Case Study

Texas: Central Region

Water Resource Strategies and Information Needs in Response to Extreme Weather/Climate Events

Central Texas Region

Water Trends

The influence of El Niño Southern Oscillation (ENSO), specifically the La Niña phase, subjects Central Texas to frequent droughts. La Niña causes lower than normal precipitation for the southwest United States, reducing soil moisture and stream flow. The area is dependent on winter rain from the Atlantic for reservoir and aquifer recharge. Observed and projected trends of increased temperature make this region even more susceptible to drought.

Central Texas depends heavily on the Highland Lakes on the Lower Colorado River for the region's water supply, especially water stored in the Lake Travis and Buchanan reservoirs. In 2011, inflow into these lakes was only 10% of the yearly average. Inflows over the past five years were the lowest of any five-year period in recorded history.

Communities south of Austin, including the city of San Antonio, rely on small karst aquifers that are prone to multi-year drought cycles. The lack of winter precipitation for recharge from the Mid-Atlantic Oscillation (MAO) combined with burgeoning population growth threaten the sustainability of area aquifers.

Governing Structures

Established by the Texas Legislature in 1934, the Lower Colorado River Authority (LCRA) is a conservation and reclamation district that relies solely on revenues generated from supplying energy, water, and community services. Six dams and reservoirs comprise the LCRA system and form the Highland Lakes. LCRA operates the reservoirs for water supply, flood control, and power generation.

Groundwater is managed by conservation districts authorized by the State of Texas. Cities manage their own water, wastewater, and stormwater services.

The Story in Brief

Central Texas entered its third consecutive year of drought in 2013, which began in 2011 when the state endured its worst single-year drought and hottest summer in recorded history. That year, communities in Central Texas faced 90 days of triple-digit heat, during which extensive wildfires burned hundreds of homes. Heading into the 2013 summer season the reservoir system on the Lower Colorado River was at even lower levels than at that same time in 2011. For the second year in a row the Lower Colorado River Authority (LCRA) had not released water for downstream agricultural uses that had an 'interruptible' standing under water rights provisions, which meant they could be curtailed. Urban users had purchased 'firm' water, available in a drought, resulting in the perception that there was plenty of water and creating tension with downstream agricultural users. Challenges persisted both in instituting an ethic of water conservation and in funding utility operations when selling less water.

Drought of 2011 to 2013

Impacts

Low winter rain and high summer temperatures caused an extreme drought in Central Texas in 2011. Lakes Travis and Buchanan, the area's main water supply reservoirs, and area aquifers were severely depleted. Water use restrictions caused an estimated $35 million in revenue loss in Austin from 2011 through March 2013. The Barton Springs/ Edwards Aquifer Conservation District (BS/EACD) also imposed pumping restrictions.

One of the most severe consequences of the 2011 drought was the extremely destructive wildfires in Bastrop County. The drought left the county vulnerable to wildfires, due to severely low field moisture. The resulting wildfire on Labor Day weekend 2011 destroyed more than 1700 homes, and two lives were lost. Property damage totaled $360 million, marking the Bastrop County wildfire as the most expensive and extensive property loss due to wildfire in Texas history. The wildfire ravaged ecosystems: more than 1.5 million trees were damaged and plans were made to plant 1 million seedlings over the next four years in order to quickly restore the forests to previous conditions.

"It does appear that drought is the new normal."

Ken Kramer, Water Resources Chair
Sierra Club, Lone Star Chapter

Extreme low water levels due to the drought are evident at Lake Travis in Austin, Texas.

As of March 2013, the region was on track for not only a third consecutive year of drought, but a summer season that was worse than the 2011 drought or one that matched the 1950s record drought. Water supply reservoirs in Central Texas were a mere 44% full compared to 75% at the same time prior to onset of the 2011 drought. South of Austin, the highly prized portion of the Edwards Aquifer, whose flows support the endangered salamander in Barton Creek, reached critically low levels. The drought was once again hitting economic sectors throughout Central Texas, including agriculture, microchip manufacturing, and energy production. Rice farmers were suffering their second consecutive year with reduced water release from LCRA; low reservoir levels were concentrating ions and metals in water, which could lead to defects and lost revenue for microchip manufacturing.

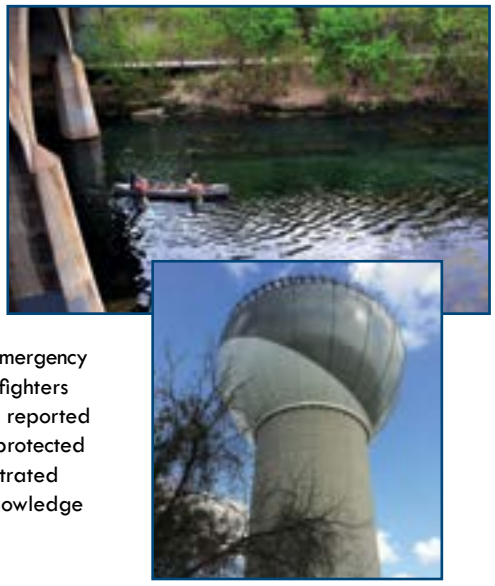
Water and Utility Community Response

The State of Texas requires communities to adopt water conservation plans and drought management plans. However, drought plans are typically only implemented once communities are in the midst of drought. In Austin, a community

A series of workshops focusing on extreme events and water resources, co-sponsored by the National Oceanic and Atmospheric Administration (NOAA), US Environmental Protection Agency (US EPA), Water Environment Research Foundation (WERF), Water Research Foundation (WaterRF), Concurrent Technologies Corporation (CTC), and NOBLIS.

NOAA EPA WERF WaterRF CTC Noblis

known for its innovation and conservation ethic, the severity of the drought required water conservation that affected the City's revenue. In 2011, a revenue-stability fee was added to customers' bills to fund fixed costs. This fee was subsequently eliminated in 2012 with the adoption of a residential-tiered minimum charge based on monthly water usage, resulting in a lower charge for low water users and a higher charge for high water users. The City of San Antonio uses a rate structure that incentivizes conservation while maintaining adequate revenues.

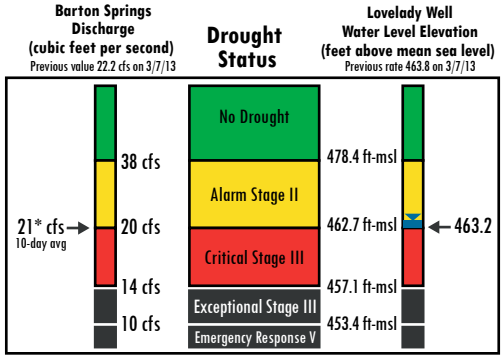


During the 2011 Bastrop County wildfire, a well-prepared emergency response team evacuated 5,000 people in 2.5 hours. Firefighters assisted water utility personnel and vice versa – firefighters reported melted meters and pipes spewing water; utility personnel protected by firefighters restored water pressure. This event demonstrated the importance of established relationships and shared knowledge between emergency responders and water managers.

The private sector realized the need to protect itself from the rising cost of scarce water supplies. One microchip company, Spansion, evaluated its water use and adopted a cutting-edge suite of practices – FAB25. The FAB25 system increased energy and water efficiency, recovered contaminants from process wastewater for resale, and enabled reuse of reclaimed water. Spansion reuses 1.3 million gallons of water per day. Since 2008, this project has decreased its city water purchase by 22%. The agriculture community also worked to reduce water losses by updating irrigation equipment and adopting practices such as laser leveling fields.

(Top) Lady Bird Lake in Austin has low water levels and algae blooms as a result of the drought, but boaters still enjoy an evening on the water. (Middle) The city of Austin uses reclaimed water from wastewater plants for watering landscapes and golf courses.

Drought Status Chart
Barton Springs/Edward Aquifer Conservation District



*Estimated based on manual measurements and correlation with Lovelady
Construction at pool makes manual measurement conditions variable.

As of early March 2013, BS/EACD, serving communities south and east of Austin was at Drought Alarm Stage II, which required permittees to curtail monthly pumpage by 20%. It is forecasted that both parts of the Edwards Aquifer will enter the Critical Stage III. The drought stages have associated requirements for residential water use (e.g., number of outdoor watering days allowed per week).

The city of San Antonio is the largest city in the nation that relies solely on groundwater for its municipal supply. Forced to adopt aggressive conservation measures in 1993 when it lost a lawsuit over the drawdown of the aquifer, the City implemented both demand management and supply management strategies. Its innovative measures include a rate structure that incentivizes conservation while adequately funding the utility. Despite doubling in population, San Antonio's water use remained the same due to their aquifer storage and recovery program, which supplies 15%–20% of its water demand. Its Drought Management Team convenes a weekly meeting to share information and develop strategies to ensure a rapid response in changing conditions.

Looking Forward

During the 1952 drought, fewer than 10 million people lived in Texas. The 2011 drought occurred with a population of 25 million that is projected to grow to 46 million by 2060. Increasing drought coupled with a growing urban population necessitates a strategy in which water conservation is standard operating procedure. Conservation would be viewed not as a drought management strategy, but as a way of life to support a vibrant economy and the beautiful natural resources that sustain it. Area water managers recognize this – building public acceptance is the challenge that lies ahead.

To learn more about how the water sector is responding to extremes, visit:
http://www.cpo.noaa.gov/ClimatePrograms/ClimateSocietalInteractionsCSI/SARPProgram/ExtremeEventsCaseStudies.aspx

Lessons Learned

- Extreme weather can have secondary and tertiary impacts (e.g. droughts produce wildfires), requiring more coordination and collaboration.
- Integrated planning between water, agriculture, energy, health, and emergency services improves resiliency.
- Aquifer storage and recovery offers potential to bank water in times of plenty for use in drought.
- Water conservation is often confused with drought management.
- Drought Management Plans must be developed before drought strikes and implemented by drought stage triggers.
- The news media is an important partner in raising public awareness.
- Public reception can be improved by conveying information through trusted sources, which vary by community.
- It is vital to understand the roles of and build relationships among community service providers.
- Urban areas lack understanding of agriculture, exacerbating drought problems.
- Rate structure can incentivize conservation while maintaining adequate revenues for utility operations.

Useful Tools and Resources

- US EPA Climate Ready Water Utilities – water.epa.gov/infrastructure/watersecurity/climate/index.cfm
- TX WARN – www.txwarn.org
- LCRA – www.lcra.org
- USGS Water Resources Home Page – www.usgs.gov/water
- SAWS – www.saws.org

Information Needs

- Studies that evaluate the socio-economic impacts of drought.
- Formal analysis of reservoirs.
- Guidance for structuring water rates to provide adequate revenue while incentivizing conservation.
- Improved monitoring to support adaptive management.
- Local (vs. regional) monthly projections and seasonal and long-term forecasts of drought parameters.
- Translating data from models and gauges into useful reports to bridge the gap between researchers and stakeholders.
- Literature that promotes awareness, adaptation, and mitigation strategies.
- Increase the education of the American public on where their water comes from
- Federal government recognition of drought as an emergency situation. The emergency management community needs increased understanding of the water sector.
- Promote a more integrated dialogue across key energy and water providers.