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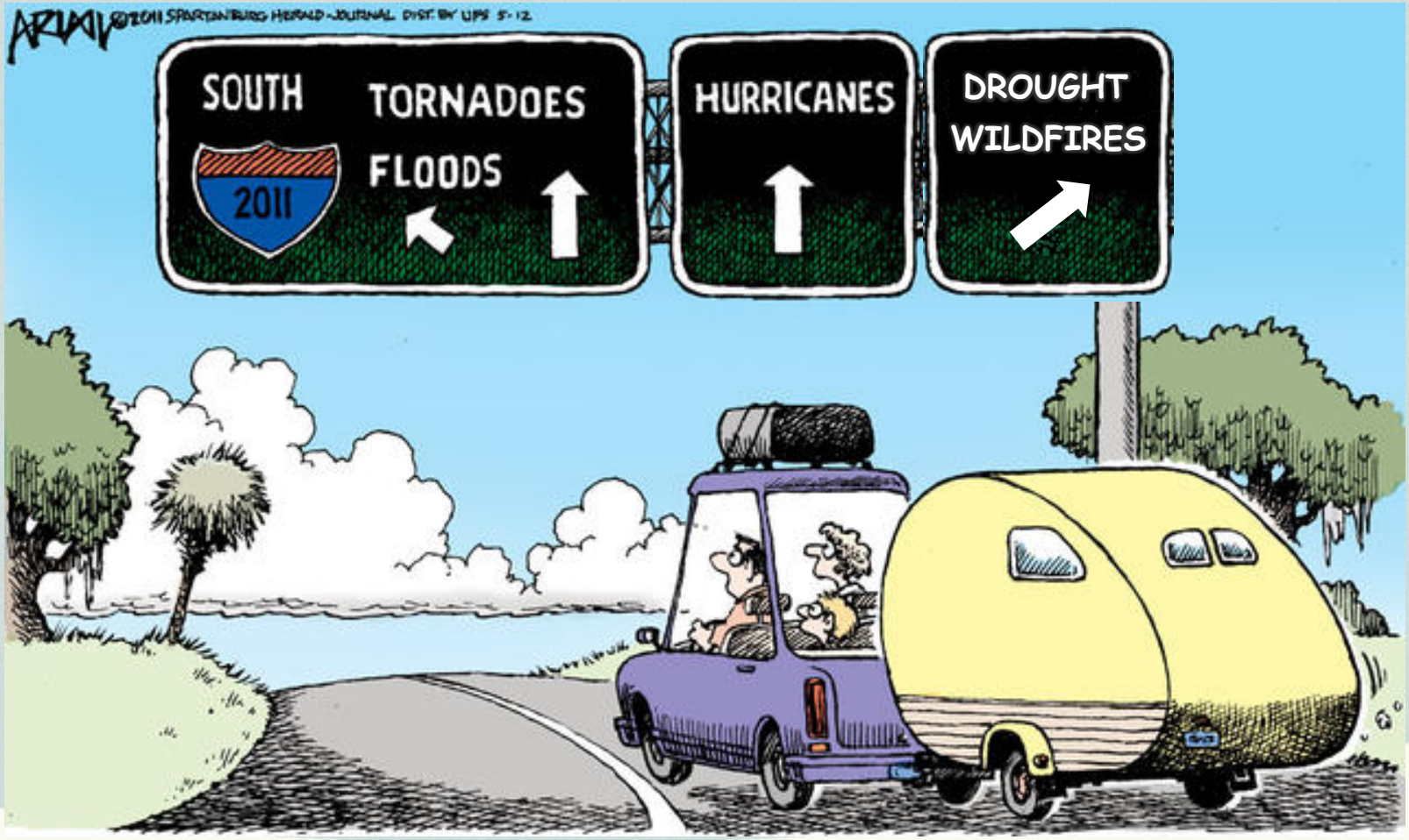
A NOAA RISA TEAM

Southern Plains DEWS Activities 2011-2015

Mark Shafer
University of Oklahoma
Norman, OK

National Drought Mitigation Center

Multi-Hazard Context



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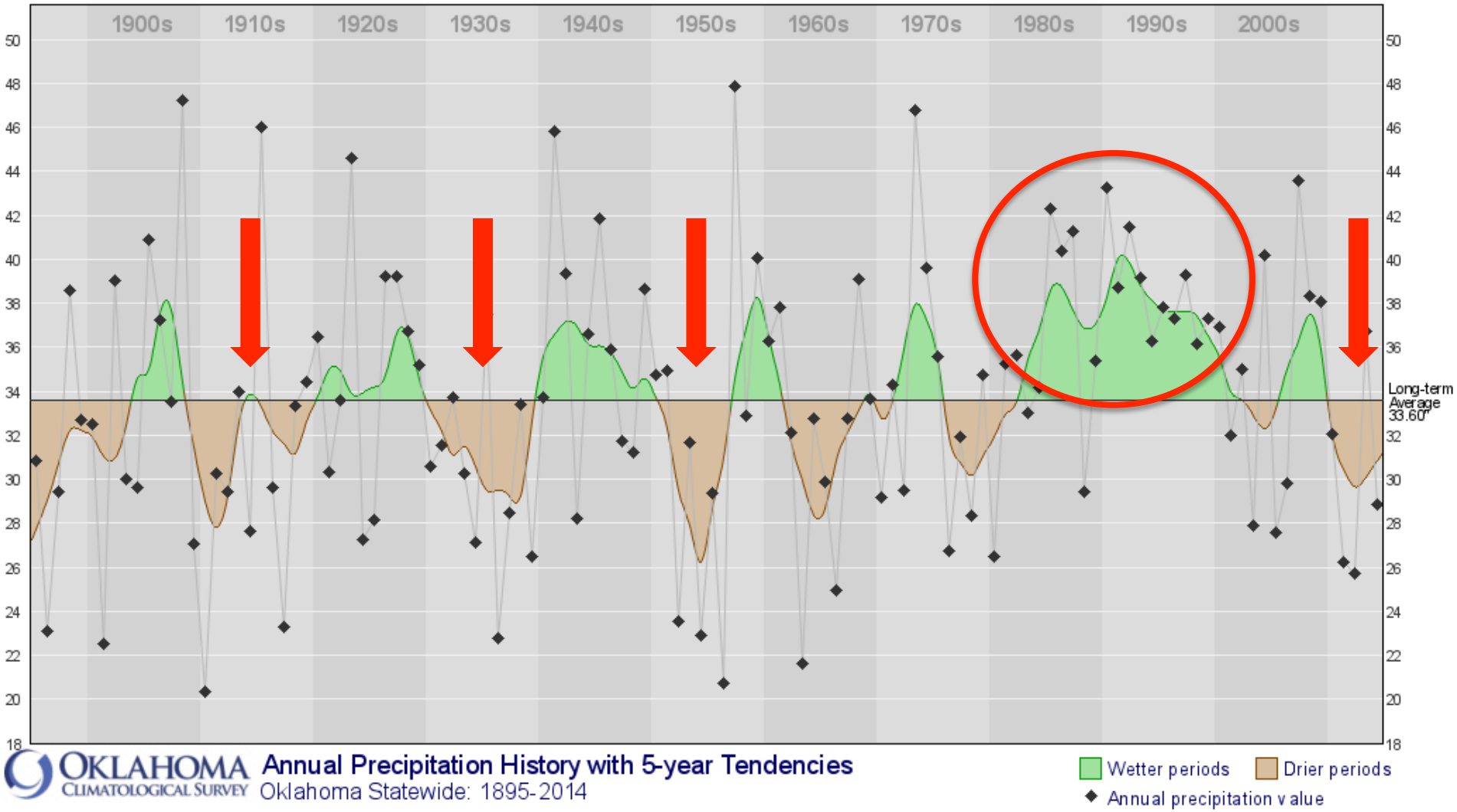
ATM LSU OU

Historical Droughts in Oklahoma



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How We Deal With Drought

We have enough water to last a couple of years

That's why we have insurance

dry years are always followed by wet years

GEORGIA: State climatologist fired suddenly amid record drought

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Causes of Drought?

✓Stationary high pressure over a wide regional area

- •Ridge set up over the region and sat all summer

✓Feedback from Dry Soils

- •Dry soils heated rapidly, increased evaporation

✓La Nina during winter & spring

- •Dry winter and spring set stage for soil feedback

✓Cool northern Pacific, Warm Atlantic

- •dry soils

➢ Widespread drought impacts observed in numerous ecological and economic sectors

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2011 Southern Plains Drought Impacts

At least $12B in crop and livestock losses

Lowest cattle inventory in decades

Record low water supply

Most severe wildfires in Texas, New Mexico History

Infrastructure: cracked pavement, foundations, water main breaks – 700 *a day* in Houston at peak

100-500 million trees killed (Texas Forest Service estimate)

In Mexico, 2.5M people in 1,500 communities lacked drinking water

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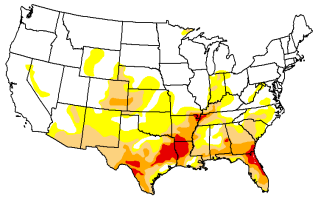
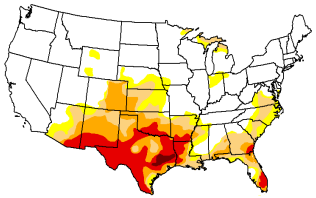
January 2011



April 2011



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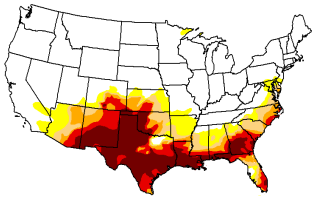
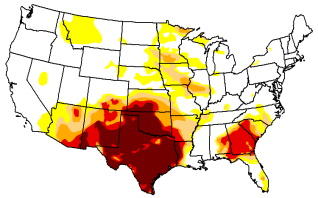
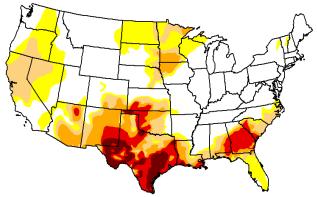


October 2011



January 2012



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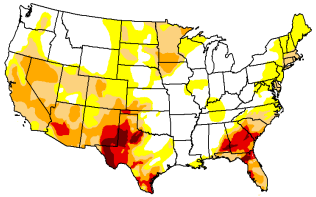

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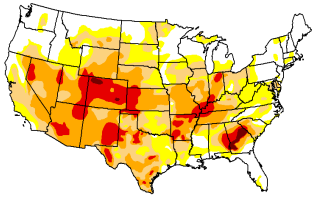

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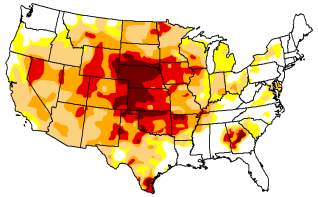

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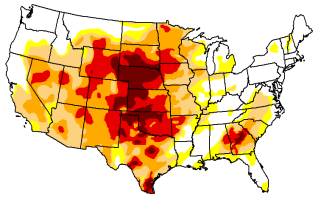

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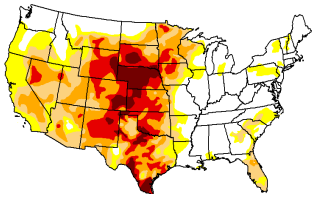

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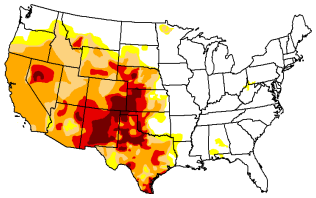

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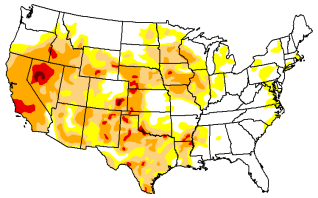

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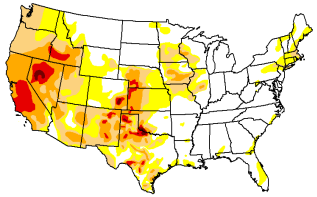

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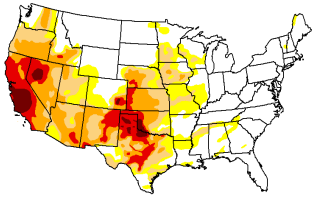

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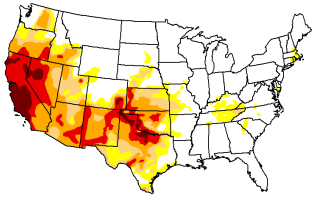

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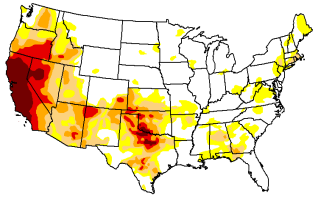

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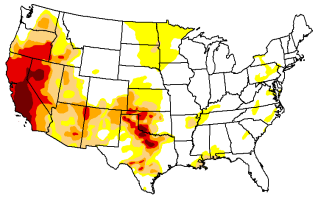

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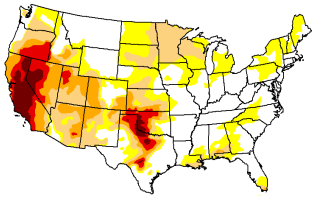

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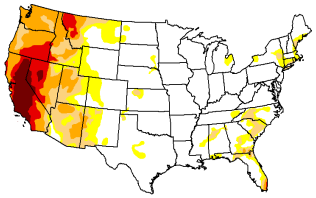

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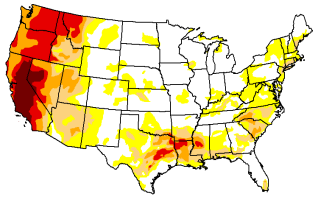
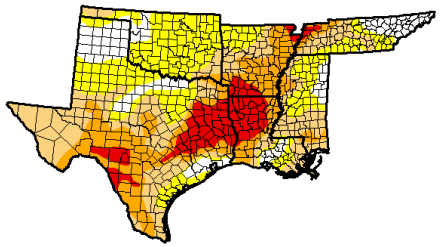


U.S. Drought Monitor
South



January 4, 2011
(Released Thursday, Jan. 6, 2011)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	12.28	87.72	58.95	31.71	11.37	0.00
Last Week 12/28/2010	8.86	91.14	67.65	35.21	10.17	0.00
3 Months Ago 10/5/2010	54.56	45.44	20.04	7.70	1.40	0.00
Start of Calendar Year 1/4/2011	12.28	87.72	58.95	31.71	11.37	0.00
Start of Water Year 9/28/2010	54.23	45.77	20.04	6.79	0.83	0.00
One Year Ago 1/5/2010	88.70	11.30	3.48	0.80	0.00	0.00

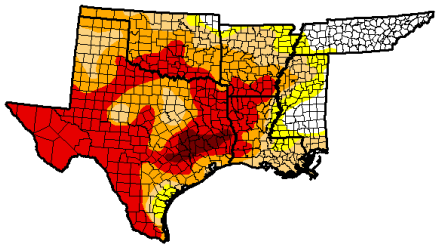
Intensity:
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Anthony Artusa
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

U.S. Drought Monitor
South



April 5, 2011
(Released Thursday, Apr. 7, 2011)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	10.66	89.34	80.83	63.51	38.29	2.43
Last Week 3/29/2011	8.33	91.67	79.16	60.10	28.53	0.00
3 Months Ago 1/4/2011	12.28	87.72	58.95	31.71	11.37	0.00
Start of Calendar Year 1/4/2011	12.28	87.72	58.95	31.71	11.37	0.00
Start of Water Year 9/28/2010	54.23	45.77	20.04	6.79	0.83	0.00
One Year Ago 4/6/2010	80.38	19.62	5.80	0.45	0.00	0.00

Intensity:
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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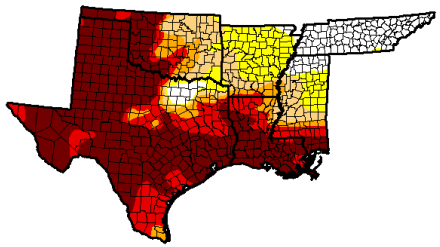
Author:
Mark Svoboda
National Drought Mitigation Center

http://droughtmonitor.unl.edu/

U.S. Drought Monitor
South



July 5, 2011
(Released Thursday, Jul. 7, 2011)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	11.07	88.93	78.07	68.29	61.76	46.80
Last Week 6/28/2011	11.22	88.78	74.12	67.72	61.57	47.27
3 Months Ago 4/5/2011	10.66	89.34	80.83	63.51	38.29	2.43
Start of Calendar Year 1/4/2011	12.28	87.72	58.95	31.71	11.37	0.00
Start of Water Year 9/28/2010	54.23	45.77	20.04	6.79	0.83	0.00
One Year Ago 7/6/2010	80.67	19.33	9.18	2.49	0.00	0.00

Intensity:
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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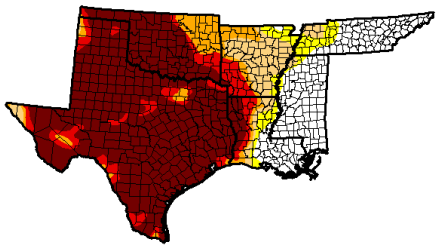
Author:
Richard Heim
NCDC/NOAA

http://droughtmonitor.unl.edu/

U.S. Drought Monitor
South



October 4, 2011
(Released Thursday, Oct. 6, 2011)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	18.31	81.69	77.36	70.07	63.80	55.39
Last Week 9/27/2011	18.34	81.66	76.26	70.61	63.67	53.77
3 Months Ago 7/5/2011	11.07	88.93	78.07	68.29	61.76	46.80
Start of Calendar Year 1/4/2011	12.28	87.72	58.95	31.71	11.37	0.00
Start of Water Year 9/27/2011	18.34	81.66	76.26	70.61	63.67	53.77
One Year Ago 10/5/2010	76.05	23.95	9.92	2.68	0.00	0.00

Intensity:
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
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Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

http://droughtmonitor.unl.edu/

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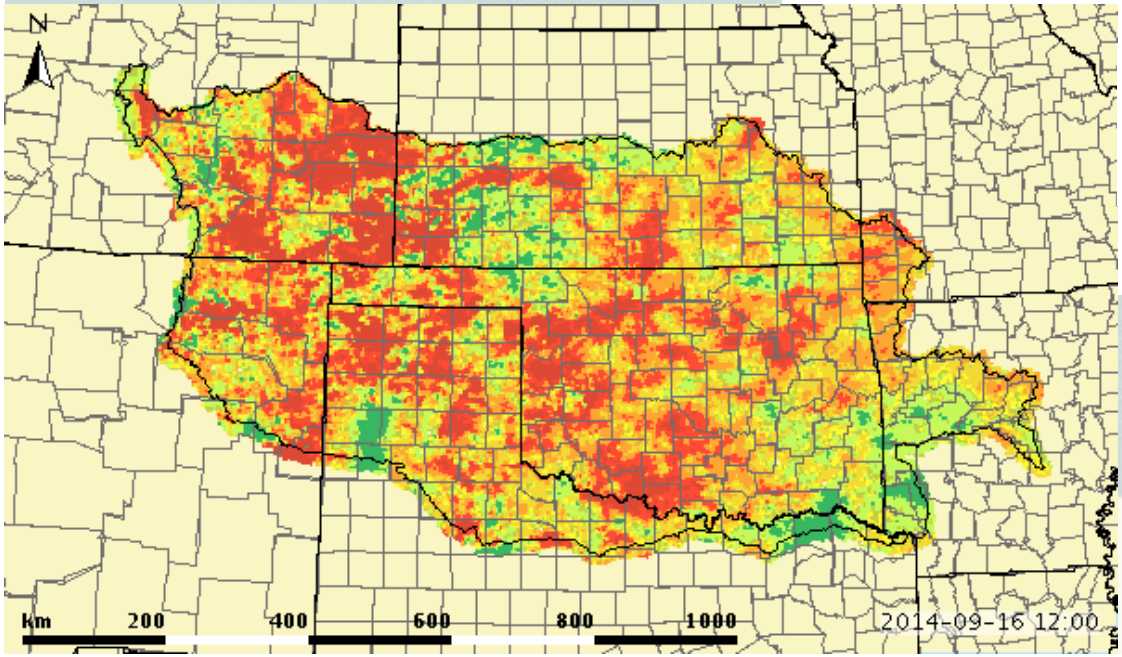
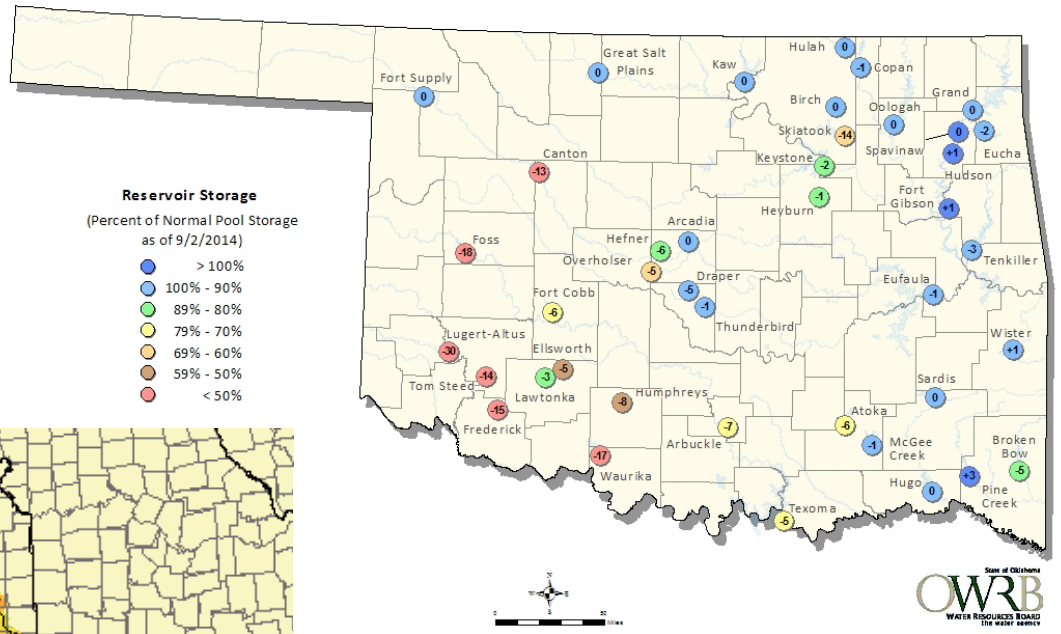
TAMU LSU OU

Even as Rainfall Returned to Normal, Sub-Surface Water Issues Lingered

Lower Zone Soil Moisture Anomaly
NWS River Forecast Center
Arkansas-Red Basin

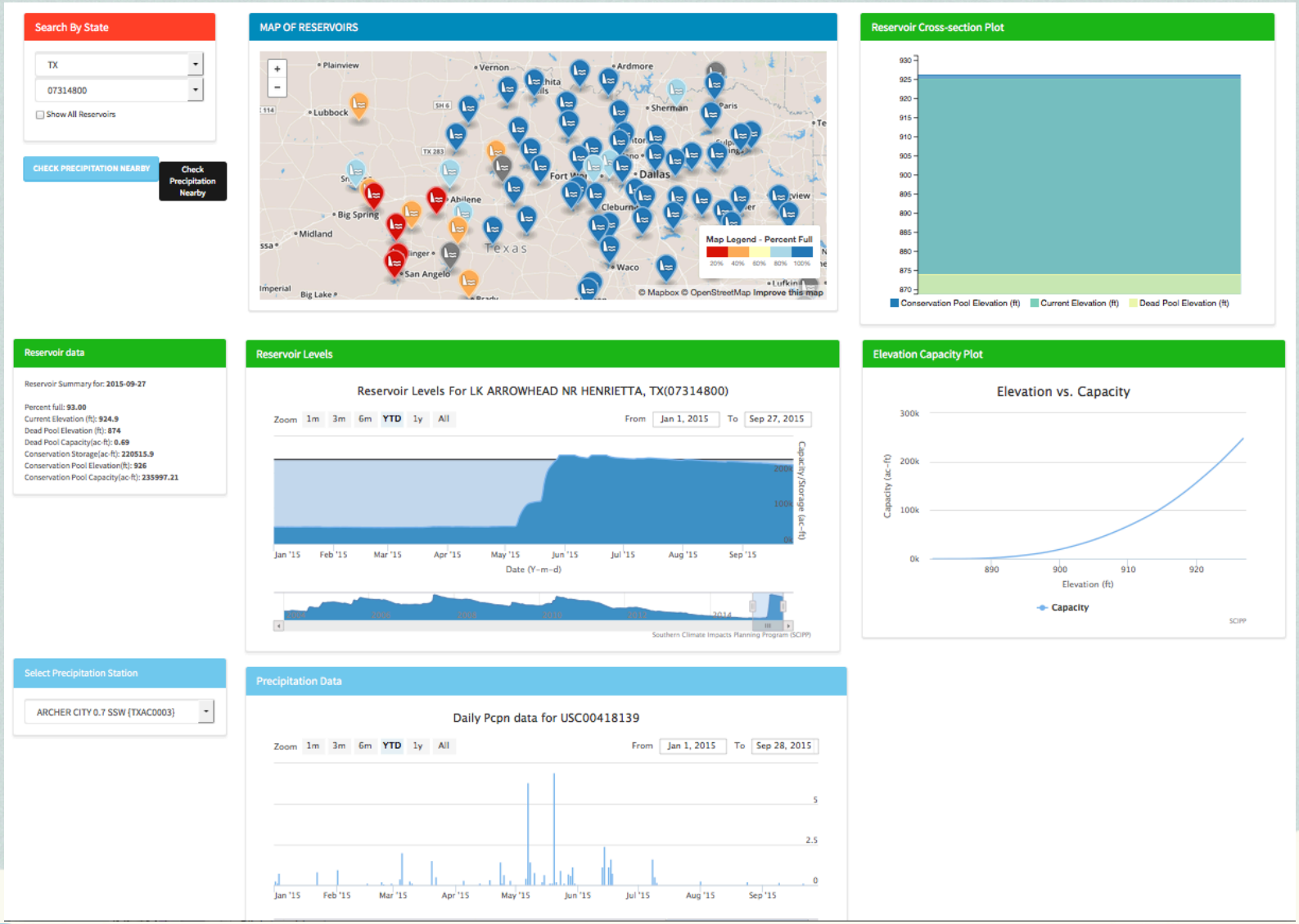


Oklahoma Surface Water Resources
Reservoir Levels and Storage as of 9/2/2014



Reservoir Monitoring (coming soon!)

http://www.southernclimate.org



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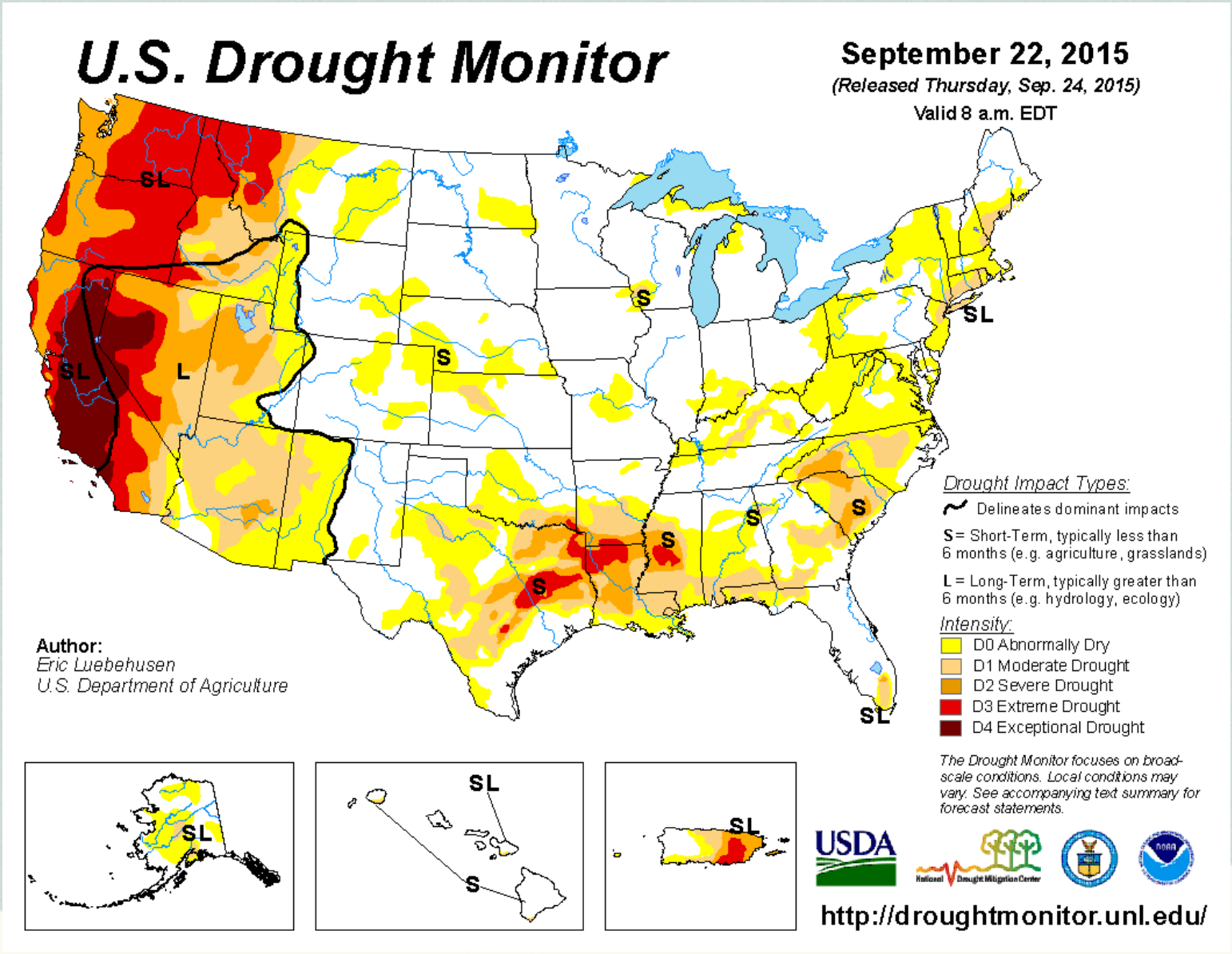
National Drought Mitigation Center

ATM LSU OU

Where Are We Now?



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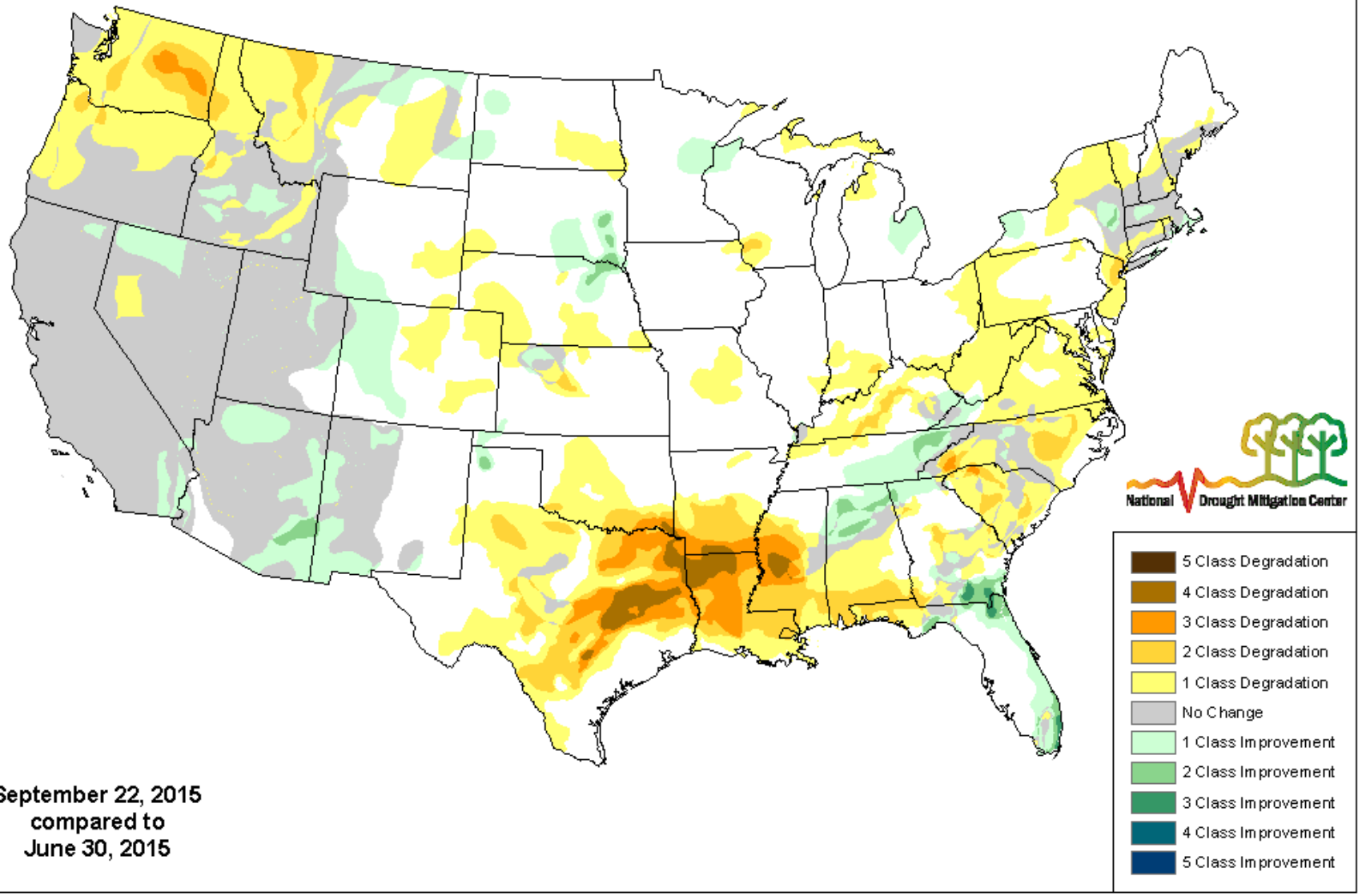
U.S. Drought Monitor Class Change

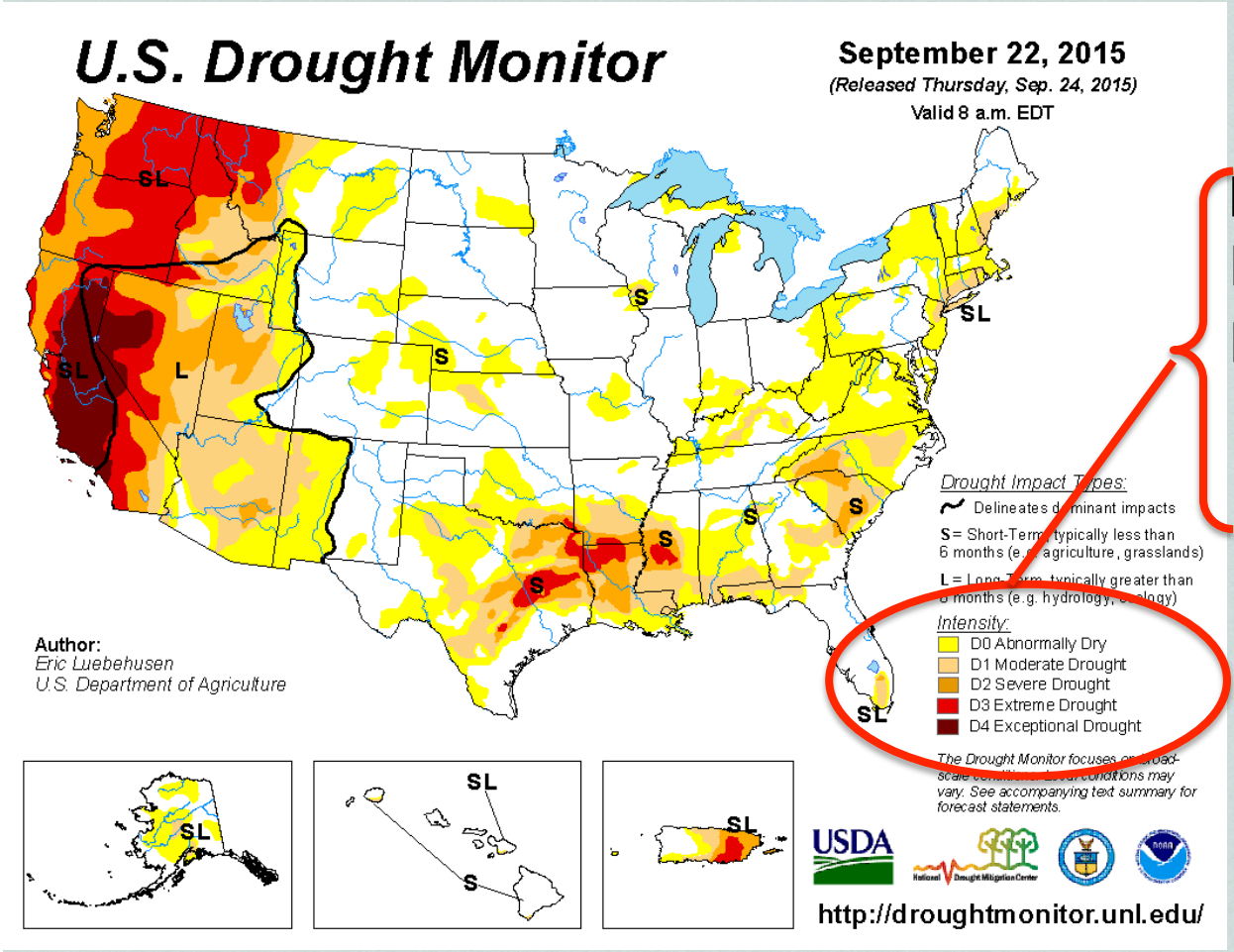
3 Months



September 22, 2015
compared to
June 30, 2015

http://droughtmonitor.unl.edu

All of this combined into a single weekly product



- D0 Abnormally Dry (30%tile)
- D1 Drought Moderate (20%tile)
- D2 Drought Severe (10%tile)
- D3 Drought Extreme (5%tile)
- D4 Drought Exceptional (2%tile)

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National Drought Mitigation Center

Drought Monitor Development Process

Monday (5 Days available)

✓Draft map sent to local experts

Tuesday (6 Days available)

✓Local expert feedback

✓Draft map sent to local experts

✓Draft text sent to local experts

Wednesday (7 Days available; ending 12Z yesterday)

✓ Local expert feedback

✓ Draft map(s) sent to local experts

✓ Draft text(s) sent to local experts (Outlook)

✓ Final map and text sent to secured ftp server

Thursday

✓Final map & text released on NDMC Website

SCIPP

National Drought Mitigation Center

Source: National Drought Mitigation Center

Southern Plains Drought Early Warning System

Partnership with NOAA, RISA, NDMC, NIDIS, AASC

Host forums, workshops, and webinars addressing current regional drought issues

21 webinars and 60 drought briefings, which are available on SCIPP's website and YouTube
http://www.southernclimate.org

Discuss impacts and management strategies

Promote planning and preparation

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National Drought Mitigation Center

Outlook and Assessment Forums

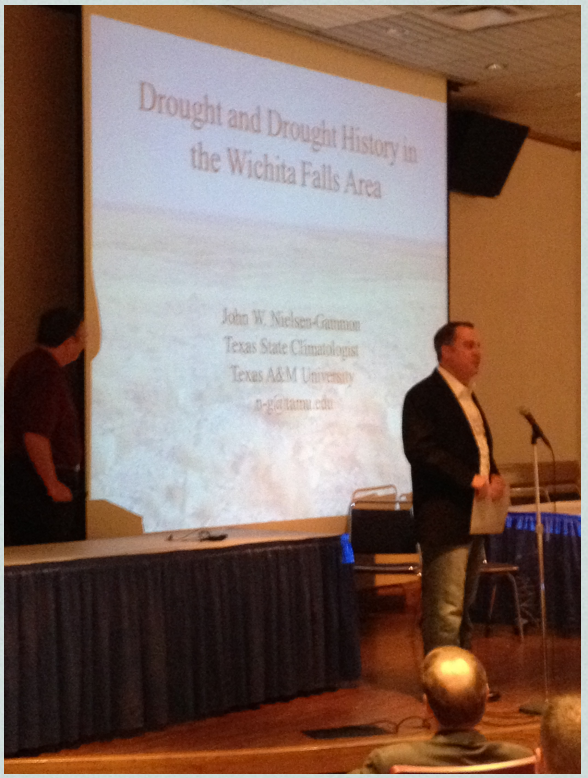
In-person meetings (Austin, Fort Worth, Lubbock, Abilene, Goodwell, Wichita Falls)

Evolution, current conditions & outlooks

Panel discussions of impacts & management strategies

Outcomes:

- Improved communication
- More guidance on product interpretation
- Explanation of causes



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National Drought Mitigation Center

Webinar Series

Bi-weekly (now as-needed)

Overview of regional drought conditions and outlook

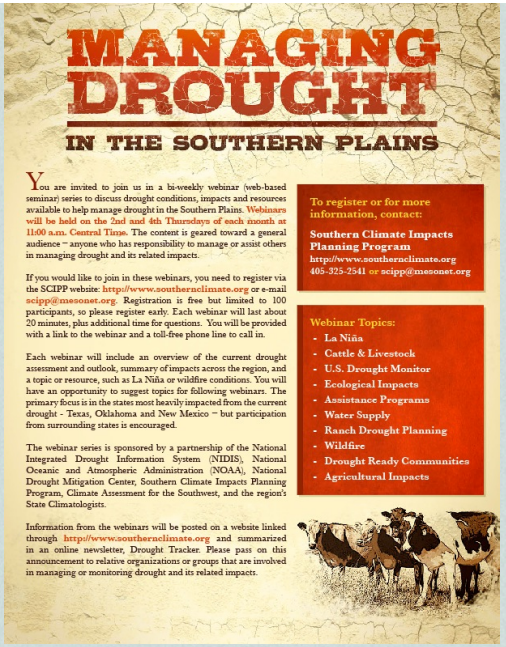
- led by the Drought Monitor authors

Discussion Topic

- Mix of technical and sector-specific information
- Presenters from multiple states, organizations

Comments & Updates from State Climatologists

Recordings posted on YouTube



MANAGING DROUGHT

IN THE SOUTHERN PLAINS

You are invited to join us in a bi-weekly webinar (web-based seminar) series to discuss drought conditions, impacts and resources available to help manage drought in the Southern Plains. Webinars will be held on the 2nd and 4th Thursdays of each month at 11:00 a.m. Central Time. The content is geared toward a general audience – anyone who has responsibility to manage or assist others in managing drought and its related impacts.

If you would like to join in these webinars, you need to register via the SCIPP website: http://www.southernclimate.org or e-mail scipp@mesonet.org. Registration is free but limited to 100 participants, so please register early. Each webinar will last about 20 minutes, plus additional time for questions. You will be provided with a link to the webinar and a toll-free phone line to call in.

Each webinar will include an overview of the current drought assessment and outlook, summary of impacts across the region, and a topic or resource, such as La Niña or wildfire conditions. You will have an opportunity to suggest topics for following webinars. The primary focus is in the states most heavily impacted from the current drought - Texas, Oklahoma and New Mexico – but participation from surrounding states is encouraged.

The webinar series is sponsored by a partnership of the National Integrated Drought Information System (NIDIS), National Oceanic and Atmospheric Administration (NOAA), National Drought Mitigation Center, Southern Climate Impacts Planning Program, Climate Assessment for the Southwest, and the region's State Climatologists.

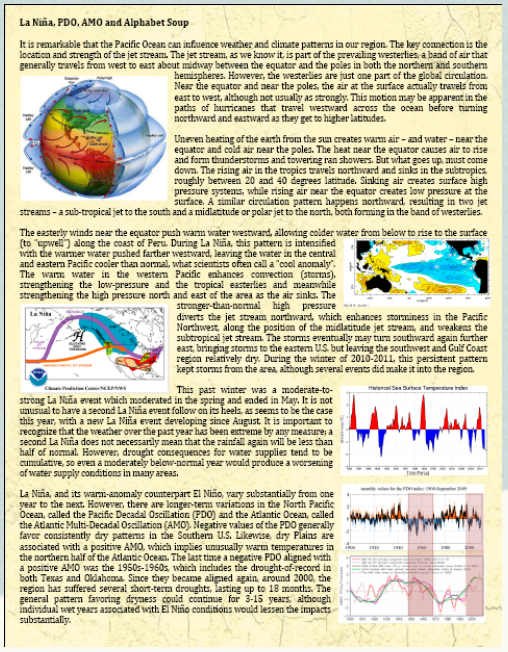
Information from the webinars will be posted on a website linked through http://www.southernclimate.org and summarized in an online newsletter, Drought Tracker. Please pass on this announcement to relative organizations or groups that are involved in managing or monitoring drought and its related impacts.

To register or for more information, contact:

Southern Climate Impacts Planning Program
http://www.southernclimate.org
405-325-2541 or scipp@mesonet.org

Webinar Topics:

- La Niña
- Cattle & Livestock
- U.S. Drought Monitor
- Ecological Impacts
- Assistance Programs
- Water Supply
- Ranch Drought Planning
- Wildfire
- Drought Ready Communities
- Agricultural Impacts



La Niña, PDO, AMO and Alphabet Soup

It is remarkable that the Pacific Ocean can influence weather and climate patterns in our region. The key connection is the location and strength of the jet stream. The jet stream, as we know it, is part of the prevailing westerlies, a band of air that generally travels from west to east about midway between the equator and the poles in both the northern and southern hemispheres. However, the westerlies are just one part of the global circulation. Near the equator and near the poles, the air at the surface actually travels from east to west, although not usually as strongly. This motion may be apparent in the paths of hurricanes that travel westward across the ocean before turning northward and eastward as they get to higher latitudes.

Uneven heating of the earth from the sun creates warm air – and water – near the equator and cold air near the poles. The heat near the equator causes air to rise and form thunderstorms and towering rain showers. But what goes up, must come down. The rising air in the tropics travels northward and sinks in the subtropics, roughly between 20 and 40 degrees latitude. Sinking air creates surface high pressure systems, while rising air near the equator creates low pressure at the surface. A similar circulation pattern happens northward, resulting in two jet streams – a sub-tropical jet to the south and a midlatitude or polar jet to the north, both forming in the band of westerlies.

The easterly winds near the equator push warm water westward, allowing colder water from below to rise to the surface (to "upwell") along the coast of Peru. During La Niña, this pattern is intensified with the warmer water pushed farther westward, leaving the water in the central and eastern Pacific cooler than normal, what scientists often call a "cool anomaly". The warm water in the western Pacific enhances convection (storms), strengthening the low-pressure and the tropical easterlies and meanwhile strengthening the high pressure north and east of the area as the air sinks. The stronger-than-normal high pressure diverts the jet stream northward, which enhances storminess in the Pacific Northwest, along the position of the midlatitude jet stream, and weakens the subtropical jet stream. The storms eventually may turn southward again further east, bringing storms to the eastern U.S. but leaving the southwest and Gulf Coast region relatively dry. During the winter of 2010-2011, this persistent pattern kept storms from the area, although several events did make it into the region.

This past winter was a moderate-to-strong La Niña event which moderated in the spring and ended in May. It is not unusual to have a second La Niña event follow on its heels, as seems to be the case this year, with a new La Niña event developing since August. It is important to recognize that the weather over the past year has been extreme by any measure; a second La Niña does not necessarily mean that the rainfall again will be less than half of normal. However, drought consequences for water supplies tend to be cumulative, so even a moderately below-normal year would produce a worsening of water supply conditions in many areas.

La Niña, and its warm-anomaly counterpart El Niño, vary substantially from one year to the next. However, there are longer-term variations in the North Pacific Ocean, called the Pacific Decadal Oscillation (PDO) and the Atlantic Ocean, called the Atlantic Multi-Decadal Oscillation (AMO). Negative values of the PDO generally favor consistently dry patterns in the Southern U.S. Likewise, dry Plains are associated with a positive AMO, which implies unusually warm temperatures in the northern half of the Atlantic Ocean. The last time a negative PDO aligned with a positive AMO was the 1950s-1960s, which includes the drought-of-record in both Texas and Oklahoma. Since they became aligned again, around 2000, the region has suffered several short-term droughts, lasting up to 18 months. The general pattern favoring dryness could continue for 8-15 years, although individual wet years associated with El Niño conditions would lessen the impacts substantially.

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A NOAA RISA TEAM

National Drought Mitigation Center

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Drought Briefings

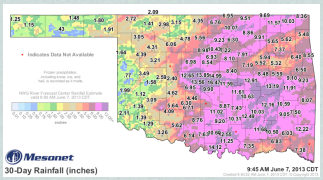
Needed to manage the workload

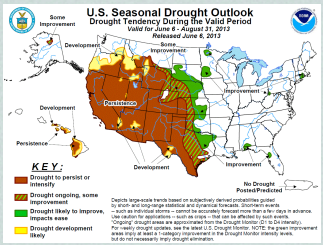
- Several days to plan, produce and summarize each webinar
- Difficulty in arranging presenters
- Patience to watch hour-long webinars

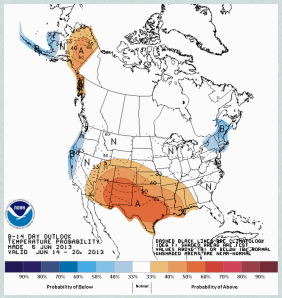
…but needed to keep people engaged and updated

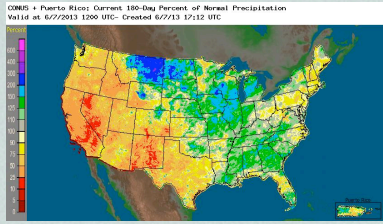
Briefings still draw a regular audience

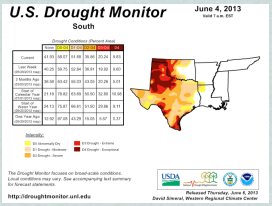
- Fairly low overhead
- Keeps people engaged so can go to them for further information
- Can help recruit participation in other events (workshops, forums, studies)
- Expand into short videos on topics?

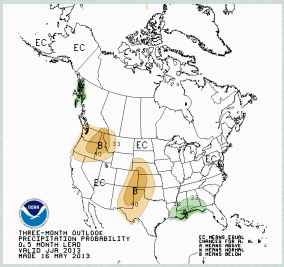


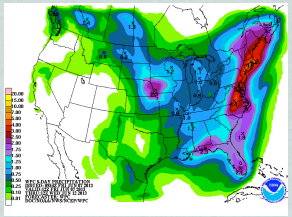












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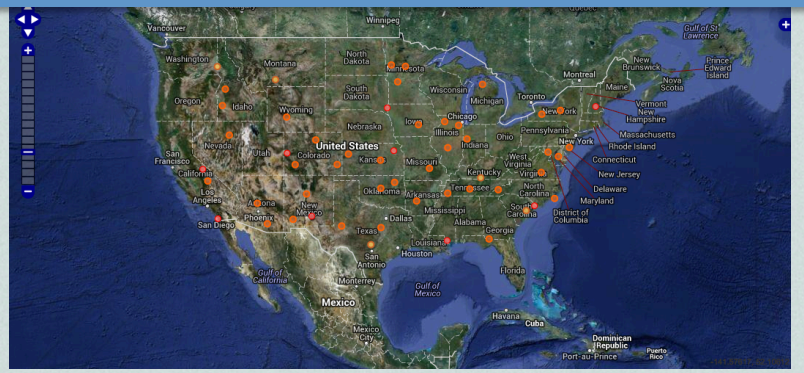
Field Photos Weekends

- "Pictures of Drought"
- Understanding comparison between indicators and impacts
- Photos taken nationally at about the same time
- Collaborated with CoCoRaHS, Earth Observations and Modeling Facility
- Conducted 3x annually since 2012



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Field Photos Weekends

- Conducted 3x annually since Labor Day 2012
  - Presidents Day (February)
  - Memorial Day (March)
  - Labor Day (September)
- Goal: to collect nearly simultaneous observations across the whole country
  - Both drought and non-drought areas
- Longitudinal analysis if repeat observers
- 3,681 photos collected to-date

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What's Wrong With This Picture?

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LSU

Thank You!

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