

NOROCK Climate Change & Ecosystem Science

Climate change is widely acknowledged to be having a profound effect on the biosphere with diverse impacts on global resources. Global warming is of particular concern in the western U.S. because associated climate change is likely to increase air and water temperatures, increase the risk of catastrophic fire, change the timing and quantity of water from snowpack, increase winter flooding in some areas, and provide habitat conditions that favor introduced species. In addition, the connections between land management practices and climate change have been increasingly acknowledged throughout science and research communities.

Current and emerging research at the Northern Rocky Mountain Science Center (NOROCK) has been focused on monitoring and modeling ecosystem responses to climatic variability throughout the western U.S. Coordination with scientists around the world have led to research networks that build our understanding of how various ecosystems respond to climate change. As issues surrounding climate change and its impact on ecosystems become more complex, the need to develop skills and tools to address them in new and innovative ways is essential and critical for effective management of our natural resources.

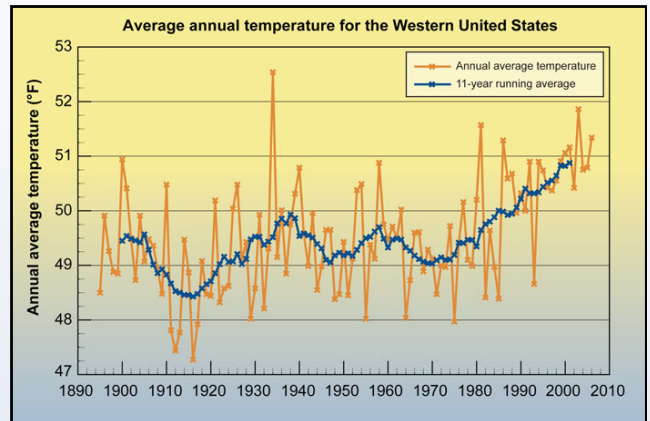


Figure courtesy of the Western Regional Climate Center

Climate Change in Mountain Ecosystems:

Climate change poses special problems for mountain protected areas, such as national parks and wilderness areas, because most of the land area within their boundaries is at higher elevations. The Climate Change in Mountain Ecosystems program has been monitoring, conducting research, and modeling mountain ecosystem responses to climatic variability since 1991. Current projects include: Glacier Research, Snow and Avalanche Research, Mountain Ecosystems Research, Landscape Change Photography, and participation in the Western Mountain Initiative.

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Climate Impacts on Burn Severity:

Researchers at NOROCK and their partners will integrate aspects of climatology and landscape fire effects derived from remote sensing to investigate relationships and trends over three distinct forest ecosystems of the western U.S. The study will consider annual area burned and severities of burns to unravel potential climatic influences across and between regions where fire has been a primary disturbance mechanism. The study builds upon past and current research to spatially quantify burn severity through Landsat remote sensing, and to model climate trends using available data. Overall, results will lead to understanding how climate may control burn patterns and heterogeneity, and influence subsequent responses in western U.S. forest ecosystems.

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Potential Impacts of Climate Change on Native Aquatic Ecosystems:

Understanding how effects of climate change will influence habitat for native fish is critical for effective management and recovery of these species. Scientists at NOROCK and their partners are examining how global warming and associated climate change may drive landscape scale impacts that affect the fresh water habitats of key native fish species. The goal is to provide tools that will help managers predict potential climate change induced impacts on native fish which will assist managers in predicting potential climate change induced impacts on various fish species throughout the Rocky Mountains and the western U.S. *Contact: Jeff Kershner, 406-994-5304, jkershner@usgs.gov*

Potential Impacts of Climate Change on Ungulates:

Scientists at NOROCK and their collaborators are examining how climate change induced events such as decreased snow pack, early spring conditions, and increased drought may alter species migration routes and population numbers, influence disease prevalence such as brucellosis in feed grounds, and impact abundance of vegetation such as aspen. The long term goal of the project is to provide the tools for natural resource managers to facilitate a better, science-based understanding of how climate change can impact various ungulate species throughout the Rocky Mountains and the interior western U.S. *Contact: Paul Cross, 406-994-6908, pcross@usgs.gov; Geneva Chong, 307-733-9219 X226, geneva_chong@usgs.gov*



Potential Impacts of Climate to Timing of Grizzly Bear Denning:

Past research by the Interagency Grizzly Bear Study Team (IGBST) observed a trend towards later den entry during 1975-99 among adult male bears, and a corresponding trend of increasing minimum fall temperatures during the same period, which may be attributed to climate change. Climate-influenced changes in timing of den entry has implications for managers tasked with minimizing conflicts between bears and humans, particularly during fall ungulate hunting seasons. Results of this analysis are pending and if earlier observed trends are confirmed IGBST will discuss the potential impacts on both bears and people of a longer active season for grizzly bears in the GYE. *Contact: Chuck Schwartz, 406-994-5043, charles_schwartz@usgs.gov*

DELIVERING SOUND SCIENCE TO PROTECT CHANGING ECOSYSTEMS:

Science Applications and Decision Support Activities of the USGS Global Change Program Office

The conservation community is currently facing a need for interdisciplinary, multi-scale science to effectively adapt to the effects of climate change. Researchers at NOROCK and their partners are working towards building capacity within this arena in mountain ecosystems throughout the western U.S. and the Northern Rockies which are highly sensitive to climate change. These same ecosystems provide up to 85% of the water upon which humans depend as well as a host of other ecosystem services such as snow-based recreation, timber, unique flora and fauna, and critical habitat for migratory birds and rare and endangered species.

A consortium of USGS researchers, including NOROCK, are developing a regional-scale mechanism that facilitates federal agency collaboration on providing decision support tools for understanding climate variability and change throughout the Northern Rockies Landscape. Our efforts tie in closely with the USDI-Fish and Wildlife Service's Landscape Conservation Cooperative for the Northern Rockies, and with the USDI-National Park Service's scenario planning efforts. The goal is to develop a true collaboration where managers, and researchers from federal, state, university and NGO programs work on conservation issues together. The intended result is to provide extension services that result in more effective management decisions, focusing on questions surrounding climate issues that are most relevant to fisheries and wildlife biologists, foresters, water managers, park superintendents, agricultural producers, and other natural resource specialists. NOROCK's climate change related research will help build these tools, while new and innovative research will keep momentum toward progress in providing dynamic, scientifically sound decision support tools to natural resource managers in the area of climate change and ecosystem science.

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A newly constructed climate station in a wetland complex at Red Rock Lakes NWR, Montana.