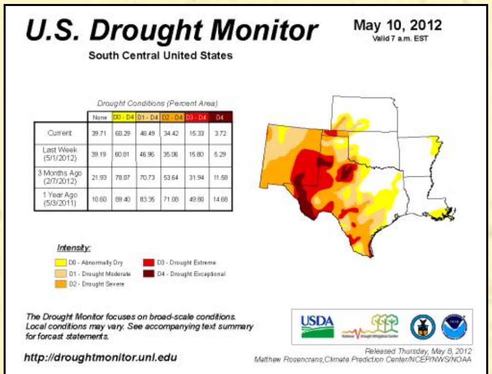
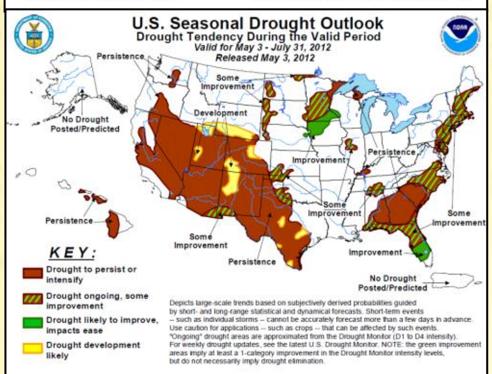
MANAGING DROUGHT
IN THE SOUTHERN PLAINS

Webinar Topic: Groundwater and Surface Water
May 10, 2012





Resources

U.S. Drought Portal
http://www.drought.gov

National Drought Mitigation Center
http://drought.unl.edu

Drought Impact Reporter
http://droughtreporter.unl.edu

State Climatologists
http://www.stateclimate.org

Southern Climate Impacts Planning Program (SCIPP)
http://www.southernclimate.org

Climate Assessment for the Southwest (CLIMAS)
http://www.climas.arizona.edu

Southern Plains Portal
http://www.drought.gov/portal/server.pt/community/southern_plains

Regional Drought Summary

Brian Fuchs, National Drought Mitigation Center

The national look at drought shows a clear division between north and south. Drought continues over parts of west Texas and is hanging on in the Southeastern U.S. in Georgia, Alabama and Florida. Not much has changed within the region in the past several weeks. There is steady improvement and some reduction of D4 since the beginning of the year. Most of the region has benefitted from above-normal precipitation in the last 3 months, although the last 30 days have been below normal in many locations.

In the longer-term, the severe deficits of 2011 are still apparent, with 9-12 inches below normal still along the Red River into southwest Arkansas and along the Gulf Coast. These areas have lingering problems even with the short-term improvement. Dryness in west Texas is quite visible in both the 12 and 24-month Standardized Precipitation Index (SPI).

The next several days show beneficial, widespread rain across Texas and the Gulf Coast from a slow-moving storm system. The seasonal outlook through May shows equal chances (EC) of precipitation across the whole region, meaning there are no clear signals as to whether rains will continue or a dry pattern may re-emerge. Temperatures are expected to be above-normal through May and into the summer. The Drought Outlook shows continued improvement in northern parts of the region, particularly in Oklahoma, but that drought is expected to persist in most of Texas and New Mexico. Some improvement is expected from eastern Texas into the southeastern U.S., especially in Florida.

Did You Know?

There are a number of products that help monitor soil moisture and groundwater:

- GRACE Data Assimilation (NASA) measures terrestrial water storage from satellite measurements
- VIC from University of Washington uses a hydrologic model to estimate surface water and infiltration
- NLDAS North American Land Data Assimilation System from NCEP estimates runoff, streamflow, soil moisture and evaporation

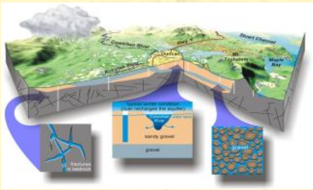
We need your help. Nobody knows drought impacts like the people who live there. Your reports to the Drought Impact Reporter or your State Climatologist helps the U.S. Drought Monitor do a better assessment of conditions, which in turn helps federal agencies target assistance to vulnerable areas. Reports could be simply things you notice or it could be specific losses, such as crops withering, selling cattle, or wildlife changes.

Produced by the Southern Climate Impacts Planning Program, http://www.southernclimate.org

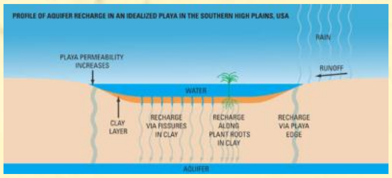
Groundwater and Surface Water

Presenters:
Bob Puhls – Oklahoma Water Survey
Larry French – Texas Water Development Board
Eric Jones – Arkansas-Red Basin River Forecast Center
Duane Smith – Choctaw and Chickasaw Nations

Increasing demands for sources of water combined with changing land use, population growth, aging infrastructure and climate change pose significant threats to our water supply. One result is enhanced development of groundwater. Although groundwater seems a plentifical and replenishable source, we often do not realize the connections between groundwater and surface water.



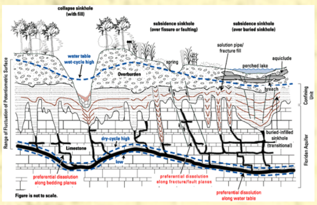
Water in streams can recharge aquifers below the streambeds (losing streams) or be fed by groundwater (gaining streams). Gravel aquifers have high yields while fractured bedrock may contain a great deal of water but are more difficult to pump. The process of water infiltrating into the aquifers can take from days to thousands of years. Pumping from these aquifers can draw down water trables resulting in gaining streams becoming losing streams as the water tables fall. As an example, the groundwater well field for the community of Spiecwood Beach, near Austin, Texas, went dry in 2011 as the levels of nearby Lake Travis declined, dropping the water table even though the community did not increase pumping.



Recharge is water that infiltrates to the water table of an aquifer. Recharge can be either diffuse (gradual infiltration over a wide area) or focused (concentrated water source, such as from a playa lake). It is nearly impossible to measure recharge so the best that can be done is various forms of estimation. Many approaches can be used, depending upon the type of aquifer and what variables are important to assess, and all may yield different results.

There are several zones below the surface. The top zone is surface water – the lakes and streams we can see and measure. Below this is the unsaturated zone, the layer through which water moves downward. Below this is a saturated zone. There may be a layer of bedrock or clay beneath the saturated zone, confining water above it except through cracks that may be created through fractures or roots. Playa Lakes – shallow lakes that fill with rains – are good sources of concentrated infiltration.

Sand, gravel or silt aquifers have many pores through which water filters slowly. These are often found below stream beds, such as alluvial aquifers. Karst aquifers – fractured bedrock – allows water to cascade through fissures and can travel tens of miles a day, but do not store as much as allivial aquifers. The Edwards Aquifer near San Antonio and the Arbuckle-Simpson Aquifer in south central Oklahoma are examples of karst aquifers.



The Arbuckle-Simpson Aquifer is designated as a sole source aquifer by the EPA, which requires additional review to assess the impacts on water of projects. Water is used primarily for minicipal applications with some agriculture, industrial and mining uses. Water is also important for tourism and recreation of the region, along with important cultural aspects with the region's Native American tribes. The aquifer provides baseflow to area springs and streams, so depleting groundwater could threaten the flow of these streams. Groundwater is treated as a private property right in Oklahoma and is managed separately from surface water. Consequently, it may be over-pumped compared to sustainable yield levels while remaining within state law on allowable extraction rates. Because of drought and pumping, flow on the Blue River in 2011 was comparable to the 1956 drought of record, following a period of 25-30 years of abundant preipitation that supported much greater yields and flows.

All of these complex factors, including soil type and land use, are combined with hourly rainfall estimated from radar and measured by rain gauges in complex computer models to estimate soil moisture in these different zones. The models are developed primarily for estimating flash flood guidance and making streamflow forecasts, but can also be used during drought to assess water sources that cannot be measured directly. The model used by the Arkansas-Red River Basin Forecast Center computes the amount of water in several layers, which are combined into an upper zone (useful for agriculture applications) and a lowe zone (good for hydrologic assessment and ground water use). The upper zone is sensitive to short-term rainfall and can change rapdily day-to-day, while the lower zone changes more slowly over time and is not extremely sensitive to a single event. The amount of water is expressed relative to historical measures as a maximum amount of water that could be held, departures from average (anomalies) or percent full. The anomalies are more sensitive over climatologically dry areas like western Oklahoma.