

Oak Splendour Beetle

Agrilus biguttatus



Oak Splendour Beetle

- Other common names: oak buprestid beetle, two spotted oak borer, metallic beetle, oak jewel beetle
- Closely related to the emerald ash borer
- Pest of Europe, northern Africa, Siberia and the Middle East
- Causes damages to oak forests, ornamental trees, and nursery trade



The oak splendour beetle (*Agrilus bigittatus*) is also commonly known as the oak buprestid beetle, the two spotted oak borer, the metallic beetle, or the oak jewel beetle. It is closely related to the emerald ash borer which is a pest that causes severe problems in the United States annually. Currently, the oak splendour beetle is isolated to areas in Europe, northern Africa, Siberia and the Middle East where they cause damage to oak forest, ornamental trees and nursery trade. There is a risk that they will eventually spread to more areas of the globe.

Information sources: 4, 6

Oak Splendour Beetle suitable climate in the U.S.



■ Potential areas in the U.S. for the oak splendour beetle to invade.

Image credits: Figure 2 - Davis, E.E., S. French, and R. C. Venette. -
https://www.researchgate.net/publication/268001382_MinI_Risk_Assessment_Metallic_Beetle_Agrilus_biguttatus_Fabricius_Coleoptera_Buprestidae_A_B_C



The oak splendour beetle is a pest in Europe, Russian Asia, northern Africa, and the Middle East. Although it has yet to invade the United States, there is risk that it will in the future due to suitable climate and vegetation. This pest could seriously threaten forest ecosystems. The pest could potentially enter the United States through wood products and wood packing materials such as dunnage and crating.

Information sources: 4, 6

Pest of Oak Trees (*Quercus*)



Image credits: English oak (*Quercus robur*) L. - Richard Webb - Bugwood.org, #1430430; downy oak (*Quercus pubescens*) Willd. - Robert Videll, DorenicumKft. - Bugwood.org, #5396237; cork oak (*Quercus suber*) L. - William M. Ciesla, Forest Health Management International - Bugwood.org, #3943053



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The Oak Splendour beetle is a pest of mainly Oak (*Quercus*). Other susceptible trees are Chestnut (*Castanea*) and beech (*Fagus*).

Primary hosts:

Quercus spp. (Oak),
Quercus cerris (European turkey oak),
Quercus ilex (Holly oak),
Quercus petraea (Durmast oak),
Quercus pubescens (Downy oak),
Quercus robur (English oak),
Quercus suber (Cork oak)

Other hosts:

Castanea sativa (European chestnut),
Cytisus scoparius (Scotchbroom),
Fagus spp. (Beech)
Fagus sylvatica (European beech),
Quercus pyrenaica (Pyrenean oak),
Quercus rubra (Northern red oak)

Information sources: 1

Damage



Dieback



D-shaped exit holes



Zig-zag larval galleries

Image credits: D-shaped exit holes from *A. biguttatus* - C. Bytrowski; oak splendour beetle (*Agrilus biguttatus*) (Fabricius, 1776) - Gyorgy Csoko, Hungary Forest Research Institute - Bugwood.org, #1233054; dieback - Joseph OBrien, USDA Forest Service - Bugwood.org, #5250215



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The oak splendour beetle will slowly damage hosts until they eventually die after several generations of invasion. Some common initial signs are yellowing or dry leaves along with girdling. The host tree can experience dieback and thinning at the crown. Other key damage includes D-shaped exit holes 3 to 4mm where adults emerged from the host. If these signs are present, it is recommended that bark be removed and check the tree for zig-zag galleries created by feeding larvae. Often, woodpecker damage increases along with the presence of this pest as a result of the larvae in host tissues. Furthermore, any signs of tree death should be examined.

Information Sources: 1

Identification

- Adults
 - 8-13mm long
 - Green and metallic
 - Two white spots on elytra
 - Short antennae



Image credits: Agrilus biguttatus adult - Natasha Wright, Florida Department of Agriculture and Consumer Services - Bugwood.org, #5284050; Agrilus biguttatus adult - Gyorgy Csoka, Hungary Forest Research Institute, - Bugwood.org, #5372055



The adults are a greenish color with a shiny metallic appearance. Their bodies are 8-13mm long with short antennae on the head. Also commonly referred to as the two spotted oak borer, this pest has white spots located on the lower elytra. The elytra are the hard wing covers found on beetles. In late Spring, they will emerge from the host and create a distinct D-shaped hole in the bark before mating and laying eggs.

Information sources: 7

Lookalikes - Adults



Agrilus ater



Agrilus guerini

Image credits: Metallic wood-boring beetle (*Agrilus ater*) Linnaeus - Hanna Royak, Museum Collections: Coleoptera: USDA APHIS ITR - Bugwood.org: #5544512; *Agrilus guerini* - H. Bouyon - inpa.mnh.fr



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The oak splendour beetle is commonly mistaken for other beetles in the same genus. Both *Agrilus ater* and *Agrilus guerini* look very similar and are the more commonly misidentified because of the white spots present on their elytra. In the United States, the oak splendour beetle may also be mistaken for other pests including *Agrilus planipennis* (Emerald ash borer), *Agrilus cuprescens*, *Agrilus cyanescens*, *Agrilus derasofasciatus*, *Agrilus hypericici*, *Agrilus obsoletoguttatus*, *Agrilus pilosovittatus*, and *Agrilus sinuatus*. These can usually be ruled out due to the lack of white spots on the wing covers.

The emerald ash borer is an invasive pest of limited distribution in the United States. It is reportable in some areas. The emerald ash borer is a common pest of ash trees. This pest is a green metallic color but lacks spots on the wing covers.

Agrilus ater has short and sharp ends on their elytra whereas the oak splendour beetle has more rounded tips on their elytra. Furthermore, the oak splendour beetle only has two spots of white further down on the wing covers while *Agrilus ater* often has three white spots.

Similar to *Agrilus ater*, *Agrilus guerini* has three white spots. Moreover, the tips of the elytra are long, sharp and pointed which is very distinct from the oak splendour beetle.

Information sources: 1

Identification



- Pupae
 - White
 - Pupate in Spring
 - Found chambers in host tissues

Image credit: *Agrilus biguttatus* pupae. Louis-Michel Nageleisen, Département de la Santé des Forêts, Bugwood.org, #2515037



Pupation will occur in the Spring of the second year of a single generation. Pupae are generally white and found within the chambers formed in plant tissues by the larvae.

Information sources: 6

Identification

- Larvae
 - White
 - Legless
 - 10-40mm
 - Two horn-like protrusions on abdomen



Image credits: oak splendour beetle (*Agrilus biguttatus*) (Fabricius, 1776) - Gyorgy Csoka, Hungary Forest Research Institute - Bugwood.org, #5371053



Oak splendour beetle larvae are white, legless creatures up to 40mm in length. They have two darker horn like protrusions from the end of their abdomens called urogomphi, and the first body segment directly behind the head is wider than the other segments. Larvae will complete 5 instars as they eat through the plant tissues creating larval galleries. As they eat, they produce frass which can be an early warning sign of host infection.

Information sources: 4, 6

Identification



- Eggs
 - Clusters of 5-6 eggs
 - 7-14 days

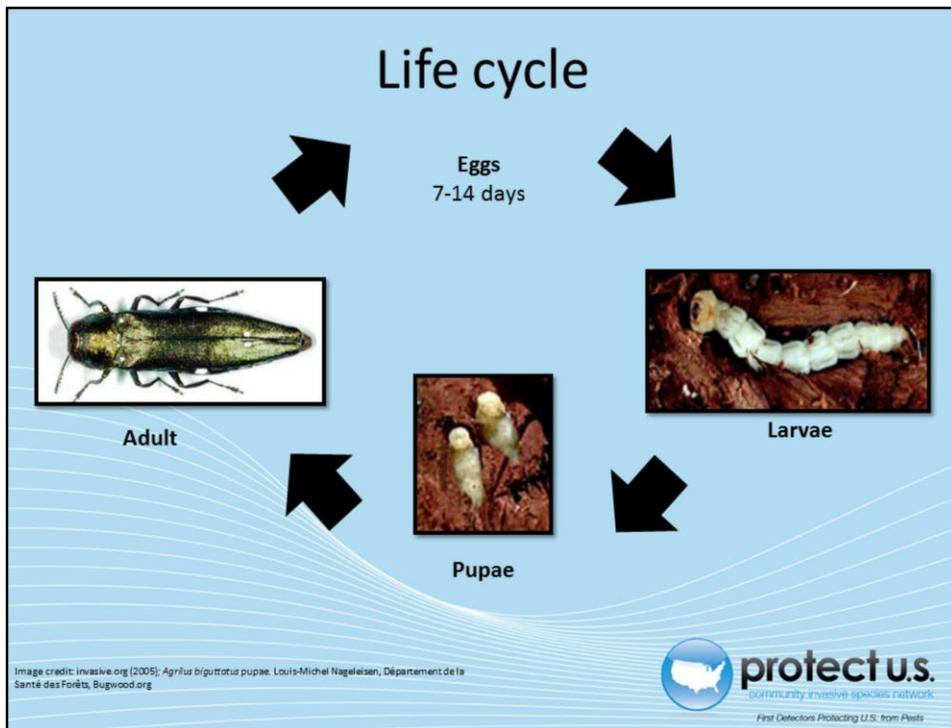
Adult female laying eggs into a crevice
in the bark of a tree

Image credits: oak splendour beetle (*Agrilus biguttatus*) (Fabricius, 1776) - Louis-Michel Nageleisen, Département de la Santé des Forêts, - Bugwood.org, #2515033



The adult oak splendour beetle will lay clusters of 5-6 eggs at a time into bark crevices. They take about 7-14 days to hatch.

Information sources: 8



In Europe, it has been reported that oak splendour beetle completes one generation in a two-year period. Between May and June of the first year, adults emerge from the host tree. Around early August, females deposit eggs in crevices of trees which take 7-14 days to hatch. The larvae feed on cambial tissues in the tree and create larval galleries until around November when they overwinter. In March of the following year, larvae continue feeding and go through 5 instars. In early September, the larvae again overwinter and pupate in the following April. Completing one generation, the adults emerge around May to mate and deposit eggs.

Information sources: 5

Monitoring

- Visual surveying for:
 - D-shaped exit holes
 - Larval galleries
 - Tree dieback
- Purple prism traps
- *Cerceris* wasps



Image credits: visual tree inspection - Andrew Koeser, International Society of Arboriculture - Bugwood.org, #5375276; emerald ash borer (*Agrilus pliospinosus*) Fairmaire, 1898 - Dawn Dailey O'Brien, Cornell University, - Bugwood.org, #5458354



The best time of the year to survey is May through August when the larvae and adults are most active. *Agrilus biguttatus* is difficult to monitor because it does not have any known trapping methods that work extremely well. The best way of monitoring is with visual surveying by looking for tree damage and the presence of the pest in any of its four life stages. Common warning signs of infestation are larval galleries beneath the bark, D-shaped exit holes, bark splitting and tree dieback. If an infestation is suspected, sweeping of foliage is recommended in sunny areas. If the D-shaped exit holes are present, it is advised to remove some of the tree bark to inspect for larval galleries or pupae.

Some resources suggest trying a purple prism trap without a lure in high risk areas like forests and nurseries. Traps should not be used as a main focus of monitoring because they have very limited success for the oak splendour beetle.

Another method is to look for *Cerceris* wasps. These are ground-nesting wasps that collect the beetles and store them in the nest. The wasps are known to collect *Agrilus biguttatus* and the nests of *Cerceris* wasps can provide a collection of beetles to confirm infestation of nearby hosts.

Information Sources: 1

Natural Control

- *Cerceris* wasps



Image credits: Sphecid wasp (*Cerceris bicornuta*) Guerin-Meneville, 1844 - Johnny N. Dell - Bugwood.org, #5387761; Sphecid wasp (*Cerceris bicornuta*) Guerin-Meneville, 1844 - Johnny N. Dell - Bugwood.org, #5347053



Cerceris wasps are a natural control of the oak splendour beetle. *Cerceris* wasps are a natural predator of the oak splendour beetle and will collect the pest in their nests. It is not known if a species of this wasp is preferential to the oak splendour beetle. Additionally, these wasps can aid in monitoring for the oak pest. *Cerceris fumipennis* is a species that is known in the United States and has been utilized in the monitoring of the emerald ash borer.

Information Sources: 1, 9

Cultural Control

- General Sanitation
 - Removal of infested hosts
- Silviculture
 - Pruning
 - Cleaning



Image credits: Silvicultural research - <http://www.nrcan.gc.ca/forests/industry/tools-research/13941>



The oak splendour beetle is very cryptic and chemical control can be extremely difficult and unsuccessful. As a result, cultural control is the best method for dealing with the pest. Cultural controls include general sanitation and silviculture. General sanitation includes removal of extremely infested hosts and host materials. This can be done by burning or chipping infested hosts to destroy all life stages of *Agrilus biguttatus*. Also, silviculture is highly recommended in areas of susceptible hosts. These practices can include pruning or thinning out trees to prevent infestation as well as cleaning. Inspection of trees should be fairly frequent and vehicles used for host transportation should be kept clean to prevent dispersal of the pest.

Information Sources: 8

Suspect Sample Submissions

- Contact your State Department of Agriculture or University Cooperative Extension laboratory
 - <http://www.npdn.org/home>
- PPQ form 391, Specimens for Determination
 - https://www.aphis.usda.gov/library/forms/pdf/PPQ_Form_391.pdf

The image shows a detailed PPQ form for sample submissions. It includes sections for:

- Specimens for Determination:** Fields for collector name, date, and location.
- Reason for Certification:** Multiple choice options for why the sample is being submitted.
- Host Information:** Fields for host name and quantity.
- Plant Distribution:** Checkboxes for various plant parts like leaves, stems, and roots.
- Plant Part Distribution:** Checkboxes for specific plant parts like fruit, seed, and wood.
- Shipping Method:** Fields for shipping method and tracking number.
- Signature and Date:** Fields for the submitter's name and date.

An example of a PPQ form for sample submissions

Image credits: https://www.aphis.usda.gov/library/forms/pdf/PPQ_Form_391.pdf



If a suspect pest has been located in the United States, a sample should be submitted for proper identification. Contact your local diagnostic lab to ship in a sample for identification. Information regarding your local diagnostic lab is available at National Plant Diagnostic Network (NPDN) website. The diagnostic lab information and available contacts are divided by state.

<http://www.npdn.org/home>

The sample specimen should be submitted along with accompanying documentation using the PPQ form 391.

https://www.aphis.usda.gov/library/forms/pdf/PPQ_Form_391.pdf

Your local diagnostic lab is part of your local cooperative extension service or your state department of agriculture. Your local lab will also have a specific form. All local labs may not be a member of NPDN. However, all labs should report new pest and pathogen detections to local regulatory officials.

Communications



- Contact your State Plant Health Director
 - https://www.aphis.usda.gov/aphis/ourfocus/planthealth/ppq-program-overview/ct_sphd



- Contact your State Plant Regulatory Official
 - <http://nationalplantboard.org/membership/>

image credits: <http://www.usda.gov/wps/portal/usda/usdahome>; <http://nationalplantboard.org/>



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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- United States Department of Agriculture, National Institute of Food and Agriculture (USDA NIFA)
- United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA APHIS PPQ)
- Cooperative Agriculture Pest Survey (CAPS) Program
- National Plant Board (NPB)
- States Department of Agriculture
- Extension Disaster Education Network (EDEN)
- Center for Invasive Species and Ecosystem Health (Bugwood)
- National Plant Diagnostic Network (NPDN)
- U.S. Department of Homeland Security (DHS)
- U.S. Forest Service (USFS)



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