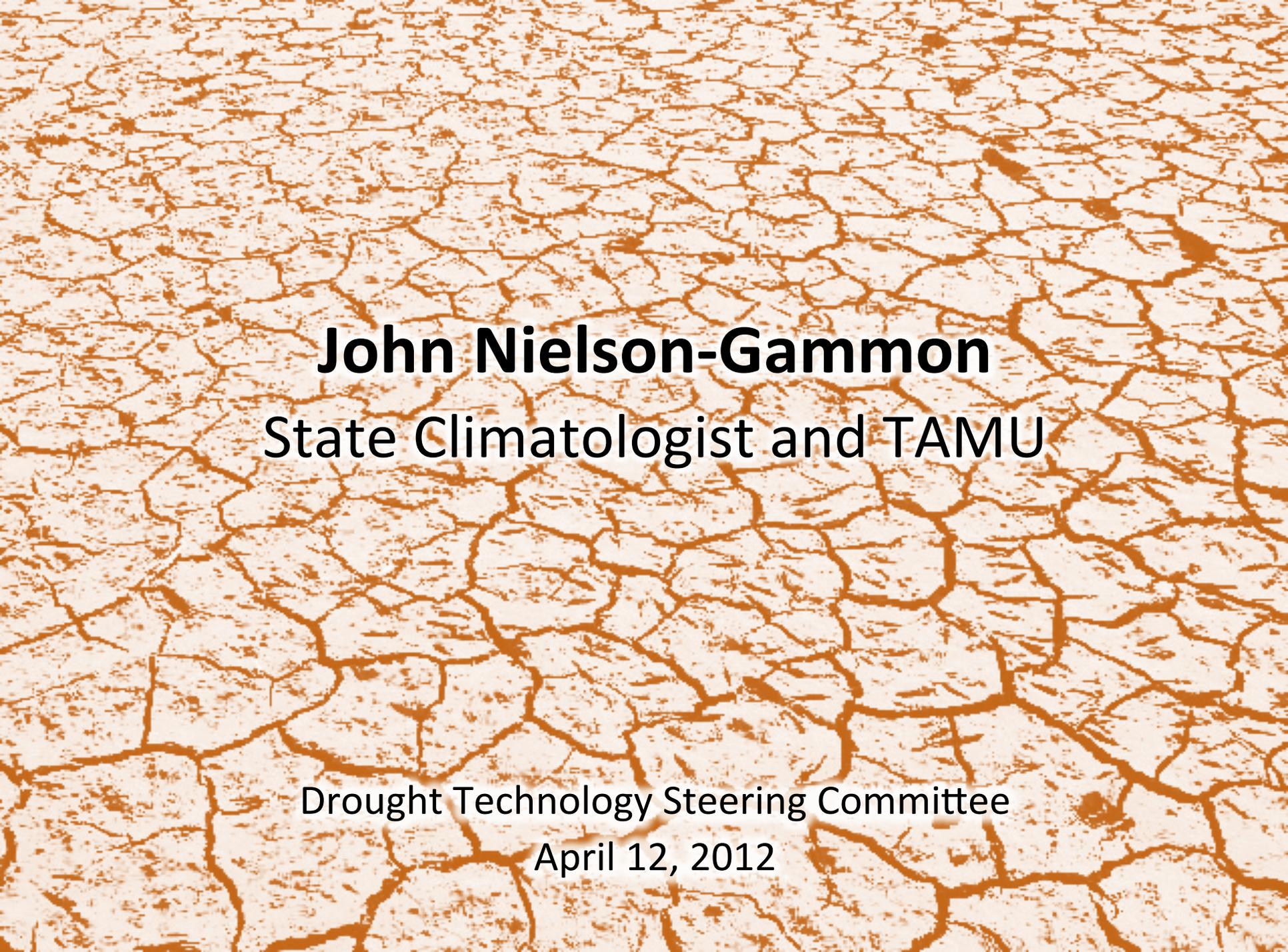




Drought Technology Steering Committee

April 12, 2012

Videoconference Presentations



John Nielson-Gammon
State Climatologist and TAMU

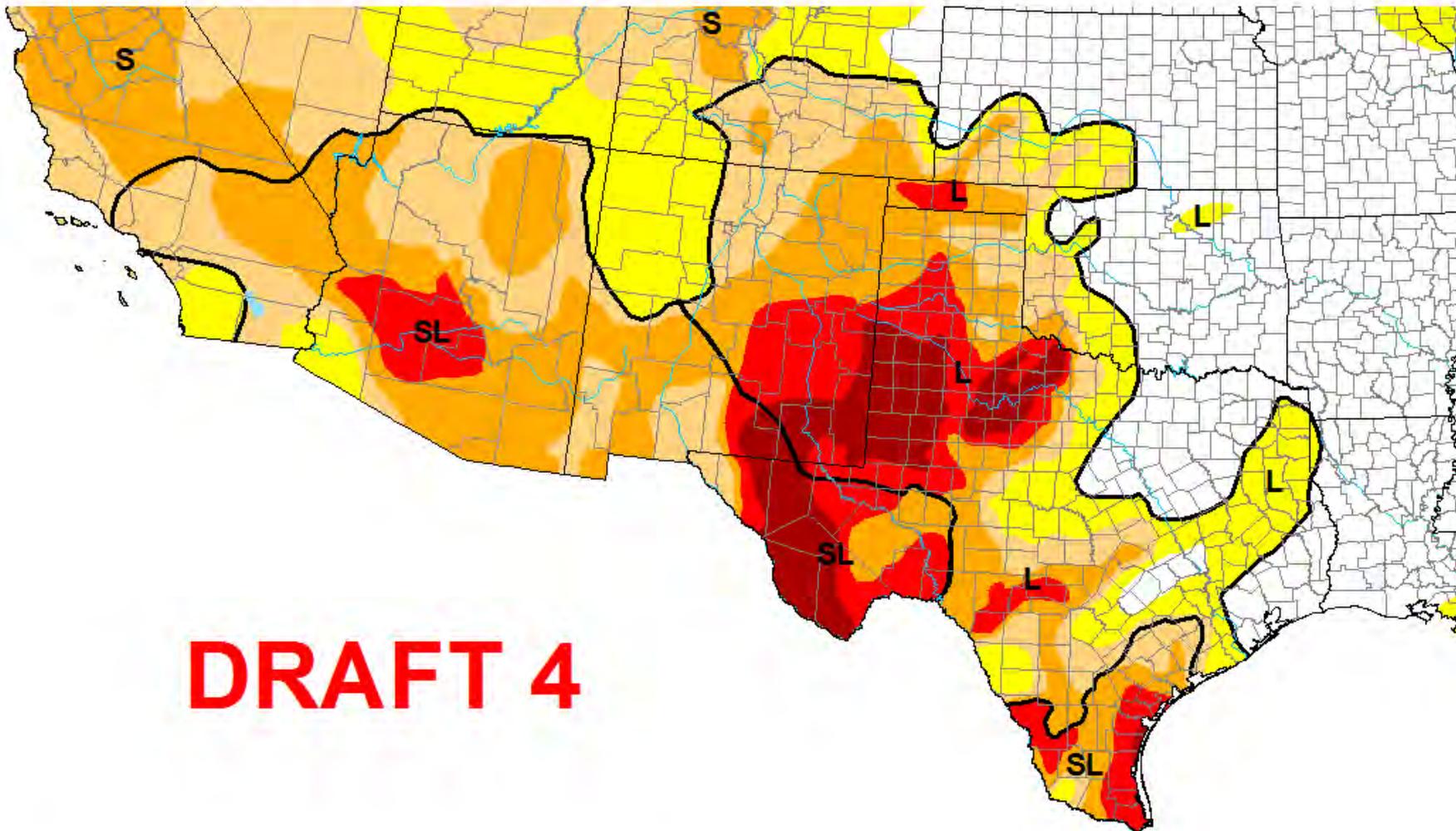
Drought Technology Steering Committee

April 12, 2012

U.S. Drought Monitor

April 10, 2012

Valid 8 a.m. EDT



DRAFT 4

Intensity:

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

Drought Impact Types:

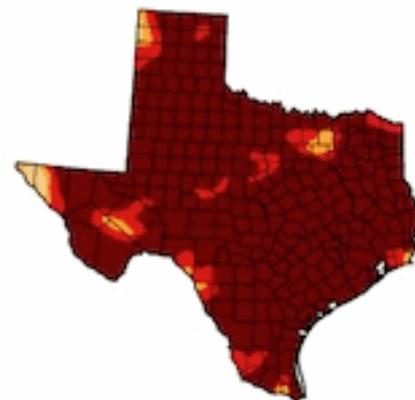
- Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)



Texas Drought Monitor Coordination Conference Call

REGISTER NOW

We will discuss drought and drought impacts throughout the state of Texas and recommend changes to the U.S. Drought Monitor to accurately reflect drought conditions. These calls are hosted by the Office of the State Climatologist and sponsored by the National Integrated Drought Information System.



This Webinar is held every week on Monday, from:
Apr 16, 2012 to Dec 17, 2012 1:00 PM - 2:15 PM CST

Register Now at:

<https://www4.gotomeeting.com/register/327874927>

Once registered you will receive an email confirming your registration with information you need to join the Webinar.

System Requirements

PC-based attendees

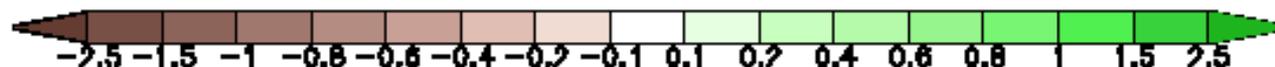
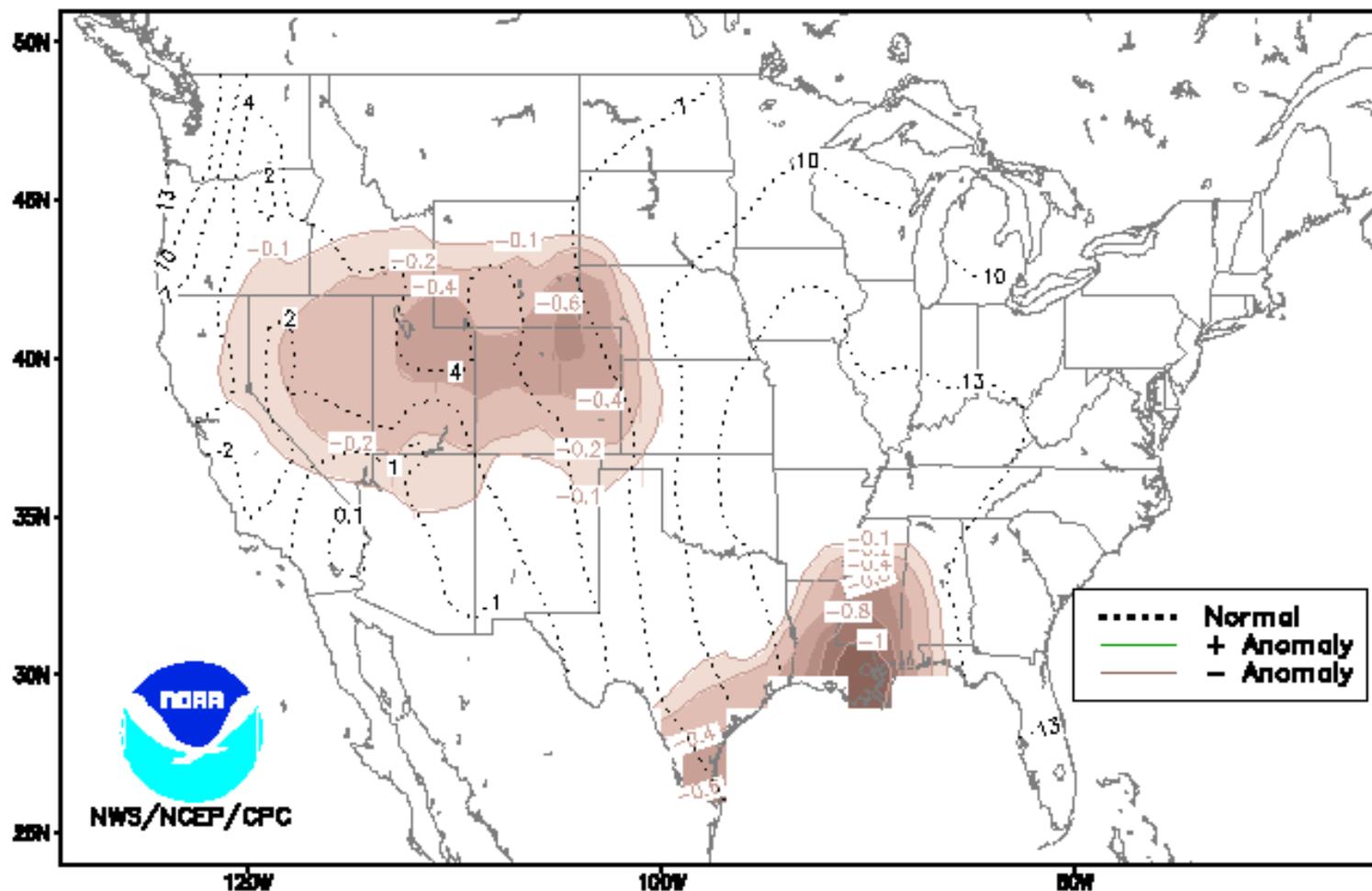
Required: Windows® 7, Vista, XP or 2003 Server

Macintosh®-based attendees

Required: Mac OS® X 10.5 or newer

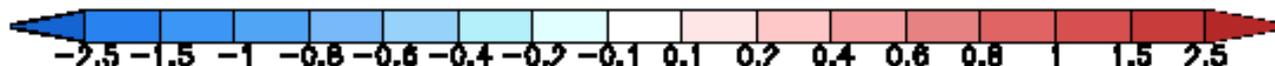
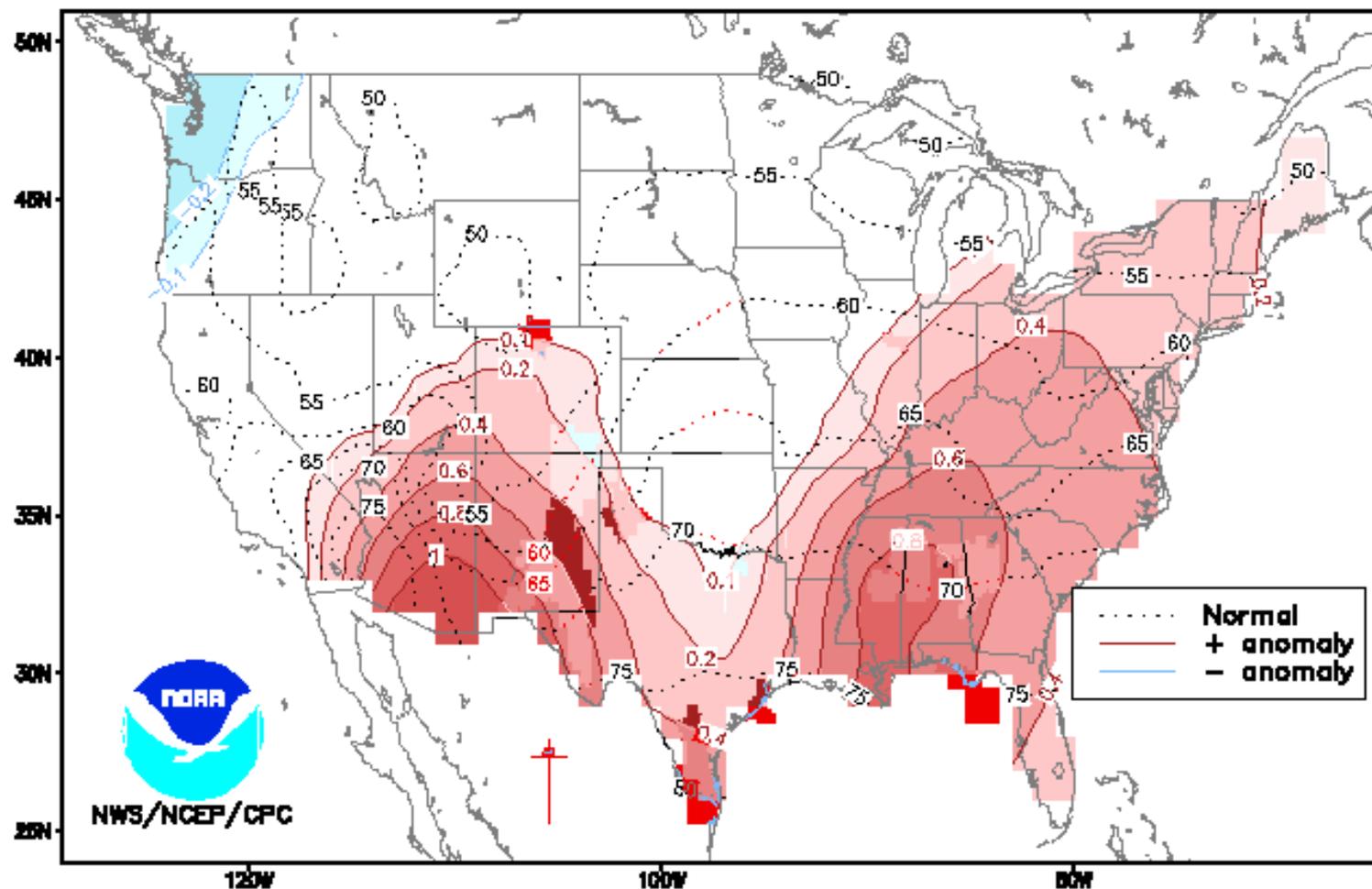
Anomaly (Inches) of the Mid-value of the 3-Month Precipitation Outlook Distribution for AMJ 2012

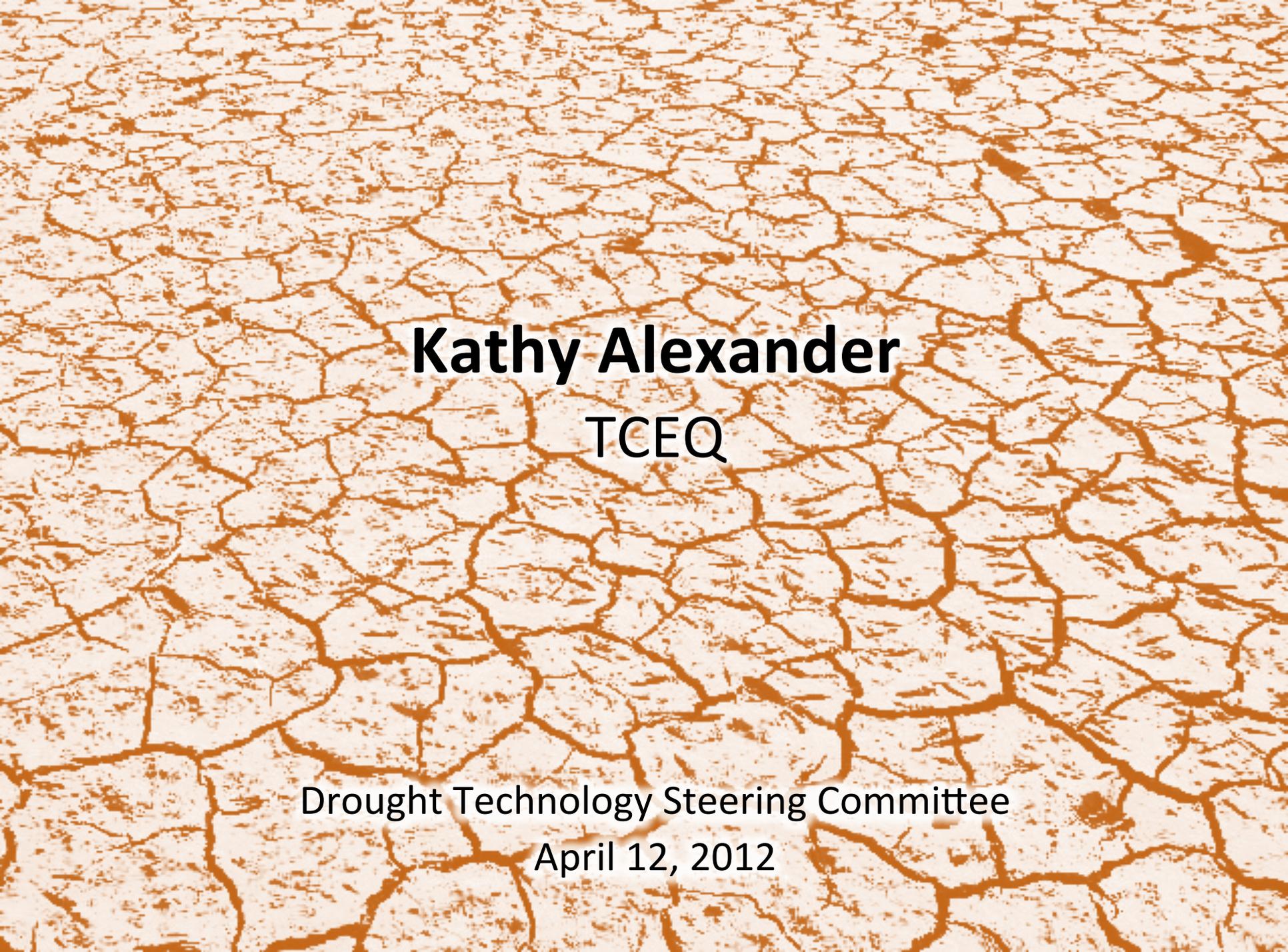
Dashed lines are the median 3-month precipitation (inches) based on observations from 1981–2010. Shaded areas indicate whether the anomaly of the mid-value is positive (green) or negative (brown) compared to the 1981–2010 average. Non-shaded regions indicate that the absolute value of the anomaly of the mid-value is less than 0.1. For a given location, the mid-value of the outlook may be found by adding the anomaly value to the 1981–2010 average. There is an equal 50–50 chance that actual conditions will be above or below the mid-value. Please note that this product is a limited representation of the official forecast, showing the anomaly of the mid-value, but not the width of the range of possibilities. For more comprehensive forecast information, please see our additional forecast products.



Anomaly (deg F) of the Mid-value of the 3-Month Temperature Outlook Distribution for AMJ 2012

Dashed lines are the median 3-month temperature (degrees F) based on observations from 1981-2010. Shaded areas indicate whether the anomaly of the mid-value is positive (red) or negative (blue) compared to the 1981-2010 average. Non-shaded regions indicate that the absolute value of the anomaly of the mid-value is less than 0.1. For a given location, the mid-value of the outlook may be found by adding the anomaly value to the 1981-2010 average. There is an equal 50-50 chance that actual conditions will be above or below the mid-value. Please note that this product is a limited representation of the official forecast, showing the anomaly of the mid-value, but not the width of the range of possibilities. For more comprehensive forecast information, please see our additional forecast products.



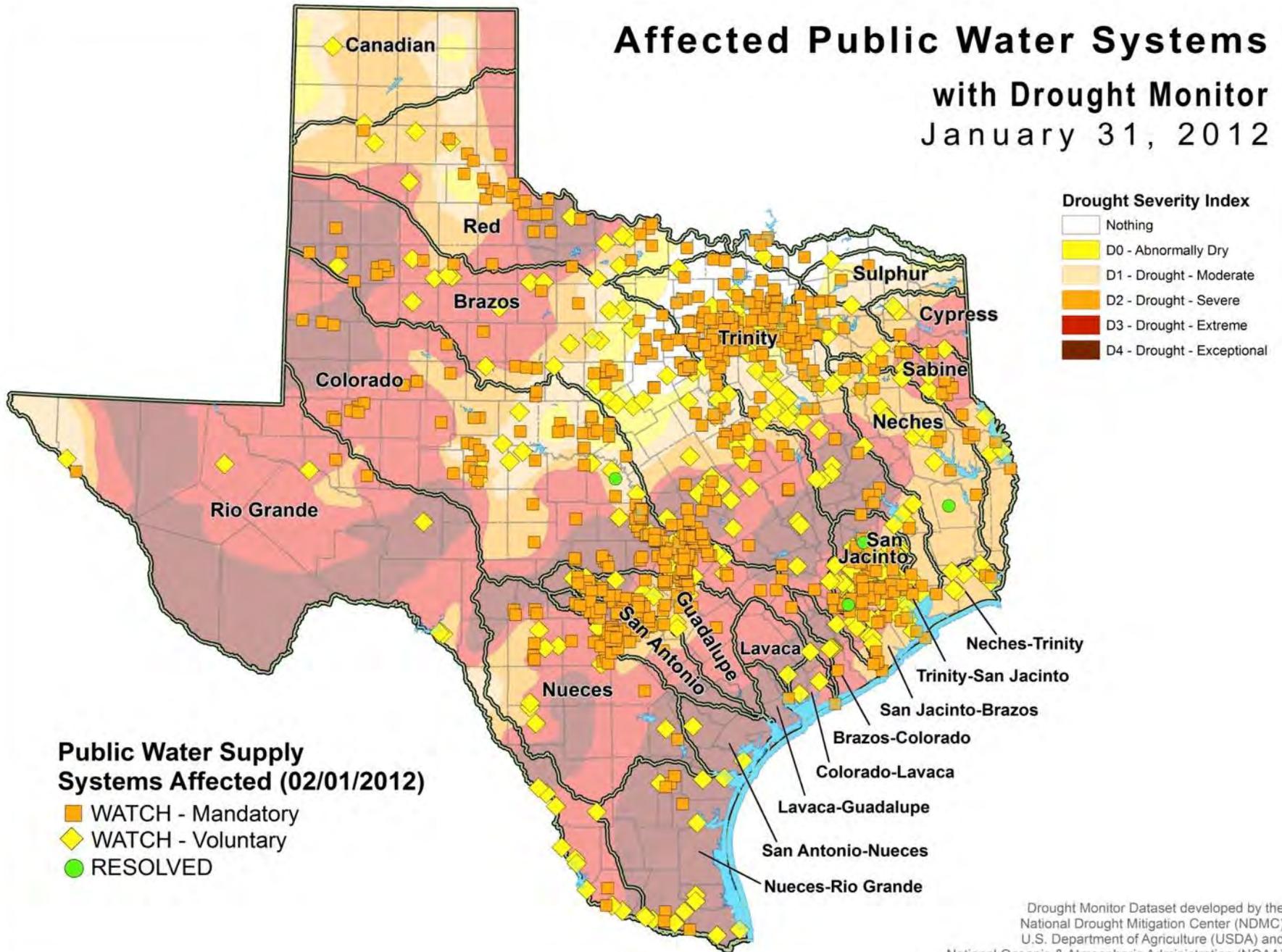


Kathy Alexander
TCEQ

Drought Technology Steering Committee

April 12, 2012

Affected Public Water Systems with Drought Monitor January 31, 2012

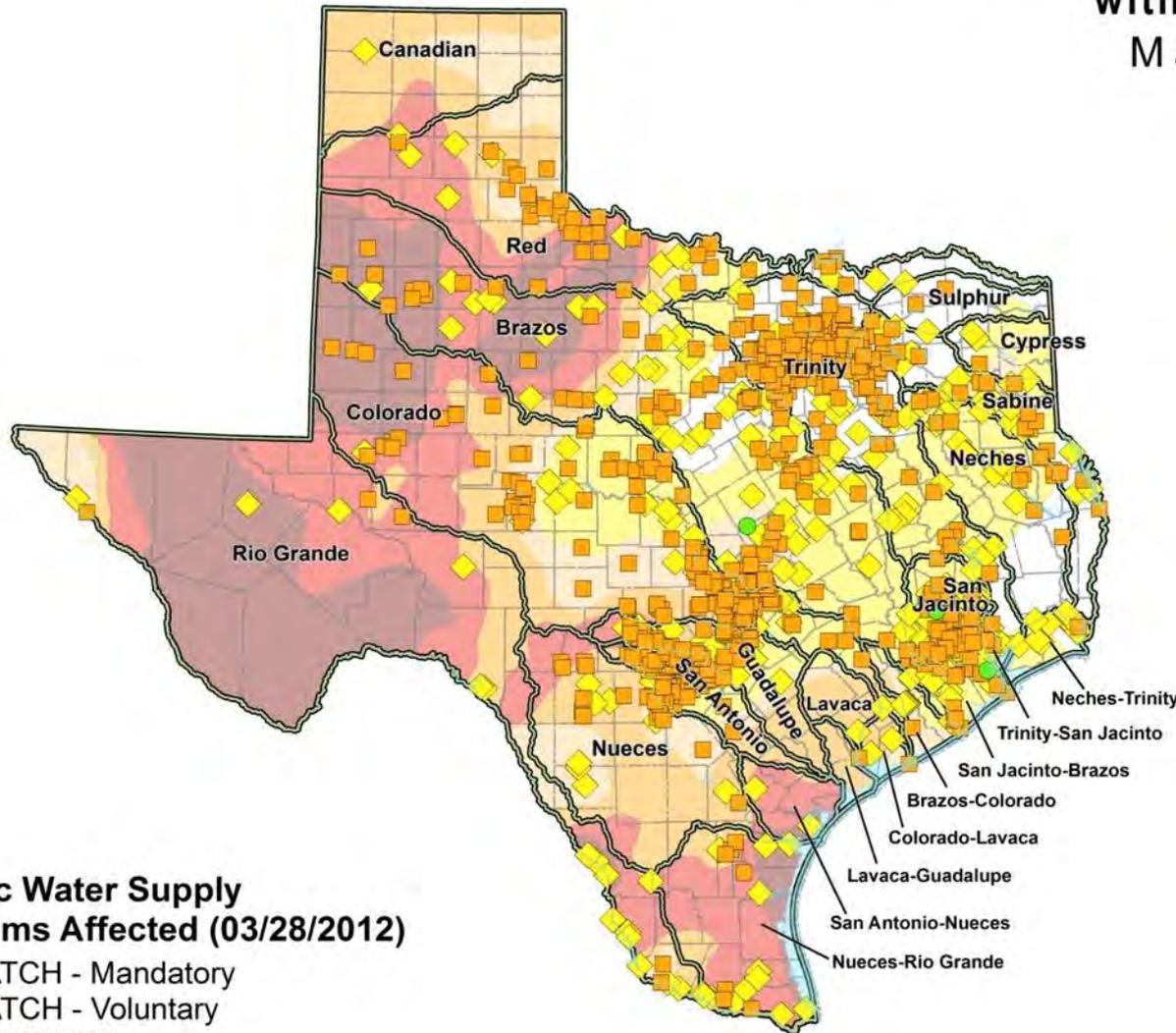


Drought Monitor Dataset developed by the National Drought Mitigation Center (NDMC) U.S. Department of Agriculture (USDA) and National Oceanic & Atmospheric Administration (NOAA)

Affected Public Water Systems

with Drought Monitor

March 27, 2012



Drought Severity Index

- Nothing
- D0 - Abnormally Dry
- D1 - Drought - Moderate
- D2 - Drought - Severe
- D3 - Drought - Extreme
- D4 - Drought - Exceptional

Public Water Supply Systems Affected (03/28/2012)

- WATCH - Mandatory
- WATCH - Voluntary
- RESOLVED



Mike Bewley
TDEM

Drought Technology Steering Committee

April 12, 2012

O.H. Ivie Reservoir

Owned and operated by the Colorado River Municipal Water District

Purpose: Water Supply

Supplies: Odessa, Big Spring, Snyder, Midland, Abilene, San Angelo, Ballinger and Millersview-Doole



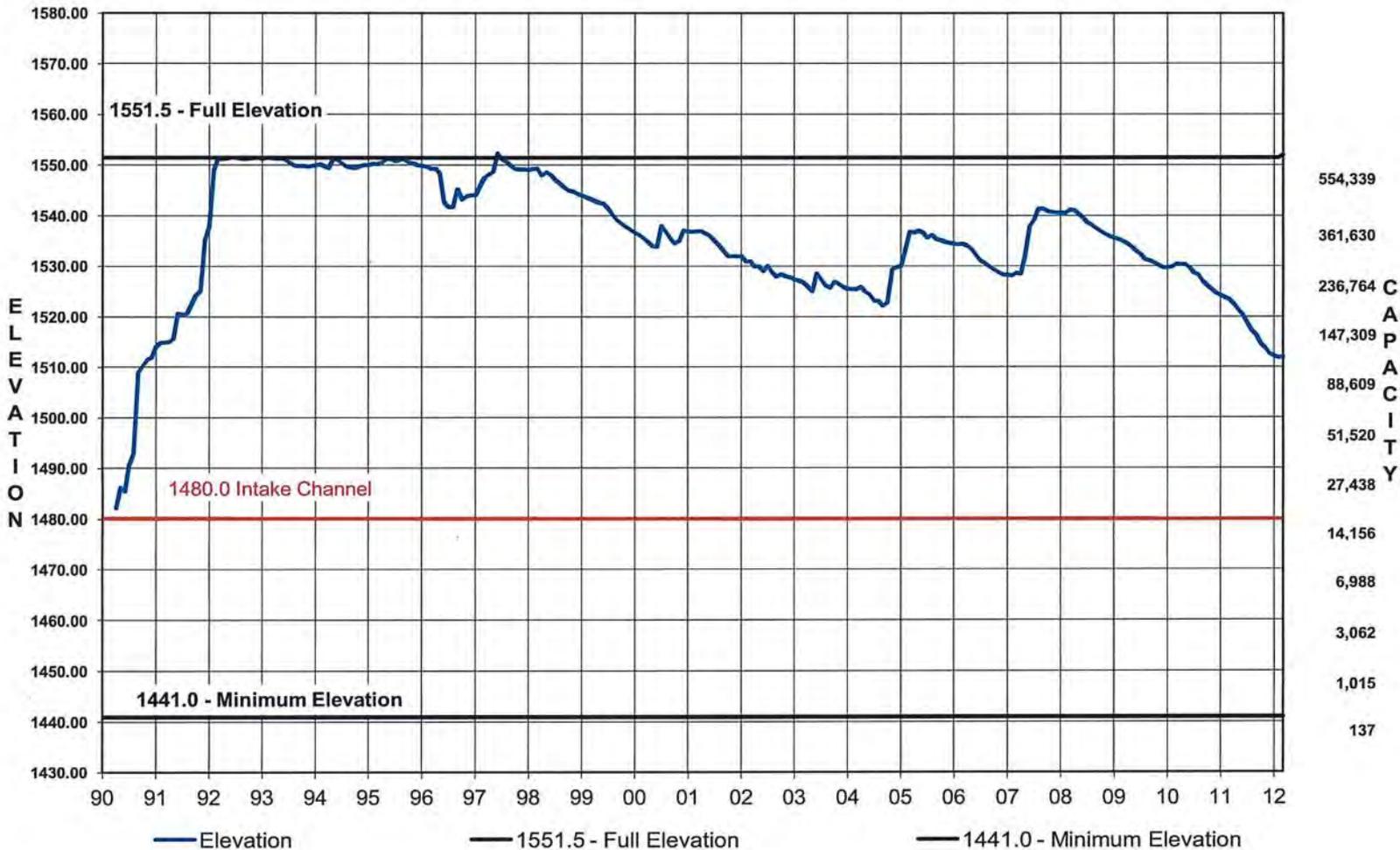
Storage Capacity: 554,339 acre-feet

Current Storage: 98,400 acre-feet

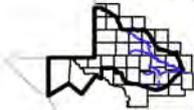
2011 Change in Storage: -81,820 acre-feet

O.H. IVIE RESERVOIR

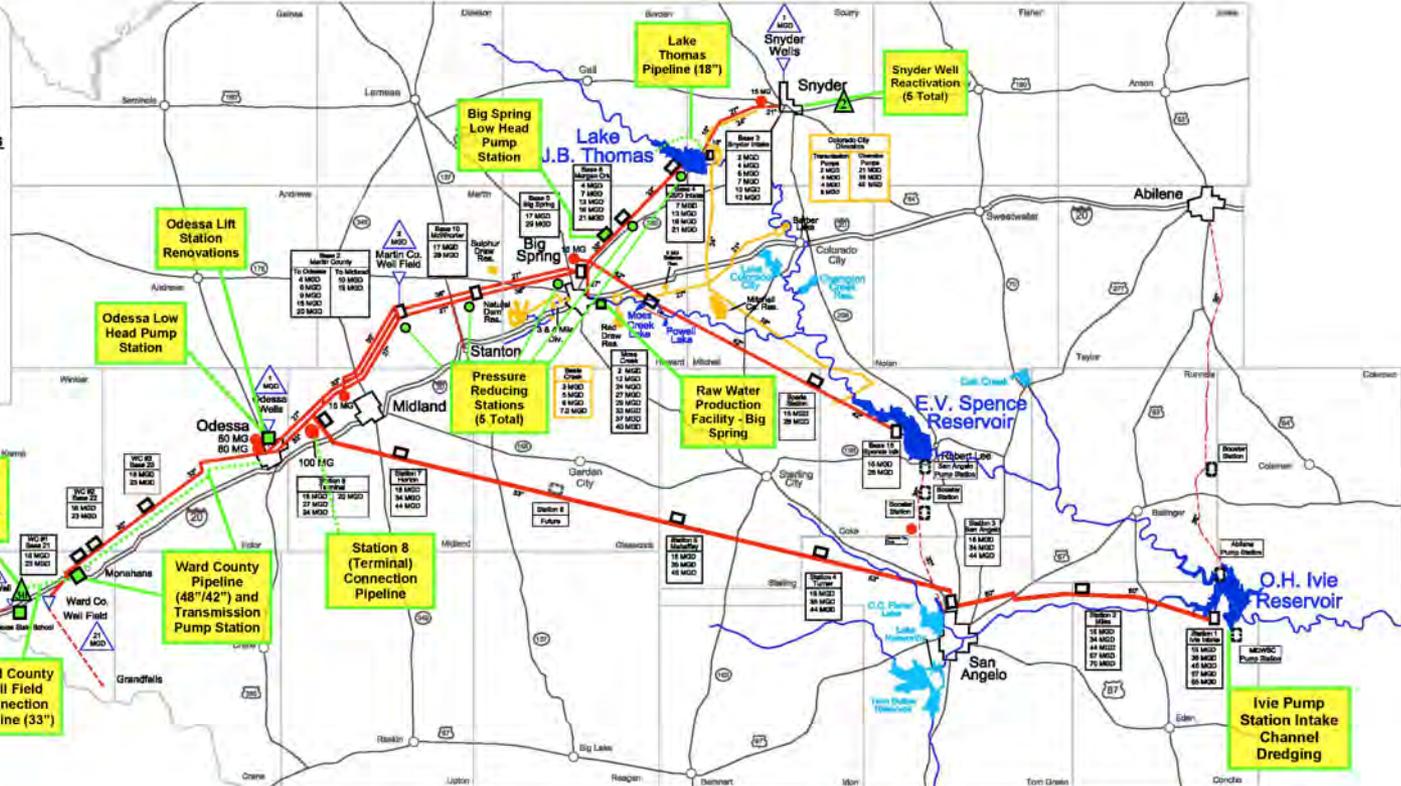
Elevation April 1990 - March 2012



Colorado River Municipal Water District Big Spring - Odessa - Snyder System Map



- MEMBER CITIES**
BIG SPRING
ODESSA
SNYDER
- MUNICIPAL CUSTOMERS**
ABILENE
GRANDFALLS
MIDLAND
MILLERVIEW-DOOLE
WSC
PYOTE
ROBERT LEE
SAN ANGELO
STANTON
WEST TEXAS STATE SCHOOL



- Raw Water
- Diverted Water
- System Storage
- District Reservoir
- Pump Station
- Pump Station
- - - - - Others
- Evaporation Res.
- Non - District Res.

Colorado River Municipal Water District
P.O. Box 869 / 400 E. 24th St.
Big Spring, Texas 79721-0869 / 79720
432-267-6341 Fax: 432-267-3121
www.crmwd.org



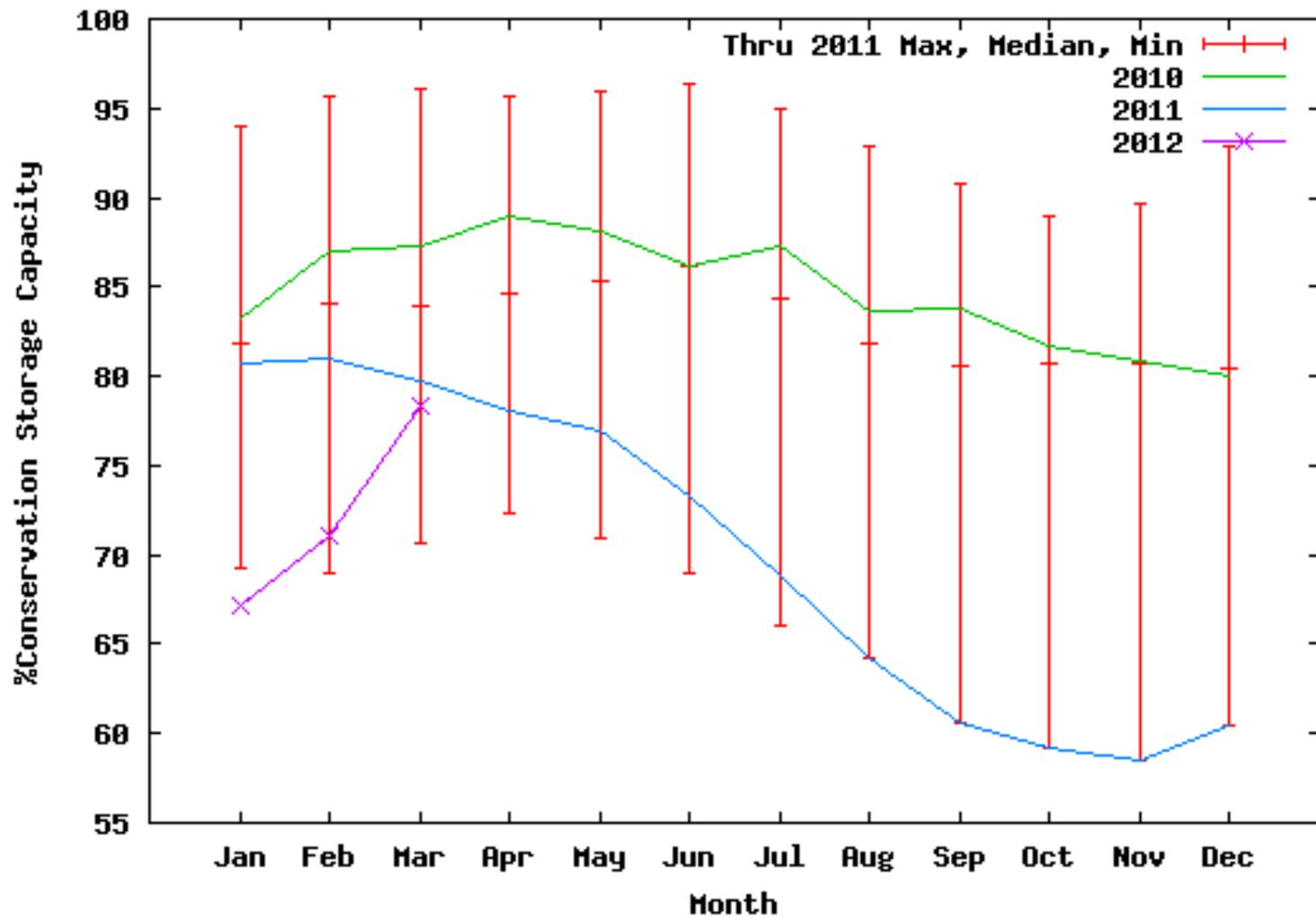
Brenner Brown

TWDB

Drought Technology Steering Committee

April 12, 2012

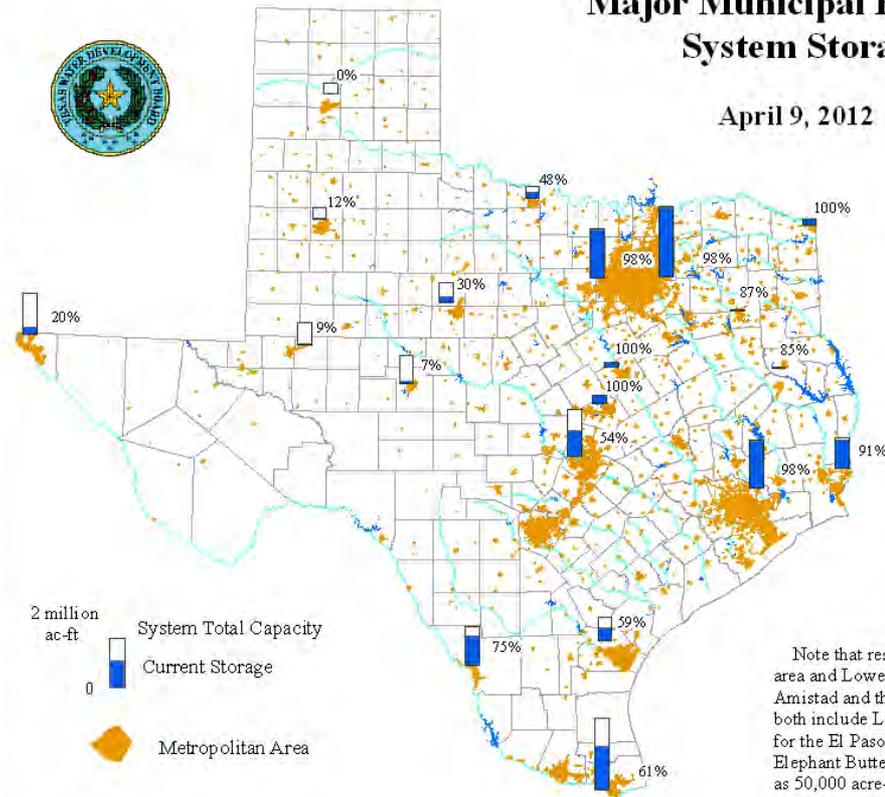
State Conservation Storage Statistics





Major Municipal Reservoir System Storage

April 9, 2012



Percent of Municipal Supply from Reservoirs for Identified Metropolitan Areas:

>75%: Houston, Fort Worth, Dallas, Austin, Corpus Christi, McAllen-Brownsville, Tyler, Beaumont-Port Arthur

25-50%: El Paso, Lubbock
5-25%: Amarillo

San Antonio, Victoria, and Bryan-College Station areas are not included on this map because they have historically relied on surface water for less than 5% of their total supply.

Note that reservoir system storage for the Laredo area and Lower Rio Grande area both include Lake Amistad and the Amarillo area and Lubbock area both include Lake Meredith. Also note that the plot for the El Paso area shows the total storage in Elephant Butte; the El Paso area receives as much as 50,000 acre-feet per year for municipal use.

2 million ac-ft System Total Capacity
0 Current Storage
Metropolitan Area

Bob Corby/Matt Ables/David Maidment

NWS

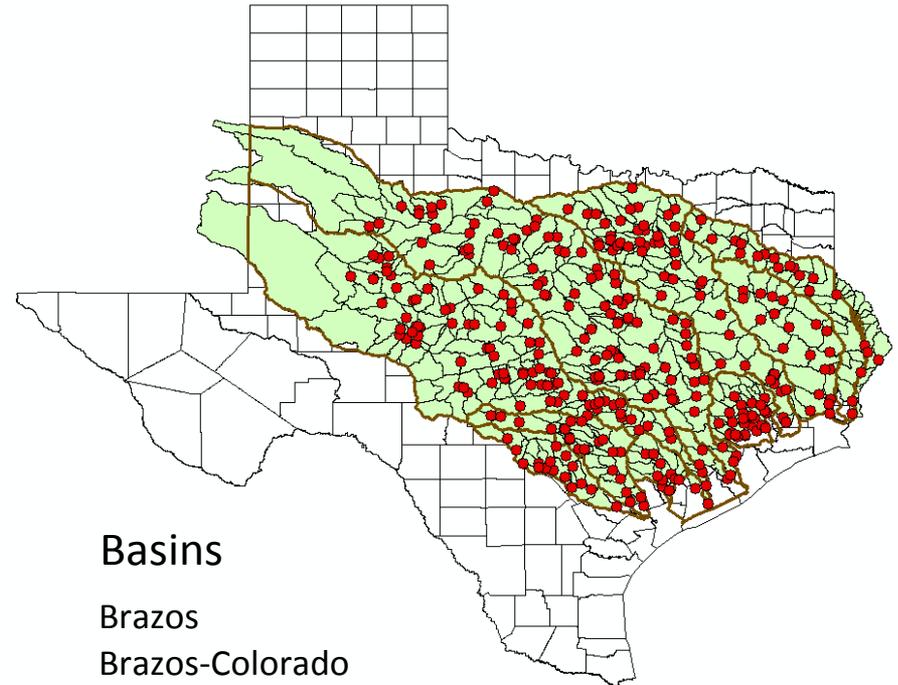
Drought Technology Steering Committee

April 12, 2012

Ensemble Streamflow Simulations for 2012

Produced by National Weather Service, distributed by University of Texas at Austin and Kisters

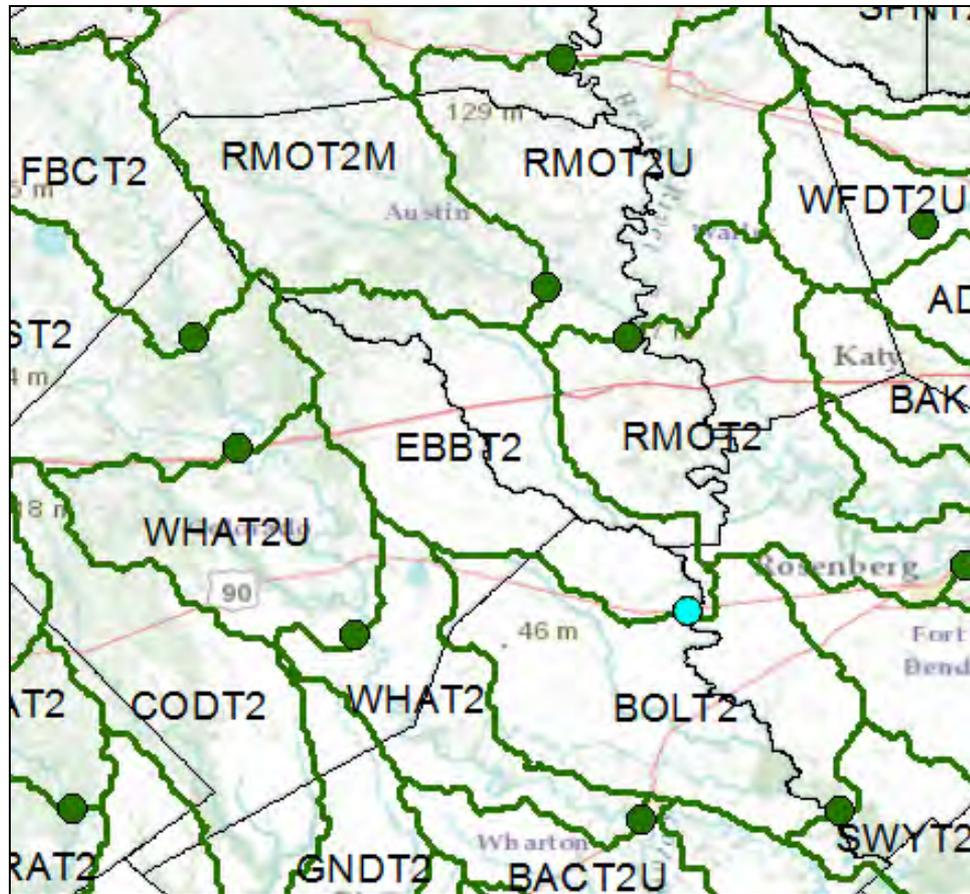
- 348 forecast points
 - Including reservoir inflows
- 11 basins
- Based on weather 1959-2009
 - 50 scenarios of daily flows for each point generated from an NWS rainfall-runoff model (with reservoirs included)
- 90+ days horizon from today (to end of summer)
- Updated weekly



Basins

Brazos
Brazos-Colorado
Colorado
Colorado-Lavaca
Guadalupe
Lavaca
Neches
Sabine
San Antonio
San Jacinto
Trinity

Forecast Points and Subbasins



FEWS XML for Forecast Ensembles

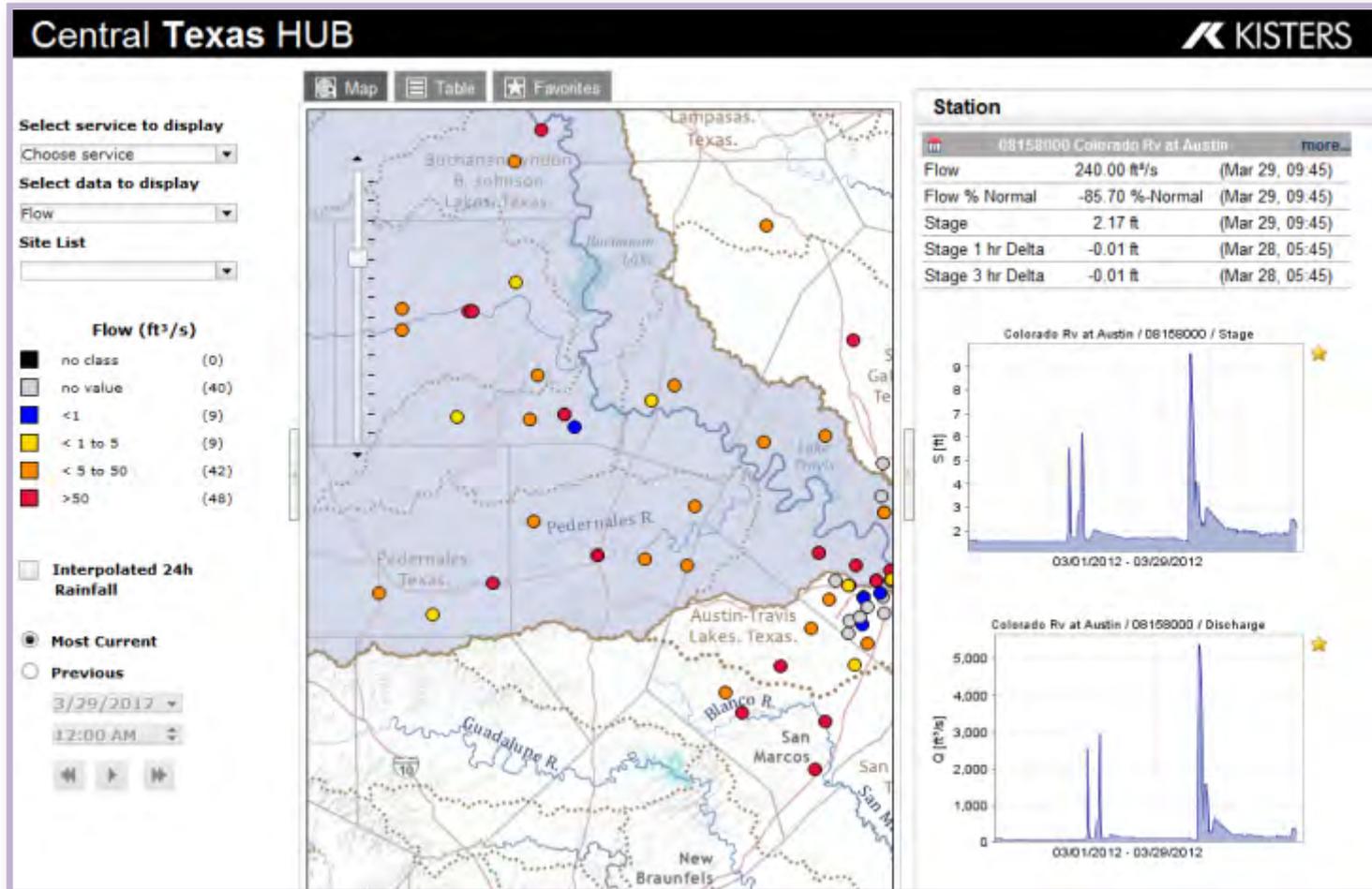
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<?xml version="1.0" encoding="UTF-8" ?>
<TimeSeries xmlns="http://www.wildelft.nl/fews/PI" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.wildelft.nl/fews/PI
http://fews.wildelft.nl/schemas/version1.0/pi-schemas/pi_timeseries.xsd" version="1.5">
  <timeZone>0.0</timeZone>
  - <series>
    - <header>
      <type>instantaneous</type>
      <locationId>EBBT2</locationId>
      <parameterId>QINE</parameterId>
      <ensembleId>ESP</ensembleId>
      <ensembleMemberIndex>1955</ensembleMemberIndex>
      <timeStep unit="second" multiplier="21600" />
      <startDate date="2012-03-22" time="12:00:00" />
      <endDate date="2012-10-08" time="12:00:00" />
      <forecastDate date="2012-03-22" time="12:00:00" />
      <missVal>-999.0</missVal>
      <stationName>East Bernard - San Bernard River</stationName>
      <units>CMS</units>
    </header>
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    <event date="2012-03-22" time="18:00:00" value="2.9602175" flag="0" />
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</TimeSeries>
```



The map shows the San Bernard River area with various station locations marked. The station 'EBBT2' is highlighted with a blue circle and a blue arrow pointing from the XML code. Other stations visible include FBCT2, RMOT2M, RMOT2U, WFDT2U, AD, BAK, WHAT2U, WHAT2, BOLT2, CODT2, GNDT2, BACT2U, and SWYT2. The map also shows the river, roads, and some geographical features like 'Austin' and 'Kato'.

Central Texas "Hub"

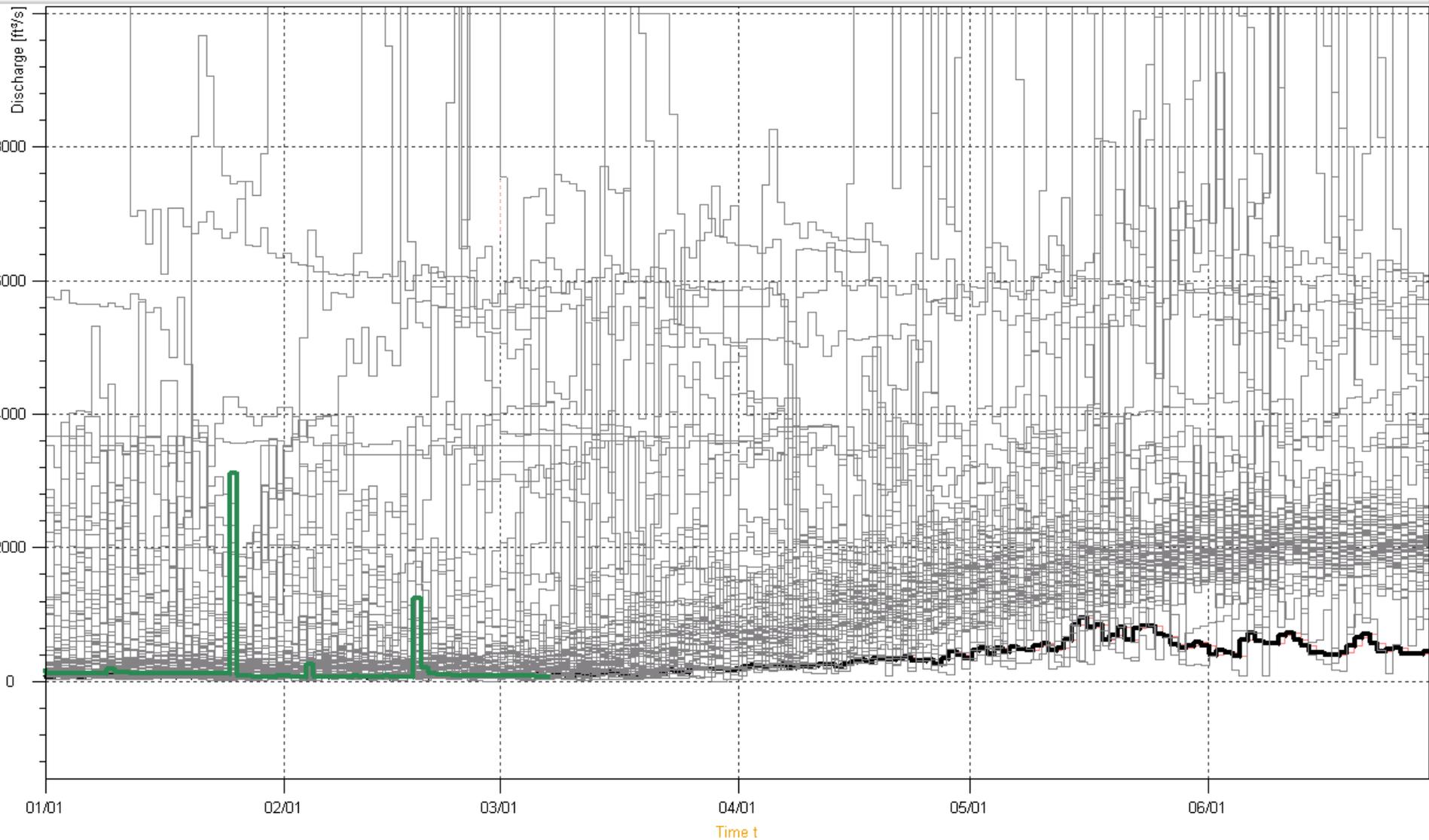
Synthesis of Water Observations Networks into Thematic Maps



<http://CentralTexasHub.org> of 28 March 2012 at my home

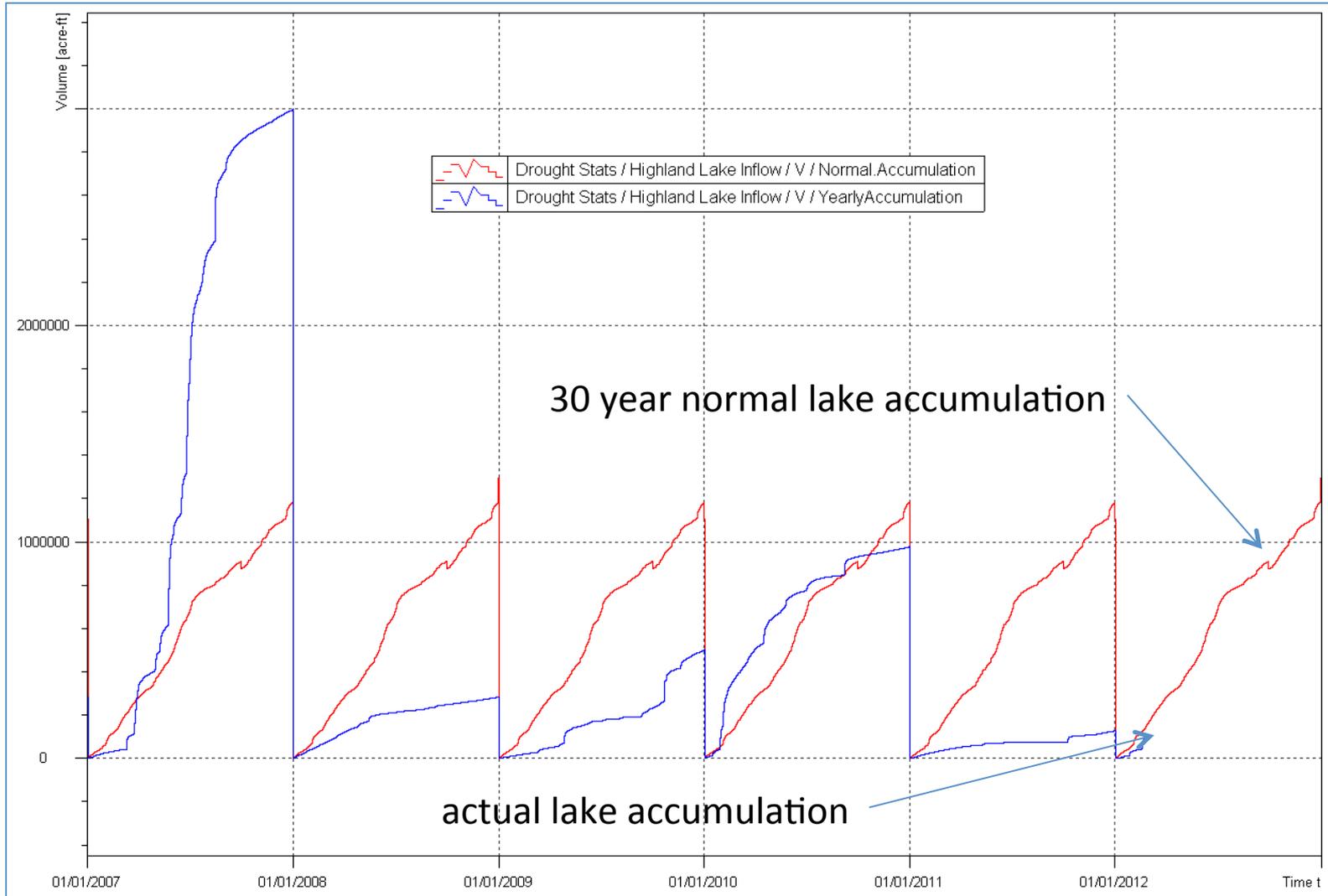
Colorado River at Austin Mean Daily Flow
Overlay Plot 1950 - 2012

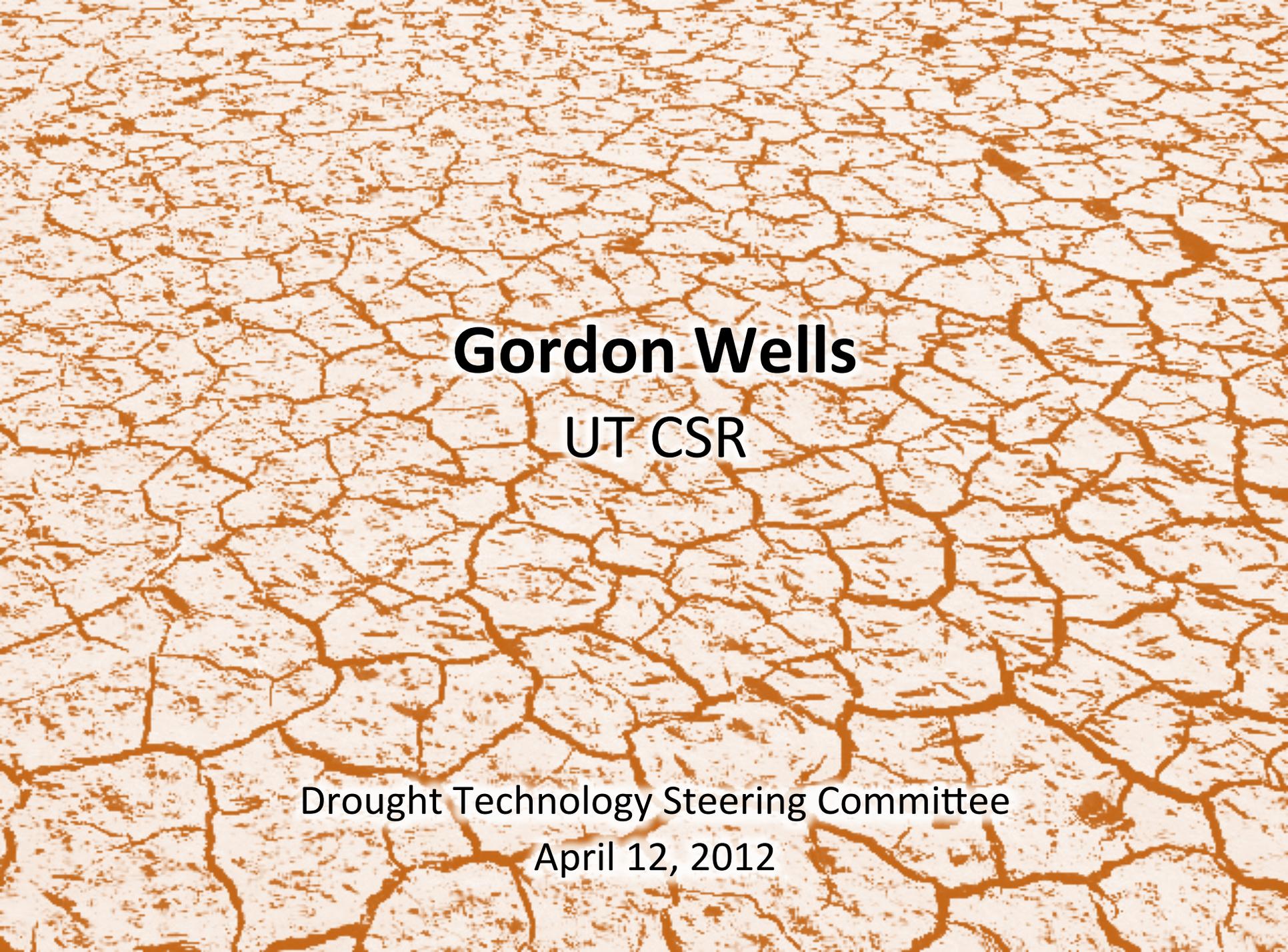
- 1950 - 2011 Mean Daily Flow
- 2012 Mean Daily Flow
- Period of Record 5th Percentile



Accumulated Inflow, 2007 – 2012

Highland Lake System





Gordon Wells

UT CSR

Drought Technology Steering Committee

April 12, 2012



Normalized Difference
Vegetation Index

January 17, 2012

Source: 16-day cycle MODIS
UT Center for Space Research



Normalized Difference
Vegetation Index

February 2, 2012

Source: 16-day cycle MODIS
UT Center for Space Research



Normalized Difference
Vegetation Index

February 18, 2011

Source: 16-day cycle MODIS
UT Center for Space Research



Normalized Difference
Vegetation Index

March 5, 2012

Source: 16-day cycle MODIS
UT Center for Space Research



Normalized Difference
Vegetation Index

March 22, 2012

Source: 16-day cycle MODIS
UT Center for Space Research

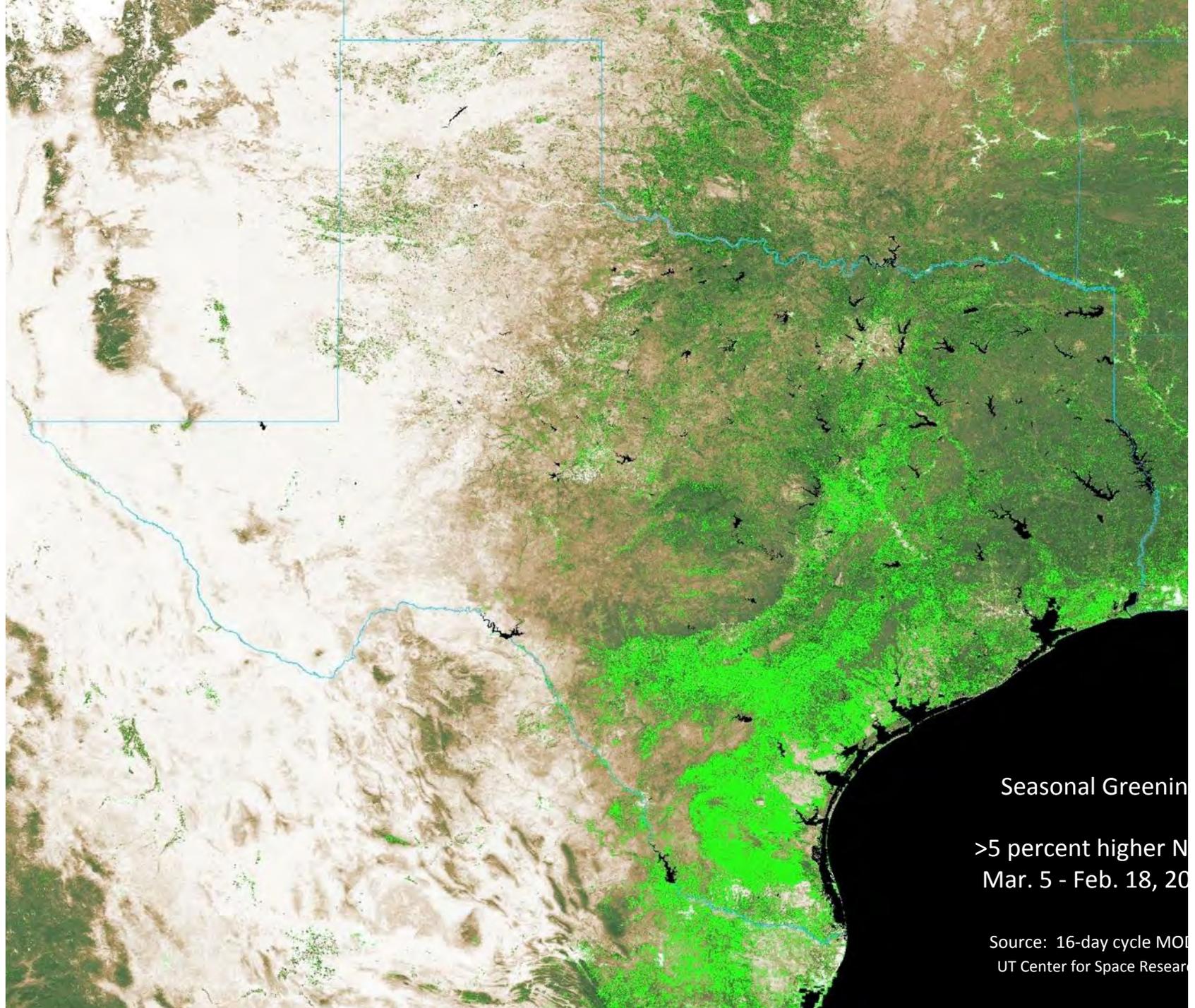




Normalized Difference
Vegetation Index

April 6, 2012

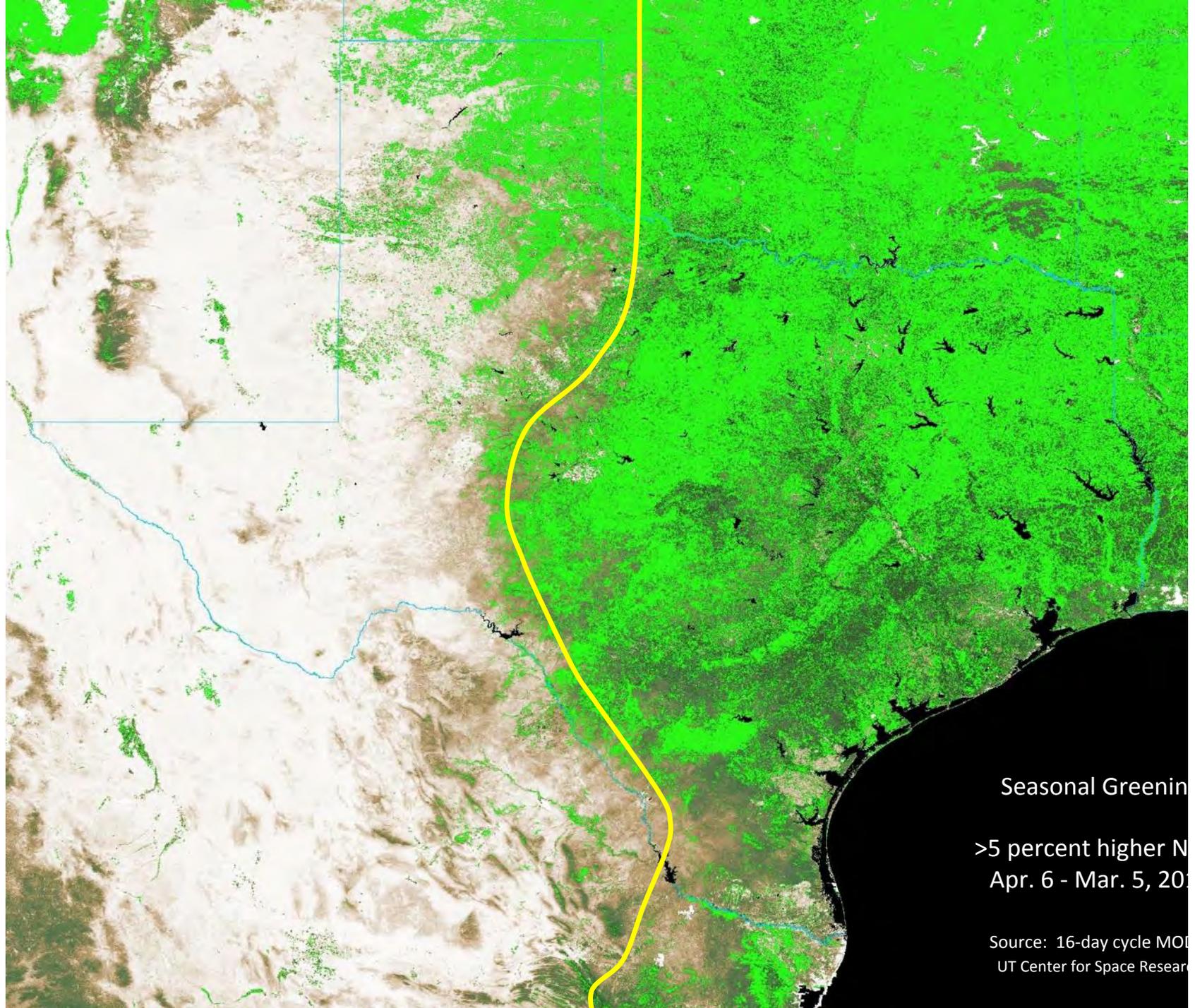
Source: 16-day cycle MODIS
UT Center for Space Research



Seasonal Greening

>5 percent higher NDVI
Mar. 5 - Feb. 18, 2018

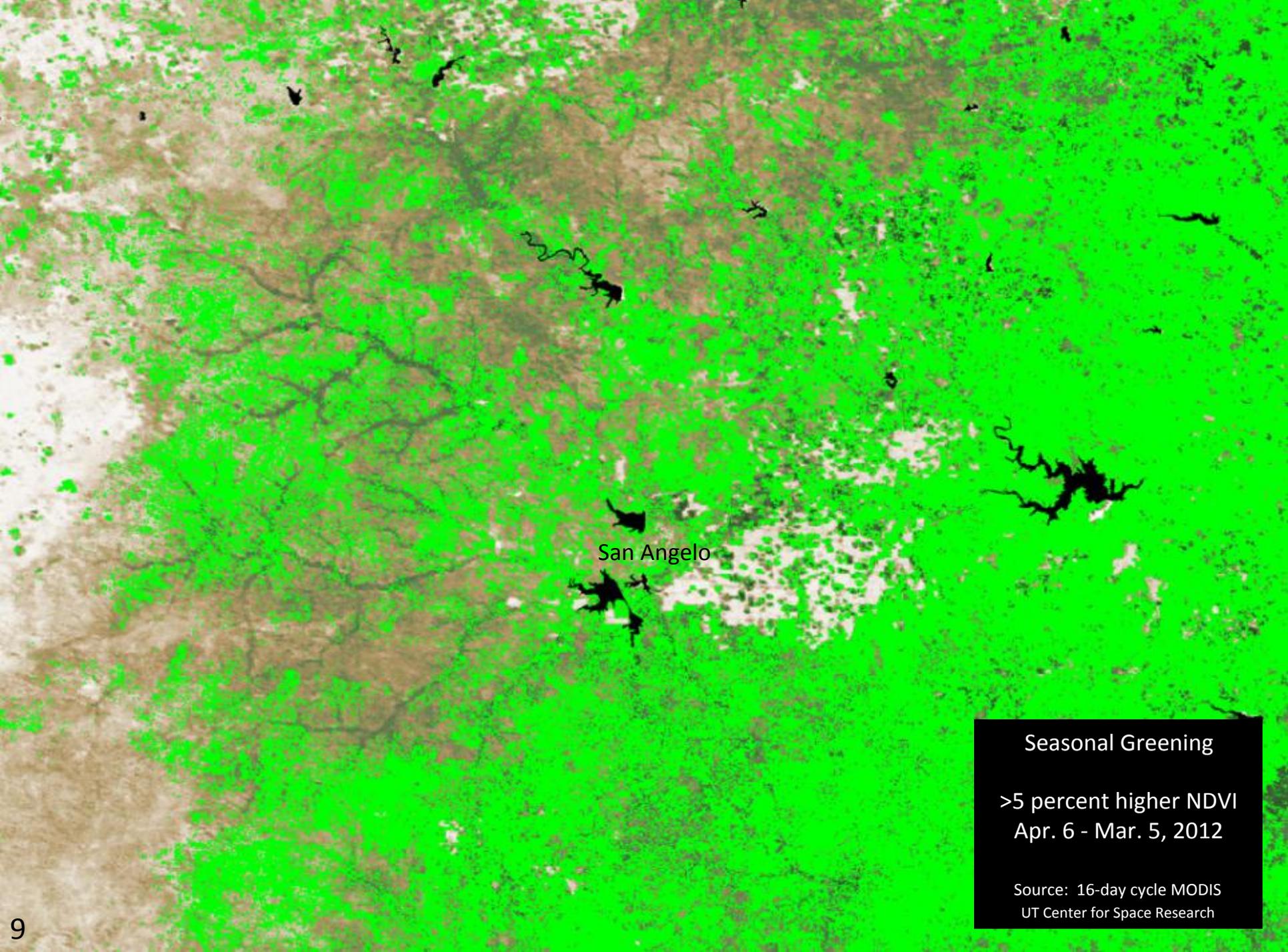
Source: 16-day cycle MODIS
UT Center for Space Research



Seasonal Greening

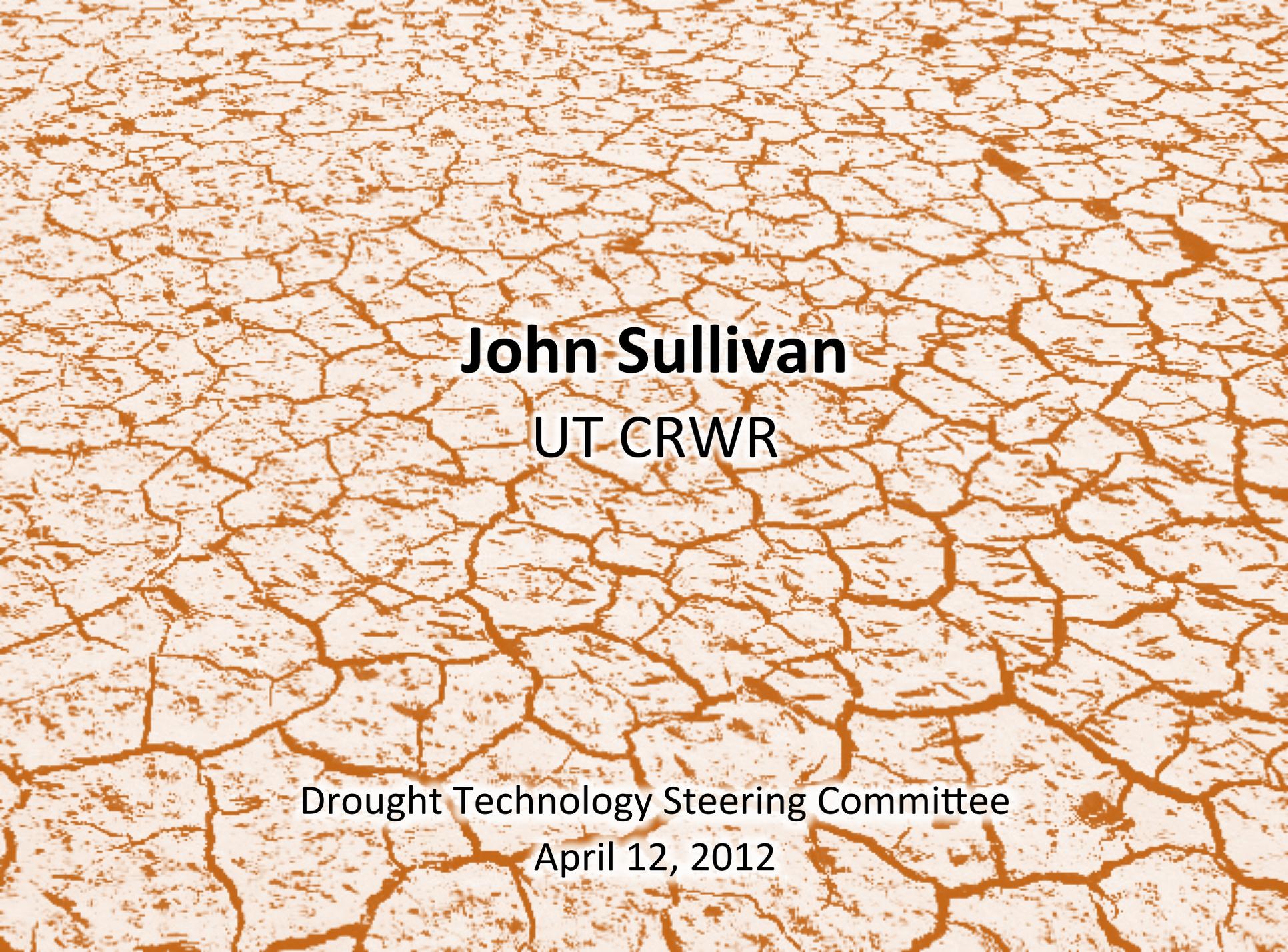
>5 percent higher N
Apr. 6 - Mar. 5, 20

Source: 16-day cycle MO
UT Center for Space Research



San Angelo

Seasonal Greening
>5 percent higher NDVI
Apr. 6 - Mar. 5, 2012
Source: 16-day cycle MODIS
UT Center for Space Research



John Sullivan
UT CRWR

Drought Technology Steering Committee

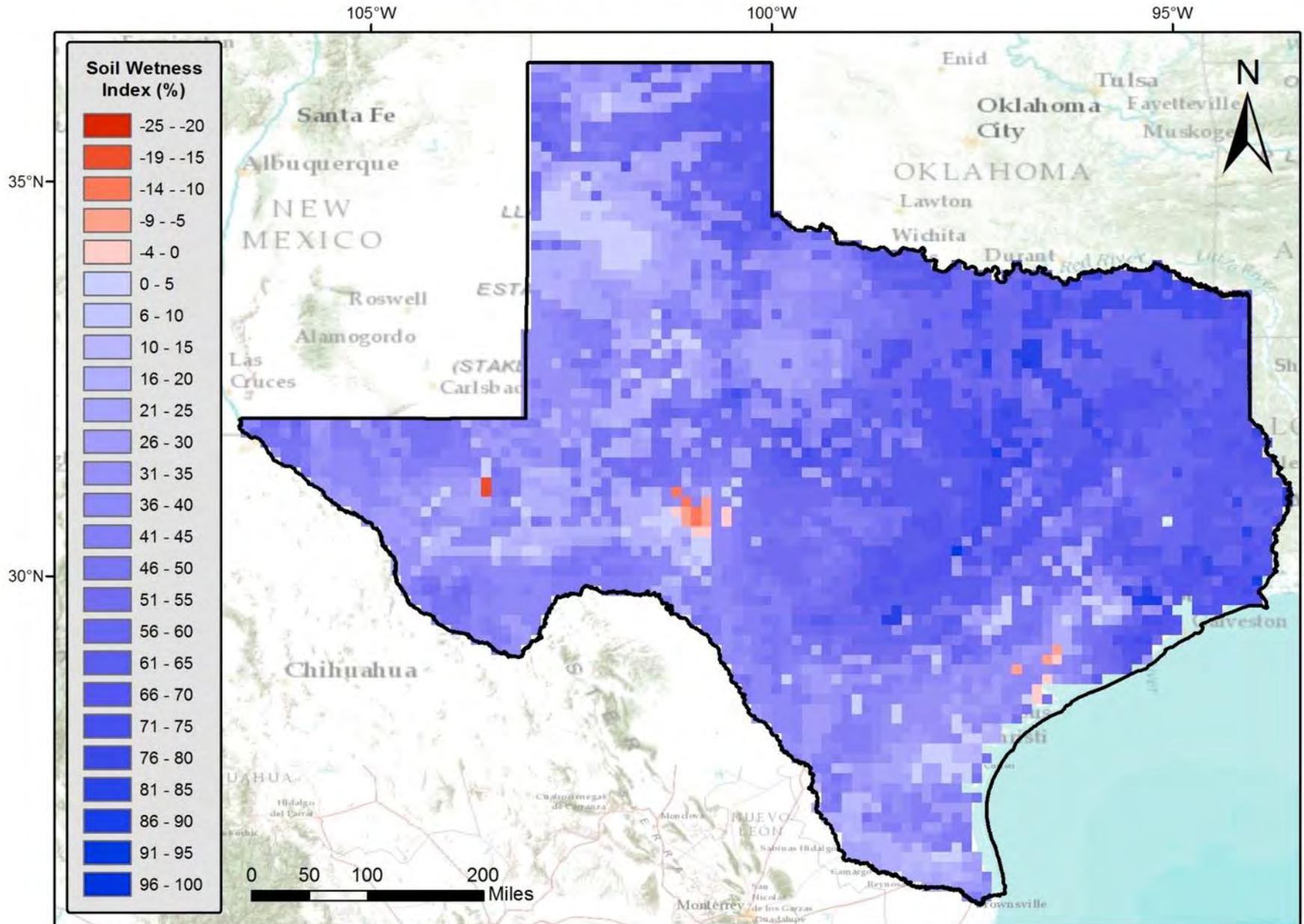
April 12, 2012

Soil Wetness Index

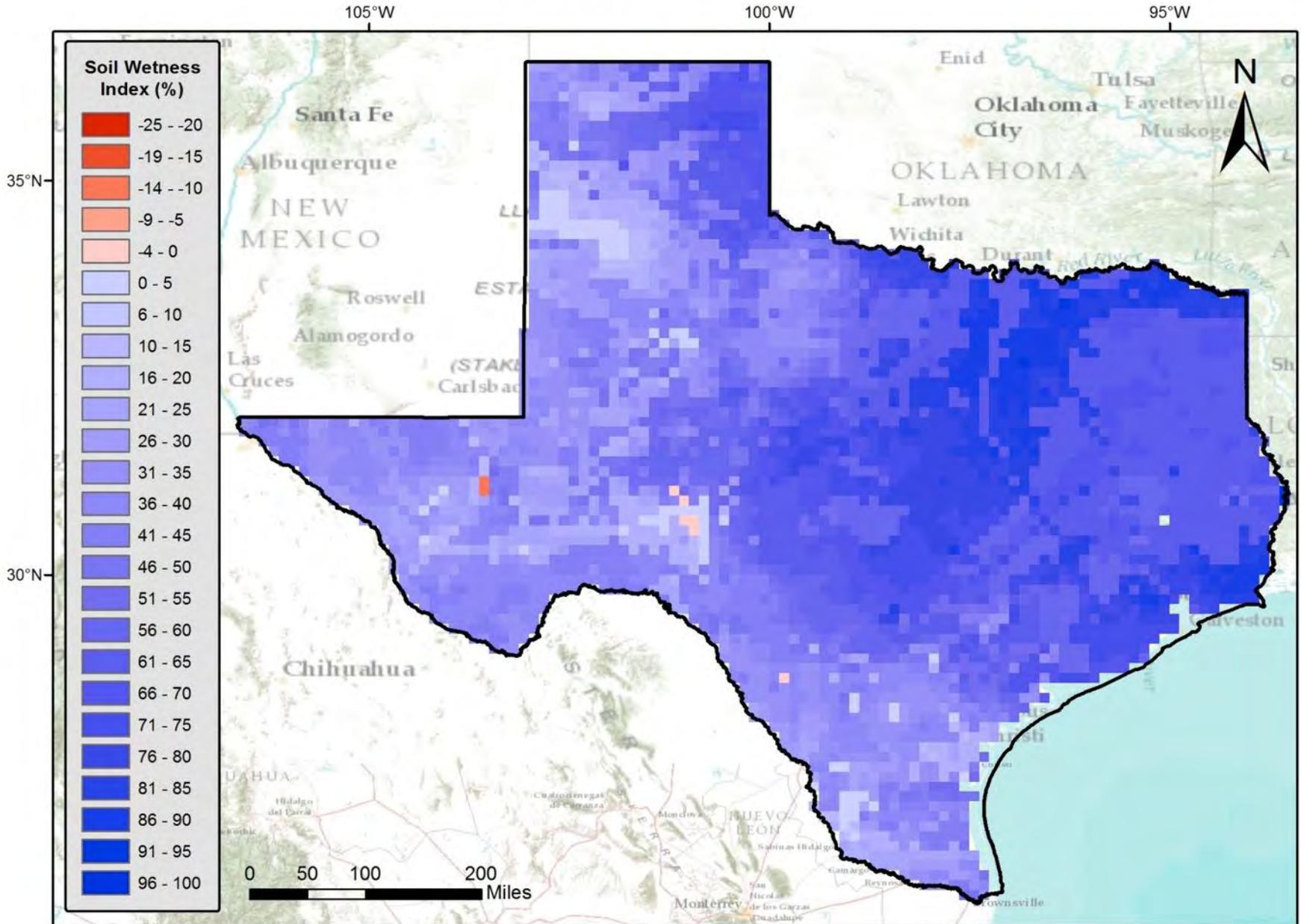
Total Texas soil water storage = 110 km³

Date	Average SWI (%)	Total Soil Moisture Volume (km ³)	Uniform Moisture Depth (cm)
August 23, 2011	22.9	25.2	3.62
December 23, 2011	43.6	48.0	6.89
March 23, 2012	50.3	55.3	7.94

December 23, 2011



March 23, 2012





Clyde Muster

TAMU

Drought Technology Steering Committee

April 12, 2012

USDA – AFRI Drought Project

- Early Warning / Decision Making Tool
 - For agricultural producers
 - For specific crops
 - 3 integrated components
 - Drought forecast program
 - Hydrologic forecast model
 - In-field crop stress monitoring
- Dr. Clyde Munster – BAEN Dept., TAMU
- Dr. John Nielsen-Gammon – ATMO Dept., TAMU
- Dr. Tom Cothren – SCSC Dept., TAMU

Drought Forecast Program

- Use real-time data
- Ensemble (probabilistic) forecasts
 - 2 week forecasts
- Will provide the following drought info:
 - Areal extent
 - Duration
 - Severity
- 4 km x 4 km grid
 - Rainfall
 - Max / min air temperature
 - Wind speed

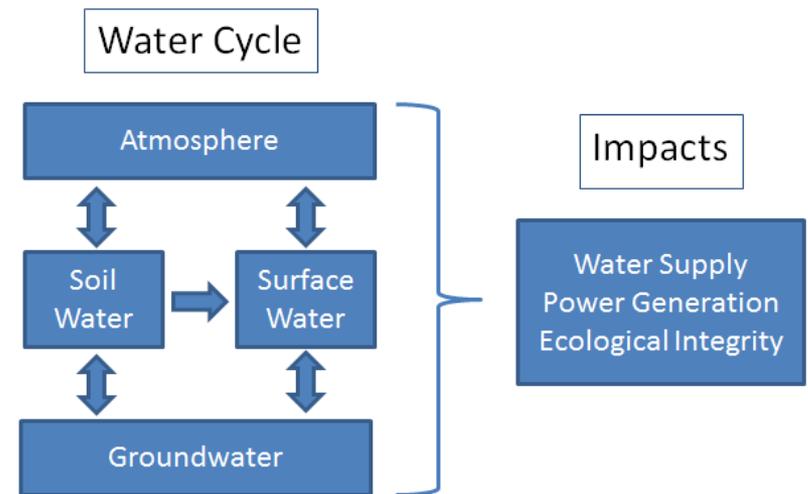
Hydrologic Forecast Model

- Soil Water Assessment Tool (SWAT)
 - Calibrate / validate model for previous droughts
 - Input the output from the weather model
 - Forecast hydrologic conditions
 - Streamflow
 - Lake / reservoir levels
 - Soil moisture
 - Groundwater levels
- In-field crop stress monitoring
 - crop specific drought indicators

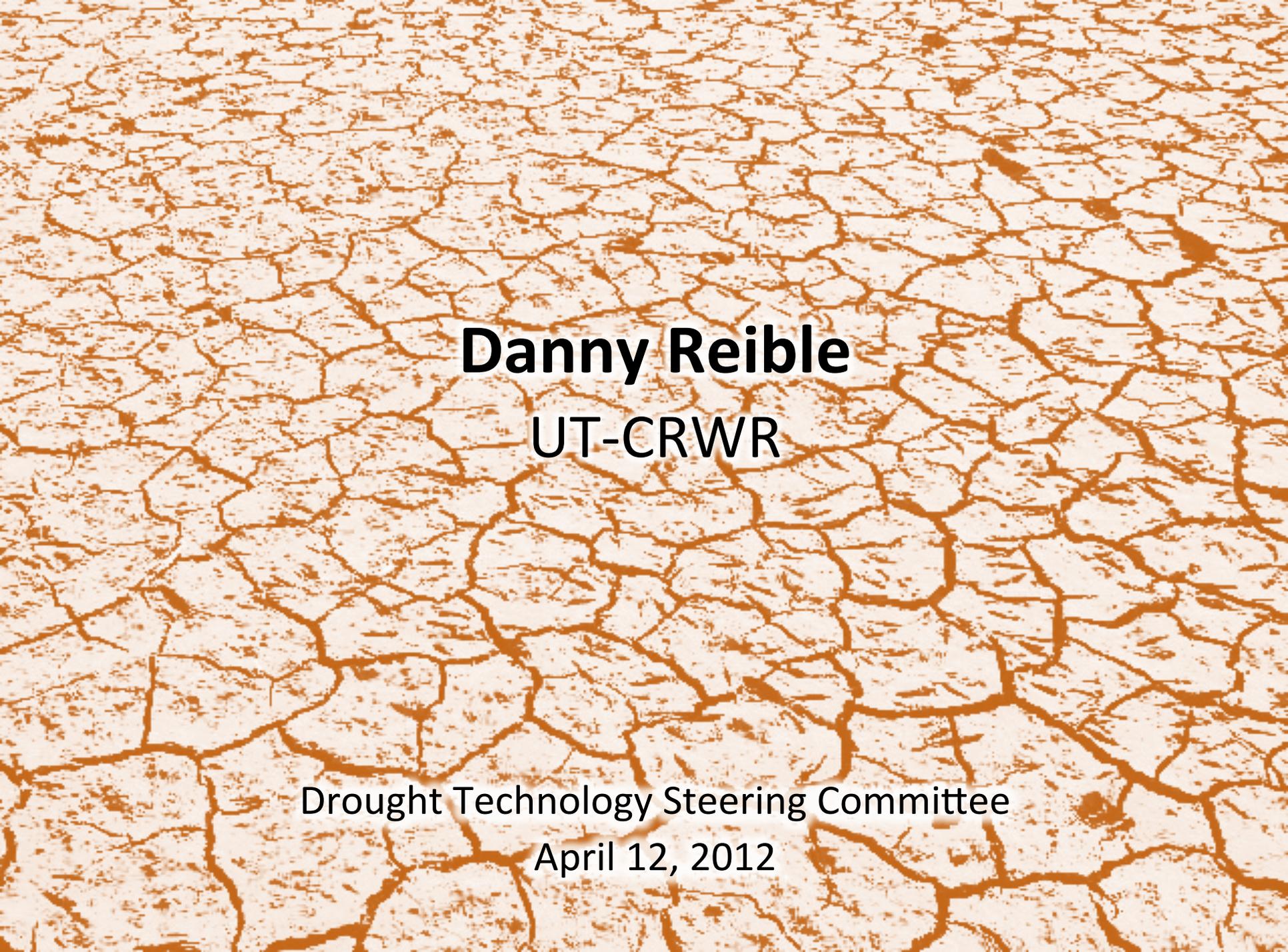
Early Warning/Decision Making Tool

- Provide agricultural producers with hydrologic forecasts
 - ✓ Maximize production
 - ✓ Minimize risk

• Similar tool can be developed for Drought Technology for Texas →



Observations – Modeling – Forecasting – Prediction



Danny Reible
UT-CRWR

Drought Technology Steering Committee

April 12, 2012

THE ACADEMY OF MEDICINE, ENGINEERING & SCIENCE OF TEXAS

MAY 20-21 AUSTIN, TEXAS

AT&T CONFERENCE CENTER



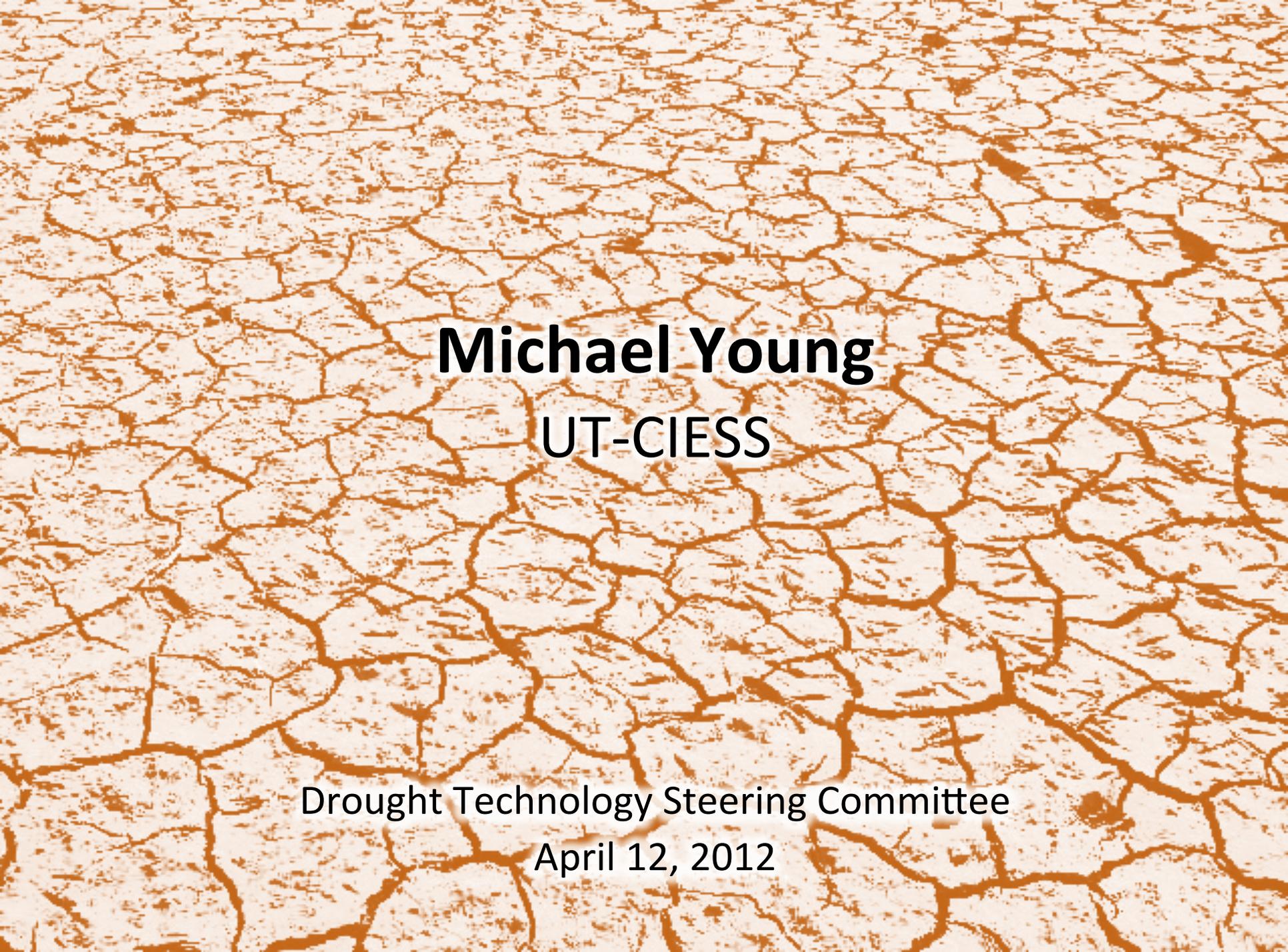
2012 TEXAS WATER SUMMIT

Securing Water for
Texas' Future

Join us for a forum exploring the state's water resources.

Scientists, engineers, policy analysts, legislators, CEOs and agency officials will gather to develop a common understanding of the science, technology, economics and policy requirements needed to address Texas' emerging water security challenges.

REGISTRATION NOW OPEN at WWW.TAMEST.ORG



Michael Young
UT-CIESS

Drought Technology Steering Committee

April 12, 2012

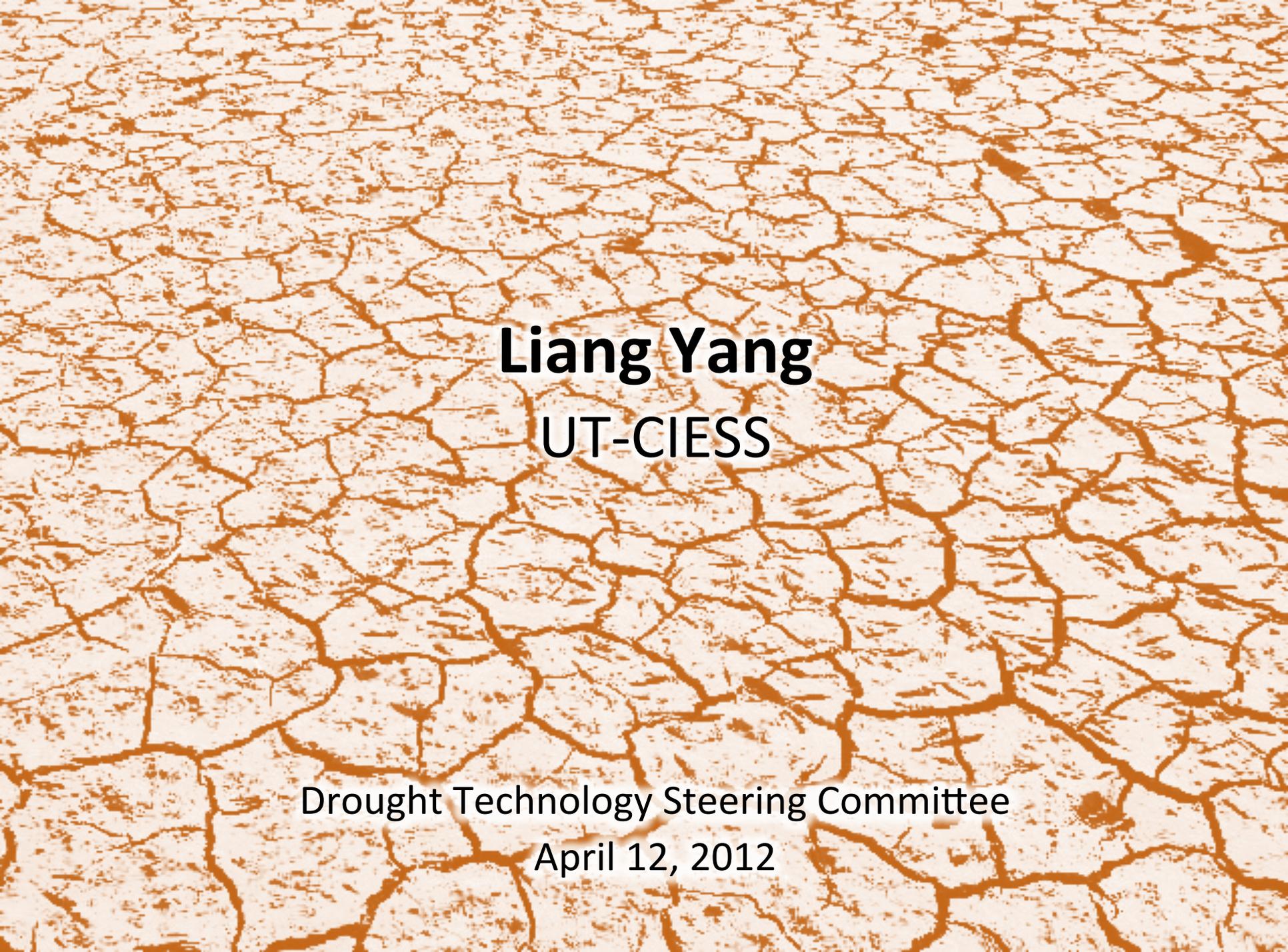
Bureau of Economic Geology – Water/Drought Related Research

Michael Young (michael.young@beg.utexas.edu)
Bridget Scanlon (bridget.scanlon@beg.utexas.edu)

- Vulnerability of water systems to drought, focusing on subsurface (soil moisture and groundwater) environments
- Comparing GRACE water storage changes with soil moisture (NLDAS) and groundwater data
- Predicting reservoir storage using neural networks including climate forecasts (Lower Colorado River)
- Assessing site suitability for aquifer storage and recovery

Bureau of Economic Geology – Water/Drought Related Research

- Soil moisture monitoring in the High Plains...expand to Lower Colorado River basin
- Optimizing conjunctive use of surface water and groundwater
- Working on water demand, particularly for utilities
- Endangered species impacts on water availability
- Expanding into water demand and economics (non-agriculture)
- Economic impacts of drought



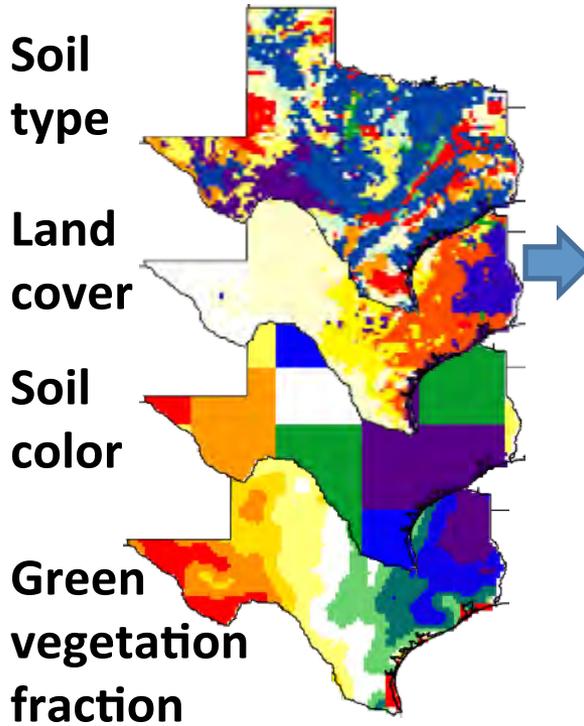
Liang Yang
UT-CIESS

Drought Technology Steering Committee

April 12, 2012

Land Surface Modeling in Support of Drought Technology Steering Committee Planning

Land surface features



**Model
output**

Noah-MP land
surface model

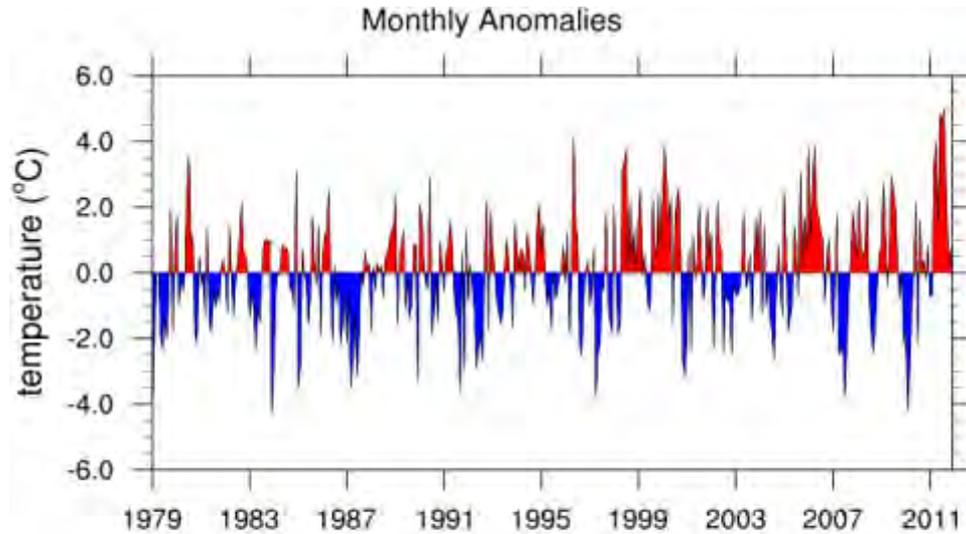
Surface runoff
Sub-surface runoff
Soil moisture
Evapotranspiration
Water table

NLDAS atmospheric forcing

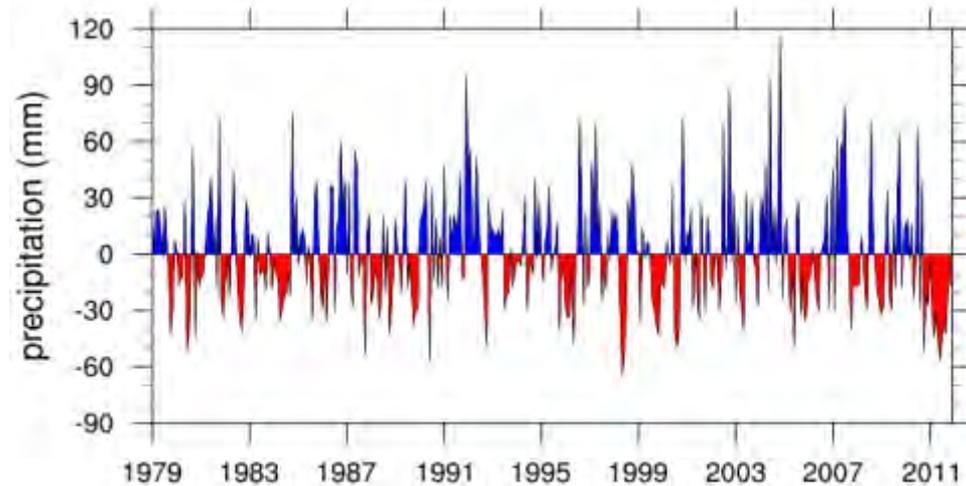
Temperature
Precipitation
Wind speed
Specific humidity
Surface pressure
Downward SW radiation
Downward LW radiation

Anomalies

2011
Highest positive
temperature anomaly

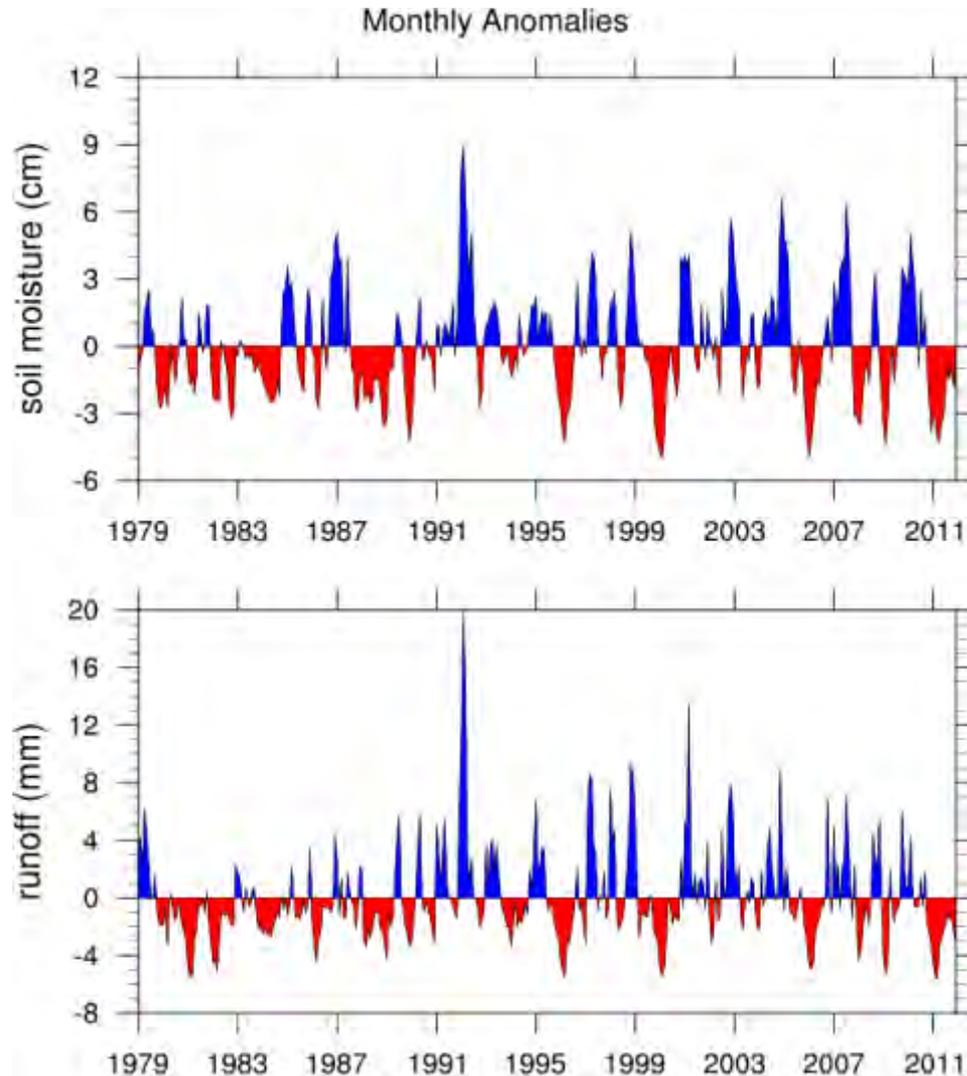


2011
Very high negative
precipitation anomaly

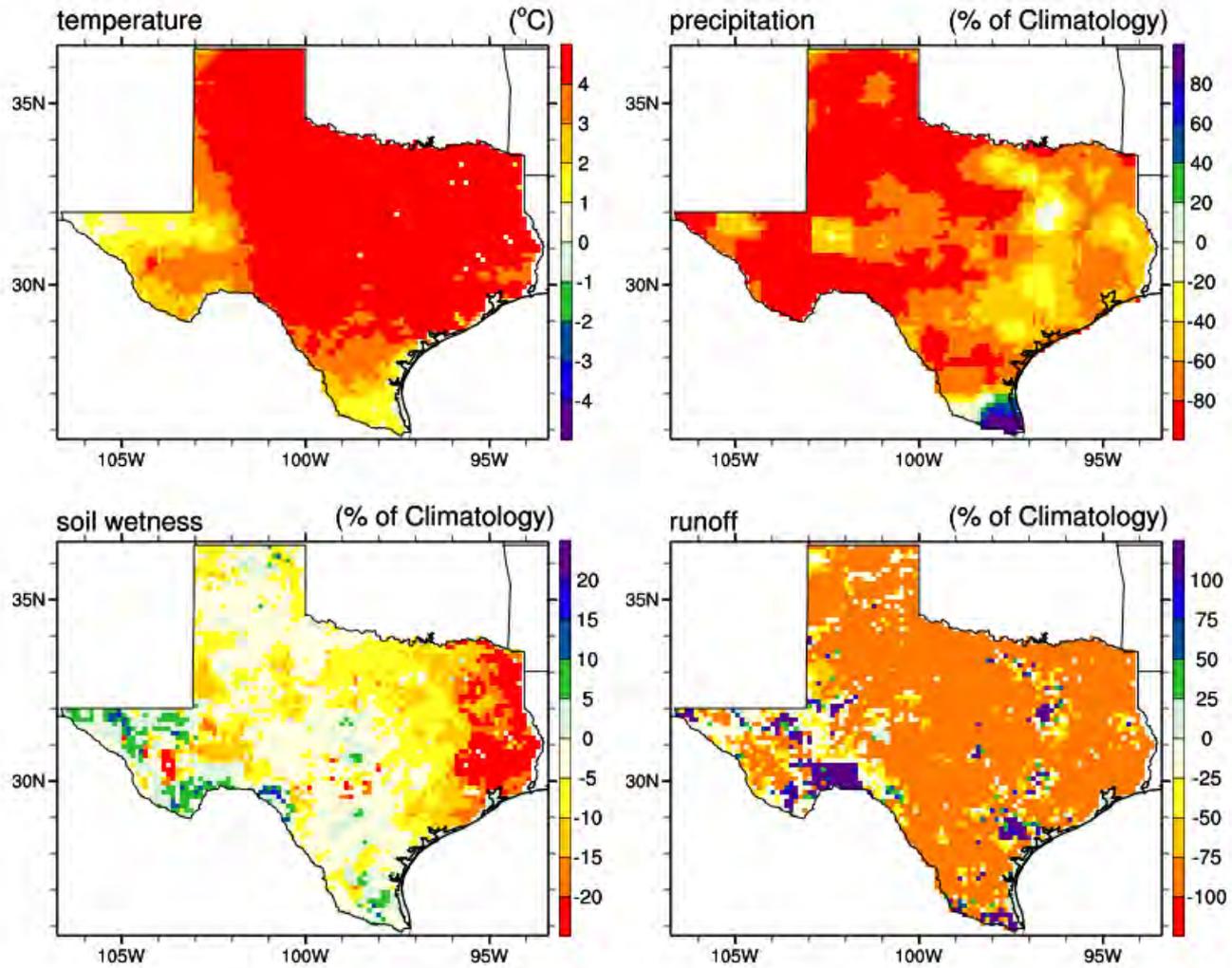


Anomalies

2011
Neither soil moisture
nor runoff anomaly
reaches the highest,
because of time lag?



Anomalies: Jun 2011



Anomalies: Aug 2011

