



April 2019 Water Supply Briefing

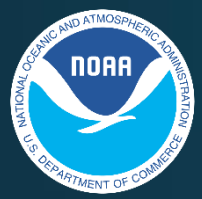
National Weather Service / Northwest River Forecast Center (NWRFC)

Telephone Conference : (415) 655-0060

Pass Code : 217-076-304#

Audio PIN is provided when logging into the webinar and will be required if you wish to ask questions at the end of presentation

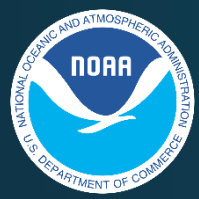
Geoffrey Walters PE, NWRFC
NWRFC.watersupply@noaa.gov
(503)326-7291



Water Supply Forecast Briefing Outline



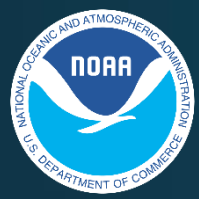
- Observed Conditions WY2019
- NWRFC Water Supply Forecast Refresher
- Water Supply Components
 - Current Model States-Regional Overview
 - 10 Day Forecasts-Model Forcings
- Current Water Supply Forecasts
- Sensitivity Analysis
- Summary



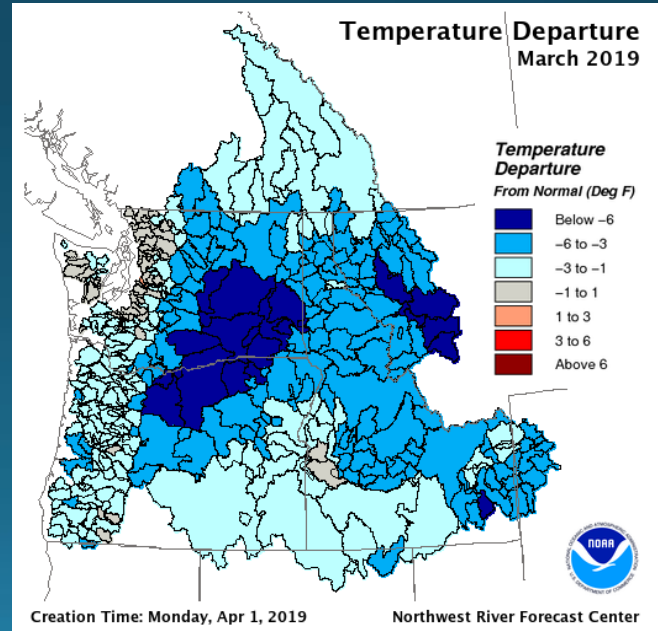
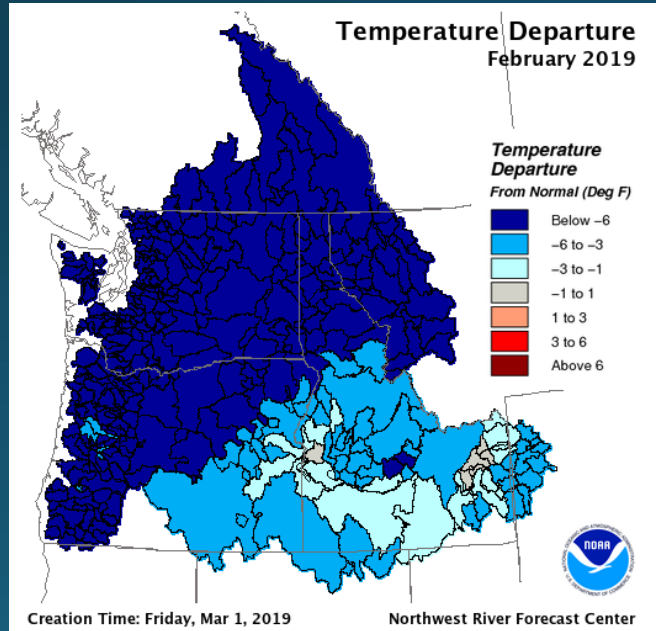
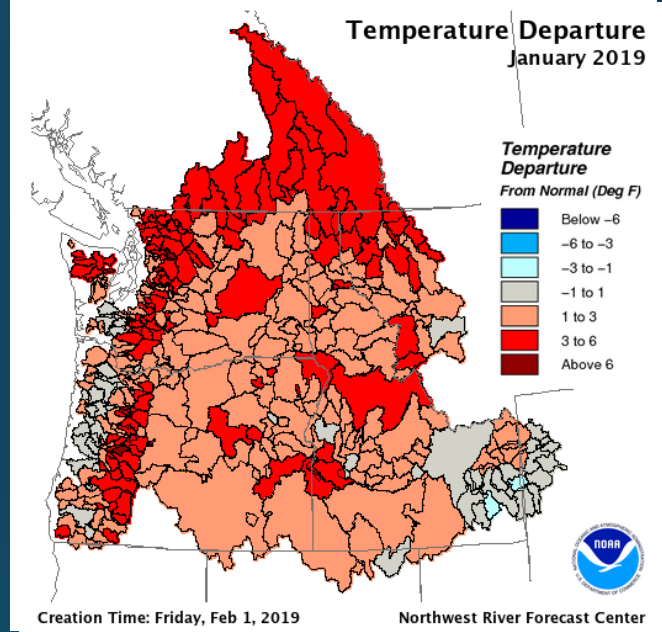
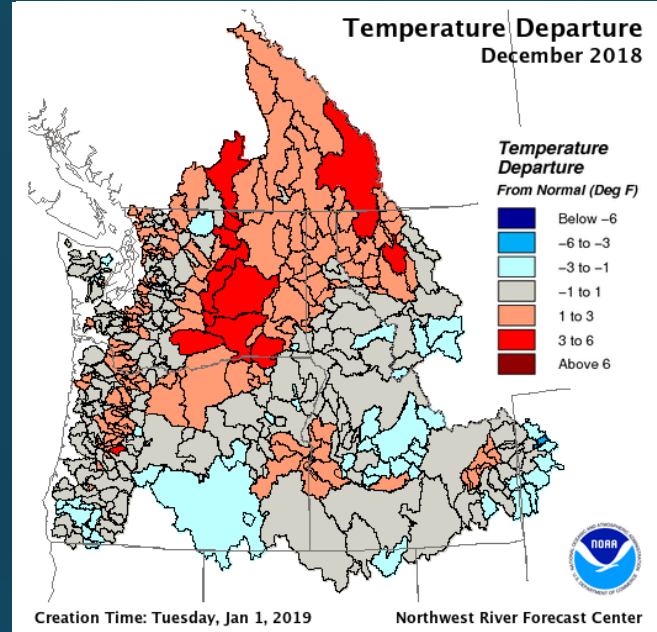
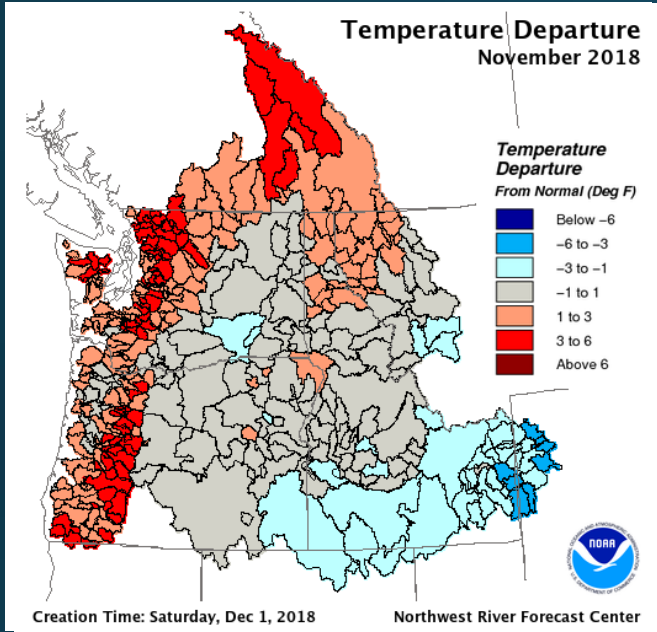
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Monthly Temperature Departure



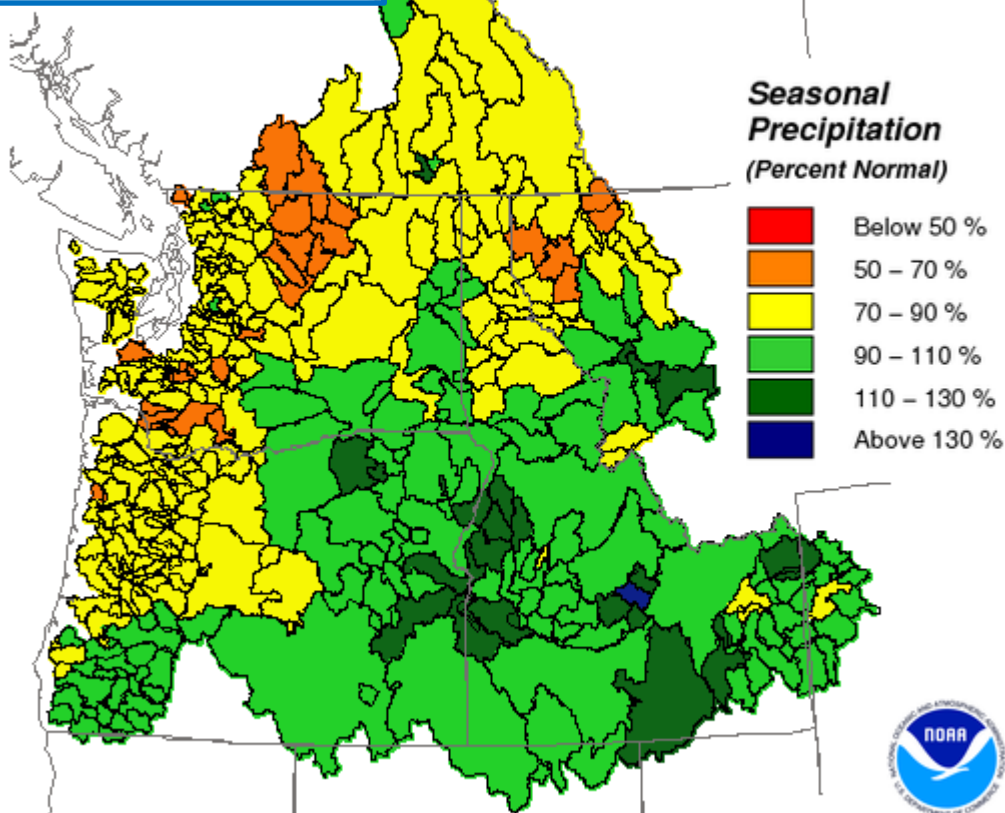


Observed % Normal Seasonal Precipitation



Oct-Feb

Seasonal Precipitation
Oct 1, 2018 - Feb 28, 2019

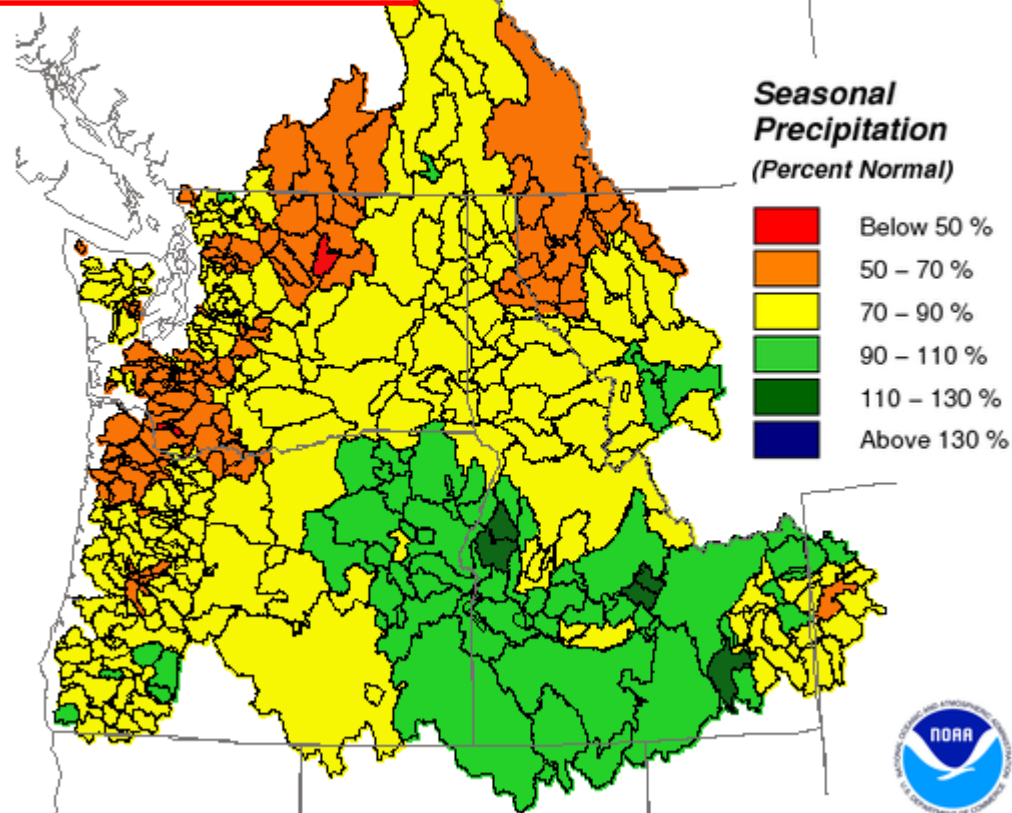


Creation Time: Friday, Mar 1, 2019

Northwest River Forecast Center

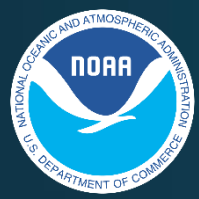
Oct-Mar

Seasonal Precipitation
Oct 1, 2018 - Mar 31, 2019

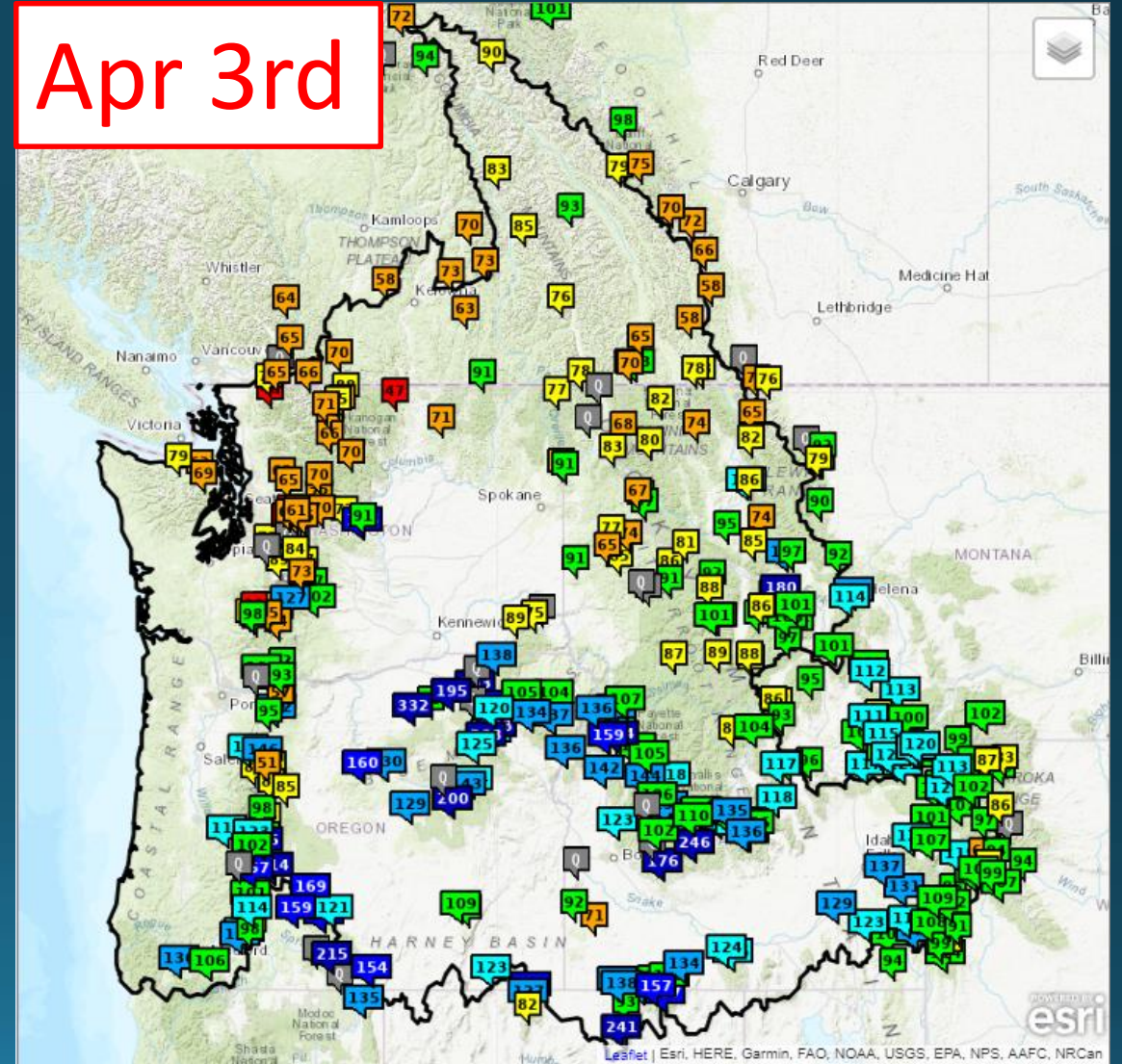
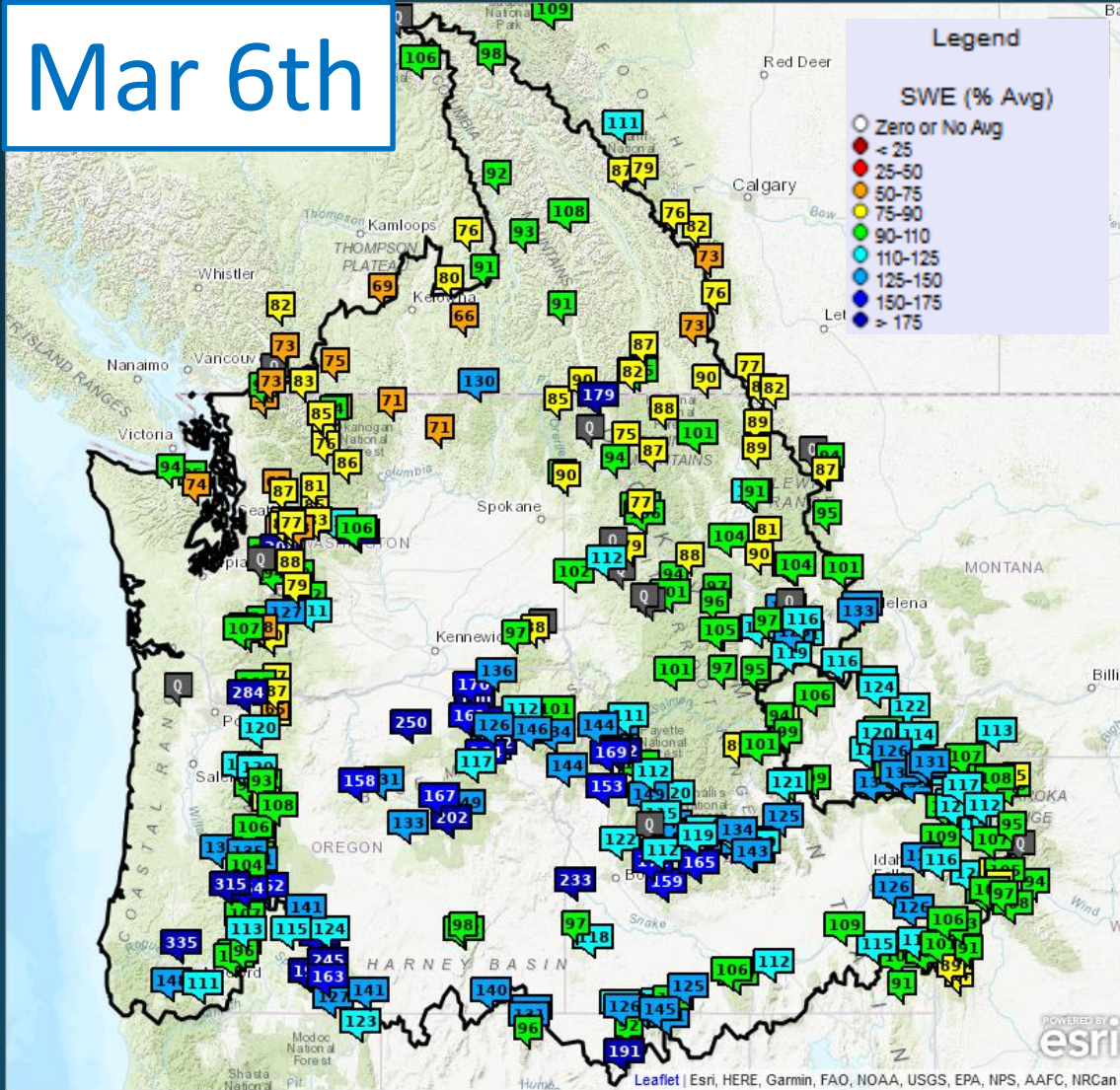


Creation Time: Monday, Apr 1, 2019

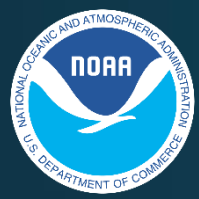
Northwest River Forecast Center



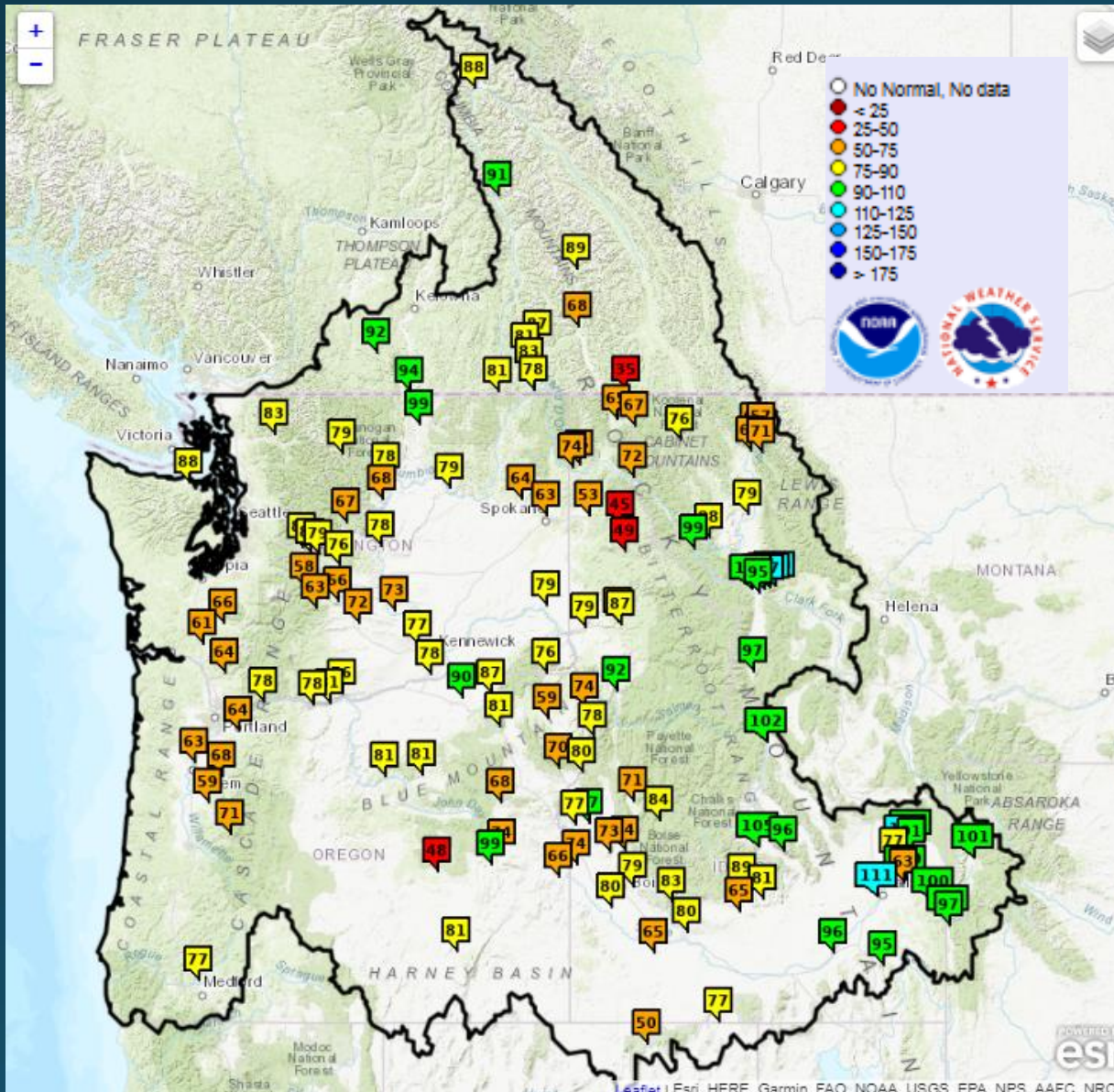
Observed Snowpack



Snow data from NRCS, BC Hydro, and Alberta Environment and Parks



Current Adjusted Runoff Conditions



% of Normal (Oct 1st– Apr 3rd)

UPPER COLUMBIA BASIN

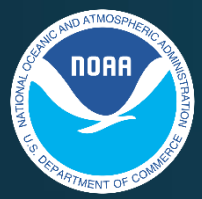
MICA	88
DUNCAN	89
QUEENS BAY	68
LIBBY	76
HUNGRY HORSE	71
GRAND COULEE	79

SNAKE RIVER BASIN

JACKSON LAKE	101
PALISADES	97
DWORSHAK	63
LOWER GRANITE	79

LOWER COLUMBIA BASIN

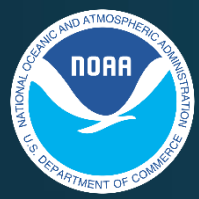
THE DALLES	78
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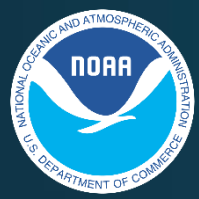
NWRFC Water Supply Forecast Refresher



- ESP: Ensemble Streamflow Prediction
- Multiple Forecast Periods (Seasonal and Monthly)
- Driven By:
 - Hydrologic Model States
 - Meteorological Forecasts*
 - Climatological Forcings (WY1949-2018)
- Issued Daily
- Two types of ESP Forecast:
 - Water Supply
 - ESP Natural

COLUMBIA - THE DALLES DAM (TDAO3) Forecasts for Water Year 2019					
Official Forecast					
[-] 10 days QPF: Ensemble: 2019-04-02 Issued: 2019-04-02					
Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	76605	81843	88	90832	92704
APR-JUL	64272	69520	87	78959	79855
APR-AUG	71206	76424	87	85388	87532
JAN-SEP	92455	97693	86	106683	114216
JAN-JUL	80122	85370	84	94810	101368
OCT-SEP	105996	111234	85	120224	130518
[-] 5 days QPF: Ensemble: 2019-04-02 Issued: 2019-04-02					
APR-SEP	73770	80033	86	88407	92704
APR-JUL	61708	67095	84	76501	79855
APR-AUG	68717	74320	85	83524	87532
JAN-SEP	89620	95883	84	104257	114216
JAN-JUL	77559	82946	82	92352	101368
OCT-SEP	103161	109424	84	117798	130518
[-] 0 days QPF: Ensemble: 2019-04-02 Issued: 2019-04-02					
APR-SEP	70604	77580	84	86642	92704
APR-JUL	59572	65420	82	73922	79855
APR-AUG	65455	72488	83	81698	87532
JAN-SEP	86455	93430	82	102493	114216
JAN-JUL	75423	81270	80	89772	101368
OCT-SEP	99996	106971	82	116034	130518

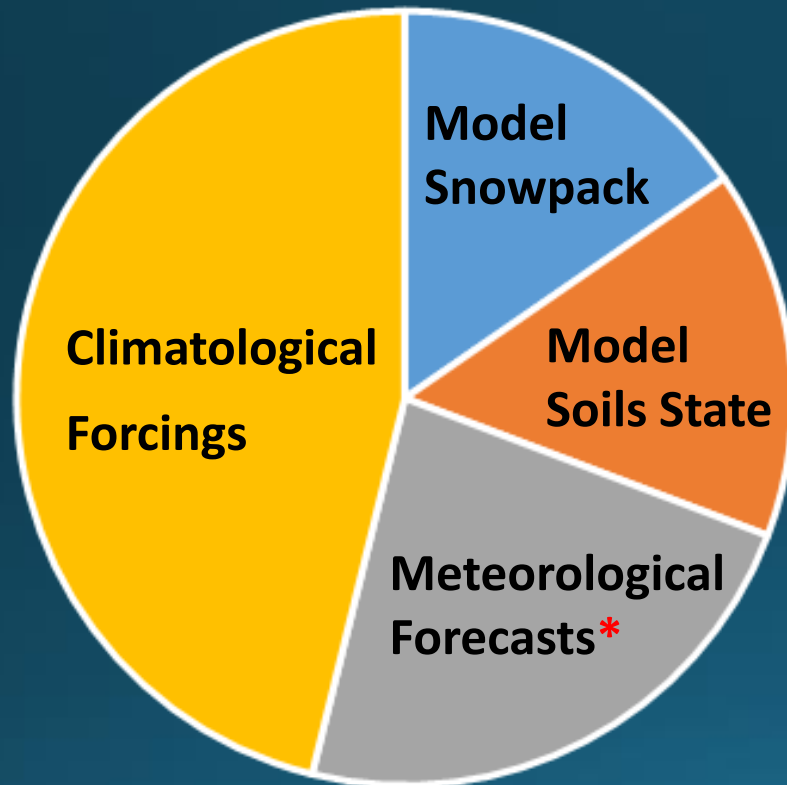
Move the mouse over the desired "Forecast Period" to display a graph.



NWRFC Water Supply Forecast Refresher



Components of Water Supply Forecasts



*Meteorological Forecast Component Includes Three Versions:
0, 5, and 10 day QPF

COLUMBIA - THE DALLES DAM (TDAO3)
Forecasts for Water Year 2019

Official Forecast

10 days QPF: Ensemble: 2019-04-02 Issued: 2019-04-02

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
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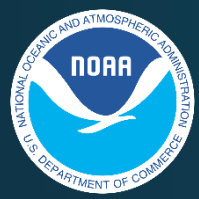
5 days QPF: Ensemble: 2019-04-02 Issued: 2019-04-02

APR-SEP	73770	80033	86	88407	92704
APR-JUL	61708	67095	84	76501	79855
APR-AUG	68717	74320	85	83524	87532
JAN-SEP	89620	95883	84	104257	114216
JAN-JUL	77559	82946	82	92352	101368
OCT-SEP	103161	109424	84	117798	130518

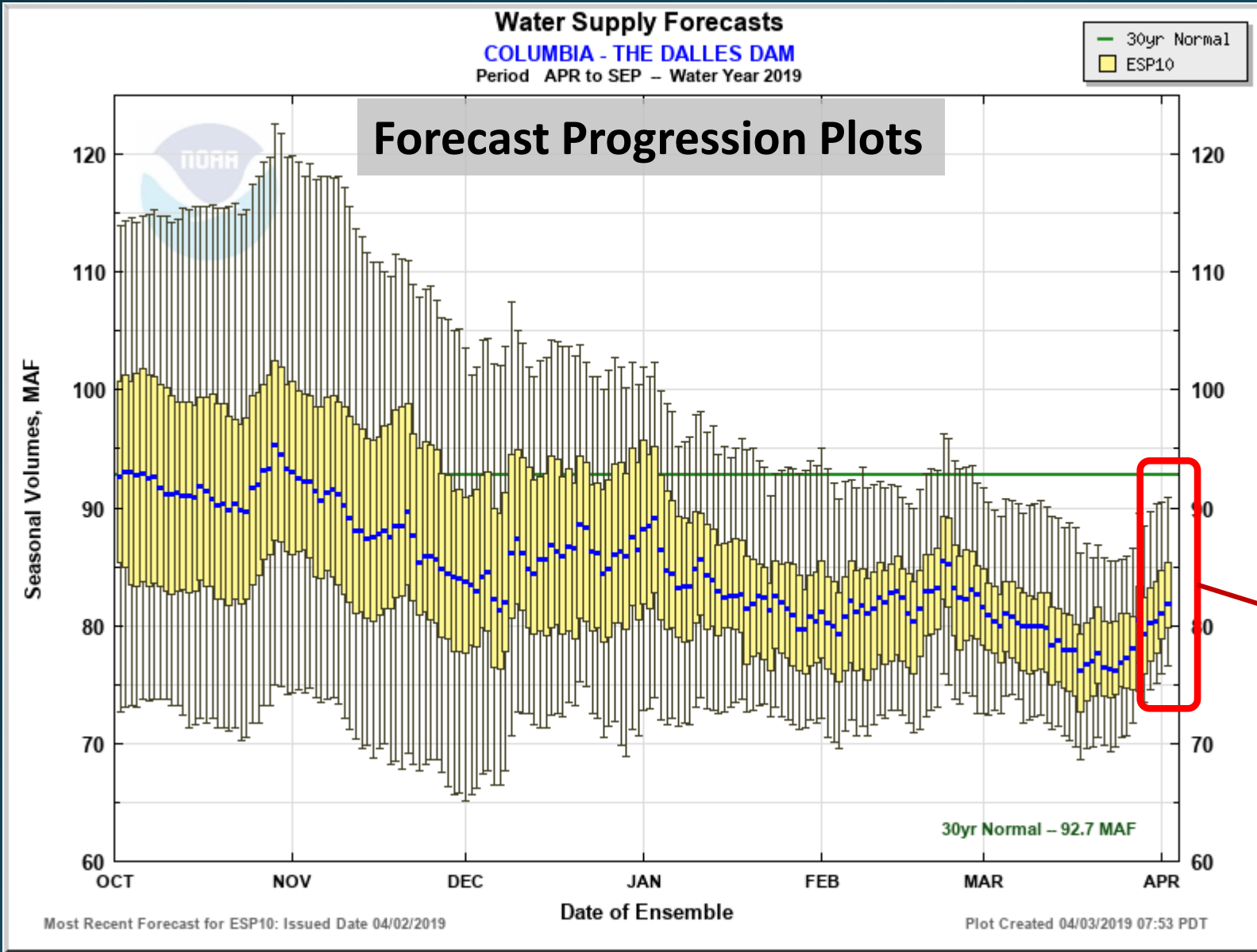
0 days QPF: Ensemble: 2019-04-02 Issued: 2019-04-02

APR-SEP	70704	77580	84	86642	92704
APR-JUL	59572	65420	82	73922	79855
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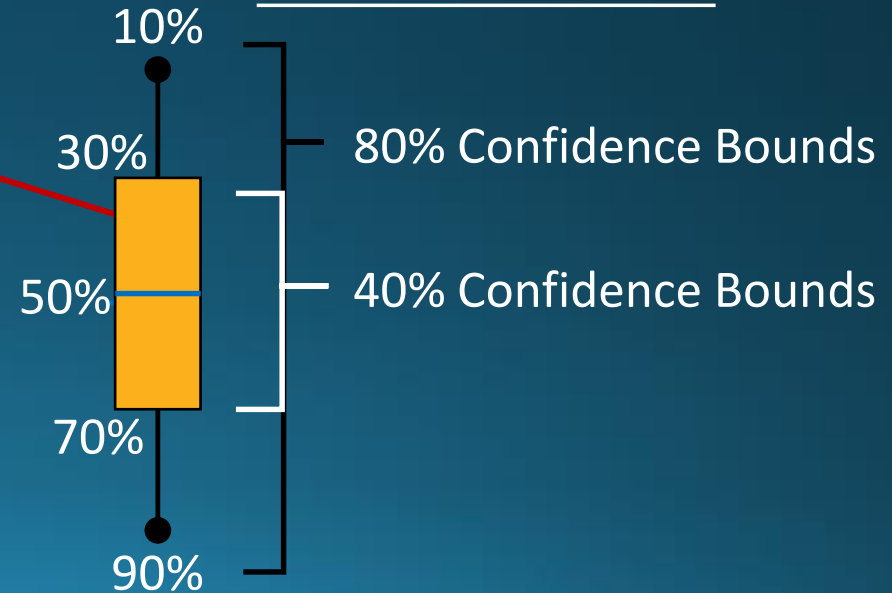


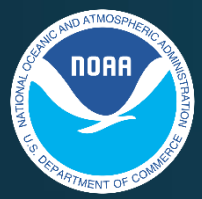
NWRFC Water Supply Forecast Refresher



**Exceedance Probabilities
 ONLY Quantify
 Uncertainty in Future
 Meteorological Forcings**

Box and Whisker Plot





Water Supply Forecast Briefing Outline



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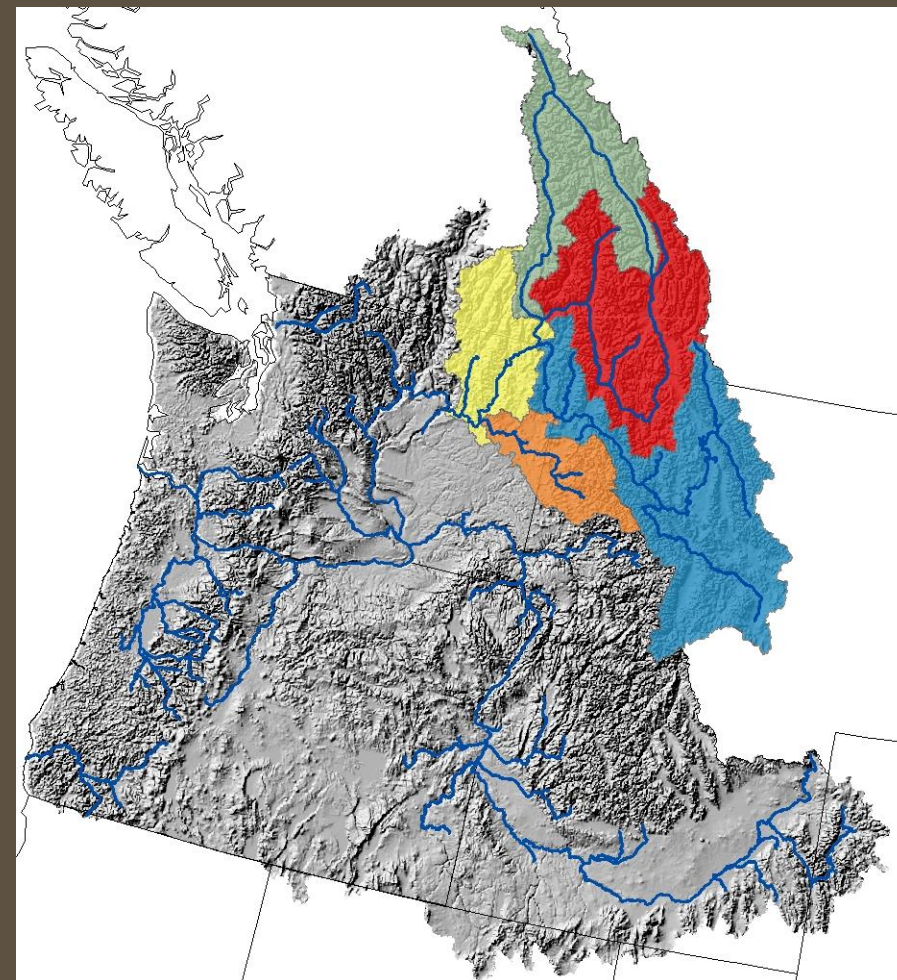


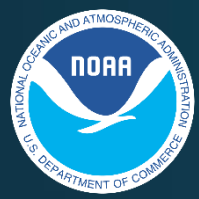
Current Model States-Regional Overview



UPPER COLUMBIA RIVER

Region	Model Forcing (WY 2019)		Current Model States (Apr 2 nd)	
	Precip. (% Norm)	Temp. Departure (DegF)	Snow Pack (% Norm)	Soil (% Norm)
Above Arrow Dam	75	-0.8	87	90
Kootenai	66	-1.1	81	46
Pend Oreille	75	-2.4	87	98
Spokane	75	-1.4	78	98
Above Grand Coulee	72	-1.5	83	81



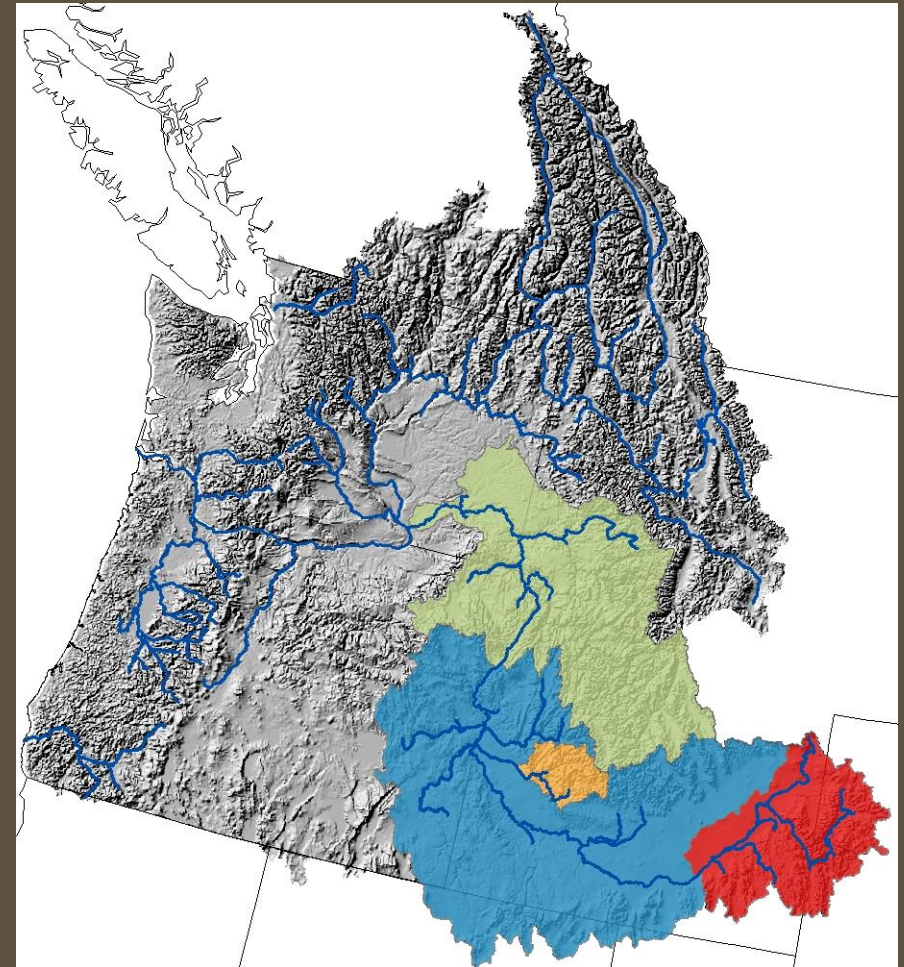


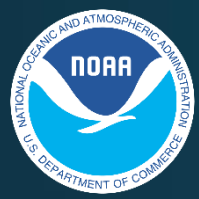
Current Model States-Regional Overview



SNAKE RIVER

Region	Model Forcing (WY 2019)		Current Model States (Apr 2 nd)	
	Precip. (% Norm)	Temp. Departure (DegF)	Snow Pack (% Norm)	Soil (% Norm)
	Above American Falls Dam	91	-1.5	121
Boise	92	-0.6	123	102
Above Brownlee Dam	94	-1.1	125	97
Above Ice Harbor Dam	89	-1.3	112	101



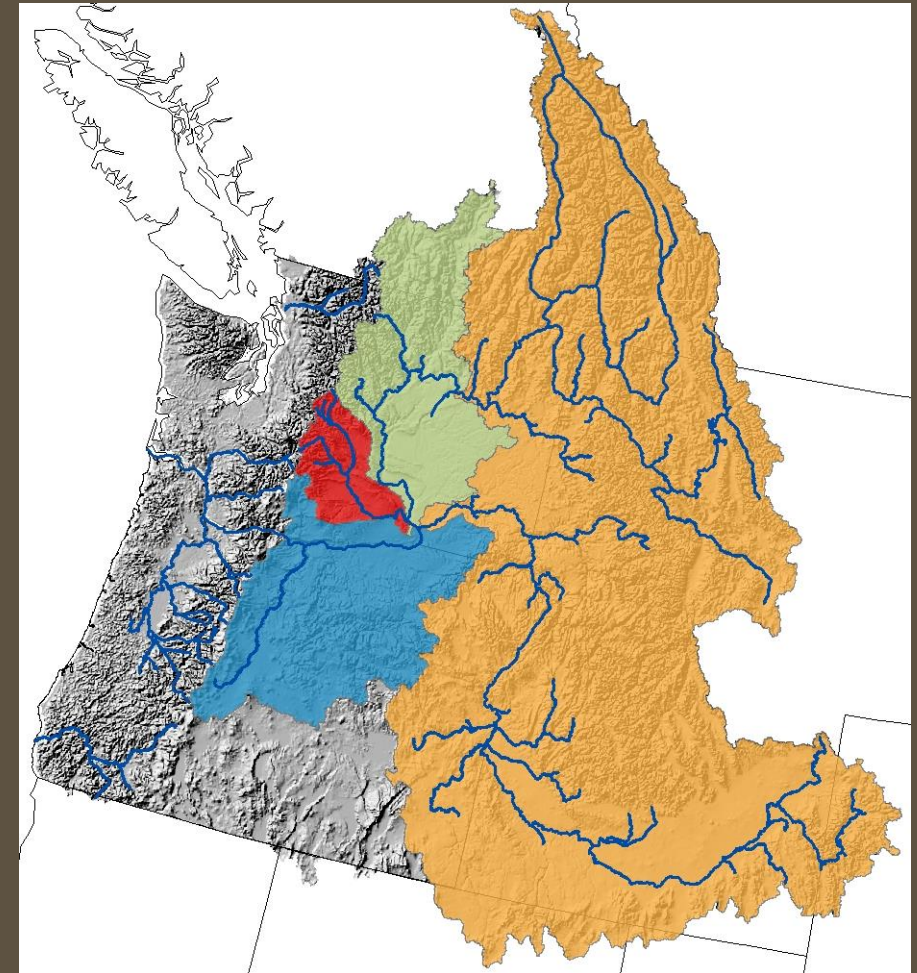


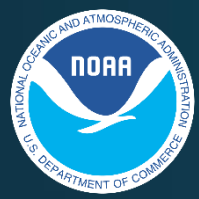
Current Model States-Regional Overview



COLUMBIA RIVER MAINSTEM

Region	Model Forcing (WY 2019)		Current Model States (Apr 2 nd)	
	Precip. (% Norm)	Temp. Departure (DegF)	Snow Pack (% Norm)	Soil (% Norm)
Yakima	74	-1.7	63	100
Upper Mid-Columbia Tribs	65	-1.1	72	85
Lower Mid-Columbia Tribs	83	-1.6	123	144
Above The Dalles Dam	79	-1.5	97	96



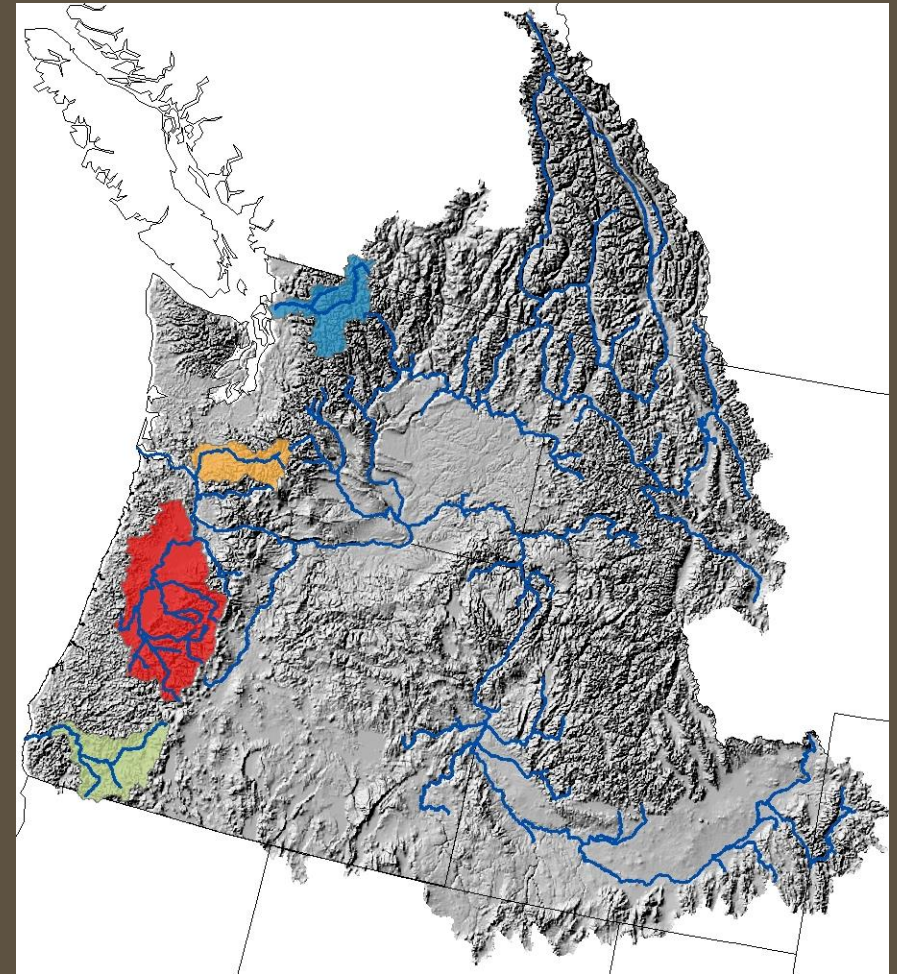


Current Model States-Regional Overview



WESTSIDE

Region	Model Forcing (WY 2019)		Current Model States (Apr 2 nd)	
	Precip. (% Norm)	Temp. Departure (DegF)	Snow Pack (% Norm)	Soil (% Norm)
	Willamette	75	-0.3	91
Rogue	89	-0.6	111	94
Skagit	74	0.5	64	71
Cowlitz	66	-0.2	74	78

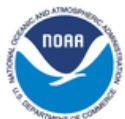




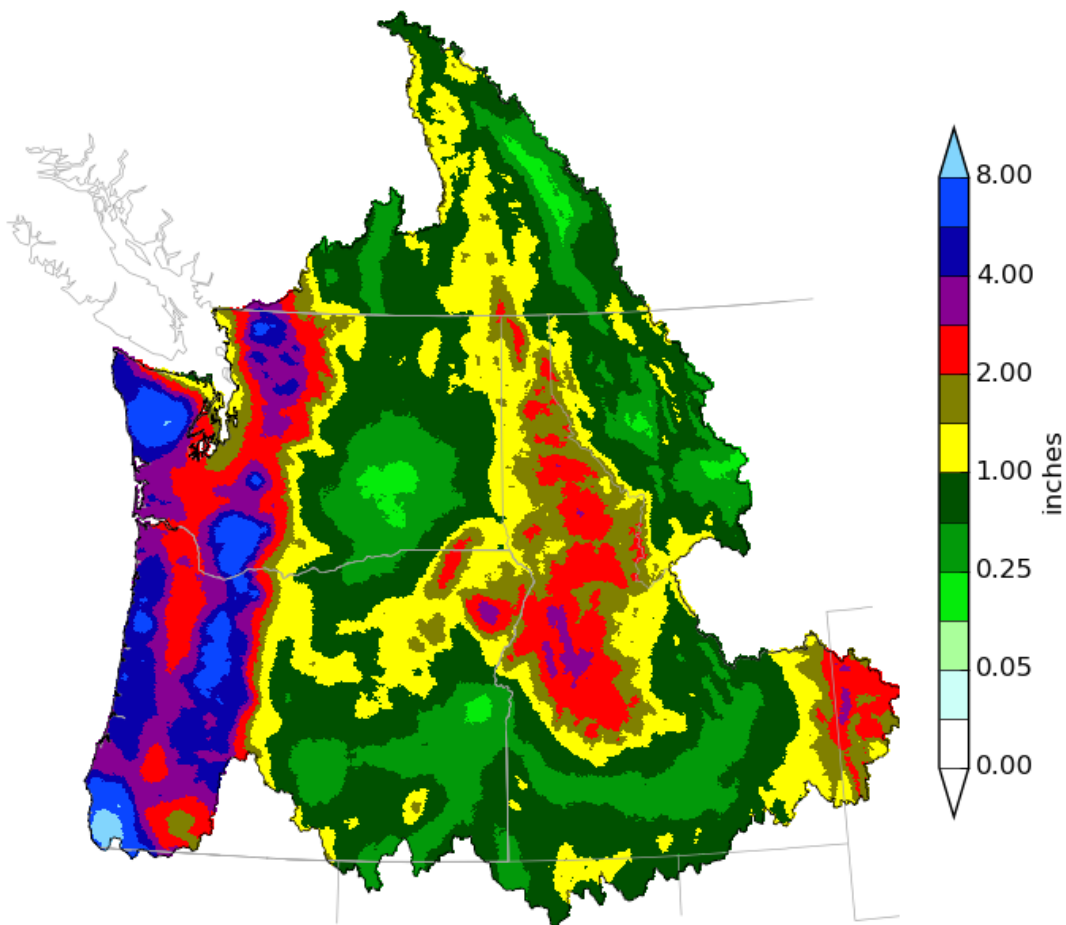
Cumulative 10 Day Precipitation Forecast



April 3-13, 2019



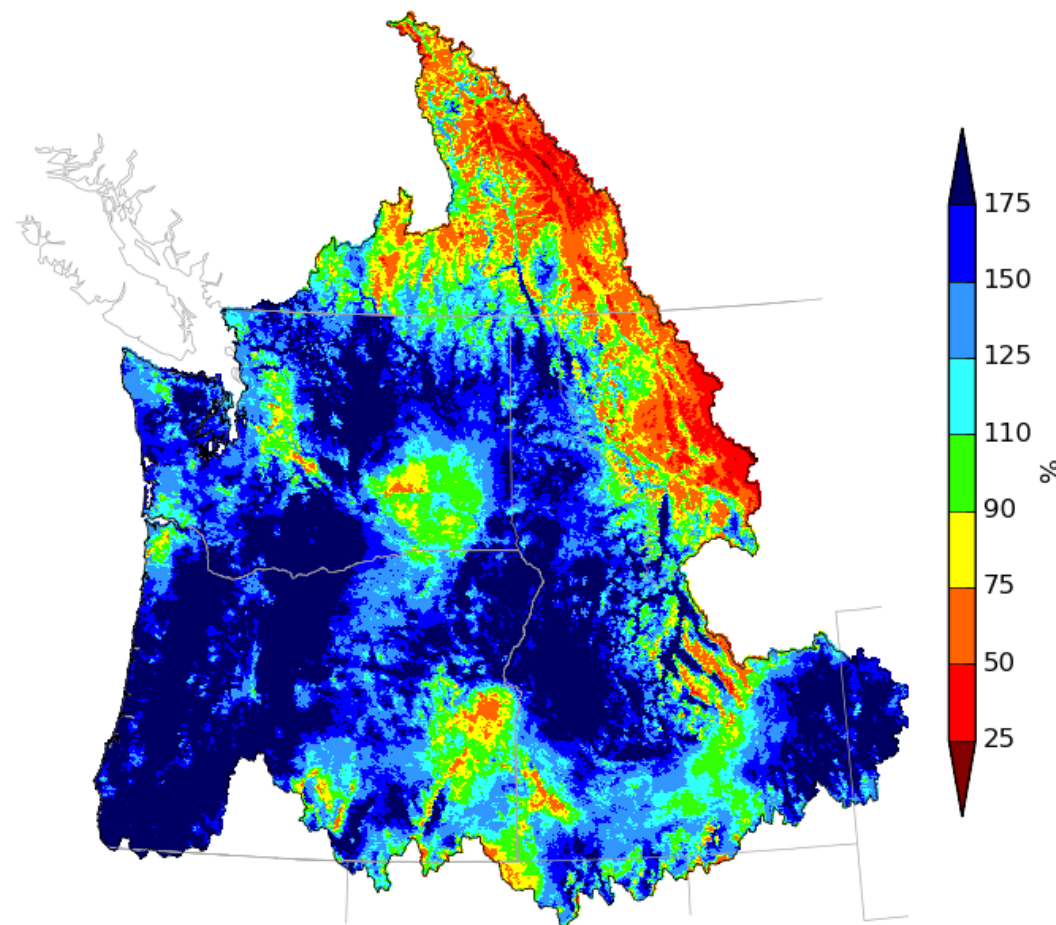
Northwest River Forecast Center
10 Day QPF, Ending 12Z, 04/13/19



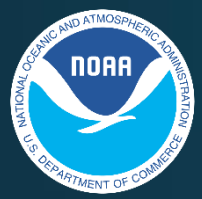
Creation Time: Wed Apr 3 22:05:01 UTC 2019



Northwest River Forecast Center
10 Day QPF (Percent of Climatology), Ending 12Z, 04/13/19



Creation Time: Wed Apr 3 22:05:46 UTC 2019



Water Supply Forecast Briefing Outline



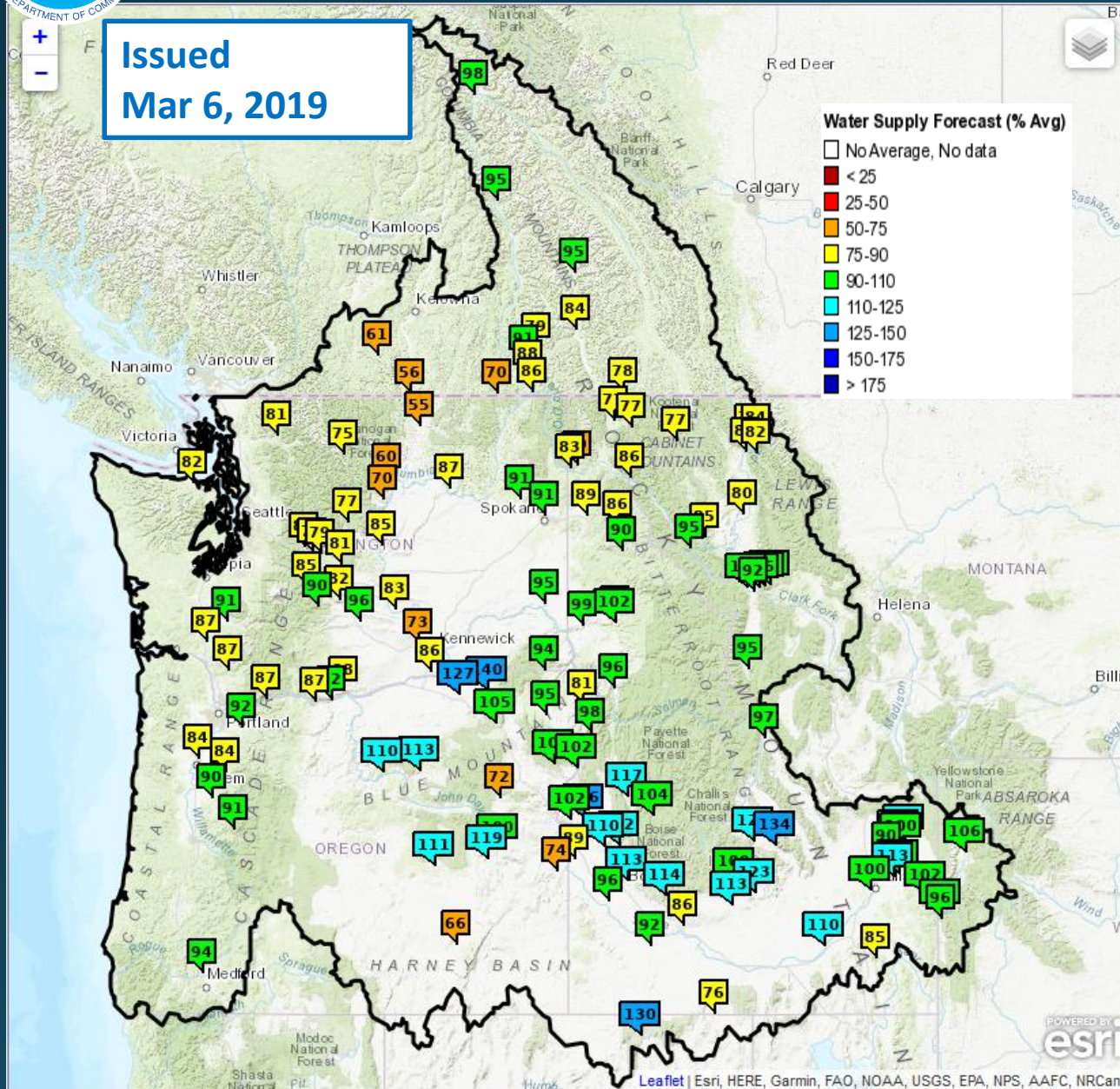
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ESP10 Apr-Sep Water Supply Forecasts

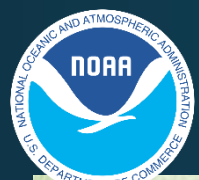


Issued
Mar 6, 2019



Basin	% 30 YR Normal
Columbia River - Mica Dam	98%
Kootenai River - Libby Dam	77%
Coeur d'Alene R - Coeur d'Alene Lake	89%
SF Flathead River - Hungry Horse Dam	82%
Pend Oreille R-Albeni Falls Dam	83%
Columbia River - Grand Coulee Dam	87%
Upper Snake River	
- Jackson Lake Dam	106%
- Palisades Dam	96%
Middle Snake Tribs	
- Lucky Peak Dam	113%
NF Clearwater River-Dworshak Dam	94%
Lower Snake River-Lower Granite Dam	95%
Lower Columbia - The Dalles Dam	87%

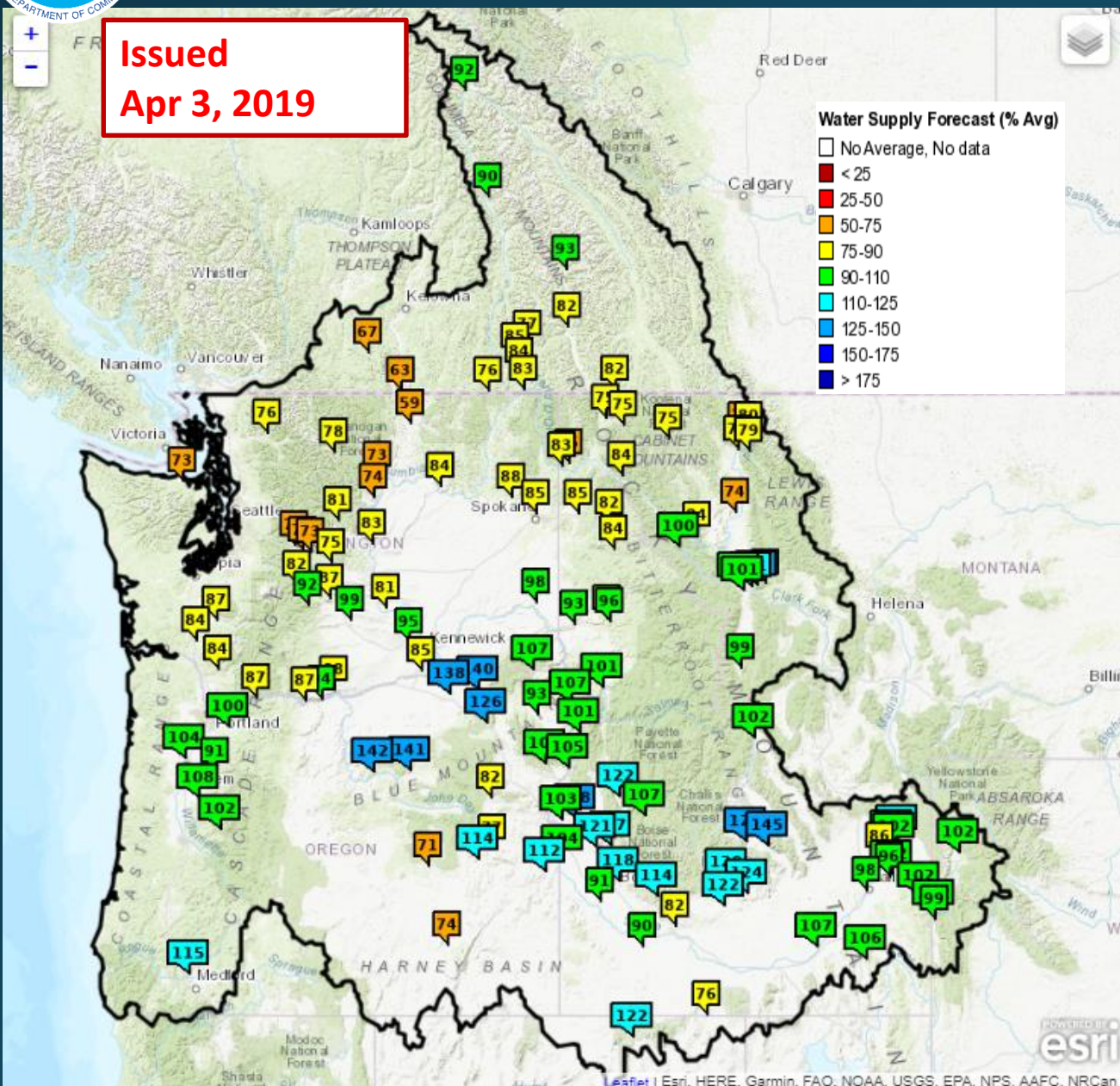
(Slide from Mar 7, 2019 WS Briefing)



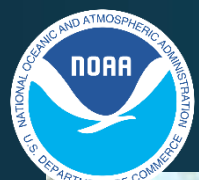
ESP10 Apr-Sep Water Supply Forecast



**Issued
Apr 3, 2019**



<u>Basin</u>	<u>% 30 YR Normal</u>
Columbia River - Mica Dam	92% (-6)
Kootenai River - Libby Dam	75% (-2)
Coeur d'Alene R - Coeur d'Alene Lake	85% (-4)
SF Flathead River - Hungry Horse Dam	82% (-3)
Pend Oreille R-Albeni Falls Dam	83% (--)
Columbia River - Grand Coulee Dam	87% (-3)
Upper Snake River	
- Jackson Lake Dam	102% (-4)
- Palisades Dam	102% (+6)
Middle Snake Tribs	
- Lucky Peak Dam	118% (+5)
NF Clearwater River-Dworshak Dam	84% (-10)
Lower Snake River-Lower Granite Dam	98% (+3)
Lower Columbia - The Dalles Dam	87% (--)
% Change from Previous WS Briefing in Parenthesis	



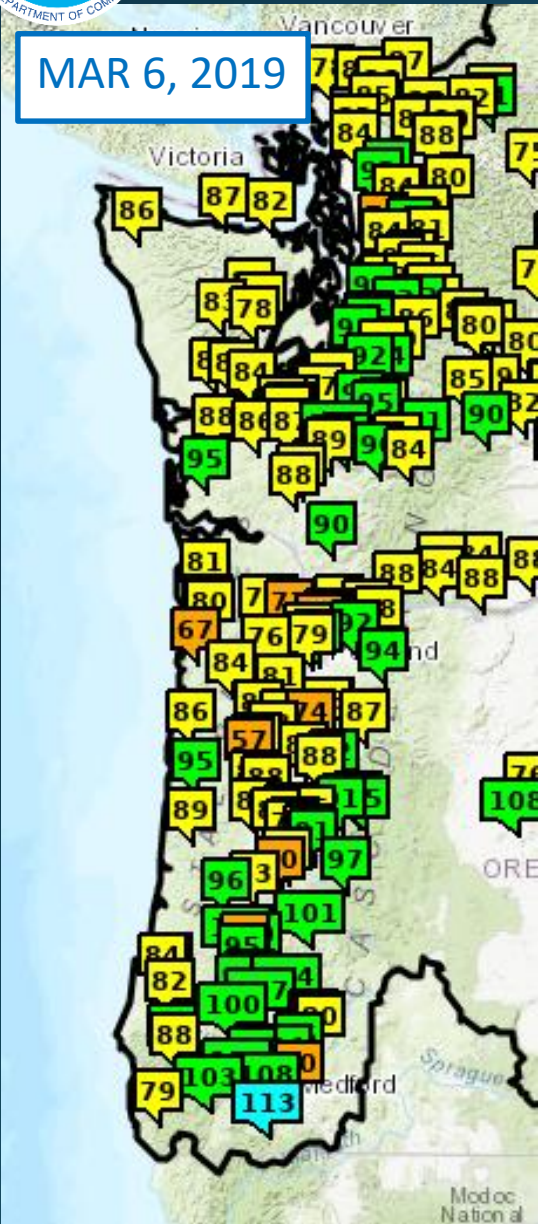
ESP10 Natural Apr-Sep Forecasts

ESP Natural - Western Oregon and Washington

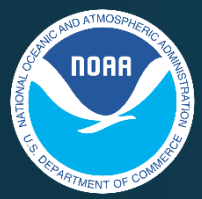


MAR 6, 2019

Apr 3, 2019



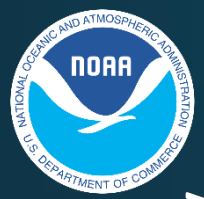
<u>Basin</u>	<u>% 30 YR Normal</u>
Skagit River near Concrete	79% (-5)
Green River Howard Hanson Res	75% (-11)
Cowlitz River Mossyrock Reservoir	85% (-5)
Cowlitz River Mayfield Reservoir	85% (-4)
Willamette River at Salem	99% (+18)
Rogue River Applegate Reservoir	121% (+8)
% Change from Previous WS Briefing in Parenthesis	



Water Supply Forecast Briefing Outline



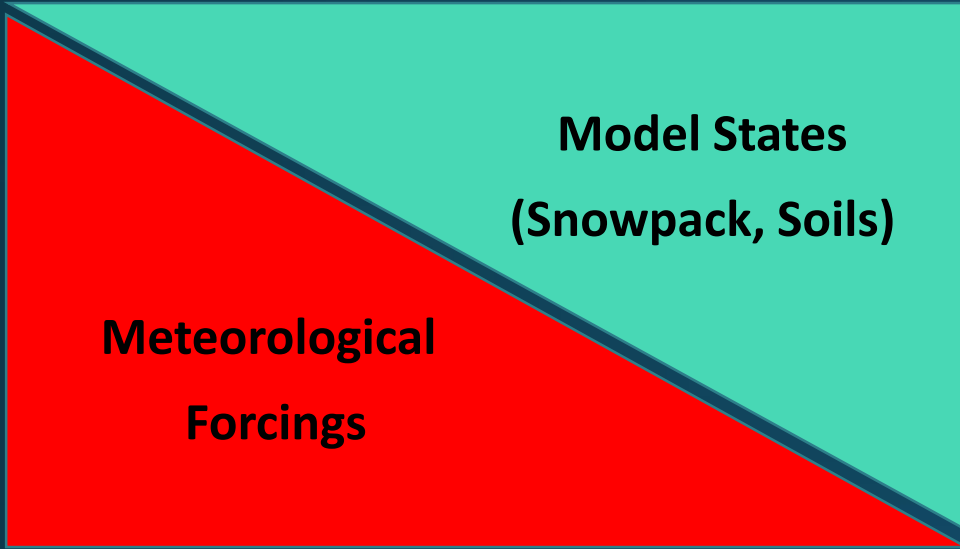
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Water Supply Forecast Sensitivity

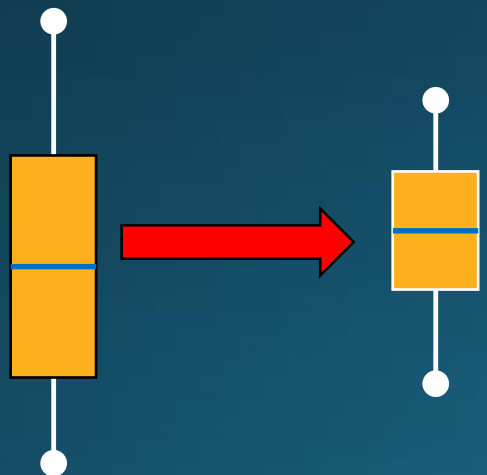


W.S. Forecast Sensitivity

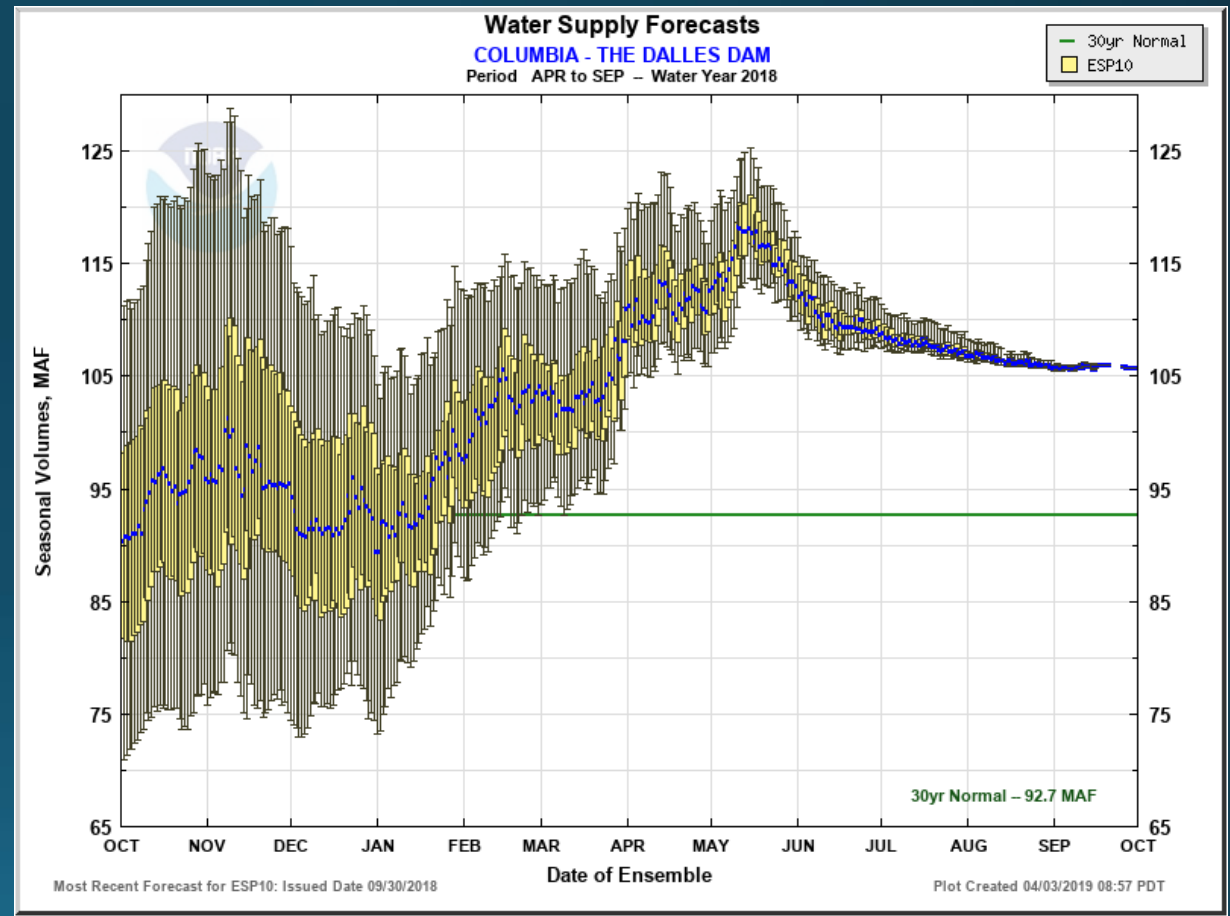


Date of Water Supply Forecast Issuance →

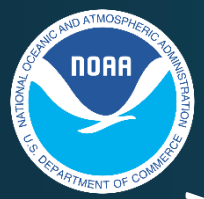
Oct 1st Forecast



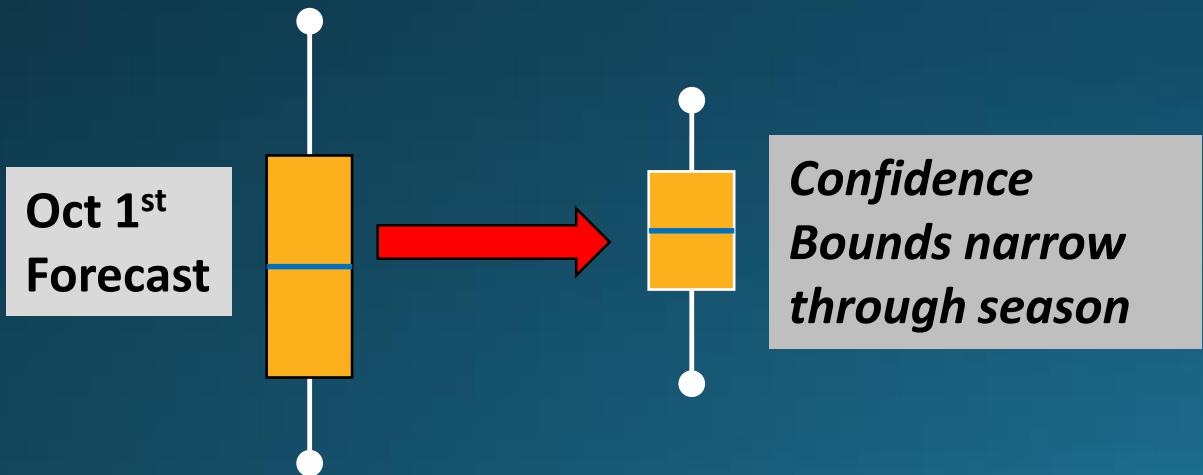
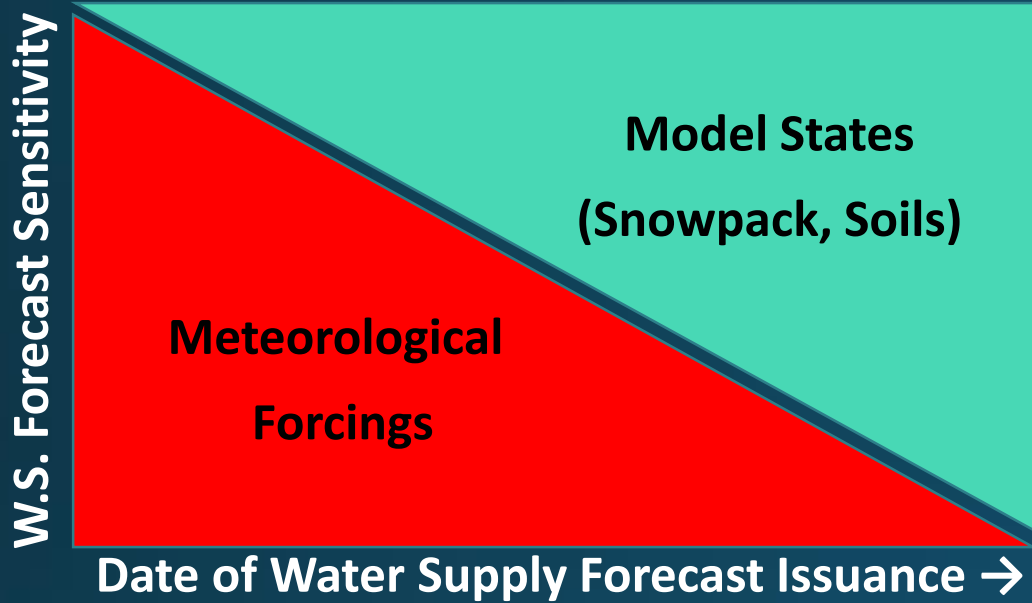
Confidence Bounds Narrow Through Season



Δ Confidence Bounds are an Index of Shifting Water Supply Forecast Sensitivity from Met. Forcings to Model States



Water Supply Forecast Sensitivity



Basin	Percent Change in 40% Confidence Bounds	
	Oct 1-Mar 1	Oct 1-Apr 2
Mica Dam	38%	24%
Libby Dam	39%	29%
Hungry Horse Dam	38%	29%
American Falls Dam	46%	35%
Brownlee Dam	64%	35%
Dworshak Dam	37%	33%

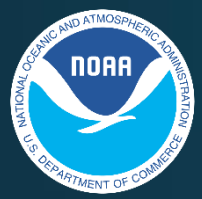
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Summary

- Observed Conditions WY2019
 - March was Cold and Dry
 - Snowpack is a Case of the **Haves** (Southern Region) and the **Have Nots** (Northern Region)
- Water supply Components
 - Model States
 - Confluence of the Columbia and Snake River is Dividing Line in Snow Pack Conditions
 - Soil State are Near Normal with the Exception of Kootenai and Lower Mid-Columbia Tributaries
 - 10 Day Forecast calls for above Normal Precipitation (*sans Above Grand Coulee*)
- Current Water Supply Forecasts
 - Majority of Water Supply Forecast have Reduced in Past Month
 - Below Normal Snowpack Driving Water Supply Forecasts above Grand Coulee
 - Dry Soil Conditions in Upper Snake Tempering Water Supply Forecast Despite Snowpack
- Sensitivity Analysis
 - Confidence Bounds are an Index of Shifting Water Supply Forecast Sensitivity



2019 Schedule for Live Water Supply Briefings

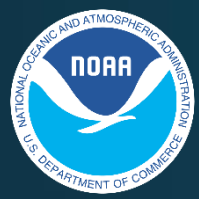
May	June
2	6
All presentations held at 10:00 am PST/PDT unless noted otherwise	

Telephone Conference Call Number
(same for each month's brief):

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Questions?

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