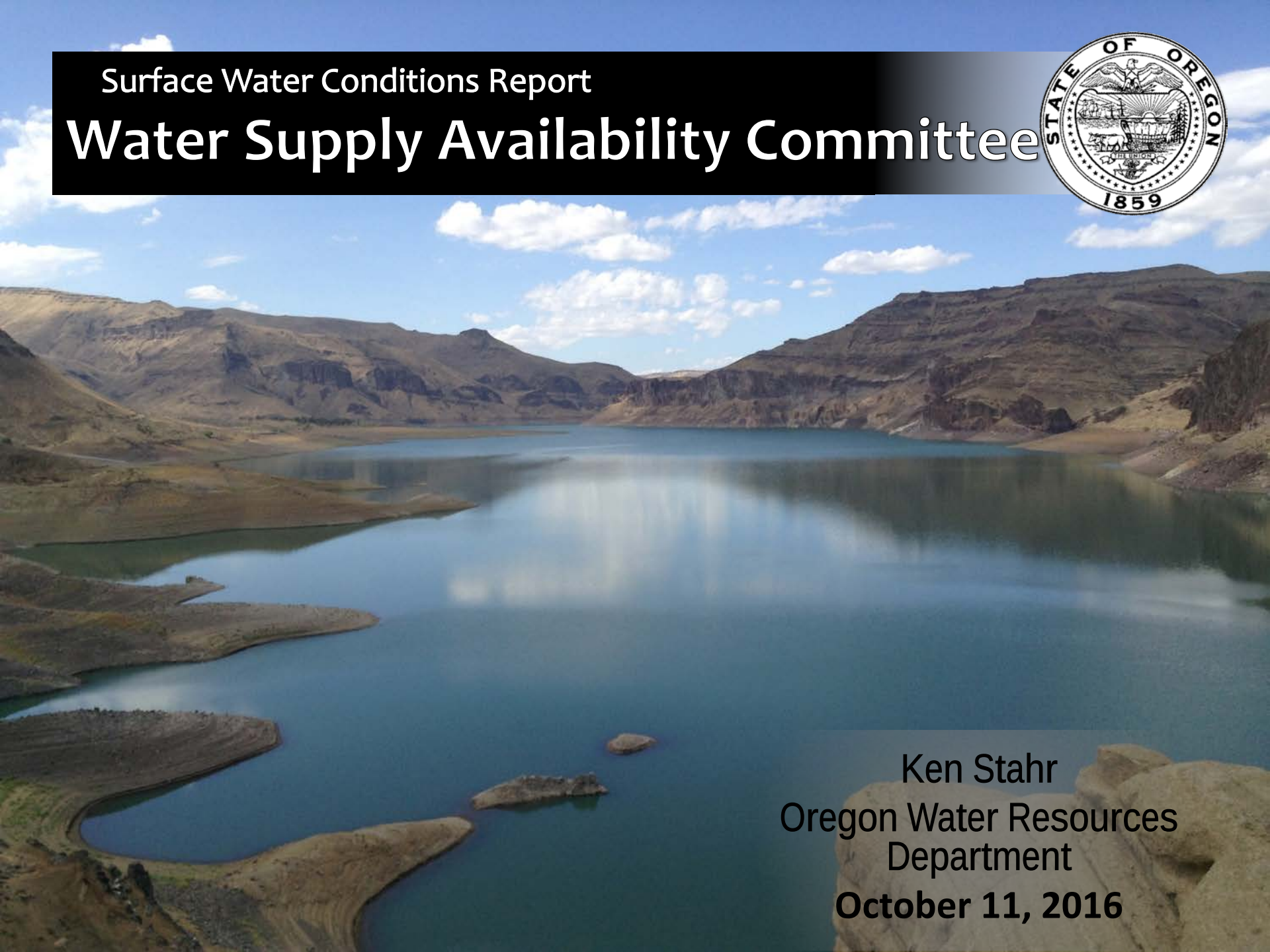
Surface Water Conditions Report

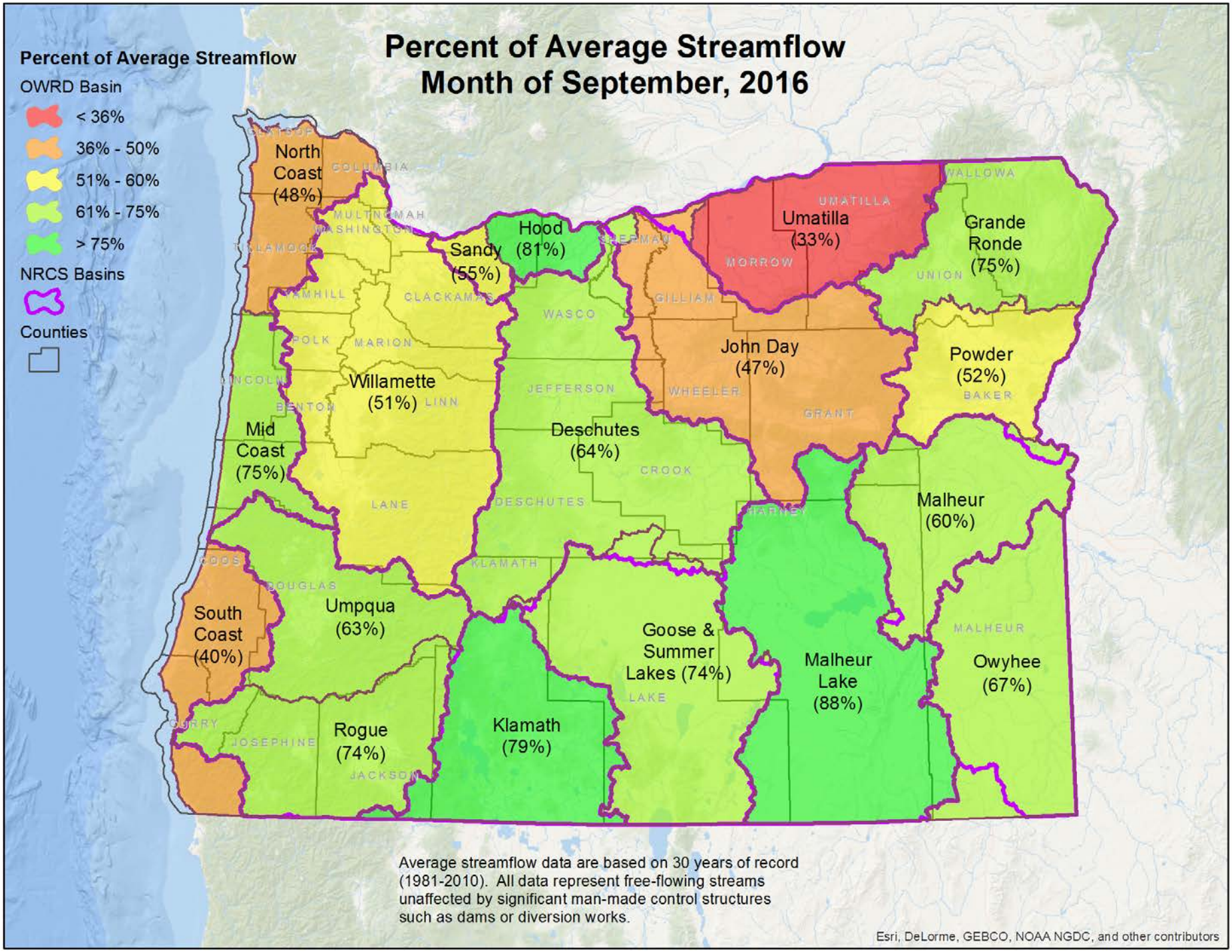
Water Supply Availability Committee



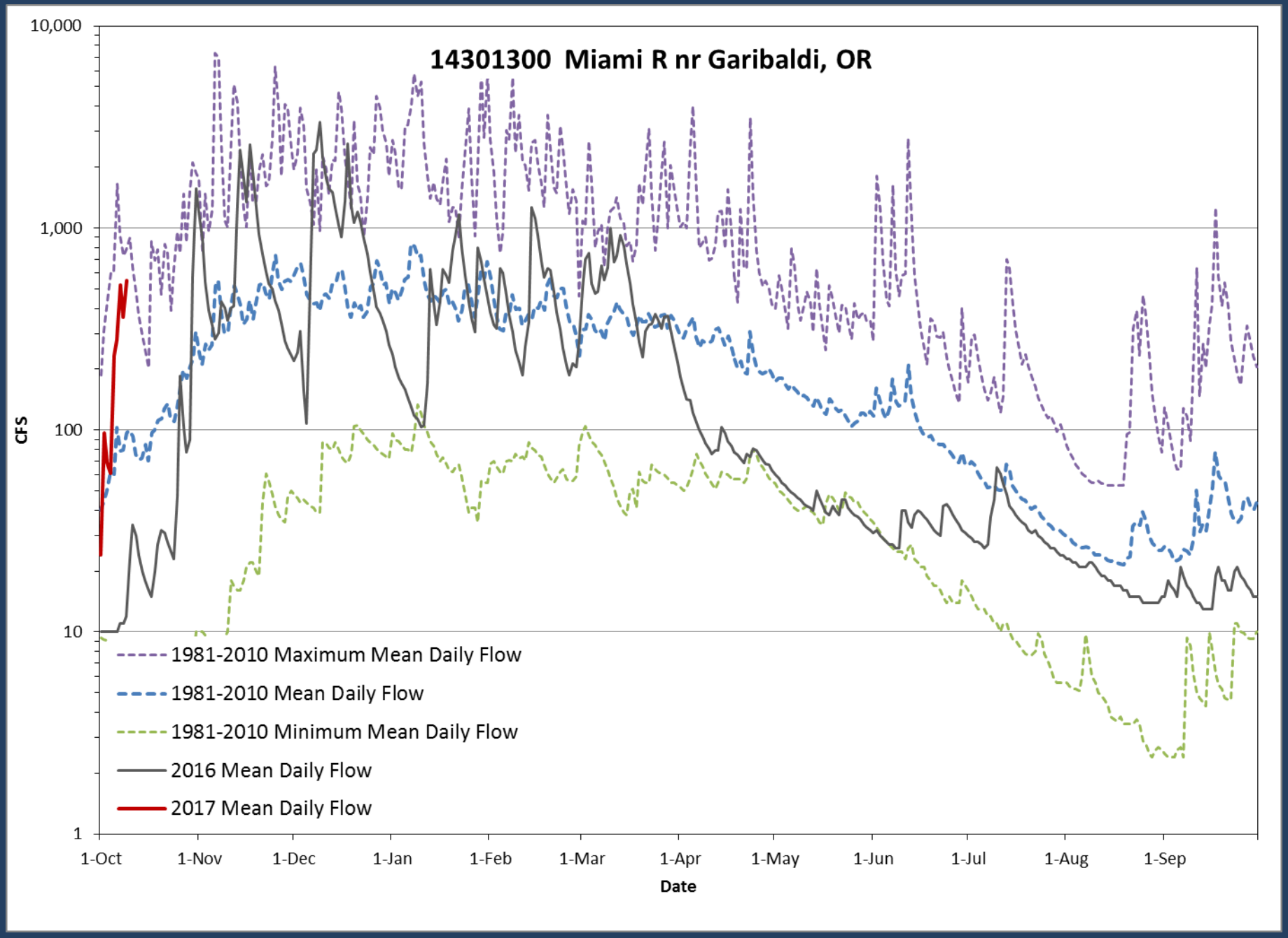
Ken Stahr
Oregon Water Resources Department

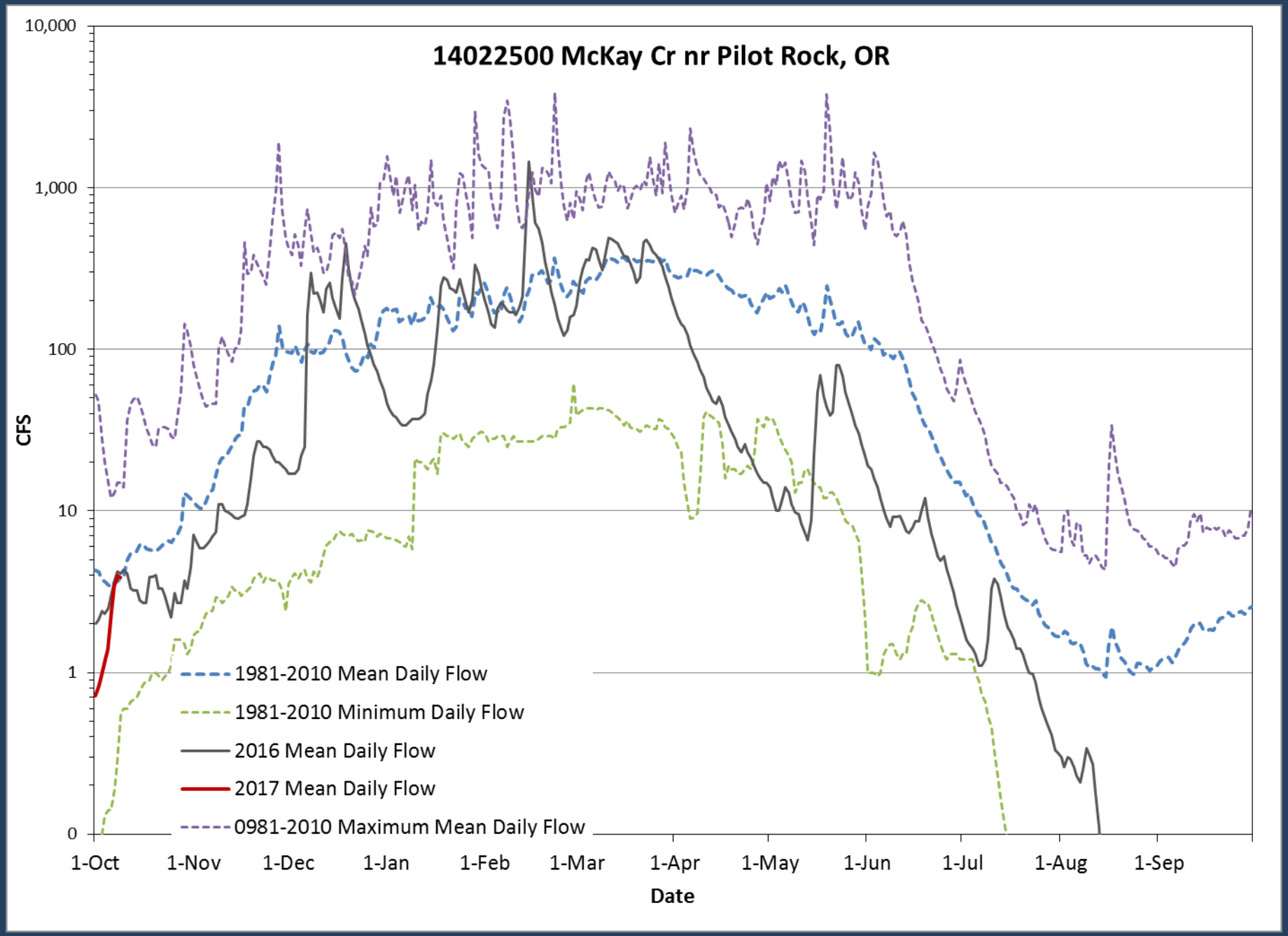
October 11, 2016

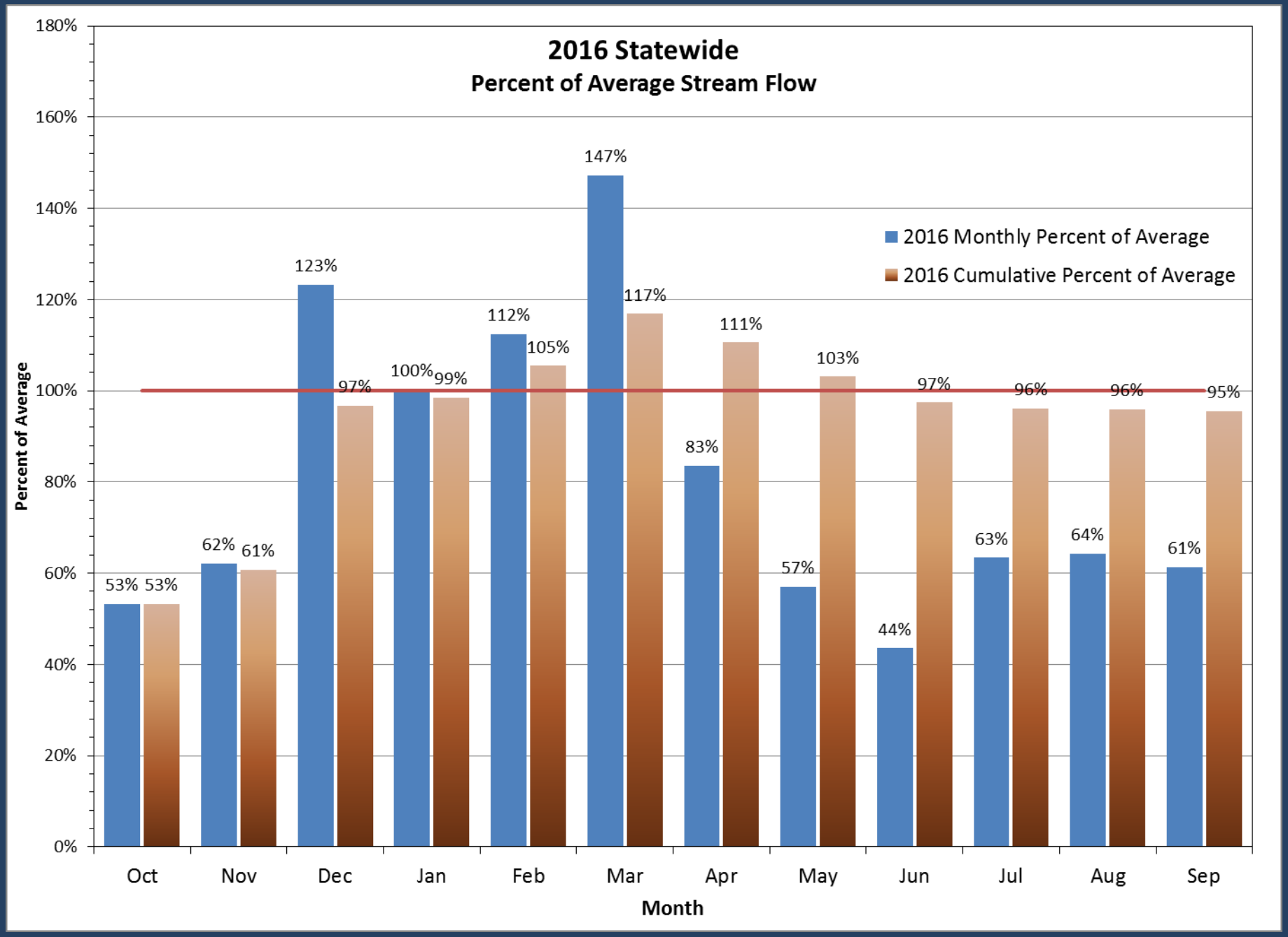
Percent of Average Streamflow
Month of September, 2016



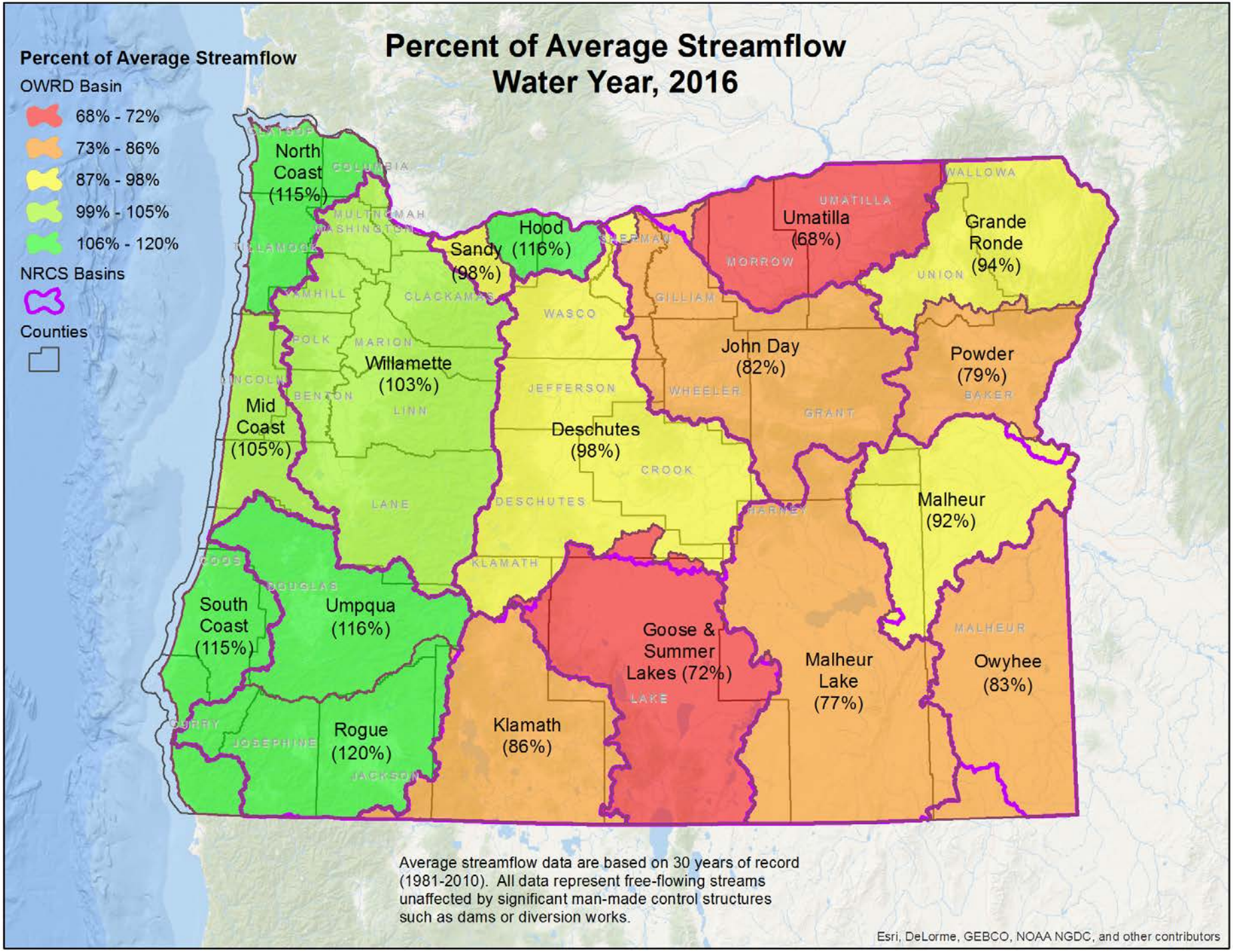
Average streamflow data are based on 30 years of record (1981-2010). All data represent free-flowing streams unaffected by significant man-made control structures such as dams or diversion works.


14301300 Miami R nr Garibaldi, OR
10,000
1,000
100
10
1
CFS
1981-2010 Maximum Mean Daily Flow
1981-2010 Mean Daily Flow
1981-2010 Minimum Mean Daily Flow
2016 Mean Daily Flow
2017 Mean Daily Flow
1-Oct
1-Nov
1-Dec
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
Date


14022500 McKay Cr nr Pilot Rock, OR
10,000
1,000
100
10
1
0
CFS
1981-2010 Mean Daily Flow
1981-2010 Minimum Daily Flow
2016 Mean Daily Flow
2017 Mean Daily Flow
0981-2010 Maximum Mean Daily Flow
1-Oct
1-Nov
1-Dec
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
Date


2016 Statewide
Percent of Average Stream Flow
2016 Monthly Percent of Average
2016 Cumulative Percent of Average
Percent of Average
Month
180%
160%
140%
120%
100%
80%
60%
40%
20%
0%
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
53%
53%
62%
61%
123%
97%
100%
99%
112%
105%
147%
117%
83%
111%
57%
103%
44%
97%
63%
96%
64%
96%
61%
95%

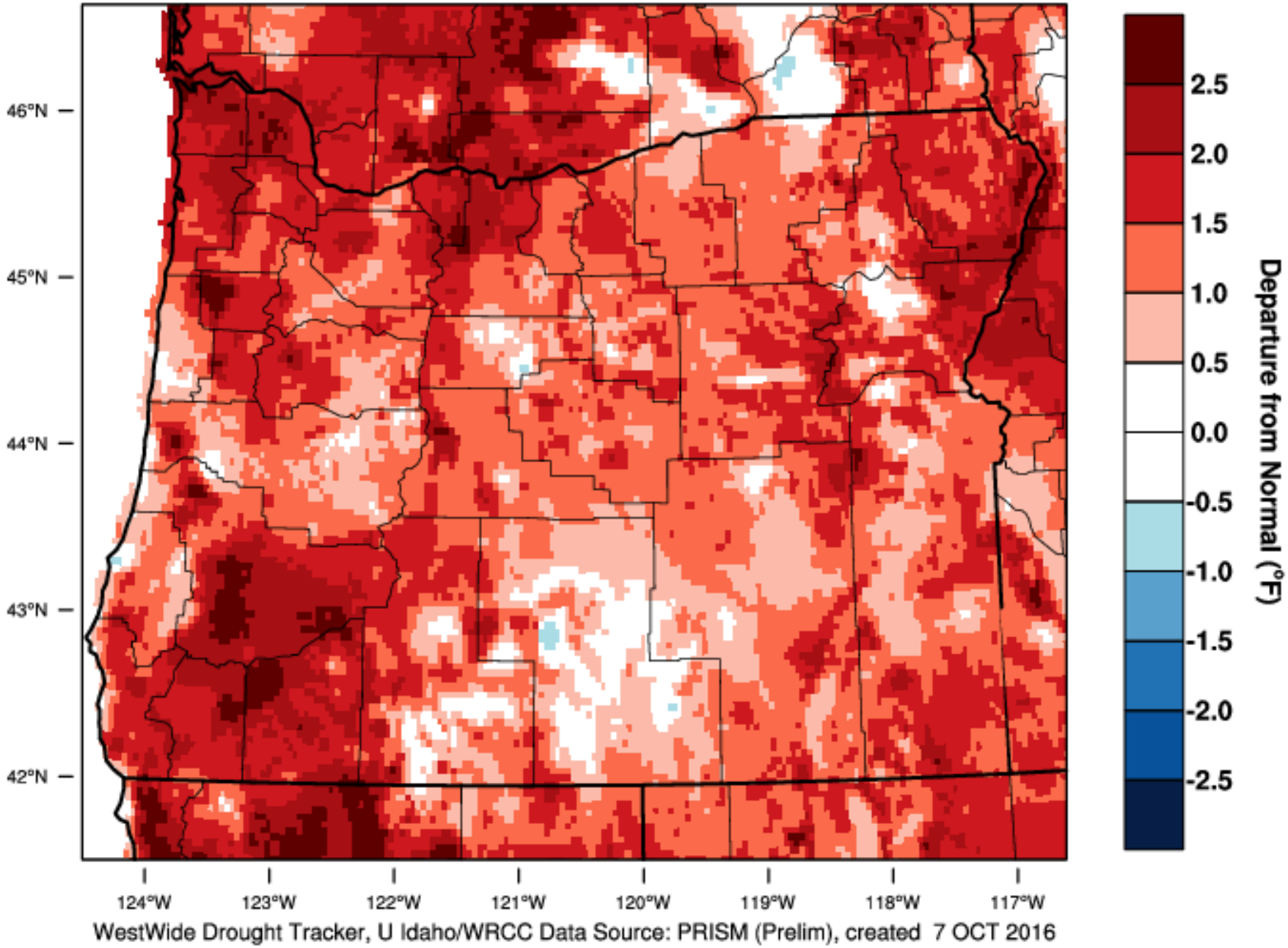
Percent of Average Streamflow
Water Year, 2016



Average streamflow data are based on 30 years of record (1981-2010). All data represent free-flowing streams unaffected by significant man-made control structures such as dams or diversion works.

Oregon - Mean Temperature

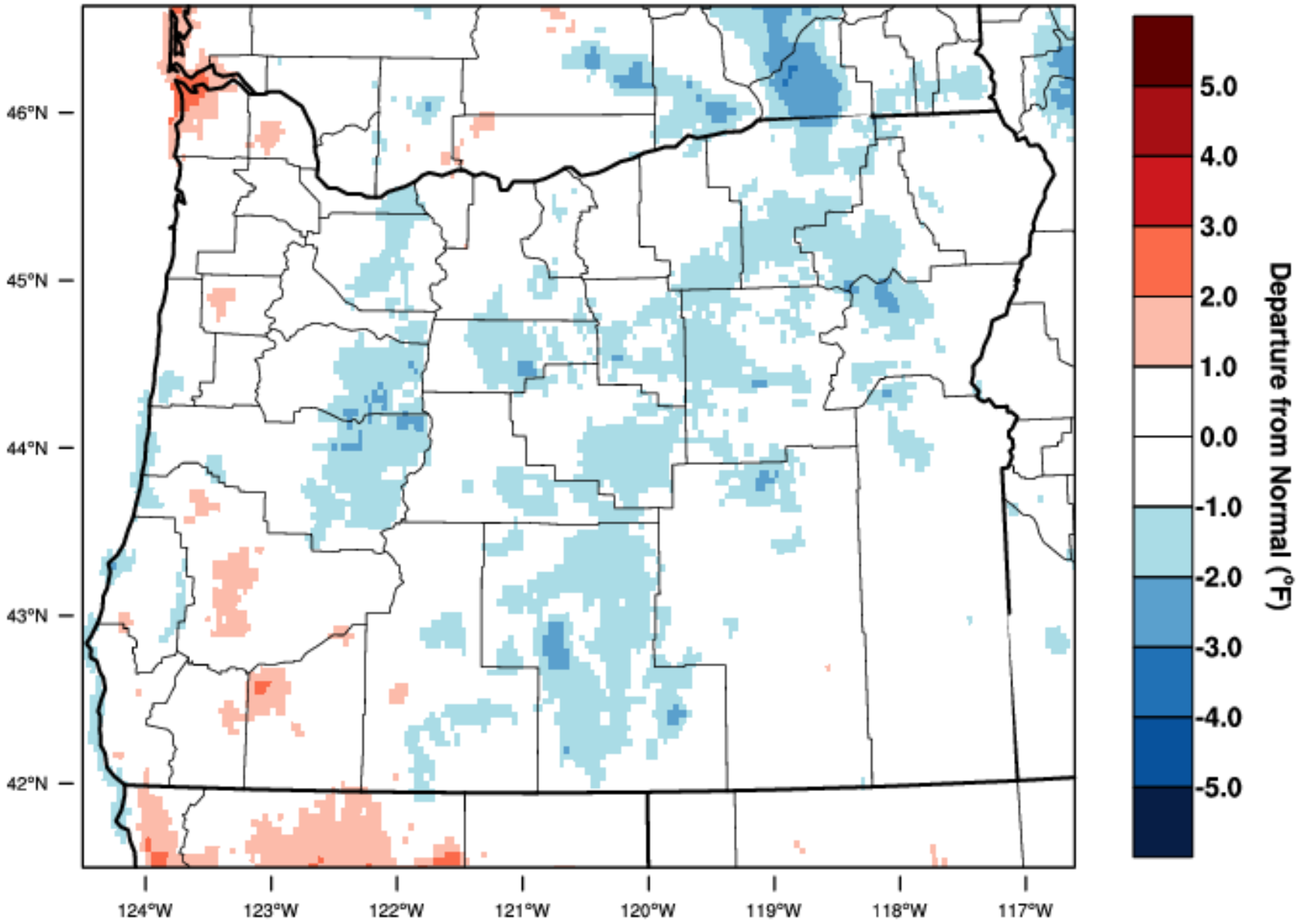
April-September 2016 Departure from 1981-2010 Normal



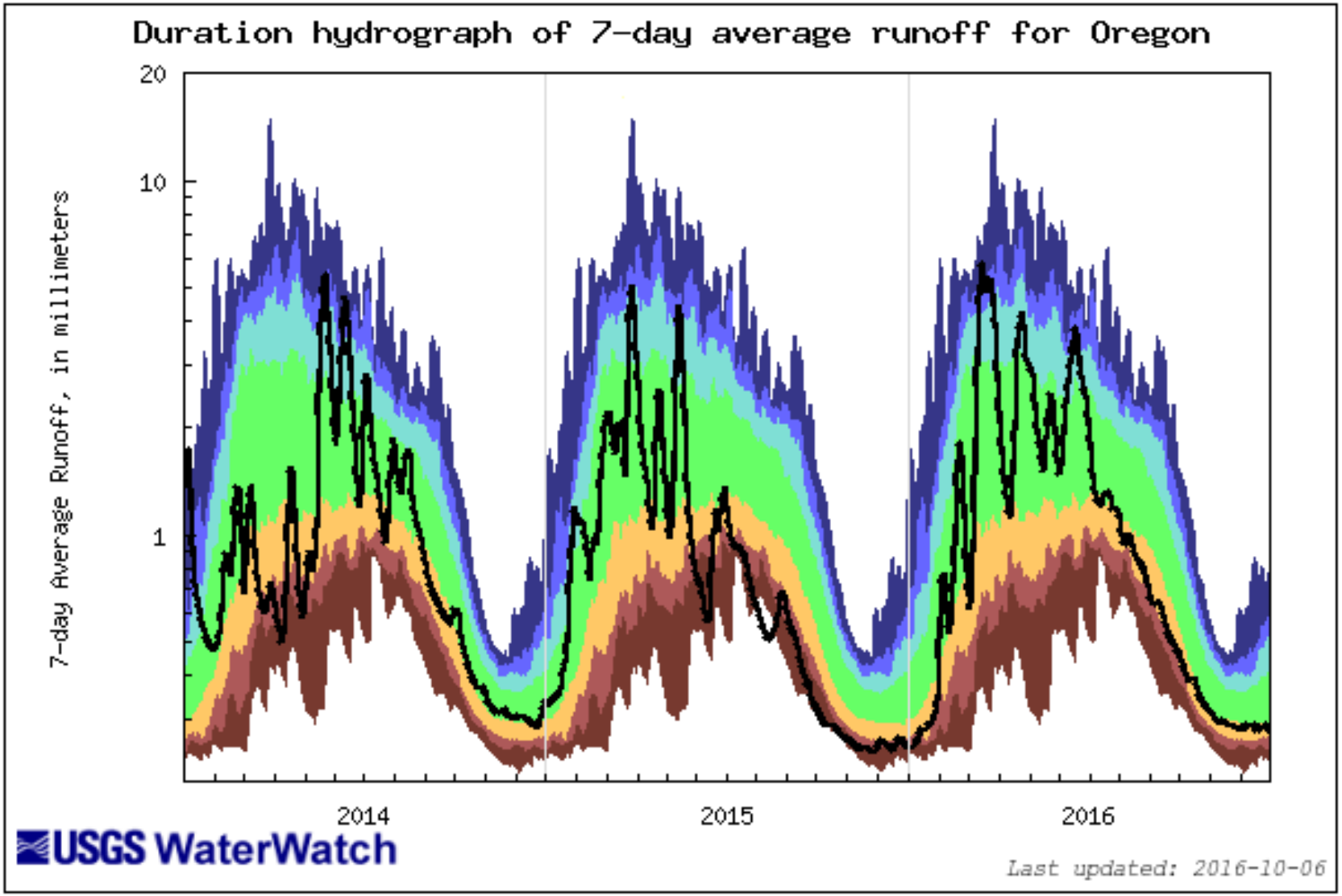
WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 OCT 2016

Oregon - Mean Temperature

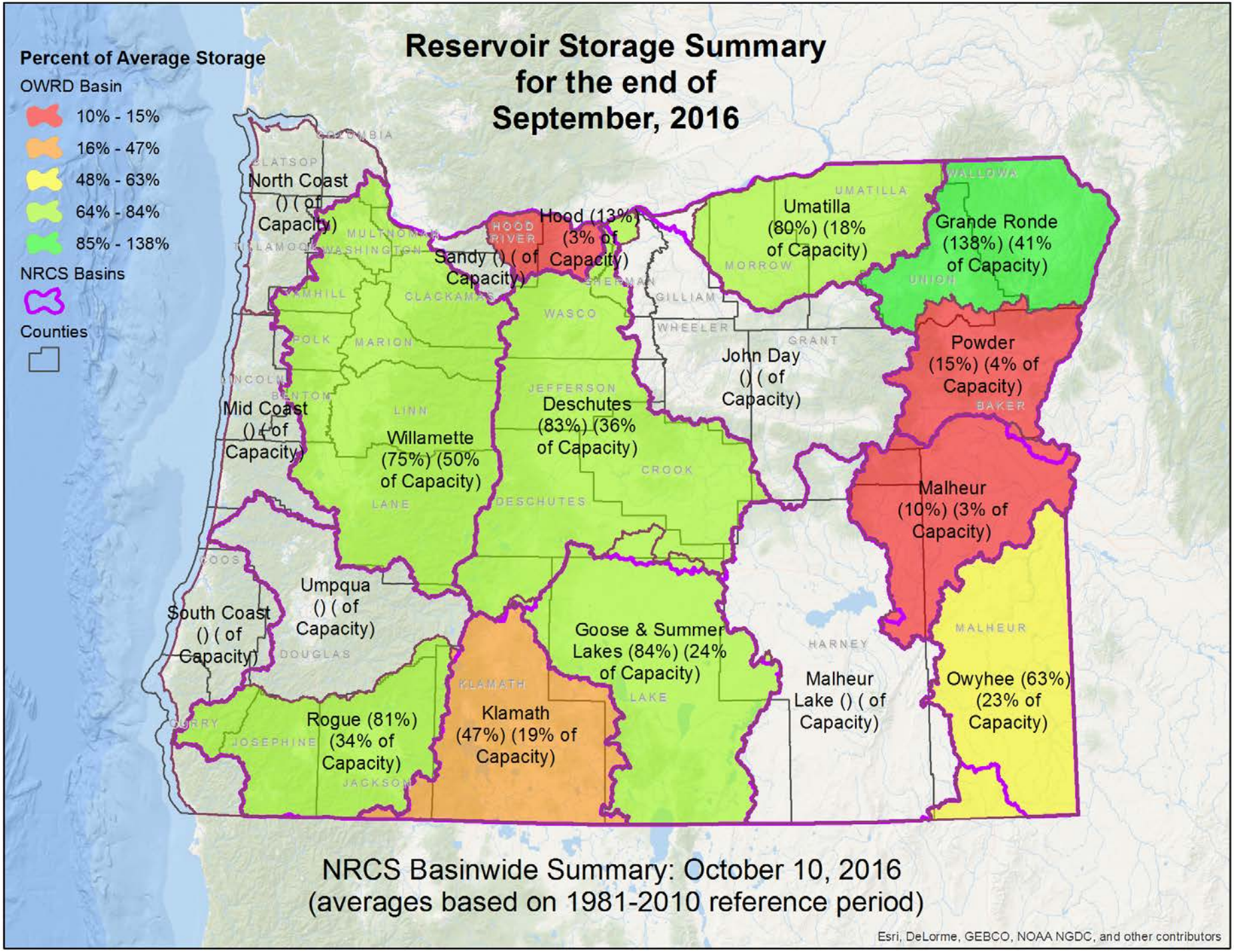
July-September 2016 Departure from 1981-2010 Normal



WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 OCT 2016



Explanation - Percentile classes							
lowest-5th percentile	6-9	10-24	25-75	76-90	91-94	95th percentile -highest	Runoff
Severe hydrologic drought	Moderate hydrologic drought	Below normal	Normal	Above normal	Much above normal		


Reservoir Storage Summary for the end of September, 2016
Percent of Average Storage
OWRD Basin
10% - 15%
16% - 47%
48% - 63%
64% - 84%
85% - 138%
NRCS Basins
Counties
North Coast () (of Capacity)
Hood (13%) (3% of Capacity)
Sandy () (of Capacity)
Umatilla (80%) (18% of Capacity)
Grande Ronde (138%) (41% of Capacity)
John Day () (of Capacity)
Powder (15%) (4% of Capacity)
Mid Coast () (of Capacity)
Willamette (75%) (50% of Capacity)
Deschutes (83%) (36% of Capacity)
Malheur (10%) (3% of Capacity)
Umpqua () (of Capacity)
South Coast () (of Capacity)
Goose & Summer Lakes (84%) (24% of Capacity)
Malheur Lake () (of Capacity)
Owyhee (63%) (23% of Capacity)
Rogue (81%) (34% of Capacity)
Klamath (47%) (19% of Capacity)
NRCS Basinwide Summary: October 10, 2016
(averages based on 1981-2010 reference period)
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

USACE Teacup Calculation

Water Control Diagram

Project numbers:

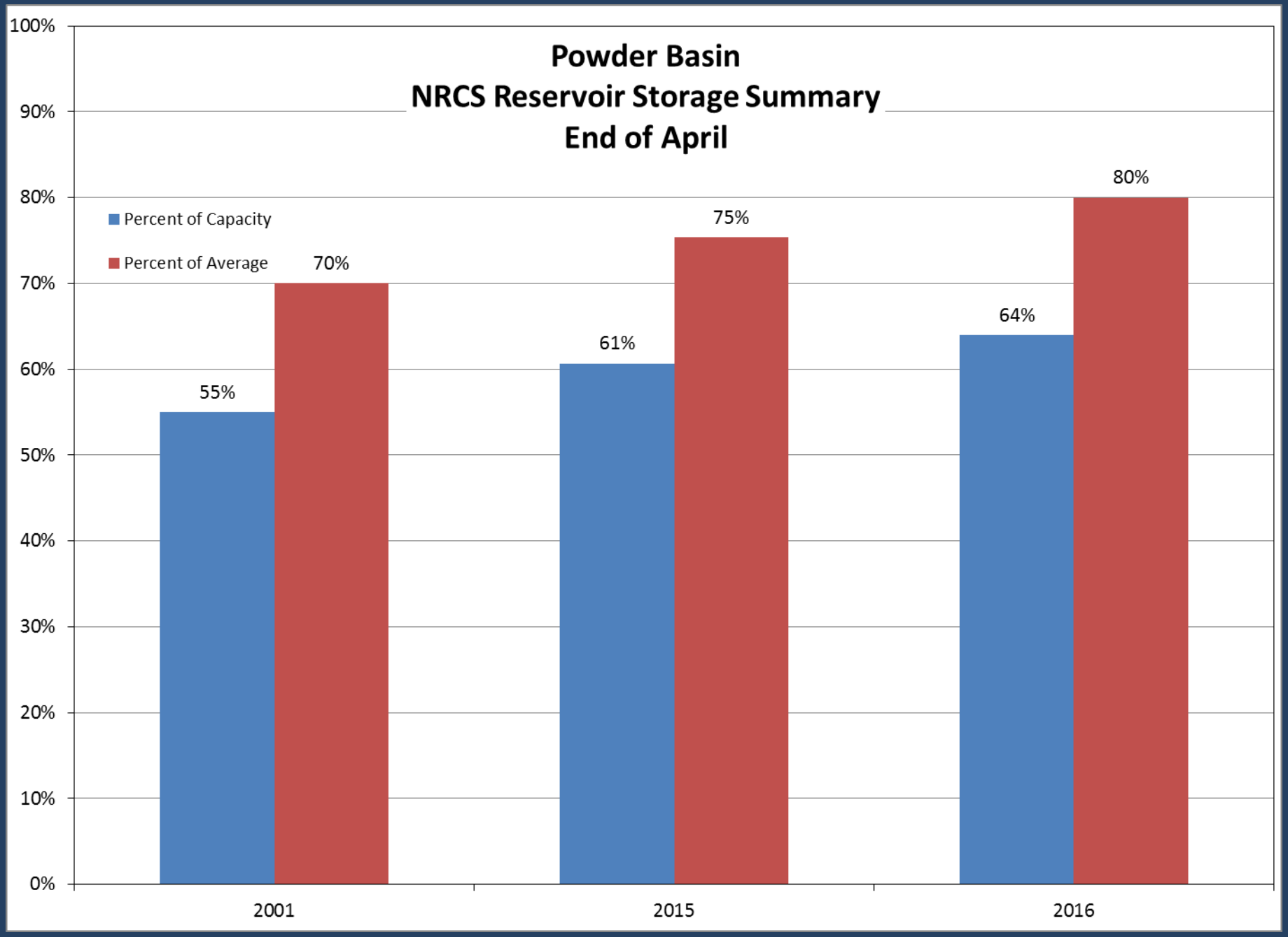
percent full / percent above WCD, where

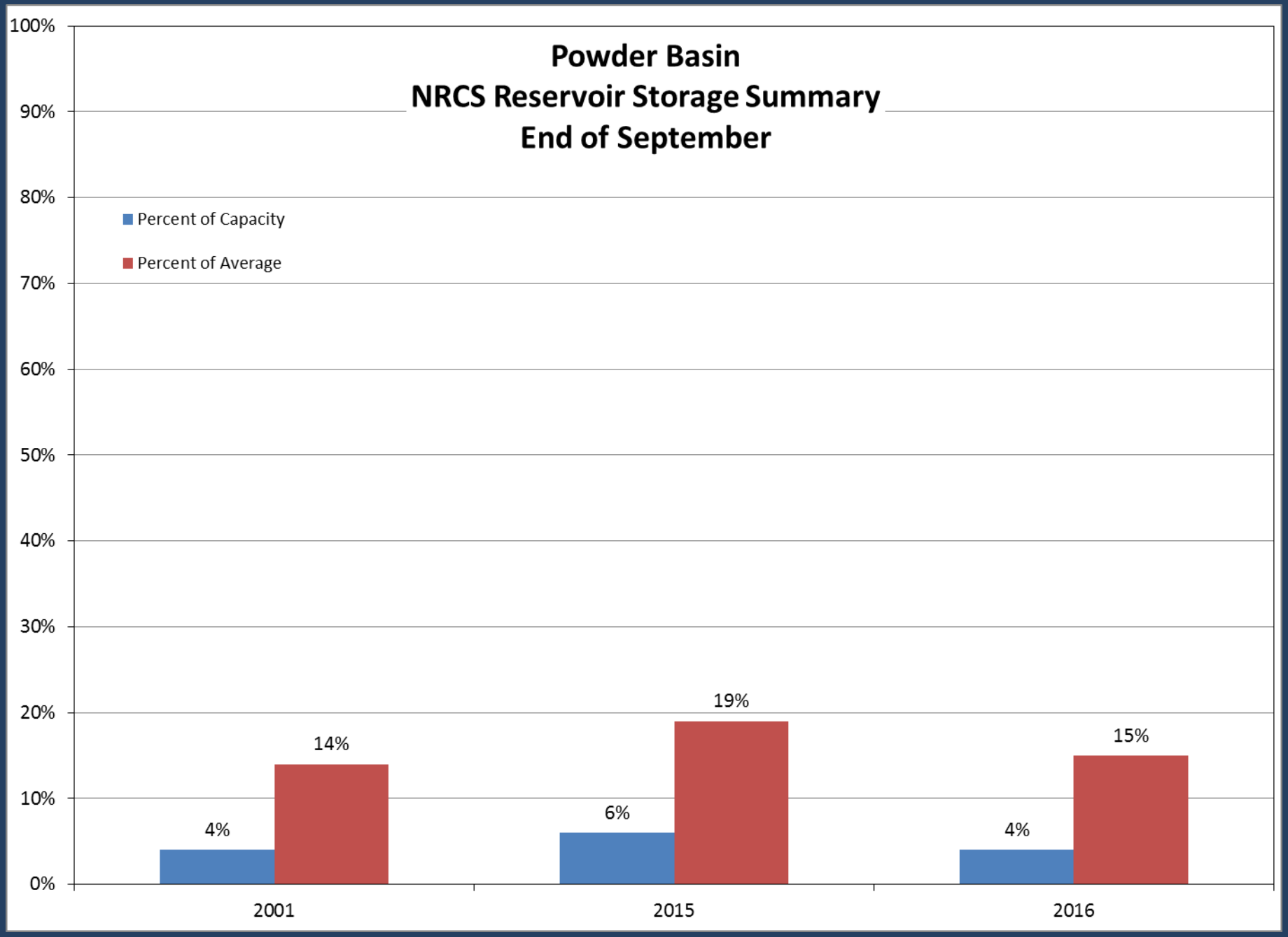
percent full = (current storage - minimum conservation storage) / (maximum conservation storage - minimum conservation storage)

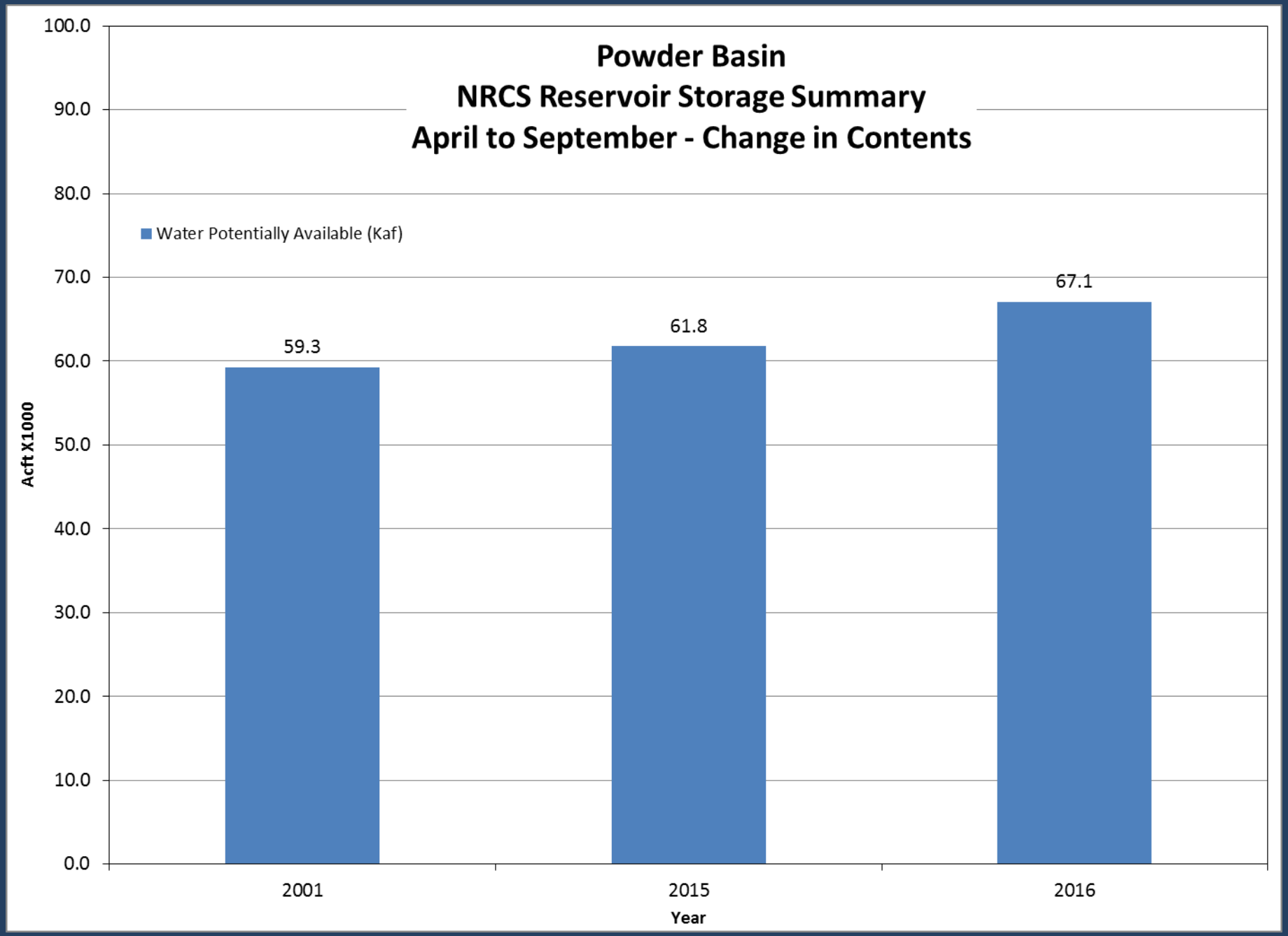
percent above water control diagram = (current storage - WCD storage) / (maximum conservation storage - minimum conservation storage)

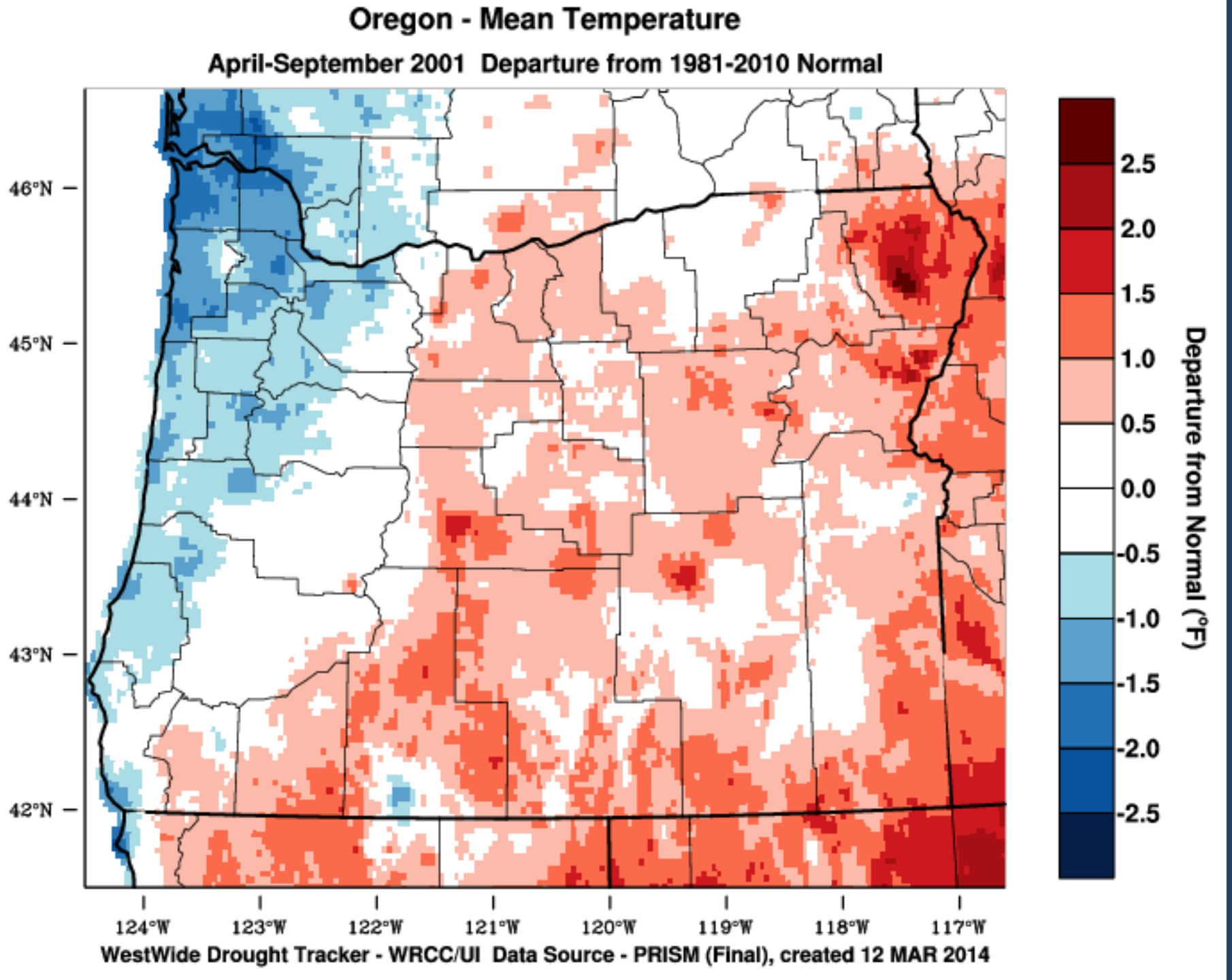
Thank You

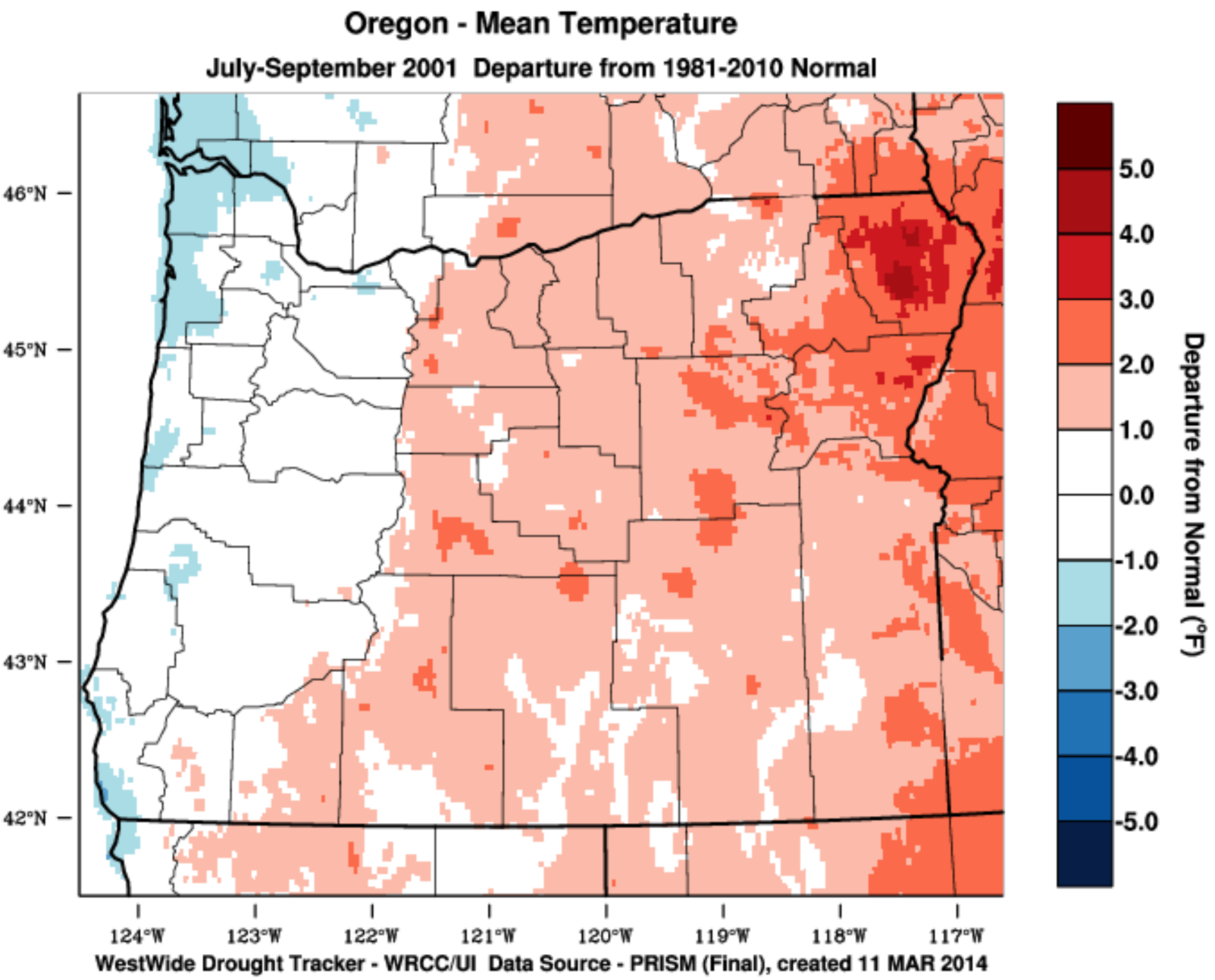
Powder Basin Storage

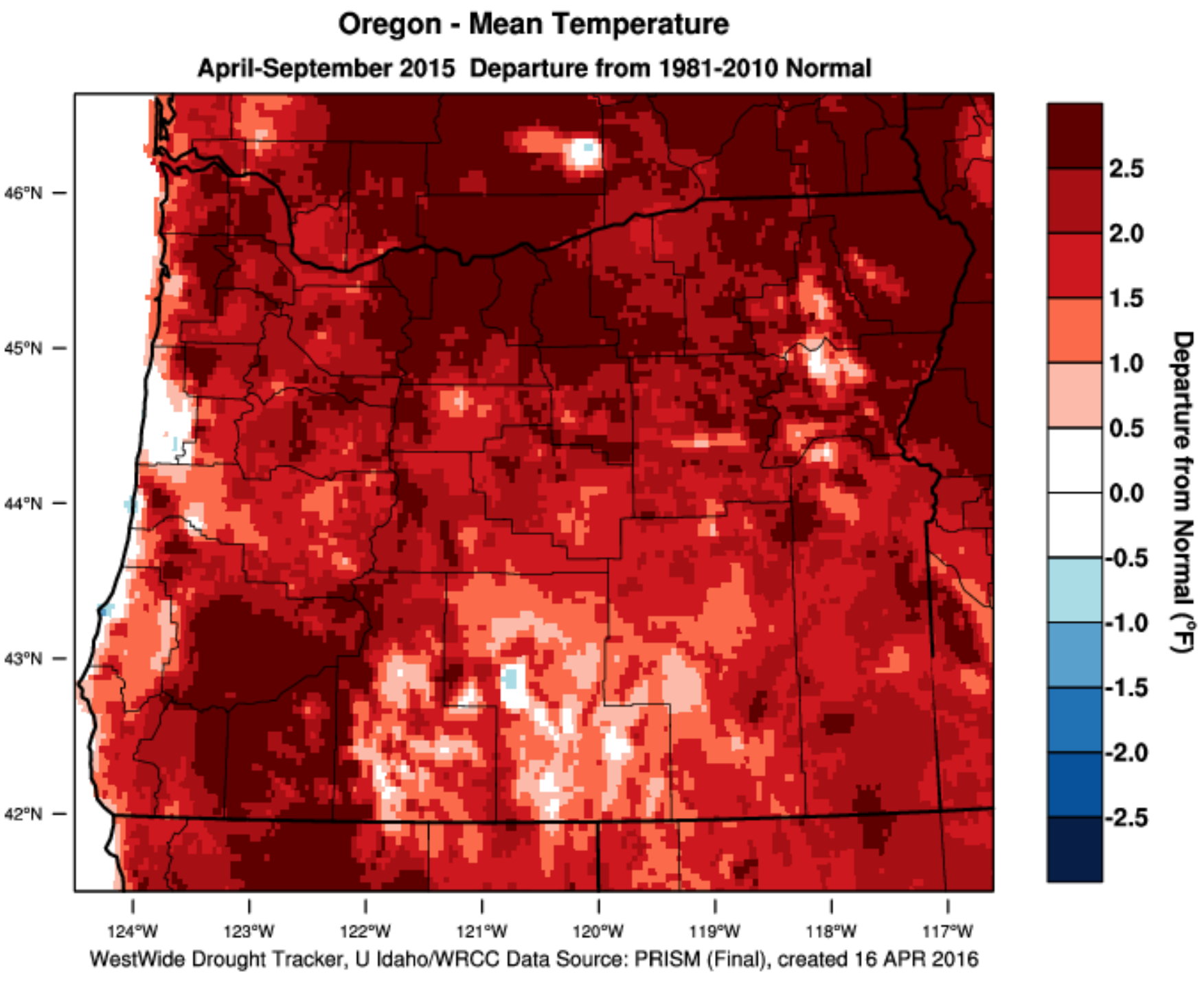

Powder Basin
NRCS Reservoir Storage Summary
End of April
Percent of Capacity
Percent of Average
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
55%
70%
61%
75%
64%
80%
2001
2015
2016


Powder Basin
NRCS Reservoir Storage Summary
End of September
Percent of Capacity
Percent of Average
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
4%
14%
6%
19%
4%
15%
2001
2015
2016


Powder Basin
NRCS Reservoir Storage Summary
April to September - Change in Contents
Water Potentially Available (Kaf)
Acft X1000
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
59.3
61.8
67.1
2001
2015
2016
Year

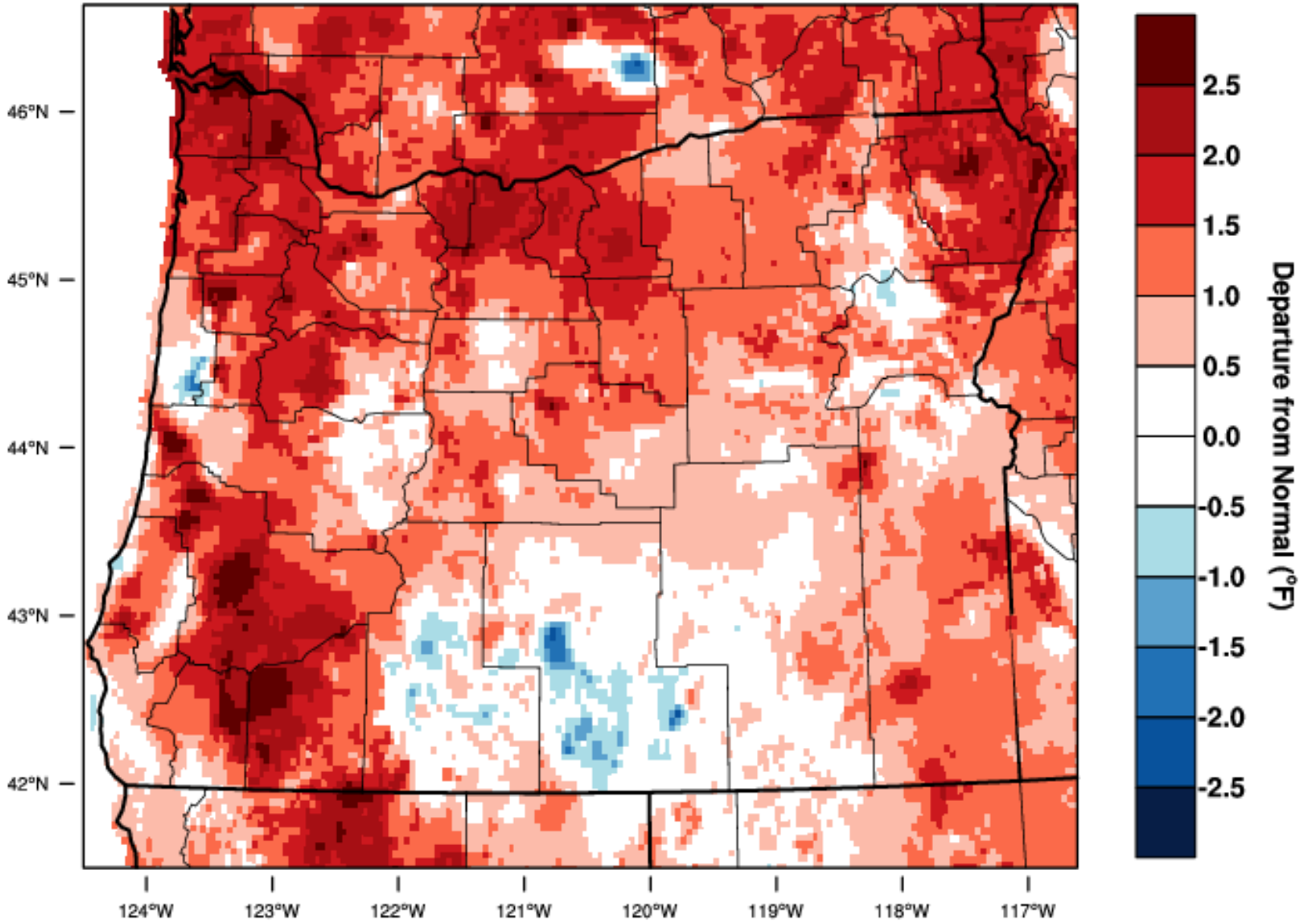

Oregon - Mean Temperature
April-September 2001 Departure from 1981-2010 Normal
46°N
45°N
44°N
43°N
42°N
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
Departure from Normal (°F)
WestWide Drought Tracker - WRCC/UI Data Source - PRISM (Final), created 12 MAR 2014


Oregon - Mean Temperature
July-September 2001 Departure from 1981-2010 Normal
46°N
45°N
44°N
43°N
42°N
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
Departure from Normal (°F)
WestWide Drought Tracker - WRCC/UI Data Source - PRISM (Final), created 11 MAR 2014


Oregon - Mean Temperature
April-September 2015 Departure from 1981-2010 Normal
46°N
45°N
44°N
43°N
42°N
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
Departure from Normal (°F)
WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Final), created 16 APR 2016

Oregon - Mean Temperature

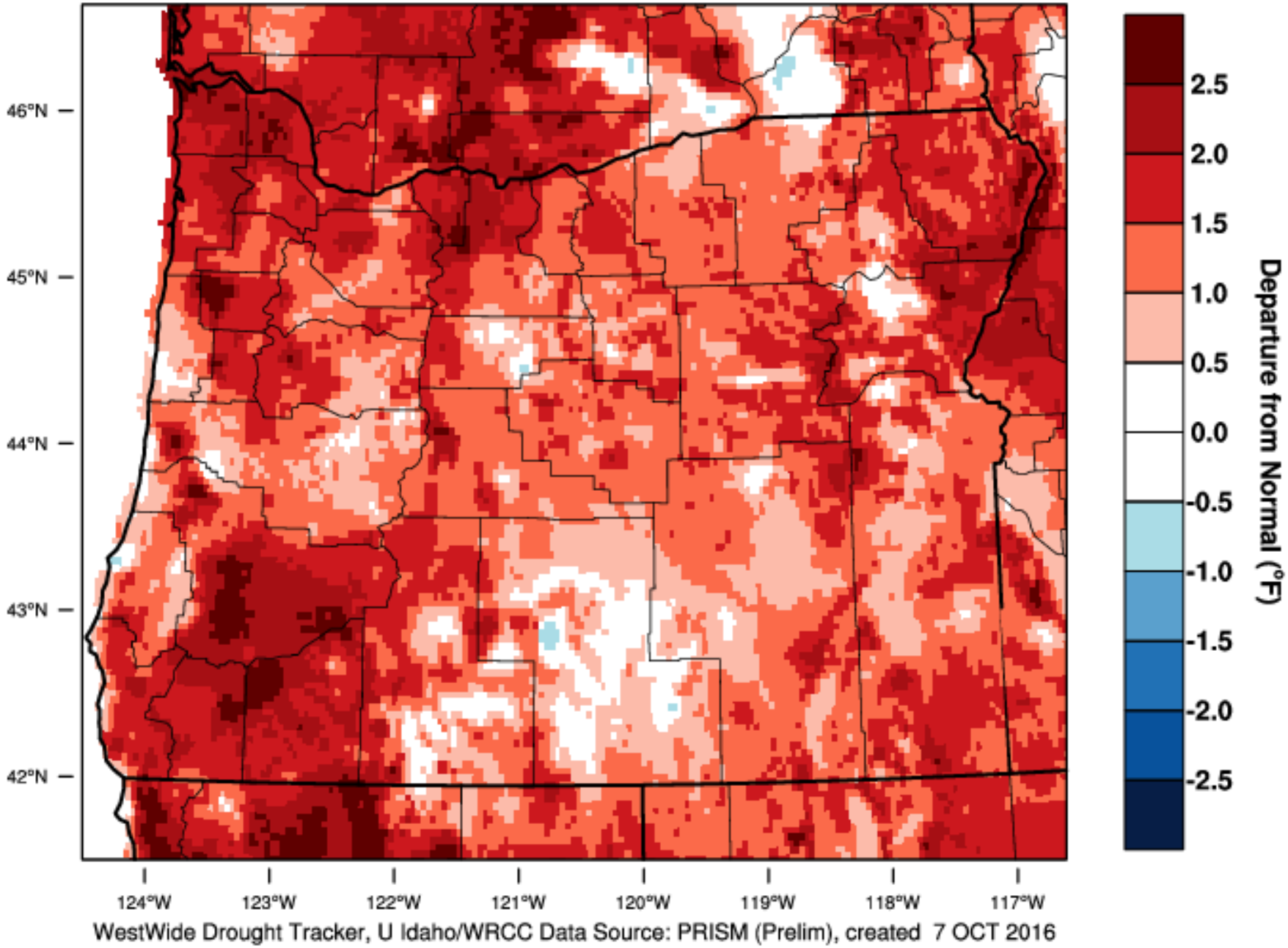
July-September 2015 Departure from 1981-2010 Normal



WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Final), created 16 APR 2016

Oregon - Mean Temperature

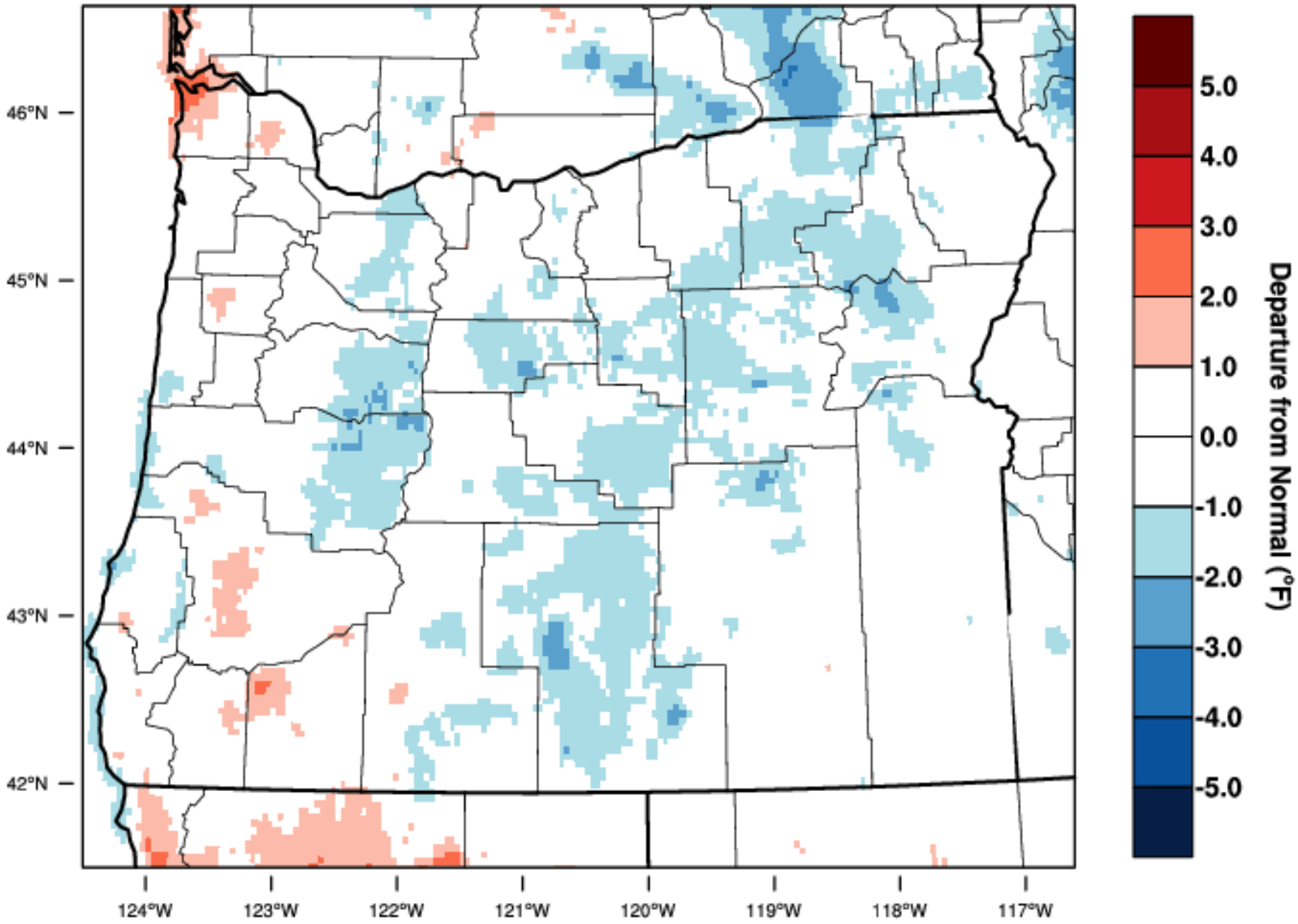
April-September 2016 Departure from 1981-2010 Normal



WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 OCT 2016

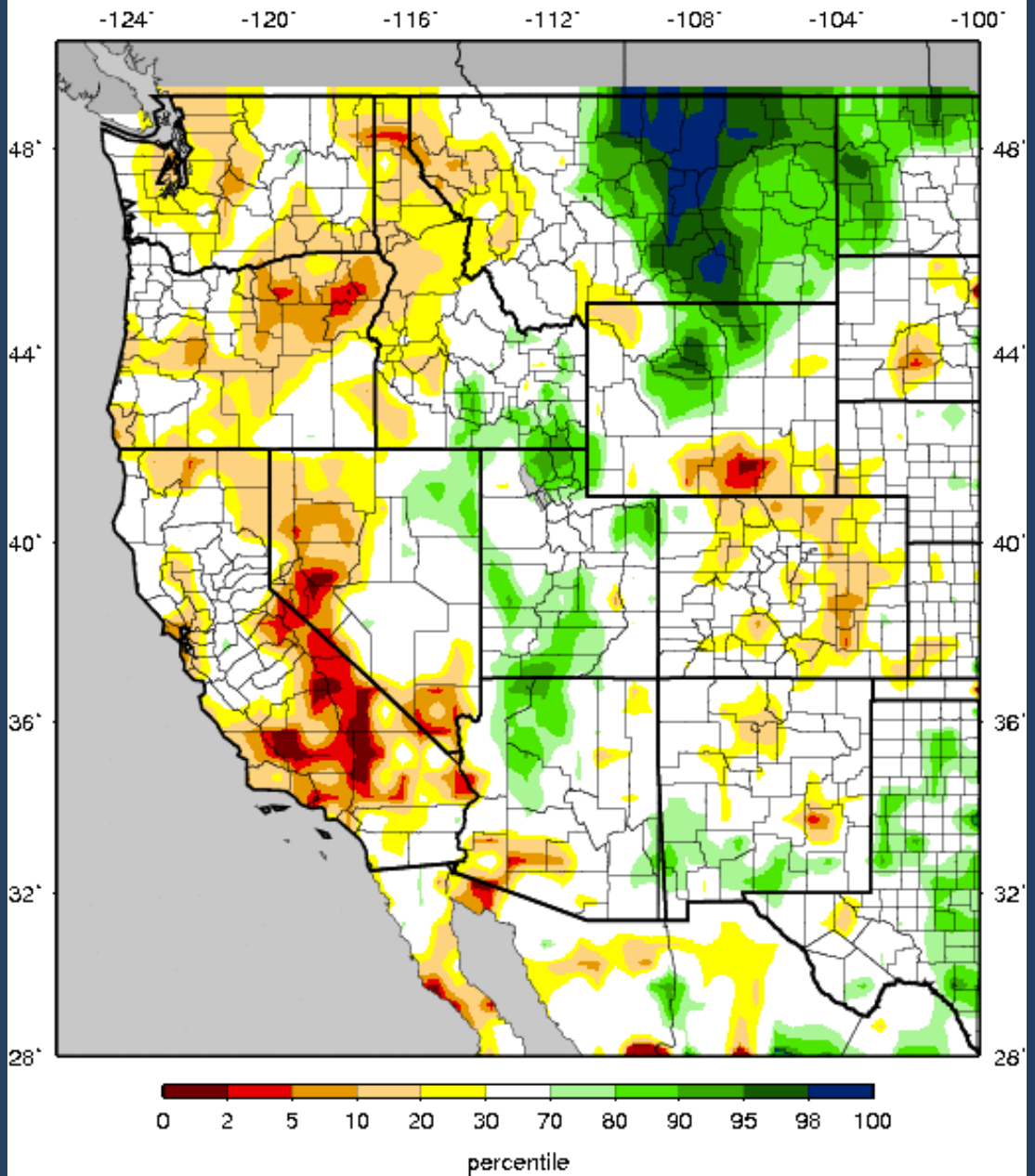
Oregon - Mean Temperature

July-September 2016 Departure from 1981-2010 Normal



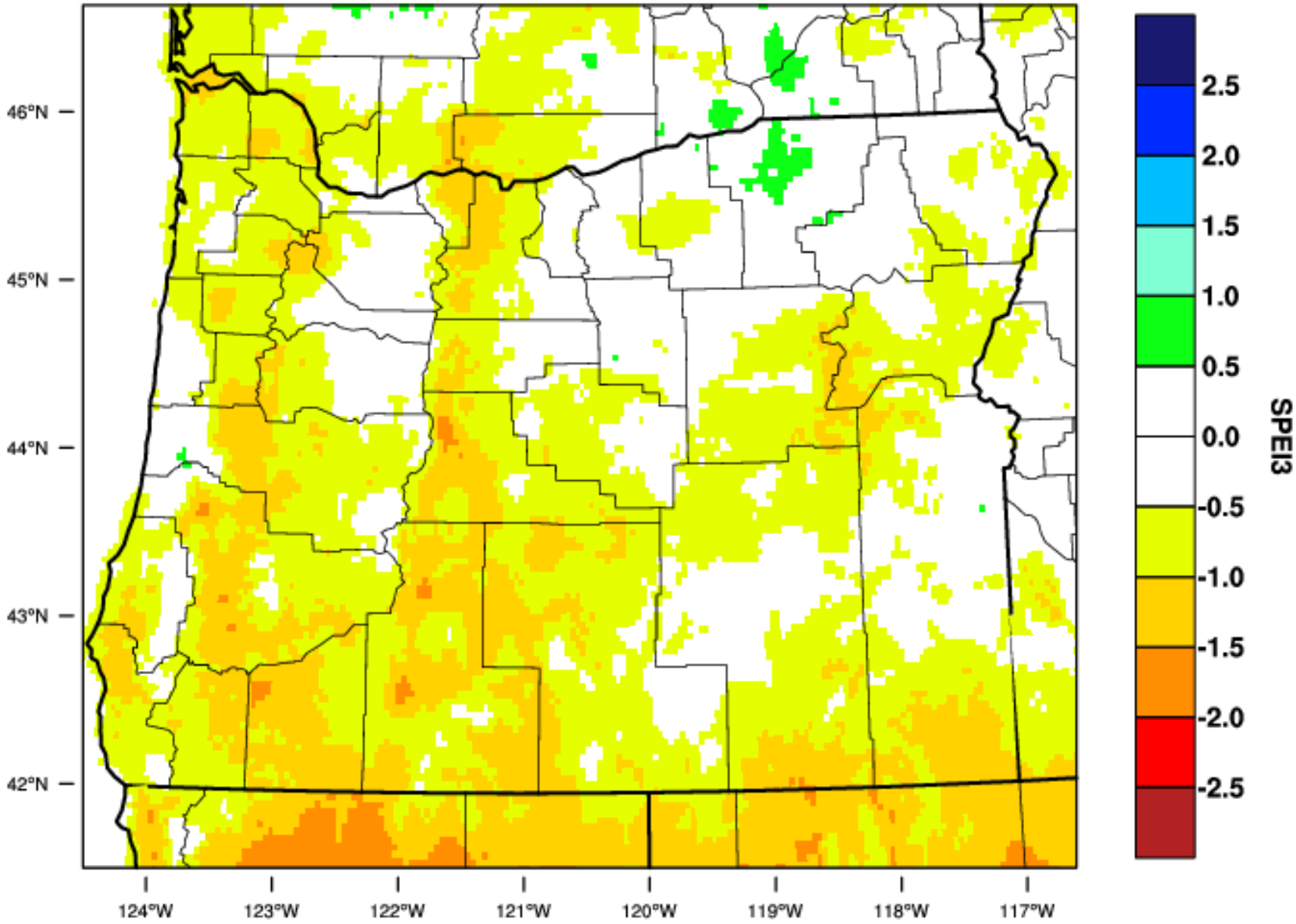
WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 OCT 2016

VIC Soil Moisture Percentiles (wrt/ 1916-2004)
Western United States - 20161005

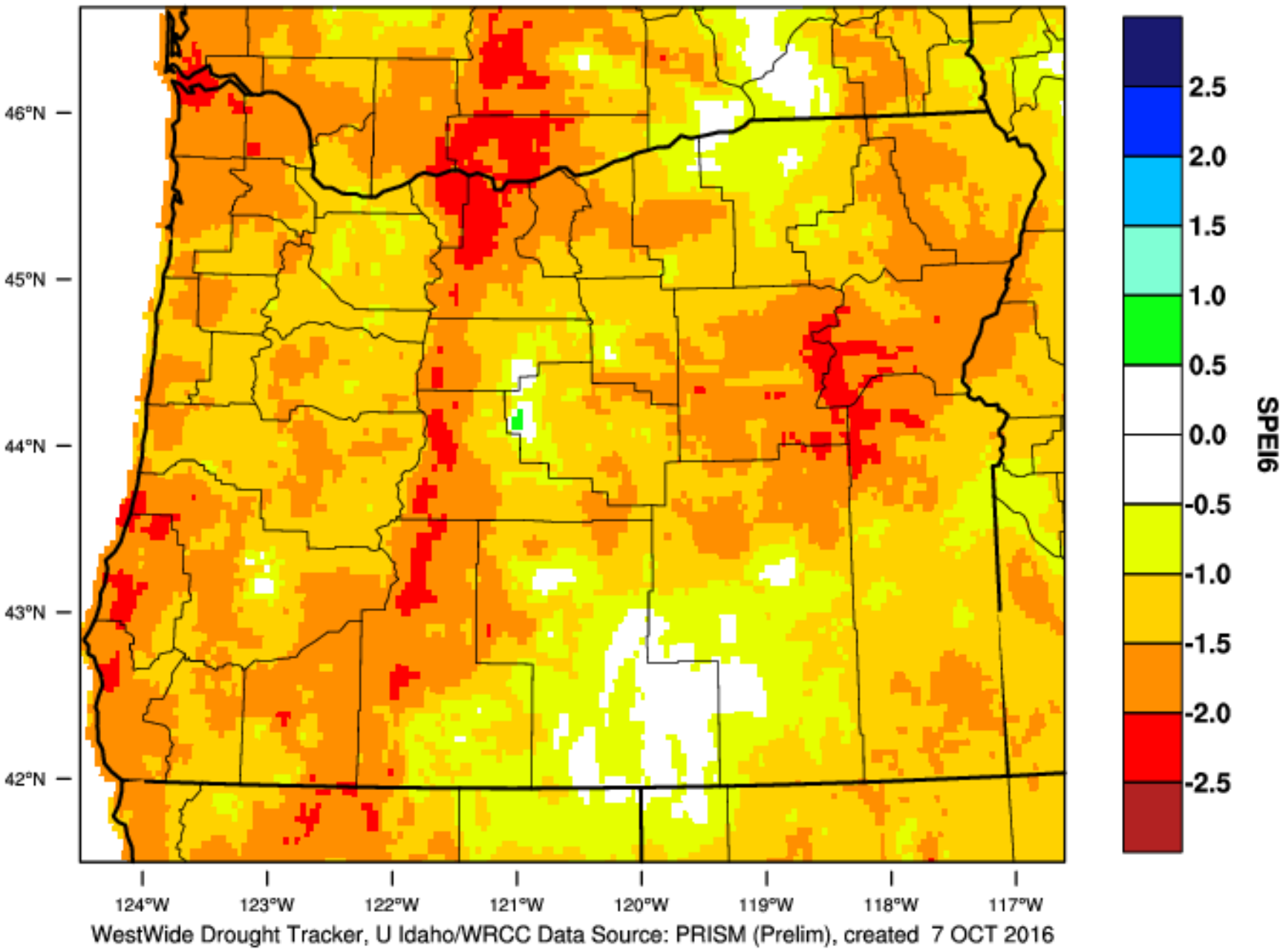


Oregon - 3 month SPEI

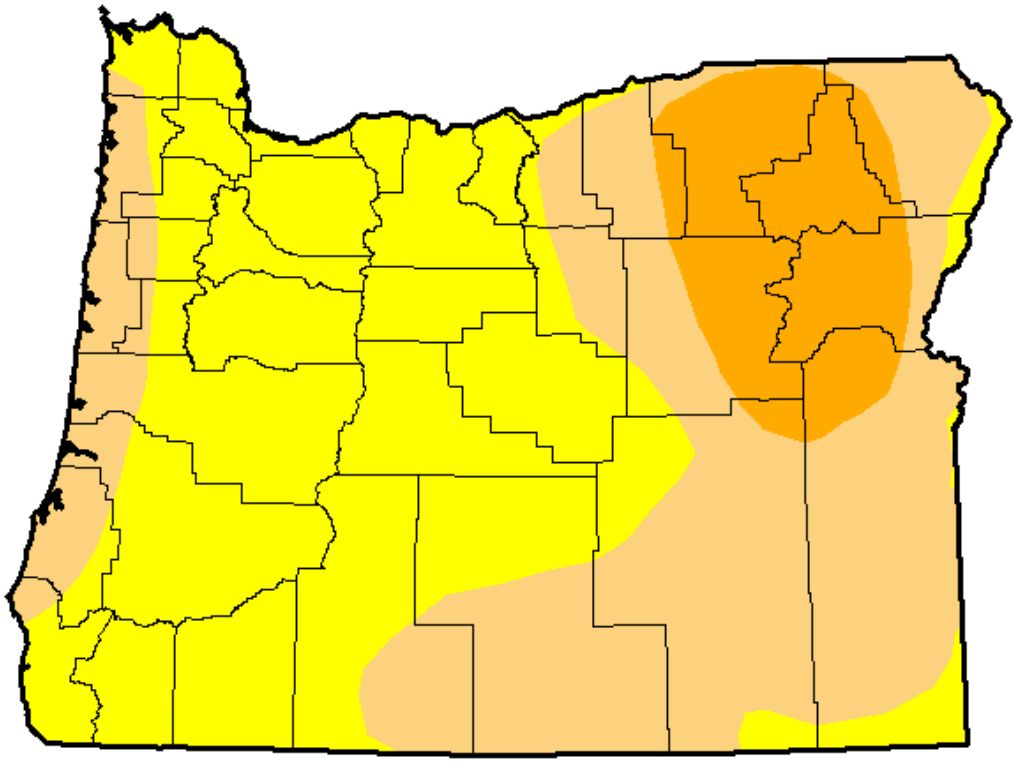
September 2016



WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 OCT 2016


Oregon - 6 month SPEI
September 2016
46°N
45°N
44°N
43°N
42°N
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
SPEI6
WestWide Drought Tracker, U Idaho/WRCC Data Source: PRISM (Prelim), created 7 OCT 2016

U.S. Drought Monitor
Oregon



October 4, 2016

(Released Thursday, Oct. 6, 2016)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	50.28	12.30	0.00	0.00
Last Week 9/27/2016	0.00	100.00	50.59	12.30	0.00	0.00
3 Months Ago 7/5/2016	0.00	100.00	49.75	0.00	0.00	0.00
Start of Calendar Year 12/29/2015	14.52	85.48	80.45	65.33	39.55	0.00
Start of Water Year 9/27/2016	0.00	100.00	50.59	12.30	0.00	0.00
One Year Ago 10/6/2015	0.00	100.00	100.00	100.00	67.29	0.00

Intensity:

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

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

Author:
Brian Fuchs
National Drought Mitigation Center

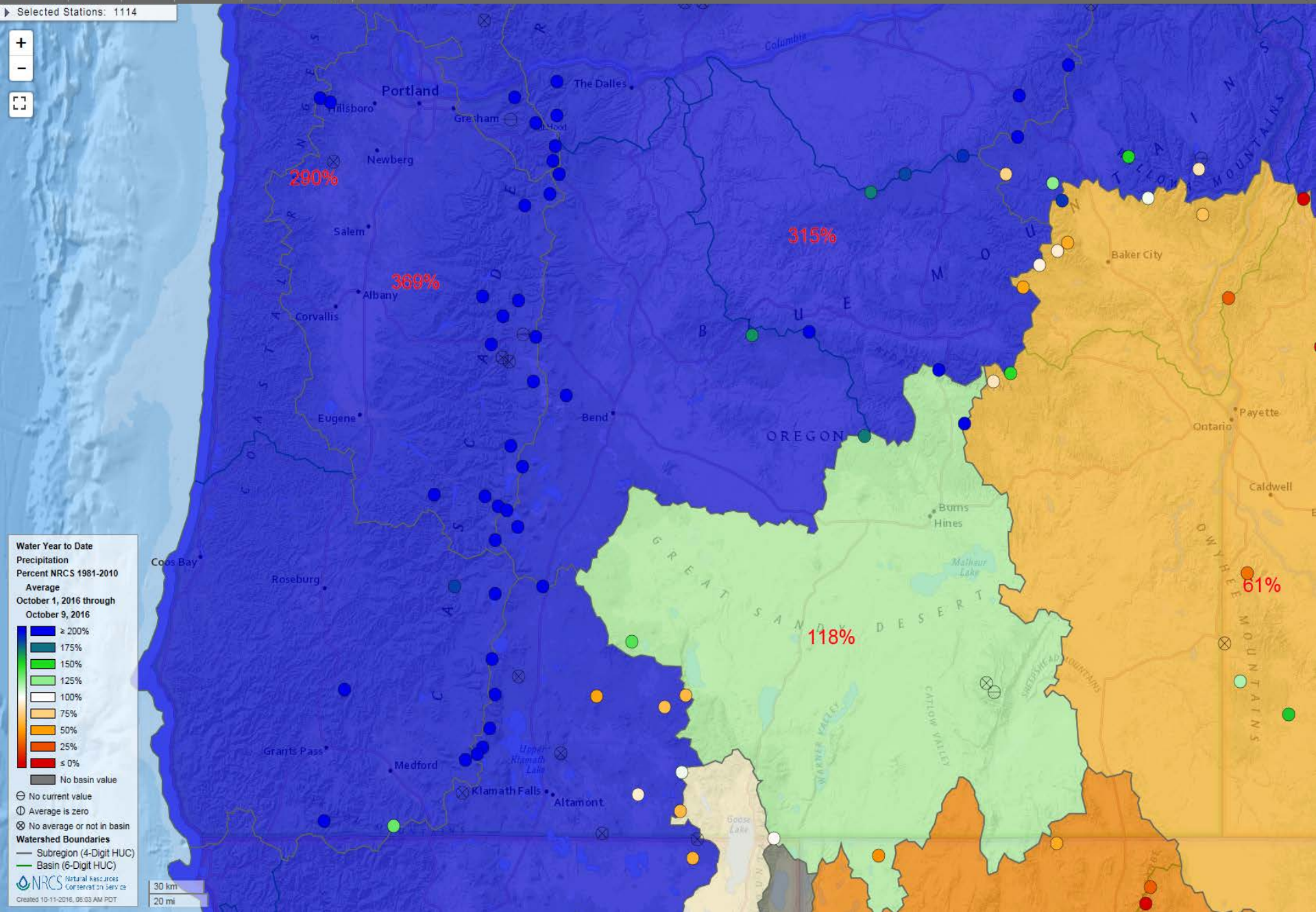
http://droughtmonitor.unl.edu/

Oregon Water Supply Availability Committee

October 11, 2016

H. Scott Oviatt
Snow Survey Supervisory Hydrologist
USDA NRCS Oregon
Scott.Oviatt@or.usda.gov
503-414-3271
http://www.nrcs.usda.gov/wps/portal/nrcs/main/or/snow/

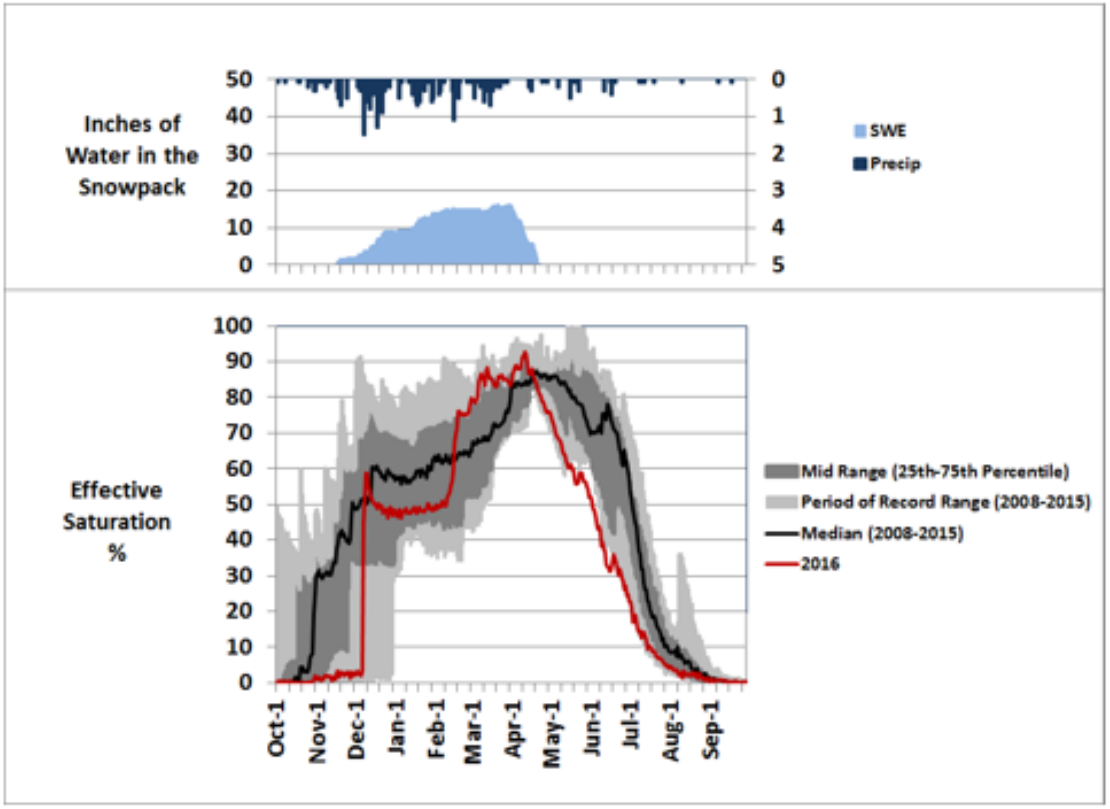
NRCS Natural Resources Conservation Service


Selected Stations: 1114
Portland
Hillsboro
Gresham
The Dalles
Mt Hood
Newberg
Salem
Albany
Corvallis
Eugene
Bend
Baker City
Ontario
Payette
Caldwell
Burns
Hines
Coos Bay
Roseburg
Grants Pass
Medford
Klamath Falls
Altamont
290%
369%
315%
118%
61%
OREGON
Columbia
Malheur Lake
Upper Klamath Lake
Goose Lake
Water Year to Date Precipitation
Percent NRCS 1981-2010 Average
October 1, 2016 through October 9, 2016
≥ 200%
175%
150%
125%
100%
75%
50%
25%
≤ 0%
No basin value
No current value
Average is zero
No average or not in basin
Watershed Boundaries
Subregion (4-Digit HUC)
Basin (6-Digit HUC)
Created 10-11-2016, 06:03 AM PDT
30 km
20 mi

Bourne, 5850'elevation

2016 Soil Moisture Conditions:

- Spring soil moisture levels reached record lows during May and June.
- As of October 1st, the soil moisture is 0.25% effectively saturated which is normal for this time of year.

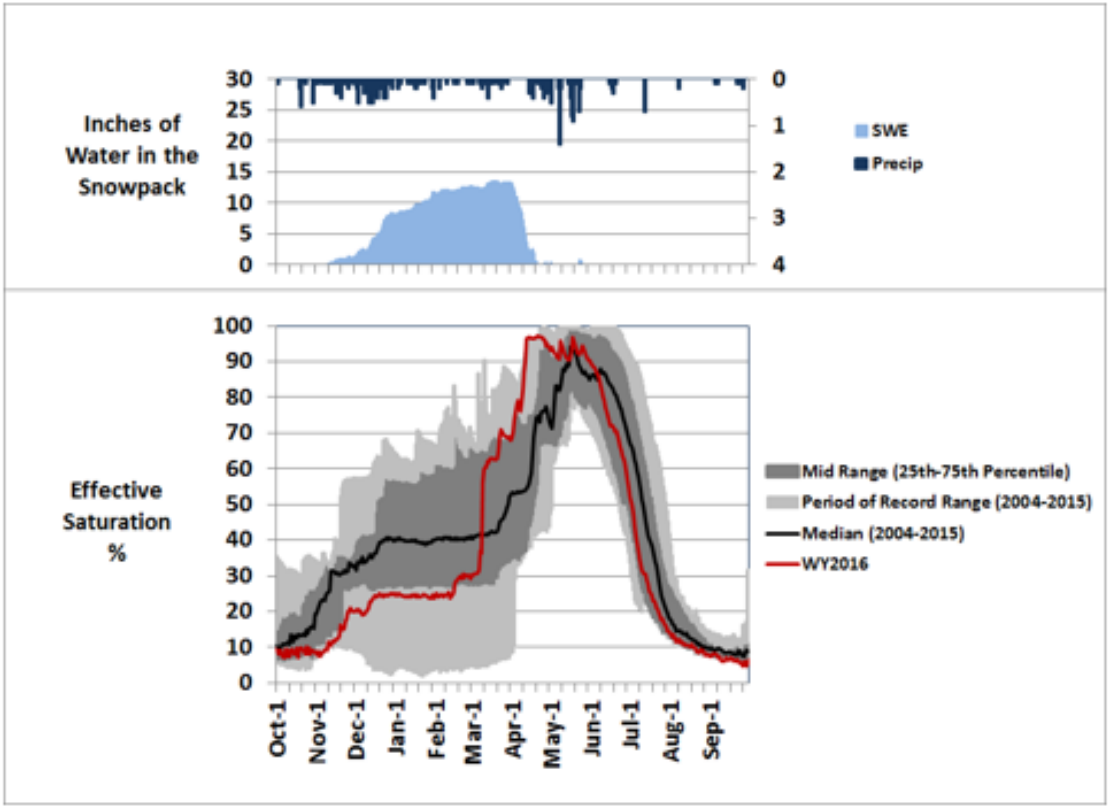


Site Characteristics: Bourne SNOTEL site sits on volcanic soils formed from ash overlying colluvium and residuum from andesitic basalt and basalt. The soil series is Monumentrock, which consists of deep, well drained soils. The site has a slope of 25 percent. Mean annual precipitation is approximately 33 inches, with roughly 50% falling as snow. Vegetation is subalpine fir, lodgepole pine, western larch, grand fir, Douglas fir, grouse huckleberry, bearberry, buffalo berry, willow, sickletop lousewort, heartleaf arnica, pearly everlasting, grasses and sedges. Soil moisture probes have been installed here since 2008, at depths of 2, 4, 8 and 40 inches. The silt equation is currently being applied to all probes.

Silvies, 6990’ elevation

2016 Soil Moisture Conditions:

- As of October 1st, the soil moisture is 6% effectively saturated which is about normal for this time of year.

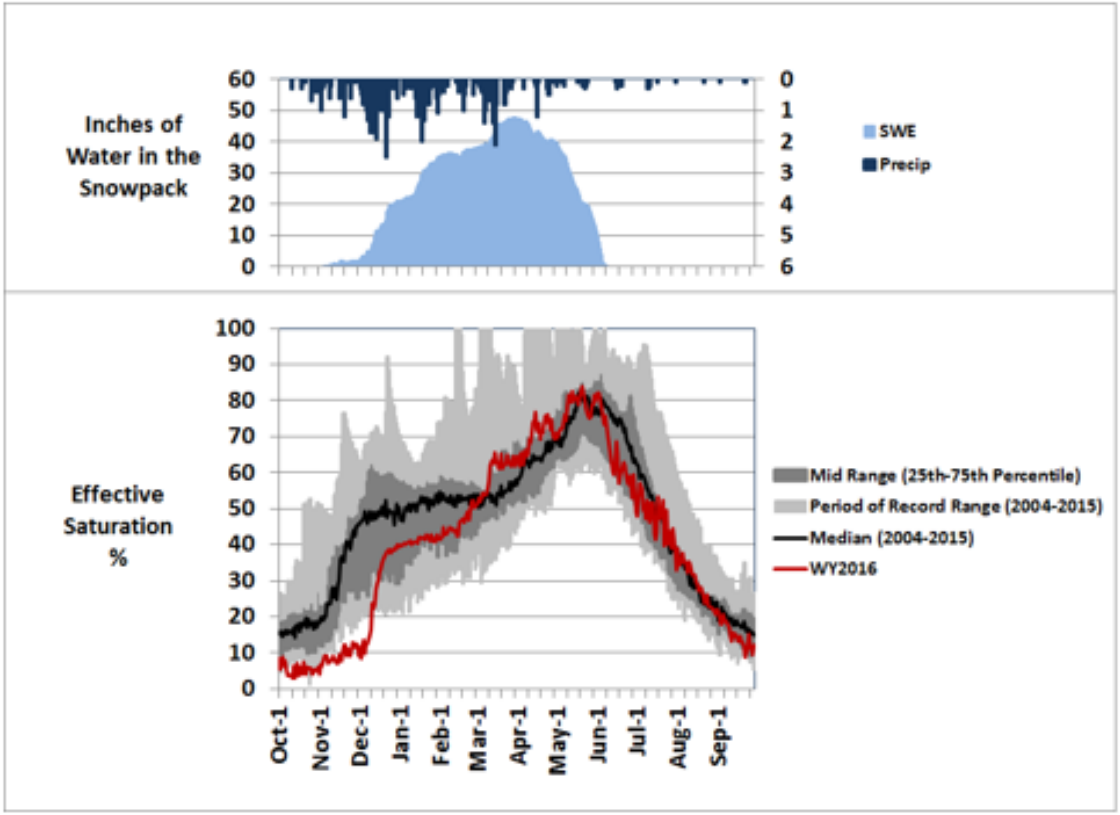


Site Characteristics: Silvies SNOTEL site sits on the Hackwood soil series which consists of very deep, well drained soils that formed in alluvium and colluvium derived from quartzite, conglomerate, and igneous rocks with a component of loess. The site has a slope of 2 percent. Mean annual precipitation is approximately 31 inches, with roughly 58% falling as snow. Vegetation is forest canopy of quaking aspen with a sparse understory of mountain brome and tall bluegrass. Soil moisture probes have been installed here since 2004, at depths of 2, 8, 20 and 40 inches. The silt equation is currently being applied to all probes.

Annie Springs, 6010' elevation

2016 Soil Moisture Conditions:

- As of October 1st, the soil moisture is 10% effectively saturated which is normal for this time of year.



Site Characteristics: Annie Springs SNOTEL site sits on volcanic soils formed when Mt. Mazama erupted, forming nearby Crater Lake. The soil series is Castlecrest, which consists of very deep, somewhat excessively drained soils formed in ash mixed with pumice, cinders and other volcanic fragments. The site has a slope of 2 to 10 percent. Mean annual precipitation is approximately 70 inches, with roughly 56% falling as snow. Vegetation is mountain hemlock, Shasta red fir, and lodge pole pine with a sparse understory of shrubs and herbs. Soil moisture probes have been installed here since 2004, at depths of 2, 4, 8, 20 and 40 inches. The silt equation is currently being applied to all probes.

Water Year 2016 Summary

I. **Beginning the water year: October through January 1st**

   a. ***Above normal precipitation and snowpack conditions summary***

II. **Snow accumulation season: January through April**

   a. ***Most of the state accumulated a near normal snowpack in the mountains***

III. **Peak of the snow season:**

   a. ***Near normal snowpack on April 1st except NW Oregon***

IV. **Springtime conditions: April through June**

   a. ***Record heat rapidly depleted the snowpack during April***

   b. Spring precipitation was below average for most of the state

V. **Summertime Streamflow**

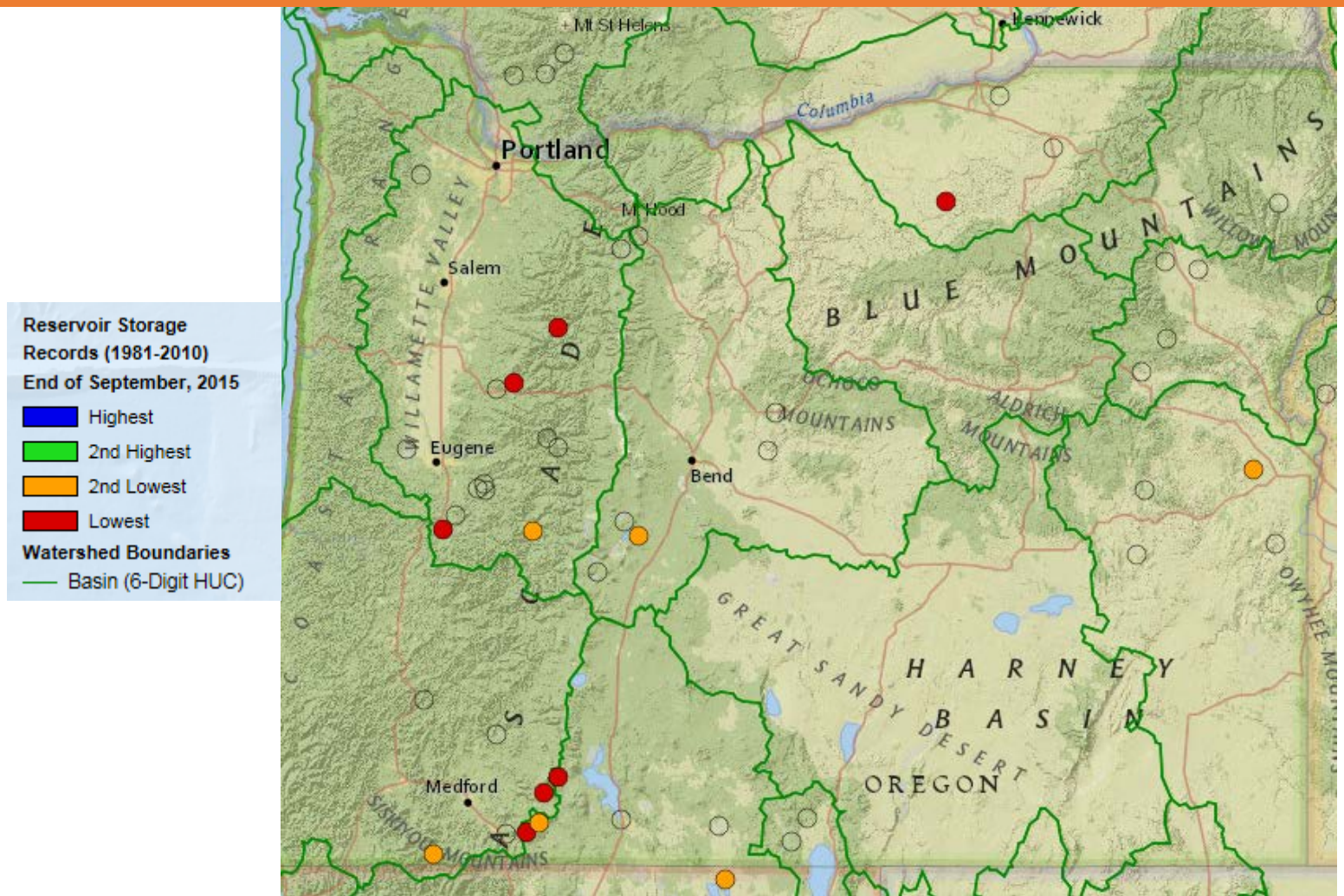
   a. Streams peaked early and began to recede earlier than normal

   b. Well below average streamflow occurred in most rivers throughout the state

Leading into Water Year 2016 (re-cap of 2015)

*Winter 2015 had a state-wide record low snowpack.
*Summer 2015 – record-breaking temperatures, placing a high demand on reservoir storage and streamflow for water supplies.
*The 2015 fire season was active.

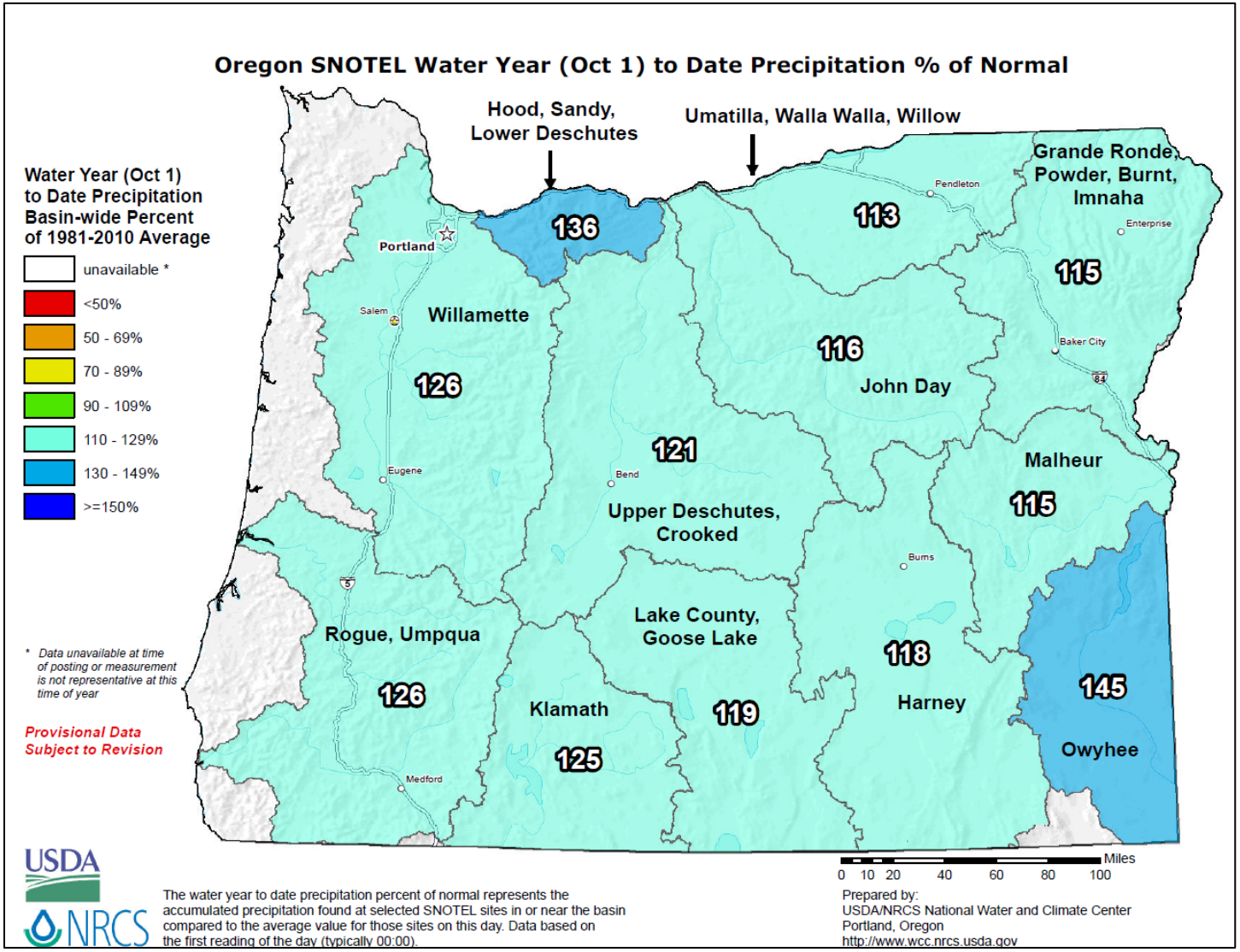
Record Low Carryover Storage in many of Oregon's major irrigation Reservoirs (end of Sept 2015):



October - December Precipitation

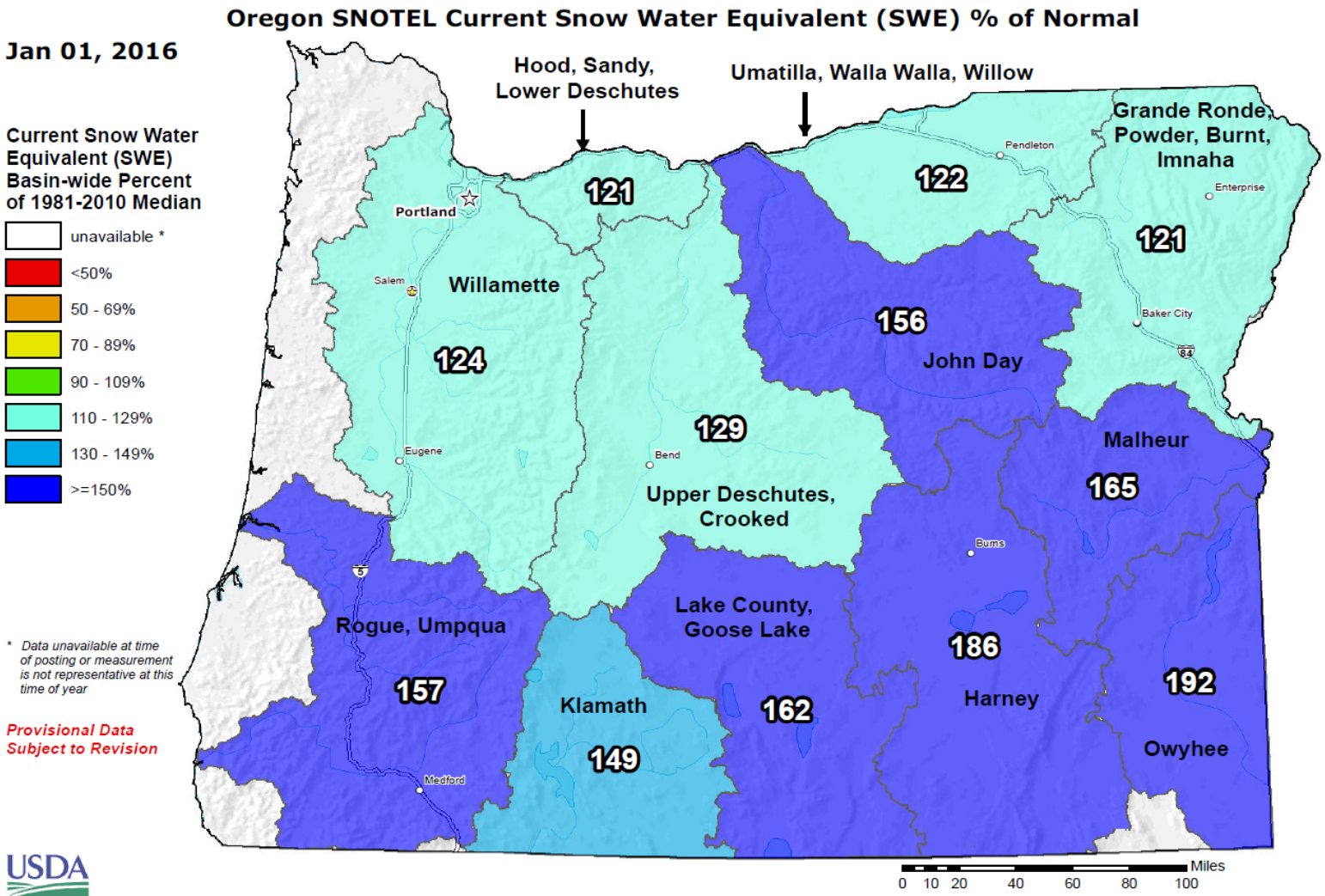
Wet start to water year 2016.

All basins received above average precipitation during Oct-Dec.



January 1, 2016 Snowpack

Above normal snowpack for Oregon



USDA NRCS

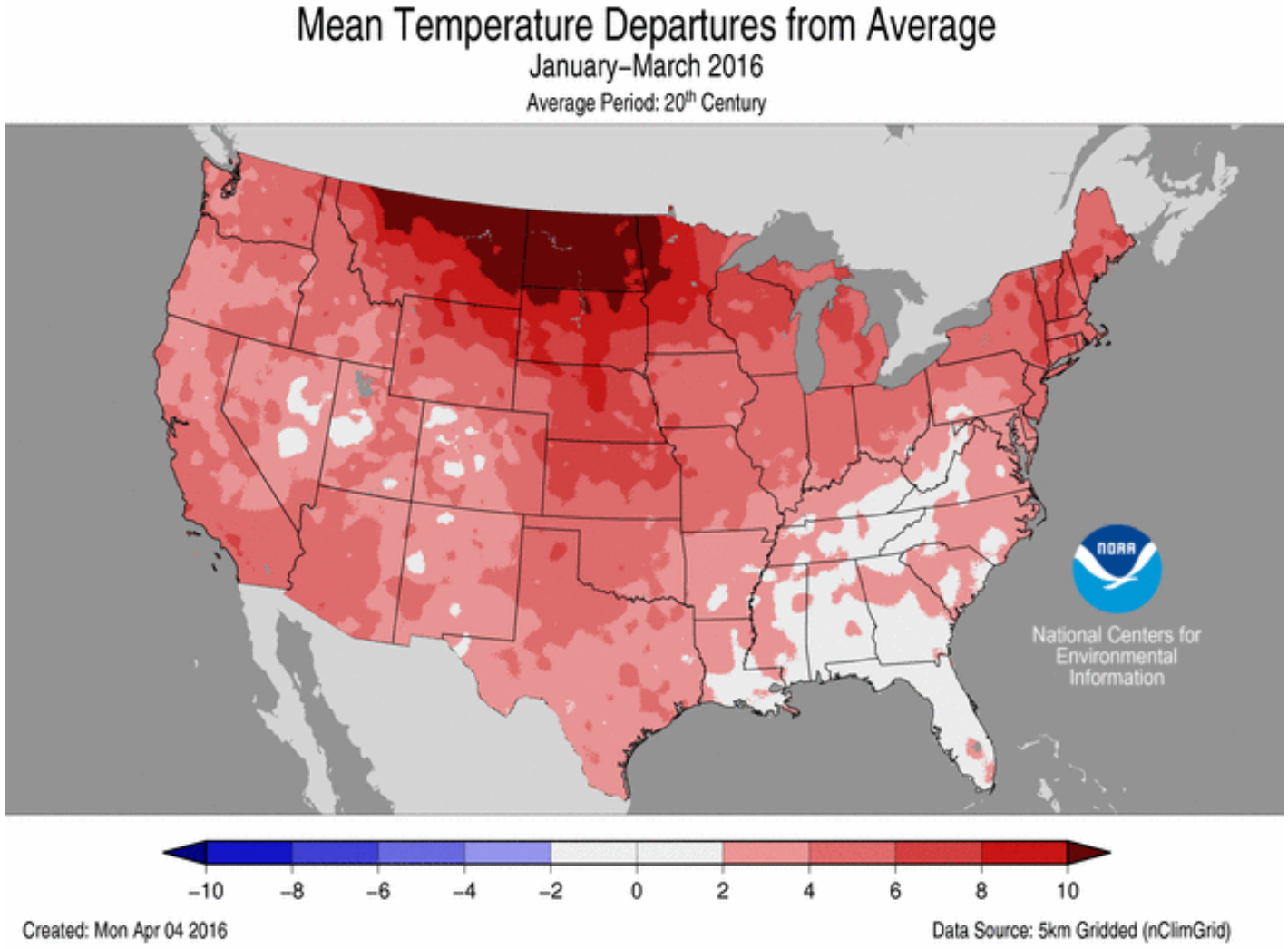
The snow water equivalent percent of normal represents the current snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov

Warmer than Usual Winter Temperatures

January - March

***Winter temperatures played a major role in shaping Oregon's winter snowpack, especially in NW Oregon**

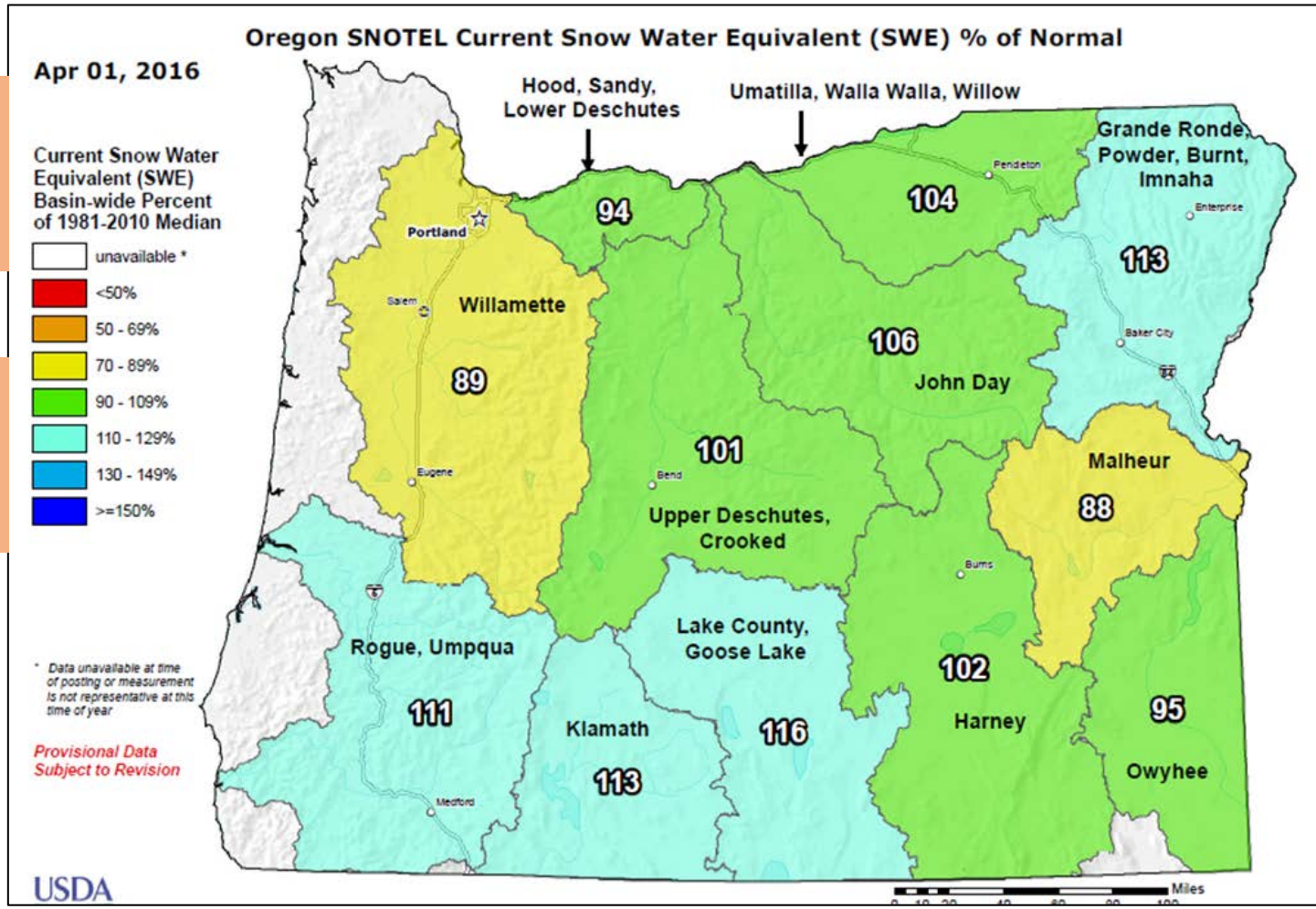


Peak of the Snow Accumulation Season
April 1st 2016:

Most of the state had a near normal to above normal snowpack at the peak of the season

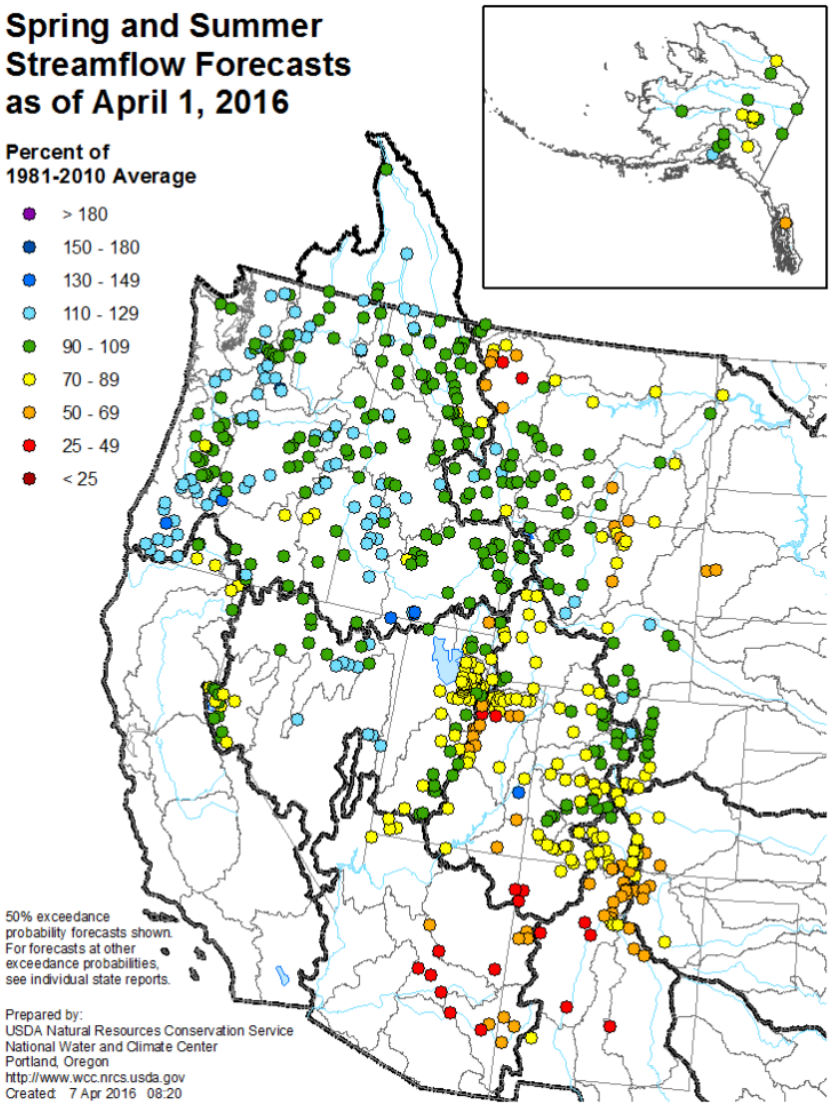
***Warmer winter temperatures resulted in more winter rain, (and less snow) than normal in the mountains of the Willamette basin.**

***Winter temperatures were overall warmer than usual but it was cold enough to keep normal amounts of seasonal snowpack for most of the state.**



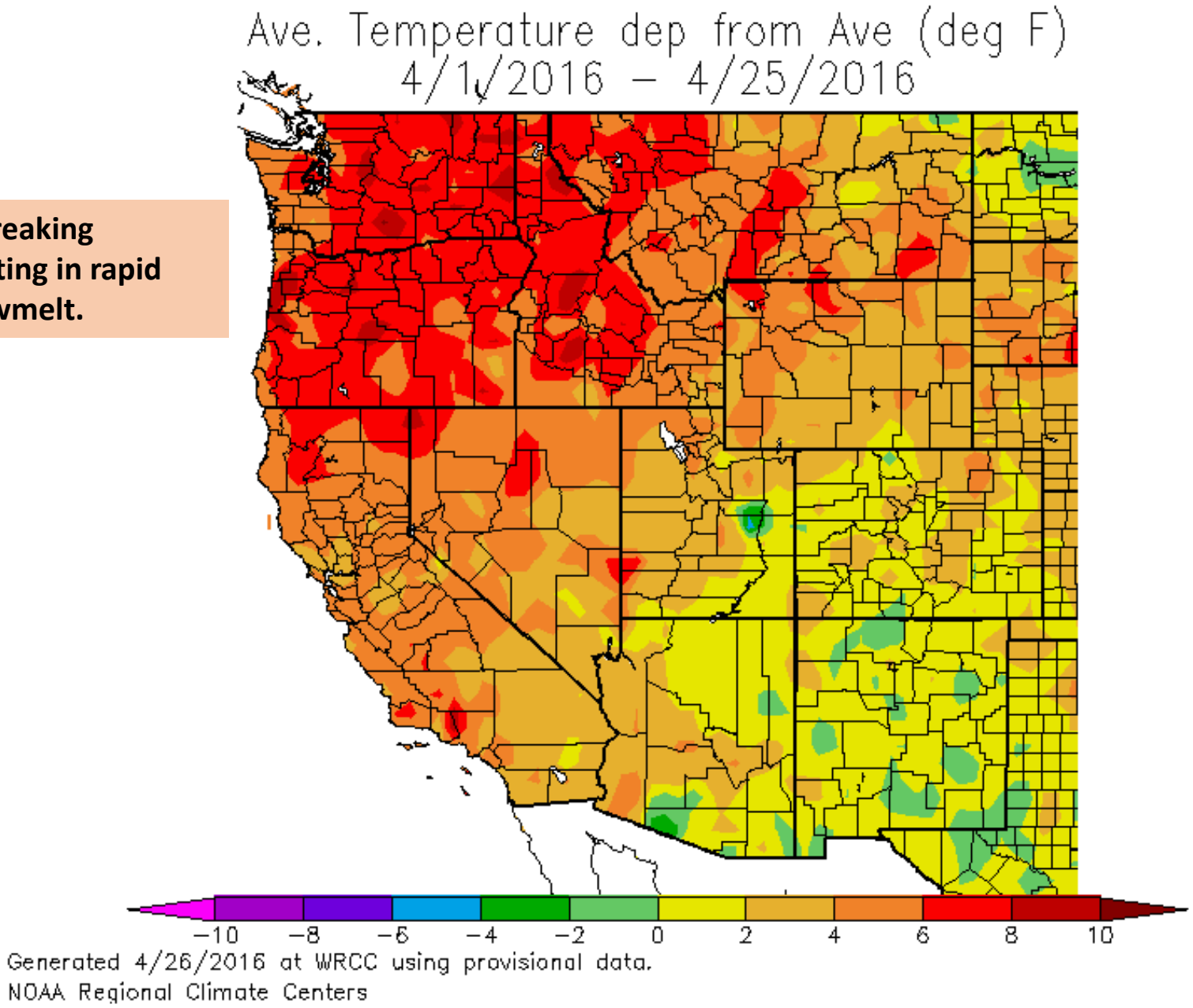
Streamflow Forecasts on April 1st:

***Water Supply Forecasts for the Apr-Sep period were calling for average to above average streamflow for most rivers on April 1st**

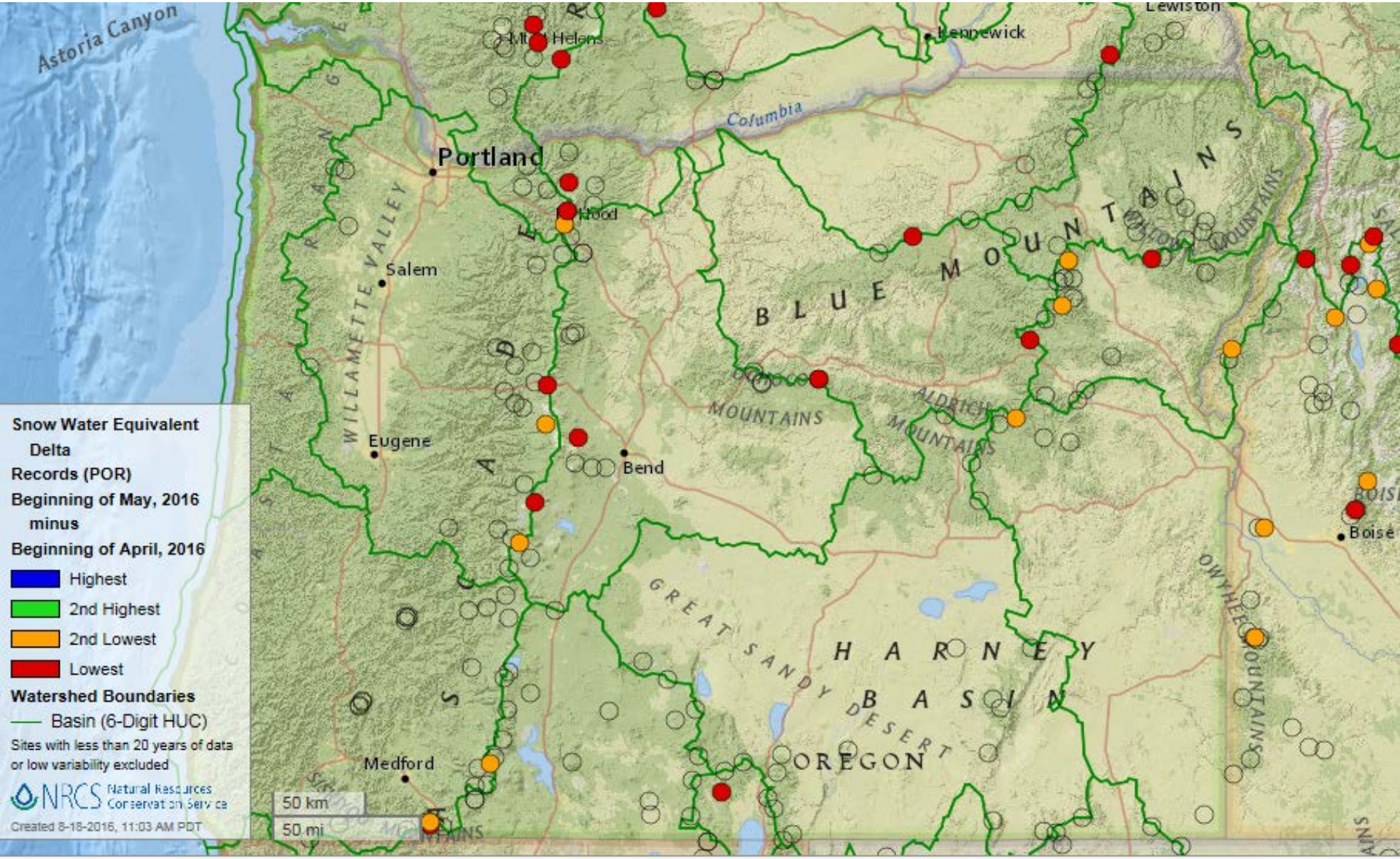


Heat Wave, April 2016

***April had record-breaking temperatures, resulting in rapid and premature snowmelt.**

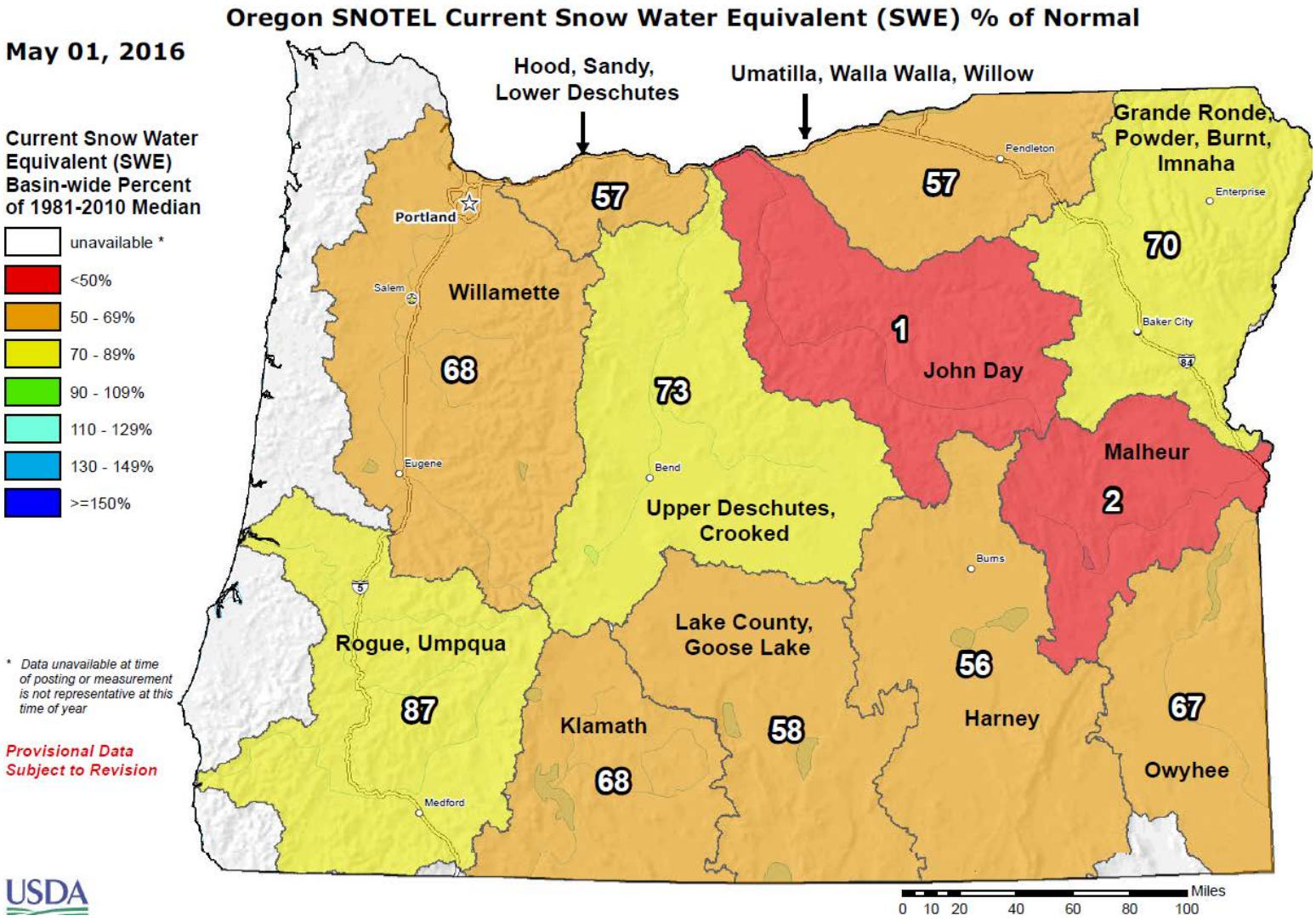


Record-breaking rate of snowmelt in April



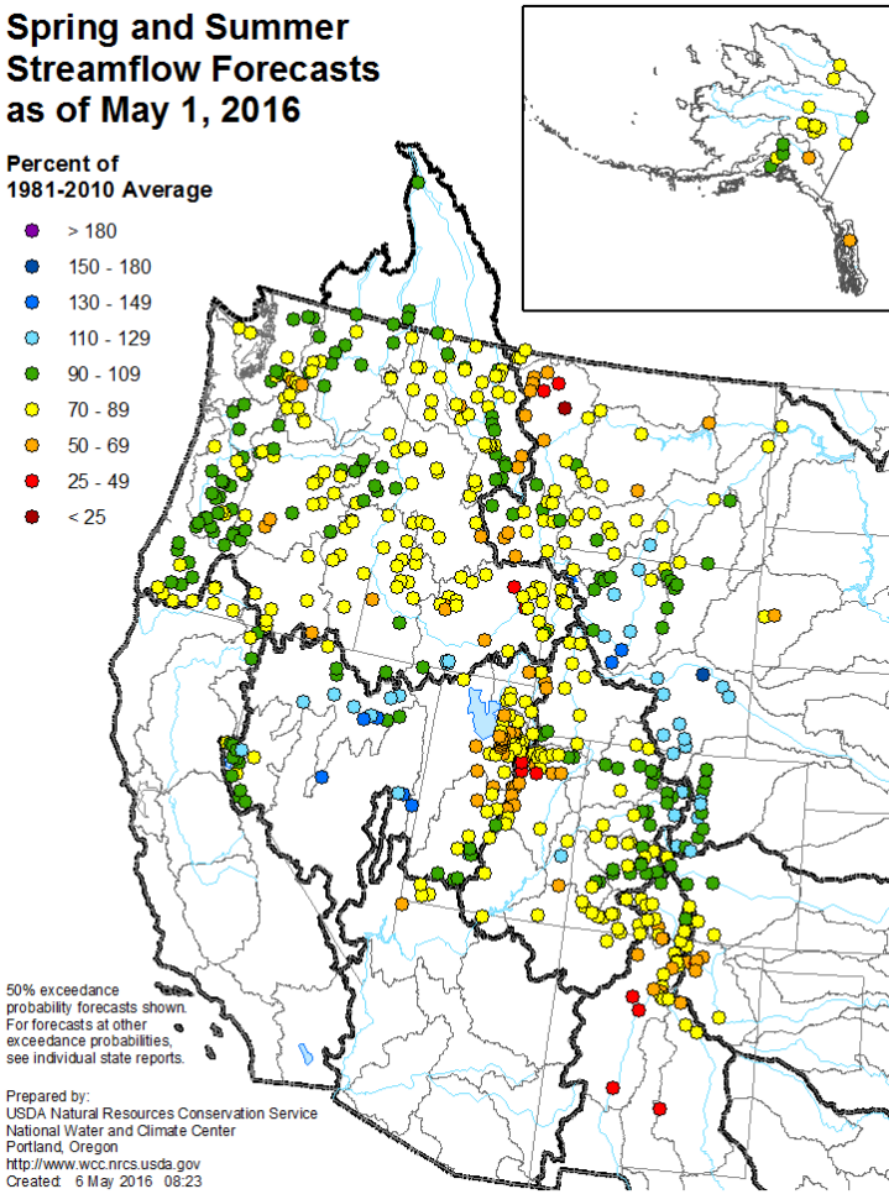
May 1st snowpack conditions

***Rapid snowmelt led to well below normal snowpack conditions by May 1st**



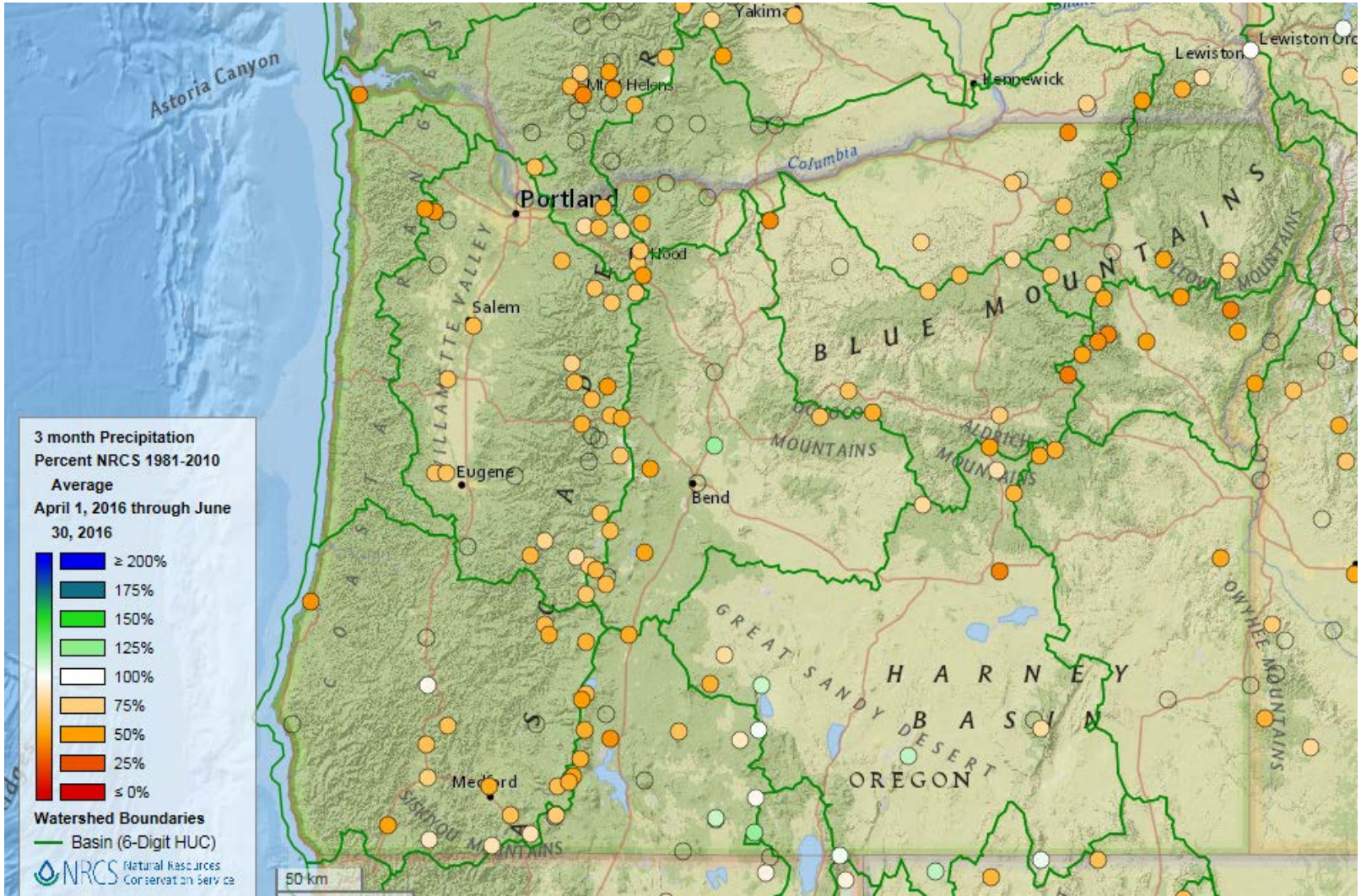
Streamflow Forecasts - May 1st:

May 1st forecasts (May – September) dropped significantly and many rivers were forecast to experience well below normal streamflows

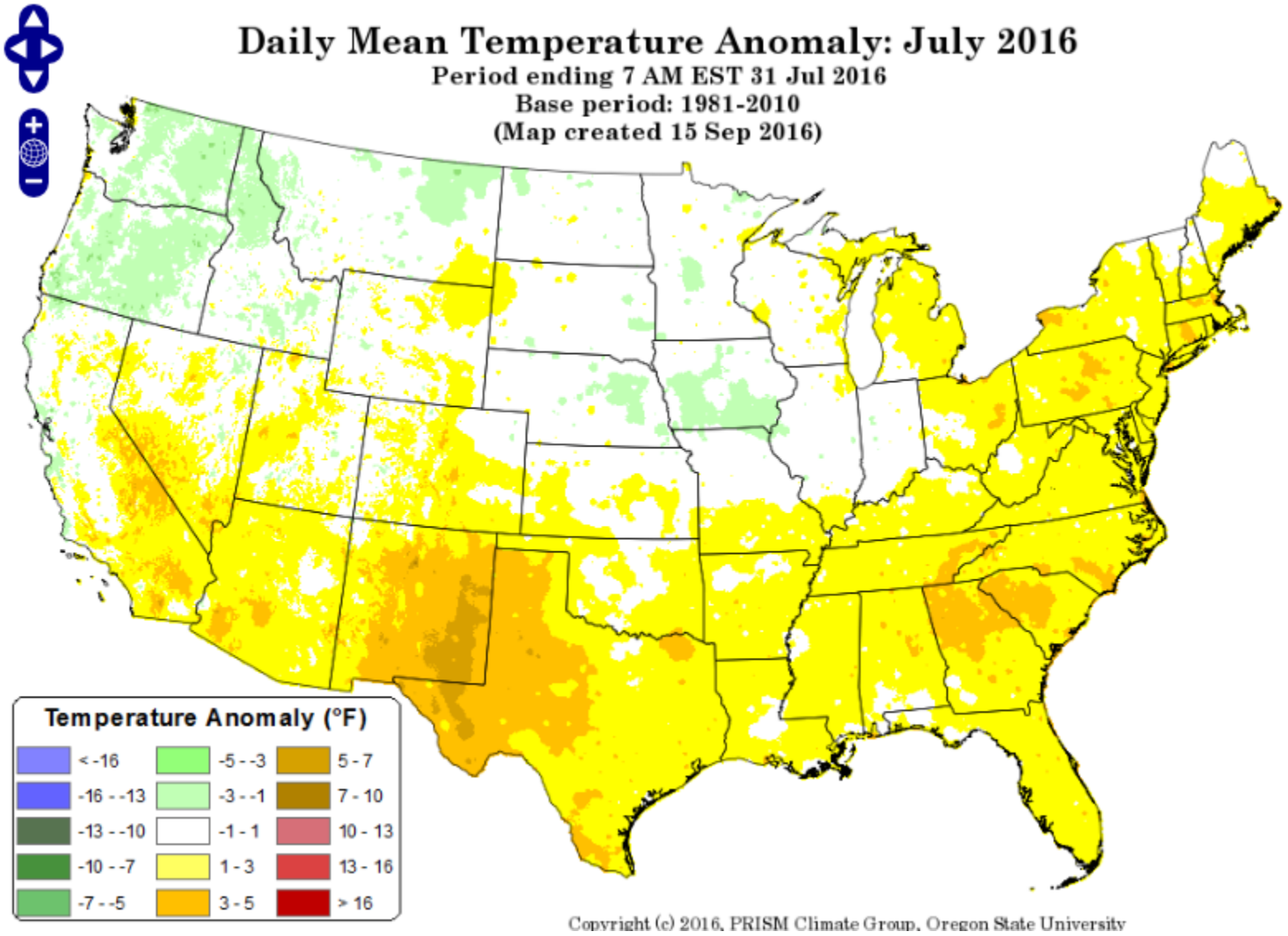


April – June Precipitation

***Spring precipitation was below average for most of the state.**
***Areas of southern Oregon (Klamath Basin), received near average amounts.**
***Meanwhile, temperatures were much warmer than normal during this time.**

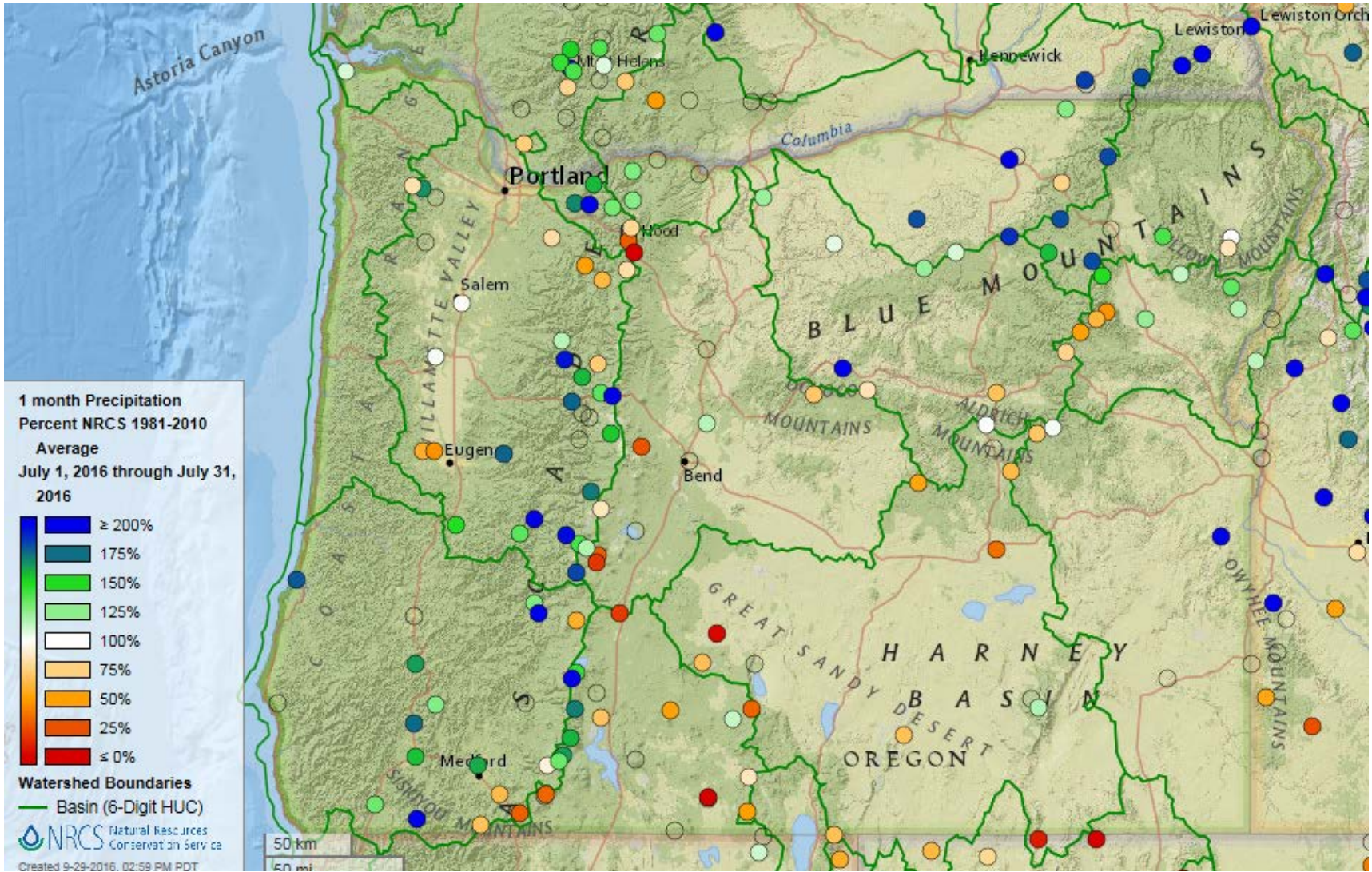


July was Cooler than Normal for the Pacific Northwest



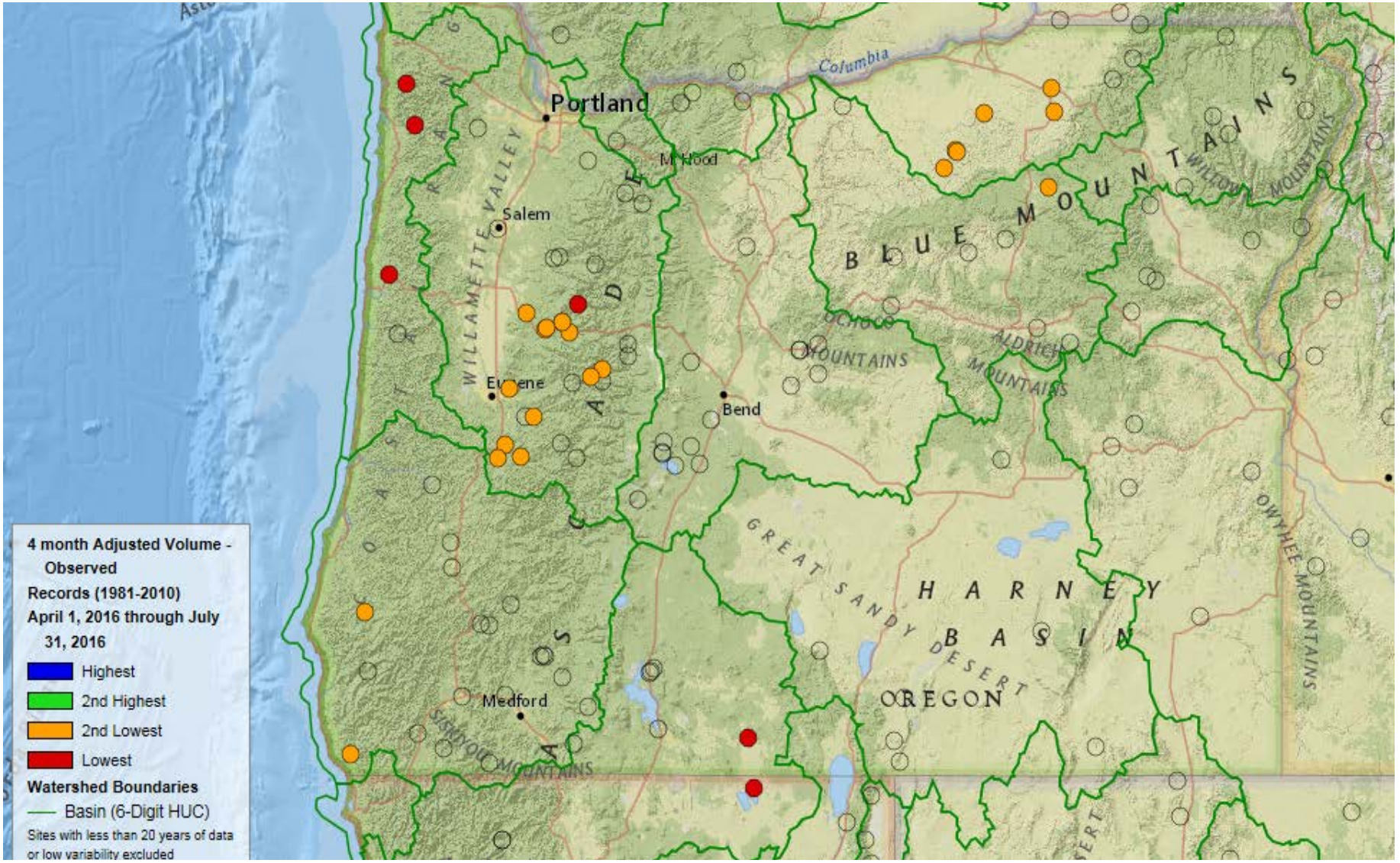
July Precipitation

***July near average to above average precipitation for Northern and Western Oregon.**
***Otherwise, dry conditions continued throughout the rest of the state.**



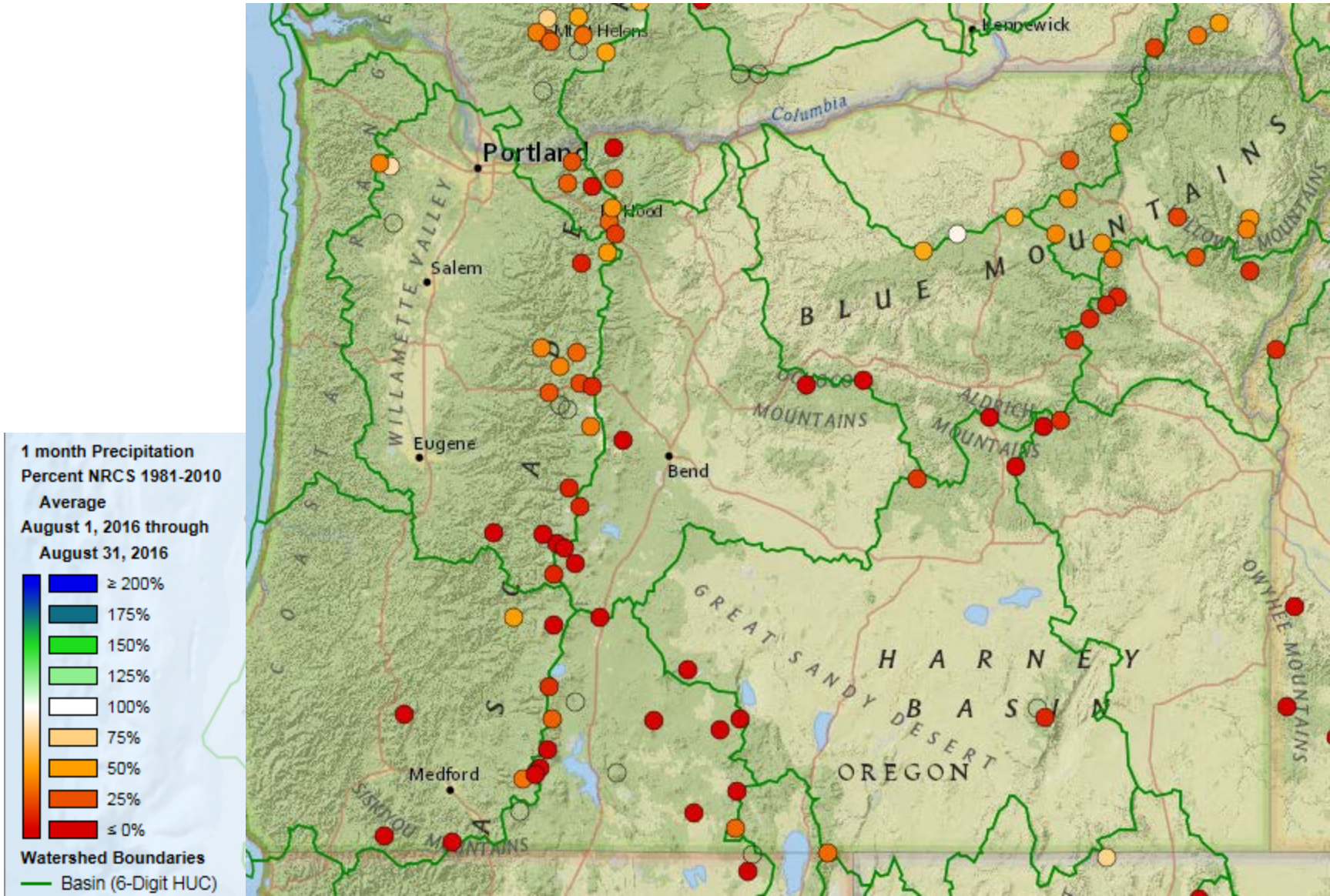
Record-Breaking Spring & Summer Streamflow

***The April – July streamflow was record breaking low in some cases.**



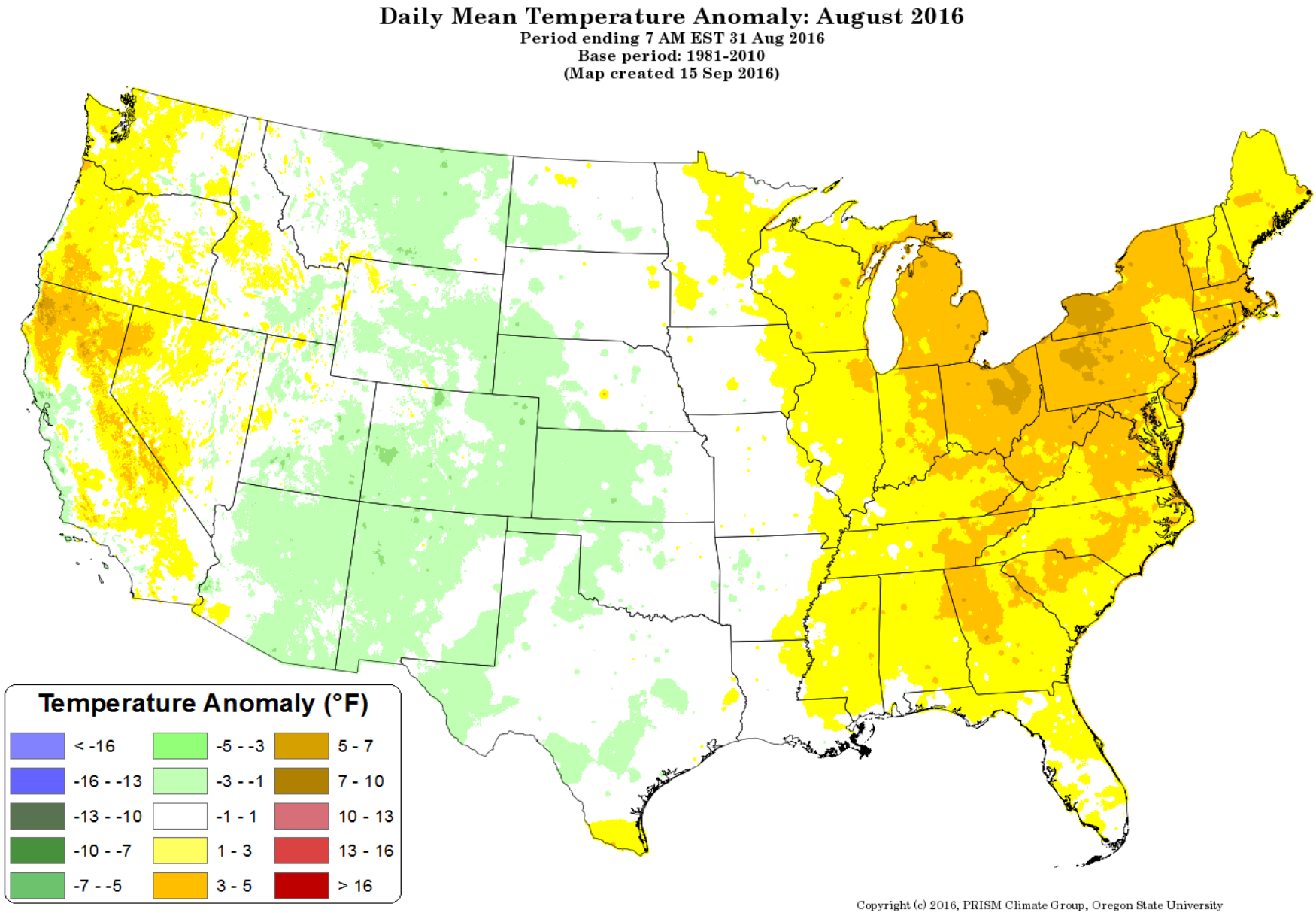
August Precipitation-Dry

***August - dry conditions throughout the state and temperatures were warmer than normal**



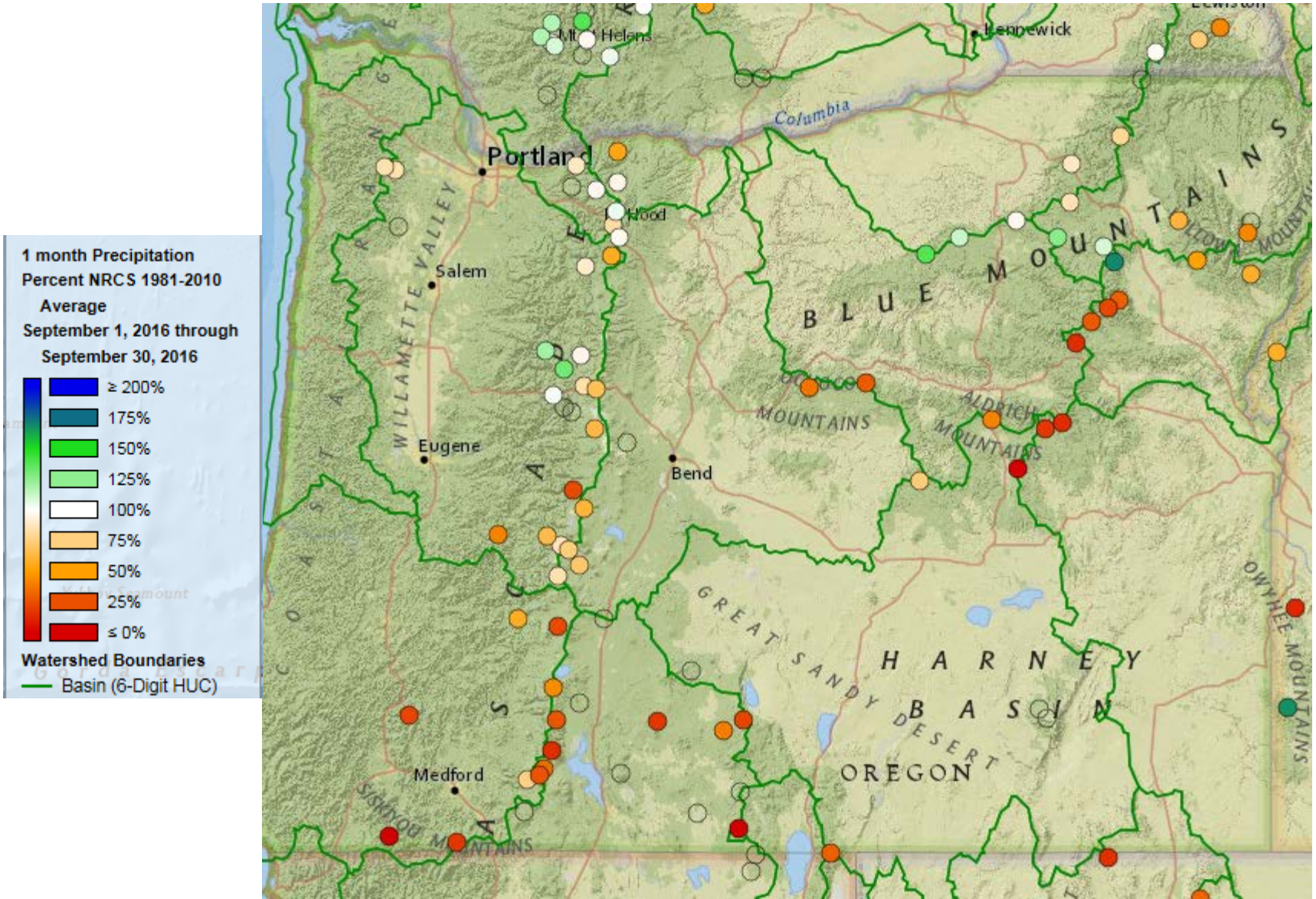
August Temperatures-Hot for Most of the State

Exception: Areas in northern and central Oregon had near normal temperatures for the month.



September Precipitation

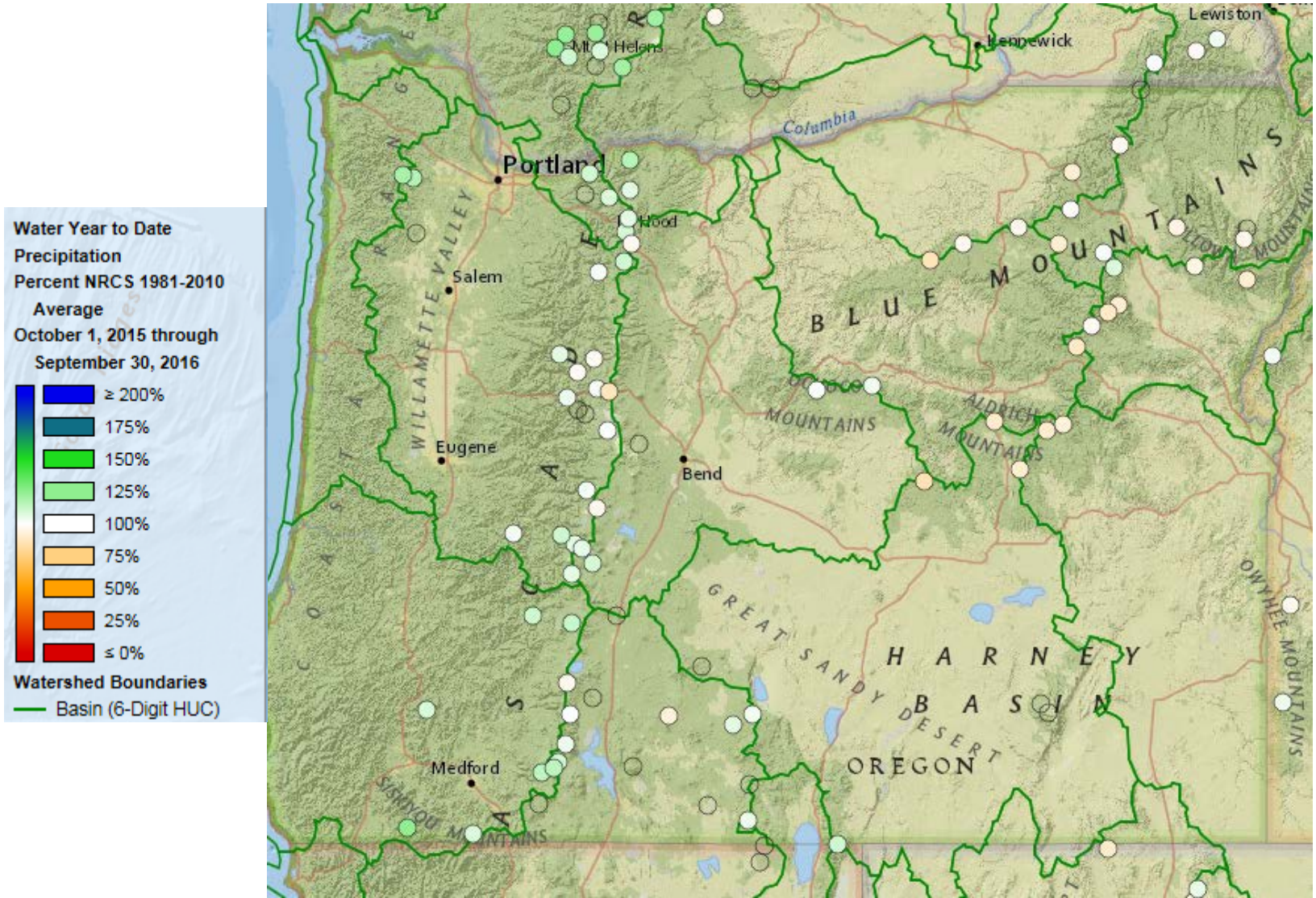
***September had an increase in precipitation with a hint of the rainy season in Oregon's northern mountains, but dry elsewhere.**



2016 Water Year Precipitation-near normal

October 1st – September 30th

***Despite some dry months during the year, the total amount received for the water year ended near average for the state.**



Summary

* Temperatures were warmer than normal for most of the season, but were cold enough to have a near normal snowpack throughout the accumulation season for most of the state.

* NW Oregon fell short of reaching the normal seasonal peak amount of snowpack, but received the normal amount of precipitation, illustrating that more rain fell than normal during the winter.

*The month of April brought record breaking temperatures, which rapidly depleted the state's snowpack.

*The early and rapid snowmelt helped boost reservoirs early in the season, but streams peaked early and began receding early. This placed a high demand for water resources in the spring and early summer.

*Streamflow was well below normal throughout the summer and some rivers experienced record low flows.

2016 illustrated:

*Temperatures can be warmer than normal but cold enough to receive a normal snowpack.

*However, achieving the normal amount of snow at the peak of the season alone is not enough. The rate and timing of snowmelt, are also major factors in sustaining streamflows at normal levels into the summer months.

Oregon Water Supply Availability Committee

October 11, 2016

H. Scott Oviatt
Snow Survey Supervisory Hydrologist
USDA NRCS Oregon
Scott.Oviatt@or.usda.gov
503-414-3271
http://www.nrcs.usda.gov/wps/portal/nrcs/main/or/snow/

NRCS Natural Resources Conservation Service

Thank you!