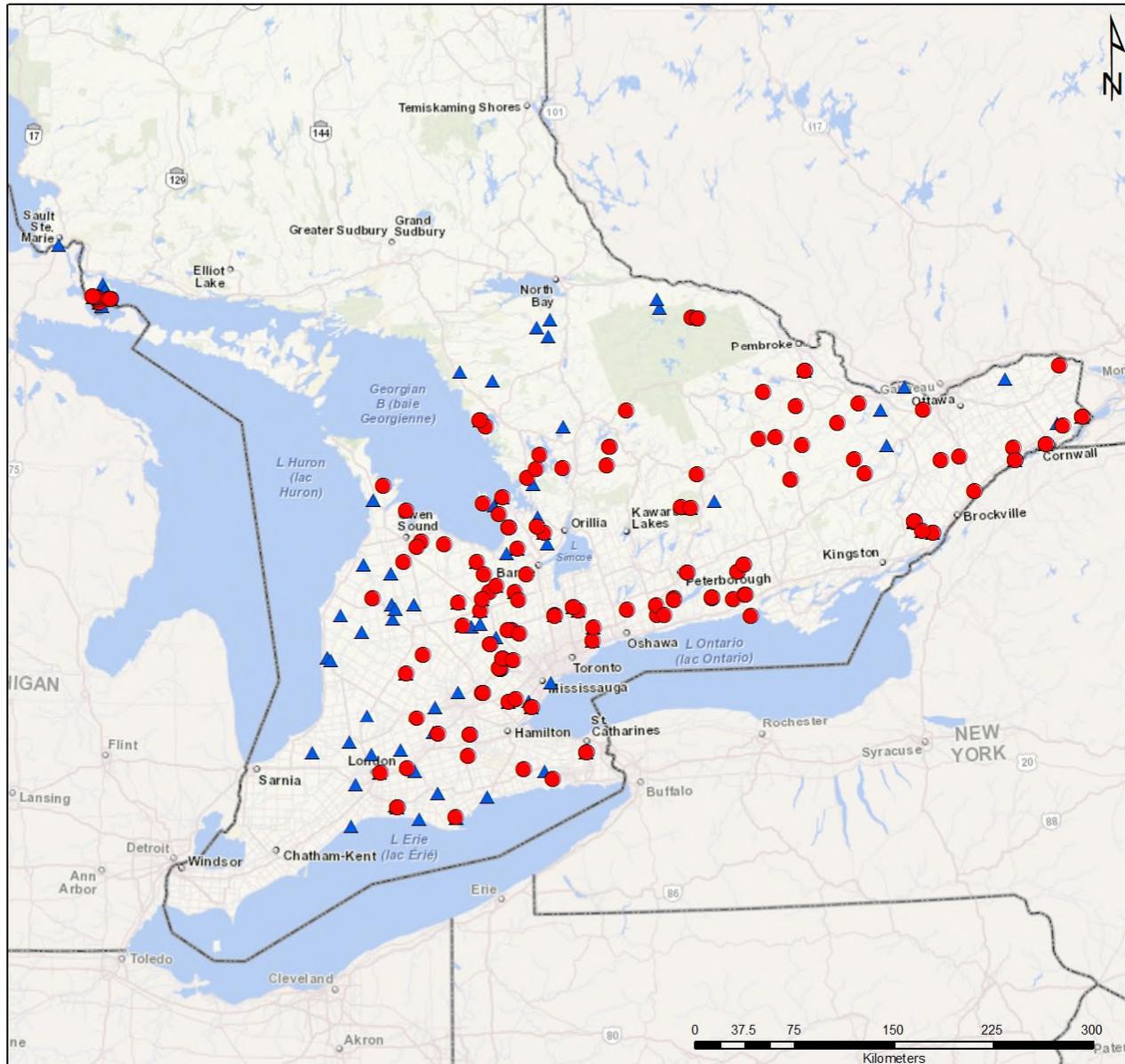
- Infested beech stands begin to show signs of growth reduction, tree deformation, declines in wood quality and mast production, as well as premature mortality.
- Three distinct phases of beech bark disease development can be observed across Ontario:
 - ✓ **Advancing front:** beech scale populations have recently colonized unaffected beech trees. Scale infestations combined with other stressors can contribute to beech decline
 - ✓ **Killing front:** scale populations rapidly build and the fungus colonizes trees. The killing front is characterized by heavy levels of 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.

Beech Bark Disease



Beech Bark Disease and Beech Scale in Ontario 1999 - 2017

- Beech bark disease detected
- ▲ Beech scale detected



Produced by:
Biodiversity and Monitoring Section
Ministry of Natural Resources and Forestry

Sources:
Base Data: MNRF LIO
Projection: Transverse Mercator
Datum: NAD 83

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Slide 61

VC1

what are grey dots, and light red dots ...

Chaimbrone, Vanessa (MNRF), 7/18/2016

Other Minor Disturbances

Insects:

- Maple and basswood leafrollers
- Blackmine beetle
- Cynipidae gall wasps



Galls caused by Callirhytis quercusoperator and Disholcaspis sp

Disease:

- Septoria leaf spot of birch and ash
- Anthracnose (elm)
- Botryosphaeria dothidea
- Tubakia leaf spot

Abitotic

- Winter drying

Other Minor Disturbances



Damage by basswood leafrollers



Tubakia leaf spot on bur oak

Cedar Browning



Winter drying



Cedar leaf miner

Other stressors that contributed to browning of cedars:

- Fletcher scale
- Spider mites
- Herbicide spraying along highways
- Heavy seed crop

Presentation Overview

- Provincial update on 2018 major forest disturbances and monitoring data
- **2018 Projects**
 - ✓ Beech Leaf Disease
 - ✓ EAB Parasitoid Release
 - ✓ Nitidulid Beetle Trapping
 - ✓ Walnut Twig Beetle Trapping
 - ✓ Asian Longhorned Beetle

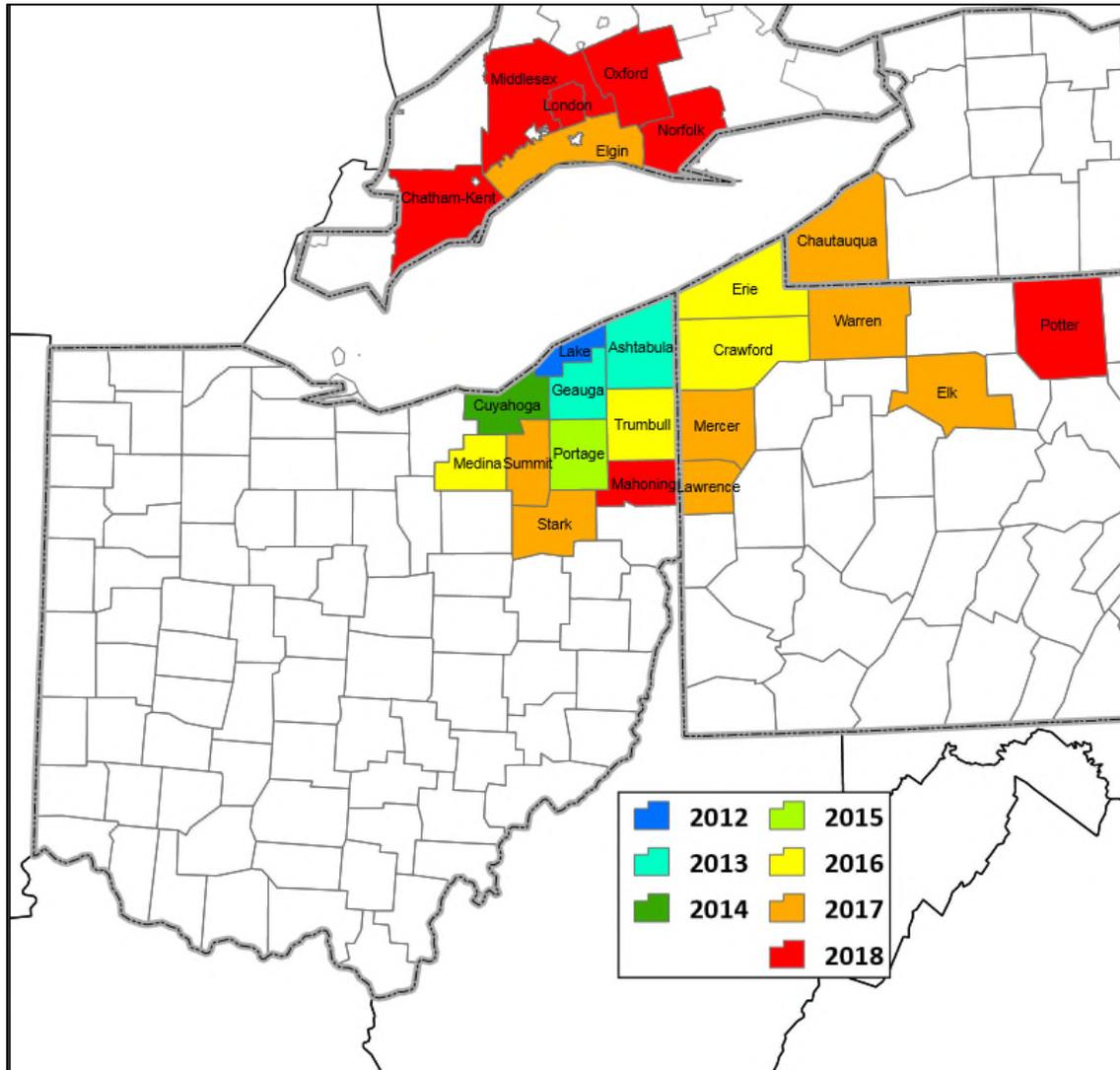


Beech Leaf Disease

Characteristic symptoms:



Beech leaf detection in the US and Ontario



Beech leaf disease - the cause?

2012 testing in Ohio:

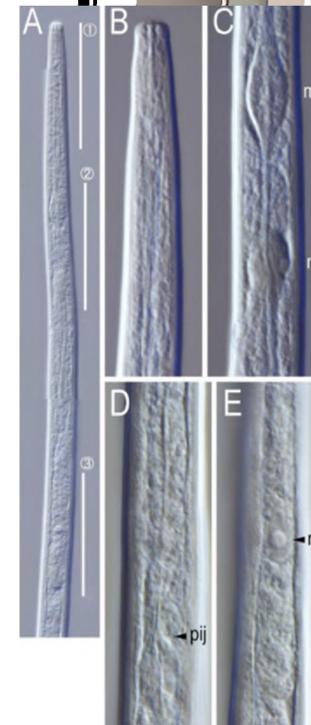
- No evidence of fungus, bacteria, virus, or phytoplasma
- *Litylenchus* nematode likely associated with BLD

May 2018

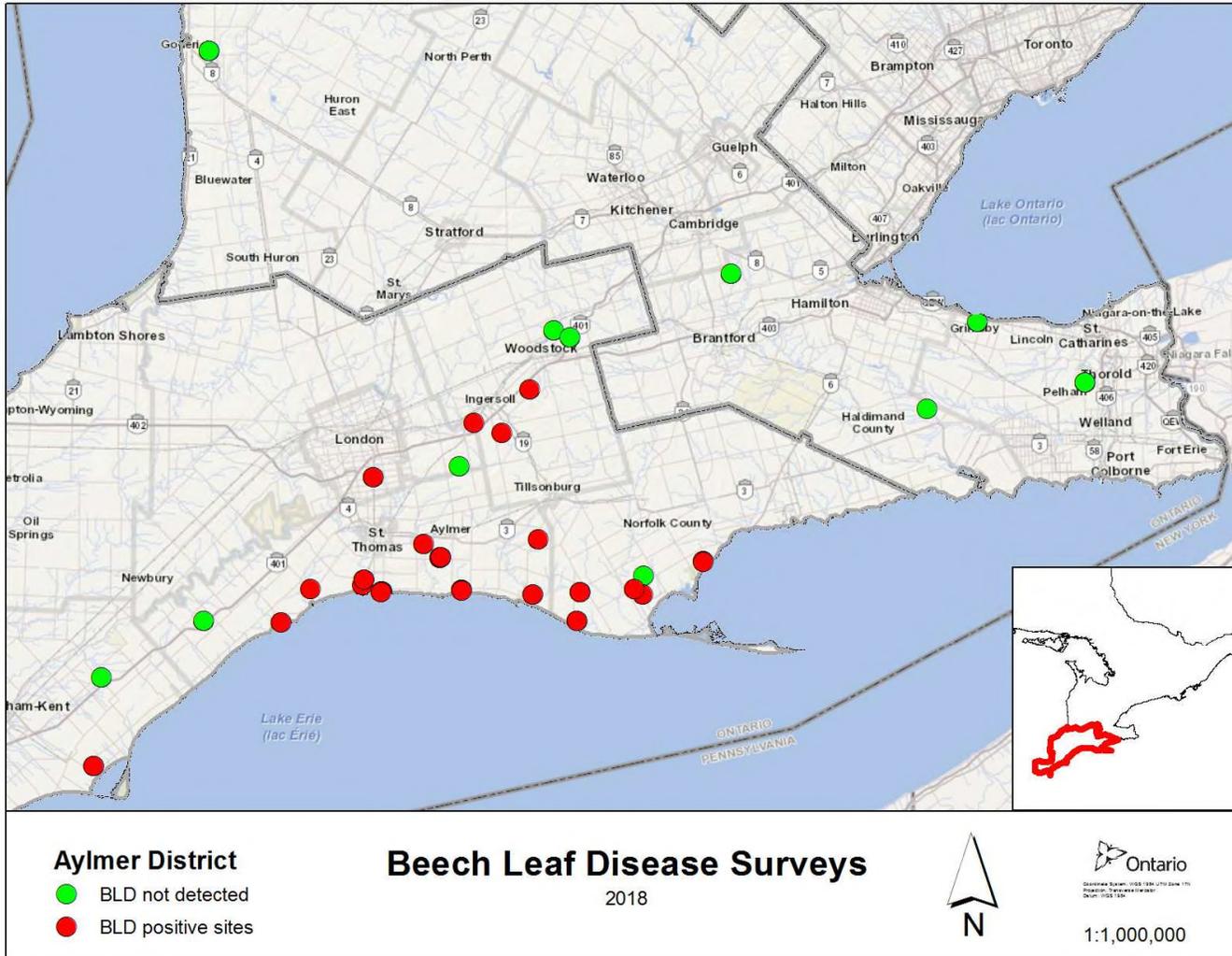
- Detected beech leaf disease on/nematode in Ontario BLD samples

June 2018

- Dr. Yu (Agriculture Canada) confirms *Litylenchus* nematode in BLD leaves



Beech leaf disease detections in Southwestern Ontario



Emerald Ash Borer – Parasitoid Release (CFS)

- Project Lead - Dr. Krista Ryall, Canada Forest Service, Sault Ste. Marie
- 3 species of wasps being released in Ontario; larval and egg parasitoids
- Sites = ash plantations/ regenerating ash, mixed woodlots; high ash component and low to moderate EAB populations
- Most parasitoids provided by USDA-APHIS Biocontrol laboratory



Figure 1. *Tetrastichus planipennis*



Figure 2. *Oobius agrili*



Figure 3. *Spathius galinae*



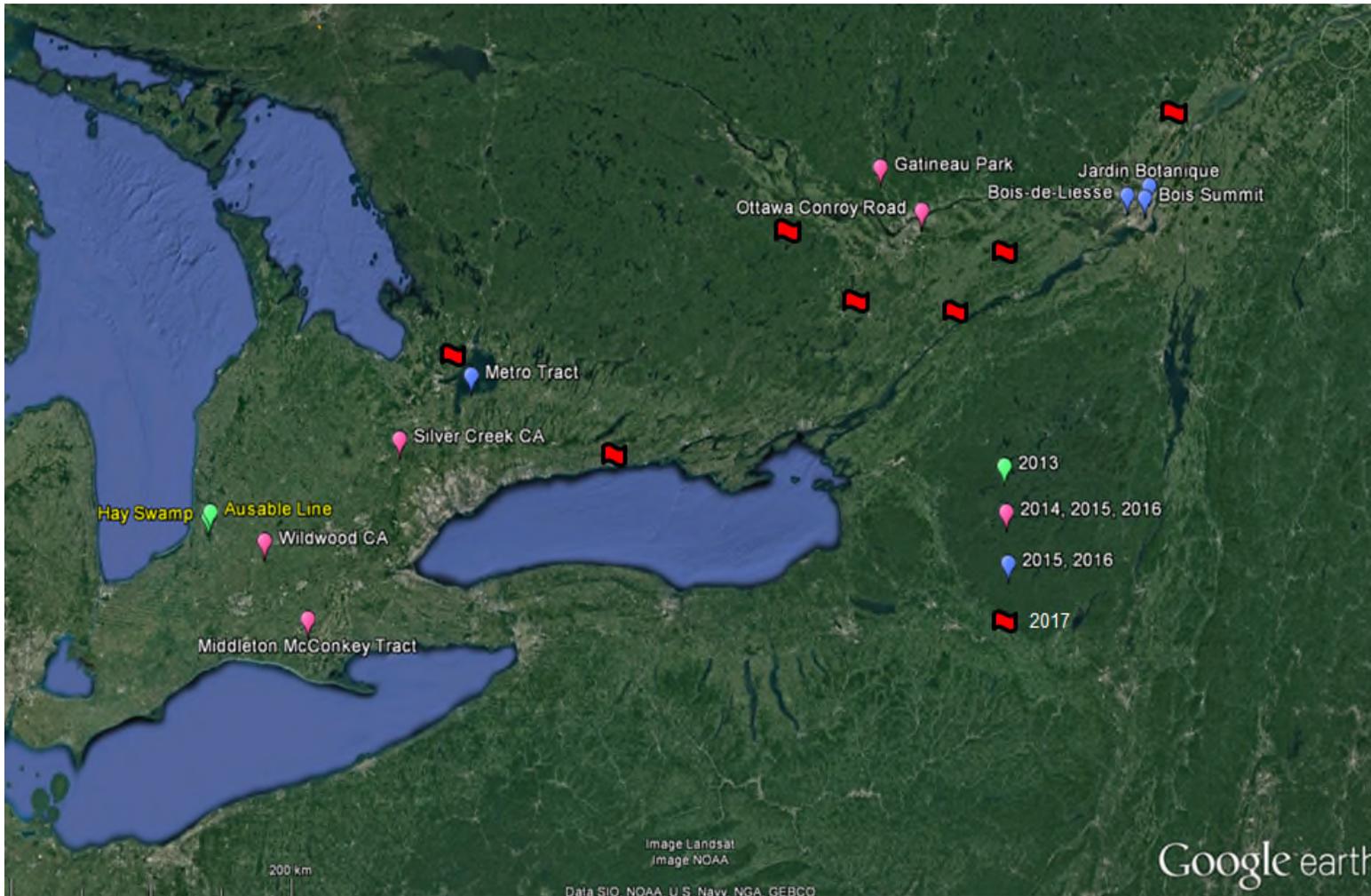
Spathius galinae

Tetrastichus planipennisi
Oobius agrili



EAB Parasitoid Release

20 release sites from 2013-2018, in both Ontario and Quebec



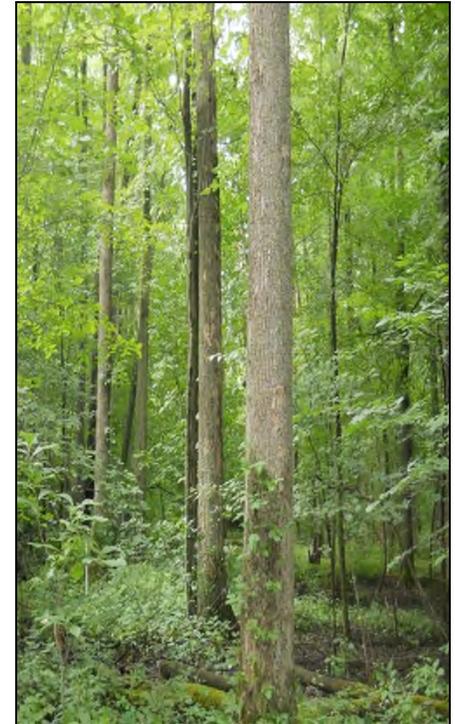
EAB Parasitoid Release

This is a **long-term project**, with a goal of establishing parasitoids to assist in regulating future EAB populations

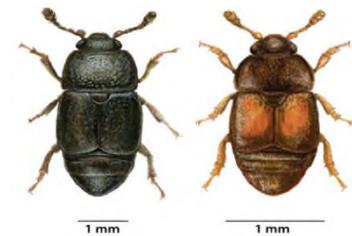
- Releases of *T. planipennisi* have been highly successful, with established populations at each completed release site; supports US reports.

Next steps...

- Finish releases at new sites established in 2017
- Begin evaluating impact of parasitoids on EAB populations
- Expand and initiate new rearing programs
- Explore potential for urban releases of *O. agrili*



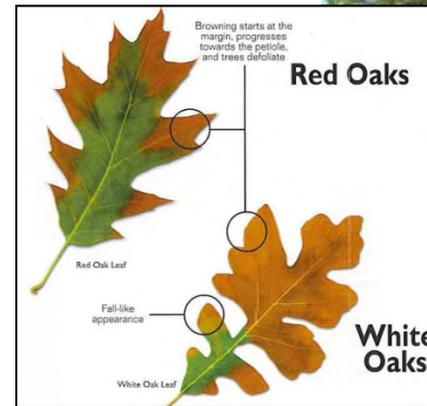
Oak Wilt, *Ceratocystis fagacearum* (Bretz) Hunt



Michigan State University

Oak Wilt - Symptoms

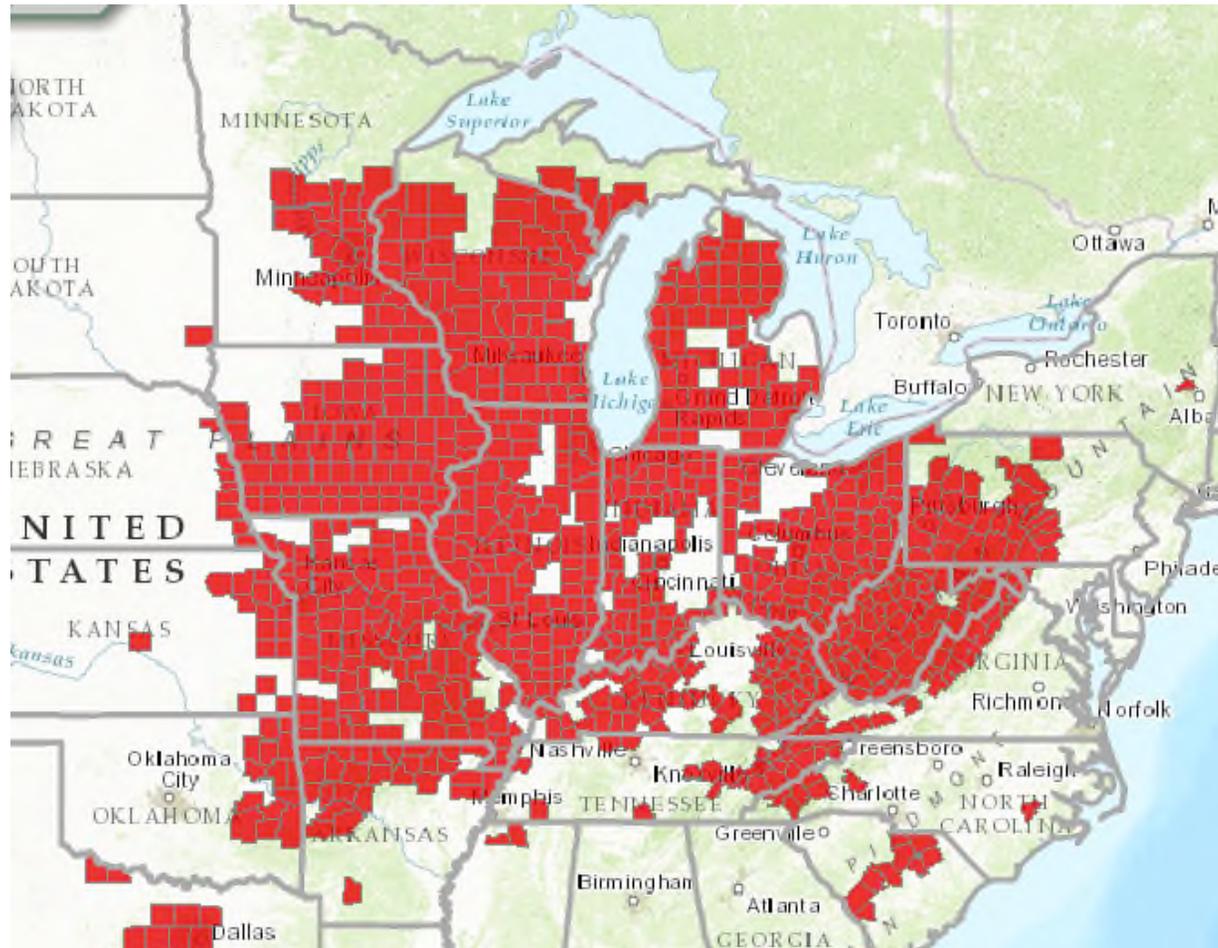
- Wilting of foliage in the top of crown first
- Loss of leaves early in the growing season fallen leaves appear brown, bronzed, or partially green
- Browning of leaves at leaf tip, progressing towards petiole
- Older pockets of oak wilt will exhibit dead trees at the centre, and declining trees scattered around perimeter
- Presence of fungal mats and bark cracks



<http://www.gardenopoliscleveland.org/>



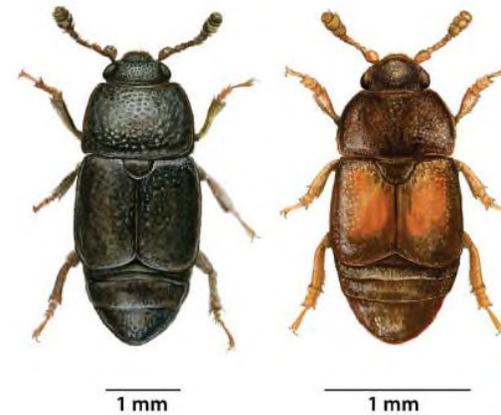
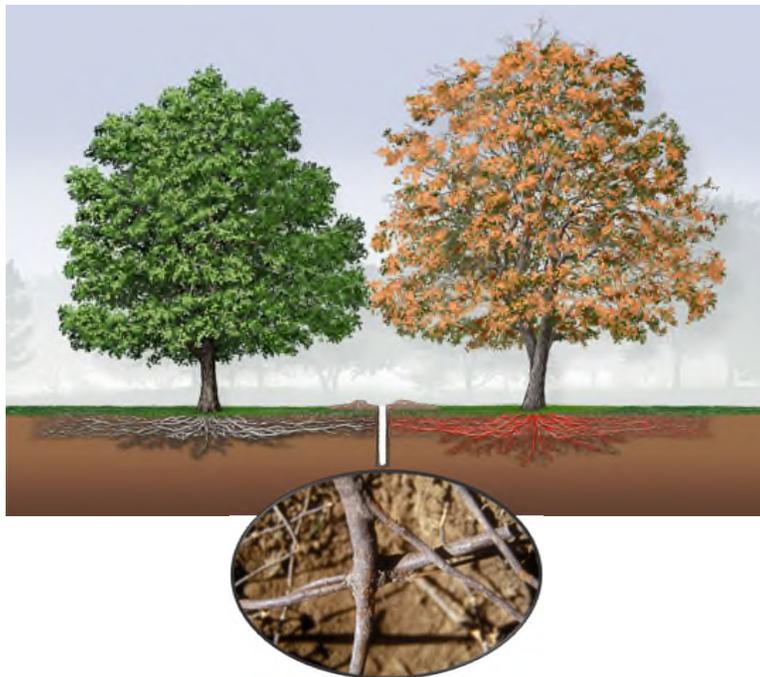
Oak Wilt - Distribution in the US



<http://foresthealth.fs.usda.gov/portal/Flex/APE>

Oak Wilt - Means of Spread:

1. Root grafts & common root systems
2. Nitidulid beetles
3. Firewood



Michigan State University



Nitidulid Beetles – Trapping Program

Objective to determine:

1. Which species are most abundant in spring and which are most abundant in summer
2. Which combinations of lures attract the most species and the most beetles?
3. What types of trapping errors occur and how can they be corrected?



Walnut Twig Beetle Trapping Program

Objective:

Early detection of walnut twig beetle, the vector for Thousand Canker Disease

- Adopted CFIA protocol in 2012
- High risk locations (hardwood sawmills, walnut importers, urban green waste disposal sites), black walnut plantations, and natural forested areas containing black walnut



Thousand Canker Disease (TCD)

- Insect – disease complex

Insect vector = Walnut twig beetle (WTB)
(*Pityophthorus juglandis*)

Fungus = *Geosmithia morbida*

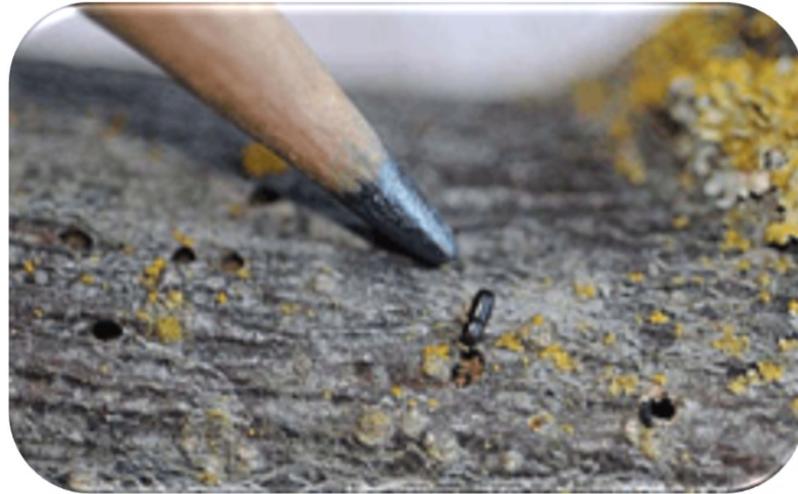
- Only recently (2008) been identified as the causal agents in the decline and mortality of certain walnut, *Juglans* spp. , with black walnut and butternut as primary hosts
- WTB beetle native to southwestern US
- Fungus from unknown origin



****Both the insect vector and the fungus are not currently known to occur in Canada**

Walnut twig beetle

- Native to Arizona, California, New Mexico and northern Mexico
- Associated with Arizona walnut (*Juglans major*) where it is considered a secondary pest to host species
- WTB has expanded its range throughout western US and recently into eastern US
- Attacks the trunks and branches of black walnut trees; initially affects branches 5-10cm DBH
- Carries the fungus *Geosmithia morbida* causing TCD and eventual death of the tree



Walnut Twig Beetle Trap Locations

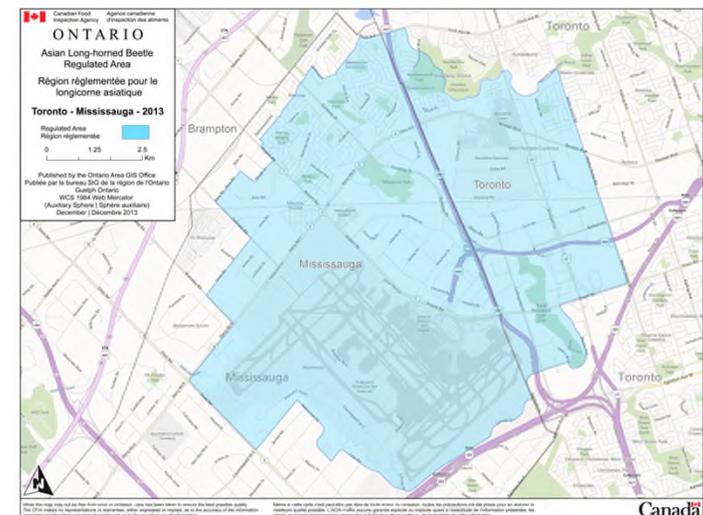


Science and Research Branch, Ministry of Natural Resources and Forestry

Asian Longhorned Beetle (ALHB) - Background



- Invasive - native to China and other parts of Asia
- ALHB has been intercepted several times in imports to Canada
- 2 infestations have been found in Ontario:
 1. 2003 near the border of Toronto and Vaughan; Declared eradicated in April 2013 after 5 years of surveying found no beetles or infested trees
 2. August 2013 in Mississauga/Toronto; infested trees were found in an industrial area near Pearson Airport; the infested trees and susceptible trees within 800 m were removed in 2013 and 2014 to eradicate the infestation



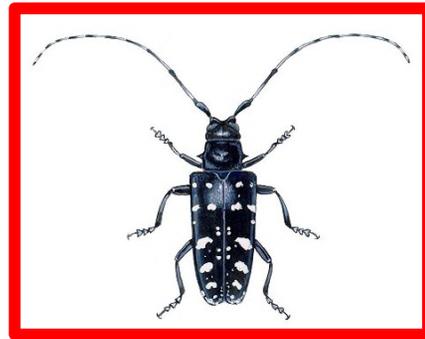
Asian Longhorned Beetle – Signs and Symptoms



ALHB - Early Detection Efforts



Routine ground surveys/ CFIA regulated surveys



Asian Longhorned beetle – Invasive

- Glossy appearance
- Multiple distinct white patches
- Banded black and white antennae

White spotted sawyer beetle – Native

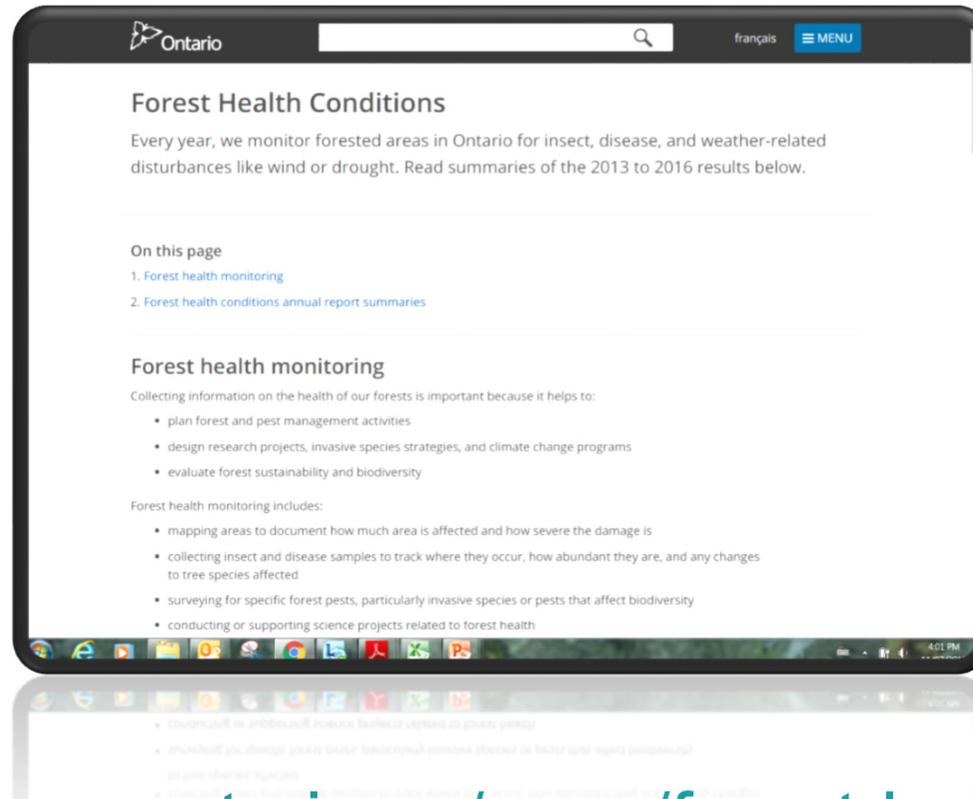
- Not glossy
- All black; some indistinct white patches
- One distinct heart shaped white dot at the back of neck

Respond to public concerns



Support CFIA (surveys and outreach)





<https://www.ontario.ca/page/forest-health-conditions>

Thank You!

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