

Managing for Change in the Gunnison Basin: Building Resilience



Rocky Mountain Biological Laboratory scientists conducting long-term research contributing to our understanding of climate change effects on species and ecosystems.

Climate change is already affecting ecosystems in the southwestern U.S. in ways we can see and measure. Warmer temperatures and episodic drought have contributed to changes in native plant and animal populations and habitats.

Our actions today to build ecosystem resilience to climate change will help us protect the Gunnison Basin's natural resources—clean air and wildlife habitat, and the livelihoods they provide in the future for people. The Gunnison Climate Working Group, a group of public and private partners formed in 2010, is looking to understand the threats posed by climate change, identify strategies to reduce adverse impacts, and promote coordinated implementation of these strategies.

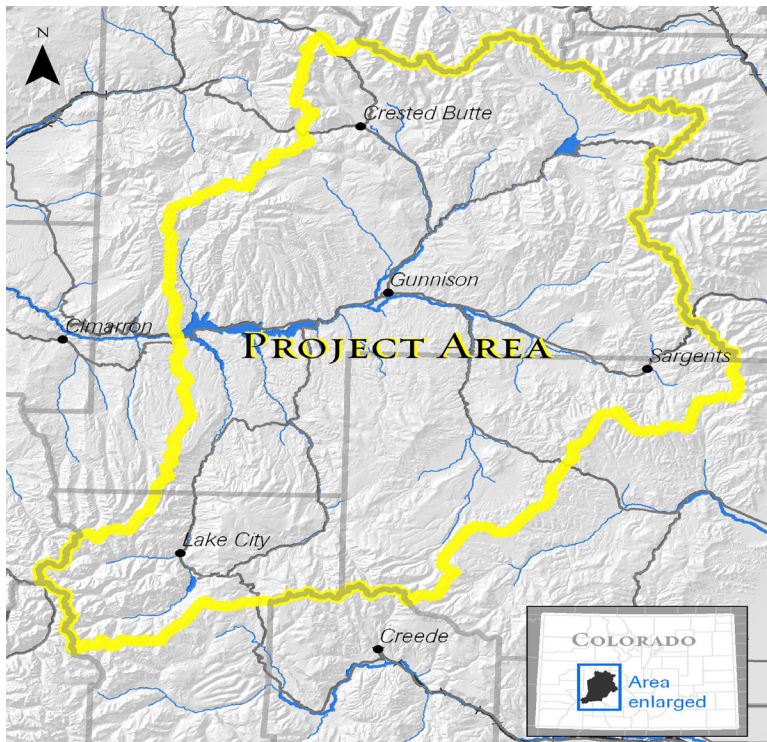
This group is also collaborating with the Southwest Climate Change Initiative (SWCCI), whose aim is to provide climate adaptation information and tools to conservation practitioners in vulnerable landscapes of Arizona, Colorado, New Mexico and Utah. Colorado's Gunnison Basin is one of four landscapes selected by the SWCCI to develop and test ways to sustain natural resources in a changing climate.

The Gunnison Basin: A Landscape at Risk

The mean annual temperature of the Gunnison Basin has risen by 1.5°F over the past 50 years, with more warming expected over the long term—a large enough rise to change the forests, grasslands and rivers that are the foundation of the region's economy. The Gunnison Basin lies within the larger Colorado River Basin, the epicenter of warming and drying in the western United States. Here, increasing dust loading from eroded lands to the southwest, combined with warmer temperatures in spring, is having a profound impact on snowmelt and stream flow.

A 2.3-Million-Acre Storehouse of Biological Diversity

The Upper Gunnison Basin encompasses 3,580 square miles and ranges from 7,500 ft. to over 14,000 ft. in elevation. The basin is well known for its diversity of habitats, from sagebrush shrublands to alpine tundra and important wildlife species, including rare species such as the Gunnison Sage-grouse, boreal toad and native cutthroat trout. Many of these and other resident species and their habitats are already responding to the effects of climate change.



(Map): The Gunnison Climate Working Group is developing strategies to address climate change issues across jurisdictional boundaries in the Upper Gunnison Basin. **(Gunnison Sage-grouse):** The group is developing a landscape scale model for enhancing the resilience of wetland/riparian habitats important for sage-grouse brood rearing and summer/fall survival.

People are Part of the Gunnison Basin

Humans have occupied the Basin for nearly 10,000 years, since the first hunter-gatherers arrived following the last Ice Age. Today, the landscape provides livelihoods and recreation for thousands of people, supporting a productive ranching economy and recreation-based tourism industry. Large forested areas provide clean water from the Gunnison River and its tributaries, used for drinking, irrigation, hydropower and recreation.

The Gunnison Basin is Showing Stress from a Changing Climate

Rocky Mountain Biological Laboratory scientists have recorded evidence of the effects of warming—plants are flowering earlier, frost damage to plants is increasing, bumble bees are moving up in elevation, and marmots are emerging earlier from hibernation. Severe drought in the early 2000s caused measurable reduction in stream flows. The challenge to the community is to manage natural resources to reduce the adverse impacts of climate change on nature and people.

Creating Practical Climate Adaptation Strategies

In December 2009, the SWCCI—with assistance of the University of Arizona’s Climate Assessment for the Southwest, Wildlife Conservation Society, USDA Forest

Service, National Center for Atmospheric Research and Western Water Assessment—convened local scientists and land managers for a Climate Change Adaptation Workshop for Natural Resource Managers. The workshop focused on sharing information about the known and projected impacts of climate change and developing practical strategies to reduce its adverse affects on three conservation features: Gunnison sage-grouse, Gunnison headwaters and alpine wetlands.

Participants reviewed two likely climate change scenarios for 2040-2060, developed by climate scientists at the Western Water Assessment and the National Center for Atmospheric Research:

1. Moderate Change Scenario: Mean annual temperature 3.6°-5.4° F warmer, no substantial change in annual precipitation, 5-10 percent decrease in annual stream flow, earlier snowpack melt, and peak stream flow seven days earlier.
2. Extreme Change Scenario: Mean annual temperature more than 5.4° F warmer, 10 percent decrease in annual precipitation, 20-25 percent decrease in annual stream flow, and peak stream flow earlier by 14+ days.

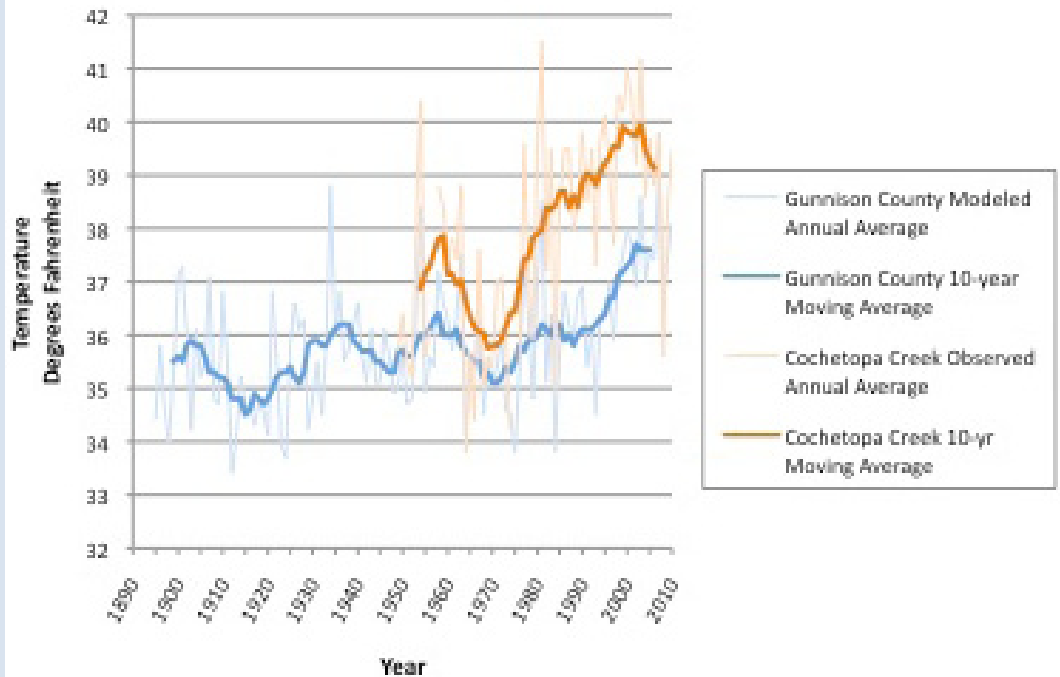
Breakout groups then developed a management objective, built a conceptual ecological model, assessed impacts of the two climate scenarios, and identified and prioritized strategic actions.

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GUNNISON CLIMATE WORKING GROUP

Bureau of Land Management
 Colorado Division of Wildlife
 Colorado Natural Heritage Program
 Gunnison County
 Gunnison County
 Stockgrowers Association
 National Park Service
 National Center for Atmospheric Research
 National Park Service
 Natural Resources Conservation Service
 Rocky Mountain Biological Laboratory
 Sustainable Development Strategies Group
 The Nature Conservancy
 U.S. Fish and Wildlife Service
 U.S. Forest Service
 Western State College
 Western Water Assessment

Average Annual Temperatures in the Gunnison Basin (1895 - 2010)



The Cochetopa Creek weather station (8,000 feet) and the Gunnison County average show a gradual warming from mid-century to the present. This warming is part of a larger pattern of long-term warming in the western U.S. that is also found in climate models. While not definitive proof that the Gunnison warming will continue at the rate it has in the recent past, it makes a case that climate model projections of even greater warming should be considered as plausible futures for the Gunnison (Joseph Barsugli, *Western Water Assessment*). Data source: Colorado Climate Center and Western Regional Climate Center.

CONSERVATION TARGET	PROJECTED IMPACT	PRELIMINARY STRATEGIC ACTION
Gunnison Sage-grouse	<ul style="list-style-type: none"> Fewer mesic and lower quality brood rearing sites. Loss of nesting habitats due to increased fire frequency, cheatgrass and sage dieback. 	<ul style="list-style-type: none"> Retain water in most vulnerable brood rearing habitats (hay meadows, seeps and springs), e.g., use conservation easements to permanently link water rights to land. Improve/restore nesting and wintering habitats, e.g., improve/re-establish leeward mountain shrub habitats with fencing and planting.
Gunnison Headwaters	<ul style="list-style-type: none"> Increased temperatures lead to decreased groundwater and base flows, reduced recharge and increased water temperatures leading to decreased riparian vegetation cover and decreased aquatic habitat. 	<ul style="list-style-type: none"> Manage water resources for groundwater recharge and base flow maintenance. Improve forest and watershed health through forest and shrubland management.
Alpine Wetlands	<ul style="list-style-type: none"> Decreases in ground and surface water flows resulting from longer dry period due to earlier snowmelt, decreased summer precipitation, and increased evaporation. 	<ul style="list-style-type: none"> Augment and maintain flows to alpine wetlands, e.g., restore disturbed areas. Minimize negative influences of recreation, grazing, and mining on hydrology, e.g., increase size of buffer zones around wetlands.

The workshop demonstrated that many of the management strategies already being planned or implemented in the Gunnison Basin can be used to prepare for climate change. But these strategies may not be effective in the face of climate change unless we accelerate and expand them, improving the health of forests, streams, other habitats, and species to make them more resilient to rising temperatures and extreme weather events.

Taking Action to Build Resilience

The Gunnison Climate Working Group's goals are to:

1. Increase understanding of the threats posed by climate change to plants, animals, ecosystems, and the benefits they provide to the Gunnison Basin community.
2. Identify priority strategies for helping people and nature cope with climate change.
3. Promote the coordinated and effective implementation of these strategies across jurisdictional boundaries.

Key outcomes include:

- Understanding of climate change projections for the Basin.
- Identification and documentation of the ecological effects of climate change.
- Increased understanding by decision-makers and stakeholders of the scientific basis of climate change and the need to take action.
- A shared program of work for adaptation.
- Resources for implementation of the group's adaptation program.

The working group is currently developing a comprehensive climate vulnerability assessment that will identify species and habitats most at risk to climate change. The group also intends to develop tools for making conservation projects "climate-smart" and to design and implement local adaptation demonstration projects for the Gunnison sage-grouse and/or other priority species and habitats.

Lessons from SWCCI Landscape Workshops

Our climate adaptation workshops at four landscapes in the Southwest have yielded valuable lessons that can be applied to other important natural areas:

1. We know enough about climate change to take local action. Though the pace of climate change is uncertain, we have enough information to act now to reduce the most likely adverse impacts of the future.
2. Conservation organizations and land managers are already doing a lot to restore and maintain ecosystems—but climate change means we must do more and do it smarter. "Climate-smart conservation" means adjusting the pace, scope and sequencing of management, activities, and coordinating our work regionally, across multiple ownerships.
3. Some management objectives may become unattainable; we must be agile and adjust our sights, perhaps aiming to conserve processes (e.g., stream flow) and functions (e.g., water supply) as much as species and habitats.
4. More than ever, conservation success will require that careful observation and monitoring be closely integrated into planning and management as landscapes are transformed by climate change.
5. Workshops, while productive, represent only the beginning of a long-term process for understanding and responding to the challenge of climate adaptation for species, habitats and ecosystems. Building resilience requires on-the-ground action.

For More Information:

Gunnison Climate Working Group:

<http://conserveonline.org/workspaces/gunnisonclimatechange>

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