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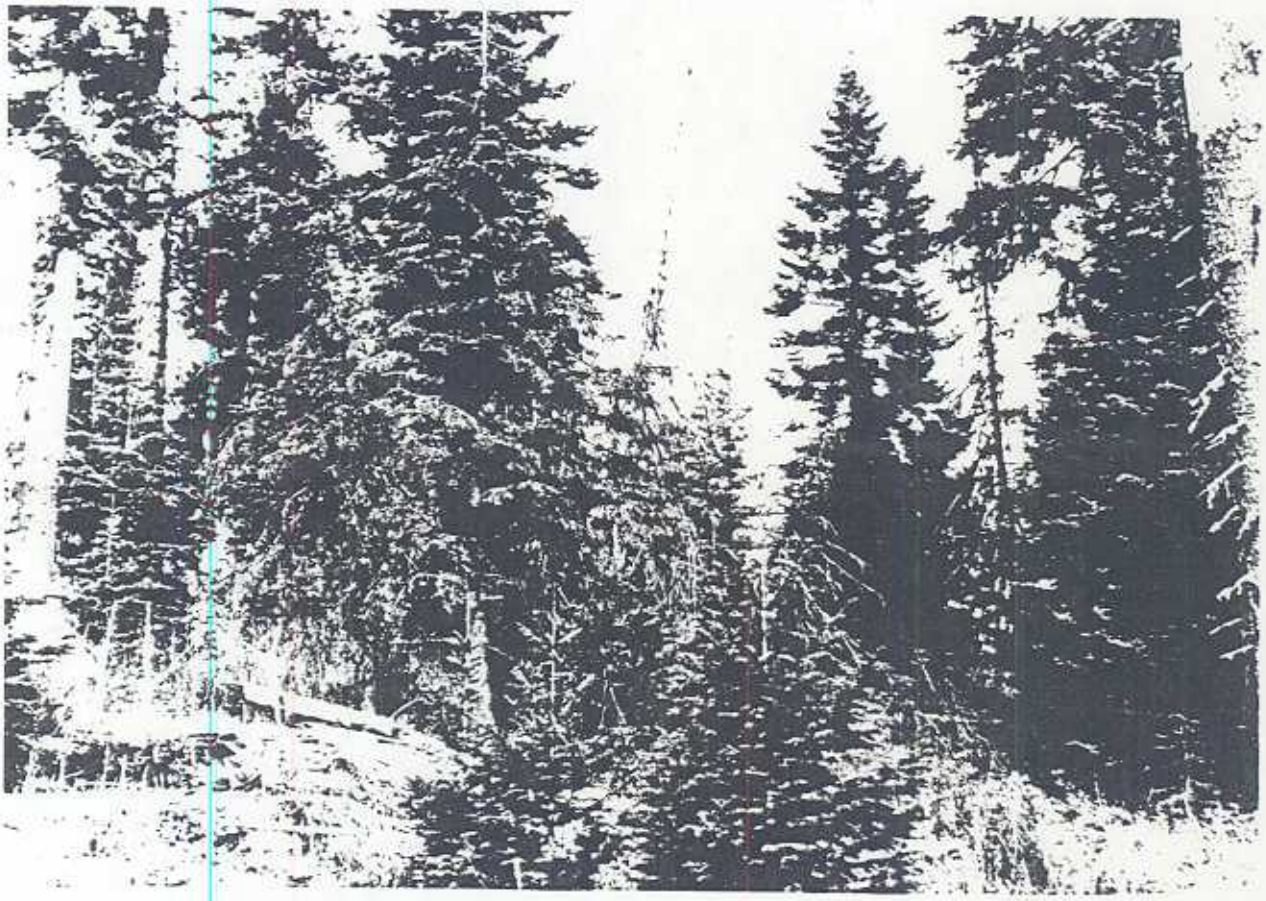
Effects of Management Activities and Stand Type on Pest-caused Losses in Mixed-conifer Stands on the Wallowa-Whitman National Forest



June 1991

EFFECTS OF MANAGEMENT ACTIVITIES AND STAND TYPE ON PEST-CAUSED LOSSES IN MIXED-CONIFER STANDS ON THE WALLOWA-WHITMAN NATIONAL FOREST

by

Craig L. Schmitt, Zone Pathologist- Wallowa-Whitman NF
and
Don J. Goheen, Tommy F. Gregg, and Paul F. Hessburg- FPM, R-6

Abstract

Fifty-four stands on six administrative units on the Wallowa-Whitman National Forest were surveyed to evaluate the incidence and severity of pest-caused damage. Surveyed stands were randomly selected to be representative of nine strata based on three past management histories in each of three different general stand types. Of the 54 stands sampled, 14 plant associations were represented. Annosus root disease and Armillaria root disease were the most frequently encountered root diseases. Root diseases were most frequently observed in selectively harvested true fir stands. Lowest incidence of root diseases were in multiple-entered stands with significant pine components in pine and Douglas-fir plant associations. Other pests including bark beetles, dwarf mistletoe, and stem decays also were found to impact Forest stands. Specific guidelines for successful management of grand fir include restricting sites where it is to be managed, minimizing disturbance, limiting rotation ages, and treating stumps with borax. On most sites we recommend that pest resistant seral species be preferred crop trees.

Appreciation is extended to the following individuals who assisted in completing this evaluation: Michael Collins, Gregory M. Filip, Keith Forrey, Ellen Michaels Goheen, Catherine Parks, and Kevin Hosman.

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Introduction

Mixed-conifer stands on the East Side of the Cascade Mountains contain a variety of tree species. Each of these conifers has a unique ecological amplitude and successional role. Humans have modified the natural system of stand succession on the East Side by excluding fire and by frequent partial cut timber harvesting. As a consequence, shade-tolerant species have proliferated in many stands over a range of plant associations. Unfortunately, fire intolerant and shade tolerant grand fir and Douglas-fir, which is intermediate in tolerance to fire and shade, are more susceptible to pest-caused damage than such common seral species as western larch and the pines. Root diseases, stem decays, and Douglas-fir dwarf mistletoe *Arceuthobium douglasii*, as well as fir engraver beetles (*Scolytus ventralis*), Douglas-fir beetle (*Dendroctonus psudotsugae*), spruce budworm (*Choristoneura occidentalis*) and Douglas-fir tussock moth (*Orgyia pseudotsugata*) can damage these more tolerant, late successional species seriously.

A previous investigation showed that the practice of periodic partial removal entries in two south-central Oregon National Forests (Ochoco and Fremont NF) contributed substantially to increased incidence and severity of pest-caused damage on those Forests by causing tree wounding, creating stumps which become infected by root disease pathogens, and, by frequently, by causing excessive site disturbance (Schmitt et al 1984). Similar, unquantified observations have been made in other East Side Oregon Forests including the Wallowa-Whitman National Forest in northeast Oregon on which most managed mixed-conifer stands have had periodic partial cuts and salvage entries over the last few decades. Wallowa-Whitman Forest and District staff, and Region-6 pathologists noticed, and were very concerned with, the apparent increase in severity of pest-caused damage in these stands. Forest Pest Management (FPM), in cooperation with the Wallowa-Whitman NF, decided to investigate the pest incidence and stand type/managment history relationships on the Forest.

A Forest-wide biological evaluation was designed and conducted to determine the kinds and severity of pest-caused losses occurring in three major stand types that were felt to be representative of most of the managed stands on the Forest. In each type, equal numbers of stands with each of 3 past harvest histories were sampled. The specific objectives of this evaluation were to: (1) determine the effects of different overstory species type (ponderosa pine, grand fir/Douglas-fir, or true fir/spruce) on pest incidence and severity; (2) determine the effects of past management activity (no harvest, one entry, or multiple entries) on the incidence of pests and pest-caused damage in each of the stand types; (3) determine possible correlations between plant community types and pest incidence, particularly for root diseases; and (4) formulate from the collected data, management recommendations to reduce future losses.

METHODS

Stand Selection

Nine stands were selected for examination on each of six Districts/Administrative units (Baker, La Grande, Pine, Unity, and Wallowa Valley Ranger Districts, and Hells Canyon NRA) on the Wallowa-Whitman NF. Each selected stand represented one of nine strata consisting of a combination of the three different species groups and the three different intensities of past management. Species composition categories were: (1) stands currently having, or once having had, a component of ponderosa pine (at least 10 percent of the total basal area) with a component of true fir; (2) stands with a grand fir component on dry sites (indicated by a significant Douglas-fir component and/or dry site indicator plant species); and (3) stands with a true fir component on wet sites (indicated by little

or no Douglas-fir stocking and the presence of Engelmann spruce and/or wet site indicator plant species). Within each of these species composition categories, the three past management levels investigated were: (1) unentered stands (no management), (2) stands that had only one entry that had occurred at least 5 years prior to examination, and (3) stands that had multiple entries, the last being at least 5 years prior to examination. Entries were one of the following types of harvests: partial removal, sanitation, individual tree selection, or commercial thinning. Any stand that had received regeneration treatments including seed-tree or shelterwood cuts, were not sampled. Stands also had to be at least 30 acres in size and contained substantial stocking of sawlog-size trees.

For each strata on each District, three stands were randomly selected from all available stands meeting the specified criteria in the Region 6 TRI (Total Resource Information) System data base. One of the three selections were randomly designated to represent the individual stratum to be examined and the two others served as alternates in case the selected stand proved inappropriate for survey.

Some strata could not be filled from the TRI data base. TRI data was sparse for unentered stands. Such stands existed, but often had not had a formal stand exam. We asked silviculturists on each District to provide us with a list of stands meeting specified criteria to fill those strata having no stands listed in the data base. Empty strata were filled from stands randomly selected from lists provided by District Silviculturists.

Stand Examination

During the 1986 and 1987 field seasons, three field crews, each consisting of a pathologist and a biological technician, conducted examinations on selected stands. Prior to sampling each stand, crews verified whether selected stands qualified for the species composition and past management history strata for which they were selected. Stands that did not qualify for the selected strata, but did meet the criteria for another, yet unsampled strata on that District, were sampled. The originally selected stand for that strata was then dropped. If the selected stand did not meet the criteria for which it was selected and the strata it fit had already been selected, one of the two alternates were randomly selected and surveyed. This procedure was used to most effectively use field time.

Each stand was delineated on a 1:15840 scale aerial photograph or orthophoto. Plot points were spaced on a systematic grid so that between 25 and 50 points, depending on stand size and conditions and time constraints, were systematically placed throughout the stand, assuring adequate coverage and representation.

At each point, a 20 BAF variable-radius plot and a 1/100 acre fixed-radius plot were established. In variable-radius plots, all dead, dying, and root-disease symptomatic trees were tallied by species, DBH, condition, and suspected causal pest(s). Dead or symptomatic trees less than 6 inches DBH but greater than 1-foot in height in fixed area plots were tallied by species, condition, and causal pest(s). Roots were exposed on dead and symptomatic trees for root disease diagnosis. Root samples with stain or decay were returned to the laboratory for culturing from a random subsample of trees identified as being infected by specific root pathogens as well as from all trees for which field identifications were uncertain or could not be made.

At every fifth fixed and variable radius plots, additional data were taken. On these intensively sampled plots, all trees, regardless of condition, were tallied by species, DBH, and condition. In addition, all trees were inspected for dwarf mistletoe, and if infected, given a Dwarf Mistletoe Rating (DMR), from 1 (light infection) to 6 (severe infection) (Hawksworth 1977). Indicators of stem decay, such as conks, wounds, and frost cracks, were also recorded. Plant community data were collected by estimating plant coverage by species for the tree, herb/shrub, and grass/forb layers. The Plant Association best describing the stand in terms of most prominant coverage was used for its classification and analysis.

At each intensively sampled plot, data from two small sawlog-size grand firs, closest to the plot center (either in or out of the variable radius plot) were recorded for use in stem infection and decay equations (Filip et al 1983). Required data included: live crown ratio, age at breast height and the presence of wounds, frost cracks, dead tops, or conks.

Data collected in stand examinations were used to construct stand tables for the nine species composition/past management regime strata on the Forest. Similar tables were constructed indicating pest incidence by species for each plant community represented in the total sample. Thus, incidence and mortality caused by each pest or mortality-causing factor could be compared among strata and plant associations. Differences were tested using factorial analysis of variance. Stand tables were also made, showing tree per acre distribution by size class, tree condition (healthy, live-infected/infested, dead) for each of the nine species composition/past management regime strata, for all species and for true firs (grand fir and subalpine fir) only. The true firs were given a separate analysis because they are the most damage-prone species on the Wallowa-Whitman National Forest.

RESULTS AND DISCUSSION

Pest incidence in sampled stands by strata is presented in Tables 1-13.

In the fifty-four stands sampled, fourteen different plant communities (Hall, 1973) and plant associations (Johnson and Sirmon, 1987) were represented (Tables 14-28). Those best covered in the sample were: grand fir/big huckleberry (n=10); Douglas-fir/grand fir/pinegrass (n=7); subalpine fir/big huckleberry and grand fir/grouse huckleberry (n=6); grand fir/twinflower and grand fir/spirea (n=5). Ten remaining plant communities/associations were represented by only one or two stands. Three plant associations of the Douglas-fir series (Douglas-fir/snowberry, Douglas-fir/spirea, and Douglas-fir ninebark), represented by five stands, were combined for analysis and stand exam summary tabulation. Levels of management are combined in tables and differences between levels were not considered in analysis of stands by plant associations/communities.

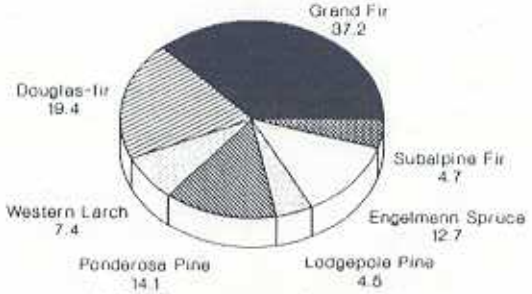
Damage by diameter size class, tree condition, and major pest groups is shown for each sample strata in Tables 29 through 46. Bark beetle incidence is presented by size class and sample strata in Tables 47 through 55.

Seven conifer species were identified in the stand examinations: grand fir, Douglas-fir, western larch, ponderosa pine, lodgepole pine, Engelmann spruce, and subalpine fir. Species composition by management history is shown for all stand types combined in Figure 1. Total basal area was highest for unentered stands (172.24 ft.^{2}); single entry stands were about 20 ft.^{2} lower (150.92 ft.^{2}); and multiple entry stands were about 15 ft.^{2} lower yet (135.14 ft.^{2}).

Major diseases of individual conifers are shown in Figures 2-8. Grand fir is increasingly impacted by annosus root disease, caused by *Heterobasidion annosum*, as management level increases (Figure 2). Level of Douglas-fir dwarf mistletoe (*Arceuthobium douglasii*) decreases from unentered, to single entry, to multiply entered stands. Salvage and sanitation harvests of dead and dying trees explains this pattern (Figure 3). Disease occurrence by management levels are also shown for western larch (Figure 4); ponderosa pine (Figure 5); lodgepole pine (Figure 6); Engelmann spruce (Figure 7); and subalpine fir (Figure 8).

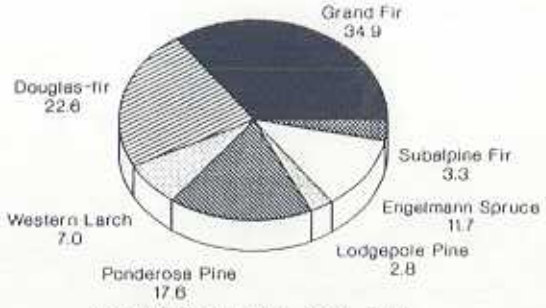
Mean Percentages of Conifers by Basal Area in Sampled Stands on the Wallowa-Whitman National Forest

Unentered Stands



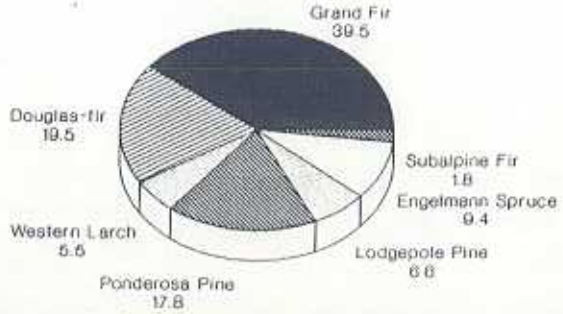
(172.24 square feet BA)

Single Entry Stands



(150.92 square feet BA)

Multiple Entry Stands



(135.14 square feet BA)

Figure 1

Percentage of Grand Fir Basal Area Affected by Diseases in Sampled Stands on the Wallowa-Whitman National Forest

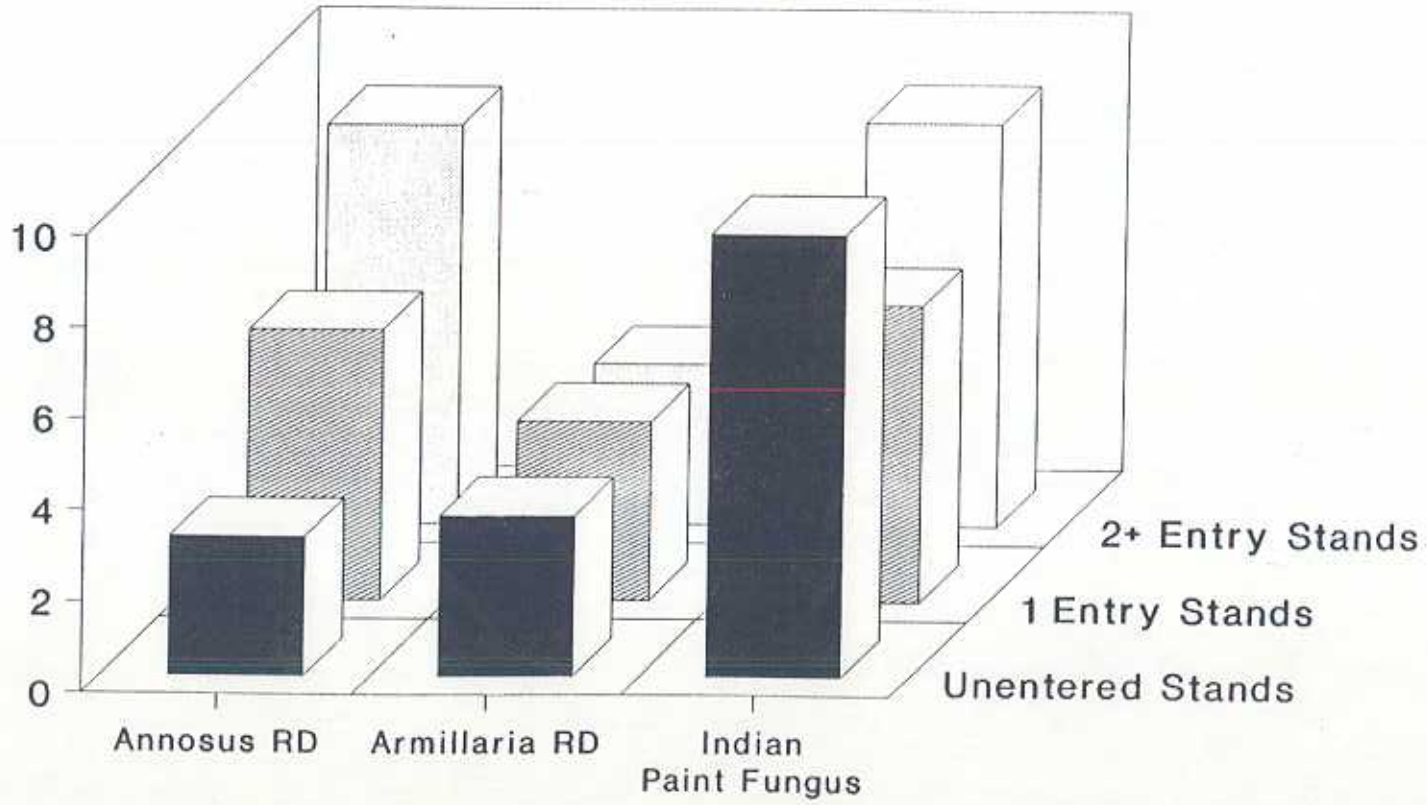


Figure 2

Percentage of Douglas-fir Basal Area Affectd by Diseases in Sampled Stands on the Wallowa-Whitman National Forest

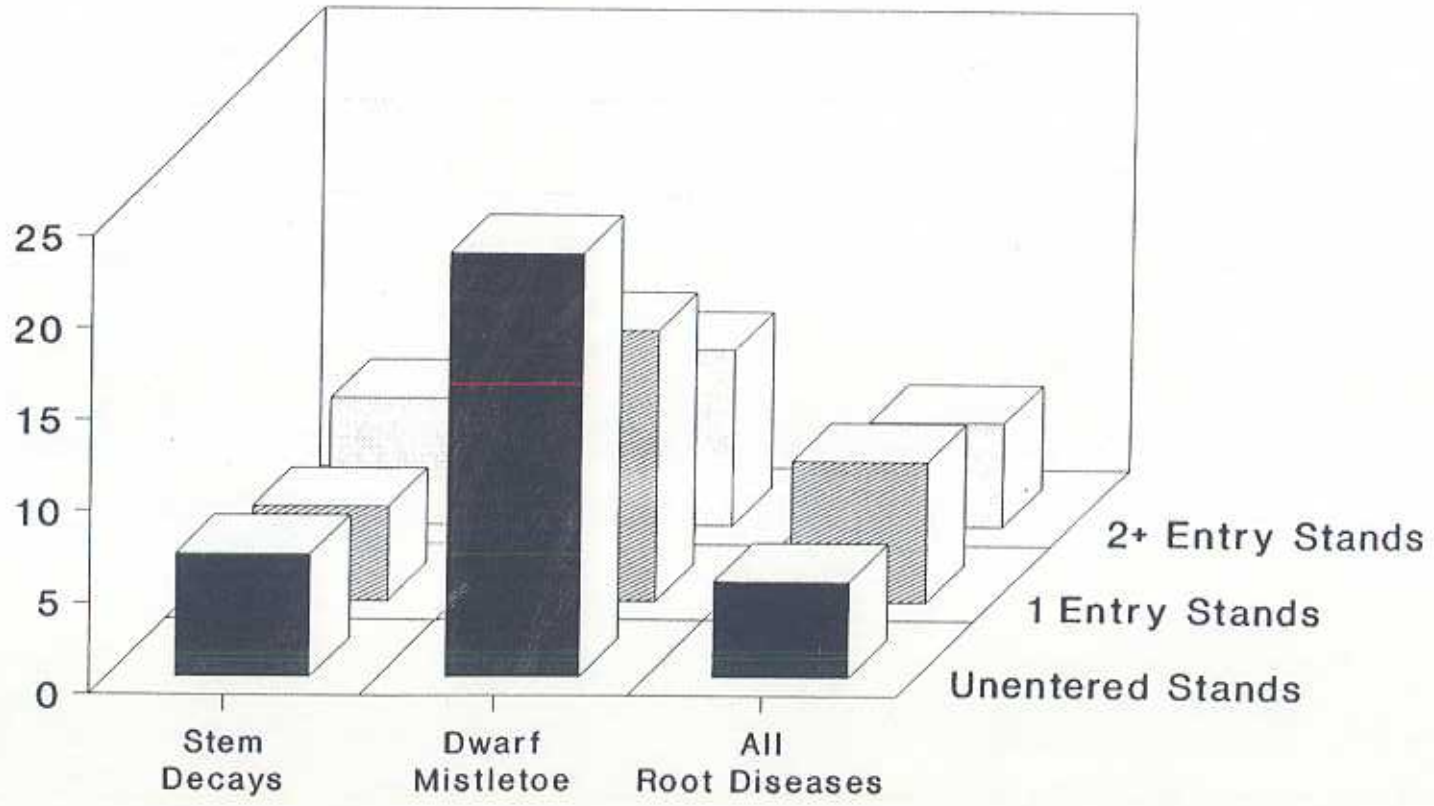


Figure 3

Percentage of Western Larch Basal Area Affected by Diseases in Sampled Stands on the Wallowa-Whitman National Forest

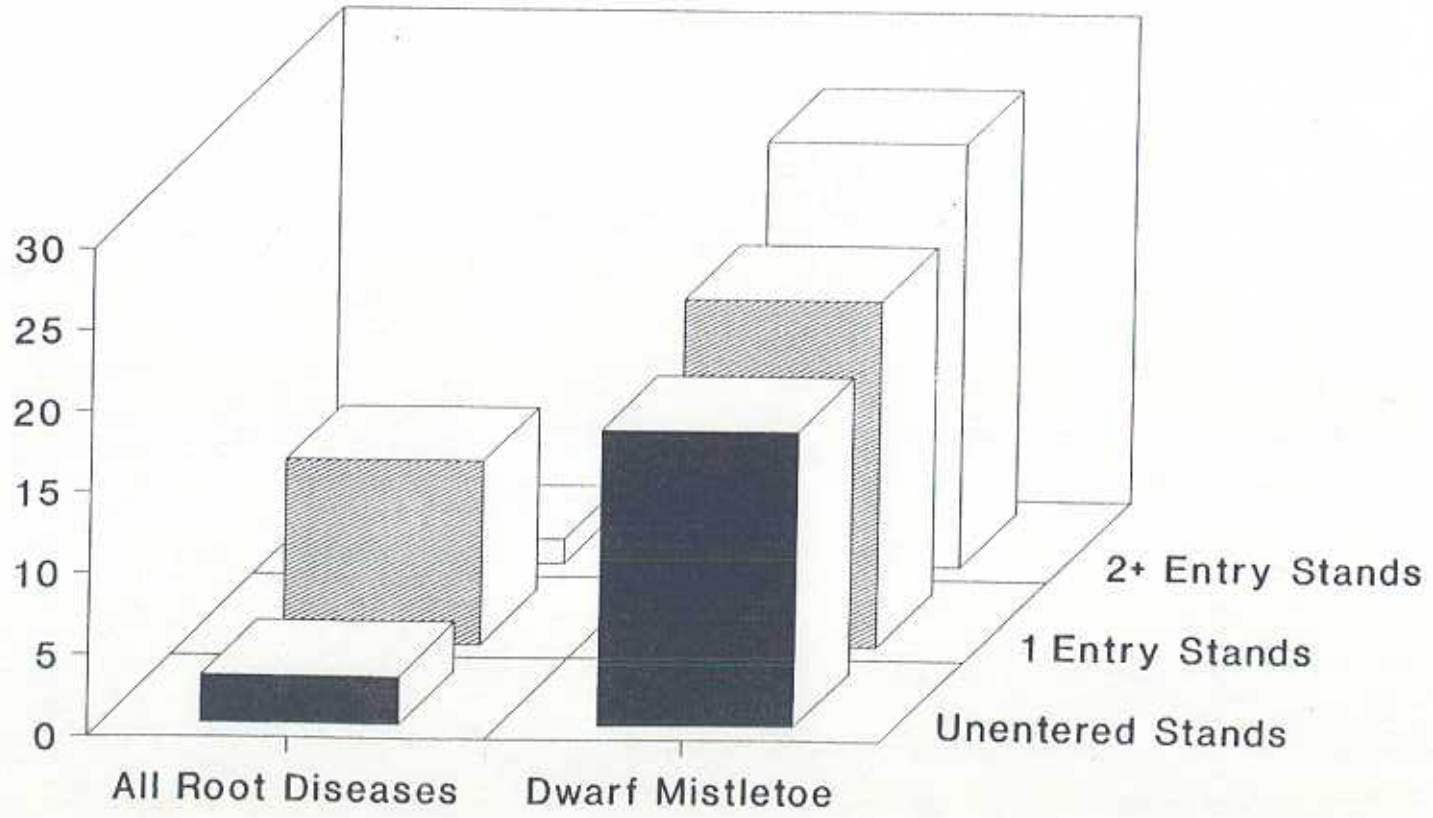


Figure 4

Percentage of Ponderosa Pine Basal Area Affected by Diseases in Sampled Stands on the Wallowa-Whitman National Forest

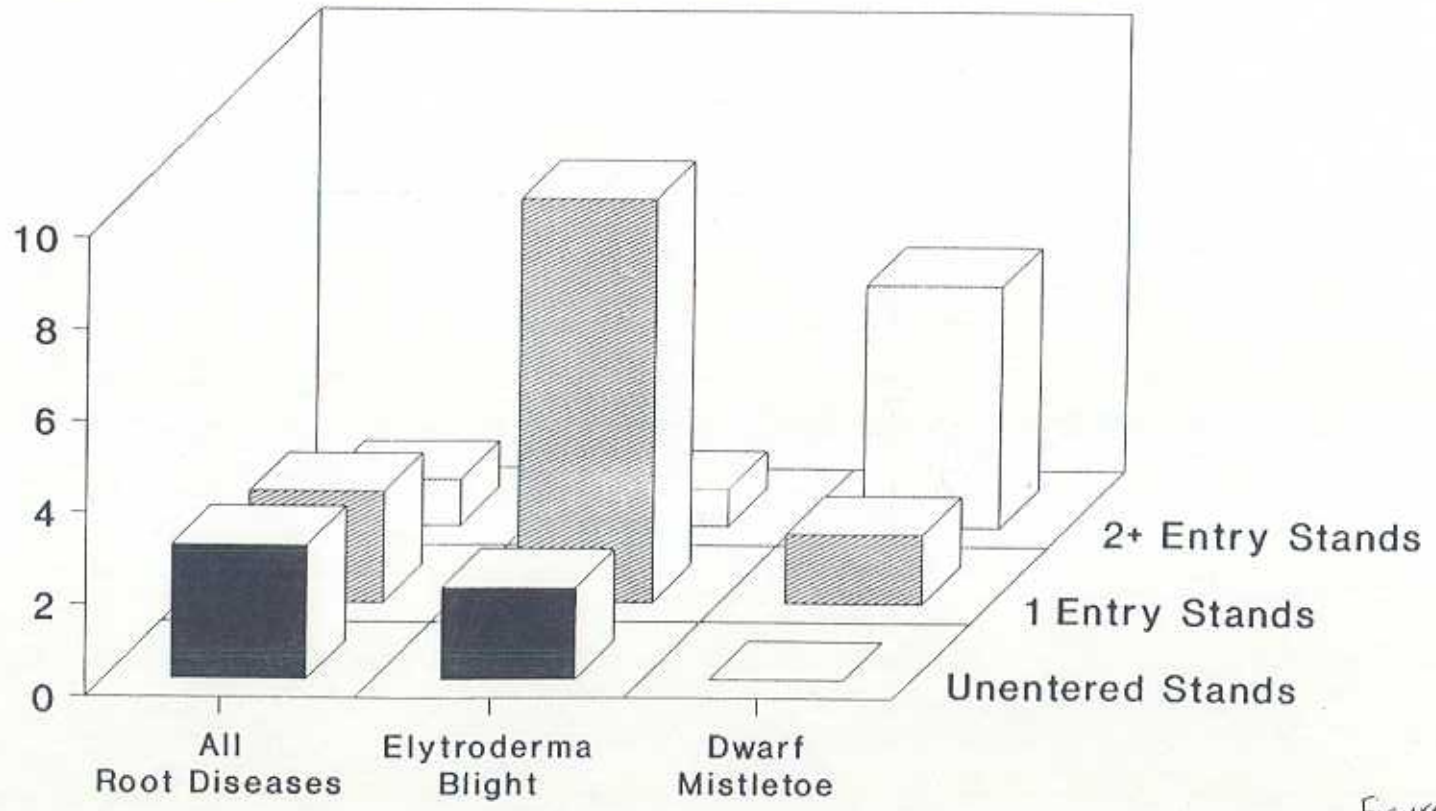


Figure 5.

Figure 5

Percentage of Lodgepole Pine Basal Area Affected by Diseases in Sampled Stands on the Wallowa-Whitman National Forest

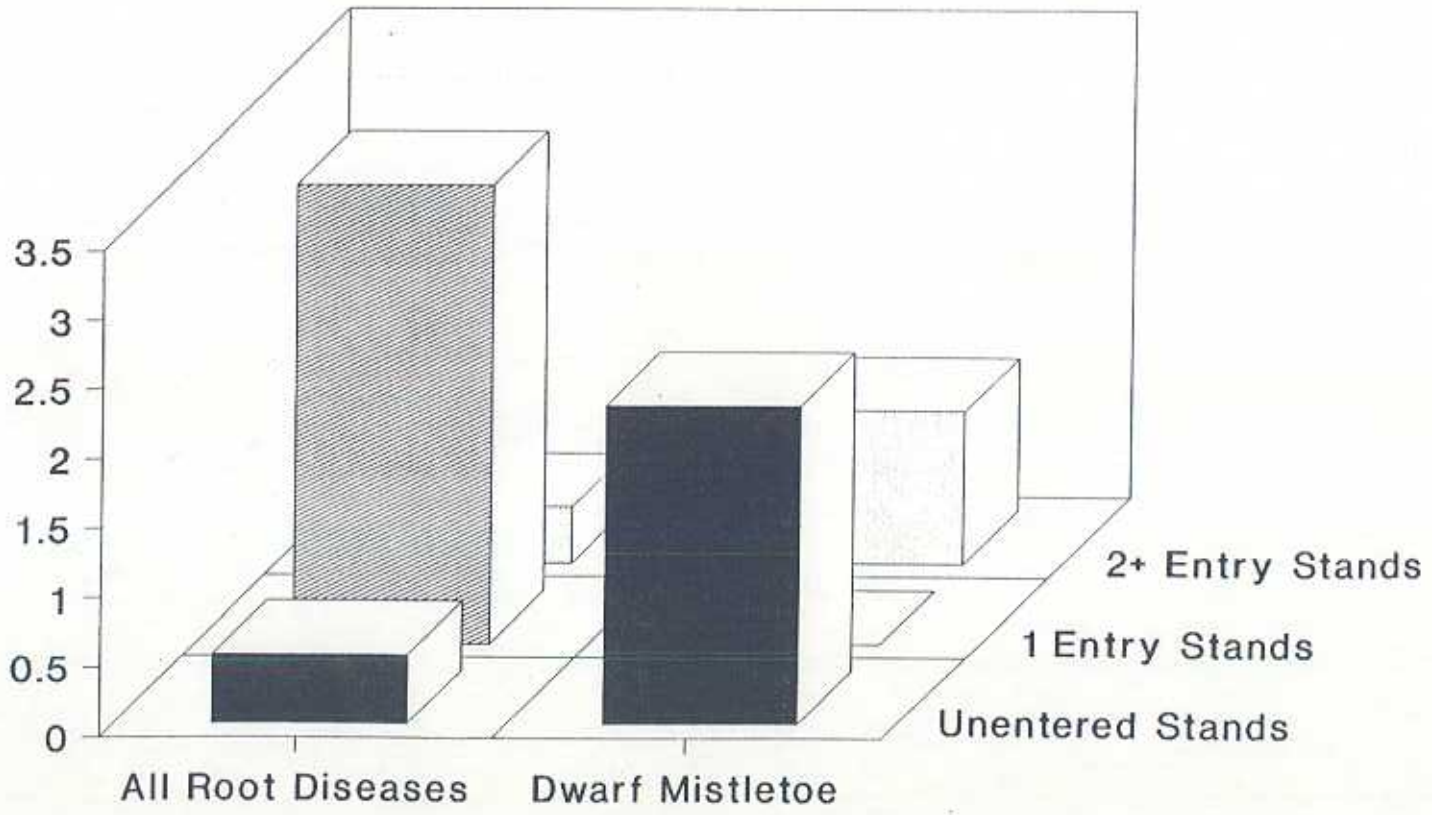


Figure 6

Percentage of Engelmann Spruce Basal Area Affected by Diseases in Sampled Stands on the Wallowa-Whitman N.F.

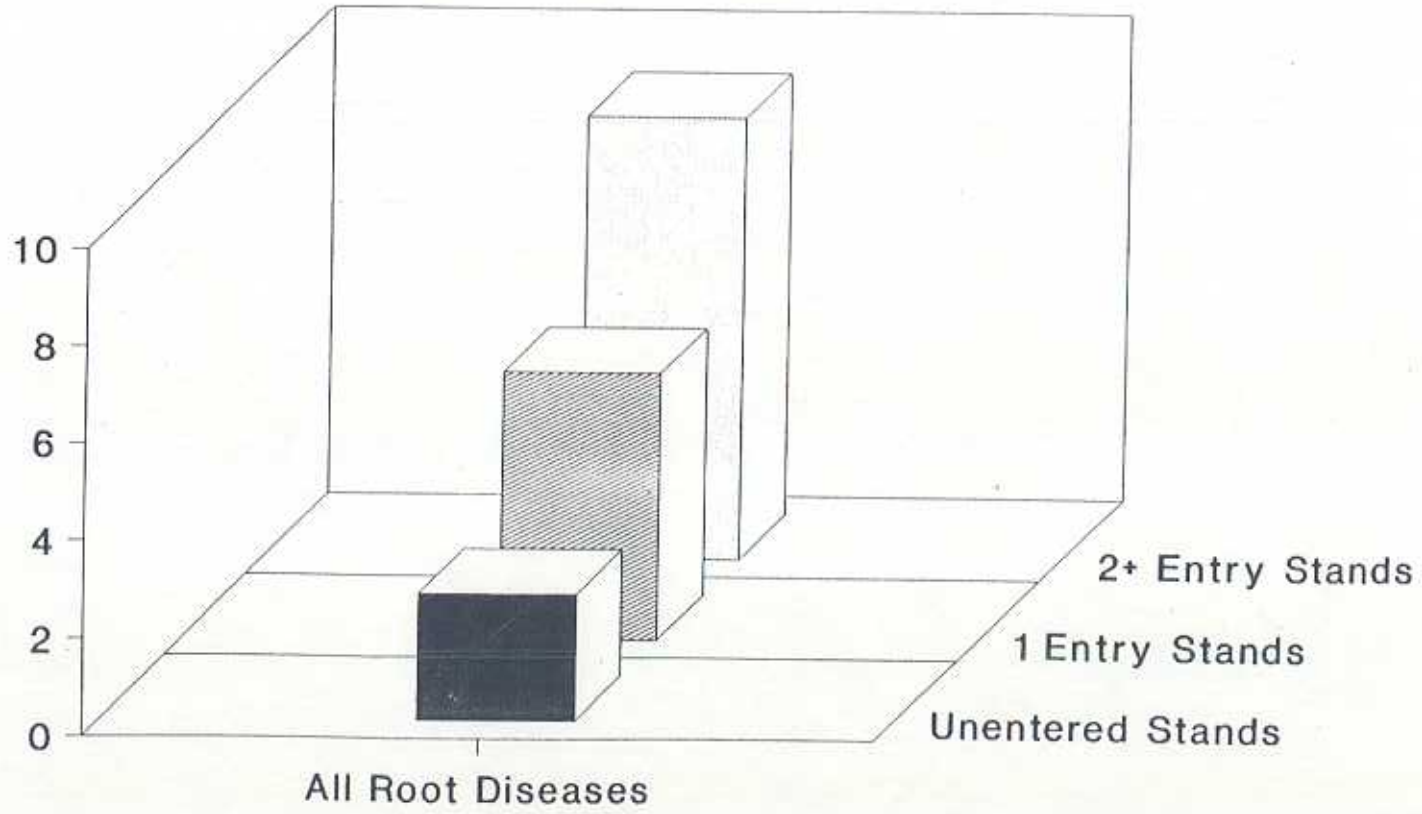


Figure 7

Percentage of Subalpine Fir Basal Area Affected by Diseases in Sampled Stands on the Wallowa-Whitman National Forest

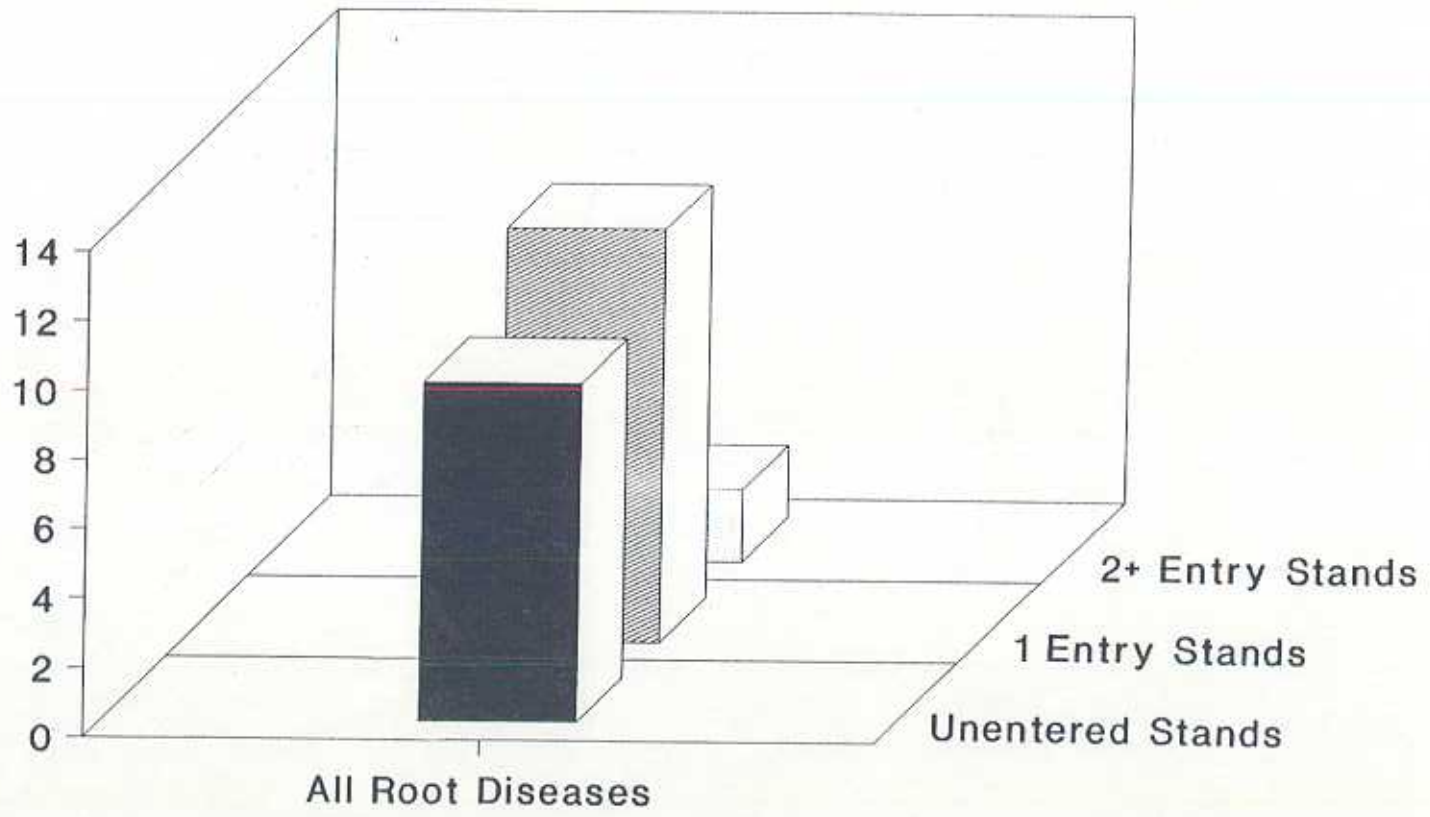


Figure 8

ROOT DISEASES

Six root diseases were identified affecting trees in this survey. Other undetermined root diseases from which collected samples failed to yield identifyable cultures, were also encountered. The most frequently occuring root diseases were: annosus root disease, Armillaria root disease, caused by *Armillaria ostoyae*; and schweinitzii butt rot, caused by *Phaeolus schweinitzii*. Root diseases found less frequently were: tomentosus root rot, caused by *Inonotus tomentosus*; black stain root disease, caused by *Ceratocystis wageneri*; and laminated root rot, caused by *Phellinus weirii* (Tables 1, 14).

Stands having the highest incidence of root diseases (dead or live-infected trees) were single entry wet fir stands, multiple entered dry fir stands, and multiple entered wet fir stands where, 11.67%, 9.8%, and 8.5% of the total basal area (BA) was affected, respectively (Table 1).

Stands having the lowest incidence of root diseases were: multiple entered pine stands, and single entry pine stands, having 2.9% and 4.1% of the total basal area affected, respectively (Table 1). Incidence of total root disease decreased with management intensity in pine stands, although that caused by annosus root disease increased. Percentages of trees affected by root diseases were higher in managed wet and dry fir stands than in corresponding unentered stands.

Analysis of root disease incidence by plant associations for all tree species is shown in Table 14. Highest incidence of root diseases were in the grand fir and subalpine fir series; specifically the grand fir/mountain maple, grand fir twinflower, and subalpine fir/big huckleberry associations with 19.55, 17.13, and 19.11 ft.^{2} BA affected, representing 11.4, 10.1, and 9.1 percent of all trees, respectively. The lowest incidence of root diseases were in associations of the Douglas-fir and ponderosa pine series, averaging less than two percent of the basal area for all tree species infected.

The relationships of root disease incidence between managed stands and unmanaged stands, and between single-entry stands and multiple-entered stands probably would be clearer and more readily quantified except that many dead and pest damaged trees are removed during harvest operations or cut for fuelwood. Although not always apparent in the data because of salvaging of infected trees, root diseases almost always increase in severity following disturbances, especially partial cutting harvests.

Annosus Root Disease

Annosus root disease, caused by the fungus, *H. annosum*, was the most common and damaging root disease encountered on this survey. On a stand basis, the highest level of annosus root disease occured in single entry wet fir stands where a mean of 10.43 ft.^{2} basal area was affected (Table 1). This was significantly greater ($p<0.05$) than the level affected in unentered wet fir stands (2.37 ft.^{2}).

Grand fir was a component in all stands sampled in the survey. Grand fir was identified in this evaluation as being the conifer species most susceptible to infection and damage caused by annosus root disease. Annosus root disease was found damaging fir in all nine sample strata (Table 2). Highest incidence of *H. annosum*-infected grand fir were in managed stands, especially single and multiple entered wet fir stands, having 7.35 and 6.90 ft.^{2} BA, respectively, and in multiple entered dry fir stands, where 5.03 ft. ^{2} BA was infected. There are statistically significant differences ($p<0.05$) in annosus incidence in grand fir between stand types (pine, wet fir, dry fir) but not between levels of management. A minor amount of annosus root disease was found to have damaged Douglas-fir, western larch, ponderosa pine, spruce, lodgepole pine, and subalpine fir; all had more damage in managed than in unentered stands, but differences were not statistically significant (Tables 3,4,5,6,12, and 13).

Plant associations in the grand fir and subalpine fir series had the highest incidence of *H. annosum* infection (Table 14). The subalpine fir/big huckleberry, grand fir/twinflower, and grand fir/mountain maple associations had the highest incidence of infection; all had in excess of 8.5 ft.^{2} of BA affected. Grand fir was most severely affected by annosus root disease in the grand fir/twinflower association on a percentage basis where 8.32 ft.^{2} BA, representing 11.9 percent of the fir, was infected (Table 15).

Annosus root disease was identified tentatively on dead and dying trees that exhibited a brown to reddish stain with uneven margins or a white, stringy or somewhate laminated decay with black flecks in the roots or root collar. Identity of the causal fungus was confirmed if diagostic fruiting structures (*Spiniger* [*Oediocephalum*]) were produced from tissue cultures taken from stained or decayed wood of suspect trees.

Heterobasidion annosum spreads long distances via windborne spores. Conks, often found in hollow stubs, stumps and around the root collar of infected trees, produce vast numbers of spores. Spores that adhere to freshly-cut stump surfaces or wounds may successfully colonize that tissue. Successful *H. annosum* infections will usually grow through the root system of stumps and infect and decay a compartmentalized cylinder of wood on wounded trees. When root systems are colonized, spread between infected trees/stumps, and susceptible trees can occur. Thus, root disease centers develop and spread. Infection results in root and butt decay leading to decline and often death. Time lag from stump colonization until resulting mortality to adjacent regeneration may be as long as 15 to 25 years. Fir engraver beetles (*Scolytus ventralis*), frequently infect and help kill annosus root disease-weakened grand fir.

We believe that most mixed conifer stands surveyed in this evaluation did not yet display the annosus root disease damage levels that can be expected in the future. Few sampled stands had a long history of grand fir partial cutting. The earliest entries in most multiple entered stands had been to remove pine only, or occasionally larch and Douglas-fir. The same was true of single entry stands that had been cut prior to 1970. Only in the most recent entries had white fir been harvested in appreciable numbers. Since stumps in most surveyed managed stands were less than 15 years old, the observable incidence of annosus root disease attributed to stump infection was relatively low. This situation is expected to change dramatically as infection spreads from older stumps. A recent evaluation on the Umatilla National Forest indicated that a mean of 89 percent of grand fir stumps between 5 and 10 years old were infected with *H. annosum*, (Filip *et al*, 1990).

Heterbasidion annosum can cause considerable damage to ponderosa pine on some eastern Oregon sites. These tend to be very dry sites. Excessive levels of damage to pines were not seen during this survey.

There are at least two seperate strains of *H. annosum* in the Northwest. Pine and true firs are attacked by different strains and cross-over, or spread between firs and pines, either adjacent trees or stumps, is not seen. Thus, annosus root diease in fir and/or infection in fir stumps, does not affect pine regeneration.

Armillaria Root Disease

Armillaria root disease, caused by the fungus, *Armillaria ostoyae*, was found damaging trees in most stand type/management level strata and plant associations (Tables 1,14). Damage was highest in stands belonging to the subalpine fir and grand fir Series. Highest incidence was in grand fir/pinegrass, subalpine fir/big Huckleberry, and grand fir/grouse huckleberry plant associations (Table 14). Stands in pine and Douglas-fir series had low levels of infection.

Grand fir had the highest incidence of damage in stands across sample strata. *A. ostoyae* occured on grand fir in all three stand types. Highest incidence was in the wet fir stands where basal area affected was: 2.92, 4.87, and 1.35 ft.^{2} BA for unmanaged, single entry, and multiple entered stands, respectively. Affected BA of grand fir in multiple entered dry fir stands also was a substantial 4.32 ft.^{2} (Table 15).

Other conifers were affected by Armillaria in some surveyed strata. Ponderosa pine was damaged by Armillaria more than any other root disease (Tables 5, 18). Douglas-fir was affected in most sample strata (Table 3), and across most plant associations (Table 16)

Armillaria ostoyae is most commonly a saprophytic and weak parasitic fungus that can become an aggressive tree-killing pathogen in some situations; variables including stand conditions and pathogen virulence are probably involved but cannot always explain root disease behavior in all cases. Several different species of *Armillaria* have been shown to exist in the Northwest. These had previously been assumed to be the same pathogen. In almost all cases where found acting as a pathogen, the species proved to be *A. ostoyae* when tested. Differences within this species are believed to exist and would explain variation in virulence and host susceptibility. In some situations; site or stand disturbances, especially soil compaction or displacement, tree wounding, and other various biotic- or abiotic-inducing factors can induce or aggravate Armillaria root disease. On many sites, saprophytic stump colonization has led to a substantial build-up of inoculum in the soil, later contributing to increased root disease severity.

A. ostoyae can survive in stumps and dead roots for at least 50 years, and can infect adjacent living trees across root grafts/contacts, or by growing a short distance (<5 feet) through the soil.

In this survey, Armillaria root disease was identified by the yellow spongy decay with numerous zone lines that it causes in roots and butts of affected trees, by the presence of rhizomorphs (shoestring-like infective structures), and especially by the diagnostic white mycelial fans formed of the causal fungus under the bark on the roots and at the root collar of infected trees.

Other Root Diseases

Several other root diseases were identified in surveyed stands.

Schweinitzii butt rot, caused by *Phaeolus schweinitzii*, damages trees by causing decay in the roots and lower butt. Advanced decay often results in windbreak (complete tree failure at the lower bole). While schweinitzii was found affecting grand fir, larch, and ponderosa pine, most damage was to Douglas-firs (Tables 1, 3). The disease occurred in all stand types and under all levels of past management. Schweinitzii was identifed on a substantial number of Douglas-firs in grand fir/mountain maple, grand fir/twinflower, and grand fir/big huckleberry associations (Table 16).

Schweinitzii butt rot most frequently damages older trees, especially those with fire scars or wounds. Incidence of this root and butt disease is probably underestimated. Trees are seldom directly killed, and even severely decayed trees seldom exhibit recognizable crown symptoms. Infection is either determined by observing conks on or around the base of infected trees or finding characteristic brown cubicle decay on roots or butts of failed trees. Usually, conks of *P. schweinitzii* are not produced frequently enough to be a completely reliable indicator of infection on all trees. Sometimes butt-swell is apparent on infected Douglas-fir.

Initial spread of *P. schweinitzii* is via windborne spores that infect fresh wounds and fire scars. Following wound or scar colonization, the fungus grows through the butt and root system, infecting adjacent trees across root contacts or grafts. Development of the disease within trees as well as

spread rates between trees is slow. Consequently, centers of infection are usually in older stands and involve only a few trees.

Tomentosus root disease or white pocket root and butt rot, caused by *Inonotus tomentosus*, was the most prevalent root disease found on Engelmann spruce in our survey. Incidence of damage was slightly higher in entered stands (Tables 1, 6). Sporophores of this fungus were not observed during the survey. Infected trees usually were identified after they had broken off and exhibited characteristic decay in the butt or exposed roots. Wind breakage and windthrow is usually more common in entered stands. Since this root disease causes no readily-identifiable symptoms, defect is hidden and damage is not recognized until trees fail or are cut. Casual observations in recently-cut units with high components of spruce as well as areas of spruce beetle-killed spruce and salvage logging indicate that the incidence and damage caused by tomentosus root disease to spruce is substantial. Damage occurs as decay in the roots and butt logs. Spread between trees is via root contacts and probably spores colonizing wounds. Tomentosus root disease was found to have caused very minor damage to grand fir and western larch.

Black stain root disease, possibly caused by *Ceratocystis wageneri*, or a closely-related fungus in the same genera, was found on two Douglas-firs in a single stand (Table 3, 16). Infected trees were still alive and exhibiting crown symptoms. Infection was probably introduced by root or root collar feeding beetles.

Laminated root rot, caused by *Phellinus weirii*, was found in one small center during the survey. While this evaluation indicates that the incidence of *P. weirii* is not extensive on the Forest, it is important to be aware that this is a particularly damaging root disease. While sampled stands did not have appreciable infection we do know of stands having catastrophic damage caused by laminated root rot on this and other East Side Forests.

Where laminated root rot occurs, management of susceptible species can lead to excessive losses and will perpetuate inoculum buildup on the site. Grand fir and Douglas-fir are very susceptible to infection and mortality. Larch is intermediately susceptible, and pines are tolerant of infection and damage. Proper management of root diseased stands usually involves managing intermediately-susceptible and tolerant species on the infected areas. Site sanitation is possible, either by managing species on the site that do not perpetuate infection, thus allowing inoculum in the soil to deteriorate, or by removing inoculum from the soil using heavy equipment. This later method is seldom recommended due to associated site disturbance and costs.

Bark Beetles

Bark beetles were found killing trees in all stand strata. Quantifying long-term impacts are difficult for several reasons:

1. Recently-killed salvable mortality is often removed as fuelwood or during harvest entries.

2. Cause of death where beetles are responsible can usually be confirmed for only a few years with most tree species due to rapid sapwood and inner bark deterioration, and obscuration of gallaries by secondary insects.

3. Beetles often attack trees affected by other pests, especially root diseases and depending upon who is making the determination, cause of mortality may be attributed to the disease, the beetle, or both.

4. Much beetle-caused damage is periodic. Endemic populations always exist, attacking and killing susceptible, weakened trees, but during periods of abnormal stress (drought, extensive defoliation) or following major disturbances (windstorms), beetle populations expand, causing much higher levels of damage. Surveys done in periods of low beetle populations do not indicate the potential of losses that can occur during catestrophic outbreaks.

In our survey, fir engravers (*Scolytus ventralis*) frequently were associated with root diseased true fir. Both grand fir and subalpine fir were affected. Although stand tables were not built presenting multiple pest occurrance for this report, incidence and damage caused by the fir engraver occurred in all nine stand sample strata. No significant differences were shown although incidence tended to be higher in the wet and dry fir types than pine stands (Tables 7, 8, 13). Plant communities showing the highest impact from fir engraver were grand fir/grouse huckleberry and grand fir/pacific yew/ queen's cup (Table 21). Differences between these and other communities were not statistically significant.

Fir engraver beetles on dead and dying true firs were identified by their characteristic galleries under the bark of infested hosts. Adult galleries are oriented horizontally, deeply scoured with a central nuptial chamber. Larval galleries radiate up and down the bole from the adult gallery.

Fir engravers exhibit a well-developed ability to locate and infest weakened and stressed trees. While fir engravers were usually found on root-diseased trees during this survey, western spruce budworm (*Choristenura occidentalis*)-casued defoliation and drought conditions intensifying in the two years since this survey was completed, have caused much higher levels of loss.

Other bark beetles were found damaging stands during this evaluation (Table 20). Most were found at endemic levels. These include western pine beetles (*Dendroctonus brevicomus*) on ponderosa pine, Ips beetles (*Ips sp.*)on both ponderosa and lodgepole pines. Douglas-fir beetles (*D. pseudot-sugae*) caused minor damage in some stands.

Usually associated with root diseased trees, we have also seen a dramatic increase in Douglas-fir beetle activity in 1988, 1989, and 1990. Below normal precipitation and spruce budworm defoliation have rendered many stands susceptible to much higher than normal levels of beetle-caused damage.

High mortality of lodgepole pine caused by mountain pine beetle (*D. ponderosae*) was found in several sampled stands. These were the remnants of the epidemic beetle outbreak that caused massive mortality in the Blue mountains for the mid- to late-1970's. While this outbreak has run it's course, the last areas damaged in northeastern Oregon were overstocked lodgepole pine in the Wallowa Mountains.

There has been an outbreak of spruce beetle (*D. rufipennis*) in the Wallowa's since the early 1980's. This outbreak was the result of population building windstorm-caused blowdown near Halfway in 1981. Several stands with extensive mortality were sampled in our survey. We expect this outbreak will impact most spruce stands on the Wallowa Mountains side of the Forest. Stands with heavy stocking of mature and overmature spruce are at highest risk.

Stem Decays

Stem decay fungi, mostly the Indian paint fungus (*Echinodontium tinctorium*), were found damaging many grand fir, and a few subalpine fir. Most damage was in the wet and dry true fir strata. Statistically significant differences ($P<0.05$) occur between strata types; reflecting differences between wet and dry fir strata, and pine stands (Table 8). For true fir stands, stem decay affected between 6.6 percent

and 15.1 percent of the fir basal area for single entry wet fir and unentered wet fir strata; respectively (Table 8).

In our survey, using equations developed by Filip *et al*, we estimated that infection varied between 9.3 and 31.8 percent; for single entry pine and unentered wet fir stands, respectively. Estimates of current decay losses varied between 0.6 and 6.3 percent of the fir cubic foot volume; for multiple entry wet fir and single entry dry fir stands, respectively (Table 56).

Amounts of fir stem decay were closely-dependent upon overstory type (pine stands have less, true fir have more), age of stand, and prevalence of wounding. Overmature stands will often have very high levels of decay even if they have never been entered. However, we know that wounding can activate latent stem decay fungi, initiating the decay process. Mature stands of true fir with a history of partial cutting and associated wounding will have high rates of stem decay.

Other stem decays identified during this survey included: red ring rot, caused by *Phellinus pini*; yellow pitted rot, caused by *Hericum abietis*; and brown trunk rot, caused by *Fomitopsis officinalis*. Unrecognized decay resulting from all fungi probably accounted for considerable hidden defect and is not reflected in tables.

Occurrence of stem decays can be detected by presence of conks on infected trees, but such fruiting bodies are often not formed until many years after infection when decay is very advanced. Overmature trees, and trees that have been suppressed for many years with poor live crown ratios are more likely to be affected by stem decay fungi than young vigorous trees. Also, true fir with wounds have particularly high probability of being infected and developing advanced decay. Wounding activates dormant Indian paint fungus infections and creates infection courts for other decay fungi. The equations developed by Filip *et al* were based on numerous dissections of randomly-selected firs and are useful for predicting estimates of infection and decay on a stand basis.

True firs, as non-resinous, thin-barked species, are much more susceptible to infection by stem decay fungi and rapid decay development than other species of conifers on the Forest. Management of unthrifty, suppressed understories and maintenance of older stands with a high incidence of wounding will result in high stem decay losses in true firs.

Stem Diseases

Stem diseases identified in this evaluation include those caused by fungi that damaged boles and branches of conifers. Elytroderma blight, caused by *Elytroderma deformans*, is a needle cast of ponderosa pine that becomes systemic on branches of it's host. Severely infected trees are impacted by reduced growth and vigor, and if infected while young, may have poor form.

Elytroderma blight was found in both entered and unentered pine and dry fir stands. Highest level was found in single entry pine where 5.88 ft.^{2} BA of pine (8.9%) were infected. In dry fir stands highest incidence was in single entered stands where 1.15 ft.^{2} of pine (8.9%) were infected (Table 11). Plant communities with the highest levels of Elytroderma blight were Abgr/Acgl/Phma, 32 ft.^{2} BA (68% of pine BA), Abgr/Vame, 1.7 ft.^{2} BA (6.7% of pine BA), and Psme Communities, 0.6 ft.^{2} BA (1.3% of pine BA) (Table 24).

Western gall rust, caused by *Endocronartium harknessi*, is primarily a disease of lodgepole pine and occasionally ponderosa pine, on the Forest. Trees are most severely damaged when galls form on the bole and cause degrade, topkill, or predispose trees to windbreak.

Western gall rust was found at relatively low levels during our survey. Lodgepole pine in the single entry dry fir and multiple entry dry fir were infected at 4.4% and 2.1%, respectively (Table 12). Plant communities with infected lodgepole pine were: Psme/Abgr/Cage, 0.11 ft.² BA (1.2% of pine BA), and Abgr/Libo, 0.12 ft.² BA (3.8% of pine BA) (Table 27).

Comandra rust, caused by *Cronartium comandrae* affects primarily ponderosa pine and sometimes lodgepole pine on the Forest. Affected trees will usually develop dead tops that progressively extend downward. After years of infection, as much as one-half of the bole may be killed. Impact is the result of growth and volume loss/defect and predisposition to other pests.

A single lodgepole pine was identified with commandra rust. This tree was in a Abgr/Vame Community and represents 0.35% of the lodgepole pine BA sampled in that community (Table 27).

Atropellis canker, caused by *Atropellis piniphila*, is a stem disease of lodgepole pine. The fungus causes a perennial canker on branches and the main bole. Damage results from reduction in wood quality, deformation and occasionally girdling, following years of infection.

Most lodgepole pine occurred in wet fir communities; atropellis canker was found damaging lodgpole pine in these stands. In unentered wet fir, single entry wet fir, and multiple entry wet fir, 1.3%, 2.7%, and 4.6% of the lodgepole pine BA were were found infected, respectively. Atropellis canker was also found in a single entry pine stand which represented 91.4 percent of a total of 0.35 ft.² pine BA, and 4.0% of the pine BA in a multiple entry dry fir stand, representing 0.38 of a total of 9.42 ft.² BA of pine.

Dwarf Mistletoes

Dwarf mistletoes (*Arceuthobium sp.*) were found infecting Douglas-fir, western larch, ponderosa pine, and lodgepole pine during this survey. Most severely infected were larch and Douglas-fir, both of which readily succumb to mortality after years of heavy infection. Growth loss is the major impact to other conifers and less severely infected larch and Douglas-fir.

Larch dwarf mistletoe occurs over 47 percent of the larch type in Oregon and Washington (Bolsinger 1978). In our survey, larch dwarf mistletoe was found in all sampled strata. Generally, unentered stands had higher amounts of affected trees. This is probably because entered stands are roaded and dead larch have been removed for fuelwood and many dying larch have been harvested. Combined totals of dwarf mistletoe infected larch for pine, wet fir, and dry fir stratas were: 20.6%, 30.4%, and 37.8% of total larch basal area, respectively (Table 10).

Most plant communities had some component of larch. All communities with larch also had some level of *A. laricis*. Highest amounts of larch dwarf mistletoe were found in Abgr/Tabr/Clun, 8.9 ft.² BA (74.2% of larch BA); Abgr/Vame, 5.78 ft.² BA (70.3% of larch BA); and Abgr/Vasc, 5.58 ft.² (30.9% of larch BA). In the community with the highest larch component, Abla/Vame (30.35 ft.² BA), dwarf mistletoe infected 12.8% (Table 23).

Larch dwarf mistletoe damages its hosts by impacting height and diameter growth, and causing mortality of severely infected trees. Height growth impacts for trees with Dwarf Mistletoe Ratings (DMR) 1 through 6 are: 98, 94, 86, 70, 38, and 6 percent of healthy, respectively. Similar diameter growth impacts are: 97, 90, 85, 69, 57, and 44 percent. Mortality estimates for 1-year periods for DMR 3 through 6 are 1, 2, 7, and 13 percent of stems (Beatty 1990).

Douglas-fir dwarf mistletoe was found in all pine, wet fir, and dry fir strata. Generally, unentered stands had more dwarf mistletoe-killed and -infected trees (basal area basis). This is probably because many dead and severely infected trees had been removed in entered stands. Proportion of dwarf mistletoe

infected Douglas-fir was highest in the dry fir stratas (22.2% of Douglas-fir BA). The pine stratas had the highest component of total Douglas-fir; infected fir comprised 13.4% of the total. In the wet fir stratas, 11.9% were infected (Table 9).

Plant communities with high levels of Douglas-fir dwarf mistletoe were: Abgr/Acgl/Phma, 21.7 ft.^{2} BA, (30.3% of Douglas-fir BA); Abgr/Caru, 8.05 ft.^{2} BA, (27.7% of Douglas-fir BA); and Psme/Abgr/Cage, 61.5 ft.^{2} BA, (23.7% of Douglas-fir BA) (Table 22).

Estimates for Douglas-fir height growth impacts with dwarf mistletoe for trees with DMR 1 through 6 are: 98, 94, 86, 70, 38, and 6 percent of healthy, respectively. Similar diameter growth impacts are: 90, 90, 60, 60, 30, and 30 percent. Estimates for mortality of sawlog-size trees for 1-year periods for DMR 3 through 6 are: 1, 4, 10, and 10 percent of stems (Beatty 1990).

Western dwarf mistletoe, which affects ponderosa pine, is much more localized on the Wallowa-Whitman NF than occurrences of Douglas-fir and larch dwarf mistletoes. Most infected stands are on the Baker District. Very little *A. campylopodum* is found on the northern part of the Forest. Dwarf mistletoe was found in single entry pine strata, 1.18 ft.^{2} BA (1.8% pine BA); and multiple entry pine, 3.8 ft.^{2} BA (6.0% pine BA) infected (Table 11).

Plant communities with highest incidence of *A. campylopodum* were Pipo-Psme/Syal/Osch, 12.8 ft.^{2} BA (26.4% of pine BA); and Abgr/Caru, 4.8 ft.^{2} BA (17.4% of pine BA) infected. Both of these communities were represented by a very limited sample (Table 24).

Lodgepole pine dwarf mistletoe mainly impacts its host by reducing height and diameter growth, and form quality. A low amount was identified in our survey. Single entry wet fir strata had 3.5% BA of the lodgepole pine infected. Very minor occurrence was observed in other strata (Table 12). Plant communities with highest levels of infection were Abgr/Vasc, 0.53 ft.^{2} BA (4.0% of pine BA); and in Abgr/Libo, 0.12 ft.^{2} BA (3.8% of the pine BA) was infected. The community with the highest component of lodgepole pine, Pico/Vasc, was not affected (Table 27).

Defoliating Insects

Western spruce budworm (*Choristoneura occidentalis*) defoliation had occurred to some surveyed stands. We did not attempt to quantify degree of defoliation or resulting damage. The budworm had been building over a several year period on portions of the Forest. At the time of this survey the Unity, Baker, and La Grande Ranger Districts had earliest occurrence of epidemic populations. Subsequent build up was on the Pine District and southern portions of the Hells Canyon NRA, and last, on portions of the Wallowa Valley District and the north portion of Hells Canyon NRA.

Most severe damage has occurred in the last several years where a combination of defoliation and drought conditions have killed a high proportion of Douglas-fir and grand fir understories in some stands and predisposed larger trees to other pests, especially bark beetles. Trees that were not killed following heavy defoliation were impacted by reduced growth and frequently, dead tops. Associated mortality or top kill had not yet occurred at the time of this evaluation in surveyed stands.

Management Implications and Recommendations

Results of this evaluation indicate the high incidence of pests and pest-caused damage in mixed-conifer stands, especially to grand fir on the Wallowa-Whitman NF. While statistically significant differences were not demonstrated for all relationships we feel confident exist, there is good evidence

that partial cutting in mixed conifer stands, and associated disturbances and wounding, increase pest incidence and resulting pest-caused damage.

Silviculturists need to carefully consider existing and potential pest problems when preparing prescriptions for stands with true firs. On sites where they will be a significant stand component, true firs need to be managed, not taken for granted. Where true firs are to be properly managed, steps must be taken to assure pests and pest-impacts are minimized.

The following are more specific recommendations for managing our more challanging pest problems:

1. Favor true firs as a silviculturally preferred objective only on those sites where firs are best adapted, such as wet and cool plant communities, rather than those sites where fir is an invader in the absence of periodic fire.

2. Managed true fir should be established following a regeneration treatment. Trees established in a free-to-grow situation will be vigorous with high live crown ratios and not be predisposed to *E. tinctorium* infection. Preferred management direction would be to have a single precommercial thinning, if needed, to space trees to desired crop tree density. This will eliminate an intermediate commercial entry and associated wounding and disturbances.

3. Borax treatment of stumps should be specified in all sawlog-size true fir stands and on sites where true firs will continue to be managed. Optional contract provision C6.412-Option 2, Treatment of stumps, requires purchasers to treat stumps larger than 12" in diameter within 48 hours with a "light" salting of grandular or powdered borax. This amounts to an application rate of about 2 pounds per 100 ft.^{2} of cut stump surface.

4. In most stands, seral species of western larch, lodgepole and ponderosa pines, and Douglas-fir which is intermediate in tolerance, should be preferred over true firs when planning harvest prescriptions and selecting leave trees in precommercial or intermediate entries. Pest impacts will be considerably lower when managing predominantly seral species under even-aged systems than mostly shade-tolerant species under uneven-aged systems.

5. True firs should be managed on relatively short rotations (120 years or less). Understory true fir that has been suppressed for any period of time is less-than desirable, but 50 years should be used as the critical threshhold.

6. Armillaria root disease, and to a much lesser extent, laminated root rot, occur on the Forest and influence management direction in stands where they occur. As with most other root diseases, the way to capture mortality, stop spread and rehabilitate the site is to convert the stand on the site to a high proportion of species showing most resistance to the specific root disease.

Preferred species to manage in laminated root rot centers and buffers are in decreasing resistance:

   a. Ponderosa, lodgepole, and western white pines

   b. Western larch and Engelmann spruce

Grand fir and Douglas-fir are highly susceptible and should not be managed in laminated root disease centers.

Armillaria root disease differs in relative host susceptibility by locality. Generally, grand fir is always very susceptible and western larch usually exhibits enough resistance to be a preferred species. Douglas-fir and pines vary considerably in resistance/susceptibility and that needs to be assessed for individual stands.

7. Favor other tree species over true firs in stands affected by annosus root disease, or if there are substantial numbers of large true fir stumps (18 inches or greater in diameter) widely distributed in the stand. Such stumps are probably already infected by *F. annosus* and can be assumed to be potential foci for new root disease centers.

Since this evaluation was completed, forest pests, especially defoliators and bark beetles, have reached epidemic proportions. Western spruce budworm has repeatedly defoliated stands in the south portion of the Forest. Last year (1990), portions of the north part of the Forest had severe defoliation. Douglas-fir beetle has been very active in stands that have high stocking levels, a large component of Douglas-fir, and have had repeated budworm defoliation. The La Grande RD has been hit hardest. Populations of the Douglas-fir tussock moth has increased in stands throughout the Forest. Defoliation was observed in some stands on the Pine RD. Whether the tussock moth population continues to build to outbreak proportions across the Forest remains to be seen.

Zone Entomologists and Pathologists now serve most eastern Oregon and eastern Washington National Forests. These specialists are available to assist Districts/Forests with developing strategies for reducing pests and pest-caused losses. Managers on other Forests should contact Forest Pest Management at the Regional Headquarters for assistance.

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Table 1: Mean Basal Area (ft.^{2}/acre) Affected by Root Diseases for All Tree Species in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

Stand Strata	Root Diseases										Total all trees/ Percent all trees affected
	Phsc	Into	Foan	Aros	Cewa	Phwe	Unkn			Sum	
A1- unentered pine	1.28		0.72	4.83			0.81			7.64	142.22 5.4%
A2- single entry pine	1.76		0.68	2.95	0.27		0.25			5.91	143.20 4.1%
A3- multiple entry pine	0.55		2.37				0.47			3.39	115.92 2.9%
B1- unentered wet fir	0.47	1.1	# 2.48	4.72			2.12			10.89	189.4 5.6%
B2- single entry wet fir	2.08	0.67	# 10.43	6.97			1.32			21.47	184.05 11.67%
B3- multiple entry wet fir	1.15	1.76	7.48	1.85		0.12	0.88			13.24	155.22 8.5%
C1- unentered dry fir	1.91	0.42	3.28	2.90			1.07			9.58	186.33 5.1%
C2- single entry dry fir	2.18	1.12	2.20	1.68			1.15			8.33	125.95 6.6%
C3- multiple entry dry fir	0.35	1.15	5.60	5.83			0.5			13.43	137.38 9.8%
statistics			P<.05 B1vsB2								

- differences are statistically significant
unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease
Cewa- Ceratocystis wageneri, cause of Black Stain Root Disease
Phwe- Phellinus weirii, cause of Laminated Root Rot

Table 2: Mean Basal Area (ft.^{2}/acre) of Grand Fir Affected by Root Diseases in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

Stand Strata	Root Diseases										Total all fir/ Percent all fir affected
	Phsc	Into	Foan	Aros	Unkn					Sum	
A1- unentered pine	0.27		0.65	2.4	0.03					3.32	25.45 13.1%
A2- single entry pine	0.13		0.58	0.38	0.1					1.09	19.47 5.6%
A3- multiple entry pine	0.07		2.03							2.1	24.1 8.7%
B1- unentered wet fir	0.13	0.17	1.98	2.92	1.03					6.23	63.05 9.9%
B2- single entry wet fir			7.35	4.87	0.38					12.6	81.2 15.5%
B3- multiple entry wet fir	0.13		6.90	1.35	0.52					8.9	69.72 12.8%
C1- unentered dry fir	0.55		3.22	1.40	0.47					5.64	103.42 5.5%
C2- single entry dry fir			1.47	0.88	0.65					3.0	57.47 5.2%
C3- multiple entry dry fir	0.27		5.03	4.32	0.27					9.62	66.32 14.5%
statistics			P<0.05 STAND TYPE								

unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease

Table 3: Mean Basal Area (ft.^{2}/acre) of Douglas-fir Affected by Root Diseases in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

Stand Strata	Root Diseases									Sums	Total all D-fir/ Percent all D-fir affected
	Phsc	Into	Foan	Aros	Cewa	Phwe	Unkn				
A1- unentered pine	0.95			1.07			0.1			2.19	53.42 4.1%
A2- single entry pine	1.53			0.97	0.27		0.15			2.92	50.98 5.7%
A3- multiple entry pine	0.38		0.01				0.3			0.69	21.28 3.2%
B1- unentered wet fir	0.2		0.08	0.25						0.53	13.08 4.1%
B2- single entry wet fir	1.73			0.30			0.06			2.09	13.62 15.3%
B3- multiple entry wet fir	0.9		0.35	0.12		0.12	0.13			1.62	25.43 6.4%
C1- unentered dry fir	1.08		0.06	1.15			0.37			2.66	33.9 7.8%
C2- single entry dry fir	2.1		0.33	0.22			0.2			2.85	37.89 7.5%
C3- multiple entry dry fir	0.35		0.38	1.32			0.1			2.15	32.27 6.7%
statistics											

unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease
Cewa- Ceratocystis wageneri, cause of Black Stain Root Disease
Phwe- Phellinus weirii, cause of Laminated root rot
Deps- Dendroctonus pseudotsugae, Douglas-fir beetle

Table 4: Mean Basal Area (ft.^{2}/acre) of Western Larch Affected by Root Diseases in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

Stand Strata	Root Diseases										Total all larch/ Percent all larch affected
	Phsc	Into	Foan	Aros	Unkn					Sum	
A1- unentered pine	0.07				0.28					0.35	2.25 15.4%
A2- single entry pine			0.1	0.13						0.23	6.48 3.6%
A3- multiple entry pine										0.0	3.78 0.0%
B1- unentered wet fir	0.13			0.28	0.07					0.48	22.42 2.1%
B2- single entry wet fir	0.35	0.12	2.0	0.68						3.15	18.72 16.8%
B3- multiple entry wet fir	0.12	0.13								0.25	8.58 2.9%
C1- unentered dry fir	0.18			0.16						0.34	13.75 2.5%
C2- single entry dry fir			0.25	0.33						0.58	6.62 8.8%
C3- multiple entry dry fir				0.12	0.07					0.19	9.93 1.9%
statistics											

unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease

Table 5: Mean Basal Area (ft.^{2}/acre) of Ponderosa Pine Affected by Root Diseases in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

Stand Strata	Root Diseases										Total all Ppine/ Percent all Ppine affected
	Phsc	Foan	Aros	Unkn						Sum	
A1- unentered pine			1.37	0.4						1.77	59.28 3.0%
A2- single entry pine	0.1		1.47							1.57	65.93 2.4%
A3- multiple entry pine	0.1	0.23		0.18						0.51	63.05 0.8%
B1- unentered wet fir										0.0	0.06
B2- single entry wet fir										0.0	0.93
B3- multiple entry wet fir										0.0	0.0
C1- unentered dry fir	0.12		0.03	0.17						0.32	13.67 2.3%
C2- single entry dry fir	0.08	0.08	0.16							0.32	13.05 2.5%
C3- multiple entry dry fir		0.18	0.03							0.21	9.03 2.3%
statistics											

unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease

Table 6: Mean Basal Area (ft.^{2}/acre) of Engelmann Spruce Affected by Root Diseases in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

Stand Strata	Root Diseases										Total all spruce/ Percent all spruce affected
	Into	Foan	Aros	Unkn						Sum	
A1- unentered pine										0.0	0.0
A2- single entry pine										0.0	0.0
A3- multiple entry pine										0.0	0.0
B1- unentered wet fir	0.93		0.2	0.15						1.28	54.88 2.3%
B2- single entry wet fir	0.57	0.6	0.25	0.35						1.77	46.43 3.8%
B3- multiple entry wet fir	1.63	0.23	0.37	0.08						2.31	28.22 8.2%
C1- unentered dry fir	0.33		0.1							0.43	10.57 4.1%
C2- single entry dry fir	1.12									1.12	6.33 17.7%
C3- multiple entry dry fir	1.15									1.15	9.73 11.8%
statistics											

unkn- unknown or unidentified root disease
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease

Table 7: Mean Basal Area (ft.^{2}/acre) of All Tree Species Affected by Bark Beetles in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

Stand Strata	Bark Beetles									Total all trees/ Percent all trees affected
	Depo	Deps	Deru	Debr	Ips	Scve	Psse	Deva	Sum	
A1- unentered pine	1.1	2.6		# 3.25		1.63	0.52	0.12	9.22	142.22 6.5%
A2- single entry pine	2:06			# 2.98	1.73	0.95	0.52	0.58	8.82	143.20 6.2%
A3- multiple entry pine	6.58	0.07		# 0.65	0.22	0.53		0.1	8.15	115.92 7.0%
B1- unentered wet fir	7.7	1.5	11.3		0.15	5.08			25.73	189.4 13.6%
B2- single entry wet fir	2.73	0.12	1.05			3.08			6.98	184.05 3.8%
B3- multiple entry wet fir	5.72	0.35	1.07			2.67			9.81	155.22 6.3%
C1- unentered dry fir	1.3	2.35		0.53	0.03	3.77		0.17	8.15	186.33 4.4%
C2- single entry dry fir	2.9	1.28		0.60		2.22			7.0	125.95 5.6%
C3- multiple entry dry fir	2.48	1.20	0.13			5.82			9.63	137.38 7.0%
statistics				P<.05 A3vsA1 &A2						

- differences are statistically significant
Depo- Dendroctonus ponderosae- mountain pine beetle
Deps- D. pseudotsugae- Douglas-fir beetle
Deru- D. rufipennis- spruce beetle
Debr- D. brevicomis- western pine beetle
Ips- Ips sp.- Ips beetles
Scve- Scolytus ventralis- fir engraver
Psse- Pseudohylesinus sericeus, beetle
Deva- D. valens- red turpentine beetle

Table 8: Mean Basal Area (ft.^{2}/acre) of Grand Fir Affected by Stem Diseases and Bark Beetles in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

	----------Stem Diseases----------						Beetles				
Stand Strata	Phpi	Ecti	Fopi*	Heab	Sum		Scve				Total all fir
A1- unentered pine	0.067	0.87	0.2	0.13	1.07		1.5				25.45
A2- single entry pine		1.27	0.13		1.27		0.95				19.47
A3- multiple entry pine		0.90	0.18		1.08		0.53				24.1
B1- unentered wet fir		8.23	1.17	0.13	9.53		5.01				63.05
B2- single entry wet fir		4.65	0.58	0.12	5.35		3.08				81.20
B3- multiple entry wet fir		7.72	0.57		8.29		2.67				69.72
C1- unentered dry fir		9.5	0.90		10.4		3.77				103.42
C2- single entry dry fir		4.37	0.45		4.82		2.15				57.47
C3- multiple entry dry fir		5.42	0.42	0.18	6.02		5.82				66.32
statistics		P<.05 STAND									

*- Saprophytic fungus; not cause of tree death
Phpi- Phellinus pini, Red Ring Rot
Ecti- Echinodontium tinctorium, Rust Red Stringy Rot
Fopi- Fomitopsis pinicola, Brown Crumbly Rot
Heab- Hericum abietis, Yellow Pitted Rot
Scve- Scolytis ventralis, fir engraver

Table 9: Mean Basal Area (ft.^{2}/acre) of Douglas-fir Affected by Dwarf Mistletoe, Stem Diseases and Bark Beetles, in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

	Mistletoe	---------Stem Diseases----------					Beetles	
Stand Strata	Ardo	Phpi	Foof	Fopi*	Heab	Sum	Deps	Total all D-fir
A1- unentered pine	6.13	0.13	0.18	2.76		3.07	2.6	53.42
A2- single entry pine	7.35			0.7		0.7		50.98
A3- multiple entry pine	3.32			1.15		1.15	0.06	21.28
B1- unentered wet fir	3.78			1.37		1.37	1.25	13.08
B2- single entry wet fir	1.60		0.12	2.7		2.82	0.12	13.62
B3- multiple entry wet fir	0.87			2.02		2.02	0.35	25.43
C1- unentered dry fir	# 13.42			2.08	0.17	2.25	2.35	33.9
C2- single entry dry fir	6.23			1.7	0.03	1.73	1.28	37.89
C3- multiple entry dry fir	# 3.42		0.08	2.17		2.25	1.20	32.27
statistics	P<0.05 C1vsC3 STAND							

#- differences are significantly different
Ardo- Arceuthobium douglasii, Douglas-fir Dwarf Mistletoe
Phpi- Phellinus pini, Red Ring Rot
Foof- Fomitopsis officinalis, Brown Trunk Rot
Fopi- Fomitopsis pinicola, Brown Crumbly Rot
Heab- Hericum abietis, Yellow Pitted Rot
Deps- Dendroctonus pseudotsugae, Douglas-fir beetle

Table 10: Mean Basal Area (ft.^{2}/acre) of Western Larch Affected by Dwarf Mistletoe, Bark Beetles, and Stem Diseases in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

	----Arla----		---Deps-----		---Foof----		---Fopi*----				Total all larch
Stand Strata	BA	%	BA	%	BA	%	BA	%			
A1- unentered pine	0.98	43.6									2.25
A2- single entry pine	1.2	18.5					0.1	1.5			6.48
A3- multiple entry pine	0.4	10.6					0.4	10.6			3.78
B1- unentered wet fir	8.53	38.1	0.25	1.1			2.37	10.6			22.42
B2- single entry wet fir	2.9	15.5					1.1	5.9			18.72
B3- multiple entry wet fir	3.68	42.9			0.13	1.5	0.88	10.3			8.58
C1- unentered dry fir	7.03	51.1					1.48	10.8			13.75
C2- single entry dry fir	2.7	40.8					0.5	7.6			6.62
C3- multiple entry dry fir	1.73	17.4					0.77	7.8			9.93
statistics	P<.05 STAND										

BA- Basal area
* - Decay-causing saprophyte; Decay probably started when tree died
% - percent of total larch basal area
Arla- Arceuthobium laricis, larch dwarf mistletoe
Deps- Dendroctonus psudotsugae, Douglas-fir beetle
Foof- Fomitopsis officinalis, Brown Trunk Rot
Fopi- Fomitopsis pinicola, Brown Crumbly Rot

Table 11: Mean Basal Area (ft.^{2}/acre) of Ponderosa Pine Affected by Dwarf Mistletoe, Stem Diseases, and Bark Beetles in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

	Pest										
Stand Strata	Arca	Phpi	Atpi	Elde	Depo	Debr	IPS	Psse	Deva		Total all Ppine
A1- unentered pine		0.25	0.04	0.87	0.72	3.25		0.52	0.12		59.28
A2- single entry pine	1.18		0.28	5.88	1.93	2.85	1.73	0.52	0.58		65.93
A3- multiple entry pine	3.8		0.25	0.58	6.25	0.65	0.22		0.1		63.05
B1- unentered wet fir					0.07						0.07
B2- single entry wet fir			0.13								0.93
B3- multiple entry wet fir											0.0
C1- unentered dry fir				0.57		0.4	0.03		0.17		13.67
C2- single entry dry fir				1.15	0.67	0.6					13.05
C3- multiple entry dry fir					0.20						9.03
statistics	P<.001 STAND				P<.001 STAND						

Arca- Arceuthobium camplopodium, Western dwarf mistletoe
Elde- Elytroderma deformans, Elytroderma blight
Atpi- Atropellis piniphila, Atropellis Canker
Phpi- Phellinus pini, Red Ring Rot
Depo- Dendroctonus ponderosae, Mountain pine beetle
Debr- D. brevicomis, Western Pine Beetle
Deva- D. valens, Red turpentine beetle
IPS- Ips sp., Ips beetle
Psse- Pseudohylesinus sericeus, Beetle

Table 12: Mean Basal Area (ft.^{2}/acre) of Lodgepole Pine Affected by Pests in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

	Bark											
	---Root Diseases---			---Beetles---		----------Other Pests----------						
Stand Strata	Unkn	Foan	Aros	Depo	IPS	Crco	Atpi	Fopi	Elde	Enha	Aram	Total All Lpp
A1- unentered pine				0.38				0.28				0.48
A2- single entry pine							0.32					0.35
A3- multiple entry pine				0.33				0.12	0.12			0.55
B1- unentered wet fir	0.12			7.63	0.15	0.07	0.2	0.25			0.53	15.18
B2- single entry wet fir	0.23	0.02		2.73	0.05		0.25	0.8				9.23
B3- multiple entry wet fir	0.08			5.72			0.78				0.2	16.82
C1- unentered dry fir				1.33				0.33				7.5
C2- single entry dry fir	0.05	0.03	0.08	2.23				0.12		0.13		2.95
C3- multiple entry dry fir			0.03	2.28			0.38	0.43		0.2	0.1	9.42
statistics												

Unkn- unknown or unidentified root disease
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease
Depo- Dendroctonus ponderosae, Mountain pine beetle
IPS- Ips sp. , Ips beetles
Enha- Endrocronartium harknesii, Western gall rust
Crco- Cronartium comandrae, Comandra rust
Atpi- Atropellis piniphila, Atropellis canker
Fopi- Fomitopsis pinicola, Brown crumbly rot
Elde- Elytroderma deformans, Elytroderma blight
Aram- Arceuthobium americanium, lodgepole pine dwarf mistletoe

Table 13: Mean Basal Area (ft.^{2}/acre) of Subalpine fir Affected by Pests in Stands Representative of the Species Composition/Past Management Strata Evaluated on the Wallowa-Whitman National Forest

	----Root Disease---				------Stem Disease------			Beetle			
Stand Strata	Unkn	Foan	Aros	Phpi	Ecti	Fopi	Heab	Scve			Total All SAF
A1- unentered pine											
A2- single entry pine											
A3- multiple entry pine											
B1- unentered wet fir	0.75	0.42	1.07	0.07		0.78	0.07				20.7
B2- single entry wet fir	0.27	0.47	0.83		0.12	0.23		0.07			13.38
B3- multiple entry wet fir	0.07					0.27					6.45
C1- unentered dry fir	0.07		0.07			0.07					3.53
C2- single entry dry fir	0.23							0.07			1.70
C3- multiple entry dry fir	0.07										0.73
statistics											

Ecti- Echinodontium tinctorium, Rust Red Stringy Rot
Fopi- Fomitopsis pinicola, Brown Crumbly Rot
Heab- Hericum abietis, Yellow Pitted Rot
Phpi- Phellinus pini, Red Ring Rot
Unkn- unknown or unidentified root disease
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease
Scve- Scolytus ventralis, Fir engraver

Table 14; Mean Basal Area ($ft.^2$/acre) Affected by Root Diseases for All Species by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Root Diseases								Sum	Total all trees/ Percent all trees affected
		Phsc	Into	Foan	Aros	Cewa	Phwe	Unkn			
Abgr/Vame CW-S2-11	10	2.72	1.56	3.67	4.15			1.57		13.67	172.7 7.9%
Psme/Abgr/Cage CW-G1-11	7	0.26		0.77	0.77			0.37		2.17	125.84 1.7%
Abgr/Spbe CW-S3-21	5	0.58		1.48	3.02			0.62		5.70	123.66 4.6%
Abla/Vame CE-S3-15	6	0.75	1.4	8.57	6.66			1.73		19.11	210.95 9.1%
Abgr/Vasc CW-S8-11	6	0.07	0.83	4.56	6.35			1.3		13.11	152.87 8.6%
Abgr/Libo CW-F3-11	5	2.78	1.28	9.02	2.46	0.8	0.23	0.56		17.13	169.60 10.1%
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5	0.58		0.38	0.44					1.4	106.76 1.3%
Abgr/Acgl CW-S9-12	2	5.8		9.1	4.25			0.4		19.55	171.65 11.4%
Abgr/Tabr/Clun CW-F4-22	2	1.85	0.95	5.9	4.25			1.6		14.55	171.55 8.5%
Pico/Vasc CL-S4-11	1			1.6	0.4			0.4		2.4	148.0 1.6%
Pipo/Agsp CP-G1-11	1									0.0	145.2
Pipo-Psme/Syal/Osch CD-S6-11	1	0.6		1.2						1.8	65.5 2.7%
Abgr/Caru CW-G1-12	2	0.2		3.35	9.2			0.25		13.0	149.3 8.7%
Abgr/Acgl/Phma CW-S4-12	1	0.6						0.6		1.2	145.4 0.8%

N- Number of sampled stands
Unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease
Cewa- Ceratocystis wageneri, cause of Black Stain Root Disease
Phwe- Phellinus weirii, cause of Laminated root rot

Table 15: Mean Basal Area ($ft.^2$/acre) of Grand Fir Affected by Root Diseases by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Root Diseases									Total all fir/ Percent all fir affected
		Phsc	Into	Foan	Aros	Unkn				Sum	
Abgr/Vame CW-S2-11	10	0.26		3.67	2.21	0.85				7.0	83.06 8.4%
Psme/Abgr/Cage CW-G1-11	7			0.51	0.57	0.06				1.14	45.61 2.5%
Abgr/Spbe CW-S3-21	5			1.48	0.46	0.4				2.34	35.78 6.5%
Abla/Vame CE-S3-15	6	0.13		5.35	3.88	0.2				9.56	63.47 15.1%
Abgr/Vasc CW-S8-11	6		0.17	3.92	4.7	0.75				9.54	80.4 11.9%
Abgr/Libo CW-F3-11	5	0.48		8.32	1.62	0.22				10.64	69.90 15.2%
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5			0.22						0.22	1.38 15.9%
Abgr/Acgl CW-S9-12	2			6.3	1.45					7.75	87.6 8.9%
Abgr/Tabr/Clun CW-F4-22	2	1.15		5.9	3.65	1.2				11.90	63.65 18.7%
Pico/Vasc CL-S4-11	1			1.6	0.4					2.0	19.2 10.4%
Pipo/Agsp CP-G1-11	1										0.0
Pipo-Psme/Syal/Osch CD-S6-11	1										0.0
Abgr/Caru CW-G1-12	2	0.2		1.65	6.25					8.1	84.10 9.6%
Abgr/Acgl/Phma CW-S4-12	1					0.6				0.6	23.10 2.6%

N- Number of sampled stands
unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease

Table 16: Mean Basal Area (ft.^{2}/acre) of Douglas-fir Affected by Root Diseases by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Root Diseases								Total all D-fir/ Percent all D-fir affected
		Phsc	Into	Foan	Aros	Cewa	Phwe	Unkn	Sum	
Abgr/Vame CW-S2-11	10	2.25			1.07			0.24	3.56	34.88 10.2%
Psme/Abgr/Cage CW-G1-11	7	0.26		0.11	0.2			0.11	0.68	27.5 2.5%
Abgr/Spbe CW-S3-21	5	0.46			0.8			0.12	1.38	22.4 6.2%
Abla/Vame CE-S3-15	6	0.4			0.12			0.07	0.59	12.78 4.6%
Abgr/Vasc CW-S8-11	6	0.07		0.08	1.03				1.18	23.45 5.0%
Abgr/Libo CW-F3-11	5	2.32		0.42	0.22	0.32	0.14	0.34	3.76	50.1 7.5%
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5	0.58			0.32			0.32	1.22	56.02 2.2%
Abgr/Acgl CW-S9-12	2	5.15		1.0	0.65				6.8	39.65 17.2%
Abgr/Tabr/Clun CW-F4-22	2	0.3	0.3		0.3			0.4	1.3	34.0 1.3%
Pico/Vasc CL-S4-11	1									10.4 0.0
Pipo/Agsp CP-G1-11	1									4.4 0.0
Pipo-Psme/Syal/Osch CD-S6-11	1			0.6					0.6	16.9 3.6%
Abgr/Caru CW-G1-12	2			1.15	2.35				3.5	19.6 17.9%
Abgr/Acgl/Phma CW-S4-12	1	0.6							0.6	71.5 0.8%

N- Number of sampled stands
unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease
Cewa- Ceratocystis wageneri, cause of Black Stain Root Disease
Phwe- Phellinus weirii, cause of Laminated root rot

Table 17: Mean Basal Area (ft.^{2}/acre) of Western Larch Affected by Root Diseases by Ecotype In Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Pest Phsc	Into	Foan	Aros	Unkn				Sum	Total all larch/ Percent all larch affected
Abgr/Vame CW-S2-11	10	0.15			0.1					0.25	8.22 3.0%
Psme/Abgr/Cage CW-G1-11	7			0.09		0.07				0.16	4.24 3.8%
Abgr/Spbe CW-S3-21	5										4.28 0.0
Abla/Vame CE-S3-15	6	0.22	0.12	2.0	0.75					3.09	30.35 10.1%
Abgr/Vasc CW-S8-11	6				0.08	0.07				0.15	18.05 0.8%
Abgr/Libo CW-F3-11	5	0.14	0.16		0.16					0.46	9.72 4.7%
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5					0.34				0.34	1.48 23.0%
Abgr/Acgl CW-S9-12	2	0.4		0.75	1.4					2.55	6.7 38.1%
Abgr/Tabr/Clun CW-F4-22	2	0.4								0.4	12.0 3.3%
Pico/Vasc CL-S4-11	1										2.0 0.0
Pipo/Agsp CP-G1-11	1										10.0 0.0
Pipo-Psme/Syal/Osch CD-S6-11	1										0.0 0.0
Abgr/Caru CW-G1-12	2				0.35					0.35	11.05 3.2%
Abgr/Acgl/Phma CW-S4-12	1										4.0 0.0

N- Number of sampled stands
ECTY- statistical differences between ecotypes
unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease

Table 18: Mean Basal Area (ft.^{2}/acre) of Ponderosa Pine Affected by Root Diseases by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Root Diseases								Sum	Total all Ppine/ Percent all Ppine affected
		Phsc	Foan	Aros	Unkn						
Abgr/Vame CW-S2-11	10	0.07		0.78	0.34					1.19	25.46 4.7%
Psme/Abgr/Cage CW-G1-11	7									0.0	34.8
Abgr/Spbe CW-S3-21	5	0.12		1.76	0.12					2.0	60.82 3.3%
Abla/Vame CE-S3-15	6									0.0	0.0
Abgr/Vasc CW-S8-11	6									0.0	0.07
Abgr/Libo CW-F3-11	5									0.0	6.74
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5		0.16	0.12						0.28	46.18 0.6%
Abgr/Acgl CW-S9-12	2	0.25	0.25	0.5						1.0	4.0 25.0%
Abgr/Tabr/Clun CW-F4-22	2									0.0	2.85 0.0%
Pico/Vasc CL-S4-11	1									0.0	0.0
Pipo/Agsp CP-G1-11	1									0.0	117.6 0.0
Pipo-Psme/Syal/Osch CD-S6-11	1	0.6	0.6							1.2	48.5 2.5%
Abgr/Caru CW-G1-12	2		0.55	0.1	0.25					0.9	27.65 3.3%
Abgr/Acgl/Phma CW-S4-12	1									0.0	46.9 0.0

N- Number of sampled stands
unkn- unknown or unidentified root disease
Phsc- Phaeolus schweinitzii, cause of Brown Cubical Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease

Table 19: Mean Basal Area (ft.^{2}/acre) of Engelmann Spruce Affected by Root Diseases by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Root Diseases									Total all spruce/ Percent all spruce affected
		Into	Foan	Aros	Unkn					Sum	
Abgr/Vame CW-S2-11	10	1.56			0.05					1.61	19.35 8.3%
Psme/Abgr/Cage CW-G1-11	7									0.0	1.71
Abgr/Spbe CW-S3-21	5									0.0	0.0
Abla/Vame CE-S3-15	6	1.3	0.33	0.23	0.28					2.14	52.87 4.1%
Abgr/Vasc CW-S8-11	6	0.33		0.22	0.08					0.63	12.30 5.1%
Abgr/Libo CW-F3-11	5	1.12	0.28	0.44						1.84	29.34 6.3%
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5									0.0	0.0
Abgr/Acgl CW-S9-12	2		0.8		0.4					1.2	32.8 3.7%
Abgr/Tabr/Clun CW-F4-22	2	0.7		0.3						1.0	55.9 1.8%
Pico/Vasc CL-S4-11	1									0.0	16.4 0.0
Pipo/Agsp CP-G1-11	1									0.0	0.0
Pipo-Psme/Syal/Osch CD-S6-11	1									0.0	0.0
Abgr/Caru CW-G1-12	2									0.0	0.0
Abgr/Acgl/Phma CW-S4-12	1									0.0	0.0

N- Number of sampled stands
unkn- unknown or unidentified root disease
Into- Inonotus (Polyporus) tomentosus, cause of White Pocket Root and Butt Rot
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease

Table 20: Mean Basal Area ($ft.^2$/acre) of All Species Affected by Bark Beetles by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Bark Beetles									Total all trees/ Percent all trees affected
		Depo	Deps	Deru	Debr	IPS	Scve	Psse	Deva	Sum	
Abgr/Vame CW-S2-11	10	0.37	2.13	6.0	0.92	0.02	2.6	0.2	0.1	12.34	172.7 7.2%
Psme/Abgr/Cage CW-G1-11	7	4.73	1.37		1.60		2.29		0.09	10.09	125.84 8.0%
Abgr/Spbe CW-S3-21	5	1.12			2.04	1.64	2.7	0.46		7.96	123.66 6.4%
Abla/Vame CE-S3-15	6	2.2		2.28		0.07	1.82			6.37	210.95 3.0%
Abgr/Vasc CW-S8-11	6	8.03	3.55	0.8	0.13	0.13	8.95			21.59	152.87 14.1%
Abgr/Libo CW-F3-11	5	2.6	0.32	0.4	0.16		2.62	0.16		6.26	169.60 3.7%
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5	1.88	1.2		2.38	0.48	0.12	0.22	0.14	6.42	106.76 6.0%
Abgr/Acgl CW-S9-12	2	0.5		0.4			1.8			2.7	171.65 1.6%
Abgr/Tabr/Clun CW-F4-22	2		0.55				6.85			7.4	171.55 4.3%
Pico/Vasc CL-S4-11	1	32.0					2.8			34.8	148.0 23.5%
Pipo/Agsp CP-G1-11	1	24.0				0.4				24.4	145.2 16.8%
Pipo-Psme/Syal/Osch CD-S6-11	1	7.2			1.7	0.1			0.6	9.6	65.5 14.7%
Abgr/Caru CW-G1-12	2	1.8	0.2				0.3			2.3	149.3 1.5%
Abgr/Acgl/Phma CW-S4-12	1	1.7			2.3	0.6			2.9	7.5	145.4 5.2%

N- Number of sampled stands
Depo- Dendroctonus ponderosae- mountain pine beetle
Deps- D. pseudotsugae- Douglas-fir beetle
Deru- D. rufipennis- spruce beetle
Debr- D. brevicomis- western pine beetle
Ips- Ips sp.- Ips beetles
Scve- Scolytus ventralis- fir engraver
Psse- Pseudohylesinus sericeus, beetle
Deva- D. valens- red turpentine beetle

Table 21: Mean Basal Area ($ft.^2$/acre) of Grand Fir Affected by Stem Diseases and Bark Beetles in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Stem Diseases					Beetles	Total all fir
		Phpi	Ecti	Fopi*	Heab	Sum	Scve	
Abgr/Vame CW-S2-11	10	0.04	5.5	0.58	0.08	6.2	2.52	83.06
Psme/Abgr/Cage CW-G1-11	7		3.66	0.06		3.72	2.23	45.61
Abgr/Spbe CW-S3-21	5		2.44	0.4		2.84	2.70	35.78
Abla/Vame CE-S3-15	6		2.8	0.07	0.13	3.0	1.75	63.47
Abgr/Vasc CW-S8-11	6		11.62	0.35	0.12	12.09	8.95	80.40
Abgr/Libo CW-F3-11	5		6.03	0.13	0.22	6.38	2.62	69.90
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5						0.12	1.38
Abgr/Acgl CW-S9-12	2		3.65	1.2		4.85	1.8	87.6
Abgr/Tabr/Clun CW-F4-22	2		15.75	4.8		20.55	6.85	63.65
Pico/Vasc CL-S4-11	1		1.2			1.2	2.8	19.2
Pipo/Agsp CP-G1-11	1							
Pipo-Psme/Syal/Osch CD-S6-11	1							
Abgr/Caru CW-G1-12	2		1.0	0.2		1.2	0.3	84.10
Abgr/Acgl/Phma CW-S4-12	1							23.10

N- Number of sampled stands
* - Decay-causing saprophyte; Decay probably started when tree died
Phpi- Phellinus pini, Red Ring Rot
Ecti- Echinodontium tinctorium, Rust Red Stringy Rot
Fopi- Fomitopsis pinicola, Brown Crumbly Rot
Heab- Hericum abietis, Yellow Pitted Rot
Scve- Scolystis ventralis, fir engraver

Table 22: Mean Basal Area (ft.^{2}/acre) of Douglas-fir Affected by Dwarf Mistletoe, Stem Diseases and Bark Beetles by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

		Mistletoe	-------Stem Diseases--------				Beetles	
ECOTYPE	N	Ardo	Phpi	Foof	Fopi*	Heab	Deps	Total all D-fir
Abgr/Vame CW-S2-11	10	9.65	0.08		1.85	0.12	1.68	34.88
Psme/Abgr/Cage CW-G1-11	7	6.51		0.06	1.66		1.37	27.5
Abgr/Spbe CW-S3-21	5	1.46			1.18			22.4
Abla/Vame CE-S3-15	6	0.04			0.25			12.78
Abgr/Vasc CW-S8-11	6	4.38		0.14	4.62		3.30	23.45
Abgr/Libo CW-F3-11	5	4.68			2.52			50.1
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5	3.6		0.14	1.48		1.2	56.02
Abgr/Acgl CW-S9-12	2	1.7		0.25	3.2			39.65
Abgr/Tabr/Clun CW-F4-22	2	7.6			3.45		0.55	34.0
Pico/Vasc CL-S4-11	1	0.8						10.4
Pipo/Agsp CP-G1-11	1							4.4
Pipo-Psme/Syal/Osch CD-S6-11	1							16.9
Abgr/Caru CW-G1-12	2	8.05			0.4		0.2	19.6
Abgr/Acgl/Phma CW-S4-12	1	21.7					0.7	71.5

N- Number of sampled stands
* - Decay-causing saprophyte; Decay probably started when tree died
Ardo- Arceuthobium douglasii, Douglas-fir dwarf mistletoe
Phpi- Phellinus pini, Red Ring Rot
Foof- Fomitopsis officinalis, Brown Trunk Rot
Fopi- Fomitopsis pinicola, Brown Crumbly Rot
Heab- Hericum abietis, Yellow Pitted Rot
Deps- Dendroctonus pseudotsugae, Douglas-fir beetle

Table 23: Mean Basal Area (ft.^{2}/acre) of Western Larch Affected by Stem Diseases, Bark Beetles and Dwarf Mistletoe by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

		-----Arla----		----Deps----		----Foof----		----Fopi*----			
ECOTYPE	N	BA	%	BA	%	BA	%	BA	%		Total all larch
Abgr/Vame CW-S2-11	10	5.78	70.3%					0.67	8.2%		8.22
Psme/Abgr/Cage CW-G1-11	7	0.86	20.3%								4.24
Abgr/Spbe CW-S3-21	5	0.8	18.7%								4.28
Abla/Vame CE-S3-15	6	3.65	12.0%								30.35
Abgr/Vasc CW-S8-11	6	5.58	30.9%					2.9	16.1%		18.05
Abgr/Libo CW-F3-11	5	3.44	35.4%			0.16	1.7%	1.0	10.3%		9.72
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5	1.02	68.9%								1.48
Abgr/Acgl CW-S9-12	2	0.8	11.9%								6.7
Abgr/Tabr/Clun CW-F4-22	2	8.9	74.2%					4.85	40.4%		12.0
Pico/Vasc CL-S4-11	1	2.0	100%								2.0
Pipo/Agsp CP-G1-11	1	2.0	20.0%					0.8	8.0%		10.0
Pipo-Psme/Syal/Osch CD-S6-11	1										0.0
Abgr/Caru CW-G1-12	2	1.05	9.5%								11.05
Abgr/Acgl/Phma CW-S4-12	1	4.0	100%					0.6	15.0%		4.0

N- Number of sampled stands
* - Decay-causing saprophyte; Decay probably started when tree died
Arla- Arceuthobium laricis, Larch dwarf mistletoe
Phpi- Phellinus pini, Red Ring Rot
Foof- Fomitopsis officinalis, Brown Trunk Rot
Fopi- Fomitopsis pinicola, Brown Crumbly Rot
Deps- Dendroctonus pseudotsugae, Douglas-fir beetle

Table 24: Mean Basal Area (ft.^{2}/acre) of Ponderosa Pine Affected by Dwarf Mistletoe, Stem Diseases, and Bark Beetles by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

		Mistletoe	---Stem Diseases--			----------Bark Beetles----------					
ECOTYPE	N	Arca	Phpi	Fopi	Elde	Depo	Debr	IPS	Psse	Deva	Total all Ppine
Abgr/Vame CW-S2-11	10		0.08	0.08	1.7	0.13	0.92		0.2	0.1	25.46
Psme/Abgr/Cage CW-G1-11	7	0.16		0.23	0.17	1.24	1.60			0.9	34.80
Abgr/Spbe CW-S3-21	5			0.22	0.58	1.12	1.4	1.64	0.46		60.82
Abla/Vame CE-S3-15	6										
Abgr/Vasc CW-S8-11	6					0.07					0.07
Abgr/Libo CW-F3-11	5								0.16		6.74
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5	1.2	0.14		0.6	1.42	2.38	0.48	0.22	0.14	46.18
Abgr/Acgl CW-S9-12	2			0.4							4.4
Abgr/Tabr/Clun CW-F4-22	2										2.85
Pico/Vasc CL-S4-11	1										
Pipo/Agsp CP-G1-11	1	0.4				24.0		0.4			117.6
Pipo-Psme/Syal/Osch CD-S6-11	1	12.8				7.2	1.2	0.1		0.6	48.5
Abgr/Caru CW-G1-12	2	4.8		0.2	0.4	1.5					27.65
Abgr/Acgl/Phma CW-S4-12	1			1.7	32.0	1.7	2.3	0.6		2.9	46.9
Statistics						P<.001 Eco-type					

N- Number of sampled stands
Arca- Arceuthobium campylopodum, Western dwarf mistletoe
Depo- Dendroctonus ponderosae, Mountain pine beetle
IPS- Ips sp., Ips beetles
Depo- Dendroctonus ponderosae, Mountain pine beetle
Debr- D. brevicomis, Western Pine Beetle
Deva- D. valens, Red turpentine beetle
Psse- Pseudohylesinus sericeus, Beetle
Elde- Elytroderma deformans, Elytroderma needle blight
Phpi- Phellinus pini, Red Ring Rot

Table 25: Mean Basal Area (ft.^{2}/acre) of Engelmann Spruce Affected by Stem Diseases and Bark Beetles by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	----Deru---- BA	%	----Fopi*---- BA	%	Total all spruce
Abgr/Vame CW-S2-11	10	6.1	31.5%	0.28	1.5%	19.35
Psme/Abgr/Cage CW-G1-11	7					1.71
Abgr/Spbe CW-S3-21	5					0.0
Abla/Vame CE-S3-15	6	2.21	4.2%	0.28	0.5%	52.87
Abgr/Vasc CW-S8-11	6	0.8	6.5%	0.07	0.6%	12.17
Abgr/Libo CW-F3-11	5	0.4	1.4%	0.8	2.7%	29.34
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5					0.0
Abgr/Acgl CW-S9-12	2	0.4	1.2%	1.2	3.7%	32.8
Abgr/Tabr/Clun CW-F4-22	2			1.1	2.0%	55.9
Pico/Vasc CL-S4-11	1			0.4	2.4%	16.4
Pipo/Agsp CP-G1-11	1					0.0
Pipo-Psme/Syal/Osch CD-S6-11	1					0.0
Abgr/Caru CW-G1-12	2					0.0
Abgr/Acgl/Phma CW-S4-12	1					0.0

N- Number of sampled stands
* - Decay-causing saprophyte; Decay probably started when tree died
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Deru- Dendroctonus rufipennis, Spruce beetle
Fopi- Fomitopsis pinicola, Brown crumbly rot

Table 26: Mean Basal Area (ft.^{2}/acre) of Lodgepole Pine Affected by Root Diseases and Bark Beetles by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	----Root Diseases---- Foan	Aros	Unkn	Bark Beetles Depo	IPS	Total all lpp
Abgr/Vame CW-S2-11	10			0.08	0.24		1.43
Psme/Abgr/Cage CW-G1-11	7	0.06			3.48		8.74
Abgr/Spbe CW-S3-21	5						0.0
Abla/Vame CE-S3-15	6			0.23	2.2	0.07	14.73
Abgr/Vasc CW-S8-11	6	0.02		0.12	8.0	0.13	13.4
Abgr/Libo CW-F3-11	5				2.44		3.16
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5				0.46		0.58
Abgr/Acgl CW-S9-12	2		0.25		0.5		0.5
Abgr/Tabr/Clun CW-F4-22	2						3.25
Pico/Vasc CL-S4-11	1				32.0		90.4
Pipo/Agsp CP-G1-11	1						0.0
Pipo-Psme/Syal/Osch CD-S6-11	1						0.0
Abgr/Caru CW-G1-12	2		0.1	0.3			7.0
Abgr/Acgl/Phma CW-S4-12	1						0.0
Statistics					P<.001 Eco-type		

N- Number of sampled stands
unkn- unknown or unidentified root disease
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease
Depo- Dendroctonus ponderosae, Mountain pine beetle
IPS- Ips sp., Ips beetles

Table 27: Mean Basal Area (ft.^{2}/acre) of Lodgepole Pine Affected by Dwarf Mistletoe and Stem Diseases by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	Pest DM		Enha	Crco	Atpi	Fopi*	Elde			Total all lpp
Abgr/Vame CW-S2-11	10						0.14	0.07			1.43
Psme/Abgr/Cage CW-G1-11	7			0.11			0.11				8.74
Abgr/Spbe CW-S3-21	5										0.0
Abla/Vame CE-S3-15	6				0.07	1.23	0.18				14.73
Abgr/Vasc CW-S8-11	6	0.53				1.02	1.4				13.4
Abgr/Libo CW-F3-11	5	0.12		0.12			0.12				3.16
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5						0.34				0.58
Abgr/Acgl CW-S9-12	2										0.5
Abgr/Tabr/Clun CW-F4-22	2										3.25
Pico/Vasc CL-S4-11	1	1.2									90.4
Pipo/Agsp CP-G1-11	1										0.0
Pipo-Psme/Syal/Osch CD-S6-11	1										0.0
Abgr/Caru CW-G1-12	2										7.0
Abgr/Acgl/Phma CW-S4-12	1										0.0

N- Number of sampled stands
DM- Arceuthobium americanum, Lodgepole pine dwarf mistletoe
* - Decay-causing saprophyte; Decay probably started when tree died
Enha- Endrocronartium harknesii, Western gall rust
Crco- Cronartium comandrae, Comandra rust
Atpi- Atropellis piniphila, Atropellis canker
Fopi- Fomitopsis pinicola, Brown crumbly rot
Elde- Elytroderma deformans, Elytroderma blight

Table 28: Mean Basal Area ($ft.^2$/acre) of Subalpine fir Affected by Pests by Ecotype in Sampled Stands on the Wallowa-Whitman National Forest

ECOTYPE	N	-----Root Diseases--- Foan	Aros	Unkn	-----Stem Diseases------- Phpi	Ecti	Fopi*	Heab	Scve	Beetles		Total all SAF
Abgr/Vame CW-S2-11	10											0.3
Psme/Abgr/Cage CW-G1-11	7			0.2					0.06			2.09
Abgr/Spbe CW-S3-21	5											0.0
Abla/Vame CE-S3-15	6	0.88	1.68	0.88	0.07	0.12	1.02	0.07	0.07			36.2
Abgr/Vasc CW-S8-11	6		0.28	0.27			0.07					5.2
Abgr/Libo CW-F3-11	5						0.16					0.68
Psme/Syal CW-S6-22 Psme/Spbe CD-S6-34 Psme/Phma CD-S7-11	5											0.0
Abgr/Acgl CW-S9-12	2											0.0
Abgr/Tabr/Clun CW-F4-22	2											0.0
Pico/Vasc CL-S4-11	1			0.4			0.8					9.6
Pipo/Agsp CP-G1-11	1											0.0
Pipo-Psme/Syal/Osch CD-S6-11	1											0.0
Abgr/Caru CW-G1-12	2											0.0
Abgr/Acgl/Phma CW-S4-12	1											0.0

N- Number of sampled stands
* - Decay-causing saprophyte; Decay probably started when tree died
unkn- unknown or unidentified root disease
Foan- Fomes annosus, cause of Annosus Root and Butt Rot
Aros- Armillaria ostoyae, cause of Armillaria Root Disease
Phpi- Phellinus pini, Red Ring Rot
Ecti- Echinodontium tinctorium, Rust Red Stringy Rot
Fopi- Fomitopsis pinicola, Brown Crumbly Rot
Heab- Hericum abietis, Yellow Pitted Rot
Scve- Scolystis ventralis, fir engraver

Table 29:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and No Harvest Entries (A1) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	403.13	100.00	-	-	100.00	192.86	100.00	-	173.91	100.00
6	40.19	0.34	-	-	0.68	2.87	0.68	-	5.23	0.34
8	21.83	-	-	-	0.87	0.47	1.52	-	1.95	1.36
10	15.10	-	-	-	1.23	-	0.30	-	1.33	0.65
12	9.64	0.09	0.09	-	0.68	0.55	0.46	-	0.45	0.60
14	9.50	-	0.09	0.06	0.75	0.31	0.25	-	0.45	0.70
16	6.88	0.19	0.05	-	0.54	0.39	0.19	-	0.62	0.59
18	3.98	0.08	0.09	0.08	0.24	0.19	0.12	-	0.17	0.18
20	2.78	0.06	0.06	-	0.12	0.06	0.06	-	0.15	0.16
22	1.94	-	-	0.08	0.10	0.15	0.06	-	0.25	0.20
24	2.31	-	0.02	0.04	0.07	0.10	0.19	-	0.19	0.15
26	1.53	0.02	-	0.04	0.09	0.13	0.12	-	0.09	0.14
28	1.28	0.03	0.02	-	-	0.13	0.06	-	0.08	0.09
30	1.47	-	0.03	-	0.03	0.05	0.10	-	0.08	0.07
32	0.68	0.01	-	0.01	0.04	0.02	0.02	-	0.04	0.07
34	0.88	-	0.03	-	-	0.02	0.06	-	0.05	0.01
36	0.36	-	-	0.02	0.01	0.02	0.02	-	0.01	0.01
38	0.19	0.01	0.01	-	0.01	0.01	0.03	-	0.03	0.03
40	0.26	-	-	-	0.01	-	0.03	-	-	0.03
42	0.06	-	-	-	0.01	-	0.01	-	0.02	0.02
44	0.13	-	-	-	-	-	-	-	0.04	0.02
46	-	-	-	-	0.01	-	-	-	-	0.01
48	0.04	-	-	-	-	-	0.01	-	-	-
50	-	-	-	-	-	-	0.01	-	0.01	-
52	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	0.01	-
TOTAL 6 INCHES AND OVER	121.03	0.83	0.49	0.33	5.49	5.47	4.30	-	11.25	5.43

Table 30:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and One Harvest Entry (A2) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	258.29	-	-	4.00	-	5.71	-	-	62.29	14.00
6	26.68	-	-	1.36	0.97	1.94	0.49	-	2.33	1.17
8	19.11	-	0.93	0.55	-	0.82	0.38	-	4.40	2.79
10	9.43	-	-	0.18	1.38	0.70	0.42	-	3.13	1.78
12	10.31	0.12	-	0.66	1.27	0.21	0.17	-	2.21	2.10
14	13.62	-	-	0.77	0.72	0.21	0.31	-	0.78	1.11
16	8.60	0.10	-	-	0.49	0.44	0.10	-	0.29	0.59
18	3.93	-	-	0.16	0.31	-	0.09	-	0.26	0.46
20	2.84	0.06	-	0.12	0.23	0.13	0.07	-	-	0.41
22	3.03	-	-	0.18	0.33	0.04	0.07	-	0.11	0.40
24	1.21	-	0.06	0.09	0.17	-	-	-	0.05	0.13
26	1.88	-	-	0.03	0.04	0.03	0.10	-	0.04	0.08
28	1.57	-	0.03	0.15	0.02	0.08	0.05	-	0.04	0.04
30	0.37	-	0.05	0.14	0.02	0.03	0.02	-	0.03	0.02
32	0.57	-	-	0.17	-	0.03	0.02	-	0.02	-
34	0.26	-	-	0.09	-	-	-	-	0.02	-
36	0.26	-	-	0.03	0.03	0.01	-	-	0.01	-
38	0.15	-	0.01	-	-	-	-	-	-	-
40	0.11	-	0.01	-	0.01	-	-	-	-	0.01
42	0.07	-	-	-	0.01	-	0.01	-	-	0.01
44	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-	-
48	0.05	-	-	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-	-	-	-
52	0.05	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	0.04	-
TOTAL 6 INCHES AND OVER	104.10	0.28	1.09	4.68	6.00	4.67	2.30	-	13.73	11.10

Table 31:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and Two or More Harvest Entries (A3) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	244.15	-	-	7.71	2.00	2.78	10.00	-	154.55	52.00
6	38.41	0.57	-	0.57	2.78	0.57	0.57	-	9.78	4.76
8	16.55	0.32	-	-	2.24	-	0.32	-	5.10	3.30
10	11.12	0.12	-	-	0.24	0.12	0.73	-	2.71	1.25
12	16.79	0.09	-	0.14	0.58	0.26	0.31	-	2.39	1.01
14	8.67	0.06	-	-	0.62	0.12	0.23	-	0.58	0.70
16	5.68	-	-	0.08	0.44	0.13	0.19	-	0.50	0.44
18	2.95	-	0.04	0.04	0.50	0.04	0.10	-	0.18	0.61
20	3.67	-	0.03	-	0.03	-	0.04	-	-	0.03
22	0.63	-	-	-	0.13	-	-	-	0.03	0.15
24	0.83	-	-	0.06	0.04	-	0.02	-	-	0.07
26	0.78	-	-	0.03	0.07	0.02	0.03	-	0.03	0.07
28	0.62	-	0.02	-	-	-	-	-	-	-
30	0.26	-	-	-	-	0.02	-	-	0.01	0.01
32	0.29	-	-	-	0.02	0.02	-	-	-	0.01
34	0.26	-	-	-	0.02	0.01	-	-	0.03	0.01
36	0.13	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	107.64	1.16	0.09	0.92	7.71	1.31	2.54	-	21.34	12.42

Table 32:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Fir Overstories and no Harvest Entries (B1) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	949.67	-	2.00	-	2.50	42.33	8.67	-	692.67	25.00
6	64.23	-	-	-	0.77	2.60	2.89	-	17.08	2.30
8	32.79	-	-	-	0.19	1.39	1.26	-	5.24	1.67
10	28.62	0.20	0.12	-	0.33	0.86	1.05	-	5.00	1.37
12	11.46	-	0.26	-	0.51	0.67	0.71	-	3.96	1.41
14	13.10	0.06	0.06	-	0.19	0.54	0.80	0.12	1.87	0.70
16	9.97	0.05	0.14	-	0.27	0.56	0.76	0.10	1.99	1.24
18	8.26	-	-	-	0.39	0.59	0.39	-	1.22	0.69
20	5.35	-	-	-	0.31	0.21	0.18	-	1.03	0.51
22	3.21	-	0.20	-	0.20	0.31	0.50	-	0.70	0.56
24	2.69	-	0.07	-	0.09	0.14	0.28	-	0.51	0.22
26	2.66	0.02	0.23	-	0.12	0.15	0.22	-	0.45	0.25
28	1.06	-	0.05	-	0.05	0.05	0.20	-	0.30	0.16
30	0.61	-	0.05	-	0.14	0.11	0.24	-	0.27	0.23
32	0.18	-	0.03	-	-	0.04	0.11	-	0.02	0.01
34	0.24	0.01	0.01	-	-	0.02	0.09	-	0.02	0.03
36	0.21	-	0.04	-	-	0.02	0.05	-	0.03	0.02
38	-	-	0.01	-	0.01	0.07	0.09	-	0.03	-
40	-	-	-	-	-	-	0.01	-	0.03	0.02
42	-	-	-	-	-	0.01	0.01	-	-	-
44	-	-	-	-	0.01	-	-	-	-	0.01
46	-	-	-	-	-	0.02	0.01	-	-	-
48	-	-	-	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-	-	-	-
52	0.05	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	184.69	0.34	1.27	-	3.58	8.36	9.85	0.22	39.75	11.40

Table 33:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Tir Overstories and One Harvest Entry (B2) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	1893.48	8.67	-	13.33	3.33	74.37	-	3.33	593.70	16.00
6	49.23	-	-	-	2.23	3.08	0.63	-	8.85	2.91
8	29.92	-	-	-	0.19	1.02	1.76	-	5.88	1.15
10	26.48	0.12	-	-	-	0.76	0.12	-	2.82	0.37
12	18.67	0.09	0.31	-	0.17	0.75	0.87	-	2.91	0.99
14	13.93	0.10	-	-	-	0.81	0.19	-	0.66	0.19
16	7.16	-	-	-	0.05	0.58	0.13	-	0.50	0.19
18	3.97	-	0.13	-	-	0.04	0.10	-	0.53	0.19
20	7.74	-	0.18	-	0.09	0.12	0.30	-	0.22	0.21
22	3.08	-	0.05	-	-	0.12	0.25	-	0.16	0.03
24	1.84	-	0.02	-	-	0.07	0.13	-	0.22	-
26	1.59	-	0.09	-	-	0.10	0.11	-	0.02	0.02
28	0.94	-	-	-	-	0.03	0.13	-	0.08	0.04
30	0.41	-	0.01	-	0.03	0.01	0.03	-	0.04	0.03
32	0.48	-	0.04	-	-	0.04	0.14	-	0.02	0.06
34	0.30	-	0.02	-	0.01	0.02	0.03	-	0.02	0.03
36	0.10	-	-	-	-	0.01	0.05	-	0.01	0.01
38	0.26	-	0.03	-	-	-	0.02	-	-	-
40	0.15	-	-	-	-	0.01	0.04	-	-	-
42	0.28	-	-	-	-	-	-	-	-	-
44	0.06	0.01	0.01	-	0.01	-	-	-	-	0.01
46	-	-	-	-	-	-	-	-	-	-
48	0.05	-	-	-	-	-	0.01	-	-	-
50	-	-	-	-	-	-	-	-	-	-
52	0.05	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	117.46	0.32	0.89	-	2.78	7.57	5.04	-	22.94	6.43

Table 34:
Mean Number of Trees/Acre by Condition and Damaging Dest for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Fir Overstories and Two or More Harvest Entries (B3) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	1253.43	4.00	4.00	8.00	21.86	4.00	8.00	-	235.36	12.00
6	72.15	0.34	-	1.36	1.70	1.89	-	-	8.16	1.02
8	16.23	-	-	-	1.53	1.96	0.77	-	7.94	0.43
10	11.92	-	-	0.25	0.74	0.31	0.73	-	4.67	0.73
12	18.25	0.09	0.77	0.17	0.51	0.98	0.17	-	2.13	0.79
14	7.64	-	0.20	0.13	0.50	0.39	0.41	-	1.00	0.78
16	8.44	0.09	0.37	-	0.28	0.19	0.64	-	0.69	0.29
18	5.56	0.04	0.42	-	0.20	0.26	0.31	-	0.65	0.28
20	5.72	0.06	0.50	-	0.16	0.06	0.49	-	0.26	0.19
22	1.84	-	0.13	-	0.16	0.11	0.24	-	0.12	0.18
24	1.06	-	0.11	-	0.11	0.08	0.15	-	0.10	0.11
26	0.90	-	0.11	-	0.02	0.02	0.14	-	0.07	0.02
28	0.59	-	0.06	-	-	0.03	0.08	-	0.03	0.02
30	-	-	0.04	-	-	0.03	0.03	-	0.03	0.03
32	-	-	-	-	-	0.02	0.04	-	0.04	0.02
34	-	-	0.02	-	-	-	0.03	-	-	-
36	-	-	0.02	-	-	-	-	-	-	-
38	-	-	-	-	-	0.01	0.01	-	-	-
40	-	-	-	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	0.02	-	-	-
48	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	150.30	0.62	2.75	1.91	5.91	6.34	4.26	-	25.89	4.89

Table 35:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and No Harvest Entries (C1) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	544.71	9.53	13.33	-	48.57	28.67	12.57	-	293.33	19.67
6	37.67	0.91	-	-	-	3.23	1.51	-	3.06	3.00
8	39.85	-	0.48	-	0.67	1.57	0.58	-	2.97	1.26
10	22.41	0.24	0.20	-	0.66	0.60	0.89	-	1.74	1.37
12	13.30	-	0.09	-	0.59	0.29	0.76	-	1.34	1.31
14	12.50	0.10	-	-	0.78	0.69	1.00	-	1.06	2.04
16	12.59	-	-	-	0.57	0.05	0.42	-	0.96	1.40
18	6.57	-	0.17	0.10	0.48	0.23	0.49	-	0.63	1.02
20	5.40	0.08	0.04	0.08	0.41	0.13	0.33	-	0.42	0.68
22	2.85	-	0.05	-	0.48	0.22	0.31	-	0.35	0.85
24	1.82	-	0.05	-	0.16	0.10	0.17	-	0.54	0.65
26	1.97	-	0.16	-	0.25	0.09	0.30	-	0.11	0.44
28	1.53	-	0.11	-	0.19	0.05	0.30	-	0.14	0.34
30	0.48	-	0.07	0.01	0.03	0.09	0.08	-	0.12	0.15
32	0.71	-	0.03	-	0.04	0.05	0.10	-	0.08	0.10
34	0.37	-	0.04	-	0.03	0.05	0.11	-	0.03	0.06
36	0.16	-	-	-	-	0.02	0.12	-	0.01	0.04
38	0.16	-	-	-	0.01	-	0.05	-	0.01	0.03
40	0.08	-	0.02	-	-	0.01	0.04	-	0.01	0.03
42	-	-	0.01	-	0.01	-	0.01	-	0.01	0.01
44	-	-	0.02	-	-	-	0.01	-	-	-
46	-	-	-	-	-	-	-	-	0.01	-
48	0.11	-	-	-	-	0.01	0.01	0.01	-	-
50	-	-	-	-	-	-	-	-	-	-
52	-	-	0.01	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	160.53	1.33	1.54	0.10	5.36	2.48	7.56	0.01	13.60	14.78

Table 36:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and One Harvest Entry (C2) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	686.47	2.50	2.86	-	39.43	14.50	5.71	-	286.67	65.14
6	38.76	-	1.46	-	1.80	-	0.97	-	3.29	3.59
8	20.05	0.24	-	-	1.37	1.89	-	-	3.20	2.38
10	16.91	0.15	0.53	-	1.17	1.04	0.68	0.12	1.93	1.99
12	17.87	-	0.12	-	0.33	0.41	0.12	0.09	1.29	0.66
14	10.90	-	0.19	-	1.03	0.20	0.18	-	0.56	1.12
16	6.03	-	0.19	-	0.46	0.26	0.10	-	0.33	0.69
18	6.03	-	0.16	-	0.31	0.10	0.19	-	0.08	0.31
20	4.37	0.01	-	0.04	0.12	0.10	0.18	-	0.22	0.28
22	2.58	-	0.04	-	0.05	0.10	0.16	-	0.03	0.05
24	0.78	-	0.09	0.06	0.05	0.06	0.12	-	0.13	0.08
26	1.48	-	0.09	0.03	0.09	-	0.05	-	0.05	0.10
28	0.42	-	0.04	0.04	0.02	0.04	0.06	-	0.06	0.02
30	0.46	-	0.07	0.04	0.03	-	0.08	-	0.03	0.05
32	0.22	-	-	0.02	0.06	0.01	0.04	-	-	0.06
34	0.09	-	0.03	0.05	0.01	0.02	0.04	-	0.01	0.01
36	-	-	-	-	-	0.13	0.04	-	0.01	-
38	0.14	-	0.02	-	0.01	-	0.03	-	0.01	0.02
40	0.08	-	0.06	-	0.01	-	0.04	-	-	0.01
42	-	-	0.02	-	0.01	0.01	0.01	-	-	0.01
44	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	127.17	0.43	3.11	0.28	6.93	4.37	3.09	0.21	11.23	11.43

Table 37:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and Two or More Harvest Entries (C3) - All Tree Species

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	618.76	-	27.00	-	-	55.86	11.43	-	296.30	99.71
6	42.68	-	-	0.49	0.34	1.42	0.68	0.49	11.47	2.87
8	21.56	0.54	-	-	0.38	1.31	1.15	0.80	4.08	1.81
10	16.24	0.52	0.18	-	0.30	1.30	1.01	-	2.71	1.12
12	12.13	-	-	-	0.29	0.95	0.62	-	1.48	1.16
14	14.03	0.69	-	-	0.21	0.62	0.93	0.09	0.82	0.67
16	9.15	-	0.07	-	0.10	0.57	0.75	-	0.29	0.34
18	6.25	0.16	0.04	-	0.04	0.36	0.31	-	0.32	0.25
20	2.53	0.08	0.12	-	0.17	0.21	0.16	-	0.09	0.20
22	1.77	0.04	0.09	-	0.11	0.12	0.24	-	0.08	0.13
24	1.18	-	-	-	0.08	0.14	0.26	-	0.04	0.12
26	0.26	-	0.06	-	-	0.08	0.09	-	0.03	-
28	0.22	-	0.02	-	0.02	0.05	0.13	-	0.02	0.02
30	0.37	-	0.01	-	-	0.02	0.10	-	0.03	0.01
32	0.12	0.01	-	-	-	-	0.02	-	-	-
34	-	-	-	-	-	-	0.01	-	-	-
36	-	-	-	-	-	-	0.03	-	-	-
38	-	-	0.01	-	-	-	0.01	-	-	-
40	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	128.49	2.40	0.60	0.49	2.04	7.15	6.50	1.38	21.46	8.70

Table 38:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and No Harvest Entries (A1) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKERS	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	394.74	200.00	-	-	-	200.00	-	-	85.71	-
6	10.19	0.68	-	-	-	2.53	-	-	0.83	-
8	3.82	-	-	-	0.18	-	-	-	0.19	-
10	3.06	-	-	-	-	-	0.12	-	-	-
12	2.12	0.09	-	-	-	0.26	0.17	-	-	-
14	1.25	-	-	-	-	0.19	0.06	-	-	-
16	1.67	0.15	-	-	0.07	0.10	0.05	-	-	-
18	0.57	0.04	-	-	-	0.04	0.08	-	0.04	-
20	0.61	-	-	-	-	0.03	0.03	-	-	-
22	0.51	-	-	-	-	0.05	0.03	-	-	-
24	0.21	-	-	-	-	0.02	0.04	-	-	-
26	0.27	-	-	-	-	0.04	0.02	-	-	-
28	0.24	0.02	-	-	-	0.03	0.03	-	-	-
30	0.14	-	-	-	-	0.03	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-
34	0.11	-	-	-	-	0.01	0.01	-	-	-
36	0.05	-	-	-	-	-	-	-	-	-
38	-	0.01	0.01	-	-	-	0.01	-	-	-
40	-	-	-	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-	-	-	-
44	0.06	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-	-
48	-	-	-	-	-	-	0.01	-	-	-
50	-	-	-	-	-	-	-	-	0.01	-
52	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	0.01	-	-	-
TOTAL 6 INCHES AND OVER	24.88	0.99	0.02	-	0.25	3.33	0.67	-	1.07	-

Table 39:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and One Harvest Entry (A2) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	167.43	-	-	-	-	-	-	-	4.00	-
6	4.85	-	-	-	-	-	-	-	-	-
8	6.01	-	-	-	-	-	-	-	-	-
10	3.32	-	-	-	-	-	0.25	-	-	-
12	0.85	0.12	-	-	-	-	-	-	-	-
14	2.32	-	-	-	-	0.13	0.19	-	0.06	-
16	2.11	-	-	-	-	0.14	0.05	-	-	-
18	-	-	-	-	-	-	0.05	-	-	-
20	-	-	-	-	-	0.04	-	-	-	-
22	0.18	-	-	-	-	-	-	-	-	-
24	-	-	0.06	-	-	-	-	-	-	-
26	0.18	-	-	-	-	0.03	0.08	-	-	-
28	0.11	-	0.03	-	-	-	0.02	-	0.02	-
30	-	-	0.03	-	-	-	0.02	-	-	-
32	-	-	-	-	-	0.02	-	-	0.02	-
34	0.05	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	0.01	-	-	0.01	-
38	0.06	-	0.01	-	-	-	-	-	-	-
40	-	-	0.01	-	-	-	-	-	-	-
42	0.07	-	-	-	-	-	0.01	-	-	-
44	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	20.21	0.12	0.14	-	-	0.37	0.67	-	0.11	-

Table 40:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and Two or More Harvest Entries (A3) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	112.96	2.00	-	-	-	-	-	-	36.10	-
6	16.58	0.57	-	-	-	1.13	-	-	-	-
8	8.05	0.32	-	-	-	0.32	-	-	0.32	-
10	2.50	-	-	-	-	-	-	-	-	-
12	3.80	-	-	-	-	0.26	0.23	-	0.09	-
14	3.21	-	-	-	-	0.06	0.06	-	-	-
16	1.53	-	-	-	-	0.08	0.05	-	0.05	-
18	0.46	-	0.04	-	-	-	0.04	-	-	-
20	0.22	-	0.03	-	-	-	-	-	-	-
22	0.13	-	-	-	-	-	-	-	-	-
24	0.15	-	-	-	-	-	-	-	-	-
26	0.13	-	-	-	-	-	-	-	-	-
28	-	-	0.02	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	0.02	-
36	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	36.76	0.89	0.09	-	-	1.85	0.38	-	0.48	-

Table 41:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Fir Overstories and No Harvest Entries (B1) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	655.50	-	2.00	-	-	19.00	-	-	401.50	-
6	23.77	-	-	-	-	1.36	0.68	-	1.78	-
8	7.16	-	-	-	-	0.19	-	-	0.19	-
10	7.95	-	0.12	-	-	0.61	-	-	0.12	-
12	3.61	-	0.26	-	-	0.19	0.09	-	0.33	-
14	3.12	-	0.06	-	-	0.13	0.11	-	-	-
16	3.82	-	0.14	-	-	0.29	0.35	-	0.05	-
18	2.73	-	-	-	-	0.45	0.19	-	0.09	-
20	1.99	-	-	-	-	0.06	0.12	-	-	-
22	1.01	-	0.20	-	-	0.15	0.25	-	0.03	-
24	1.17	-	0.04	-	-	0.14	0.15	-	0.06	-
26	2.17	0.02	0.23	-	-	0.15	0.10	-	0.02	-
28	0.59	-	0.05	-	-	0.03	0.08	-	0.02	-
30	0.61	-	0.04	-	-	0.08	0.16	-	0.02	-
32	0.12	-	0.03	-	-	0.04	0.10	-	-	-
34	0.13	-	0.01	-	-	0.01	0.06	-	-	-
36	0.21	-	0.04	-	-	0.02	0.02	-	-	-
38	-	-	0.02	-	0.01	0.05	0.08	-	-	-
40	-	-	-	-	-	-	0.01	-	-	-
42	-	-	-	-	-	0.01	0.01	-	-	-
44	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	0.02	0.01	-	-	-
48	-	-	-	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-	-	-	-
52	0.01	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	60.17	0.02	1.24	-	0.01	3.98	2.57	-	2.71	-

Table 42:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Fir Overstories and One Harvest Entry (B2) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	1115.86	5.33	-	-	3.33	37.33	-	-	245.56	-
6	27.16	-	-	-	-	1.26	-	-	4.26	-
8	13.37	-	-	-	-	-	0.90	-	1.47	-
10	13.04	0.12	-	-	-	0.23	-	-	0.41	-
12	7.92	0.09	0.31	-	-	0.51	0.09	-	1.08	-
14	5.61	-	-	-	-	0.41	0.19	-	0.06	-
16	4.13	-	-	-	-	0.21	0.05	-	0.05	-
18	1.07	-	0.07	-	-	0.08	-	-	0.11	-
20	3.77	-	0.18	-	-	0.12	0.06	-	0.03	-
22	1.01	-	0.05	-	-	0.09	0.19	-	0.09	-
24	0.96	-	-	-	-	0.04	0.02	-	0.08	-
26	0.72	-	0.09	-	-	0.10	0.07	-	-	-
28	0.63	-	-	-	-	0.03	0.05	-	-	-
30	0.45	-	0.01	-	-	0.01	-	-	0.01	-
32	0.48	-	0.01	-	-	0.02	0.06	-	-	-
34	-	-	-	-	-	0.02	0.03	-	-	-
36	0.10	-	-	-	-	0.01	0.01	-	-	-
38	0.17	-	0.02	-	-	-	-	-	-	-
40	0.08	-	-	-	-	0.01	0.04	-	-	-
42	0.28	-	-	-	-	-	-	-	-	-
44	0.06	0.01	0.01	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-	-
48	0.05	-	-	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	81.06	0.22	0.75	-	-	3.15	1.76	-	7.65	-

Table 43:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Fir Overstories and Two or More Harvest Entries (B1) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	660.79	-	4.00	-	21.86	-	4.00	-	165.21	-
6	21.22	0.34	-	-	0.68	1.89	-	-	1.36	-
8	10.50	-	-	-	0.76	1.34	0.38	-	1.53	-
10	5.50	-	-	-	-	0.31	-	-	0.52	-
12	13.58	-	0.77	-	0.17	0.98	-	-	-	-
14	3.90	-	0.20	-	-	0.39	0.13	-	0.11	-
16	3.93	0.09	0.37	-	0.10	0.11	0.19	-	0.15	-
18	1.98	0.04	0.42	-	0.08	0.26	0.11	-	0.07	-
20	1.91	0.06	0.50	-	-	0.06	0.27	-	0.06	-
22	1.08	-	0.13	-	-	0.11	0.14	-	0.05	-
24	0.85	-	0.11	-	0.04	0.04	0.07	-	0.04	-
26	0.36	-	0.11	-	-	0.02	0.10	-	-	-
28	0.20	-	0.06	-	-	-	0.03	-	-	-
30	-	-	0.04	-	-	0.03	-	-	-	-
32	-	-	-	-	-	0.02	0.04	-	-	-
34	-	-	0.02	-	-	-	0.01	-	-	-
36	-	-	0.02	-	-	-	-	-	-	-
38	-	-	-	-	-	0.01	0.01	-	-	-
40	-	-	-	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	0.02	-	-	-
48	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	65.01	0.53	2.75	-	1.83	5.57	1.50	-	3.89	-

Table 44:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and No Harvest Entries (C1) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	459.24	2.86	-	-	45.71	22.00	9.71	-	235.29	-
6	24.66	0.91	-	-	-	3.23	0.34	-	0.68	-
8	25.83	-	0.48	-	-	1.29	0.19	-	0.32	-
10	15.48	-	-	-	-	0.60	0.47	-	0.12	-
12	10.75	-	0.09	-	-	0.17	0.38	-	0.46	-
14	8.22	-	-	-	-	0.15	0.35	-	-	-
16	6.56	-	-	-	-	0.05	0.29	-	-	-
18	5.50	-	0.17	-	0.04	0.28	0.04	-	0.08	-
20	3.23	-	0.04	-	-	0.03	0.25	-	0.12	-
22	1.73	-	0.05	-	-	0.15	0.20	-	-	-
24	1.38	-	-	-	-	0.07	0.13	-	-	-
26	1.21	-	0.16	-	-	0.04	0.15	-	0.04	-
28	1.27	-	0.11	-	-	0.08	0.20	-	0.03	-
30	-	-	0.07	-	-	0.07	0.07	-	0.01	-
32	0.12	-	0.03	-	-	0.05	0.06	-	-	-
34	-	-	0.04	-	-	0.06	0.06	-	0.02	-
36	-	-	-	-	-	0.02	0.08	-	-	-
38	-	-	-	-	-	-	0.03	-	0.01	-
40	-	-	0.02	-	-	0.01	0.05	-	-	-
42	-	-	0.01	-	-	-	0.01	-	-	-
44	-	-	0.02	-	-	-	0.01	-	-	-
46	-	-	-	-	-	-	-	-	0.01	-
48	-	-	-	-	-	0.01	0.01	-	-	-
50	-	-	-	-	-	-	-	-	-	-
52	-	-	0.01	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	105.94	0.91	1.30	-	0.04	6.36	3.37	-	1.90	-

Table 45:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and One Harvest Entry (C2) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	530.07	2.50	2.86	-	-	9.50	-	-	177.87	-
6	32.54	-	1.46	-	-	-	-	-	-	-
8	13.13	0.24	-	-	-	0.72	-	-	0.27	-
10	6.98	0.15	0.53	-	-	-	0.12	-	-	-
12	8.34	-	0.12	-	-	0.21	-	-	0.39	-
14	5.37	-	0.09	-	-	0.12	-	-	0.19	-
16	2.31	-	0.19	-	-	0.26	0.05	-	0.07	-
18	1.68	-	0.16	-	-	0.10	0.09	-	-	-
20	2.92	-	0.04	-	-	0.10	0.05	-	-	-
22	1.45	-	-	-	-	0.10	0.04	-	-	-
24	-	-	0.06	-	-	0.06	0.04	-	-	-
26	0.28	-	0.03	-	-	-	0.03	-	0.03	-
28	0.42	-	0.04	-	-	0.03	-	-	0.03	-
30	0.21	-	0.04	-	-	-	0.01	-	-	-
32	-	-	-	-	-	0.01	-	-	-	-
34	0.09	-	0.03	-	-	0.02	0.02	-	-	-
36	-	-	-	-	-	0.04	0.07	-	-	-
38	-	-	0.02	-	-	-	0.03	-	-	-
40	0.08	-	0.04	-	-	-	0.02	-	-	-
42	-	-	0.02	-	-	0.01	0.01	-	-	-
44	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	75.80	0.39	2.87	-	-	1.78	0.58	-	0.98	-

Table 46:
Mean Number of Trees/Acre by Condition and Damaging Pest for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and Two or More Harvest Entries (C3) - True Fir Species Only

DBH Class (Inches)	HEALTHY	LIVE-INFECTED				DEAD				MISTLETOE INFECTED
		ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	ROOT DISEASE	STEM DISEASE	STEM CANKER	UNKNOWN	
< 6 INCHES	474.47	24.22	-	-	-	43.53	2.86	-	110.10	-
6	26.68	-	-	-	-	0.47	-	-	1.02	-
8	11.19	0.54	-	-	-	1.11	0.38	-	0.66	-
10	9.43	0.35	0.18	-	-	0.89	0.42	-	0.59	-
12	5.94	-	-	-	-	0.87	0.29	-	0.24	-
14	9.70	0.09	-	-	0.09	0.56	0.31	-	0.09	-
16	5.53	-	0.07	-	-	0.57	0.44	-	0.05	-
18	2.64	0.16	0.04	-	-	0.28	0.23	-	0.04	-
20	0.74	0.08	0.09	-	-	0.13	0.13	-	0.03	-
22	0.61	0.04	0.05	-	-	0.09	0.20	-	-	-
24	0.30	-	-	-	0.03	0.14	0.15	-	-	-
26	0.26	-	0.06	-	-	0.08	0.07	-	-	-
28	-	-	0.02	-	0.02	0.04	0.08	-	-	-
30	-	-	0.01	-	-	0.02	0.05	-	-	-
32	-	-	-	-	-	-	0.02	-	-	-
34	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	0.02	-	-	-
38	-	-	0.01	-	-	-	0.01	-	-	-
40	-	-	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	73.02	1.26	0.53	-	0.14	5.25	2.80	-	2.72	-

Table 47:

Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and No Harvest Entries (A1) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	-	-	-	-	-	-	-	-
6	0.34	-	-	-	-	0.34	-	-
8	0.55	-	-	-	-	-	-	-
10	0.18	-	-	-	-	0.12	-	-
12	0.21	0.09	-	-	-	0.21	-	-
14	-	0.30	-	-	-	0.19	-	-
16	-	0.19	-	0.38	-	0.05	-	-
18	-	0.04	-	0.19	-	-	0.09	-
20	-	-	-	0.09	-	0.03	0.03	-
22	-	0.05	-	0.11	-	0.05	-	-
24	0.04	0.12	-	0.02	-	0.02	-	-
26	0.02	0.06	-	0.02	-	0.04	0.04	-
28	0.02	0.07	-	0.05	-	0.03	-	-
30	0.02	0.04	-	0.10	-	-	-	-
32	-	0.02	-	0.01	-	-	-	-
34	0.02	-	-	0.02	-	0.02	-	-
36	-	-	-	0.02	-	-	-	-
38	-	0.02	-	0.02	-	0.02	0.01	-
40	-	0.03	-	-	-	-	-	-
42	-	0.01	-	0.03	-	-	-	-
44	-	0.01	-	0.01	-	-	-	0.06
46	-	0.01	-	-	-	-	-	-
48	-	-	-	-	-	0.01	-	-
50	-	-	-	0.01	-	0.01	-	-
52	-	-	-	-	-	-	-	-
54	-	-	-	-	-	0.01	-	-
TOTAL 6 INCHES AND OVER	1.40	1.06	-	1.08	-	1.15	0.19	0.01

Table 48:
Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and One Harvest Entry (A2) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	-	-	-	-	2.86	-	-	-
6	0.68	-	-	-	1.80	-	-	0.49
8	1.15	-	-	1.04	1.29	-	-	-
10	1.01	-	-	1.07	0.88	-	0.25	0.53
12	0.55	-	-	0.88	0.33	-	-	0.12
14	0.13	-	-	0.18	-	0.25	-	0.09
16	0.05	-	-	0.12	-	0.05	-	-
18	-	-	-	0.05	-	0.05	-	-
20	-	-	-	0.04	-	-	-	-
22	0.05	-	-	-	-	-	-	-
24	0.02	-	-	0.03	-	-	-	-
26	-	-	-	-	-	0.04	-	-
28	-	-	-	0.04	-	0.02	0.02	-
30	-	-	-	0.01	-	-	-	-
32	-	-	-	0.02	-	0.02	0.02	-
34	-	-	-	0.02	-	-	-	-
36	-	-	-	-	0.01	0.03	0.01	-
38	-	-	-	-	-	-	-	-
40	-	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-
48	-	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-
54	-	-	-	0.01	-	-	0.01	-
								-
TOTAL 6 INCHES AND OVER	3.64	-	-	3.50	4.31	0.46	0.31	1.23

Table 49:

Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Pine Overstories and Two or More Harvest Entries (A3) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	16.00	-	-	-	2.78	2.00	-	-
6	6.31	-	-	0.47	0.68	0.57	-	-
8	3.10	-	-	0.72	0.19	-	-	-
10	2.55	-	-	0.24	-	-	-	-
12	1.85	-	-	-	-	0.26	-	-
14	0.52	-	-	-	-	0.06	-	-
16	0.44	0.05	-	-	-	0.08	-	-
18	0.14	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-
26	-	-	-	0.03	-	-	-	-
28	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-
34	-	-	-	0.01	-	-	-	-
36	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	14.91	0.05	-	1.47	0.87	0.97	-	-

Table 50:

Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Fir Overstories and No Harvest Entries (B1) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	28.00	-	-	-	-	-	-	-
6	12.75	-	-	-	-	2.04	-	-
8	3.73	-	-	-	0.24	-	-	-
10	2.57	-	0.61	-	-	0.37	-	-
12	1.70	-	0.74	-	0.09	0.38	-	-
14	0.33	-	0.94	-	-	0.27	-	-
16	0.45	0.35	0.63	-	-	0.10	-	-
18	0.08	-	0.78	-	-	0.23	-	-
20	0.03	0.12	0.64	-	-	0.04	-	-
22	-	-	0.29	-	-	0.09	-	-
24	-	-	0.34	-	-	0.13	-	-
26	-	0.02	0.38	-	-	0.12	-	-
28	-	0.04	0.20	-	-	0.05	-	-
30	-	0.01	0.17	-	-	0.09	-	-
32	-	-	0.02	-	-	0.05	-	-
34	-	0.03	0.02	-	-	0.05	-	-
36	-	0.01	0.03	-	-	0.03	-	-
38	-	0.01	0.03	-	-	0.04	-	-
40	-	0.02	0.02	-	-	0.03	-	-
42	-	-	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-
46	-	-	-	-	-	0.01	-	-
48	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	21.64	0.61	5.84	-	0.33	4.12	-	-

Table 51:
Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Fir Overstories and One Harvest Entry (B1) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	6.00	-	-	-	3.70	-	-	-
6	1.31	-	0.34	-	-	-	-	-
8	1.50	-	-	-	-	0.32	-	-
10	0.94	-	0.23	-	-	0.41	-	-
12	1.24	-	-	-	-	0.23	-	-
14	0.19	-	-	-	-	0.37	-	-
16	0.15	-	0.21	-	-	0.10	-	-
18	0.04	-	-	-	-	0.15	-	-
20	-	-	-	-	-	0.06	-	-
22	-	-	0.03	-	-	0.14	-	-
24	-	-	0.04	-	-	0.11	-	-
26	-	-	0.02	-	-	0.06	-	-
28	-	-	0.05	-	-	0.02	-	-
30	-	-	0.03	-	-	0.03	-	-
32	-	-	-	-	-	0.01	-	-
34	-	-	-	-	-	0.01	-	-
36	-	-	-	-	-	0.01	-	-
38	-	-	-	-	-	-	-	-
40	-	-	-	-	-	0.01	-	-
42	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	5.37	-	0.95	-	-	2.04	-	-

Table 52:

Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Wet True Fir Overstories and Two or More Harvest Entries (B3) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	2.00	-	-	-	12.00	-	-	-
6	6.12	-	-	-	-	-	-	-
8	3.83	-	-	-	-	0.57	-	-
10	2.80	-	0.25	-	-	0.43	-	-
12	1.02	-	0.21	-	-	0.43	-	-
14	0.43	-	-	-	-	0.14	-	-
16	0.28	-	0.10	-	-	0.17	-	-
18	-	0.05	0.05	-	-	0.21	-	-
20	-	-	0.04	-	-	0.03	-	-
22	-	-	0.05	-	-	0.08	-	-
24	-	-	0.07	-	-	0.10	-	-
26	-	0.04	0.04	-	-	0.04	-	-
28	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-
34	-	-	-	-	-	0.01	-	-
36	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-
40	-	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-
46	-	-	-	-	-	0.02	-	-
48	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	14.48	0.09	0.81	-	-	2.23	-	-

Table 53:
Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and No Harvest Entries (C1) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	-	-	-	-	3.33	2.00	-	-
6	0.34	-	-	-	-	0.68	-	-
8	0.38	0.19	-	-	-	0.78	-	-
10	0.85	-	-	-	-	0.67	-	-
12	0.17	0.34	-	-	-	0.21	-	-
14	0.12	-	-	-	-	0.06	-	-
16	0.10	-	-	-	-	0.10	-	-
18	0.08	0.23	-	-	-	0.08	-	-
20	-	-	-	-	-	0.06	-	-
22	-	0.08	-	-	-	0.11	-	-
24	0.02	0.02	-	-	-	0.11	-	-
26	0.02	0.06	-	-	-	0.06	-	-
28	-	0.08	-	-	-	0.06	-	-
30	-	0.04	-	-	-	0.08	-	-
32	-	0.02	-	0.03	-	0.01	-	-
34	-	0.02	-	0.01	-	0.05	-	-
36	-	0.01	-	0.01	-	0.02	-	-
38	-	0.01	-	-	-	0.01	-	-
40	-	0.02	-	-	-	-	-	-
42	-	0.01	-	0.01	-	0.01	-	-
44	-	-	-	-	-	0.01	-	-
46	-	-	-	-	-	0.01	-	-
48	-	-	-	0.01	-	0.01	-	-
50	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	2.08	1.15	-	0.07	-	3.19	-	-

Table 54:

Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and One Harvest Entry (C2) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	32.00	-	-	-	-	-	-	-
6	1.36	-	-	-	-	-	-	-
8	1.73	-	-	-	-	0.51	-	-
10	1.49	-	-	-	-	0.12	-	-
12	0.79	-	-	0.09	-	0.11	-	-
14	0.19	-	-	0.12	-	0.23	-	-
16	-	-	-	-	-	0.29	-	-
18	0.08	-	-	-	-	0.09	-	-
20	-	0.09	-	0.06	-	0.05	-	-
22	-	-	-	0.03	-	0.03	-	-
24	0.02	0.10	-	0.02	-	0.06	-	-
26	-	-	-	0.04	-	-	-	-
28	0.02	-	-	-	-	-	-	-
30	0.01	0.07	-	-	-	0.01	-	-
32	-	-	-	-	-	0.01	-	-
34	-	-	-	-	-	0.02	-	-
36	0.01	0.03	-	-	-	0.07	-	-
38	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	5.70	0.29	-	0.36	-	1.60	-	-

Table 55:
Mean Number of Trees/Acre Affected by Beetles for Sampled Stands on the Wallowa-Whitman National Forest Having Dry True Fir Overstories and Two or More Harvest Entries (C3) - All Tree Species

DBH Class (Inches)	MOUNTAIN PINE BEETLE	DOUGLAS FIR BEETLE	SPRUCE BEETLE	WESTERN PINE BEETLE	IPS sp.	FIR ENGRAVER BEETLE	SILVER FIR BEETLE	RED TURPENTINE BEETLE
< 6 INCHES	20.00	-	-	-	-	-	-	-
6	6.27	-	-	-	-	0.34	-	-
8	1.53	-	0.19	-	-	0.93	-	-
10	0.89	-	-	-	-	0.77	-	-
12	0.09	-	0.09	-	-	0.71	-	-
14	0.15	0.25	-	-	-	0.56	-	-
16	-	0.10	-	-	-	0.63	-	-
18	-	0.19	-	-	-	0.35	-	-
20	-	0.06	-	-	-	0.12	-	-
22	-	-	-	-	-	0.15	-	-
24	-	0.02	-	-	-	0.17	-	-
26	-	0.02	-	-	-	0.10	-	-
28	-	0.02	-	-	-	0.06	-	-
30	-	0.01	-	-	-	0.04	-	-
32	-	0.01	-	-	-	0.02	-	-
34	-	-	-	-	-	-	-	-
36	-	-	-	-	-	0.02	-	-
38	-	-	-	-	-	0.01	-	-
40	-	-	-	-	-	-	-	-
TOTAL 6 INCHES AND OVER	8.93	0.68	0.28	-	-	5.00	-	-

Table 56: Average Stand Parameters and Estimated Echinodontium tinctorium Infection and Decay Within Surveyed Stands Grouped by Sample Strata on the Wallowa-Whitman National Forest

Survey Strata	Mean age	Mean LCR	Percent wounds	Overstory species	Percent ET	Percent CF Decay
A1- UNENTERED PINE	91.3	69.2	30.1	THREE PINE TWO FIR	13.3	1.7
A2- SINGLE ENTRY PINE	72.2	80.6	28.7	TWO PINE THREE FIR	9.3	1.2
A3- MULTIPLE ENTRY PINE	67.3	81.7	35.3	THREE PINE TWO FIR	10.3	1.2
B1- UNENTERED WET FIR	128.6	61.0	49.3	ALL FIR	31.8	4.7
B2- SINGLE ENTRY WET FIR	129.6	70.9	42.8	ALL FIR	19.4	5.3
B3- MULTIPLE ENTRY WET FIR	129.6	74.8	60.8	ALL FIR	16.2	6.3
C1- UNENTERED DRY FIR	119.0	68.7	42.3	ALL FIR	26.3	3.4
C2- SINGLE ENTRY DRY FIR	80.8	71.6	16.3	ALL FIR	23.7	0.6
C3- MULTIPLE ENTRY DRY FIR	95.0	74.9	43.3	ALL FIR	18.9	2.0

DBH- diameter breast height (4.5')
LCR- Live Crown Ratio
Overstory species- Pine (>60% Basal Area); Fir (>40% Basal Area)
Percent ET- Actual values; includes only trunk infection
Percent CF decay- Deductions for decay; Cubic Foot Volume

From: Filip et al, 1983