Managing emerald ash borer when it gets to a western state: The Colorado Experience

Idaho Hort Expo –

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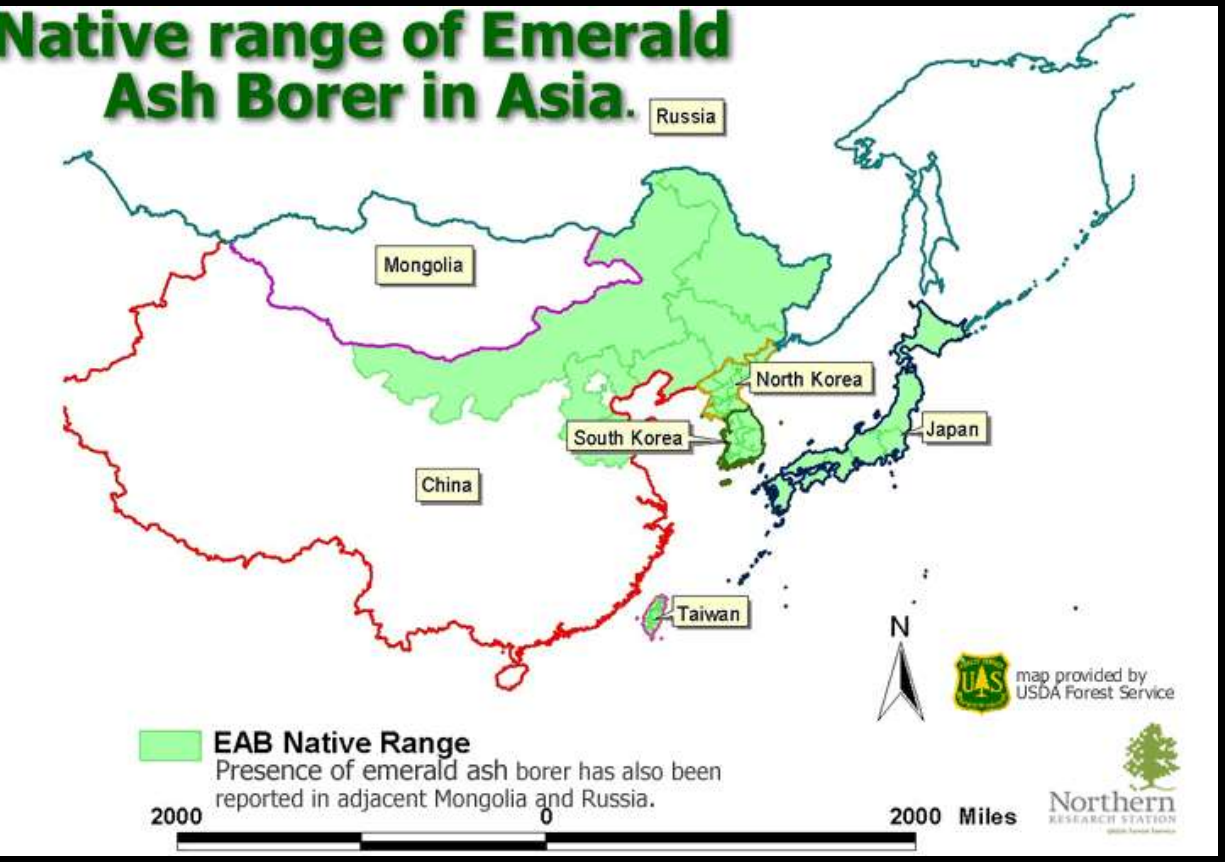
This presentation will be posted at the Insect Information Web Site

- Housed at Department of Bioagricultural Sciences and Pest Management
  - Search BSPM CSU
- Click on Outreach
- Insect Information
  - Extension presentations for 2019 posted at bottom of page

Emerald ash borer (EAB) is a green-colored beetle…….

…that develops in ash trees (*Fraxinus* species)…

……and is Native to Asia



Larvae tunnel under the bark girdling the cambium.

Photo by Edward Czerwinski

Effects of larval tunneling are cumulative, and ultimately lethal to the tree. Most trees are dead within 5 years after the initial colonization.

Photograph by Art Wagner

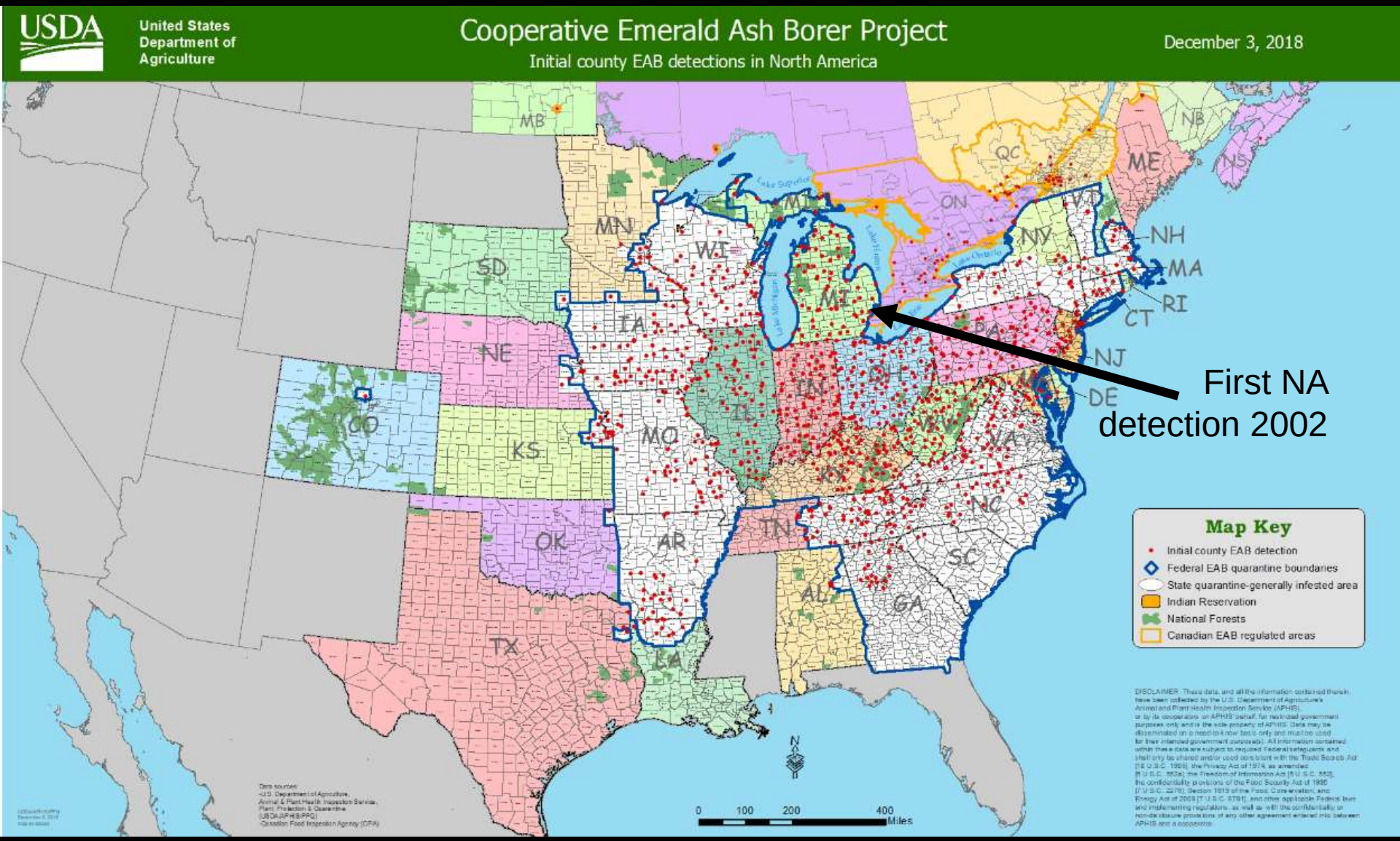
Photograph by MI Department of Agriculture

How will plant condition affect rate of EAB injury?

More stressed trees will very likely be more readily colonized and die more rapidly than healthier trees.

Photograph by MI Department of Agriculture

Emerald ash borer was accidentally introduced into and has since spread through North America



Lilac/Ash Borer does not equal Emerald Ash Borer!

Lilac/ash borer, a clearwing borer moth

Emerald ash borer, a metallic wood borer/ flatheaded borer

Photograph by Debbie Miller

Emerald ash borer

Agrilus plannipennis

Photograph by David Cappaert

Order Coleoptera (beetles)

Family Buprestidae (metallic wood borers, flatheaded borers

Lilac/Ash Borer

Podosesia syringae

Order: Lepidoptera (Moths and butterflies)
Family: Sesiidae (Clearwing borers)

Emerald ash borer larvae create meandering tunnels in the cambium that produce girdling wounds.

Note: **Attacks can occur throughout the crown and on the trunk of the tree.**

Photograph by Eric Day

Photograph by
David Cappaert

Lilac/ash borer larvae create irregular gouging wounds that extend often into the heartwood.

Attacks are concentrated at the lower trunk of the tree

EAB adults chew through the bark, producing D-shaped exit holes

Lilac/ash borer emerges from *irregularly round holes*. The pupal skin is pulled out when the adult emerges.

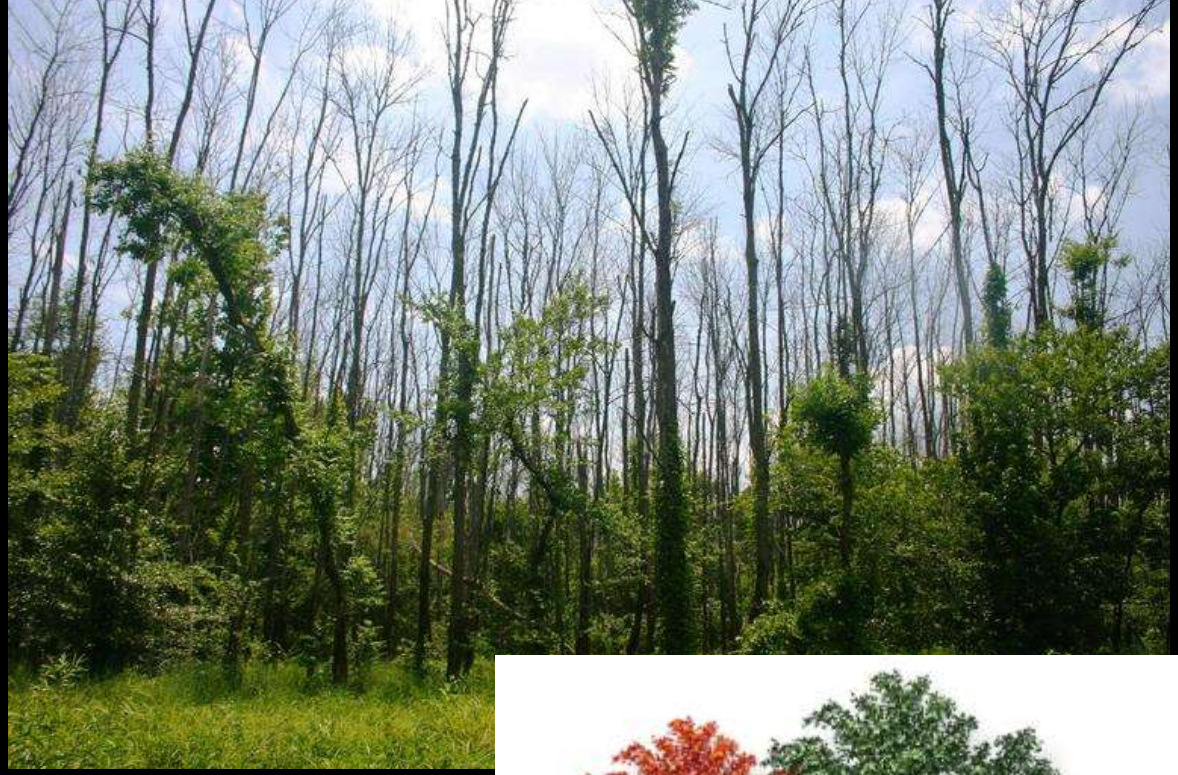
Damage potential to its host

10 – EAB now defines an aggressive tree killing insect in North America.

Damage potential to its host

2, maybe 3 – Lilac/ash borer has far lower ability to seriously damage its host

Emerald ash borer ***is devastating to all species of ash that are native to North America***



Green ash

White ash

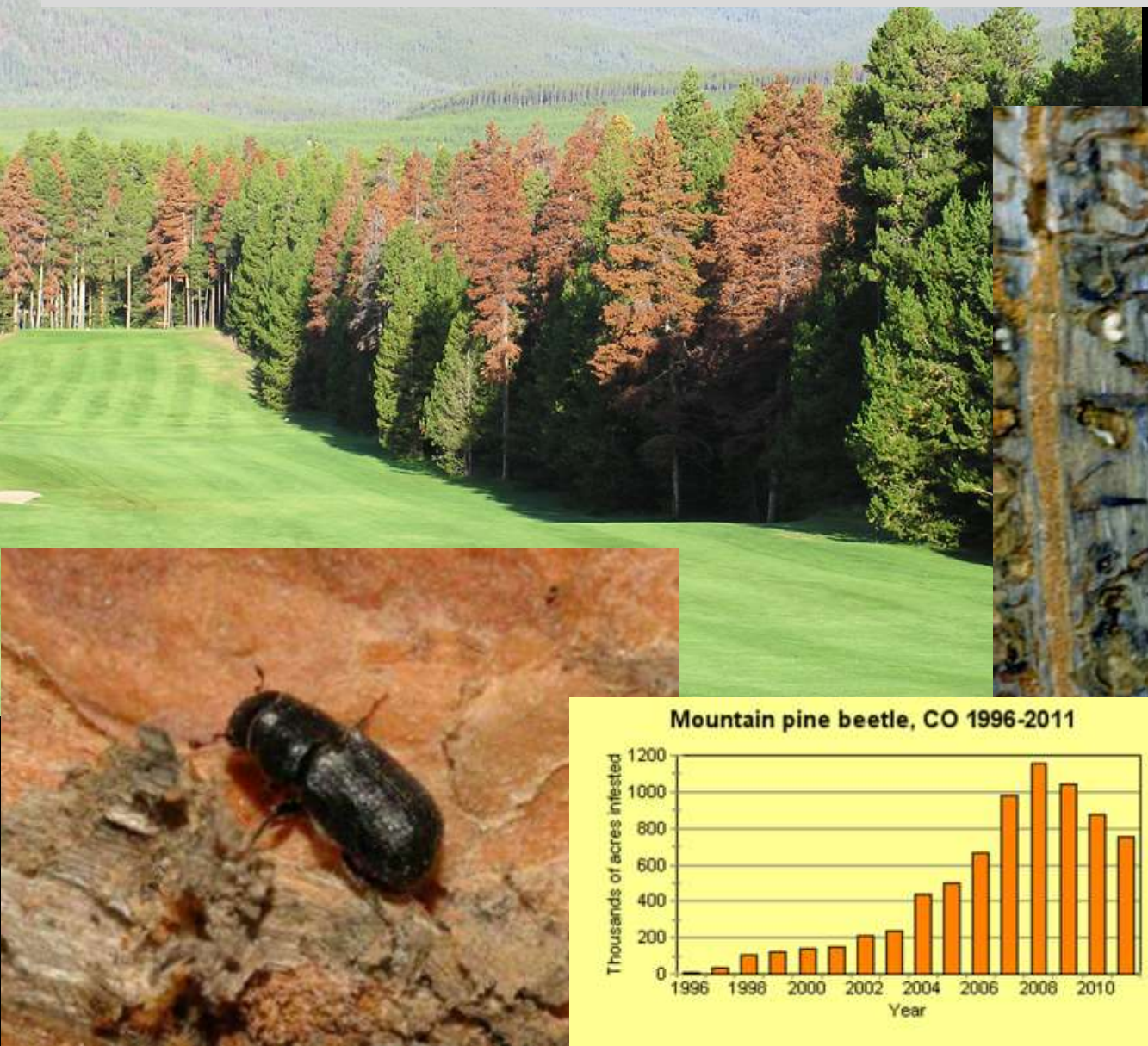
Why is EAB so destructive to ash trees in North America?

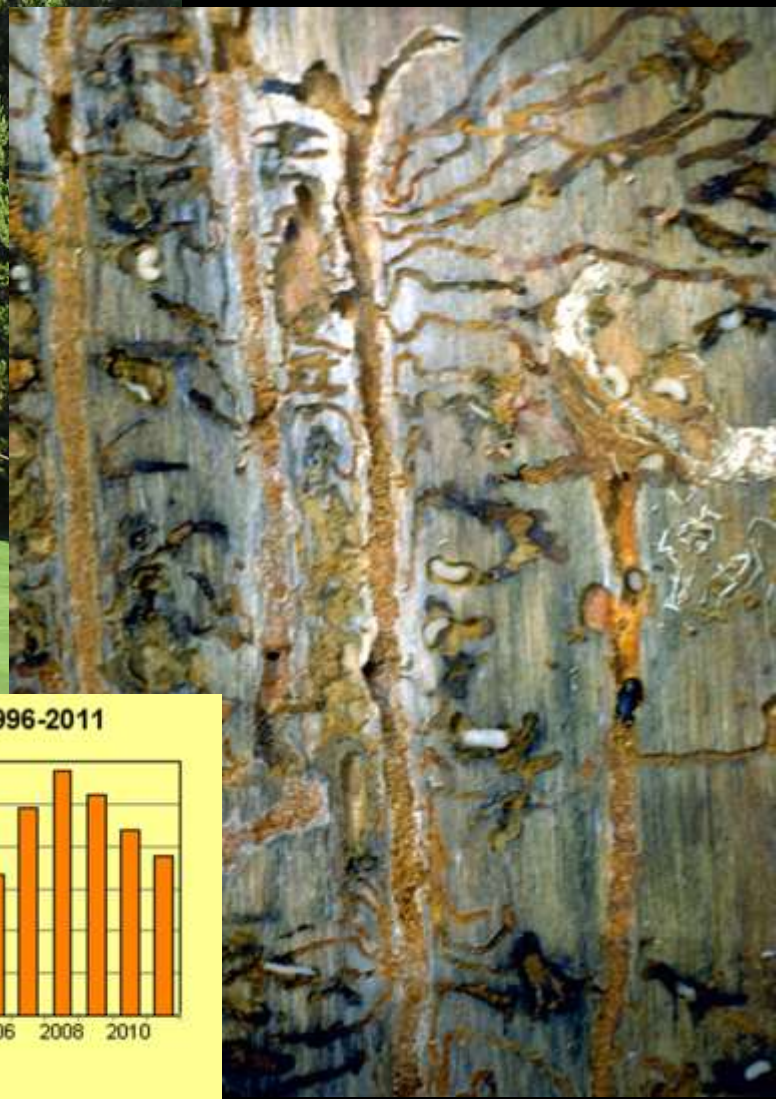
NA ash species lack ability to ability to resist EAB

EAB Will Kill All Unprotected Ash

Thanks to Cliff Sadof, Purdue University for this clip

Common question: How is this different from mountain pine beetle? MPB killed a lot of trees.





Chestnut blight – Devastated American chestnut in early 1900s, caused by a fungus

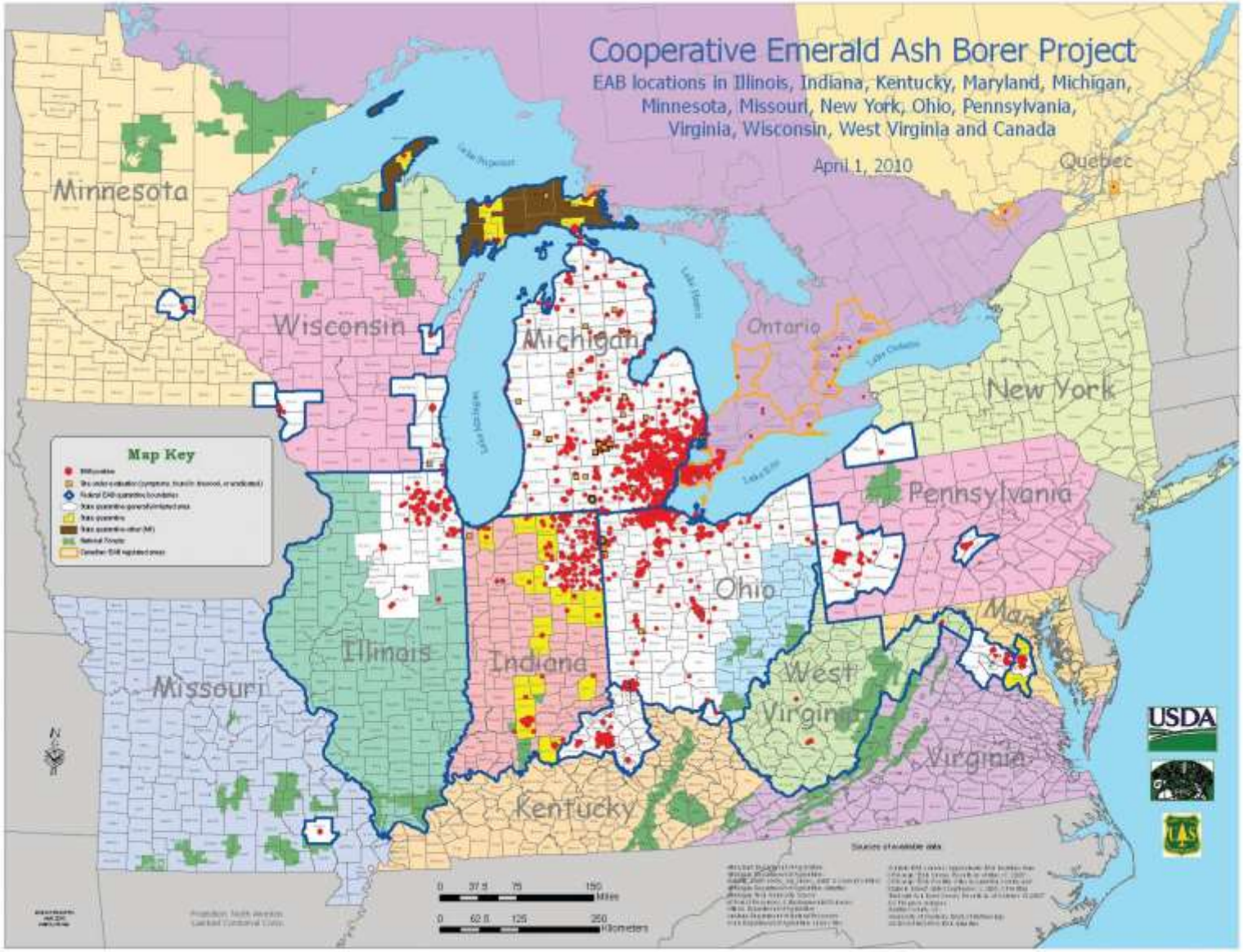
Dutch elm disease – Devastated American elm in mid century. Caused by a fungus, vectored by a bark beetle

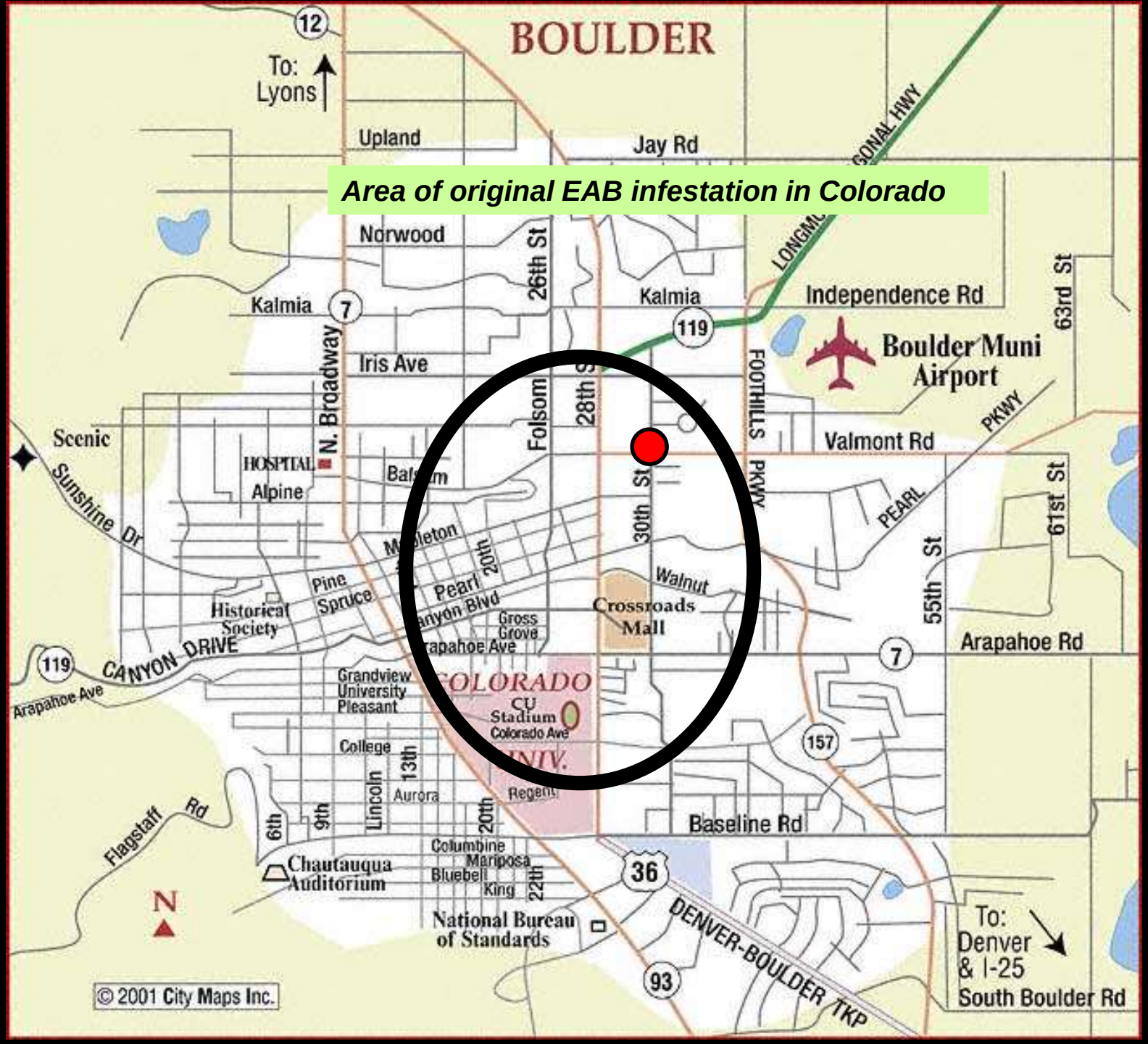
Colorado EAB Tree #1

Located near the intersection of 30th and Valmont, Boulder

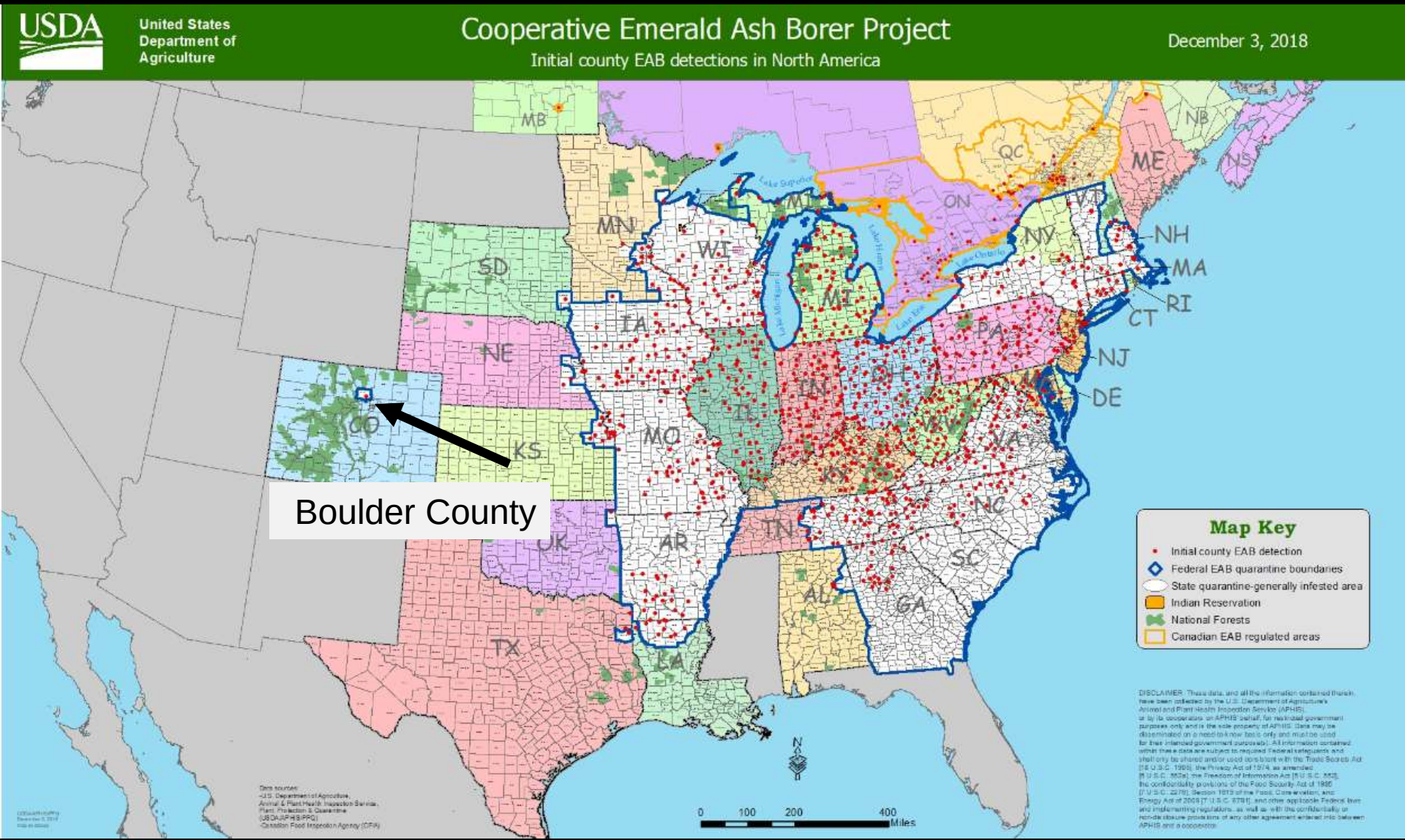
September 23, 2013

Known positive locations of emerald ash borer as of April, 2010




Area of original EAB infestation in Colorado
BOULDER
To: Lyons
12
Upland
Jay Rd
Norwood
26th St
Kalmia
7
Kalmia
119
Independence Rd
Boulder Muni Airport
63rd St
Iris Ave
N. Broadway
Folsom
28th St
FOOTHILLS PKWY
Valmont Rd
PKWY
Scenic
Sunshine Dr
HOSPITAL
Alpine
Balsam
Mapleton
30th St
PEARL
61st St
55th St
Pine
Spruce
Pearl
20th
Walnut
Historical Society
Canyon Blvd
Gross Grove
Crossroads Mall
Arapahoe Ave
Arapahoe Rd
119
CANYON DRIVE
Arapahoe Ave
Grandview
University
Pleasant
COLORADO
CU Stadium
Colorado Ave
UNIV.
College
13th
157
Lincoln
Aurora
Regent
Flagstaff Rd
6th
9th
20th
Baseline Rd
Columbine
Mariposa
Chautauqua Auditorium
Bluebell
King
22th
36
N
National Bureau of Standards
DENVER-BOULDER TKP
To: Denver & I-25
93
South Boulder Rd
© 2001 City Maps Inc.

Emerald ash borer was accidentally introduced into and has since spread through North America



Unlike states to the east, Colorado (and Idaho) are compartmentalized by geography

The current infestation is an infestation of the South Platte River drainage, not the State of Colorado

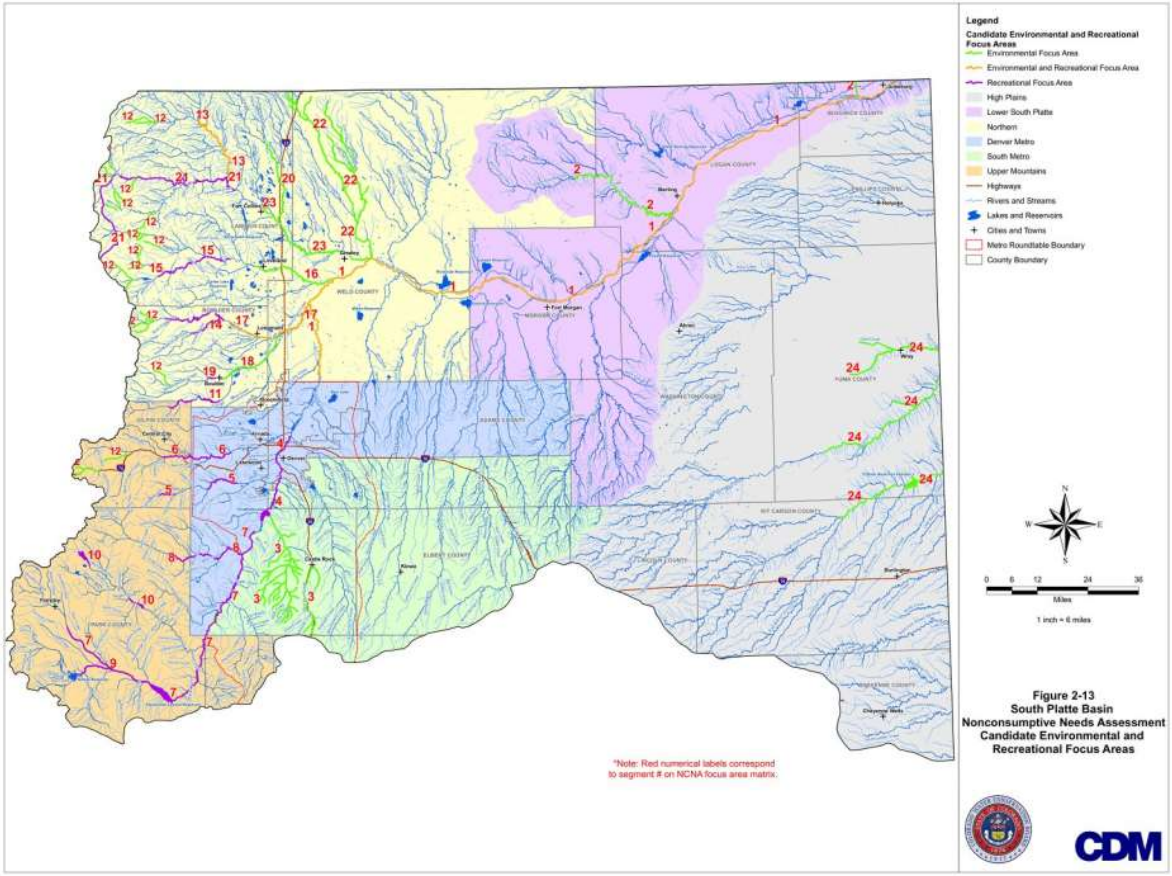


Figure 2-13
South Platte Basin
Nonconsumptive Needs Assessment
Candidate Environmental and Recreational Focus Areas

Within the next five years, emerald ash borer *will* move out of Boulder into the surrounding counties

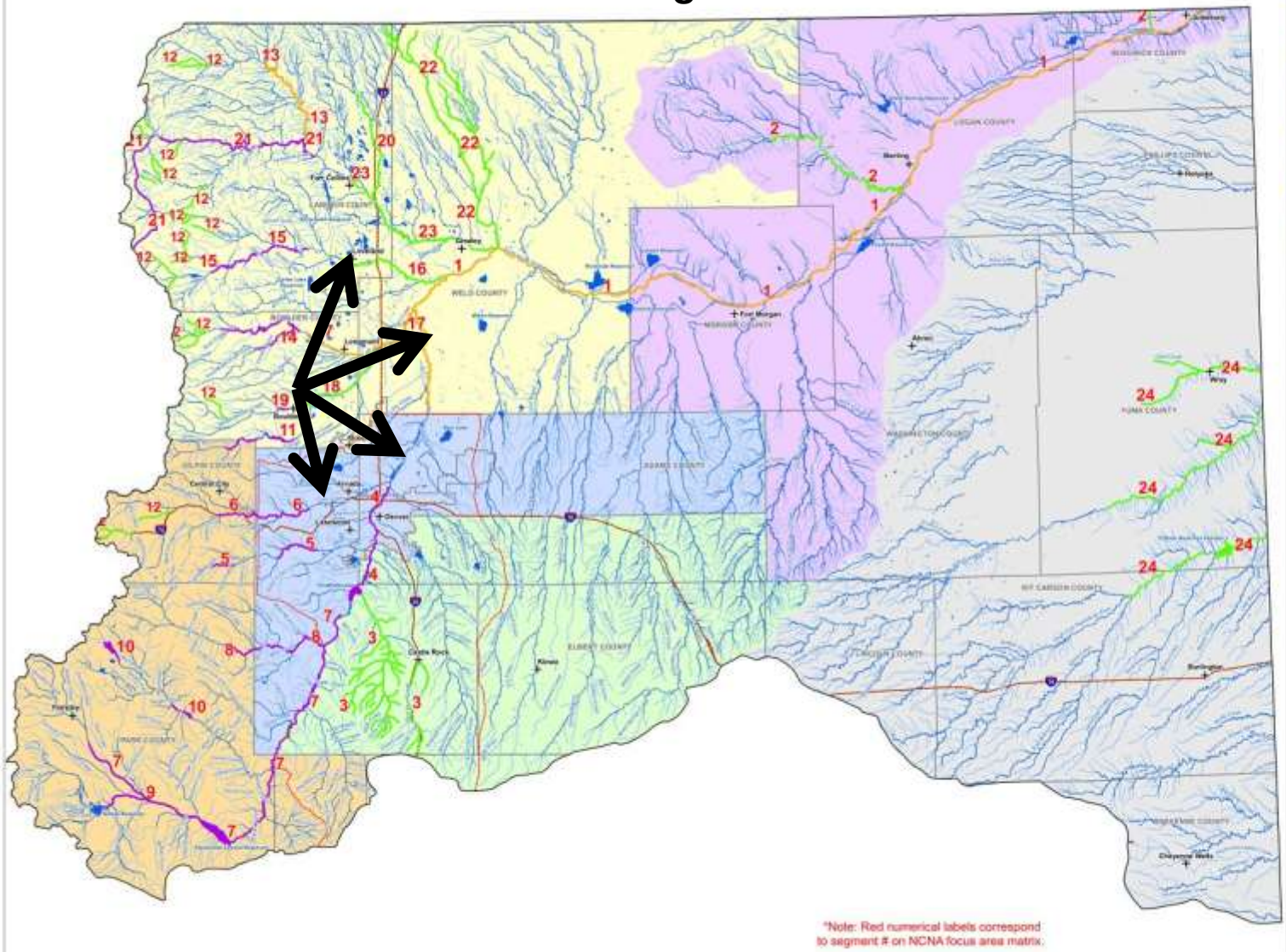
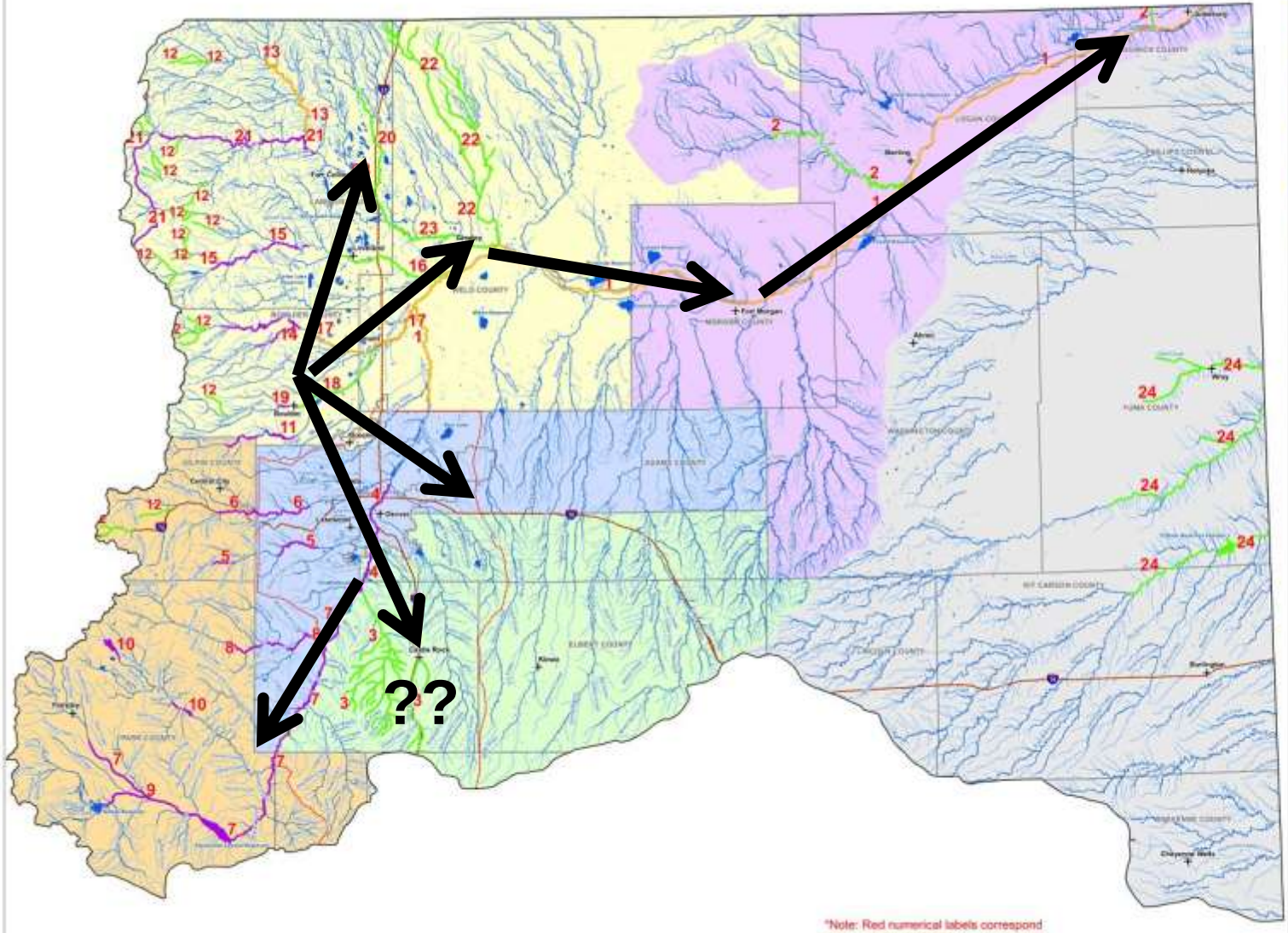


Figure 2-13
South Platte Basin
Nonconsumptive Needs Assessment
Candidate Environmental and Recreational Focus Areas

CDM

Over time the South Platte River Drainage will be colonized by emerald ash borer



*Note: Red numerical labels correspond to segment # on NCNA focus area matrix.

Legend

Candidate Environmental and Recreational Focus Areas

- Environmental Focus Area
- Environmental and Recreational Focus Area
- Recreational Focus Area
- High Plains
- Lower South Platte
- Northern
- Denver Metro
- South Metro
- Upper Mountains
- Highways
- Rivers and Streams
- Lakes and Reservoirs
- Cities and Towns
- Metro Roundtable Boundary
- County Boundary

N W E S

0 6 12 24 36

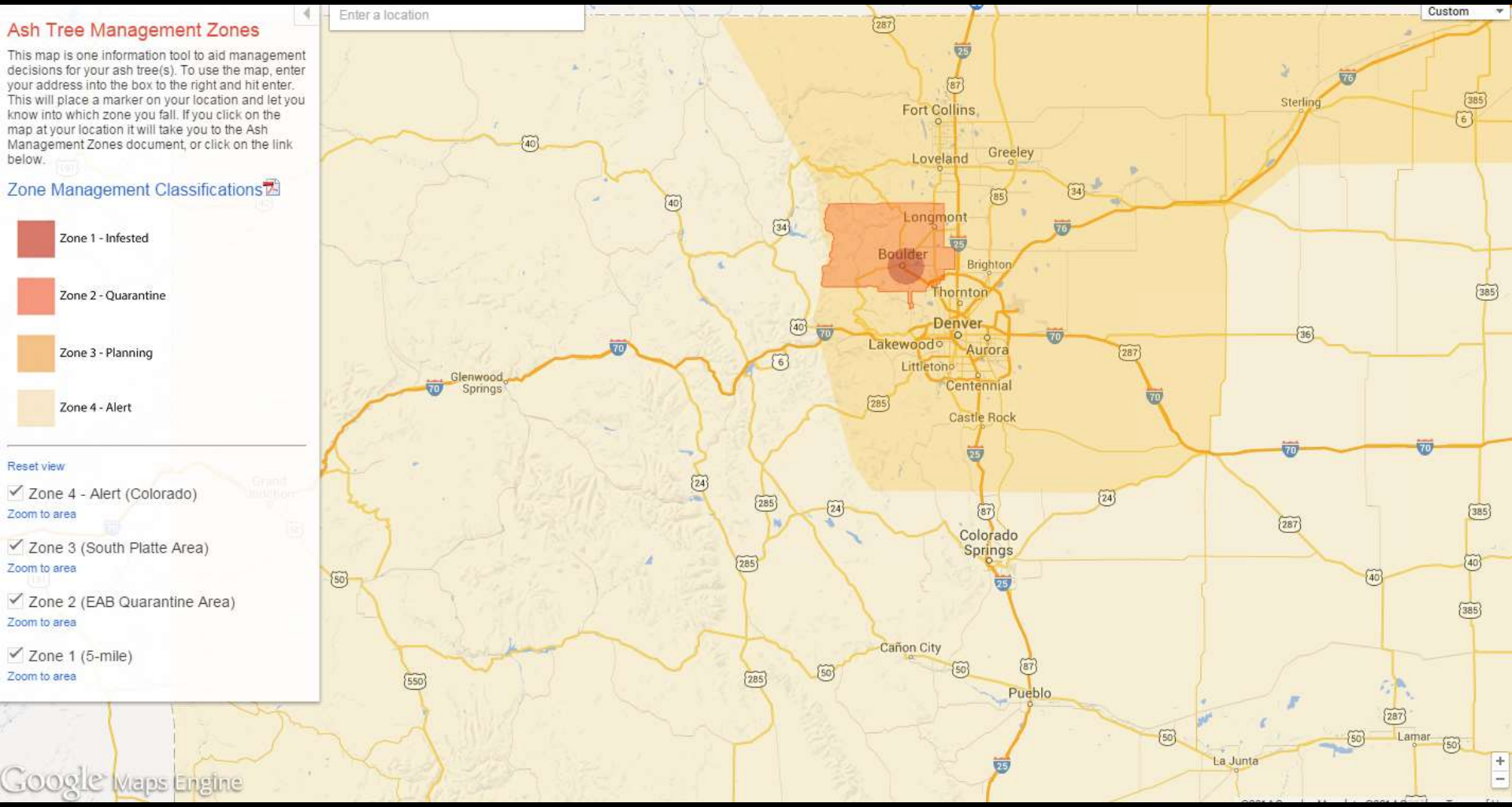
Miles

1 inch = 6 miles

Figure 2-13
South Platte Basin
Nonconsumptive Needs Assessment
Candidate Environmental and Recreational Focus Areas

CDM

Important Note: **Emerald ash borer is an insect that is falls under federal quarantine laws.**



Counties with EAB infestations are subject to restrictions on movement of many wood products outside county borders.

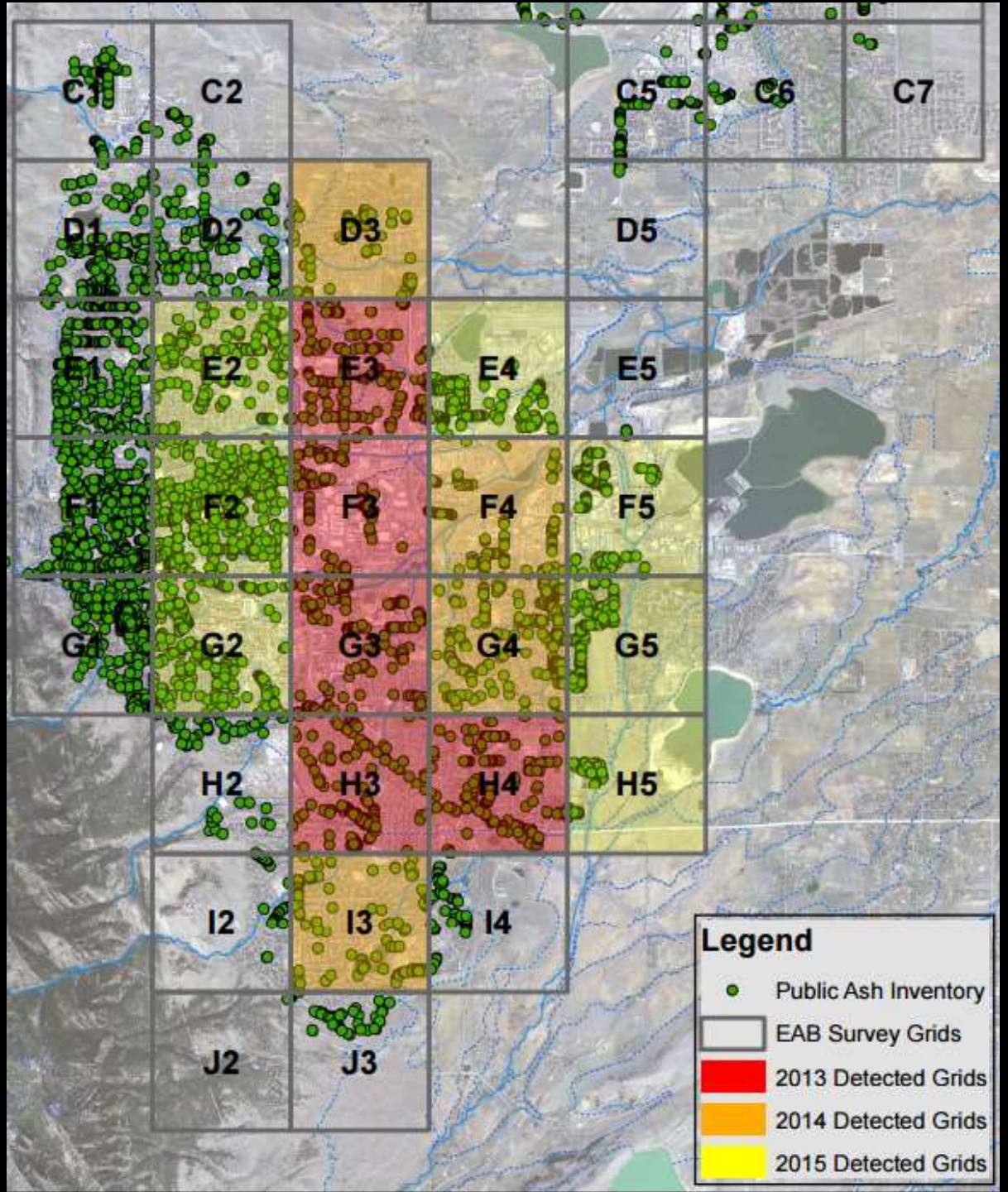
Fifth Anniversary!

Emerald Ash Borer in Colorado

Colorado EAB Tree #1

Located near the intersection of 30th and Valmont, Boulder

September 23, 2013



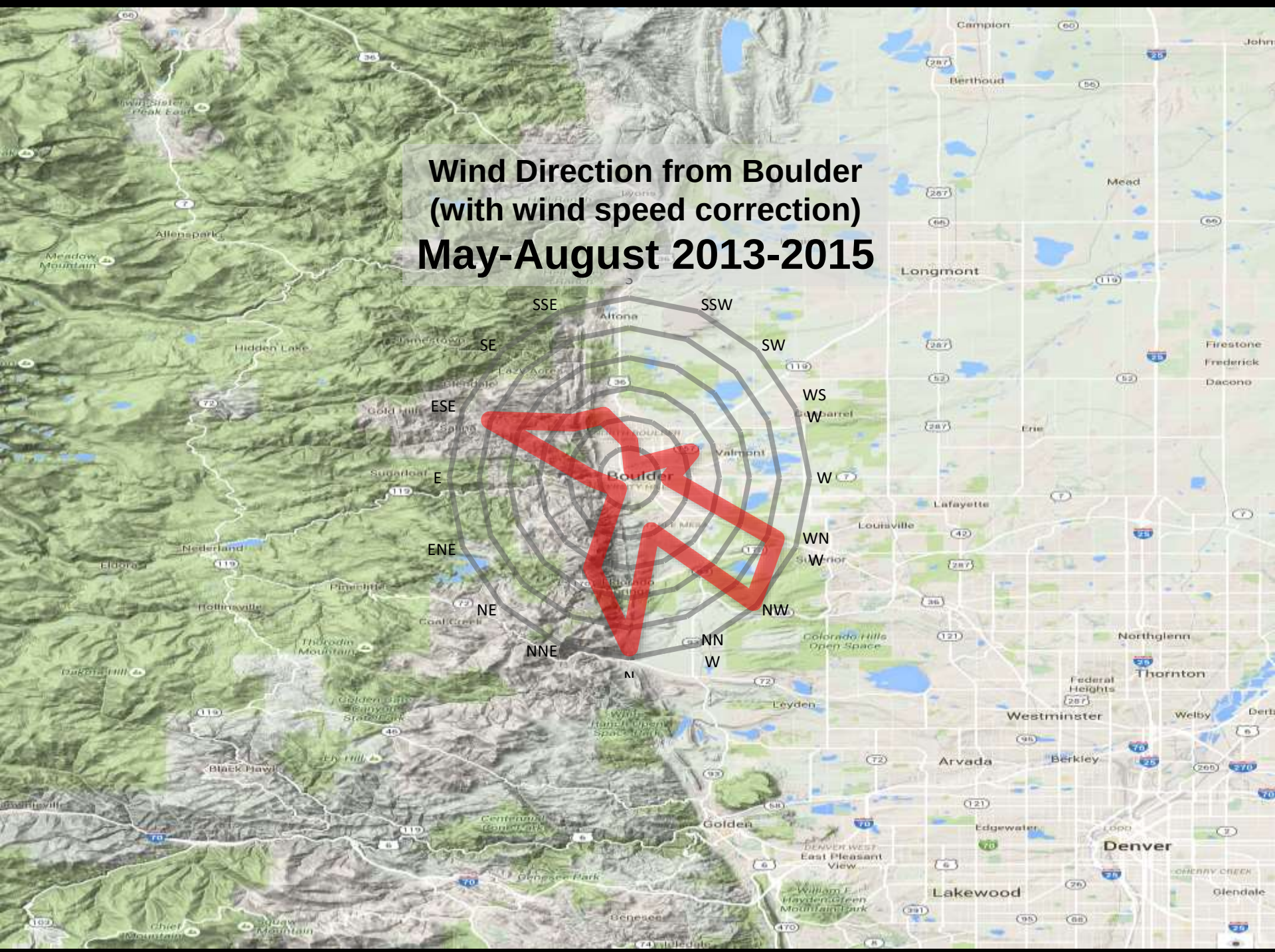
Areas known to be infested with emerald ash borer in Boulder end of 2015

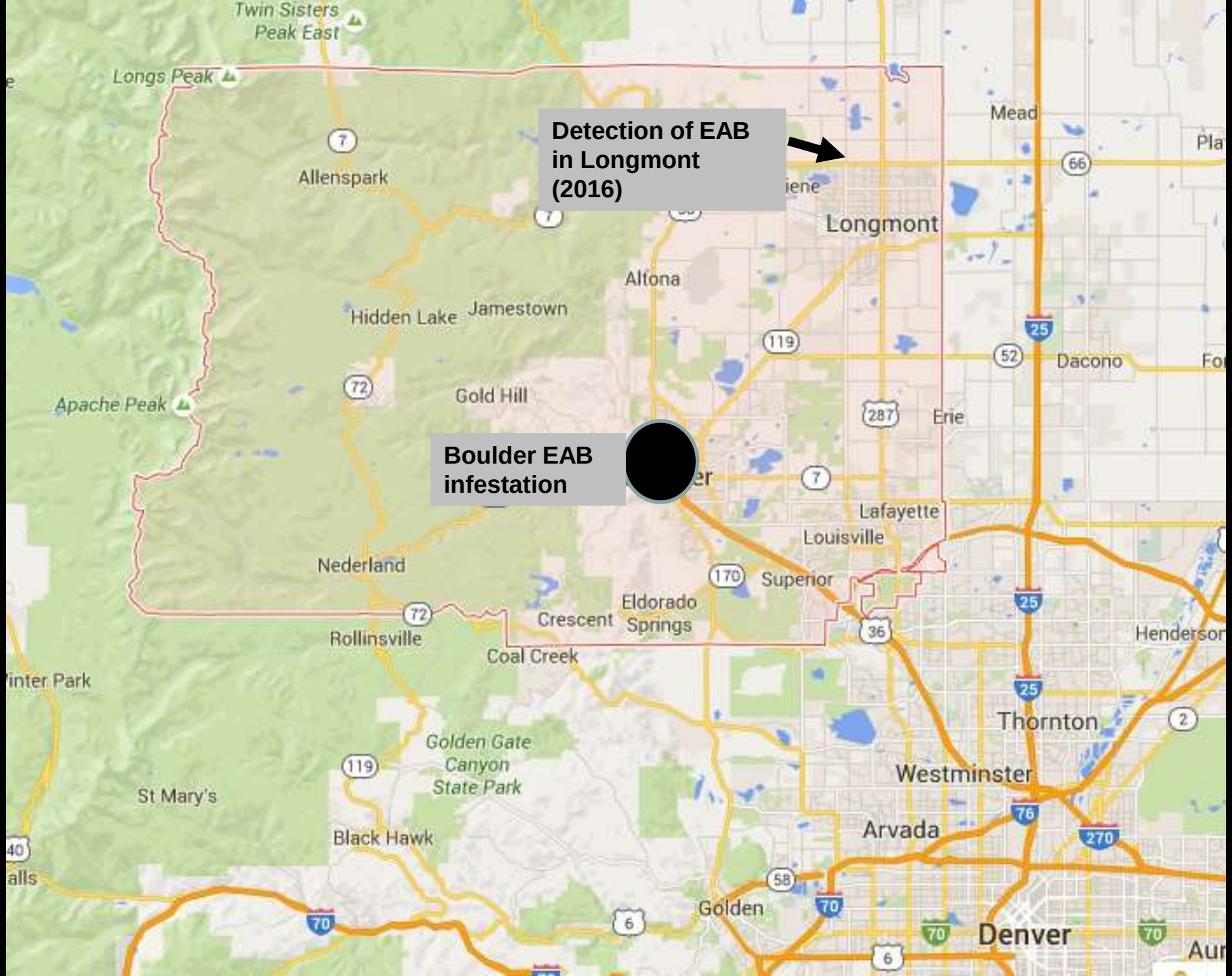
How does EAB spread?

- **Wind-blown dispersal of adults**
  - **Peak period of adult dispersal is late May through late July**
- **Butt-heads that move wood containing developing stages**

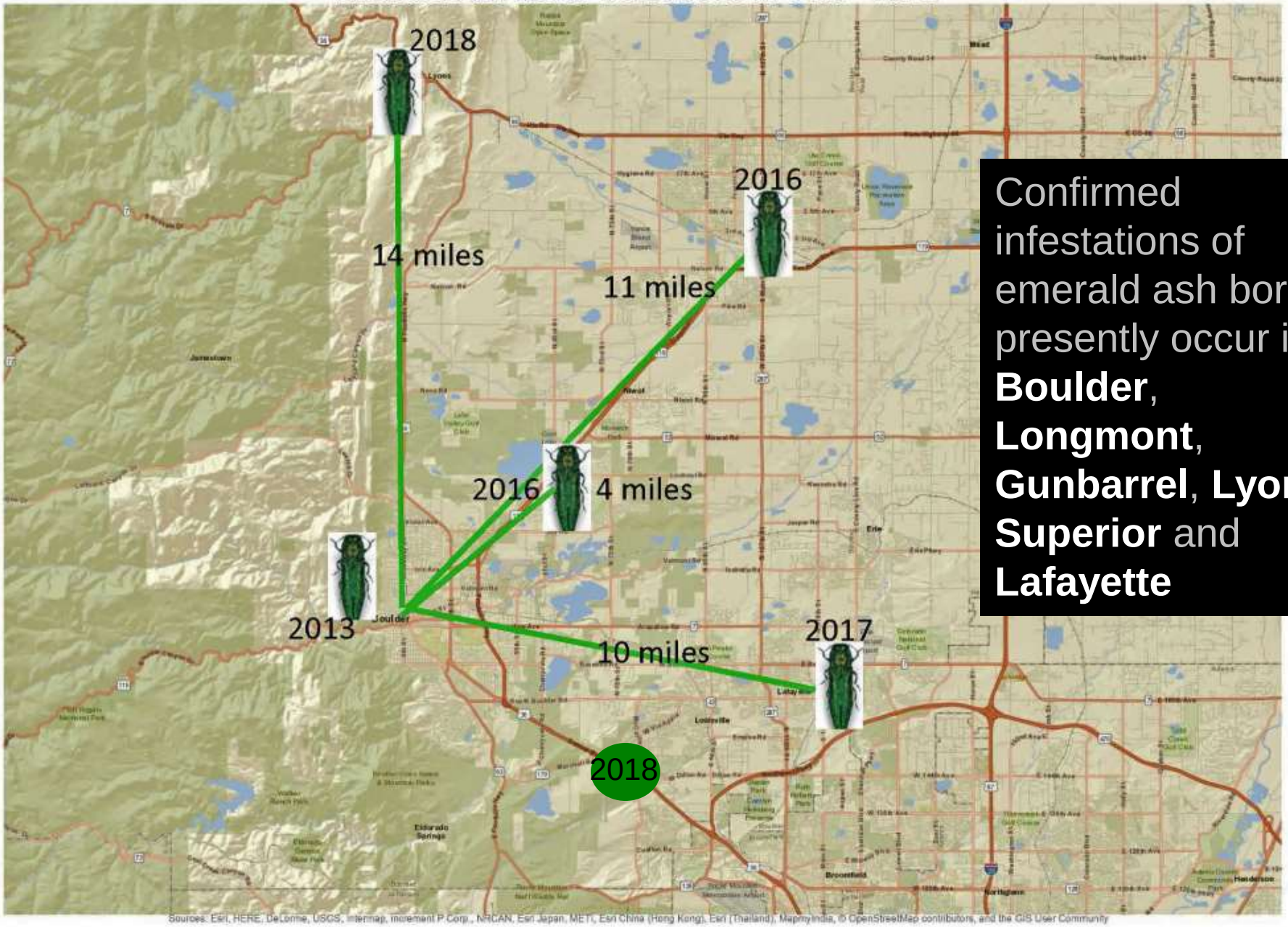
Wind Direction from Boulder (with wind speed correction)

May-August 2013-2015




Detection of EAB in Longmont (2016)
Boulder EAB infestation
Twin Sisters Peak East
Longs Peak
Apache Peak
Allenspark
Hidden Lake
Jamestown
Gold Hill
Nederland
Rollinsville
Coal Creek
Crescent
Eldorado Springs
Golden Gate Canyon State Park
St Mary's
Black Hawk
Golden
Altona
Longmont
Mead
Dacono
Erie
Lafayette
Louisville
Superior
Thornton
Westminster
Arvada
Denver

Emerald Ash Borer Detections in Colo - 2018



Confirmed infestations of emerald ash borer presently occur in **Boulder**, **Longmont**, **Gunbarrel**, **Lyons**, **Superior** and **Lafayette**

How far away is emerald ash borer from your community?

How far away is emerald ash borer from your community?

One truckload

Known CO distribution of emerald ash borer as of today

- **Known infestation is still presently confined to areas within Boulder County limits**
  - **Steady expansion has occurred within the original areas of infestation**
    - **Tree decline symptoms are advancing, but at a slower rate than was originally anticipated**
  - **Detections have been made in five adjacent communities**
  - ***Extensive trapping and surveys conducted in 2018 have still not detected EAB anywhere outside Boulder County***

If EAB became established in Boise, how would that affect the risk of EAB to:

Nampa?
Meridian?
Idaho Falls/Pocatello?
Couer d'Alene/Post Falls??
Twin Falls?

Note: Wind direction through Boise in June is mostly *from the West and North*

Detecting Emerald Ash Borer

Symptom that will develop as EAB injuries accumulate –
Progressive dieback of the crown

0%

10%

20%

30%

40%

50%

Possible symptom of EAB injury – irregular yellowing of the foliage

Leaf size decreases in EAB affected trees

ADIOS condition of regional ash greatly complicates EAB detection

ADIOS - Ash Decline of Idiopathic Origins

- Residual effects of drought
- Residual effects of freezing injuries
- Cumulative effects from secondary pests
  - Ash bark beetles
  - Cytospora cankers
- ??????

Detecting Emerald Ash Borer

Detecting Emerald Ash Borer in Colorado

The presence of the insect is a positive detection

Many native metallic wood borers have a similar appearance to EAB

Cypriacus intricata

Buprestis confluenta

Agrilus cyanescens

Agrilus lacustris

Emerald Ash Borer and Colorado Insects of Similar Appearance

Adults of the emerald ash borer (*Agrilus plannipennis*) have an elongate, rather bullet-form body, typical of most beetles in the metallic wood borer/flatheaded borer family Buprestidae. Emerald ash borer is about 9-13 mm in length, large for members of the genus *Agrilus*, but mid-sized for most other members of this insect family.

Other Metallic Wood Borers that Resemble Emerald Ash Borer

The emerald ash borer is one of many insects found in Colorado that are in the beetle family Buprestidae, the metallic wood borers. All develop as borers of woody plants when in their larval stage, a type of flatheaded borer. General body form of all metallic wood borers are similar, with an elongated body, often a bit pointed at the hind end, and some sort of metallic sheen to the body. The coloration of most is bronze or gun metal gray, but some are green, which can cause some confusion with emerald ash borer.

Phaenops gentilis. Known as the "green flatheaded pine borer", *Phaenops gentilis* is likely to be the beetle most commonly encountered in Colorado that can be mistaken for emerald ash borer. It is approximately the same size as the emerald ash borer (9-13 mm) but has a broader body form and the wings are covered with minute punctures. The adults are bright bluish green and have no yellow spots. *Phaenops gentilis* develops in several species of pine.

Our interim publication on EAB look-alikes in Colorado.

Meandering tracks under the bark of ash always indicate some flatheaded borer. They will *almost always* indicate emerald ash borer.

Bark cracking can be a good clue that EAB may be present in a tree

A good place to look is the underside of limbs, particularly in the area near the trunk

Peeling the bark away from a cracked area may reveal earlier larval tunneling

Detecting Emerald Ash Borer in Colorado

Look for D-shaped exit holes in ash trees

Other wood boring insects can be found in ash trees

Wood Boring Insects of Ash Trees

Ash is one of the most widely planted trees in Colorado, with most plantings involving various cultivars of green ash (*Fraxinus pennsylvanica)* or white ash (*F. americana*). Several insects are associated with these plants, including leafcurling aphids, various caterpillars and sawflies that chew the leaves, and wood borers and bark beetles that develop within the trunk and limbs of the tree.

The wood borers and bark beetles can be particularly difficult to identify since there is minimal evidence of their activity on the surface of the plant and there is some overlap in the injuries that different species produce. Furthermore, there is greatly increased interest in these insects since the 2013 discovery of a new wood borer, the emerald ash borer, in Boulder County. With the addition of this new species there are now over a half dozen insects that may be found tunneling into trunks and branches of ash trees growing in Colorado: lilac/ash borer, flatheaded appletree borer, emerald ash borer, redheaded ash borer, banded ash borer, pigeon tremex, ash bark beetles (2-3 species) and ambrosia beetles.

Major Wood Borers of Ash

Some general aspects of life history and appearance are similar to those of emerald ash borer. Larvae of the flatheaded appletree borer are cream colored, have a small head with pronounced dark jaws, feature a broadly flattened area behind the head, and have a very elongate and somewhat flattened body. The broadened area behind the head is much wider in the flatheaded appletree borer than with emerald ash borer, and they grow larger.

Flatheaded appletree borer larva. Photograph by David Shetlar, The Ohio State University

Our interim publication on EAB look-alikes in Colorado. This is now being produced as an Extension Fact Sheet.

Lilac/ash borer

New Fact Sheet Available:

Lilac/Ash Borer: A Common Wood Borer of Colorado's Street Trees

Flatheaded appletree borer

A generalist flatheaded borer/metallic wood borer that is associated with many hardwood that are in decline

Ash bark beetles

An important contributor to limb dieback in Colorado ash

Ash bark beetles usually are found in limbs – but can occur in the trunk

Redheaded ash borer

Two roundheaded borers/ longhorned beetles occasionally occur in ash trees in advanced decline

Banded ash borer

Meandering tracks under the bark of ash always indicate some flatheaded borer. They will *almost always* indicate emerald ash borer.

Detecting emerald ash borer in Colorado ash

Flatheaded appletree borer

A generalist flatheaded borer/metallic wood borer that is associated with many hardwood that are in decline

Flatheaded appletree borer larvae produce dry, powdery sawdust excrement

Detecting Emerald Ash Borer in Colorado

Look for D-shaped exit holes in ash trees

Flatheaded appletree borer also produces a D-shaped exit hole when it emerges from an ash tree

Easily viewed D-shaped exit holes ***are not going to be found in the trunk during the first couple of years of infestation!***

Early EAB activity will be higher in the crown of the tree and requires inspecting upper branches.

Possible symptom of EAB injury – irregular yellowing of the foliage

Declining ash trees with dead leaves hanging on the tree – High likelihood of EAB

Can you control EAB once it gets here?

- How do you define control?

- Will you be able to eliminate it?
- Will you be able to slow its spread?
- Will you be able to protect individual trees?

Can you control EAB once it gets here?

- How do you define control?

- **Will you be able to eliminate it from the state?**
  - **No. Once it is established in an municipality where ash are common, it will not be possible to eradicate it.**

Can you control EAB once it gets here?
- How do you define control?

- Will you be able to eliminate it from the state?
  - **No. Once it is established in a municipality area where ash are common, it will not be possible to eradicate it.**
- **Will you be able to slow its spread?**
  - **Absolutely yes. Insecticide treatment of trees can control the insect. Removal of infested trees can decrease EAB population build-up. Strict enforcement of restrictions on ash wood movement will slow spread to new areas.**

SLOWING ASH MORTALITY: A POTENTIAL STRATEGY TO SLAM EMERALD ASH BORER IN OUTLIER SITES

Deborah G. McCullough[1,2], Nathan W. Siegert[1], and John Bedford[3]

[1]Michigan State University, Department of Entomology and [2]Department of Forestry, East Lansing, MI 48824

[3]Michigan Department of Agriculture, Lansing, MI 48909

The SLAM (SLow Ash Mortality) strategy for EAB management was immediately embraced by the City of Boulder.

……The rate of ash decline in the infested area has been slower – much slower – than most anticipated.

Can you control EAB once it gets here?
- How do you define control?

- Will you be able to eliminate it from the state?
  - **No. Once it is established in a municipality area where ash are common, it will not be possible to eradicate it.**
- Will you be able to slow its spread?
  - **Yes. Insecticide treatment of trees can control the insect. Removal of infested trees can decrease EAB population build-up. Strict enforcement of restrictions on ash wood movement will slow spread to new areas.**
- **Will you be able to save individual trees?**
  - **Definitely yes. There are some highly effective treatments – but they are $$ *and must be sustained for the life of the tree.***

Control Options for Management of Emerald Ash Borer

Ash Tree Treated
For Emerald Ash Borers
Untreated Ash Tree

Important note regarding EAB control

Present controls can allow trees to recover if EAB-induced crown thinning has not exceeded 30-50%

0%

10%

20%

30%

40%

50%

Emerald Ash Borer Control Options

- Soil applications with systemic insecticides
  - imidacloprid, dinotefuran
- Non-invasive trunk sprays of systemic insecticides
  - dinotefuran
- Trunk injections of systemic insecticides
  - Emamectin benzoate (TREE-Age), azadirachtin (TreeAzin), imidacloprid

Adults as they feed on foliage

Young larvae that tunnel in the phloem and cambium

Target Life Stages for EAB Treatments

Emerald Ash Borer Insecticides

- Imidacloprid (Merit, Xytect, Zenith, etc.)
  - Soil drench, possible trunk injection
- Dinotefuran (Safari, Zylam, Transtect)
  - Basal trunk spray, possible soil drench
- Emamectin benzoate (Tree-age, Arbormectin)
  - Trunk injection only
- Azadirachtin (TreeAzin, AzaSol, others)
  - Trunk injection only

One good thing about emerald ash borer –

We have learned a lot about insect control

Soil Treatment Options for EAB

- Imidacloprid
  - Merit, Xytect, Criterion, Zenith, Bandit……
    - 75WSP and 2F formulations
  - Several retail formulations now available
    - Typically 1.47% liquid formulations
- Dinotefuran
  - Safari, Zylam, Transtect

Soil application option – imidacloprid applied as drench or injection

Over-the-Counter Imidacloprid Formulations

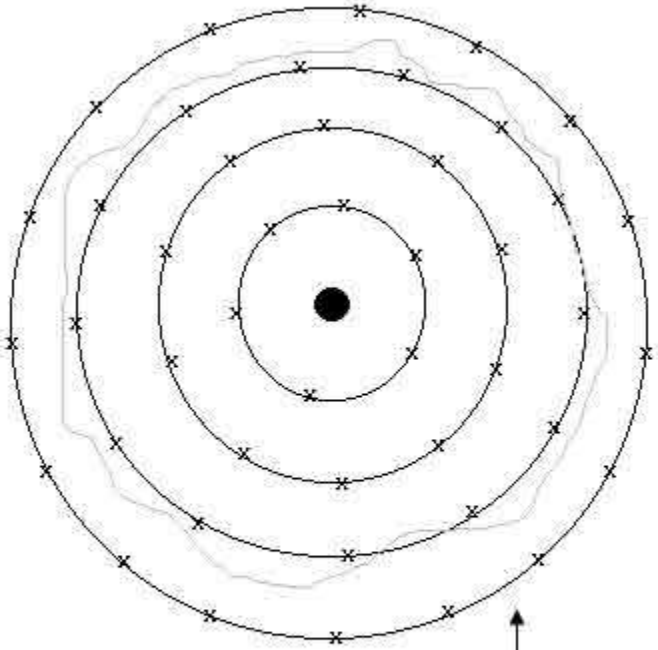
Primary method of imidacloprid application – soil applications for root uptake

Optimal Application – Soil drench within 18-24 inches of the Trunk

Yes

No?

Soil Injection Patterns



Circular Pattern

Injections are made at each "X" spaced apart every 2.5-feet.
Rings are also spaced apart by 2.5-feet.

****

A circle of 40-ft diameter (i.e., 40-ft canopy spread) covers 1250 sq ft.

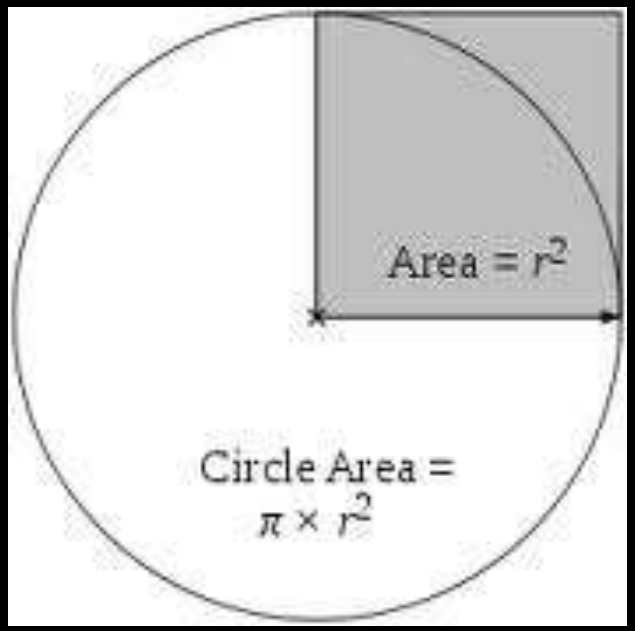
Bird's eye views from above the tree looking through the canopy to the ground. The dark spot represents the trunk, while the irregular grey line represents the border of the canopy (the drip line).

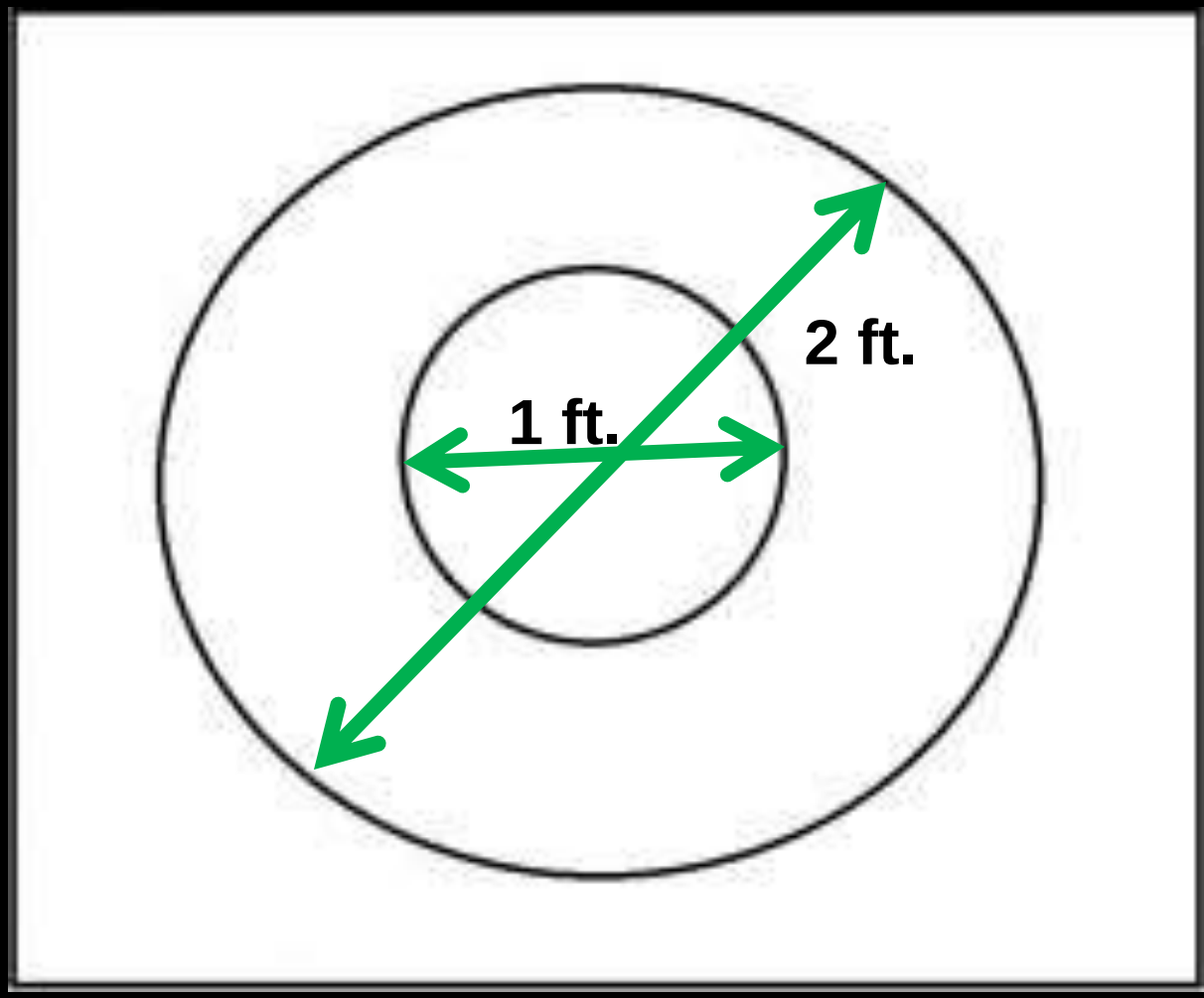
07.07.2011

Soil applications of systemic insecticides should not be made if there are flowering plants at the application site

Modifying use rates of systemic insecticides by DBH/tree size

Area increases as the square of the width (diameter)





Example: A circle that is 2 ft. wide has an area 4X greater than a circle of 1 ft. diameter

Bottom line: Larger trees have proportionately much greater volume than do smaller trees. Insecticides rates based on DBH will be more diluted in larger trees.

What rate of use for imidacloprid soil treatments?

- **Use 1X rate on small trees**
  - **less than 15-inches DBH**
- **Use 2X rate on large trees**
  - **greater than 15-inches DBH**

1X rate = 1.4 grams active ingredient/inch DBH

Use of High or Low Rates of Imidacloprid?

Low Rates (1X, 1/2X)

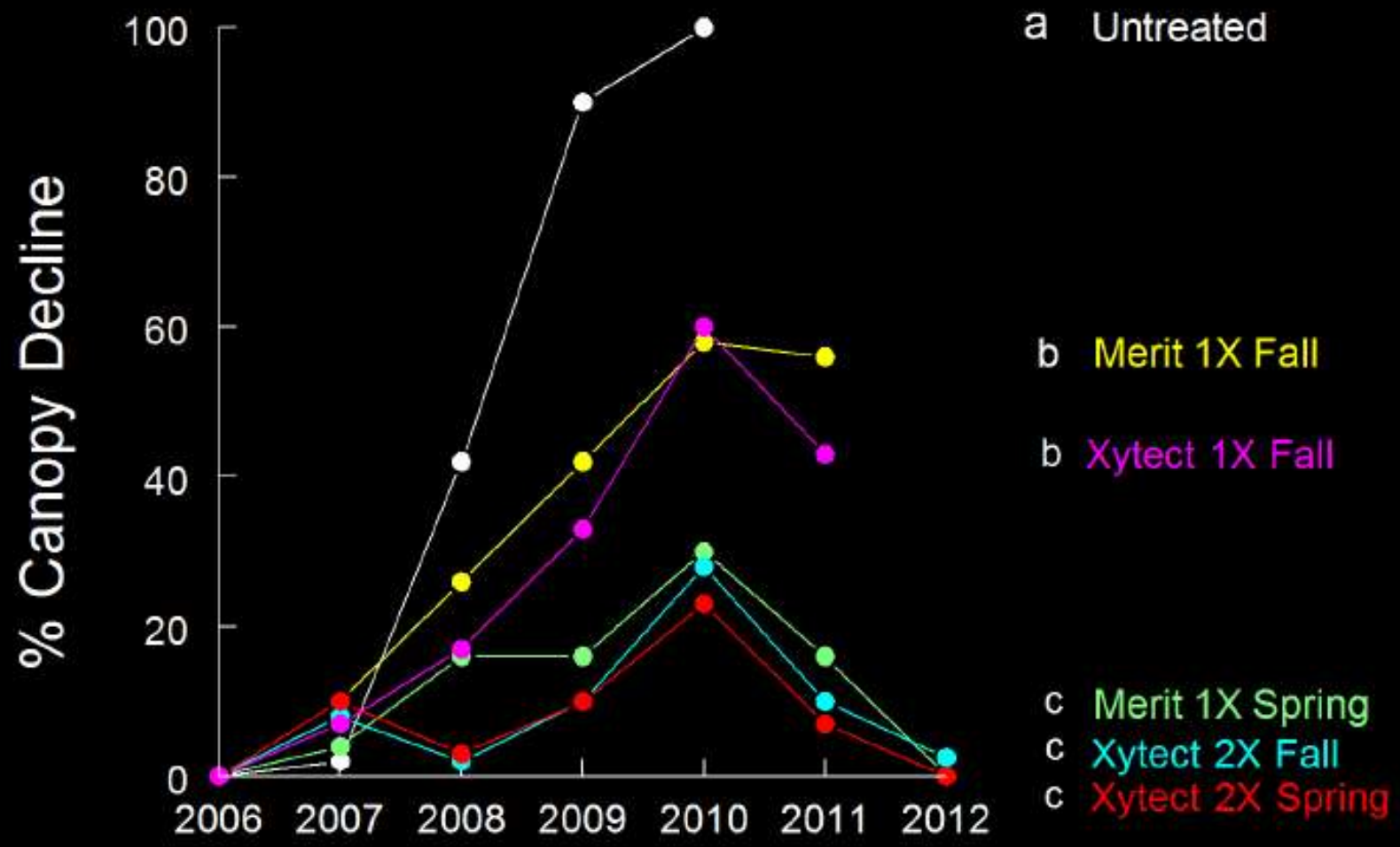
- Smaller trees
- EAB populations low, moderate
- Spring applications

High Rates (2X)

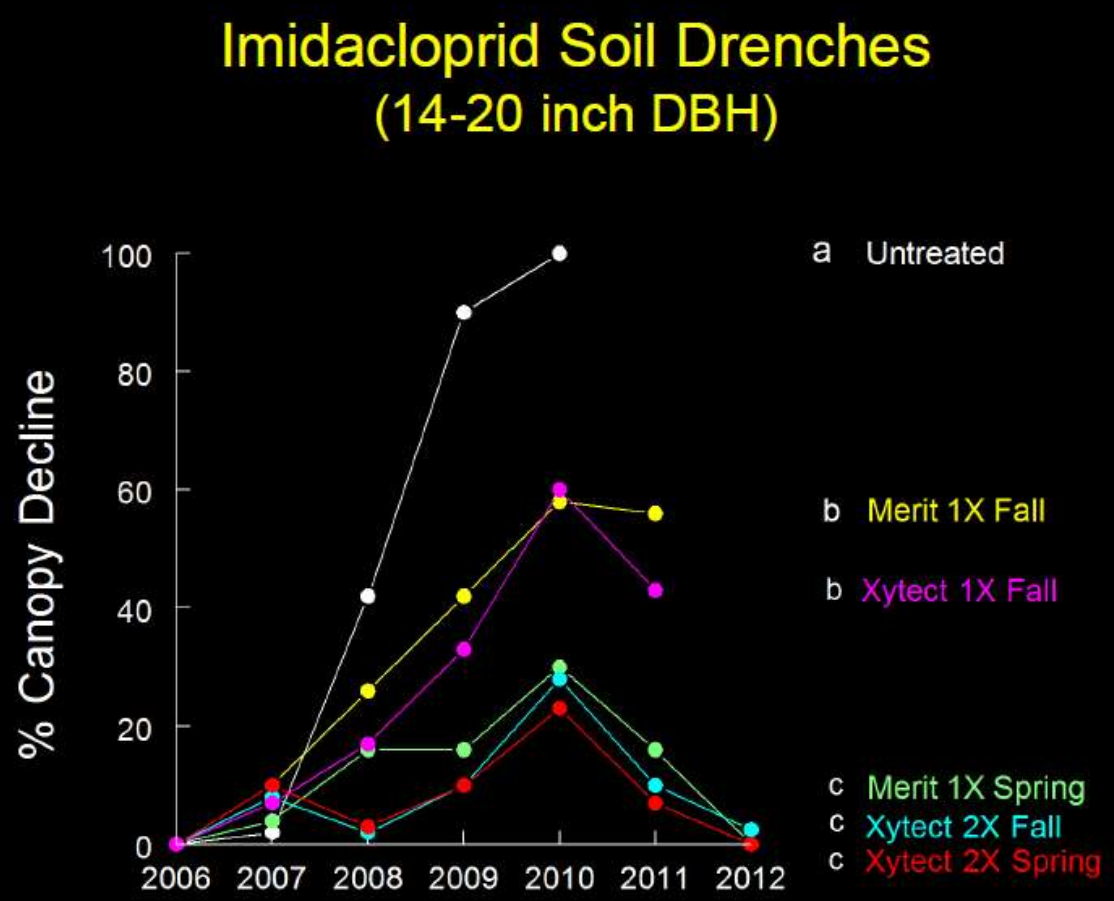
- Large trees
- High EAB populations present (peak outbreak phase)
- Fall applications

What are the Trade-offs with Fall Applications vs. Spring Applications?

Imidacloprid Soil Drenches
(14-20 inch DBH)



Take home message: Spring applications are more efficient in the use of soil applied imidacloprid than is a fall application to ash (a deciduous tree)



Another consideration with fall vs. spring applications of systemic insecticides?

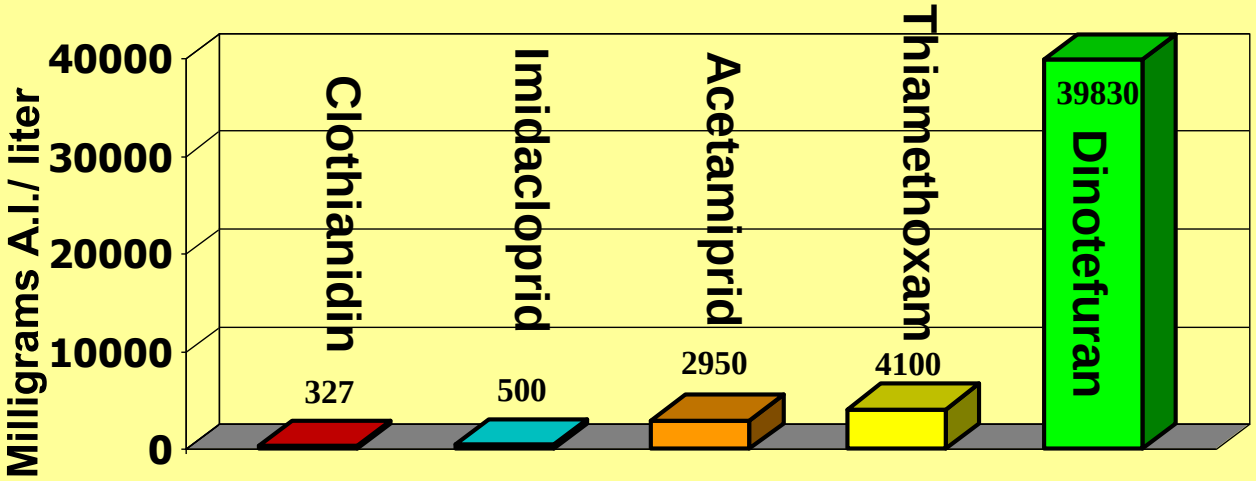
Effects on potential residues present in nectar and pollen

Soil drench with dinotefuran (Safari, Zylam, Transtect)

Basal trunk spray with dinotefuran (Safari, Zylam, Transtect)

Relative Water Solubility of Neonicotinoids:

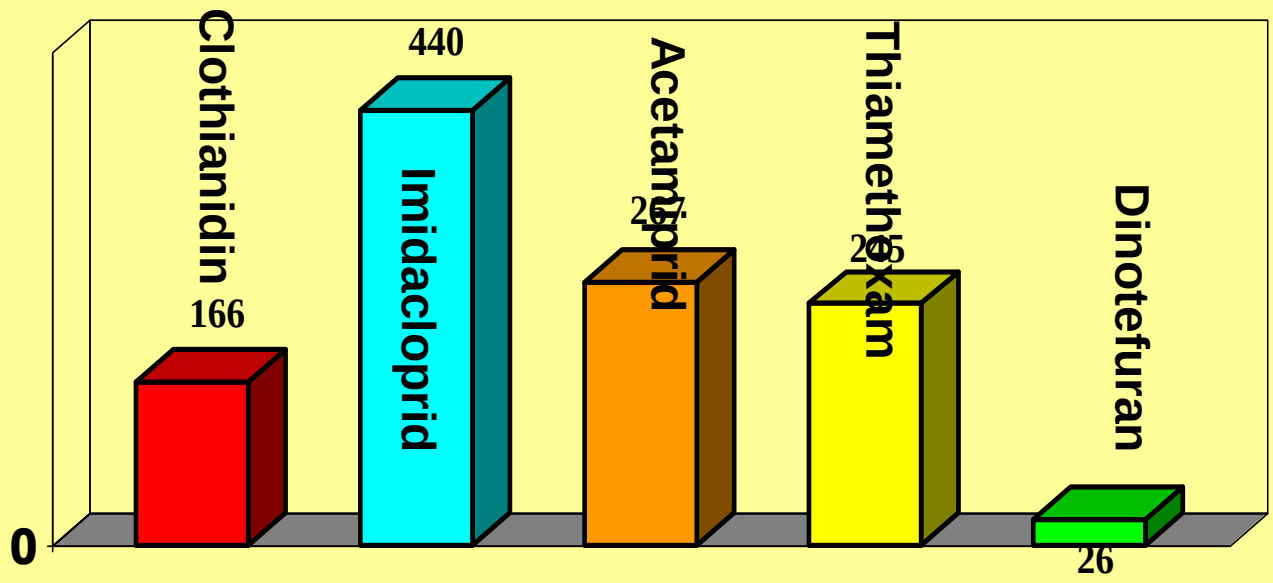
Water Solubility (Active Ingredient)



Information sources
Clothianidin (Celero), Acetamiprid (Tristar), Dinotefuran (Safari) – EPA Pesticide Fact Sheet
Imidacloprid (Marathon), hiamethoxam (Flagship) – MSDS for Products

Slide information courtesy J. Chamberlin

K_{oc} Values of Neonicotinoids:



Source Data: EPA Pesticide Fact Sheets

Basal Trunk Sprays of Dinotefuran

- Enters tree through thin areas of bark
- Can be expected to reach peak levels in foliage in about 2-3 weeks
- Adjuvant? – No evidence that adjuvants improve uptake of dinotefuran trunk sprays.

Trunk injection with emamectin benzoate (TREE-age, Arbormectin)

Target pests of emamectin benzoate (TREE-age) trunk injections

Flatheaded borers

Roundheaded borers

Adults as they feed on foliage

Young larvae that tunnel in the phloem and cambium

Emamectin benzoate has consistently provided two years of control of EAB. Present data suggests 3 years of control can be expected.

Target pests of emamectin benzoate (Arbormectin TREE-age) trunk injections

Clearwing borers

Bark beetles

Emamectin BenzoateTrunk Injections

Advantages

- Can consistently provide 2, probably 3 years control
- Provides lilac/ash borer control
- Applications can be made at many times during the season

Disadvantages

- Involves trunk wounding
- Requires skill in proper application
- High cost

Trunk injection with azadiractin (TreeAzin)

Some efficacy and tree wounding issues are unresolved at present

Target pests of TreeAzin trunk injections

Flatheaded borers

Elm leaf beetle

Leaf feeding caterpillars

Sawflies

Prophylactic Treatment for EAB?

- There can be **zero benefit if the insect is not present in the tree**

Prophylactic Treatment for EAB?

- Existing insecticides can allow trees to recover if there is less than 30% canopy loss due to EAB injury
  - This will normally take several years to develop following initial infestation

Do emerald ash borer treatments pose a risk to pollinators?

What is the incidence of ash pollen collection by honey bees?

Green Ash

Fraxinus pensylvanica

White Ash

Fraxinus americana

Male flowers of green ash

North American species of ash are dioecious, and, primarily, wind pollinated

Female flowers of green ash

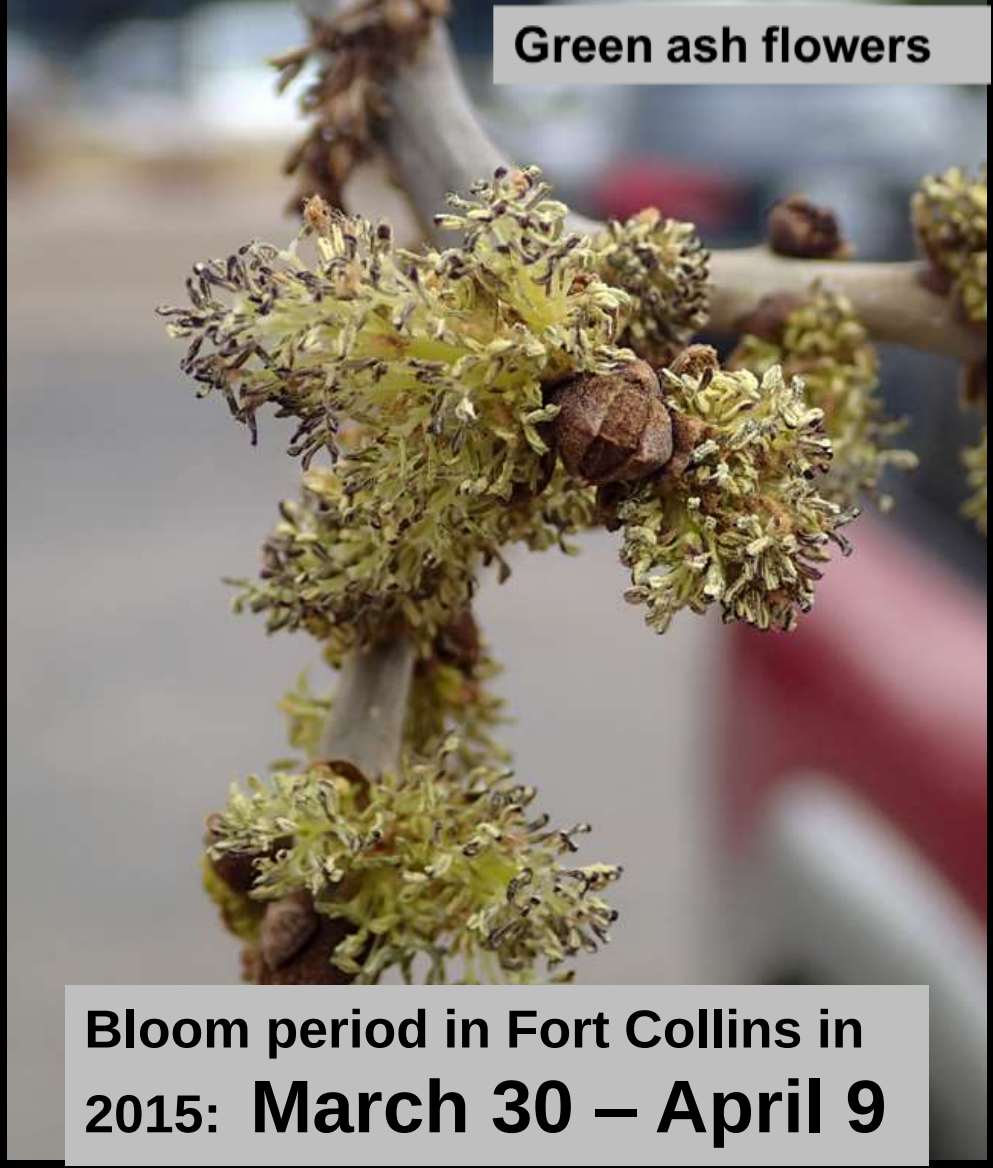
Male flowers produce pollen that may be collected by bees

White ash flowers

Green ash flowers

The period when pollen is being produced is brief, about 7 to 10 days

Bloom period in Fort Collins in 2015: April 20-29



Bloom period in Fort Collins in 2015: March 30 – April 9

Colorado March-April Pollen Collections in Urbanized Areas

- **In 2014 *no ash pollen was identified in any samples during standard pollen analysis***
  - Presence of ash pollen was indicated by PCR
    - Collection incidence <1%

Colorado Spring Pollen Collections in Urbanized Areas

- In 2014 no ash pollen was identified in any samples during standard pollen analysis
  - Presence of ash pollen was indicated by PCR
    - Collection incidence <1%
- **In 2015, ash pollen was detected in three samples of thirteen collected when ash was in bloom**
  - Ash pollen constituted 3%, 8% and 11% of the total in these three samples, respectively

Colorado Spring Pollen Collections in Urbanized Areas

- In 2014 no ash pollen was identified in any samples during standard pollen analysis
  - Presence of ash pollen was indicated by PCR
    - Collection incidence <1%
- **In 2015, ash pollen was detected in three samples of thirteen during standard pollen analysis**
  - Ash pollen constituted 3%, 8% and 11% of the total in these two samples, respectively
- **Average incidence of pollen collection during period of ash bloom was 3.6%**

Primary Flowering Plants Present During Green Ash Bloom in 2015

- Norway maple
- Nanking cherry
- *Prunus sargentii*
- Flowering pear
- Hackberry
- Willow
- Iris
- Dandelions
- Violets
- Candytuft
- Grape hyacinth
- Crocus
- Yellow alyssum

Green ash grown in association with flowering pear and cherry, downtown Boulder

Primary Flowering Plants Present During White Ash Bloom in 2015

- Crabapple, apple
- **Many** *Prunus*
- Honeysuckle
- Redbud
- Serviceberry
- Japanese flowering quince
- Common lilac
- Catmint
- Candytuft
- Grape hyacinth, hyacinth
- Daffodils
- Basket-of-gold
- Blue mustard
- Dandelion

Ash grown in association with redbud, downtown Boulder, a few blocks away

Corollary: The greater the number of bee-attractive plants flowering when ash is flowering will reduce bees collecting ash pollen.

Can We Manage the Emerald Ash Borer Disaster and Conserve the Honey Bee?

Photograph by Steven Valley

I think we can.

Some important pollinator resource plants early in the season

Several very early flowering bulbs in Iridaceae, Amaryllidaceae and Liliaceae *are important early season pollen sources.*

Some early season, predominantly trees and shrubs can be very important early season pollen sources for honey bees

Maples are an exceptionally important early season source of pollen

Trunk Injections

Trunk injection with emamectin benzoate (Arbormectin, TREE-age)

Trunk injection with azadirachtin (TreeAzin, Azasol, AzaGuard, etc.)

Ash Biopsies

We are injecting more trees due to emerald ash borer – what is the effect on the tree?

Arboriculture & Urban Forestry 2011. 37(1): 6–12

Tree Wound Responses Following Systemic Insecticide Trunk Injection Treatments in Green Ash (*Fraxinus pennsylvanica* Marsh.) as Determined by Destructive Autopsy

Joseph J. Doccola, David R. Smitley, Terrance W. Davis, John J. Aiken, and Peter M. Wild

Abstract. Trunk injection of systemic insecticides or fungicides is an effective way to manage destructive insects or diseases of trees, but many arborists are still reluctant to inject trees because of the potential for infection by pathogens, structural damage, or adverse effects on tree health. The authors of the following study examined wound responses of green ash (*Fraxinus pennsylvanica* Marsh.) for two years following trunk injection, by sectioning tree trunks to look for evidence of infection associated with injection sites, and by collecting data on annual radial growth and rate of closure around injection sites. All healthy trees successfully compartmentalized injection wounds without any signs of infection, decay, or structural damage. Wound closure was positively correlated with the tree health as measured by annual radial growth.

Key Words. Canopy Dieback; Decline; Emerald Ash Borer; Stem Injection; Systemic Insecticide; Tree Health; Wound Closure; Woundwood.

“wound closure rates are strongly dependent on tree health as expressed by ring growth.”

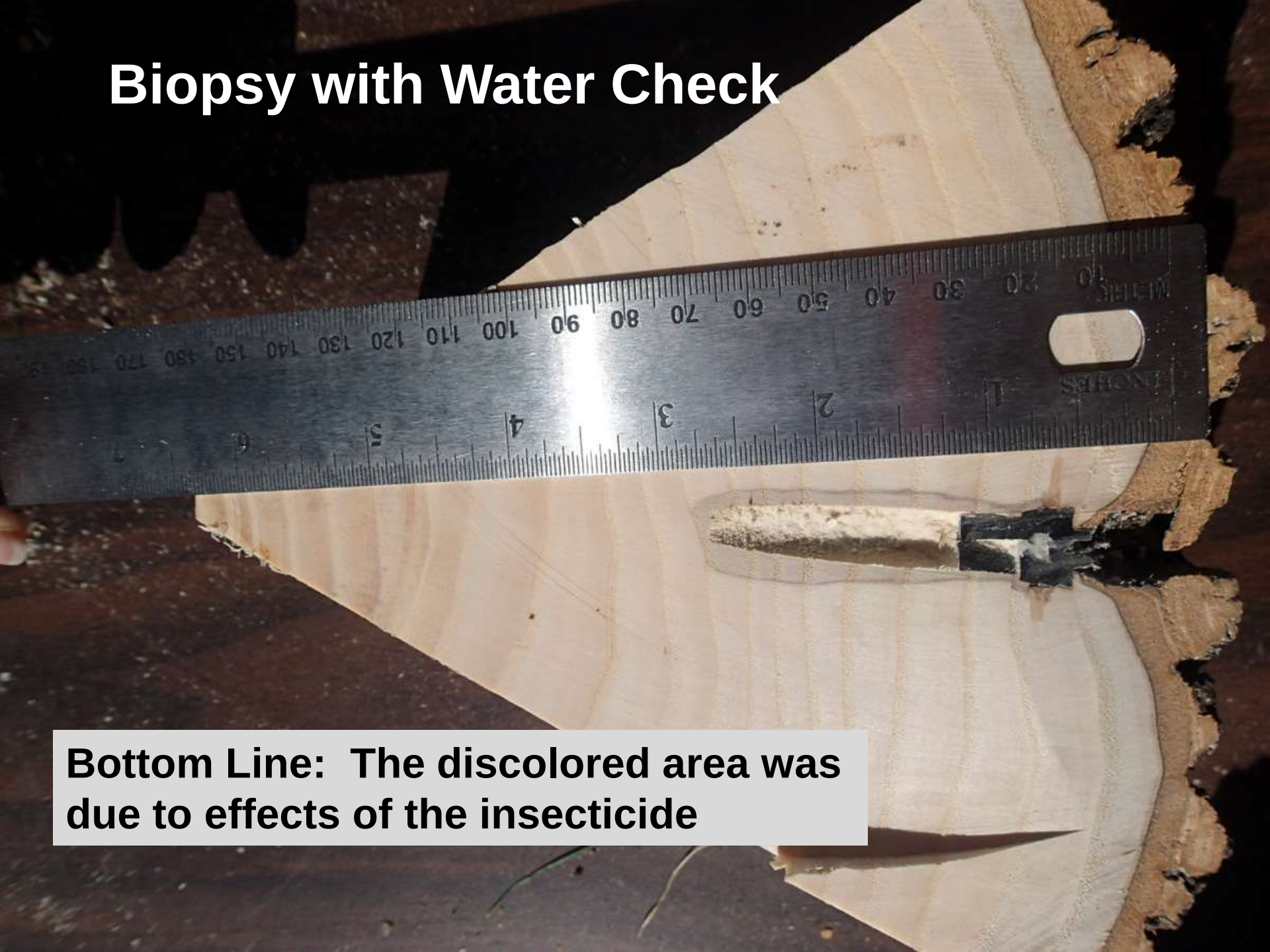
Biopsies of Green Ash Trunk Injected in June 2014

Discoloration is present in areas where the insecticide was injected

Internal discoloration associated with another tree injection

A column of the discoloration typically extended at least a foot above the injection site

Biopsy with Water Check



Bottom Line: The discolored area was due to effects of the insecticide

In the trees dissected in September 2015 good wound closure was noted and there was no evidence of decay.

Ash biopsy showing wound closure after 5 years in Michigan.

Wound closure will differ among trees, largely due to site/health of the tree. And effects of trunk injections could be cumulative.

And when injections cause cracking and produce poorly closing wounds ????

There are several tree injection systems

Emerald Ash Borer – Some Summary Points

- Emerald ash borer is the real deal – a non-native species with a clear track record of being able to cause extreme damage.
  - **The question of its appearance in Idaho is *when it will appear and where, not if it will appear.***
  - **Idaho geography will require human transfers to move it to different regions of the state**

Emerald Ash Borer – Some Summary Points

- Emerald ash borer is the real deal – a non-native species with a clear track record of causing extreme damage.
- Preparations should be made now for its ultimate arrival
  - **Resources are best directed to efforts that *can mitigate effects of EAB***

THIS ASH TREE IS AT RISK OF BEING KILLED BY THE EMERALD ASH BORER

(ACTUAL SIZE ⟶)

If you see dying ash trees in your neighborhood, submit a report to:
WWW.MASSNRC.ORG/PESTS

For more information about emerald ash borer and the damage this invasive pest causes, visit:
WWW.EMERALDASHBORER.INFO

This tree was tagged on _____ by: _____

MDAR

Note on a Definition

Triage - **(in medical use)** ***the assignment of degrees of urgency to wounds or illnesses*** **to decide the order of treatment of a large number of patients or casualties**

TREE-age – **an emamectin benzoate insecticide formulation widely used as a trunk injection to control emerald ash borer and other insects**

Should ash (*Fraxinus*) be recommended for planting in Idaho?

the "Request Planting Permit" box and write the desired tree species down. Pl
has approved the permit.

Here are some Class II species that may be appropriate:

CLASS II

- Mountain Alder/Green Ash
- Raywood Ash/White Ash
- River Birch/Amur Corktree
- Turkish Hazel/Ginkgo
- Hackberry/Honeylocust
- Hornbeam/Horsechestnut
- American Linden/Littleleaf Linden
- Silver Linden/Cucumbertree
- Norway Maple/Sugar Maple
- Japanese Pagodatree/Persimmon
- Sweetgum/Yellowwood

I did see green ash and white ash mentioned here

Medium Trees

Catalpa, Western	*Catalpa speciosa*	40–60		White flowers. Long,
Chokecherry	*Prunus virginiana* 'Canada Red'	20–30		Pyramidal. Foliage sta
Goldenrain Tree	*Koelreuteria paniculata*	30–40		Yellow flowers. Yellow seedpod.
Hawthorn, Downy	*Craetaegus mollis*	20–30		White or red flowers i
Hawthorn, Thornless Cockspur	*Craetaegus crus-galli* var. *inermis*	20–30		Persistent fruit. Red f
Hawthorn, Washington	*Crataegus phaenopyrum*	15–25		Pyramidal form.
Honeylocust, Thornless	*Gleditsia triacanthos* var. *inermis*	35–70		Fast growing. Long b
Locust	*Robinia* 'Idaho'	25–40		Rose-pink, fragrant fl
Maple, Big-tooth	*Acer saccharum* var. *grandidentatum*	25–50		Rounded form.

Not listed here – *Trees for southwestern Idaho landscapes: Selection and Irrigation*

Should ash (*Fraxinus*) be recommended for planting in Idaho?

- Higher risk sites
  - High population of ash in vicinity
    - Includes native ash
  - High visitation by people from EAB-infested areas

Should ash (*Fraxinus*) be recommended for planting in Idaho?

- Lower risk sites
  - Ash is uncommonly planted at present
  - Low visitation by people from EAB-infested areas

Emerald Ash Borer – Some Summary Points

- Emerald ash borer is the real deal – a non-native species with a clear track record of causing extreme damage.
- Preparations should be made now for its ultimate arrival
- Individual trees can be protected from EAB by use of insecticides – but EAB can not be eliminated once established
  - **Controls involve the use of insecticides that will have to be sustained for the desired life of the trees**
  - **Coordinated city plans can reduce the rate of tree loss (SLAM strategies)**

Entertaining visitors from the East this year? – Tell them you will provide all the firewood they need.

This presentation will be posted at the Insect Information Web Site

- Housed at Department of Bioagricultural Sciences and Pest Management
  - Search BSPM CSU
- Click on Outreach
- Insect Information
  - Extension presentations for 2019 posted at bottom of page