Mar 2017 Water Supply Briefing

National Weather Service, Northwest River Forecast Center

Telephone Conference: 1-888-677-0012
Pass Code: 91999

Presentation available after brief at:
www.nwrfc.noaa.gov/presentations/presentations.cgi

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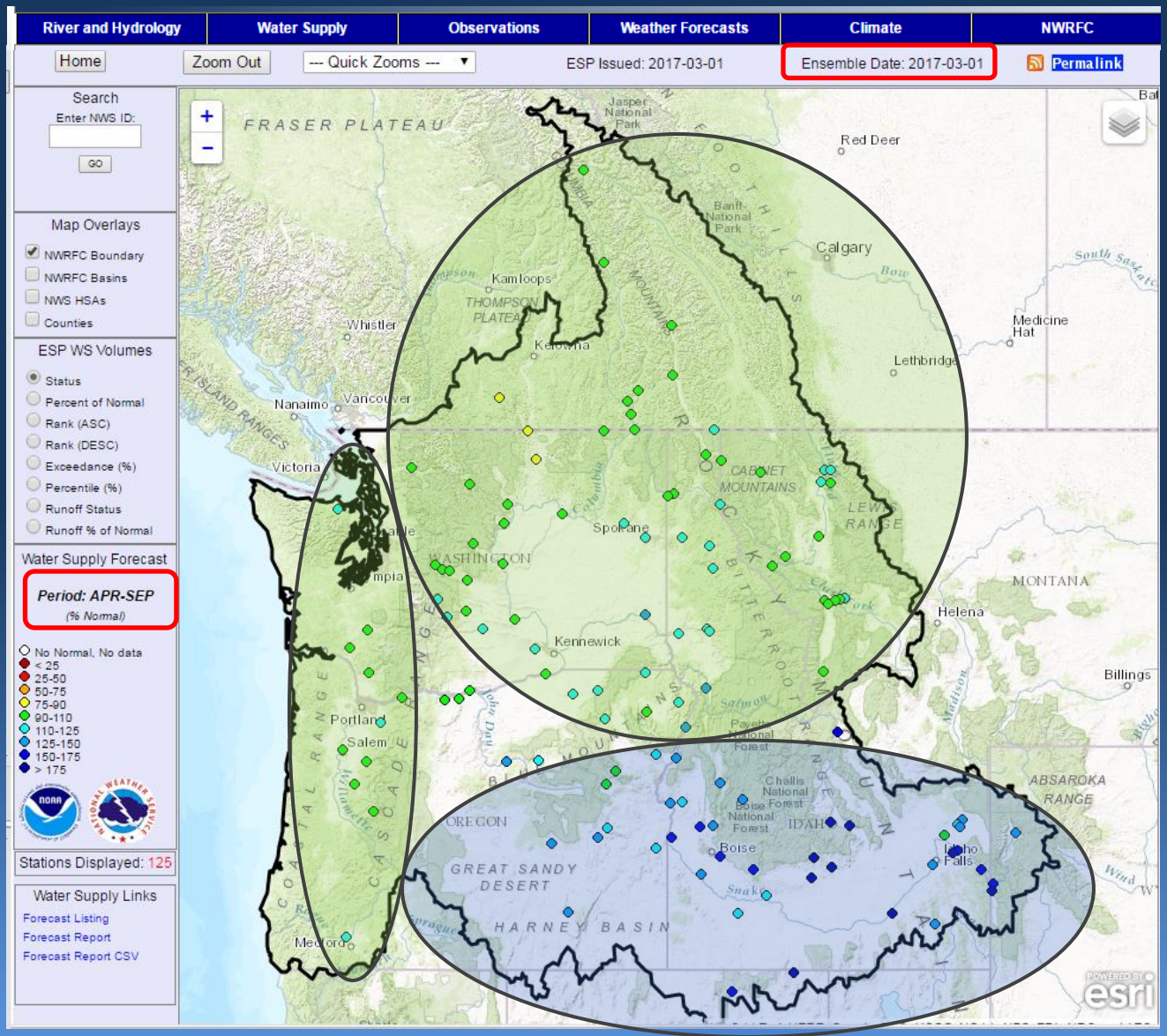
Presentation Outline

- Basic summary of latest forecasts
- NWRFC volume forecasting overview, background
  - Modeling system
  - Forecast methodology
- Forecast inputs
  - Observed conditions
  - Future conditions
- Forecast outputs
  - Latest volume forecasts
- Tour of various products
  - Monthly volumes
  - Climate index relationships
  - Data downloads
- Questions

Water Supply Summary

www.nwrfc.noaa.gov/ws/

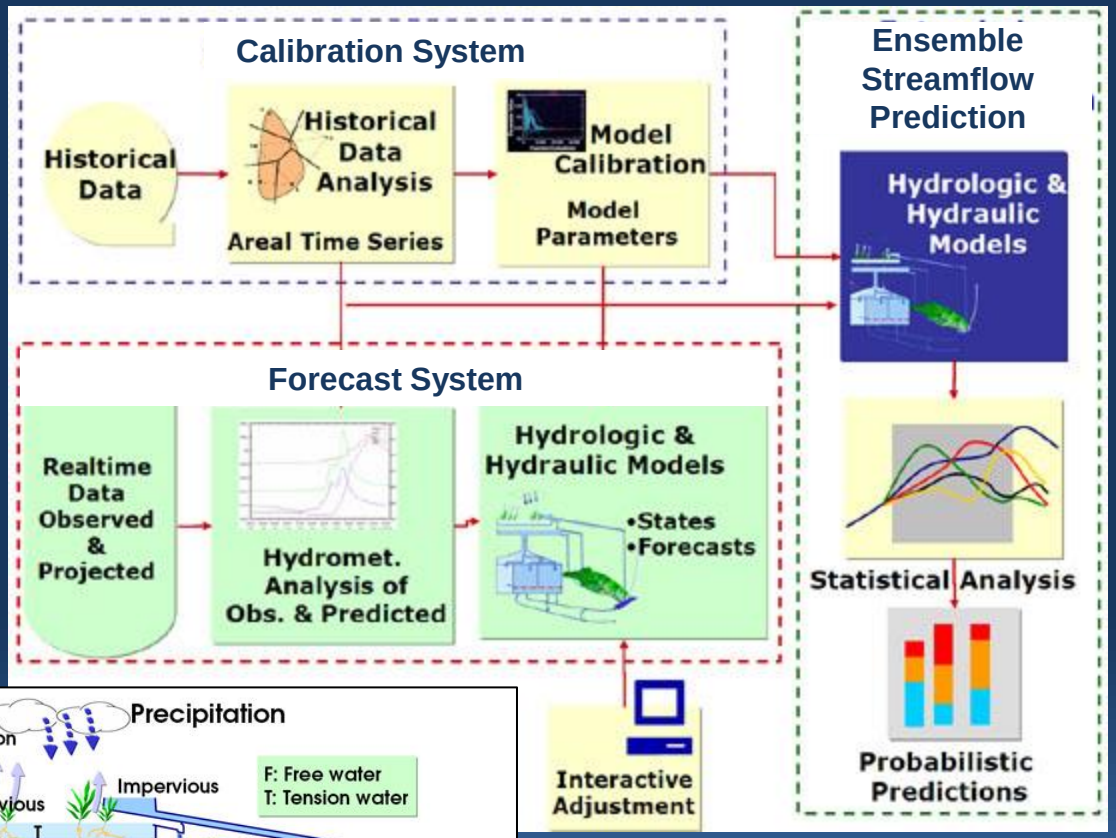


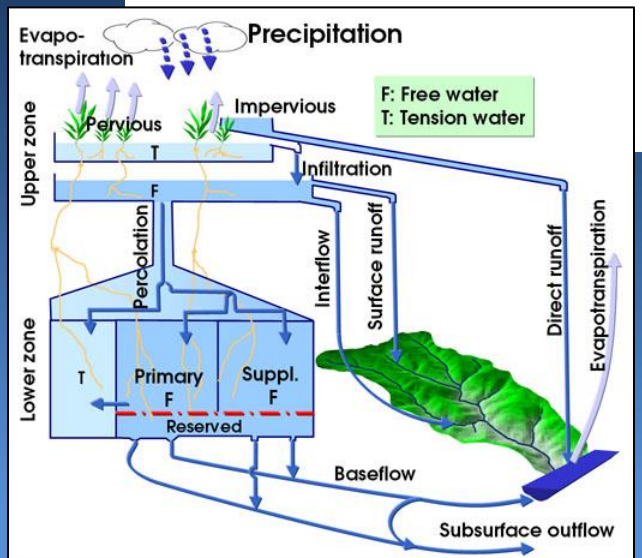
- West of Cascades:
  - Near to slightly above normal
- East of Cascades:
  - Near to slightly above normal throughout northern tier
  - Above to well above normal across southern tier
  - Near normal at Grand Coulee and The Dalles
- Primary drivers:
  - Snowpack distribution
  - Weather yet to come

Volume Forecasting Overview

Modeling System

- Community Hydrologic Prediction System (CHPS) software platform
- National Weather Service River Forecast System (NWSRFS) modeling components
- Models are physically- and empirically-based, but simplified
  - Conceptual, or lumped parameter
  - Primary inputs are precipitation and temperature
  - Primary outputs are streamflows



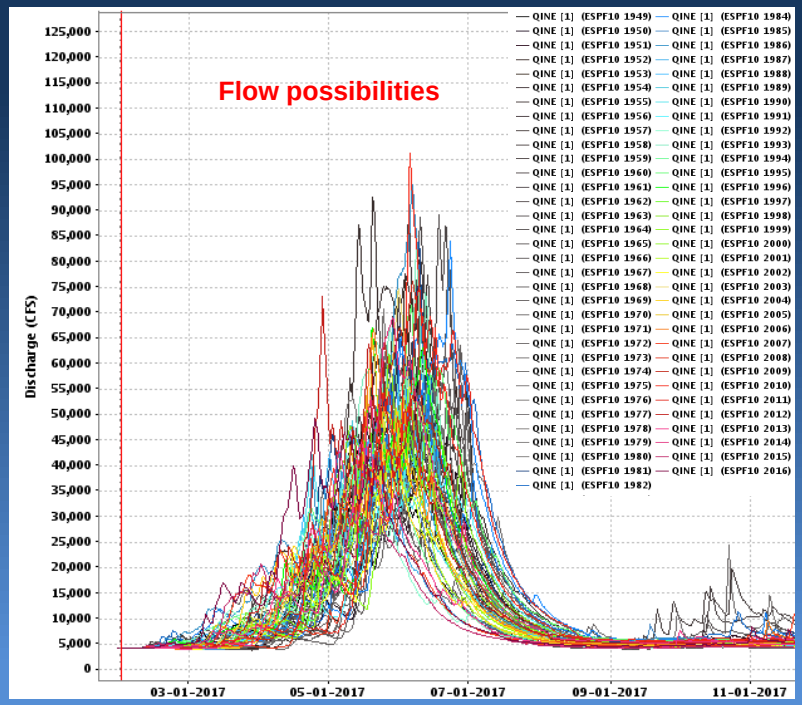


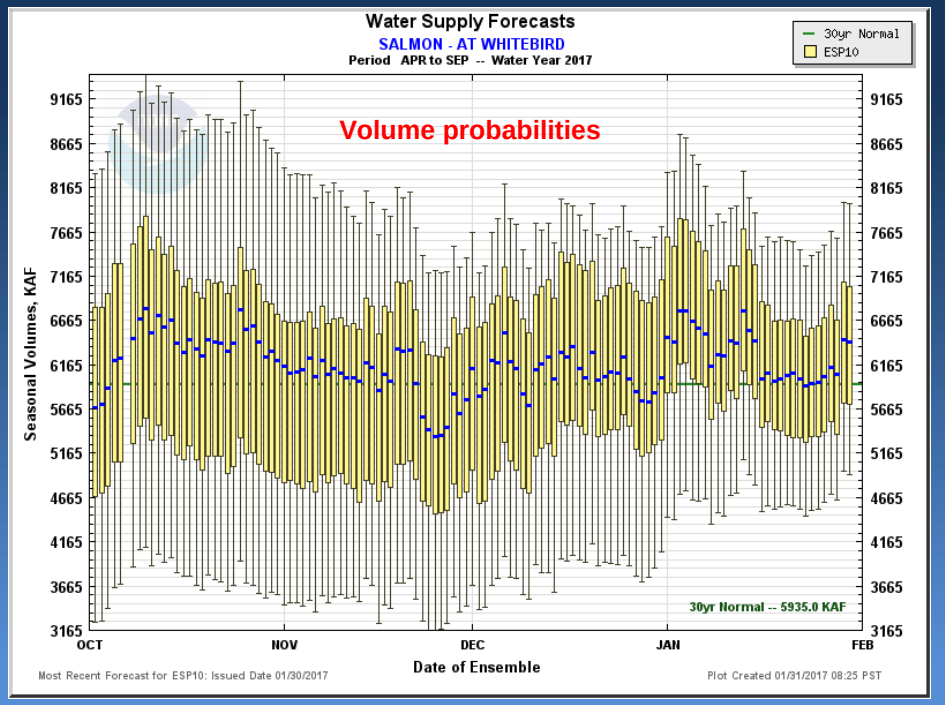
Forecast Methodology

- ESP: Ensemble Streamflow Prediction
- Volume forecasts produced from:
  - Quantitative precipitation forecast (QPF)
  - Quantitative temperature forecast (QTF)
  - Traces of historically observed precipitation and temperature (climatology)
  - Combinations of weather possibilities run through hydrologic models to generate streamflows, which are aggregated to volumes

Deterministic forecasts in near term

Ensemble forecasts beyond





Forecast Methodology

- Forecasts are updated daily, but observed data is assimilated and models are run continuously
- Forecasts are compared to 30 year observed (adjusted) runoff normals (currently 1981-2010)
- Water supply forecasts:
  - Volumes are adjusted for major upstream storage and diversions, as described in the adjustment section of the NWRFC water supply webpage
- Natural volume forecasts:
  - Volumes are adjusted for all* man-made upstream activity, including storage, consumptive use, and diversions
    - *All known to hydrologic model, that is

Volume Forecast Inputs

Volume Forecast Inputs

- Observed Conditions:
  - Precipitation
  - Temperature
  - Snowpack
  - Soil moisture

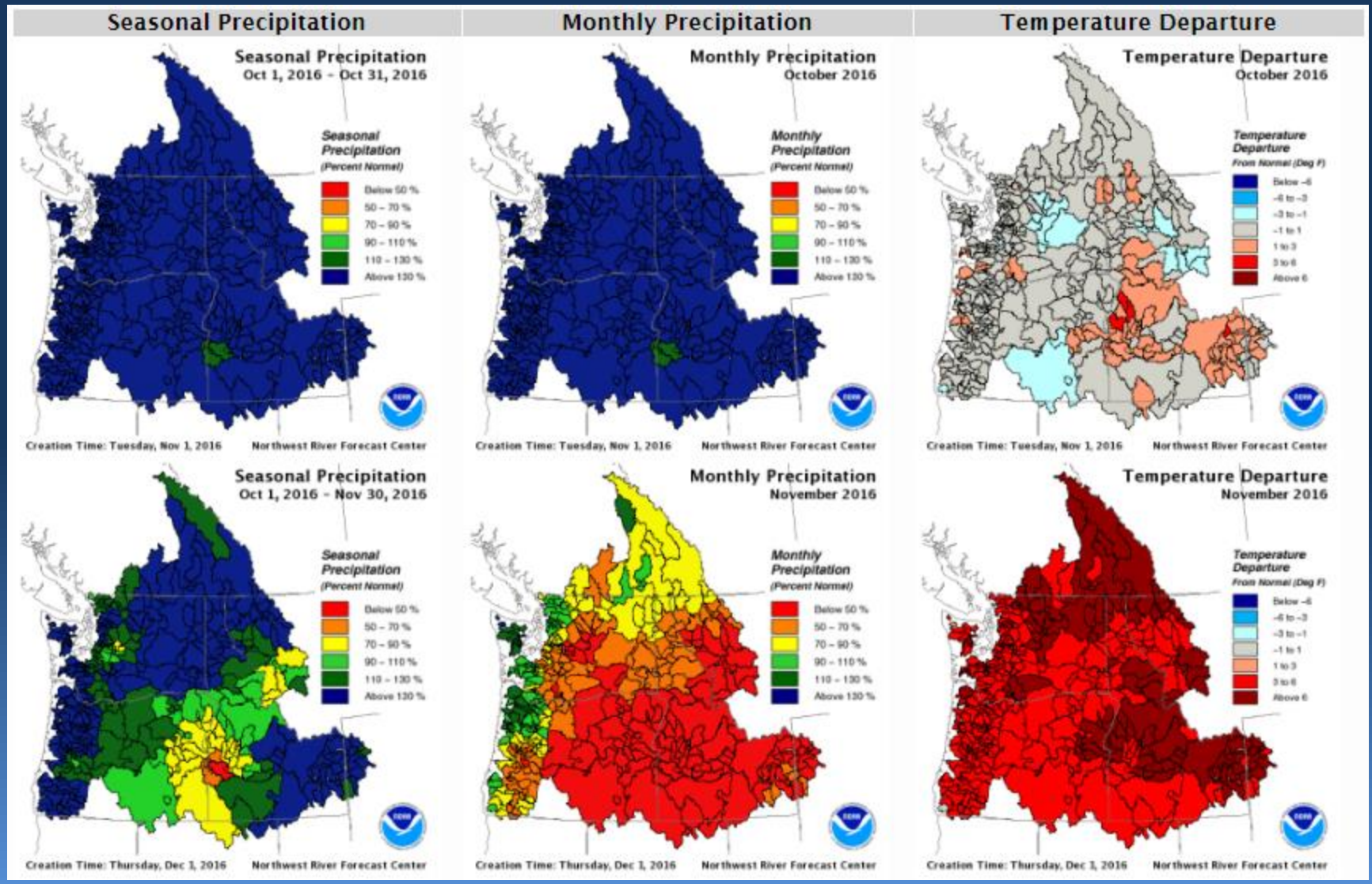
Model “states”

- Future Conditions (Anticipated and Statistical):
  - 0, 5, or 10 days of QPF/QTF
  - Ensemble of precipitation and temperature climatology appended thereafter

Model “forcings”

Observed Precipitation and Temperatures

www.nwrfc.noaa.gov/water_supply/wy_summary



Observed Precipitation and Temperatures

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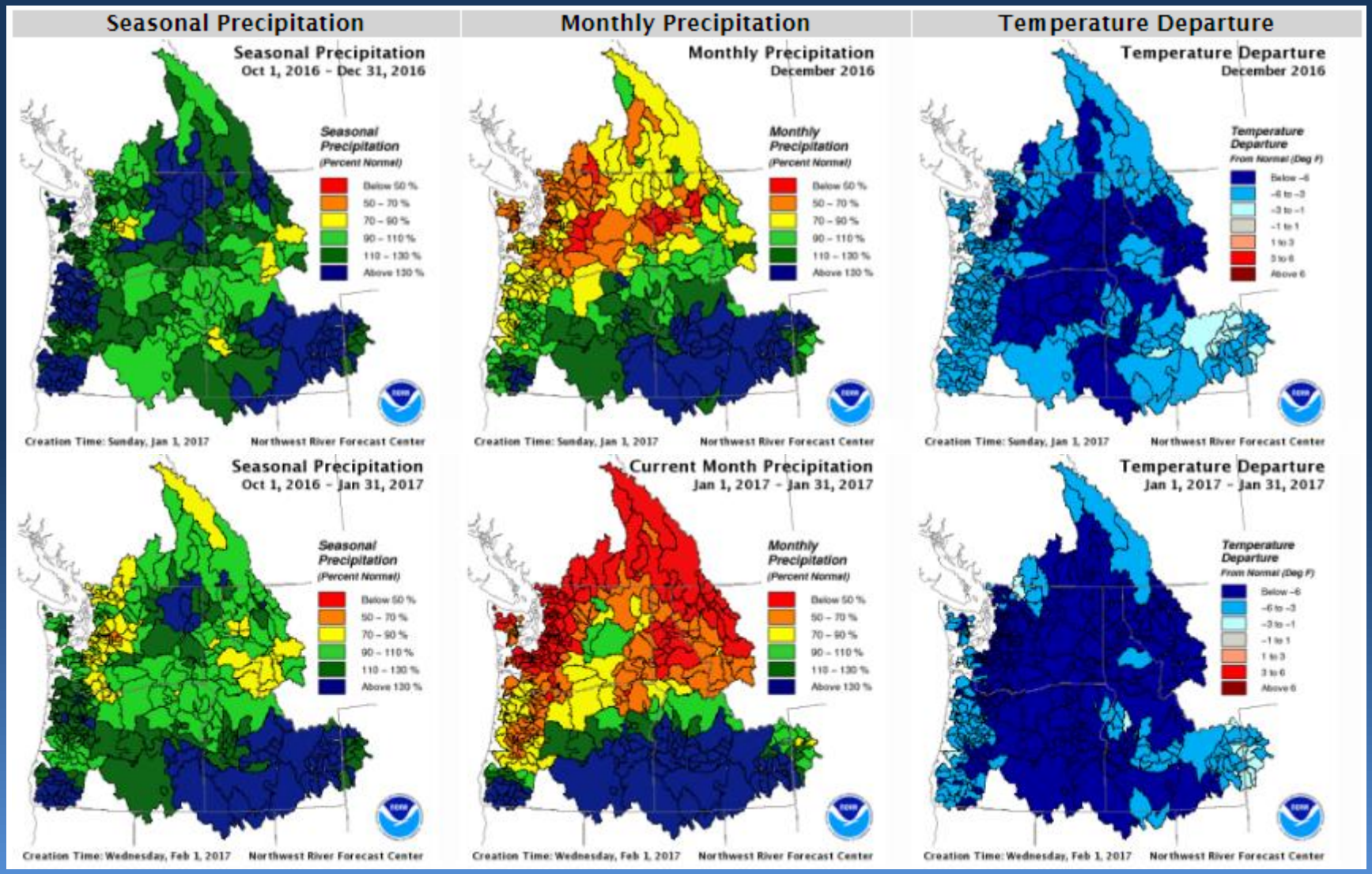

Observed Precipitation and Temperatures

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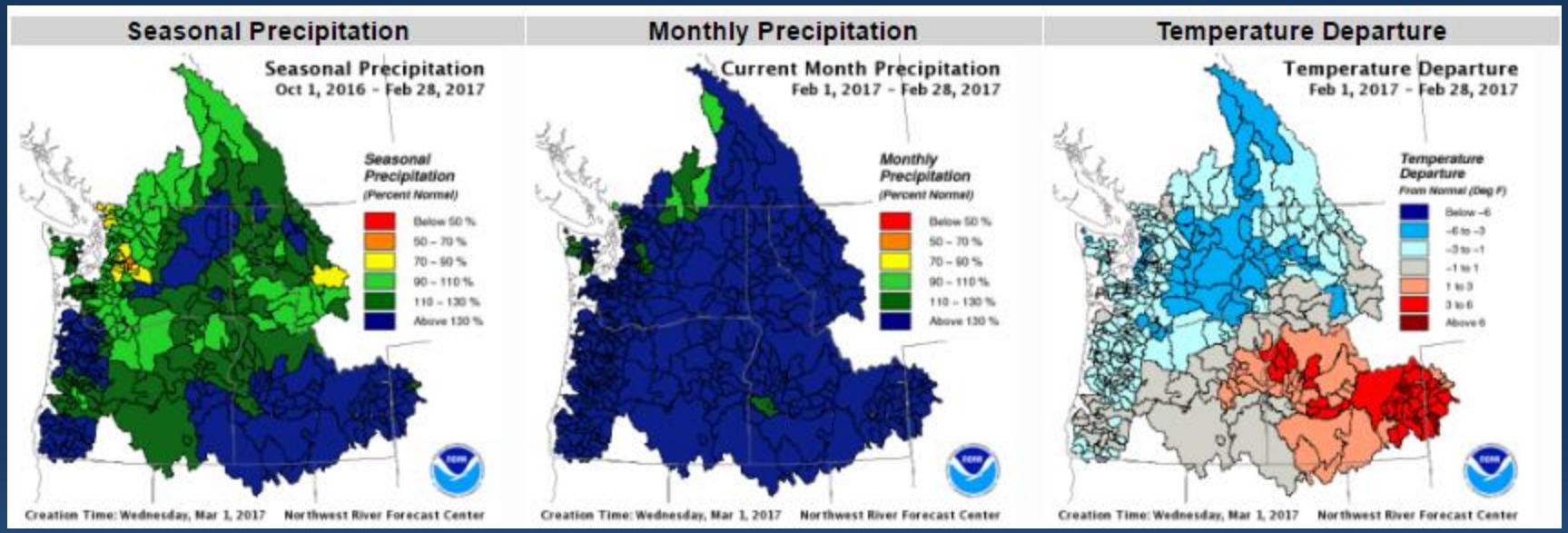
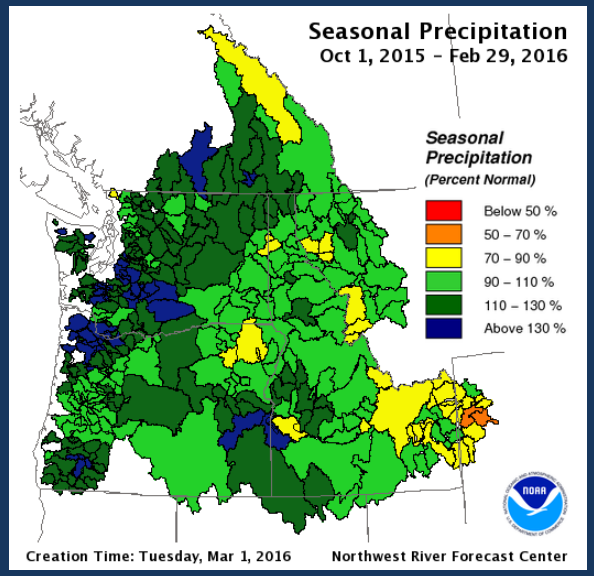
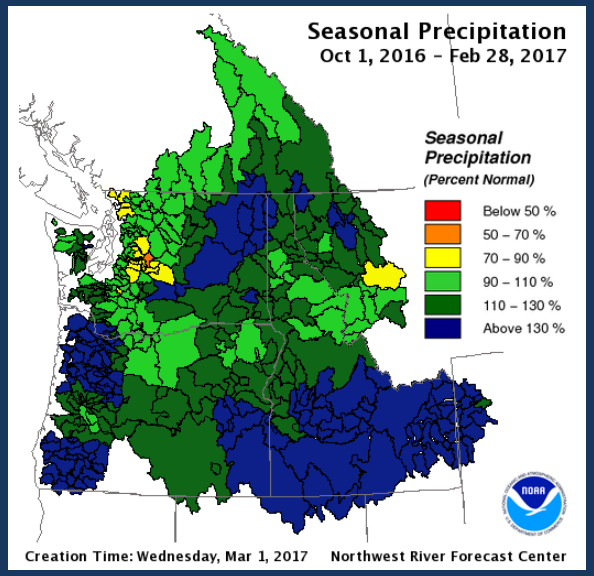


- Very wet February, across entire domain
- Cool temperatures along northern tier, helping build stronger snow packs
- Warmer temperatures in the southern tier, leading to lower elevation melt and rain-on-snow
  - Caused extensive sheet flooding, and some streamflow flooding, but nothing too detrimental to seasonal volumes

Observed Precipitation Summary

www.nwrfc.noaa.gov/water_supply/wy_summary

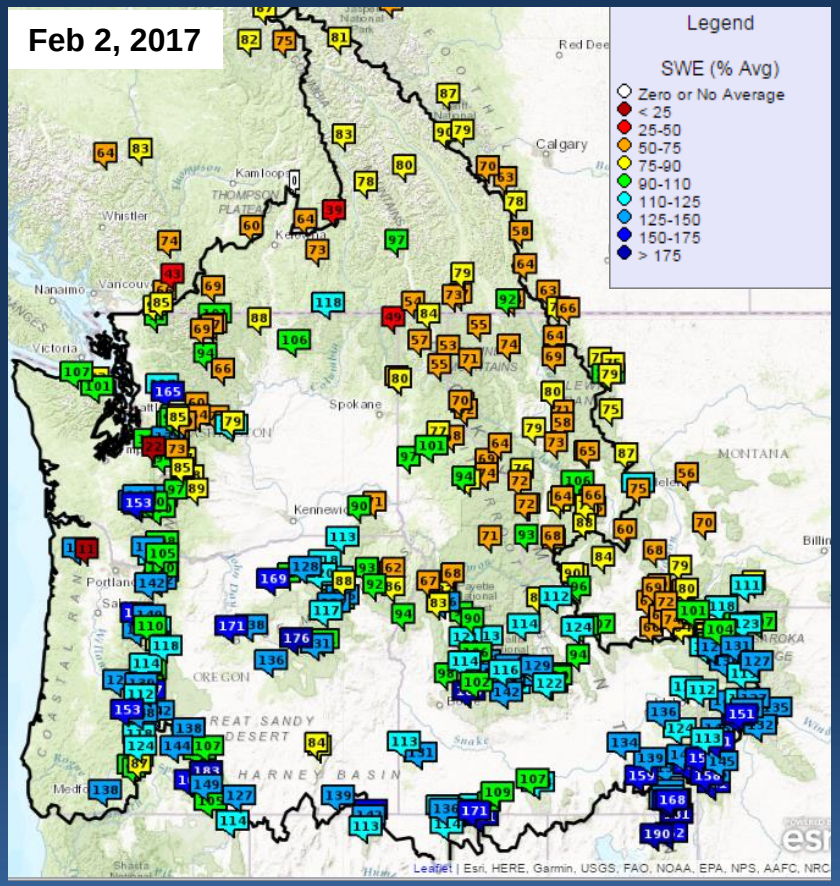


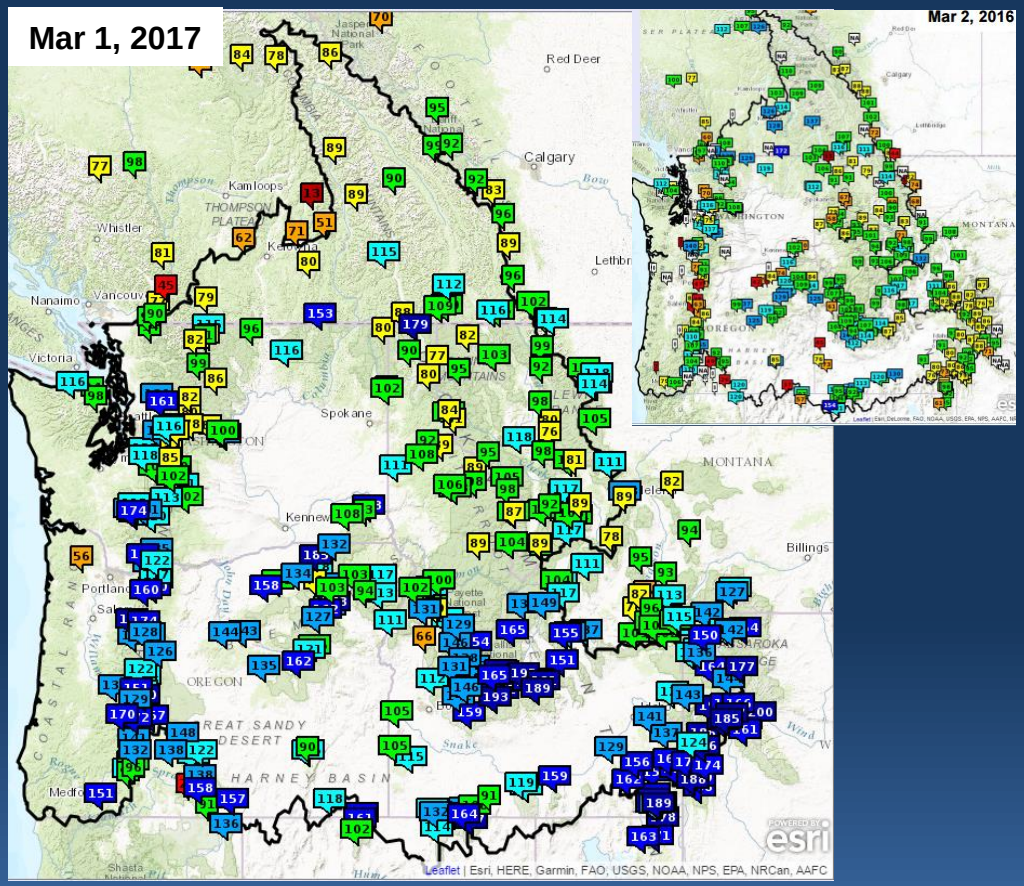


DIVISION NAME	WY 2016 % NORM	WY 2017 % NORM
Columbia River above Arrow Lakes	98	98
Kootenai River	107	124
Pond Oreille River	100	119
Spokane River	101	113
Columbia River above Grand Coulee	103	115
Snake River	100	136
Columbia River above The Dalles	104	119
Western Washington	118	101
Western Oregon	116	135

Observed Snowpack Conditions

www.nwrfc.noaa.gov/snow

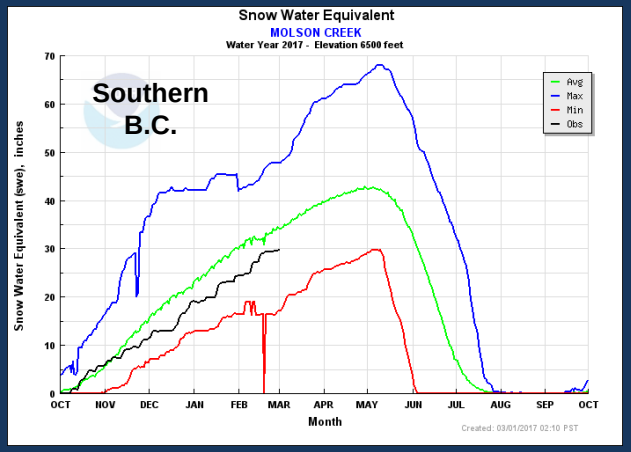


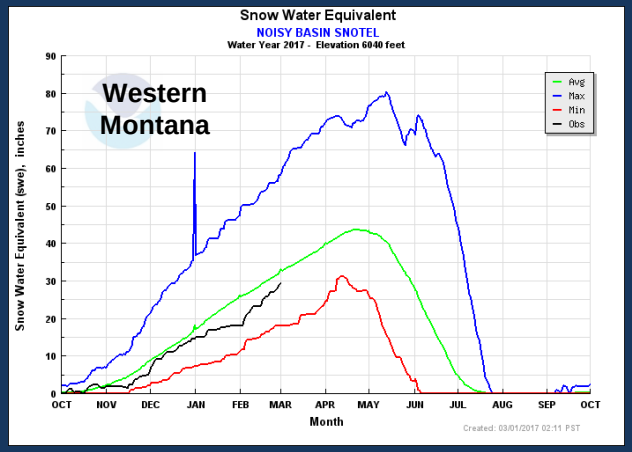


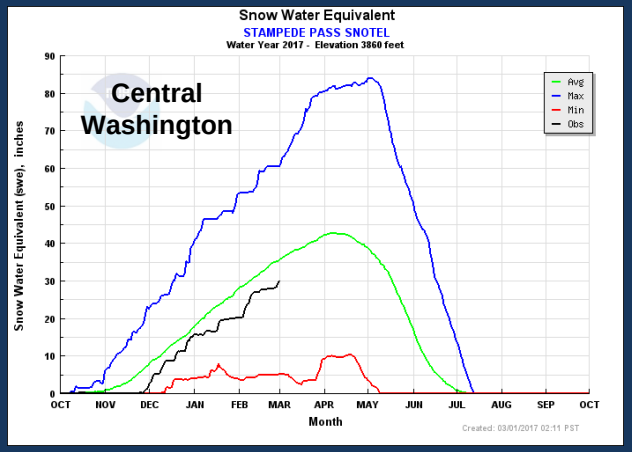
- Still a pronounced lateral divide between the southern and northern tiers of our domain
  - Less dramatic than last month though → heavy Feb
- Observed snow water equivalent (SWE) values provided by:
  - Natural Resources Conservation Service (NRCS) SNOTEL network, and Environment Canada (EC) Automated Snow Pillow network

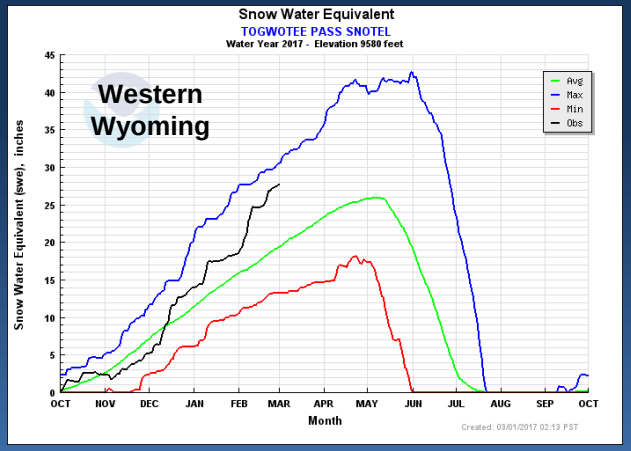
Observed Snowpack Conditions

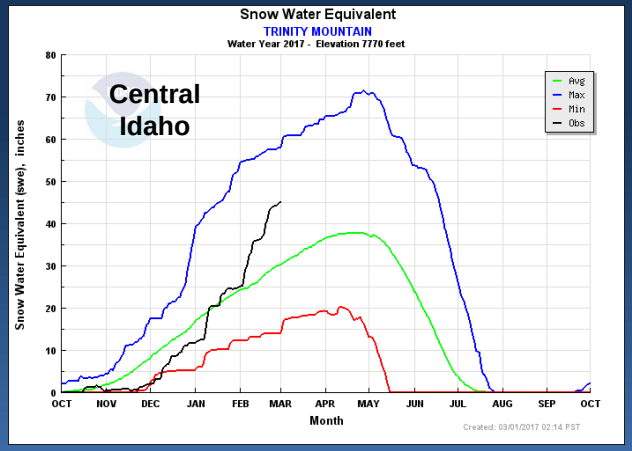
www.nwrfc.noaa.gov/snow

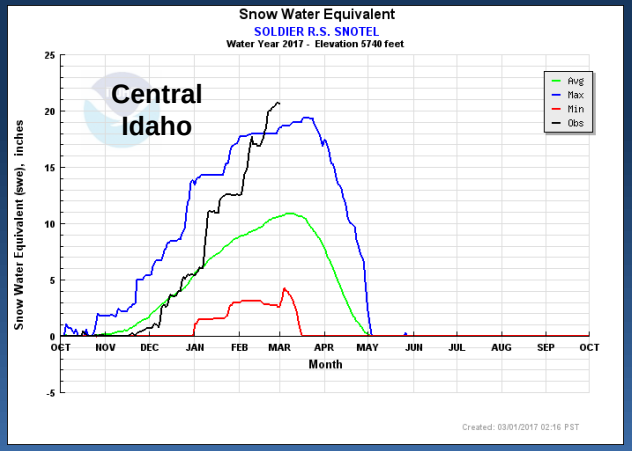






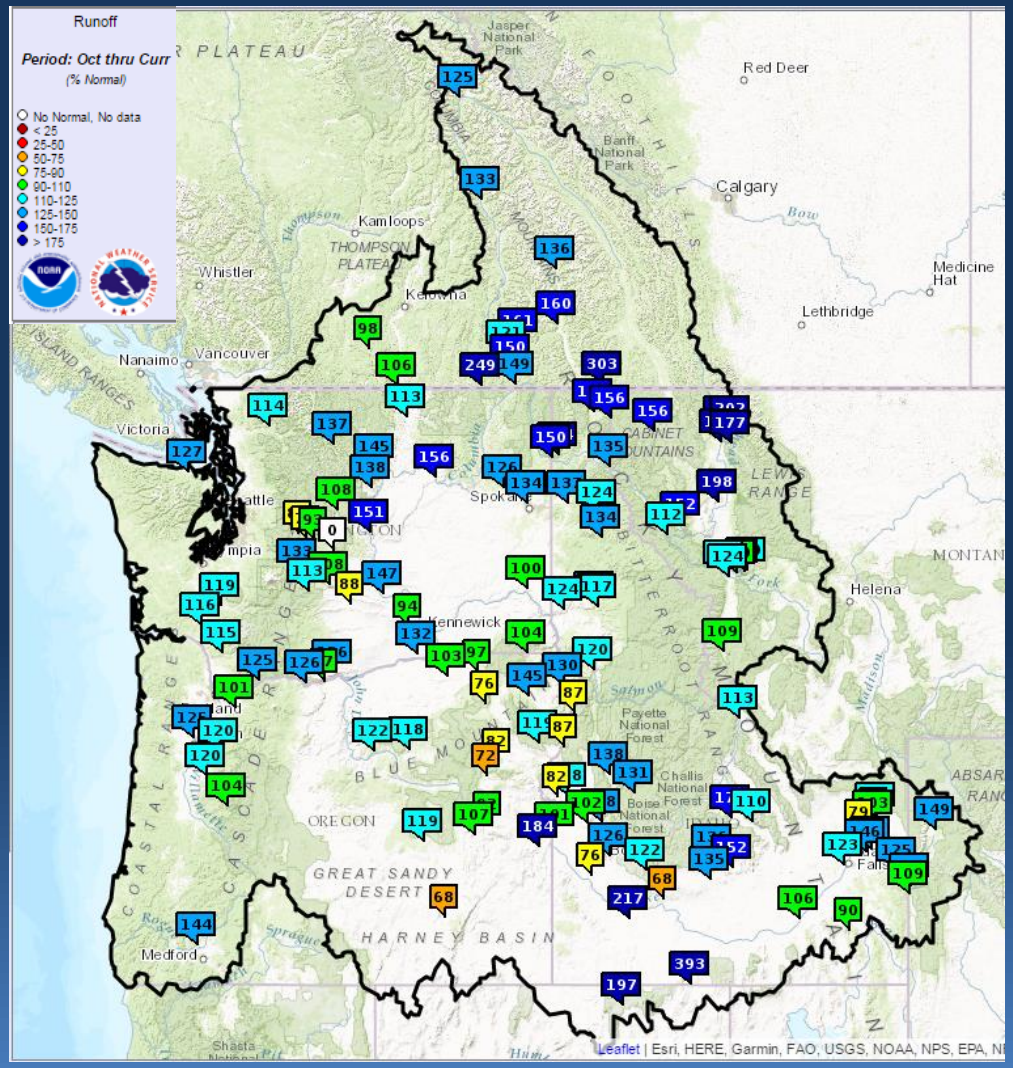






- Near to slightly below normal numbers in the north, above normal numbers in the south
- Also note the record values at some lower elevation locations along the southern tier

Runoff Conditions



LOCATION	Oct 1 – Mar 1 % NORM	Jan 1 – Mar 1 % NORM
Columbia River – Arrow Lakes	121	90
Kootenai River – Queens Bay	160	103
Columbia River – Birchbank	150	114
Pond Oreille River – Albeni Falls	150	106
Spokane River – Long Lake	125	124
Columbia River – Grand Coulee	156	116
Snake River – Lower Granite	100	109
Columbia River – The Dalles	126	110

- Observed (adjusted) runoff since Oct 1 likely not best indicator of seasonal volumes
  - Wet Oct, warm Nov, high fall runoff
- Runoff totals since Jan 1 more indicative of overall basin condition
  - Near to above normal

- As temperatures warm, well above normal runoff is anticipated along our southern tier

Volume Forecast Inputs

- Observed Conditions:
  - Precipitation
  - Temperature
  - Snowpack
  - Soil moisture

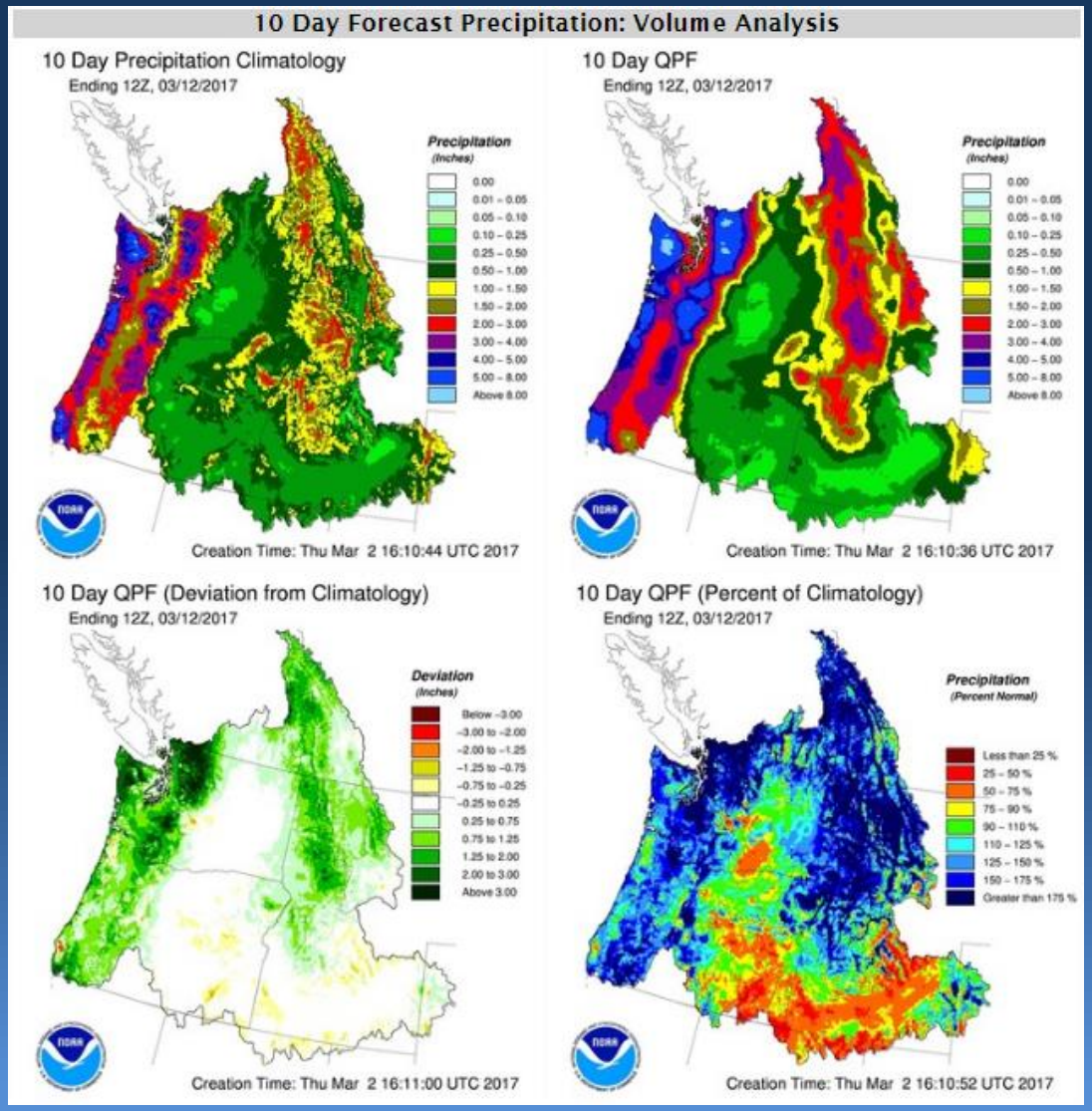
Model “states”

- Future Conditions (Anticipated and Statistical):
  - 0, 5, or 10 days of QPF/QTF
  - Ensemble of precipitation and temperature climatology appended thereafter

Model “forcings”

Deterministic Forcings (QPF and QTF)

www.nwrfc.noaa.gov/water_supply/wy_summary

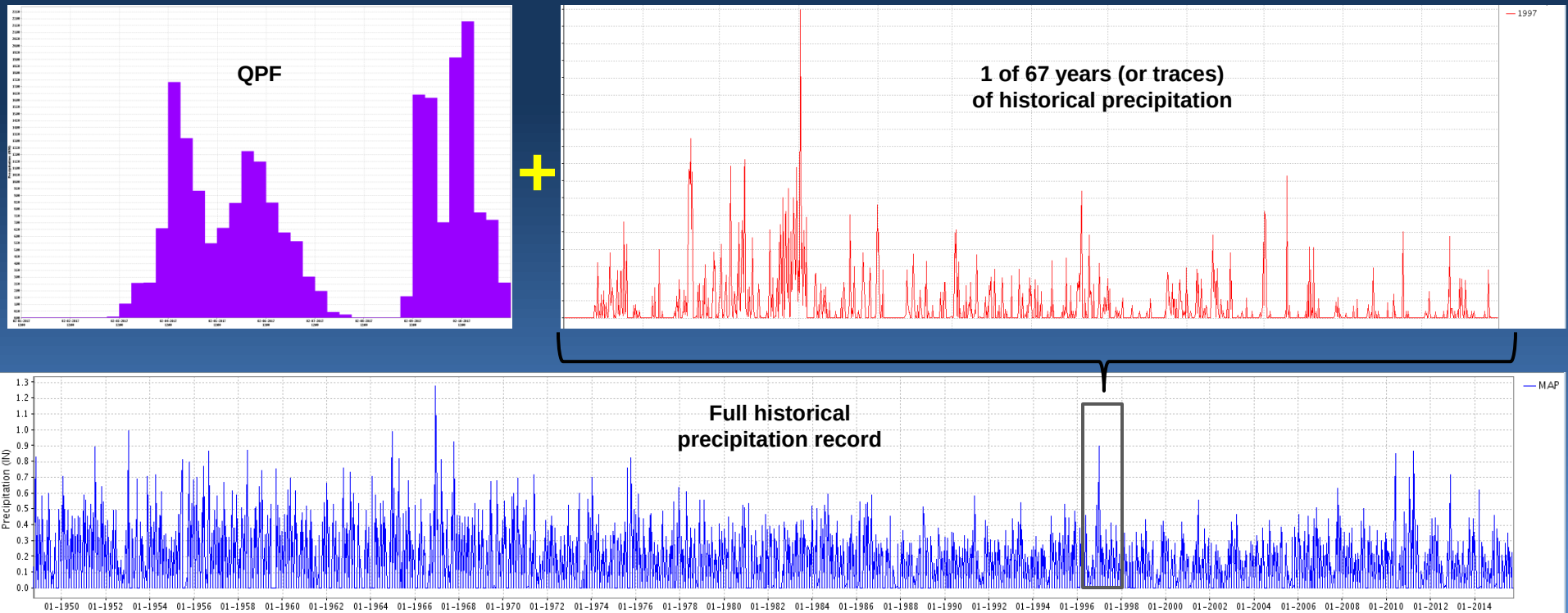


- Generally wet conditions forecasted over next 10 days
  - Namely west of the Cascades and along northern tier
- Cool temperatures
- Good for snow packs, namely up north
- Volume forecasts are trending higher

Ensemble Forcings (Climatology)

- Probabilistic guidance (climatological possibilities) used beyond deterministic (QPF/QTF) period (0, 5, or 10 days)

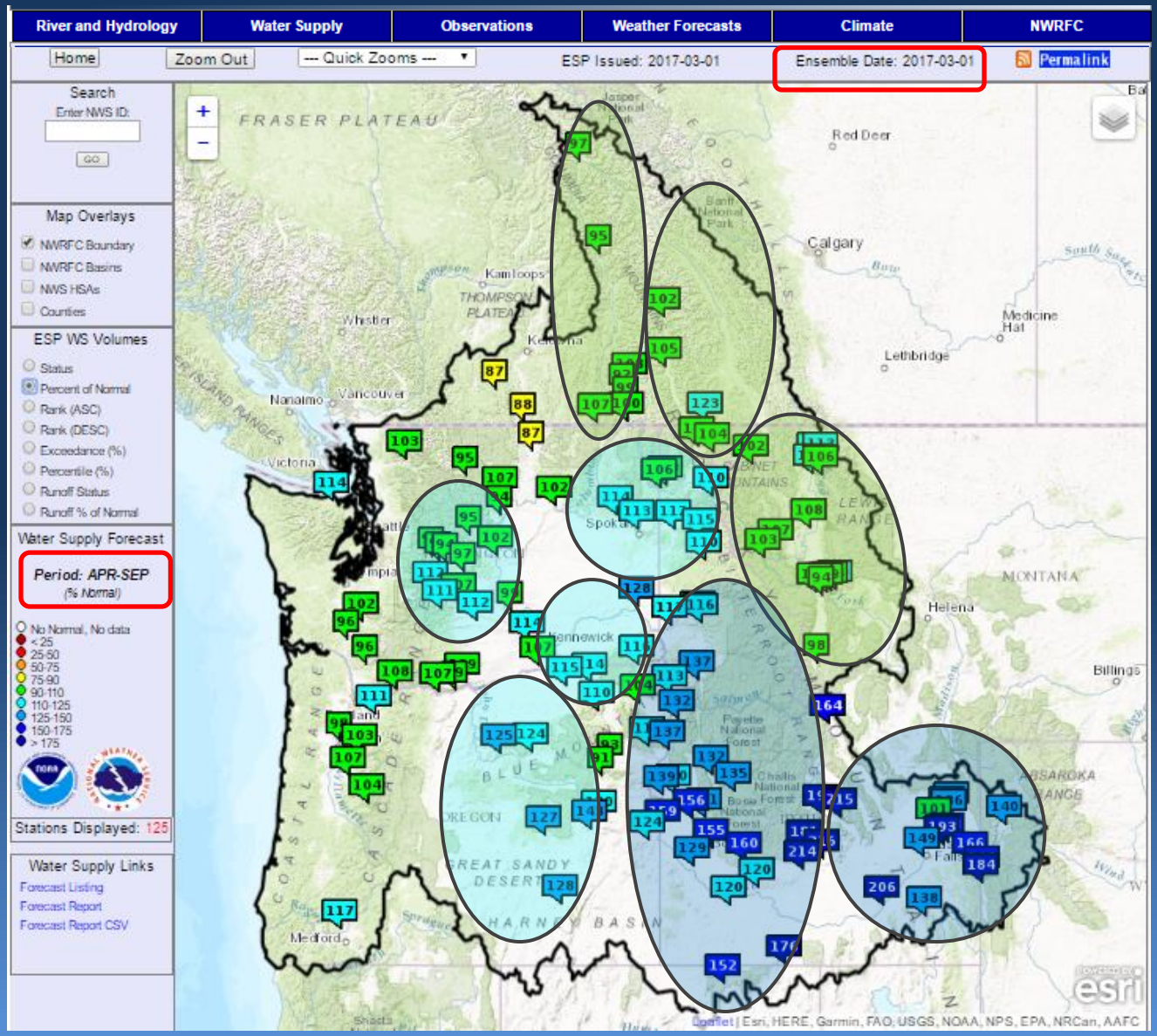
- Unique sets (years) of historical observations
  - Precipitation and temperature data for every year of historical record (1949 – 2016)
  - QPF/QTF + one year of historical data = one forcing trace



Latest Volume Forecasts

Water Supply Forecasts

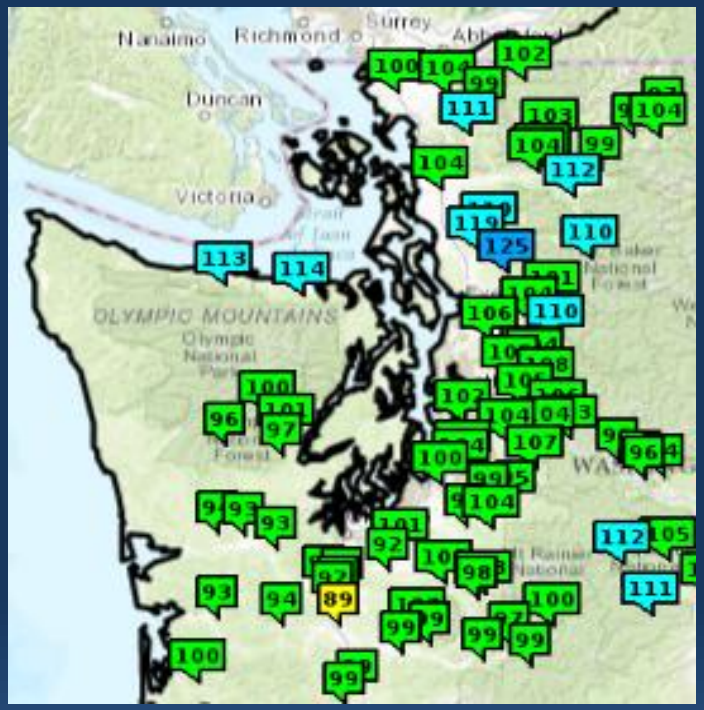
www.nwrfc.noaa.gov/ws/



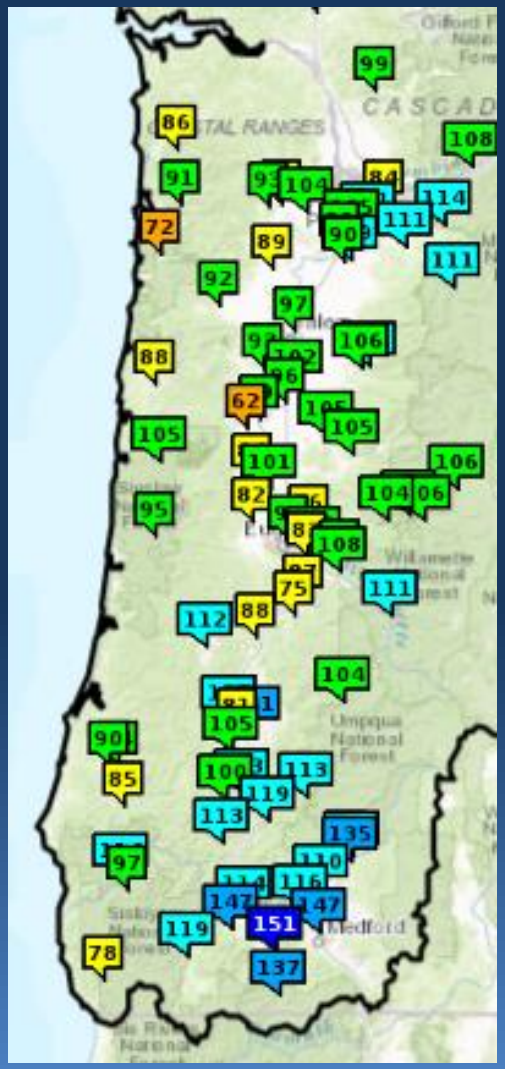
LOCATION	APR – SEP % NORM
Kootenai River – Queens Bay	105
Columbia River – Birchbank	99
Clark Fork – Cabinet Gorge	110
Spokane River – Spokane	113
Columbia River – Grand Coulee	102
Snake River – Shelley	149
Snake River – Lower Granite	128
Yakima River – Parker	112
John Day River – Service Creek	125
Grande Ronde -- Troy	116
Columbia River – The Dalles	107

Natural Volume Forecasts

www.nwrfc.noaa.gov/ws/



LOCATION	APR – SEP % NORM
Skagit River – Concrete	104
Stillaguamish River - Arlington	119
Snohomish River - Monroe	106
Cedar River – Renton	102
Cowlitz River – Castle Rock	99
Chehalis River – Porter	93
Dungeness River – Sequim	114



LOCATION	APR – SEP % NORM
Lewis River – Merwin	99
Clackamas River – Estacada	111
Tualatin River – Farmington	104
Nehalem River – Foss	86
Mckenzie River – Vida	104
Coast Fk Willamette River – Goshen	83
Willamette River – Salem	97
Siuslaw River – Mapleton	95
Umpqua River – Elkton	112
SF Coquille River – Myrtle Point	90
Rogue River – Grants Pass	114
Illinois River – Agness	97

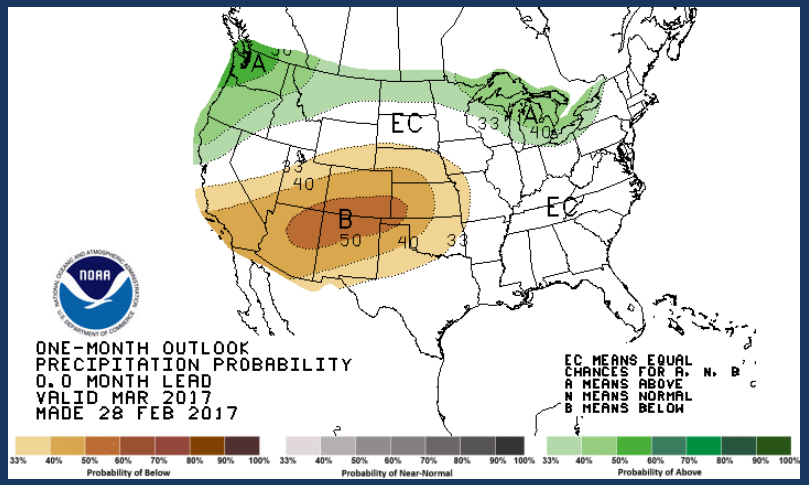
Climate Outlook

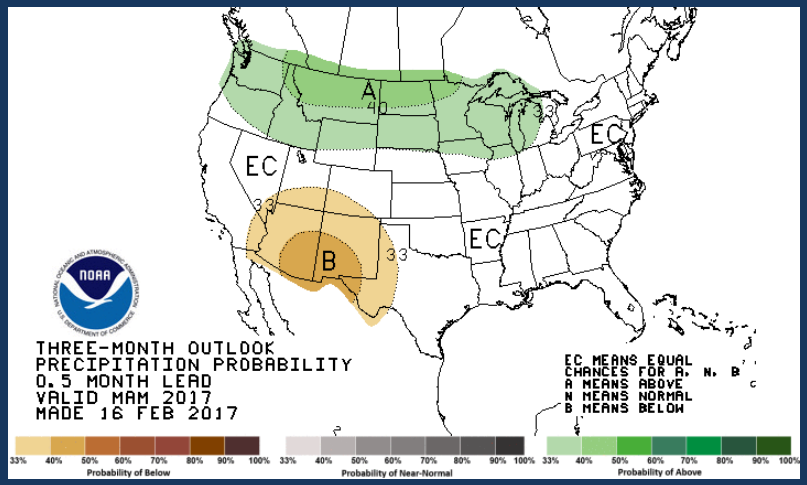
www.cpc.ncep.noaa.gov

Current Month Outlook

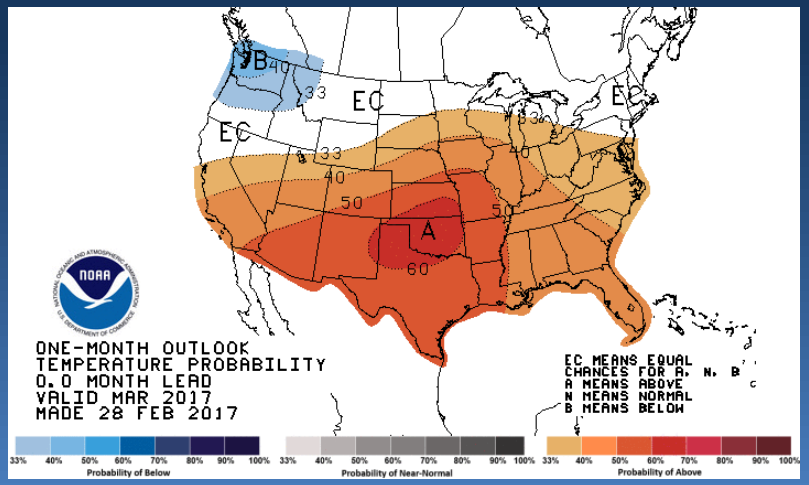
Three Month Outlook

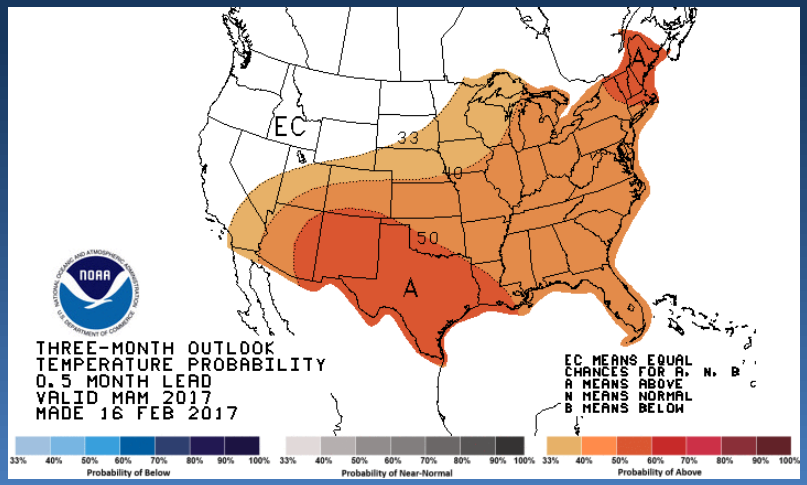
Precipitation





Temperature





- Above normal precipitation favored through at least March
- Below normal temperatures favored through March

Conditions good for snow packs, volume forecasts could trend higher

Volume Forecast Products

Various Volume Products

www.nwrfc.noaa.gov/ws/

Close | Data/Normals | Rankings | ENSO / Runoff | Adjustments | Verification | Verify All Years | Archive | Monthly Water Supply Forecasts | Help

COLUMBIA - THE DALLES DAM (TDAO3)
Forecasts for Water Year 2017

Official Forecast

10 days QPF: *Ensemble:* 2017-03-01 *Issued:* 2017-03-01

Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	30 Year Average (1981-2010)
APR-SEP	89927	99651	107	110341	92704
APR-JUL	77429	85752	107	96181	79855
APR-AUG	84734	93512	107	103475	87532
JAN-SEP	113805	123657	108	136169	114216
JAN-JUL	100683	109115	108	120679	101368
OCT-SEP	136213	146066	112	158577	130518

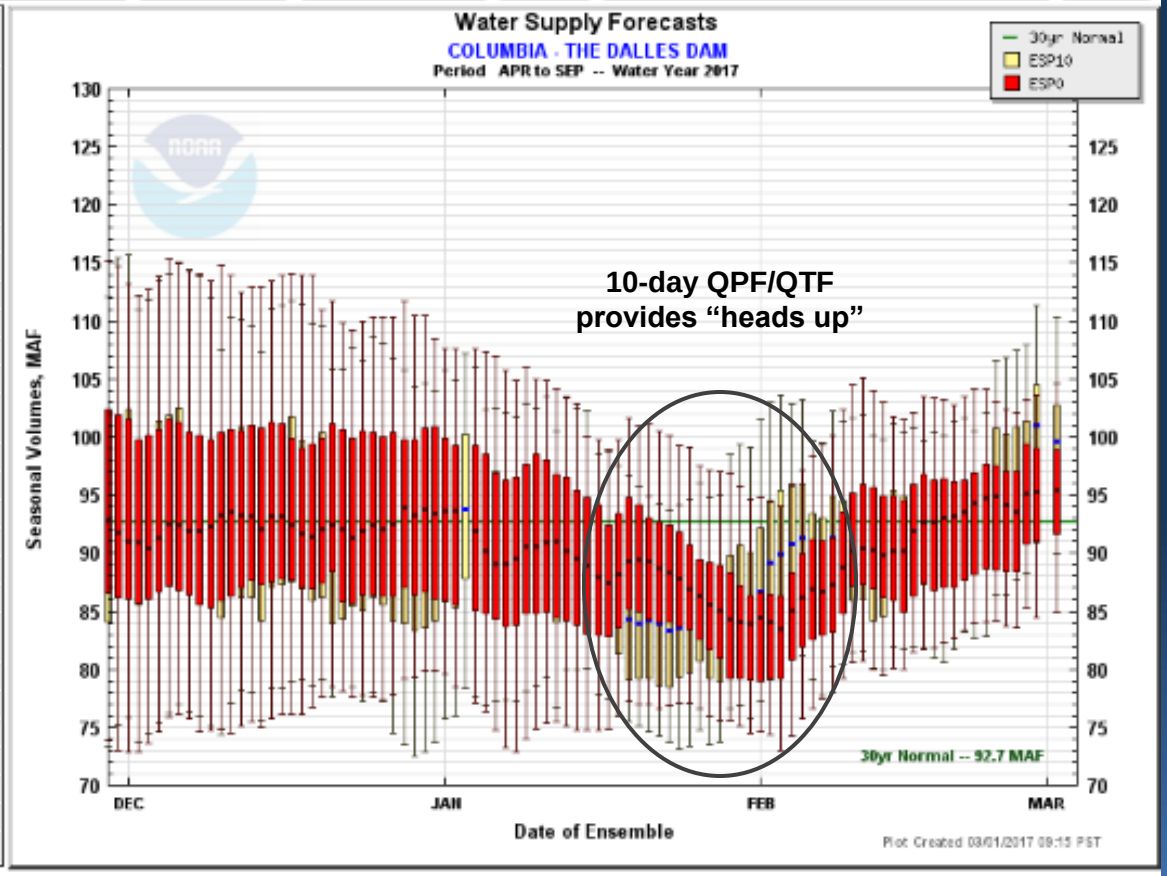
5 days QPF: *Ensemble:* 2017-03-01 *Issued:* 2017-03-01

APR-SEP	88078	97990	106	108096	92704
APR-JUL	75418	84115	105	93307	79855
APR-AUG	82433	92328	105	101959	87532
JAN-SEP	112063	122074	107	133773	114216
JAN-JUL	99856	108081	107	118714	101368
OCT-SEP	134472	144482	111	156182	130518

0 days QPF: *Ensemble:* 2017-03-01 *Issued:* 2017-03-01

APR-SEP	84961	95363	103	104566	92704
APR-JUL	71693	82013	103	90779	79855
APR-AUG	79649	89558	102	98597	87532
JAN-SEP	108123	119248	104	129264	114216
JAN-JUL	96167	106029	105	116411	101368
OCT-SEP	130531	141655	109	151673	130518

Move the mouse over the desired "Forecast Period" to display a graph.



Max Scale | Scale To Data | Scale To Last 45 Days

Overlay

ESP10 | ESP5 | ESP0

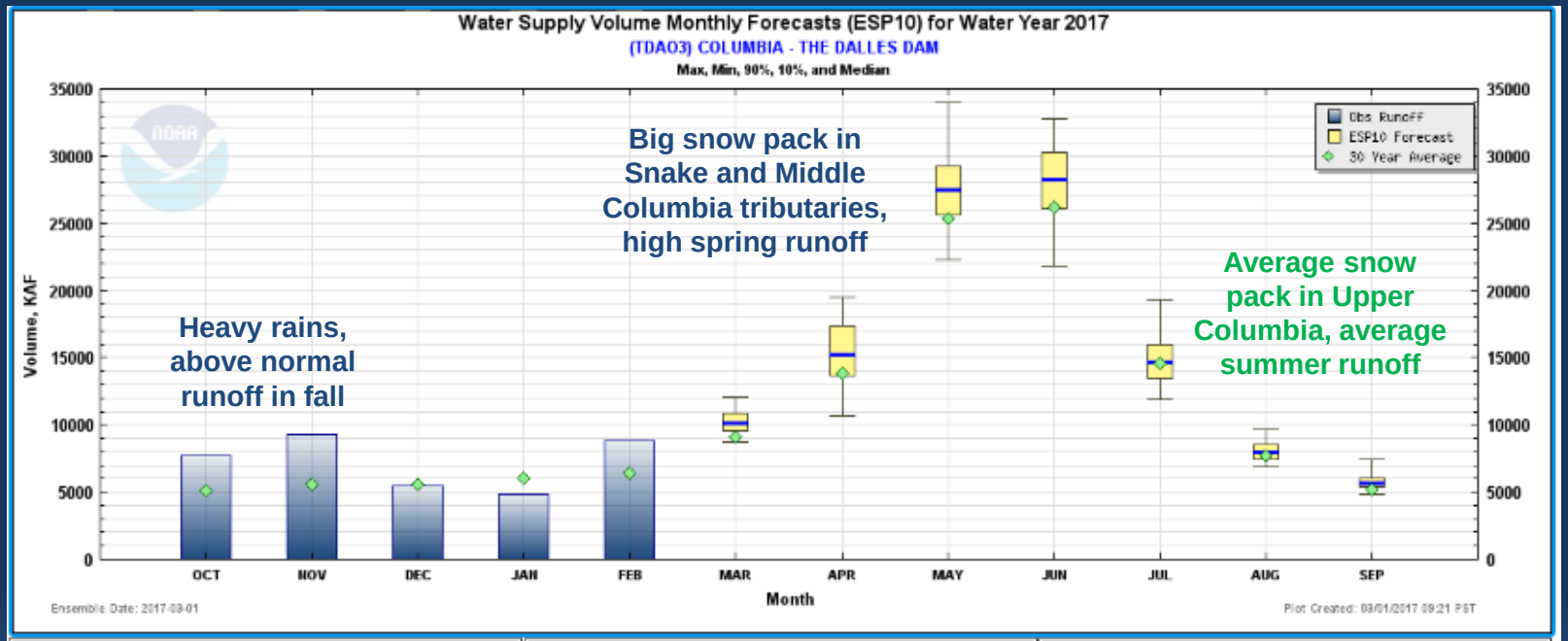
Data Files

CSV (ESP10 / APR-SEP)

Forecast Ensemble

Monthly Volumes

www.nwrfc.noaa.gov/ws/



COLUMBIA - THE DALLES DAM
Forecasts For Water Year 2017

ESP Monthly Water Supply Forecast
10 days QPF: Ensemble: 2017-03-01 Issued: 2017-03-01

Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	Obs Runoff (2017-03-01)	30 Year Average (1981-2010)
OCT					7896	5080
NOV					9262	5612
DEC					5476	5610
JAN					4871	6011
FEB					8819	6392
MAR	8694	10140	111	12094		9110
APR	10892	15187	110	19474		13808
MAY	22276	27486	108	33973		25354
JUN	21851	28239	108	32750		26157
JUL	11848	14670	101	19302		14536
AUG	6885	7963	104	9677		7677
SEP	4844	5621	109	7469		5172

Move the mouse over the desired "Forecast Table" to update graph.
* Partial Monthly Total

CSV Download | ESP10 | Forecast Ensemble

COLUMBIA - THE DALLES DAM
Forecasts For Water Year 2017

ESP Monthly Water Supply Forecast
5 days QPF: Ensemble: 2017-03-01 Issued: 2017-03-01

Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	Obs Runoff (2017-03-01)	30 Year Average (1981-2010)
OCT					7896	5080
NOV					9262	5612
DEC					5476	5610
JAN					4871	6011
FEB					8819	6392
MAR	8460	10141	111	12998		9110
APR	10484	15104	109	18877		13808
MAY	21930	26866	106	32968		25354
JUN	21437	27641	106	32022		26157
JUL	11706	14518	100	19172		14536
AUG	6808	7950	104	9629		7677
SEP	4832	5605	108	7566		5172

Move the mouse over the desired "Forecast Table" to update graph.
* Partial Monthly Total

CSV Download | ESP5 | Forecast Ensemble

COLUMBIA - THE DALLES DAM
Forecasts For Water Year 2017

ESP Monthly Water Supply Forecast
0 days QPF: Ensemble: 2017-03-01 Issued: 2017-03-01

Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	Obs Runoff (2017-03-01)	30 Year Average (1981-2010)
OCT					7896	5080
NOV					9262	5612
DEC					5476	5610
JAN					4871	6011
FEB					8819	6392
MAR	7948	10099	111	13419		9110
APR	10321	15031	109	18405		13808
MAY	21274	26161	103	32138		25354
JUN	20523	26966	103	31324		26157
JUL	11182	14002	96	18639		14536
AUG	6656	7711	100	9296		7677
SEP	4736	5507	106	7457		5172

Move the mouse over the desired "Forecast Table" to update graph.
* Partial Monthly Total

CSV Download | ESP0 | Forecast Ensemble

Volume Rankings

www.nwrfc.noaa.gov/ws/

- Current volume forecasts can be viewed in context of historical volumes
- Shown here, near record seasonal volumes are forecasted in some locations (Upper Snake)
- Can be helpful for identifying analog years to aid in water management planning

SNAKE - NEAR HEISE (HEII1)
Period Rankings - 1970 to 2017
APR-SEP Normal -- 3785 (KAF)

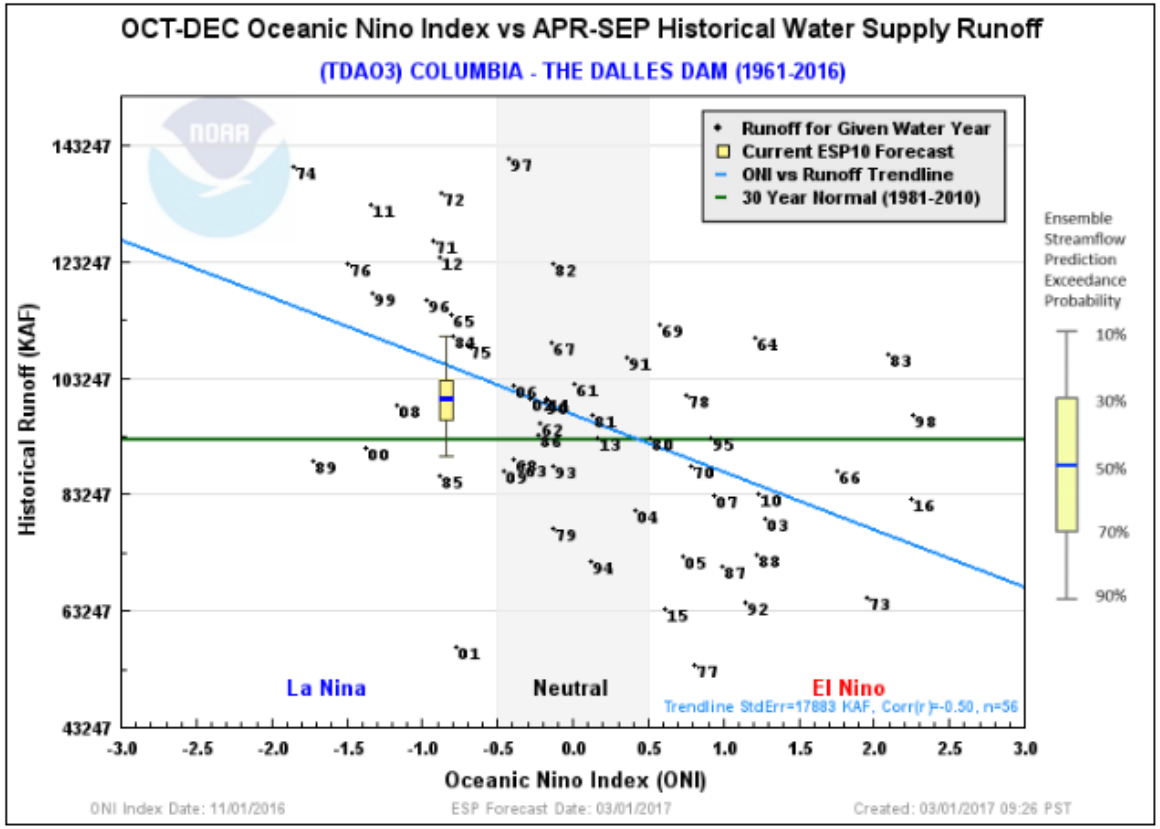
Rank	Year	Period Volume (KAF)	Percent of Normal	Exceedance Probability*
1	1997	7008.75	185	2.083 %
2	2011	6282.00	166	4.167 %
3	2017	6180.45	163	6.250 %
4	1971	6166.60	163	8.333 %
5	1986	6053.67	160	10.417 %
6	1982	5773.14	153	12.500 %
7	1996	5583.85	148	14.583 %
8	1974	5555.37	147	16.667 %
9	1972	5309.94	140	18.750 %
10	1984	5046.15	133	20.833 %

SNAKE - NEAR HEISE (HEII1)
Period Rankings - 1970 to 2017
JAN-JUL Normal -- 3790 (KAF)

Rank	Year	Period Volume (KAF)	Percent of Normal	Exceedance Probability*
1	1997	6885.26	182	2.083 %
2	2017	6091.48	161	4.167 %
3	1986	6074.61	160	6.250 %
4	1971	5903.61	156	8.333 %
5	2011	5844.00	154	10.417 %
6	1996	5568.31	147	12.500 %
7	1974	5477.20	145	14.583 %
8	1982	5426.51	143	16.667 %
9	1972	5276.14	139	18.750 %
10	1984	4923.66	130	20.833 %

Climate Index Relationships

www.nwrfc.noaa.gov/ws/



For Data Used in Plot (1961 - 2016)

Options

Station Identifier: TDAO3

Climate Index

Index: ONI

Period: OND

Runoff / Forecast Type: Water Supply

Runoff Period: APR-SEP

Water Year Range: 1961 2016

Plot Forecast:

Press Refresh when ready.

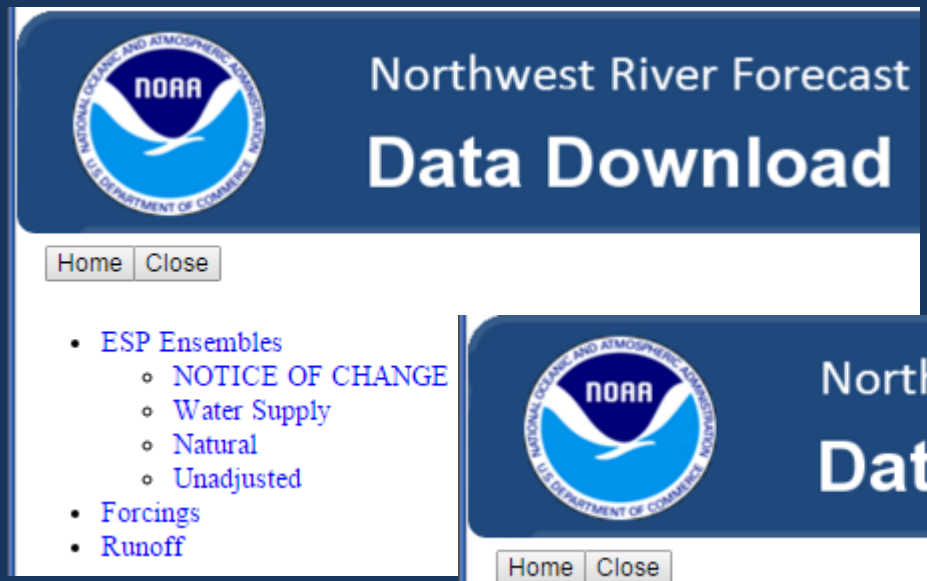
Description

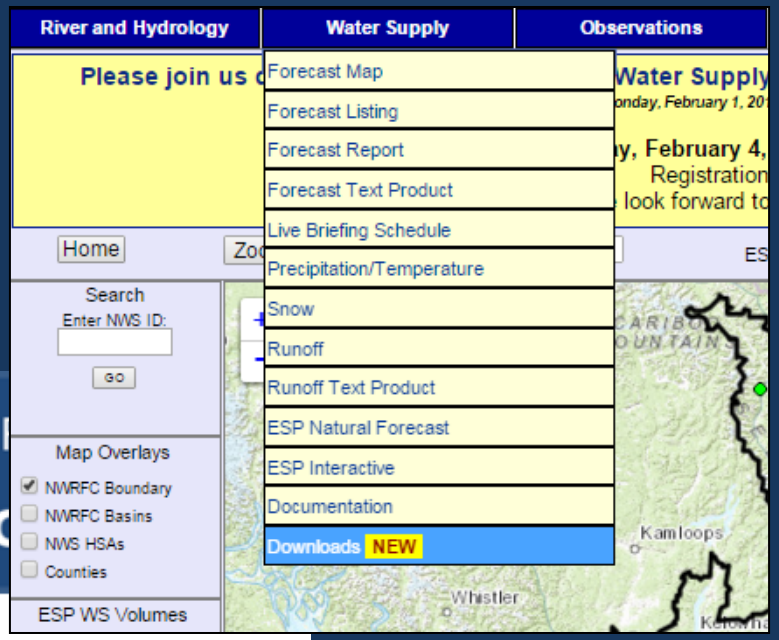
The **Oceanic Nino Index (ONI)** is the 3 month running average of the sea surface temperature (SST) anomaly for the Nino 3.4 region. The ONI is used by NOAA to make official ENSO phase classifications.

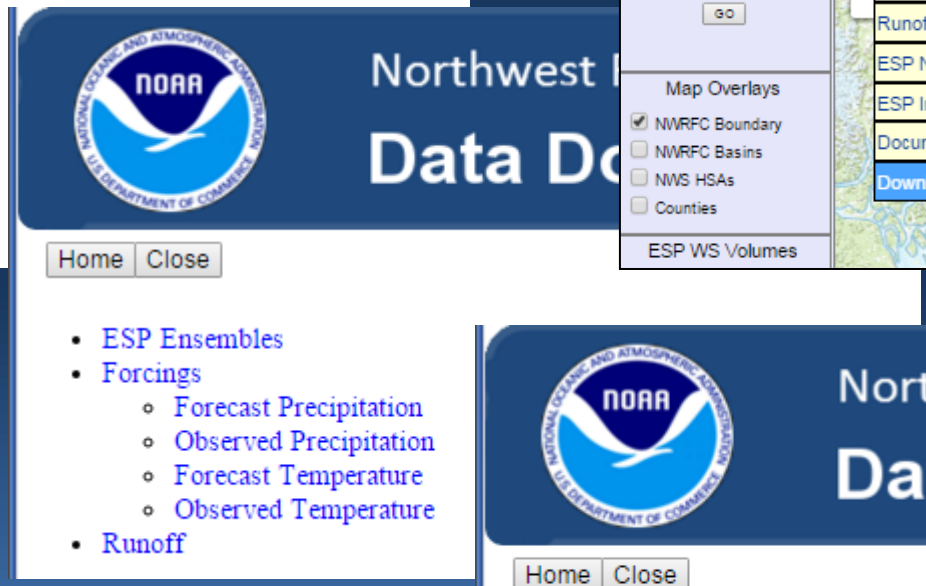
Source: ONI index is courtesy of NOAA's Climate Prediction Center (Click Here)

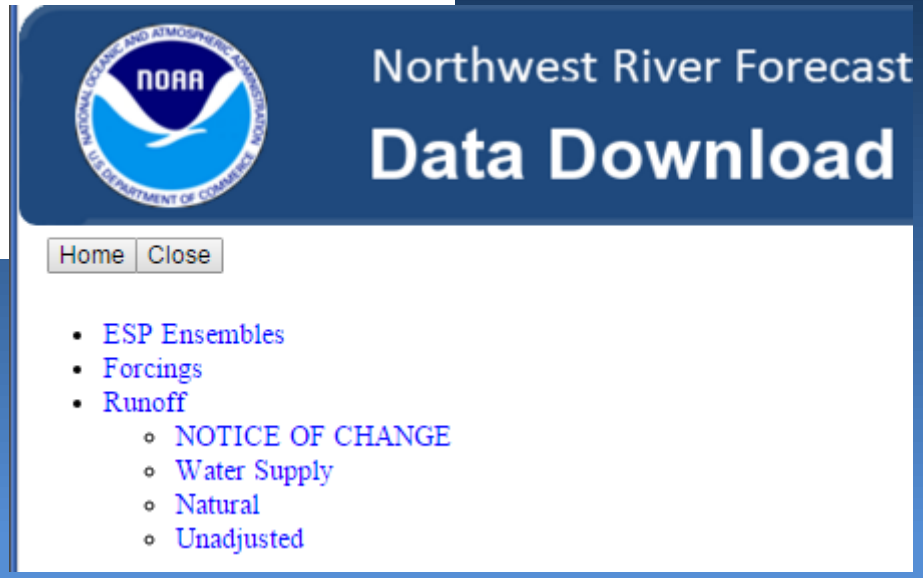
- Can now specify from a variety of climate indices, index periods, forecast types, and ranges of water year

Data Downloads









- Can now download observed and forecasted precipitation, temperatures, and streamflows from our web
  - In .csv and .xml formats

Mar 2017 Water Supply Briefing

National Weather Service, Northwest River Forecast Center

Questions?

Presentation available after brief at:
www.nwrfc.noaa.gov/presentations/presentations.cgi

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