Forest Health Protection

Pacific Southwest Region

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Subject: Tree Hazards in Paradise Lake Recreation Area (FHP Evaluation NE04-04)

To: District Ranger, Feather River Ranger District, Plumas National Forest

At the request of Chad Courtright (Small Sales Office, Feather River RD) Forest Health Protection (FHP) evaluated some of the tree hazards in Paradise Lake recreation area on March 17, 2004. The objective was to examine and determine the hazard potential for a few of the trees that are being considered for removal in the Paradise Lake Hazard Tree Project. Bill Woodruff (FHP Plant Pathologist) and Danny Cluck (FHP Entomologist) conducted the examination with Chad Courtright and Mike Mateyka (District Silviculturist).

The stem decay fungus *Phellinus pini* was confirmed in some of the Douglas-fir and western pine beetle was confirmed as the cause of two groups of ponderosa pine snags. Sugar pine needle diseases *Lophodermella arcuata* and *Lophodermium nitens* were found to be causing thin foliage and branch mortality on many large sugar pine in the area. A large Douglas-fir (estimated 90" dbh), within striking distance of the Paradise Irrigation District (P.I.D.) residence (see Figure 1), is in advanced stages of decline from unknown causes.

Confirmed tree hazards are the dead trees and large dead branches which can strike people or property and the large declining Douglas-fir tree that could strike the P.I.D. residence, people or property when it falls. Potential tree hazards are the old Douglas-fir trees known to be infected with *P. pini*, but without invasive examination, it is impossible to know the extent of decay.

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A short follow-up visit by FHP Plant Pathologists Woodruff and John Pronos occurred on April 1st.

Existing Condition

The Paradise Lake recreation area consists of a developed day-use area that is managed by P.I.D. and the Forest Service, and dispersed recreation land that is managed by the Forest Service or private owners. This second growth mixed conifer forest is stocked with many large Douglas-fir, ponderosa pine, sugar pine, white fir and incense-cedar. The understory is heavily stocked with these same species as well as tanoak. An old railroad grade that passes through the Forest Service land has been converted to a recreation trail. The day-use area includes a P.I.D. residence which is occupied year-round, picnic sites, a playground, waterfront access, trails and roads.

Douglas-fir appears to be the major species in the day-use area and many of these are very large. Many *P. pini* conks are present on some of the large Douglas-fir. A number of medium-size, older Douglas-fir and white fir stumps are present in the day-use area. Most of these stumps had no signs of decay, so it is not known why the trees were removed. The dispersed recreation area appears to have more ponderosa pine and a fairly equal representation of sugar pine, incense-cedar, Douglas-fir and white fir.

Proposed Silvicultural Activities

Current plans are to remove the hazard trees throughout the area in 2004. In three to five years, an intensive vegetation management project is planned to reduce fuels and improve the vigor of the forest. Due to the proximity to Magalia, the long-term objective is to reduce the fire hazards which threaten the community.

Insect and Disease Occurrences

Only insects and diseases associated with the suspected hazard trees were surveyed during this evaluation. Two small groups of large ponderosa pine snags were examined. This recent mortality was found to be the result of western pine beetle activity.

A heavily defoliated medium-size (estimated 16" dbh) sugar pine was examined (Figure 2). The symptoms indicate root disease, but no signs of root disease were found. Adjacent ponderosa pine were not affected. Similar defoliation in numerous nearby sugar pine is present, although the tree pictured in Figure 2 is one of the most heavily defoliated. No insect defoliators were found so sample branches from a nearby tree were examined in the lab. Fruiting bodies like those formed by *Lophodermella arcuata* and *Lophodermium nitens* were found on about 10% of the dead needles. It is assumed that these sugar pine needle diseases are the cause of this condition. The tree pictured in Figure 2 probably was impacted by several consecutive years of infection and may

die as a result. Most of the other defoliated sugar pine should recover if they do not experience more defoliation in the near future. It would be useful to monitor a few of these over time to document subsequent changes in tree health.

A very large (estimated 84" dbh, 150' tall) Douglas-fir is located approximately 60 feet downhill from the P.I.D. residence. This tree is located in a large clearing, open to the wind, between Paradise Lake and the house. A road and parking area is located between the tree and the house and the main park road is located about 75 feet further downhill from the tree. As seen in Figure 1, this tree has a dead top and many dead branches. A trail of ants (indicating possible decay) streamed from the upper crown of this tree into the forest. This Douglas-fir is in the advanced stages of decline, and a strong wind off of Paradise Lake could topple this tree into the house, park visitors, vehicles or other property. For safety, this tree should be removed.

Numerous large Douglas-fir and at least one ponderosa pine in the day-use area are infected with *Phellinus pini*. Also known as red ring rot or white pocket rot, this disease is capable of causing extensive decay in the boles of conifers. Several large Douglas-fir near the playground and one (with a yellow "2" painted on it) near picnic site #14 were examined. The largest tree had 7" *P. pini* conks spaced twenty feet apart on the bole and the smallest tree had 2" conks spaced less than three feet apart over much of the bole. At least two large Douglas-fir trees in the playground area have approximately 40 *P. pini* conks per tree growing over much of their boles (Figures 3 and 4). The Region 5 Timber Cruise Book (R5-2400-28A) states that "larger conks have more decay" than smaller ones. According to the Timber Cruise Book, all of these trees would be culled (ie. not capable of yielding useable lumber). This, however, does not mean that these trees are hazardous. Some of the infected trees could contain enough sound wood to remain standing for many years; conversely, some might have excessive decay in spots and snap off at these spots during high wind events.

The crowns of the *P. pini* infected Douglas-fir appeared full and green and no evidence of past tree failure was observed in the day-use area. The tree canopy is mostly closed and the trees are sheltered from wind which might have otherwise snapped decaying trees. None-the-less, it is impossible to know how much of the structural integrity of these trees has been lost due to decay from *P. pini.* The only way to know for sure is to destructively sample the trees to determine the amount of sound wood present in each tree. It might be helpful to fall and section some of the Douglas-fir trees with numerous *P. pini* conks to see how much decay exists.

Another hazardous situation is present in the numerous large dead branches high in the crowns of some of the older conifers (Figure 5). Of particular concern, are the large dead branches hanging over the playground, picnic tables, parking areas and other places were people linger.

Management Implications

The very large Douglas-fir near the P.I.D. residence should be removed because it is in poor health, has visible defects, is open to the wind and will most likely cause injury or property damage when it falls. Likewise, any dead trees and large dead branches that could cause injury or property damage when they fall should be removed. The partially defoliated sugar pine trees do not present hazards at this time and can be maintained on the site. Some of these trees should be monitored over time to assess the rate of decline or recovery from this current condition. A copy of USDA Forest Service publication: Long-Range Planning for Developed Sites in the Pacific Northwest: The Context of Hazard Tree Management was provided to help with hazard tree evaluation and monitoring in Paradise Lake Recreation area. This publication should help with the long-term management of the vegetation as well.

The toughest decision is what to do with the *P. pini* infected Douglas-fir trees. Apparently tree failure has not yet resulted in trees weakened by this disease. However it is impossible to know the extent of the decay at all points of all the infected trees. There is some level of risk involved in retaining trees with numerous or large *P. pini* decay conks. For maximum safety, all of the trees with *P. pini* conks would be removed. However, if all the infected Douglas-fir trees were removed, much of the day-use area would be cleared of trees, some of which are not hazardous. Even if only the trees with numerous or large conks were removed, the old forest character of the day-use area would be degraded. If the management objective is to keep as many of the infected Douglas-fir trees as possible which have a low risk of failure, then enough of the infected trees have to be cored or otherwise tested to determine that there is enough sound wood at all points along the boles of those trees to justify keeping them.

Alternatively, a few of the trees with numerous and/or large *P. pini* conks could be felled and sectioned to assess the amount of decay at various points along their boles. If excessive decay exists, then trees with fewer and smaller conks would be felled and sectioned until we were satisfied that only sturdy trees remained. Instead of falling trees, it may be possible to core trees or probe them with instruments designed to locate decay. This last option would require sampling the boles of trees at various heights where the *P. pini* conks exist.

Ponderosa pine trees killed by the western pine beetle should be removed as hazards if they are in striking distance of people or property. In addition, green infested ponderosa pine (trees with 10 or

more red pitch tubes over 50% of the bole circumference above 5 feet and/or frass/boring dust present in bark crevices covering greater than 1/3 of the bole circumference) may be considered dead and removed as hazards if they are within striking distance of people or property. Removal of western pine beetle killed or green infested trees would not impact beetle populations or reduce future bark beetle related mortality. For western pine beetle, removal of dead or green infested trees has not been shown to control or reduce bark beetle populations.

Continued bark beetle related mortality is likely during extended drought periods without a reduction stand density. The fact that bark beetles have successfully attacked and killed several ponderosa pine indicates that portions of Paradise Lake recreation area are overstocked. This stand condition in conjunction with extended dry periods causes extreme moisture stress in trees therefore reducing their resistance to bark beetle attacks. Maintaining stocking levels at about 80% of normal will decrease competition for limited water and nutrients, increase tree health and vigor and reduce future bark beetle related mortality.

Summary

Confirmed tree hazards are the dead trees and large dead branches in upper tree crowns that are within striking distance of people or property; and the large declining Douglas-fir tree that could strike the P.I.D. residence, people or property when it falls.

The pathogen that could most impact future management in Paradise Lake recreation area is *Phellinus pini*. Advanced decay from *P. pini*, as indicated by the large number or size of conks growing on a number of old Douglas-fir trees, will continue to increase and weaken the infected trees. At some point each affected tree will fail, probably when stressed by a strong gust of wind. Removing nearby trees which are sheltering any tree with advanced root, butt or bole decay will subject the weak trees to wind gusts which may topple them. For this reason, if it is necessary to remove trees to meet management objectives, it is wise to first remove the trees with visible *P. pini* conks or with unhealthy appearing crowns, which might indicate advance decay in the bole or roots, in the absence of any known insect or disease problem.

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Following this report are biological summaries for Phellinus pini and western pine beetle. If you need further assistance, please do not hesitate to call Bill Woodruff at 252-6680.

/s/ Bill Woodruff

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Figures

Figure 1. Douglas-fir near P..I.D. residence

Figure 2. Defoliated sugar pine

Figure 3. Douglas-fir w/ *P. pini* conks (Marked with a yellow no. 2)

Figure 4. Douglas-fir w/ *P. pini* conks (Near SW corner of playground)

Figure 5. Douglas-fir w/ large dead branches

APPENDIX

Phellinus pini

Red ring rot, also called white pocket rot, is caused by a wood decay fungus, *Phellinus* (*Fomes*) *pini*, that attacks Douglas-firs, pines, true firs, hemlock, and rarely incense-cedar. It occurs throughout the coniferous forests of the world, and is the single most damaging heart rot organism in the West.

Red ring rot attacks young-growth as well as old-growth trees. It usually infects through branch stubs, and rarely through open wounds. Thus, this fungus may cause serious heart rot problems in managed stands of the future.

The perennial, woody fruiting bodies or conks that arise from the branch stubs or knots of living trees are the best indicators of decay. Sometimes only punky knots bearing the inner portion of the fruiting body remain on the stem. These punky knots may later be overgrown by new wood, becoming swollen knots that are the only symptom of decay. When conks or swollen knots are present, assume that advanced decay extends about 3-5 feet above and 5-7 feet below the indicator. If conks or swollen knots are visible along much of the stem, heart rot will be extensive.

Western pine beetle

The western pine beetle, *Dendroctonus brevicomis*, has been intensively studied and has proven to be an important factor in the ecology and management of ponderosa pine throughout the range of this host species (Miller and Keen 1960). This insect breeds in the main bole of living ponderosa pine larger than about 8 inches dbh. Normally it breeds in trees weakened by drought, overstocking, root disease, dwarf mistletoe or fire. Adult beetles emerge and attack trees continuously from spring through fall. Depending on the latitude and elevation, there can be from one to four generations per year.

Initial attacks are made about mid-bole and subsequent attacks fill in above and below. Pitch tubes are formed on the tree trunk around the entry holes. The pitch tubes are red-brown masses of resin and boring dust. Relatively few, widely scattered, white pitch tubes usually indicate that the attacks were not successful and that the tree should survive. Pheromones released during a successful attack attract other western pine beetles. Attacking beetles may spill over into nearby apparently healthy trees and overwhelm them by sheer numbers.

These beetles pass through the egg, larval, pupal and adult stages during a life-cycle that varies in length dependent primarily upon temperature. Adults bore a sinuous gallery pattern in the phloem and the female lays eggs in niches along the sides of the gallery. The larvae are small white grubs that first feed in the phloem and then mine into the middle bark where they complete most of their development. Bluestain fungi, introduced during successful attacks, contribute to the rapid tree mortality associated with bark beetle attacks.

Outbreaks of western pine beetle have been observed, and surveys made, in pine regions of the West since 1899 (Hopkins 1899; cited in Miller and Keen 1960). An insect survey completed in 1917 in northern California indicated that over 25 million board feet of pine timber had been killed by bark beetles. Information from surveys initiated in the 1930s indicates that there were enormous losses attributed to western pine beetle around that time. During the 1930's outbreak, most of the mortality occurred in stands of mature or overmature trees of poor vigor (Miller and Keen 1960). Group kills do not typically continue to increase in size through successive beetle generations as is typical with Jeffrey pine beetle. Rather, observations indicate that emerging beetles tend to leave the group kill area to initiate new attacks elsewhere.

The availability of suitable host material is a key condition influencing western pine beetle outbreaks. In northeastern California, drought stress may be the key condition influencing outbreaks. When healthy trees undergo a sudden and severe moisture stress populations of western pine beetle are likely to increase. Healthy trees ordinarily produce abundant amounts of resin, which pitch out attacking beetles, but when deprived of moisture, stressed trees cannot produce sufficient resin flow to resist attack. Any condition that results in excessive demand for moisture, such as tree crowding, competing vegetation or protracted drought periods; or any condition that reduces that ability of the roots to supply water to the tree, such as mechanical damage, root disease, or soil compaction, can cause moisture stress and increase susceptibility to attack by the western pine beetle. Woodpeckers and predaceous beetles are natural control agents when beetle populations are low.