

California Pest Rating Profile for
***Agrilus auroguttatus* Schaeffer: Goldspotted oak borer**

Coleoptera: Buprestidae

Previous Pest Rating: Q

Pest Rating: B as of 09/30/2022

Comment Period: 08/16/2022 – 09/30/2022

Initiating Event:

Goldspotted oak borer has been known to be present in California since 2004. It has killed tens of thousands of oak trees in California and is now present in Los Angeles, Orange, Riverside, San Bernardino, San Diego counties. It has not yet undergone review under the current pest rating process. Therefore, a pest rating proposal is needed.

History & Status:

Background: *Agrilus auroguttatus* (goldspotted oak borer, or GSOB) had previously been considered either a synonym or subspecies of *A. coxalis*, but Hespenheide et al (2011) determined that *A. auroguttatus* and *A. coxalis* are two distinct species. Adult GSOB is a small beetle (approximately 9 mm in length) that is metallic green with golden spots on the elytra.

GSOB is thought to have been introduced to California from Arizona (where it is native) through movement of firewood. The large expanses of apparently unsuitable habitat between San Diego County and southeastern Arizona favor this explanation over that of natural dispersal (Coleman and Seybold, 2011). Flight mill tests resulted in an average flight distance of approximately 790 meters in 24 hours, further support that long-distance dispersal is likely human-aided (Lopez et al., 2014).

Adult GSOB feed on oak leaves, but this feeding is not reported to have significant impacts on tree health. Eggs are laid on the bark and larvae burrow into and feed on the on phloem. There appear to be four larval instars, and the life cycle appears to be approximately one year, but there is evidence of longer and shorter life cycles in some cases. Larvae are present throughout the year, and larval feeding causes branch dieback and eventually (after 3-5 years, or less if the tree is weakened, as from drought) tree death (Coleman et al., 2017; Coleman and Seybold, 2011; Haavik et al., 2013).

In the 2000s, expanding oak (*Quercus agrifolia*, *Q. kelloggii*, and *Q. chrysolepis*) mortality was noticed in San Diego County. Surveys in 2008 determined that the cause of this mortality was GSOB, which had been known to be established in California (in San Diego County) since 2004 (Coleman and Seybold, 2011). Symptoms associated with, and leading to mortality include crown thinning, feeding galleries, and patches of necrosis in phloem that produce a reddish-brown sap (Lynch et al., 2014). D-shaped exit holes are characteristics of this beetle, and attacks appear to be focused on the main trunk and large branches (Coleman and Seybold, 2011). In addition to direct impacts by GSOB larval feeding on the tree vasculature, Lynch et al. (2014) suggested that various pathogenic fungi may be involved in death of oaks infested by GSOB. For example, GSOB may weaken a tree, and a pathogen may ultimately kill it. Singleton (2014) found evidence that female GSOB preferred to oviposit in trees that were highly GSOB-infested (and presumably stressed). Coleman et al. (2011) found no evidence that drought stress predisposed *Q. agrifolia* to infestation by GSOB. In San Diego County, infestation rates have exceeded 90% in some areas and mortality has reached 45% (Coleman et al., 2017). Scott et al. (2015) reported losing up to 25 percent of their oak trees in a single year, presumably mostly or entirely due to GSOB. GSOB is reported to have killed over 80,000 trees in California (The goldspotted oak borer).

GSOB hosts in the presumed native range in Arizona include *Q. emoryi* and *Q. hypoleucoides* (Coleman and Seybold, 2011). Absence of historical reports suggest that GSOB was not causing significant mortality in its native range, and the rate of infestation in Arizona was reported to be 4% (Coleman et al., 2017; Coleman and Seybold, 2011).

GSOB was not the subject of eradication efforts, although extensive outreach and research on spread, impacts, and control (including sanitation) has occurred and continues (Goldspotted oak borer; The goldspotted oak borer). Regarding trapping, Coleman et al. (2014) tested lures and found them not to be effective. Their recommendation was to place sticky purple prism traps adjacent to host trees.

Worldwide Distribution: GSOB is native to southeastern Arizona. It is reported from: **North America:** United States (Arizona and California), Mexico (Baja California Sur) (CDFA; Coleman, 2015; Coleman and Seybold, 2011; Goldspotted oak borer; Jones et al., 2013).

Official Control: GSOB is on the A1 list for Turkey (EPPO global database).

California Distribution: GSOB is known to be present in Los Angeles, Orange, Riverside, San Bernardino, San Diego counties (California Department of Food and Agriculture; Coleman, 2015; Goldspotted oak borer; Jones et al., 2013).

California Interceptions: GSOB not been intercepted in California (California Department of Food and Agriculture).

The risk GSOB poses to California is evaluated below.

Consequences of Introduction:

- 1) **Climate/Host Interaction:** Three of the main hosts of GSOB in California, *Q. kelloggii*, *Q. agrifolia*, and *Q. chrysolepis*, are all very widespread trees in along the length of California. If the climate is suitable, GSOB could become established over the entire length of California along the Coast Range and western slope of the Sierra Nevada (Coleman et al., 2017). Therefore, it receives a **Medium (2)** in this category.

- Low (1) Not likely to establish in California; or likely to establish in very limited areas.

- **Medium (2) may be able to establish in a larger but limited part of California.**

- High (3) likely to establish a widespread distribution in California.

2) **Known Pest Host Range:** GSOB is only known to feed on *Quercus* species. Besides the oak species already mentioned as hosts, laboratory tests with cut logs also suggest *Q. wislizeni* may be a suitable host. However, other oaks that were found to be fed upon by larvae in the laboratory, *Q. suber*, *Q. lobata*, and *Q. douglasii*, are reported to be infested in the field at much lower densities than the “preferred” hosts of the red oaks (including *Q. agrifolia* and *Q. kelloggii*) (Haavik et al., 2013). Therefore, it receives a **Low (1)** in this category.

- **Low (1) has a very limited host range.**

- Medium (2) has a moderate host range.

- High (3) has a wide host range.

3) **Pest Reproductive and Dispersal Potential:** GSOB is suspected to have been introduced to California via the movement of firewood. Dead oak branches and trunks are likely to be collected and moved as firewood. In addition, this beetle flies. Therefore, it receives a **Medium (2)** in this category.

- Low (1) does not have high reproductive or dispersal potential.

- **Medium (2) has either high reproductive or dispersal potential.**

- High (3) has both high reproduction and dispersal potential.

4) **Economic Impact:** It is unlikely that other states or countries could impose quarantines on California products because of the presence of GSOB in California. Untreated wood (including firewood), which is the most likely pathway for movement of GSOB, is already considered a high-risk material and commercial shipments of such material from California are likely of small

volume if they occur at all. In addition, GSOB does not appear to be a listed quarantine pest in most areas of the world. Therefore, it receives a **Low (1)** in this category.

Economic Impact:

- A. The pest could lower crop yield.
- B. The pest could lower crop value (includes increasing crop production costs).
- C. The pest could trigger the loss of markets (includes quarantines).
- D. The pest could negatively change normal cultural practices.
- E. The pest can vector, or is vectored, by another pestiferous organism.
- F. The organism is injurious or poisonous to agriculturally important animals.
- G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact Score: Low

– **Low (1) causes 0 or 1 of these impacts.**

– Medium (2) causes 2 of these impacts.

– High (3) causes 3 or more of these impacts.

- 5) **Environmental Impact:** Three of the main hosts of GSOB, *Q. kelloggii*, *Q. agrifolia*, and *Q. chrysolepis*, are all very widespread trees in along the length of California. Continued large-scale tree death appears likely to occur as this pest continues to spread in California. GSOB could exclude other wood borers from dead/dying oak trees in California (Haavik et al., 2014). Large-scale oak tree death could impact endangered species. GSOB is likely to kill oak tree plantings. Therefore, GSOB receives a **High (3)** in this category.

Environmental Impact: A, C, E

- A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.**

B. The pest could directly affect threatened or endangered species.

C. The pest could impact threatened or endangered species by disrupting critical habitats.

D. The pest could trigger additional official or private treatment programs.

E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

Environmental Impact Score: High (3)

- Low (1) causes none of the above to occur.
- Medium (2) causes one of the above to occur.
- **High (3) causes two or more of the above to occur.**

Consequences of Introduction to California for GSOB: Medium (9)

Add up the total score and include it here.

- Low = 5-8 points
- Medium = 9-12 points
- High = 13-15 points**

6) Post Entry Distribution and Survey Information: GSOB is known to be established in five southern California counties. It receives a **Low (-1)** in this category.

–Not established (0) Pest never detected in California, or known only from incursions.

–**Low (-1) Pest has a localized distribution in California, or is established in one suitable climate/host area (region).**

–Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.

–High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

Final Score:

7) The final score is the consequences of introduction score minus the post entry distribution and survey information score: Low (8)

Uncertainty:

GSOB is already established in southern California. There is some uncertainty regarding how much it can continue to spread in the state, especially considering that it appears to be native only to southeastern Arizona. There is low uncertainty regarding its potential to kill trees, as it is already doing this. However, the importance of other factors (e.g., drought, pathogenic fungi) in these deaths and the ultimate ecological impacts of these tree deaths are not completely understood. Therefore, the risk posed to California by GSOB may be under or overestimated in this proposal, and in the case of climate change, it may change in the future.

Conclusion and Rating Justification:

GSOB is reported to kill oak trees in California on a large scale. It is established in California, but only in a limited portion of the southern portion of the state. Eradication does not appear to be practical at this time. For these reasons, a “B” rating is justified.

References:

California Department of Food and Agriculture. Pest and damage record database. Accessed March 22, 2022:

<https://pdr.cdfa.ca.gov/PDR/pdrmainmenu.aspx>

Coleman, T. W. 2015. Influence of the invasive goldspotted oak borer on fuel loading on southern California. Pacific Southwest Research Station Technical Report 251:339-343.

Coleman, T. W. and Seybold, S. J. 2011. Collection history and comparison of the interactions of the goldenspotted oak borer, *Agrilus auroguttatus* Schaeffer (Coleoptera: Buprestidae), with host oaks in southern California and southeastern Arizona, U.S.A. The Coleopterists Bulletin 65:93-108.

Coleman, T. W., Chen, Y., Graves, A. D., Hishinuma, S. M., Grulke, N. E., Flint, M. L., and Seybold, S. J. 2014. Developing monitoring techniques for the invasive goldspotted oak borer (Coleoptera: Buprestidae) in California. Environmental Entomology 43:729-743.

Coleman, T. W., Jones, M. I., Smith, S. L., Venette, R. C., Flint, M. L., and Seybold, S. J. Goldspotted oak borer. 2017. United States Department of Agriculture Forest Insect & Disease Leaflet 183:

EPPO global database. Accessed July 22, 2022:
<https://gd.eppo.int/taxon/AGRLGT>

Goldspotted oak borer. Accessed: July 15, 2022:
<https://ucanr.edu/sites/gsobinfo/>

Haavik, L. J., Coleman, T. W., Flint, M. L., Venette, R. C., and Seybold, S. J. 2013. *Agrilus auroguttatus* (Coleoptera: Buprestidae) seasonal development within *Quercus agrifolia* (Fagales: Fagaceae) in southern California. *Annals of the Entomological Society of America* 106:189-197.

Haavik, L. J., Graves, A. D., Coleman, T. W., Flint, M. L., Venette, R. C., and Seybold, S. J. 2013. Suitability of native and ornamental oak species in California for *Agrilus auroguttatus*. *Entomologia Experimentalis et Applicata* 150:86-97.

Hespenheide, H. A., Westcott, R. L., and Bellamy, C. L. 2011. *Agrilus* Curtis (Coleoptera: Buprestidae) of the Baja California Peninsula, México. *Zootaxa* 2805:36-56.

Jones, M. I., Coleman, T. W., Graves, A. D., Flint, M. L., and Seybold, S. L. 2013. Sanitation options for managing oak wood infested with the invasive goldspotted oak borer (Coleoptera: Buprestidae) in southern California. *Journal of Economic Entomology* 106:235-246.

Lopez, V. M., McClanahan, M. N., Graham, L., and Hoddle, M. S. 2014. Assessing the flight capabilities of the goldspotted oak borer (Coleoptera: Buprestidae) with computerized flight mills. *Journal of Economic Entomology* 107:1127-1135.

Lynch, S. C., Zambino, P. J., and Eskalen, A. 2014. Occurrence, incidence and associations among fungal pathogens and *Agrilus auroguttatus*, and their roles in *Quercus agrifolia* decline in California. *Forest Pathology* 44:62-74.

Scott, T. A., Turner, K., Washington, Ca., and Corella, K. 2015. Pacific Southwest Research Station Technical Report 251:307-315.

Singleton, L. 2014. Host tree and site characteristics influencing goldspotted oak borer, *Agrilus auroguttatus* Schaeffer (Coleoptera: Buprestidae), populations in southern California. Master's Thesis, California State University, Long Beach, California.

The goldspotted oak borer. Accessed July 15, 2022:
<https://cizr.ucr.edu/invasive-species/goldspotted-oak-borer>

Responsible Party:

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***Comment Period: 08/16/2022 – 09/30/2022**

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at [permits\[@\]cdfa.ca.gov](mailto:permits[@]cdfa.ca.gov).

Comment Format:

- ❖ Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

Example Comment:

Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to "Climate/Host Interaction" here.]

- ❖ Posted comments will not be able to be viewed immediately.

- ❖ Comments may not be posted if they:

Contain inappropriate language which is not germane to the pest rating proposal;

Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

Violates agency regulations prohibiting workplace violence, including threats.

- ❖ Comments may be edited prior to posting to ensure they are entirely germane.
- ❖ Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Pest Rating: B