

# Pests & Diseases Threatening Wisconsin's Urban Forests:

*How to Follow the Rules & Help Slow the Spread of Invasive Species*



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AND CONSUMER PROTECTION (WDATCP)

# DATCP's Plant Protection Section and Invasive Pests and Diseases: Overview

WDATCP's Plant Protection Section: Staff & Nursery Licensing Law

Major urban forest pests – Invasive, most introduced to WI / US

- Established in WI: GM, PSB, EAB
- Not found in WI: HWA, EHS, ALB, MPB, TCD, SOD
- Report Insects Not Found in Our State:  
WI Pest Hotline: (866) 440-7523  
[DATCPPestHotline@wi.gov](mailto:DATCPPestHotline@wi.gov)

# Inspection Territories

Ten staff cover nurseries, Christmas tree fields, sod farms, seed labelers, logs & firewood inspections

Ensure licensing, export & quarantine compliance

Nursery Website has Inspector Contact Information

<https://datcp.wi.gov>

(search nursery inspection)



[Timothy.Allen@wi.gov](mailto:Timothy.Allen@wi.gov) (715) 891 - 8158  
[Timothy.Boyle@wi.gov](mailto:Timothy.Boyle@wi.gov) (715) 819 - 6671  
[Shanon.Hankin@wi.gov](mailto:Shanon.Hankin@wi.gov) (608) 224 - 4576  
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[Marcia.Wensing@wi.gov](mailto:Marcia.Wensing@wi.gov) (262) 468 - 1309

# Nursery Licensing in Wisconsin

Nursery Dealers need a license if **perennial** plant, tree, shrub **sales** exceed \$250 / year (Wis. Stat. 94.10)

Landscapers and arborists are nursery dealers if they bill clients for perennial plantings

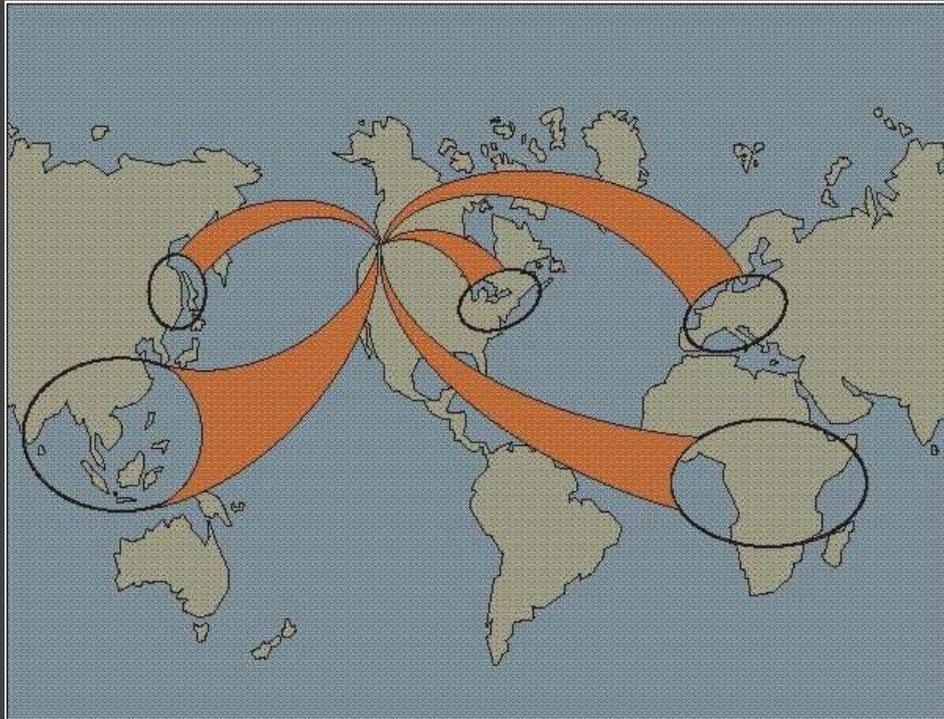
Dealer license fees start at \$30 / year and are based on annual **perennial** purchases

Licenses support inspections, lab services & pest management recommendations

Growers may apply for licenses and pay online: <https://mydatcp.wi.gov/>



# Invasive Species in the United States



Cost US > \$120 billion / year in losses, management, control<sup>1</sup>

Displace native species, destroy habitat, alter ecosystem processes

Over 360 tree and shrub insects, 20 pathogens<sup>2</sup>

<sup>1</sup> Pimentel, D., Zuniga R., Morrison, D. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics* 52(3):273-288 · February 2005

<sup>2</sup> Liebold, A.M., MacDonald, W.L., Bergdahl, D., Mastro, V.C., 1995. Invasion by exotic forest pests: a threat to forest ecosystems. *Forest Science* 41 (2), 1 - 49.

# Gypsy Moth, *Lymantria dispar* (Lepidoptera: Erebidae)



Native to Europe and North Africa, in WI since mid-1970's

Introduced by Leopold Trouvelot into Medford, MA in 1869

Larvae hatch and feed in May- July, molting 5-6x before pupating; adults emerge/mate in July; white flightless females lay egg masses

# Gypsy Moth Impacts



Gypsy moth feeds on over 300 trees and shrubs, prefers oak, willow, aspen, birch, basswood, tamarack and linden.

Gypsy moth has defoliated > 75 million acres nationwide since 1970

Each larvae can eat one square foot of foliage per day

Repeated defoliations (or single defoliations of conifers) can lead to mortality; decline, and increased susceptibility to insects and diseases

# Gypsy Moth Natural Enemies



Gypsy moth killed by *Entomophaga maimaiga* (fungi) hang head facing down; infected cadavers drop to the ground; acts at lower populations; aided by wet weather

Gypsy moth killed by NPV (virus) appear as an inverted 'V'; helps bring down outbreaks

Other natural enemies include egg & larval parasitoids, ground beetles, & mice

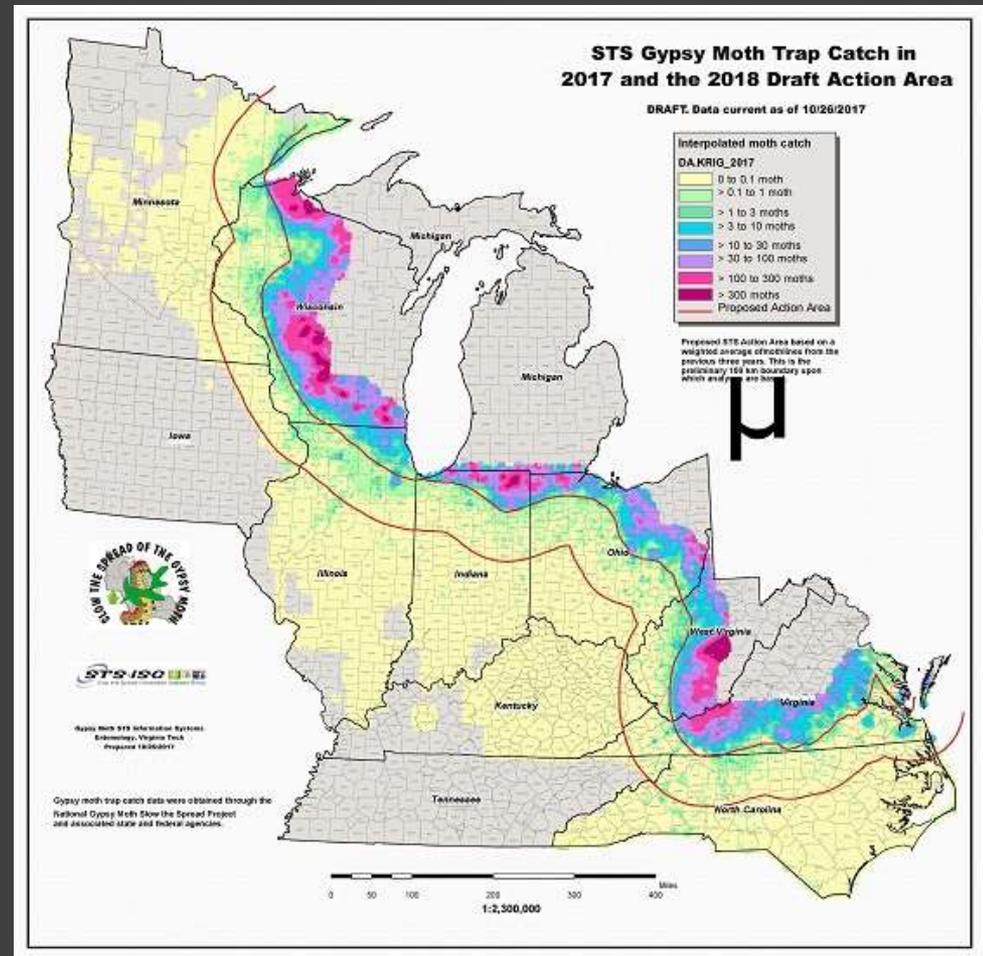
# Slow the Spread: an Effective, Multistate, Multiagency Program

Funded by Congress since 2000, STS is a region wide effort to reduce the rate at which gypsy moth spreads

It is a partnership among 11 states & the USDA Forest Service that involves trapping and treatments along the leading edge of gypsy moth populations

STS has reduced gypsy moth spread by over 70%, from 13 to 3 miles per year

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



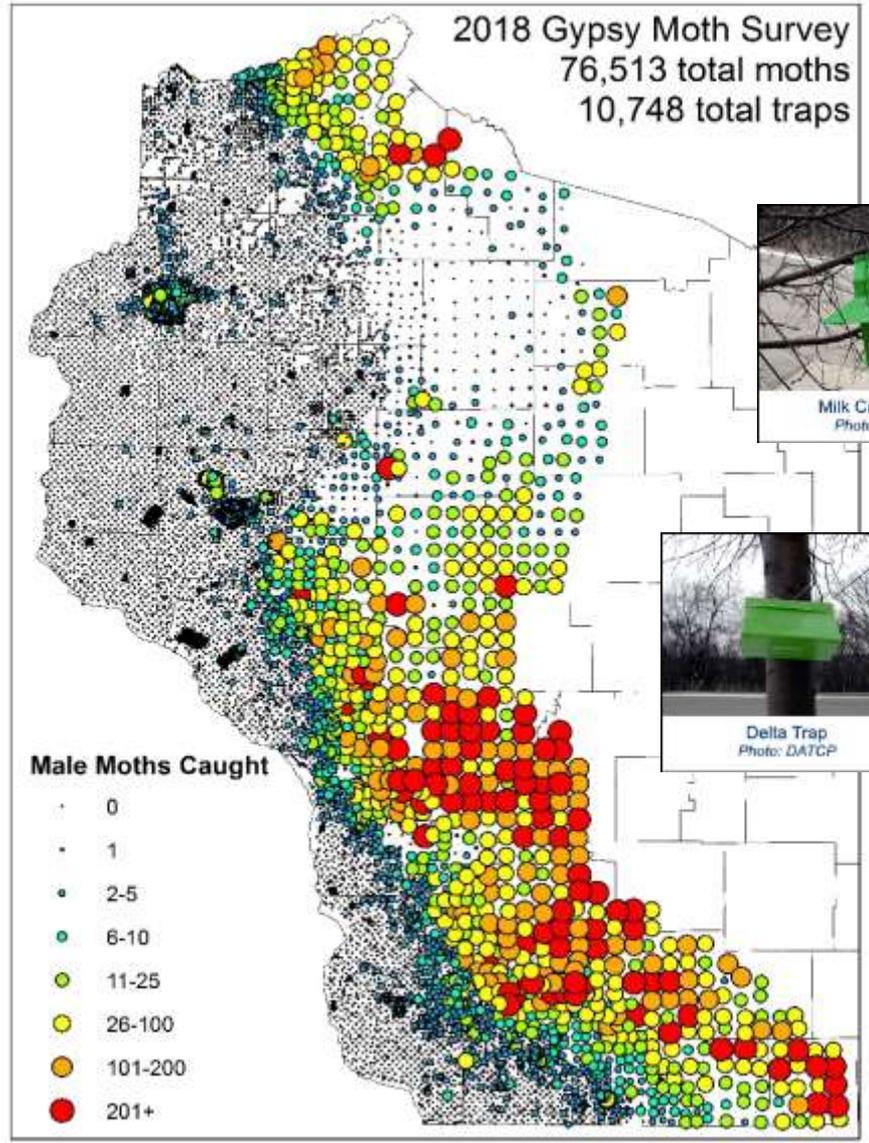
# 2018 Gypsy Moth Trap Catch

DATCP set 10,748 gypsy moth traps in western Wisconsin in 2018

76,513 male moths caught in 2018

Catch was 109,333 in 2017 (prolonged cold winter temperatures in NC WI)

Trapping informs slow-the-spread treatments, quarantines



# Treatments used in the Wisconsin STS Gypsy Moth Program



***Bacillus thuringiensis (var. kurstaki) (BT)***: Derived from naturally-occurring soil bacteria; applied as Foray 48B in May and June; destroys larval gut. Lepidoptera-specific; breaks down in UV light, rain.

**Mating Disruption (MD)**: Female gypsy moth pheromone applied in June - July as waxy droplets / SPLAT or flakes. It does not kill, but confuses adult male moths, who can't find and mate with flightless females.

# 2018 Gypsy Moth STS Treatments



STS Program treated 80,912 acres at 36 sites across 14 counties in Western WI in 2018

Btk (Foray 48B, 24 BIU) applied to 24,612 acres at 25 sites, May 22- June 5

Mating Disruption Pheromone (SPLAT) applied to 56,300 Acres at 11 Sites, June 28 – July 11 (cyan areas on map)

# Pine Shoot Beetle



Pine Shoot Beetle, or *Tomicus piniperda* (L.) is a bark beetle native to Europe, Africa, and N Asia

Causes pine dieback, yellowing, and dead, bored-out shoots

Since its discovery in OH in 1992, it has been found in 20 states, including WI



PSB Detected in Christmas tree fields in Dane, Jefferson, Milwaukee, Ozaukee, Sheboygan, Taylor, Walworth and Waukesha counties in 2017; PSB detected in Ozaukee Co (1 field) in 2018

# Emerald Ash Borer



Emerald Ash Borer, *Agrilus planipennis* (Coleoptera: Buprestidae) or EAB, is native to NE China, Taiwan, Korea, Mongolia, Japan, and the Russian Far East,

Introduced from Asia on Solid Wood Packing Material, detected in MI in 2002

Detected in 35 states, DC, & Ontario, Manitoba, New Brunswick, Quebec, Canada.

Causes 100% ash mortality by feeding on inner bark, girdling trees, which often die within 4 years

Four host-specific EAB biological control agents: *Spathius agrili*, *Tetrastichus planipennisi*, *Oobius agrili*, *Spathius galinae*

High value ash trees can be protected with insecticide (i.e., emamectin benzoate)



# Hemlock Woolly Adelgid (HWA), *Adelges tsugae*



HWA is an invasive, introduced aphid-like insect (Order Hemiptera) from Asia that sucks fluid from bases of needles

HWA has killed hemlock across 20 eastern states since its introduction in 1951



HWA is not found in WI

HWA only occurs on hemlock trees in the US; it often co-occurs with Elongate Hemlock Scale, or EHS

# Hemlock Woolly Adelgid - Life Stages



Adult females



Settled Nymphs

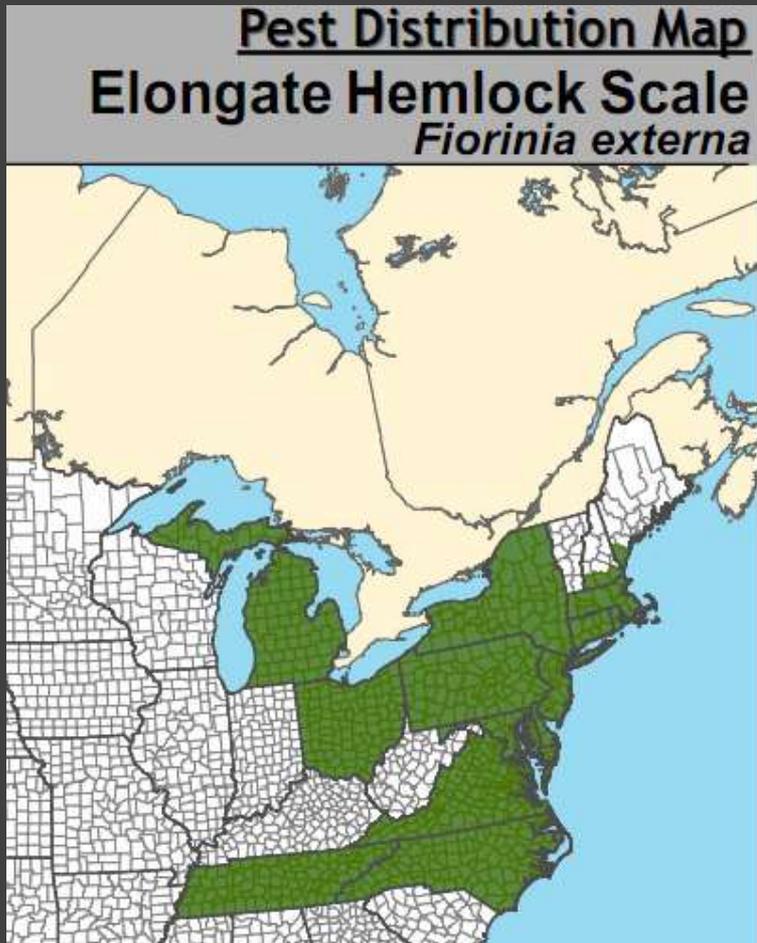


Eggs



Crawler nymphs

# Elongate Hemlock Scale, *Fiorinia externa*



Native to Asia, EHS is an armored scale insect introduced into at least 16 states since its discovery in NY in 1908

EHS is cold-tolerant; sucks fluid from undersides of hemlock, fir, spruce needles (up to 43 conifer species)

Hard to control with pesticides, as scales are protected under waxy coverings, crawlers emerge throughout season (systemics don't work)

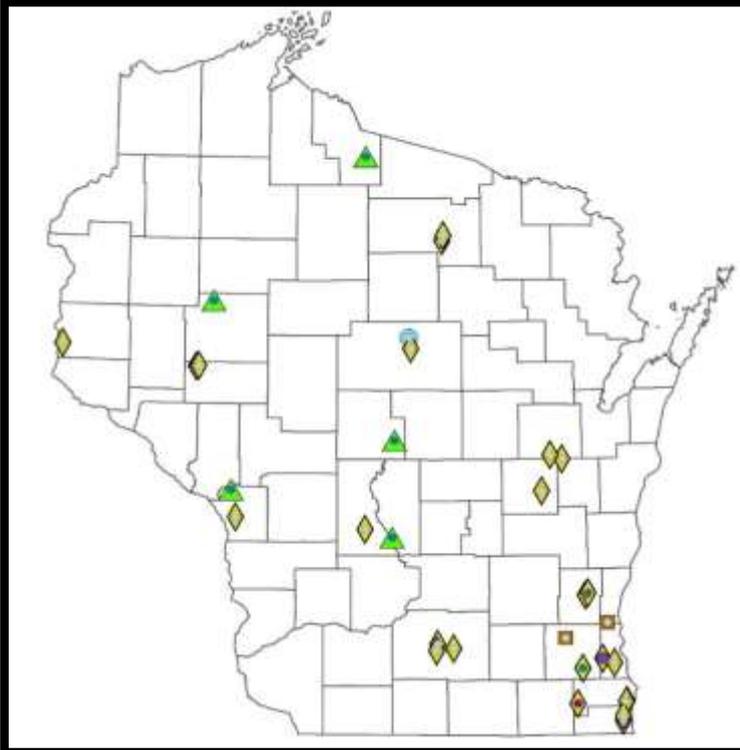
EHS leads to conifer decline and needle loss, yellowing

# Elongate Hemlock Scale Life Cycle



- Females are immobile and lay up to 20 yellow eggs, overwinter, & have brown scale coverings
- Crawlers settle on undersides of needles to feed and mature, prefer new growth
- Male nymphs have white coverings and develop wings; Adult Males do not feed; leave scale covering to mate
- Mobile crawlers emerge throughout year; can create new infestations

# Elongate Hemlock Scale: 2014-18 Detections



## Year Detected

- 2014
- 2015
- 2016
- 2017
- 2018

## Type of Inspection

- HWA quarantine violation
- Nursery Inspection
- Wreathmaker
- Xmas Lot

EHS has never been detected on the landscape in Wisconsin

DATCP has detected EHS 33 times during inspections in 19 Wisconsin counties from 2014-18

Nursery and HWA quarantine detections on hemlock trees – treated or destroyed

Xmas Tree lot detections on cut Fraser and balsam fir trees, wreaths, and other décor – material removed from sale, burned, thrown in trash

Lab samples taken from infested material verified the presence of live crawlers

# Elongate Hemlock Scale, *Fiorinia externa*



- EHS is not currently a quarantine pest
- DATCP's pest abatement authority (Wis. Stat. 94.02), prohibiting injurious pests on plant material, required removal from sale and destruction of infested material to protect the green industry and native hemlocks from EHS
- DATCP communicated with growers, retailers, and departments of agriculture in other states on EHS, prior to 2018 detections

# Asian Longhorned Beetle, *Anaplophora glabripennis* (Coleoptera: Cerambycidae)

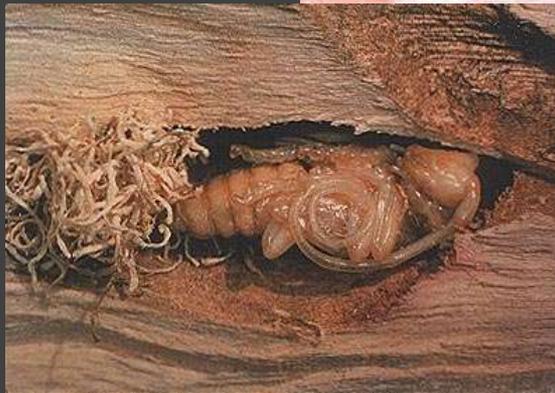


E. Richard Hoebeke, Cornell University, Bugwood.org

- 1½-inch long shiny black and white adults with long antenna
- Native to Asia, not found in Wisconsin, first found in North America in NY in 1996
- ALB larvae bore into sapwood and heartwood, and leave perfectly round pencil-sized exit holes in trees
- Trees can die from ALB in 10-15 years

# Life cycle of ALB

Adults emerge through round holes in late spring/summer to feed and mate. Female lays 35-90 eggs in shallow pits (soon heal shut).



Round-headed borer larvae emerge in 10-15 days. Early stages feed on cambium. Later stages feed on and overwinter in sapwood and heartwood.

Pupate for 2 –3 weeks. ALB has one generation per year.

# ALB has many susceptible tree hosts – could devastate forests



Most susceptible: Maples (silver, sugar, Norway, boxelder)



Moderately susceptible:  
Elm, Horsechestnut, Birch, Willow, Poplar,  
Ash



“Resistant” trees: Cherry, Apple, Oak, Basswood

# Identifying Characteristics of ALB



Adults  $\frac{3}{4}$  -  $1\frac{1}{2}$  " long, black and white banded antenna  $1\frac{1}{2}$  -  $2\frac{1}{2}$  X as long as body.

Females larger than males with shorter antenna.

Bluish legs

Mottled "starry sky" elytra, black scutellum

Look for sawdust, round, drill-like adult emergence holes,  $\frac{3}{8}$  -  $\frac{5}{8}$  inches in diameter



Native Pine Sawyers resemble ALB, but do NOT have bluish legs, less shiny

# Signs and Symptoms of ALB

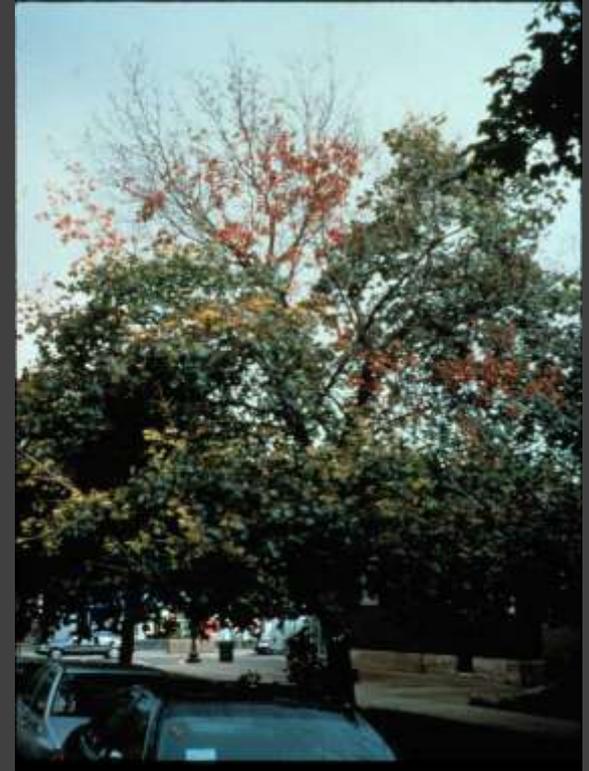


Accumulation of sawdust (larval frass) in branch crotches

Oval egg pits



Round, drill-like adult emergence holes, 3/8 - 5/8 inches in diameter



Branch flagging often starts in upper crown

# Management of ALB



Susceptible trees examined for symptoms and signs of ALB

- If detected, remove infested and nearby susceptible trees within quarantine zone
- Trees outside eradication zone often treated with imidacloprid
- Replant with trees resistant to ALB

# Mountain Pine Beetle

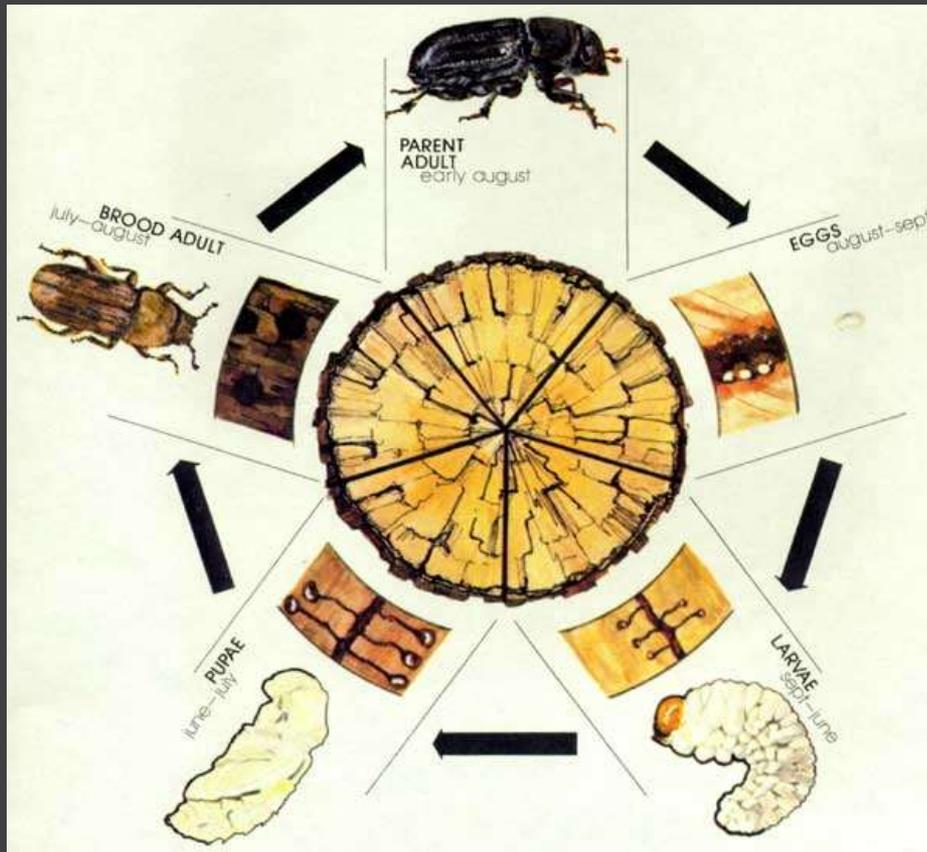


Photo: barkbeetles.org

Mountain Pine Beetle (MPB), *Dendroctonus ponderosae*, is a bark beetle (Coleoptera: Scolytinae) native to western North America

Uses massive attack and pathogenic fungi to overcome tree defenses during outbreaks (every 10-30 years)

Mature pines susceptible (lodgepole, whitebark, jack, red, white)

# Mountain Pine Beetle



Jerald E. Dewey, USDA Forest Service, Bugwood.org

The mountain pine beetle, *Dendroctonus ponderosae* is the most destructive pest of mature pines in North America

The most recent, outbreak of MPB spans more than 88 million acres of pine forests in CO, WY, ID, MT, SD, British Columbia and Alberta.

# Thousand Cankers Disease



- Native to the western United States
- Primarily affects black walnut, *Juglans nigra*
- TCD = (*Geosmithia morbida*) and the walnut twig beetle (*Pityophthorus juglandis*) or other beetle vectors

# Sudden Oak Death (SOD)

## *Phytophthora ramorum*



*Phytophthora ramorum*, an oomycete fungus, causes Sudden Oak Death (SOD), resulting in oak mortality in CA and OR. It also causes leaf blight in over 100 species of plants representing 70 genera

Described in Europe in 2001. Now known in 6 European countries, CA and OR, and British Columbia, Canada

Bark canker and foliar lesions initially. Oak crown dies in 2-4 weeks



# What Can You to Protect Urban Forests from Introduced , Invasive Species?



**Learn to ID invasive insects: Report pests not known to be in Wisconsin to the Pest Hotline: (866) 440-7523**

**Wash vehicles and equipment before traveling to a new city or county**

**Maximize tree species diversity in forests and urban forest plantings**

**Follow plant regulations – Tim will describe those rules now...**

# DATCP's Forest Pests and Disease Regulations: Overview

Forest pest quarantines: Slows artificial spread; excludes pests

State and Federal (APHIS) Quarantines: GM, EAB, PSB, ALB, SOD

State Quarantined Only: HWA, TCD, MPB

Vectors of invasive pests and Diseases: firewood, nursery stock, logs, pulpwood, decorative products

Firewood: Use Local or Certified: [www.dontmovefirewood.org](http://www.dontmovefirewood.org)

How to know the Rules? <https://nationalplantboard.org/laws-and-regulations/>

APHIS PPQ (crucial for interstate shipping or for arborists who work across state lines): <https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases>

# Quarantines

What is a quarantine?

- A law that describes a geographic area which contains material presumed to be infested with a damaging pest or disease

Quarantine regulations limit the legal movement of certain materials from the quarantine. Quarantines can be established by individual states or by the federal government and can be external or internal.

External quarantines seek to prevent introduction of a pest.

Internal quarantines seek to prevent the spread of a pest.

# Federal Domestic Quarantines under 7 Code of Federal Regulations 301

Gypsy Moth (7 CFR 301.45-2a)

Pine Shoot Beetle (7 CFR 301.45-3)

Emerald Ash Borer (7 CFR 301.53-3)

Asian Longhorn Beetle (7 CFR 301.51-3)

*Phytophthora ramorum* / SOD (7 CFR 301.92-3)

# Quarantines governed by Wisconsin Admin. code ATCP 21

21.10 Gypsy Moth

21.12 Pine Shoot Beetle

21.16 Hemlock Woolly Adelgid

21.17 Emerald Ash Borer

21.18 Asian Longhorn Beetle

21.19 *Phytophthora ramorum* (Sudden Oak Death)

21.21 Thousand Cankers Disease

21.22 Mountain Pine Beetle

# Compliance Agreements – What are they and who needs one?

## What is a compliance agreement?

A limited exemption from certain quarantine regulations if particular conditions are met.

## Who needs a compliance agreement?

Any company moving regulated material out of a quarantine.

Any company with facilities located outside a quarantine that receive material from a quarantine area.

# Gypsy Moth Quarantine

Businesses that move forest products or nursery stock out of a quarantined area (or out of state) are required to have a Compliance Agreement

DATCP staff can train your staff in gypsy moth ID, upon request

USDA APHIS issued 123 (interstate) GM CAs in 2018

50 of Wisconsin's 72 counties are quarantined for gypsy moth. Most recent Taylor (2015), Iowa (2014).

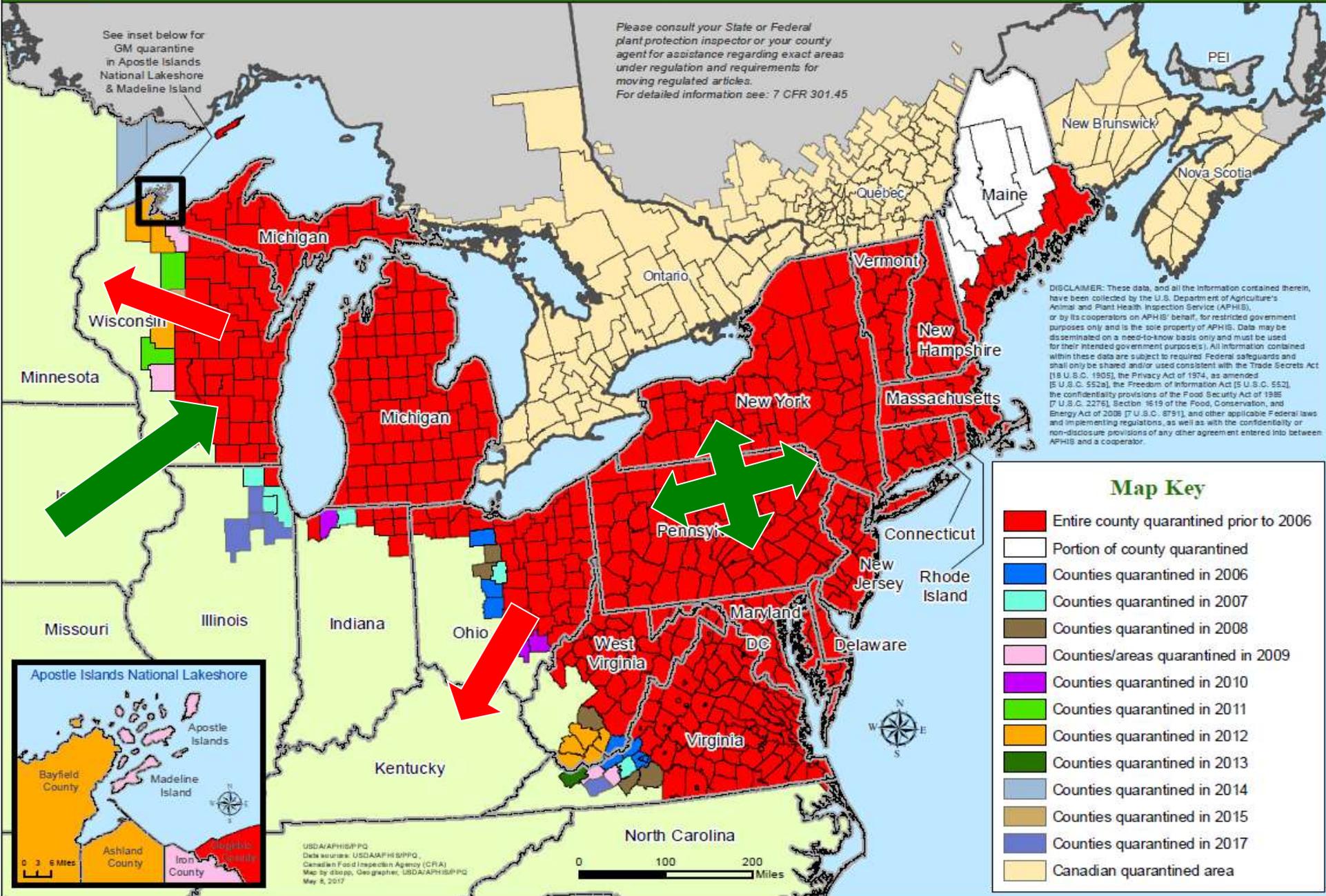


# European Gypsy Moth (*Lymantria dispar*) North America quarantine

See inset below for GM quarantine in Apostle Islands National Lakeshore & Madeline Island

Please consult your State or Federal plant protection inspector or your county agent for assistance regarding exact areas under regulation and requirements for moving regulated articles. For detailed information see: 7 CFR 301.45

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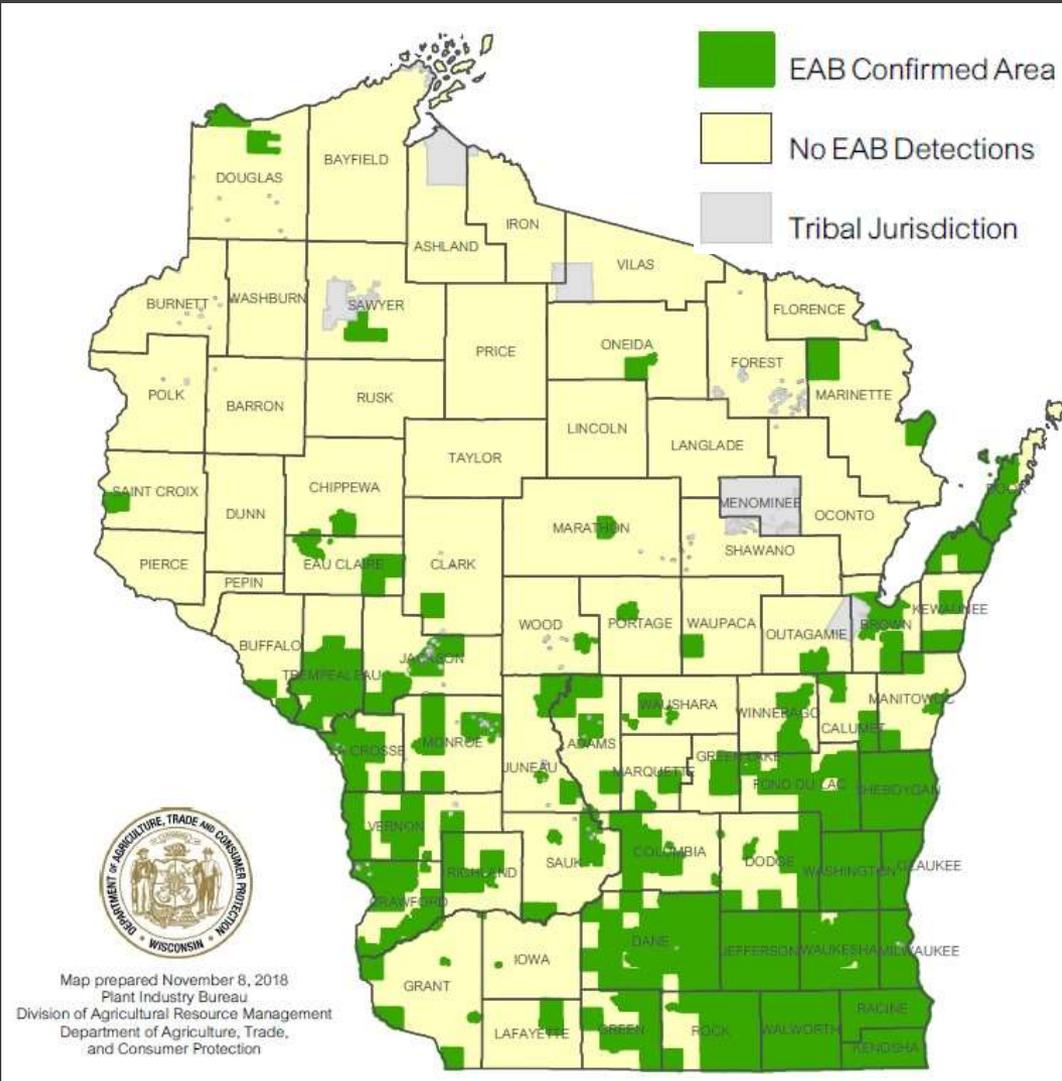
### Map Key

- Entire county quarantined prior to 2006
- Portion of county quarantined
- Counties quarantined in 2006
- Counties quarantined in 2007
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- Counties quarantined in 2013
- Counties quarantined in 2014
- Counties quarantined in 2015
- Counties quarantined in 2017
- Canadian quarantined area





# Emerald Ash Borer in Wisconsin



Statewide EAB quarantine enacted 03/30/2018, and Wisconsin was added to federal quarantine on 07/26/2018 to avoid isolating mills from ash, transportation routes

Tribal lands regulated independently

This EAB distribution map (which will continue to be updated) is at: <http://emeraldashborer.wi.gov>

# Emerald Ash Borer Federal Quarantine & Proposed deregulation



In 2018, USDA set up 26 Compliance Agreements with businesses needing to ship regulated articles outside quarantine area, requiring wood processing between Oct 1- Apr 30, kiln sterilize, heat treat, or remove bark and 1/2" cambium)

APHIS has proposed deregulating EAB, in order to focus limited resources on managing this rapidly spreading pest (i.e., expanding biocontrol)



# Asian Longhorned Beetle



ALB state exterior quarantine ATCP 21.18, APHIS federal quarantine: 7 CFR 301.51-3

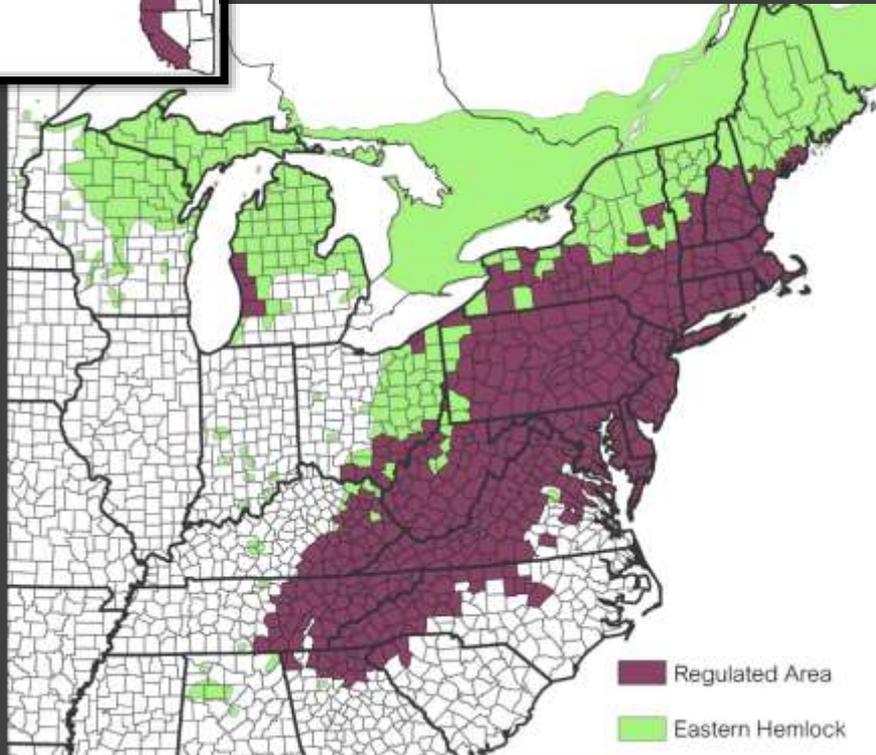
Regulated articles include non-coniferous firewood, nursery stock, logs, green lumber, stumps, roots and branches from maple, birch, elm, ash, poplar and other hosts.

Regulatory Success: ALB quarantines lifted in IL and NJ; MA, NY, and OH eradications underway





# Hemlock Woolly Adelgid



DATCP's exterior quarantine, ATCP 21.16, restricts hemlock nursery stock from infested areas (in purple). Hemlock range shown in green. Also, no import of logs, bark, and firewood from infested/regulated areas without treatment

DATCP inspects nursery stock for HWA. Nurseries importing hemlock from infested area must have state phyto or CA certifying inspection / treatment.

# Mountain Pine Beetle



## THE BEETLE AND ITS HOSTS

- Mountain pine beetle occurrence
- Lodgepole pine range
- Jack pine range
- Other pine species

0 mi 200  
0 km 200



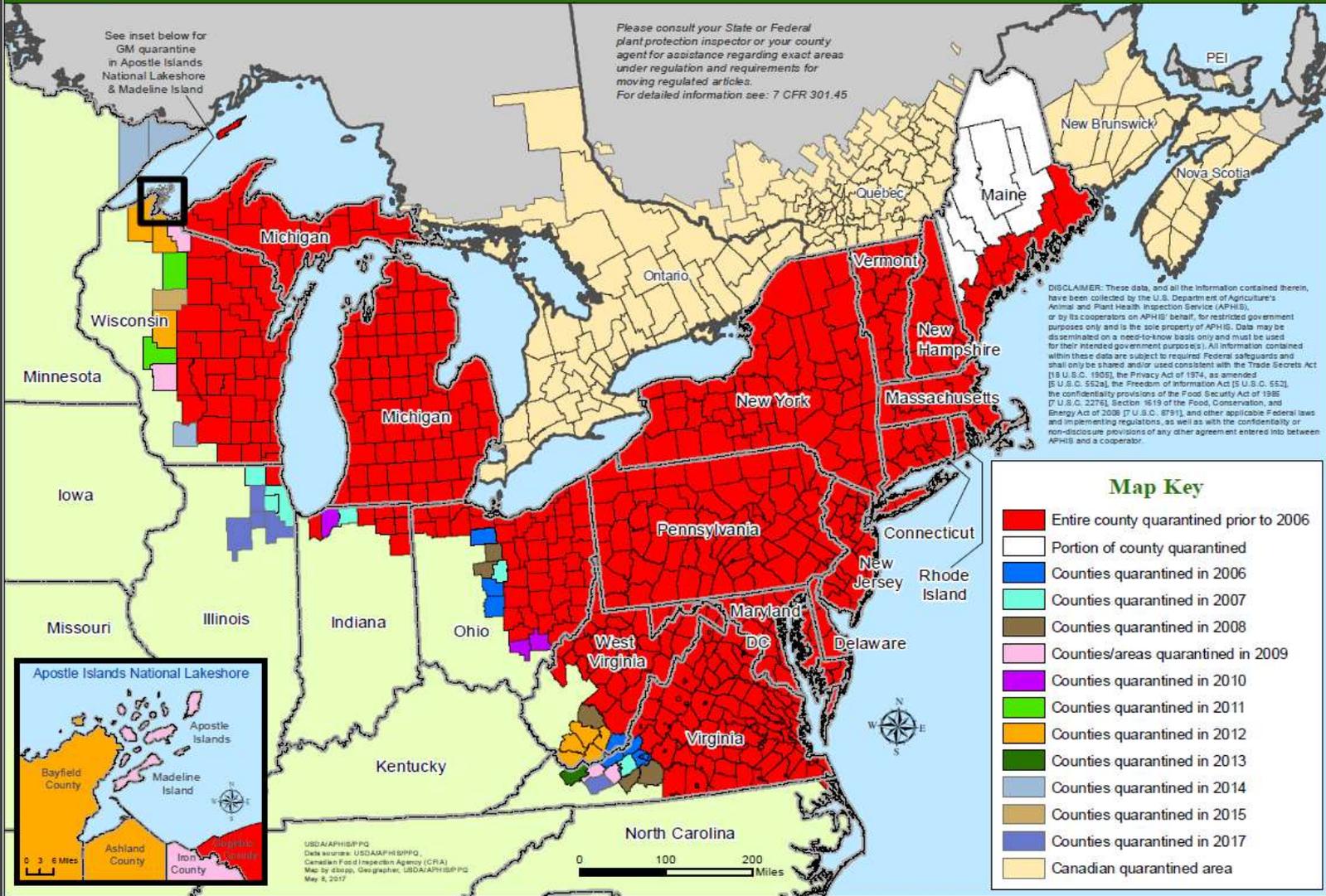
Mountain Pine Beetle Exterior Quarantine, ATCP 21.22 finalized in May 2017

ATCP 21.22 prohibits importation of mountain pine beetle (except for research); firewood; pine logs, stumps, branches or lumber with bark from infested area (W. US and Canada)

Exemptions: KD lumber, furniture, Xmas trees, nursery stock, and mulch/chips



# European Gypsy Moth (*Lymantria dispar*) North America quarantine



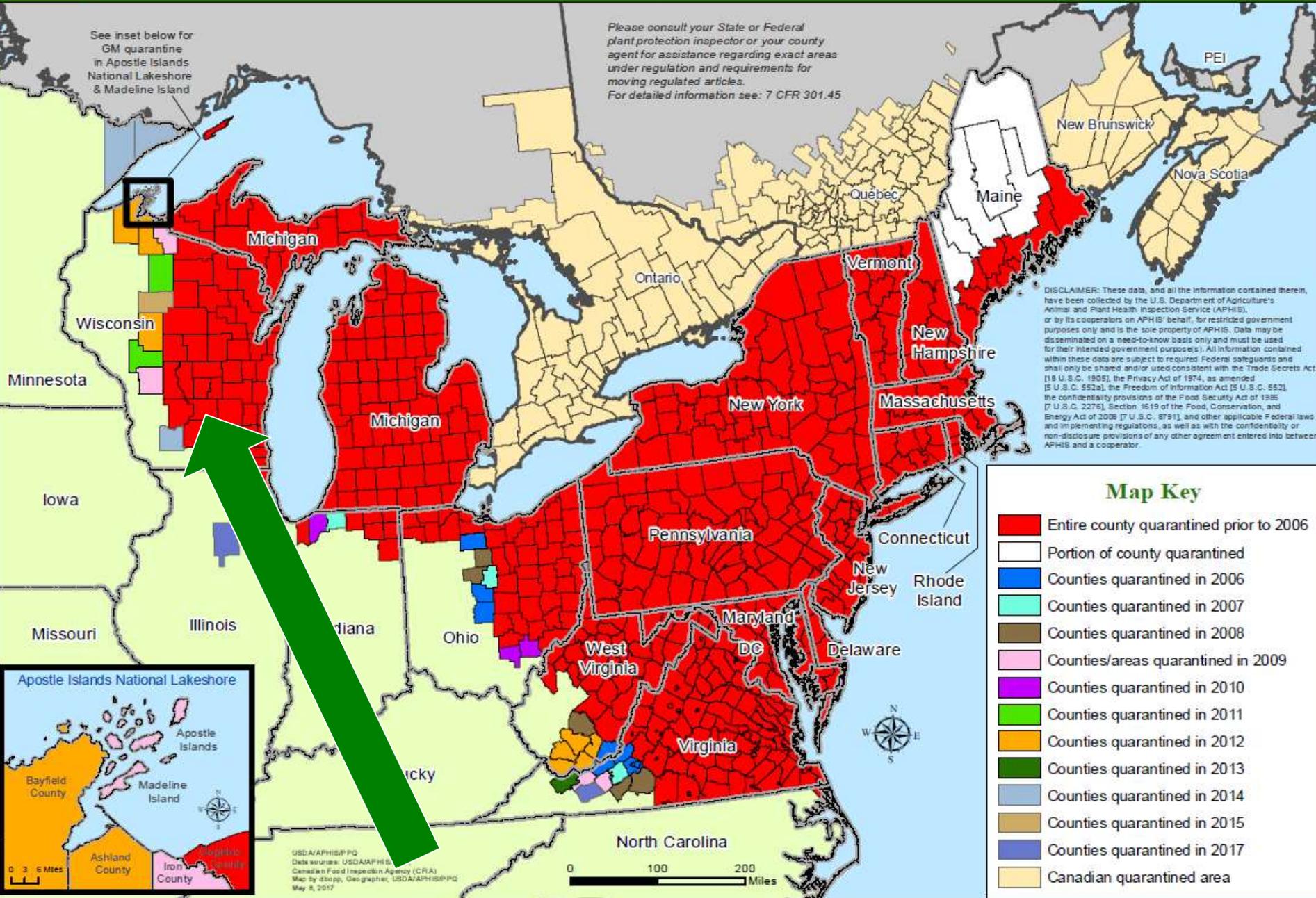
POP quiz – can you legally bring firewood from TN?

# European Gypsy Moth (*Lymantria dispar*) North America quarantine

See inset below for GM quarantine in Apostle Islands National Lakeshore & Madeline Island

Please consult your State or Federal plant protection inspector or your county agent for assistance regarding exact areas under regulation and requirements for moving regulated articles. For detailed information see: 7 CFR 301.45

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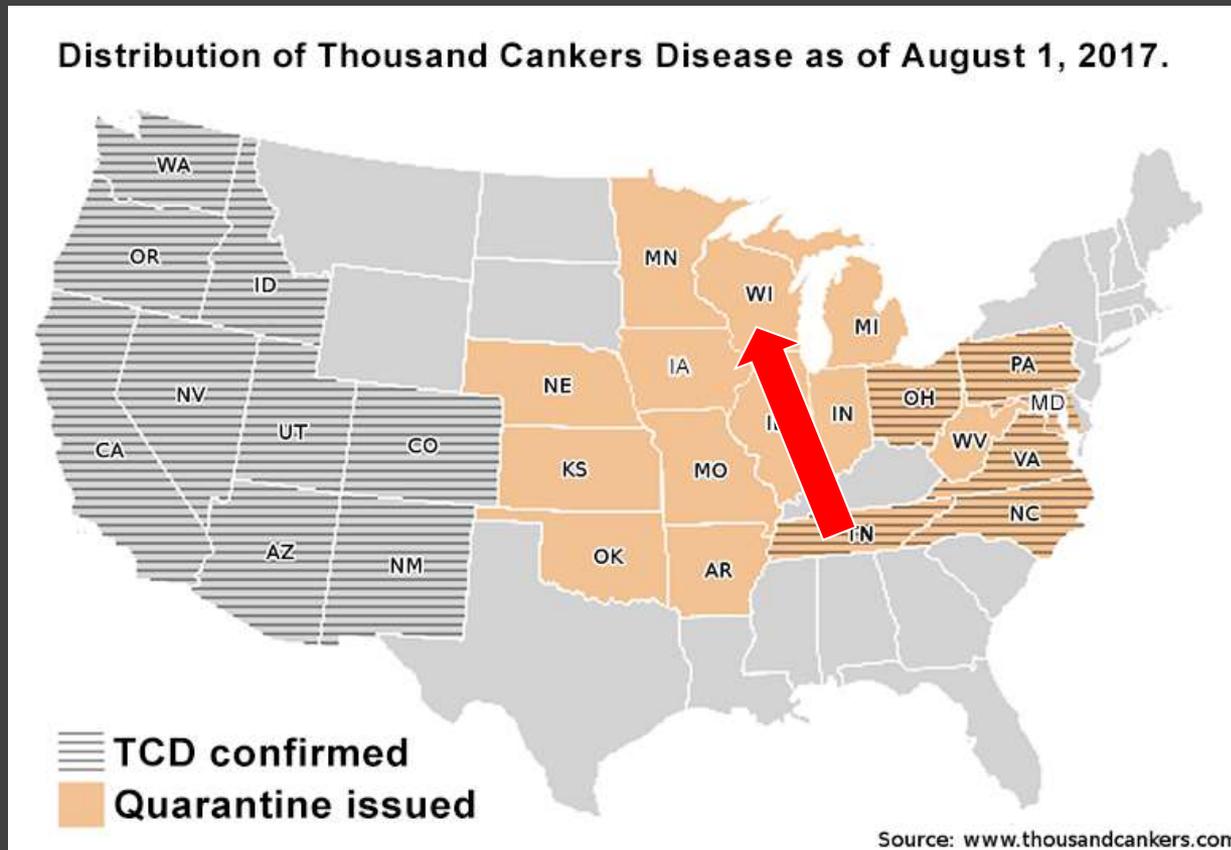


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- Canadian quarantined area



# Thousand Cankers Disease ATCP 21.21



No firewood permitted into Wisconsin from TCD states without treatment, documentation, and pre-notification.



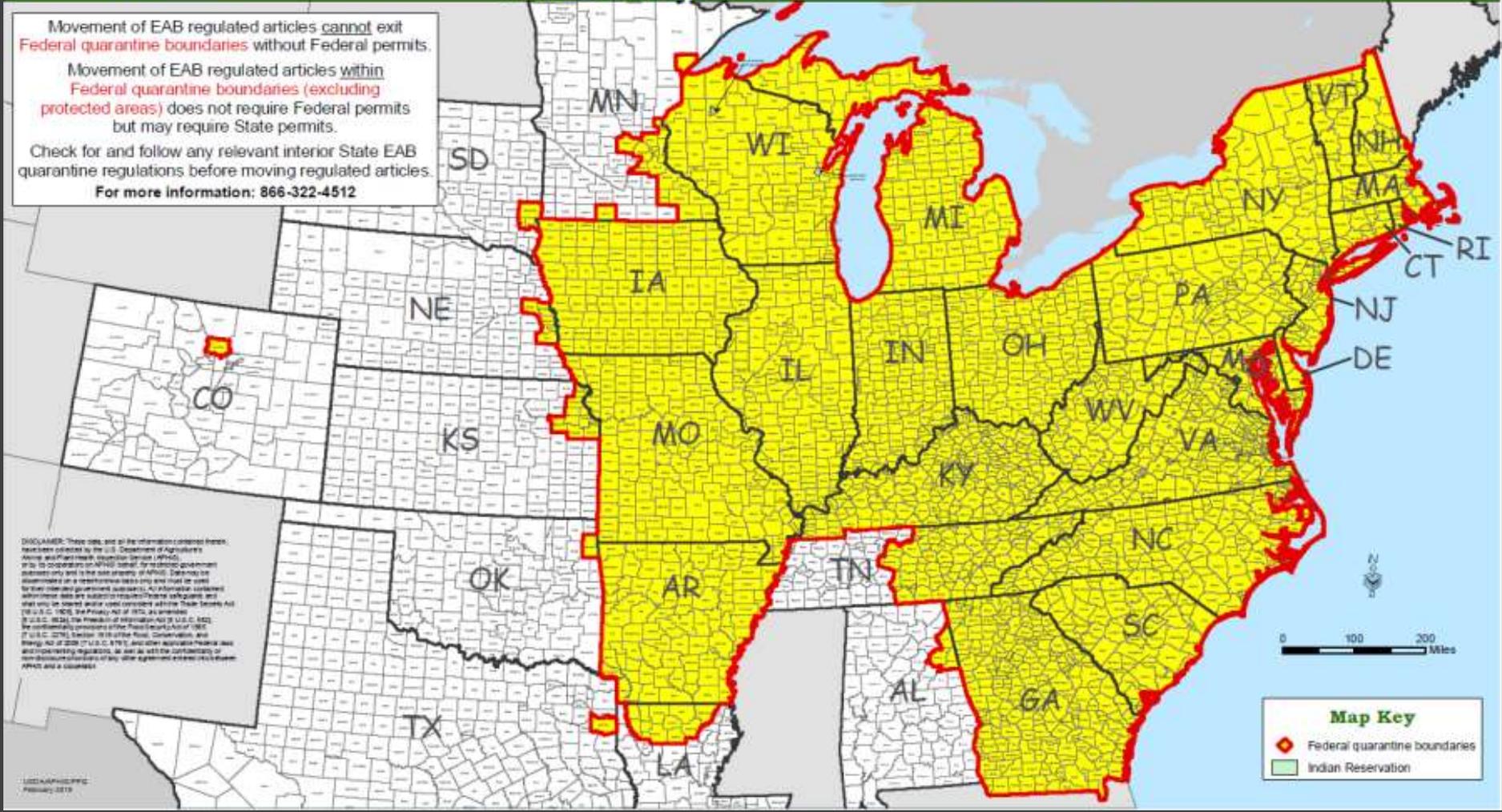
# Cooperative Emerald Ash Borer Project

Movement of EAB regulated articles cannot exit Federal quarantine boundaries without Federal permits.

Movement of EAB regulated articles within Federal quarantine boundaries (excluding protected areas) does not require Federal permits but may require State permits.

Check for and follow any relevant interior State EAB quarantine regulations before moving regulated articles.

For more information: 866-322-4512



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USDAPHIS/PHQ  
February 2019

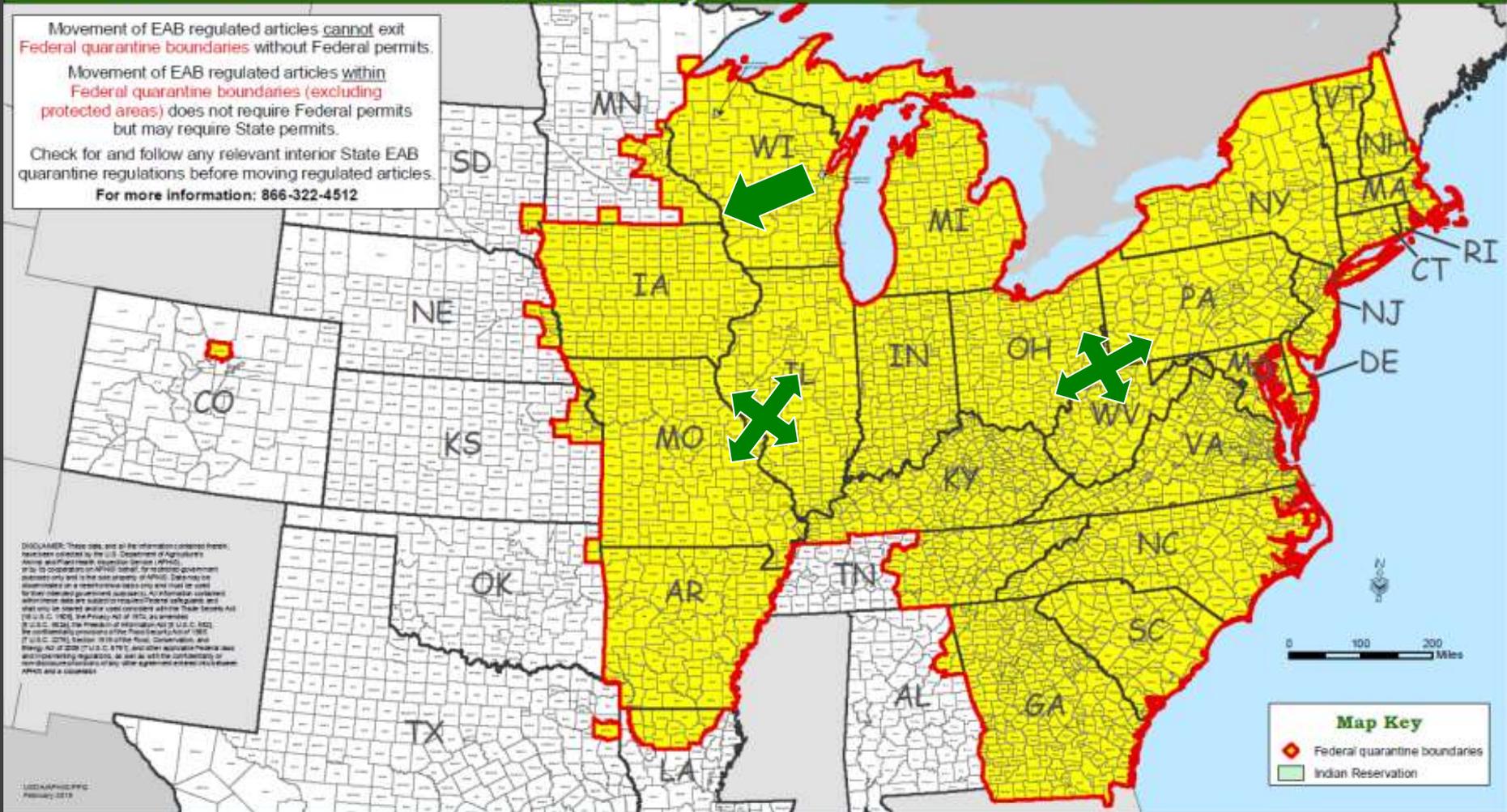
Can you legally move ash street trees from Green Bay to an urban wood sawmill in La Crosse without a compliance agreement?

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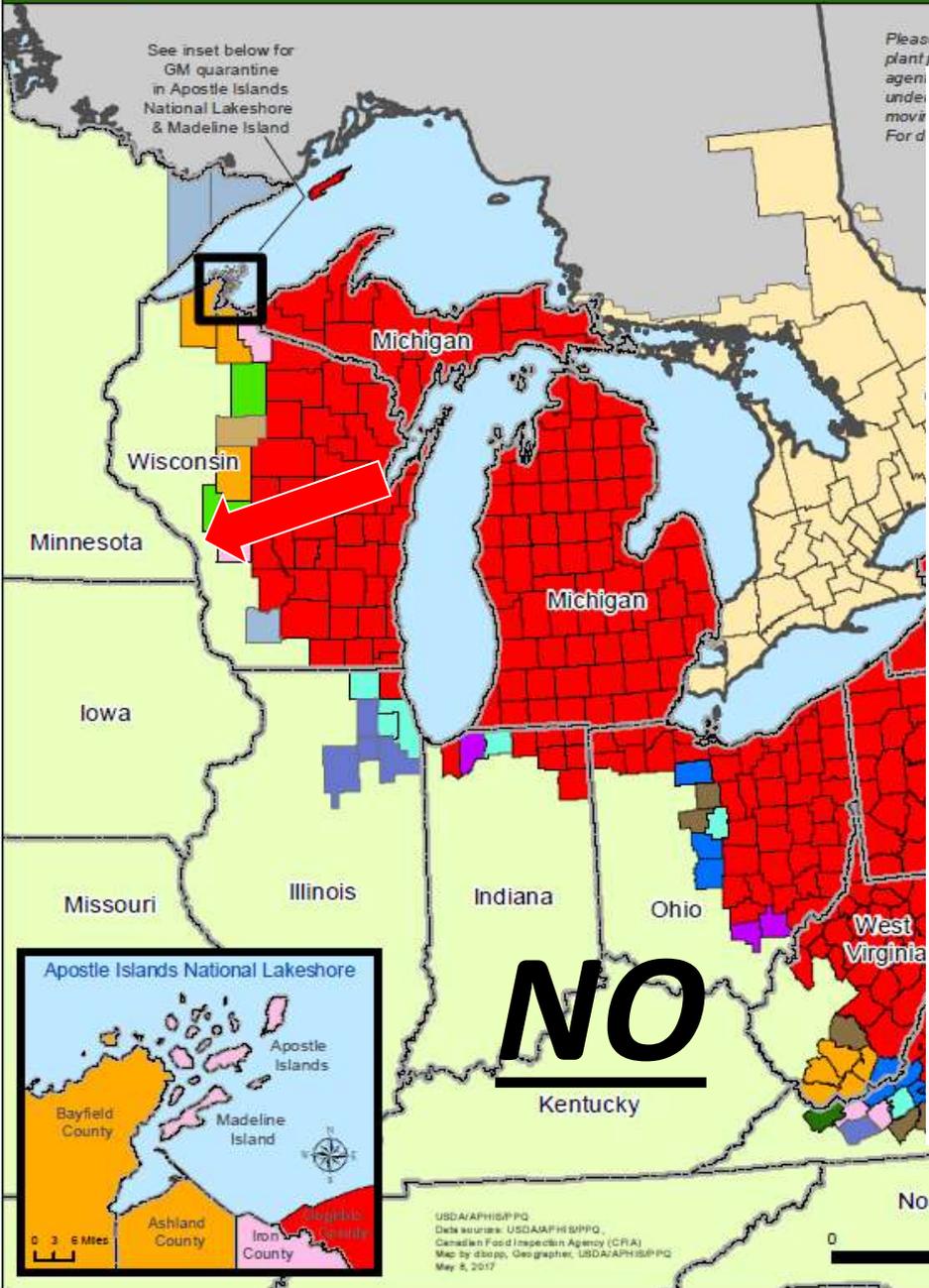
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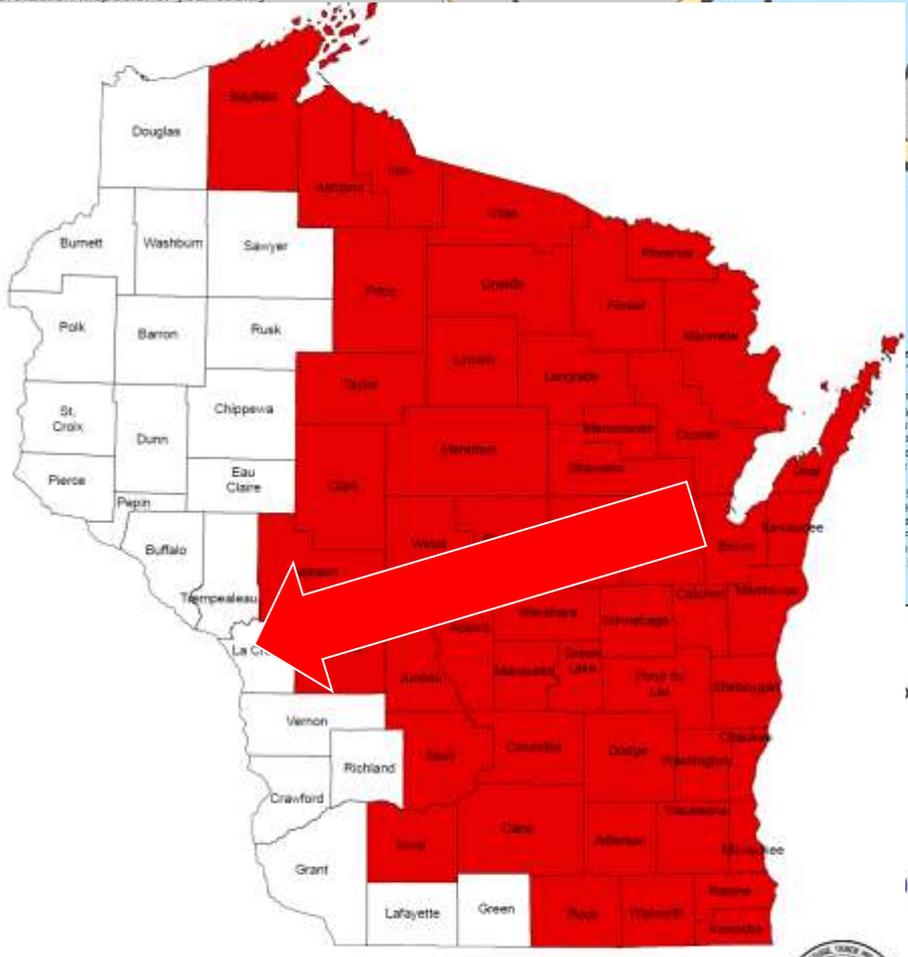


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# European Gypsy Moth (*Lymantria dispar*) North America quarantine



Please consult your State or Federal plant protection inspector or your county agent under moving for d



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# Certified / Local Firewood: Slowing the Spread of pests and disease

WDATCP's Certified Firewood Dealer program\* for those that:

Season firewood for a full 24 months (~10 dealers)

Heat treat to 140 degrees for 60 minutes (~20 dealers)

USDA also certifies at this rate

Certification program is not pest-specific so it will likely continue as quarantines come and go

*Non-certified firewood is subject to various external and gypsy moth quarantine rules and must be from within 10 miles for state lands and 25 miles for federal lands*

\*ATCP 21.22



# Thanks! Questions?



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