

Drought Technology for Texas

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Water Forum II: Texas Drought and Beyond
University of Texas at Austin

22 October 2012



THE UNIVERSITY OF TEXAS AT AUSTIN
**CENTER FOR INTEGRATED
EARTH SYSTEM SCIENCE**

- **Water Forum I**, Feb 13, 2012
- State water agencies and academic speakers
- Formed a **Drought Technology Steering Committee** to continue dialog
 - TWDB, TCEQ, TPWD, TDEM
 - UT Austin, TAMU – College Station, Texas Tech
- **Acknowledgements:** Brenner Brown, Kathy Alexander, David Bradsby, Mike Bewley, Byron Tapley, Himanshu Save, Gordon Wells, Teresa Howard, Johnnie Sullivan, Zong-Liang Yang, Xitian Cai, Jay Banner, Eric James, Charlie Kreidler, Cedric David, Dharhas Pothina

<http://www.texasdroughtinfo.org>



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AT&T CONFERENCE CENTER

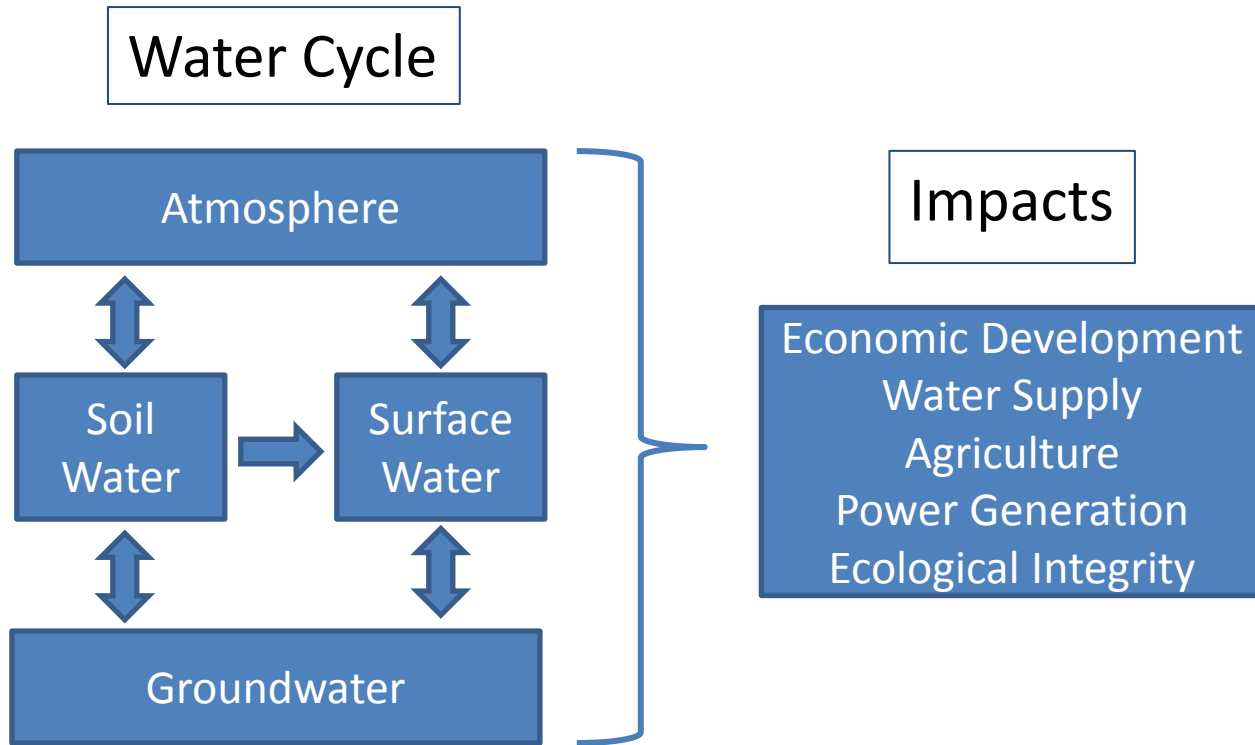
2012 TEXAS WATER SUMMIT

*Securing Water for
Texas' Future*

Hosted By The University of Texas at Austin and The University of Texas System

<http://www.tamest.org/events/2012-water-summit.html>

Drought Technology



Observations – Modeling – Forecasting – Prediction

Soil Water In Texas

Soil water system has 78 Km³ of water storage capacity in top 1m of soil

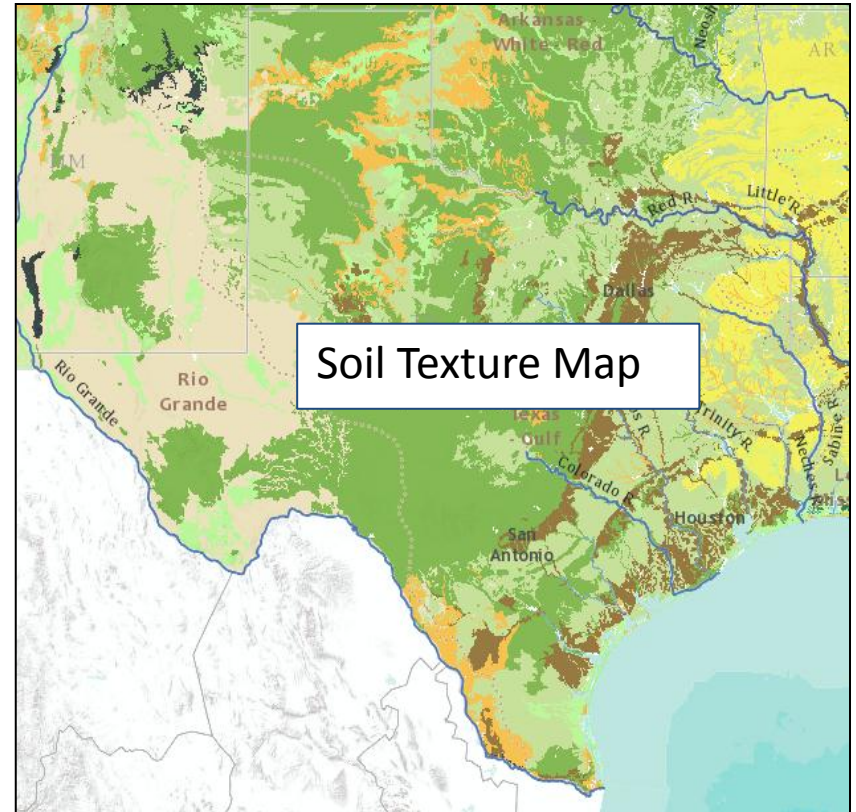
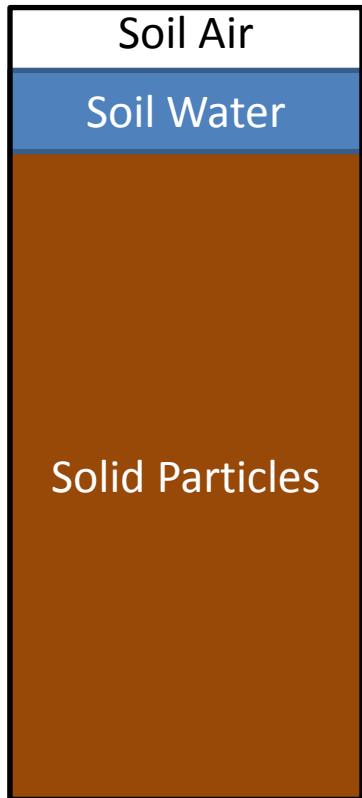
Soil Wetness Index

Saturated

100

Oven Dry

0



First meter of Texas soil contains
11 cm of soil water and soil air

105°W

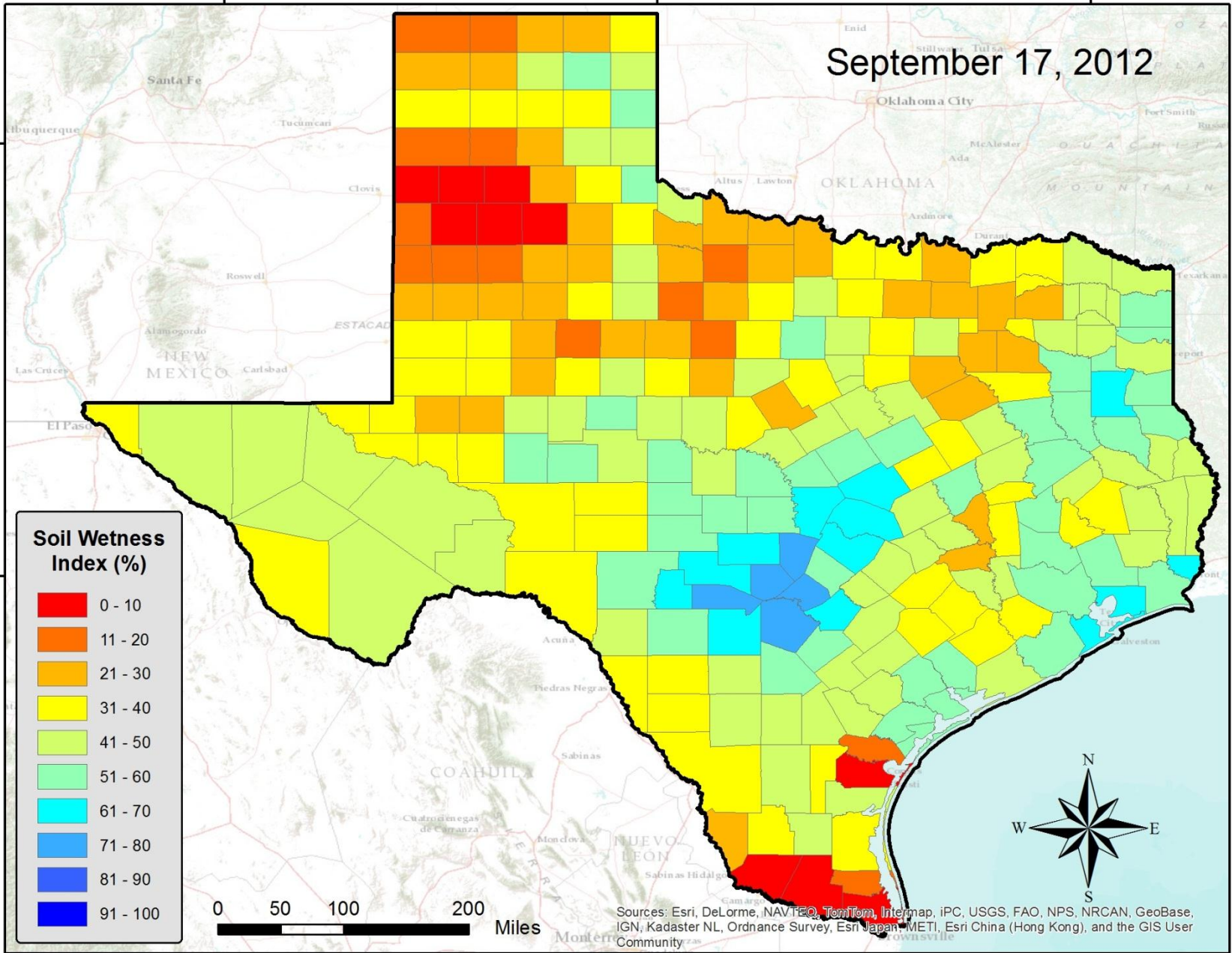
100°W

95°W

September 17, 2012

35°N

30°N



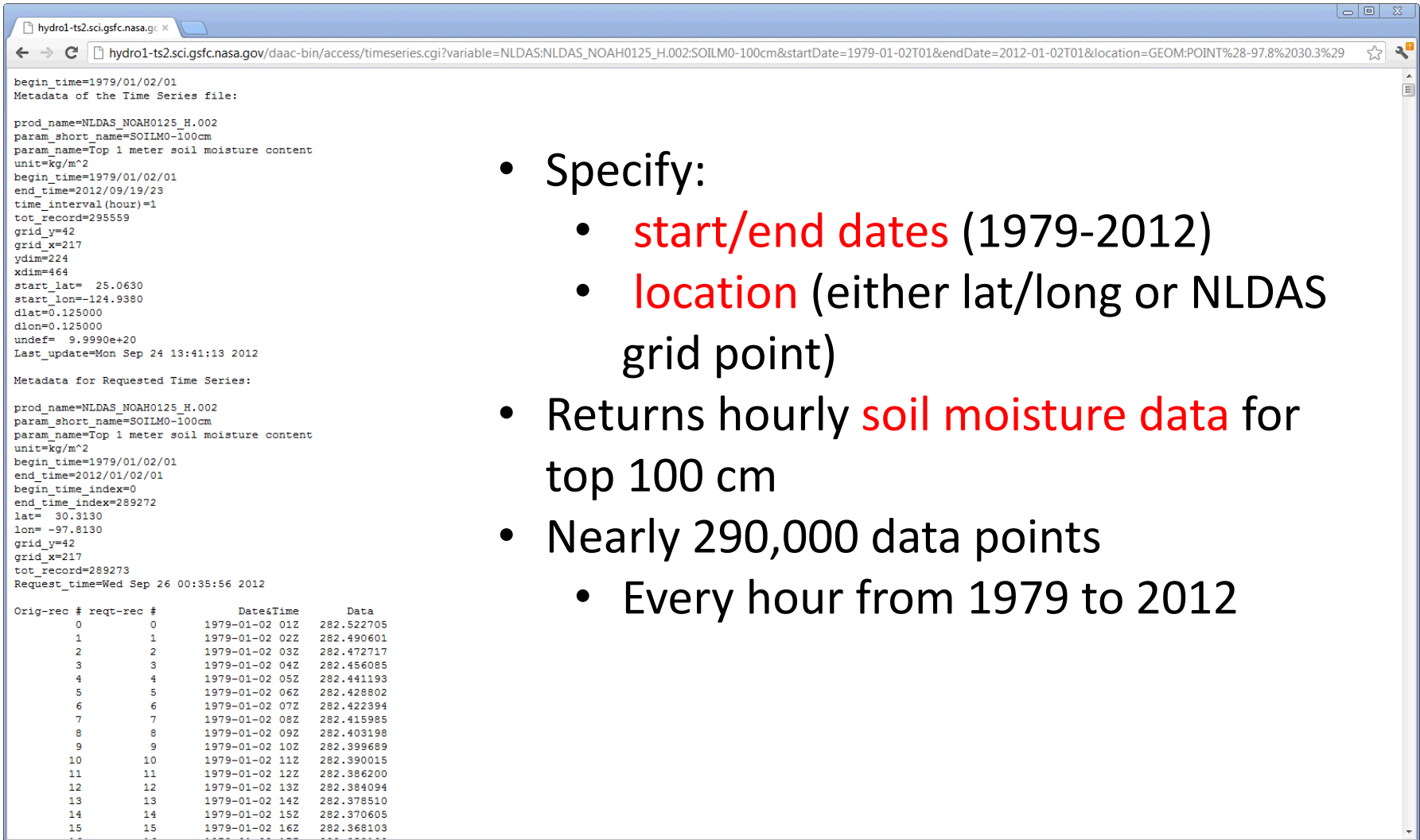
Soil Wetness Index (%)

-  0 - 10
-  11 - 20
-  21 - 30
-  31 - 40
-  41 - 50
-  51 - 60
-  61 - 70
-  71 - 80
-  81 - 90
-  91 - 100

0 50 100 200 Miles

Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

New NLDAS Web Service



begin_time=1979/01/02/01
Metadata of the Time Series file:

```
prod_name=NLDAS_NOAH0125_H.002
param_short_name=SOILM0-100cm
param_name=Top 1 meter soil moisture content
unit=kg/m^2
begin_time=1979/01/02/01
end_time=2012/09/19/23
time_interval(hour)=1
tot_Record=295559
grid_y=42
grid_x=217
ydim=224
xdim=464
start_lat= 25.0630
start_lon=-124.9380
dlat=0.125000
dlon=0.125000
undef= 9.9990e+20
Last_update=Mon Sep 24 13:41:13 2012
```

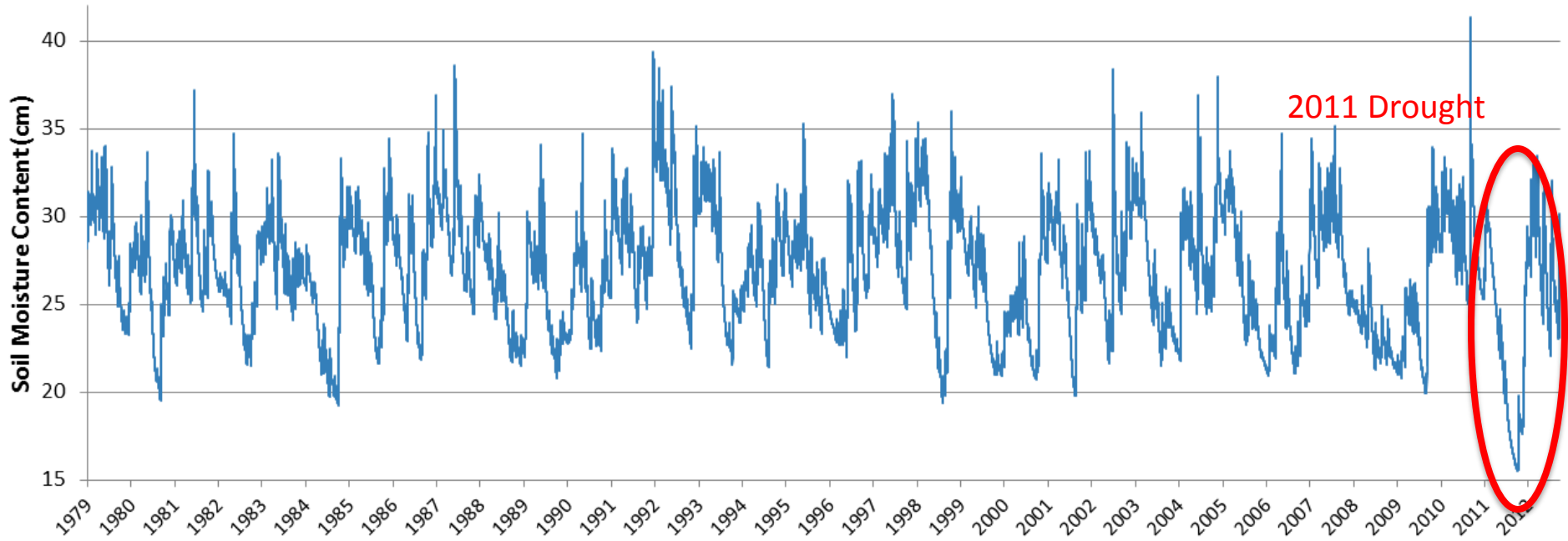
Metadata for Requested Time Series:

```
prod_name=NLDAS_NOAH0125_H.002
param_short_name=SOILM0-100cm
param_name=Top 1 meter soil moisture content
unit=kg/m^2
begin_time=1979/01/02/01
end_time=2012/01/02/01
begin_time_index=0
end_time_index=289272
lat= 30.3130
lon= -97.8130
grid_y=42
grid_x=217
tot_record=289273
Request_time=Wed Sep 26 00:35:56 2012
```

Orig-rec #	reqt-rec #	Date&Time	Data
0	0	1979-01-02 01Z	282.522705
1	1	1979-01-02 02Z	282.490601
2	2	1979-01-02 03Z	282.472717
3	3	1979-01-02 04Z	282.456085
4	4	1979-01-02 05Z	282.441193
5	5	1979-01-02 06Z	282.428802
6	6	1979-01-02 07Z	282.422394
7	7	1979-01-02 08Z	282.415985
8	8	1979-01-02 09Z	282.403198
9	9	1979-01-02 10Z	282.399689
10	10	1979-01-02 11Z	282.390015
11	11	1979-01-02 12Z	282.386200
12	12	1979-01-02 13Z	282.384094
13	13	1979-01-02 14Z	282.378510
14	14	1979-01-02 15Z	282.370605
15	15	1979-01-02 16Z	282.368103

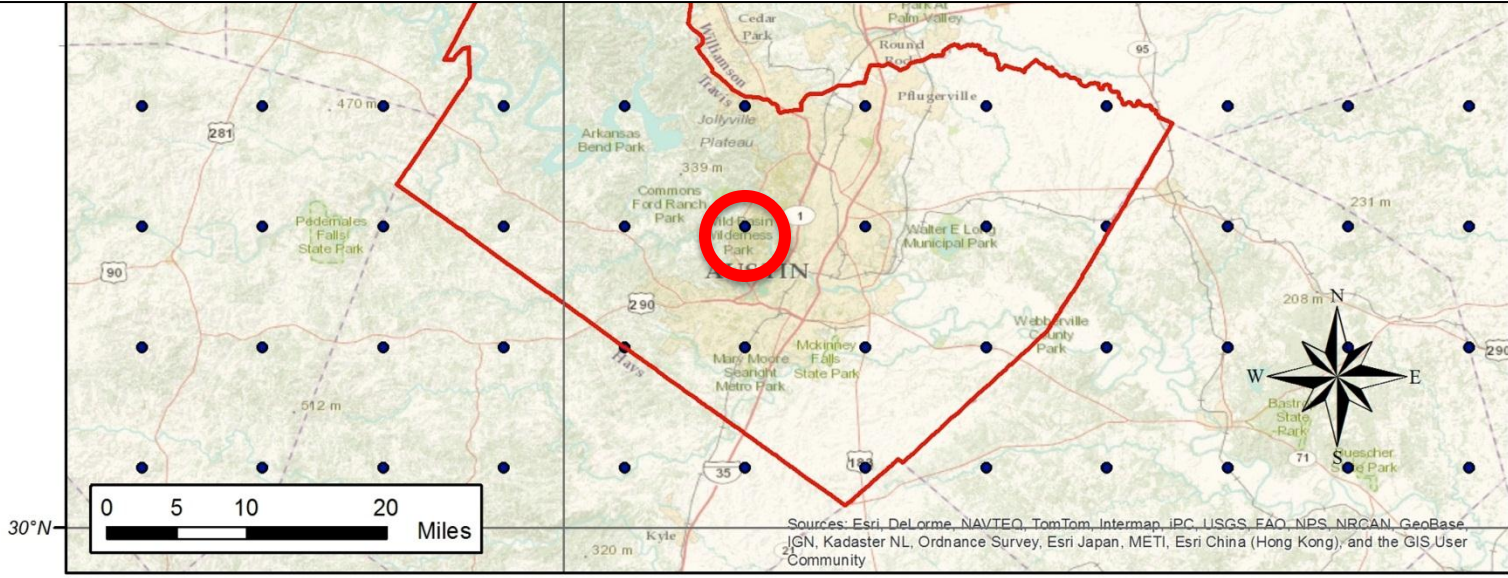
- Specify:
 - start/end dates (1979-2012)
 - location (either lat/long or NLDAS grid point)
- Returns hourly soil moisture data for top 100 cm
- Nearly 290,000 data points
 - Every hour from 1979 to 2012

NLDAS Grid Points over Texas



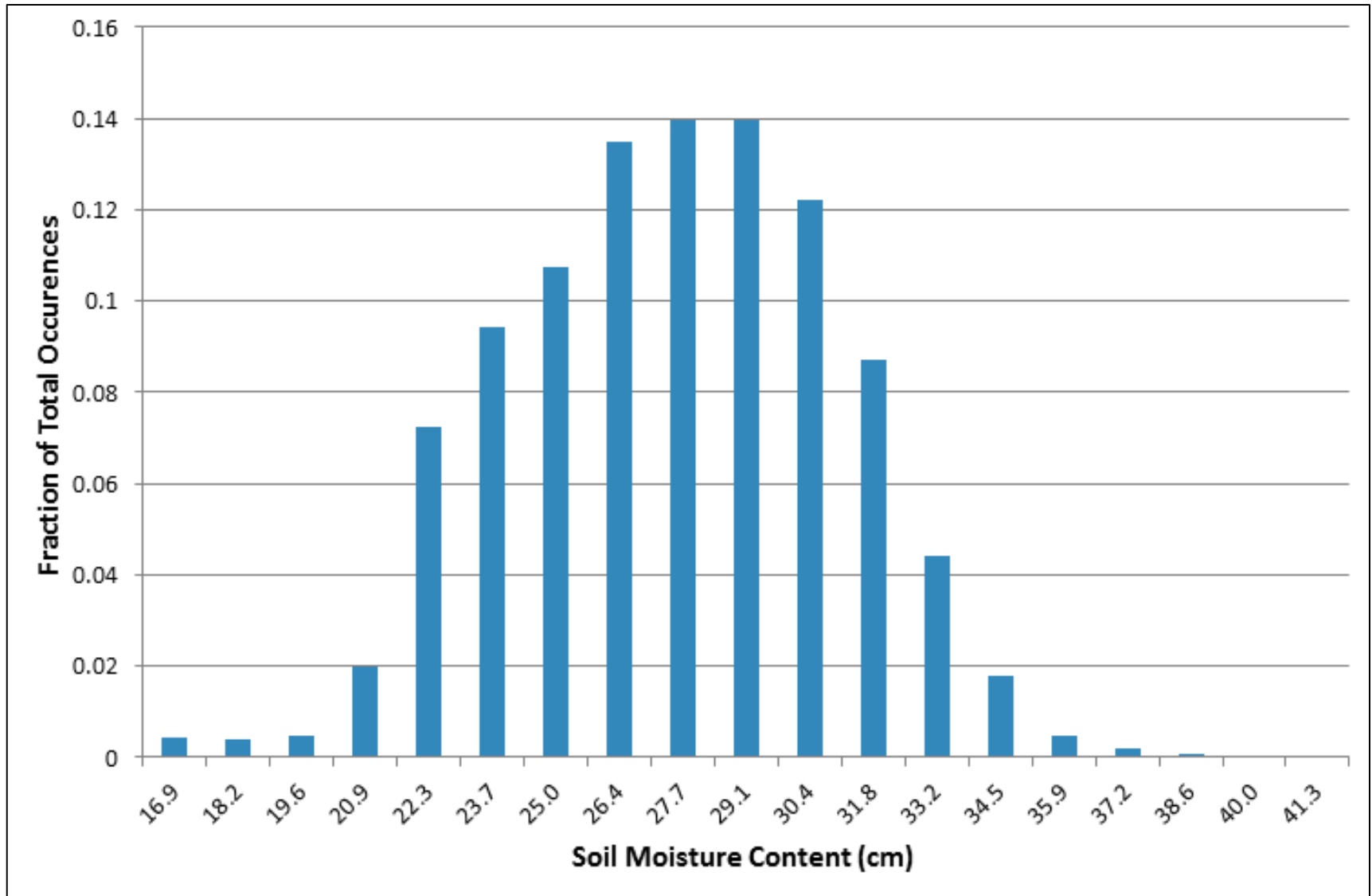
1979

2012

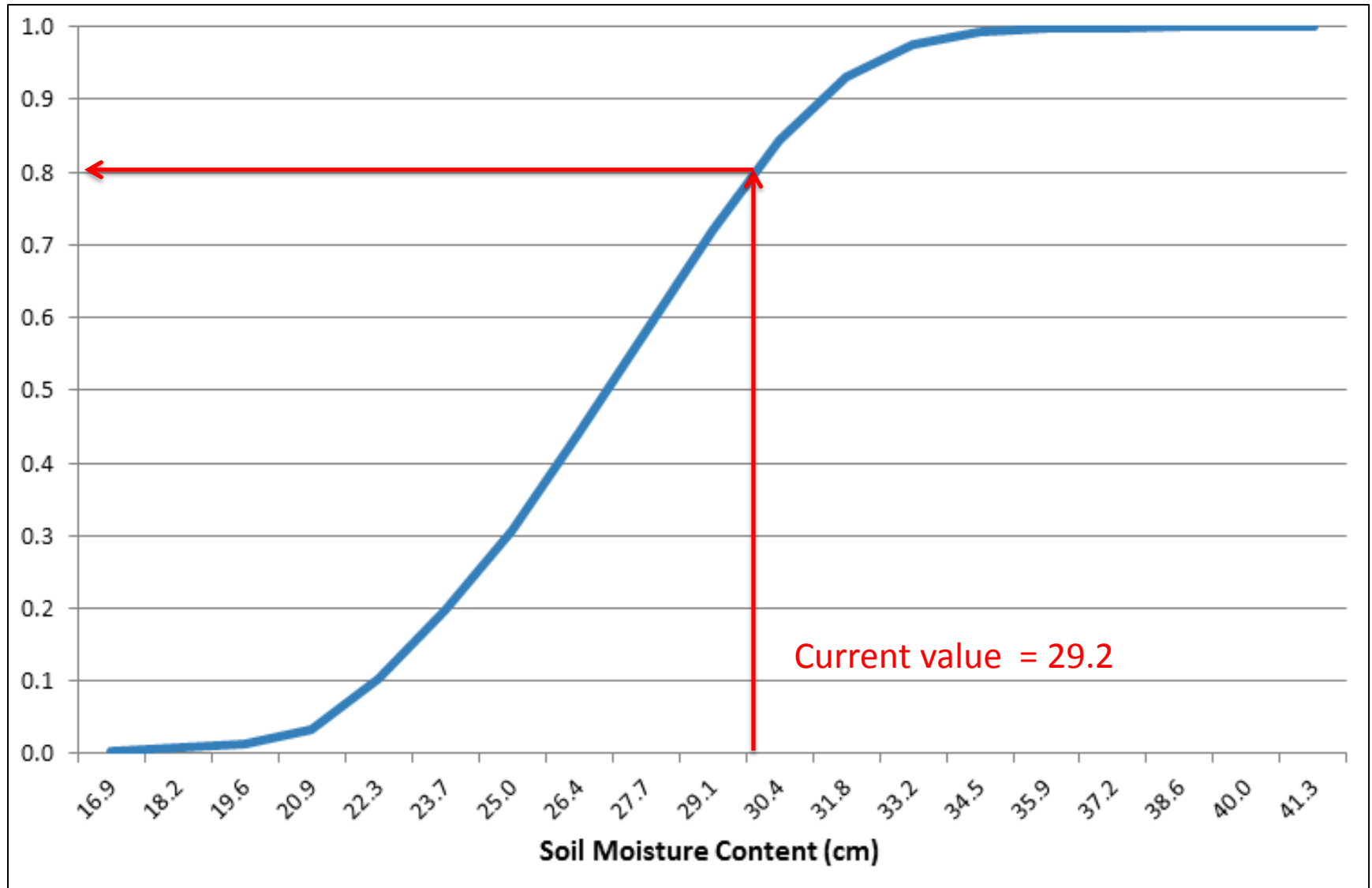


Sources: Esri, DeLorme, NAVTEO, TomTom, Intermap, IPC, USGS, FAO, NPS, NRCAN, GeoBase, JGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Relative Frequency Curve

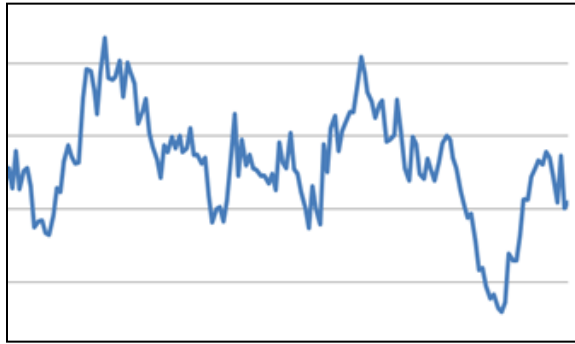


Cumulative Frequency Curve

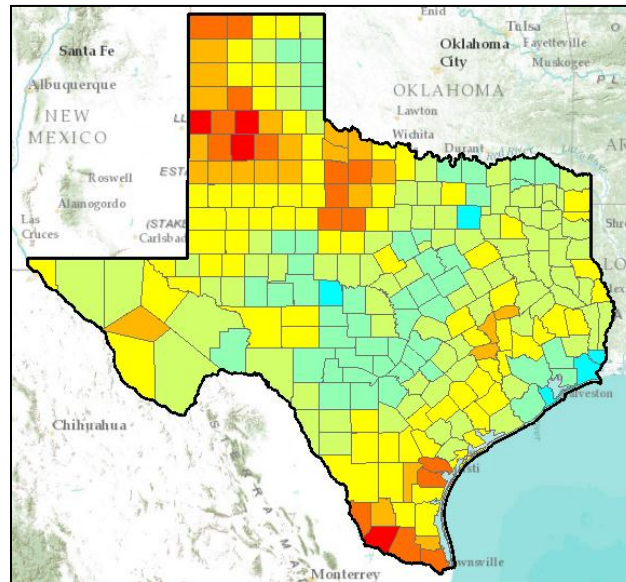


Texas Water and Climate Data System

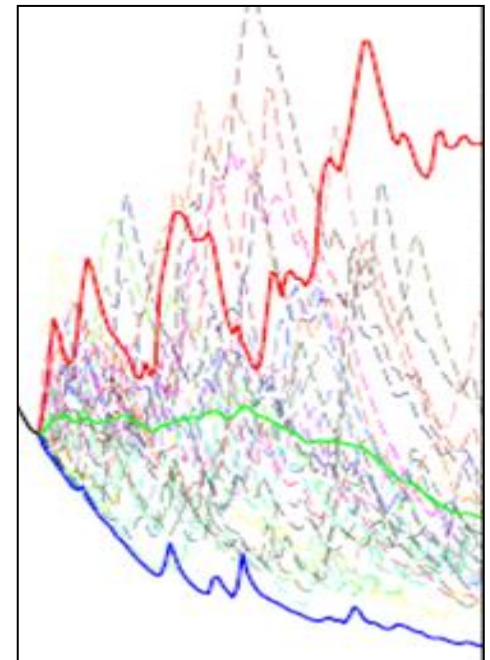
Improve our state-wide, real-time
situational awareness of water conditions



Statistics from past



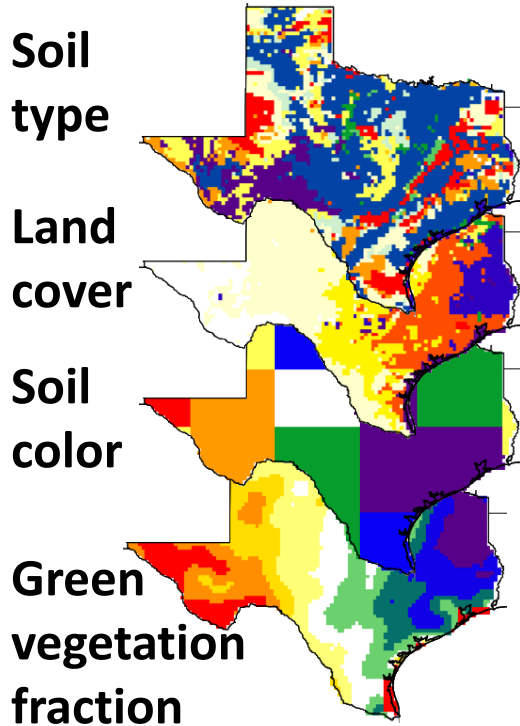
Current situation



Short-term
predictions

Calculate the Soil Water Balance of Texas

Land surface features



Model
output

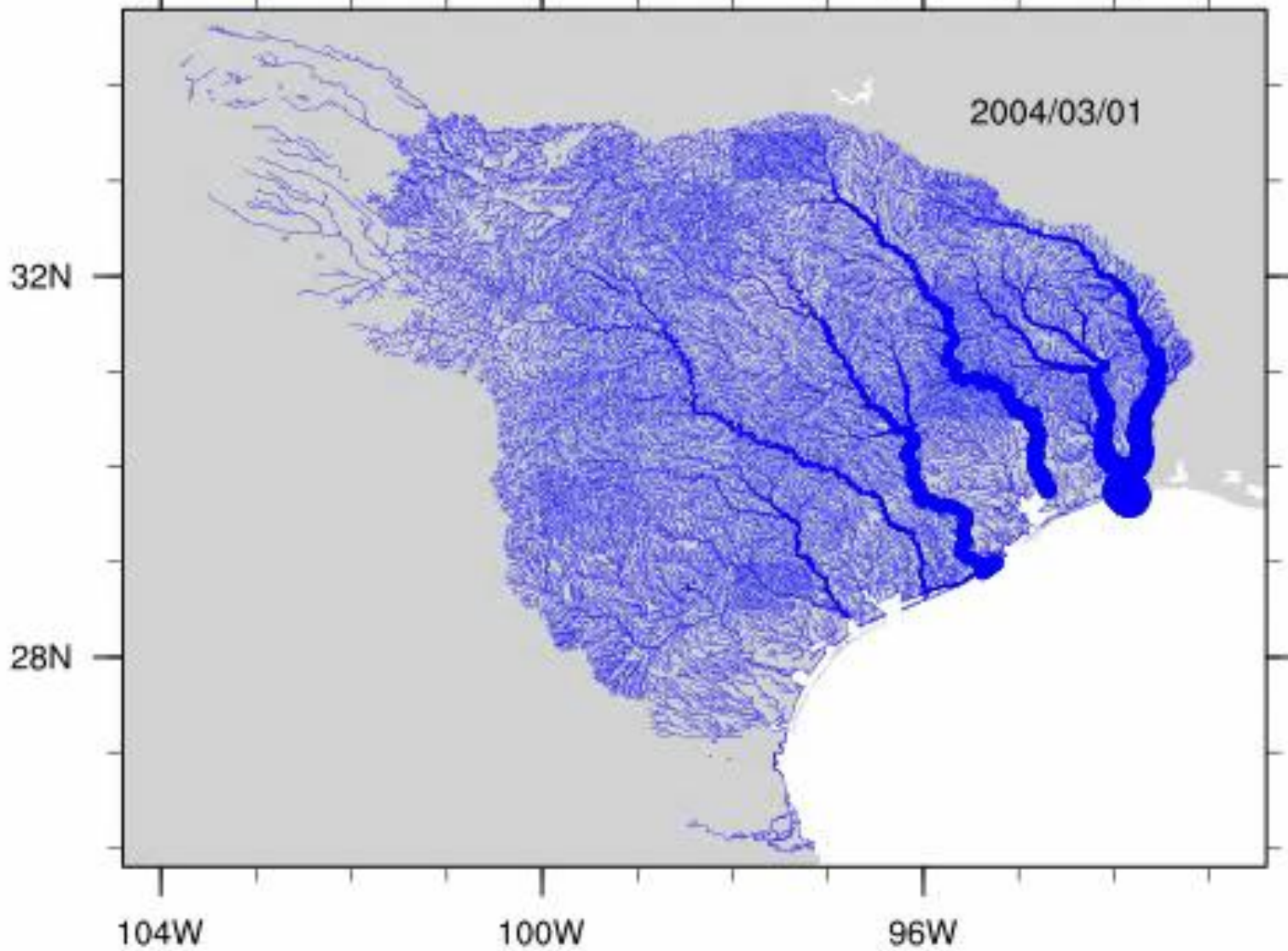
Noah-MP land
surface model

NLDAS atmospheric forcing

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

Surface runoff
Sub-surface runoff
Soil moisture
Evapotranspiration
Water table

River flow in the Texas Gulf Coast Hydrologic Region

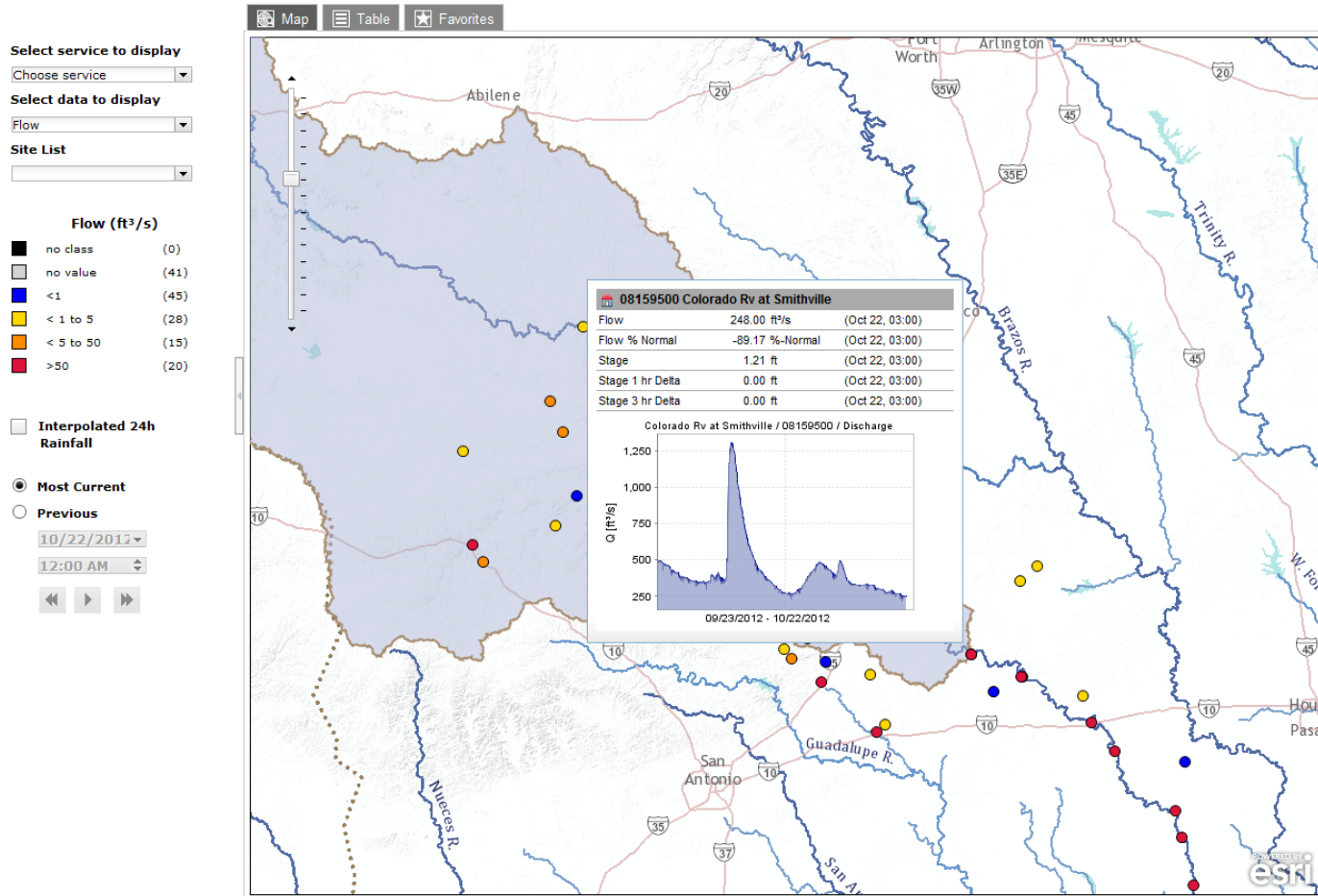


RAPID River Flow Model

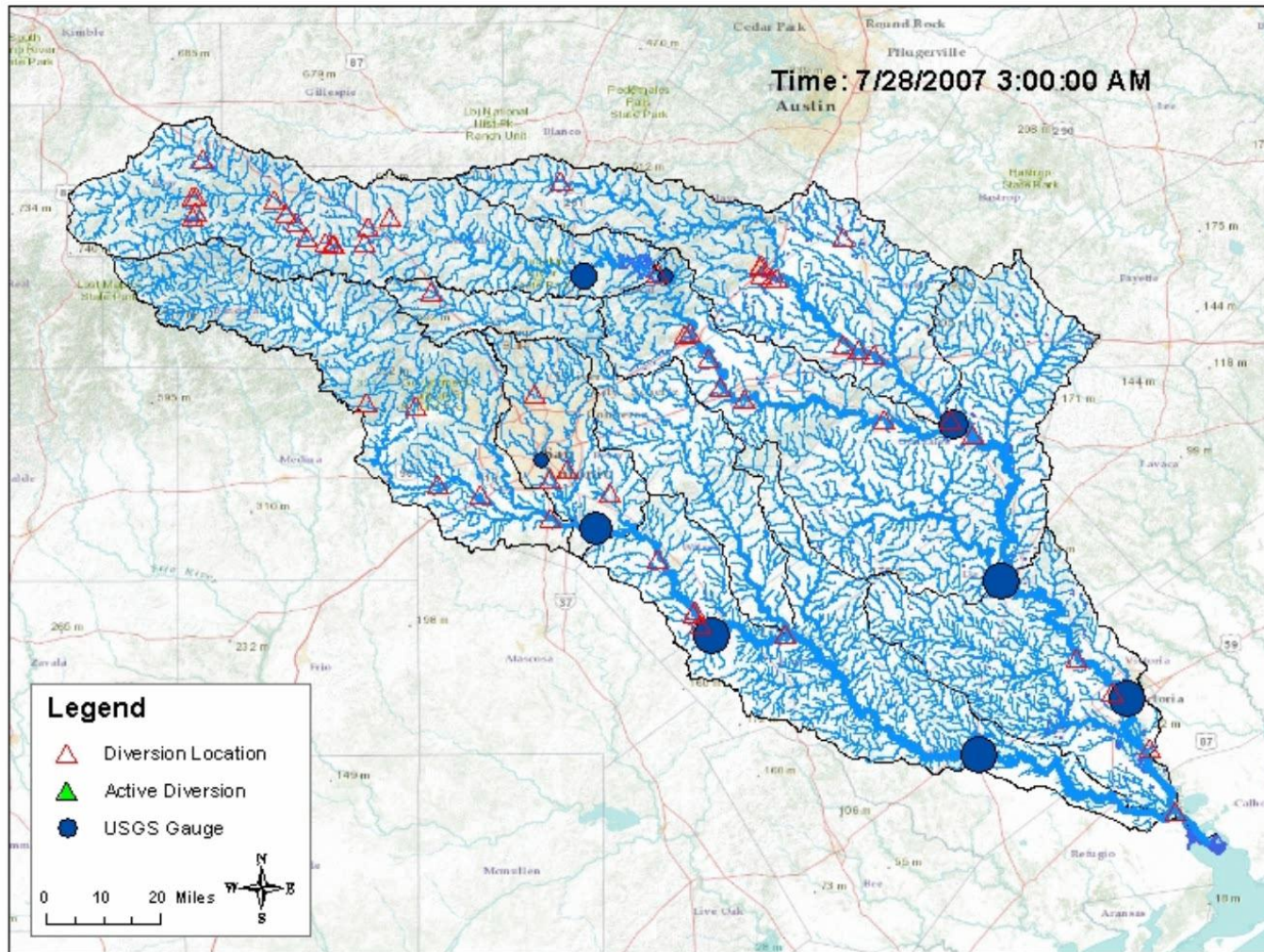
Central Texas Hub

Synthesized Real-Time Water Observations

Central Texas HUB



TCEQ Water Master Operations



Drought Technology for Texas

- Last severe drought in 1996 led to **Senate Bill 1** in 1997 and SB2, SB3 later
- Great improvement in **long term water planning** (10 to 50 years in future)
- The 2011 drought exposed
 - We need a state-wide, real-time **water climate and data system**
 - We need to be able to **see ahead** 6-18 months for rational water decision making