



Mediterranean Oak Borer

September 2024



Crown dieback from MOB and associated fungi (Christine Buhl, ODF).

Summary

Mediterranean oak borer (MOB, *Xyleborus monographus*) is a tiny brown woodboring insect called an “ambrosia” beetle. This beetle tunnels into many species of oaks. They have been found in Oregon infesting Oregon white oak (*Quercus garryana*). Despite being a woodboring beetle, they do not eat wood. These beetles carry fungi (such as *Raffaelea montetyi* and *Fusarium solani*) with which they inoculate their tunnels to feed their young. These fungi clog water-conducting tissues and cause a wilting disease in susceptible trees. Over several years, large numbers of adult beetles infest and reinfest the trees, often killing whole branches, large portions of the tree crown, and later whole trees.

Current distribution

MOB is native to Europe, western Asia (Iran, Israel, Russia, and Turkey), and northern Africa (Algeria and Morocco). It has spread long distances to Korea and the United States (California and Oregon). In its native range it infests weakened or dying oak and beech tree species that are already suffering from drought, other pests, or disease. Outside of its range it

has been killing unhealthy but also seemingly healthy oaks in California and Oregon.

In California, widespread reports of dying valley oak (*Quercus lobata*) came from Napa and Sonoma counties in 2019. Large populations of MOB have likely been present there and killing trees since at least the early 2010s. MOB infestations have since spread to nearby Lake and Sacramento counties. Blue oak (*Q. douglasii*) is also a known host. In California, a single attack was found in a severely distressed California black oak (*Q. kelloggii*) and another attack in fire-damaged Oregon white oak. California officials found that MOB is already established and too widespread to be eradicated from central California.



MOB females are the size of a pencil lead. Males (inset) are slightly smaller, have a rhino horn-like structure, and are flightless (Curtis Ewing, CAL Fire).

In Oregon a single beetle was first captured in a trap in 2018 at Chinook Landing near Troutdale. Since then, adults have been found in traps in Multnomah, Clackamas, Marion, and Washington counties. In 2022, two Oregon white oak trees were found to be positive for MOB, one near Troutdale and another in Wilsonville. Since then, additional MOB-infested trees have been



identified in both counties. A multiagency task force is monitoring population spread and testing management strategies to slow the spread of this insect. Map of current MOB detections in Oregon:

<https://tinyurl.com/mobfieldmap>

<https://tinyurl.com/mobfielddash>

Hosts

The primary hosts of MOB are oak (*Quercus*) species. Reported from California and Oregon: Section *Quercus* (white oaks): *Q. lobata*, *Q. douglasii*, *Q. garryana*; Section *Lobatae* (red oaks): *Q. kelloggii*.

Reported from Europe, Asia & literature records: Section *Quercus* (white oaks): *Q. boissieri*; *Q. lustanica*; *Q. petraea*; *Q. pubescens*; *Q. robur*. Section *Lobatae* (red oaks): *Q. rubra*. Section *Mesobalanus*: *Q. canariensis*; *Q. frainetto*; *Q. pyrenaica*. Section *Cerris*: *Q. castaneifolia* var. *incana*; *Q. calliprinos*; *Q. cerris*; *Q. coccifera*; *Q. ilex*; *Q. suber*. Section *Ponticae*: *Q. pontica*. In its native range, MOB has also been reported to attack non-oak species such as maple, walnut, beech, elm, cherry, chestnut, and hornbeam

Signs and symptoms of infestation

Infested oak trees may have obvious canopy dieback that starts as red/brown leaves on a whole branch or large section of crown which slowly progresses across the entire crown. Dead leaves eventually drop leaving bare, dead branches. Dieback may also be accompanied by crown thinning. Crown symptoms are most noticeable in summer relative to healthy oaks with green crowns. It is not uncommon for older oak trees to lose a branch occasionally, or for crowns to have scattered small spots of leaf dieback. However, infestation from this insect causes more widespread dieback that spreads throughout the crown.

As beetle populations increase, attacks may also be seen at the base of the tree, even if there are still portions of live crown. The insect pushes out pale boring dust (frass) which accumulates in mounds in bark crevices or around the base. Beetles also create perfectly round 1/16th of an inch (1.3-1.5 mm) holes. These holes are hard to

spot because they are small and often hidden in bark cracks.



Frass created by MOB (Christine Buhl, ODF)

Beetles create black-stained networks of brood tunnels (galleries) primarily in sapwood. Individual tunnels are about 1/16th of an inch (1.2-1.5 mm) wide and galleries are branched and overlapping. Black-stained holes and galleries are visible in exposed wood and dropped branches.



Black-stained galleries in sapwood (Curtis Ewing, CAL FIRE and Christine Buhl, ODF).



Tiny brown beetles may be seen crawling around the outside of the tree, mixed in with frass, or within their galleries nearly all year long. Females average 1/8th of an inch (3.1 mm long). Males are 1/10th of an inch (2.3 mm long), have a rhino horn-like structure, and are flightless. Females far outnumber males. Eggs, small white larvae, and pupae are also present inside galleries. MOB can produce 2-3 generations a year.

Similar damage

Thinning crowns, stunted foliage growth, and branch dieback in oaks can also be caused by other stressors. These include: drought, storm damage, wood-rotting fungi, gall-making or foliage-attacking insects and squirrels, and various other bark beetles and woodboring insects. See images of damage from other oak pests to differentiate from MOB attacks:

https://www.oregon.gov/odf/Documents/forest_benefits/oak-pests.pdf



Scattered leaf and twig dieback from oak galls and squirrels and tunnels from other non-pest woodboring insects and (right) (Christine Buhl,

Many other non-pest, native and exotic ambrosia beetles create similar boring dust, stained galleries, and holes in oak and may be confused with MOB, however, none of these beetles are known to cause major crown dieback. Typically, other ambrosia beetles known in Oregon attack already dead or dying oaks. When reporting a suspected MOB infestation, ensure that the tree is an oak (any species) and look specifically for portions of crown dieback and pale boring dust as indicators of MOB attack.

Pathways

The invasion pathways by which MOB came to California and Oregon from Europe are unknown. Genetic analyses show that multiple introductions of MOB have occurred from Europe to the West Coast of the U.S. The likely

culprit is untreated and MOB-infested oak wood, such as: raw oak timber, pallets, crates, packing materials, hobby wood, and firewood. There could also be an association with oak wine barrel staves imported from Europe. The nursery industry may also be a potential pathway for this pest as many ambrosia beetles are pests of nursery trees worldwide.

Management

At this time, few control strategies for MOB have been proven as effective, although methods are currently being tested and guidance will be updated as we learn more. The guidance below lists our currently known best practices as well as some strategies that may be attempted for control.

Prevention

Healthy trees are more defended trees. Improving tree health may help trees resist or tolerate MOB and associated fungi.

- Drought stress is one of the most common primary causes of tree stress that reduces defenses against pests. Even drought-tolerant trees such as oaks can benefit from slow, deep watering, even 1-2 waterings during the hottest summer months, although take care to avoid overwatering oaks by allowing soil to dry between waterings:
https://www.oregon.gov/odf/Documents/forest_benefits/fact-sheet-watering-your-trees.pdf
- Near oaks avoid activities such as construction and road building that may cause root compaction. A good rule of thumb is to space these activities *at least* twice the distance of the crown diameter.
- Large, unsupported branches can break during storms and invite harmful fungi or insect pest attacks. Preventive pruning of large and unsupported branches may avoid further damage and encourage better wound healing.
- Systemic injection of insecticide (e.g., emamectin benzoate) + fungicide (e.g., propiconazole) *may* be effective in preventing MOB attack and disease transmission, although more testing is necessary to verify if this is effective. Repellants are also being tested.

- Sterilize equipment with 70% ethanol, 5% bleach, hydrogen peroxide, or Lysol after use in infestation areas.
- Forest insects and diseases are moved through firewood. Avoid transporting more than 10 miles from where it was cut.
<https://www.dontmovefirewood.org>

Control

Ensure that infestation by MOB is correctly identified and use control strategies before infestations spread to nearby trees.

- It is optimal to cut and burn infested trees (including stump) on site. This is the only method confirmed to kill all MOB in infested wood material. Air curtain incinerators are strongly encouraged to reduce carbon emissions.
- If burning is not an option, chip infested material (including stump) to 1"x1" and leave on site but away from other oaks.

Other less favorable options may include:

- Transport of covered infested material to a disposal facility that can implement one of the above methods. It is best to transport material during colder months when beetles are less active (December-February) to avoid spreading MOB in transit.
- Bury infested material at least 5 inches below the surface. More testing is needed to determine optimal burial depth.
- Covering infested material by thick, clear tarps to prevent beetles from exiting has limited effectiveness but may be utilized if no other options are available and material is completely sealed until it can be destroyed.
- If dieback is caught early, and signs and symptoms appear to be isolated in one part of the tree, and there is no frass at the base, the infested portion may be removed to attempt control. However, this action may not eradicate beetles or disease elsewhere in the tree and will not prevent future attacks but may buy time to implement other preventive actions or treatments.

Report an Invader!

If you observe signs and symptoms of possible MOB infestation, report it! Describe the location and your observations and submit photos and your contact information.



<https://oregoninvasiveshotline.org/reports/create>

Current efforts

An interagency task force is monitoring and mapping MOB populations and active infestations, attempting to identify pathways of introduction, and testing efficacy of multiple management strategies.

Additional resources

University of California Agriculture and Natural Resources MOB page:

<https://ucanr.edu/sites/mobpc/>

