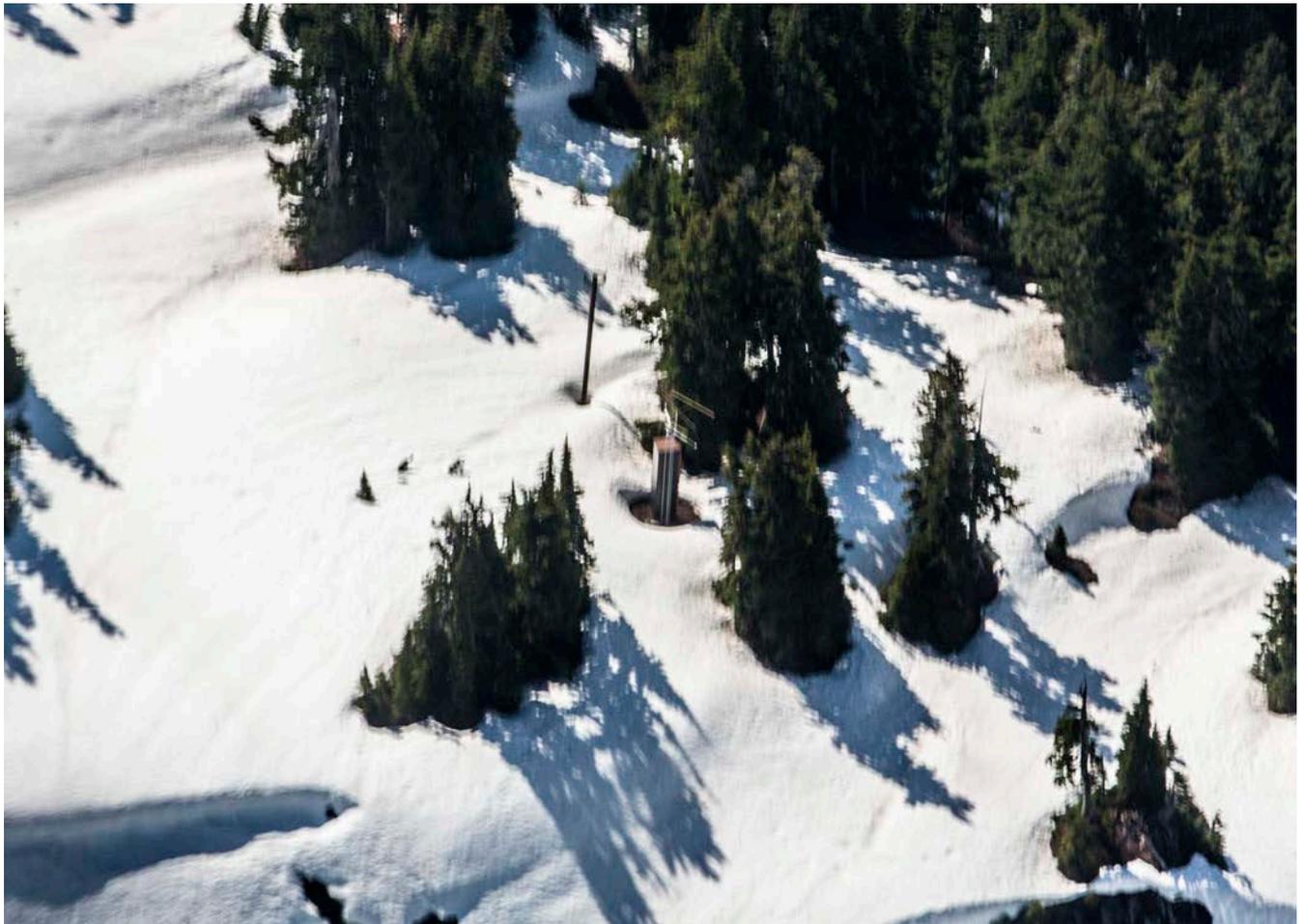


Washington

Water Supply Outlook Report

June 1, 2016



Easy Pass SNOTEL, Baker River, May 31, 2016, Puget Sound Energy. Easy Pass holds the record for the most snow water content in the entire SNOTEL network, June 3, 2012 with 129.7 inches.

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

For more water supply and resource management information, contact:

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How forecasts are made

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

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

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

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Washington Water Supply Outlook

June 2016

General Outlook

“A continuing saga” is the only way to describe the rapid snow melt spurred by above normal temperatures. As of June 1 only 25% of the 70 active SNOTEL sites in Washington still have measurable snowpack. Normally only 40% of the total would be snow free by June 1. Most melted out sites did so 2-4 weeks earlier than normal. According to the U.S. Drought Monitor abnormally dry conditions (D0) have taken over Western Washington as well as the southern border. Long range forecasts for the summer continue to be warmer than normal with equal chances of precipitation. Predictions for next winter support a strong probability for an El Nino which typically produces a healthy snowpack for the state. <http://www.cpc.ncep.noaa.gov/>

This the final report for 2016 and is has been another very interesting and record setting year. Due to time constraints this will be an abbreviated version but all pertinent data and information can be found online.

Snowpack

The June 1 statewide SNOTEL readings were 47% of normal. Many basins completely melted out by June 1. Paradise SNOTEL at 5,130 feet on Mt. Rainer had the highest percentage with 81%. All basins reported considerable decreases from last month. Only basins with high elevation or shaded sites have snow remaining. This late in the season percent of normal can be very misleading. As an example a site which would normally have 2 inches of snow water might have 4 inches or 200%. Time should be spent researching the actual water content when making management or mountain travel decisions. Detailed snowpack analysis can be found online: <http://www.wcc.nrcs.usda.gov/basin.html>

BASIN	PERCENT OF MEDIAN	LAST YEAR PERCENT MEDIAN
Spokane	50	0
Newman Lake	0	0
Pend Oreille	65	34
Okanogan	54	12
Methow	63	9
Conconully Lake	0	0
Central Columbia	62	23
Upper Yakima	21	0
Lower Yakima	53	2
Ahtanum Creek	0	0
Walla Walla	0	0
Lower Snake	38	3
Cowlitz	67	0
Lewis	51	0
White	63	3
Green	0	0
Puyallup	63	3
Cedar	0	0
Snoqualmie	12	0
Skykomish	0	0
Tolt	0	0
Skagit	52	6
Nooksack	36	0
Olympic Peninsula	1	0
Baker	24	0

Precipitation

The state mostly received below normal precipitation for the month of May however year to date statewide SNOTEL averages remain above normal at 120%. The Pend Oreille, which includes parts of Idaho and Montana, recorded the highest percentages in the state at 107%. Alpine SNOTEL in the Tolt River Basin received the most rain last month with a total of 6.5 inches or 66% of normal. Basin specific information is available at: <http://www.wcc.nrcs.usda.gov/basin.html>

RIVER BASIN	JUNE PERCENT OF AVERAGE	WATER YEAR PERCENT OF AVERAGE
Spokane	99	102
Pend Oreille	107	100
Upper Columbia	68	112
Central Columbia	78	124
Upper Yakima	77	120
Lower Yakima	76	125
Walla Walla	64	101
Lower Snake	67	100
Lower Columbia	49	121
South Puget Sound	75	122
Central Puget Sound	75	120
North Puget Sound	60	116
Olympic Peninsula	40	129

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. June 1 Reservoir storage in the Yakima Basin was 830,000-acre feet, 115% of average for the Upper Reaches and 232,000-acre feet or 108% of average for Rimrock and Bumping Lakes. The power generation reservoirs included the following: Coeur d'Alene Lake, 233,000 acre feet, 88% of average and 98% of capacity; and the Skagit River reservoirs at 90% of average and 67% of capacity. Recent climate impacts and management procedures could affect these numbers on a daily or weekly basis.

BASIN	PERCENT OF CAPACITY	CURRENT STORAGE AS PERCENT OF AVERAGE
Spokane	98	88
Pend Oreille	86	98
Upper Columbia	101	129
Central Columbia	91	126
Upper Yakima	100	115
Lower Yakima	100	108
Lower Snake	96	107
North Puget Sound	67	90

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

Streamflow

Above normal temperatures and continued early snow melt contributed to a statewide decrease in streamflow forecasts for this summer. June-September forecasts for some Western Washington streams include the Cedar River near Cedar Falls, 74%; White River, 69%; and Skagit River, 81%. Some Eastern Washington streams include the Yakima River near Parker 60%, Wenatchee River at Plain 68%; and Spokane River near Post Falls 75%. Volumetric forecasts are developed using current, historic and average snowpack, precipitation and streamflow data collected and coordinated by organizations cooperating with NRCS. A complete listing by basin can be found online at: <http://www.wcc.nrcs.usda.gov/basin.html>

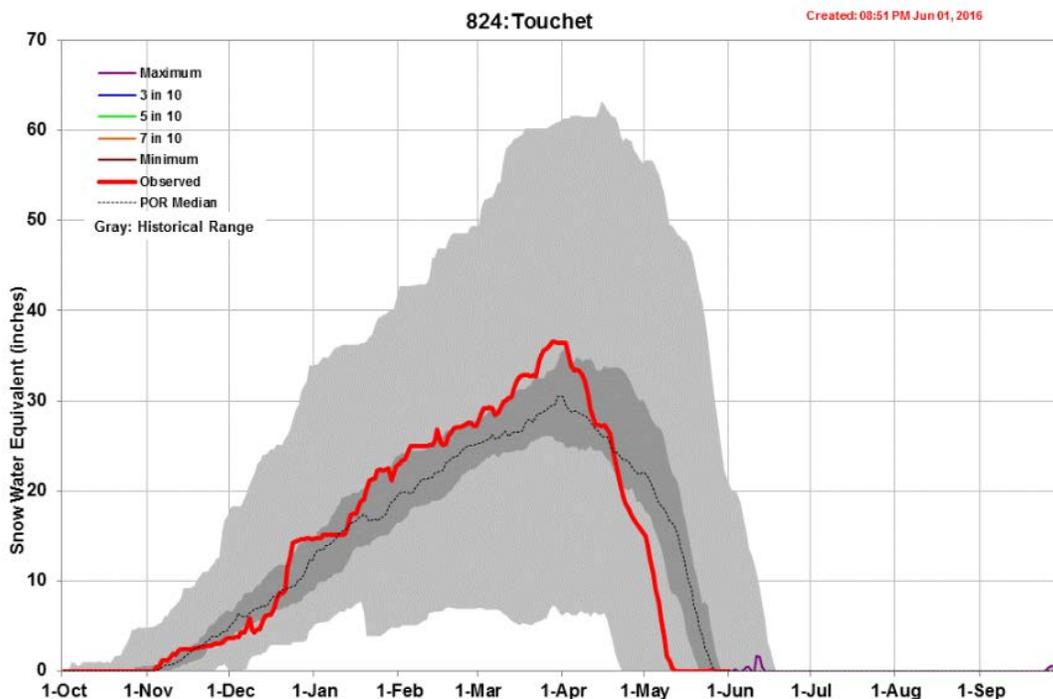
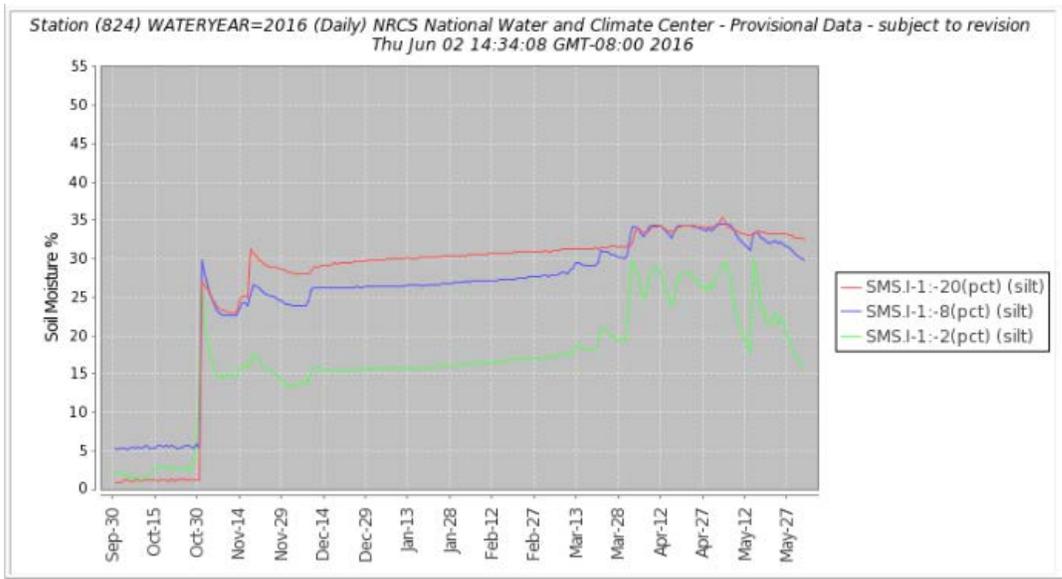
BASIN	PERCENT OF AVERAGE (50 PERCENT CHANCE OF EXCEEDENCE)
Spokane	75-79
Pend Oreille	82-85
Upper Columbia	70-81
Central Columbia	68-87
Upper Yakima	37-53
Lower Yakima	57-80
Walla Walla	71-76
Lower Snake	53-57
Lower Columbia	63-84
South Puget Sound	69-81
Central Puget Sound	73-79
North Puget Sound	72-82
Olympic Peninsula	62-64

STREAM	PERCENT OF AVERAGE JUNE STREAMFLOWS
Pend Oreille at Albeni Fall Dam	85
Kettle at Laurier	90
Columbia at Birchbank	117
Spokane at Spokane	56
Similkameen at Nighthawk	96
Okanogan at Tonasket	121
Methow at Pateros	146
Chelan at Chelan	130
Wenatchee at Pashastin	111
Cle Elum near Roslyn	101
Yakima at Parker	95
Naches at Naches	98
Grande Ronde at Troy	70
Snake below Lower Granite Dam	90
Columbia River at The Dalles	92
Lewis at Merwin Dam	56
Cowlitz below Mayfield Dam	66
Skagit at Concrete	94
Dungeness near Sequim	104

Soil Moisture

Current soil moisture data is available from a limited number of SNOTEL sites scattered throughout each basin. As the effort continues to install additional sensors and more years of data are acquired this information will become invaluable to the streamflow forecasting community.

The following graph shows a very typical spring soil moisture profile at Touchet SNOTEL site near Dayton, WA. Notice the profile recharge when fall rains began, a decline before snow began, followed by a steady recharge throughout the winter. This particular soil has very good water holding capability in that even after the snow was gone only the surface began to dry out. This will help sustain a healthy forest throughout the spring. The second graph is snowpack projection for the same site which shows a normal peak around April 1 and subsequent rapid melt curve. Notice how this site melted out about 2 weeks early.



This is an automated product based on SNOTEL data, provisional data are subject to change. This product combines the historical period of record data (gray background) with the recent daily data (heavy red, left) to project into the future (colored lines, right). This product does not consider climate information such as El Nino or short range weather forecasts and therefore should only be used as a seasonal planning tool. Contact Jim.Marron@por.usda.gov 503 414 3047



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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:

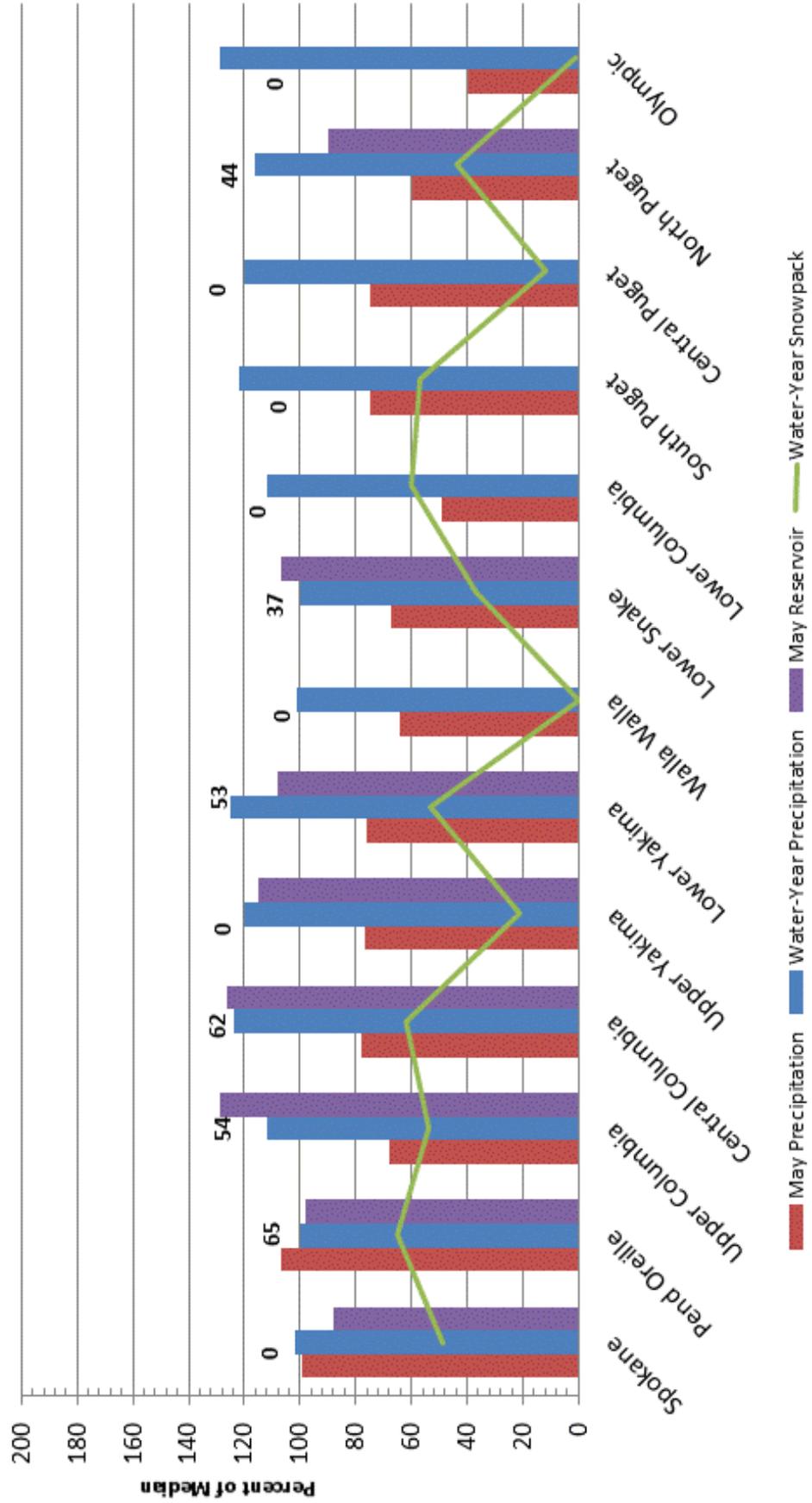
<http://www.nrcs.usda.gov/wps/portal/nrcs/site/wa/home/>

NRCS National:

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

June 1, 2016 - Snowpack, Precipitation and Reservoir Conditions at a Glance

(Water Year = October 1, 2015 - Current Date)



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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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