

# EXECUTIVE SUMMARY

## Mapping New Terrain: Climate Change and America's West



### Consortium for Integrated Climate Research in Western Mountains (CIRMOUNT)

Climate change portends far-reaching transformations across America's West, an expanse dominated by immense mountain ranges. From these peaks come the region's life blood—water that courses through its streams and runs out its faucets, power that fuels its industries and lights its cities, and natural resources that feed its economy and provide many of its jobs. Vast ranchlands, forested suburban tracts, densely populated urban areas of the West—many afford spectacular views of the mountains beyond. And to these mountains, though seemingly distant, the communities of the West are intricately tied.

Why should we be concerned about how climate change is affecting the mountains? Despite their imposing grandeur and apparent fortitude, the mountains contain highly sensitive environments hosting delicately balanced physical and natural systems. A warming of only a few degrees has major implications for alpine regions—for high mountain glaciers, for snowpacks, and for snowmelt. Downhill, this affects water supply, energy availability, and recreational opportunities.

Climate change is predicted to significantly alter the alpine landscape. Distinct ecological communities occur along the incline, encountered as successive layers on a hike from the foothills to the peaks. Each of these alpine ecosystems has specific requirements for temperature and precipitation. As global warming continues, complex changes in alpine plant and animal communities are likely to occur, increasing vulnerability of species to local extinctions.

Scientific studies and observations to date reveal initial alarming trends related to climate change in combination with patterns of economic development. Experts gathered at the Mountain Climate Sciences Symposium (MCSS), held in Tahoe, CA, in May of 2004, noted the following as occurring in many areas throughout the West:

- **Water Supply** Higher temperatures are impacting water supplies by shrinking glaciers, diminishing snowpacks, and accelerating snowmelt. Meanwhile, continued development is increasing demand for water. Taken together, these trends increase the chances of regional water shortages during drought years.
- **Massive Forest Dieback** Recent severe drought increased susceptibility of trees to bark beetles; massive, quickly reproducing infestations resulted in widespread, rapid forest dieback.
- **Development of Rural Lands** Accelerating suburban development on city fringes and exurban development (between 6 and 25 homes per square kilometer and rapidly increasing road densities) of private rural lands are increasing scarcity of wildlands and associated resources; increasing wildfire is placing homes in these developments at risk. Climate changes are accentuating problems associated with air quality.
- **Wildfire** Enormous, destructive crown fires are consuming tinderbox forests, which resulted from drought, extensive tree mortality, and long-term fire suppression.
- **Biodiversity and Wildlife** Development of sparsely settled areas, massive forest dieback, extensive high-severity crown fires, and changes in high-altitude ecosystems are altering biodiversity and wildlife habitat.

However, substantially more information is needed to fully draw the picture. Despite the importance of the mountains as key providers of essential resources, scientists have conducted few systematic large-scale studies to date. Research has been telling, but fragmentary; weather and hydrology stations exist, but are few and far between. Scientists cannot yet respond meaningfully to essential questions managers are asking about climate change, such as how water flows will be affected, what species may be at risk, and whether increased wildfire looms on the horizon.

The MCSS set the stage for unprecedented cooperation among researchers, policy makers, and resource managers to identify the most important questions about how climate change will affect the West. Together, scientists and managers are specifying the first installations of monitoring equipment and suggesting major avenues of investigation. And, importantly, the group is focusing on how to integrate the studies across both geographic regions and academic fields.

As an outcome of the meeting, a consortium of experts whose work relates to climate change in mountainous regions was established. Priority goals set by the Consortium for Integrated Climate Research in Western Mountains (CIRMOUNT) fall under action goal categories of the national Climate Change Science Program and include the following:

#### Observation

**Implement coordinated high-elevation climate and ecosystem monitoring throughout the western mountains of North America.** Install a network of high-altitude meteorological and hydrological stations and conduct long-term ecosystem observations. Where possible use standardized instruments and protocols to optimize comparisons. Gather both baseline and ongoing data for comparisons over time.

#### Research

**Promote and facilitate climate research related to mountainous regions of the West.** Specifically, improve knowledge of both the Earth's past and present climate in the western region, better characterize the natural variability, and increase understanding of what causes the climate to vary. Increase knowledge of how western ecosystems respond to climate change, including their sensitivity and adaptability.

#### Communication

**Provide data and research results in effective formats for scientific, managerial, and general audiences.** Share findings through web sites, publications, scientific meetings, focus groups, and education centers. Organize monitoring data and research results in easily accessible Internet-based databanks. Integrate western climate change information into current environmental education efforts.

#### Decision Support

**Provide sound climate-related science for effective land management in western North America.** For long-term planning, develop accurate projections related to western climate change and its effects on natural systems and resources. Assist policy makers and land-use professionals in managing risks and opportunities related to climate variability and change.

CIRMOUNT plans a second meeting in March of 2005, in Pray, Montana, near Yellowstone National Park. One facet of this first-in-a-series of biennial MTNCLIM conferences will be to highlight relevant research and accelerate progress toward achieving the goals listed above. The meeting will focus on mountain climate sciences and the effects of climate variability on ecosystems, natural resources, and conservation in the mountains of western North America. MTNCLIM 2005 will also emphasize related resource management, policy, and societal implications. The Consortium invites interested scientists, managers, and policy makers to attend the meeting and join its endeavors.

MTNCLIM 2005 Conference Website: <http://www.fs.fed.us/psw/mtnclim>

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CIRMOUNT's steering committee involves scientists from NOAA, USDA Forest Service, US Geological Survey, Montana State University, University of Arizona, University of California, the Desert Research Institute, and the Mountain Research Initiative

