Planning and Implementing Whitebark Pine Protection and Restoration Efforts in the GYA

GYCC Whitebark Pine Subcommittee

Subcommittee Structure

Overall (long-term) Strategy

Ongoing Efforts

Scientific Collaboration

Climate Change Responses

Whitebark Pine Subcommittee

Formed in 2000

Representatives from:

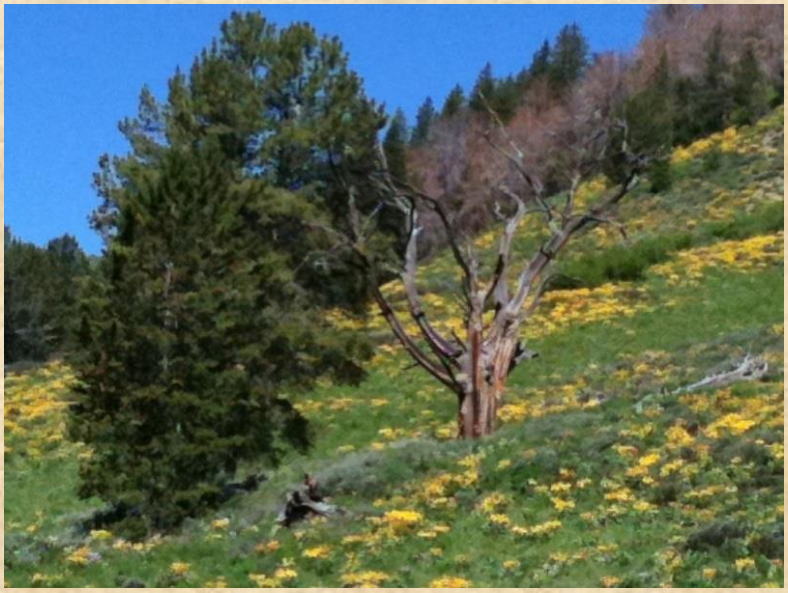
Beaverhead-Deerlodge NF
Bridger-Teton NF
Caribou-Targhee NF
Custer Gallatin NF
Shoshone NF
Grand Teton NP
Yellowstone NP
BLM Montana
BLM Wyoming
NPS - Greater Yellowstone Network
Forest Service Regional Geneticist
US Geological Survey

Collaboration on:

Strategy
Sharing of resources (seed/seedlings, labor, $$)
Coordinated funding requests

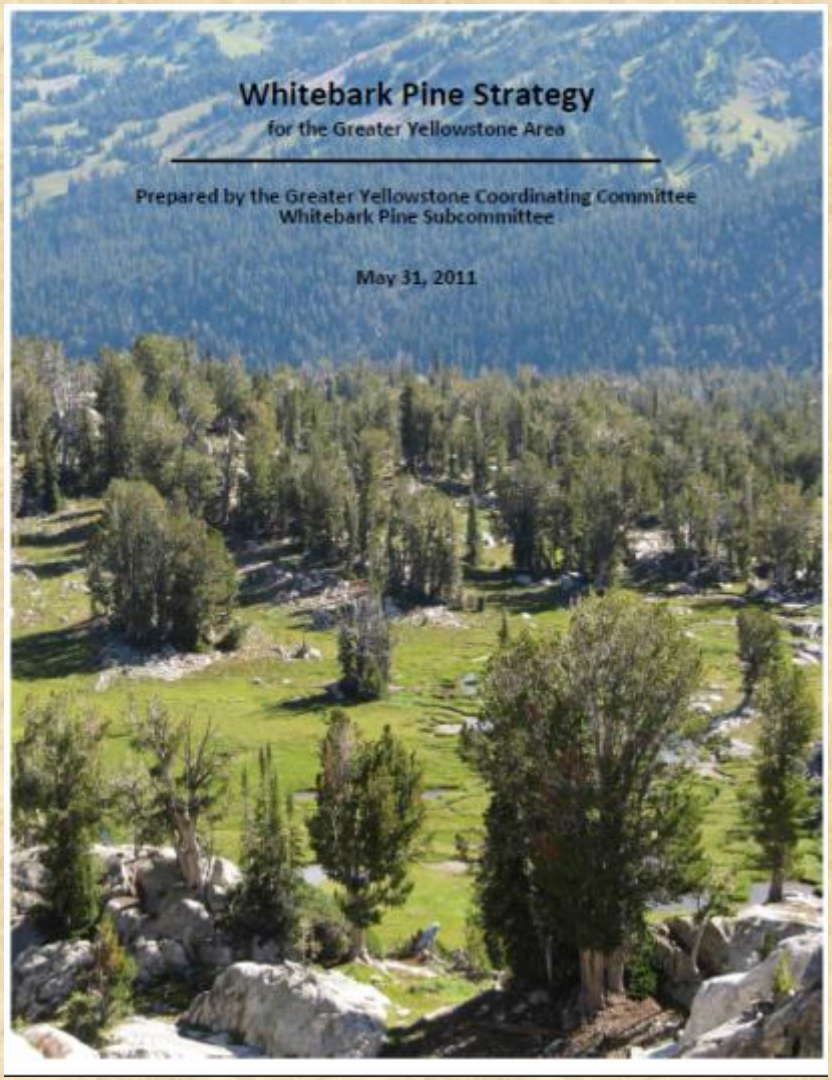
Why is Whitebark Pine Important?

- Keystone species at high elevations
  - Regulates snowmelt
  - Important food for wildlife, including grizzly bear
- Aesthetic values in mountain areas
- Threats warrant listing under Endangered Species Act



Condition of Whitebark Pine in the Greater Yellowstone Area

- Found on 2.5 million acres (~10%) of the Greater Yellowstone Area
- 95% of stands have been impacted by mountain pine beetle, 50% have high to complete overstory mortality
- White pine blister rust infection rates 20-30%, but less than in MT and Northern ID
- Most beetle-killed areas have advanced regeneration, but burn areas not regenerating due to beetles killing natural seed source



Overall Strategy

Contents

http://www.fedgycc.org/documents/WBPStrategyFINAL5.31.11.pdf

or Google: “GYCC whitebark pine”

Strategic Objectives

- Protect as many remaining cone-bearing whitebark pine trees as practical throughout the GYA.
- Maintain and restore the role of whitebark pine in ecosystem function.
- Ensure whitebark pine regeneration and genetic variability through natural and assisted regeneration.
- Promote population resilience through genetic conservation and planting of rust resistant seedlings.
- Promote fire planning and use that protects high value whitebark pine resources and provides for long-term restoration
- Work collaboratively across administrative boundaries to implement the strategy for the GYA.

Methods

Protection and Restoration Tool: Natural Regeneration

Purpose of Treatment

- Increase genetic diversity; seed dispersal by nutcrackers influences genetic patterns (Krakowski et al. 2003).
- Decrease costs of regeneration.

Description of Treatments

- Areas with less squirrel predation on seed caches such as higher elevations may have greater natural regeneration success (Lorenz 2008).
- Retain seed-producing trees in a variety of areas to ensure nutcrackers have a source of seeds to cache.
- Nutcrackers are the main seed dispersal mechanism and will cache seed in openings or closed canopies, steep slopes, needle litter, rocks, and tree trunks (Lorenz 2008).
- Regeneration is more successful when associated with Vaccinium scoparium (Tomback et al. 1993).
- Make sure there is enough seed cached in an area to regenerate; rodents will feed on the cached seeds.
- At least 20–50 cone-bearing trees per acre are needed to be considered a seed source (Keane et al. in prep); 120–280 cones/acre are needed to support a nutcracker (McKinney 2007).

Treatment Priorities

- Local extinctions can occur if stands of whitebark pine decline and seed sources are not close enough to provide adequate regeneration.
- 10 km is the maximum distance to expect nutcrackers to reestablish a whitebark pine stand.

Left: Natural regeneration.
Right: Whitebark pine seedling, Shoshone National Forest.
NPS photos by Nancy Bockino.

Restoration Tool: Thinning

Purpose of Treatment

- Reduce competition with shade-tolerant tree species.
- Release of seedlings and saplings in understory.
- Create nutcracker openings.
- Reduce susceptibility to mountain pine beetle.
- Decrease susceptibility to stand replacing fire.
- Simulate a mixed severity fire without the risk of burning.
- Fell trees to augment fire.

Description of Treatments

- Mechanical removal of trees competing with whitebark pine (e.g., lodgepole pine, subalpine fir, and Engelmann spruce) can be done in the overstory and/or understory of a mature stand with a commercial timber sale, stewardship agreement, service contract, or agency hired crews (force account).
- This could consist of cutting all non-whitebark pine trees below a threshold diameter. Remove slash if fire is a concern.
- Cut trees that compete with seedling/sapling/pole size trees to release their growth, potentially resulting in larger and more frequent cone crops.
- Clear-cut or clear-cut with reserves to simulate a stand-replacing fire and provide nutcracker caching sites. Remove all non-whitebark pine from an area; leave some down material for nutcracker caches or planting microsites.
- Cut some trees to leave down material in stands or across the landscape to provide nutcracker caching sites. Open canopy to provide caching sites.
- Thin stands to a basal area of 60 to 80 square feet to reduce susceptibility to mountain pine beetle. Stands with less than 45 square feet of basal area and a stand density index of less than 80 are less susceptible to mountain pine beetle attacks, as are trees less than 7" DBH (Perkins and Roberts 2003).
- Remove mountain pine beetle-infested trees prior to beetle flight to decrease numbers of beetles that can attack new green trees. This is effective in small, accessible stands to reduce beetle populations in an area (Carroll et al. 2006).
- Thin ladder fuels, especially subalpine fir and spruce, to reduce susceptibility to stand-replacing crown fire.
- If promoting nutcracker caching of seeds is a treatment goal, reduce slash concentrations to allow nutcracker access to the ground.
- Fell or slash non-whitebark pine trees to leave on the ground to enhance the fuel bed. Slash left on site will provide quickly drying fine fuel loadings so that the burn can be implemented under moist conditions and a prescribed fire will spread to more of a burn unit.
- Avoid burning any live whitebark pine as a result of slash burning.

Thinning and removing large trees.
USFS photo by Bob Keane.

Prioritization

Table 2. Scoring system for stand condition assessments to determine priority for protection and restoration.

WHITEBARK PINE STAND-LEVEL CONDITION ASSESSMENT		
	Protect	**Restore**
Canopy Damage Score (Integration of: Landscape Assessment 2009, RSAC Landsat Imagery Canopy Change 2000–07, Condition Assessment 2009)		
A. Very low canopy damage; current mountain pine beetle activity none to very low (LAS 0–0.9)	5	0
B. Low canopy damage; current mountain pine beetle activity low (LAS 1.0–2.0)	4	0
C. Moderate canopy damage; current mountain pine beetle activity moderate (LAS 2.1–3.0; RSAC 20–39)	3	2
D. High canopy damage; current mountain pine beetle activity low (LAS 5.0–5.5; no RSAC equivalent)	3	4
E. High canopy damage; current mountain pine beetle activity very high (LAS 3.1–4.9; RSAC 20–39)	2	4
F. Canopy loss to fire (RSAC 0–4; 79–100)	1	4
G. Very high canopy damage; current mountain pine beetle activity very low (LAS 5.6–6.0; no RSAC equivalent)	1	5
Stand Structure Score (stand type and canopy cover)		
A. WBPD stand and closed/moderate canopy cover	4	4
B. WBPD stand and open canopy cover	3	3
C. WBPMX stand and closed/moderate canopy cover	2	2
D. WBPMX stand and open canopy cover	1	1
E. Burned stands	0	0
Overall Current Stand Condition Score (canopy damage and stand structure)	1–9	0–9

Protection

Primarily funded by USDA FS - Forest Health Protection western pine beetle $$, but also clearing around WBP seed trees to protect from fire (Caribou-Targhee NF)

Long-term Monitoring

National Park Service Inventory and Monitoring Program (GYN)

Objectives:

- estimating the proportion of live whitebark pine trees >1.4m tall infected with white pine blister rust and the rate at which infection changes over time;
- determining the relative severity of infection of white pine blister rust in whitebark pine trees;
- estimating the survival of whitebark pine trees >1.4m tall, taking into account effects of white pine blister rust, mountain pine beetle, and fire; and
- assessing and monitoring whitebark pine recruitment in the understory.

Cone Collection

Cones collected from *phenotypically* disease-resistant trees to produce seedlings for general reforestation efforts

Seedlots are shared among the cooperators

Seed Orchard

Selected Plus Trees' progeny are tested for resistance to white pine blister rust.

Proven resistant parents are grafted and included in the Little Bear Seed Orchard (Custer Gallatin NF) to produce a supply of disease- resistant seedlings for outplanting.

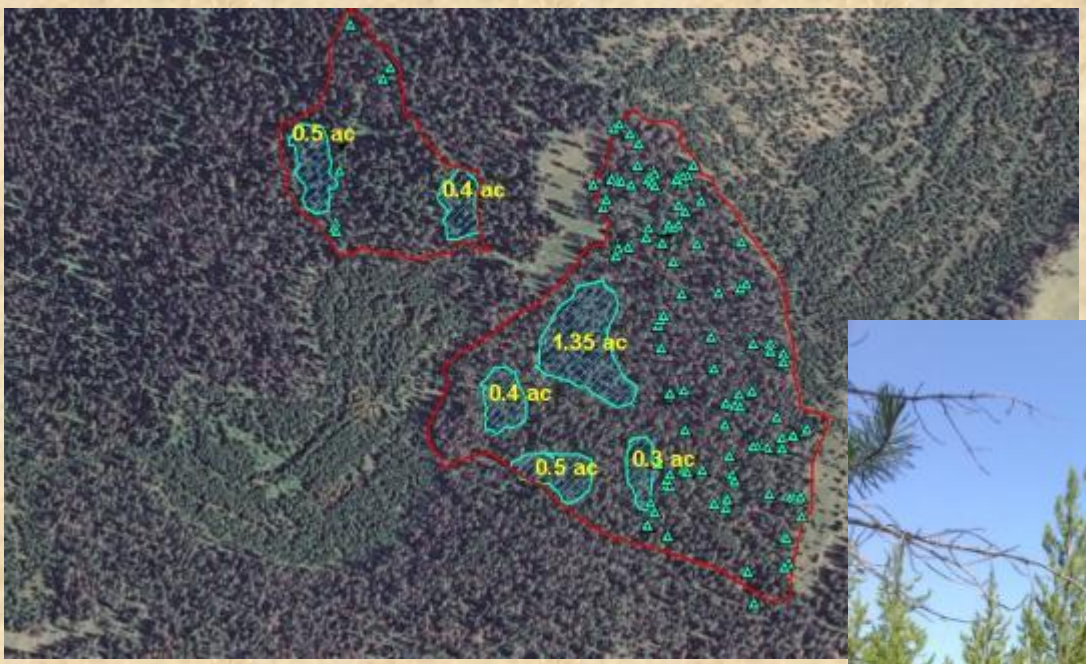
470 grafts planted in June 2013 96 in July 2014

Planting

2012 29,000 seedlings, 131 acres
2013 51,000 seedlings, 253 acres (planned*)
2014 146,000 seedlings, 730 acres
2015 63,000 seedlings, 250 acres

Stand Treatments

Cooke City, Gallatin NF
Grouse Mountain, Bridger-Teton NF



Nutcracker openings

Daylighting
(sapling to mature)

Collaboration with Agency and University Scientists

- Long-term stand and tree condition monitoring (Greater Yellowstone Network)
- Monitoring results of specific stand treatments (FS - Rocky Mountain Research Station)
- Genetics – identifying and selecting for rust resistance and other traits (drought and cold tolerance, etc.)
- Potential impacts of climate change on long-term restoration success and need to adjust strategy implementation

Climate Related Questions

- Where should treatments be placed in the landscape?
- At a landscape scale, how effective would the climate informed treatments be under current land allocation constraints?
  - For example, is connectivity & genetic exchange maintained under future climate and current land allocation?
- What spatial distribution of treatments is necessary to maintain functioning WBP regardless of current land allocation constraints?
- How will the values of ecosystem services vary under various treatments & future climate scenarios?

Summarize climate research - October 2014

Paleo (Whitlock et al.): present during variable climates

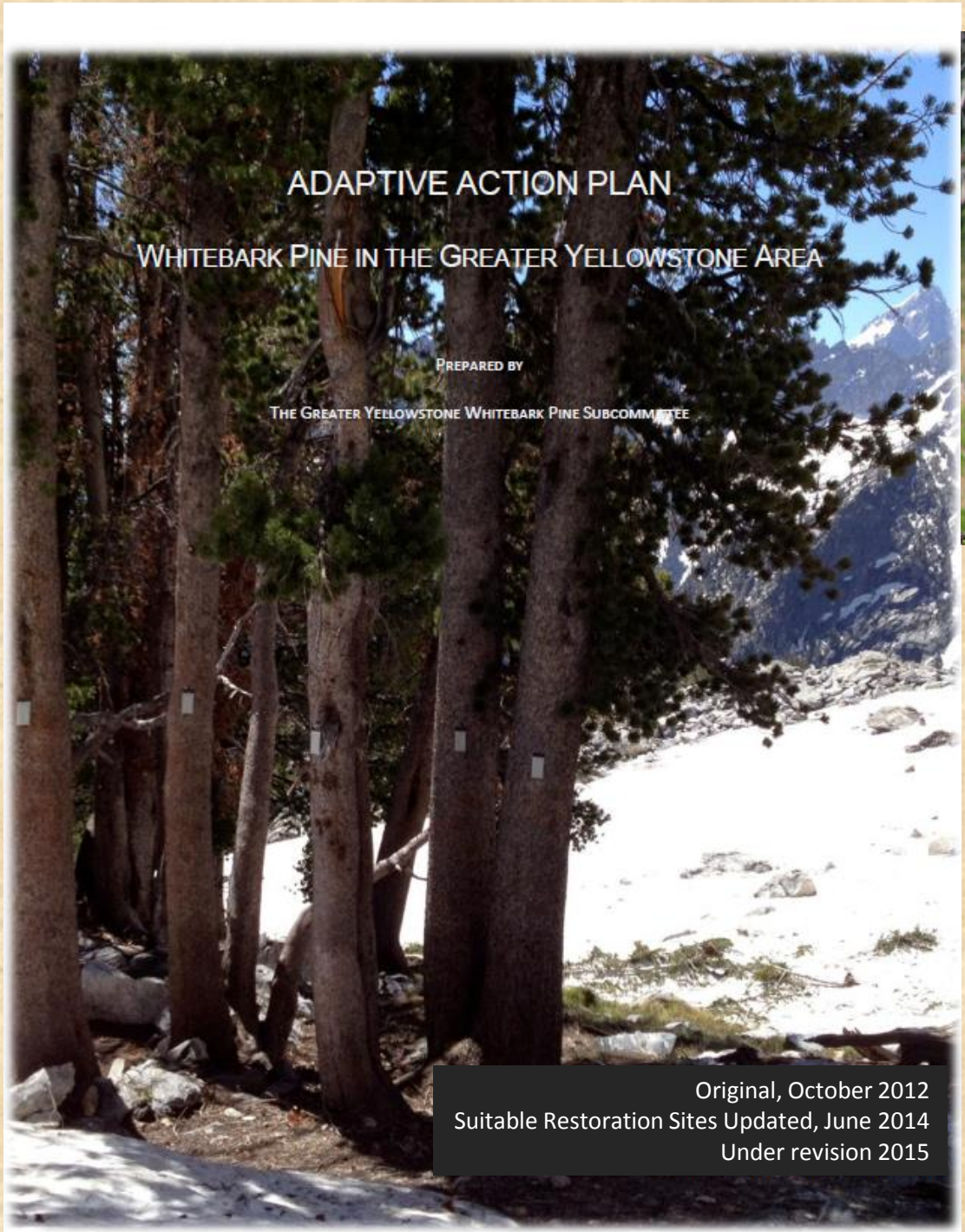
Climate Envelope (Chang et al.): decrease in suitable habitat based on current whitebark pine occupancy and projected climates.

Mountain Pine Beetle & WBP Projections (Buotte et al.): conditions are going to remain favorable for mountain pine beetle into the future.

Genetic Resistance (Mahalovich): greater resistance to BR, drought tolerance high

Restoration effort under climate change scenarios (Keane et al.): decline will be exacerbated with climate change, but planting rust resistant seedlings & employing restoration treatments may assure whitebark pine presence on the landscape into the future.

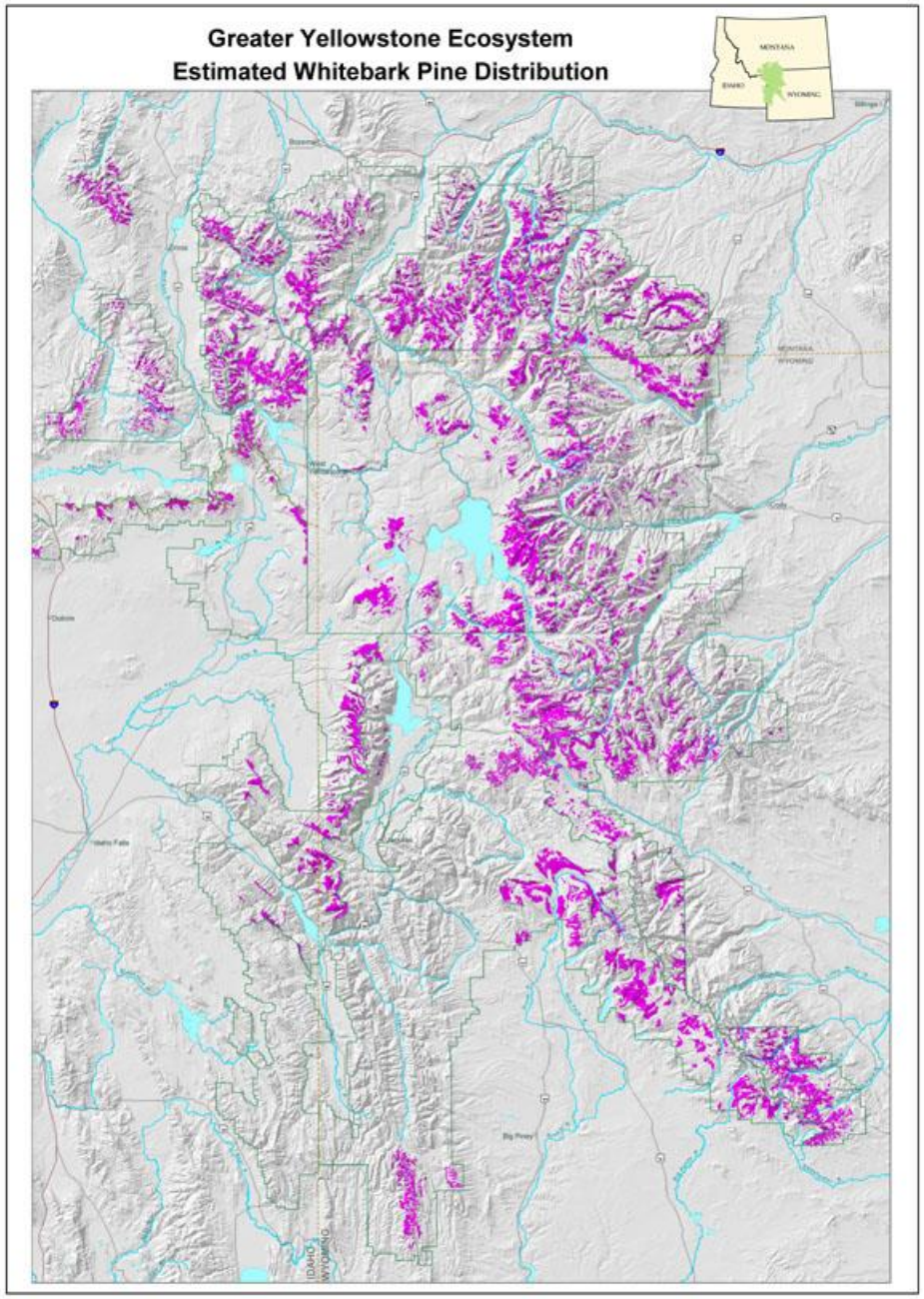
Micro-refugia and whitebark pine (Thoma et al.): climate & site characteristic interactions - location on the ground can have an impact on tree survival. Paying attention to micro-refugia is important for resilience and persistence.



Chapter 16.
Case Study: Whitebark Pine in Greater Yellowstone Ecosystem.

Karl Buermeyer, Kristin Legg, & Daniel Reinhart.

In: ***Climate change in wildlands: Pioneering approaches to science and management in the Rocky Mountains and Appalachians*** **(LCCVP team)**


Greater Yellowstone Ecosystem
Estimated Whitebark Pine Distribution
MONTANA
IDAHO
WYOMING
IDAHO
WYOMING

Adapting to Climate Change

- Maintain annotated bibliography of all research publications
- Host researchers to present findings
- Identify and incorporate core micro-refugia
- Continue to adapt restoration & protection actions based on research and monitoring findings
- Coordinate periodic ecosystem-wide aerial survey for whitebark pine
- Continue long-term monitoring including natural regeneration surveys
- Discuss how monitoring can provide feedback to modeling efforts

Monitor, Monitor, & Adapt!!!

QUESTIONS?

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