TREE NOTES

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Pete Wilson
Governor
State of California

Richard A. Wilson
Director

Douglas Wheeler
Secretary for Resources
The Resources Agency

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Managing Bark Beetles in Urban and Rural Trees

Bruce W. Hagen

Urban Forester, CDF Resource Management, P.O. Box 670, Santa Rosa, CA 95402-0670. (Revised 2002)

Bark beetles belong to a group of small, but destructive insects that kill or damage trees by tunneling under the bark to reproduce. Much of the damage is caused by the developing offspring. Trees stressed by unfavorable environmental conditions, disease, defoliation, age, or poor tree care are most susceptible. Bark beetles commonly attack conifers, however some prefer hardwoods, e.g., oak, elm or Prunus species. Most are fairly specific as to their preferred host tree(s), and each species favors a particular part of the tree. For instance, it is not unusual to find one species of beetle attacking the top and large branches, (Tree Note #8) another attacking the main trunk, (Tree Note # 13), and yet another attacking the tree base (Tree Note #9).

Natural resistance to bark beetle attack in pines and other conifers involves sustained pitch flow from their entry wounds. In this manner, attacking beetles are repelled (`pitched out'). Drought, root loss, root disease or old age, affect pitch flow, greatly limiting the capacity to resist beetle attack. Unless overwhelmed by attacking beetles (masse attack), healthy trees with an adequate water supply are seldom killed or seriously injured. Once a suitable tree is found, bark beetles produce a powerful volatile attractant (pheromone), which attracts more beetles from the surrounding area. Host resistance is soon overcome if there are sufficient numbers of attacking beetles.

Life History

Attacking beetles tunnel through the bark to the wood surface below. In pine, this often releases pitch, which may form a tube (`pitch tube'), around the tunnel entrance. Fungi, introduced on the bodies of the colonizing beetle, invade the tree's conducting system, inhibiting water, nutrient and pitch flow. This symbiotic relationship ensures the beetle's reproductive success by quickly destroying the tree's natural defenses. As tunnels are extended under the bark, boring dust (frass) is expelled through the entrance hole.

Pitch tubes, pitch streaming down the trunk and frass are the earliest signs of bark beetle attack. In hardwoods, signs of early attack are bleeding, frothy or wet spots, or just powdery boring dust. Ultimately, the tree's foliage fades, wilts and turns brown as the tree dies. Beetles may complete their development, emerge and fly off before symptoms are noted.

Adult females lay their eggs in tunnels constructed under the bark between the wood and moist inner bark. Once the eggs hatch, the resulting beetle grub (larvae) burrow away from the 'egg' tunnel. When fully grown, the larvae transform to pupae and then to adults. The tunnels constructed by the adult females and their offspring typically girdle the tree. Each species has a characteristic tunneling pattern, which can be used for identification even if the beetles have left. Emerging adults bore out through the bark, leaving it riddled with small 'shot holes'. Most species of bark beetles produce several generations a year. The last generation typically overwinters under the bark, emerging the following spring. Adult bark beetles are small, cylindrical, shiny brown, dark red or black and typically about the size of a grain of rice. The larvae are grub-like, dirty white, legless, and 'C' shaped with a distinct light brown head.

Signs And Symptoms of Bark Beetle Infestation

- gradual or sudden tree death
- yellow to brown or red brown foliage (fade)
- bleeding on the trunk, frothy wet material. (oak bark beetles)
- white pitch tubes (initial attack of the Western pine beetle)
- pitch streaming down trunk (initial attack of the fir engraver)
- small reddish brown pitch tubes on bark (most pine engravers)
- large pinkish to reddish brown pitch tubes near tree base (red turpentine beetles)
- white to pinkish pitch granules near base (red turpentine beetle)
- sawdust-like and cinnamon colored boring dust (frass) collecting in bark crevices and spider webs
- tunnels under the bark.
- wood surface 'engraved' by boring activity
- emergence holes in bark
- bark flecked (woodpeckers)

Management Options

Sanitation: Once a tree is infested, there is essentially no hope of saving it. However, if only a limb or top is involved, it may be possible to eliminate the infestation by pruning out and destroying the affected portion. If detected early, prompt tree removal and proper handling of the wood and branches can eliminate the beetle brood, preventing neighboring trees from becoming infested. Unfortunately, symptoms are typically detected after the beetles have flown. Although they are no longer a threat to surrounding trees, standing dead trees should be removed because they are a fire hazard and will eventually fall.

The wood from trees containing live beetle brood can be safely kept if cut, stacked, and carefully tarped with clear plastic sheeting to contain beetles (see Tree Note #3). The tarping must remain intact and form a tight seal against the ground to prevent beetle escape. Store the wood in direct sunlight, well away from other trees of the same or related species. The moisture that condenses on the plastic's surface traps and kills the emerging beetles. Temperatures within tarped woodpiles or logs exposed to sunlight heats the water droplets killing the trapped beetles (see Tree Note #3).

Other methods to kill beetles in infested wood are to debark the wood or treat with an approved pesticide. Burning or burial at a sanitary landfill are other options. The severed branches (slash) must also be disposed of or treated.

Slash from non-infested pines, a favored breeding material for pine engravers, should be treated to prevent a population buildup. Although chipping is very effective for this purpose, branches up to six inches in diameter can be cut into 2 feet lengths and scattered in a sunny location. This causes rapid drying, making the wood unsuitable for colonization.

Prevention: is the most prudent method to minimize tree loss. This is best done by preventing or minimizing root injury and other damage during construction, road building or logging, reducing water stress during droughts and in hot, dry inland areas by periodic, deep watering, and by selectively removing trees (thinning) to reduce competition for water and nutrients. Drought is perhaps the most common factor predisposing trees to bark beetle attack. Careful periodic watering of landscape trees beginning in the late spring continuing through the summer will greatly improve their resistance to attack.

During construction, avoid grade change - the removal or addition of soil close to trees. Excavation and trenching can sever roots, while the addition of fill-soil can suffocate them. Fill-soil can impede water infiltration and or drainage, leading to drought conditions or waterlogging. If possible, fence off the root protection zone(s) (radius of dripline plus 50%) during construction to avoid soil disturbance and soil compaction from heavy equipment. Compaction destroys the soil's natural porosity, reducing its capacity to hold air and water. Hard, dry and poorly aerated soil impairs tree health and pest resistance. Soil can also be compacted by vehicles, livestock, and foot traffic within the dripline. Try to eliminate or at least limit these activities within the dripline, and mulch the impacted area with six inches of wood chip mulch or coarse, ground bark to reduce further compaction and to help improve soil conditions.

Chemicals: Certain pesticides can be applied directly to the bark of high value landscape trees to prevent attack. Carbaryl, chlorpyrifos, and Astro® or Dragnet® are currently registered insecticides for this purpose. The entire trunk and large branches must be thoroughly treated at the recommended rate. Applying pesticides to the lower 10 feet of pines, however, can prevent red turpentine beetle attack. Chemical spraying provides only temporary protection and must be repeated yearly as long as the tree remains stressed. A more practical approach is to reduce stress through a long-term tree care program of irrigation, mulching and moderate fertilization.

Systemic chemicals injected through the bark do not control bark beetle infestations (Koehler 1979). The reason being is that the distribution of systemic chemicals is dependent upon a functional water conducting system. Tests have also shown that the preventative treatment with systemic materials does not prevent successful attack. (Wentz 1990).

Horticultural: Practices such as tree selection, timing of pruning, watering, fertilization, weed and brush control, and selective removal (thinning) are perhaps the most effective, least expensive methods to prevent bark beetle problems:

- Select trees that are well adapted to the local environmental conditions and make sure that the seedlings are grown from seeds collected in seed zone compatible with you locality (latitude and altitude).
- Avoid planting Monterey pine except where they are native.
- Most conifers require little or no pruning, however if it is necessary to remove lower limbs or shorten limbs for clearance, prune from Nov. 1st to March 1st when most beetles are inactive. Avoid topping conifers. Rather than making a tree conform to a desired size by pruning, select and plant the right tree in the first place.
- Low to moderate fertilization can improve a tree's growth and pest resistant. Excess fertilization, on the other hand, can, stimulate rapid, yet weak growth, decrease root to shoot ratio, potentially reducing drought tolerance, cause or exacerbate pest problems, burn foliage or contaminate ground water. Apply no more than 1 to 2 pounds of actual nitrogen every 2 to 3 years, unless a nutrient deficiency has been identified.
- Remove weeds, brush and dense ground covers, e.g., turf, ivy, junipers, hypericum, etc. within the dripline. Such plants compete strongly for available water and nutrients.
- Mulch the soil surface within the dripline with 4" to 6" of coarse organic mulch or allow pine needles to accumulate. It may be necessary to remove pine needles from under conifers close to structures for fire safety.
- Prune lower tree limbs to provide 10 feet or more of clearance for fire safety. Remove shrubs, brush, tall grass and other vegetation that can carry fire into the trees growing above. The removal of lower branches should not exceed 1/3 of the tree's total tree height.'
- Trees that overhang houses should be pruned at least ten feet above the roof.
- Deep water on a regular, but infrequent basis. Use a sprinkler or soaker hose to apply water to a depth of at least 12". This may take 3 to 4 hours or longer. Apply the water to the outer half of the dripline and at least 10' beyond (area under the tree) every 4 to 6 weeks during the dry season.
- Native oaks are particularly susceptible to root disease and should be irrigated no more than 2 to 3 times during the dry season.
- Selectively remove trees (thin) to improve spacing and reduce competition. On average, allow one foot or more of spacing for each inch of tree diameter at breast height.

Drought stress and bark beetles are largely responsibility for the increased mortality seen in conifers, particularly pines. Less than normal rainfall prior in recent years has greatly impaired the health and natural resistance of many urban and rural trees. Unless homeowners and small landowners take a more active role in managing their trees, more will die.

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Jesse Rios: Editor
CDF Forest Pest Management (916) 653-9476