



TREE NOTES

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The Red Turpentine Beetle

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The red turpentine beetle (RTB), *Dendroctonus valens*, is one of a number of bark beetle species that attack pines. Attacks are common on ponderosa, Monterey, and Coulter pines, but all pine species may be attacked. In general, RTB is not considered to be a tree killer, but its attacks may indicate that the tree is stressed and at increased risk of dying. Tree death is often attributed to other beetles that attack either before or after the RTB does. On Monterey pines, however, there is evidence that RTBs kill some trees.

As a group, bark beetles are small insects that attack living or recently dead trees by tunneling into the inner bark of the tree where the beetles mate, lay eggs, and their offspring feed. When a live tree is attacked, the successful development of the offspring, or larvae, only takes place if the tree or a part of it is killed. RTB attacks generally start near ground level and rarely occur above eight feet (*). Attacks are distinguished by the presence of large, light pink to reddish-brown pitch tubes, about 1 to 2 inches in diameter



Figure 1. RTB pitch tubes on a fire-scorched pine.

around the base of the tree (fig. 1), and/or piles of pink or white granular material on the ground (fig. 2). Pitch tubes of other bark beetles are noticeably smaller than those of RTB and typically extend higher on the bole of the tree. Because RTB pitch tubes are so conspicuous, they frequently arouse concern from landowners. The presence of pitch tubes on a tree does not

necessarily mean the tree is dying, but they may be reason for concern.

* Pitch masses of an inch or more in diameter that occur higher on the trunk or on branches are probably due to attacks by the sequoia pitch moth.

Evaluating Attacks

The RTB is attracted by the odor of tree pitch or resin. Since injured or diseased pines may release or produce excess pitch as a defensive reaction, this can serve as a cue to the beetles enabling them to locate trees that are stressed and suitable for attack.

The pitch tubes that form when RTBs attack a tree are the result of this defensive reaction, i.e. pitch is released by the tree in response to the beetle's tunneling activity. As long as the tree continues to release resin and pitch tubes are formed, the tree is resisting attack. A few pitch tubes on an otherwise healthy tree or old pitch tubes that are hard and have turned yellow are generally little reason for concern.

In contrast, numerous pitch tubes suggest a tree may be stressed and beetles are attracted to it. If new pitch tubes keep appearing on the tree, there may be good reason for concern. The appearance of five or more new pitch tubes over a one-to-two month period definitely warrants a more careful inspection of the tree to determine why the tree is being attacked. Injury, disease, or attacks by other bark beetles are likely causes for repeated RTB attacks. A tree that exhibits symptoms of stress and has many RTB attacks is at high risk for mortality. When assessing tree vigor, consider the following:

- Is there an abundance of green foliage or does it look sparse and off color?
- Has there been any major wounding to the trunk or roots of the tree?
- Have the roots been disturbed i.e. by soil compaction, pavement or have roots been cut?

The foliage or crown of a tree is a good indicator of vigor. If the tree has received major injury or is suffering from disease, the crown may reflect this. Trees that are suffering from chronic stress will exhibit some of the following symptoms:

- Needles shorter than normal.
- Poor needle retention, resulting in tufts of foliage at branch ends (lion's tail) and a thin crown that is easy to see through.
- Off-color, chlorotic foliage.
- Slow height growth, resulting in a flattened or rounded top.
- Excessive amounts of dead and dying branches.

In contrast, a vigorous, fast growing tree will have a pointed top and a full green crown.

When stressed, a tree may not be able to produce enough pitch to expel the bark beetles. Under these conditions pitch tubes may be absent, but coarse granular pitch and/or a fine sawdust-like material may be present in cracks and crevices of the bark, and around the base of the tree (fig. 2). If an abundance of fine dust is present, the tree may already be dead and you should be able to find live bark beetle adults (fig. 3) and/or larvae (fig. 4) beneath the bark. Another clear indication that the tree is dead is a change in foliage color from green to straw yellow and eventually to a dull reddish brown. If the tree is dying, this change will occur uniformly throughout the crown, affecting all needles.



Figure 2. Dry boring dust from RTB attacks.

Life Cycle and Identification

The adult RTB (fig. 3) is reddish brown and approximately one quarter to three eighths of an inch long. One generation per year is typical but the life cycle may be longer or shorter depending upon location within the state. In warmer parts of the state, attacks may be initiated at nearly any time of the year,

although most attacks occur in the spring and summer. In areas where it snows, attacks seldom occur from November through March, with most attacks occurring in the spring. When the adult beetles attack, they create an irregular, vertically-oriented tunnel in the inner bark of the tree. This tunnel is about half an inch wide, may be more than a foot long, and is packed with frass (boring dust and fecal material). During the early stages of attack, small, oval eggs about the size of a pin head may be found along the edges of the tunnel.

Larvae (fig. 4) hatch from the eggs and feed on the inner bark or phloem, eventually reaching



Figure 3. RTB adult



Figure 4. RTB larvae

a size similar to or slightly exceeding that of the adult. A distinct feature of RTB larvae is that they feed as a group, whereas most other bark beetle larvae maintain separate feeding tunnels. After reaching full size, the larvae transform to pupae, which are white and soft like a larva but have a form that more resembles an adult. Pupae do not move about, but remain stationary in protective cells called pupal chambers while they transform into the adult insect. At first the adult is a light yellowish brown, but it darkens to the typical reddish brown color by the time it is ready to leave the tree. Once the adult leaves the dead tree, the cycle is complete. This new adult and others like it fly in search of other trees to attack.

Management Considerations

The most effective means of preventing attacks by the RTB is to maintain tree vigor and avoid practices that attract beetles.

Red turpentine beetle activity often is associated with tree diseases, including annosus and blackstain root diseases and pitch canker. If disease is present, it will be important to learn about the disease and how it can be managed.

Wounding has the potential to attract RTB. If portions of the root system are cut or paved over, the vigor of the tree may be seriously impacted. Any sudden or dramatic change in the soil/root environment e.g. compaction, grade changes, flooding etc., will adversely

affect the tree's health. When building near trees, special precautions need to be taken to maintain the integrity of the tree's environment and health.

RTB attacks frequently occur on pines that have been damaged by fire. Although fires typically strike unexpectedly, there are preventative measures that can be taken to make your property fire safe and lessen the likelihood of damage to you, your home, and your trees.

When trees grow too closely together, they compete with one another for moisture and other resources. This creates stress that can lead to bark beetle infestations. In forest situations, thinning trees to achieve wider spacing can help to alleviate this stress and reduce the possibility of tree mortality. To the extent possible, leave the healthiest trees and remove those of low vigor. Competition for water is particularly severe during droughts, but the best time to thin trees is during periods of average or above average precipitation. When thinned at this time, the trees are better able to adjust to, and take advantage of, the added space.

For high value trees on non-timberland sites, supplemental irrigation may help alleviate stress resulting from drought and increase the tree's ability to resist bark beetle attack. During periods of average or above average precipitation, however, it is not necessary to water native forest trees and generally it is not recommended. Spring precipitation is especially important to native trees since it helps them survive California's long, dry summers. When spring precipitation is below normal, this is a good time to provide supplemental water.

When irrigating, it is important to deliver a sufficient amount of water to a location where the tree can utilize it. For native trees, this generally means deep irrigation. Frequent, superficial irrigation that penetrates only a few inches into the soil is not likely to benefit these trees and may have negative impacts such as promoting disease, decreasing oxygen exchange for deeper roots, and encouraging shallow rooting. As a rule of thumb, a single irrigation should penetrate 1-2 feet into the soil and the upper foot of soil should be allowed to thoroughly dry before repeating. Soil conditions and other factors will determine the appropriate time between irrigations in general, allow at least a couple of weeks. Water should be applied to the area beneath the crown's dripline, but avoid watering near the bole of the tree. Water should be applied continuously, but not running off, until it has soaked in to the desired depth. Under all but the harshest drought conditions, it is best to cut back and

cease supplemental irrigation by early to mid-summer.

Certain pesticide formulations containing carbaryl, chlorpyrifos, or permethrin when applied to the bark of a tree have been proven effective at preventing bark beetle attacks. Pesticide applied to the lower 6-8 feet of the tree trunk can be used to prevent RTB attacks, but it must be realized that other species of bark beetles may pose a threat to the tree as well. Pesticide treatments can be useful at protecting high value trees during drought or other periods of acute stress. There are a number of factors to consider before choosing to use pesticides for this purpose:

- Only those portions of the main stem of the tree that are sprayed will be safe from bark beetle attack.
- It is important to use a pesticide specifically formulated for use against bark beetles. All pesticides must be applied according to label instructions, and if the pesticide is a restricted material it must be applied by a Certified Applicator or under their direct supervision. Pesticides that are injected into the tree have not been proven effective against bark beetles.
- One treatment in the spring, generally in April or May before bark beetle flight begins, is usually sufficient to protect trees for the duration of the beetles' flight season. A common mistake is to spray pesticides on a tree that is already dead or dying.
- The use of pesticides against bark beetles is best viewed as a temporary measure for protecting trees during periods of temporary stress. Once the threat of beetle attack has passed, pesticide treatment should be discontinued. Trees that have little or no chance of recovering from the effects of chronic stress should not be treated with pesticides, as such attempts to save them eventually fail.

Further Reading

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