Feb 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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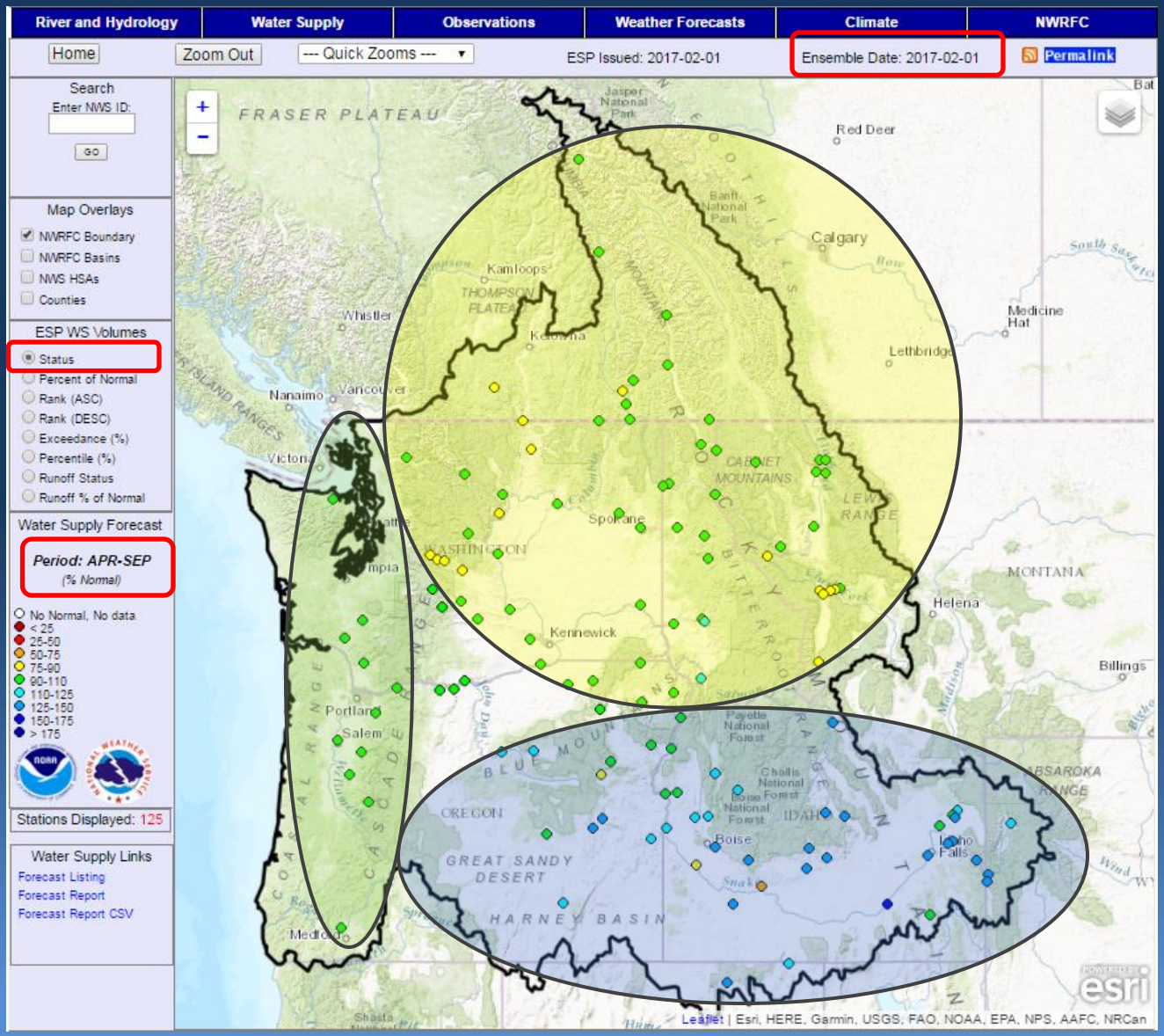
Presentation Outline

- Basic summary of latest forecasts
- NWRFC volume forecasting overview, background
  - Modeling system
  - Forecast methodology
- Forecast inputs
  - Observed conditions
  - Potential 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/

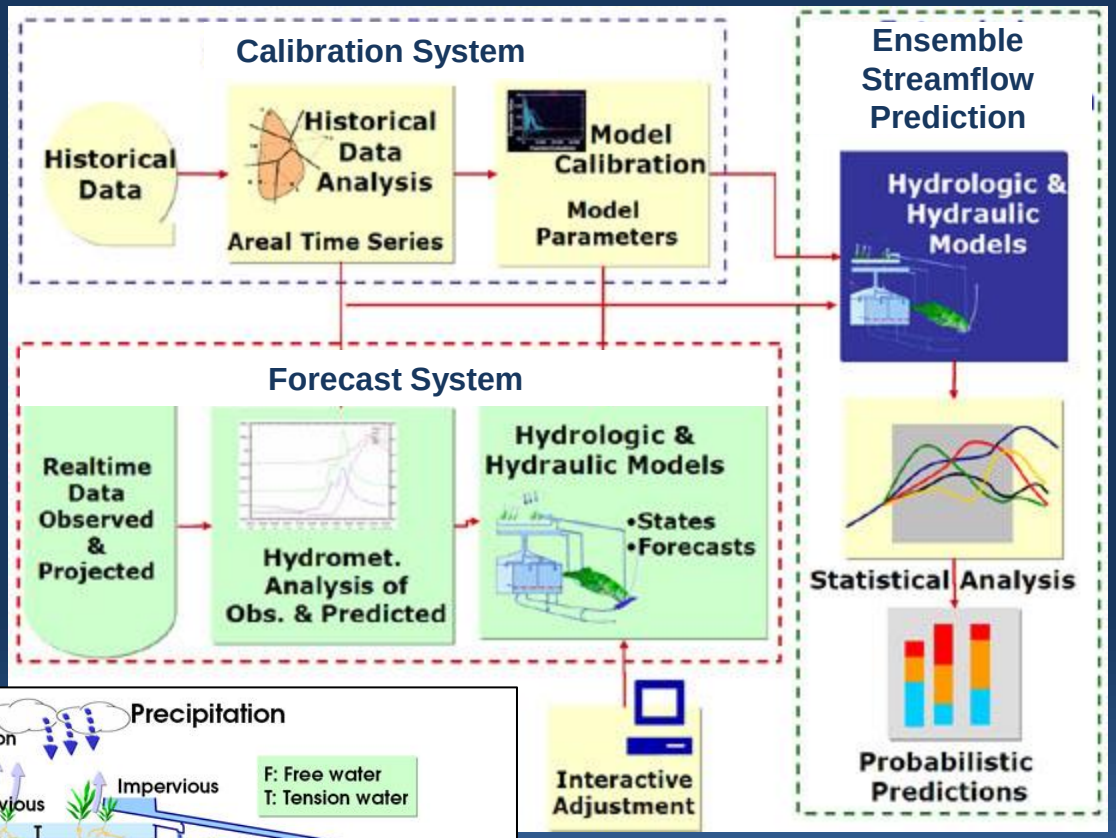


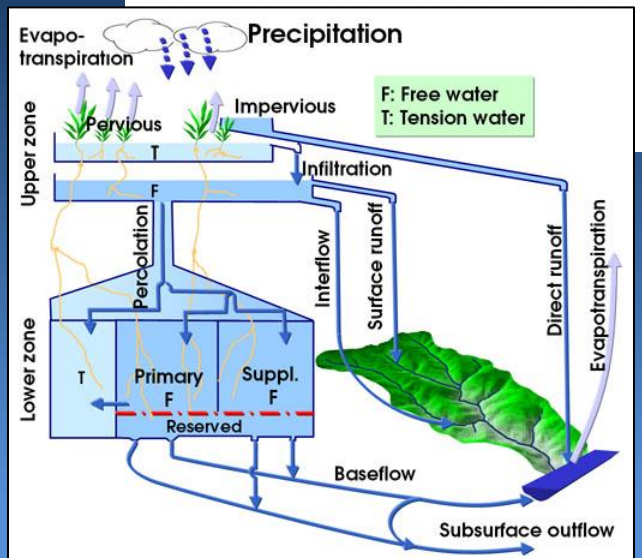
- West of Cascades:
  - Near normal
- East of Cascades:
  - Near normal to slightly below normal throughout northern tier
  - Near normal to well above normal across southern tier
  - Near normal at The Dalles
- Primary drivers:
  - Snowpack distribution
  - Weather yet to come

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



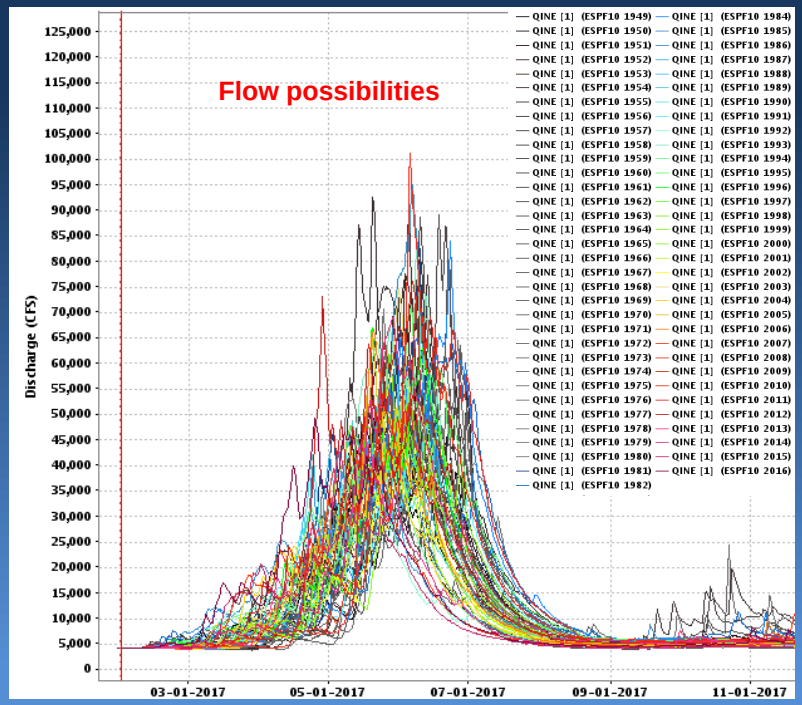


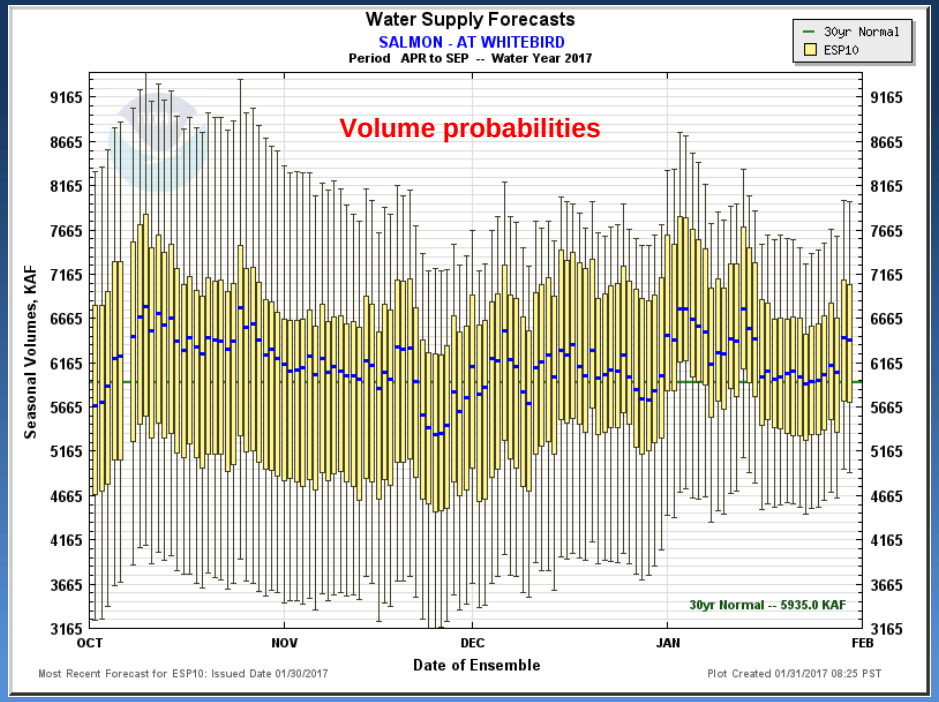
Forecast Methodology

- 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 significant upstream reservoir storage, 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.

Volume Forecast Inputs

Volume Forecast Inputs

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

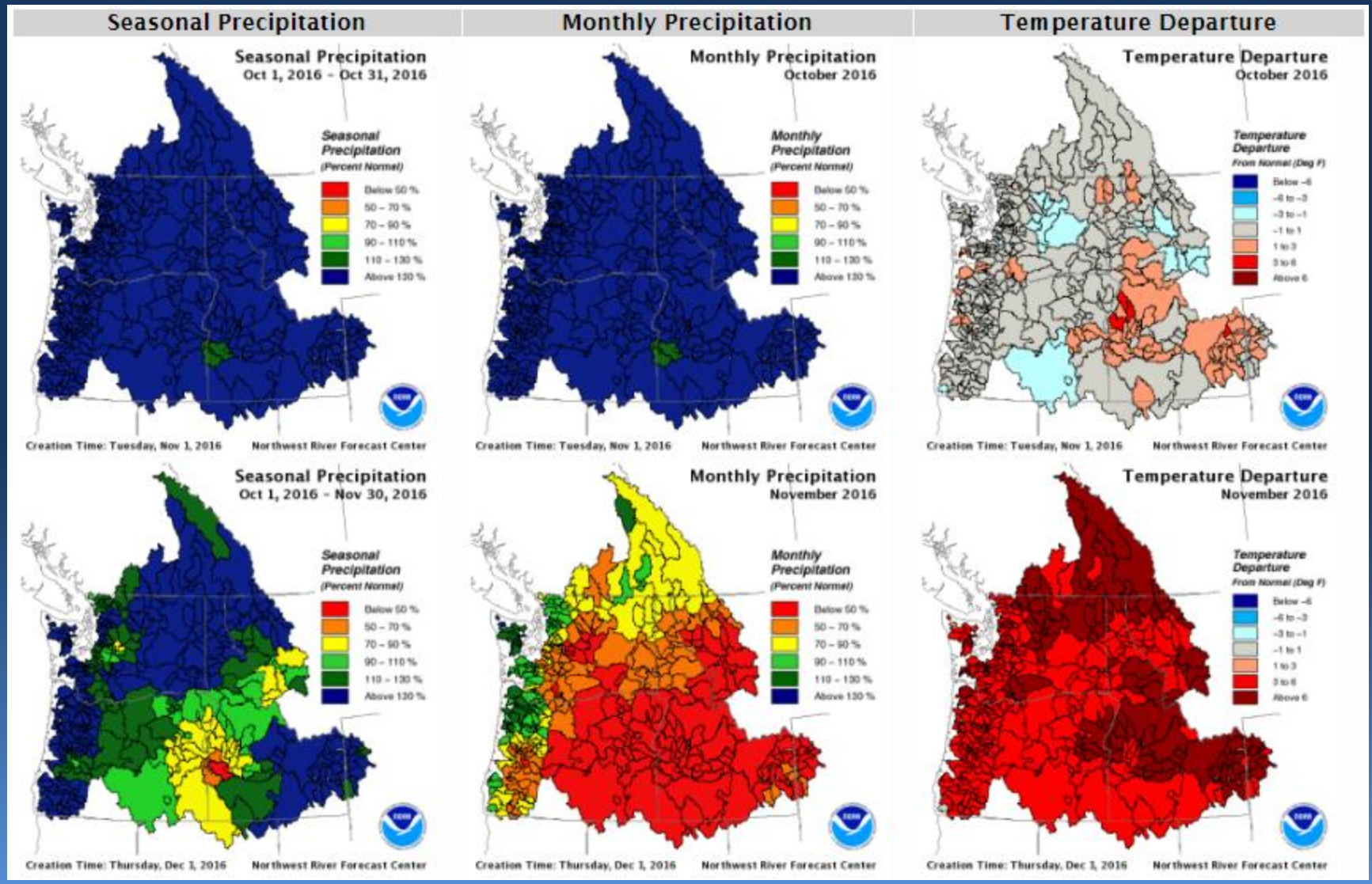
Model “states”

- Future Conditions (Anticipated and Possible):
  - 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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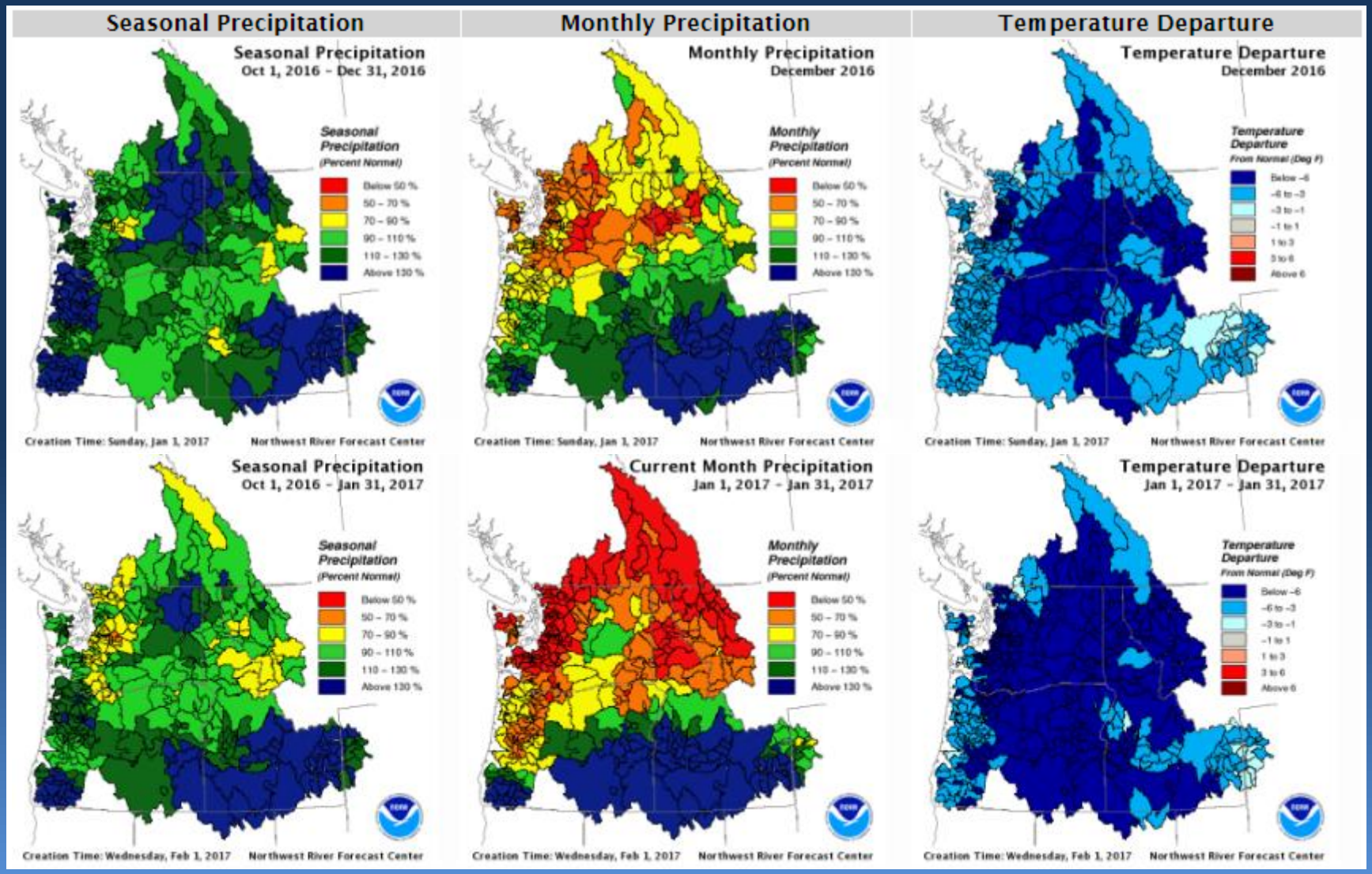

Observed Precipitation Summary

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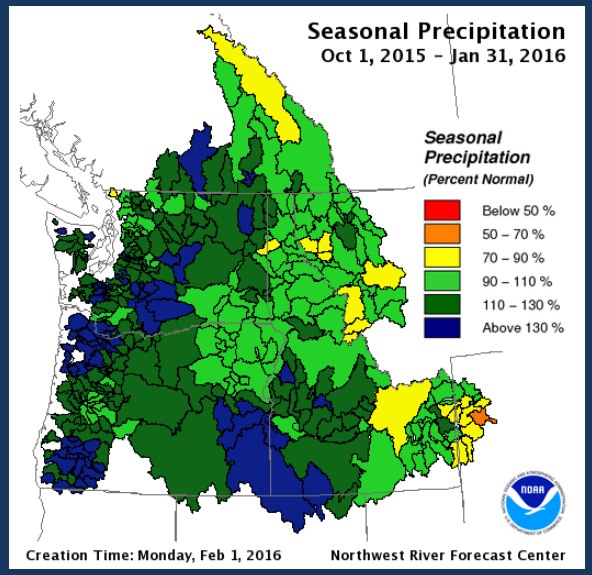
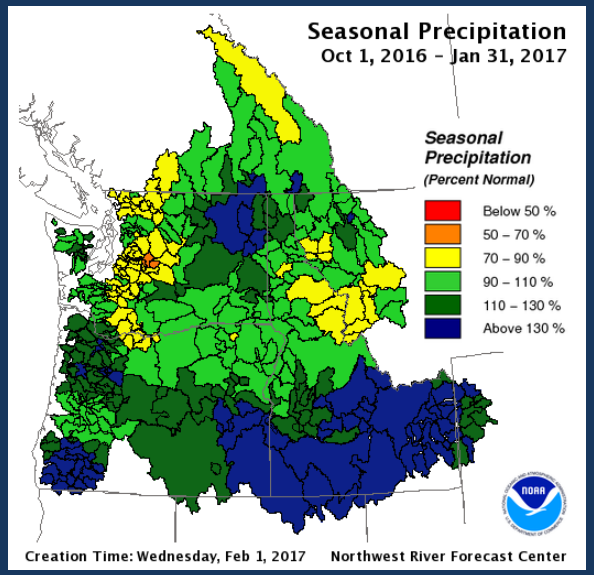
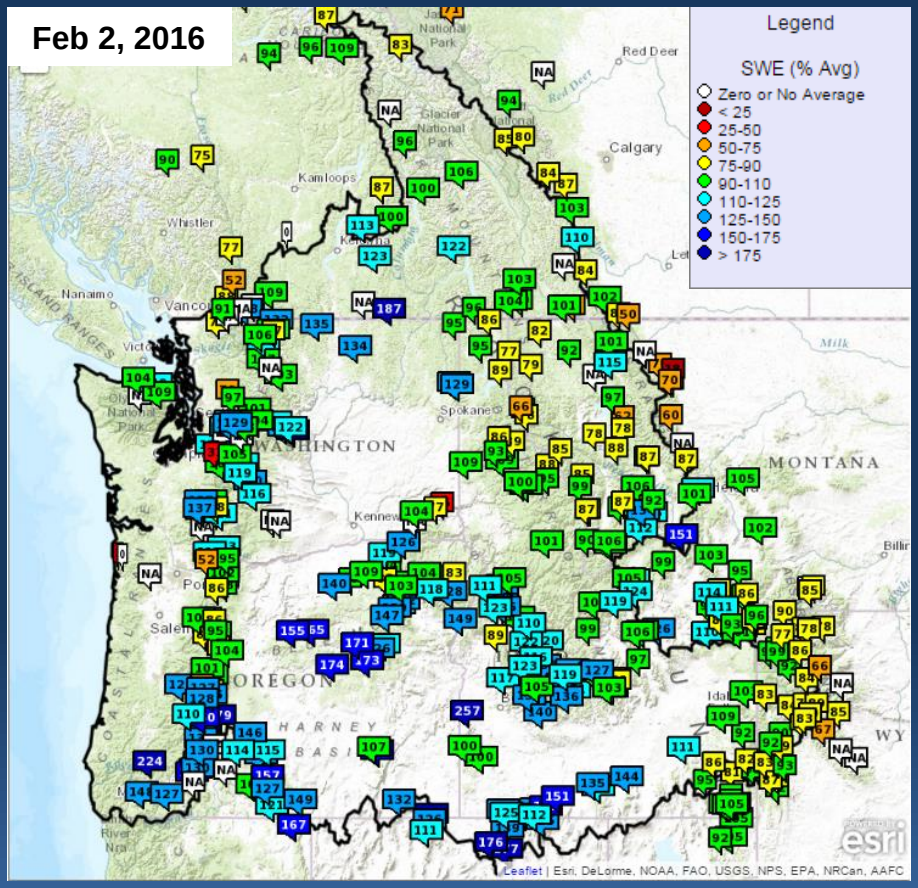


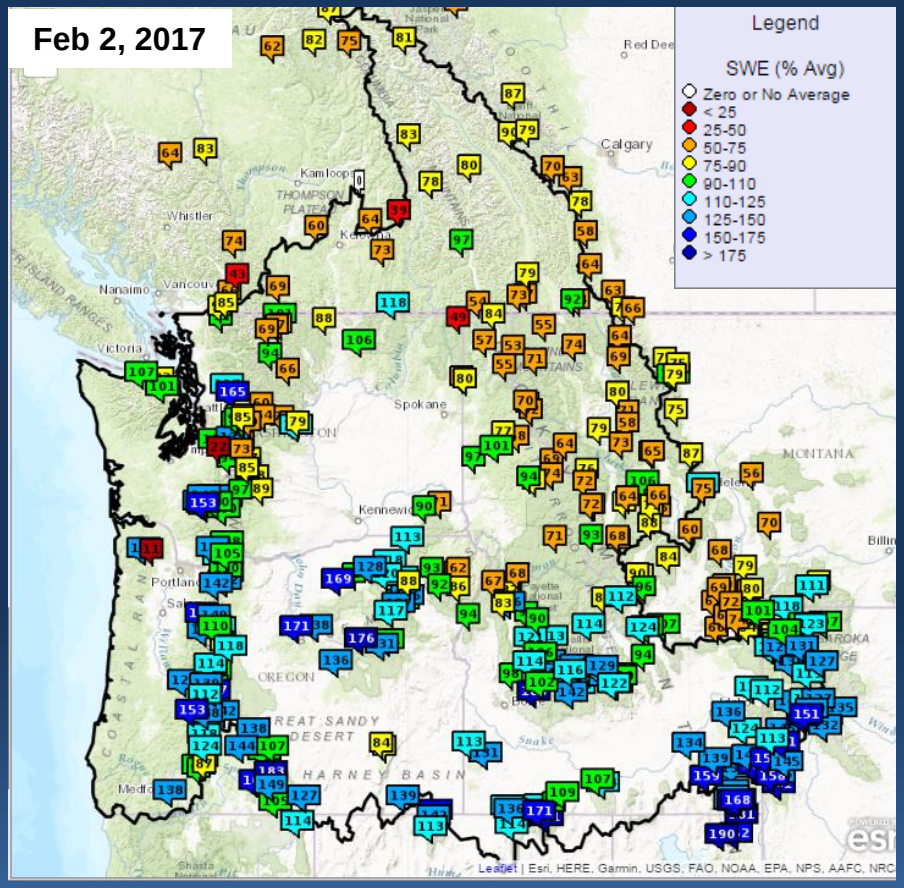


DIVISION NAME	WY 2016 % NORM	WY 2017 % NORM
Columbia River above Arrow Lakes	94	93
Kootenai River	106	107
Pond Oreille River	99	98
Spokane River	98	94
Columbia River above Grand Coulee	101	101
Snake River	109	120
Columbia River above The Dalles	108	106
Western Washington	118	92
Western Oregon	125	125

Observed Snowpack Conditions

www.nwrfc.noaa.gov/snow

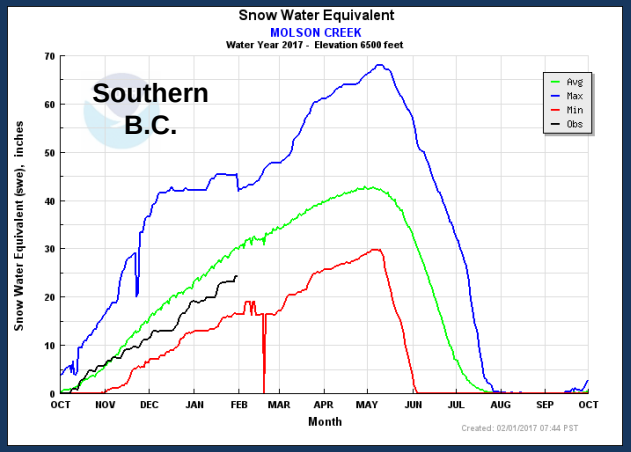


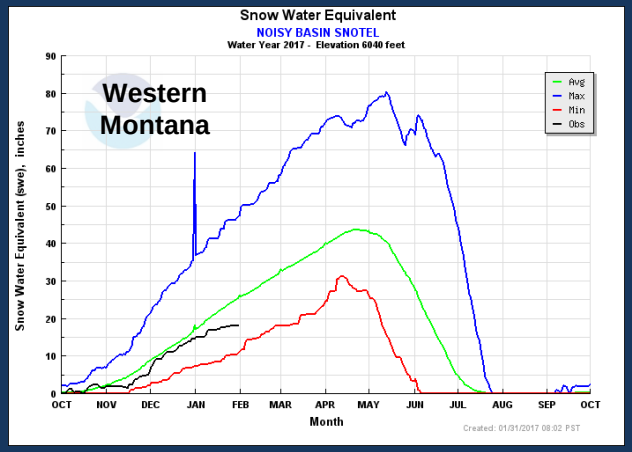


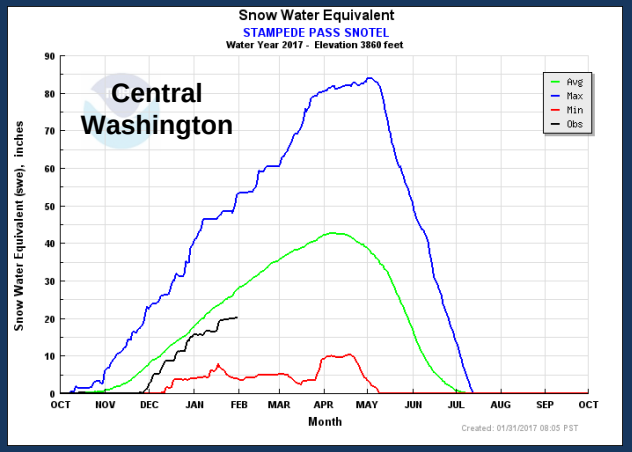
- Distinct lateral divide between the southern and northern tiers of our east-side domain
- Observed snow water equivalent (SWE) values provided by:
  - Natural Resources Conservation Service (NRCS) SNOTEL network, and Environment Canada (EC) Automated Snow Pillow network

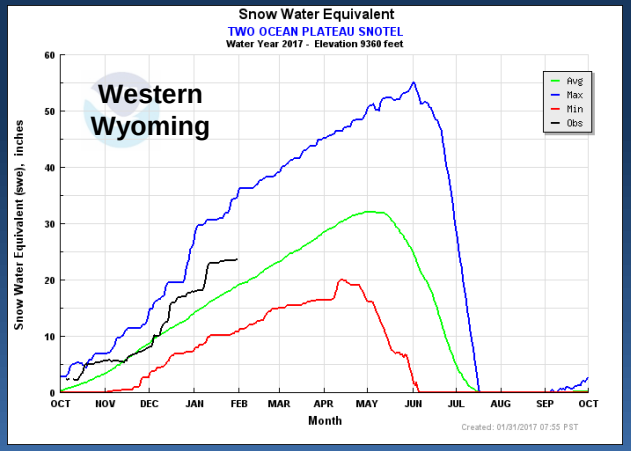
Observed Snowpack Conditions

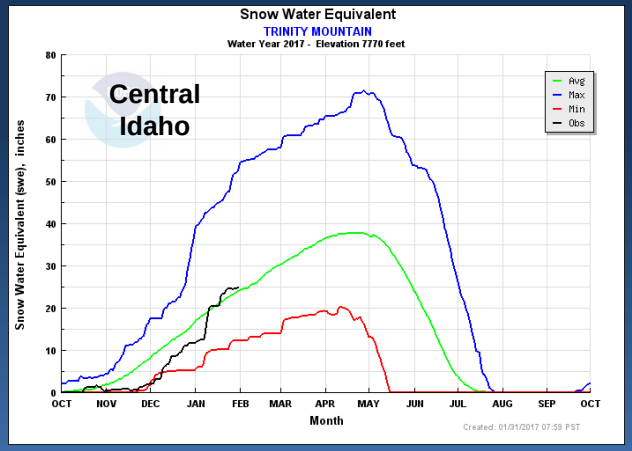
www.nwrfc.noaa.gov/snow

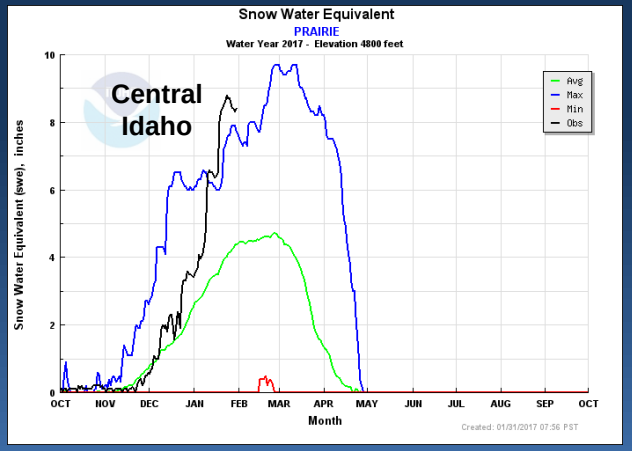






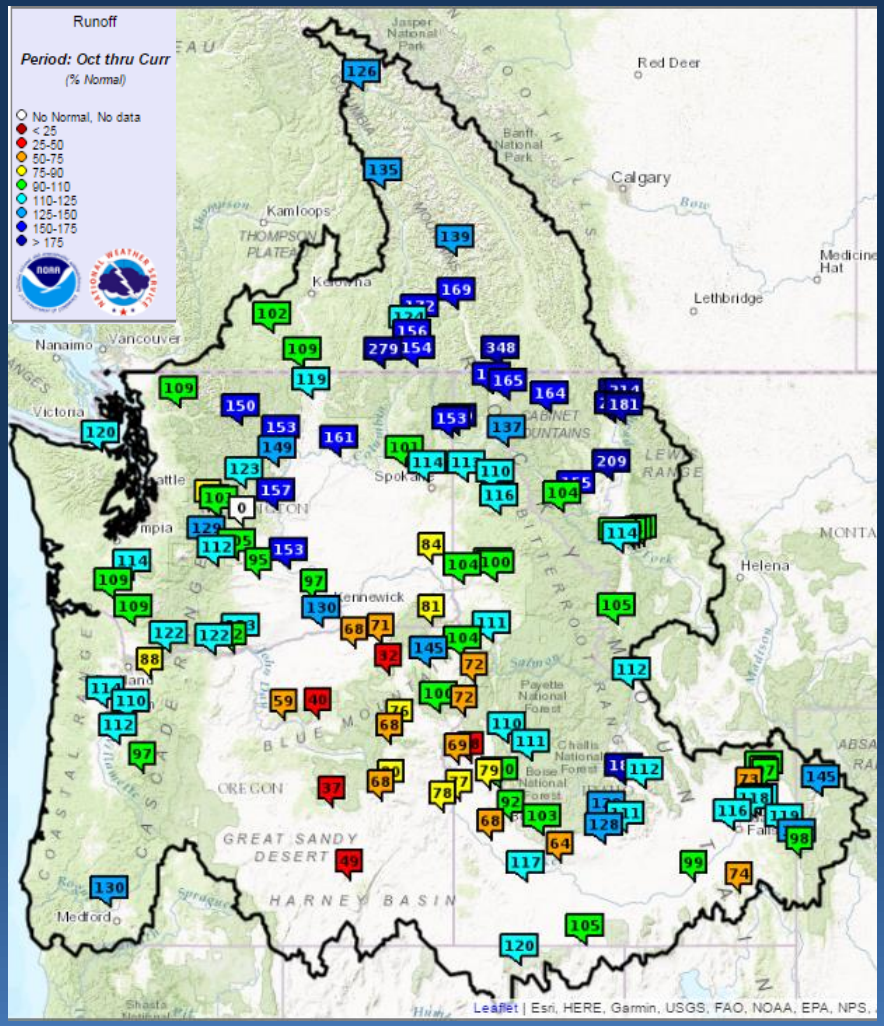






- Same picture: lower numbers in the north, healthy numbers in the south
- Also note the record numbers observed at some low elevation locations along the southern tier

Soil Moisture (Streamflow) Conditions



LOCATION	Oct 1 – Jan 31 % NORM	Jan 1 – Jan 31 % NORM
Columbia River – Arrow Lakes	124	81
Kootenai River – Queens Bay	170	96
Columbia River – Birchbank	156	110
Pond Oreille River – Albeni Falls	154	76
Spokane River – Long Lake	101	56
Columbia River – Grand Coulee	161	94
Snake River – Lower Granite	84	64
Columbia River – The Dalles	123	81

- Observed (adjusted) runoff since Oct 1 is at or above normal in many places → wet Oct, warm Nov
- However, the picture for runoff since Jan 1 is much different → cold Dec/Jan
- Soils should be primed, but frozen stream gages add uncertainty

Volume Forecast Inputs

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

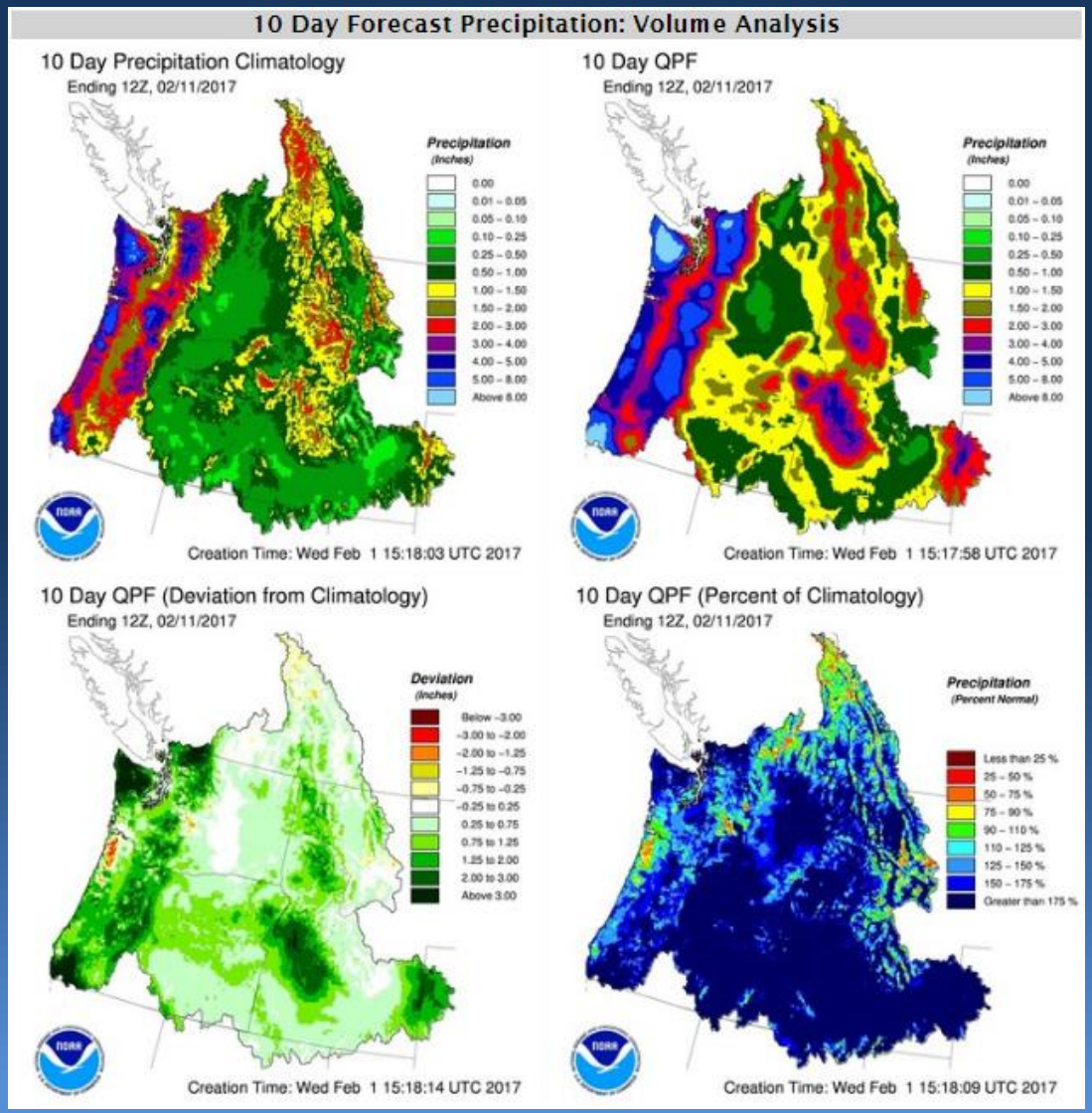
Model “states”

- Future Conditions (Anticipated and Possible):
  - 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

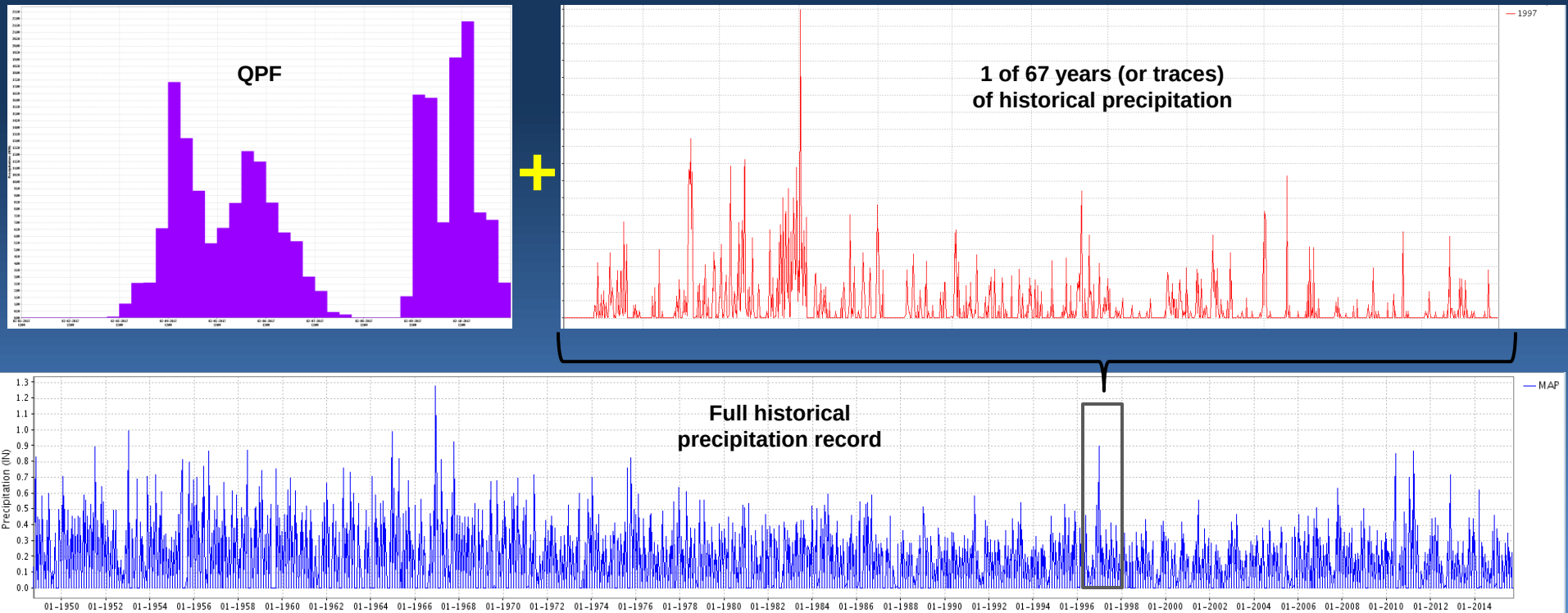


- Wet conditions forecasted across the Northwest over the next 10 days
- No significant warming expected
- Good for snow packs, including up north
- Volume forecasts are trending higher

Ensemble Forcings (Climatology)

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

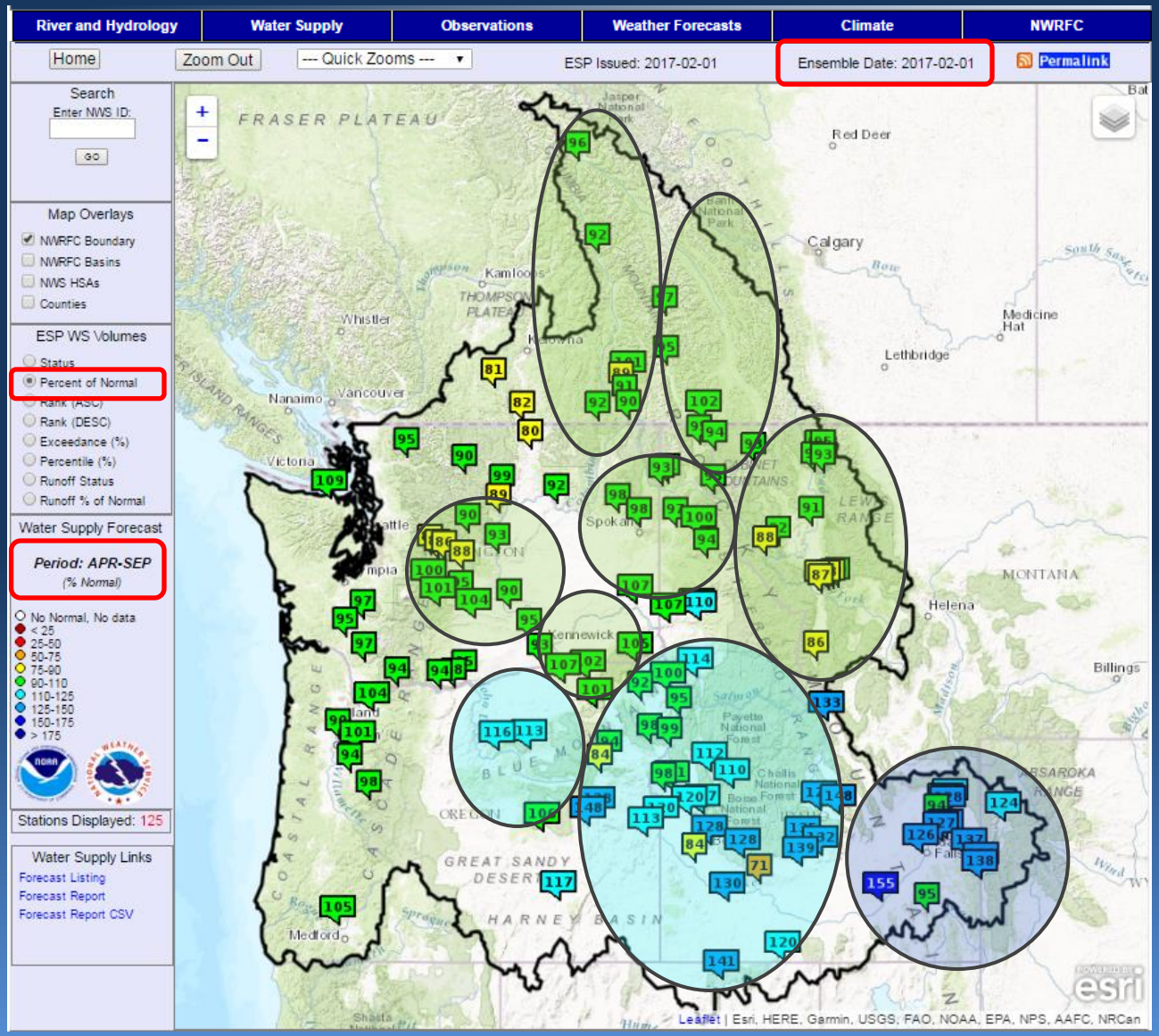
- Unique sets (years) of historical observations
  - Precipitation and temperature data for every year of historical record (1949 – 2016)
  - QPF/QTF + one year of historical data = one forcing trace



Latest Volume Forecasts

Water Supply Forecasts

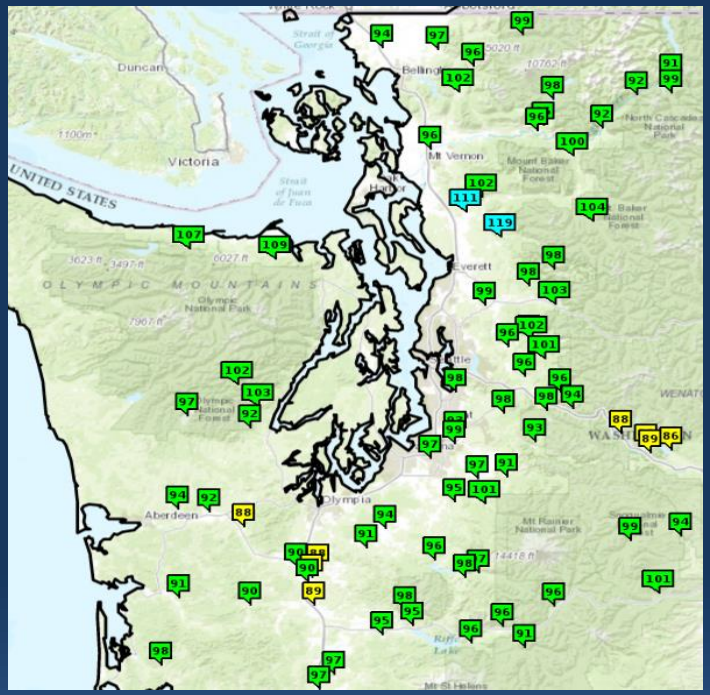
www.nwrfc.noaa.gov/ws/



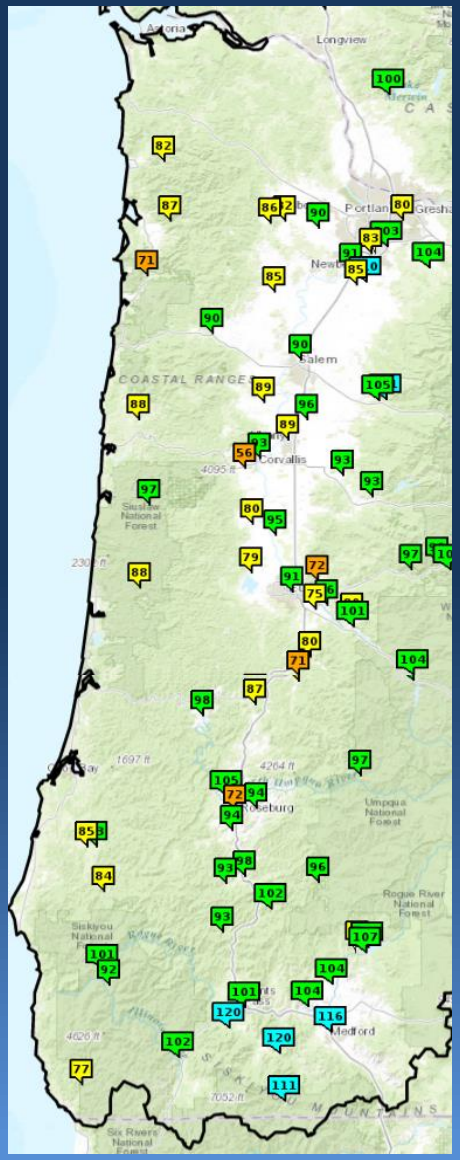
LOCATION	APR – SEP % NORM
Kootenai River – Queens Bay	95
Columbia River – Birchbank	91
Clark Fork – Cabinet Gorge	95
Spokane River – Spokane	98
Columbia River – Grand Coulee	92
Snake River – Shelley	126
Snake River – Lower Granite	107
Yakima River – Parker	104
John Day River – Service Creek	116
Grande Ronde -- Troy	105
Columbia River – The Dalles	94

Natural Volume Forecasts

www.nwrfc.noaa.gov/ws/



LOCATION	APR – SEP % NORM
Skagit River – Concrete	96
Stillaguamish River - Arlington	111
Snohomish River - Monroe	99
Cedar River – Renton	98
Cowlitz River – Castle Rock	97
Chehalis River – Porter	88
Dungeness River – Sequim	109



LOCATION	APR – SEP % NORM
Lewis River – Merwin	100
Clackamas River – Estacada	104
Tualatin River – Farmington	90
Nehalem River – Foss	82
Mckenzie River – Vida	97
Coast Fk Willamette River – Goshen	75
Willamette River – Salem	90
Siuslaw River – Mapleton	88
Umpqua River – Elkton	98
SF Coquille River – Myrtle Point	85
Rogue River – Grants Pass	101
Illinois River – Agness	92

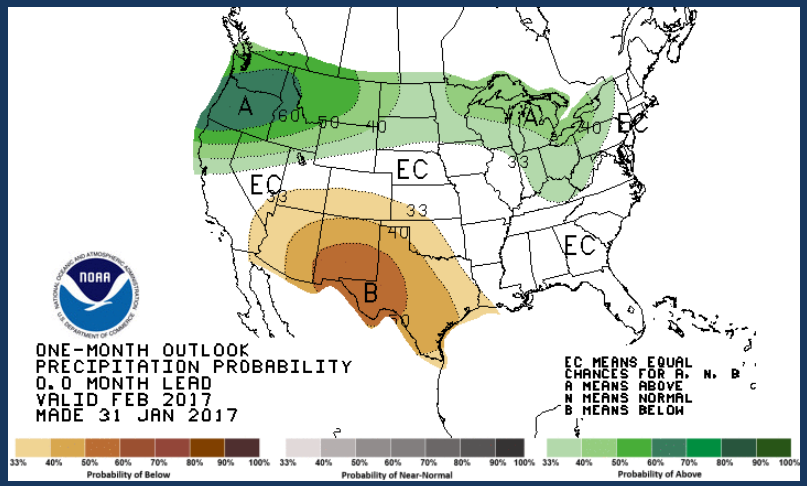
Climate Outlook

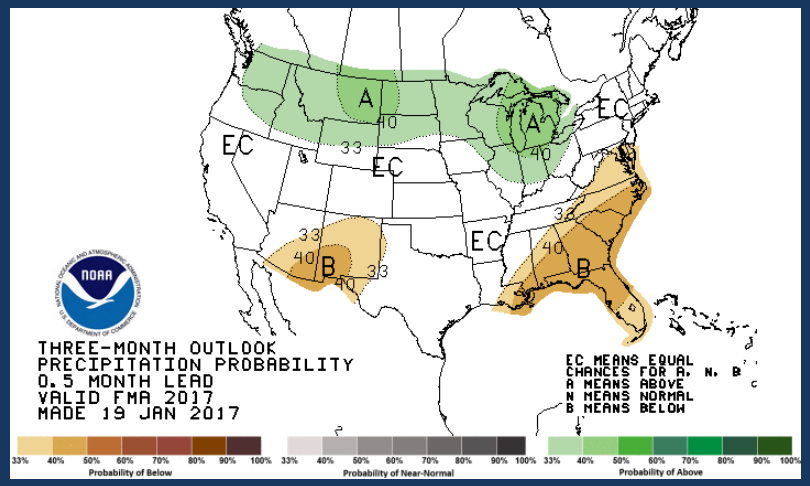
www.cpc.ncep.noaa.gov

Current Month Outlook

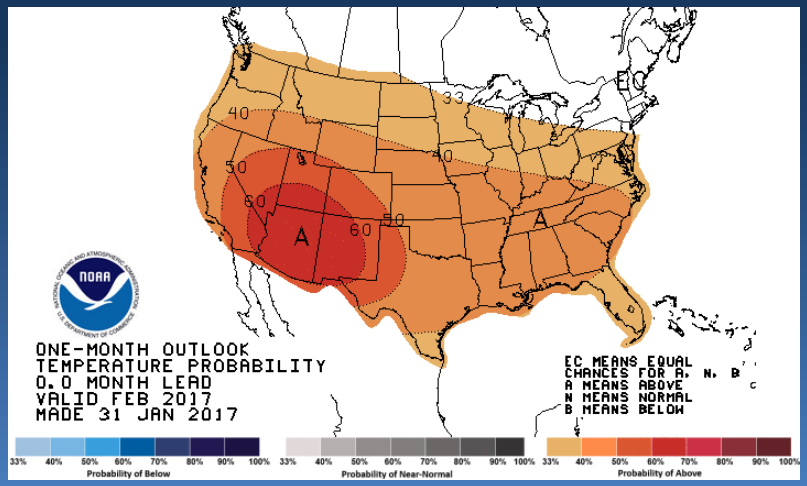
Three Month Outlook

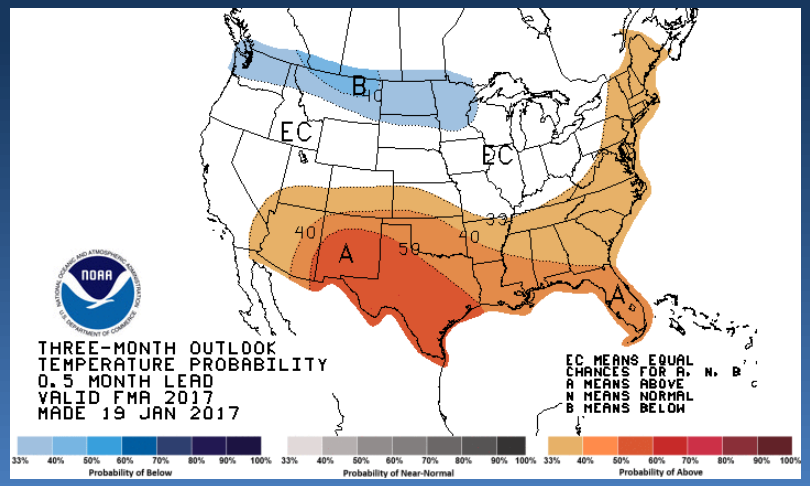
Precipitation





Temperature





- Feb expected to be wet, potentially benefiting our northern tier
- Slight potential for above normal precipitation to continue through Apr

Volume forecasts may trend upwards

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:*** **2017-02-01** ***Issued:*** 2017-02-01

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	77268	86733	94	101488	92704
APR-JUL	65483	74825	94	86852	79855
APR-AUG	72926	81458	93	95124	87532
JAN-SEP	93543	105030	92	122276	114216
JAN-JUL	81953	92538	91	108764	101368
OCT-SEP	115952	127439	98	144684	130518

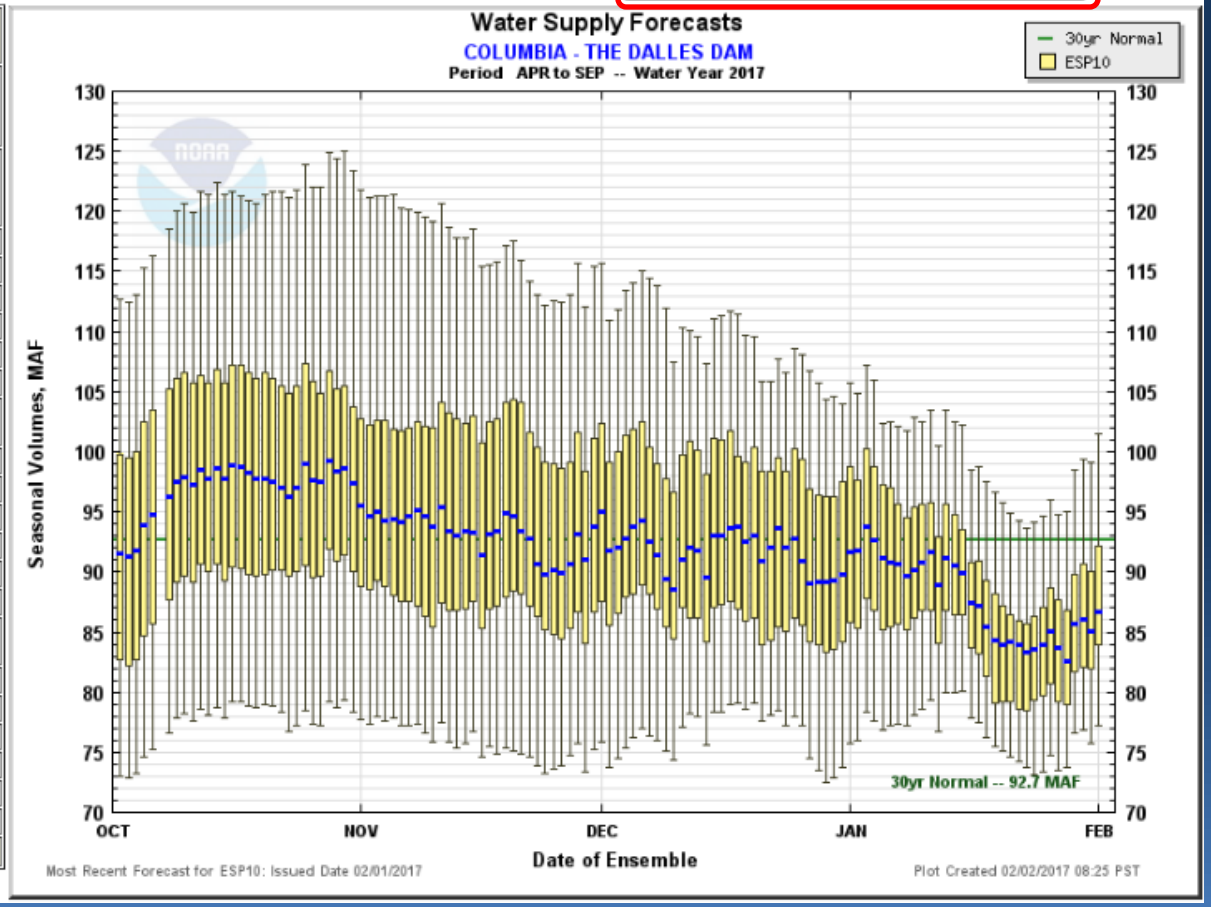
5 days QPF:Ensemble: **2017-02-01** ***Issued:*** 2017-02-01

APR-SEP	76146	86466	93	97739	92704
APR-JUL	64397	72652	91	84406	79855
APR-AUG	71167	80561	92	91578	87532
JAN-SEP	92591	103570	91	120417	114216
JAN-JUL	81969	90603	89	105124	101368
OCT-SEP	115000	125979	97	142826	130518

0 days QPF:Ensemble: **2017-02-01** ***Issued:*** 2017-02-01

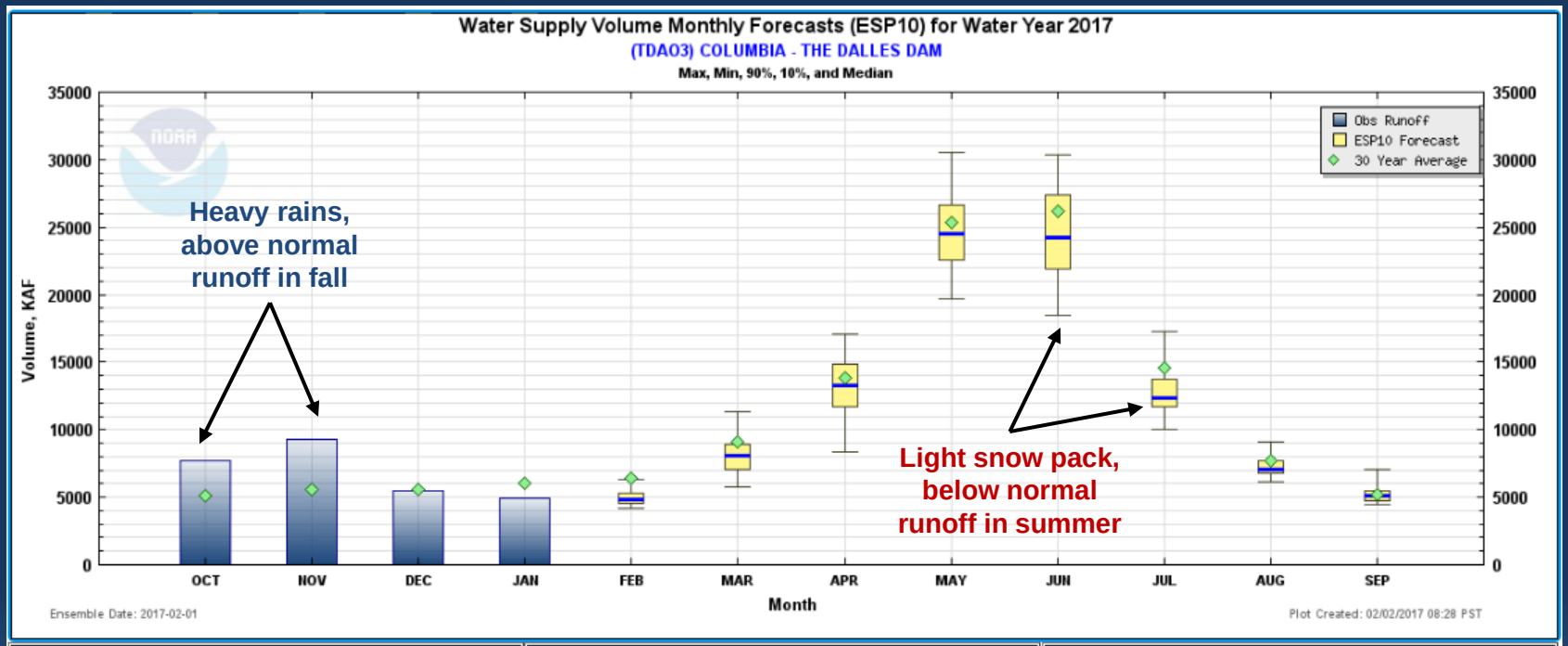
APR-SEP	74620	84493	91	94814	92704
APR-JUL	63007	71285	89	82526	79855
APR-AUG	69451	79319	91	89512	87532
JAN-SEP	91078	101483	89	114729	114216
JAN-JUL	79418	88750	88	102747	101368
OCT-SEP	113487	123892	95	137138	130518

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



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: 2017-02-01 Issued: 2017-02-01

Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	Obs Runoff (2017-02-01)	30 Year Average (1981-2010)
OCT					7696	5080
NOV					9262	5612
DEC					5476	5610
JAN					4885	6011
FEB	4166	4854	76	6285		6392
MAR	5780	8083	89	11322		9110
APR	8340	13282	96	17070		13808
MAY	19650	24467	96	30541		25354
JUN	18439	24277	93	30334		26157
JUL	10018	12311	85	17242		14536
AUG	6115	7075	92	9115		7677
SEP	4426	5076	98	7036		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: 2017-02-01 Issued: 2017-02-01

Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	Obs Runoff (2017-02-01)	30 Year Average (1981-2010)
OCT					7696	5080
NOV					9262	5612
DEC					5476	5610
JAN					4885	6011
FEB	4125	4935	77	7397		6392
MAR	5750	7859	86	11363		9110
APR	8025	12803	93	16369		13808
MAY	19014	23885	94	31094		25354
JUN	18301	23676	91	29102		26157
JUL	9899	12284	85	17001		14536
AUG	6096	7121	93	9192		7677
SEP	4395	5121	99	6922		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: 2017-02-01 Issued: 2017-02-01

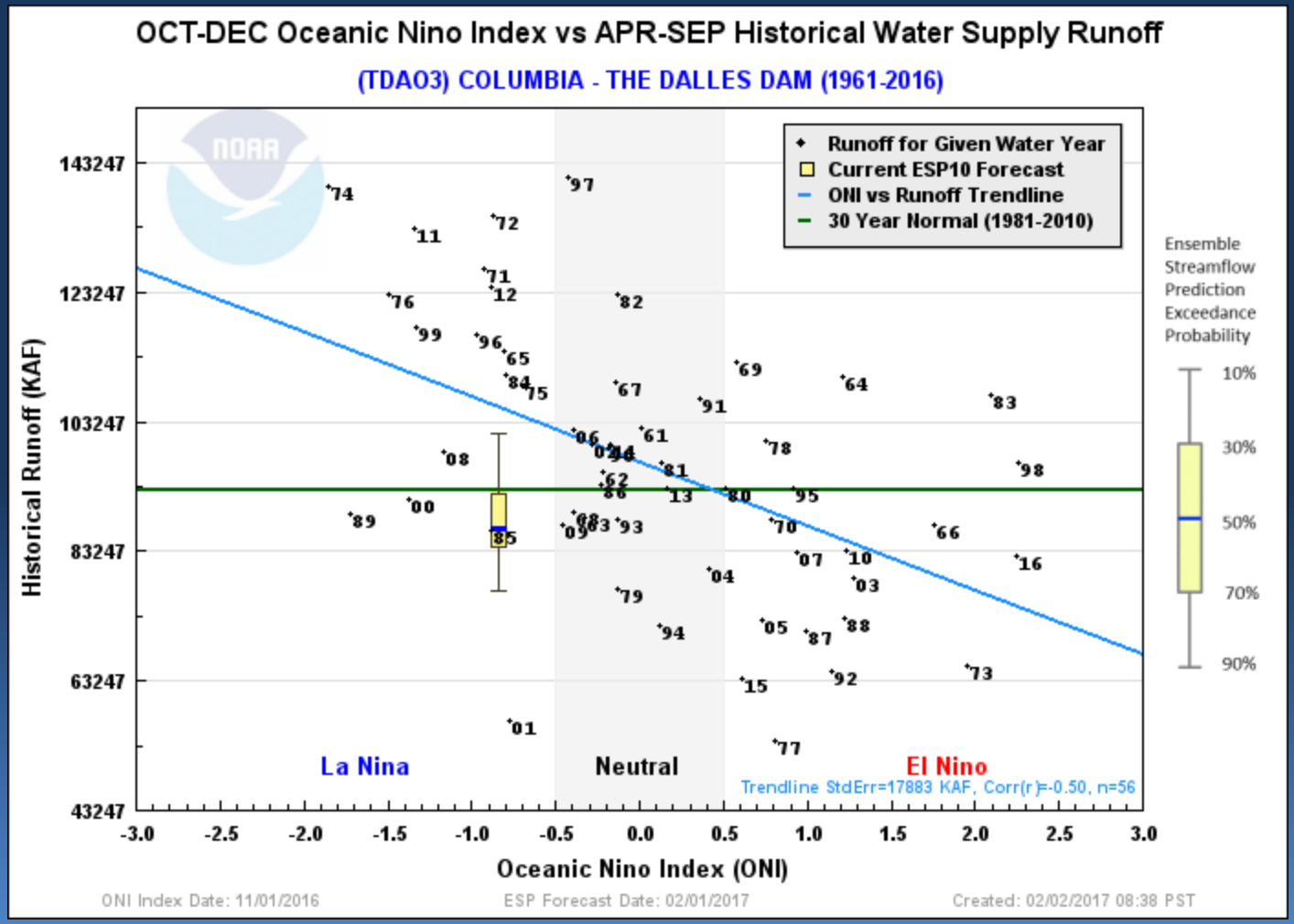
Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	Obs Runoff (2017-02-01)	30 Year Average (1981-2010)
OCT					7696	5080
NOV					9262	5612
DEC					5476	5610
JAN					4885	6011
FEB	4119	4969	78	7209		6392
MAR	5711	7627	84	10894		9110
APR	7717	12354	89	15843		13808
MAY	18340	22905	90	29594		25354
JUN	17824	22780	87	28240		26157
JUL	9658	12080	83	16218		14536
AUG	6015	7084	92	9056		7677
SEP	4315	5048	98	6871		5172

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

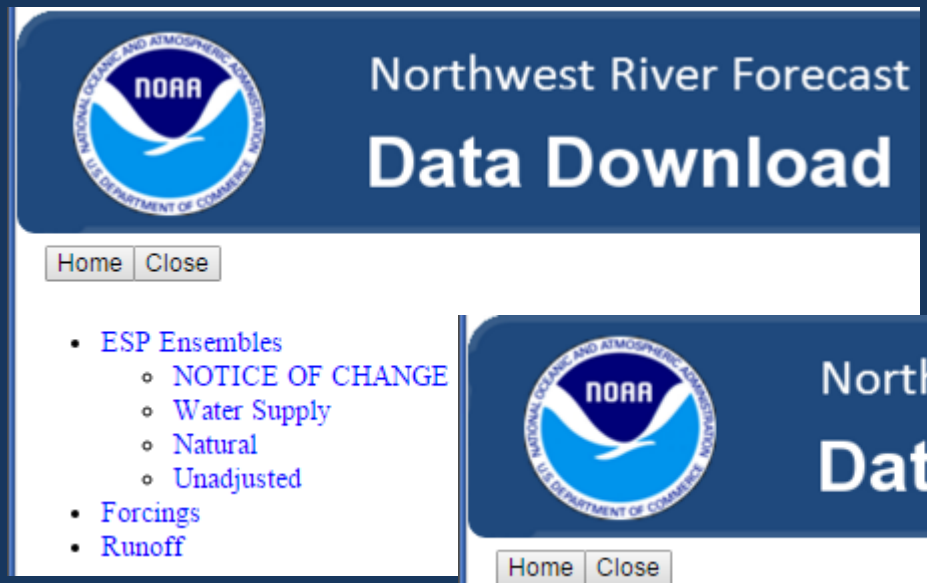
CSV Download | ESP0 | Forecast Ensemble

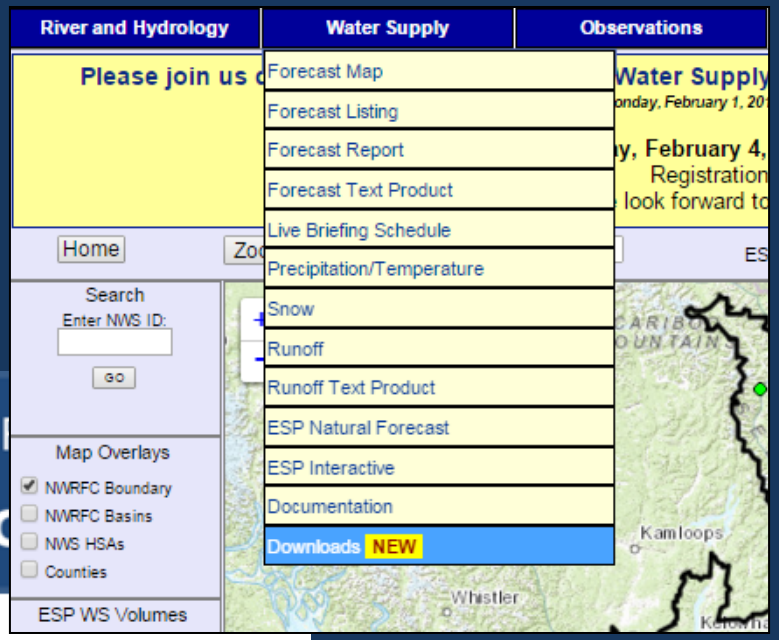
Climate Index Relationships

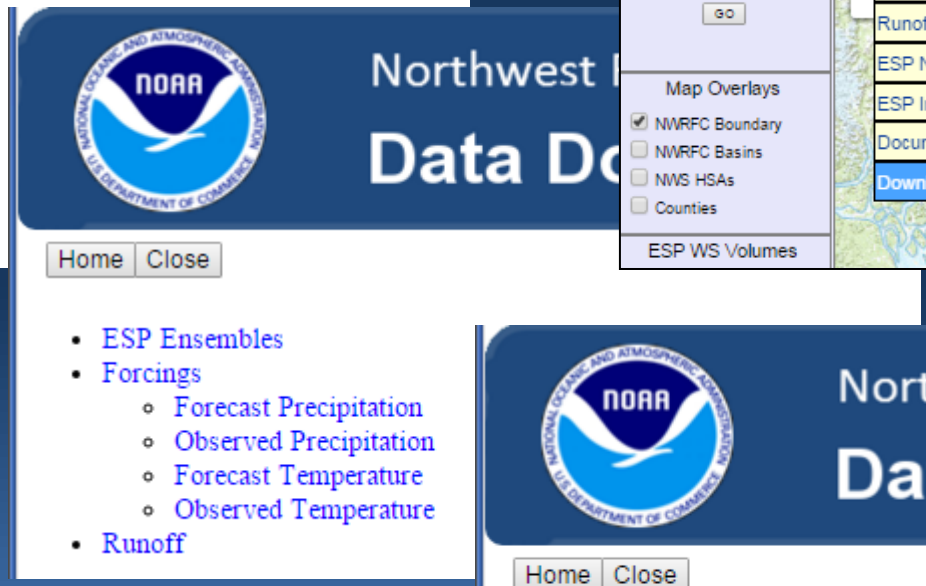
www.nwrfc.noaa.gov/ws/

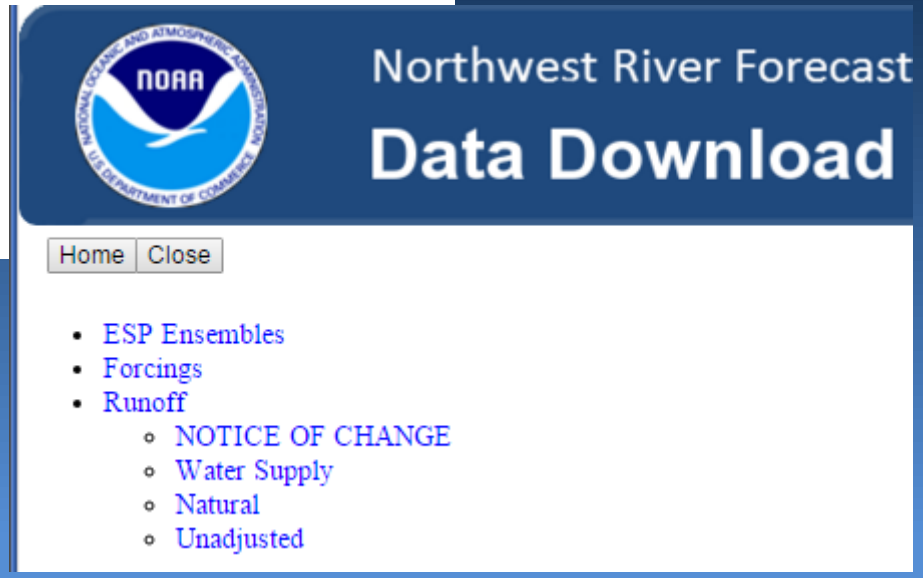


Data Downloads









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

Feb 2017 Water Supply Briefing

National Weather Service, Northwest River Forecast Center

Questions?

Presentation available after brief at:
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