

Memorandum

To: Angela Bernheisel

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From: Department of Forestry and Fire Protection

Subject: 5080 Pest Control
Bonny Doon Ecological Reserve & Martin Fire

On October 26, 2010, I conducted a forest pest evaluation of portions of the Bonny Doon Ecological Reserve and a sampling of surrounding private properties damaged by the 520-acre Martin Fire (June 2008). In attendance were Cal Fire's Angela Bernheisel and Rich Sampson, the Reserve's Val Haley, Santa Cruz County Environmental Coordinator Matt Johnston, and adjacent several landowners (Powell, Jessen, Moeller, Stewart, and Barone). I also toured other parts of the Reserve along Martin Road between the Fire Station and Ice Cream Grade on October 27.

Some areas are dominated by a ponderosa pine overstory and some with a more mixed overstory of Douglas-fir, ponderosa pine, and tanoak. Other codominants in the area are knobcone pine, madrone, chinquapin, and live oaks.

Though many trees were destroyed in the Martin Fire, surviving ponderosa pines have varying degrees of basal scorch. Basal scorch is associated with cambium damage and resultant poor tree health and pest defenses. Scores of ponderosa pine have been dying over the past two summers post fire and remaining pines will be subject to further devastating losses due to continued beetle attack. Ponderosa pine logs stacked in the parking area near the Fire Station all had galleries of the western pine beetle, a primary attacker of fire scorched, large diameter ponderosa pine. As we checked the dead and dying ponderosa pines across Martin Road and south from the Fire Station, these trees were also killed by the western pine beetle. Some of the more recently attacked pines had bark chipped off by woodpeckers, another indicator that the standing trees had been attacked by bark beetles. I could not sample small diameter portions of these trees, but pine engraver beetles could have attacked the upper portions in conjunction with the western pine beetle.

Western Pine Beetle life cycle and signs of attack (from Tree Note #13)

Adult beetles are small, dark brown-to-black averaging about 4mm in length. Female beetles initiate attacks and are joined by males. There is one male/female pair per attack, and thousands of attacks may occur on one tree. The initial attacking beetles produce a potent pheromone capable of attracting large numbers of beetles to an individual tree. Each pair constructs a winding, egg laying gallery in the inner bark next to the wood. The attacking beetles introduce blue staining fungi which may aid in killing the tree by clogging the water conducting system. Larvae feed away from the egg niches and soon start tunneling toward the outer bark, where they complete their feeding and transformation from larva to adult. Thousands of tiny emergence holes indicate the adult beetles have exited the trees. During warm weather, the time frame from initial attack to brood adult emergence is slightly more than two months. There are usually multiple generations produced each year.

Attacks generally start at mid-height on the bole and progress upward, but usually not past 6 inches in diameter, and downward to the base. In response to beetle attacks, the tree releases pitch at the attack site, thus producing pitch tubes. Trees already under moisture stress may not be able to produce enough pitch as a defense against the beetles. If pitch masses are cream colored, the tree likely was successful in pitching out the attacking beetles. If the pitch masses are reddish, this indicates the beetles attacked successfully, and wood and frass has mixed with the pitch to produce the reddish color. Where no pitch was formed, only reddish boring dust may be visible, collecting in bark crevices. Another sign of attack is woodpecker feeding. Woodpeckers chip away at the bark in search of the developing western pine beetles in the outer bark. In stark contrast to healthy bark, the bole will appear light reddish-brown in areas where the woodpeckers have been working. Well after the beetles have killed the tree, the tree's foliage fades in color, progressing from green to straw-yellow to sorrel.

Other pests

An additional pine pest in the area is western gall rust. This rust fungus is killing branch tips, causing the numerous red flagged branches in the area. None of the killed branch tips were symptomatic of pitch canker.

Toward Ice Cream Grade there were 4 other groupings of dead and dying, large diameter ponderosa pine. Numbers of dead and dying trees in these groupings were 6, 3, 2, and 2. All dead and dying ponderosa pine were attacked by western pine beetle, with varying incidence of western gall rust, red turpentine beetle, and woodpecker activity.

Newly formed sporophores of the velvet top fungus (*Phaeolus schweinitzii*), were scattered throughout the area, mostly in close association with Douglas-fir trees and stumps. This fungus decays roots and heartwood of the lower butt log. Although the sporophores I saw were in close association with DF,

ponderosa pine is also a host and could have root decay from this fungus. Most associations with incidence of this pathogen are mature trees, past fires capable of causing deep wounds in roots or bases of trees, or ground line scarring from machinery. Trees with extensive root decay may show above ground symptoms of thinning and declining crowns. Small, scattered twigs may begin to die with increased root disease. Advanced root disease may also lead to bark beetle attacks or to increased probability of wind throw, especially along the windward side of stands or stands prone to on-shore breezes.

I inspected the stems and sprouts of tanoaks and found no indication of sudden oak death in the stand portions evaluated.

June 2005 Observations

In June 2005 I conducted a previous pest evaluation along the Outer Loop Road through the Ecological Reserve. Primary pests noted at that time were annosus root disease in knobcone pine and Pacific madrone, Armillaria root disease in chinquapin, pine engraver beetles in knobcone pine brood material (downed stems > 3 inches in diameter), western gall rust in knobcone pine, madrone canker, *Phaeolus schweinitzii* in knobcone pine, and *Phellinus pini* (stem decay) in knobcone pine. It may be safe to assume that many of these pests are likely resident in the forested areas surrounding those stands visited this year.

More Information on major pests

One may download several Tree Notes on the above pests at our Cal Fire web site, and more specifically by going to the following link:

<http://ceres.ca.gov/foreststeward/pdf/treenote30.pdf>. Please see:

- Tree Note #3 for managing beetles in firewood
- Tree Note #6 for Annosus root disease
- Tree Note #9 for red turpentine beetle
- Tree Note #13 for **western pine beetle**
- Tree Note #16 for madrone canker
- Tree Note #22 for western gall rust, and
- Tree Note #28 for pine engraver beetles.

Management Recommendations

Management of this current pest outbreak is urgently warranted. Should no action be taken to abate the beetle outbreak and initiate integrated stand management prescriptions to promote sustained forest health, the Bonny Doon Ecological Reserve and surrounding private properties may experience:

- vast losses in their mature ponderosa pine stand component
- increased windthrow of root diseased trees as stands become more open with the loss of large ponderosa pines
- increased public safety issues with dead trees bordering roads and trails
- increased fuels build-up with fire prone dead trees

- site conversion to plants not meeting the needs of land managers and property owners, and
- a need for costly revegetation efforts.

Although stand compositions may vary from landowner-to-landowner, programs or projects should consider some or all of the following recommendations.

1. The most imminent threat to the trees within and adjacent to the Martin Fire is the continuing attack of ponderosa pine by the western pine beetle. The most likely trees to be attacked are those with moisture stress due to cambium damage from the fire (scorched tree bases), and those with annosus or schweinitzii root diseases. Although not observed this October, pine engraver beetles are also likely to kill or top-kill fire scorched ponderosa pines. Scorched trees may not fully recover for some time, so stand improvement strategies such as thinning to reduce competition for available water may be fine for the long term, but not likely successful in abating the current western pine beetle attacks. A stand sanitation harvest in which recently attacked and high-risk green trees are removed before the beetles have a chance to attack and further build beetle populations. Trees that are high-risk to beetle attack are those with severe bark scorch, thinning crowns with poor needle retention, or flat-topped crowns indicating a cessation of growth. To minimize site disturbance from multiple stand entries, any stands in need of thinning should have a combination prescription of sanitation and thinning. The next western pine beetle flight is generally in the spring (April and May), but may be sooner at low elevations near the coast.

2. The harvesting of green ponderosa pines may create brood material in which pine engraver beetles build populations and may attack surrounding, stressed pines. All green pines stems greater than 3 inches in diameter should be treated soon after brood material creation. Ideally, branches should be removed from the stems and scattered to allow solarization of the stems. To further speed up the drying process and limit successful engraver beetle attacks, the brood material should be cut to short lengths (less than 4 feet) and scattered in a sunny location. If brood material is created during a time when pile burning may be conducted, the material could be burned in lieu of the above solarization strategy. Early season pine engraver beetle attacks have been observed as early as February in low elevations near the coast.

3. Since *Heterobasidion irregulare*, cause of annosus root disease in pines and madrone, was detected in the Reserve in 2005, the fungus is likely present in the area. Annosus can spread from tree-to-tree through root grafts or short distance through soil, advancing up the roots to girdle trees at the root collar. The fungus also moves into new areas when its spores (year-round) land on susceptible (newly sawn) pine stumps and colonize the stump's root system.

From the stump's root system, the fungus then advances onto the healthy roots of adjacent (normally within 50 feet) pines or madrones. To minimize the introduction of spores onto freshly created stumps, the stump surfaces should be treated with a sprinkling of Sporax with a few hours of stump creation. Sporax is a registered pesticide, though it is basically granular borax soap. Trained applicators are necessary.

4. Since *schweinitzii* root disease was found in both pines (2005) and Douglas-fir (2010), keeping the stands wind firm should be considered in conjunction with other stand manipulations or strategies. Thinning levels (basal area per acre) should be kept conservative to minimize the effects of high winds in the post harvest (commercially or non-commercially) stands. Try to avoid stem scarring and wounding, which in turn will minimize the introduction of *Phaeolus schweinitzii* into roots or butts. Also, minimize fuels build-ups to avoid intense fires, and any future prescribed fires should be scheduled when fire intensity can be minimized.

5. High valued, healthy ponderosa pines may be protected from western pine beetle attacks by spraying the bark with certain formulations of carbaryl, chlorpyrifos, or permethrin ahead of the next flight period. Treatment of large trees may be expensive and may require the expertise of a professional pesticide applicator. Only those portions of the stems which can be reached and treated will be protected. The use of such pesticides should be viewed as short term, and are usually not warranted once the current outbreak subsides. Landowners should check with their local Agricultural Commissioner for limitations or current availability and registration status of these pesticides.

6. Since the Reserve and surrounding properties are within two Zones of Infestation- Sudden Oak Death and Coastal Pitch Canker- stand activities should also incorporate practices designed to minimize the risk of introducing or spreading those pests. Tools, equipment, vehicles (ATVs, etc.), and shoes should be clean of mud, small woody debris, and/or pitch, and hand tools and shoes should be treated with Lysol prior to entering and leaving the forested area. Lysol minimizes the risk for spreading both pitch canker and sudden oak death. Larger equipment (chippers, trucks) could be cleaned with a power wash.

I realize the timber market is currently not healthy, and the likelihood of a quick commercial sale of ponderosa pine and Douglas-fir from the Bonny Doon area is minimal. In lieu of commercial operations, high risk pines could be felled and utilized on-site as road barriers, fencing, or milled on-site with a portable mill for lumber utilization.

Dead and Dying Tree Exemptions are not practical since the volume of dead and dying trees exceeds the Forest Practice limits and the current market may not support a commercial timber operation.

Emergency Notices may be useful as they do not have the harvest volume restrictions of Exemptions. Green, high-risk trees are allowed to be removed under the premises that they are likely to die within one year during beetle outbreaks. Again, the current market may not support a commercial timber operation.

There may be other programs, such as CFIP and EQIP, which could be of assistance if those programs have sufficient funds and are available.

Since the current beetle outbreak and remnant stressed trees from the Martin Fire overlap several private properties along with the Reserve, landowners should try to coordinate any pest management activities, especially if any form of funding is sought, or if there are any special county rules and regulations that receive a blanket coverage or allowance for pest management, pesticide use (including Sporax), burning permits including air quality approvals, chipper and portable mill usage, or potential use of inmate crew work force. Perhaps this report could supplement any message or other forest management recommendations you may have to the Rural Bonny Doon Association or local Fire Safe Council.

Please let me know if I can assist with any technical advice for particular pest issues or if you need me to provide further technical assistance to land managers for the Bonny Doon Ecological Reserve (CA Department of Fish and Game) or Matt Johnston with Santa Cruz County, or to funding programs such as CFIP or EQIP.

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