TITLE: INT-F-05-02 **Evaluation and Monitoring of Whitebark Pine Regeneration After Fire in the Frank Church River of No Return Wilderness Area**

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

DURATION: Year 2 of 3-year project **FUNDING SOURCE**: Fire Plan EM

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PROJECT OBJECTIVES:

1. Investigate and compare whitebark pine reproduction in old burns, recent burns and unburned areas in the Frank Church River of No Return Wilderness Area
2. Evaluate and monitor whitebark pine populations for incidence of white pine blister rust and mountain pine beetle
3. Evaluate and monitor whitebark pine mortality from blister rust and bark beetles
4. Evaluate changes in fire risk and fuel loading related to mortality from blister rust and bark beetles
5. Collect cones/seeds from whitebark populations at high risk of loss
6. Collect cones/seeds from whitebark populations to contribute to the ongoing U.S.F.S. Whitebark Pine Genetic Restoration program for the Intermountain West for ecosystems degraded by white pine blister rust
7. 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. This interesting bird species stores the nutritious and calorie-laden whitebark pine seeds by burying them, often in burn sites. Although the nutcrackers retrieve many of the seeds they bury, a sufficient number of seeds remain buried and then germinate. Thus, wildland fire creates favorable reproductive conditions; Clark's nutcracker "plants" the seeds; together they help to ensure long-term survival of whitebark pine populations.

Currently, however, by virtually all measures of population vigor, whitebark pine populations are in decline throughout the species' range. Losses are primarily due to an exotic invasive disease, 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 birds and mammals, and the trees provide soil and habitat stability in environments too harsh for most other tree species.

The Frank Church River of No Return Wilderness Area is the largest contiguous wilderness area in the lower 48 states. The wilderness area includes a significant portion of the whitebark pine distribution west of the Greater Yellowstone Ecosystem. To date, however, whitebark pine populations in the Frank Church Wilderess Area have not been included in efforts to evaluate incidence, spread and mortality due to blister rust, or in efforts to monitor reproductive success after fire. Nor have these populations been included in the U.S.F.S. Genetic Restoration Program for the Intermountain West.

During field work conducted in the summer of 2005, we confirmed the presence of blister rust on mature and juvenile whitebark pines in the Frank Church Wilderness Area. Trees are dieing of rust and bark beetles (see progress report). Because this keystone species is in decline, it is imperative to evaluate and monitor incidence, spread and mortality due to blister rust and mountain pine beetles, to assess their interaction with the risk and ecological impacts of fires in this ecosystem and to evaluate current reproductive success on old and new burns. In addition, to hedge against potential loss of these populations, seed samples should be archived for use in potential future efforts to restore fire-damaged ecosystems and ecosystems altered by invasive species such as blister rust.

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, brown 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.

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 their effects on whitebark pine populations and the reproductive status of the species. In anticipation of, and as insurance against total population loss, we are also proposing to make seed collections for long-term gene conservation and for potential future restoration efforts. Although restoration is not a generally accepted approach in wilderness areas, the large-scale decimation of this species by an invasive exotic and the likely fire damage to whitebark pine ecosystems suggests a possible exception to the general management philosophy in this case.

b. **Methods**: We plan to assess and monitor the condition of 3 whitebark pine populations Frank Church River of No Return Wilderness Area over a three-year period. Measures include incidence of and mortality due to blister rust, mortality due to mountain pine beetles, fuel loadings, and reproduction on old burns, newly burned and unburned sites. The University of Idaho Taylor Ranch will be used as the "base camp" for this study. When possible graduate and undergraduate students will be involved in the fieldwork. Pack animals will continue to be used to access the remote, high elevation areas where whitebark pine populations can be found. Populations were selected to the north and south of Big Creek. We generally follow protocols for plot establishment and monitoring developed by the Whitebark Pine Ecosystem Foundation but also conduct the study in accordance with the Research Guidelines expressed in the Wilderness Plan for the Frank Church RONR Wilderness Area.

In year 1, permanent plots were established in each population; our target was 10 plots per population, which we achieved in 2 of the 3 population/habitat type/burn type combinations we selected. The markers we used are small and inconspicuous and placed in low visibility locations. Plots have been identified by GPS and mapped using more traditional methods. Depending on availability, 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 rust, beetles and/or fire. Additional seeds will be archived for long-term genetic conservation to be used in future breeding programs.

Data collected includes 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 rust incidence, annual mortality from rust or beetles, and regeneration numbers and types in burned and unburned areas. Potential adjunct studies might involve assessment of changes in proportions of rust resistant genotypes over time, and/or differences among populations and years in incidence of bird and squirrel sightings as related to changes in population size and vigor in the whitebark pines.

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

d. **Schedule of activities**:
Year 1: We established plots in 3 populations; collected baseline data; conducted preliminary analysis and summaries of data (see progress report)

Year 2: Depending on availability of cones, we plan to cage developing cones in 1 population; collect data in permanent plots; collect mature cones; conduct analysis comparing data from year 2 to baseline. If time permits, we will establish plots in a 4th population.

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.

e. **Progress/Accomplishments**
During 2005 we sought, found and hired two assistants to conduct the field research. Jodie Krakowski, a research technician at the University of British Columbia and Catherine Roberts, an undergraduate student at the University of Idaho began work in late May 2005. We convened at the University of Idaho, where we developed a field plan and data sheets specific to our project and a reasonable, but tentative, schedule of field operations. We purchased needed equipment (including a GPS Unit) and conducted training sessions with personnel from the USFS on habitat typing, identifying blister rust and mountain pine beetle attack on whitebark pine, and data collection on fuel loadings. We also submitted our request for a permit to conduct this research in the wilderness area. Catherine and Jodie flew in to Taylor Ranch in early June and coordinated their field activities with Jim and Holly Akenson, who were able to pack them in to their base camps. Although we had anticipated relatively easy access to the first population (due to the mild and open winter), we discovered that late spring precipitation had resulted in large snow drifts that impeded the reconnaissance of populations and establishment of plots early in the season. Once the snow had melted, however, Jodie and Catherine were able to access three populations (as planned) where they established plots and collected baseline data. Dr. Fins joined Jodie and Catherine while they were at Taylor Ranch to review progress and review and revise procedures after the reconnaissance trip to first population. Subsequently we used email regularly and phone occasionally to communicate about the project. Catherine left Taylor Ranch in early August, having completed the field work. Jodie remained at Taylor Ranch until mid-August to conduct preliminary analyses and to summarize their findings. (See attached progress report for more complete information and preliminary analysis of data.)

COSTS:

	Item	**Requested FM EM Funding***	**Procurements Supplies and OE**	**Overhead**
Year 2006			$1,500	$14,545
Administration	Salaries and	$31,501	**TOTAL**	**$60,722**

	Fringe	$5,825	**REQUESTED**	
	Travel	$7,350		

*Total funding request for 2006 is 7.1% higher than request for 2005 due to salary increases. Funding for year 3 is projected to be similar to year 2.