

Increased health woes among climate change impacts

By Melanie Lenart

This article is the first in a two-part series considering the findings of a new climate assessment for the Southwest. This part explores health issues and vulnerable populations, with an emphasis on tribes.

A correction was made to the article on Jan. 24

An increase in respiratory problems from raging wildfires and dust, more heat-related deaths in an aging population, and shifts in the range of diseases—these are some of the human health-related impacts the Southwest region will face as a result of climate change. The effects, detailed in an upcoming report focused on six western states including Arizona and New Mexico, go far beyond the well-known challenge to regional water supplies.

The report, Assessment of Climate Change in the Southwest United States, is part of an ongoing national effort to synthesize the

state-of-the-art science of climate-related change and its impacts. The full Southwest assessment will be posted in coming weeks, but the summary for decision makers is currently available (*see links below*). In the meantime, the Southwest chapter of the National Climate Assessment—which was informed by an earlier draft of the Southwest report—is available for viewing and public comment (*see related story on p. 4*)*.

More heat-related woes

Arizona tops the list of states contributing to the 400 heat-related deaths that already occur across the nation in an average year, and that number is expected to rise as temperature does, noted Heidi Brown, lead author of the regional assessment's health chapter. For the six states in the region—Arizona, New Mexico, Colorado, Utah, Nevada and California—the Southwest's average annual temperature is projected to climb by an average of 2°F to 6°F by

mid-century. What's more, the biggest increases are expected to occur in summer (*Figure 1*).

“As we look to the future, heat waves are expected to become more humid, with higher overnight temperatures,” Brown explained in one of several webinars about the report findings. Higher humidity translates into less opportunity for nighttime cooling.

Vulnerable populations

People living without air conditioning in inner city neighborhoods are more vulnerable to heat-related illnesses than people in climate-controlled homes surrounded by shade trees. At the same time, as the draft Southwest chapter points out, the 92.7 percent of the region's people who live in cities can expect to lose their cooling power

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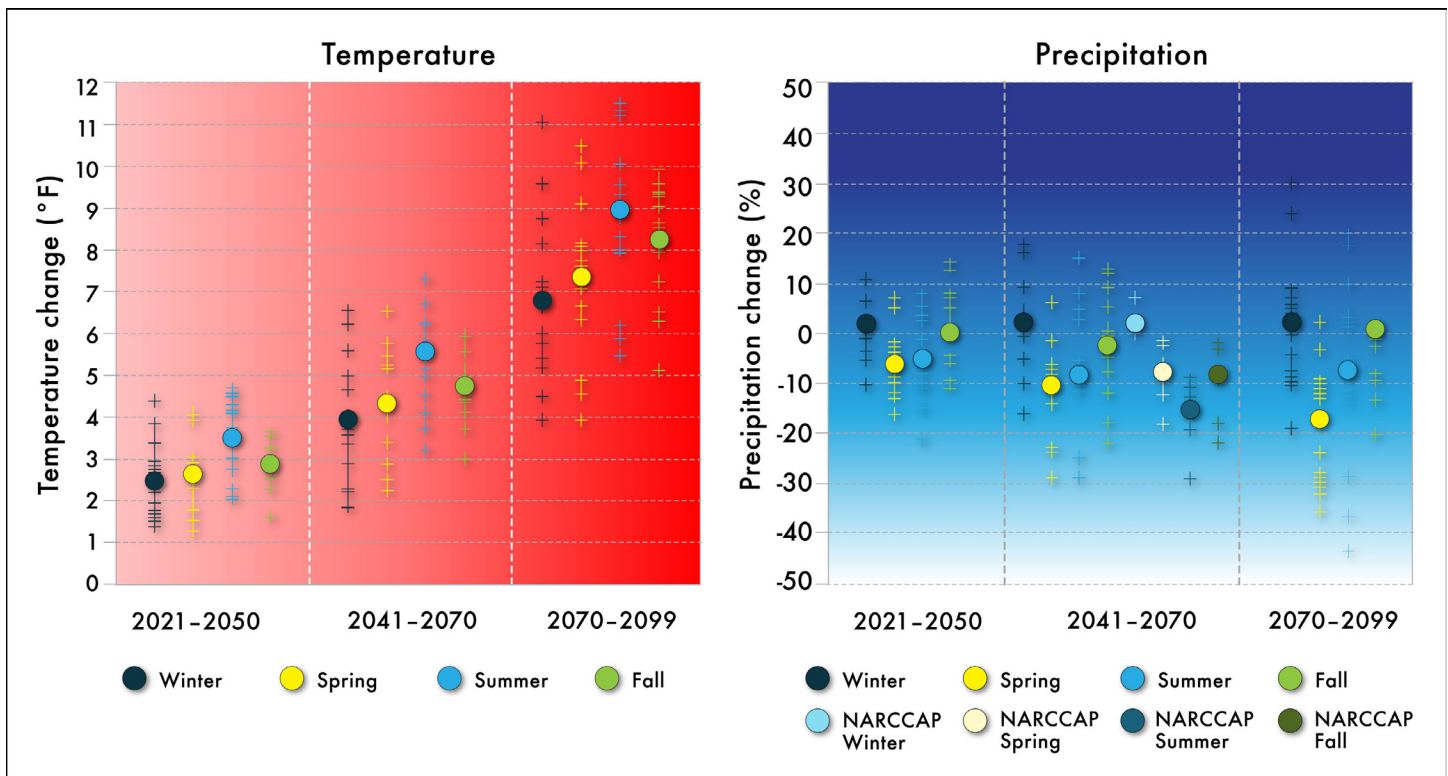


Figure 1. Projected changes in average seasonal temperatures (left, in degrees Fahrenheit) and precipitation (right, in percent) for the scenario involving high emissions of greenhouse gases. The change is relative to the 1971–2000 time frame. Colored dots represent an average from 15 climate models, while the plus signs represent the individual models. The NARCCAP results show the average from four models dynamically downscaled to the region. Seasons are: winter, December-February; spring, March-May; summer, June-August; and fall, September-November. This figure is from the Summary for Decision Makers version of the Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment, which was posted online in June 2012.

Increased health woes, continued

from time to time, as all that electricity draw for AC can “trigger cascading energy system failures, resulting in blackouts or brownouts.”

The general lack of air-conditioning, among many other reasons, makes the nearly 1 million people belonging to the 182 tribes in the six southwestern states among the more vulnerable of the region’s residents to changing climate.

For instance, about 40 percent of Navajo Nation residents lack electricity and plumbing, said Margaret Hiza Redsteer, lead author of the regional assessment chapter on tribes. So they don’t even have the option of cooling off with a cold drink or refreshing shower, much less with air-conditioning.

“We have conducted surveys of tribal elders on the Navajo Nation,” said Redsteer, a hydrologist with U.S. Geological Survey. She learned that, in the past decade, “they have had a few elderly people die during the really hot months.”

Age also influences susceptibility to heat, Brown said. She noted that some of the chapter’s projected rise in heat-related deaths relates to the aging population, as more Baby Boomers reach their mid-60s—the age when vulnerability generally increases. Children under 4 years old also face higher risks. That doesn’t mean, though, that older children and young adults have no worries.

“We see these things across the board, not just in the elderly,” Brown said. Young, seemingly healthy athletes can also fall ill or worse to heat, she noted.

More wildfires, more pollution

The health effects of wildfires are a growing concern given the recent ramping up of large fires, noted Gregg Garfin, lead editor of the regional assessment. As reported in its chapter on natural resources, efforts to suppress wildfires have been failing more often in recent years in the six southwestern states. Researchers found that more than three times greater area burned from 1987 to 2003 (excluding prescribed burns) compared to the period 1970 -1986.

Future precipitation remains challenging to predict, but the report’s detailed evaluations of climate models (*Figure 1*) found they generally agree on a likely precipitation decline during the spring season—right when diminishing snowpack in much of the Southwest is setting the stage for wildfires. Between existing forest conditions and projected climatic changes, researchers expect the number of acres burned to continue to increase—perhaps doubling in the southern Rockies.

The threat from these wildfires goes far beyond forest boundaries, as the smoke contains particles of a size that aggravates lungs. Garfin recalled witnessing the extent of the polluting haze from two record-breaking fires that burned simultaneously in the summer of 2011: a 156,000-acre

fire in New Mexico’s Jemez Mountains, and a 538,000-acre fire in Arizona’s White Mountains.

“I remember I flew to Denver. It was a clear day, aside from that smoke. No clouds. And when you arrived in Denver,” Garfin said, “you couldn’t see the Rocky Mountains, there was so much smoke from those fires.”

Dust also harms lungs

Along with lung-damaging smoke from wildfires, particles from dust storms are expected to taint southwestern air more often. As temperatures and evaporation rates rise, soils are projected to lose moisture overall, making soil particles more prone to becoming airborne dust. Soil disturbance, such as by farming or construction activity, also helps kick up dust.

Add a bit of wind to the mix, and driving conditions can lead to fatal accidents, as has been the case on numerous occasions in recent years on Interstate-10 between Tucson and Phoenix. Dust also darkens snow, making it less reflective and so quicker to melt, thus exacerbating droughts. Some researchers have likened conditions in the future Southwest to those of the 1930s Dust Bowl.

The Navajo Nation is already experiencing the impacts of excess dust caused by aridity.

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The National Climate Assessment: climate science in the decision-making context

The National Climate Assessment, which was released for public review on January 14, notes that the nation can expect more heat stress, wildfires, floods and electrical brownouts as temperatures climb a projected 2 to 4 degrees Fahrenheit in most regions within the next few decades. The National Climate Assessment receives input from regional assessments, like the one in the Southwest chronicled above.

As in the Southwest, the extra heat and wildfires are expected to take a toll on the health of Americans throughout the country. Nationally, these and other stressors relating to climate change are expected to lead to more than 1,000 premature deaths a year for every 2-degree temperature rise, if no actions are taken to adapt or reduce vulnerabilities to them.

Like the national and regional assessments, the national assessment includes background chapters devoted to the underlying science as well as the likely impacts of climate change on a variety of sectors. These include energy, transportation, natural resources, water, agriculture, tribes, urban areas and, of course, human health. While the national report has more than 240 authors, thousands of people contributed to the underlying documents produced for it, noted Katharine Jacobs, director of the National Climate Assessment.

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Increased health woes, continued

The reservation, located in northern Arizona, already was on the driest third of the tribe's traditional homeland, Redsteer said—and it's gotten drier since the 1950s.

Residents on the Navajo and neighboring Hopi reservations are finding it increasingly challenging to continue their ancient traditions of growing corn, and to support the sheep and cattle that have allowed them to be self-sufficient in more recent times. Formerly stable sand dunes have been mobilizing and, in some cases, creeping up to people's doorsteps, Redsteer explained. The shifting sands and drought are chasing young families off the Navajo reservation, as documented by the last census, she said. Meanwhile, the abundance of airborne dust has been prompting health warnings.

"During the Dust Bowl, when the conditions got severe, a lot of people died because of the particulate concentration of dust in their lungs. They would get pneumonia," Redsteer said. "There's no way of tracking those kinds of things on the reservation, but I do know that the Indian Health Service in Chinle has been very concerned about the dust level on windy days."

Climate and disease

Besides being unhealthy overall, dust particles can transport the fungus that causes Valley Fever, a lung infection that can be debilitating.

Shifts in diseases are challenging to predict but likely to occur. Even the bubonic plague might alter its range, according

to the regional assessment's health chapter. Physicians reported about 40 cases of plague in the U.S. between 2005 and 2009—almost all in the six states covered by the regional assessment. The good news is the flea-carried bacteria *Yersinia pestis*, which killed off roughly a third of the population of Europe during Black Death epidemics, stops in its tracks once temperatures rise above 80 degrees, Brown said.

Unfortunately, the same cannot be said for West Nile virus. The mosquitoes that carry it generally can develop faster and survive longer as temperatures warm. As the report states, mosquitoes are likely to expand geographically, such as into the foothills of the Rocky Mountains, and in time, with longer seasons for potential outbreaks. Predicting overall incidence, though, remains challenging.

"Mosquitoes aren't flying syringes," Brown said. It takes time for the virus to build up enough to be passed along. West Nile virus tends to incubate in birds as well, so four different life forms – virus, mosquito, bird and human, all with their own responses to climate—can be involved in its spread.

Behavior and health

Individual behavior can also affect a person's likelihood of having health trouble as climate shifts. For instance, a study of health problems during the 2003 wildfires in southern California found asthmatic children actually suffered fewer respiratory problems than non-asthmatic children. The researchers found that the kids with

asthma generally heeded the health warnings and wore masks or stayed inside, limiting their exposure to the smoke pollution.

People can limit their exposure to mosquitoes, to some extent, which can affect their chances of contracting West Nile disease and other mosquito-borne illnesses. And, as Brown pointed out, an improvement in personal hygiene and public sanitation since the Dark Ages has so far helped keep the plague in check.

"I think it's because we've changed the way we live," Brown said, when asked why the Black Death was no longer reaching epidemic proportions. Tongue-in-cheek, she added, "How many fleas do you have on you right now?"

Additional Information

View the Southwest Climate Assessment's Summary for Decision Makers: <http://www.southwestclimatealliance.org/announcements/southwest-climate-assessment-summary-decision-makers-now-available>

View summary webinars that cover six topics, including climate projects and energy impacts: <http://www.southwestclimatealliance.org/media>

Part Two of this series will be published in the February issue. It will consider some of the report's suggestions for adapting to climate change in the context of its impacts.

The National Climate Assessment, continued

"Clearly this is a major contribution to understanding what actually is changing both in the physical climate and in terms of impacts," Jacobs explained. "One of the most important aspects of this assessment is that people working on adaptation planning have an opportunity to understand what the future might look like."

"A scientific assessment is a critical evaluation of information for the purposes of informing decisions on a complex issue," explained Gregg Garfin, one of two lead convening authors on the Southwest chapter in the national assessment, and lead editor of the Southwest assessment. "So, again, the idea is to be relevant to policy without any policy prescription."

The report will be the first major government document delivered as an "e-book," according to Jacobs, who added that the electronic format will help make the roughly 1,000-page document more useful to decision-makers. Comments will be accepted online until April 12.

You can view the National Climate Assessment report, including the Southwest chapter and a forum for public comments at: <http://ncadac.globalchange.gov/>