DIRECTOR'S MESSAGE - CLIMATE CHANGE AND WHITEBARK PINE REVISITED

Diana F. Tomback

The climate change predictions for whitebark pine based on bioclimatic envelope models (aka species distribution models) are in general agreement, but will they be right? They indicate that warming temperatures will result in distributional shifts of whitebark pine to higher elevations and more northern latitudes, and, ultimately, the whitebark pine distribution will dwindle to a mere handful of locations in the western United States. These predictions are often portrayed as "whitebark pine moves upward and off the top of mountains, and marches across the Canada-U.S. border to more northern latitudes." (Then, WPEF-Canada takes over all our work!) This scenario does not encompass future mortality from white pine blister rust, future outbreak patterns for mountain pine beetles, plus predictions of larger, more severe wildfires occurring at shorter intervals, which could influence future whitebark pine distributions in complex ways.

In addition to altered disturbance regimes, there are many other reasons to be skeptical of this simplistic scenario, and these are discussed in the WPEF white paper by Keane et al. 2013, "Climate change and whitebark pine: compelling reasons for restoration," which is posted at www.whitebarkfound.org and addressed in my Fall/Winter 2013 Director's message. Factors, such as the great genetic diversity of whitebark pine associated with its broad geographic range; local variation in topography providing diverse microclimates; and the resilience of old growth, cone-bearing whitebark pine trees to climate change over centuries together argue that these predictions may exaggerate distributional changes.

Now, Keane et al. (2016) have a forthcoming U.S. Forest Service, Rocky Mountain Research Station, General Technical Report, "Restoring whitebark pine (*Pinus albicaulis*) ecosystems in the face of climate change." This publication builds on the tools and strategies previously described by Keane et al. (2012) in "A range-wide restoration strategy for whitebark pine (*Pinus ablicaulis*)," USDA Forest Service, RMRS-GTR-279. Keane et al.'s (2016) revisited recommendations are informed by a major simulation modeling effort using two geographic regions in Montana as case histories—the East Fork of the Bitterroot River, Bitterroot National Forest, and the Crown of the Continent, which is defined for this effort as comprising a portion of Glacier National Park and adjacent Flathead National Forest. The simulations were run with FireBGCv2, "a mechanistic, individual-tree gap model that is implemented in a spatial domain." The climate inputs for the model used projections from a global climate model with the best performance for the Northwestern U.S. The simulations projected landscapes to the year 2100.

The results indicated that whitebark pine was retained on the landscape over time, but at 10-30% lower basal areas depending on various conditions, such as fire, restoration treatments, and geographic region. First of all, increased fire in the Bitterroot favored whitebark pine. Restoration efforts including thinning and prescribed burning generated the highest whitebark pine basal areas for the Bitterroot study area, but these "treatments" had little effect on the Crown study area. When simulations were carried out to 500 years, the benefit of both restoration and planting blister rust-resistant whitebark pine seedling became apparent, increasing the number of cone-bearing whitebark pine, and reducing the impact of white pine blister rust.

The simulations indicated that the benefits of restoration treatments varied geographically. But in successional communities, the removal of competing shade-tolerant conifers through thinning and prescribed fire helped maintain whitebark pine communities, and planting rust-resistant seedlings spread resistance to blister rust. Given the long generation time of whitebark pine, the benefits may not be hugely apparent within our lifetimes, but these efforts may make the difference ultimately between whitebark pine survival and extirpation. More simulation exercises like these but based on different regional conditions may help us prioritize and allocate scarce resources for restoration projects.

WPEF business and thanks

On behalf of the Board of Directors, I would like to thank Gerry Gray for his service as a board member over the last three years. This position was one of the two that the board itself can fill, and Gerry was our first board member from the eastern U.S.

We are grateful to the organizing committee of the Ashland, Oregon, WPEF annual Science and Management Workshop at Southern Oregon University. Special thanks to Kristen Chadwick and Jen Beck for their work on the program, to Sean Smith for the venue, and to Jen Beck, Michael Kauffman, and Rich Sniezko for leading very successful and informative field trips throughout the week. We are indebted to Laura DeNitto for another enjoyable and successful silent auction.

I would also like to acknowledge the Lazar Foundation and Norcross Foundation for recent grants to the WPEF, and to Charles Bacon and Cynthia Dusel-Bacon for their generous donation in support of the Ashland meeting.