Observations and Monitoring

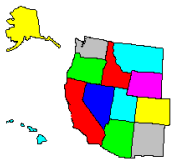
Kelly Redmond

Western Regional Climate Center

Desert Research Institute

Reno NV

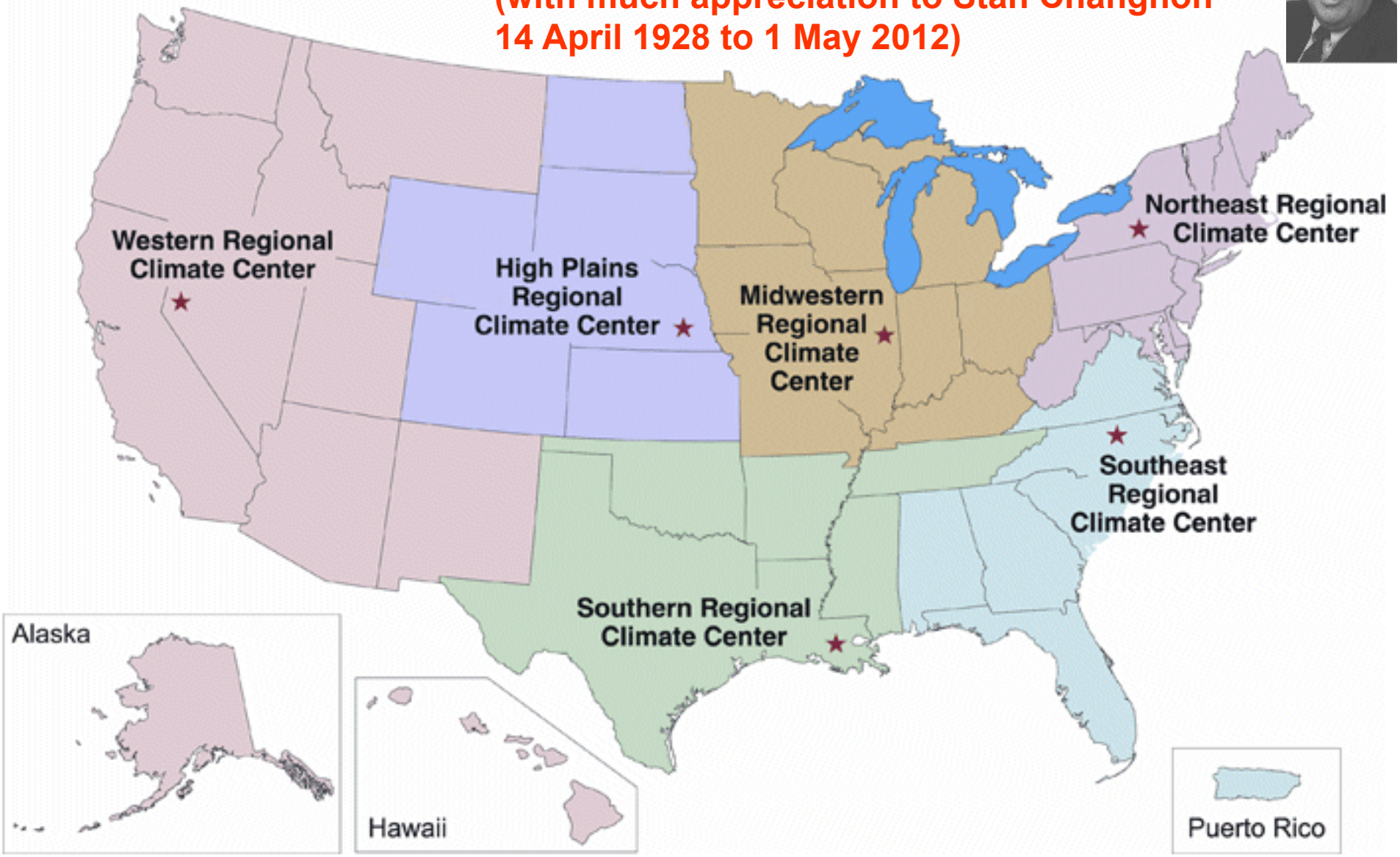
Drought in the Rio Grande / Bravo
First Technical Scoping Workshop
Meeting Host:
International Boundary and Water Commission
El Paso TX
2012 August 15-16



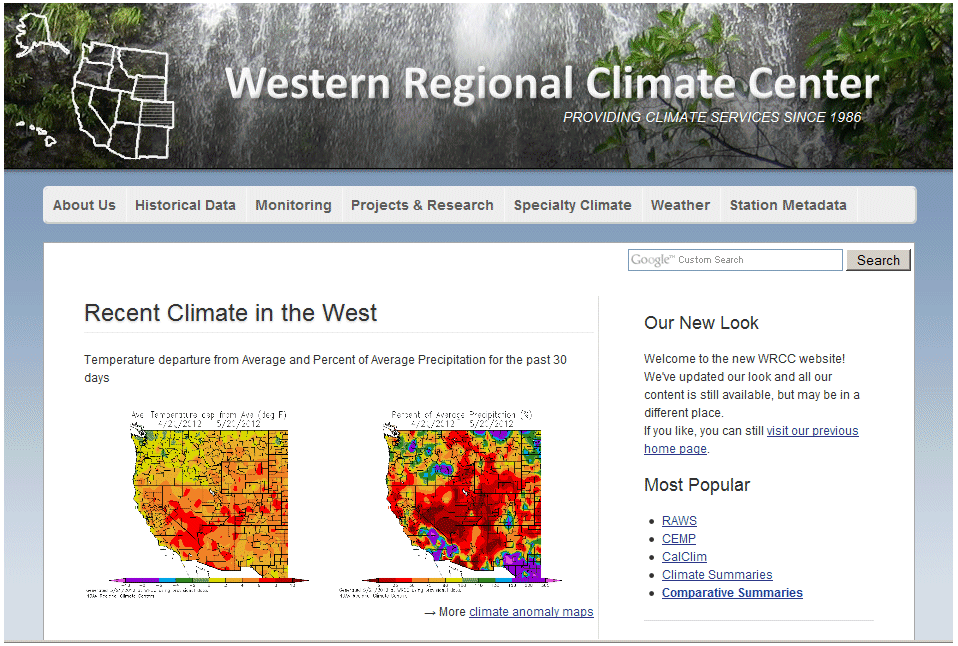
Western Regional
Climate Center

DRI
Desert Research Institute

Regional Climate Centers (1986 +)
(with much appreciation to Stan Changnon 14 April 1928 to 1 May 2012)



Western Regional Climate Center



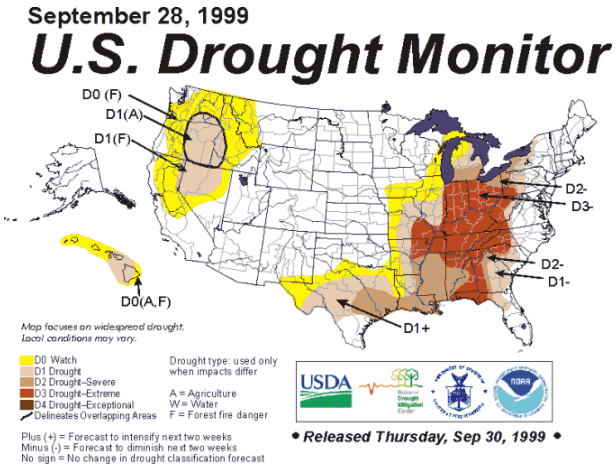
Specializes in data, observations, climate monitoring,

in mountainous and complex topography,

significant snow influences on hydrology

Mission

- **Act as a repository of historical climate data and information**
- **Disseminate high quality climate data and information pertaining to the western United States**
- **Engage in applied research related to climate issues**
- **Improve the coordination of climate-related activities across scales**
  - **Local**
  - **State**
  - **Regional**
  - **National**



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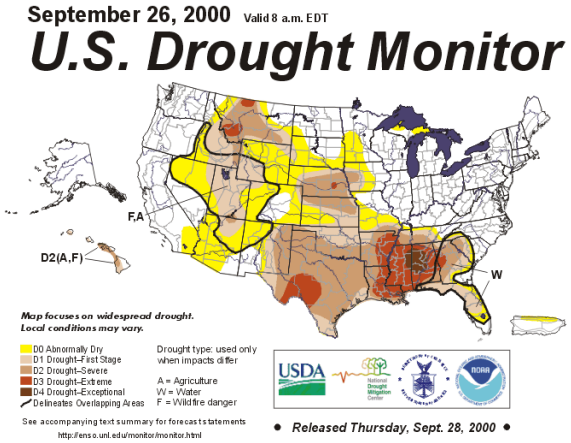

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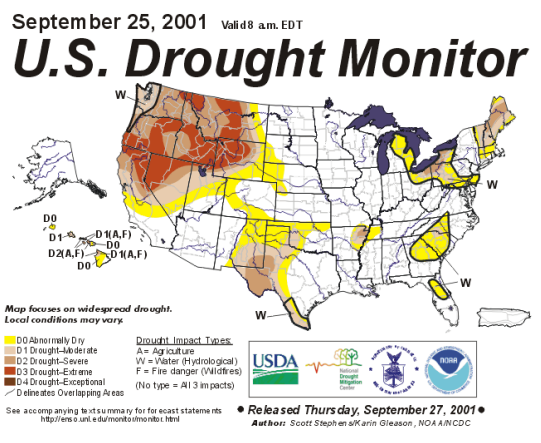

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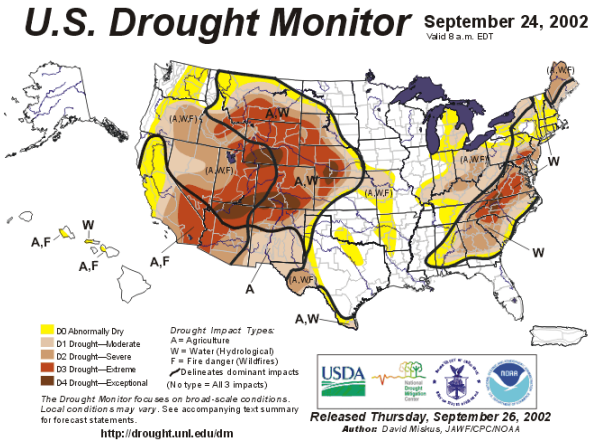

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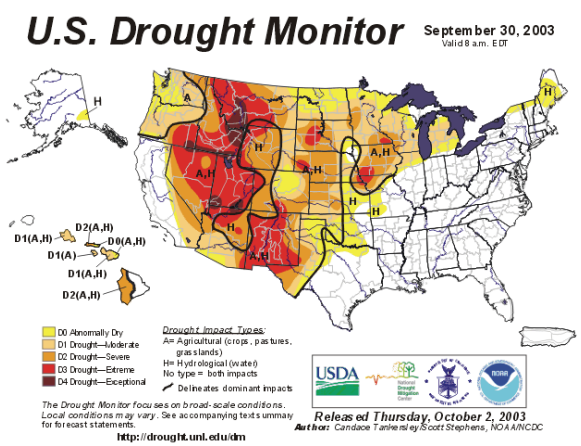

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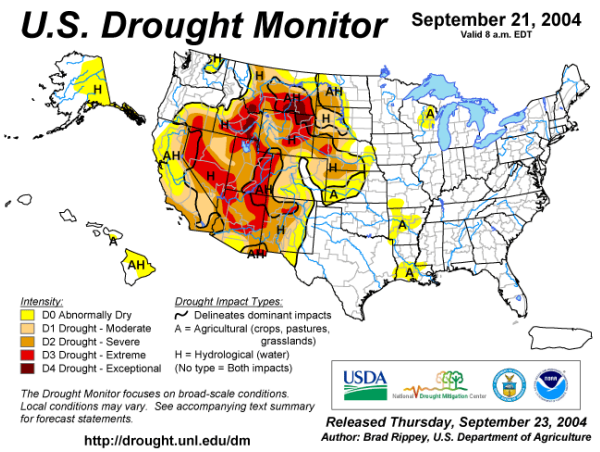

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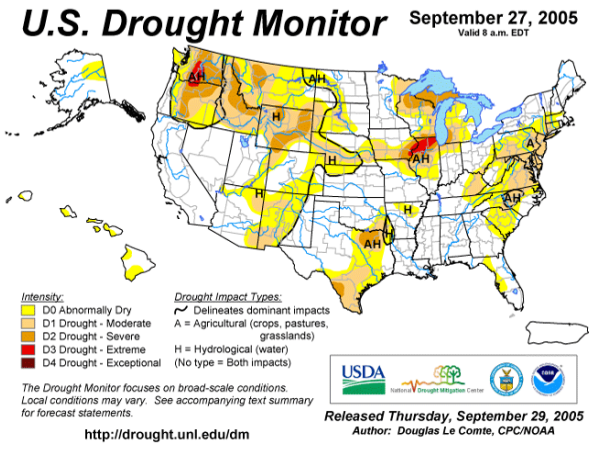

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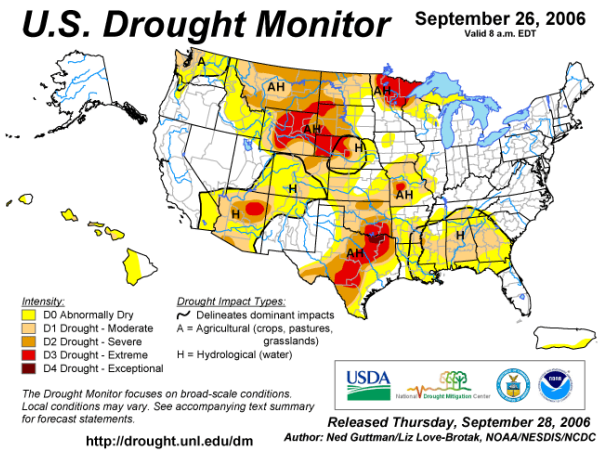

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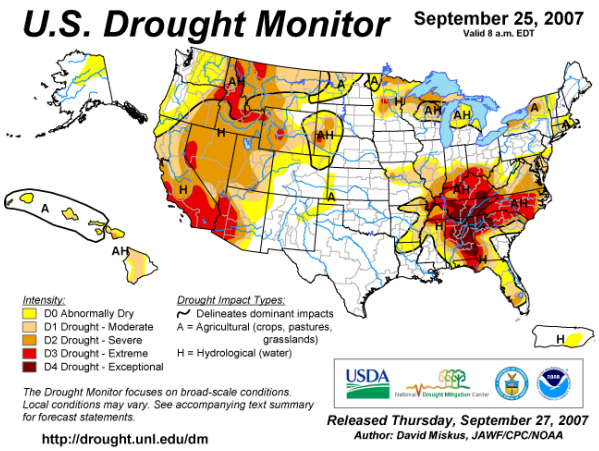

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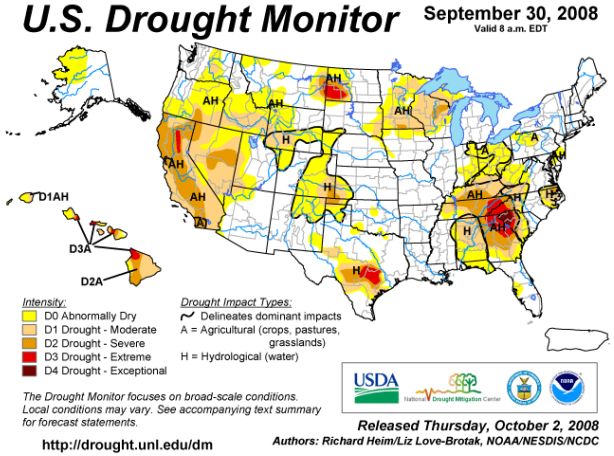

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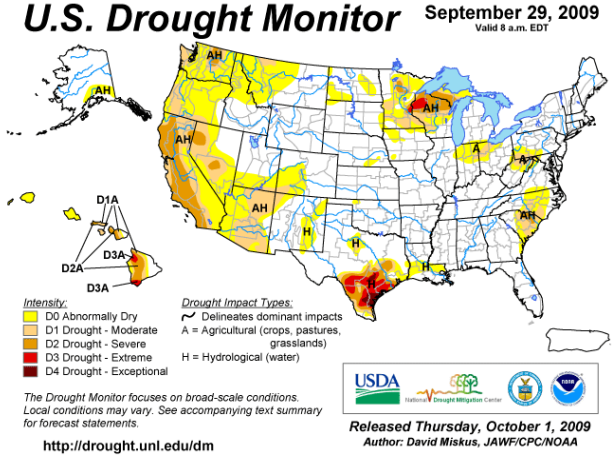

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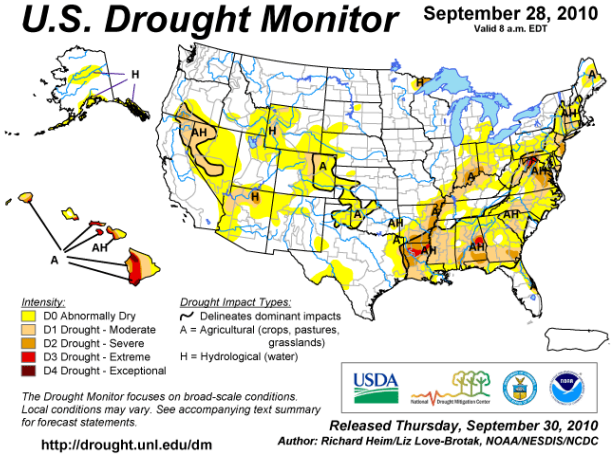

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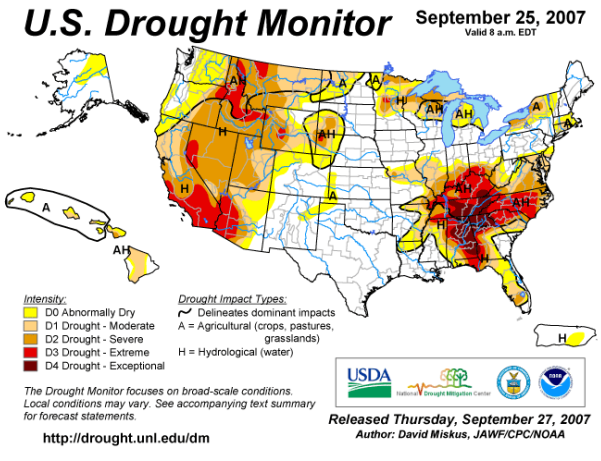

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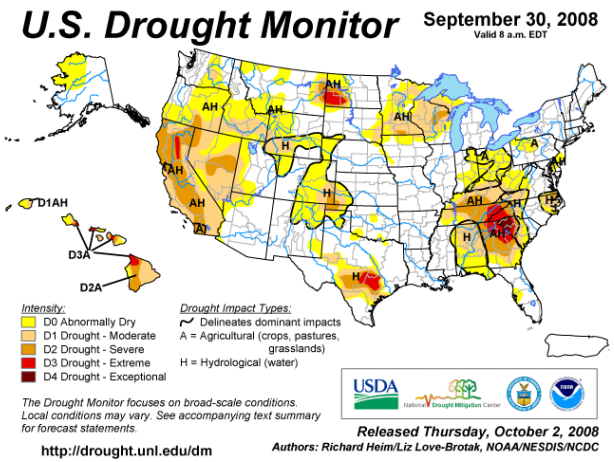

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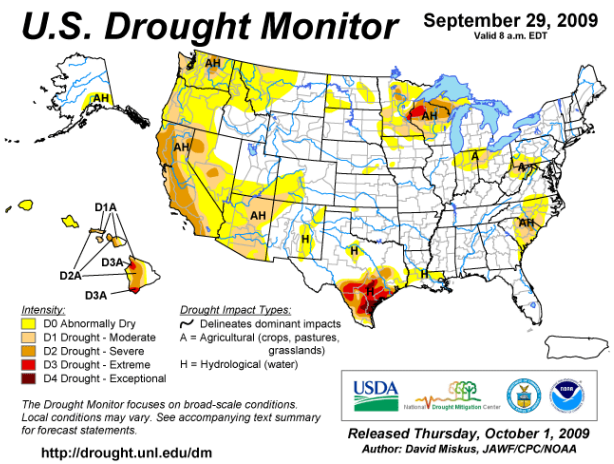

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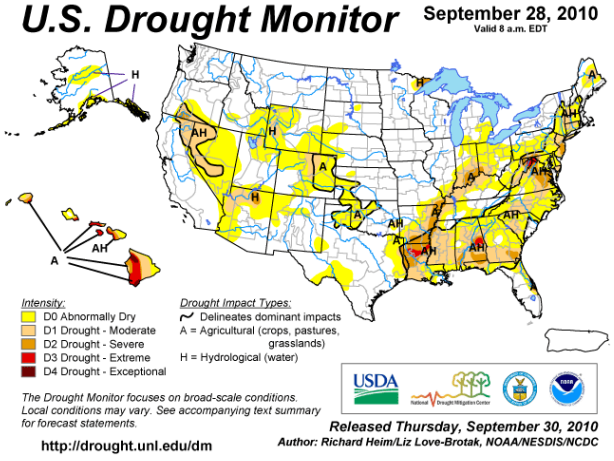

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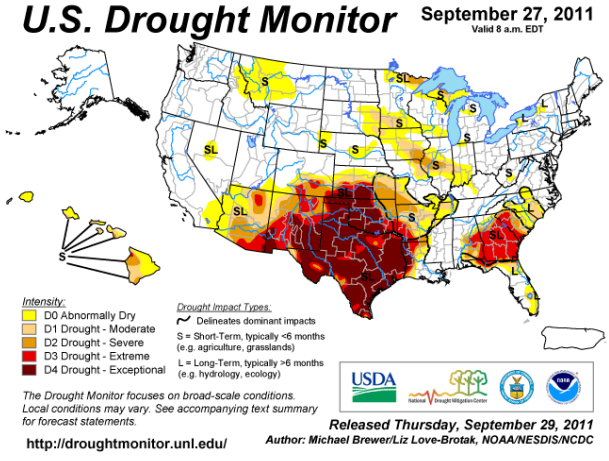

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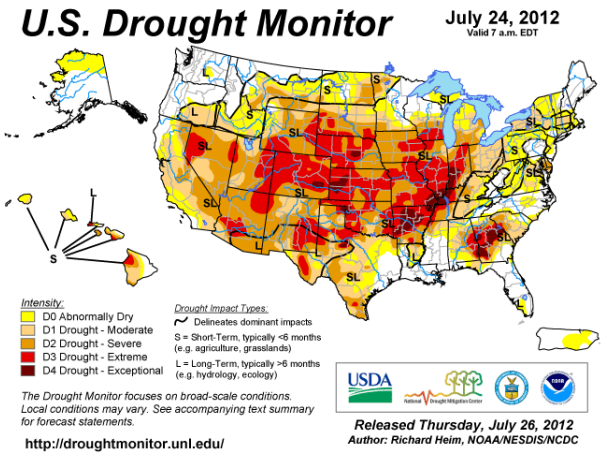
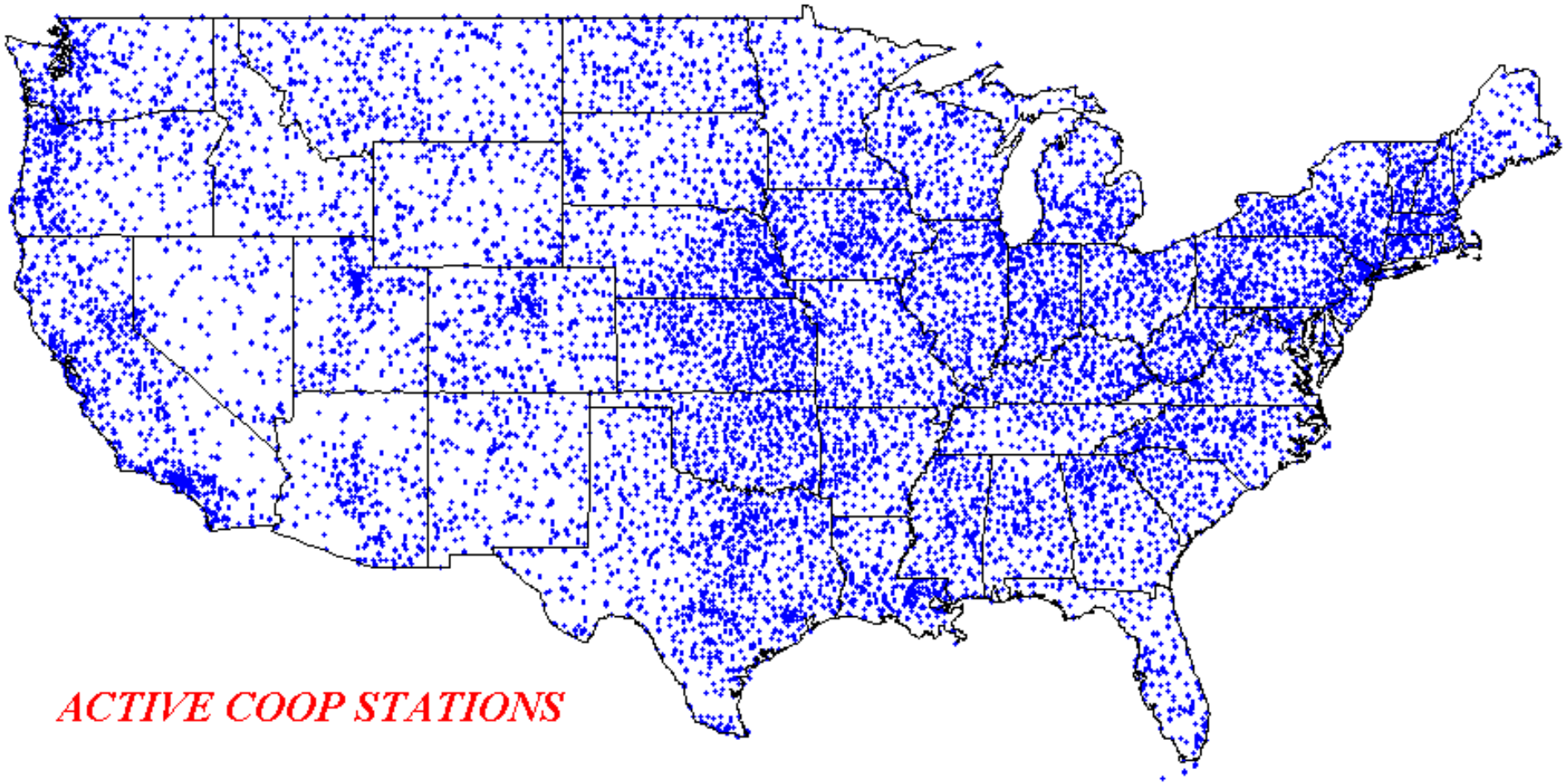
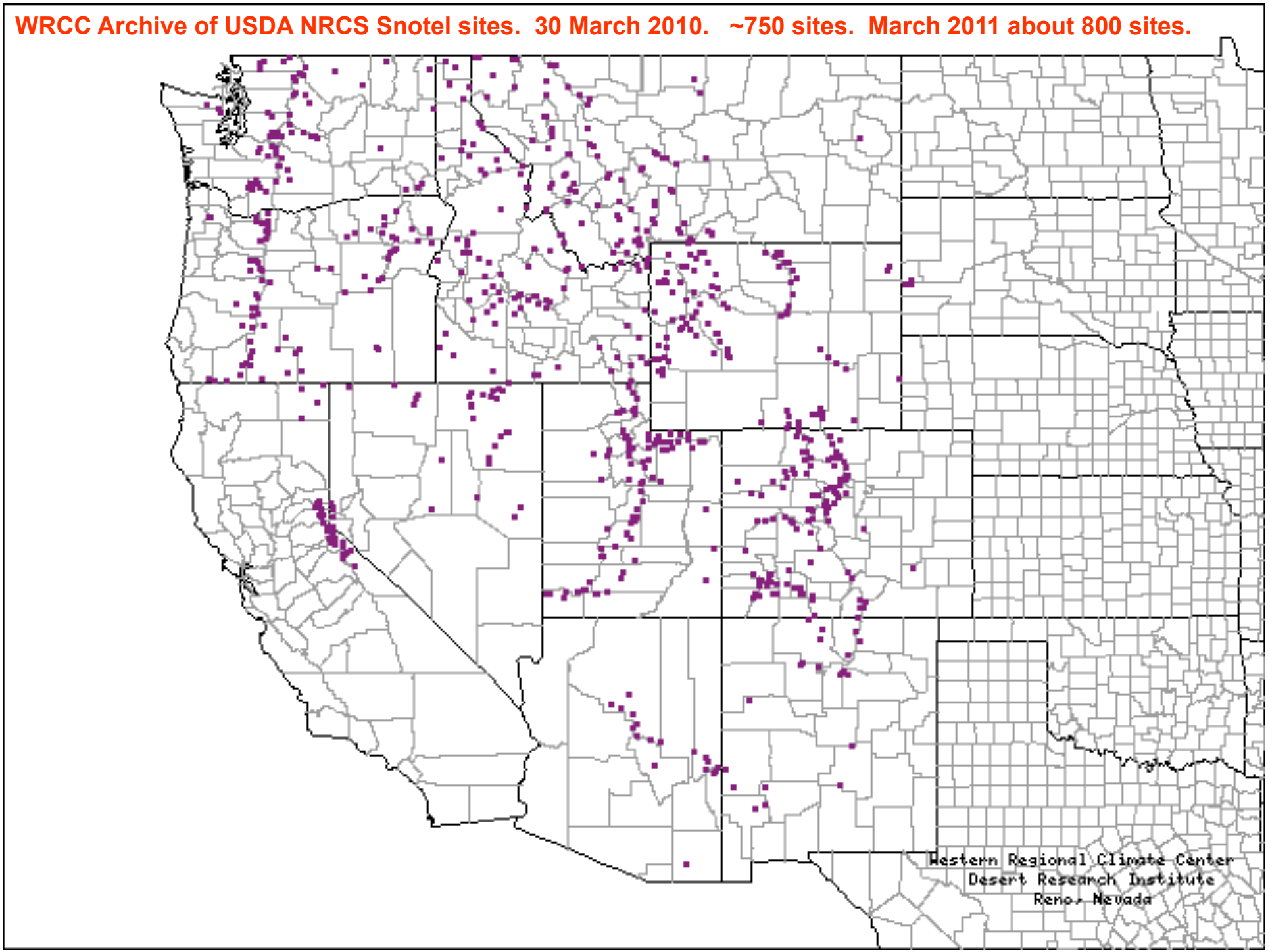


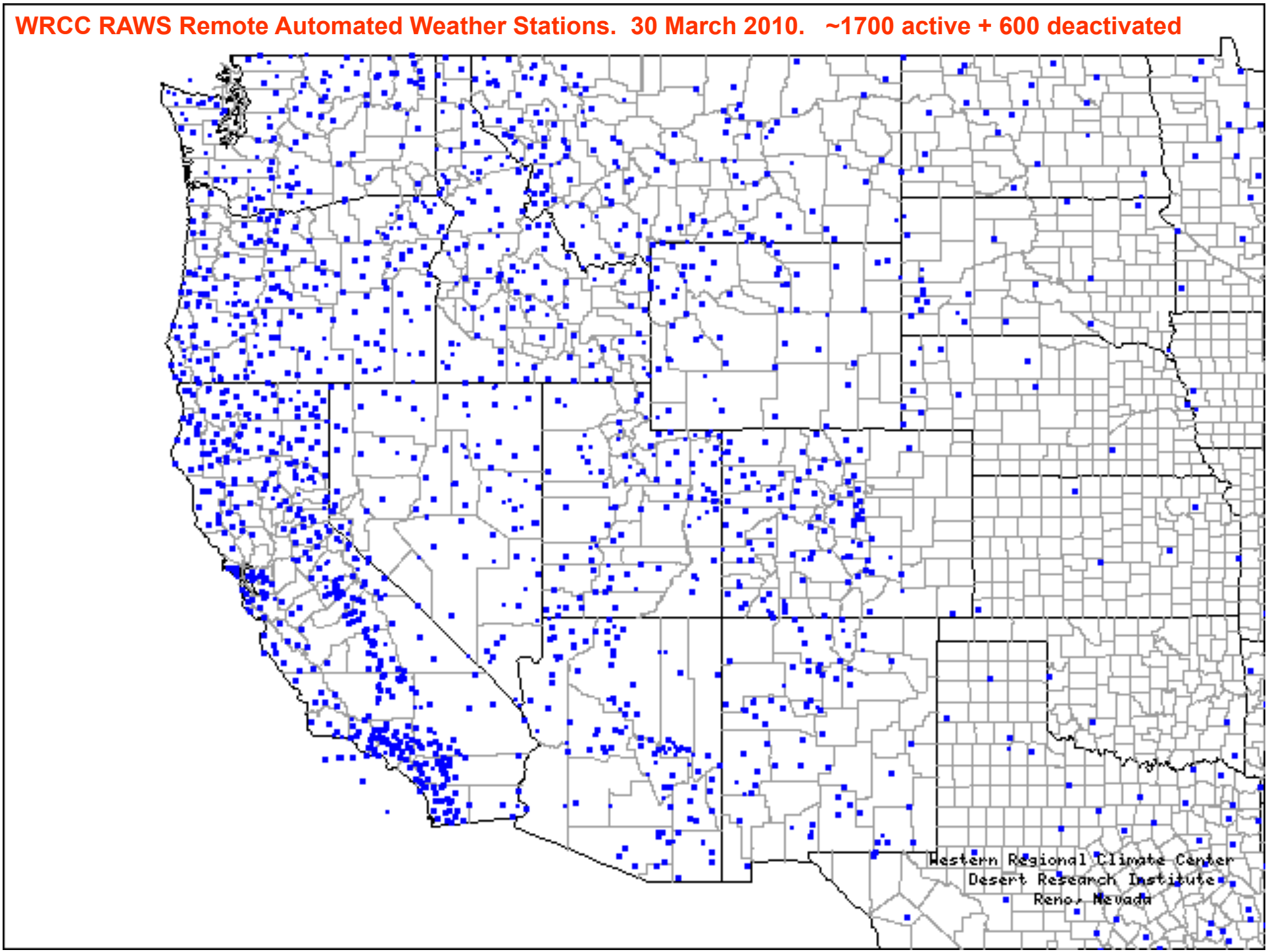
Jul 24, 2012


ACTIVE COOP STATIONS

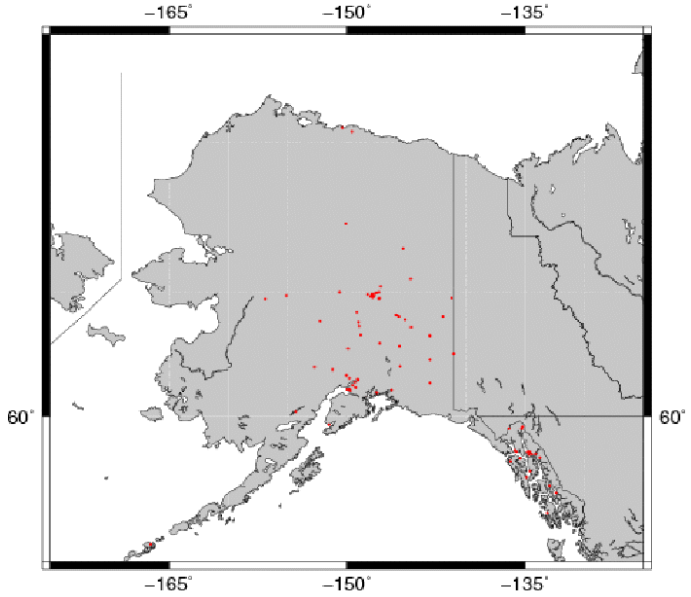
WRCC Archive of USDA NRCS Snotel sites. 30 March 2010. ~750 sites. March 2011 about 800 sites.

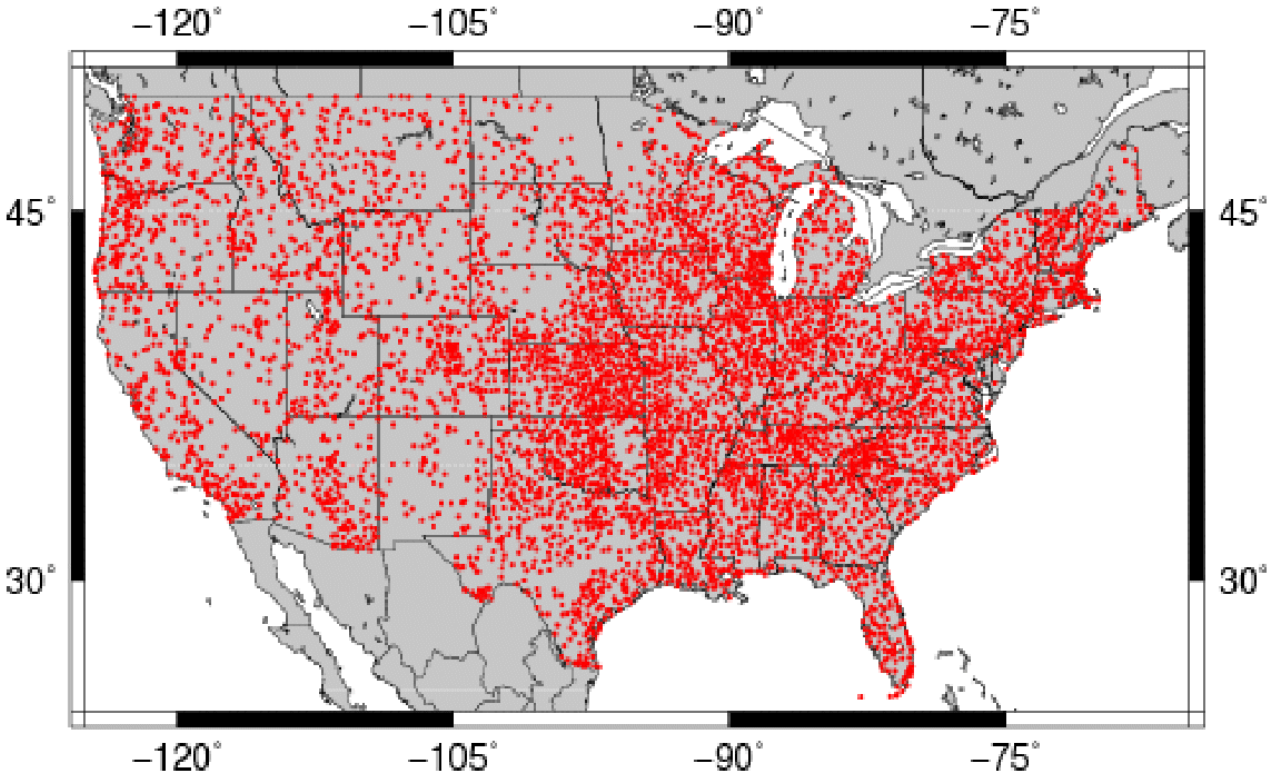


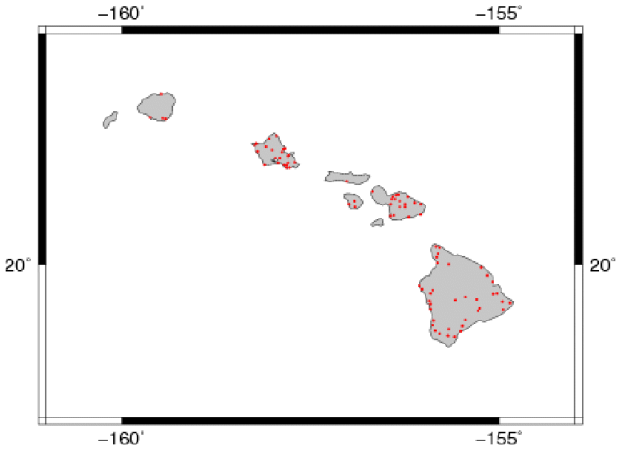
WRCC RAWS Remote Automated Weather Stations. 30 March 2010. ~1700 active + 600 deactivated

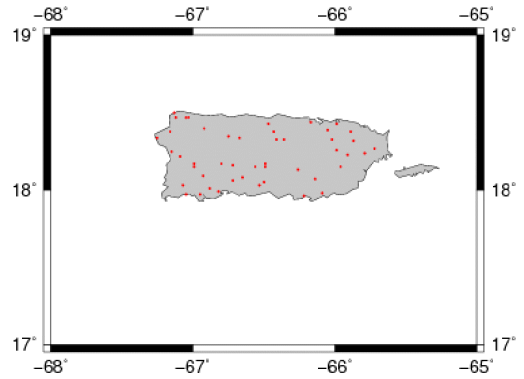


June 2012. NOAA WeatherCoder III. Web entry of manual observations. 6288 stations (84.2%) routed thru WRCC daily, 1180 remain. Pathway to national distribution. 40 WFOs now considered "paperless."
WRCC: Ongoing maintenance and operations.
Special project to enhance capabilities.
<u>Concern:</u> Potential reduction in number of stations.







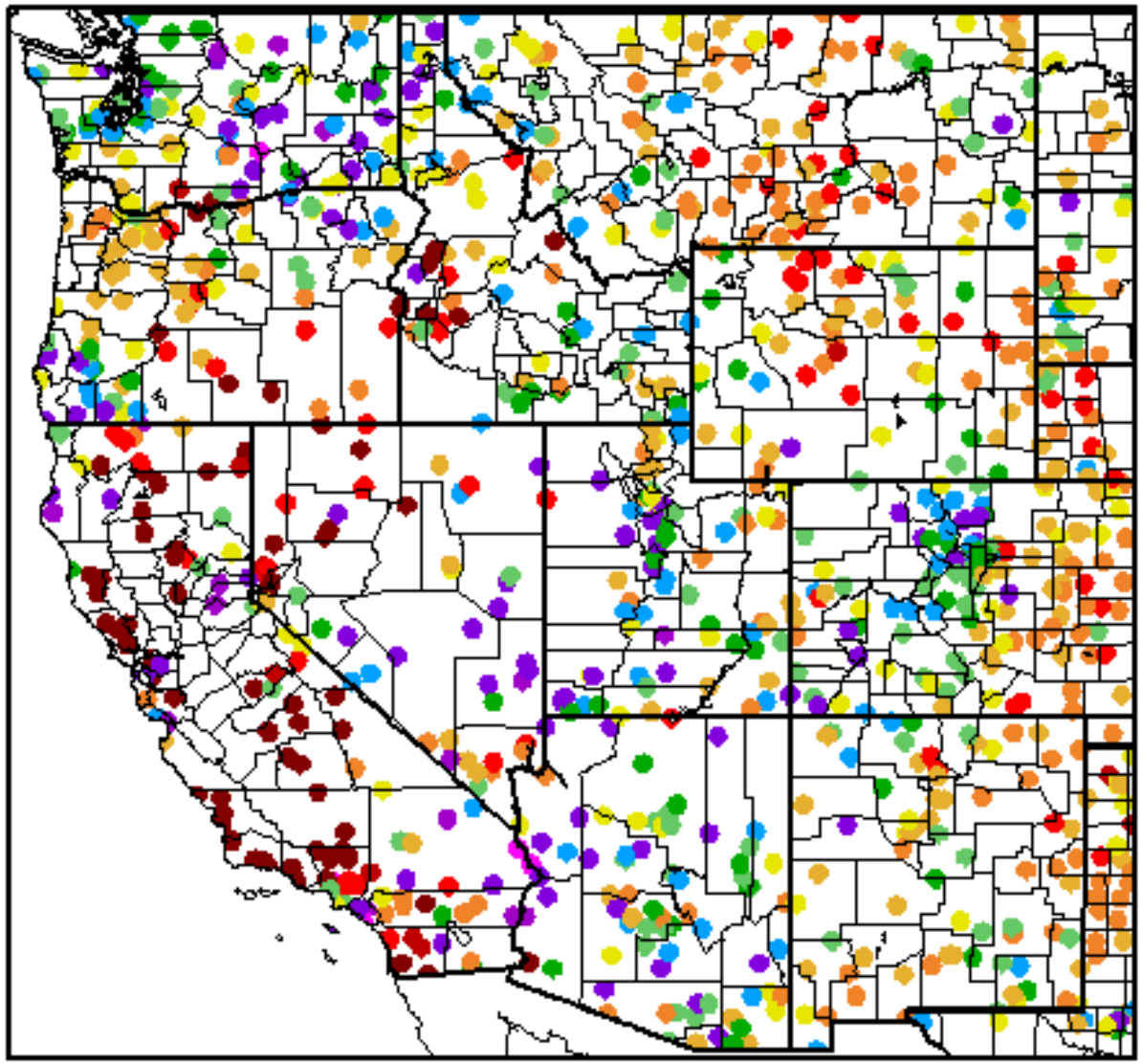


Stations Ingested by ACIS

Applied Climate Information System

July 2012

Percent of Normal Precipitation (%)
6/29/2012 – 7/28/2012



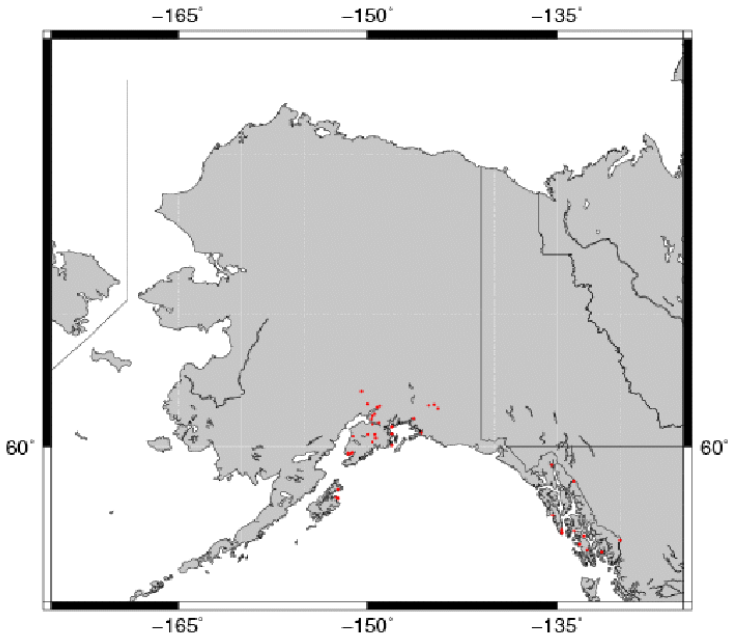
Generated 7/29/2012 at HPRCC using provisional data.

Regional Climate Centers

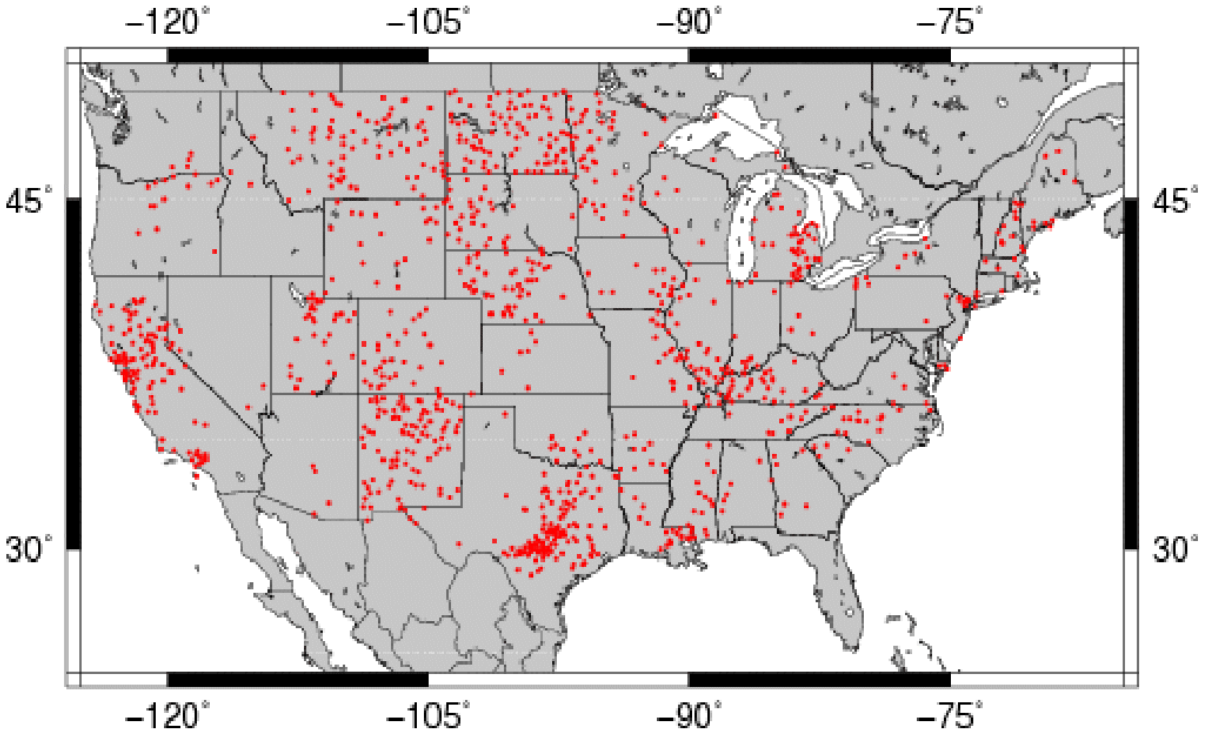
June 2012. NOAA WeatherCoder III.

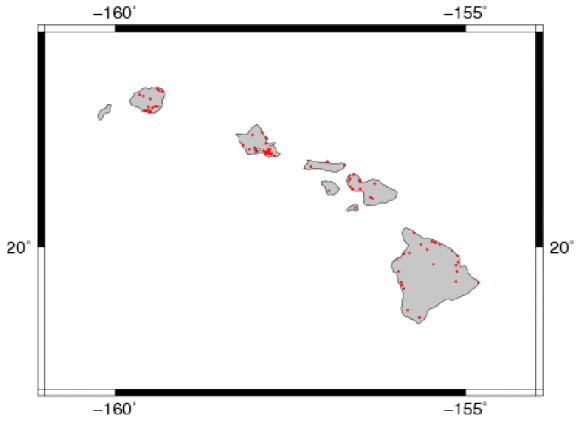
Stations that remain to be converted.

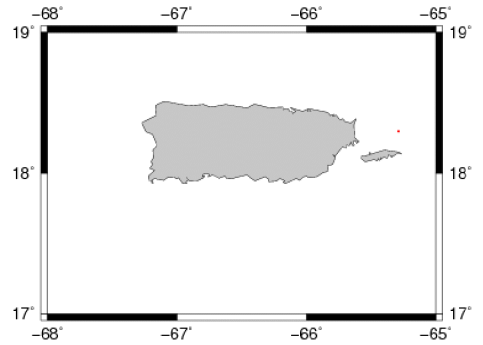
Approx 1180 still left.

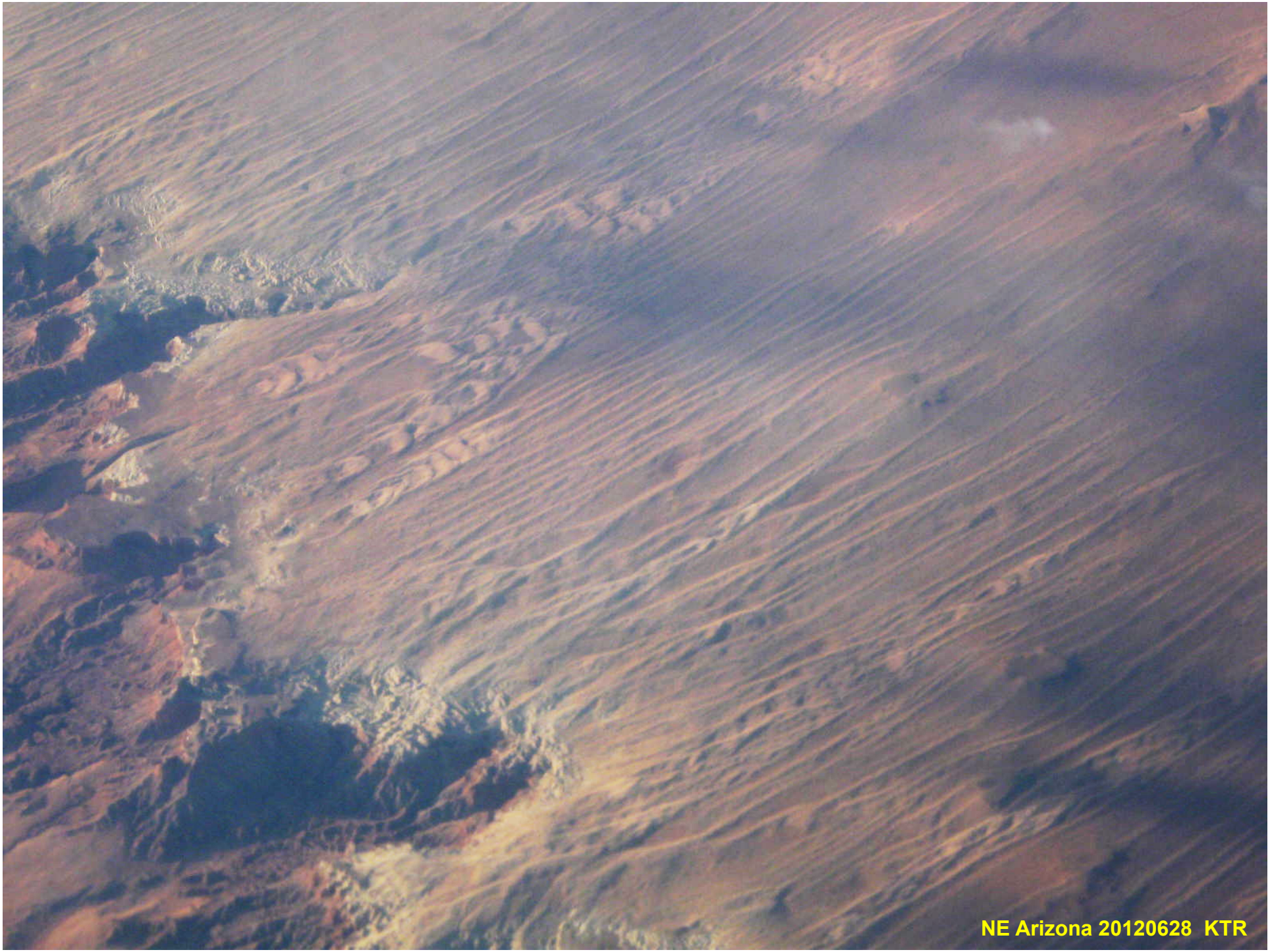


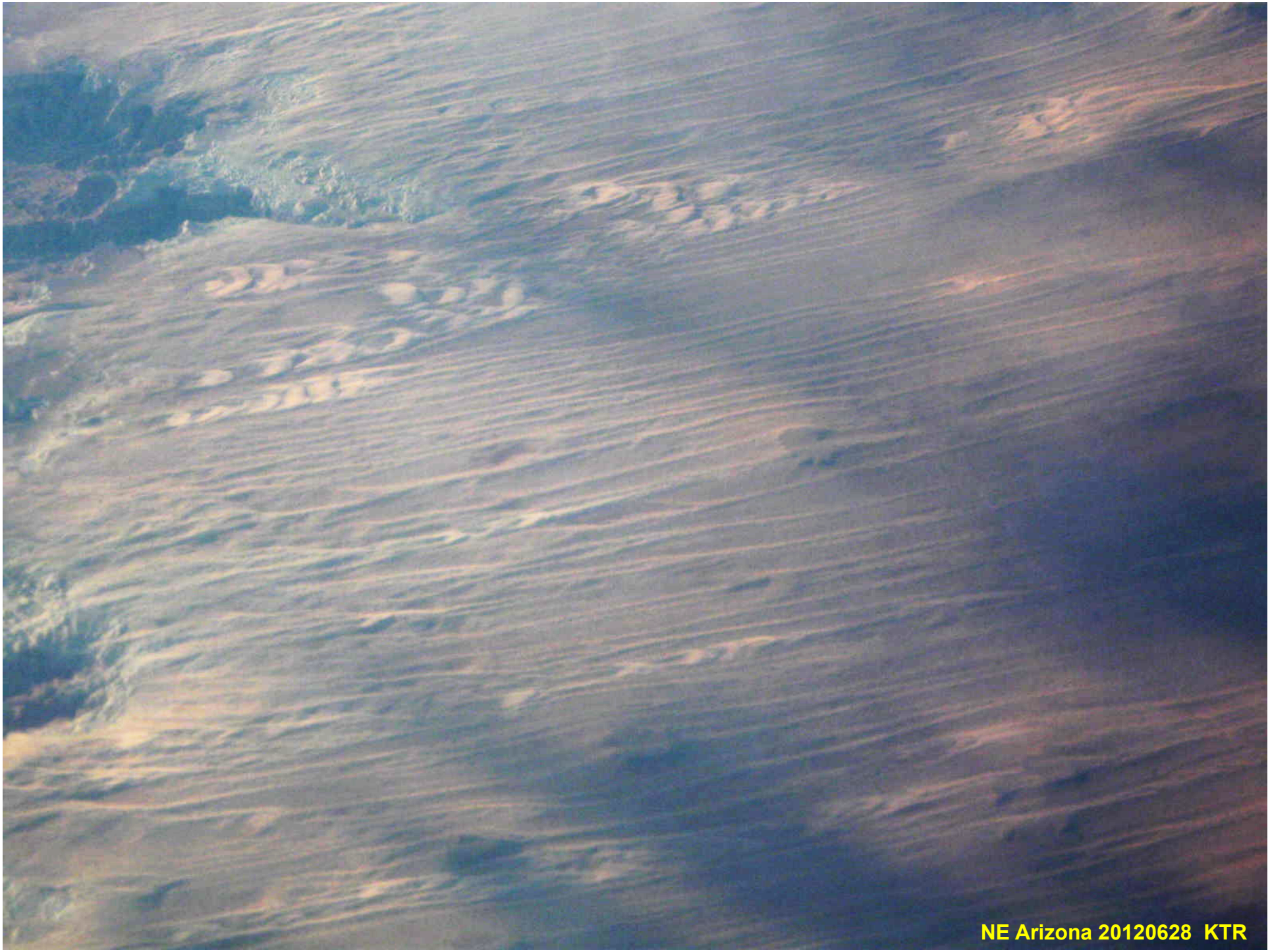
Stations yet to convert for 201206








NE Arizona 20120628 KTR


NE Arizona 20120628 KTR

US Climate Reference Network | USRCRN

USCRN Overview

The **U.S. Climate Reference Network (USCRN)** consists of 114 stations developed, deployed, managed, and maintained by the National Oceanic and Atmospheric Administration (NOAA) in the continental United States for the express purpose of detecting the national signal of climate change. The vision of the USCRN program is to maintain a sustainable high-quality climate observation network that 50 years from now can with the highest degree of confidence answer the question: How has the climate of the nation changed over the past 50 years? These stations were designed with climate science in mind.

Three independent measurements of temperature and precipitation are made at each station, insuring continuity of record and maintenance of well-calibrated and highly accurate observations. The stations are placed in pristine environments expected to be free of development for many decades. Stations are monitored and maintained to high standards, and are calibrated on an annual basis. In addition to temperature and precipitation, these stations also measure solar radiation, surface skin temperature, and surface winds, and are being expanded to include triplicate measurements of soil moisture and soil temperature at five depths, as well as atmospheric relative humidity. Experimental stations have been located in Alaska since 2002 and Hawaii since 2005, providing network experience in polar and tropical regions. Deployment of a complete 29 station USCRN network into Alaska began in 2009. This project is managed by NOAA's National Climatic Data Center and operated in partnership with NOAA's Atmospheric Turbulence and Diffusion Division.

USRCRN
United States REGIONAL Climate Reference Network
Click here for USRCRN

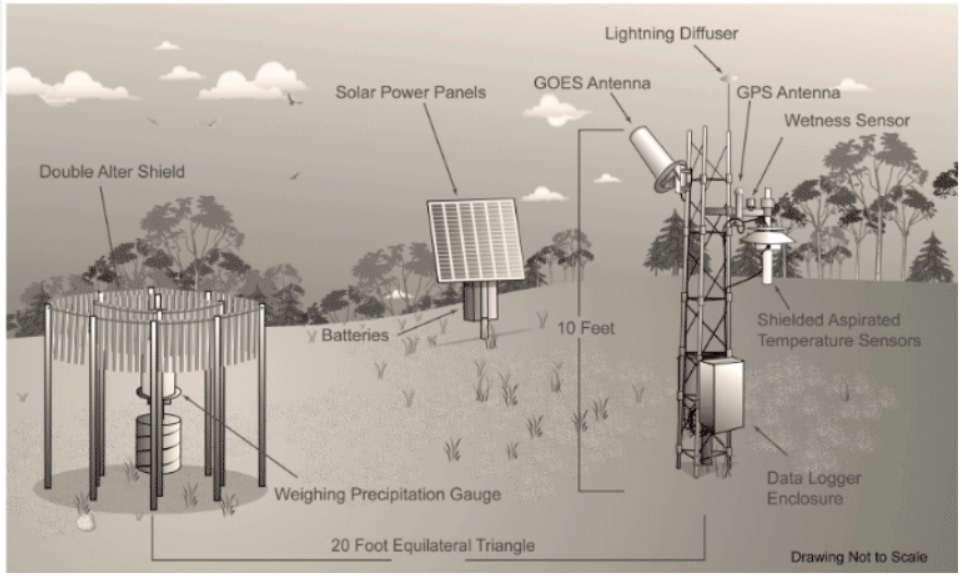
USRCRN

Overview | Map | Photos | Contacts | Documents

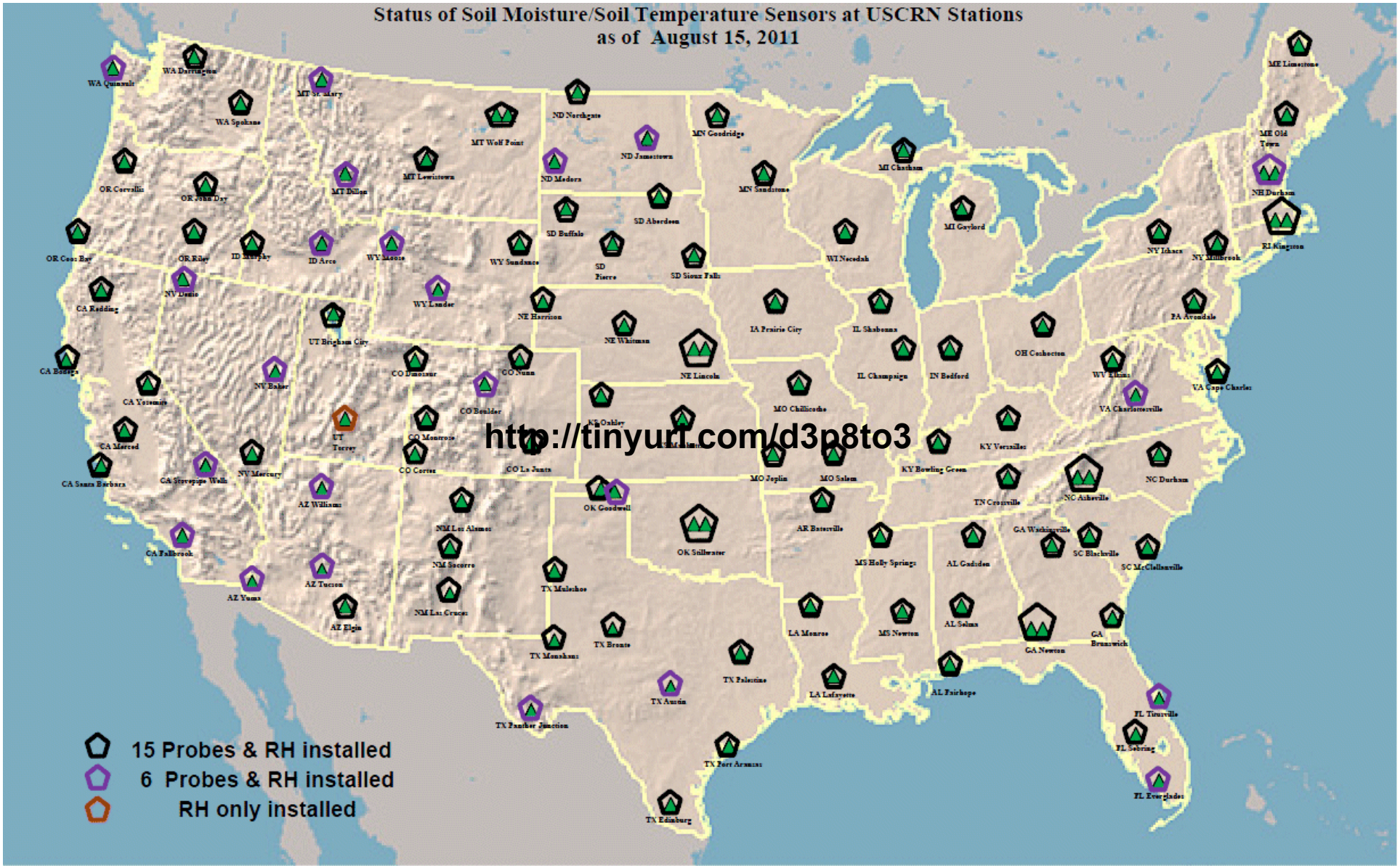
USRCRN Overview

A new network of stations called the **U.S. Regional Climate Reference Network (USRCRN)** is now being deployed by NOAA. These stations maintain the same level of climate science quality measurements as the national-scale U.S. Climate Reference Network (USCRN), but are spaced more closely, and focus solely on temperature and precipitation.

Beginning with a pilot project in the Southwest, USRCRN stations will be deployed at a 130 km spatial resolution to provide for the detection of regional climate change signals. Following completion of the pilot project, the long-term vision is deployment in each of the nine NOAA climate regions of the United States at a 130 km spatial resolution that will allow the detection of regional climate change signals. As with the USCRN, USRCRN stations have triple redundancy and are placed in pristine environments. About 538 locations in the United States will have either a USRCRN or USCRN station at the end of deployment for this project. This project is managed by NOAA???s National Climatic Data Center in partnership with the Office of Science and Technology in NOAA's National Weather Service and NOAA's Atmospheric Turbulence and Diffusion Division.



US CRN Climate Reference Network . Installed and running. Status 2011 August 15



NCDC

Regional Climate Reference Network

Was originally intended as a US grid of 1000 stations, circles 50 km in radius.

WRCC has performed most of the field surveys.
HPRCC performed surveys for plains locations east of the Rockies in NM, CO.

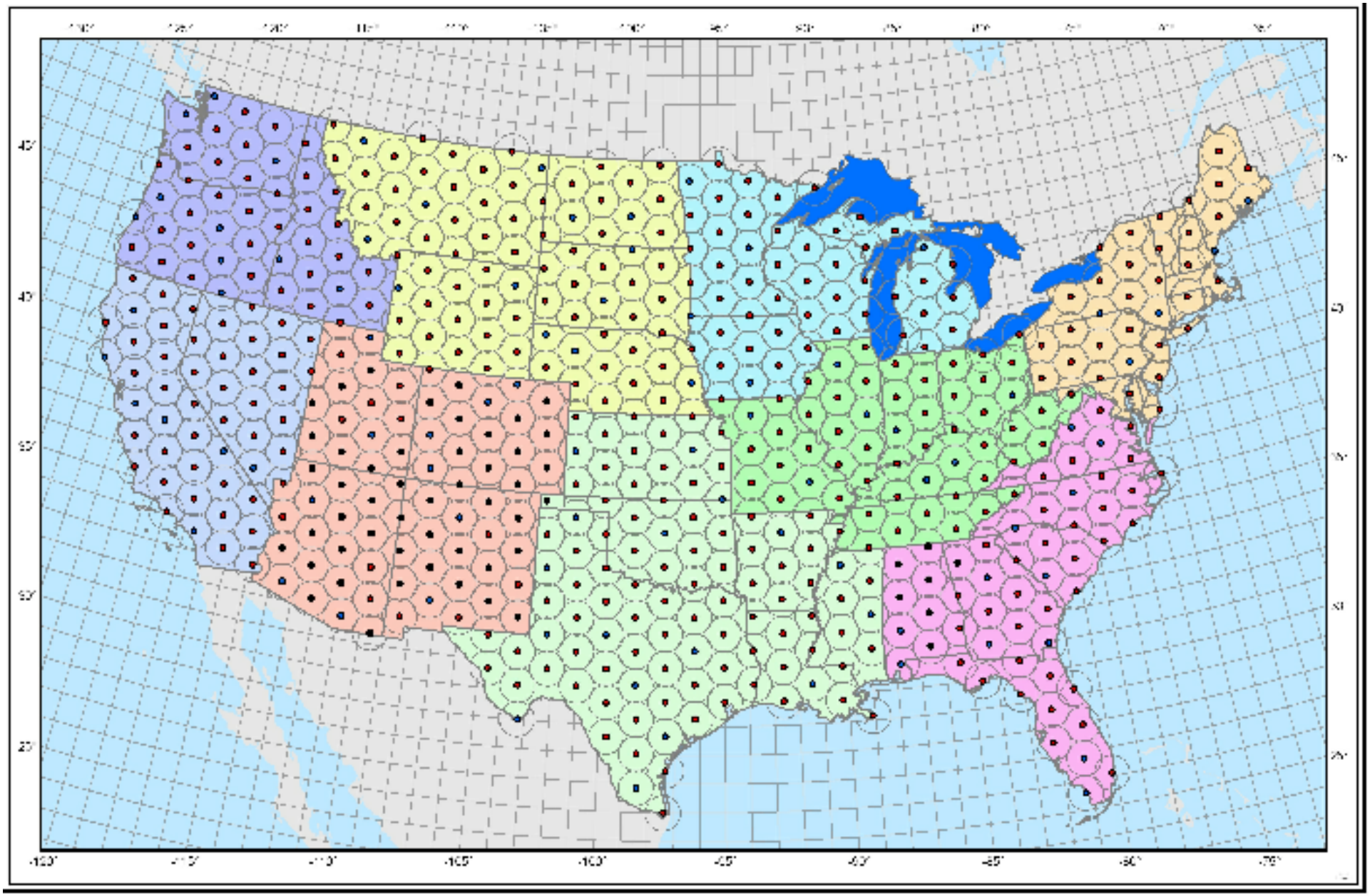
The 4-Corner states (AZ-NM-UT-CO) were completely surveyed, and nearly all approved sites were installed. Currently up and running, maintenance status is unclear.

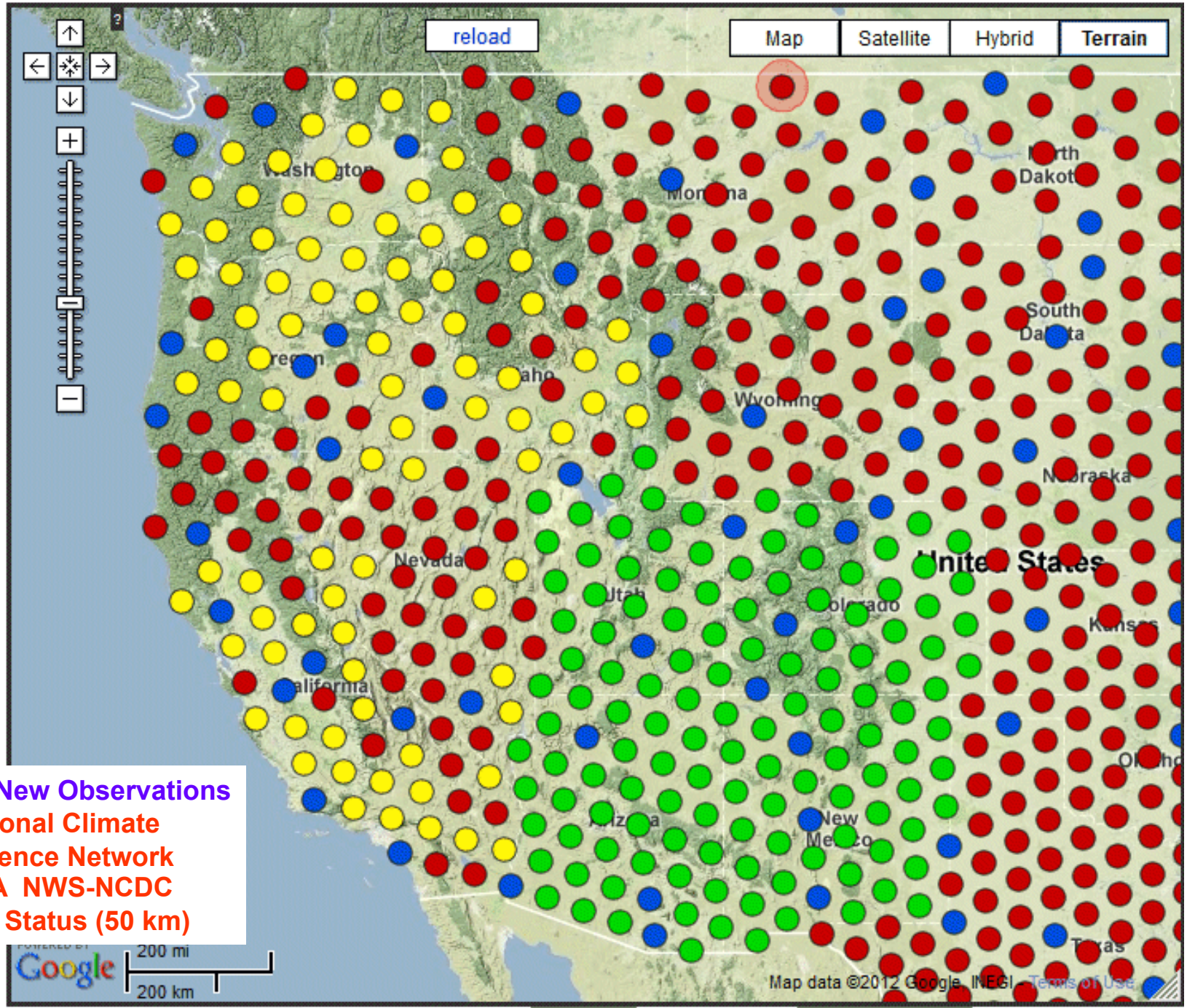
The five Pacific states (CA-NV-OR-WA-ID) were next. The US grid was re-evaluated, and a new grid of 538 stations was defined, with 65 km radius.

Candidate sites were being surveyed in 2012 on the new grid for the 5 western continental states, but at a slower rate while the permitting process was re-evaluated. During this time the project was suspended for budget reasons. No stations have been deployed in the 5 westernmost continental states.

The following maps show the revised RCRN grid, and the two grid systems for the West (50 and 65 km). Colors represent internal project tracking processes. Stations in blue are already CRN sites. Sites in green are nearly all installed, mostly using the original 50-km radius.

2010 revised grid. USRCRN (US Regional Climate Reference Network)





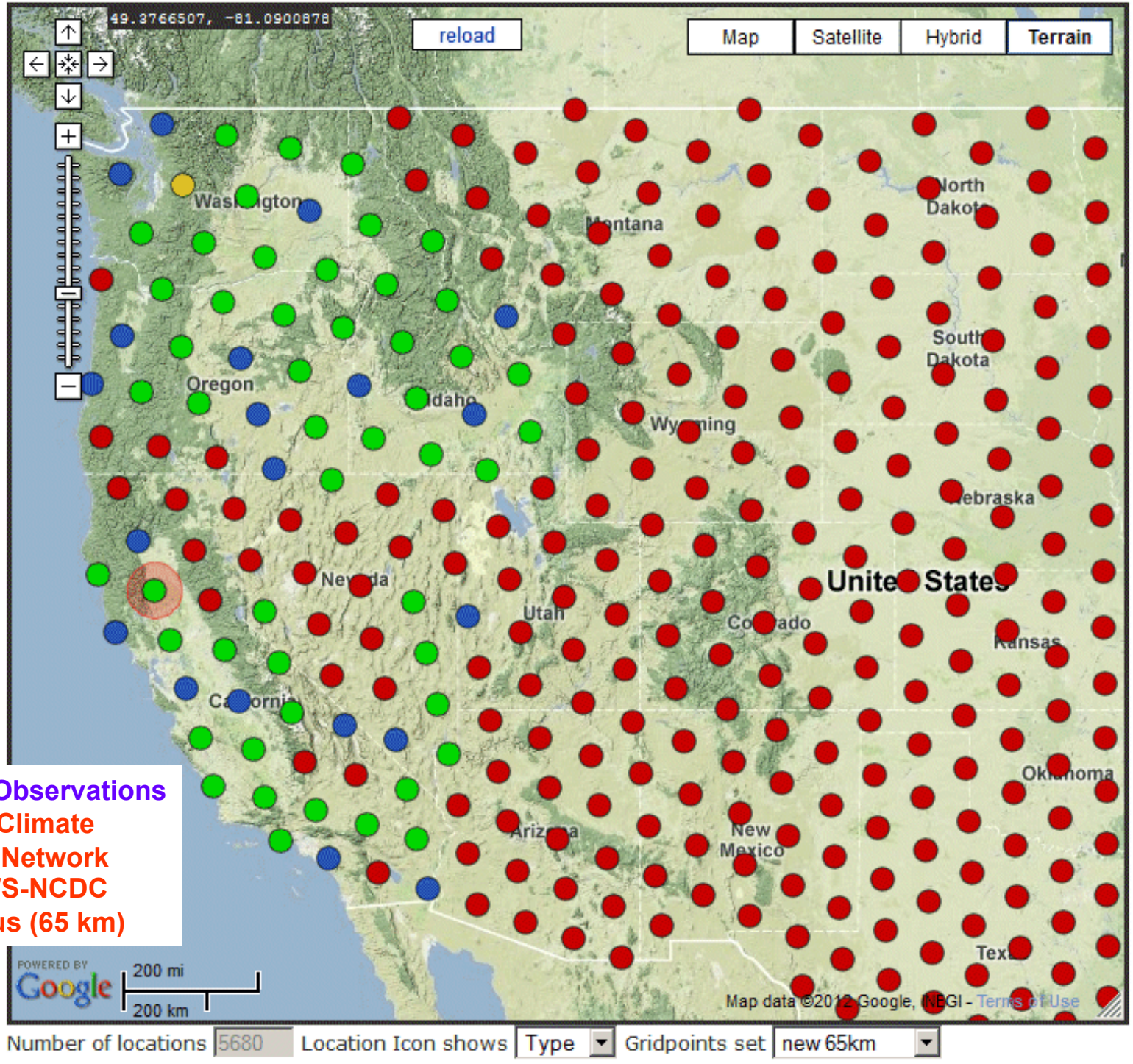
Potential New Observations
Regional Climate Reference Network
NOAA NWS-NCDC
WRCC Status (50 km)

Status:
5 more states under way.
4-Corner Nearly Complete
73 + 76 sites

Program Suspended March 2012

No further surveys or installations planned at this time.

Potential New Observations
Regional Climate Reference Network
NOAA NWS-NCDC
WRCC Status (65 km)



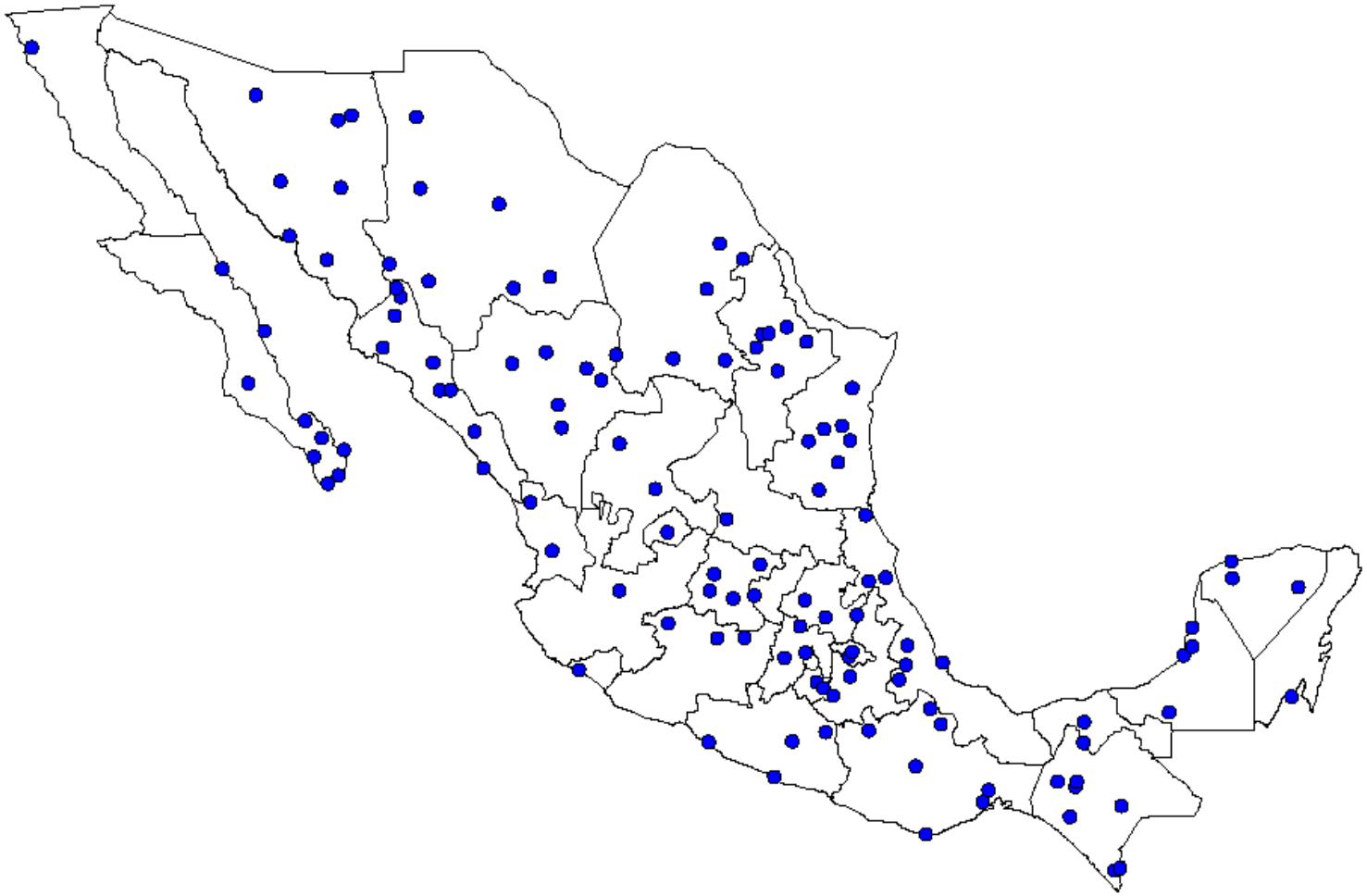
Next three slides illustrating some Mexican networks taken from a presentation after August 2011 by

Art Douglas and Phil Englehart
Creighton University
Omaha NE

Climate Division Drought Monitoring in Mexico: Expanding the Reliability of Long Term Regional Records

main message:
Most Mexican sites are not close to the Rio Grande / Bravo mainstem or even in the basin

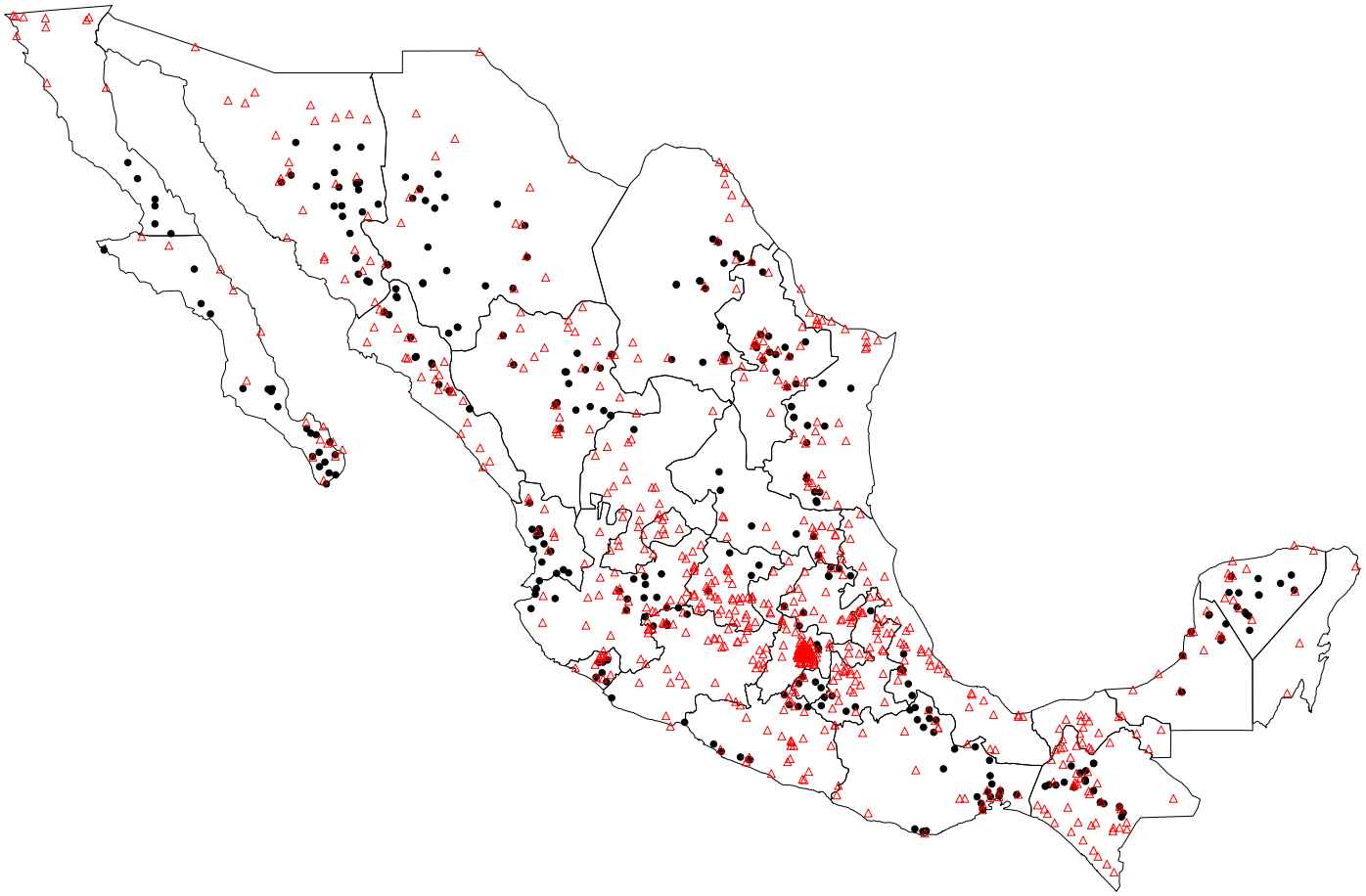
CURRENT NADM GRID: Merged Long Term CLICOM Stations with Operational GASIR Stations
2002 Analysis Identified 132 High Quality Stations



from Douglas and Englehart

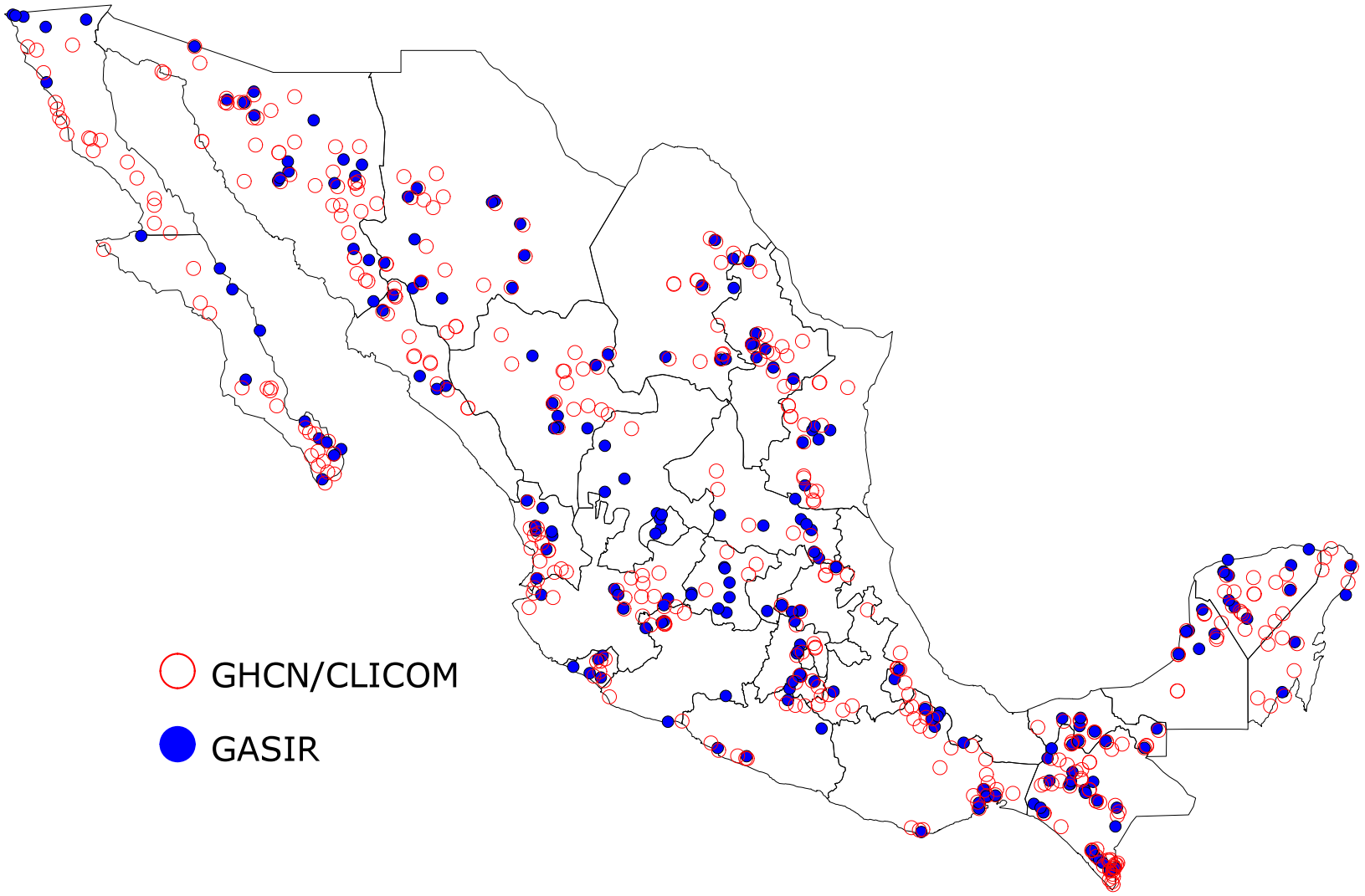
GASIR: CNA Surface Water Management and Engineering for Rivers

• Operational observing network (2001-present with roughly 600-1,200 stations reporting through the period).



from Douglas and Englehart

Station Distribution and Data Sources for the 25 Synoptic Climate Divisions in Mexico 380 CLICOM and 214 GASIR Stations



from Douglas and Englehart

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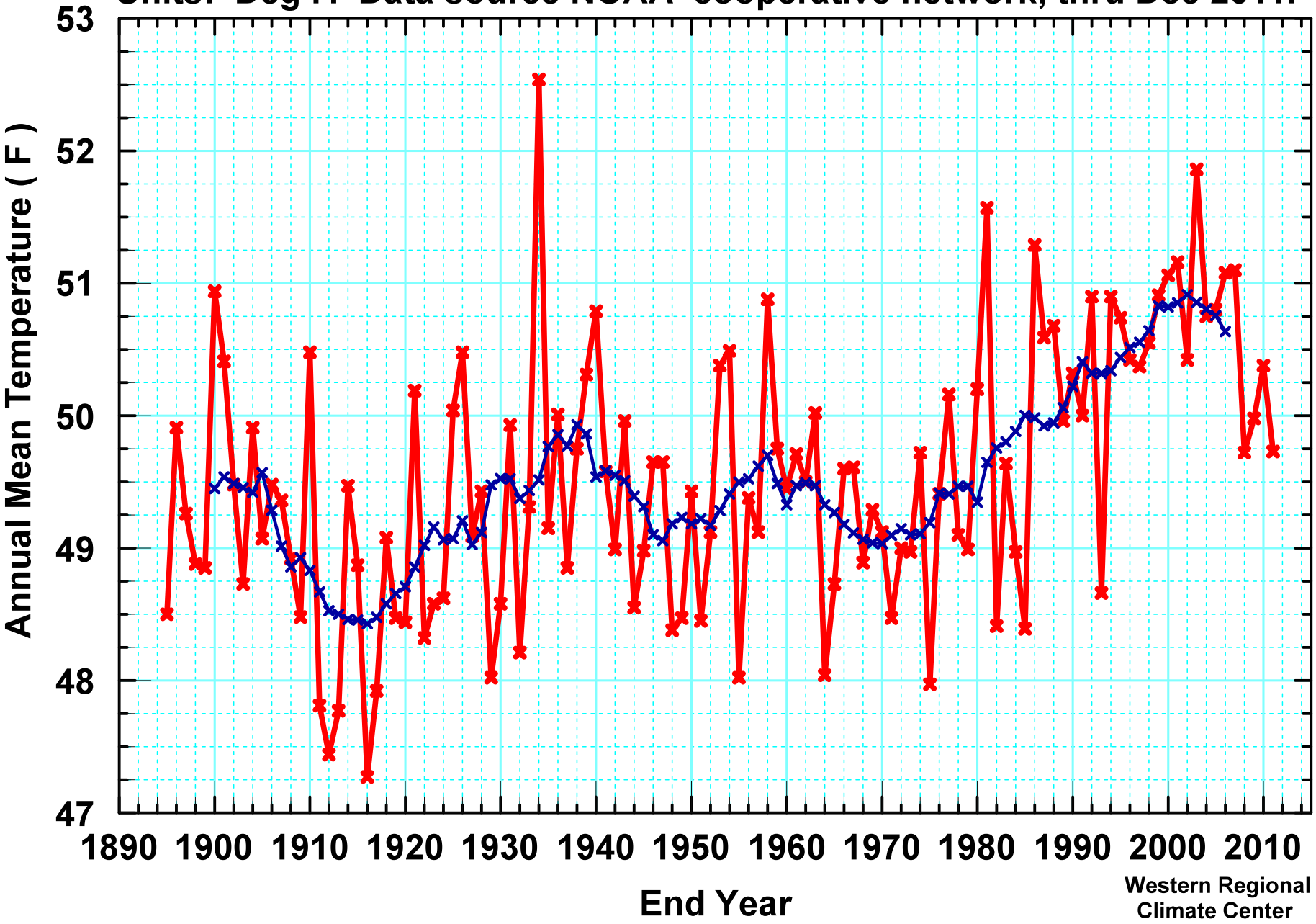
Western United States (11 states) Annual Jan-Dec Temperature
Provisional data from NCDC / CPC. Blue: 11-year running mean.
Units: Deg F. Data source NOAA cooperative network, thru Dec 2011.
Annual Mean Temperature (F)
53
52
51
50
49
48
47
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
End Year
Western Regional
Climate Center

Leave Feedback

WestWideDroughtTracker

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Select Year: 1934 Select Month: 12

Submit

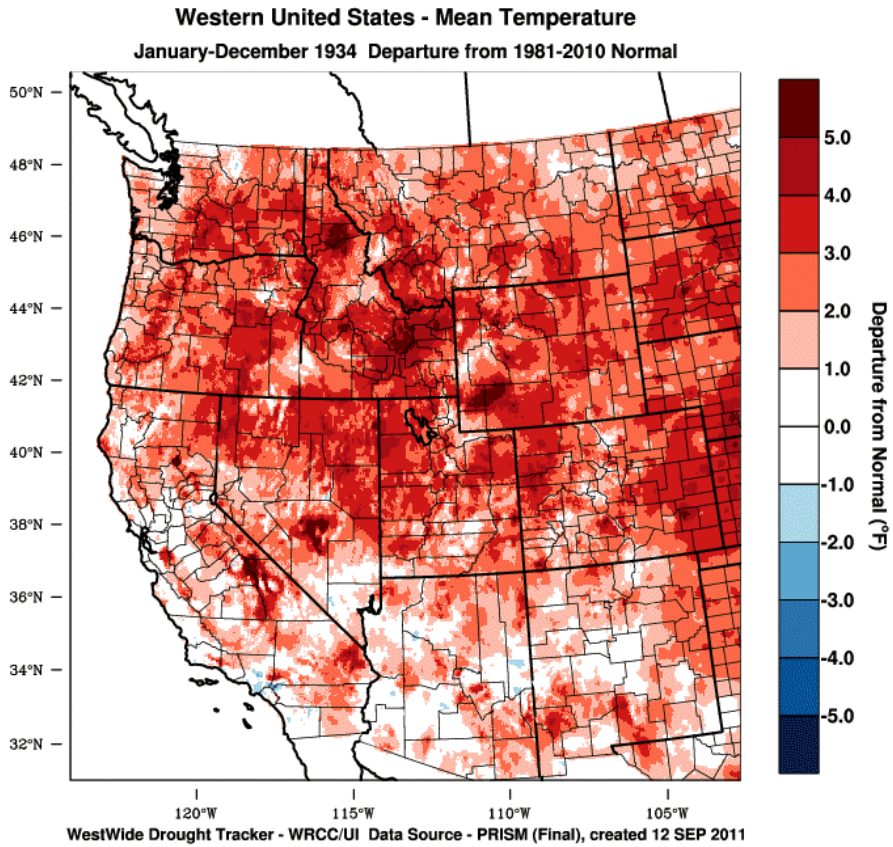
Choose Year/Month, press Submit and then choose product below

Climate Product Options

Expand All | Contract All

- Variable
  - Drought Index
    - Palmer Index
      - PDSI
      - Palmer Z-Index
      - Self-Calibrated PDSI
    - SPI
    - SPEI
  - Climate
    - Temperature
      - Anomaly
        - Last Full Month
        - Last 2-Months
        - Last 3-Months
        - Last 4-Months
        - Last 5-Months
        - Last 6-Months
        - Last 7-Months
        - Last 8-Months
        - Last 9-Months
        - Last 10-Months
        - Last 11-Months
        - Last 12-Months
      - Percentile
    - Precipitation
      - Anomaly
      - Percentile
- Region
  - Western US
  - Arizona
  - California
  - Colorado
  - Idaho
  - Montana
  - Nevada
  - New Mexico
  - Oregon
  - Utah
  - Washington
  - Wyoming
  - United States

Archived Image:
PRISM > 012/1934 > Temperature Anomaly 12 Month > Western US



Download PRISM Temperature Anomaly 12 Month NETCDF Data for United States

Download PRISM Temperature Anomaly 12 Month GeoTIFF Data for United States

In Final Stages .....

Maps for each month
From PRISM 4x4 km
HCN Station version too

1895 - Present

Updated each month

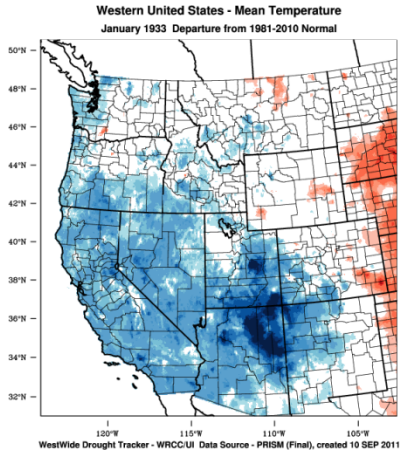
Palmer PDSI
Palmer scPDSI
Palmer Z-Index
SPI (1 - 72 mo)
SPEI (1 - 72 mo)
T departure, percentile
(prior 1-12 mo)
P percentage, percentile
(prior 1-12 mo)

Time Series Plots
(pts, div/cty/st/HUC/HCN)

Western states, West, USA

About 3 million maps

VIC, SM not operational



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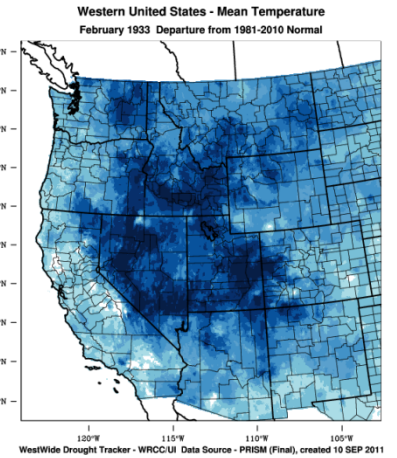

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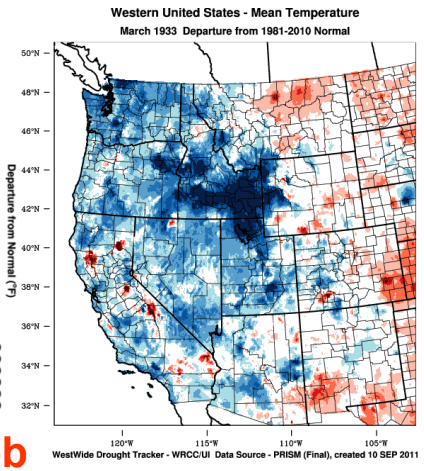

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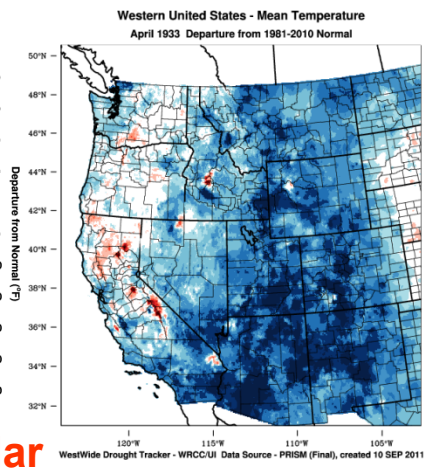

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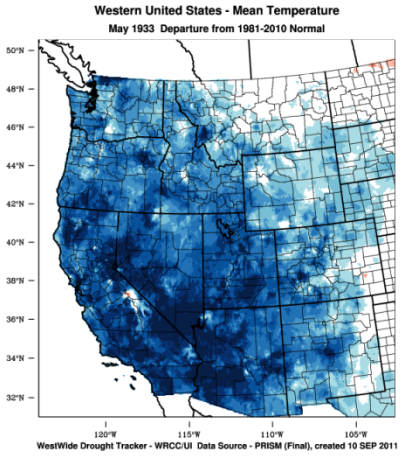

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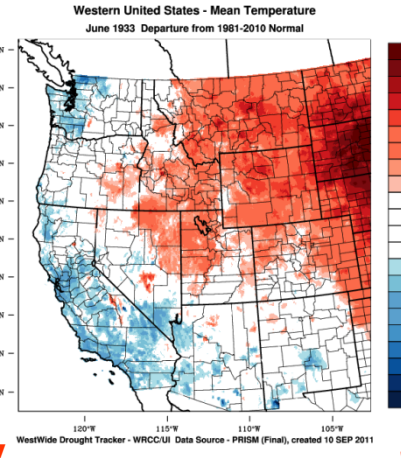

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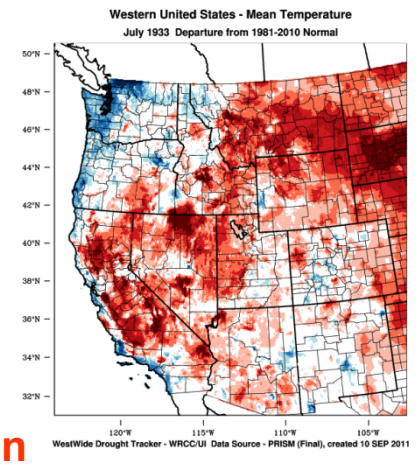

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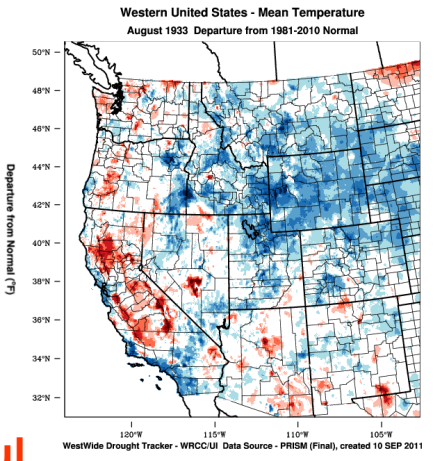

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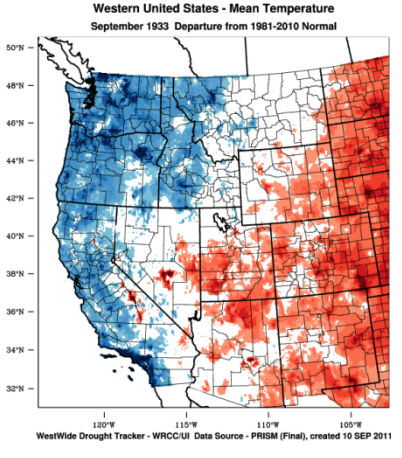

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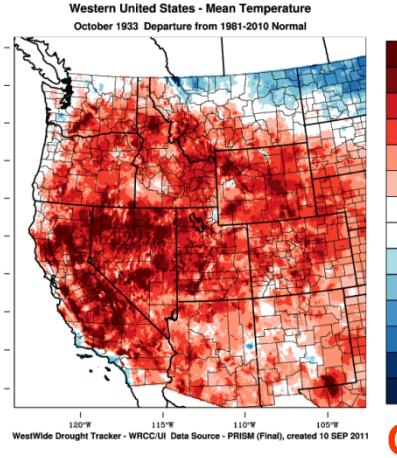

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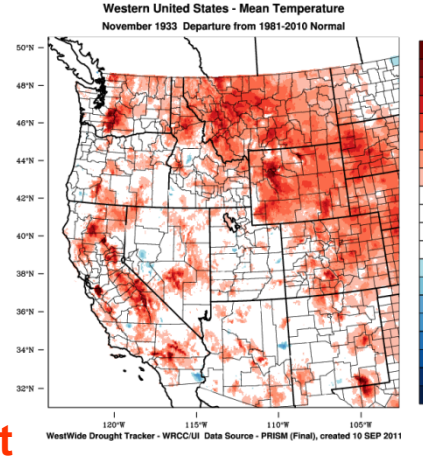

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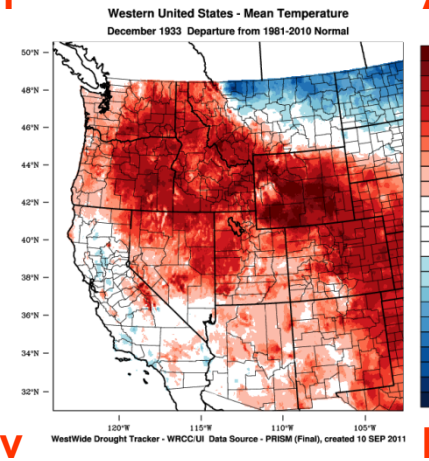
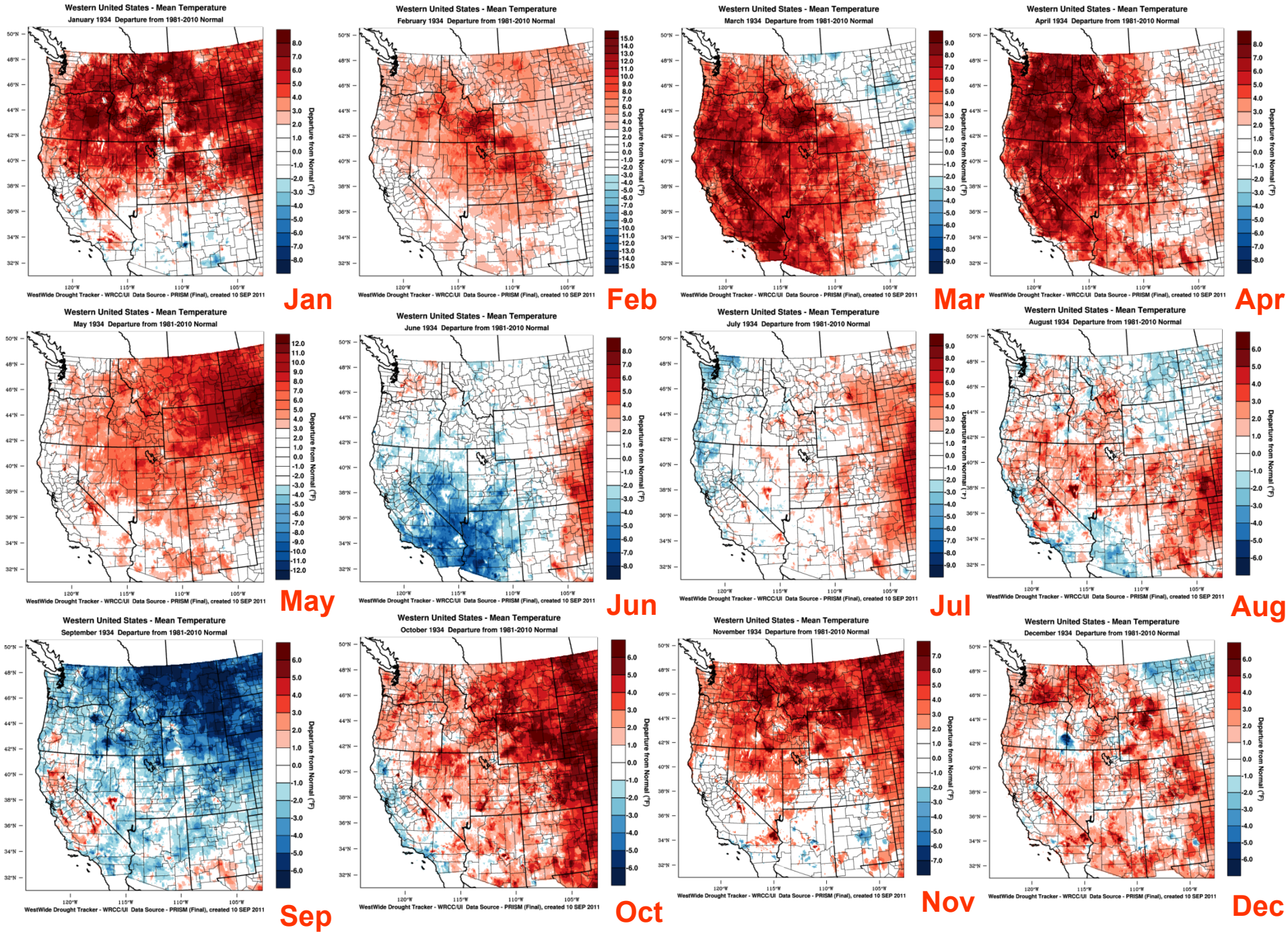


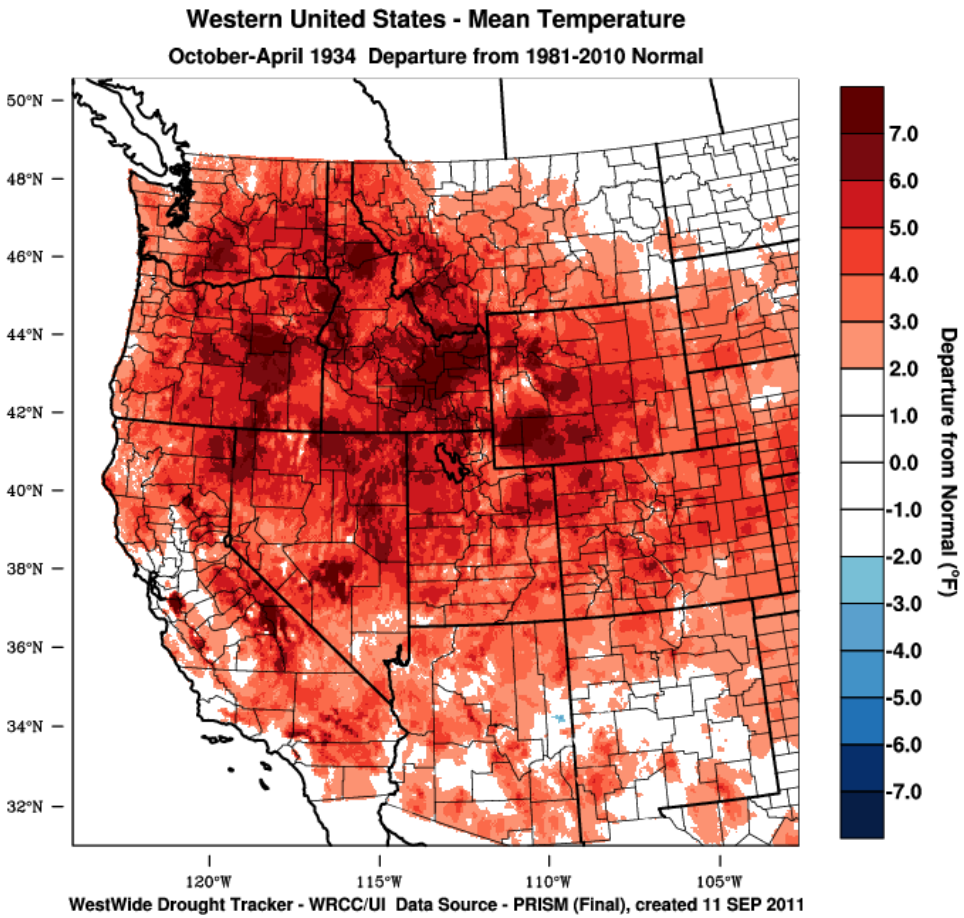
Dec

Jan thru Dec 1933

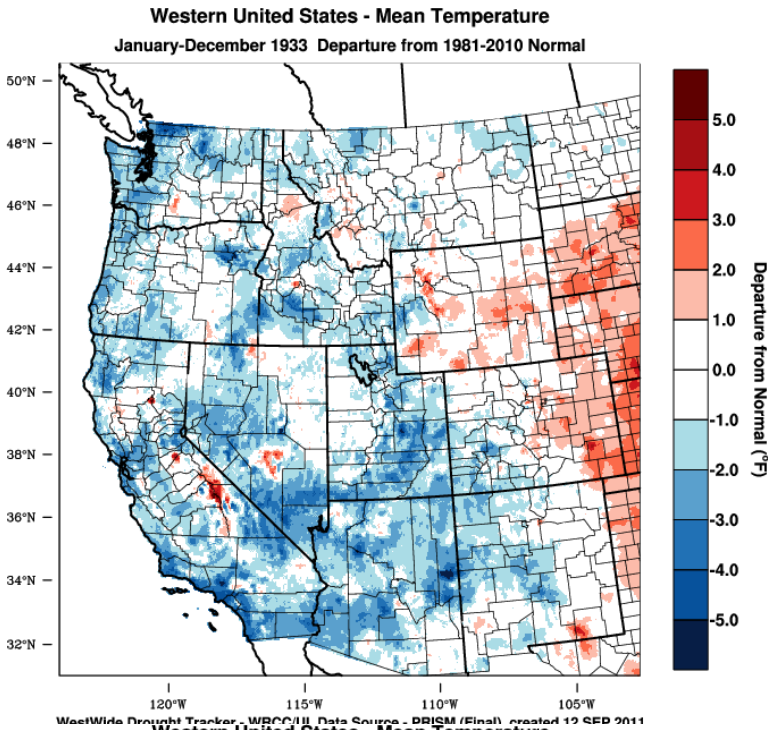


Jan thru Dec 1934

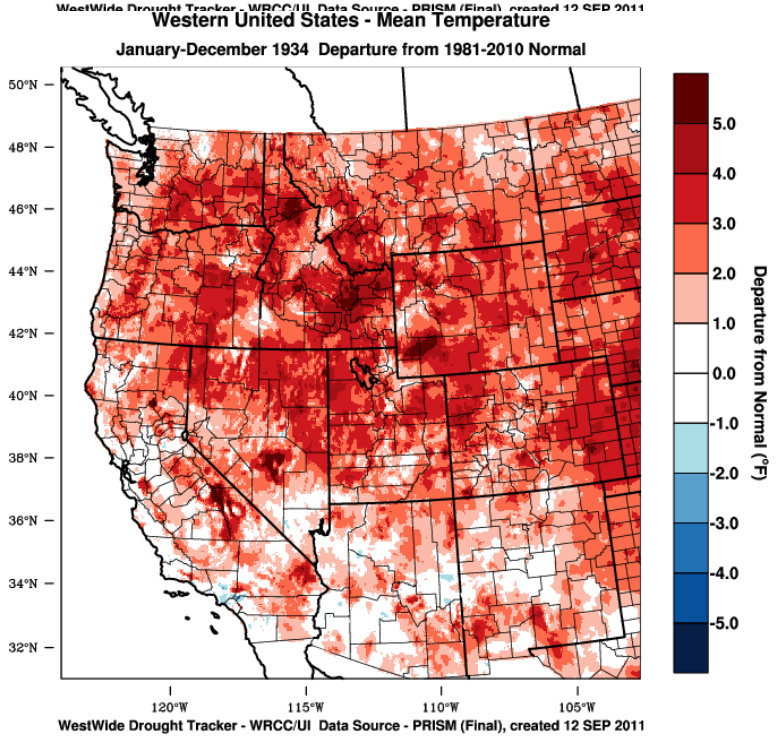
Oct - Apr 1933-34

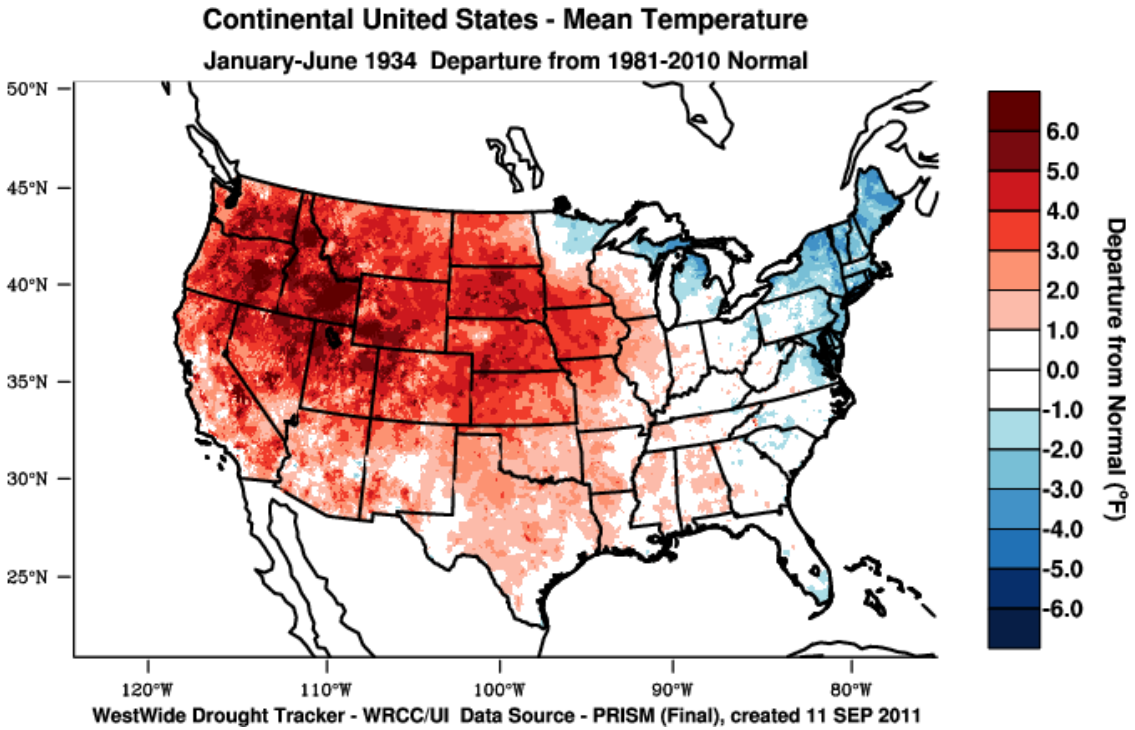


Annual 1933



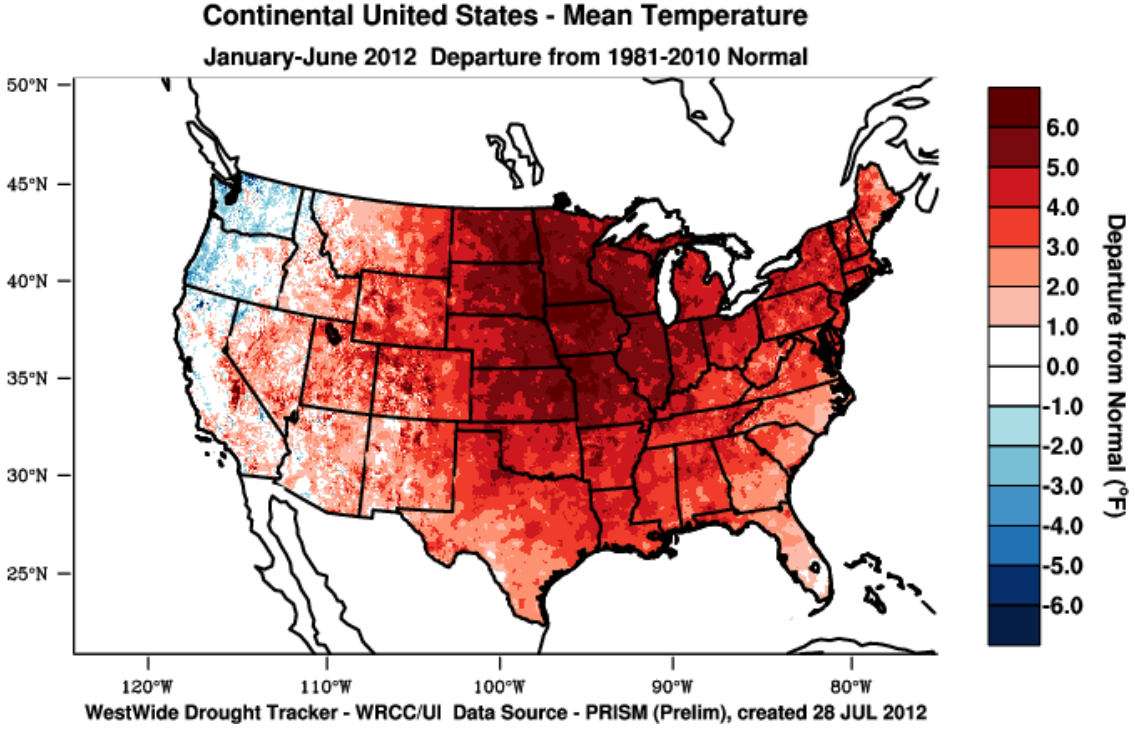
Annual 1934





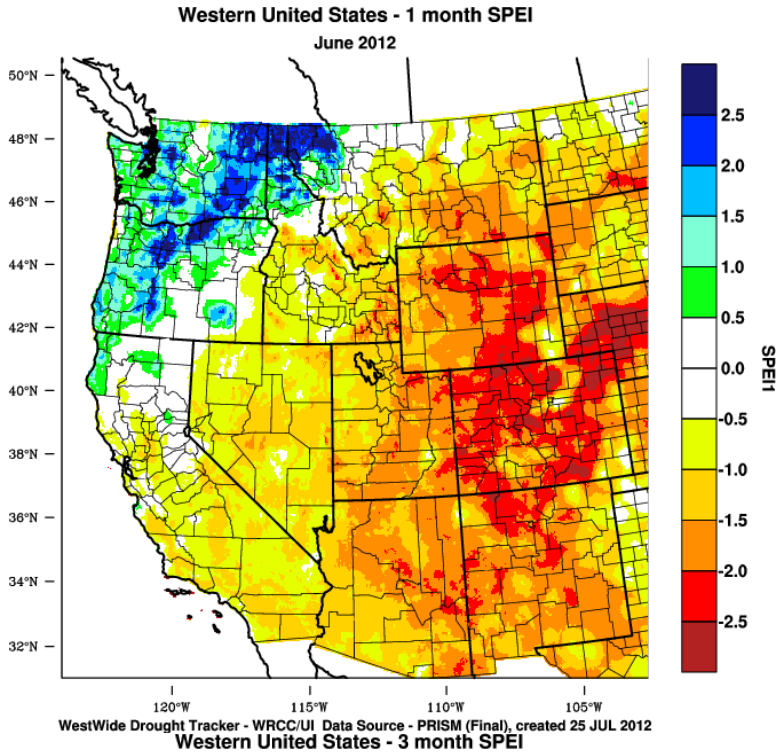
Jan - Jun 1934

Temp



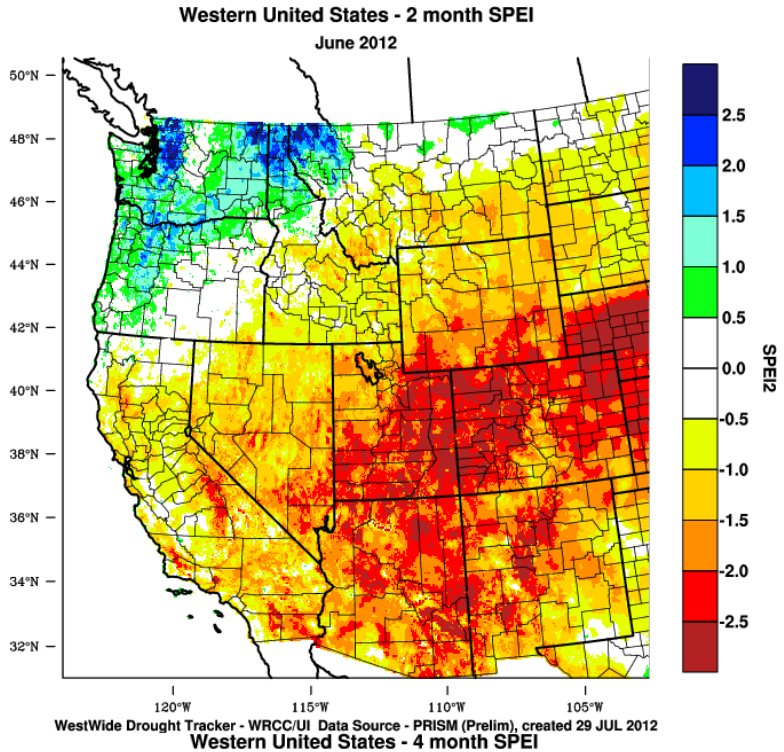
Jan - Jun 2012

Temp

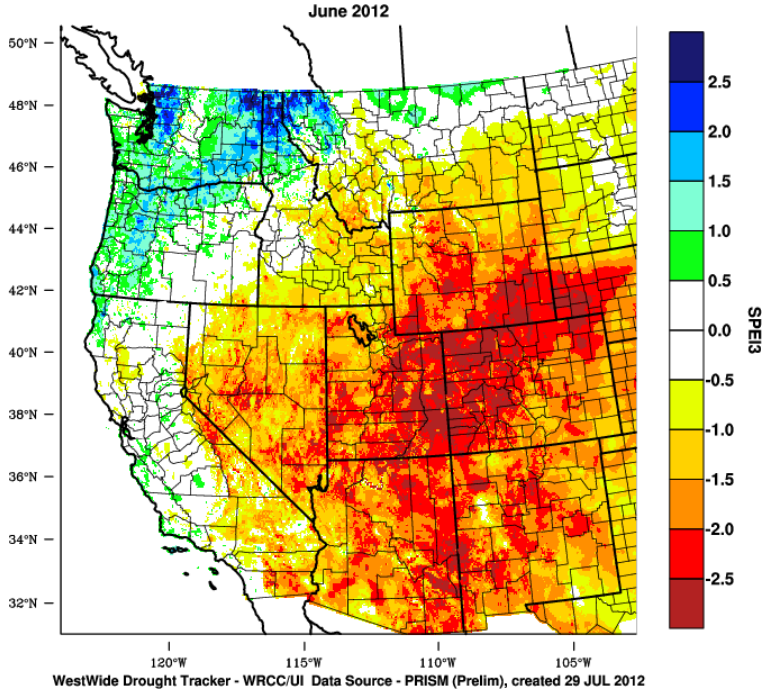


SPEI Thru June 2012

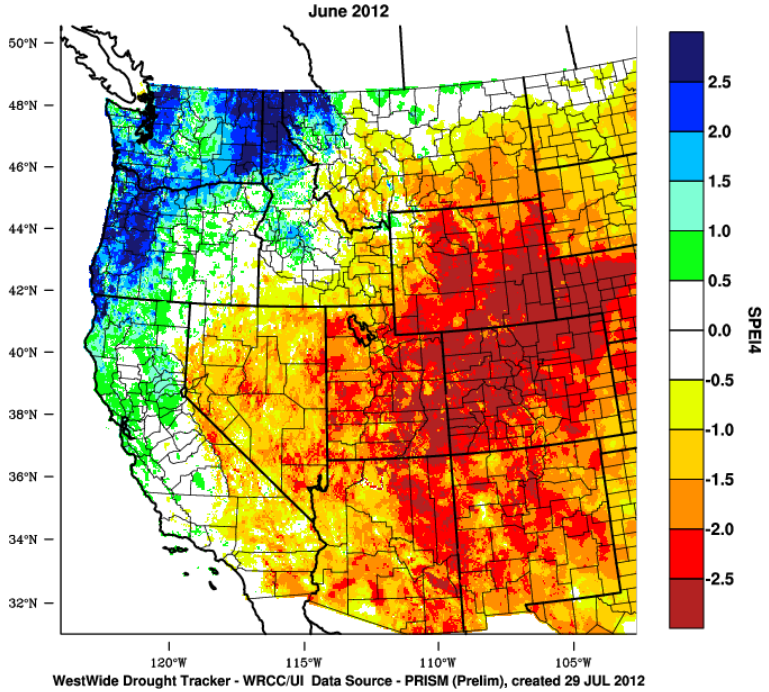
1-mo



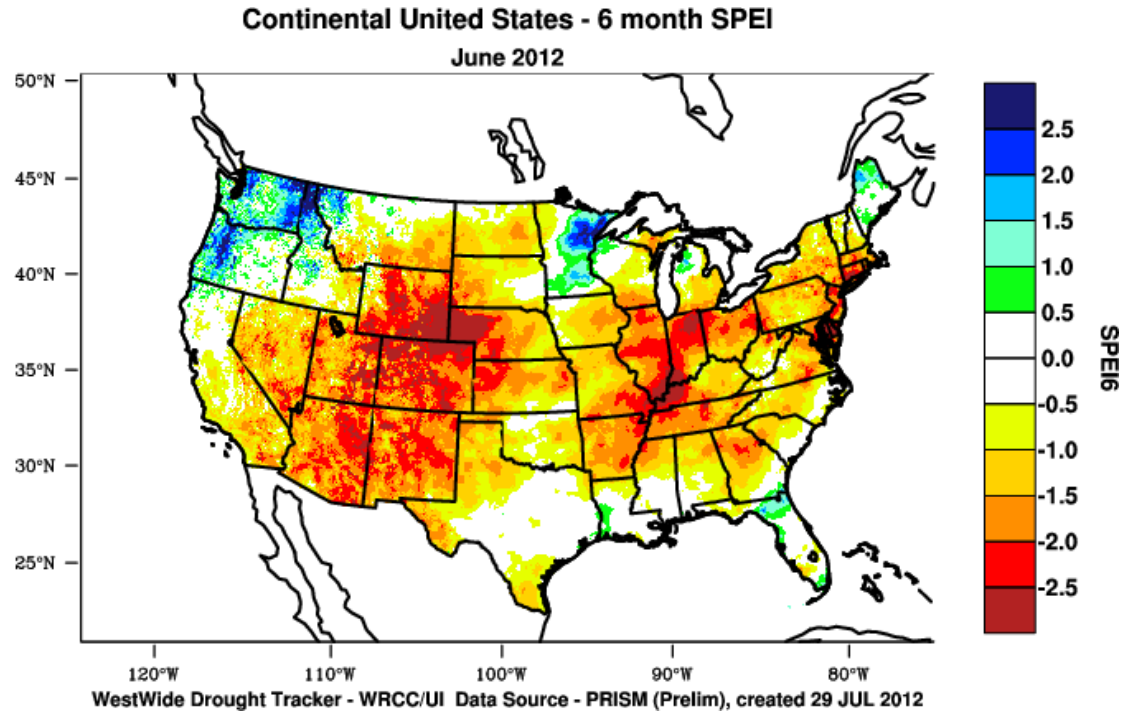
2-mo

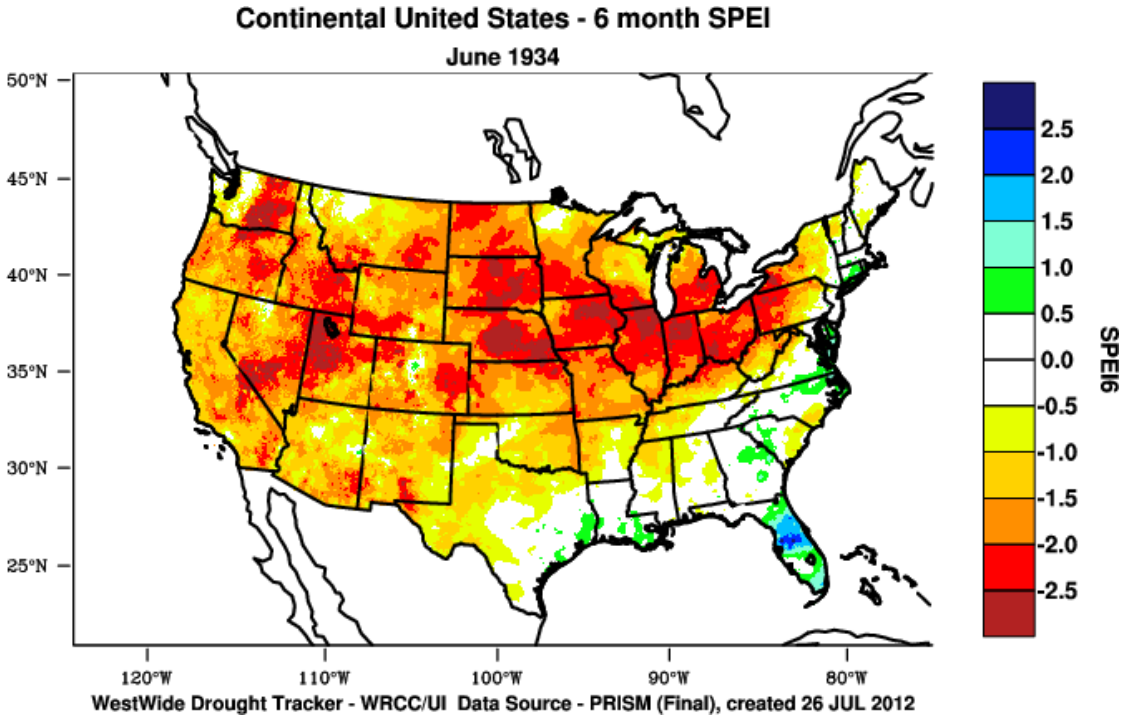


3-mo



4-mo



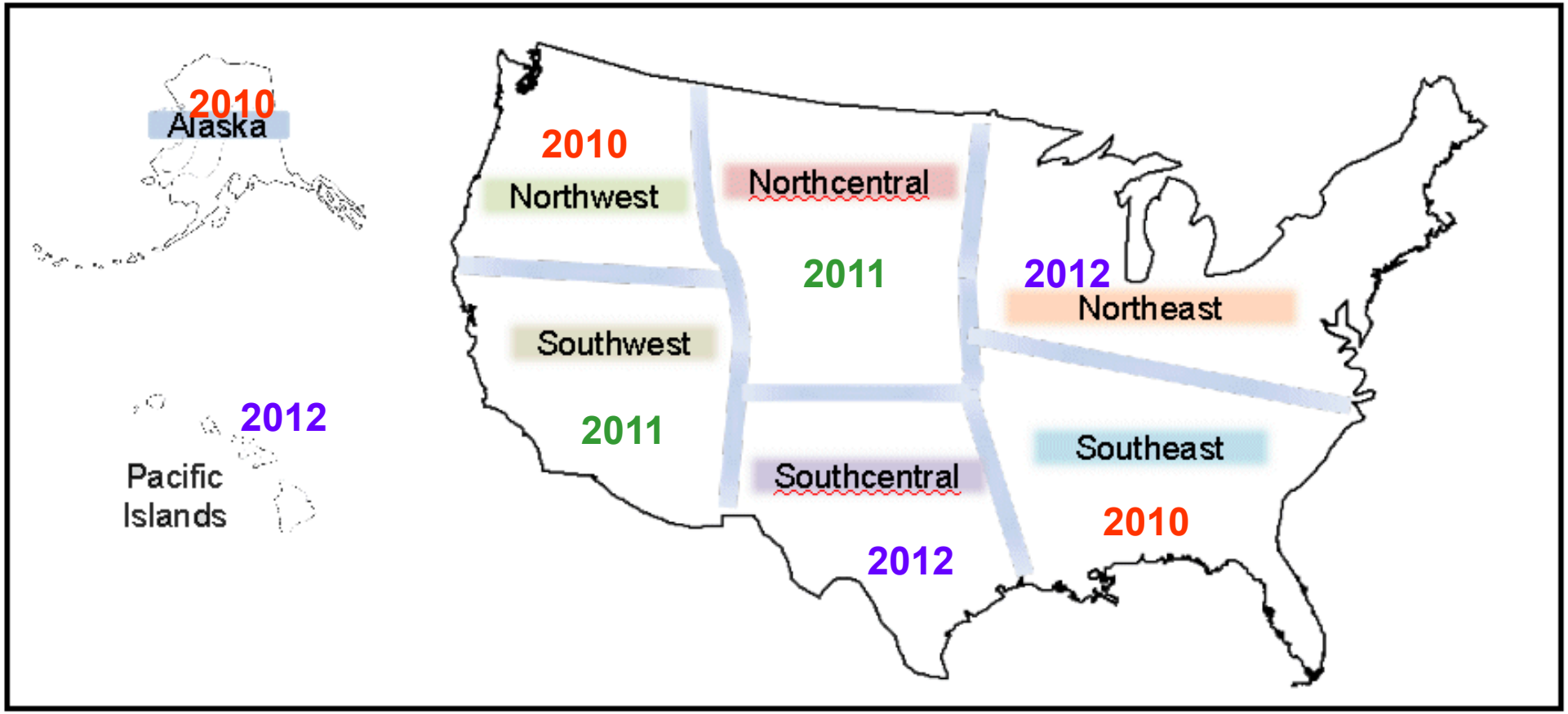


Standardized Precipitation Evapotranspiration Index
6-month
thru June

2012 6-mo

1934 6-mo

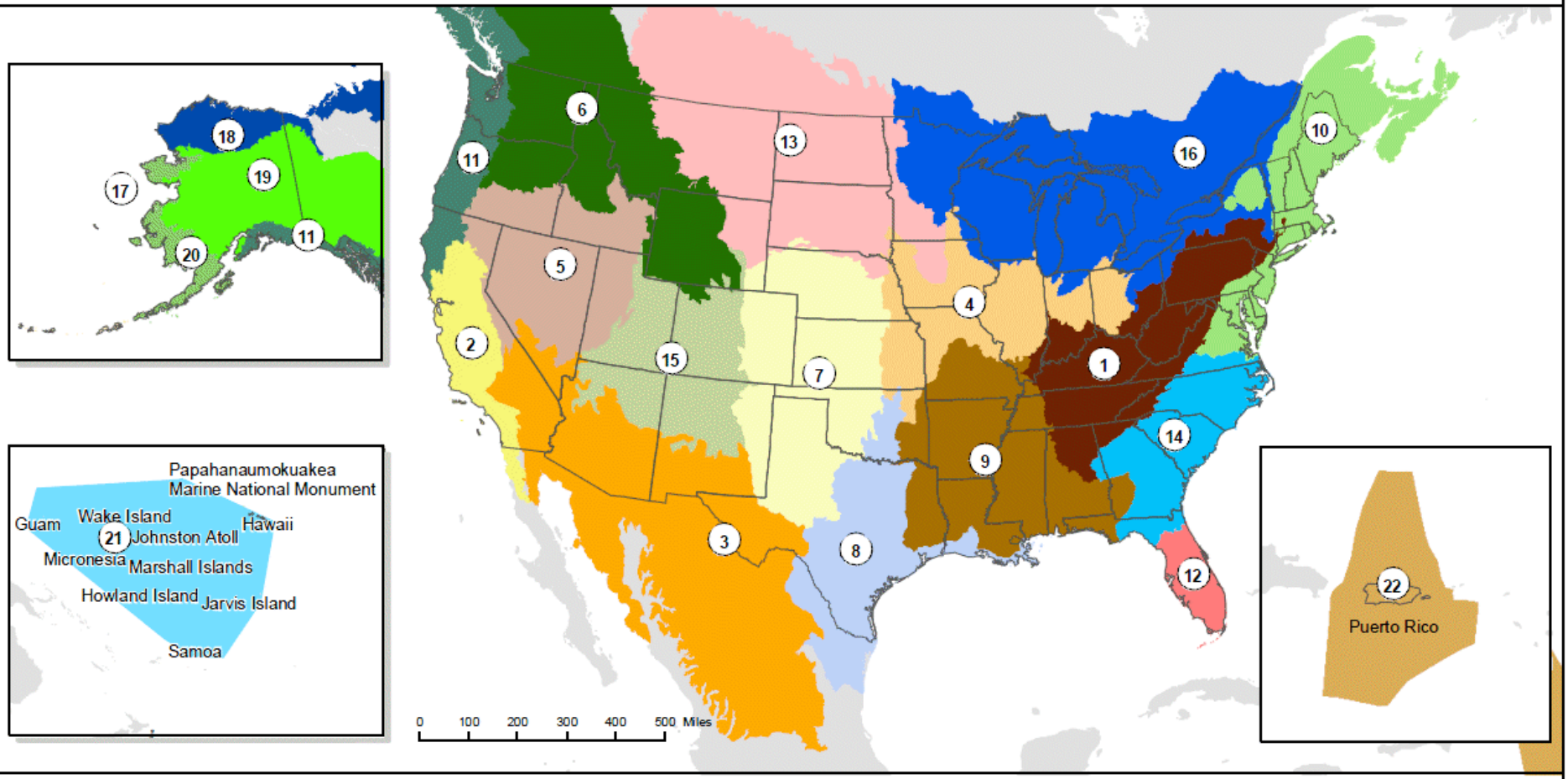
Department of Interior
Climate Science Centers
DOI includes USGS, NPS, FWS, BLM, BOR,BIA, others



AK --	UAF, UAA
NW --	OSU, U Wash, U Idaho
SE --	NC State, UNV, Duke, LSU, Texas Tech, Iowa St U
SW --	U AZ, UC Davis, Scripps / UCSD, UCLA, U Colo, DRI / WRCC
NC --	CSU, UM, MSU, UNL/HPRCC, U Colo, Colo School Mines, U Wyo, KSU, Iowa St U
NE --	U Mass, Col Menominee Nat, Columbia, MB Lab, U Minn, U Mo-Columbia, UW-Madison
SC --	U OK, Texas Tech, LSU, Chickasaw Nat, Choctaw Nat, OK St U, GFDL
PI --	U HI-Manoa, U HI-Hilo, U Guam

Landscape Conservation Cooperatives

Approx 2010



Landscape Conservation Cooperatives

1. Appalachian
2. California
3. Desert
4. Eastern Tallgrass Prairie and Big Rivers
5. Great Basin
6. Great Northern
7. Great Plains
8. Gulf Coast Prairie
9. Gulf Coastal Plains and Ozarks
10. North Atlantic
11. North Pacific
12. Peninsular Florida
13. Plains and Prairie Potholes
14. South Atlantic
15. Southern Rockies
16. Upper Midwest and Great Lakes
17. Aleutian and Bering Sea Islands
18. Arctic
19. Northwestern Interior Forest
20. Western Alaska
21. Pacific Islands
22. Caribbean
Unclassified

Albers Equal Area Conic NAD83
Produced by FWS, IRTM, Denver, CO
Map Date: 12142011

The Future

THIS AFTERNOON	TONIGHT	MONDAY	MONDAY NIGHT	TUESDAY	TUESDAY NIGHT	WEDNESDAY	WEDNESDAY NIGHT	THURSDAY
Sunny	Clear	Sunny	Mostly Clear	Sunny	Clear	Sunny	Clear	Sunny
High: 91 °F	Low: 53 °F	High: 96 °F	Low: 54 °F	High: 97 °F	Low: 55 °F	High: 96 °F	Low: 55 °F	High: 96 °F