Status of 5-Needle Pines in Washington and Northern Oregon

2003 Emphasis on Whitebark Pine, *Pinus albicaulis*

Diane M. Hildebrand[1], Dave Doede[2], Robin Shoal[3]

[1]Plant Pathologist, FHP Westside Service Center, Sandy, OR; [2]Geneticist, Gifford Pinchot NF, Trout Lake, WA; [3]Biological Technician, Olympic National Forest, Olympia, WA

PROJECT OBJECTIVES

The overall objective is to determine the health of 5-needle pines in Washington and northern Oregon, and make recommendations for conservation and restoration. We request funds for one year at a time as part of the larger long term project. The first emphasis is on high elevation ecosystems containing whitebark pine; second, sugar pine near the edge of its range, for example sugar pine on the northern Willamette and southern Mt. Hood National Forests; then western white pine and sugar pine at all elevations and latitudes.

METHODS

Once candidate stands were located using local knowledge and existing information, field surveys consisted of transects run along compass bearings. Start location and direction for each transect was chosen to represent local stand conditions. Transect width was originally fixed at 20 ft, while transect length was allowed to vary depending on density of whitebark pine. A transect consisted of sequential segments, with each segment 1/10th acre in area, or 218 ft long. Minimum transect length was two segments. Transects were traversed until a minimum of 50 whitebark pine trees or clumps greater than 4.5 feet tall were tallied. At least 30 of these trees or clumps had to be or contain living trees. If the edge of the stand or a topographical obstacle was encountered before the minimum number of trees were sampled, the transect was offset at least 20 feet toward the center of the stand and the direction reversed.

All 5-needle pines encountered in the transect were tallied by size class (seedling, sapling, pole, mature). Trees over 4.5' tall were coded for height, condition (live, dead), probable cause of mortality if dead, presence or absence of conelets, and number of stems per clump. Each stem was examined and coded for incidence and severity of white pine blister rust, and evidence of bark beetle activity and *Armillaria* root rot. At the end of each transect segment, the crew estimated the percent cover of all tree species, identified major species present; estimated percent cover of whitebark pine, noted *Ribes* species present and entered longitude and latitude. Two average whitebark pine trees--one pole and one mature--were cored in each transect, and transported back for aging. After completing each transect, crew considered the transect and its vicinity and rated it for balsam woolly adelgid (BWA) presence, site description, and species mix. Each host species infested was coded for each of the four BWA symptoms: gouting, stem infestation, crown abnormality, and mortality caused by BWA.

Need to Modify the Protocol

Initially, transects consisted of fixed width segments, each segment 20'x 218' (1/10th acre). The number of segments was varied to attain at least 50 WBP clumps > 4.5' tall, of which at least 30 contained a living tree. This protocol was changed to allow the crew to also vary the width of segments within transects because WBP densities in some areas were so low that transects would have been unreasonably long. Transects had a minimum of 2 segments, each 1/10 acre in area.

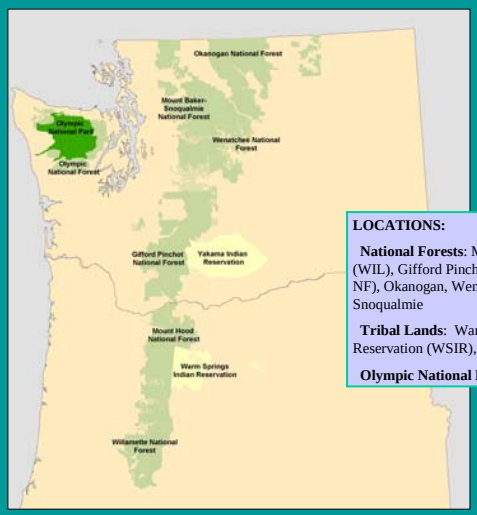
Two average WBP trees, one pole and one mature, were cored in each transect. This procedure gave only a very rough idea of stand age. In these severe and variable environments, age and stand establishment is extremely variable. Any inferences based on the ages of two trees per transect are open to question.

Accomplishments

For 2003, we gathered available information from aerial surveys, inventory plots, and other sources to find candidate high elevation 5-needle pine stands. During late summer we conducted extensive ground surveys of candidate stands to determine size-class distribution, frequency, mortality agents, and incidence and severity of white pine blister rust in 5-needle pines, and balsam woolly adelgid presence and effects on the true fir component.

Olympic NF: Completed extensive surveys for the Forest, with 5 transects on 4 sites in Buckhorn Wilderness.

Mt Hood NF: Completed extensive surveys for the Forest, with 10 transects on 10 sites.



LOCATIONS:

National Forests: Mt. Hood (MTH), Willamette (WIL), Gifford Pinchot (GIP), Olympic (OLY NF), Okanogan, Wenatchee, Mt. Baker-Snoqualmie

Tribal Lands: Warm Springs Indian Reservation (WSIR), Yakama Indian Reservation

Olympic National Park (OLY NP)

Summary for Olympic National Forest

21% of whitebark pine clumps had white pine blister rust.

Whitebark pine is limited to the Buckhorn Wilderness, where it occurs in patches above 5500 feet. Tree form ranges from krumholz to mature trees with heights up to 40 feet. Of the total of 256 clumps observed in the five transects, 21% contained one or more stems with blister rust cankers, ranging from 11% to 39%. Few *Ribes* plants were present inside the transects, but *Ribes* are common in the north- and east-facing drainages immediately adjacent to whitebark pine habitat. Dense cold fog frequently rolls up out of these drainages and settles over the peaks and ridges, facilitating spread of white pine blister rust.

Live stems on transects were 88 percent saplings (at least 4.5'tall and up to 5" DBH), 9 percent poles (between 5 and 9" DBH), and 3 percent mature trees (greater than 9" DBH). Overall mortality was high, with approximately 25 percent of stems dead. Size distribution among dead trees was 79 percent saplings, 16 percent poles, and 5 percent mature trees. Only 15 mature trees were encountered along transects and mortality was nearly 50%. Cause of mortality was difficult to determine for many of the dead trees.

We saw only one live whitebark pine affected by mountain pine beetle.

Summary for Mt. Hood National Forest

62% of live whitebark pine trees had white pine blister rust.

Ten whitebark pine stands displayed a variety of conditions, ranging from very dense, krumholz stands with relatively light white pine blister rust infection to very sparse, heavily infected stands. All stands displayed some white pine blister rust infection, and amount of infection was independent of Ribes presence and WBP density. No Ribes plants were observed on any transect, possibly due to the very high elevations (5672'—6604') of the stands. Incidence of white pine blister rust ranged from 27 to 90 percent of live stems infected, with an average of 62 percent. In all stands, the majority of stems occur in the sapling size class, heights are low (average 9'-14') and ages are moderate (40-138 yrs).

Stand density, stem survival and regeneration varied greatly. In three stands, WPBR infection was severe with over 80% of the live stems infected and greater than 50% with lethal infections (on bole or within 6" from bole). Pruning could help the 15% or so of stems with branch infection located between 6" and 24" from bole, but at least 50% of the stems at these sites will suffer topkill or die fairly soon.

Three stands had clump survival <50%. WPBR infection is severe at these sites, 70 –90% of the live stems are infected and 55-75% have lethal infections. One of these stands would benefit from pruning, with 30 % of live stems with infections over 6" from the bole. All sites would benefit from planting with resistant stock, particularly at sites where regeneration is sparse and stocking and survival rates are low.

No Armillaria root rot was encountered on any transects. Bark beetles were observed at two areas with intensity either light or difficult to determine. Mortality at these sites undoubtedly includes these agents. Evidence of balsam woolly adelgid was prevalent only in one area.

Other Cooperators: Carol Aubry, Geneticist, OLY NF; Jim Hadfield, FHP Pathologist; Beth Willhite, FHP Entomologist; Ben Smith, FHP Aerial Survey Technician; Dave Leach, Silviculturist, WIL; Nancy Lankford, Silviculturist, MTH; Jeff Reis, Inventory, MTH; Bob Obedzinski, Silviculturist, GIP; Jeanne M Rice, Ecologist, MTH; Lyn Medley, Tree Improvement Specialist, WSIR; Steve Acker, Supervisory Botanist, OLY NP.