Japanese Beetle/ Emerald Ash Borer Update

CR 207 Credit

RMRTA 2019 Conference & Trade Show

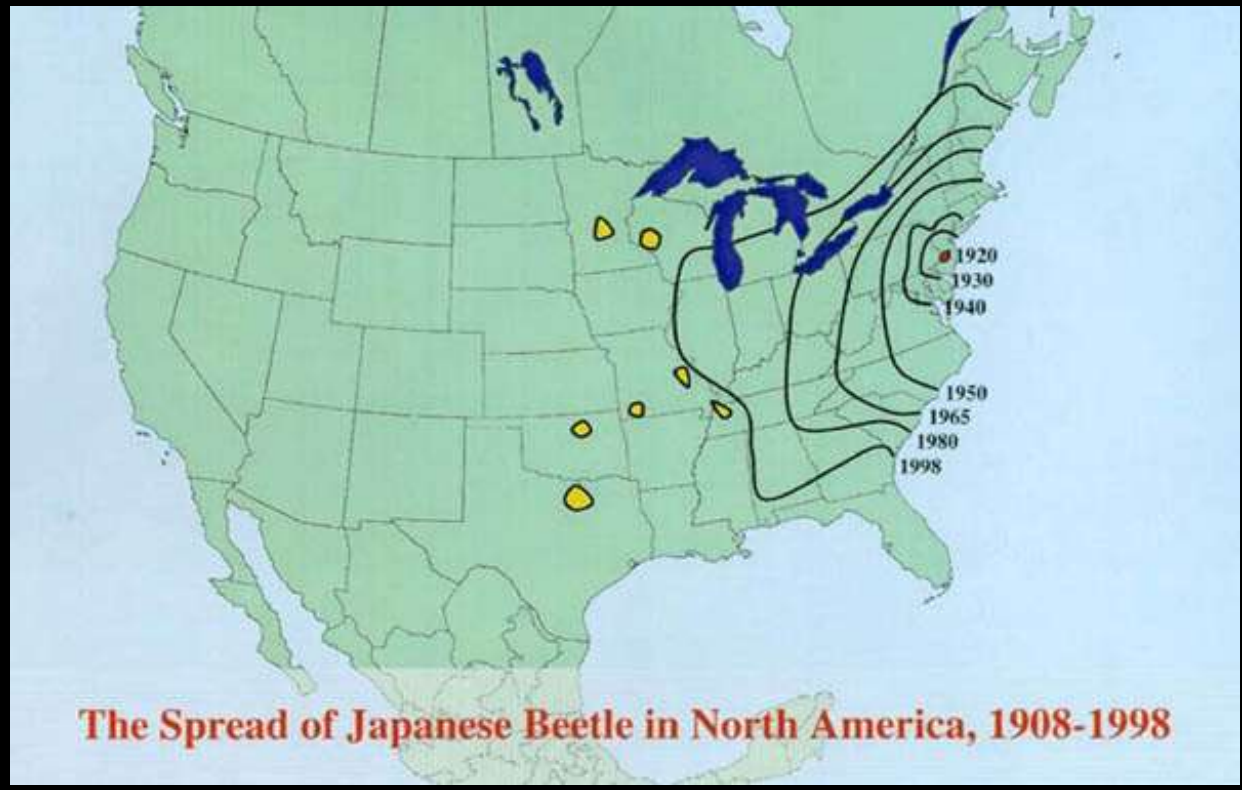
Whitney Cranshaw
Colorado State University

Japanese beetle

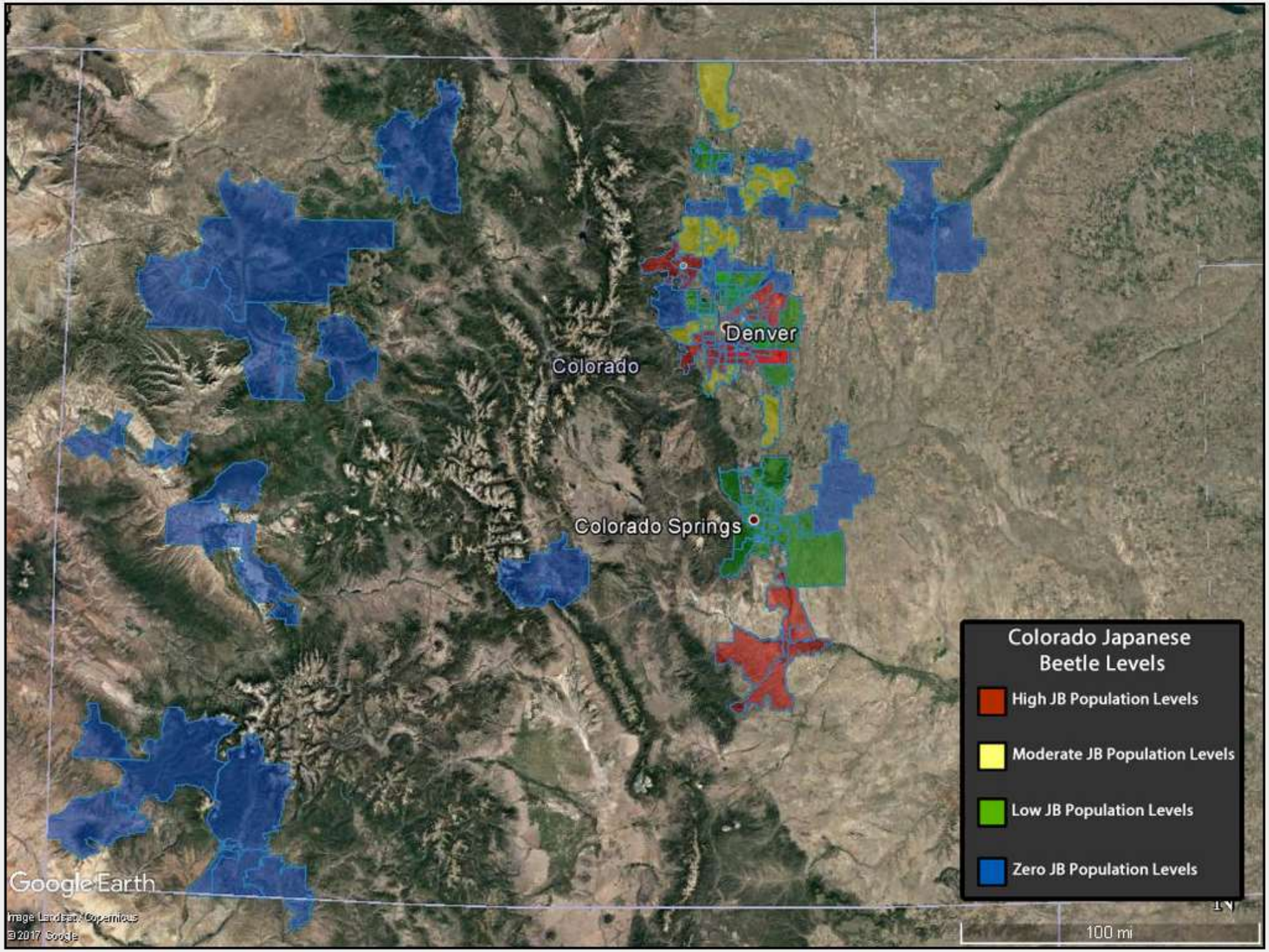
Popillia japonica

Coleoptera: Scarabaeidae

First U.S. detection – **1916** near Riverton, New Jersey

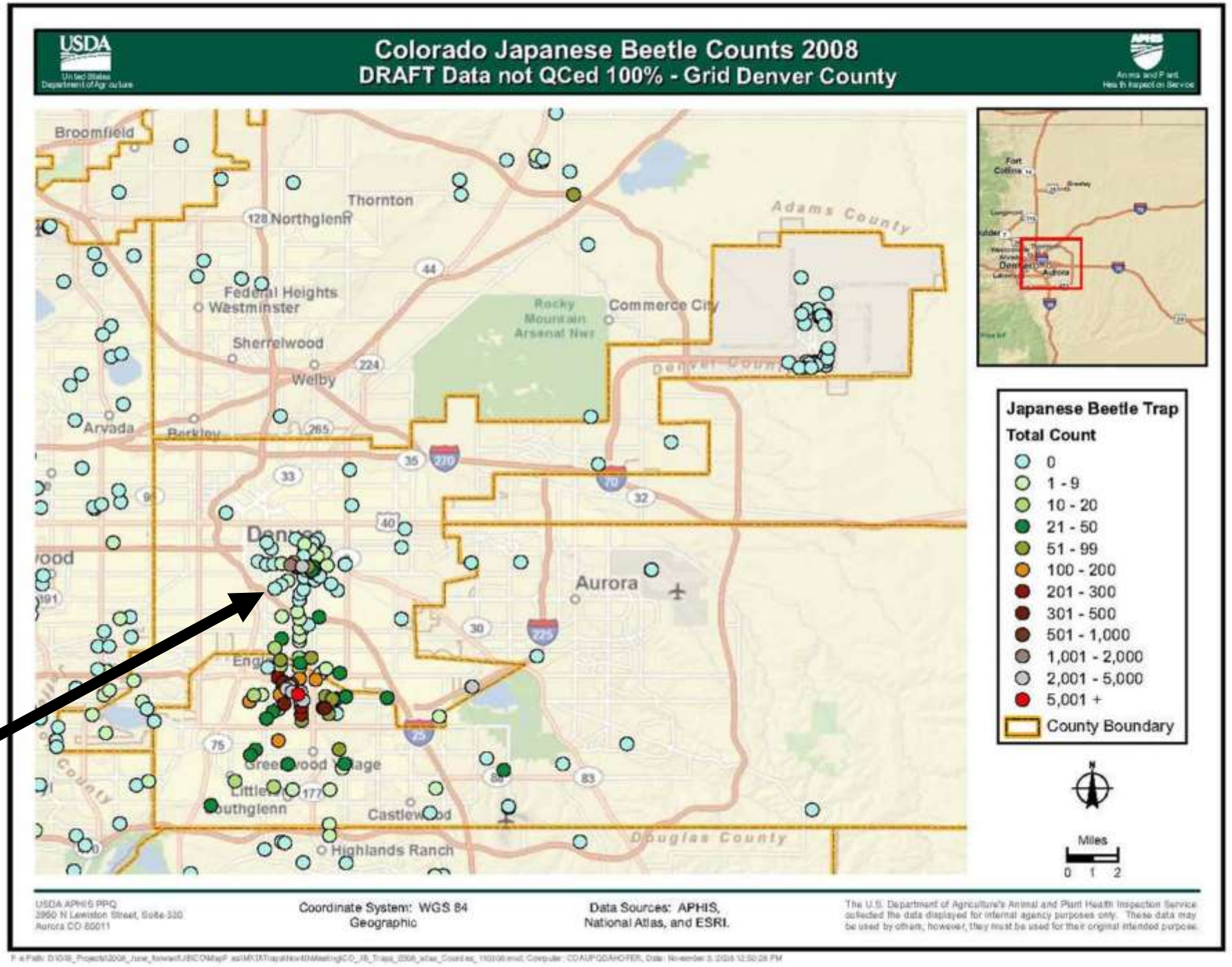


Distribution of Japanese beetle in Colorado based on CDA trapping



This is a map of the JB situation in the Denver metro area ten years ago

An area around here now traps ***more than 2000 per day!***



Japanese beetle damages plants in *two distinct ways*

Japanese beetle adults chew on leaves and flowers **of many plants**

Japanese beetle larvae (grubs) – *among the most damaging turfgrass insects in the US*

Japanese beetle affects yard/garden plants *in two distinct ways*

White grubs prune the roots, producing drought stress symptoms

Skunk digging damage associated with white grub infestations

Managing Japanese beetle in the larval (white grub) stage

Recommendations for Japanese Beetle Larval Control

- Cultural Controls
- Biological Controls
- Chemical Controls

One resource. The Extension Fact Sheet on Japanese Beetle management

COLORADO STATE UNIVERSITY EXTENSION

Japanese Beetle

Fact Sheet No. **5.601** Insect Series | **Home and Garden**

by W. Cranshaw*

For close to a century, the Japanese beetle (*Popillia japonica*) has been one of the most seriously damaging insect pests of both turfgrass and landscape plants over a broad area of the eastern US. Recently, there have become a few permanent, reproducing populations of this insect in some communities along the Front Range of Colorado. At some of these sites high numbers of Japanese beetles now regularly occur and adult beetles are causing significant damage to leaves and flowers of many susceptible landscape plants.

Figure 2. Japanese beetle damage to leaves of grape.

Description of the Japanese Beetle

The adult Japanese beetle has an oval form is about 7/16-inch in length. It body with a dark head and the legs on the thorax are well developed. Normally the body curves into a "C-shape". These features are also typical of other white grubs found in association with turfgrass in Colorado, such as

Quick Facts

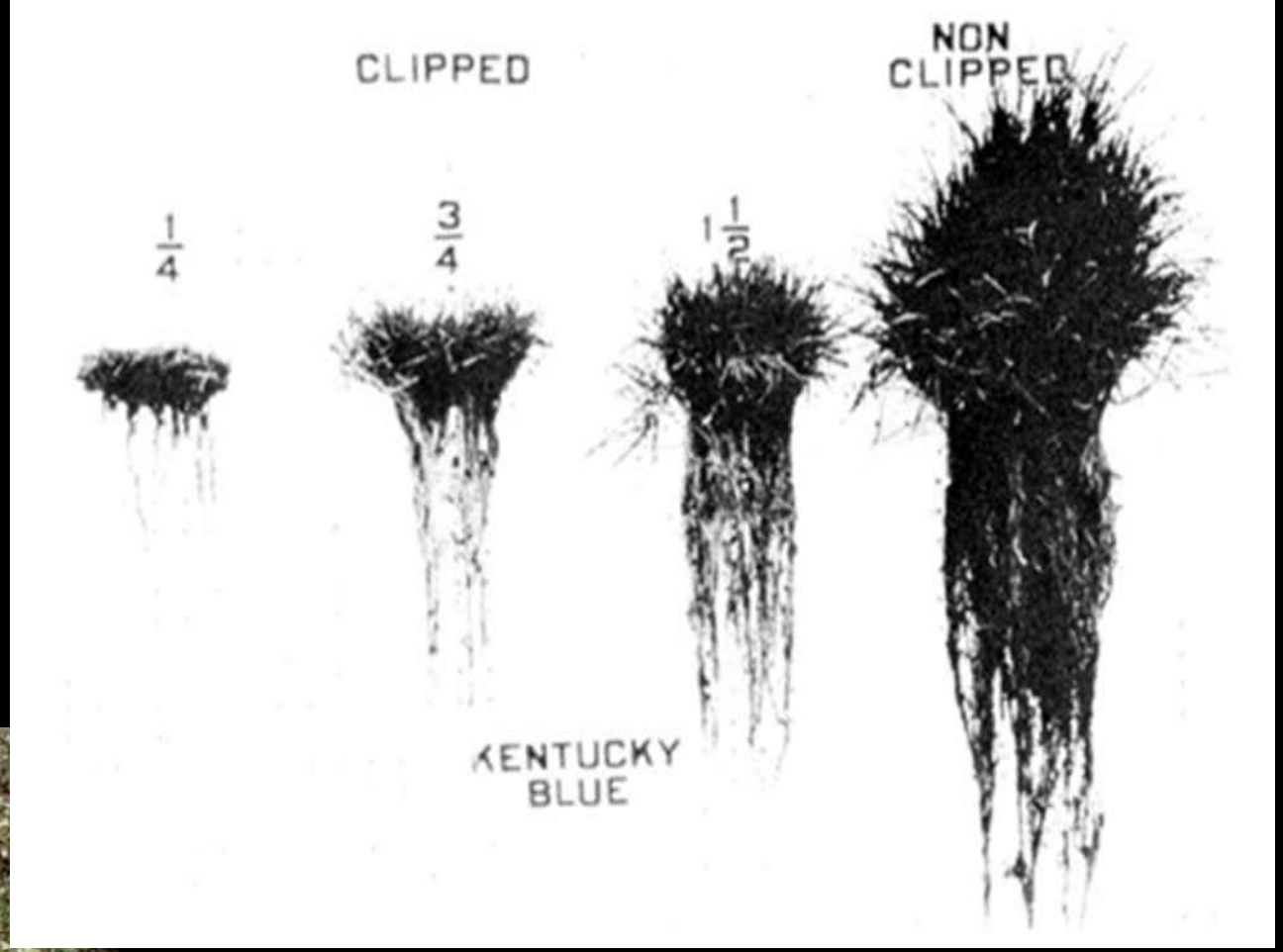
- Japanese beetle adults chew flower blossoms and leaves of many commonly grown plants.
- Japanese beetle larvae are a type of white grub that feeds on the roots of grasses.
- Adults are best controlled by handpicking or by use of certain insecticide sprays.
- Japanese beetle traps can capture many adults have never been shown to reduce damage to nearby plants.
- Japanese beetle larvae can

Recommendations for Japanese Beetle
Larval (Grub) Control

- **Cultural Controls**
  - **Promotion of root growth to tolerate larval feeding**
    - Allowance of some soil drying during critical JB life stages
    - Provision of water to allow tolerance and recovery from root loss

White grubs damage turfgrass by feeding on roots

Grasses with larger root mass are better able to tolerate effects of root pruning insects

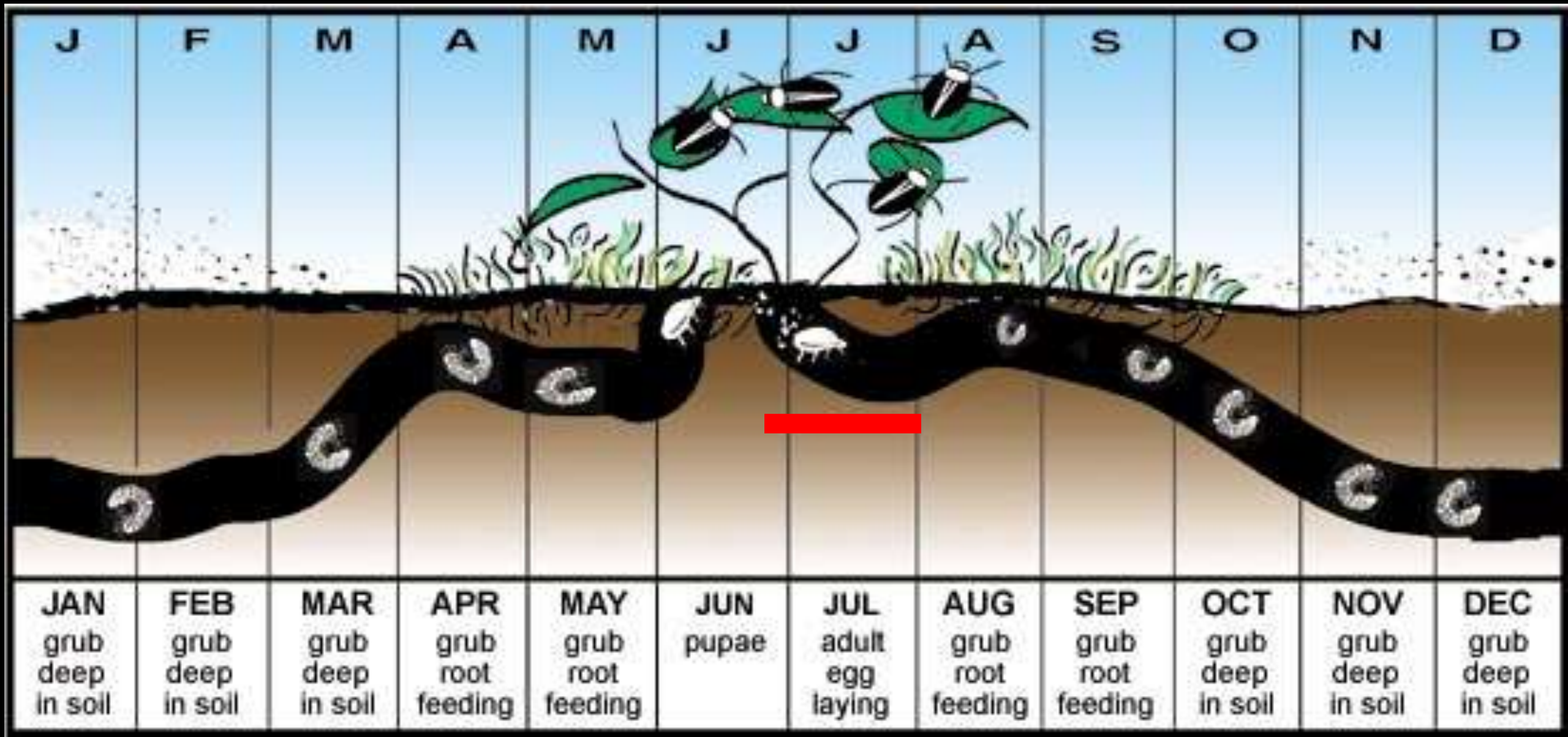


Mowing height greatly affects root mass of turfgrasses!

Recommendations for Japanese Beetle Larval Control

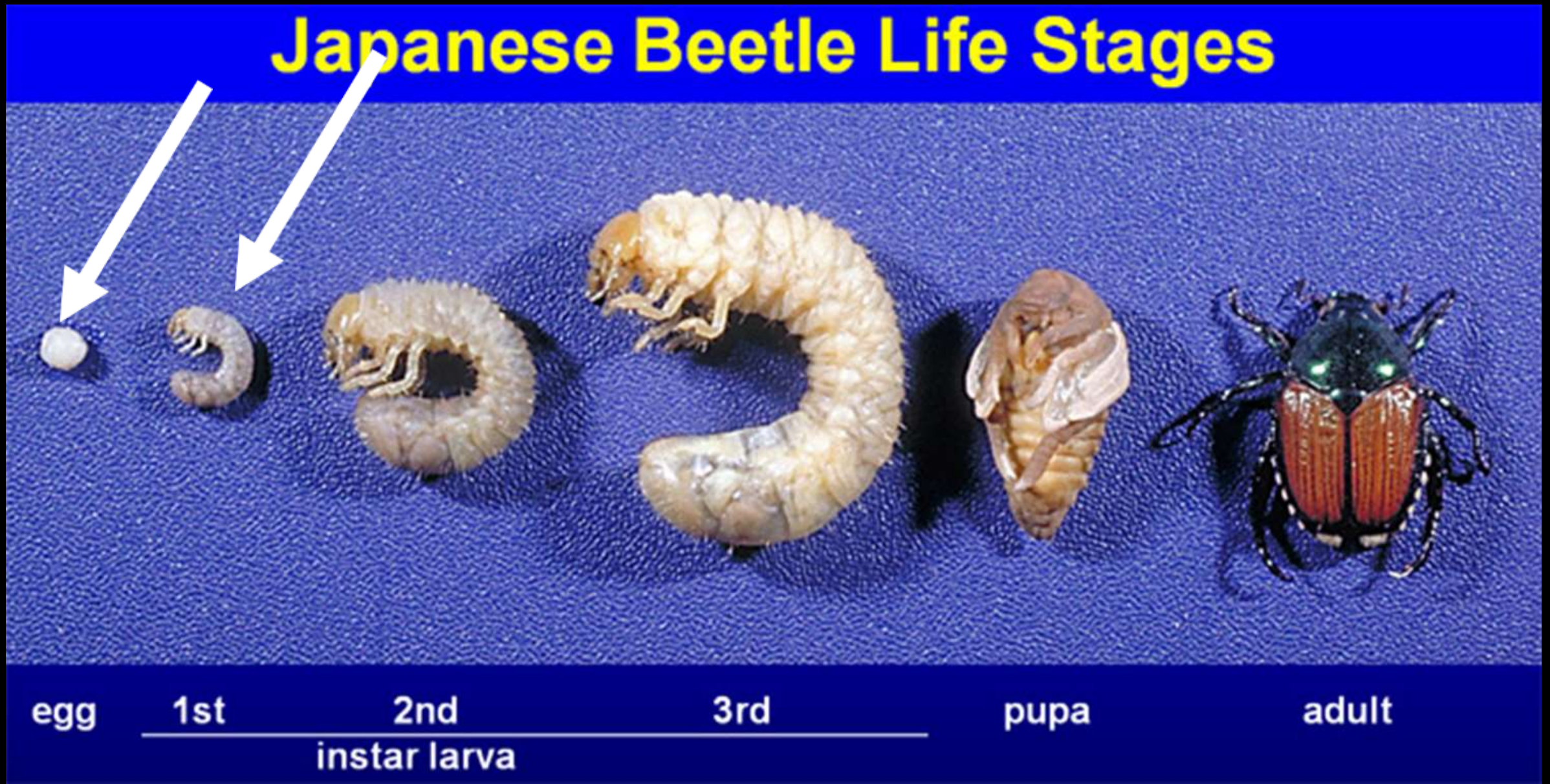
- **Cultural Controls**
  - Promotion of root growth to tolerate larval feeding
  - **Allowance of some soil drying during critical life stages**
  - Provision of water to allow tolerance and recovery from root loss

Generalized Life History Sequence of Japanese Beetle



Adults burrow into the ground to lay eggs. Eggs are only laid in soil that is suitably moist.

Eggs and 1st stage larvae are very sensitive to drying



Recommendations for Japanese Beetle Larval Control

- **Cultural Controls**
  - Promotion of root growth to tolerate larval feeding
  - Allowance of some soil drying during critical JB life stages
  - **Provision of water to allow tolerance of and recovery from root loss**

White Grub Larval Treatments

- **Insecticides**
  - Imidacloprid (Merit, Mallet, Zenith, etc.
  - Clothianidin (Arena)
  - Chlorantraniliprole (Acelepryn, Scott's GrubEx)
  - Trichlorfon (Dylox, Proxol, Bayer Advanced 24 Hour Grub Killer Plus Granules)
- **Biological Controls**
  - *Heterorhabditis* spp. parasitic nematodes
  - *Bacillus thuringiensis* var. *galleriae* (grubGONE!)

Imidacloprid for White Grubs

- **Trade Names(Retail): Merit, Zenith, Mallet, etc.**
- **Neonicotinoid insecticide**
  - **Moves systemically in plants**
  - **Can have hazard to bees exposed through nectar, pollen**
- **Provides control for month or two**
  - **Fairly slow moving in soil and into plants**

Optimal time for application: Early period of egg hatch – ***typically late June through midJuly***

Systemic insecticides and Pollinators – *Should we be concerned about their use on turfgrass?*

A key risk to pollinators when using insecticides on turfgrass

Application to flowering weeds

Mowing before application >greatly< decreases hazard to pollinators!

Chlorantraniliprole for White Grubs

- Trade Names: **Acelepryn, GrubEx**
- Anthranilic diamide insecticide
  - Limited systemic activity
  - **Very low hazard to bees**
- Relatively slow acting
- Provides control for months

Optimal time for application: Early period of egg hatch – ***typically mid-late June through midJuly***

Recommendations for Japanese Beetle Larval Control

- Cultural Controls
- Chemical Controls
- **Biological Controls**
  - Insect parasitic nematodes (*Heterorhabditis* spp.)
  - *Bacillus thuringiensis* var. *galleriae*
  - Milky spore

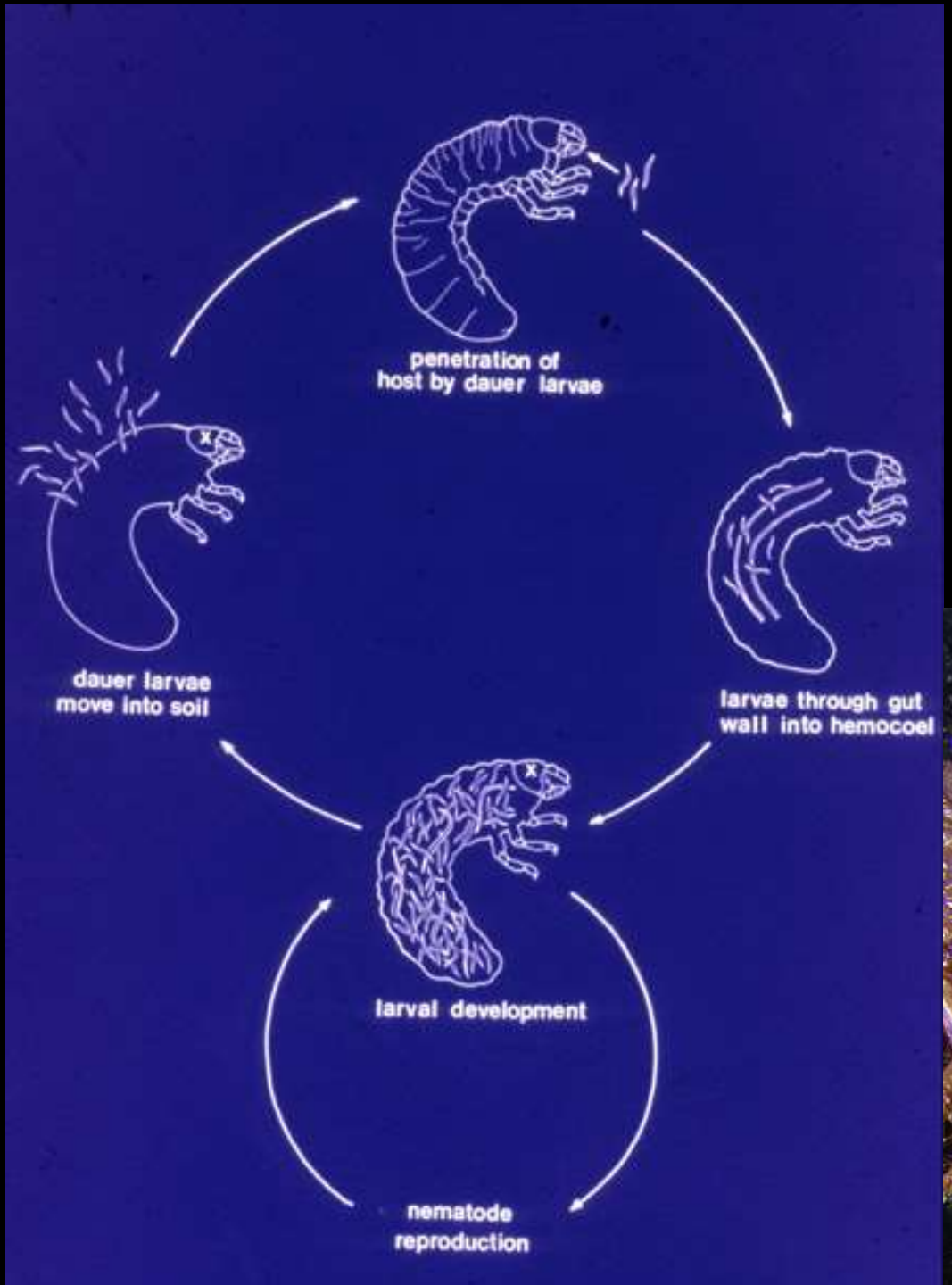
Insect Parasitic Nematodes (“Beneficial Nematodes”, “Predator Nematodes”)

Photograph courtesy of Peggy Greb

Nematodes enter insects through natural openings

Heterorhabditis species

nematodes can penetrate directly through the body wall



Insect parasitic nematodes enter a host insect and introduce bacteria (*Xenorhabdus* spp.)

The bacteria kill the insect

The nematodes eat the bacteria and the decomposed insect

Grubs turn a reddish color when killed by *Heterorhabditis* nematodes

White Grub Larval Treatments

- **Imidacloprid (Hi-Yield Insect & Grub Control, Hi-Yield Grub Control II, Bayer Advance Season Long Grub Control, Merit, Zenith, Mallet, etc.)**
- **Chlorantraniliprole (Acelepryn, Scott's Grub-Ex)**
- ***Heterorhabditis* spp. parasitic nematodes**
- ***Bacillus thuringiensis* var. *galleriae*/Btg (grubGONE!)**

New biological control for Japanese beetle - *and other grubs?*

BTG - *Bacillus thuringiensis* var. *galleriae*

Perhaps best niche for BTG is to control adults?

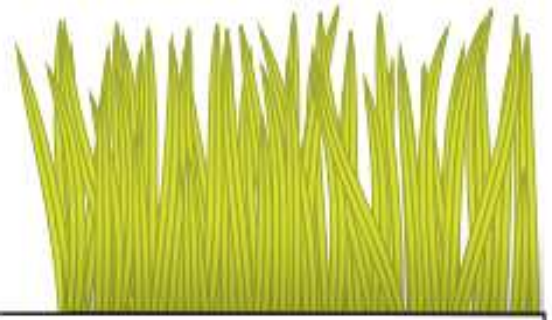
grubGONE!® G

BIOLOGICAL INSECT CONTROL

Biological Insecticide Granule Controls Annual White Grubs in Turf and Ornamentals

ACTIVE INGREDIENT: Bacillus thuringiensis subsp. galleriae, Strain SDS-502 fermentation solids, spores, and insecticidal toxins* ..... 9.0% w/w
OTHER INGREDIENTS: ..... 91.0% w/w
TOTAL: ..... 100.0% w/w

*Contains a minimum of 1 x 10^{10} CFU per gram.



KEEP OUT OF REACH OF CHILDREN

CAUTION: See side/back panel for additional precautionary statements.

EPA Reg No.: 88347-2
EPA Est. No.: 9198-OH-1, 9198-OH-2

FIRST AID	
If on skin or clothing:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
If inhaled:	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. • Call a poison control center or doctor for further treatment advice.
If swallowed:	• Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to by a poison control center or doctor. • Do not give anything by mouth to an unconscious person.

HOT LINE NUMBER

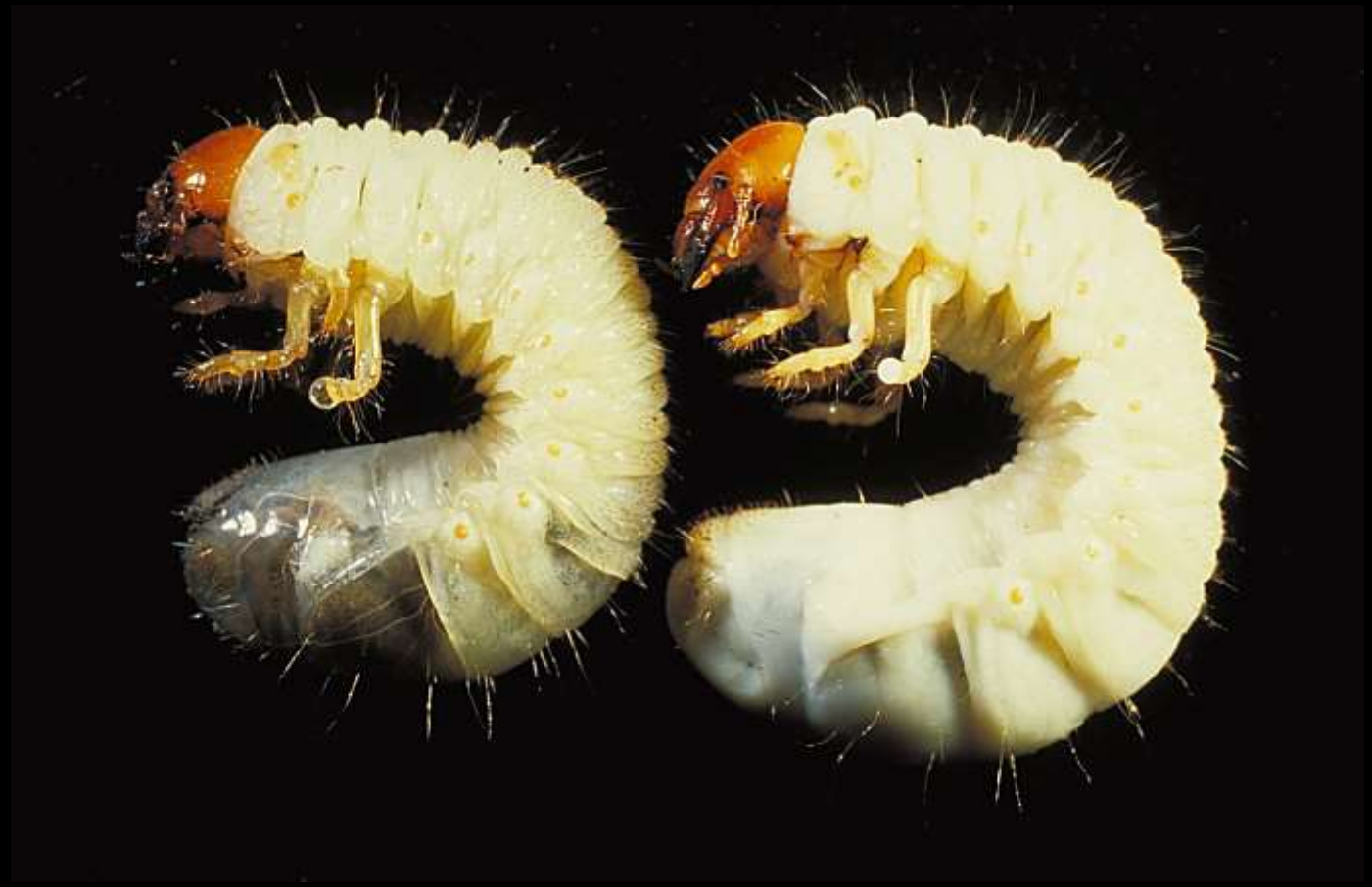
Have the product container or label with you when calling a poison control center or doctor, or when going for treatment. For emergency information concerning this product, call the National Pesticide Information Center (NPIC) at 1-800-858-7378 seven days a week, 6:30 am to 4:30 pm. Pacific Time (NPIC website: www.npic.orst.edu). During other times, call your poison control center at 1-800-222-1222.

Manufactured for:
Phyllom BioProducts

made in USA

Phyllom BioProducts Corp.
484 Lake Park Ave #23
Oakland, CA 94610
Tel: 650.322.5000
Email: products@phyllom.com

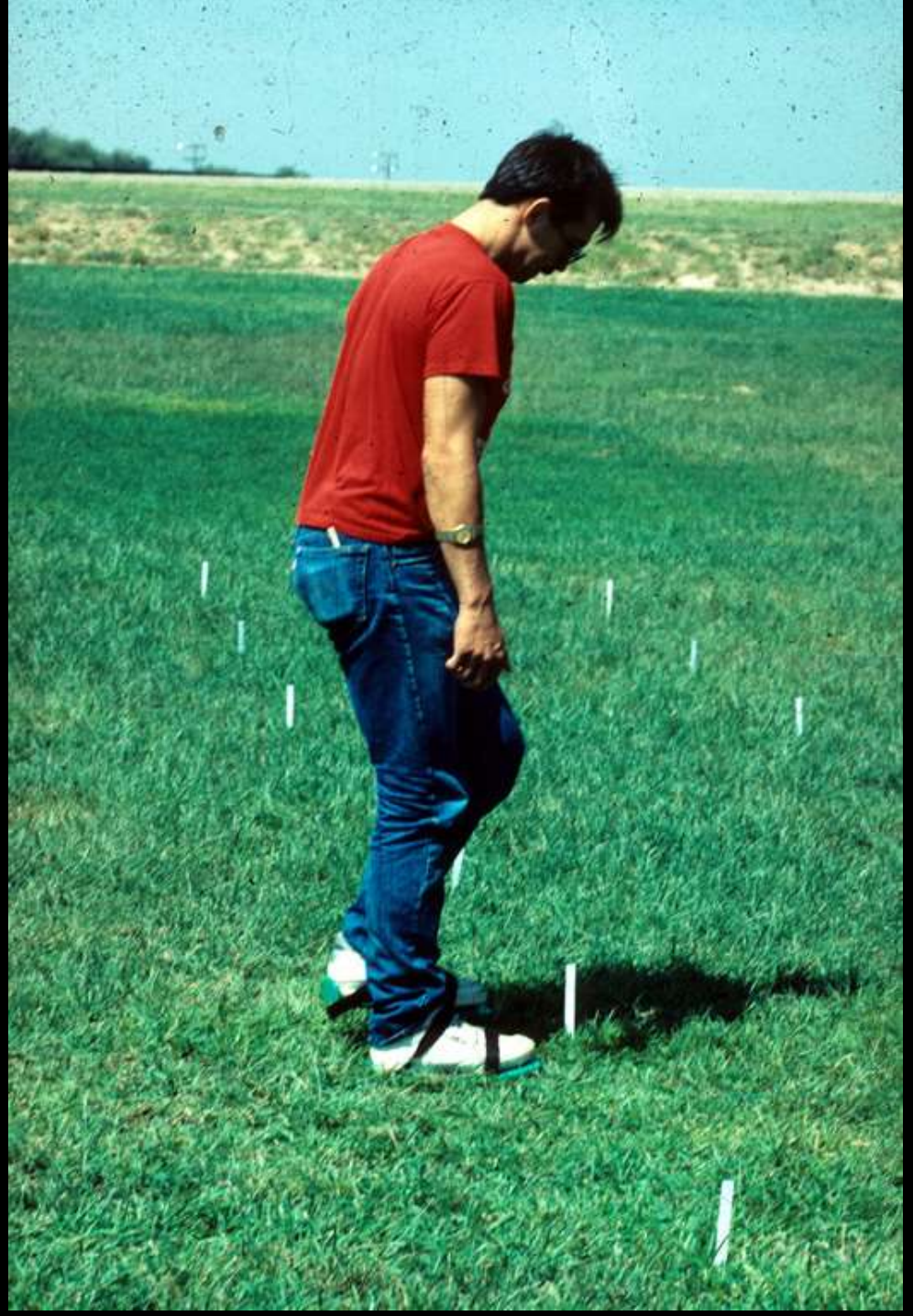
Milky Spore for Japanese Beetle?



Used to permanently establish a biological control organism – ***not useful for immediate control.***

White grub blast from the past

Lawn Aerator Sandals (a.k.a., “Spikes O’ Death”)



Spikes O’ Death In Action

SPIKES OF DEATH

Close to Home by John McPherson

Question: Does control of larvae in a yard affect the number of adults in a yard?

????????

Answer: Very likely, NO

Some Highly Mobile Insects

Corn earworm (adults)

Crucifer flea beetles

Japanese beetle (adults)

Grasshoppers

Potato/tomato psyllid

Adult beetles feed on both flowers and leaves of many ornamental plants as well as garden vegetables and herbs

Skeletonizing injuries produced by Japanese beetle adults feeding on leaves

Flowers are often a favored plant part targeted by adult Japanese beetles

Issue of unusual concern with Japanese beetle

Overlap of adult feeding on flowers – *and use of those flowers by pollinators*

Uber-host Plants Favored by Japanese Beetle Adults in CO

- Roses**
- Linden*
- Virginia Creeper*
- Silver lace**

Other Plants Commonly Grown in CO that are Highly Favored by Japanese Beetle

Ornamentals

- Hollyhock*
- Gaura**
- Rose-of-Sharon**
- Crabapple
- Japanese maple
- Peking cotoneaster
- Canna lily**

Food Crops

- Beans (green, edamame)
- Basil
- Raspberry*
- Grape

- * JB populations overlap with flowering
- ** JB populations overlap >*alot*< with flowering

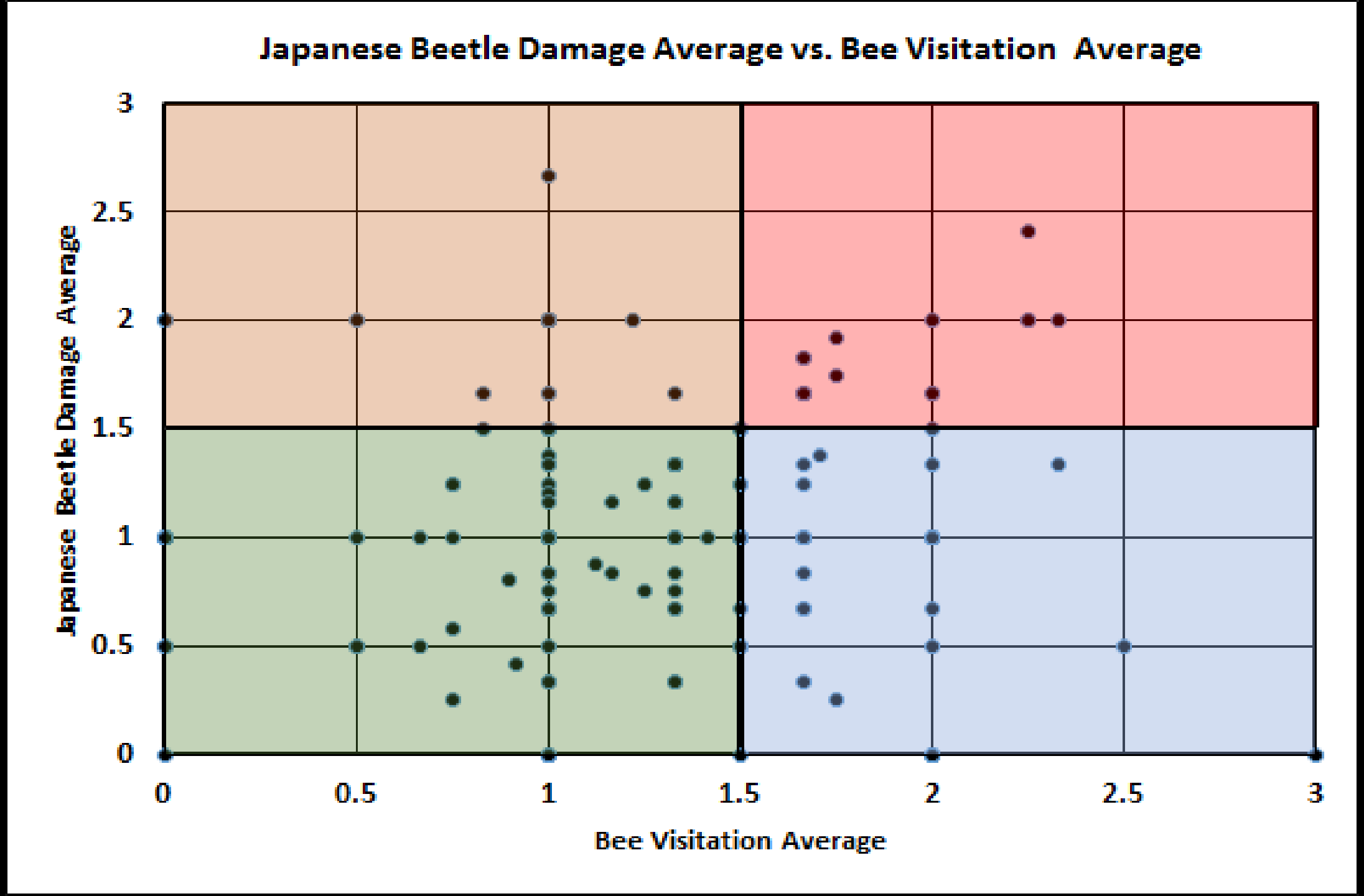
Evaluations of roses at the War Memorial Garden in Littleton, 2016-2019

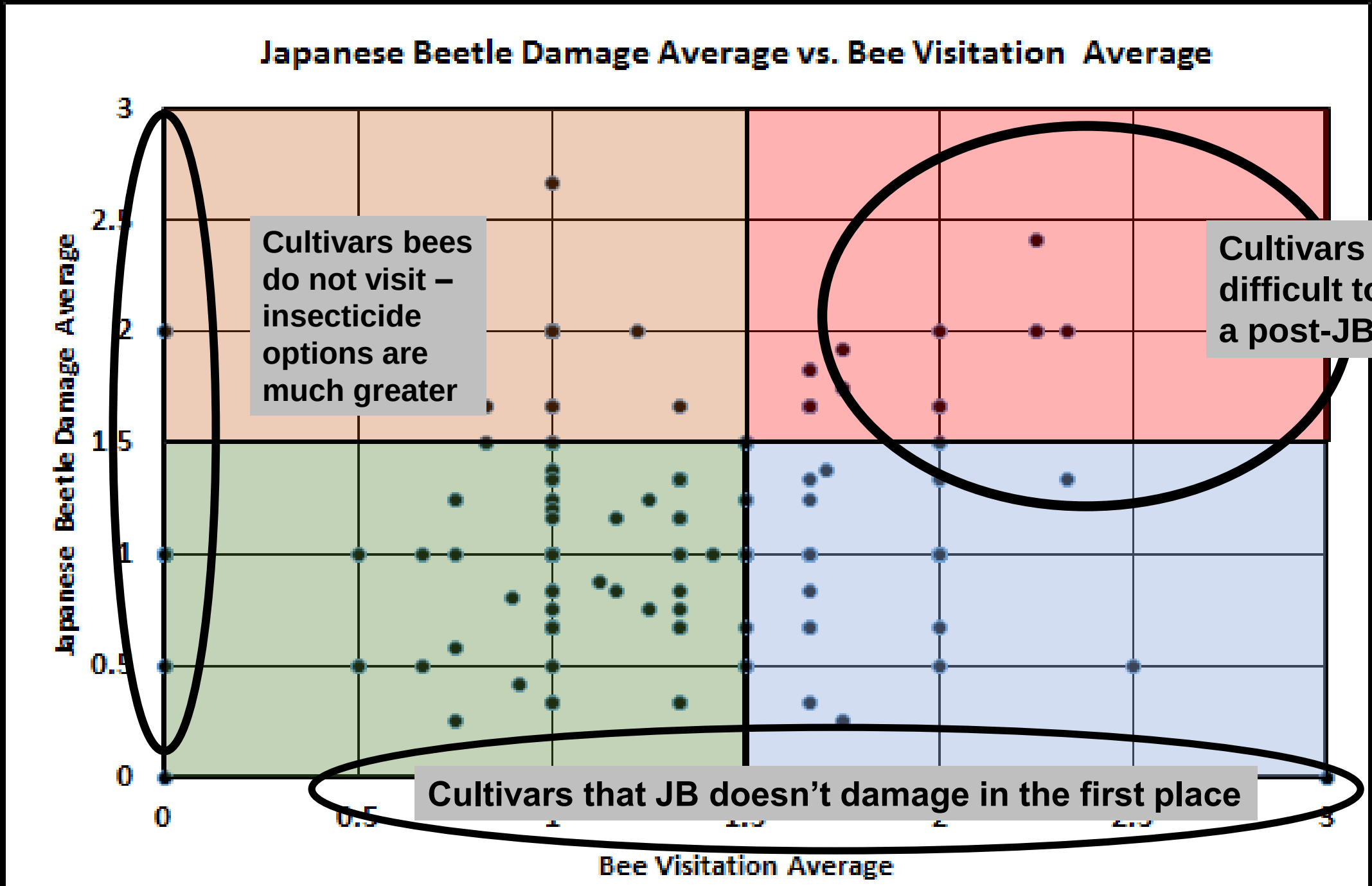
Japanese Beetle Damage Evaluations on Roses – War Memorial Rose Garden

- Seven observations were made during season
- Damage by Japanese beetle ranked on a **0 to 3 scale (no damage to heavy damage)**

Japanese Beetle Damage Evaluations on Roses – War Memorial Rose Garden

- Seven observations were made during season
- Damage by Japanese beetle ranked on a 0 to 3 scale (no damage to heavy damage)
- Observed flower visitation by bees ranked on a 0 to 3 scale (no visitation to high visitation)


Japanese Beetle Damage Average vs. Bee Visitation Average
Japanese Beetle Damage Average
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
Bee Visitation Average


Japanese Beetle Damage Average vs. Bee Visitation Average
Japanese Beetle Damage Average
Bee Visitation Average
3
2.5
2
1.5
1
0.5
0
0
0.5
3
Cultivars bees do not visit – insecticide options are much greater
Cultivars that will be difficult to maintain in a post-JB world
Cultivars that JB doesn't damage in the first place

What should we do about the Japanese Beetle?

We should try to systematically categorize all rose cultivars for susceptibility to Japanese beetle – and use by pollinating bees

The curious phenomenon of geranium toxicity to Japanese beetle

Geranium Toxicity to Japanese Beetle

- Beetles become paralyzed within a couple of hours after feeding on flowers of zonal geraniums
  - Often recover in lab, rarely outdoors
- Toxin is present in flowers, but not leaves

Recommendations for Japanese Beetle Adult Control

- Physical/Cultural Controls
  - –Traps
  - –Hand Picking
- Chemical Controls

Japanese beetle controls

Hand Picking

Primary benefit from handpicking

Reduction in volatile attractants produced by plant wounding

Handpicking may be more effective for infestations on foliage versus flowers

Some flowers (e.g., rose) *can produce high levels of volatile attractants - without wounding* - and may possess attractive colors

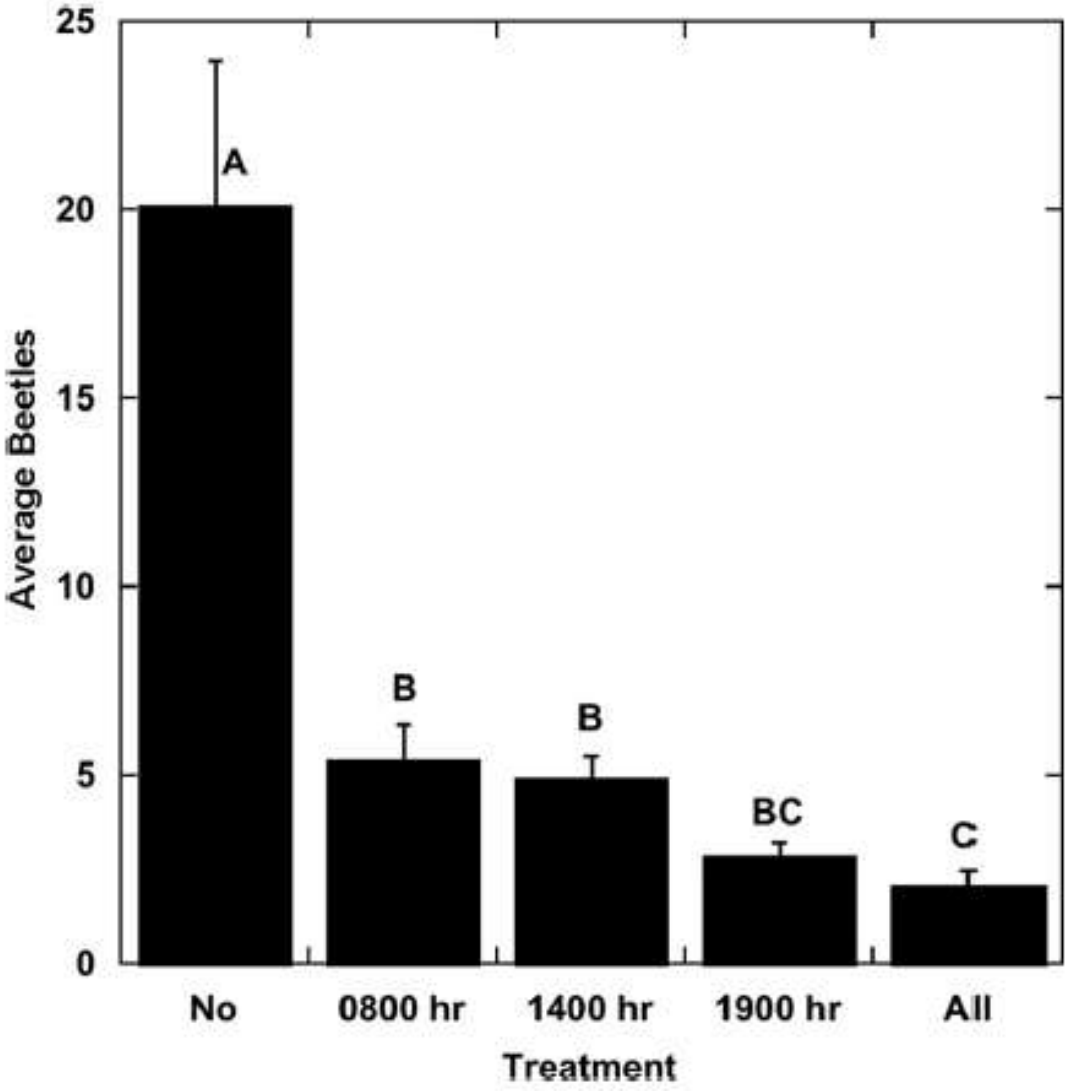
Effectiveness of Hand Removal for Small-Scale Management of Japanese Beetles (Coleoptera: Scarabaeidae)

PAUL V. SWITZER[1] AND RYAN M. CUMMING

Department of Biological Sciences, Eastern Illinois University, Charleston, IL 61920

Can time of day when you hand pick have effects for JB management?

Possibly yes. It may be more effective to *handpick in the evening* than at other times of the day for reducing numbers of beetles on the plants.



Japanese beetle traps are excellent for detecting presence of the insect in an area

Japanese beetle traps *are minimally useful - at best -* for control of existing Japanese beetle infestations!

If you insist on using a Japanese beetle trap

- Do not place them anywhere near (at least 30 feet away from) any plant on which Japanese beetles feed
- Avoid placing them in a site where they are likely to draw beetles from long distances

If you insist on using a Japanese beetle trap

- **Do not place them anywhere near (at least 30 feet away from) any plant on which Japanese beetles feed**
- **Avoid placing them in a site where they are likely to draw beetles from long distances**

….and preferably give the trap to your neighbor!

Do you have >a lot< of Japanese beetles in your trap??

There are about 836 Japanese beetles per cup

Chemical Controls Most Effective for Control of Japanese Beetle Adults

- Most pyrethroids (e.g., cyfluthrin, permethrin, bifenthrin)
- Carbaryl
- Acetamiprid
- Imidacloprid
- Chlorantraniliprole

Do not treat plants with flowers in bloom!

Overlap of adult feeding on flowers – *and use of those flowers by pollinators*

Never apply persistent insecticides to plants that are in flower and attractive to pollinators!!

Chemical Controls Most Effective for Control of Japanese Beetle Adults

- ~~Most pyrethroids (e.g., cyfluthrin, permethrin, bifenthrin)~~
- ~~Carbaryl~~
- ~~Imidacloprid~~
- ~~Acetamiprid~~
  - ~~Ortho Rose and Flower Killer~~
- Chlorantraniliprole
  - Acelepryn

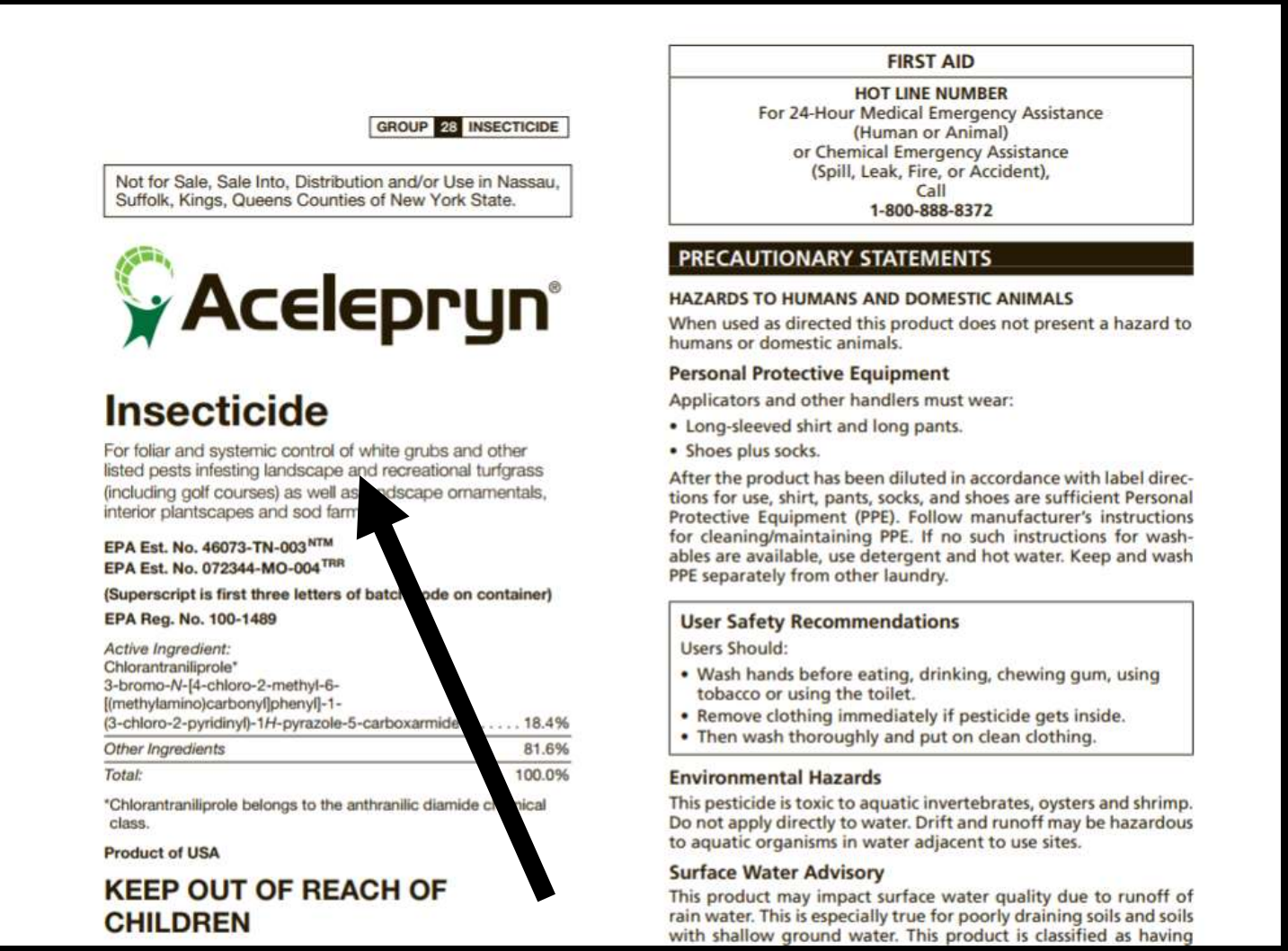
Do not treat plants with flowers in bloom!

Pollinator hazard warning statement regarding use of Tristar 8.5 SL (acetamiprid)

ENVIRONMENTAL HAZARDS

This product is toxic to wildlife. This product is toxic to bees and other pollinating insects exposed to direct treatment. Do not apply this product while bees or other pollinating insects are actively visiting the treated area. Risk to managed bees and native pollinators from contact with pesticide spray or residues can be minimized when applications are made at dawn or dusk or when temperature is below 55°F at the site of application. Do not apply directly to water, or to

This type of warning statement allows use of this product on a plant in flower *only during times of day when pollinators are not visiting the plant*



GROUP 28 INSECTICIDE

Not for Sale, Sale Into, Distribution and/or Use in Nassau, Suffolk, Kings, Queens Counties of New York State.

Acelepryn®

Insecticide

For foliar and systemic control of white grubs and other listed pests infesting landscape and recreational turfgrass (including golf courses) as well as ndscape ornamentals, interior plantscapes and sod farm

EPA Est. No. 46073-TN-003 NTM
EPA Est. No. 072344-MO-004 TRR
(Superscript is first three letters of batch ode on container)
EPA Reg. No. 100-1489

Active Ingredient:
Chlorantraniliprole*
3-bromo-*N*-[4-chloro-2-methyl-6-[(methylamino)carbonyl]phenyl]-1-(3-chloro-2-pyridinyl)-1*H*-pyrazole-5-carboxamide 18.4%

Other Ingredients	81.6%
Total:	100.0%

*Chlorantraniliprole belongs to the anthranilic diamide c nical class.

Product of USA

KEEP OUT OF REACH OF CHILDREN

FIRST AID

HOT LINE NUMBER
For 24-Hour Medical Emergency Assistance
(Human or Animal)
or Chemical Emergency Assistance
(Spill, Leak, Fire, or Accident),
Call
1-800-888-8372

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

When used as directed this product does not present a hazard to humans or domestic animals.

Personal Protective Equipment

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants.
- Shoes plus socks.

After the product has been diluted in accordance with label directions for use, shirt, pants, socks, and shoes are sufficient Personal Protective Equipment (PPE). Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables are available, use detergent and hot water. Keep and wash PPE separately from other laundry.

User Safety Recommendations

Users Should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing immediately if pesticide gets inside.
- Then wash thoroughly and put on clean clothing.

Environmental Hazards

This pesticide is toxic to aquatic invertebrates, oysters and shrimp. Do not apply directly to water. Drift and runoff may be hazardous to aquatic organisms in water adjacent to use sites.

Surface Water Advisory

This product may impact surface water quality due to runoff of rain water. This is especially true for poorly draining soils and soils with shallow ground water. This product is classified as having

Labeled for use on turfgrass and landscape ornamentals

Environmental hazards statements do include warnings for aquatic organisms.

They do not have any pollinator warning statements

Btg - Bacillus thuringiensis var. *galleriae*

Sold as ***beetleGONE!*** in commercial/ ag markets

Sold as ***beetleJUS*** in gardener market

Adult control

Btg-susceptible Insects

Weevils

Scarab Beetles

Bacillus thuringiensis (Bt)

- Derived from a widely distributed soil bacterium
- Active ingredient a toxic protein crystal that destroys cells of the midgut
- Used as a stomach poison
- Several different strains – each effective against different insects

Several Bt strains are present, each with specific activity

Caterpillars – kurstaki, *aizawi* strains

Leaf beetles – *tenebrionis* strain

Gnat, mosquito larvae – *israelensis* strain

Scarab beetles – *galleriae* strain

Treated Foliage Consumed

Feeding Inhibition (1 Hour)

- Toxin Crystals Dissolve in Gut.
- Larvae Stop Feeding.
- Growth Stops.

Death（2-5 Days）

- Starvation
- Gut Disruption

New biological control for Japanese beetle ***- and other grubs?***

Bacillus thuringiensis var. *galleriae*

Sold as ***beetleGONE!*** in commercial/ag markets

Sold as ***beetleJUS*** in gardener market

Water check

beetleJUS treated

beetleJUS for adult Japanese beetle?

Provides **good reduction in feeding** injury by Japanese beetle

Provides **fair mortality** of Japanese beetles and mortality is slow

Persistence of effects probably a few days

Bee hazard warnings and use restrictions?

None. You can apply this product to plants in bloom when bees are visiting.

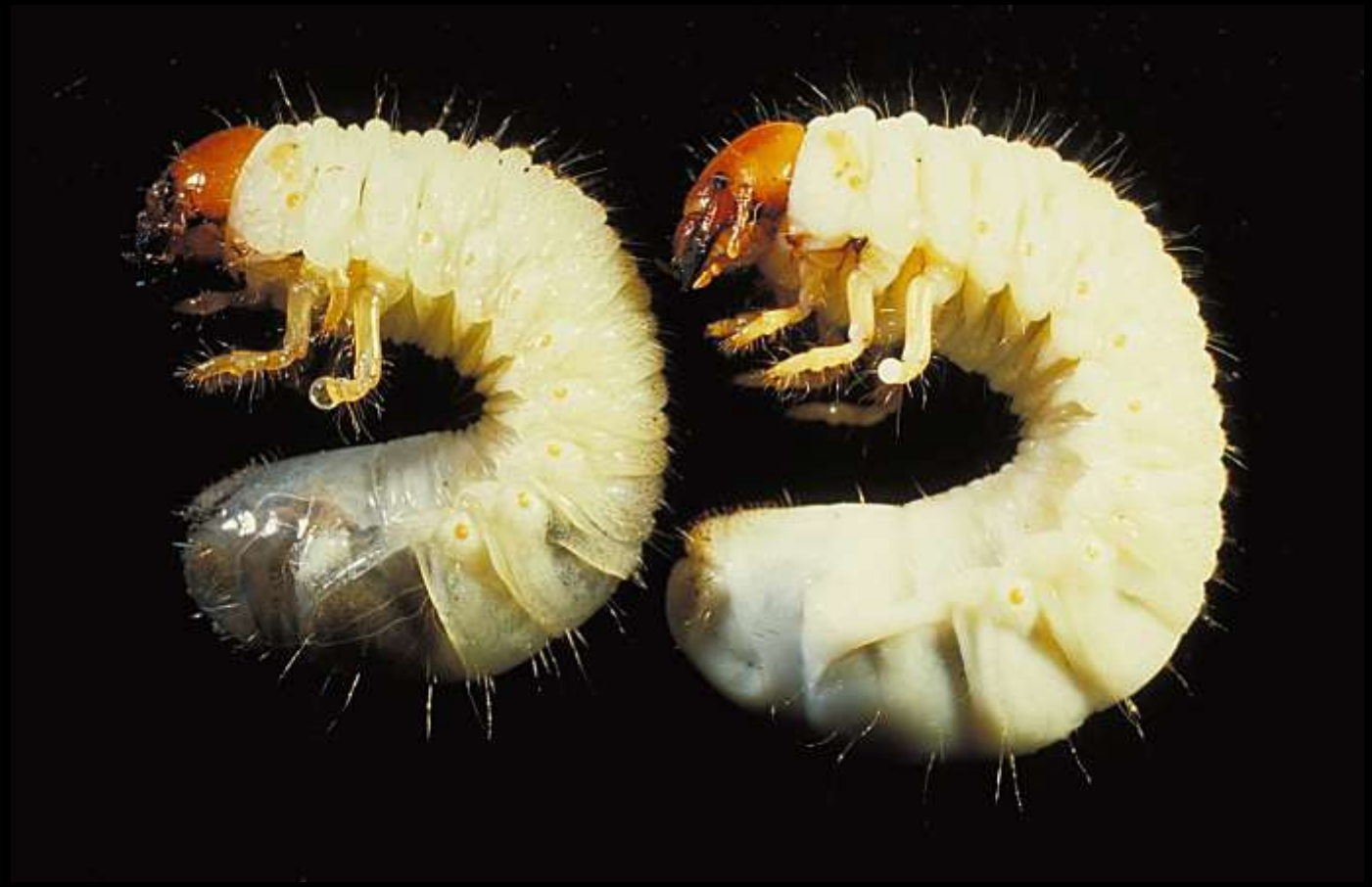
What should we do about the Japanese Beetle?

We should attempt transfers, *for permanent establishment in Colorado*, of some Japanese beetle natural enemies present in states to the east.

Natural Enemies of Japanese Beetle Exist Elsewhere in the US

- ***Paenibacillus popilliae*** **(Milky spore)**
  - Bacterium
- ***Istocheta aldrichi***
  - Tachinid fly
- ***Tiphia vernalis***
  - Parasitoid wasp
- ***Ovavesicula popilliae***
  - Fungus (microsporidium)

Milky Spore for Japanese Beetle?



Used to permanently establish a biological control organism – ***not useful for immediate control.***

Natural enemies of Japanese Beetle that were introduced once and now established elsewhere in the United States

- *Paenibacillus popilliae* (Milky spore)
  - Bacterium
- ***Ovavesicula popilliae****
  - Microsporidium (fungus)
- ***Istocheta aldrichi****
  - Tachinid fly
- ***Tiphia vernalis****
  - Parasitoid wasp

* Species involved in Colorado Japanese Beetle Biological Control Program

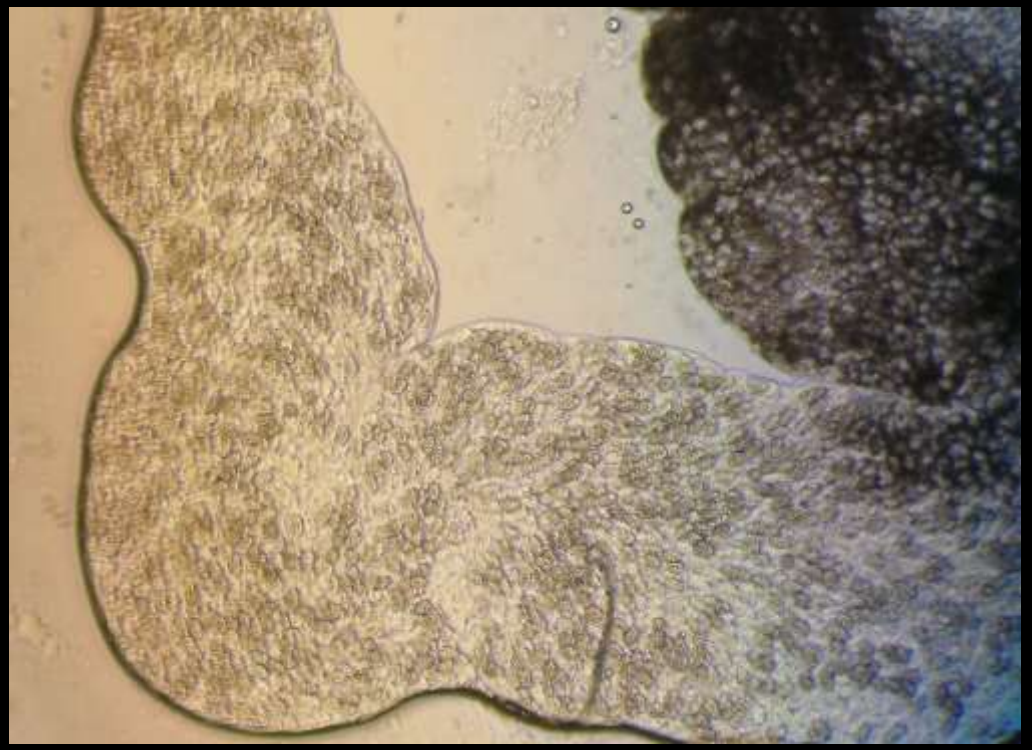
Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

Ovavesicula popilliae – a fungal disease of Japanese beetle larvae

Ovavesicula infection of Malpighian tubules of Japanese beetle larva

Target stage – larvae in soil

Ovavesicula popilliae infects the Malpighian tubules of Japanese beetle larvae and adults



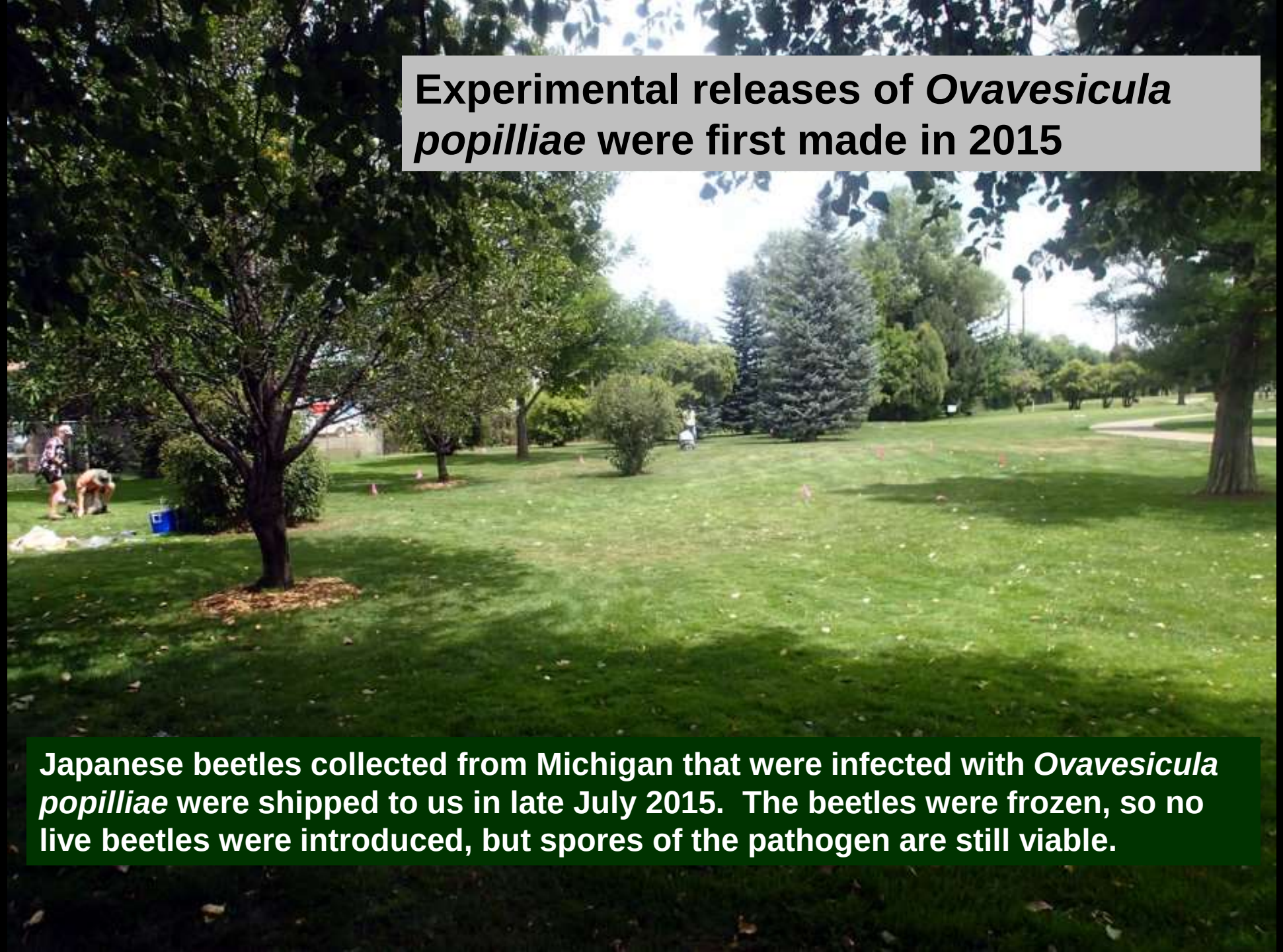
Malpighian tubules packed with spores of *Ovavesicula popilliae*

Source: David Smitley, Michigan State University

Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

Ovavesicula popilliae – a fungal disease that infects Japanese beetle larvae

Main observed effects from infection – reduced winter survival (larvae), shortened life span, reduced fecundity (adults)



Experimental releases of *Ovavesicula popilliae* were first made in 2015

Japanese beetles collected from Michigan that were infected with *Ovavesicula popilliae* were shipped to us in late July 2015. The beetles were frozen, so no live beetles were introduced, but spores of the pathogen are still viable.

Dead, frozen Op-infected beetles arrive

Beetles are blended into a slurry

Diluted with water the slurry is poured over sites where high numbers of JB grubs are present, and immediately watered in

2015 releases of *Ovavesicula popilliae* – It took!

Positive infections confirmed in 2017 from both Flatirons Golf Course (Boulder) and Pueblo Zoo release sites!!!!

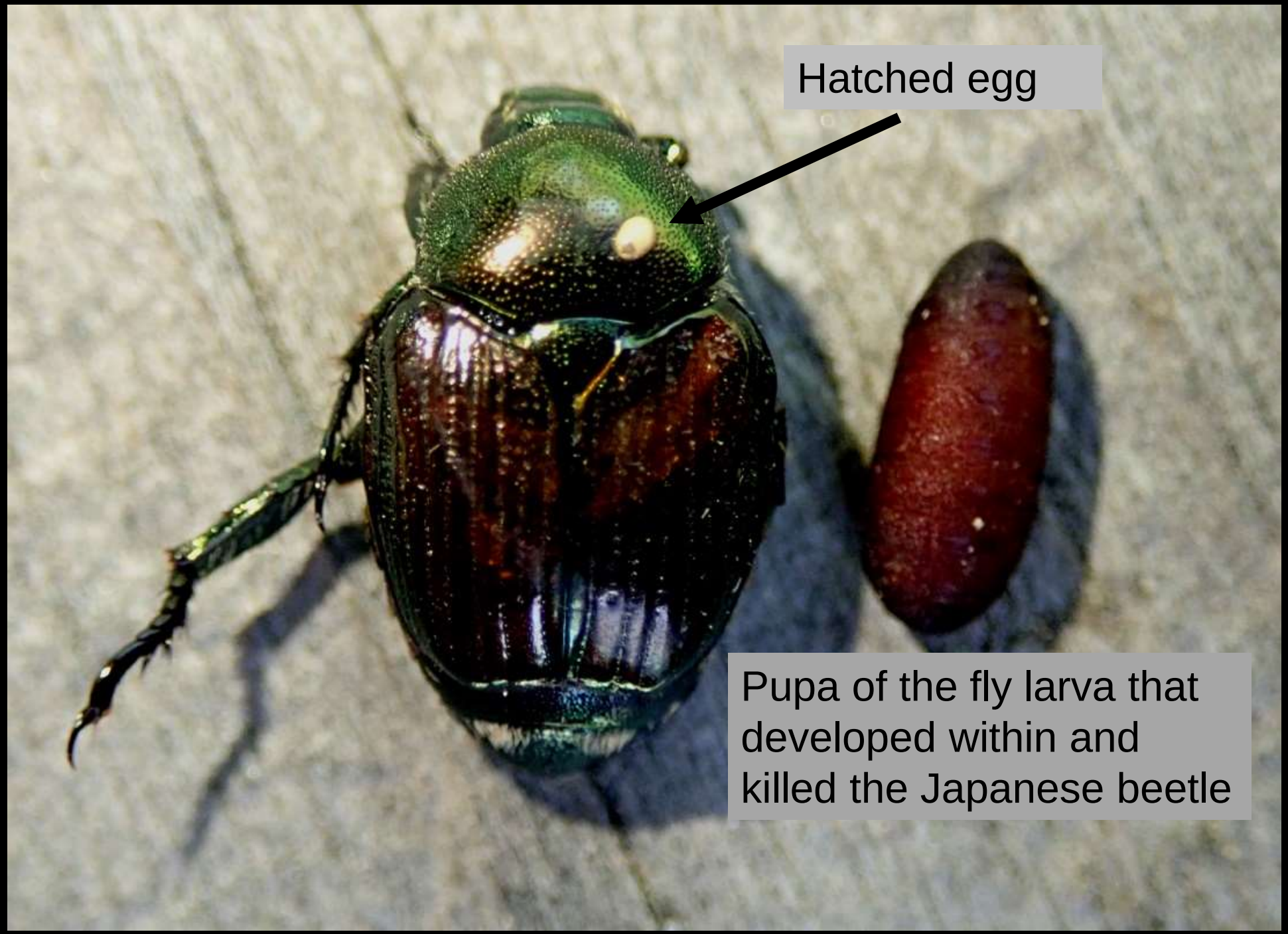
Ovavesicula popilliae as a JB Biocontrol Agent

- **Colorado release sites as of today**
  - Pueblo (2), Boulder (1), Littleton (2), Cherry Hills (1), Denver (3)
- **Characteristics needed for future release sites**
  - **Site must have high numbers of JB grubs**
  - Site must be at least 1 mile from any previous release site
  - Someone must commit to maintaining a JB trap at the site for the first year of the release

Istocheta aldrichi – the "winsome fly"

Diptera: Tachinidae

The adult flies glue their eggs onto adult Japanese beetles. The larva tunnels into and kills the beetle.


Hatched egg
Pupa of the fly larva that developed within and killed the Japanese beetle

Istocheta aldrichi as a JB Biocontrol Agent

- **Colorado release sites as of today**
  - Pueblo (1), Littleton (1), Denver (1)
- **Characteristics needed for future release sites**
  - Site must have high numbers of JB adults
  - **Site must have abundant amounts of suitable flowering plants during July**
  - Site must be at least 1 mile from any previous release site
  - Someone must commit to maintaining a JB trap at the site for the first year of the release

Tiphia vernalis spring tiphia

Hymenoptera: Tiphiidae

The adult wasps dig into the soil and lay their eggs on late stage Japanese beetle grubs

Photographs courtesy of David Shetlar, the Ohio State University

Tiphia vernalis as a JB Biocontrol Agent

- **Colorado release sites as of today**
  - Littleton (1), Boulder (1)
- **Characteristics needed for future release sites**
  - **Site must have high numbers of JB larvae**
  - **Site must have abundant amounts of suitable flowering plants during May**
  - Site must be at least 1 mile from any previous release site
  - Someone must commit to maintaining a JB trap at the site for the first year of the release

What can we hope for with the Japanese Beetle Biological Control Program?

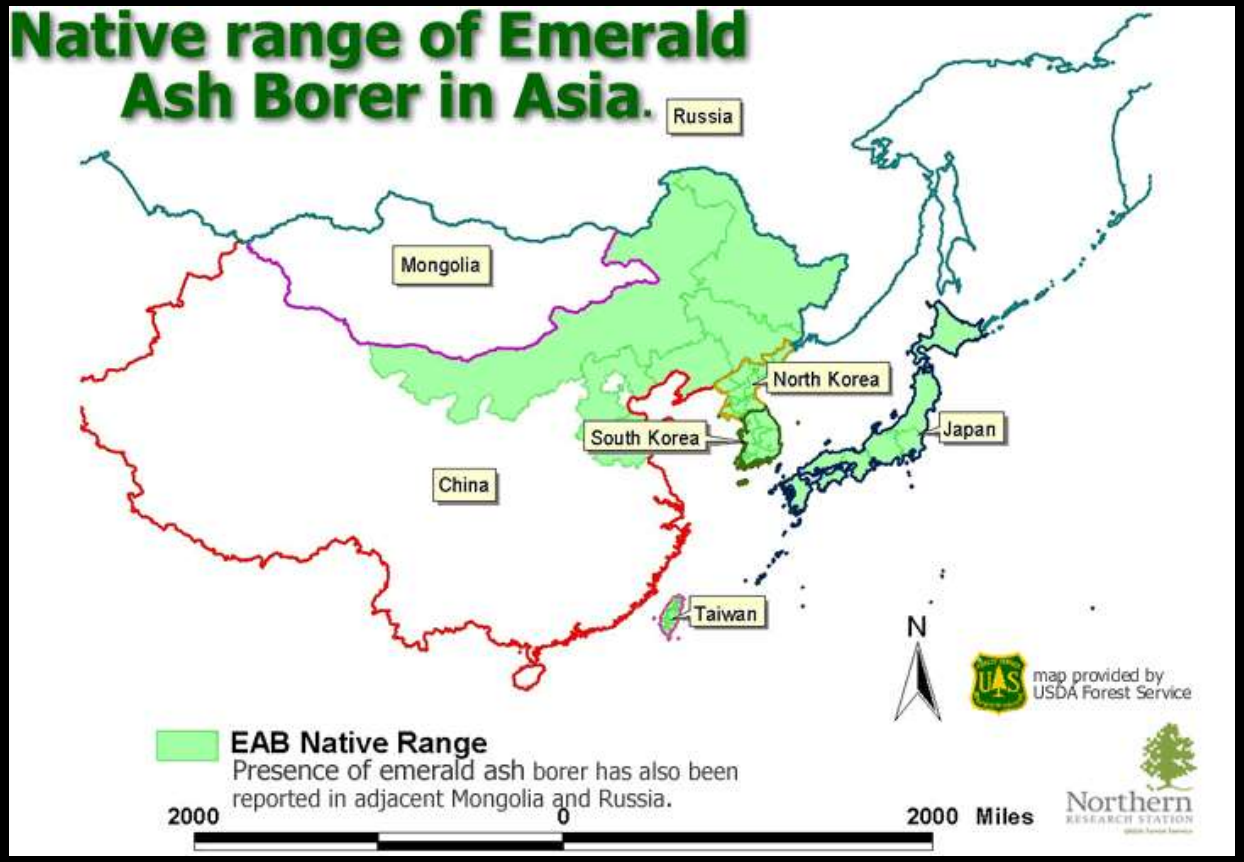
- One or more of the organisms will establish and reproduce at the release site
- The organism(s) will then spread on their own over time to cover a wide area
- As the organisms establish and increase, populations of Japanese beetle will decrease
  - These reductions will be permanent

Present Situation with Emerald Ash Borer in Colorado

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

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

……and is native to Asia

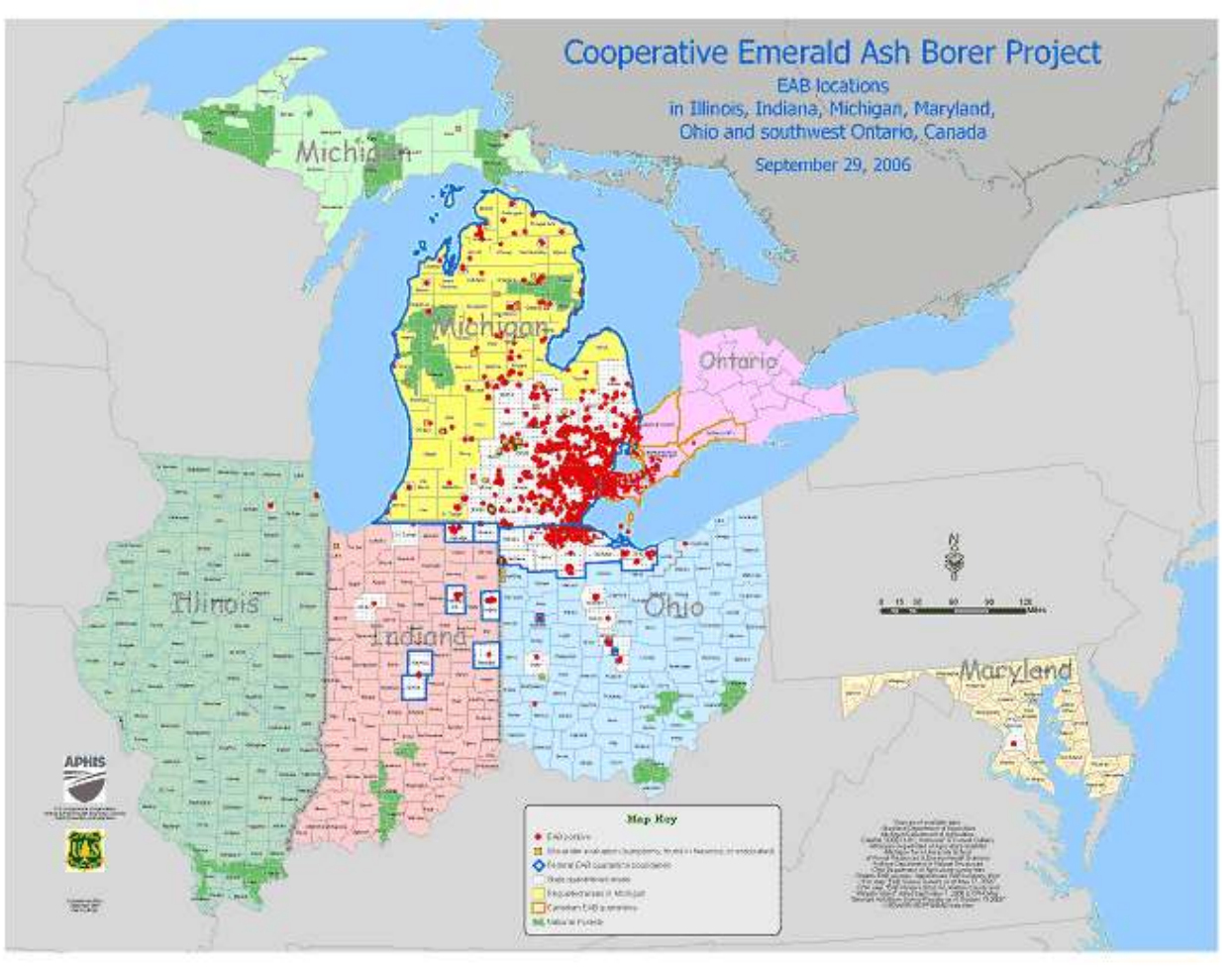


In its native range emerald ash borer is insignificant as a species, limiting attacks to very stressed trees.

Emerald ash borer was first detected in North America in the Detroit area in 2002

It is thought to have arrived some time during the early 1990's

Known distribution in 2006



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

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

Symptoms of EAB injury are expressed as progressive thinning of the crop canopy





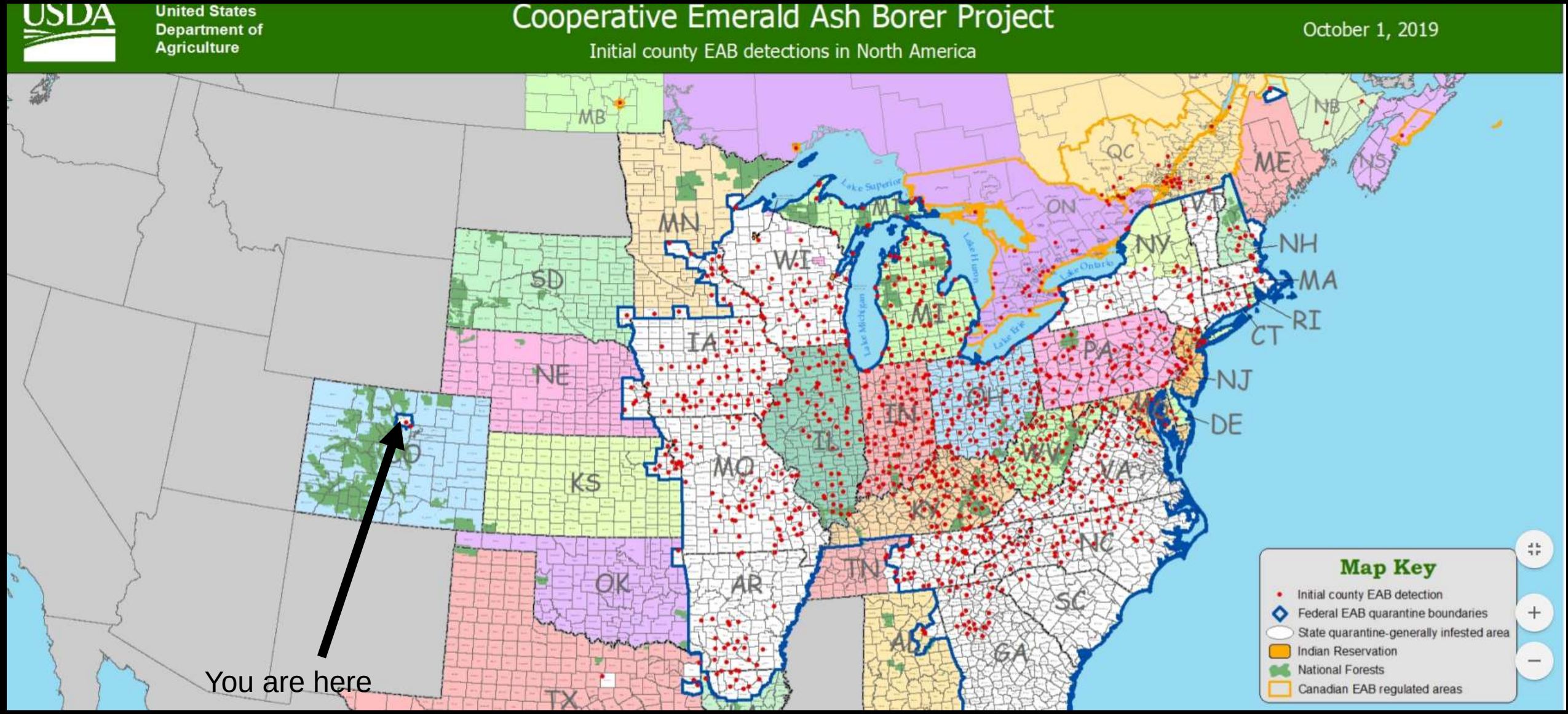

EAB larval injuries progress to tree death, if the tree is not effectively treated to control the insect.

EAB injuries produce a progressive and, to some extent, reversible condition

EAB Will Kill All Unprotected Ash

Thanks to Cliff Sadof of Purdue University for this graphic

Known distribution of Emerald Ash Borer as of about two months ago



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

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)

Colorado State University
Extension

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

Fact Sheet No. 5.614 | Insect Series | Trees and Shrubs

by W.S. Cranshaw*

Lilac/ash borer (*Podosesia syringae*[1]) is common wood borer associated with ash throughout Colorado and a species that is native to North America. Damage is caused by the larvae which tunnel into the trunks and lower branches of ash trees. These feeding injuries produce irregular gouging wounds under the bark and tunneling frequently extends deeply into the heartwood

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

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

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

After emergence emerald ash borer adults feed on ash foliage for a couple of weeks, and eggs mature

Photograph by David Cappaert

EAB likely will emerge sometime in midMay.

Most all eggs will be laid in June and into early 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.**

EAB egg

Eggs of both species are laid on the bark of ash trees

Clearwing borer eggs

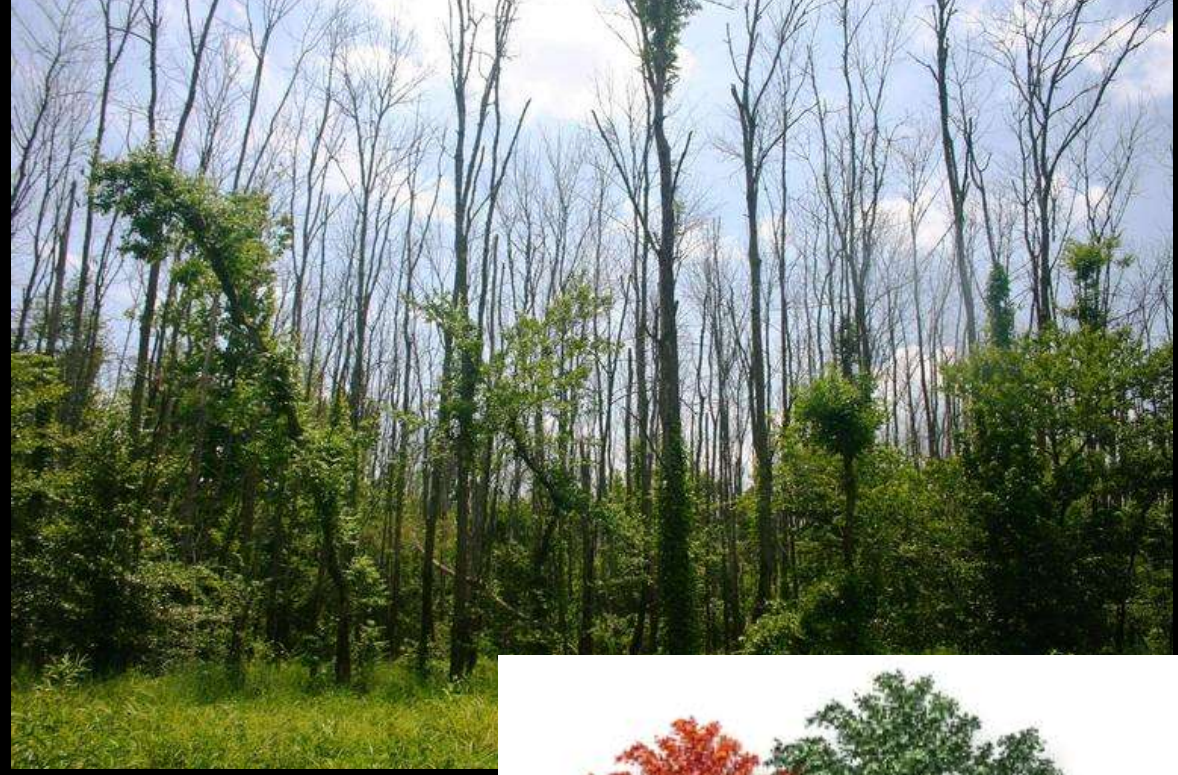
Damage potential to its host

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***



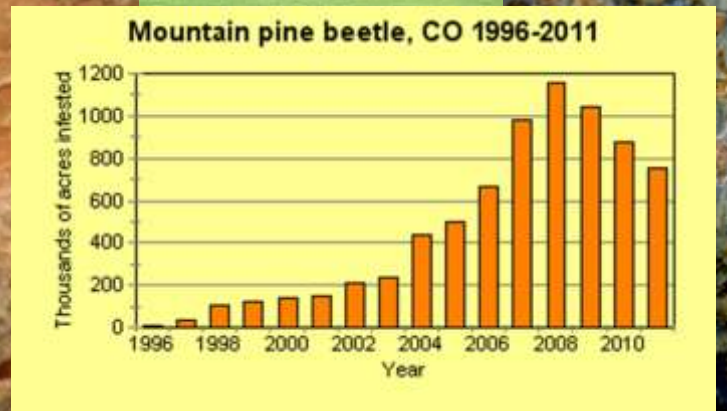
Green ash

White ash

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

NA ash species lack ability to ability to resist EAB

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

Two tree diseases of exotic origin that have permanently altered North American ecology

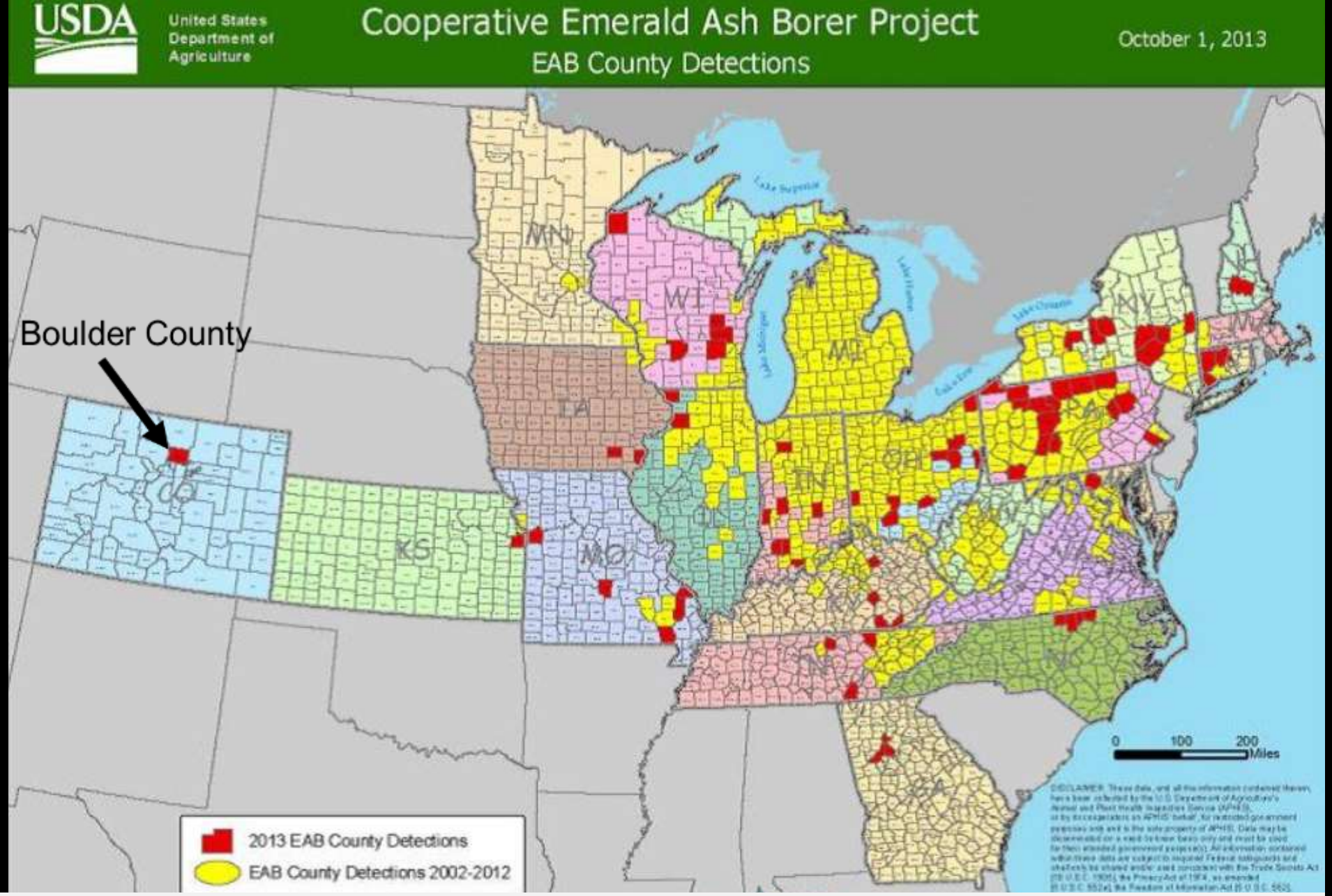
Dutch elm disease – Devastated American elm in mid 1900s. Caused by a fungus, vectored by a bark beetle

Colorado EAB Tree #1

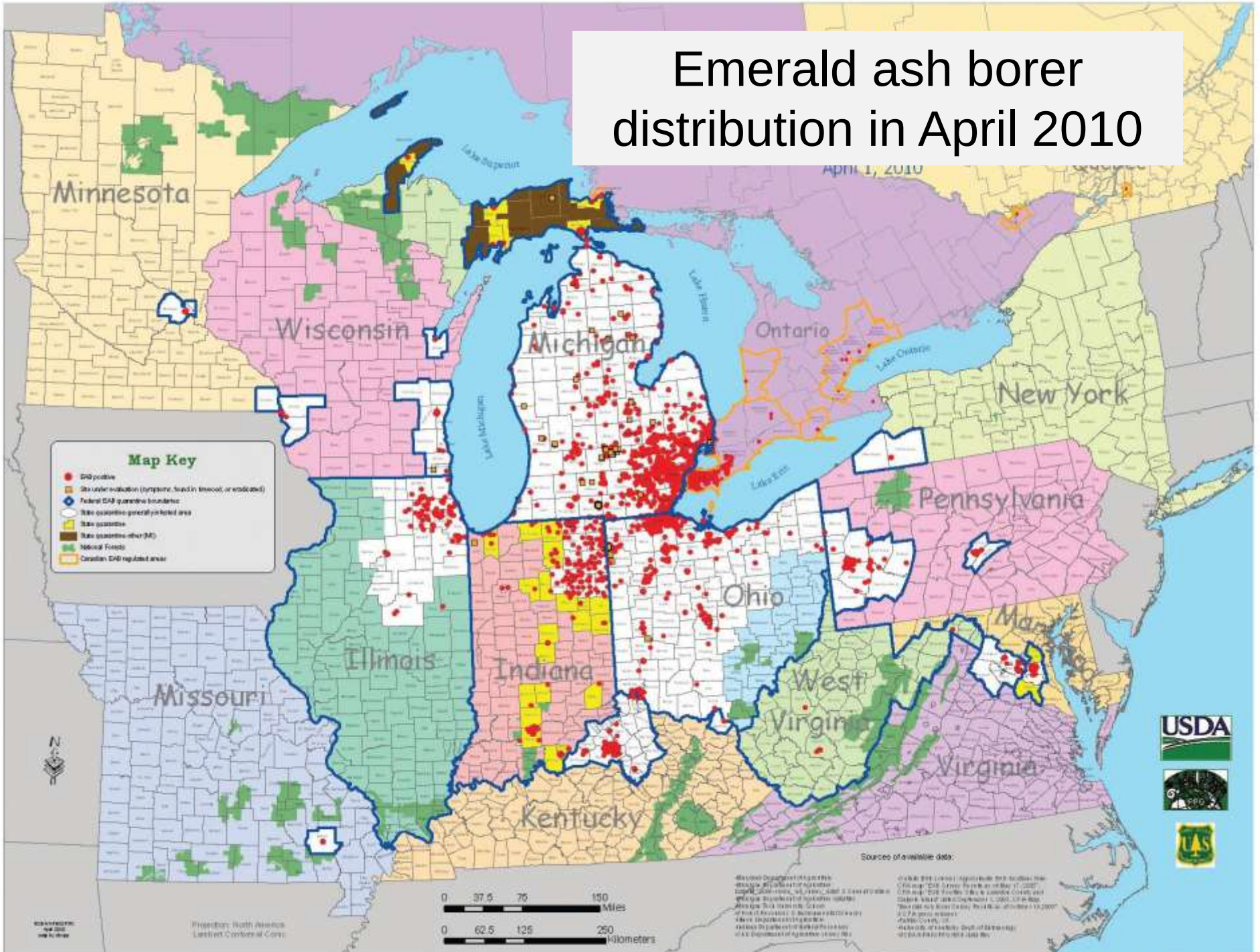
Located near the intersection of 30th and Valmont, Boulder

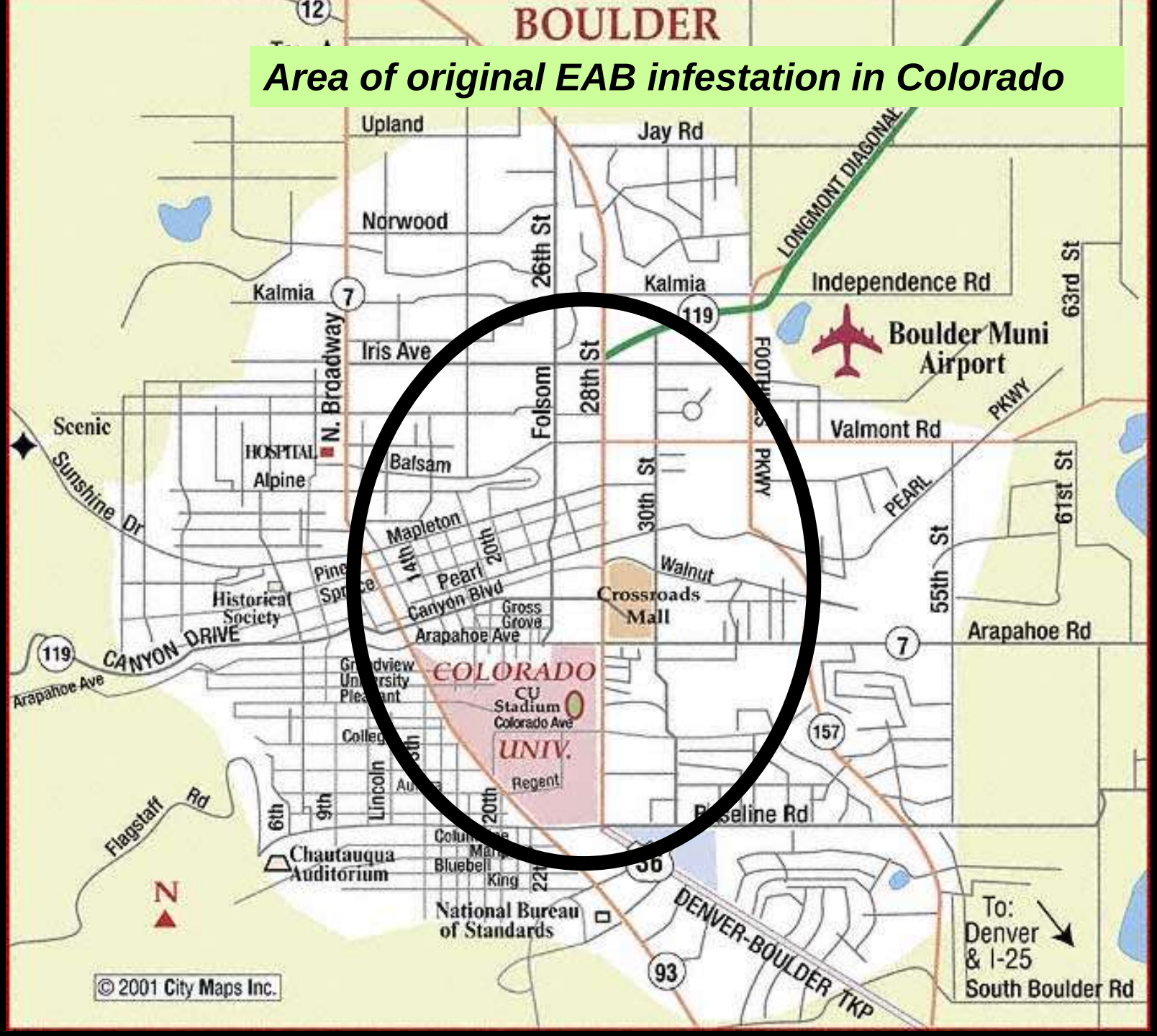
September 23, 2013

How did it get to Colorado?



This is the known distribution of EAB in North America at the time it was first found in Colorado in 2013


Emerald ash borer distribution in April 2010
Minnesota
Wisconsin
Michigan
Ontario
New York
Pennsylvania
Ohio
Illinois
Indiana
Missouri
West Virginia
Virginia
Kentucky
Map Key
USDA
0 37.5 75 150 Miles
0 62.5 125 250 Kilometers

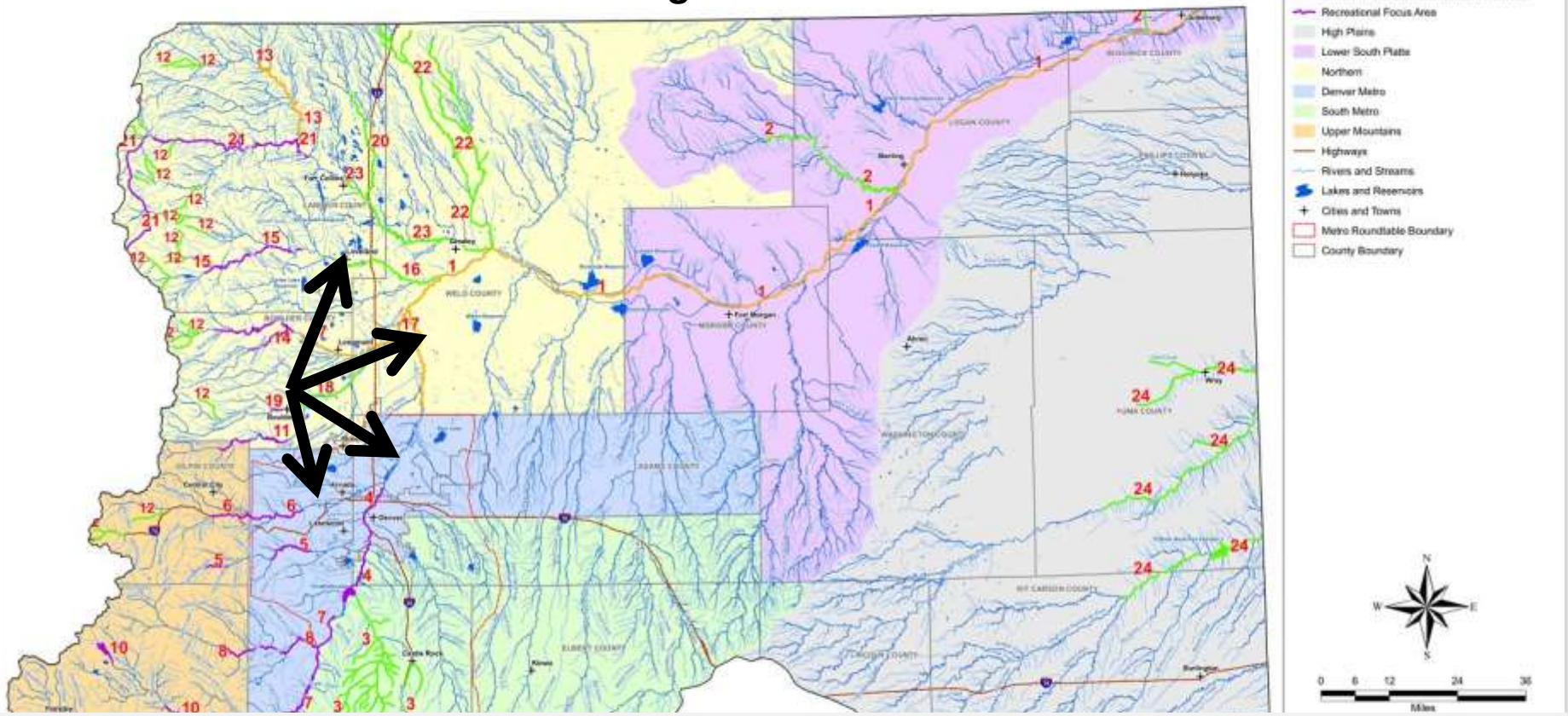

Area of original EAB infestation in Colorado
BOULDER
Upland
Jay Rd
LONGMONT DIAGONAL
Norwood
26th St
Kalmia
7
Kalmia
119
Independence Rd
63rd St
Boulder Muni Airport
Iris Ave
N. Broadway
Folsom
28th St
FOOTHILLS PKWY
PKWY
Valmont Rd
Scenic
Sunshine Dr
HOSPITAL
Alpine
Balsam
30th St
PEARL
61st St
Mapleton
14th
20th
Pearl
Canyon Blvd
Walnut
Crossroads Mall
55th St
Historical Society
Gross Grove
Arapahoe Ave
Arapahoe Rd
119
CANYON DRIVE
Arapahoe Ave
COLORADO
CU Stadium
Colorado Ave
UNIV.
Regent
157
Lincoln
6th
9th
20th
Flagstaff Rd
Chautauqua Auditorium
National Bureau of Standards
36
DENVER-BOULDER TKP
93
To: Denver & I-25
South Boulder Rd
N
© 2001 City Maps Inc.

Important difference with Colorado infestation – Colorado has geography!

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

Within Colorado 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



This is a slide I have been using since January 2014. The title should now read, “After 6 years, emerald ash borer has moved into the edge of adjacent counties”

to segment # on NCNA focus area matrix.

CDM

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

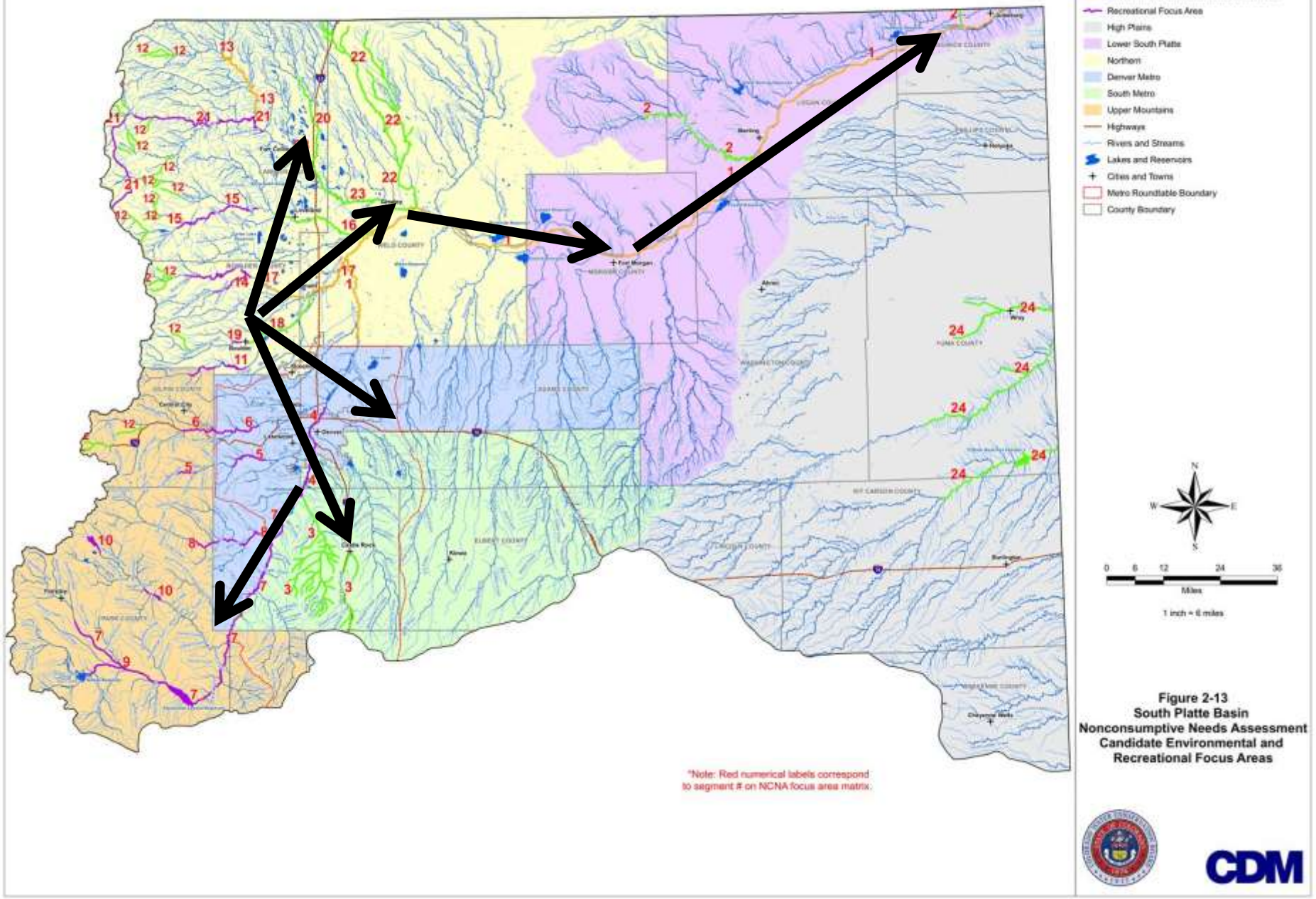


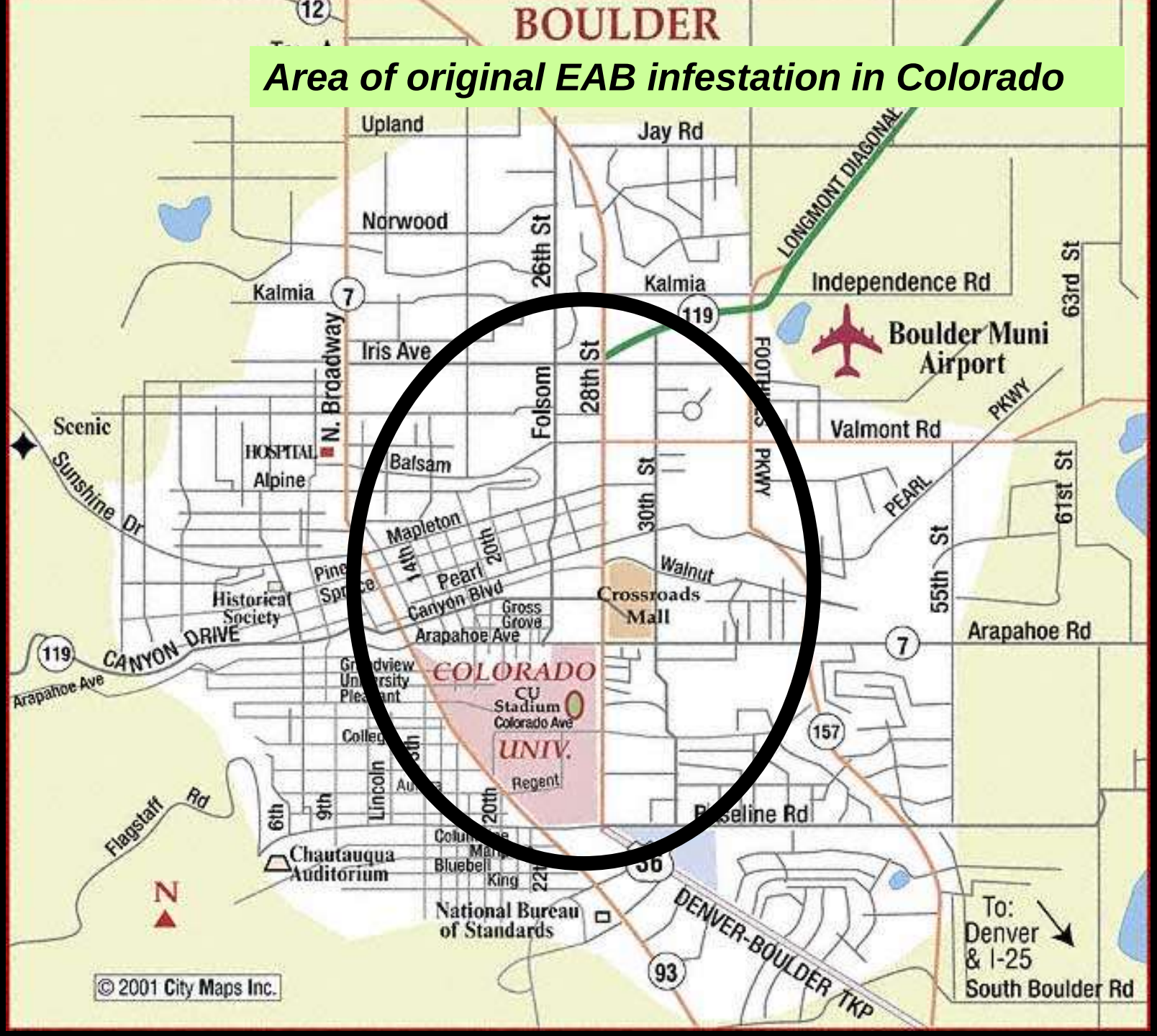
Figure 2-13
South Platte Basin
Nonconsumptive Needs Assessment
Candidate Environmental and Recreational Focus Areas

CDM

Colorado EAB Tree #1

Located near the intersection of 30th and Valmont, Boulder

September 23, 2013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FOOTHILLS PKWY
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Valmont Rd
Scenic
Sunshine Dr
HOSPITAL
Alpine
Balsam
30th St
PEARL
61st St
Mapleton
14th
20th
Pearl
Canyon Blvd
Walnut
Crossroads Mall
55th St
Historical Society
Gross Grove
Arapahoe Ave
Arapahoe Rd
119
CANYON DRIVE
Arapahoe Ave
COLORADO
CU Stadium
Colorado Ave
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157
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36
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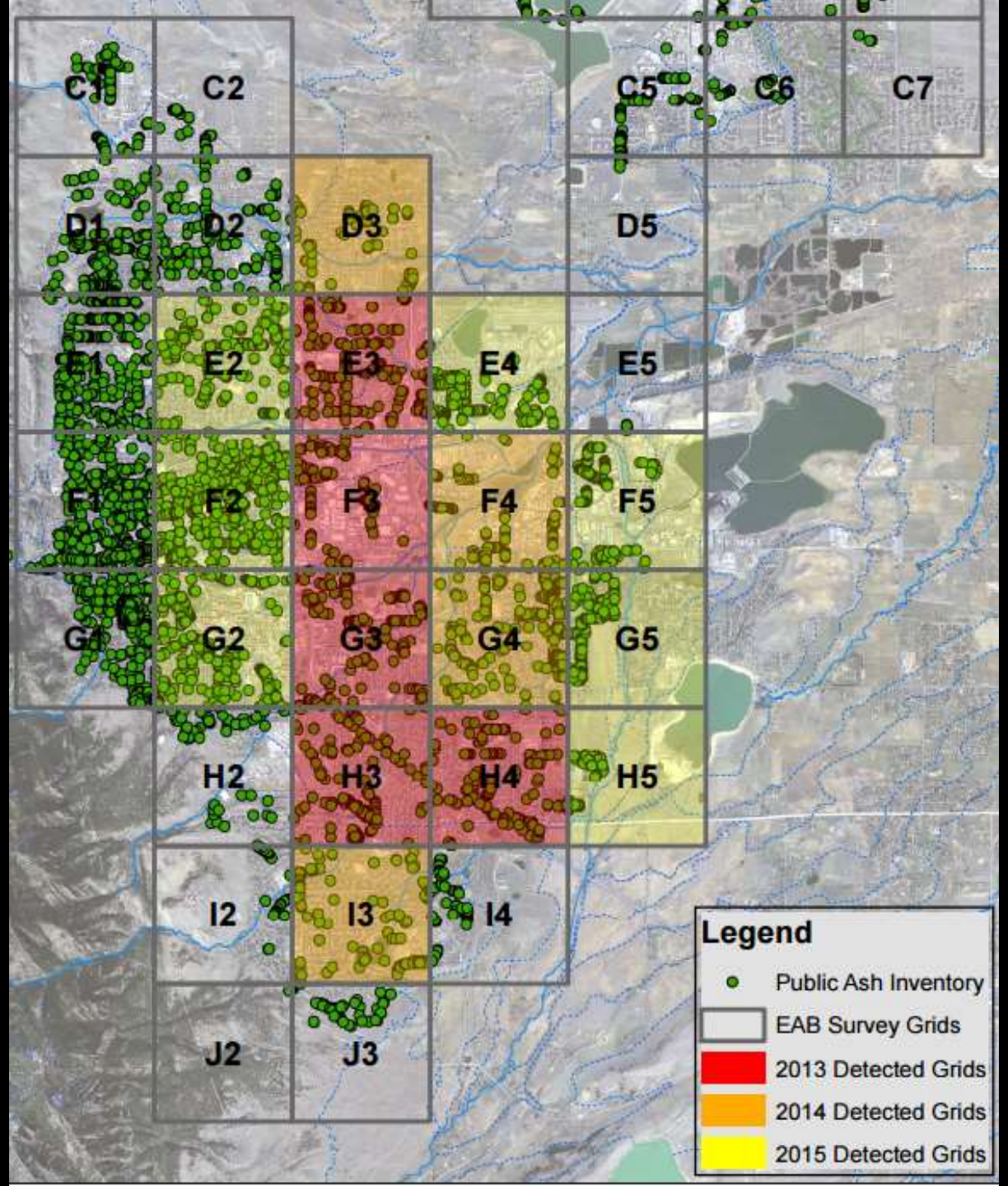
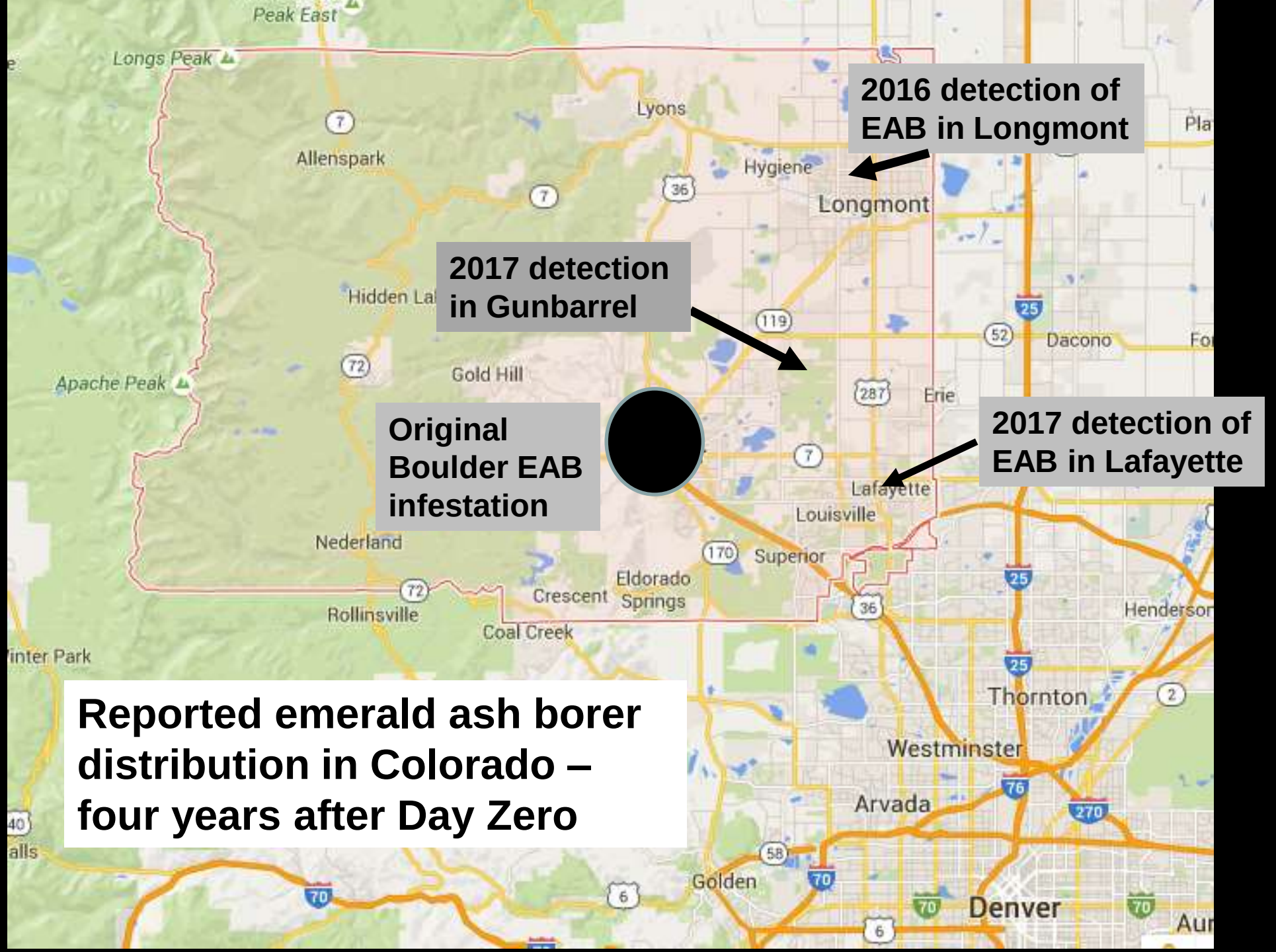
© 2001 City Maps Inc.

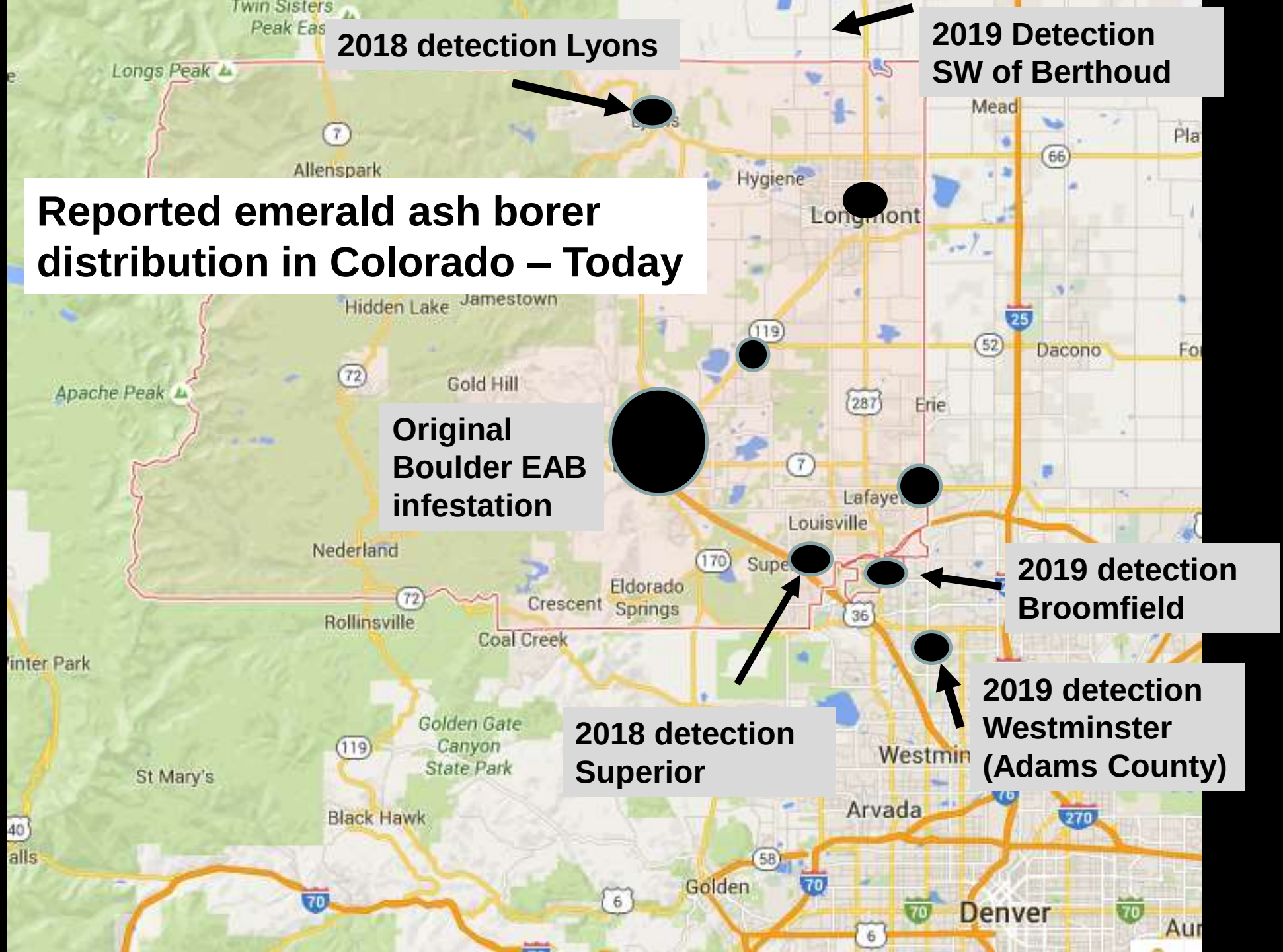


Areas known to be infested with emerald ash borer in Boulder (original site of Colorado establishment)

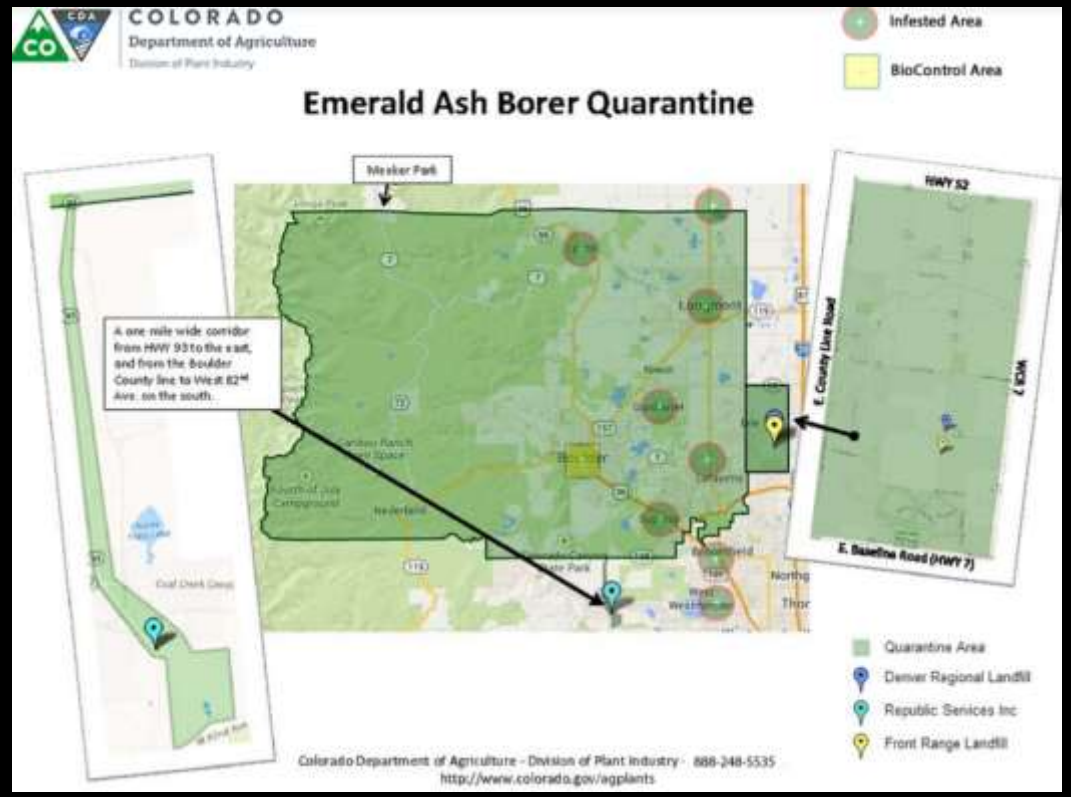

2016 detection of EAB in Longmont
2017 detection in Gunbarrel
Original Boulder EAB infestation
2017 detection of EAB in Lafayette
Reported emerald ash borer distribution in Colorado – four years after Day Zero
Peak East
Longs Peak
Allenspark
Lyons
Hygiene
Longmont
Hidden La
Gold Hill
Apache Peak
Dacono
Erie
Lafayette
Louisville
Nederland
Superior
Eldorado Springs
Crescent
Rollinsville
Coal Creek
Thornton
Westminster
Arvada
Golden
Denver

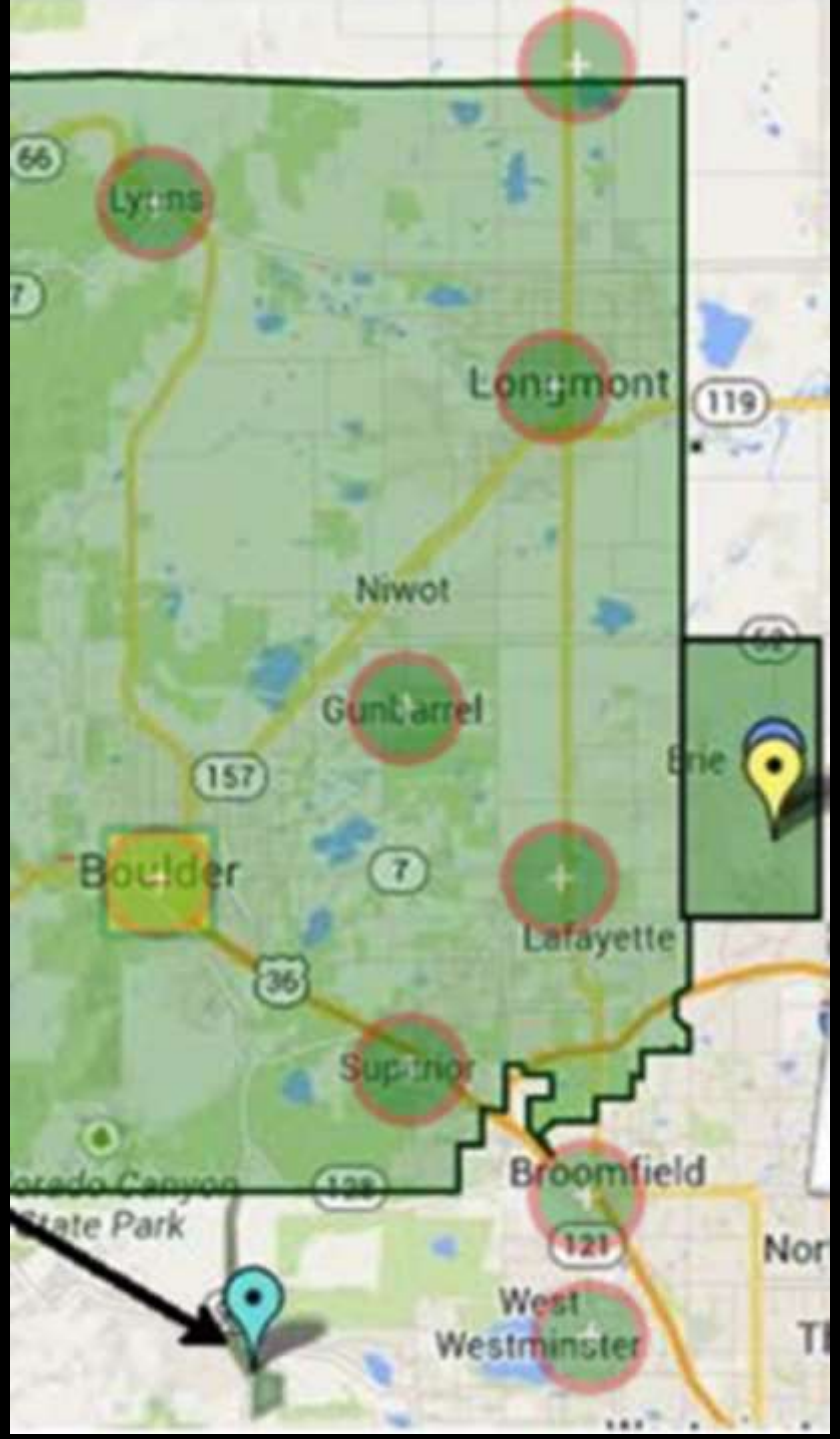
Sixth Anniversary!

Emerald Ash Borer in Colorado


Reported emerald ash borer distribution in Colorado – Today
2018 detection Lyons
2019 Detection SW of Berthoud
Original Boulder EAB infestation
2019 detection Broomfield
2019 detection Westminster (Adams County)
2018 detection Superior
Longs Peak
Allenspark
Hygiene
Longmont
Mead
Hidden Lake
Jamestown
Gold Hill
Apache Peak
Dacono
Erie
Louisville
Nederland
Eldorado Springs
Crescent
Rollinsville
Coal Creek
Golden Gate Canyon State Park
St Mary's
Black Hawk
Arvada
Golden
Denver
Westmin

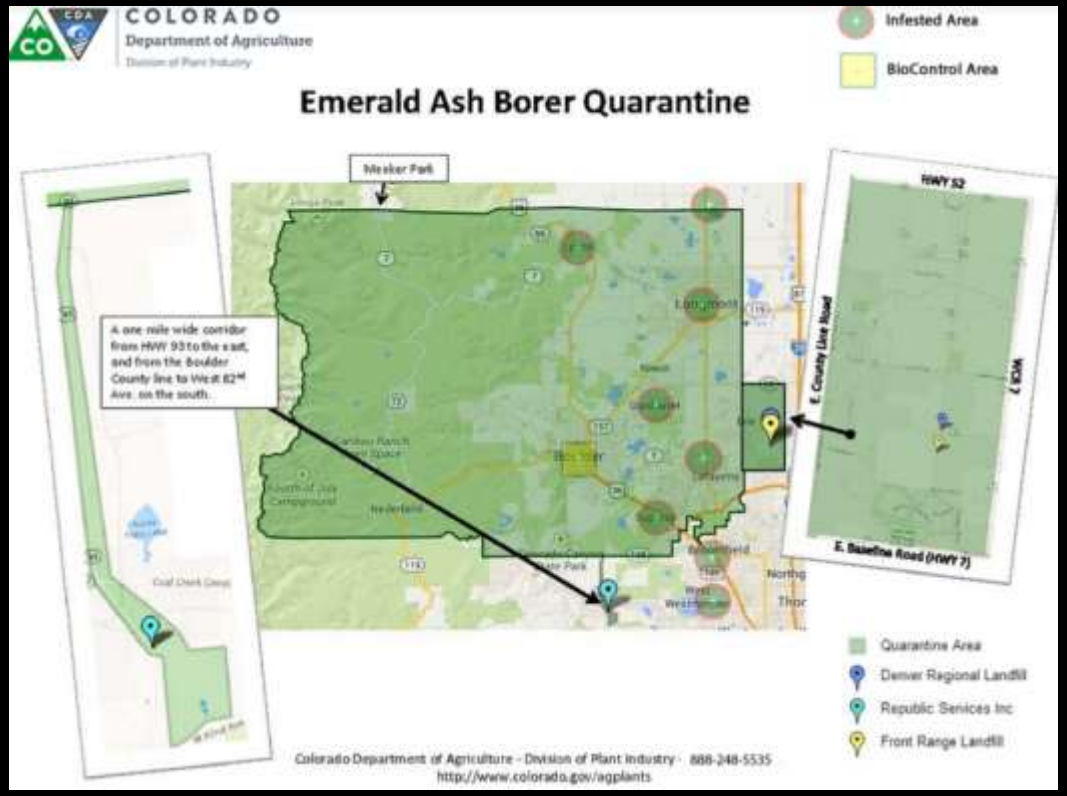
This is the map you can find of EAB distribution on the Colorado Department of Agriculture (CDA) Web Site



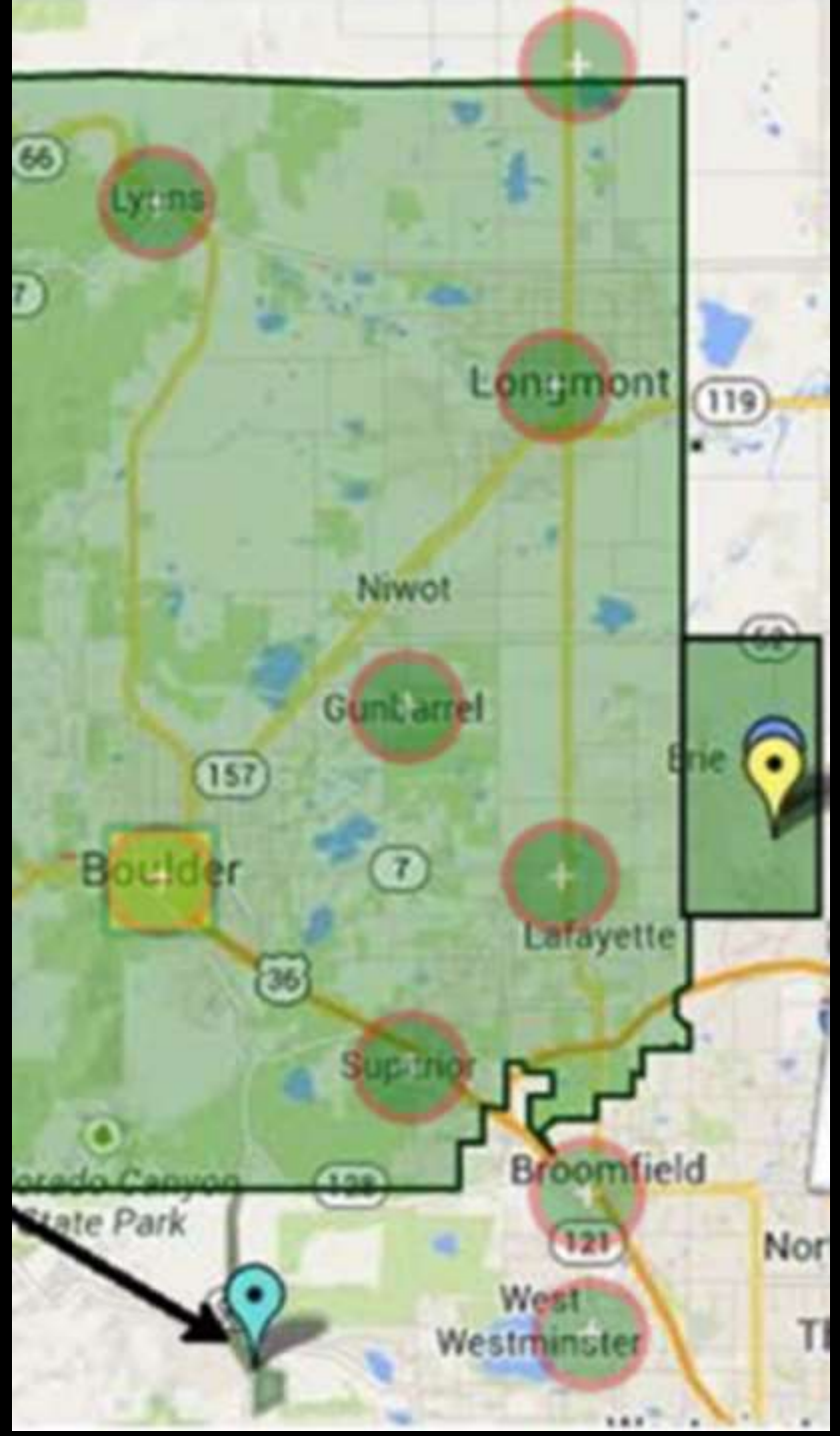


The newest findings are outside Boulder County, which has been quarantined for EAB since 2013

This is the map you can find of EAB distribution on the Colorado Department of Agriculture (CDA) Web Site



The newest findings are outside Boulder County, which has been an **EAB quarantine zone since 2013**



How will EAB spread once established?

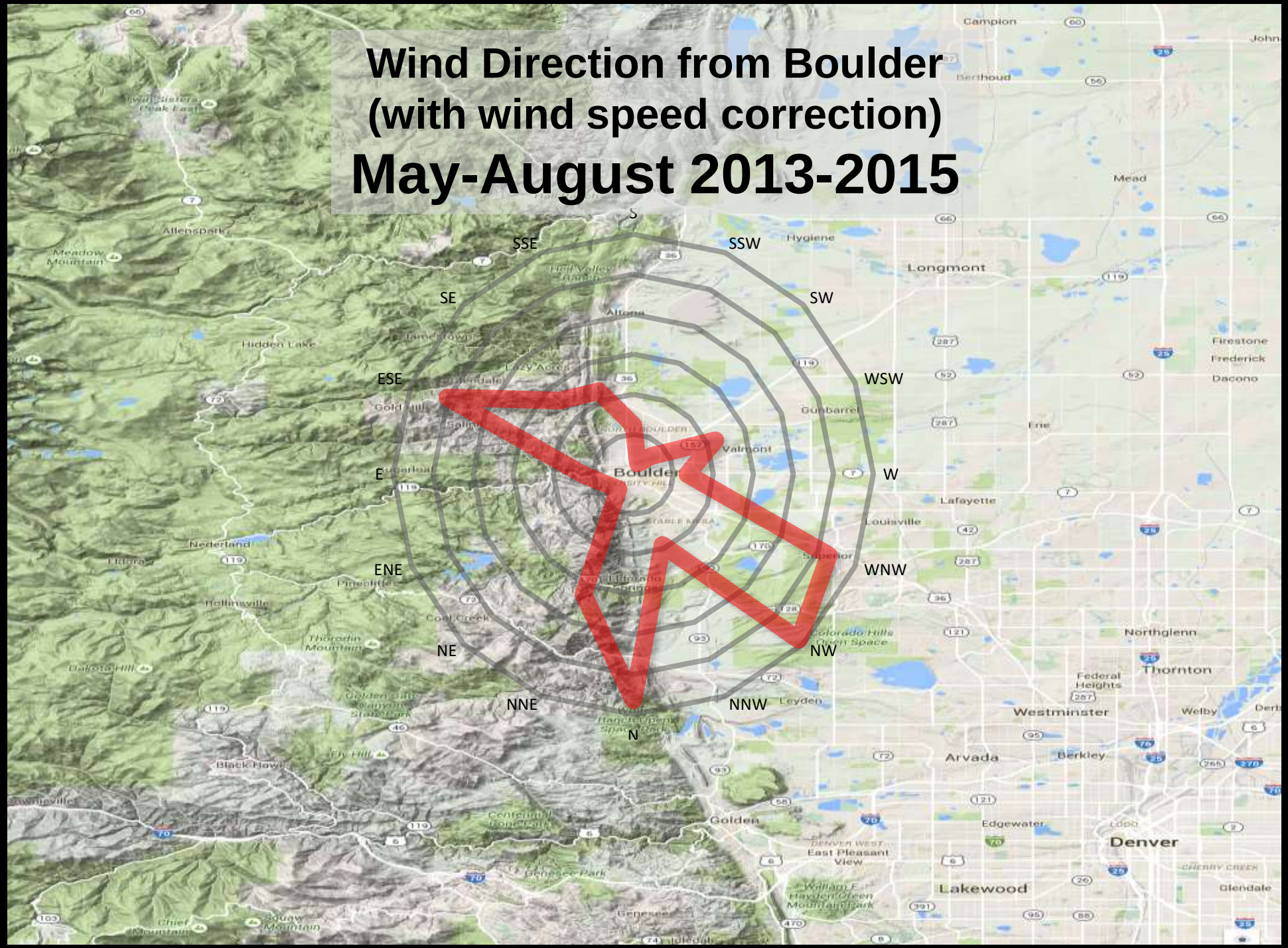
- Wind-blown dispersal of adults
  - Peak period of adult dispersal is late May through late July
- Butt-heads that move wood containing developing stages

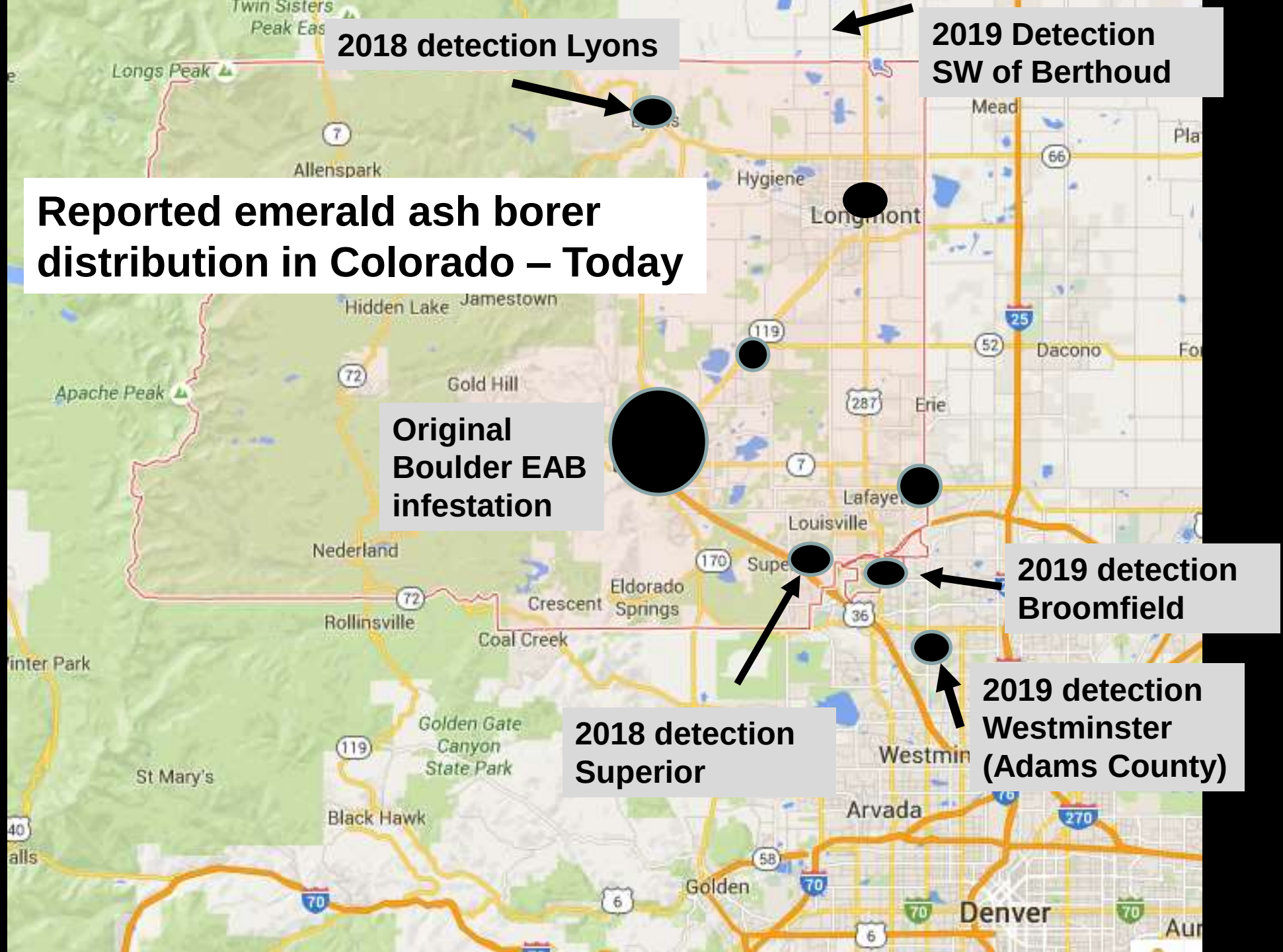
Photograph by David Cappaert

EAB likely will emerge sometime in mid-late May.

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
S
SSE
SSW
SE
SW
ESE
WSW
E
W
ENE
WNW
NE
NW
NNE
NNW
N
Boulder
Longmont
Lafayette
Louisville
Superior
Broomfield
Westminster
Arvada
Thornton
Northglenn
Federal Heights
Berkley
Edgewater
Denver
Lakewood
Golden
Nederland
Hygiene
Mead
Firestone
Frederick
Dacono
Erie
Gunbarrel
Valmont
Hidden Lake
Allenspark
Meadow Mountain
Leyden
Welby
Glendale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Hidden Lake
Jamestown
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Apache Peak
Dacono
Erie
Louisville
Nederland
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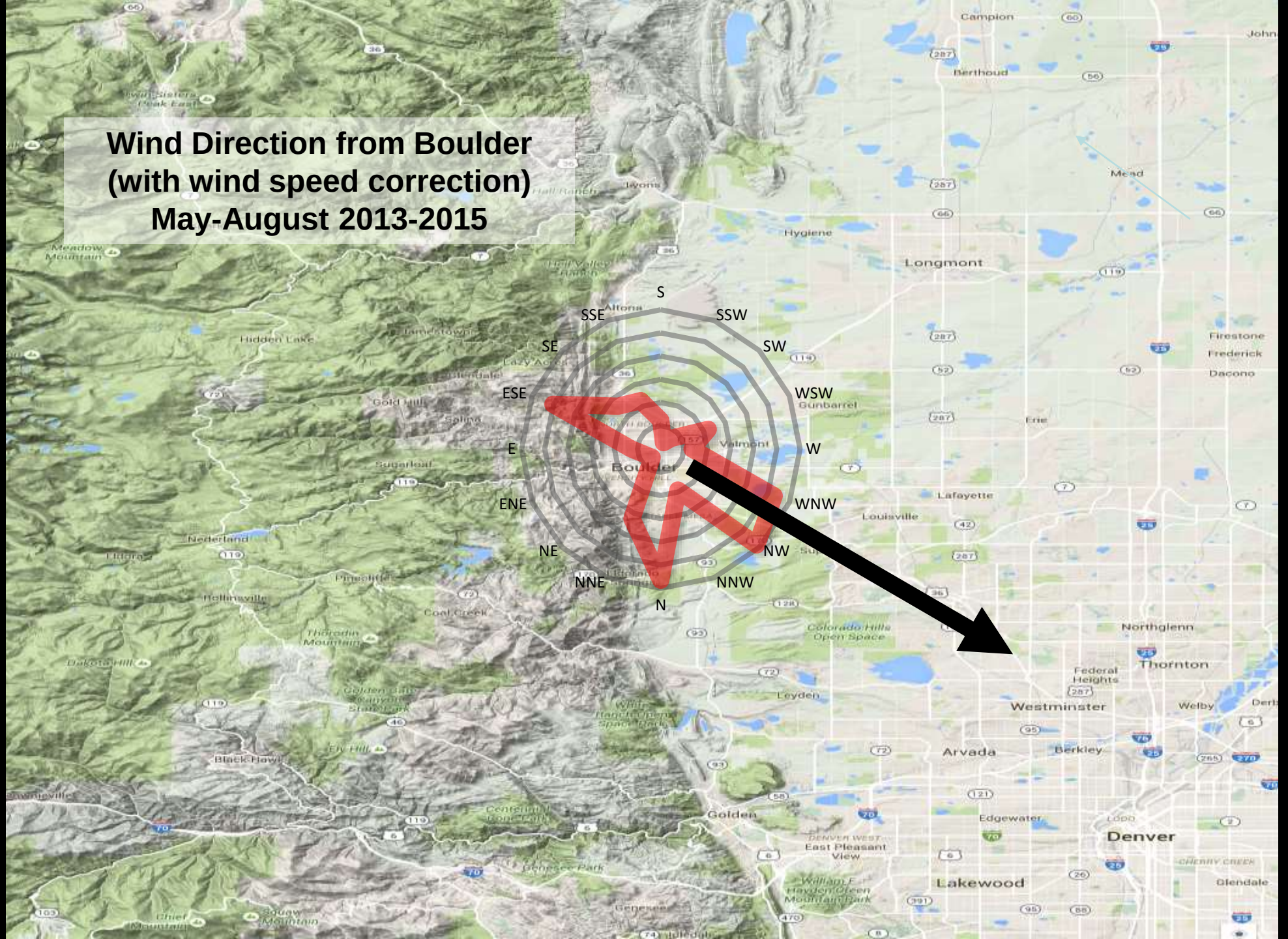
Crescent
Rollinsville
Coal Creek
Golden Gate Canyon State Park
St Mary's
Black Hawk
Arvada
Golden
Denver
Westmin


Wind Direction from Boulder
(with wind speed correction)
May-August 2013-2015
S
SSE
SSW
SE
SW
ESE
WSW
E
W
ENE
WNW
NE
NW
NNE
NNW
N
Boulder
Longmont
Lafayette
Louisville
Erie
Gunbarrel
Hygiene
Mead
Firestone
Frederick
Dacono
Northglenn
Thornton
Westminster
Arvada
Berkley
Federal Heights
Welby
Edgewater
Denver
Lakewood
Golden
Leyden
Nederland
Hollinsville
Black Hawk
Coal Creek
Gold Hill
Sugarloaf
Hidden Lake
Meadow Mountain
Lyons
Altona
Valmont
Campion
Berthoud
Glendale

How far away is emerald ash borer from your community?

How far away is emerald ash borer from your community?

One truckload