



What Made The Forests Red?

The Future of Whitebark Pine in America West



By: Tulip Jie Zhang

College of St. Benedict Department of Environmental Studies

Faculty Advisors: Dr. Jean Lavigne and Dr. Troy Knight

Abstract:

In the American West, there are large numbers of trees in the woods that look red, and many of them are turning grey, especially at higher elevation. Most of the trees dying are Whitebark Pines (*Pinus albicaulis*) which is a subalpine five-needle conifer. They are slow growing trees that survive in harsh environments where it is difficult for most tree species to grow. The branches of Whitebark Pines have form twisted, and windsculpted, which is the symbol of wilderness in America West. Currently, tremendous numbers of Whitebark pines are dying by turning red/grey. There are several reasons: Mountain Pine Beetle (*Dendroctonus ponderosae*) attacks have increased because of global warming; blister rust is caused by invasive fungi disease; and the suppression of fire caused by human activity. In 2010, I had chance to visit Wind River Range of Greater Yellowstone System, I was impressed by the beautiful old Whitebark Pine Forest, and also amazed by the amount of trees that are losing. Thus, in this research, I will investigate whether there is a way to save the Whitebark Pine forest. This research considers ways to deal with the beetles and tree disease, and also provides suggestions of forest restoration. Moreover, this research also discusses whether human beings, as well as the ecosystem, will be able to adapt if Whitebark Pine forests keep declining.

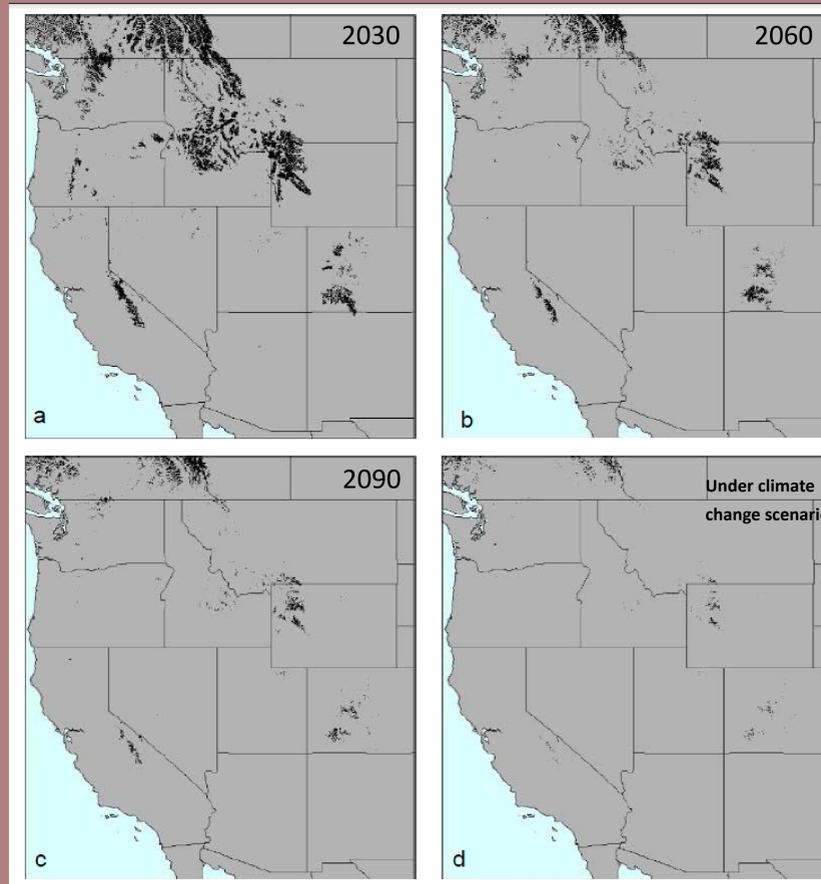


Fig. Modeled bioclimate profile of *Pinus albicaulis* for the present (a) and predicted climate for decades 2030 (b), 2060 (c) and 2090 (d) under climate change scenario using an average of Hadley and CCMA GCM scenarios of 1% per year increase GPa. Black indicates location of pixels receiving $\geq 50\%$ proportion of votes in favor of being within the climate profile. (Warwell 2007)

Strategies:

- A. Stop the blister rust infection by spraying chemicals— Carbaryl and Verbenone
- B. Relocate small sprouts to unaffected areas
- C. Restore forests by collecting healthy pine cones, planting seedlings, and by nursing them carefully
- D. Improve habitat by creating open spaces for seeding by Clark's nutcracker
- E. If the decline continues, it may be necessary to replant Whitebark pine areas with other tree species



Dead White Bark Pine Forest (By Tulip Jie Zhang 2009)



Whitebark Pine Cones (By Josh Mogerman 2008)



Whitebark Pine Cones (Kurt Repanshek National Parks Traveler 2011)



Clark's Nut Cracker (Harold Stiver 2012)

Conclusions:

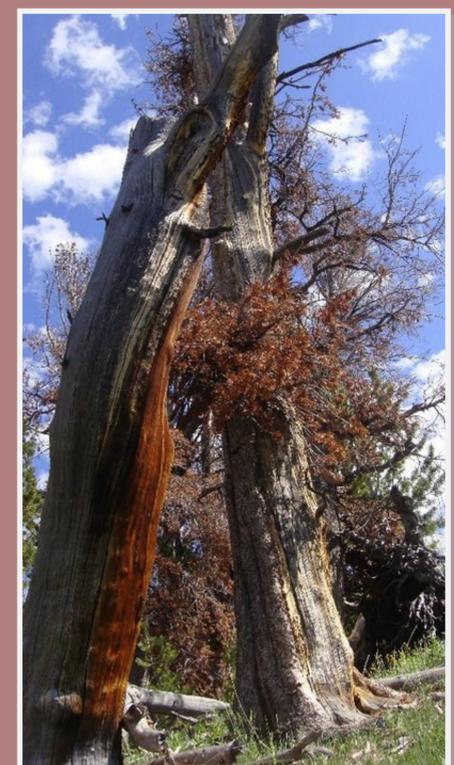
- I. Techniques such as removing mountain pine beetles could become more efficient with experience and practice
- II. Methods such as relocating and restoration take a long time
- III. Human aided migration is necessary for maintaining the ecosystem. Ecosystem may adapt better after years when the landscape changes.
- IV. Government intervention, social media, and education play an important role in making a difference.



Mountain Pine Beetle (By Tulip Zhang 2009)



Blister Rust (National Parks Service 2013)



Dead White Bark Pine trees (By Tulip Zhang 2009)