Issue 5

Topics

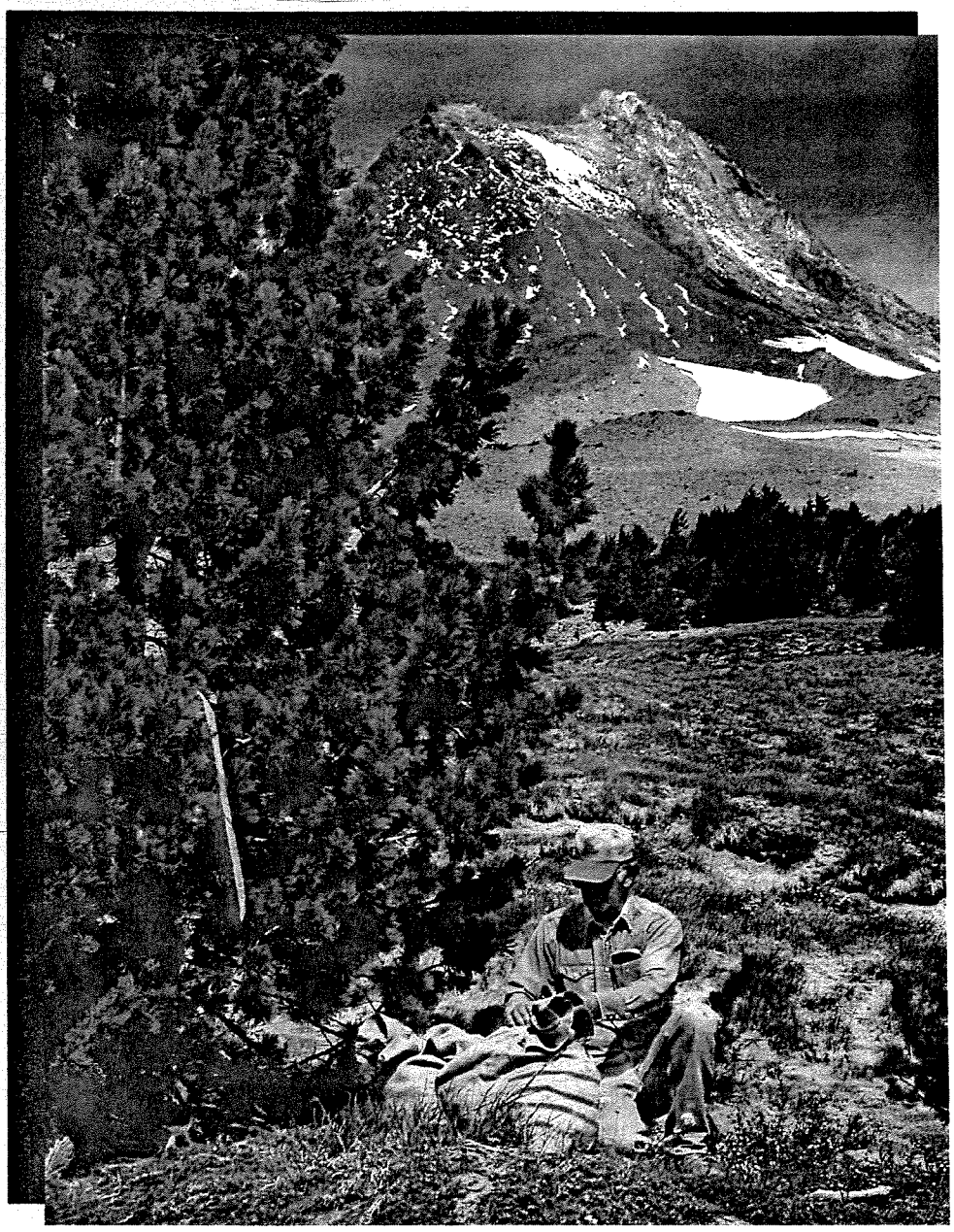
WPEF
P.O. Box 16775
Missoula, MT
59808

Fall | Winter 2003

Nutcracker Notes

Whitebark Pine Ecosystem Foundation

Whitebark Pine along the Pacific Crest: Photo Essay



Larry Elliott bagging whitebark pine cones above Mount Hood Meadows. Photo by Doug Jones.

Young whitebark pine near Marmot Pass in the Buckhorn Wilderness, Olympic Mountains. Photo by Robin Shoal.

The horizontal trunk of this venerable whitebark near Marmot Pass is over three feet in diameter. Photo by Robin Shoal.

WPEF's Mission:
Counteract the decline of whitebark pine, a keystone species of high-mountain ecosystems in western North America.

Director's Message

Diana Tomback
Director of the Whitebark
Pine Ecosystem Foundation

The long, grueling fire season of 2003 put the damper on a number of plans for both WPEF members and our professional colleagues, not to mention the danger it posed to property and life. Some National Forest districts were short on personnel and **not** able to identify plus trees and harvest cones, despite the widespread bumper cone crop in whitebark pine. This was extremely unfortunate, since seeds with potential blister rust resistance are the cornerstone of a whitebark pine restoration program. On a more upbeat note, some fires did burn in successional whitebark pine forests, providing opportunities for whitebark pine regeneration.

As of August 1st, the fire season showed no signs of diminishing, forcing the WPEF to postpone the September workshop, "Monitoring whitebark pine for blister rust: a methods workshop," and our annual meeting in West Yellowstone, Montana. Many of the registered and potential participants were facing uncertainties about attendance and whether they could get travel funds. We were also concerned that our field instruction site for the workshop in the Caribou-Targhee National Forest would be closed—a fear that came to pass. The decision to postpone turned out to be a good one.

Please note that we have rescheduled the WPEF Blister Rust Monitoring Workshop for Monday, June 28 through Wednesday, June 30, 2004, at the Holiday Inn SunSpree Resort in West Yellowstone. The purpose of this workshop is to teach symptoms of blister rust in whitebark pine, sampling strategy, and standardized methods for efficient field assessment of stands. (By moving the workshop from September to late June, we should avoid fire-season problems.) For registration and information, please contact Debbra Graham at Continuing Education, University of Montana, debbra.graham@mso.umt.edu, (406) 243-4623. We thank the Greater Yellowstone Coordinating Committee; USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory; National Park Service, Rocky Mountain Cooperative Ecosystem Studies Unit; USDA Forest Service, Forest Health Protection; and Continuing Education, University of Montana, for reaffirming their sponsorship and financial support for this workshop. **Continued on Page 4....**

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WPEF's ranks have been growing. We passed the 100th-member mark in September. We now have members throughout the range of whitebark pine, from California through the Northwest, and across western Canada. Many members are professionals in resource management or research, but others are concerned citizens. At the fall WPEF board meeting, we elected Cyndi Smith, Parks Canada Conservation Biologist for Waterton Lakes National Park, Alberta, Canada, as a new member of the WPEF Board of Directors. Cyndi has been active in the Foundation since its inception, and a good spokesperson for the plight of whitebark pine in the Canadian Rocky Mountains. Our concern for the rapid decline of whitebark pine ecosystems is international: Blister rust has been found throughout the range of whitebark pine in Canada. We are currently partnering with Cyndi Smith and Waterton Lakes National Park on a Y2Y (Yellowstone-to-Yukon) Wilburforce Foundation grant to assess blister rust levels, and hope to become further involved in projects in Canada.

I would like to briefly explain the impetus behind the workshop "Monitoring whitebark pine for blister rust" and how it relates to the big picture. Many geographic areas within the range of whitebark pine, as well as within the ranges of other five-needled white pines, have not been methodically assessed for blister rust infection, damage, and mortality. The survey methods developed by the WPEF enable standardization of assessment data and comparison throughout the range of whitebark pine, as well as monitoring of blister rust infection levels and damage within a region. Assessment itself must be kept in perspective: The ultimate goal for collecting assessment data is to prioritize geographic areas for whitebark pine restoration. Assessment and monitoring without the end-goal of restoration accomplishes only the detailed documentation of the decline and local extinction of a critical forest resource. However, reliable assessment and good geographical coverage allow us to prioritize areas for restoration and to anticipate where restoration efforts must be placed in the future. In other words, assessment must lead to planning and restoration.

I will close with a news item that underscores the relentless spread of white pine blister rust across our western landscape. This past September, the first case of blister rust in Rocky Mountain bristlecone pine (*Pinus aristata*) was discovered by Jim Blotchett and Kelly Sullivan (USDA Forest Service, Forest Health Protection, Region 2) in the Sangre de Cristo Mountains of southern Colorado. Now, the only five-needled white pine in the West **not** known to be infected by blister rust is Great Basin bristlecone pine (*Pinus longaeva*). This underscores the urgency of our mission in assessing conditions and in designing and undertaking restoration. ■

Whitebark Pine Studies in the Forest Service's Northwest Region

Sheila Martinson, Regional Geneticist
smartinson@fs.fed.us

So far, work on whitebark pine in the Forest Service's Pacific Northwest Region relates to location and health assessment of populations, cone collections, seed germination, and studies of blister rust inoculation at the Dorena Genetic Resource Center south of Eugene, Oregon. Screening to find natural genetic resistance to white pine blister rust has only recently started. White pine blister rust has been present in some parts of the range of whitebark pine for nearly a century, so surveys may reflect an underestimate of its natural historic abundance.

Washington State

Whitebark pine surveys have been conducted on the Okanogan, Olympic, and Mt. Baker-Snoqualmie National Forests. The objective of these surveys is to map distribution of whitebark pine populations, and to assess infection rate and mortality from white pine blister rust and other causes. Needle samples have been collected concurrently with these surveys and in cooperation with North Cascades and Mount Rainier National Parks for isozyme and microsatellite analysis at NFGEL (National Forest Gel Electrophoresis Lab). An interagency agreement has been initiated between the Forest Service and Olympic National Park to map whitebark pine populations in the national park, to collect needle samples for DNA analysis from a subset of the populations, to conduct white pine blister rust and balsam wooly adelgid surveys, and to establish monitoring plots in the national park and the neighboring Buckhorn Wilderness in the Olympic National Forest. The Buckhorn Wilderness population is geographically isolated from other populations on the Olympic peninsula, and thus, genetic analysis may reveal interesting population structure and genetic diversity indicators.

Surveys to assess infection rate and mortality from white pine blister rust are being conducted on the Gifford Pinchot National Forest in areas known to have whitebark pine populations. The Colville National Forest continues to locate and map populations of whitebark pine. Cone collections have been made from various stands across the forest beginning in 1995 for genetic conservation, reforestation, blister rust resistance screening, and genetic variation studies. GPS locations of individual trees from which cones have been collected and for trees showing potential phenotypic signs of resistance to blister rust were gathered by volunteers. Preliminary rust infections surveys of stands have been conducted as well as a preliminary seedling establishment survey of recently burned areas. Planting of seedlings has been done in selected areas, such as the Olson Peak fire, and Round Top Mountain.

Oregon State

Mapping and cone collection in whitebark pine populations

Continued ↗

has begun on the Fremont-Winema National Forest. Cones were collected from 16 trees on Deschutes National Forest in the Mt. Bachelor, Newberrry National Volcanic Monument, and Odell Butte areas in 2001. In 2003 cone collections were made in the Windigo Pass area. In the Blue Mountains of eastern Oregon (Umatilla, Wallowa-Whitman, and Malheur National Forests), stand mapping and development of GIS coverage is underway. Forest personnel have found that aerial photos can be used to help narrow the search for whitebark pine populations.

The Umatilla National Forest has obtained USFS Forest Health Protection funds to conduct a modified stand exam in the Indian/Rock Vinegar Hill area to determine stand condition, extent and severity of rust, level of mortality across age classes, and degree of stand regeneration. Fieldwork was completed in early August, and an analysis of increment cores will determine total age and growth-rate patterns. A restoration project including thinning and girdling competing conifers and burning was completed in 2003. Similar stand treatments were conducted on the Baker district of the Wallowa-Whitman National Forest, but lynx habitat issues currently conflict with and constrain treatments in whitebark pine stands.

Cones were caged and collected from the Blue Mountains for use in blister rust resistance screening and also for future reforestation of stands that are at high risk for stand-replacing fires. On the Mount Hood National Forest, whitebark pine condition surveys have been conducted, and cones were caged and collected from approximately 17 trees.

Because of concern over widespread population declines, the distribution, stand conditions, and health of whitebark pine were evaluated along the Pacific Crest National Scenic Trail on the Umpqua National Forest during the summer of 1998. A series of transects were installed at one-air-mile intervals along approximately 30 miles of the trail. Whitebark pine occurred on 76 percent of the survey transects. Of all whitebark pine encountered, 44 percent were alive and healthy, 46 percent were alive but infected by the blister rust fungus, and 10 percent were dead. Two-thirds of the mortality was due to white pine blister rust. Mountain pine beetle (*Dendroctonus ponderosae*) alone accounted for 13 percent of the mortality. Detailed results of this survey constitute a reference condition for whitebark pine that can be used to assess change in its status in this part of southwest Oregon. The publication by Goheen et al, 2002, The status of whitebark pine along the Pacific Crest National Scenic Trail on the Umpqua National Forest, Gen. Tech. Rep. PNW-GTR-530, is available at http://www.fs.fed.us/pnw/pubs/gtr530.pdf. Additional work to characterize other

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Germinating Whitebark Pine at Dorena Nursery

Lee E. Riley, Carmen M. Coumas, Judith F. Danielson, and Richard A. Sniezko
Dorena Genetic Resource Center,
Umpqua National Forest, Cottage Grove, OR

Production of whitebark seedlings in nursery regimes, for both disease screening and reforestation, requires overcoming some inherent problems of regeneration in the species. Seed germination is generally poor and erratic. Only 10 to 15 percent germinate in the first year under natural conditions. The presumed reasons for this include predation and caching of seeds by animals before the embryos mature, lack of suitable substrate or climatic conditions, complex physiological requirements for release from dormancy, and extremely hard seed coats. All of these factors may be positively adaptive in a natural environment over the long term, providing a small supply of germinants over a period of 2 to 3 years given the proper conditions. But they present serious challenges in a nursery environment. The previous literature on attempts to successfully produce whitebark seedlings is varied but not extensive, and determining a routinely satisfactory protocol has been difficult. The most successful procedures to date are those developed by Coeur d'Alene Nursery (Burr and others 2001).

In 2001, Dorena Genetic Resource Center initiated a whitebark pine germination study. The objective of this study was to compare the protocols used by Coeur d'Alene Nursery (the "control") with a variety of pre-sowing and culturing treatments to determine best germination and growing procedures for this difficult species in a different growing environment, and with seed lots of various ages from different locations.

A total of 20 lots of whitebark pine, with storage times ranging from 0 to 7 years, were used in this study. Nineteen lots were individual tree collections from 5 forests in Washington and Oregon; 1 bulk seed lot was from the Shoshone National Forest in Wyoming.

Overall treatment germination percentages ranged from 31 to 74 percent. The overall germination in the control treatment was 69 percent. The overall germination in the chosen protocol for Dorena GRC was 74 percent. Full details of the study will be published in a forthcoming issue of the *Native Plant Journal*.

Key Findings

1) A longer stratification period (120 days) reduced the number of seed that required nicking of the seed coat prior to germination. Many seed split naturally during the extended time in cold stratification, greatly reducing seed handling and preparation time.

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Whitebark Pine Conservation on the Mount Hood National Forest

Doug Jones, Permit Specialist,
Mount Hood National Forest

Whitebark pine is a special feature of the timberline zone on Mount Hood, a snow-clad volcano in the "backyard" of the Portland metropolitan area. The Mount Hood National Forest is concerned about the condition of the whitebark pine stands around Mt. Hood because mortality seems heavy and increasing over the past 10 years. Many of the whitebark pine communities are within Wilderness, where restoration treatments may not be allowed. Moreover, unlike the Rocky Mountains, the high country on Mount Hood seldom experiences lightning fires, and prescribed fire is not likely to be a useful tool.

The national forest's ecology and silviculture groups are working together on an assessment of whitebark pine conditions. The survey data will be used to map current and historical occurrences of whitebark pine and to assess the damaging agents. This information will be used to develop a conservation plan for whitebark pine on Mount Hood.

Extensive surveys in 2003 found that in some areas, such as Lookout Mountain and Badger Butte just east of Mt. Hood, the species is mostly dead. Three non-wilderness areas have good access to living populations: Timberline Lodge, Mount Hood Meadows Ski Area, and Cloud Cap Inn. The trees at Timberline and Cloud Cap are in poor condition and on-going attacks by beetles and blister rust at Cloud Cap allow one to witness large multi-stemmed whitebark pines succumbing each year.

Some encouraging results were found at Mount Hood Meadows. Although not yet quantified, it appears that the healthiest whitebark pines are in the krummholz zone, where trees develop into huge sprawling shrubs, rather than lower on the slopes where mountain hemlock is a vigorous competitor. Also, there is a noticeable quantity of regeneration in the ski area and just to the north on the edge of White River Canyon.

The Mount Hood whitebark pines had a bumper crop of cones in 2003, and the national forest's reforestation staff collected cones. Trees with apparently strong blister rust resistance where selected at Meadows and Cloud Cap and cages were used on some trees. Cone collection started in mid-September at Meadows where 11 bushels were gathered by trained tree climbers and a ground crew of fire personnel. Unfortunately, the following day saw 6 inches of snowfall, and when the crew went to Cloud Cap 2 days later, the nutcrackers had gotten nearly the entire crop – including from within cages! Does a snow storm trigger a feeding frenzy with the nutcrackers?

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Ghost Trees of Crater Lake

Ron Mastrogiuseppe, Director
The Crater Lake Institute,
P.O. Box 2, Crater Lake, OR 97604

Crater Lake National Park was established in 1902 to protect a deep blue mountain lake of indescribable beauty. It is the sacred landscape to Native peoples, a geological wonder enhanced by the verdure of coniferous forests. What better place to understand the nature of dynamic Nature?

Crater Lake caldera embraces the deepest lake in the US. It is a classic example of a Cascadian caldera, resulting from the awe-inspiring volcanism that destroyed ancient Mount Mazama 7700 years ago. Because the caldera rim is so accessible by an historic rim road, many lake view points permit the visitor to see whitebark pines (*Pinus albicaulis*) established in groups or rows along the caldera rim edge and to witness Clark's Nutcrackers (*Nucifraga columbiana*)opening seed cones in early autumn. The popular 2.5 mile trail to Mount Scott's summit and the more popular Watchman Lookout hike both meander through whitebark pine woodland ascending the slopes.

Crater Lake National Park was the first place I learned about whitebark pines forty years ago. Following one night at The Watchman Lookout, I awoke to the sounds of a large flock of Clark's Nutcrackers opening whitebark pine seed cones. At this time, the Park Naturalist, Richard Brown, was monitoring Nutcracker longevity through leg banding, and we often discussed the relationship of these Corvids with whitebark pine. Brown was a keen observer and an excellent naturalist and teacher. While white pine blister rust had infected both sugar pine and western white pine, it was not then known in the Park's whitebark pines.

Now the Park is 101 years old, and many of its majestic whitebark pines are dying or already dead. This dramatic mortality has been underway for at least the past 20 years, based on observations in permanent plots we established beginning 25 years ago. The mortality is also very obvious in pumice field tree atolls along the North Entrance road to North Junction.

Of all the geological features of the caldera, the best known is Wizard Island, a cinder cone whose age is probably greater than 7000 years. Its formation resulted from ejected material falling back to earth so evenly that a very symmetrical shape resulted in the western portion of the lake. This symmetry allows synecological studies of plant distributions according to aspect. This feature resulted in a published paper by M.T. Jackson, and A. Faller in 1973[1] and is the only available vegetation

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Current Studies at Crater Lake National Park

Michael Murray, Terrestrial Ecologist
P.O. Box 7, Crater Lake, OR 97604

This year's activities consisted of cone collection for rust-resistance testing, installation of long-term monitoring plots, and fire history research. We targeted ten trees for collection at Rim Village where blister rust is most abundant in the Park. This site receives about 500,000 visitors annually. A 60-foot boomlift was used along the Promenade Walk as a safe, cost-effective, and thrilling alternative to hand climbing (see photograph). Many cones had separated from their branches by the collection date (October 24) and uncaged cones were completely picked by nutcrackers. This was a combined effort of maintenance, interpretation, and resource science personnel at the Park. The U.S. Forest Service Dorena Tree Improvement Center has been given all seeds to propagate and test for resistance. Any seedlings proven to be resistant will be used to revegetate Rim Village's parking lot which will be re-located away from the Caldera in 2005.

Seven long-term monitoring plots were installed in the Park at a variety of habitats. The primary objectives are to determine rates of blister rust infection and death. This effort consists of inspecting more than 500 trees annually. An unanticipated finding is the discovery of a variety of insects that are living in these trees—moths, yellow-jackets, and mountain pine beetles. All tree size-classes appear to be well represented within stands.

The first year of a fire history study was completed this summer. The objectives are to gain an understanding of fire regimes associated with whitebark pine communities in the Cascade Range and to describe historic and current stand conditions and estimate potential ecological effects of fire exclusion policies. Preliminary findings indicate Cascadian stands historically burned in all types of severity. Some stands never, or rarely burned as a unit, and exhibit trees upwards of 500 years old. We've determined only two fire return intervals so far. A 37-year interval at Crater Lake and a 116-year interval at Mount Rainier. We will continue to collect and analyze more evidence during 2004.

Blister rust surveys are an ancillary component of all whitebark pine efforts at Crater Lake National Park. Surveys thus far indicate that up to 20 percent of the trees are infected with active cankers. The west side of the Park is hardest hit. As we continue to fill information gaps, questions regarding future management arise. Should we protect certain trees in special sites such as Rim Village from beetle infestation with chemicals? Where should we plant rust resistant trees? How can fire be reintroduced without causing unacceptable mortality to remaining whitebark pines? We will continue to cooperate with other agencies and interests in our quest to retain whitebark pine ecosystems. ■

Surveying Elusive Whitebark in the Olympic Mountains

Robin Shoal, Biological Science Technician
Olympic National Forest, Olympia, WA; rshoal@fs.fed.us

The Olympic Peninsula, in the northwest corner of Washington State, is known for its soggy maritime climate and lush temperate rain forests. Fires are rare. In this verdant environment, surrounded on three sides by marine waters, one wouldn't expect to find a tree species that prefers cold, dry conditions, but there is a small niche for whitebark pine in the rain shadow region in the northeast corner of the Olympic Mountains.

Annual average precipitation across the peninsula ranges from over 200 inches near Quinault, in the peninsula's southwest corner, to less than one-tenth of that around the rugged peaks framing the Dungeness and Gray Wolf river basins. Scattered above forest line on the south- and west-facing slopes of these peaks and ridges, one can find small, scattered populations of whitebark pine. This slender horseshoe of whitebark pine habitat straddles the boundary between the Olympic National Forest and the Olympic National Park.

In the summers of 2002 and 2003, we conducted extensive surveys of whitebark pine stands in the vicinity of Marmot Pass, east of the Dungeness basin in the Olympic National Forest's Buckhorn Wilderness. We also surveyed whitebark pine on the Mount Baker-Snoqualmie and the Okanogan and Wenatchee National Forests in the Cascade Range. Our primary objectives were to locate and map the extent of whitebark pine on these national forests and to assess the degree of infection by white pine blister rust. We also made observations about cones, overall mortality, size and age class composition of the stands, additional tree species present, Clark's nutcracker and other wildlife activity, mountain pine beetle, and *Ribes* species. In 2003 we began collecting branch tips for genetic analysis, and in both years we cored a small number of trees to determine their age.

In the Buckhorn Wilderness, whitebark pine occurs on dry, exposed slopes above 5500 feet (1675m). On exposed ridges and saddles, the species grows in krumholz form. On lower slopes and in more protected areas, mature trees reach heights of up to 40 feet. Associated tree species are subalpine fir *(Abies lasiocarpa)*, lodgepole pine *(Pinus contorta)*, western white pine *(Pinus monticola)*, and Alaska yellow cedar *(Chamaecyparis nootkaensis)*. Whitebark in the Buckhorn Wilderness does not generally occur in neat, definable "stands." It is patchy, and fades in and out with changes in slope, aspect, and soil composition.

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Northwest Region Continued from Page 5 ....
whitebark pine stands in the southern Oregon Cascades is planned for the near future.

Dorena Genetic Resource Center:

Cone and Seed Processing: Dorena has been processing whitebark pine cones from individual-tree collections since 1994. Through early fall 2003, cones have been received from 7 national forests (Mt. Hood, Colville, Fremont, Deschutes, Umatilla, Winema and Umpqua), as well as from Crater Lake National Park, and the Warm Springs Indian Reservation. A total of 101 seedlots was processed between 1994 and 2001, and cones from about 100 additional parent trees have been or are expected to be received this fall, including cones from pines at Mount Rainier National Park. Seed from these collections has been used to refine stratification and germination protocols for whitebark pine and testing for the presence of major gene resistance to white pine blister rust. In September 2004, 46 of these seed lots will be inoculated as three year old seedlings. Many of the seed lots collected to date were included in a genetic variation test (common garden study) that is part of Andy Bower's current Ph.D. project at the University of British Columbia.

Nursery Culturing Study: The production of whitebark pine seedlings for blister rust screening and reforestation requires the development of nursery culturing regimes to optimize both germination and subsequent growth. In 2002, Dorena initiated a small germination and culturing trial utilizing seed from 20 families scattered across the range of the species in Oregon and Washington. For information on this study, see the poster by Riley and others at the Dorena Genetic Resource Center website: www.fs.fed.us/r6/dorena. The majority of the seedlings produced from this study will be inoculated with blister rust in 2004. The remaining surplus seedlings will be planted in suitable sites on the national forests where the seed was collected.

Inoculation Trials: Initial studies of rust inoculation conducted on seedlings from different areas have shown interesting preliminary results that were presented at the Western International Forest Disease Work Conference in 2003. Those wishing more information on these technical studies can obtain it from the author.

The following people contributed information for this synopsis of activities: Carol Aubry, Area Geneticist for Olympic, Mount Baker-Snoqualmie, and Wenatchee NF; Tom Despain, Area Geneticist for Okanagon and Colville NF; Dave Doede, Area Geneticist for Gifford Pinchot, Mount Hood, and Siuslaw National NF; Nancy Lankford, Silviculturist, Mt. Hood NF; Jim Hamlin, Area Geneticist for Umpqua, Rogue-Siskiyou, Deschutes, Ochoco, Winema-Fremont, and Willamette NF; Richard Sniezko, Geneticist at Dorena Genetic Resource Center; Angelia Kegley, Dorena Genetic Resource Center; Donna Stubbs, Fremont NF; Ellen Goheen, Area Pathologist for Rogue-Siskiyou and Umpqua NF. ■

Mount Hood Continued from Page 6 ....
The cones are taken to the Regional seed extraction facility at Bend. Then, seeds are transported to the Dorena Tree Improvement Center for analysis of rust resistance and planting. Dorena has extensive experience with Western White Pine blister rust testing and breeding. Approximately 50% of the seeds can be planted without resistance studies and those will be available for out-planting on the national forest in 2006-7.

The Mount Hood National Forest has roughly 100 two-year old whitebark pine seedlings that will be planted at Meadows in Fall 2004. Seed for these seedlings came from Timberline some years ago. The Forest would like to help the whitebark pine population at Cloud Cap, an area of century-old buildings on the National Register of Historic Places. It is easy to identify large healthy whitebark pines on turn-of-the-century photographs of Cloud Cap and compare them with skeletons of trees that remain today.

The Forest will continue working with the ski area manager at Meadows to minimize the number of whitebark pine damaged by snow grooming and cut for ski trails. Sites will be sought where conditions appear suitable for planting seedlings, and where they would be out of the way of ski area operations. A number of local environmentalists are interested in helping to plant the seedlings and to monitor their success over time. The good access, inherently "disturbed" conditions, and cooperation of people associated with the ski area could help this site become a successful area for restoring whitebark pine. ■

Dorena Continued from Page 5 ....
2) In contrast to previous literature, seed stored in excess of 4 years maintained viability. Under the chosen regime (as determined by this study), seed stored for 1 to 3 years ranged from 37 to 100 percent germination, while seed stored for 4 or more years ranged from 42 to 100 percent germination.

Literature Cited

Burr, K., Eramian A., Eggleston K. 2001. Growing whitebark pine seedlings for restoration. In: Tomback D., Arno S., Keane R., editors. Whitebark pine communities. Washington: Island Press. p 325-345. ■

Indian-peeled Continued from Page 14 ....
Towards the end of the field semester, while completing my final independent study project on whitebark pine, I encountered several bear-peeled trees in lake basins along the Swan Range. I also read documentation of other tree species being peeled as a source of food by native peoples in different parts of the northern hemisphere, including ponderosa pine in northwestern Montana. However, to my knowledge, these scarred trees may be the first evidence of the cultural use of whitebark pine. As a brief visitor to Montana, and a new student of whitebark pine ecology, it was fascinating and exciting to discover yet another dimension to the ecological and cultural value of these extraordinary trees. ■

Ghost Trees Continued from Page 6 . . . .
monitoring report for the island. At the time of this study, whitebark pine dominated the summit crater rim community along the southwest slope of the island. The ages of the trees were largely unknown since decay is common in the oldest wood. Mountain hemlock (*Tsuga mertensiana*) and true fir (*Abies magnifica* var. *shastensis*) were associates, but lodgepole pine (*Pinus. contorta* ssp. *murrayana*) was surprisingly rare on the island. Whitebark pine encircles the summit crater and extends only a few hundred feet downslope. There were approximately 27 living whitebark pines per acre in the crater rim community. Whitebark pine represents approximately 73 percent of the stems in this community.

Thirty years ago there was significant whitebark pine mortality: 45 percent of standing stems greater than four inches dbh were snags. Jackson and Faller observed that the leafless mistletoe, *Arceuthobium tsugense* was present, but did not detect white pine blister rust. However, we do not know of any pathologist who had examined these trees by this date, and we must remember the adage, "*the absence of evidence is not proof of absence.*" We do know that the regional endemic, Crater Lake currant (*Ribes erythrocarpum*), is a member of the plant community on the island's shady north slope. Along the rim, this currant forms a ground cover beneath whitebark pine and other conifers. Another *Ribes* is present on dry, rocky slopes: wax currant (*R. cereum*). Thus, the alternate host of white pine blister rust grows near Wizard Island's whitebark pines.

In all my searching, I have not yet located any authentic fire scars in whitebark pines at Crater Lake. Many of the lower stem scars are believed to have been made by porcupines. Evidently due to the extensive amount of bare rocky ground surface, fires in whitebark pine woodlands have been very local, small lightning-ignited fires. The only recent fire to kill several whitebark pines was the late summer 1978 Goodbye Fire, which raced up the south slope to the summit crater of Crater Peak, a sight for visitors traveling the south entrance road.

There are many factors that collectively bring about tree death, including drought, indigenous insects, and diseases. When an exotic disease like blister rust is added to the cumulative effects of these other factors, the trees have little natural resistance. Long-lived trees such as whitebark pine tend to have restricted living cambium, further narrowed by ice and sand abrasion. An introduced disease can be the final and dramatic affliction. Trees that appear healthy today may exhibit signs of blister rust within a few years and slowly perish.

The subtle characteristics of the life stages of blister rust are best identified by pathologists, and the actual entry date of this exotic disease into the Park is not accurately known. I suspect that blister rust brought about the rapid decline in whitebark pines on Wizard Island's summit during the late 1960s and early 1970s. It will be necessary to locate and identify rust resistant trees in the existing population of whitebark pines. Then, restoration projects need to cultivate more resistant recruits to fill the widening gap in age classes.

WIND-BLOWN PINE
On this torn ridge he rooted, proud and free,
Battling the wild earth-forces for control;
Life granted not his dream of beauty, so he,
Majestically dying, reached his goal.

Ernest J. Moll 1935, Blue Interval: Poems of Crater Lake ■

Whitebark Pine in the Beaverhead-Deerlodge National Forest

[excerpts from Lee Harry, Silviculturist, Dillon, MT; lharry@fs.fed.us]

During the summer of 2003 the Gravelly Range near Ennis, MT, was experiencing heavy mortality of whitebark pine due to mountain pine beetle attacks. Trees at higher elevations (above about 8300 feet) have sustained less damage from beetles. Blister rust infection rates and numbers of cankers per tree are the highest I've seen on our forest. In some stands 95 percent of the trees are infected. There isn't a huge amount of mortality due to rust at this time, but damage appears to be worsening.

Another hard-hit area is the Occidental Plateau near Boulder, MT. Rust infection rates are similarly high there, although numbers of cankers per tree are a bit lower. Beetle activity is presently low. The rest of our national forest has rust, but only about 40 to 60 percent of trees are infected, with only a few cankers per tree. Mountain pine beetle is active in much of our forest, but only the Madison Ranger District has heavy whitebark pine mortality from beetles so far.

The 2003 cone crop is good in both the heavily damaged areas—Gravelly Range and Occidental Plateau—and we are making collections from "plus trees" of whitebark pine (trees of good vigor). One big concern is collecting at maturity, when the embryo is adequately developed. ■

1 Jackson, M.T. and A. Faller 1973. Structural analysis and dynamics of the plant communities of Wizard Island, Crater Lake National Park. Ecological Monographs 43: 441-461.

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Olympic Continued from Page 7 . . .

Our surveys consisted of 15-foot-wide (2002) or 20-foot-wide (2003) compass-bearing belt transects beginning at or near stand edge and running through a representative portion of each stand surveyed. We used a handheld GPS data recorder to collect elevation and location information. Whitebark pine grows primarily in multi-stem clumps, and for each of a minimum of fifty clumps encountered within a transect we recorded the number of stems, the size class of each individual stem, which stems were dead and which were alive, and the presence or absence of observable blister rust and mountain pine beetle symptoms. Blister rust infections were coded for severity based on the location of the canker relative to the bole of the tree, and whether or not the disease had caused top-kill of the infected tree. We completed five survey transects, observing a total of 862 stems in 256 clumps.

Some Findings

Saplings, trees at least 4.5 feet tall and up to 5 inches in diameter at breast height (dbh), comprised 88 percent of the whitebark pines in the survey transects. An additional 9 percent were poles (between 5 and 9 inches dbh), and 3 percent were mature trees (greater than 9 inches dbh). Tree cores taken in 2003 have not yet been analyzed.

Overall mortality is high. Snags and down dead whitebark pine are abundant. Of the 590 individual stems observed in the three 2003 survey transects, 25 percent were dead. The size class percentages for live trees are similar to the overall ratios. Larger-diameter trees comprise a relatively greater portion of the dead trees. Only 15 mature trees were encountered, and mortality of mature trees within these transects was nearly 50 percent. Although much of this mortality is likely the result of blister rust, many of the trees have been dead for so long that definitively assigning any single cause of mortality is difficult.

Of the total of 256 clumps observed in the five transects, 21 percent contained one or more stems with blister rust cankers. We encountered only a few *Ribes* plants inside the transects, but *Ribes* are common in the north- and east-facing drainages immediately adjacent to whitebark pine habitat. Fog and mist frequently rolls up out of these drainages and settles over the peaks and ridges, providing prime conditions for spores of the fungus to infect five-needle pines. Mountain pine beetle does not currently appear to be much of a concern in whitebark pine in this vicinity. We saw only one live whitebark pine affected by mountain pine beetle.

As it was in much of the West, 2003 was a good cone crop year for whitebark pine in the Olympics. A group of five or six adult Clark's nutcrackers was observed in both 2002 and 2003, but in 2003 they were especially as they raucously harvested seeds. Chipmunks were also seen in the treetops, gleaning seeds from cones opened by the nutcrackers. We also found a number of blister rust cankers that had been gnawed by rodents.

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The whitebark pine population in the Olympic Mountains is separated from its nearest Cascade Range neighbor by nearly 100 miles (160km) as the corvid flies. It seems unlikely that there is much transfer of seed between the Cascades and the Olympics. In order to get a sense of what relationships might exist between the Olympic population and whitebark pine populations on the Mount Baker-Snoqualmie and the Okanogan and Wenatchee National Forests, in 2003 we took genetic samples (growing branch tips) from all the sites we surveyed on these three forests. The samples will be analyzed this winter at the Forest Service's Genetic Electrophoresis Lab in Placerville, California.

What's next for Olympic whitebark pine?

The Olympic National Forest and the Olympic National Park will collaborate in 2004 to survey whitebark pine in the park. When these surveys are complete we will have a strong base of knowledge about whitebark pine populations on the Olympic Peninsula. Scientists and land managers in the region can use this information to guide long-term management of the Olympic whitebark pine ecosystem. ■

Commentary on Idaho's Giant Whitebark Pine

Ron Lanner, Emeritus Visiting Scientist
Institute of Forest Genetics, Placerville, CA
Pinetree30@earthlink.net; www.ronaldlanner.com

[Editor's Note: Ron is the author of several books including Made for Each Other: A Symbiosis of Birds and Pines *published in 1996 by Oxford University Press.]*

The photo in Issue 4 of *Nutcracker Notes* of that magnificent Lake Imogene whitebark pine is quite revealing, even though, unfortunately we can't see the live bark strip or what looks like a second trunk behind the big bare bole. For one thing, its large limbs show it grew up in the open, unshaded by nearby trees or from above. Second, its considerable height indicates it was not really very stressed. If it had led a dog's life it would not have kept extending a viable leader for many years, or carried enough foliage on its network of branches to fuel the growth of a massive vertical trunk over many meters. And the conifers in the background—Engelmann spruce(?)—are tall, slender, and normal in growth habit, suggesting this is a low stress area. Actually, this whitebark is a tree that had it good for centuries.

The suggestion that its strip-bark status is due to bark beetles and an "inhospitable" climate is off the mark. Mountain pine beetle strip-kills are narrow and cat-face

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Whitebark Pine Discovered on Mount Ashland

Frank A. Lang, Emeritus Professor of Biology
Southern Oregon University, Ashland, OR

On August 31, 2003, while attending a Forest Service-sponsored trip, to examine the proposed expansion of the Ski Ashland development, I discovered a whitebark pine tree with a single cone growing near the moraine at the bottom of the bowl on Mount Ashland in the eastern Siskiyous. The trip leaders Steve Johnson of the Forest Service and ski area manager Jeff Hanson, witnessed this event, and another participant confirmed my identification. Surrounding the tree are several small five-needled saplings that could be whitebark pine or the much more common western white pine. Two weeks later Jim Duncan and I found a second whitebark pine tree with cones near a large western white pine on the east edge of a man-made tree island on the west edge of upper Dream ski run near the entrance to Caliban.

As far as I can determine, these are the first documented discoveries of whitebark pine on Mount Ashland (which is 7523 feet in elevation) or in the eastern Siskiyous. Like Mount Ashland's Engelmann spruce and subalpine fir, the whitebark pine may offer evidence of a colder climate in the past. This tiny population is at risk from white pine blister rust and disturbance from a proposed ski area expansion. The Rogue River National Forest and Ski Ashland are aware of these whitebark pine trees. Hopefully they will make every effort to avoid damaging them. Possibility other observers have seen whitebark pines on this mountain or other nearby peaks and photographed or collected specimens, but failed to report the find. I would appreciate learning about any documented reports. [The author's address is 535 Taylor Street, Ashland, OR 97520; phone 541-482-5235.]■

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like, and don't spread tangentially. And cambium under bark is well-protected from any conceivable climatic insult. As in very old bristlecone pines (I hate the word "ancient," don't you?) the dead trunk sectors are probably due to the death of the major roots that watered those sectors and the branches emanating from them. The roots died because they are very old and have outlasted the soil they grew in. Sheet erosion or mass-wasting afflicts all trees that are not in a microtopographical situation that accumulates soil. Let trees live long enough and their roots will be eroded out of their anchorage.

What I find interesting about this big old whitebark is its lack of steep forks of the trunk and major limbs. Such forks give open-grown whitebarks (and limber pines, too) a characteristic crown with discrete broomlike crownlets. I think they multiply the trees' cone-bearing potential by

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providing many more terminal buds in which cones can form. But what causes such un-pinelike behavior—such excessive forking?

A few years ago I dissected the forks of a whitebark sapling and found many of them to harbor rotten bud or shoot remnants, indicating that terminal buds or young shoots had died, and laterals had supplanted them. This had apparently occurred repeatedly. Why? I speculate that the buds or immature shoots are killed by white pine weevils, *Pissodes strobi*. This beetle is best-known for raising hell with eastern white pine, but in the West it does the same with Sitka and Engelmann spruces. I have bored several entomologists over the years with this speculative tale of weevils making trees fork, to make more cones, to feed more nutcrackers, to cache more seeds, to grow more pines, to be forked by more .... well, you get it. But the entomologists haven't got there yet, assuming there is somewhere to get to. Let this be one more reminder to check it out.

The picture also reveals the presence of burls or tumors on the big trunk, and a right-handed spiral grain of the wood cells (tracheids). The origin of burls like these is murky. Back in the 1950s, cancer researchers were intrigued with trunk burls on white spruce along the Maine coast. After a few years of wheel-spinning, they decided these overgrowths could tell them little they wanted to know about cancers afflicting humans, so they decamped and went on their way. One hypothesis they put forth was that salt-spray was the culprit that caused the cambium to overreact locally on the spruce trunks. One might claim support for this idea from the similar burls on Sitka spruce growing along the coast of the Olympic Peninsula. But salt spray doesn't seem too hot an idea for the Imogene Lake whitebark, or for the beautifully tumored lodgepole pines used to build the Lodge at Yellowstone.

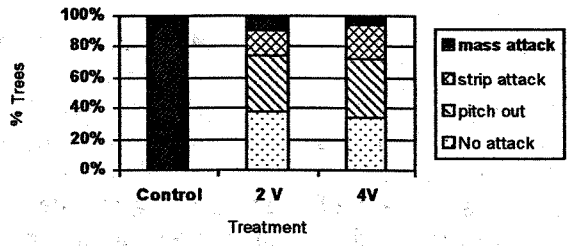
The cause of spiral grain is as unclear as that of tumors. In the early times of tree research (when I was a forestry student) the quick answer was "Coriolis force," resulting from the rotation of the earth. Thus, trees in the northern hemisphere were said to have a right-handed spiral and those in the southern hemisphere a left-handed spiral. But walk around anywhere and you are likely to see both spirals in the same area. The latest formulation is that spiral grain is caused when an asymmetrical tree, like one with its crown concentrated on one side, is torqued by a unidirectional wind. This idea is enthusiastically supported by some very smart people who work in the area of mechanics and physics, but there seems to be an inconvenient lack of evidence. Nor has a convincing mechanism been suggested to take it from torque to cambial reorganization. But such musings as these can help pass the time spent under a big old tree.■

Beetle Continued from Page 14....

Results

The verbenone pouch protected trees very well, especially considering we also baited the trees (attracted beetles to the trees). Some pitch outs (few beetles attacked and the trees pitched them out) and strip attacks (only part of the tree was colonized by beetles) occurred on the verbenone treated trees but these attacks did not result in death of the trees. Significantly more mass attacks (fatal to the tree) occurred in the control trees ($p<0.001$) than either the 2V or the 4V treatment. There was no significant difference between the 2V and 4V treatments (figure 2) (Kegley et al. 2003). All control trees with tree baits on them were mass attacked.

Figure 2. MPB attack by treatment in the Selkirk Mountains.



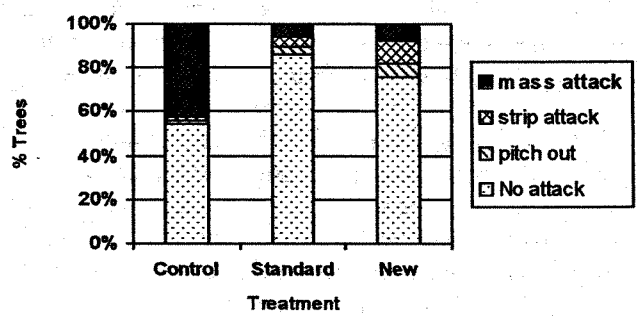
Seeley Lake Test

After the encouraging results in the Selkirk Mountains, we repeated the test on Morrell Peak near Seeley Lake, Montana in 2003 with a few changes. The company that produced the verbenone pouch (PheroTech) made a longer-lasting pouch that was intended to release verbenone more slowly and would not need to be replaced mid-season like the original standard pouch. Our treatments were 1) control, no verbenone, 2) two standard verbenone pouches per tree replaced in late July, and 3) two new (slow-release) pouches per tree that were not replaced. We thought that placing tree baits (attractant pheromone) on the tree was an extremely tough test for verbenone in our first test, so we placed the baits roughly 10-15 feet away from the treated trees on Morrell Peak. As in the first test, there were approximately 50 trees in each treatment and treated trees were at least 130 feet apart.

Results

Once again verbenone protected trees from MPB attack and there were significantly more control trees mass attacked than either of the verbenone treatments (fig. 3). There was no significant difference between the standard and new pouches for mass attacks. However, there were twice as many pitchouts or strip attacks on trees treated with the new pouch as compared to the standard pouch. Statistical analysis is pending. Not all control trees were mass attacked in this test, probably because tree baits were not placed directly on the trees and/or MPB populations were not as high as in the Selkirk Mountains.

Figure 3. MPB attack by treatment on Morrell Peak.



Additional verbenone pouches in this test were placed on site and collected at 2-week intervals. These were sent to the Pacific Southwest Research Station to analyze for verbenone content to determine actual release rate under field conditions.

Conclusions/Future Testing

Verbenone pouches have shown great promise in protecting whitebark pine trees from MPB attack, even when using tree baits to attract beetles. Operationally, tree baits would not be used and thus, attacks on treated trees should be less. This treatment would be especially useful in protecting high-value, blister rust resistant whitebark pine.

Currently, the standard pouch, produced by Phero Tech, has shown the best, most consistent protection when replaced mid-season. It is commercially available and registered for use in managing MPB. But replacing the pouches doubles the cost. The current price is $5.50 per pouch ($11.00 per tree using 2 pouches per tree) multiplied by two (replacement mid-season = $22.00 per tree) plus labor costs. Pouch cost should decrease as the demand for verbenone increases.

Results from the pouch analysis will give us a better idea of how fast verbenone is actually released from pouches in the field. Further statistical analysis and field testing will determine if Phero Tech's slower release pouch performs just as well as the standard. Treating trees only once per year would greatly reduce costs. We also plan on testing a new improved slow-release pouch produced by another company for less cost in 2004.

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Nutcracker Chatter
(News Briefs)

Check Out www.whitebarkfound.org

Our world-class volunteer Web Master, Chuck Crouter, reports that WPEF's web site had 12,000 hits in the month of September. Why, so much traffic? Look it up for yourself. The site has a smorgasbord of information and educational material about whitebark pine ecosystems, a photo library, WPEF membership information, and a new bargain offer on the book *Whitebark Pine Communities: Ecology and Restoration.*

Whitebark in the News

This year produced some newspaper accounts about the importance of whitebark pine cone crops for sustaining wildlife, and specifically pointing to a good cone crop in the Yellowstone area that bodes well for bears. We also saw a new kind of appreciation of whitebark and WPEF's mission to conserve it in major newspapers. Syndicated environmental writer Ed Marston (Writers on the Range) placed a compelling account of whitebark pine's values and the perils it faces in several major newspapers, including the Salt Lake Tribune. Marston's article features the work of the WPEF and our Director Diana Tomback. This article can be picked up from the opening page of our web site.

WPEF Blister Rust Workshop Re-scheduled for June, 2004

See the details in the Director's Message, page 3 of this issue, and join us in West Yellowstone.

WPEF's Field Trip Ascends 2400 Feet Through Whitebark Pine

WPEF had planned its annual meeting and field trip in the West Yellowstone area in September, in conjunction with the Blister Rust Workshop. When the frenzied 2003 wildfire season put the kibosh on our plans, we had to quickly regroup. Once the fires were subdued, WPEF scheduled a board meeting for October 10th in Missoula, followed by a day hike October 11th through the extensive whitebark pine zone on Saint Mary Peak (9350 feet) near Stevensville. Twenty-seven daring souls, including a fewfrom Canada, attended this nature hike and field discussion of whitebark pine ecology. Despite a light coating of new snow and freezing temperatures, the sun came out just long enough to warm us as we lunched among whitebark pines and nutcrackers on a lofty ridgetop. Plans are already in the works for a different but equally interesting whitebark pine day hike next autumn, to be announced in the spring-summer *Nutcracker Notes* and on our web site.

Call for Papers and Observations

If you have observations, other information, or commentary about whitebark pine ecosystems, please consider submitting it to *Nutcracker Notes.* The exchange of information and ideas is an important part of WPEF's mission. As is illustrated by the contents of this issue, submissions can range from brief observations to more lengthy, semi-technical articles—up to a maximum of 1200 words. We also use a few color photographs in each of the twice-yearly issues—deadlines for submissions are November 1st and May 1st. The editor is willing to work from a "draft" version of a short article. Submissions are preferred as Microsoft Word documents e-mailed to the editor (arnos@mcn.net). To obtain publication quality, color photographs must be submitted on a compact disc (CD)—to Steve Arno, 5755 Lupine Lane, Florence, MT 59833.■

Beetle Literature Cited

Amman, G.D., R.W. Their, J.C. Weatherby, L.A. Rasmussen, and A.S. Munson. 1991. Optimum dosage of verbenone to reduce infestation of mountain pine beetle in lodgepole pine stands of central Idaho. USDA Forest Service, Research Paper INT-446.

Amman, G.D., and B.S. Lindgren. 1995. Semiochemicals for management of mountain pine beetle: status of research and application, pp. 14-22. In Salom and Hobson (eds.), Application of semiochemicals for management of bark beetle infestations-Proceedings of an informal conference, USDA Forest Service, INT-GTR-318.

Bentz, B.J., C.K. Lister, J.M. Schmid, S.A. Mata, L.A. Rasmussen, D. Haneman. 1989. Does verbenone reduce mountain pine beetle attacks in susceptible stands of ponderosa pine. USDA For. Service Res. Note RM-495

Bentz, B.J., S.J. Kegley, K.E. Gibson, and R. Their. 2003. *In press.* A test of nonhost tree volatiles and verbenone for reducing the number of mountain pine beetle-attacked trees. RMRS Rpt.

Gibson, K.E, R.F. Schmitz, G.D. Amman, and R.D. Oakes. 1991. Mountain pine beetle response to different verbenone dosages in pine stands of western Montana. USDA Forest Service, Res. Pap. INT-444.

Kegley, S.J., Gibson, K.E., Schwandt, J. and Marsden, M. 2003. A test of verbenone to protect individual whitebark pine from mountain pine beetle attack. USDA Forest Service Forest Health Protection Northern Region Rpt. 03-9. 6 p.

Kegley, S.J., J.W. Schwandt and K.E. Gibson. *In prep.* Forest health assessment of whitebark pine in five areas on the Idaho Panhandle National Forest and the flight period of mountain pine beetle. USDA For. Service Northern Region Rpt.

Progar, Robert A. *In press.* Verbenone reduces mountain pine beetle attack in lodgepole pine. Western Journal of Applied Forestry

Shore, T.L., L. Safranyik, and B.S. Lindgren. 1991. The response of mountain pine beetle (*Dendroctonus ponderosae*) to lodgepole pine trees baited with verbenone and *exo*-brevicomin, Journal of Chemical Ecology 18(4):533-541.■

Protecting Whitebark Pine from Beetle Attacks

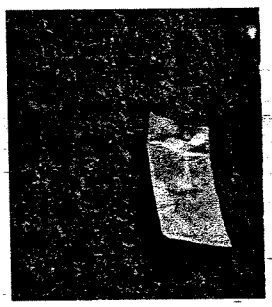
Sandy Kegley, Entomologist, USFS Northern Region, Coeur d'Alene, ID. skegley@fs.fed.us.

Ken Gibson, Entomologist, USFS Northern Region, Missoula, MT. kgibson@fs.fed.us.

Recent outbreaks of mountain pine beetle (MPB), *Dendroctonus ponderosae*, in Idaho and Montana have given us an opportunity to test a new formulation of verbenone for protecting individual whitebark pine trees from MPB attack. Verbenone has been tested in the past with inconsistent results in protecting lodgepole and ponderosa pine stands (Amman et al. 1991, Amman and Lindgren 1995, Bentz et al. 1989, Gibson and others 1991, Shore et al. 1991). We tested a new "pouch" formulation, releasing 10 times as much verbenone as past releasers, in our individual tree test. This new pouch has also been tested recently for protecting lodgepole and whitebark pine stands (Bentz et al. 2003, Progar 2003).

Selkirk Mountains Test

Our first test on individual whitebark pine trees was conducted in 2002 in the Selkirk Mountains on the Idaho Panhandle National Forest. MPB had been active in the area since 1999 and populations are very high (see photo on opposite page). We had 3 treatments: 1) control, no verbenone, 2) two verbenone (2V) pouches on individual trees, or 3) four verbenone (4V) pouches on individual trees. There were approximately 50 trees in each treatment and treated trees were located at least 130 feet apart to ensure treatments did not affect each other. Verbenone pouches (figure 1) were stapled to whitebark pine trees as high as we could reach on the bole in the 4 cardinal directions for 4V treatment and on the east and west sides of the trees for 2V treatment. Because of an apparently long flight period of MPB in whitebark pine where beetles were caught in pheromone traps from early June through mid-September (Kegley et al. in prep), trees were selected and treated the first week in June, and verbenone pouches were replaced at the end of July. In addition to verbenone pouches, every tree in the test was baited with an attractant pheromone (tree bait) to assure equal beetle pressure.



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Indian-peeled whitebark pines found in Montana

Zachary Wallace; zw657@bard.edu
[contact: Melanie Parker at Northwest Connections, P.O. Box 1309, Condon, MT 59826; www.northwestconnections.org]

On an early September backpacking trip in northwestern Montana's Swan Range, the students and instructors of the Northwest Connections Landscape and Livelihood field semester encountered four whitebark pine trees with tall oval-shaped scars in their bark. At first we assumed the incisions to be the past work of hungry bears, as bear-stripped trees of several species are a fairly common sight in this area. However, the peculiarly uniform shape of the scars led us to look closer. In place of the typical pattern of horizontal tooth marks, we found precise incisions at the bases of the scars. The evidence of tool marks, together with the height and shape of the scars and the location of the trees along a historical Native American trail, led us to conclude that these whitebark pine are likely examples of "cultural scarring"—the result of a native method of food gathering commonly practiced on other trees species, yet not documented to our knowledge in whitebark pine. (See photo).

[Editor's Note: A student of anthropology at University of British Columbia has reported, via e-mail to W.P.E. F., similar scarring on whitebark pine in the interior of southwestern B.C., but has not yet provided documentation.]

The trail on which the trees are located leads eastward over the Swan crest into the Bob Marshall Wilderness. Northwest Connections co-founder Tom Parker learned of the trail from the late Joe Wilhelm, a lifetime resident of the Swan Valley, knowledgeable woodsman and mentor. Wilhelm, who possessed of a photographic memory, traced the trail in the early part of the last century with his brother-in-law Russ Haasch. Parker retraced the route himself in the late 1970s. The field semester students follow a portion of the trail each year both to appreciate the historical human presence in the wilderness area, and to comprehend the skill and courage of native people in their navigation of the trail's winding route and harrowing descents. The trail was likely used by the Flathead (Salish) people in the early summer, after spring snowmelt rendered its steep path navigable.

The peeled trees are located in a lake basin along the trail. All four of the trees, now dead or nearly dead, display similar 5 to 6 foot tall, 8 to 12 inch wide, oval-shaped scars. Tool marks are visible at the bases of the scars where native people cut into the bark, evidently peeling it upwards to access the sweet inner cambium layer for food. The trees are between 10 and 20 inches in diameter and are part of a stand that is suffering high mortality from white pine blister rust and mountain pine beetle attacks.

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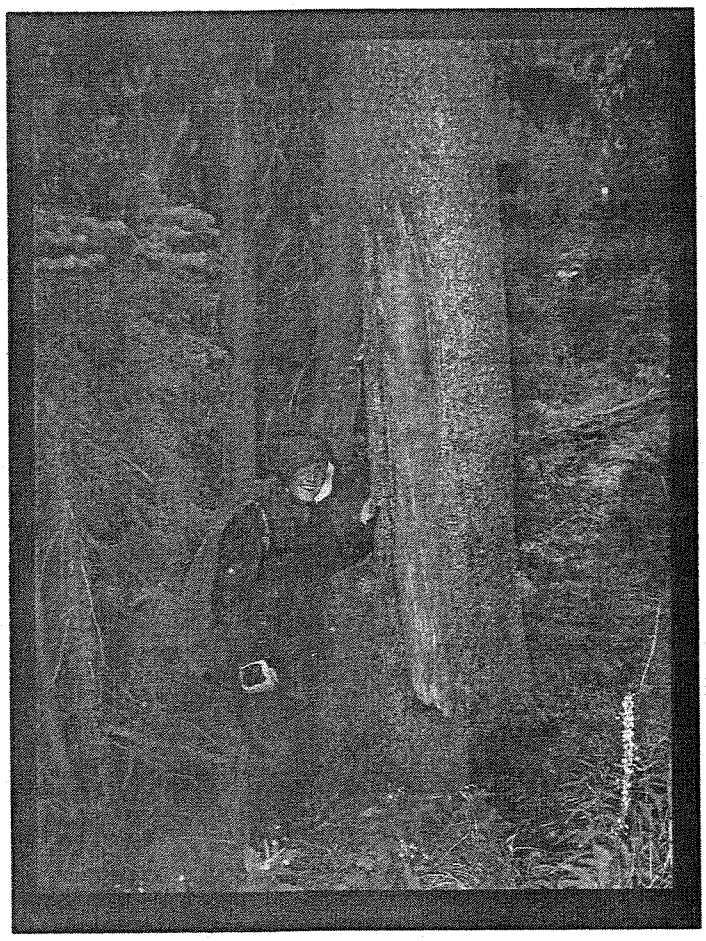
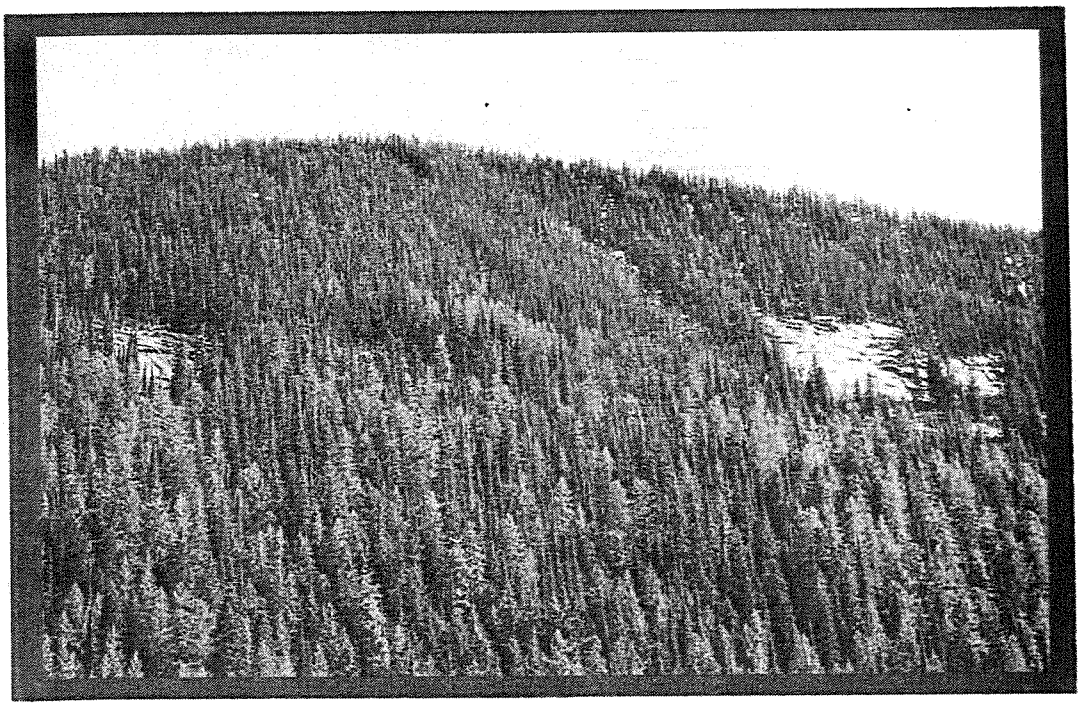
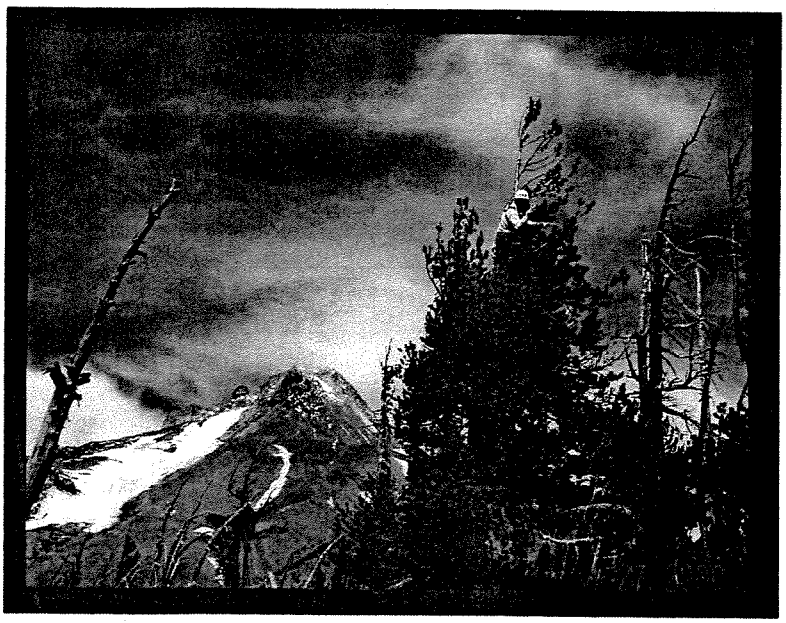


Culturally scarred whitebark pine on an ancient Indian trail in the Swan Range, western Montana. Photo supplied by Melanie Parker, Northwest Connections, Condon, MT.

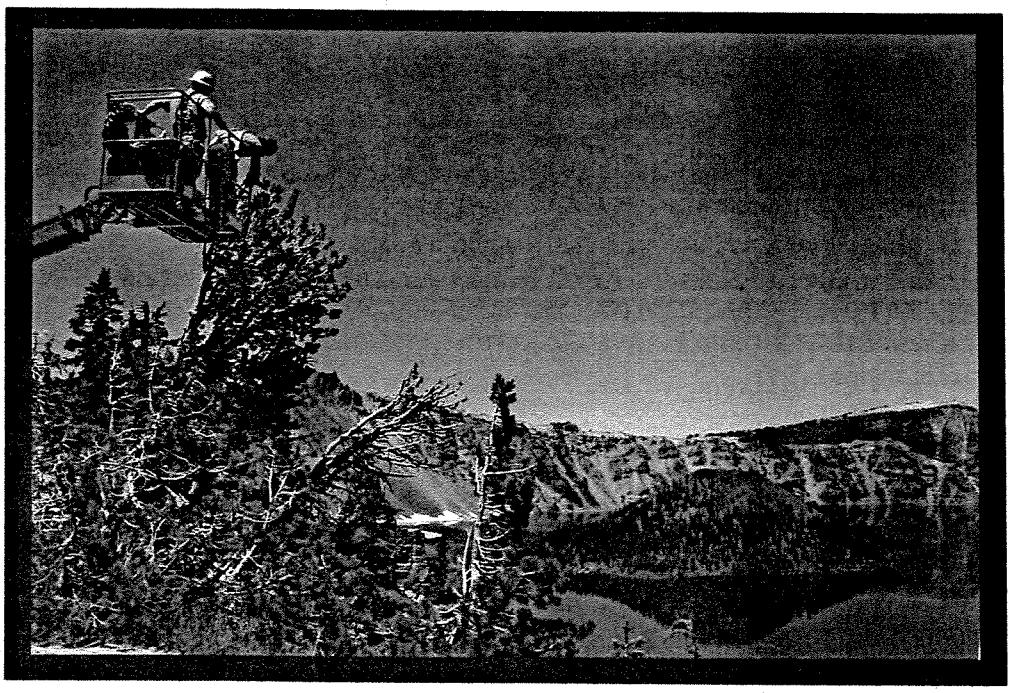
Beetle-killed whitebark pine (orange color) in the Selkirk Mountains, Idaho Panhandle National Forests. Yellow trees below are western larch in fall color. Photo by Sandy Kegley.



Whitebark Pine along the Pacific Crest: Photo Essay



Edan Lira collecting whitebark pine cones at Mount Hood Meadows. Photo by Burnham Chamberlain.



Boom-lift used for harvesting whitebark pine cones at Crater Lake Rim. Photo by Michael Murray.