

# CLIMATE CHANGE ADAPTATION WORKSHOP FOR NATURAL RESOURCE MANAGEMENT

June 12, 2008 - Silverton, CO

**Sponsors:** Consortium for Integrated Climate Research in Western Mountains (CIRMOUNT), Mountain Studies Institute (MSI), and San Juan Public Lands Center (USFS/BLM)

**Participants:** Fifty-five (55) including representatives from San Juan Public Lands Center (USFS/BLM); Grand Mesa, Uncompahgre and Gunnison National Forest; Rio Grande National Forest; Colorado State Forest Service; US Forest Service Research Stations; League of Women Voters; Southwest Marketing Network; Sheep Mountain Alliance; The Nature Conservancy; National Park Service; Environmental Protection Agency; US Geological Survey; Montezuma Climate Action Network; Mountain Studies Institute; The New Communities Coalition; Wildlife Conservation Society; Representative John Salazar; La Plata County; University of Colorado at Boulder; Colorado State University; University of Idaho; Rutgers University; Desert Research Institute; Forest Magazine; Geomatrix Consultants; Four Waters Engineering; Ecosphere Environmental Services; and Cork Tree Consulting.

## **Background**

This workshop followed the three-day long Mountain Climate (MTNCLIM) Research Conference organized by CIRMOUNT and hosted by MSI. It also served as follow up to a 2006 MSI-led climate change conference focused on the San Juan Mountain region. This earlier conference initiated the San Juan Climate Initiative, a stakeholder and scientist driven effort, which has an overall objective of providing strategies for climate change adaptation and planning while using the best science available.

A premise of both the San Juan Climate Initiative and this workshop is that even if greenhouse gas emissions are significantly lowered, a significant amount of climate change will still occur this century. Furthermore, significant warming has already been observed. Currently, global greenhouse gas emissions are not declining, and actually the rate is accelerating. Thus, developing adaptation strategies for managing natural resources in a warmer future is prudent. While the focus is adaptation, these efforts also seek to include strategies that also incorporate mitigation (lowering of greenhouse gas emissions or sequestering carbon) into natural resource management.

CIRMOUNT and MTNCLIM conference: <http://www.fs.fed.us/psw/cirmount/meetings/>  
San Juan Climate Initiative: [www.mountainstudies.org/Research/sjClimateInitiative.htm](http://www.mountainstudies.org/Research/sjClimateInitiative.htm)

## **Objectives**

The goals of this “Climate Change Adaptation Workshop for Natural Resource Management” include continuing to:

- 1) educate stakeholders about the climate outlook for this region;
- 2) gather stakeholders’ input on current/future climate stresses on natural resources and existing/future vulnerabilities;

- 3) learn from efforts in other regions and begin to think about what kinds of adaptation and mitigation strategies could be used in this region;
- 4) and discuss how to organize the San Juan Climate Initiative.

## **Presentations**

### REGIONAL CLIMATE OUTLOOK

*Koren Nydick, Mountain Studies Institute, Silverton, CO*

Climate is warming in the West and is likely to do so more in the future. Locally, in the San Juan Mountain region, there has been a significant warming trend of about 1 degree Celsius since about 1990. This warming appears to have been more pronounced in winter for the lower elevation sites and in spring and summer at higher elevations. Snowfall and snow depth also have declined during this period. Global circulation models project 4-5 degree F increase in annual average temperature by mid-century for the Intermountain West with the greatest warming in summer. This could result in 30-60 fewer days below freezing for Colorado by 2050. Modeling of future precipitation is highly uncertain for the San Juans; more precipitation is projected for the northern western states and less for the southern. Even without a change in precipitation, moisture will decrease due to increased evaporation and evapo-transpiration (the latter by plants) with warmer temperatures. Average moisture conditions in the future could be similar to or even worse than historical droughts.

Monitoring of climate change impacts on natural resources in the San Juan region has not been extensive, but some observations and analyses exist and additional knowledge can be gleaned from studies in other mountain areas. Both snowmelt and stream flow already appear to be occurring about two weeks earlier in the San Juans due to spring warming. Wildfire has increased throughout the western U.S. and this increase is strongly associated with warmer spring and summer temperatures and earlier spring snowmelt. Depending on fire intensity, soil erosion, runoff, storm flows, and resulting flooding can increase greatly after a fire, as occurred after the 2002 Missionary Ridge Fire near Durango, Colorado. In other mountain ranges, warmer spring temperatures or earlier snowmelt have led to declines in certain flowering plants and earlier emergence or arrival of some small mammals and migratory birds. Range contractions, shifts to higher elevations, and extirpation of some small mammals have also been observed recently. These observations may be early warning signs as warming is projected to reduce the extent of the alpine tundra ecosystem. Other life zones may shift upwards, possibly reducing or eliminating some ecosystems. Certain species may increase growth or reproduction rates with warming, however, and this includes elk and cutthroat trout. Diseases like the West Nile virus and whirling disease also are likely to increase. Populations of the pine bark beetle have already exploded as winter temperatures have warmed, leading to beetle killed lodgepole pine forests in places like northern Colorado, Idaho, and western Canada. Similarly, in the lower elevations of the San Juan region, a large scale die-off of pinyon pine occurred in 2002-2003 due to warm “global change” type drought and an associated bark beetle (pinyon ips) outbreak. Sudden Aspen Decline (SAD) has recently been observed in the San Juans as well, and may be related to warmer

temperatures and drought stress. Warming could indirectly affect other resources, such as air and water quality. Warming could amplify formation of ozone, emissions of smoke (from increased forest fires), methylation of mercury in lakes and reservoirs, and growth of algae in nutrient-rich rivers.

Several efforts are underway to improve understanding of current and likely future impacts of climate change on natural resources in the San Juans. A high-elevation instrumented watershed with meteorological, energy balance, and detailed snow monitoring was installed in 2004 on Red Mountain Pass by the Center for Snow and Avalanche Studies. The Mountain Studies Institute (MSI) funded Imtiaz Rangwala, a PhD student from Rutgers University, to analyze changes in temperature, precipitation, and streamflow specifically for the San Juan Mountain region. MSI installed long-term alpine vegetation monitoring plots in the mountain near Lake City in 2006 as part of the Global Research Initiatives in Alpine Environments (GLORIA) project. In 2007 and 2008 MSI funded researchers at University of Colorado to begin monitoring small mammals, including the pika, in the San Juans and compare results to historical data. Forest health projects, mainly undertaken by the US Forest Service, are monitoring tree mortality (including SAD) and regeneration after wildfire. Additional work, including downscaled climate projections for our region, more extensive analyses of existing data, and expanded monitoring, are needed.

#### ADAPTATION OPTIONS FOR PUBLIC LAND MANAGERS TO CLIMATE CHANGE

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Climate has fundamentally defined our natural resources. Climate CHANGE is redefining these resources, and will continue to do so. Rather than simply adding and ranking the importance of climate change against a host of pressing issues, managers are wise to begin to include climate change considerations into all activities and plans. Preparing for and adapting to climate change is as much a cultural and intellectual challenge as it is an ecological one. Successful adaptation begins by moving away from traditional ways of managing resources. Many natural resource agencies have changed their priorities and management strategies in response to increased scientific understanding. Today, confronted not only with climate change but with many other threats to natural resources from within and outside jurisdictional boundaries, resource managers again have the opportunity to revisit resource management practices and policies. Adaptation strategies include broadening the portfolio of management approaches to include scenario planning and adaptive management, increasing the capacity to learn from management successes and failures, and examining and responding to the multiple scales at which species and processes function.

Successful adaptation includes encouraging managers to take reasoned risks without concern for retribution. “Safe-to-fail” policies reward front-line managers for making decisions to protect resources under uncertainty. Although not desired, failures provide tremendous opportunities for learning. Learning from mistakes and successes is a critical

part of adaptation to climate change. Promote training, continuous inquiry, allowance for periodic failure, an atmosphere of respect, and personal initiative.

Uncertainty should not be an excuse for inaction. As climate change continues, thresholds of resilience will be overcome. Managers need to first identify what is at risk, define the baselines (reference conditions) that constitute “unimpaired” in a changing world, decide the appropriate scales at which to manage the processes and resources, set measurable targets of protection, monitor management results to measure success or failure over time, and adjust management activities accordingly. Science-based management principles will become more important when examples from the past may not serve as guides for future conditions. Many management goals can only be achieved through regional interagency cooperation.

#### OLYMPIC NATIONAL FOREST CASE STUDY

*Dave Peterson, US Forest Service, Seattle, WA, [peterston@fs.fed.us](mailto:peterston@fs.fed.us)*

Olympic National Forest managers are just beginning to understand the potential impacts of a changing climate. Climate research has not been readily available to managers and published literature is often hard to interpret for a specific locale. With the formation of a research-management partnership, Olympic managers and federal and university scientists have developed a conceptual basis for framing management considerations in light of climate change. Key concepts for adaptation are: (1) increase landscape diversity, (2) maintain biological diversity, (3) plan for post-disturbance management, (4) implement early detection / rapid response, (5) manage for realistic outcomes, (6) incorporate climate change in restoration, (7) develop climate-smart regulations and policy, and (8) anticipate and plan for big surprises. Reduced emphasis on historical references, increased collaboration across agency boundaries, and a willingness to truly institutionalize adaptive management will increase our ability to adapt to a changing climate.

#### TAHOE NATIONAL FOREST CASE STUDY

*Connie Millar, US Forest Service, Albany, CA, [cmillar@fs.fed.us](mailto:cmillar@fs.fed.us)*

Land management has been traditionally based on the precept that future environmental conditions will mirror past conditions. Climate change is turning this notion on its head. We can no longer assume that precipitation will fall in the same amounts and during the same time of year as in the past. Changes in temperature and precipitation set the stage for a broad range of other changes: from insect outbreaks and fire frequency, to the range and viability of specific species, both plant and animal.

Current management directives, from national legislation to individual forest plans, generally do not address the need to manage ecosystems so they are resilient to future environmental changes. A case study for the Tahoe National Forest evaluated the current management policies for their ability to accommodate climate adaptive management. It

identified opportunities and barriers for facilitating adaptation to a changing climate within the current management and political framework.

### Summary of Findings

- Few management policies of the Tahoe National Forest (TNF) specifically address climate change, but many practices are consistent with adaptive conditioning.
- Proactive thinking by TNF staff about climate change and climate implications and support by line officers for broad science-based thinking and proactive behavior have prepared the TNF institutionally to move forward with proactive climate management.
- A number of barriers to proactive climate management exist, including public opposition to active management, limited funding and staff capacity, checkerboard land ownership patterns, and current laws and policies that result in crisis management rather than long-term, phased management plans.
- Adaptive capacity to respond to climate change could be possibly increased by developing integrated management strategies that specifically address the challenges and contexts implied by climate change; modeled simulations of future climates, species movement, and rates of change; and a scientific clearing house for climate information; among other ideas.

### **Discussion Summary**

The discussion of climate change in southwestern Colorado was initiated with a short list of discussion questions posed to the participants. These discussion questions were:

- 1) What are your concerns now?
- 2) How will climate change affect those stressors?
- 3) How will you cope with climate change?
- 4) What do you need to know for better management in the face of climate change?

This discussion was not meant to cover all possible concerns of participants. Rather, it was meant to highlight some priority issues and begin a critical conversation about climate change in southwestern Colorado.

Dialogue began with a focus on potential changes in moisture with climate change and the resulting implications for fire and fuels. Fire frequency will likely increase with a warming climate, resulting in increased damage to homes and infrastructure. Suppressing fire in the wildland-urban interface will become increasingly expensive with increasing fire frequency. Consideration of the location of building in relation to the wildland-urban interface in planning and policy could help to reduce these costs. At an extreme, letting homes in fire-prone areas burn could reduce building in areas where the cost of fire suppression is high.

The difficulty in decision-making in regards to fire and other resource issues in the face of uncertain future climate was discussed. Uncertainty in the future role of prescribed burning was also discussed. The more severe fire conditions in a warmer future, along with air pollution issues, may limit the application of prescribed burns. For these reasons, currently more expensive mechanical fuel reduction treatments may have to replace prescribed burning. Mechanical fuel reductions could allow biomass utilization for energy.

Climate change will influence both water quality and water quantity. Reductions in mountain snowpack will shift the timing of peak runoff and result in reduced summer stream flows. Lower summer flows and increased stream temperatures will likely result in the loss of regional fish habitat. Concerns about water rights and agriculture were raised, and questions were raised about the effectiveness of government policy on drought in the face of long-term drought with climate change. The possibility of using silvicultural treatments to influence snowpack and water yield was introduced.

Potential opposition to climate change adaptation actions by the Forest Service and/or Bureau of Land Management was discussed. Since most of the Forest Service actions in the region revolve around restoration and fuel reduction treatments, public opposition is unlikely. However, action in roadless areas may lead to public opposition.

Although different stakeholders are likely to have different views on how best to adapt to climate change, there are merits to cooperation among various stakeholders. Extending climate change dialogue and plans for adaptation to other stakeholders may increase public support. It is also important for natural resource specialists to be involved in climate change adaptation discussion and planning at the community level in order to share natural resources experience in other venues.

Current regional initiatives were discussed, including the San Juan Climate Initiative and San Juan Collaboratory that partners the San Juan Public Lands (USFS/BLM) with Mountain Studies Institute, University of Colorado at Boulder, and Fort Lewis College. The San Juan Public Lands Center, with the assistance of Collaboratory partners, has five main areas of emphasis in regards to climate change adaptation and mitigation, including Global Climate Model downscaling for prediction of local effects, carbon baseline assessments, climate change adaptation planning, carbon management planning, and prioritization of funds for carbon sequestration.

The discussion concluded with ideas on how to continue dialogue and how to generate interest and participation from other community members. It was suggested that Mountain Studies Institute was well-positioned to facilitate the effort and that this may garner more public support than a government-led effort. Several interacting focus groups may be warranted, including public lands management, water management, recreation and tourism, and agriculture. The Southwest Marketing Network has already begun A Climate change, Energy, and Food Systems project.