

# What do we do now? Important climate change issues vocalized by resource managers

By ZACK GUIDO

For many people climate change is imperceptible, slow, and masked by swings in the weather. Cold fronts sweeping down from the north, sweltering summer heat waves, torrential rains from Pacific tropical storms, and late-winter dry spells make it difficult to see consistent changes. But to the trained eye and to agencies tasked with managing the landscape, climate change is an immediate and clear challenge best met head-on with strategic planning.

Dale Hall, former director of the U.S. Fish and Wildlife Service (FWS), made that challenge clear when he wrote in a 2007 message, “The warming of the earth could potentially have more far-reaching impacts on wildlife and wildlife habitat than any challenge that has come before us.”

That is why the Southwest and California and Nevada Regions of the FWS, along with the US Geological Survey (USGS) launched an effort in 2008 to reduce the effects of a changing climate on the diverse ecosystems of California, Nevada, Arizona, and New Mexico.

This effort included a three-day workshop with top scientists from universities and more than 200 FWS and USGS employees and interest groups who met in Tucson, Ariz., in August 2008 to translate science on the environmental effects of climate change into real action.

Based on that workshop, the Climate Assessment for the Southwest (CLIMAS) project at The University of Arizona and FWS has released a new report that identifies the major challenges climatic changes will present to the conservation and protection of fish, wildlife, and habitats in the Southwest.



**Figure 1.** The Apache trout is one of two trout species native to Arizona. It is listed as a threatened under the Endangered Species Act. *Photo is courtesy of the U.S. Fish and Wildlife Service.*

“Climate change is likely to be the toughest environmental challenge we will address this century, and desert ecosystems will be especially hard hit,” said Benjamin Tuggle, FWS’s Southwest Regional Director.

“We will only be able to meet our conservation goals by collaborating on a landscape level with academic institutions, other natural resource managers, land users and the public at large,” Tuggle said. “Our partnership with CLIMAS allows us to analyze and prioritize some of the best strategic thinking on ways to address a warming climate in our critical Southwest desert landscapes.”

## Putting Knowledge into Action

FWS has one sweeping charge: conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continued benefit of the American people. Its flagship conservation tool—the National Wildlife Refuge System (NWRS)—protects approximately 150 million acres that provide sanctuary to more than 700 species of birds, 220 species of mammals, and 200 species of fish. About 25 percent of

all threatened and endangered species in the U.S. are found within refuges, which encompass a combined area about the size of New Mexico and Arizona.

While the NWRS has definite borders, plant and animal habitat does not. Therein lies one of the largest challenges: How does the FWS fulfill its mission if climate change forces plants and animals to seek new territory—habitat that may lie outside the protective boundaries of the NWRS?

This issue and many others were discussed by resource managers during the 2008 workshop and is the focus of the report, “Putting Knowledge into Action: Tapping the Institutional Knowledge of U.S. Fish and Wildlife Service Regions 2 and 8 to Address Climate Change,” released by CLIMAS and FWS Sept. 15.

The workshop included small group discussions, led by CLIMAS, in which resource managers discussed the obstacles

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## What do we do now, continued

and opportunities climate change presents. Their comments covered a range of topics, from the need to retool management strategies to improvements to public outreach.

Some meeting participants suggested conservation strategies should target an entire ecosystem instead of “charismatic” species such as the Gila monster that have widespread popular appeal; protecting one animal will not be effective if its food source becomes scarce. Other participants noted that climate change liaisons to the public will help increase awareness and engage interested citizens in management activities, such as empowering people to collect data on the timing of plant flowering.

Across the Southwest, the effects of climate change already are being observed, and little doubt exists within the scientific community that change will continue. The average annual temperature has risen 2.5 degrees F in Arizona and 1.8 degrees F in New Mexico since 1976, according to the report. Winter snow is melting earlier in the year compared with time periods before 1950. Rain is replacing some snow storms, and April snowpack—critical to the region’s water supply—contains less water. In addition, yearly streamflows in the Colorado River basin have decreased slightly since 1950, and computer models generally project declines in the average annual runoff in the Southwest as the amount of snow decreases and evaporation increases (see side bar).

In turn, these changes influence the size and frequency of wildfires and many ecosystem processes, such as the timing of plant and animal life-cycle events and the distribution and extinction of species, according to the report. Climate change likely will alter habitat ranges for animals, pushing them outside current preservation areas.

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## Climate Change Impacts

Climate change and variability shape wildlife and landscapes. Research in the Southwest has documented climate-change related impacts and suggests these changes will continue. Some of the impacts are summarized below. More details and corresponding citations can be found at the Southwest Climate Change Network Web site, [www.southwestclimatechange.org](http://www.southwestclimatechange.org).



### Temperature

Temperatures in Arizona and New Mexico have been rising, particularly since the mid-1970s. Since 1976, the average annual temperature increased by 2.5 degrees F in Arizona and 1.8 degrees F in New Mexico. The Intergovernmental Panel on Climate Change (IPCC) projects the world’s average annual temperature this century will likely increase between 3 and 7 degrees F. Projections for the Southwest show greater temperature increases than the global average, with summer temperatures rising even higher than winter ones.

### Precipitation

Precipitation records for the Southwest contain a high degree of variability. The observational evidence shows some support for Global Climate Model (GCM) projections of a poleward shift in the jet stream, a pattern that could mean El Niño events might often fail to bring rain and snow to the Southwest. Annual precipitation is projected to drop by 5 percent by century’s end for much of Arizona and New Mexico, based on results from GCMs.

### Fire

In recent years, the number of acres burned and the frequency of fires have increased in the West. Temperature increases and possible reductions in winter precipitation will likely cause this trend to continue, although other factors also may influence future fires.

### Snowpack

In comparison to time periods before 1950, winter snowpack is melting earlier in the year; rain is replacing some snow storms, especially at elevations of 5,000–8,000 feet; and the April snowpack contains less water. Higher projected future temperatures will likely continue these trends.

### Streamflow

Annual streamflows in the Colorado River basin have decreased slightly since 1950. Models generally project substantial declines in the average annual runoff

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## What do we do now?, continued

### Insights from the Report

During the small group sessions, meeting participants prioritized the actions that will guide the FWS on climate change adaptation. The most important steps included more educational programs for the public; more regional-scale, holistic conservation planning; more scientific research to study climate and ecosystem connections, and improved communication and collaboration.

Several other key findings of the report included:

- Participants of the group discussions were most concerned about the impacts of climate change on water issues and on species and habitat.
- Participants stated effective climate change planning will require fortifying existing partnerships and developing new ones.
- Participants stated that although many people are wary of using climate and other models, they find it unavoidable and therefore urge cautious and well-informed use.
- Integrated assessments of species and habitat risks, including climate change and other threats, will improve resource management.

Group discussions also highlighted ways to improve the efficacy of resource management in the face of climate change. These included improving the ability to translate science to the public and decision makers; building new collaborations with existing partners; working with other organizations to, among other things, synthesize impact assessments, fact sheets, and other information; and enhancing the commitment to monitoring species and habitats.

### Moving Forward

As the Southwest and other U.S. states grapple with climate change, one thing is certain: decision makers need useful and up-to-date climate data and information. The goal of the report was to synthesize the ideas of resource managers, providing a context for future planning and providing a window into the key issues resource managers face.

“The Fish and Wildlife Service recognizes that climate change poses a serious challenge to their conservation practices. This report highlights challenges and opportunities FWS employees identified as critical in the context of a changing climate, including the need to form new partnerships, to build climate concerns

into management priorities, to develop a better understanding of potential climate-driven impacts, and to find new ways of interacting with the public,” said Dan Ferguson, CLIMAS program manager and co-author of the report. “This workshop represents an important step forward.”

## Climate Change, continued

in the Southwest due in large part to declines in the amount of snow and higher evaporation.

### Phenology

Studies document an advance in the date that flowers bloom in the West. Because the date and abundance of flower blooms are highly correlated with winter snowpack, projected declines in snowpack will decrease flower abundance and advance the date of flowering.

It also became a stepping stone for a second workshop on the challenges climate change presents to management that convened in Austin, Texas, several weeks ago. Resource managers and academics discussed issues related to Texas and Oklahoma, setting the stage for strategic planning for that region.

In announcing that workshop, Tuggle said, “This workshop, along with the Tucson meeting a year ago, sets the stage for the upcoming climate-related challenges in the Southwest Region that we are already beginning to face, but are only just beginning to identify.”

To read the report, visit:

[http://www.climas.arizona.edu/pubs/pdfs/knowledge\\_into\\_action.pdf](http://www.climas.arizona.edu/pubs/pdfs/knowledge_into_action.pdf).



**Figure 1.** The Gila monster's habitat is primarily in the desert Southwest, where urban sprawl and habitat destruction have caused its numbers to dwindle. Currently, Arizona and Nevada have state laws that help protect them. Photo credit: Manny Rubio, Arizona-Sonora Desert Museum, Sonoran Desert Digital Library.

