



# The Western Mountain Initiative

A Network of Mountain Protected Areas for Global Change Research

**Overview Fact Sheet: The Western Mountain Initiative (WMI) is an Integration of Research Programs that Study Global Change in Mountain Ecosystems of the Western United States**

## The Independently Developed Programs Are:

- ◆ **Pacific Northwest (Olympic and North Cascades National Parks)**  
*CLIMET: Climate-Landscape Interactions on a Mountain Ecosystem Transect*
- ◆ **Sierra Nevada (Sequoia-Kings Canyon and Yosemite National Parks)**  
*Sierra Nevada Forest Dynamics: Pattern, Pace, and Mechanisms of Change*
- ◆ **Northern Rockies (Glacier National Park)**  
*CLIMET: Climate-Landscape Interactions on a Mountain Ecosystem Transect; and Invasibility of Tundra in the Northern Rocky Mountains*
- ◆ **Central Rockies (Rocky Mountain National Park)**  
*Global Change Impacts in the Colorado Rockies Biogeographical Area*
- ◆ **Southern Rockies (Bandelier National Monument)**  
*Sensitivity of Semiarid Woodlands and Forests to Climate-Induced Disturbances in the Southwestern U.S.*



The objective of the Western Mountain Initiative (WMI) is to understand and predict the responses – emphasizing sensitivities, thresholds, resistance, and resilience – of Western mountain ecosystems to climatic variability and change.

The rate and magnitude of ecosystem responses to changes in the global atmospheric environment are variable and uncertain, ranging from gradual to abrupt, from moderate to profound. The least understood and least predictable responses are those of greatest importance to policy makers and land managers: responses that are both abrupt and profound. Recent examples of such responses include ongoing drought-induced forest mortality on millions of acres in New Mexico, Arizona, and southern California, and the increasingly large area burned by severe wildfires in the western United States during the past two decades. In both cases, ecosystem thresholds were exceeded relatively quickly, leading to large and often unanticipated changes that will have long-term consequences for ecosystem structure, function, and production of goods and services.

In the face of anticipated climatic change over the next several decades, are significant changes in ecosystem structure and processes likely to become more common? Are these changes predictable? What are the characteristics of ecosystems likely to respond quickly or gradually, profoundly or minimally? How will ecological and economic productivity be affected at various spatial and temporal scales?

Mountain ecosystems of the western United States are ideally suited to address these questions. First, they lend themselves to ecological inquiry because they have: a) compressed climatic and biogeographic zones containing many ecosystems within relatively small areas; b) rich paleoecological resources, which record past environmental changes and consequent ecosystem responses; and c) common ecological drivers, such as snowpack, which facilitate comparisons across ecosystems. Second, because national parks and wildernesses of the montane West have



experienced minimal human disturbance, effects of environmental changes on ecosystems can be inferred with fewer confounding influences than on intensively managed lands. Third, Western mountain ecosystems are important to society, providing water, wood products, carbon sequestration, biodiversity, and recreational and spiritual opportunities. Finally, more than a decade of USGS research at seven Western mountain parks provides the foundation for broad syntheses of existing knowledge.

**WMI Will Address Four Key Questions Regarding Western Mountains:**

1. How are climatic variability and change likely to affect disturbance regimes (particularly fire)?
2. How are changing climate and disturbance regimes likely to affect the composition, structure, and productivity of vegetation (particularly forests)?
3. How will climatic variability and change affect hydrologic processes in the mountainous West?
4. Which mountain resources and ecosystems are likely to be most sensitive to future climatic change, and what are possible management responses?

**WMI Will Address US Climate Change Science Program (CCSP) Goals**

- ◆ CCSP Strategic Plan Goal 4: "understand the sensitivity and adaptability of different natural and managed ecosystems and human systems to climate and related global changes," with knowledge syntheses on "thresholds of change that could lead to discontinuities (sudden changes) in some ecosystems and climate-sensitive resources."
- ◆ CCSP Strategic Plan Goal 1 ("improve knowledge of the Earth's past and present climate and environment, including its natural variability").
- ◆ CCSP Strategic Plan Goal 5 ("explore the uses and identify the limits of evolving knowledge to manage risks and opportunities related to climate variability and change"); this fits USGS long-term and five-year global change goals and complements USDA Forest Service global change goals.



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