United States Department of Agriculture

NRCS Natural Resources Conservation Service

Washington
Water Supply Outlook Report
March 1, 2015

Brown Top Aerial Marker
104% of normal 3/1/2008

Brown Top Aerial Marker
65% of normal 3/1/2015

Photos by Keith Kingslien

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.

Washington
Water Supply Outlook

March 2015

General Outlook

Essentially no measureable snow accumulated throughout the month of February until the very last days of the month when areas above 4000 feet elevation received a light dusting. More than 27 percent of our SNOTEL and snow course network set new all-time record low or near record low snow water equivalent for March 1. Total precipitation was near normal for the month however temperatures were 4-10 degrees above normal. Short term weather forecasts are calling for a chance of warm rain however weather forecasters are sticking with the warm and dry scenario for the next several months. A continuation of current conditions will most certainly drive our snowpack into a deeper depression. http://www.cpc.ncep.noaa.gov/

Snowpack

The March 1 statewide SNOTEL readings were 29% of normal but vary across the state. The Cedar River was snow free followed closely by the Olympics at only 2% of the 30-year median for March 1, the lowest year on record in both basins since measurements began. Readings from the Methow River Basin reported the highest at 85% of normal for March 1. Westside medians from SNOTEL, and March 1 snow surveys, included the North Puget Sound river basins with 39% of normal, the Central and South Puget river basins with 14% and 34% respectively, and the Lower Columbia basins with 21% of normal. Snowpack along the east slopes of the Cascade Mountains included the Yakima area with 30% and the Wenatchee area with 51%. Snowpack in the Spokane River Basin was at 43% and the Walla Walla River Basin had 46% of the long term median.

BASIN	PERCENT OF NORMAL	PERCENT OF LAST YEAR
Spokane	43	100
Newman Lake	20	78
Pend Oreille	85	123
Okanogan	79	92
Methow	85	88
Conconully Lake	58	54
Central Columbia	51	92
Upper Yakima	25	97
Lower Yakima	34	88
Ahtanum Creek	30	86
Walla Walla	46	85
Lower Snake	60	100
Cowlitz	32	103
Lewis	7	66
White	46	87
Green	8	75
Puyallup	38	88
Cedar	0	97
Snoqualmie	6	96
Skykomish	11	93
Skagit	62	108
Nooksack	15	97
Baker	26	88
Olympic Peninsula	2	77

Precipitation

Precipitation fell in the form of rain only last month with near average rainfall over most of the state. Even so the water-year to date precipitation remains near to slightly above normal in all basins. The Upper Yakima area was the driest at 72% of normal precipitation for February. Waterhole SNOTEL near Hurricane Ridge measured 198% of normal rainfall. Elbow Lake SNOTEL in the South Fork Nooksack River Basin continues to rein over the entire SNOTEL network with a water-year accumulation of 113.7 inches, 19 inches above normal or 120% of average for the water-year.

RIVER BASIN	FEBRUARY PERCENT OF AVERAGE	WATER YEAR PERCENT OF AVERAGE
Spokane	81	89
Pend Oreille	85	104
Upper Columbia	75	107
Central Columbia	83	99
Upper Yakima	72	89
Lower Yakima	95	100
Walla Walla	94	94
Lower Snake	89	94
Lower Columbia	97	103
South Puget Sound	100	101
Central Puget Sound	102	100
North Puget Sound	129	114
Olympic Peninsula	158	110

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. More rainfall than snow has helped buffer many reservoirs to above normal levels for this time of year. In most cases managers are electing to hold this excess water due to the uncertainty of the snowpack. March 1 Reservoir storage in the Yakima Basin was 776,000-acre feet, 172% of average for the Upper Reaches and 232,000-acre feet or 170% of average for Rimrock and Bumping Lakes. The power generation reservoirs included the following: Coeur d'Alene Lake, 144,000 acre feet, 109% of average and 60% of capacity; and the Skagit River reservoirs at 57% of average and 96% of capacity. 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	60	109
Pend Oreille	41	81
Upper Columbia	75	120
Central Columbia		
Upper Yakima	93	172
Lower Yakima	100	170
Lower Snake	83	122
North Puget Sound	57	96

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

Streamflow

April to September runoff forecasts for March 1 continued to drop since the February forecasts were issued due to the obvious lack of snowfall and above normal temperatures. February streamflows were mostly well above normal due to heavy rains and snow melt. April-September forecasts for some Western Washington streams include the Cedar River near Cedar Falls, 64%; White River, 81%; and Skagit River, 86%. Some Eastern Washington streams include the Yakima River near Parker 54%, Wenatchee River at Plain 69%; and Spokane River near Post Falls 53%. 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 of average flows 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 to ensure adequate water supply this summer.**

BASIN	PERCENT OF AVERAGE (50 PERCENT CHANCE OF EXCEEDENCE)
Spokane	53-57
Pend Oreille	67-98
Upper Columbia	51-92
Central Columbia	63-89
Upper Yakima	37-49
Lower Yakima	54-72
Walla Walla	74-83
Lower Snake	69-97
Lower Columbia	58-84
South Puget Sound	70-81
Central Puget Sound	57-75
North Puget Sound	85-94
Olympic Peninsula	66-68

STREAM	PERCENT OF AVERAGE FEBRUARY STREAMFLOWS
Pend Oreille at Albeni Fall Dam	281
Kettle at Laurier	567
Columbia at Birchbank	220
Spokane at Spokane	197
Similkameen at Nighthawk	355
Okanogan at Tonasket	254
Methow at Pateros	309
Chelan at Chelan	282
Wenatchee at Pashastin	251
Cle Elum near Roslyn	200
Yakima at Parker	169
Naches at Naches	219
Grande Ronde at Troy	154
Snake below Lower Granite Dam	141
Columbia River at The Dalles	131
Lewis at Merwin Dam	96
Cowlitz below Mayfield Dam	108
Skagit at Concrete	187
Dungeness near Sequim	190

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

Soil Moisture

Near to above normal fall precipitation provided for wet and nearly saturated soils (60-70% saturation) as the snow finally began to accumulate in mid-December. Great fall soil moisture conditions can help buffer low snowpack runoff come spring. The recent dry spell has resulted in a slight reduction to stored soil moisture however levels are still in good shape. 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.

Natural Resources Conservation Service

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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

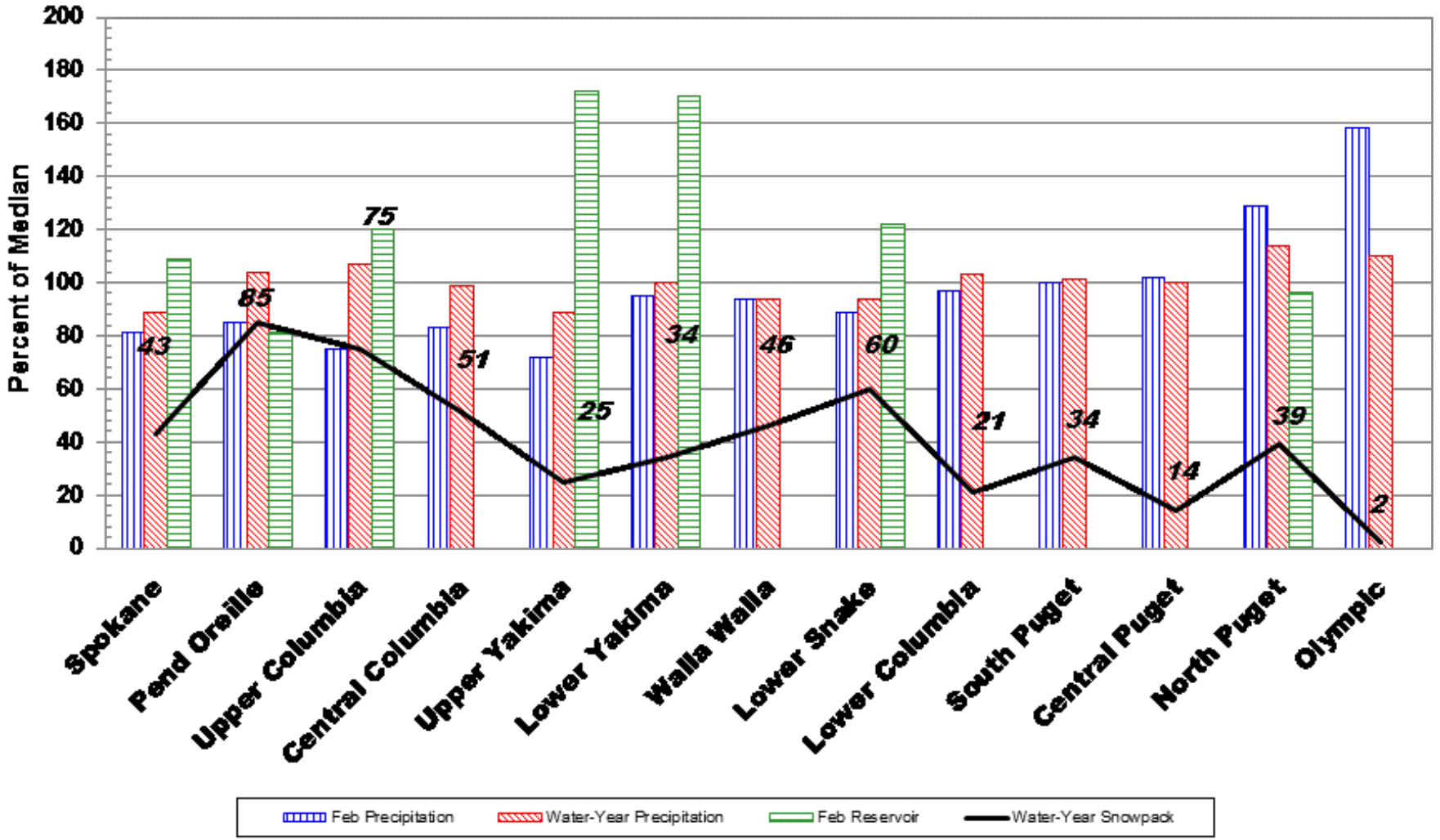
Washington:
http://www.nrcs.usda.gov/wps/portal/nrcs/site/wa/home/

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

NRCS Natural Resources Conservation Service

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

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



Western Snow Conference

The Western Snow Conference is an annual tradition which started in 1932 as an international forum for individuals and organizations to share scientific, management and socio-political information on snow and runoff. The principal aim of the Western Snow Conference is to advance snow and hydrological sciences. The South Pacific Area Committee is making plans for the 83rd Annual Western Snow Conference in 2015.

Mark your calendar and start thinking about submitting a paper to attend the 2015 Western Snow Conference:

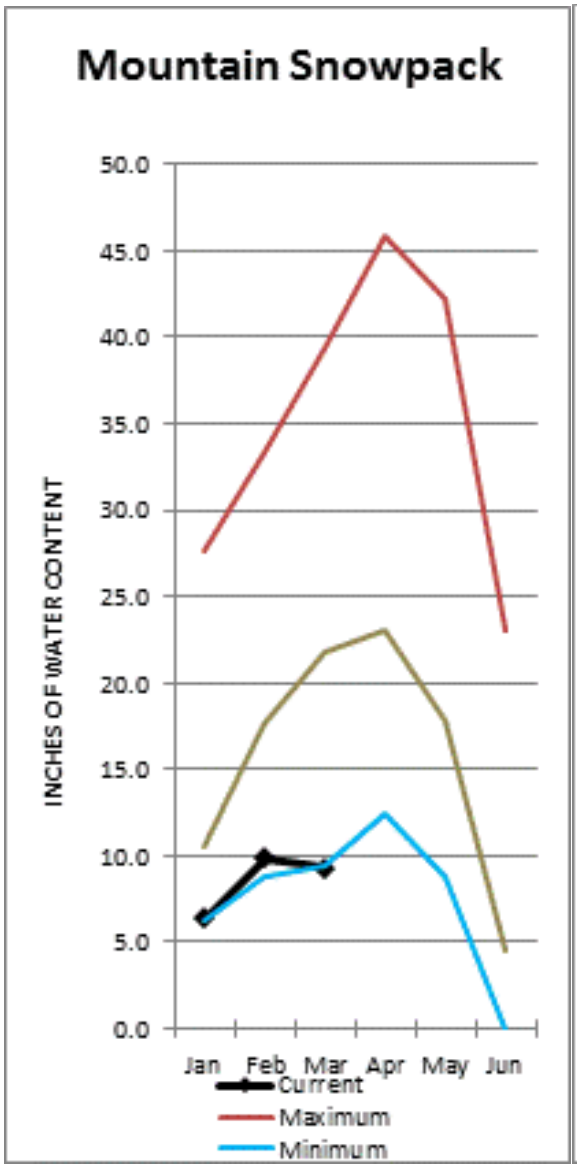
Dates: April 20-24, 2015
Location: Grass Valley, California

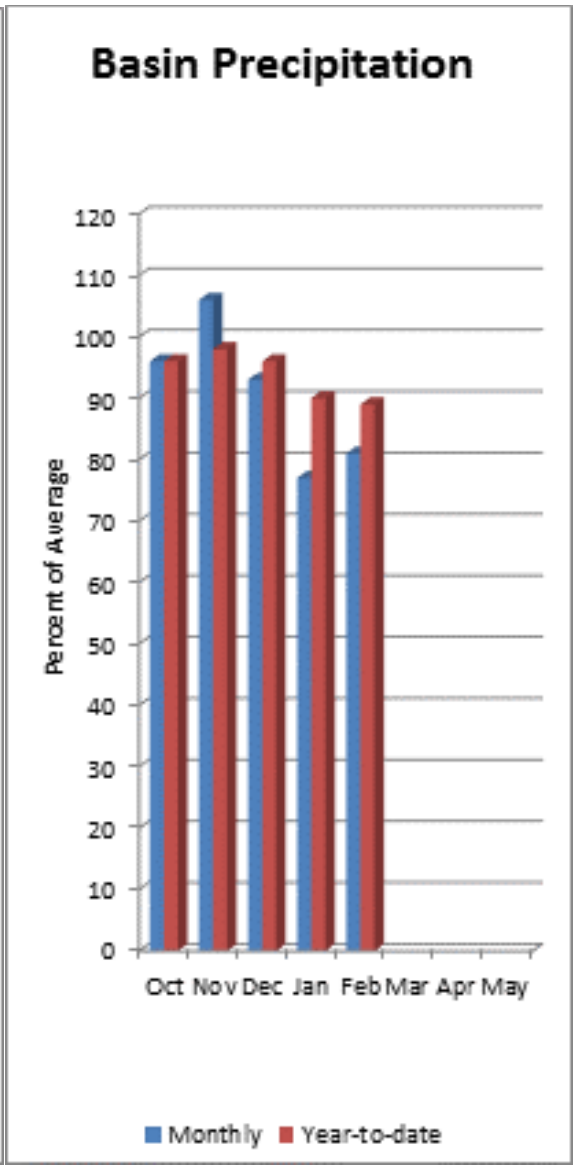
The Conference will begin Monday, April 20th with a short course and panel discussion on " LIDAR Basics, Applications, and Use in Snow Hydrology and Field Studies " with several invited experts in the field. Tuesday and Wednesday will include formal paper and poster presentations on a variety of topics, including climate variability, climate change impacts on snow and runoff, water management, water supply forecasting, and modeling and climatology of snow. Thursday will include a technical tour to visit hydrologic and gold mining points of interest around Grass Valley

Additional information about the conference and the Call for Papers will be posted on the WSC web page at http://www.westernsnowconference.org/

Also find Western Snow Conference on Facebook and Twitter.

Spokane River Basin





The March 1 forecasts for summer runoff within the Spokane River Basin are 53% of average near Post Falls and 57% at Long Lake. The Chamokane River near Long Lake forecasted to have 54% of average flows for the May-August period. The forecast is based on a basin snowpack that is 32% of normal and precipitation that is 89% of average for the water year. Precipitation for February was slightly below normal at 81% of average. Streamflow on the Spokane River at Spokane was 137% of average for February. March 1 storage in Coeur d'Alene Lake was 144,000 acre feet, 109% of average and 60% of capacity. Snowpack at Quartz Peak SNOTEL site was 79% of average with 6.2 inches of water content, over 2 inches less than last month. Average temperatures in the Spokane basin were 4-6 degrees above normal for February and 3-5 degrees above normal for the water year.

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

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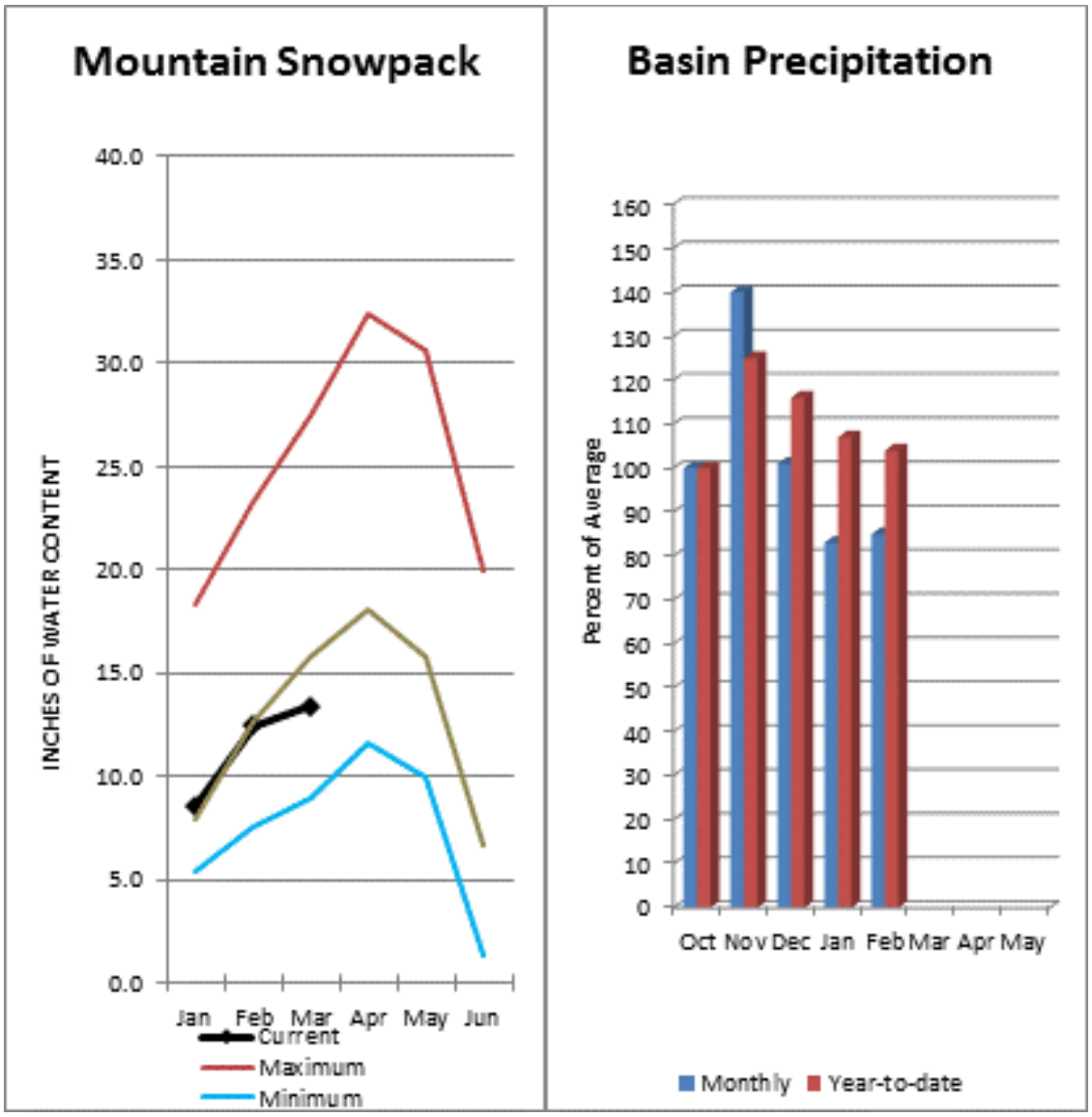
Spokane
Streamflow Forecasts - March 1, 2015

Spokane	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment: Chance that actual volume will exceed forecast — 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Spokane R nr Post Falls[2]								
	APR-JUL	560	975	1260	53%	1540	1960	2390
	APR-SEP	600	1020	1310	53%	1600	2020	2480
Spokane R at Long Lake[2]								
	APR-JUL	705	1160	1460	56%	1770	2220	2620
	APR-SEP	845	1310	1620	57%	1940	2400	2850
Chamokane Ck nr Long Lake								
	MAY-AUG	1.67	2.9	5	54%	7.1	10.2	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 February, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Coeur d' Alene	144.1	70.2	132.8	238.5
Basin-wide Total	144.1	70.2	132.8	238.5
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2015	# of Sites	% Median	Last Year % Median
Spokane	15	43%	100%
Newman Lake	3	20%	78%



The April – September average forecast for the Priest River near the town of Priest River is 67% and the Pend Orielle below Box Canyon is 98%. February streamflow was 281% of average on the Pend Oreille River and 216% on the Columbia at Birchbank. March 1 snow cover was 85% of normal in the Pend Oreille Basin River Basin. Bunchgrass Meadows SNOTEL site had 11.9 inches of snow water on the snow pillow. Normally Bunchgrass would have 22.5 inches on March 1. Precipitation during February was 85% of average, dropping the year-to-date precipitation at 104% of average. Reservoir storage in the basin, including Lake Pend Oreille and Priest Lake was 81% of normal. Average temperatures were 4-6 degrees above normal for February and 3-5 degrees above normal for the water year.

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

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Pend Oreille Basins
Streamflow Forecasts - March 1, 2015

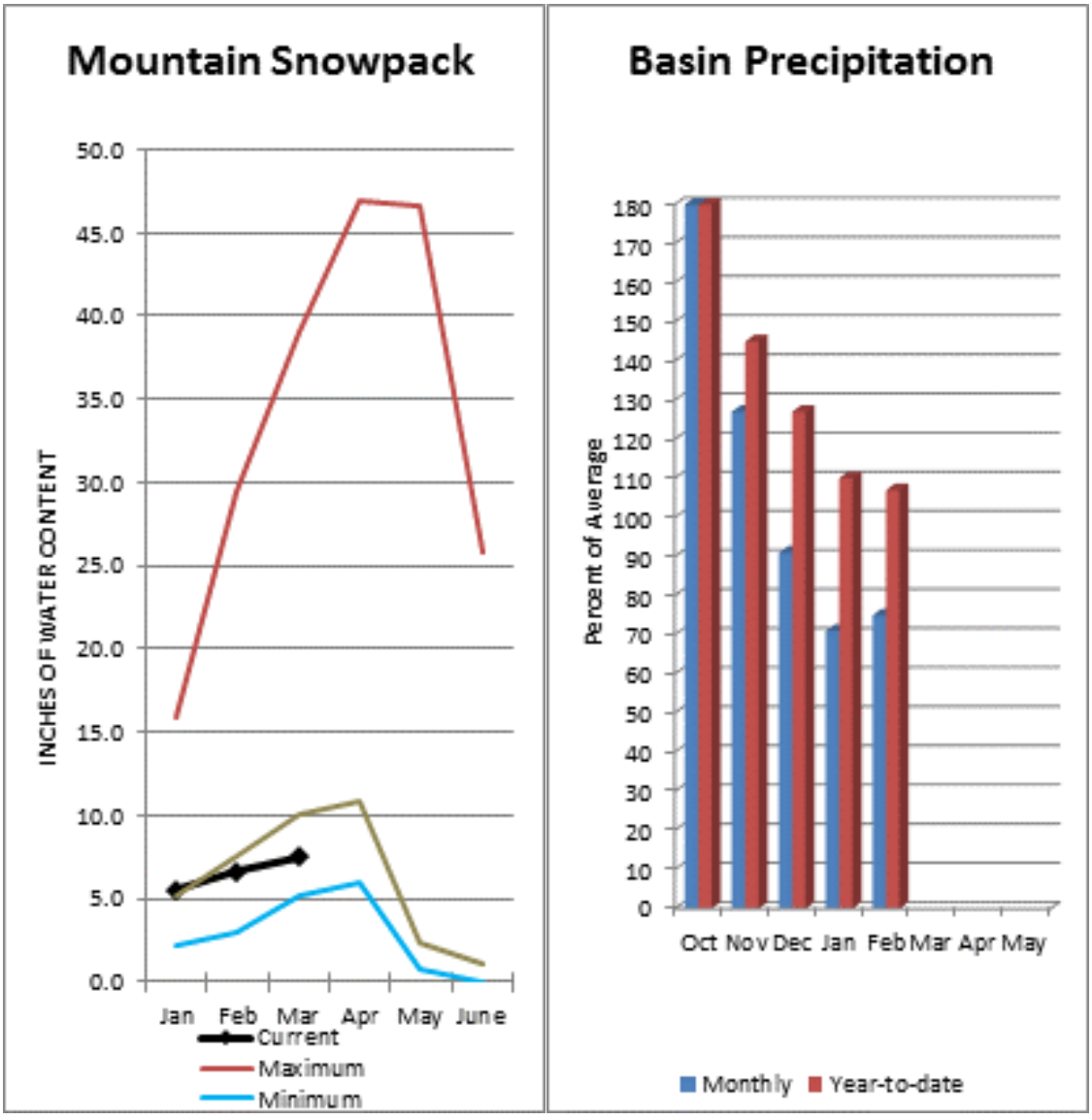
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Pend Oreille Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Pend Oreille Lake Inflow[2]								
	APR-JUL	9520	10700	11600	98%	12400	13600	11800
	APR-SEP	10400	11700	12600	98%	13500	14800	12800
Priest R nr Priest River[2]								
	APR-JUL	375	460	520	67%	580	665	780
	APR-SEP	400	490	555	67%	620	710	830
Pend Oreille R bl Box Canyon[2]								
	APR-JUL	9680	10900	11800	99%	12600	13800	11900
	APR-SEP	10500	11800	12800	98%	13700	15100	13000

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 February, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Pend Oreille	610.0	571.0	792.6	1561.3
Priest Lake	78.9	60.3	57.1	119.3
Basin-wide Total	688.8	631.3	849.7	1680.6
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis March 1, 2015	# of Sites	% Median	Last Year % Median
Pend Oreille Basins	69	86%	124%
Colville River	2	28%	68%
Kettle River	5	74%	93%



Summer runoff average forecast for the Okanogan River is 71%, Similkameen River is 92%, Kettle River 91% and Methow River is 92%. March 1 snow cover on the Okanogan was 79% of normal, Omak Creek was 43% and the Methow was 85%. February precipitation in the Upper Columbia was 75% of average, with precipitation for the water year at 107% of average. February streamflow for the Methow River was 309% of average, 254% for the Okanogan River and 174% for the Similkameen. Snow-water content at Salmon Meadows SNOTEL was 6.5 inches or 75% of normal for March 1. Combined storage in the Conconully Reservoirs was 17,600 acre-feet or 120% of normal. Temperatures were 4-6 degrees above normal for February and 2-4 degrees above for the water year.

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Upper Columbia Basins
Streamflow Forecasts - March 1, 2015

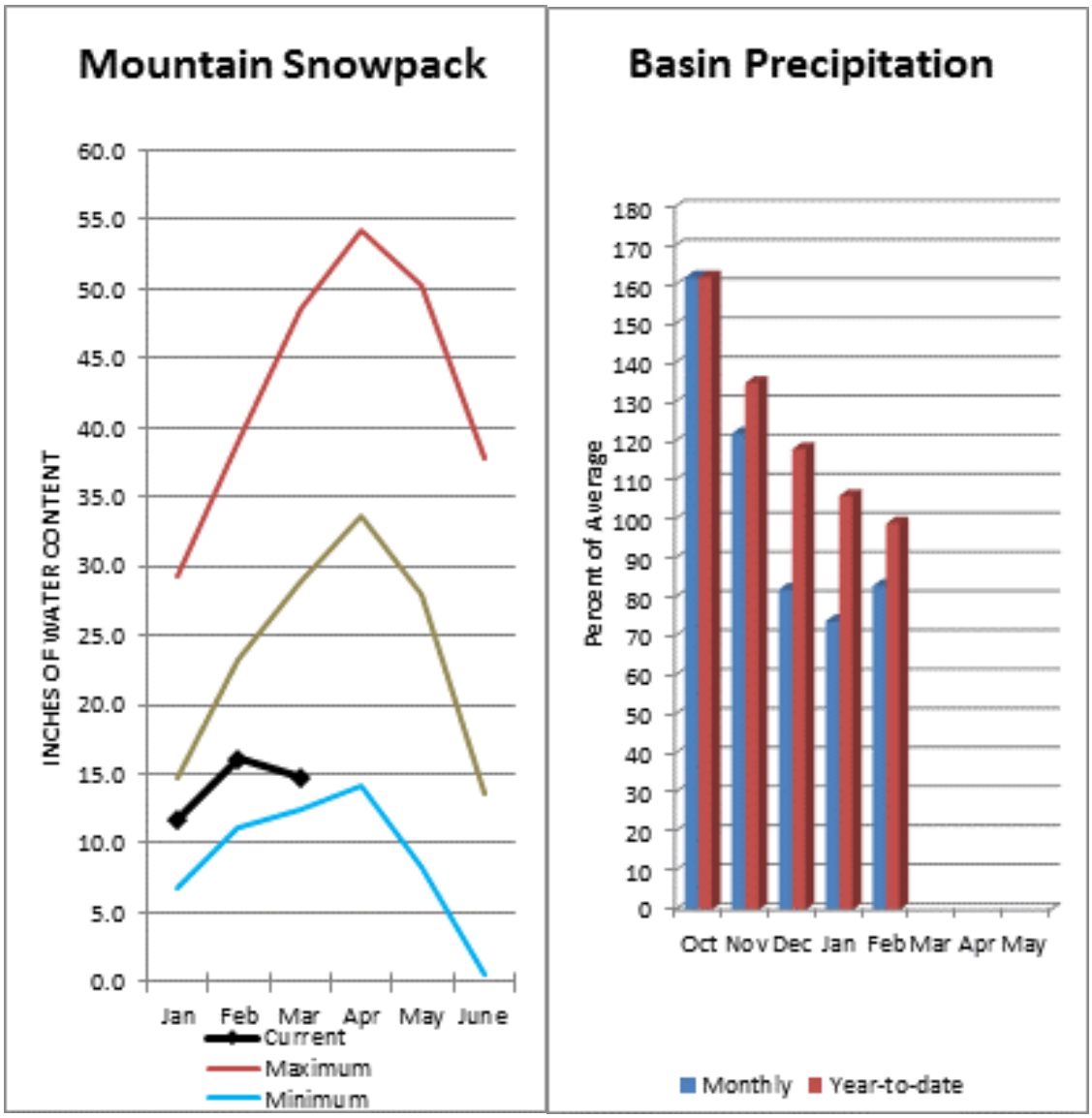
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Upper Columbia Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Kettle R nr Laurier								
	APR-JUL	1260	1490	1650	92%	1810	2040	1800
	APR-SEP	1300	1550	1720	91%	1890	2140	1880
Colville R at Kettle Falls								
	APR-JUL	23	43	61	51%	82	117	119
	APR-SEP	26	48	67	51%	89	128	131
Columbia R at Grand Coulee[1,2]								
	APR-JUL	36300	42200	44900	88%	47600	53500	51015
	APR-SEP	42600	49700	52900	88%	56100	63200	60110
Similkameen R nr Nighthawk[1]								
	APR-JUL	765	1000	1110	93%	1210	1450	1200
	APR-SEP	835	1070	1180	92%	1290	1530	1280
Okanogan R nr Tonasket[1]								
	APR-JUL	580	910	1060	72%	1210	1530	1480
	APR-SEP	640	1000	1170	71%	1330	1690	1650
Okanogan R at Malott[1]								
	APR-JUL	600	940	1100	76%	1250	1590	1450
	APR-SEP	660	1040	1210	75%	1380	1750	1620
Methow R nr Pateros								
	APR-JUL	610	700	760	91%	825	915	835
	APR-SEP	660	755	820	92%	885	980	895
Columbia R at Birchbank[1,2]								
	APR-JUL	24800	28200	29800	88%	31400	34800	33840
	APR-SEP	30400	34700	36700	88%	38700	43000	41750

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 February, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Conconully Lake (Salmon Lake Dam)	6.9	9.3	7.3	10.5
Conconully Reservoir	10.7	11.7	7.4	13.0
Basin-wide Total	17.6	21.0	14.7	23.5
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis March 1, 2015	# of Sites	% Median	Last Year % Median
Upper Columbia Basins	26	75%	89%
Okanogan River	15	79%	92%
Omak Creek	3	43%	45%
Sanpoil River	1	0%	42%
Similkameen River	5	82%	114%
Toats Coulee Creek	4	86%	79%
Conconully Lake	3	58%	54%
Methow River	5	90%	94%



Precipitation during February was 83% of average in the basin and 99% for the year-to-date. Runoff for Entiat River is forecast to be 75% of average for the summer. The April-September average forecast for Chelan River is 77%, Wenatchee River at Plain is 69%, Stehekin River is 89% and Icicle Creek is 63%. February average streamflows on the Chelan River were 282% and on the Wenatchee River 251%. March 1 snowpack in the Wenatchee River Basin was 51% of normal; the Chelan, 72%; the Entiat, 63%; Stemilt Creek, 54% and Colockum Creek, 44%. Lyman Lake SNOTEL had the most snow water with 38.1 inches of water. This site would normally have 48.6 inches on March 1. Temperatures were 4-6 degrees above normal for February and 3-4 degrees above normal for the water year.

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

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Central Columbia Basins
Streamflow Forecasts - March 1, 2015

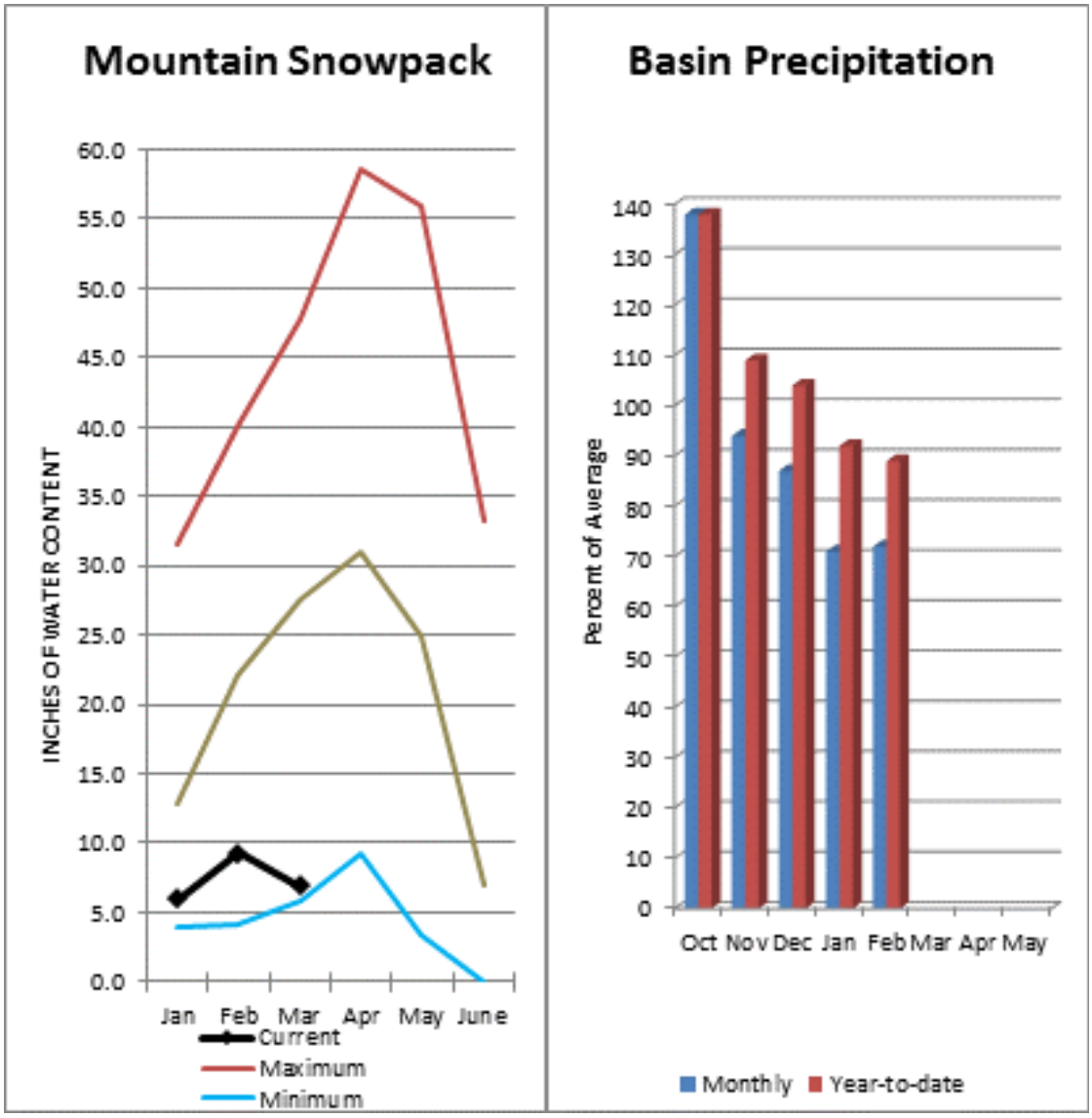
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Central Columbia Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Stehekin R at Stehekin								
	APR-JUL	485	555	605	89%	655	730	680
	APR-SEP	570	645	700	89%	750	825	790
Chelan R at Chelan								
	APR-JUL	650	735	790	79%	845	930	1000
	APR-SEP	710	805	865	77%	930	1020	1120
Entiat R nr Ardenvoir								
	APR-JUL	121	140	153	77%	167	186	200
	APR-SEP	132	152	166	75%	179	199	220
Wenatchee R at Plain								
	APR-JUL	550	640	705	71%	765	860	990
	APR-SEP	590	685	750	69%	815	915	1080
Icicle Ck nr Leavenworth								
	APR-JUL	135	160	177	64%	194	220	275
	APR-SEP	143	171	189	63%	210	235	300
Wenatchee R at Peshastin								
	APR-JUL	760	885	970	71%	1050	1170	1370
	APR-SEP	805	935	1020	68%	1110	1250	1490
Columbia R bl Rock Island Dam[2]								
	APR-JUL	40700	45400	48500	87%	51600	56300	55770
	APR-SEP	47600	53000	56700	87%	60400	65800	65200

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 February, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Chelan			279.8	676.1
Basin-wide Total			0.0	0.0
# of reservoirs	0	0	0	0

Watershed Snowpack Analysis March 1, 2015	# of Sites	% Median	Last Year % Median
Central Columbia Basins	3	72%	87%
Chelan Lake Basin	3	72%	87%
Entiat River	1	63%	94%
Wenatchee River	7	51%	92%
Stemilt Creek	1	54%	84%
Colockum Creek	1	44%	98%



March 1 reservoir storage for the Upper Yakima reservoirs was 776,000-acre feet, 172% of average. Forecasts for the Yakima River at Cle Elum are 49% of average and the Teanaway River near Cle Elum is at 37%. Lake inflows are all forecasted to be below average this summer as well. February streamflows within the basin were Cle Elum River near Roslyn at 200%. March 1 snowpack was 25% based upon 8 snow course and SNOTEL readings within the Upper Yakima Basin. Precipitation was 72% of average for February and 89% 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.

Data Current as of: 3/5/2015 12:04:25 PM

Upper Yakima River
Streamflow Forecasts - March 1, 2015

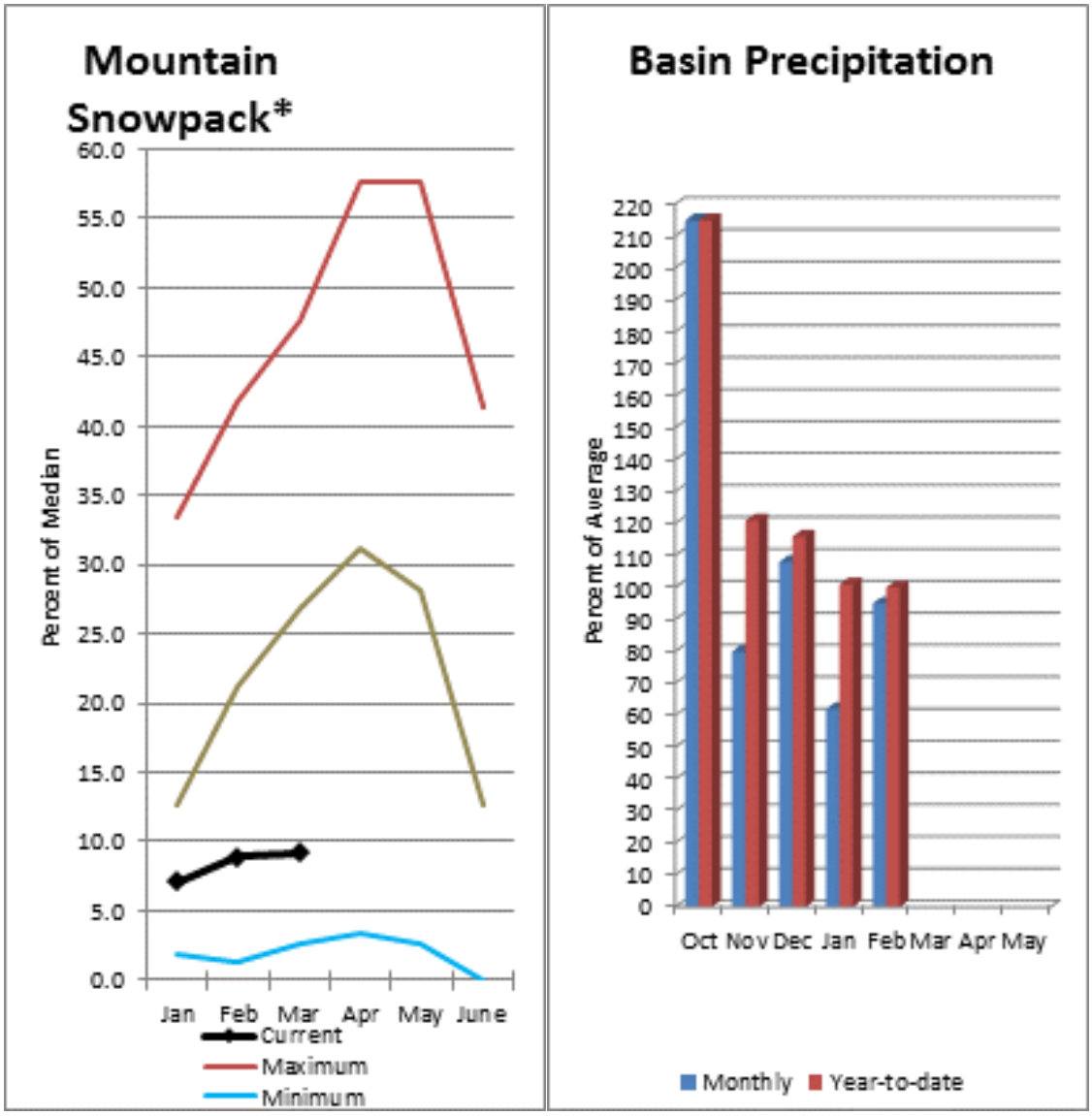
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Upper Yakima River	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Keechelus Reservoir Inflow[2]								
	APR-JUL	26	44	56	48%	68	85	116
	APR-SEP	32	50	62	49%	74	92	126
Kachess Reservoir Inflow [2]								
	APR-JUL	22	36	46	44%	55	69	104
	APR-SEP	27	41	51	45%	60	74	113
Cle Elum Lake Inflow [2]								
	APR-JUL	132	169	194	50%	220	255	385
	APR-SEP	139	179	205	49%	235	275	415
Yakima R at Cle Elum [2]								
	APR-JUL	179	290	365	48%	435	545	755
	APR-SEP	200	325	410	49%	490	615	830
Teanaway R bl Forks nr Cle Elum								
	APR-JUL	16	35	47	36%	60	78	130
	APR-SEP	17.6	36	49	37%	62	80	133

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 February, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Keechelus	157.8	106.2	92.3	157.8
Kachess	223.4	187.0	143.6	239.0
Cle Elum	394.8	193.9	214.4	436.9
Basin-wide Total	776.0	487.2	450.3	833.7
# of reservoirs	3	3	3	3

Watershed Snowpack Analysis March 1, 2015	# of Sites	% Median	Last Year % Median
Upper Yakima River	8	25%	97%



February average streamflows within the basin were: Yakima River near Parker, 143% and the Naches River near Naches, 221%. March 1 reservoir storage for Bumping and Rimrock reservoirs was 232,000-acre feet, 170% of average. Forecast averages for Yakima River near Parker are 54%; American River near Nile, 64%; Ahtanum Creek, 66%; and Klickitat River near Glenwood, 58%. March 1 snowpack was 34% based upon 7 snow course and SNOTEL readings within the Lower Yakima Basin and Ahtanum Creek reported in at 30% of normal. Precipitation was 95% of average for February and 100% for the water-year. Temperatures were 4-8 degrees above normal for February and for 3-5 degrees above normal for the water year. Volume forecasts for Yakima Basin are for natural flow. As such, they March 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.

Data Current as of: 3/5/2015 12:04:28 PM

Lower Yakima River
Streamflow Forecasts - March 1, 2015

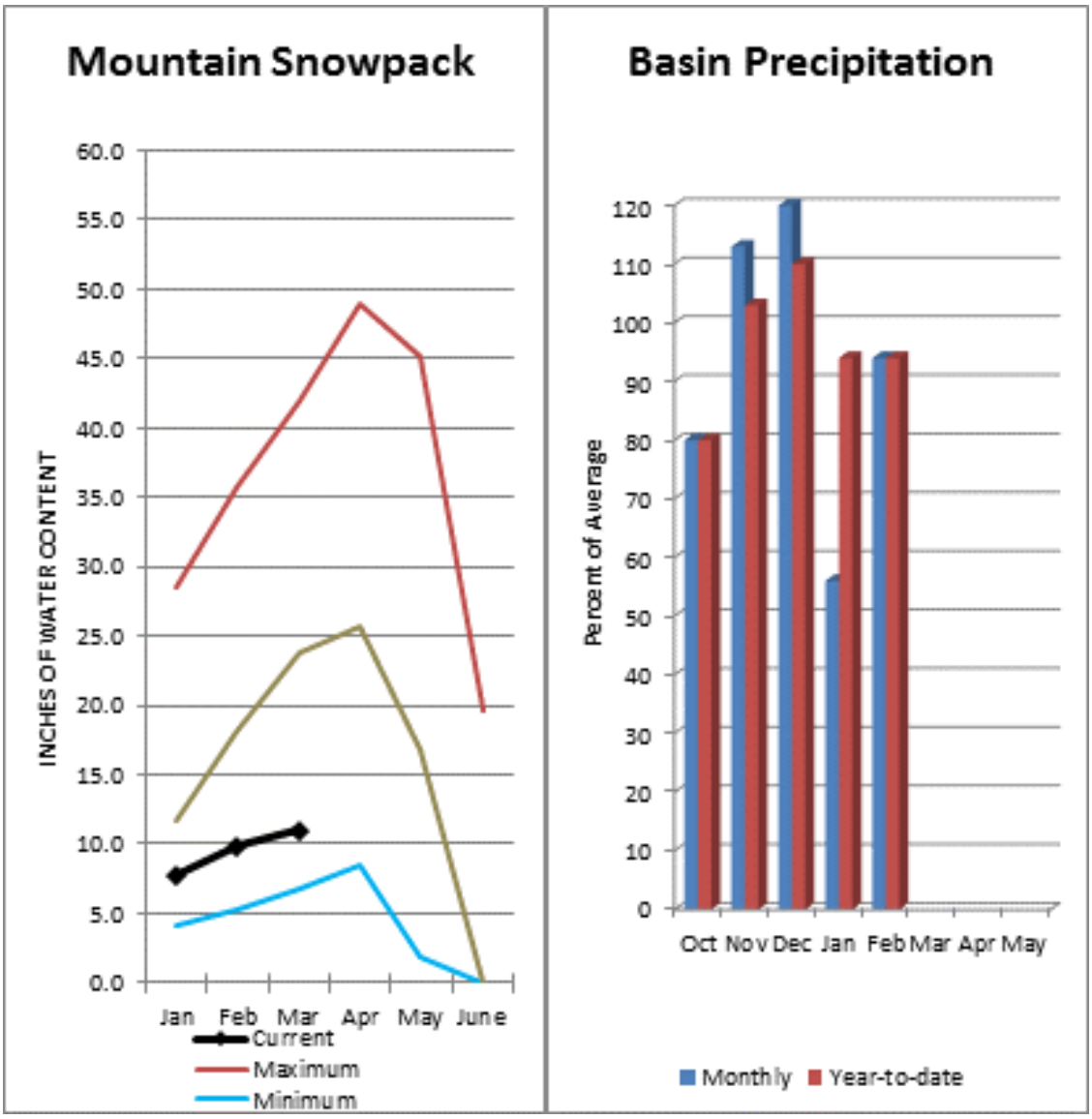
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

Lower Yakima River	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Bumping Lake Inflow [2]								
	APR-JUL	57	71	80	70%	90	104	114
	APR-SEP	61	76	85	69%	95	109	123
American R nr Nile								
	APR-JUL	46	58	66	65%	75	87	102
	APR-SEP	48	61	70	64%	78	91	110
Rimrock Lake Inflow [2]								
	APR-JUL	107	123	135	72%	146	163	187
	APR-SEP	126	145	158	72%	171	190	220
Naches R nr Naches								
	APR-JUL	310	390	445	64%	495	575	700
	APR-SEP	330	415	475	63%	535	620	760
Ahtanum Ck at Union Gap								
	APR-JUL	7.5	13.2	17.1	63%	21	27	27
	APR-SEP	9.3	15	19	66%	23	29	29
Yakima R nr Parker [2]								
	APR-JUL	550	760	900	54%	1040	1250	1660
	APR-SEP	625	840	990	54%	1130	1350	1820
Klickitat R nr Glenwood								
	APR-JUL	49	63	72	57%	82	96	126
	APR-SEP	55	70	81	58%	91	107	139
Klickitat R nr Pitt								
	APR-JUL	210	260	295	68%	325	375	435
	APR-SEP	265	320	360	69%	400	455	520

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 February, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Bumping Lake	33.8	16.7	13.3	33.7
Rimrock	197.8	142.1	123.3	198.0
Basin-wide Total	231.6	158.8	136.6	231.7
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis March 1, 2015	# of Sites	% Median	Last Year % Median
Lower Yakima River	7	34%	88%
Ahtanum Creek	2	30%	86%



February precipitation was 94% of average, maintaining the year-to-date precipitation at 94% of average. Snowpack in the basin was 46% of normal. Streamflow forecasts are 74% of average for Mill Creek and 83% for the SF Walla Walla near Milton-Freewater. Average temperatures were 4-6 degrees above normal for February and 3-5 degrees above normal for the water year.

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

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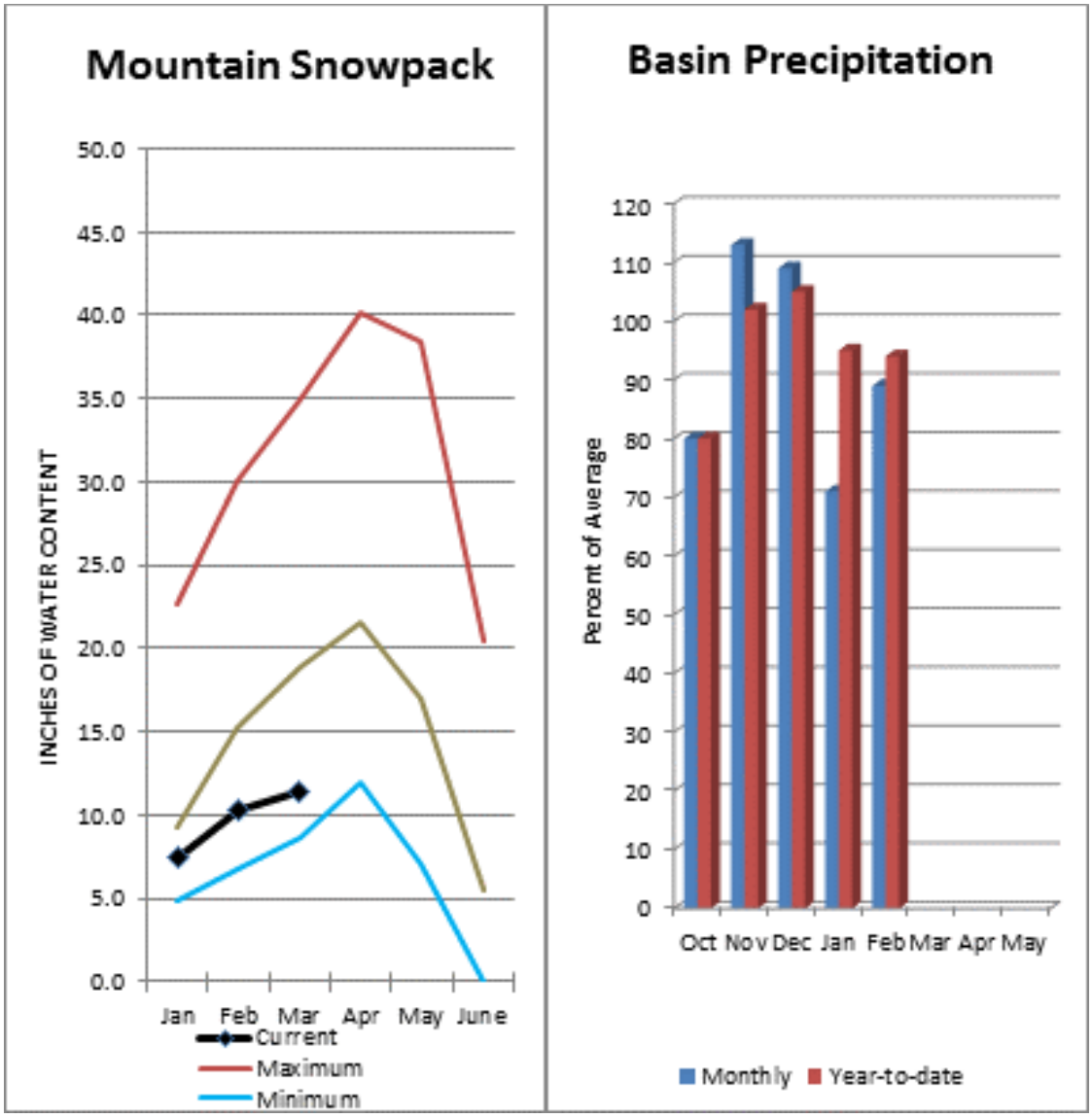
Walla Walla River
Streamflow Forecasts - March 1, 2015

		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								
	MAR-SEP	52	61	66	83%	71	80	80
	APR-JUL	31	38	43	80%	48	55	54
	APR-SEP	42	50	55	83%	60	68	66
Mill Ck nr Walla Walla								
	APR-JUL	10.6	14.7	17.5	73%	20	24	24
	APR-SEP	12.7	17.1	20	74%	23	27	27

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 March 1, 2015	# of Sites	% Median	Last Year % Median
Walla Walla River	2	46%	85%



The Grande Ronde River can expect summer flows to be about 92% of normal. The forecast for Asotin Creek at Asotin predicts 69% of average flows for the April – July runoff period. February precipitation was 89% of average, bringing the year-to-date precipitation to 94% of average. March 1 snowpack readings averaged 60% of normal. February streamflow was 114% of average for Snake River below Lower Granite Dam and 154% for Grande Ronde River near Troy. Dworshak Reservoir storage was 122% of average. Average temperatures were 4-6 degrees above normal for February and 3-5 degrees above for the water year.

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

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

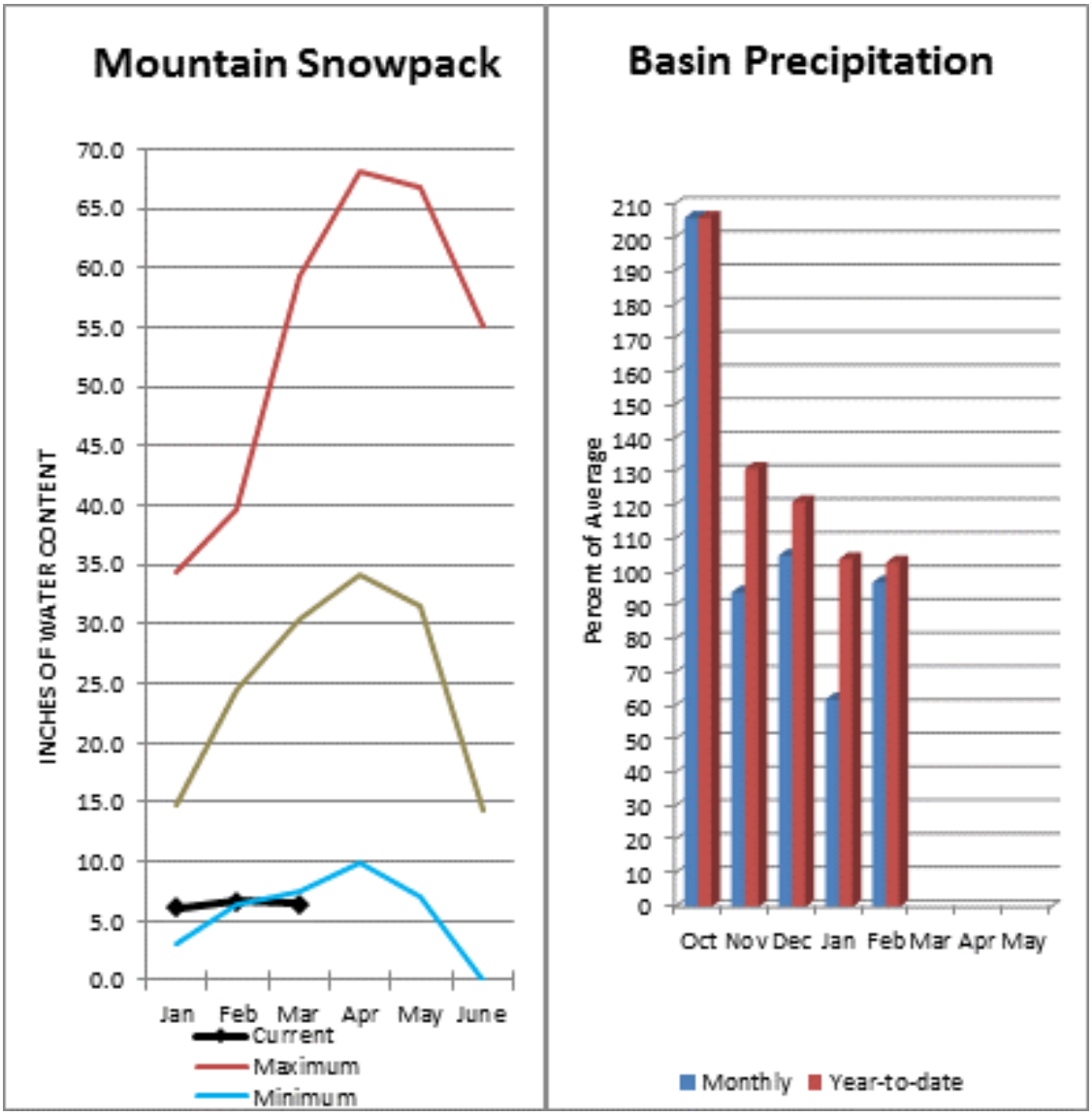
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

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								
	MAR-JUL	1060	1260	1390	92%	1520	1720	1510
	APR-SEP	865	1060	1200	92%	1330	1530	1310
Asotin Ck at Asotin								
	APR-JUL	9.2	18	24	69%	30	39	35
Clearwater R at Spalding[2]								
	APR-JUL	5140	6070	6700	97%	7330	8260	6890
	APR-SEP	5450	6410	7060	97%	7720	8680	7270
Snake R bl Lower Granite Dam[12]								
	APR-JUL	8100	13100	15400	78%	17600	22600	19848
	APR-SEP	9530	15100	17700	79%	20300	25900	22280

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 February, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Dworshak Reservoir	2880.4	2365.4	2358.0	3468.0
Basin-wide Total	2880.4	2365.4	2358.0	3468.0
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2015	# of Sites	% Median	Last Year % Median
Lower Snake, Grande Ronde, Clearwater Basins	14	60%	100%



Forecasts for April – September streamflows within the basin are Lewis River at Ariel, 71% and Cowlitz River at Castle Rock, 84% of average. The Columbia at The Dalles is forecasted to have 84% of average flows this summer according to the River Forecast Center. February average streamflow for Cowlitz River was 108%. The Columbia River at The Dalles was 131% of average. February precipitation was 97% of average and the water-year average was 103%. March 1 snow cover for Cowlitz River was 32%, and Lewis River was 7% of normal. Temperatures were 2-4 degrees above normal during February and for the water year.

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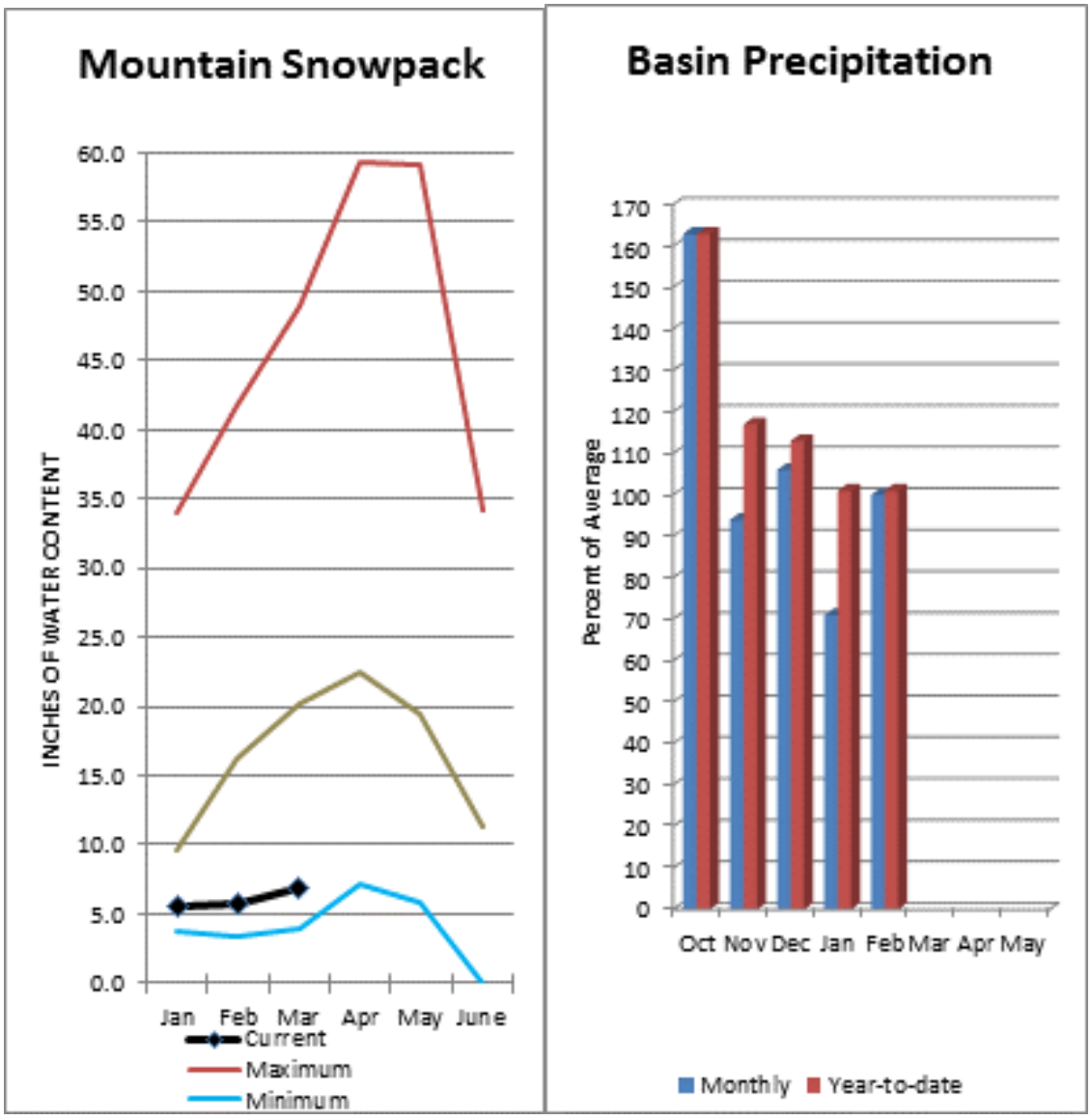
Lower Columbia Basins
Streamflow Forecasts - March 1, 2015

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]								
	APR-JUL	52700	59700	64500	81%	69300	76300	79855
	APR-SEP	63700	71900	77500	84%	83100	91300	92704
Klickitat R nr Glenwood								
	APR-JUL	49	63	72	57%	82	96	126
	APR-SEP	55	70	81	58%	91	107	139
Klickitat R nr Pitt								
	APR-JUL	210	260	295	68%	325	375	435
	APR-SEP	265	320	360	69%	400	455	520
Lewis R at Ariel[2]								
	APR-JUL	420	585	700	72%	815	980	970
	APR-SEP	500	670	790	71%	910	1080	1120
Cowlitz R bl Mayfiled[2]								
	APR-JUL	810	1050	1210	75%	1370	1610	1620
	APR-SEP	935	1200	1370	74%	1550	1810	1840
Cowlitz R at Castle Rock[2]								
	APR-JUL	1370	1650	1840	83%	2030	2310	2230
	APR-SEP	1610	1910	2120	84%	2330	2630	2520

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 March 1, 2015	# of Sites	% Median	Last Year % Median
Lower Columbia Basins	11	19%	85%
Lewis River	5	7%	69%
Cowlitz River	6	32%	103%



Summer runoff is forecast to be 70% of normal for the Green River below Howard Hanson Dam and 81% for the White River near Buckley. March 1 snowpack was 46% of average for the White River, 38% for Puyallup River and 8% in the Green River Basin. February precipitation was 100% of average, bringing the water year-to-date to 101% of average for the basins. Average temperatures in the area were 2-4 degrees above normal for February and for the water-year.

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

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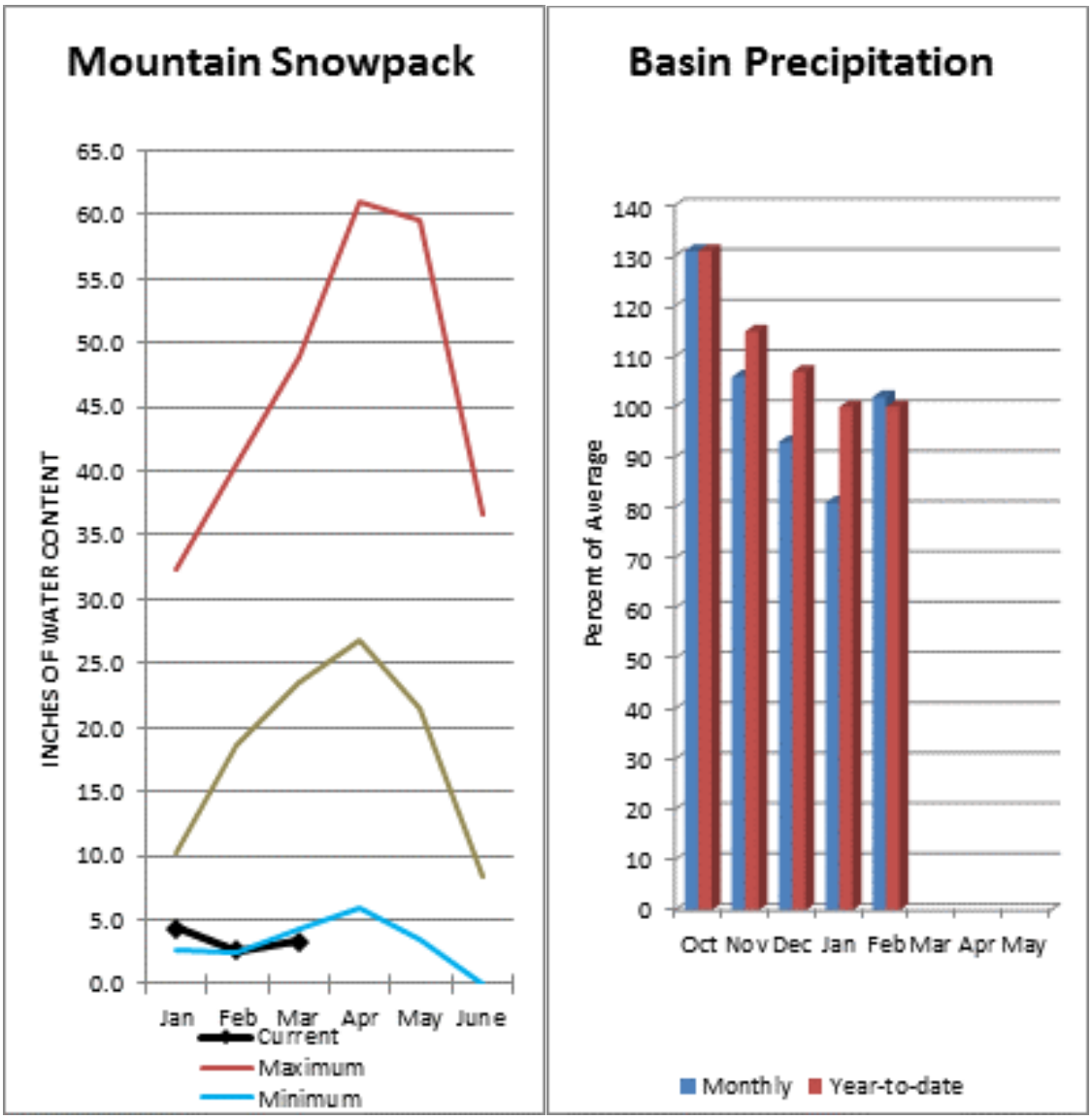
South Puget Sound Basins
Streamflow Forecasts - March 1, 2015

		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]								
	APR-JUL	235	315	350	81%	385	465	430
	APR-SEP	285	375	415	81%	455	545	515
Green R bl Howard A Hanson Dam[1,2]								
	APR-JUL	75	129	158	67%	190	270	235
	APR-SEP	95	152	182	70%	215	295	260

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 March 1, 2015	# of Sites	% Median	Last Year % Median
South Puget Sound Basins	10	34%	85%
White River	3	46%	87%
Green River	2	8%	75%



Forecast for spring and summer flows are: 64% for Cedar River near Cedar Falls; 57% for Rex River; 75% for South Fork of the Tolt River; and 76% for Taylor Creek near Selleck. Basin-wide precipitation for February was 102% of average, bringing water-year-to-date to 100% of average. March 1 median snow cover in Cedar River and Tolt River basins had melted out. Snoqualmie River Basin was 6%, and Skykomish River Basin was 11%. This is a new all-time record low for March 1 snow survey at Alpine Meadows, since records began in 1969. Temperatures were 2-4 degrees above normal for February and for the water-year.

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

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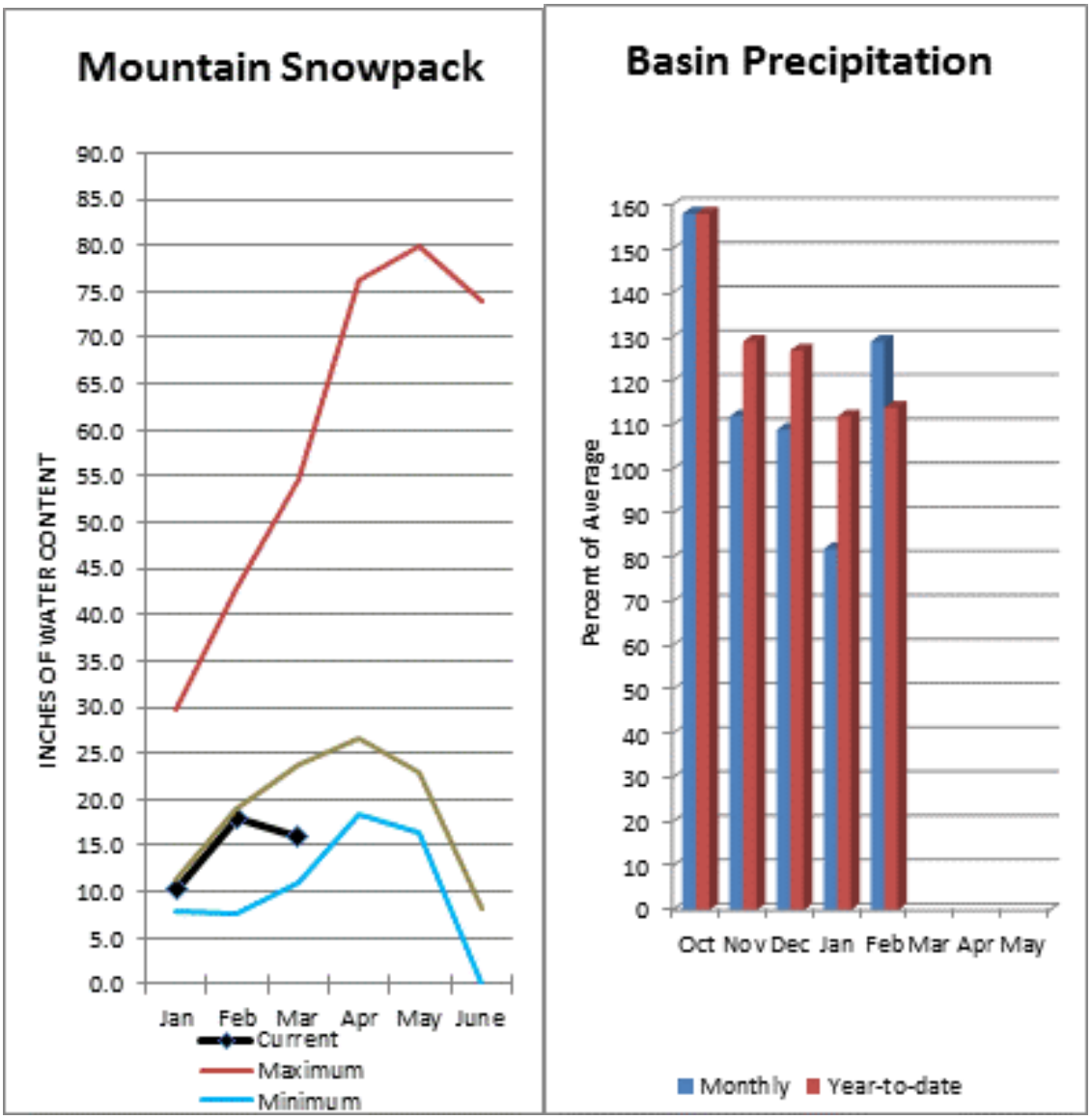
Central Puget Sound Basins
Streamflow Forecasts - March 1, 2015

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								
	APR-JUL	25	35	42	60%	49	59	70
	APR-SEP	31	42	49	64%	56	67	76
Rex R nr Cedar Falls								
	APR-JUL	5	9.8	13.1	55%	16.4	21	24
	APR-SEP	7.2	12.1	15.5	57%	18.9	24	27
Taylor Ck nr Selleck								
	APR-JUL	9.6	12.6	14.7	74%	16.7	19.7	20
	APR-SEP	12.9	16.1	18.3	76%	21	24	24
SF Tolt R nr Index								
	APR-JUL	6.4	8.7	10.3	73%	11.9	14.3	14.2
	APR-SEP	7.5	10.2	12	75%	13.8	16.5	16.1

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 March 1, 2015	# of Sites	% Median	Last Year % Median
Central Puget Sound Basins	14	7%	96%
Puyallup River	5	38%	88%
Cedar River	5	0%	97%
Tolt River	3	0%	98%
Snoqualimie River	5	6%	96%
Skykomish River	3	11%	93%



Forecast for Skagit River streamflow at Newhalem is 86% of average for the spring and summer period. February streamflow in Skagit River was 187% of average. Other forecast points included Baker River at 85% and Thunder Creek at 94% of average. Basin-wide precipitation for February was 129% of average, bringing water-year-to-date to 114% of average. March 1 average snow cover in Skagit River Basin was 62%, Nooksack River Basin was 15% and Baker River Basin 26%. March 1 Skagit River reservoir storage was 96% of average and 57% of capacity. Average temperatures were 2-4 degrees above normal for February and 2-3 degrees above for the water year.

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

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North Puget Sound Basins
Streamflow Forecasts - March 1, 2015

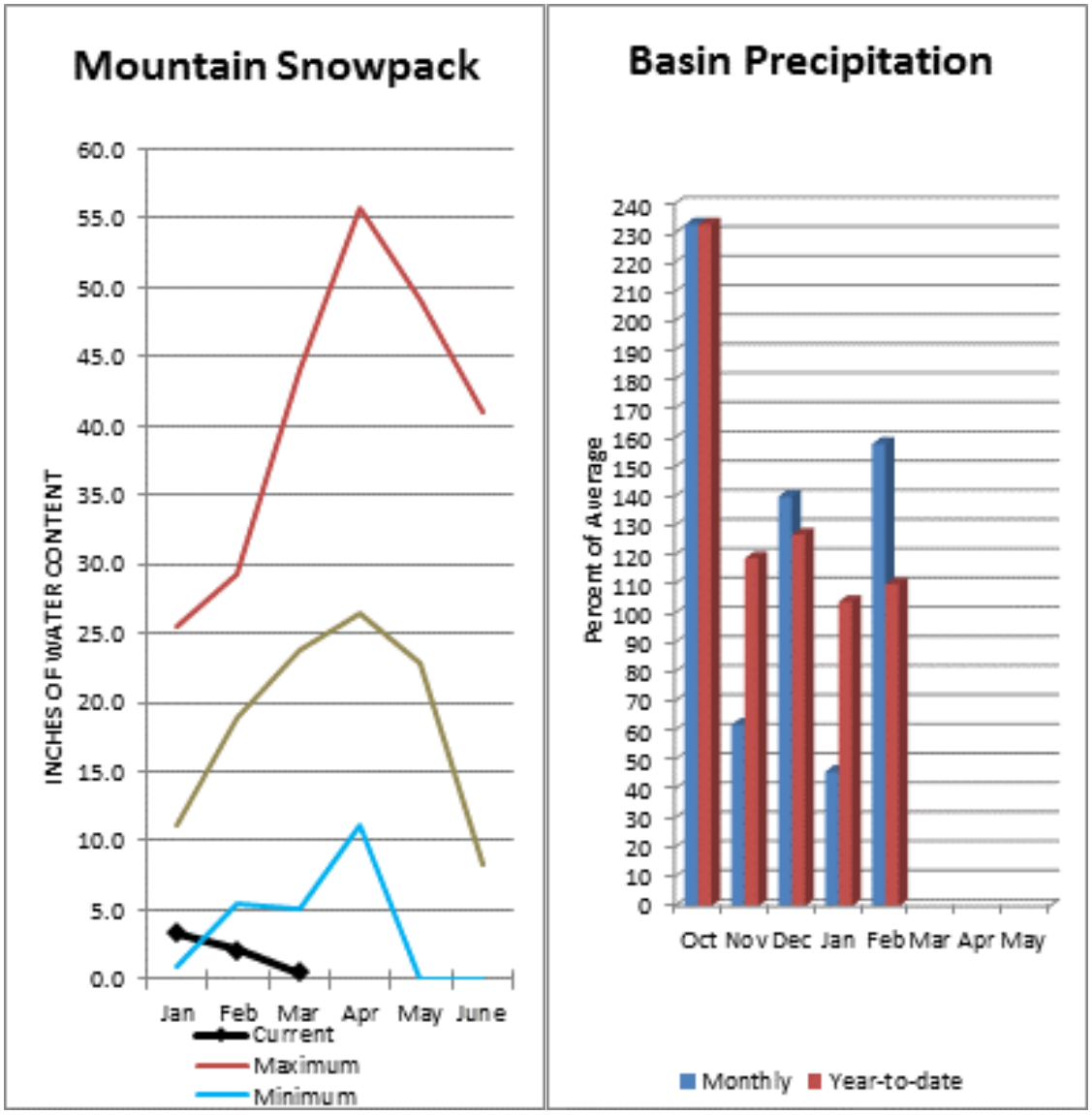
Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

North Puget Sound Basins	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Thunder Ck nr Newhalem								
	APR-JUL	185	205	220	94%	230	250	235
	APR-SEP	270	295	310	94%	325	350	330
Skagit R at Newhalem[2]								
	APR-JUL	1230	1380	1480	88%	1580	1730	1680
	APR-SEP	1470	1640	1750	86%	1860	2030	2030
Baker R at Concrete								
	APR-JUL	500	595	660	85%	720	815	780
	APR-SEP	620	750	835	85%	920	1050	980

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 February, 2015	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Ross	798.1	451.0	832.4	1404.1
Diablo Reservoir			86.2	90.6
Basin-wide Total	798.1	451.0	832.4	1404.1
# of reservoirs	1	1	1	1

Watershed Snowpack Analysis March 1, 2015	# of Sites	% Median	Last Year % Median
North Puget Sound Basins	25	39%	97%
Skagit River	15	62%	108%
Baker River	7	26%	88%
Nooksack River	3	15%	97%



Forecasted average runoff for streamflow for the Dungeness River is 77% and Elwha River is 73% February runoff in the Dungeness River was 190% of normal. Big Quilcene and Wynoochee rivers may expect below average runoff this summer as well. February precipitation was 46% of average. Precipitation has accumulated at 104% of average for the water year. February precipitation at Quillayute was 79% of normal. Olympic Peninsula snowpack averaged a dismal 9% of normal on March 1, the lowest region in the state and falling within the driest 5% of data records. Temperatures were 4-6 degrees above average for February and 2-3 degrees above normal for the water year.

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

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Olympic Penninsula
Streamflow Forecasts - March 1, 2015

Olympic Penninsula	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Dungeness R nr Sequim								
	APR-JUL	60	71	79	66%	87	101	120
	APR-SEP	71	85	95	66%	105	122	145
Elwha R at McDonald Bridge nr Port Angeles								
	APR-JUL	215	245	270	68%	295	330	400
	APR-SEP	255	295	320	68%	350	395	470

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 March 1, 2015	# of Sites	% Median	Last Year % Median
Olympic Penninsula	6	2%	77%

Issued by

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Chief
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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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Mount Vernon, WA 98273-2873

Washington Water Supply Outlook Report

Natural Resources Conservation Service
Spokane, WA