

Managing Goldspotted Oak Borer in Weir Canyon, Orange County, CA

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Introduction

At the urban-wildland interface in southern California, oak woodlands are important habitat for many species of plants and animals, but an invasive tree pest, goldspotted oak borer (*Agrilus auroguttatus*), has caused significant habitat loss. This beetle was first detected in San Diego in 2004, and it has spread through transportation of infested firewood to other areas, including Orange County where it was confirmed in Weir Canyon in 2014. In response, the Irvine Ranch Conservancy has been tracking and managing this infestation by conducting intensive field surveys. Highly infested trees are removed and chipped before adult emergence while minimally infested trees are treated with a contact insecticide, carbaryl (Sevin SL). Weir Canyon is one of the first satellite outbreaks for which eradication is being attempted, so it is important to measure treatment effectiveness to improve management practices and minimize impacts. From five years (2014-2019) of data collection, we will determine if carbaryl treatments affect infestation severity levels over time and prevent new infestations.

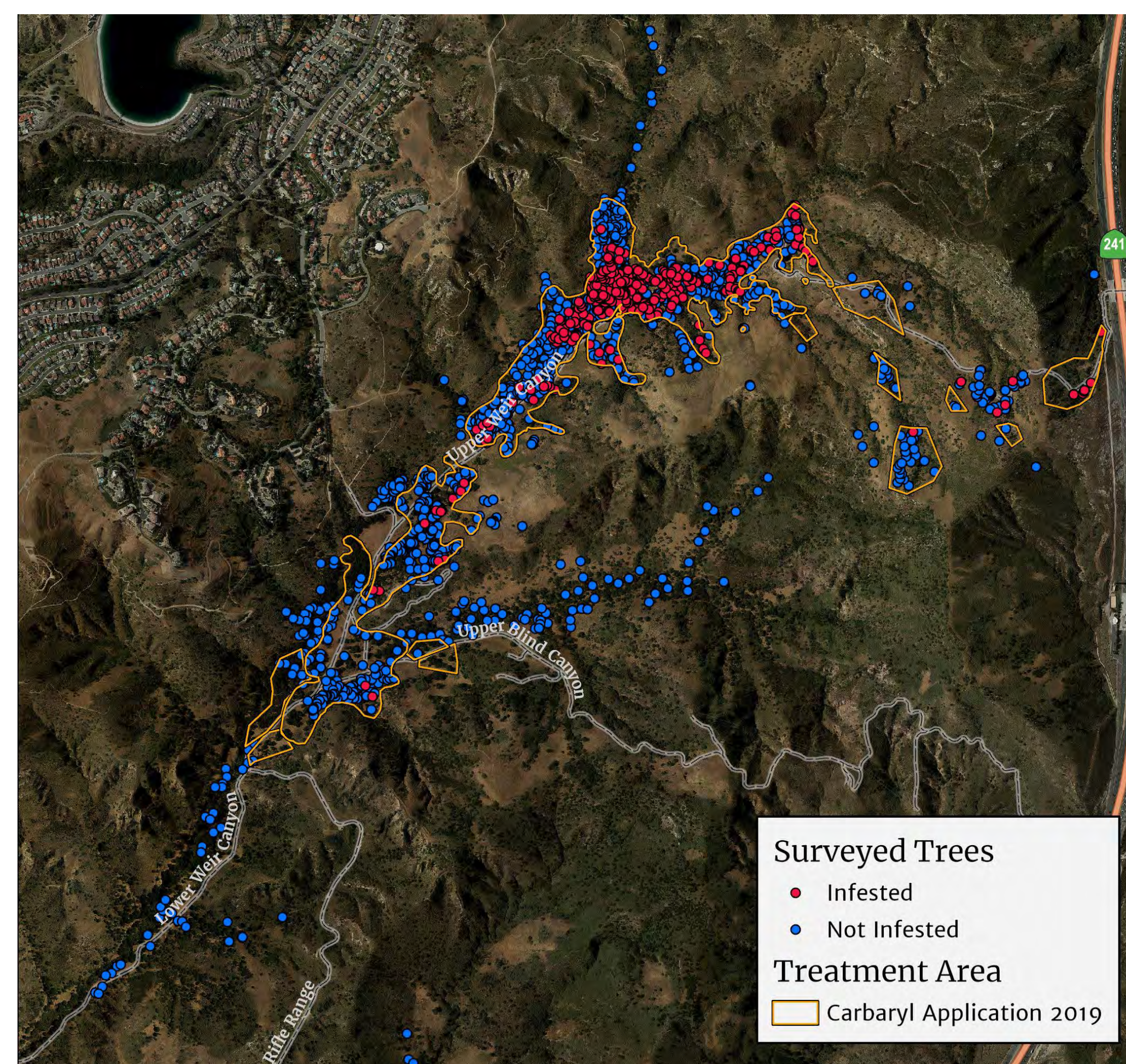


Carbaryl application via trunk spray to a coast live oak tree

Objectives

Determine efficacy of carbaryl treatment on GSOB-infested coastal live oaks (*Quercus agrifolia*) in Weir Canyon, Orange County by investigating:

1. Total trees at each infestation level over a three-year monitoring period (2016-2019)
2. Number of new infestations of untreated vs. carbaryl-treated trees



Surveyed trees and treatment area in Weir Canyon in 2019

Results

Infestation Severity of Carbaryl-treated Trees from 2016-2019

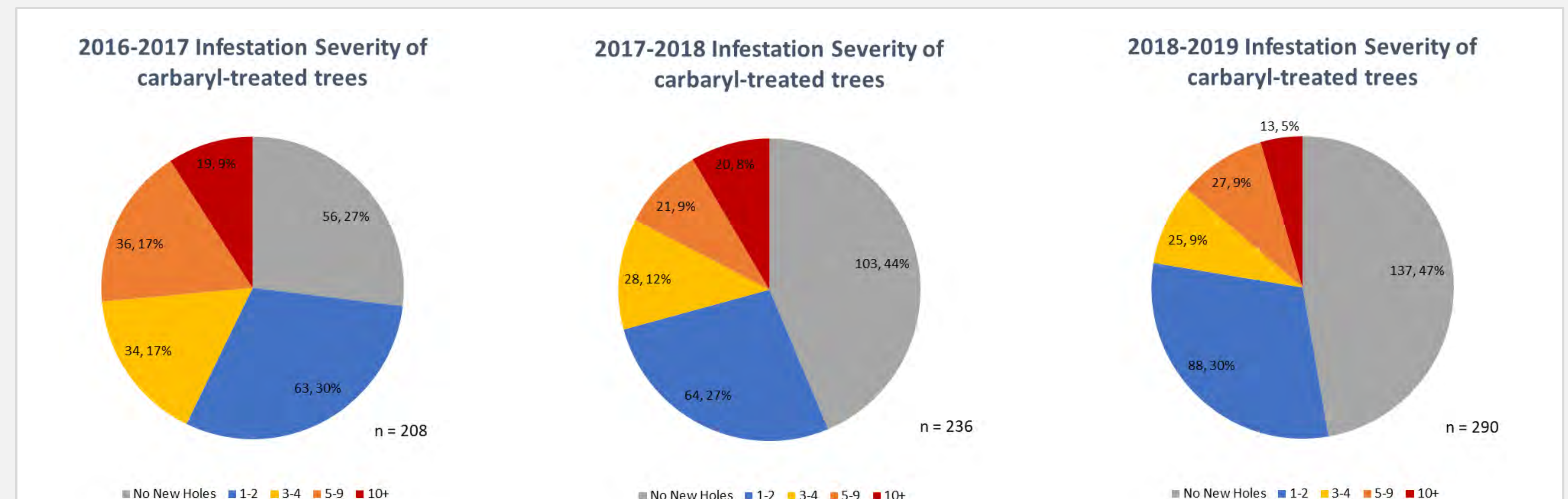


Figure 1 a/b/c. Number and Percent of carbaryl-treated trees in each infestation severity category from survey years 3, 4, and 5. Total number and percentage of highly and moderately infested carbaryl-treated trees per year decreased since survey 3 (2016-2017). Survey 5 (2018-2019) had the lowest number of highly infested trees and the greatest percentage of trees that were lightly infested or had no new holes.

Results (cont.)

New Infestations of Untreated vs. Carbaryl-Treated Trees

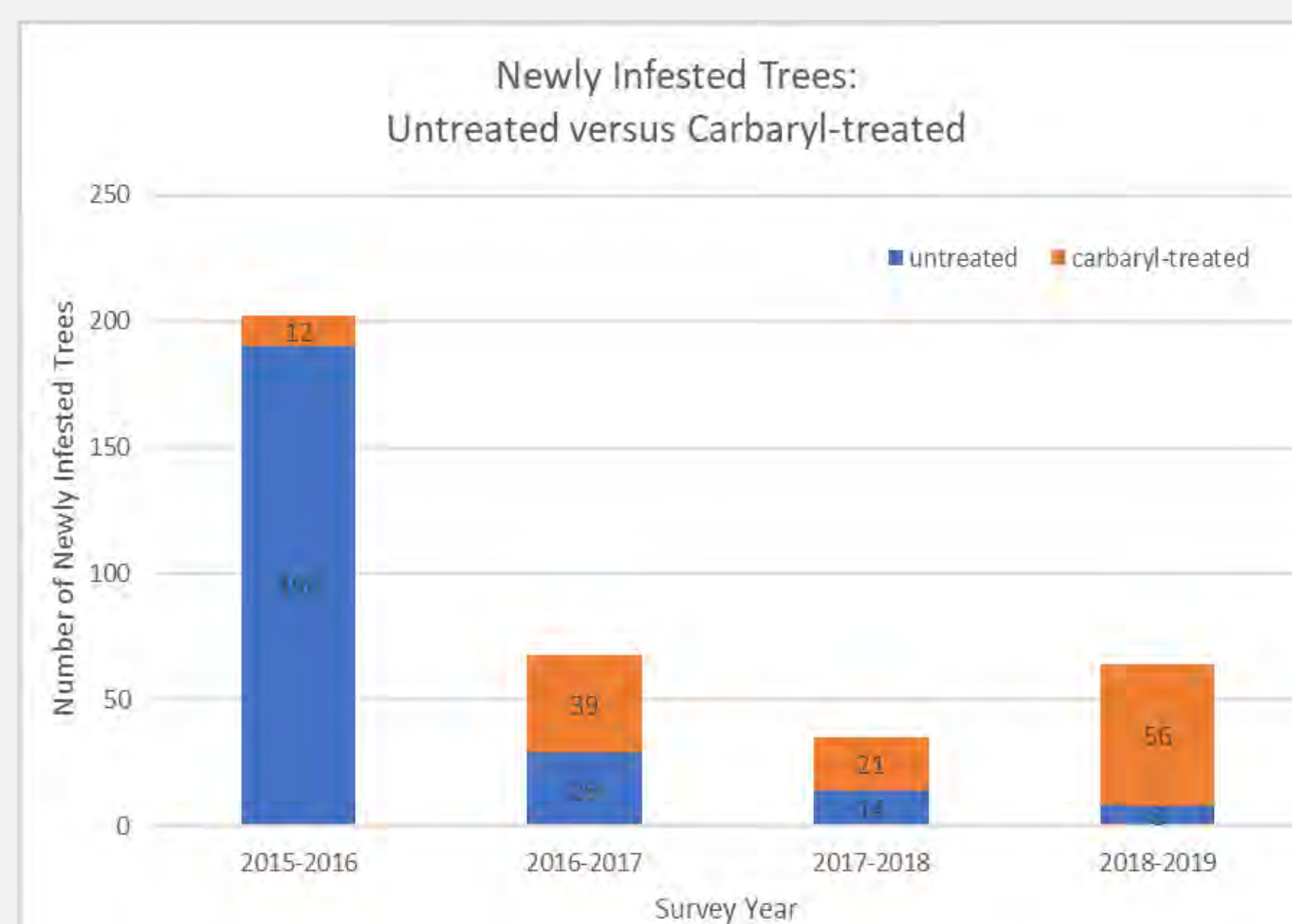


Figure 2. Number of newly infested untreated trees compared to newly infested trees that were treated with carbaryl. Survey 1 (2015-2016) had the greatest number of newly infested untreated trees across all survey years. However, recent survey years show a higher ratio of newly infested carbaryl-treated trees to untreated trees. Total number of newly infested trees decreased since the first survey year.

Conclusions and Discussion

- Carbaryl treatments are an effective strategy maintain low GSOB infestation levels in infested trees
- The proportion of highly and moderately infested trees to lowly-infested and trees with no holes have decreased since treatment in 2016
- Total number of infested trees continued to increase over time
- Uncertain whether preventative carbaryl treatments are effective deterring GSOB infestations on previously uninfested trees

Carbaryl application to trunks can be an effective option for controlling goldspotted oak borer infestation severity in *Quercus agrifolia* trees. While some treated trees still exhibit higher infestation levels, the proportion of trees with high infestation severity have decreased over the study period. In the 2015-2016 survey year, fewer carbaryl-treated trees compared to untreated trees became infested, however in the following years, more carbaryl-treated trees compared to untreated trees became infested. These results may be partially biased since untreated trees were likely outside of the 100-meter buffer spray zone, hence, further from the main infestation zone and perhaps less likely to become infested. Removal of brood trees may play a role in keeping infestation severity levels low and preventing further spread, therefore, should continue to be implemented annually. Lastly, other factors such as variability in annual precipitation and fire could influence GSOB populations. In October of 2017, the Canyon 2 fire swept through Weir Canyon. It was followed by a year of low rainfall. Further research needs to be conducted on using carbaryl as a preventative treatment and the effects of fire and drought on GSOB populations.

Materials and Methods

Site:

This study was conducted in an oak woodland in Weir Canyon in Orange County, CA located within the Irvine Ranch Open Space Preserve owned by Orange County Parks and managed by the Irvine Ranch Conservancy.

Monitoring and Treatment:

- Annual surveys conducted from October through March by IRC staff and volunteers
- Surveyed trees are assigned a unique identification and location data is recorded
- New exit holes are counted each year and sprayed with paint to ensure they will not be recounted the in the following survey year. The number of exit holes roughly correspond to the severity of infestation (Coleman et al. 2015)
- Before the flight season in May, infested and uninfested trees within 100 meters of the infestation zone are treated with carbaryl

Analysis:

For this study, we are looking at a subset of the total trees that are surveyed annually – previously or newly infested trees treated with carbaryl prior to the previous flight season. In the early stages of this outbreak, other pesticides were also experimentally utilized. To maintain consistency, trees that have had pesticide applications other than carbaryl were excluded from this study. We calculated the number of infested, carbaryl-treated trees in each infestation level per survey year. Infestation levels were determined by the number of new exit holes counted in each survey year. We considered trees with 1-2 new holes as low infestation, 3-9 new holes as moderate infestation, and 10 or more new holes as high infestation. The analyses for each survey year have different sample sizes due to the increasing number of infested trees each year. Additionally, we compare the number of newly infested trees treated with carbaryl to newly infested trees without treatment.

References

Coleman, T. W., M.I. Jones, S. L. Smith, R. C. Venette, M. L. Flint, and S. J. Seybold. 2015. Goldspotted Oak Borer. Forest Insect & Disease Leaflet 183. USDA Forest Service, Pacific Northwest Region (R6), Portland, Oregon.

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