Whitebark Pine in Peril: A Rangewide Assessment and Strategies for Restoration

John W. Schwandt

USDA Forest Service, Northern Region, Forest Health Protection, Coeur d'Alene Field Office, Coeur d'Alene, Idaho, 83815

The following is a brief summary of the results of year-long special assignment for the US Forest Service Washington Office of Forest Health Protection. This assignment was the result of a prior study that found most of our native five needled pines are declining (Samman et al. 2004). My assignment was to:

- Compile a range-wide health assessment of whitebark pine
- Compile restoration strategies
- Describe information needs and challenges to restoration

This was a challenging assignment, but I found a great number of resource specialists from several agencies that willing shared data and experiences with me and my final report, *Whitebark Pine in Peril: A case for restoration* (Schwandt, 2006), is a tribute to their generosity. Copies are available from my office (e-mail: jschwandt@fs.fed.us).

Health Assessment

Although there has been no range-wide systematic health assessment for whitebark pine,

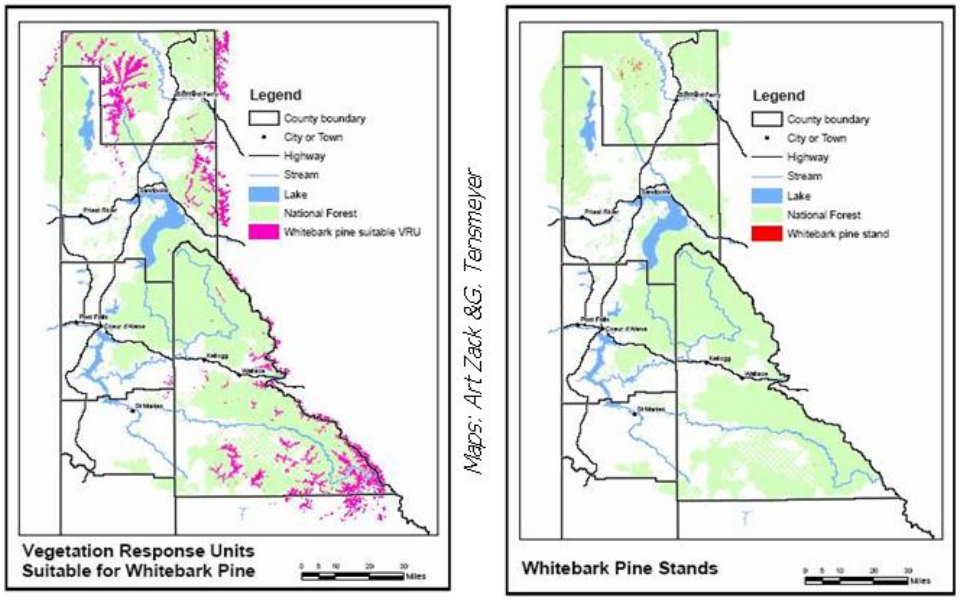

Fig.1 Potential historic and current range of whitebark pine in northern Idaho.

many surveys have found that this species is in peril in much of its range. White bark pine has disappeared from as much as 98% of its potential habitat in northern Idaho (fig 1.) This dramatic decline is due to a combination of several factors including white pine blister rust, competing vegetation, fire, and bark beetle outbreaks. All of these factors may be exacerbated by climate changes. White pine blister rust is a primary concern because this introduced disease has radically altered historical regeneration pathways by quickly killing small trees as well as causing mortality or reducing cone crops in large trees. Rust infected trees have been found in all but the very southern tip of its range in the southern Sierra Nevada in California. Although surveys have found wide variation, infection levels are generally lower in drier habitats, and blister rust continues to spread and intensify (Schwandt 2006). Hopefully additional permanent monitoring plots will help to explain this variation as well as provide additional information on spread, intensification, and mortality rates.

The urgency for restoration in some areas has been increased by recent outbreaks of the mountain pine beetle (MPB) which has killed thousands of mature trees, some of which may carry natural resistance to blister rust (fig. 2). Although mountain pine beetle is a native insect and outbreaks in the past have been documented (Perkins and Sweetnam, 1996), the current outbreaks have been more intense due to warm winters resulting in reduced beetle mortality and more beetles completing their life cycle in a single year rather than two (Logan and Powell 2001).

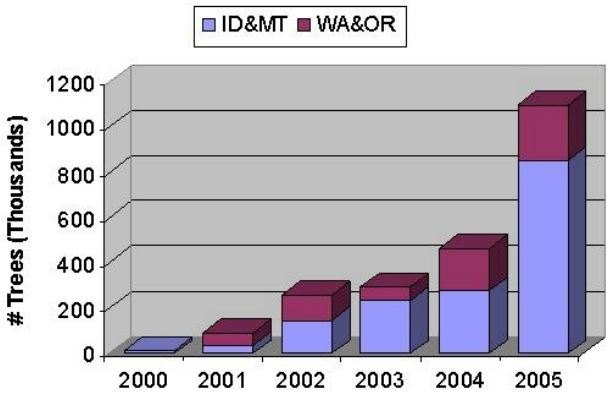

Fig 2. Whitebark pine killed by MPB in the Pacific Northwest over the last several years

Restoration Strategies

Fig. 3. testing for rust resistance

The ultimate goal is to increase the proportion of whitebark pine with natural blister rust resistance that will survive in the presence of white pine blister rust. This will require strategies that will protect and enhance existing whitebark pine populations and restore populations where they have been lost. This includes strategies that:

- will evaluate and monitor whitebark health,
- promote selection of natural blister rust resistance,
- reduce competing vegetation,
- enhance regeneration opportunities,
- conserve isolated gene pools, and
- minimize bark beetle losses.

Surveys continue to show rust spreading and intensifying throughout the range of whitebark pine (Ward et al. 2006, Smith et al. 2006). Fortunately preliminary testing has found some whitebark pine have natural resistance to blister rust (fig. 3.), and efforts are underway across the range to identify trees without blister rust to test for resistance. At the same time it is important to protect existing populations and enhance natural regeneration wherever possible to maintain populations and encourage natural selection.

Whitebark pine is strongly dependent on fires to create planting sites and reduce competing vegetation (especially in the Rocky Mountains, Arno 2001). However, fire suppression in some areas is preventing the natural role of fire and accelerating conversion to competing vegetation. Although wildfires have burned entire populations in some remote areas, prescribed fire and wildland fire are key tools for restoration and need to be encouraged wherever possible.

It is clear that without active management, losses will continue so managers need to prioritize and implement these strategies based on stand conditions, whitebark pine health, and management objectives.

Information Needs and Challenges

Since most whitebark pine occurs in remote or wilderness areas, the logistics of planting seedlings or implementing treatments such as thinning or girdling competing vegetation can be a major challenge. However, it maybe possible to plant seeds instead of seedlings and use wildland fire to enhance natural restoration in remote areas. In addition, logistics of locating and protecting rust resistant trees from mountain pine beetle can be a challenge. However, anti-aggregant pheromones are being developed and are showing promise of protecting high value individual trees from mountain pine beetle attacks (Kegley and Gibson 2004).

There are still many unanswered questions regarding whitebark pine restoration. Answers to these questions will provide practical information that can be used to prioritize stands for restoration based on potential ecosystem impacts. Major information needs include:

- determine frequency of natural resistance across the range of whitebark pine
- identify resistance mechanisms, their heritability, frequency, and distribution
- guidelines for growing, testing, and regenerating seedlings at high elevations
- examine rust epidemiology and variation of infection to develop hazard rating models
- further examination of relationships between whitebark pine and nutcrackers and other wildlife as well as bark beetles, fire, and climate
- further examination of the genetic variability in both the rust and whitebark pine

Conclusion

Since the spread of white pine blister rust appears to be relentless, we must act now to develop and implement strategies to conserve and restore whitebark pine to maintain the diversity and health of whitebark pine ecosystems. If all whitebark are eliminated within the caching range of Clark's nutcrackers (about 20 km), that piece of the whitebark pine range will be permanently lost unless it is artificially replanted. If seed have not been collected from these areas, a small part of the gene pool will be lost forever (Tomback 2001).

Successful restoration will take a long time and will require range-wide, coordinated multi-agency efforts with a long-term commitment. However, if we can establish enough rust resistant whitebark pine in an area, it may be possible for natural processes to eventually resume restoration. Therefore it is critical that implementation of restoration efforts be given high priority by land managers.

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Figure 3. Richard Sniezko