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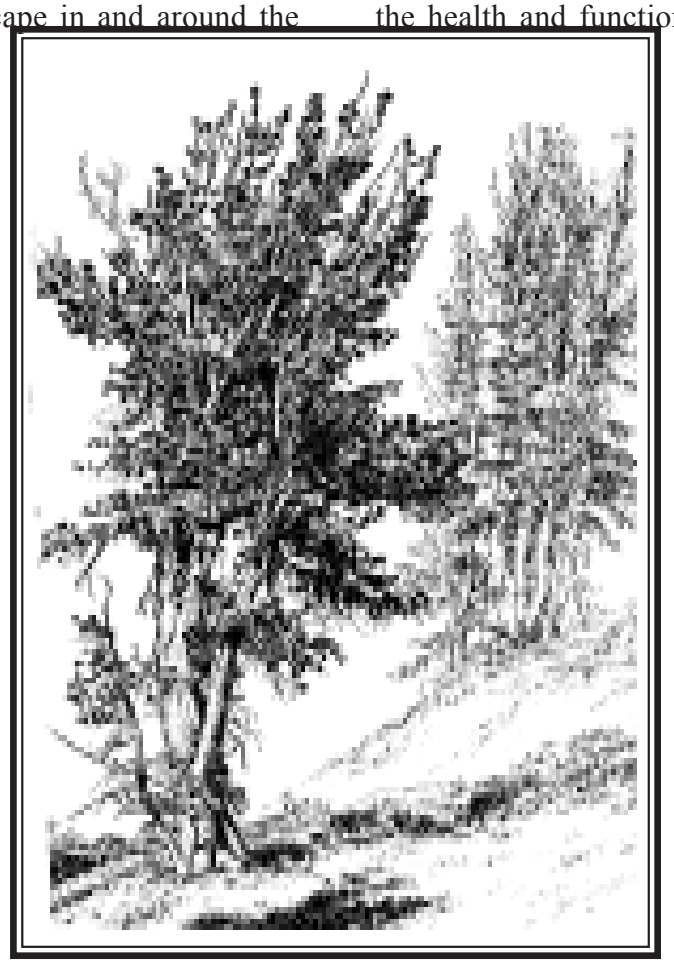
Reestablishing Whitebark Pine Ecosystems

An ongoing, multi-year study investigating methods for restoring whitebark pine to the high elevation landscape in and around the Bitterroot Mountains of west-central Montana and east-central Idaho is providing land managers with important guidelines for reestablishing these valuable, yet declining, forests.



Whitebark pine (*Pinus albicaulis*) is a major seral tree species found in most upper subalpine areas of the northern Rocky Mountains and Cascades in the United States and Canada. This "keystone" species is critical to the many unique ecosystem processes in high elevation landscapes — protecting watersheds, promoting post-fire forest regeneration and providing a food source for wildlife. Sadly, these diverse and unique forests are rapidly declining in about 50 percent of the specie's range because of white pine blister rust, mountain pine beetle epidemics and advancing succession resulting from fire exclusion. The net result is the rapid die-off of whitebark pine and the successional replacement with fir and spruce.

These long-term, detrimental effects illuminate the need for innovative techniques that restore the health and function of these high elevation ecosystems. Extensive field sampling and simulation modeling show that, without proactive restoration treatments, whitebark pine forests will continue to decline, forever changing the character of high mountain landscapes.

Treatments

"Prescribed burning and selection cuttings, either alone or together, are the most practical restoration treatments we have found so far," says Robert Keane, Research Ecologist with the Rocky Mountain Research Station's Fire Sciences Laboratory in Missoula, Montana. Keane, who heads the study on the Bitterroot National Forest, called "Restoring Whitebark Pine Ecosystems" (RWPE), explains that prescribed burning is useful because it returns fire to the ecosystem, while selection cuttings are effective in areas where burning is difficult and access is available.

"Cuttings ensure selective removal of competing spruce and fir trees and generate cured slash that can help implement prescribed fire in an environment that is otherwise difficult to burn except under severe fire weather," says Keane. "Prescribed burning is usually necessary after a cutting because fire eliminates the numerous small fir and spruce seedlings that escape the cutting. Fire also reduces slash to clear the ground for optimal caching by Clark's nutcrackers," he said. The bird transports seeds from distant burns that can readily recolonize large, stand-replacement burns. It has evolved a mutualistic relationship with the pine, harvesting seeds from cones and storing them in caches that can contain as many as 15 seeds. The Clark's nutcracker especially likes to cache seeds in open areas, such as those created by fire, and the pine is more likely to survive to maturity in these openings. "In fact," says Keane, "essentially all whitebark pine regeneration originates from unclaimed nutcracker caches."

Restoration treatment studies were implemented on five RWPE sites. Circular 0.5- to 2- acre harvest units, called nutcracker openings, were created at

Prescribed burning will remove small fir and spruce seedlings that escape cuttings.

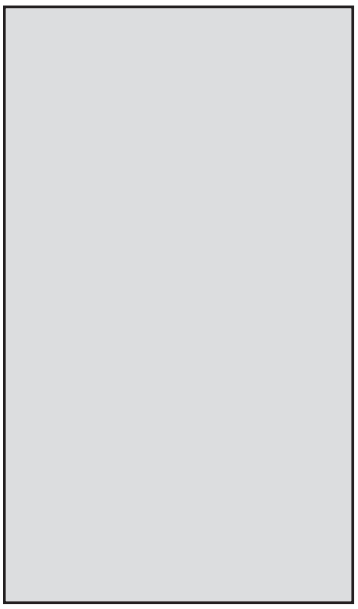
whitebark pine to encourage nutcracker caching. Prescribed burning inside these openings and within unharvested units killed over 40 percent of the mature subalpine fir and reduced fuel loadings by 45 percent to create ideal caching habitat. Cutting at the three other sites was done to eliminate fir and spruce competition, create slash fuels to enhance fire spread, and widen prescribed burning windows.

"It takes great patience to restore whitebark pine ecosystems with prescribed burning," says Keane. "High elevation whitebark pine forests are rarely sufficiently dry in the summer to conduct a prescribed burn because of late snowmelt and abundant summer precipitation. Autumn seems to be the best season to initiate prescribed fire, providing fire danger is low in adjacent areas. Since fine herbaceous and woody fuels are rarely cured by the beginning of fall, it is essential that an early, hard frost kill most herbaceous plants and shrub foliage so they will dry quickly and provide dry fine fuels for fire propagation," says Keane.

The Wildland Fire Use

Whitebark pine ecosystem restoration does not exclusively imply that historical stand structures be recreated using silviculture or prescribed fire. Keane believes the most practical tool for creating many, large openings over extensive, remote landscapes is prescribed natural fires, or wildland fire use strategy (fires allowed to burn under prescribed fire weather conditions). "Whitebark pine benefits from wildland fire because it is more capable of surviving fire and regenerating than its associated shade-tolerant species," he said. Fires managed

as wildland fire use can have many advantages. First, ignitions usually occur during the summer, the season when most whitebark pine forests burned historically. Second, a summer ignition can be allowed to burn over many weeks, creating a mosaic of low to high severity fire patterns across the burned area, which was historically common in whitebark pine forests. Third, more area can be treated at less cost than with conventional prescribed fire because fire control structures are minimal and usually fewer people manage the fire. However, scientists point out the risks of wildland fire use fires that can become uncontrollable wildfires due to the lack of control structures and long burning seasons, endangering human life and property.



Scientists believe that maintenance of native fire regimes is the single most important management action to ensure conservation of whitebark pine into the future because it creates favorable habitat for seed caching by Clark's nutcrackers that will effectively regenerate whitebark pine and enhance natural rust resistance. They also point out the importance of designing restoration treatments to match the characteristics of natural disturbance processes prevalent on the project landscape, and since fire shaped most historical whitebark pine landscapes, it would be desirable to craft restorative treatments to emulate fire's effect.

Researchers say that to succeed over the long term, ecosystem restoration must emphasize the return of ecosystem processes rather than historical stand and landscape structures and compositions. Keane notes that historical disturbance regimes, stand structures, and landscape patterns should be used as guides rather than goals in restoration efforts. "It is important that restored processes be in agreement with current and future abiotic and biotic conditions so that restoration activities will have long-term success. Once important processes, such as the fire regime, are restored to an ecosystem, suitable stand and landscape structures and compositions will follow," he said.

It Can Be Done

Flexibility is crucial for restoration projects because fire and climate regimes are notoriously variable in time and space. It is also highly probable that political, social and biological climates will change during the century-long successional periods common in whitebark pine forests, and major advances in research and technology can quickly render planned restoration treatments ineffective or obsolete. Researchers recommend managers take an adaptive management approach to managing landscapes where all landscapes would be evaluated every 10 to 20 years to assess their need for restoration and plan accordingly.

Finally, Keane stresses the importance of monitoring restoration treatments. "It provides feedback as to the success of the treatments for the specified objective to the entire land management community. More importantly, monitoring is critical for building comprehensive knowledge bases for others to use in their restoration projects," he says. He also recommends a campaign to inform and educate the public about the value of whitebark pine and the importance of restoration.

Early results from RWPE restoration treatments, and from simulation modeling, show prescribed burning and selective cutting treatments can be highly effective for restoring whitebark pine. Moreover, scientists' observations in this ecosystem lead them to believe that any ecologically sound treatment that opens the canopy and reduces subalpine fir competition will be successful.

A new book that details the whitebark pine ecosystem and strategies for restoring the species has been published. *Whitebark Pine Communities: Ecology and Restoration*, Diana F. Tomback, editor; Stephen F. Arno, Robert E. Keane, consulting editors. 440 p., is available from Island Press, 1718 Connecticut Avenue, N.W., Suite 300, Washington, D.C. 20009 (www.islandpress.org). For additional information on the Bitterroot Mountains study, contact Robert Keane, 800 East Beckwith, PO Box 8089, Missoula, MT 59807, e-mail: rkeane@fs.fed.us.

Clark's Nutcracker

Fire Effects Research

This research on whitebark pine ecosystems is based out of the USDA Forest Service's Fire Sciences Laboratory in Missoula, Montana. Administered by the Agency's Rocky Mountain Research Station, the lab is the world's leading facility for research on wildland fire. Three units work together to provide land managers with information on fire behavior, fire effects and fire chemistry. Robert Keane and other scientists with the Fire Effects unit help determine the impacts of fire on forest, range, and wetland ecosystems. Researchers provide practical guides and information systems so that land managers can better apply fire effects knowledge in land management decisions. Their findings provide a scientific basis for when and how to use prescribed fire to treat fuels, restore fire-dependent ecosystems and manage vegetation in the wildland-urban interface. For additional information, visit the website www.firelab.org.

Publication Reviews

The Bitterroot Ecosystem Management Research Project: What We Have Learned

(Proceedings RMRS-P-17)

The varied topics presented in these symposium proceedings represent the diverse nature of the Bitterroot Ecosystem Management Research Project (BEMRP), located on the Bitterroot National Forest in western Montana and northeastern Idaho. Separated into six sections, the papers cover the different themes researched by BEMRP collaborators as well as brief overviews of five other ecosystem management projects. The sections include: Understanding the Ecosystem, Its Parts and Processes; Understanding the People and Their Relationship to the Ecosystem; Implementation for Specific Landscape Areas; Overviews of Other Ecosystem Management Research Projects in the West; Fieldtrip Abstracts; and Poster Session Abstracts. The papers presented here are from a symposium held to summarize research conducted under the first five-year charter for BEMRP. The gathering took place May 18-20, 1999 in Missoula, Montana and was attended by land managers, researchers and interested publics. The proceedings can be ordered by visiting the website www.fs.fed.us/rm/main/pubs/newpubs/np00_4od.html, or by writing the Rocky Mountain Research Station.

Forest Insect and Disease Tally System (FINDIT) User Manuel

(General Technical Report RMRS-GTR-49)

FINDIT, the Forest Insect and Disease Tally System, is an easy-to-use tool for analyzing insect and disease population information taken during stand surveys. Incidence of insects, pathogens and other biotic and abiotic influences on forest ecosystems are summarized using traditional mensurational measurements. Information is summarized by diameter class, tree species, influencing agent, and for the entire stand. Several insect and disease hazard rating systems are also included. FINDIT version 1.2 runs within the Windows platform. This publication is available electronically on the Web at www.fs.fed.us/rm/pubs/rmrs_gtr49.html, or it can be ordered by writing the Rocky Mountain Research Station.

RMRScience is a quarterly report from the USDA Forest Service's Rocky Mountain Research Station. Each issue highlights on-going or recently completed research, and features findings useful to land managers and other natural resource specialists...a tool for getting research results into the hands of users. To be added to the mailing list, free-of-charge, write RMRScience, Rocky Mountain Research Station, 2150 Centre Ave., Bldg. A, Fort Collins, CO 80526; or e-mail cfletcher@fs.fed.us; or fax (970) 295-5927. Comments and suggestions are always welcome.

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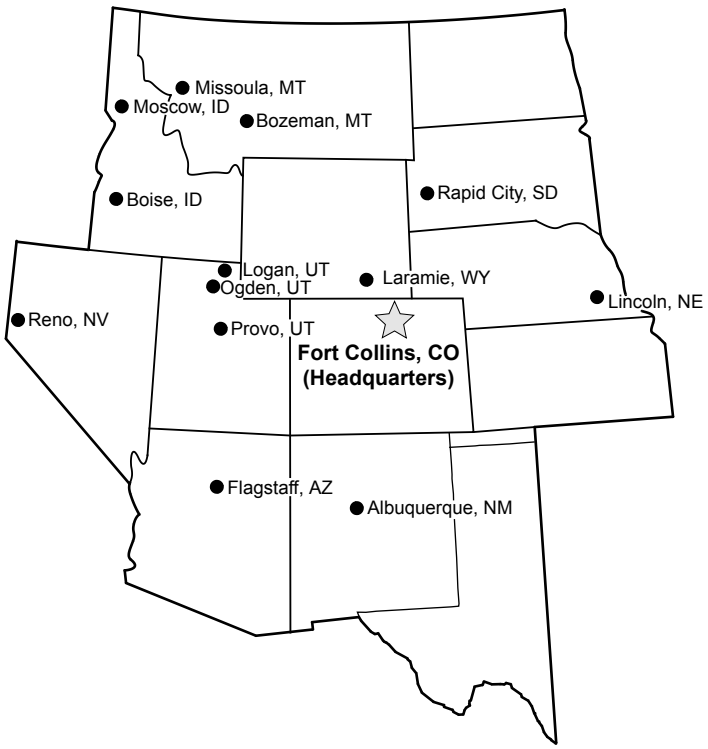

The USDA Forest Service's Rocky Mountain Research Station is one of seven units nationwide that make up the most extensive natural resource research organization in the world. Headquartered at the foot of the Rockies in Fort Collins, CO, the Station maintains 14 field laboratories within a 14 state territory (see map). Scientists conduct studies nationwide, with emphasis on the Rocky Mountains, Great Basin, Great Plains, and Southwest. Research serves the Forest Service, as well as other federal agencies, international organizations, private groups, and individuals. For more information, visit our website at http://

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