TITLE: Status of 5-needle pines in Washington and northern Oregon (with emphasis on high elevation stands with whitebark pine, *Pinus albicaulis*).

LOCATIONS for 2004: Mt. Hood National Forest (MTH), Willamette National Forest (WIL), Gifford Pinchot National Forest (GIP),

DURATION: Year 1 of 1-year project [Funds requested for 1 year at a time as part of a larger, long term project, beginning in 2003.] **FUNDING SOURCE:** Base

PROJECT CO-LEADERS: Dave Doede, Geneticist, GIP, 509.395.3433, ddoede@fs.fed.us, Carol Aubry, Geneticist, OLY NF, caubry@fs.fed.us

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COOPERATORS: Dave Leach, Silviculturist, WIL; Beth Willhite, Entomologist, FHP; Nancy Lankford, Silviculturist, MTH; Jeff Reis, Inventory, MTH; Bob Obedzinski, Silviculturist, GIP; Jeanne M Rice, Ecologist, MTH; Ben Smith, Aerial Survey Technician, FHP;

PROJECT OBJECTIVES: For 2004, compile maps and reports summarizing information from 2003 surveys of white bark pine stands (on MTH); conduct extensive ground surveys (on GIP and WIL) of candidate stands to determine size-class distribution, frequency, mortality agents, and incidence and extent of white pine blister rust in 5-needle pines, and balsam woolly adelgid presence and effects on the true fir component. Candidate stands are located using available information from aerial surveys, inventory plots, and other sources.

The larger long term project has the overall objective of determining the health of 5-needle pines in Washington and northern Oregon, and making recommendations for conservation and restoration. The first emphasis is on high elevation ecosystems with whitebark pine; the second, sugar pine near the edge of its range; and then western white pine and sugar pine at all elevations and latitudes. Survey data will be entered into the corporate database, FS VEG, and the Regional Balsam Woolly Adelgid database. **The overall project will take a number of years,** as we accomplish consecutive portions as funding permits. Additional locations include Wenatchee National Forest, Warm Springs Indian Reservation (WSIR), Mt. Baker-Snoqualmie National Forest, Olympic National Forest, Olympic National Park (OLY NP), Okanogan National Forest, Yakama Indian Reservation. Additional cooperators include Lyn Medley, Tree Improvement Specialist, WSIR; Steve Acker, Supervisory Botanist, OLY NP;

JUSTIFICATION: Linkage to FHM survey and plot data: Aerial surveys are able to detect recent mortality in larger trees, but do not detect conditions in smaller trees below the canopy, lower branch flagging, or lethal bole cankers which have not yet killed the tree. Consequently blister rust infection levels are under-reported. Additionally, the effects of rust infection are often confounded with bark beetles as the beetles attack and kill infected trees. The annual aerial detection survey indicates scattered mortality in high elevation 5-needle pines due to white pine blister rust and/or mountain pine beetle. The established Continuous Vegetation Survey (CVS or FIA) plot network does not capture enough high elevation stands to describe the status of 5-needle pines, primarily because of their small, patchy distribution. For example, there is only

one CVS plot in the white bark pine zone on the GIP. Other data sets, such as ecology plots, do not have information on incidence of blister rust, only causes of mortality. Where 5-needle pine representation in stands is low in frequency and spotty in distribution, inventory plots often don't reveal the condition of the species. Additional ground surveys are needed.

Significance in terms of geographic scale, biological impact, and/or political importance: Five-needle pines are important stand components because they are tolerant of root diseases that are devastating to some other species. They are pioneering species that provide food and habitat for many birds and mammals, long standing snags, and large down woody material. Whitebark pine is an important species at very high elevations because it tolerates extreme environmental conditions and acts as a nurse crop for less hardy plant species; it also provides watershed protection by catching and retaining snow and stabilizing soil in harsh open areas. High elevation populations are often isolated and disjunct from the main species distribution, very possibly containing unique genetic variation due to genetic drift and/or different selection pressures. Unfortunately, years of mountain pine beetle mortality, blister rust damage and mortality, and fire exclusion may have reduced the historic functions of these species in the ecosystem. The data gathered from this survey will aid managers in setting priorities and committing resources to managing these species.

Probability this project will be successfully completed: This project has a high probability of successful completion. Restoration of five needle pines, particularly with reference to effects from white pine blister rust, has a high priority for both the Genetics and FHP programs. The extensive survey protocol is a refinement of that used to survey white bark pine on the WEN in 2002. Motivated and experienced field crews will ensure data will be collected in a timely and efficient manner.

DESCRIPTION: a. Background: Preliminary information from previous surveys in the Pacific Northwest, including Ellen Goheen's ongoing FHM EM project, indicates high mortality, stand encroachment, and low representation in some size classes for all 5-needle pines. In the case of western white pine, we have current inventory information, however, the historical component from coast range to Cascades was far more significant. Restoration would include returning stand compositions to the range of natural variability before the advent of white pine blister rust.

In the case of whitebark pine, we have insufficient survey data on the extent and condition of populations to accurately determine the status of the species. Anecdotal evidence from field visits indicates substantial blister rust infection and recent mortality, along with older mortality from mountain pine beetle. Information on amounts of regeneration is very sketchy and dated. Much of the type is in wilderness, and the species is not commonly included in management plans. Conservation will require stand management, disturbance management, and planting.

b. Methods for Extensive Survey of Whitebark Pine in 2004: Potential whitebark pine (wbp) stands will be identified using aerial survey data, CVS plots, ecology plots, aerial photos, habitat mapping parameters, and local knowledge. Field surveys will consist of transects run along compass bearings. Start location and direction for each transect will be chosen to represent local stand conditions. At the beginning of each transect, crew will enter longitude and latitude, and take four digital photographs, one in each cardinal direction. Transect width is 20 to 30 ft, and transect length will vary, depending on density of wbp. A transect will consist of sequential segments, with each segment $1/10^{th}$ acre in area, [e.g., 20 ft wide by 218 ft long]. Minimum transect length is two segments. Transects will be traversed until a minimum of 50 wbp trees or

clumps greater than 4.5 feet tall are tallied. At least 30 of these trees or clumps must be or contain living trees. If the edge of the stand or a topographical obstacle is encountered before the minimum number of trees is sampled, the transect will be offset toward the center of the stand and the direction reversed.

All 5-needle pines encountered in the transect will be tallied by size class (seedling, sapling, pole, mature). Trees over 4.5' tall will be 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 will be examined and coded for incidence and severity of white pine blister rust, and evidence of bark beetle activity. At the end of each transect segment, crew will estimate the percent cover of all tree species, identify major species present; estimate percent cover of wbp, note Ribes species present and enter longitude and latitude. Two average wbp trees, one pole and one mature, will be cored in each transect, and transported back for aging. After completing each transect, crew will consider the transect and its vicinity to rate for balsam woolly adelgid (BWA) presence, site description, and species mix. Each host species infested will be coded for each of the four BWA symptoms: gouting, stem infestation, crown abnormality, and mortality caused by BWA.

c. Products for 2004: For MTH, maps and reports summarizing data from 2003 surveys including wbp and bwa information; analysis of historical occurrence of wbp and draft white paper on conservation strategy and restoration opportunities for wbp on MTH. For GIP and WIL, maps and reports summarizing data from 2004 surveys including wbp and bwa information.

d. Schedule of Activities: February – June 2004: Analysis, maps, and reports of MTH data.

July - September 2004: Extensive field surveys in white bark pine zone on GIP and WIL.

October 2004 -February 2005: Analysis, maps; reports from surveys in 2004 on GIP and WIL.

COSTS are broken down to accommodate smaller amounts of funding:

For 2004, Extensive Surveys at high elevation: **GIP $7,400** and **WIL $7,400**.

Mapping and analyses; reports: **MTH $6300** and **GIP $2800** and **WIL $2800**.

3 Forests Combined YEAR 2004	**Item**	**FHM EM $ Request**	**Other-Source Funding**	**Source**
Administration	Salary	18,200	4000	USFS Ecol/Inv/Gen
	Overhead (19%)	5,100		
	Travel	4,000		
Procurements	Contracting			
	Equipment		1,000	USFS Ecol/Inv/Gen
	Supplies		400	
TOTAL		27,300	5,400	