UTTON TRANSBOUNDARY RESOURCES CENTER

Water Matters!

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Drought

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"It's forgotten how to rain down here."

Dr. Phil King, Department of Civil Engineering, New Mexico State University

"I'll consider the drought to be over when Elephant Butte spills."

Gary Esslinger, Treasurer-Manager, Elephant Butte Irrigation District

Drought

New Mexico is renowned for its high deserts, mild climate, and abundant sunshine. Incidentally, these physical attributes, which make New Mexico so unique and beautiful, are also characteristic of a naturally dry environment. The state has been subjected to severe drought conditions in the past, alternating with times of uncharacteristically high supplies of moisture upon which its population has at times over-relied.

This article will provide various definitions of drought and a short history of drought in New Mexico; discuss impacts of drought on the state's human water user communities and environment; discuss in brief the priority call and water sharing agreements as tools for coping with insufficient water supplies; and examine some recent efforts to prepare more effectively for continuing drought conditions.

What is Drought?

Droughts are extended periods of time when an area experiences a shortage in water supply, traditionally associated with below-average precipitation alone, or in combination with above-average temperatures. There is no single standard definition of drought, and the severity of a drought is often a matter of perspective. For example, in times of reduced precipitation, farmers who rely on surface water may experience the painful consequences of water shortage long before farmers who rely on groundwater. Farmers with access to stored water can forestall the impacts of drought longer than those without. For urbanites, a drought may not become apparent until they are prohibited from watering their lawns or washing their cars.

Climate scientists characterize droughts in several ways. When there is less precipitation than average, it is referred to as a meteorological drought. When there is a shortage of surface water in streams and reservoirs, it is a hydrologic drought. When soils are too dry to support healthy crop production, it is an agricultural drought. Shortages of water associated with increased demands for water are known as socioeconomic droughts.

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New Mexico's Historic Droughts

Accurate rainfall measurements in New Mexico have been collected for the past century. However, analyses of the growth of tree rings have given us insight into levels of precipitation over the last 2,000 years. Because trees grow faster during periods of high precipitation, they leave wider rings during wet periods. This allows us to gauge with fair accuracy wet and dry periods of the past. Tree ring analyses indicate that New Mexico experienced significant prehistoric droughts between 300 and 500 A.D. and between 1400 and 1600 A.D. When compared to the older record of precipitation provided by tree ring analyses, it appears that the past two centuries in New Mexico have actually been remarkably wet.

The driest periods identified in New Mexico's recent history were 1576–1585; 1772–1781; 1623–1632; 1874–1883; 1893–1902; and 1950–1959.

The drought of the 1950s is still imprinted vividly on the memory of many New Mexicans. While New Mexico's average annual precipitation over the twentieth century was 13.5 inches, it ranged from less than twelve inches to less than nine inches during the 1950s (with less than nine inches in 1951, 1953, and 1956). Stream flow, groundwater levels, and artesian pressure reached record lows in much of the State. Farmers in the Middle Rio Grande recall that the ditches, the river, and even the drains were often dry.

The dust bowl conditions of the Great Plains in the 1930s illustrate that the impacts of drought may not only be exclusively attributable to water shortages but also to over-reliance on unusual periods of high supply. One of the wettest periods of the twentieth century was 1912–1921. These unusually wet conditions encouraged massive agricultural development across the Great Plains and the West, primarily utilizing deep plowing that resulted in the elimination of native grasses. When a moderate drought struck the southwestern Great Plains in the 1930s, the exposed soils of a hundred million acres of farmland eroded as they were left vulnerable to the effects of wind.

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As in the dust bowl, the impacts of the drought of the 1950s in New Mexico were exacerbated by the rapid water supply development that took place during the wet period of the 1940s. As noted above, drought is often a matter of perspective. Creating reliance on the robust supplies during wet periods through rapidly increased development of water supplies and granting increased numbers of permits to develop water rights, increased the pain felt everywhere when supplies dwindled to below pre-wet period levels.

Impacts of Drought on New Mexico

Agricultural production suffers in times of drought. The loss of pasture requires ranchers to either sell off their livestock or pay for supplemental feed. This can be devastating to small ranchers and significantly reduce profit margins for large ranchers. Ranchers who rely on federal grazing allotments may be required to remove their cattle for several years to allow grasses to recover. This was the case with some U.S. Bureau of Land Management allotments in 2013. Overall in that year, most New Mexico ranchers reduced their herds by 25 percent.

The reductions in irrigation allotments due to a lack of adequate reservoir storage provide another dramatic illustration of the impacts of drought. In 2012, farmers in the lower Rio Grande were allotted a scant ten inches of water per acre, far short of the three to four acre-feet per acre of water needed to

irrigate New Mexico's iconic green chile, for example. In 2013, that allotment dropped to 3.5 inches. Most dramatically, farmers in the Arch-Hurley Conservancy District of the Tucumcari area in eastern New Mexico have only been able to irrigate during three of the past six years.

When surface water becomes scarce, farmers turn to groundwater. By the end of the 1950s, about 2,000 wells had been drilled to supplement the decreased surface water irrigation allotments of the drought. The resulting economic and environmental costs of drought for farmers were significant. Relying on groundwater pumping due to a lack of surface water can increase a farmer's annual expenditures by up to 15 percent. Additional expenditures can accrue if a farmer has to deepen existing wells or drill new ones. Moreover, the higher levels of salts and minerals in groundwater, when used on crops repeatedly and for extended periods of time, may also cause soil quality to diminish, thereby negatively affecting farming in the future.

The drought year of 2013 also illustrates the impact drought can have on municipalities. The Village of Magdalena saw its groundwater table drop twenty feet in the first half of the year. The Village was served by only one well, which became ineffective when the groundwater table dropped below the level of its pump. Water had to be trucked in to serve the 1,000 residents of Magdalena until a new well could be permitted and drilled. Other towns like Las Vegas and Hanover also came very close to severe water shortages.

Municipalities across New Mexico have responded to drought conditions by implementing water conservation programs. Residents of Albuquerque, Santa Fe, Las Cruces and many other towns have had their water use restricted in some manner. Whether it is through limitations on outside watering, increased fees for water usage to discourage excessive uses, or fines for wasting water, New Mexico's municipal water suppliers are showing real concern about preserving adequate water supplies.

The prior fourteen years were the driest in the last century for the Colorado River Basin, at a time when the water usage in the Upper Colorado Basin reached its highest levels ever.

The impacts of drought on our reservoirs, rivers, and forests are dramatic. In the fall of 2012, Elephant Butte Reservoir held only 5 percent of its full capacity in storage. By the fall of 2014, the levels only increased to 7 percent. Statewide, New Mexico reservoirs were at a mere 26 percent of their storage capacity as of fall 2014. El Vado Reservoir, which holds the irrigation water supply for the Middle Rio Grande, was at 27 percent capacity in September 2014. Brantley Reservoir on the Lower Pecos was at 37 percent. Landowners around Heron Reservoir watched the shoreline recede from their properties as the water level drew down to only 18 percent of full storage capacity.

The rivers that fill New Mexico's reservoirs are all experiencing significant impacts from drought. In 2012, stretches of the Pecos River ran dry for two-and-a-half months. The Rio Grande now regularly dries below Albuquerque, with long stretches going dry in 2011, 2012, and 2013. New Mexico relies heavily on imported water from the Colorado River. Unfortunately, supplies in the Colorado Basin are so low that the Bureau of Reclamation anticipates releasing 750,000 acre-feet less than normal from Lake Powell in 2014. The prior fourteen years were the driest in the last century for the Colorado River Basin, at a time when the water usage in the Upper Colorado Basin reached its highest levels ever.

New Mexico's forests have also taken a severe hit from the drought. The effects of drought on trees is often compounded by insect damage, as trees are more susceptible to insect infestations when they are already stressed by dry conditions. Between 2002 and 2004, bark beetles decimated huge areas of New Mexico piñon pine growth. At the

end of 2013, bark beetles surged in numbers again around Santa Fe.

Dry conditions have encouraged wildfires of epic proportions. In 2012, over 465 square miles of the Gila National Forest burned, and the Little Bear Fire burned 44,000 acres of the Lincoln National Forest. In 2013, the total acreage burned by wildfires was also remarkable: the Tres Lagunas fire in the Pecos Wilderness burned over 10,000 acres; the Thompson Ridge Fire in the Valles Caldera National Preserve burned almost 24,000 acres; and, the Silver Fire in the Gila area burned over 138,000 acres.

Just as drought exacerbates fire conditions, the impacts of fires can impair water supplies. The city of Alamogordo traditionally relied on Bonito Lake for 15 percent of its water supply. After the Little Bear fire in 2012, the lake filled with sediment that ran off of the burn scar. It is estimated that it may cost as much as $24 million to rehabilitate the lake. Likewise, the Upper Hondo Water Users have had to dig hundreds of yards of silt out of their ditches for the past three years after a fire in their watershed.

Prior Appropriation and Drought

Under the prior appropriation doctrine, water users with senior water rights are legally entitled to be served first in times of drought. Junior water right owners may receive little or no water. Senior water right owners may issue a priority call, that is, they may call for their water to be delivered before junior right owners are served. In 2013 there were two examples of a priority call being made. On the Pecos River, the Carlsbad Irrigation District asked the State Engineer to deliver its water before allowing junior water users upstream to divert their water. Because many of the upstream junior users rely on groundwater pumping, however, it was estimated that curtailing their diversions would not result in increased surface water reaching Carlsbad for years to come. Fortunately, several days of intense rains in the area during the late season restored surface supply levels dramatically.

Under the prior appropriation doctrine, water users with senior water rights are legally entitled to be served first in times of drought.

Another priority call was made in 2013 on the Rio Chama. The Upper Chama water users had achieved some agreement about sharing and rotating their scant water supplies. However, the situation became strained and in late July, the Acequia de Chamita filed a request for a priority call in federal court, asserting its 1600 priority date. Again, further escalation of the conflict was avoided when summer monsoons increased available water supplies.

In contrast to these rare priority calls, cooperative agreements to share water during times of shortage are the norm in New Mexico. These agreements range from large-scale interstate arrangements to local understandings. The seven states that share the Colorado River have developed Interim Guidelines for Lower Basin Shortages. These guidelines allow for coordinated operation of Lake Powell and Lake Mead to minimize shortages in the Lower Colorado Basin, while avoiding curtailment of users in the Upper Colorado Basin.

A smaller-scale, local example of a cooperative agreement that overcame the need for a priority call is found on the Rio Jemez. In 1996, the Pueblo of Jemez requested a federal court to enforce its senior water rights by shutting down upstream junior users. At the request of the court, the Pueblo and the five non-pueblo irrigation communities that make up the Rio Jemez Water Users developed an Irrigation Agreement. This flexible Agreement calls for rotations of water deliveries depending on available supplies and restricts non-pueblo pumping of groundwater. A water master enforces the Agreement. The Agreement has the force of law as it was incorporated as a stipulated order in the ongoing adjudication of the Rio Jemez water rights.

Planning for Drought

In recent times, efforts have been made by New Mexico's executive and legislative branches to prepare for water shortages. In 1996, Governor Gary Johnson established the New Mexico Drought Task Force. Governors Richardson and Martinez maintained the Task Force, which has produced guidance for New Mexico's government agencies. In 2002, the Task Force produced the New Mexico Drought Plan and updated the Plan in 2006. Again in 2008, the Drought Task Force provided a set of recommendations to then Governor Richardson. Some of the actions recommended in these documents included the following (grouped together here by the entities responsible for implementing the recommendations):

The State of New Mexico and All Political Subdivisions

- Adopt long-term, comprehensive, and integrated water planning;
- Consult and negotiate with Native American tribes;
- Complete ongoing water right adjudications and prioritize adjudication of all basins;
- Upgrade and develop water infrastructure;
- Promote conservation and reuse of water;
- Promote healthy watersheds and healthy river ecosystems; and
- Invest in technical resources and position New Mexico as a global leader in water, energy, and agricultural research and technology.

Office of the State Engineer/ Interstate Stream Commission

- Enhance meteorological, snow, and streamflow monitoring capacity;
- Continue state and regional water planning;
- Provide technical assistance with water leak detection;
- Promote best practices for water conservation;
- Maintain an open Elephant Butte Pilot Channel;
- Continue operation of the Middle Rio Grande Conservancy District Water Management Decision Support System;
- Expand water conservation education and outreach;
- Lead efforts to create guidelines for more efficient water use;
- Support the Acequia Re-loan Program;
- Support the San Juan River Administration Agreements;
- Support the Metering Re-loan Program; and
- Support Middle Rio Grande Endangered Species Act River Operations Optimization.

Energy Minerals and Natural Resources Department

- Continue the Green Power Purchase initiatives;
- Diversify recreational opportunities and other programs that will appeal to visitors even in drought conditions;
- Pre-position resources necessary for fire suppression; and
- Conduct community wildfire planning.

Tourism Department

- Educate potential visitors and residents about recreations opportunities and combat sensational news reports that may negatively impact tourism; and
- Continue to hold an annual spring briefing with State Parks to present updates on drought impacts to tourist activities.

New Mexico Department of Agriculture

- Coordinate information exchange with the U.S. Department of Agriculture; and
- Assist agricultural producers with planning and preparing for drought.

New Mexico Finance Authority

- Provide financial and administrative support to assist with drought relief.

The Pueblo of Zuni has also engaged in drought planning. Its impressive 2001 Drought Contingency Plan ("Zuni Plan") provides good descriptions of concrete drought preparation actions. Despite its traditional reluctance to discuss natural disasters, the Pueblo, after the drought of 1996, developed specific action items to address drought in the future, noting that its traditional way is to deal with drought using actions rather than words. The potential impacts of drought on seven water use areas were analyzed: municipal, domestic, farm, ranch, fish and wildlife, recreation, construction, and fire suppression. Specific actions to mitigate the impacts of drought on all of these sectors of use are listed in the Zuni Plan. The Zuni Plan also specifically identifies which entities within the Pueblo are responsible for implementing the Plan recommendations. It further identifies external partners who can assist with implementation. Finally, the Zuni Plan includes budget estimates for each of these items and identifies the priorities for funding.

Expecting Drought

At the end of 2013, the Bureau of Reclamation released its Upper Rio Grande Impact Assessment, which assessed impacts of projected temperature increases and changes in precipitation and snowmelt patterns. The anticipated increases in temperature and evaporation, combined with decreased stream flow and snowpack, are projected to result in a one-third decrease in water available in the Rio Grande by the end of the century. These projections are bolstered by the ongoing increases in temperature in the Rio Grande Basin, which are rising at the fastest rate in the last 10,000 years.

To prepare for future droughts, Governor Martinez made a significant water-related proposal for the 2014 legislative session. She proposed that 60 percent of the available capital outlay funding (potentially $112 million) be dedicated to water infrastructure funding and suggested that the money be dedicated to water infrastructure, watershed restoration, and dam repair. In announcing this funding proposal, she wisely observed, "While we cannot dictate the duration or magnitude of these [drought] crises, we can and must dictate our response."

Fall 2014 Update

The start of 2014 was an extremely dry time in New Mexico and one of the driest in recorded history. Fortunately, the 2014 monsoon season reversed the below-average precipitation trend with above-average precipitation beginning in July and continuing through August. September was a particularly impressive month for the southern part of the state with robust precipitation levels. Unfortunately, the northern portion of New Mexico did not receive the same improvement in precipitation. Although there should be celebration with the above-average levels from the monsoon, New Mexico is still in a significant water crisis with long-term water conservation issues that need to be addressed immediately.

By Adrian Oglesby (2014)

The anticipated increases in temperature and evaporation, combined with decreased stream flow and snowpack, are projected to result in a one-third decrease in water available in the Rio Grande by the end of the century.

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