Project Number: INT-F-05-02

TITLE: Evaluation and Monitoring of Whitebark Pine Regeneration After Fire in the Frank Church River of No Return Wilderness

LOCATION: Frank Church River of No Return Wilderness; Payette National Forest

DURATION: Year 1 of 3-year project **FUNDING SOURCE**: Fire Plan

PROJECT LEADER: Lauren Fins, Department of Forest Resources, College of Natural Resources, University of Idaho, Moscow, ID 83843-1133; 208-885-7920; lfins@uidaho.edu

PROJECT OBJECTIVES:

- Investigate and compare whitebark pine reproduction in old burns, recent burns and unburned areas in the Frank Church River of No Return Wilderness (FC-RONRW)
- Evaluate changes in fire risk and fuel loading related to mortality from blister rust and bark beetles
- Evaluate and monitor whitebark pine populations for incidence of and mortality from white pine blister rust and mountain pine beetle
- Collect cones/seeds from whitebark populations at high risk of loss in order to contribute to the ongoing USFS Whitebark Pine Genetic Restoration program for the Intermountain West for ecosystems degraded by white pine blister rust; Archive seed for potential use in restoration of fire-damaged ecosystems and for long-term conservation of germplasm

JUSTIFICATION:
Whitebark pine is a keystone species of high elevation Rocky Mountain ecosystems. The species' reproductive success depends largely on the interaction of wildland fire and Clark's nutcracker. There has been an extensive increase in fire in the FC-RONRW since 2000. While no specific FHM surveys have been completed in the wilderness, we confirmed the presence of blister rust on mature and juvenile whitebark pines during a reconnaissance trip in August 2004. Incidents of both white pine blister rust and mountain pine beetle were detected.

The FC-RONRW includes a significant portion of the whitebark pine distribution west of the Greater Yellowstone Ecosystem. These populations have not been included in efforts to monitor reproductive success after fires, or to evaluate the incidence, spread and mortality due to blister rust. These populations have also not been included in the USFS Genetic Restoration Program for the Intermountain West.

Currently by virtually all measures of population vigor, whitebark pine populations are in decline throughout the species' range. Losses are primarily due to white pine blister rust, which rapidly kills old and young trees alike; mountain pine beetles are also killing a significant number of trees. With high levels of mortality (80-90 percent in some stands), fuel loadings and the risk of fire are likely increasing at higher than historical levels. Where only a few scattered whitebark pines remain, fires have the potential to destroy the remnants of these potentially unique and ecologically important populations. The rapid decline and possible loss of whitebark pine populations can have a domino effect

on high elevation forest communities where their seeds provide a critical food source for wildlife, and the trees provide soil and habitat stability in environments too harsh for most other tree species.

Because this keystone species is in decline, it is imperative to evaluate and monitor incidence, spread and mortality from blister rust and mountain pine beetles, to assess their interaction with fire risk and ecological impacts of fires and to evaluate current reproductive success on old and new burns. The outcome of this monitoring effort will be useful in both wildland fire use and fire restoration decisions. In addition, seed samples will be archived for use in potential future efforts to restore fire-damaged ecosystems and ecosystems altered by invasive species such as blister rust, to hedge against potential loss of these populations.

DESCRIPTION:

a. Background: Whitebark pine is a high elevation conifer with a competitive edge in harsh environments. While it often occurs in mixed stands with subalpine fir and lodgepole pine, whitebark pine out-competes other species on high ridges where soils are poor and cold temperatures prevail. As the only North American pine with wingless seeds and cones that remain closed even after they mature, whitebark is unique. Its closed cones, with their large, heavy, nutrient-laden and calorie-rich seeds, provide a critical food source for Clark's nutcrackers, pine squirrels and, in some parts of its range, grizzly bears. As a pioneer species that repopulates after burns, whitebark pine also stabilizes soils and moderates the environment for new communities of flora and fauna.

White pine blister rust, a disease caused by an invasive exotic fungus (*Cronartium ribicola*), was introduced into western North America in 1910. The disease, which first appeared on whitebark pine in Idaho in 1938, can kill susceptible trees within just a few years after infection, although some infected trees may live for many years. Genetic resistance to blister rust has been found in whitebark and other five-needle pines, but only in low frequencies. In addition to the risk of death from blister rust, mountain pine beetles tend to be attracted to trees that are infected with blister rust. Beetles can kill trees in a single season.

The combination of blister rust and bark beetles has begun to decimate whitebark pine populations. The resulting rapid build-up of fuels has likely increased the probability of stand-replacing fires and potential fire damage to whitebark pine ecosystems, threatening the long-term viability of this keystone species. Thus, it is critical to assess the effects of insect and disease on whitebark pine populations and the reproductive status of the species. In anticipation of, and as insurance against total population loss, seed collections will be made for long-term gene conservation and for potential future restoration efforts. Although restoration is not generally undertaken in wilderness, the large-scale decimation of this species by an invasive exotic and the likely fire damage to whitebark pine ecosystems suggests a possible exception.

b. Methods: We plan to evaluate and monitor the condition of 3 whitebark pine populations in the FC-RONRW. Measures will include fuel loadings; reproduction on old burns, newly burned and unburned sites; incidence of and mortality due to blister rust; and mortality due to mountain pine beetles. The University of Idaho Taylor Ranch will be used as the "base camp" for this study. Two students, one graduate

and one undergraduate, will be involved in the fieldwork. Pack animals will be used to access the remote, high elevation areas where whitebark pine populations can be found. Populations will be selected to the north and south of Big Creek. We will generally follow protocols for plot establishment and monitoring developed by the Whitebark Pine Ecosystem Foundation but will conduct the study in accordance with the guidelines in the Wilderness Plan. Any aerial detection survey and/or FIA monitoring will be incorporated into the data.

In year 1, permanent plots will be established in each population; our target is 10 plots per population. Plots will be identified by GPS and mapped using more traditional methods. In years 2 and 3, cones will be protected and later collected. Seeds will be extracted and contributed to the USFS Whitebark Pine Genetic Restoration Program for the Intermountain West. These genotypes will be particularly useful if entire whitebark pine populations are lost to fire, rust and/or beetles. Additional seeds will be archived for long-term genetic conservation to be used in future breeding programs.

Data collected will include tree size and location, incidence and mortality from blister rust, canker location, tree condition, mortality from beetles, regeneration counts, occurrence of other tree species and predominant understory species. Analyses will compare regeneration numbers and types in burned and unburned areas, rust incidence and annual mortality from rust or beetles.

c. **Products**: Annual reports will be written and sent to the USDA Forest Service. We will present results of this work at a professional meeting, for example, at a meeting of the Whitebark Pine Ecosystem Foundation. We will also write a manuscript for publication.

d. Schedule of activities:

- Year 1: Establish plots in 3 populations; collect baseline data; preliminary analysis and summaries of data
- Year 2: Cage developing cones in 1 population; collect data in permanent plots; collect mature cones; conduct analysis comparing data from year 2 to baseline
- Year 3: Cage developing cones in 2 populations; collect data in permanent plots; collect mature cones; conduct analysis comparing year 3 to baseline and year 2; present results at professional meeting; write manuscript for publication

COSTS:

	Item	Requested FM EM Funding	Other Source Funding	Source
Year 2005				
Administration	Salaries and Fringe	$29,665 $5,590		
	Travel	$6,350		
Procurements	Supplies and OE	$1,500		
	Overhead	$13,578		
TOTAL REQUESTED		$56,683		

Funding for years 2 and 3 is projected to be similar to year 1.