Status of Important Forest Pests in the Boreal Forests of Ontario – 2016

Boreal Forest Health Review

Thunder Bay, Ontario

March 22, 2017

Mike Francis, Lia Fricano and Vance Boudreau Ontario Ministry of Natural Resources and Forestry

Boreal Forest Health Review 2016

Overview

- Forest Health Unit
- Major Forest Disturbances in the Boreal Forest 2016

- Jack pine budworm
- Spruce budworm
- Large aspen tortrix
- Ice damage
- Forest tent caterpillar
- Whitespotted sawyer beetle
- Blowdown
- Hail

Forest Health Staff

Forest Health Staff:

- **Field Coordinator**
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- **NW Region**
  - Kyle Webb
  - Kirstin Hicks
  - Vance Boudreau
- **NE Region**
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- **Southern Region**
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- Trisha Westman (A\Manager Biodiversity and Monitoring OMNRF)
- Shelagh Duckett (A\Coordinator –Biodiversity and Monitoring Section NW Region, OMNRF)
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- Hugh Lougheed (Manager - Forest Sustainability and Information Section - Crown Forests and Lands Policy Branch, OMNRF)
- John Johnson (GIS Analyst, Natural Resources Information Unit, OMNRF)
- Alvaro Duran (Research and Monitoring Section, OMNRF)

Jack pine budworm (*Choristoneura pinus pinus* Freeman)

Overwinter

May

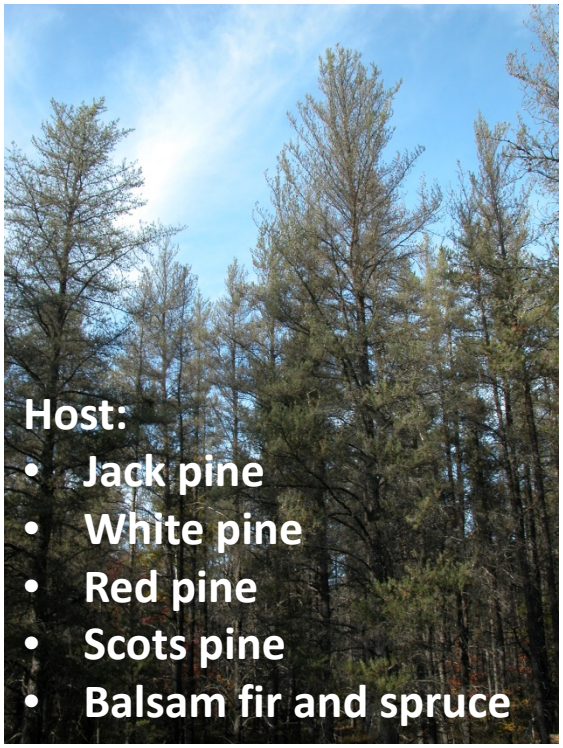
June

July

August

Jack pine budworm lifecycle

Jack pine budworm (*Choristoneura pinus pinus* Freeman)



Host:

- Jack pine
- White pine
- Red pine
- Scots pine
- Balsam fir and spruce

Damage:
2-3 consecutive years of severe defoliation can lead to top and whole tree mortality

Jack pine budworm (*Choristoneura pinus pinus* Freeman)

Pest Information

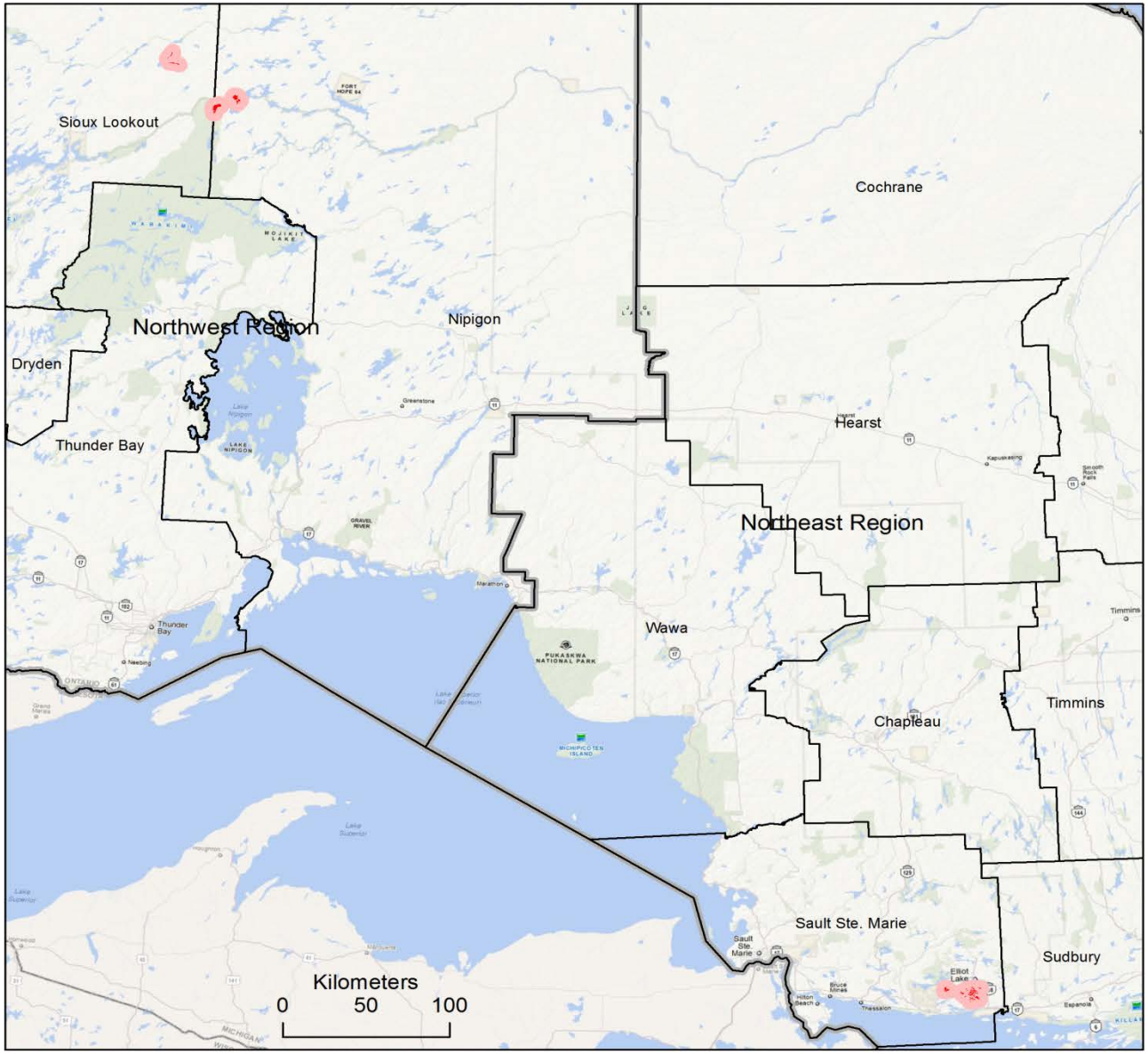
Pest Origins:	Native to North America
Pest Type:	Defoliator
Host Species:	Jack pine, red pine, Scots pine, white pine
Infestation Area:	5,085 ha (2016)

Jack pine budworm (*Choristoneura pinus pinus* Freeman)

Jack pine budworm 2016

Overview
Areas-within-which jack pine budworm caused defoliation.
5,085 ha

Area of Moderate-to-Severe Defoliation

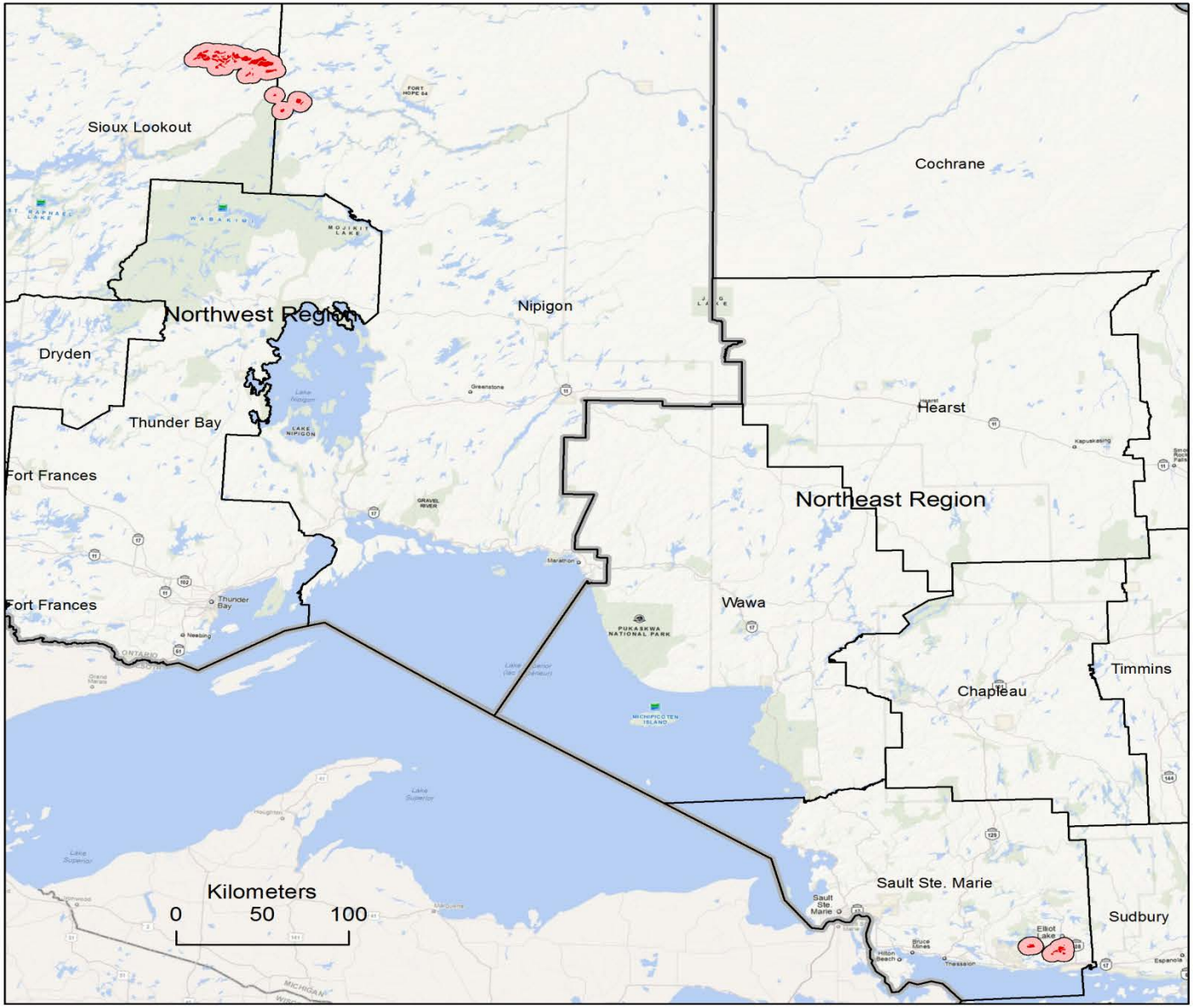


Jack pine budworm (*Choristoneura pinus pinus* Freeman)

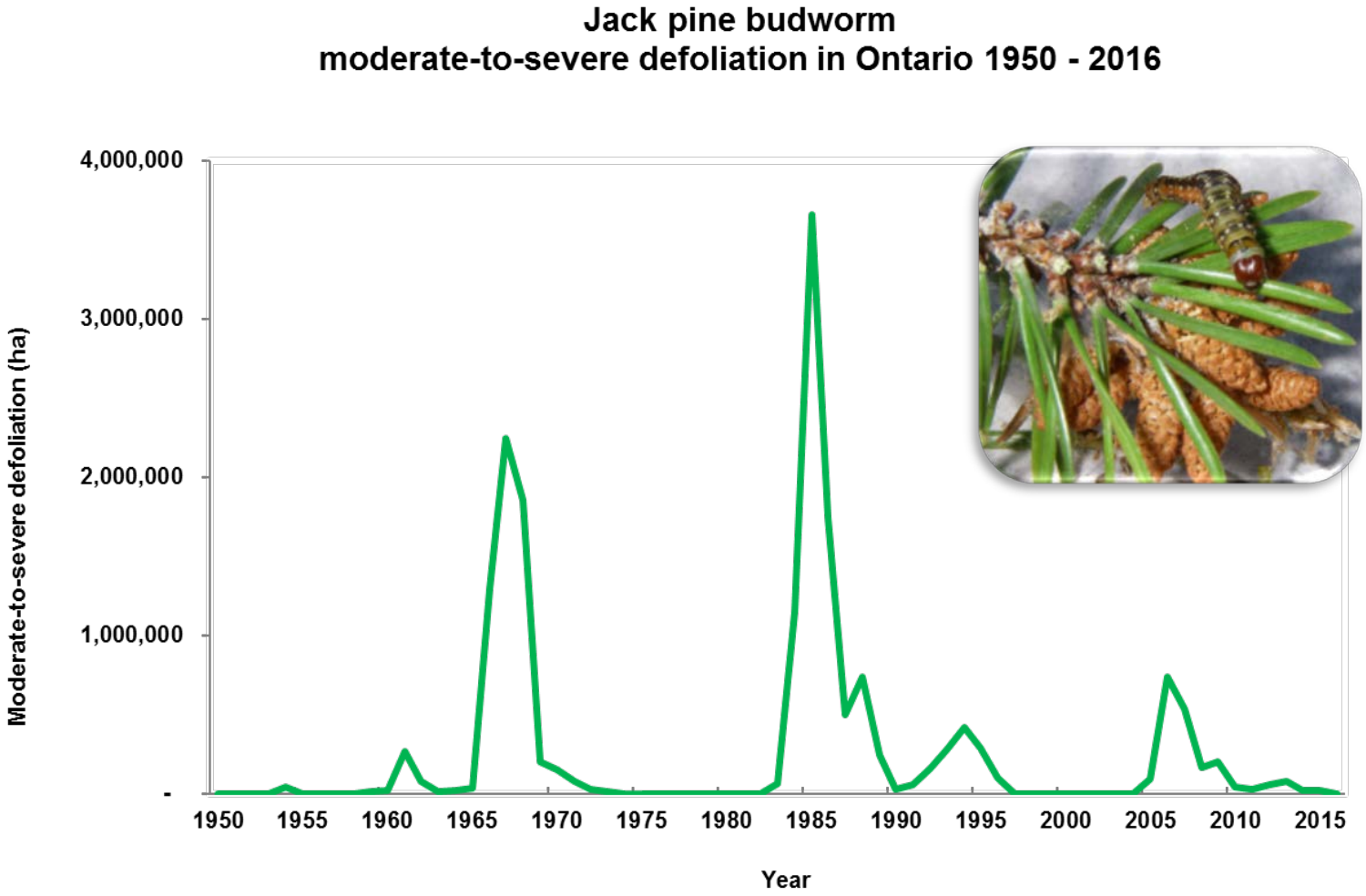
Jack pine budworm 2015

Overview
Areas-within-which jack pine budworm caused defoliation.
21,349 ha

Area of Moderate-to-Severe Defoliation



Jack pine budworm (*Choristoneura pinus pinus* Freeman)

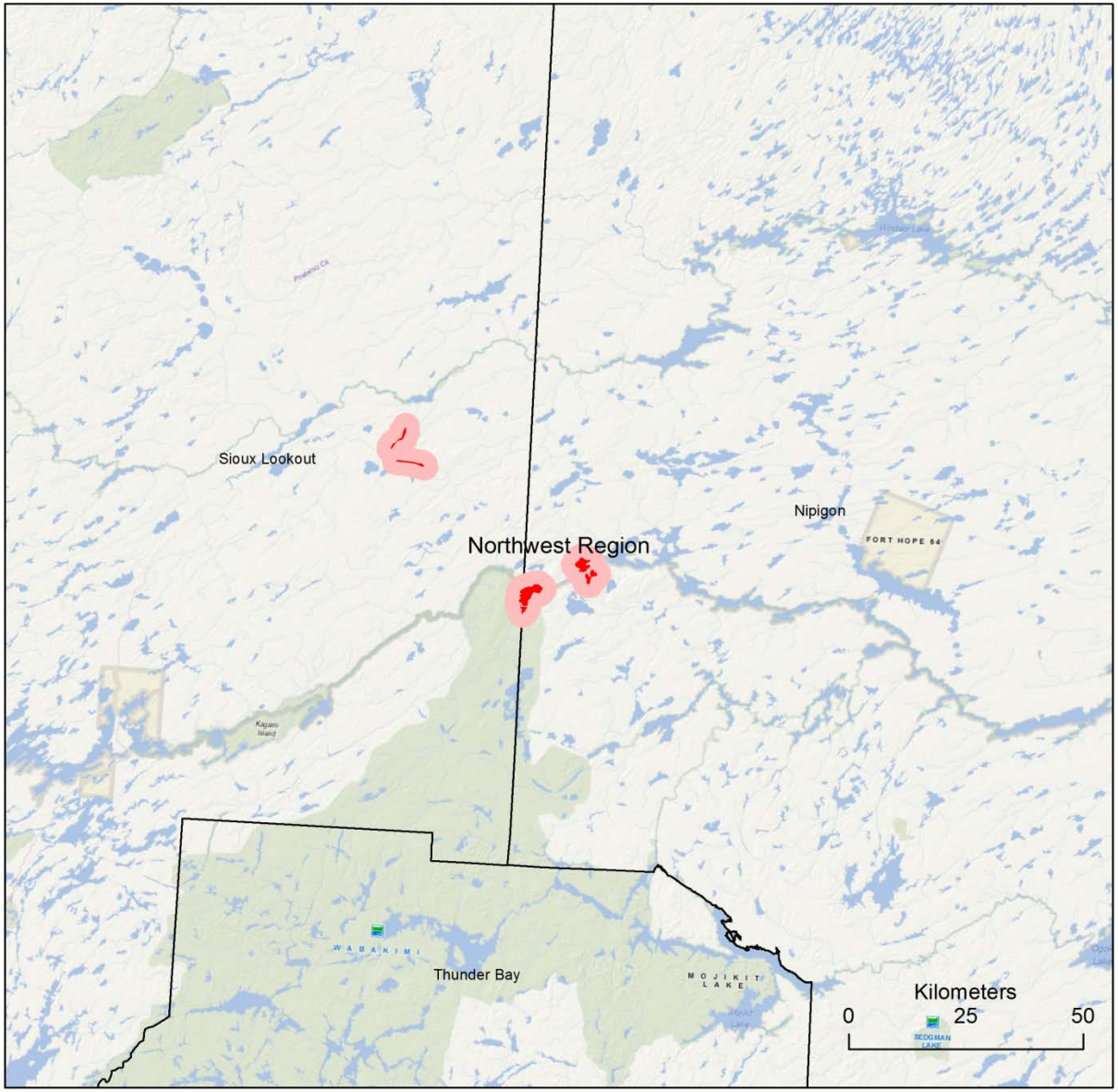


Jack pine budworm (*Choristoneura pinus pinus* Freeman)

Jack pine budworm 2016

Northwest Region
Areas-within-which jack pine budworm caused defoliation.
2,682 ha

Area of Moderate-to-Severe Defoliation

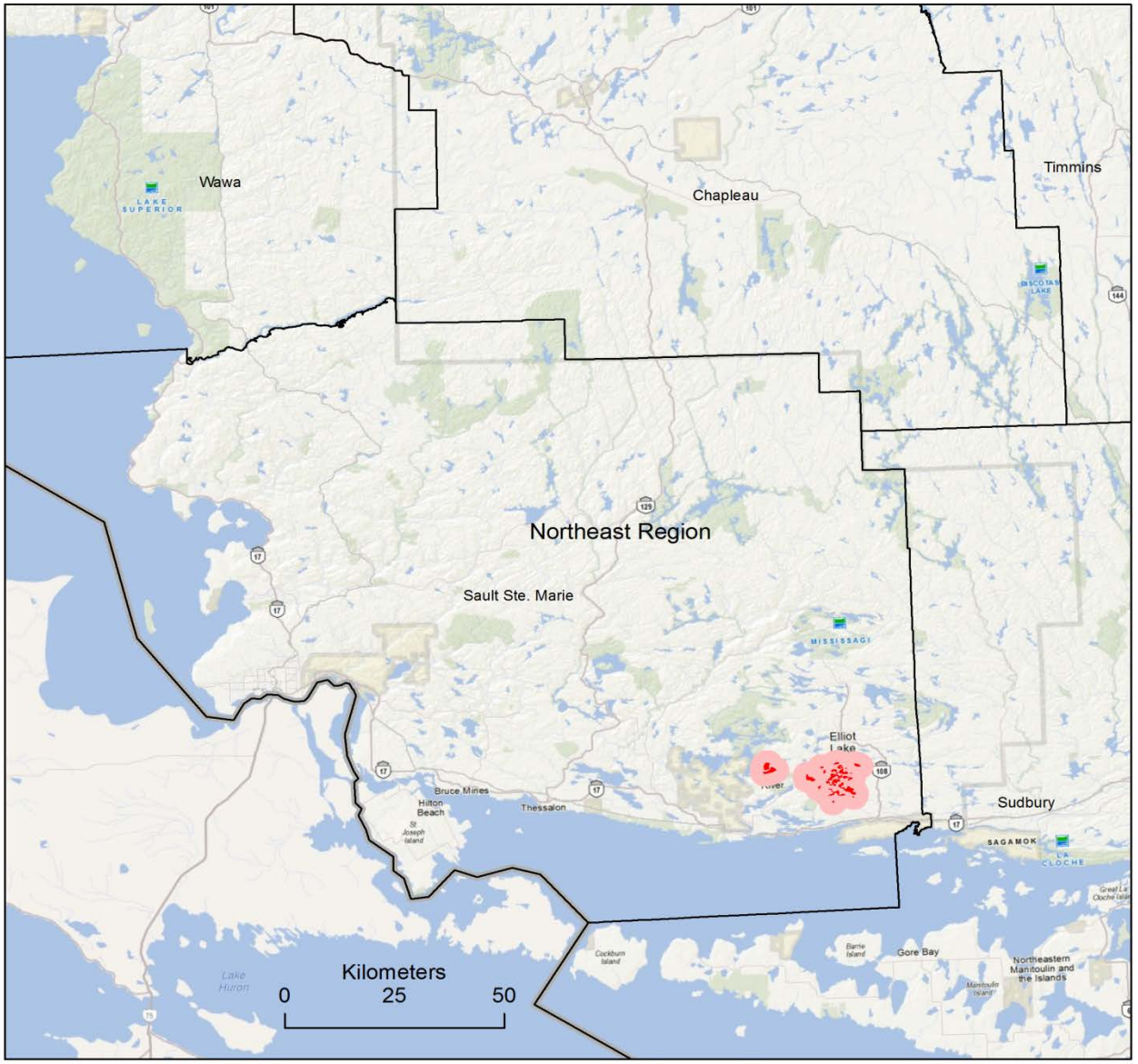


Jack pine budworm (*Choristoneura pinus pinus* Freeman)

Jack pine budworm 2016

Northeast Region
Areas-within-which jack pine budworm caused defoliation.
2,403 ha

Area of Moderate-to-Severe Defoliation



Jack pine budworm (*Choristoneura pinus pinus* Freeman)

Jack pine budworm Pheromone Trapping Results 2016

Highlights:

- Traps deployed in 75 locations (NE-37, NW-38) in 2016.
- Increased catches in NE decline in NW
- NE Region had an average of 14 moths/trap, 3 locations over 50 moths/trap. High of 78 moths/trap Merritt Twp .
- NW Region had an average of 1 moth/trap, High of 14 in Sioux Lookout District.

Northwest Region

Plot #	Reg	District	Twp/Location	Avg
Sio-Pip-Pj1	NW	Sioux lookout	Musselwhite mine road	13.5
178	NW	Sioux Lookout	Stanzhikimi Lake	7.5
Sio-Pic-Pj1	NW	Sioux Lookout	Hwy 808	6.5
153	NW	Red Lake	Cochenour	5.0
144	NW	Red Lake	Snake Falls	3.0
113	NW	Fort France	HAWK RC	2.0
Phero4	NW	Thunder Bay	Kakabeka Falls	2.0
126	NW	Kenora	Coyle	1.5
133	NW	Kenora	Jaffray	1.5
117	NW	Fort France	KE DESPA	1.0
118	NW	Fort France	RINCE ROA	1.0
128	NW	Kenora	Ewart	1.0
100	NW	Dryden	Mafeking	0.5
127	NW	Kenora	DEVONSHIRE	0.5
140	NW	Red Lake	Cochenour	0.5
Phero2	NW	Thunder Bay	Graham Road	0.5
91	NW	Dryden	Breithaupt	0.0
92	NW	Dryden	Hyndman	0.0
93	NW	Dryden	Bradshaw	0.0
94	NW	Dryden	Bradshaw	0.0
99	NW	Dryden	Lac Seul-Route	0.0
106	NW	Dryden	Turtle River	0.0
110	NW	Fort France	AWN ROA	0.0
111	NW	Fort France	TRUT LAK	0.0
114	NW	Fort France	ALLO LAK	0.0
Phero 5	NW	Fort France	Plot Despa	0.0
122	NW	Fort France	TRAW LAK	0.0
125	NW	Kenora	KIRKUP	0.0
129	NW	Kenora	WORK	0.0
131	NW	Kenora	MacNicol	0.0
132	NW	Kenora	Mark Lake	0.0
142	NW	Red Lake	Ear Falls	0.0
139	NW	Red Lake	Bateman	0.0
151	NW	Red Lake	Gold Pines	0.0
157	NW	Red Lake	Ear Falls	0.0
170	NW	Sioux Lookout	Lomond	0.0
Phero 1	NW	Thunder Bay	Boreal Road	0.0
Phero3	NW	Thunder Bay	English River	0.0

Northeast Region

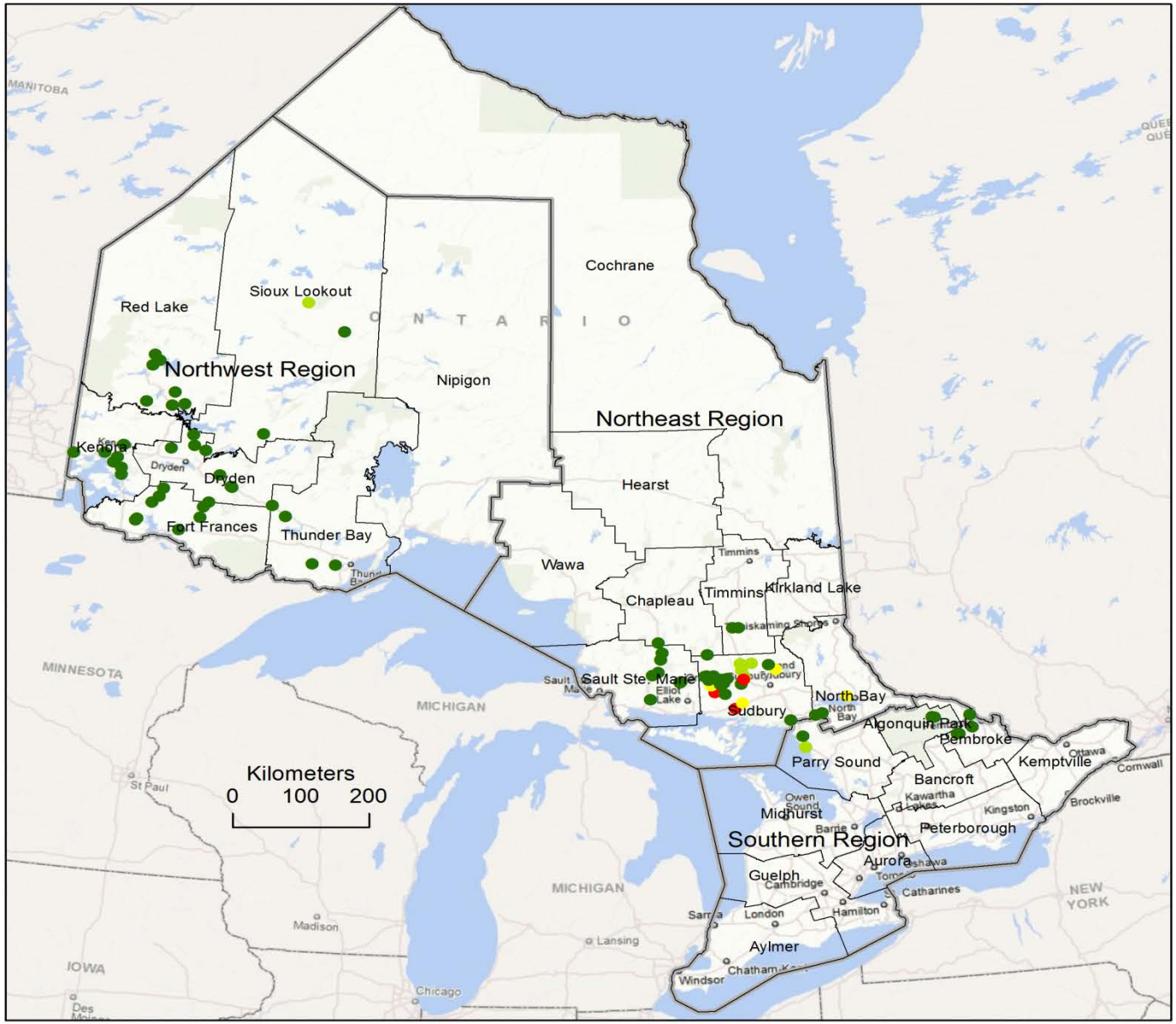
Plot #	Reg	District	Twp/Location	Avg
	NE	Sudbury	MERRITT	78.0
33	NE	Sudbury	Hart	64.5
	NE	Sudbury	MANDAMIN	56.0
	NE	Sudbury	NAIRN	45.0
	NE	Sudbury	Cartier	32.5
34	NE	Sudbury	Hutton	27.0
60	NE	Sudbury	TEASDALE	26.5
	NE	Sudbury	Moncreiff	22.0
21	NE	Sudbury	Antrim	21.0
62	NE	Sudbury	Ulster	15.0
50	NE	Sudbury	Rhodes	11.0
40	NE	Sudbury	MONESTIME	9.0
47	NE	Sudbury	Olinyk	9.0
52	NE	Sudbury	Rowat	9.0
57	NE	Sudbury	Scollard	8.5
41	NE	Sudbury	Moses	8.0
87	NE	Timmins	Westbrook	8.0
17	NE	Sault Ste. Marie	WELLS	7.0
20	NE	Sudbury	Allen	7.0
	NE	Sudbury	Rowat	7.0
	NE	Sault Ste. Marie	SAGARD	6.5
29	NE	Sudbury	Ermatinger	6.0
	NE	Sudbury	Solski	5.5
63	NE	Sudbury	WEEKS	5.0
11	NE	Sault Ste. Marie	SAGARD	4.5
	NE	Sudbury	Roberts	4.5
1	NE	North Bay	Latchford	4.0
48	NE	Sudbury	PRESCOTT	4.0
86	NE	Timmins	Vrooman	3.5
75	NE	Sudbury	IVY Twp	3.5
14	NE	Sault Ste. Marie	VILLENEUVE	2.5
	NE	Sudbury	MONESTIME	2.5
	NE	Chapleau	Deans	2.0
	NE	Sault Ste. Marie	Villeneuve (replaces Parke Twp)	2.0
3	NE	Sault Ste. Marie	LANE	1.5
7	NE	Sault Ste. Marie	MARTEL	1.0
35	NE	Sudbury	LEFEBVRE	1.0

Jack pine budworm (*Choristoneura pinus pinus* Freeman)

Jack pine budworm Pheromone Trapping Results 2016

Average Number of Moths per Trap

- < 10
- 10 - 25
- 26 - 50
- 50 plus



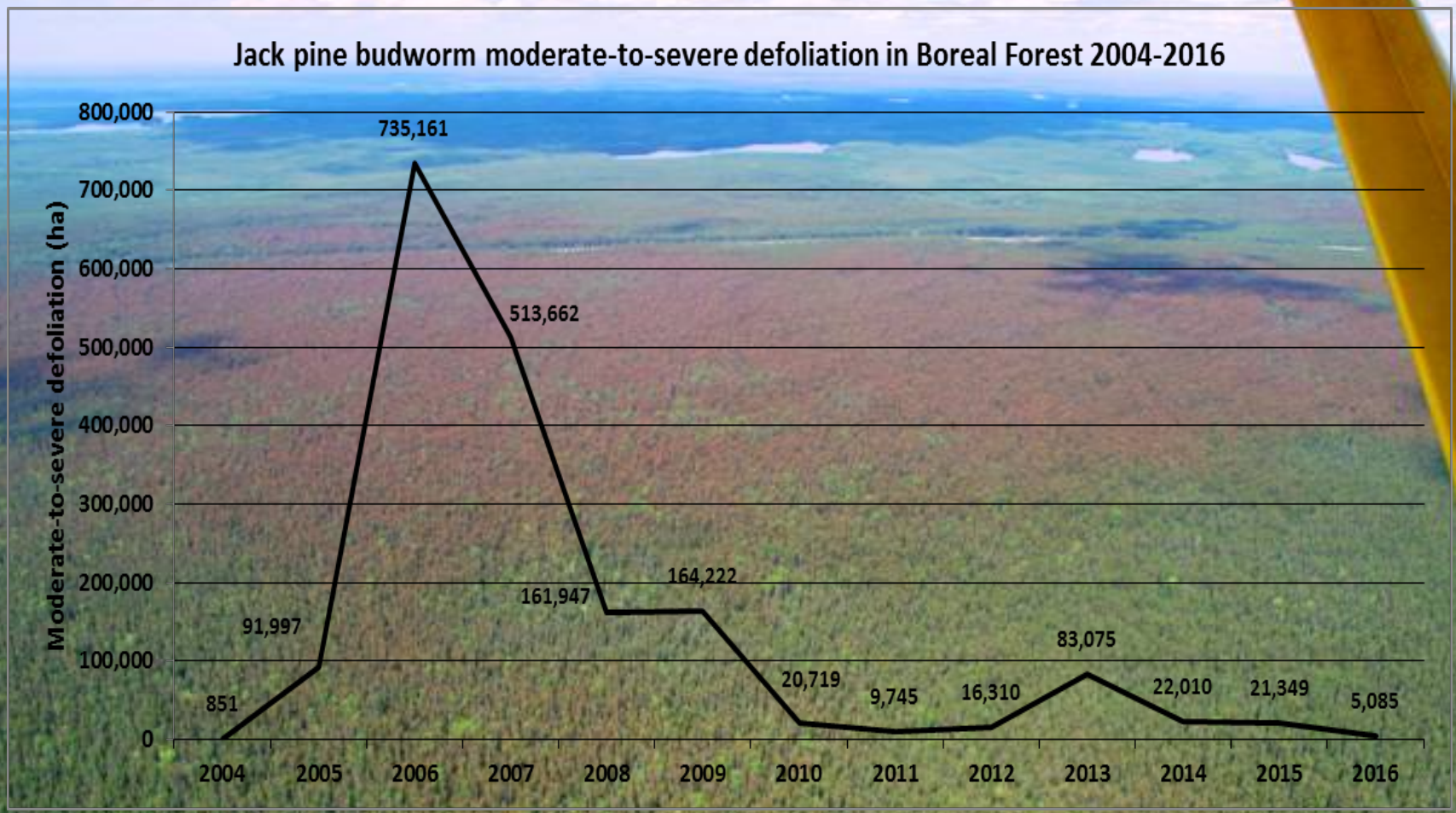
Jack pine budworm (*Choristoneura pinus pinus* Freeman)

Jack pine flower surveys 2016

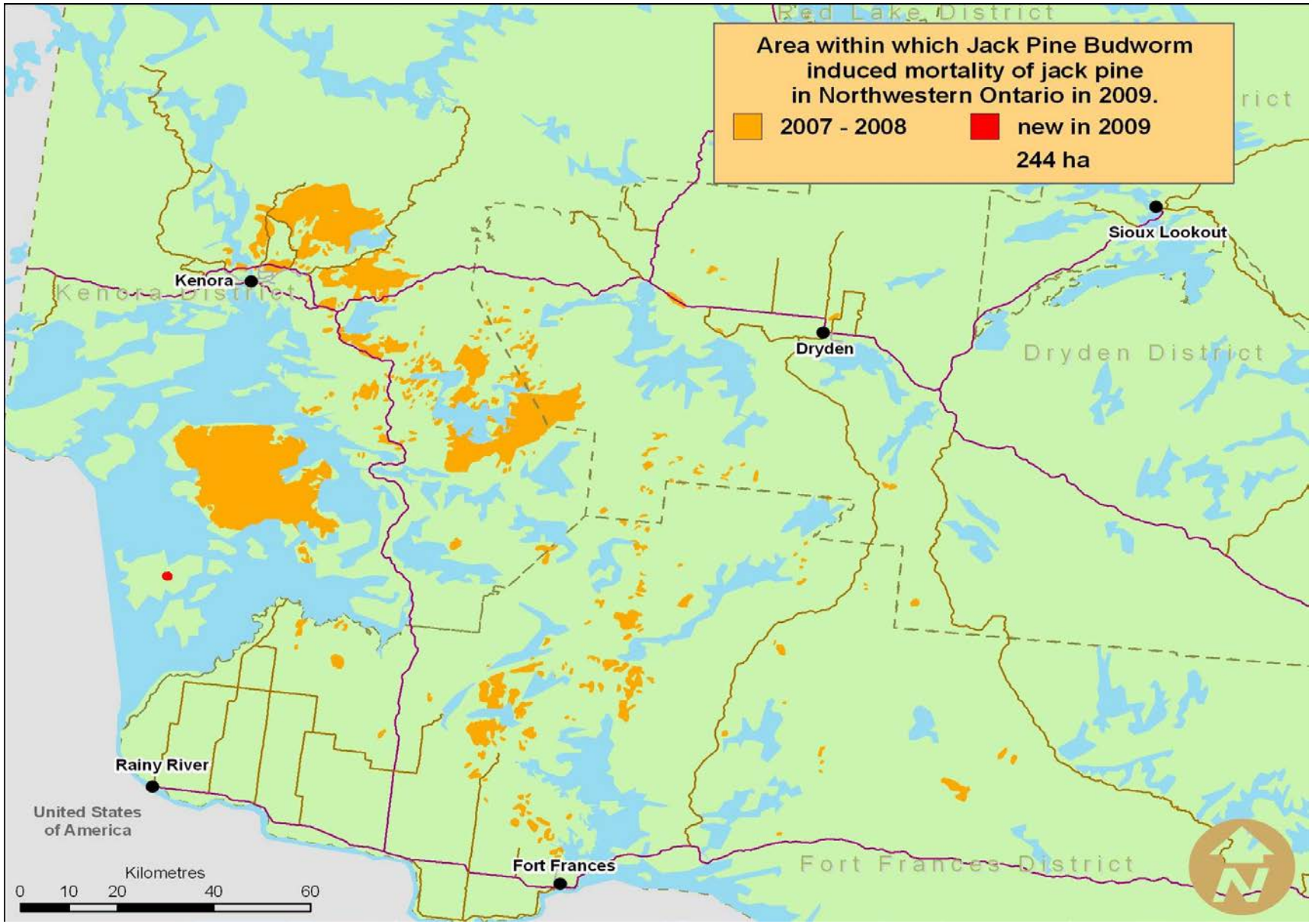
NE Region- High 59%, Moderate 19%

NW Region – High 24%, Moderate 36%

Jack pine budworm (*Choristoneura pinus pinus* Freeman)



Jack pine budworm (*Choristoneura pinus pinus* Freeman)



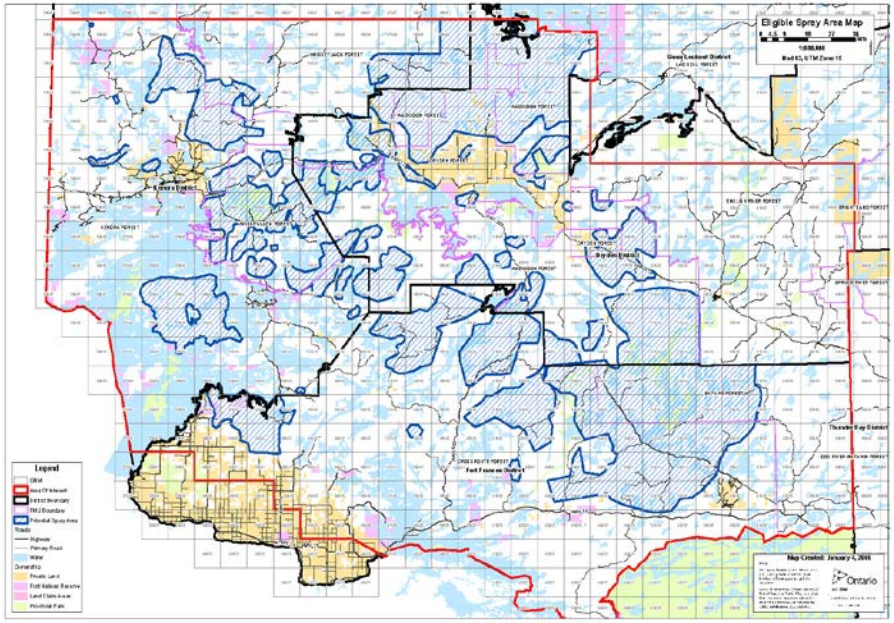
Jack pine budworm (*Choristoneura pinus pinus* Freeman)

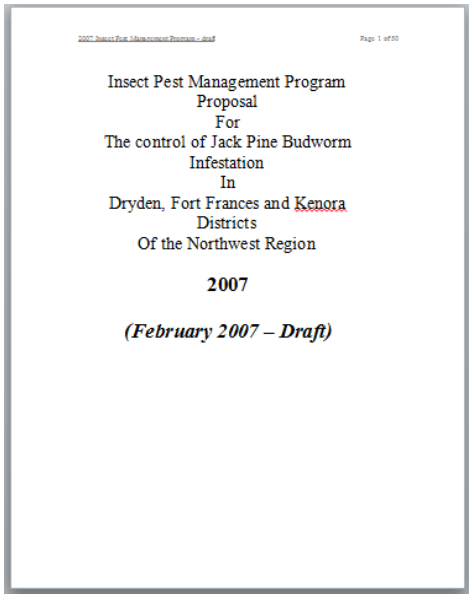
Jack pine budworm (*Choristoneura pinus pinus* Freeman)

FOREST PEST MANAGEMENT PROGRAM

	Area spayed with *Btk* (ha)		
Region	**2006**	**2007**	**2009**
NW	109,131	172,413	58,146
NE	-	-	22,833
Total	**109,131**	**172,413**	**80,979**

Jack pine budworm (*Choristoneura pinus pinus* Freeman)





2007 Insect Pest Management Program - draft Page 1 of 50

Insect Pest Management Program
Proposal
For
The control of Jack Pine Budworm
Infestation
In
Dryden, Fort Frances and Kenora
Districts
Of the Northwest Region

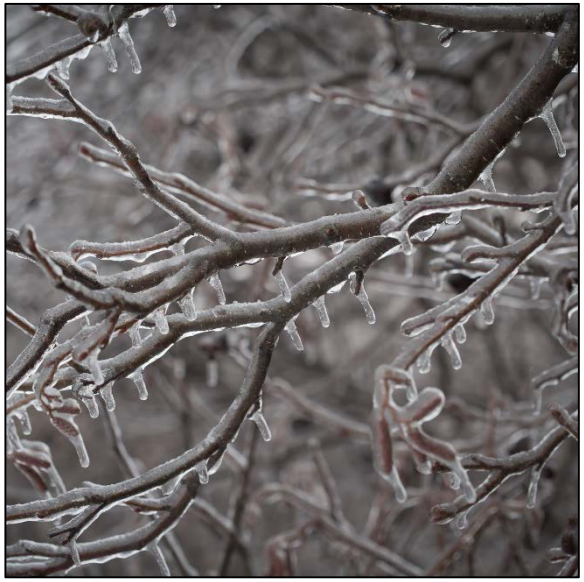
2007

(February 2007 – Draft)

Lia Fricano

Forest Health – Northeast

Today I am going to talk about



Ice damage

Large aspen tortrix

Spruce budworm

Storm – Freezing Rain

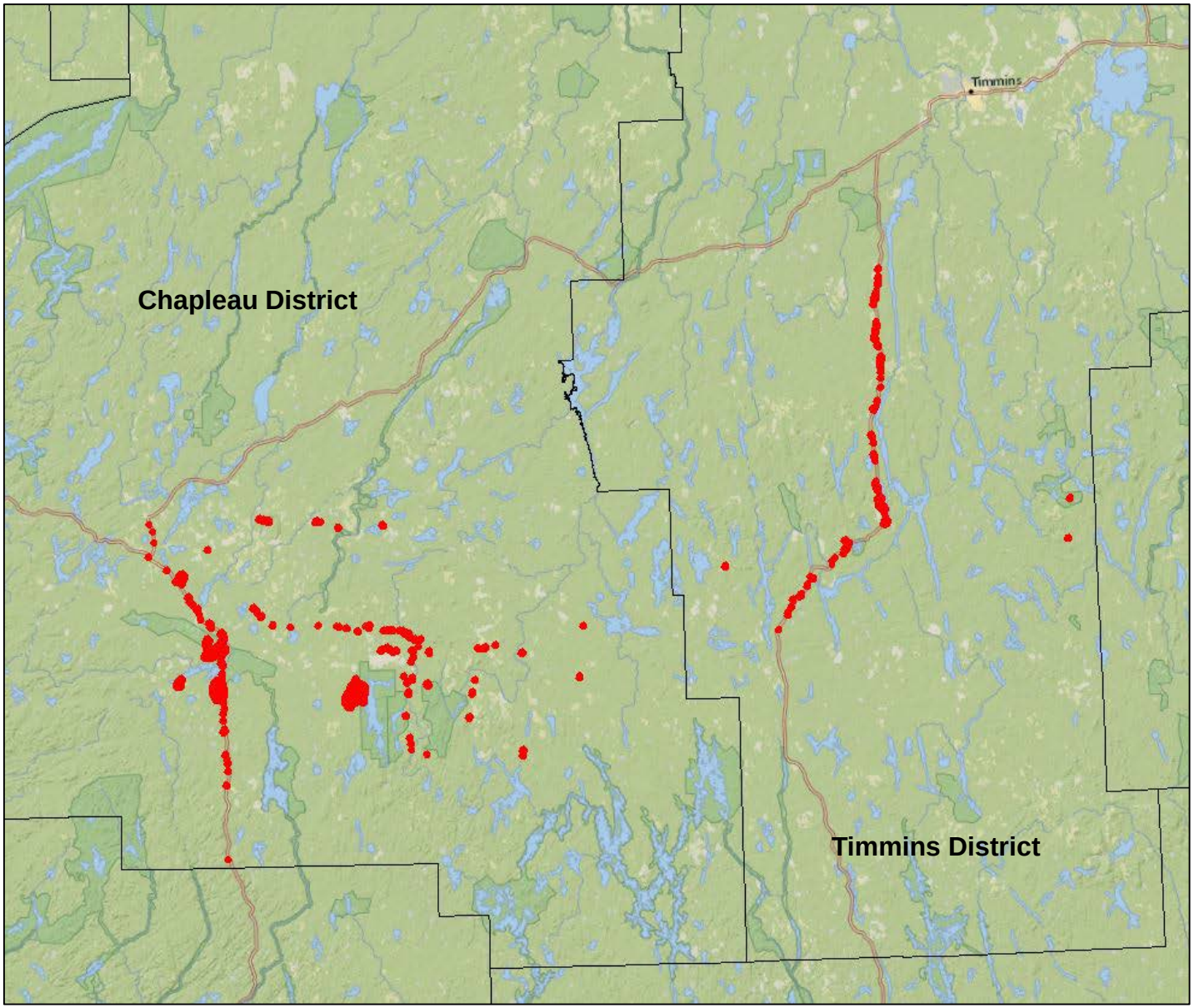
- **December 13 to 15, 2015**
- **3569 ha affected (3,147 ha Chapleau District - 422 ha Timmins District)**
- **Trees snapped on main bole or were bent over from the weight of the ice**

Ice damage 2016

Northeast Region

3569 ha damage

Area within which ice caused damage



> 60 degree bend = low chance of recovery

LARGE ASPEN TORTRIX
facts

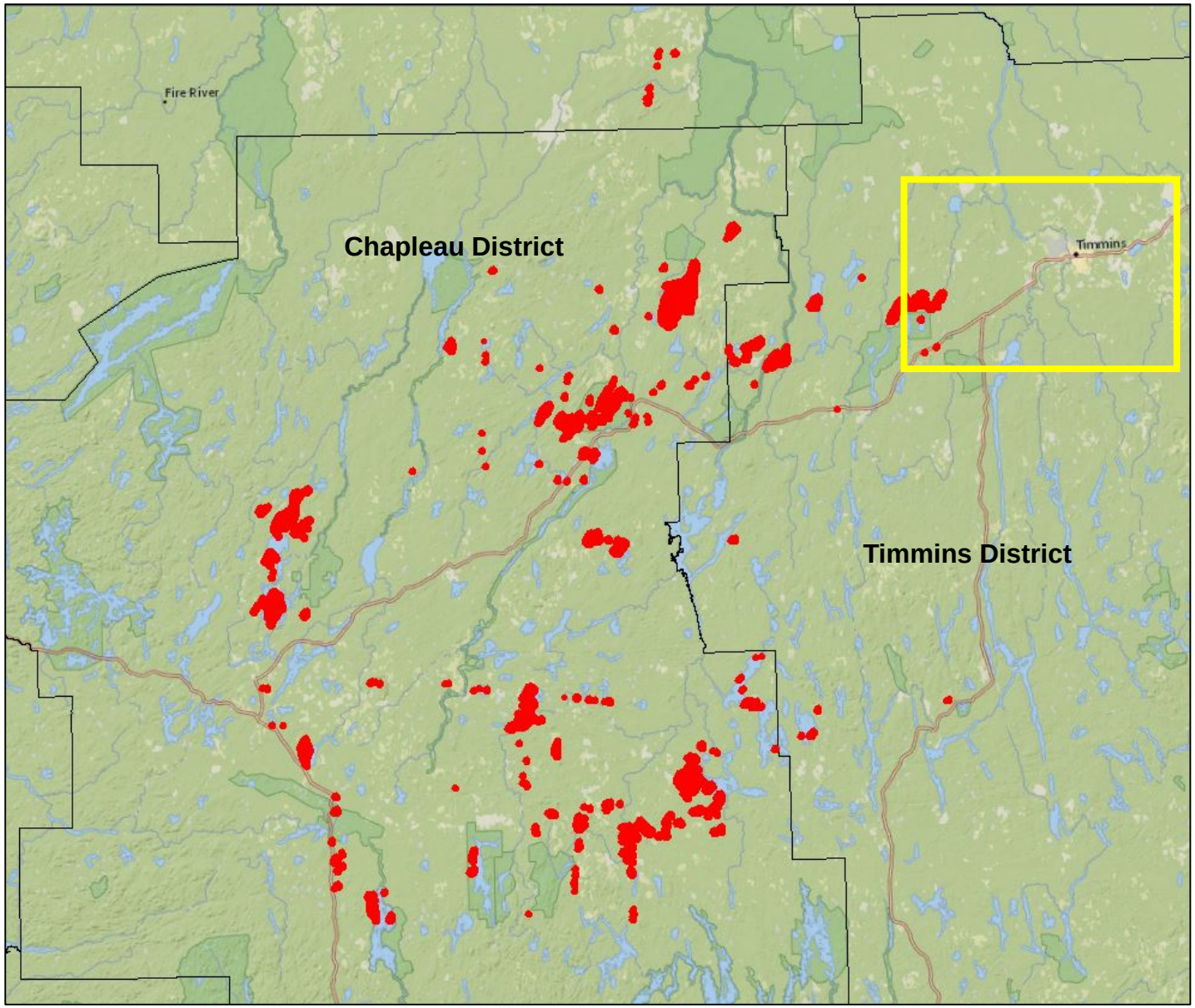
- Preferred host is trembling aspen
- Second to forest tent caterpillar as the biggest defoliator of aspen
- Infestations remain high for about 2 to 3 years and then suddenly crash
  - large number of natural parasites
  - competition from other aspen defoliators can deplete food sources, causing starvation

Large aspen tortrix 2016

Northeast Region

22,587 ha

Area within which LAT caused moderate to severe defoliation



Large Aspen Tortrix Defoliation (ha) 2005 to 2016		
Year	**Northeast**	**Northwest**
2016	22,587	0
2015	0	0
2014	0	0
2013	0	0
2012	3,521	0
2011	12,595	0
2010	15,594	0
2009	88,743	0
2008	21,681	42,586
2007	0	78,650
2006	0	24,757
2005	0	0

Signs of
LARGE ASPEN TORTRIX

1. **Crowns appear thin**
2. **Whole or partial leaves left on the tree**
3. **Larvae pupate inside leaf cones**

Signs of
LARGE ASPEN TORTRIX

Leaves are rolled up into a cone and fastened with silk threads

Pupa protruding from leaf shelter

LARGE ASPEN TORTRIX
aerial view

SPRUCE BUDWORM facts

- Considered to be the most serious pest in Ontario
- Outbreaks occur every 30 to 40 years and last about 10 to 15 years
- Most severe in mature balsam fir and white spruce stands
- Prefers balsam fir first, then white spruce
  - Other hosts include red and black spruce, jack pine, and tamarack
- Larvae feed on newly emerging buds and new foliage
- Complete defoliation on balsam fir can occur after four years and trees could begin dying by the fifth year

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SPRUCE BUDWORM life cycle

Young larvae feeding
(May)

Mature larvae feeding
(June to July)

Aerial surveys conducted when 60-75% of larvae have pupated

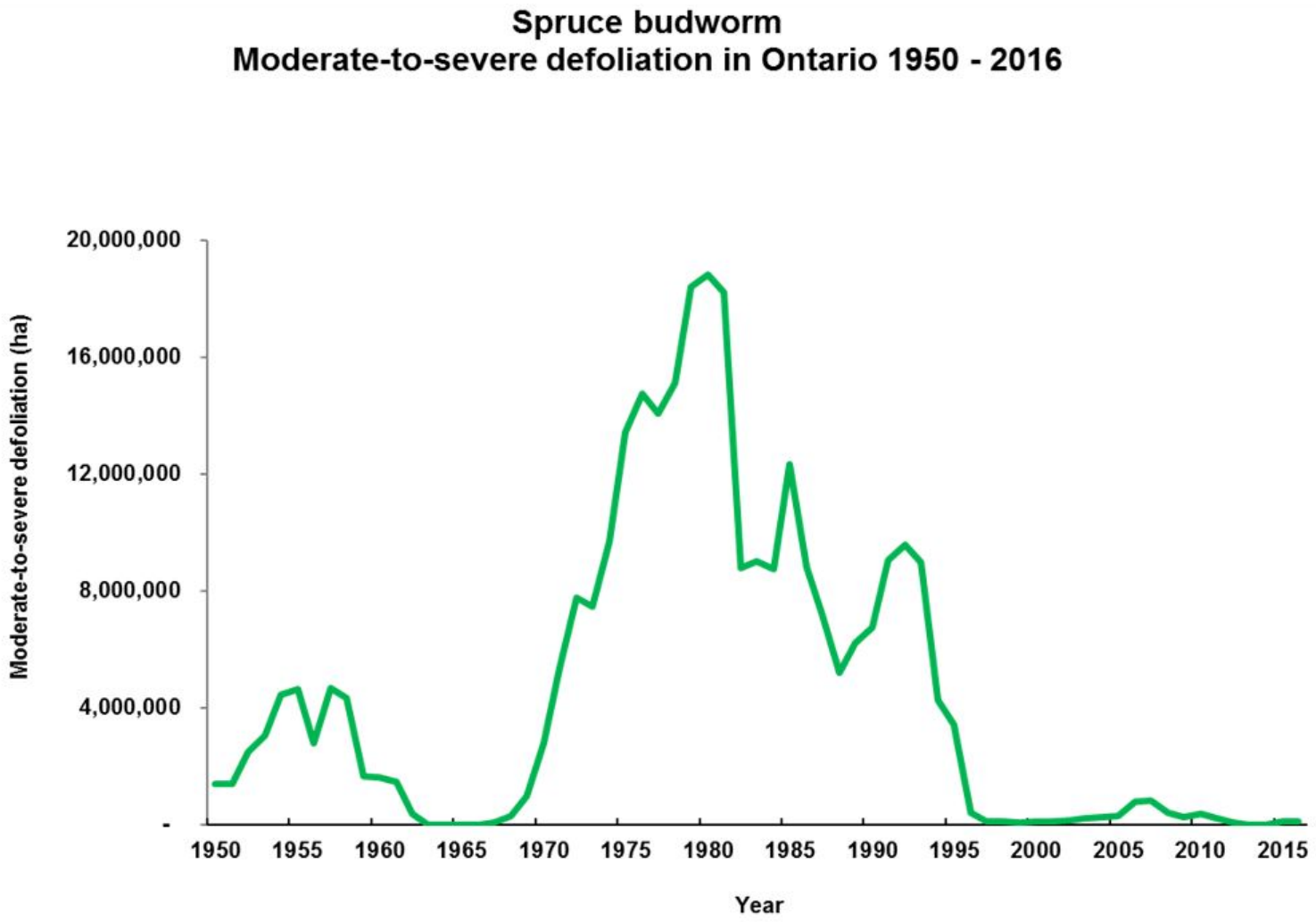
Pupate
(June to July)

Adult moth
(July to August)

Young larvae overwinter in hibernaculum until May

Egg masses
(August)

SPRUCE BUDWORM 1950 – 2016

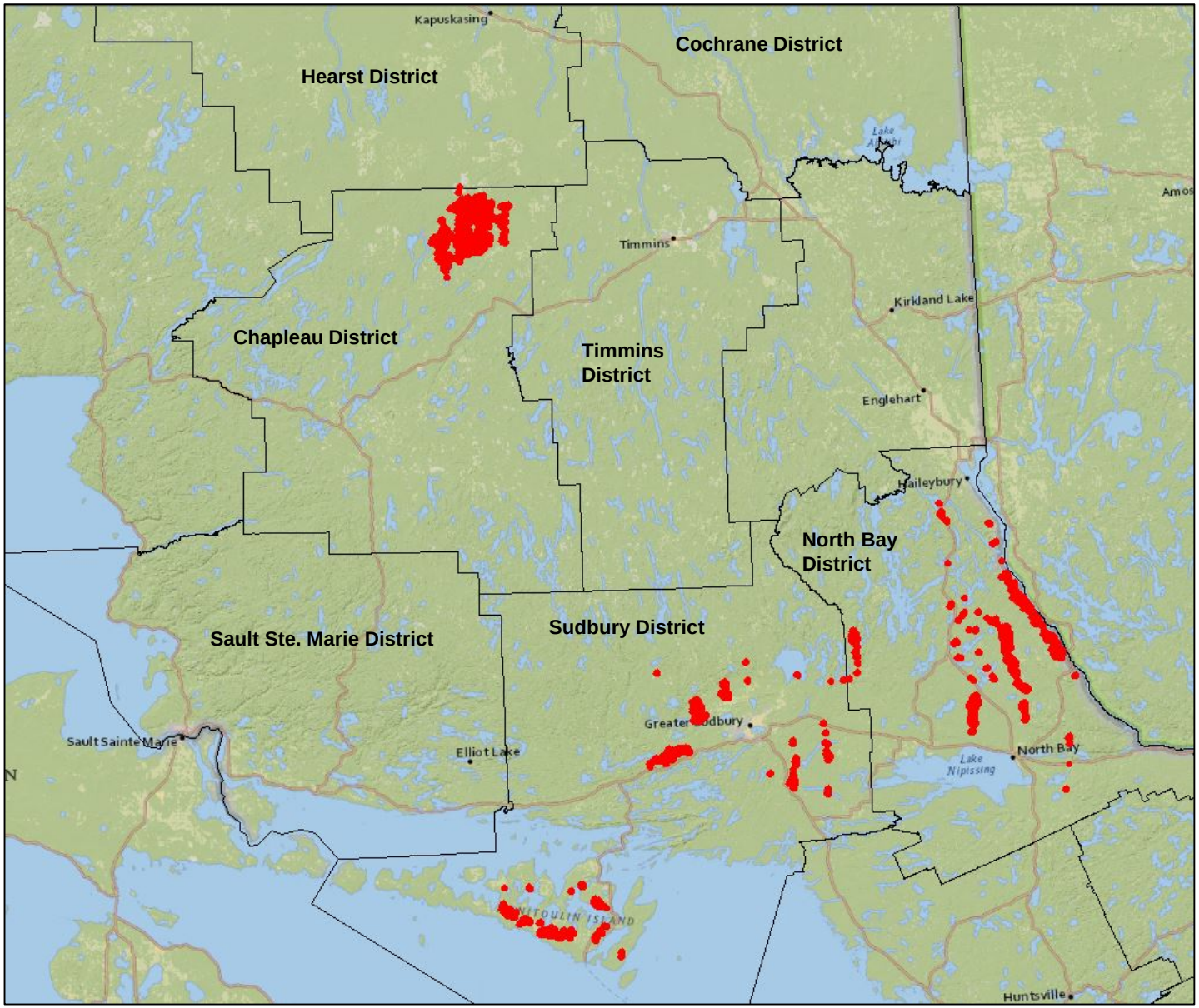


Spruce Budworm 2014

Northeast Region

30,317 ha

Area within which SBW caused moderate to severe defoliation

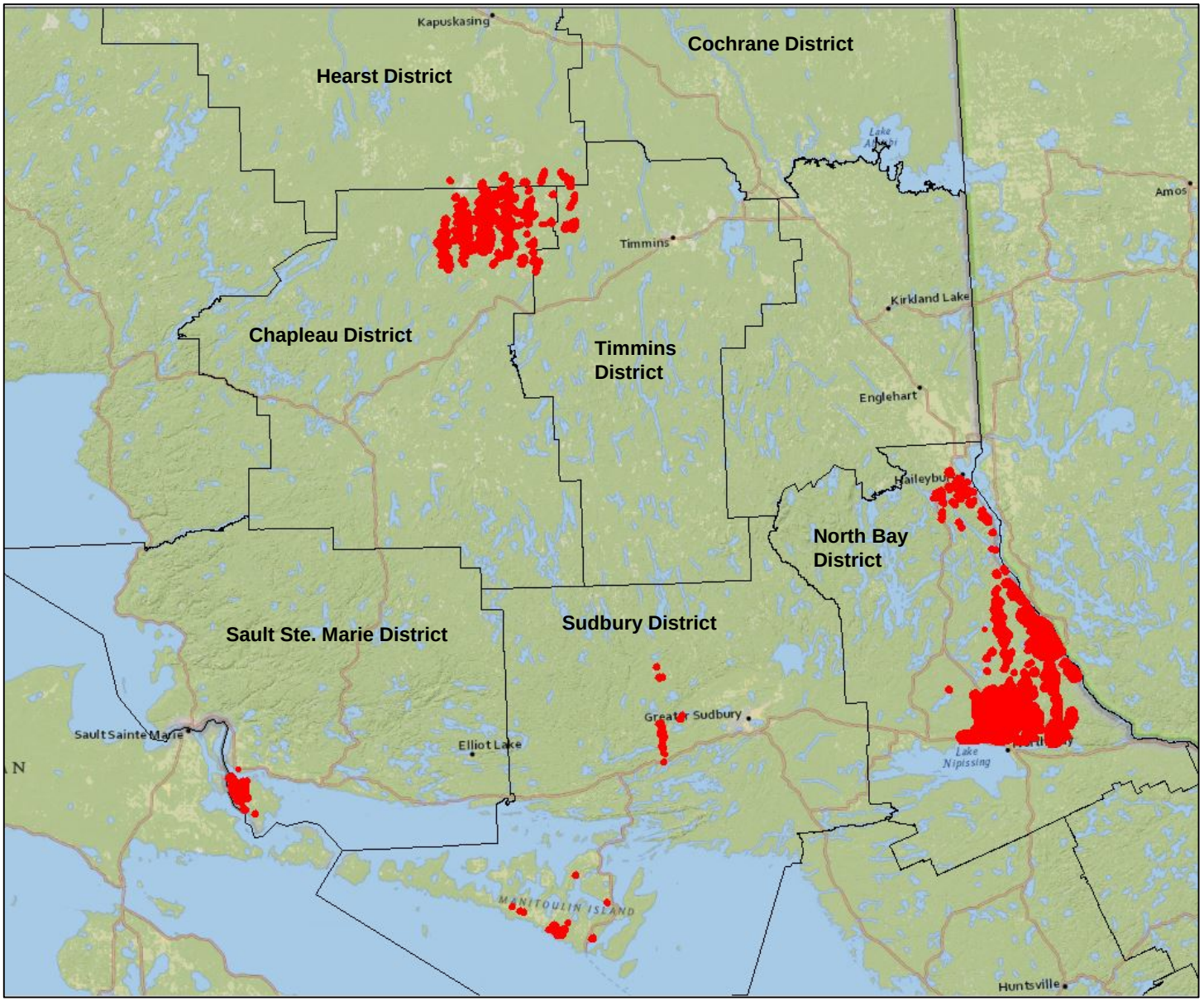


Spruce Budworm 2015

Northeast Region

148,542 ha

Area within which SBW caused moderate to severe defoliation

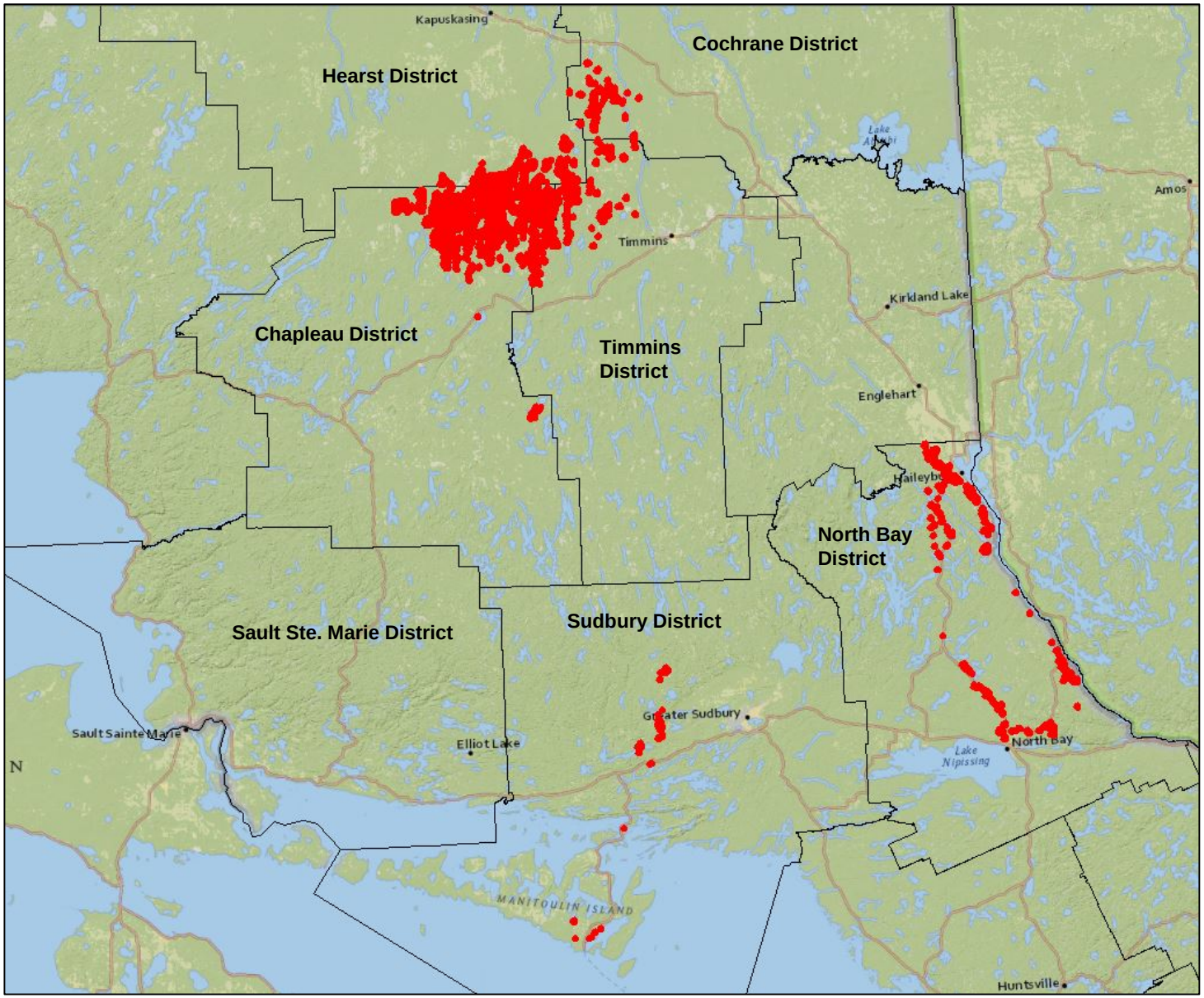


Spruce Budworm 2016

Northeast Region

115,877 ha

Area within which SBW caused moderate to severe defoliation



Signs of
SPRUCE BUDWORM

early spring – young larvae emerge and start to feed

MNRF Science

Signs of
SPRUCE BUDWORM

A distinct reddish halo of dry foliage appears as a result of mature larvae severing and webbing together needles in the process of feeding

MNRF Science

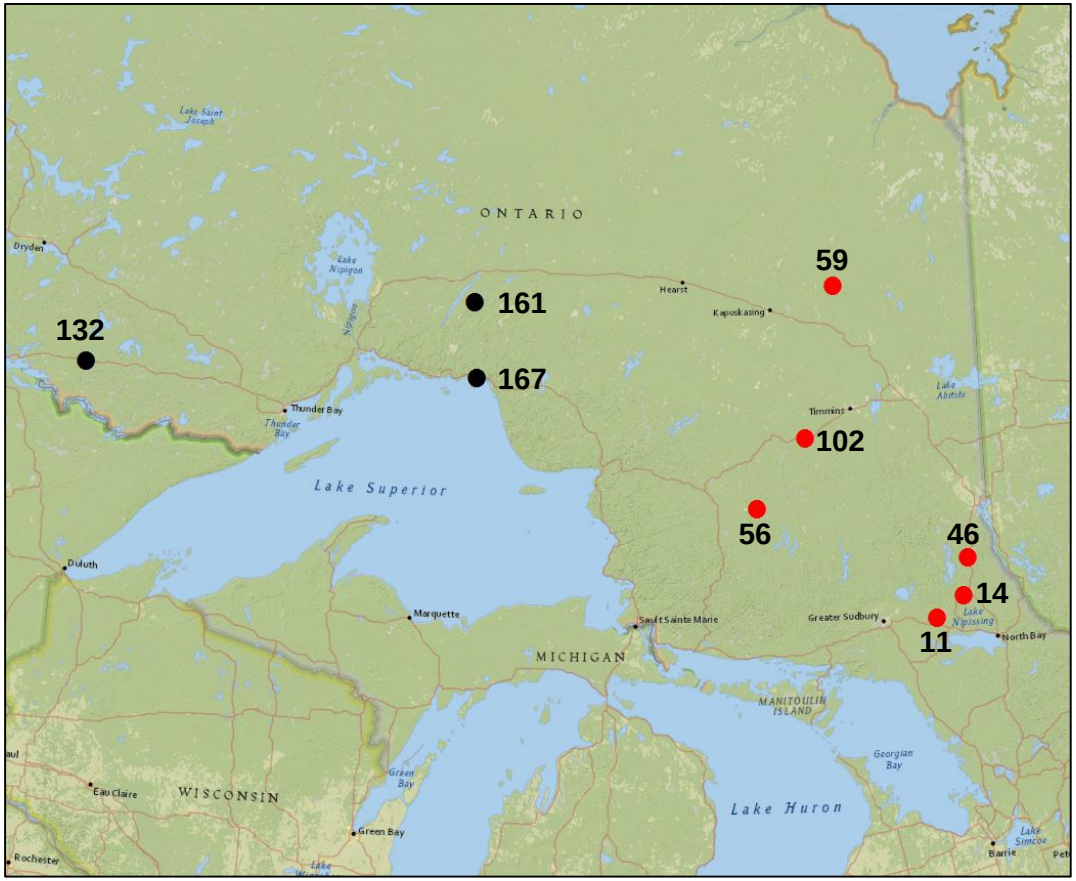
Aerial View

SPRUCE BUDWORM

3 FORECASTING METHODS

1. Pheromone traps
2. Egg mass densities
3. 2nd instar larvae survey

Forecasting method 1 – Pheromone traps



NE/NW PHEROMONE TRAP RESULTS between 2014 to 2016			
Plot	**2014**	**2015**	**2016**
NE 11	97	22	215
NE 14	29	46	161
NE 46	236	643	930
NE 56	119	113	273
NE 59	80	41	252
NE 102	72	73	172
NW 132	40	69	17
NW 161	12	66	16
NW 167	18	260	43

● **northwest** ● **northeast**

Forecasting method 2 – Egg mass densities

- 6 upper crown branches collected/site
- Each branch measured and rated for current years defoliation
- Each branch examined for current years egg masses
- Egg masses are counted to predict size of next generation

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Forecasting method 3 – 2nd instar larvae survey

- 10 upper crown branches/site
- Early winter
- Each sample soaked for 2 hours in a sodium hydroxide solution
- Samples are run through a series of sieves
- Larvae are then counted to estimate populations based on numbers/area of foliage

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SPRUCE BUDWORM
outbreak concerns

- **Wood supply and economic impacts**
- **Fuel for forest fires**
- **Reduction of wintering yards for deer and moose**

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Spruce Budworm

control options for wood supply and economic impacts

1. Pesticide control
   - Bacillus thuringiensis ssp. kurstaki (Btk)
   - Typically achieves ~60% population control
   - May keep trees live through an infestation cycle

2. Accelerated or redirected harvest

3. Do nothing and continue to monitor to support informed decisions

Vance Boudreau

Forest Health – Northwest

Forest tent caterpillar (*Malacosoma disstria* Hubner)

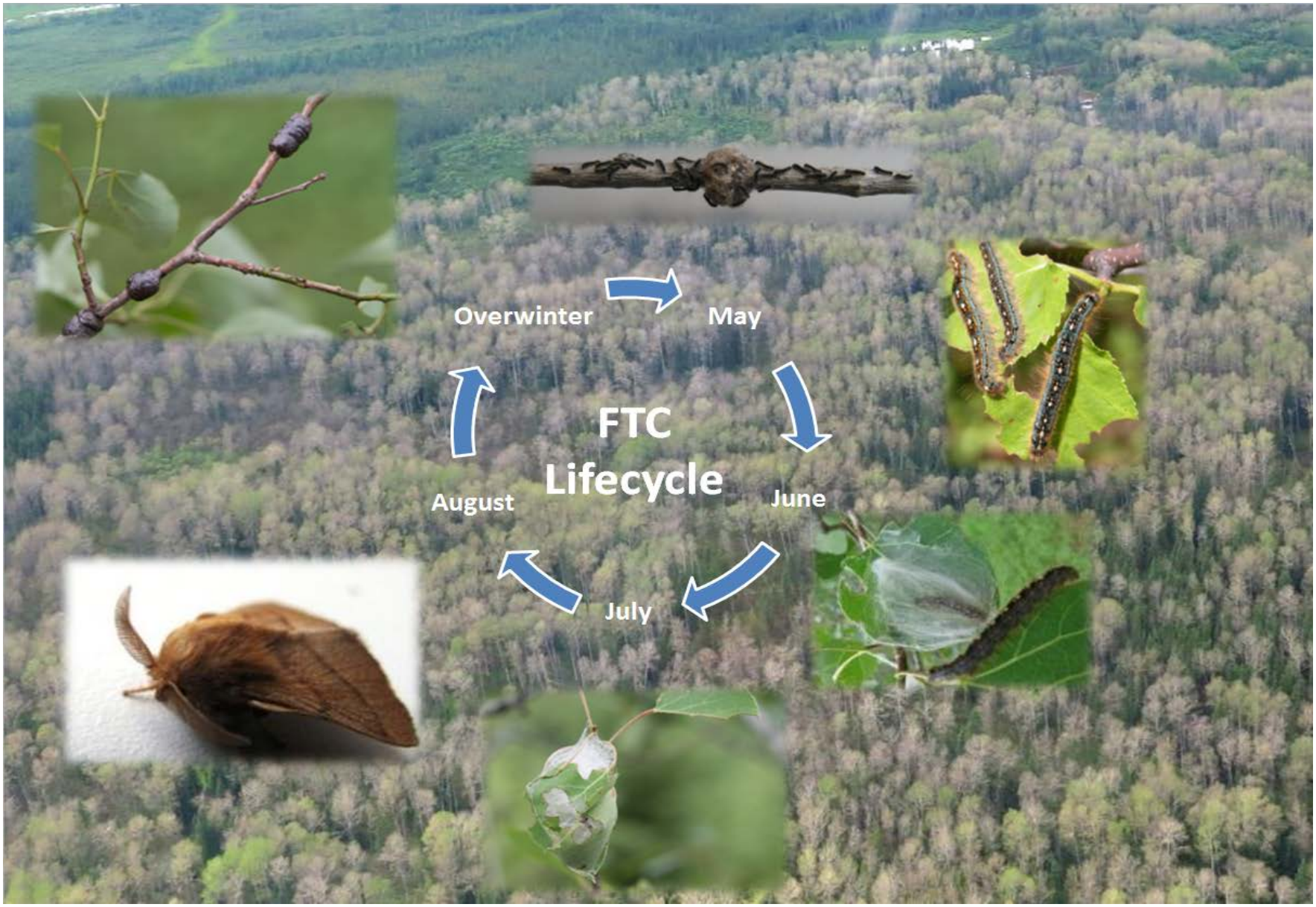
Pest Information

Pest Origins:	Native to North America
Pest Type:	Defoliator
Host Species:	Hardwoods
Infestation Area:	1,123,440 ha (2016)

Forest tent caterpillar (*Malacosoma disstria* Hubner)

Forest tent caterpillar
Moderate-to-severe defoliation in Ontario 1950 - 2016

Forest tent caterpillar (*Malacosoma disstria* Hubner)



Forest tent caterpillar (*Malacosoma disstria* Hubner)

Old – dull and grey

New – dark and shiny

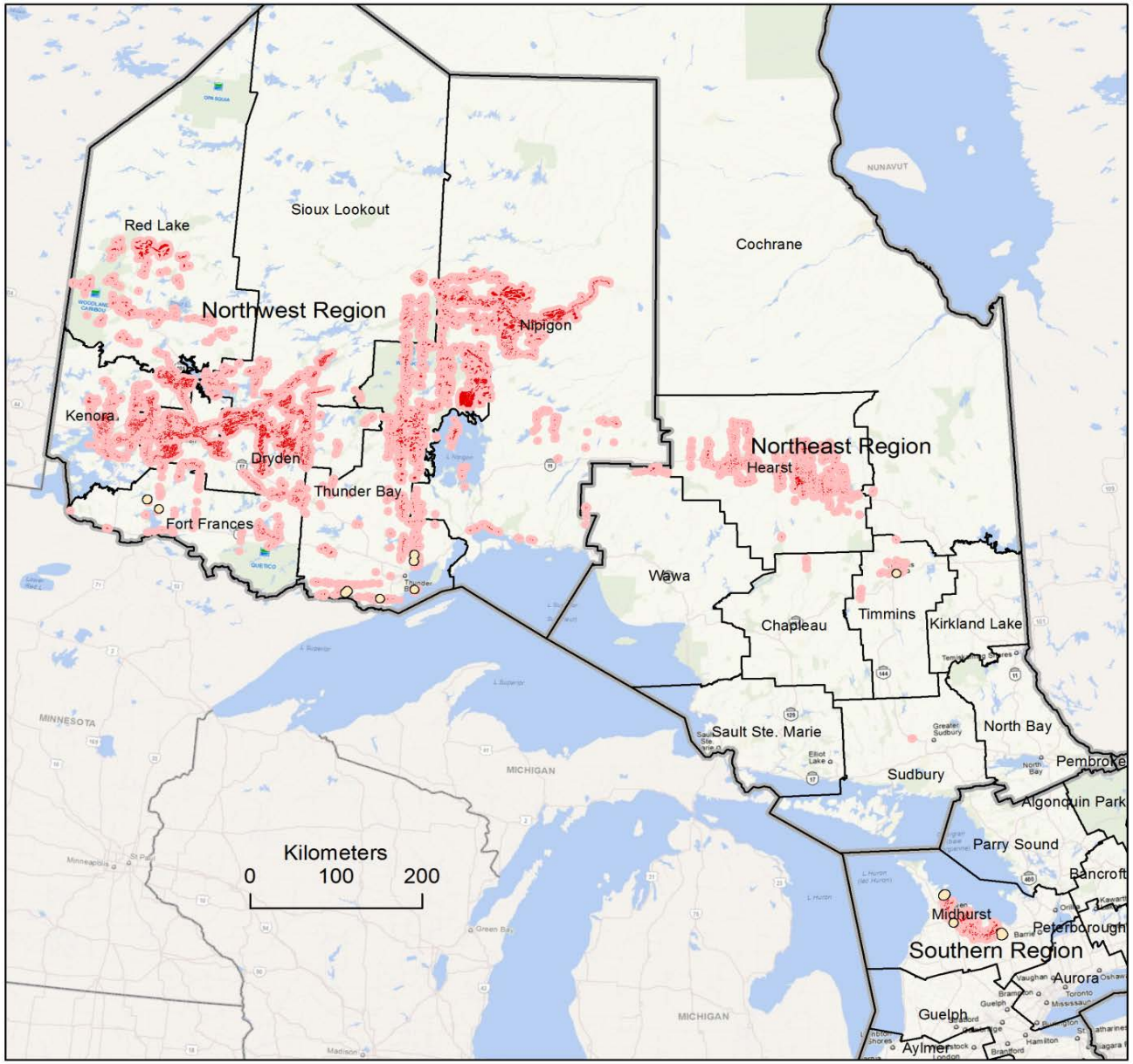
Forest tent caterpillar (*Malacosoma disstria* Hubner)

Forest tent caterpillar 2015

Overview
Areas-within-which forest tent caterpillar caused defoliation.
Moderate-to-severe = 681,644 ha
Light = 1,342 ha

Area of Moderate-to-Severe Defoliation

Area of Light Defoliation



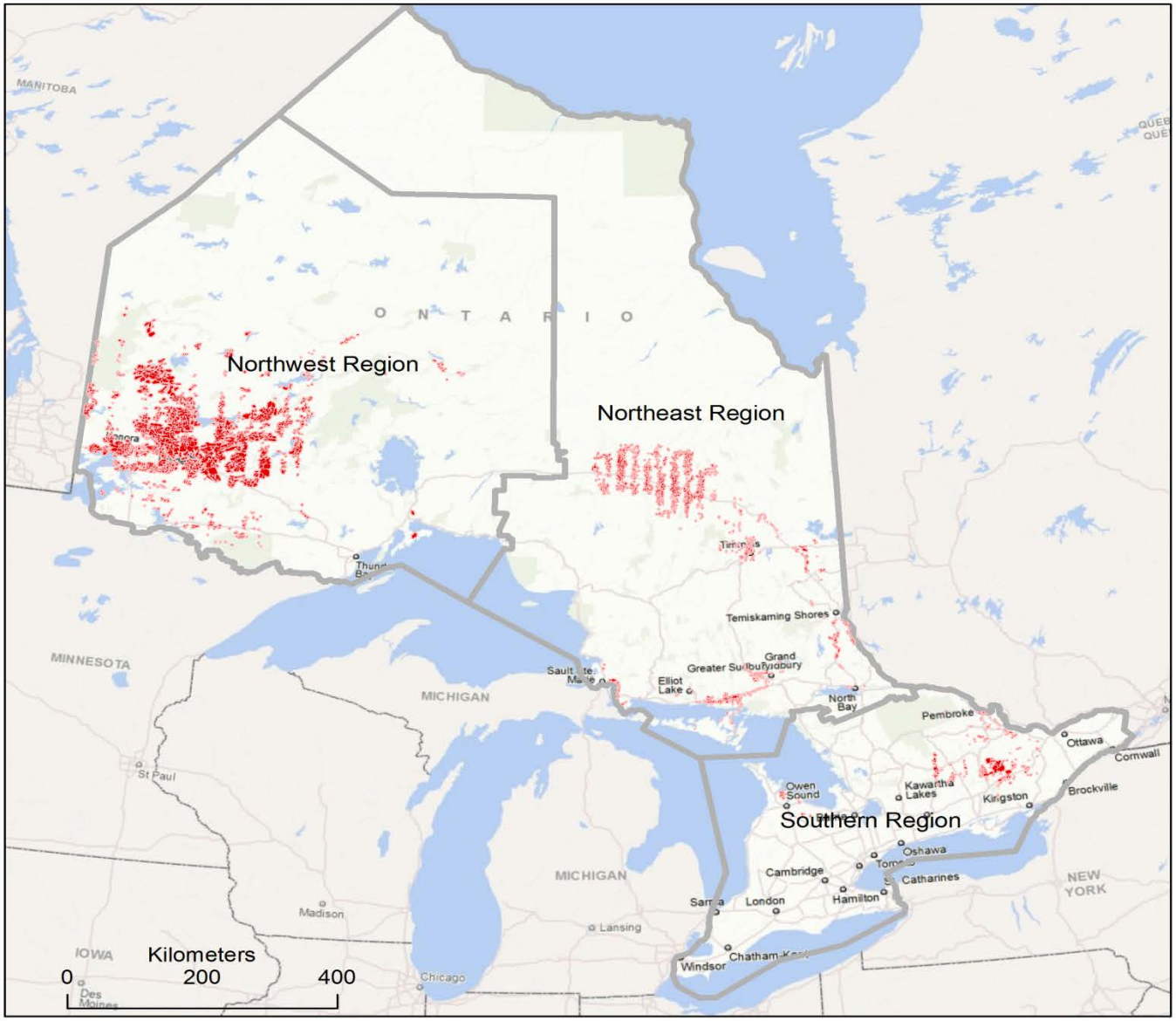
Forest tent caterpillar (*Malacosoma disstria* Hubner)

Forest tent caterpillar 2016

Overview
Areas-within-which forest tent caterpillar caused defoliation.
Moderate-to-severe = 1,123,440 ha
Light = 263 ha

Area of Moderate-to-Severe Defoliation

Area of Light Defoliation

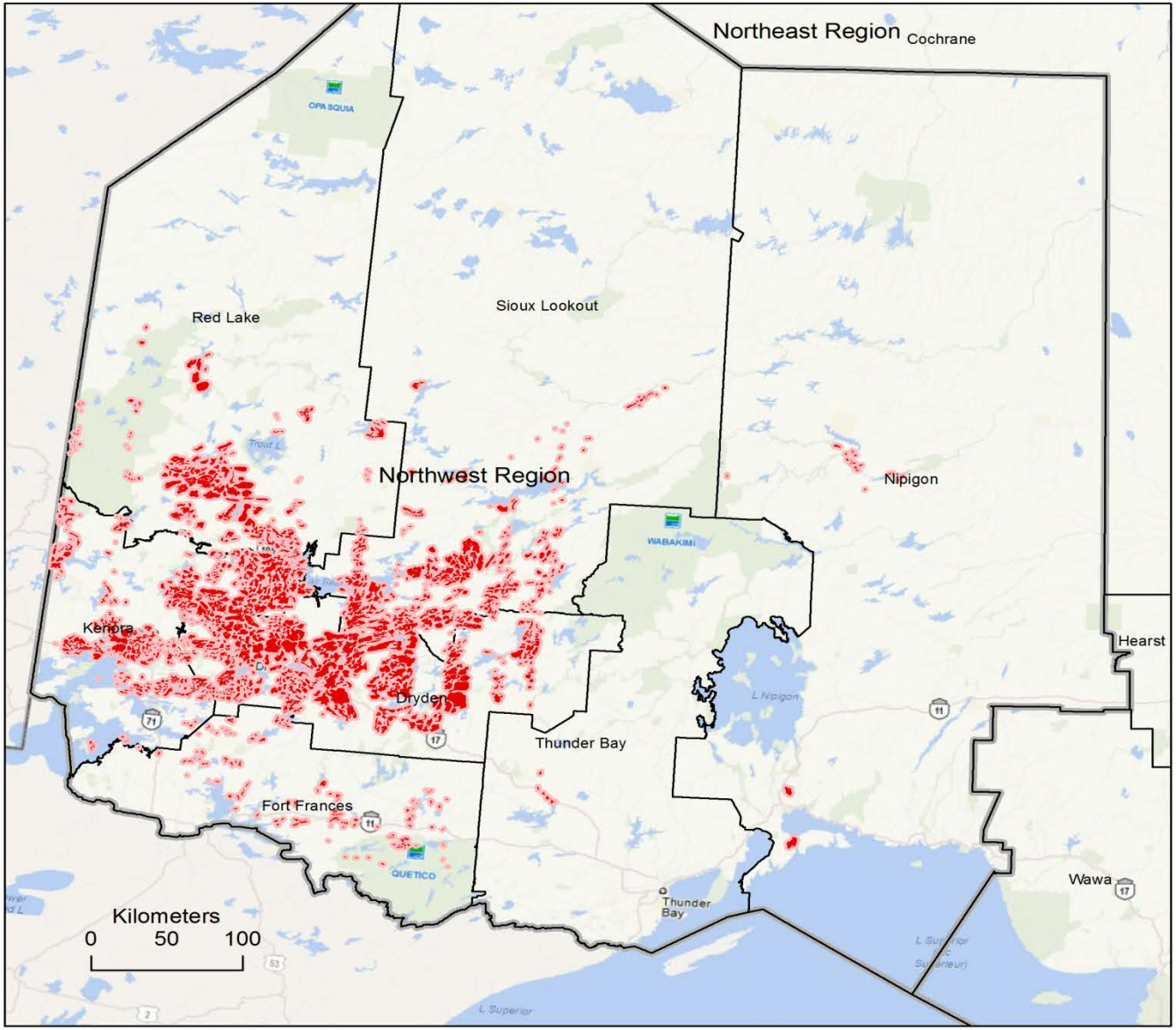


Forest tent caterpillar (*Malacosoma disstria* Hubner)

Forest tent caterpillar 2016

Northwest Region
Areas-within-which forest tent caterpillar caused defoliation.
Moderate-to-severe = 940,399 ha

Area of Moderate-to-Severe Defoliation



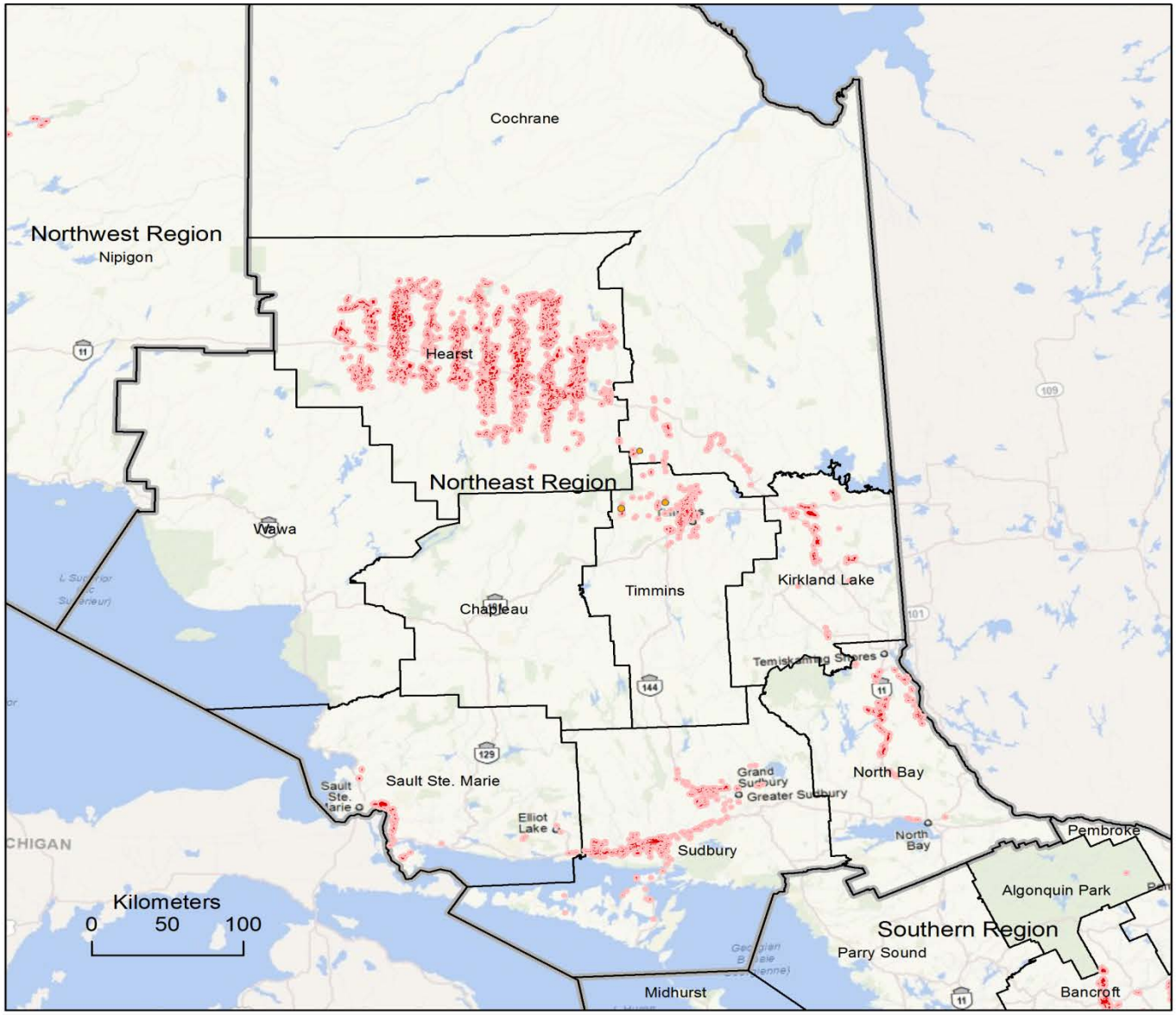
Forest tent caterpillar (*Malacosoma disstria* Hubner)

Forest tent caterpillar 2016

Northeast Region
Areas-within-which forest tent caterpillar caused defoliation.
Moderate-to-severe = 132,135 ha
Light = 61 ha

Area of Moderate-to-Severe Defoliation

Area of Light Defoliation



Natural Factors Contributing to Outbreak Collapse

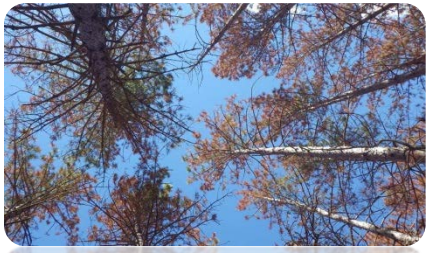
- Low spring temperatures
- Adverse weather conditions
- Starvation of larva
- Disease/Pathogens
  - Nuclear Polyhedrosis Virus (NPV)
  - *Entomopthera* fungi
- Pupal parasitoids
  - Sarcophagid flies

Hail damage

Pest Information

Damage Type:	Abiotic Damage – Weather Event
Damage Area:	Light and moderate-to-severe 1,553 ha (2016)

Hail damage

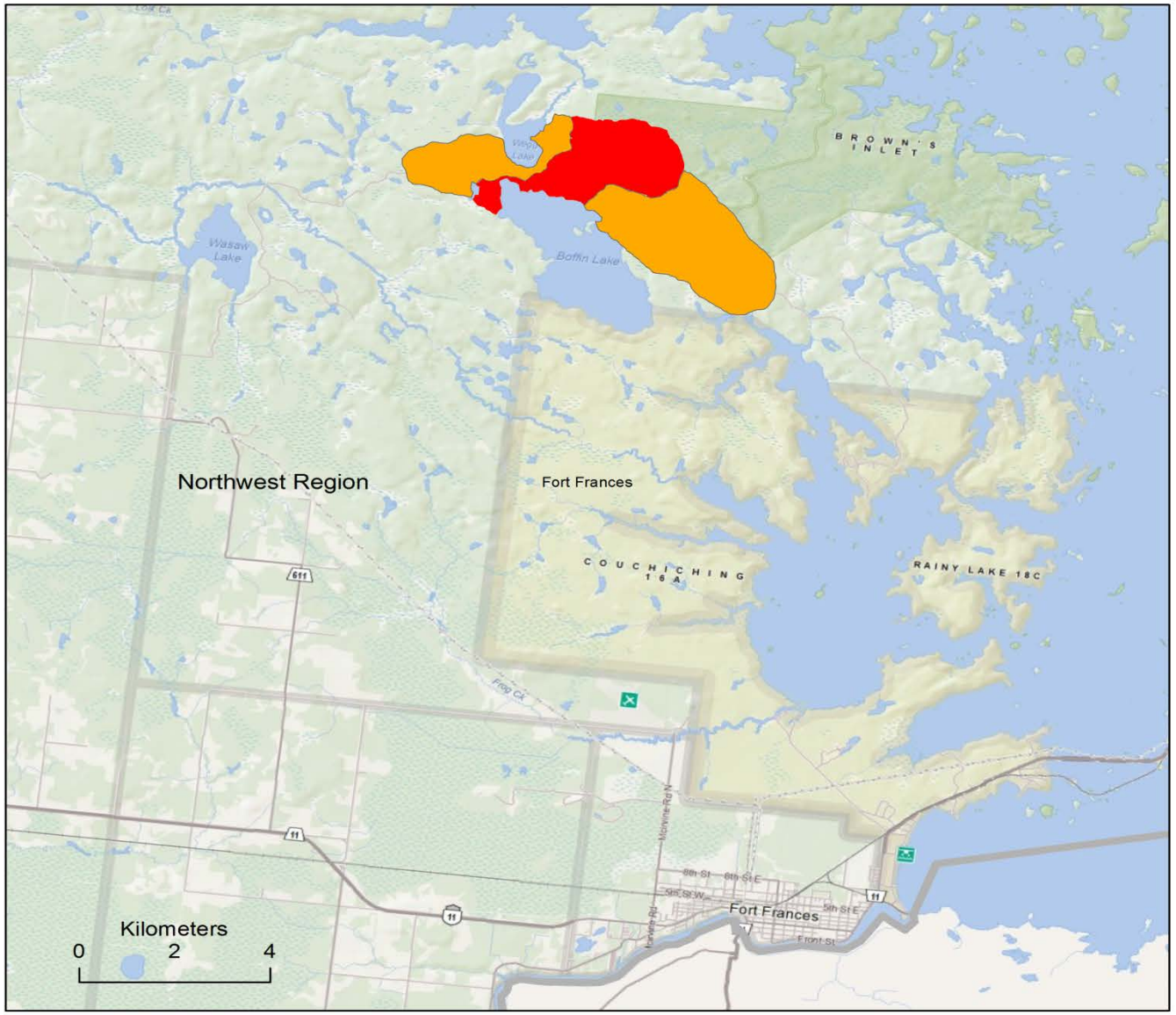


Hail damage 2016

Northwest Region
Areas-within-which hail caused damage.
Light = 1,051 ha
Moderate-to-severe = 502 ha

Area of hail damage light

Area of hail damage moderate-to-severe



Hail damage

Hail damage

Red Pine Damage

Blowdown

Pest Information

Damage Type:	Abiotic Damage – Weather Event
Damage Area:	11,448 ha (2016)

Blowdown

Blowdown 2016

Overview
Areas-within-which blowdown caused damage.
11,448 ha

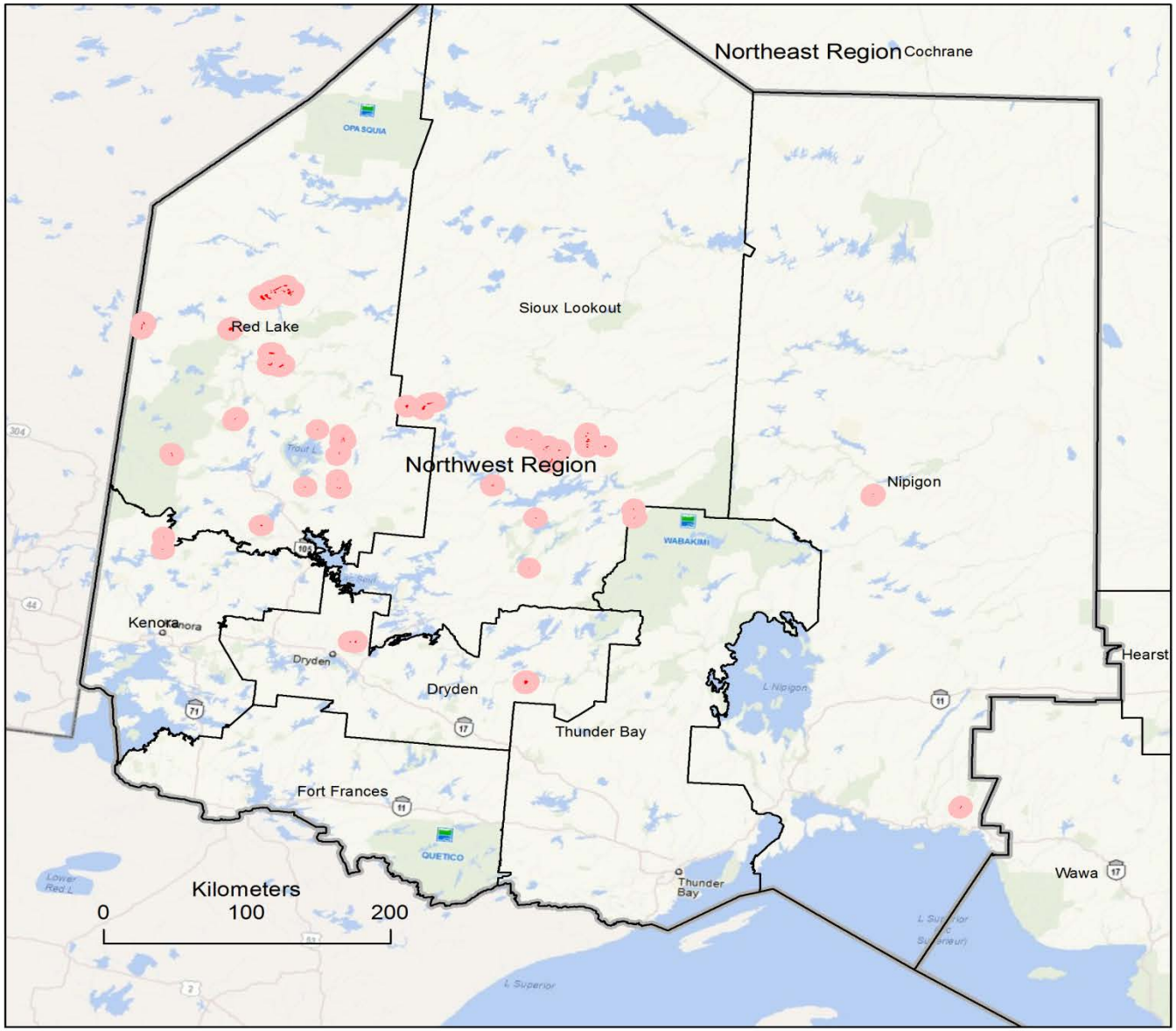
Area of Blowdown

Blowdown

Blowdown 2016

Northwest Region
Areas-within-which blowdown caused damage.
11,098 ha

Area of Blowdown



Blowdown

Blowdown 2016

Northeast Region
Areas-within-which blowdown caused damage.
350 ha

Area of Blowdown

Whitespotted sawyer beetle (*Monochamus s. scutellatus* (Say))

Pest Information

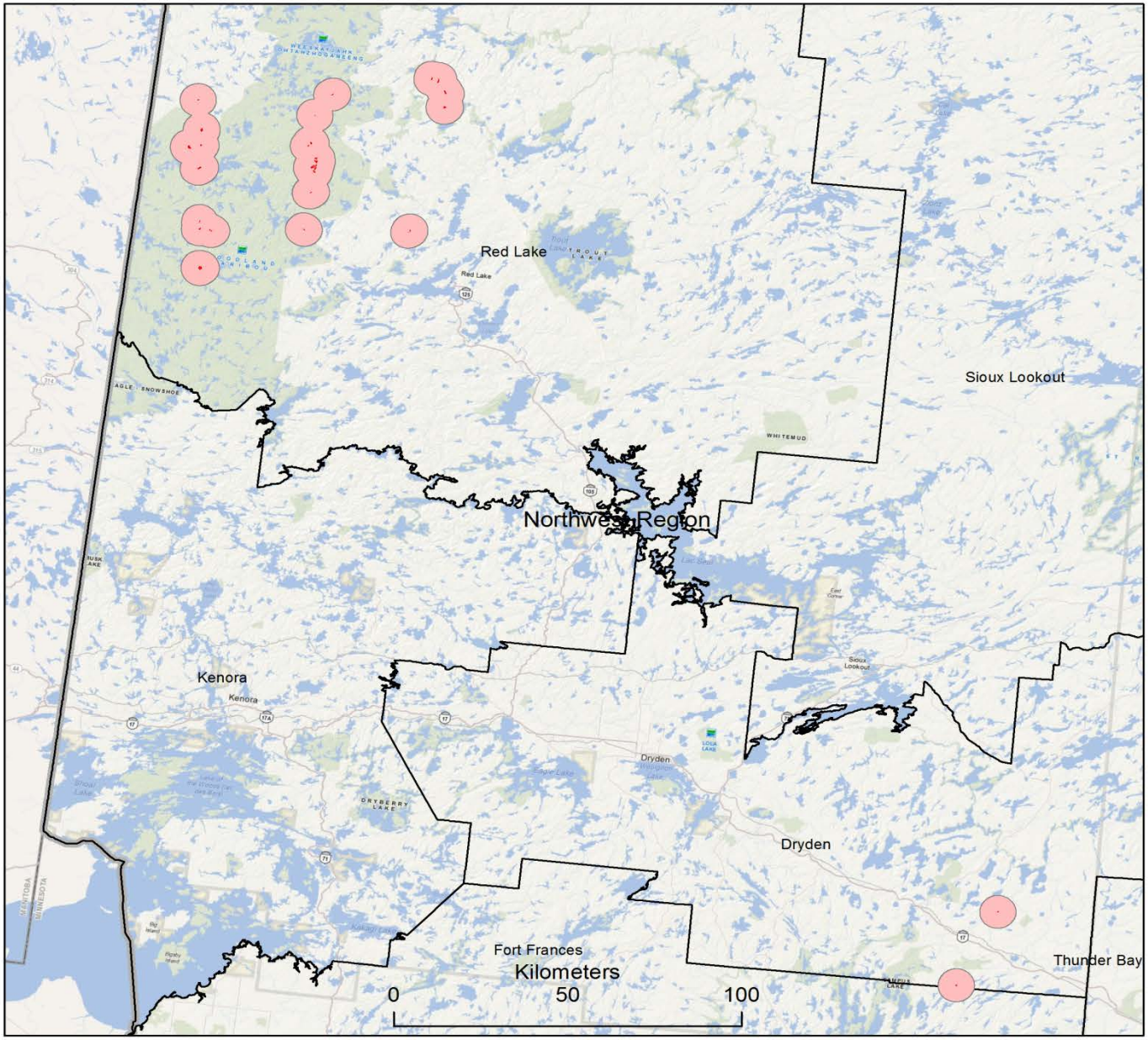
Pest Origins:	Native to North America
Pest Type:	Wood borer
Host Species:	Jack pine
Infestation Area:	40,697 ha (2016)

Whitespotted sawyer beetle (*Monochamus s. scutellatus* (Say))

Whitespotted sawyer beetle 2015

Northwest Region
Areas-within-which whitespotted sawyer beetle caused **Moderate-to-severe damage = 925 ha**

Area of Moderate-to-Severe Damage

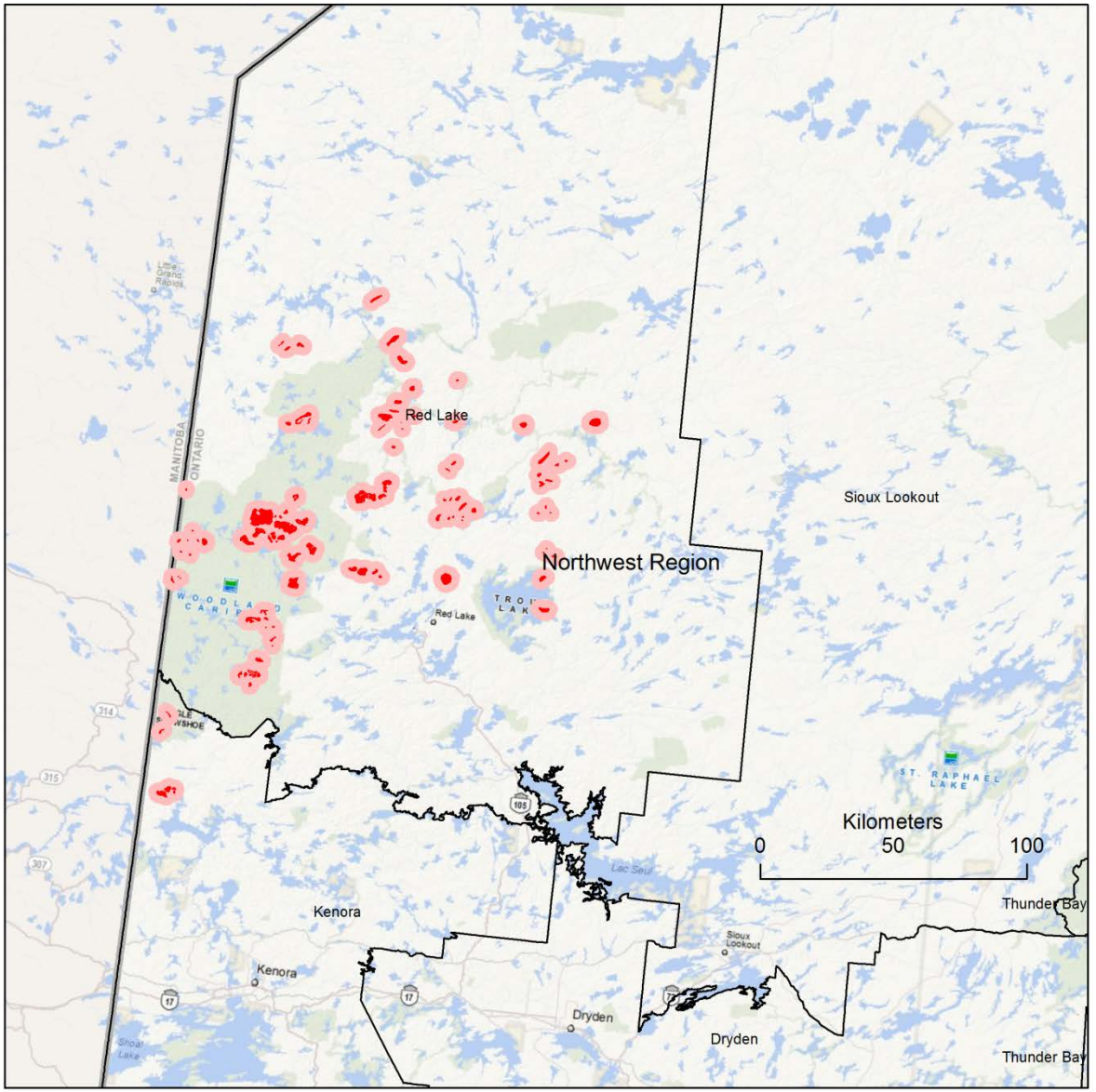


Whitespotted sawyer beetle (*Monochamus s. scutellatus* (Say))

Whitespotted sawyer beetle 2016

Northwest Region
Areas-within-which whitespotted sawyer beetle caused **Moderate-to-severe damage = 40,697 ha**

Area of Moderate-to-Severe Damage



Whitespotted sawyer beetle (*Monochamus s. scutellatus* (Say))

White Spotted Sawyer Beetle

The white spotted sawyer beetle (*Monochamus scutellatus*) is normally a secondary pest because it ordinarily attacks weakened, dying or recently dead trees and rarely healthy trees. It is native to North America and its preferred hosts are pine, spruce and balsam fir trees. This pest finds ideal conditions for breeding in older weaker trees, windfall trees and trees defoliated by other pests.

Life Cycle

The life cycle of this insect covers a two-year period. The large adult beetle is totally black with a little white at the base of the elytra and is mainly active during sunny days from mid-June to late August. The female will lay her eggs in bark crevices or in slits made with their strong jaws. Once the larva hatch they begin to bore tunnels through the phloem, into the cambium and by September are tunnelling towards the interior. By the end of September they are in the interior and will overwinter.

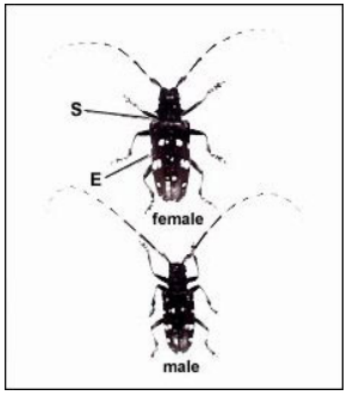
Whitespotted sawyer beetle (*Monochamus s. scutellatus* (Say))

Life Cycle

The following spring the larvae become active again and extend their tunnels into the interior, at this point sawdust may be seen at the base of the tree as the larvae pushes any excess sawdust out. By mid-summer the larva starts to tunnel back to the surface and by late September the larva is about 5 mm from the surface where it builds a pupal case to overwinter and emerge the following June as an adult.

Whitespotted sawyer beetle (*Monochamus s. scutellatus* (Say))

Asian Longhorn



Asian Longhorned Beetle
Anoplophora glabripennis (Motschulsky)

Origin and North American Range: Native to Asia; immigrant in North America (Brooklyn and Amityville, NY); interceptions of this species have occurred at ports of entry in North America.

Hosts: Adults are drawn to recently felled, stressed, or apparently healthy hardwood trees.

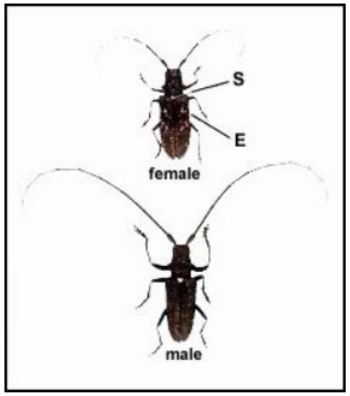
Overall appearance: Glossy black; very smooth and finely punctate (having microscopic dimples); 20-35 mm long.

Elytra (E): Both sexes have up to 20 irregularly distinct white spots.

Scutellum (S): Generally black.

Antennae: Segments 3-11 distinctly banded white and black in both sexes; Female- antennae usually 1.3 times body length; Male- antennae usually 2.5 times the body length

Legs: In both sexes, bluish-white especially on the dorsal surface



Whitespotted Sawyer
Monochamus scutellatus (Say)

Origin and North American Range: Native to North America; transcontinental from Alaska throughout Canada (and the Northern United States) and southward to North Carolina in the east and New Mexico in the west.

Hosts: Adults are drawn to dying, stressed, or recently felled conifers.

Overall appearance: Generally bronzy-black; coarsely and roughly punctate; 15-28 mm long.

Elytra (E): Female- generally mottled with whitish patches; Male- generally completely bronzy-black.

Scutellum (S): Generally white (covered with white or ashy-colored scales).

Antennae: Female- faintly banded gray and black; slightly longer than the body; Male- all black; much longer than the body.

Legs: In both sexes, generally dark or slightly gravish-black overall

Whitespotted Sawyer

Whitespotted sawyer beetle (*Monochamus s. scutellatus* (Say))

Asian Longhorned Beetle

Male

Female

white-spotted sawyer

Male

Female

QUESTIONS

MNRF Science