The Hydrologic Cycle

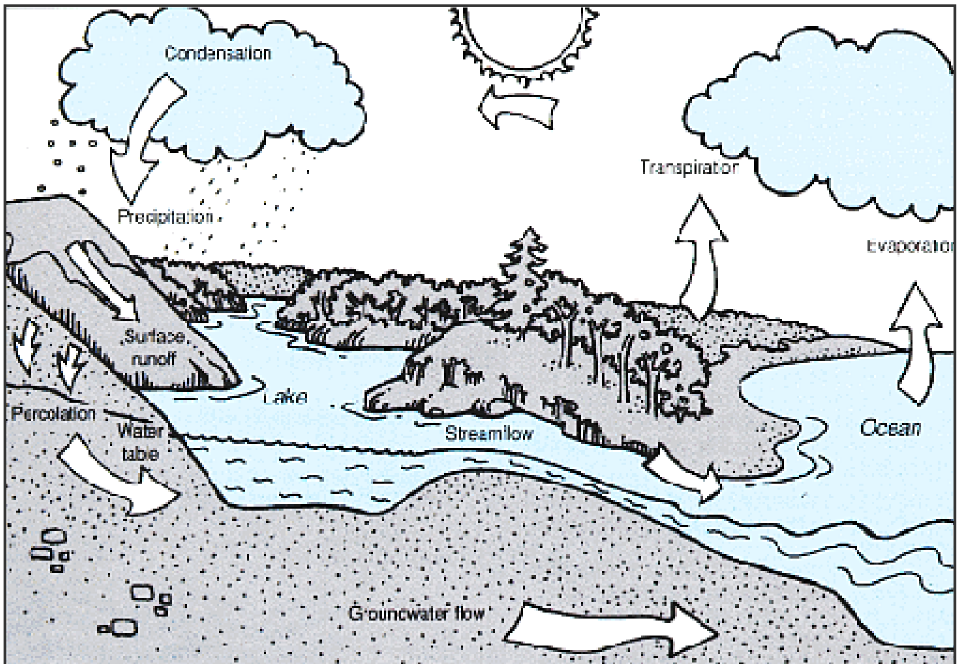


Figure 4.1: The hydrologic cycle (Earthscape, 2001).

IV. Hydrology and Water Use

Introduction

This section of the watershed assessment characterizes the hydrology of the subbasin and evaluates the potential impacts of human activities on hydrology within the subbasin. Land and water use are evaluated for potential impacts to surface water quantity and quality. Alterations to the natural hydrologic cycle potentially cause increased peak flows and/or reduced low flows resulting in changes to water quality and aquatic ecosystems (WPN, 1999). The degree to which hydrologic processes are affected by land and water use depends on the location, extent, and type of use activities.

Both land use and water use can impact the hydrologic cycle by increasing peak flows and decreasing low flows. High peak flows can negatively impact aquatic ecosystems by scouring streambeds, increasing erosion, raising sediment loads and transporting large woody debris downstream. Low stream flows can cause migration barriers, high temperatures, and stranding of fish.

Methodology

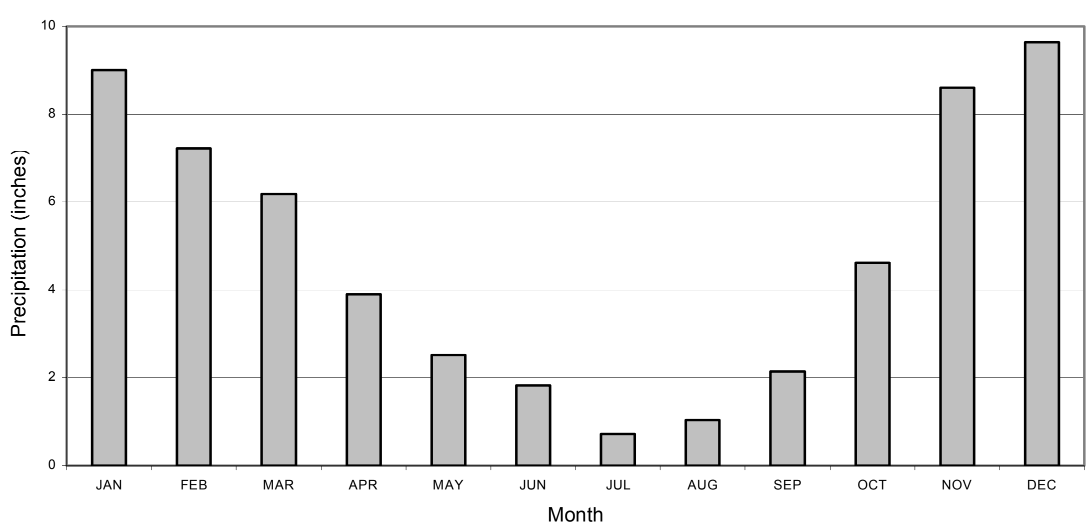
General Watershed Characteristics

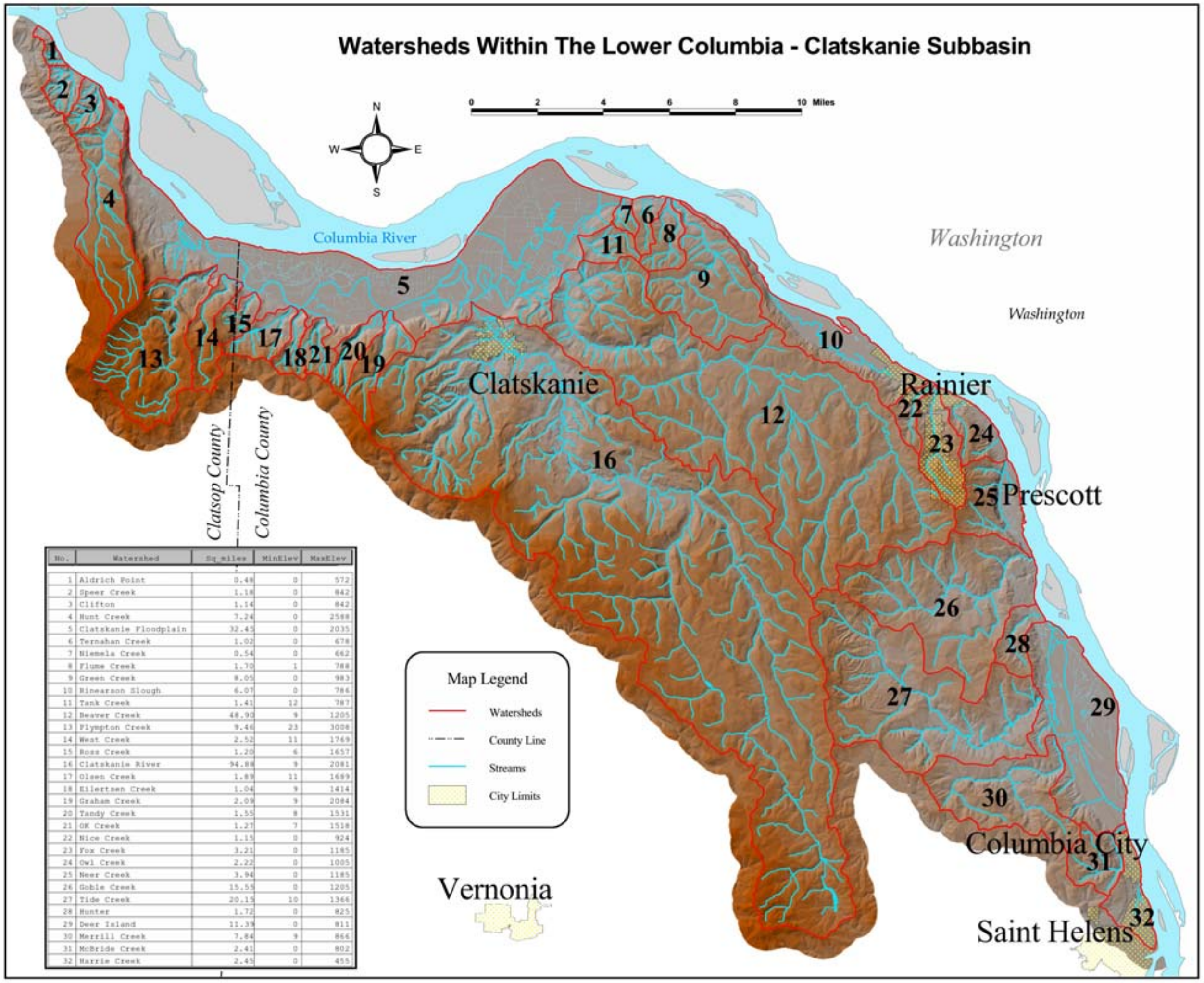
It is useful in watershed planning and management to have a conceptual framework within which to assess the potential impacts of land and water use. The hydrologic cycle is such a framework that describes the paths through which water moves through the earth's surface layers, including the atmosphere (Figure 4.1). The cycle is a complex web of continual flows, or fluxes, of water among the major reservoirs, or stocks of water in the earth's surface layers (Dingman, 1994). These reservoirs include the oceans, atmosphere, aquifers, and freshwater lakes. Water typically enters a watershed through rain or snowfall but from there it can travel along many different paths as outlined in Figure 4.1. The hydrologic cycle is too complicated to completely analyze within this assessment, however through analysis of land and water uses we can gain an understanding of the major potential impacts. Our focus is on the surface water and to a limited extent the linkage between surface and ground water.

The hydrologic cycle also provides the framework for delineating watersheds. A watershed is the area that topographically appears to contribute all the water that passes through a given cross section of a stream. Watersheds within the Lower Columbia – Clatskanie Subbasin were delineated based on the topographical features apparent from maps and GIS data. 10-meter digital elevation models (DEMs) were used in a GIS to delineate the boundaries. These models are raster data sets of elevation in a grid of 10 x 10 meter cells. The raster data format is composed of a grid of identically sized cells as opposed to the vector format which is composed of lines and points. When viewed in a GIS the model gives a three-dimensional perspective of the landscape. Watersheds were delineated by drawing the boundaries at right angles to contour lines beginning at the downstream end of the main channel of the watershed. With this technique, ridgelines define the boundary of a watershed. The Lower Columbia - Clatskanie Subbasin is an area of land consisting of watersheds of various sizes (Figure 4.2). The majority of the watersheds flow directly into the Columbia River.

Precipitation and stream flow have been characterized for each of these watersheds (Table 4.1). There are two active weather stations within the subbasin, one in Clatskanie and one in St. Helens. The average monthly precipitation is presented in Figures 4.3 and 4.4 for both of these weather stations. It is clear from the data that on average the town of Clatskanie receives more rainfall than St. Helens.

Figure 4.3 : Average precipitation for Clatskanie (1935-1999).





No.	Watershed	Sq_miles	MinElev	MaxElev
1	Aldrich Point	0.48	0	572
2	Speer Creek	1.18	0	842
3	Clifton	1.14	0	842
4	Hunt Creek	7.24	0	2588
5	Clatskanie Floodplain	32.45	0	2035
6	Ternahan Creek	1.02	0	678
7	Niemela Creek	0.54	0	662
8	Flume Creek	1.70	1	788
9	Green Creek	8.05	0	983
10	Rinearson Slough	6.07	0	786
11	Tank Creek	1.41	12	787
12	Beaver Creek	48.90	9	1205
13	Plympton Creek	9.46	23	3008
14	West Creek	2.52	11	1769
15	Ross Creek	1.20	6	1657
16	Clatskanie River	94.88	9	2081
17	Olsen Creek	1.89	11	1699
18	Eilertsen Creek	1.04	9	1414
19	Graham Creek	2.09	9	2084
20	Tandy Creek	1.55	8	1531
21	OK Creek	1.27	7	1518
22	Nice Creek	1.15	0	924
23	Fox Creek	3.21	0	1185
24	Owl Creek	2.22	0	1005
25	Neer Creek	3.94	0	1185
26	Goble Creek	15.55	0	1205
27	Tide Creek	20.15	10	1366
28	Hunter	1.72	0	825
29	Deer Island	11.39	0	811
30	Merrill Creek	7.84	9	866
31	McBride Creek	2.41	0	802
32	Harris Creek	2.45	0	455

Data source: USGS digital line graph files; USGS 10 meter digital elevations models; Oregon State Service Center for GIS city boundaries.

Figure 4.2: Shaded relief map displaying the ridgelines seperating the watersheds of the subbasin.

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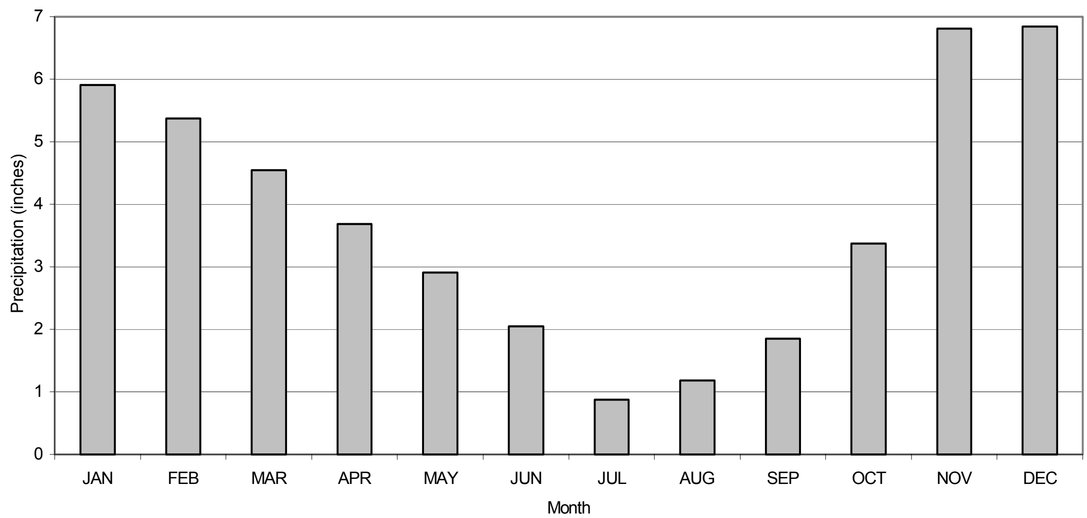
Watershed	Area		Topography (feet)			Avg_Ppt	Frequency and Magnitude of Floods (cfs)				
	Acres	Sq Miles	Min Elev	Max Elev	Avg Elev	(inches)	100 year	50 year	25 year	10 year	2 year
Aldrich Point	303.8	0.48	0	572	215	76	98	87	76	61	35
Beaver Creek	31294.1	48.90	9	1205	695	58	3953	3544	3160	2602	1557
Clatskanie Fl	20766.1	32.45	0	2035	107	55	2587	2322	2075	1711	1030
Clatskanie River	60723.9	94.88	9	2081	925	60	7349	6586	5868	4830	2884
Clifton	728.2	1.14	0	842	349	71	193	171	150	122	71
Deer Island	7286.9	11.39	0	811	83	46	829	748	674	558	343
Eilertsen Creek	664.9	1.04	9	1414	744	66	162	145	127	104	61
Flume Creek	1086.9	1.70	1	788	452	53	189	169	151	124	75
Fox Creek	2052.4	3.21	0	1185	632	54	337	302	269	221	133
Goble Creek	9954.3	15.55	0	1205	498	50	1209	1088	976	806	490
Graham Creek	1335.0	2.09	9	2084	1027	69	315	280	246	201	117
OK Creek	815.6	1.27	9	1518	667	66	194	173	152	124	73
Green Creek	5152.6	8.05	0	983	514	54	751	673	601	495	298
Harrie Creek	1565.9	2.45	0	455	142	44	206	185	167	138	85
Hunt Creek	4633.1	7.24	0	2588	1054	70	949	844	742	606	353
Hunter	1103.5	1.72	0	825	369	45	156	140	126	104	64
McBride Creek	1542.8	2.41	0	802	453	46	215	193	174	143	88
Merrill Creek	5015.4	7.84	9	866	451	49	649	584	524	433	263
Neer Creek	2521.3	3.94	0	1185	445	53	393	353	315	259	156
Nice Creek	733.2	1.15	0	924	470	52	131	117	105	86	52
Niemela Creek	346.8	0.54	0	662	368	54	72	64	57	47	28
Olsen Creek	1208.1	1.89	11	1689	624	64	263	234	206	169	99
Owl Creek	1423.6	2.22	0	1005	414	50	222	199	178	147	89
Plympton Creek	6056.3	9.46	23	3008	1487	71	1220	1085	953	779	453
Rinearson Slough	3882.4	6.07	0	786	195	51	546	490	439	362	219
Ross Creek	766.6	1.20	6	1657	694	62	170	152	134	109	64
Speer Creek	755.8	1.18	0	842	289	73	206	183	160	130	75
Tandy Creek	991.7	1.55	8	1531	659	67	235	209	183	150	87
Tank Creek	899.4	1.41	12	787	389	55	168	150	133	110	66
Ternahan Creek	652.8	1.02	0	678	359	53	121	109	97	79	48
Tide Creek	12896	20.15	10	1366	541	52	1592	1430	1281	1058	640
West Creek	1725.9	2.70	11	1769	1082	67	380	338	297	243	142

Table 4.1: Hydrological watershed characteristics for the Lower Columbia-Clatskanie Subbasin.

Figure 4.4 : Average precipitation for St. Helens (1976-1999)



Average annual precipitation for each watershed was calculated from the Oregon Annual Precipitation GIS data sets created by the Oregon Climate Service (Daly, 1998). Through overlay analysis, the precipitation polygons were cut to fit the watershed boundaries (Figure 4.5). A weighted average precipitation was calculated for each of the newly formed polygons based on the percent of total watershed area that each polygon represents. The sum of the weighted averages of the precipitation polygons within each watershed is equal to the average annual precipitation of the watershed (Table 4.1).

There are no active stream gages within the Oregon portion of the Lower Columbia-Clatskanie Subbasin. Records from stream gages in the subbasin, including the portion of the subbasin in Washington, are summarized in Table 4.2. The data for Oregon consists of a few discontinuous records of annual peak flows. On the other hand the subbasin in Washington is well represented by stream gages with daily records of five to seventy years in duration. Given this contrast in data, streamflow was calculated using models developed by the USGS for the state of Washington (Sumioka et al. 1998). A similar model exists for Oregon (Harris et al. 1979) however the Oregon model does not represent the subbasin as well. The Oregon model places the subbasin within the Willamette Basin, a distinctly different region. The coast and the Columbia River heavily influence the climate within the Lower Columbia-Clatskanie Subbasin. The Washington models also include more recent precipitation and stream flow data.

Data source: Oregon Climate Sevice PRISM data set.

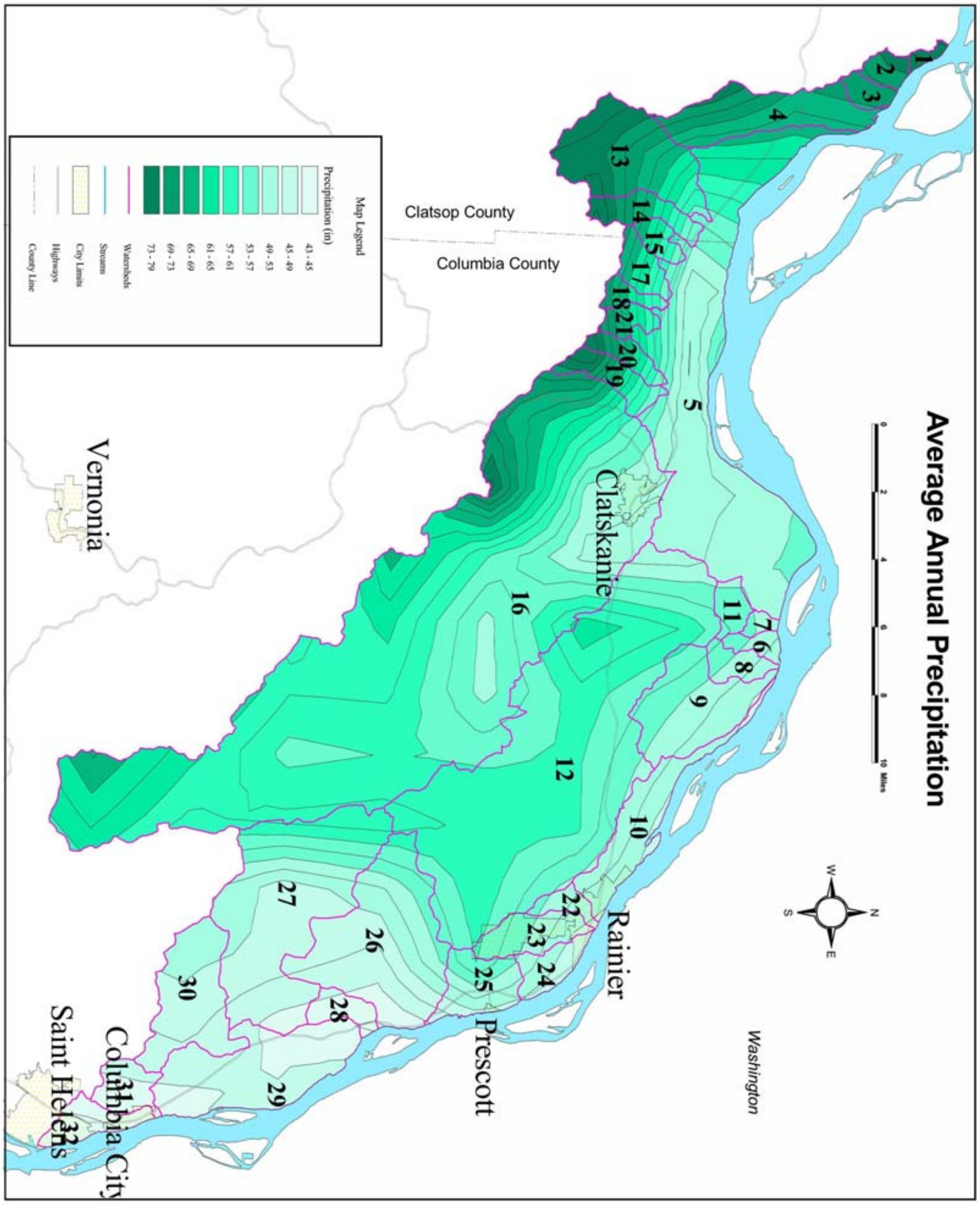


Figure 4.5: Average annual precipitation as inches of rain. A snow pack does not form within the subbasin.

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Summary of Streamflow Data for the Lower Columbia - Clatskanie Subbasin			
Washington	Stream	Years	Data
	Elochoman R.	1940-1971	Daily values
	Kalama R.	1912-1982	Daily values
	Mill Cr.	1950-1955	Daily values
	Abernathy Cr.	1950-1957	Daily values
	Trib at Carrols	1949-1970	Annual Peak flows
Oregon	Stream	Years	Data
	Clatskanie R.	1950-1954	Annual Peak flows
	Fall Cr.	1972-1983	Annual Peak flows
	Merrill Cr.	1972-1976	Annual Peak flows

Table 4.2: Stream flow records for the Lower Columbia-Clatskanie Subbasin in Oregon and Washington.

The magnitudes of five stormflow events have been predicted for each watershed. Stormflows that have a frequency of occurrence of once every 100, 50, 25, 10, and 2 years are given in Table 4.1. The models were tested by comparing predictions to data from historic stream gage records. Table 4.3 shows the values predicted by the Washington USGS model (Sumioka et al. 1998). In order to evaluate the models, the historic location of each stream gage was mapped and new watershed boundaries were drawn with the stream gage as the mouth of the watershed. For example, area and stormflow for the Clatskanie River watershed in Table 4.3 reflects the position of the historic stream gage that was located several miles upstream of the city of Clatskanie. Historic peak flows were within the range of the predicted stormflows. Therefore, the model predicts reasonable flow rates for annual peak flows of the five frequencies.

Predicted Peakflow								
	Area		Avg_Ppt	Frequency and Magnitude of Stormflow (cfs)				
Name	Acres	Sq Miles	(inches)	100 year	50 year	25 year	10 year	2 year
Clatskanie River	34954.6	54.62	57	4258	3820	3410	2810	1686
Fall Creek	1480.9	2.31	63	308	274	242	198	117
Merrill Creek	4803.5	7.51	49	625	562	504	417	253

Historic Peakflows (OWRD & USGS)					
Clatskanie River		Fall Creek		Merrill Creek	
Date	Flow	Date	Flow	Date	Flow
1/22/1950	795	1/21/1972	40	1/21/1972	480
2/15/1950	1110	12/21/1972	99	12/21/1972	330
2/24/1950	2000	1/16/1974	98	1/16/1974	560
3/5/1950	725	1/14/1975	73	1/14/1975	340
11/17/1950	935	12/4/1975	113	2/27/1976	450
1/25/1951	750	12/13/1977	135		
3/15/1951	970	2/7/1979	51		
12/5/1951	1460	1/12/1980	108		
2/1/1952	920	12/25/1980	104		
1/20/1953	948	2/20/1982	144		
12/6/1953	1130	12/4/1982	114		
12/9/1953	1840	11/17/1983	56		
1/5/1954	1600				
2/13/1954	1600				

Table 4.3: Comparison of predicted stormflow to historic peak flows of three stream gages.

Hydrologic Condition Assessment

Land use practices can modify the amount of water available for runoff, the routing of water to streams or travel distance to the stream, the lag time (delay between rainfall events and peak streamflow events), and the streamflow velocity. Land use practices that affect the rate of infiltration and/or the ability of the soil surface to store water are typically most influential in affecting the watershed's hydrology. The hydrologic condition assessment is a screening process designed to identify land use activities that have the potential to impact the hydrology of a watershed. The evaluation process is not definitive; more technical analyses are necessary to determine the magnitude of impacts. This section will assess whether there is a potential risk of peak flow enhancement. There are four main components to the assessment: forestry, agriculture, forest and rural roads, and urban and/or rural residential development. Land uses have been delineated for the entire subbasin from aerial photographs and maps. Roads were adapted from USGS digital line graphs and edited with digital aerial photographs.

Forestry

The potential effects of forest practices on hydrology include changes in peak flows, water yield, and low flows. The greatest likelihood of hydrological impacts from timber harvest is through increases in peak flows associated with rain-on-snow events (WPN, 1999). According to the OWEB ecoregions descriptions the rain-on-snow zone in the coast range is 1000-3600 feet in elevation. Above 3600 feet a snow pack will typically form. However, there are no areas within the subbasin above 3600 feet in elevation. Crown closure is used to analyze the potential for peak flow enhancement from rain-on-snow events. Historic crown closure for the Coast Range is described by OWEB as being greater than 70%. This is the standard that will be used to evaluate current crown closure within the subbasin. The estimate of 70% historic crown closure is a conservative estimate that will provide a high level of protection to streams.

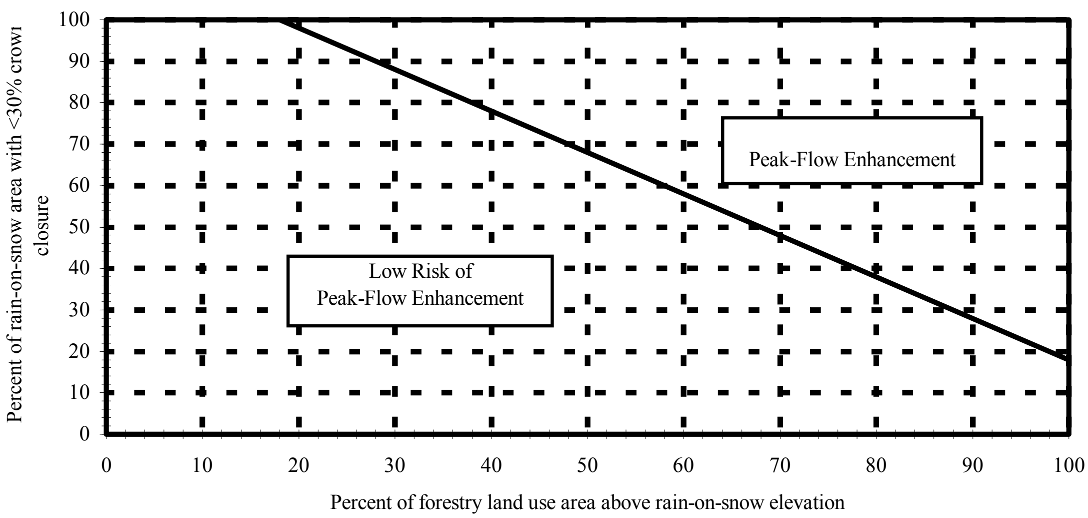
The potential risk from rain-on-snow events was evaluated for each watershed in the subbasin. The following steps outline the evaluation process:

1) Calculate area of each watershed above an elevation of 1000 feet.
2) Watersheds that are more than 75% in the rain (below 1000 feet) zone are considered to have a low risk of peak flow enhancement. Six watersheds were identified as having more than 25% of their area above 1000 feet in elevation and were further analyzed in the following steps.
3) Areas that have a crown closure of less than 30% were identified on aerial photographs using recent ODF stand exam data for reference. State Forest lands cover most of Plympton Creek and Hunt Creek as well as part of the upper Clatskanie River. Clearcuts that occurred later than the aerial photographs were identified on state lands but not on private lands. Information for private timber sales was not available. Research has shown that peak flow enhancement as a result of clear-cutting is evident in stands as old as 25 years of age (Spence et al, 1996; Coffin and Harr, 1992; Somers et

al, 1991). Clearcuts, forest openings, and stands less than 25 years of age were identified on aerial photographs as stands with a less than 30% canopy closure.

4) Potential Risk of Peak-Flow Enhancement was assessed based on the Interim Rain-on-Snow Rules outlined by OWEB (Figure 4.6). The chart is read by finding the percent of forestry land use area above 100 feet in elevation is along the lower axis and the percent of that area that has less than a 30% crown closure along the upright axis.

Figure 4.6: Risk Classes, Forestry-Related Impacts During Rain-on-Snow Events



Agriculture

Agricultural land uses typically cause increased levels of runoff through native vegetation removal and soil compaction. The assessment of impacts from agricultural land uses is based on the Natural Resources Conservation Service (NRCS) infiltration/runoff model. Storm runoff is estimated based on the average 2-year 24-hour rainfall estimated from precipitation-frequency maps. NRCS soil surveys are used to estimate the potential change in infiltration based on hydrologic soil groups. The steps to the assessment are outlined below.

1) The watersheds with the highest percentage of land utilized for agriculture were identified. Deer Island, Rinearson Slough, and the Clatskanie Floodplain are the areas of highest concentration of crop and pasture lands.
2) Using the NRCS soil surveys GIS data the hydrologic soil groups were identified separately for crops and pasture.
3) The 2-year 24-hour rainfall amount was estimated from the Precipitation Frequency Atlas of the Western United States (Miller, 1973).
4) Cover types and treatment practices were identified for all agricultural lands. There are relatively few varieties of crops harvested within the subbasin. The vast majority of croplands within the subbasin have been converted into

cottonwood plantations. All croplands were therefore assigned a cover type of woods with a hydrologic condition of fair (telephone consultation with Don Mehlhoff, NRCS, September 2000). Pasturelands were also identified and evaluated as having a hydrologic condition of fair.
5) Background conditions for agricultural lands were considered to be woods in good hydrologic condition.
6) Average change in runoff depth from background was calculated for watersheds with a high percentage of agricultural land uses.

The potential for peak-flow enhancement from agricultural land uses was assessed for each watershed based on the rules outlined to the right (WPN, 1999).

Change in Runoff from Background (inches)	Relative Potential for Peak-Flow Enhancement
Less than 0.5	Low
0.5 to 1.5	Moderate
Greater than 1.5	High

Forest and Rural Roads

Forest and rural roads have the potential to increase peak flows. Road networks increase the impervious surface area and provide a route for rain and snow melt to stream channels. Roads within the subbasin were derived from USGS digital line graphs and aerial photographs. All roads were identified as either forest or residential. Urban roads are considered in the runoff from urban areas and therefore all urban roads were excluded from this section of the analysis. The steps included in this part of the assessment are outlined below.

1) Calculate the total length of forest and rural roads within each watershed. Roads within agricultural areas were included with the rural roads.
2) Calculate impervious area by multiplying the length of road by a standard width. Roads are divided into two levels of use main arteries or minor roads. Main arteries are assigned a width of 35 feet and minor roads 25 feet. Road widths are based on the guidelines established in the Oregon Watershed Assessment Manual.
3) Calculate percent of watershed in roads and assess the potential for peak flow enhancement.

The potential for peak flow enhancement was rated based on the rules outlined in the box to the right (WPN, 1999).

Rural Areas in Roads	Potential Risk for Peak-Flow Enhancement
Less than 4%	Low
4% to 8%	Moderate
Greater than 8%	High

Urban and Rural Residential

The urban and rural residential assessment relies on an estimate of the area within each watershed that is impervious. The average percent of impervious surfaces within land developments is the basis for estimating the total impervious surface area of a watershed. The altered hydrologic regime of a watershed under urban and residential conditions causes alteration of physical habitats. Impervious surfaces such as rooftops and parking lots increase runoff and lead to a high risk of peak-flow enhancement. The following steps were taken to assess the potential risk for peak-flow enhancement.

1) Identify percent of each watershed under urban, industrial, and rural residential land uses.
2) Calculate the weighted average percent imperviousness for the combined area of urban, industrial, and rural residential land uses. The average impervious area (%) for these three land uses is presented in the box to the right (WPN, 1999).

Type of Land	**Average Area (%)**
Urban	85
Industrial	72
Rural Residential	25

3) Estimate percent impervious surface within each watershed from urban, industrial, and rural residential land uses.

The potential for peak flow enhancement was assessed based on the rules in the box to the right (WPN, 1999).

Percent Imperviousness from Urban/Rural Land Use	**Potential Risk for Peak-Flow Enhancement**
Less than 5%	Low
5% to 10%	Moderate
Greater than 10%	High

Water Use

Water use can potentially impact low-flow levels and water quality. This assessment of water use is primarily focused on low-flow issues, water quality is addressed in a later section of the watershed assessment. Surface and groundwater rights are listed in the Appendix Table 4.2a. There are 439 records of water rights filed with the Oregon Water Resources Department (OWRD) for the Lower Columbia-Clatskanie Subbasin.

Water availability is essential to both spawning and fish passage. OWRD has calculated the water availability for many of the watersheds within the subbasin (Figure 4.7). Water availability reports were obtained from OWRD at the 50% exceedance level for each of the water availability basins (WABs) in Figure 4.7. The 50% exceedance level is the streamflow that is expected 50% of the time. The natural variability in stream flow will include infrequent extremes in peak flows and low flows. Therefore, the 50% exceedance level represents the average stream flow.

Consumptive water use is measured as the portion of water withdrawals that does not return to the stream. Agricultural uses consume the most water. Domestic and industrial uses return water to the stream after treatment. Consumptive water use is calculated by OWRD for each of the WABs at the 50% exceedance level.

There are three WABs within the subbasin that have instream water rights: Clatskanie River, Beaver Creek, and Plympton Creek. Instream water rights are assigned to streams based on recommendations from ODFW. Streams with this type of water right are considered to have essential habitat for fish. Portland State University assigned a flow restoration priority to each watershed. The criteria for assigning flow restoration priority are water availability and anadromous fish presence. High priority watersheds have anadromous fish presence as reported by ODFW and negative net available water. All other watersheds are assigned a low priority.

Data source: USGS digital line graph files; Oregon Department of Water Resources water rights records and GIS coverages; Oregon State Service Center for GIS city boundaries.

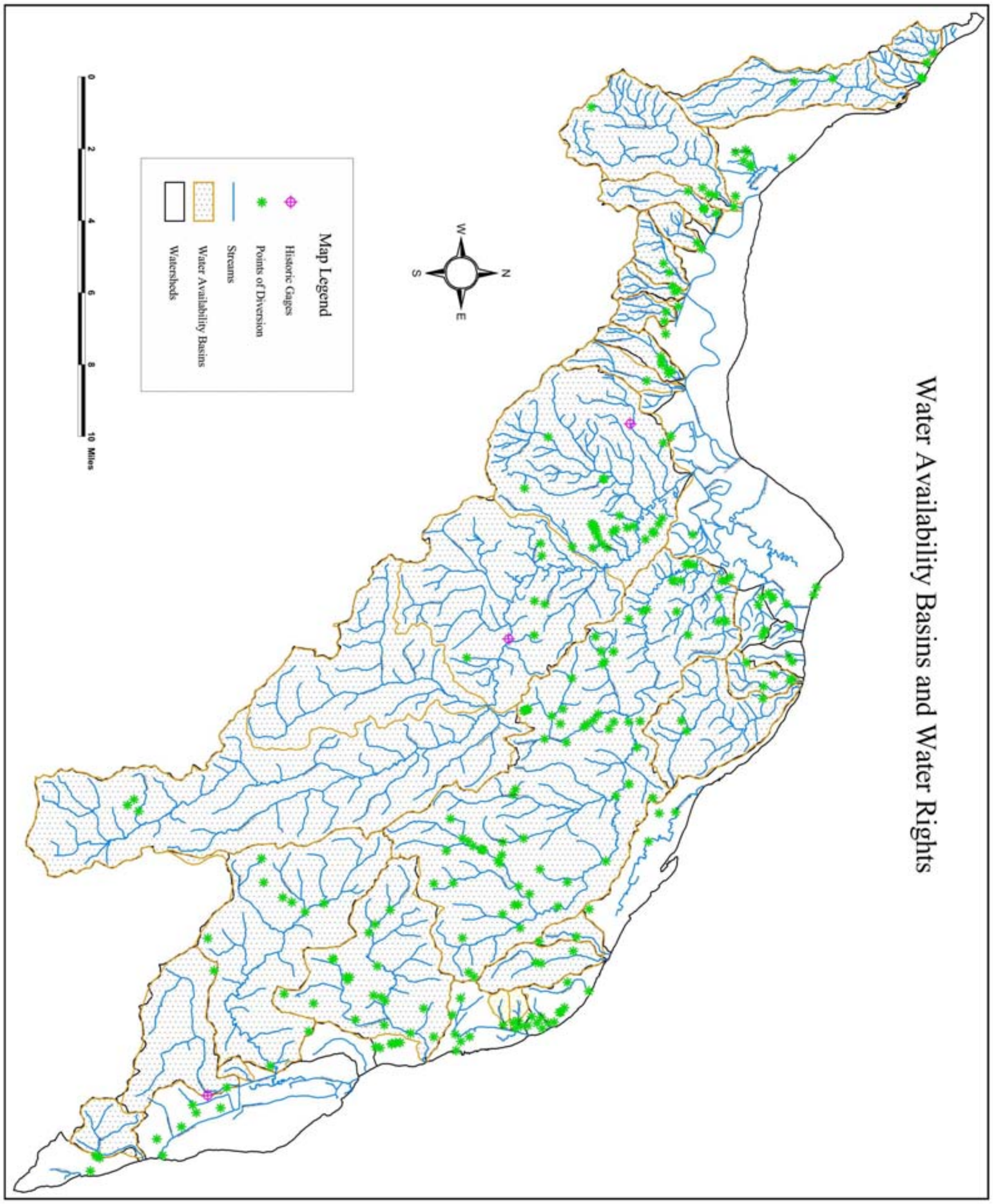


Figure 4.7: Water availability basins, water rights points of diversion, and historic stream gage locations.

Lower Columbia-Clatskanie Watershed Assessment *Page IV-15* *Hydrology and Water Use Assessment*

Results

Forestry

Potential risk of peak flow enhancement from rain-on-snow events is low within the subbasin (Table 4.4). Column three of the table shows the percent of the forestry land use area that is within the rain-on-snow zone. There are six watersheds in which 25% or more of the total forestry area is within the rain-on-snow zone. Column six lists the percent of the rain-on-snow areas that are estimated to have less than 30% crown closure. The percent of forestlands above 1000 feet and with canopy closure less than 30% is high for Eilertsen Creek and Graham Creek. However, none of the watersheds were found to have a high risk of peak flow enhancement from clear cutting.

Agriculture

Crop and pasture land uses are concentrated in the floodplains of the Columbia River. The Clatskanie Floodplain, Deer Island, and Rinearson Slough watersheds have the highest concentration of both land uses. Results from the agricultural land use assessment are presented in Table 4.5. Preliminary data from the cropland and pastureland analysis is listed in the Appendix Table 4.1a.

Within Table 4.5, columns two, four, and six contain the percent of cropland and pastureland in the three most abundant hydrologic soil groups. The average change from the background runoff depth for each soil group is recorded in columns three, five, and seven. Runoff depth is a measure of how much of the 2-year 24-hour precipitation event is converted into runoff. Background refers to the natural or historic conditions.

Column eight contains the weighted average change in runoff depth from background conditions. The weighted average change is calculated by summing the product of the percent of crop/pasture in each soil group multiplied by the average change from background (i.e. column 2 x column 3 + column 4 x column 5 + column 6 x column 7). The last calculation is the estimate of the percent total change from background. This is the weighted average change from background adjusted by the percent of the watershed in agricultural use.

Deer Island was found to have a high risk of peak flow enhancement from agricultural land uses. Clatskanie Floodplain, Green Creek, and Rinearson Slough all have a moderate risk of peak flow enhancement. Watersheds in which the area occupied by agricultural land use is less than 10% of the total watershed area were not evaluated, but are considered to have a low risk of peak-flow enhancement.

Forest and Rural Roads

Results from the forest and rural road analysis are presented in Table 4.6. The total watershed area is recorded in column two and the area minus urban land uses in column three. The roaded area is the length multiplied by the standard widths of forest and rural roads. Roaded area is a measure of the total surface area of the forest and rural roads within each watershed. Percent area roaded represents the proportion of the total watershed area that is road surface. OWEB guidelines specify that the percent of area

Name	< 1000ft	>= 1000ft	Analysis Necessary	Historic Closure	Percent At Risk[a]	Potential Risk
Aldrich Point	100	0	No			Low
Speer Creek	100	0	No			Low
Clifton	100	0	No			Low
Hunt Creek	49	51	Analyze	~70%	31%	Low
Clatskanie	96	4	No			Low
Ternahan Creek	100	0	No			Low
Niemela Creek	100	0	No			Low
Flume Creek	100	0	No			Low
Green Creek	100	0	No			Low
Rinearson Slough	100	0	No			Low
Tank Creek	100	0	No			Low
Beaver Creek	94	6	No			Low
Plympton Creek	18	82	Analyze	~70%	8%	Low
West Creek	34	66	Analyze	~70%	29%	Low
Ross Creek	76	24	No			Low
Clatskanie River	55	45	Analyze	~70%	33%	Low
Olsen Creek	81	19	No			Low
Eilertsen Creek	71	29	Analyze	~70%	42%	Low
Graham Creek	47	53	Analyze	~70%	45%	Low
Tandy Creek	78	22	No			Low
OK Creek	87	13	No			Low
Nice Creek	100	0	No			Low
Fox Creek	90	10	No			Low
Owl Creek	100	0	No			Low
Neer Creek	91	9	No			Low
Goble Creek	95	5	No			Low
Tide Creek	91	9	No			Low
Hunter	100	0	No			Low
Deer Island	100	0	No			Low
Merrill Creek	100	0	No			Low
McBride Creek	100	0	No			Low
Harrie Creek	100	0	No			Low

Table 4.4: Results of forestry land use analysis. Potential risk of peak flow enhancement from rain-on-snow events.

[a] Percent of the forested area in the rain-on-snow zone that has less than 40% canopy closure.

roaded in a watershed must be at least 4% for a moderate risk of peak flow enhancement to be assessed. There are three watersheds that rate as having a moderate risk of peak flow enhancement from forest and rural roads. All three of these watersheds are smaller than 1.4 square miles and contain limited potential for salmonid habitat. Niemela Creek watershed is less than a mile square in area and Ross Creek and OK Creek watersheds are not much larger at 1.2 and 1.3 square miles respectively.

Urban and Rural Residential

A summary of the results from the urban and rural residential land use assessment is presented in Table 4.7. Total watershed area as well as area of urban, industrial, and rural residential land uses are recorded in columns two through five. The percent of the watershed area that is contained in urban, industrial, and rural residential land uses is presented in column six. A weighted average percent impervious area for the combined area of urban, industrial, and rural residential land uses is reported in column seven. The estimate of percent total impervious area is equal to column six multiplied by column seven.

Watershed Name	Percent of Crop/Pasture in 1st Hydrologic Soil Group	Average Change from Background[a]	Percent of Crop/Pasture in 2nd Hydrologic Soil Group	Average Change from Background[b]	Percent of Crop/Pasture in 3rd Hydrologic Soil Group	Average Change from Background[c]	Weighted Average Change from Background[d]	Estimate of Percent Total Change[e]	Potential Risk of Peak-flow Enhancement
Clatskanie Floodplain	0.06	6.5	0.46	2.4	0.48	1.7	2.3	1.3	Moderate
Deer Island	0.28	3.8	0.47	2.6	0.25	1.3	2.6	1.8	High
Flume Creek	1.00	2.6	0.00		0.00		2.6	0.3	Low
Goble Creek	0.15	3.0	0.85	2.1	0.00		2.2	0.3	Low
Green Creek	0.83	3.0	0.17	1.9	0.00		2.8	0.5	Moderate
Niemela Creek	0.65	2.2	0.35	1.4	0.00		1.9	0.4	Low
Rinearson Slough	0.22	5.8	0.32	2.1	0.47	1.6	2.6	1.1	Moderate
Ternahan Creek	1.00	2.7	0.00		0.00		2.7	0.3	Low
Tide Creek	0.22	3.3	0.78	2.2	0.00		2.5	0.3	Low

Table 4.5: Results from analysis of potential peak flow enhancement from pasture and crop land uses.

[a] Average of the change from background for crop and pasture lands in the most abundant soil group.
[b] Average of the change from background for crop and pasture lands in the second most abundant soil group.
[c] Average of the change from background for crop and pasture lands in the third most abundant soil group.
[d] Average of columns 3,5, and 7 weighted by the percent of total agricultural area covered by each hydrologic soil group.
[e] Weighted average change from background adjusted by the percent of total watershed area covered by agricultural land use.

Watershed Name	Area (sq mi)	Area minus Urban Land Uses (sq mi)	Length of Minor Roads (ft)	Length of Main Arteries (ft)	Roaded Area (sq mi)	Percent Area Roaded	Relative Potential for Impact
Aldrich Point	0.48	0.48	2593.01	0.00	0.00	0%	Low
Beaver Creek	48.90	48.81	605571.97	708244.80	1.43	3%	Low
Clatskanie Floodplain	32.02	28.61	187423.92	518491.93	0.82	3%	Low
Clatskanie River	94.73	93.60	2209266.02	464483.04	2.56	3%	Low
Clifton	1.14	1.14	16580.42	3179.72	0.02	2%	Low
Deer Island	11.39	10.66	78113.94	113574.68	0.21	2%	Low
Eilertsen Creek	1.04	1.04	27920.28	925.39	0.03	3%	Low
Flume Creek	1.70	1.70	24218.80	21407.50	0.05	3%	Low
Fox Creek	3.21	3.03	49603.72	20576.79	0.07	2%	Low
Goble Creek	15.55	15.54	132498.94	220224.12	0.40	3%	Low
Graham Creek	2.52	2.52	67273.02	11429.64	0.07	3%	Low
Green Creek	8.05	8.05	86401.48	116991.33	0.22	3%	Low
Harrie Creek	2.45	0.89	334.34	14712.86	0.02	2%	Low
Hunt Creek	7.24	7.24	194921.02	26009.82	0.21	3%	Low
Hunter	1.72	1.72	17300.51	14009.43	0.03	2%	Low
McBride Creek	2.41	2.36	36820.82	14987.53	0.05	2%	Low
Merrill Creek	7.84	7.84	171220.69	40031.47	0.20	3%	Low
Neer Creek	3.94	3.41	41190.45	54014.80	0.10	3%	Low
Nice Creek	1.15	0.97	342.21	14796.64	0.02	2%	Low
Niemela Creek	0.54	0.54	16101.77	8534.53	0.03	5%	Moderate
OK Creek	1.27	1.17	43236.50	7035.61	0.05	4%	Moderate
Olsen Creek	1.89	1.89	59466.71	4955.53	0.06	3%	Low
Owl Creek	2.22	1.79	11393.50	11041.66	0.02	1%	Low
Plympton Creek	9.46	9.46	164391.45	8484.56	0.16	2%	Low
Rinearson Slough	6.07	5.49	45113.52	89800.20	0.15	3%	Low
Ross Creek	1.20	1.20	48566.60	1069.26	0.04	4%	Moderate
Speer Creek	1.18	1.18	23475.02	2148.69	0.02	2%	Low
Tandy Creek	1.55	1.55	14773.85	6023.46	0.02	1%	Low
Tank Creek	1.41	1.41	17772.38	19792.89	0.04	3%	Low
Ternahan Creek	1.02	1.02	10603.99	18805.51	0.03	3%	Low
Tide Creek	20.15	20.15	348015.25	173232.16	0.53	3%	Low
West Creek	2.70	2.70	47982.25	7909.67	0.05	2%	Low

Table 4.6: Summary of potential risk of peak flow enhancement from forest and rural roads.
[a] Total surface area of forest and rural roads.
[b] Percent of watershed area (minus urban land uses) covered by road surfaces.

Total impervious area from urban, industrial, and rural residential land uses is greater than 10% within eight of the watersheds. A high risk of peak flow enhancement was assessed for Harrie Creek, Nice Creek, and Owl Creek watersheds. A moderate risk of peak flow enhancement was assessed for Clatskanie Floodplain, Fox Creek, Neer Creek, OK Creek, and Rinearson Slough watersheds.

Water Use

Water availability basins identified by OWRD closely follow the watershed boundaries delineated by Portland State University (Figure 4.7). The Clatskanie River watershed has been broken into four WABs by OWRD. The floodplains of the Columbia River and Tributaries are not included in the WABs. Additionally, the northwestern and southeastern watersheds are not included in the Oregon Water Resources Department's WABs.

Table 4.8 summarizes the net water available based on the 50% exceedance level. Water uses within the subbasin have resulted in negative net water availability in Beaver Creek, Clatskanie River, Fox Creek, Graham Creek, Little Jack Falls, and Plympton Creek. Of these six watersheds Clatskanie River, Beaver Creek, and Plympton Creek have anadromous fish presence and instream water rights. These three watersheds are assigned a high priority for flow restoration, are other watersheds are low. The instream water rights in the Clatskanie River, Beaver Creek, and Plympton Creek watersheds exceed the forecasted natural stream flow at the 50% exceedance level, contributing to the negative net water availability (Figures 4.8-4.10).

A measure of the consumptive uses in each WAB is presented in Table 4.9 as percent of natural stream flow at the 50% exceedance level. Watersheds with the highest consumptive use (at least 10%) present the greatest opportunity for flow restoration through conservation measures, increased efficiency of use, and/or best management practices. The Clatskanie River, Beaver Creek, and Plympton Creek watersheds have less than 10% consumptive use.

Watershed Name	Area (acres)	Urban (acres)	Industrial (acres)	Rural Residential (acres)	Percent of Area Occupied by Land Uses[a]	Weighted Average Percent Impervious[b]	Estimate of Percent Total Impervious Area[c]	Relative Potential for Peak-Flow Enhancement
Aldrich Point	304	0.0	0.0	0.0	0.0%	0.0%	0.0%	Low
Beaver Creek	31294	0.0	41.1	3620.0	11.7%	25.5%	3.0%	Low
Clatskanie Fl	20766	14.1	1469.1	1749.8	15.6%	46.6%	7.3%	Moderate
Clatskanie River	60724	712.5	67.3	973.6	2.9%	51.2%	1.5%	Low
Clifton	728	0.0	0.0	0.0	0.0%	0.0%	0.0%	Low
Deer Island	7286	59.3	85.8	221.0	5.0%	45.7%	2.3%	Low
Eilertsen Creek	665	0.0	0.0	8.1	1.2%	25.0%	0.3%	Low
Flume Creek	1087	0.0	0.0	154.5	14.2%	25.0%	3.6%	Low
Fox Creek	2052	115.2	0.0	94.4	10.2%	58.0%	5.9%	Moderate
Goble Creek	9954	0.0	5.2	614.9	6.2%	25.4%	1.6%	Low
Graham Creek	1335	0.0	0.0	35.8	2.7%	25.0%	0.7%	Low
Green Creek	5153	0.0	0.0	759.3	14.7%	25.0%	3.7%	Low
Harrie Creek	1565	908.6	83.6	46.3	66.4%	81.3%	53.9%	High
Hunt Creek	4633	0.0	0.0	0.0	0.0%	0.0%	0.0%	Low
Hunter	1103	0.0	0.0	47.0	4.3%	25.0%	1.1%	Low
McBride Creek	1542	16.8	14.6	4.0	2.3%	72.9%	1.7%	Low
Merrill Creek	5015	0.0	0.0	148.5	3.0%	25.0%	0.7%	Low
Neer Creek	2521	36.0	159.8	36.3	9.2%	66.7%	6.1%	Moderate
Nice Creek	733	113.6	0.0	107.6	30.2%	55.8%	16.8%	High
Niemela Creek	347	0.0	0.0	18.3	5.3%	25.0%	1.3%	Low
OK Creek	816	0.0	66.3	0.3	8.2%	71.8%	5.9%	Moderate
Olsen Creek	1208	0.0	0.0	42.6	3.5%	25.0%	0.9%	Low
Owl Creek	1423	274.2	0.0	15.2	20.3%	81.9%	16.6%	High
Plympton Creek	6055	0.0	0.0	61.8	1.0%	25.0%	0.3%	Low
Rinearson Slough	3882	247.3	114.1	280.1	16.5%	56.5%	9.3%	Moderate
Ross Creek	767	0.0	0.0	18.7	2.4%	25.0%	0.6%	Low
Speer Creek	756	0.0	0.0	1.6	0.2%	25.0%	0.1%	Low
Tandy Creek	992	0.0	0.0	29.6	3.0%	25.0%	0.7%	Low
Tank Creek	899	0.0	0.0	109.9	12.2%	25.0%	3.1%	Low
Ternahan Creek	653	0.0	0.0	66.8	10.2%	25.0%	2.6%	Low
Tide Creek	12895	0.0	0.0	515.6	4.0%	25.0%	1.0%	Low
West Creek	1725	0.0	0.0	80.5	4.7%	0.0%	0.0%	Low

Table 4.7: Summary of risk of peak flow enhancement from urban and rural residential land uses.

[a] Percent of total watershed area developed into urban, industrial, and rural residential land uses.
[b] Average percent impervious of developed area. Percent imperviousness for each land use weighted by the percent of developed area covered by each land use.
[c] Weighted average percent impervious adjusted by the percent of total watershed area that is developed.

Water Availability Basins	Month											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Adams Cr	1.17	1.52	1.07	0.58	0.28	0.20	0.08	0.04	0.03	0.04	0.15	1.04
Beaver Cr	66.50	61.50	12.50	**-0.56**	**-0.70**	1.44	1.93	2.19	2.86	**-0.86**	**-5.60**	28.50
Clatskanie R	180.00	169.00	68.30	25.30	32.30	8.67	**-0.04**	0.06	0.28	**-61.10**	**-26.20**	91.30
Eilertson Cr	4.25	4.14	2.89	2.14	1.32	0.79	0.41	0.26	0.24	0.19	0.69	3.17
Flume Cr	4.76	4.66	3.09	2.14	1.20	0.60	0.22	0.11	0.07	0.05	0.36	3.44
Fox Cr	8.19	10.80	7.59	4.29	1.99	0.98	0.05	**-0.32**	**-0.24**	**-0.10**	0.84	7.36
Goble Cr	44.50	56.70	40.20	24.20	13.10	8.17	3.56	2.02	1.95	2.37	7.14	41.20
Graham Cr	5.37	5.25	3.50	2.61	1.52	0.56	0.07	**-0.10**	**-0.05**	**-0.24**	0.37	3.78
Green Cr	24.20	23.60	15.60	11.20	6.51	3.62	1.64	1.02	0.80	0.59	2.52	17.90
Hunt Cr	46.30	43.90	31.60	24.90	16.30	10.40	5.77	4.09	4.05	3.98	13.40	37.40
Jack Falls	1.11	1.43	1.04	0.60	0.32	0.18	0.07	0.03	0.30	0.30	0.13	0.98
Kelly Creek	7.91	7.53	5.19	3.54	1.93	1.22	0.48	0.24	0.17	0.18	1.34	6.27
Little Jack Falls	1.16	1.53	1.06	0.55	0.23	0.07	**-0.05**	**-0.09**	**-0.09**	**-0.09**	0.01	1.01
McBride Cr	6.61	8.54	6.01	3.39	1.69	1.16	0.48	0.25	0.20	0.25	0.89	5.94
Merrill Cr	23.68	30.48	21.68	12.87	6.85	4.70	2.20	1.29	1.24	1.54	4.12	21.78
Nice Cr	3.16	4.07	2.93	1.73	0.94	0.52	0.19	0.09	0.08	0.10	0.41	2.84
OK Cr	4.38	4.27	2.94	2.15	1.28	0.76	0.37	0.23	0.20	0.14	0.63	3.23
Olsen Cr	7.96	7.71	5.40	4.03	2.49	1.42	0.68	0.43	0.37	0.31	1.27	6.04
Plympton Cr	16.90	14.70	1.26	**-0.04**	**-0.04**	**-0.24**	**-0.19**	**-0.18**	**-0.22**	**-17.00**	**-8.94**	6.26
Ross Cr	5.10	4.93	3.40	2.38	1.35	0.72	0.26	0.13	0.09	0.08	0.58	3.88
Tandy Cr	6.05	5.91	4.10	3.03	1.81	1.19	0.67	0.51	0.59	0.48	1.18	4.50
Tide Cr	64.10	81.60	57.80	34.70	18.60	11.20	4.52	2.39	2.30	3.03	9.99	59.70
West Cr	11.50	11.10	7.83	6.09	3.94	2.19	1.10	0.71	0.71	0.57	2.27	8.75

Table 4.8: Water availability summary based on data from Oregon Water Resources Department (WRD). Water availability basins do not cover the entire subbasin. Units are cubic feet per second.

Water Availability Basins	Month											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Adams Cr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Beaver Cr	0%	0%	0%	1%	1%	3%	5%	6%	5%	5%	2%	0%
Clatskanie R	0%	0%	0%	0%	1%	1%	3%	3%	3%	4%	1%	0%
Eilertson Cr	7%	7%	**10%**	**14%**	**22%**	**37%**	**68%**	**103%**	**111%**	**136%**	**42%**	9%
Flume Cr	4%	4%	6%	9%	**16%**	**32%**	**83%**	**154%**	**222%**	**286%**	**53%**	6%
Fox Cr	**13%**	**10%**	**12%**	**20%**	**35%**	**52%**	**95%**	**144%**	**130%**	**111%**	**56%**	**13%**
Goble Cr	0%	0%	0%	0%	0%	1%	4%	6%	2%	1%	0%	0%
Graham Cr	**12%**	**12%**	**17%**	**21%**	**32%**	**56%**	**91%**	**116%**	**108%**	**151%**	**66%**	**16%**
Green Cr	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Hunt Cr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Jack Falls	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Kelly Creek	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Little Jack Falls	9%	7%	9%	**17%**	**32%**	**61%**	**183%**	**550%**	**550%**	**550%**	**92%**	**10%**
McBride Cr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Merrill Cr	0%	0%	0%	0%	1%	1%	3%	4%	3%	1%	0%	0%
Nice Cr	1%	1%	1%	2%	3%	5%	**14%**	**25%**	**27%**	**23%**	7%	1%
OK Cr	2%	2%	3%	4%	6%	**10%**	**18%**	**26%**	**29%**	**36%**	**11%**	2%
Olsen Cr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Plympton Cr	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	0%	0%
Ross Cr	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Tandy Cr	0%	0%	0%	1%	5%	9%	**19%**	**22%**	**12%**	4%	2%	0%
Tide Cr	0%	0%	0%	1%	2%	3%	**10%**	**16%**	**11%**	4%	1%	0%
West Cr	2%	2%	3%	4%	6%	9%	**17%**	**24%**	**24%**	**28%**	9%	3%

Table 4.9: Consumptive water use summary. Calculations based on the 50% exceedance of streamflow data from Oregon Water Resources Department.

Figure 4.8: Comparison of natural flow to instream r
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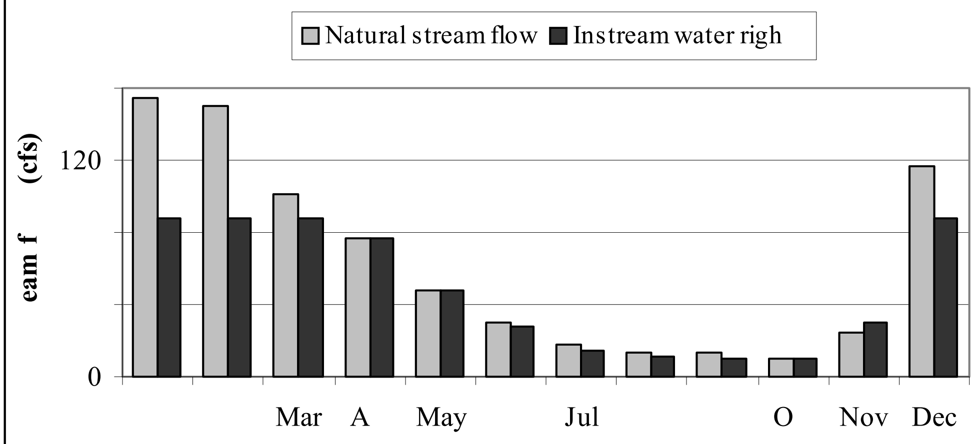


Conclusions

Although no significant risk of peak flow enhancement was determined for forestry land uses, there have been substantial floods in the past due to rain-on-snow events. The aerial photographs used in this analysis were taken in 1994 and do not contain all of the areas that currently have less than 30% canopy cover. ODF stand exams were used to supplement the aerial photographs on state lands, but no information was available for private lands. Rain-on-snow events are the primary cause of peak flow enhancement from timber harvesting. In addition to rain-on-snow events, removal of vegetation has the immediate impact of increasing base flows by reducing the amount of rainfall lost through the interception and evapotranspiration pathways of the hydrologic cycle. However, as the vegetation returns to a clear-cut the interception and evapotranspiration levels rapidly increase.

Fog drip is another source of precipitation within the coast range. Water vapor condenses on the leaves and branches of trees as fog moves through the forest. The reduction in leaf surface area due to timber harvesting significantly reduces the amount of fog drip. The absolute effect of timber harvesting on stream flow is difficult to acertain. Rain-on-snow events and the effects to snow pack are the most predictable impacts from timber harvesting.

Agriculture has a much more measurable effect on stream flow. The Natural Resource Conservation Service has developed models for predicting the impacts from various agricultural practices. Evaluation of the croplands and pasturelands within the subbasin indicates that the risk from peak flow enhancement is significant within four of the watersheds of the subbasin. However, these “watersheds” are actually pieces of the Columbia River floodplain where the streams of the subbasin mix with the brackish waters of the Columbia River. The highest concentration of croplands and pasturelands

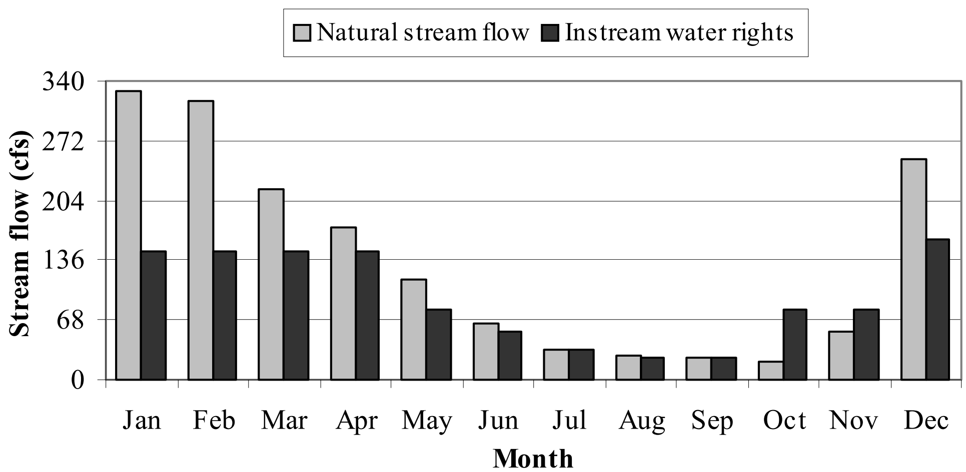


Figure 4.9: Comparison of natural flow to instream water rights for the Clatskanie River water availability basin.

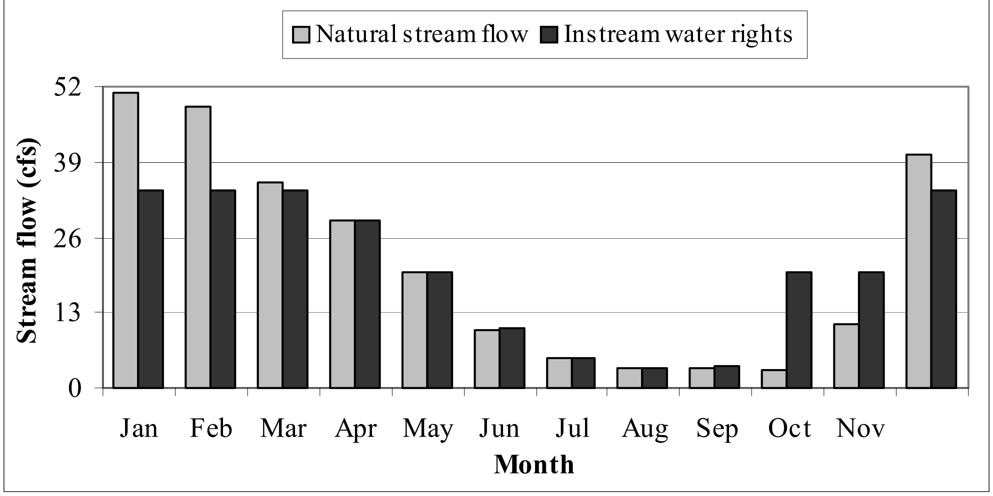
are found along the Columbia River. Although runoff is potentially high in these areas the impacts to hydrology are questionable since these areas are not truly watersheds.

Forest and rural roads can serve as conduits for storm flow, routing water from hill slopes into stream channels. The OWEB watershed manual recommends a road width of 25 for forest roads and 35 for rural roads that would include the rolling surface and the roadside ditch. This is a conservative estimate that will provide a high level of protection for stream channel habitats. Results from the analysis roads indicate that the risk of peak flow enhancement from forest and rural roads is not significant based on the available information. However, the Lower Columbia River Watershed Council has indicated that the GIS data has underestimated the density of roads within the Clatskanie Watershed and probably other watersheds of the subbasin (Lower Columbia River Watershed Council Meeting, May 22, 2001).

Urban and rural residential land uses are spread throughout the subbasin with the highest concentration in the east. Risk of peak flow enhancement is based on an average total impervious area. The total impervious area for urban (including industrial) and residential lands is calculated as a percent of total area. Eight watersheds within the subbasin are at risk of peak flow enhancement from urban and rural residential land uses. Water quality becomes a concern in these watersheds, because runoff from urban and residential areas often carries a variety of compounds and wastes.

Water use has the impact of reducing low flows especially during the driest time of the year. Six of the water availability basins of the Lower Columbia-Clatskanie Subbasin have negative net water availability. The OWRD has estimated that at the fifty percent exceedance level the Beaver Creek, Clatskanie River, Fox Creek, Graham Creek, Little Jack Falls, and Plympton Creek WAB's have negative net available water during several months of the year. Of these six watersheds Beaver Creek, Clatskanie River, and Plympton Creek have anadromous fish presence and instream water rights. Instream

Figure 4.10: Comparison of natural flow to instream water rights for the Plympton Creek water availability basin.



water rights within these three streams exceed the natural stream flow predictions at the 50% exceedence level contributing to the negative net water available. These three watersheds are considered to be high priority for flow restoration. However, analysis of the consumptive uses within these watersheds indicates that conservation measures, increased efficiency of use, and/or best management practices will not be enough to restore flow levels. In addition, instream water rights contribute to the negative net available water.

Data Gaps

1. Current forest stand surveys from private landowners.
2. Recent aerial photographs, preferably from no more than two years ago.

Confidence Evaluation

Moderate. The potential risk of peak flow enhancement from forestry is based on satellite image interpretation from 1995. Although the quality of the data is presumably high the level of detail and accuracy of the data is not optimal. The majority of forestlands within the subbasin are privately owned and information regarding the age and structure of forest stands is not readily available. Recent aerial photographs could be used to improve the detail of the forest stands database, but such photographs were unavailable.

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Appendix Tables

Hydrology and Water Use Assessment

Watershed Name	Cover Type	Hydrologic Soil Group	Hydrologic Condition	Curve Number	Background Curve Number	Rainfall Depth (in)[a]	Current Runoff Depth (in)	Background Runoff Depth (in)	Change from Background
Clatskanie Floodplain	Pasture	A	Fair	49	30	28	14.25	7.76	6.49
	Pasture	C	Fair	79	70	28	23.3	20.50	2.80
	Pasture	D	Fair	84	77	28	24.67	22.70	1.97
	Crop	C	Fair	76	70	28	22.4	20.50	1.90
	Crop	D	Fair	82	77	28	24.19	22.70	1.49
Deer Island	Pasture	A	Fair	49	30	20	9.59	5.07	4.52
	Pasture	B	Fair	69	55	20	14.03	10.99	3.04
	Pasture	D	Fair	84	77	20	17.3	15.81	1.49
	Crop	A	Fair	43	30	20	8.13	5.07	3.06
	Crop	B	Fair	65	55	20	13.2	10.99	2.21
	Crop	D	Fair	82	77	20	16.9	15.81	1.09
Flume Creek	Pasture	C	Fair	79	70	26	21.55	18.94	2.61
Goble Creek	Pasture	B	Fair	69	55	20	14.03	10.99	3.04
	Pasture	C	Fair	79	70	20	16.28	14.23	2.05
Green Creek	Pasture	C	Fair	79	70	26	21.55	18.94	2.61
	Pasture	D	Fair	84	77	26	22.83	20.97	1.86
Niemela Creek	Pasture	C	Fair	79	70	26	21.55	18.94	2.61
	Crop	C	Fair	76	70	26	20.7	18.94	1.76
	Crop	D	Fair	82	77	26	22.37	20.97	1.40
Rinearson Slough	Pasture	A	Fair	49	30	25	12.5	6.75	5.75
	Pasture	C	Fair	79	70	25	20.67	18.15	2.52
	Pasture	D	Fair	84	77	25	21.91	20.11	1.80
	Crop	C	Fair	76	70	25	19.85	18.15	1.70
	Crop	D	Fair	82	77	25	21.45	20.11	1.34
Ternahan Creek	Pasture	C	Fair	79	70	27	22.43	19.72	2.71
Tide Creek	Pasture	B	Fair	69	55	22	15.57	12.29	3.28
	Pasture	C	Fair	79	70	22	18.04	15.80	2.24

Table A4.1: Data for crop and pasture land use analysis. Percent of crop and pasture lands in each hydrologic soil group.

[a] 2year-24hour rainfall estimated from Precipitation Frequency Atlas of the Western United States (Miller et al, 1973).

Watershed	Permit[a]		Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Beaver Cr	G	3941	V	19680507	0.020	cfs	IM	A WELL	BEAVER CR	T7N R3W Sect10 SENE	70956
Beaver Cr	G	9412	V	19800225	0.090	cfs	DN	WELL 1	LOST CR	T7N R3W Sect16 NWSW	70956
Beaver Cr	G	9412	V	19800225	0.090	cfs	DN	WELL 2	LOST CR	T7N R3W Sect16 NWSW	70956
Beaver Cr	G	9412	V	19800225	0.030	cfs	DN	WELL 3	LOST CR	T7N R3W Sect16 NWSW	70956
Beaver Cr	G	12944	V	19941101	0.110	cfs	DO	WELL 1	BEAVER CR	T7N R2W Sect19 SENE	70956
Beaver Cr	G	12944	V	19941101	0.110	cfs	DO	WELL 2	BEAVER CR	T7N R2W Sect19 SENE	70956
Beaver Cr	G	12944	V	19941101	0.110	cfs	DO	WELL 3	BEAVER CR	T7N R2W Sect19 NESE	70956
Beaver Cr	G	12944	V	19941101	0.110	cfs	DO	WELL 4	BEAVER CR	T7N R2W Sect20 NESW	70956
Beaver Cr	G	12944	V	19941101	0.110	cfs	DO	WELL 5	BEAVER CR	T7N R2W Sect20 NWSW	70956
Beaver Cr	R	1960	V	19561116	0.090	af	MU	N FK STEWART CR	STEWART CR	T8N R4W Sect35 NESW	70956
Beaver Cr	R	5574	V	19700108	2.000	af	WI	UNN STR	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	R	5574	V	19700108	1.000	af	FI	UNN STR	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	R	5574	V	19700108	1.000	af	LV	UNN STR	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	R	5574	V	19700108	0.600	af	LV	UNN STR	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	R	5574	V	19700108	0.600	af	FI	UNN STR	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	R	5574	V	19700108	0.200	af	FI	UNN STR	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	R	5574	V	19700108	0.200	af	LV	UNN STR	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	R	5574	V	19700108	2.000	af	LV	UNN STR/RES 1	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	R	5588	V	19700216	1.000	af	WI	UNN STR	LOST CR	T7N R3W Sect29 NENE	70956
Beaver Cr	R	5588	V	19700216	1.000	af	LV	UNN STR	LOST CR	T7N R3W Sect29 NENE	70956
Beaver Cr	R	5588	V	19700216	5.000	af	WI	UNN STR	LOST CR	T7N R3W Sect29 NENE	70956
Beaver Cr	R	5588	V	19700216	5.000	af	LV	UNN STR	LOST CR	T7N R3W Sect29 NENE	70956
Beaver Cr	R	11258	V	19900814	1.000	af	WI	LOST CR	BEAVER CR	T7N R3W Sect8 SESE	70956
Beaver Cr	R	12017	V	19940708	5.000	af	WI	N FK STEWART CR/RES	STEWART CR	T8N R4W Sect34 SWNE	70956
Beaver Cr	R	100512	V	19930101	5.000	af	FP	LOST CR/RES 2	LOST CR	T7N R3W Sect19 SWNE	70956
Beaver Cr	R	100512	V	19930101	5.000	af	WI	LOST CR/RES 2	LOST CR	T7N R3W Sect19 SWNE	70956
Beaver Cr	R	100512	V	19930101	5.000	af	FP	PALMER CR/RES 1	LOST CR	T7N R3W Sect18 SESW	70956
Beaver Cr	R	100512	V	19930101	5.000	af	WI	PALMER CR/RES 1	LOST CR	T7N R3W Sect18 SESW	70956
Beaver Cr	R	100512	V	19930101	5.000	af	WI	UNN STR/RES 3	LOST CR	T7N R3W Sect18 SESW	70956
Beaver Cr	R	100512	V	19930101	5.000	af	FP	UNN STR/RES 3	LOST CR	T7N R3W Sect18 SESW	70956
Beaver Cr	R	101419	V	19930101	0.370	af	LV	UNN STR/RES 1	LOST CR	T7N R4W Sect13 NESE	70956
Beaver Cr	R	101419	V	19930101	5.000	af	LV	UNN STR/RES 2	LOST CR	T7N R4W Sect13 NESE	70956
Beaver Cr	R	101906	V	19930101	1.190	af	FI	PALMER CR/RES 1	LOST CR	T7N R4W Sect13 SESE	70956
Beaver Cr	R	103151	V	19930101	5.000	af	DN	A SPR/RES	BEAVER CR	T8N R4W Sect35 NESE	70956
Beaver Cr	R	103252	V	19930101	0.400	af	FP	UNN STR/RES 1	LOST CR	T7N R3W Sect20 SWSE	70956
Beaver Cr	R	103252	V	19930101	0.400	af	WI	UNN STR/RES 1	LOST CR	T7N R3W Sect20 SWSE	70956
Beaver Cr	R	103252	V	19930101	0.400	af	FP	UNN STR/RES 2	LOST CR	T7N R3W Sect20 SESE	70956
Beaver Cr	R	103252	V	19930101	0.400	af	WI	UNN STR/RES 2	LOST CR	T7N R3W Sect20 SESE	70956
Beaver Cr	S	7739	V	19270112	0.100	cfs	DO	UNN SPR	BEAVER CR	T7N R4W Sect24 NWNE	70956
Beaver Cr	S	8017	V	19270525	0.010	cfs	DO	UNN SPR	UNN STR	T6N R3W Sect2 SESE	70956
Beaver Cr	S	9230	V	19290904	0.010	cfs	DO	UNN STR	LOST CR	T7N R3W Sect17 SENE	70956
Beaver Cr	S	9412	V	19291204	0.080	cfs	IR	S FK BEAVER CR	BEAVER CR	T7N R3W Sect15 SENE	70956
Beaver Cr	S	9412	V	19291204	0.080	cfs	IR	BEAVER CR	DOBBINS SL	T7N R3W Sect15 SENE	70956
Beaver Cr	S	9560	V	19300315	0.010	cfs	DO	UNN SPR/BROOK	S BR STEWART CR	T7N R4W Sect1 NESW	70956
Beaver Cr	S	10393	V	19311017	0.050	cfs	IR	BEAVER CR	DOBBINS SL	T7N R3W Sect17 NENE	70956

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Beaver Cr	S 11802	V	19350805	0.070	cfs	IR	BEAVER CR	DOBBINS SL	T6N R3W Sect1 NWNE	70956
Beaver Cr	S 11811	V	19350813	0.250	cfs	IR	S FK BEAVER CR	BEAVER CR	T7N R3W Sect36 NESE	70956
Beaver Cr	S 11811	V	19350813	0.250	cfs	IR	S FK BEAVER CR	BEAVER CR	T7N R3W Sect36 SENE	70956
Beaver Cr	S 13121	V	19380719	0.020	cfs	DO	UNN SPR	BEAVER CR	T7N R4W Sect3 SENW	70956
Beaver Cr	S 14153	V	19391125	0.230	cfs	IR	S FK BEAVER CR	BEAVER CR	T7N R2W Sect30 SWSE	70956
Beaver Cr	S 14867	V	19410416	0.005	cfs	DO	SPR 1	BEAVER CR	T7N R3W Sect15 NWNE	70956
Beaver Cr	S 14867	V	19410416	0.005	cfs	DO	SPR 2	BEAVER CR	T7N R3W Sect15 NWNE	70956
Beaver Cr	S 16949	V	19460420	0.006	cfs	IR	BEAVER CR	DOBBINS SL	T7N R2W Sect20 SWSW	70956
Beaver Cr	S 18521	V	19481014	0.330	cfs	IM	BEAVER CR	DOBBINS SL	T7N R4W Sect11 NWSE	70956
Beaver Cr	S 19756	V	19500808	0.010	cfs	DO	A SPR	BEAVER CR	T7N R3W Sect15 NWNE	70956
Beaver Cr	S 20146	V	19510314	0.090	cfs	IR	UNN STR	GIRT CR	T7N R3W Sect36 SENW	70956
Beaver Cr	S 20344	V	19510517	0.100	cfs	IR	GIRT CR	BEAVER CR	T6N R2W Sect6 NESW	70956
Beaver Cr	S 21222	V	19520430	0.110	cfs	IR	GIRT CR	BEAVER CR	T6N R2W Sect6 NESW	70956
Beaver Cr	S 21639	V	19520725	0.180	cfs	IR	BEAVER CR	DOBBINS SL	T7N R3W Sect9 SWSE	70956
Beaver Cr	S 21843	V	19521014	0.010	cfs	DO	UNN SPR	BEAVER CR	T7N R2W Sect19 NESW	70956
Beaver Cr	S 21933	V	19520527	0.010	cfs	DO	A SPR	BEAVER CR	T8N R4W Sect34 NESE	70956
Beaver Cr	S 22221	V	19530330	0.130	cfs	IR	LOST CR	BEAVER CR	T7N R3W Sect21 SWNW	70956
Beaver Cr	S 22347	V	19521024	0.040	cfs	IR	UNN STR	BEAVER CR	T7N R2W Sect30 SWNW	70956
Beaver Cr	S 22611	V	19530825	0.140	cfs	IR	BEAVER CR	DOBBINS SL	T6N R3W Sect1 SENW	70956
Beaver Cr	S 23112	V	19541210	0.080	cfs	IR	WILSON CR	S FK BEAVER CR	T7N R3W Sect36 SENW	70956
Beaver Cr	S 23112	V	19541210	0.140	cfs	IR	UNN STR	WILSON CR	T7N R3W Sect25 SWSW	70956
Beaver Cr	S 23333	V	19540903	0.170	cfs	MU	N FK STEWART CR	STEWART CR	T8N R4W Sect35 NESE	70956
Beaver Cr	S 23827	V	19550819	0.010	cfs	DO	A SPR	UNN STR	T6N R2W Sect7 SENW	70956
Beaver Cr	S 24581	V	19561115	0.010	cfs	DO	UNN SPR	BEAVER CR	T8N R4W Sect34 NESE	70956
Beaver Cr	S 24582	V	19561116	0.090	af	MU	RESERVOIR	BEAVER CR	T8N R4W Sect35 NESE	70956
Beaver Cr	S 27158	V	19610127	0.010	cfs	DO	A SPR	UNN STR	T6N R3W Sect12 NWNE	70956
Beaver Cr	S 31990	V	19660912	0.010	cfs	DI	A SPR	BEAVER CR	T7N R4W Sect3 SESE	70956
Beaver Cr	S 32017	V	19660922	0.005	cfs	LV	A SPR	BEAVER CR	T7N R4W Sect3 SESE	70956
Beaver Cr	S 32017	V	19660922	0.005	cfs	DI	A SPR	BEAVER CR	T7N R4W Sect3 SESE	70956
Beaver Cr	S 33192	V	19680425	0.010	cfs	DI	A SPR	BEAVER CR	T7N R2W Sect30 NESE	70956
Beaver Cr	S 34264	V	19690526	0.040	cfs	IR	UNN STR	GIRT CR	T6N R3W Sect1 NENW	70956
Beaver Cr	S 34437	V	19690529	0.010	cfs	DI	A SPR	BEAVER CR	T8N R4W Sect35 NESE	70956
Beaver Cr	S 34549	V	19690723	0.010	cfs	DO	A SPR	UNN STR	T7N R2W Sect32 SENW	70956
Beaver Cr	S 34854	V	19700108	0.040	cfs	WI	UNN STR/RES 1	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	S 34854	V	19700108	0.040	cfs	LV	UNN STR/RES 1	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	S 34854	V	19700108	0.040	cfs	LV	UNN STR/RES 2	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	S 34854	V	19700108	0.040	cfs	WI	UNN STR/RES 2	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	S 34854	V	19700108	0.040	cfs	WI	UNN STR/RES 3	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	S 34854	V	19700108	0.040	cfs	LV	UNN STR/RES 3	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	S 34854	V	19700108	0.040	cfs	LV	UNN STR/RES 4	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	S 34854	V	19700108	0.040	cfs	WI	UNN STR/RES 4	LOST CR	T7N R3W Sect29 SWSE	70956
Beaver Cr	S 34889	C	19700730	0.120	cfs	DI	UNN STR	BEAVER CR	T7N R2W Sect29 SWSW	70956
Beaver Cr	S 34910	V	19700216	0.050	cfs	LV	RESERVOIR 1	LOST CR	T7N R3W Sect29 NENE	70956
Beaver Cr	S 34910	V	19700216	0.050	cfs	WI	RESERVOIR 1	LOST CR	T7N R3W Sect29 NENE	70956
Beaver Cr	S 34910	V	19700216	0.050	cfs	WI	RESERVOIR 2	LOST CR	T7N R3W Sect29 NENE	70956

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Beaver Cr	S 34910	V	19700216	0.050	cfs	LV	RESERVOIR 2	LOST CR	T7N R3W Sect29 NENE	70956
Beaver Cr	S 34910	V	19700216	0.050	cfs	LV	UNN STR	LOST CR	T7N R3W Sect29 NWNE	70956
Beaver Cr	S 34910	V	19700216	0.050	cfs	WI	UNN STR	LOST CR	T7N R3W Sect29 NWNE	70956
Beaver Cr	S 35376	C	19700716	0.020	cfs	DO	A SPRING	BEAVER CR	T6N R2W Sect4 SWNW	70956
Beaver Cr	S 35955	C	19710216	0.005	cfs	DO	UNN STR	LOST CR	T7N R3W Sect28 SENW	70956
Beaver Cr	S 35955	C	19710216	0.005	cfs	IR	UNN STR	LOST CR	T7N R3W Sect28 SENW	70956
Beaver Cr	S 35955	C	19710216	0.060	cfs	IR	WASHBURN CR	LOST CR	T7N R3W Sect28 SENW	70956
Beaver Cr	S 35995	V	19710225	0.002	cfs	DN	SPR 1	GIRT CR	T7N R3W Sect36 SWNE	70956
Beaver Cr	S 35995	V	19710225	0.001	cfs	DN	SPR 2	GIRT CR	T7N R3W Sect36 SWNE	70956
Beaver Cr	S 36652	V	19720124	0.005	cfs	DI	UNN STR	GIRT CR	T6N R3W Sect1 NWSW	70956
Beaver Cr	S 36933	V	19720524	0.010	cfs	DI	UNN STR	LOST CR	T7N R3W Sect21 SESW	70956
Beaver Cr	S 37286	C	19730423	0.020	cfs	FI	BEAVER CR/RES	COLUMBIA R	T7N R3W Sect36 SWSE	70956
Beaver Cr	S 37358	V	19720725	0.080	cfs	IR	LOST CR	BEAVER CR	T7N R3W Sect20 NENE	70956
Beaver Cr	S 37460	V	19721005	0.005	cfs	DO	A SPR	GIRT CR	T6N R3W Sect1 SENW	70956
Beaver Cr	S 37460	V	19721005	0.003	cfs	IR	A SPR	GIRT CR	T6N R3W Sect1 SENW	70956
Beaver Cr	S 37460	V	19721005	0.003	cfs	LV	A SPR	GIRT CR	T6N R3W Sect1 SENW	70956
Beaver Cr	S 37579	V	19721228	0.130	cfs	IR	LOST CR	BEAVER CR	T7N R3W Sect20 NENE	70956
Beaver Cr	S 37969	C	19730410	0.010	cfs	LV	A SPRING	BEAVER CR	T7N R4W Sect11 SWSE	70956
Beaver Cr	S 37969	C	19730410	0.010	cfs	DI	A SPRING	BEAVER CR	T7N R4W Sect11 SWSE	70956
Beaver Cr	S 39387	V	19740703	0.005	cfs	DI	A SPR	BEAVER CR	T7N R4W Sect3 SESE	70956
Beaver Cr	S 40323	V	19750821	0.005	cfs	DI	SPR 1	BEAVER CR	T6N R2W Sect4 NENE	70956
Beaver Cr	S 40323	V	19750821	0.005	cfs	DI	SPR 2	BEAVER CR	T6N R2W Sect3 NWNW	70956
Beaver Cr	S 41141	V	19761001	0.891	cfs	DI	SPRING 1	BEAVER CR	T7N R2W Sect29 SWSE	70956
Beaver Cr	S 41141	V	19761001	0.891	cfs	DI	SPRING 2	BEAVER CR	T7N R2W Sect29 SWSE	70956
Beaver Cr	S 41366	C	19760820	0.015	cfs	DO	LOST CR	BEAVER CR	T7N R3W Sect17 SWSE	70956
Beaver Cr	S 41366	C	19760820	0.680	cfs	IR	LOST CR	BEAVER CR	T7N R3W Sect17 SWSE	70956
Beaver Cr	S 41366	C	19760820	0.005	cfs	LV	LOST CR	BEAVER CR	T7N R3W Sect17 SWSE	70956
Beaver Cr	S 41366	C	19760820	0.750	cfs	PW	UNN STR	LOST CR	T7N R3W Sect17 SESE	70956
Beaver Cr	S 41472	V	19770215	0.010	cfs	DI	UNN STR	S FK BEAVER CR	T7N R3W Sect34 SENE	70956
Beaver Cr	S 41578	V	19761203	0.010	cfs	DI	A SPR	S FK BEAVER CR	T7N R3W Sect34 NENE	70956
Beaver Cr	S 43027	V	19780224	0.010	cfs	DI	A SPRING	BEAVER CR	T7N R4W Sect14 NENE	70956
Beaver Cr	S 43957	C	19790227	0.001	cfs	LV	UNN STR	BEAVER CR	T7N R4W Sect3 NESW	70956
Beaver Cr	S 43957	C	19790227	0.005	cfs	DO	UNN STR	BEAVER CR	T7N R4W Sect3 NESW	70956
Beaver Cr	S 44789	V	19800325	0.010	cfs	IR	WILSON CR	S FK BEAVER CR	T7N R3W Sect36 SWSE	70956
Beaver Cr	S 44791	V	19800114	0.050	cfs	DN	A SPR	BEAVER CR	T7N R2W Sect32 NWNW	70956
Beaver Cr	S 45340	C	19800225	0.007	cfs	DN	A SPRING	BEAVER CR	T7N R4W Sect2 SWSE	70956
Beaver Cr	S 47219	V	19820723	0.010	cfs	DN	A SPR	BEAVER CR	T7N R4W Sect3 NESW	70956
Beaver Cr	S 47219	V	19820723	0.010	cfs	DN	BEAVER CR	DOBBINS SL	T7N R4W Sect3 NESW	70956
Clatskanie R	R 11164	V	19870619	6.800	af	RC	DRIBBLE CR	CLATSKANIE R	T5N R3W Sect23 NWSE	70945
Clatskanie R	R 11164	V	19890515	8.200	af	RC	DRIBBLE CR	CLATSKANIE R	T5N R3W Sect23 NWSE	70945
Clatskanie R	R 100926	V	19930101	5.000	af	FP	UNN STR/RES	W FK CLATSKANIE R	T5N R3W Sect23 SWSE	70945
Clatskanie R	R 100926	V	19930101	5.000	af	WI	UNN STR/RES	W FK CLATSKANIE R	T5N R3W Sect23 SWSE	70945
Clatskanie R	R 100926	V	19930101	5.000	af	AS	UNN STR/RES	W FK CLATSKANIE R	T5N R3W Sect23 SWSE	70945
Clatskanie R	R 100926	V	19930101	5.000	af	RC	UNN STR/RES	W FK CLATSKANIE R	T5N R3W Sect23 SWSE	70945
Clatskanie R	R 101470	V	19930101	0.170	af	FP	LANGFIELD CR/RES	CLATSKANIE R	T7N R4W Sect26 NESW	70945

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Clatskanie R	R 102955	V	19930101	0.030	af	LV	UNN STR/RES	CLATSKANIE R	T7N R4W Sect16 NENW	70945
Clatskanie R	R 103016	V	19930101	0.360	af	FW	A SPR/RES	CLATSKANIE R	T7N R4W Sect28 NESE	70945
Clatskanie R	S 967	V	19111117	2.000	cfs	DO	WEST CR	CONYERS CR	T0 R0 Sect0	70945
Clatskanie R	S 2797	C	19160108	10.500	cfs	PW	FALL CR	CLATSKANIE R	T0 R0 Sect0	70945
Clatskanie R	S 6366	V	19240609	2.500	cfs	PW	ROARING CR	CONYERS CR	T7N R4W Sect18 SESE	70945
Clatskanie R	S 6366	V	19240609	2.500	cfs	FI	ROARING CR	CONYERS CR	T7N R4W Sect18 SESE	70945
Clatskanie R	S 6366	V	19240609	2.500	cfs	IR	ROARING CR	CONYERS CR	T7N R4W Sect18 SESE	70945
Clatskanie R	S 6980	V	19250627	0.010	cfs	ID	ROARING CR	CONYERS CR	T7N R4W Sect32 SWNW	70945
Clatskanie R	S 7579	C	19260811	0.800	cfs	FI	CONYER'S CR	CLATSKANIE R	T7N R5W Sect25 NESE	70945
Clatskanie R	S 8900	V	19290201	0.050	cfs	PW	UNN SPRS	CLATSKANIE R	T7N R4W Sect9 SWNW	70945
Clatskanie R	S 8900	V	19290201	0.050	cfs	DO	UNN SPRS	CLATSKANIE R	T7N R4W Sect9 SWNW	70945
Clatskanie R	S 9631	V	19300506	0.120	cfs	IR	PERKINS CR	CLATSKANIE R	T7N R4W Sect21 SENE	70945
Clatskanie R	S 9900	V	19301007	0.780	cfs	DO	UNN SPR/UNN STR	CLATSKANIE R	T6N R3W Sect6 NWSW	70945
Clatskanie R	S 9900	V	19301007	0.780	cfs	IM	UNN SPR/UNN STR	CLATSKANIE R	T6N R3W Sect6 NWSW	70945
Clatskanie R	S 11680	V	19350515	0.125	cfs	IR	PERKINS CR	CLATSKANIE R	T7N R4W Sect2 SESE	70945
Clatskanie R	S 11680	V	19350515	0.125	cfs	DO	PERKINS CR	CLATSKANIE R	T7N R4W Sect21 SESE	70945
Clatskanie R	S 11702	V	19350605	0.050	cfs	DO	SMALL SPR	MERRIL CR	T7N R4W Sect21 NENE	70945
Clatskanie R	S 11829	V	19350925	0.050	cfs	DI	MERRIL CR	CLATSKANIE R	T7N R4W Sect21 SENW	70945
Clatskanie R	S 16248	V	19450402	0.010	cfs	DO	UNN SPR	CLATSKANIE R	T7N R4W Sect16 NESW	70945
Clatskanie R	S 24579	V	19561113	0.010	cfs	DO	UNN SPR	CLATSKANIE R	T7N R4W Sect16 NESW	70945
Clatskanie R	S 30107	V	19641026	0.005	cfs	DO	CONYERS CR	CLATSKANIE R	T7N R5W Sect25 SENE	70945
Clatskanie R	S 33209	V	19680712	0.010	cfs	DO	MERRIL CR	CLATSKANIE R	T7N R4W Sect21 SENW	70945
Clatskanie R	S 33285	V	19680710	0.015	cfs	DO	MERRIL CR	CLATSKANIE R	T7N R4W Sect21 SESW	70945
Clatskanie R	S 33286	V	19680710	0.020	cfs	DO	MERRIL CR	CLATSKANIE R	T7N R4W Sect21 SENW	70945
Clatskanie R	S 34064	V	19690410	1.400	cfs	MU	ROARING CR	CONYERS CR	T7N R4W Sect19 NENE	70945
Clatskanie R	S 34361	V	19690505	0.010	cfs	DO	MERRIL CR	CLATSKANIE R	T7N R4W Sect21 NENW	70945
Clatskanie R	S 34406	V	19691209	0.010	cfs	DO	MERRIL CR	CLATSKANIE R	T7N R4W Sect21 NENW	70945
Clatskanie R	S 35351	V	19700709	0.010	cfs	DO	MERRIL CR	CLATSKANIE R	T7N R4W Sect21 NENW	70945
Clatskanie R	S 35999	V	19710322	0.005	cfs	DO	A SPR	MERRIL CR	T7N R4W Sect21 NWNE	70945
Clatskanie R	S 36523	C	19720922	0.005	cfs	DO	UNNAMED SPRING	CLATSKANIE R	T7N R4W Sect9 NESW	70945
Clatskanie R	S 36880	V	19720502	0.005	cfs	DO	A SPR	CLATSKANIE R	T7N R4W Sect9 SWNW	70945
Clatskanie R	S 37659	V	19730306	0.005	cfs	DO	A SPR	CLATSKANIE R	T7N R4W Sect17 NESE	70945
Clatskanie R	S 39967	V	19750404	0.010	cfs	LV	A SPR	CLATSKANIE R	T7N R4W Sect9 NWSE	70945
Clatskanie R	S 39967	V	19750404	0.010	cfs	DO	A SPR	CLATSKANIE R	T7N R4W Sect9 NWSE	70945
Clatskanie R	S 40188	V	19760114	0.005	cfs	DS	A SPR	CLATSKANIE R	T7N R4W Sect27 NWSW	70945
Clatskanie R	S 40755	V	19760614	0.005	cfs	DO	DRIBBLE CR	CLATSKANIE R	T5N R3W Sect23 NESW	70945
Clatskanie R	S 41544	V	19770523	0.005	cfs	DO	A SPR	CLATSKANIE R	T7N R4W Sect26 SESW	70945
Clatskanie R	S 41841	V	19770318	0.005	cfs	DO	A SPR	CLATSKANIE R	T7N R4W Sect25 SESW	70945
Clatskanie R	S 44880	C	19791022	15.000	cfs	FI	CLATSKANIE R	COLUMBIA R	T7N R4W Sect15 NESW	70945
Clatskanie R	S 45851	V	19810414	0.005	cfs	DO	MERRIL CR	CLATSKANIE R	T7N R4W Sect16 SESE	70945
Clatskanie R	S 47408	V	19820503	0.005	cfs	DO	A SPRING	FALL CR	T7N R5W Sect12 SENE	70945
Clatskanie R	S 47408	V	19820503	0.005	cfs	DO	UNN STR	FALL CR	T7N R5W Sect12 SENE	70945
Clatskanie R	S 50760	V	19890515	0.050	cfs	RC	W FK CLATSKANIE R/RS	CLATSKANIE R	T5N R3W Sect23 NWSE	70945
Clatskanie R	S 51275	V	19900326	0.005	cfs	LV	MERRIL CR	CLATSKANIE R	T7N R4W Sect9 NESW	70945
Clatskanie R	S 51275	V	19900326	0.010	cfs	DO	MERRIL CR	CLATSKANIE R	T7N R4W Sect9 NESW	70945

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Clatskanie R	S 52731	V	19950613	0.010	cfs	DO	A SPR	CLATSKANIE R	T7N R4W Sect16 SENW	70945
Clatskanie Floodplain	G 6456	V	19750509	0.022	cfs	SC	QUINCY-MAYGER WELL	BRADBURY SL	T8N R4W Sect26 NWNW	
Clatskanie Floodplain	G 6456	V	19750509	0.011	cfs	IR	QUINCY-MAYGER WELL	DOBBINS SL	T8N R4W Sect26 NWNW	
Clatskanie Floodplain	G 8580	C	19781205	48.570	cfs	FI	WELL 4	HANSEN SL	T8N R6W Sect27 NENW	
Clatskanie Floodplain	G 8580	C	19781205	48.570	cfs	FI	WELL 5	HANSEN SL	T8N R6W Sect27 NWNE	
Clatskanie Floodplain	G 8580	C	19781205	48.570	cfs	FI	WELL 6	HANSEN SL	T8N R6W Sect27 NWNE	
Clatskanie Floodplain	GR 250	V	19491101	0.891	cfs	DO	A WELL	COLUMBIA R	T8N R6W Sect22	
Clatskanie Floodplain	GR 250	V	19491101	0.891	cfs	IM	A WELL	COLUMBIA R	T8N R6W Sect22	
Clatskanie Floodplain	GR 250	V	19491101	0.891	cfs	FP	A WELL	COLUMBIA R	T8N R6W Sect22	
Clatskanie Floodplain	R 103070	V	19930101	1.380	af	FW	A SPR/RES	W PORT SL	T7N R5W Sect6 SWNE	
Clatskanie Floodplain	S 7522	V	19260802	0.120	cfs	DI	MCFARLANE CR	HANSEN SL	T8N R6W Sect35 NENW	
Clatskanie Floodplain	S 7522	V	19260802	0.120	cfs	PW	MCFARLANE CR	HANSEN SL	T8N R6W Sect35 NENW	
Clatskanie Floodplain	S 8209	V	19270922	0.050	cfs	DO	UNN STR	WESTPORT SL	T7N R5W Sect12 NENE	
Clatskanie Floodplain	S 9300	V	19291001	1.100	cfs	FP	BEAVER SL	CLATSKANIE SL	T7N R3W Sect13 NESE	
Clatskanie Floodplain	S 9300	V	19291001	1.100	cfs	ID	BEAVER SL	CLATSKANIE SL	T7N R3W Sect13 NESE	
Clatskanie Floodplain	S 13410	V	19380920	0.009	cfs	DO	UNN STR	CLATSKANIE SL	T7N R4W Sect4 SENW	
Clatskanie Floodplain	S 13410	V	19380920	0.009	cfs	LV	UNN STR	CLATSKANIE SL	T7N R4W Sect4 SENW	
Clatskanie Floodplain	S 21760	V	19520909	0.010	cfs	DO	MCFARLANE CR	HANSEN SL	T8N R6W Sect35 NWNW	
Clatskanie Floodplain	S 23489	V	19540917	0.030	cfs	DI	UNN SPR	MCFARLANE CR	T8N R6W Sect35 SWNW	
Clatskanie Floodplain	S 23879	V	19551020	0.002	cfs	DI	UNN STR	WESTPORT SL	T8N R6W Sect36 NWSW	
Clatskanie Floodplain	S 30725	V	19650720	0.200	cfs	GD	A SPRING	DRISCOLL SL	T8N R6W Sect34 NENE	
Clatskanie Floodplain	S 30725	V	19650720	0.223	cfs	GD	UNN STR	DRISCOLL SL	T8N R6W Sect34 SENE	
Clatskanie Floodplain	S 36434	V	19710806	0.250	cfs	IR	DOBBINS SL	COLUMBIA R	T8N R4W Sect23 NWNW	
Clatskanie Floodplain	S 36434	V	19711228	0.040	cfs	IR	DOBBINS SL	COLUMBIA R	T8N R4W Sect23 NWNW	
Clatskanie Floodplain	S 41506	V	19770324	8.000	cfs	PW	DOBBINS SL	COLUMBIA R	T8N R4W Sect15 SESE	
Clatskanie Floodplain	S 43564	V	19720114	0.500	cfs	QM	A SPRING	DRISCOLL SL	T8N R6W Sect34 NESE	
Clatskanie Floodplain	S 48684	C	19840820	0.320	cfs	IR	CLATSKANIE SL	COLUMBIA R	T7N R4W Sect4 NENW	
Clatskanie Floodplain	S 48684	C	19840820	0.320	cfs	IR	CLATSKANIE SL	COLUMBIA R	T7N R4W Sect4 SWNW	
Clifton	S 38631	V	19750612	0.010	cfs	DO	UNN STR	COLUMBIA R	T8N R6W Sect5 SENW	
Clifton	S 38631	V	19750612	0.010	cfs	DO	UNN STR	COLUMBIA R	T8N R6W Sect5 SWNE	
Deer Island	G 6687	C	19751022	1.400	cfs	FI	WELL 1	DEER ISLAND SL	T5N R1W Sect17 SESE	
Deer Island	G 6687	C	19751022	1.400	cfs	FI	WELL 2	DEER ISLAND SL	T5N R1W Sect17 SESE	
Deer Island	G 6687	C	19751022	1.400	cfs	FI	WELL 3	DEER ISLAND SL	T5N R1W Sect17 SESE	
Deer Island	G 6687	C	19751022	1.400	cfs	FI	WELL 4	DEER ISLAND SL	T5N R1W Sect17 SESE	
Deer Island	G 11865	V	19930818	0.223	cfs	IM	A WELL	BENHAM SL	T5N R1W Sect7 NENE	
Deer Island	G 12344	V	19920615	0.100	cfs	IR	WELL MW3	COLUMBIA R	T5N R1W Sect17 SESE	
Deer Island	GR 48	V	19510810	0.390	cfs	IR	A WELL	BENHAM SL	T5N R1W Sect16 SWSW	
Deer Island	GR 626	V	19500331	0.557	cfs	IR	A WELL	BENHAM SL	T5N R1W Sect8 NWSW	
Deer Island	GR 1794	V	19510430	0.668	cfs	IL	A WELL	BENHAM SL	T5N R1W Sect17 SESE	
Deer Island	GR 3097	V	19550607	0.135	cfs	IR	A WELL	BENHAM SL	T5N R1W Sect17 NWNE	
Deer Island	S 1179	V	19120531	0.110	cfs	ID	UNN STR	BENHAM SL	T5N R1W Sect7	
Eilertsen Cr	S 10224	V	19310617	0.100	cfs	DO	EILERTSON CR	WESTPORT SL	T7N R5W Sect8 NENE	30100320
Eilertsen Cr	S 44553	V	19771110	0.050	cfs	DS	EILERTSON CR	WESTPORT SL	T7N R5W Sect8 NWNE	30100320
Eilertsen Cr	S 44553	V	19771110	0.040	cfs	DN	UNN STR	WESTPORT SL	T7N R5W Sect8 NENE	30100320
Eilertsen Cr	S 44553	V	19771110	0.010	cfs	LV	UNN STR	WESTPORT SL	T7N R5W Sect8 NENE	30100320

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Flume Cr	S 30595	V	19650707	0.008	cfs	DI	FLUME CR	COLUMBIA R	T8N R3W Sect30 SWNE	30100309
Flume Cr	S 30595	V	19650707	0.002	cfs	LV	FLUME CR	COLUMBIA R	T8N R3W Sect30 SWNE	30100309
Flume Cr	S 36739	V	19730226	0.005	cfs	LV	A SPR	FLUME CR	T8N R3W Sect29 SWNW	30100309
Flume Cr	S 36739	V	19730226	0.005	cfs	DI	A SPR	FLUME CR	T8N R3W Sect29 SWNW	30100309
Flume Cr	S 37647	C	19730301	0.010	cfs	DI	UNN STR	COLUMBIA R	T8N R3W Sect30 NENW	30100309
Flume Cr	S 38431	V	19740123	0.020	cfs	DI	UNN STR	FLUME CR	T8N R3W Sect19 NESW	30100309
Flume Cr	S 38716	V	19730925	0.010	cfs	DI	FLUME CR	COLUMBIA R	T8N R3W Sect19 NWSE	30100309
Flume Cr	S 42095	V	19770715	0.005	cfs	DO	A SPR	FLUME CR	T8N R3W Sect30 SWSW	30100309
Fox Cr	R 1319	V	19520103	14.500	af	MU	FOX CR	COLUMBIA R	T7N R2W Sect2 SWNE	30100312
Fox Cr	S 674	C	19110320	0.500	cfs	DO	FOX CR	COLUMBIA R	T7N R2W Sect28	30100312
Fox Cr	S 674	V	19110320	0.500	cfs	DO	FOX CR	COLUMBIA R	T7N R2W Sect28 SWNE	30100312
Fox Cr	S 17069	V	19460705	0.010	cfs	DO	SPRINGS	FOX CR	T7N R2W Sect21 SENW	30100312
Fox Cr	S 21029	V	19520103	0.300	cfs	MU	FOX CR/RES	COLUMBIA R	T7N R2W Sect28 SWNE	30100312
Fox Cr	S 34978	V	19700810	0.950	cfs	MU	FOX CR	COLUMBIA R	T7N R2W Sect28 NWNE	30100312
Goble Cr	G 7953	V	19771201	0.033	cfs	SC	A WELL	GOBLE CR	T6N R2W Sect14 NENE	30100301
Goble Cr	G 7953	V	19771201	0.033	cfs	GD	A WELL	GOBLE CR	T6N R2W Sect14 NENE	30100301
Goble Cr	R 3880	V	19631030	0.500	af	FI	DRAINAGE/GROUND SEEP	COLUMBIA R	T6N R2W Sect34 SWNE	30100301
Goble Cr	R 8412	V	19820301	0.200	af	LV	DRAINAGE WAY	S FK GOBLE CR	T6N R2W Sect22 SESW	30100301
Goble Cr	R 8412	V	19820301	0.300	af	DO	UNN STR	S FK GOBLE CR	T6N R2W Sect22 NWSW	30100301
Goble Cr	R 12076	V	19900326	5.000	af	IR	UNN STR/RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	R 12076	V	19900326	5.000	af	RC	UNN STR/RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	R 12076	V	19900326	5.000	af	FW	UNN STR/RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	R 12076	V	19900326	5.000	af	DN	UNN STR/RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	R 12076	V	19951220	4.100	af	RC	UNN STR/RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	R 12076	V	19951220	4.100	af	FW	UNN STR/RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	R 12076	V	19951220	4.100	af	DN	UNN STR/RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	R 12076	V	19951220	4.100	af	IR	UNN STR/RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	R 12313	V	19970307	0.260	af	FP	UNN STR/RES 1	GOBLE CR	T6N R2W Sect20 NENE	30100301
Goble Cr	R 12313	V	19970307	0.260	af	FW	UNN STR/RES 1	GOBLE CR	T6N R2W Sect20 NENE	30100301
Goble Cr	R 12326	V	19970307	0.050	af	FW	UNN STR/RES 2	GOBLE CR	T6N R2W Sect20 NENE	30100301
Goble Cr	R 12326	V	19970307	0.050	af	FP	UNN STR/RES 2	GOBLE CR	T6N R2W Sect20 NENE	30100301
Goble Cr	R 12804	V	19990601	3.000	af	WI	A SPR/RES	S FK GOBLE CR	T6N R2W Sect23 SENW	30100301
Goble Cr	S 4699	V	19200719	2.500	cfs	MU	GOBLE CR	COLUMBIA R	T6N R2W Sect15 SWSE	30100301
Goble Cr	S 14476	V	19400709	0.005	cfs	DO	SPR 1	COLUMBIA R	T6N R2W Sect14 SENE	30100301
Goble Cr	S 14476	V	19400709	0.005	cfs	DO	SPR 2	COLUMBIA R	T6N R2W Sect14 SENE	30100301
Goble Cr	S 14557	V	19400821	0.020	cfs	DO	A SPR	COLUMBIA R	T6N R2W Sect14 SENE	30100301
Goble Cr	S 18211	V	19480323	0.180	cfs	IR	GOBLE CR	COLUMBIA R	T6N R2W Sect15 NESE	30100301
Goble Cr	S 18700	V	19490316	0.005	cfs	LV	SEEPAGE	COLUMBIA R	T6N R2W Sect13 SWNW	30100301
Goble Cr	S 18700	V	19490316	0.005	cfs	LV	A SPR	GOBLE CR	T6N R2W Sect14 SENE	30100301
Goble Cr	S 19383	V	19500417	0.120	cfs	IR	GOBLE CR	COLUMBIA R	T6N R2W Sect17 SENW	30100301
Goble Cr	S 19772	V	19500814	0.003	cfs	DO	UNN STR	GOBLE CR	T6N R2W Sect11 NENE	30100301
Goble Cr	S 21175	V	19520505	0.120	cfs	IR	GOBLE CR	COLUMBIA R	T6N R2W Sect17 SWSE	30100301
Goble Cr	S 21687		19520806	0.050	cfs	DO	GOBLE CR	COLUMBIA R	T6N R2W Sect11 SWSE	30100301
Goble Cr	S 22586	V	19530804	0.010	cfs	DS	GOBLE CR	COLUMBIA R	T6N R2W Sect16 SESE	30100301
Goble Cr	S 22586	V	19530804	0.030	cfs	IR	GOBLE CR	COLUMBIA R	T6N R2W Sect16 SESE	30100301

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Goble Cr	S 35679	V	19701104	0.010	cfs	DO	A SPR	GOBLE CR	T6N R2W Sect10 SENE	30100301
Goble Cr	S 35904	V	19710208	0.010	cfs	IR	GOBLE CR	COLUMBIA R	T6S R2W Sect14 NWSW	30100301
Goble Cr	S 38850	V	19731107	0.005	cfs	DO	A SPR	GOBLE CR	T6N R2W Sect15 NWSE	30100301
Goble Cr	S 42850	V	19771201	0.060	cfs	SC	A SPR	COLUMBIA R	T6N R2W Sect14 NENE	30100301
Goble Cr	S 42850	V	19771201	0.060	cfs	GD	A SPR	COLUMBIA R	T6N R2W Sect14 NENE	30100301
Goble Cr	S 46720	V	19820301	0.005	cfs	DO	A RESERVOIR	S FK GOBLE CR	T6N R2W Sect22 NWSW	30100301
Goble Cr	S 46720	V	19820301	0.005	cfs	DO	DRAINAGE WAY	S FK GOBLE CR	T6N R2W Sect22 NWSW	30100301
Goble Cr	S 49724	V	19860718	0.005	cfs	DO	A SPR	S FK GOBLE CR	T6N R2W Sect14 NESW	30100301
Goble Cr	S 52920	V	19900326	0.005	cfs	DO	A SPR	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	S 52920	V	19900326	0.005	cfs	DO	A SPR	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	S 52920	V	19900326	0.005	cfs	DO	A SPR	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	S 52920	V	19900326	0.005	cfs	DO	A SPR	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	S 52920	V	19900326	9.100	af	DN	RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Goble Cr	S 52920	V	19900326	9.100	af	IR	RES	GOBLE CR	T6N R2W Sect28 NWNE	30100301
Graham Cr	S 15307	V	19420409	0.600	cfs	LV	GRAHAM CR	WESTPORT SL	T7N R5W Sect1 SESW	30100308
Graham Cr	S 15307	V	19420409	0.200	cfs	IM	GRAHAM CR	WESTPORT SL	T7N R5W Sect1 SESW	30100308
Graham Cr	S 15307	V	19420409	1.000	cfs	DO	GRAHAM CR	WESTPORT SL	T7N R5W Sect11 SESW	30100308
Graham Cr	S 15307	V	19420409	1.000	cfs	DO	GRAHAM CR	WESTPORT SL	T7N R5W Sect11 SESW	30100308
Graham Cr	S 15307	V	19420409	0.600	cfs	LV	GRAHAM CR	WESTPORT SL	T7N R5W Sect11 SESW	30100308
Graham Cr	S 15307	V	19420409	1.800	cfs	IM	GRAHAM CR	WESTPORT SL	T7N R5W Sect11 SESW	30100308
Graham Cr	S 30432	V	19650429	0.040	cfs	DI	GRAHAM CR	WESTPORT SL	T7N R5W Sect11 SESW	30100308
Graham Cr	S 30432	V	19650429	0.010	cfs	LV	GRAHAM CR	WESTPORT SL	T7N R5W Sect11 SESW	30100308
Green Cr	GR 3560	V	19520620	0.056	cfs	IR	A WELL	GREEN CR	T7N R3W Sect5 NESE	30100310
Green Cr	S 12151	V	19360409	1.000	cfs	FI	GREEN CR	COLUMBIA R	T7N R3W Sect0 SWNW	30100310
Green Cr	S 39604	C	19741104	0.100	cfs	FI	RUDOLPH POND	COLUMBIA R	T8N R3W Sect28 SWSW	30100310
Green Cr	S 39604	C	19741104	0.100	cfs	FI	E FK GREEN CR	GREEN CR	T8N R3W Sect28 SWSW	30100310
Green Cr	S 46638	V	19811109	0.040	cfs	IR	GREEN CR	COLUMBIA R	T8N R3W Sect33 NWNW	30100310
Harrie Cr	GR 3873	V	19390306	0.223	cfs	MU	A WELL	HARRIE CREEK	T5N R1W Sect28 SENE	
Hunt Cr	S 6372	C	19230614	0.250	cfs	DO	UNN STR	HUNT CR	T8N R6W Sect17 SWSE	30100302
Hunt Cr	S 51052	V	19890117	1.000	cfs	QM	HUNT CR	COLUMBIA R	T8N R6W Sect29 NENE	30100302
McBride Cr	G 13048	C	19960213	1.340	cfs	MU	WELL 1	COLUMBIA R	T5N R1W Sect21 SWNE	30100316
McBride Cr	GR 258	V	19540908	4.641	cfs	MU	A WELL	MCBRIDE CR	T5N R1W Sect21 SWNE	30100316
McBride Cr	S 4770	V	19200901	0.100	cfs	MU	3 UNN SPRS	COLUMBIA R	T5N R1W Sect28 SENW	30100316
Merrill Cr	S 6539	V	19241021	0.100	cfs	DO	A SPR	MERRILL CR	T5N R2W Sect10 SWNW	30100315
Merrill Cr	S 19238	V	19500105	0.250	cfs	IR	MERRILL CR	TIDE CR	T5N R1W Sect6 SESW	30100315
Merrill Cr	S 19683	V	19500619	0.200	cfs	IR	UNN STR	TIDE CR	T5N R2W Sect3 NWSW	30100315
Merrill Cr	S 35132	V	19710104	0.040	cfs	IR	MERRILLL CR	TIDE CR	T5N R2W Sect12 NESE	30100315
Neer Cr	G 11042	V	19890814	1.500	cfs	IM	WELL 1	COLUMBIA R	T6N R2W Sect1 NWSW	
Neer Cr	G 11042	V	19890814	1.500	cfs	IM	WELL 2	COLUMBIA R	T6N R2W Sect1 NWSW	
Neer Cr	R 5296	V	19680626	0.800	af	IR	UNN STR	NEER CR	T6N R2W Sect3 NWSE	
Neer Cr	R 5594	V	19700803	350.000	af	RC	NEER CR/NORTH RES	COLUMBIA R	T7N R2W Sect35	
Neer Cr	R 5594	V	19700803	350.000	af	RC	NEER CR/SOUTH RES	COLUMBIA R	T6N R2W Sect1 NWSW	
Neer Cr	S 12363	V	19360306	0.020	cfs	DO	NEER CR	COLUMBIA R	T7N R2W Sect35 NENW	
Neer Cr	S 12363	V	19360306	0.030	cfs	IM	NEER CR	COLUMBIA R	T7N R2W Sect35 NENW	
Neer Cr	S 12363	V	19360306	0.030	cfs	IM	LITTLE JACK FALLS	NEER CR	T7N R2W Sect26 SESW	30100317

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Neer Cr	S 12363	V	19360306	0.020	cfs	DO	LITTLE JACK FALLS	NEER CR	T7N R2W Sect26 SESW	30100317
Neer Cr	S 26307	V	19590807	0.100	cfs	MU	LITTLE JACK FALLS	NEER CR	T7N R2W Sect26 SESW	30100317
Neer Cr	S 26706	V	19600419	0.010	cfs	DO	UNN SPR	NEER CR	T6N R2W Sect13 NWSW	
Neer Cr	S 30613	V	19650716	0.005	cfs	DO	WELTER CR	NEER CR	T6N R2W Sect2 NWSE	
Neer Cr	S 33534	V	19680529	0.060	cfs	IR	PRUITT RESERVOIR	NEER CR	T6N R2W Sect3 NWSE	
Neer Cr	S 33534	V	19680529	0.060	cfs	IR	UNN STR	NEER CR	T6N R2W Sect3 NWSE	
Neer Cr	S 34488	V	19690627	0.010	cfs	DO	A SPR	NEER CR	T6N R2W Sect2 NWSW	
Neer Cr	S 34488	V	19691007	0.010	cfs	IR	A SPR	NEER CR	T6N R2W Sect2 NWSW	
Neer Cr	S 34941	V	19700803	1.000	cfs	RC	NEER CR/N & S RS	COLUMBIA R	T6N R2W Sect2 SENE	
Neer Cr	S 37868	V	19730327	0.010	cfs	IR	LITTLE JACK FALLS	NEER CR	T7N R2W Sect26 SWSE	30100317
Neer Cr	S 37868	V	19730327	0.010	cfs	RC	LITTLE JACK FALLS	NEER CR	T7N R2W Sect26 SWSE	30100317
Neer Cr	S 42754	V	19770323	0.020	cfs	DI	A SPRING	COLUMBIA R	T7N R2W Sect26 SESW	
Neer Cr	S 42754	V	19770323	0.020	cfs	DI	NORTH SPRING	COLUMBIA R	T7N R2W Sect26 NESW	
Nice Cr	S 674	C	19110331	0.150	cfs	DO	NICE CR	COLUMBIA R	T0 R0 Sect0	30100311
Nice Cr	S 674	V	19110331	0.150	cfs	DO	NICE CR	COLUMBIA R	T7N R2W Sect20 SENE	30100311
Nice Cr	S 38893	V	19731214	0.010	cfs	DI	A SPR	NICE CR	T7N R2W Sect28 SWNW	30100311
Niemela Cr	S 35841	V	19701221	0.003	cfs	DI	NIEMELA CR	COLUMBIA R	T8N R4W Sect24 NWSW	
Niemela Cr	S 35841	V	19701221	0.002	cfs	DI	A SPR	NIEMELA CR	T8N R4W Sect24 NWSW	
OK Cr	S 15437	V	19430225	0.250	cfs	DO	OK CR	WESTPORT SL	T7N R5W Sect9 SENW	30100306
OK Cr	S 15437	V	19430225	0.030	cfs	LV	OK CR	WESTPORT SL	T7N R5W Sect9 SENW	30100306
OK Cr	S 30607	V	19650713	0.010	cfs	DI	UNN STR	OK CR	T7N R5W Sect10 SWNW	30100306
OK Cr	S 30669	V	19650726	0.015	cfs	DO	UNN STR	OK CR	T7N R5W Sect9 NWNW	30100306
OK Cr	S 30669	V	19650726	0.005	cfs	LV	OK CR	WESTPORT SL	T7N R5W Sect9 NWNW	30100306
OK Cr	S 31253	V	19660218	0.010	cfs	DO	A SPR	OK CR	T7N R5W Sect9 SWNE	30100306
Olsen Cr	S 2247	V	19140923	0.007	cfs	IM	A SPR	OLSEN CR	T7N R5W Sect8 SWNW	30100305
Olsen Cr	S 37840	V	19740621	0.005	cfs	DO	S OLSEN CR	OLSEN CR	T7N R5W Sect8 SENW	30100305
Owl Cr	G 6385	V	19730330	0.020	cfs	DO	A WELL	COLUMBIA R	T7N R2W Sect26 NENW	
Owl Cr	G 12122	V	19910911	0.100	cfs	MU	A WELL	COLUMBIA R	T7N R2W Sect26 SESE	
Owl Cr	G 13692	V	19980507	0.167	cfs	MU	A WELL	COLUMBIA R	T7N R2W Sect26 SESE	
Owl Cr	S 5998	V	19230816	0.500	cfs	DO	OWL CR	COLUMBIA R	T0 R0 Sect0	
Owl Cr	S 5998	V	19230816	0.500	cfs	IM	OWL CR	COLUMBIA R	T0 R0 Sect0	
Owl Cr	S 9744	V	19300703	0.020	cfs	DO	A SPR	OASIS CR	T7N R2W Sect23 NWSW	
Owl Cr	S 11716	V	19350601	0.010	cfs	DS	UNN SPR	OASIS CR	T7N R2W Sect22 NESE	
Owl Cr	S 20180	V	19471110	0.010	cfs	DI	UNN SPR	OASIS CR	T7N R2W Sect23 NWSW	
Owl Cr	S 20776	V	19510927	0.090	cfs	IR	OASIS CR	COLUMBIA R	T7N R2W Sect26 NENW	
Owl Cr	S 26256	V	19590706	0.090	cfs	IR	OASIS CR	COLUMBIA R	T7N R2W Sect26 NENW	
Owl Cr	S 26364	V	19590901	0.010	cfs	DO	UNN SPR	OASIS CR	T7N R2W Sect23 SESW	
Owl Cr	S 31647	V	19660609	0.100	cfs	DO	OASIS CR	COLUMBIA R	T7N R2W Sect26 NWNW	
Owl Cr	S 37548	C	19741120	0.005	cfs	DO	UNNAMED SPRING	OWL CR	T7N R2W Sect22	
Owl Cr	S 38084	V	19730227	0.010	cfs	DO	THAYERS SPRING	COLUMBIA R	T7N R2W Sect23 NWSW	
Owl Cr	S 38084	V	19730227	0.010	cfs	CM	THAYERS SPRING	COLUMBIA R	T7N R2W Sect23 NWSW	
Owl Cr	S 44088	C	19790426	0.005	cfs	DO	UNN STR	COLUMBIA R	T7N R2W Sect26 NESW	
Owl Cr	S 44088	C	19790426	0.010	cfs	IR	UNN STR	COLUMBIA R	T7N R2W Sect26 NESW	
Plympton Cr	G 3333	V	19660616	0.080	cfs	DO	A WELL	PLYMPTON CR	T7N R6W Sect1 SWNW	70950
Plympton Cr	R 102185	V	19930101	1.200	af	FP	PLYMPTON CR/RES 3		T7N R6W Sect21 NESE	70950

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Plympton Cr	R 102185	V	19930101	1.200	af	FM	PLYMPTON CR/RES 3		T7N R6W Sect21 NESE	70950
Plympton Cr	R 102854	V	19930101	0.330	af	RC	SPRS/RES 1	PLYMPTON CR	T7N R6W Sect1 NWNW	70950
Plympton Cr	R 102854	V	19930101	0.330	af	AS	SPRS/RES 1	PLYMPTON CR	T7N R6W Sect1 NWNW	70950
Plympton Cr	R 102854	V	19930101	0.330	af	FW	SPRS/RES 1	PLYMPTON CR	T7N R6W Sect1 NWNW	70950
Plympton Cr	R 102854	V	19930101	0.500	af	RC	SPRS/RES 2	PLYMPTON CR	T7N R6W Sect1 NWNW	70950
Plympton Cr	R 102854	V	19930101	0.500	af	FW	SPRS/RES 2	PLYMPTON CR	T7N R6W Sect1 NWNW	70950
Plympton Cr	R 102854	V	19930101	0.500	af	AS	SPRS/RES 2	PLYMPTON CR	T7N R6W Sect1 NWNW	70950
Plympton Cr	R 102854	V	19930101	1.000	af	FW	SPRS/RES 3	PLYMPTON CR	T7N R6W Sect1 SWSW	70950
Plympton Cr	R 102854	V	19930101	1.000	af	RC	SPRS/RES 3	PLYMPTON CR	T7N R6W Sect1 SWSW	70950
Plympton Cr	R 102854	V	19930101	1.000	af	AS	SPRS/RES 3	PLYMPTON CR	T7N R6W Sect1 SWSW	70950
Plympton Cr	S 14213	V	19400109	0.400	cfs	IM	PLYMPTON CR	WESTPORT SL	T8N R6W Sect36 NESW	70950
Plympton Cr	S 34594	C	19700123	0.010	cfs	DO	A SPRING	PLYMPTON CR	T7N R6W Sect2 SENE	70950
Plympton Cr	S 34594	C	19700123	0.010	cfs	IR	A SPRING	PLYMPTON CR	T7N R6W Sect2 SENE	70950
Plympton Cr	S 52865	V	19941209	0.860	cfs	FP	PLYMPTON CR	COLUMBIA R	T7N R6W Sect21 NESE	70950
Plympton Cr	S 52865	V	19941209	0.860	cfs	FM	PLYMPTON CR	COLUMBIA R	T7N R6W Sect21 NESE	70950
Rinearson Sl	S 7560	V	19260910	0.190	cfs	ID	UNN SPR	RINEARSON SL	T7N R3W Sect11 NENW	
Rinearson Sl	S 12151	V	19360409	1.000	cfs	FI	SPRINGS	UNN STR	T7N R3W Sect4 SWNW	
Rinearson Sl	S 12440	V	19361110	0.020	cfs	DO	RINEARSON SL	COLUMBIA R	T7N R3W Sect12 NWSW	
Rinearson Sl	S 14343	V	19400520	0.010	cfs	DO	WINTERS SP	RINEARSON SL	T7N R2W Sect17 SWSW	
Rinearson Sl	S 21598	V	19520709	0.510	cfs	IR	RINEARSON SL	COLUMBIA R	T7N R3W Sect2 NESW	
Rinearson Sl	S 41543	C	19770428	2.000	cfs	IM	RINEARSON SL	COLUMBIA R	T7N R3W Sect3 SENE	
Ross Cr	S 45630	V	19791003	0.005	cfs	DO	A SPR	ROSS CR	T7N R5W Sect6 NWSE	30100304
Speer Cr	S 24846	V	19570416	0.010	cfs	DO	KELLY CR	COLUMBIA R	T8N R6W Sect6 NWSE	30100319
Speer Cr	S 38631	V	19750612	0.010	cfs	DO	UNN STR	COLUMBIA R	T8N R6W Sect5 SWNW	30100319
Speer Cr	S 38631	V	19750612	0.010	cfs	CM	UNN STR	COLUMBIA R	T8N R6W Sect5 SWNW	30100319
Tandy Cr	S 5790	V	19230301	0.230	cfs	ID	A SPR	TANDY CR	T7N R5W Sect10 SWNE	30100307
Tandy Cr	S 5790	V	19230301	0.230	cfs	ID	TANDY CR	WESTPORT SL	T7N R5W Sect10 SENE	30100307
Tandy Cr	S 15427	V	19430209	0.650	cfs	IR	TANDY CR	WESTPORT SL	T7N R5W Sect1 SENE	30100307
Tandy Cr	S 15427	V	19430209	0.010	cfs	DO	TANDY CR	WESTPORT SL	T7N R5W Sect11 NWNW	30100307
Tandy Cr	S 15427	V	19430209	0.650	cfs	IR	TANDY CR	WESTPORT SL	T7N R5W Sect2 SWSW	30100307
Tandy Cr	S 31404	V	19650510	0.050	cfs	DO	TANDY CR	WESTPORT SL	T7N R5W Sect10 SENE	30100307
Tandy Cr	S 31404	V	19650510	0.010	cfs	LV	TANDY CR	WESTPORT SL	T7N R5W Sect10 SENE	30100307
Tandy Cr	S 45009	V	19800418	0.005	cfs	DO	A SPRING	WESTPORT SL	T7N R5W Sect11 NWNW	30100307
Tank Cr	G 7711	V	19771207	0.070	cfs	QM	WELL 1	TANK CR	T8N R4W Sect35 SENE	
Tank Cr	G 7711	V	19771207	0.130	cfs	QM	WELL 2	TANK CR	T8N R4W Sect35 NESE	
Tank Cr	G 7711	V	19771207	0.035	cfs	QM	WELL 3	TANK CR	T8N R4W Sect26 SWNW	
Tank Cr	G 7711	V	19771207	0.035	cfs	QM	WELL 4	TANK CR	T8N R4W Sect26 NWNW	
Tank Cr	R 101739	V	19930101	0.030	af	WI	UNN STR/RES	TANK CR	T8N R4W Sect26 SWNW	
Tank Cr	R 101819	V	19930101	0.100	af	LV	TANK CR/RES	DOBBINS SL	T8N R4W Sect25 SWNW	
Tank Cr	S 28539	V	19630104	0.005	cfs	DO	UNN STR	TANK CR	T8N R4W Sect25 SENW	
Tank Cr	S 36867	V	19720424	0.010	cfs	DO	UNN STR	TANK CR	T8N R4W Sect25 SWNW	
Tank Cr	S 37520	V	19730810	0.010	cfs	DI	TANK CR	DOBBINS SL	T8N R4W Sect26 NESW	
Ternahan Cr	S 38508	V	19730803	0.005	cfs	LV	TERNAHAN CR	COLUMBIA R	T8N R4W Sect24 NESE	
Ternahan Cr	S 38508	V	19730803	0.010	cfs	DI	TERNAHAN CR	COLUMBIA R	T8N R4W Sect24 NESE	
Ternahan Cr	S 41858	V	19770324	0.020	cfs	DI	TERNAHAN CR	COLUMBIA R	T8N R4W Sect24 NESE	

Watershed	Permit[a]	Status[b]	Priority[c]	Rate/Volume[d]		Use[e]	Primary Stream/Source	Secondary Stream	Location	WAB #
Ternahan Cr	S 53566	V	19970210	0.010	cfs	DN	TERNAHAN CR	COLUMBIA R	T8N R4W Sect24 NESE	
Ternahan Cr	S 53580	V	19980723	0.005	cfs	DO	TERNAHAN CR	COLUMBIA R	T8N R4W Sect24 NESE	
Ternahan Cr	S 53633	V	19990222	0.010	cfs	DN	TERNAHAN CR	COLUMBIA R	T8N R4W Sect24 NESE	
Tide Cr	G 6068	V	19740322	0.020	cfs	IR	A WELL	TIDE CR	T5N R2W Sect10 SWNE	30100313
Tide Cr	R 1519	V	19530223	0.030	af	IR	ENDICOTT CR	TIDE CR	T0 R0 Sect0	30100313
Tide Cr	S 8208	V	19270817	0.050	cfs	DO	UNN SPR	UNN STR	T6N R2W Sect26 NWSE	30100313
Tide Cr	S 10013	V	19310113	0.020	cfs	DS	BISHOP CR	TIDE CR	T5N R2W Sect6 NWNE	30100313
Tide Cr	S 11360	V	19340809	0.010	cfs	DS	BISHOP CR	TIDE CR	T5N R3W Sect1 NWNE	30100313
Tide Cr	S 20136	V	19510305	0.300	cfs	IR	TIDE CR	COLUMBIA R	T5N R2W Sect3 NESW	30100313
Tide Cr	S 20136	V	19510305	0.300	cfs	IR	TIDE CR	COLUMBIA R	T5N R2W Sect3 SENW	30100313
Tide Cr	S 22434	V	19530223	0.190	cfs	IR	TIDE CR	COLUMBIA R	T6N R2W Sect29 SESW	30100313
Tide Cr	S 22434	V	19530223	0.190	cfs	IR	ENDICOTT CR/RES	TIDE CR	T6N R2W Sect29 SESW	30100313
Tide Cr	S 28927	V	19630619	0.010	cfs	DO	A SPR	TIDE CR	T6N R2W Sect27 SENE	30100313
Tide Cr	S 29419	V	19640227	0.005	cfs	DO	UNN SPR	ENDICOTT CR	T6N R2W Sect32 SWNW	30100313
Tide Cr	S 29419	V	19640227	0.005	cfs	LV	UNN SPR	ENDICOTT CR	T6N R2W Sect32 SWNW	30100313
Tide Cr	S 31725	V	19660621	0.610	cfs	IR	TIDE CR	COLUMBIA R	T6N R2W Sect29 SWNW	30100313
Tide Cr	S 37311	V	19730323	0.350	cfs	IR	TIDE CR	COLUMBIA R	T5N R2W Sect10 NENE	30100313
Tide Cr	S 42928	V	19780221	0.005	cfs	DO	A SPR	TIDE CR	T5N R2W Sect9 NWSW	30100313
Tide Cr	S 46631	V	19811015	0.005	cfs	DO	UNN STR	ENDICOTT CR	T6N R2W Sect32 NWNW	30100313
Tide Cr	S 51024	V	19900214	0.450	cfs	IM	TIDE CR	COLUMBIA R	T6N R2W Sect36 SWNE	30100313
Tide Cr	S 51024	V	19900518	0.220	cfs	IM	TIDE CR	COLUMBIA R	T6N R2W Sect36 NWSE	30100313
West Cr	S 7549	V	19260805	0.500	cfs	DO	WEST CR	WESTPORT SL	T7N R6W Sect1 SWNE	30100303
West Cr	S 30688	V	19650729	0.500	cfs	DO	WEST CR	WESTPORT SL	T7N R6W Sect1 SWNE	30100303
West Cr	S 30796	V	19650603	0.020	cfs	IR	WEST CR	WESTPORT SL	T7N R6W Sect1 NWNE	30100303
West Cr	S 30796	V	19650603	0.005	cfs	DO	WEST CR	WESTPORT SL	T7N R6W Sect1 NWNE	30100303
West Cr	S 52496	V	19920506	0.170	cfs	DO	WEST CR	COLUMBIA R	T7N R6W Sect1 SWNE	30100303

[a] Permit types: g - groundwater; gr - groundwater registration; r - reservoir; s - surface.
[b] Status codes: c - canceled; v - non-canceled.
[c] Date of appropriation.
[d] Rate of water withdrawal: cfs - cubic feet per second; af - acre feet.
[e] Water use type: DO - domestic; DI - domestic/including lawn and garden; DN - domestic/including non-commercial; DS - domestic/stock; GD - group domestic; SC - school; IM - industrial/manufacturing; CM - commercial; FI - fish; RC - recreation; PW - power; LV - livestock; WI - wildlife; IR - irrigation; ID - irrigation and domestic; IL - irrigation and stock; MU - municipal; QM - quasi-municipal