United States Department of Agriculture



Washington Water Supply Outlook Report June 1, 2014



Unknown windshield sunset, Pattee

Water Supply Outlook Reports and Federal - State – Private Cooperative Snow Surveys

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How forecasts are made

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. These forecasts are coordinated between hydrologists in the Natural Resources Conservation Service and the National Weather Service. 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 uncertain 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.

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Washington Water Supply Outlook

June 2014

General Outlook

May was a tale of two worlds as far as weather was concerned. West of the Cascades we experienced very wet conditions, helping to set a new Feb-July total rainfall record in Seattle, whereas Eastern Washington received well below normal precipitation at most locations, to the point of almost no rain in Leavenworth at only 0.09 inches. Both short term and long term weather forecasts are calling for mostly dryer and warmer conditions for the rest of summer as we transition to an El' Nino for this fall and winter, however accurately predicting long range weather is a shot in dark at best so it's advisable to just watch it do what it's going to do and make note in record book afterword. Remember, it always gets warm and it hardly rains in summer anyway.

Snowpack

The June 1 statewide SNOTEL readings showed considerable variation across the state. Percent of normal readings for this time of year can be somewhat misleading in that during the melt cycle SNOTEL sites melt at different rates. Essentially sites below 4000 feet elevation are snow free, 4-5000 feet is represented by approximately 50% of normal snowpack remaining. Whereas sites above 5000 feet tend to still be above normal due to heavier snowpack through the winter and a slight lag in reaching peak and starting the melt phase. For water resource decision making one should take a very close look at actual water content, along with other variables, and not rely on percent of normal for a basin. If a basin is showing zero snow it does not mean that it is completely snow free, only that our SNOTEL network within the basin has melted out.

BASIN	PERCENT OF LAST YEAR	PERCENT OF AVERAGE
Spokane	170	165
Newman Lake	0	0
Pend Oreille	202	173
Okanogan	93	139
Methow	131	140
Conconully Lake	0	0
Central Columbia	111	110
Upper Yakima	75	84
Lower Yakima	98	86
Ahtanum Creek	0	0
Walla Walla	0	0
Lower Snake	238	184
Cowlitz	91	132
Lewis	34	59
White	92	120
Green	32	62
Puyallup	102	120
Cedar	0	0
Snoqualmie	53	75
Skykomish	49	97
Skagit	108	117
Nooksack	96	147
Olympic Peninsula	59	93

Precipitation

May precipitation favored the west slopes of the cascades with above average rainfall whereas the east side of the state as well as the Olympics didn't fare so well. Basin precipitation amounts vary with a low of 41% in the Walla Wall to a high of 127% in the Lower Columbia. The wettest spot in the state was reported at Alpine Meadows SNOTEL in the Tolt River Basin with a May accumulation of 12.5 inches, or 128% of average. The highest percent of average was at Spenser Meadow SNOTEL which received 158% of average precipitation. Leavenworth was the driest location with only 0.09 inches of rainfall, or 8% of normal.

RIVER BASIN	MAY	WATER YEAR
	PERCENT OF AVERAGE	PERCENT OF AVERAGE
Spokane	70	95
Pend Oreille	92	93
Upper Columbia	87	75
Central Columbia	48	91
Upper Yakima	77	97
Lower Yakima	72	94
Walla Walla	41	99
Lower Snake	55	97
Lower Columbia	127	96
South Puget Sound	102	107
Central Puget Sound	107	108
North Puget Sound	114	98
Olympic Peninsula	85	76

Reservoir

Seasonal reservoir levels in Washington can vary greatly due to specific watershed management practices required in preparation for irrigation season, fisheries management, power generation, municipal demands and flood control. Most all reservoirs in the state have either reached maximum storage or are well on their way to filling. Reservoir storage in the Yakima Basin was 827,000-acre feet, 114% of average for the Upper Reaches and 230,000-acre feet or 107% of average for Rimrock and Bumping Lakes. The power generation reservoirs included the following: Coeur d'Alene Lake, 211,000 acre feet, 79% of average and 88% of capacity; and the Skagit River reservoirs at 75% of average and 56% of capacity. Recent climate impacts and management procedures can affect these numbers on a daily or weekly basis.

BASIN	PERCENT OF	CURRENT STORAGE AS
	CAPACITY	PERCENT OF AVERAGE
Spokane	88	79
Pend Oreille	92	105
Upper Columbia	98	98
Central Columbia	76	105
Upper Yakima	99	114
Lower Yakima	99	107
Lower Snake	82	92
North Puget Sound	56	75

Streamflow

A lack of adequate rain along with early and rapid melt of low and mid elevation snow caused this month's forecast runs to drop. Forecasts vary from 65% of average for the Ahtanum Creek to 134% of average for the Okanogan River at Malott. June-September forecasts for some Western Washington streams include the Cedar River near Cedar Falls, 103%; White River, 114%; and Skagit River, 120%. Some Eastern Washington streams include the Yakima River near Parker, 84%: Wenatchee River at Plain, 115% and Spokane River near Post Falls, 114%. Volumetric forecasts are developed using current, historic and average snowpack, precipitation and streamflow data collected and coordinated by organizations cooperating with NRCS. May runoff varied greatly by basin and is often influenced this time of year by reservoir control which can cause sudden changes in daily flows. Caution should be taken when working or playing in or near streams influenced by spring snowmelt.

BASIN	PERCENT OF AVERAGE FORECAST
	(50 PERCENT CHANCE OF EXCEEDENCE)
Spokane	91-114
Pend Oreille	108-125
Upper Columbia	78-134
Central Columbia	92-115
Upper Yakima	85-103
Lower Yakima	65-93
Walla Walla	92-97
Lower Snake	90-129
Lower Columbia	85-102
South Puget Sound	101-114
Central Puget Sound	95-132
North Puget Sound	104-120
Olympic Peninsula	91-92

STREAM	PERCENT OF AVERAGE MAY
	RUNOFF
Pend Oreille at Albeni Fall Dam	137
Kettle at Laurier	114
Columbia at Birchbank	120
Spokane at Spokane	123
Similkameen at Nighthawk	158
Okanogan at Tonasket	173
Methow at Pateros	121
Chelan at Chelan	114
Wenatchee at Pashastin	122
Cle Elum near Roslyn	120
Yakima at Parker	119
Naches at Naches	112
Grande Ronde at Troy	88
Snake below Lower Granite Dam	111
Columbia River at The Dalles	118
Cowlitz below Mayfield Dam	131
Skagit at Concrete	135
Dungeness near Sequim	110

Soil Moisture

Current soil moisture data is available from a limited number of SNOTEL sites scattered throughout each basin. As the effort continues to install additional sensors and more years of data are acquired this information will become invaluable to the streamflow forecasting community. Light fall precipitation created drier than optimal soil moisture conditions coming into winter however greater than normal precipitation during February and April helped buffer soil moisture levels back to near normal conditions for that time of year. For the most part east side soils began to dry out after final snow melt however west cascade soil moisture continues to stay near saturation.

BASIN	ESTIMATED PERCENT SATURATION
Spokane	70
Pend Oreille	55
Upper Columbia	60
Central Columbia	55
Upper Yakima	81
Lower Yakima	63
Walla Walla	70
Lower Snake	70
Lower Columbia	72
South Puget Sound	82
Central Puget Sound	N/A
North Puget Sound	89
Olympic Peninsula	56



BASIN SUMMARY OF SNOW COURSE DATA

JUNE 2014

SNOW COURSE	ELEVATION	DATE	SNOW DEPTH	WATER CONTENT	LAST YEAR	AVERAGE 1971-00	SNOW COURSE	EL	EVATION	DATE	SNOW DEPTH	WATER CONTENT	LAST YEAR	AVERAGE 1971-00
ALPINE MEADOWS SN	TL 3500	6/01/14	33	21.9	54.5	30.7	MOUNT CRAG	SNOTEL	3960	6/01/14	0	.0	10.3	4.1
BADGER PASS SNOTE	L 6900	6/01/14	53	28.2	18.6	17.2	MT. KOBAU	CAN.	5500	5/28/14	0	.0	7.3	
BARKER LAKES SNOT	EL 8250	6/01/14	39	13.9	8.9	11.0	MOWICH	SNOTEL	3160	6/01/14	0	.0	.0	.0
BASIN CREEK SNOTE	L 7180	6/01/14	0	.0	.0	.3	MOUNT GARDNER	SNOTEL	2920	6/01/14	0	.0	.0	.0
BEAVER PASS SNOTE	L 3630	6/01/14	37	17.3	24.8	21.4	N.F. ELK CR S	NOTEL	6250	6/01/14	0	.0	.0	.0
BLACK PINE SNOTEL	7100	6/01/14	0	.0	.0	.0	NEVADA RIDGE	SNOTEL	7020	6/01/14	13	5.6	.0	2.5
BLEWETT PASS#2SNO	TEL 4240	6/01/14	0	.0	.0	.0	NEZ PERCE CMP	SNOTEL	5650	6/01/14	0	.0	.0	.0
BUCKINGHORSE SNOT	EL 4870	6/01/14	57	30.0	41.4		NOISY BASIN S	NOTEL	6040	6/01/14	72	33.7	25.4	28.5
BUMPING RIDGE SNO	TEL 4610	6/01/14	0	.0	.0	6.5	OLALLIE MDWS	SNOTEL	4030	6/01/14	64	24.5	32.1	29.0
BUNCHGRASS MDWSNO	TEL 5000	6/01/14	30	10.7	5.5	6.4	OPHIR PARK		7150	5/27/14	15	6.7	.0	3.2
BURNT MOUNTAIN PI	L 4170	6/01/14	0	.0	1.0	.0	PARADISE SNOT	EL	5130	6/01/14	120	83.4	79.0	61.9
CALAMITY SNOTEL	2500	6/01/14	0	.0	.0		PARK CK RIDGE	SNOTEL	4600	6/01/14	14	4.0	1.6	4.6
CAYUSE PASS SNOTE	L 5240	6/01/14	71	31.7	38.9		PEPPER CREEK	SNOTEL	2140	6/01/14	0	.0	.0	
CHICKEN CREEK	4060	5/27/14	0	.0	.0	.0	PETERSON MDW	SNOTEL	7200	6/01/14	12	4.0	.0	1.3
COMBINATION SNOTE	L 5600	6/01/14	0	.0	.0	.0	PIGTAIL PEAK	SNOTEL	5800	6/01/14	96	53.4	41.1	36.6
COPPER BOTTOM SNO	TEL 5200	6/01/14	0	.0	.0		PIKE CREEK SN	OTEL	5930	6/01/14	0	.0	.0	.0
CORRAL PASS SNO	TEL 5800	6/01/14	70	31.3	29.8	26.0	POPE RIDGE	SNOTEL	3590	6/01/14	0	.0	.0	.0
COUGAR MIN. SNO	TEL 3200	6/01/14	0	.0	.0	.0	POTATO HILL	SNOTEL	4510	6/01/14	4	1.9	6.5	
DALI CREEK SNOTEL	5760	6/U1/14 E/30/14	12	.0	.0	.0	QUARTZ PEAK	SNOTEL	4700	6/01/14	0	.0	.0	.0
DISCOVERI BASIN	6400	5/30/14	12	4.9	.0	. 2	DATNY DAGG	GNOTEL	4210	6/01/14	44	26 5	14 4	19 7
DINGENESS SNO	TET. 4010	6/01/14	0	.0	.0		DEX DIVED	SNOTEL	3810	6/01/14		20.5	13.8	10.7
ELBOW LAKE SNO	TEL 3200	6/01/14	ő	.0	. 0 6 0	.0	POCKER DEAK S	NOTEL.	8000	6/01/14	33	15 1	5.0	10 6
EMERY CREEK SNOTE	L 4350	6/01/14	ŏ	.0	.0	.0	SADDLE MTN SN	OTEL	7900	6/01/14	50	27.5	6.5	13.3
ENDERBY C	AN. 5800	6/01/14	85	43.6	39.5		SALMON MDWS	SNOTEL	4460	6/01/14	0	.0	.0	.0
FISH LAKE SNO	TEL 3430	6/01/14	0	.0	.0	.0	SASSE RIDGE	SNOTEL	4340	6/01/14	8	3.0	4.9	.0
FLATTOP MTN SNOTE	L 6300	6/01/14	95	46.6	36.8	32.3	SATUS PASS		3960	6/01/14	0	.0	.0	
FROHNER MDWS SNOT	EL 6480	6/01/14	0	.0	.0	.0	SAVAGE PASS	SNOTEL	6170	6/01/14	36	15.2	2.1	4.3
GRAVE CRK SNOTEL	4300	6/01/14	0	.0	.0	.0	SAWMILL RIDGE	SNOTEL	4640	6/01/14	0	.0	1.9	
GREEN LAKE SNO	TEL 5920	6/01/14	0	.0	.8	4.0	SENTINEL BT S	NOTEL	4680	6/01/14	0	.0	.0	.0
GROUSE CAMP SNO	TEL 5390	6/01/14	0	.0	.0	.0	SHEEP CANYON	SNOTEL	3990	6/01/14	4	2.2	23.7	5.9
HAND CREEK SNOTEL	5030	6/01/14	0	.0	.0	.0	SHERWIN	SNOTEL	3200	6/01/14		.0	.0	.0
HARTS PASS SNO	TEL 6490	6/01/14	57	34.1	31.8	24.6	SILVER STAR M	TN CAN.	5600	6/01/14	48	23.7	23.2	
HELL ROARING DIVI	DE 5770	5/30/14	51	23.7	14.1	11.3	SKALKAHO SNOT	EL	7260	6/01/14	22	10.2	.0	9.5
HERRIG JUNCTION	4850	5/27/14	33	14.8	.0	.3	SKOOKUM CREEK	SNOTEL	3310	6/01/14	0	.0	3.5	.0
HIGH RIDGE SNOT	TEL 4920	6/01/14	0	.0	.0	.0	SOURDOUGH GUL	SNOTEL	4000	6/01/14	0	.0	.0	.0
HUCKLEPEDDY CNOT	EL 6050	6/01/14	69	42.4	25.6	23.5	SPENCER MDW	SNOTEL	3400	6/01/14	0	.0	.0	.0
HIMBOLDT CLCU SNO	TEL 2250	6/01/14	0	.0	.0	.0	SPIRII LARE	NOTEL	5700	6/01/14	0	.0	.0	.0
TNDIAN BOCK SNOTE	IED 4250	6/01/14	0	.0	.0		GTAUL DEAK CM	OTEL	6030	6/01/14	74	36 9	24 1	25.8
JUNE LAKE SNOT	д 3300 тет. 3440	6/01/14	0	.0	23.0		STANDFOR DASS	SNOTEL	3850	6/01/14	16	8 7	14 1	14 1
KRAFT CREEK SNOTE	L 4750	6/01/14	õ	.0			STEVENS PASS	SNOTEL	3950	6/01/14	23	10.8	11.6	3.0
LOLO PASS SNO	TEL 5240	6/01/14	14	7.9	.0	.0	STRYKER BASIN		6180	5/27/14	67	33.9	19.4	20.1
LONE PINE SNO	TEL 3930	6/01/14	8	5.8	28.2	13.7	SUNSET	SNOTEL	5540	6/01/14	12	5.0	.0	.3
LOOKOUT SNO	TEL 5140	6/01/14	5	1.6	.0	.0	SURPRISE LKS	SNOTEL	4290	6/01/14	31	15.2	24.6	16.9
LOST HORSE SNO	TEL 5120	6/01/14	0	.0	.0	.0	SWAMP CREEK	SNOTEL	3930	6/01/14	0	.0	.0	.0
LOST LAKE SNO	TEL 6110	6/01/14	100	46.4	27.2	31.9	SWIFT CREEK	SNOTEL	4440	6/01/14	46	21.4	47.2	40.8
LUBRECHT SNOTEL	4680	6/01/14	0	.0	.0	.0	THUNDER BASIN	SNOTEL	4320	6/01/14	3	5.9	6.7	6.8
LYMAN LAKE SNO	TEL 5980	6/01/14	87	47.5	47.3	48.9	TINKHAM CREEK	SNOTEL	2990	6/01/14	0	.0	12.5	.0
LYNN LAKE SNOTEL	3900	6/01/14	0	.0	11.4		TOUCHET	SNOTEL	5530	6/01/14	0	.0	.0	.0
MARTEN RIDGE SNOT	EL 3520	6/01/14	51	31.4	39.9		TROUGH #2	SNOTEL	5480	6/01/14	0	.0	.0	.0
MEADOWS PASS SNO	TEL 3230	6/01/14	0	.0	2.4	.0	TWELVEMILE SN	OTEL	5600	6/01/14	0	.0	.0	.0
M F NOOKSACK SNO	TEL 4970	6/01/14	119	73.4	65.4	51.6	TWIN LAKES SN	OTEL	6400	6/01/14	58	29.9	8.4	16.5
MICA CREEK SNO	TEL 4510	6/UI/14	0	.0	.0	.0	UPPER WHEELER	SNOTEL	4330	6/01/14	0	.0	.0	.0
MORE LAKE SNU	16L 3410	6/01/14	00	29.4	31.0	3∠.8	WARM SPRINGS	GNOTEL	5010	6/01/14	5/	40.1 10 €	21.3	14.0
MOSOUTTO PDC SNO	TEL 5010	6/01/14	21	10 9	.0 10 4	.0	WATERHULE WELLS COFFY	SNOTEL	4030	6/01/14	30	14 9	20 5	10.0
MOSQUITO RDG SNU	J200	0/01/14	21	10.0	10.4	0.4	WHITE DASS RS	SNOTEL	4440	6/01/14	50	14.0	20.5	1 4
							WHITE ROCKS M	TN CAN.	7200	5/31/14	6	2.3	10.1	
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Helpful Internet Addresses

NRCS Snow Survey and Climate Services Homepages

Washington: <u>http://www.wa.nrcs.usda.gov/snow</u>_

Oregon: <u>http://www.or.nrcs.usda.gov/snow</u>

Idaho: <u>http://www.id.nrcs.usda.gov/snow</u>_

National Water and Climate Center (NWCC): http://www.wcc.nrcs.usda.gov

USDA-NRCS Agency Homepages

Washington: <u>http://www.wa.nrcs.usda.gov</u>

NRCS National: <u>http://www.nrcs.usda.gov</u>



Released by

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Roylene Rides At The Door State Conservationist Natural Resources Conservation Service Spokane, Washington

The Following Organizations Cooperate with the Natural Resources Conservation Service in Snow Survey Work*:

Canada	Snow Survey Network Program – British Columbia Ministry of
	Environment
	River Forecast Center – British Columbia Ministry of Forests, Lands and
Q 1-1-	Natural Resource Operations
State	Washington State Department of Ecology
F . 1	Washington State Department of Natural Resources
Federal	Department of the Army
	Corps of Engineers
	U.S. Department of Agriculture
	U.S. Department of Commerce
	NOAA, National Weather Service
	U.S. Department of Interior
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