



# Climate Change Scenario Planning for Whitebark Pine

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## Introduction

Climatic change is impacting ecosystems of protected areas globally and models project more extreme changes but with high levels of uncertainty.



Resource managers and policy makers can be overwhelmed by the complexity and uncertainty in climate change projections and often lack applicable knowledge of local effects and apparent ways to respond.

Scenario planning integrates scientific knowledge in context of environmental, social, political, economic, and technical factors to explore and describe a range of plausible futures that enable managers to consider how to define and meet their desired conditions under changing circumstances with greater efficiency and confidence.

Under some scenarios, it may be possible to develop effective conservation and management strategies using familiar tools, whereas in other scenarios, novel ecological conditions may preclude “business as usual” and require paradigm shifts in protected-area management.

**Project purpose:** Identify and explore how whitebark pine (WBP) and American pika may respond to potential climatic, biological, and ecological drivers, critical uncertainties, and political and social issues across protected areas of the Sierra Nevada, Klamath, and Upper Columbia Basin National Park Service Inventory and Monitoring Networks and assess the implications for management options and decisions.

**Strategic challenge:** Under some climate scenarios, it might be possible to develop effective conservation and management strategies using familiar tools, whereas in other scenarios, wholly novel ecological conditions may preclude “business as usual” and require wholesale paradigm shifts in approaches to protected-area management.

**Focal questions:** How might climate change affect montane and high elevation ecosystems of the Klamath, Sierra, and Upper Columbia Basin regions over the next 20-30 years? How can managers conserve key species with climate change?

## Methods

We hosted a workshop on September 16, 2015 involving researchers and protected area managers to discuss current climatic, biological, and ecological factors influencing WBP populations and challenges to effective conservation and management actions.



## Key Results

### Bioclimatic and ecological factors

- All factors should be considered in context of their influence on dynamics of 1) white pine blister rust, 2) mountain pine beetle outbreaks, and 3) wildland fire
- The relationship and potential impacts of temp and precip on cone production, seed germination, and seedling growth and development are unclear, requiring more research
- Climate impacts on community interactions are critical including pathogen host availability and encroachment
- Tree mortality and low cone production could impact Clark’s Nutcracker populations
- Soil properties (e.g. mycorrhizae) & drought may limit tree species movements
- Introduction of new pathogens for trees and nutcrackers possible but highly uncertain
- Potential adaptation and genetic structure in pathogens is unclear
- Fire mosaic impacts on WBP and tree communities varies across regions
- Need for better understanding of genetic blister rust resistance modes, potential genetic markers

### Sociopolitical factors

- Agency interpretation of Wilderness Act protections constrains management actions available
- Feasibility of some actions limited by funding, resources, policy, clash of species-specific policies
- Management tends to be reactive, proactive management to prevent disaster not reinforced
- Need for education and outreach to managers, policy makers, NGOs
- Need for political leverage to enact policy change and garner funding

## Next steps

We will further synthesize the results of the workshop, survey the broader whitebark management community, produce summary and review documents of the status of WBP. In 2016-17 we hope to use this information to inform and conduct a series of scenario planning workshops throughout the Klamath, Sierra, and Upper Columbia Basin Networks to build scenarios and encourage management actions that further conservation of WBP throughout their range.

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