

# Update on Insect Issues Affecting Trees and Shrubs (207)

2018 ISA Pesticide Applicators Workshop



Whitney Cranshaw

Colorado State University



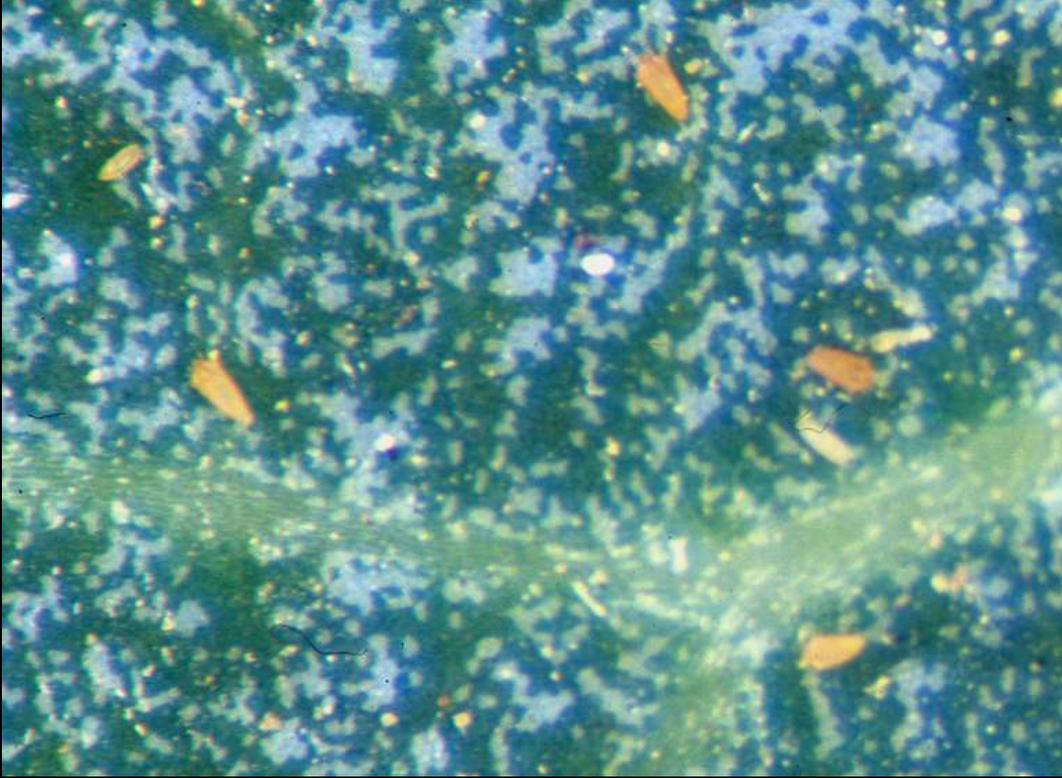
**Boabab**  
*Adansonia* spp.



## Outbreaks of ash flowergall mite



**Ash flowergall mite is  
an eriophyid mite**





**Ash flower gall mite develops within the male flowers of ash trees, causing them to become grossly distorted and to persist on the trees**



Typical ash flowergalls



**Galls noted in 2018  
were much more  
extensive than normal  
in many sites**



**White ash with  
old galls,  
November 2018**



**Cottonwood Leaf  
Beetle**

**Knab's Leaf Beetle**

**Outbreaks of two beetles  
on *Populus* and *Salix***





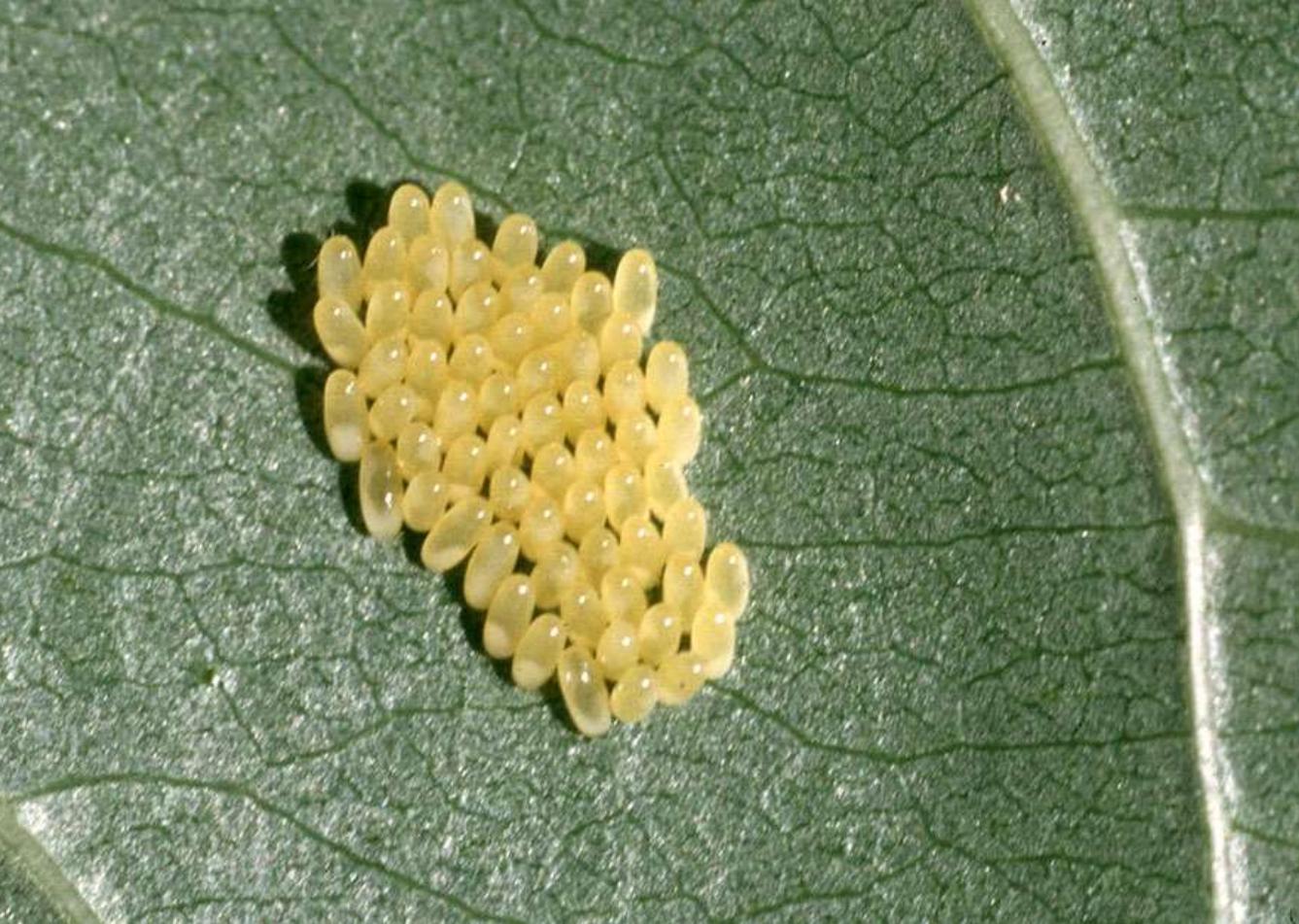
# Cottonwood Leaf Beetle

*Chrysomela scripta*

Coleoptera: Chrysomelidae

Hosts are cottonwoods, some poplars,  
occasionally some willows





**Eggs are laid on their host plants – cottonwoods, certain poplars, occasionally some willows.**





**Young larvae initially feed as a group and produce skeletonizing injuries**



**As the larvae get older they  
feed as more generalist  
defoliators**





**Adult with  
prepupa**



**Pupa and  
adult**

# Knab's Leaf Beetle

*Chrysomela knabi*

Coleoptera: Chrysomelidae

Hosts: Certain **willows**, occasionally aspen



**Outbreaks of two beetles  
on *Populus* and *Salix***



**These insects may co-occur on certain willows**





A concern?

Probably not much.  
These are native  
species, just having a  
particularly good year.





# Gambel oak borer

*Agrilus quercicola*

Another native insect,  
acting badly



An emergent  
pest of  
English oak



Gambel oak borer is in the same genus (*Agrilus*) as many of the flatheaded borers one can find in shade trees (e.g., bronze birch borer, honeylocust borer, emerald ash borer)

It is a native insect to Colorado, normally associated with Gambel oak



The adult emerges from a D-shaped exit hole, as do other metallic wood borers





**A native insect acting badly**

## **Gambel Oak Borer**

**This insect is native to Gambel oak but had never been reported to cause injury before 2003.**

**Populations exploded during the 2001-2003 drought years.**

**In 2003 a massive flight of adult insects colonized and killed oak trees that were at least 30 miles away.**



**Large plantings of oaks killed by Gambel oak borer in 2003**



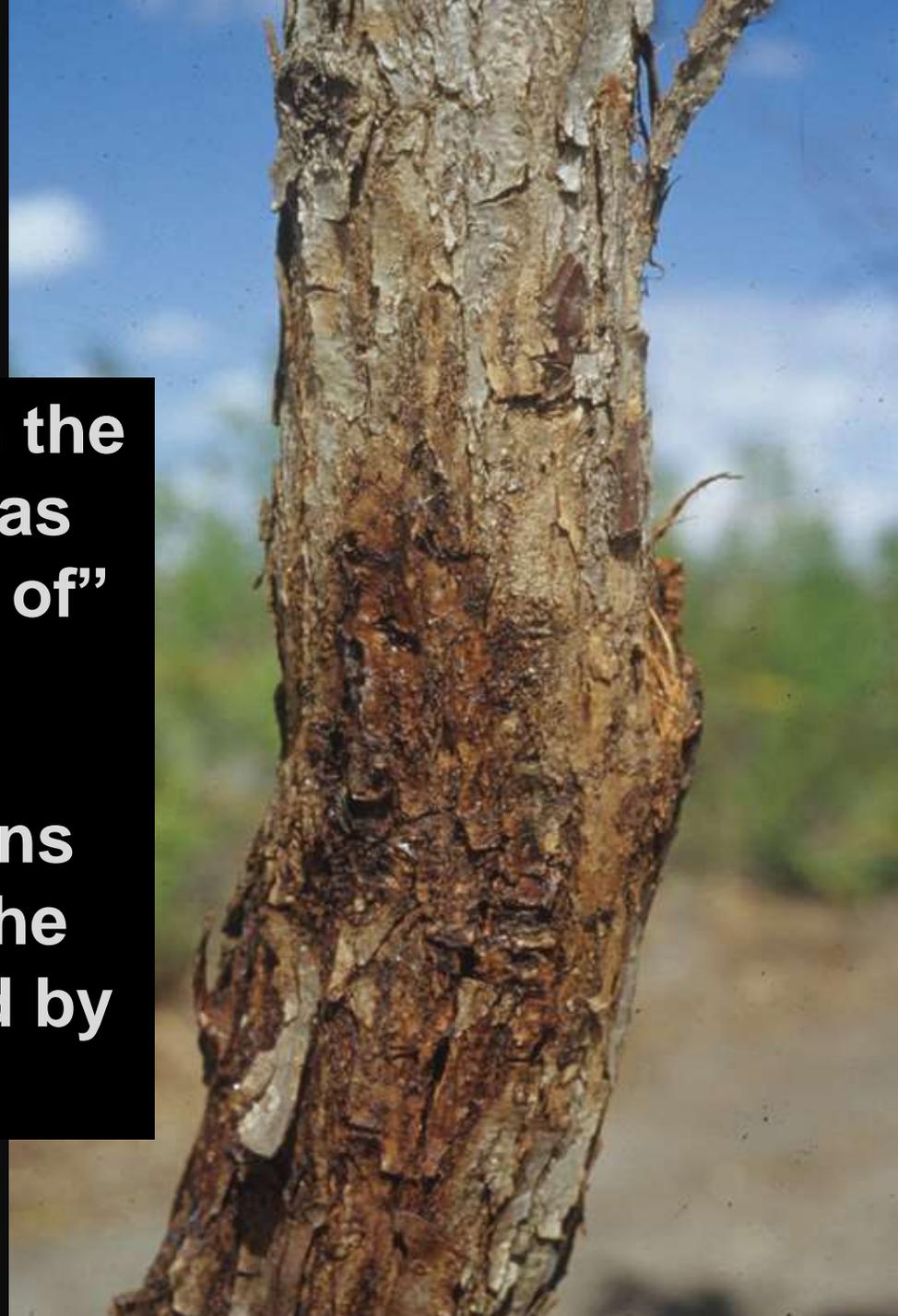
**Native Gambel oak and source of Gambel oak borer**





**The 2003 outbreak in the Denver metro area was thought to be a “one of” event**

**With the return of rains and end of drought the problem disappeared by 2004**



Several reports of declining English oak, associated with a flatheaded borer, were received in 2017



This proved to be the Gambel oak borer



**This insect continues to be damaging to English oak in both the Denver area and in parts of Boulder**



# Gambel Oak Borer In English Oak

- **Cultural Controls**
  - Provide adequate watering to plants
- **Biological Controls**
- **Insecticidal Controls**

# Gambel Oak Borer In English Oak

- Cultural Controls
  - Provide adequate watering to plants
- Biological Controls
- Insecticidal Controls

*Phasgonophora sulcatus* – a wasp that kills the larvae of Gambel oak borer (and other borers)



# Gambel Oak Borer In English Oak

- **Insecticidal Controls**

- Preventive sprays of permethrin, bifenthrin

- **In place before egg laying (mid June)**

- Trunk sprays of dinotefuran

- **June**

- Imidacloprid soil drench/injection

- **Applied shortly before adults emerge (late May)**

# Fifth Anniversary!

## Emerald Ash Borer in Colorado





# Colorado EAB Tree #1

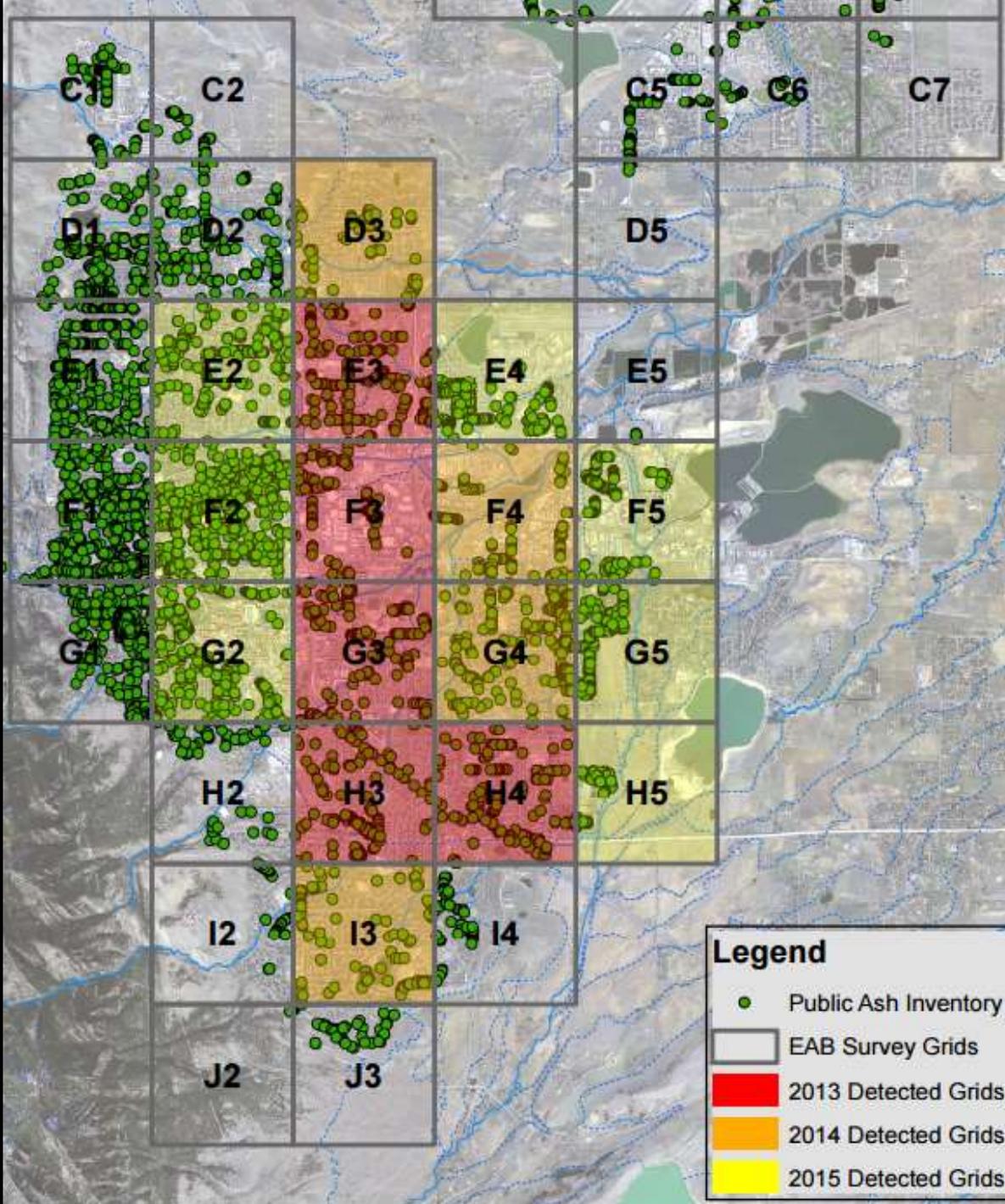
Located near the  
intersection of 30<sup>th</sup> and  
Valmont, Boulder

September 23, 2013

# BOULDER

## Area of original EAB infestation in Colorado



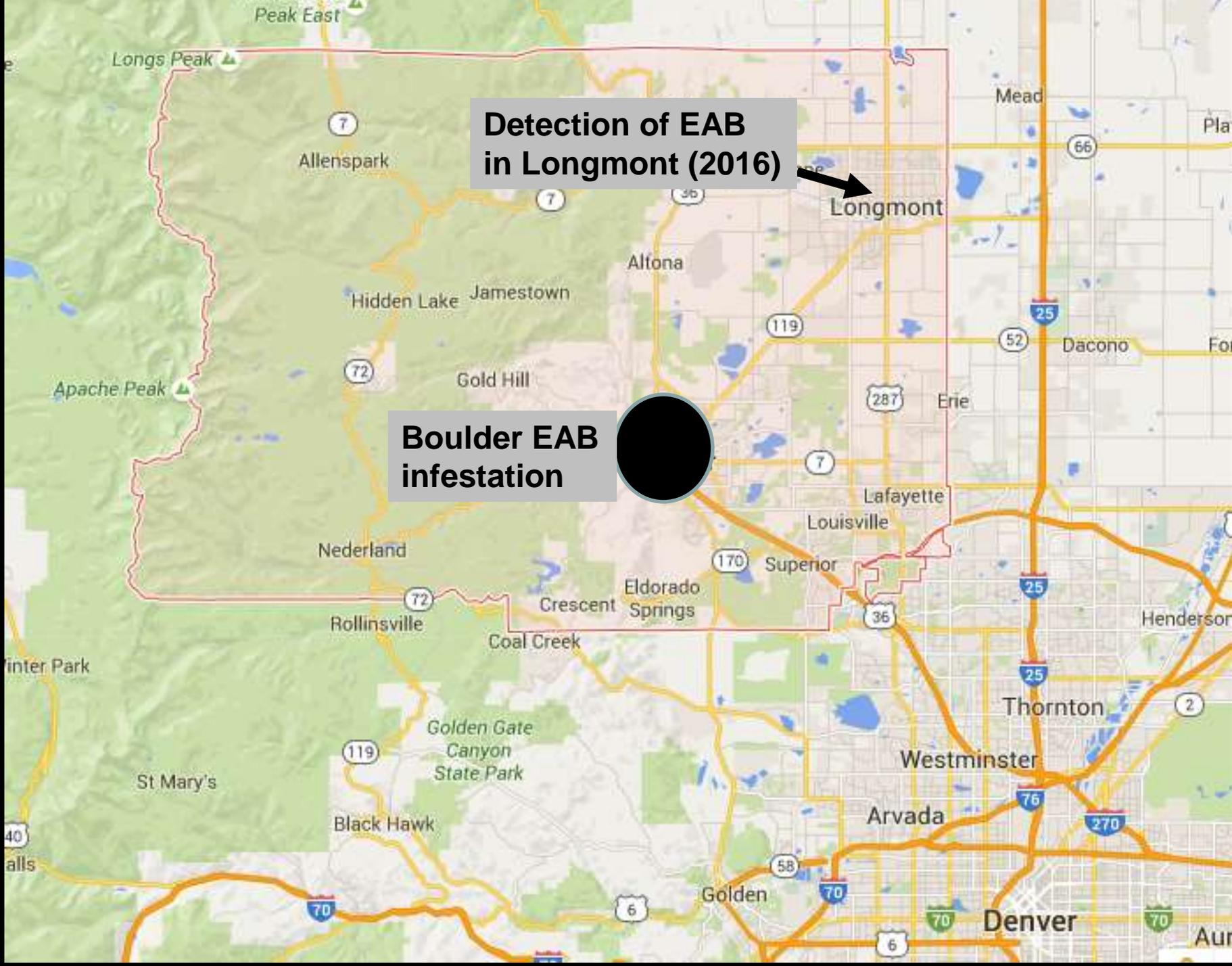


**Areas known  
to be infested  
with emerald  
ash borer in  
Boulder end  
of 2015**

# How will EAB spread in Colorado?

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

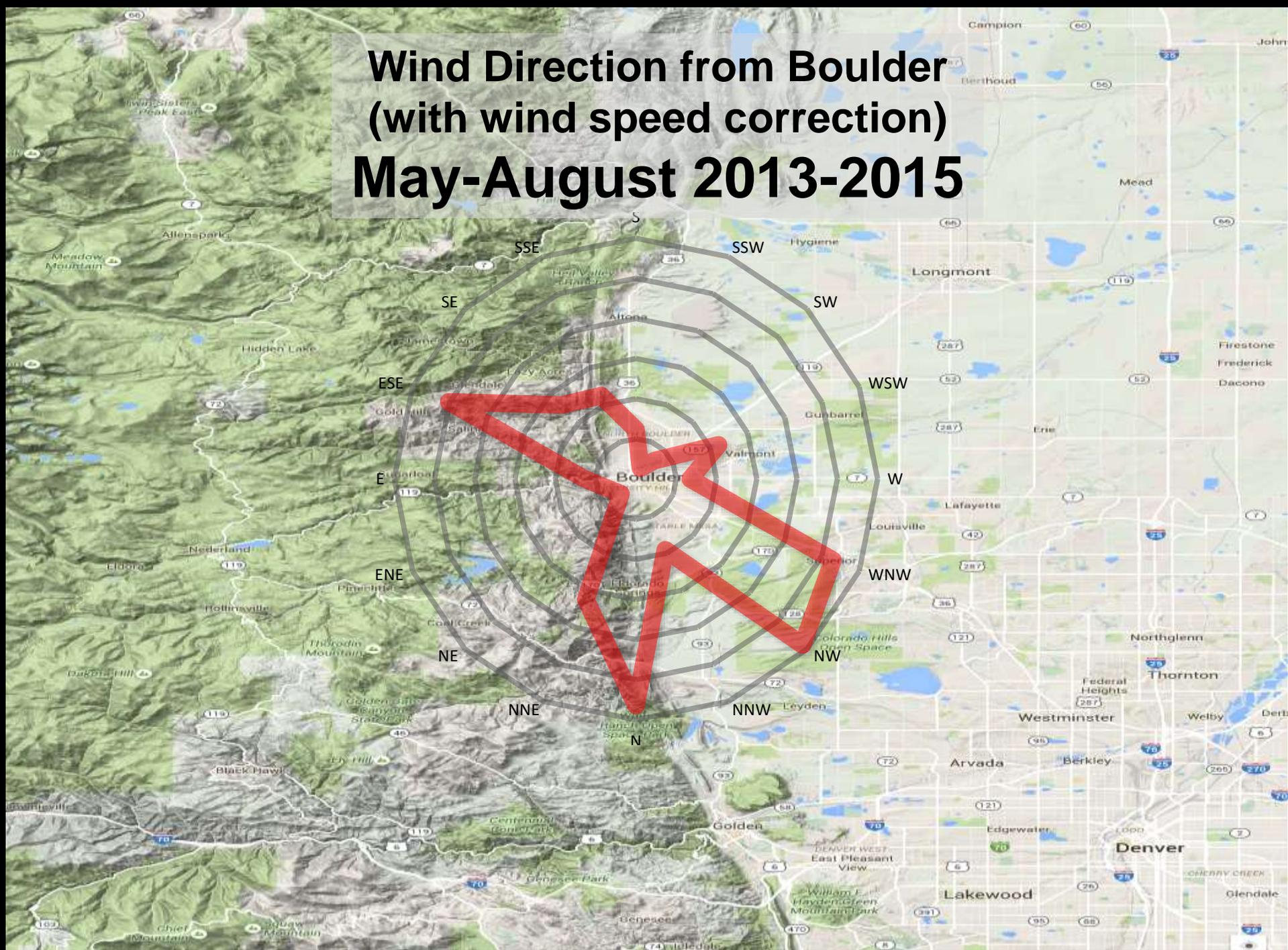




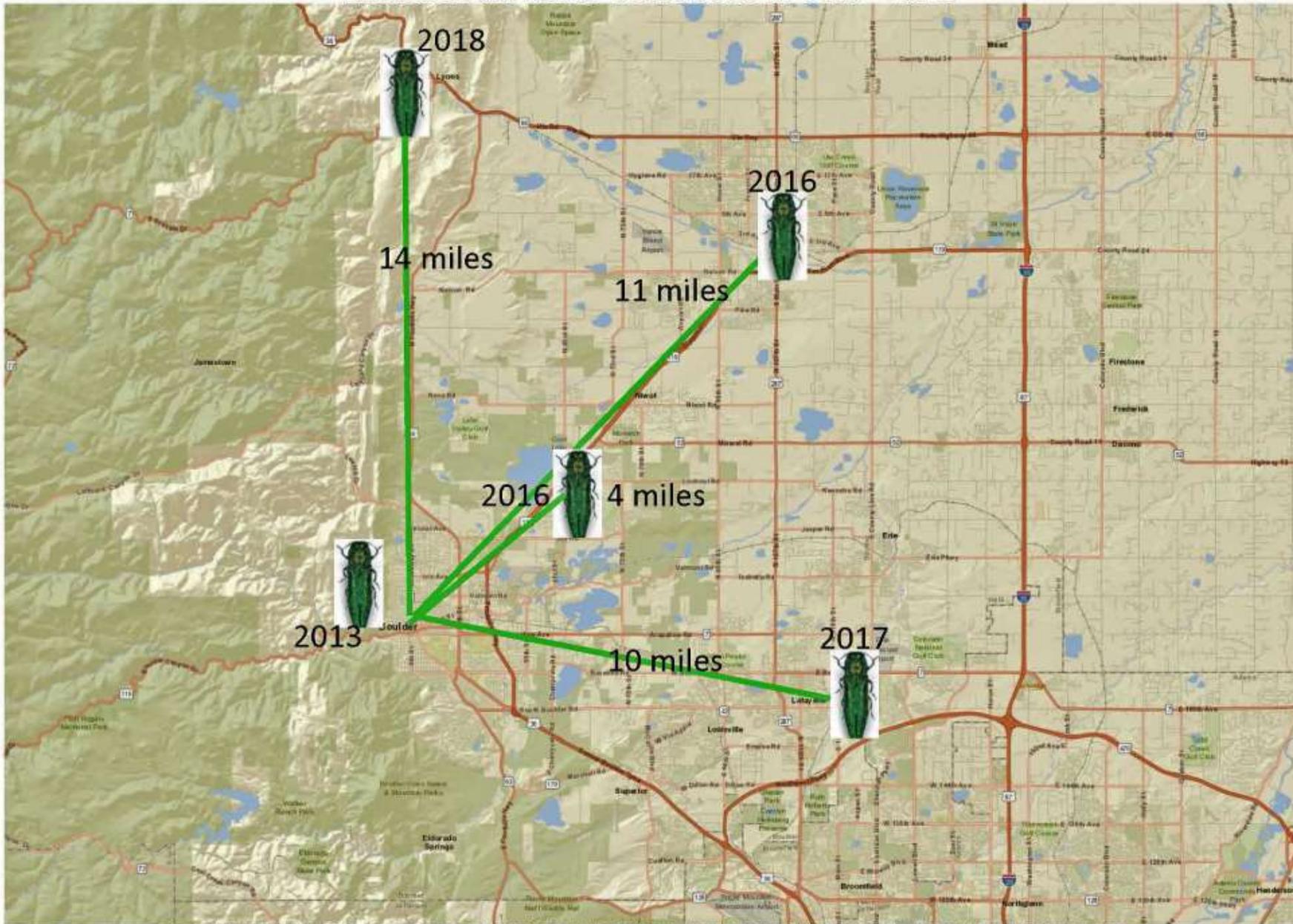
**Detection of EAB  
in Longmont (2016)**

**Boulder EAB  
infestation**

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



# Emerald Ash Borer Detections in Colo - 2018



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), Swire, © OpenStreetMap contributors, and the GIS User Community

0 2.25 4.5 9 Miles 1 in = 3 miles

Created by: D. West

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

# **Main Points About Emerald Ash Borer in Colorado Today**

- **All known infestations remain confined within Boulder County**
  - In time it 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

# 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, azadirachtin, imidacloprid

*One more borer!*

# Pigeon Tremex

*Tremex columba*





**Pigeon tremex – a wood boring wasp of deciduous trees in decline (ash, elm, maples).**



Larva in wood



Adults emerge from perfectly round exit holes in early-mid summer





**Pigeon Tremex**



**Giant Ichneumon Wasp**

# Giant Ichneumon Wasp

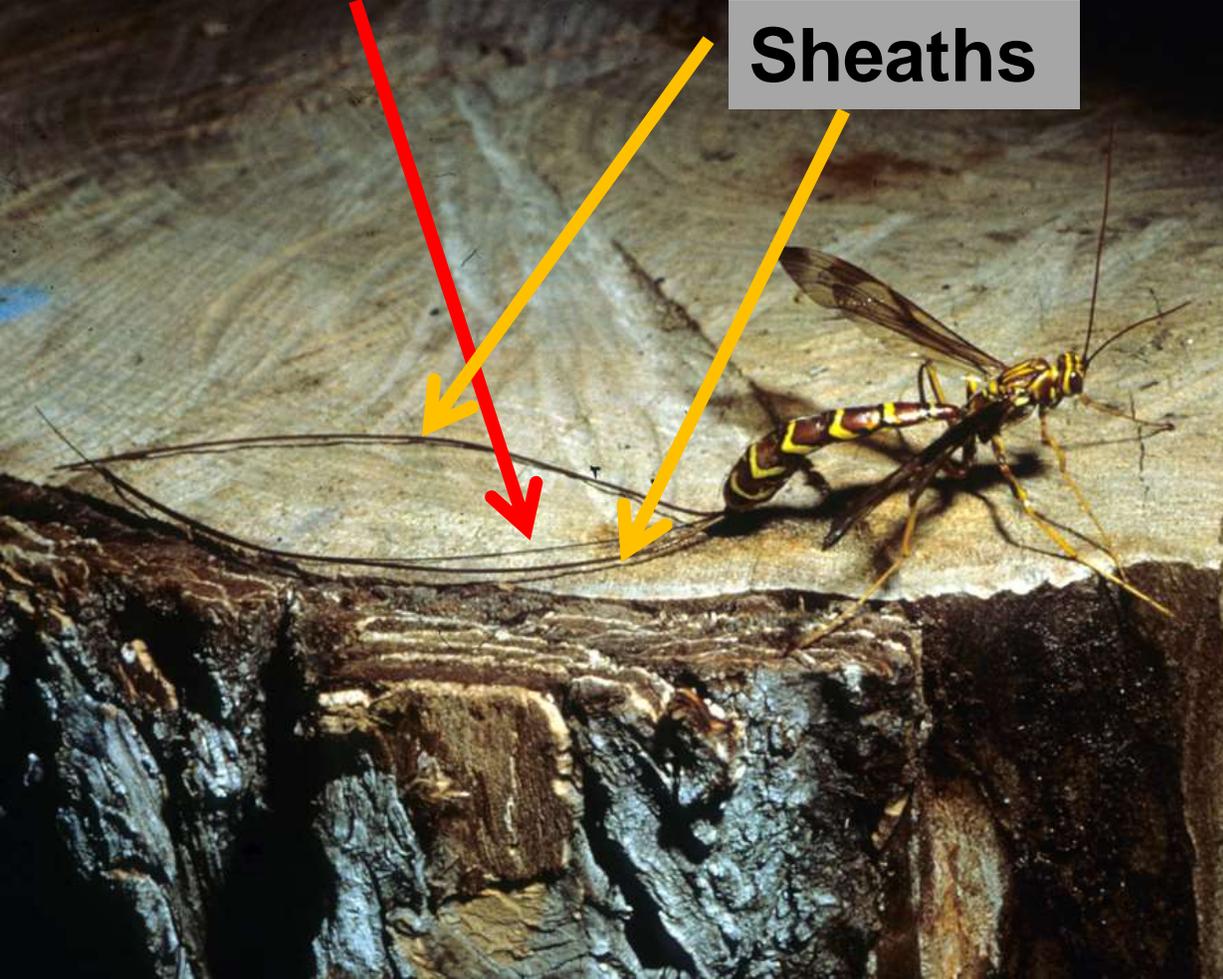
*Megarhyssa lunator*



Parasitoid of the pigeon tremex larva (borer)

Ovipositor

Sheaths





**Giant ichneumon wasp –  
the largest parasitoid wasp of  
the region**

Photographs courtesy of Mark MacMillan





# Root Weevils

*Otiorhynchus* spp., primarily



**Adults produce** leaf notching wounds





Larvae of root weevils feed on roots, usually of the same plant on which the adults produce leaf notching



**Black vine weevil**



**Common species of leaf notching root weevils**

**Strawberry root weevil**



**Decorated root weevil**



**Rough strawberry root weevil**



**Lilac root weevil**



## Lilac root weevil

*Otiorhynchus meridionalis*



A recent invasive species – *and a cause for concern?*



Adults feed at night. They notch leaves, making angular cuts along the leaf edge



Lilac, peony and privet  
seem to be the  
primary hosts for lilac  
root weevil





**Larva and root injury to peony by lilac root weevil**

# Root Weevil Control

- **Adult Control (foliage)**
  - A persistent pyrethroid (Tempo, Onyx, Scimitar, etc.)
- **Adult Control (soil injection/drench)**
  - Imidacloprid (*after flowering!*)
- **Larval Control (soil drench)**
  - *Heterorhabditis* spp. nematodes

# Insect Parasitic Nematodes

- Also known as entomopathogenic nematodes
  - Associated with pathogenic fungi
- Commercially available genera
  - *Steinernema*
  - *Heterorhabditis*



*Heterorhabditis* spp.  
nematodes **can**  
**penetrate directly**  
**through the body wall**



} = *Heterorhabditis* spp.  
} = *Steinernema* spp.

# Reddish color change from larvae killed by *Heterorhabditis* sp. nematodes



# Only insect parasitic nematodes in the genus *Heterorhabditis* are recommended for control of white grubs and root weevil larvae

## Entomopathogenic Nematodes

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

**Parasitic (Predatory) Nematodes- *Heterorhabditis* species.** Insect-parasitic nematodes in the genus *Heterorhabditis* are applied to soil as a drench to control larvae of various insects. They are capable of penetrating the body of insect larvae and are the most effective form of control of soil-dwelling white grubs and root weevils, as well as caterpillars. Several *Heterorhabditis* species are available, which vary some in pathogenicity to insects and sensitivity to temperature. Among those available are *H. bacteriophora* (= *heliothidis*) (e.g., HeteroMask, Grub-Away, BioStrike Hb, GrubStake Hb), *H. indica* (e.g., Grub Stake Hi), *H. marelatus*, and *H. megidis*.

Sources (*Heterorhabditis bacteriophora*): 4, 6, 7, 8, 10, 13, 16, 18, 20, 22, 27, 33

Sources (*Heterorhabditis megidis*): 11

Sources (Unspecified *Heterorhabditis* spp.): 1

Source (Unknown predatory nematodes/Mixture of *Heterorhabditis* and *Steinernema*): 2, 5, 10, 12, 14, 18, 21, 25, 26, 32, 33

# BIOLOGICAL CONTROL ORGANISMS FOR INSECTS AND MITES

Whitney Cranshaw, Austin Broberg, and Wendlin Burns  
Colorado State University  
May 31, 2017 Version

A wide variety of beneficial organisms are offered for sale by several suppliers to assist in management of insects and mites. The following is a listing of most of the US suppliers and it is organized into three sections. First is a brief description of organisms with potential applications followed by reference to sources where they may be purchased. This is followed by a brief summary listing of pest groups and the associated potential biological controls. At the end is a listing of addresses of many suppliers/producers.

**Regulatory Note:** Under current pesticide law, biological control organisms that involve microbes – such as bacteria, viruses, or fungi – are classified as pesticides and can only be used on crops for which they are labeled. These are in the section *Pathogens of Insects*. “Higher” organisms used for insect control – such as other insects, predatory mites and nematodes – are exempt and can be used on all crops.

## Predators of Insects/Mites

**Convergent Lady Beetle/Lady Beetles.** When sold as “lady beetles” or “ladybugs” the species involved is the convergent lady beetle, *Hippodamia convergens*, a native lady beetle found throughout North America. Purchased lady beetles are all field collected insects, captured in high elevation areas of California where they periodically migrate to and mass aggregate, allowing easy collection. Ability of the collected lady beetles to reproduce is suspended (they are in “reproductive diapause”) so eggs are not produced for several weeks after release. (Pre-feeding lady beetles prior to release can allow some egg maturation to start and a few companies provide such “pre-conditioned” lady beetles). Lady beetles tend to readily disperse from the area of release. Since they store well, lady beetles are available most of the year, although supplies often are limited by midsummer.

Sources: 1, 2, 4, 5, 8, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 30, 32, 33, 34

**Twospotted Lady Beetle.** The twospotted lady beetle, *Adalia bipunctata*, is an aphid predator that most commonly forages on shade trees, shrubs, and fruit trees. It is widely established and common in most of

This source list is one of many things you can find at the **Insect Information Website**



**Leaf notching  
by root weevils**



**Leafcutter bee  
wounds**



**Leafcutter bee damage to rose,  
lilac and Virginia creeper**





**Leafcutter Bees**  
Hymenoptera: Megachilidae





## Leafcutter bee nest sites

Soft, rotting wood is  
often excavated for  
nest sites



Drilled wood block for leafcutter bees, filled with nest cells



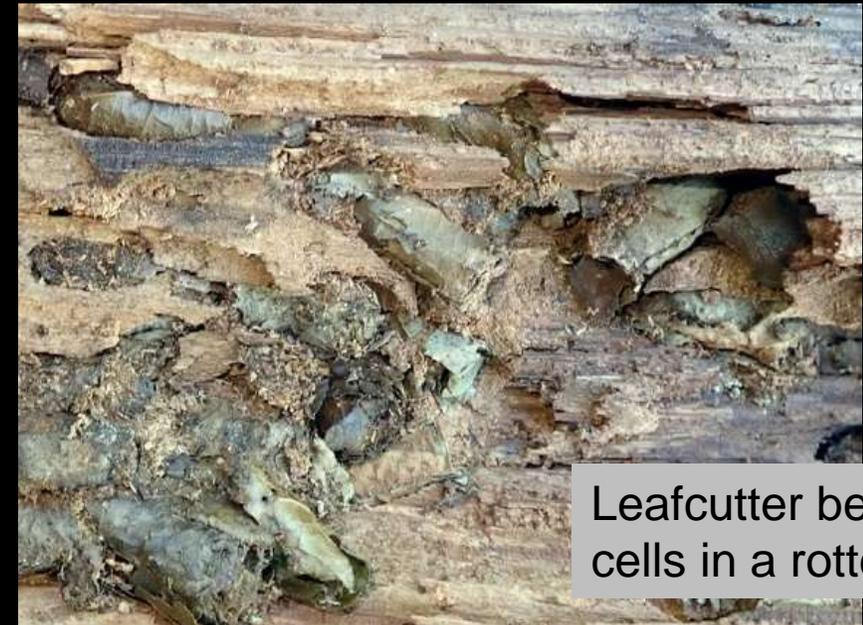
Leafcutter bee nest cells and exposed larvae



## Leafcutter bee nest cells



Leafcutter bee excavating nest cells in rotten wood of a porch deck



Leafcutter bee nest cells in a rotten log

Nest cells in pith of rose cane



Photograph courtesy of David Shetlar, Ohio State University

# Pith nesting by leafcutter bees

Nest cells with pollen in stem of weed



Photograph courtesy of David Shetlar, Ohio State University

**A common practice is to provide nest sites for cavity-nesting bees such as leafcutter bees and mason bees**



**Leafcutter bees cut fragments from the edges of leaves that are suitable for nest building**



# Line the nest with leaf/flower fragment



**Note:** Neither the bee or larva feed on the fragments



# For nest construction:



3-4 rectangular pieces,  
crimped for the base

Oval pieces along the sides of  
the cell



# Provision the nest with pollen



**Note:** Leafcutter bees carry pollen on their abdomen (ventral side)





**Plugs of pollen/nectar in cells  
constructed within a plant stem**



# For nest construction:



3-4 rectangular pieces,  
crimped for the base

Oval pieces along the sides of  
the cell

Nearly perfect circles used to  
cap the cell





## **For nest construction:**

**3-4 rectangular pieces,  
crimped for the base**

**Oval pieces along the  
sides of the cell**

**Near perfect circles used  
to cap the cell**

**All leaf fragments are  
oriented with the smooth  
side inwards**



# Japanese Beetle

*Popillia japonica*





**Japanese beetle**  
**damages plants in**  
*two distinct ways*

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



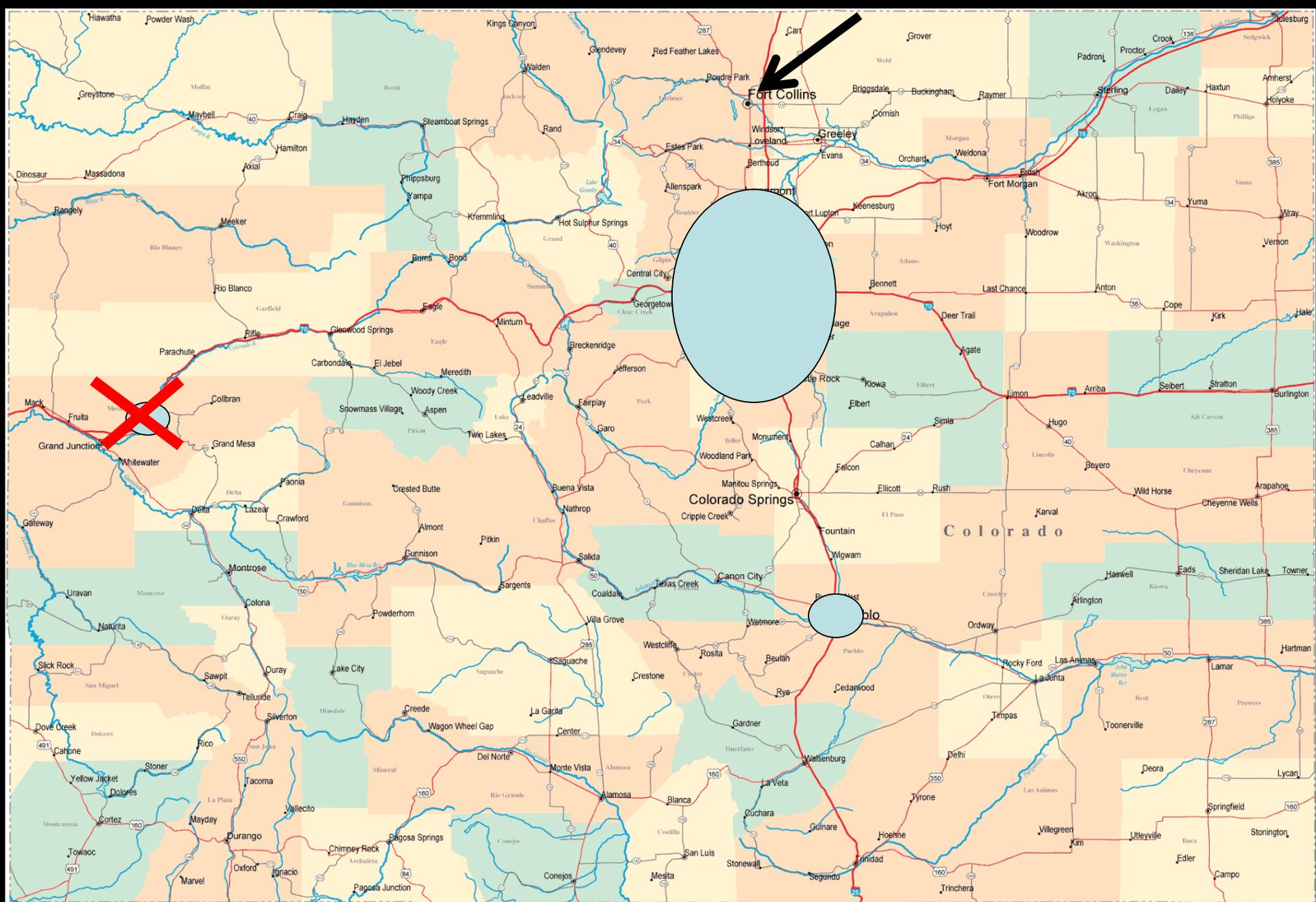
**Flowers are often a favored plant part targeted by adult Japanese beetles**



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

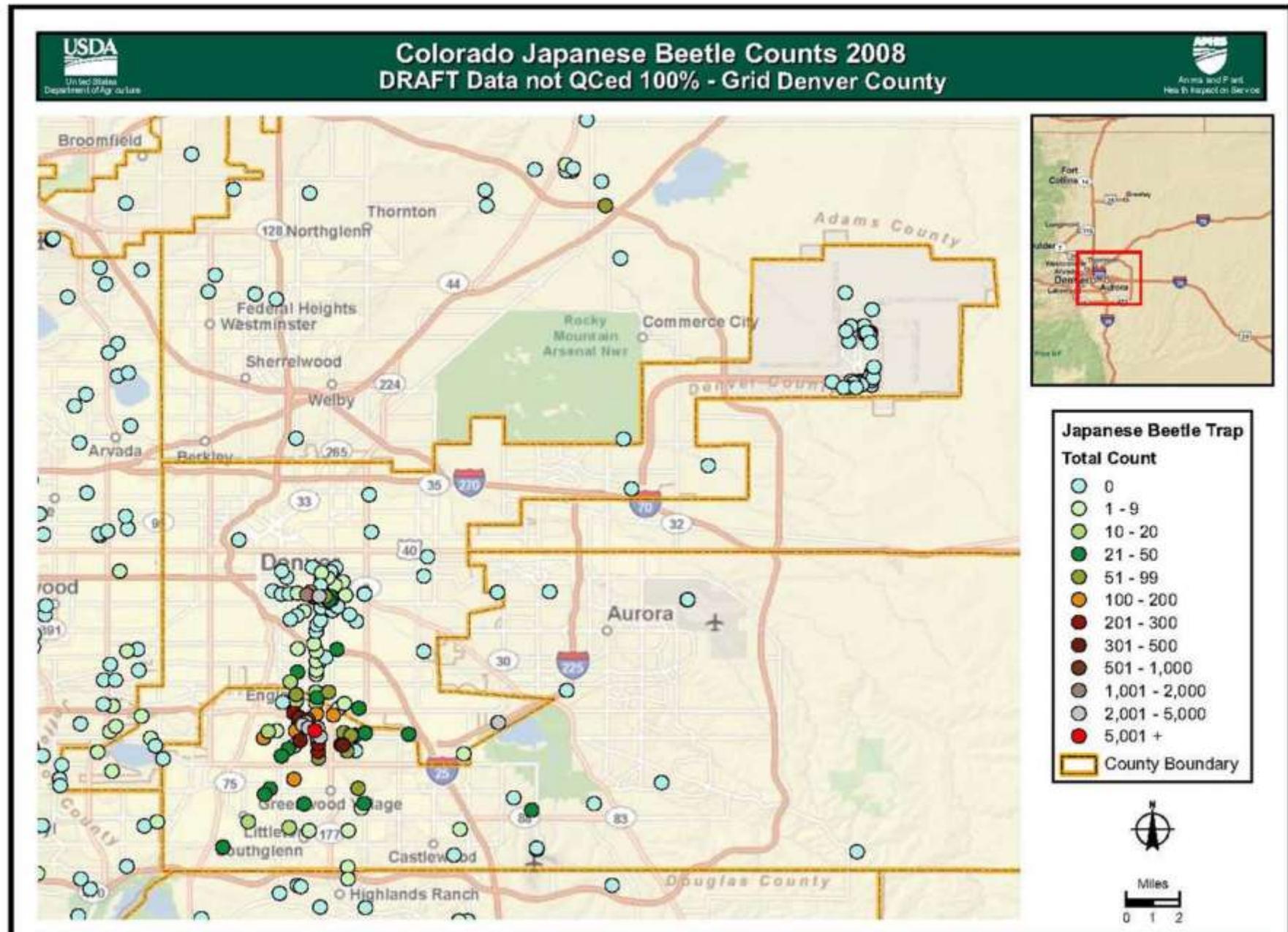


Japanese beetle affects  
yard/garden plants **in two  
distinct ways**



**Japanese beetle is present in two main areas – *and spreading fast***

# Results from extensive trapping of Japanese beetle in Denver area in 2008



USDA APHIS PRQ  
2950 N Lewiston Street, Suite 330  
Aurora CO 80011

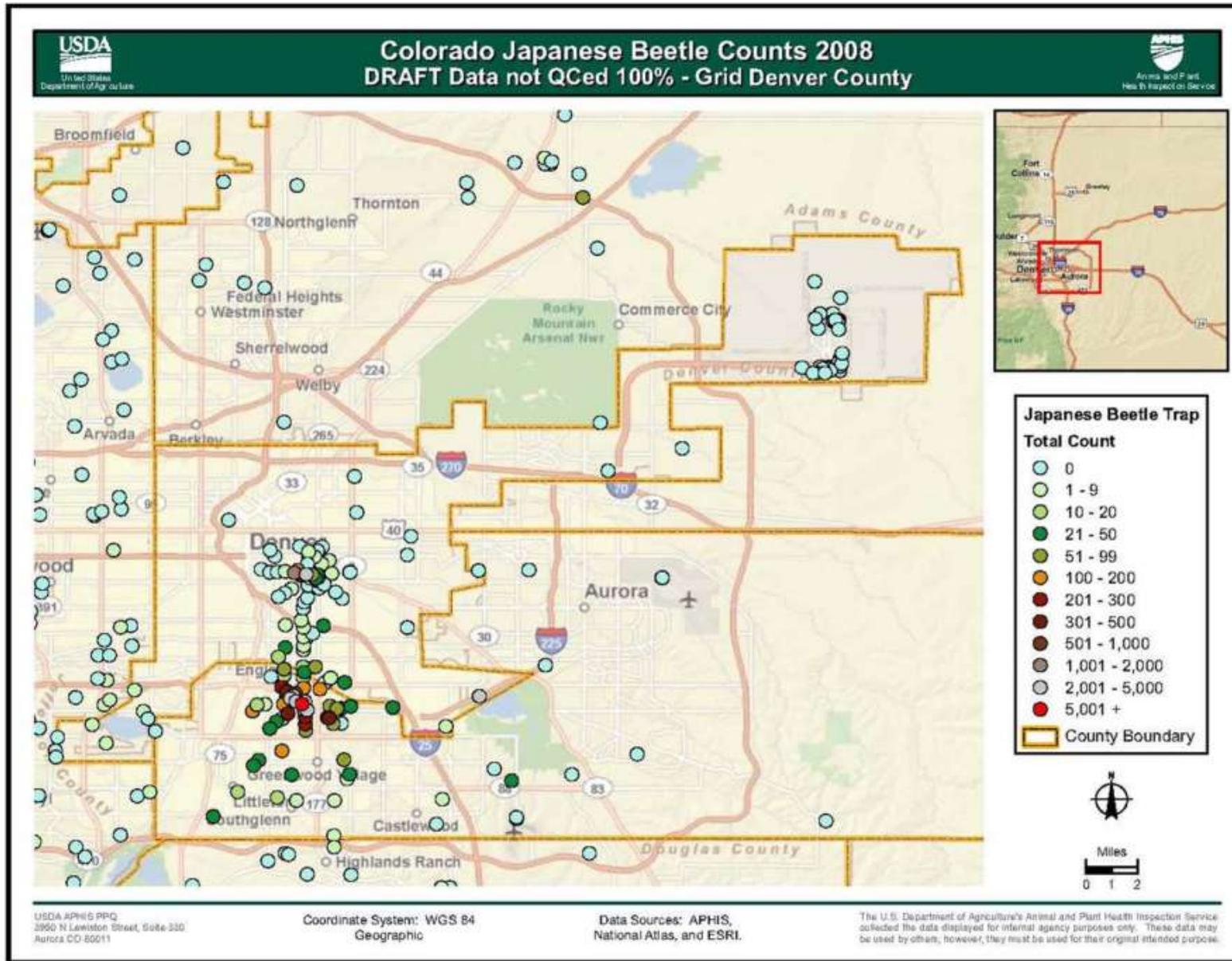
Coordinate System: WGS 84  
Geographic

Data Sources: APHIS,  
National Atlas, and ESRI.

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service collected the data displayed for internal agency purposes only. These data may be used by others; however, they must be used for their original intended purpose.

# Proposed Project for 2019

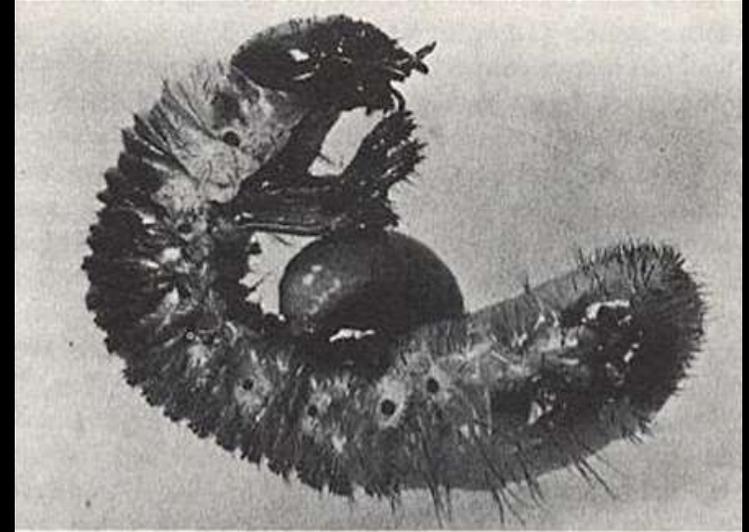
Repeat/Expand the 2008 Japanese beetle survey to establish the present situation in eastern Colorado



Should we now consider trying to introduce natural enemies of Japanese beetle into Colorado?



Yes!



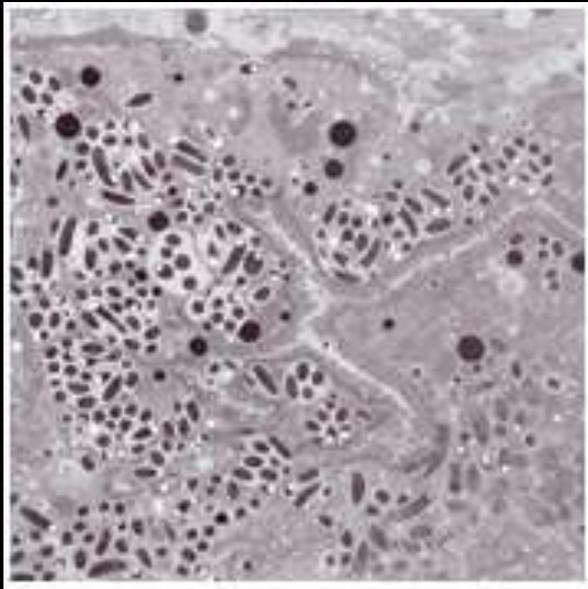
## Natural Enemies of Japanese Beetle Exist Elsewhere in the US

- ***Paenibacillus popilliae*** (Milky spore)
  - Bacterium
- ***Istochoeta aldrichi*\***
  - Tachinid fly
- ***Tiphia* species\***
  - Parasitic wasps
- ***Ovavesicula popilliae*\***
  - Microsporidium (fungus)

\* Species involved in Colorado Japanese Beetle Biological Control Program

## Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

*Ovavesicula popilliae* – a microsporidian disease of Japanese beetle larvae

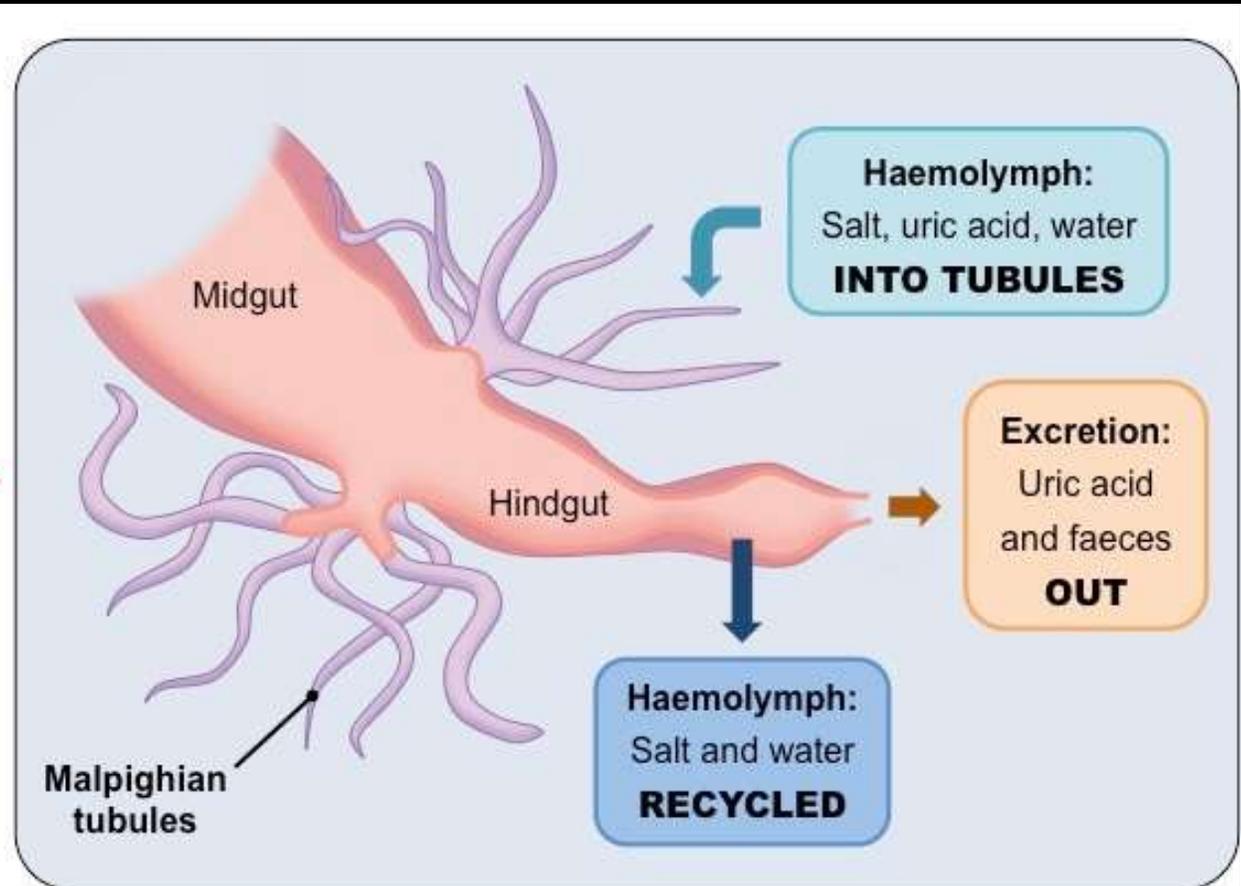
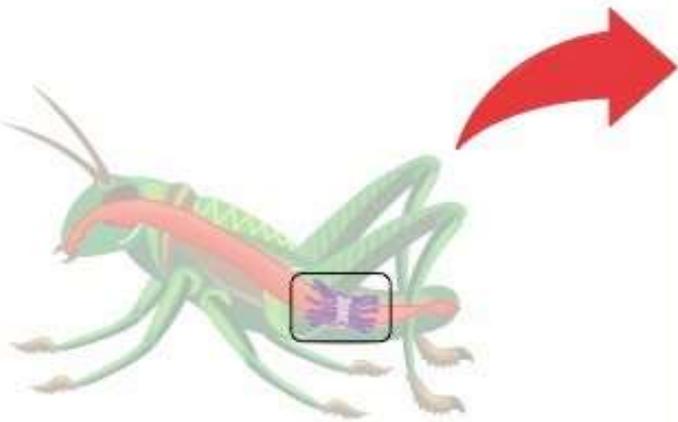
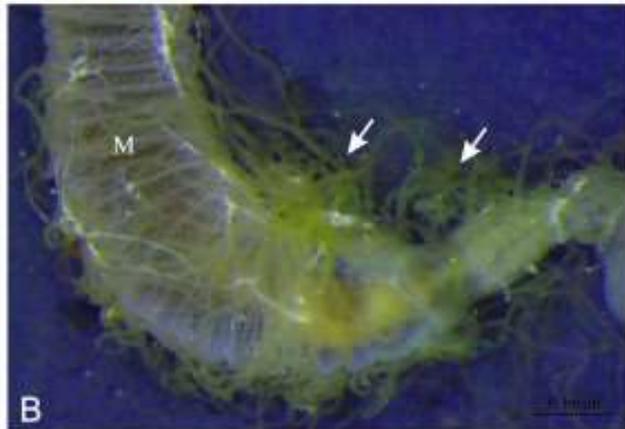


*Ovavesicula* infection of Malpighian tubules of Japanese beetle larva



**Main observed effects from infection – reduced fecundity, reduced winter survival**

The **Malpighian tubules** of insects filter wastes from the blood, functioning somewhat like what the kidney does in humans



## Heavy *O. popilliae* infection of Malpighian tubules of Japanese beetle



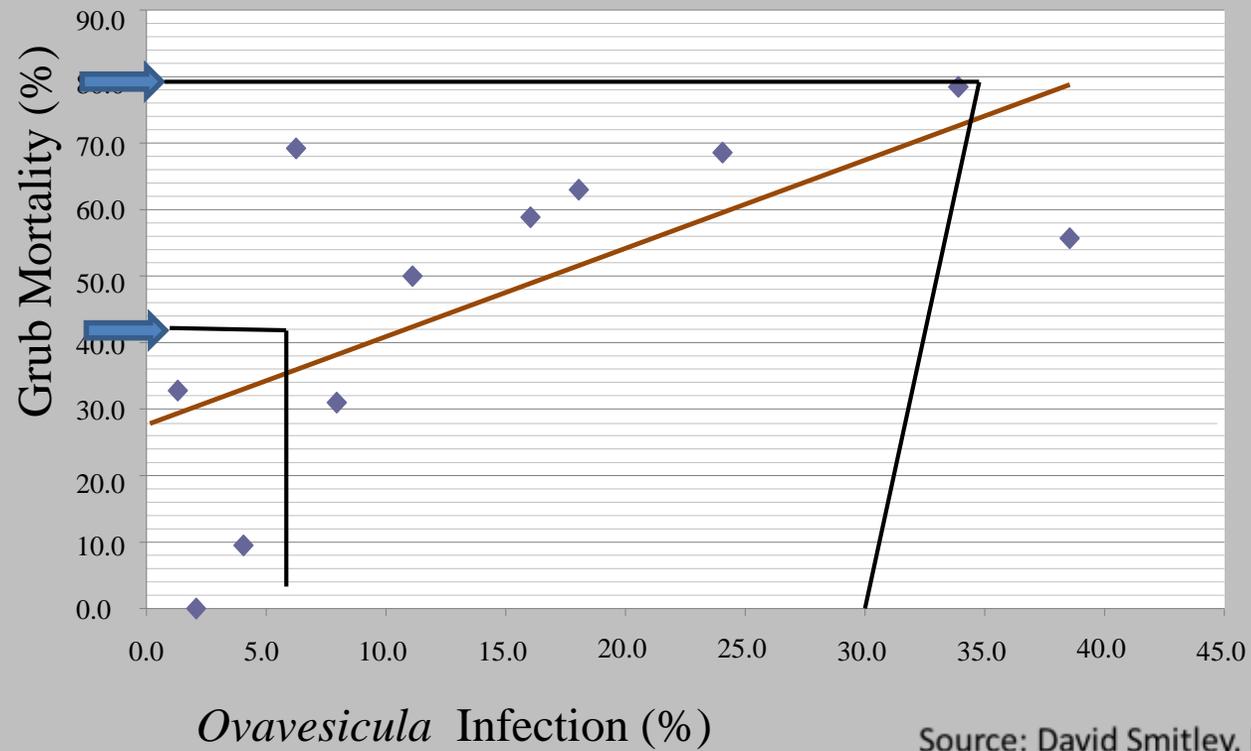
Source: David Smitley, Michigan State University

A light micrograph showing a cross-section of a malpighian tubule. The tubule is filled with numerous small, dark, spherical structures, which are sporophorous vesicles of the fungus *O. popilliae*. The tubule is surrounded by a thin layer of tissue. The overall appearance is that of a densely packed, elongated structure.

Infected  
malpighian  
tubule packed  
with *O. popilliae*  
sporophorous  
vesicles

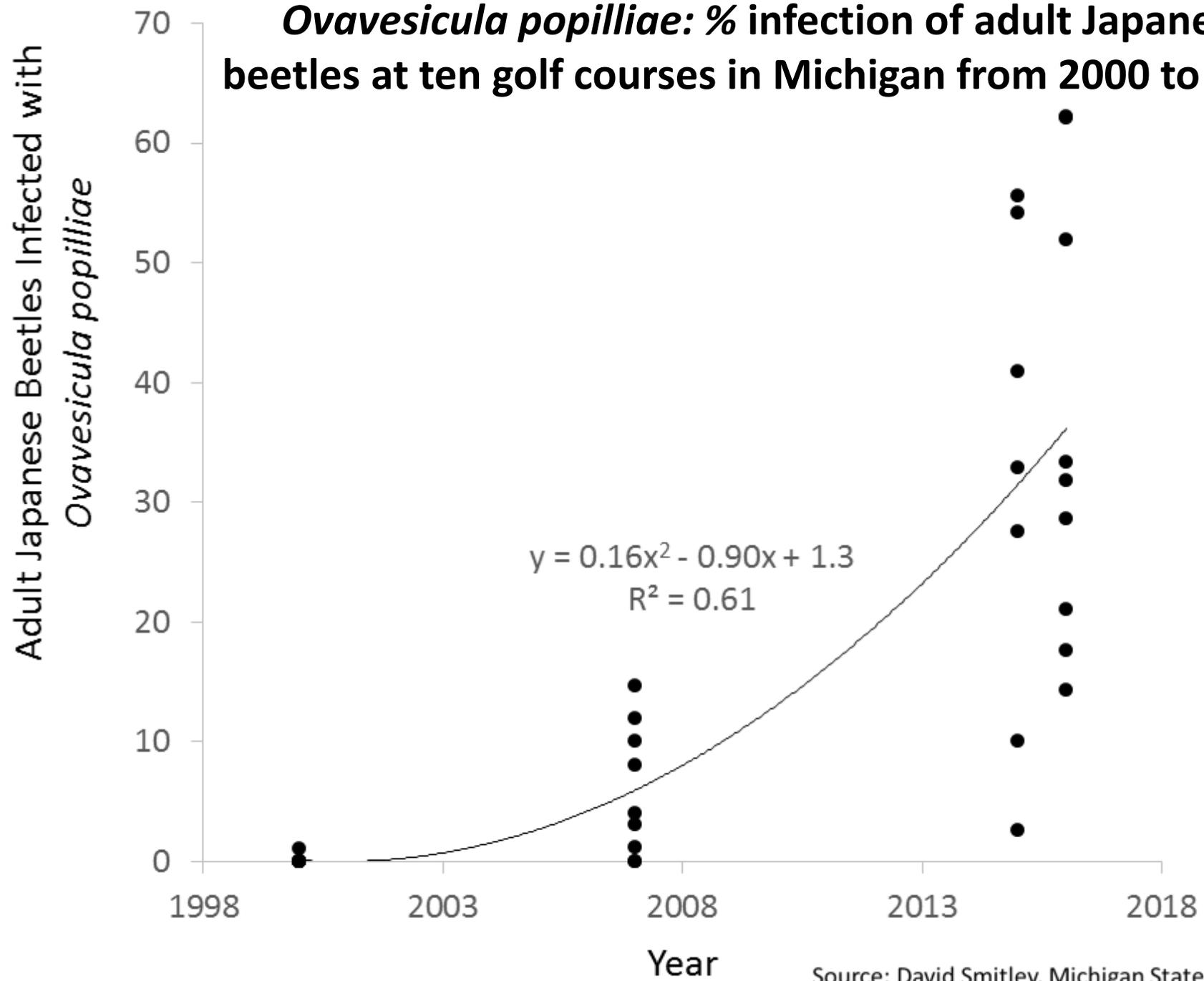
Source: David Smitley, Michigan State University

## Year 6: Impact of *Ovavesicula* Infection on Winter Grub Mortality (Oct.'05 to April '06)

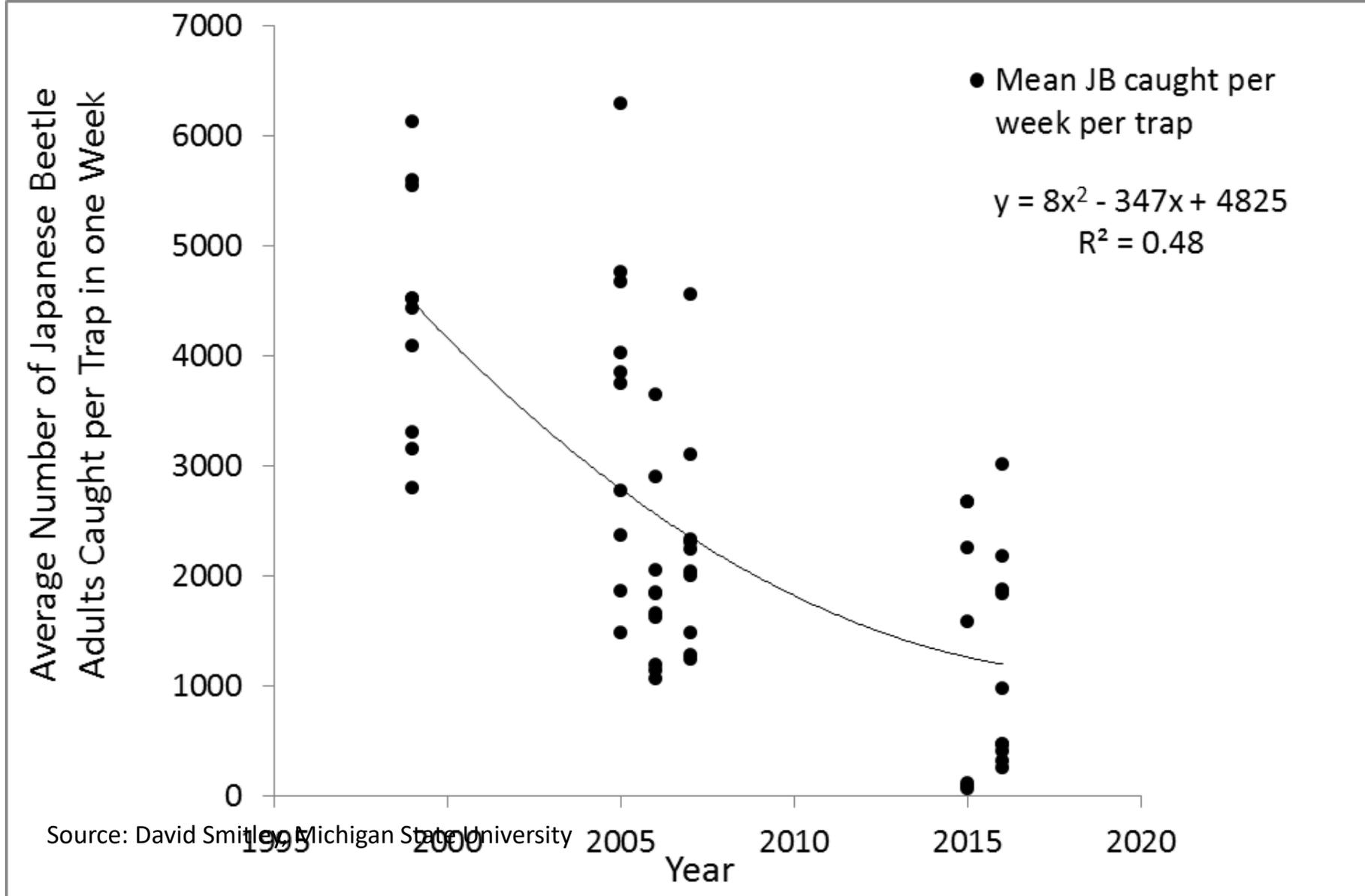


Source: David Smitley, Michigan State University

***Ovavesicula popilliae*: % infection of adult Japanese beetles at ten golf courses in Michigan from 2000 to 2016.**

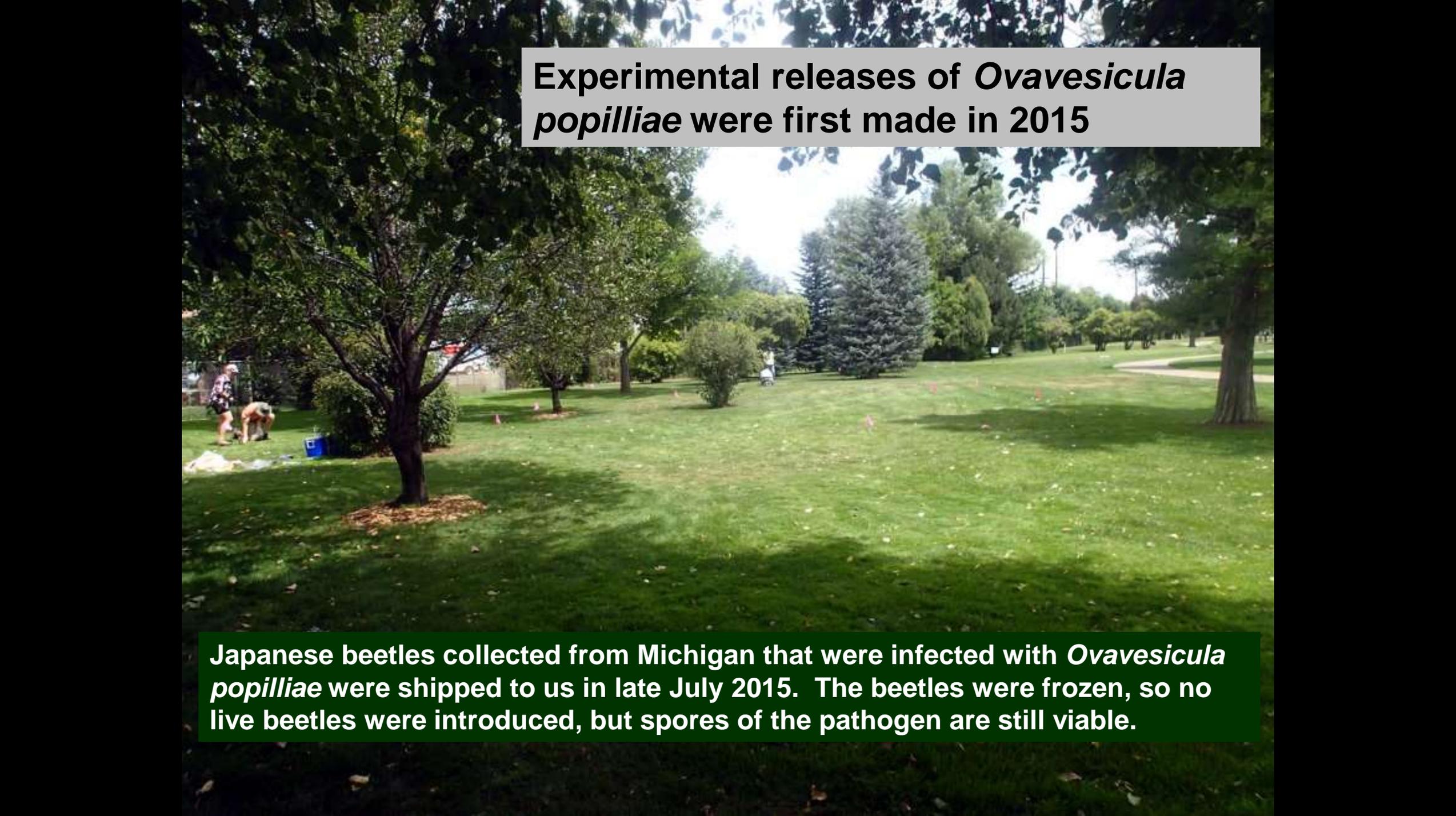


Source: David Smitley, Michigan State University



Japanese beetle trap catches at ten golf courses in southern Michigan from 1999 to 2016.

Data are mean beetles/trap/week.

A photograph of a golf course with a person and a dog in the background. The scene is a lush green lawn with several trees and a path in the distance. A person is standing near a dog on the left side of the frame. The background shows a well-maintained golf course with various trees and a path leading into the distance.

**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.**

**The infected (but dead and frozen) beetles were applied in several ways**



**Inserted whole into soil**

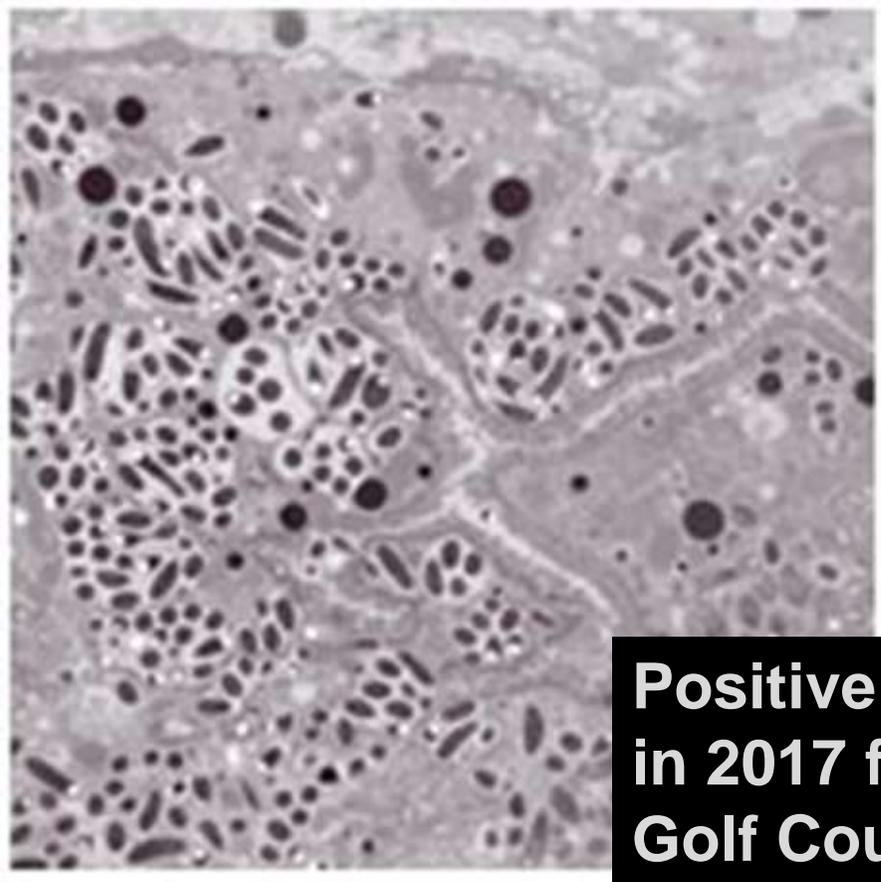


**Blended and applied as slurry**



**Broadcast whole on surface**

# 2015 releases of *Ovavesicula popilliae* – It took!



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



ROCKY MOUNTAIN REGIONAL TURFGRASS ASSOCIATION

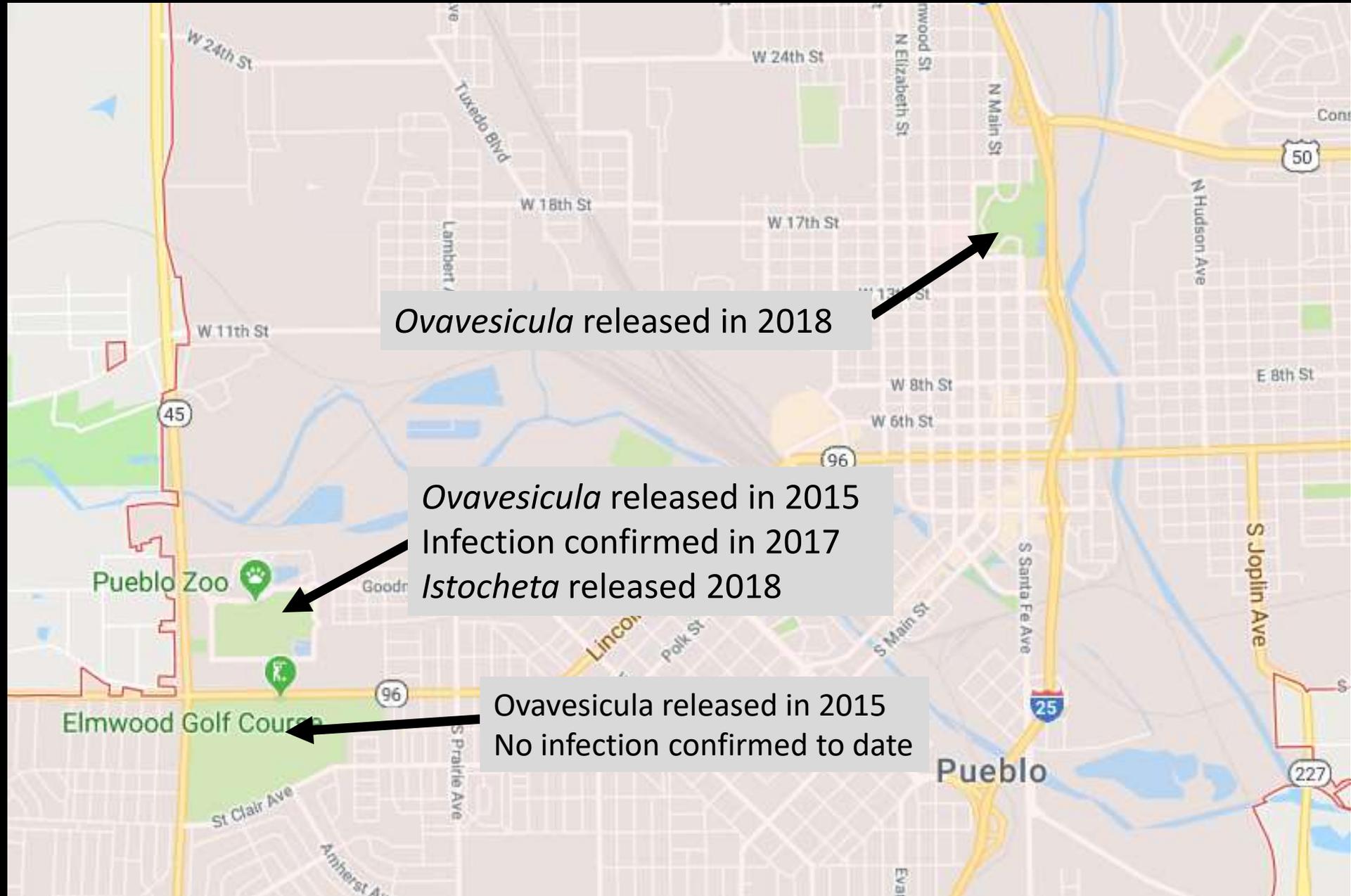
This project was supported by the RMRTA!!! Thank you!!!

Japanese beetle  
biological control  
sites in the Denver  
Metro area - **2018**

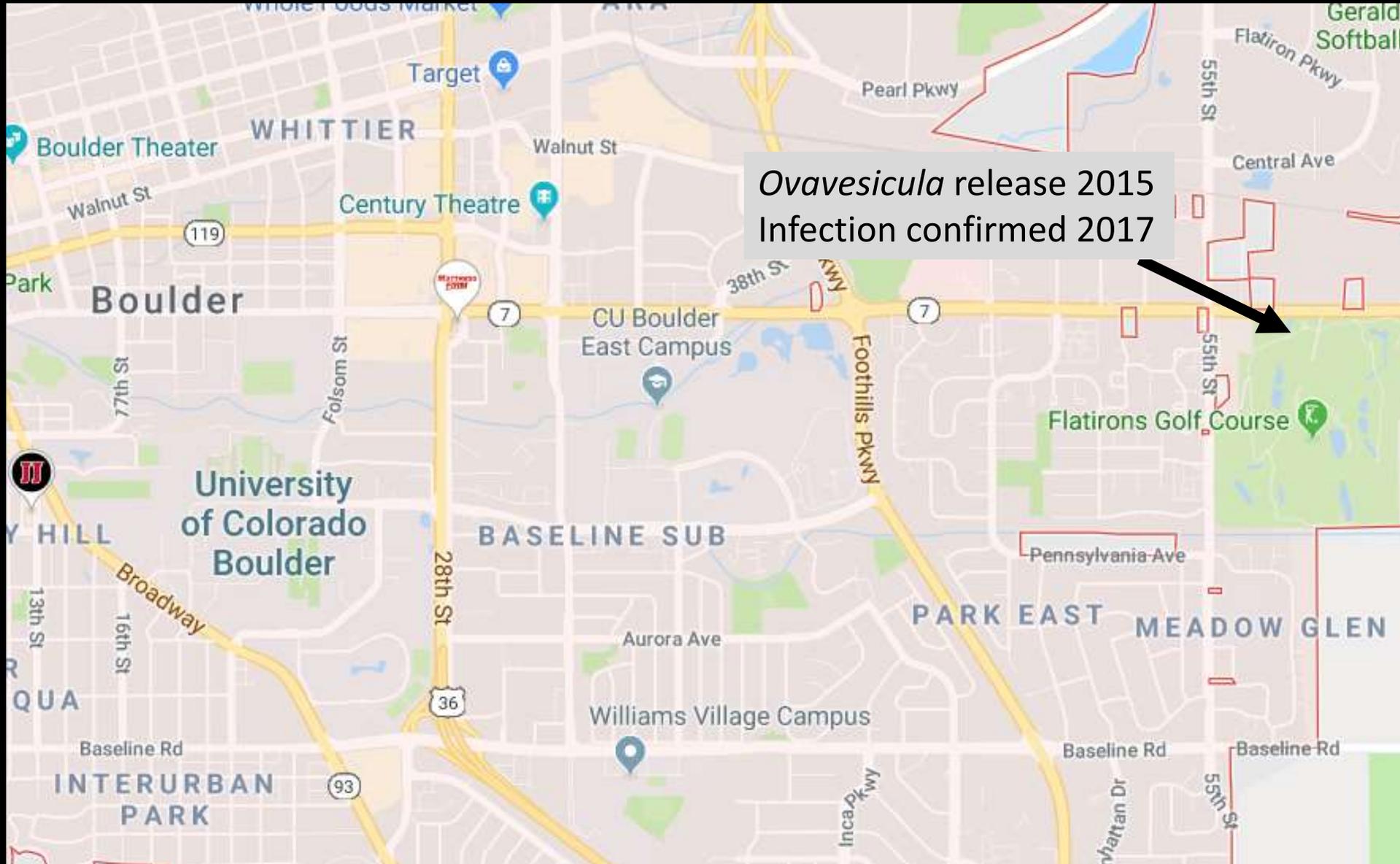
*Ovavesicula  
popilliae* was  
released at six  
sites during  
August



# History of JB Biological Control Releases in Pueblo



# History of JB biological control releases in Boulder



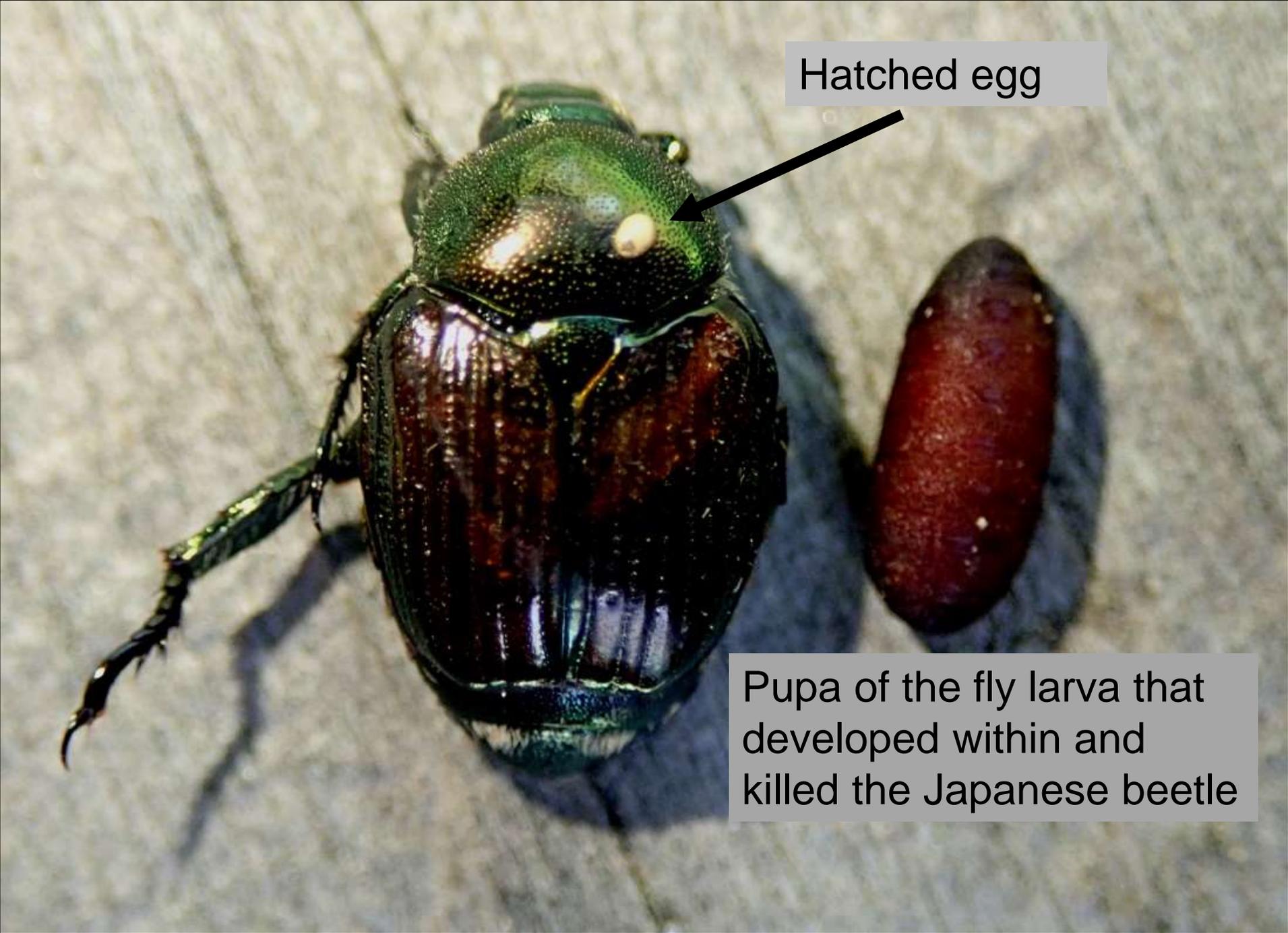
# *Istocheta aldrichi*

– the “winsome fly”

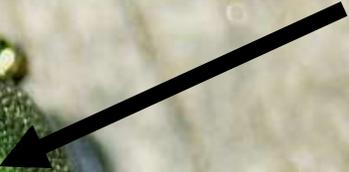
Diptera: Tachinidae



The adult flies glue their eggs onto adult Japanese beetles



Hatched egg



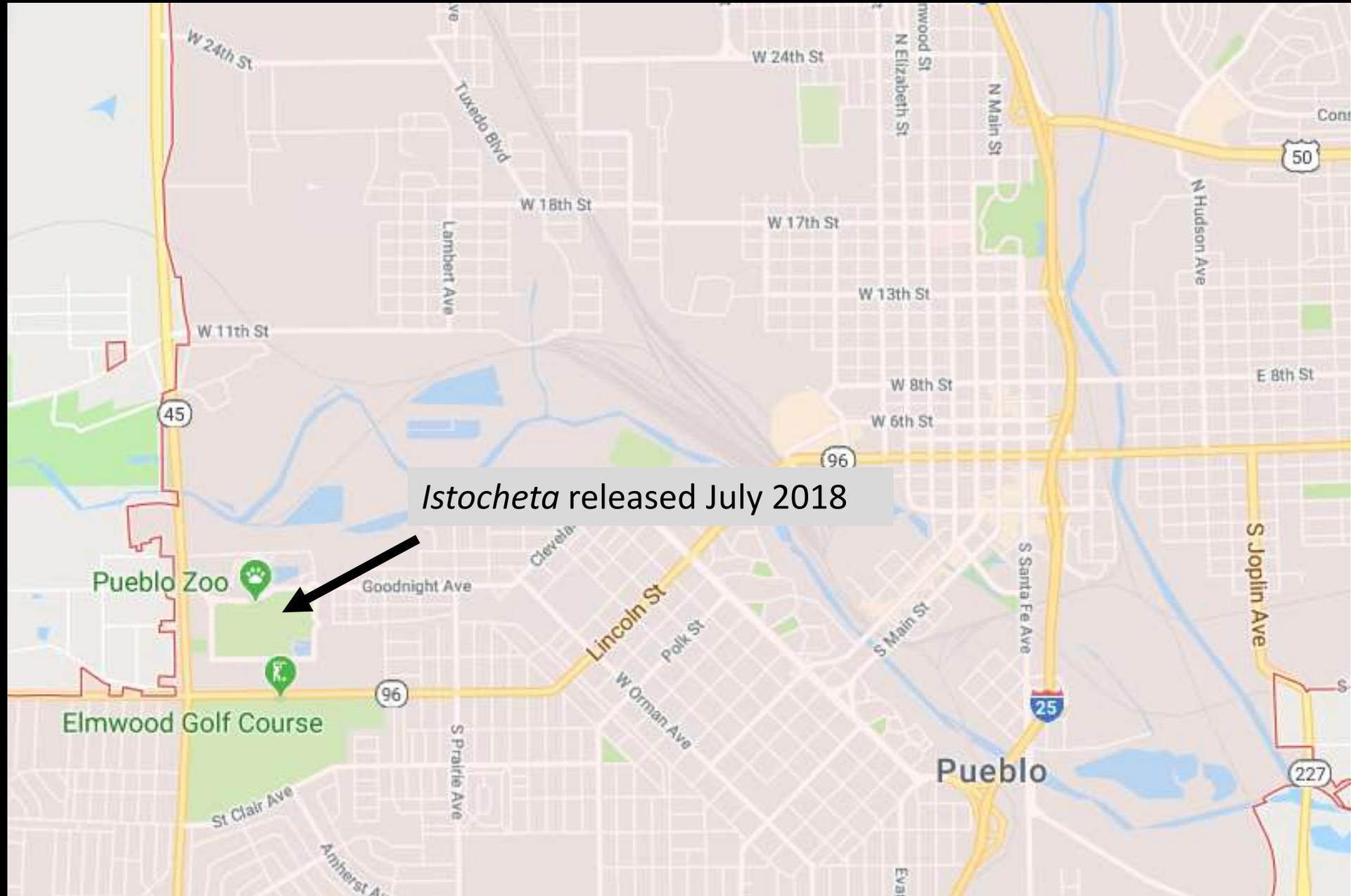
Pupa of the fly larva that developed within and killed the Japanese beetle

Japanese beetle biological control sites in the Denver Metro area - 2018

*Istocheta aldrichi* was released at two sites during July



# History of JB Biological Control Releases in Pueblo



# *Tiphia vernalis*

spring tiphia

Hymenoptera: Tiphidae

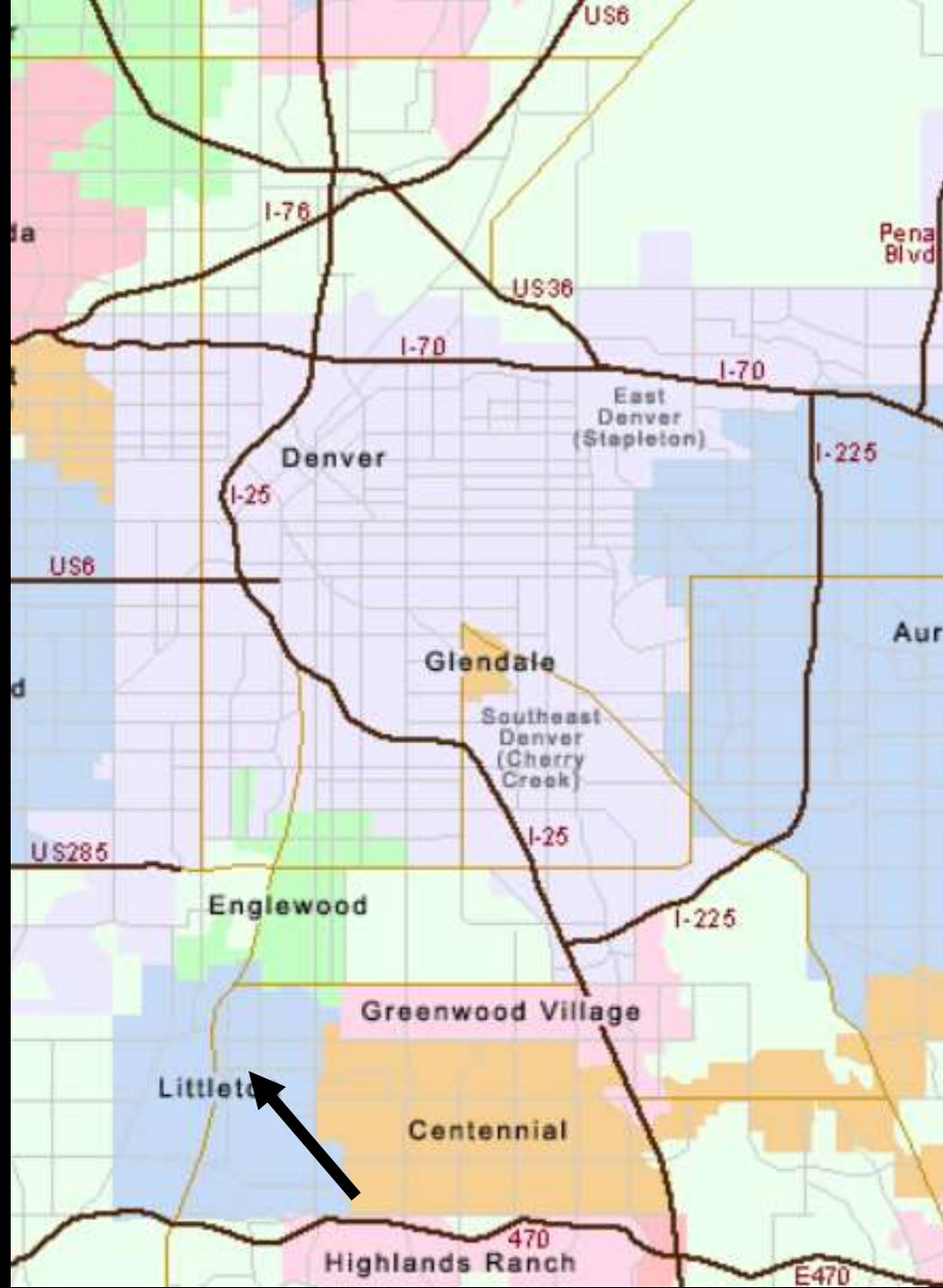


The adult wasps dig into the soil and lay their eggs on late stage Japanese beetle grubs

Photographs courtesy of David Shetlar, the Ohio State University

Japanese beetle  
biological control  
sites in the Denver  
Metro area - **2018**

*Tiphia vernalis*  
was released at  
the Sterne Park  
site (Littleton)  
in May





At almost all JB biocontrol release sites traps were maintained to try and establish a 2018 baseline population estimate, against which future comparisons can be made

# Proposed Japanese Beetle Biological Control Plan

- **Attempt to establish all 3 JB biocontrols at strategically located sites where the insect is in high population (2018-2021?)**
  - Denver/Arapahoe County Metro Area – 8-12 sites
  - Boulder (3-4 sites)
  - Pueblo (3-4 sites)
  - Other (TBD)
- Monitor establishment and spread of the released biological control organisms (2018-2030?)
- Periodically census JB by trapping to detect changes in populations (2018-2030?)

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**A new leafmining insect in  
Siberian elm to watch for**

*Stigmella multispicata* – the larva  
of a tiny moth

Photograph courtesy of Daniel Gilrein

# Leafminers and Needleminers



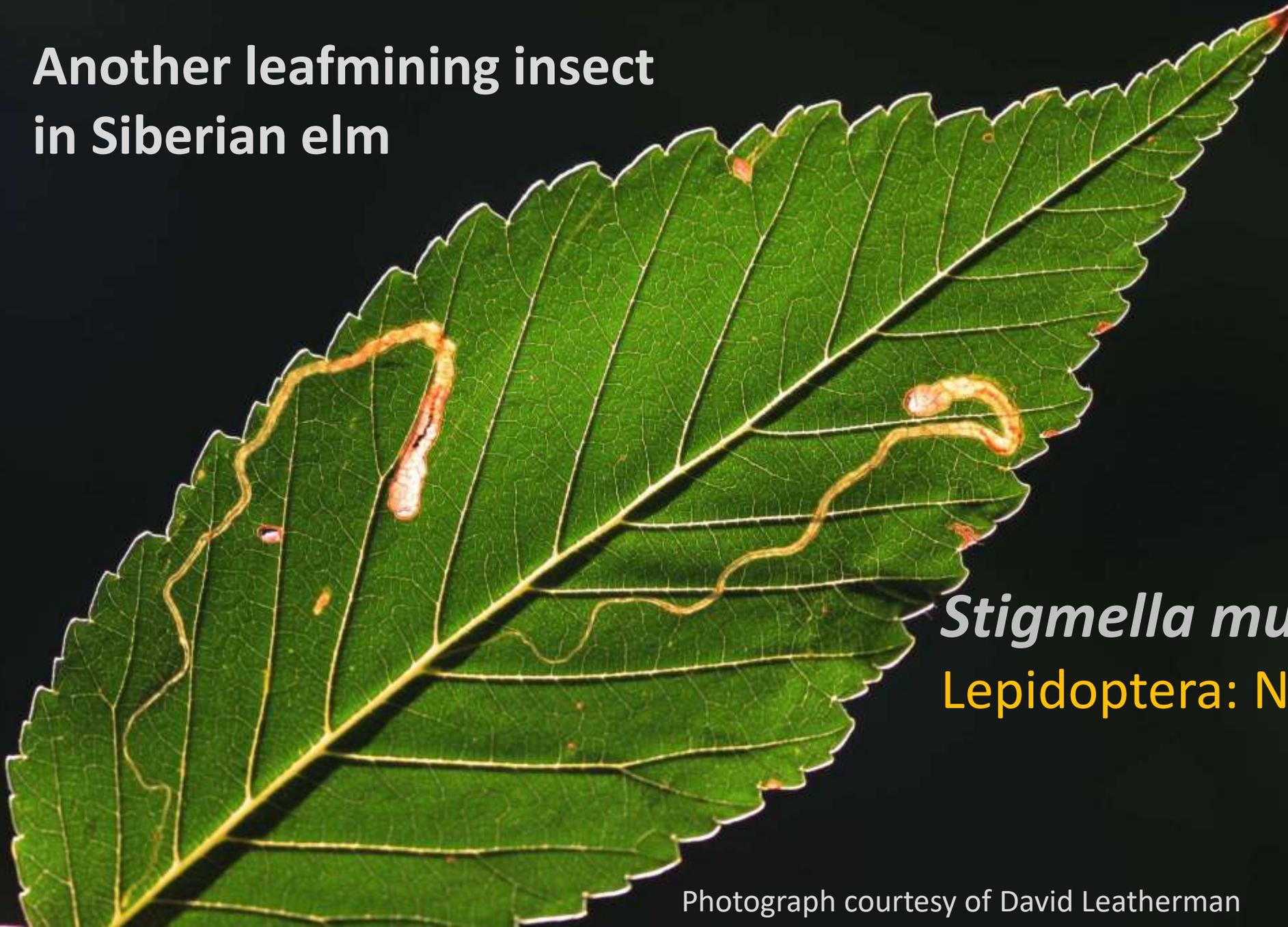
**The leaf mine is produced by a developing insect that feeds between the upper and lower surfaces of the leaf**



***Tease the leaf apart and you should find the insect - and/or its frass!***



Another leafmining insect  
in Siberian elm



*Stigmella multispicata*  
Lepidoptera: Nepticulidae

Photograph courtesy of David Leatherman

Photograph courtesy of Daniel Gilrein

**This elm-infesting leafminer produces gradually widening serpentine mines in the center of the leaves**



Photograph courtesy of Daniel Gilrein



Photograph by  
Greg Raterman



**The adult is a tiny moth  
that emerges in spring**

You may notice small green worms dropping or spinning down from trees in September.

**European elm flea weevil injury** – larvae produce a serpentine mine that terminates in a blotch-type mine



**Larval mines initially are serpentine and meander. They then terminate as a blotch at the leaf edge.**



**Larvae develop within the leaf mine  
and later pupate in the leaf mine**





**When the adults come out in June they chew small holes (shothole wounds) in leaves**



**Blotch mine of elm – Elm leafminer (a type of sawfly)**



**Elm leafminer adults are present shortly after new growth emerges in spring**



**Eggs are inserted into the leaf at the junction of the midrib and a large vein**



**Larval tunnels expand  
as the insect grows**



**When full grown the larvae cut out of the mines, drop to the ground and produce a cocoon in which they will later pupate**

**There is one generation produced per year**





***Agromyza aristata*** – a  
type of leafmining fly.  
Uncommon in elm.

# Review of Elm Leafmining Patterns

- ***Stigmella multispictata*** (the new one)
  - Gradually enlarging serpentine form mine visible from the top. At least two generations/cycles of leafmining per year
- **European elm flea weevil**
  - Serpentine leafmine ending in a blotch at the leaf edge. Feeding usually completed by the end of May.
- **Elm leafminer**
  - Large blotch mine made in May/June
- ***Agromyza aristata***
  - Long serpentine mine. (Rare)



End of season curiosity

Mites massed on aspen –  
with sheet-like webbing





Periodically there are reports of a sheet like material on aspen that cover large numbers of mites

This has also been reported to occur on willow in Montana





These mites were also observed in the mulch and lower trunk of spen



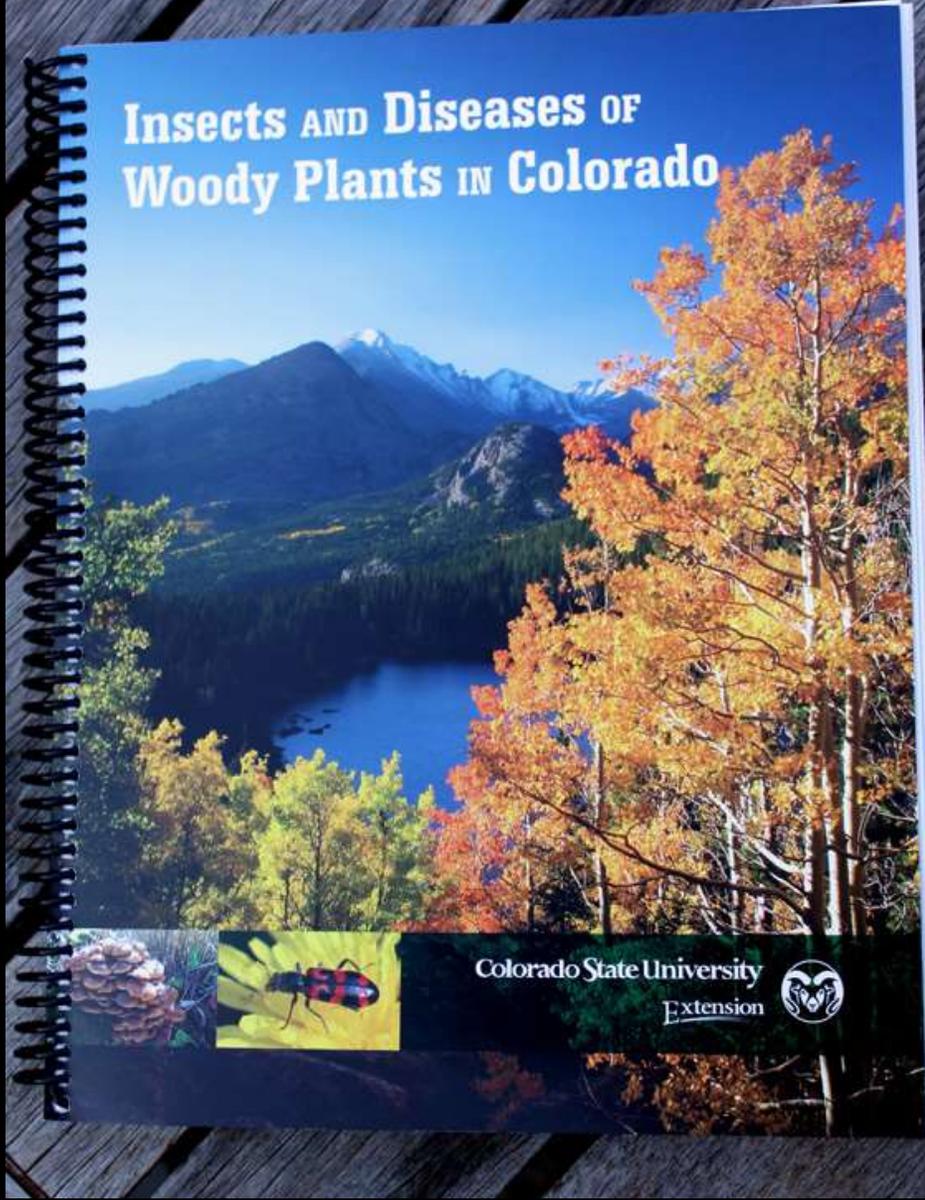
# *Eotetranychus populi*



These are winter-form females of the spider mite *Eotetranychus populi*

Hosts include aspen, various *Populus* and willows

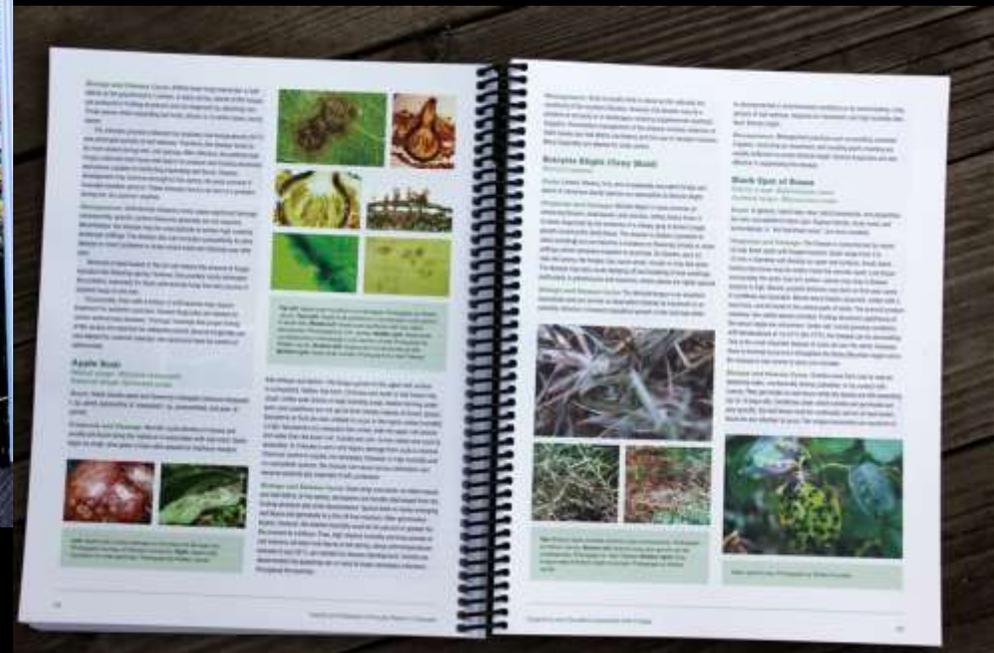
# Insects AND Diseases OF Woody Plants IN Colorado



## Bulletin 506A

Available at CSU University  
Resource Center

[www.csuextstore.com](http://www.csuextstore.com)



# ***New Online Horticultural Entomology Course!***

- **BSPM 356 – Horticultural Entomology**
  - Taught in both Spring and Fall Semesters
- **Comprised of three 1-credit modules**
  - 356A Basics of Entomology, Basics Identification, Basic Management
  - 356B Entomology of Horticultural Food Crops
  - 356C Entomology of Landscape Plants

# **This presentation will be posted at the Insect Information Web Site**

- **Housed at Department of Bioagricultural Sciences  
and Pest Management**
  - **Search BSPM CSU**
- **Within Extension and Outreach**
- **Insect Information**
  - **Extension presentations for 2018 posted at bottom of page**

## Insect Information

*All materials needed in another accessible format can be made available upon request.*

### Arthropods of Colorado Fact Sheets

This is a listing of about 200 downloadable fact sheets related to insects and other "bugs" found in Colorado. It contains fact sheets that are written for the Colorado Arthropods of Interest series and the Extension fact sheets that are related to insects.

Fact Sheets

Click here for over 200 Fact Sheets

### Some Entomology Hot Links:

- [Colorado Hemp Insect Website](#)
- [Western Colorado Entomology Website](#)
- [IPM Images/Bugwood \(Cranshaw\)](#)
- [IPM Images/Bugwood \(Peairs\)](#)
- [Entomology Resources List](#)
- [Honey Bee Swarm Hotlines](#)

### Miscellaneous Insect Information

## Emerald Ash Borer Information

This is a listing of downloadable publications, web links and other resources related to the presence of emerald ash borer in Colorado.

### Information

Colorado Emerald Ash Borer Response Team –[Frequently Asked Questions](#)

[Questions and Answers about Emerald Ash Borer](#)

[Identification of Emerald Ash Borer and Insects of Similar Appearance](#)

[Wood Boring Insects of Ash Trees](#)

[Control Options for Emerald Ash Borer in Colorado](#)

[National Emerald Ash Borer web site](#)

[Colorado Department of Agriculture – Emerald Ash Borer Web Site](#)

[Insecticide Options for Protecting Ash Trees from Emerald Ash Borer, 2<sup>nd</sup> Edition](#)



Click here to bring  
up links related to  
**Emerald Ash  
Borer**

# Japanese Beetle Information

This is a listing of publications and other resources to assist with understanding and managing Japanese beetle in Colorado.

## Resources

[Biology and Management of Japanese Beetle \(Potter and Held, 2002\)](#)

[Biology of Japanese Beetle \(Fleming, 1972\)](#)

[Insecticide and Biological Control Options for Control of Japanese Beetle Larvae \(White Grubs\) in Lawns](#)

[Insecticide Options for Control of Adult Japanese Beetle on Leaves and Flowers](#)

[Japanese Beetle Extension Fact Sheet 5.601](#)

[Questions and Answers about Japanese Beetle in Colorado](#)

[Relative Susceptibility of Landscape Plants to Japanese Beetle \(Held, 2004\)](#)

[CSU Insect Information Website](#)



Click here to  
bring up links  
related to  
**Japanese  
Beetle**

## Master Gardener Information

This includes the handouts and PowerPoint presentations (as PDF) used in Master Gardener Entomology training. These will get updated annually at the end of the winter/spring training programs.

[Handouts](#)

[PowerPoint Presentations Used in 2018](#)

## Recent Extension Presentations

This is a listing that provides the PowerPoint presentations (as PDF) of most Extension entomology programs conducted during the past 12 months.

[PowerPoint Presentations/Webinars](#)



**Click Here for the  
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# **This presentation will be posted at the Insect Information web site**

- **Housed at** Department of Bioagricultural Sciences and Pest Management
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  - **Extension presentations for 2018** posted at bottom of page