USDA Southwest Regional Hub for Adaptation to and Mitigation of Climate Change

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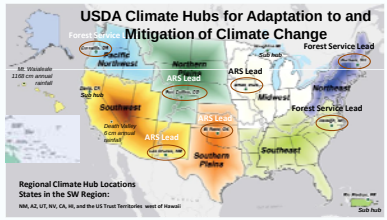
USDA Regional Climate Hubs

In early 2014, the USDA formed seven regional climate hubs across the United States to support climate-smart decision making. This multi-agency effort (Agricultural Research Service, Forest Service, Natural Resources Conservation Service, Farm Service, and Rural Development) will deliver science-based knowledge to farmers, ranchers, and forest landowners. The Southwest Climate Hub covers Arizona, California, Hawaii, Nevada, New Mexico, and Utah.



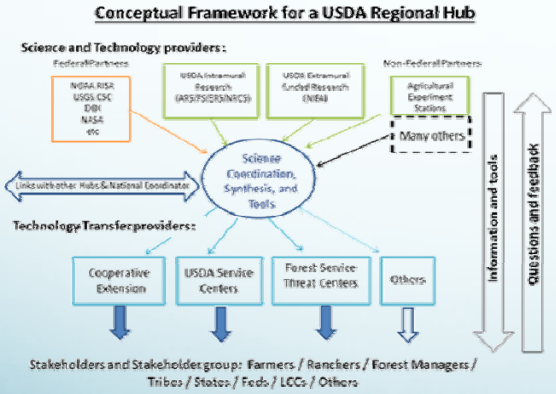
Each hub will provide:

- Technical support for land managers to respond to drought, heat stress, floods, pests, and changes in growing season
- Regional assessments and forecasts for hazard and adaption planning
- Outreach and education for land managers on ways to mitigate risks and thrive despite change

What type of agricultural production is in the Southwest?

The Southwestern states offer highly diverse agricultural crops which include cotton, lettuce, tree fruit, cantaloupes, grapes, onions, and pecans. The region relies on irrigation more heavily than any other region in the U.S. As such, water supplies, primarily driven by winter snowfall amounts in the Sierra Nevada Mountains and the Rocky Mountains, are critical to meeting irrigation needs in the Southwest. Total farm income for the region exceeded $55.7 billion in 2012. Livestock account for approximately one-third of the agricultural profits in these six states. Ranchers adjust livestock numbers their rangelands can support based on the amount of seasonal and annual rainfall.

USDA Regional Climate Hub Framework



Outreach and Information for Stakeholders

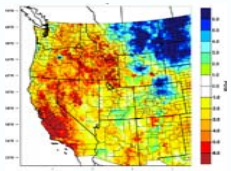
Delivered by cooperative extension agents in all six Southwest states.

Provide information in support of climate-smart decision making and gathering feedback from farmers, ranchers and foresters.

How do climate and weather variability affect Southwestern producers?

Producers in the Southwestern United States already operate under extreme weather conditions. Climate impacts producers' day-to-day decisions. Farmers and ranchers are currently coping with weather-related issues including:

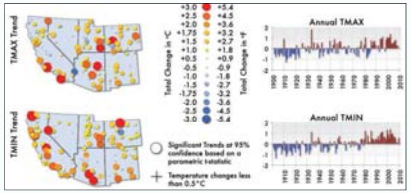
- A prolonged, extreme drought persisting over several years
- Large, destructive and catastrophic wildfires that have taken both lives and property
- Expansive areas of forest tree mortality as a result of insect outbreaks
- A severe decline in reservoir water supplies across the region to previously unseen levels
- Documented rising temperatures that increase the frequency of heat waves and reduce the frequency of cold snaps
- Extreme floods and hillslope failure events

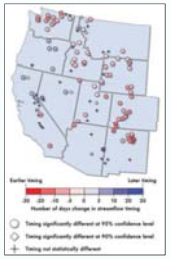


Palmer drought severity index, Jan 2014

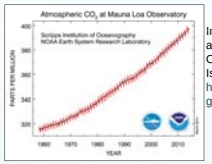
Changing climatic conditions in the Southwest that impact temperatures, alter growing seasons, increase plant moisture stress, and have the potential to trigger extreme events directly contribute to these recent regional catastrophes and water scarcities. Water is a scarce and vital resource to farmers and ranchers in the region. Models predict that drought and increased competition for water will be a more frequent reality in the coming years. This means reduced soil moisture and grazing productivity. Combined with warmer temperatures, farmers will face a longer frost-free season which can reduce yields of tree fruit and wine grapes, stress livestock, and increase agricultural water demand.

Observed changes in the Southwestern U.S.

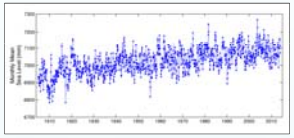




The 1901–2010 trends in annually averaged daily maximum temperature (TMAX, top) and daily minimum temperature (TMIN, bottom). Units are the change in ˚ C/110yrs. Trends computed from 251 stations for precipitation analysis and 180 stations for temperature analysis using GHCN V3 data. Source: Menne and Williams (2009) in Assessment of climate change in the Southwest U.S., Garfin et al. (2013). Right: Observed changes in streamflow timing 1950-2000 vs. 2001-2010 in snowmelt dominated rivers of the Southwest.

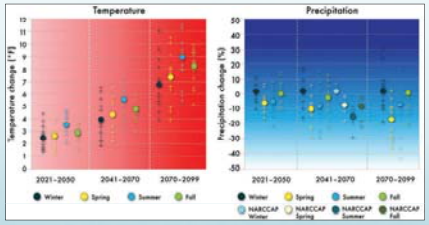


Increase in CO_2 observed at the Mauna Loa Observatory on the Big Island of Hawaii. http://www.esrl.noaa.gov/gmd/ccgg/trends/



Monthly mean sea level rise at Honolulu Tide Gauge (1905-2013)
http://www.psmsl.org/data/obtaining/stations/155.php

Projected changes in the Southwestern U.S.



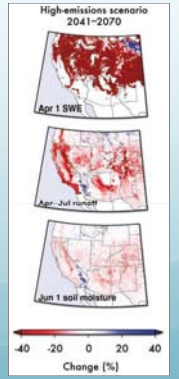


Figure 1.6 Projected change in average seasonal temperatures (degrees F, left) and precipitation (% change, right) for the Southwest region for the high-emissions (A2) scenario. A fifteen-model average of mean seasonal temperature and precipitation changes for early-, mid-, and late-twenty-first century with respect to the simulations' reference period of 1971–2000. Changes in precipitation also show the averaged 2041–2070 NARCCAP for global climate model simulations. The seasons are December–February (winter), March–May (spring), June–August (summer), and September–November (fall). Plus signs are projected values for each individual model and circles depict overall means. Source: Mearns et al., 2009. Right: Projected water cycle changes in snow water equivalent, April-July runoff and June 1 soil moisture in assessment of climate change in the Southwest U.S. (Garfin et al., 2013).

Southwest Success Stories

Water Supply Forecasts: From 2006-2012, the Agricultural Research Service and Natural Resources Conservation Service partnered with the National Science Foundation, New Mexico State University, and landowners to expand and upgrade instrumentation throughout the Upper Rio Grande Watershed in northern New Mexico. These instrumented stations are used in real time to provide water supply forecasts for the Upper Rio Grande, which supplies 56 percent of the irrigated agricultural needs in New Mexico. The improved forecasts support decision-making regarding crop selection, time of planting, and irrigation scheduling.

Forest Pest Management: From 2000-2009, an estimated 21.7 million acres of forest were impacted by bark beetles in the intermountain west. Although western forests have experienced regular outbreaks of insects throughout history, recent infestations are unprecedented due to extended drought and warmer winters. One recently treated area is within California's Lake Davis Recreational Area of the Plumas National Forest. The Forest Service is developing comprehensive restoration strategies to address insect infestations and other significant disturbance factors that threaten the long-term sustainability of southwestern forests areas and restore weed-infested rangelands; and improve productivity of Pacific Northwest agricultural and rangelands under current and potential future climate conditions.

Regional Agricultural Vulnerability Assessments: Researchers at U.C. Davis assessed local impacts of climate for Yolo County by developing a spatially explicit agricultural vulnerability index based on 22 climate, crop, land use, and socio-economic attributes. This study incorporated assessments of farmers' attitudes and the county development plan to assess local readiness for changing climates. The study serves as both a model for regional assessments and a template for on-going collaborative efforts among California's urban regions, U.C. Davis, and others.

Improving Irrigation Efficiency: From 1972 to 2010, land irrigated with low-volume, efficient irrigation increased by 38 percent in California. Recently, researchers at USDA/ARS and U.C. Davis have advanced growers' abilities to measure crop water demand and accurately determine irrigation needs using a technology called surface renewal. Continued work to support efficient crop irrigation will help farmers cope with current and future climate variability and increasing water demands.

Climate Hub information developed, tested, and provided to schools by the Asombro Institute for Science Education

Mission: To increase scientific literacy by providing hands-on, inquiry-based science education starting with middle school programs

Resources

USGS Climate Science Centers
http://www.doi.gov/csc/index.cfm

FWS Landscape Conservation Cooperatives
http://www.fws.gov/landscape-conservation/lcc.html

NOAA Regional Integrated Science and Assessment
http://www.climas.arizona.edu/
http://meteora.ucsd.edu/cap/
http://www.pacificrisa.org/

Western Regional Climate Center
http://www.wrcc.dri.edu/

Education

Animal Agriculture and Climate Change
http://animalagclimatechange.org/

NRCS Short Course: Why do we care about climate change?
https://aglearn.usda.gov/customcontent/NRCS/NRCS-NEDC-000283/index.htm

Climate Change and Agriculture in the US
http://www.usda.gov/oce/climate_change/effects_2012/CC%20and%20Agriculture%20Report%20(02-04-2013)b.pdf

USFS Climate Change Resource Center
http://www.fs.fed.us/ccrc/

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