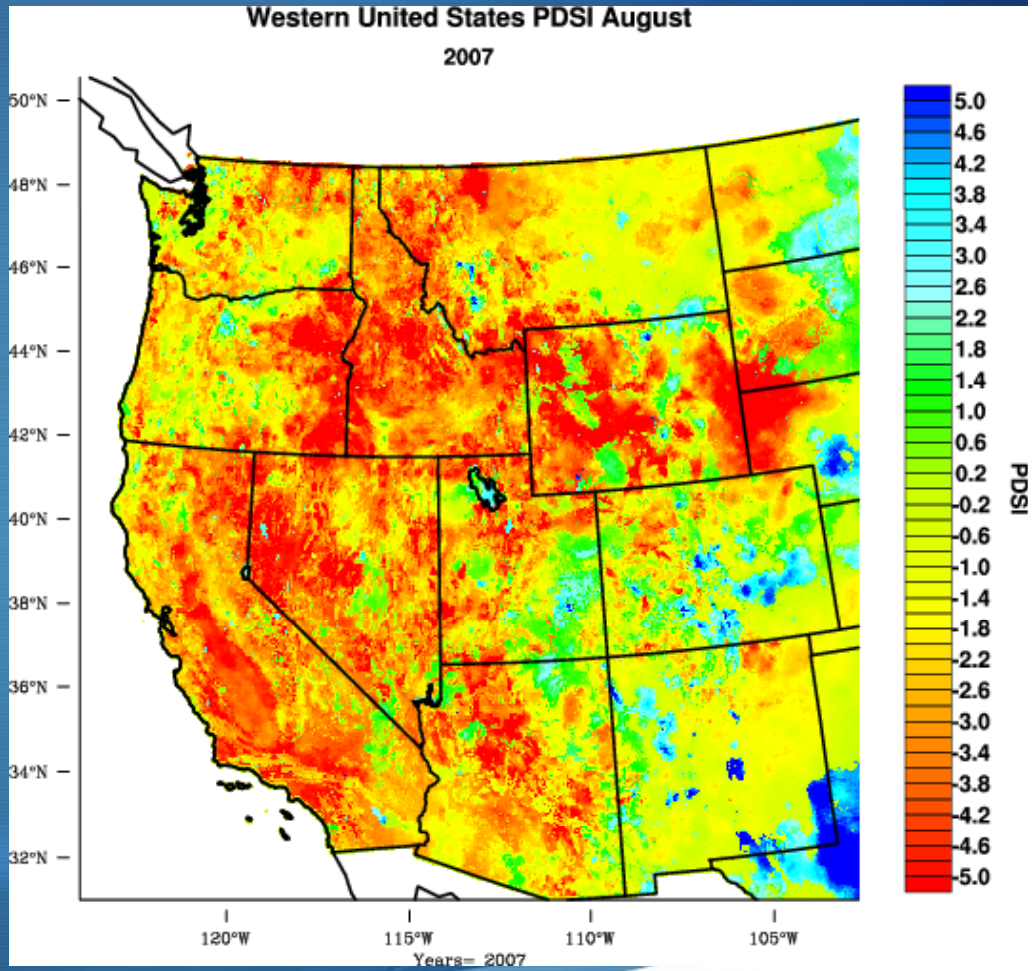
WestWide Drought Tracker

Laura Edwards and Kelly Redmond

Western Regional Climate Center

John Abatzoglou

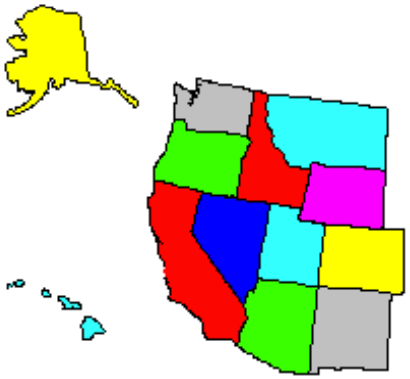
University of Idaho



USDM Forum October 7, 2009
Austin, TX

WRCC

www.wrcc.dri.edu



Western Regional Climate Center

Historical Climate Information
Western U.S. Historical Summaries; Precipitation Maps; Station Inventories; Wind and Evaporation Data; Coastal Water Table; State Narratives; Station Descriptions; Anomalies.

Current Observations, Forecasts and Monitoring
Nat'l Weather Service Current and Past 24-hour Reports; Snotel; Climate Prediction Center Outlooks; Satellite and Radar Imagery; SPI; Anomalies; Divisional Climate Plots; ACIS; CoCoRaHS.

WRCC Projects
El Nino & La Nina; CEMP; WET; BLM RAWS; Yucca Mtn; Current Weather Plots; NSOE; Snotel; CoCoRaHS; California Climate Data Archive; Photo Gallery; Webcam; WxCoder.

More Climate Information
Solar Radiation; Sunrise/Sunset Information (USNO); WGA data and information; Nat'l Climatic Data Center; Climate Prediction Center; CEFA; Nat'l Drought Mitigation Center.

Educational and Travel Pages
Terms; More about Weather and Climate - for teachers and kids! Climate for resorts and Nat'l parks around the West.

About the WRCC
Staff; Funding; Overview of WRCC; DRI Home Page; INTERNAL.

WRCC Supports a Three-Partner National Climate Services Program - the Partners Include:
National Climatic Data Center (NCDC), Regional Climate Centers (RCC's), and State Climate Offices.

WWDT motivations

- Complex topography in contiguous 11 western states
- Snow-driven hydrology, but not everywhere
- Delayed response: snow processes, delayed delivery of water, water not used where it falls
- “one less stop” shopping
- Builds heavily on our existing infrastructure

WestMap

Climate Analysis & Mapping Toolbox

Westmap

Joint project between

U Arizona

DRI / WRCC

OSU PRISM Grp

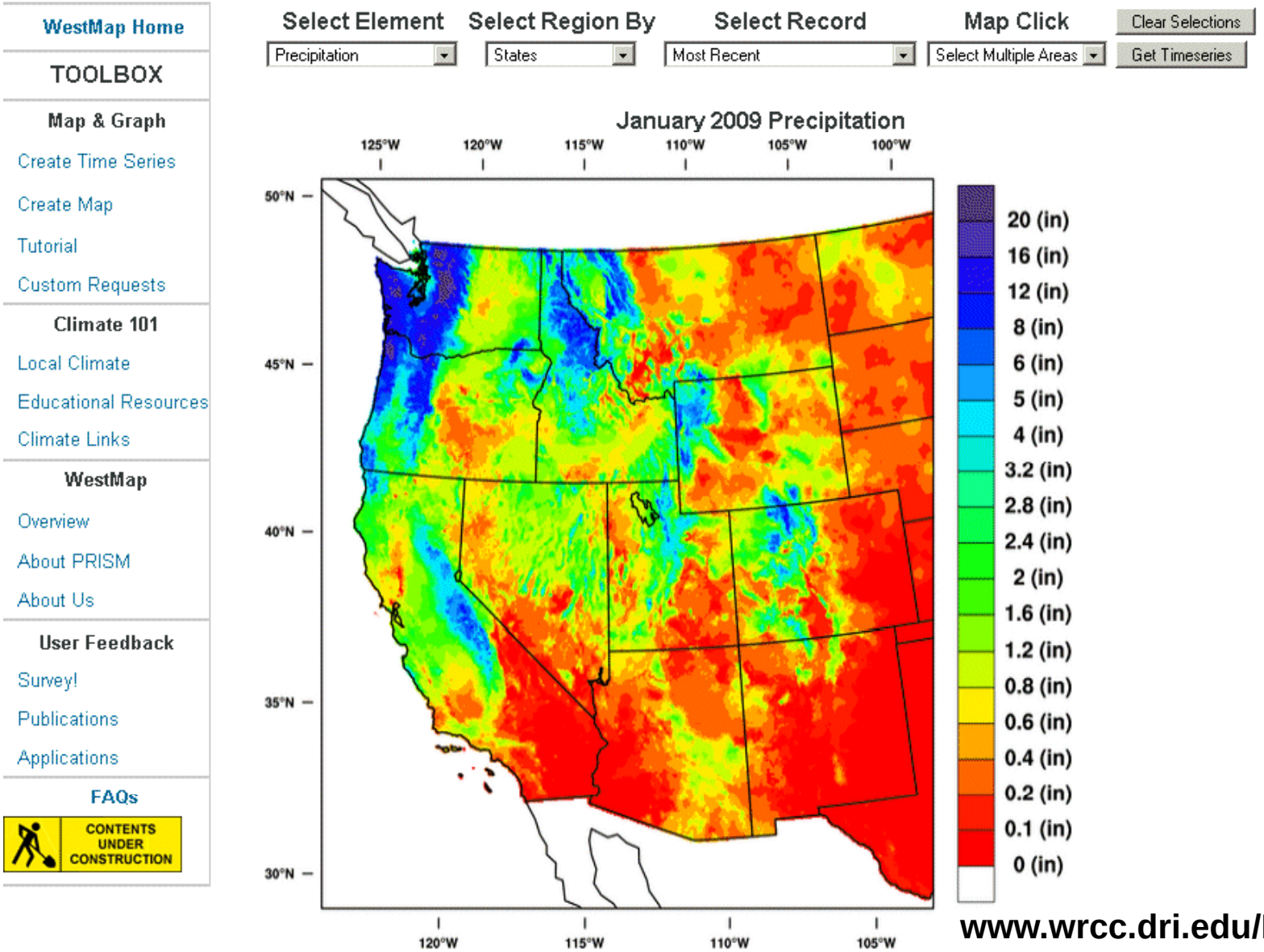
NOAA – NCTP (now TRACS)

CLIMAS

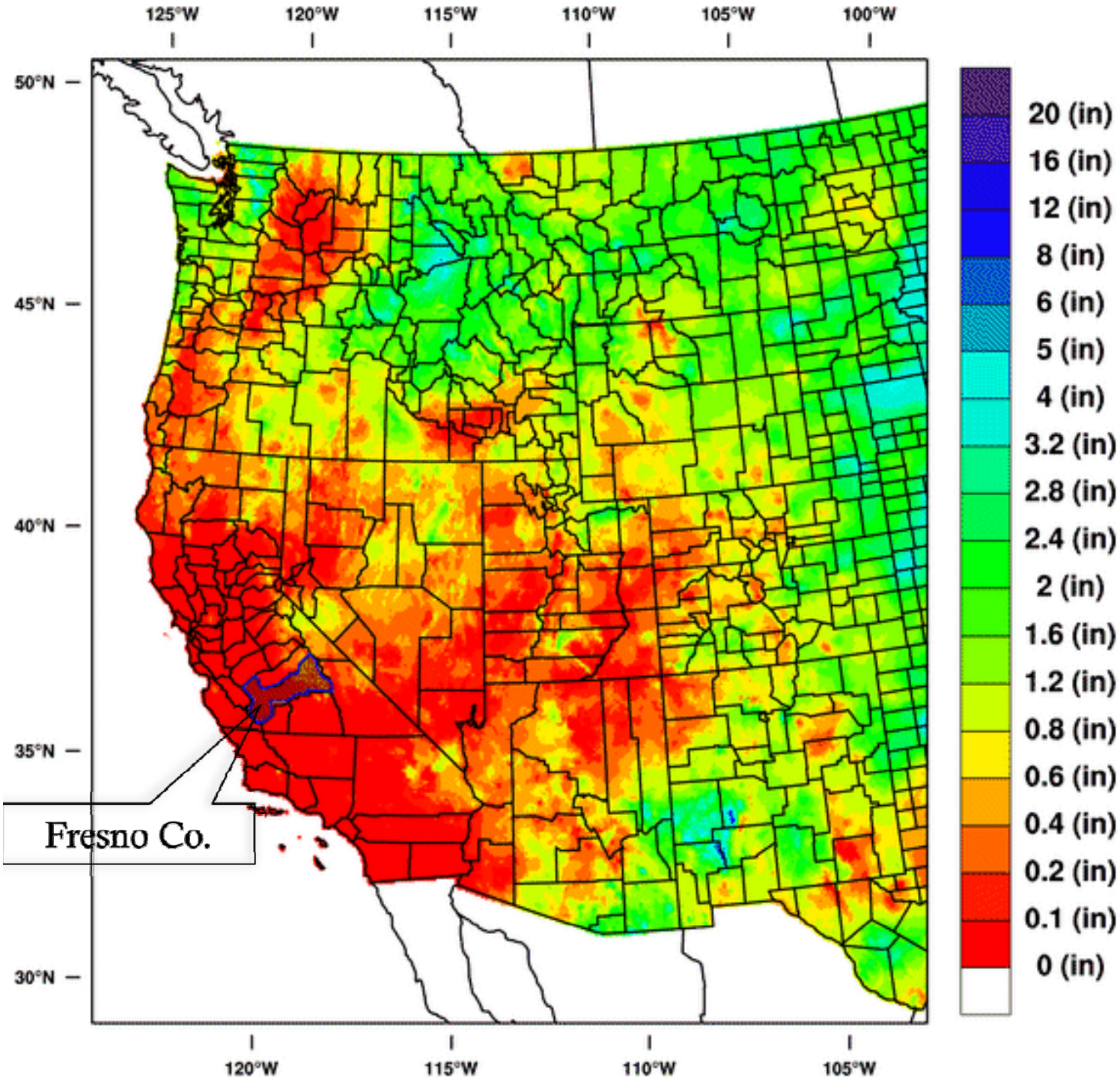
WRCC

CAP

At present is restricted to just the western United States



www.wrcc.dri.edu/PROJECTS.html



Areas:

States

Counties

Hydrobasins

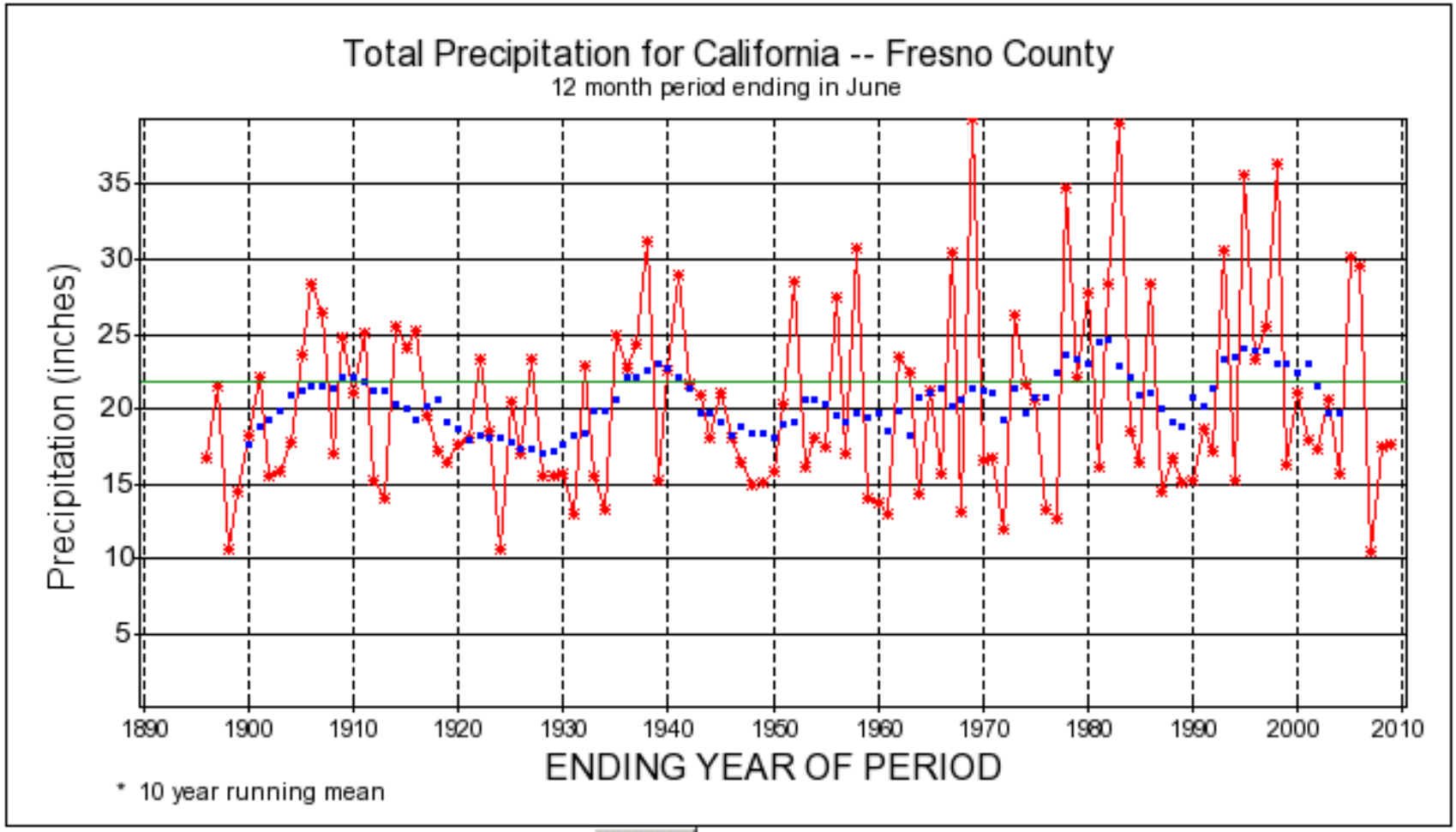
Climate Divisions

Grid squares

Individual Pixels

Uses 4 km PRISM Monthly Data

1895 through the latest month

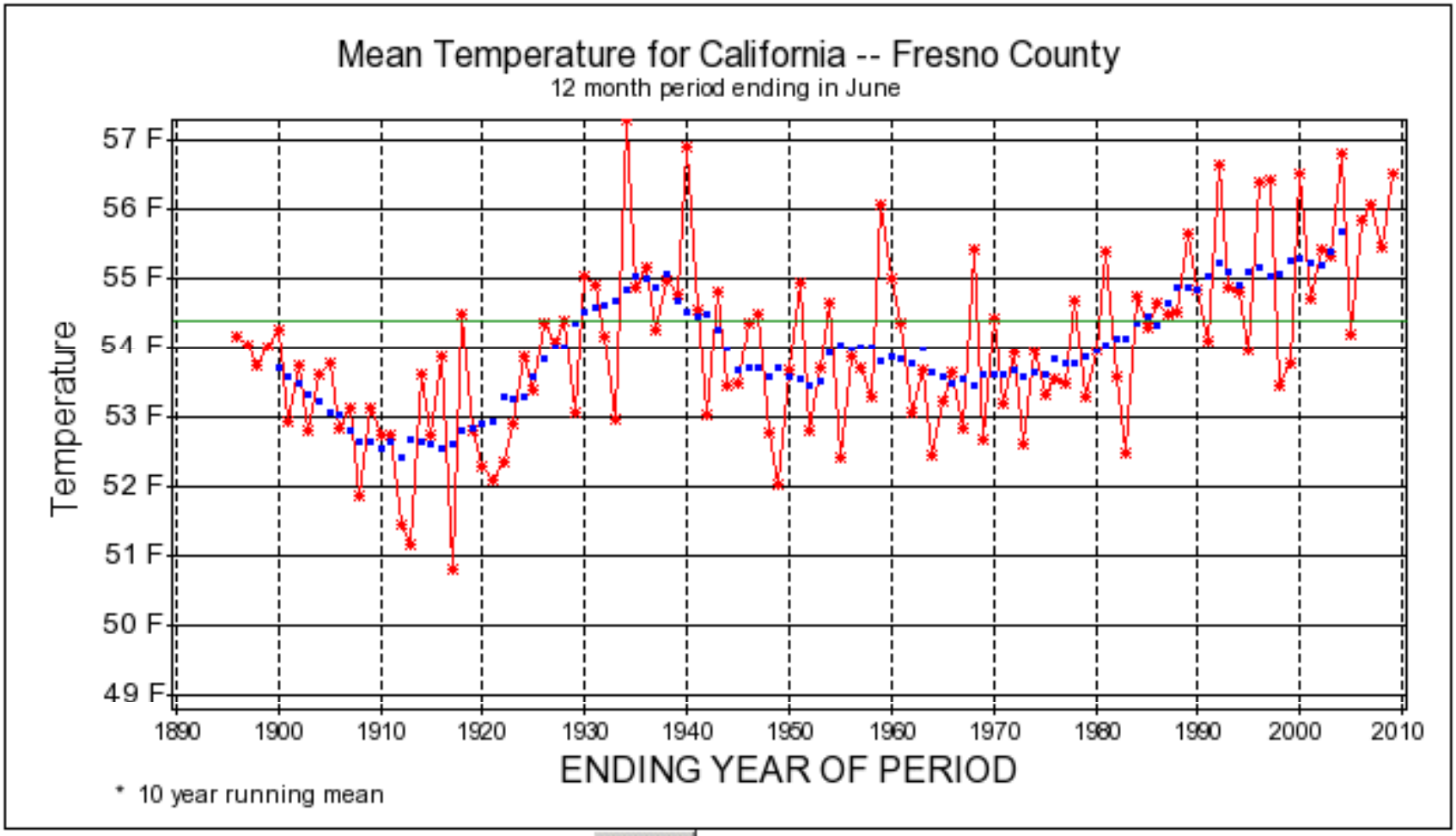


Back * Previous page with saved values.

```
12-Month Period Ending in June
AVERAGE        20.311
MEDIAN         18.100
MINIMUM        10.420
MAXIMUM        39.520
SKEWNESS        0.971
COEFF OF VAR    0.304
SIGMA (RMS)    21.233
NUMBER OBS    114.000
```

Precipitation
July-June
1895-1896
Thru
2008-2009

Mean: 1971-2000



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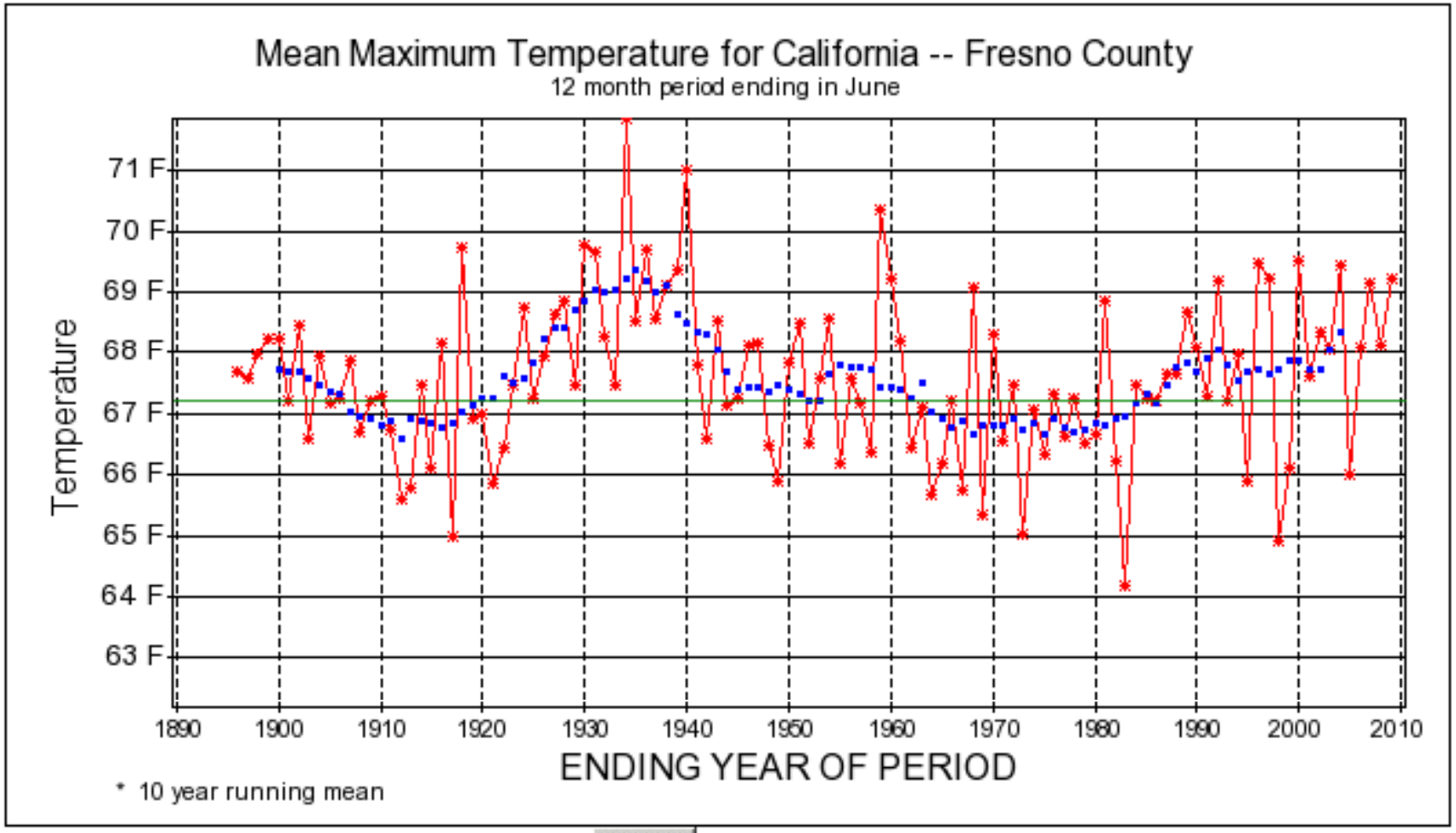
```
12-Month Period Ending in June
AVERAGE        54.008
MEDIAN         53.921
MINIMUM        50.800
MAXIMUM        57.317
SKEWNESS        0.290
COEFF OF VAR    0.023
SIGMA (RMS)    54.022
NUMBER OBS    114.000
```

Mean Temperature
July-June
1895-1896
Thru
2008-2009

Mean: 1971-2000



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```
12-Month Period Ending in June
AVERAGE        67.595
MEDIAN         67.479
MINIMUM        64.192
MAXIMUM        71.883
SKEWNESS        0.244
COEFF OF VAR    0.019
SIGMA (RMS)    67.608
NUMBER OBS    114.000
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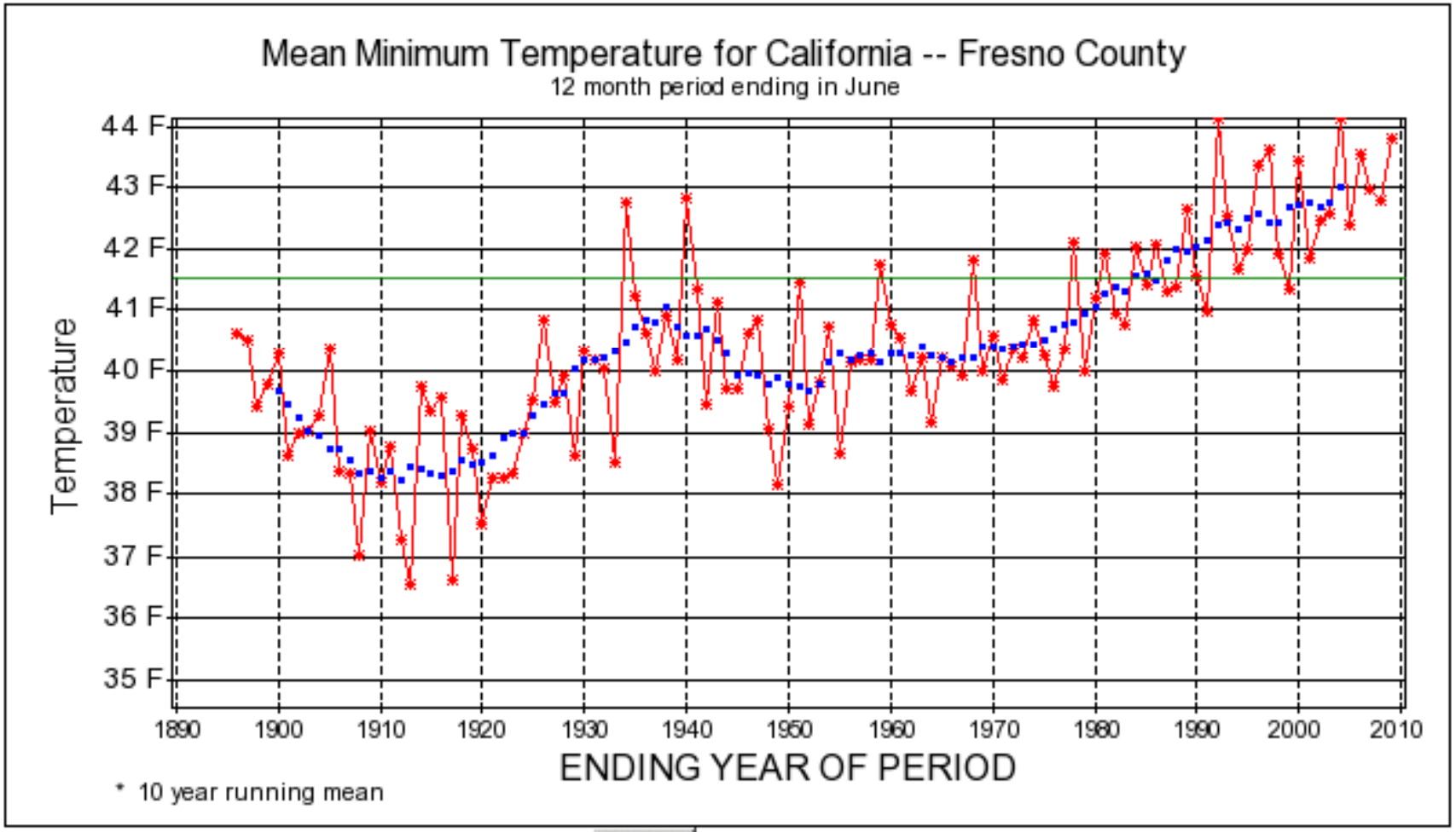
Mean Maximum Temperature
July-June
1895-1896
Thru
2008-2009

Mean: 1971-2000



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```
12-Month Period Ending in June
AVERAGE        40.421
MEDIAN         40.246
MINIMUM        36.533
MAXIMUM        44.175
SKEWNESS        0.146
COEFF OF VAR    0.039
SIGMA (RMS)    40.453
NUMBER OBS    114.000
```

Mean Minimum Temperature
July-June
1895-1896
Thru
2008-2009

Mean: 1971-2000

To resolve fine spatial scales, WWDT needs PRISM data

PRISM updates were about to terminate in June 2009

A Surface Climate Mapping Consortium was formed

- Advocate for support of spatial climate mapping generally
- Enlist support for monthly climate updates
- Suggest and help prioritize research and development topics

Sufficient resources have been identified to resume monthly updates

Highest R&D priority

- Move all activity from 4 km to 0.8 km resolution
- Use same methodology for all updates
  - Currently there are some differences
- Recompute monthly updates at 0.8 km resolution
  - Then degrade to 4 km for tools and tractability

Another priority

- Develop a version of PRISM data that is more
  - "climate change compatible"

Also: Drought needs daily data. How to develop fine scale daily updates ???

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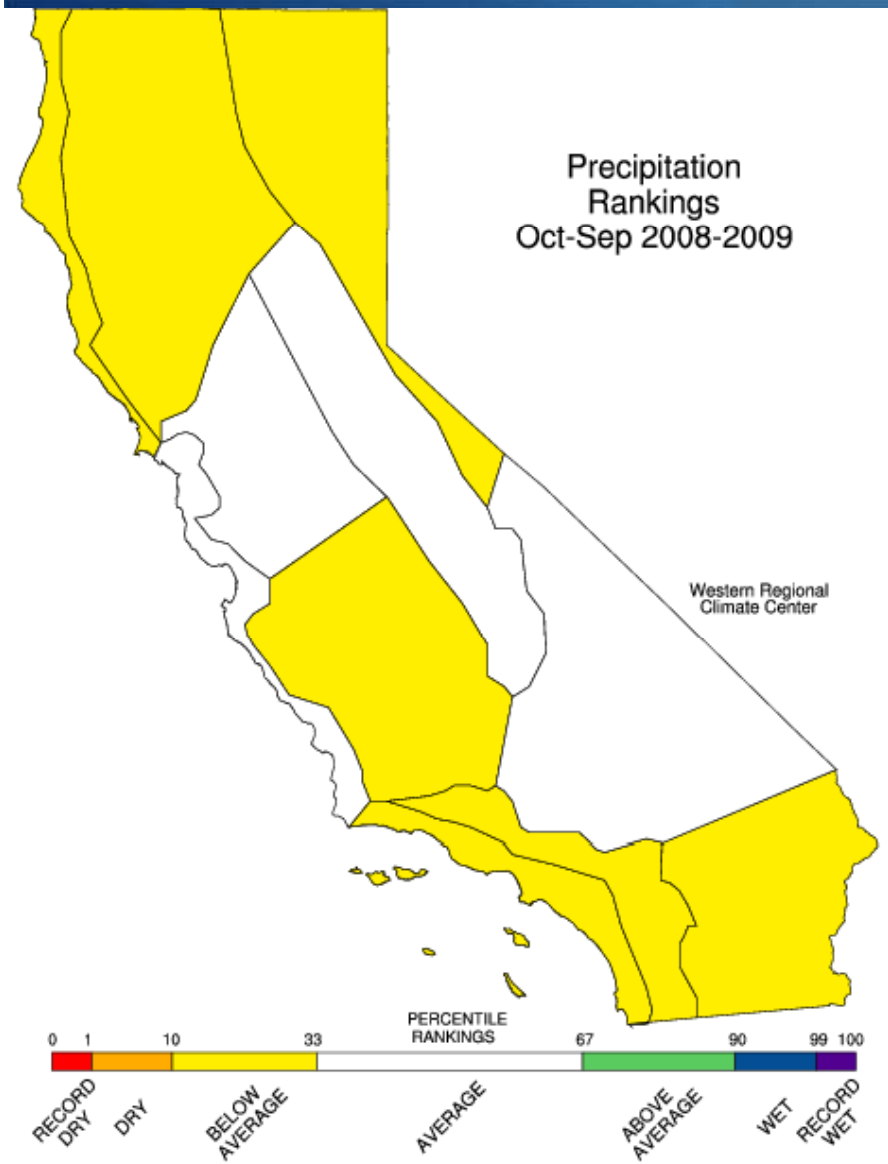
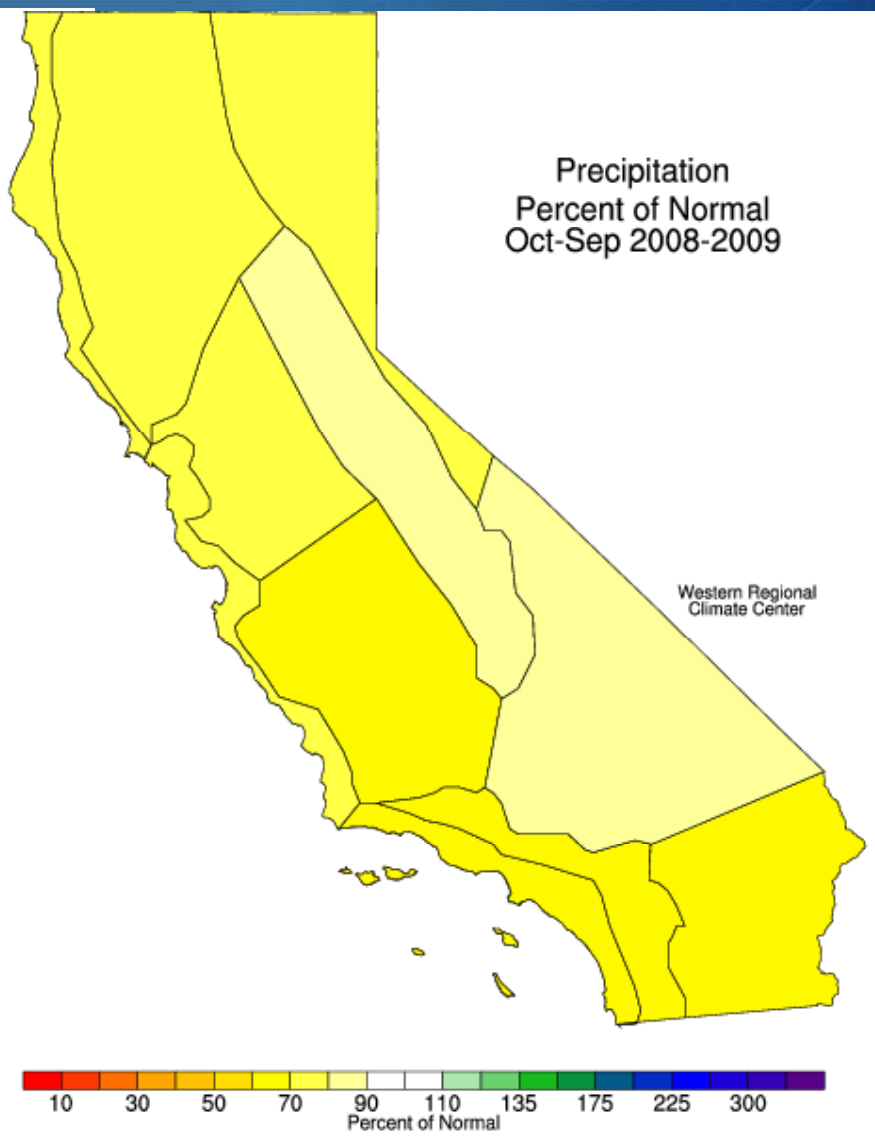
California Climate Tracker

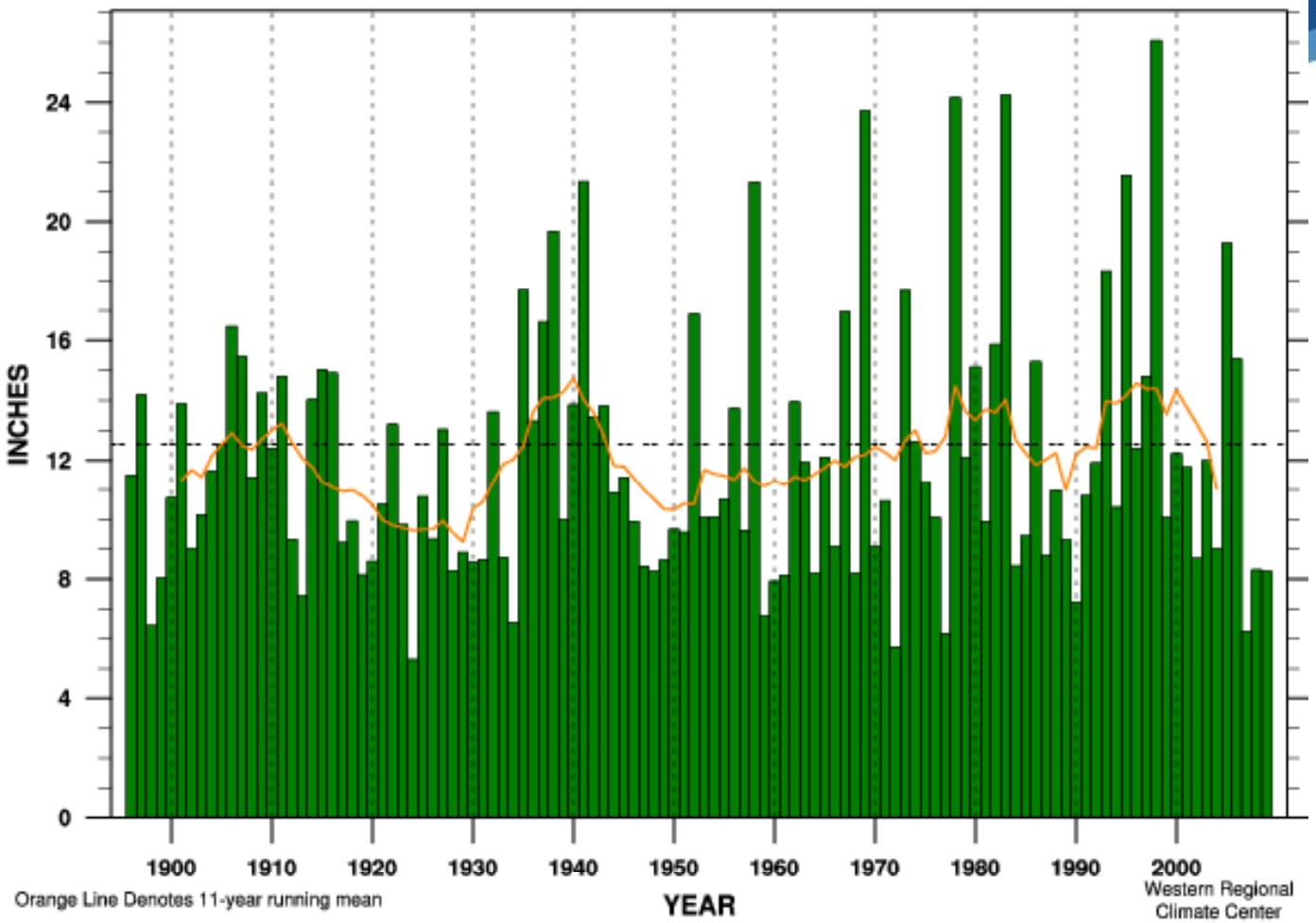




We have temperature too!

For climate regions: see Abatzoglou et al. 2009

San Joaquin Valley Region
Precipitation Oct-Sep



Linear Trend 1895-present	+ 1.43 ± 2.38 in.	(+ 11 ± 18%) per 100 yr			
Linear Trend 1949-present	+ 1.90 ± 7.32 in.	(+ 15 ± 58%) per 100 yr			
Linear Trend 1975-present	- 5.56 ± 18.79 in.	(- 44 ± 149%) per 100 yr			
Wettest Year	26.08 in. (208%)	in 1998		MEAN	12.53 in.
Driest Year	5.30 in. (42%)	in 1924		STDEV	4.88 in.
Oct-Sep 2009	8.25 in. (65%)			RANK	16 of 114

What WWDT has to offer

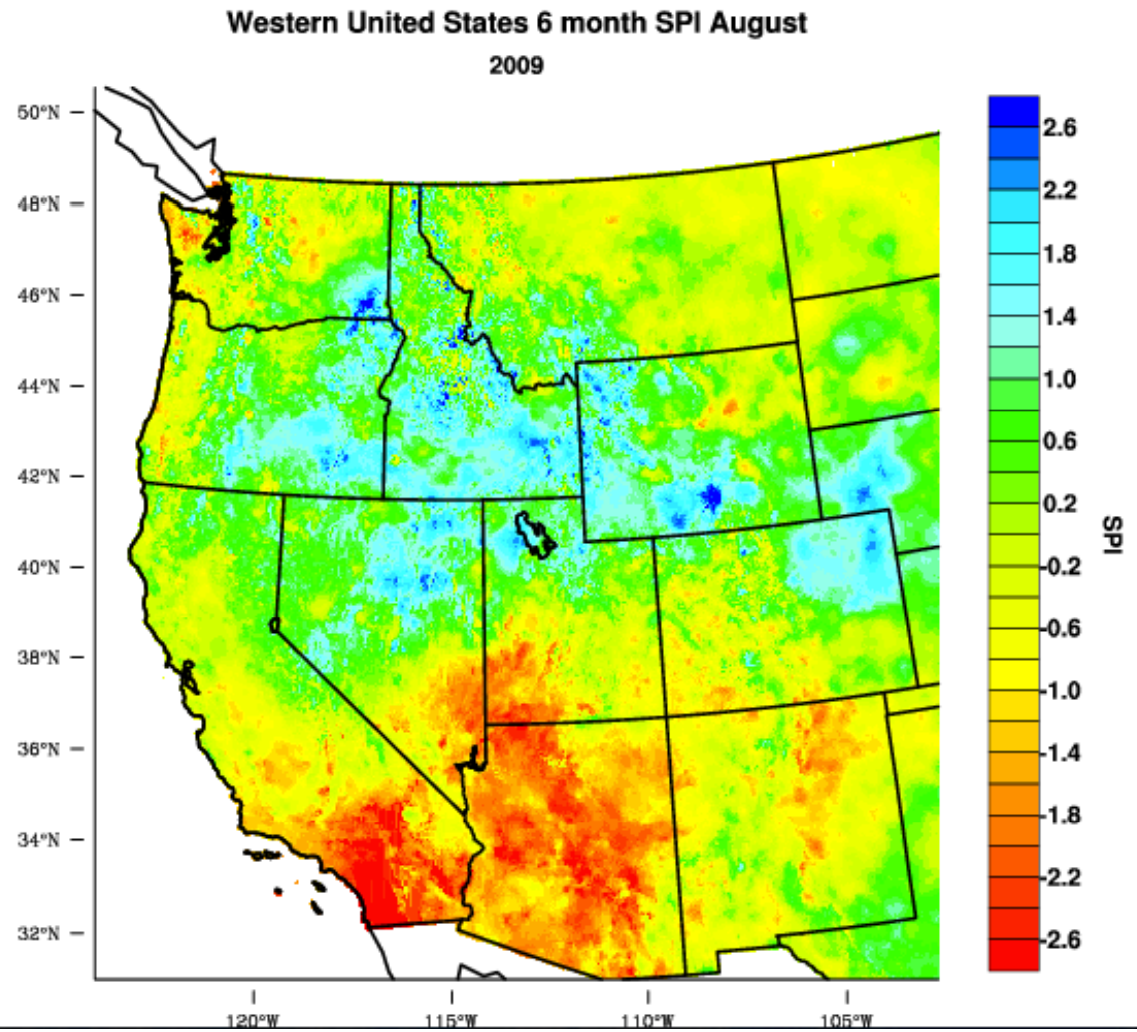
- Spatial scale: 4 km PRISM resolution
- Data sets: climatological and hydrological (PRISM, VIC)
  - Gridded and station data (COOP and others), access PRISM by grid cell
- Visualization: maps and time series
  - Pre-set, or select your own region
- Eventual tie-in to Drought Monitor-Decision Support System

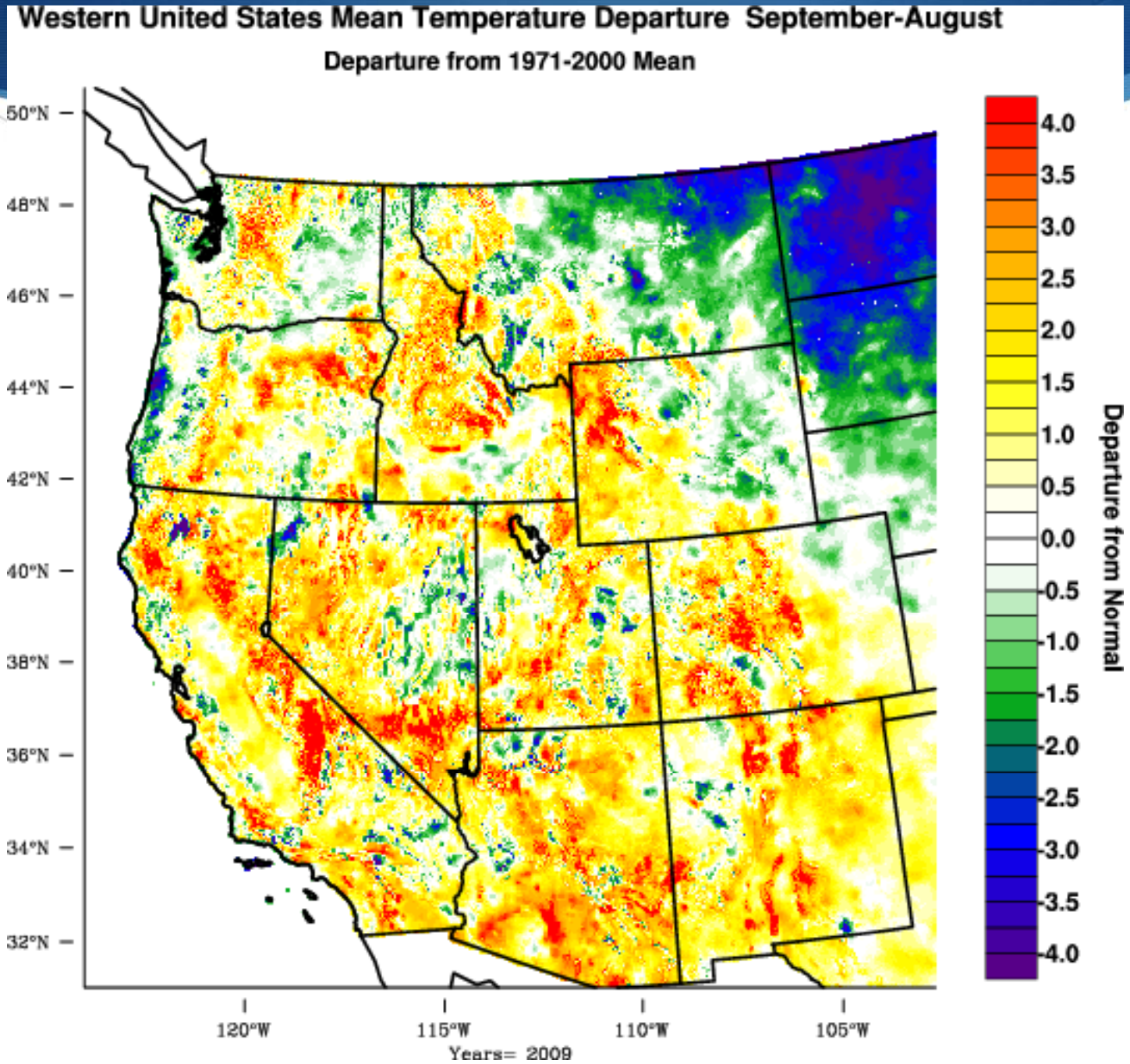
WestWideDroughtTracker

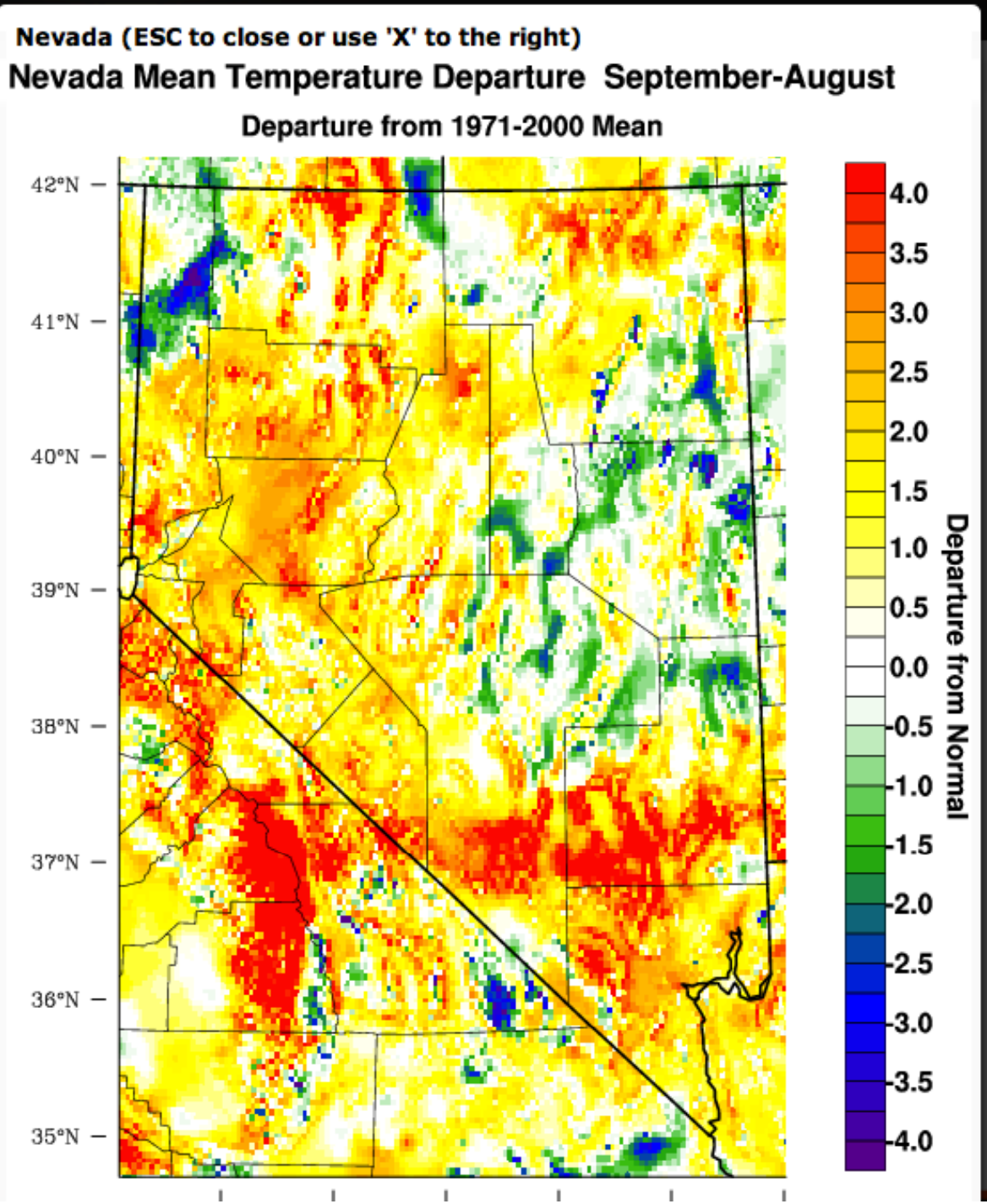
NOAA TRACS

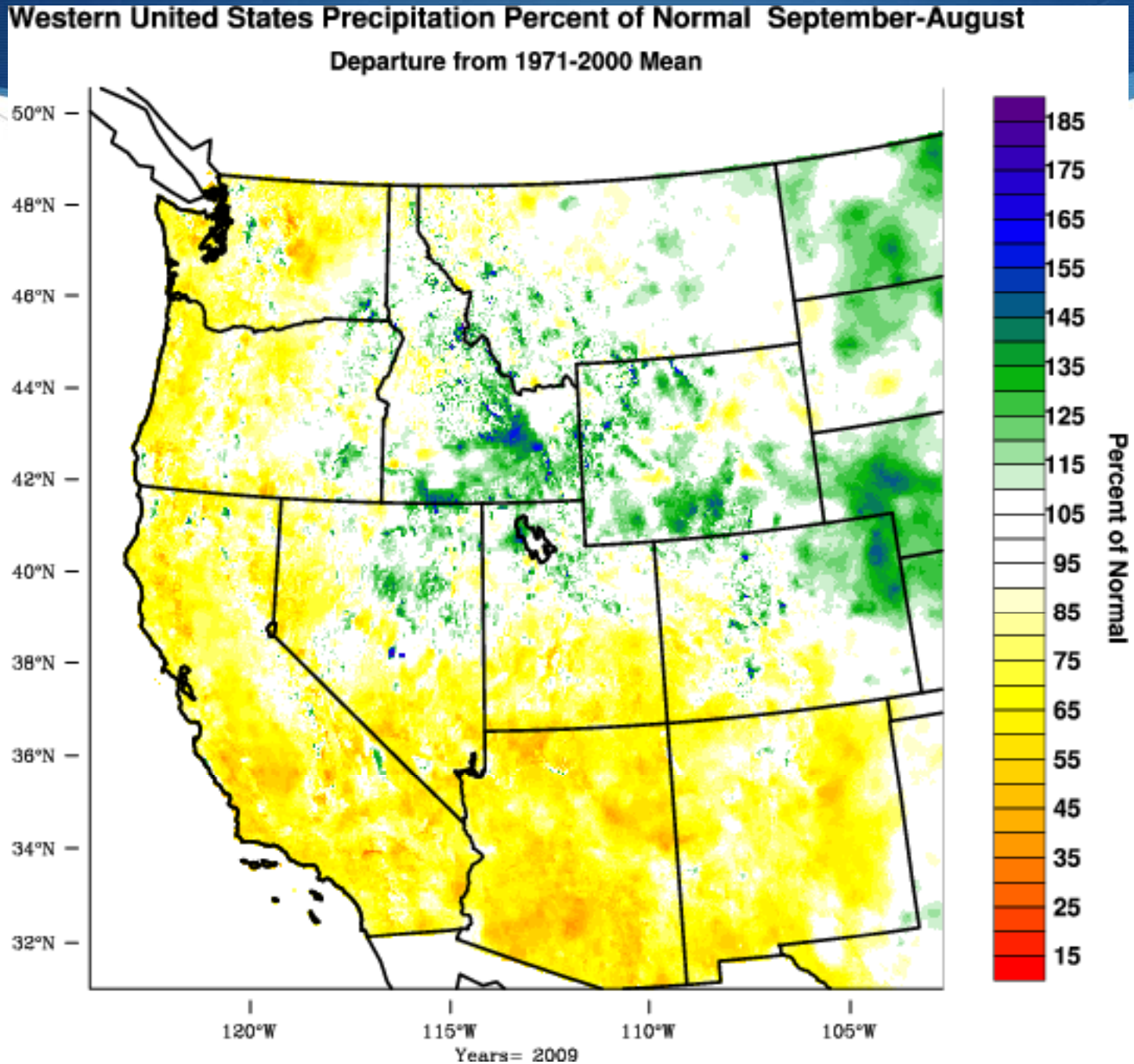
Home SPI Precipitation Temperature PDSI About Contact

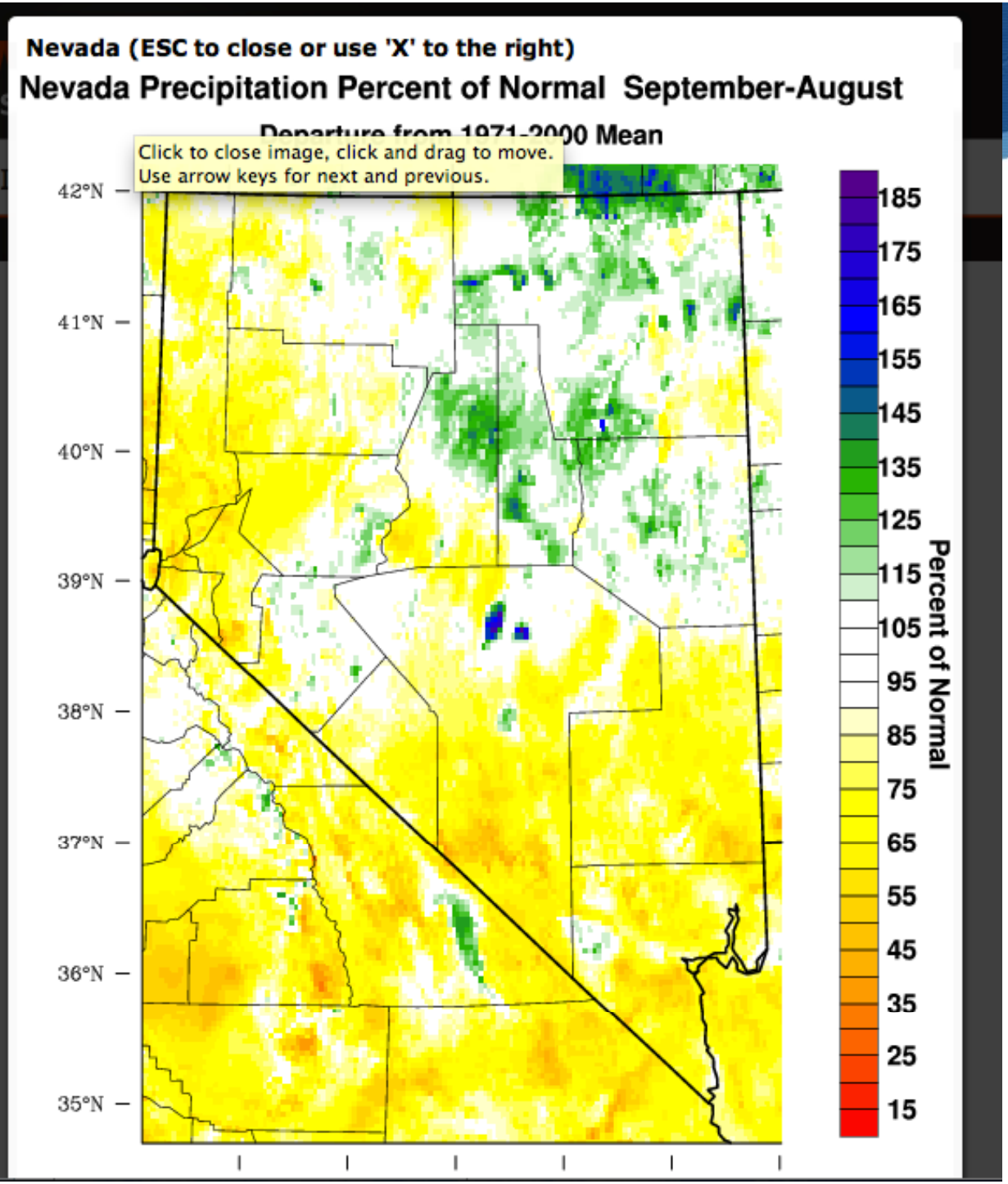
To access maps, first select from the suite of drought indices and climate variables listed in the menu bar above. Second, detailed maps at state and county levels are available by progressively clicking on the region of interest.

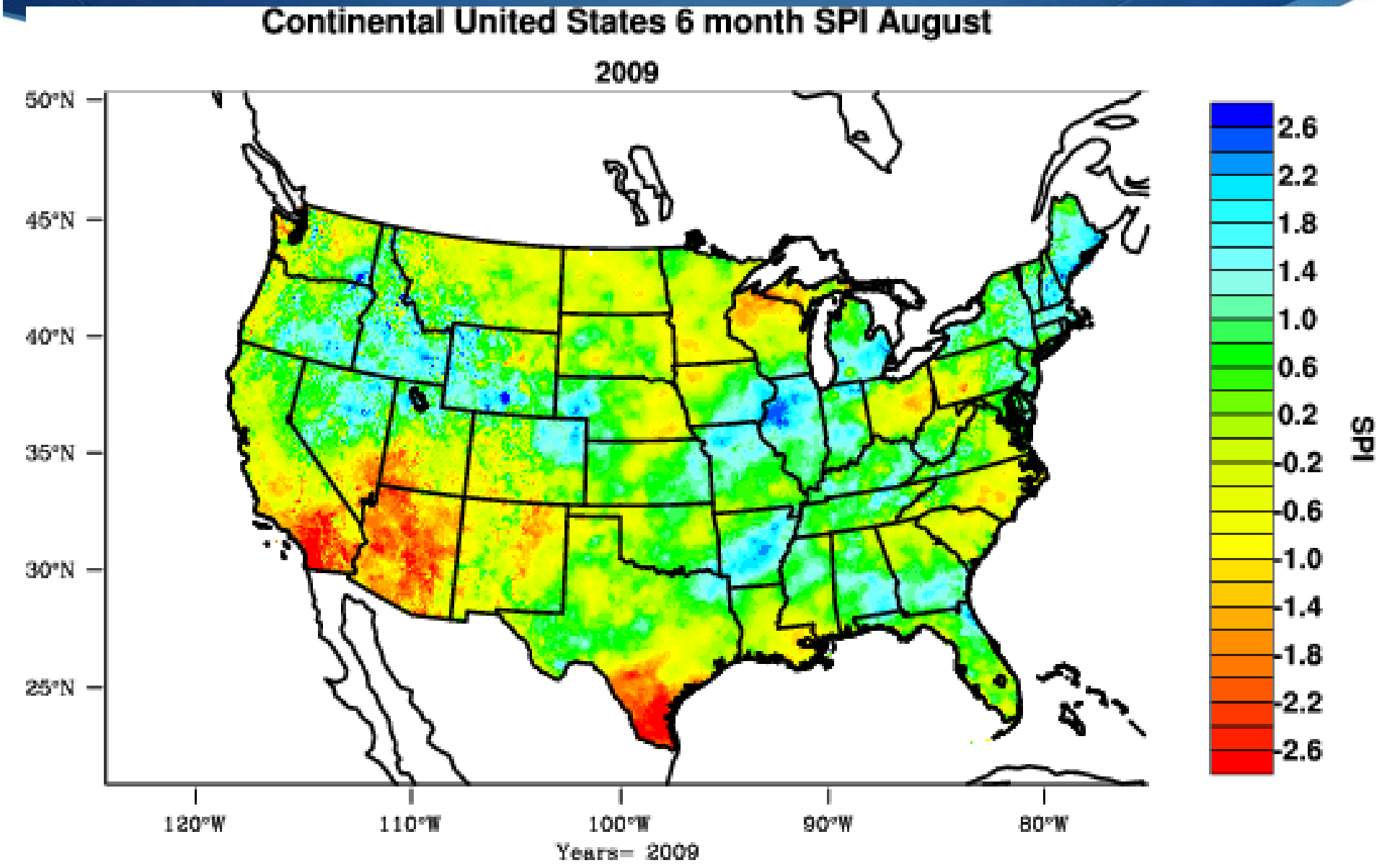


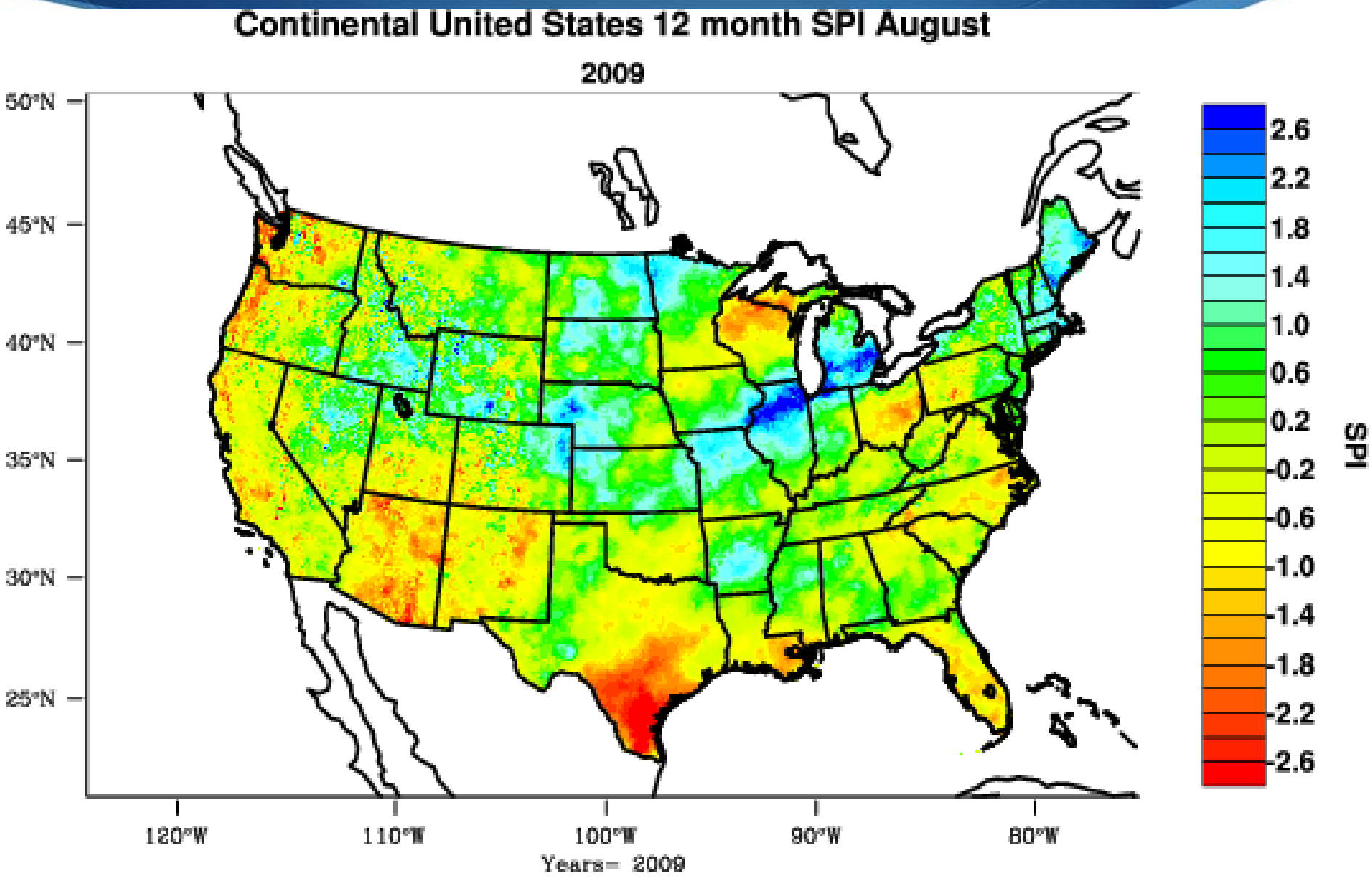

Western United States Mean Temperature Departure September-August
Departure from 1971-2000 Mean
50°N
48°N
46°N
44°N
42°N
40°N
38°N
36°N
34°N
32°N
120°W
115°W
110°W
105°W
Years= 2009
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
Departure from Normal

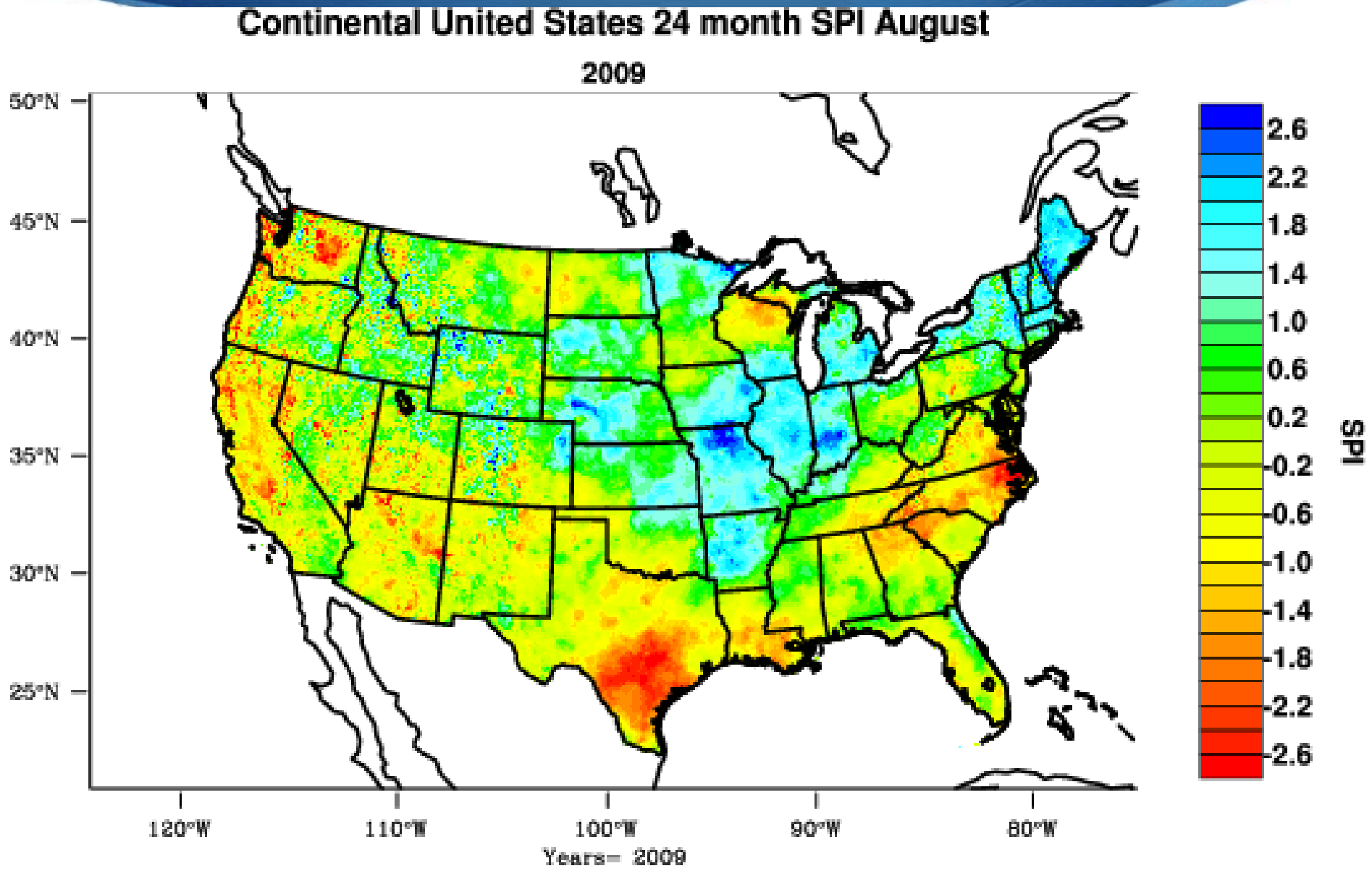

Nevada (ESC to close or use 'X' to the right)
Nevada Mean Temperature Departure September-August
Departure from 1971-2000 Mean
42°N
41°N
40°N
39°N
38°N
37°N
36°N
35°N
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
Departure from Normal

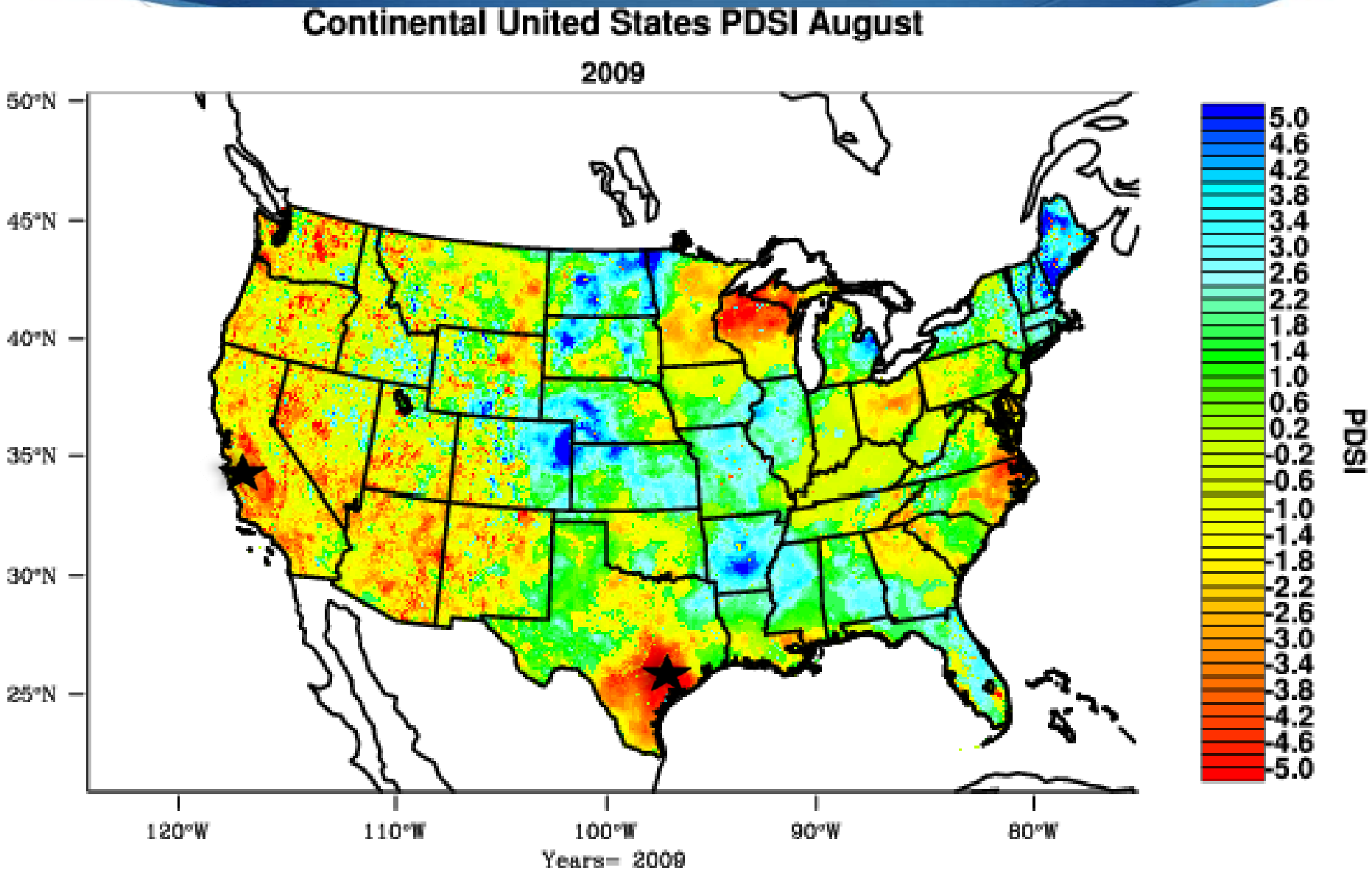

Western United States Precipitation Percent of Normal September-August
Departure from 1971-2000 Mean
50°N
48°N
46°N
44°N
42°N
40°N
38°N
36°N
34°N
32°N
120°W
115°W
110°W
105°W
Years= 2009
185
175
165
155
145
135
125
115
105
95
85
75
65
55
45
35
25
15
Percent of Normal


Nevada (ESC to close or use 'X' to the right)
Nevada Precipitation Percent of Normal September-August
Departure from 1971-2000 Mean
Click to close image, click and drag to move.
Use arrow keys for next and previous.
42°N
41°N
40°N
39°N
38°N
37°N
36°N
35°N
185
175
165
155
145
135
125
115
105
95
85
75
65
55
45
35
25
15
Percent of Normal

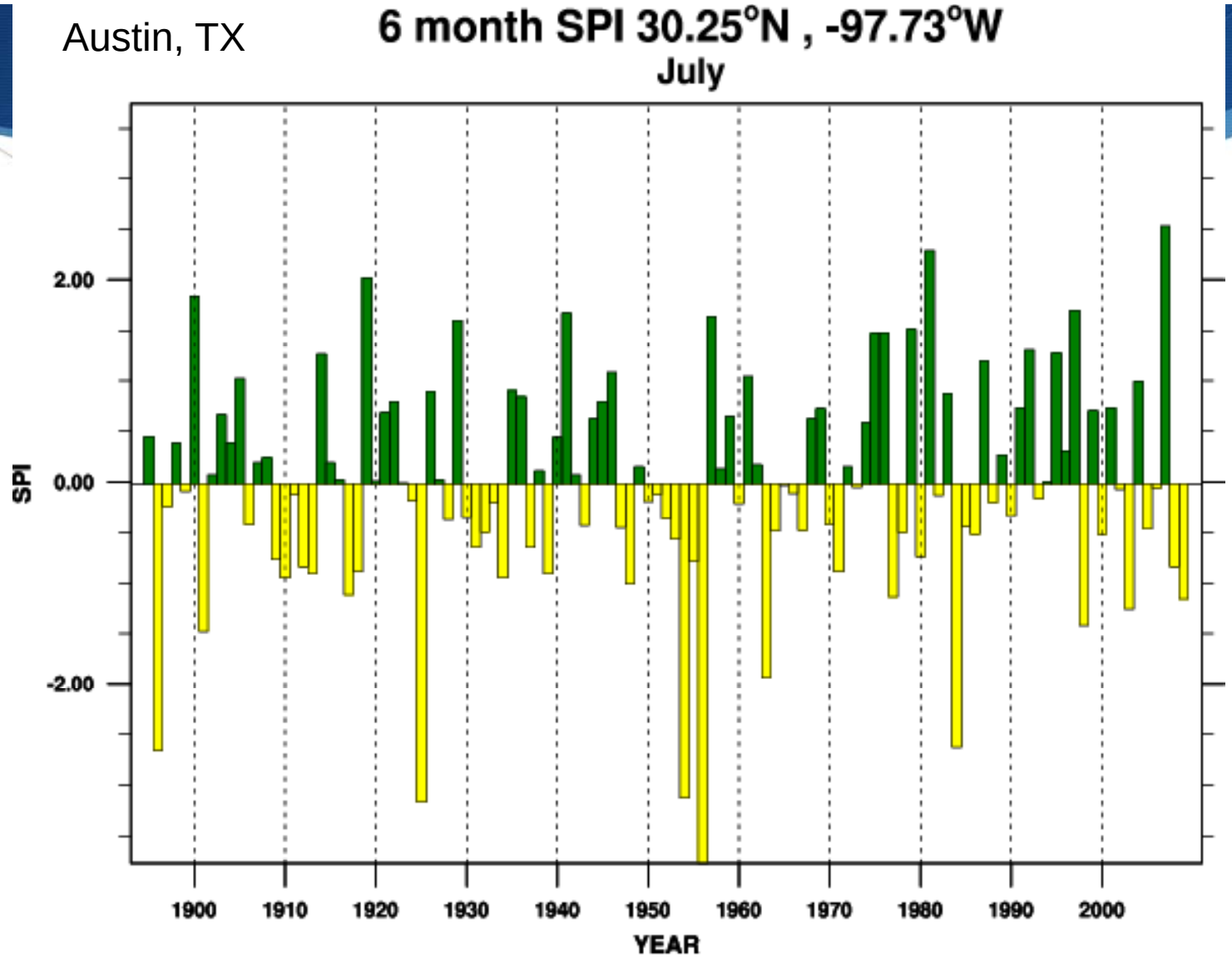

Continental United States 6 month SPI August
2009
50°N
45°N
40°N
35°N
30°N
25°N
120°W
110°W
100°W
90°W
80°W
Years= 2009
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
-2.2
-2.6
SPI


Continental United States 12 month SPI August
2009
50°N
45°N
40°N
35°N
30°N
25°N
120°W
110°W
100°W
90°W
80°W
Years= 2009
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
-2.2
-2.6
SPI


Continental United States 24 month SPI August
2009
50°N
45°N
40°N
35°N
30°N
25°N
120°W
110°W
100°W
90°W
80°W
Years= 2009
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
-2.2
-2.6
SPI


Continental United States PDSI August
2009
50°N
45°N
40°N
35°N
30°N
25°N
120°W
110°W
100°W
90°W
80°W
Years= 2009
5.0
4.6
4.2
3.8
3.4
3.0
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
-2.2
-2.6
-3.0
-3.4
-3.8
-4.2
-4.6
-5.0
PDSI

Austin, TX



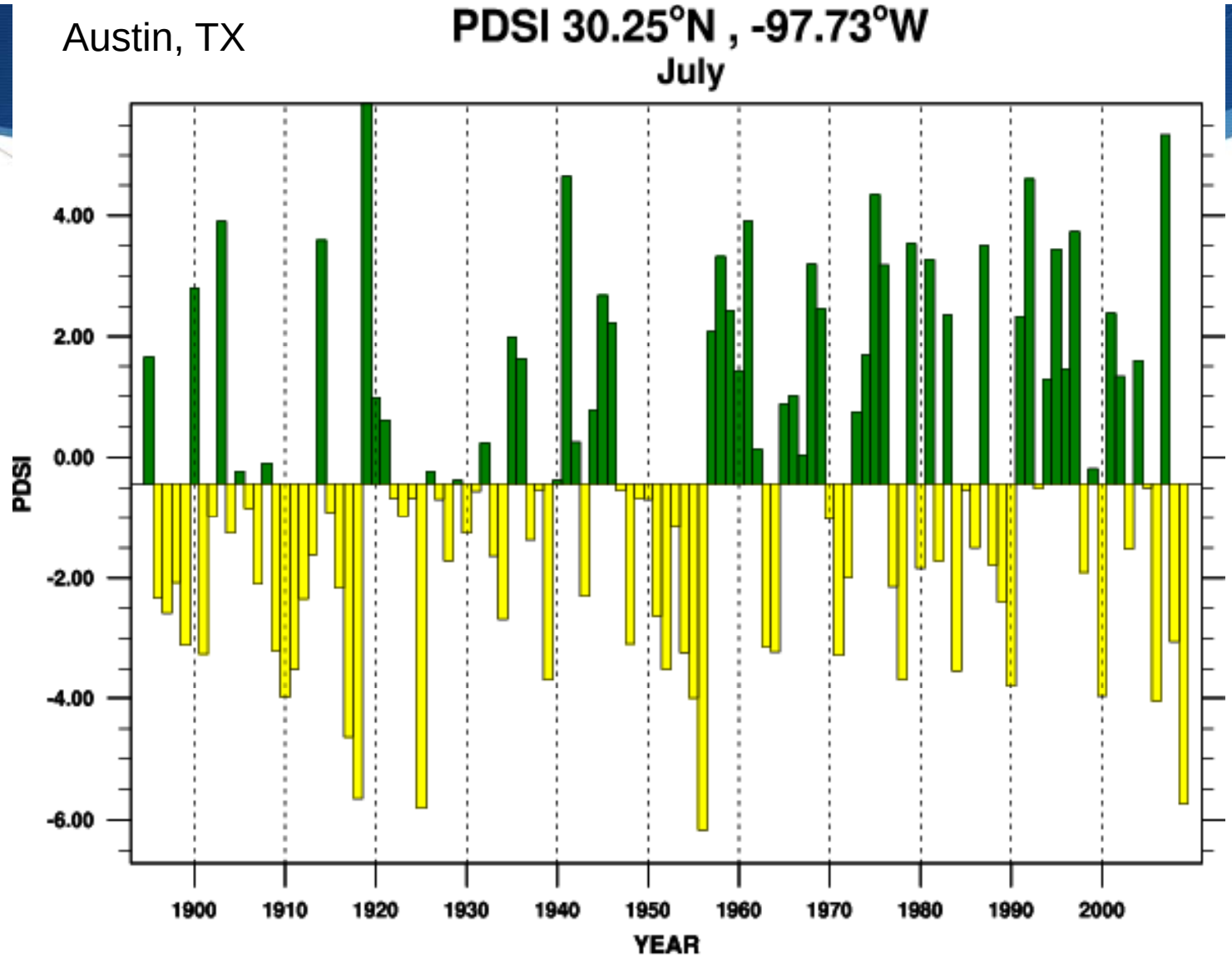
WestWide Drought Tracker
NOAA TRACS

Linear Trend 1895-2009	+ 0.02±	0.01	/10yr	
Wettest Year	2.53	(+ 2.54)	in 2007	
Driest Year	-3.78	(- 3.76)	in 1956	
2009	-1.16	(- 1.14)		

Base Period Statistics
1895-2009

MEAN	-0.02
STDEV	1.08
RANK	10 of 115

Austin, TX



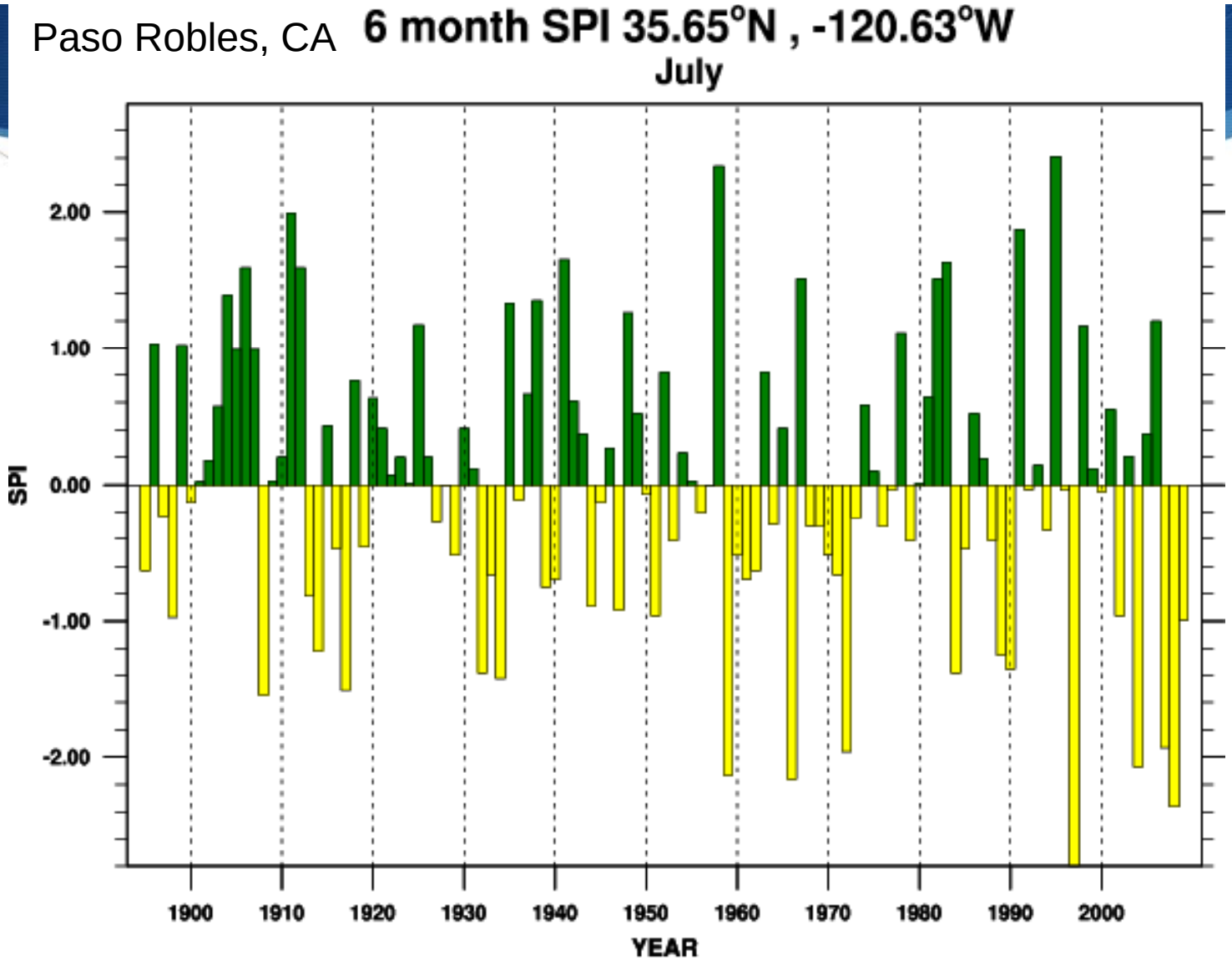
WestWide Drought Tracker
NOAA TRACS

Linear Trend 1895-2009	+ 0.13± 0.01 /10yr			
Wettest Year	5.85	(+ 6.28)	in 1919	
Driest Year	-6.16	(- 5.72)	in 1956	
2009	-5.73	(- 5.29)		

Base Period Statistics
1895-2009

MEAN	-0.44
STDEV	2.67
RANK	3 of 115

Paso Robles, CA



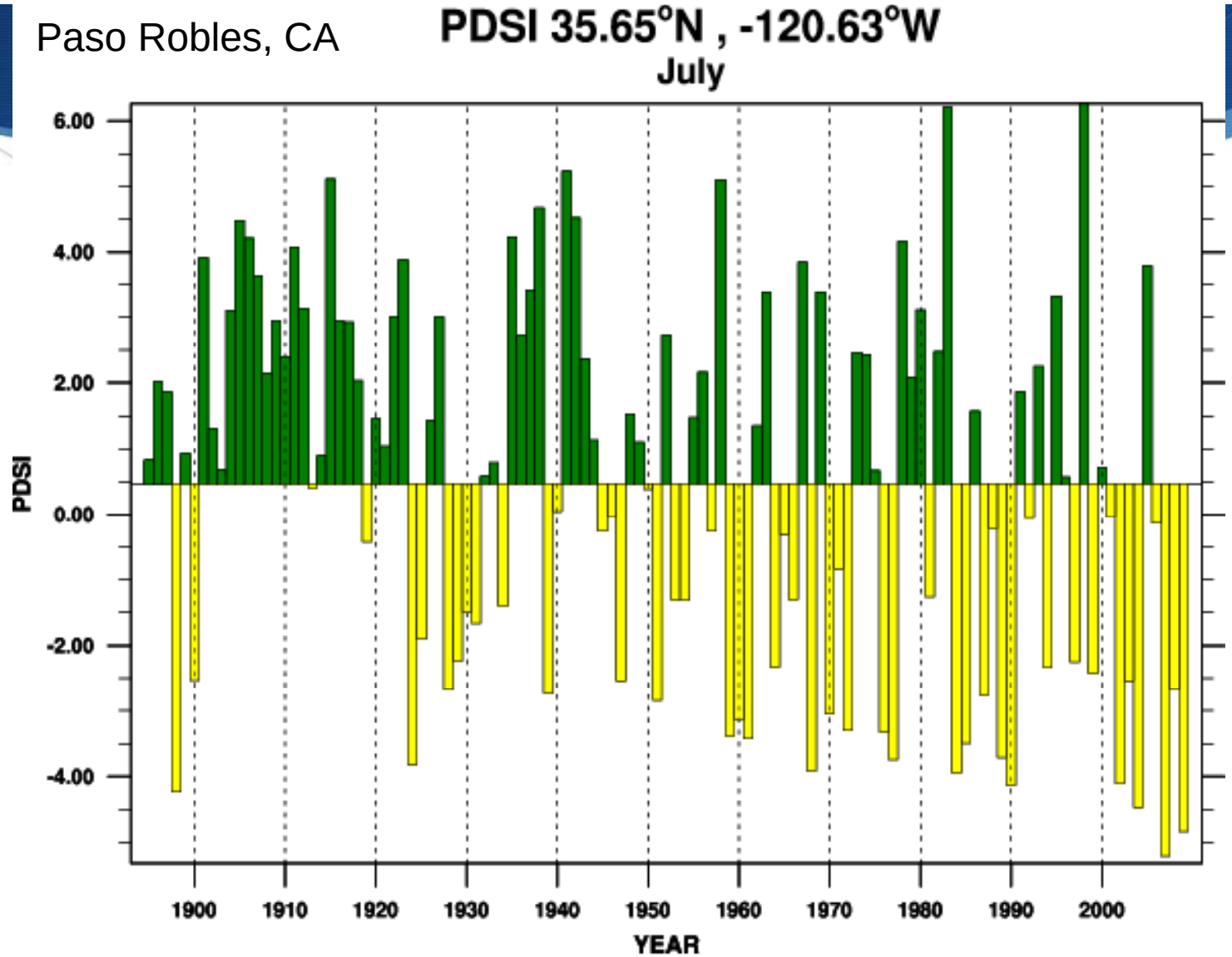
WestWide Drought Tracker
NOAA TRACS

Linear Trend 1895-2009	- 0.05±	0.01	/10yr	
Wettest Year	2.34	(+ 2.34)	in 1958	
Driest Year	-2.80	(- 2.79)	in 1997	
2009	-0.99	(- 0.99)		

Base Period Statistics
1895-2009

MEAN	-0.00
STDEV	1.02
RANK	16 of 115

Paso Robles, CA

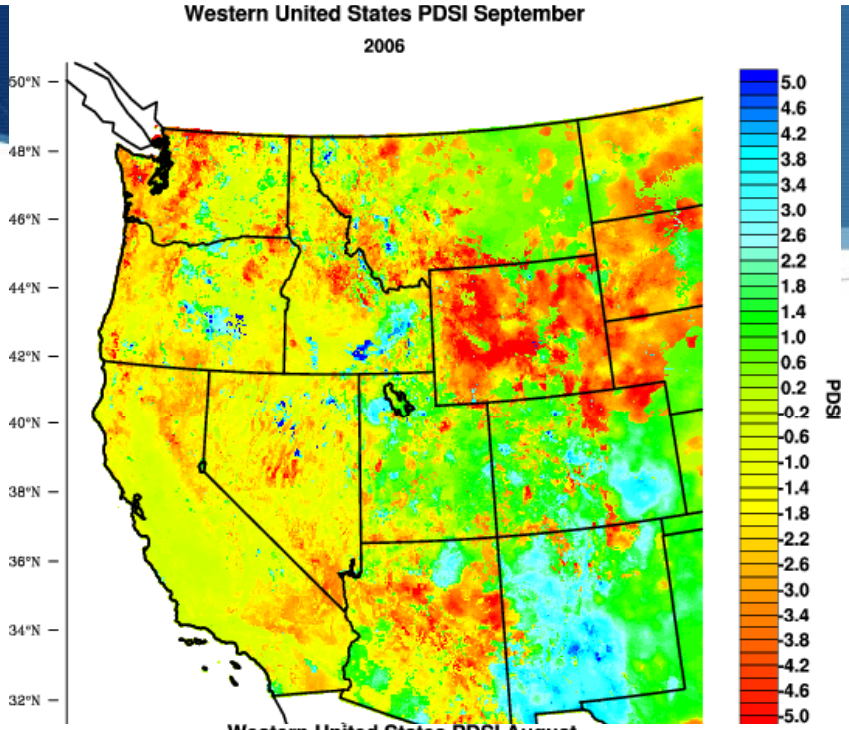


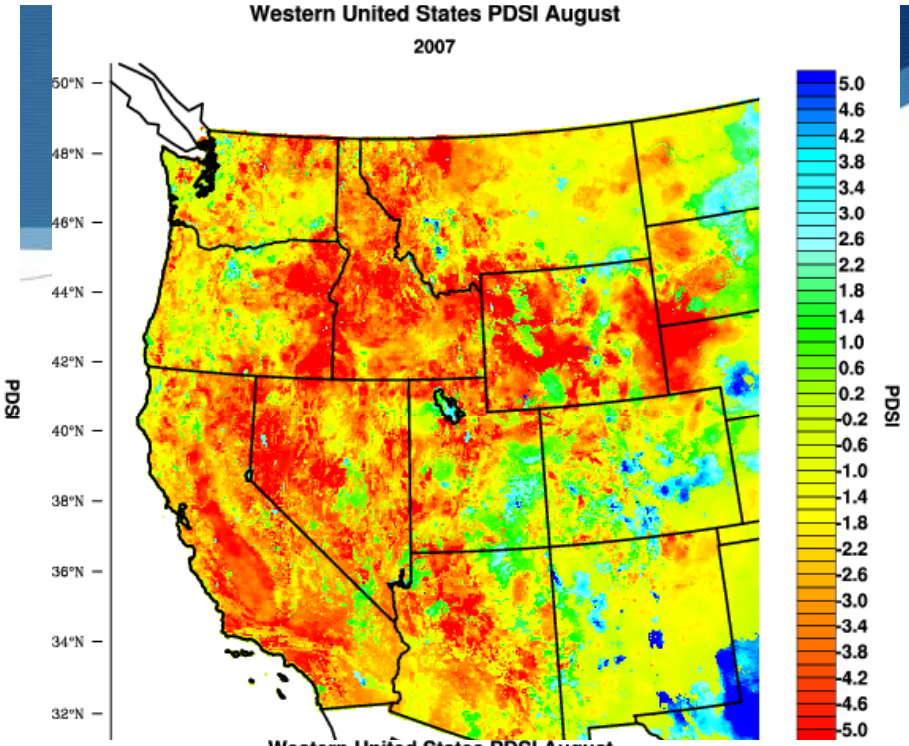
WestWide Drought Tracker
NOAA TRACS

Linear Trend 1895-2009	- 0.28± 0.02 /10yr			
Wettest Year	6.20	(+ 5.73)	in 1983	
Driest Year	-5.20	(- 5.66)	in 2007	
2009	-4.83	(- 5.30)		

Base Period Statistics
1895-2009

MEAN	0.47
STDEV	2.86
RANK	2 of 115


Western United States PDSI September
2006
50°N
48°N
46°N
44°N
42°N
40°N
38°N
36°N
34°N
32°N
5.0
4.6
4.2
3.8
3.4
3.0
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
-2.2
-2.6
-3.0
-3.4
-3.8
-4.2
-4.6
-5.0
PDSI


Western United States PDSI August
2007
50°N
48°N
46°N
44°N
42°N
40°N
38°N
36°N
34°N
32°N
5.0
4.6
4.2
3.8
3.4
3.0
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
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-2.6
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-3.4
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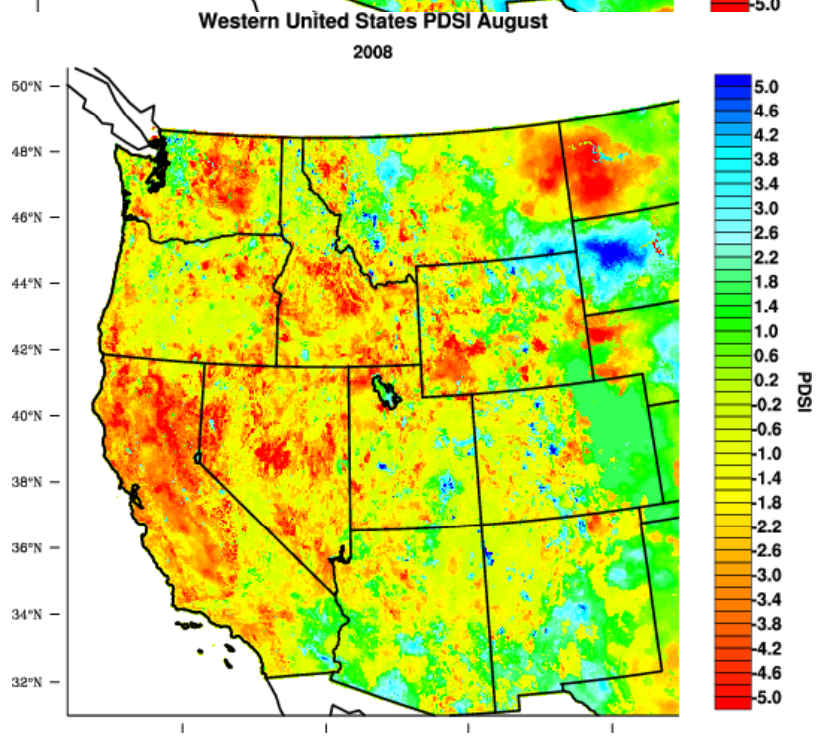
-5.0
PDSI


Western United States PDSI August
2008
50°N
48°N
46°N
44°N
42°N
40°N
38°N
36°N
34°N
32°N
5.0
4.6
4.2
3.8
3.4
3.0
2.6
2.2
1.8
1.4
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-1.0
-1.4
-1.8
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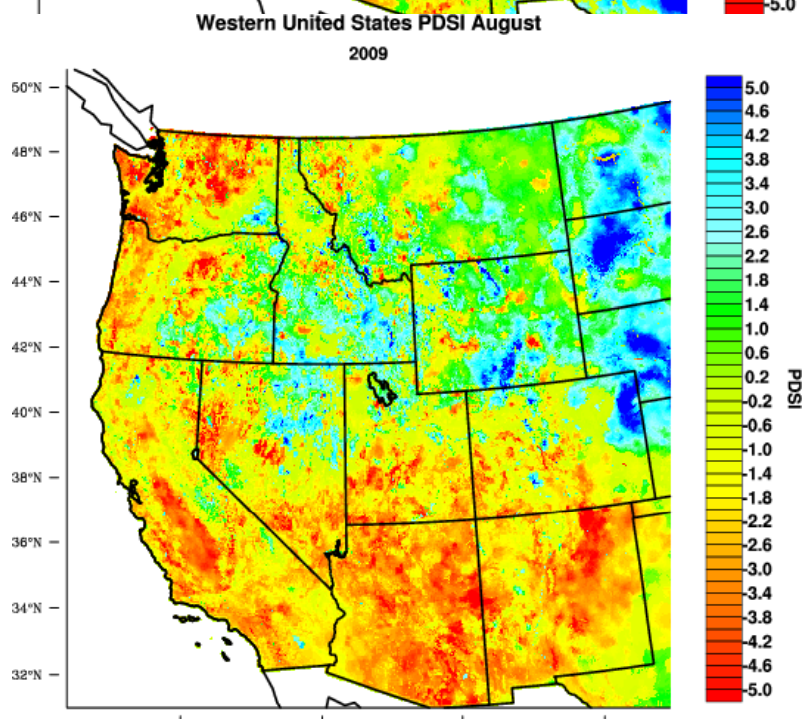
-5.0
PDSI


Western United States PDSI August
2009
50°N
48°N
46°N
44°N
42°N
40°N
38°N
36°N
34°N
32°N
5.0
4.6
4.2
3.8
3.4
3.0
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
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-2.6
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-3.4
-3.8
-4.2
-4.6
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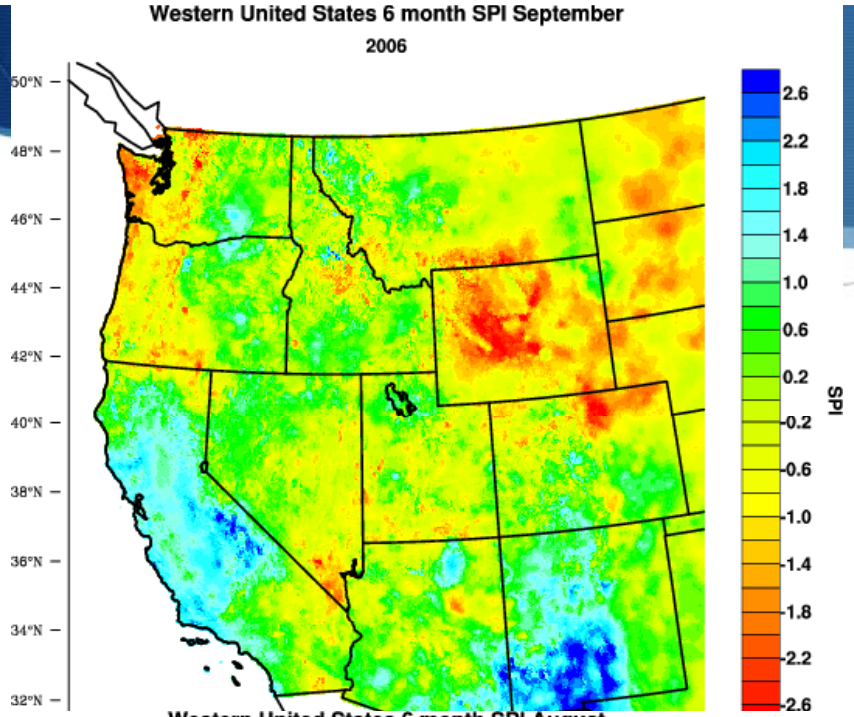
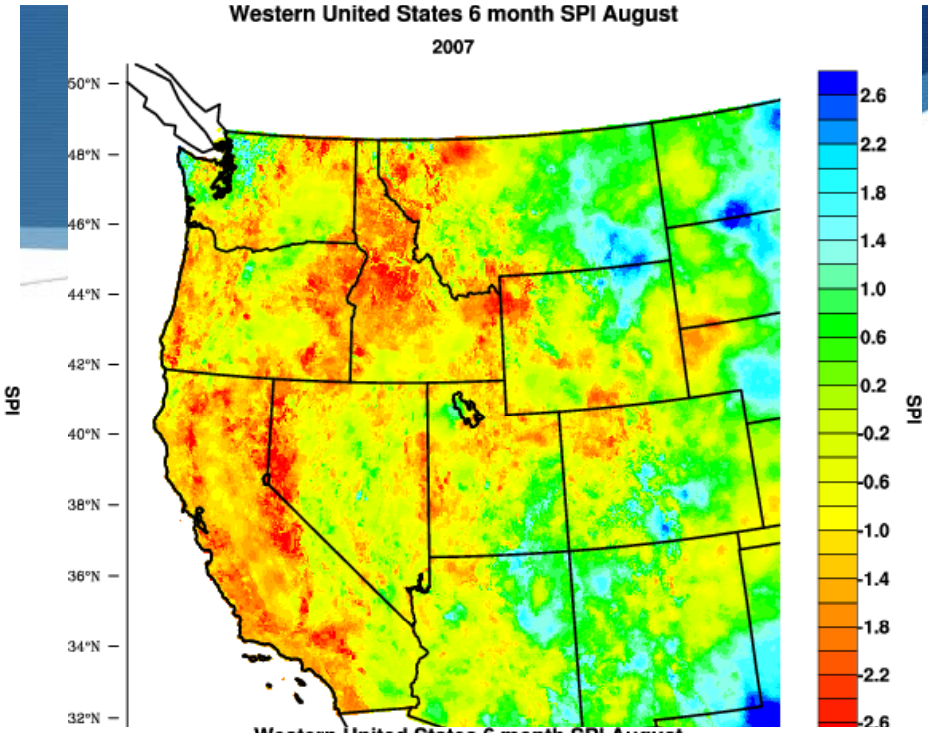
PDSI


Western United States 6 month SPI September
2006
50°N
48°N
46°N
44°N
42°N
40°N
38°N
36°N
34°N
32°N
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
-2.2
-2.6
SPI


Western United States 6 month SPI August
2007
50°N
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44°N
42°N
40°N
38°N
36°N
34°N
32°N
2.6
2.2
1.8
1.4
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-1.0
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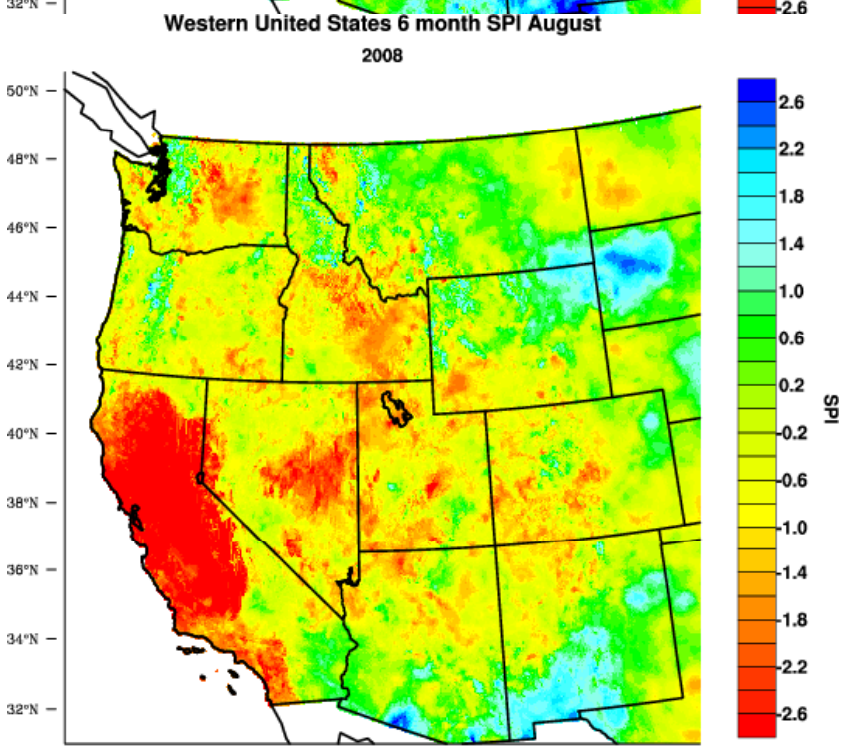
-1.8
-2.2
-2.6
SPI


Western United States 6 month SPI August
2008
50°N
48°N
46°N
44°N
42°N
40°N
38°N
36°N
34°N
32°N
2.6
2.2
1.8
1.4
1.0
0.6
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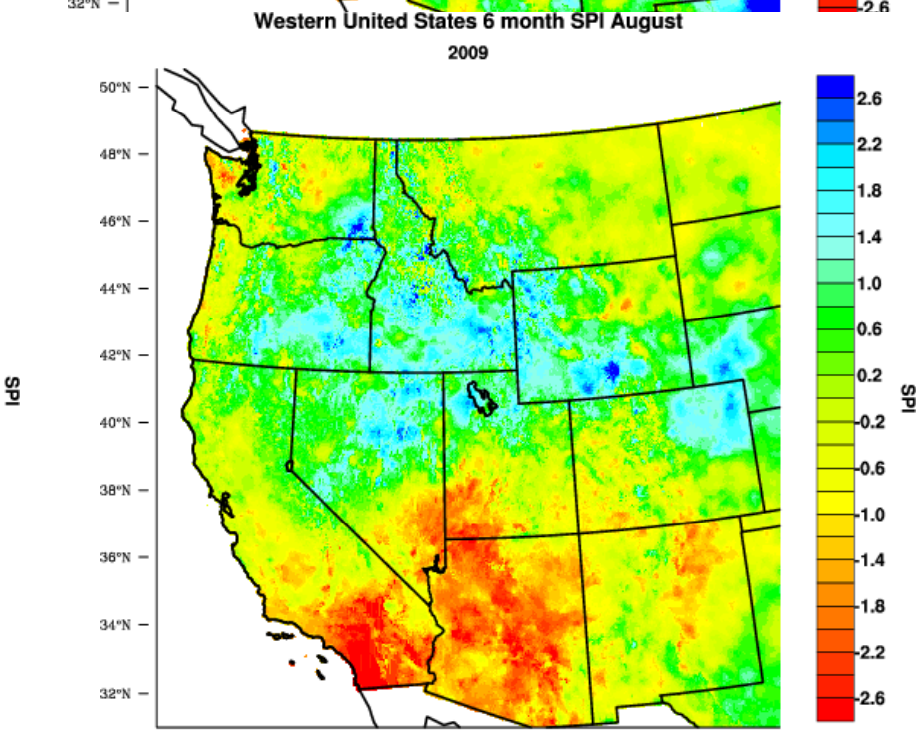
-0.2
-0.6
-1.0
-1.4
-1.8
-2.2
-2.6
SPI


Western United States 6 month SPI August
2009
50°N
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46°N
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42°N
40°N
38°N
36°N
34°N
32°N
2.6
2.2
1.8
1.4
1.0
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-1.8
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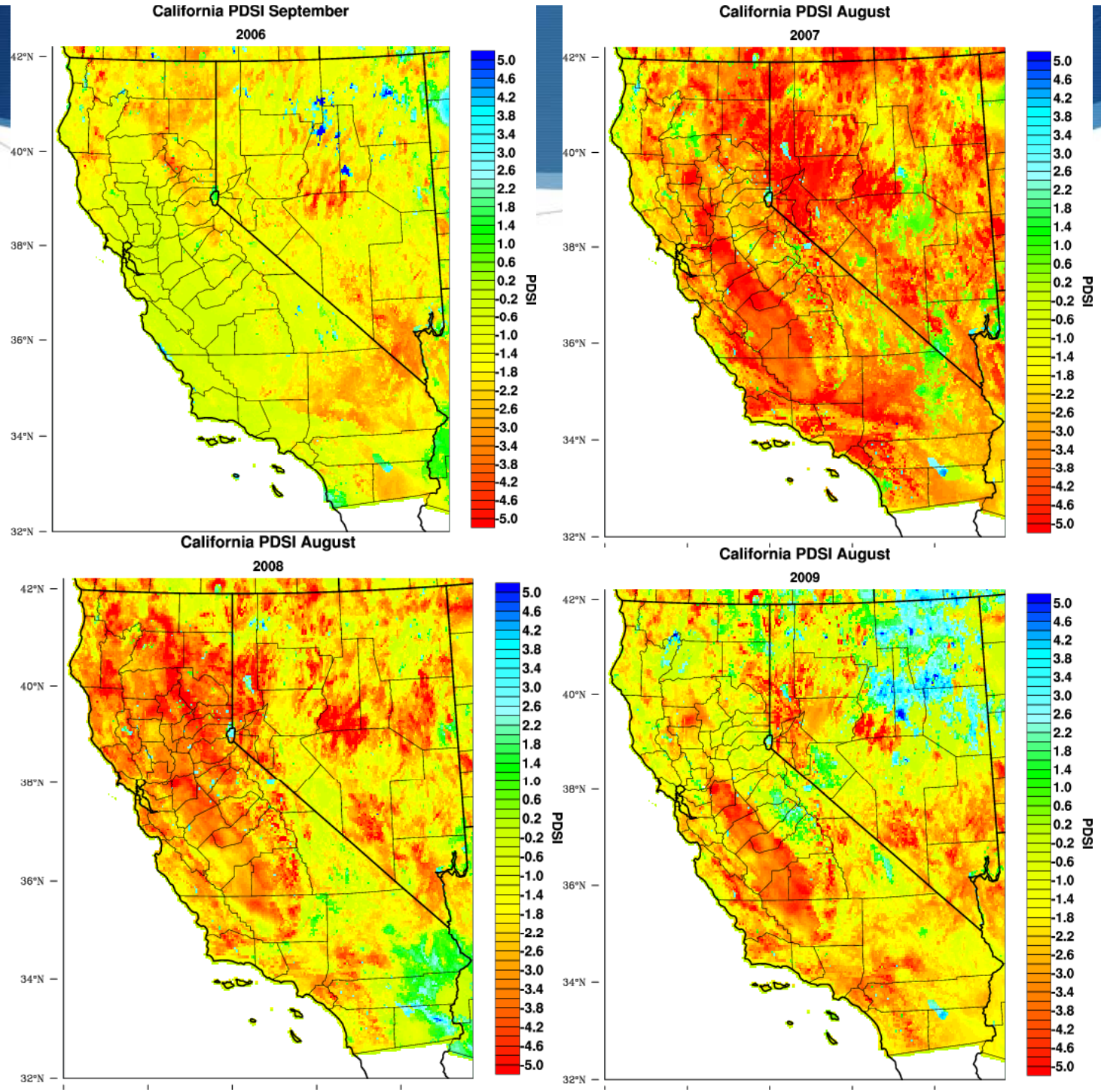
SPI


California PDSI September
2006
California PDSI August
2007
California PDSI August
2008
California PDSI August
2009
42°N
40°N
38°N
36°N
34°N
32°N
5.0
4.6
4.2
3.8
3.4
3.0
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
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-1.0
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-4.2
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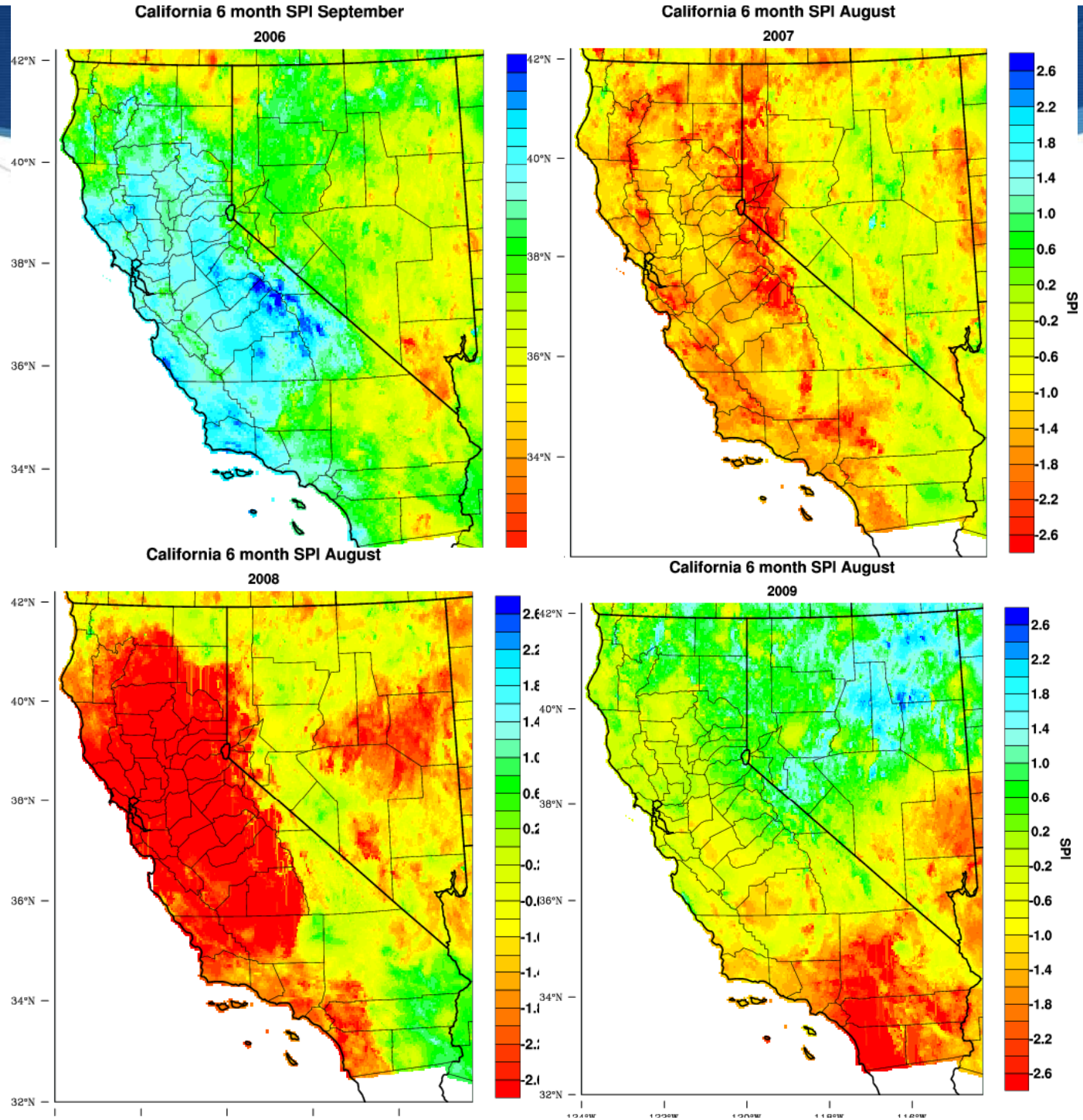
PDSI


California 6 month SPI September
2006
California 6 month SPI August
2007
California 6 month SPI August
2008
California 6 month SPI August
2009
42°N
40°N
38°N
36°N
34°N
32°N
2.6
2.2
1.8
1.4
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.4
-1.8
-2.2
-2.6
SPI

California SPI animation

Links to other WRCC projects

- Westmap: forms a basis for WWDT
- California Climate Tracker: rankings, percentile information
- Freezing levels: water budget
- WxCoder III: data availability and data quality
- ACIS: data availability, and other products

North American Freezing Level Tracker (not quite online yet)

North American Freezing Level Tracker

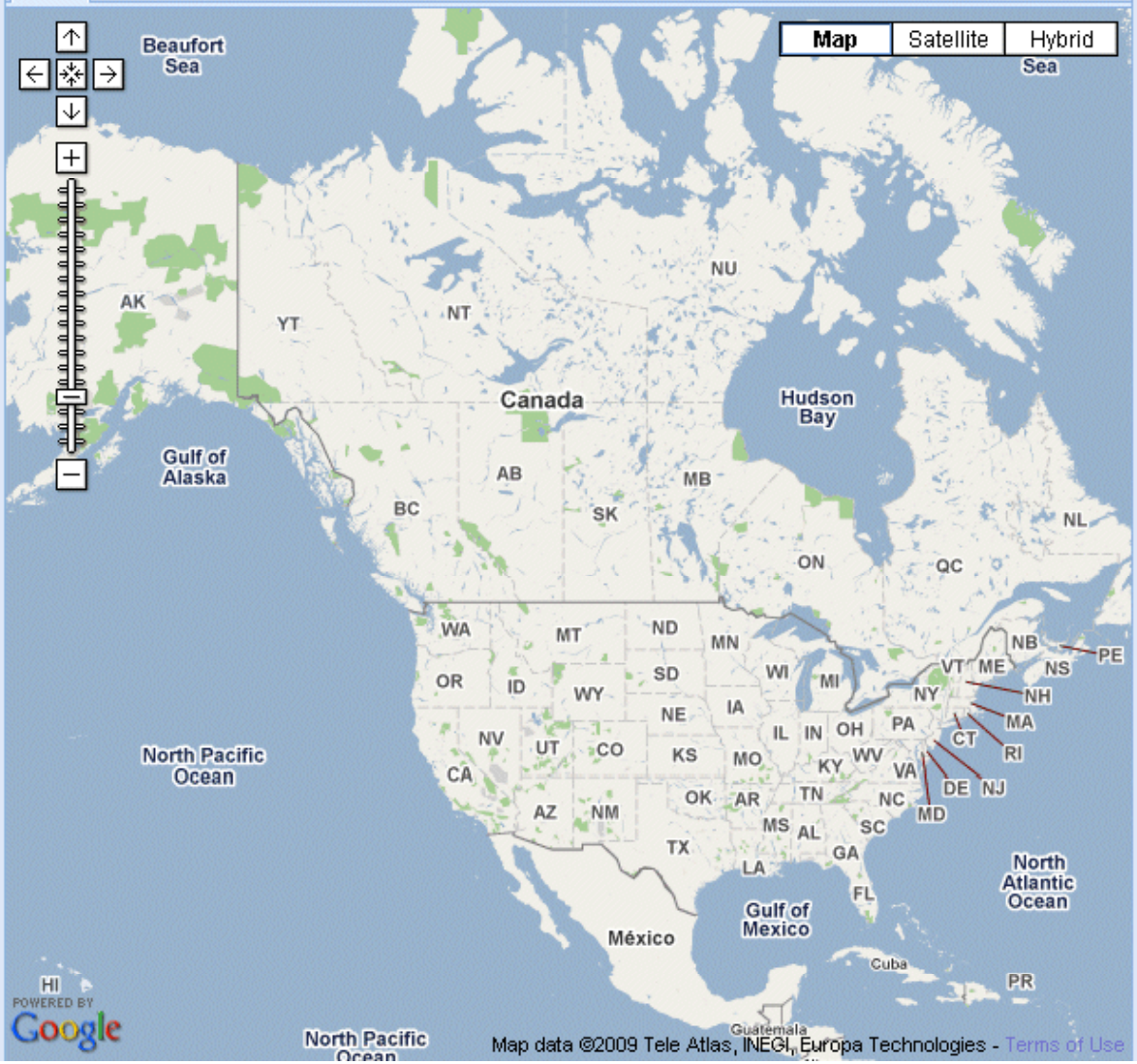
About

Description

Click anywhere on the map to place a marker. It can then be dragged around the map.
Use the Products panel on the right to generate products for the marker's location.

Settings

Map



Products

Monthly Bar Graph

Lat:

Lon:

Span: 1 Month

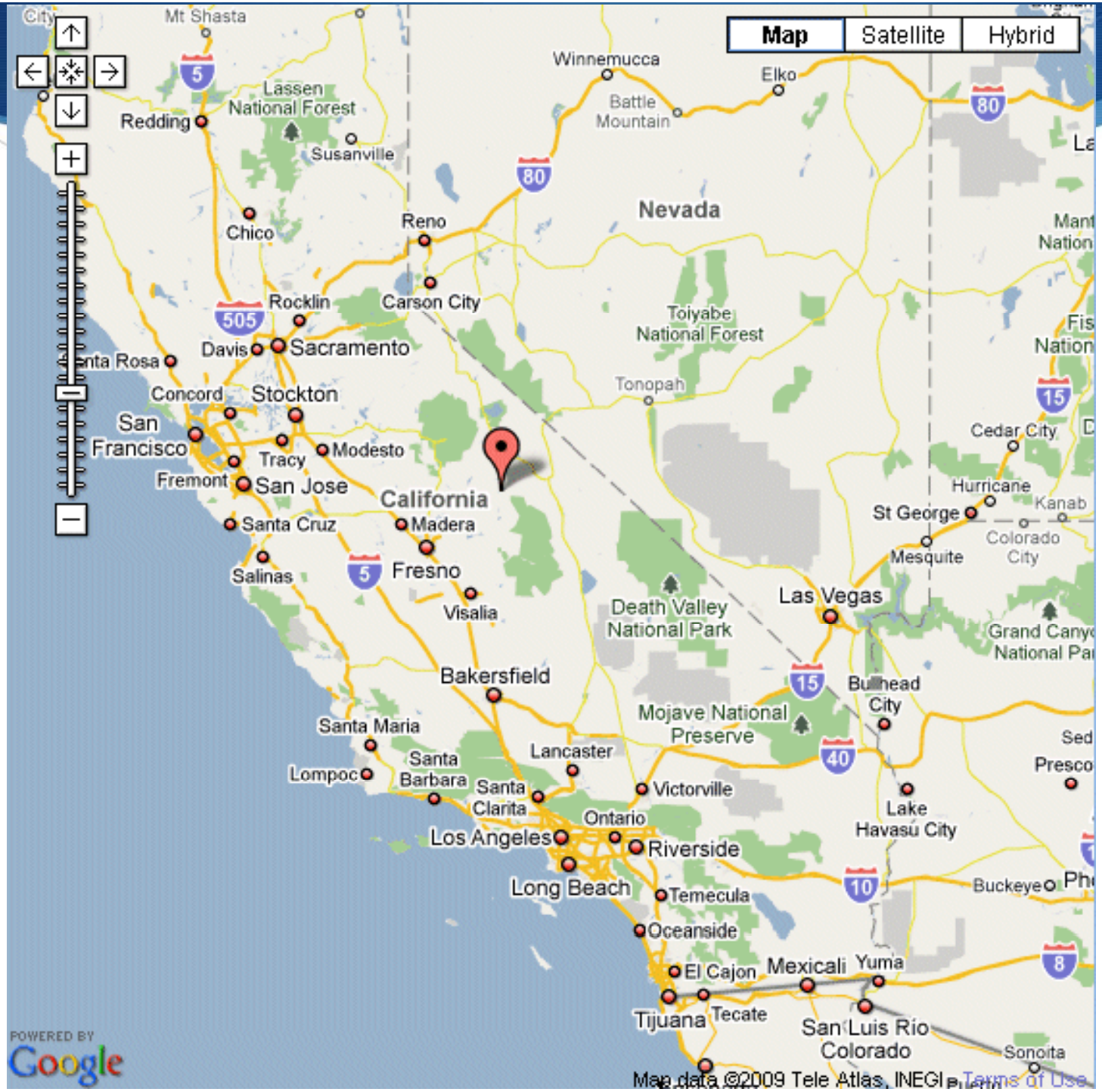
End Month: Jan

Level: 0 C

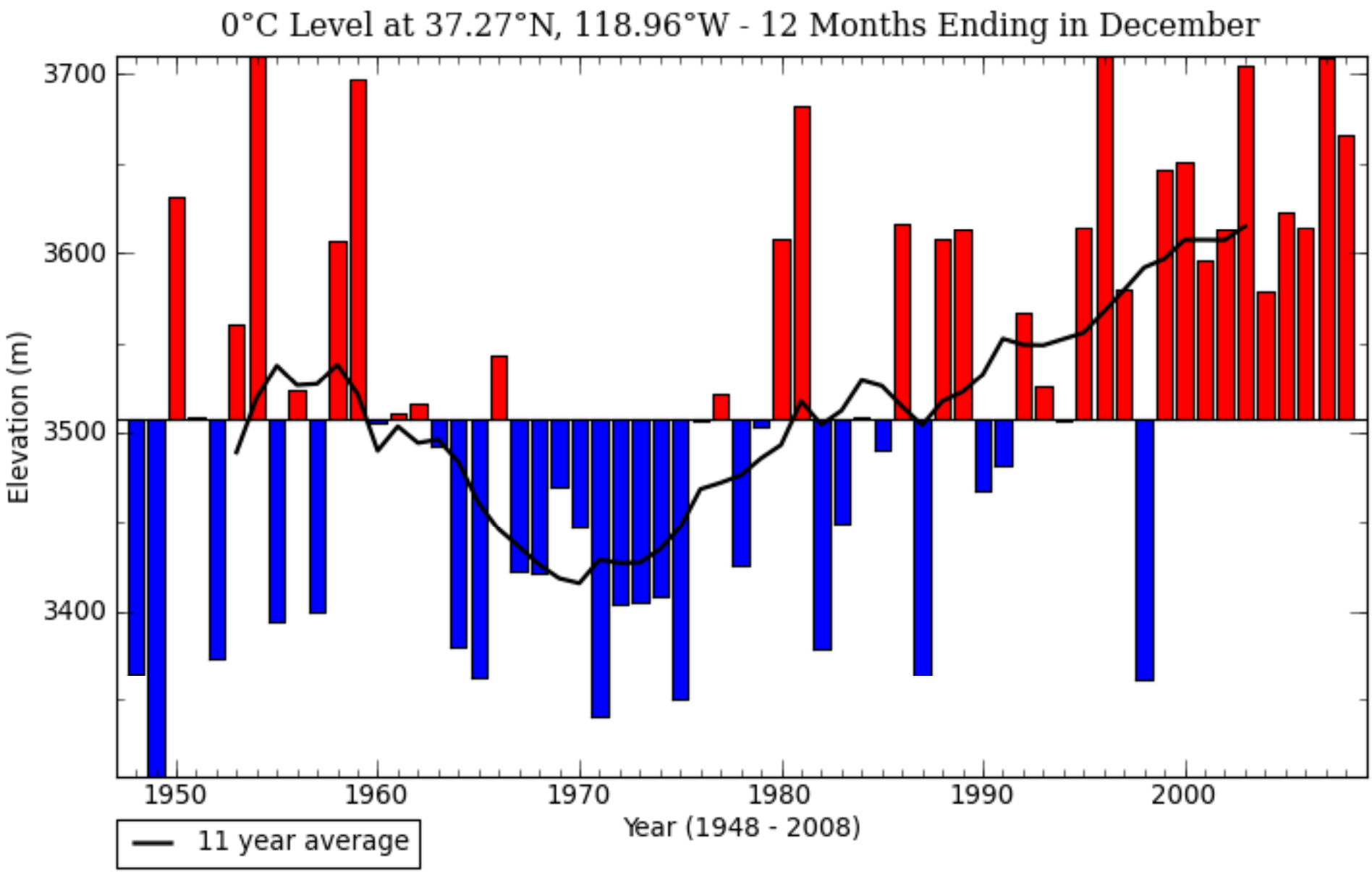
Running average: None

Go

Last 12 Months

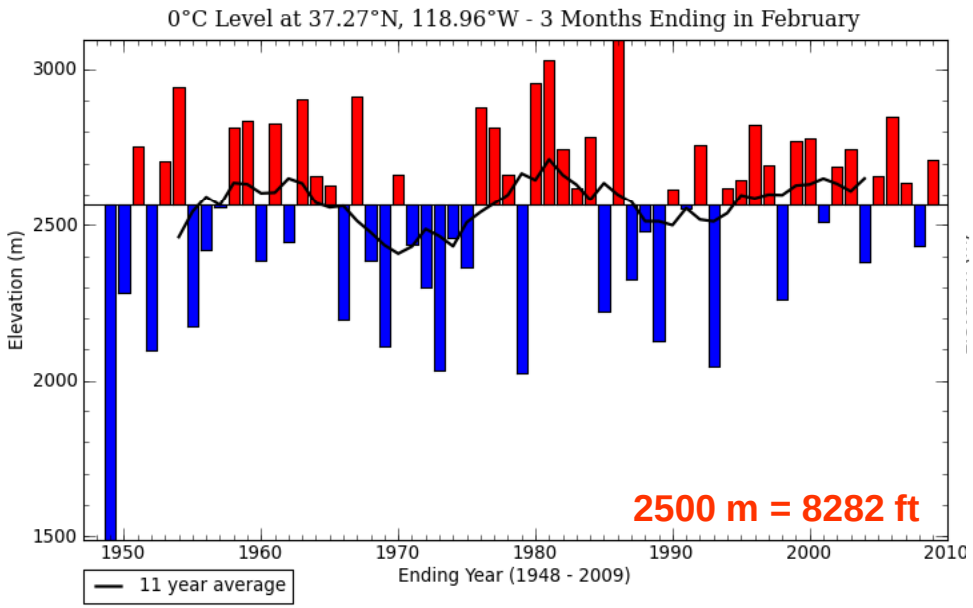

Map
Satellite
Hybrid
Mt Shasta
Lassen National Forest
Redding
Susanville
Winnemucca
Battle Mountain
Elko
Nevada
Chico
Reno
Carson City
Rocklin
Davis
Sacramento
Toiyabe National Forest
Tonopah
Concord
Stockton
San Francisco
Tracy
Modesto
Fremont
San Jose
California
Santa Cruz
Madera
Salinas
Fresno
Visalia
Death Valley National Park
Las Vegas
Cedar City
Hurricane
St George
Kanab
Colorado City
Mesquite
Bakersfield
Mojave National Preserve
Bullhead City
Santa Maria
Lancaster
Lompoc
Santa Barbara
Santa Clarita
Victorville
Lake Havasu City
Ontario
Los Angeles
Riverside
Long Beach
Temecula
Buckeye
Oceanside
El Cajon
Mexicali
Yuma
Tijuana
Tecate
San Luis Rio Colorado
Sonoita
POWERED BY Google
Map data ©2009 Tele Atlas, INEGI
Terms of Use

Sequoia National Park Annual Mean Freezing Level

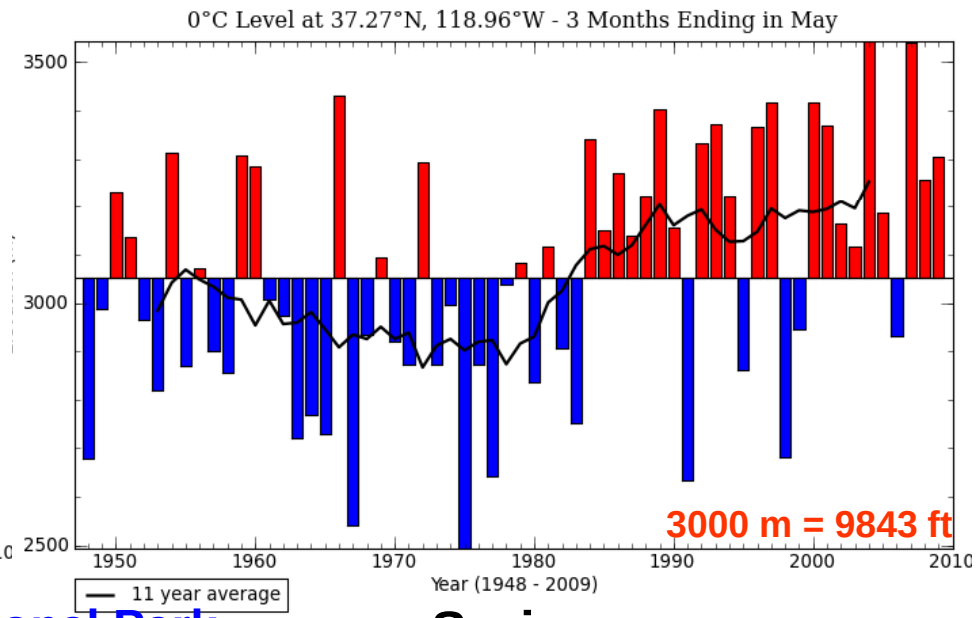


3500 m = 11484 ft

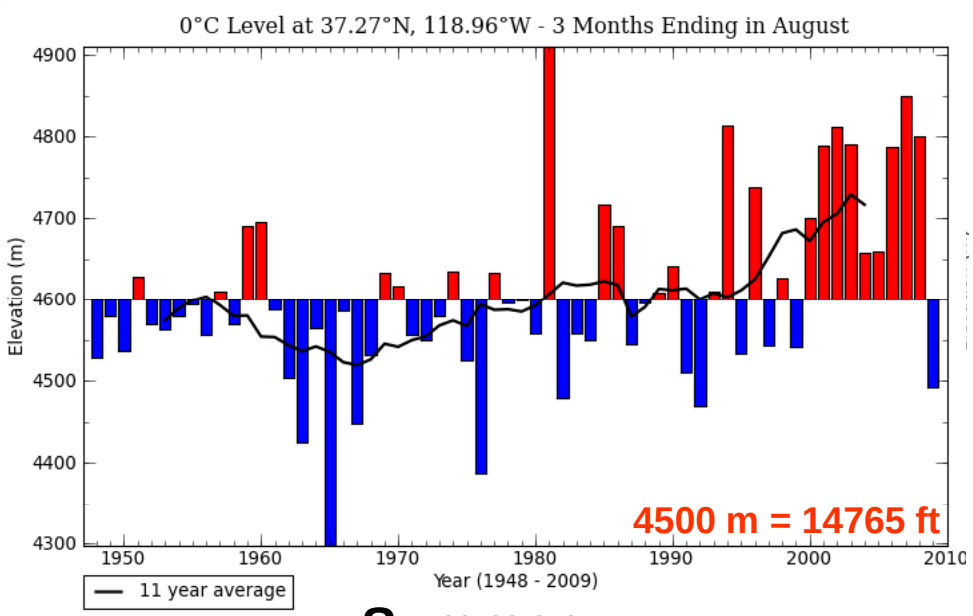
Sequoia National Park
Freezing Level 1948-Aug 2008



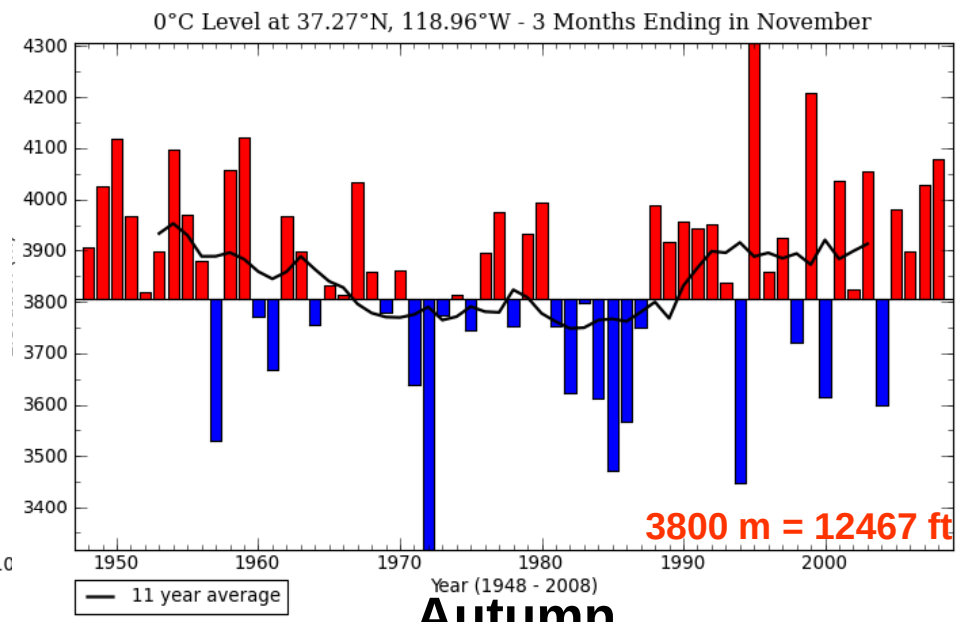
Winter



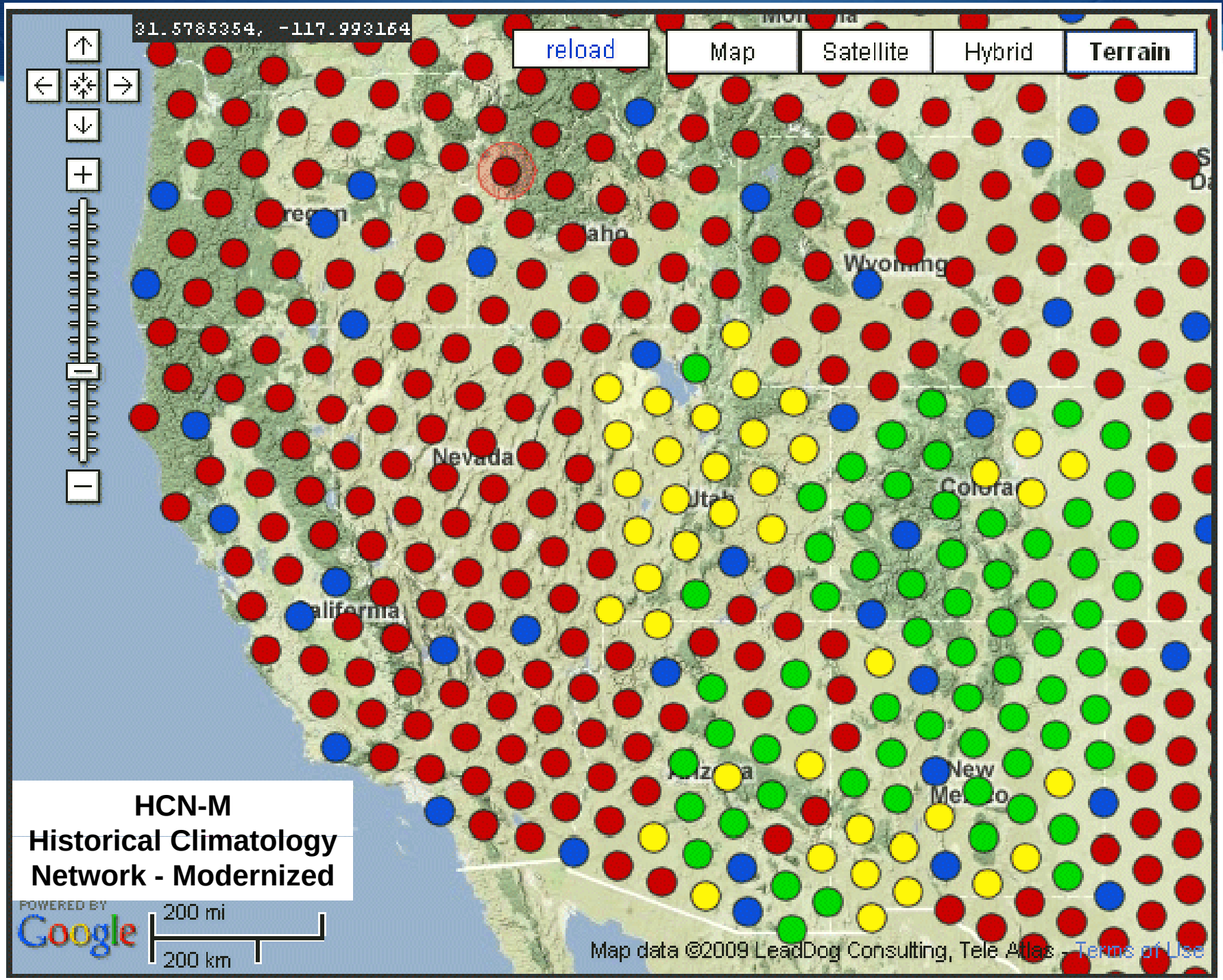
Spring



Summer



Autumn



HCN-M
Historical Climatology Network - Modernized

WWDR links to external projects

- USDM: decision making tools, objective input
- Drought impacts: complementary to objective indicators
- Drought Portal/NIDIS: more information for the western states

Needs and future directions

- Fine spatial scale, daily resolution climate data set
- Resolve differences between PRISM climatological and monthly calculation methodologies
- More substantial tie-in to Drought Portal
- Drought community surveys

Thanks!

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kelly.redmond@dri.edu