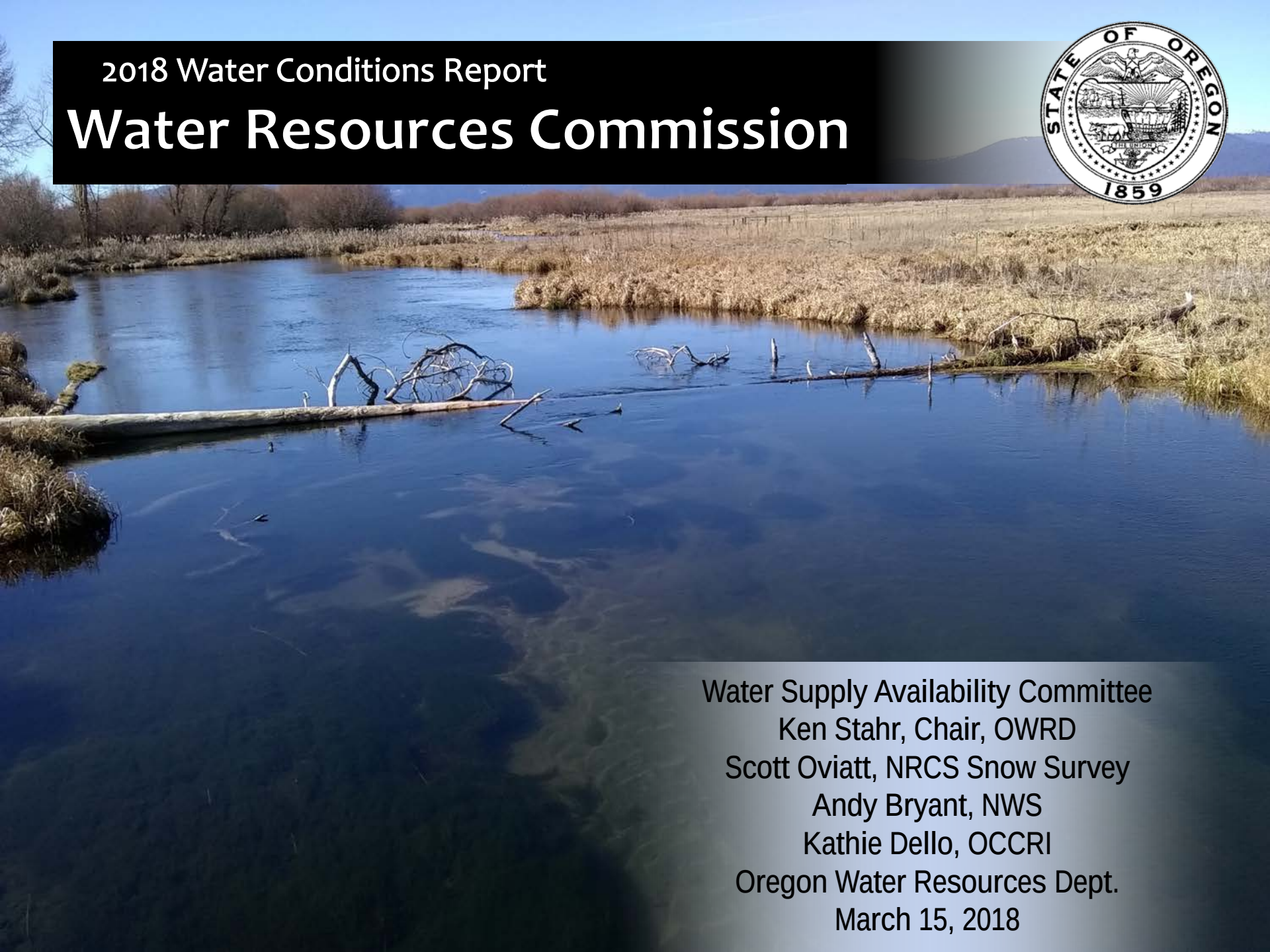
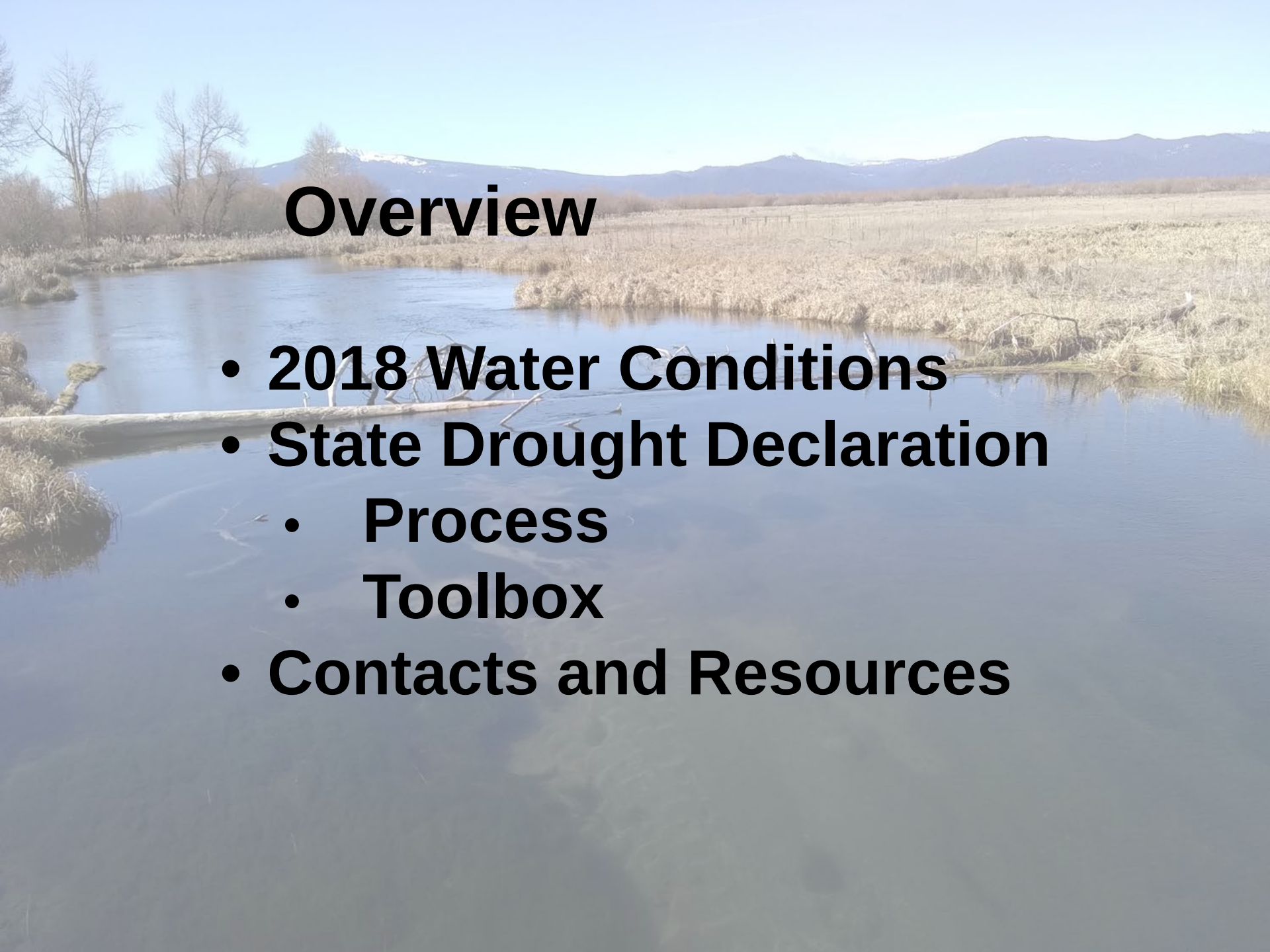


2018 Water Conditions Report

Water Resources Commission

Water Supply Availability Committee
Ken Stahr, Chair, OWRD
Scott Oviatt, NRCS Snow Survey
Andy Bryant, NWS
Kathie Dello, OCCRI
Oregon Water Resources Dept.
March 15, 2018



Overview

- 2018 Water Conditions
- State Drought Declaration
  - Process
  - Toolbox
- Contacts and Resources

Oregon Water Resources Commission Meeting
March 15, 2018

Hungry Flat Snow Course – 03/01/18
Upper Deschutes Elevation 4400’
10” Depth, 1.5” SWE - 71% Normal
Last year 5.9” SWE - 281% Normal

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

INTRODUCTION

- Approximately 50-80% of western water supply comes from snowmelt run-off
- Measurement of snow water content for determination of water supply has been on-going for over 100 years
- Due to the significance of snowmelt run-off as a major contributor to streamflow, the federal government funded a program to measure western snowpack and ultimately forecast future streamflows volumes
- Snow measurements are conducted using several methods, both manual and automated
- Forecasts and numerous other products generated from snow data are used for water supply, drought identification, recreation, flood forecasting, and many other applications

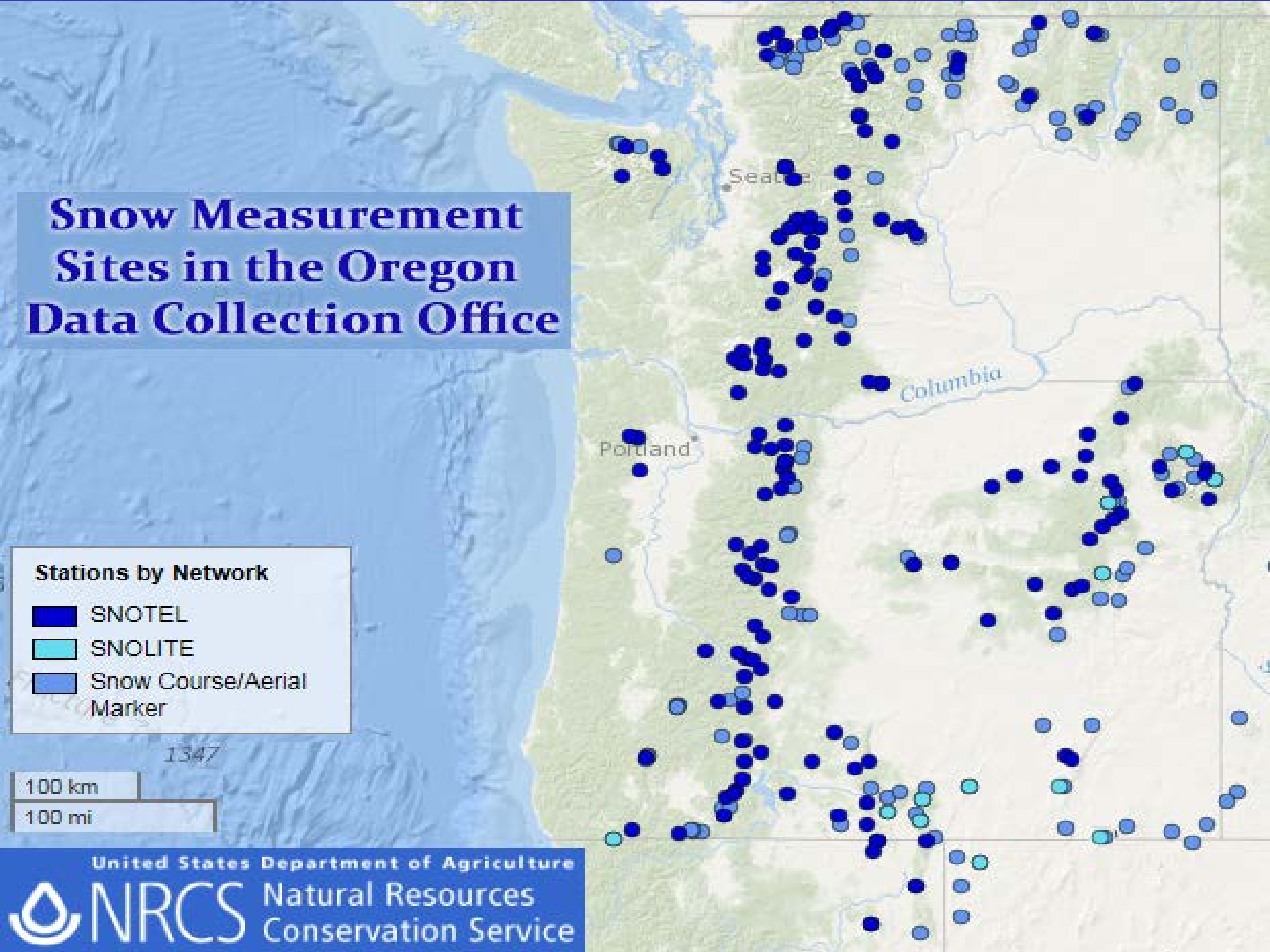
COMMON TERMINOLGY

SWE = Snow Water Equivalent, the depth of water in inches if snow was melted to liquid

Water Year Precipitation = The amount of precipitation (liquid and frozen) Accumulated from October 1 through date of reference. Water year 2018 is the period – October 1, 2017 through September 30, 2018

Streamflow Forecast = A water supply forecast issued on the first of each month From January through June. Refers to the volume of water (Thousands of Acre Feet) forecast to pass by a real-time gaging station operated by OWRD or USGS.

Snow Measurement Sites in the Oregon Data Collection Office



United States Department of Agriculture
NRCS Natural Resources Conservation Service

Data Collection Efforts

- **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

SNOW COURSES

155 Snow Courses & Aerial Markers

Manual Monthly Measurements:

Snow Water Equivalent (SWE)

Snow Depth

NRCS Natural Resources Conservation Service

Aerial Markers

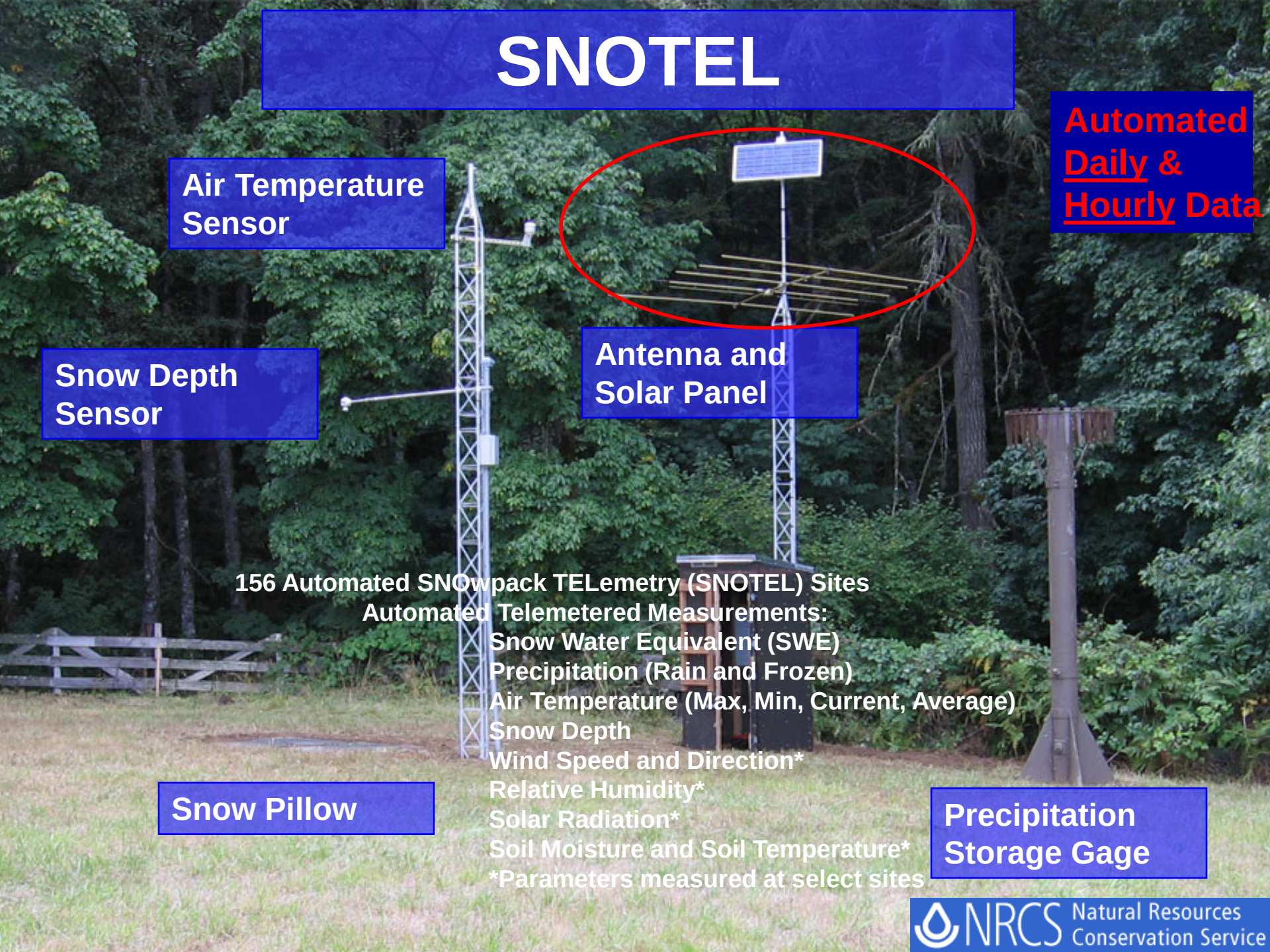
Manually Measured Monthly Data

NRCS Natural Resources Conservation Service

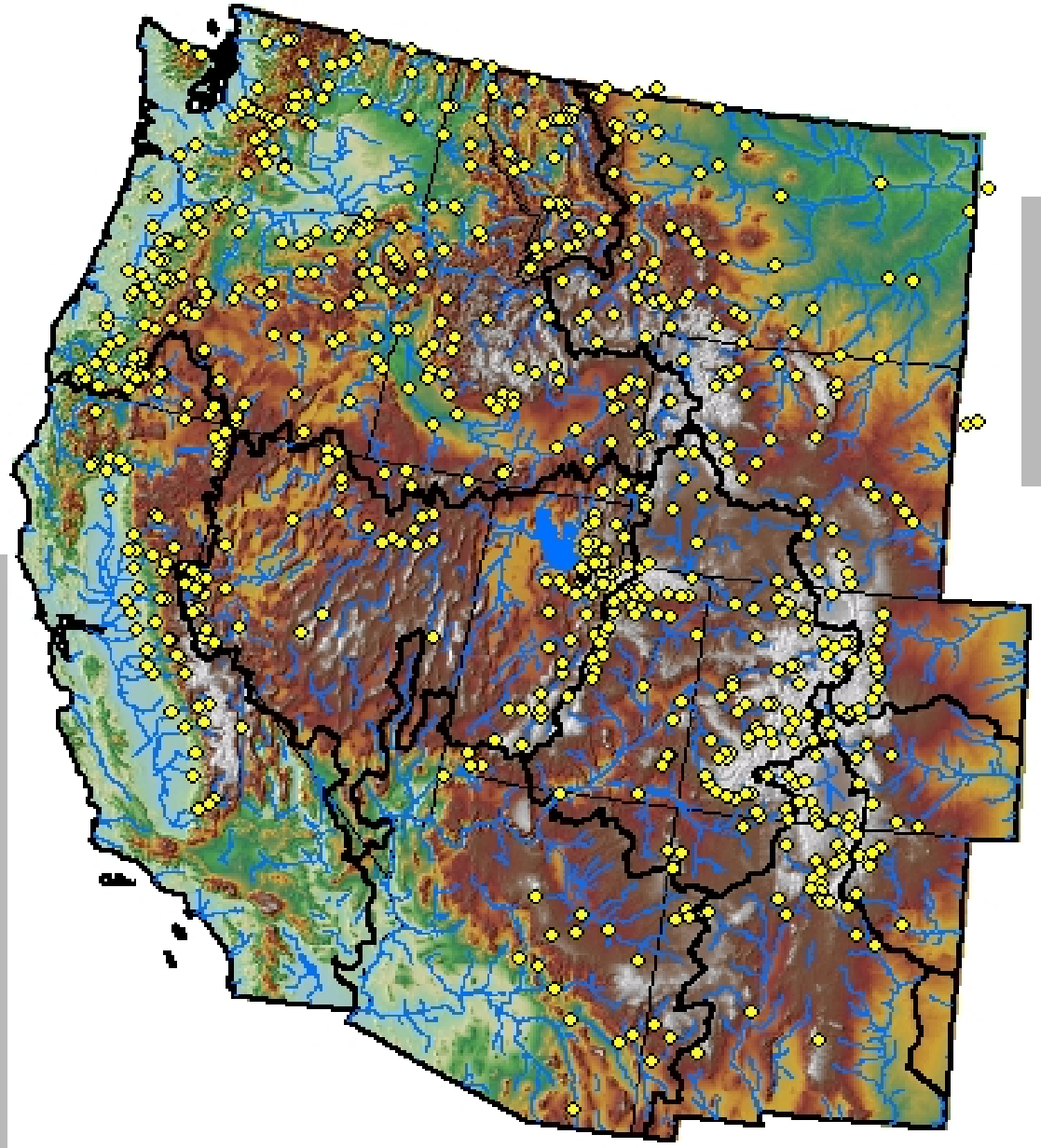
SNOLITE SITES

12 SNOLITE (Automated Aerial Marker) Sites
Automated Telemetered Measurements:
Snow Water Equivalent (SWE)
Air Temperature
(Max, Min, Current, Average)
Snow Depth

NRCS Natural Resources Conservation Service


SNOTEL
Air Temperature Sensor
Automated Daily & Hourly Data
Snow Depth Sensor
Antenna and Solar Panel
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
Snow Pillow
Precipitation Storage Gage
NRCS Natural Resources Conservation Service

NRCS Forecast Points



OVER 10,000 NRCS Forecasts Issued Westwide

NRCS uses statistical forecasting models to relate SWE and Water Year Precipitation at SNOTEL sites to USGS or OWRD real-time stream gaging Stations

NRCS Natural Resources Conservation Service

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

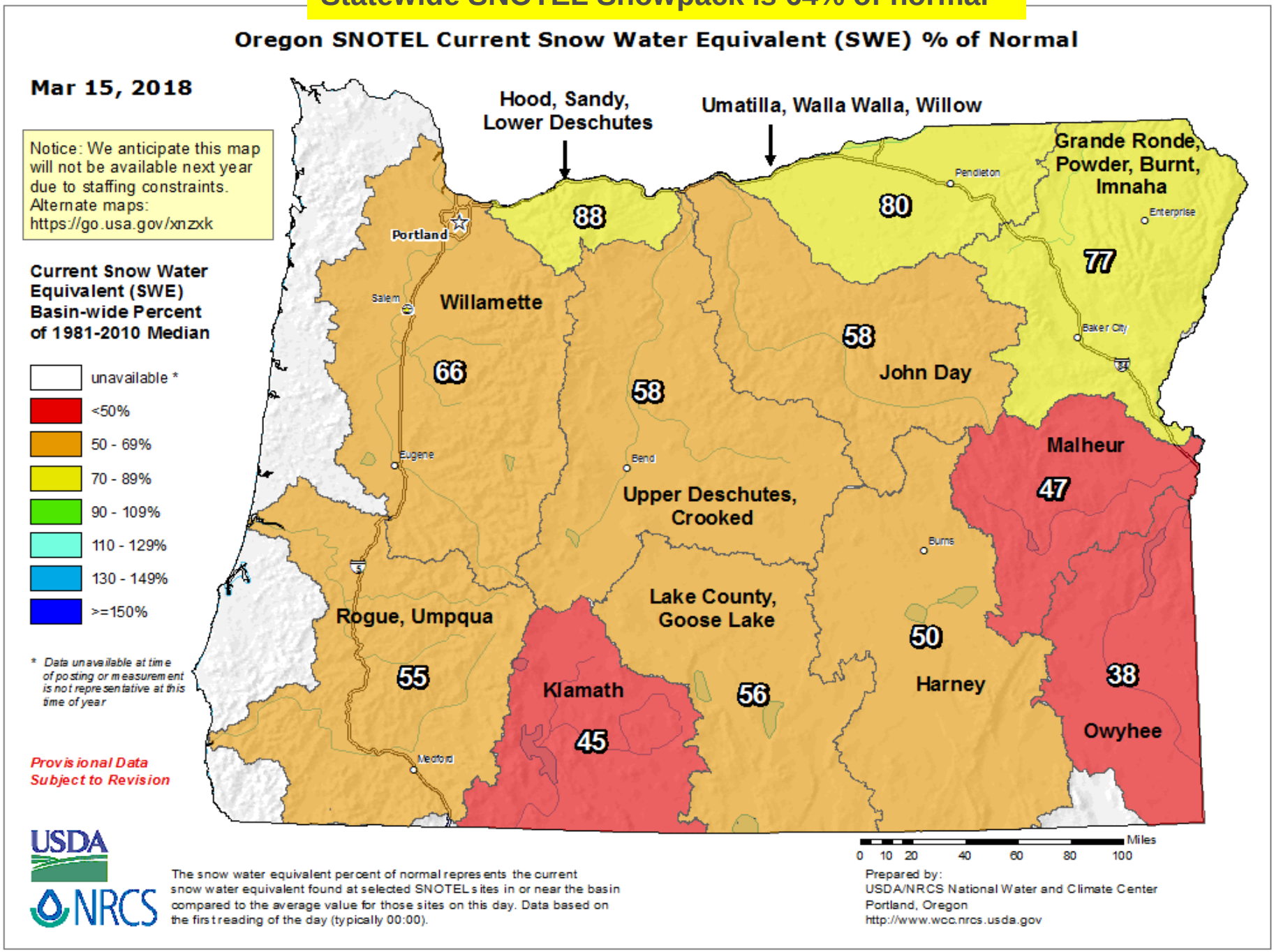
Irrigation is critical to agriculture in the US. Nearly 50% of the value of commodities sold comes from the 16% of irrigated cropland.

State and Local Groups

- OWRD
- ODF
- ODFW
- ODA
- Local Water Managers
- Irrigation Districts and Companies
- Municipalities
- State Water Supply Availability Committee
- State Drought Readiness Council
- Power Companies
- University Researchers
- Avalanche Centers
- Producers and Ranchers
- Recreationists and Tourism Groups

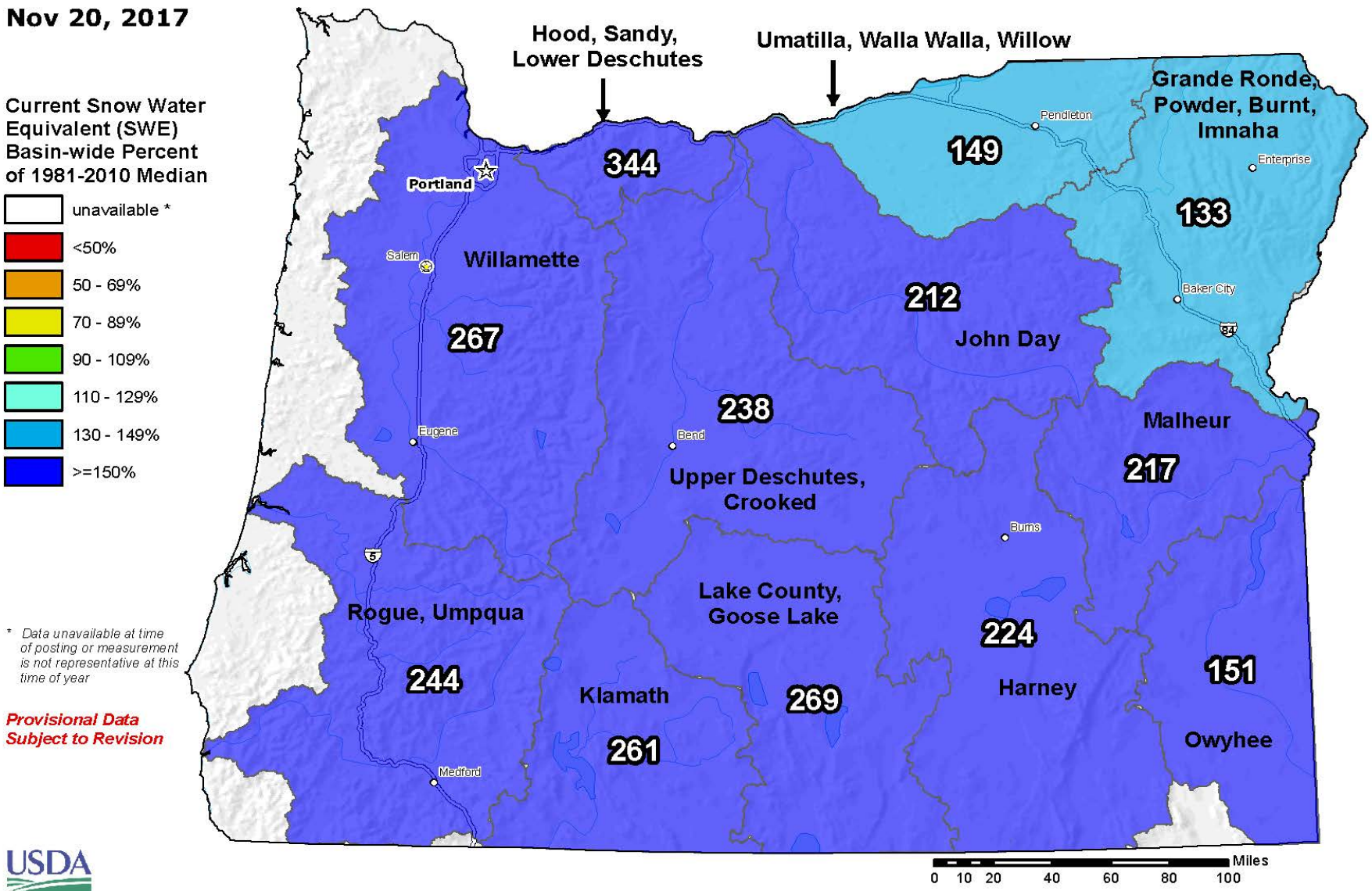
2018 Current Conditions

Statewide SNOTEL Snowpack is 64% of normal



Statewide SNOTEL Snowpack was 236% of normal

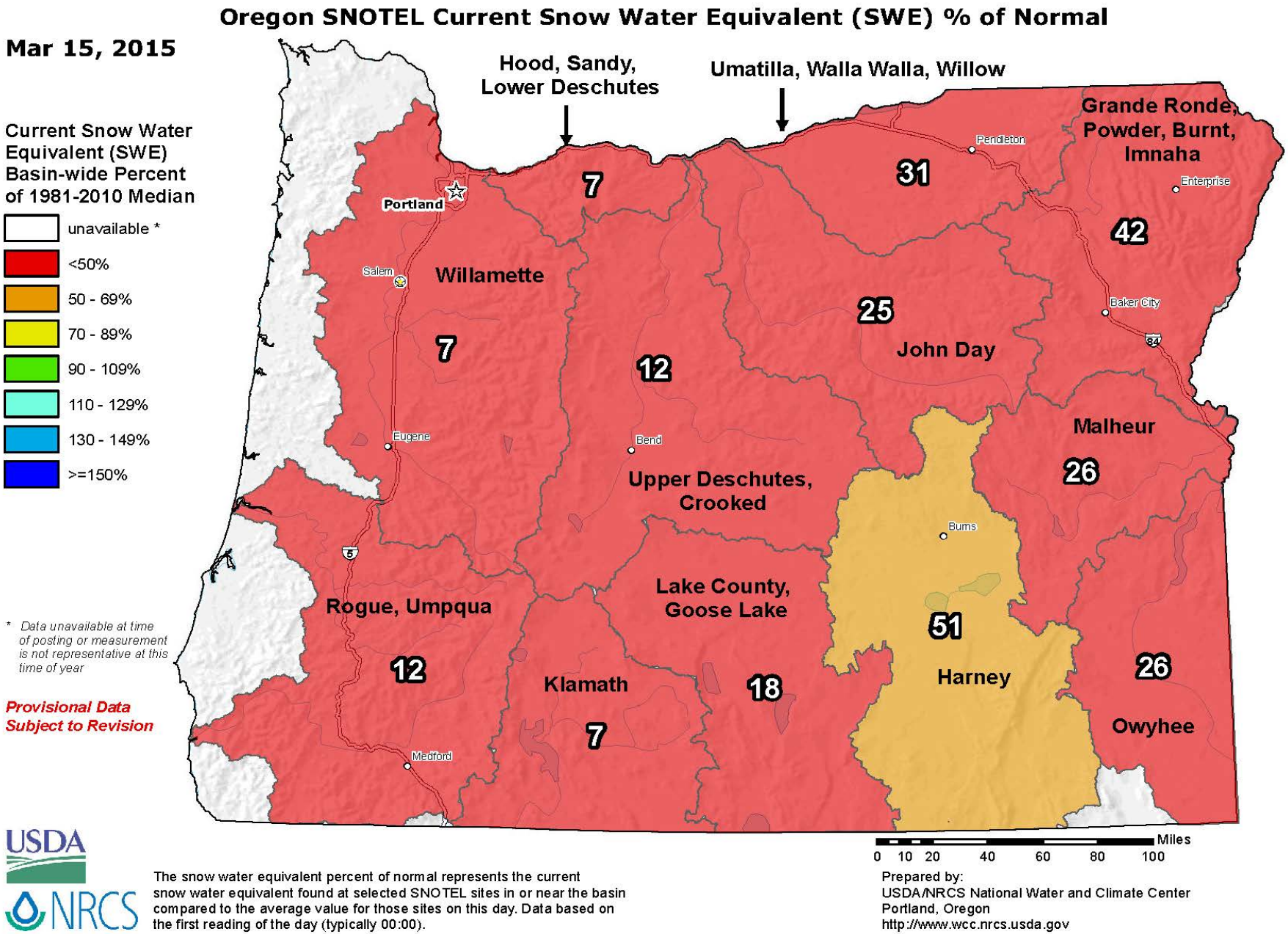
Oregon SNOTEL Current Snow Water Equivalent (SWE) % of Normal



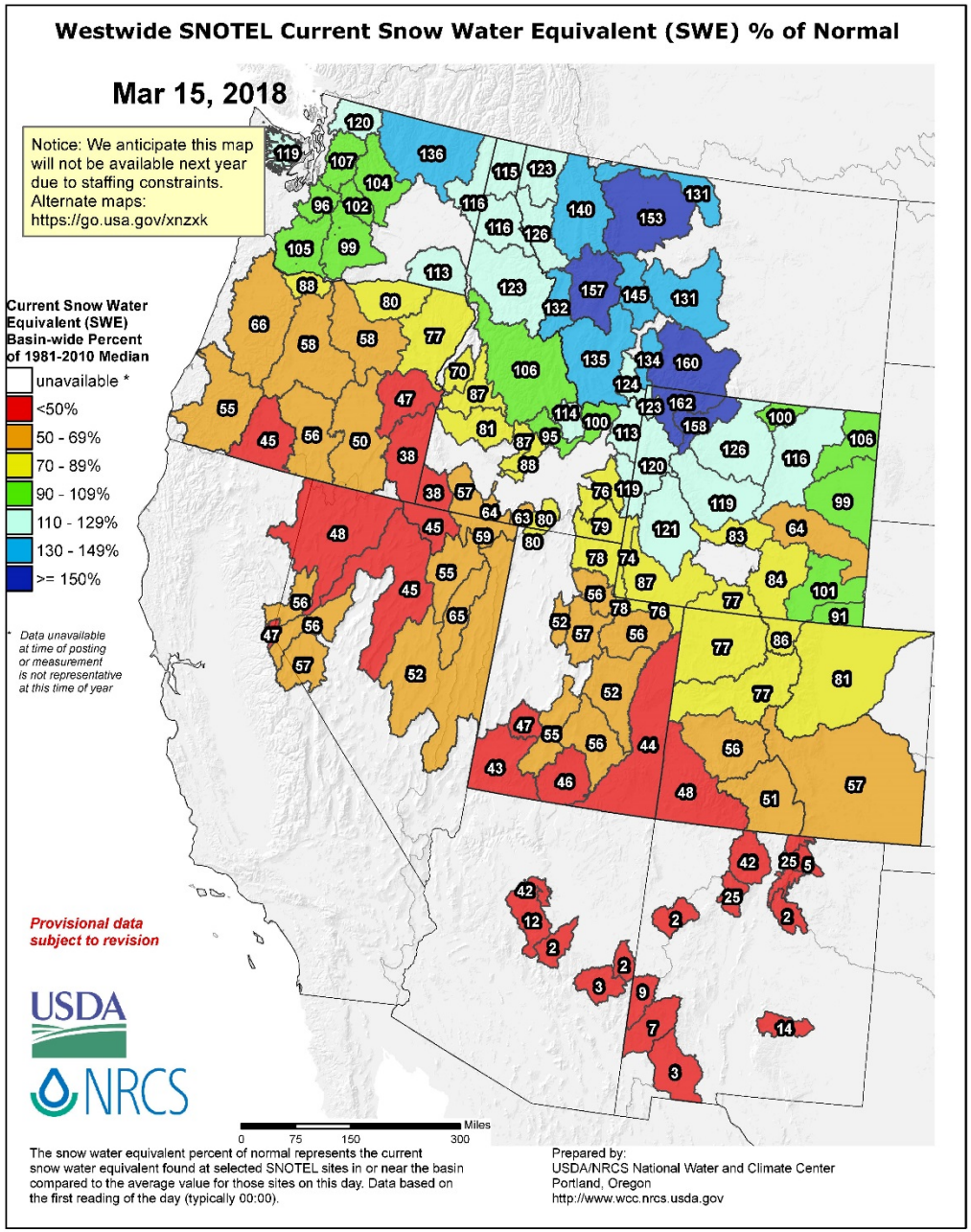
The snow water equivalent percent of normal represents the current snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

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

Statewide SNOTEL Snowpack was 17% of normal

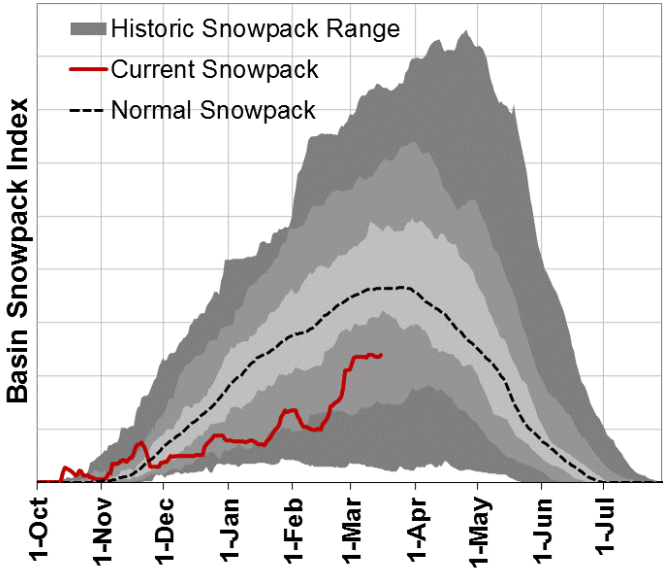


West-Wide Snowpack – March 15, 2018



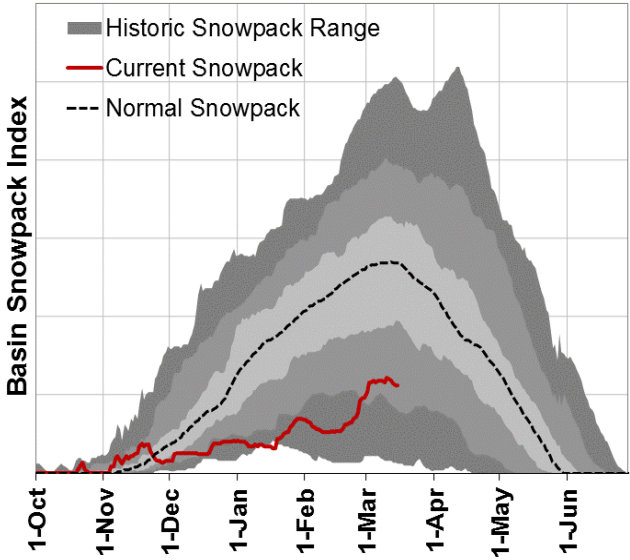
Water Year 2018

Willamette

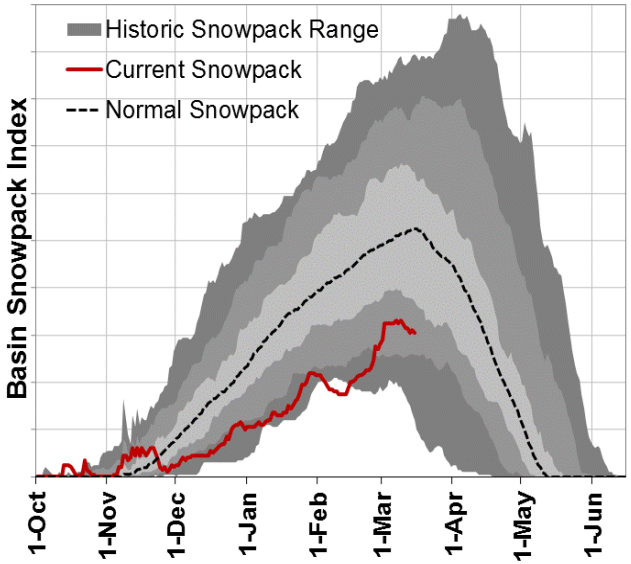


Rogue/Umpqua

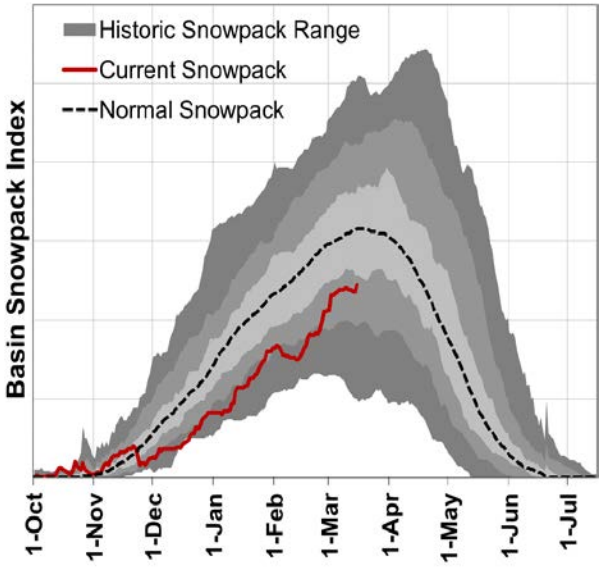
Klamath



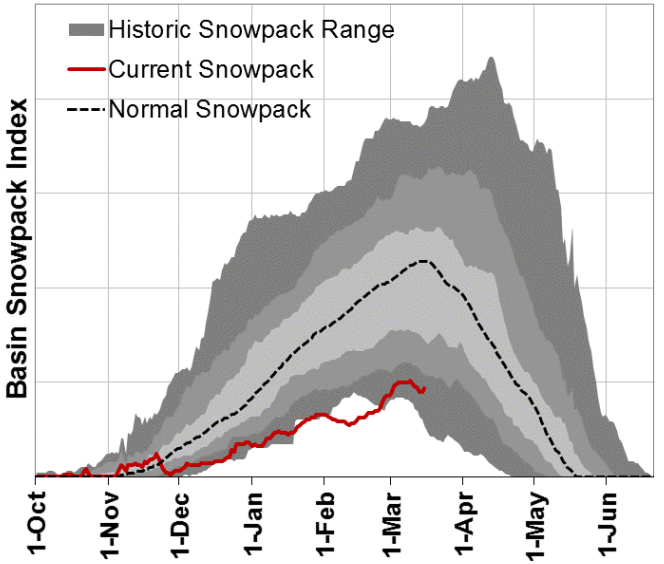
John Day



Grande Ronde/Powder/Burnt

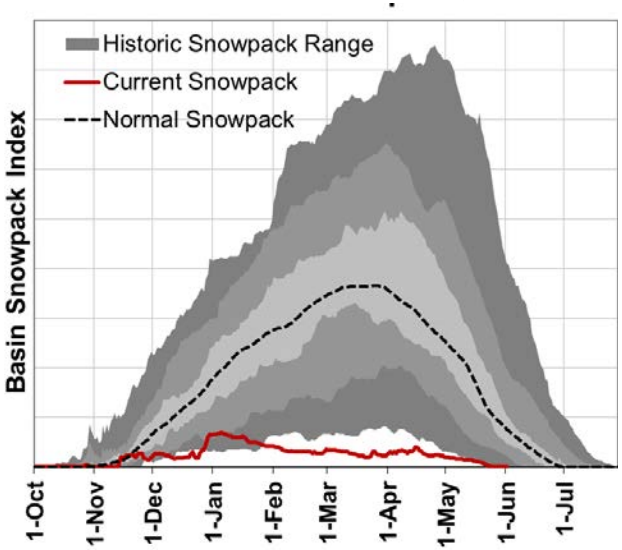


Owyhee/Malheur

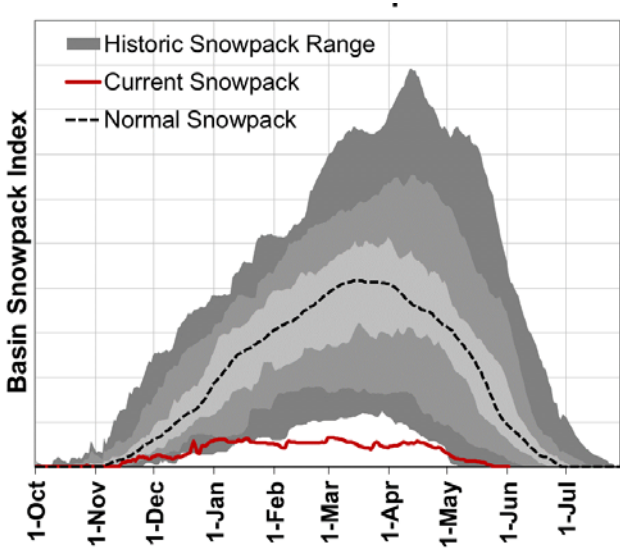


Water Year 2015

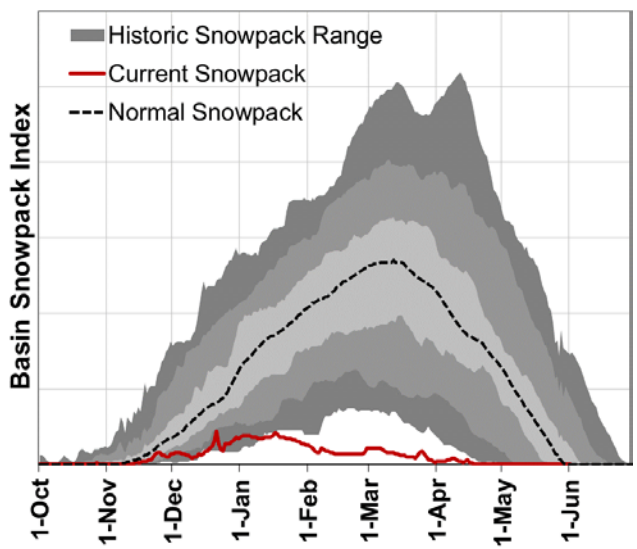
Willamette



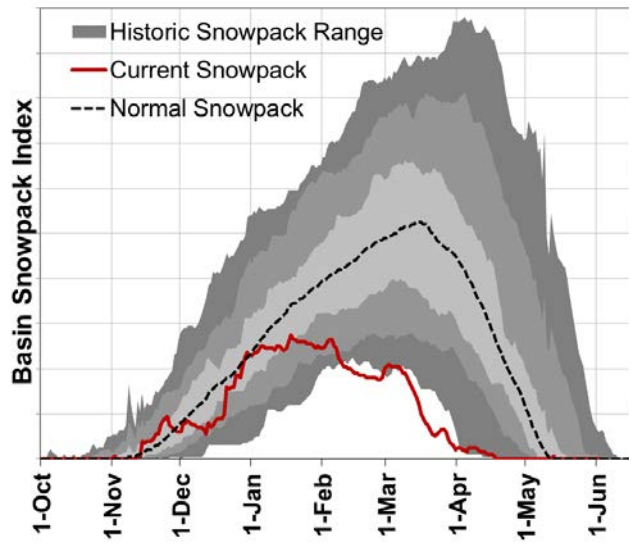
Rogue/Umpqua



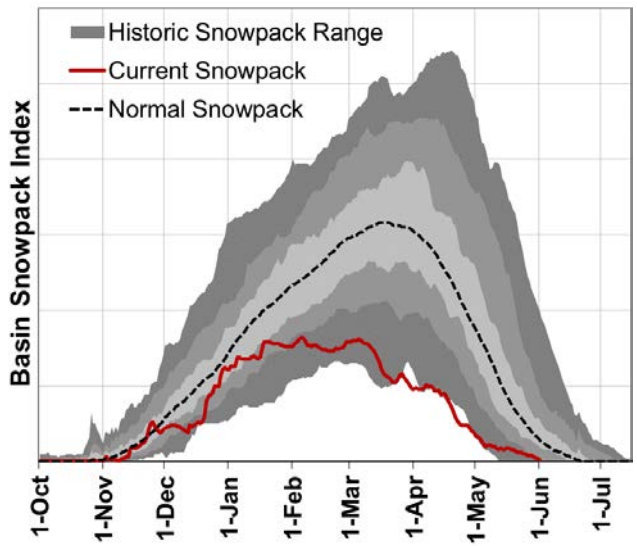
Klamath



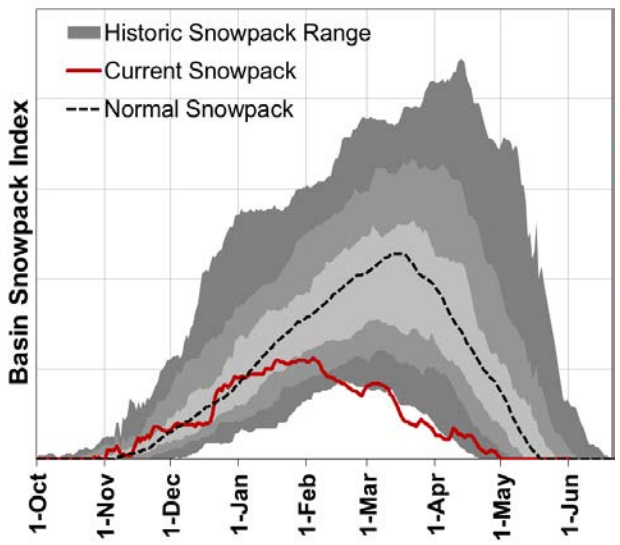
John Day



Grande Ronde/Powder/Burnt

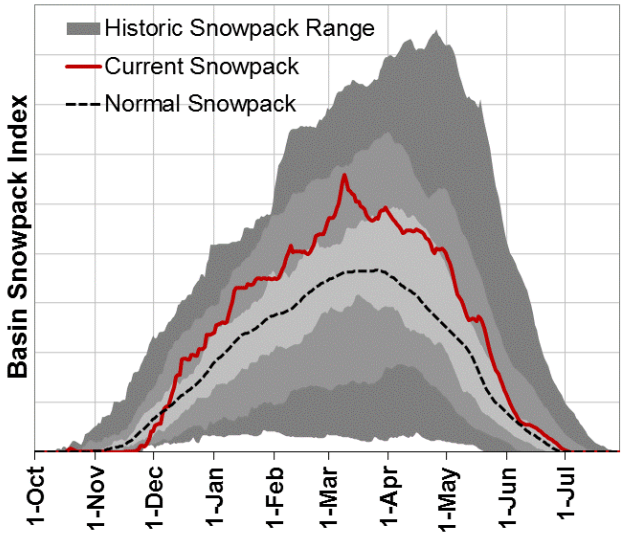


Owyhee/Malheur



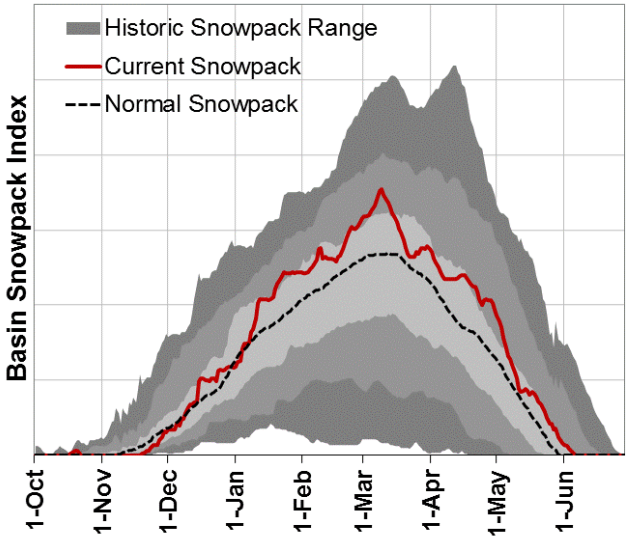
Water Year 2017

Willamette

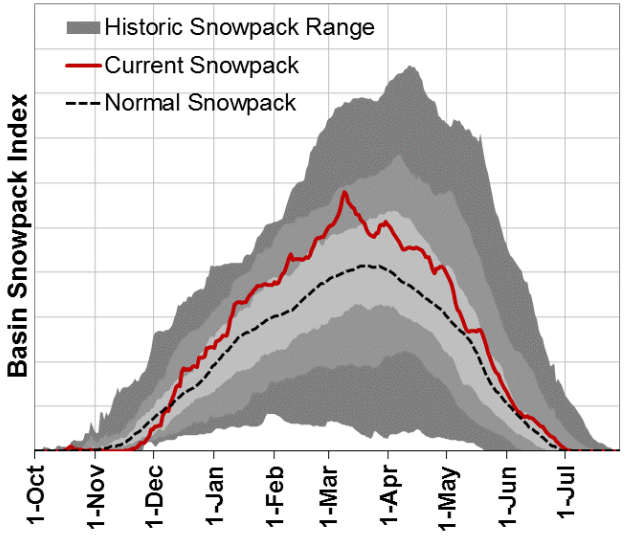


Rogue/Umpqua

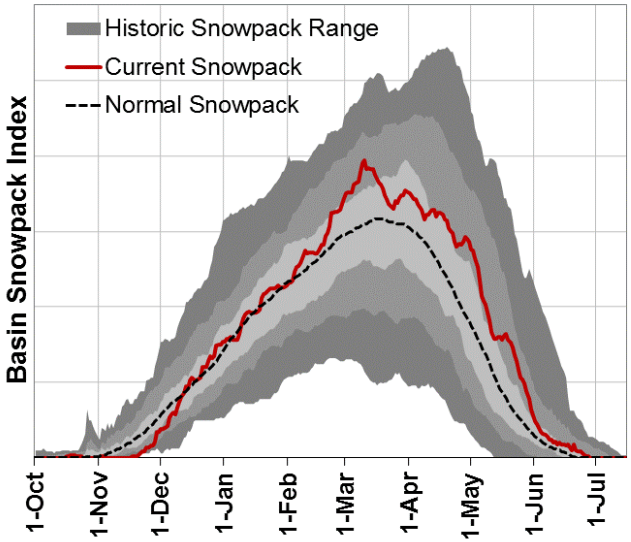
Klamath



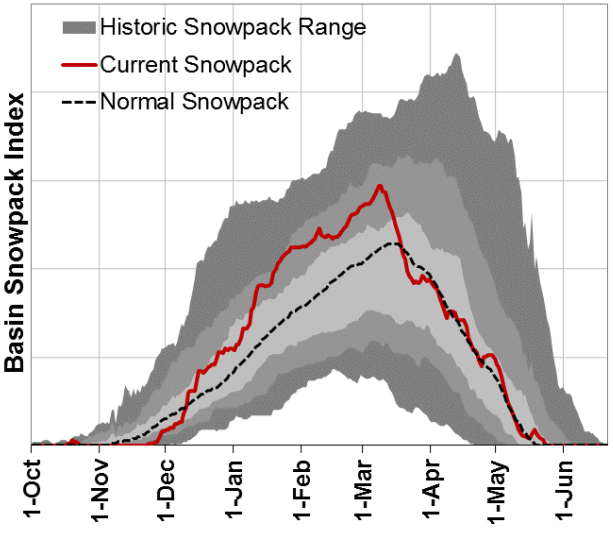
Deschutes



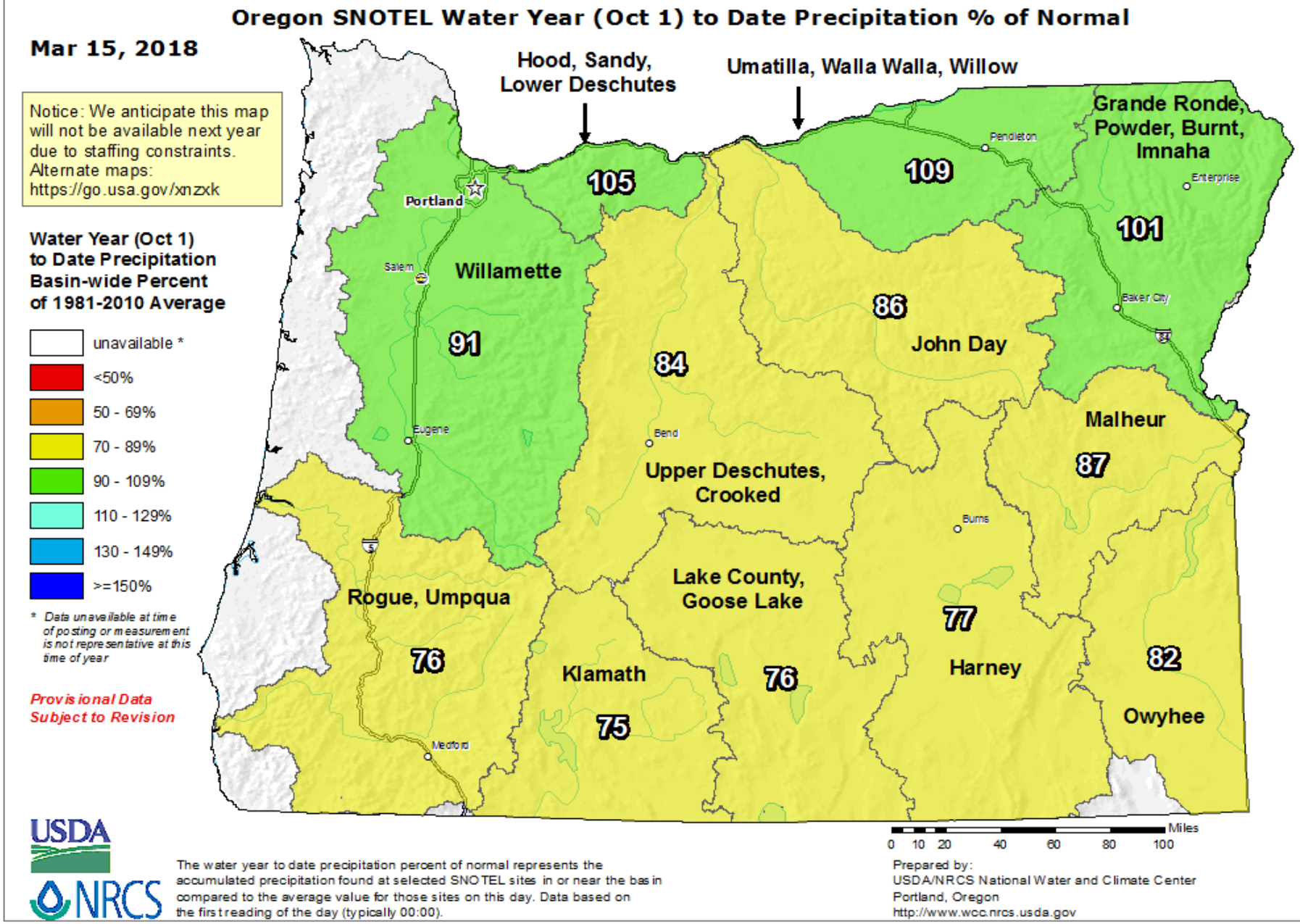
Grande Ronde/Powder/Burnt



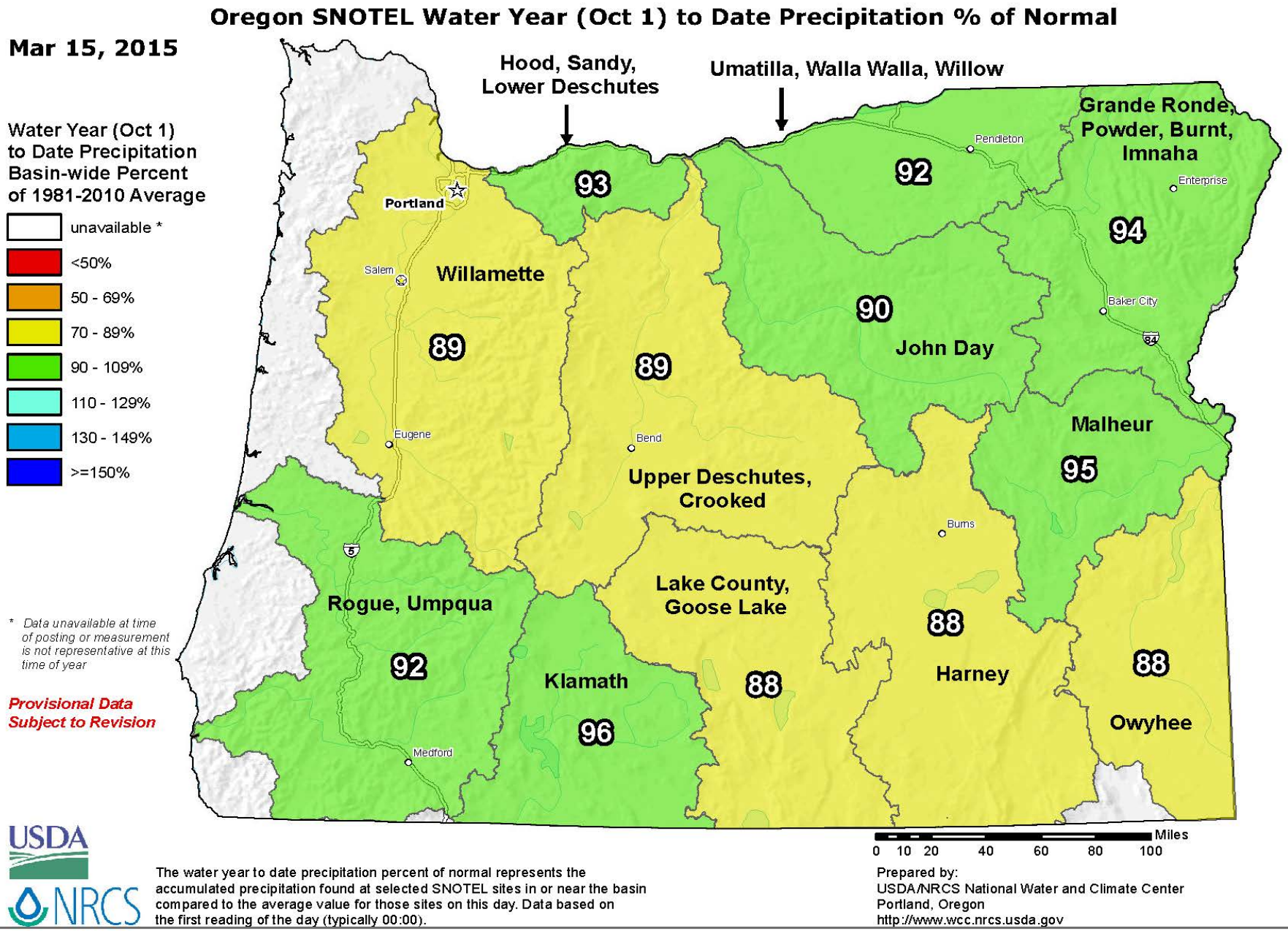
Owyhee/Malheur



Statewide SNOTEL Water Year Precipitation is 90% of average



Statewide SNOTEL Water Year Precipitation was 92% of average



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

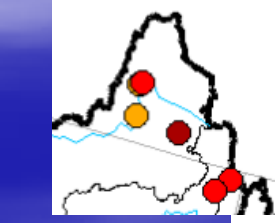
Columbia River and Pacific Coastal Basins Mountain Snowpack as of March 1, 2018

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

NOTICE: This map will be discontinued after May 2018 due to staffing constraints.

Alternate maps: go.usa.gov/xnzxk



Prepared by:
USDA Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
https://www.wcc.nrcs.usda.gov
Created: 5 Mar 2018 10:46

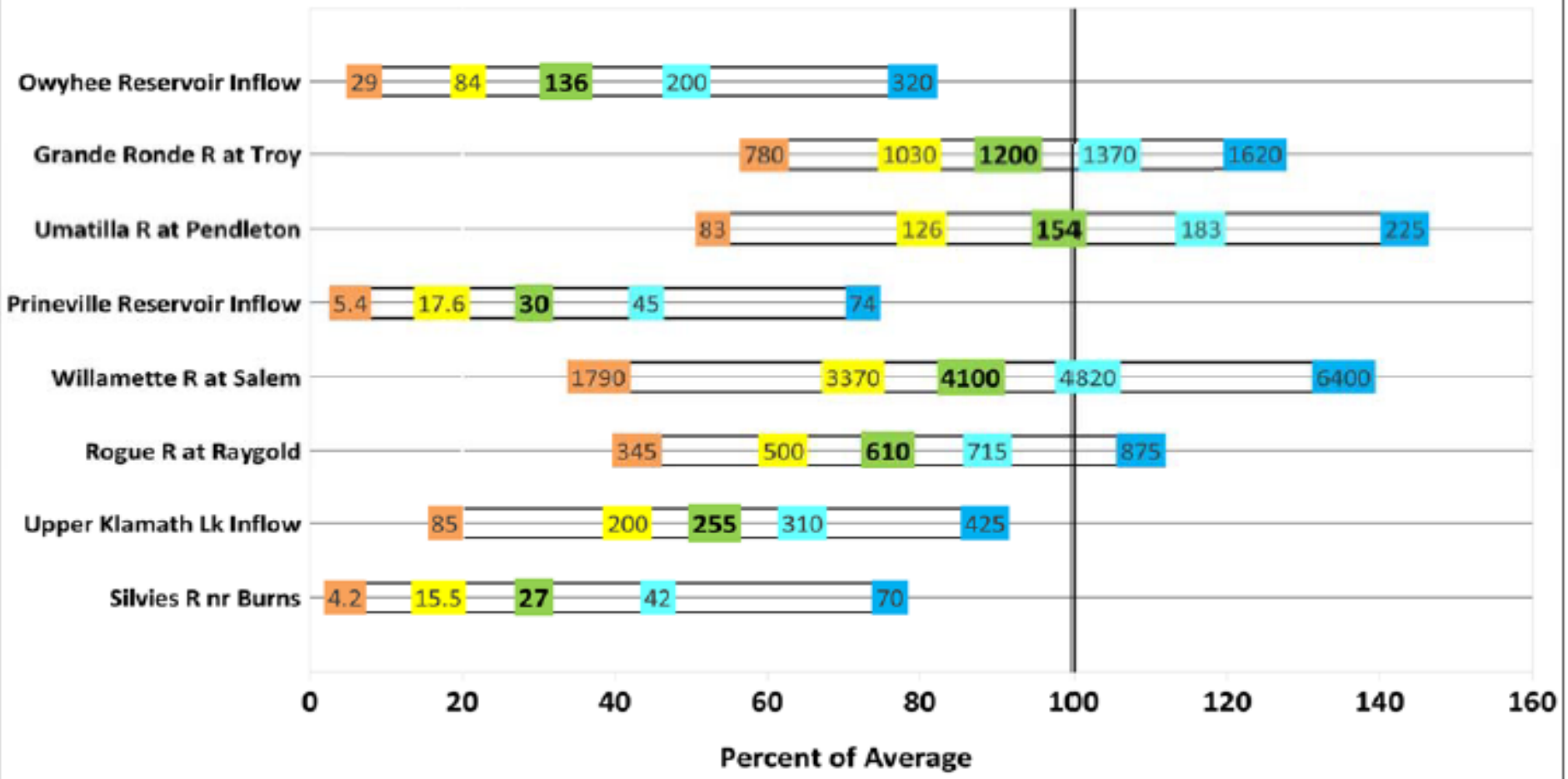
NRCS Natural Resources Conservation Service

March 1, 2018

Summary of Streamflow Forecasts across Oregon

April through September Forecast Volumes at a Selection of Streamflow Points

(Volumes listed in KAF)



Legend: ←----------Drier----------**Future Conditions**----------Wetter----------→

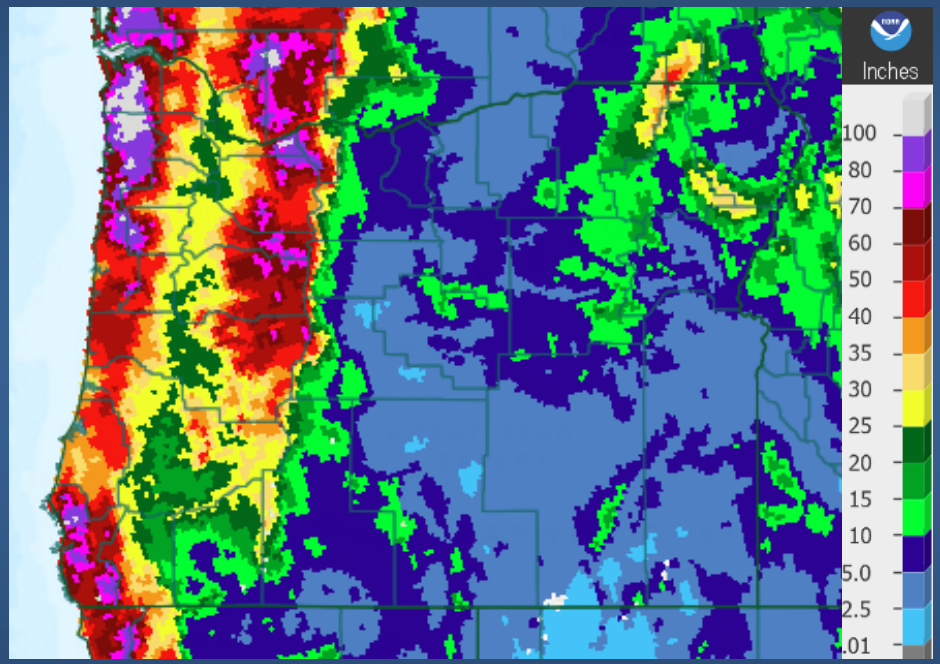
90% Exceedance Forecast (KAF)	70% Exceedance Forecast (KAF)	50% Exceedance Forecast (KAF)	30% Exceedance Forecast (KAF)	10% Exceedance Forecast (KAF)
There is a 90% chance that flows will exceed this volume.	There is a 70% chance that flows will exceed this volume.	There is a 50% chance that flows will exceed this volume.	There is a 30% chance that flows will exceed this volume.	There is a 10% chance that flows will exceed this volume.

Andy Bryant, NWS Portland

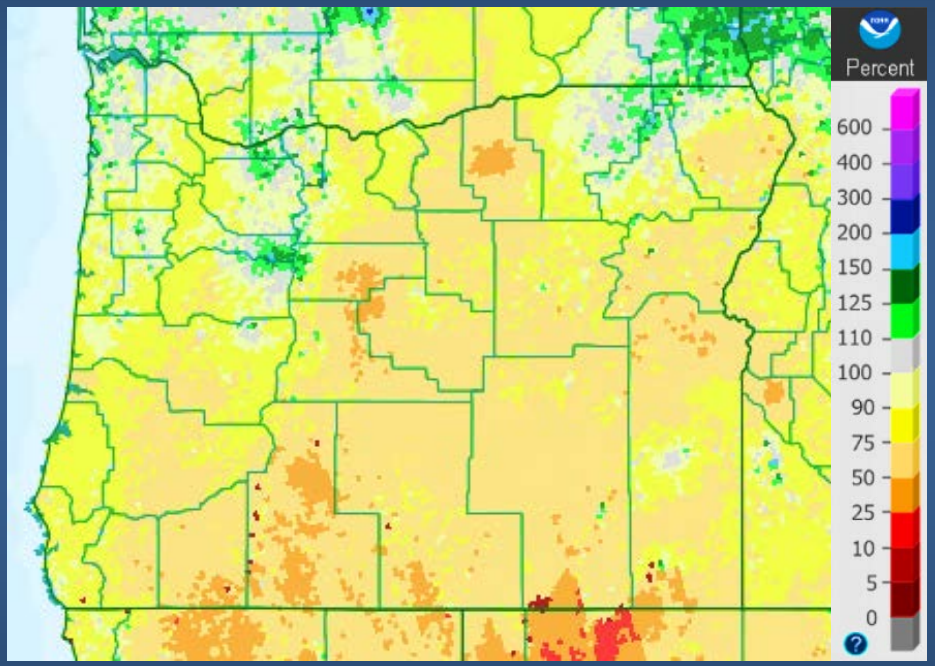
March 15, 2018 NWS Update

WY2018 Precipitation thus far

Observed Precipitation
October 1, 2017 – March 13, 2018



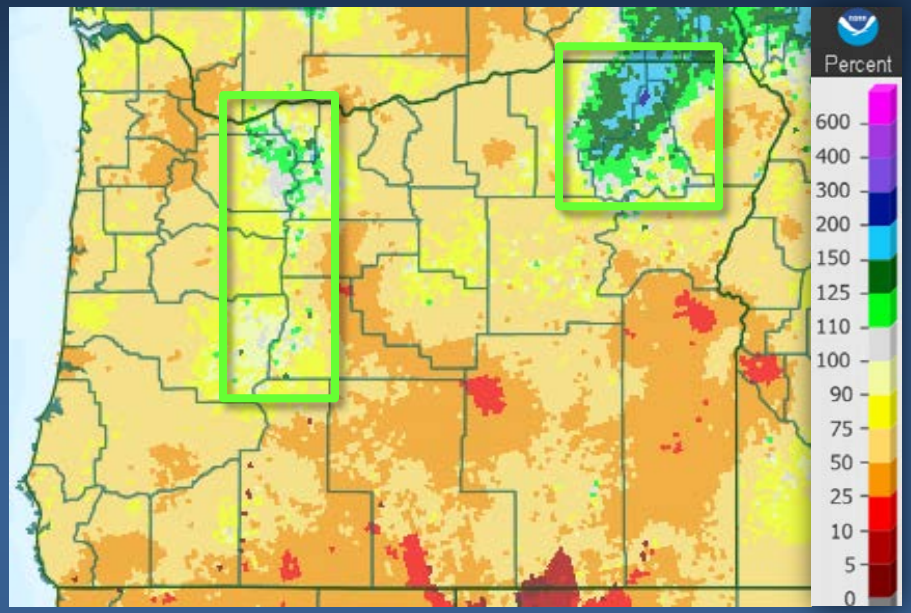
Percent of Average
October 1, 2017 – March 13, 2018



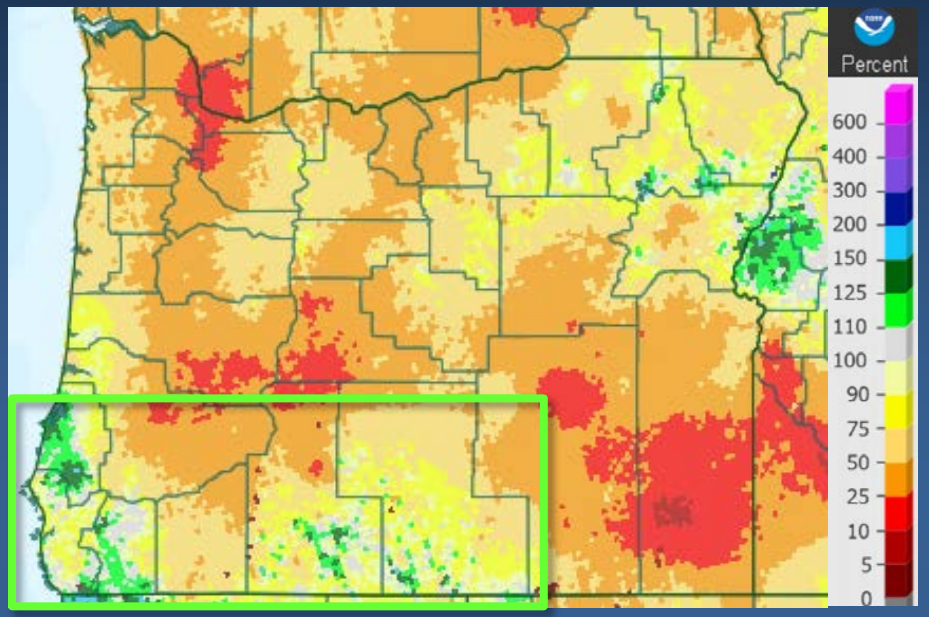
Source: water.weather.gov/precip/index.php

February & March (so far) 2018

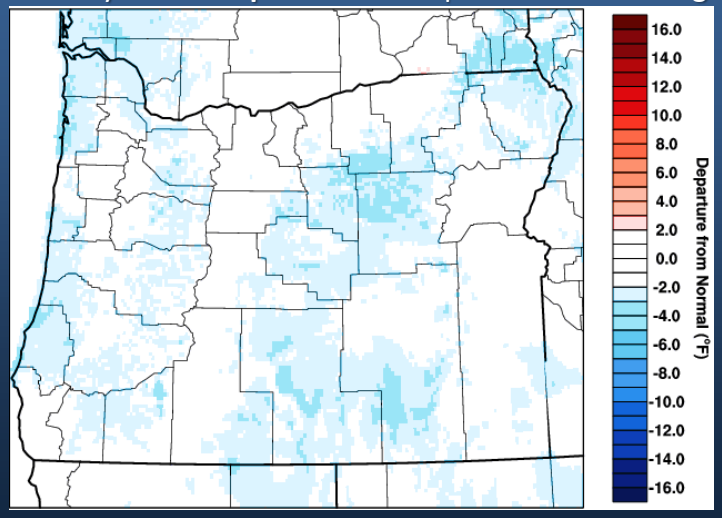
February 2018 **Precipitation** - Percent of Average



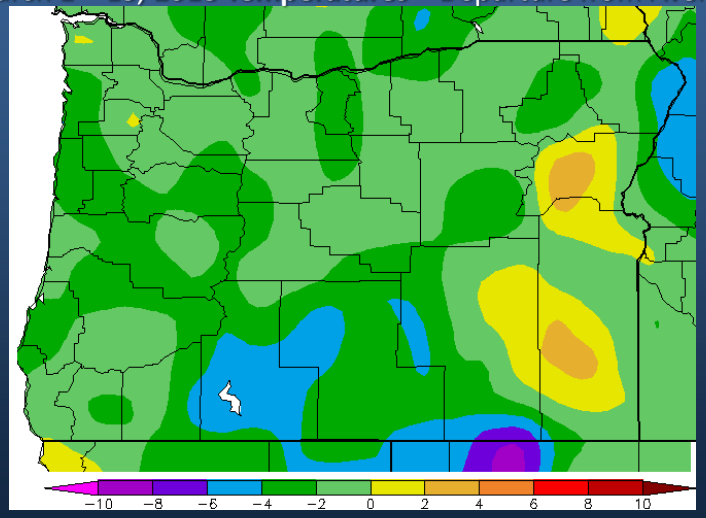
March 1 – 13, 2018 **Precipitation** - Percent of Average



February 2018 **Temperatures** – Departure from Average



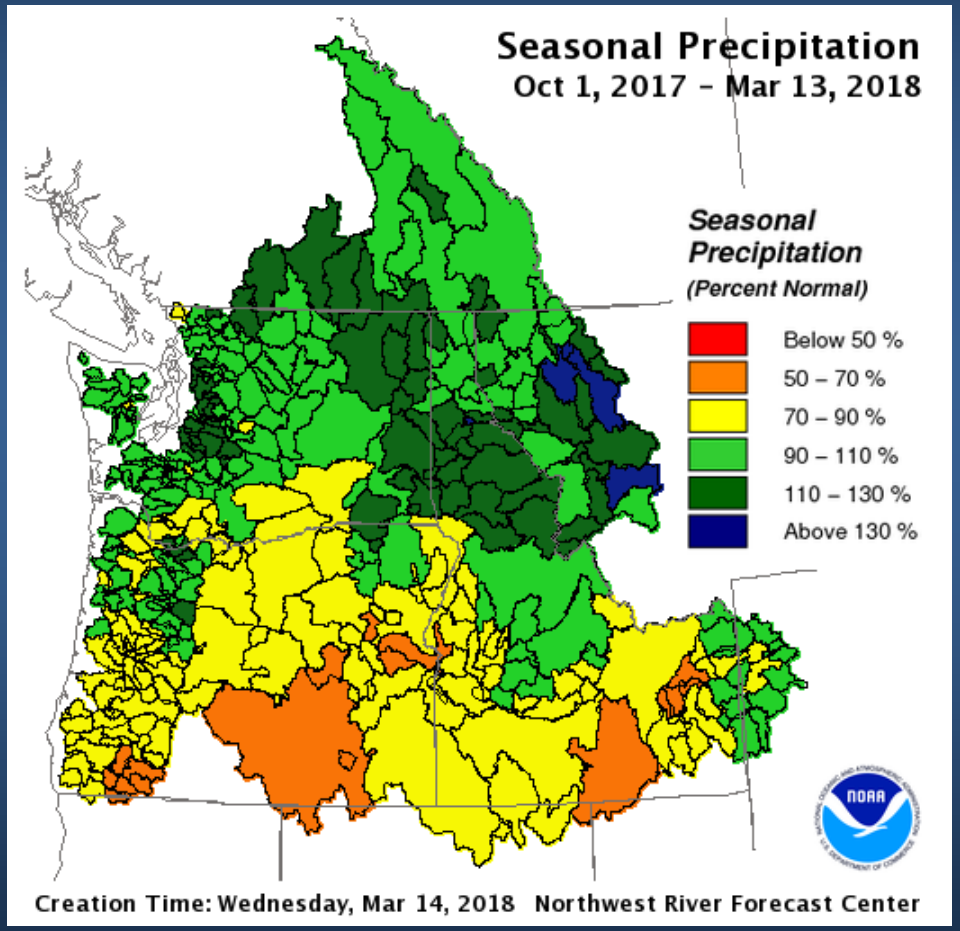
March 1 – 13, 2018 **Temperatures** – Departure from Average



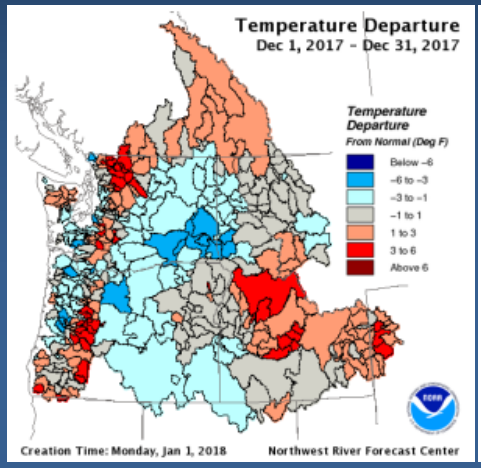
Sources: water.weather.gov/precip/index.php & wrcc.dri.edu

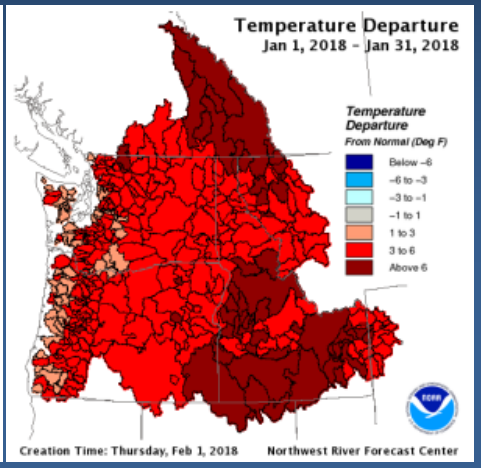
Columbia Basin Conditions
Water Year 2018 thus far

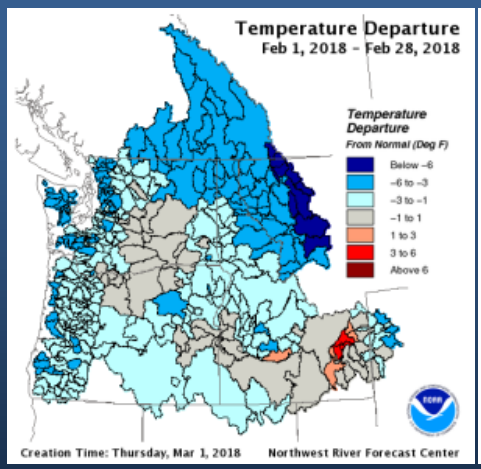
Precipitation

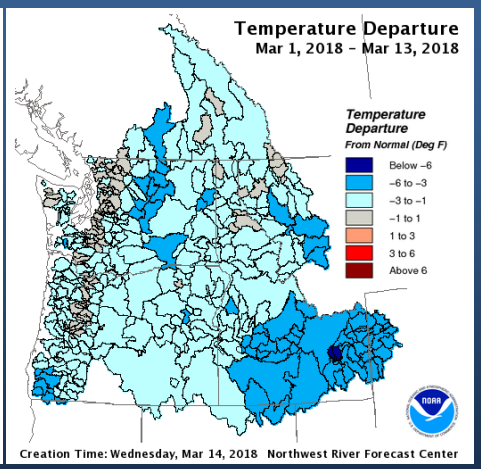


Temperatures





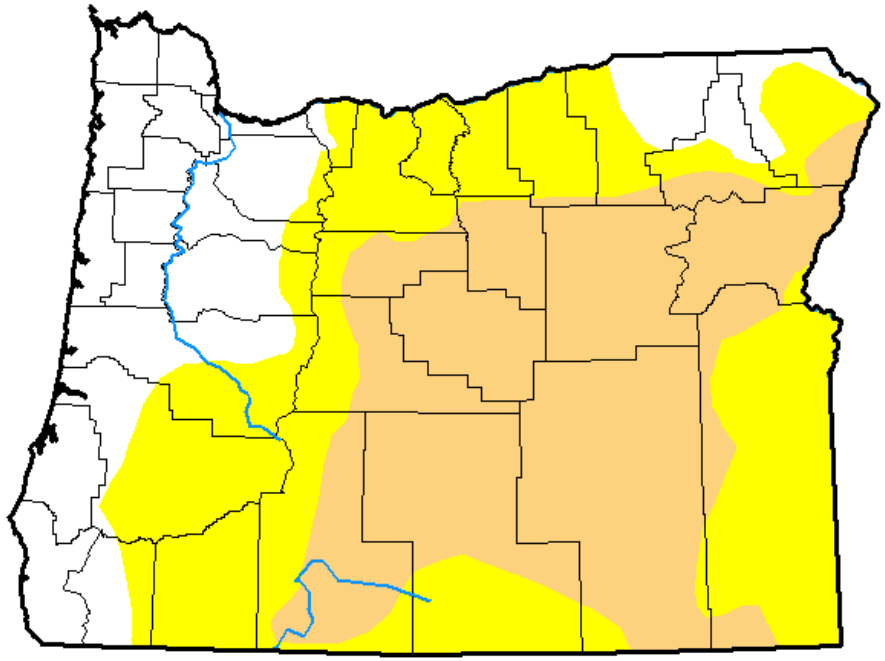




Source: www.nwrfc.noaa.gov

Drought Monitor

U.S. Drought Monitor
Oregon



March 13, 2018

(Released Thursday, Mar. 15, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	23.86	76.14	38.32	0.00	0.00	0.00
Last Week *03-06-2018*	23.86	76.14	38.32	0.00	0.00	0.00
3 Months Ago *12-12-2017*	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year *01-02-2018*	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year *09-26-2017*	39.23	60.77	28.57	0.00	0.00	0.00
One Year Ago *03-14-2017*	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:

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

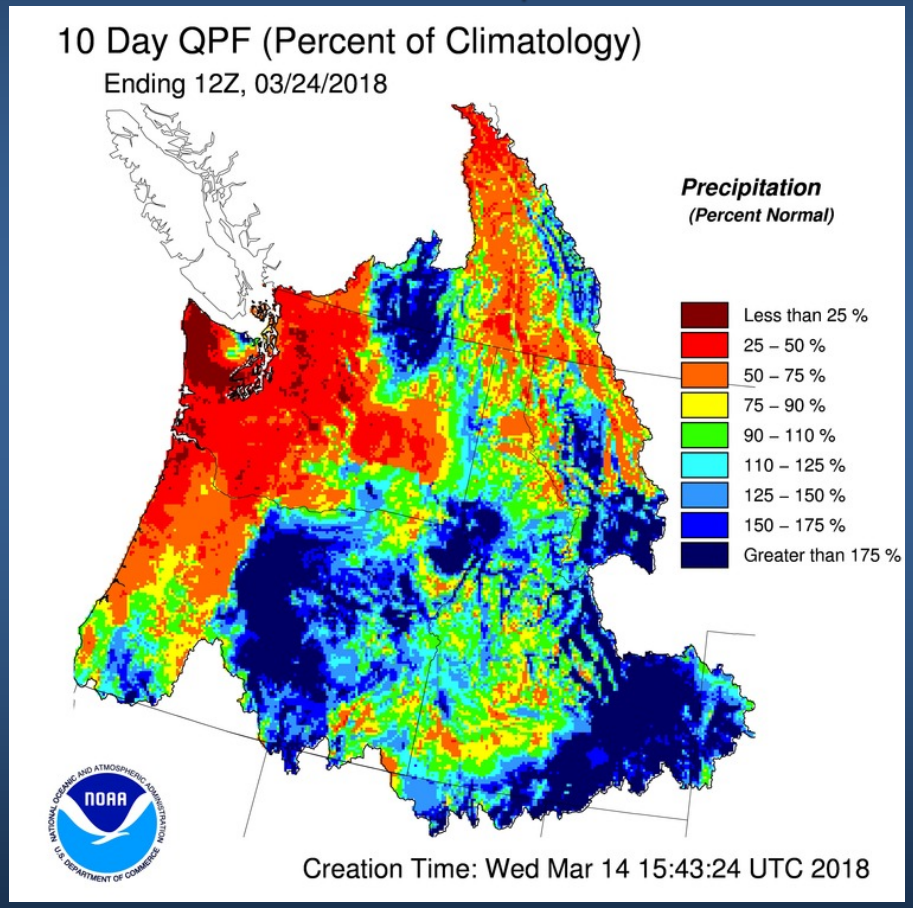
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

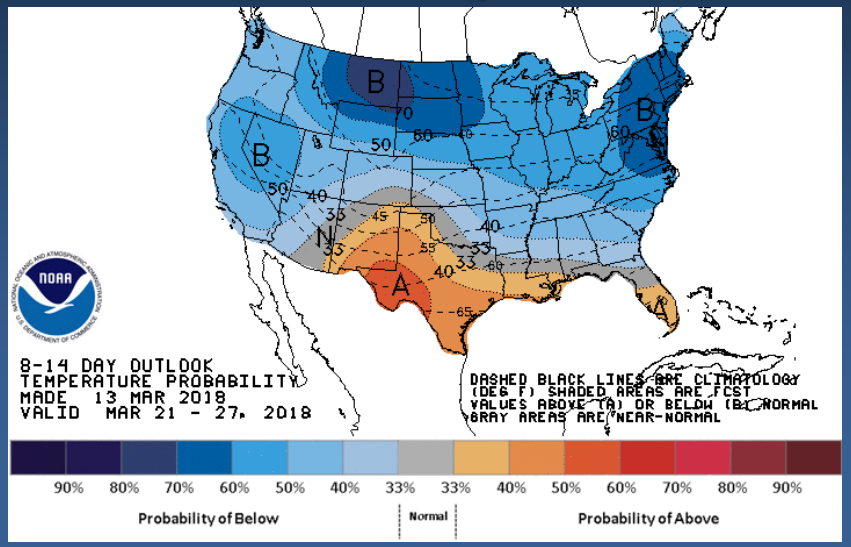
http://droughtmonitor.unl.edu/

March Outlook

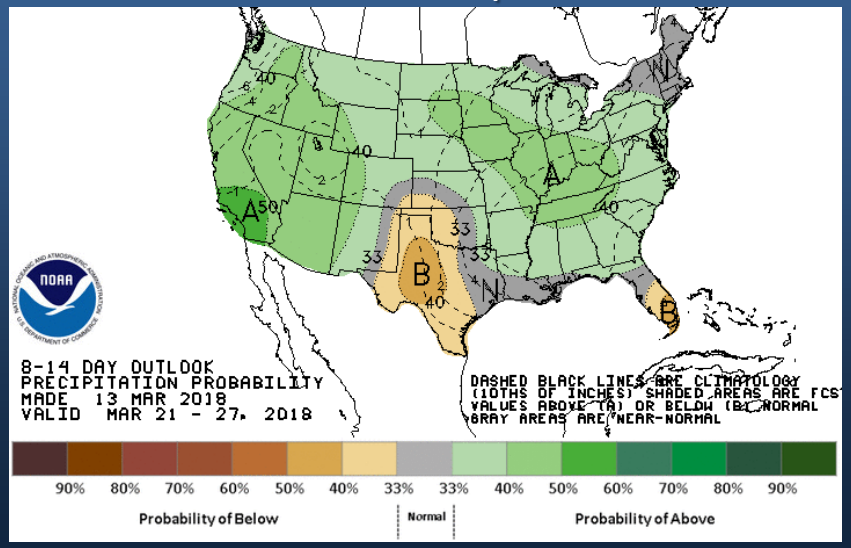
March 14 - 23, 2018
Forecast Precipitation



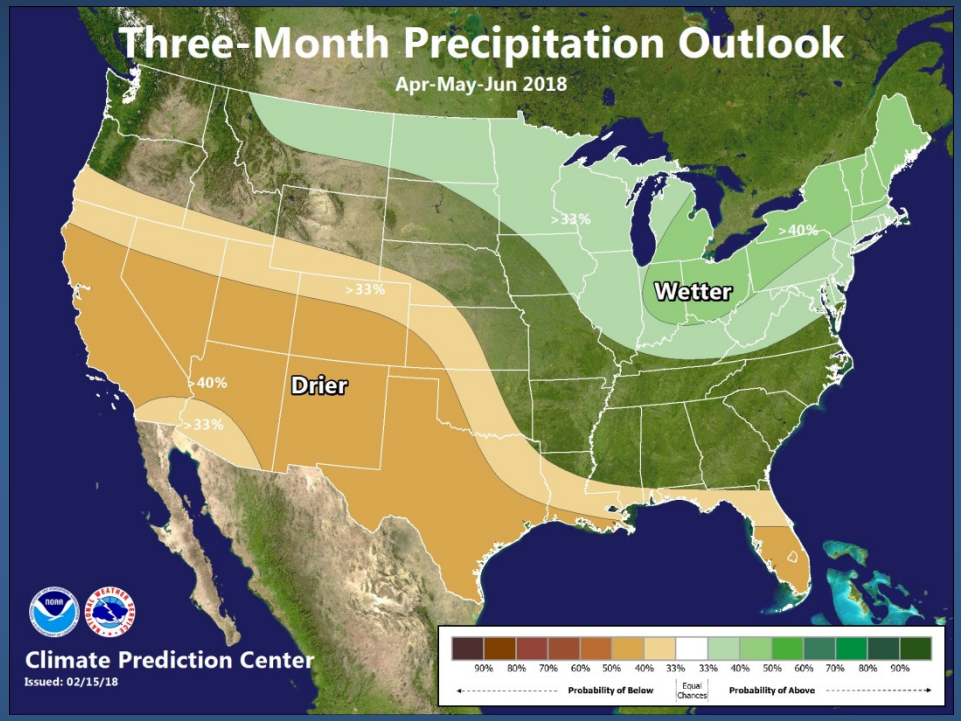
Late-March 2018: Temperature Outlook



Late-March 2018: Precipitation Outlook



Outlook for April-May-June 2018



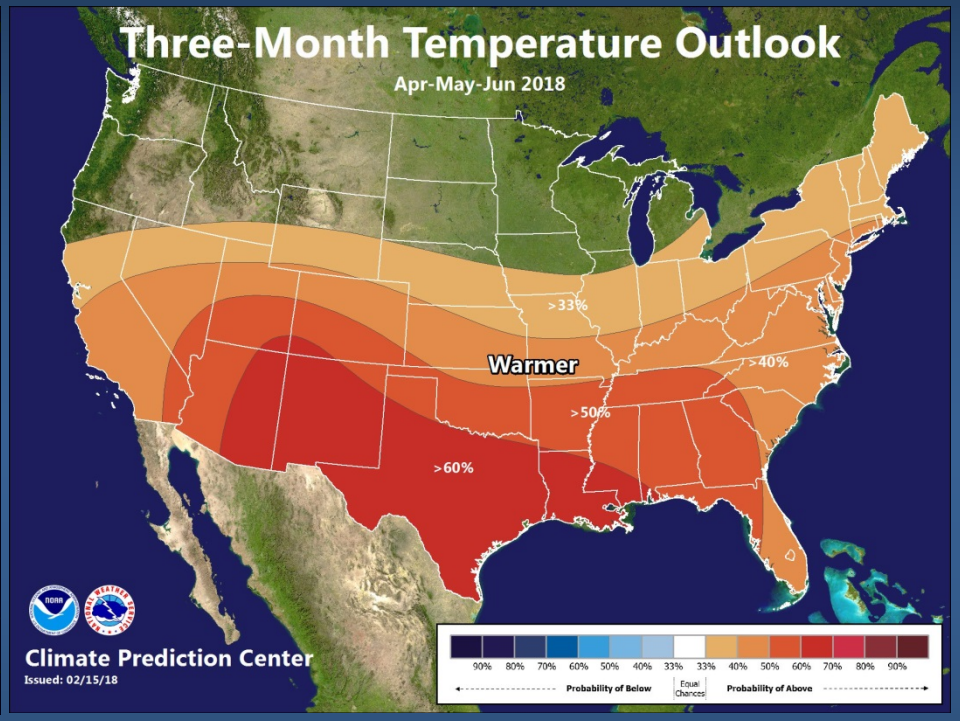
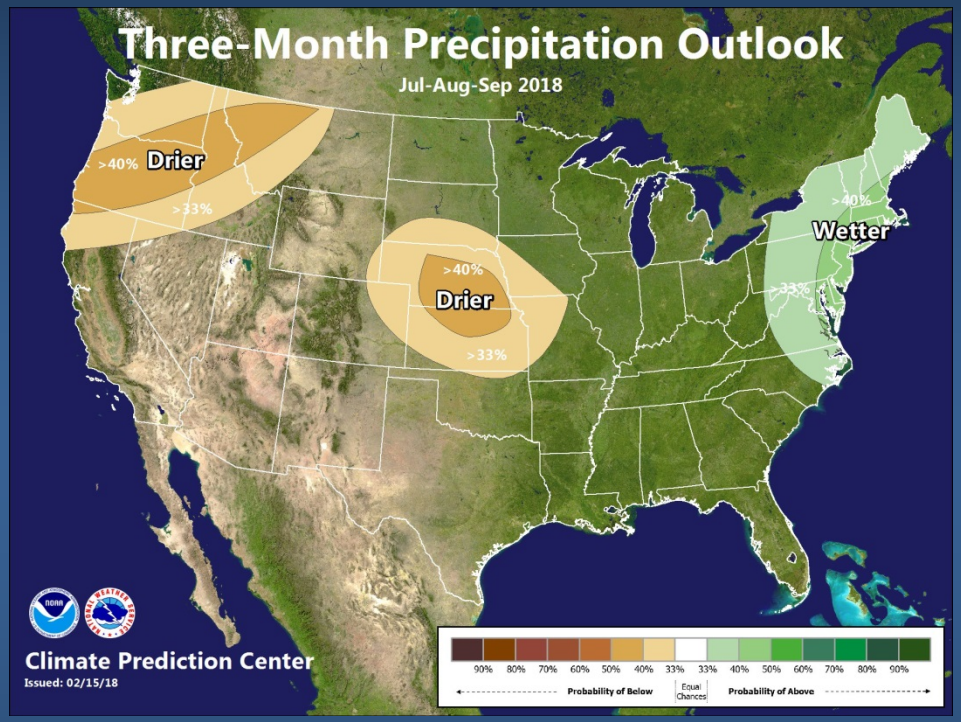


Image source: www.cpc.ncep.noaa.gov

Outlook for July-August-September 2018



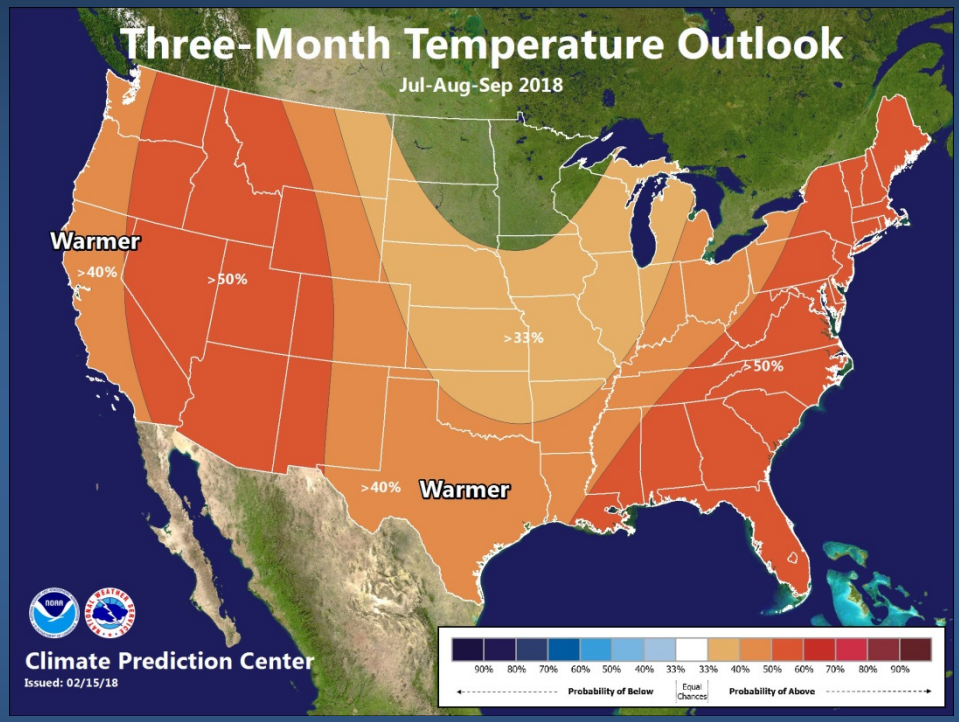
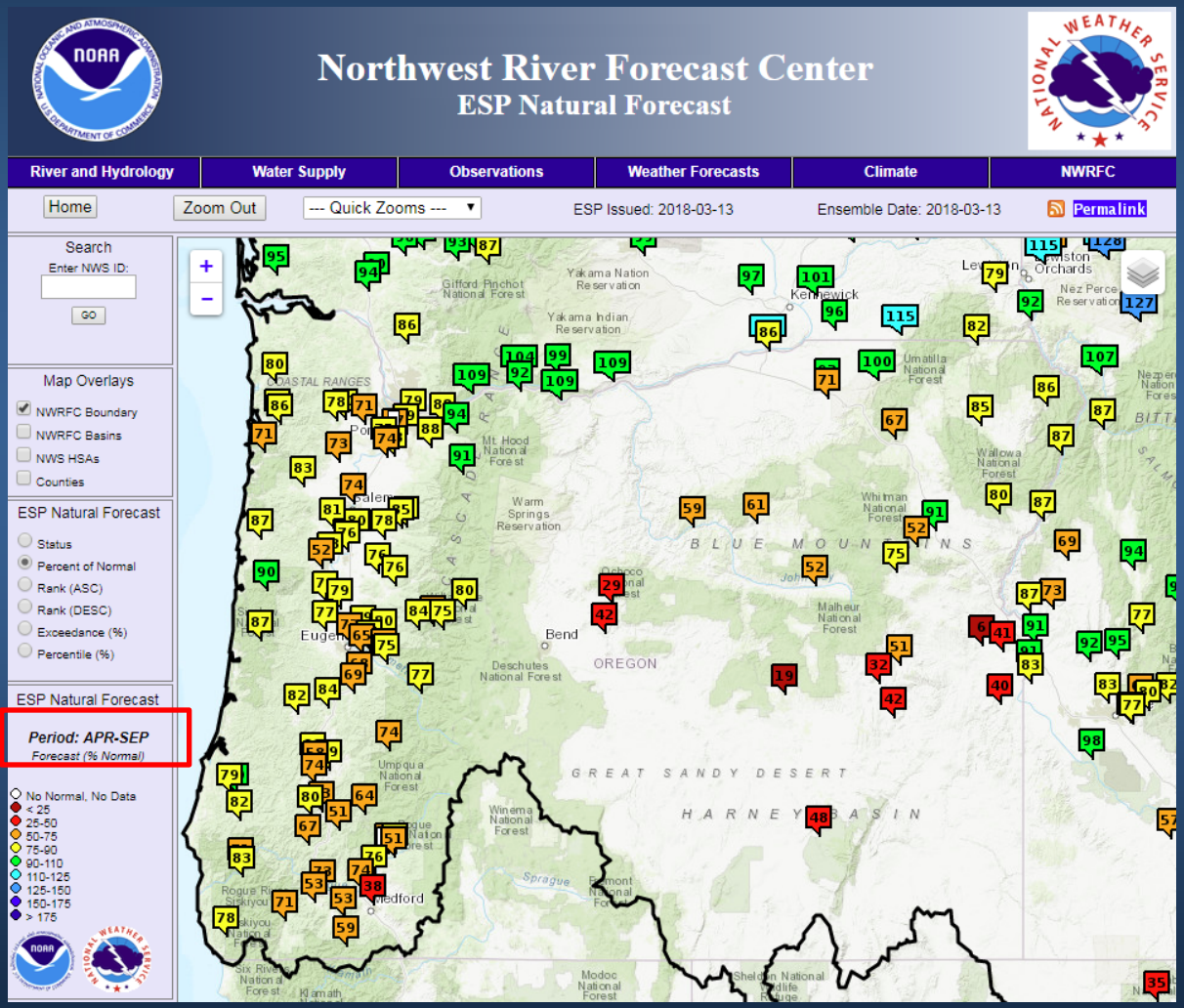
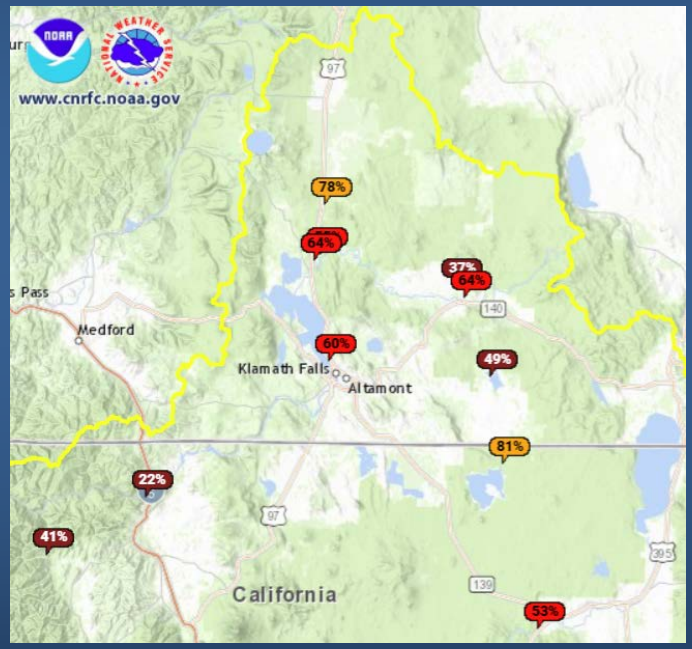


Image source: www.cpc.ncep.noaa.gov

Water Supply Forecasts

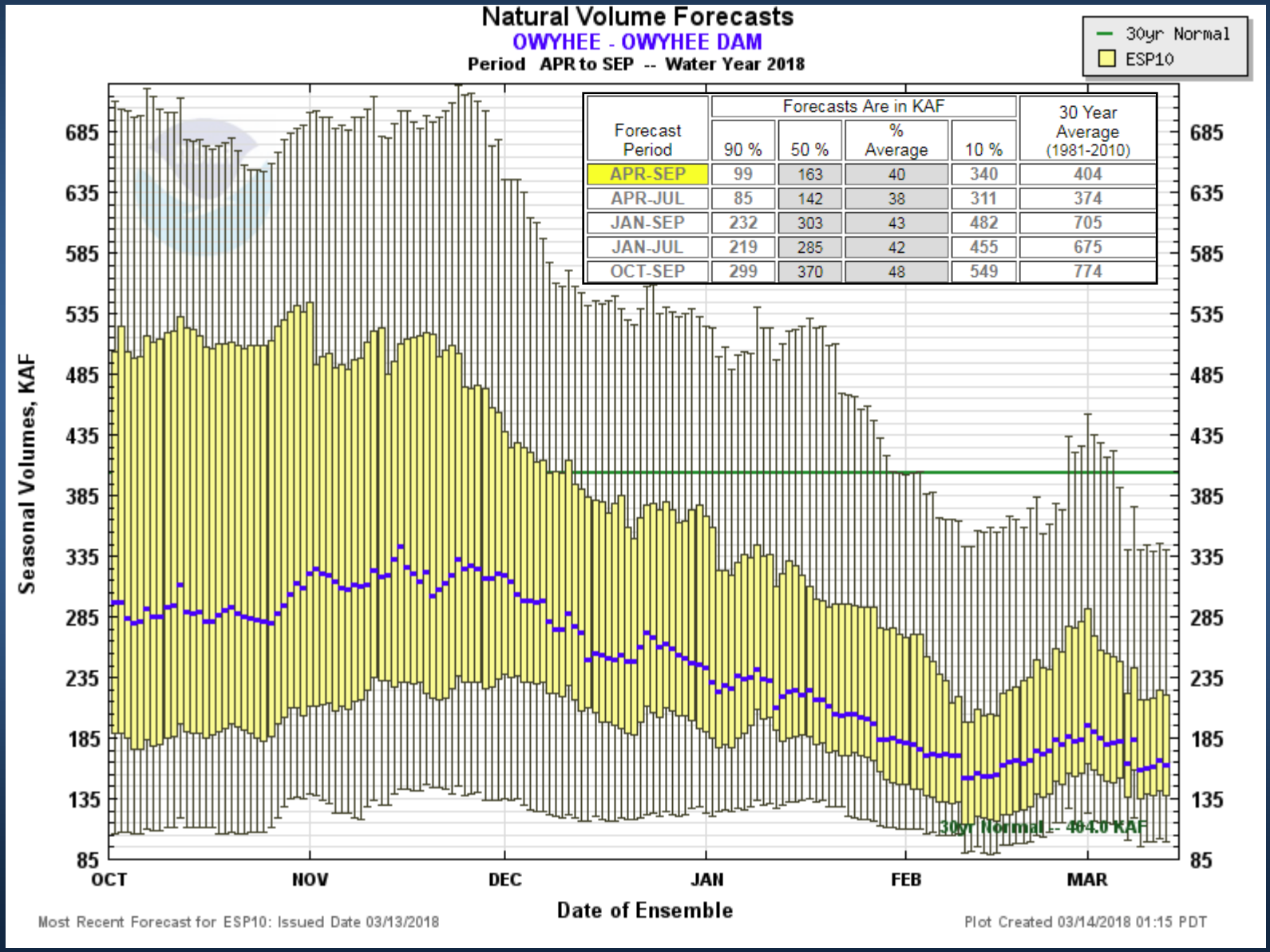




Source: www.nwrfc.noaa.gov & www.cnrfc.noaa.gov

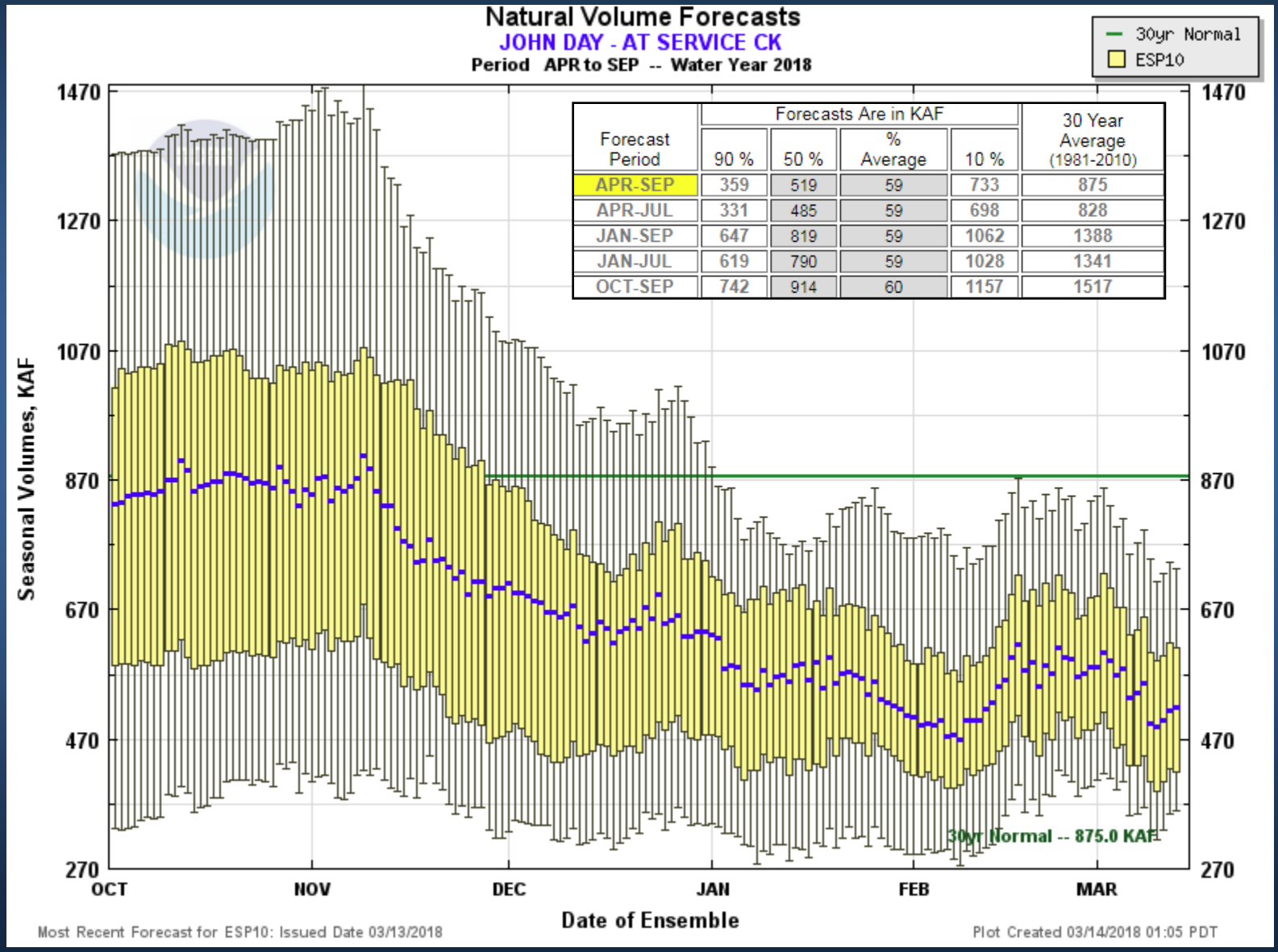
Water Supply Forecasts

Owyhee R below Owyhee Dam



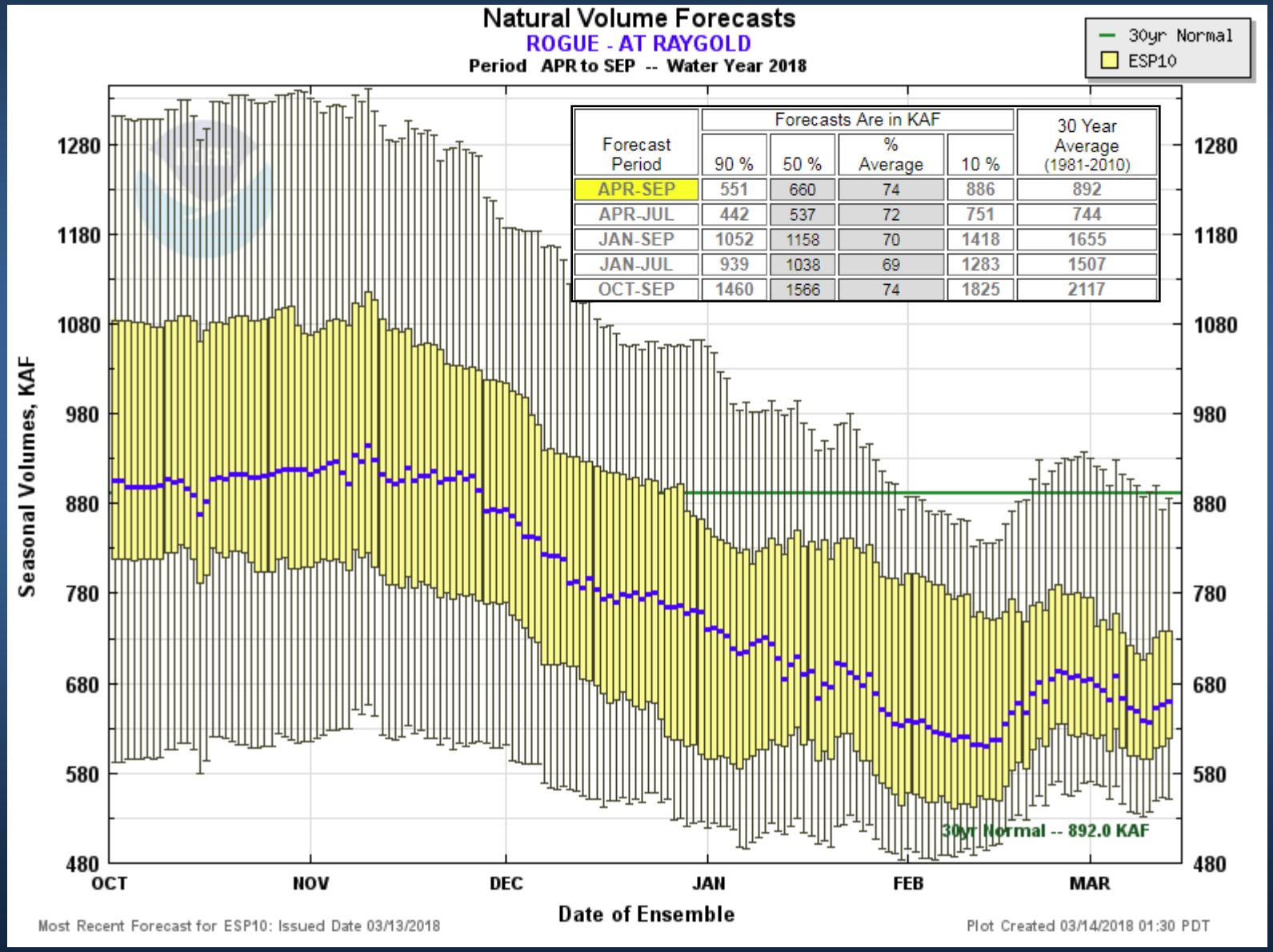
Water Supply Forecasts

John Day R at Service Creek



Water Supply Forecasts

Rogue R at Raygold

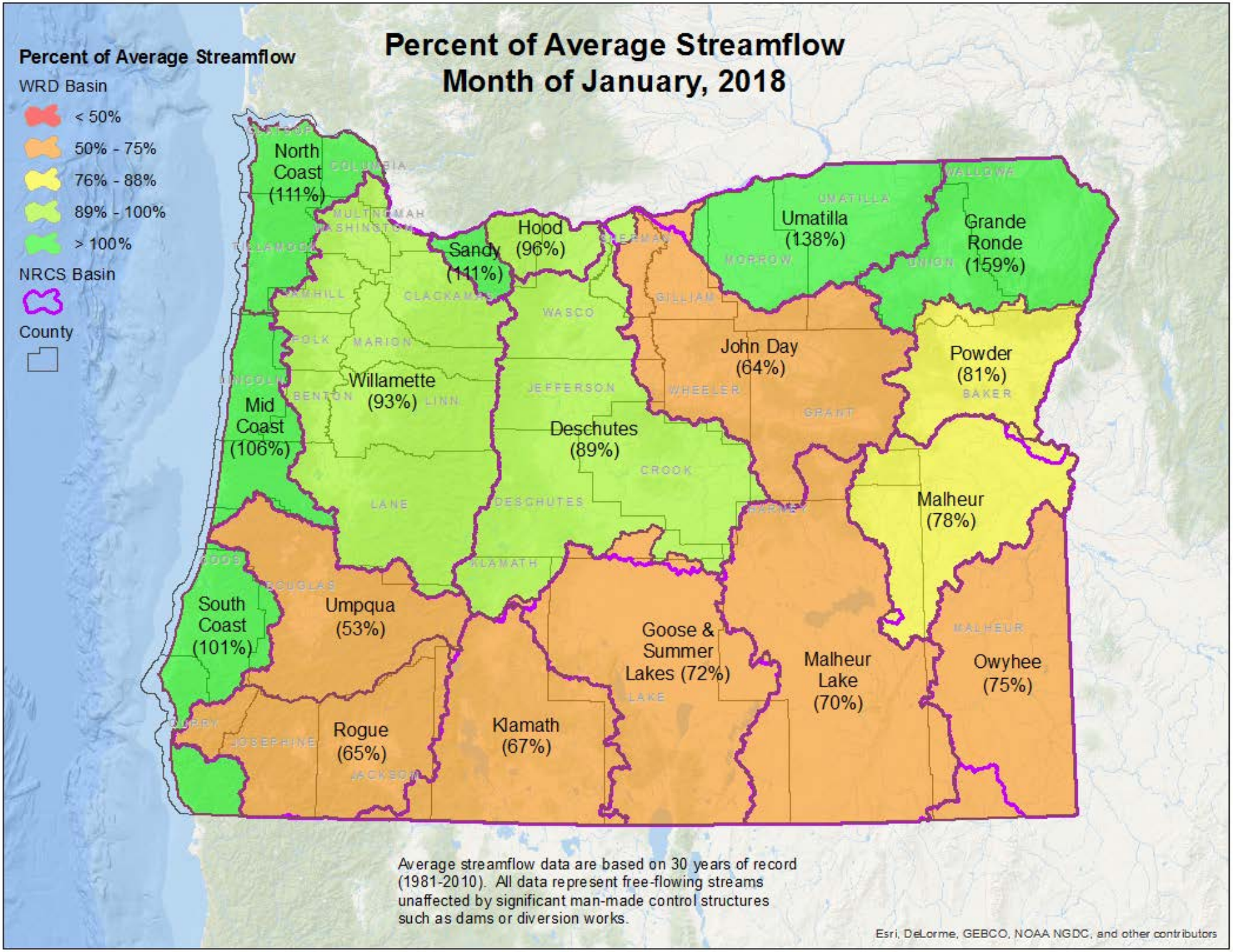


OREGON

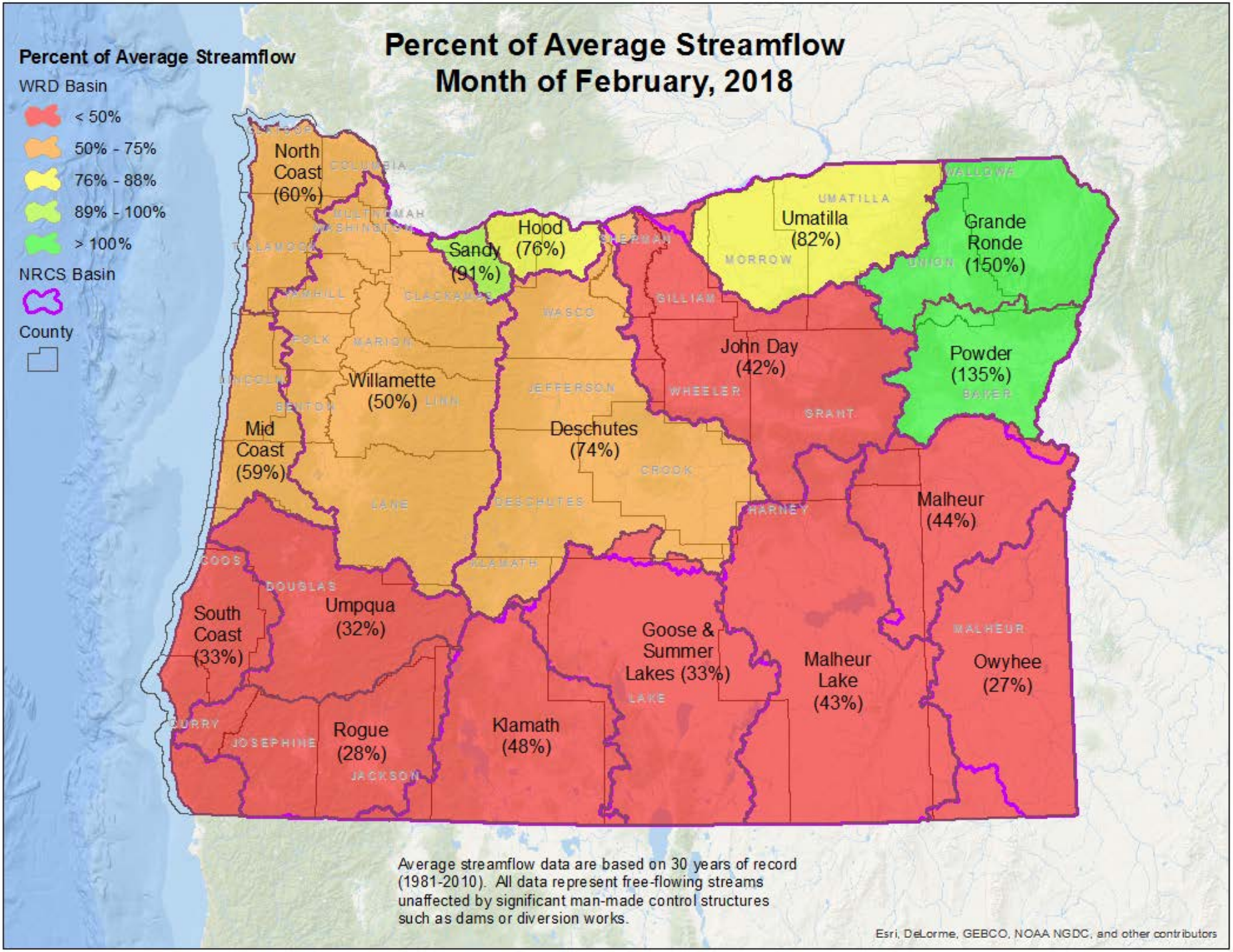
WATER RESOURCES DEPARTMENT

Streamflow and Storage Update

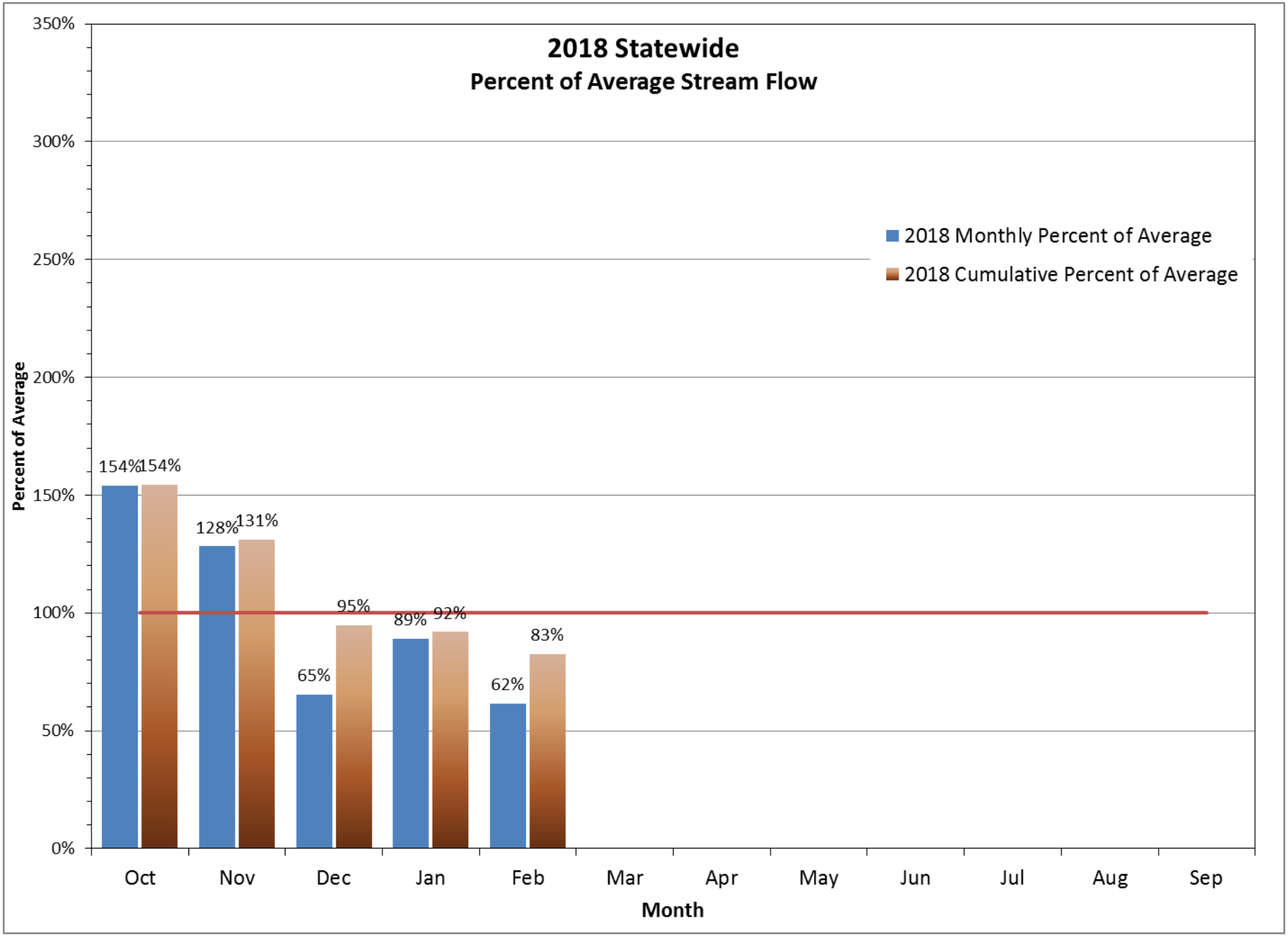
Percent of Average Streamflow
Month of January, 2018

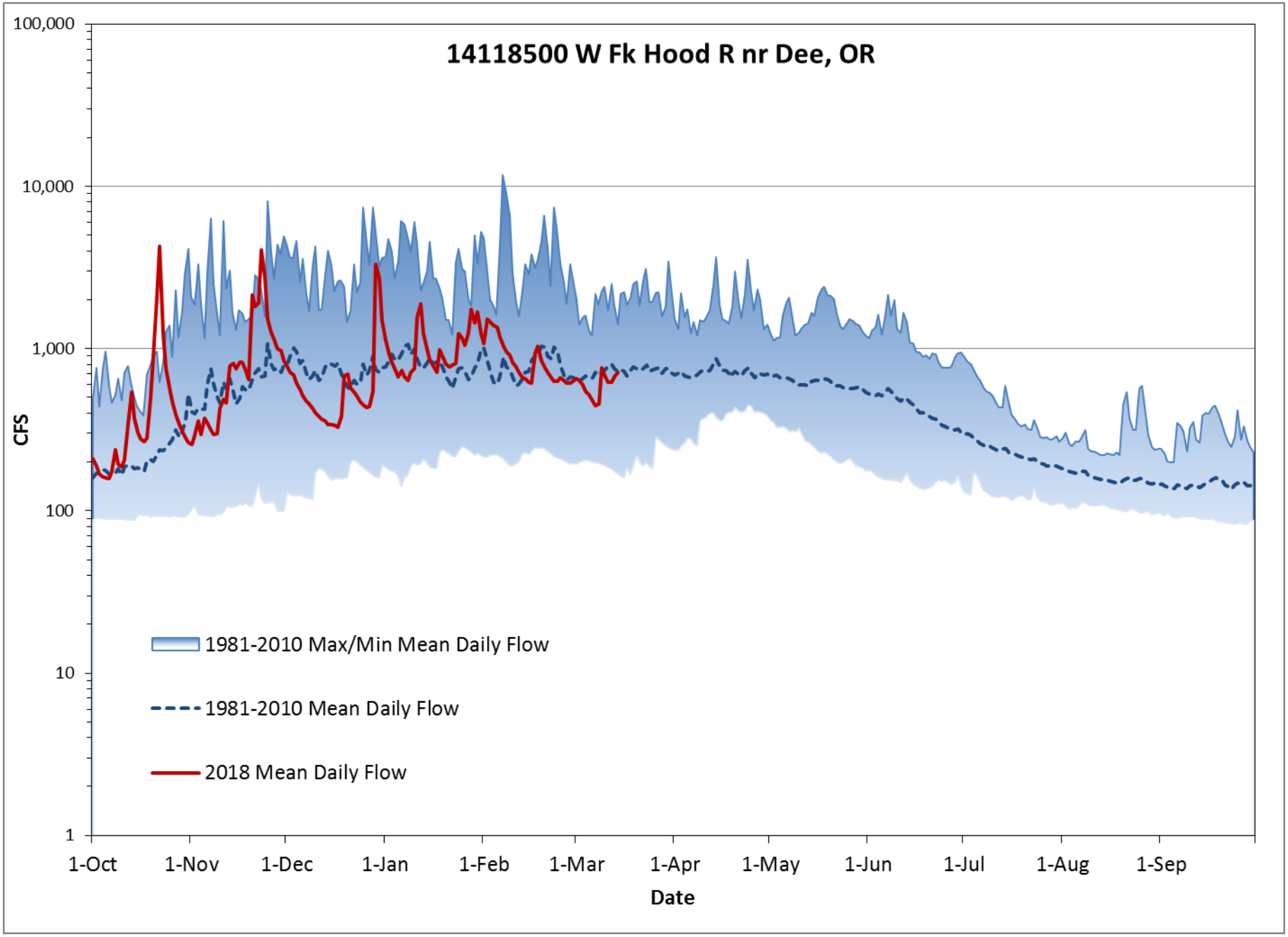


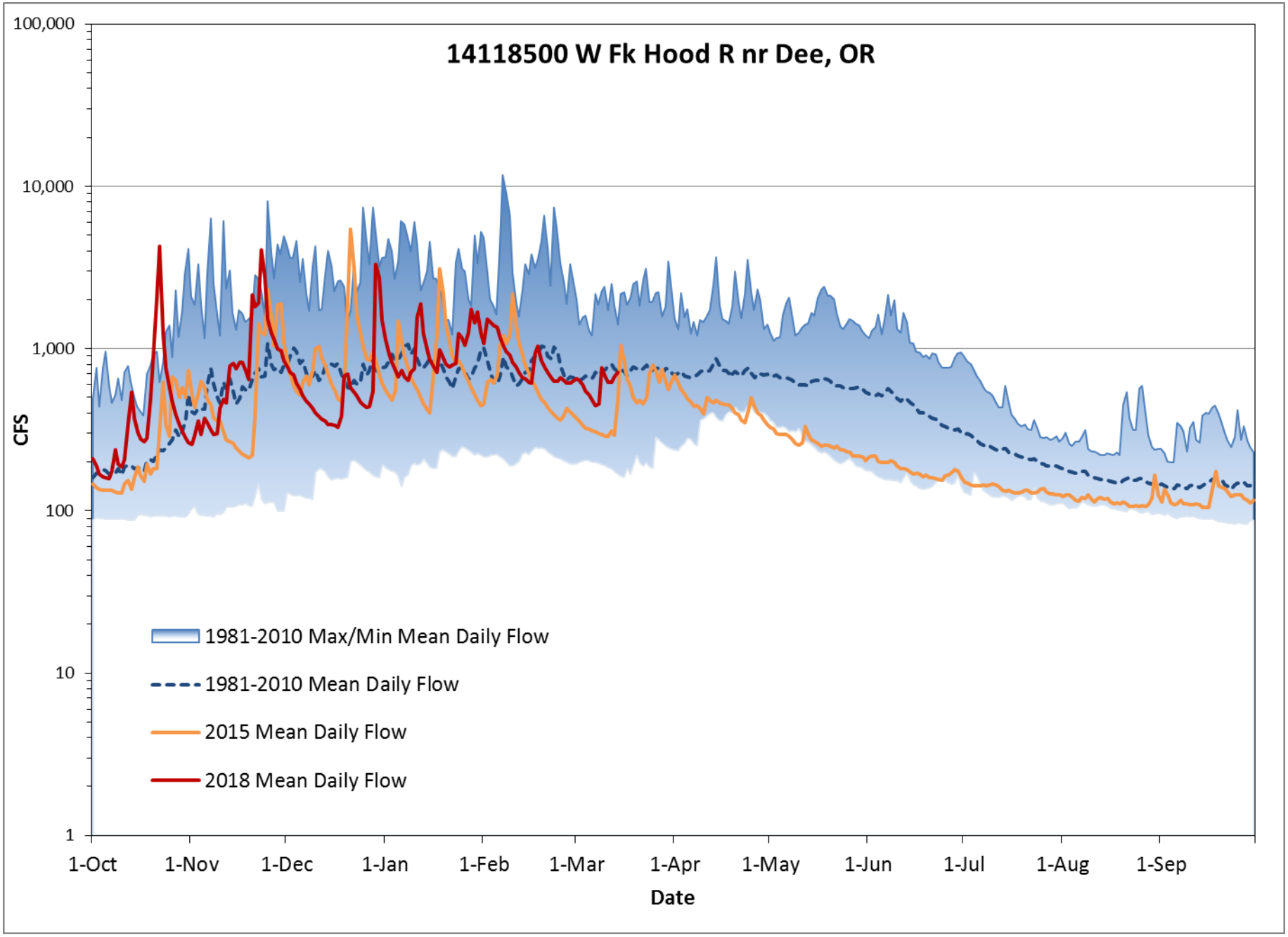
Percent of Average Streamflow
Month of February, 2018

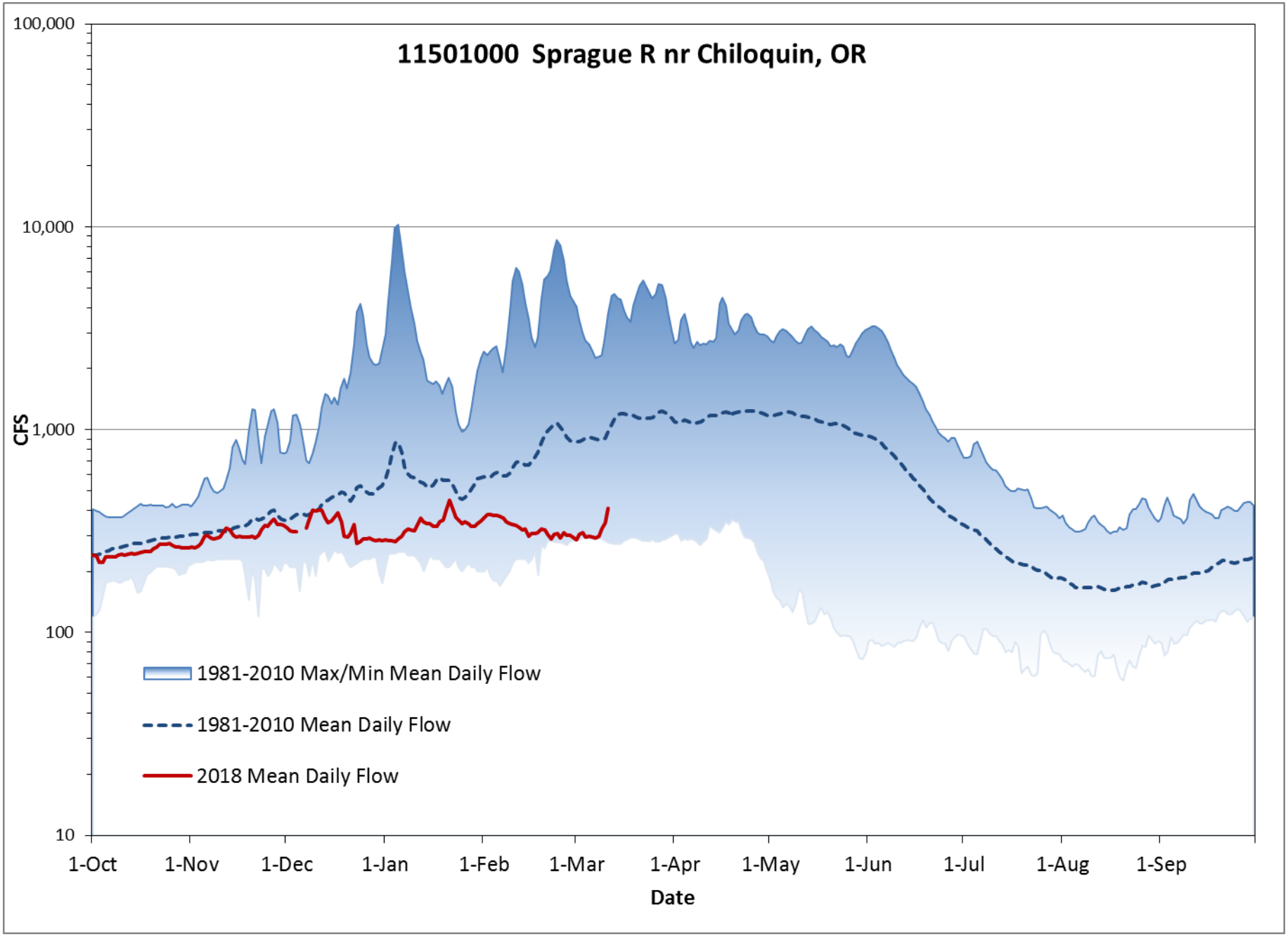


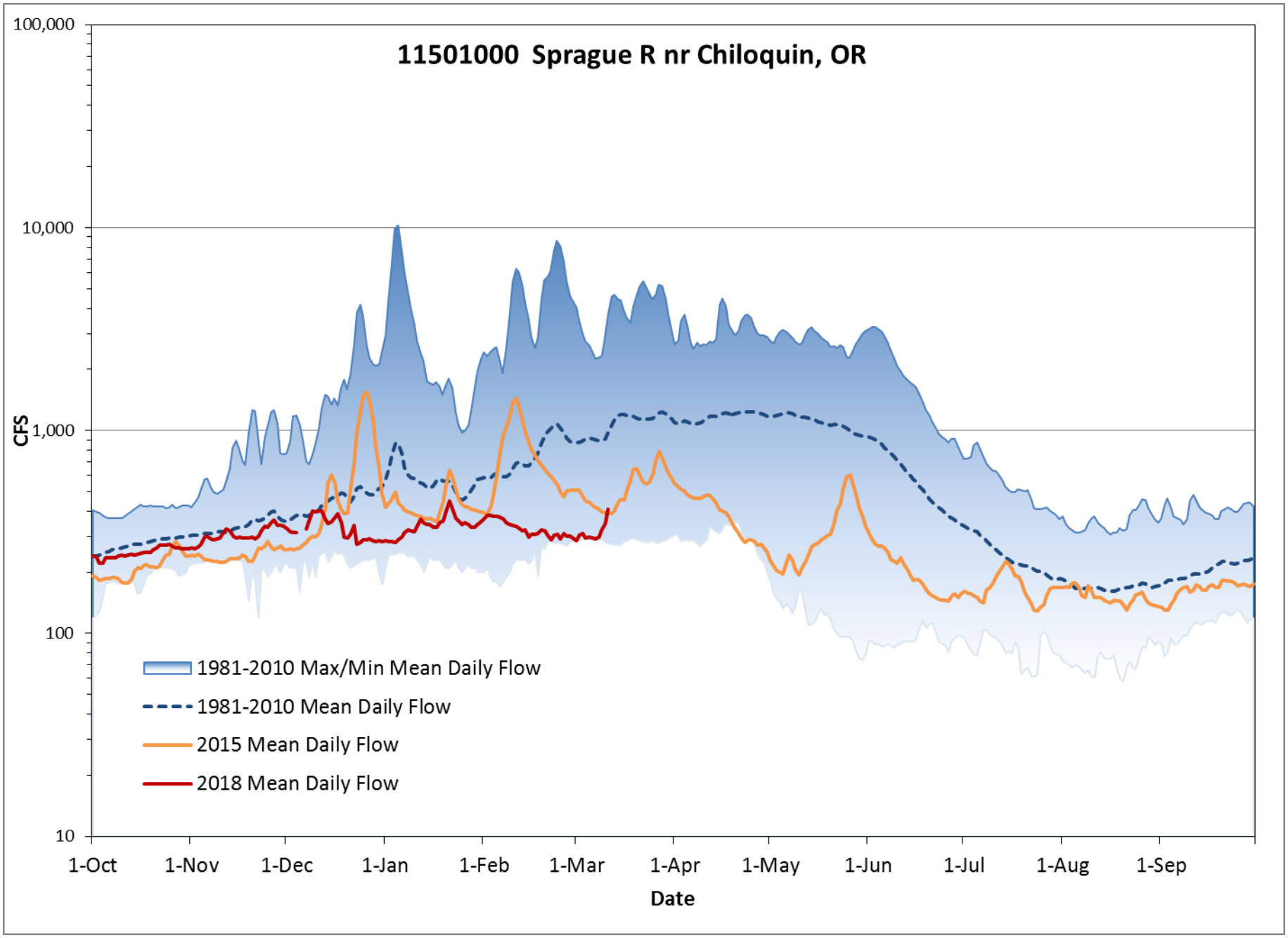
Average streamflow data are based on 30 years of record (1981-2010). All data represent free-flowing streams unaffected by significant man-made control structures such as dams or diversion works.

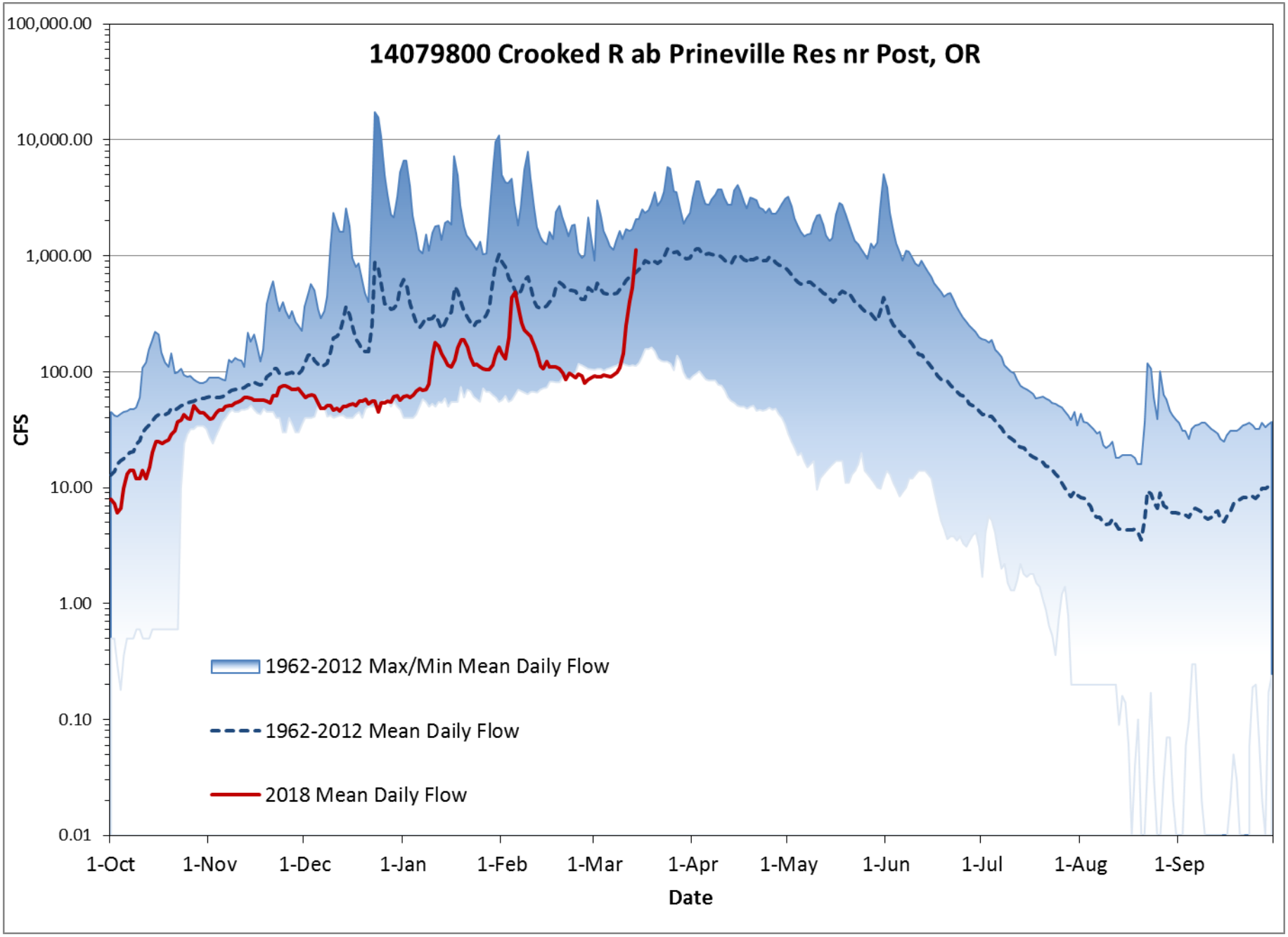

2018 Statewide
Percent of Average Stream Flow
2018 Monthly Percent of Average
2018 Cumulative Percent of Average
Percent of Average
350%
300%
250%
200%
150%
100%
50%
0%
154%
154%
128%
131%
65%
95%
89%
92%
62%
83%
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Month

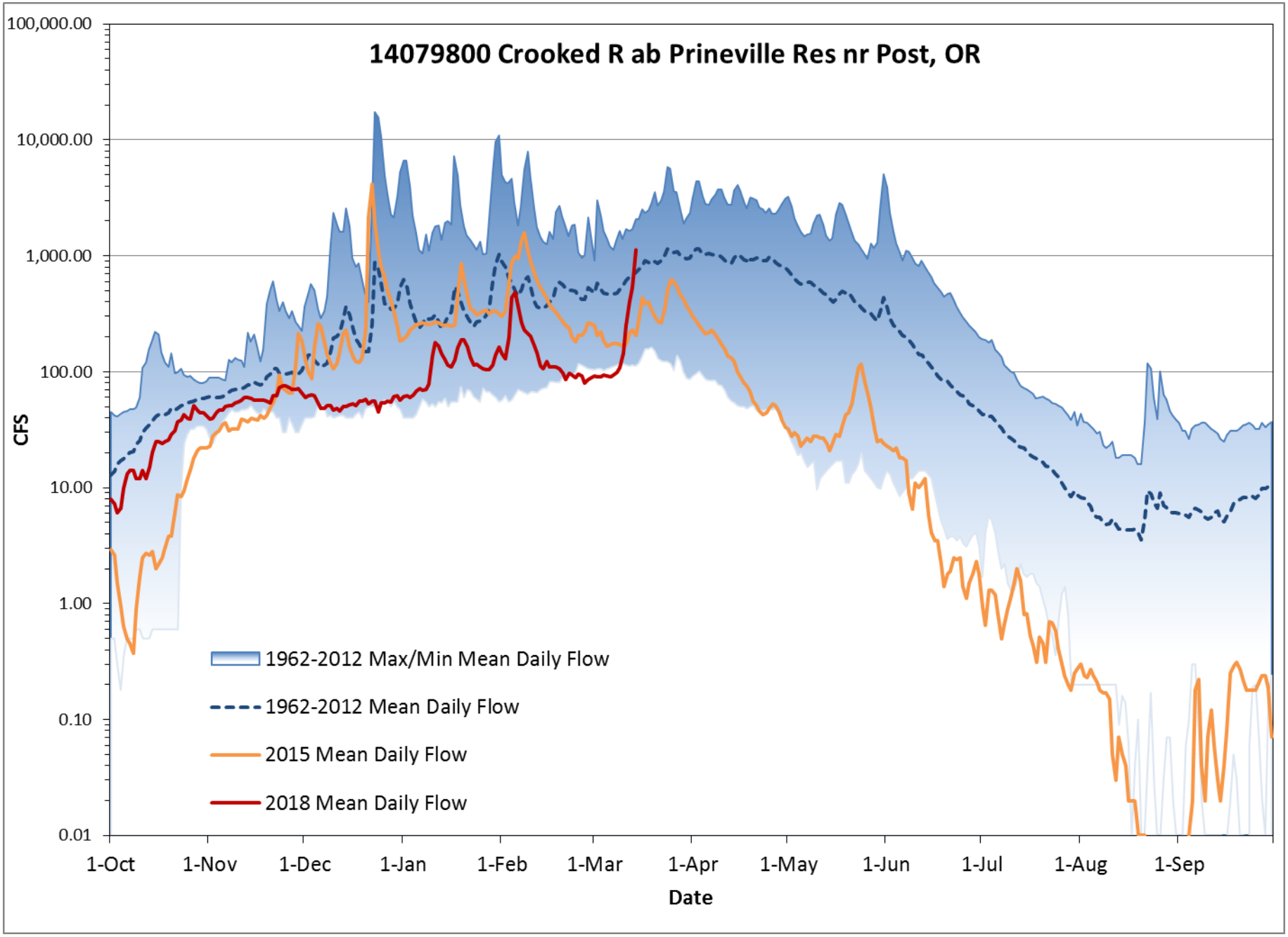

14118500 W Fk Hood R nr Dee, OR
100,000
10,000
1,000
100
10
1
CFS
1981-2010 Max/Min Mean Daily Flow
1981-2010 Mean Daily Flow
2018 Mean Daily Flow
1-Oct
1-Nov
1-Dec
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
Date


14118500 W Fk Hood R nr Dee, OR
100,000
10,000
1,000
100
10
1
CFS
1981-2010 Max/Min Mean Daily Flow
1981-2010 Mean Daily Flow
2015 Mean Daily Flow
2018 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

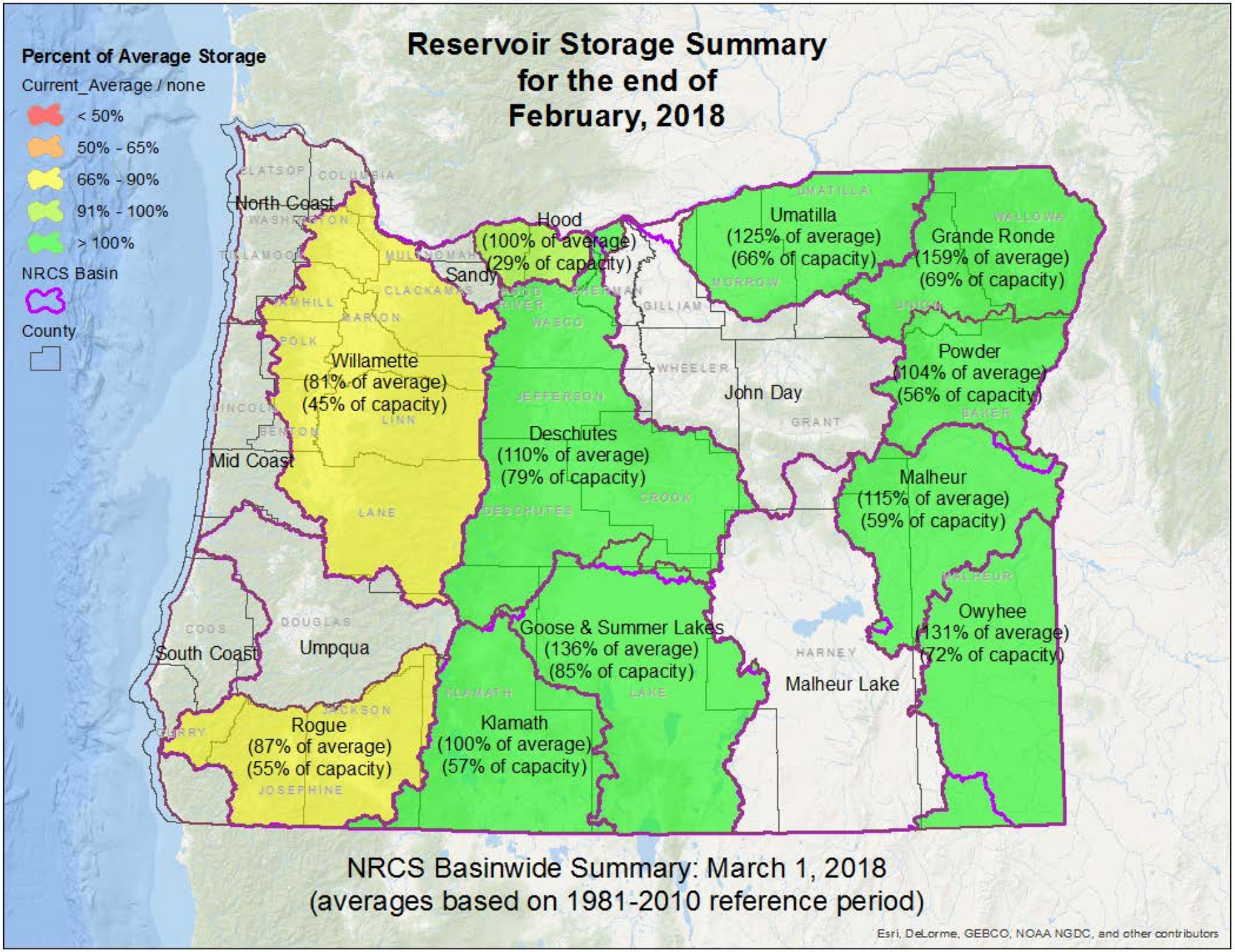

11501000 Sprague R nr Chiloquin, OR
100,000
10,000
1,000
100
10
CFS
1981-2010 Max/Min Mean Daily Flow
1981-2010 Mean Daily Flow
2018 Mean Daily Flow
1-Oct
1-Nov
1-Dec
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
Date


11501000 Sprague R nr Chiloquin, OR
100,000
10,000
1,000
100
10
CFS
1981-2010 Max/Min Mean Daily Flow
1981-2010 Mean Daily Flow
2015 Mean Daily Flow
2018 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

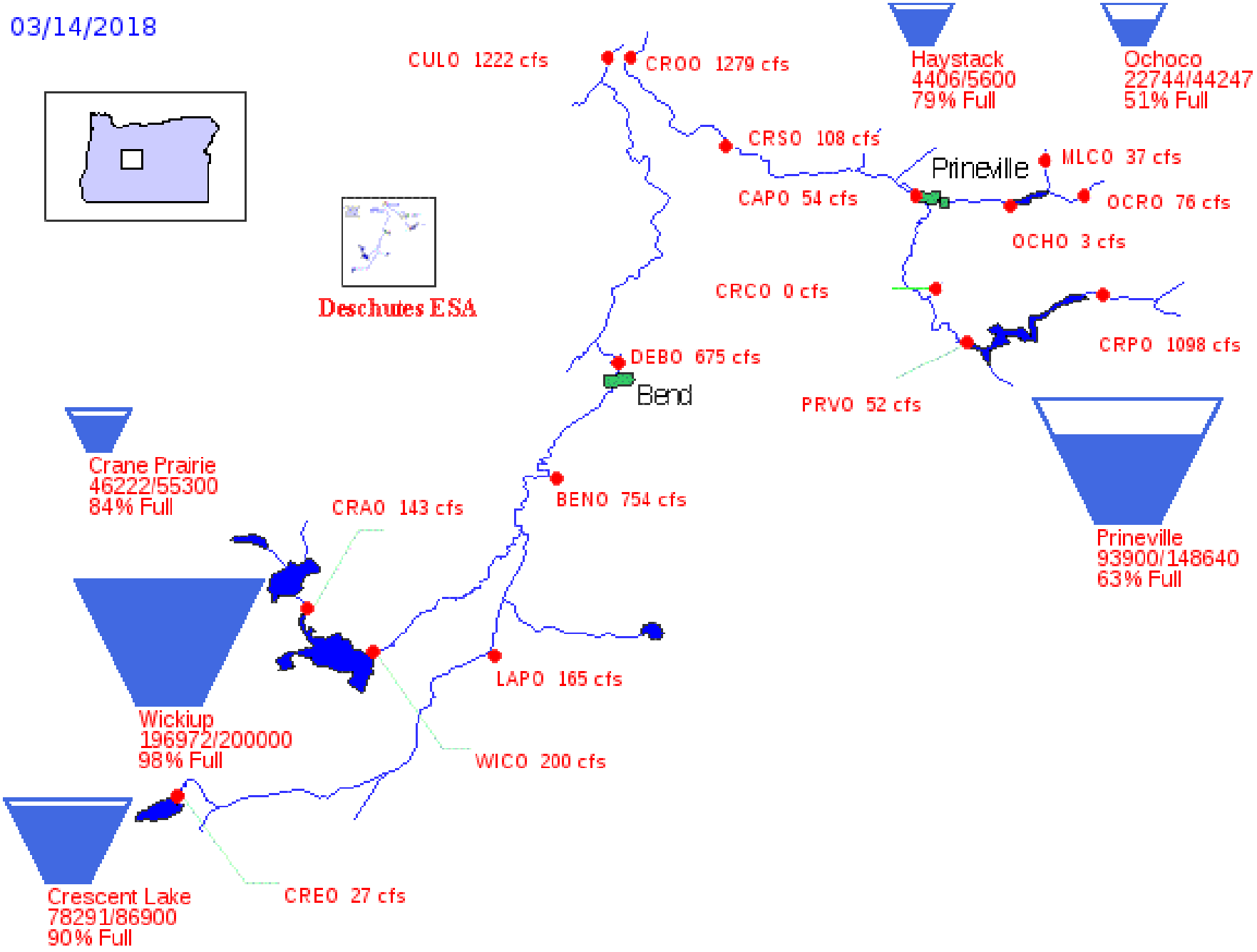

14079800 Crooked R ab Prineville Res nr Post, OR
100,000.00
10,000.00
1,000.00
100.00
10.00
1.00
0.10
0.01
CFS
1962-2012 Max/Min Mean Daily Flow
1962-2012 Mean Daily Flow
2018 Mean Daily Flow
1-Oct
1-Nov
1-Dec
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
Date


14079800 Crooked R ab Prineville Res nr Post, OR
100,000.00
10,000.00
1,000.00
100.00
10.00
1.00
0.10
0.01
CFS
1962-2012 Max/Min Mean Daily Flow
1962-2012 Mean Daily Flow
2015 Mean Daily Flow
2018 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

Reservoir Storage Summary for the end of February, 2018



NRCS Basinwide Summary: March 1, 2018
(averages based on 1981-2010 reference period)


03/14/2018
CULO 1222 cfs
CROO 1279 cfs
Haystack
4406/5600
79% Full
Ochoco
22744/44247
51% Full
CRSO 108 cfs
Prineville
MLCO 37 cfs
CAPO 54 cfs
OCRO 76 cfs
OCHO 3 cfs
Deschutes ESA
CRCO 0 cfs
CRPO 1098 cfs
DEBO 675 cfs
Bend
PRVO 52 cfs
Crane Prairie
46222/55300
84% Full
CRAO 143 cfs
BENO 754 cfs
Prineville
93900/148640
63% Full
LAPO 165 cfs
Wickiup
196972/200000
98% Full
WICO 200 cfs
Crescent Lake
78291/86900
90% Full
CREO 27 cfs

drought, water, and climate update

Kathie Dello

Associate Director, Oregon Climate Change Research Institute
Oregon State University

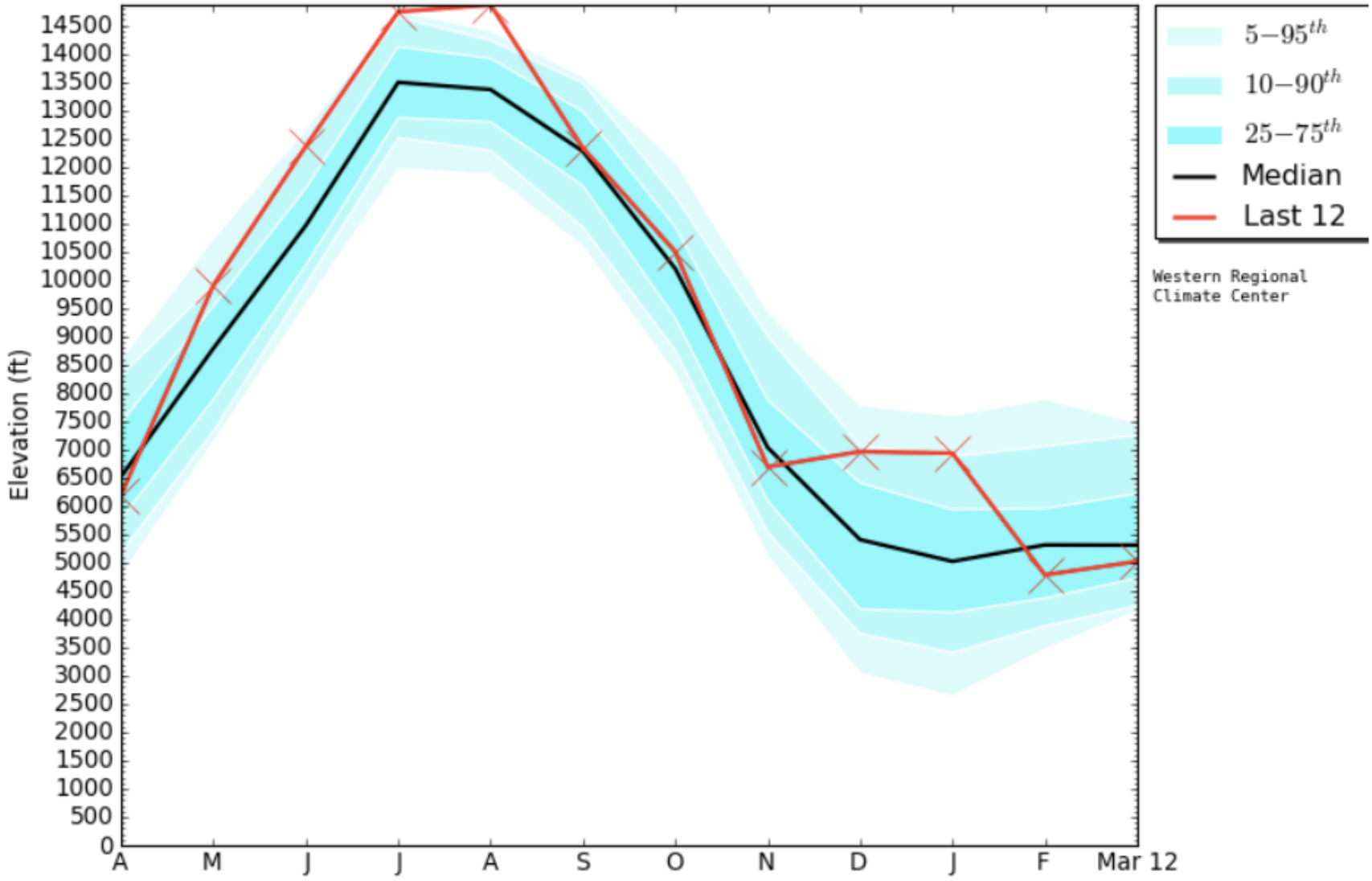
March 15, 2018

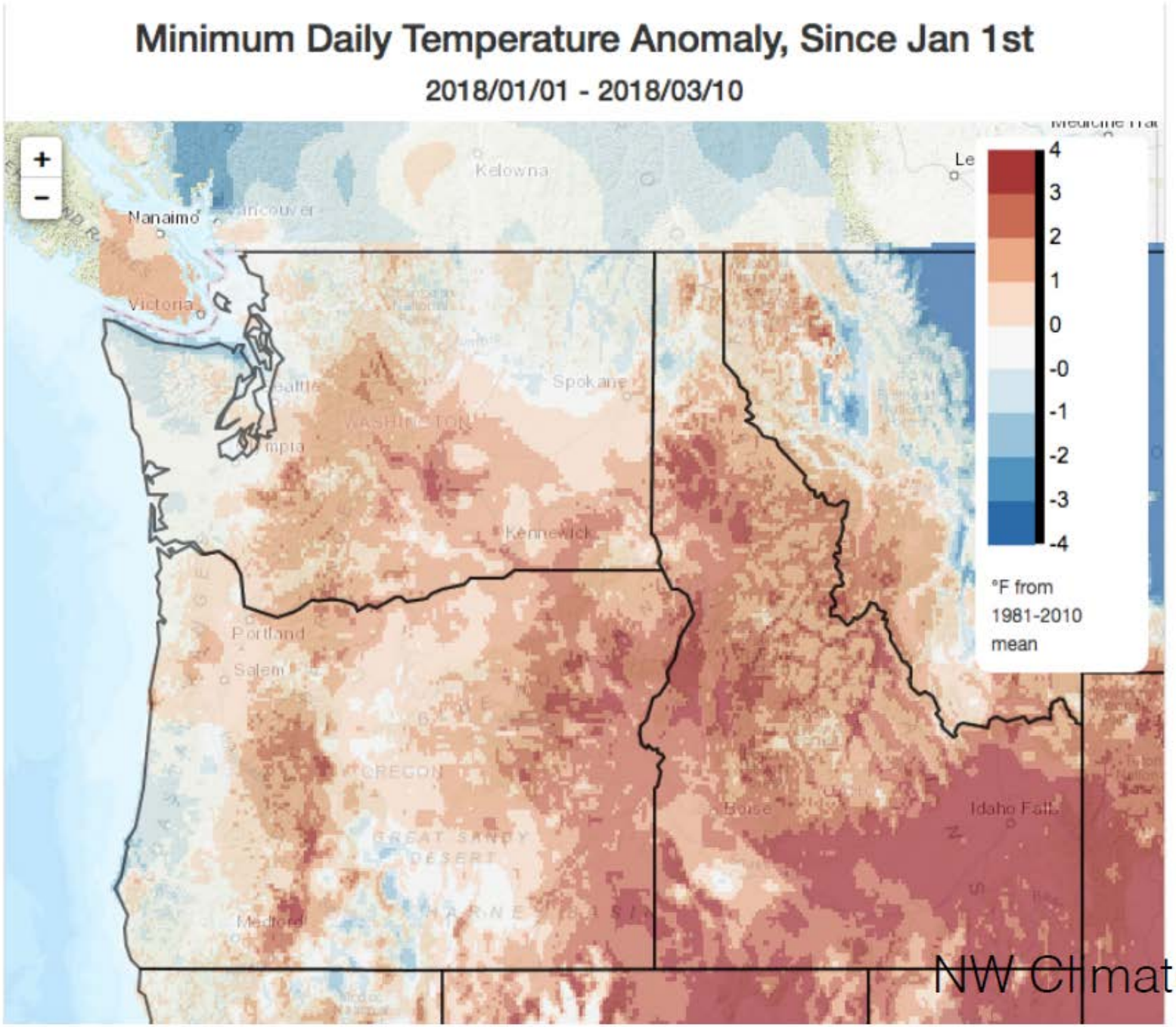
Oregon State University

OCCRI

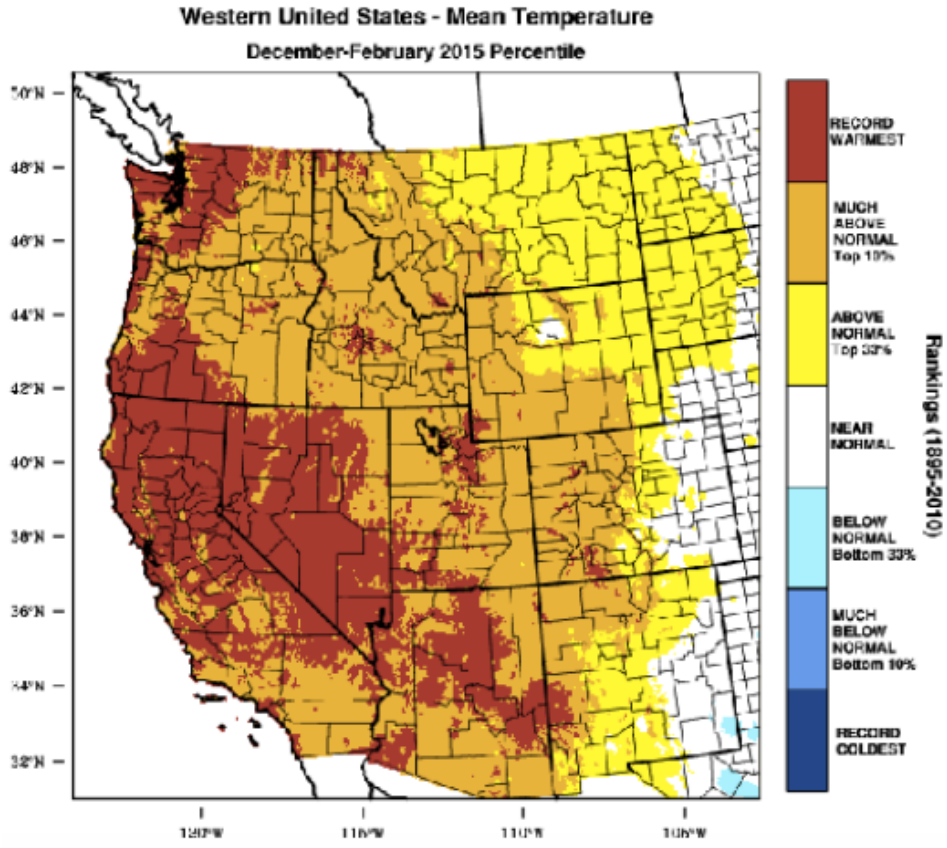

photo: Philip Mote

Freezing level height at Santiam Pass

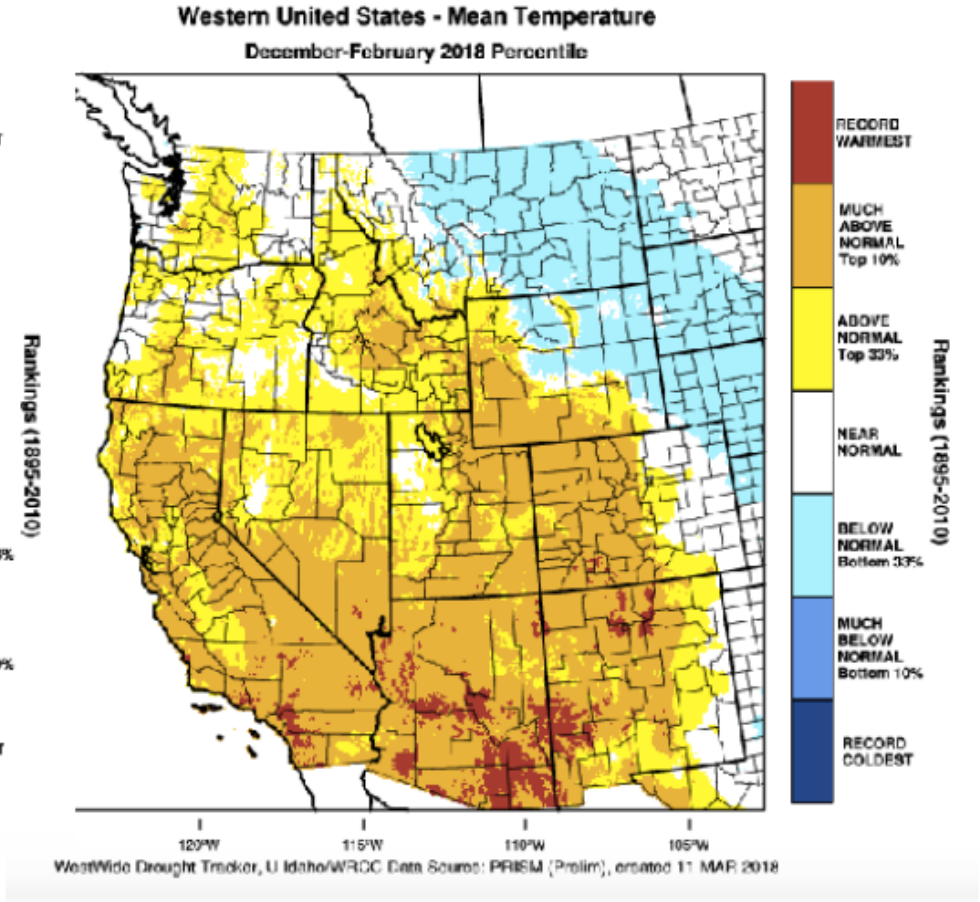



Minimum Daily Temperature Anomaly, Since Jan 1st
2018/01/01 - 2018/03/10
Kelowna
Nanaimo
Victoria
Spokane
Kennewick
Portland
Salem
Boise
Idaho Falls
4
3
2
1
0
-0
-1
-2
-3
-4
°F from
1981-2010
mean
NW Climate Toolbox

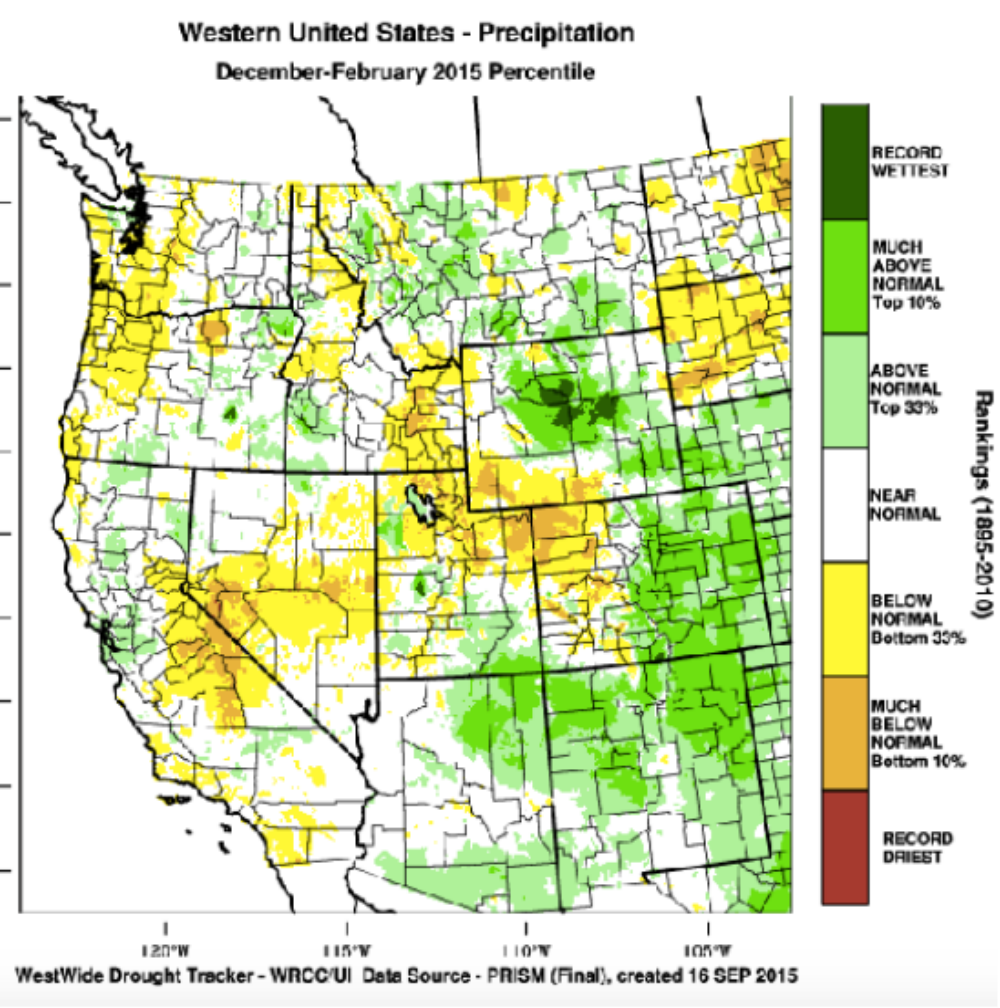
Winter 2015



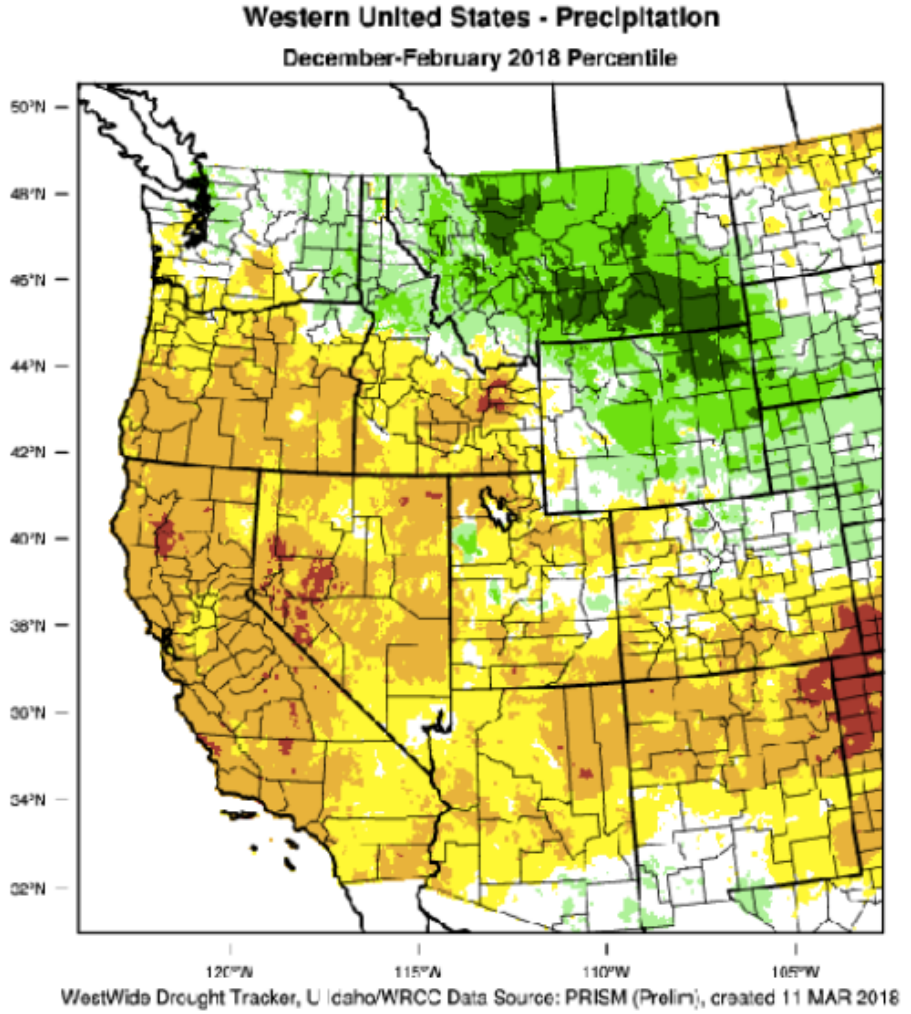
Winter 2018



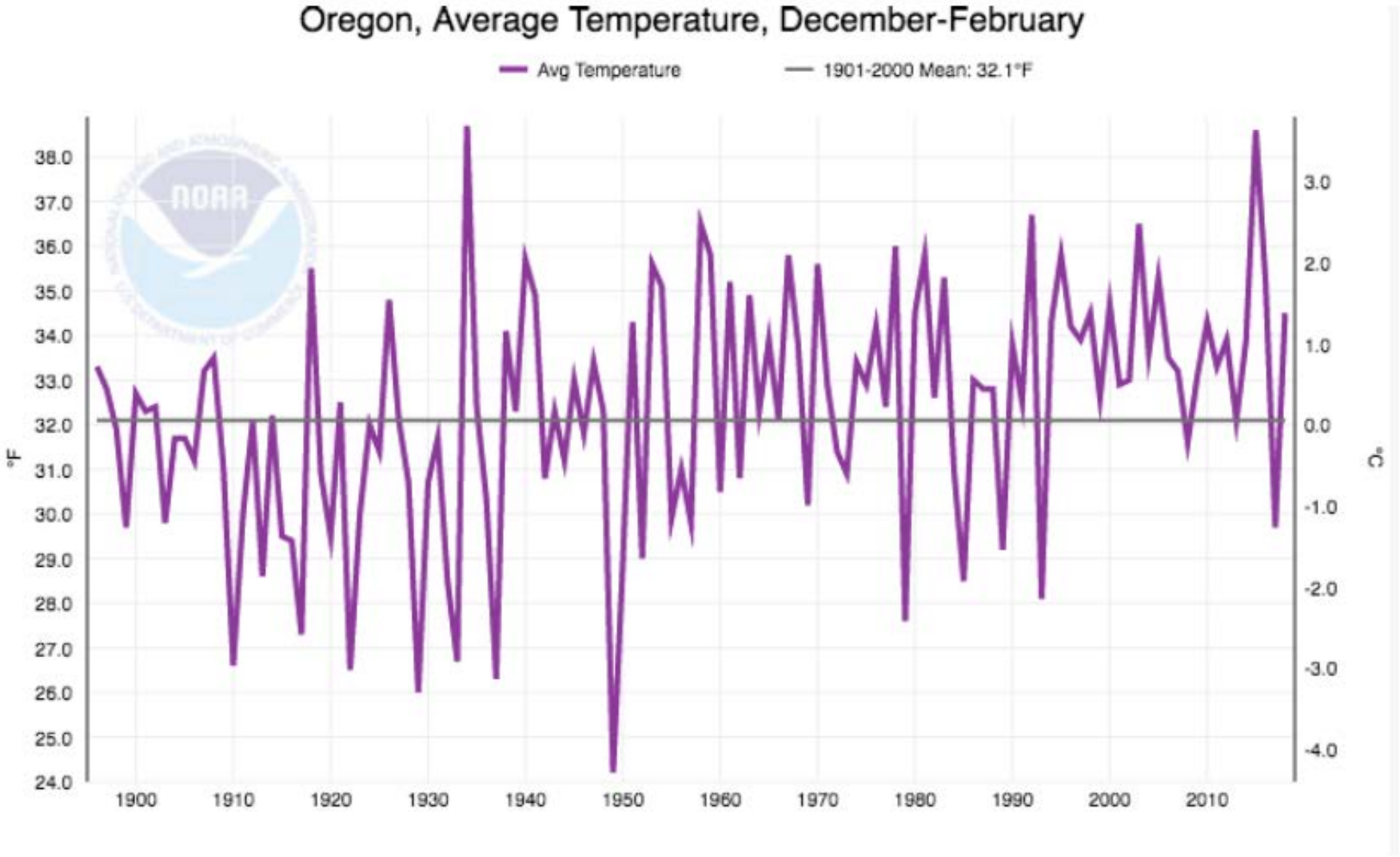
Winter 2015



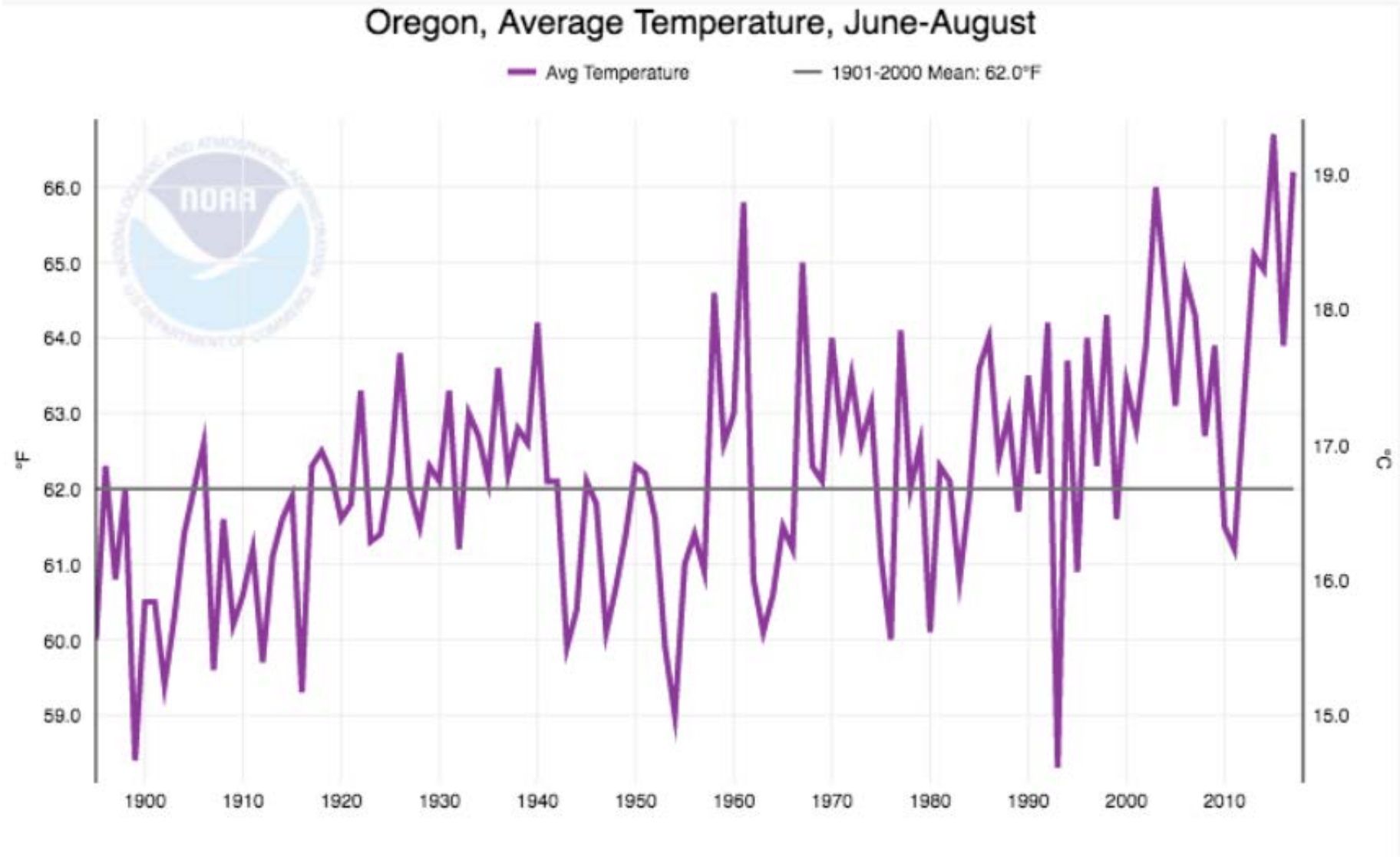
Winter 2018



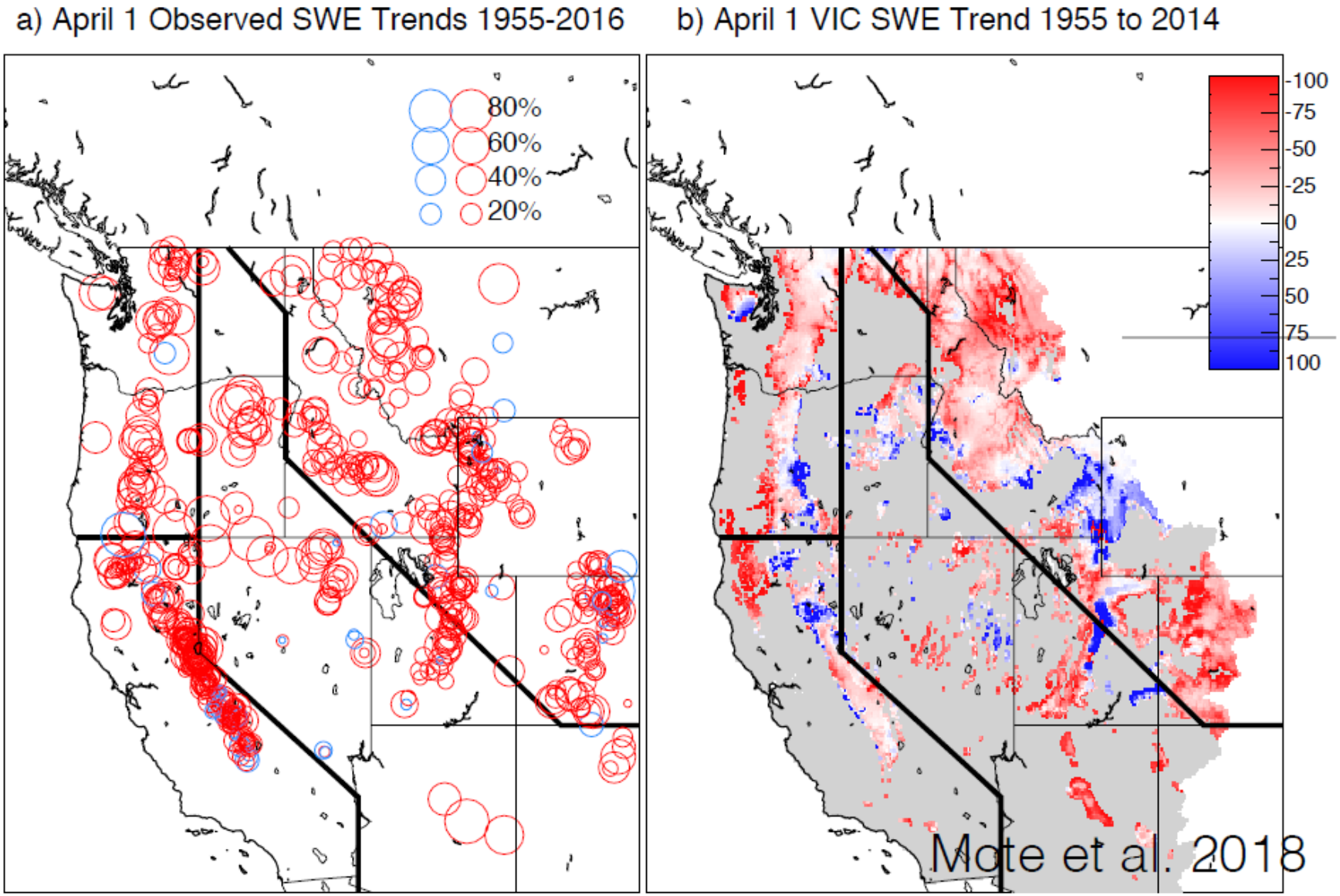
Our winters are warming



Our summers are warming



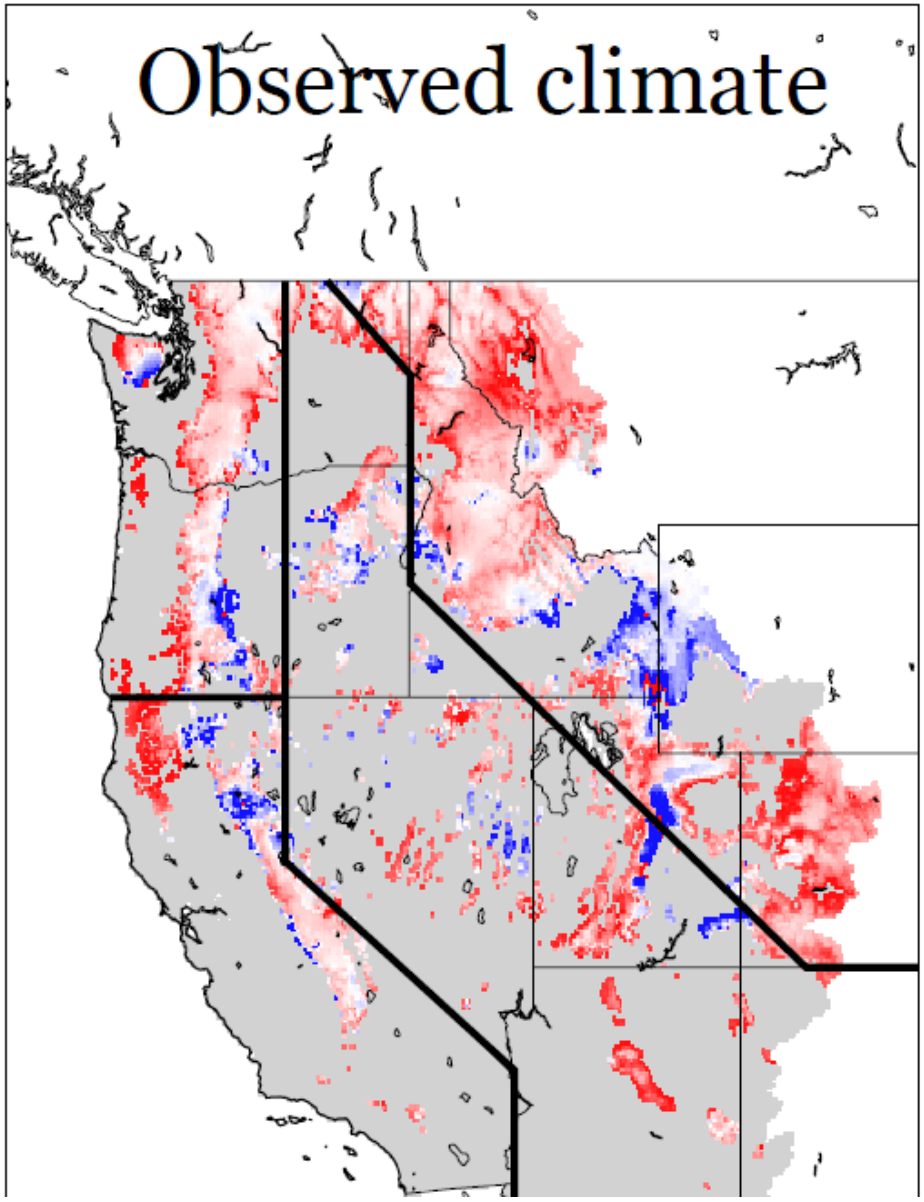
Obs & model: 90% decline

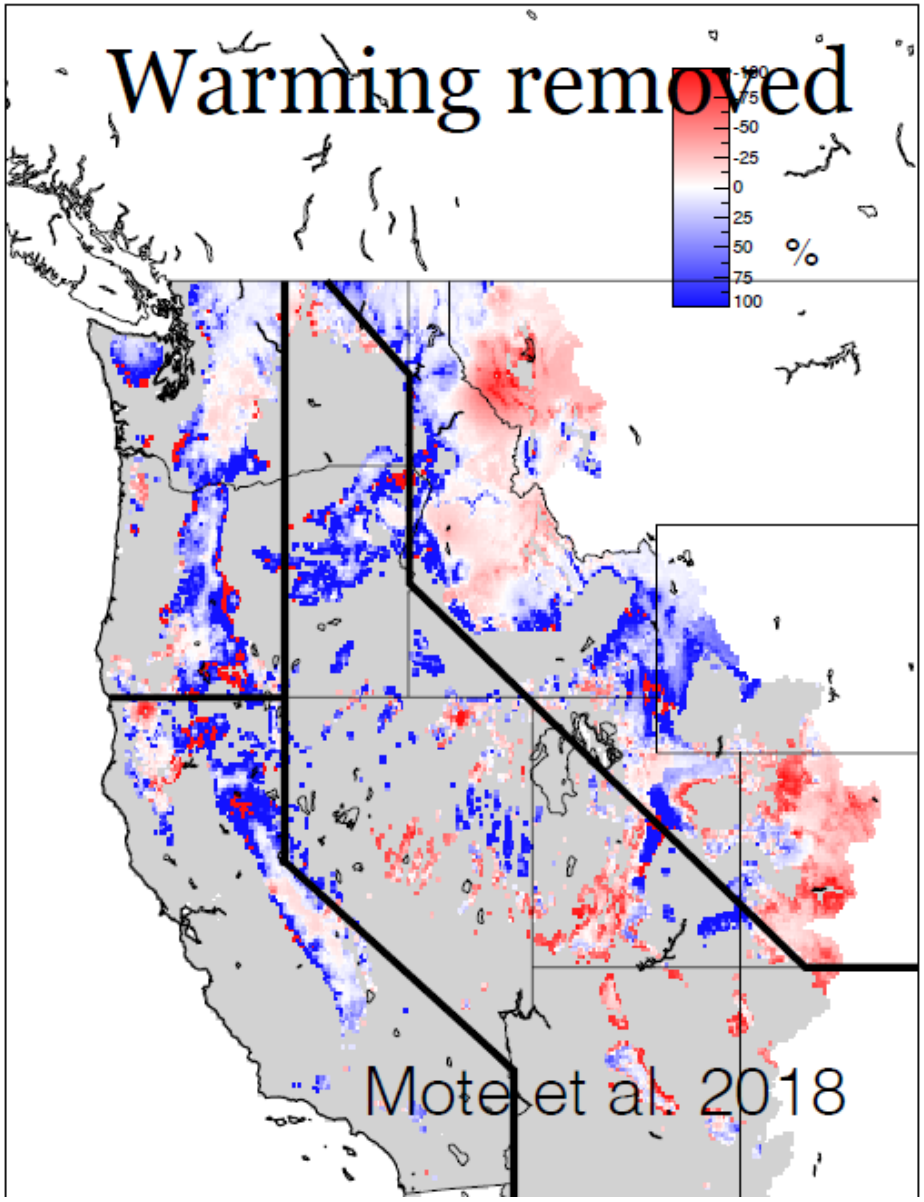


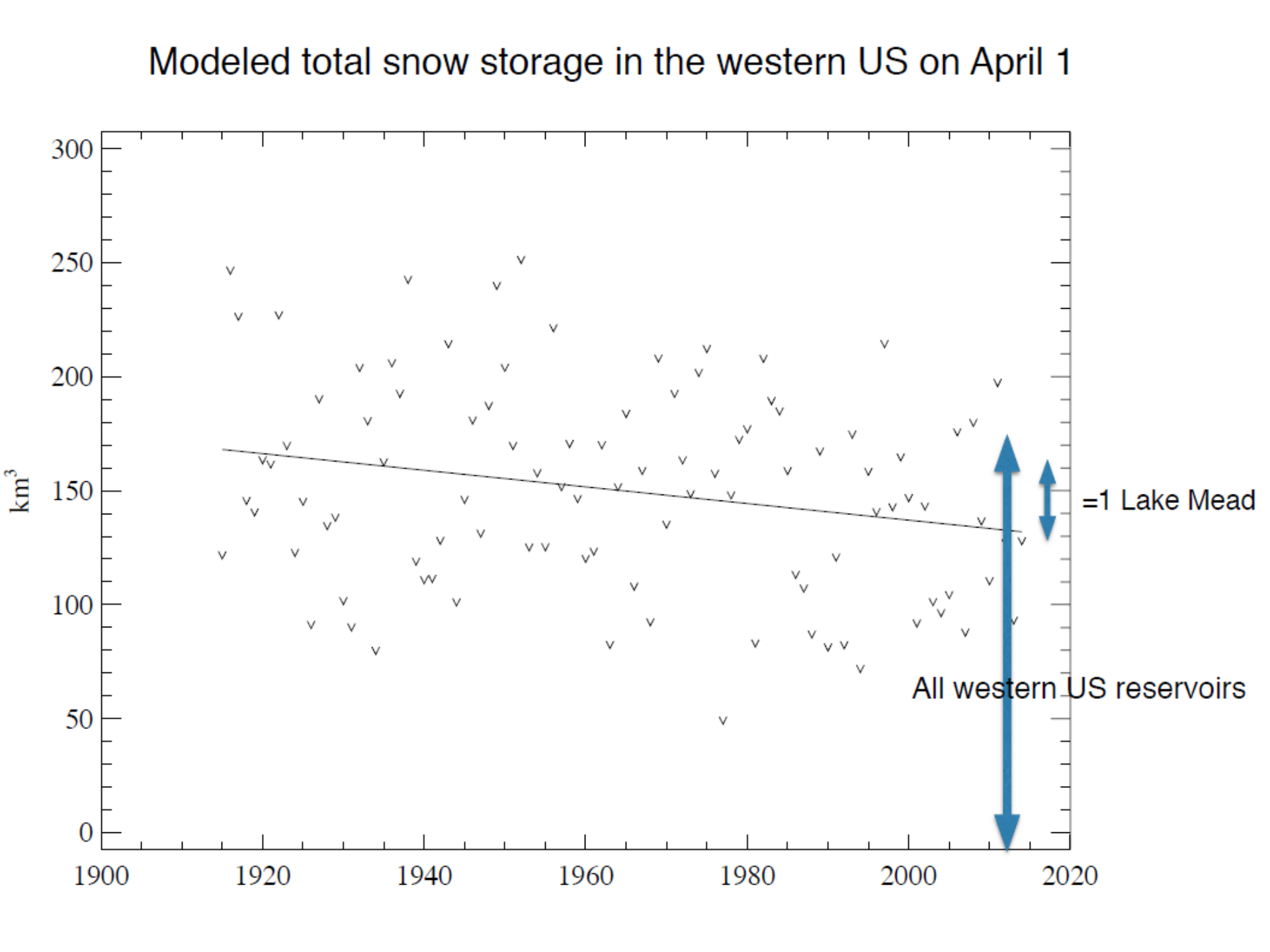
Role of warming

b) April 1 VIC SWE Trend 1955 to 2014

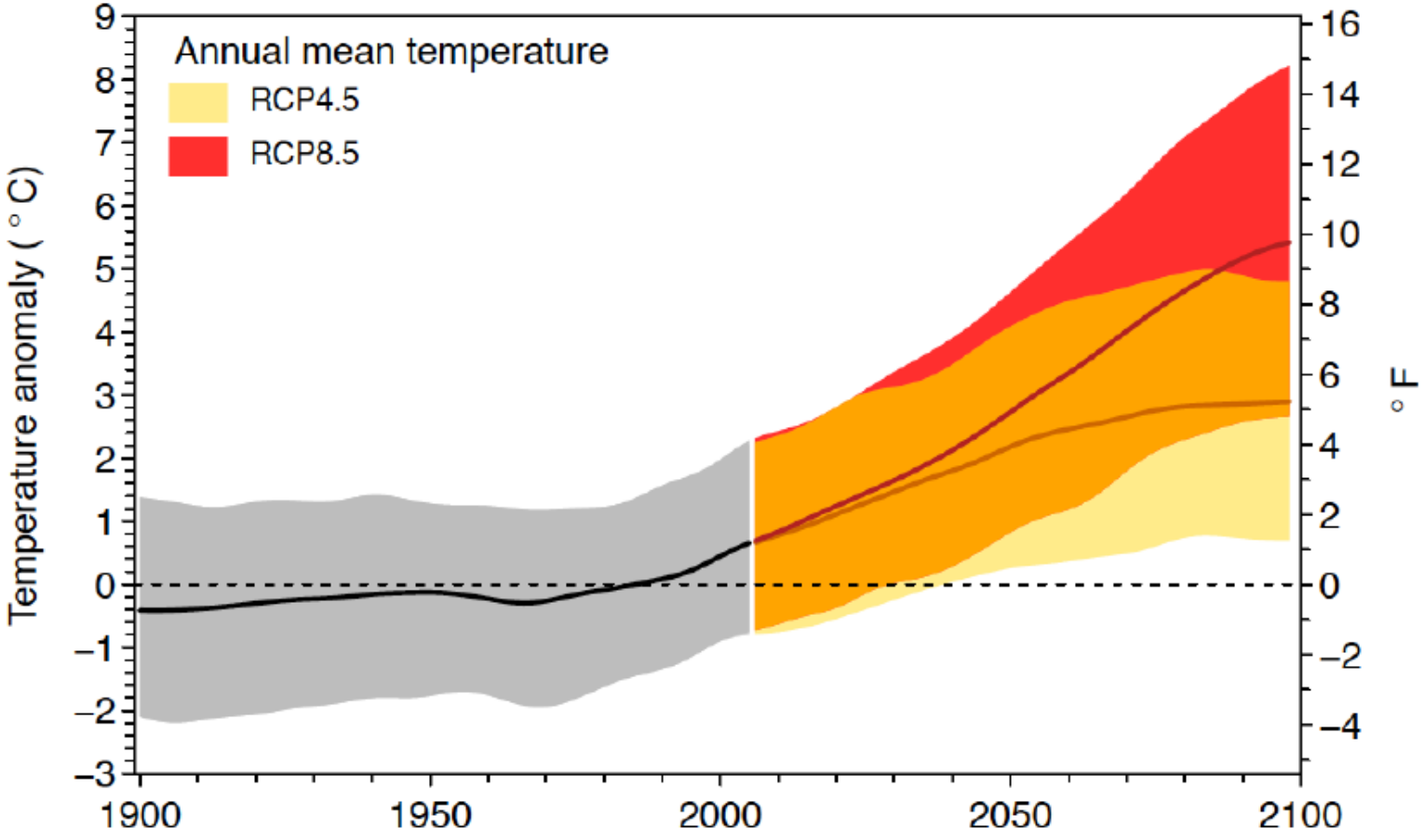
c) April 1 VIC SWE Trend(Detrended) 1955 to 2014






Modeled total snow storage in the western US on April 1
300
250
200
150
100
50
0
km3
1900
1920
1940
1960
1980
2000
2020
=1 Lake Mead
All western US reservoirs

Temperature Projections for the Columbia Basin**

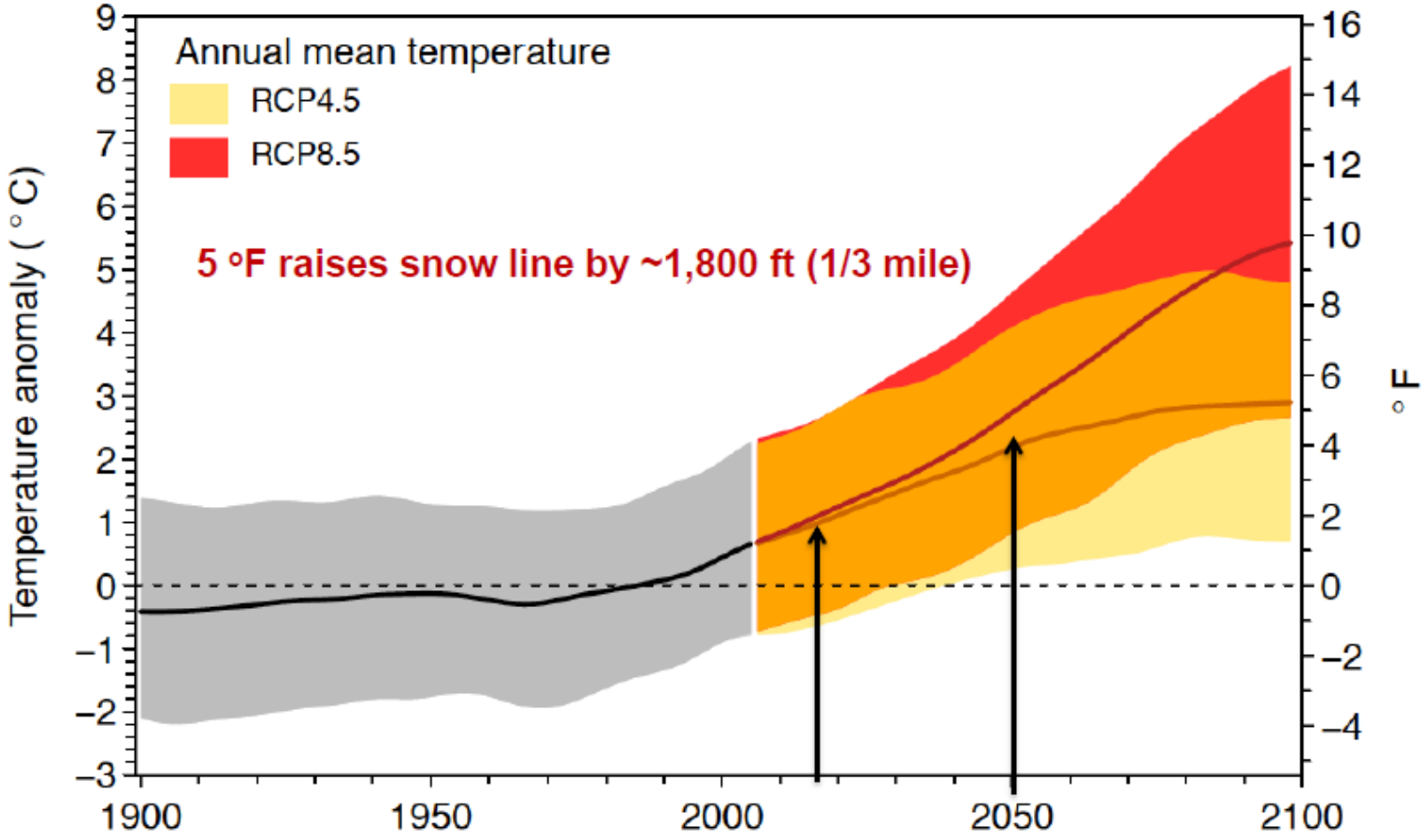


*Departure from 1979-1999 average
**Above Bonneville Dam

Source: Rupp, Abatzoglou, & Mote, Climate Dynamics, 2016

Red: High Emissions
Yellow: Low Emissions

Temperature Projections for the Columbia Basin**

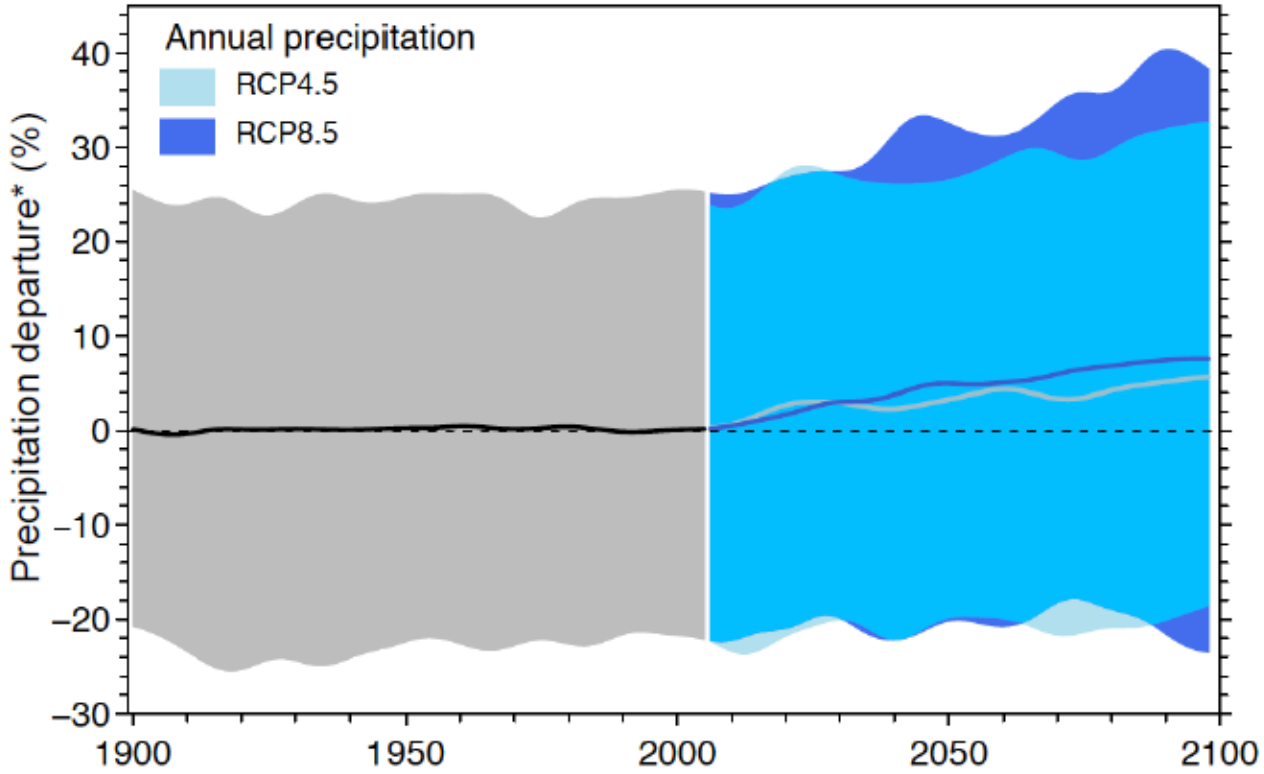


*Departure from 1979-1999 average
**Above Bonneville Dam

Source: Rupp, Abatzoglou, & Mote, Climate Dynamics, 2016

Red: High Emissions
Yellow: Low Emissions

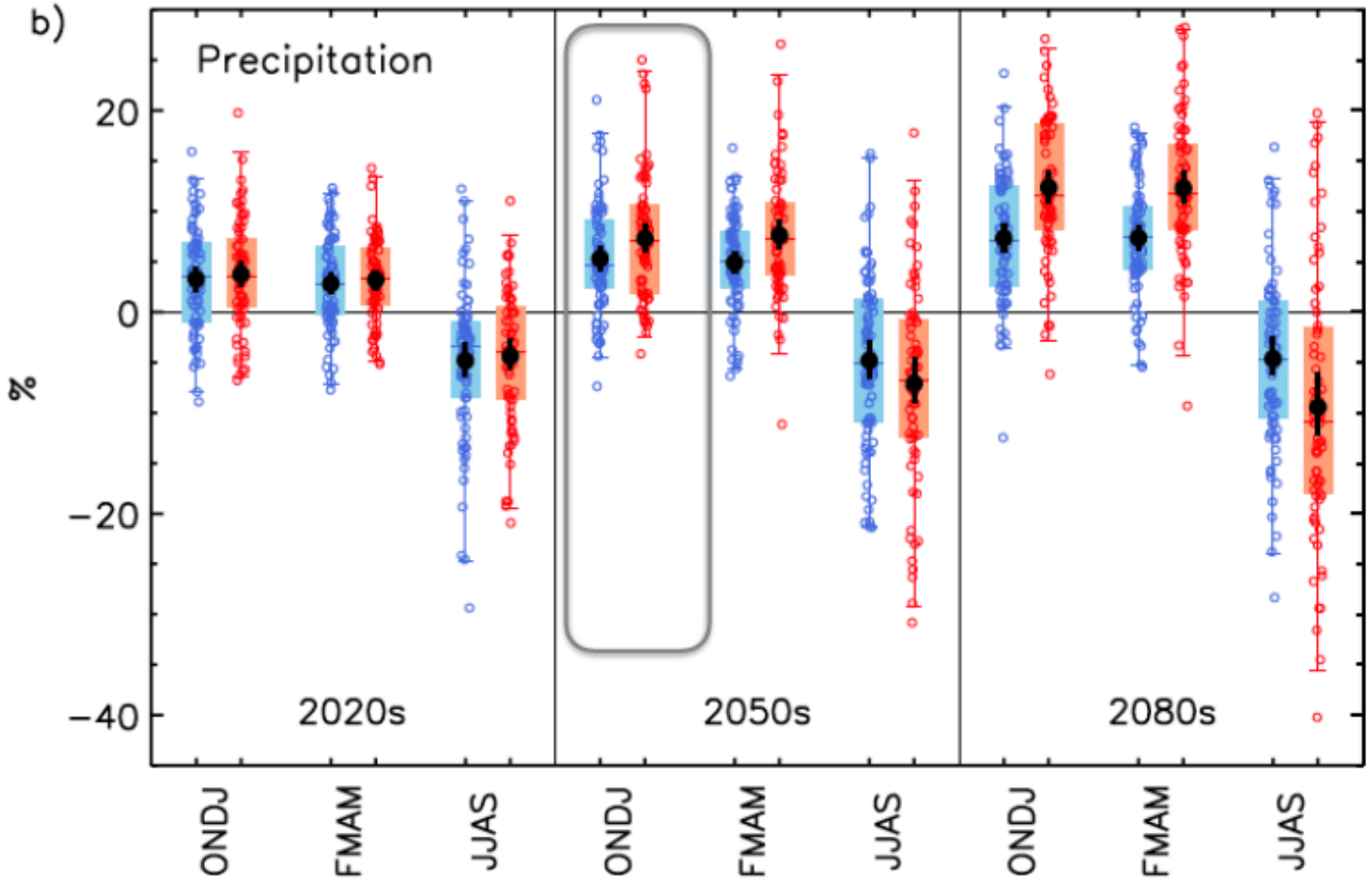
Precipitation Projections for the Columbia Basin



*Relative departure from 1979-1999 average

Source: Rupp, Abatzoglou, & Mote, Climate Dynamics, 2016

Precipitation changes by season: Columbia Basin



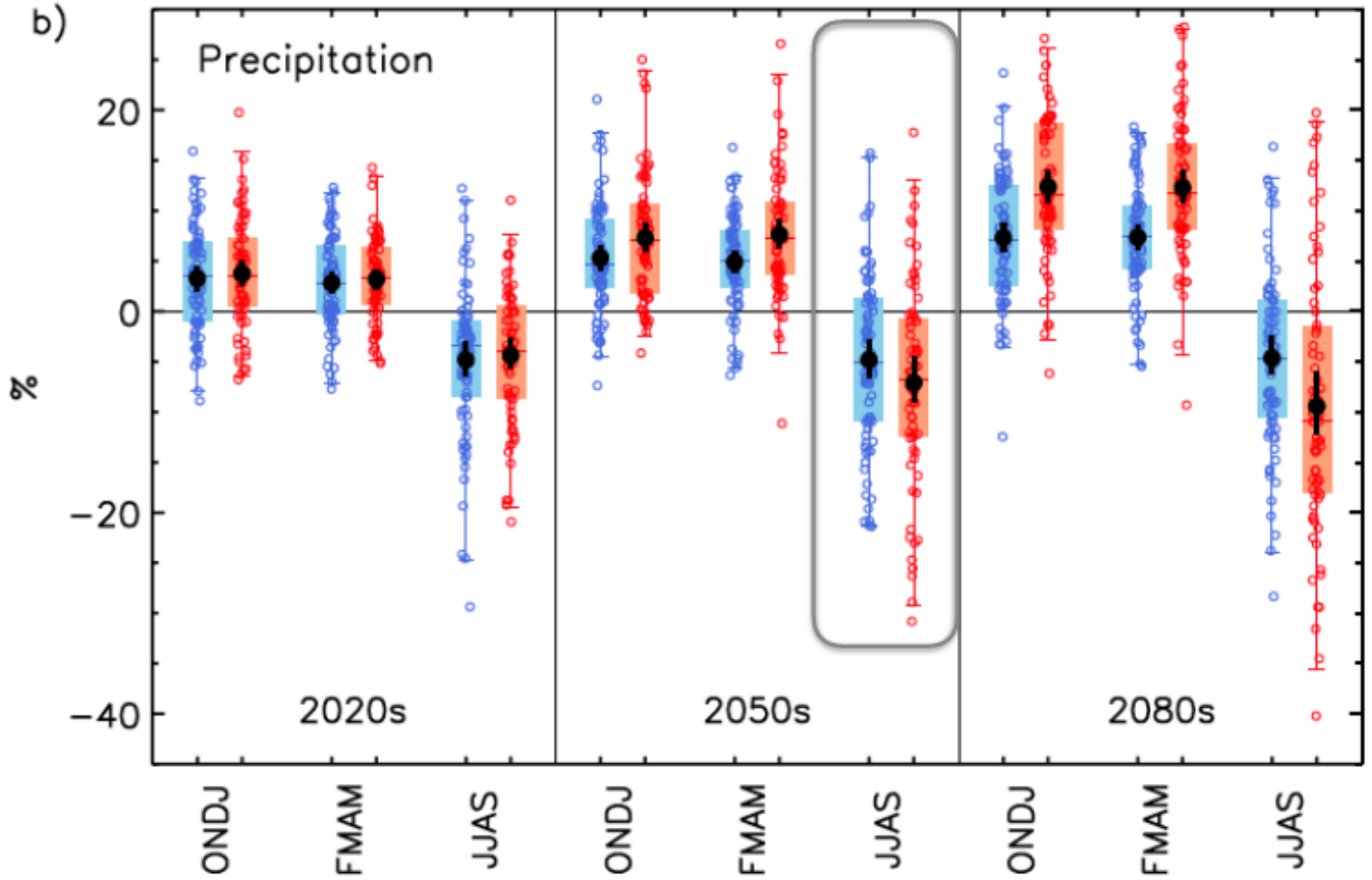
*Departure from 1979-1999 average

Source: Rupp, Abatzoglou. & Mote, Climate Dynamics, 2016

RCP45
RCP85

Red: High Emissions
Blue: Low Emissions

Precipitation changes by season: Columbia Basin



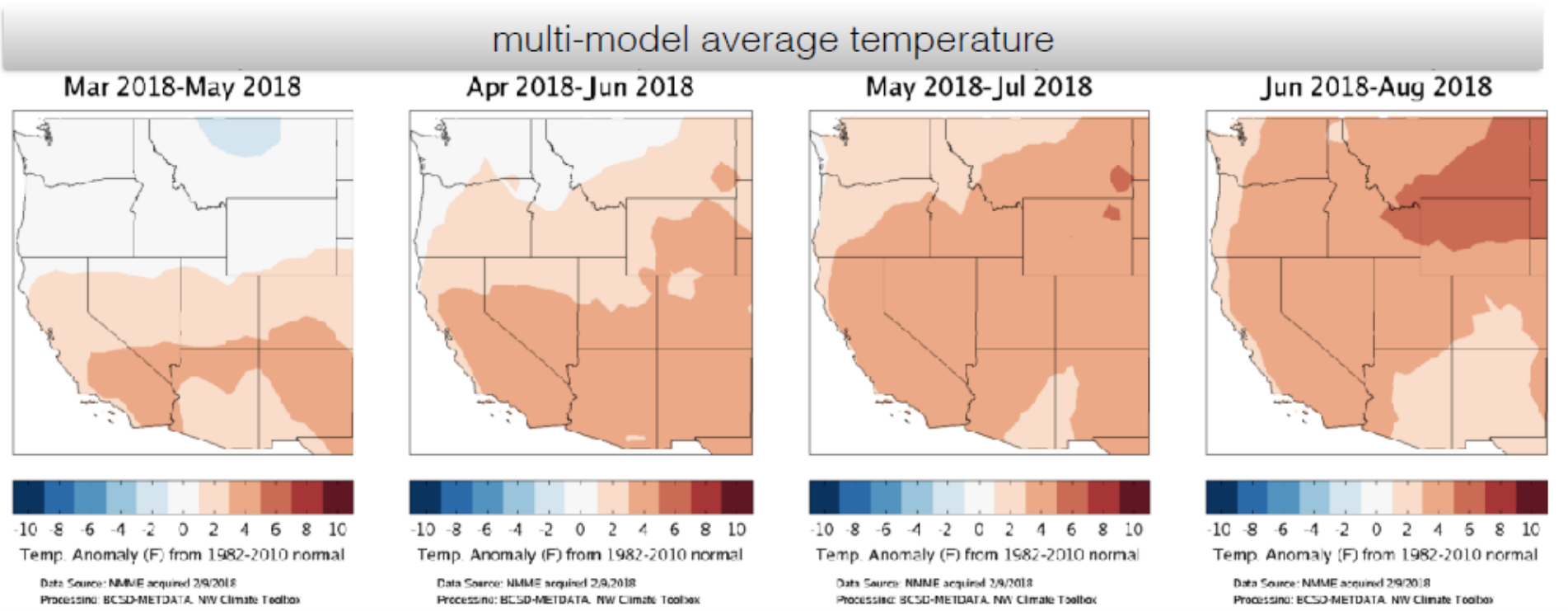
*Departure from 1979-1999 average

Source: Rupp, Abatzoglou. & Mote, Climate Dynamics, 2016

RCP45
RCP85

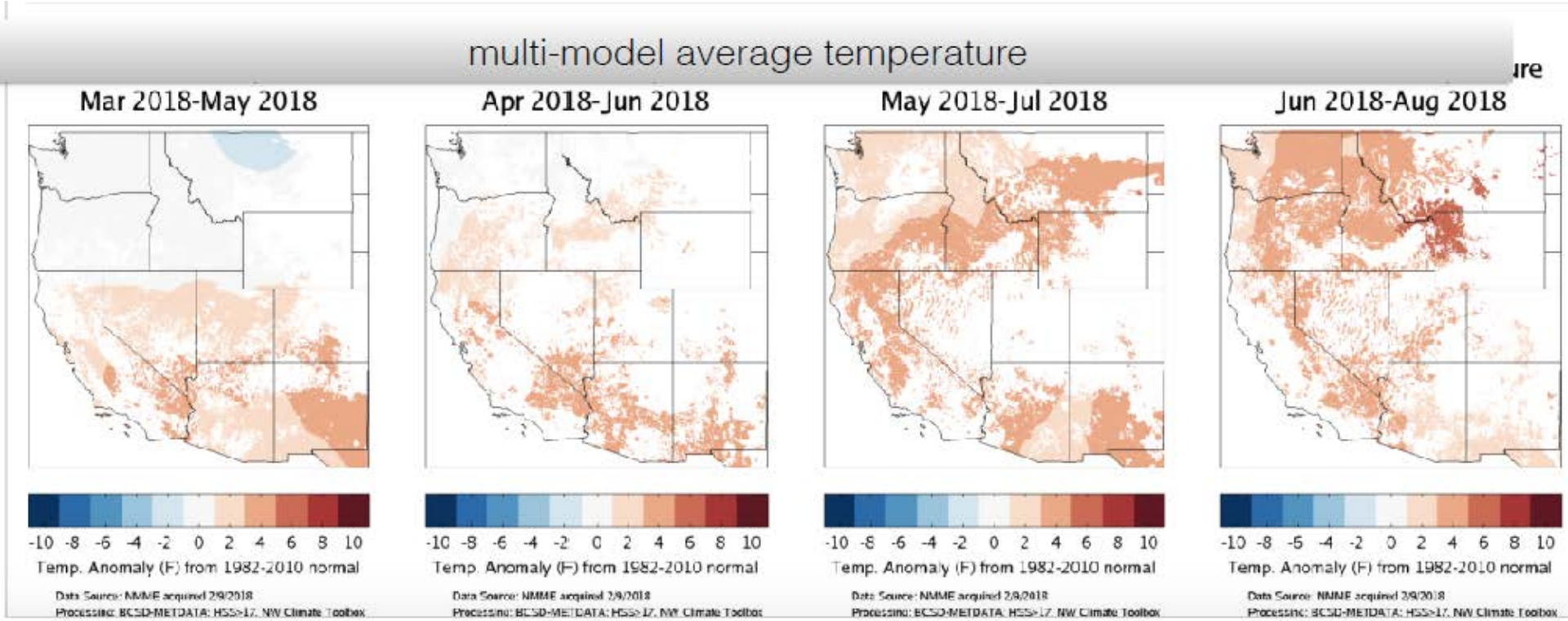
Red: High Emissions
Blue: Low Emissions

Seasonal Forecasts (Feb 9, 2018)



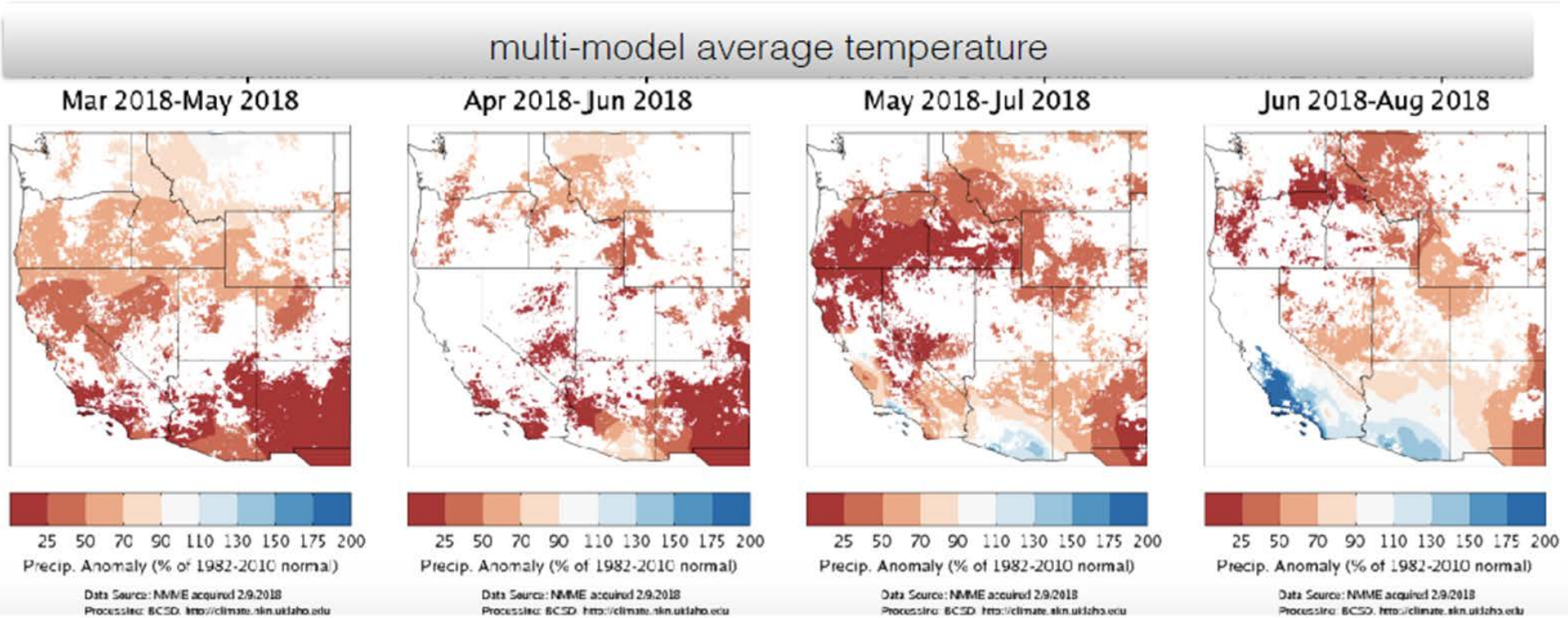
NW Climate Toolbox

Seasonal Forecasts (Feb 9, 2018)



NW Climate Toolbox

Seasonal Forecasts (Feb 9, 2018)



NW Climate Toolbox

Thank you!

dellok@oregonstate.edu
occri.net

State Drought Declarations: Process and Toolbox

Declaring a Drought: Process

- Declaration by County Commission
  - ~ with descriptions and observations
- Water Supply Availability Committee
  - ~ add details re water conditions
- Drought Readiness Council
  - ~ makes recommendation to Governor

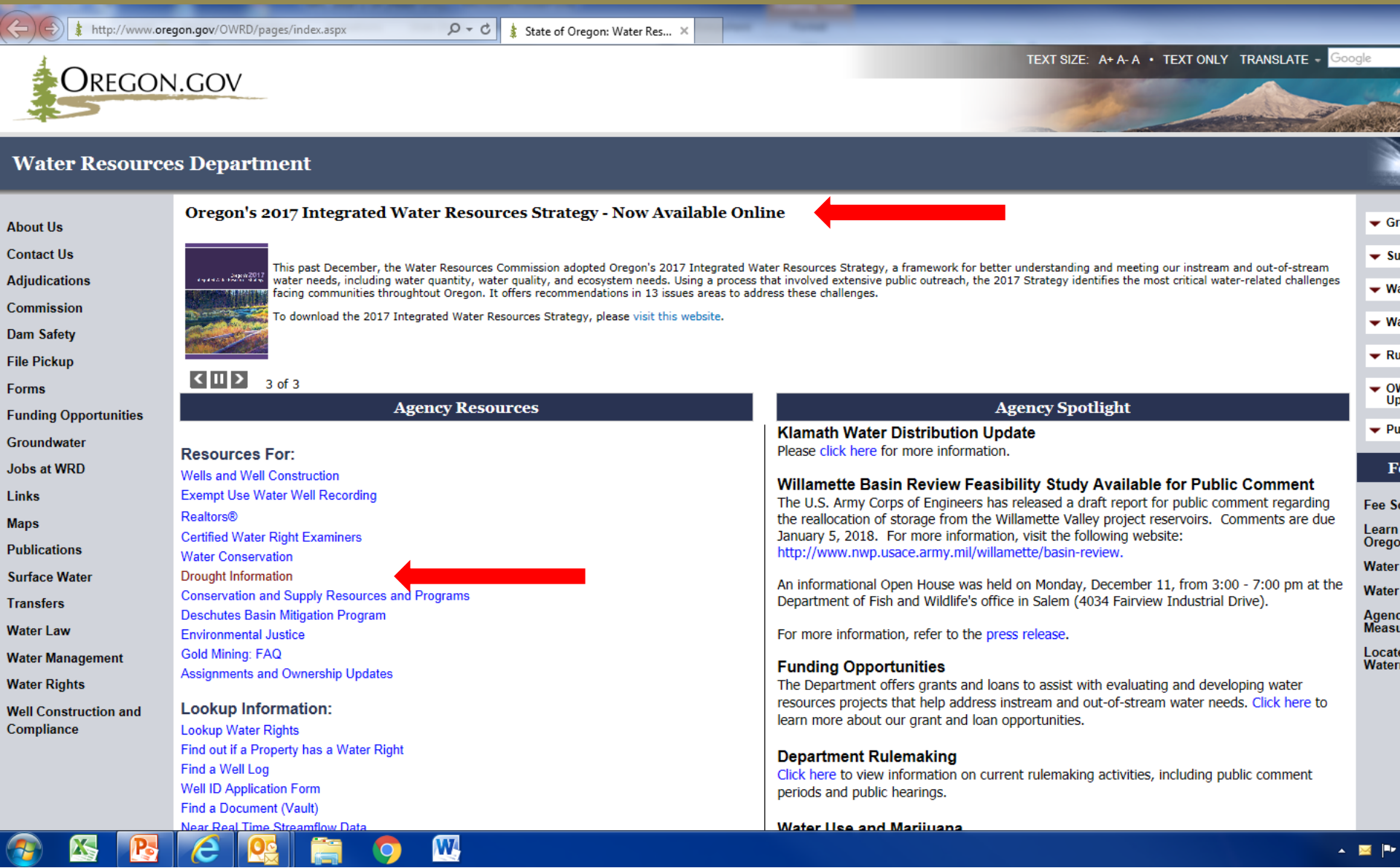
Note 1: Governor can declare independently from this process as well

Note 2: State process ≠ Federal process

Declaring a Drought: Toolbox

- **Temporary Emergency Water Use Permit –** expedites processing of a groundwater permit as an alternative to an already-existing surface water right. Only granted if water is available.
- **Temporary Transfer –** expedites processing of a request to change type of water use, place of use. or location of diversion.
- **Human or Stock Water Use Preference –** grants preference over other uses regardless of priority date.

Contacts and Resources



Thank you.