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Subject: Biological Evaluation of Insect and Disease Conditions in the Hi-Grouse Project Area, Goosenest Ranger District (FHP Report No. N09-02)

To: Patricia Grantham, Forest Supervisor, Klamath National Forest

On May 19 and 20, 2008, Pete Angwin (Plant Pathologist) and Cynthia Snyder (Entomologist) from Forest Health Protection in Redding visited the Hi-Grouse project area of the Goosenest Ranger District. We were accompanied on both days by Rob Schantz, Silviculturist from the TEAMS Planning Enterprise Unit in Bend, OR. On May 19, Christy Cheyne, wildlife biologist for the Goosenest Ranger District also accompanied us.

The objective of the visit was to assess insect and disease conditions in the area, particularly with regard to annosus root disease in mixed conifer stands, mountain pine beetle in ponderosa pine and lodgepole pine, and lodgepole pine dwarf mistletoe in lodgepole pine. The incidence of annosus root disease was of particular concern, and needed confirmation in various Units in the project area. During the two days in the area, we visited proposed Units 8, 18, 12, 13, 27 and 62. The Units represented the range of stand conditions and silvicultural treatments under consideration, ranging from no treatment to varying degrees of thinning and the creation of group openings.

Unit 8

Unit 8 is composed of a mix of ponderosa pine and white fir. However, white fir predominates in the areas we visited, and often comprised up to 90% of the stand species composition. Historically, fire had kept the white fir in check, but with fire prevention, the white fir has increased in number (Figure 1).

Scattered groups of dead and dying fir were noted in the stand. Fruiting bodies of the root disease fungus *Heterobasidion annosum* were found in the hollowed-out interior of several of the fir stumps that were near the stand openings, confirming the presence of the S-type of *H. annosum* (Figure 2). This variety of the annosus root disease is common in true fir, as well as giant sequoia and hemlocks, but does not infect pines. In contrast, the P-type of *H. annosum* affects pines (including ponderosa and lodgepole pine), incense-cedar, western juniper and manzanita. Both types of the fungus have been identified on the Goosenest Ranger District. In white fir, higher mortality levels are typically found on dryer sites, where trees cannot withstand the effects of the root disease pathogen, particularly during periodic droughts. In general, unless the impacts of the root disease are beneficial for wildlife (requiring smaller diameter dead fir) or stands can be

managed on short rotations, it is best to manage for the pine species, which are better adapted to the dryer conditions than fir (however, annosus root disease in pine is generally also common in even dryer, warmer east-side sites, dryer than what is generally found at Hi-Grouse).

In addition to the scattered annosus root disease centers in the unit, we also found a group of ponderosa pine with numerous bark beetle attacks. Several of the pines in this group had already died. Inspection under the bark of one of the fading trees showed the presence of western pine beetle (*Dendroctonus brevicomis*) galleries.

Two possible treatment prescriptions are under consideration for this stand. One is to implement a "Ponderosa Pine Reestablishment" treatment, in which all but the most healthy fir would be removed in all areas except in clumps where there are no pine. Healthy red fir would also be retained in wetter areas that have a mix of ponderosa pine and red fir. Planting of ponderosa pine and rust-resistant sugar pine would be performed in areas that would be understocked after the treatment. The other alternative would be to do nothing. Under the do nothing alternative, continued mortality of the fir and pine would occur due to the effects of annosus root disease and the fir engraver beetle (*Scolytis ventralis*) in the fir and bark beetles in the pine, driven by the overstocking and lack of adequate moisture. This mortality would greatly accelerate during times of drought.

Figure 1. White fir and ponderosa pine in Unit 8.

Figure 2. Old *Heterobasidion annosum* fruiting body from a hollow stump in Unit 8.

Although restoring the site to one with a greater ponderosa pine component would leave the stand in a very open condition for many years, it may be the best way to break the cycle of mortality that is currently underway. Because a high level of annosus root disease is already in the stand, treatment of freshly cut stumps with Sporax (the only currently EPA-registered borax product in California) may only have limited effect on reducing the establishment of new root disease centers. However, application may be considered as "cheap insurance" against new establishment of the root disease pathogen if it is economically feasible. At the very least, any pine greater than 14 inches in diameter at stump height should be treated if there are additional leave pines nearby.

Unit 18

Unit 18 is a mixed conifer stand, consisting of white fir, ponderosa pine and lodgepole pine. The ponderosa pine component was much greater than was seen in Unit 8. The unit is very overstocked. Overall, the ponderosa pine appeared to be in pretty good shape, but pockets of mortality in the lodgepole pine due to mountain pine beetle (*Dendroctonus ponderosae*) and western pine beetle were noted (Figures 3 and 4). Stalactiform rust (*Cronartium coleosporioides*) was also found scattered in the lodgepole pine. Although one white fir that had blown down appeared to have decay that was consistent with annosus root disease, very little additional evidence of root disease was found. This is likely because the stand does not have much of a history of logging, as indicated by an overall lack of stumps (Rob said that if the stand had been logged at all, it was back in the 1930's).

Figure 3. Bark beetle group mortality in Unit 18.

Figure 4. Mountain pine beetle gallery in lodgepole pine in Unit 18

The proposed prescription is to thin from below to about 80ft^2 BA, with areas as low as 50ft^2 BA in areas with less pine stocking. The healthiest ponderosa pine with the best form would be kept, along with all predominant trees and lesser amounts of healthy lodgepole pine and small diameter white fir. Group openings of up to one acre would be used in areas affected by annosus root disease. The prescription would give the opportunity to remove the trees that are being affected with bark beetles and rust, which would contribute to the overall health of the remaining stand. In addition, the thinning would reduce the risk of future bark beetle attacks. Although annosus root disease is not prevalent in this stand, it is present in the general area. I therefore recommend treating any conifer stumps greater than 14 inches in diameter with borax immediately after the cut to provide protection against the introduction of annosus root disease.

Unit 12

Unit 12 is dominated by lodgepole pine, though minor numbers of ponderosa pine and white fir are also in the stand. Much of the lodgepole pine in the overstory has been killed by mountain pine beetle. In addition, the lodgepole pine in both the overstory and understory is heavily infested with lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) (Figure 5). While

lodgepole pine dwarf mistletoe primarily infects lodgepole pine, it only occasionally infects ponderosa pine, and white fir is not a host. No infected ponderosa pine or white fir was noted. Western gall rust (*Endocronartium harknessii*) was noted only sporadically, and annosus root disease was not found in the stand.

Figure 5. Dwarf mistletoe infestation in lodgepole pine at Unit 12.

The proposed treatment for the stand is to address the mountain pine beetle and dwarf mistletoe by removing most of the overstory, leaving only a small number of uninfected lodgepole pine and most of the remaining ponderosa pine and white fir, and heavily thinning or masticating the remaining understory. In essence, this would be a fuels treatment, leaving an open pole-sized stand with a few remaining mistletoe-free overstory trees, which would develop in time into a mixed-species stand still dominated by lodgepole pine, but with some ponderosa pine and white fir as well. When thinning the understory, great care will should taken to leave only dwarf mistletoe-free or lightly infected lodgepole pines (Dwarf Mistletoe rating of 2 or less, with infections limited to the lower crown). To prevent the introduction of annosus root disease into the stand, any freshly cut conifer stumps larger than 14 inches in diameter should be treated with Sporax. The drastic stocking reduction of lodgepole pine will greatly reduce the risk of future bark beetle attack. The success of the treatment will largely rest on the ability to leave relatively mistletoe-free lodgepole pine. If this can be accomplished, the treatment will have very positive long-term effects.

Unit 13

The situation in Unit 13 is similar to that in Unit 12, except that there is more ponderosa pine and white fir in both the overstory and understory, as well as a small amount of red fir. As at Unit 12, portions of the overstory lodgepole pine has been killed by mountain pine beetle, but the overall level of mortality is not as great. However, the remaining overstocked stand is at very high risk to future attack. Lodgepole pine dwarf mistletoe infections are also common, though not quite as plentiful as in Unit 12 (Figure 6). The presence of annosus root disease, at least at a low level, was confirmed with the discovery of annosus conks in an old white fir stump (Figure 7). Again, this indicates the presence of the S-Type of *H. annosum*, which does not affect the pines.

Figure 6. Dwarf mistletoe-infested overstory in Unit 13.

Figure 7. Old white fir stump with *H. annosum* fruiting bodies.

The proposed treatment is to heavily thin and remove dead material contributing to high fuel loadings, similar to what is proposed in Unit 12. In this Unit, there is more white fir and ponderosa pine to work with, so the progression of lodgepole pine dwarf mistletoe may be more easily broken up. The thinning will also greatly reduce the risk to bark beetle attack. Again, the success of the treatment will depend on the ability sanitize the remaining understory of dwarf mistletoe and Sporax treatment of any conifer stumps over 14 inches in diameter is recommended to prevent the establishment of new annosus root disease centers.

Unit 27

Unit 27 consists primarily of white fir, with small numbers of ponderosa pine (only about 2 pines per acre). While in the Unit, we noted many openings that appeared to be caused by annosus root disease (near cut stumps, and the fir at the edges of the openings had varying degrees of deterioration, from thining green foliage, to yellow foliage, to red, to dead and downed) (Figure 8). Fruiting bodies of *H. annosum* were easily found in several large decayed white fir stumps, confirming that the fungus is both widespread and active (Figure 9). Some western

Figure 8. Annosus root disease center in Unit 27.

Figure 9. Fresh *H. annosum* fruiting body from white fir stump in Unit 27.

pine bark beetle attacks were also noted in some of the ponderosa pine. Because of the high amount of annosus root disease, options are essentially limited to either implementing a complete regeneration cut to convert the stand to pine or other non-S-type annosus host species, or to do nothing, postponing treatment until after the stand has unraveled. Rob proposes the no treatment option, and will maintain the Unit as northern spotted owl habitat within a critical habitat block for as long as possible. The only treatment would be some thinning and piling of white fir smaller than 8 inches DBH to reduce ladder fuels and fire hazard along the main road. In my opinion, the fir mortality from annosus root disease will eventually eliminate the stand characteristics needed for northern spotted owl habitat, and the Unit will need to be regenerated. However, in order to maintain immediate stand diversity in the area, it may be desirable to defer treatment as Rob suggests. Because annosus root disease is already widespread, and none of the cut tree stumps will be 14 inches or larger, treatment of the stumps with Sporax will not be necessary.

Unit 62

About 15 to 20 years ago, much of the overstory of Unit 62 was removed, leaving a mixed conifer stand of ponderosa pine, white fir and lodgepole pine (Figure 8). Unit 62 has much more ponderosa and lodgepole pine than Unit 27. Although annosus root disease pockets are scattered in the white fir in this unit, the infestation is not as heavy as in Unit 27. The presence of *H. annosum* was confirmed by the discovery of fruiting bodies and characteristic laminated decay in a large (approx. 30-inch diameter) white fir stump in one of the stand openings (Figure 11). The non-host pine species have no doubt helped to reduce the underground spread of the disease.

Figure 10. Annosus root disease center in Unit 62.

Figure 11. Fresh *H. annosum* fruiting body from white fir stump in Unit 62.

The occurrence of ponderosa and lodgepole pine in the unit provides more options for management than was available in Unit 27. In addition, many of the white fir that are away from the root disease pockets have pointed tops, indicating good vigor. Rob proposes to perform a thinning of trees generally less than 12 inches DBH, in which the pines would be favored. To further reduce root disease levels and promote the health and vigor of the remaining pines, Rob may also consider removing all fir from around selected root disease pockets where healthy ponderosa and lodgepole pines are present. Healthy looking white fir would also be retained in areas outside of root disease pockets where low numbers of ponderosa or lodgepole pine are

present. Planting of ponderosa pine and sugar pine would be done in areas having a higher incidence of annosus root disease. Again, if any conifer stumps (pine or fir) larger than 14 inches in diameter are created during this thin, they should be treated with Sporax to prevent the establishment of new root disease centers. As in Unit 8, the emphasis on pine will help to reduce the overall impact of annosus root disease in the unit.

Summary and Conclusions

The forest disease and insect situations at Hi Grouse, particularly those posed by annosus root disease, bark beetles and dwarf mistletoe, present many challenges to the long-term management of the area. However, the treatments that Rob Schantz proposes will do much to improve the situations in the various units of the proposed treatment area. By manipulating unit species composition away from true fir and applying Sporax to freshly cut conifer stumps where appropriate, many of the impacts of annosus root disease will be reduced over the long term.

Please feel free to call if you have any questions regarding this report.

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