Oregon Water Resources Committee Meeting
June 18, 2015

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NRCS Natural Resources Conservation Service

Brief History - Snow Survey Measurement and Water Supply Forecasting in the West

- Snow has been measured and data disseminated in the Western United States for over 100 years, beginning with Dr. James Church in Lake Tahoe Region in 1906-1910.
- Snow surveys were initiated with the concept that streamflow could be forecast using snow data as a primary input. Cooperative snow survey programs were established in:
  - California 1917
  - Nevada, Wyoming 1919
  - Washington 1920
  - Montana 1922
  - Utah 1923
  - Oregon 1928
- These programs were administered by cooperators, such as State Engineers, Irrigation Districts, Power and Utility Companies, Universities

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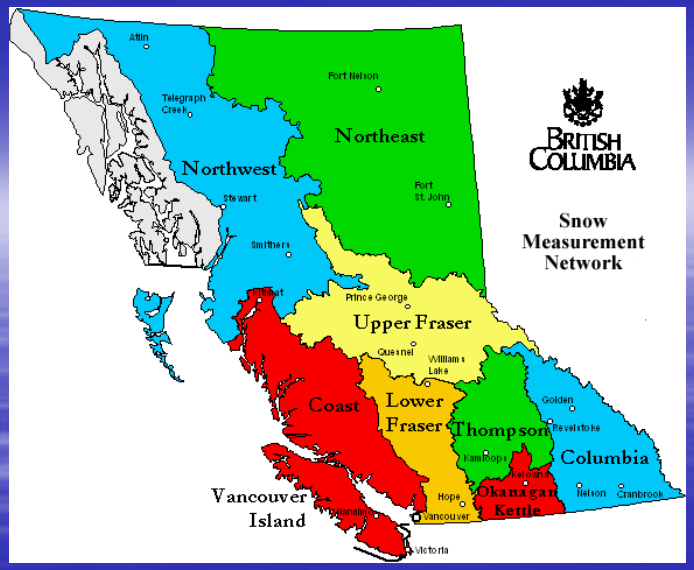
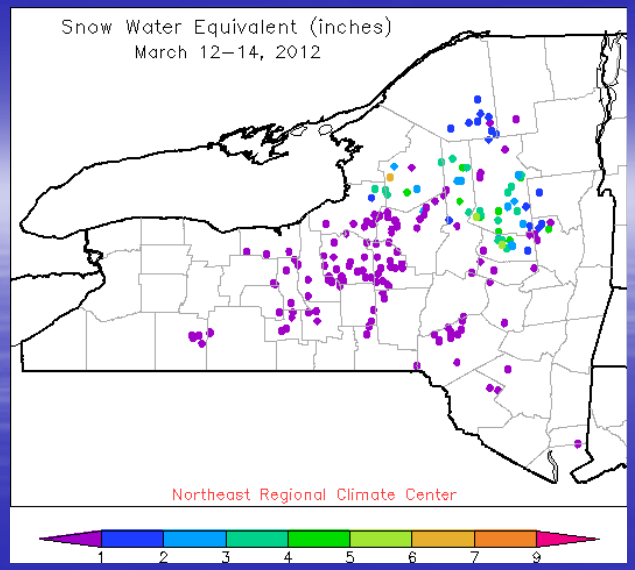
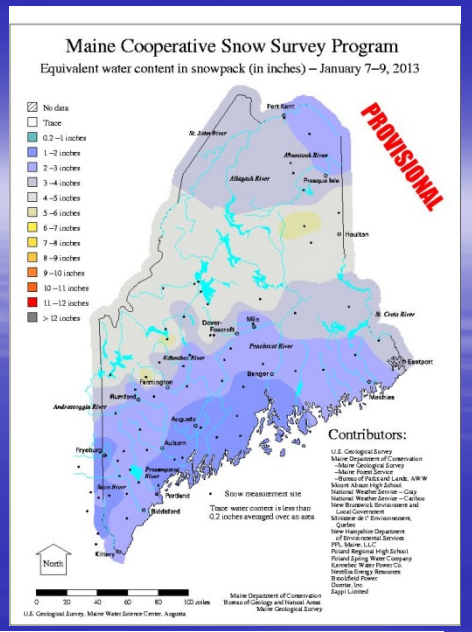
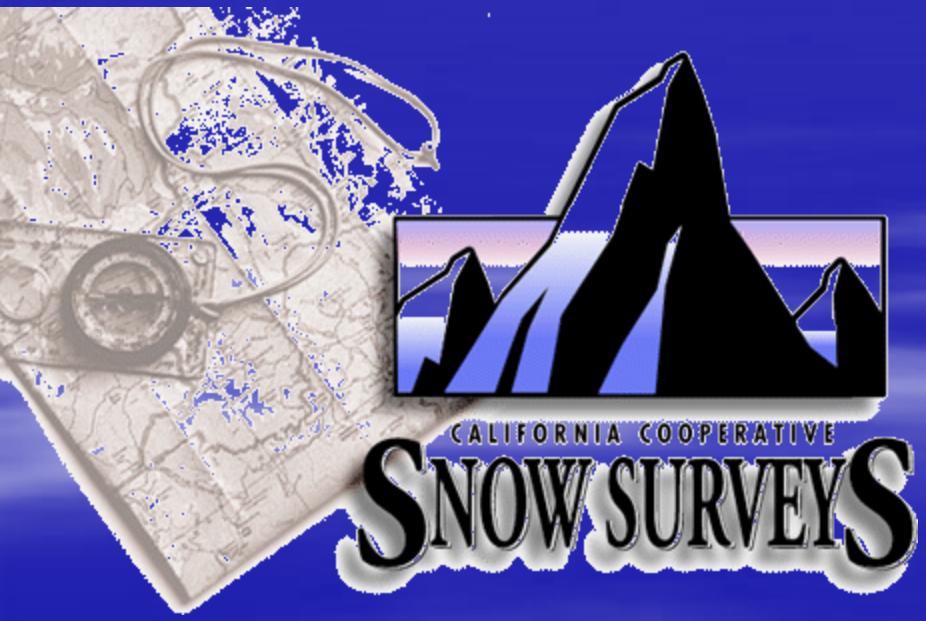
Brief History - Snow Survey Measurement and Water Supply Forecasting in the West
(continued)

- In 1935 cooperatives were brought under federal coordination after the 1934 drought. Among the agencies considered to administer the new program were the Weather Bureau (then a part of USDA) and the Forest Service.
- The program was merged into the Bureau Of Agricultural Engineering (USBAE). In 1939 USBAE was transferred to Soil Conservation Service, (SCS) Research Division.
- In 1953, the SCS Research Division was transferred to Agricultural Research Service (ARS), however the Snow Survey program remained an SCS program.
- In 1994, SCS became the Natural Resources Conservation Service (NRCS), snow surveys remains a program within the agency





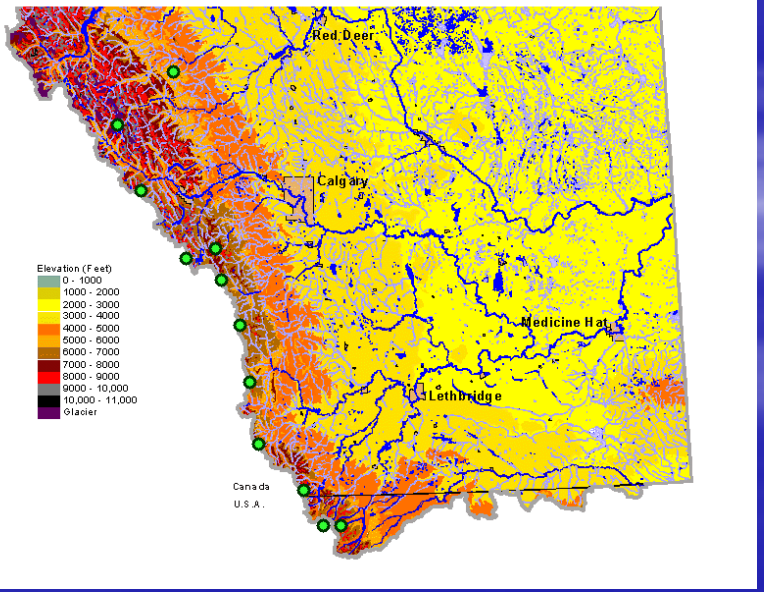




South Saskatchewan River Basin

Oldman River Sub Basin

Snow Data



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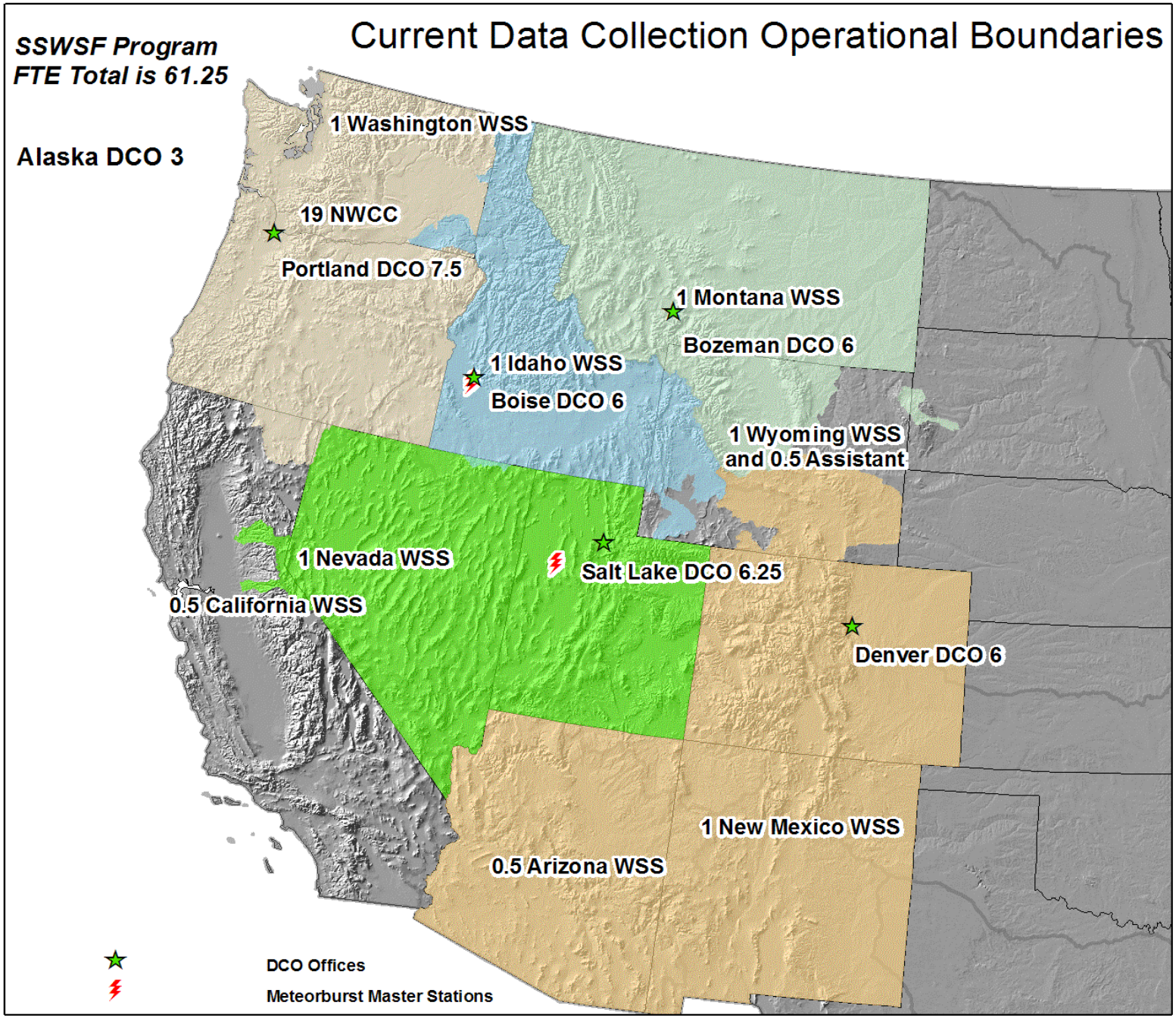
Current Data Collection Operational Boundaries

SSWSF Program
FTE Total is 61.25



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Data Collection Office Duties

- **Snow Courses:**
  Site maintenance, data collection, quality control and archival
- **SNOTEL Sites:**
  Site maintenance/repair, data collection, quality control and archival
- **Snow and water supply data analysis, interpretation, and dissemination:**

  Develop and release state water supply outlook reports

  Handle media contacts and issue news releases

  Work with state and federal entities in assessing/mitigating flood and drought conditions

2015 Oregon NRCS Snow Survey Staffing

Scott Oviatt
Snow Survey Supervisory Hydrologist

Bill Overman
Lead Hydrologic Technician

Melissa Webb
Hydrologist
Assistant DCO Supervisor

Julie Koeberle
Hydrologist

Amy Burke
Hydrologist

Bruce Green
Management Analyst

Dan Fries
Hydrologic Technician

Joe Akers
Permanent Seasonal Hydrologic Technician

VACANT
Hydrologist

Scott Pattee
Washington Water Supply Specialist

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NRCS Oregon Data Collection Office
Snow Survey and SNOTEL Data Collection Network

- **156 Automated SNOwpack TELemetry (SNOTEL) Sites**

  Automated Telemetered Measurements:
  - Snow Water Equivalent (SWE)
  - Precipitation (Rain and Frozen)
  - Air Temperature (Max, Min, Current, Average)
  - Snow Depth
  - Wind Speed and Direction*
  - Relative Humidity*
  - Solar Radiation*
  - Soil Moisture and Soil Temperature*

  *Parameters measured at select sites

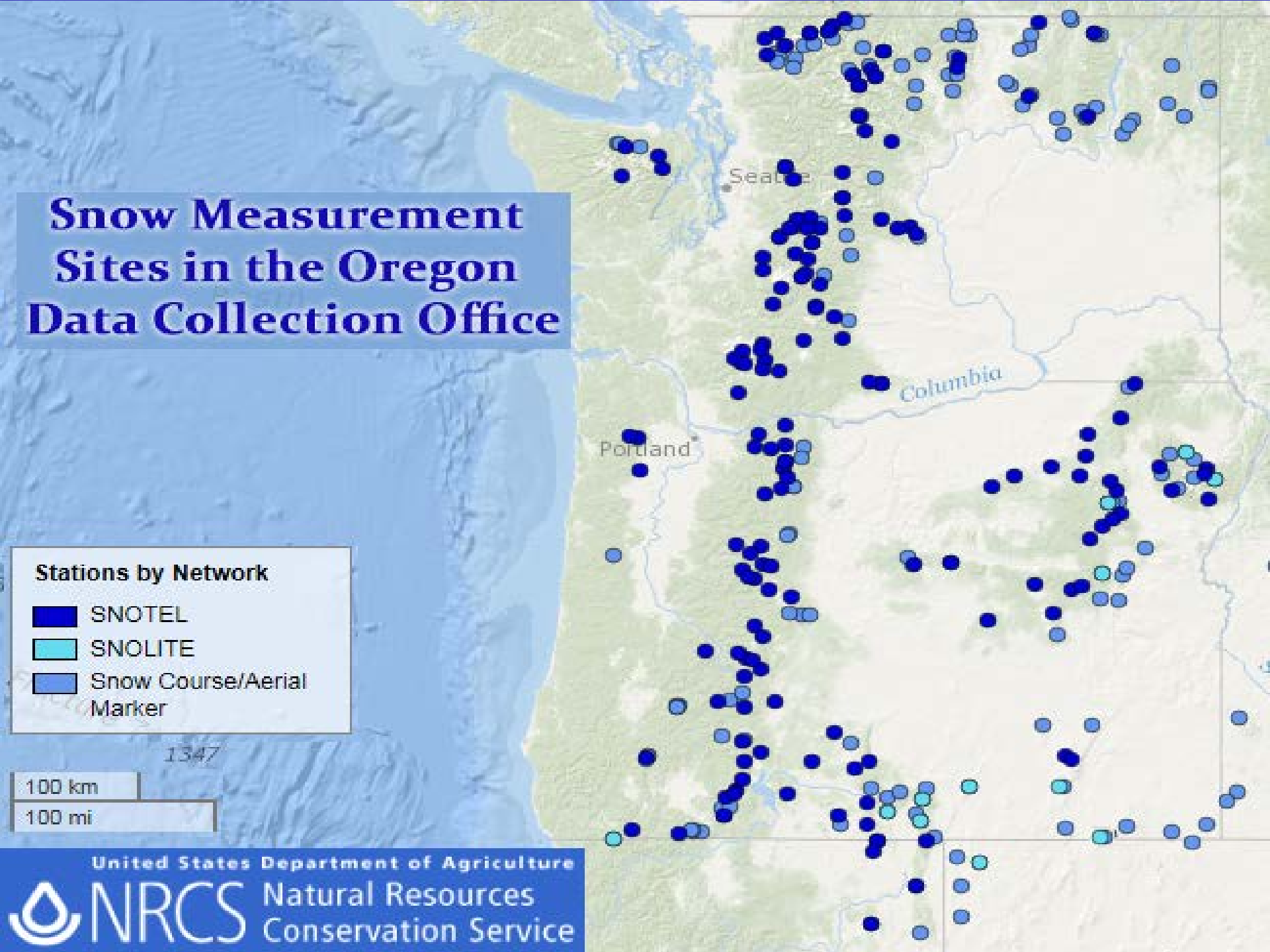
- **12 SNOLITE (Automated Aerial Marker) Sites**

  Automated Telemetered Measurements:
  - Snow Water Equivalent (SWE)
  - Air Temperature (Max, Min, Current, Average)
  - Snow Depth

- **155 Snow Courses & Aerial Markers**

  Manual Monthly Measurements:
  - Snow Water Equivalent (SWE)
  - Snow Depth

Snow Measurement Sites in the Oregon Data Collection Office



United States Department of Agriculture
NRCS Natural Resources Conservation Service

Manual Snow Course

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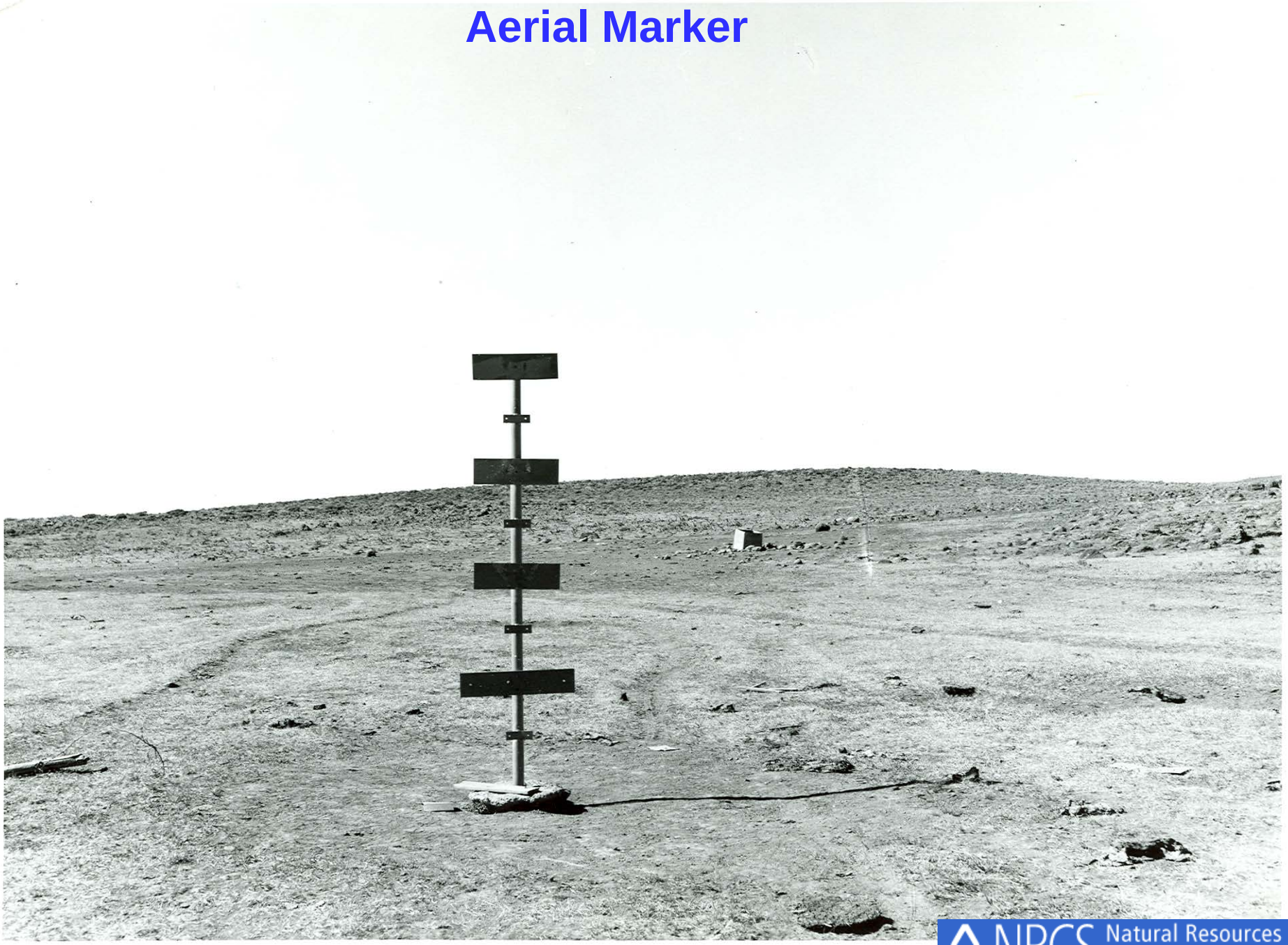
Aerial Marker



SNOLITE Site

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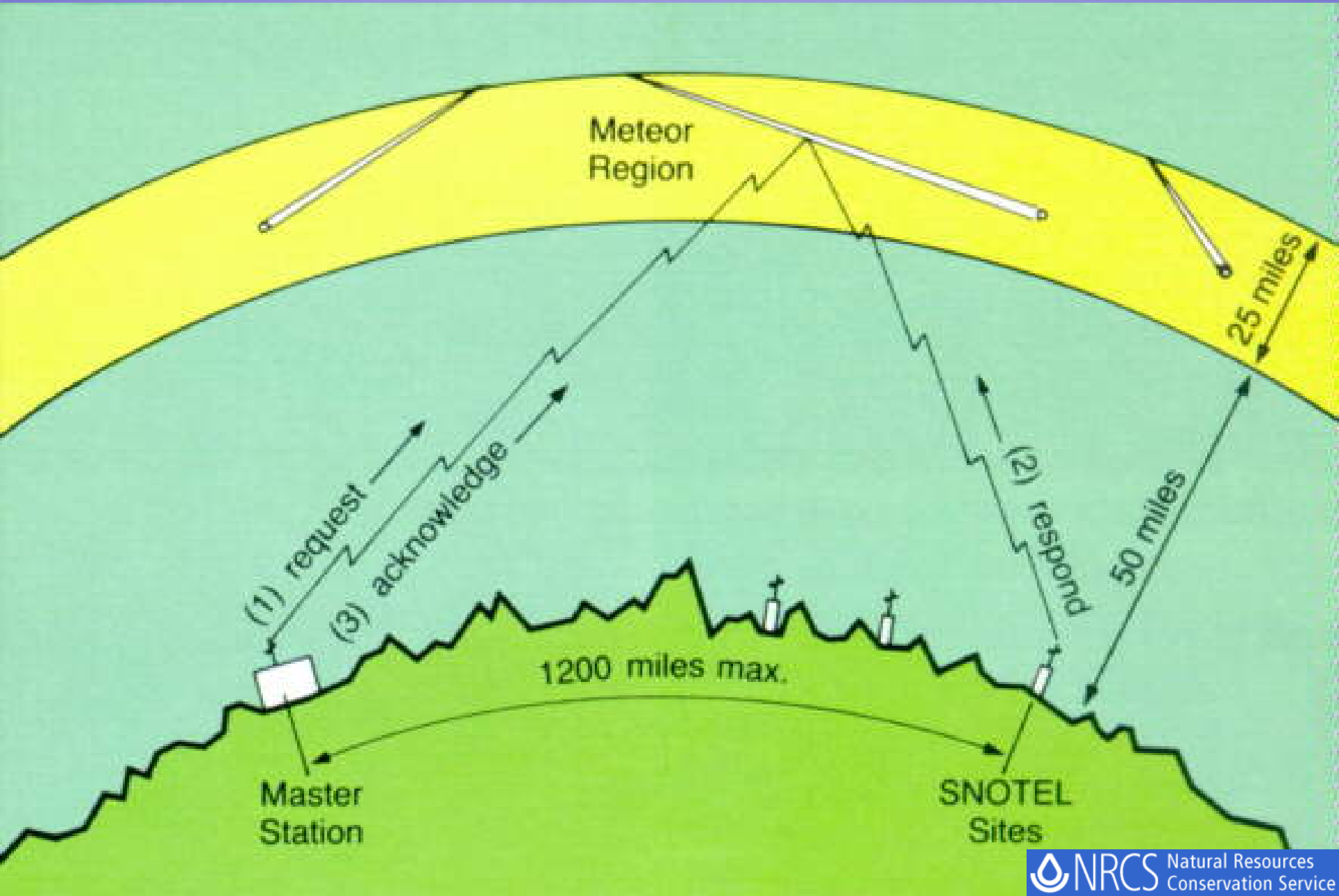
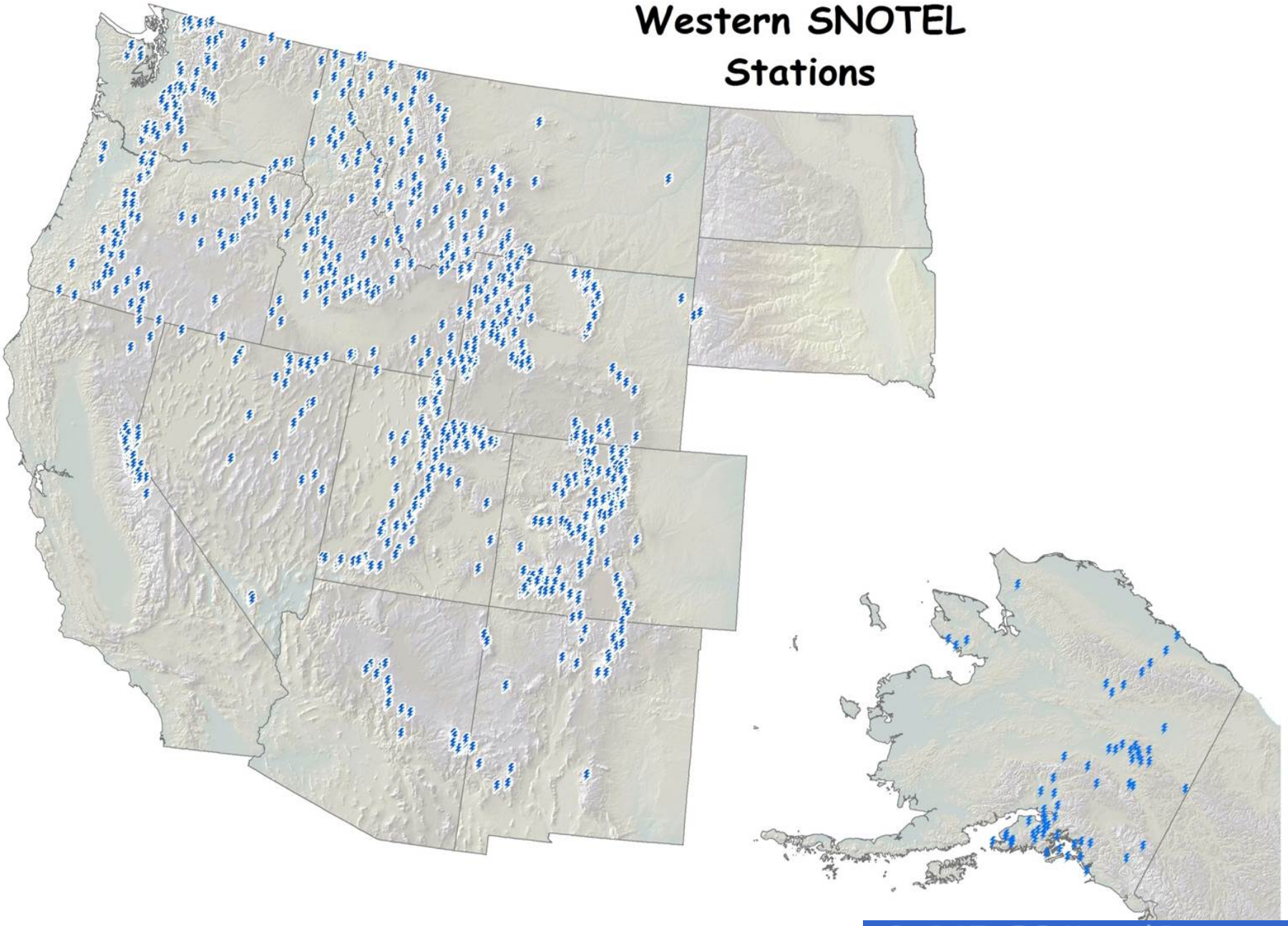
SNOTEL COMMUNICATION USING METEOR BURST TECHNOLOGY



Western SNOTEL Stations



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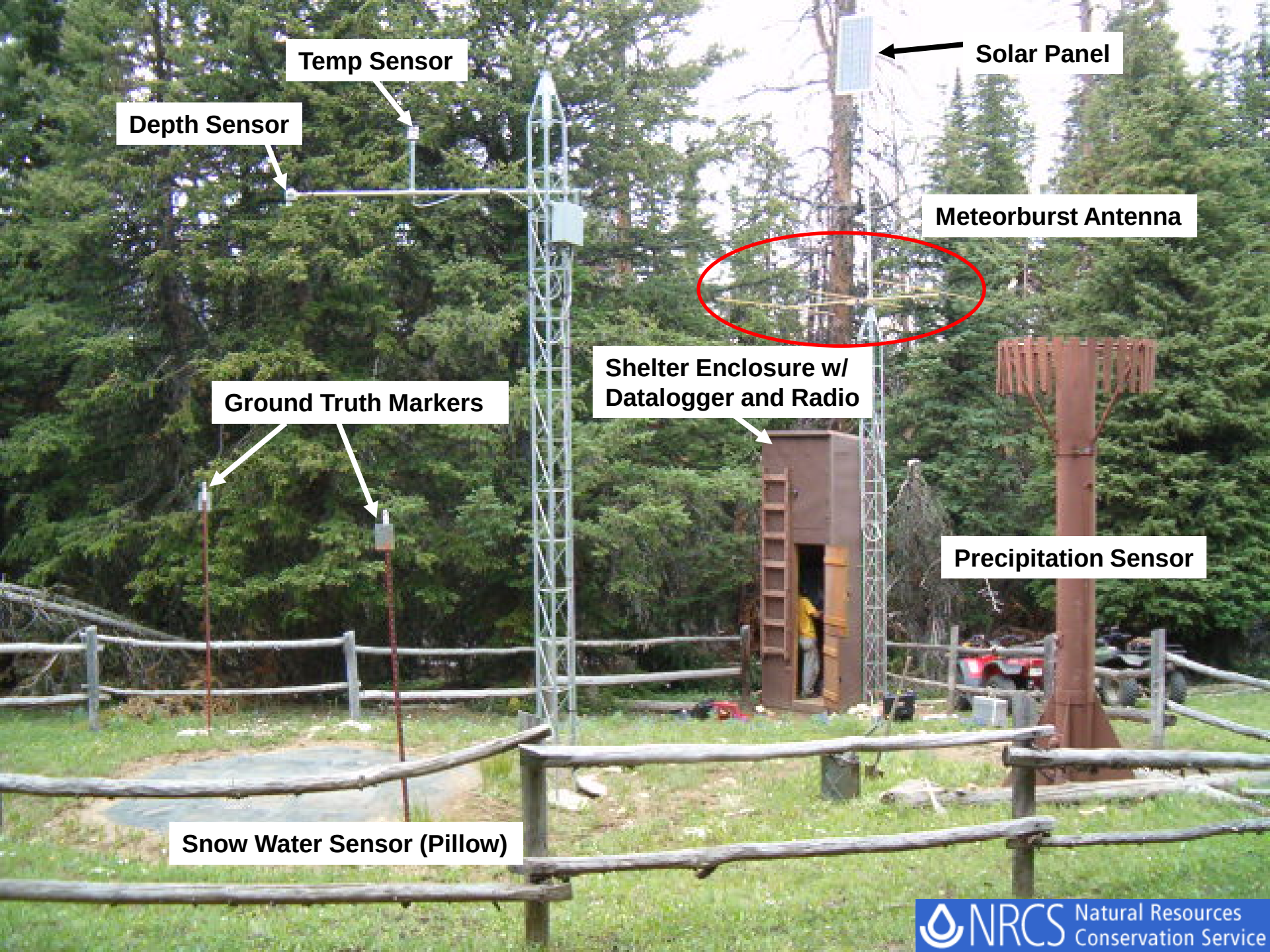

Temp Sensor
Depth Sensor
Solar Panel
Meteorburst Antenna
Shelter Enclosure w/
Datalogger and Radio
Ground Truth Markers
Precipitation Sensor
Snow Water Sensor (Pillow)
NRCS Natural Resources
Conservation Service

MEASURED PARAMETERS

SNOW WATER EQUIVALENT (SWE) – Daily Values from Snow Pillows and Manual Measurements (SNOTEL and SNOW COURSE)

SNOW DEPTH – Daily Values from Snow Depth Sensors and Manual Measurements (SNOTEL, SNOW COURSE and AERIAL MARKERS)

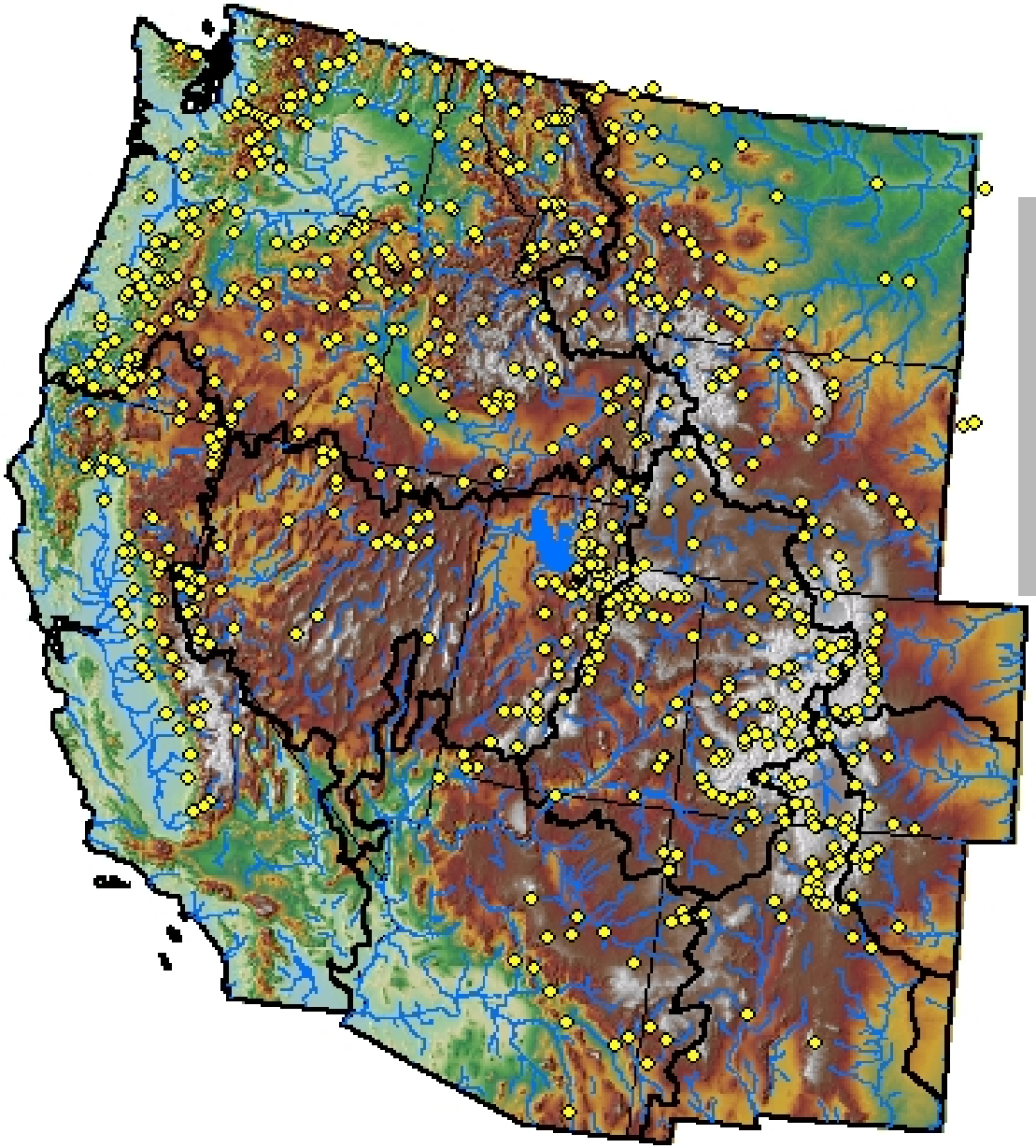
PRECIPITATION – Daily Totals and Accumulated Through Water Year (SNOTEL)

AIR TEMPERATURE – Daily Average, Maximum and Minimum (SNOTEL)

ADDITIONAL PARAMETERS and COOPERATOR REQUESTS

Soil Water Content and Temperature, Relative Humidity, Wind Speed, Wind Direction, Solar Radiation, and others.

NRCS Forecast Points



OVER 10,000 NRCS Forecasts Issued Westwide in Water Year 2014

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USERS and USES of NRCS Data, Forecasts, Products, and Reports

Federal Agencies

- USGS
- USFS
- Other USDA
- USACE
- USBR
- National Weather Service
- NWS - River Forecast Centers
- NOAA
- NASA
- NPS

State and Local Groups

- OWRD
- ODF
- ODFW
- Local Water Managers
- Irrigation Districts and Companies
- Municipalities
- State Water Availability Committee
- Governor's Drought Task Force
- Power Companies
- University Researchers
- Avalanche Centers
- Producers and Ranchers
- Recreationists and Tourism Groups

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SYNOPSIS of 2015 Water Year in Oregon

1. Lack of sustained Pacific storm impacts
2. Near-record warm temperatures
3. Lack of snowfall
4. Lack of snowpack development

Resulting in surface water shortages

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Oregon 2015 Peak Snowpack

Record Low Snowpack Year

- 60% of long-term snow monitoring sites in Oregon set new records for the lowest and earliest peak snowpack ever measured (>30 yrs of record)

- Due to warm mountain temperatures, one third of snow monitoring sites did not receive enough snow to build a lasting snowpack this winter (i.e. they were primarily snow-free throughout the winter months)

- Snowpack peaked much earlier and lower than normal across the state: 30% to 90% below typical peak levels and 1-3 months earlier than normal

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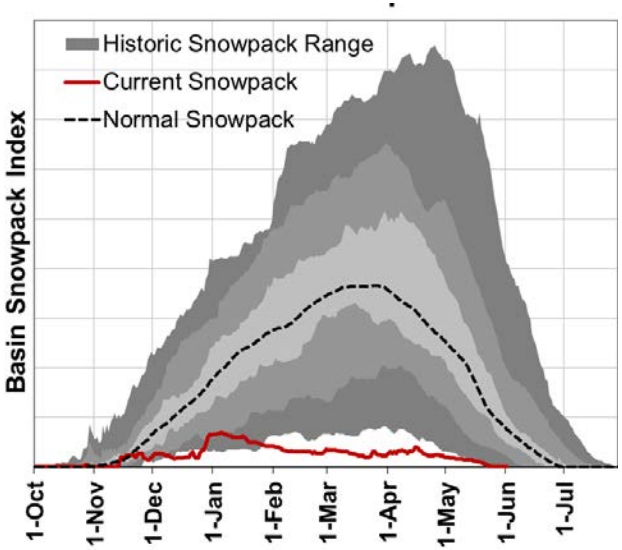
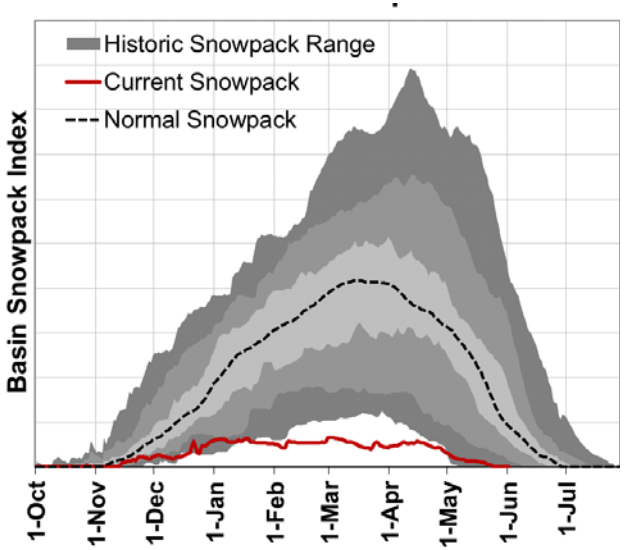
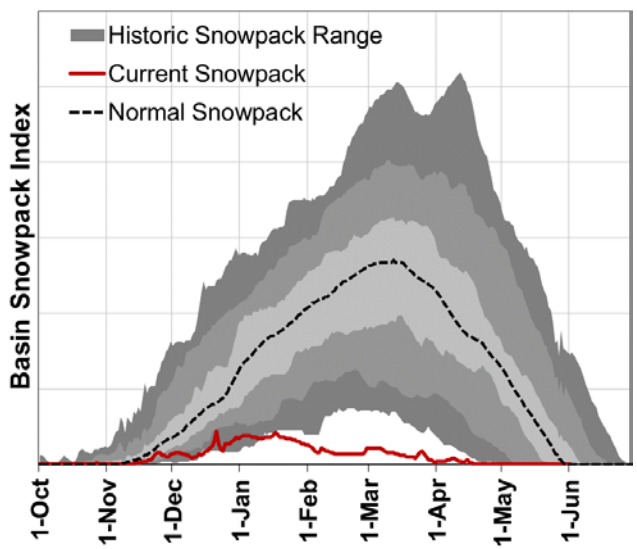
Willamette



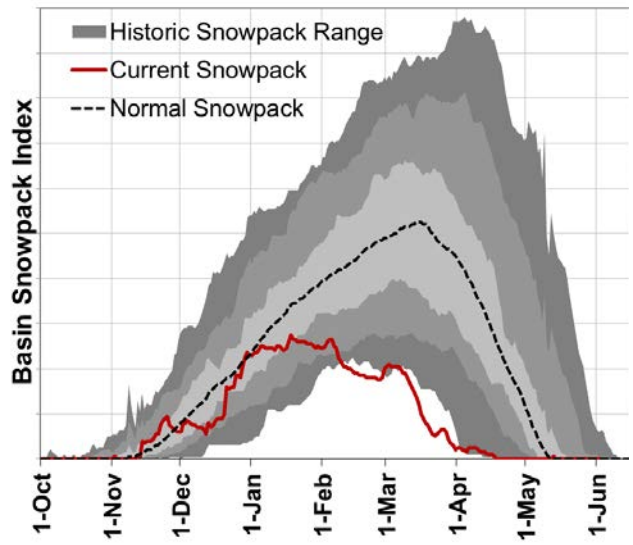
Rogue/Umpqua



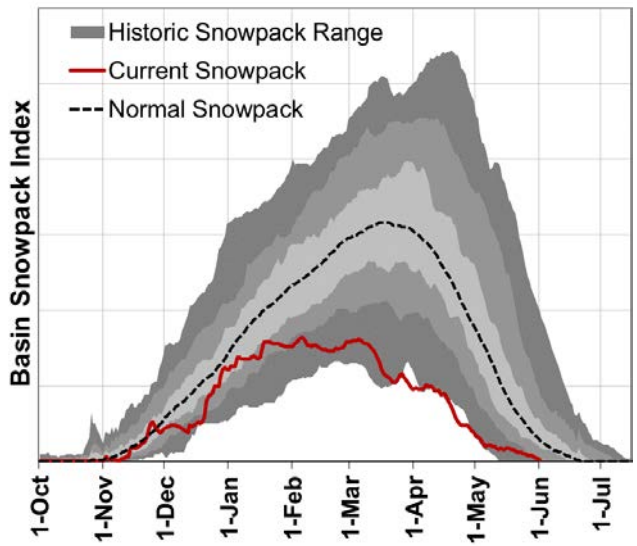
Klamath



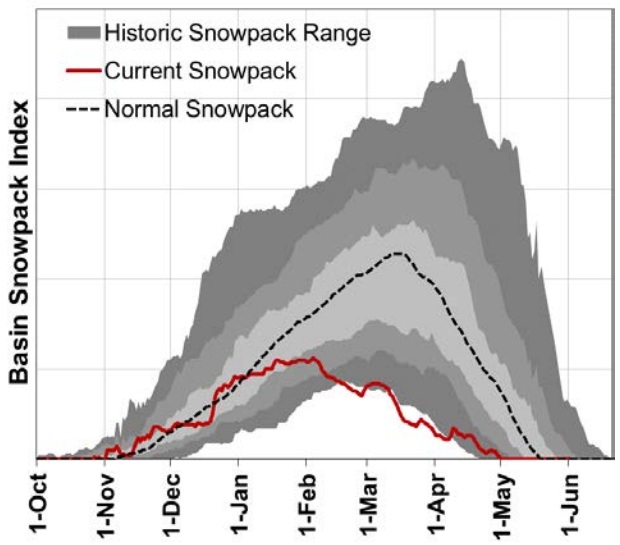
John Day



Grande Ronde/Powder/Burnt

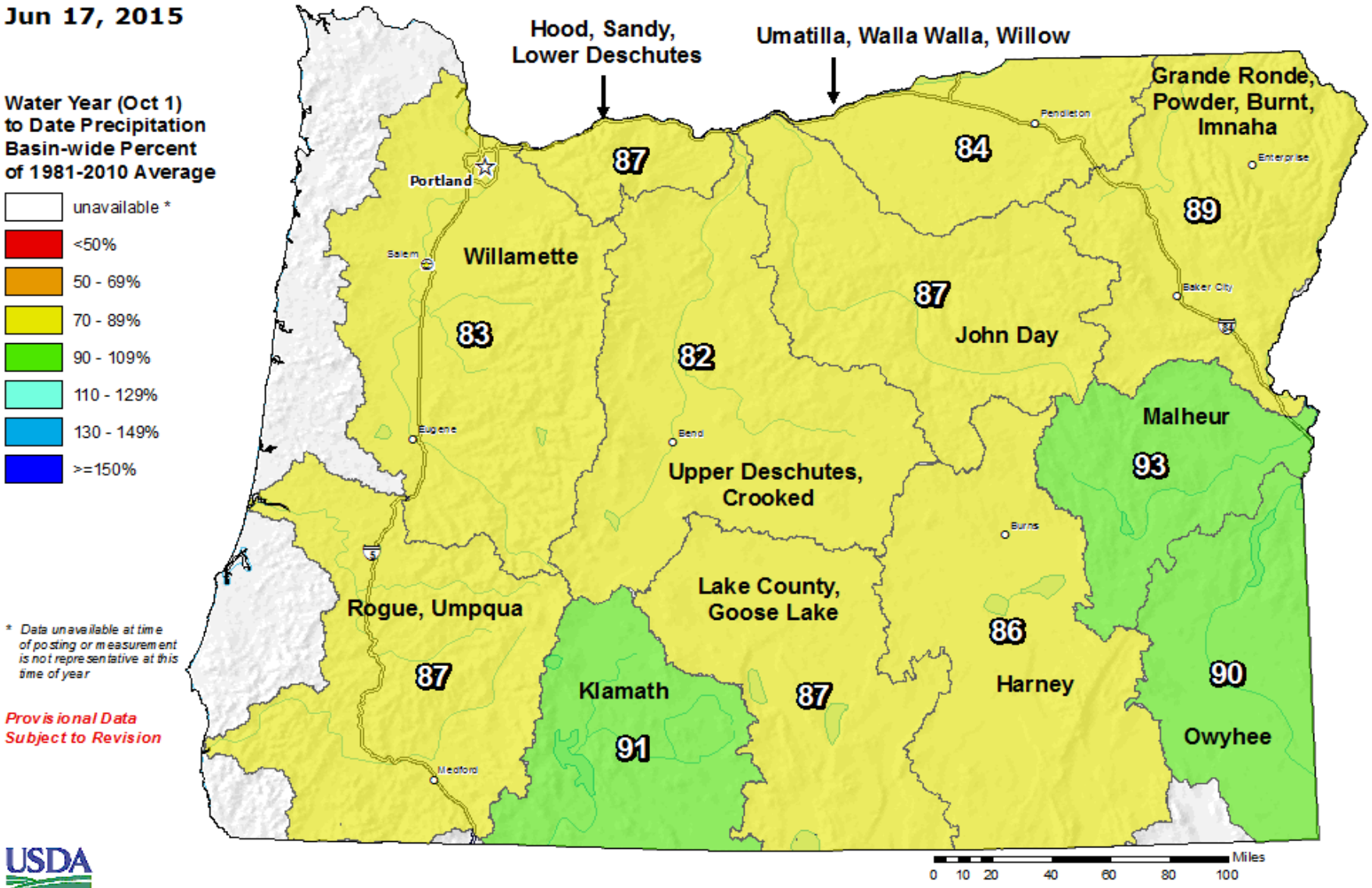


Owyhee/Malheur



Oregon SNOTEL Water Year (Oct 1) to Date Precipitation % of Normal

Jun 17, 2015



* *Data unavailable at time of posting or measurement is not representative at this time of year*

Provisional Data Subject to Revision

USDA NRCS

The water year to date precipitation percent of normal represents the accumulated precipitation 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
http://www.wcc.nrcs.usda.gov

Mountain Soil Moisture

Measured at 12 SNOTEL Sites across Oregon

- Mountain soil moisture was higher than normal this winter
  - Shallow snowpacks allowed precipitation to reach soil during times when it would normally be frozen/bound in snowpack

- As of June 1, soils are continuing drying process due to lack of snowpack melt-off and warm drier conditions. Most locations are exhibiting soil moisture conditions similar to typical July or August conditions)

- Soils will depend on rainfall to maintain moisture through the summer and leading into next fall (less likely scenario)

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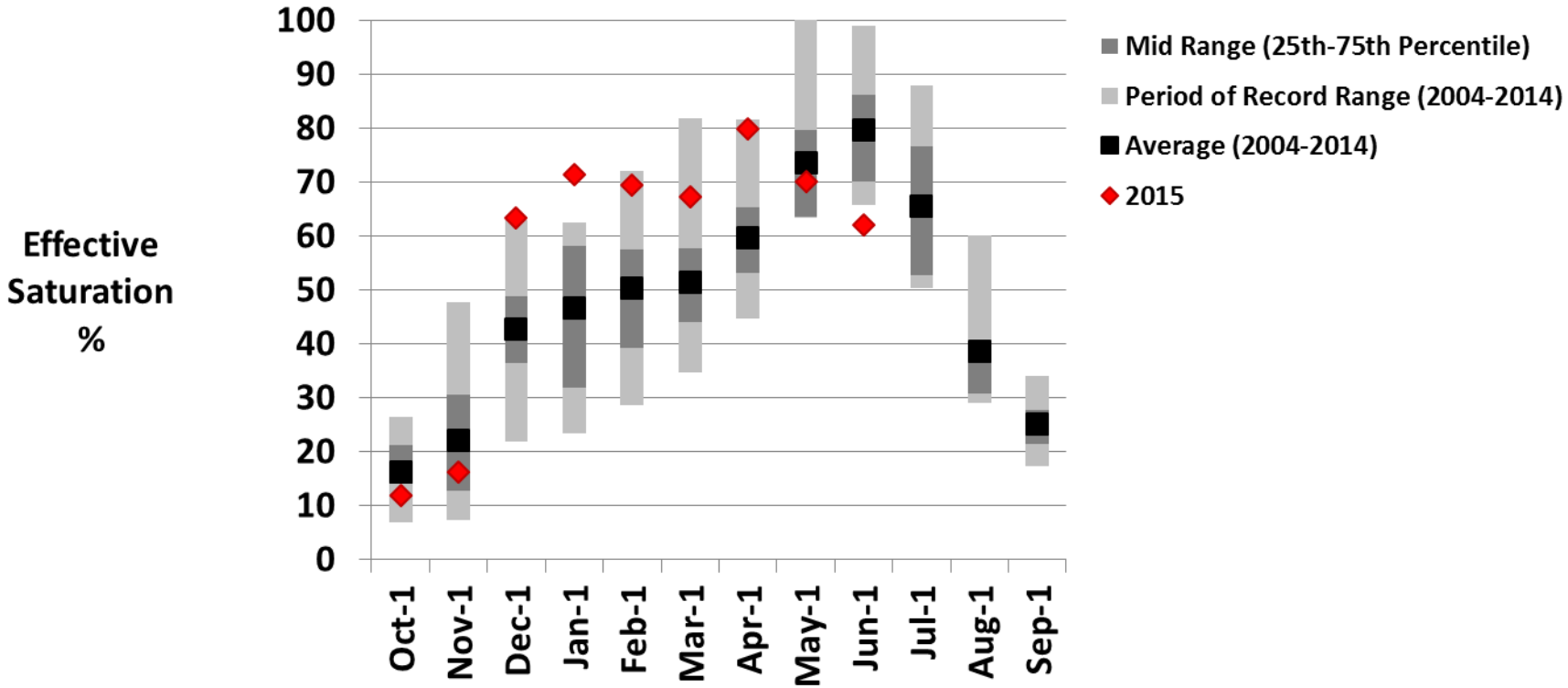
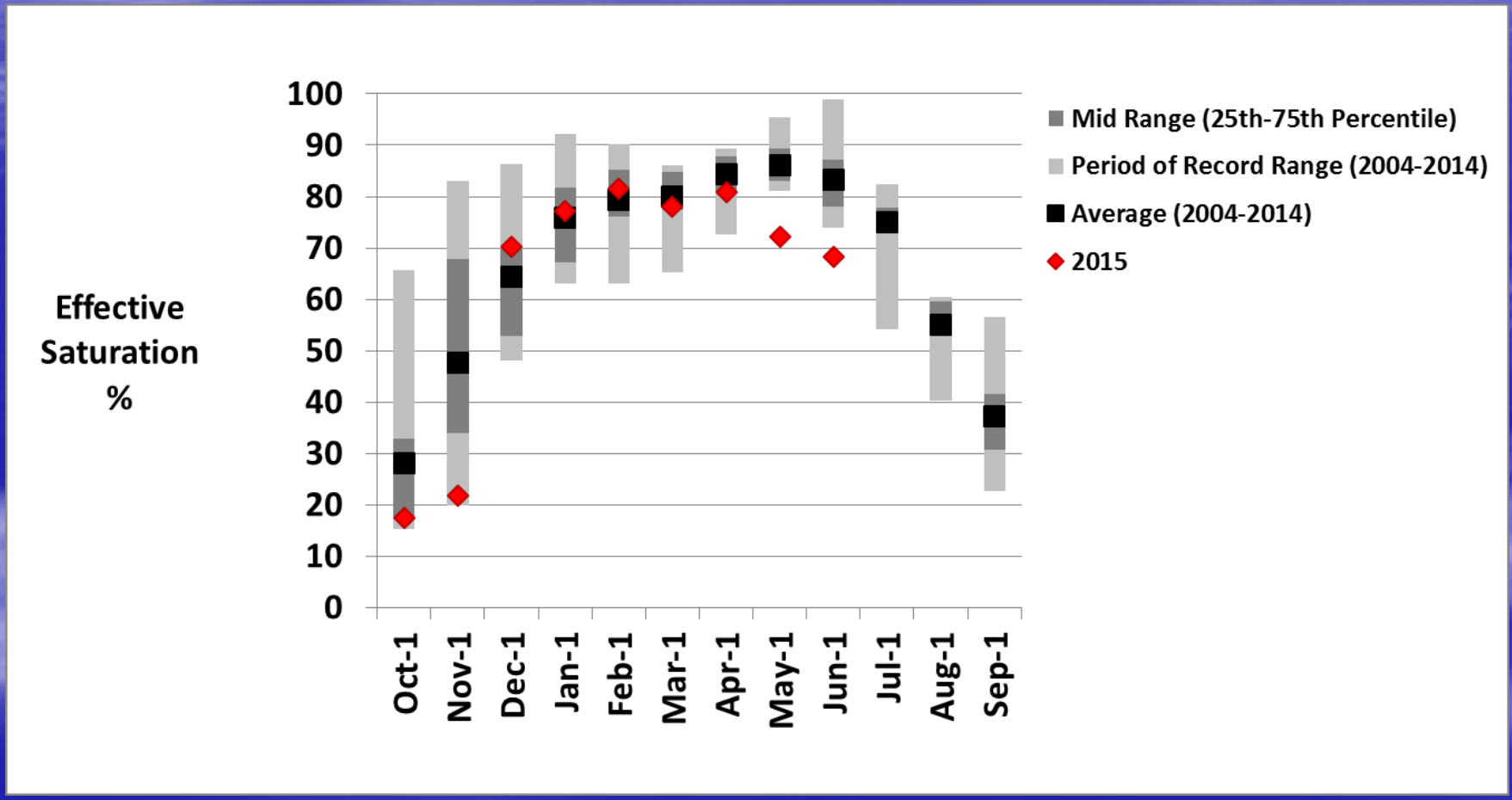
Annie Springs SNOTEL Soil Moisture

(Klamath Basin, 6010 ft)



High Ridge SNOTEL Soil Moisture

(Umatilla Basin, 4920 ft)



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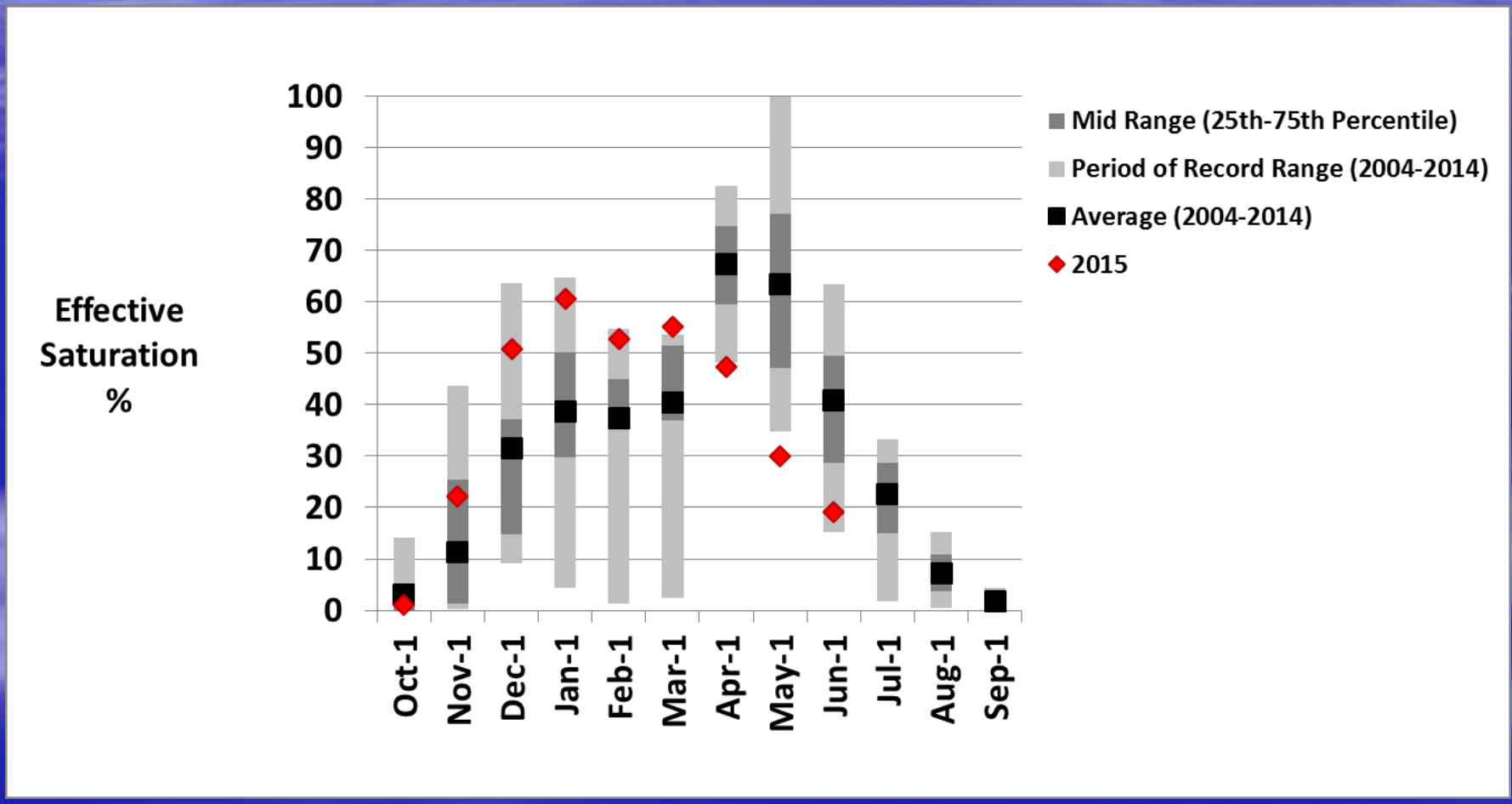
Chemult SNOTEL Soil Moisture

(Klamath Basin, 4920 ft)



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NRCS Streamflow Water Supply Forecasting

Streamflow volume forecasts are produced by analyzing statistical relationships between snowpack, precipitation (or a combination of the two), and the resultant summer/seasonal streamflow volumes observed at identified points or gaging stations

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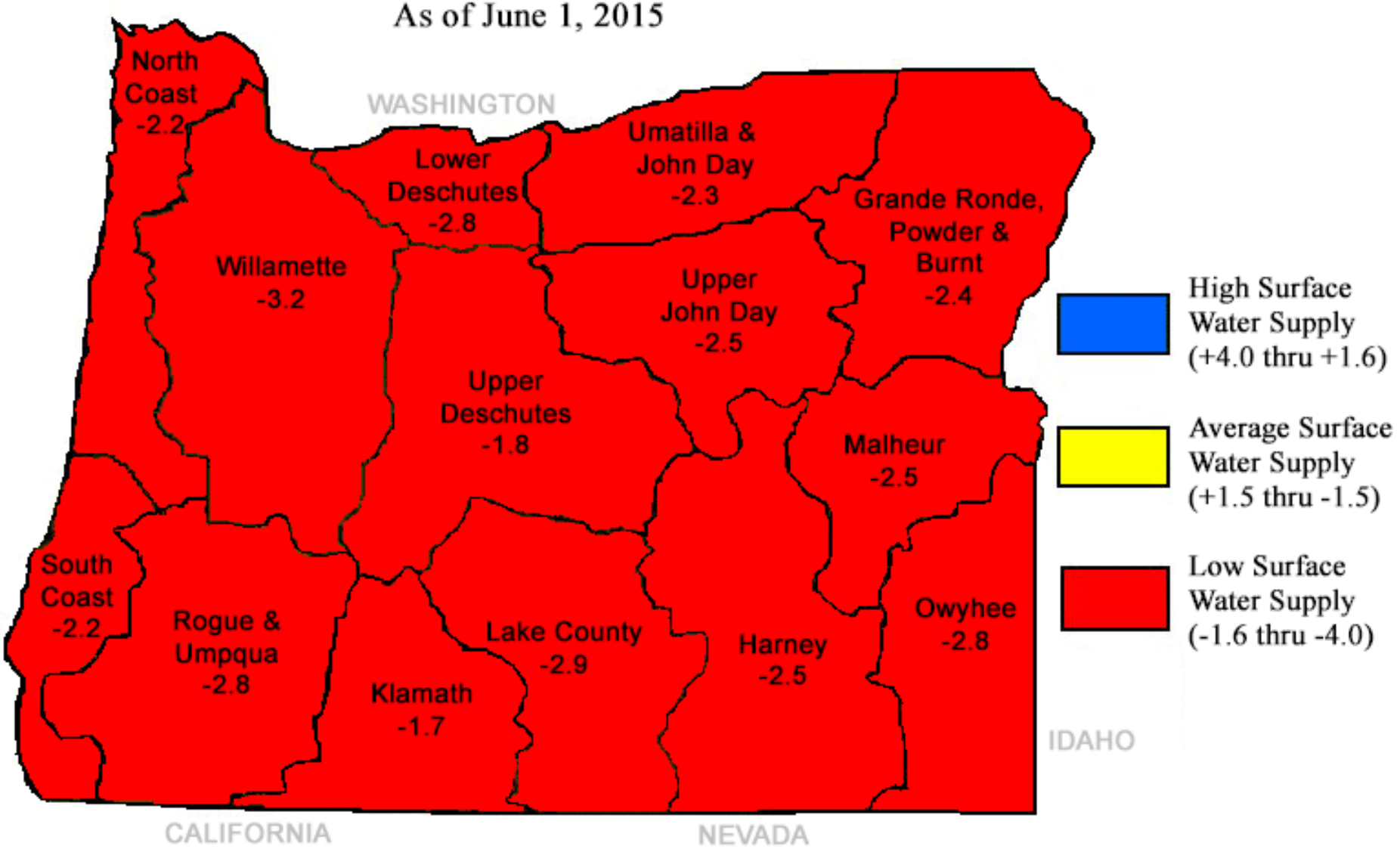
Summary of Forecasts for Water Year 2015

BASIN	AVERAGE FORECAST VALUES FOR EACH MONTH (50% Probability Exceedance Value)					
	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun
OWYHEE AND MALHEUR BASINS	101	52	32	27	24	40
GRANDE RONDE, POWDER, BURNT AND IMNAHA BASINS	104	84	79	51	43	36
UMATILLA, WALLA WALLA AND WILLOW BASINS	108	83	79	63	52	42
JOHN DAY BASIN	102	72	65	48	36	34
UPPER DESCHUTES AND CROOKED BASINS	98	72	63	44	33	27
HOOD, SANDY AND LOWER DESCHUTES BASINS	90	71	71	62	55	52
WILLAMETTE BASIN	95	81	81	76	59	60
ROGUE AND UMPQUA BASINS	88	74	76	64	41	41
KLAMATH BASIN	48	47	41	40	37	60
LAKE COUNTY AND GOOSE LAKE BASINS	79	53	45	33	14	20
HARNEY BASIN	84	56	42	28	20	21

OREGON SURFACE WATER SUPPLY INDEX (SWSI)
As of June 1, 2015



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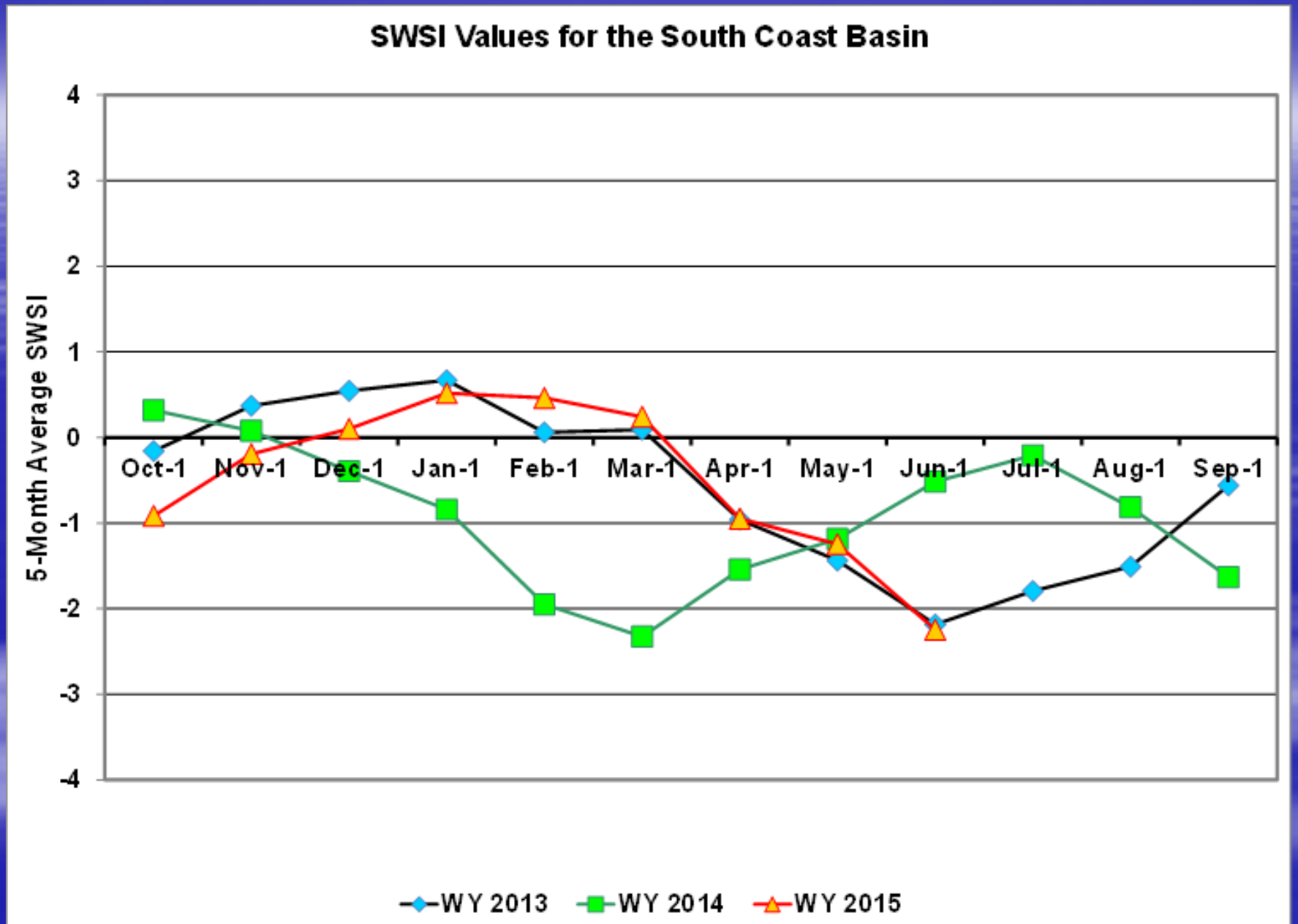

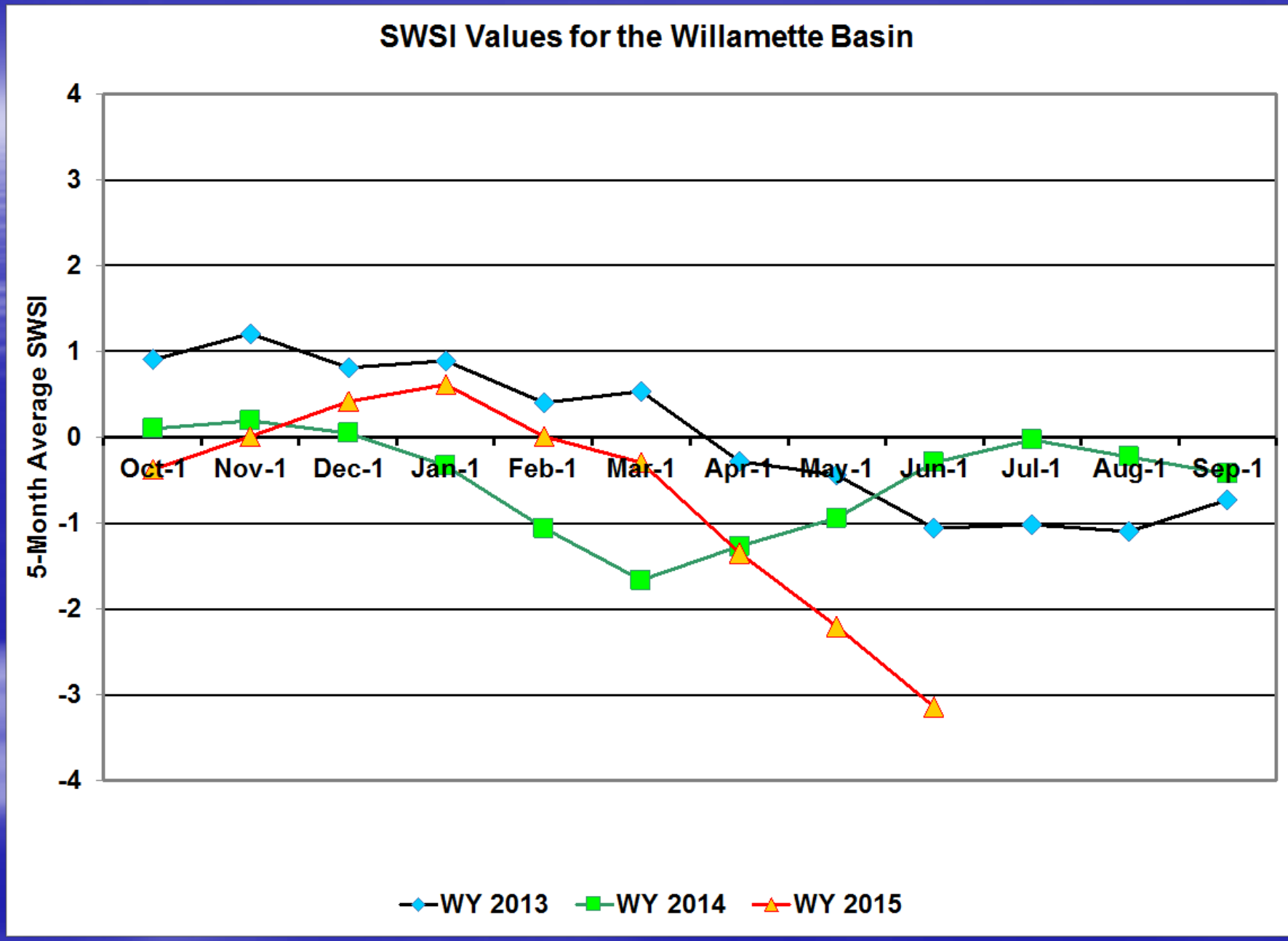

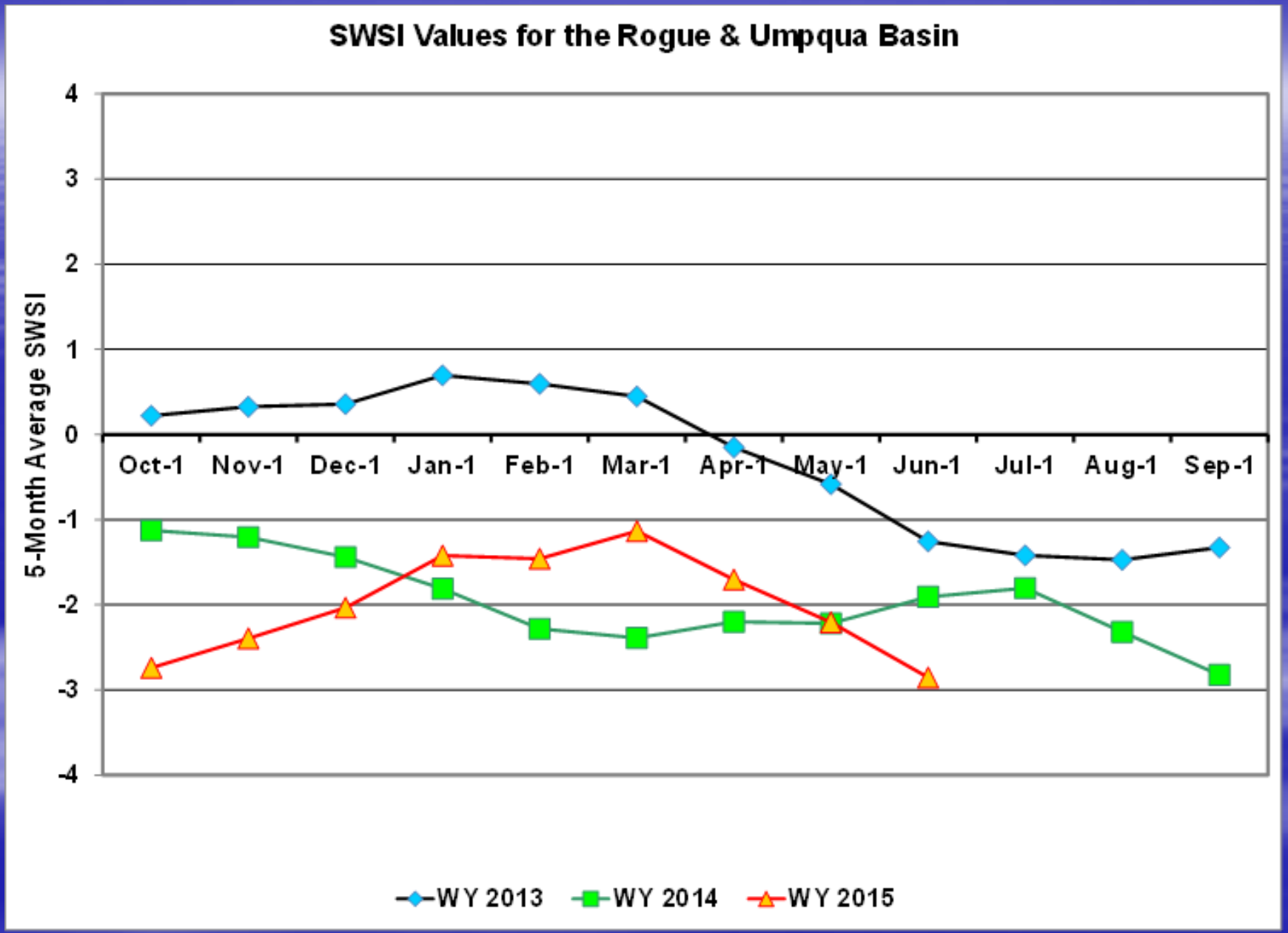

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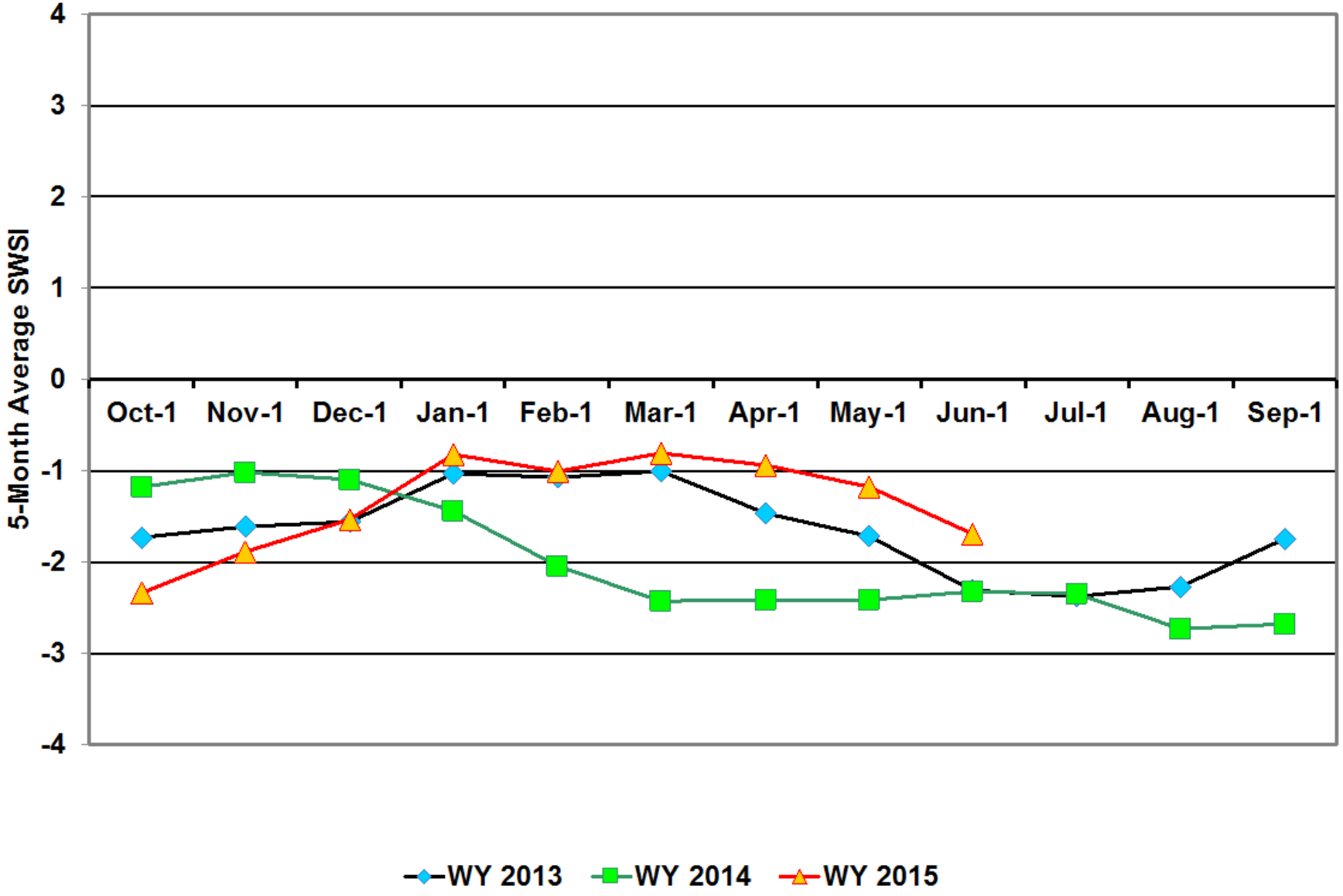
SWSI Values for the Klamath Basin



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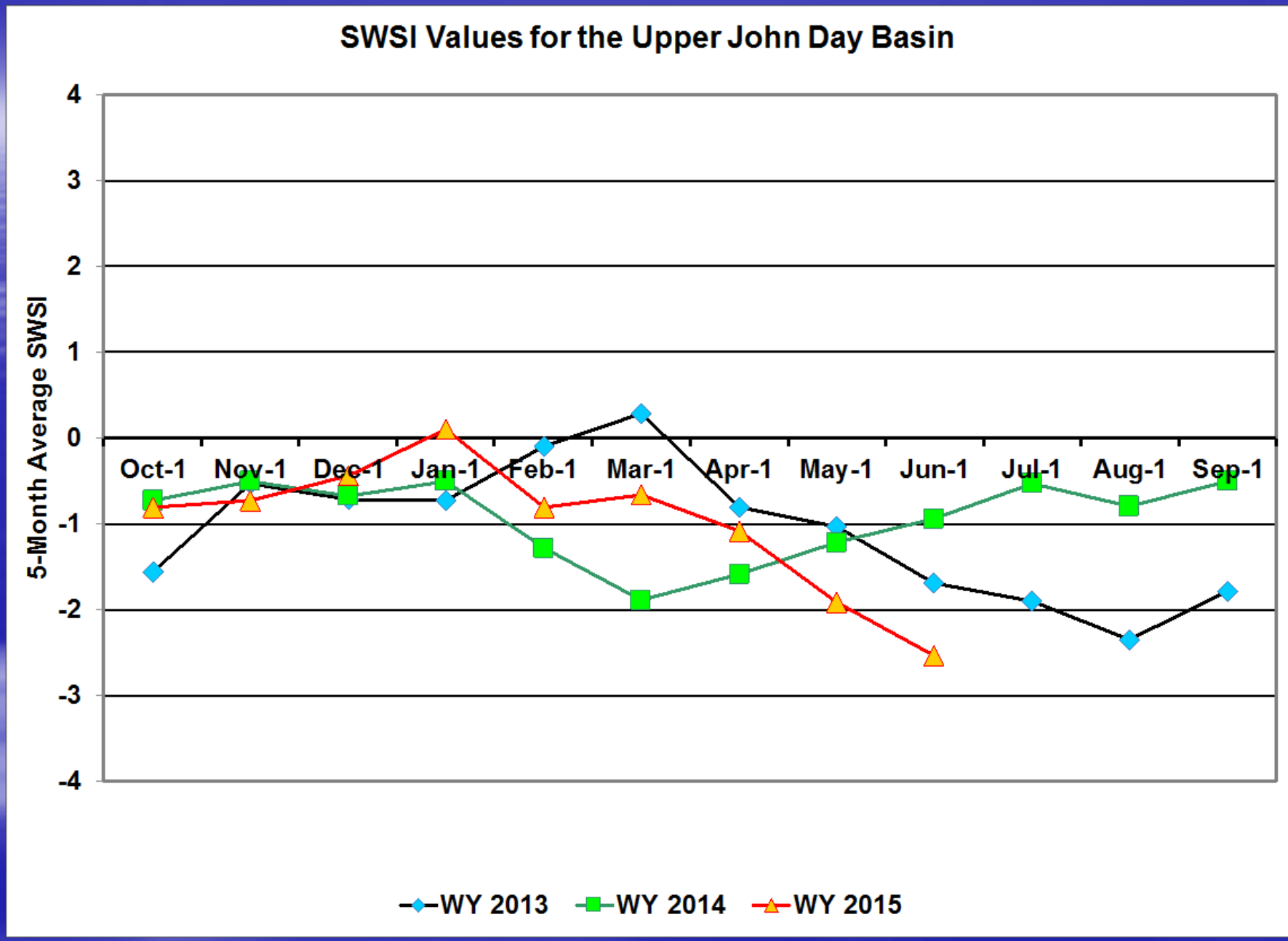

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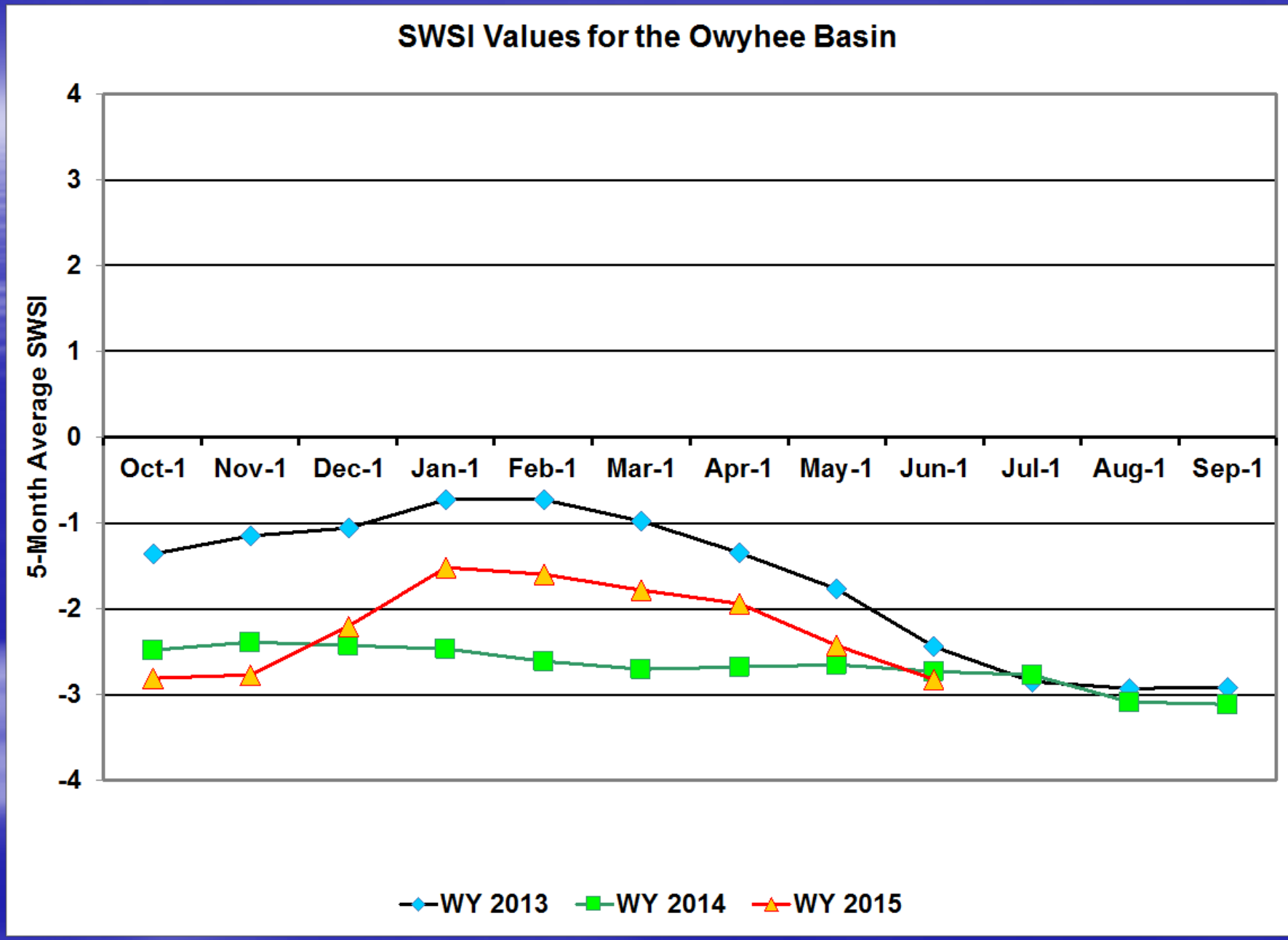
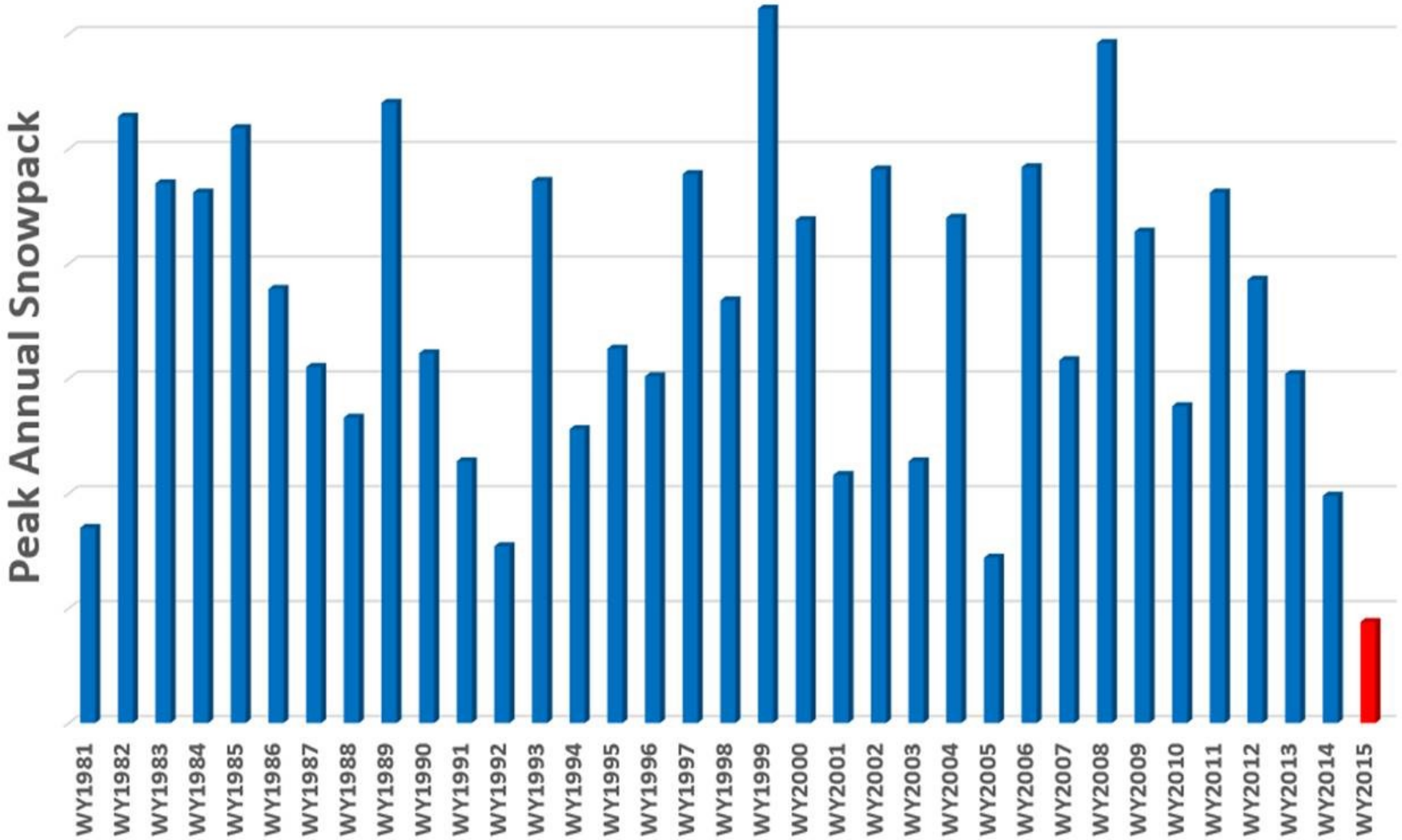


Oregon Snowpack Lowest on Record

2015 Water Year



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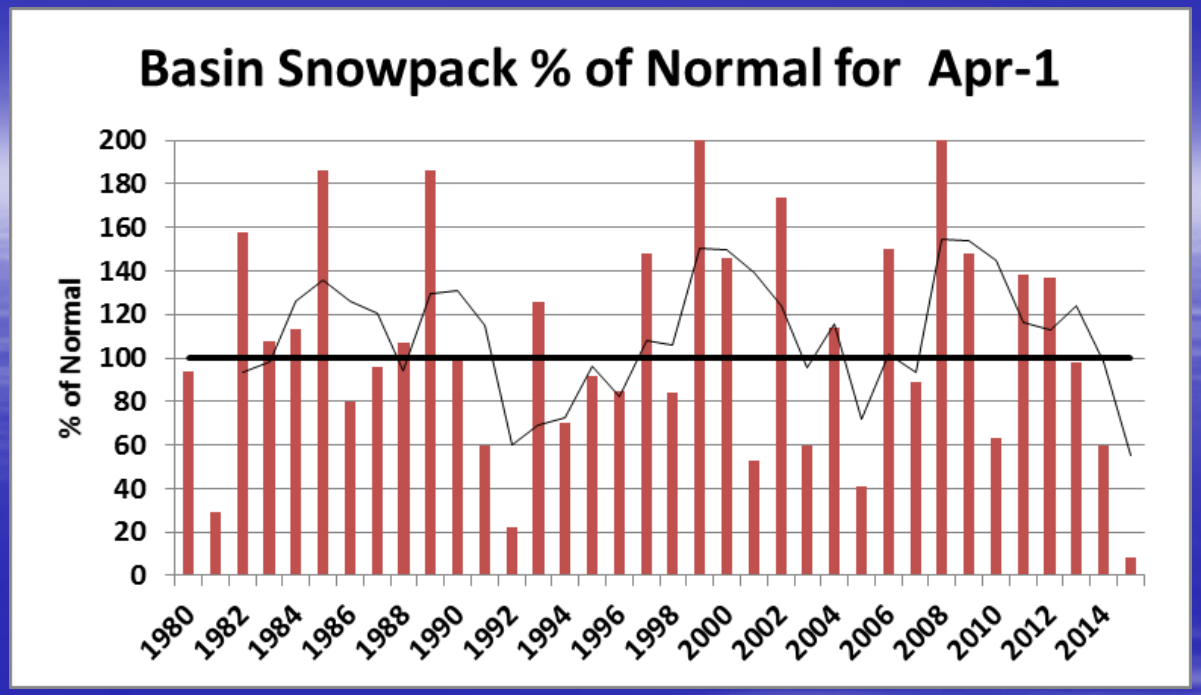
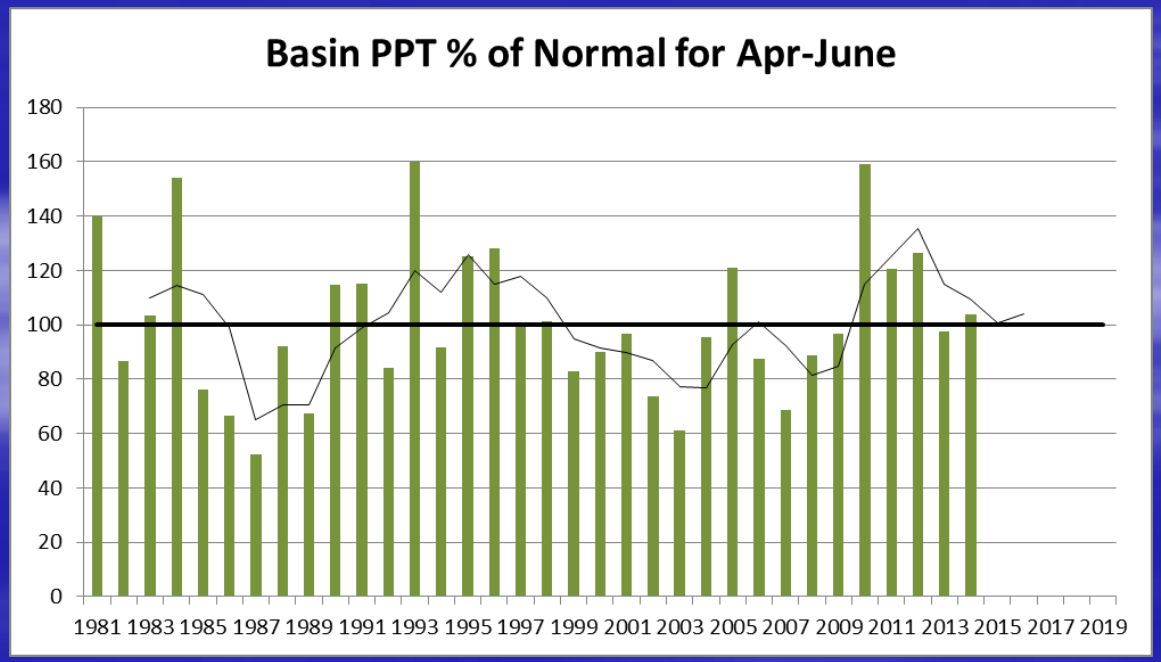
Willamette Snowpack and Precipitation Trends





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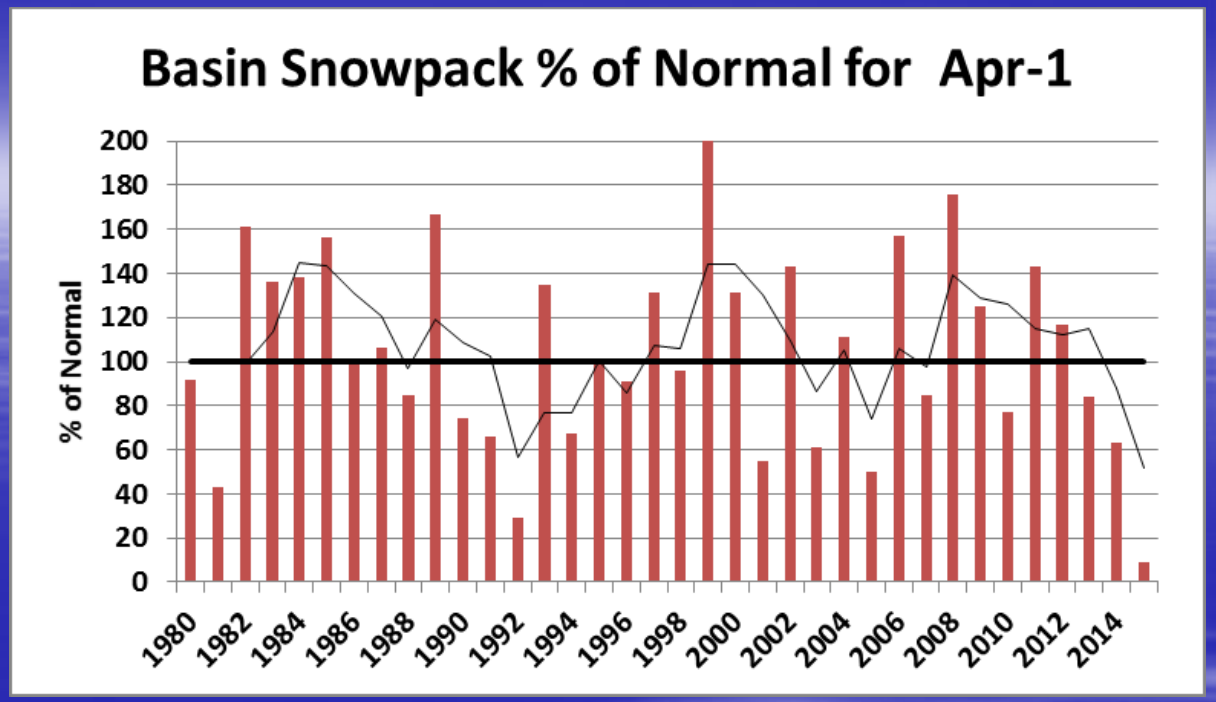
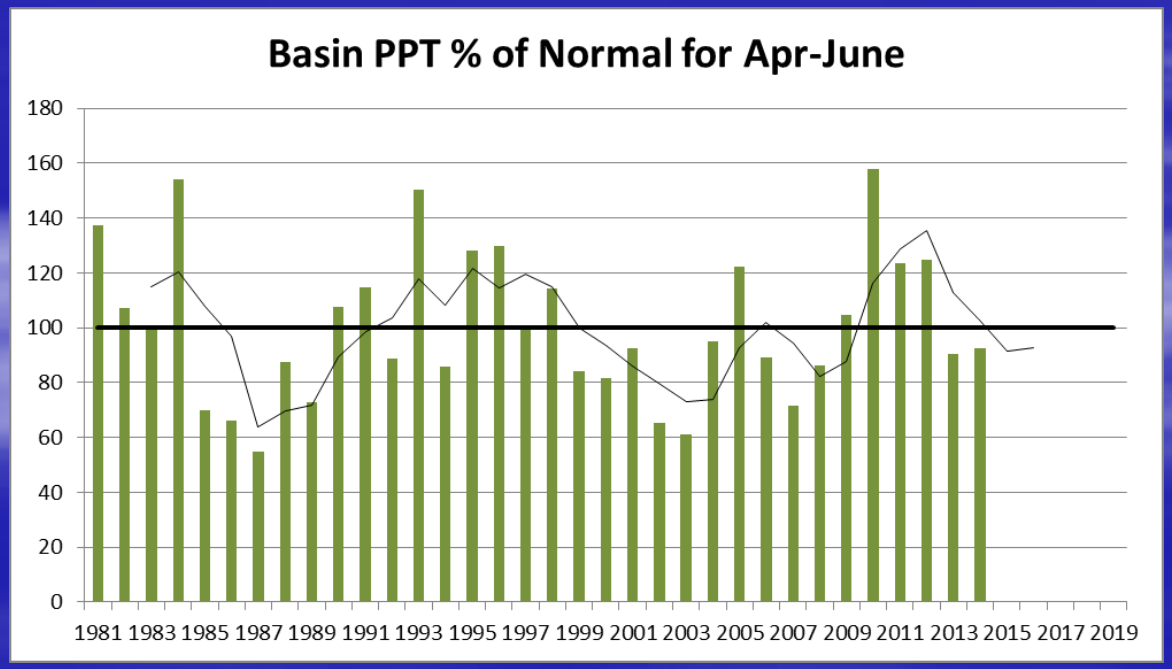
Upper Deschutes and Crooked River Snowpack and Precipitation Trends





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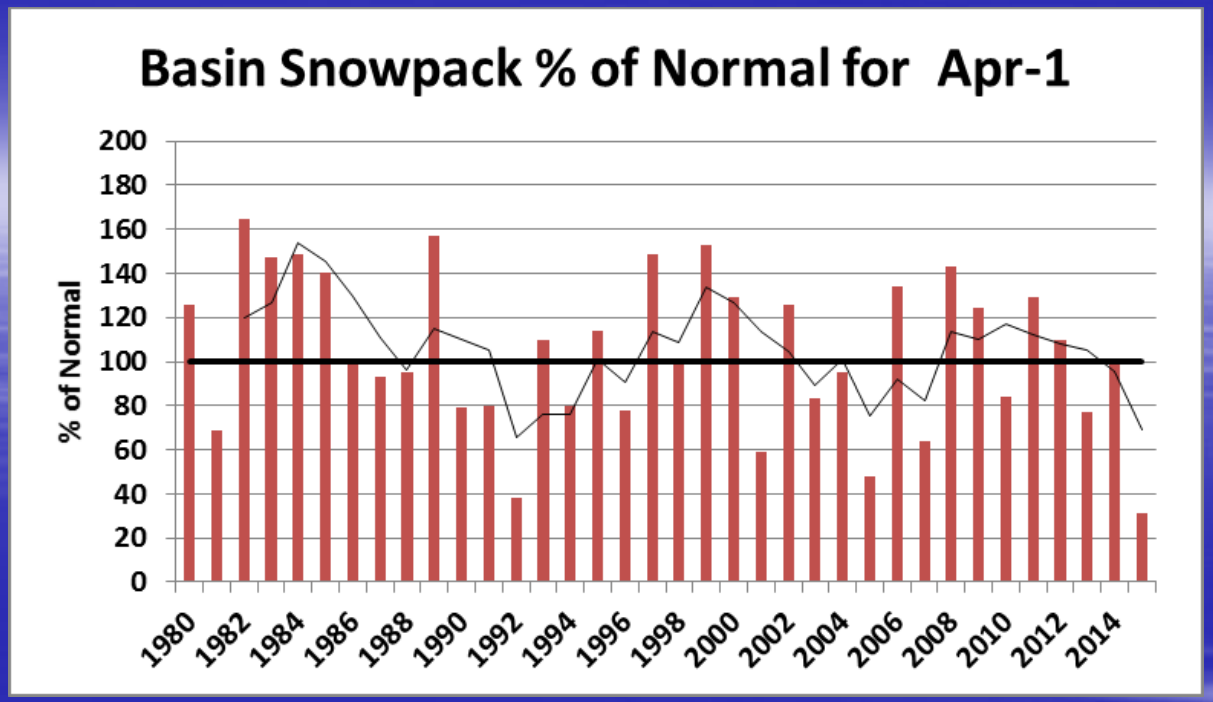
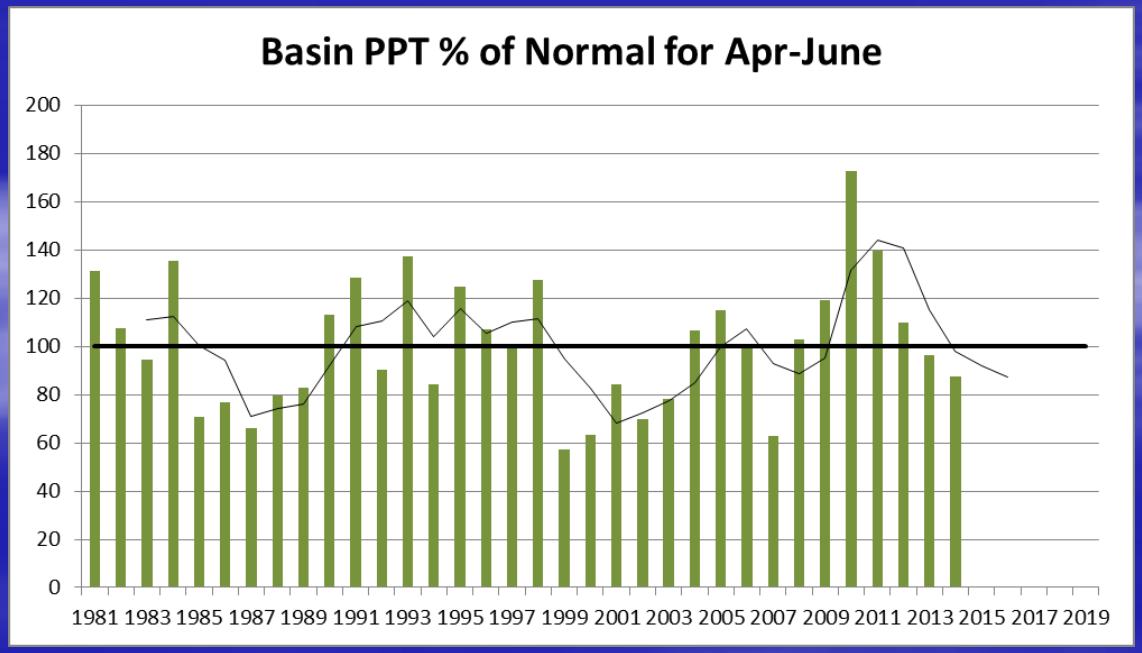
Grande Ronde, Powder, Burnt, Imnaha Snowpack and Precipitation Trends





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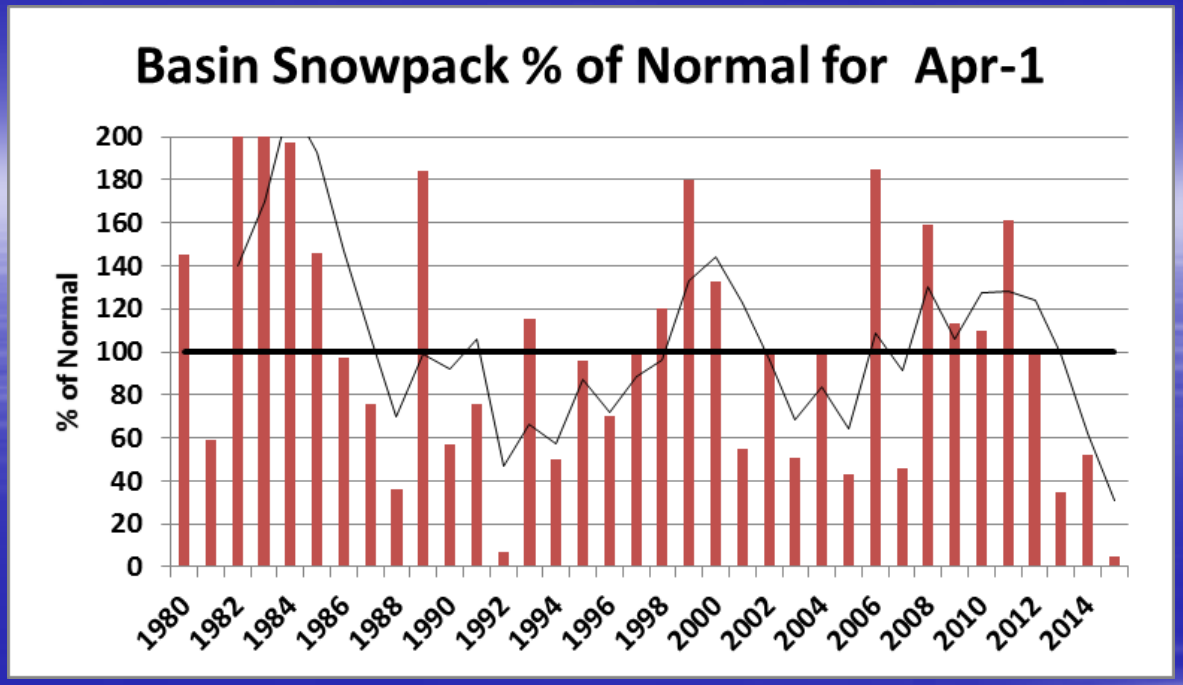
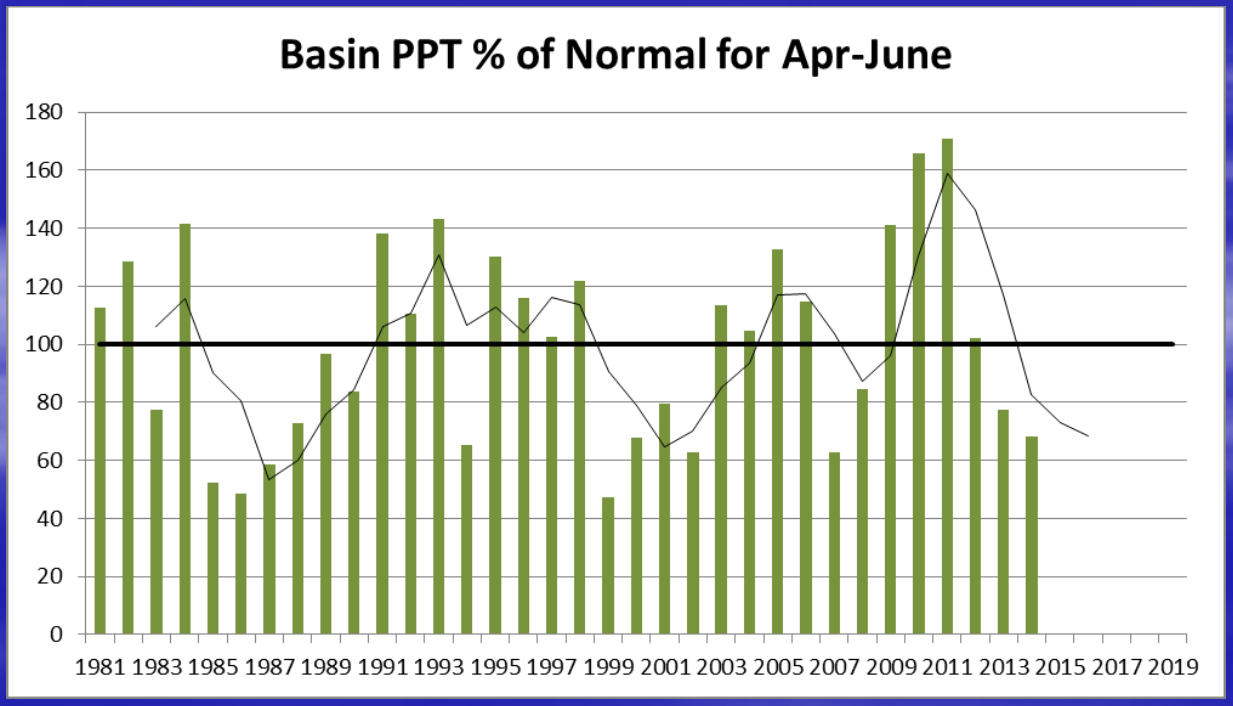
Malheur Snowpack and Precipitation Trends





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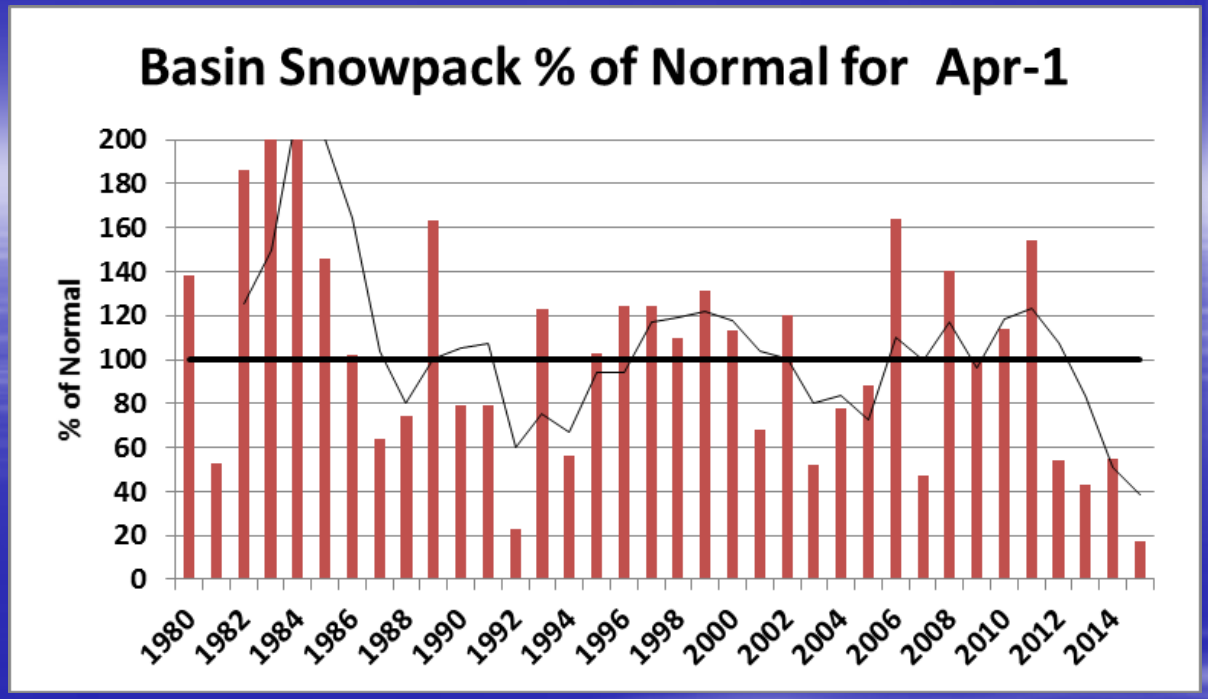
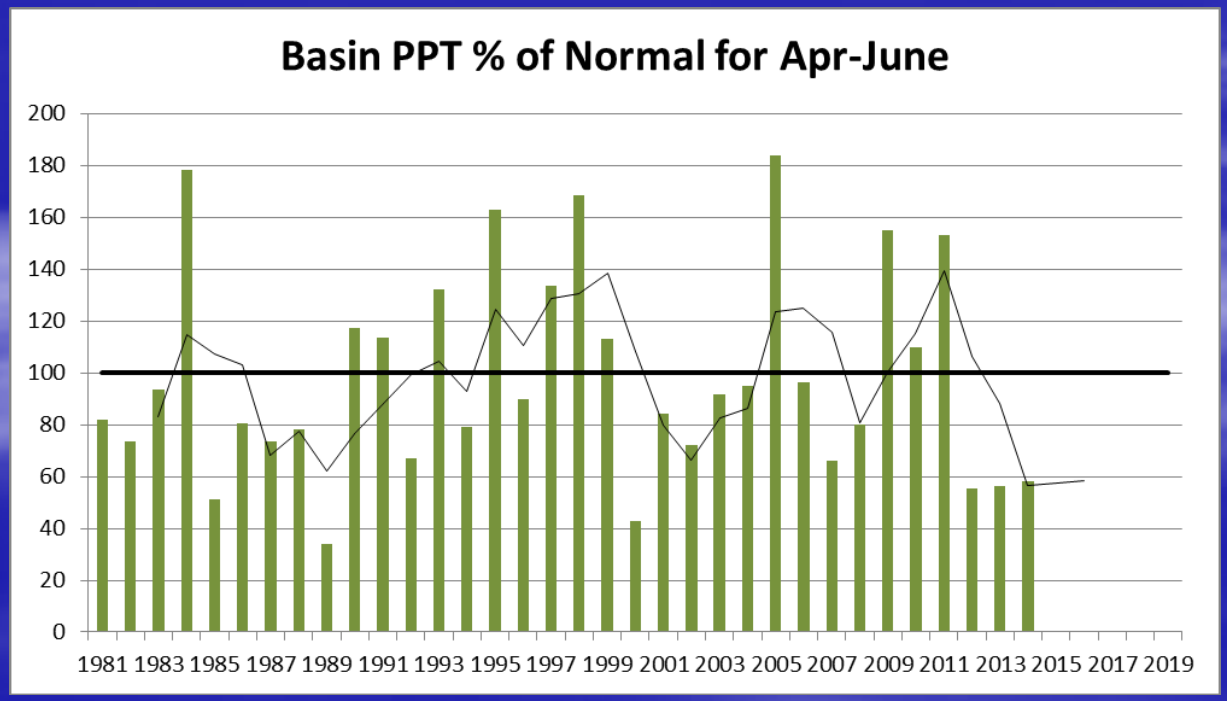
Owyhee Snowpack and Precipitation Trends





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SUMMARY

2015

- Warm Air Temperatures Resulted in Lack of Snow and Snow Pack Development
- Lack of Snowmelt Runoff Resulted in Low (Some Record Low) Stream Flows
- Streamflow Volume Forecasts have generally decreased through the water year due to the lack of snowpack, and recent precipitation shortages
- SWSI trends are indicating decreasing water supply, many at historic lows

Long-term Snowpack Precipitation Trends

- Most basins are showing marked decreased April snowpack, especially in the last 5 years
- April through June basin precipitation values are near normal, but not supplemented by snowmelt runoff

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Thank you!