Oak Ambrosia Beetle

Platypus quercivorus

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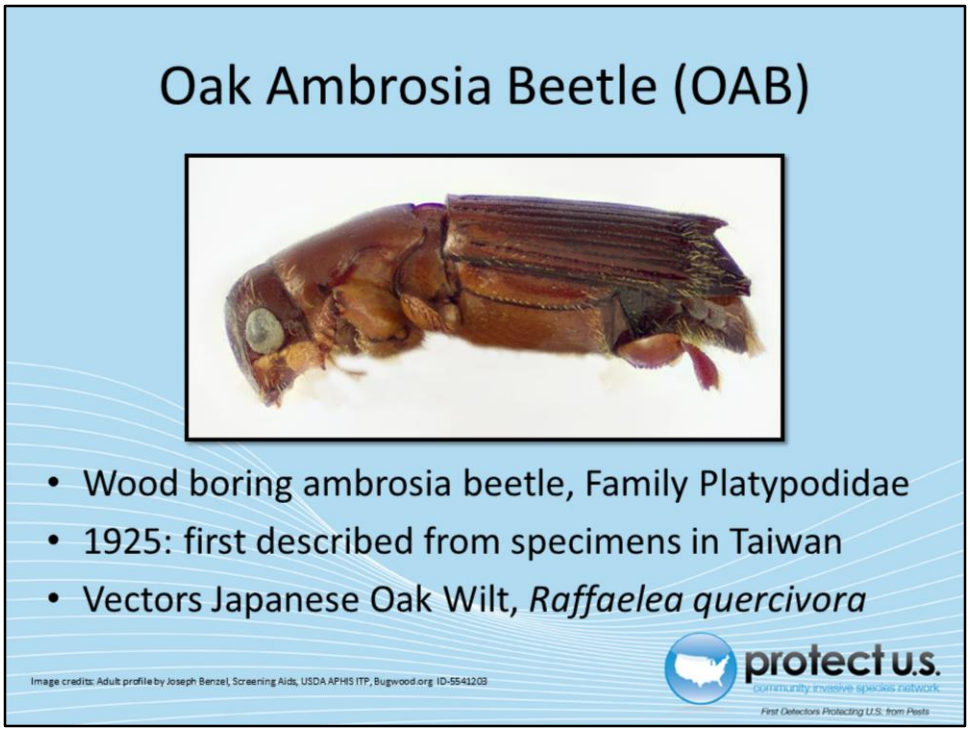
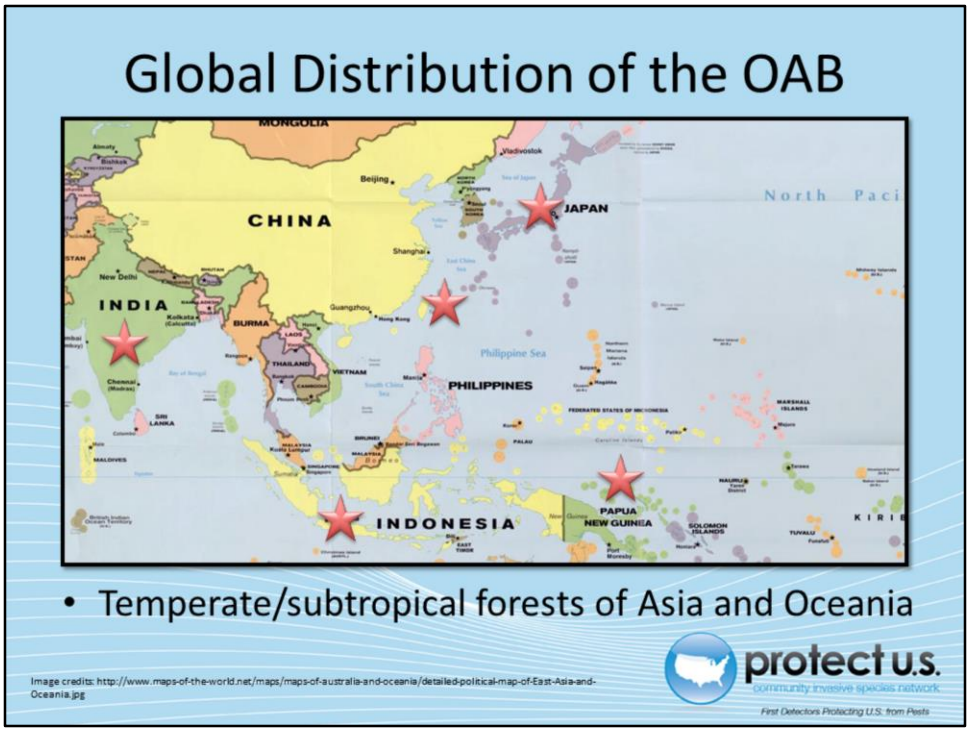
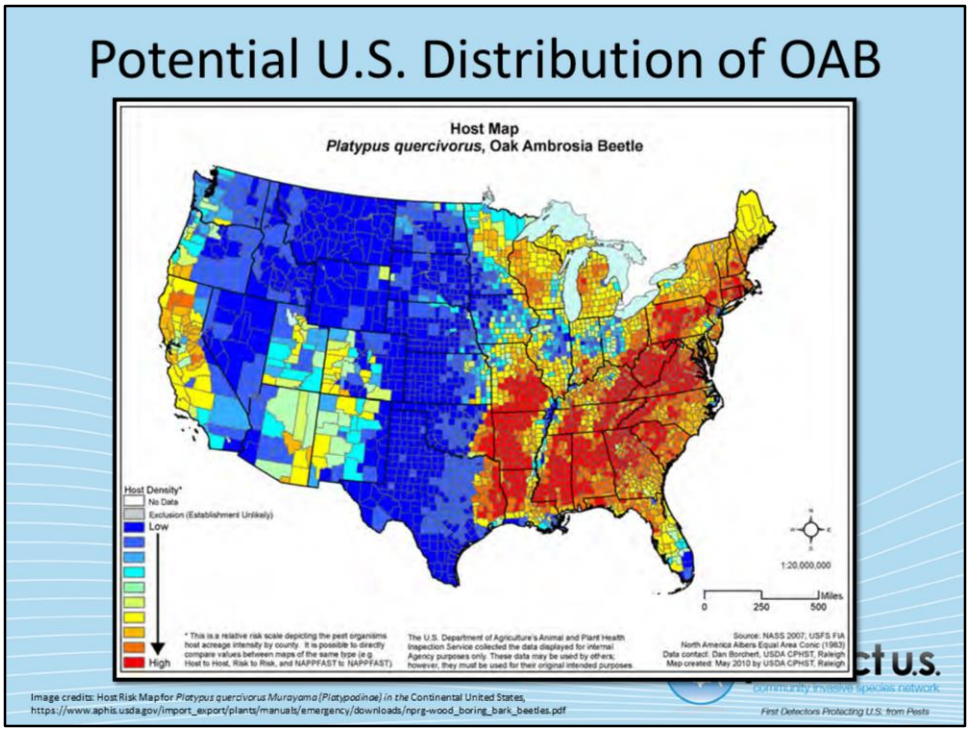


The Oak Ambrosia Beetle, *Platypus quercivorus*, belongs to the wood boring ambrosia beetle Family Platypodidae (2). Platypodidae is a very diverse family with over 1,000 species distributed primarily throughout the tropics (1). Only seven species, all belonging to the genus *Platypus*, are found in the United States of which four occur in Florida (1).

Oak Ambrosia Beetle was first described from specimens in Taiwan in 1925 (4). This beetle is part of a ambrosia beetle-fungus complex, serving as a vector of Japanese Oak Wilt, *Raffaelea quercivora* , a fungal disease that is devastating several species of oaks in Japan(6).



The global distribution of the Oak Ambrosia Beetle is limited to the temperate and subtropical forests of Asia and parts of Oceania (3). The pest is widespread throughout Japan. However, populations are also present in Bengal (India), Java (Indonesia), Papua New Guinea, and Taiwan (2).

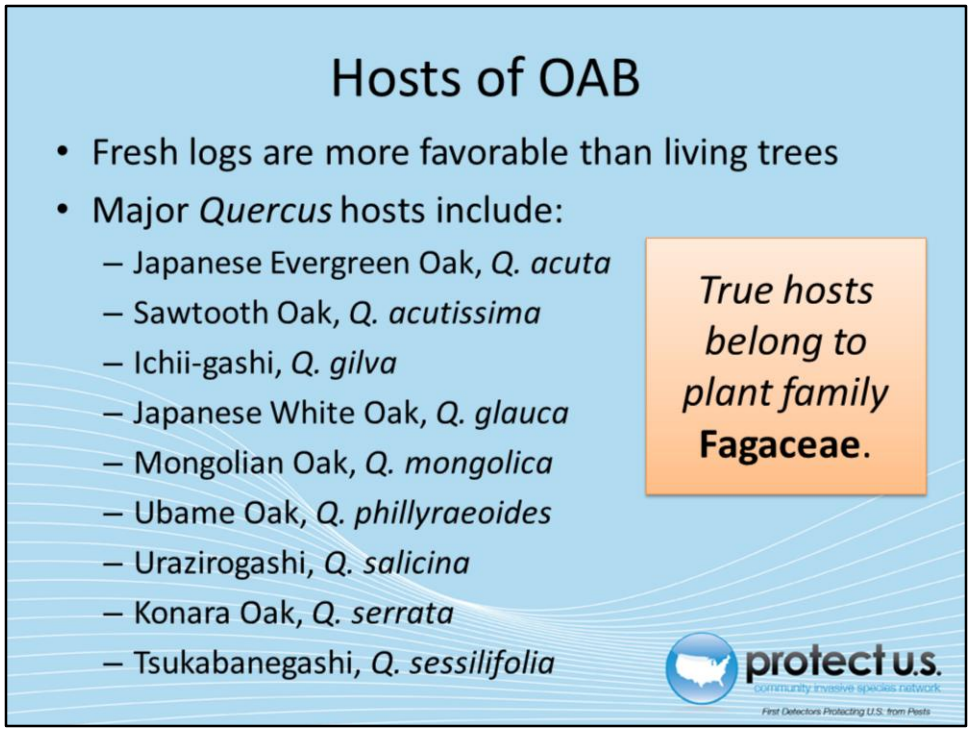


This host map created by USDA-APHIS-PPQ-CPHST in the 2011 Exotic Wood Borer and Bark Beetle National Survey Manual illustrates the potential risk of Oak Ambrosia Beetle distribution based on the density of host acreage in different counties (11). Note the higher relative risk along the Atlantic seaboard and southeastern US.

USDA-APHIS-PPQ-CPHST and NCSU cooperators are working to revise the NCSU/APHIS Plant Pest Forecast System, a tool which will be able to combine available distribution and survey data for the purpose of predicting the potential distribution of pests and diseases in new areas.

CPHST is also revising the Exotic Wood Borer and Bark Beetle National Survey Manual as part of the Cooperative Agricultural Pest Survey (CAPS) Program. More up-to-date pest datasheets will be included in this revision.

For more information on these programs visit:
https://www.aphis.usda.gov/aphis/ourfocus/planthealth/ppq-program-overview/sa_cphst/sa_projects/ct_pest-detection



The Oak Ambrosia Beetle is a polyphagous forest pest which feeds on multiple species of plant hosts. Pest insects are unwanted insects which attack, injure, or cause nuisance to agricultural and ecological systems or livestock and other animals.

At present, the Oak Ambrosia Beetle's true host range is limited to the family Fagaceae (3). This family contains beeches, oaks, and their relatives. Oak Ambrosia Beetle was first recorded on *Quercus* species in southern Kyushu, Japan in the 1930's (10). The genus *Quercus* contains the oaks, a very common group of native trees found naturally (and ornamentally) throughout every state in the US. At least 28 *Quercus* species present in the continental US may potentially serve as hosts of the Oak Ambrosia Beetle should it be introduced to North America (3).

Fresh logs are favored by the beetles compared to living trees and infestation levels usually peak in early summer (3, 10). At times, Oak Ambrosia Beetle may attack non-Fagaceous trees in areas surrounding dense infestations (2). However, the beetles cannot support successful reproduction (3).

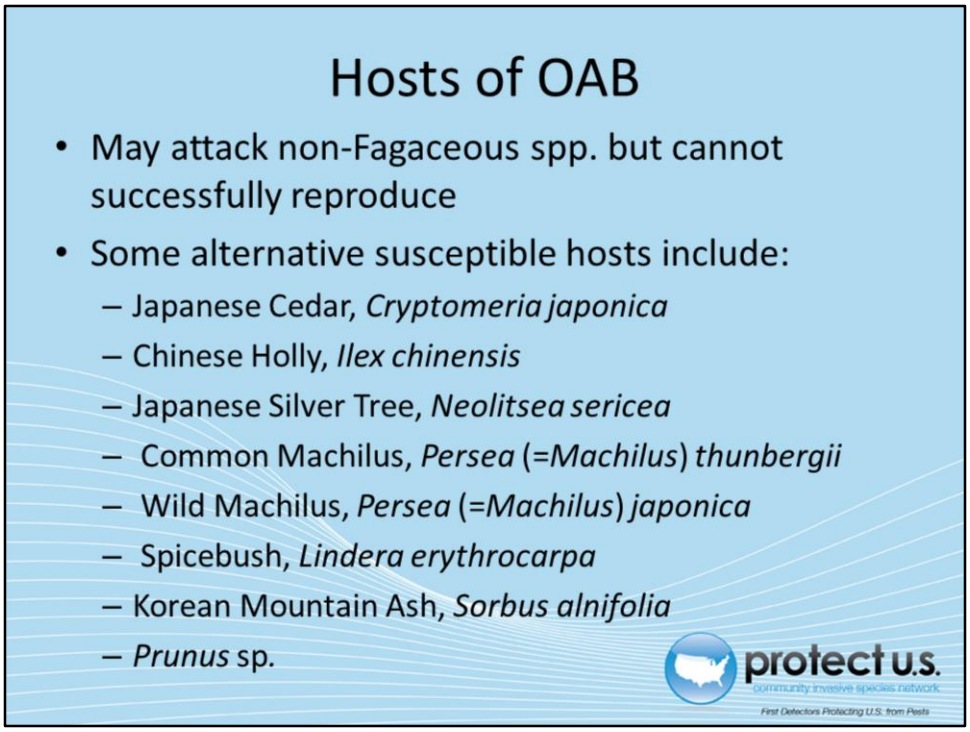
Major hosts of the Oak Ambrosia Beetle from the genus *Quercus* include (11):

- Japanese Evergreen Oak, *Q. acuta*
- Sawtooth Oak, *Q. acutissima*
- Ichii-gashi, *Q. gilva*
- Japanese White Oak, *Q. glauca*
- Mongolian Oak, *Q. mongolica*
- Ubame Oak, *Q. phillyraeoides*
- Urazirogashi, *Q. salicina*
- Konara Oak, *Q. serrata*
- Tsukabanegashi, *Q. sessilifolia*

Minor hosts include (11):

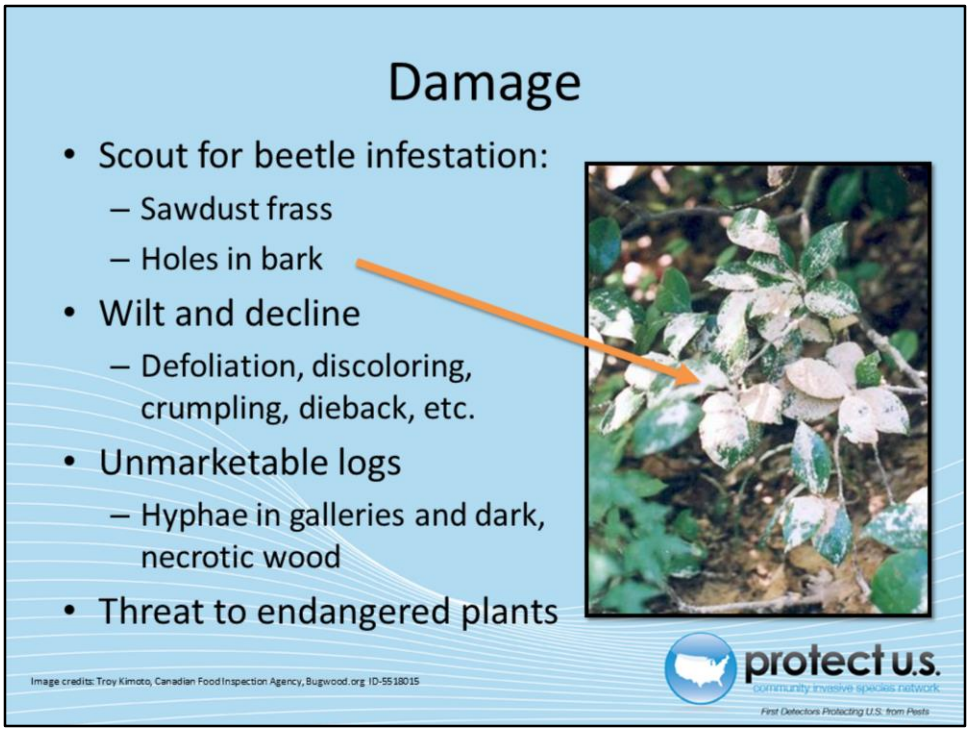
- Japanese Chinkapin, *Castanopsis cuspidata*
- Sudajii, *C. sieboldii*
- Japanese Tanbark Oak, *Lithocarpus edulis*
- Japanese-Oak, *L. glaber*
- Japanese White Oak, *Quercus myrsinaefolia*

Quercus spp. rank among the top 10 most common hardwood trees found in the eastern US, comprising nearly 31% of all hardwood production (9). Oak forests account for approximately 69% of forested land in the US, comprising roughly 622 million acres (3). Oak trees are part of a lucrative hardwood industry and also provide various ecosystem services such as habitat and food for wildlife, recreation, soil stability etc.



Alternative susceptible hosts of the Oak Ambrosia Beetle include (3):

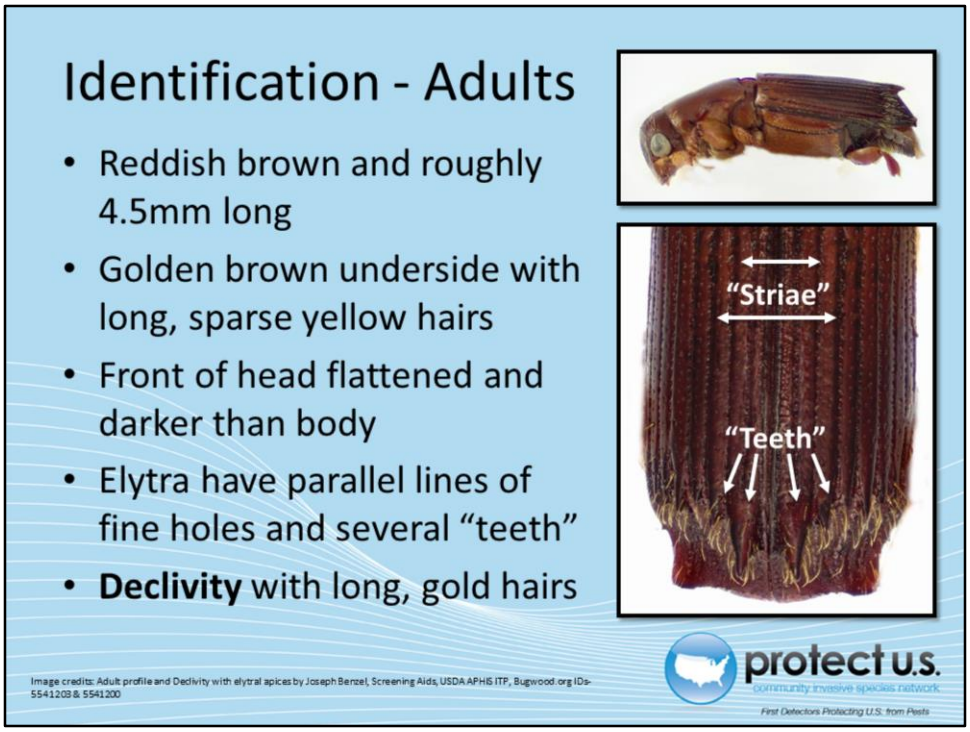
- Japanese Cedar, *Cryptomeria japonica* (Taxodiaceae)
- Chinese Holly, *Ilex chinensis* (Aquifoliaceae)
- Lauraceae members
    - Japanese Silver Tree, *Neolitsea sericea*
    - Common Machilus, *Persea* (=*Machilus*) *thunbergii*
    - Wild Machilus, *Persea* (=*Machilus*) *japonica*
    - Spicebush, *Lindera erythrocarpa*
- Rosaceae members
    - Korean Mountain Ash, *Sorbus alnifolia*
    - *Prunus* sp.



Oak Ambrosia Beetle infestations can be identified by the presence of white boring dust and frass on the ground or surrounding foliage at the base of a tree or fallen logs (4). Minute entrance and exit holes in the bark may also be indicative of beetles (4). However, other beetles can produce similar damage. Therefore, identification of this pest cannot be guaranteed unless a specimen is observed under scope.

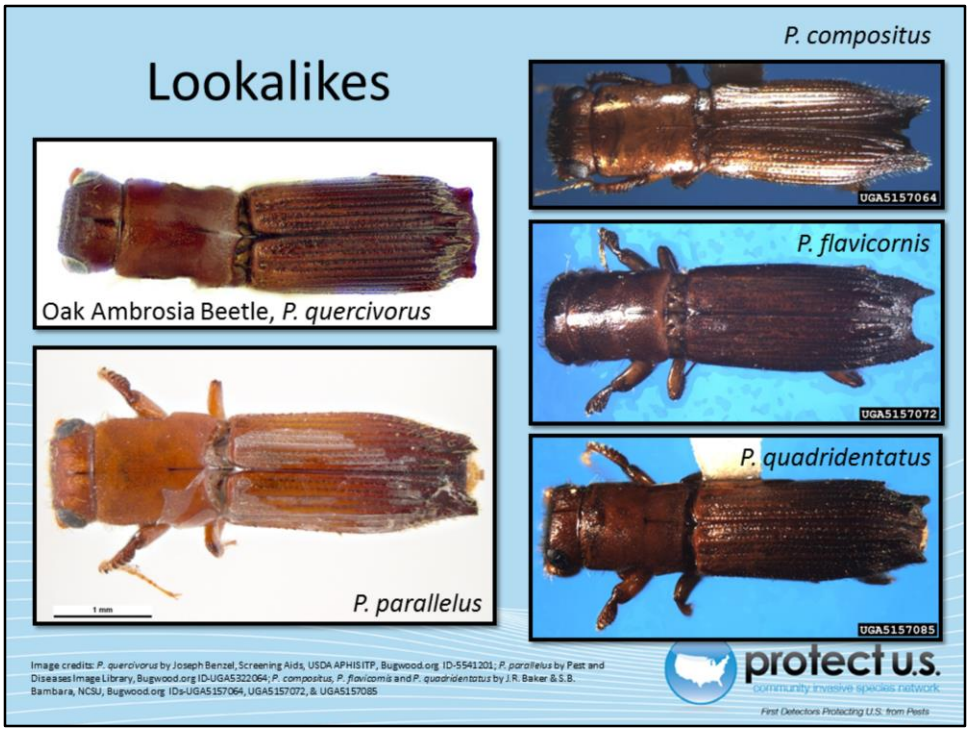
Since Oak Ambrosia Beetle vectors Japanese Oak Wilt, routine scouting for signs and symptoms of wilt will benefit management plans. Rust-colored, crumpled leaves, premature defoliation, and stem dieback are typical wilt symptoms (2). When logs are felled, fungal hyphae can be seen in beetle galleries and the wood may appear dark and necrotic (4). As with many other insect species, Oak Ambrosia Beetle exhibits positive phototaxis (12). Infestations tend concentrate in upper forest margins where sun exposure is greatest and then spread outward and downward along the slopes and the population density increases and suitable resources dwindle (12).

Although Oak Ambrosia Beetle in not yet present in the US, the potential risks associated with its introduction could lead to environmental and financial damage. Oak Ambrosia poses a potential threat to several endangered plant species that are protected in various states, for example, the American Chestnut (*Castanea dentata*) and Willow Oak (*Quercus phellos*) (3).



Identification of the Oak Ambrosia Beetle relies primarily on adult morphology although trained taxonomists may readily identify late instar larvae (4). Since the other life stages (eggs, larvae, and pupae) occur within the wood tissue they are not typically used for identification.

Adults are rust-colored or reddish brown and measure about 4.5mm in length (11). The venter is a golden brown color, females being slightly lighter than males, with long yellow hairs sparsely distributed (11). The head is flattened at the front and usually darker than the rest of the body (11). Elytra, the hardened forewings which cover the beetle's abdomen, have distinct, finely punctured striae and several pointed "teeth" at the posterior margin (11). The striae are thin lines made of tiny holes running parallel to the edge of the body (11). The declivity or posterior slope of the abdomen is more pronounced in males versus females with long golden hairs present in both sexes (11).

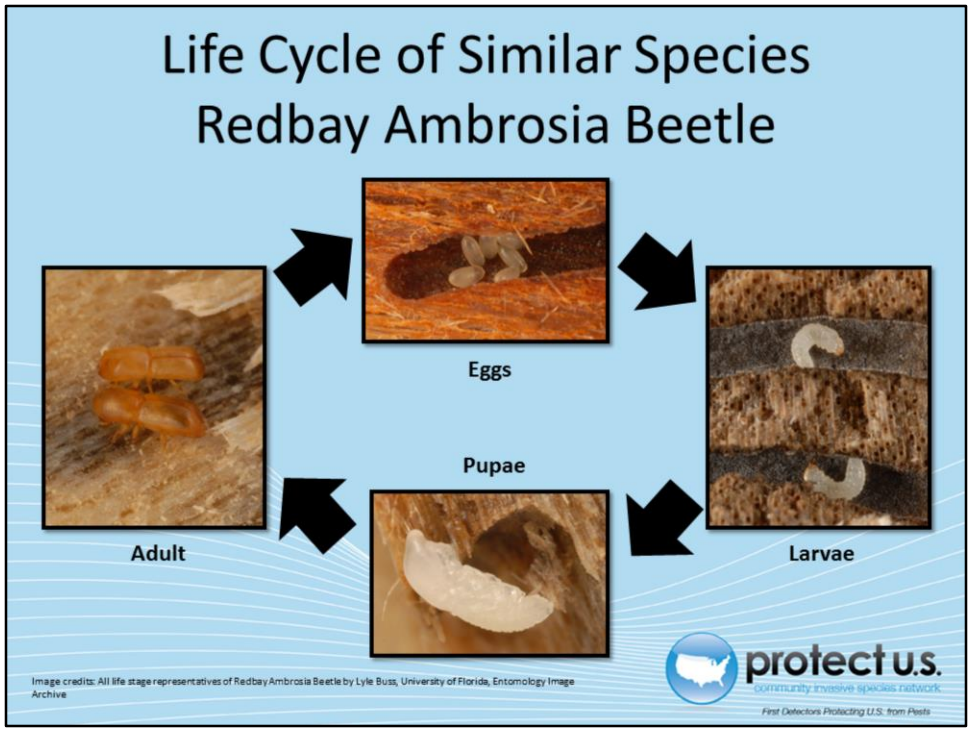


Like other ambrosia beetles, the Oak Ambrosia Beetle is very small and much of its life cycle is hidden in galleries within trees or logs. These factors can make it difficult to not only understand the pest but also properly identify it.

Each life stage of the Oak Ambrosia Beetle may be easily confused at first glance with other bark or ambrosia beetles in the families Platypodidae and Scolytidae. A more elongate body form, shorter abdomen, and elongated first tarsal segments, are distinguishing traits of Platypodids such as the Oak Ambrosia Beetle (1).

Accurate species identification will depend on specific microscopic features such as the presence of pronotal pores, tarsal length, elytral striae, and posterior declivity (1). Host preference and known range could also prove diagnostic.

This slide shows compares the Oak Ambrosia Beetle (featured at the top left) to four other *Platypus* species found in FL. Note the overall similarities from a top-down or dorsal view of the beetle. The general body shape and color make them difficult to distinguish at first glance. You can see differences in the “teeth” on the posterior edge of the elytra along the declivity as mentioned before.



This life cycle features images of the Redbay Ambrosia Beetle, *Xyleborus glabratus*, a representative of the bark and ambrosia beetle family Scolytidae. Redbay Ambrosia Beetle is similar in appearance and biology to Oak Ambrosia Beetle, and is a vector of Laurel Wilt Disease, *Raffaelea lauricola*, a relative of Japanese Oak Wilt, *R. quercivora* (7).

New adult Oak Ambrosia Beetles emerge and disperse in late June throughout early fall (3). Adult males initiate attacks on suitable Fagaceous hosts and a combination of plant volatiles, aggregation pheromone, and male sounds attract both sexes triggering a massive attack (3, 10). Like other Platypodids, the Oak Ambrosia Beetle is a monogamous species, adult pairs create one gallery system and fulfill their life cycle within the host (10).

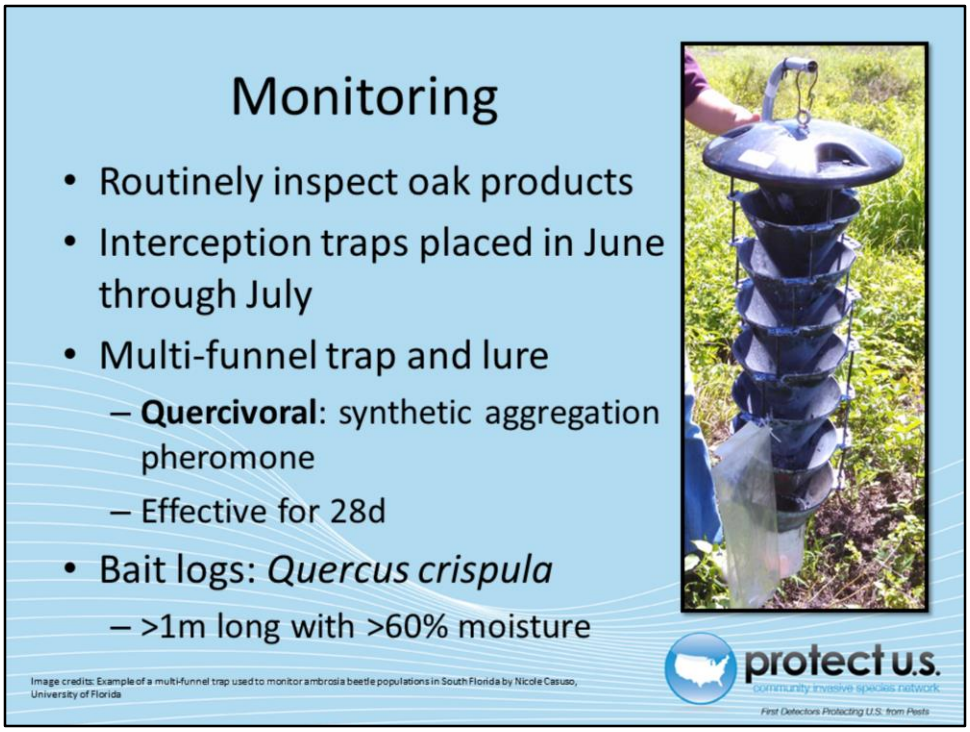
Initial entry of living hosts occurs lower on the trunk only a few feet off the ground, with the rate of infestation showing a positive correlation with tree diameter (3). Females meet males at the entrance holes and extend the gallery into an oviposition chamber post-copulation (10). As the female bores into the wood, the males guard the entrance and remove sawdust and frass from the galleries (10).

Eggs are elongated and cylindrical (11). They are deposited in oviposition galleries along with fungi (*Raffaelea quercivora*) that was stored in the female's mycangia (3, 11). This fungi is cultivated as a food source for the larvae and adults (12). Eggs hath within one week depending on moisture conditions within the wood (3).

Larvae are legless, creamy-white with a sclerotized, amber head capsule, and range from 2 to 6mm (0.08 to 0.24in) at maturity (2). Larvae undergo five instars, feeding on the cultivated fungus growing throughout the gallery system (11). Larvae may overwinter in the larval gallery during the last instar. (3). Those that do not overwinter pupate in vertical chambers where the adult will stay until its cuticle sclerotizes (11).

Pupation usually occurs in May and genders can be distinguished at this time (3). Pupae are white, slightly larger than the adults, and formed in 1cm-long (0.39in) pupal chambers that branch off from the larval gallery (3).

New adults emerge from their pupae and can remain in their parental host galleries until the following spring or leave in search for a new host (3).

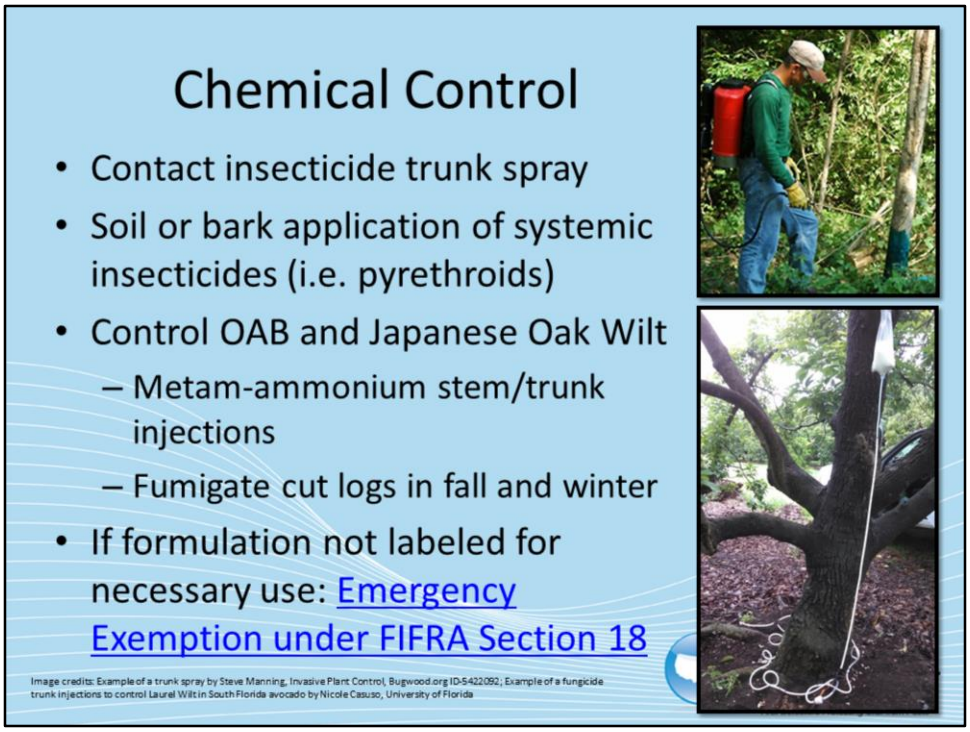


Oak Ambrosia Beetle was added to the Analytic Hierarchy Process Prioritized Pest List FY 2012 (11). Since then it has been recommended that timber producers as well as exporters/importers routinely inspect all oak products for signs of beetle infestation such as galleries or fungal hyphae and necrotic wood (3).

In Japan, researchers recommend the use of interception traps during June or July in conjunction with visual surveys and inspections (3). These non-selective traps composed of nylon mesh and wooden stakes were designed to suit steep terrain and high winds of the hillsides and mountains where infestations are prevalent and should be checked weekly for adult beetles (3).

Additionally, the USDA-APHIS-PPQ CAPS Program has approved a multi-funnel trap and lure survey method. This system utilizes a synthetic aggregation pheromone for Oak Ambrosia Beetle called **quercivoral** (11). The lure is effective for 4 weeks and works best at the edge of forests where the available light is greatest and attracts adults (11). The image on the right is an example of a multi-funnel trap used to monitor for other ambrosia beetle species in South Florida.

Lastly, bait logs have been suggested as a monitoring tool. Contrary to the multi-funnel traps, they should be placed away from direct sunlight (3). The bait logs are typically greater than 1m long and contain over 60% moisture (3). However, this method is not feasible in the US because the recommended species used in Japan, *Quercus crispula*, is not readily available.



Contact insecticides sprayed on trunks and systemic insecticides (such as pyrethroids) applied to soil or bark are used to control the Oak Ambrosia Beetle (5). Basal trunk spray is a common application method for various pesticides as seen in the photo at the top right. Scientists also observed control of both the beetles and their fungal symbiont, Japanese Oak Wilt, with host stem injections of metam-ammonium (12). An example of a fungicide trunk injection setup can be seen in the bottom right photo. Fumigation of cut logs is another strategy employed in Japan during the fall and winter (8).

In the event that a proposed compound is an approved effective control method at time of pest detection but is not yet labeled for the specific use site or target host, a quarantine exemption request may be submitted to the EPA under FIFRA Section 18. For additional information regarding this procedure visit: https://www.epa.gov/pesticide-registration/pesticide-emergency-exemptions#info (12).

Management of any pest can benefit from maintaining healthy plants and sanitary growing conditions that increase plant vigor and decrease their susceptibility to insect attacks and diseases. Appropriate nutrient levels, irrigation rates and timing, and stand density should be taken into consideration to minimize abiotic stress. However, it is important to keep in mind that Oak Ambrosia Beetle may still attack healthy trees and therefore, growers should remain vigilant and proactive to prevent severe damage.

Applying adhesive and a plastic wrap to trunks has been used to create a barrier that deters beetle boring into the bark (5). The photo is an example of how plastic trunks wraps are used to deter other beetle pests such as the Pecan weevil, *Cucurlio* caryae, in pecan trees. If an infestation does occur, it is important to remove and destroy any infested material using methods such as chipping and/or burning (8). At times clear cutting a field may prove necessary and beneficial to control beetle populations (5).

Remember that new pest and pathogen records must be reported to your State Plant Health Director (SPHD) and your State Plant Regulatory Official (SPRO). The SPRO is a State Department of Agriculture Employee and the SPHD is a USDA-APHIS-PPQ employee.

The link to your SPRO is on the National Plant Board (NPB) website. It has an interactive map and when you click on your state it will take you to another page with contact information. The NPB is a cooperative organization that includes membership from all State Departments of Agriculture.

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