United States Department of Agriculture
Natural Resources Conservation Service

National Water and Climate Center Snow Survey and Water Supply Forecasting Program and SCAN

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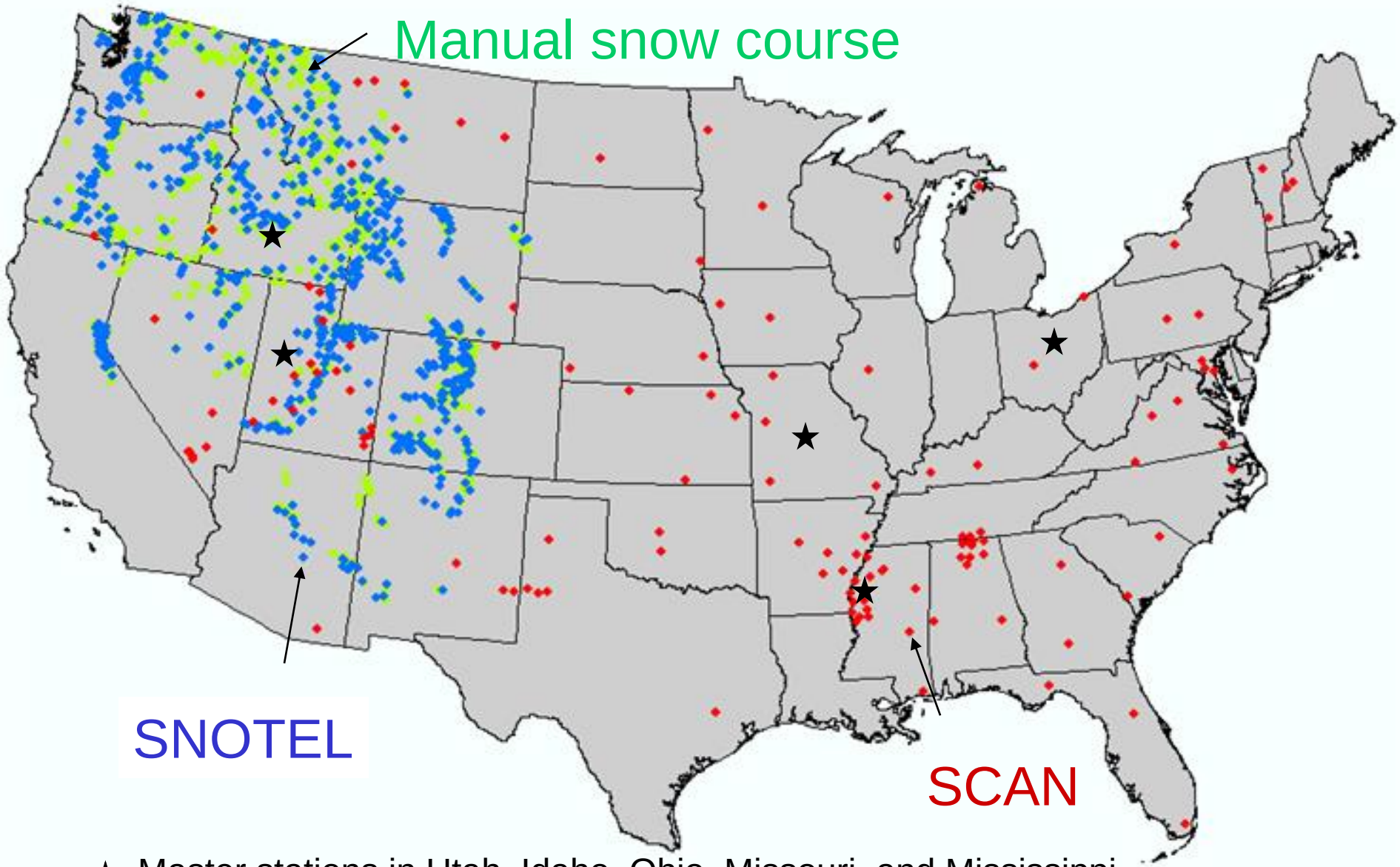
USDA-NRCS National Water and Climate Center
Portland, OR



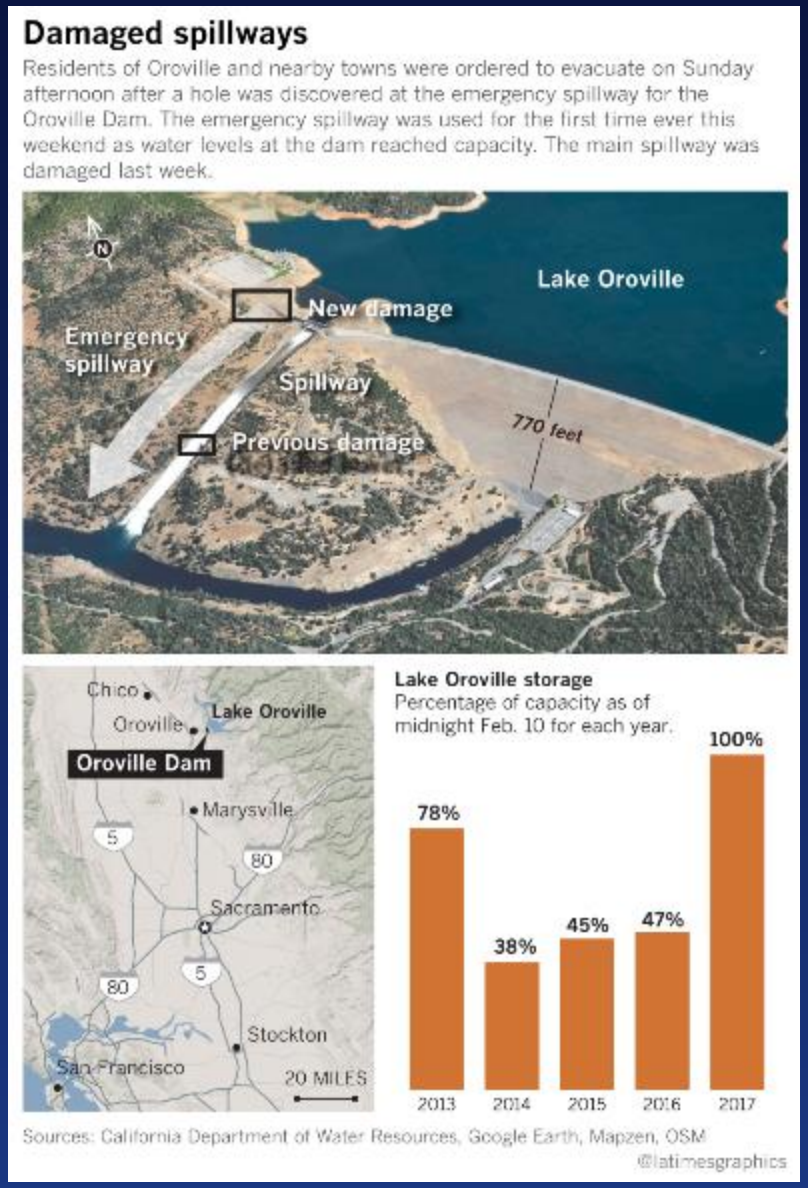
★ Master stations in Utah, Idaho, Ohio, Missouri, and Mississippi.

A Century Of Progress

- 1906 - Initial snow studies by Dr. Church at Lake Tahoe
- Purpose – provide forecasts for agricultural (irrigation) water needs
- 1906-1909 - Snow survey sampler perfected
- 1909-1910 - First water supply forecast issued
- Soil Conservation Service Program since 1939

Mission critical commitments for providing data and forecasts in real time

- International Treaties - Columbia River Treaty, Colorado River Compact
- Bonneville Power (Oregon – Washington) – hydroelectric power generation
- Salt River Project (Arizona) – hydroelectric power generation
- U.S. army Corps of Engineers – reservoir management
- Bureau of Reclamation – reservoir management
- U.S. Forest Service – land management, avalanche
- NOAA (NIDIS and National Weather Service) – river forecasts, flooding, emergency management
- Denver Water – water supply
- City of Seattle – water supply, power generation
- Portland Water Bureau – water supply
- Idaho Power – hydroelectric power generation
- Many more



USA Today , February 13, 2017

LA Times, February 13, 2017

SALT LAKE CITY (KSL.com 2/10/2017) — A deep snowpack, saturated soil, warm weather and rain in the forecast all combine to mean potential flooding in Utah; several areas prone to flooding could be vulnerable as early as Friday.

The Cache County Sheriff's Office warned residents Thursday to prepare for localized flooding because of warm temperatures and the rainy forecast. Sandbags will be available in the lobby of the county jail, as well as piles of sand to fill them with. Drivers are reminded to be cautious when encountering standing water. Northern Utah could see anywhere from 1½ to 2 inches of rain Friday night into Saturday, with rain falling as high as 9,000 feet and heavy snow above that.

Hydrologist Randy Julander, with the U.S. Department of Agriculture's Natural Resources Conservation Service, and Brian McInerney, a hydrologist with the National Weather Service in Salt Lake City, told water managers Thursday the soil in many places is saturated, and more rain will cause problems in flood-prone places in northern Utah. Areas near the Weber River, the Bear River and parts of Box Elder County and Cache County have been swamped by this kind of rain event flooding in the past.

ELKO, Nev. (AP) (2/10/2017) - A rural northeast Nevada county declared a state of emergency Thursday after an earthen dam failed, releasing fast-moving water that forced trains to reroute and closed part of a washed out state highway near the Utah line.

A 65-mile stretch of U.S. Highway 93 from Wells north to the Idaho line also was closed due to flooding a day after the dam broke near Montello, state transportation officials said.

Elko County Sheriff Jim Pitts said county commissioners approved the state of emergency as his deputies searched for anyone who might be stranded by floodwaters.

No injuries have been reported, but authorities said there appeared to be extensive damage to several ranches and farms.

About 30 residences have been impacted by the floodwaters in Montello since the Twentyone Mile Dam broke Wednesday afternoon, Pitts said. A 10-mile stretch of State Route 233 remained closed.

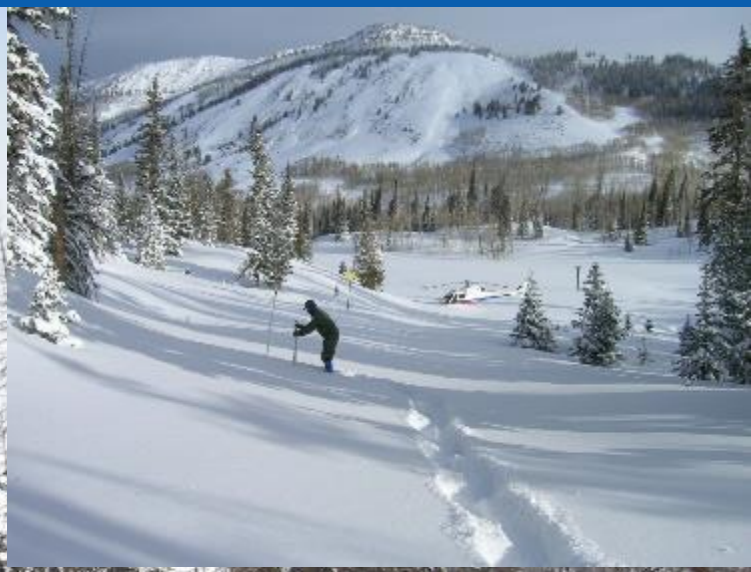
Big Idaho snowpack has water managers pleased and worried (Boise, Idaho, AP) February 10, 2017

Experts say this year's winter in Idaho has been unusual for the amount of snow in lower elevations — 500 percent above average in some areas — that has caused dozens of buildings to collapse.

Gov. C.L. "Butch" Otter has declared states of emergency in eight counties due to snowstorms this winter, including Boundary County in northern Idaho earlier this week where heavy snow is causing problems. Elsewhere, flooding is starting to be a concern.

"We're watching it by the hour," said Otter spokesman Jon Hanian on Thursday. "In some of the troubled areas they're taking steps now to make sure we're ahead of the curve."

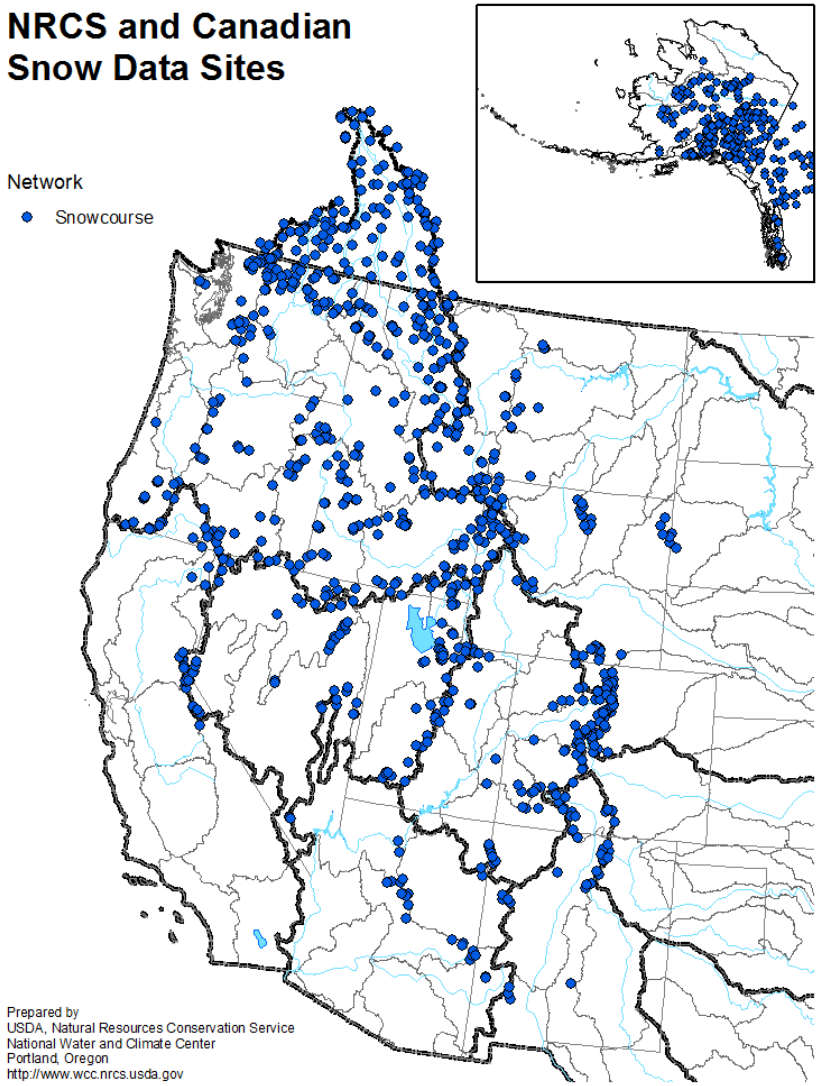
Read more here: http://www.thestate.com/news/business/national-business/article131668049.html#storylink=cpy

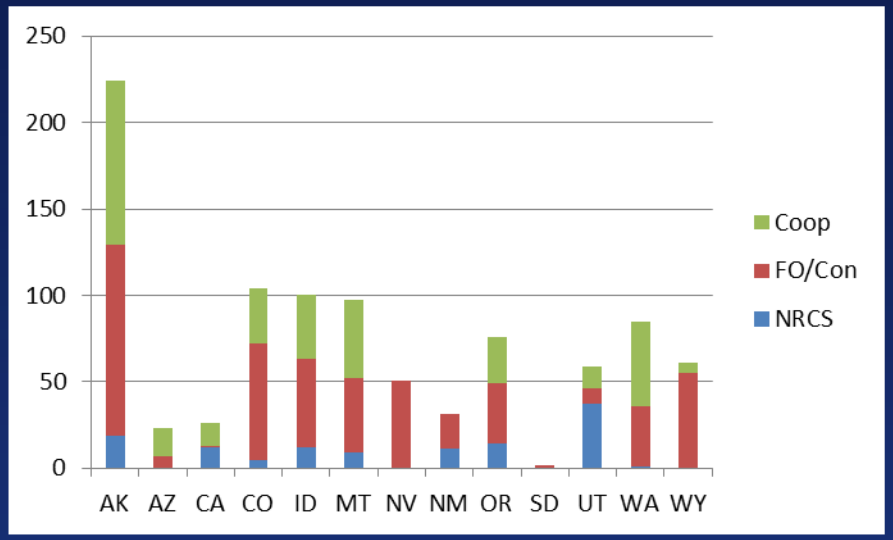


Manual Snow Surveys

Metal tube inserted into snow and weighed to measure water content.

+300,000 snow course measurements to date


NRCS and Canadian
Snow Data Sites
Network
Snowcourse
Prepared by
USDA, Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov


250
200
150
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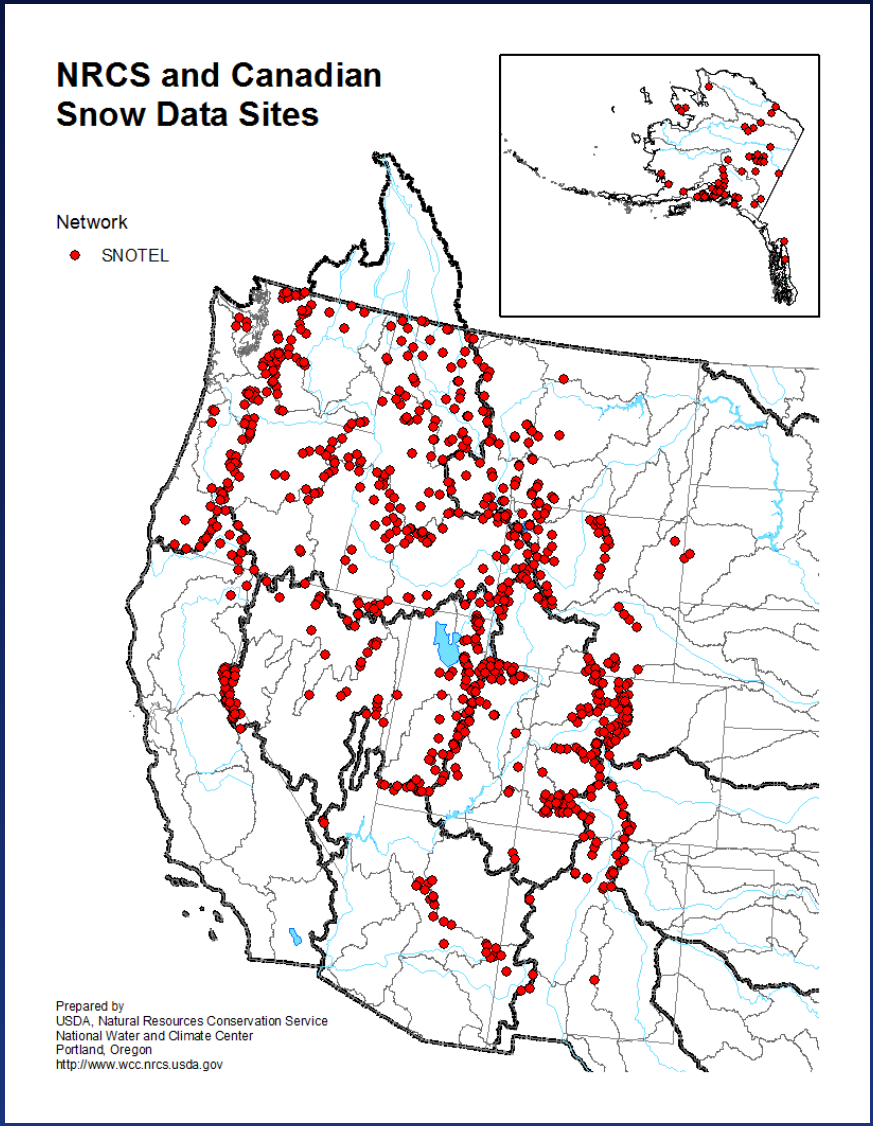
50
0
AK
AZ
CA
CO
ID
MT
NV
NM
OR
SD
UT
WA
WY
Coop
FO/Con
NRCS

NRCS SNOTEL Network

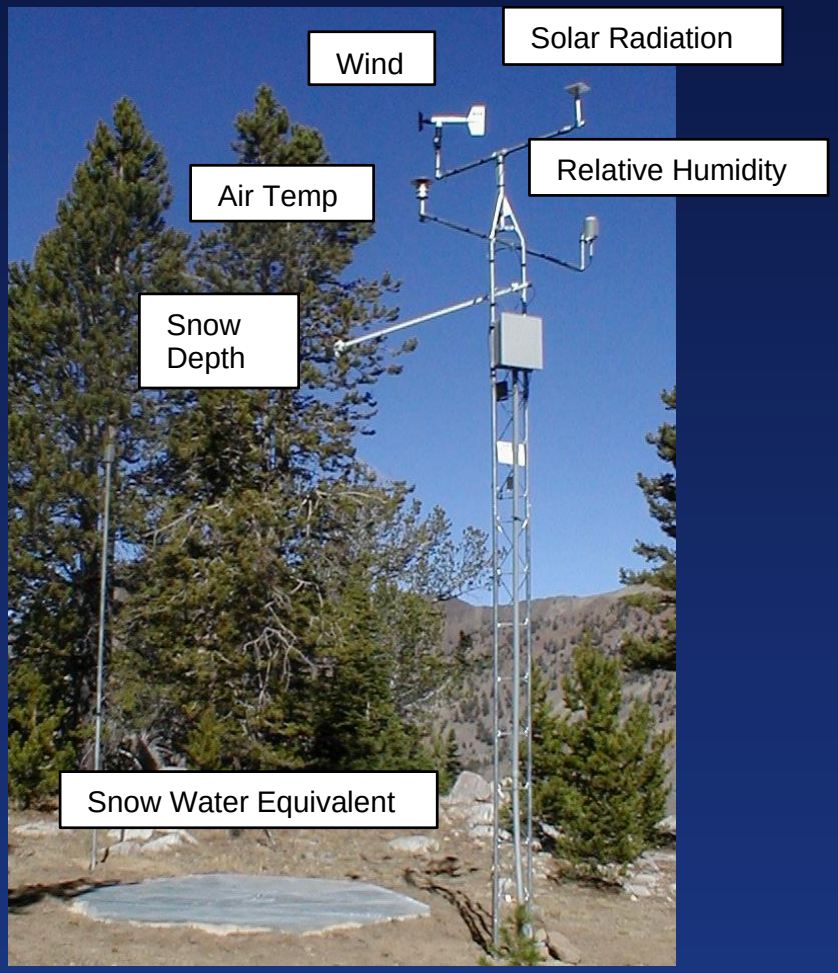
- SNOTEL network
  - 13 Western States
  - 885 sites (includes SnoLite)
  - More than 16 million observations/year
  - Data transmitted in near real time every hour for most stations
- Snow courses = 1 measurement/ month SWE and depth
- SNOTEL = 720 transmissions/month of multiple sensors
- Safety



http://www.wcc.nrcs.usda.gov/snow/

SNOTEL Site - Augmented Data Array

- **Snow water content**
- **Precipitation**
- **Temperature**
- **Snow depth**
- **Relative humidity**
- **Wind speed/direction**
- **Solar radiation**
- **Soil moisture / temperature**



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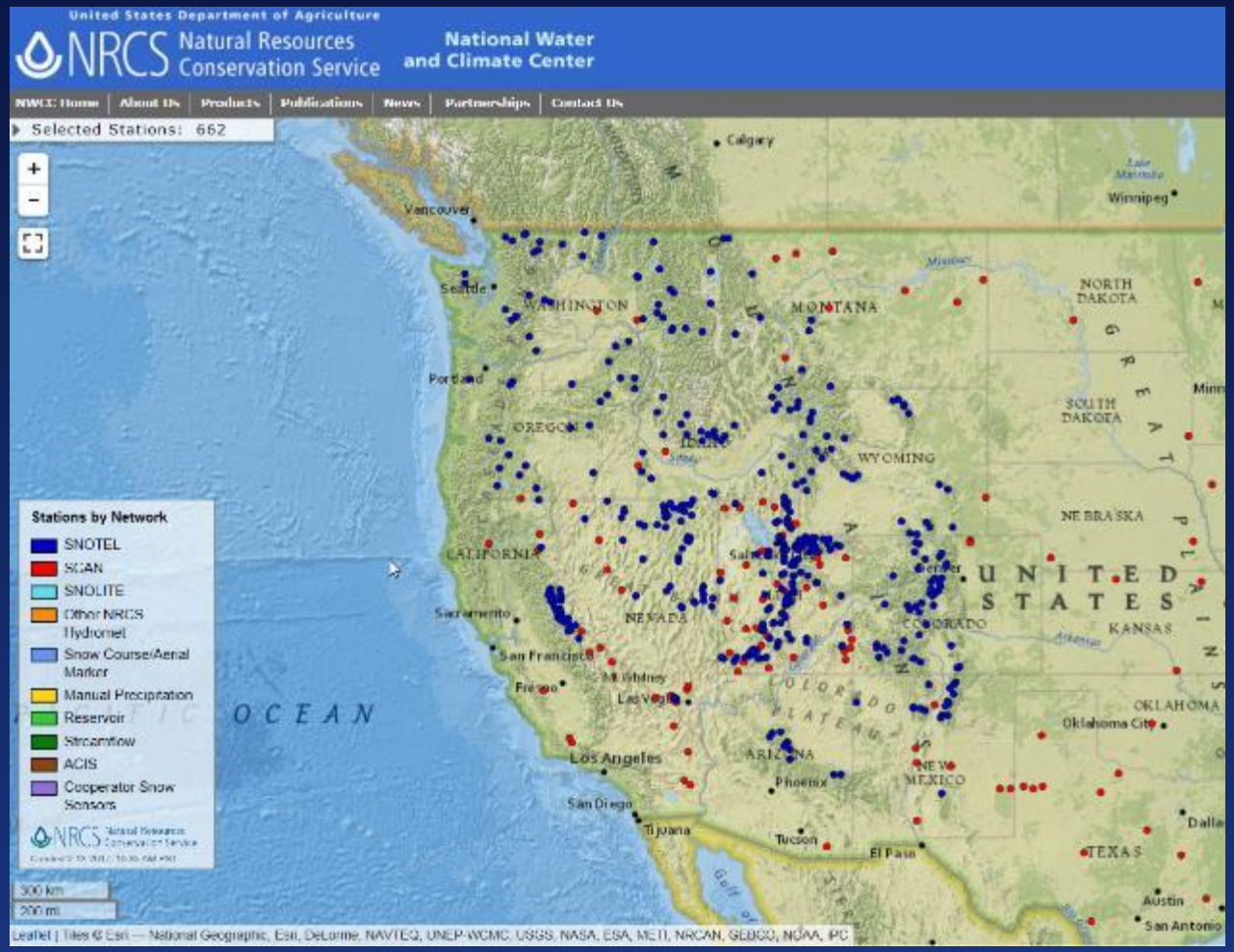
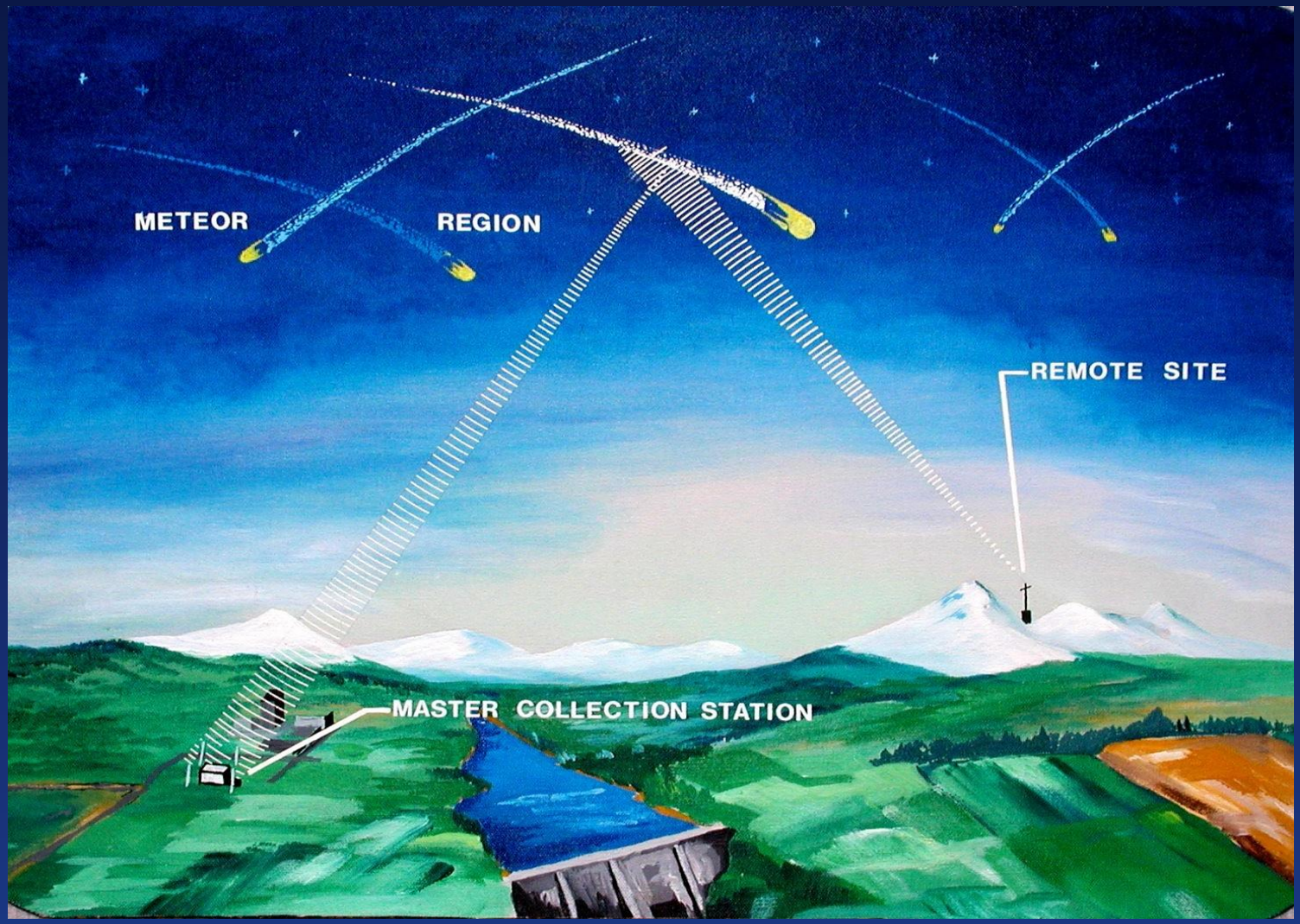
Expansion of soil moisture to SNOTEL network (data starts 2003)



Meteor Burst Technology



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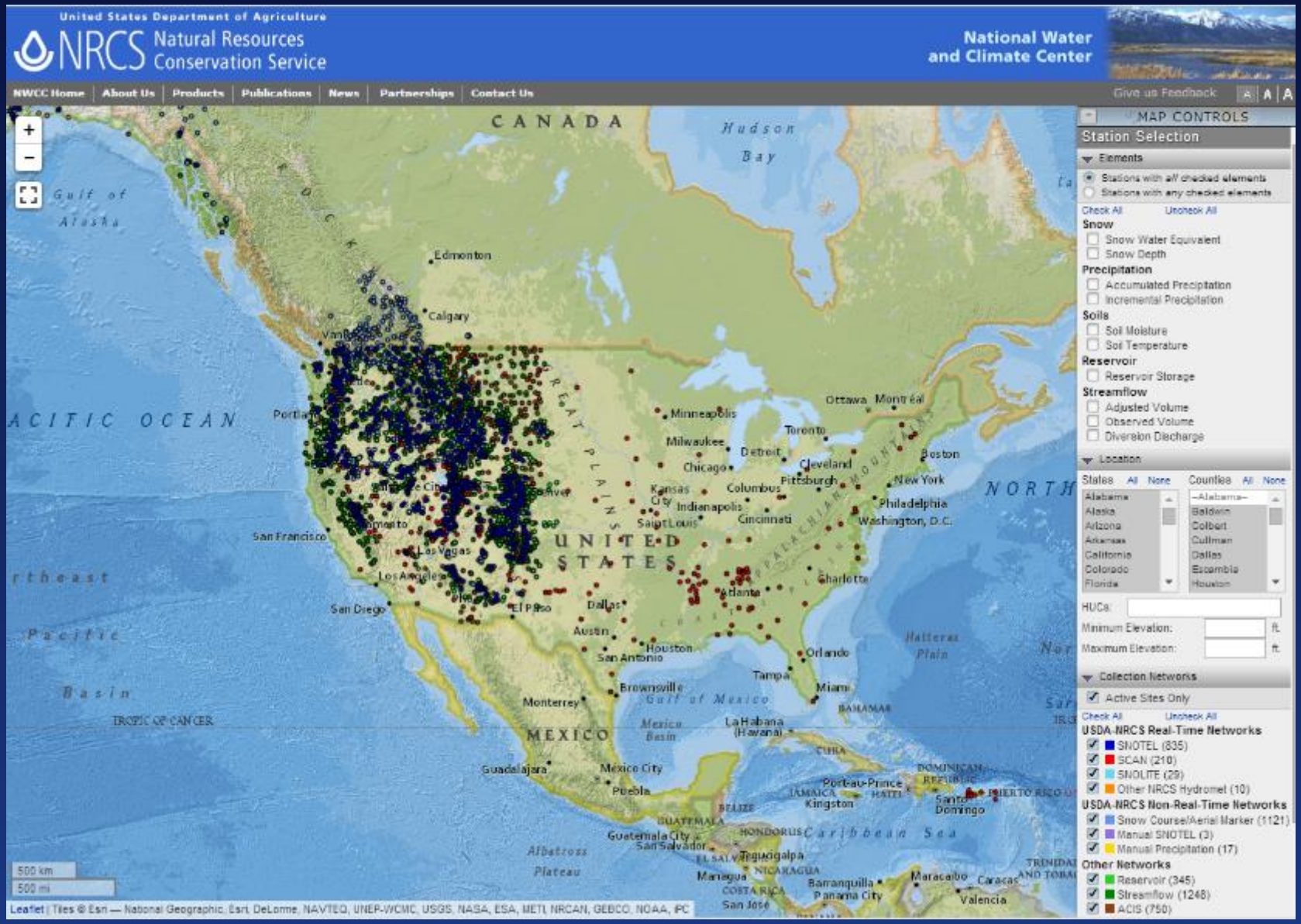

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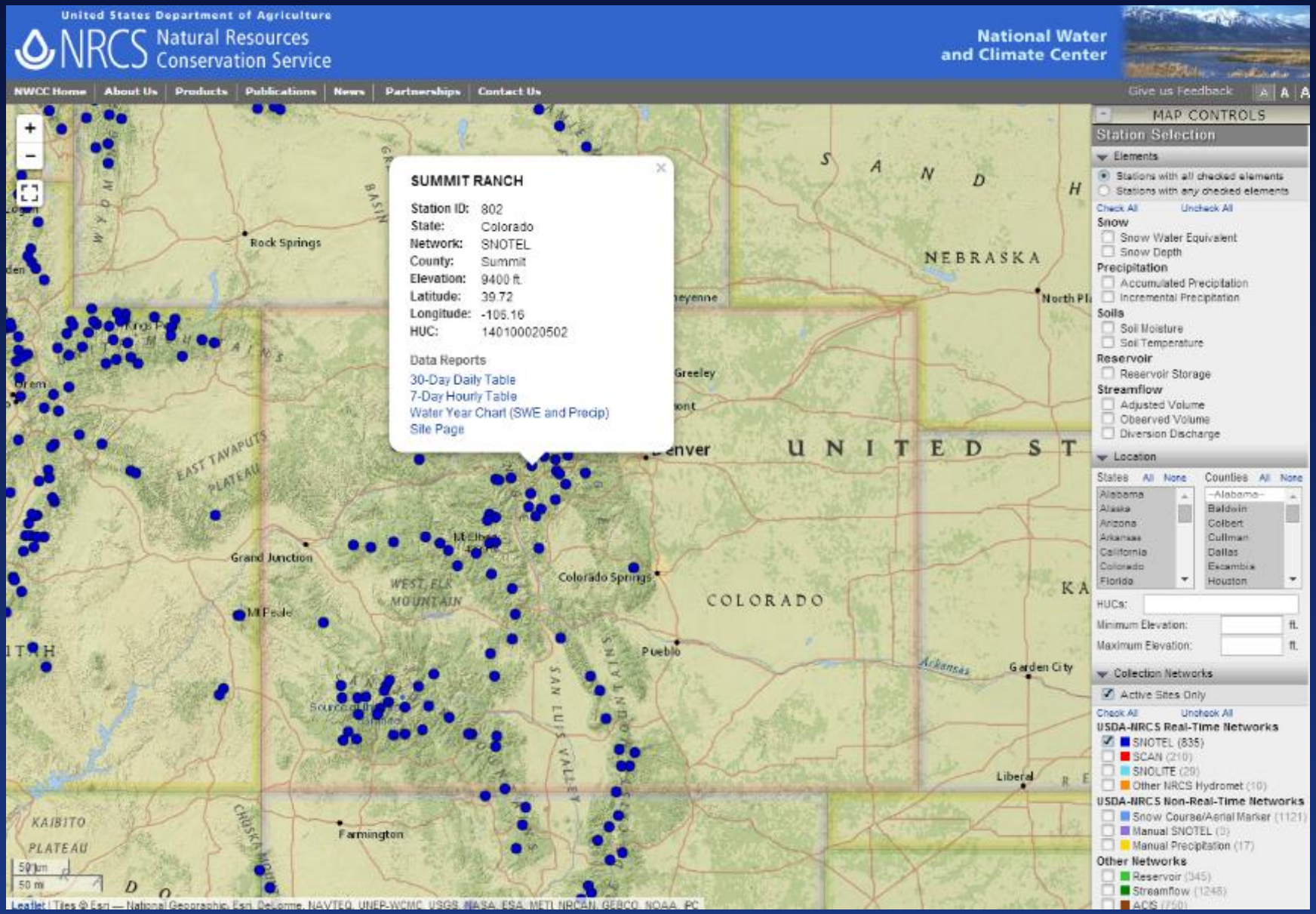

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USDA NRCS

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National Water and Climate Center

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Report Generator 1.3

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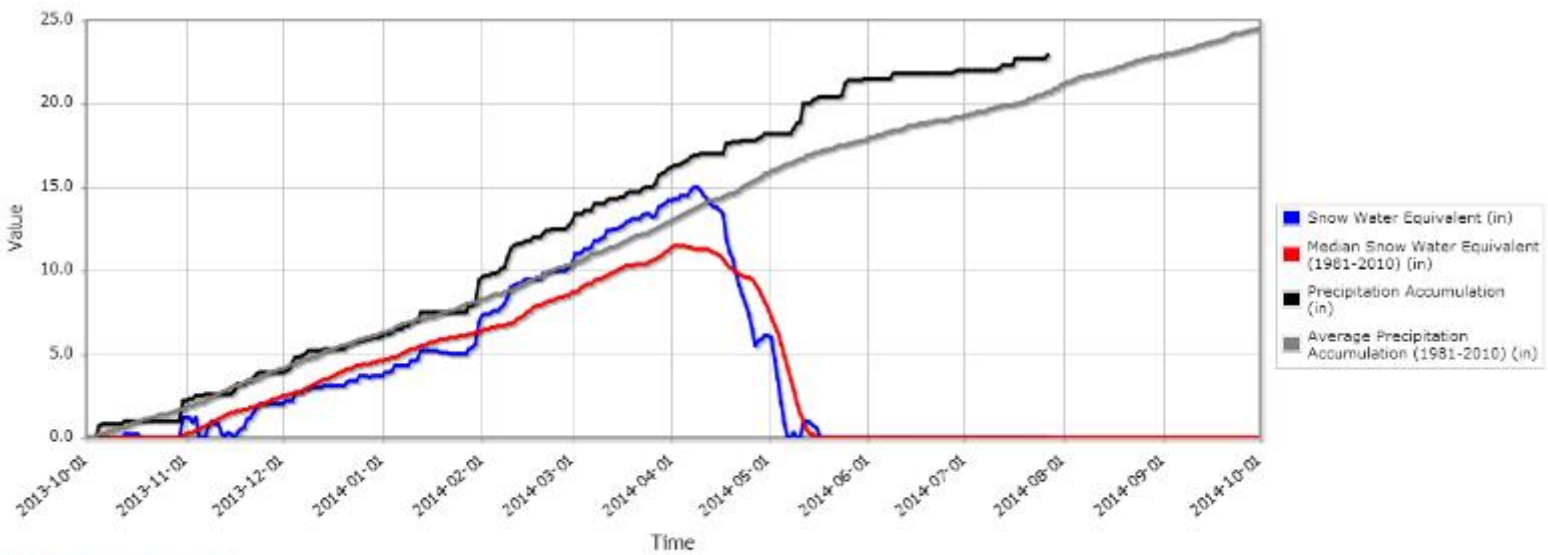
View Station Information

Create/Modify Report | View Report

Output Format | Layout | Units | Time Period | Fit Chart To Screen

Chart Help

Summit Ranch (802) Colorado SNOTEL Site - 9400 ft



Export Chart As Image

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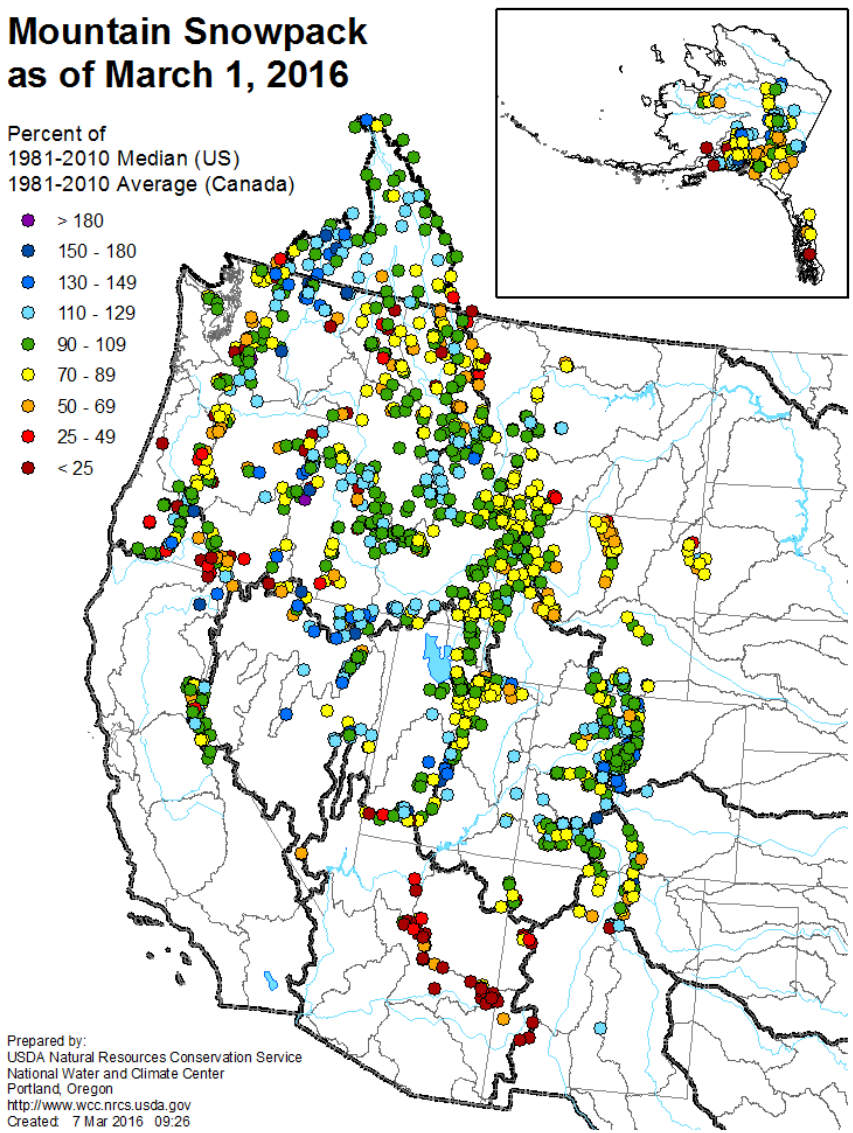
Mountain Snowpack
as of March 1, 2016
Percent of
1981-2010 Median (US)
1981-2010 Average (Canada)
> 180
150 - 180
130 - 149
110 - 129
90 - 109
70 - 89
50 - 69
25 - 49
< 25
Prepared by:
USDA Natural Resources Conservation Service
National Water and Climate Center
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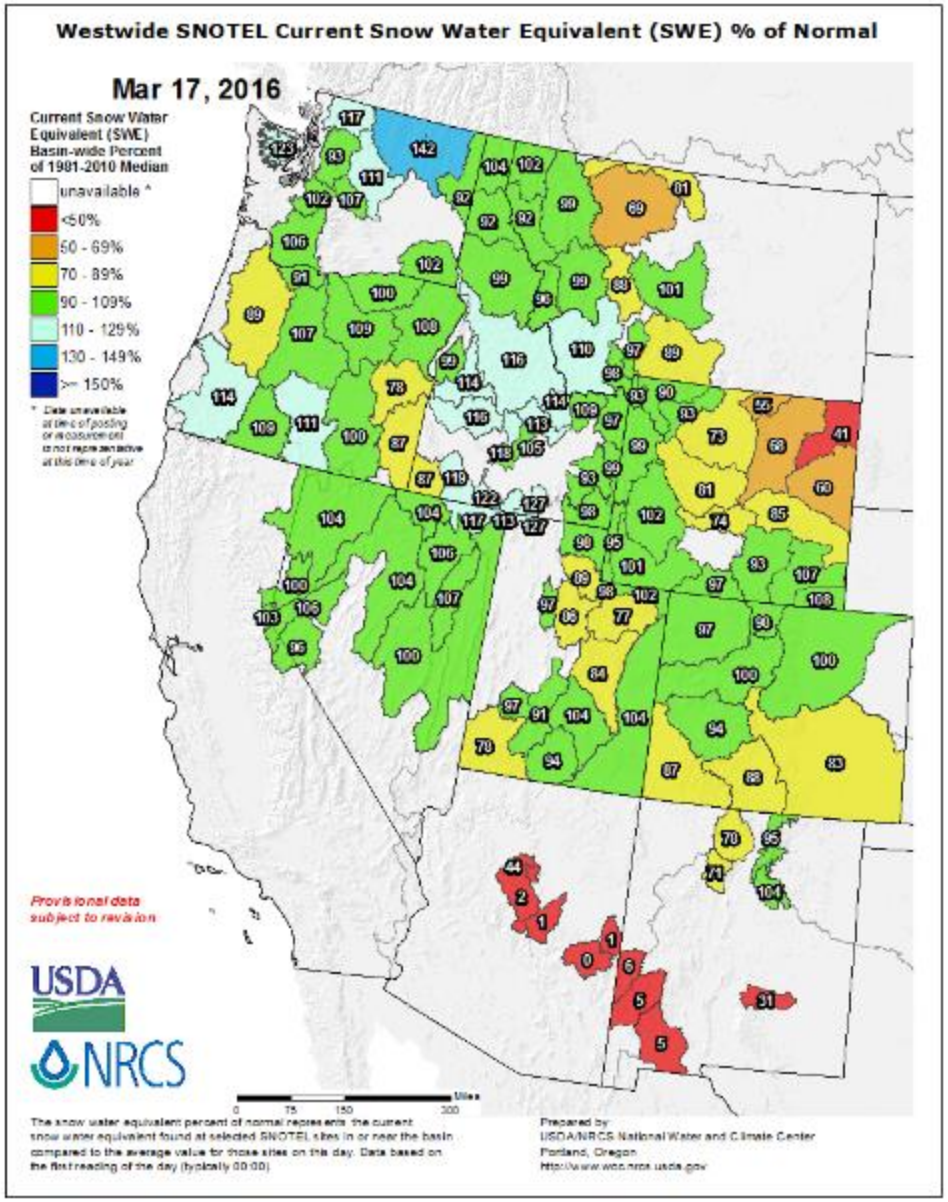
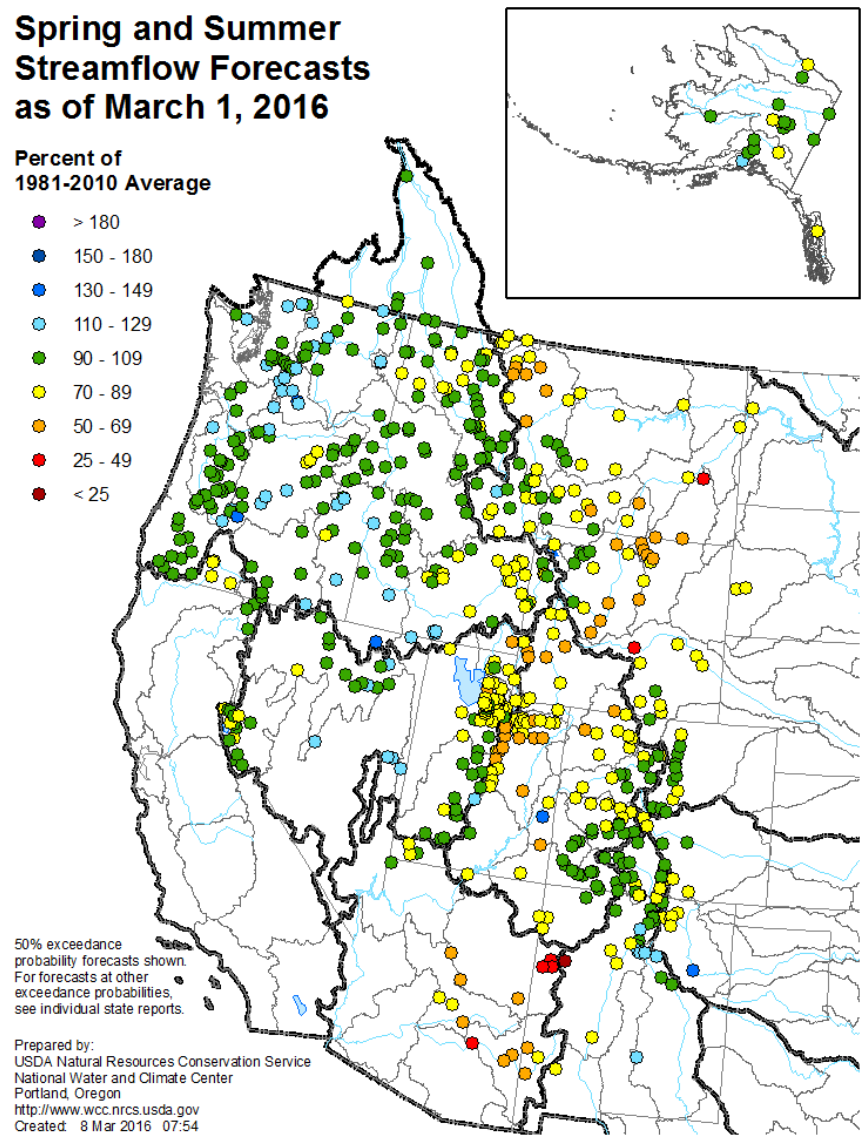
Created: 7 Mar 2016 09:26


Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal
Mar 17, 2016
Current Snow Water Equivalent (SWE) Basin-wide Percent of 1981-2010 Median
unavailable *
<50%
50 - 69%
70 - 89%
90 - 109%
110 - 129%
130 - 149%
>= 150%
Provisional data subject to revision
USDA
NRCS
The snow water equivalent percent of normal represents the current snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).
Prepared by
USDA/NRCS National Water and Climate Center
Portland, Oregon


Spring and Summer
Streamflow Forecasts
as of March 1, 2016
Percent of
1981-2010 Average
> 180
150 - 180
130 - 149
110 - 129
90 - 109
70 - 89
50 - 69
25 - 49
< 25
50% exceedance
probability forecasts shown.
For forecasts at other
exceedance probabilities,
see individual state reports.
Prepared by:
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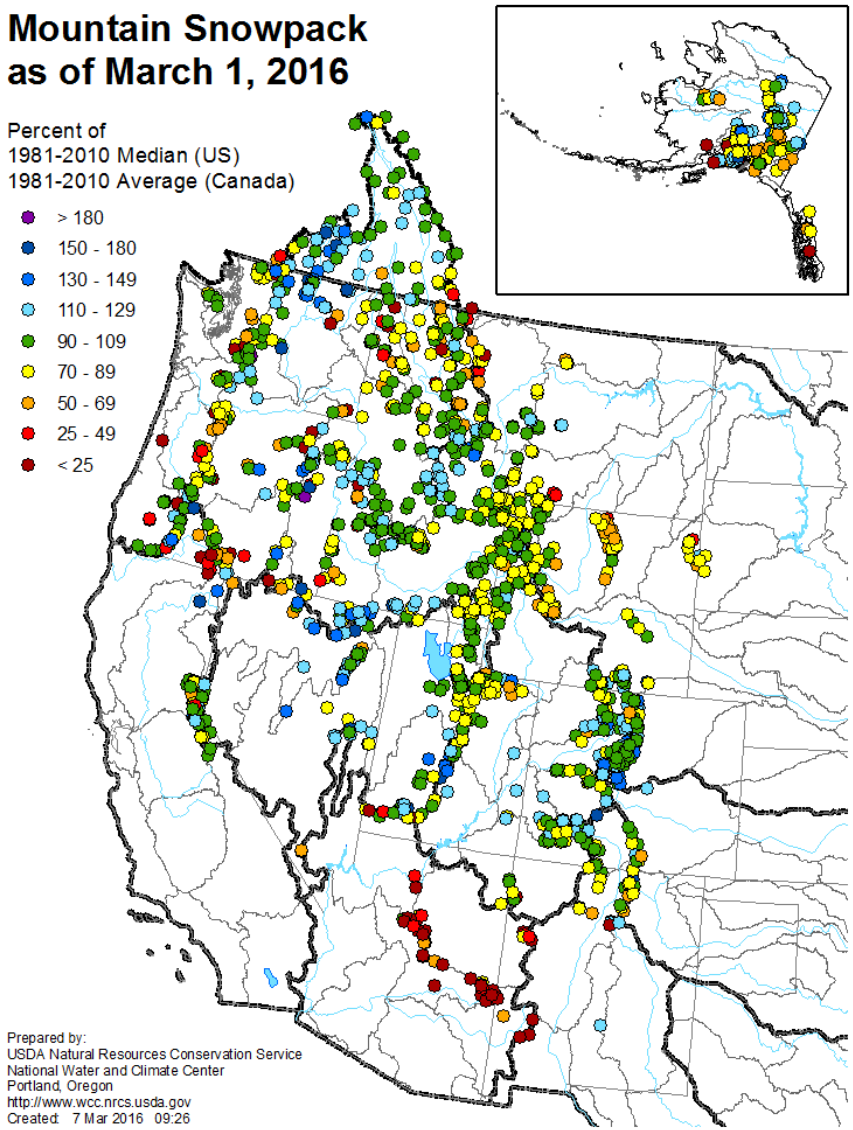
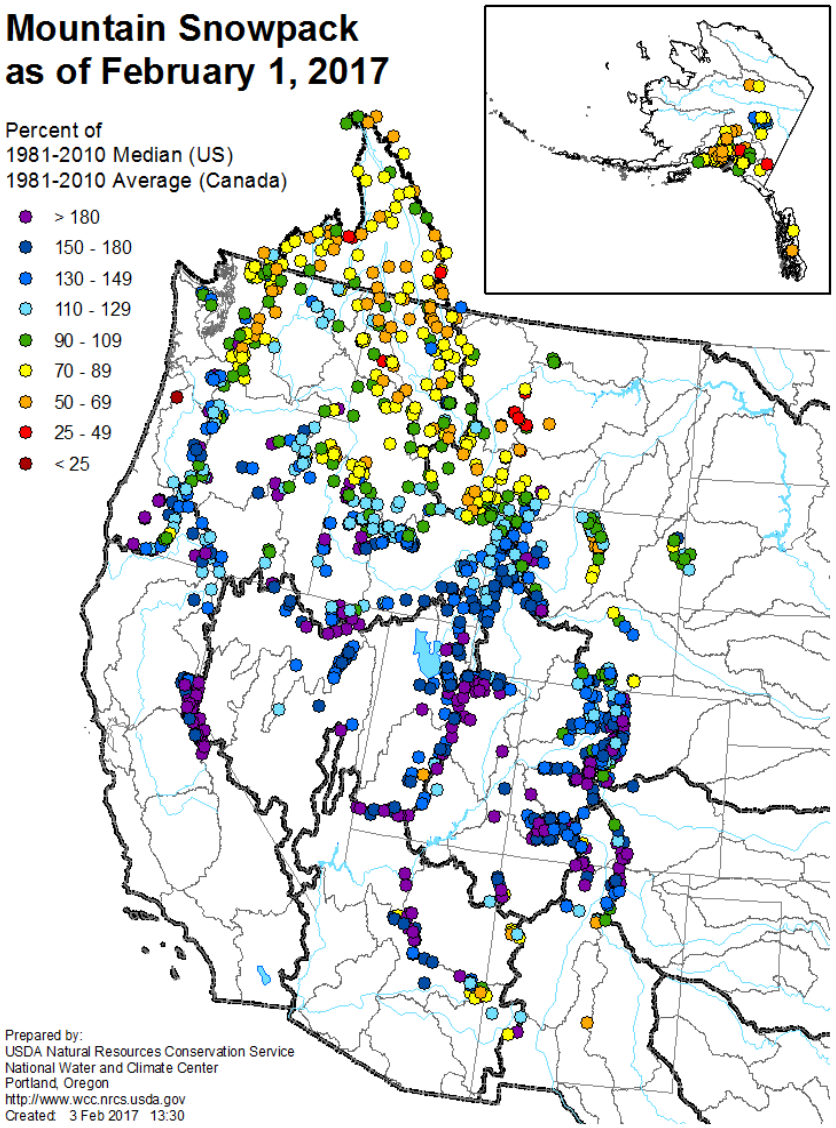
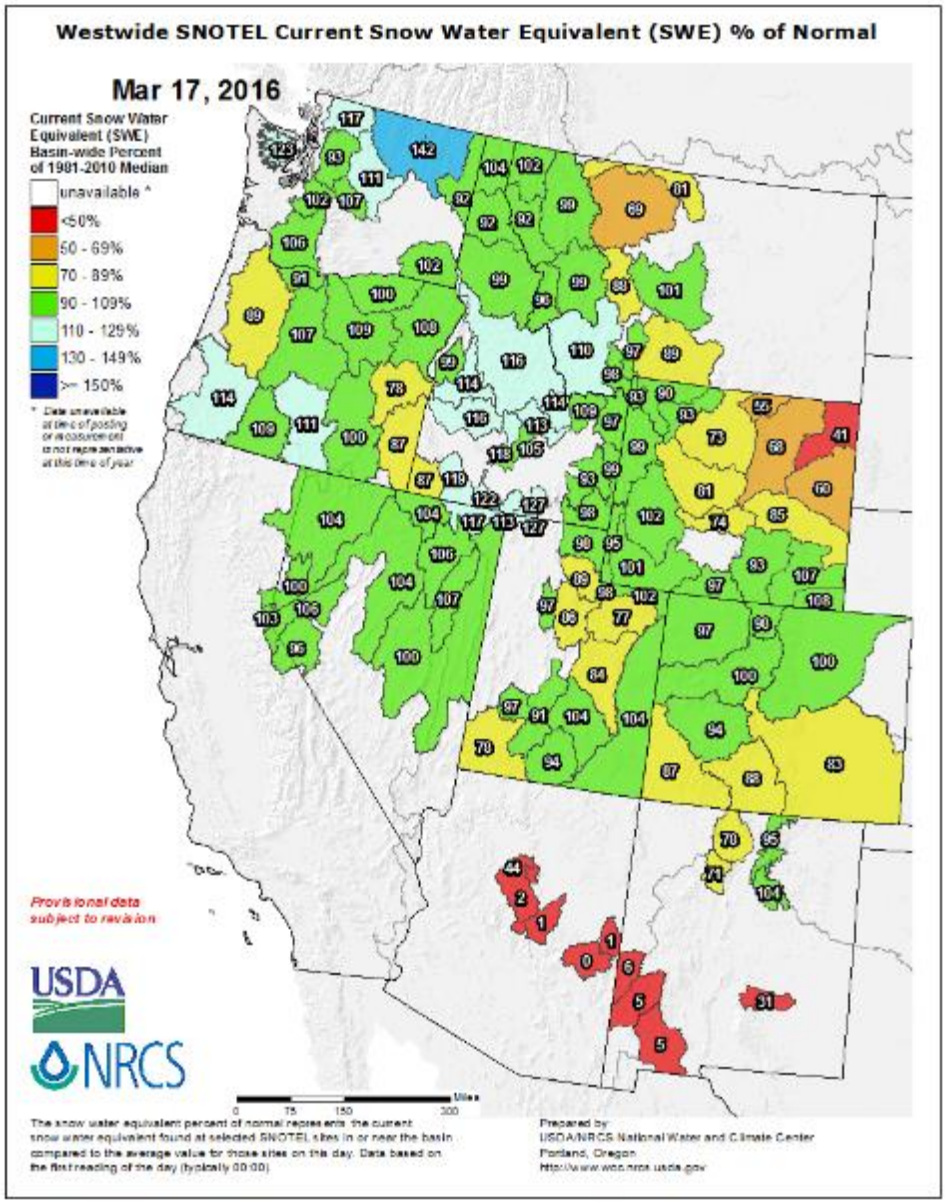
Created: 8 Mar 2016 07:54

Mountain Snowpack as of March 1, 2016



Mountain Snowpack as of February 1, 2017

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50 - 69%
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USDA
NRCS
Miles
0 75 150 300
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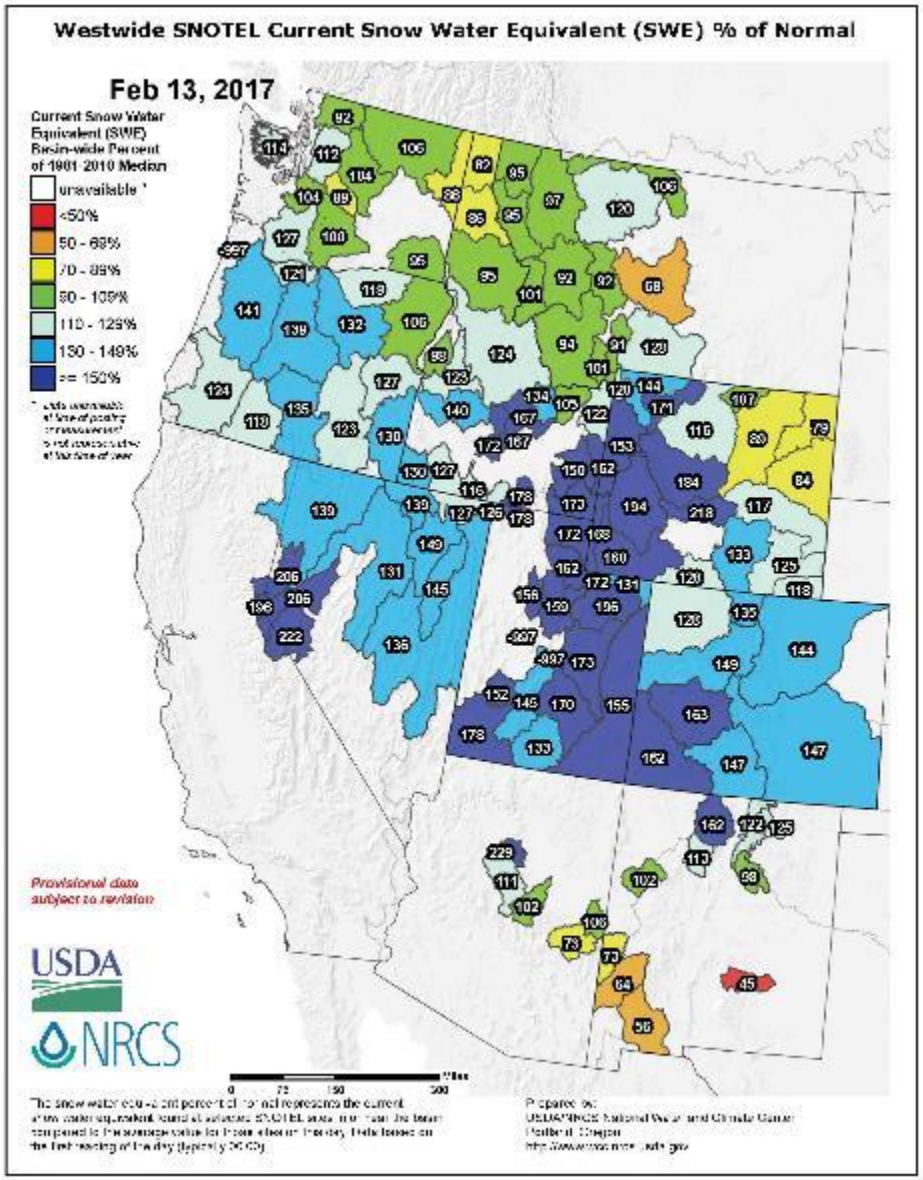
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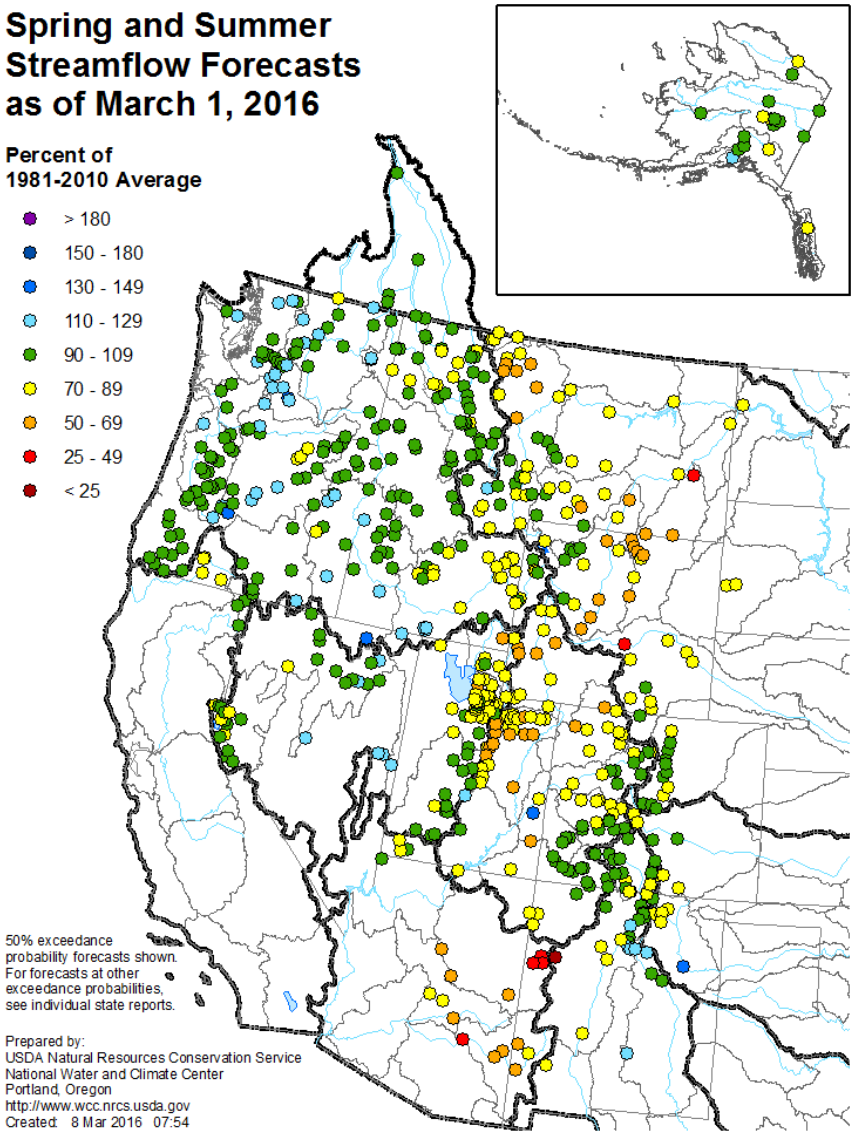
0 75 150 300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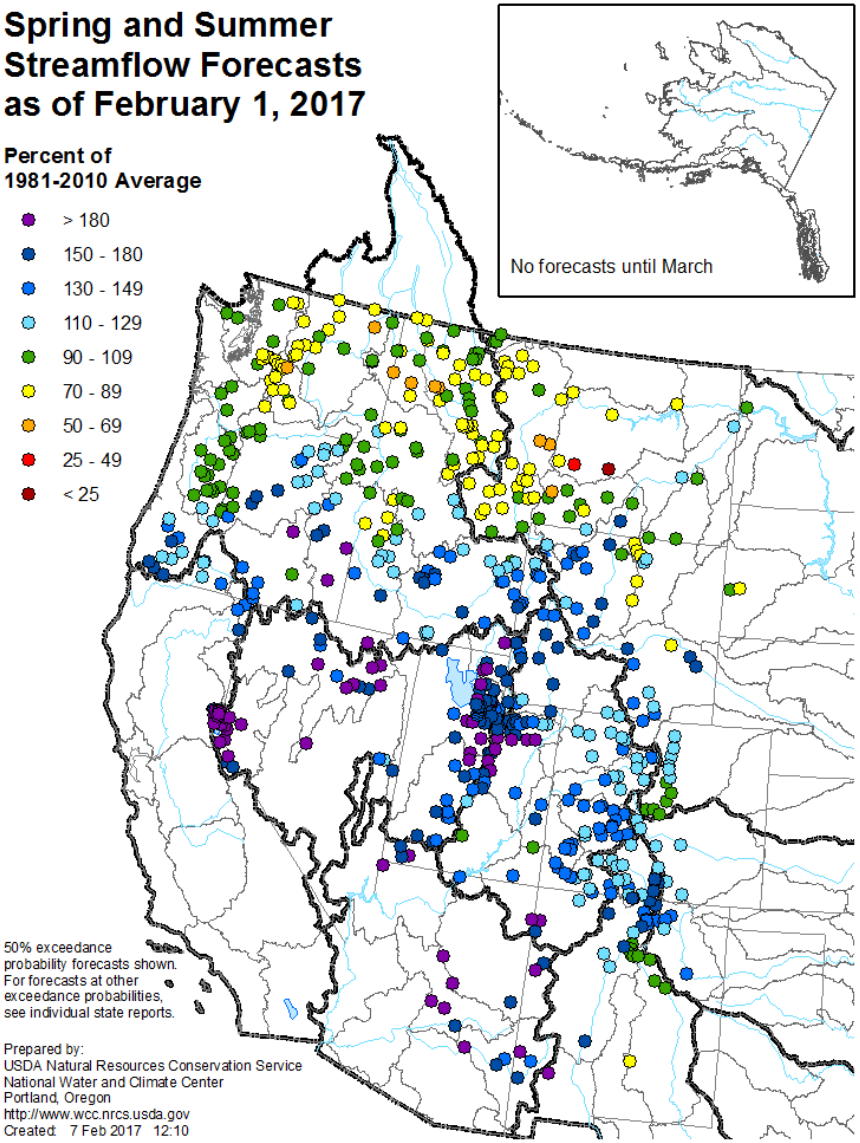
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Streamflow Forecasts
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Percent of
1981-2010 Average
> 180
150 - 180
130 - 149
110 - 129
90 - 109
70 - 89
50 - 69
25 - 49
< 25
No forecasts until March
50% exceedance
probability forecasts shown.
For forecasts at other
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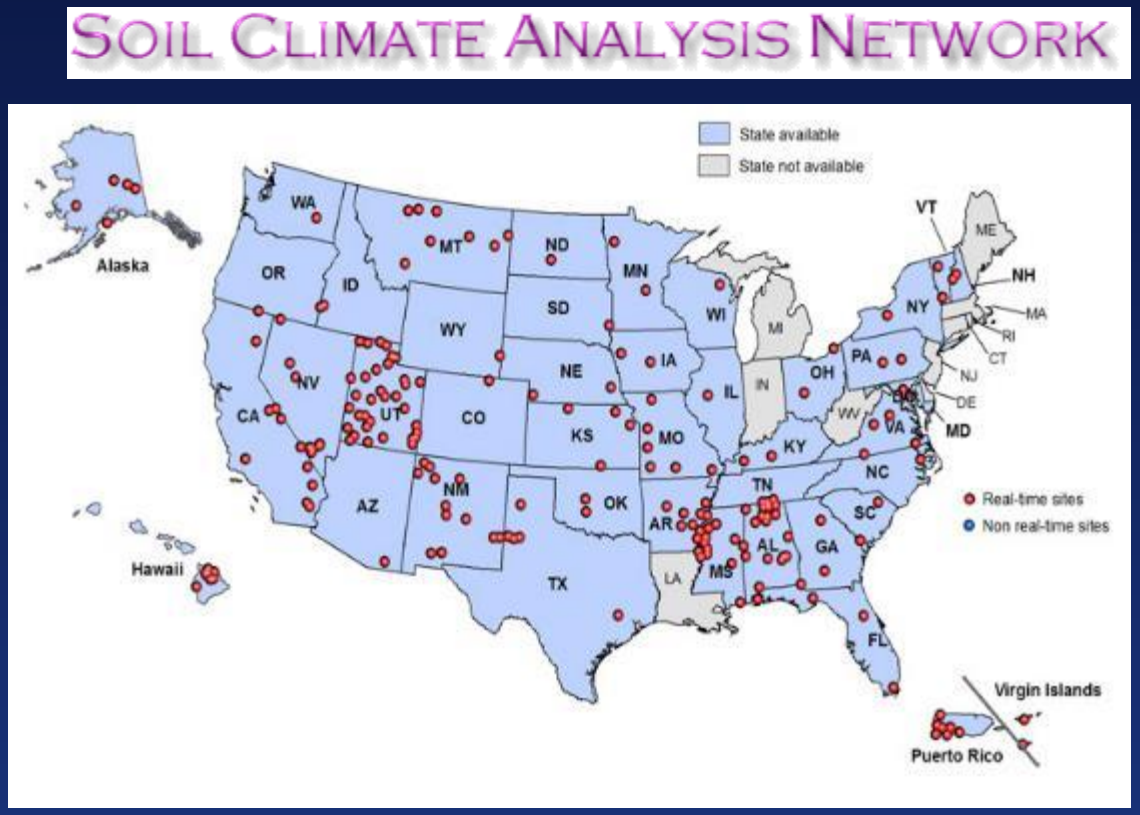
Soil Climate Analysis Network

- **SCAN** (Soil Climate Analysis Network)
  - 221 sites in 40 States and US Territories
  - Soil-climate monitoring
  - Uses meteor burst telemetry
  - Critical for drought monitoring
- www.wcc.nrcs.usda.gov/scan/



Johnson Farm, Nebraska SCAN Site

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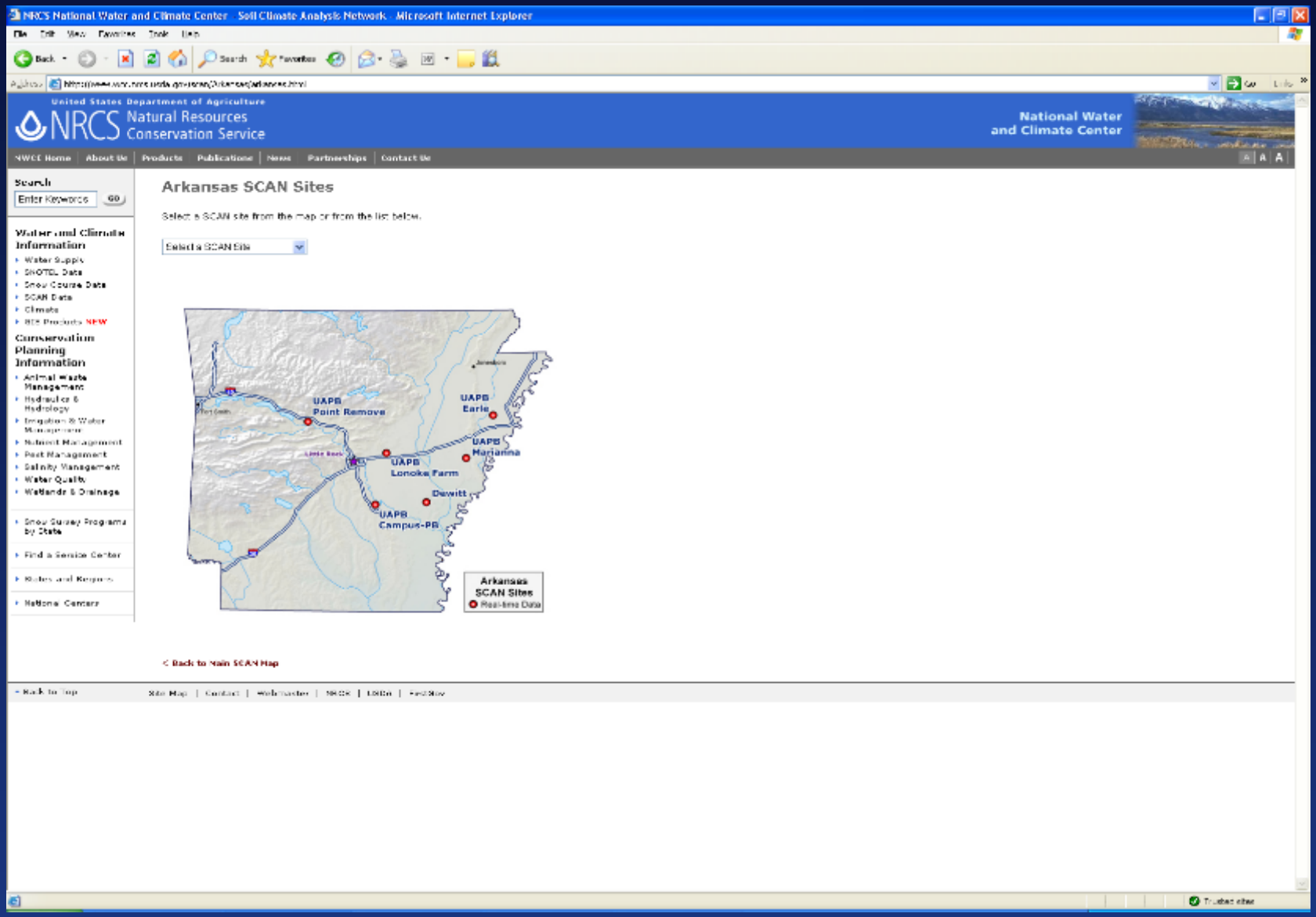
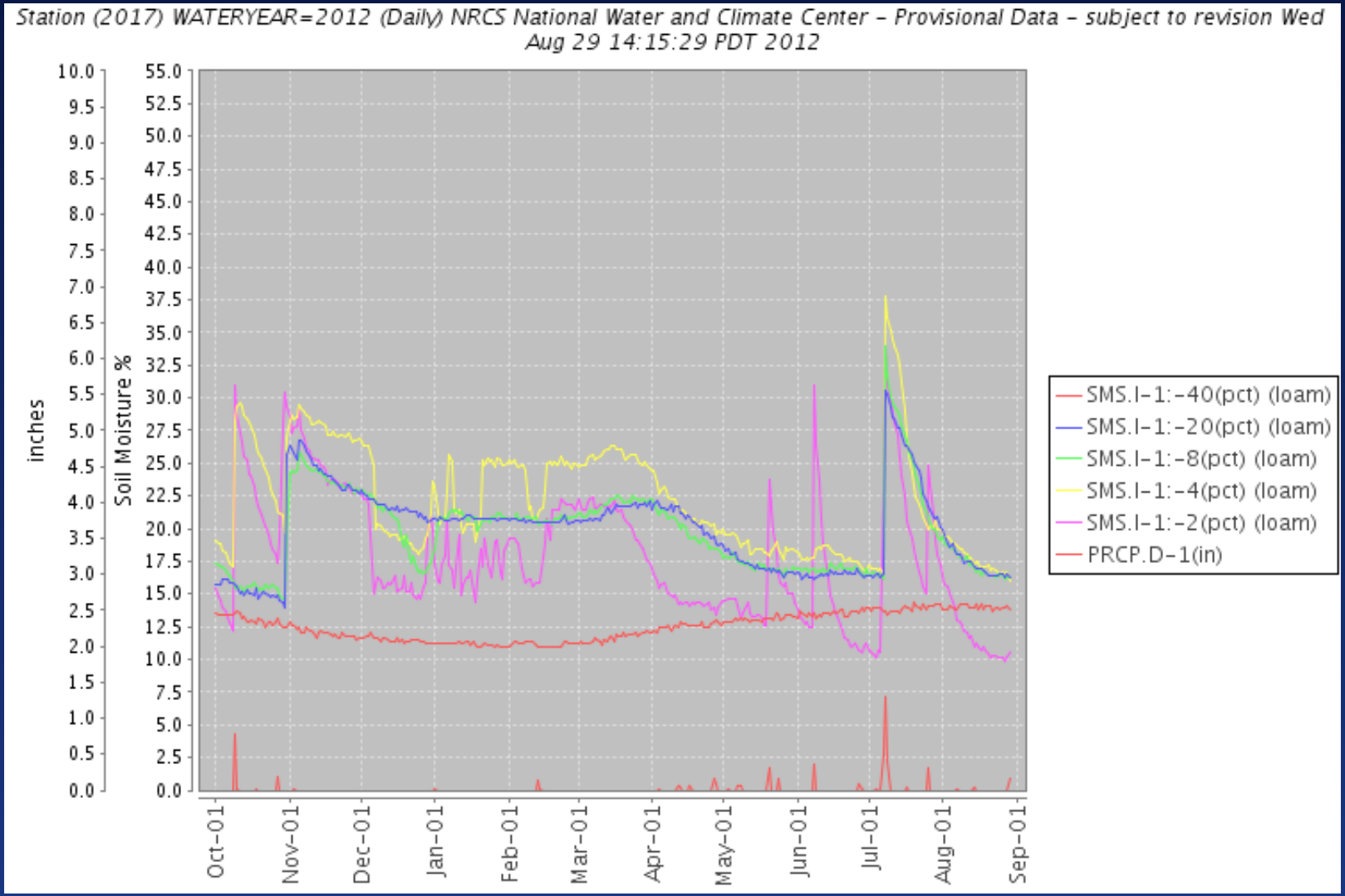


SCAN Data Plot



Colorado SCAN Site NUNN

Drought

- NIDIS workshops
- NIDIS Soil Moisture Monitoring workgroup
- Development of a National Soil Moisture Network – Serve as Lead. Developing a real-time map product of soil moisture from in situ, remote sensing and modeling data from various sources. Combined organizational effort of federal, state, university, private sector and citizen science groups and agencies

Future Directions

- ✓ Further automating of manual snow courses to SNOTEL sites where real-time information is needed to provide water supply forecasts.
- ✓ Expansion of SCAN to provide governments, water managers, agricultural producers, businesses and researchers improved information about soil moisture conditions and potential droughts.
- ✓ Improving models and computational capacity to provide more frequent and accurate water supply forecasts and assessments of soil moisture.
- ✓ Development of simulation modeling capabilities to compliment statistical modeling efforts

More Information

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