APPENDIX F: FOREST INSECTS AND PATHOGENS

Author: Rich Fairbanks
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Management actions, or lack of action, may affect the growth, vigor and resiliency of stands to resist insect and disease infestations. This affects the impacts of large scale, high severity wildland fire events on these stands.

Insects and disease occur in all forested areas covered by this analysis. Where populations are endemic, insects and pathogens have little effect on fire and fuels. Occasionally, they reach epidemic levels. Most trees of susceptible species are defoliated, setting them up for secondary attacks by bark beetles. This creates a large volume of available fuel (dead trees) and tends to create warmer, drier within-stand microclimates.

Perhaps the most serious insect is the Western spruce budworm (*Choristoneura occidentalis*). Within the analysis area, this insect causes epidemic level mortality over thousands of acres, primarily true fir in the High Cascades Zone. Major outbreaks of this pathogen were recorded during 1949-1953 and 1986-1993. There is some evidence that such outbreaks are occurring over larger areas due to the effects of fire suppression. Suppression tends to increase habitat quality for the insect (USDA, 1995).

Over time, undisturbed stands at high elevations develop very high stocking levels (measured by trees per acre), with two to more layers of true fir and mountain hemlock. This provides ideal habitat for budworm, which is essentially a grazer. Budworm eat current year buds and foliage and excrete frass onto the forest floor. An area experiencing severe attack can cause complete defoliation in 4 to 5 years (Furniss and Carolin, 1977). Budworm also provide a food source for birds and other insects. In this way they take nutrients locked up in fir needles and put them back into the soil (personal communication, Phillip Jaspers, Forest Silviculturist, April 2000). Thus, to some extent, budworm provides the same nutrient cycling function as fire and other types of disturbance. Budworm outbreaks also set up a "window of opportunity" for stand replacement fires. For five to ten years after a major outbreak, the forest is much more susceptible to severe fire because of increased fuel loading.

A relatively common pathogen, especially in the High Cascades Zone, is *Phellinus weirii (Murr.) Gilb.* This native pathogen has been present in high elevation forest for over a thousand years. This root-rotting fungus affects roots and lower boles mainly in Douglas-fir, mountain hemlock and true firs in high elevation forests. It results in initial growth loss and eventual death of infected individuals. *P. weirii* spreads through root contact between uninfected and infected trees (USDA, 1978). Root rot centers consist of a core area of infected trees, usually an acre or more in

size, with an influx of other species (commonly lodgepole pine, white pine) and younger age classes beginning to colonize the site (Dickman, 1984).

Fire is thought to deter spread of *P. weirii* by killing infected trees and creating conditions for less susceptible species (e.g., lodgepole pine, white pine) to colonize.

Past Condition

Evidence of spruce budworm epidemics can be inferred by tree ring analysis. This evidence indicates that budworm defoliation has been a factor for hundreds of years. Outbreaks are cyclical and tend to occur decades apart.

It is suspected that outbreak size and intensity was limited by fire. Budworm's primary hosts are the fire sensitive true firs. Susceptible stands tend to be those with multiple canopy layers. Fires tended to maintain populations of Western white pine and lodgepole pine, which are not hosts for budworm. Fires also tended to kill fire sensitive individual trees and remove understory trees.

Phellinus weirii has been known to occur in high elevation forests for centuries. This root rot survived in remnant individuals after a severe fire. Postfire conditions in high elevation forests created conditions that deterred fungal spread, by introducing less susceptible species, and creating low density stands where root contact was minimal.

Phellinus weirii may also have influenced fire activity by creating a horizontal, as well as a vertical fuel bed for increased ease of fire to move through a stand (Dickman, 1987).

Current Condition

Spruce budworm outbreaks have occurred in the High Cascades; the most recent was from 1986 to 1993. Within the analysis area, this outbreak was confined to the area along the crest of the Cascades, between Mt Jefferson and the Three Sisters. Fuels have been treated in some areas where they posed a danger to life and property.

It is difficult to assess the influence of fire suppression on *P. weirii* spread. One can hypothesize that with continued full fire suppression *P. weirii* could become more prevalent in these ecosystems.

Desired Future Condition

Fifteen hundred to twenty four hundred (1500-2400) acres may be treated in the High Cascades zone, possibly reducing habitat for budworm. Priority for treatment will be those areas where fuel conditions pose a danger to life and property.

The overall desired condition would be to minimize epidemic levels of insects and pathogens, and allow endemic levels to continue in the High Cascades.

LITERATURE CITED

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