WHAT'S HAPPENING UPSLOPE

The Health of Timberline Forests: *A formidable enemy of whitebark pine is on the move in the Three Sisters Wilderness Area.*

SYNOPSIS

In 2008, Wolftree received funding from several organizations to initiate a project that helps the USDA Forest Service engage in activities that promote sustainable ecosystems in the Three Sisters Wilderness. The Project proposed to accomplish this goal through public outreach, survey and monitoring of resources, and restoration. The funding organizations included the National Forest Foundation[1] , Laird Norton Family Foundation (Landmark Project), The Mountaineers Foundation, and the Mazamas.

Over the summer, Wolftree staff and volunteers established 30 permanent plots (~500 m^2 in size) in the upper montane and subalpine forests within the wilderness area. The purpose of these plots is to establish long-term monitoring sites designed to measure changes in the composition and condition of timberline forests. In addition, the plots furnish detailed information about the presence or absence of white pine blister rust (Cronartium ribicola) in forests containing whitebark pine (Pinus albicaulis). White pine blister rust is an invasive pathogen that infects five needle pines such as whitebark pine, western white pine (Pinus monticola), limber pine (Pinus flexilis), and others. A native of Eurasia, the rust entered North America in the early 1900's on imported white pine saplings grown in Germany.

Preliminary findings indicate that white pine blister rust is present throughout the Three Sisters Wilderness area. Evidence of the pathogen was found in over 70% of the plots. In addition, the data suggest the rust is often associated with elevated mountain pine beetle, mistletoe and porcupine activity.

The number of active branch or stem cankers[2] per tree was less in eastside versus westside forest stands. It was observed that fewer numbers of cankers per tree may result in a lower mortality rate, especially in younger trees. Besides local micro-climatic differences, the team speculated that fewer cankers per tree may be attributed to stand structure, composition, and the scarcity of the rust's secondary host. The presence of secondary hosts, such as gooseberry and currant, are required to complete the rust's life cycle. This finding may lead to an effective treatment that would slow the infection rate and the loss of whitebark pine regeneration in the eastern regions of the wilderness.

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[1]A significant portion of this Project was funded by the National Forest Foundation's Wilderness Stewardship Challenge grant. The Foundation provides nationwide competitive challenge grants to community-based nonprofit organizations to implement projects benefitting the Forest Service 10-Year Wilderness Stewardship Challenge. For more information go to the National Forest Foundation website: www.nationalforests.org

[2] Cankers are swellings on the stem or branch that contain powdery orange spores (aecia) of the rust. As the disease develops, cankers increase in size and develop necrotic centers, surrounded by pustules of spores.

WHY IS WHITEBARK PINE IMPORTANT?

Whitebark pine lives in high-elevation environments, generally above 5,000 feet in the Cascade Mountains. The slow growing species is well suited to survive in low temperatures, heavy snow, and high winds. Whitebark pine is considered a pioneer species and plays a distinctive role in establishing new forest communities in the upper montane and subalpine regions. The bountiful production of large seeds annually not only increases the likelihood of successful regeneration, it provides food for the local fauna. These valued fruits are a staple for bears and squirrels in alpine areas throughout the western mountains of the US. In addition, the seeds are essential in the diet of the Clark's nutcracker (Nucifraga columbiana).

It takes about 50 years for whitebark pine to reach sexual maturity. Over the next 200-300 years each tree will produce enormous quantities of seed. A stand is replaced about every 300-400 years through natural disturbances and regeneration. In many cases, the successful regeneration and expansion of the tree's distribution is due to the seed-caching behavior of the Clark's nutcracker.

This relationship between the tree and the bird has been well documented in the research literature. This partnership is timeless and is probably linked at the genetic level. Many suggest that the species may have a mutually obligate interdependence, whereby their mutualism is so strong, the two species may not be able to survive without each other.

Despite their ability to thrive in some of the harshest environments on the planet, this unusual relationship illustrates the fragility of these unique forests. Just over 100 years ago, an exotic, invasive pathogen was delivered to our continent by humans. This event threatens to reshape an entire landscape and derail tens of thousands of years of evolutionary engineering between a tree and a bird.

WHAT IS BEING SURVEYED AND WHY?

The survey techniques adopted by Wolftree were derived from the methods published by the Whitebark Pine Ecosystem Foundation[3] . Sampling in each of the plots includes the tally of all trees, shrubs, and herbaceous species as well as recording the presence or absence of white pine blister rust, invasive weeds, boring and defoliating insects, dwarf mistletoe, native pathogens, and signs of recent fire. The age of the forest stand is determined through annual tree ring samples. The ring data also provides historical information about climate and other environmental features in the area.

All of our 2008 data has been transferred to the USDA Deschutes National Forest and the Whitebark Pine Ecosystem Foundation. Education and Outreach materials will be available on Wolftree's website by late spring 2009. The establishment of permanent plots is the essential first step for implementing restoration measures in these unique plant communities. Over the winter, Wolftree will explore treatment options with forest pathologists in hopes of beginning work in the field by early summer of 2009.

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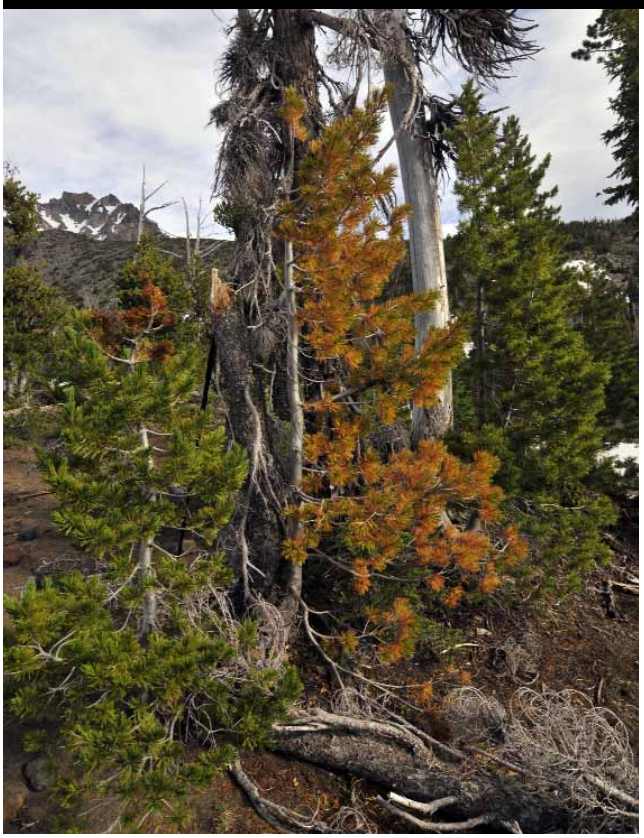
3 Tomback, Diana F., Robert E Keane and Cyndi Smith. 2005. Methods for Surveying and Monitoring Whitebark Pine Blister Rust Infection and Damage. Whitebark Pine Ecosystem Foundation, Missoula, MT.

Top: Years of mortality at timberline ~ looking south towards Broken Top.
Bottom: Physical and biological damage is common in the harsh timberline environment.



Top Left: The Wolftree crew searches for the invasive pathogen. Top Right: Rust on a young whitebark pine. Bottom Left: Transect line through a permanent plot. Bottom Right: Painted metal tags on a tallied tree.

Top: Plot locations are documented from above via high resolution images provided by *Google*.
Bottom: A view from plot 01, Broken Top from remote camp three.