

WHITEBARK PINE RESTORATION CHALLENGES

RESTORATION SITE VISITS IN THE BRIDGER MOUNTAINS



Field Trip Summary 2 | September 2013

As part of the 13th Whitebark Pine Ecosystem Science and Management Workshop - Challenges of Whitebark Pine Restoration, participants visited a whitebark pine restoration area near Fairy Lake in the Bridger Mountains north of Bozeman, MT (Figure 1).



Figure 1. Whitebark pine and limber pine ecosystem at the Fairy Lake study area north of Bozeman, MT. Photo courtesy of the Northern Rockies Fire Science Network (NRFSN).

The restoration site at about 8,000 feet supports both whitebark pine (*Pinus albicaulis*) and limber pine (*P. flexilis*). Restoration efforts included prescribed fire and planting whitebark pine seeds. Site visits included discussions about the importance of, and challenges to, whitebark pine restoration, as well as site-specific study results following a 2004 prescribed fire and a direct seedling trial conducted in 2009.

Several area experts and specialists helped lead field trip discussions and highlight restoration study findings -

- Jodie Canfield, Wildlife Program Manager for the Custer Gallatin National Forest (CGNF)
- Clay DeMastus, Forestry Technician for the CGNF
- Diana Tomback, Professor at the University of Colorado Denver
- Bob Keane, Research Ecologist with the USFS Rocky Mountain Research Station
- John Schwandt, Forest Pathologist with the USFS Forest Health Protection (retired)
- Kirk and Beth Horn, members of the Whitebark Pine Ecosystem Foundation

DECLINE OF A KEYSTONE SPECIES

Whitebark pine is a keystone species, a species which is critical to the structure, function, and processes of the ecosystem in which it occurs. Whitebark pine is the initial post-disturbance colonizer of high-elevation sites, where soils are poor and growing seasons are short in western North America. Whitebark pine establishment on recently disturbed high-elevation sites serves to stabilize and moderate the environment enough for other tree species to become established and fosters longer snow pack retention. This process eventually increases the duration of runoff to lower elevation streams and vegetation. Whitebark pine also produces large protein-rich seeds, which are a critical food source for bears, squirrels, and birds.

Whitebark pine is in decline throughout its range because of widespread mortality caused by white pine blister rust (WPBR, *Cronartium ribicola*) and mountain pine beetle (MPB, *Dendroctonus ponderosae*) infestations. Whitebark pine is highly vulnerable to infection from WPBR. Recent surveys in the Greater Yellowstone Ecosystem suggest maximum WPBR resistance for whitebark pine populations may be less than 7%. Whitebark pine is also highly susceptible to MPB. Aerial surveys conducted by Forest Health Protection in 2009 found that 95% of whitebark pine stands had measurable MPB activity.

Climate change has exacerbated MPB and WPBR damage to whitebark pine. As temperature and precipitation patterns have changed with a warming climate, the historic range of MPB has expanded. Warmer temperatures coupled with moderate precipitation levels may also increase the level of competition whitebark pine faces, allowing more and/or new species to colonize whitebark pine habitats that were once inhospitable because of extremely cold temperatures.

PRESCRIBED FIRE AND REGENERATION

In 2004, the Custer Gallatin National Forest conducted a fall prescribed fire in the Fairy Lake area, where whitebark pine and limber pine occur together, WPBR infection is high, and MPB activity is moderate.

The prescribed fire was designed to mimic a light to moderate surface fire, create habitat for seed caching by birds and squirrels, and reduce the presence of young subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), and Douglas fir (*Pseudotsuga menziesii*) trees. Clark's nutcracker (*Nucifraga columbiana*) is one of the primary dispersers of whitebark pine seeds and plays an important role in whitebark pine regeneration. Clark's nutcracker preferentially caches seeds in burned areas.

The prescribed fire was patchy with some slash pile consumption, some stand-replacement, and some low-severity surface fire within the burned area perimeter.

Prescribed fire effects were -

- Forbs and grasses recovered quickly after the fire, limiting the creation of seed caching sites.
- Slightly higher MPB occurrence on burned plots suggested that fire-weakened trees attracted MPB activity.
- Regeneration of whitebark pine and limber pine was not improved on burned plots.
- Effects of the fire were outweighed by the already severe impacts of WPBR.

Whitebark pine trees that are resistant to white pine blister rust are referred to as "plus trees" and have been targeted for seed collection for later use in restoration efforts.

SEEDING TO RESTORE WHITEBARK PINE

Because of the rapid decline and the many threats to successful reproduction of whitebark pine, restoration has become a priority on public lands. Whitebark pine seedlings grown from seed collected from plus, or blister rust-resistant, trees take years to produce, are expensive, and logistics of planting in remote sites are complicated. Thus, direct seeding as a method for restoring whitebark pine was evaluated at the Fairy Lake site and other Northern Rockies regions.

At the Fairy Lake site, whitebark pine germination was very poor. Warm stratification with or without scarification treatments resulted in just 18 to 22% germination. However, the 2009 seeding trials with warm stratification or warm stratification with scarification at other planting sites in the Northern Rockies resulted in germination as high as 50 to 64%. While seedling establishment was disappointing at the Fairy Lake site, trials conducted at other Northern Rockies sites suggest that seeding may warrant further consideration.



Figure 2. Seeding whitebark pine at the Fairy Lake study site. Photo courtesy of John Schwandt, USFS Forest Health Protection (retired).

ADDITIONAL READING & INFORMATION

Bockino, N.K. and Tinker, D.B. 2012. Interactions of whitepine blister rust and mountain pine beetle in whitebark pine ecosystems in the southern Greater Yellowstone Ecosystem. *Natural Areas Journal*. 32(1): 31-40.

Keane, R.E. and Parsons, R.A. 2010. Restoring whitebark pine forests of the northern Rocky Mountains, USA. *Ecological Restoration*. 28(1): 56-70.

Keane, R.E. and Arno, S.F. 1993. Rapid decline of whitebark pine in western Montana: evidence from 20-year re-measurements. *Western Journal of Applied Forestry* 8: 44-47.

Schwandt, J.W. 2006. Whitebark pine in peril: a case for restoration. USDA Forest Service Report R1-06-28.

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The Northern Rockies Fire Science Network (NRFNSN) is a go-to resource for managers and scientists involved in fire and fuels management in the Northern Rockies. The NRFNSN facilitates knowledge exchange by bringing people together to strengthen collaborations, synthesize science, and enhance science application around critical management issues.

