WC-DM-09-01: Goldspotted oak borer: Distribution of a new non-native pest of oaks

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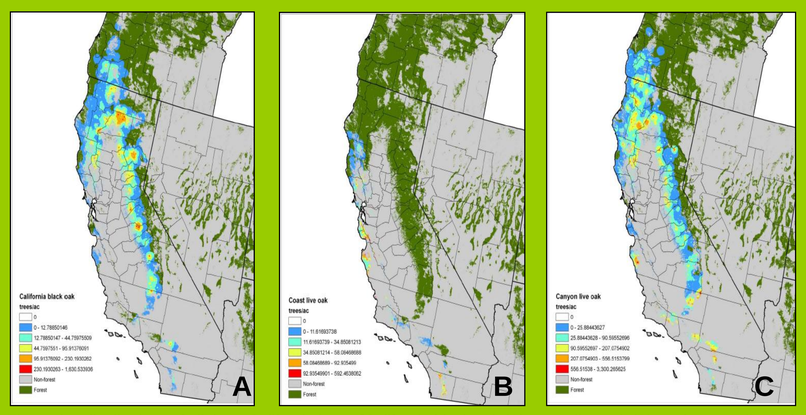
INTRODUCTION

- The goldspotted oak borer (GSOB), *Agrilus coxalis*, continues to cause oak mortality in southern California. The infestation is expanding in all directions from the Cleveland National Forest in San Diego Co. Oak mortality is now estimated at >20,000 trees in a 4,903 km^2 area. The beetle is believed to be exotic to California, associated with new hosts, and lacks natural enemy populations found in its native region of Arizona. The beetle is aggressively attacking healthy trees across all ownerships and oak mortality is expected to continue.

GSOB adults average 1 cm in length and are easily identified by the gold-colored spots on the surface of the wingcovers (A). Extensive larval feeding from GSOB (B) eventually leads to tree mortality, such as these dead and recently killed California black oak found on the Cleveland NF (C). A high-value coast live oak killed by GSOB on private land (D).

- GSOB is currently the most significant insect threat to oaks in California. Northern expansion of the GSOB population in California is a major concern for this new exotic pest.
- Evidence of oak firewood movement out of the infested area is a common sight on private land (see right).



The native distributions of all three California hosts [California black oak (A), coast live oak (B), and canyon live oak (C)] extend further north in the state along the coast or the Sierra Nevada Mountains. Currently, GSOB is killing trees across an elevational range of 90 to 1,800 m in California, including successful survival in areas with winter snow cover and low winter temps of ~2°C. The threat for a northern expansion is imminent. Movement of infested firewood represents a significant threat for expanding the distribution of this exotic pest.

OBJECTIVE

- **The objective of this project was to delimit the distribution of the exotic goldspotted oak borer (GSOB), *Agrilus coxalis*, in California.**

METHODS

- The distribution of GSOB was estimated by flight trapping adults and through ground surveys. For trapping, purple prism flight-intercept panel traps were hung 2 m from the forest floor and installed primarily throughout southern California. This monitoring occurred at 71 locations, which were located primarily near mortality centers established from previous aerial surveys, as well as in areas with susceptible oak species (coast live oak, *Quercus agrifolia*, California black oak, *Q. kelloggii*, and canyon live oak, *Q. chrysolepis*) or at firewood distribution centers.

Emerald ash borer purple prism traps were established at 71 sites in California to monitor for GSOB populations.

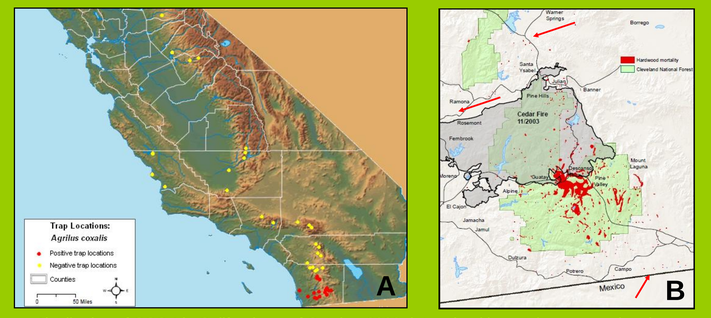
Ground surveys for GSOB supplemented trapping efforts in southern California.

- Trapping sites were concentrated on the Descanso Ranger District, Cleveland NF, but also included oak stands on other districts on the Cleveland, San Bernardino, Angeles NFs, as well as in the central and southern Sierra Nevada Mountain Range, the coast range near San Luis Obispo, and one urban site (Bakersfield).
- Trapping was initiated on 11 April and ended on 1 October 2009. Ground surveys were conducted in susceptible oak stands and in areas where tree mortality had been mapped from aerial surveys. During ground surveys, we examined oak crowns for die back and the main stem for emergence holes, bark staining, and woodpecker foraging (see below).

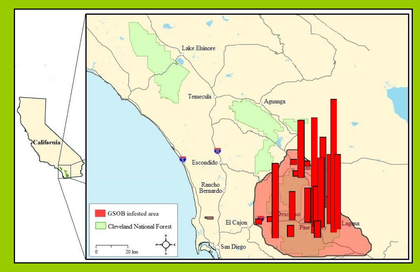
Ground surveys supplemented trapping efforts in southern California by assessing susceptible oak species for crown thinning and die back (A), bark staining (B), D-shaped exit holes (C), and woodpecker foraging (D). Larval samples were collected from infested trees.

RESULTS AND DISCUSSION

- Trap catches and ground surveys were effective at detecting GSOB in areas with and without known tree mortality (Figure A below). The distribution of GSOB is still limited to San Diego Co., but newly detected sites in the western portion of the county need to be surveyed more extensively. The distribution is approaching Riverside Co. to the north.
- The new zone of infestation extends further to the west in suburban San Diego and north of the Descanso RD, CNF on the Santa Ysabel Open Space Preserve. Data and activities from this study have been shared with collaborating agencies and presented (oral and poster presentations) at numerous scientific, technical, and public meetings.



Distribution of GSOB in California as of October 2009 determined by catches on purple prism flight-intercept panel traps and through ground surveys (A). Cumulative oak mortality since 2002, mapped via aerial surveys in San Diego Co. (B). New sites with GSOB-caused oak mortality are noted with red arrows.



The estimated zone of infestation (in red) with the density of adult catches from purple-prism flight traps in 2009. Mean (s.e.) trap catch for GSOB was 10.2 (±1.7).

- The zone of infestation and tree mortality is expanding from the Descanso Ranger District, Cleveland NF and Cuyamaca State Park (see above).
- Purple prism flight traps are inefficient for detecting GSOB populations when densities are low. Trapping methods need to be improved to enhance detection in newly infested areas.

FUTURE WORK

- In 2010, trapping and surveys will focus on areas in northern San Diego, Riverside, and San Bernardino Cos. Ground surveys will also continue in susceptible oak stands considered at immediate risk. Satellite locations in central and northern California will continue to be monitored with an emphasis on oak firewood distribution points.
- Studies are currently underway to enhance survey and detection methods for GSOB by assessing oak volatiles from crude extracts of oak phloem and bark, conducting electroantennogram dectection (EAD) analyses, and field testing of promising oak volatile crude extracts.

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