Western Plant Diagnostic Network

First Detector News

A Quarterly Pest Update for WPDN First Detectors

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NPDN
National Plant Diagnostic Network

In this Issue

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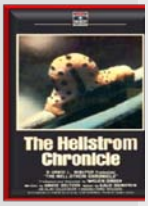
When you Travel, Please Remember:
DON'T MOVE FIREWOOD!



Dear WPDN First Detectors,

When one hears the term "boring beetles," one may think one is headed to a really bad science fiction movie! Invasive beetles that bore into trees (boring beetles = woodborers) have become a very big problem in the United States and Canada. Many of these beetles are also vectors of plant diseases. This edition of the WPDN News and Pest Update discusses examples of boring beetles that have come into the United States since 1980. The jump in the number of non-native borers since 1980 is likely a result of the widespread increase in containerized shipping. Wood-boring insects can be transported in wood pallets, wood crating, and dunnage (unprocessed timbers) used to protect and support cargo in containers. Other exotic forest pests arrive on live plants imported for planting or propagation, while other insects simply hitchhike on imported cargo. **Moving firewood from an infested area to a non-infested area is a guaranteed method of spreading the infestation**. Please find links to the NPDN family of newsletters at: Newsletters

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Invasive Woodboring Beetles

Introduction by Steven J. Seybold, Ph.D., USDA Forest Service/UC Davis Forest Entomologist

Biological invasions by alien arthropod species (insects, mites, etc.) represent a major threat to economic and environmental resources worldwide (Pimentel, 1993; Pimentel et al., 2000). Conservatively, in the U.S. alone, approximately 4500 introduced or exotic arthropod species have an estimated annual economic impact totaling $20.04 billion USD (Pimentel et al., 2005). In addition to economic damages, introduced arthropod species negatively impact biodiversity by outcompeting native arthropod species for resources and feeding upon genetically naïve plant populations (Wilcove et al., 1998). Thus, the introduction of non-native arthropods to new environments can have unpredictable ecological consequences (Hoagland and Jin, 2006).

The introduction of alien-invasive bark beetles and wood-boring insects (subcortical insects) to new environments has had a disproportionately large economic and environmental impact, both domestically and internationally. For example, in 2002 the emerald ash borer (EAB), *Agrilus planipennis* Fairmaire, a generalist herbivore of ash species, was detected in Michigan. In the following years, the spread of established populations of EAB contributed to the mortality of approximately 15 million ash trees throughout the eastern United States, and resulted in economic losses exceeding $1.7 billion USD in Michigan alone (Poland and McCullough, 2006). The cost was associated primarily with the removal of dead and dying trees in municipalities.

Most experts feel that the main pathways for invasive woodborers into and within the U.S. have been ship dunnage (crating, framing, pallets and the like), as well as firewood. Many of these subcortical insects can survive long duration movement on ships from Eurasia, in containers moved by rail or truck within the U.S., or in the family car or moving van on the U.S. interstate system because they have cryptic habits of completing development within the wood or just beneath the bark in the phloem. If the material is suitably fresh (wood within 1 to 5 yrs of harvest or phloem within 1-2 yrs of harvest), the insects are able to complete their life cycles and emerge as new adults at their new destination. Wood products from both conifer and hardwood trees can harbor these pests. Please see the last article in this edition: Wood Packing Restrictions in International Ocean Freight.

In the U.S. some of the major invasive subcortical insects that have attracted the attention of regulators and land managers include EAB, the Asian longhorned beetle (ALB), *Anoplophora glabripennis* (Motschulsky), the goldspotted oak borer (GSOB), *Agrilus auroguttatus* Schaeffer, the redbay ambrosia beetle, *Xyleborus glabratus* Eichhoff, and the European woodwasp, *Sirex noctilio* All of these are beetles that colonize hardwoods except for *S. noctilio*, which is a primitive wasp that primarily attacks pines. All of these insects are from Eurasia, except GSOB, which is an interesting case of an "indigenous" exotic species that appears to have been moved from its native home in southeastern Arizona to new oak species in San Diego, Co., California. Despite this short geographic distance, GSOB has settled in a particularly vulnerable ecosystem and is causing great damage to coast live oaks and California black oaks in rural eastern San Diego Co. It appears to be a classic case of movement of a pernicious insect on firewood. In addition to the invasive subcortical insects noted here, there are a wide number of other invasive insects in this ecological guild that threaten forest and shade trees in the U.S. (Lee et al., 2007; Seybold and Downing, 2009). Sadly, the numbers of these species have been on the upswing as international trade escalates and inspection of the large number of containers becomes a challenging task.

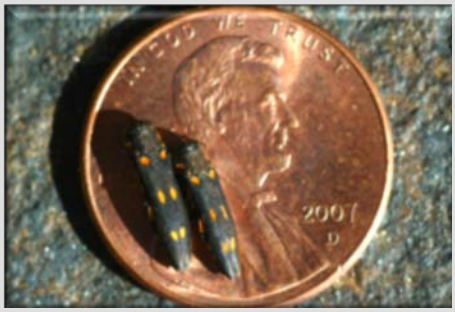
Image: Great Lakes Export

Image: Great Lake Exports

The Goldspotted Oak Borer (GSOB)

Agrilus auroguttatus Schaeffer (Coleoptera: Buprestidae)

A Native Species with a New Range

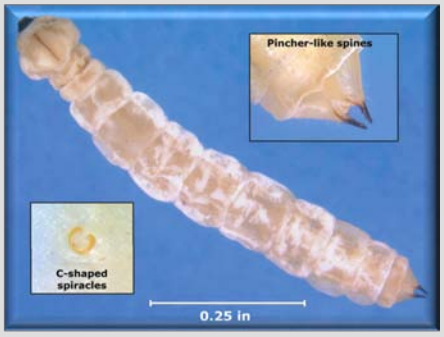


Photos courtesy of Tom W. Coleman, USDA Forest Service

Adult GSOB **Relative size of two GSOB** **Larvae of GSOB**

The goldspotted oak borer (GSOB) is a flatheaded borer (Family Buprestidae) native to oak forests in the foothills of mountain ranges of southeastern Arizona. Since 2002, GSOB has contributed to the mortality of more than 21,500 oaks over approximately 4,900 km^2 of San Diego County, California, and this infested area continues to increase as the GSOB population grows and spreads. In its native range, GSOB is not a pest. This may be due to efficient population control by natural enemies and natural levels of resistance by oak species that have co-evolved with GSOB. GSOB was first detected in 2004 in San Diego County by the California Department of Food and Agriculture during a survey for exotic woodborers. Four years later (2008), it was found attacking three species of oak in the Cleveland National Forest in San Diego county: coast live oak (*Quercus agrifolia*), canyon live oak (*Q. chrysolepis*), and California black oak (*Q. kelloggii*). Although elevated levels of oak mortality had been aerially mapped by the USDA Forest Service in the Cleveland National Forest since 2002, it was not known that GSOB was the cause of such mortality until 2008 when it was officially confirmed through stem bark samples as the primary mortality agent. The general belief until this time was that drought was the main contributing factor to the loss of so many oaks. For more information on the life cycle and damage please see

Goldspotted Oak Borer Field ID Guide and Goldspotted Oak Borer UC Riverside



From left to right: Adult GSOB and chewing damage on an oak leaf; GSOB larva, note the spines; meandering larval galleries filled with dark frass.

Photos courtesy of Tom W. Coleman, USDA Forest Service

Emerald Ash Borer (EAB)

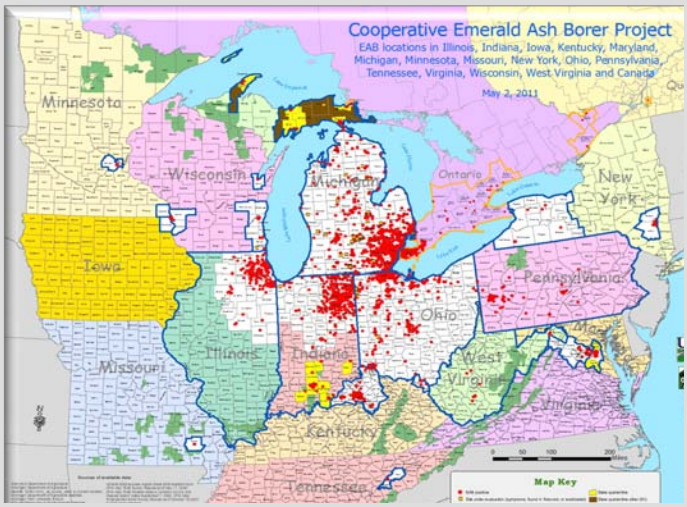
Agrilus planipennis Fairmaire,

(Coleoptera: Buprestidae)


Adult emerald ash borer with wings extended; the relative size of the EAB; and an EAB larva within an ash tree

from Emerald Ash Borer Wikipedia

The emerald ash borer (EAB) is a flatheaded borer native to Asia. In North America the borer is an invasive species, highly destructive to ash trees in its introduced range. The damage of this brilliantly green beetle rivals that of chestnut blight and Dutch elm disease. To put its damage in perspective, chestnut blight killed around 3.5 billion chestnut trees while there are 3.5 billion ash trees in Ohio alone. Dutch elm disease killed only a mere 200 million elm trees, whereas EAB threatens 7.5 billion ash trees in the U.S. The insect threatens the entire North American genus of *Fraxinus*. Past invasive tree pests have typically only threatened a single species within a genus. Since its accidental introduction into the U.S. and Canada in the 1990s, and its subsequent detection in 2002, it has spread to 14 states and adjacent parts of Canada. It has killed at least 50 - 100 million ash trees so far and threatens to kill most of the ash trees throughout North America. Green ash and black ash are preferred host trees, whereas white ash is also killed rapidly, but usually only after green and black ash trees are eliminated from an area. Blue ash displays some resistance to EAB by forming callous tissue around the larval galleries; however, blue ash is usually killed eventually as well. The natural range of EAB is eastern Russia, northern China, Japan, and Korea. Its first confirmed North American detection was in June 2002 in Canton, Michigan. It is suspected, that it was introduced by overseas shipping containers delivered to the Detroit area.. It has since been found in several other parts of the U.S. and Canada. Ohio, Minnesota, and Ontario have experienced emerald ash borer invasion from Michigan. Additionally, Maryland and Virginia received shipments of infested trees from a Michigan nursery. EAB was confirmed in Indiana in April 2004, in Central Kentucky in the spring of 2009, and in northeastern Iowa in May 2010.



Spread of EAB in US and Canada as of May 2, 2011

photo courtesy of the State of Michigan

EAB feeds just beneath the bark of ash trees

The Redbay Ambrosia Beetle

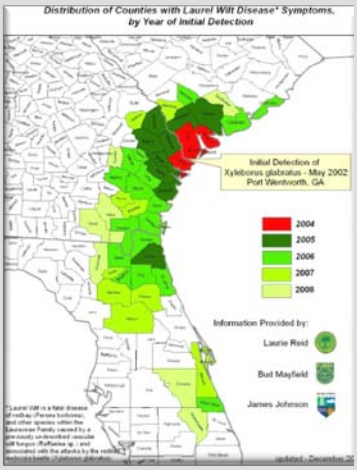
Xyleborus glabratus Eichhoff

(Coleoptera: Curculionidae)

Vector of Laurel Wilt - Avocado Industry in Danger

Adult Redbay Ambrosia Beetle

photo courtesy of Michael Thomas



Spread of the insect and disease

Insect vectored fungus in the vascular tissue of redbay

In 2003, a new disease first appeared on redbay, *Persea borbonia*, in the Savannah, Georgia area at Port Wentworth and is now established on the Atlantic coastal plains of South Carolina, Georgia and Florida. Native members of the Lauraceae are affected, as is avocado (*Persea americana*). Steve Fraedrich of the USDA Forest Service, and his team, established that the causal agent is a newly-described fungus, *Raffaelea lauricola*, which is vectored by the introduced redbay ambrosia beetle, *Xyleborus glabratus*. The appearance of the disease was coincidental with the appearance of *X. glabratus* from Asia, and the pathogen was probably brought over with the beetle in solid wood packing material. The redbay ambrosia beetle, is native to India, Japan, Myanmar, and Taiwan. The females mate with their flightless brothers and fathers in the trees where they develop and then only the females fly to new trees to initiate galleries in the wood. They provision the galleries with the fungus that provides the food source for their larvae. The pest continues to expand rapidly to new areas posing a threat to redbay and avocado trees in the U.S. and in the countries of Central and South America. The beetle transmits the causal pathogen of laurel wilt disease among plants in the Laurel family Lauraceae.. The *X. glabratus* and *R. lauricola* symbiosis is considered a "very high risk" invasive disease pest complex having potential equal to that of chestnut blight and Dutch elm disease. Laurel wilt is a relatively new disease and much is still unknown about how it will impact the flora of North America. Symptoms of laurel wilt include wilted stems and leaves, black streaking in the wood and strings of compacted sawdust protruding from tree trunks. Laurel wilt can spread in at least two ways: one is via the beetle's natural reproduction and migration. A second way is through the sale and transport of beetle-infested wood, a result of redbay's use as firewood and for outdoor grilling. In the WPDN region, avocado, California laurel /Oregon myrtle, bay laurel , in Hawaii Holio (*Cryptocarya mannii*) and Kauna'oa pehu (*Cassytha filiformis*). Once again, through quarantine measures and a ban on moving firewood out of the infested areas, the USDA and state departments of agriculture are trying to contain the spread of the beetle-pathogen complex.

A Woodboring Beetle that keeps trying to enter the U.S.!

The Brown Fir Longhorned Beetle
Callidiellum villosulum Fairmaire
(Coleoptera: Cerambycidae)

Callidiellum villosulum (Fairmaire), also known as the brown fir longhorned beetle (BFLB), has been found in real wood trunks of artificial Christmas trees imported from China. During the time period 1999 – 2001, more than 20 interceptions of this species were recorded. On March 28, 2011, Customs and Border Patrol (CBP) announced they intercepted the BFLB once again, this time in Baltimore. This recent interception arrived in a container of crafts. During the inspection, CBP officers noticed the wood crating was made of non-compliant wood packing material (see following article). Additionally, the North American Forest Commission assessed the threat as that of very high risk due in part to the suitable climatic conditions at various ports of entry and the uncertainty of how well it could adapt to North American trees. See the BFLB Pest Assessment.
This insect infests conifers in the family FKA Taxodiaceae, now combined as a subfamily into Cupressaceae . North American members of this subfamily include coast redwood, *Sequoia sempervirens*, and giant sequoia, *Sequoiadendron giganteum*. These trees are a major component of the flora of the west coast. Bald cypress, *Taxodium distichum*, is a major component of the coastal flora of the southeastern U.S. and a member of the Cupressaceae. If they prove to be susceptible to this insect, the unique ecosystems in which they occur could be seriously compromised. In its natural range, *Callidiellum villosulum* attacks Chinese fir, *Cunninghamia lanceolata*, and Japanese cedar or Sugi, *Cryptomeria japonica*. Neither of these host genera are indigenous to North America. However these species are used in some areas as landscape or ornamental trees. Dawn Redwood, *Metasequoia glyptostroboides*, now planted widely as an ornamental, could also be susceptible.

Wood Packing Restrictions in International Ocean Freight

The International Plant Protection Convention (ISPM) 15 requires that all international ocean freight shipments using any species of raw wood packaging must be fumigated or heat treated to kill insects or fungi and stamped with the approved stamp, before international ocean freight is allowed entry or crossing through a participating country. The stamps show customs that all solid wood packaging material for the international ocean freight shipment has been treated to meet the ISPM 15 requirements. Non-compliance can be a serious problem for your ocean freight export or import. Customs can turn back, repackage, or destroy items that do not meet the ISPM 15 standards for the international ocean freight shipment. For example, the U.S. standard requires immediate re-export of non-compliant products with no exceptions. Delays and increased ocean freight shipping costs will be the responsibility of the shipper. See Wood Packing ISPM 15

Courtesy of Ohio Dept of Agriculture

ISPM 15Labeled packing material

Courtesy of TLT EXPRESS