



National Park Service Whitebark Pine Conservation

Cascade Mountains

Jennifer Beck, Crater Lake National Park

Regina Rochefort, North Coast Cascades Network

Sean Smith, Klamath Network

Rocky Mountains

Dawn LaFleur, Glacier National Park

Dan Reinhart, Grand Teton National Park

Kelly McCloskey, Grand Teton National Park

Roy Renkin, Yellowstone National Park

Erin Shanahan, Greater Yellowstone Network

Kristin Legg, Greater Yellowstone Network

Sierra Nevada Mountains

Jonathan Beals-Nesmith, Sierra Nevada Network

Garret Dickman, Yosemite National Park

Intermountain Region

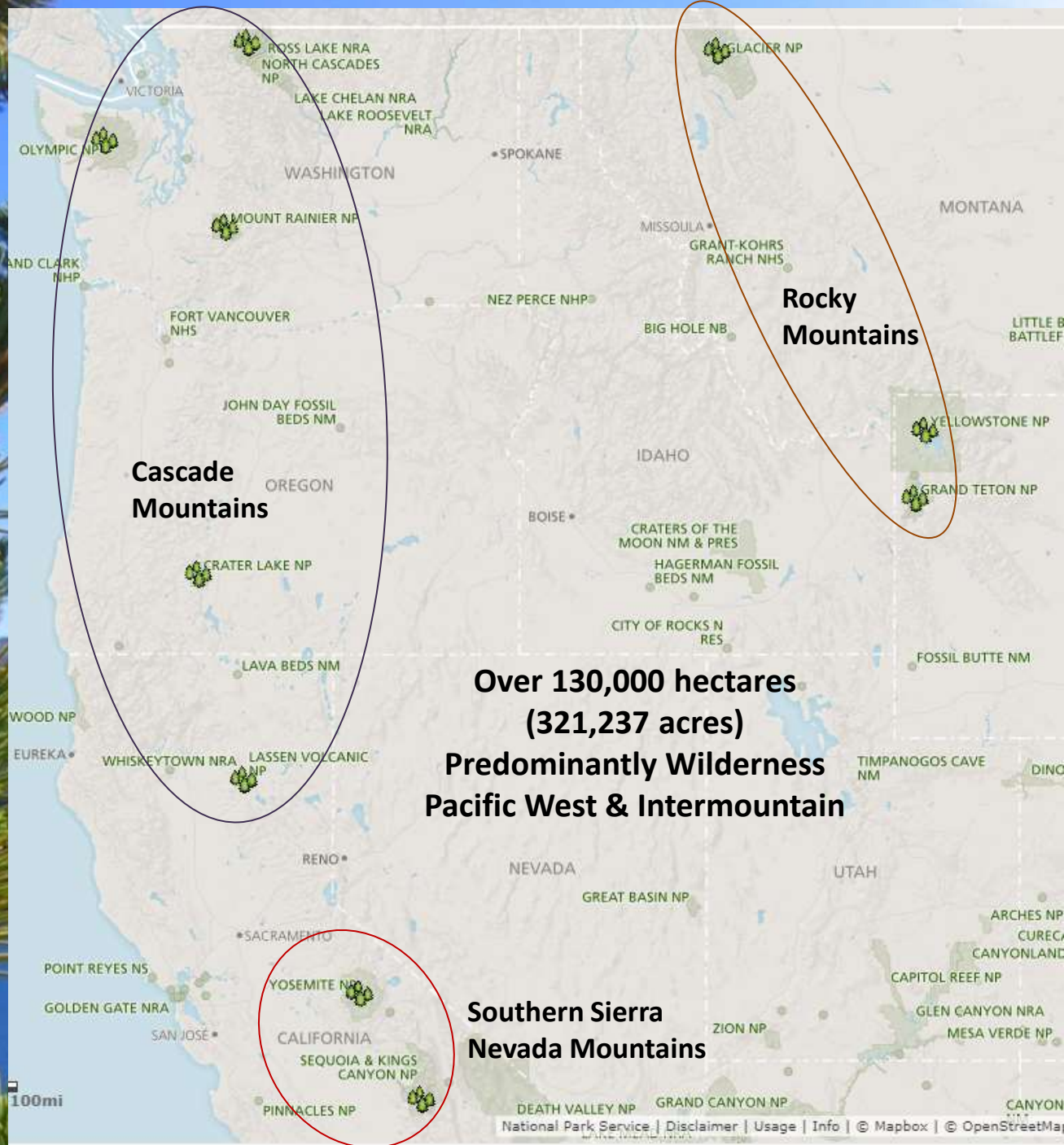
Mike Wrigley

Pacific West Region

Mietek Kolipinski

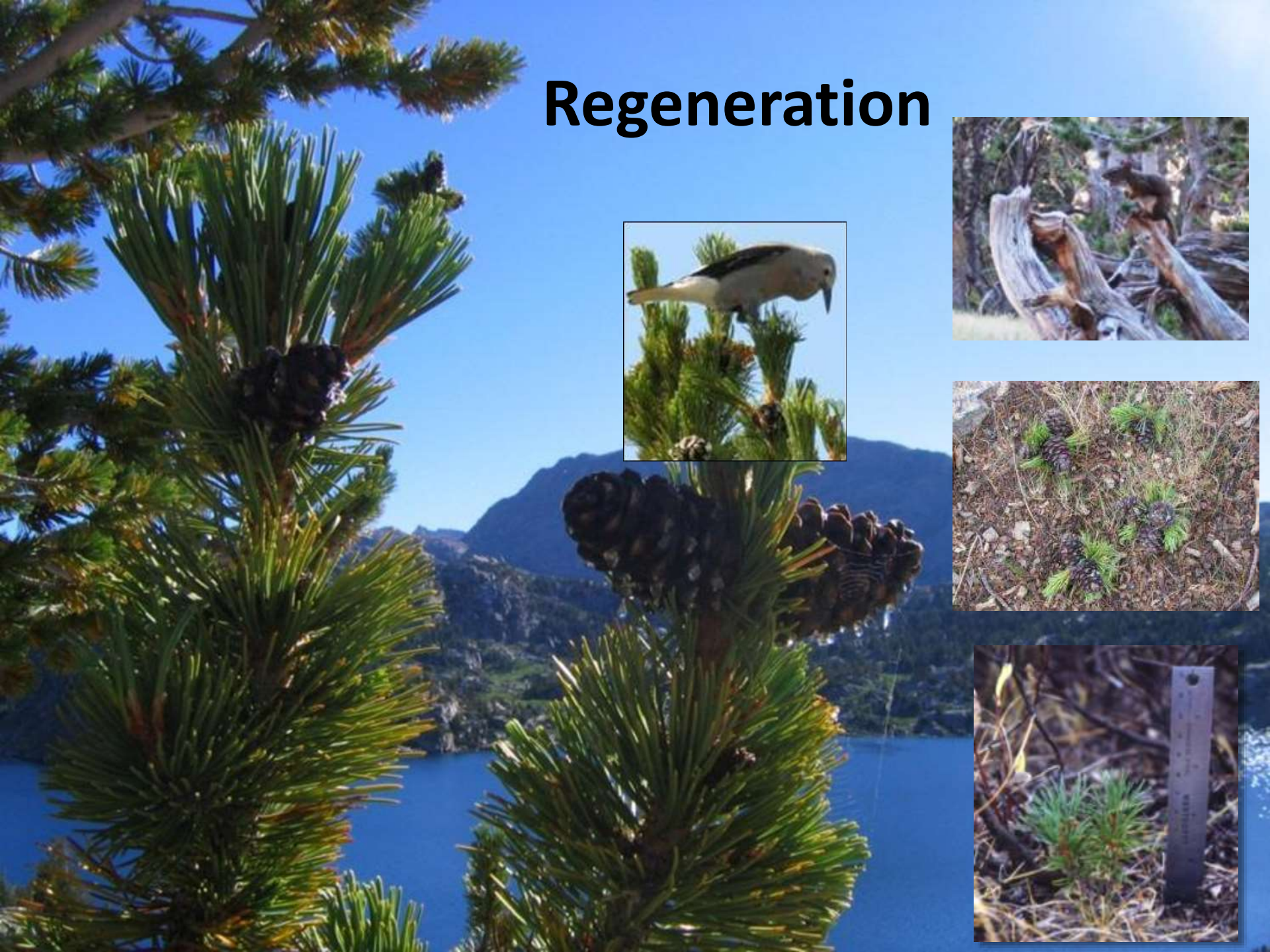
Natural Resources Science and Stewardship – Biological Resource Division

Bill Austin, Endangered Species Coordinator



Region	Park(s)	Hectares (estimate)	Blister Rust Infection	Mortality	Agents of Mortality*
Cascade Mountains	Crater Lake	2100	51%	16%	Other MPB BR
	Lassen Volcanic	260	54%	10%	Other Other bark beetles BR MPB
	Mount Rainer	1200	38%	44%	BR
	North Cascades	4000	44%	21%	BR
	Olympic	40	NA	NA	
Rocky M. Greater Yellowstone	Grand Teton John D. Rockefeller Yellowstone	3000 450 50000	13-25% for GYA** (Grand Teton 38%)	26% (>70% in overstory)	MPB BR Fire
Rocky M. Crown of Continent	Glacier	26000	78%	Significant	BR
Southern Sierra Nevada Mountains	Sequoia Kings	25000	0.5%	Low	NA
	Yosemite	20000	0%	Low	NA
*MPB = Mountain Pine Beetle; BR = Blister Rust; other includes unknown, fire **GYA infection rate					

Regeneration



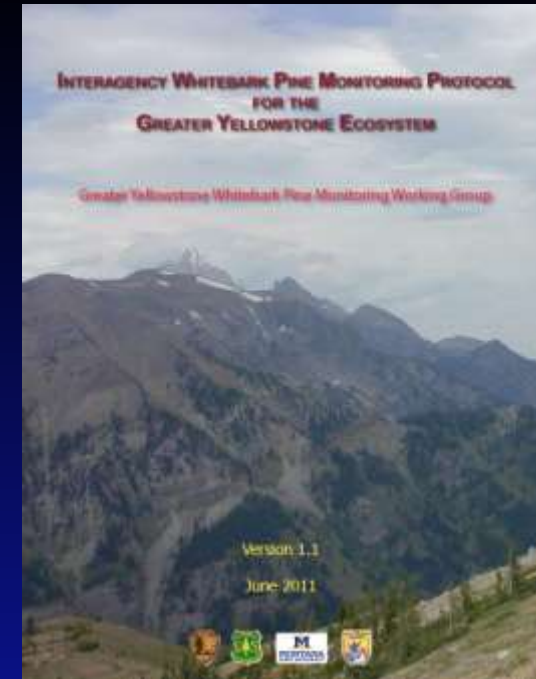
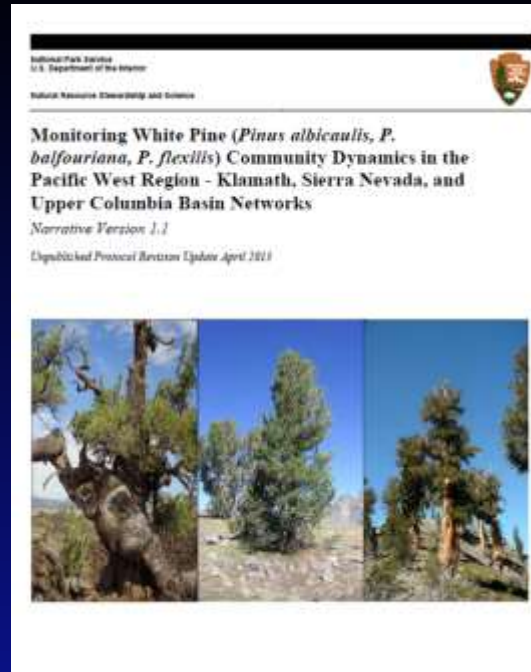
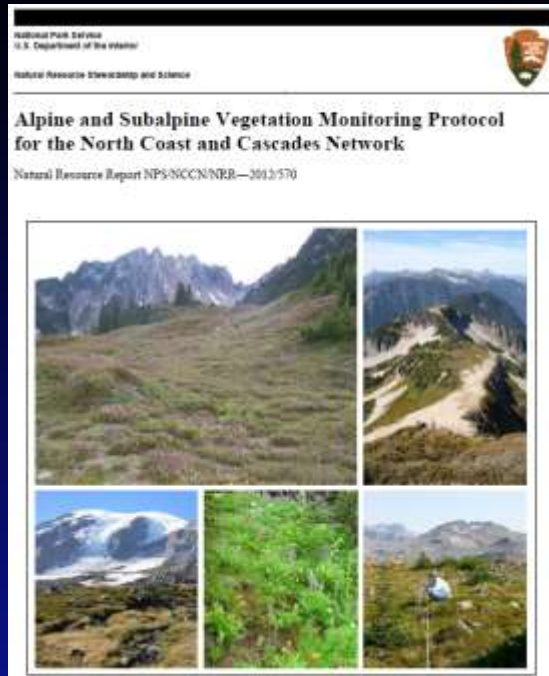
Conservation Management

- Monitoring
- Research
- Protection
- Restoration

NPS, 2006 Management Policies
Wilderness Act
Park Management Objectives



Monitoring & Research



Crater Lake, Glacier, Grand Teton





National Park Service Whitebark Pine Conservation

Cascade Mountains

Klamath Network

<https://science.nature.nps.gov/im/units/klmn/monitor/whitebark.cfm>

North Coast Cascades Network

<https://science.nature.nps.gov/im/units/nccn/monitor/subalpine.cfm>

Rocky Mountains

Greater Yellowstone Network

https://science.nature.nps.gov/im/units/gryn/monitor/whitebark_pine.cfm

Greater Yellowstone Whitebark Pine Strategy

Crown of the Continent Research Learning Center

<https://www.nps.gov/articles/whitebark-pine-brief.htm>

Sierra Nevada Mountains

Sierra Nevada Network

<https://science.nature.nps.gov/im/units/sien/monitor/forests.cfm>



GLACIER WHITEBARK CONSERVATION MANAGEMENT ACTIONS

Seed Collection

Purpose: to collect seed from potentially blister-rust resistant whitebark pine trees for propagation and use in future restoration projects.

Seedling survival

Purpose: Seed collected from whitebark pine trees that show signs of genetic resistance from blister rust is germinated and grown in a nursery setting. Seedlings are planted at specific sites around Glacier National Park in an effort to restore the ecosystem with disease-resistant trees.

Cone tree monitoring

Purpose: to identify and build baseline data for potential rust resistant whitebark pine trees ("plus trees") for field monitoring over time, as well as identify potential cone collection trees for the future.

Seed planting

Purpose: Due to the mortality and expense associated with growing and planting seedlings, seeds from potentially resistant whitebark pine trees were directly planted in the ground at specific sites around Glacier National Park in an effort to restore the ecosystem with disease-resistant trees.


U.S. Department of the Interior

Glacier Lake National Park



Whitebark Pine Conservation Plan



WHITEBARK PLUS TREE MONITORING

A. INTRODUCTION

Whitebark pine (*Pinus albicarpa*) populations have declined dramatically in Glacier National Park, largely due to the introduction of a non-native fungus, white pine blister rust (*Cronium elaeagni*). White pine blister rust is a disease of five-needled pines and has been linked to the decline of all five-needled pines in the park. Spores from a secondary host infect trees through the needles and the fungus subsequently grows into the stem, producing fusiform cankers, almost always eventually killing the tree (Hoff 1952). Glacier National Park not only has a high mortality rate associated with blister rust, but it also has an extremely high blister rust infection rate of remaining live trees. Infection is estimated at 70% for whitebark pine trees that remain in the Park (Kendall and Keane 2001). A massive effort at spraying secondary hosts for white pine blister rust in the Park was attempted between 1930 and 1970. Tens of thousands of *Pinus* species were removed by hand pulling and chemical control with no success at curtailing the disease (USGS 2008). Additionally, climate change may favor conditions that enhance distribution of blister rust spores. Recent climatic conditions produce frequent "wetter years" that promote massive numbers of infections (Korner 2010). Therefore, it does not appear that preventing the spread of blister rust is an effective strategy for preservation of whitebark pine.

Testing advantages of natural blister rust resistance may be a more effective strategy for restoration of whitebark pine. Natural genetic resistance has been found in several species of five-needled pines and there is preliminary evidence that whitebark pine may also exhibit natural resistance (Schwartz 2006). A protocol has been implemented by U.S. Forest Service nurseries whereby potential rust-resistant seedlings are tested for resistance. Preliminary tests have revealed resistance in many whitebark pine seedlings (Matschke et al. 2006).

Glacier National Park has been attempting to utilize naturally resistant trees in its restoration programs for the past 18 years. Cones have been collected from phenotypic resistant whitebark pine trees since 1997. Phenotypic indicators of blister rust resistance include no or very few active blister rust cankers, no or very few inactive blister rust cankers, no or little saprot to canopy cover of tree (flag, dead branches, etc.), and the presence of cones. Why tags are placed around cones during seed production for protection from predators with seed then collected later in the season. Despite best intentions, seed was collected from 1997 to 2006 so that it is now impossible to tell which seedlings were grown from which potential rust resistant cone tree. Beginning in 2007, seedlings were able to be tracked to a parent tree in a particular

location in the park. A "Plus Tree" has been identified and its cones have been monitored to date, their seed