

Horticultural Insect Pests with a Threat for Introduction or Spread in Utah



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First Detector Training

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Light Brown
Apple Moth

Exotic Insects of Concern

- ▣ Light Brown Apple Moth
- ▣ Emerald Ash Borer
- ▣ Asian Longhorned Beetle
- ▣ Sirex Woodwasp
- ▣ Viburnum Leaf Beetle
- ▣ Multicolored Asian Lady Beetle
- ▣ Black Walnut Twig Beetle

Light Brown Apple Moth (LBAM)

- *Epiphyas postvittana* (Lepidoptera: Tortricidae) - leafroller
- Native to Australia; now widely distributed in New Zealand, United Kingdom, & Ireland
- Detected in Hawaii in late 1800's
- Alameda County, CA - adult detection
 - March 2007
- As of Aug 2007 - detected in 11 California Counties



LBAM male (left) and female



LBAM larva feeding on an apple

Why is LBAM such a Threat to U.S. Horticultural Industries?

- Economically damaging pest - fruit, leaves, & buds
- Broad host range
 - > 120 plant genera in over 50 families (>250 spp.)
 - Compositae, Leguminosae, Polygonaceae, & Rosaceae are preferred
- Crops at risk in CA:
 - Tree fruits (pome, stone & citrus), grapes
 - Landscape ornamentals
- Potential for spread to other states



Leaf rolling injury to rose



Larval feeding injury on strawberry leaves

LBAM Life History and Identification

- 3/8-1/2 inch long moth
 - Bell shaped
 - Color & pattern variation
- Egg mass laid on upper surfaces of smooth leaved host plants
- Young larva - pale yellow-green body with brown head - hang from silken thread
- Pupa - green to brown
- 4-6 wk life cycle in summer
- 2-4 generations/year in CA



Adult moths exhibit variation in color & pattern



Egg masses contain 3-150 eggs

LBAM Identification

- Many native & exotic tortricids can be confused with LBAM
- Larvae cannot be reliably identified by morphological characters only



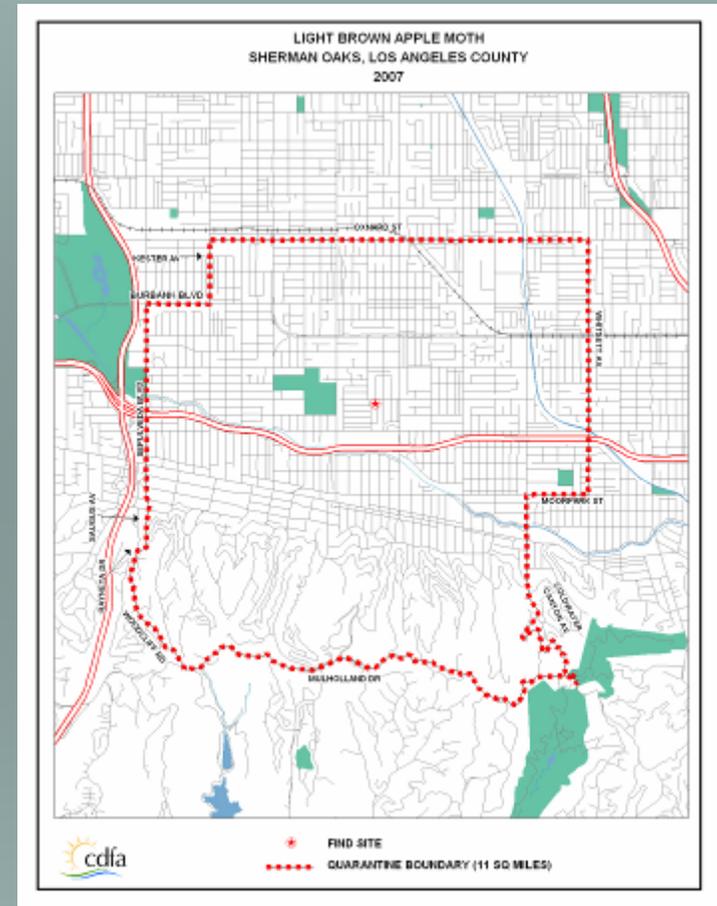
Larvae look like many other leafrollers



Adults can be identified by a trained specialist

Current Status of LBAM in the U.S.

- The CDFA has imposed internal quarantines and USDA has issued a Federal Order
- Quarantined areas:
 - CA: Alameda, Contra Costa, Marin, Monterey, Santa Clara, Santa Cruz, San Francisco, Los Angeles, Napa, Solano, and San Mateo
 - HI: all counties
- Nursery stock, cut flowers & greenery, green waste, fruits & vegs., green hay, fresh herbs



Example of CA LBAM quarantine map

Current Status of LBAM in the U.S.

- ▣ LBAM pheromone identified
- ▣ Pheromone traps: >9,300 moths caught in CA since March 2007 (as of 10/12/07)
- ▣ Mating Disruption: Checkmate LBAM-F (Suterra®)
- ▣ CDFA's on-line LBAM info.:
http://www.cdfa.ca.gov/phpps/PDEP/lbam/lbam_main.html
- ▣ National Survey (USDA APHIS CAPS)
 - ▣ Utah survey in 2008 (Erin & Marion)

Current LBAM Programs in CA

■ Suppression/Eradication Programs in CA:

■ Area-wide approaches:

- Pheromone mating disruption (in prep)
- Sterile insect release (under research)
- Classical biological control

■ Small-scale approaches:

- Reduced-risk insecticides
 - IGRs (Intrepid®, Confirm®)
 - Spinosad (Success®, Entrust®, Conserve®)
 - Bt, NPV
 - Augmentative biocontrol (generalist predators, parasitoids)



Checkmate® dispenser

Info / Resources

UC IPM LBAM Bulletin

http://www.aphis.usda.gov/plant_health/plant_pest_info/lba_moth/downloads/LBAM_IPM_UCD_avis.pdf

USDA APHIS Plant Health Bulletin on LBAM

http://www.aphis.usda.gov/plant_health/plant_pest_info/lba_moth/index.shtml

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Light Brown Apple Moth in California: Quarantine, Management, and Potential Impacts

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In March 2007 the presence of the light brown apple moth (LBAM), *Epiphyas postvittana*, was confirmed in California by the U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS). This is the first time this pest has been detected in the continental United States. It was first found in Alameda County and as of July 2007 has been found in the San Francisco Bay area counties of Alameda, Contra Costa, Marin, Napa, San Francisco, Santa Clara, San Mateo, and Solano, in the central coast counties of Monterey and Santa Cruz, and in Los Angeles County. APHIS considers LBAM to be a High-Risk pest and the California Department of Food and Agriculture (CDFA) considers it to be a Class A pest. Because of this, CDFA issued a State Interior Quarantine order restricting interstate shipment of plant material from counties where LBAM has been found. APHIS later issued a Federal Domestic Quarantine order on May 2, 2007, with restrictions on interstate shipment of plant material.

The purpose of this publication is to help readers:

- Understand why LBAM is subject to quarantine regulations
- Understand the difference between controlling pests that are regulated under a quarantine and managing them in an integrated pest management program
- Learn about LBAM biology and identification
- Learn how to send in a sample for identification
- Become familiar with potential IPM alternatives that might be used in conjunction with eradication efforts
- Learn about possible pesticide treatments for LBAM and how to mitigate their impact on the environment
- Understand possible impacts on various sectors of agriculture and residential areas

While the document generally describes current CDFA and APHIS quarantine regulations and the LBAM situation in California, the legal and latest information, including maps of quarantined areas, can be found on the CDFA LBAM Web site (http://www.cdffa.ca.gov/plants/plant/Item_main.htm).



Figure 1. Female (left) and male light brown apple moths. Used with the permission of D. Williams, State of Victoria Department of Primary Industries.

University of California Agriculture and Natural Resources
UC Statewide Integrated Pest Management Program

This publication is available online at <http://www.ipm.ucdavis.edu/EXT/CEP/lbavision/aphis0701.pdf>
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Emerald Ash Borer (EAB)

- *Agrilus planipennis*
(Coleoptera: Buprestidae) -
flatheaded beetle
- Native to Asia
- Discovered in SE Michigan -
2002
- Current U.S. distribution:
IL, IN, MD, MI, OH ; also
Ontario, Canada



Adult



Larvae - flattened, wide
prothorax behind head

EAB Hosts & Injury

- Only ash attacked in U.S.:
 - Green ash (*F. pennsylvanica*)
 - White ash (*F. americana*)
 - Black ash (*F. nigra*)
 - Several hort. varieties
- In Asia, ash, elm & walnut are hosts
- Forest, landscape, & nursery trees are at risk
- Wilting leaves & thinning canopy are early signs of infestation
- May require 3-4 yr to kill trees
- Stressed and healthy trees have been attacked
- D-shaped exit holes



Adults are 1 - 1 $\frac{1}{4}$ " long;
metallic green wing covers



Larval galleries,
girdle trees;
feed in cambium
under bark

Emerald Ash Borer



An exotic beetle from Asia was discovered in July 2002 feeding on ash (*Fraxinus* spp.) trees in southeastern Michigan. It was identified as *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae). Larvae feed in the cambium between the bark and wood, producing galleries that eventually girdle and kill branches and entire trees. Evidence suggests that *A. planipennis* has been established in Michigan for at least six to ten years. More than 3000 square miles in southeast Michigan are infested and more than 5 million ash trees are dead or dying from this pest. This exotic pest is also established in Windsor, Ontario, Canada. In 2003, newly established populations were detected in other areas of southern Michigan and several locations in Ohio. Infested ash nursery trees were also found in Maryland and Virginia.

Identification

Adult beetles are generally larger and a brighter green than the native North American species of *Agrilus* (Fig. 1). Adults are slender, elongate and 7.5 to 13.5 mm long. Males are smaller than females and have fine hairs on the ventral side of the thorax, which the females lack. Color varies but adults are usually bronze or golden green overall, with darker, metallic, emerald green wing covers. The top of the abdomen under the wings is metallic purplish red and can be seen when the wings are spread. The prothorax, the segment behind the head to which the first pair of legs is attached, is slightly wider than the head but the same width as the base of the wing covers.



Figure 1. Adult emerald ash borer.

Larvae reach a length of 26 to 32 mm, are white to cream-colored and dorso-ventrally flattened (Fig. 2). The brown head is mostly retracted into the prothorax and only the mouth parts are visible externally. The 10-segmented abdomen has a pair of brown, pincer-like appendages on the last segment.



Figure 2. Second, third, and fourth stage larvae.

Biology

The emerald ash borer generally has a one-year life cycle in southern Michigan but could require two years to complete a generation in colder regions. In 2003, adult emergence began in early June, peaked in late June and early July, and continued into late July. Beetles usually live for about 3 weeks and are present into mid-August. Adult beetles are active during the day, particularly when conditions are warm and sunny.

Most beetles remain in protected locations in bark crevices or on foliage during rain, heavy cloud cover, high winds, or temperatures above 32°C (90°F). Beetles feed on ash foliage, usually in small, irregularly-shaped patches along the margins of leaves.

Females can mate multiple times and egg laying begins a few days after the initial mating. Females can lay at least 60 to 90 eggs during their lifetime. Eggs are deposited individually in bark crevices on the trunk or branches. Eggs hatch in 7 to 10 days.

After hatching, first instar larvae chew through the bark and into the cambial region. Larvae feed on phloem and the outer sapwood for several weeks. The S-shaped feeding gallery winds back and forth, becoming progressively wider as the larva grows (Fig. 3). Galleries are packed with fine, sawdust-like frass. Individual galleries often extend over an area that is 20 to 30 cm in length, though the length of the affected area can range from 10 to 50 cm or longer.

Feeding is completed in autumn and pre-pupal larvae overwinter in shallow chambers excavated in the outer sapwood or in the bark on thick-barked trees. Pupation begins in late April or May. Newly eclosed adults often remain in the pupal chamber for 1 to 2 weeks before emerging head-first through a D-shaped exit hole that is 3–4 mm in diameter (Fig. 4).

Figure 3. Galleries excavated by larvae.

Info / Resources

USDA Pest Alert

http://www.na.fs.fed.us/spfo/pubs/pest_al/eab/eab.pdf

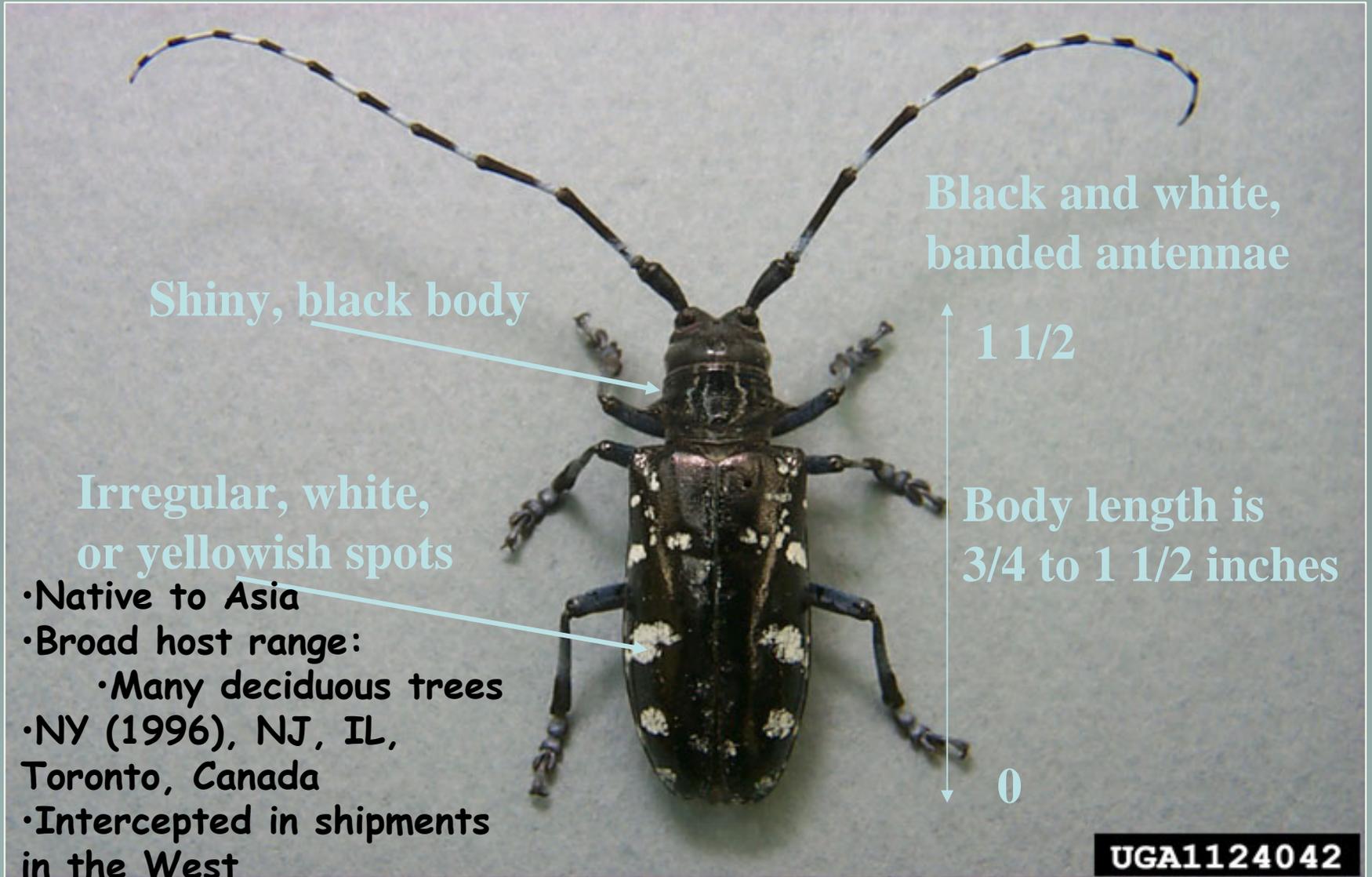
Michigan Dept. of Agric. Pest Alert

http://www.michigan.gov/documents/mda_EAB_Hitchhiker_Brochure3_146785_7.pdf

USDA National Invasive Species Profile

<http://www.invasivespeciesinfo.gov/animals/eab.shtml>

Asian Longhorn Beetle



Shiny, black body

Black and white,
banded antennae

1 1/2

Irregular, white,
or yellowish spots

Body length is
3/4 to 1 1/2 inches

- Native to Asia
- Broad host range:
 - Many deciduous trees
- NY (1996), NJ, IL, Toronto, Canada
- Intercepted in shipments in the West

0

UGA1124042

Sirex Woodwasp

- Detected regularly at ports-of-entry in wooden packing materials
- Single U.S. infestation - NY (2005)
- Many pine spp. are hosts - attacks living and dying/dead wood
- Concern for introduction in scrap & firewood



Adult male



Larva has a posterior spine

Regional Pest Alert

Asian Longhorned Beetle

Anoplophora glabripennis

Origin and Distribution

The Asian longhorned beetle (ALB), native to China and Korea, was first discovered in the United States in 1996 on Long Island, New York. A second infestation was encountered in Chicago, Illinois in 1998. Infestations in New York, Illinois, and New Jersey have resulted in the removal of thousands of trees and cost state and federal governments in excess of \$168 million since the pest was first discovered in the United States. Frequently transported from Asia or elsewhere in wood packing materials, the insect poses a serious threat to healthy trees. In the past decade, Asian longhorned beetles have been intercepted in the western region of the United States inside or near warehouses in Hawthorne, Los Angeles, South Gate, and Sacramento, California, and in Bellingham and Seattle, Washington.

Description

The shiny black, bullet-shaped adult is about 1 to 1.5 inches long with irregular sized and shaped white spots. Its black-and-white banded antennae are usually longer than its body. The elongated feet are black with a whitish-blue upper surface. Adults can be seen from late spring through fall depending on climate and geographical location. Although its size and large mandibles may cause it



Adult Asian longhorned beetle.

to appear threatening, the beetle is harmless to humans and pets. Adult females use their mandibles to chew a pit and then deposit an egg into it. Each female lives several weeks and will lay up to 90 eggs. The larva tunnels under the bark, eventually tunneling deep into the tree. Larval tunneling produces frass that consists of feces and wood fibers resembling sawdust. The large, light cream-colored larva that lives entirely within the wood of trees is the most damaging stage of the beetle. Typically, the life cycle of the ALB is completed in one year.

Damage

The Asian longhorned beetle larvae bore deep into healthy deciduous hardwood trees such as maple, bittersweet, birch, horse chestnut, poplar, willow, elm, hickberry, sycamore, mimosa, and ash, eventually killing them. The impact on many of California's native hardwood species is currently unknown. Round exit holes, approximately 3/8 of an inch in diameter, located on trunks and branches, egg laying sites, frass at the base of



Asian longhorned beetle pupa.

Info / Resources

USDA Pest Alerts

Asian Longhorned Beetle

<http://www.wripmc.org/alerts/AsianLonghornBeetle.pdf>

Sirex Woodwasp

http://na.fs.fed.us/spfo/pubs/pest_al/sirex_woodwasp/sirex_woodwasp.htm

Viburnum Leaf Beetle

- Coleoptera:
Chrysomelidae
- First intro to North America - 1947
- Since 1996: NY, CT, OH, Mass, Penn, Ontario, Canada
- Heavy defoliation (skeletonizing) of Viburnum



Larval feeding



Adult Viburnum leaf beetle

Multicolored Asian Lady Beetle (MALB)

- Occurs in UT
- Accidental & intentional releases
- Tremendous variance in color & spot pattern
- Feeds on arboreal aphids (maple, birdcherry, plum)
- Nuisance pest!
 - Invade homes to over winter
 - Stain carpets, fabrics - yellow/orange defensive chemical
 - Bad odor
 - "Bite" - "taste" humans
 - Allergic reactions in some people - dermal and respiratory



Adult appearance varies greatly



Larvae are whitish-yellow and grayish-black

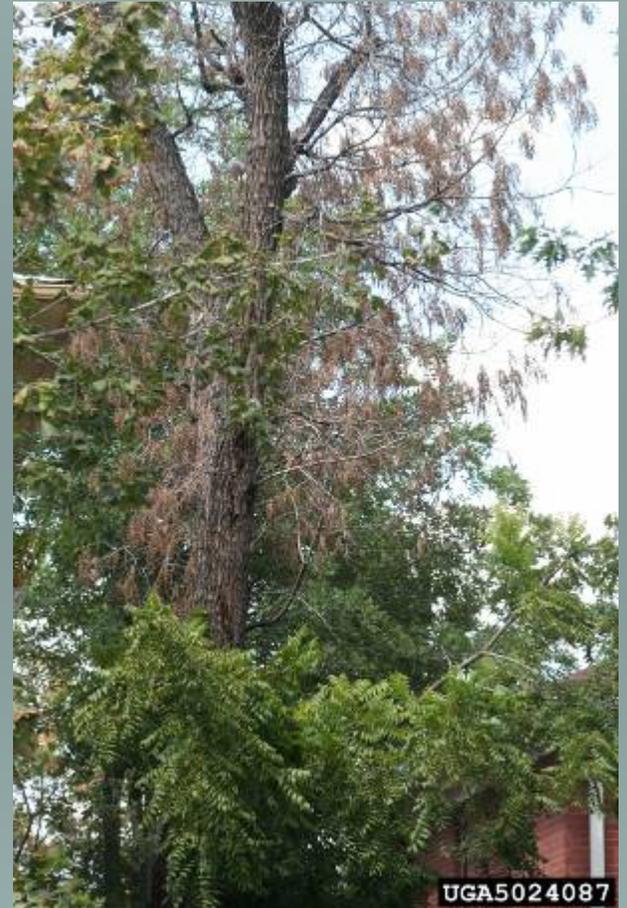
Congregation of MALB



National Pest Alert: http://www.ncipmc.org/alerts/malb_alert.pdf

Black Walnut Twig Beetle

- ▣ *Pityophthorus juglandis*
(Coleoptera: Curculionidae)
- ▣ Walnut tree decline observed in UT ~10 yrs
- ▣ Identified by Dr. S.L. Wood, BYU
- ▣ Detected in 2004 in Boulder, CO
- ▣ Substantial black walnut tree loss
- ▣ Associated with drought & other stresses, & *Fusarium* fungus (beetle may vector)



Black walnut tree dieback

Black Walnut Twig Beetle Management

- In UT, we noticed increase in problem under drought conditions (late '90s-early '00s)
- Black walnut is not well adapted to UT conditions
- Maintain tree vigor (irrigation) - dry springs and falls can be especially hard on trees
- Remove dead/dying limbs & trees
- Insecticides
 - Trunk spray: carbaryl, permethrin
 - Soil drench: imidacloprid (?)
- City of Boulder, CO fact sheet:
 - http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=7793&Itemid=900#black%20walnut



Adults and larvae feed in cambium & create galleries