

Washington Water Supply Outlook Report May 1, 2015

Glacier Lilies blooming on the Cox Valley snow course where there would normally be 80" of snow, April 29, 2015. Picture by Bill Baccus, Olympic NPS.



Cox Valley snow course is just one of eleven long-term measurement sites in Washington that were snow free for the very first time. The second lowest year at Cox Valley was in 2005 when it measured 4.4" of water content.

98 snow sites were measured in Washington on May 1 and 66 of those were snow free. 77% of all long-term sites (23+ years) recorded record low SWE for May 1.

With record low snowpack comes a change in peak accumulation and timing of that peak. Looking only at long-term sites 17 of 34 sites recorded the earliest peak on record which was 48 days early on average. Average peak SWE was only 36% of normal.

Paradise SNOTEL recorded the largest deficit with 50" of SWE less than the normal peak. Olallie Meadows followed closely behind with a deficit of 46".

Reminder: We are soliciting field work photos from our snow surveyors again this year. Each month we pick one to grace the cover of this report. The photographer will be given proper credit of course. Please include all specific information when submitting photos. Scott.pattee@wa.usda.gov

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

May 2015

General Outlook

It's official winter is over. Statewide we received about 60% of normal precipitation in April with minimal amounts falling in the form of mountain snow. The meager storm activity in April was just not enough to make any difference for summer water supply since the melt cycle was already in the advanced stages and in fact many sites had melted out weeks ahead of schedule. Streamflow forecasts for May-September runoff have also dropped as would be expected under current conditions. Drought conditions continue to worsen with severe drought status creeping in the South Central part of the state. Both short and long term weather forecasts call for persistence of above normal temperatures with slightly below to normal precipitation. However it's worth mentioning that now is the time of year when even "normal" precipitation doesn't amount to very much as it is.

<http://www.cpc.ncep.noaa.gov/>

Snowpack

The May 1 statewide SNOTEL readings were 17% of normal which continues to be an all-time record low. Seven basins were snow free on the 1st of the month including Newman Lake, Conconully, Walla Walla, Lewis, Cedar and the Olympics. Readings from the Methow River Basin remained steady from last month at 79% of normal on May 1. Westside medians from SNOTEL, and May 1 snow surveys, included the North Puget Sound river basins with 30% of normal, the Central and South Puget river basins with 1% and 28% respectively, and the Lower Columbia basins with 13% of normal. Snowpack along the east slopes of the Cascade Mountains included the Lower Yakima with 19% the Wenatchee area with 29% and the Chelan Lake Basin with 53%. Snowpack in the Spokane River Basin was at 23% of the long term median.

BASIN	PERCENT OF NORMAL	LAST YEAR PERCENT OF NORMAL
Spokane	23	132
Newman Lake	0	74
Pend Oreille	66	161
Okanogan	73	128
Methow	79	119
Conconully Lake	0	0
Central Columbia	29	108
Upper Yakima	2	106
Lower Yakima	19	102
Ahtanum Creek	1	71
Walla Walla	0	116
Lower Snake	32	127
Cowlitz	25	125
Lewis	0	76
White	37	114
Green	0	77
Puyallup	33	116
Cedar	0	112
Snoqualmie	1	112
Skykomish	1	103
Skagit	54	124
Nooksack	14	117
Baker	15	114
Olympic Peninsula	0	88

Precipitation

Seasonally moderate temperatures brought both snow and rain but not in enough quantity to make any real difference. Overall the east side of the state captured about 50% of normal precipitation while the west side did a little better at about 70% of normal. The Upper Columbia area was the driest at 31% of normal precipitation for April. All three SNOTEL sites within the Nooksack drainage received at least 80% of normal rainfall last month. Elbow Lake SNOTEL in the South Fork Nooksack River Basin continues to rein over the entire SNOTEL network with a water-year accumulation of 137.9 inches, 20 inches above normal or 117% of average for the water-year.

RIVER BASIN	APRIL PERCENT OF AVERAGE	WATER YEAR PERCENT OF AVERAGE
Spokane	55	88
Pend Oreille	54	95
Upper Columbia	31	95
Central Columbia	52	93
Upper Yakima	46	84
Lower Yakima	58	95
Walla Walla	41	86
Lower Snake	51	86
Lower Columbia	53	98
South Puget Sound	71	96
Central Puget Sound	72	96
North Puget Sound	69	109
Olympic Peninsula	74	103

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 reservoirs filled early this year due to winter rain storms. In most cases managers elected to hold this excess winter water due to the uncertainty of the snowpack. May 1 Reservoir storage in the Yakima Basin was 805,000-acre feet, 132% of average for the Upper Reaches and 225,000-acre feet or 126% of average for Rimrock and Bumping Lakes. The power generation reservoirs included the following: Coeur d'Alene Lake, 209,000 acre feet, 92% of average and 88% of capacity; and the Skagit River reservoirs at 94% of average and 51% of capacity. Due to the absents of low elevation snow pack many of the irrigation reservoirs have been forced to begin drafting in order to supplement natural flow and provide early season irrigation needs. Recent climate impacts and management procedures may affect these numbers on a daily or weekly basis.

BASIN	PERCENT OF CAPACITY	CURRENT STORAGE AS PERCENT OF AVERAGE
Spokane	88	92
Pend Oreille	56	90
Upper Columbia	91	130
Central Columbia		
Upper Yakima	97	132
Lower Yakima	97	126
Lower Snake	93	122
North Puget Sound	51	94

For more information contact your local Natural Resources Conservation Service office.

Streamflow

May to September runoff forecasts for May 1 continued to drop since the April forecasts were issued due to the obvious lack of new snowfall and below average precipitation. April streamflows were near to below normal due mostly to the lack of rain and near normal temperatures. May-September forecasts for some Western Washington streams include the Cedar River near Cedar Falls, 45%; White River, 69%; and Skagit River, 76%. Some Eastern Washington streams include the Yakima River near Parker 27%, Wenatchee River at Plain 47%; and Spokane River near Post Falls 34%. Volumetric forecasts are developed using current, historic and average snowpack, precipitation and streamflow data collected and coordinated by organizations cooperating with NRCS. **The 50% chance of exceedance forecast is normally used for planning purposes however with the current uncertainty in weather forecasts and the current lack of snow in most locations it may be advisable to use the 70-90% chance of exceedance volumes to ensure adequate water supply this summer. Please refer to the forecast chart for each basin in the pages below as well as the “Interpreting Water Supply Forecasts” web page: <http://www.wcc.nrcs.usda.gov/factpub/intprpret.html>**

BASIN	PERCENT OF AVERAGE (50 PERCENT CHANCE OF EXCEEDENCE)
Spokane	34-47
Pend Oreille	54-80
Upper Columbia	31-72
Central Columbia	47-65
Upper Yakima	18-33
Lower Yakima	8-46
Walla Walla	58-69
Lower Snake	36-65
Lower Columbia	25-79
South Puget Sound	50-69
Central Puget Sound	45-65
North Puget Sound	69-89
Olympic Peninsula	47-53

STREAM	PERCENT OF AVERAGE APRIL STREAMFLOWS
Pend Oreille at Albeni Fall Dam	104
Kettle at Laurier	113
Columbia at Birchbank	107
Spokane at Spokane	58
Similkameen at Nighthawk	138
Okanogan at Tonasket	165
Methow at Pateros	158
Chelan at Chelan	92
Wenatchee at Pashastin	76
Cle Elum near Roslyn	52
Yakima at Parker	45
Naches at Naches	49
Grande Ronde at Troy	42
Snake below Lower Granite Dam	64
Columbia River at The Dalles	83
Lewis at Merwin Dam	52
Cowlitz below Mayfield Dam	65
Skagit at Concrete	92
Dungeness near Sequim	75

For more information contact your local Natural Resources Conservation Service office.

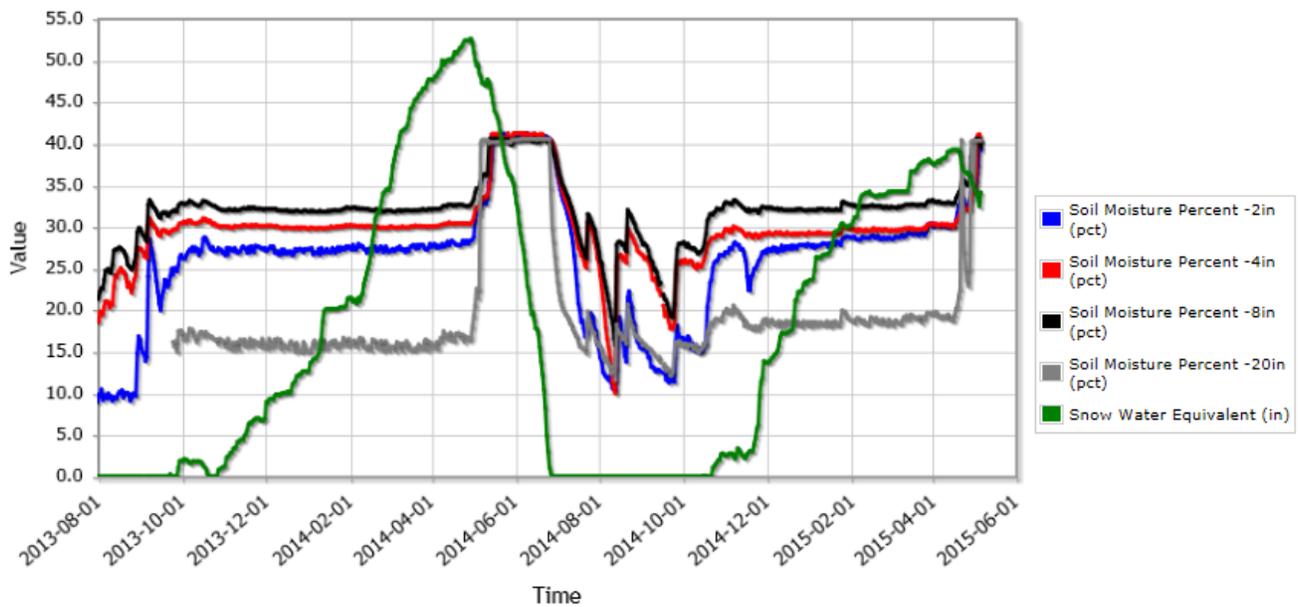
Soil Moisture

With snow melting early this spring the soil moisture conditions are also in decline, 2-4 weeks earlier than normal.

The following graph from Hart Pass SNOTEL shows a very typical interaction between soil moisture, fall rain, snow accumulation and snow melt. Water-year 2014 was a near normal year with a good snowpack. See where the peak SWE is followed shortly by the increase in soil moisture to the point of saturation. Notice also that the 20" sensor does not seem to be effected by fall rains and only reacts to intense spring melt. All sensors appear to hold saturation until all snow has melted.

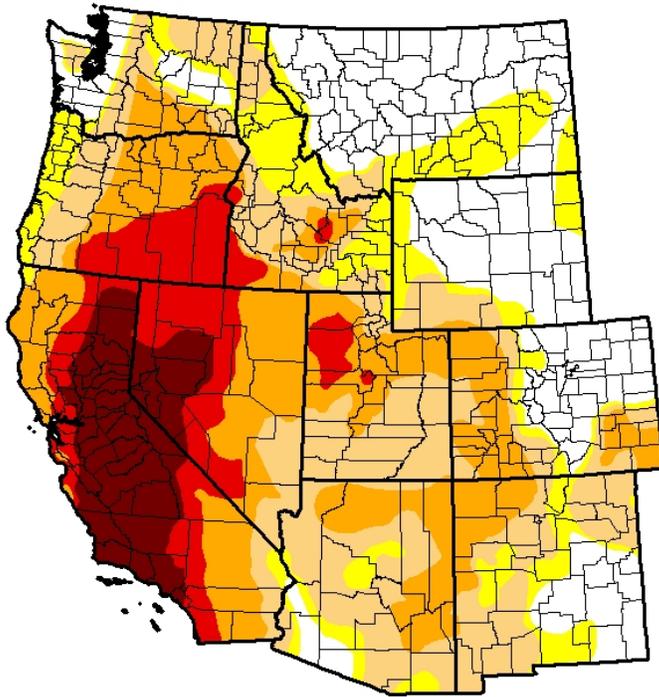
2015 appears to have had a rough start with sporadic fall rains often followed by extended dry periods. A lesser snowpack may mean an earlier melt as well as the soils didn't seem to have the same rapid reaction to peak SWE. Very reminiscent of 2005 where the snow melted about a month early and soil saturation only lasted about 1/3rd of normal.

Harts Pass (515) Washington SNOTEL Site - 6490 ft



U.S. Drought Monitor West

May 5, 2015
(Released Thursday, May 7, 2015)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	23.35	76.65	63.22	39.05	17.54	7.95
Last Week 4/28/2015	26.14	73.86	62.12	39.33	17.64	7.95
3 Months Ago 2/9/2015	30.68	69.32	52.74	31.35	18.51	6.96
Start of Calendar Year 12/31/2014	34.76	65.24	54.48	33.50	18.68	5.40
Start of Water Year 9/30/2014	31.48	68.52	55.57	35.65	19.95	8.90
One Year Ago 5/6/2014	30.20	69.80	61.47	45.60	19.60	4.69

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

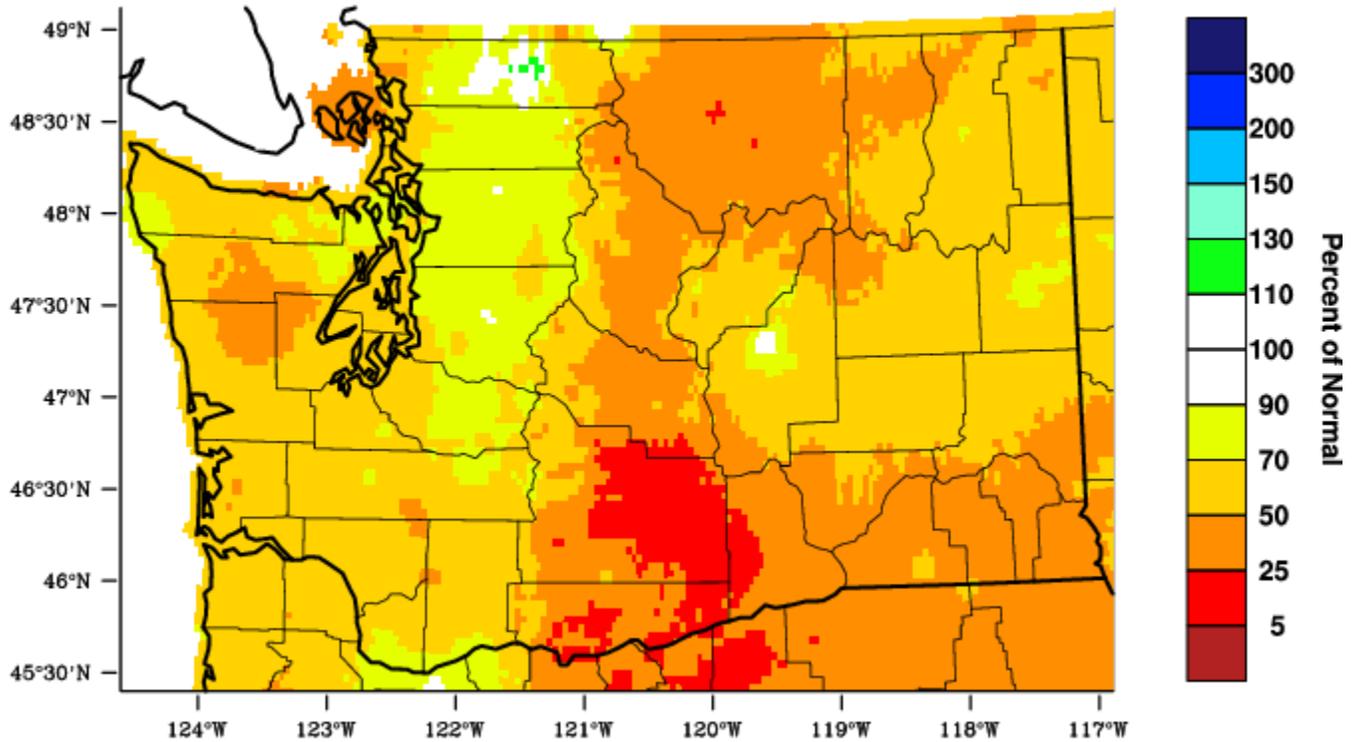
Mark Svoboda
National Drought Mitigation Center



<http://droughtmonitor.unl.edu/>

Washington - Precipitation

April 2015 Percent of 1981-2010 Normal



WestWide Drought Tracker - WRCC/UI Data Source - PRISM (Prelim), created 5 MAY 2015



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Helpful Internet Addresses

NRCS Snow Survey and Climate Services Homepages

Washington:
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/wa/snow/>

Oregon:
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/or/snow/>

Idaho:
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/id/snow/>

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

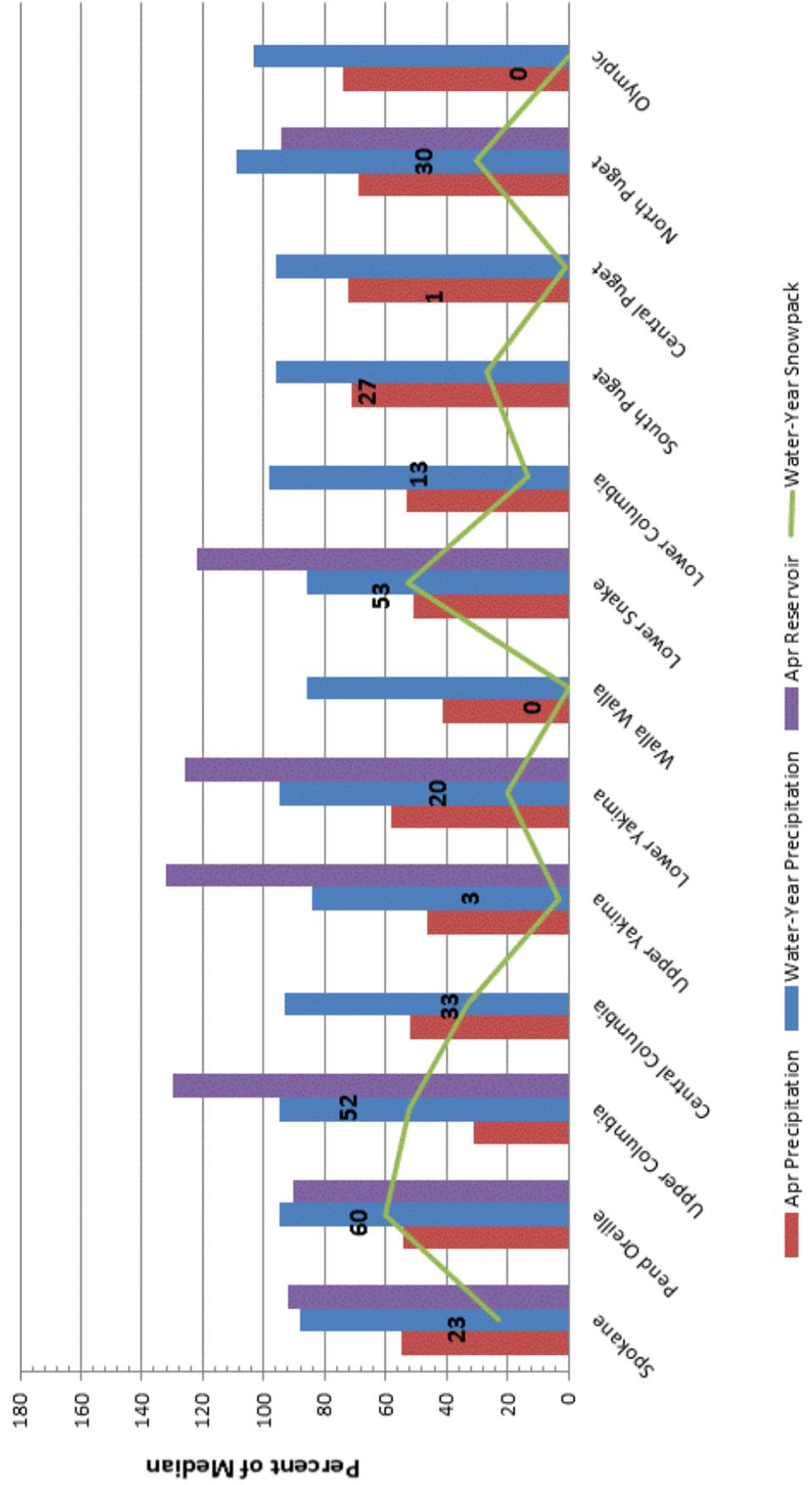
USDA-NRCS Agency Homepages

Washington:
<http://www.nrcs.usda.gov/wps/portal/nrcs/site/wa/home/>

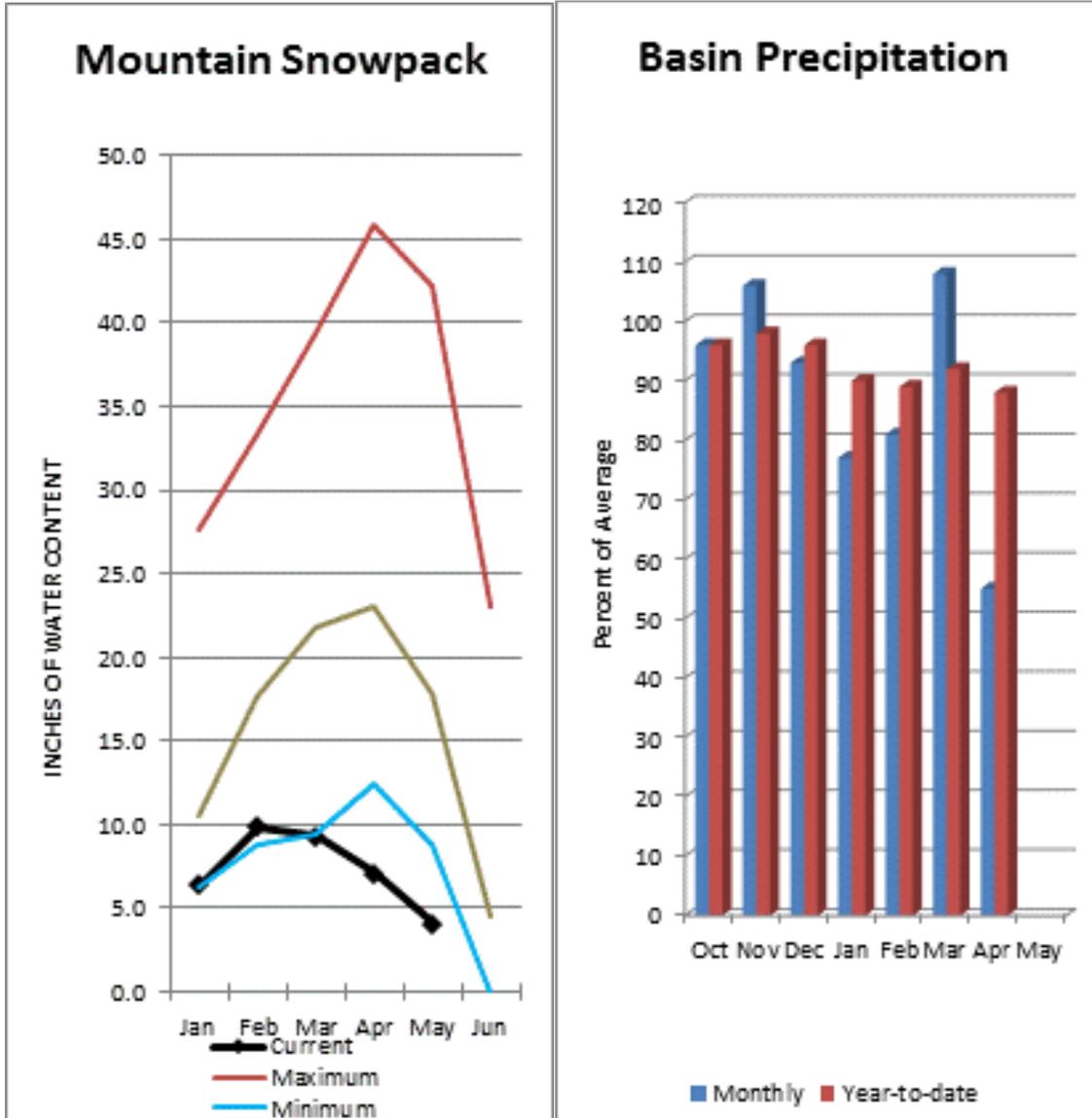
NRCS National:
<http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>

May 1, 2015 - Snowpack, Precipitation and Reservoir Conditions at a Glance

(Water Year = October 1, 2014 - Current Date)



Spokane River Basin



The May 1 forecasts for summer runoff within the Spokane River Basin are 34% of average near Post Falls and 42% at Long Lake. The Chamokane River near Long Lake forecasted to have 47% of average flows for the May-August period. The forecast is based on a basin snowpack that is 23% of normal and precipitation that is 88% of average for the water year. Precipitation for April was near normal at 55% of average. Streamflow on the Spokane River at Spokane was 58% of average for April. May 1 storage in Coeur d'Alene Lake was 209,000 acre feet, 92% of average and 100% of capacity. Snowpack at Quartz Peak SNOTEL site was melted out by the 1st of the month. Normally the site would still have 19 inches of water content Average temperatures in the Spokane basin were 1-3 degrees above normal for April and 2-4 degrees above normal for the water year.

For more information contact your local Natural Resources Conservation Service office.

Data Current as of: 5/7/2015 11:52:22 AM

Spokane Streamflow Forecasts - May 1, 2015

Spokane	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						30yr Avg (KAF)
		90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	
Spokane R nr Post Falls ²	MAY-JUL	69	340	525	34%	710	980	1530
	MAY-SEP	53	350	550	34%	750	1050	1620
Spokane R at Long Lake ²	MAY-JUL	137	465	685	40%	905	1230	1710
	MAY-SEP	235	580	815	42%	1050	1400	1950
Chamokane Ck nr Long Lake	MAY-AUG	0.56	2.5	4.4	47%	6.2	8.9	9.3

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

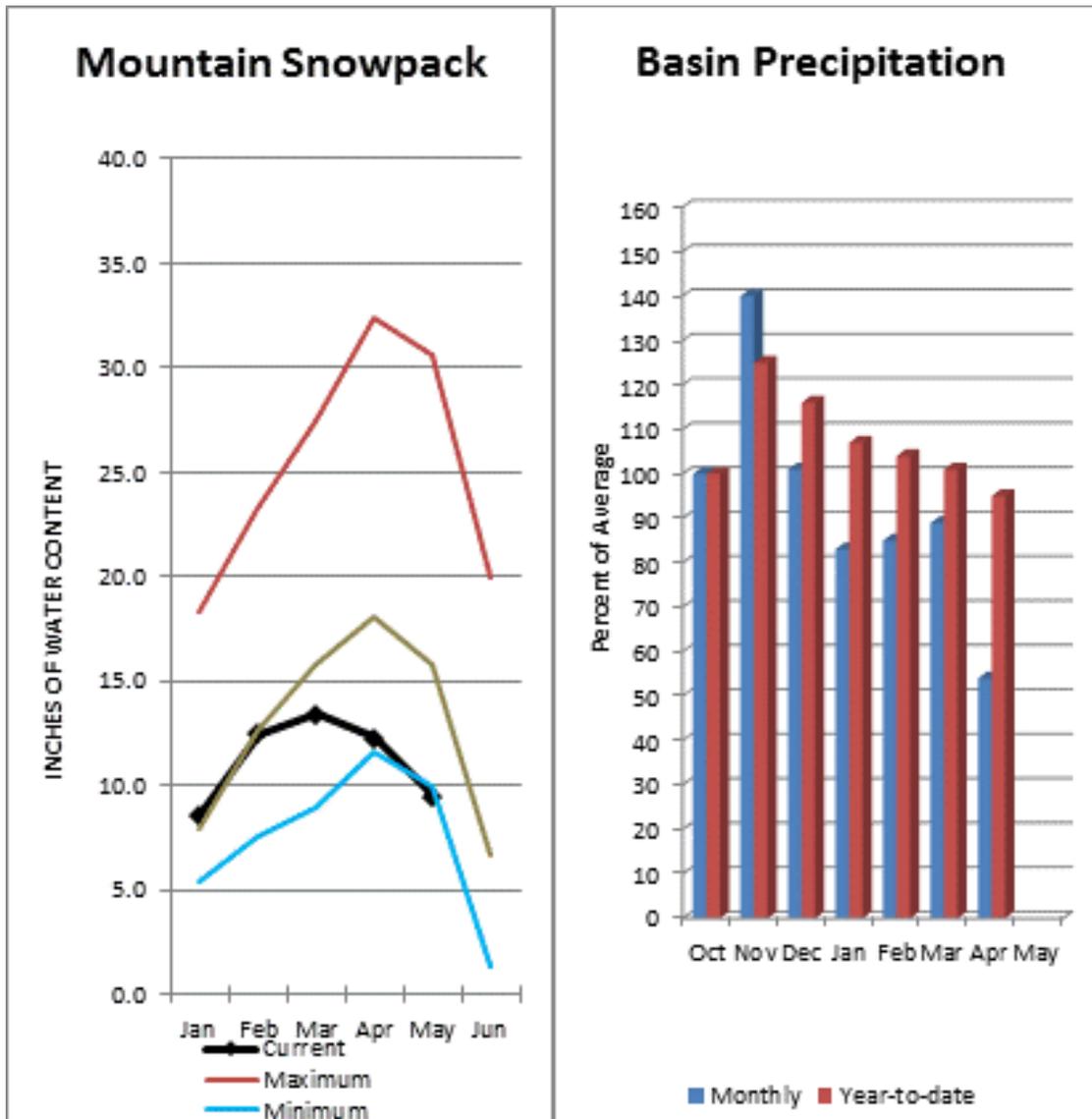
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Coeur d' Alene	209.1	238.6	228.0	238.5
Basin-wide Total	209.1	238.6	228.0	238.5
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Spokane	12	23%	132%
Newman Lake	1	0%	74%

Pend Oreille River Basins



The May – September average forecast for the Priest River near the town of Priest River is 54% and the Pend Oreille below Box Canyon is 80%. April streamflow was 104% of average on the Pend Oreille River and 107% on the Columbia at Birchbank. May 1 snow cover was 60% of normal in the Pend Oreille Basin River Basin. Bunchgrass Meadows SNOTEL site had 7.4 inches of snow water on the snow pillow. Normally Bunchgrass would have 23.6 inches on May 1. Precipitation during April was 54% of average, keeping the year-to-date precipitation at 95% of average. Reservoir storage in the basin, including Lake Pend Oreille and Priest Lake was 90% of normal. Average temperatures were 1-3 degrees above normal for April and 2-4 degrees above normal for the water year.

For more information contact your local Natural Resources Conservation Service office.

Pend Oreille River Basins

Data Current as of: 5/7/2015 11:52:25 AM

Pend Oreille Basins Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Pend Oreille Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Pend Oreille Lake Inflow ²	MAY-JUL	6080	7030	7680	79%	8330	9280	9690
	MAY-SEP	6720	7810	8550	80%	9290	10400	10700
Priest R nr Priest River ²	MAY-JUL	220	270	305	53%	345	405	580
	MAY-SEP	245	300	340	54%	380	450	630
Pend Oreille R bl Box Canyon ²	MAY-JUL	6140	7100	7750	79%	8390	9350	9750
	MAY-SEP	6790	7880	8620	80%	9360	10500	10800

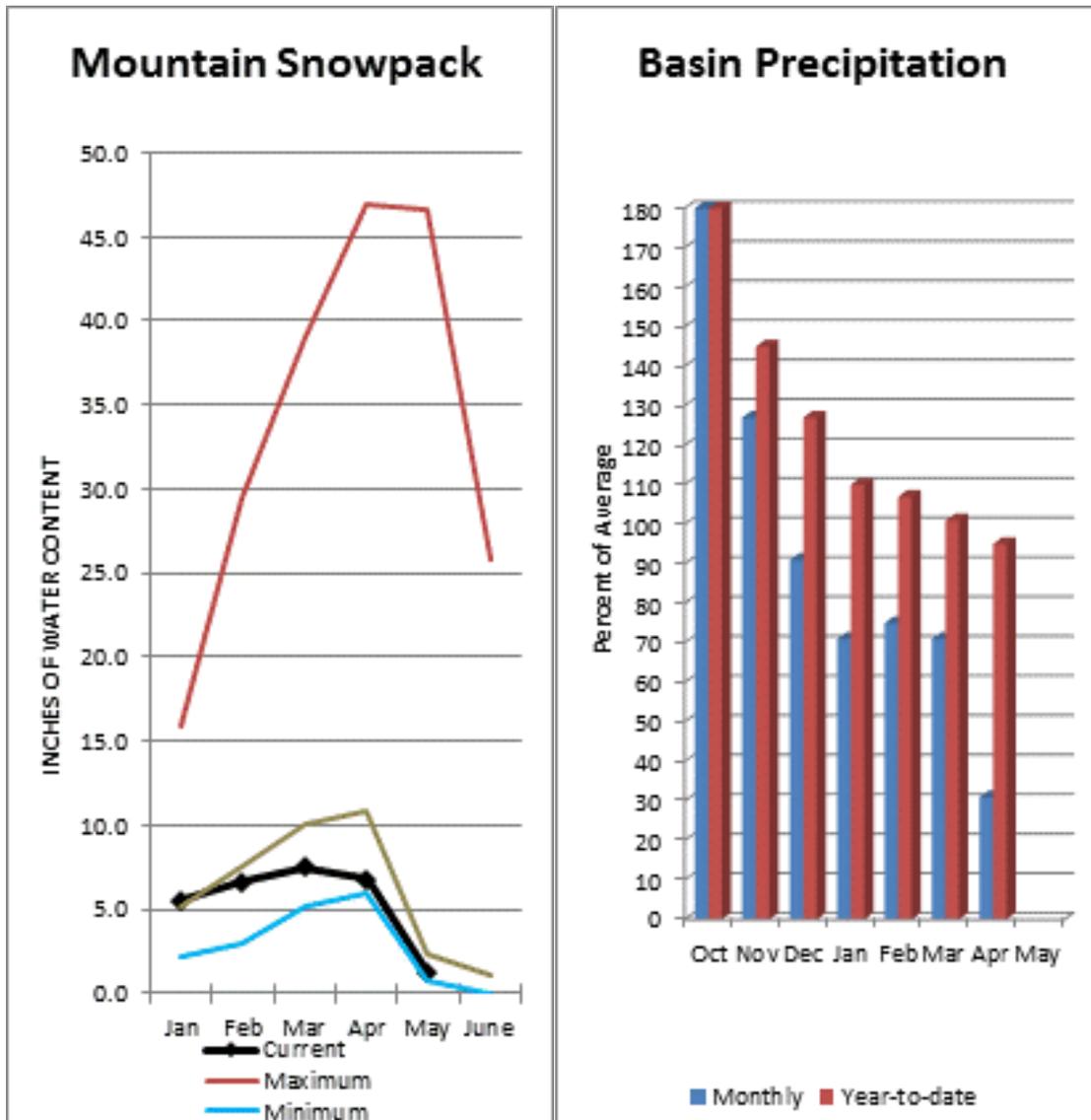
1) 90% and 10% exceedance probabilities are actually 95% and 5%

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

3) Median value used in place of average

Reservoir Storage End of April, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Pend Oreille	851.9	846.5	931.7	1561.3
Priest Lake	81.9	95.9	101.9	119.3
Basin-wide Total	933.8	942.5	1033.6	1680.6
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Pend Oreille Basins	68	60%	161%
Colville River	0		
Kettle River	5	58%	127%



Summer runoff average forecast for the Okanogan River is 72%, Similkameen River is 64%, Kettle River 58% and Methow River is 41%. May 1 snow cover on the Okanogan was 74% of normal, Omak Creek was 0% and the Methow was 79%. April precipitation in the Upper Columbia was 31% of average, with precipitation for the water year at 95% of average. April streamflow for the Methow River was 158% of average, 165% for the Okanogan River and 138% for the Similkameen. Salmon Meadows SNOTEL, in the Conconully Basin, was snow free on May 1. Combined storage in the Conconully Reservoirs was 21,500 acre-feet or 130% of normal. Temperatures were 4-6 degrees above normal for April and 2-4 degrees above for the water year.

Upper Columbia River Basins

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Upper Columbia Basins Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Upper Columbia Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Kettle R nr Laurier	MAY-JUL	535	695	800	55%	905	1060	1450
	MAY-SEP	585	765	885	58%	1010	1190	1530
Colville R at Kettle Falls	MAY-JUL	5.7	13.7	21	29%	30	46	72
	MAY-SEP	7.7	17.4	26	31%	37	55	84
Columbia R at Grand Coulee ^{1,2}	MAY-JUL	28600	31300	32500	74%	33700	36400	43870
Similkameen R nr Nighthawk ¹	MAY-JUL	440	610	685	65%	760	930	1060
	MAY-SEP	455	645	730	64%	815	1000	1140
Okanogan R nr Tonasket ¹	MAY-JUL	440	750	890	68%	1030	1340	1300
	MAY-SEP	490	840	1000	68%	1160	1510	1470
Okanogan R at Malott ¹	MAY-JUL	450	775	920	72%	1070	1390	1270
	MAY-SEP	500	865	1030	72%	1200	1560	1440
Methow R nr Pateros	MAY-JUL	191	245	290	40%	335	405	730
	MAY-SEP	215	280	325	41%	375	455	790
Columbia R at Birchbank ^{1,2}	MAY-JUL	20200	23400	24900	82%	26400	29600	30480

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

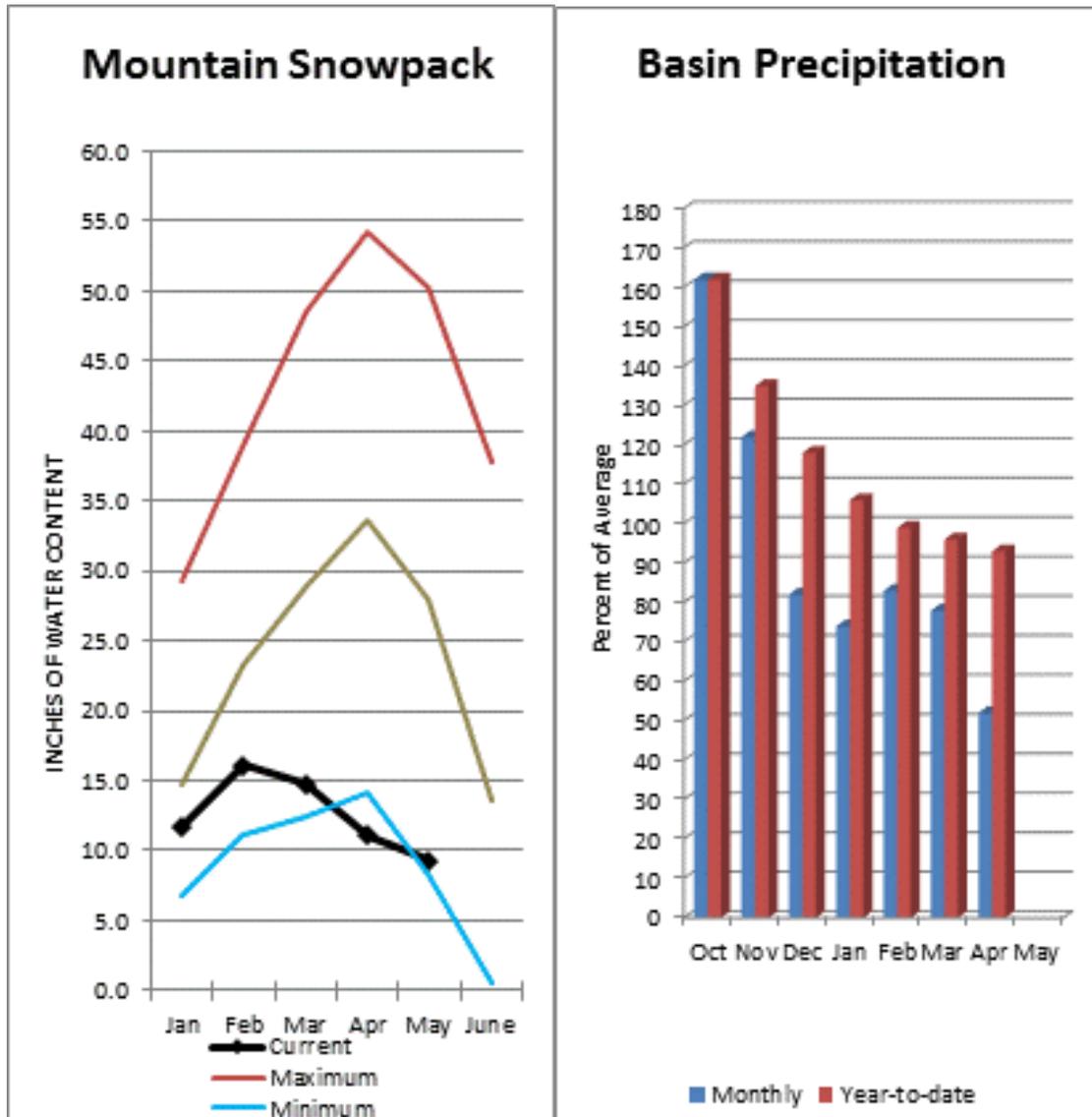
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Conconully Lake (Salmon Lake Dam)	9.0	9.7	7.6	10.5
Conconully Reservoir	12.5	11.5	8.9	13.0
Basin-wide Total	21.5	21.2	16.5	23.5
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Upper Columbia Basins	15	69%	129%
Okanogan River	12	73%	129%
Omak Creek	1	0%	68%
Sanpoil River	0		
Similkameen River	5	63%	139%
Toats Coulee Creek	0		
Conconully Lake	1		
Methow River	4	79%	119%

Central Columbia River Basins



Precipitation during April was 52% of average in the basin and 93% for the year-to-date. Runoff for Entiat River is forecast to be 60% of average for the summer. The May-September average forecast for Chelan River is 65%, Wenatchee River at Plain is 49%, Stehekin River is 61% and Icicle Creek is 55%. April average streamflows on the Chelan River were 92% and on the Wenatchee River 76%. May 1 snowpack in the Wenatchee River Basin was 29% of normal; the Chelan, 53%; the Entiat, 0%; Stemilt Creek, 0% and Colockum Creek, 0%. Lyman Lake SNOTEL had the most snow water with 40 inches of water. This site would normally have 61.2 inches on May 1. Temperatures were 1-3 degrees above normal for April and 2-4 degrees above normal for the water year.

For more information contact your local Natural Resources Conservation Service office.

Central Columbia River Basins

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Central Columbia Basins Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

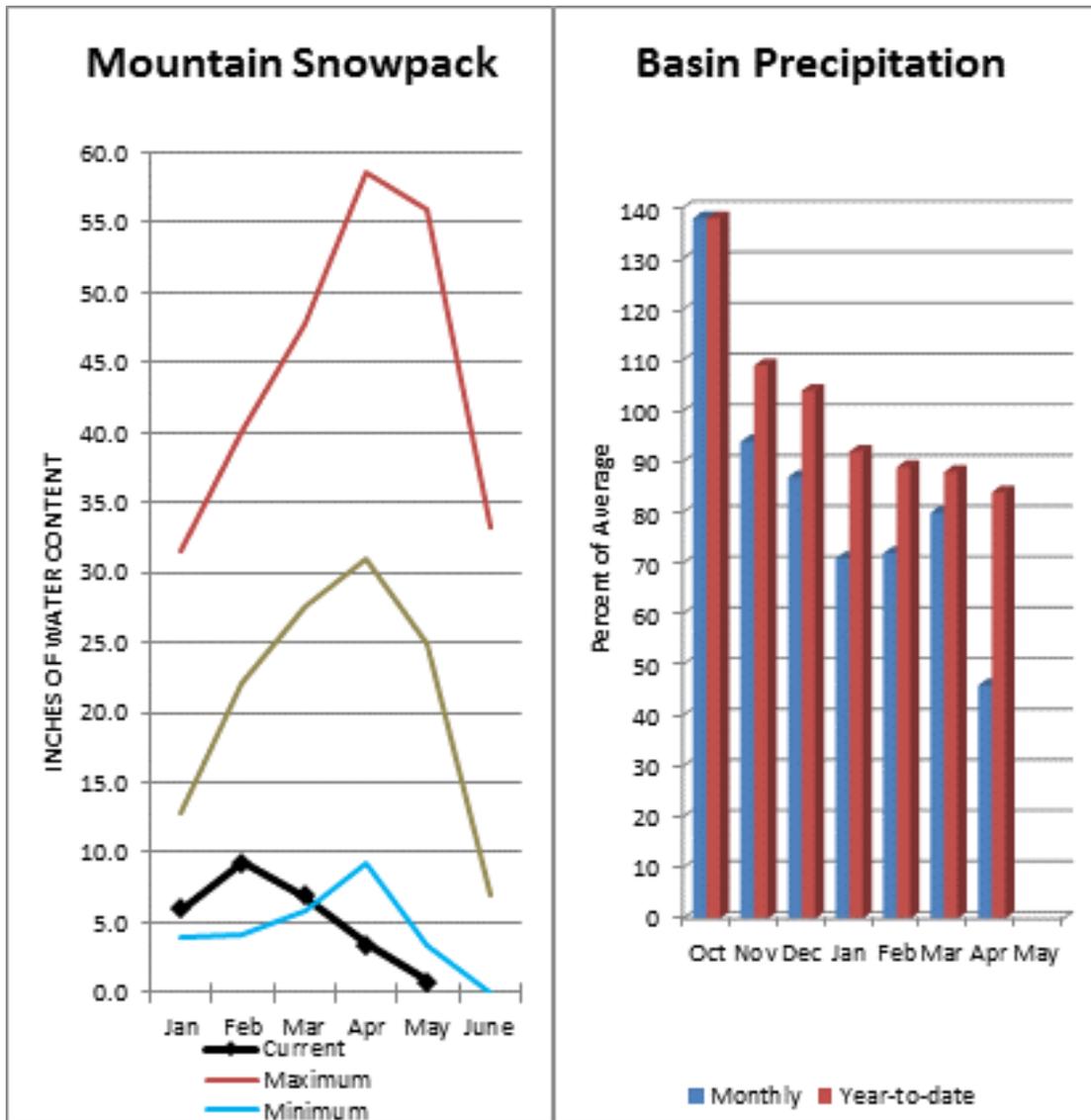
Central Columbia Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Stehekin R at Stehekin	MAY-JUL	295	330	360	61%	390	430	595
	MAY-SEP	365	400	430	61%	455	500	705
Chelan R at Chelan	MAY-JUL	485	535	570	66%	605	655	860
	MAY-SEP	545	595	630	65%	670	725	975
Entiat R nr Ardenvoir	MAY-JUL	84	98	108	61%	118	133	178
	MAY-SEP	90	107	118	60%	130	146	196
Wenatchee R at Plain	MAY-JUL	295	360	405	49%	445	510	825
	MAY-SEP	310	380	430	47%	480	550	920
Icicle Ck nr Leavenworth	MAY-JUL	75	108	131	56%	153	186	235
	MAY-SEP	80	118	143	55%	168	205	260
Wenatchee R at Peshastin	MAY-JUL	440	525	580	51%	635	720	1140
	MAY-SEP	465	555	615	49%	675	765	1260
Columbia R bl Rock Island Dam ²	MAY-JUL	29800	32800	34800	73%	36800	39800	47930
	MAY-SEP	36400	40000	42400	74%	44900	48500	57360

- 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
- 3) Median value used in place of average

Reservoir Storage End of April, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Chelan		291.7	300.7	676.1
Basin-wide Total		0.0	0.0	0.0
# of reservoirs	0	0	0	0

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Central Columbia Basins	3	53%	118%
Chelan Lake Basin	3	53%	118%
Entiat River	1	0%	108%
Wenatchee River	7	29%	108%
Stemilt Creek	1	0%	84%
Colockum Creek	1	0%	178%

Upper Yakima River Basin



May 1 reservoir storage for the Upper Yakima reservoirs was 805,000-acre feet, 132% of average. Forecasts for the Yakima River at Cle Elum are 25% of average and the Teanaway River near Cle Elum is at 18%. Lake inflows are all forecasted to be below average this summer as well. April streamflows within the basin were Cle Elum River near Roslyn at 52%. May 1 snowpack was 2% based upon 8 snow course and SNOTEL readings within the Upper Yakima Basin. Precipitation was 46% of average for April and 84% for the water-year. Volume forecasts for the Yakima Basin are for natural flow. As such, they may differ from the U.S. Bureau of Reclamation's forecast for the total water supply available, which includes irrigation return flow.

For more information contact your local Natural Resources Conservation Service office.

Upper Yakima River Basin

Data Current as of: 5/7/2015 11:52:33 AM

Upper Yakima River Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Upper Yakima River	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Keechelus Reservoir Inflow ²	MAY-JUL	8.4	12.1	15	18%	18.2	24	85
	MAY-SEP	13.30257	18.22312	22	23%	26.1323	32.87373	96
Kachess Reservoir Inflow ²	MAY-JUL	7.56285	10.08406	12	16%	14.08247	17.45685	76
	MAY-SEP	10.6	13.7	16	19%	18.5	23	84
Cle Elum Lake Inflow ²	MAY-JUL	58	79	94	31%	109	130	305
	MAY-SEP	66	93	111	33%	129	156	340
Yakima R at Cle Elum ²	MAY-JUL	46	92	123	22%	154	200	570
	MAY-SEP	73	127	164	25%	200	255	645
Teanaway R bl Forks nr Cle Elum	MAY-JUL	6.17491	10.3041	13.7	17%	17.57875	24.18442	79
	MAY-SEP	6.99567	11.45562	15.1	18%	19.2469	26.28419	82

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

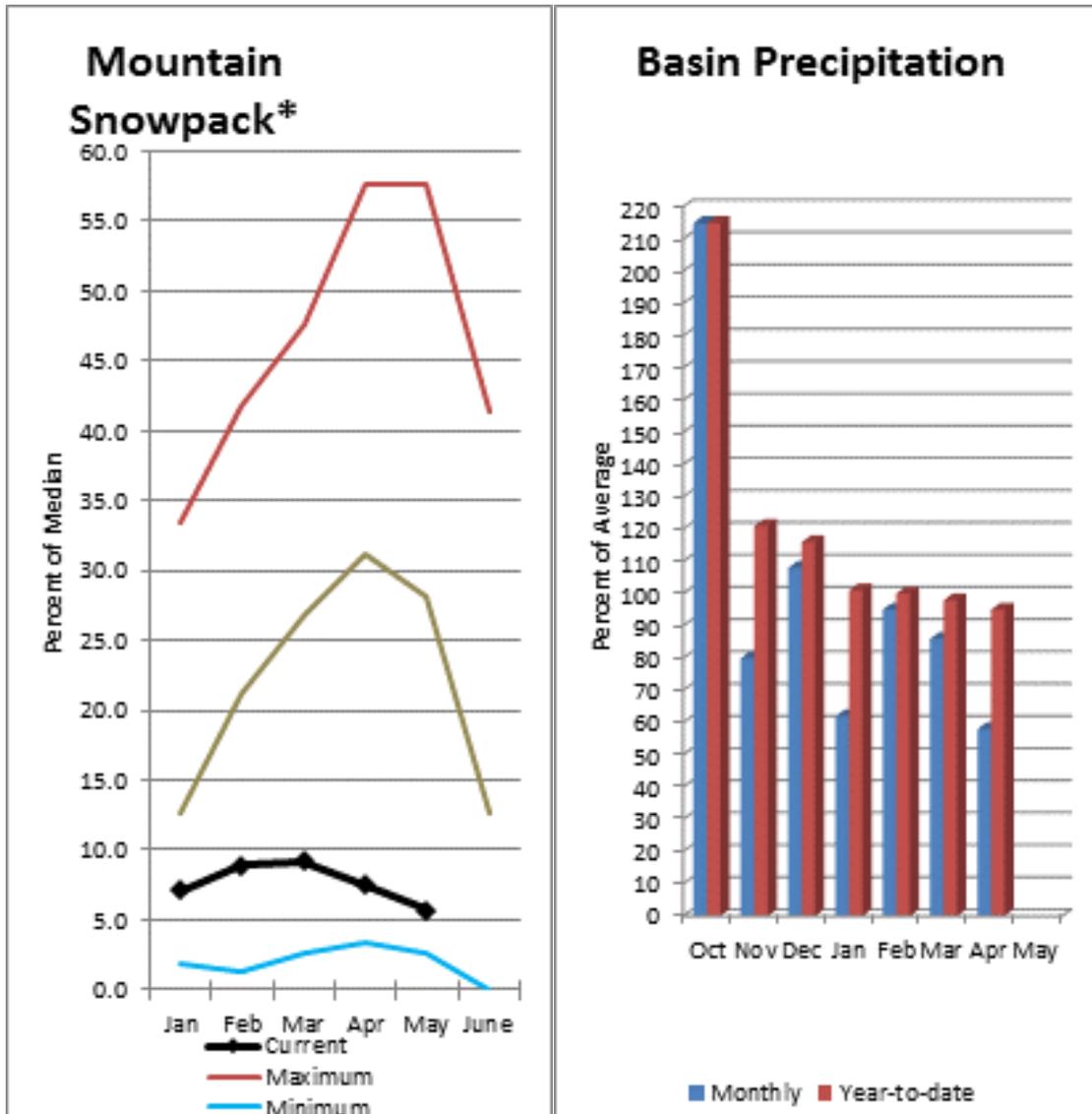
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Keechelus	142.1	140.9	122.1	157.8
Kachess	237.3	224.2	183.7	239.0
Cle Elum	425.5	318.7	302.6	436.9
Basin-wide Total	804.8	683.8	608.4	833.7
# of reservoirs	3	3	3	3

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Upper Yakima River	8	2%	106%

Lower Yakima River Basin



April average streamflows within the basin were: Yakima River near Parker, 45% and the Naches River near Naches, 49%. May 1 reservoir storage for Bumping and Rimrock reservoirs was 225,000-acre feet, 126% of average. Forecast averages for Yakima River near Parker are 27%; American River near Nile, 23%; Ahtanum Creek, 8%; and Klickitat River near Glenwood, 25%. May 1 snowpack was 19% based upon 7 snow course and SNOTEL readings within the Lower Yakima Basin and Ahtanum Creek reported in at 1% of normal. Precipitation was 58% of average for April and 95% for the water-year. Temperatures were 1-3 degrees above normal for April and for 2-4 degrees above normal for the water year. Volume forecasts for Yakima Basin are for natural flow. As such, they May differ from the U.S. Bureau of Reclamation's forecast for the total water supply available, which includes irrigation return flow.

For more information contact your local Natural Resources Conservation Service office.

Lower Yakima River Basin

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Lower Yakima River Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Lower Yakima River	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Bumping Lake Inflow ²	MAY-JUL	8.2	14.9	19.4	21%	24	31	93
	MAY-SEP	8.1	15.8	21	20%	26	34	103
American R nr Nile	MAY-JUL	8	15.2	20	24%	25	32	84
	MAY-SEP	7.3	15.6	21	23%	27	35	92
Rimrock Lake Inflow ²	MAY-JUL	32	42	49	32%	56	67	151
	MAY-SEP	39	52	61	33%	70	84	185
Naches R nr Naches	MAY-JUL	39	61	87	16%	100	134	540
	MAY-SEP	44	70	91	15%	115	156	600
Ahtanum Ck at Union Gap	MAY-JUL	0	0.29	0.86	4%	1.72	3.6	19.3
	MAY-SEP	0.13	0.85	1.69	8%	2.8	5	21
Yakima R nr Parker ²	MAY-JUL	135	240	310	25%	380	485	1230
	MAY-SEP	178	290	370	27%	450	560	1390
Klickitat R nr Glenwood	MAY-JUL	14.3	19.3	23	24%	27	34	97
	MAY-SEP	18.2	24	28	25%	33	41	110
Klickitat R nr Pitt	MAY-JUL	92	111	124	41%	139	161	305
	MAY-SEP	140	165	182	46%	200	230	395

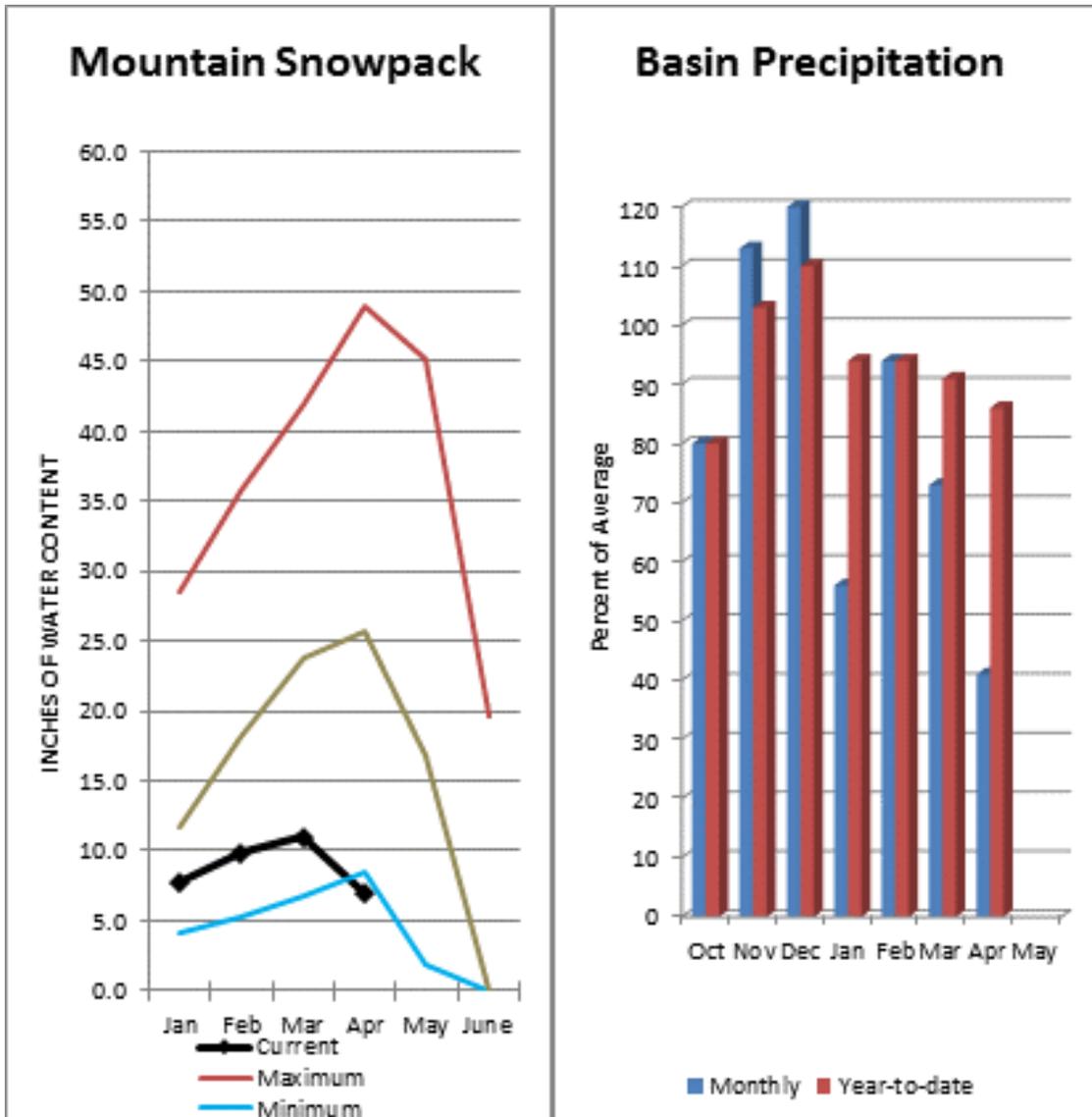
1) 90% and 10% exceedance probabilities are actually 95% and 5%

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

3) Median value used in place of average

Reservoir Storage End of April, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Bumping Lake	33.6	21.0	21.7	33.7
Rimrock	191.2	173.8	156.9	198.0
Basin-wide Total	224.8	194.8	178.6	231.7
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Lower Yakima River	7	19%	102%
Ahtanum Creek	2	1%	71%



April precipitation was 41% of average, maintaining the year-to-date precipitation at 86% of average. Milkshakes SNOTEL still recorded 11.2 of water content on May 1 but the rest of the sites had melted out. Milkshakes is too new to have a normal calculation. Streamflow forecasts are 58% of average for Mill Creek and 69% for the SF Walla Walla near Milton-Freewater. Average temperatures were 1-3 degrees above normal for April and 2-4 degrees above normal for the water year.

For more information contact your local Natural Resources Conservation Service office.

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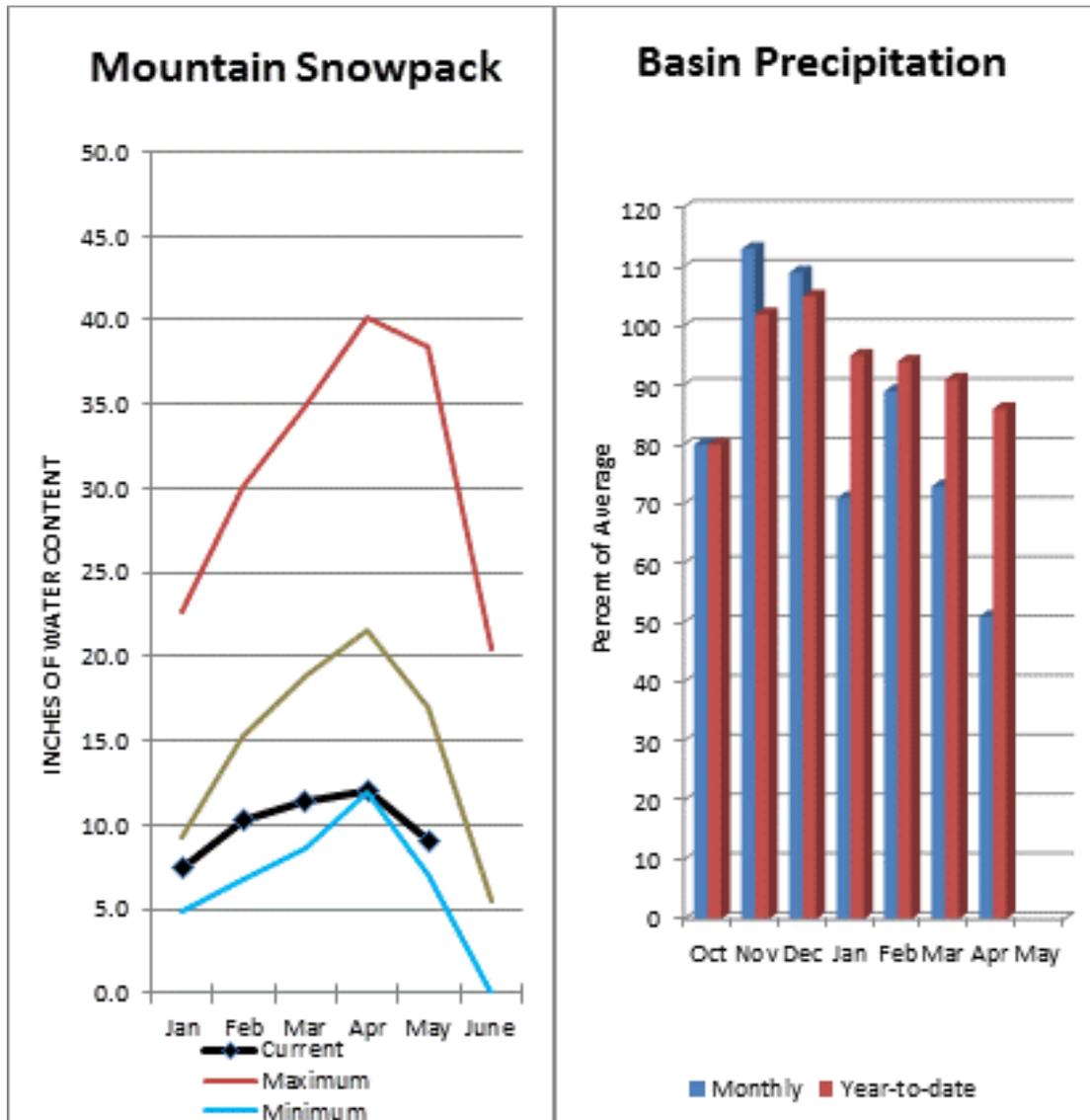
Walla Walla River Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Walla Walla River	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
SF Walla Wall R nr Milton-Freewater	MAY-JUL	17	21	24	65%	27	32	37
	MAY-SEP	26	31	34	69%	38	43	49
Mill Ck nr Walla Walla	MAY-JUL	4.4	6.4	8	58%	9.8	12.8	13.9
	MAY-SEP	6.1	8.3	10	58%	11.8	14.8	17.3

- 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
- 3) Median value used in place of average

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Walla Walla River	2	0%	116%



The Grande Ronde River can expect summer flows to be about 48% of normal. The forecast for Asotin Creek at Asotin predicts 36% of average flows for the May – July runoff period. April precipitation was 51% of average, bringing the year-to-date precipitation to 86% of average. May 1 snowpack readings averaged 32% of normal. April streamflow was 64% of average for Snake River below Lower Granite Dam and 42% for Grande Ronde River near Troy. Dworshak Reservoir storage was 122% of average. Average temperatures were 1-3 degrees above normal for April and 2-4 degrees above for the water year.

For more information contact your local Natural Resources Conservation Service office.

Lower Snake River Basin

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Lower Snake, Grande Ronde, Clearwater Basins Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Lower Snake, Grande Ronde, Clearwater Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Grande Ronde R at Troy	MAY-JUL	250	330	395	46%	465	575	860
	MAY-SEP	295	385	450	48%	520	635	945
Asotin Ck at Asotin	MAY-JUL	5.1	7.1	8.6	36%	10.3	13	24
Clearwater R at Spalding ²	MAY-JUL	2450	2990	3350	64%	3710	4250	5260
	MAY-SEP	2710	3280	3670	65%	4060	4630	5640
Snake R bl Lower Granite Dam ¹²	MAY-JUL	3670	5930	6960	46%	7990	10300	15280
	MAY-SEP	5080	7690	8880	50%	10100	12700	17715

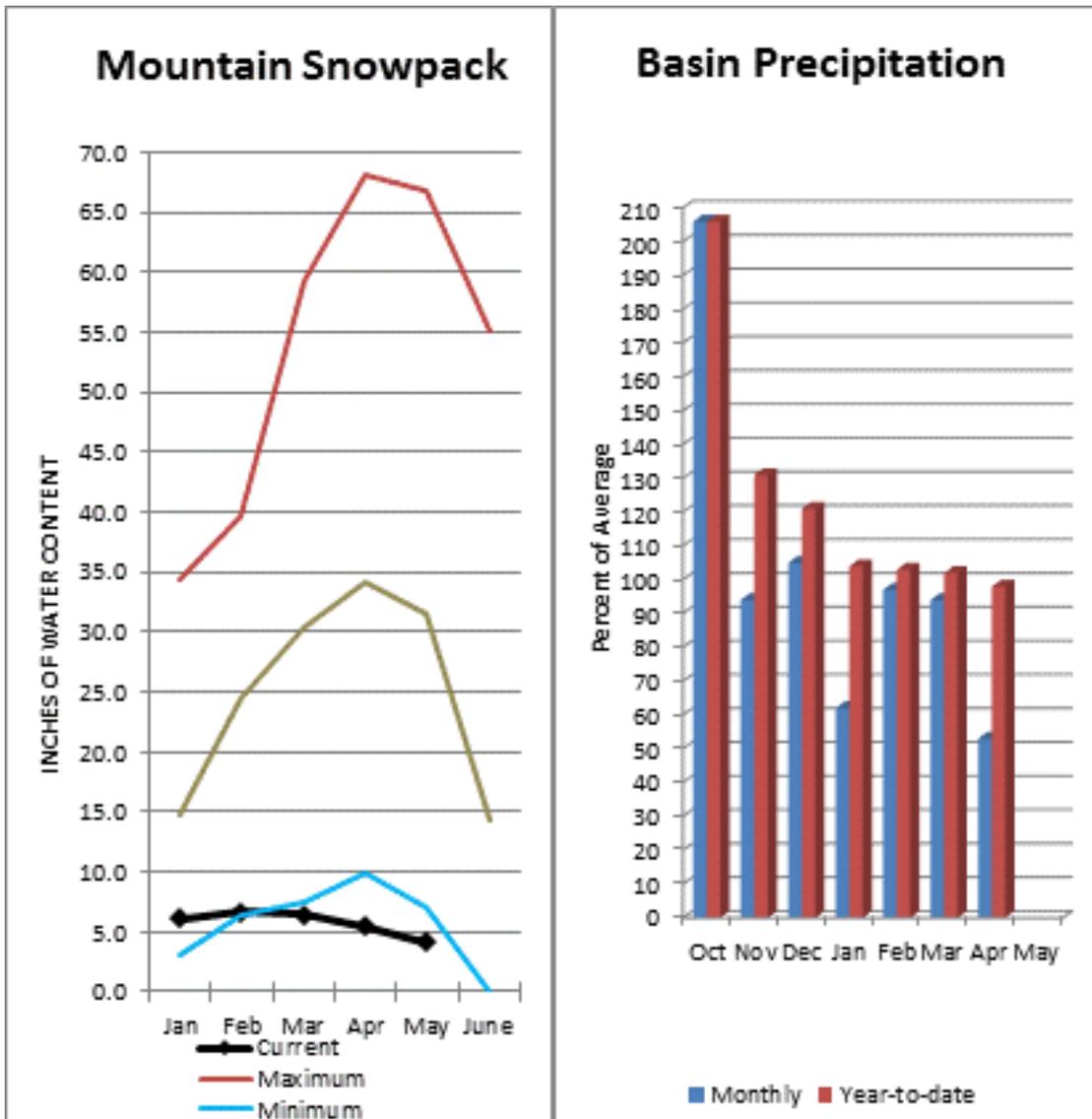
1) 90% and 10% exceedance probabilities are actually 95% and 5%

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

3) Median value used in place of average

Reservoir Storage End of April, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Dworshak Reservoir	3218.2	1888.3	2646.0	3468.0
Basin-wide Total	3218.2	1888.3	2646.0	3468.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Lower Snake, Grande Ronde, Clearwater Basins	14	32%	127%



Forecasts for May – September streamflows within the basin are Lewis River at Ariel, 60% and Cowlitz River at Castle Rock, 79% of average. The Columbia at The Dalles is forecasted to have 65% of average flows this summer according to the River Forecast Center. April average streamflow for Cowlitz River was 65%. The Columbia River at The Dalles was 83% of average. April precipitation was 53% of average and the water-year average was 98%. May 1 snow cover for Cowlitz River was 25%, and Lewis River was 0% of normal. Temperatures were 1-3 degrees above normal during April and for the water year.

Lower Columbia River Basins

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Lower Columbia Basins Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast

Lower Columbia Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Columbia R at The Dalles ²	MAY-JUL	36100	40300	43100	65%	45900	50100	66050
	MAY-SEP	44600	49700	53100	67%	56500	61500	78900
Klickitat R nr Glenwood	MAY-JUL	14.3	19.3	23	24%	27	34	97
	MAY-SEP	18.2	24	28	25%	33	41	110
Klickitat R nr Pitt	MAY-JUL	92	111	124	41%	139	161	305
	MAY-SEP	140	165	182	46%	200	230	395
Lewis R at Ariel ²	MAY-JUL	185	280	345	56%	410	505	615
	MAY-SEP	280	390	460	60%	535	640	770
Cowlitz R bl Mayfield ²	MAY-JUL	465	615	715	61%	815	965	1180
	MAY-SEP	580	765	885	64%	1010	1190	1390
Cowlitz R at Castle Rock ²	MAY-JUL	865	1070	1200	75%	1330	1530	1600
	MAY-SEP	1140	1350	1500	79%	1650	1860	1890

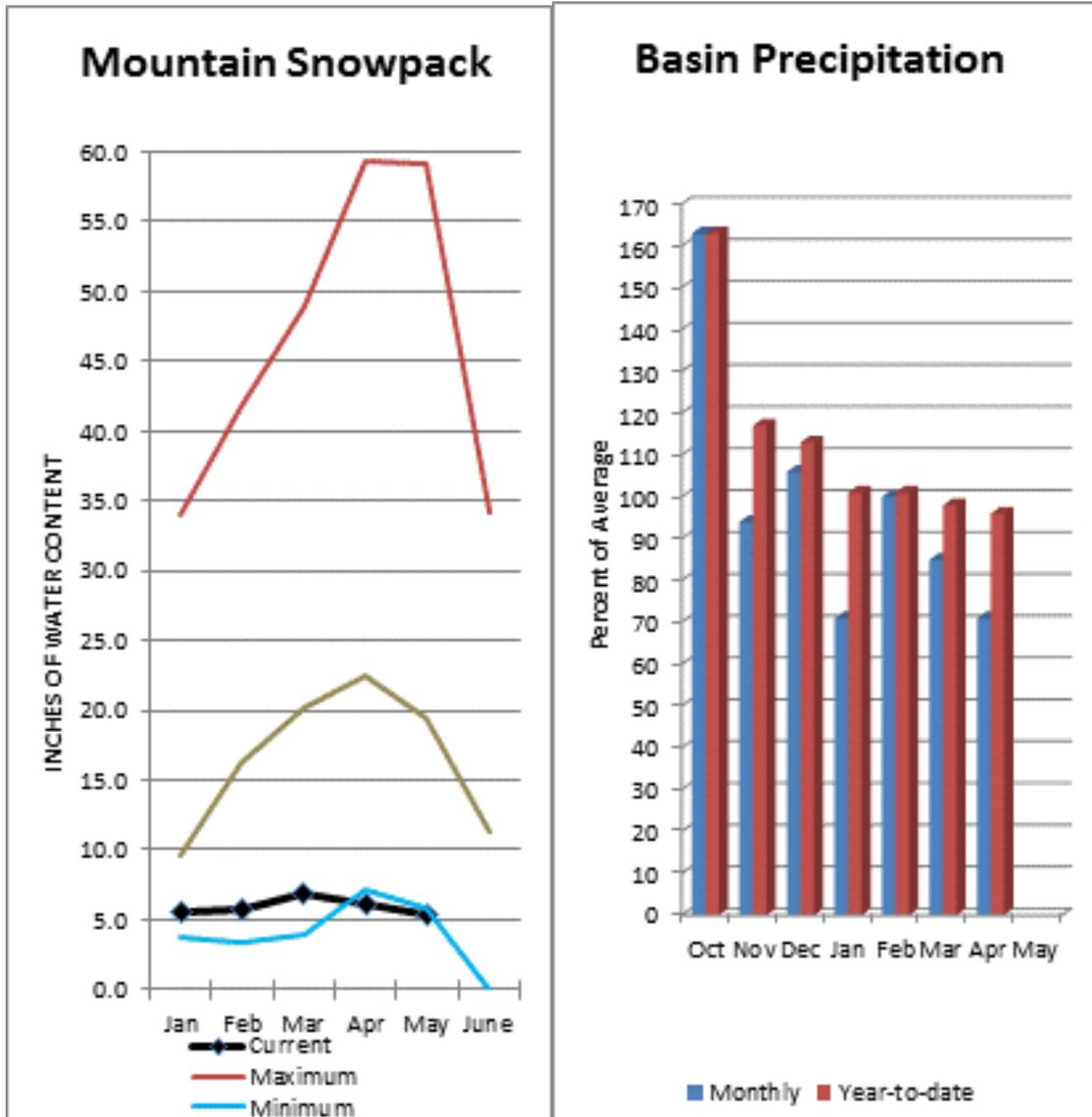
1) 90% and 10% exceedance probabilities are actually 95% and 5%

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

3) Median value used in place of average

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Lower Columbia Basins	11	13%	101%
Lewis River	5	0%	76%
Cowlitz River	6	25%	125%

South Puget Sound River Basins



Summer runoff is forecast to be 50% of normal for the Green River below Howard Hanson Dam and 69% for the White River near Buckley. May 1 snowpack was 37% of average for the White River and 33% for the Puyallup River. The Green River Basin had melted out prior to May 1. April precipitation was 71% of average, bringing the water year-to-date to 96% of average for the basins. Average temperatures in the area were 1-3 degrees above normal for April and for the water-year.

For more information contact your local Natural Resources Conservation Service office.

South Puget Sound River Basins

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South Puget Sound Basins Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

South Puget Sound Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
White R nr Buckley ^{1,2}	MAY-JUL	128	195	225	68%	255	320	330
	MAY-SEP	176	255	290	69%	325	405	420
Green R bl Howard A Hanson Dam ^{1,2}	MAY-JUL	28	52	66	43%	81	121	152
	MAY-SEP	41.93168	71.82427	88	50%	105.81709	150.95059	175

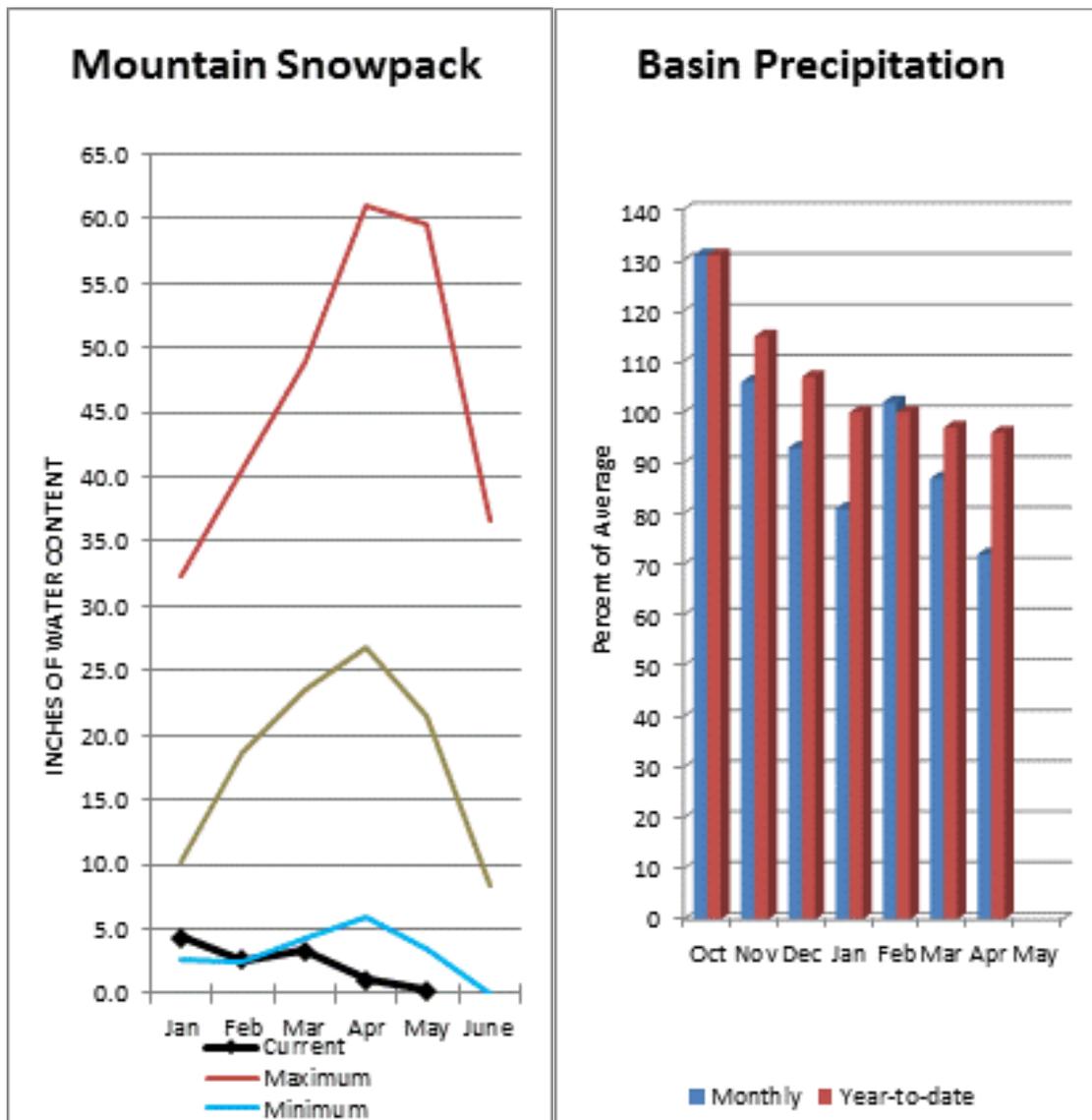
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2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
South Puget Sound Basins	10	28%	108%
White River	3	37%	114%
Green River	2	0%	77%

Central Puget Sound River Basins



Forecast for spring and summer flows are: 45% for Cedar River near Cedar Falls; 46% for Rex River; 51% for South Fork of the Tolt River; and 65% for Taylor Creek near Selleck. Basin-wide precipitation for April was 72% of average, bringing water-year-to-date to 96% of average. Thanks to an end of month snow storm both the Cedar River and Tolt River basins picked up a wee bit of snow, but only enough to last a day or two. Snoqualmie River Basin was 1%, and Skykomish River Basin was 2%. This is a new all-time record low for May 1 snow survey at Alpine Meadows, since records began in 1969. Temperatures were 1-3 degrees above normal for April and for the water-year.

For more information contact your local Natural Resources Conservation Service office.

Central Puget Sound River Basins

Data Current as of: 5/7/2015 11:52:50 AM

Central Puget Sound Basins Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast

Central Puget Sound Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Cedar R nr Cedar Falls	MAY-JUL	12.2	16	19	39%	22	27	49
	MAY-SEP	16.6	21	25	45%	29	35	56
Rex R nr Cedar Falls	MAY-JUL	3.3	4.6	5.7	35%	6.9	8.8	16.2
	MAY-SEP	5.2	7.1	8.5	46%	10.1	12.6	18.5
Taylor Ck nr Selleck	MAY-JUL	5.6	7	8	60%	9.1	10.9	13.3
	MAY-SEP	7.9	9.7	11	65%	12.4	14.6	16.9
SF Tolt R nr Index	MAY-JUL	2.9	3.7	4.3	41%	4.9	6	10.4
	MAY-SEP	4.1	5.3	6.3	51%	7.3	8.9	12.3

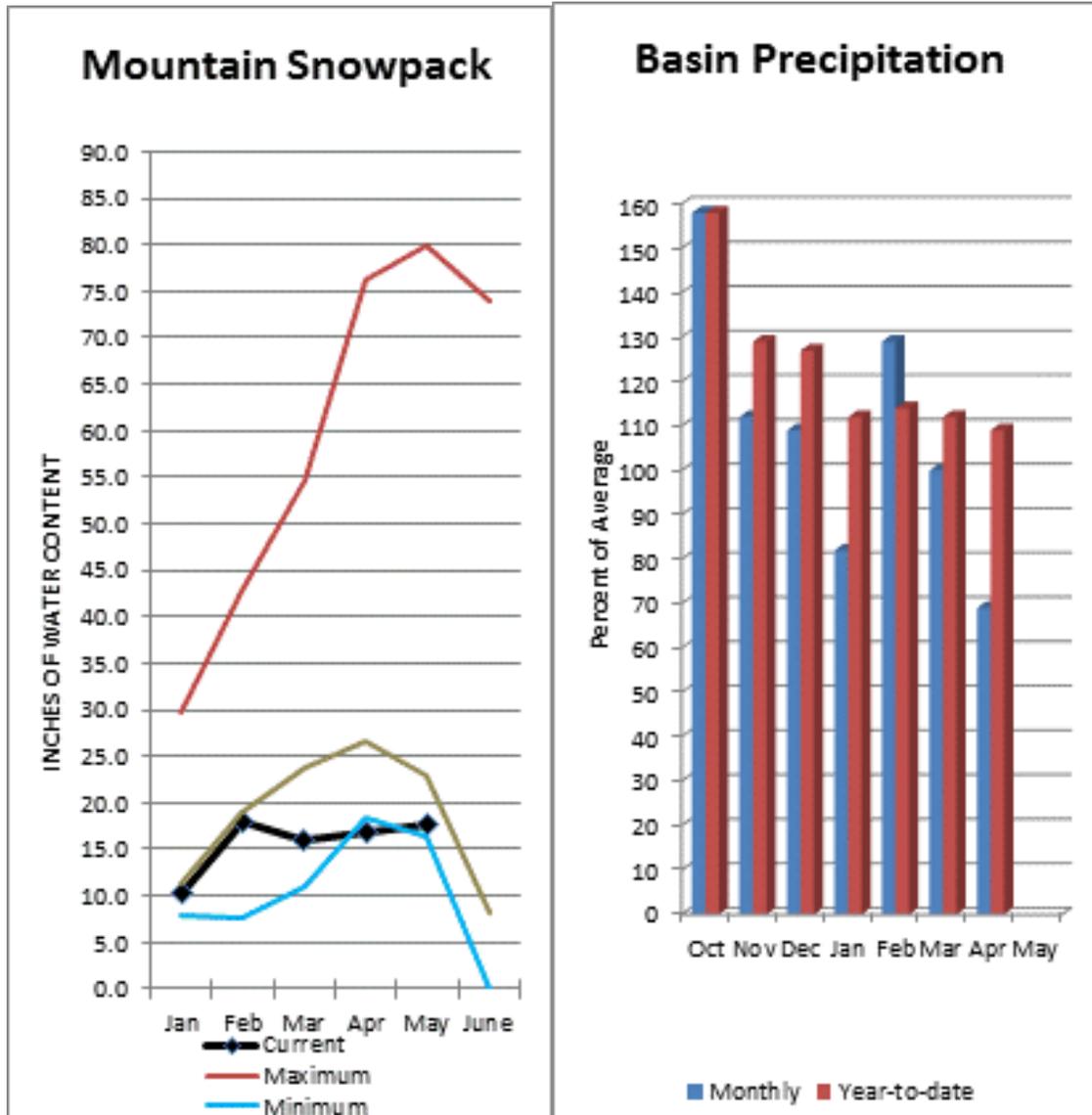
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2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Central Puget Sound Basins	12	1%	112%
Puyallup River	5	33%	116%
Cedar River	4	0%	112%
Tolt River	2	0%	126%
Snoqualmie River	4	1%	112%
Skykomish River	2	1%	103%

North Puget Sound River Basins



Forecast for Skagit River streamflow at Newhalem is 76% of average for the spring and summer period. April streamflow in Skagit River was 92% of average. Other forecast points included Baker River at 69% and Thunder Creek at 76% of average. Basin-wide precipitation for April was 69% of average, bringing water-year-to-date to 109% of average. May 1 average snow cover in Skagit River Basin was 54%, Nooksack River Basin was 14% and Baker River Basin was 15%. May 1 Skagit River reservoir storage was 94% of average and 51% of capacity. Average temperatures were 1-3 degrees above normal for April and 2-4 degrees above for the water year.

For more information contact your local Natural Resources Conservation Service office.

North Puget Sound River Basins

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North Puget Sound Basins Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast

North Puget Sound Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Thunder Ck nr Newhalem	MAY-JUL	154	173	186	89%	200	220	210
	MAY-SEP	230	255	270	89%	285	310	305
Skagit R at Newhalem ²	MAY-JUL	925	1020	1090	77%	1160	1260	1420
	MAY-SEP	1140	1260	1340	76%	1420	1540	1770
Baker R at Concrete	MAY-JUL	340	395	435	69%	475	545	635
	MAY-SEP	450	525	575	69%	630	715	835

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

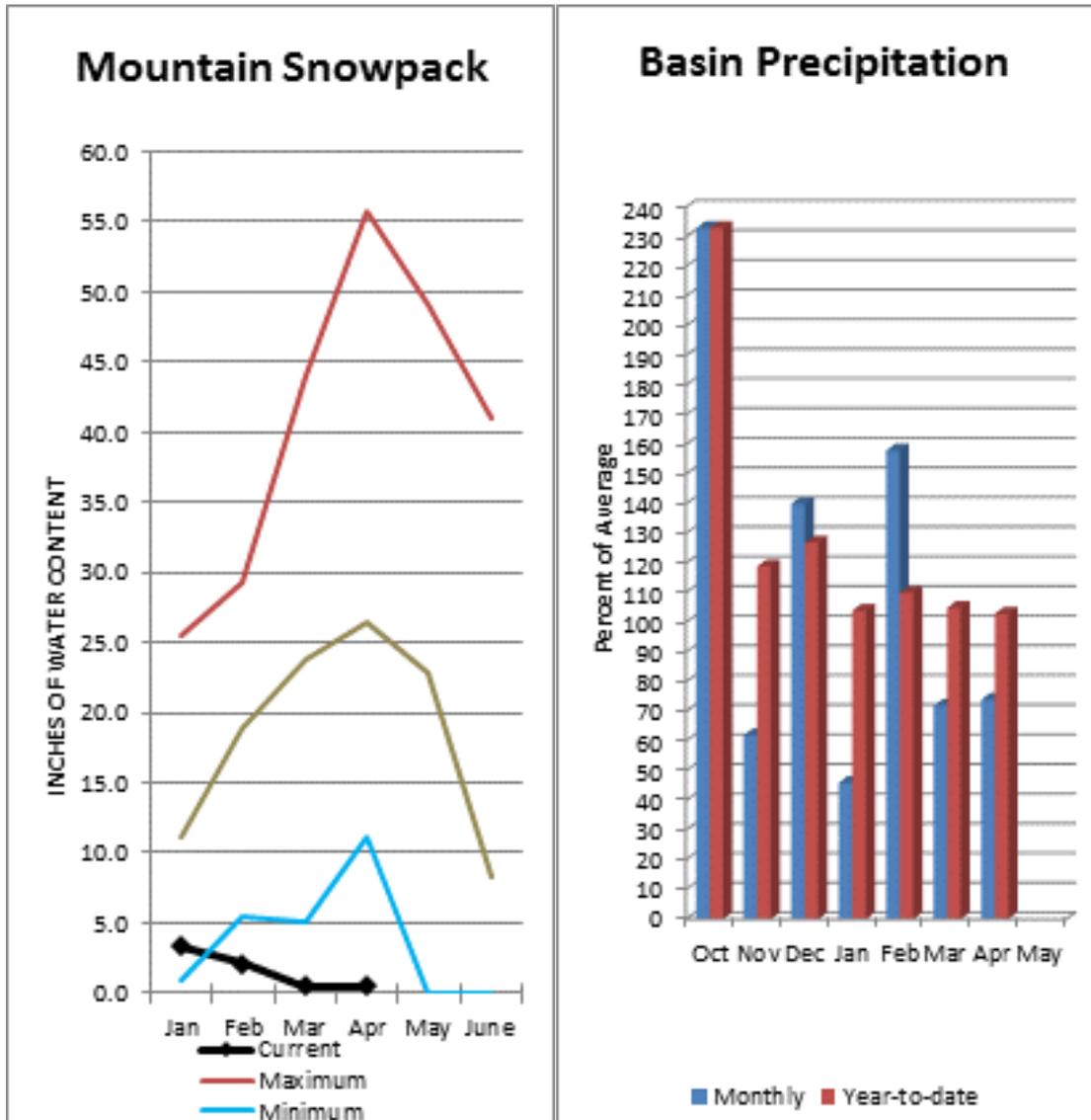
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

Reservoir Storage End of April, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Ross	710.1	376.3	754.4	1404.1
Diablo Reservoir			85.9	90.6
Basin-wide Total	710.1	376.3	754.4	1404.1
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
North Puget Sound Basins	25	30%	118%
Skagit River	16	54%	124%
Baker River	6	15%	114%
Nooksack River	3	14%	117%

Olympic Peninsula River Basins



Forecasted average runoff for streamflow for the Dungeness River is 47% and Elwha River is 53% April runoff in the Dungeness River was 75% of normal. Big Quilcene and Wynoochee rivers may expect below average runoff this summer as well. April precipitation was 74% of average. Precipitation has accumulated at 103% of average for the water year. Olympic Peninsula snowpack had melted out prior to May 1. Only the highest elevations and glaciers still have snow which is visible from afar. Temperatures were 1-2 degrees above average for April and 2-3 degrees above normal for the water year.

For more information contact your local Natural Resources Conservation Service office.

Olympic Peninsula River Basins

Data Current as of: 5/7/2015 11:52:57 AM

Olympic Peninsula Streamflow Forecasts - May 1, 2015

Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast

Olympic Peninsula	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Dungeness R nr Sequim	MAY-JUL	32	43	50	50%	57	68	101
	MAY-SEP	35	49	59	47%	69	83	125
Elwha R at McDonald Bridge nr Port Angeles	MAY-JUL	124	149	166	52%	183	210	320
	MAY-SEP	152	182	205	53%	225	255	390

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

3) Median value used in place of average

Watershed Snowpack Analysis May 1, 2015	# of Sites	% Median	Last Year % Median
Olympic Peninsula	6	0%	88%

Issued by

Jason Weller
Chief
Natural Resources Conservation Service
U.S. Department of Agriculture

Released by

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 Natural Resource Operations
State	Washington State Department of Ecology Washington State Department of Natural Resources
Federal	Department of the Army Corps of Engineers U.S. Department of Agriculture Forest Service U.S. Department of Commerce NOAA, National Weather Service U.S. Department of Interior Bonneville Power Administration Bureau of Reclamation Geological Survey National Park Service Bureau of Indian Affairs Recourse Conservation & Development Councils
Local	City of Tacoma City of Seattle Chelan County P.U.D. Pacific Power and Light Company Puget Sound Energy Washington Water Power Company Snohomish County P.U.D. Colville Confederated Tribes Spokane County Yakama Indian Nation Whatcom County Pierce County Kalispel Tribe of Indians Spokane Indian Tribe Jamestown S'klallum Tribe
Private	Okanogan Irrigation District Wenatchee Heights Irrigation District Newman Lake Homeowners Association Whitestone Reclamation District

*Other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.



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Washington Water Supply Outlook Report

Natural Resources Conservation Service
Spokane, WA

