

Detecting Emerald Ash Borer in the Western States



Utah MG First Detector Training – September 22, 2017
Whitney Cranshaw, Colorado State University



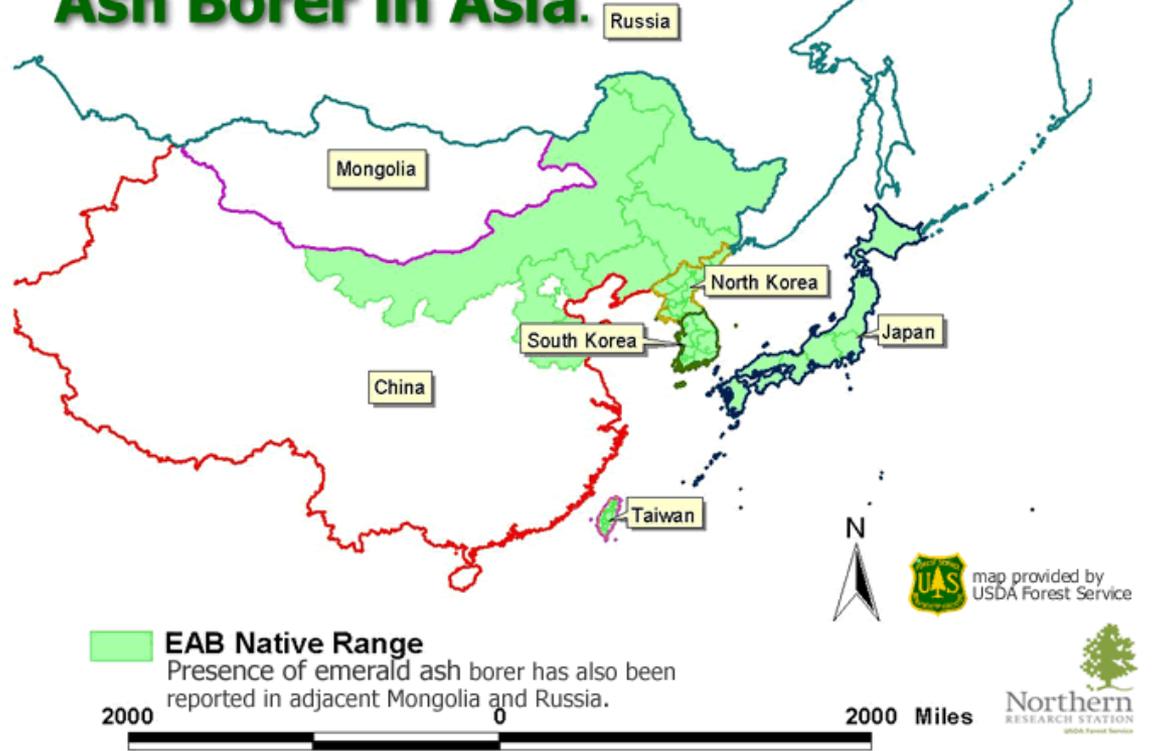
**Emerald ash borer
(EAB) is a green-
colored beetle.....**

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



.....and is native to Asia

Native range of Emerald Ash Borer in Asia.



In its native range emerald ash borer is insignificant as a species, limiting attacks to very stressed trees.

Damage is done by the larvae that tunnel under the bark, girdling the cambium.



UGA5016056



Photo by Edward Czerwinski

Effects of larval tunneling are cumulative, and damage will accelerate as larval populations increase within the tree.



Photograph by Art Wagner



Photograph by MI Department of Agriculture

**Progressive injuries
ultimately lead to tree
death, usually within
five years of a tree
initially being colonized**



How will plant condition affect rate of EAB injury?

More stressed trees will very likely die more rapidly than healthier trees.



Photograph by MI Department of Agriculture

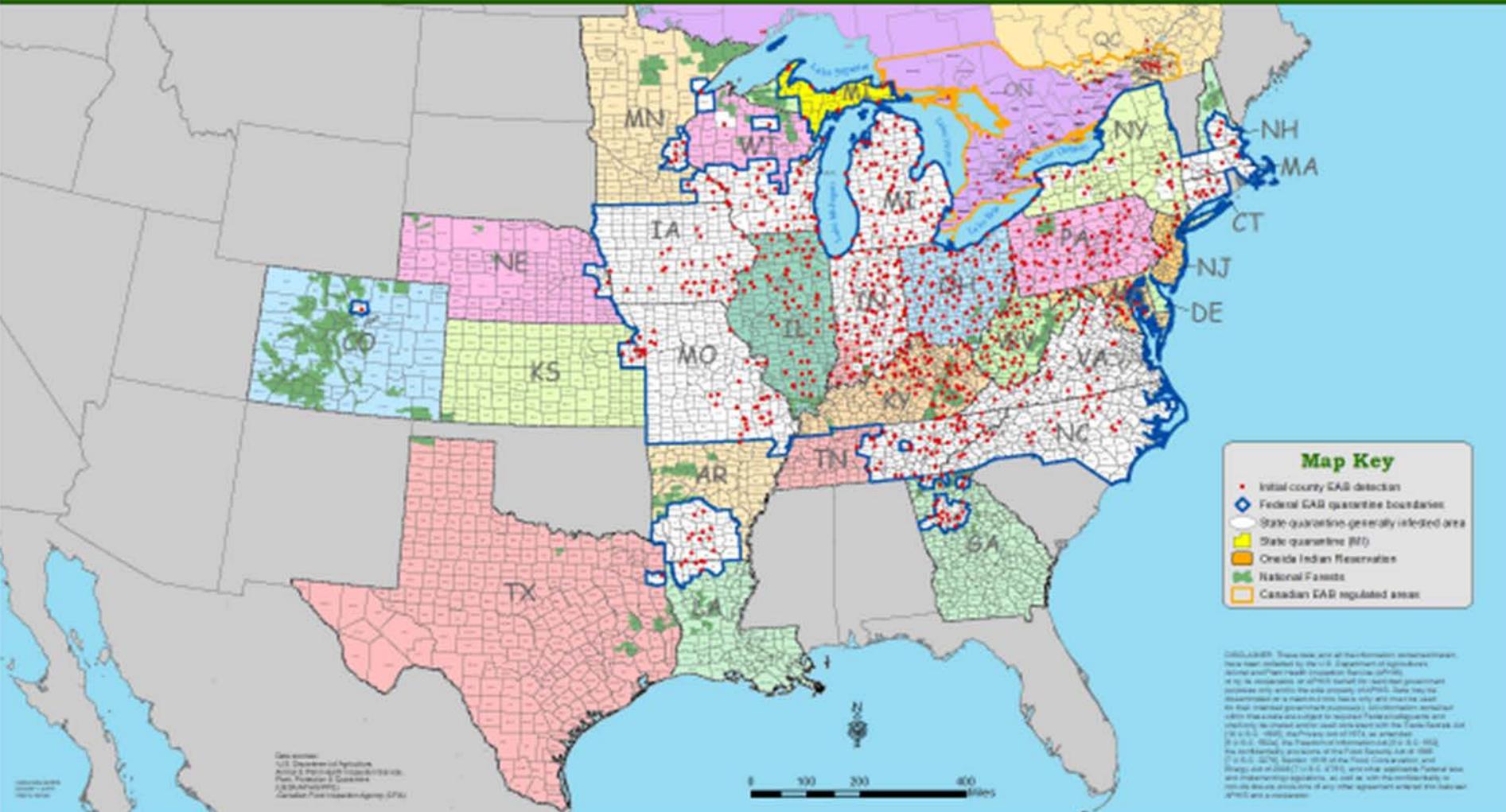
Emerald ash borer has steadily spread to include a large area of the eastern US and Canada



United States
Department of
Agriculture

Cooperative Emerald Ash Borer Project Initial county EAB detections in North America

October 1, 2016



How does Emerald Ash Borer compare to the borer we already have in ash - Lilac/Ash Borer?



Lilac/ash borer,
a clearwing
borer moth



Emerald ash
borer, a metallic
wood borer/
flatheaded borer



UGA9000019





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



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

Photograph by
David Cappaert

Attacks are concentrated at the lower trunk of the tree





UGA5110034



Photograph by Debbie Miller

5449376

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



Chewing of the exit hole is done by the larva of the lilac/ash borer – the adult stage cannot chew.^{gh}



Extruded pupal skin



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



Photograph by Debbie Miller



Photograph by Debbie Miller

After emergence emerald ash borer adults feed on ash foliage for a period and eggs mature.



**EAB likely will
emerge sometime
in midMay.**

Photograph by David Cappaert

**Eggs will be
laid in June
and into July**



Photograph by Dan Herms



Adult stages of the lilac ash borer do not feed on any parts of the ash tree.

Male flying to a pheromone trap

Adults of the lilac/ash borer are present in mid-late spring. Most eggs are generally laid in May through early June.





**Eggs of both species
are laid on the bark of
the host tree**

EAB egg



**Clearwing
borer eggs**



5382317

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

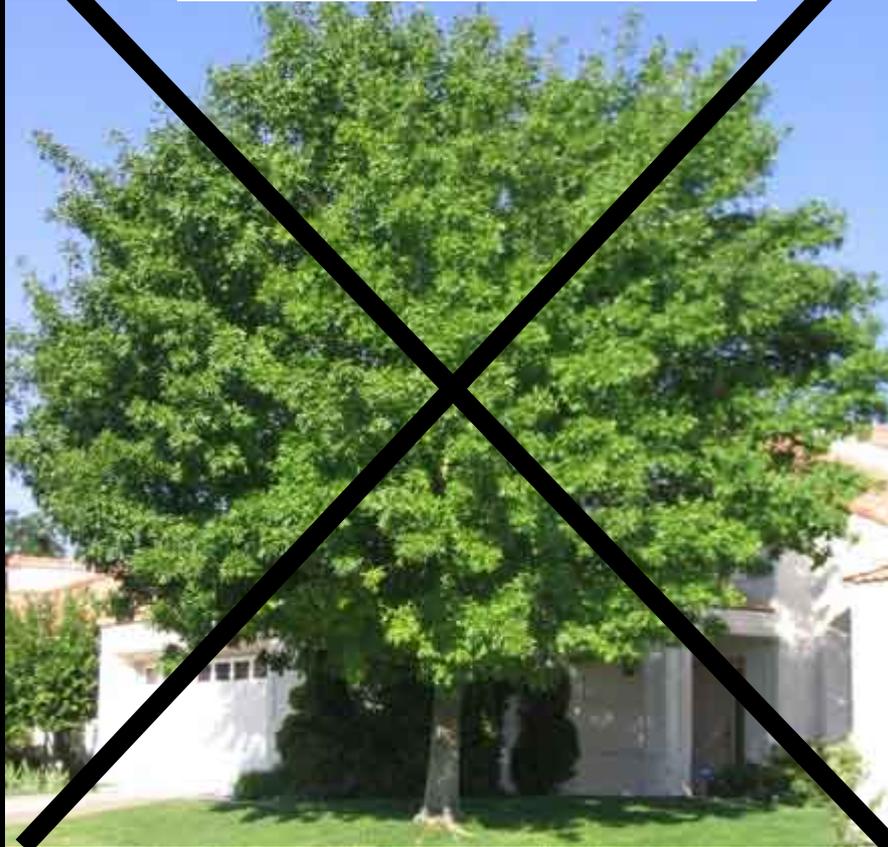


Green ash



White ash

No EAB Resistance



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

NA ash species lack ability to resist EAB



No EAB Resistance

Ash that are native to Utah



Singleleaf ash

Fraxinus anomala

Velvet ash

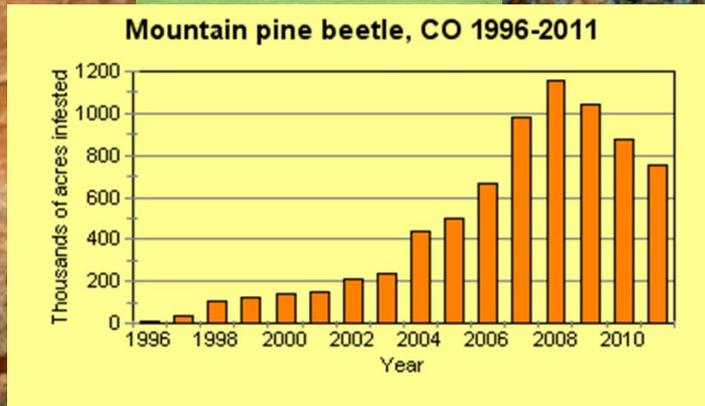
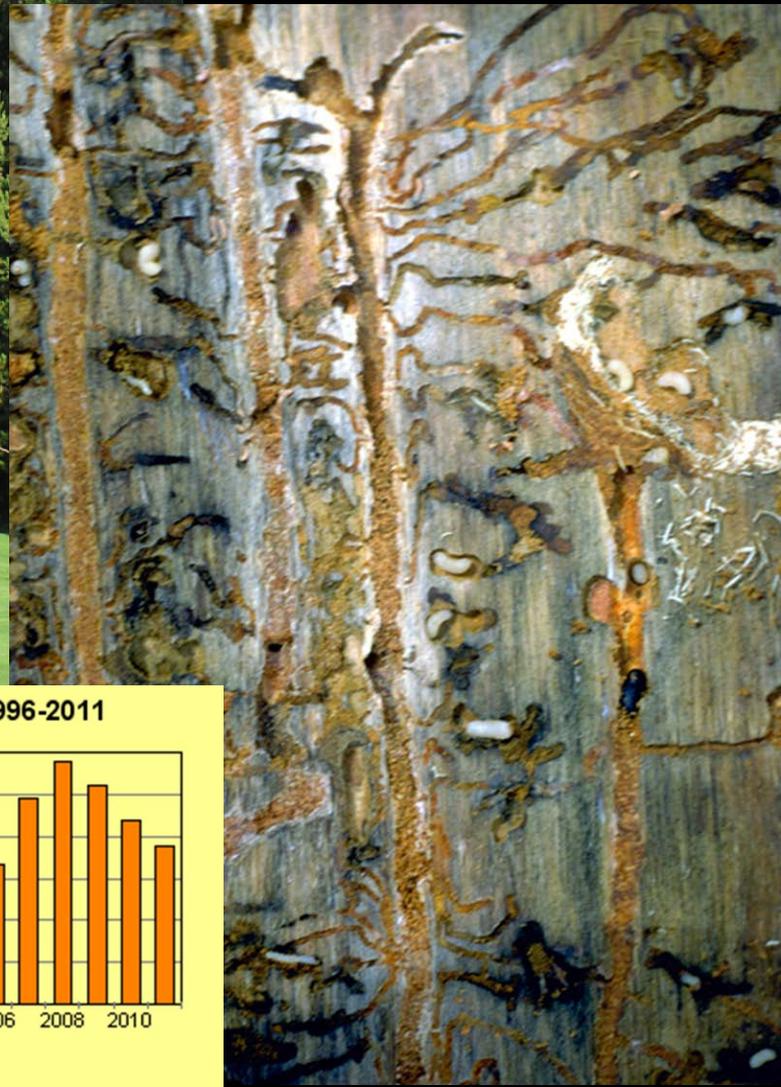
Fraxinus velutina



EAB Will Kill All Unprotected Ash



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

***How did it get to
Colorado?***

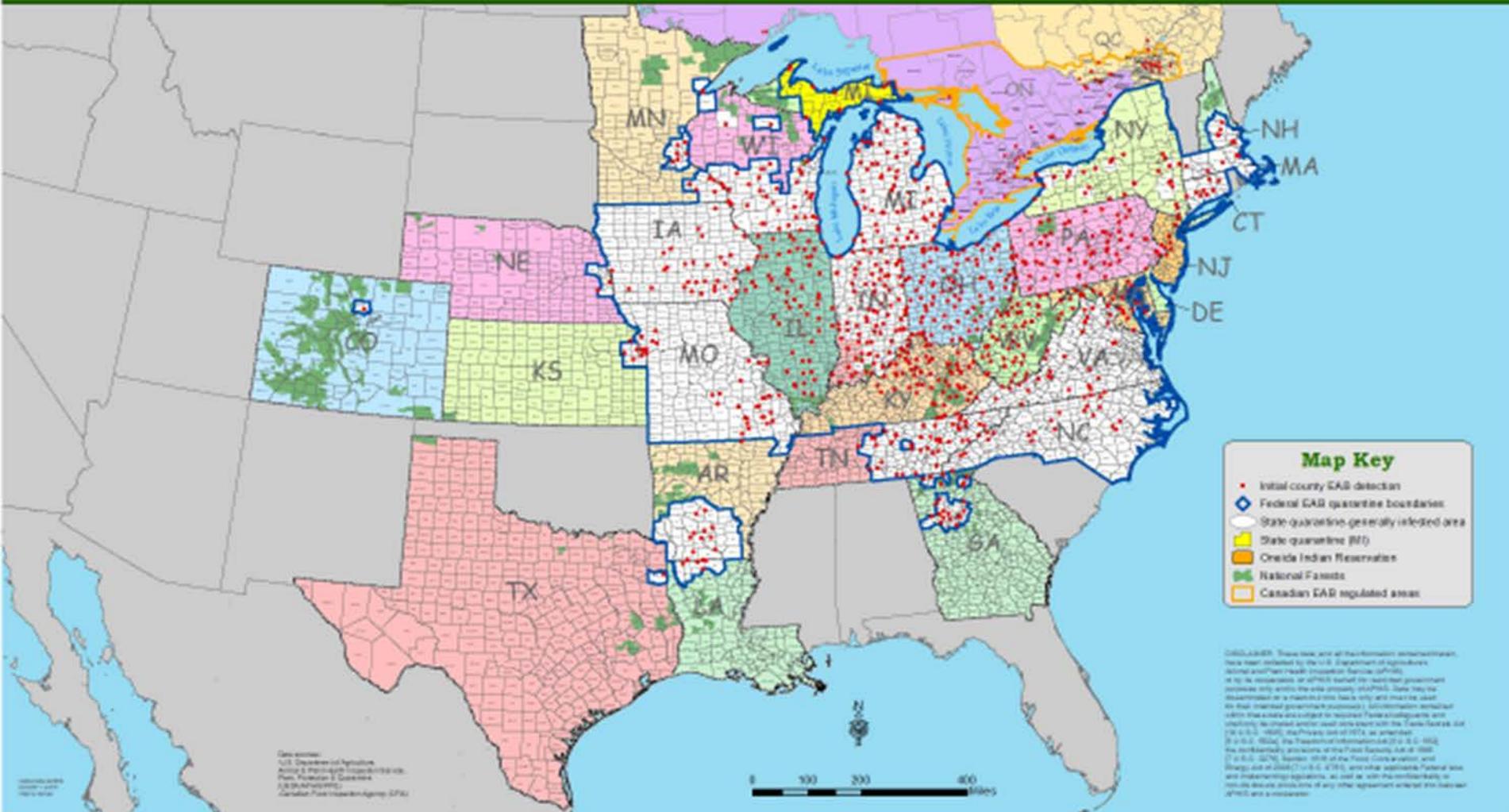
Reported distribution of emerald ash borer as of a year ago



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BOULDER

Area of original EAB infestation in Colorado



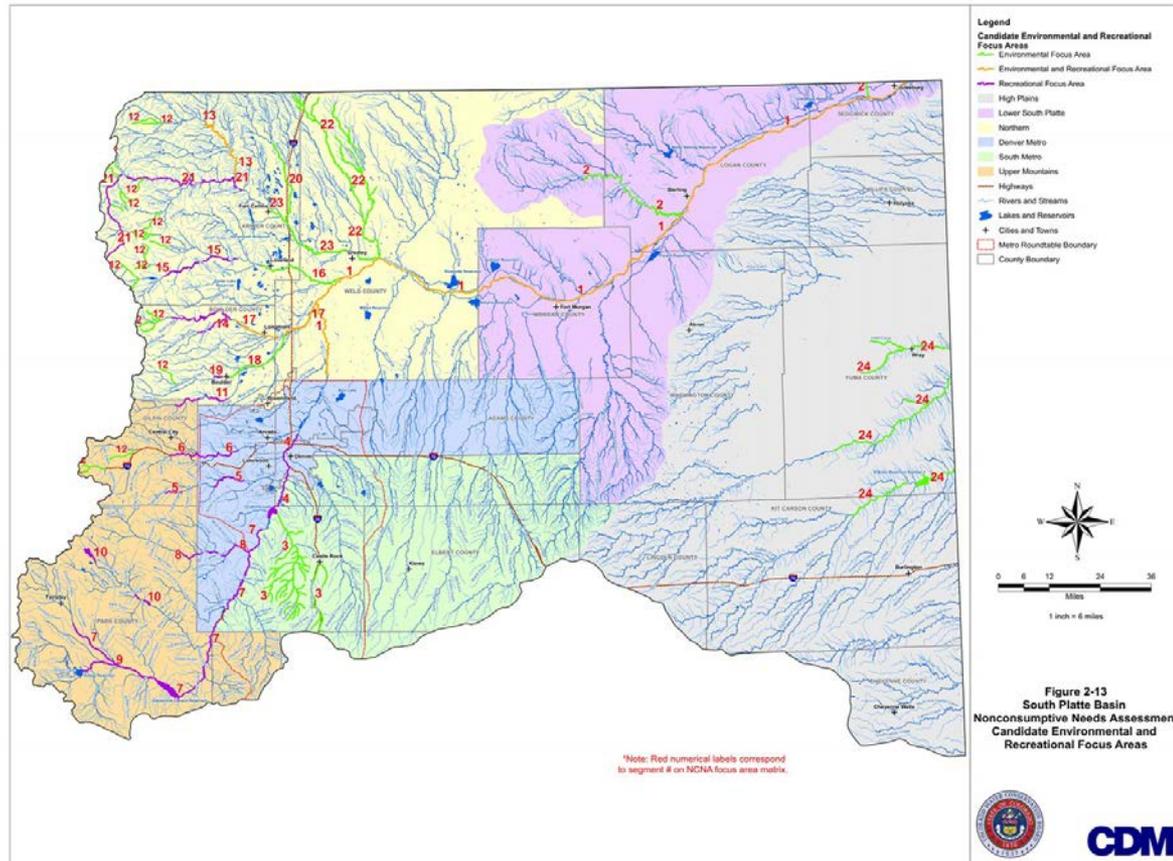


COLORADO

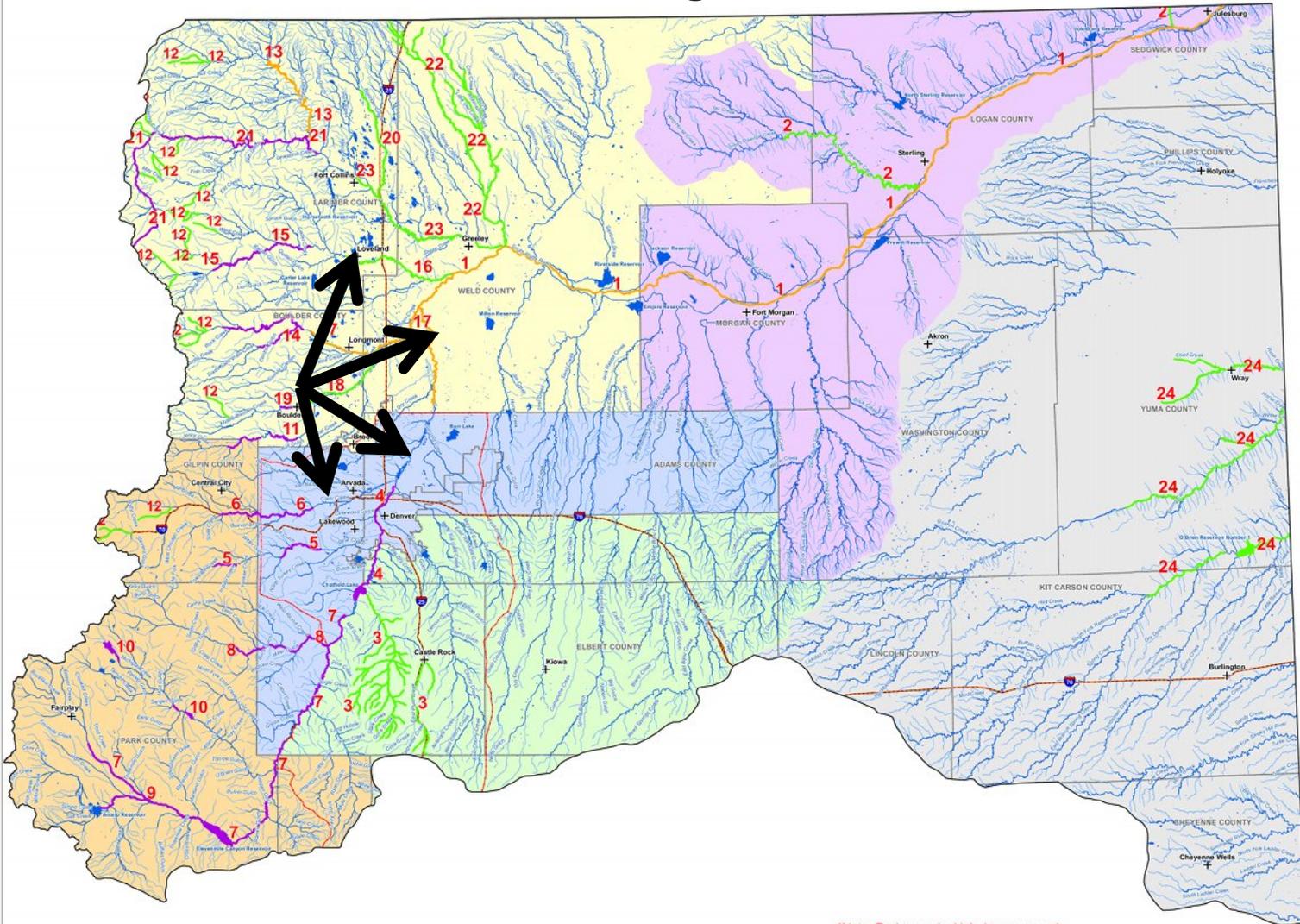


Unlike states to the east, Colorado is highly compartmentalized due to its geography

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



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



*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

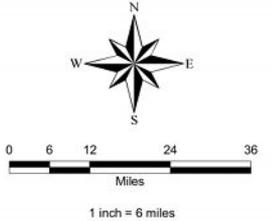
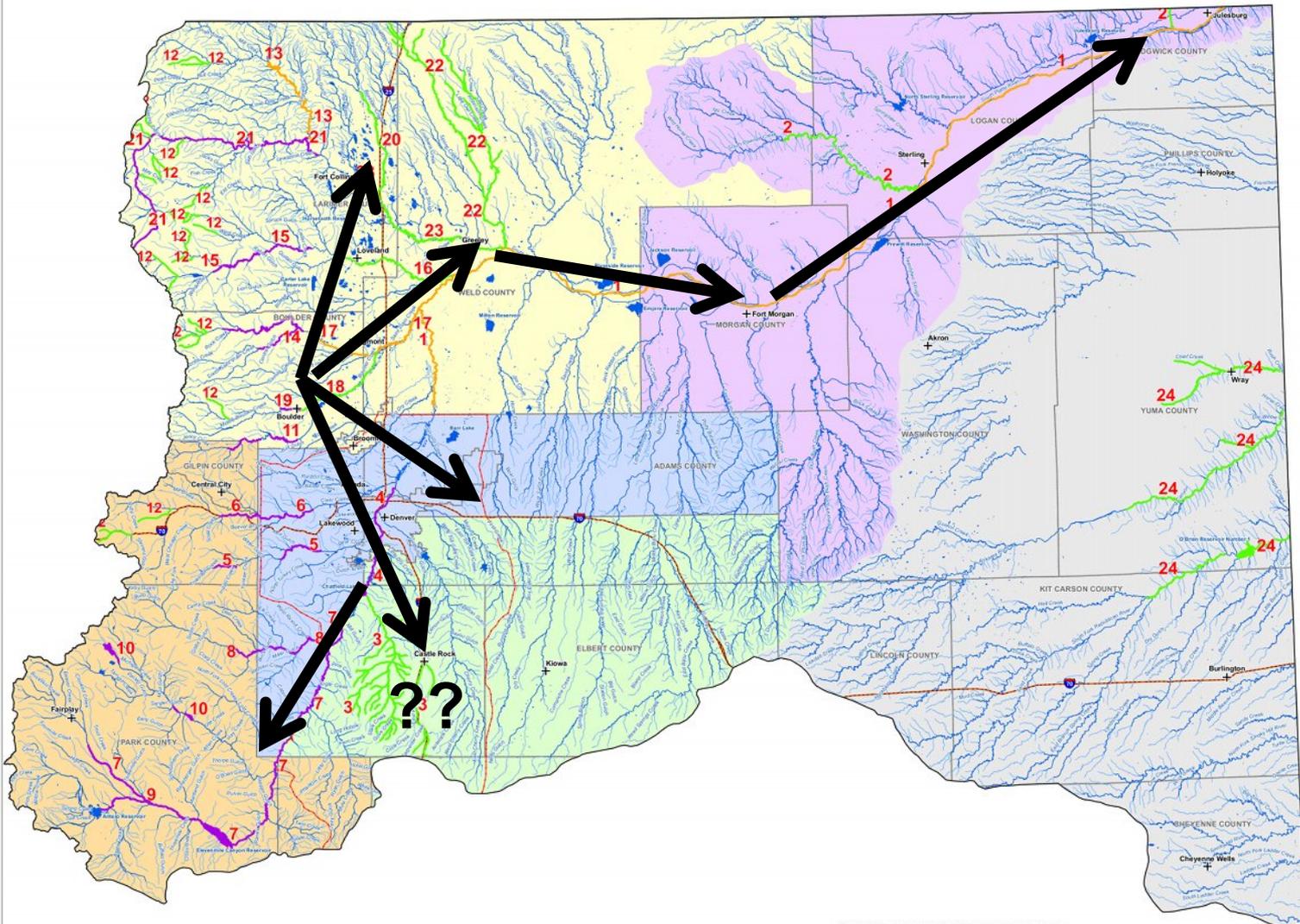


Figure 2-13
South Platte Basin
Nonconsumptive Needs Assessment
Candidate Environmental and Recreational Focus Areas



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



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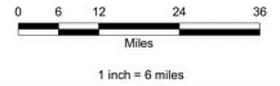
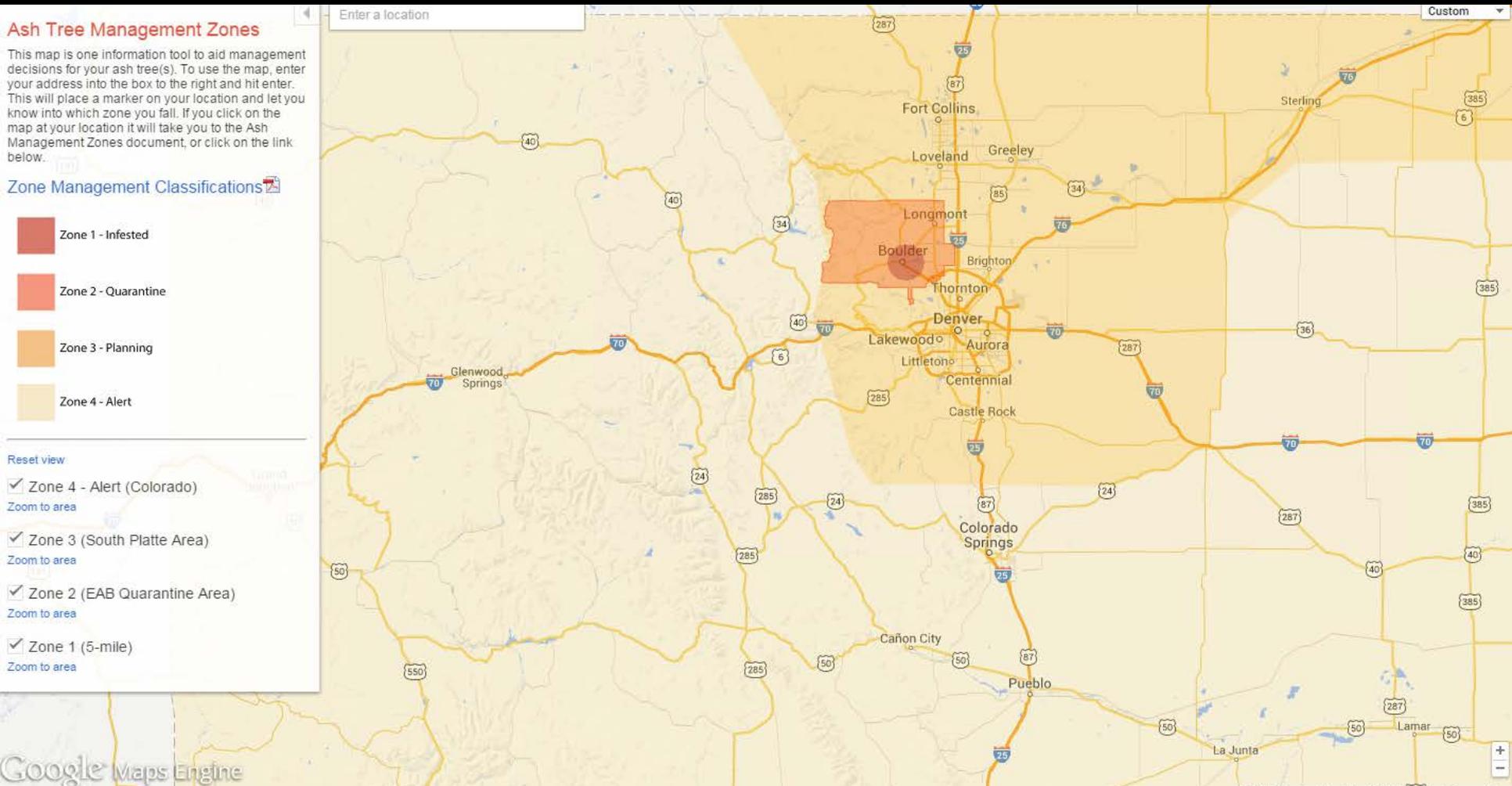


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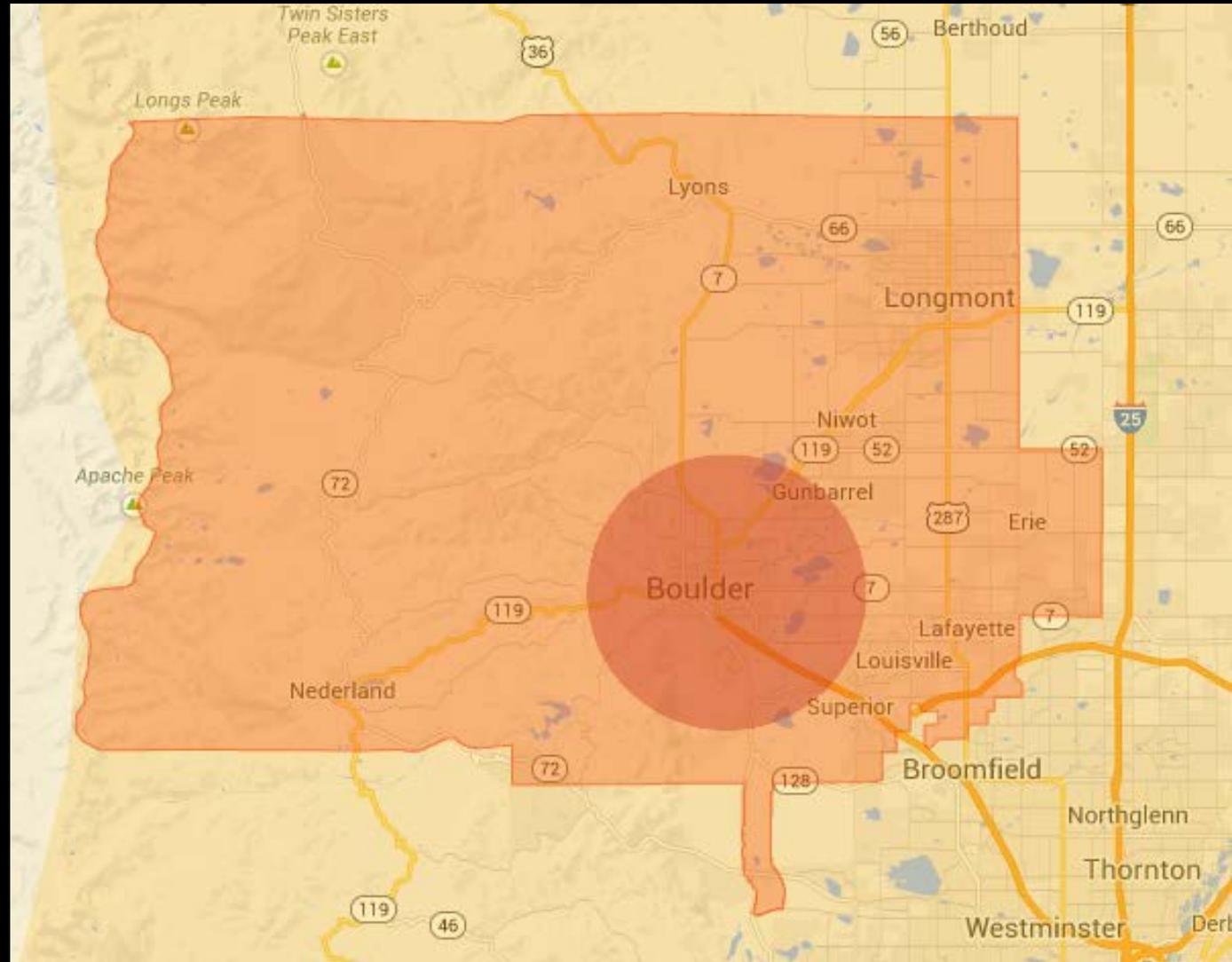


Important Note: Emerald ash borer is an insect that falls under federal quarantine laws.

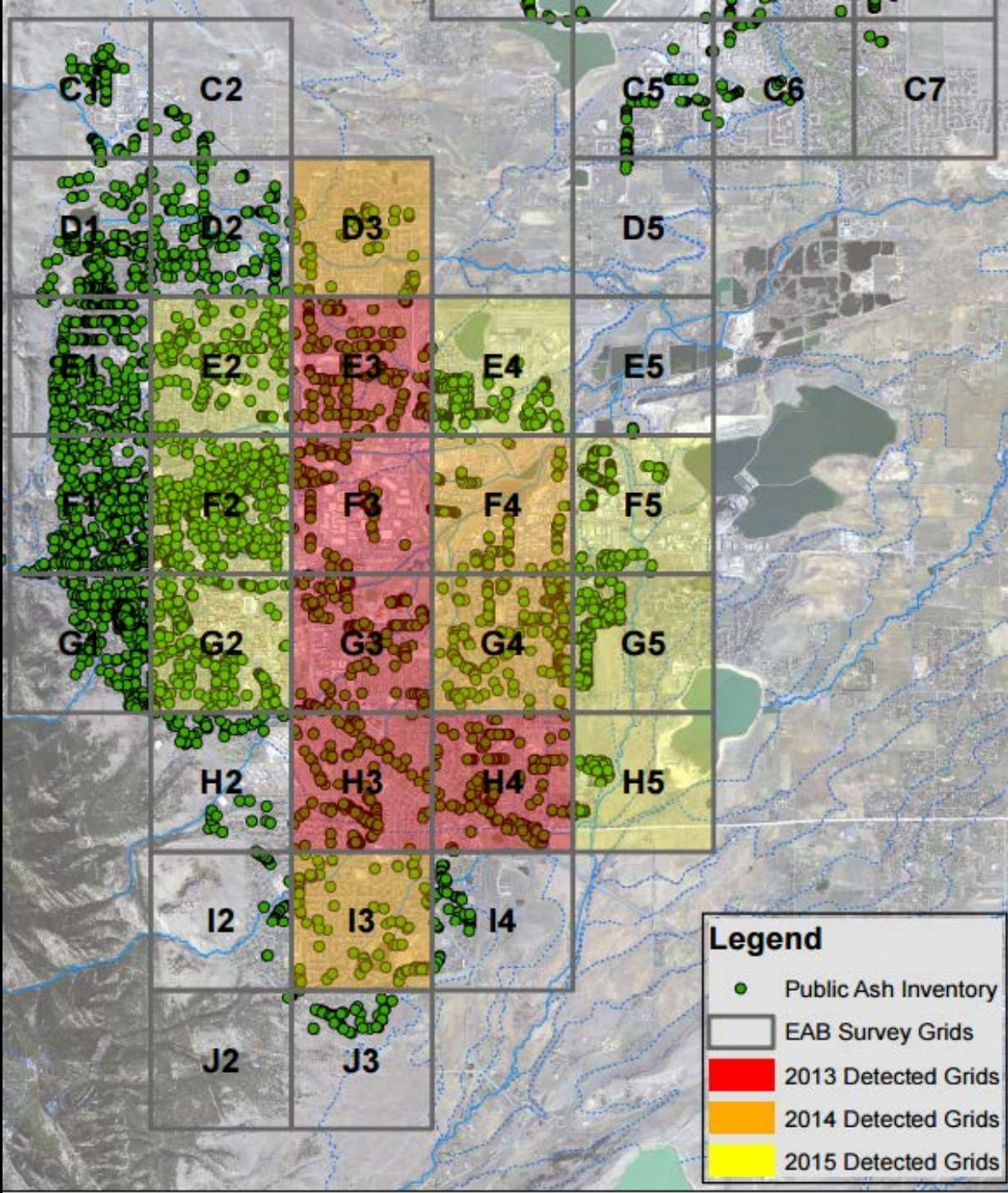


Counties with EAB infestations are subject to restrictions on movement of many wood products outside county borders.

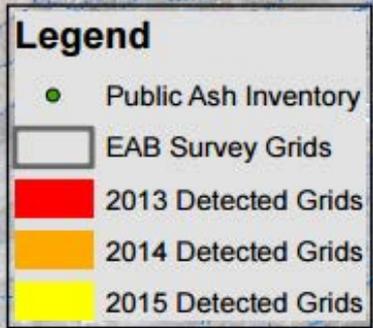
Present EAB quarantine area in Colorado

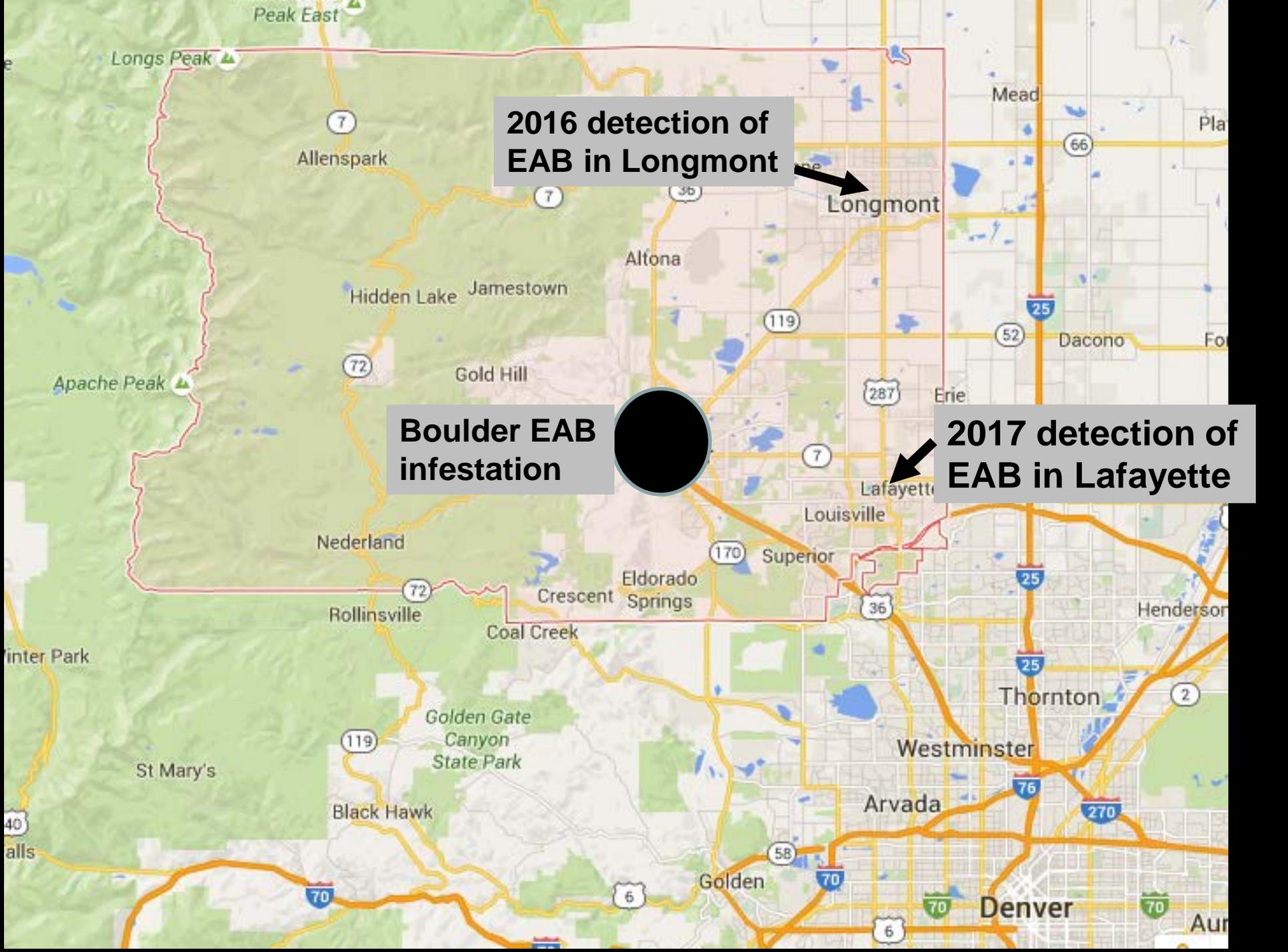


*** Plus some areas of Jefferson, Weld and Larimer Counties that include landfills used by Boulder County**



Areas known to be infested with emerald ash borer in Boulder (original site of Colorado establishment)





2016 detection of EAB in Longmont



Boulder EAB infestation



2017 detection of EAB in Lafayette



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 as predicted in core area of infestation**
 - **Detections have been made in two adjacent communities**

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 - Steady expansion has occurred within the original areas of infestation
 - Tree decline symptoms are advancing as predicted in core area of infestation
 - Detections have been made in two adjacent communities
 - ***Extensive trapping and surveys conducted in 2017 have still not detected EAB anywhere outside Boulder County***

How will EAB spread once established?

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



**EAB likely will
emerge sometime
in mid-late May.**

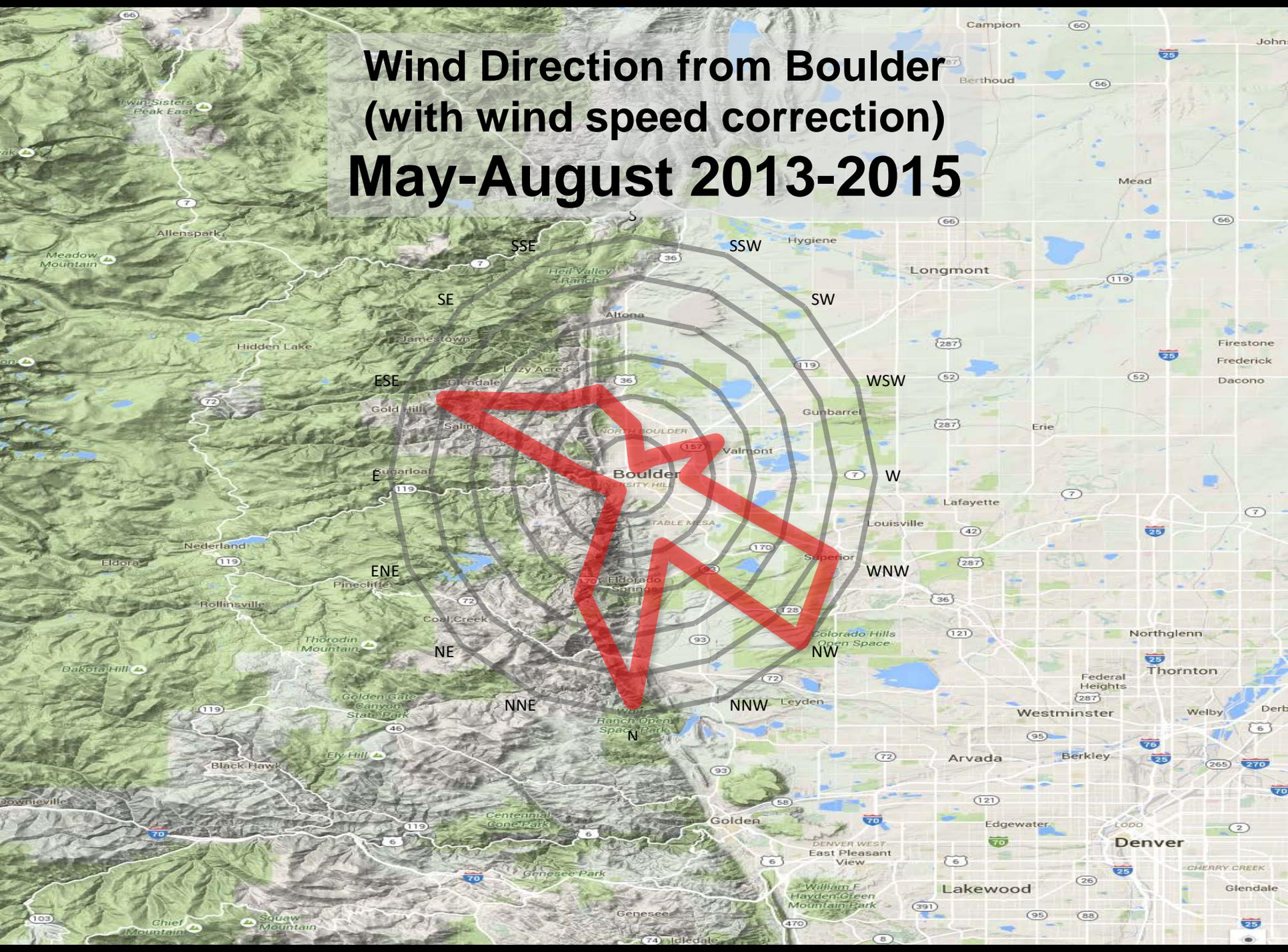
Photograph by David Cappaert

**Most eggs will
be laid in June,
egg laying will
continue
through summer**



Photograph by Dan Herms

Wind Direction from Boulder (with wind speed correction) May-August 2013-2015



How far away is emerald ash borer from your community?



How far away is emerald ash borer from your community?



**One
truckload**

Detecting Emerald Ash Borer



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





0%



10%



20%



30%



40%



50%

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
- ???????

**Possible symptom
of EAB injury –
irregular yellowing
of the foliage**





Leaf size decreases in EAB affected trees

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



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



Look for D-shaped exit holes in ash trees



5449376



Flatheaded appletree borer

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

Detecting Emerald Ash Borer



The presence of the insect is a positive detection

Regional metallic wood borers with some resemblance to EAB



Cypriacus intricata



Buprestis confluenta



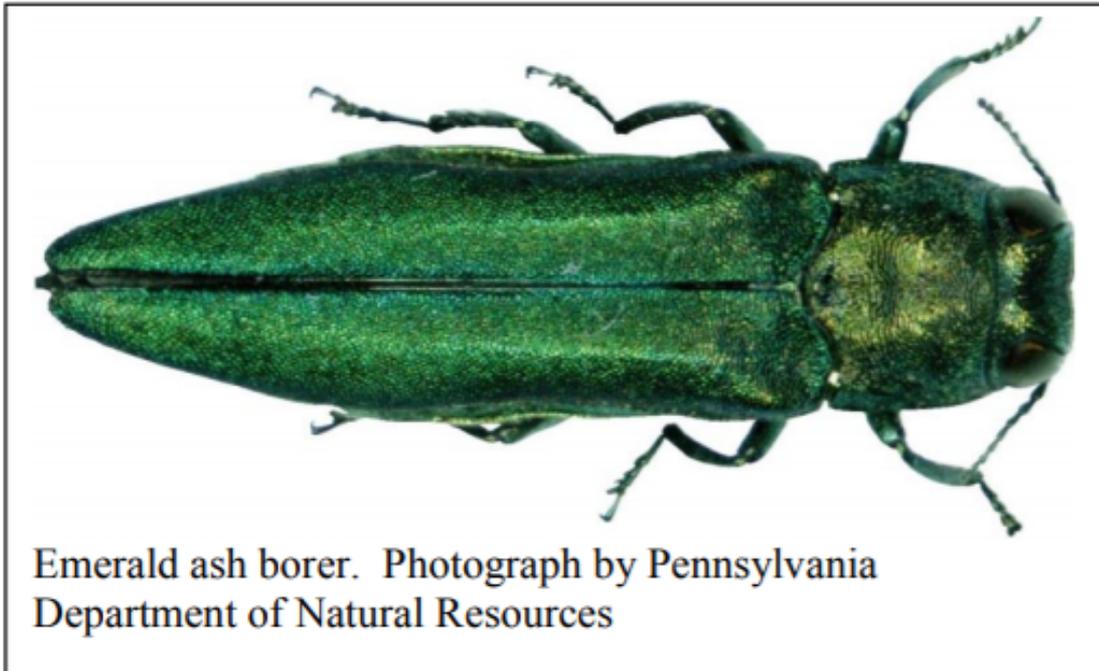
Agrilus cyanescens



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.



Emerald ash borer. Photograph by Pennsylvania Department of Natural Resources

Perhaps the most conspicuous feature is that the emerald ash borer has uniformly green bright, metallic wing covers, sometimes with slight purplish hues. The thorax may be more metallic brown and underneath the wing covers the abdomen is purple. Adults are active between late May to midAugust and almost always they would be found on the leaves or bark of an ash tree.



Many metallic colored beetles that may be mistaken for emerald ash borer



Other wood boring insects can be found in ash trees





Lilac/ash borer





Lilac/Ash Borer







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**



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

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

Lilac/ash borer. The lilac/ash borer (*Podosesia syringae*) is a native insect to North America and the most commonly encountered wood borer found in ash throughout Colorado. It is a type of moth in the “clearwing borer”



Can you control EAB once it gets here?

- How do you define control?

- Will you be able to eliminate it from the state?
- 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 area where ash are common, it will not be possible to eradicate it.**
 - **Ability to detect the distribution of the insect is difficult – it will be more widespread than detection abilities allow**

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.

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- 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.

Main Points About Emerald Ash Borer in Colorado Today

- **Known infestation presently confined to areas within Boulder City limits and a limited areas of Longmont, Lafayette**
 - In time will spread throughout South Platte drainage
- **Treatments are available that can protect individual trees once they first become infested**
 - Each treatment option involves decisions balancing costs, environmental hazards, effectiveness, and ease of application



Control Options for Management of Emerald Ash Borer



Ash Tree Treated
For Emerald Ash Borers

Untreated Ash Tree



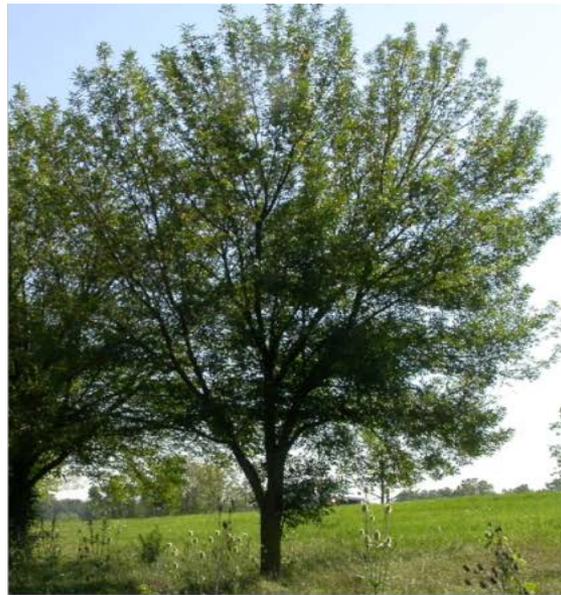
Important note regarding EAB control

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



UGA1460072

Emerald Ash Borer

Insecticides

- Imidacloprid (Merit, Xytect, Criterion, etc.)
 - Soil drench, possible trunk injection
- Dinotefuran (Safari, Zylam)
 - Basal trunk spray, possible soil drench
- Emamectin benzoate (Tree-Age, others)
 - Trunk injection only
- Azadirachtin (Treeazin, Azasol, others)
 - Trunk injection only

Primary method of imidacloprid application – soil applications for root uptake





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



Trunk Injections





Trunk injection with emamectin benzoate (TREE-age)

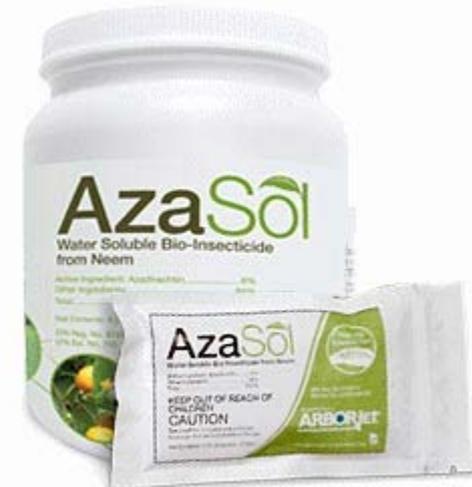




New formulations of emamectin benzoate are coming onto the market. This should decrease costs.

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

OMRI
LISTED
For Organic Use



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 Utah is when it will appear, not if it will appear.***
 - ***Early detection will allow the most effective response for slowing its spread***

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***
 - *Assessing plants at risk*
 - *Promoting alternative species*



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:



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 be recommended for planting in Utah?



recommended shade trees Utah



All

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Images

News

Maps

More

Settings

Tools

About 4,520,000 results (0.70 seconds)

Some **shade trees** you may want to consider include the acer (maple), alnus (alder), betula (birch), carpinus (hornbeam), celtis (hackberry), fagus (beech), fraxinus (ash), plantanus (sycamore), populus (poplar, cottonwood, aspen), salix (willow), tilia (linden), quercus (oak) and ulmus (elm). Aug 18, 2015



Salt Lake City Forestry Website *does not* include ash as a suggested tree

Forestry - Suggested Trees | Salt Lake City - The Official City Government Website - Google Chrome

www.slcgov.com/forestry/trees



WELCOME

Calendars City Directory Info Center How can we help?

Home Online Services Residents Businesses City Life Get Involved Government

Home » Forestry - Suggested Trees



Forestry

- Parks & Public Lands Homepage
- Forestry Home
- ▶ Online Services
- ▼ Suggested Trees
 - Native Trees
 - Small

Forestry - Suggested Trees

Descriptions of Suggested Trees and Suitable Site Features

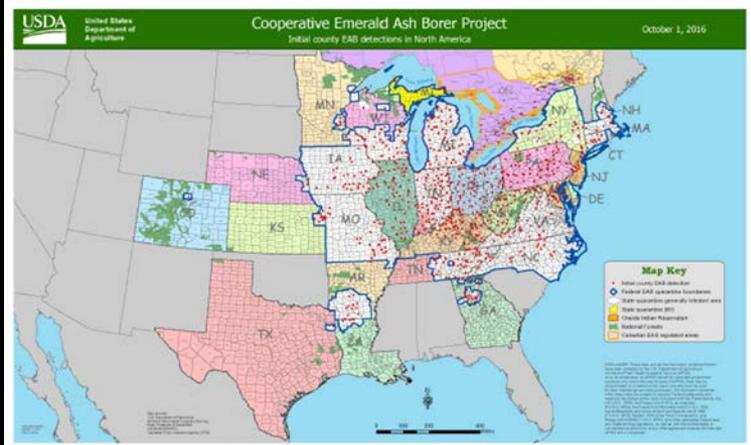
Native Utah Trees

[Click here](#) for a list of trees native to Utah.

Small Tree Species

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**



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

