ADAPTING TO CLIMATE CHANGE
SOUTHWEST

EPA United States Environmental Protection Agency

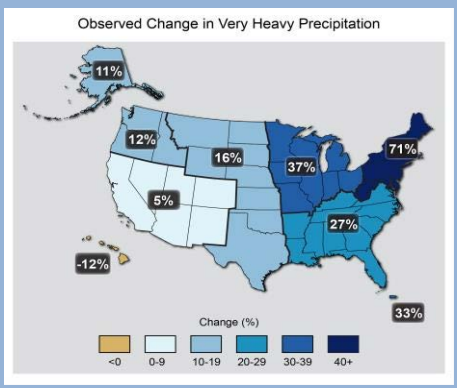
The Southwest is the hottest and driest region in the U.S., already parched and facing climate change challenges. Its northern half is expected to get hotter, its southern half, significantly drier. Projected higher temperatures in most areas, increased precipitation, and more frequent and intense storms in others, pose challenges to communities as they protect water infrastructure, maintain air quality, and protect streamflows and wetlands. Many communities are building resilience to the risks they face under current climatic conditions. This fact sheet provides examples of communities that are going beyond resilience to anticipate and prepare for future impacts.

Moving Beyond Resilience to Adaptation

Climate change adaptation goes beyond resilience by taking actions to address future risks. Adaptation refers to how communities anticipate, plan, and prepare for a changing climate.

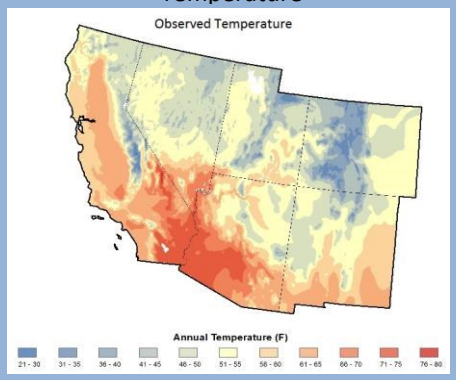
Observed and Projected Changes in the Southwest

Intense storms have increased



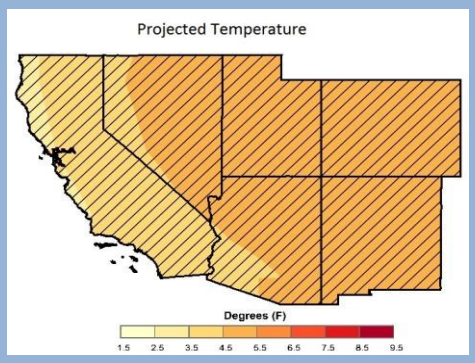
The Southwest experienced a 5% increase in the amount of precipitation falling in very heavy events (the heaviest 1%) from 1958 to 2012.

Average Annual Temperature



This map shows the average annual temperature (°F) from 1981 to 2010 in the Southwest.

Average Annual Temperature Increases



The Southwest is expected to experience an increase in the average annual temperature (°F) from 2041 to 2070 compared to 1971 to 1999 under a high emissions scenario.

Protecting Water Infrastructure

Future projections for less total annual rainfall, less snowpack in the mountains, and earlier snowmelt mean that less water will likely be available during the summer months when demand is highest. This will make it more difficult for water managers in the Southwest to satisfy water demands throughout the course of the year. Freshwater resources along the California coast, however, face risks from climate-induced drought and sea level rise. As sea levels rise more quickly, saltwater moves into freshwater areas. This may force water managers to seek other sources of fresh water. Key vulnerabilities include:

- More frequent and intense storms may overwhelm operations and service capacity of water and wastewater systems, which could threaten drinking water availability, and lead to more sewer system overflows.
- Flooding and storms may cause the release of contaminants from Corrective Action sites, Superfund sites, brownfield sites and landfills.
- Sea level rise and storm surge may submerge and damage critical facilities.

Adaptation in Action

Southern Nevada Water Authority (SNWA) -- a cooperative of seven drinking water and wastewater agencies -- serves more than two million residents in Nevada, including the city of Las Vegas. SNWA worked with EPA's Climate Ready Water Utilities program to conduct a vulnerability assessment of the Las Vegas service area that considered climate change impacts and vulnerabilities in in 2035 and in 2060. Projected climate impacts included hotter and drier summers, drought conditions, and increased algal blooms. SNWA followed this initial analysis with more in-depth assessments of water source availability under future climate change, population increase, and water demand projections. These later assessments provided SNWA with a better understanding of its climate risks and potential vulnerabilities, and enabled them to begin to adapt. SNWA continues to adapt as a member of the Water Utility Climate Alliance, a consortium of ten of the largest water providers around the country, actively engaged on climate change adaptation.

Maintaining Air Quality

Increased warming and drought caused by or linked to climate change have increased wildfires and impacts to people and ecosystems in the Southwest. Fire models project more wildfire and increased risks to communities. High temperatures associated with climate change are also contributing to the formation of ground-level ozone, which poses a risk to people with asthma and other respiratory illnesses. Ground-level ozone is projected to increase, causing more heart and lung disease and deaths. Key vulnerabilities include:

- Climate change can exacerbate peak ozone concentrations on days where weather already contributes to high ozone concentrations, e.g., days with warmer or stagnant air.
- Climate change can lengthen the ozone season, which typically occurs during the summer, which is also prime wildfire season.
- Higher temperatures from climate change are projected to increase the frequency and severity of wildfires.

Adaptation in Action

Wildfires are an obvious threat to property and public safety, and they can also significantly affect air quality by increasing the amount of particulates in the air. Because of this, California included wildfire threats within its 2009 Climate Adaptation Strategy and seeks to reduce the risk of wildfires occurring in the future and reduce the vulnerability of people to wildfires. The state conducted a vulnerability assessment to better understand the projected impact climate change could have on wildfire activity, including concerns such as the effectiveness of California's climate sinks (i.e., carbon stored in vegetation) and how projected climate changes are expected to impact them. California's 2010 Rangeland Assessment's chapter on climate change notes that the fire season has been starting sooner and ending later, and the severity of wildfire acreage burned has been increasing in recent years. California is addressing the risk that more wildfires will occur under a changing climate by improving land use planning by avoiding future development in high fire hazard areas, implementing fire safe practices around homes, and using ignition-resistant construction.

Protecting Streamflows and Wetlands

Winter snowpack, which slowly melts and releases water in spring and summer, when both natural ecosystems and people have the greatest needs for water, is key to the Southwest's hydrology and water supplies. Over the past 50 years, there has been less late-winter precipitation falling as snow, earlier snowmelt, and earlier arrival of most of the year's streamflow. Recent streamflows in the four major drainage basins of the Southwest have been lower than their twentieth century averages. Streamflow totals in the Sacramento-San Joaquin Rivers, Upper Colorado, Rio Grande, and Great Basin were 5% to 37% lower during 2001–2010 than their twentieth century average flows. Moreover, in the late 20th century it was seen that flows in many snowmelt-fed streams of the Southwest tended to peak and subside earlier in the year than they previously had.
Key vulnerabilities include:

- Increased air temperatures cause more evaporation of rainfall and runoff. This can result in reducing the volume of runoff to rivers and reservoirs by two or three times more than the rainfall itself is reduced.
- Reduced amounts of rainfall affect the functioning of inland and coastal wetlands, which we rely on to filter water and help reduce flooding.

Adaptation in Action

Regional water purveyors in the Los Osos Groundwater Basin in California worked together with the Morro Bay National Estuary Program to better identify climate change threats to their groundwater supplies from saltwater intrusion and alterations to the groundwater recharge cycle. With help from EPA, the local water purveyors used the Climate Resilience Evaluation and Awareness Tool (CREAT) to identify climate change threats and potentially vulnerable assets, and evaluate adaptation options throughout their groundwater basin. This partnership and collaborative research allowed stakeholders to gain valuable insights about water resource management in the Los Osos Basin, and informed the ongoing development of the Los Osos Groundwater Basin Management Plan. These stakeholders are continuing their work to ensure that effective adaptation options will be applied to address the expected impacts of climate change.

For a comprehensive view of projected climate changes in your region, consult:

- ***Climate Change Impacts in the United States: The Third National Climate Assessment***
- ***EPA's Climate Change Adaptation Resource Center***

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