



OREGON DEPARTMENT OF AGRICULTURE

Best Management Practices: Mediterranean Oak Borer

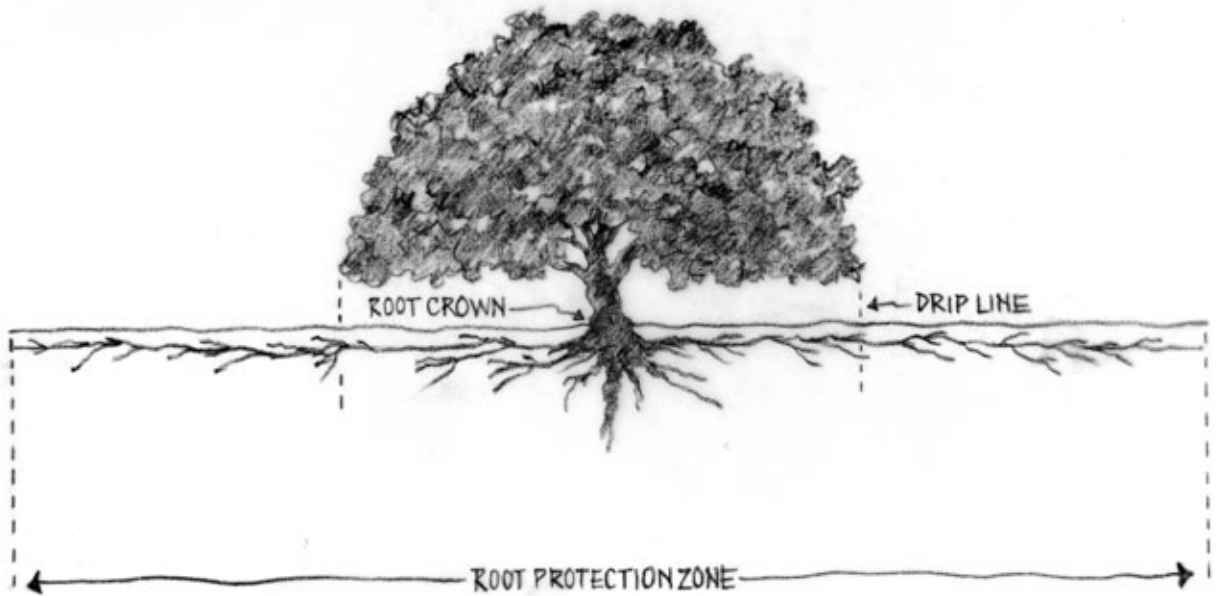
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Summary:

Mediterranean Oak Borer (MOB, *Xyleborus monographus*) is a recently-detected exotic invasive insect first found in Oregon in 2018. MOB is a tiny woodboring ambrosia beetle that vectors fungi that can kill oak trees. We are still learning about the biology of this insect and associated fungi and studying potential strategies for management. Below is the suggested guidance that outlines our current state of knowledge on best management strategies. We also acknowledge methods below where efficacy is unknown, yield mixed results, or require more study but may be tested when options are limited.

Decision key:

- 1. Get familiarized with MOB signs and symptoms, other oak pests that may be confused with MOB, and current infestation areas:**
 - a. MOB signs and symptoms video: https://youtu.be/_IQEPLkUciM
 - b. MOB fact sheet: <https://tinyurl.com/MOB-oregon>
 - c. MOB summary video: https://www.youtube.com/watch?v=1-rP9HphWKQ&list=PLkKSxcmPDVNCimJryLDbk_FmdNqnYQTM3&ab_channel=ODFForestHealth
 - d. Other oak pests: <https://www.oregon.gov/odf/Documents/forestbenefits/oak-pests.pdf>
 - e. MOB infestation map: <https://tinyurl.com/mobfieldmap>
- 2. Oaks are not infested nor in a known infested area:**
 - a. Monitor oaks for early signs of stress/lowered resilience to MOB
 - b. Remove large, unsupported branches that may break in upcoming storms:
 - Tree care before the storm: <https://www.oregon.gov/odf/Documents/forestbenefits/reducing-tree-damage-in-future-storms.pdf>
 - How to prune: <https://extension.oregonstate.edu/video/pruning-pros-collars-ridges>
 - c. Apply nematode treatment to reduce carpenterworm attacks: <https://ipm.ucanr.edu/PMG/PESTNOTES/pn74105.html>
 - d. Irrigate responsibly. In rare cases, providing supplemental watering *may* increase oak resilience. Slow, deep watering once a month during the hottest summer months. Do not overwater by avoiding standing water, and do not water oaks with signs of root rot (e.g., exterior fungal conks): <https://www.oregon.gov/odf/Documents/forestbenefits/fact-sheet-watering-your-trees.pdf>
 - e. Preventative removal or avoidance of planting oaks is not advised at this time. We do not have enough evidence to indicate that this insect will contribute to significant mortality of healthy oaks.
 - f. Avoid construction, development, paving roads or parking lots near oaks. Keep these activities and structures away at least twice the distance of the crown diameter to avoid root compaction.



3. Oaks are not infested but are within known infestation area:

- a. Apply preventative management strategies – see above
- b. Preventative treatment of insecticide + fungicide is a test strategy. System trunk injections of emamectin benzoate + propiconazole have shown *some* efficacy in other ambrosia beetle + fungal systems. Exterior sprays or insecticide-treated nets may also provide a barrier to insect entry and kill on contact, although: the entire tree must be covered, total pest mortality has not been proven, non-target impacts on natural enemies can further reduce onsite pest control. Efficacy of preventative treatment can be improved by also addressing tree stress or reduced vigor, which lowered resistance to pest attack. Various repellants, which repel but do not kill pests, have either mixed results in efficacy or have limited coverage across time and space. *The effectiveness of these strategies is still being tested and their use is currently experimental.*

4. Oaks are infested:

- a. Verify infestation status, report to the hotline for confirmation (include location, images, contact info): <https://oregoninvasiveshotline.org/>
- b. Once MOB infestation is confirmed by agency-trained natural resource specialists, apply management according to infestation progression:
 - i. Dieback present in a single branch but pale frass is not visible at the base of the trunk:
 - Remove and destroy (burn, chip onsite) the branch and consult with an arborist on ways to improve tree health or test pesticide treatment to prevent future attacks. Recognize that the underlying cause for attack may be environmental stress and additional MOB attacks may occur and contribute to more crown and eventually whole-tree mortality. *The effectiveness of partial removal strategies is still being tested and its use is currently experimental.*

- ii. Dieback or thinning in the crown is present and pale frass is visible at the base of the trunk:
 - Currently the State suggests (but does not require) infested oaks to be destroyed. Infested oaks may serve as a “source” for building up MOB populations that can then spread to healthy trees, however if they are destroyed, they *may* also serve as a “sink” by reducing the local population. The addition of chemical attractants to trees, bolts, or traps which will then be destroyed has also shown limited efficacy and risks attracting more insects to the localized area.
 - Infested oaks that are in residential or urban areas or may be a hazard to people and structures should be prioritized for removal.
 - Currently, there is no quarantine for movement of oak. Utilize signage to prevent firewood collectors. Untreated wood of any kind should not be moved into the state or more than 10 miles within the state:
<https://www.dontmovefirewood.org/map/oregon/>
 - Be aware of city tree removal codes, wildfire and air quality burn restrictions.
 - Sterilize equipment using 70% ETOH, 5% Bleach, Oxidate (hydrogen peroxide), or Lysol.

Oak disposal strategies, from most to least preferred:

1. Cut infested trees flush to the ground (do not leave stumps) and incinerate on site. Air Curtain Incinerators (ACI) can reduce carbon emissions but material must be dry, free of dirt, and reduced to smaller pieces for incineration.
2. Cut infested trees flush to the ground (do not leave stumps) and chip material to 1 inch on at least two dimensions and leave on site. Chip does not need to be covered but avoid spreading chips near uninfested oaks, it is unknown if the fungi can survive in and spread in chipped material.
3. Cut infested trees flush to the ground (do not leave stumps) and provide covered transport to a chipping or incineration facility for immediate disposal. If the facility cannot destroy the material, it should remain completely covered until chipped or incinerated.
4. Bury infested material. Currently optimal burial depth is unknown and at least 12 inches is suggested.

Resources:

- ISA-certified arborists: <https://www.treesaregood.org/findanarborist>
- Tri-county drop-off chipping facility: <https://www.shbark.com/>
- ACI operators: <https://www.oregon.gov/deq/aq/cao/pages/air-curtain-incinerators.aspx>

Citations:

1. Increased pest attraction to stressed trees (Kimmerer and Kozlowski 1982; Ranger et al. 2013, 2018, 2019; Catry et al. 2017; Souchu et al. 2023)
2. Effectiveness of chipping (Spence et al. 2013; Jones and Paine 2015; Olatinwo et al. 2021; Haack et al. 2024)
3. Effectiveness of burial (FIDL 116, DeGomez 2006)
4. Mixed efficacy of systemic insecticide injections (Carrillo et al. 2013; Peña et al. 2011; Fettig et al. 2013; Reding et al. 2013)
5. Mixed efficacy of exterior sprays ()
6. Insecticide-treated nets (Curtis et al. 2006; Skrzecz et al. 2015; Franjevi et al. 2016; Galko et al. 2019; Marianelli et al. 2019; Ranger et al. 2019 and 2021)
7. Mixed efficacy of repellants (Ranger et al. 2013; Agnello 2018; Byers et al. 2018; Rivera et al. 2020; Cloonan et al. 2023)
8. Attract and destroy results (Ranger et al. 2012 and 2015; Werle et al. 2018; Martini et al. 2020)
9. Non-target impacts of sprays (Frank and Sadof 2011)