



# Climate Change and Drought

## What it means to tribes and how we can adapt

### What is drought?

The National Oceanic and Atmospheric Administration (NOAA) defines drought as “a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people<sup>[1]</sup>”. The West has often suffered from extensive drought periods including some of the longest drought events on Earth - so called mega-droughts<sup>[2]</sup>. As global temperatures rise due to climate change, areas such as the Southwest are likely to experience “increasing and deepening drought conditions<sup>[3]</sup>”. This could have devastating effects on water supply for ecosystems, agriculture, and for human consumption.

### What are the facts?

Over the last century the average global temperature has increased by approximately 1.2° C (2.2° F)<sup>[4]</sup>. Comprehensive, long-term research by governmental agencies and academic institutions indicates that this temperature increase is directly linked to human activities - specifically large-scale greenhouse gas emissions. This human-induced, or anthropogenic, temperature change is causing variable global and regional climatic effects.

Climate model projections for the Southwest suggest increasing temperatures into the future which may in turn increase rates of evapotranspiration and exacerbate regional drought conditions<sup>[3]</sup>. Projections about precipitation in the Southwest are less certain but suggest that a decrease is likely by the end of the century<sup>[6,7]</sup>. Nonetheless, the Southwest is expected to become more arid as temperatures increase and moisture levels decrease. This is a concern, particularly where water shortage is already an issue.

An added consideration for future water demand in the Southwest is urban development. The Southwest is experiencing some of the fastest climate change-induced warming in the nation, as well as rapid population growth<sup>[5]</sup>.

These two issues in concert present serious questions about water availability and access into the future.

### Quick facts about drought in the Southwest:

- The Southwest has been in a consistent state of drought since 1999.
- Historical drought trends along with projected temperature increases suggest that droughts will become even more severe over time.
- Reconstructed drought trends (assembled from tree ring data) indicate longer drought patterns over the last 100 years than previously observed.
- Winter and spring storm tracks, which bring annual regional rain, are projected to shift northward.



*Prolonged drought conditions can cause severe damage to croplands.*

*Photo: Hopi Department of Natural Resources*

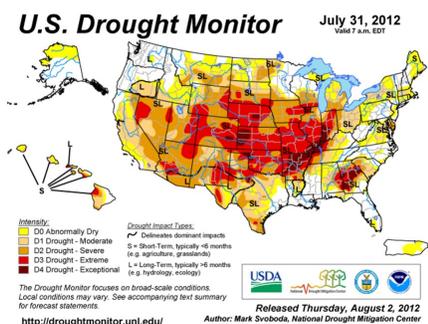
### Why does drought matter?

One concern is that future precipitation patterns may be characterized by more intense and less frequent rain events. This is disconcerting because when rain falls more intensely, soils, especially hard-packed desert clays, may not absorb the water fast enough. Water that would have otherwise slowly percolated through the soil and subsequently recharged the aquifer, instead runs off the soil's surface and can increase the risk of flooding in surrounding areas.

Another concern is that drier conditions can adversely affect populations that are dependent on a consistent water supply for agriculture and human consumption.

Aquifers throughout the Southwest are being strained as population size and water demands increase<sup>[5]</sup>. City growth results in more impermeable paved surfaces preventing rain water from soaking into the ground and recharging aquifers. These growth and development trends in combination with climate change, have rendered serious challenges for long-term management of aquifers.

An additional drought-related concern that directly affects Southwestern tribes is that of native vegetation and livestock rangeland loss. These landscape-scale changes are problematic because of their potential impacts on medicinal and culturally-significant plant species as well as local food security, and economic stability.



Drought intensity map available through the National Integrated Drought Information System (NIDIS) website

### What about the Colorado River?

The promise of water supplied from the Colorado River is responsible for much of the Southwest's urban growth in places such as Las Vegas, NV and Phoenix, AZ. Unfortunately however, the water flow calculations which were used to determine state allocations under the 1922

Colorado River Compact, reflected the highest flow rates that the Colorado River had seen in five centuries<sup>[6]</sup>. Currently the Colorado River does not have enough water to meet agreed upon allocation amounts. This issue is particularly germane to tribes given that some water allotments have not yet been quantified.

### What can tribes do?

Drought conditions necessitate adaptation strategies on the part of impacted populations. Given that human activities exacerbate drought conditions, it is also advisable to consider the policy and population-wide dimensions of drought, water use, and energy policy.

There are several crucial steps that can be taken to ensure tribal resiliency in a changing climate: (1) establish and protect tribal water rights, (2) create tribal drought and water management plans that take projected climate change impacts into consideration, (3) establish a tribal drought and climate monitoring program.

In addition, drastic reductions in water use can be made through simple behavioral changes and efficiency adjustments in homes, businesses and industry.

The following are examples of water wise practices:

- ⇒ Partner with local representatives to create regional water policy and water management plans
- ⇒ Remain abreast of newly introduced water-use and energy policy
- ⇒ Implement regionally specific water conservation practices (ex: rainwater harvesting for irrigation)

### References

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2. CLIMAS Droughts, Megadroughts, and More: A Conversation with Jonathan Overpeck <http://www.climas.arizona.edu/feature-articles/july-2012>
3. Drought Preparedness for Tribes in the Four Corners Region, Workshop Report <http://www.drought.gov/imageserver/NIDIS/workshops/tribal/Drought-Preparedness-Tribal-Lands-FoursCorners-2011-1.pdf>
4. NASA—The Ups and Downs of Global Warming <http://climate.nasa.gov/news/index.cfm?NewsID=175>
5. U.S. Global Climate Research Program—Global Climate Change Impacts in the United States, Regional Climate Impacts: Southwest <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/full-report>
6. University of Colorado at Boulder—Western Water Assessment, [http://www.colorado.edu/colorado\\_river/law.html](http://www.colorado.edu/colorado_river/law.html)
7. CLIMAS Southwest Climate Outlook, September 2009 [http://www.climas.arizona.edu/files/climas/pdfs/feature-articles/2009\\_sept\\_fwsreport.pdf](http://www.climas.arizona.edu/files/climas/pdfs/feature-articles/2009_sept_fwsreport.pdf)
8. U.S. Department of Agriculture—Southwestern Region Climate Change Trends and Forest Planning [http://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb5181242.pdf](http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5181242.pdf)

### To learn about funding opportunities, please visit the following sites:

Tribal Climate Change Funding Guide: <http://tribalclimate.uoregon.edu/publications/>

Tribes & Climate Change Funding page: <http://www4.nau.edu/tribalclimatechange/resources/funding.asp>

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