



United States  
Department of  
Agriculture



Natural Resources  
Conservation  
Service

# Oregon Basin Outlook Report

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May 1, 2019



Flooding on Highway 34 in Corvallis, OR on April 9, 2019  
*Photo: Ron Seymour*

**A moisture-laden storm during the second week of April brought heavy rain, warm temperatures, and rapid snowmelt to many parts of the state. In Corvallis, the Willamette River overtopped its banks, forcing evacuations and closing Highway 34 for several days. In eastern Oregon, the John Day River and its tributaries also flooded surrounding areas as a result of the same storm. Many SNOTEL sites and NWS weather stations received record-breaking amounts of precipitation for the month of April and many rivers and streams experienced their highest April flows on record. Despite the rapid snowmelt, many basins in eastern and southern Oregon still had above average amounts of snow on May 1<sup>st</sup>. In western and central Oregon, snowpack had diminished to below average amounts.**

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# General Outlook

May 1<sup>st</sup>, 2019

## SUMMARY

The dynamic month of April brought record-breaking amounts of rainfall across the state, causing rapidly rising rivers, widespread flooding, and significant impacts to water-logged communities. Numerous records were broken for both total April precipitation and streamflow volumes for the month. As the temperatures warmed up and sunshine replaced the rain clouds for the latter half of the month, spring snowmelt began in earnest and many snow monitoring sites experienced more than double the usual amount of snowmelt for the month.

Reservoir operators were kept on their toes this month, carefully balancing flood control measures while working to maintain the ability to meet summer water supply needs. Heavy rains and abundant snowmelt worked together to rapidly increase reservoir storage as well as to replenish soil moisture and groundwater reserves. The moisture-rich month of April has led the drought monitor to reduce the current drought severity. As of May 1<sup>st</sup>, the U.S. Drought Monitor (<https://droughtmonitor.unl.edu/>) indicates that just 17% of the state is in an abnormally dry category, a significant improvement from last month when 82% was listed as in abnormally dry or moderate drought status.

The May through September streamflow forecasts are pointing towards near to above average water supply conditions in eastern and southern Oregon this summer, while forecasts in western and central Oregon are predicting below to near average flows for most streams and rivers. Weather conditions over the next few months are critical as they will control the rate and timing of snowmelt as well as the drying of soils. As the heat of summer approaches, these conditions will be important contributors to fire danger levels. Based on current reservoir storage and streamflow forecasts, many parts of the state will likely have adequate water supplies this summer season.

## SNOWPACK

Thanks in large part to February's record-breaking snow accumulation, most of Oregon's basins started the month of April with above normal amounts of snow. Early April brought unusually heavy rain, which combined with snowmelt to result in record high April streamflows and flooding in many parts of the state. The last two weeks of April were dry and unusually warm which revved up the snowmelt engine and led to melt rates which were two to four times the normal rate for the month at many sites. Despite rapid melt rates, most basins in eastern Oregon are still holding above normal amounts of snow as of May 1<sup>st</sup>, while mountain snowpacks across the rest of the state are generally below normal.

In general, snow monitoring sites in eastern and southern Oregon basins reached higher than normal peak levels this winter (100% to 160% of normal), while basins in western and central Oregon peaked slightly lower (90% to 130% of normal). So far this spring, SNOTEL sites across the state have been melting out at very close to normal timing, with most sites becoming snow-free within a few days of their normal snow-free date.

## **PRECIPITATION**

Record-breaking April precipitation caused widespread flooding across much of Oregon during the first half of the month. Evacuations, school closures, landslides and inundated highways impacted many communities and the damage from the flooding is still being assessed in some locations. Western and northern Oregon basins received the most precipitation relative to normal (165% to 200%). Twenty-one SNOTEL sites and ten National Weather Service (NWS) sites set new record highs for April precipitation and numerous others received the second highest amount of precipitation on record. Several of these new records were set at weather stations that have been measuring precipitation for over 90 years, such as Riddle 2 NNE which had the wettest April in its 106-year period of record.

This year's two strikingly high precipitation months, February and April, have balanced out periods of lower precipitation, resulting in water year total amounts (October through April) that are generally near average to above average as of May 1<sup>st</sup>. In particular, basins in eastern and southern Oregon have received 100%-120% of normal water year precipitation, while those in western and central Oregon have received 85%-100% of average.

## **RESERVOIRS**

Across the state, most reservoirs stored significantly higher amounts of water on May 1<sup>st</sup> than they did on April 1<sup>st</sup>. As heavy rain and snowmelt swelled creeks and rivers across Oregon in April, reservoir managers faced the difficult task of balancing flood control with storage for the summer months, and most reservoirs statewide are now storing near average to above average amounts of water.

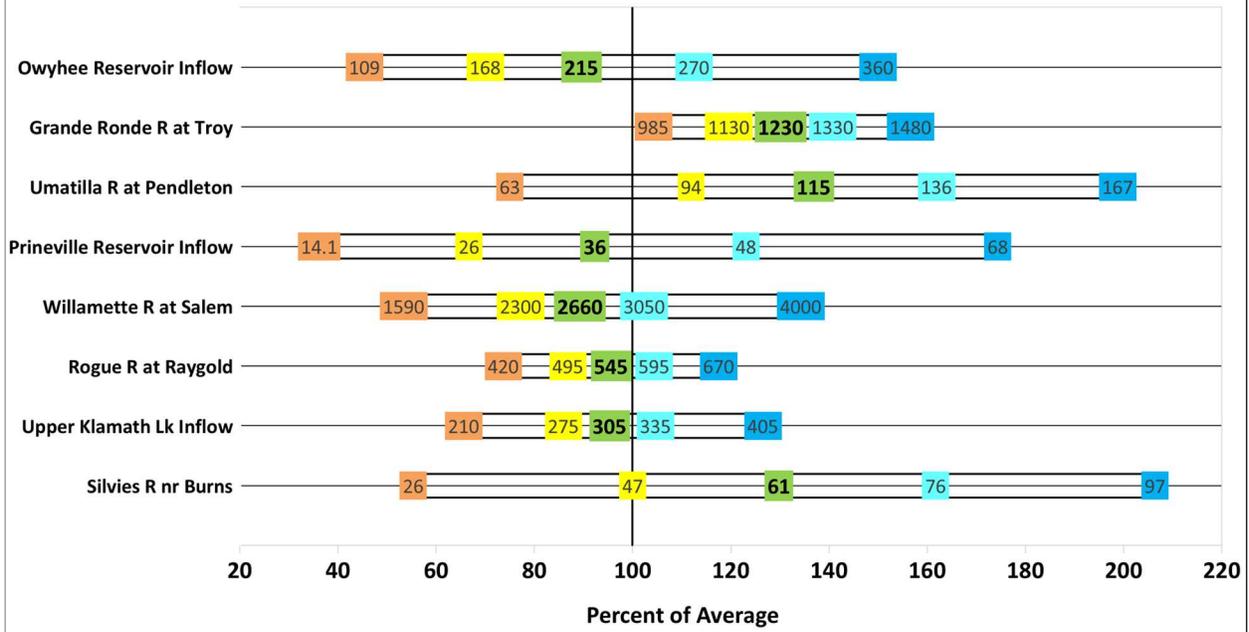
On May 1<sup>st</sup>, Lake County and Goose Lake Basins had the highest basin-wide reservoir storage with 140% of normal, and the lowest was the Grande Ronde, Powder, Burnt, and Imnaha Basins with 93%.

## **STREAMFLOW**

Over half of Oregon's long-term streamflow gaging stations recorded the highest April streamflow on record. Many of Oregon's rivers and streams swelled past flood stage in the second week of April causing widespread impacts due to flooding and landslides. Flow volumes for the month blasted previous records for many rivers and streams in western and northern Oregon – some of these rivers have been measured for over 100 years. The majority of rivers and streams in the state reported flows at least double their usual April volumes and a handful of creeks in the Umatilla, Walla Walla and Willow Creek basins experienced 300% to 500% of their usual flow.

To accompany the forecast summary graphic on the next page, here are some helpful reminders about interpreting streamflow forecasts published in this document. For each forecast point, five possible streamflow volumes are predicted. Where the observed streamflow occurs within this spectrum depends on the range of future weather conditions. If water users wish to plan conservatively, they may lean toward using the 70% chance of exceedance forecast, or the drier forecast. Conversely, if a water user believes future conditions will provide more water to the system, they could choose to use the 30% chance of exceedance forecast (the wetter forecast). These arrays of forecasts are shown in the chart above and explained in more detail at the end of this document.

**Summary of Streamflow Forecasts across Oregon**  
 May through September Forecast Volumes at a Selection of Streamflow Points  
 (Volumes listed in KAF)



<b>Legend:</b> ←-----Drier-----Future Conditions-----Wetter-----→				
<b>90% Exceedance Forecast (KAF)</b> There is a 90% chance that flows will exceed this volume.	<b>70% Exceedance Forecast (KAF)</b> There is a 70% chance that flows will exceed this volume.	<b>50% Exceedance Forecast (KAF)</b> There is a 50% chance that flows will exceed this volume.	<b>30% Exceedance Forecast (KAF)</b> There is a 30% chance that flows will exceed this volume.	<b>10% Exceedance Forecast (KAF)</b> There is a 10% chance that flows will exceed this volume.

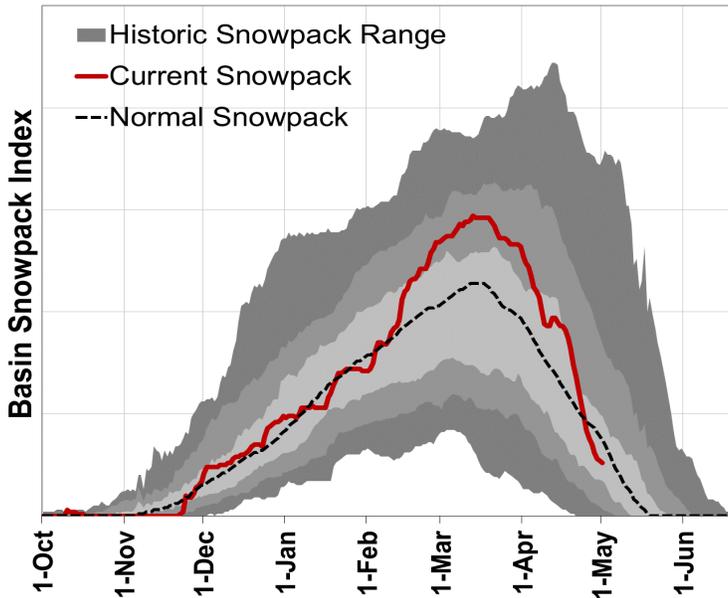
All forecasts are listed with units of 1000 acre-feet (KAF). This report contains data furnished by the Oregon Department of Water Resources, U.S. Geological Survey, NOAA National Weather Service and other cooperators. This report will be updated monthly, January through June.



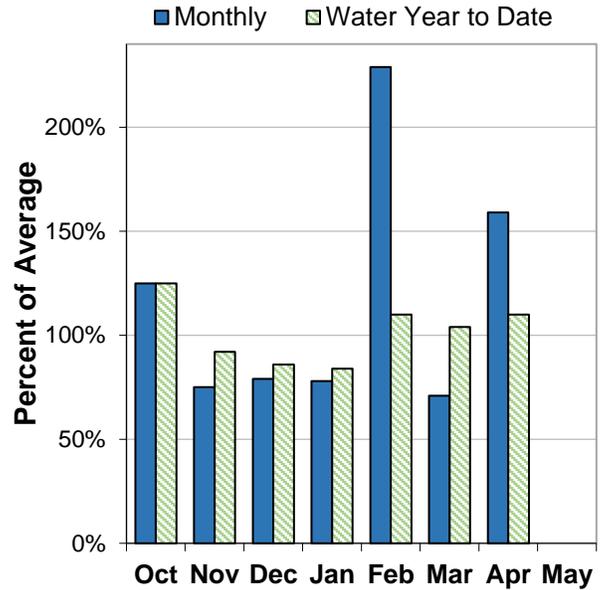
# Owyhee and Malheur Basins

May 1, 2019

## Mountain Snowpack



## Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 71% of normal. In general, SNOTEL sites in the basin reached 110% to 170% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 159% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 110% of average.

### RESERVOIR

As of May 1, storage at major reservoirs in the basin ranges from 94% of average at Bully Creek Reservoir to 121% of average at Lake Owyhee.

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 88% to 185% of average. Water supplies in the Malheur River basin are forecast to be well above normal this summer, while flows in the Owyhee River basin are likely to be slightly below normal for the summer period.

## Owyhee And Malheur Basins Summary for May 1, 2019

### Forecast Exceedance Probabilities for Risk Assessment \*

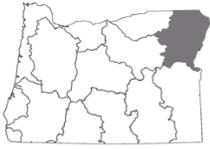
Streamflow Forecasts May 1, 2019	Forecast Period	←-----Drier-----Future Conditions-----Wetter-----→						30-Year Average (KAF)
		90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	
Owyhee R nr Rome	MAY-JUL	67	118	162	86%	215	300	188
	MAY-SEP	80	135	180	88%	230	320	205
Owyhee R bl Owyhee Dam <sup>2</sup>	MAY-JUL	83	138	184	88%	235	325	210
	MAY-SEP	109	168	215	90%	270	360	240
Malheur R nr Drewsey	MAY-JUL	39	52	60	182%	69	82	33
	MAY-SEP	42	55	63	185%	72	85	34
NF Malheur R at Beulah <sup>2</sup>	MAY-JUL	40	48	54	159%	60	69	34
	MAY-SEP	46	55	61	153%	67	77	40

\* 90%, 70%, 50%, 30% & 10% exceedance probabilities are the chance that observed streamflow volume will exceed the forecasted volume  
 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

Reservoir Storage	Current (KAF)	Last Year (KAF)	Average (KAF)	% of Average	Useable Capacity (KAF)
Beulah	55.1	40.2	49.0	112%	59.2
Bully Creek	23.7	17.8	25.3	94%	23.7
Lake Owyhee	646.4	574.1	533.1	121%	715.0
Warm Springs	142.4	122.4	126.8	112%	169.6

Snowpack Summary by Basin	Basin Snowpack % of Median		
	# of Sites	Current Yr	Last Yr
East Little Owyhee Basin	2	135%	45%
South Fork Owyhee Basin	4	77%	18%
Upper Malheur Basin	3	114%	0%
Upper Owyhee Basin	5	77%	18%

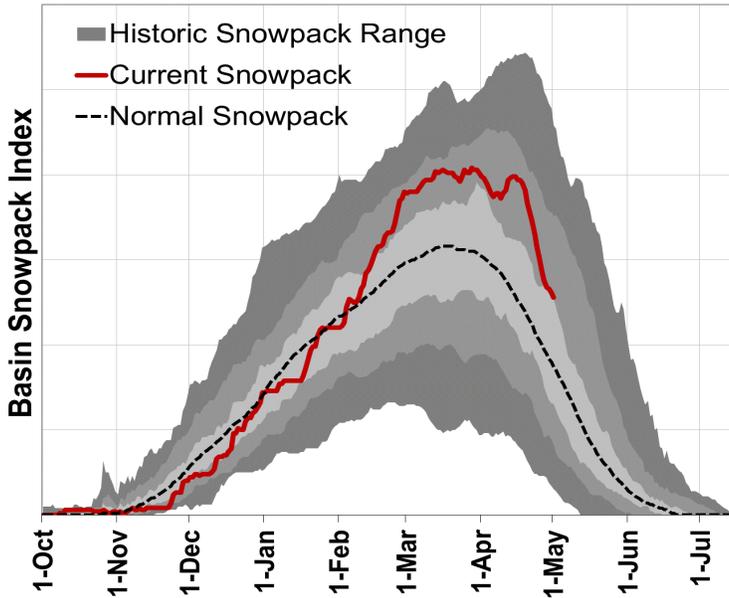
Basin Snowpack Measurement Sites	Elevation (ft)	Date Measured	Snow Depth	Snow Water Equivalent (in)			
				Current SWE	Last Yr SWE	Median	% of Median
Granite Peak SNOTEL	8543	1-May	57	26.6	8.8	19.5	136%
Trout Creek AM	7890	1-May	27	12.2	2.4		
Toe Jam SNOTEL	7700	1-May	32	14.3	0.0		
Govt Corrals AM	7400	1-May	32	14.4	0.0		
Jack Creek Upper SNOTEL	7250	1-May	31	13.3	4.7	14.4	92%
Fawn Creek SNOTEL	7000	1-May	21	6.5	0.0	11.4	57%
Buckskin Lower SNOTEL	6915	1-May	0	0.0	0.0	0.2	0%
Big Bend SNOTEL	6700	1-May	0	0.0	0.0	0.0	
Fry Canyon SNOTEL	6700	1-May	0	0.0	0.0		
Laurel Draw SNOTEL	6697	1-May	0	0.0	0.0	0.0	
South Mtn. SNOTEL	6500	1-May	0	0.0	0.0	5.6	0%
Taylor Canyon SNOTEL	6200	1-May	0	0.0	0.0	0.0	
Blue Mountain Spring SNOTEL	5870	1-May	13	6.5	0.0	5.7	114%
Barney Creek (New) Snow Course	5830	1-May	7	3.3			
Mud Flat SNOTEL	5730	1-May	0	0.0	0.0	0.0	
Reynolds Creek SNOTEL	5600	1-May	0	0.0	0.0	0.0	
Call Meadows AM	5380	1-May	0	0.0			
Rock Springs SNOTEL	5290	1-May	0	0.0	0.0	0.0	
Lake Creek R.S. SNOTEL	5240	1-May	0	0.0	0.0	0.0	



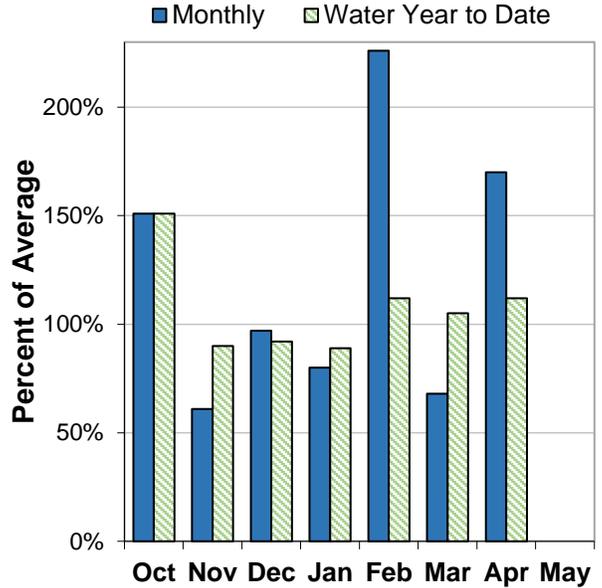
# Grande Ronde, Powder, Burnt and Imnaha Basins

May 1, 2019

## Mountain Snowpack



## Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 136% of normal. In general, SNOTEL sites in the basin reached 100% to 140% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 170% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 112% of average. Out of 41 years of measurements, Bourne SNOTEL set a new record for highest April precipitation (4.0 inches, 172% of normal).

### RESERVOIR

As of May 1, storage at major reservoirs in the basin ranges from 71% of average at Phillips Lake to 123% of average at Wolf Creek Reservoir.

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 115% to 140% of average. Two long-term stream gage stations in the basin set new records for highest April streamflows: Catherine Creek near Union (96 years of record, 216% of normal) and Grande Ronde River at Troy (75 years of record, 245% of normal). Water managers in the basin should expect above normal to well above normal streamflows this summer.

## Grande Ronde, Powder, Burnt And Imnaha Basins Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
Burnt R nr Hereford <sup>2</sup>	MAY-JUL	9.6	14.6	18.6	127%	23	30	14.6
	MAY-SEP	11.4	16.6	21	129%	25	33	16.3
Powder R nr Sumpter <sup>2</sup>	MAY-JUL	29	37	42	117%	47	56	36
	MAY-SEP	31	38	43	116%	49	58	37
Pine Ck nr Oxbow	MAY-JUL	122	143	158	141%	172	193	112
	MAY-SEP	129	150	165	140%	179	200	118
Imnaha R at Imnaha	MAY-JUL	200	235	255	128%	275	305	200
	MAY-SEP	225	255	280	127%	300	330	220
Catherine Ck nr Union	MAY-JUL	45	53	58	126%	64	72	46
	MAY-SEP	49	57	63	126%	68	77	50
Lostine R nr Lostine	MAY-JUL	101	108	113	115%	117	124	98
	MAY-SEP	110	117	122	115%	128	135	106
Bear Ck nr Wallowa	MAY-JUL	53	59	62	117%	66	71	53
	MAY-SEP	56	61	65	116%	69	74	56
Grande Ronde R at Troy	MAY-JUL	880	1020	1120	130%	1220	1370	860
	MAY-SEP	985	1130	1230	130%	1330	1480	945

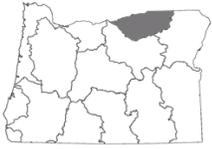
\* 90%, 70%, 50%, 30% & 10% exceedance probabilities are the chance that observed streamflow volume will exceed the forecasted volume  
 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

<b>Reservoir Storage</b>	<b>Current (KAF)</b>	<b>Last Year (KAF)</b>	<b>Average (KAF)</b>	<b>% of Average</b>	<b>Useable Capacity (KAF)</b>
Phillips Lake	37.1	47.1	52.6	71%	73.5
Thief Valley	14.1	14.0	13.7	103%	13.3
Unity	24.2	25.0	24.1	101%	25.5
Wallowa Lake	24.6	25.5	20.2	122%	37.5
Wolf Creek	10.7	9.3	8.7	123%	11.1

<b>Snowpack Summary by Basin</b>	<b>Basin Snowpack % of Median</b>		
	<b># of Sites</b>	<b>Current Yr</b>	<b>Last Yr</b>
Burnt Basin	2	275%	0%
Imnaha Basin	4	119%	77%
Lower Grande Ronde Basin	4	102%	75%
Powder Basin	9	149%	61%
Upper Grande Ronde Basin	9	150%	88%
Wallowa Basin	6	114%	79%

## Grande Ronde, Powder, Burnt And Imnaha Basins Summary for May 1, 2019

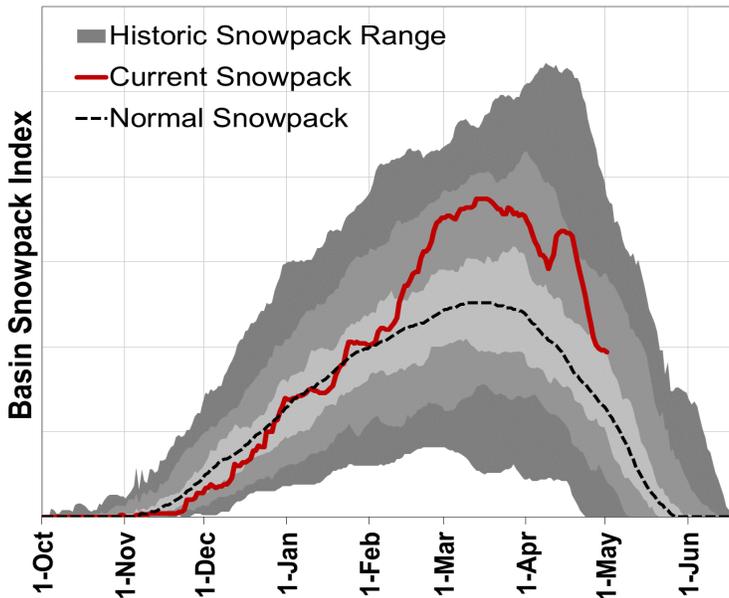
Basin Snowpack Measurement Sites	Elevation (ft)	Date Measured	Snow Depth	Snow Water Equivalent (in)			
				Current SWE	Last Yr SWE	Median	% of Median
Mt. Howard SNOTEL	7910	1-May	47	21.2	14.8	16.8	126%
Aneroid Lake #2 SNOTEL	7400	1-May	62	24.2	21.7	25.2	96%
Anthony Lake (Rev) Snow Course	7160	30-Apr	60	32.0	22.8	26.9	119%
TV Ridge AM	7050	1-May	35	15.4	12.4	19.5	79%
Bald Mtn AM	6600	1-May	66	28.4		19.5	146%
Big Sheep AM	6230	1-May	49	21.1	13.6	19.2	110%
Bear Saddle SNOTEL	6180	1-May	43	15.1	6.4	10.3	147%
Bourne SNOTEL	5850	1-May	20	9.5	0.0	4.7	202%
Barney Creek (New) Snow Course	5830	1-May	7	3.3			
Moss Springs SNOTEL	5760	1-May	53	24.4	22.5	18.5	132%
Taylor Green SNOTEL	5740	1-May	31	16.8	4.2	10.0	168%
Spruce Springs SNOTEL	5700	1-May	15	6.4	2.2	5.1	125%
Wolf Creek SNOTEL	5630	1-May	27	13.1	3.5	6.9	190%
Milk Shakes SNOTEL	5580	1-May	87	39.1	38.3		
West Branch SNOTEL	5560	1-May	33	15.9	3.2	8.9	179%
Touchet SNOTEL	5530	1-May	55	25.5	20.4	21.8	117%
Eilertson Meadows SNOTEL	5510	1-May	6	2.6	0.0	0.0	
West Eagle Meadows AM	5500	1-May	47	22.1	10.5	18.8	118%
Gold Center SNOTEL	5410	1-May	0	0.0	0.0	0.0	
Schneider Meadows SNOTEL	5400	1-May	57	26.7	10.7	17.3	154%
Beaver Reservoir SNOTEL	5150	1-May	7	2.9	0.0	0.0	
Tipton SNOTEL	5150	1-May	11	5.5	0.0	2.0	275%
High Ridge SNOTEL	4920	1-May	51	26.8	17.5	11.0	244%
County Line SNOTEL	4830	1-May	0	0.0	0.0	0.0	
Bowman Springs SNOTEL	4530	1-May	0	0.0	0.0	0.0	
Sourdough Gulch SNOTEL	4000	1-May	0	0.0	0.0	0.0	



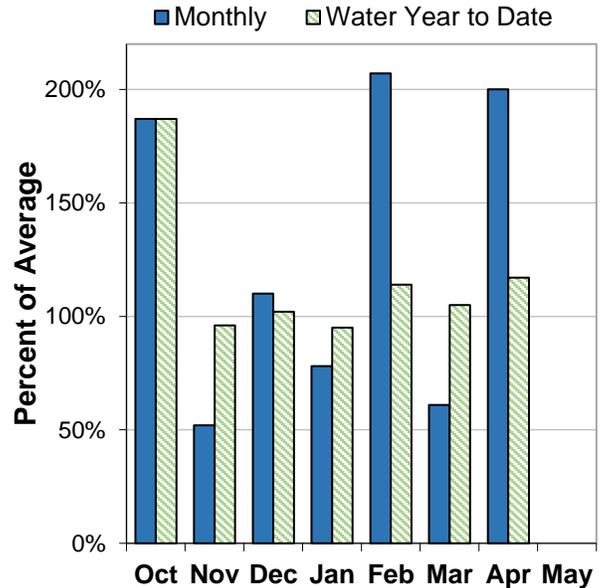
# Umatilla, Walla Walla and Willow Basins

May 1, 2019

### Mountain Snowpack



### Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 153% of normal. In general, SNOTEL sites in the basin reached 100% to 180% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 200% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 117% of average. Out of 41 years of measurements, Bowman Springs SNOTEL set a new record for highest October-April precipitation (28.5 inches, 145% of normal). Four long-term SNOTEL sites (with over 38 years of measurement) - High Ridge, Bowman Springs, Emigrant Springs, and Touchet - set new records for highest April precipitation.

### RESERVOIR

Reservoir storage across the basin is currently above average. As of May 1, storage at major reservoirs in the basin ranges from 107% of average at Willow Creek Reservoir to 121% of average at McKay Reservoir.

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 114% to 231% of average. Almost every gaged stream or river in the basin measured at or very near the record high flow for April, including these new records: McKay Ck near Pilot Rock (436% of avg, 93 yrs of record), Butter Ck near Pine City (455% of avg, 94 yrs of record), and Willow Ck at Heppner (752% of avg, 68 yrs of record). Water managers in the basin should expect above normal to well above normal streamflows this summer.

## Umatilla, Walla Walla And Willow Basins Summary for May 1, 2019

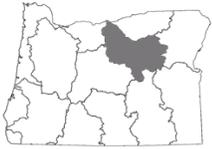
<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
SF Walla Walla R nr Milton-Freewater	MAY-JUL	34	39	43	116%	47	52	37
	MAY-SEP	46	52	56	114%	60	66	49
Umatilla R ab Meacham nr Gibbon	MAY-JUL	34	48	57	136%	67	81	42
	MAY-SEP	40	53	63	131%	72	86	48
Umatilla R at Pendleton	MAY-JUL	57	87	108	137%	129	159	79
	MAY-SEP	63	94	115	137%	136	167	84
McKay Ck nr Pilot Rock	MAY-JUL	10.5	19.3	27	191%	36	51	14.1
	MAY-SEP	10.8	19.7	27	189%	36	51	14.3
Butter Ck nr Pine City	MAY-JUL	6.3	9.0	11.0	216%	13.3	17.0	5.1
	MAY-SEP	7.2	9.9	12.0	214%	14.2	18.0	5.6
Willow Ck ab Willow Lk nr Heppner	MAY-JUL	2.9	5.0	6.7	163%	8.6	11.9	4.1
	MAY-SEP	3.1	5.2	7.0	163%	9.0	12.4	4.3
Rhea Ck nr Heppner	MAY-JUL	5.2	7.6	9.5	232%	11.5	15.0	4.1
	MAY-SEP	6.0	8.5	10.4	231%	12.5	16.0	4.5

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

<b>Reservoir Storage</b>	<b>Current (KAF)</b>	<b>Last Year (KAF)</b>	<b>Average (KAF)</b>	<b>% of Average</b>	<b>Useable Capacity (KAF)</b>
Cold Springs	34.4	32.3	31.9	108%	38.6
Mckay	64.3	65.5	53.3	121%	71.5
Willow Creek	6.2	6.0	5.8	107%	9.8

<b>Snowpack Summary by Basin</b>	<b>Basin Snowpack % of Median</b>		
	<b># of Sites</b>	<b>Current Yr</b>	<b>Last Yr</b>
Umatilla Basin	5	190%	80%
Walla Walla Basin	7	153%	87%

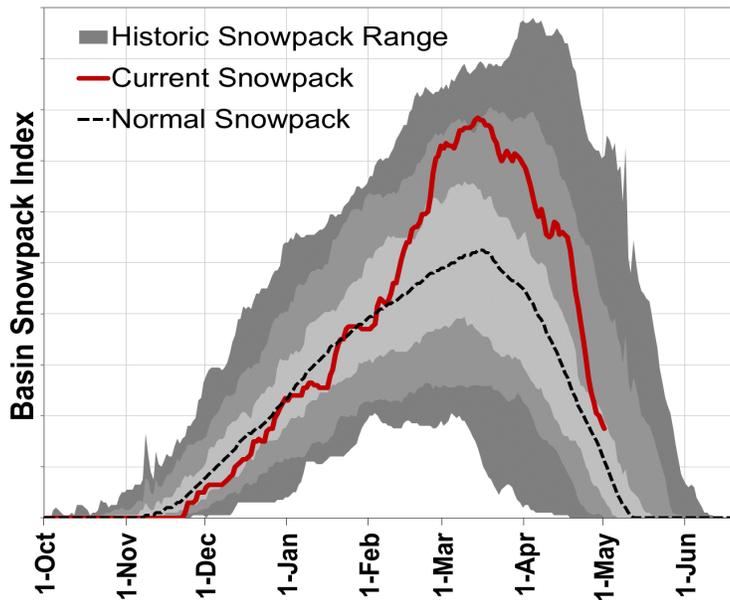
<b>Basin Snowpack Measurement Sites</b>	<b>Elevation (ft)</b>	<b>Date Measured</b>	<b>Snow Depth</b>	<b>Snow Water Equivalent (in)</b>			
				<b>Current SWE</b>	<b>Last Yr SWE</b>	<b>Median</b>	<b>% of Median</b>
Arbuckle Mtn SNOTEL	5770	1-May	30	14.9	0.0	11.0	135%
Spruce Springs SNOTEL	5700	1-May	15	6.4	2.2	5.1	125%
Milk Shakes SNOTEL	5580	1-May	87	39.1	38.3		
Touchet SNOTEL	5530	1-May	55	25.5	20.4	21.8	117%
Madison Butte SNOTEL	5150	1-May	0	0.0	0.0	0.0	
Lucky Strike SNOTEL	4970	1-May	0	0.0	0.0	0.0	
High Ridge SNOTEL	4920	1-May	51	26.8	17.5	11.0	244%
Bowman Springs SNOTEL	4530	1-May	0	0.0	0.0	0.0	
Emigrant Springs SNOTEL	3800	1-May	0	0.0	0.0	0.0	



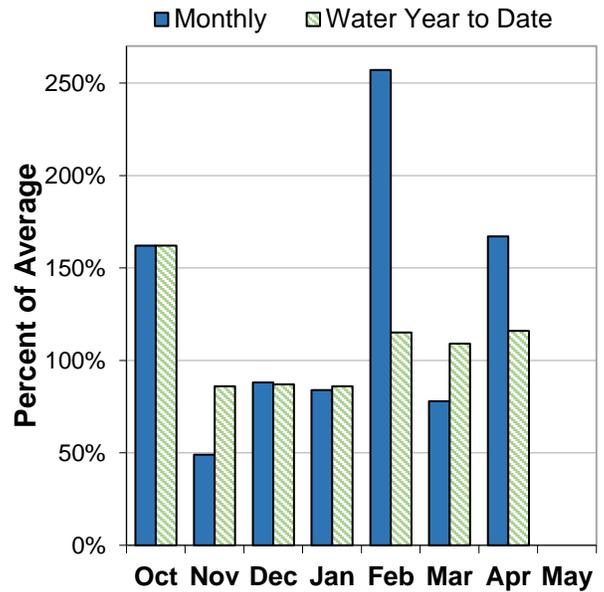
# John Day Basin

May 1, 2019

## Mountain Snowpack



## Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 161% of normal. In general, SNOTEL sites in the basin reached 120% to 150% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 167% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 116% of average. Three long-term monitoring sites set new records for highest April precipitation: Mitchell 2 E (23 years of record), Madison Butte SNOTEL (39 years of record), and Arbuckle Mtn SNOTEL (41 years of record).

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 103% to 143% of average. Almost every gaged stream or river in the basin measured at or very near the record high flow for April, including these new records: John Day River at McDonald Ferry (271% of normal, 115 years of record), NF John Day River at Monument (235% of normal, 95 years of record), and Camas Creek near Ukiah (269% of normal, 93 years of record). Water managers in the basin should expect near normal to well above normal streamflows this summer.

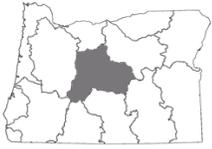
## John Day Basin Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
Strawberry Ck nr Prairie City	MAY-JUL	5.9	7.2	8.1	111%	9.1	10.4	7.3
	MAY-SEP	6.6	7.9	8.9	113%	9.8	11.2	7.9
Mountain Ck nr Mitchell	MAY-JUL	1.47	2.2	2.9	104%	3.5	4.7	2.8
	MAY-SEP	1.56	2.3	3.0	103%	3.7	4.8	2.9
Camas Ck nr Ukiah	MAY-JUL	12.5	20	25	143%	31	38	17.5
	MAY-SEP	13.4	21	26	143%	31	39	18.2
MF John Day R at Ritter	MAY-JUL	51	69	81	108%	93	111	75
	MAY-SEP	55	74	86	108%	98	117	80
NF John Day R at Monument	MAY-JUL	300	380	435	123%	495	575	355
	MAY-SEP	315	400	455	121%	515	595	375

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

<b>Snowpack Summary by Basin</b>	<b>Basin Snowpack % of Median</b>		
	<b># of Sites</b>	<b>Current Yr</b>	<b>Last Yr</b>
Lower John Day Basin	3	307%	0%
North Fork John Day Basin	8	139%	51%
Upper John Day Basin	5	148%	2%

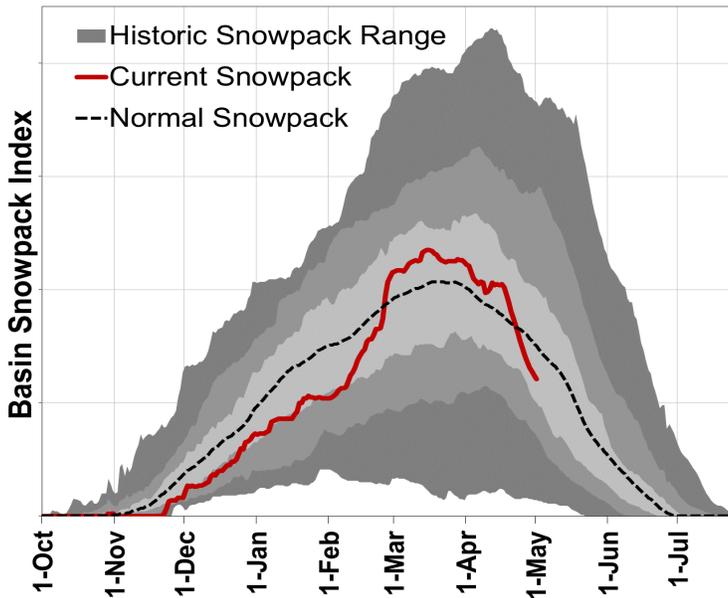
<b>Basin Snowpack Measurement Sites</b>	<b>Elevation (ft)</b>	<b>Date Measured</b>	<b>Snow Depth</b>	<b>Snow Water Equivalent (in)</b>			
				<b>Current SWE</b>	<b>Last Yr SWE</b>	<b>Median</b>	<b>% of Median</b>
Anthony Lake (Rev) Snow Course	7160	30-Apr	60	32.0	22.8	26.9	119%
Snow Mountain SNOTEL	6230	1-May	5.8	0.2	4.2	138%	
Blue Mountain Spring SNOTEL	5870	1-May	13	6.5	0.0	5.7	114%
Bourne SNOTEL	5850	1-May	20	9.5	0.0	4.7	202%
Derr. SNOTEL	5850	1-May	11	4.6	0.0	1.5	307%
Barney Creek (New) Snow Course	5830	1-May	7	3.3			
Arbuckle Mtn SNOTEL	5770	1-May	30	14.9	0.0	11.0	135%
Ochoco Meadows SNOTEL	5430	1-May	0	0.0	0.0	0.0	
Gold Center SNOTEL	5410	1-May	0	0.0	0.0	0.0	
Starr Ridge SNOTEL	5250	1-May	0	0.0	0.0	0.0	
Lake Creek R.S. SNOTEL	5240	1-May	0	0.0	0.0	0.0	
Madison Butte SNOTEL	5150	1-May	0	0.0	0.0	0.0	
Tipton SNOTEL	5150	1-May	11	5.5	0.0	2.0	275%
Lucky Strike SNOTEL	4970	1-May	0	0.0	0.0	0.0	
County Line SNOTEL	4830	1-May	0	0.0	0.0	0.0	
Marks Creek Snow Course	4580	30-Apr	0	0.0		0.0	



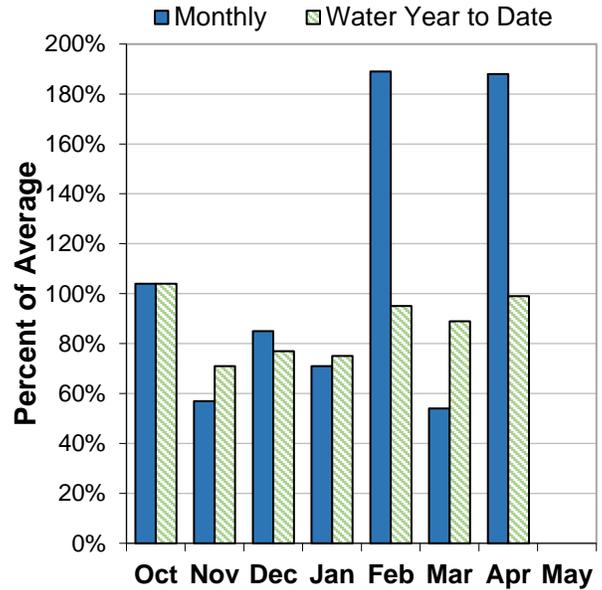
# Upper Deschutes and Crooked Basins

May 1, 2019

### Mountain Snowpack



### Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 85% of normal. In general, SNOTEL sites in the basin reached 90% to 130% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 188% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 99% of average. Three long-term monitoring sites set new records for highest April precipitation: Wickiup Dam (79 years of record), Summit Lake SNOTEL (39 years of record), and New Crescent Lake SNOTEL (39 years of record).

### RESERVOIR

As of May 1, storage at major reservoirs in the basin ranges from 73% of average at Wickiup Reservoir to 124% of average at Crescent Lake.

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 55% to 103% of average. Measured for 107 years, Whychus Creek near Sisters set a new record high for April streamflow at 209% of normal. Despite the high April flows in some areas, water managers in the basin should expect well below normal to near normal streamflows this summer.

## Upper Deschutes And Crooked Basins Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
Deschutes R bl Snow Ck	MAY-JUL	12.4	15.9	18.3	76%	21	24	24
	MAY-SEP	25	31	35	74%	39	45	47
Crane Prairie Reservoir Inflow <sup>2</sup>	MAY-JUL	24	30	34	74%	38	44	46
	MAY-SEP	40	51	58	75%	65	76	77
Crescent Lake Inflow <sup>2</sup>	MAY-JUL	4.3	6.6	8.2	68%	9.8	12.1	12.0
	MAY-SEP	3.0	5.9	7.9	55%	9.9	12.9	14.4
Little Deschutes R nr La Pine <sup>2</sup>	MAY-JUL	15.9	27	35	78%	43	54	45
	MAY-SEP	16.4	29	38	75%	47	60	51
Deschutes R at Benham Falls <sup>2</sup>	MAY-JUL	192	210	220	88%	230	250	250
	MAY-SEP	325	350	365	88%	380	405	415
Wychus Ck nr Sisters	MAY-JUL	21	23	25	83%	27	29	30
	MAY-SEP	29	32	34	81%	36	39	42
Prineville Reservoir Inflow <sup>2</sup>	MAY-JUL	15.5	27	36	92%	47	65	39
	MAY-SEP	14.1	26	36	92%	48	68	39
Ochoco Reservoir Inflow <sup>2</sup>	MAY-JUL	3.8	7.1	10.0	104%	13.3	19.1	9.6
	MAY-SEP	3.3	6.6	9.4	103%	12.7	18.5	9.1

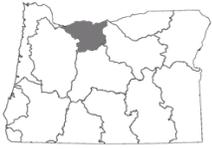
\* 90%, 70%, 50%, 30% & 10% exceedance probabilities are the chance that observed streamflow volume will exceed the forecasted volume  
 2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

<b>Reservoir Storage</b>	<b>Current (KAF)</b>	<b>Last Year (KAF)</b>	<b>Average (KAF)</b>	<b>% of Average</b>	<b>Useable Capacity (KAF)</b>
Crane Prairie	46.9	48.2	44.1	106%	55.3
Crescent Lake	62.6	79.5	50.5	124%	86.9
Ochoco	37.3	29.8	34.5	108%	44.2
Prineville	148.7	120.5	142.9	104%	148.6
Wickiup	134.9	183.4	184.5	73%	200.0

<b>Snowpack Summary by Basin</b>	<b>Basin Snowpack % of Median</b>		
	<b># of Sites</b>	<b>Current Yr</b>	<b>Last Yr</b>
Little Deschutes Basin	4	96%	77%
Upper Crooked Basin	2	307%	0%
Upper Deschutes Basin	9	82%	62%

## Upper Deschutes And Crooked Basins Summary for May 1, 2019

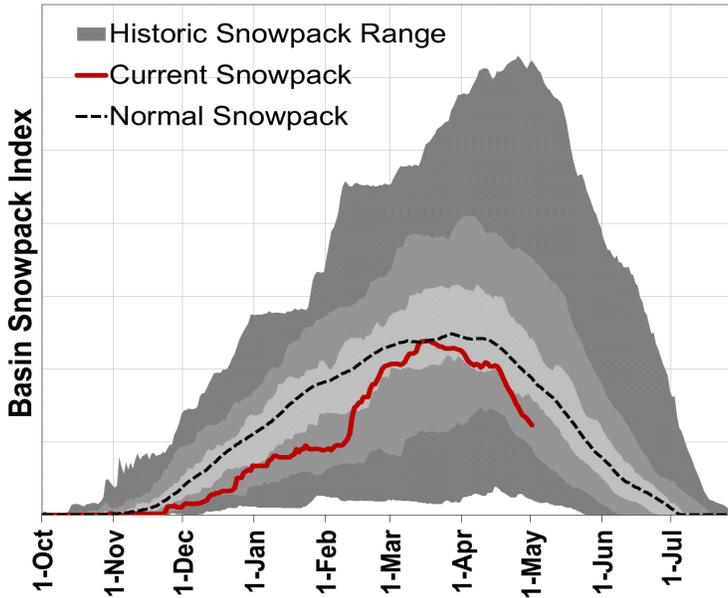
Basin Snowpack Measurement Sites	Elevation (ft)	Date Measured	Snow Depth	Snow Water Equivalent (in)			
				Current SWE	Last Yr SWE	Median	% of Median
Snow Mountain SNOTEL	6230	1-May		5.8	0.2	4.2	138%
Derr. SNOTEL	5850	1-May	11	4.6	0.0	1.5	307%
Three Creeks Meadow SNOTEL	5690	1-May	10	4.1	0.0	13.4	31%
Summit Lake SNOTEL	5610	1-May	82	42.3	35.1	40.8	104%
Bald Peter Snow Course	5600	2-May	35	17.0		28.6	59%
Irish Taylor SNOTEL	5540	1-May	70	28.4	22.6	39.8	71%
Ochoco Meadows SNOTEL	5430	1-May	0	0.0	0.0	0.0	
Racing Creek Snow Course	5160	2-May	21	10.0		5.0	200%
Cascade Summit SNOTEL	5100	1-May	50	20.6	15.7	24.9	83%
Roaring River SNOTEL	4950	1-May	36	18.7	13.5	20.9	89%
New Crescent Lake SNOTEL	4910	1-May	0	0.0	0.0	0.0	
Chemult Alternate SNOTEL	4850	1-May	0	0.0	0.0	0.0	
Hogg Pass SNOTEL	4790	1-May	20	8.0	4.8	19.3	41%
McKenzie SNOTEL	4770	1-May	53	25.0	23.9	35.1	71%
Marks Creek Snow Course	4580	30-Apr	0	0.0		0.0	
Salt Creek Falls SNOTEL	4220	1-May	22	12.2	3.2	10.1	121%
Santiam Jct. SNOTEL	3740	1-May	0	0.0	0.0	0.0	



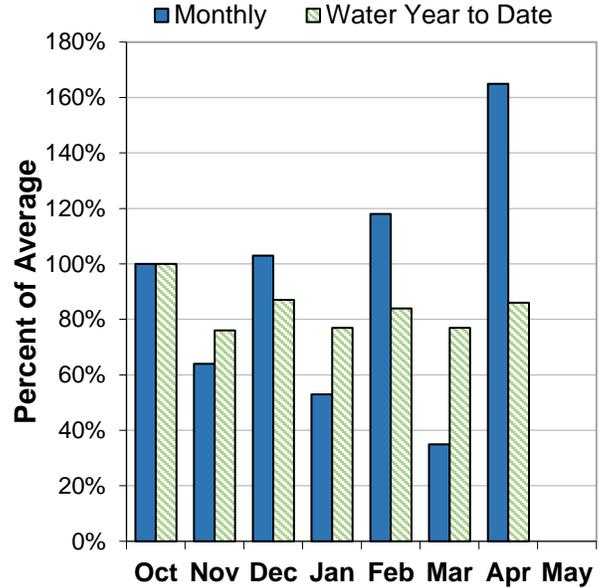
# Hood, Sandy and Lower Deschutes Basins

May 1, 2019

### Mountain Snowpack



### Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 66% of normal. In general, SNOTEL sites in the basin reached 70% to 110% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 165% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 86% of average. Out of 39 years of measurements, Clear Lake SNOTEL set a new record for highest April precipitation (6.6 inches, 206% of normal).

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 77% to 102% of average. Two long-term stream gage stations in the basin set new records for highest April streamflows: Warm Springs River near Kahneeta (47 years of record, 222% of normal) and Sandy River near Marmot (106 years of record, 190% of normal). Despite the high April flows in some areas, water managers in the basin should expect well below normal to near normal streamflows this summer.

## Hood, Sandy And Lower Deschutes Basins Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
WF Hood R nr Dee	MAY-JUL	35	49	59	76%	68	82	78
	MAY-SEP	49	64	75	78%	85	100	96
Hood R at Tucker Bridge	MAY-JUL	79	99	113	75%	127	146	151
	MAY-SEP	109	131	147	77%	162	184	190
Sandy R nr Marmot	MAY-JUL	163	191	210	100%	230	255	210
	MAY-SEP	205	240	260	102%	280	315	255

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

<b>Reservoir Storage</b>	<b>Current (KAF)</b>	<b>Last Year (KAF)</b>	<b>Average (KAF)</b>	<b>% of Average</b>	<b>Useable Capacity (KAF)</b>
Clear Lake	4.3	5.2	5.4	80%	13.1

<b>Snowpack Summary by Basin</b>	<b>Basin Snowpack % of Median</b>		
	<b># of Sites</b>	<b>Current Yr</b>	<b>Last Yr</b>
Lower Columbia - Sandy Basin	7	66%	102%
Lower Deschutes Basin	4	63%	82%
Middle Columbia - Hood Basin	6	70%	102%

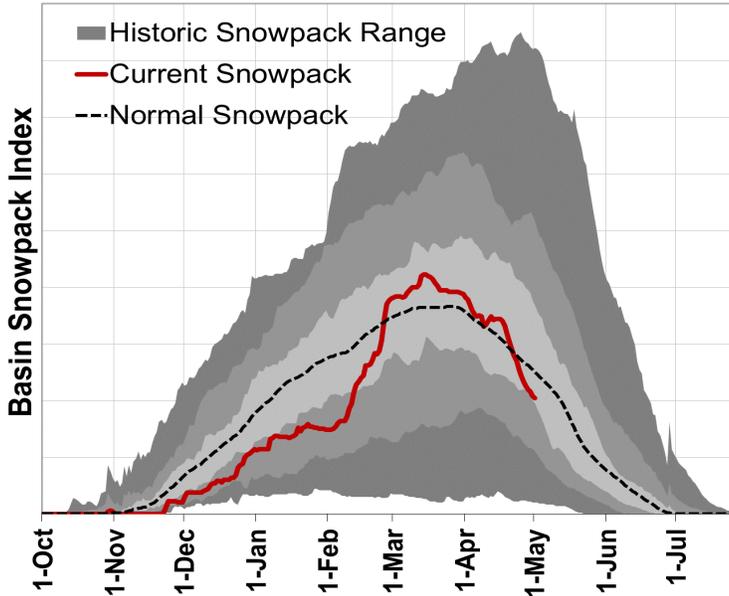
<b>Basin Snowpack Measurement Sites</b>	<b>Elevation (ft)</b>	<b>Date Measured</b>	<b>Snow Depth</b>	<b>Snow Water Equivalent (in)</b>			
				<b>Current SWE</b>	<b>Last Yr SWE</b>	<b>Median</b>	<b>% of Median</b>
Bald Peter Snow Course	5600	2-May	35	17.0		28.6	59%
Mt Hood Test Site SNOTEL	5370	1-May	91	42.7	47.8	62.0	69%
Racing Creek Snow Course	5160	2-May	21	10.0		5.0	200%
Red Hill SNOTEL	4410	1-May	59	29.5	41.7	39.8	74%
Surprise Lakes SNOTEL	4290	1-May	62	30.3	44.0	42.6	71%
Beaver Creek #2 Snow Course	4220	1-May	0	0.0		0.3	0%
Beaver Creek #1 Snow Course	4210	1-May	15	6.0		7.6	79%
Mud Ridge SNOTEL	4070	1-May	17	6.5	19.3	17.8	37%
Clear Lake SNOTEL	3810	1-May	4	1.8	0.0	1.6	113%
Blazed Alder SNOTEL	3650	1-May	25	11.3	27.0	20.4	55%
Clackamas Lake SNOTEL	3400	1-May	0	0.0	0.0	0.0	
Greenpoint SNOTEL	3310	1-May	1	0.6	0.0	1.2	50%
North Fork SNOTEL	3060	1-May	13	6.2	16.0	7.3	85%
South Fork Bull Run SNOTEL	2690	1-May	0	0.0	0.0	0.0	



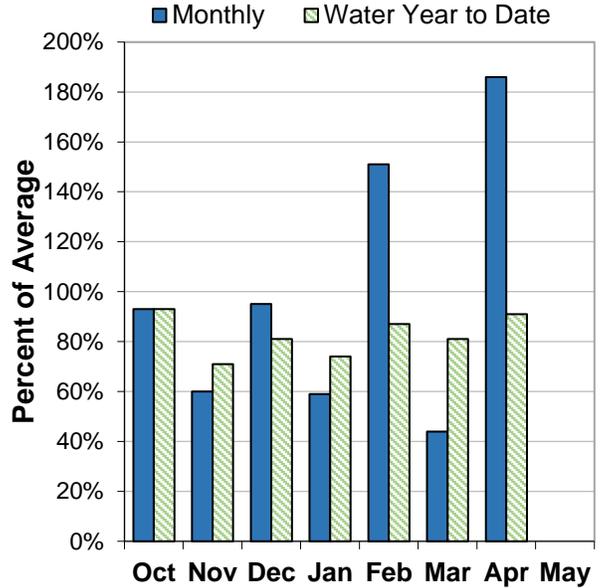
# Willamette Basin

May 1, 2019

## Mountain Snowpack



## Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 85% of normal. In general, SNOTEL sites in the basin reached 90% to 130% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 186% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 91% of average. Thirteen out of 27 long-term monitoring sites in the basin set new records for April precipitation, including 4 weather stations that have been measured for over 74 years: Cottage Grove Dam, Oakridge Fish Hatchery, Mc Kenzie Bridge Ranger Station, and Leaburg 1 SW.

### RESERVOIR

As of May 1, storage at major reservoirs in the basin ranges from 96% of average at Dorena Reservoir to 172% of average at Foster Reservoir.

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 83% to 99% of average. Almost every gaged stream or river in the basin measured at or very near the record high flow for April, including these new records: Willamette River at Salem (237% of normal, 99 years of record), Clackamas River at Estacada (200% of normal, 112 years of record), North Santiam River at Mehama (225% of normal, 102 years of record), and McKenzie River near Vida (205% of normal, 95 years of record). Despite the record high April flows, water managers in the basin should expect below normal to near normal streamflows this summer.

## Willamette Basin Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
Hills Creek Reservoir Inflow <sup>1,2</sup>	MAY-JUN	59	106	127	84%	149	196	152
	MAY-SEP	116	168	192	87%	215	270	220
Lookout Point Reservoir Inflow <sup>1,2</sup>	MAY-JUN	198	320	375	94%	435	555	400
	MAY-SEP	345	485	545	96%	610	750	570
McKenzie R bl Trail Bridge	MAY-JUN	94	111	119	87%	128	147	137
	MAY-SEP	200	230	245	91%	255	290	270
Cougar Lake Inflow <sup>1,2</sup>	MAY-JUN	52	79	94	84%	109	147	112
	MAY-SEP	89	122	138	86%	156	198	160
Blue Lake Inflow <sup>1,2</sup>	MAY-JUN	12.8	26	33	80%	42	64	41
	MAY-SEP	16.4	31	39	83%	48	72	47
McKenzie R nr Vida <sup>1,2</sup>	MAY-JUN	290	395	445	87%	495	625	510
	MAY-SEP	580	720	785	90%	855	1020	870
Detroit Lake Inflow <sup>1,2</sup>	MAY-JUN	134	210	245	86%	280	360	285
	MAY-SEP	250	340	385	90%	425	515	430
North Santiam R at Mehama <sup>1,2</sup>	MAY-JUN	162	280	335	85%	390	505	395
	MAY-SEP	280	425	490	86%	560	705	570
Green Peter Lake Inflow <sup>1,2</sup>	MAY-JUN	60	99	120	83%	143	200	145
	MAY-SEP	83	128	152	86%	178	240	177
Foster Lake Inflow <sup>1,2</sup>	MAY-JUN	114	189	230	84%	270	380	275
	MAY-SEP	160	245	290	87%	340	460	335
South Santiam R at Waterloo <sup>2</sup>	MAY-JUN	119	198	240	84%	290	410	285
	MAY-SEP	167	260	305	87%	360	485	350
Willamette R at Salem <sup>1,2</sup>	MAY-JUN	980	1560	1880	85%	2220	3070	2200
	MAY-SEP	1590	2300	2660	89%	3050	4000	2980
Oak Grove Fk ab Powerplant	MAY-JUL	60	69	76	95%	83	92	80
	MAY-SEP	93	107	116	97%	125	139	120
Clackamas R ab Three Lynx	MAY-JUL	215	255	280	97%	305	345	290
	MAY-SEP	305	345	375	99%	400	445	380
Clackamas R at Estacada	MAY-JUL	295	355	395	98%	435	495	405
	MAY-SEP	390	455	500	98%	545	610	510

\* 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

## Willamette Basin Summary for May 1, 2019

Reservoir Storage	Current (KAF)	Last Year (KAF)	Average (KAF)	% of Average	Useable Capacity (KAF)
Blue River	76.1	77.8	73.5	103%	82.3
Cottage Grove	26.9	27.8	26.7	101%	31.8
Cougar	163.0	157.6	151.9	107%	174.9
Detroit	420.8	423.6	408.5	103%	426.8
Dorena	58.8	60.5	61.5	96%	72.1
Fall Creek	107.0	92.3	108.0	99%	116.0
Fern Ridge	96.2	97.2	89.1	108%	97.3
Foster	42.3	26.8	24.6	172%	46.2
Green Peter	379.0	400.4	378.4	100%	402.8
Hills Creek	261.8	230.5	247.3	106%	279.2
Lookout Point	405.2	333.4	373.8	108%	433.2
Timothy Lake	60.8	63.0	59.0	103%	63.6
Henry Hagg Lake	53.3	53.3	52.6	101%	53.3

Snowpack Summary by Basin	Basin Snowpack % of Median		
	# of Sites	Current Yr	Last Yr
Clackamas Basin	9	66%	101%
McKenzie Basin	13	85%	60%
Middle Fork Willamette Basin	7	92%	64%
North Santiam Basin	4	99%	139%
South Santiam Basin	4	99%	139%

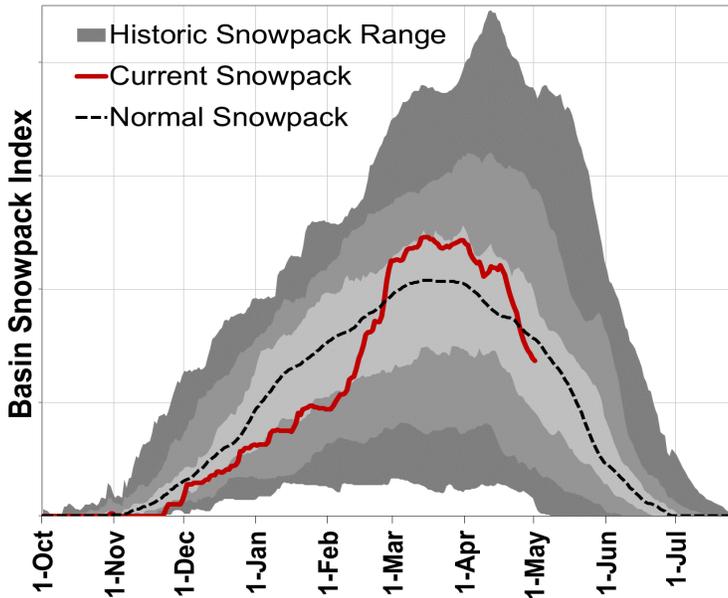
Basin Snowpack Measurement Sites	Elevation (ft)	Date Measured	Snow Depth	Snow Water Equivalent (in)			
				Current SWE	Last Yr SWE	Median	% of Median
Summit Lake SNOTEL	5610	1-May	82	42.3	35.1	40.8	104%
Irish Taylor SNOTEL	5540	1-May	70	28.4	22.6	39.8	71%
Cascade Summit SNOTEL	5100	1-May	50	20.6	15.7	24.9	83%
Roaring River SNOTEL	4950	1-May	36	18.7	13.5	20.9	89%
Holland Meadows SNOTEL	4930	1-May	27	13.8	4.6	10.7	129%
McKenzie SNOTEL	4770	1-May	53	25.0	23.9	35.1	71%
Bear Grass SNOTEL	4720	1-May	75	40.7	42.6		
Beaver Creek #2 Snow Course	4220	1-May	0	0.0		0.3	0%
Salt Creek Falls SNOTEL	4220	1-May	22	12.2	3.2	10.1	121%
Beaver Creek #1 Snow Course	4210	1-May	15	6.0		7.6	79%
Mud Ridge SNOTEL	4070	1-May	17	6.5	19.3	17.8	37%
Little Meadows SNOTEL	4020	1-May	32	16.1	22.6	16.0	101%
Clear Lake SNOTEL	3810	1-May	4	1.8	0.0	1.6	113%
Santiam Jct. SNOTEL	3740	1-May	0	0.0	0.0	0.0	
Daly Lake SNOTEL	3690	1-May	0	0.0	0.0	0.3	0%
Jump Off Joe SNOTEL	3520	1-May	0	0.0	0.0	0.0	
Peavine Ridge SNOTEL	3420	1-May	0	0.0	0.0	0.0	
Clackamas Lake SNOTEL	3400	1-May	0	0.0	0.0	0.0	
Smith Ridge SNOTEL	3270	1-May	0	0.0	0.0		
Saddle Mountain SNOTEL	3110	1-May	0	0.0	0.0		
Railroad Overpass SNOTEL	2680	1-May	0	0.0	0.0	0.0	
Marion Forks SNOTEL	2590	1-May	0	0.0	0.0	0.0	
Seine Creek SNOTEL	2060	1-May	0	0.0	0.0	0.0	
Miller Woods SNOTEL	420	1-May	0	0.0	0.0		



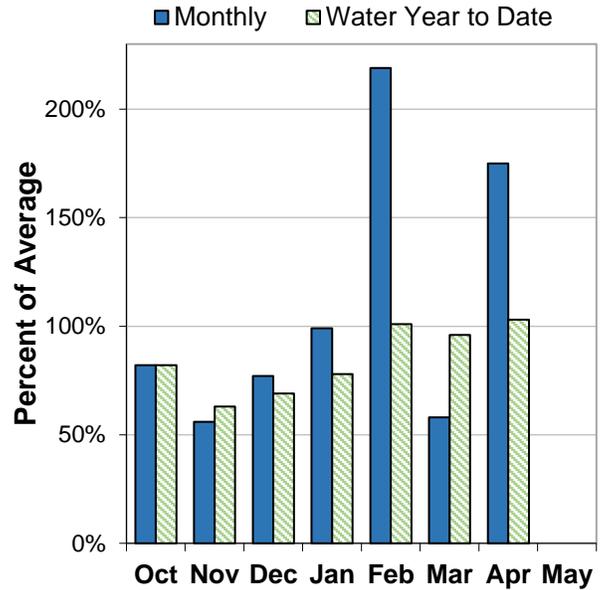
# Rogue and Umpqua Basins

May 1, 2019

## Mountain Snowpack



## Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 90% of normal. In general, SNOTEL sites in the basin reached 90% to 120% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 175% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 103% of average. Three long-term monitoring sites set new records for highest April precipitation: Riddle 2 NNE (106 years of record), Diamond Lake SNOTEL (39 years of record), and Toketee Falls (67 years of record).

### RESERVOIR

As of May 1, storage at major reservoirs in the basin ranges from 64% of average at Hyatt Prairie Reservoir to 110% of average at Applegate Reservoir.

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 92% to 108% of average. Almost every gaged stream or river in the basin measured at or very near the record high flow for April, including these new records: Umpqua River near Elkton (235% of normal, 114 years of record), South Umpqua River near Brockway (248% of normal, 88 years of record), Rogue River near Agness (253% of normal, 59 years of record), and Applegate Lake Inflow (242% of normal, 81 years of record). Water managers in the basin should expect slightly below normal to slightly above normal streamflows this summer.

## Rogue And Umpqua Basins Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
South Umpqua R at Tiller	MAY-JUL	56	88	110	104%	132	164	106
	MAY-SEP	71	104	122	106%	148	181	115
Cow Ck ab Galesville Reservoir	MAY-JUL	3.6	6.2	8.0	107%	9.8	12.4	7.5
	MAY-SEP	5.2	8.0	9.4	108%	11.6	14.4	8.7
South Umpqua R nr Brockway	MAY-JUL	225	260	200	103%	305	340	194
	MAY-SEP	250	285	225	105%	335	370	215
North Umpqua R at Winchester	MAY-JUL	295	395	465	98%	530	630	475
	MAY-SEP	405	510	580	98%	650	755	590
Lost Creek Lk Inflow <sup>2</sup>	MAY-JUL	275	320	345	93%	375	420	370
	MAY-SEP	390	435	470	95%	505	555	495
Rogue R at Raygold <sup>2</sup>	MAY-JUL	300	370	415	94%	460	530	440
	MAY-SEP	420	495	545	96%	595	670	570
Rogue R at Grants Pass <sup>2</sup>	MAY-JUL	305	375	425	93%	475	550	455
	MAY-SEP	415	490	545	94%	600	675	580
Applegate Lake Inflow <sup>2</sup>	MAY-JUL	38	53	63	91%	73	88	69
	MAY-SEP	44	59	69	92%	80	95	75
Sucker Ck bl Ltl Grayback nr Holland	MAY-JUL	14.4	24	30	91%	37	47	33
	MAY-SEP	17.5	27	34	94%	41	51	36
Illinois R nr Kerby	MAY-JUL	35	67	88	98%	109	141	90
	MAY-SEP	40	72	94	98%	116	148	96

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

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

<b>Reservoir Storage</b>	<b>Current (KAF)</b>	<b>Last Year (KAF)</b>	<b>Average (KAF)</b>	<b>% of Average</b>	<b>Useable Capacity (KAF)</b>
Applegate	68.2	63.3	62.1	110%	75.2
Emigrant Lake	36.9	30.6	36.0	102%	39.0
Fish Lake	4.8	6.3	5.8	83%	7.9
Fourmile Lake	6.7	8.5	8.7	77%	15.6
Howard Prairie	32.2	39.2	46.7	69%	62.1
Hyatt Prairie	8.5	7.1	13.2	64%	16.2
Lost Creek	291.0	299.4	301.1	97%	315.0

## Rogue And Umpqua Basins Summary for May 1, 2019

Snowpack Summary by Basin	Basin Snowpack % of Median		
	# of Sites	Current Yr	Last Yr
Applegate Basin	5	93%	30%
Middle Rogue Basin	7	92%	26%
North Umpqua Basin	7	104%	84%
South Umpqua Basin	10	161%	54%
Upper Rogue Basin	11	84%	51%

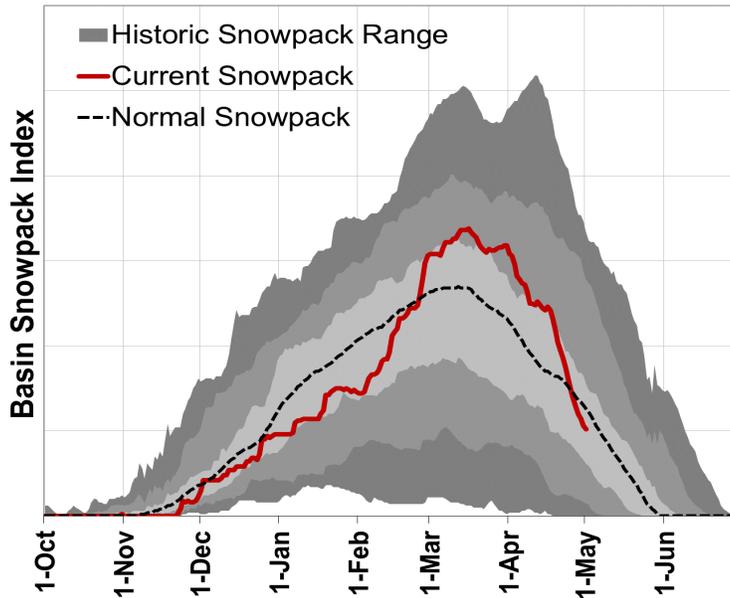
Basin Snowpack Measurement Sites	Elevation (ft)	Date Measured	Snow Depth	Snow Water Equivalent (in)			
				Current SWE	Last Yr SWE	Median	% of Median
Park H.Q. Rev Snow Course	6570	1-May	110	57.0	44.8	61.0	93%
Caliban (Alt.) Snow Course	6500	30-Apr	66	30.2	11.0	29.2	103%
Mt. Ashland Switchback Snow Course	6430	30-Apr	59	27.7	8.0	30.6	91%
Ski Bowl Road Snow Course	6070	30-Apr	31	15.1	2.2	21.5	70%
Big Red Mountain SNOTEL	6050	1-May	48	24.2	10.1	23.5	103%
Annie Springs SNOTEL	6010	1-May	72	34.1	23.2	43.6	78%
Fourmile Lake SNOTEL	5970	1-May	41	19.0	9.1	22.5	84%
Cold Springs Camp SNOTEL	5940	1-May	27	11.6	3.0	21.1	55%
Sevenmile Marsh SNOTEL	5700	1-May	49	24.3	11.0	24.3	100%
Summit Lake SNOTEL	5610	1-May	82	42.3	35.1	40.8	104%
Billie Creek Divide SNOTEL	5280	1-May	17	8.5	1.7	10.8	79%
Diamond Lake SNOTEL	5280	1-May	1	0.1	0.0	0.0	
Bigelow Camp SNOTEL	5130	1-May	0	0.0	0.0	0.0	
Beaver Dam Creek Snow Course	5120	1-May	0	0.0	0.0	0.0	
King Mountain 1 Snow Course	4760	30-Apr	3	1.5	0.0	0.0	
Deadwood Junction Snow Course	4660	1-May	0	0.0	0.0	0.0	
Fish Lk. SNOTEL	4660	1-May	0	0.0	0.0	0.0	
Howard Prairie SNOTEL	4580	1-May	0	0.0	0.0	0.0	
Howard Prairie Snow Course	4580	1-May	0	0.0	0.0	0.0	
Red Butte 1 Snow Course	4460	30-Apr	7	2.8	1.5	2.8	100%
King Mountain SNOTEL	4340	1-May	0	0.0	0.0	0.0	
Red Butte 2 Snow Course	4050	30-Apr	0	0.0	0.0	0.0	
Silver Burn Snow Course	3680	1-May	0	0.2	0.0	0.0	
King Mountain 3 Snow Course	3680	30-Apr	0	0.0	0.0	0.0	
Red Butte 3 Snow Course	3500	30-Apr	0	0.0	0.0	0.0	
Tokenetee Airstrip SNOTEL	3240	1-May	0	0.0	0.0	0.0	
King Mountain 4 Snow Course	3050	30-Apr	0	0.0	0.0	0.0	
Red Butte 4 Snow Course	3000	30-Apr	0	0.0	0.0	0.0	



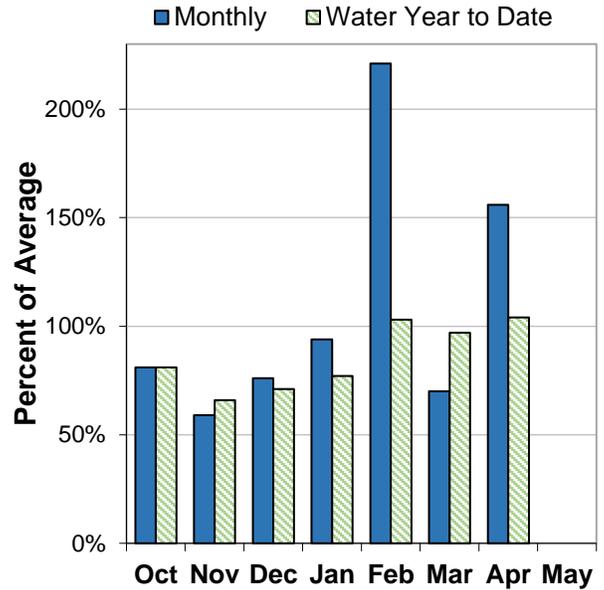
# Klamath Basin

May 1, 2019

## Mountain Snowpack



## Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 84% of normal. In general, SNOTEL sites in the basin reached 100% to 140% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 156% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 104% of average. Four long-term monitoring sites set new records for highest April precipitation: Chiloquin 7 NW, Chemult SNOTEL, Cold Springs SNOTEL (all with over 37 years of measurements) and Annie Springs SNOTEL (measured since 2000).

### RESERVOIR

Reservoir storage across the basin is currently above average. As of May 1, storage at major reservoirs in the basin ranges from 111% of average at Clear Lake to 140% of average at Gerber Reservoir.

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 95% to 122% of average. Water managers in the basin should expect near normal to above normal streamflows this summer.

## Klamath Basin Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
Gerber Reservoir Inflow <sup>2</sup>	MAY-JUL	0.88	3.6	6.6	122%	10.4	17.6	5.4
	MAY-SEP	1.05	4.0	7.1	122%	11.1	18.5	5.8
Sprague R nr Chiloquin	MAY-JUL	79	103	119	101%	135	159	118
	MAY-SEP	101	126	143	101%	160	185	141
Williamson R bl Sprague nr Chiloquin	MAY-JUL	134	161	180	96%	199	225	187
	MAY-SEP	190	220	240	98%	260	290	245
Upper Klamath Lake Inflow <sup>1,2</sup>	MAY-JUL	141	200	225	94%	255	315	240
	MAY-SEP	210	275	305	95%	335	405	320

\* 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

<b>Reservoir Storage</b>	<b>Current (KAF)</b>	<b>Last Year (KAF)</b>	<b>Average (KAF)</b>	<b>% of Average</b>	<b>Useable Capacity (KAF)</b>
Clear Lake	281.5	228.2	254.1	111%	513.3
Gerber	95.3	84.9	68.2	140%	94.3
Upper Klamath Lake	511.4	458.9	448.0	114%	523.7

<b>Snowpack Summary by Basin</b>	<b>Basin Snowpack % of Median</b>		
	<b># of Sites</b>	<b>Current Yr</b>	<b>Last Yr</b>
Lost Basin	3		
Sprague Basin	5	65%	23%
Upper Klamath Lake Basin	8	84%	51%
Williamson River Basin	5	87%	65%

## Klamath Basin Summary for May 1, 2019

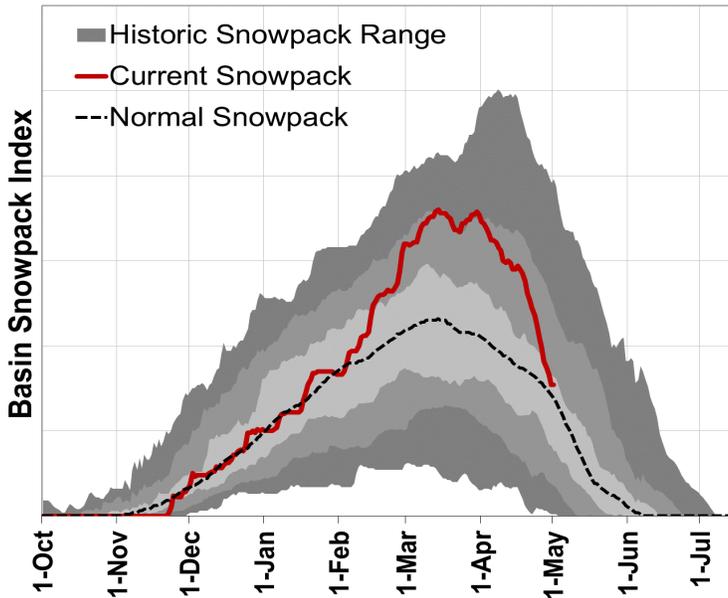
Basin Snowpack Measurement Sites	Elevation (ft)	Date Measured	Snow Depth	Snow Water Equivalent (in)			
				Current SWE	Last Yr SWE	Median	% of Median
Summer Rim SNOTEL	7080	1-May	17	6.0	4.9	11.7	51%
Swan Lake Mtn SNOTEL	6830	1-May	39	20.2	4.6		
Park H.Q. Rev Snow Course	6570	1-May	110	57.0	44.8	61.0	93%
Crazyman Flat SNOTEL	6180	1-May	14	7.5	0.0	4.6	163%
Ski Bowl Road Snow Course	6070	30-Apr	31	15.1	2.2	21.5	70%
Annie Springs SNOTEL	6010	1-May	72	34.1	23.2	43.6	78%
Finley Corrals AM	6000	1-May	0	0.0	0.0	4.6	0%
Fourmile Lake SNOTEL	5970	1-May	41	19.0	9.1	22.5	84%
Cold Springs Camp SNOTEL	5940	1-May	27	11.6	3.0	21.1	55%
Strawberry SNOTEL	5770	1-May	0	0.0	0.0	0.0	
Cox Flat AM	5750	1-May	0	0.0	0.0		
Silver Creek SNOTEL	5740	1-May	0	0.0	0.0	0.0	
Quartz Mountain SNOTEL	5720	1-May	0	0.0	0.0	0.0	
Sevenmile Marsh SNOTEL	5700	1-May	49	24.3	11.0	24.3	100%
State Line SNOTEL	5680	1-May	0	0.0	0.0		
Sun Pass SNOTEL	5400	1-May	13	6.8	0.0		
Billie Creek Divide SNOTEL	5280	1-May	17	8.5	1.7	10.8	79%
Diamond Lake SNOTEL	5280	1-May	1	0.1	0.0	0.0	
Crowder Flat SNOTEL	5170	1-May	0	0.0	0.0	0.0	
Beaver Dam Creek Snow Course	5120	1-May	0	0.0	0.0	0.0	
Taylor Butte SNOTEL	5030	1-May	0	0.0	0.0	0.0	
Gerber Reservoir SNOTEL	4890	1-May	0	0.0	0.0	0.0	
Chemult Alternate SNOTEL	4850	1-May	0	0.0	0.0	0.0	
Deadwood Junction Snow Course	4660	1-May	0	0.0	0.0	0.0	
Fish Lk. SNOTEL	4660	1-May	0	0.0	0.0	0.0	
Howard Prairie SNOTEL	4580	1-May	0	0.0	0.0		
Howard Prairie Snow Course	4580	1-May	0	0.0	0.0	0.0	



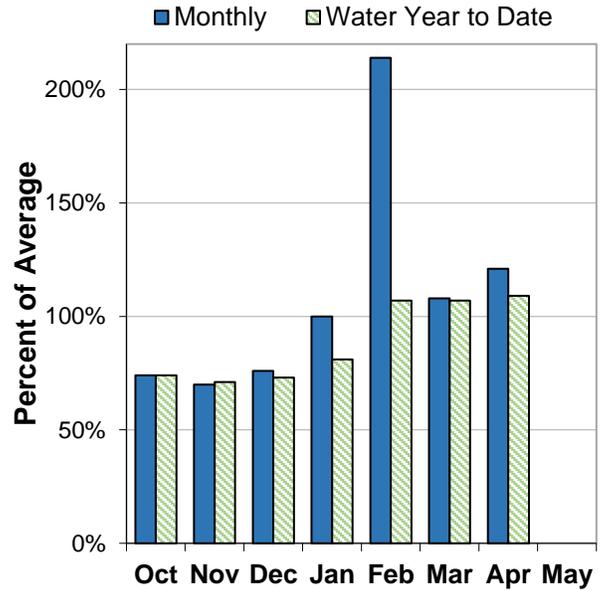
# Lake County and Goose Lake Basins

May 1, 2019

## Mountain Snowpack



## Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 111% of normal. In general, SNOTEL sites in the basin reached 120% to 160% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 121% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 109% of average.

### RESERVOIR

Reservoir storage across the basin is currently well above average. As of May 1, storage at major reservoirs in the basin ranges from 124% of average at Cottonwood Reservoir to 142% of average at Drews Reservoir.

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 133% to 140% of average. Two long-term stream gage stations in the basin set new records for highest April streamflows: Chewaucan River near Paisley (95 years of record, 235% of normal) and Deep Creek above Adel (88 years of record, 319% of normal). Water managers in the basin should expect well above normal streamflows this summer.

## Lake County And Goose Lake Basins Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
Twentymile Ck nr Adel	MAY-JUL	7.7	12.1	15.0	139%	17.9	22	10.8
	MAY-SEP	8.3	12.7	15.7	140%	18.7	23	11.2
Deep Ck ab Adel	MAY-JUL	36	47	55	134%	62	73	41
	MAY-SEP	38	50	57	133%	65	76	43
Honey Ck nr Plush	MAY-JUL	6.5	10.3	12.8	139%	15.3	19.0	9.2
	MAY-SEP	6.6	10.4	13.0	140%	15.5	19.3	9.3
Chewaucan R nr Paisley	MAY-JUL	48	59	66	132%	73	84	50
	MAY-SEP	54	65	72	133%	79	90	54

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

<b>Reservoir Storage</b>	<b>Current (KAF)</b>	<b>Last Year (KAF)</b>	<b>Average (KAF)</b>	<b>% of Average</b>	<b>Useable Capacity (KAF)</b>
Cottonwood	8.8	5.5	7.1	124%	9.3
Drews	65.0	54.4	45.7	142%	63.5

<b>Snowpack Summary by Basin</b>	<b>Basin Snowpack % of Median</b>		
	<b># of Sites</b>	<b>Current Yr</b>	<b>Last Yr</b>
Goose Lake Basin	3	135%	59%
Lake Abert Basin	2	37%	30%
Summer Lake Basin	9	111%	46%
Upper Pit Basin	3	69%	32%

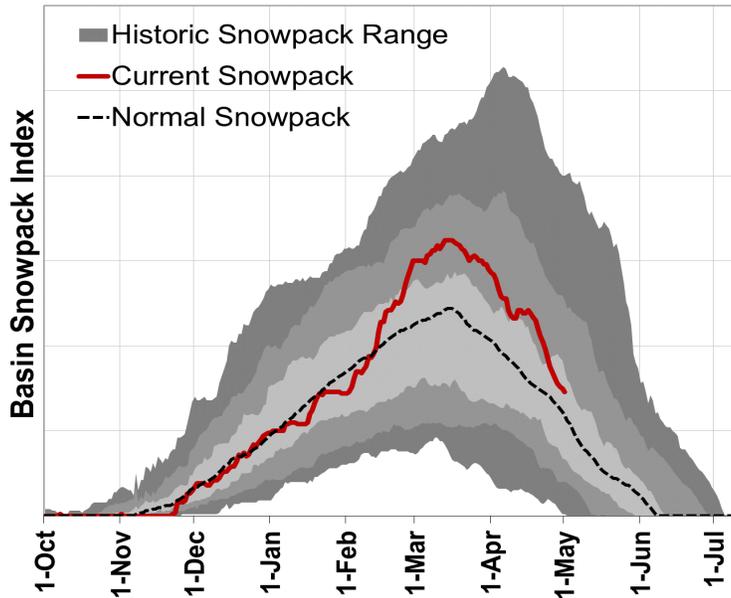
<b>Basin Snowpack Measurement Sites</b>	<b>Elevation (ft)</b>	<b>Date Measured</b>	<b>Snow Depth</b>	<b>Snow Water Equivalent (in)</b>			
				<b>Current SWE</b>	<b>Last Yr SWE</b>	<b>% of Median</b>	<b>% of Median</b>
Dismal Swamp SNOTEL	7360	1-May	76	38.1	21.6	26.0	147%
Summer Rim SNOTEL	7080	1-May	17	6.0	4.9	11.7	51%
Cedar Pass SNOTEL	7030	1-May	19	9.8	3.8	12.9	76%
Patton Meadows AM	6800	1-May	28	12.6	0.5	11.5	110%
Sherman Valley AM	6640	1-May	14	6.6	0.0		
Bear Flat Meadow AM	6580	1-May	11	5.0			
Hart Mountain AM	6430	1-May	0	0.0	0.0		
Rogger Meadow AM	6360	1-May	18	8.5	0.0		
Adin Mtn SNOTEL	6190	1-May	0	0.0	0.8	1.4	0%
Crazyman Flat SNOTEL	6180	1-May	14	7.5	0.0	4.6	163%
Finley Corrals AM	6000	1-May	0	0.0	0.0	4.6	0%
Sheldon SCAN	5860	1-May	0	0.0	0.0	0.0	
Strawberry SNOTEL	5770	1-May	0	0.0	0.0	0.0	
Cox Flat AM	5750	1-May	0	0.0	0.0		
Silver Creek SNOTEL	5740	1-May	0	0.0	0.0	0.0	
State Line SNOTEL	5680	1-May	0	0.0	0.0		
Crowder Flat SNOTEL	5170	1-May	0	0.0	0.0	0.0	



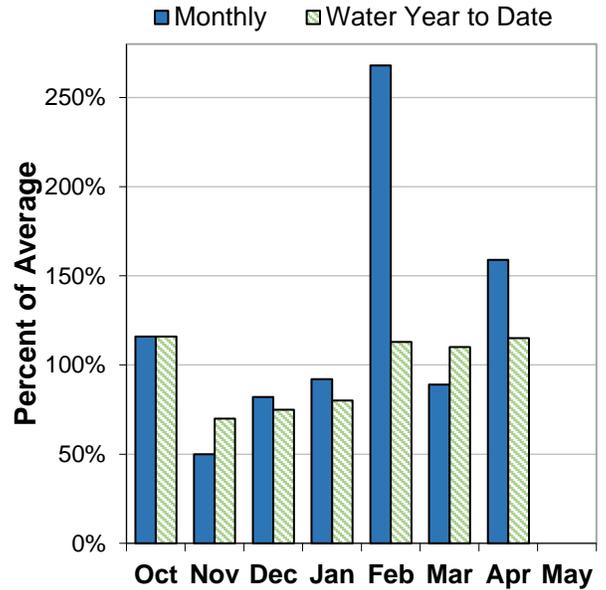
# Harney Basin

May 1, 2019

## Mountain Snowpack



## Basin Precipitation



## Summary of Water Supply Conditions

### SNOWPACK

As of May 1, the basin snowpack was 124% of normal. In general, SNOTEL sites in the basin reached 110% to 150% of normal peak snowpack levels this winter.

### PRECIPITATION

April precipitation was 159% of average. Precipitation since the beginning of the water year (October 1 - May 1) has been 115% of average. Out of 39 years of measurements, the Burns Airport weather station set a new record for highest April precipitation (2.3 inches, 247% of normal).

### STREAMFLOW FORECAST

The May through September streamflow forecasts in the basin range from 119% to 130% of average. Water managers in the basin should expect above normal to well above normal streamflows this summer.

## Harney Basin Summary for May 1, 2019

<b>Forecast Exceedance Probabilities for Risk Assessment *</b>								
<b>Streamflow Forecasts May 1, 2019</b>	<b>Forecast Period</b>	←-----Drier-----Future Conditions-----Wetter-----→						<b>30-Year Average (KAF)</b>
		<b>90% (KAF)</b>	<b>70% (KAF)</b>	<b>50% (KAF)</b>	<b>% Avg</b>	<b>30% (KAF)</b>	<b>10% (KAF)</b>	
Silvies R nr Burns	MAY-JUL	24	44	58	129%	72	93	45
	MAY-SEP	26	47	61	130%	76	97	47
Donner Und Blitzen R nr Frenchglen	MAY-JUL	37	50	58	118%	66	79	49
	MAY-SEP	42	55	64	119%	73	86	54
Trout Ck nr Denio	MAY-JUL	4.0	5.7	6.8	121%	7.9	9.6	5.6
	MAY-SEP	4.6	6.2	7.4	123%	8.5	10.2	6.0

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

<b>Snowpack Summary by Basin</b>	<b>Basin Snowpack % of Median</b>		
	<b># of Sites</b>	<b>Current Yr</b>	<b>Last Yr</b>
Alvord Lake Basin	1	124%	64%
Donner und Blitzen River Basin	2	124%	46%
Silvies River Basin	4	138%	5%
Upper Quinn Basin	3	135%	45%

<b>Basin Snowpack Measurement Sites</b>	<b>Elevation (ft)</b>	<b>Date Measured</b>	<b>Snow Depth</b>	<b>Snow Water Equivalent (in)</b>			
				<b>Current SWE</b>	<b>Last Yr SWE</b>	<b>Median</b>	<b>% of Median</b>
Granite Peak SNOTEL	8543	1-May	57	26.6	8.8	19.5	136%
Trout Creek AM	7890	1-May	27	12.2	2.4		
Fish Creek SNOTEL	7660	1-May	75	33.1	16.9	26.6	124%
Govt Corrals AM	7400	1-May	32	14.4	0.0		
Silvies SNOTEL	6990	1-May	27	12.7	0.0	10.3	123%
Buckskin Lower SNOTEL	6915	1-May	0	0.0	0.0	0.2	0%
V Lake AM	6600	1-May	0	0.0	0.0		
Disaster Peak SNOTEL	6500	1-May	0	0.0	0.0	0.0	
Hart Mountain AM	6430	1-May	0	0.0	0.0		
Snow Mountain SNOTEL	6230	1-May	0	5.8	0.2	4.2	138%
Lamance Creek SNOTEL	6000	1-May	0	0.0	0.0	0.0	
Blue Mountain Spring SNOTEL	5870	1-May	13	6.5	0.0	5.7	114%
Sheldon SCAN	5860	1-May	0	0.0	0.0	0.0	
Call Meadows AM	5380	1-May	0	0.0			
Rock Springs SNOTEL	5290	1-May	0	0.0	0.0	0.0	
Starr Ridge SNOTEL	5250	1-May	0	0.0	0.0	0.0	
Lake Creek R.S. SNOTEL	5240	1-May	0	0.0	0.0	0.0	
Buckskin Lake AM	5190	1-May	0	0.0			

# Recession Forecasts for Oregon

Recession flow forecasts are presented below for key streamflow sites where reliable daily streamflow data are available. The recession flow forecasts use exceedance probabilities in a format similar to the standard water supply forecasts presented in this document. Each forecast provides a range of possible outcomes representing the uncertainty of forecasting models.

The types of forecasts in the table below are:

- 1) Threshold flow -- Date that the daily streamflow rate falls below the given threshold flow
- 2) Peak flow -- Maximum daily flow
- 3) Date of peak flow -- Date of occurrence of maximum daily flow
- 4) Average daily flow on a given date

<b>OWYHEE AND MALHEUR BASINS</b>					
<i>FORECAST POINT</i>	<i>FORECAST THRESHOLD</i>	<i>FORECAST VALUE</i>			<i>LONG-TERM AVERAGE VALUE</i>
		<i>----- CHANCE OF EXCEEDING -----</i>			
		<i>90%</i>	<i>50%</i>	<i>10%</i>	
Owyhee R nr Rome	2000 cfs	Observed May 3rd			<b>May 5</b>
Owyhee R nr Rome	1000 cfs	May 9	May 15	May 21	<b>May 18</b>
Owyhee R nr Rome	500 cfs	May 19	May 30	June 9	<b>June 2</b>

<b>UPPER JOHN DAY BASIN</b>					
<i>FORECAST POINT</i>	<i>FORECAST THRESHOLD</i>	<i>FORECAST VALUE</i>			<i>LONG-TERM AVERAGE VALUE</i>
		<i>----- CHANCE OF EXCEEDING -----</i>			
		<i>90%</i>	<i>50%</i>	<i>10%</i>	
John Day R at Service Creek	Average Daily Flow on Aug. 1st	205	390	575	<b>271</b>

<b>UPPER DESCHUTES AND CROOKED BASINS</b>					
<i>FORECAST POINT</i>	<i>FORECAST THRESHOLD</i>	<i>FORECAST VALUE</i>			<i>LONG-TERM AVERAGE VALUE</i>
		<i>----- CHANCE OF EXCEEDING -----</i>			
		<i>90%</i>	<i>50%</i>	<i>10%</i>	
Crane Prairie Inflow *	Date of Peak	May 10	May 21	June 4	<b>May 25</b>
Crane Prairie Inflow	Peak Flow	270	390	510	<b>403</b>
Crane Prairie Inflow	Average Daily Flow on Oct. 1st	185	220	250	<b>269</b>
Prineville Reservoir Inflow	150 cfs	May 29	June 18	July 8	<b>May 30</b>
Prineville Reservoir Inflow	80 cfs	June 4	June 24	July 14	<b>June 7</b>
Whychus Creek nr Sisters	100 cfs	July 10	Aug 7	Aug 27	<b>August 16</b>

<b>ROGUE AND UMPQUA BASINS</b>					
<i>FORECAST POINT</i>	<i>FORECAST THRESHOLD</i>	<i>FORECAST VALUE ----- CHANCE OF EXCEEDING ----- -----</i>			<i>LONG-TERM AVERAGE VALUE</i>
		90%	50%	10%	
South Umpqua R nr Brockway *	90 cfs	Aug 7	Aug 22	Sep 6	<b>August 8</b>
South Umpqua R at Tiller	140 cfs	July 11	July 28	Aug 17	<b>July 11</b>
South Umpqua R at Tiller	90 cfs	Aug 2	Aug 22	Sep 6	<b>August 1</b>
South Umpqua R at Tiller	60 cfs	Sep 11	Oct 6	Oct 31	<b>August 28</b>

\*Dates are based on streamflow data adjusted for releases from Galesville Reservoir to reflect natural flow conditions and do not match observed gage data. There is an approximately 20% chance in any given year that the flow will not recede below 90 cfs; the dates given here are for the event that the flow does recede below 90 cfs.

<b>LAKE COUNTY AND GOOSE LAKE BASINS</b>					
<i>FORECAST POINT</i>	<i>FORECAST THRESHOLD</i>	<i>FORECAST VALUE ----- CHANCE OF EXCEEDING ----- -----</i>			<i>LONG-TERM AVERAGE VALUE</i>
		90%	50%	10%	
Deep Ck ab Adel	100 cfs	June 22	July 7	July 23	<b>June 17</b>
Honey Ck nr Plush	100 cfs	May 10	May 26	June 20	<b>May 16</b>
Honey Ck nr Plush	50 cfs	May 21	June 13	July 6	<b>June 4</b>
Twentymile Ck nr Adel	50 cfs	May 29	June 24	July 18	<b>May 30</b>
Twentymile Ck nr Adel	10 cfs	July 7	July 28	Aug 12	<b>July 7</b>

<b>HARNEY BASIN</b>					
<i>FORECAST POINT</i>	<i>FORECAST THRESHOLD</i>	<i>FORECAST VALUE ----- CHANCE OF EXCEEDING ----- -----</i>			<i>LONG-TERM AVERAGE VALUE</i>
		90%	50%	10%	
Silvies R nr Burns	400 cfs	May 9	May 22	June 7	<b>May 21</b>
Silvies R nr Burns	200 cfs	May 18	June 8	June 29	<b>June 2</b>
Silvies R nr Burns	100 cfs	June 4	June 26	July 18	<b>June 13</b>
Silvies R nr Burns	50 cfs	June 27	July 18	Aug 12	<b>July 3</b>
Donner Und Blitzen R nr Frenchglen	200 cfs	June 1	June 16	July 1	<b>June 20</b>
Donner Und Blitzen R nr Frenchglen	100 cfs	June 21	July 6	July 23	<b>July 9</b>

# 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.



## 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.

**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.

JOHN DAY BASIN Streamflow Forecasts - February 1, 2013								
Forecast Point	Forecast Period	Drier Future Conditions			Wetter		30-Yr Avg. (1000AF)	
		90% (1000AF)	70% (1000AF)	50% (1000AF) (% AVG.)	30% (1000AF)	10% (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 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.

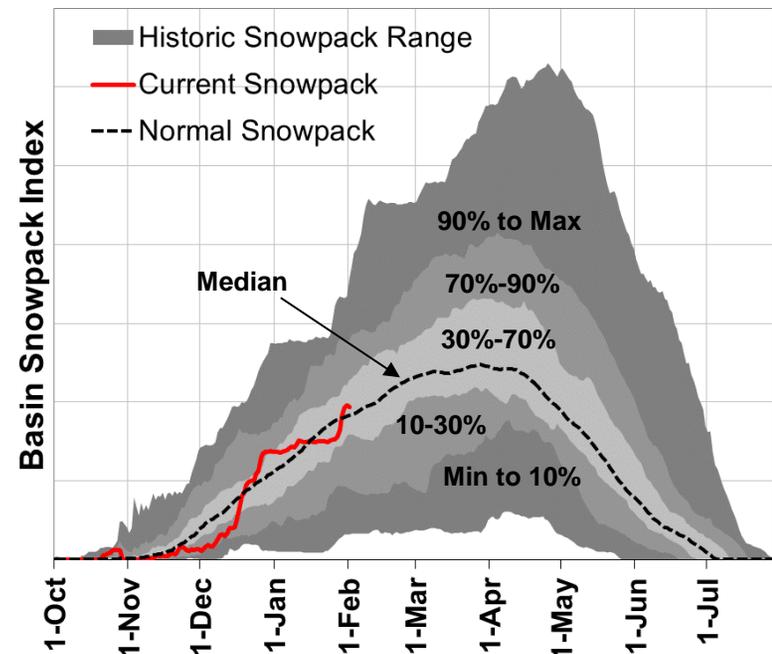
## Interpreting Snowpack Plots

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 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 10<sup>th</sup> percentile and the 90<sup>th</sup> percentile to maximum). The medium grey shading indicates the range from the 10<sup>th</sup> to 30<sup>th</sup> percentiles and the 70<sup>th</sup> to 90<sup>th</sup> percentiles. The light grey shading indicates the range between the 30<sup>th</sup> to 70<sup>th</sup> percentiles, while the median is the 50<sup>th</sup> percentile. A percentile is the value of the snowpack index below which the given percent of historical years fall. For instance, the 90<sup>th</sup> 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).

## Mountain Snowpack



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Official Business



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

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