

Sustainable Forestry Conference

Forest Health Update



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Topics

- Declines
- Spruce Budworm
- Hemlock Woolly Adelgid
- Eastern Larch Bark Beetle
- Emerald Ash Borer



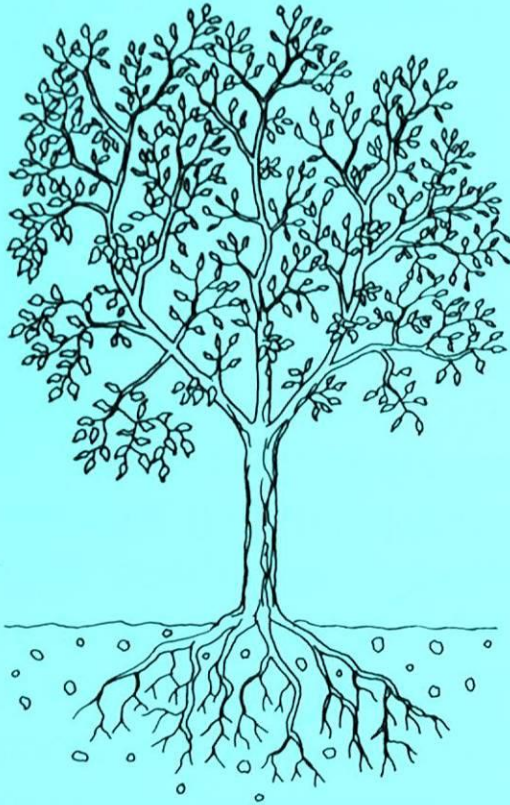
Declines



Aspen
Sugar Maple
Ash
Oak
Hickory
Walnut
Spruce

Sugar maple decline

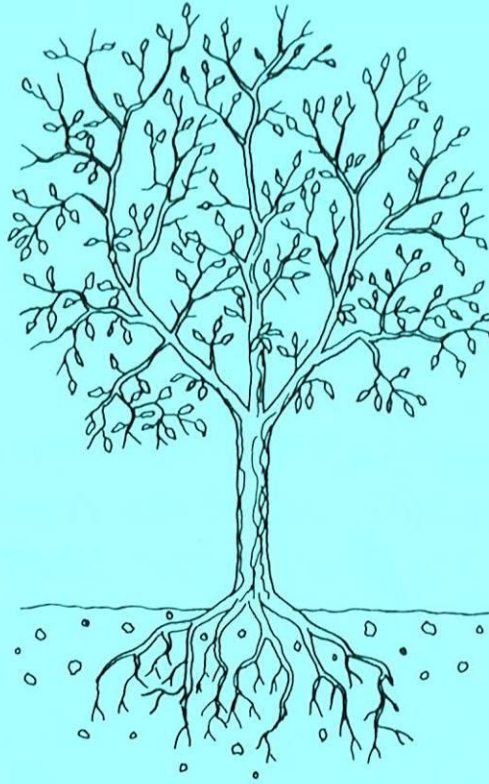
PREDISPOSING



Long-term factors:

- Climate
- Soil moisture
- Genotype of host
- Soil nutrients
- Air pollutants

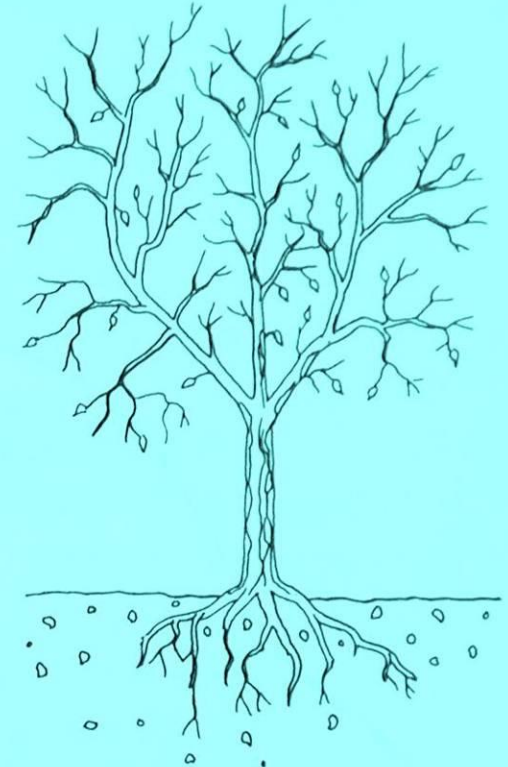
INCITING



Short-term factors:

- Insect defoliation
- Frost
- Drought
- Salt
- Air pollutants
- Mechanical injury

CONTRIBUTING



Long-term factors:

- Bark beetles
- Canker fungi
- Viruses
- Root-decay fungi

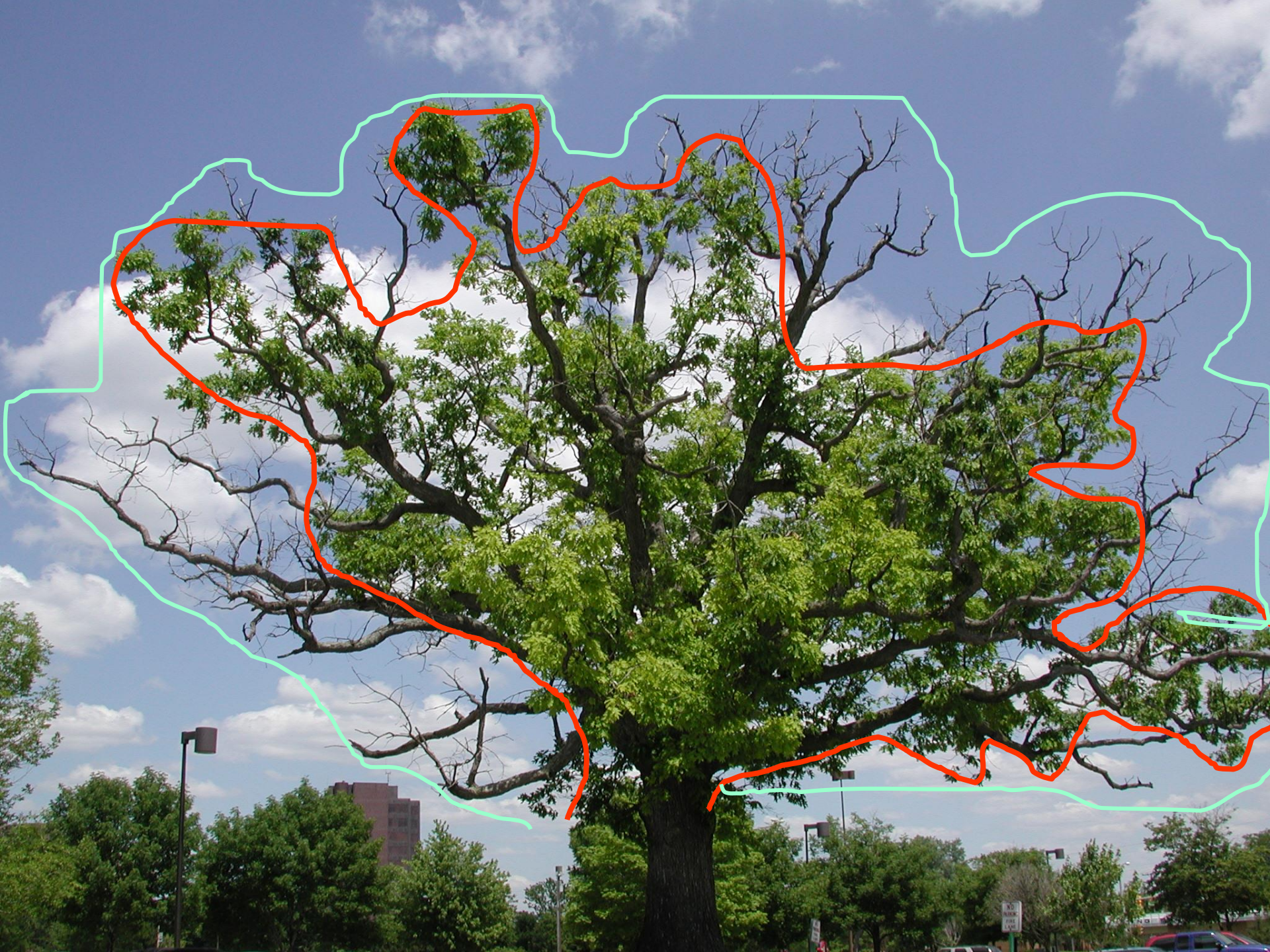
FIGURE 18-2 Categories of factors influencing declines.

Declines: Conifers vs. Hardwoods

- The most efficient foliage in hardwoods is shade leaves. These should be the last leaves lost during a decline episode.
- The most efficient photosynthate-producing foliage in conifers are the new needles.

In general, when trees are declining:

- Hardwoods lose foliage from the top-down, and outside-in
- Conifers lose foliage from the bottom-up, and inside-out



Conifer Decline



Oak Decline / Lake County 2011



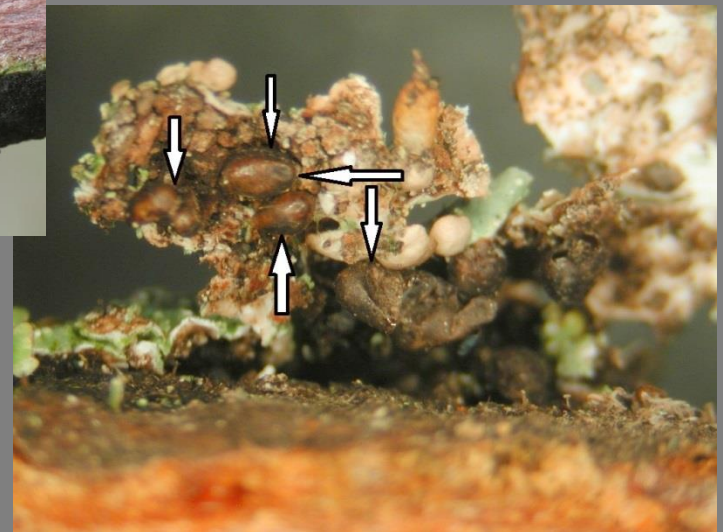
Northern Pin Oak on Outwash Plains

White Pine Decline



Matsucoccus Scale

Joe O'Brien Image



Spruce Budworm





Spruce Budworm (*Choristoneura fumiferana*)



- One of the most destructive native insects in spruce/ fir forests of USA & Canada.
- Balsam fir & white spruce
- Eats bases of young needles, then older needles.
- Defoliation in late spring / early summer.



Eastern Canada Spruce/Fir Resource

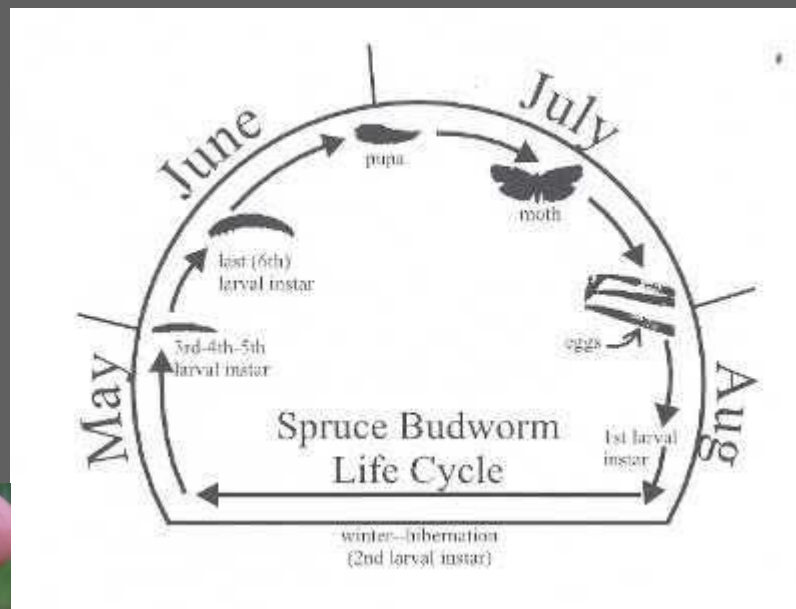
- The spruce-fir forest of eastern Canada
 - At least seven outbreaks since 1700
 - Each extending over millions of acres.
 - Severe & widespread mortality
- From 1978 to 1982
 - 1.5 billion ft³
 - About 2/3s of the annual harvest
 - 1/2 of the allowable cut

Eastern Canada Spruce/Fir Resource

- Total area of moderate to severe defoliation in Ontario eastward in 1981
 - 94.1 million acres
 - Dead and dying trees in an area of 62.3 million acres.

Michigan

- Area visibly defoliated by SBW
 - 1980: 859,000 acres
 - 1981: 161,000 acres
 - 1982: 116,000 acres
- Early 1980's
 - Spruce-Fir mortality - mapped on 519,000 acres



Spruce Budworm

- Age dependent
- Site stress enhanced
- High % of staminate flowers - highest risk
- Reddish-brown cast from June to late summer
- 30 - 50 Year Cycles





Evaluate damage in the fall
after brown needles are
removed via rain and winds.

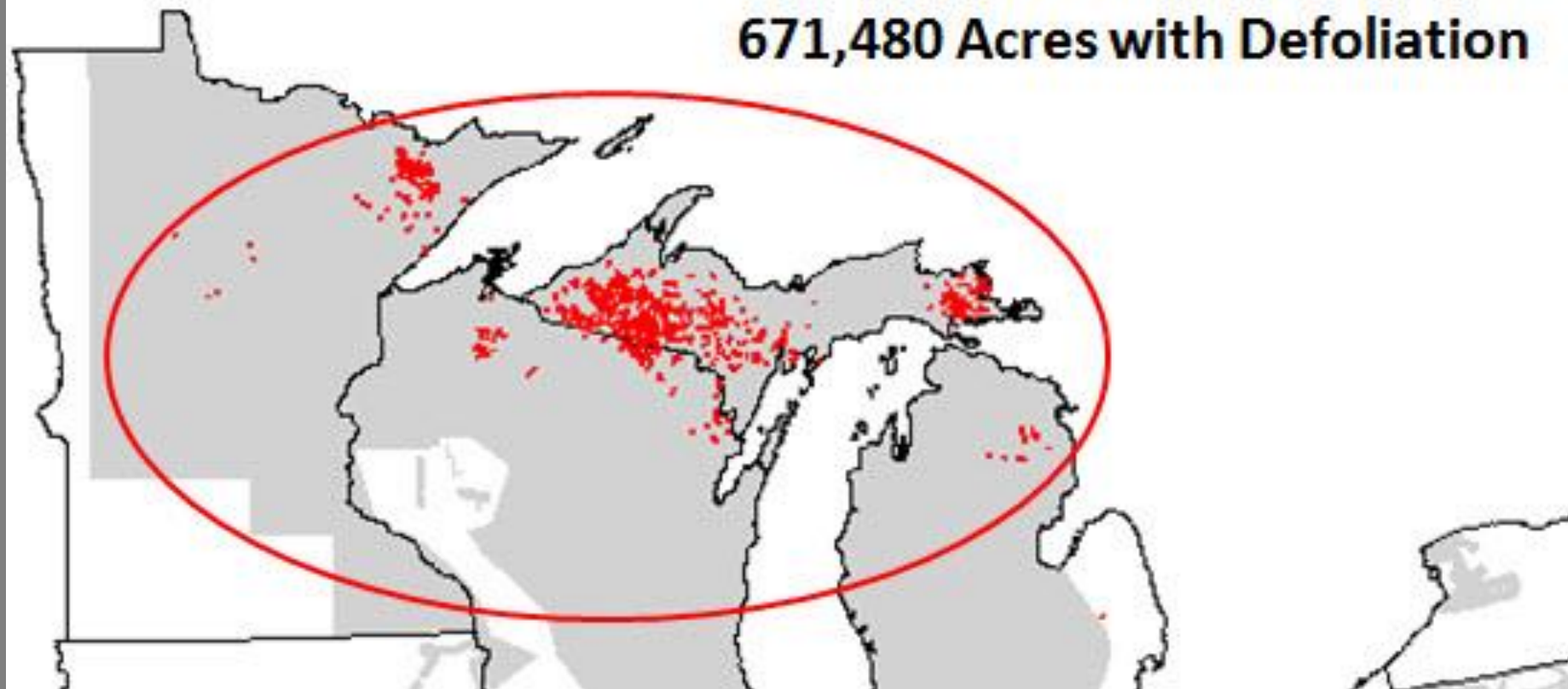
Top-kill and mortality
with consecutive
years of defoliation





2015 Aerial Survey Map / SBW

Spruce Budworm
671,480 Acres with Defoliation



Managing the State's Spruce-Fir

- Top-killing usually occurs after three years of repeated defoliation
- Tree mortality generally begins after 5 years
- Overall, 67% of the balsam fir and 42% of the white spruce was killed in the last outbreak.
- Stands with nonhost conifers or hardwoods in the overstory sustain less mortality.
- Severe damage can occur to regeneration and young stands with a scattered overstory of host trees.

Managing the State's Spruce-Fir

- Identify high-value spruce and fir stands.
- Manage balsam fir and mixed balsam fir and white spruce stands on a 50 year rotation, and white spruce stands on a 70 year rotation.
- Manage for even-aged, well stocked stands.
- When clearcutting, all spruce or balsam fir, including nonmerchantable trees, should be cut to avoid leaving a scattered residual overstory of host trees.

How to rate spruce-fir vulnerability to budworm in Minnesota. Batzer, et al (1980)

Basal Area of Other Species (percent)	Original balsam fir basal area (square feet per acre)					
	20	40	60	80	100	120
	Dead balsam fir basal area (square feet per acre)					
0	15	35	54	73	93	112
10	11	30	50	69	89	108
20	7	26	46	65	84	104
30	3	22	41	61	80	100
40		18	37	57	76	95
50		14	33	52	72	91
60		9	29	48	68	87

Hemlock Woolly Adelgid

Hemlock decline and mortality typically occur within 4 to 10 years.



Hemlock Woolly Adelgid





- Hemlock is shade tolerant, long lived, a resource for wildlife and plays an important role in many ecological processes in forests
- Hemlock provides critical winter cover, food and habitat for several birds and mammal species
- Warming of cold water streams.

Hemlock Woolly Adelgid

- A sucking insect
- Introduced from Asia
- Discovered in the 1920's in western states
- Found in eastern states in 1950's

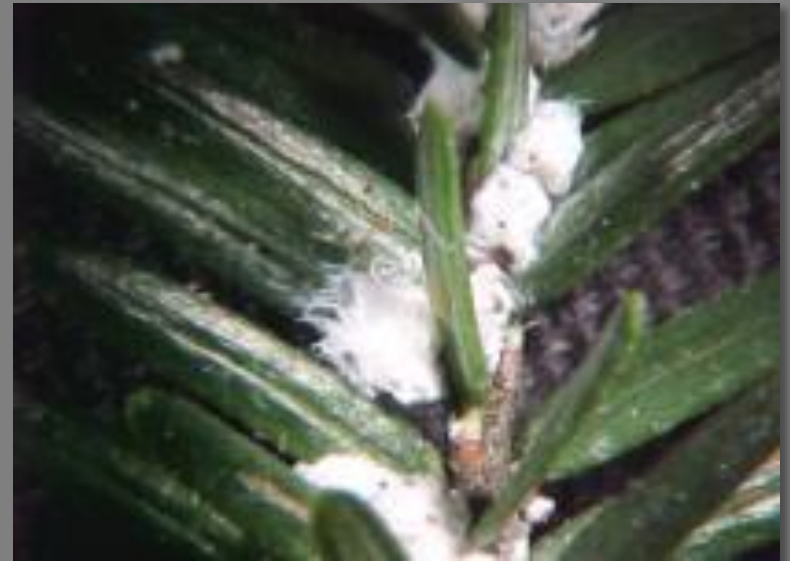


Tree Injury & Symptoms

- Lives Off Twigs
- Needles Turn Greyish Green
- No Buds
- Needle Drop
- Low Vigor
- Secondary Infestations
- Four Year Mortality



White cottony masses found on the twig at the base of needles



Not to be confused with:



Not to be confused with:



Wool From White Pine
Aphids or
Beech Scale
blown in from
neighboring tree

Not to be confused with:



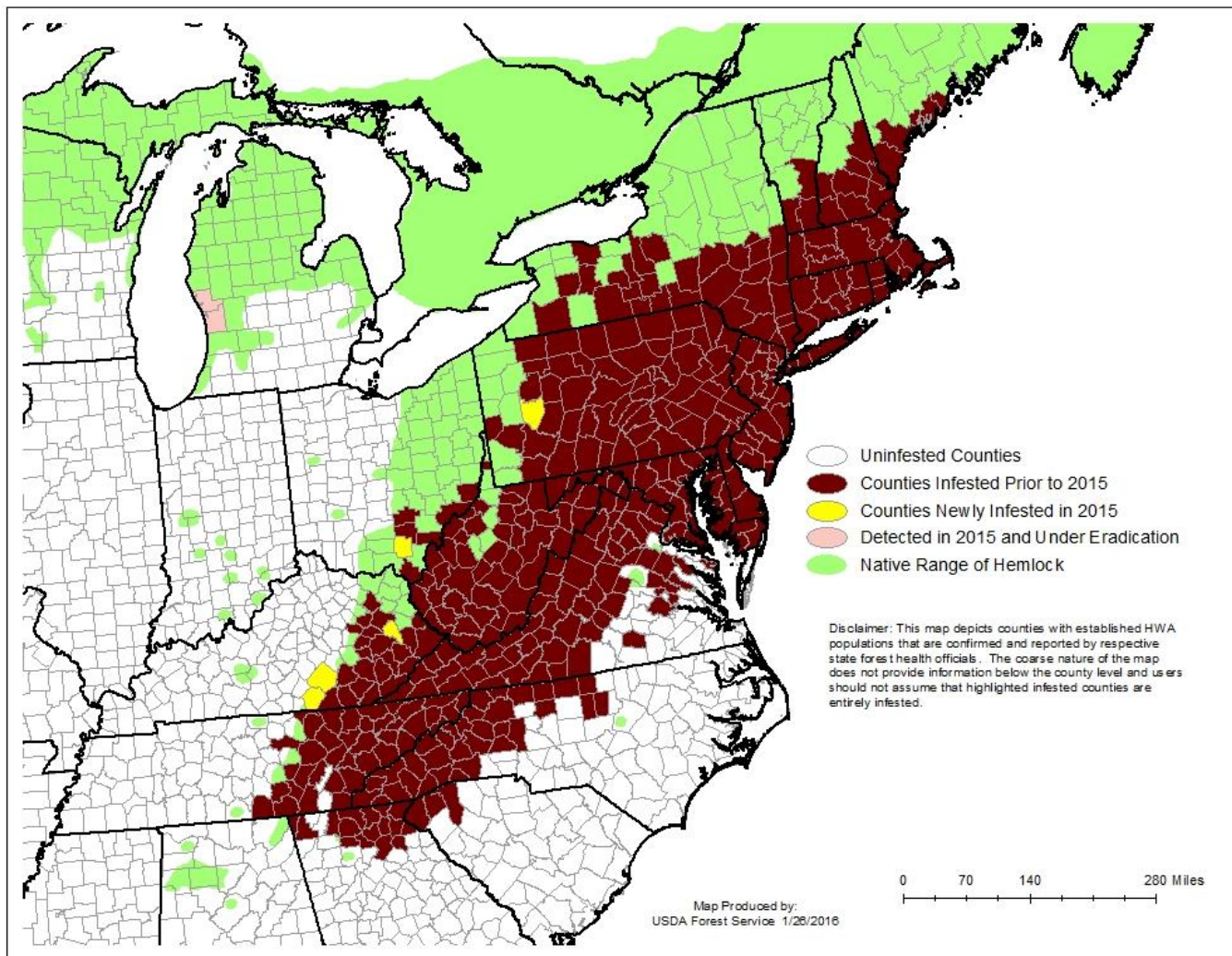
Remember that hemlock woolly adelgid :

- **Has “wool” that is attached to the twig not the needle.**
- **Is immobile when covered in wax**
- **Is waxy, not silky or stretchy**
- **Is wispy like a cotton ball, not fabric-like**
- **Has separate balls of “wool”**
- **Doesn't look painted on (like pine sap)**



Hemlock Woolly Adelgid

Distribution as of 2015



HWA Infestation History in Michigan

(Year Detected)

Muskegon Co.
(2015)

N. Ottawa Co.
(2010, 2016)

S. Ottawa Co.
(2010, 2015, 2016)

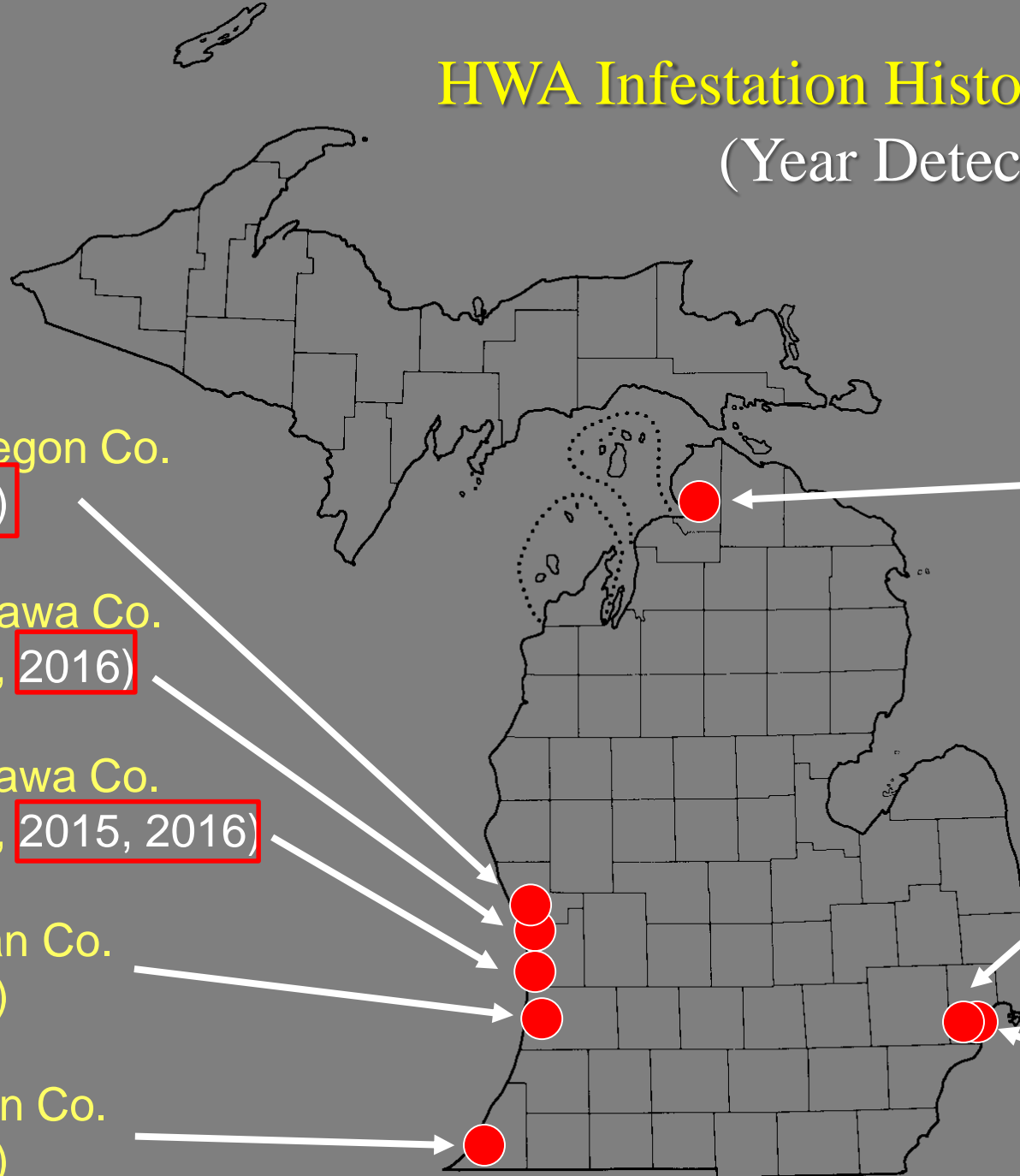
Allegan Co.
(2013)

Berrien Co.
(2012)

Emmet Co.
(2006, 2007,
2010)

Macomb Co.
(2010)

Macomb Co.
(2010)



Southwest Lower Peninsula

Half mile buffers

Muskegon Co.

15HWA05

15HWA04

Ottawa Co.

16HWA01

15HWA06

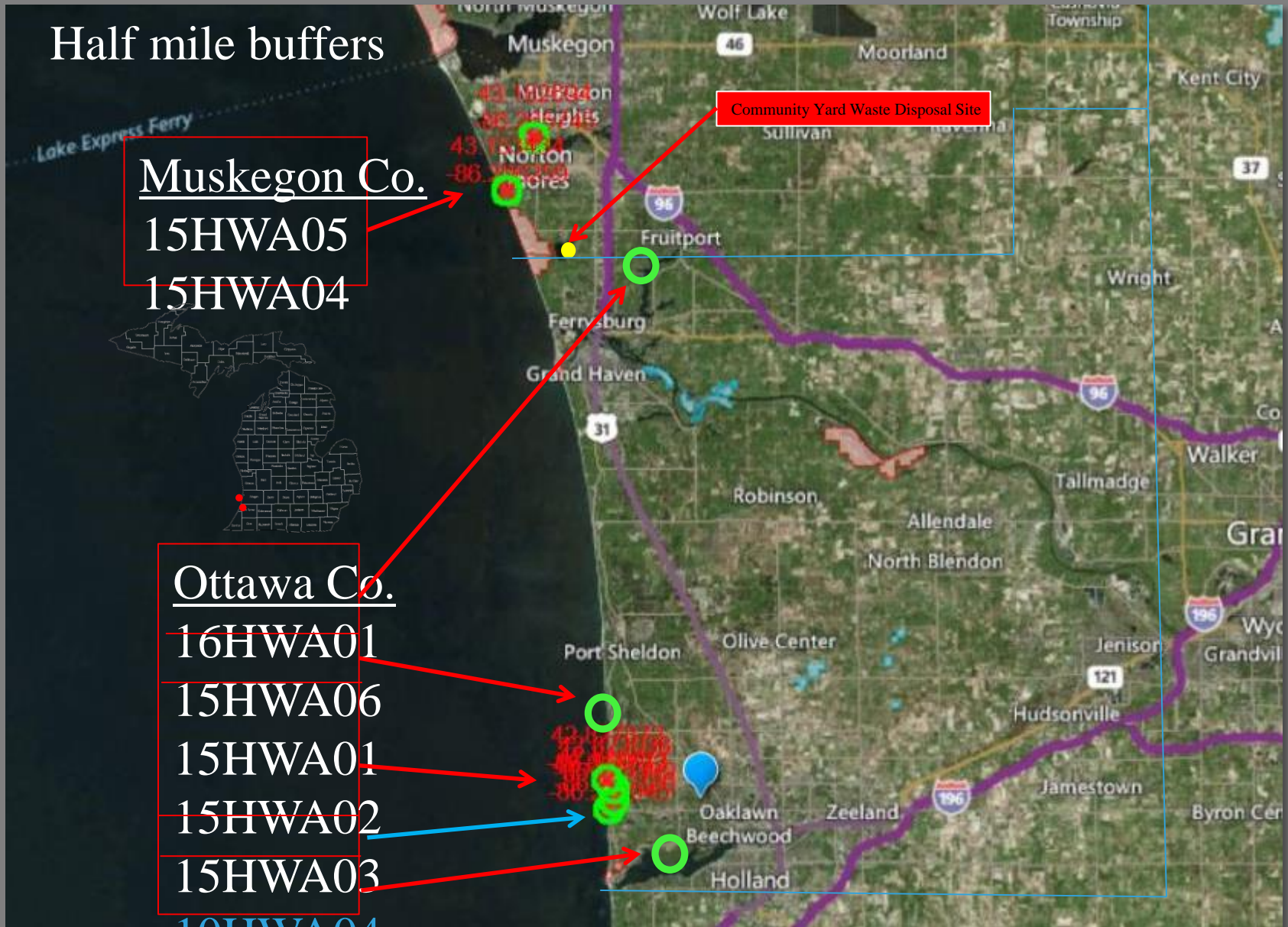
15HWA01

15HWA02

15HWA03

10HWA04

Community Yard Waste Disposal Site



Balsam Woolly Adelgid

Adelges piceae



Trees Affected:

- All true firs, *Abies* spp., including balsam and Fraser fir.



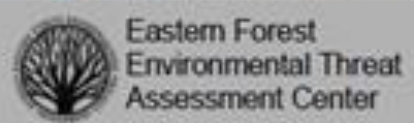
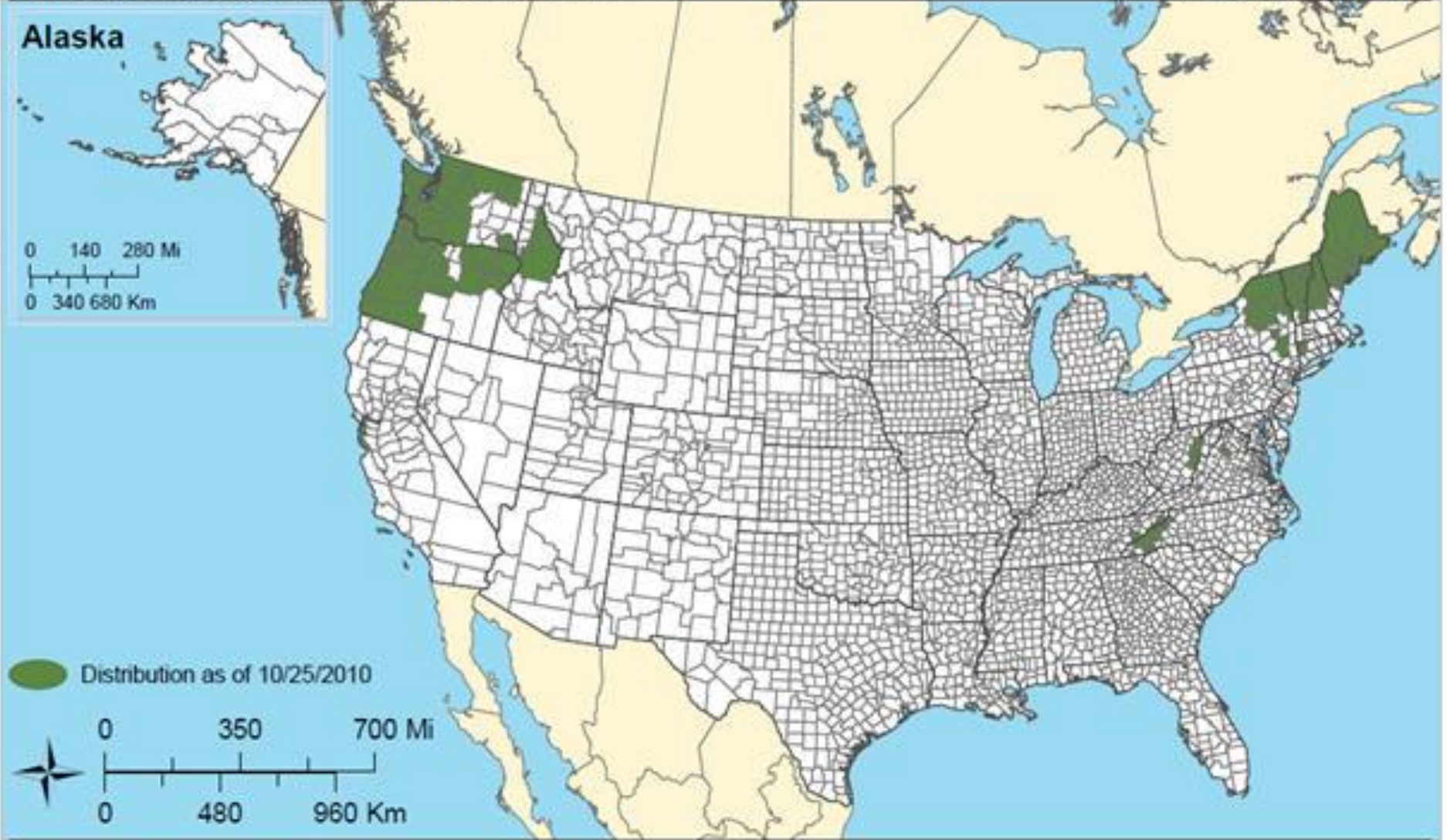


Alien Forest Pest Explorer

www.fs.fed.us/ne/morgantown/4557/AFPE/

Pest Distribution Map

Balsam Woolly Adelgid
Adelges piceae





Eastern Larch Beetle (*Dendroctonus simplex*)

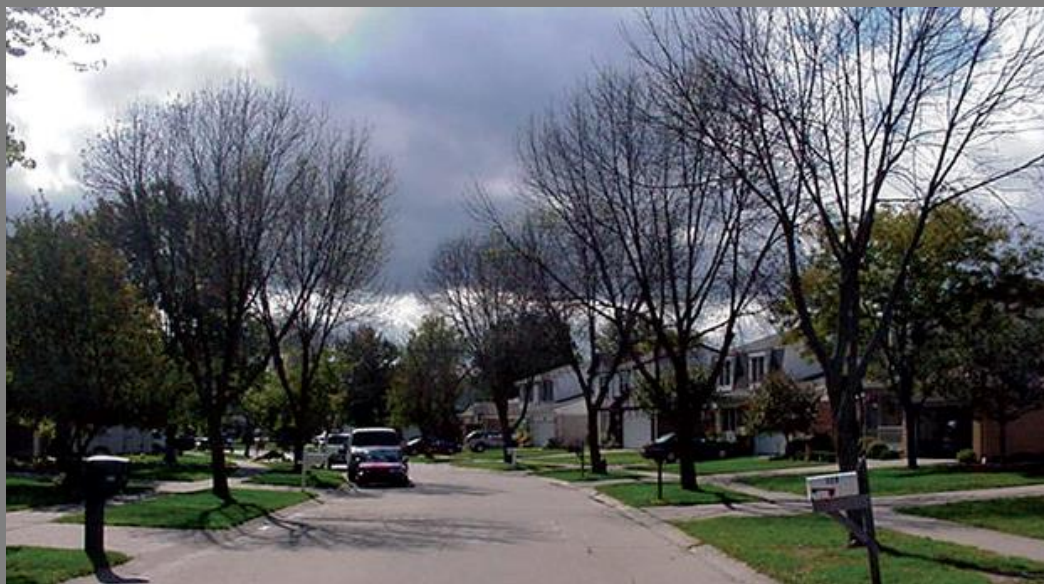






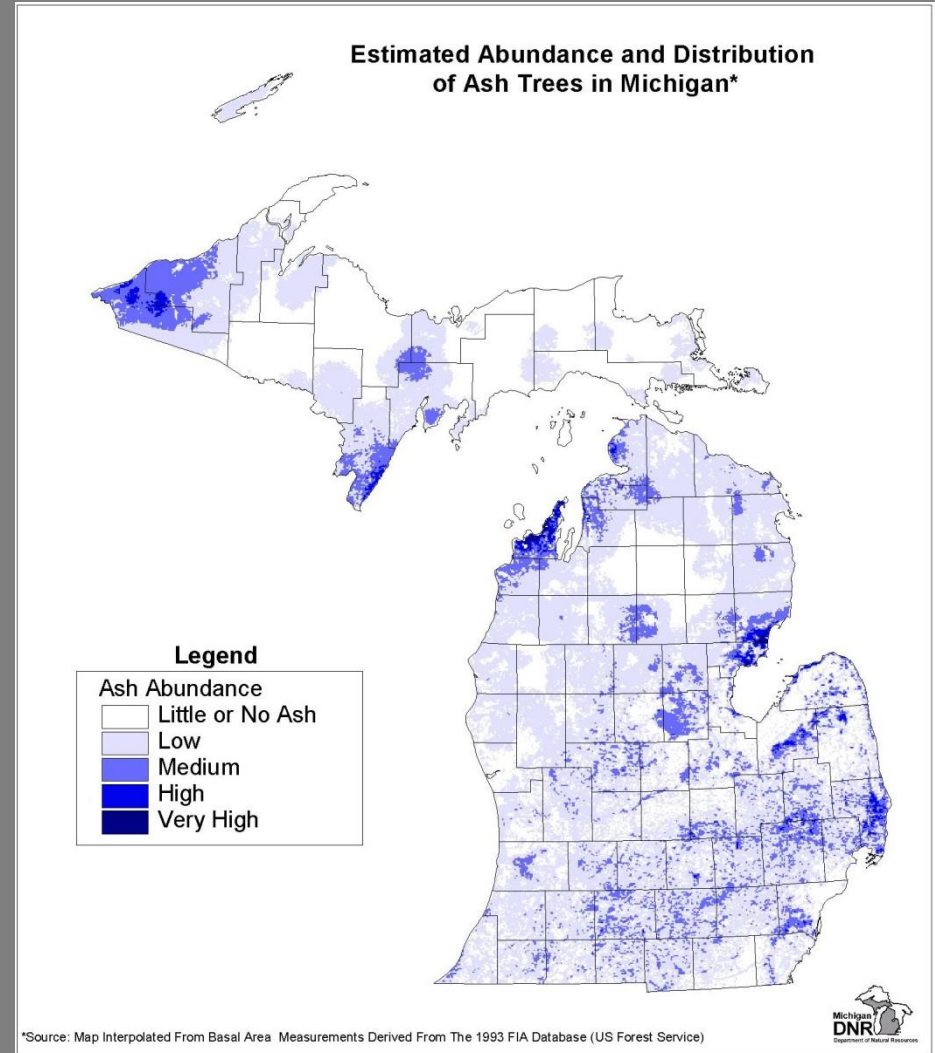
Emerald Ash Borer (EAB)

Adults are present mid-May to August. Live for 3-6 weeks and feed on ash leaves.



Michigan's Ash Resource

- 917 million ash > 1" dbh
- 171 million ash > 5" dbh
- 51 million ash > 9" dbh
- White & green ash - 2.6 billion board feet
- Black ash - .42 billion board feet
- 6% of hardwood volume
- 3.7% all species volume



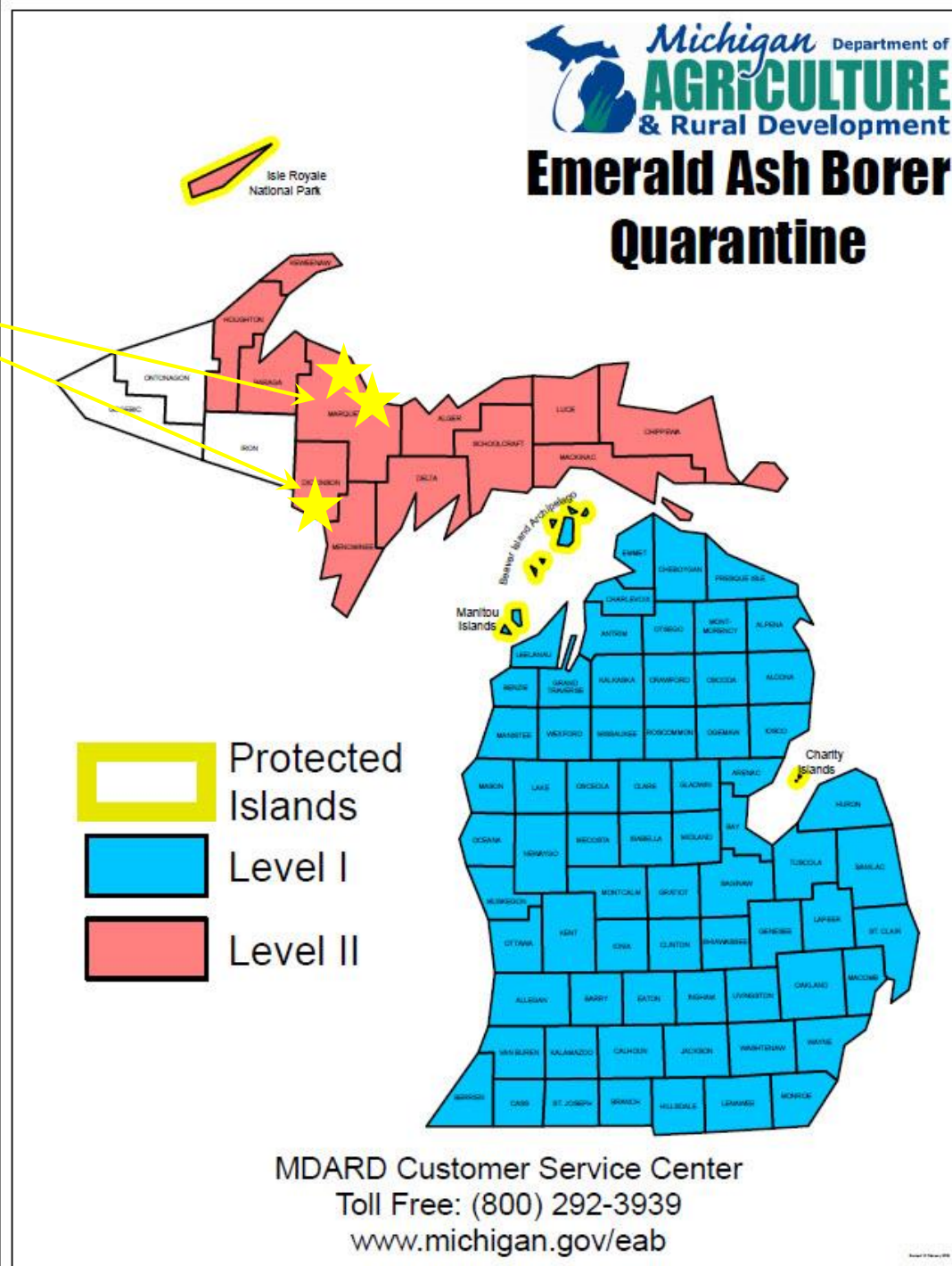


EAB: Inherent Problems

- Difficult to detect
- Effective Vector
..Firewood
- Ash decline
 - Ash yellows
 - Drought
 - Over stocking



2015 Detections



Compliance Agreements

- A regulated article being moved with a Compliance Agreement out of a Quarantine Level I or II area may only move to a facility with a Compliance Agreement for processing, utilization and/or disposal and can only move from October 1 through April 30.

Tree-ageTM (emamectin benzoate)



- Protect valuable landscape ash trees
- Purchased and applied only by trained, certified arborists and landscapers.
- Trunk injection at tree base.
- Systemic insecticide, more effective in healthy trees

-
- Bayer Advanced Tree & Shrub Insect Control
(Imidacloprid) (Also, dinotefuran products)
 - Apply around the base of ash in spring prior to leaf emergence (April)
 - 1 oz / inch circumference / healthy trees!

A close-up photograph of several bright yellow caterpillars with red spots and black dots, crawling on a green pine branch. The background is a blurred forest scene.

2015 Forest Health Highlights



Michigan Department of Natural Resources

Thank you



www.michigan.gov