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

Diane Alston
Utah State University Extension Entomologist
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
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
**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 & veggies, 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)
Info / Resources

UC IPM LBAM Bulletin


USDA APHIS Plant Health Bulletin on LBAM

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
An exotic beetle from Asia was discovered in July 2002 feeding on ash (Fraxinus spp.) trees in southeastern Michigan. It was identified as Aegosoma pini-medusae (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. pini-medusae has been established in Michigan for at least six to ten years. More than 2000 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 2005, 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 gold 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.

Larvae reach a length of 25 to 52 mm, are white to cream colored and dorsoventrally 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, picelike appendages on the last segment.

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 2 weeks and are present into mid-August. Adult beetles fly 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 chips. Individual galleries often extend over an area that is 20 to 50 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).

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**USDA Pest Alert**

**Michigan Dept. of Agric. Pest Alert**

**USDA National Invasive Species Profile**
http://www.invasivespeciesinfo.gov/animals/eab.shtml
Asian Longhorn Beetle

- Black and white, banded antennae
- Shiny, black body
- Irregular, white, or yellowish spots
- Body length is $\frac{3}{4}$ 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

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Sirex Woodwasp

- Detected regularly at ports-of-entry in wooden packing materials
- 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 1996. 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 $188 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 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 lays several weeks and will lay up to 90 eggs. The larvae tunnel under the bark, eventually tunneling deep into the tree. Larval tunneling produces trees that consist of views and wood fibers resembling sawdust. The large, light brown-colored larva that lives entirely within the wood of the tree 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, beech, birch, horse chestnut, poplar, willow, elm, hackberry, sycamore, manna, 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, from at the base of
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**
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 overwinter
  - 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

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 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:

Adults and larvae feed in cambium & create galleries