

Drought & Local-Level Monitoring

Pinal County Local Area Impact Assessment Group

Tuesday, July 18, 2006
Central Arizona College
Coolidge, Arizona

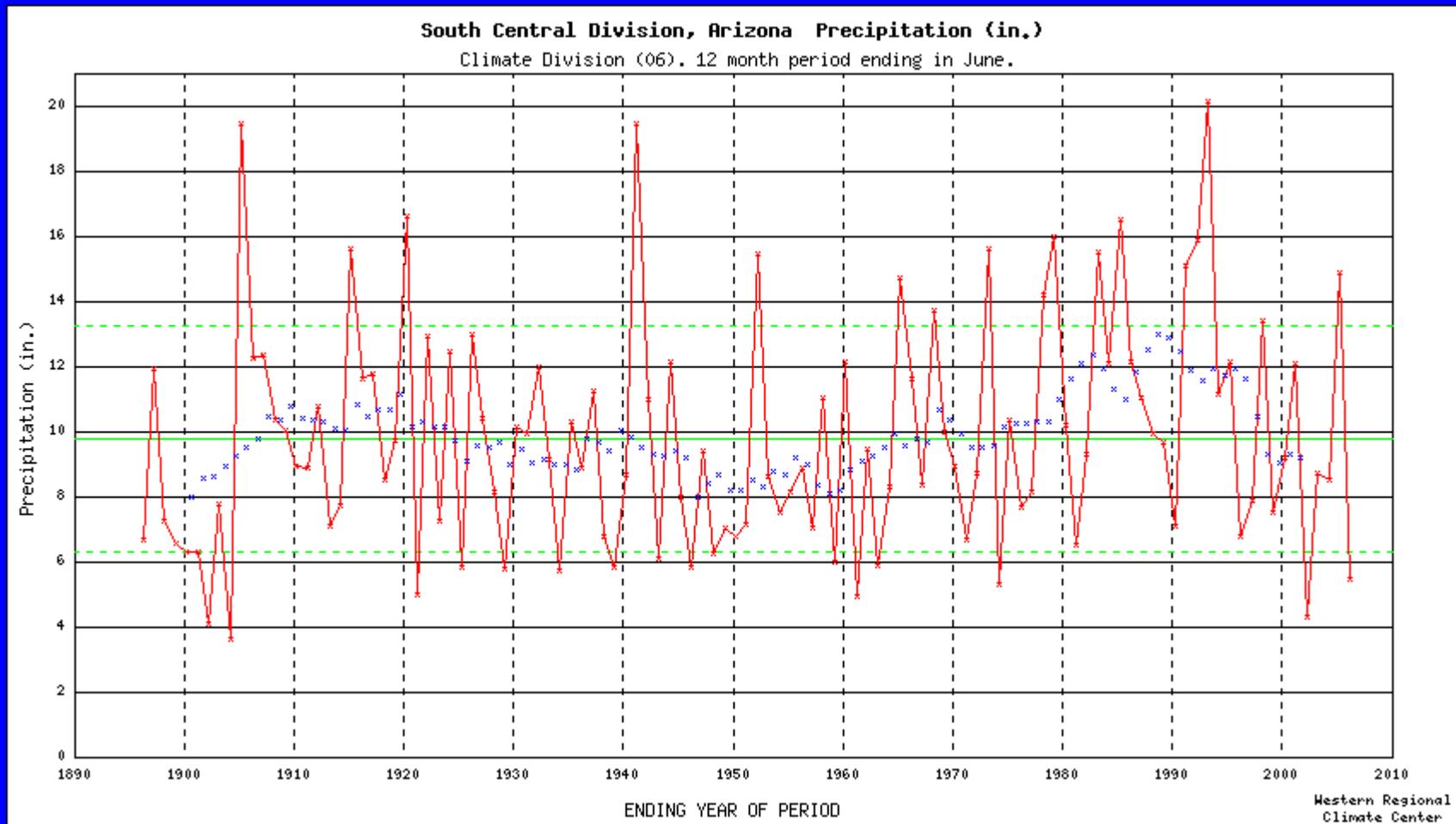
Gregg Garfin, *Program Manager*
CLIMAS/ISPE
University of Arizona



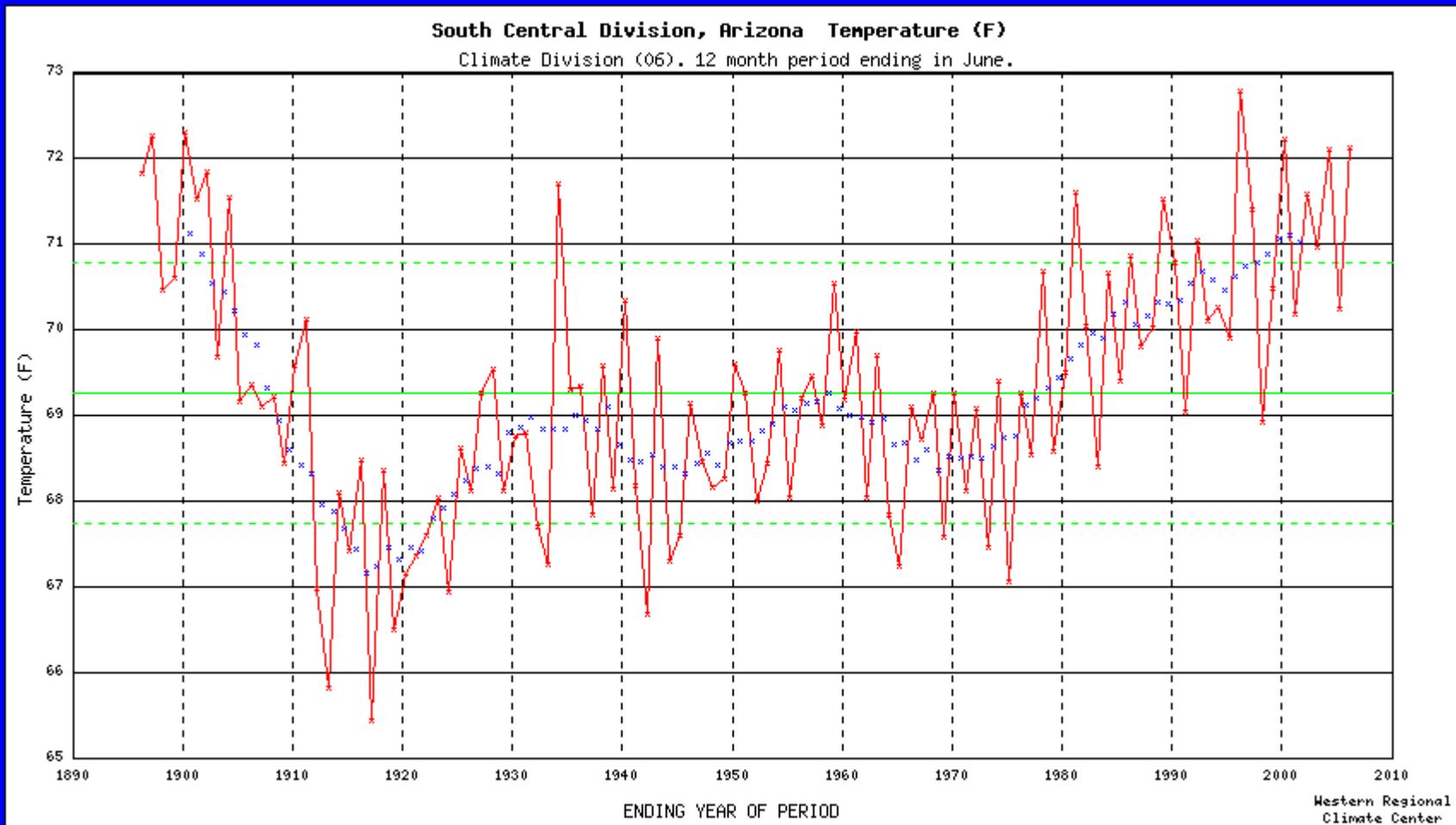
CLIMAS
Climate Assessment Project for the Southwest



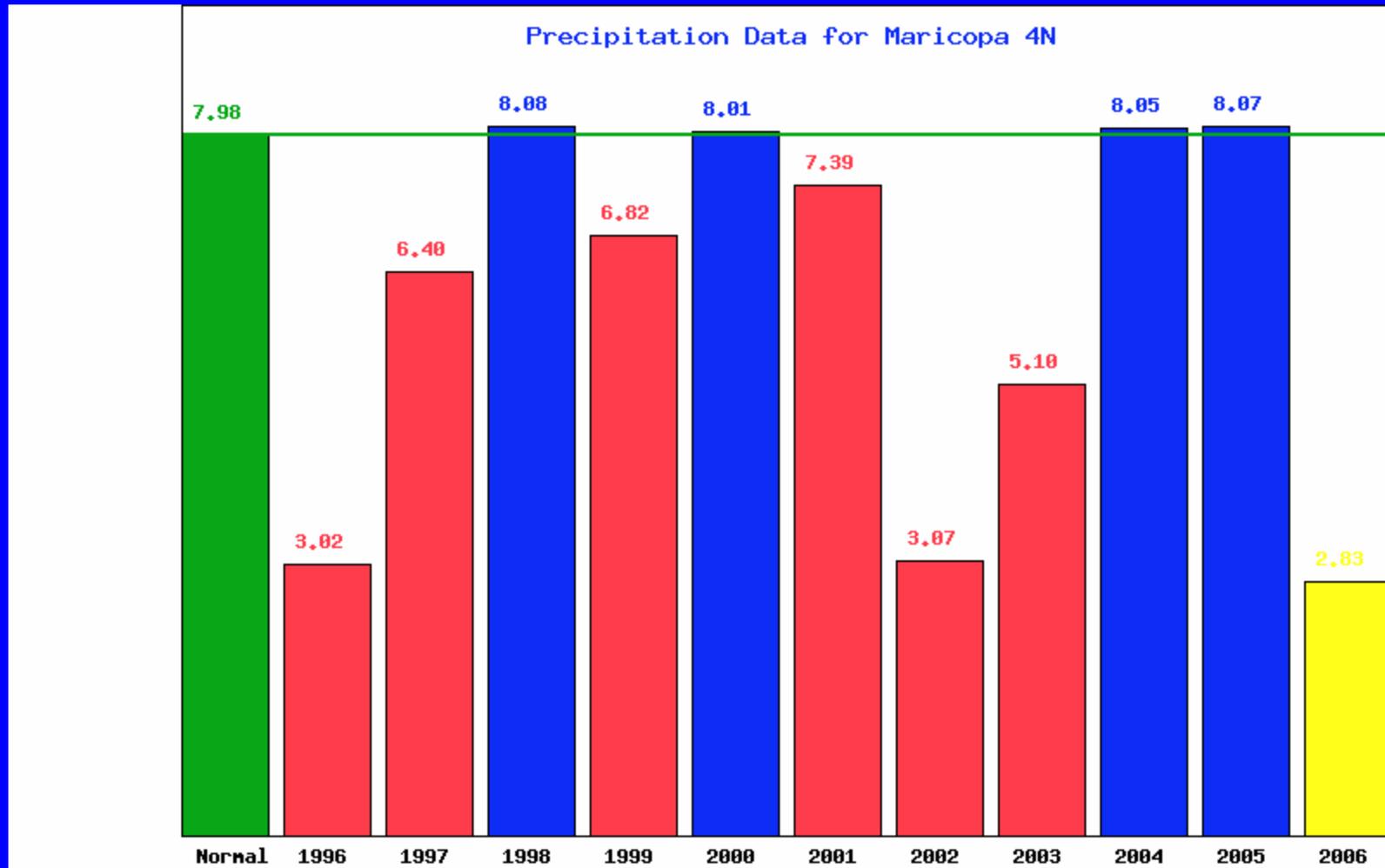
State of the Drought



Western Regional Climate Center
<http://www.wrcc.dri.edu/divisional.html>



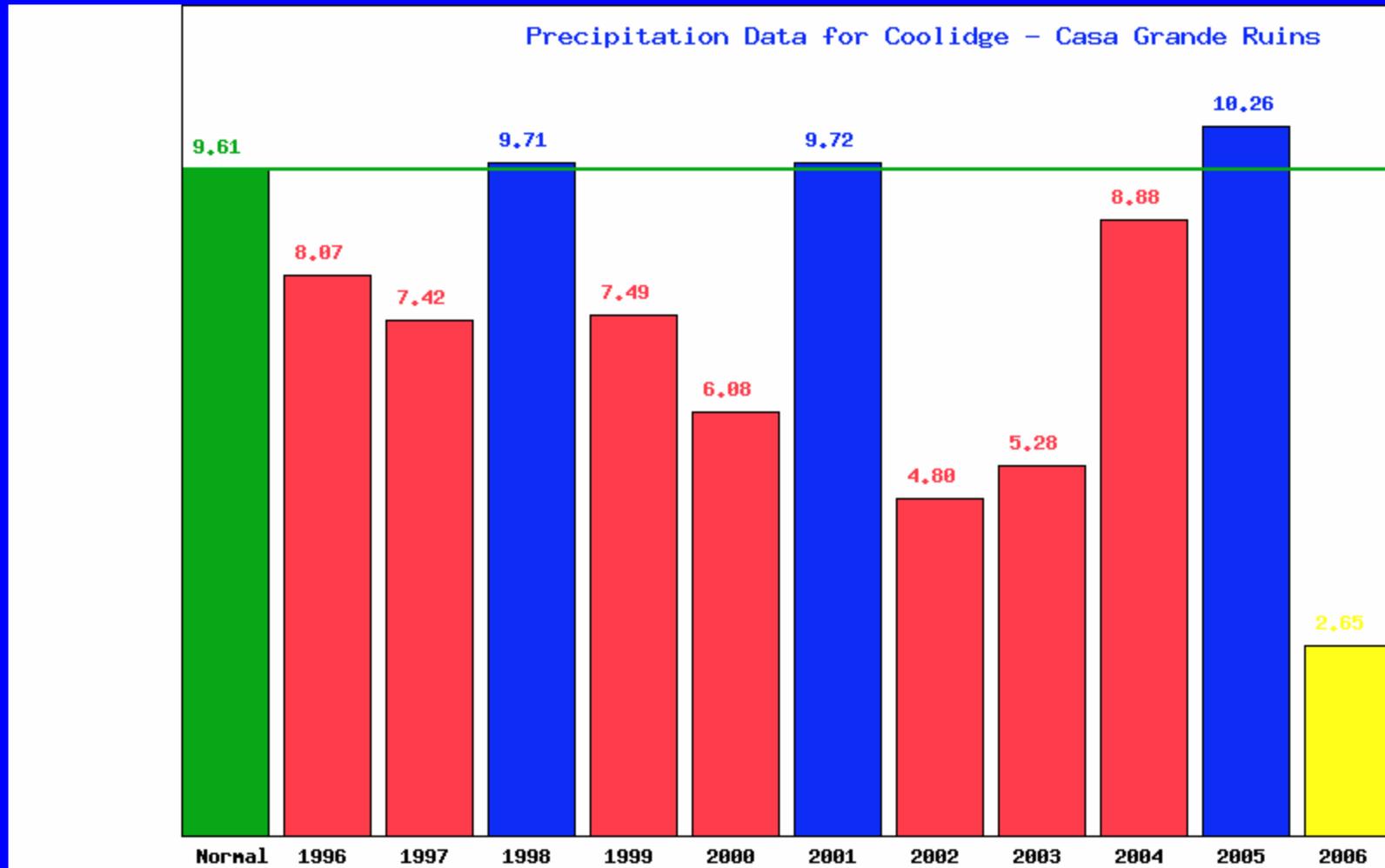
Western Regional Climate Center
<http://www.wrcc.dri.edu/divisional.html>



Since 1999: -9.6"

National Weather Service Phoenix

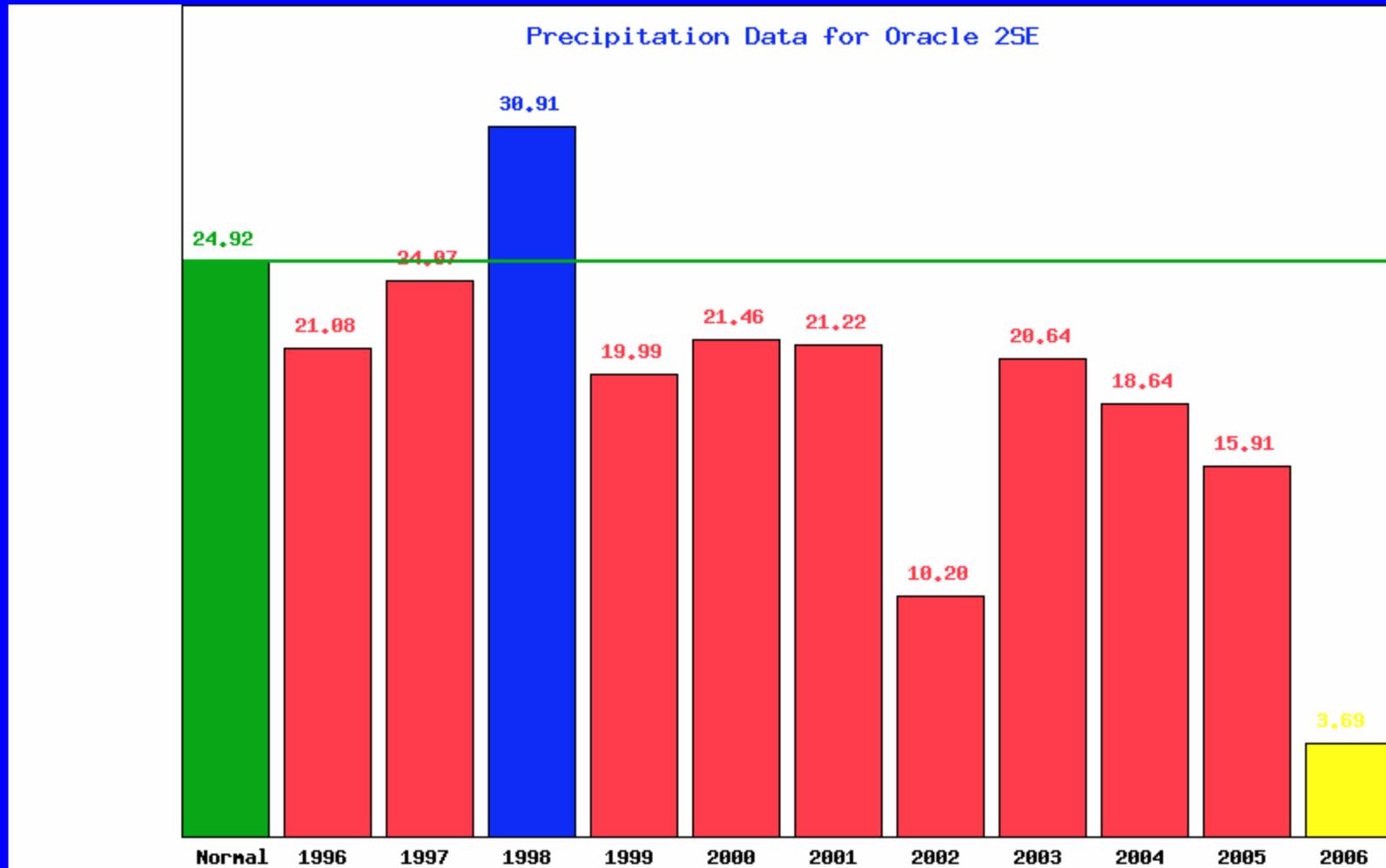
<http://www.wrh.noaa.gov/psr/DroughtPage.php?data=ALLDATA>



Since 1999: -15.8"

National Weather Service Phoenix

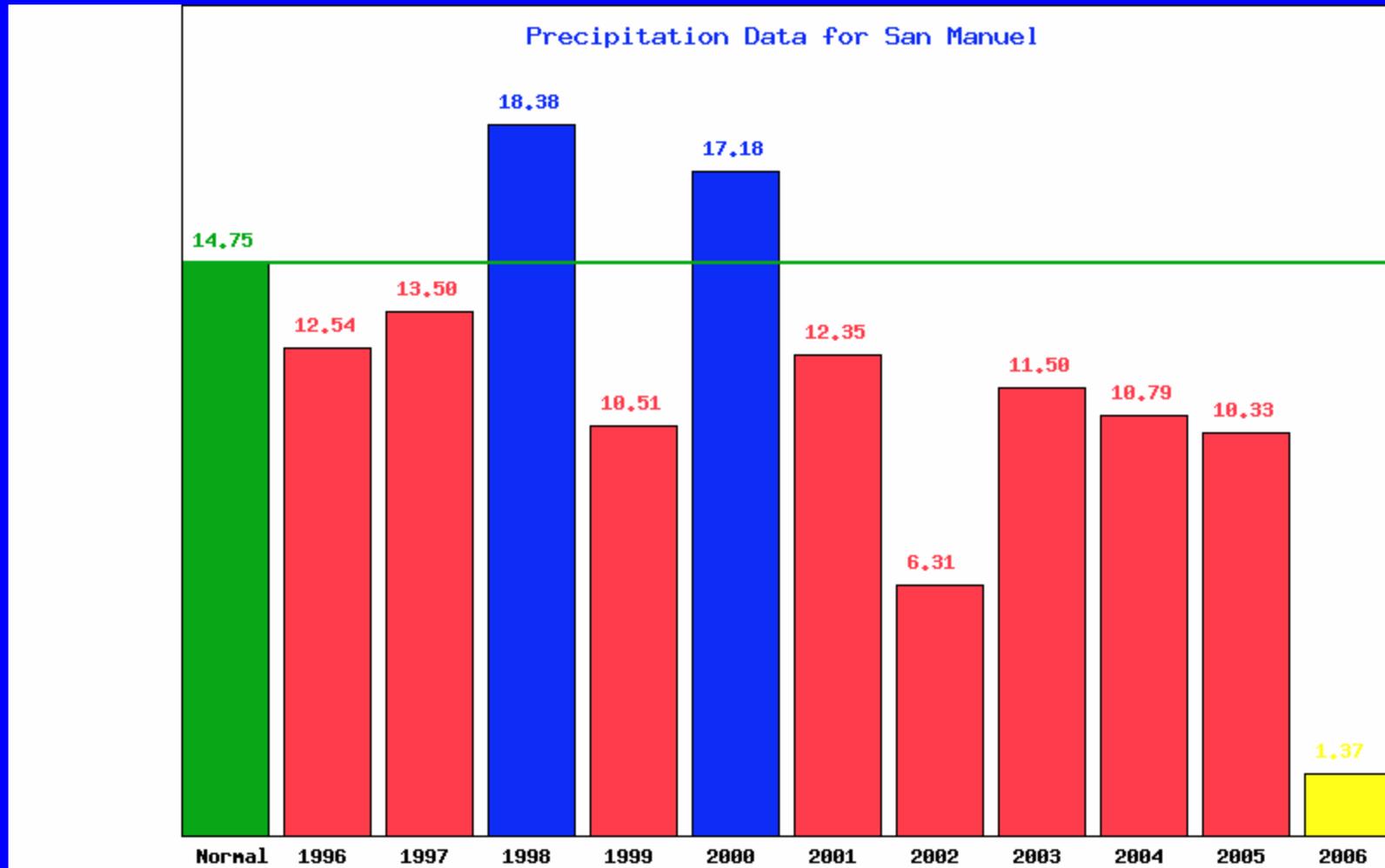
<http://www.wrh.noaa.gov/psr/DroughtPage.php?data=ALLDATA>



Since 1999: -52.2"

National Weather Service Phoenix

<http://www.wrh.noaa.gov/psr/DroughtPage.php?data=ALLDATA>



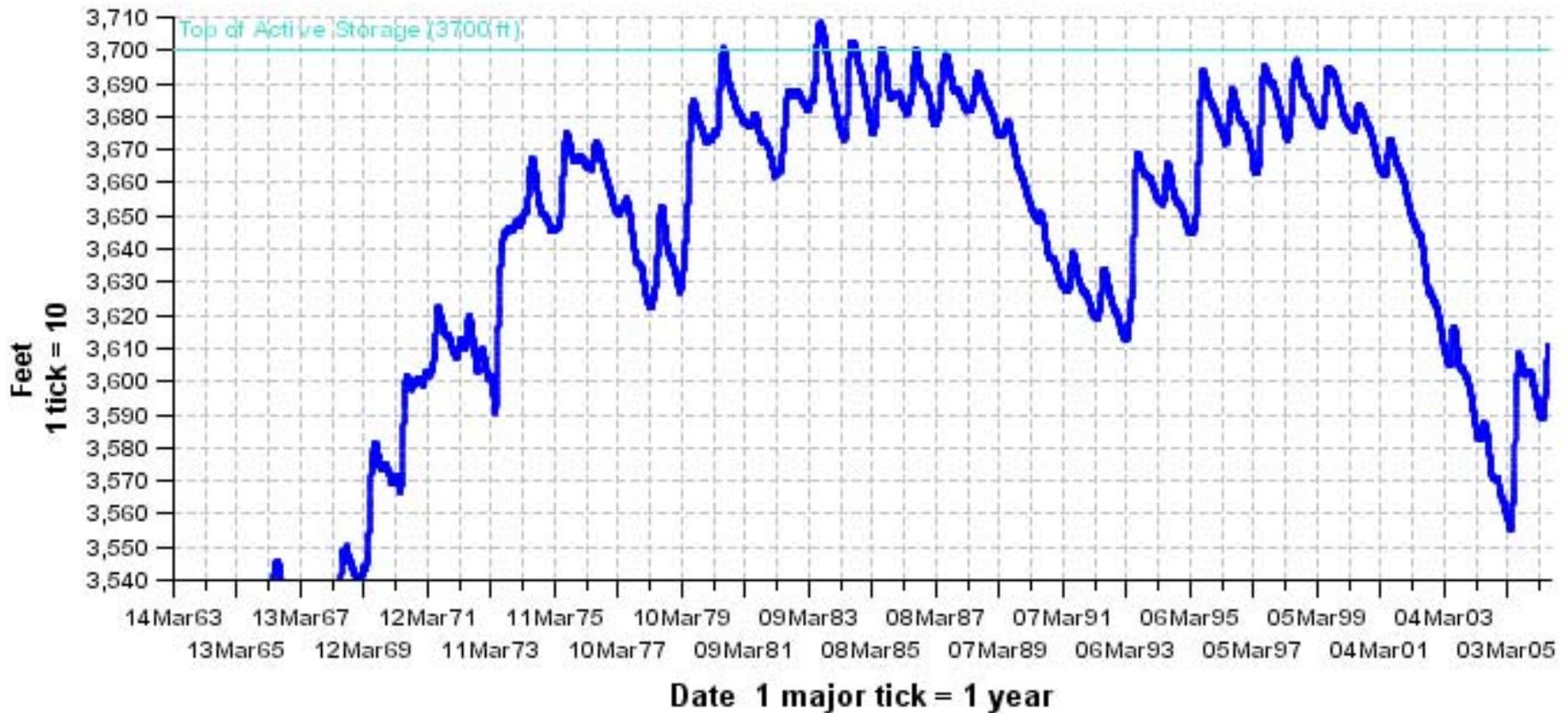
Since 1999: -27.9"

National Weather Service Phoenix

<http://www.wrh.noaa.gov/psr/DroughtPage.php?data=ALLDATA>

Lake Powell

(US Bureau of Reclamation -- <http://www.usbr.gov/uc/crsp/GetSiteInfo>)



2000 – 62%

2001 – 59%

2002 – 25%

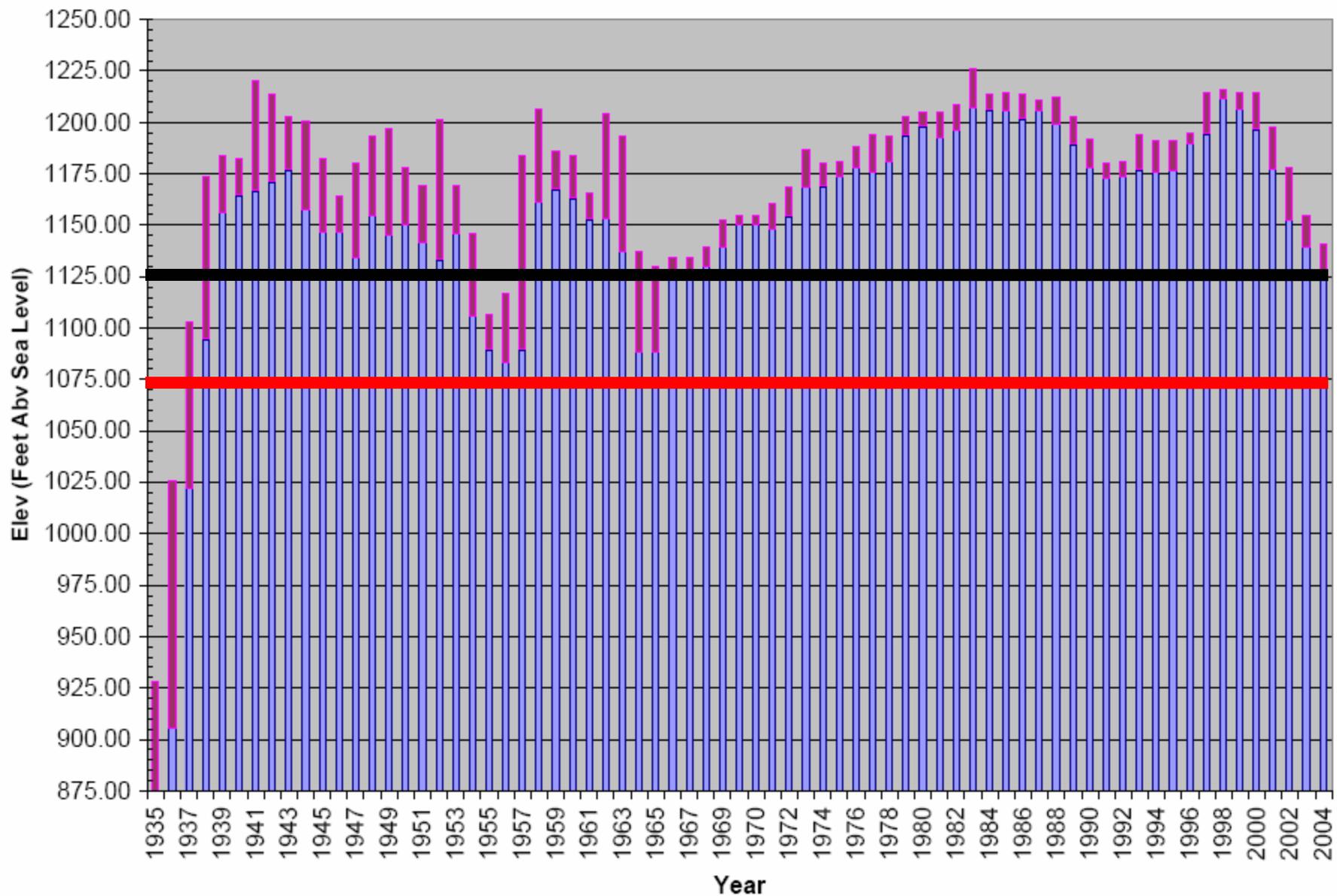
2003 – 51%

2004 – 49%

2005 – 105%

2006 – 66%

Lake Mead High and Low Elevations (1935-2004)



Note: Low Elevation for 1935 is 673.50 feet

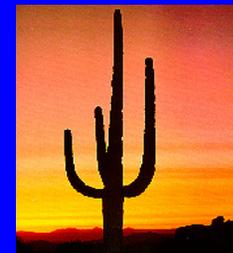
Lake Mead

(US Bureau of Reclamation -- <http://www.usbr.gov/lc/riverops.html>)

Arizona Drought Monitoring Technical Committee



ARIZONA DIVISION OF
EMERGENCY MANAGEMENT



OFFICE OF THE ARIZONA
STATE CLIMATOLOGIST

Components of Drought Risk Management

$$\text{Risk} = \text{Hazard} \times \text{Vulnerability}$$

(natural event) (social factors)

**Monitoring
Including LAIAGs**

Drought Monitoring Philosophy

- Watersheds
 - Big picture – raise the initial flag
 - Long-term data – comparison with past
- Multiple drought types and maps
- Consult short period of record and qualitative data

Drought Indicators

Data to describe drought conditions

- precipitation
- streamflow
- reservoir levels
- groundwater
- drought indices

1975-present

Drought Triggers

Specific values of the indicators that initiate and terminate drought status levels and management responses

Level	Description	Percentile
0	No Drought	40.1-100.0%
1	Abnormally Dry	25.1-40.0%
2	Moderate Drought	15.1-25.0%
3	Severe Drought	5.1-15.0%
4	Extreme Drought	0.0-5.0%

Drought Trigger Goals

- Advance warning going in to drought
- Cautious coming out of drought
 - 4 month consistency requirement
- Smooth transitions between drought levels
- Consistency with historical impacts

Drought Trigger Steps

- Rank raw data = “percentiles”
- Assign each indicator a status level
- Average the drought status levels
- Apply consistency criteria, if necessary

Corroborative Data

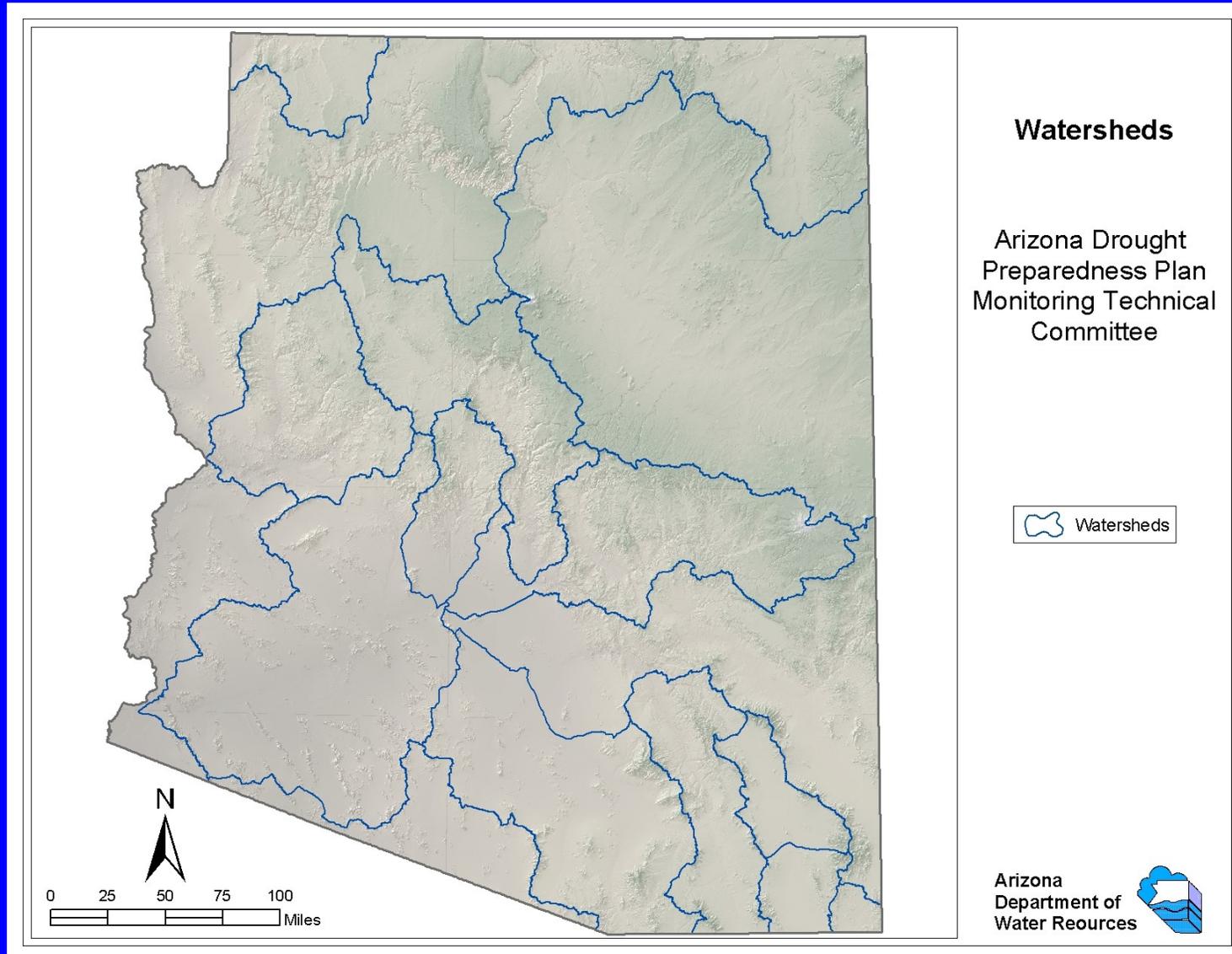
Two step process

- Calculated drought status
- Consult additional data sources, in order to corroborate drought status and add spatial precision

Examples:

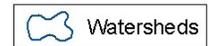
- Snowpack reports
- Range and pasture status reports
- Satellite vegetation health

Spatial Resolution



Watersheds

Arizona Drought
Preparedness Plan
Monitoring Technical
Committee



Arizona
Department of
Water Resources



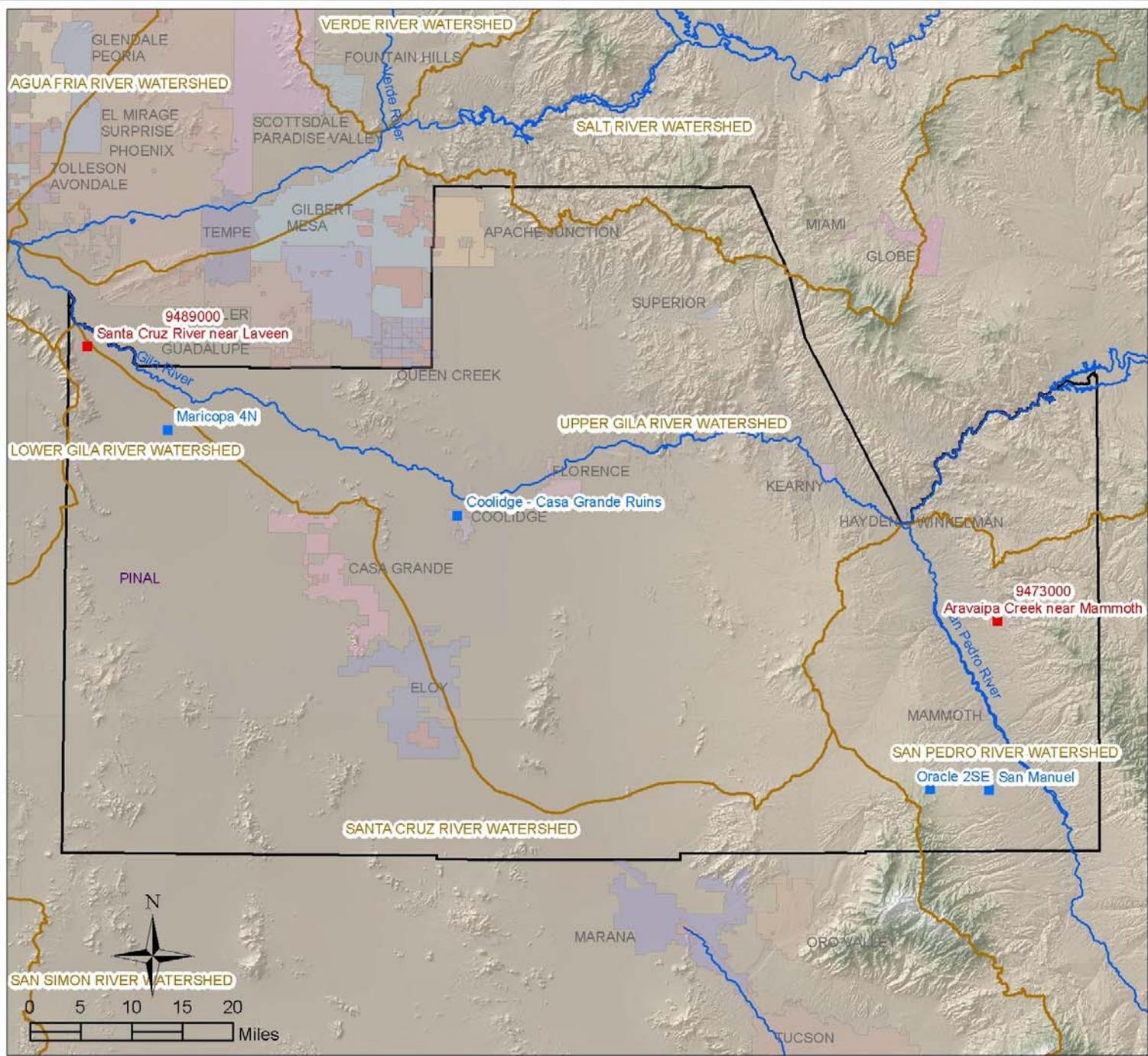
Watersheds and Rain Gages



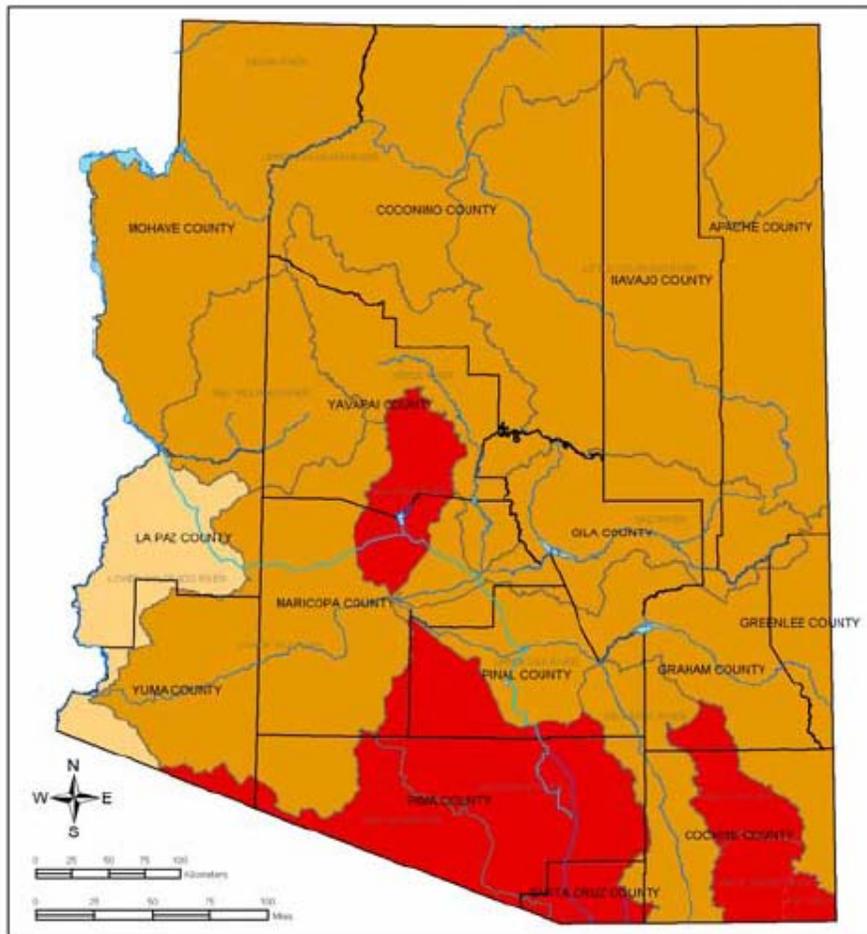
Courtesy of Andy Fisher, Arizona Department of Water Resources

Pinal County Stream Gages and Rain Gages

- Rain Gages
- USGS Gage
- Rivers
- Watersheds
- Pinal County



July 2006 Status Maps

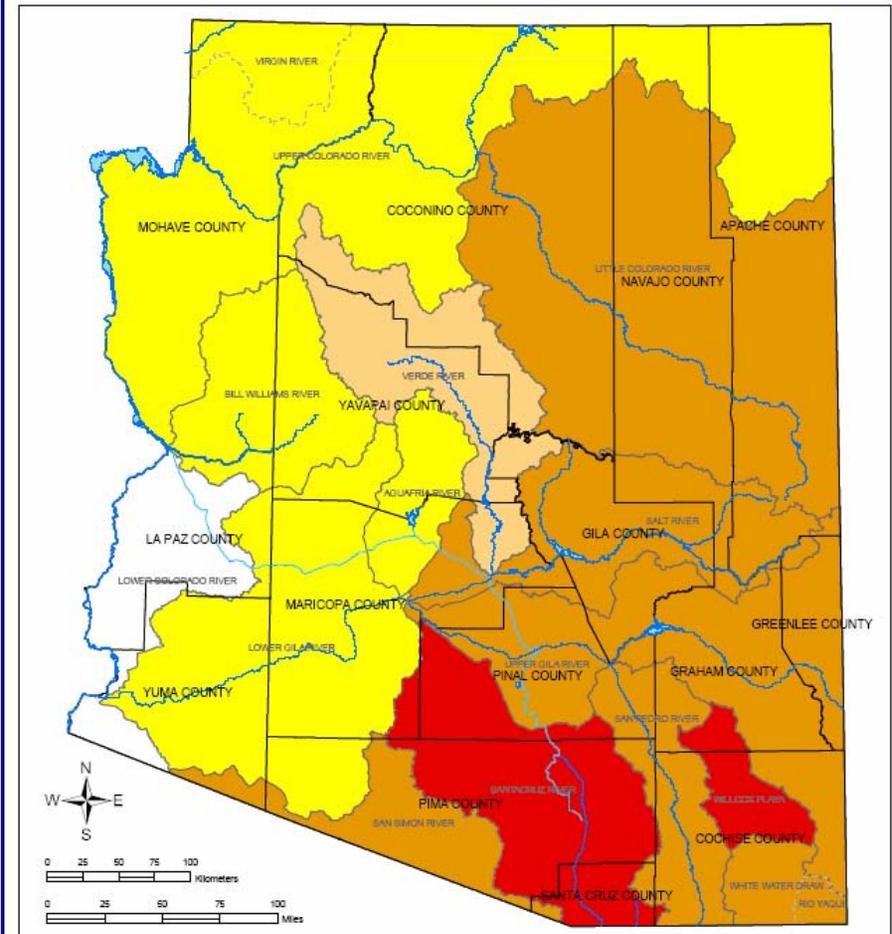


- Watershed Drought Level**
- Normal
 - Abnormally Dry
 - Drought - Moderate
 - Drought - Severe
 - Drought - Extreme
- Counties**
- Lakes
 - Rivers
 - CAP Aqueduct
 - Merged Watershed*

June 2006 Short Term Drought Status
Data Through May 31st, 2006

Arizona Drought Preparedness Plan
Monitoring Technical Committee

* Watershed merged due to limited data.



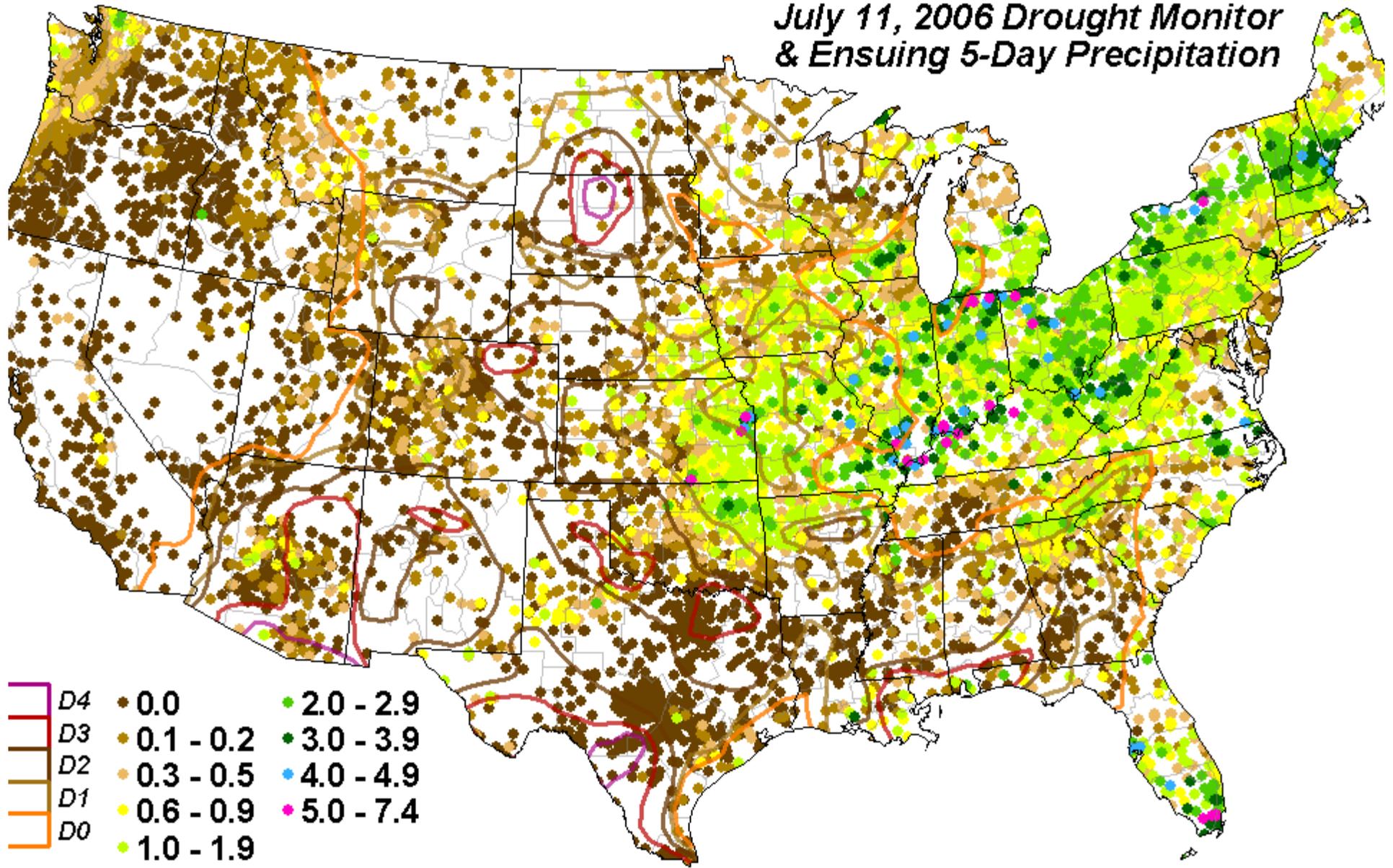
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June 2006 Long Term Drought Status
Data Through May 31st, 2006

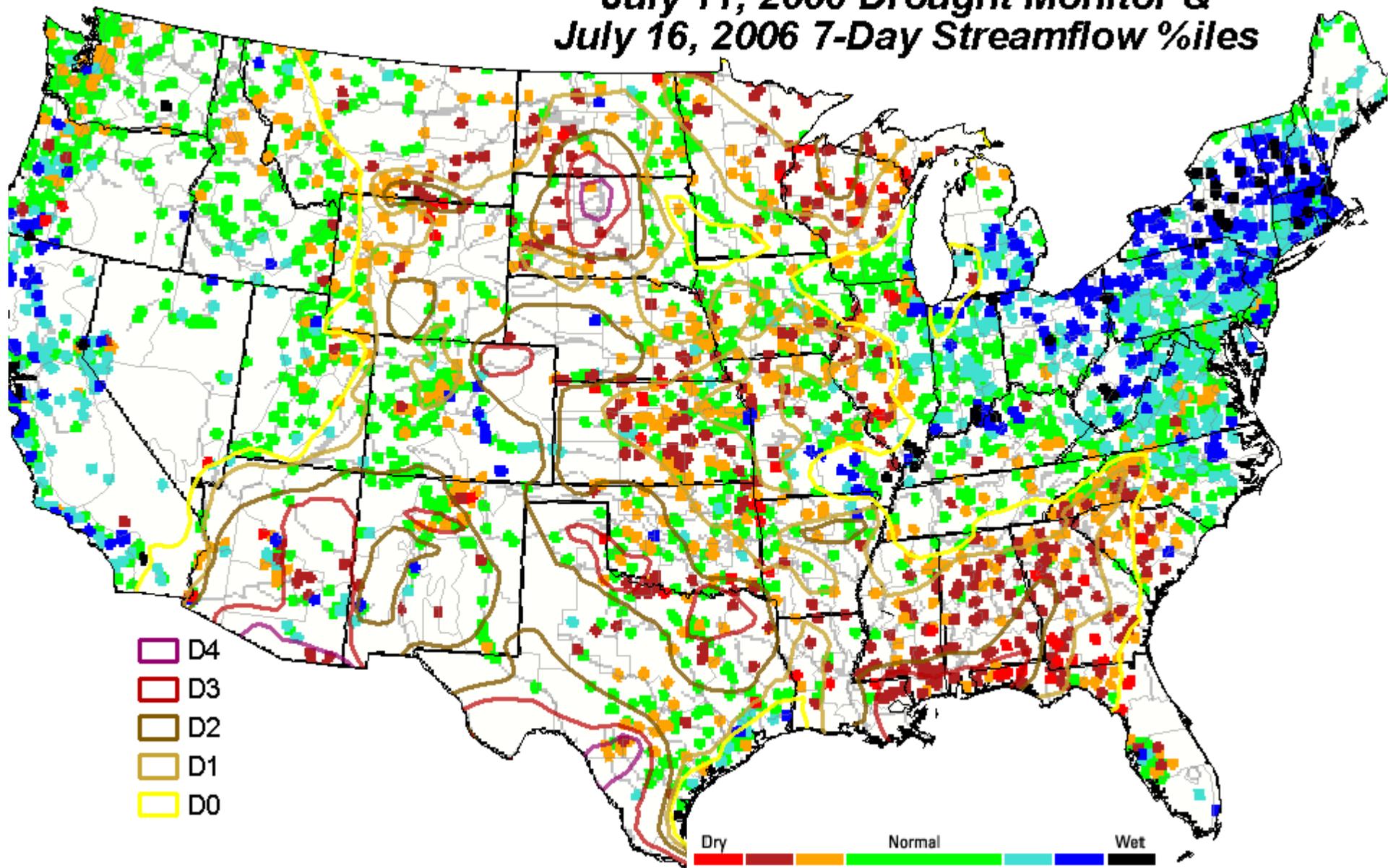
Arizona Drought Preparedness Plan
Monitoring Technical Committee

* Watershed merged due to limited data.

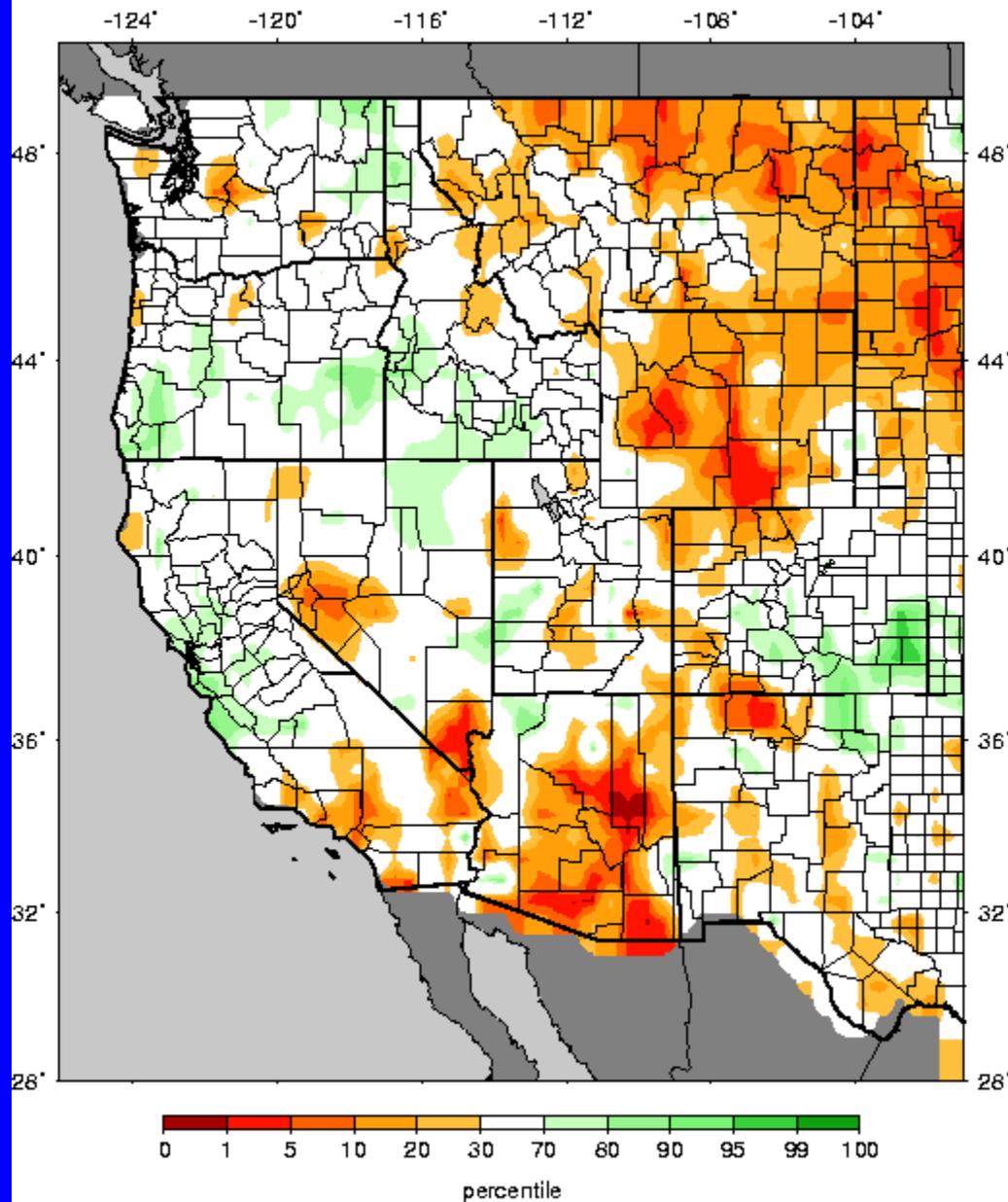
*July 11, 2006 Drought Monitor
& Ensuing 5-Day Precipitation*



**July 11, 2006 Drought Monitor &
July 16, 2006 7-Day Streamflow %iles**



Soil Moisture Percentiles (wrt/ 1915-2003)
Western United States - 20060716

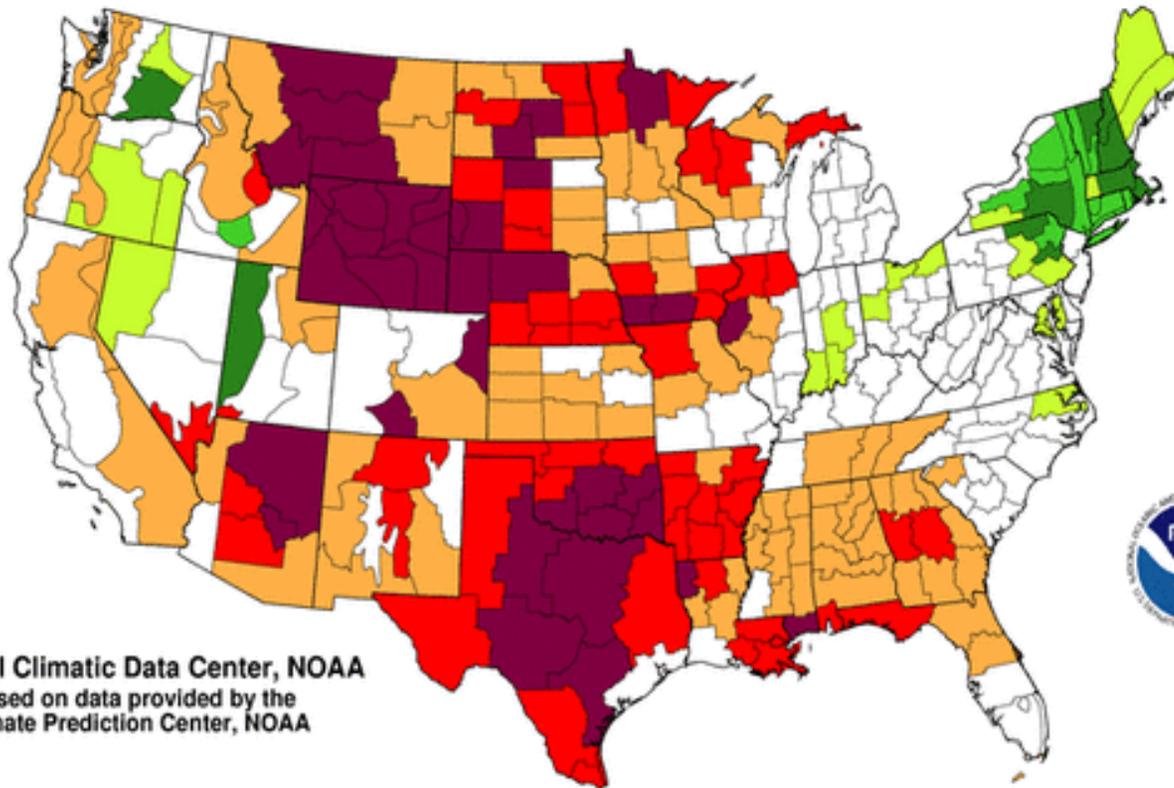


University of Washington

<http://www.hydro.washington.edu/forecast/monitor/index.shtml>

Palmer Drought Index Long-Term (Meteorological) Conditions

July 9, 2006 - July 15, 2006



National Climatic Data Center, NOAA
based on data provided by the
Climate Prediction Center, NOAA

extreme
drought



-4.00
to
and
below

severe
drought



-3.00
to
-3.99

moderate
drought



-2.00
to
-2.99

mid-
range



-1.99
to
+1.99

moderately
moist



+2.00
to
+2.99

very
moist



+3.00
to
+3.99

extremely
moist



+4.00
to
and
above



National Drought Mitigation Center



National Drought Mitigation Center



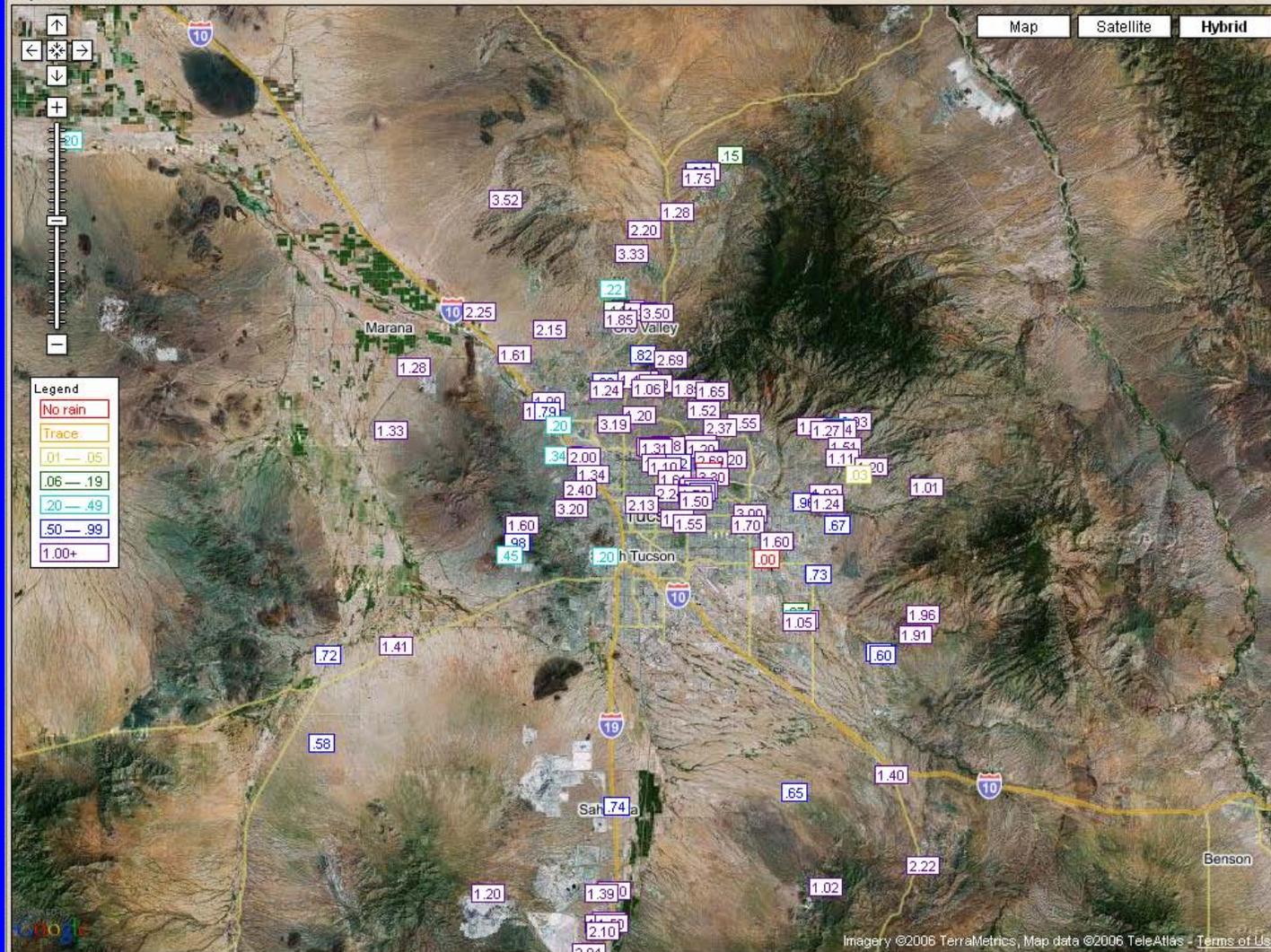
National Drought Mitigation Center

LAIAGs & Drought Monitoring

The link between “numbers” and people

- Instantaneous conditions
- Credible information on local impacts
 - Impacts speak to decision-makers
- Quantitative precipitation totals through volunteer rain log network
 - Spatial variability
- Verification

Report of Rainfall Data



Select predefined region:
 Tucson

Select a report type:
 Single day
 Date range
 Monthly totals
 July 2006

Get report

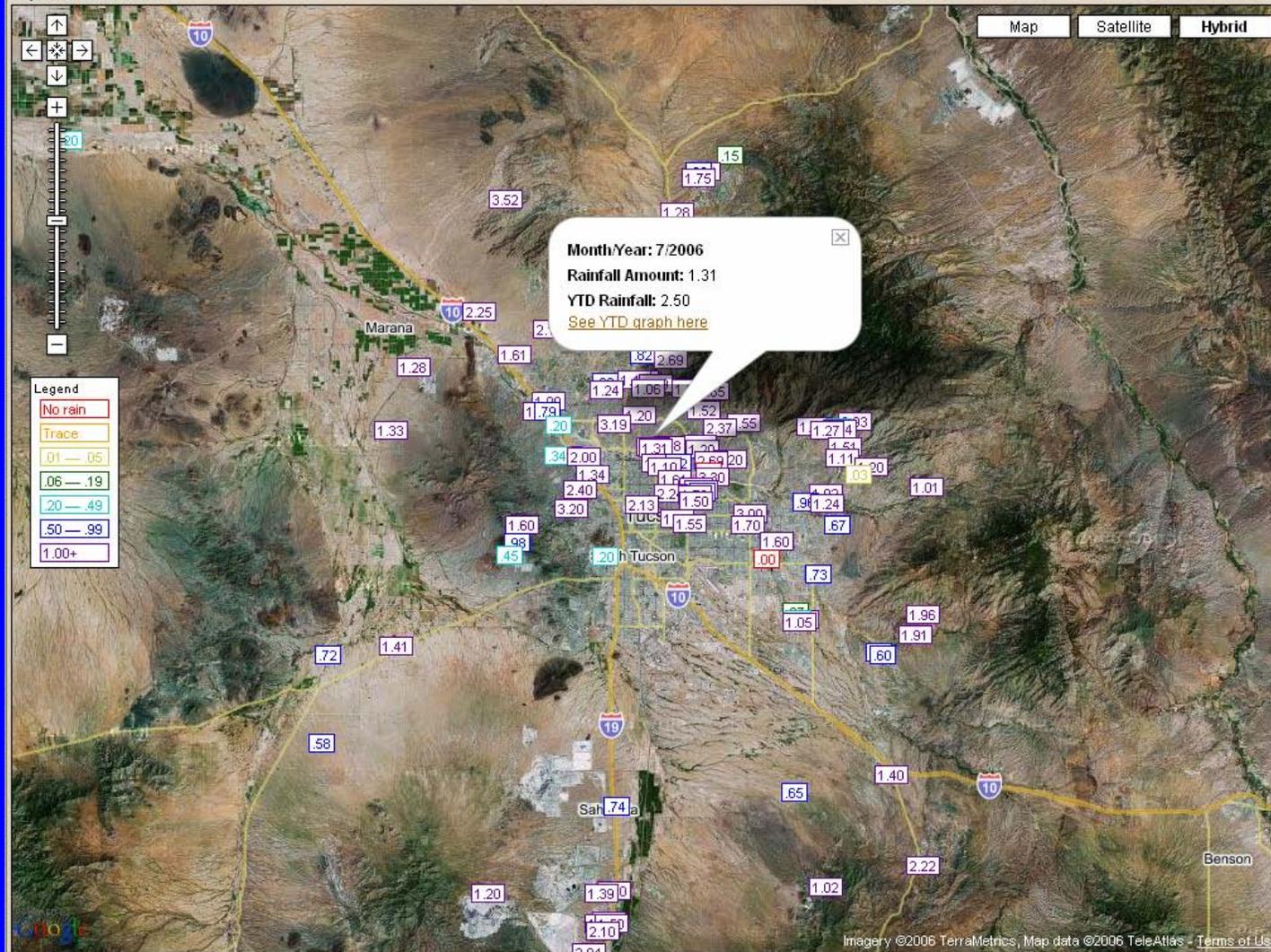
Need a rain gauge?
 Buy a Tru-Chek gauge here at Rainlog.org

Thanks to the following sponsor(s):



http://www.rainlog.org/usprn/html/main/maps.jsp

Report of Rainfall Data



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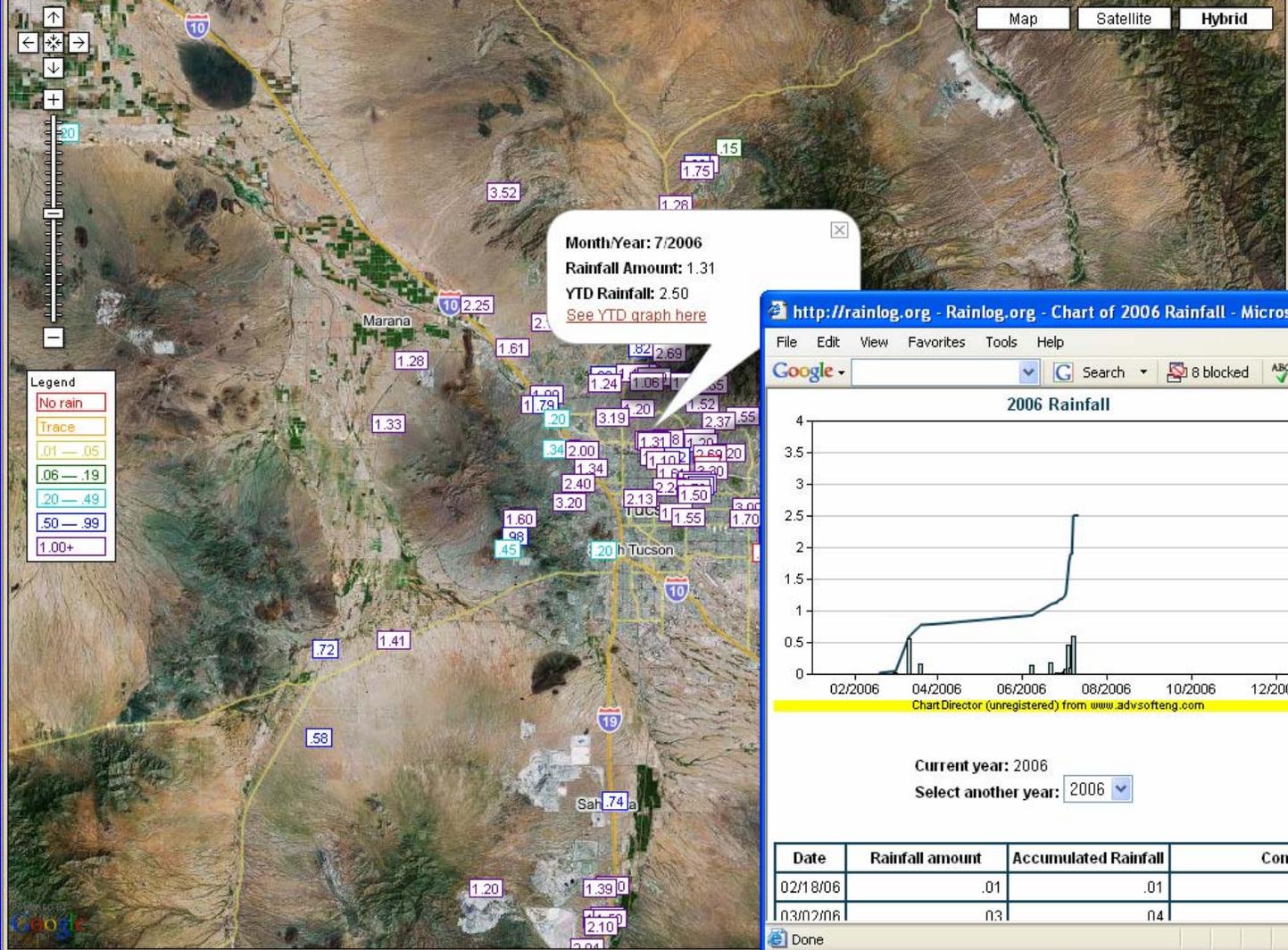
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Report of Rainfall Data

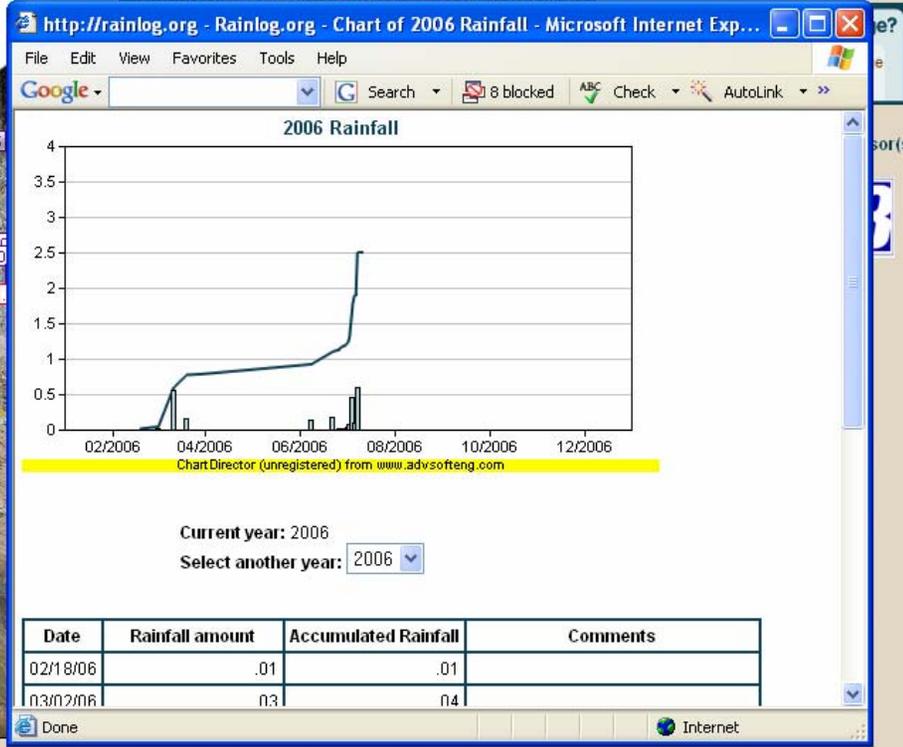


Select predefined region:
 Tucson

Select a report type:
 Single day
 Date range
 Monthly totals

July 2006

Get report



http://www.rainlog.org/usprn/html/main/maps.jsp

LAIAGs & Drought Monitoring

Drought impacts monitoring

- Hauling water, water conveyance issues
 - Seeps, springs, stock ponds
 - Soil conditions
 - Range impacts

LAIAGs & Drought Monitoring

Drought impacts monitoring

- Vegetation condition
 - Indicator species
- Water table declines
- Wildlife
- Subsidence

LAIAGs & Drought Monitoring

Drought impacts monitoring strategies

- Systematic qualitative monitoring of selected locations

LAIAGs & Drought Monitoring

How do communities benefit?

- Pro-active approach saves money
 - Think Katrina

LAIAGs & Drought Monitoring

How do communities benefit?

- Increased knowledge, improved reporting
 - State drought report – local conditions
 - Local variations
 - Information sharing

LAIAGs & Drought Monitoring

How do communities benefit?

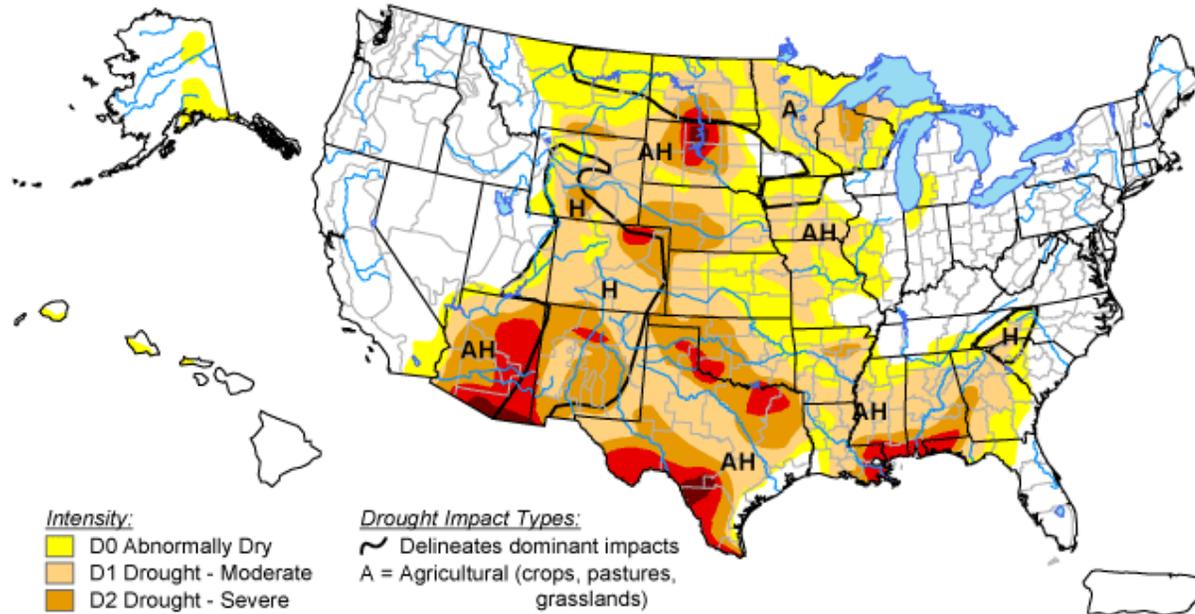
- Better coordination with the state
 - Documentation for aid requests
 - Federal drought assistance
 - Infrastructure improvements
- Documentation for conflict resolution

LAIAGs & Drought Monitoring

U.S. Drought Monitor

July 11, 2006

Valid 8 a.m. EDT



Intensity:

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

Drought Impact Types:

- Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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



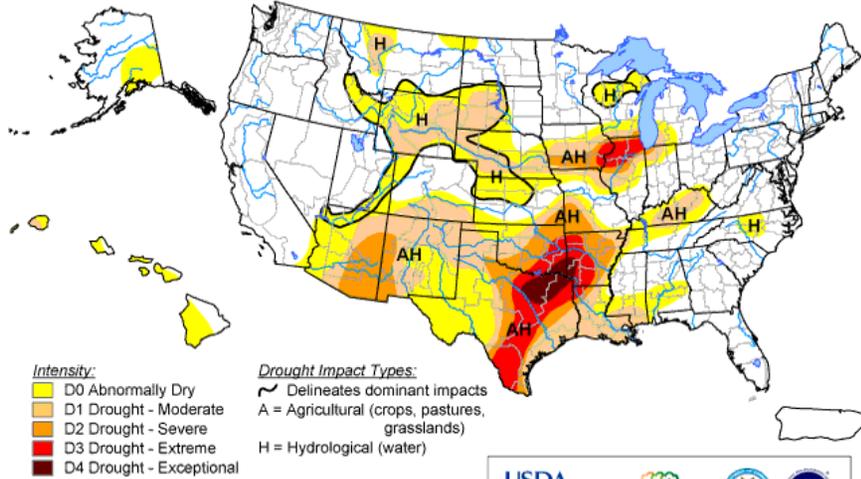
Released Thursday, July 13, 2006

Author: Doug Le Comte and Tom Heddinghaus, CPC/NOAA

<http://drought.unl.edu/dm>

U.S. Drought Monitor

January 24, 2006
Valid 7 a.m. EST



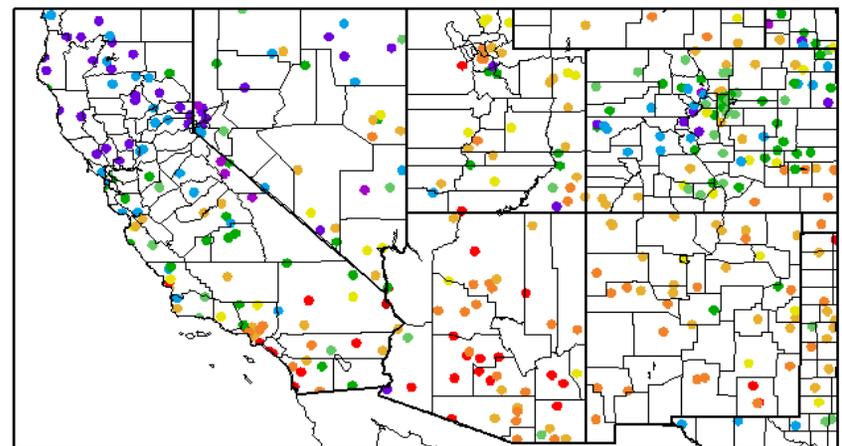
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



Released Thursday, January 26, 2006



Percent of Normal Precipitation (%)
7/24/2005 - 1/23/2006



Generated 1/24/2006 at HPRCC using provisional data.

NOAA Regional Climate Centers

How can the Monitoring Committee help?



Gregg Garfin, Program Manager
Climate Assessment for the Southwest
gmgarfin@email.arizona.edu
520-622-9016