United States
Department of
Agriculture

Natural Resources
Conservation
Service

Oregon
Basin Outlook Report

June 1, 2019

Glacier lily after a late season snowstorm, Snow Mountain SNOTEL, May 21, 2019
Photo: Lauren Austin, Oregon Snow Survey

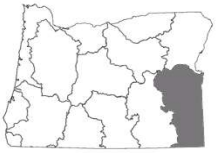
After April's high streamflows, rapid melting, and widespread flooding, the month of May was relatively uneventful. The first two weeks were dry and warm, and the month ended with above average precipitation and cool temperatures in parts of the state that preserved the remaining snowpack and brought late season snowstorms to the mountains of eastern Oregon.

General Outlook

June 1st, 2019

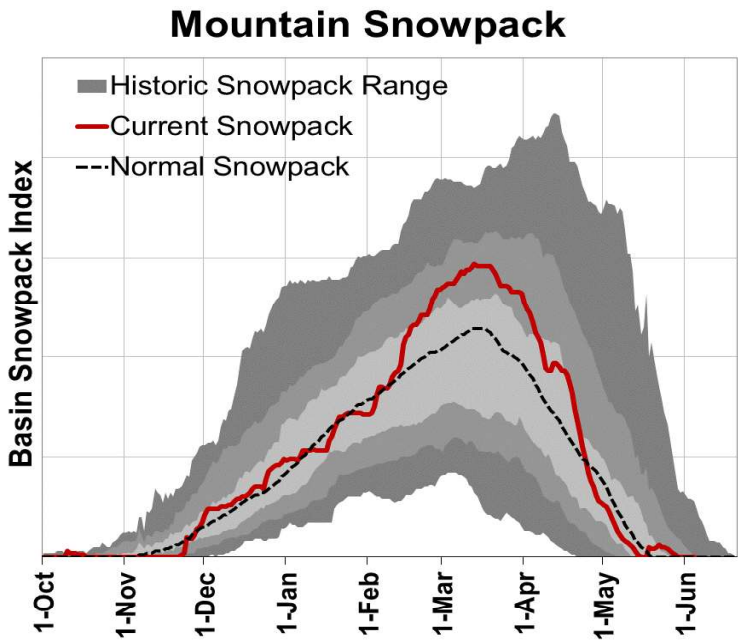
SUMMARY

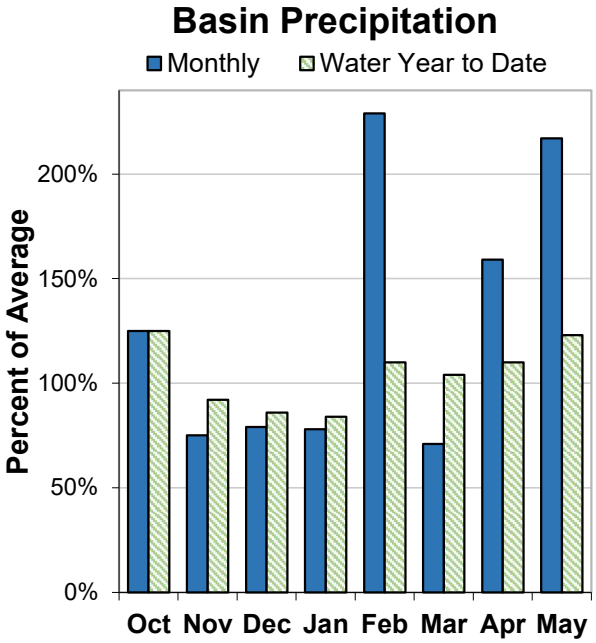
- In general, western Oregon had below normal snowpack by the peak of the season; eastern and southern Oregon received above normal amounts of snow this season. The lowest snowpack was in the Hood, Sandy, and lower Deschutes basins, where the snowpack never fully recovered from early season deficits, despite record-breaking snow in February.
- As of June 1st, 13 SNOTEL sites in Oregon still had snow, which is normal for this time of year.
- The snow at 70% of long-term snowpack monitoring stations melted within a week of their normal melt out date.
- Most of the state has received near average to well above average precipitation for the current water year period (October 1st to June 1st). As of June 1st, basins in eastern and southern Oregon received 100-125% of normal water year precipitation, while northwestern Oregon received 80-90% of normal water year precipitation.
- The first two weeks of May brought relatively little precipitation to the state, while the latter half of the month was unusually wet. Most of eastern Oregon still ended the month with above average May precipitation, 100-220% of normal. Western and central Oregon basins were significantly drier with 45-95% of normal May precipitation.
- While most rivers tapered from the record high April streamflows, many rivers in eastern and southern Oregon experienced an uptick in flows during the last part of the month during rainfall events. Streamflows varied by region, with above average flows (100-190%) in eastern Oregon and below average flows (30-80%) in most of western Oregon.
- Statewide reservoir storage on June 1st was generally near normal. In western and central Oregon, basin reservoir storage was 90-100% of normal, while basins in southern and eastern Oregon stored 95-145% of normal.

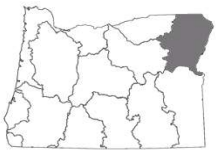


Owyhee and Malheur Basins

June 1, 2019

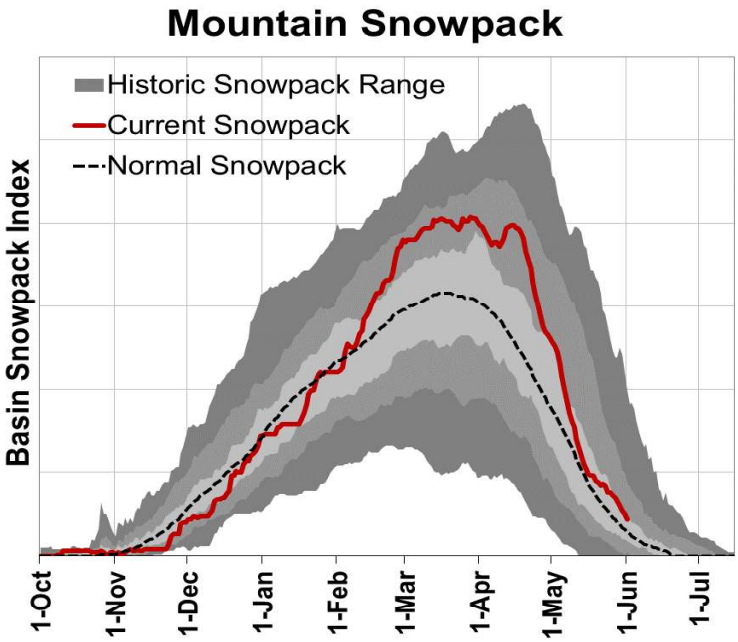


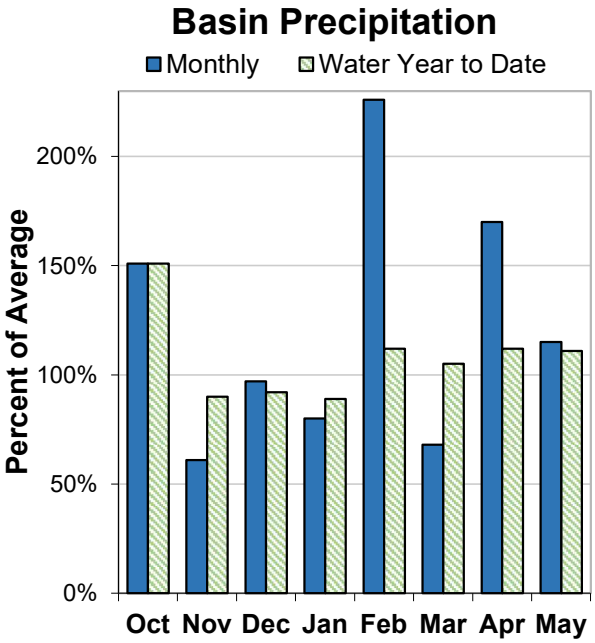


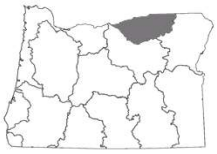


Grande Ronde, Powder, Burnt and Imnaha Basins

June 1, 2019

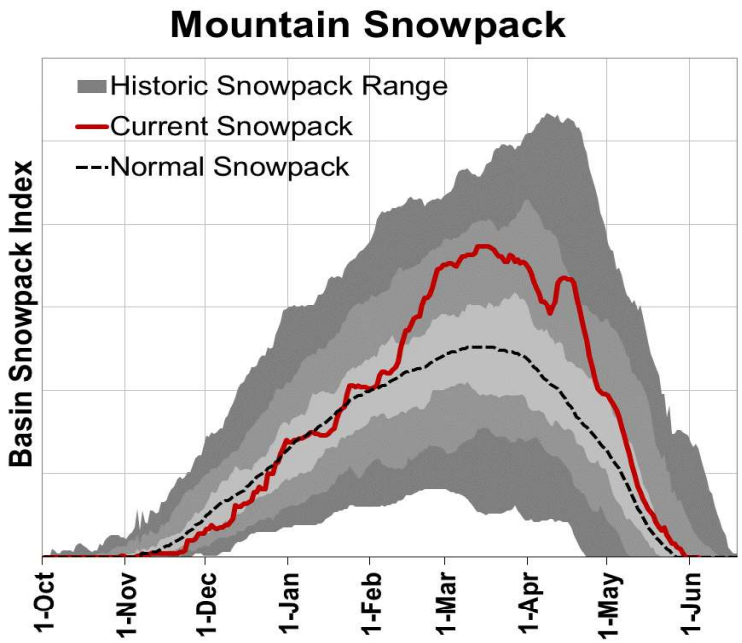


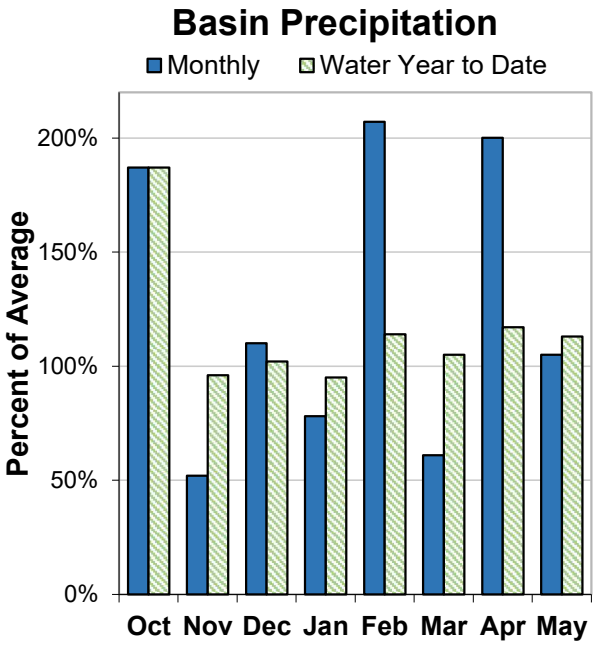


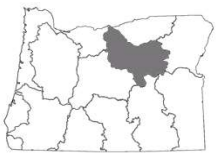


Umatilla, Walla Walla and Willow Basins

June 1, 2019

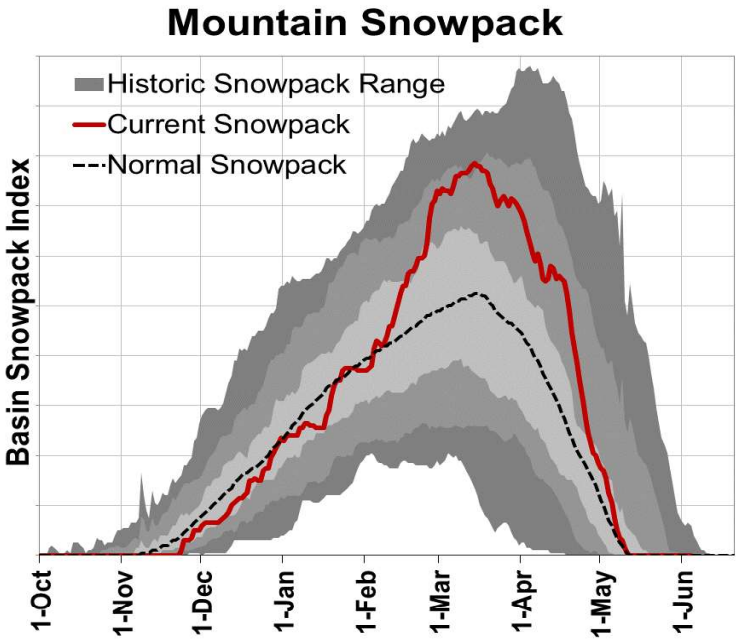


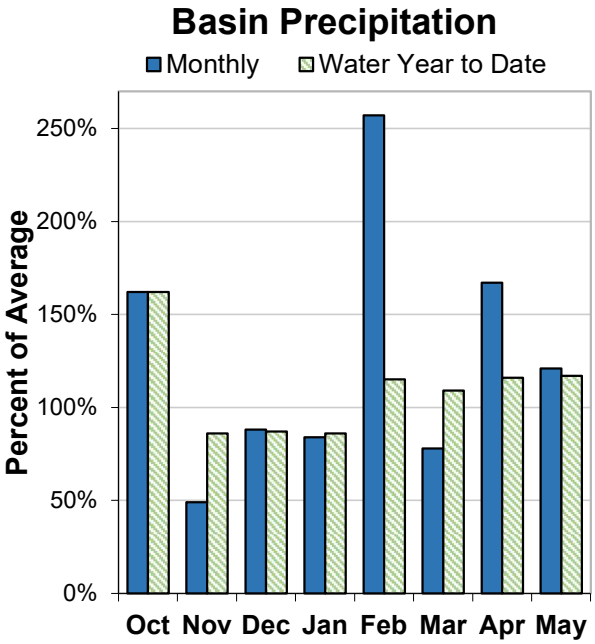


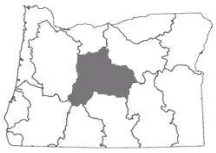


John Day Basin

June 1, 2019

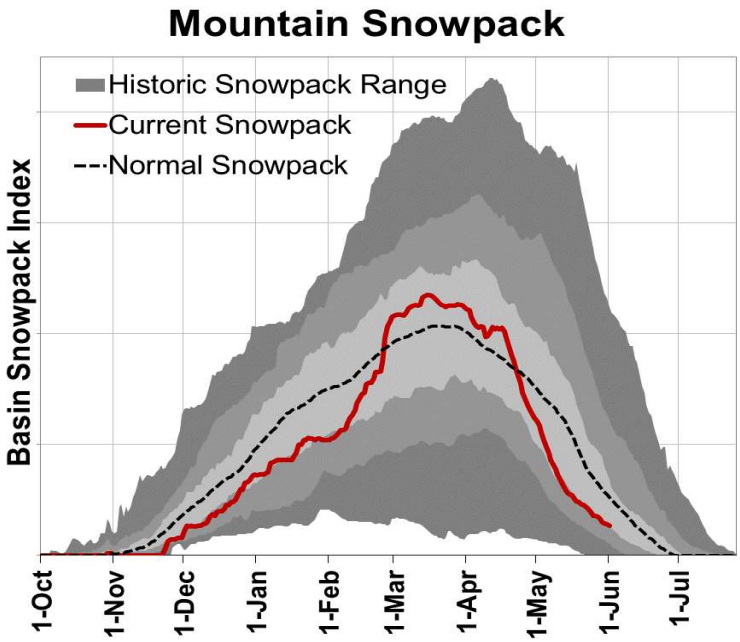


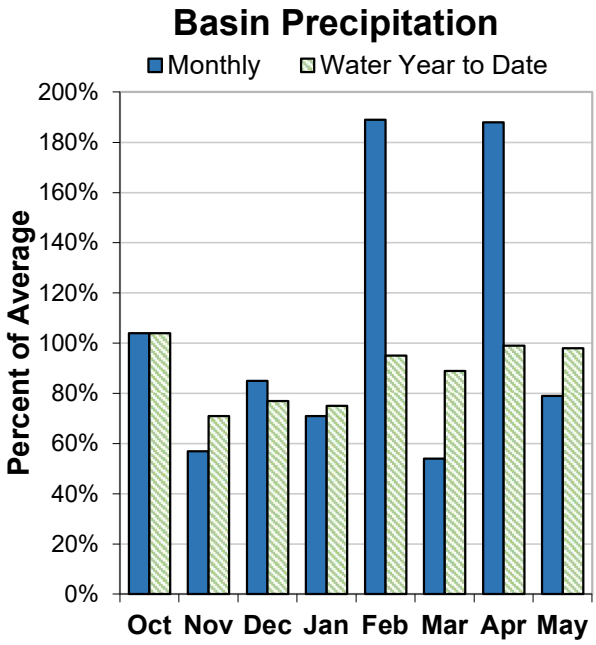


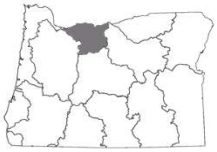


Upper Deschutes and Crooked Basins

June 1, 2019

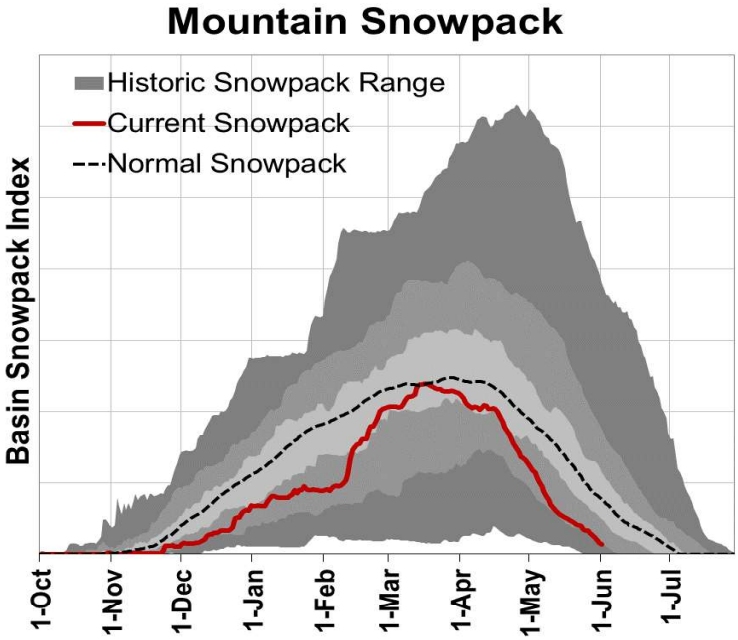


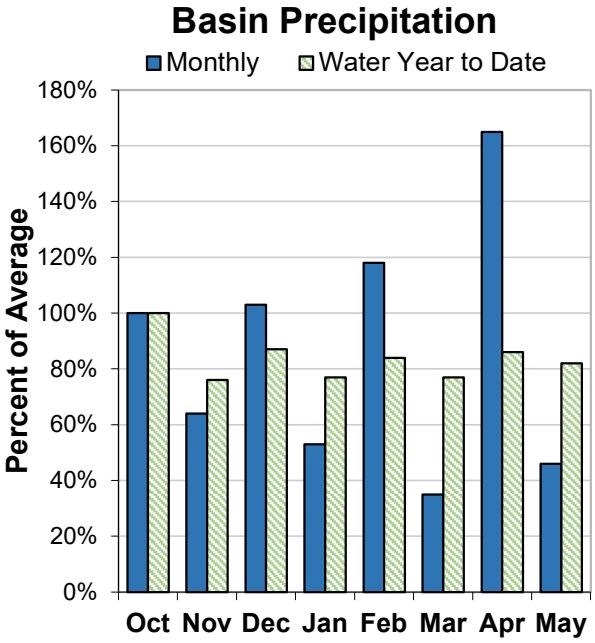


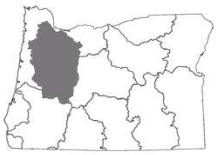


Hood, Sandy and Lower Deschutes Basins

June 1, 2019

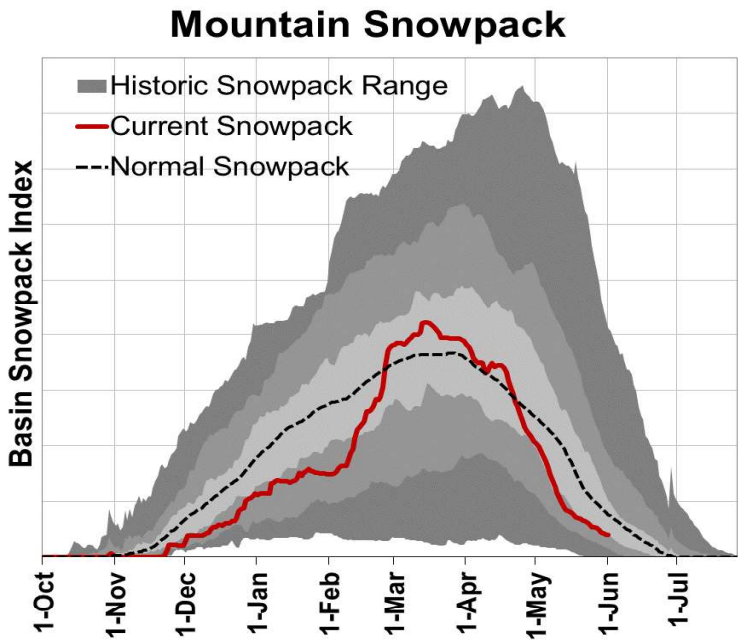


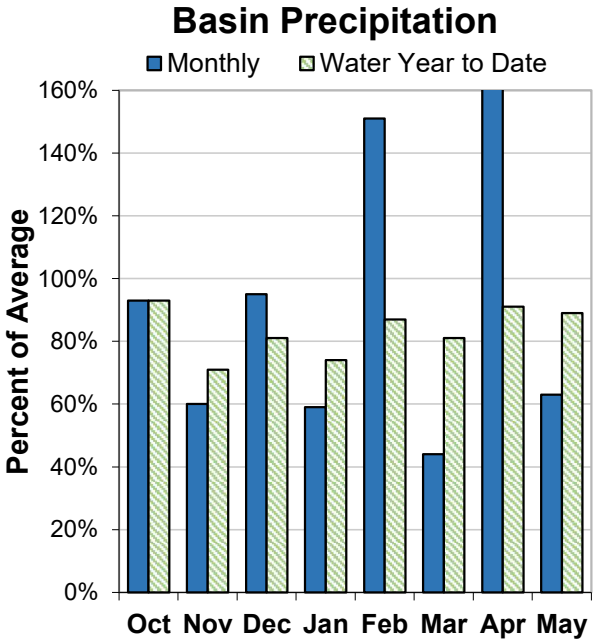


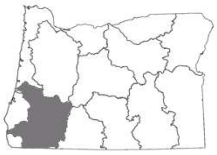


Willamette Basin

June 1, 2019

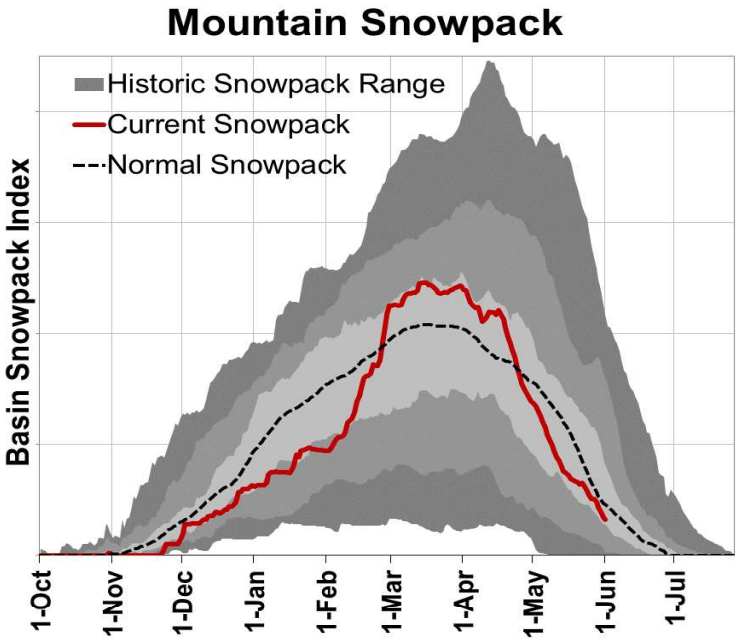


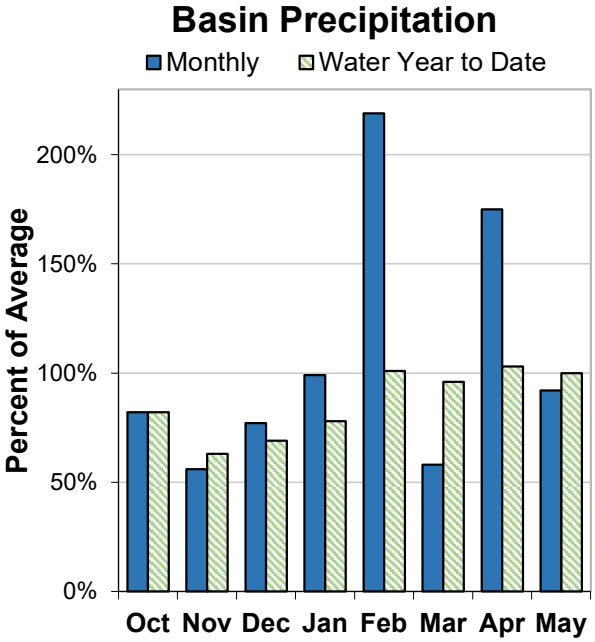


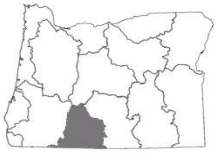


Rogue and Umpqua Basins

June 1, 2019

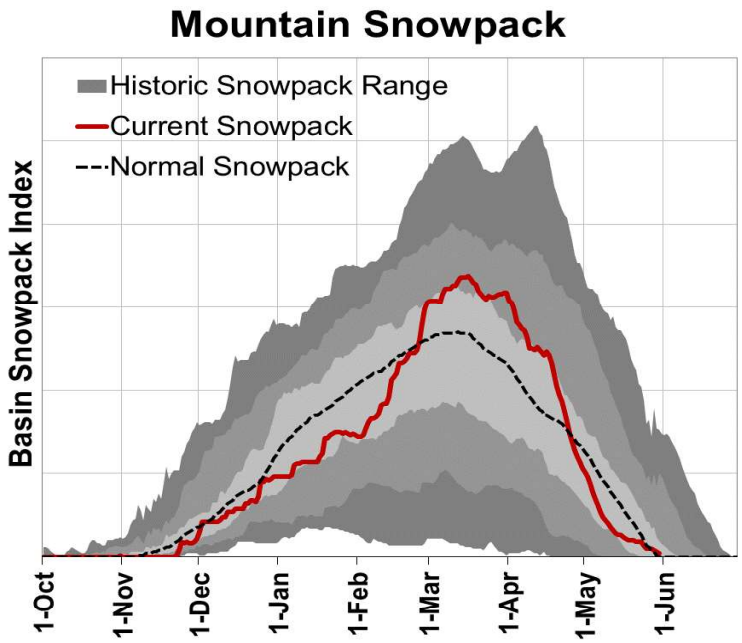


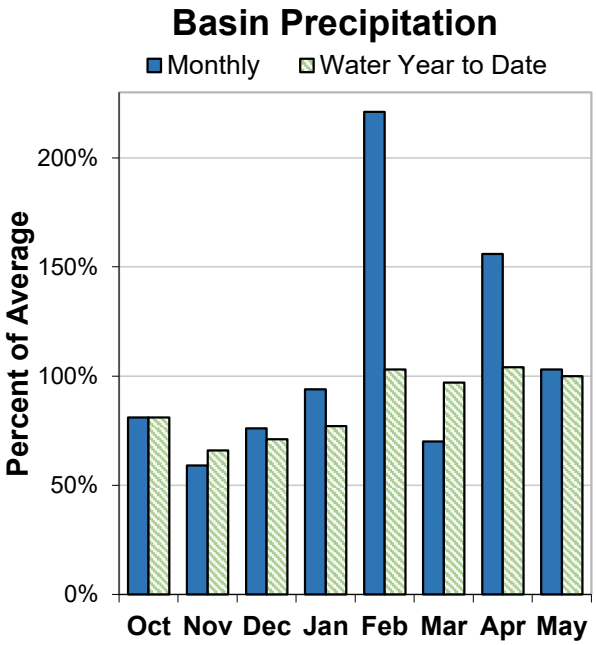


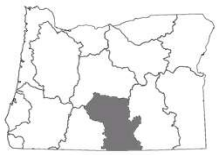


Klamath Basin

June 1, 2019

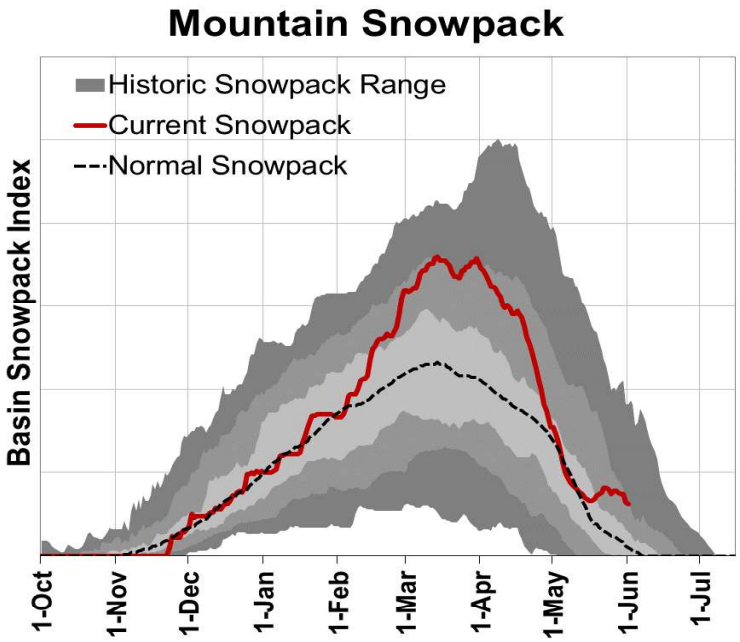


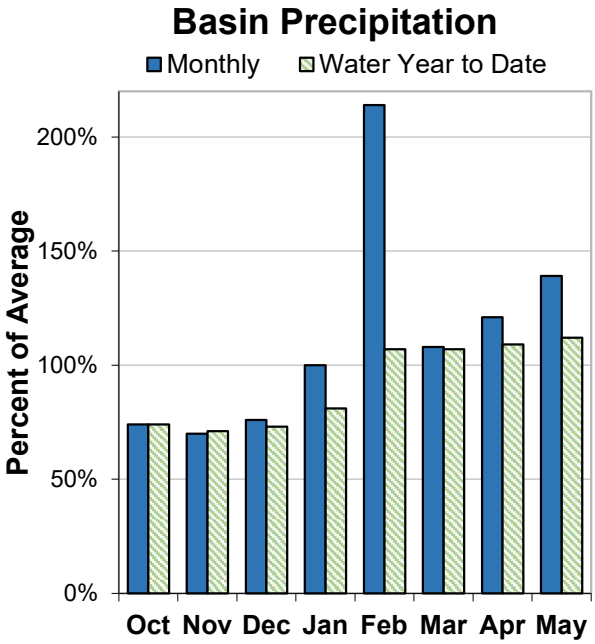


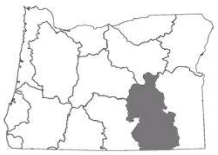


Lake County and Goose Lake Basins

June 1, 2019

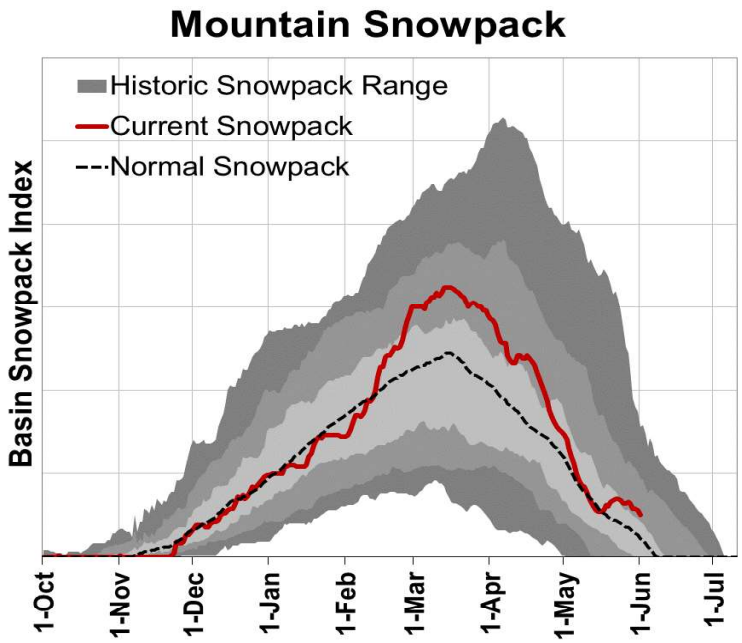


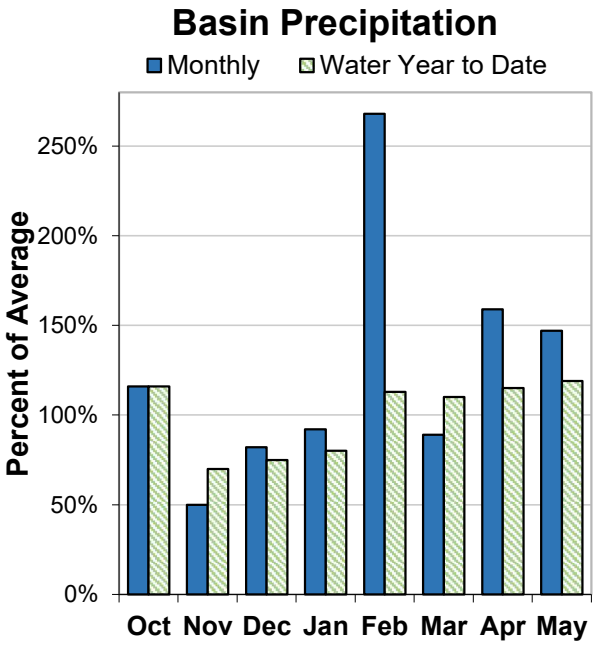




Harney Basin

June 1, 2019





Willamette Basin Summary for June 1, 2019

Forecast Exceedance Probabilities for Risk Assessment *

Streamflow Forecasts June 1, 2019	Forecast Period	←--------Drier---------- 90% (KAF)	70% (KAF)	Future Conditions 50% (KAF)	50% % Avg	--------Wetter--------→ 30% (KAF)	10% (KAF)	30-Year Average (KAF)
Hills Creek Reservoir Inflow[1,2]	JUN-SEP	69	96	108	84%	120	147	129
Lookout Point Reservoir Inflow[1,2]	JUN-SEP	190	255	285	86%	315	380	330
McKenzie R bl Trail Bridge	JUN-SEP	139	164	175	90%	186	210	195
Cougar Lake Inflow[1,2]	JUN-SEP	45	64	73	81%	82	101	90
Blue Lake Inflow[1,2]	JUN-SEP	0.79	6.0	11.2	57%	16.4	28	19.8
McKenzie R nr Vida[1,2]	JUN-SEP	385	465	490	86%	535	615	570
Detroit Lake Inflow[1,2]	JUN-SEP	147	198	220	85%	245	295	260
North Santiam R at Mehama[1,2]	JUN-SEP	152	240	280	84%	315	405	335
Green Peter Lake Inflow[1,2]	JUN-SEP	4.2	38	58	68%	78	121	85
Foster Lake Inflow[1,2]	JUN-SEP	6.6	79	114	70%	150	225	164
South Santiam R at Waterloo[2]	JUN-SEP	3.1	83	120	70%	156	235	171
Willamette R at Salem[1,2]	JUN-SEP	645	1130	1320	80%	1560	2040	1640
Oak Grove Fk ab Powerplant	JUN-JUL	30	37	41	89%	45	52	46
	JUN-SEP	63	73	80	94%	87	97	85
Clackamas R ab Three Lynx	JUN-JUL	81	112	133	90%	154	184	148
	JUN-SEP	161	194	215	91%	240	275	235
Clackamas R at Estacada	JUN-JUL	100	150	183	89%	215	265	205
	JUN-SEP	195	250	285	90%	325	380	315

Klamath Basin Summary for June 1, 2019

Streamflow Forecasts June 1, 2019	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	50% % Avg	30% (KAF)	10% (KAF)	Average (KAF)
Gerber Reservoir Inflow[2]	JUN-JUL	0.09	0.74	1.70	119%	2.7	4.1	1.43
	JUN-SEP	0.14	0.94	2.0	112%	3.1	4.7	1.78
Sprague R nr Chiloquin	JUN-JUL	34	44	51	102%	59	69	50
	JUN-SEP	52	66	76	104%	85	99	73
Williamson R bl Sprague nr Chiloquin	JUN-JUL	67	79	87	97%	95	107	90
	JUN-SEP	120	136	147	99%	158	174	149
Upper Klamath Lake Inflow[1,2]	JUN-JUL	57	85	97	93%	110	138	104
	JUN-SEP	108	153	176	96%	193	235	183

Rogue And Umpqua Basins Summary for June 1, 2019

Streamflow Forecasts June 1, 2019	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	50% % Avg	30% (KAF)	10% (KAF)	Average (KAF)
Lost Creek Lk Inflow[2]	JUN-JUL	149	168	182	89%	195	215	205
	JUN-SEP	255	280	300	91%	320	345	330
Rogue R at Raygold[2]	JUN-JUL	139	169	190	86%	210	240	220
	JUN-SEP	255	290	315	90%	340	380	350
Rogue R at Grants Pass[2]	JUN-JUL	131	166	190	86%	215	250	220
	JUN-SEP	235	280	310	91%	335	380	340
Applegate Lake Inflow[2]	JUN-JUL	14.7	20	24	86%	28	34	28
	JUN-SEP	20	26	31	91%	35	41	34
Sucker Ck bl Ltl Grayback nr Holland	JUN-JUL	7.6	11.0	13.3	98%	15.6	19.0	13.6
	JUN-SEP	11.0	14.8	17.4	99%	20	24	17.6
Illinois R nr Kerby	JUN-JUL	13.4	27	36	113%	45	59	32
	JUN-SEP	18.8	33	43	113%	53	67	38

* 90%, 70%, 50%, 30% & 10% exceedance probabilities are the chance that observed streamflow volume will exceed the forecasted volume

1) 90% and 10% exceedance probabilities are actually 95% and 5%

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

Basinwide Summary: June 1, 2019 (averages based on 1981-2010 reference period)	Reservoir Storage Summary for the end of May 2019								
OWYHEE AND MALHEUR BASINS	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Beulah	58.9	33.7	46.7	59.2	99%	57%	79%	126%	72%
Bully Creek	23.5	13.9	23.2	23.7	99%	59%	98%	101%	60%
Lake Owyhee	703.9	523.1	536.2	715.0	98%	73%	75%	131%	98%
Warm Springs	168.4	105.7	122.4	169.6	99%	62%	72%	138%	86%
Basin-wide Total	954.7	676.4	728.5	967.5	99%	70%	75%	131%	93%
GRANDE RONDE, POWDER, BURNT AND IMNAHA BASINS	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Phillips Lake	48.0	46.3	58.7	73.5	65%	63%	80%	82%	79%
Thief Valley	14.3	14.1	13.6	13.3	107%	106%	102%	105%	104%
Unity	24.8	21.9	22.4	25.5	97%	86%	88%	111%	98%
Wallowa Lake	28.1	34.2	27.2	37.5	75%	91%	73%	103%	126%
Wolf Creek	11.1	9.6	9.7	11.1	100%	87%	87%	115%	99%
Basin-wide Total	126.3	126.1	131.6	160.9	78%	78%	82%	96%	96%
UMATILLA, WALLA WALLA AND WILLOW BASINS	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Cold Springs	27.3	26.7	28.2	38.6	71%	69%	73%	97%	95%
Mckay	65.6	63.2	57.0	71.5	92%	88%	80%	115%	111%
Willow Creek	6.1	6.0	5.9	9.8	62%	61%	60%	103%	102%
Basin-wide Total	98.9	96.0	91.1	119.9	82%	80%	76%	109%	105%
UPPER DESCHUTES AND CROOKED BASINS	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Crane Prairie	47.6	48.5	42.8	55.3	86%	88%	77%	111%	113%
Crescent Lake	65.7	81.7	54.4	86.9	76%	94%	63%	121%	150%
Ochoco	38.4	25.4	34.6	44.2	87%	57%	78%	111%	73%
Prineville	148.8	111.3	140.5	148.6	100%	75%	95%	106%	79%
Wickiup	119.6	138.6	159.7	200.0	60%	69%	80%	75%	87%
Basin-wide Total	420.1	405.4	432.0	535.1	79%	76%	81%	97%	94%
WILLAMETTE BASIN	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Blue River	70.8	71.0	78.6	82.3	86%	86%	96%	90%	90%
Cottage Grove	26.3	27.2	30.3	31.8	83%	85%	95%	87%	90%
Cougar	107.1	115.8	165.0	174.9	61%	66%	94%	65%	70%
Detroit	423.0	421.8	423.4	426.8	99%	99%	99%	100%	100%
Dorena	60.0	56.3	70.4	72.1	83%	78%	98%	85%	80%
Fall Creek	107.4	106.0	115.5	116.0	93%	91%	100%	93%	92%
Fern Ridge	96.5	96.3	91.5	97.3	99%	99%	94%	105%	105%
Foster	46.0	44.1	46.3	46.2	100%	95%	100%	99%	95%
Green Peter	350.6	357.2	381.2	402.8	87%	89%	95%	92%	94%
Hills Creek	256.2	218.0	268.3	279.2	92%	78%	96%	95%	81%
Lookout Point	384.3	296.2	396.8	433.2	89%	68%	92%	97%	75%
Timothy Lake		63.0	62.3	63.6		99%	98%		101%
Henry Hagg Lake	52.9	52.6	52.5	53.3	99%	99%	98%	101%	100%
Basin-wide Total	1981.0	1862.4	2119.8	2215.9	89%	84%	96%	93%	88%
ROGUE AND UMPQUA BASINS	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Applegate	68.5	67.5	64.9	75.2	91%	90%	86%	105%	104%
Emigrant Lake	36.0	28.9	35.5	39.0	92%	74%	91%	101%	81%
Fish Lake	5.3	6.6	6.2	7.9	67%	83%	78%	85%	106%
Fourmile Lake	9.0	7.9	10.7	15.6	58%	51%	69%	84%	74%
Howard Prairie	33.0	36.9	48.3	62.1	53%	59%	78%	68%	76%
Hyatt Prairie	9.1	6.4	13.2	16.2	56%	39%	81%	69%	48%
Lost Creek	295.5	282.3	302.6	315.0	94%	90%	96%	98%	93%
Basin-wide Total	456.3	436.5	481.4	531.0	86%	82%	91%	95%	91%
KLAMATH BASIN	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Clear Lake	276.4	218.3	247.4	513.3	54%	43%	48%	112%	88%
Gerber	89.9	79.7	65.0	94.3	95%	85%	69%	138%	123%
Upper Klamath Lake	558.2	427.4	445.2	523.7	107%	82%	85%	125%	96%
Basin-wide Total	924.4	725.4	757.6	1131.3	82%	64%	67%	122%	96%
LAKE COUNTY AND GOOSE LAKE BASINS	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)	Current % Capacity	Last Year % Capacity	Average % Capacity	Current % Average	Last Year % Average
Cottonwood		5.6	7.0	9.3		60%	75%		80%
Drews	65.1	50.8	45.5	63.5	102%	80%	72%	143%	112%
Basin-wide Total	65.1	50.8	45.5	63.5	102%	80%	72%	143%	112%

Basin Outlook Reports: How Forecasts Are Made

Federal – State – Private
Cooperative Snow Surveys

For more water supply and resource management information, contact:

USDA, Natural Resources Conservation Service
Snow Survey Office
1201 NE Lloyd Suite 900
Portland, OR 97232
Phone: (503) 414-3271
Web site ***http://www.or.nrcs.usda.gov/snow***

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Measurements of snow water equivalent at selected manual snow courses and automated SNOTEL sites, along with precipitation, antecedent streamflow, and indices of the El Niño / Southern Oscillation are used in computerized statistical and simulation models to prepare runoff forecasts. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences

Forecasts of any kind, of course, are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast, for which there is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertainty is in the forecast. As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the range around the 50% exceedance probability forecast. Users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount. By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

Interpreting Water Supply Forecasts

Each month, five forecasts are issued for each forecast point and each forecast period. Unless otherwise specified, all streamflow forecasts are for streamflow volumes that would occur naturally without any upstream influences. Streamflow forecasts help users make risk-based decisions. Water users can select the forecast corresponding to the level of risk they are willing to accept in order to minimize the negative impacts of having more or less water than planned for. Users need to know what the different forecasts represent if they are to use the information correctly when making operational decisions. The following is an explanation of each of the forecasts.

90 Percent Chance of Exceedance Forecast. There is a 90 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 10 percent chance that the actual streamflow volume will be less than this forecast value.

70 Percent Chance of Exceedance Forecast. There is a 70 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 30 percent chance that the actual streamflow volume will be less than this forecast value.

50 Percent Chance of Exceedance Forecast. There is a 50 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 50 percent chance that the actual streamflow volume will be less than this forecast value. Generally, this forecast is the middle of the range of possible streamflow volumes that can be produced given current conditions.

30 Percent Chance of Exceedance Forecast. There is a 30 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 70 percent chance that the actual streamflow volume will be less than this forecast value.

10 Percent Chance of Exceedance Forecast. There is a 10 percent chance that the actual streamflow volume will exceed this forecast value, and there is a 90 percent chance that the actual streamflow volume will be less than this forecast value.

*Note: There is still a 20 percent chance that actual streamflow volumes will fall either below the 90 percent exceedance forecast or above the 10 percent exceedance forecast.

These forecasts represent the uncertainty inherent in making streamflow predictions. This uncertainty may include sources such as: unknown future weather conditions, uncertainties associated with the various prediction methodologies, and the spatial coverage of the data network in a given basin. AF stands for acre-feet. Forecasted volumes of water are typically in thousands of acre-feet.

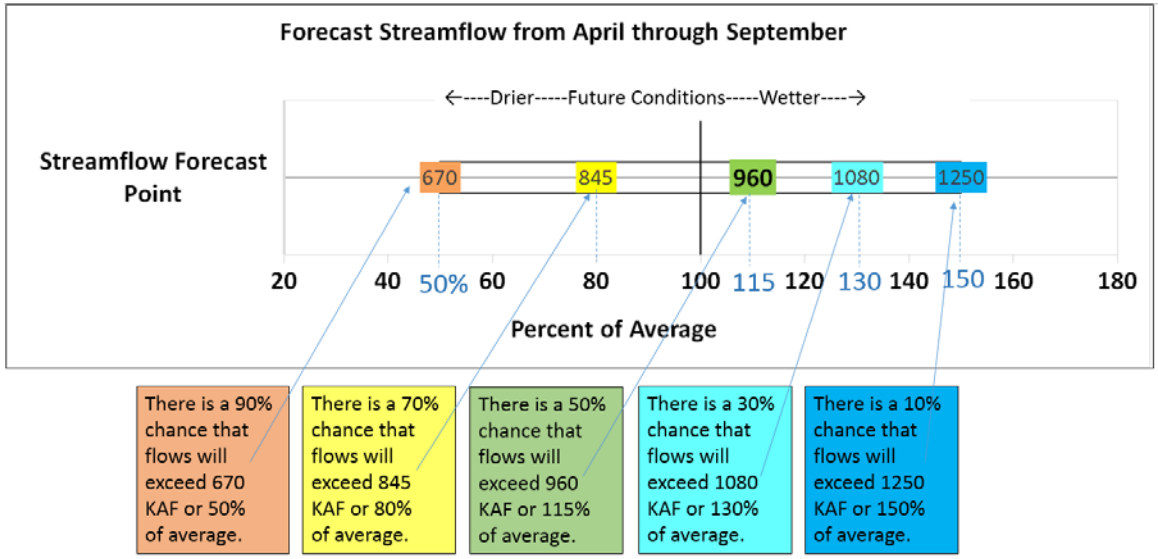
30-Year Average. The 30-year average streamflow for each forecast period is provided for comparison. The average is based on data from 1981-2010. The % AVG. column compares the 50% chance of exceedance forecast to the 30-year average streamflow; values above 100% denote when the 50% chance of exceedance forecast would be greater than the 30-year average streamflow.

To Decrease the Chance of Having Less Water than Planned for: A user might determine that making decisions based on a 50 percent chance of exceedance forecast is too much risk to take (there is still a 50% chance that the user will receive less than this amount). To reduce the risk of having less water than planned for, users can base their operational decisions on one of the forecasts with a greater chance of being exceeded such as the 90 or 70 percent exceedance forecasts.

To Decrease the Chance of Having More Water than Planned for: A user might determine that making decisions based on a 50 percent chance of exceedance forecast is too much risk to take (there is still a 50% chance that the user will receive more than this amount). To reduce the risk of having more water than planned for, users can base their operational decisions on one of the forecasts with a lesser chance of being exceeded such as the 30 or 10 percent exceedance forecasts.

<u>Graphical Representation of Streamflow Forecast Range:</u>

This type of graphic is used in the state-wide streamflow forecast summary



Using the Forecasts - an Example

Using the 50 Percent Exceedance Forecast. Using the example forecasts shown here, there is a 50% chance that actual streamflow volume at the Mountain Creek near Mitchell will be less than 4.4 KAF between April 1 and Sept 30. There is also a 50% chance that actual streamflow volume will be greater than 4.4 KAF.

JOHN DAY BASIN
Streamflow Forecasts - February 1, 2013

Forecast Point	Forecast Period	<<====== Drier ====== 90% (1000AF)	70% (1000AF)	Future Conditions ======= Chance Of Exceeding * 50% (1000AF)	(% AVG.)	======= Wetter =====>> 30% (1000AF)	10% (1000AF)	30-Yr Avg. (1000AF)
Strawberry Ck nr Prairie City	MAR-JUL	5.0	6.6	7.6	89	8.6	10.2	8.5
	APR-SEP	5.2	6.8	7.9	90	9.0	10.6	8.8
Mountain Ck nr Mitchell	FEB-JUL	3.2	5.4	6.9	99	8.4	10.6	7.0
	APR-SEP	1.7	3.3	4.4	90	5.5	7.1	4.9

** 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.*

Using the 90 and 70 Percent Exceedance Forecasts. If an unexpected shortage of water could cause problems (such as irrigated agriculture), users might want to plan on receiving 3.3 KAF (from the 70 percent exceedance forecast). There is a 30% chance of receiving *less* than 3.3 KAF.

Alternatively, if users determine the risk of using the 70 percent exceedance forecast is too great, then they might plan on receiving 1.7 KAF (from the **90** percent exceedance forecast). There is 10% chance of receiving less than 1.7 KAF.

Using the 30 or 10 Percent Exceedance Forecasts. If an unexpected excess of water could cause problems (such as operating a flood control reservoir), users might plan on receiving 5.5 KAF (from the 30 percent exceedance forecast). There is a 30% chance of receiving *more* than 5.5 KAF.

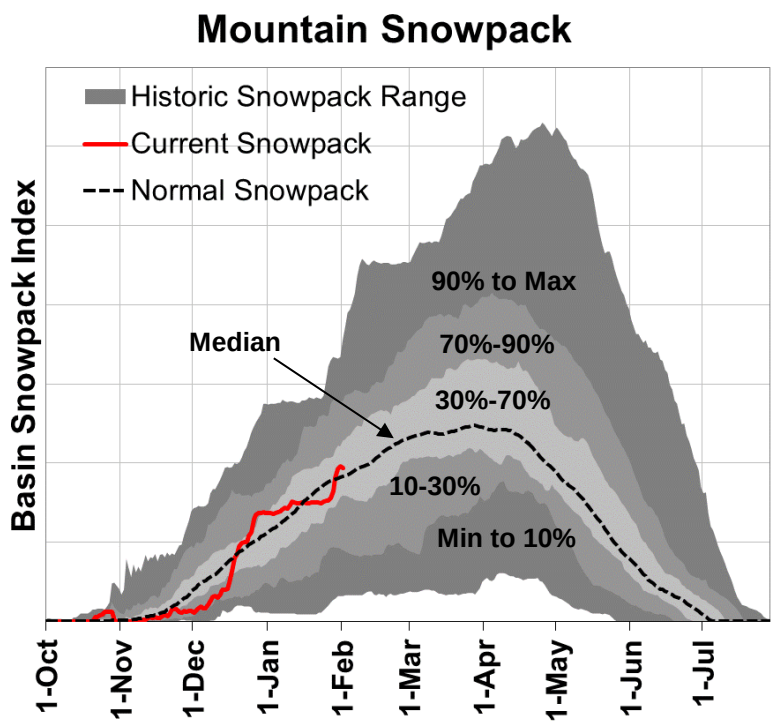
Alternatively, if users determine the risk of using the 30 percent exceedance forecast is too great, then they might plan on receiving 7.1 KAF (from the 10 percent exceedance forecast). There is a 10% chance of receiving more than 7.1 KAF.

Interpreting Snowpack Plots

The basin snowpack plots display an index calculated using daily SNOTEL data for many sites in each basin. They show how the current year's snowpack data compares to historical data in the basin. The "Current Snowpack" line can be compared with the "Normal Snowpack" (median) line, as well as the historic range for the basin. This gives users important context about the current year and historic variability of snowpack in the basin.

The grey shaded areas represent different percentiles of the historical range of the snowpack index for each day. The dark grey shading indicates the extreme lows and highs in the SNOTEL record (minimum to the 10th percentile and the 90th percentile to maximum). The medium grey shading indicates the range from the 10th to 30th percentiles and the 70th to 90th percentiles. The light grey shading indicates the range between the 30th to 70th percentiles, while the median is the 50th percentile. A percentile is the value of the snowpack index below which the given percent of historical years fall. For instance, the 90th percentile line indicates that the snowpack index has been below this line for 90 percent of the years of record.

** Please note: These plots only use daily data from SNOTEL sites in the basin. Because snow course data is collected monthly, it cannot be included in these plots. The official snowpack percent of normal for the basin incorporates both SNOTEL and snow course data, so occasionally there might be slight discrepancies between the plot and official basin percent of normal (stated in basin summary below each plot).



USDA Natural Resources Conservation Service
1201 NE Lloyd Suite 900
Portland, OR 97232-1274

Official Business

This publication may be found online at:
http://www.or.nrcs.usda.gov/snow

Issued by
Matthew Lohr, Chief
Natural Resources Conservation Service
U.S. Department of Agriculture

Released by
Ron Alvarado, State Conservationist
Natural Resources Conservation Service
Portland, Oregon

IMPORTANT NOTICE

WE ARE NOW OFFERING AN EMAIL SUBSCRIPTION FOR THE OREGON BASIN OUTLOOK REPORT

If you would like to receive this document in PDF format via an email announcement, please sign up on our website to update your subscription preference.

You will receive an email each month as soon as the report is published with a link to the PDF document on our website. By choosing this paperless option, you will receive your water supply information much faster and also help us save natural resources by reducing our hardcopy printing.

If you would like to update your subscription, please sign up on our website by clicking the email updates link on the left hand side of the webpage:
Snow Survey Homepage:
http://www.or.nrcs.usda.gov/snow