

**COLUMBIA RIVER WATER MANAGEMENT GROUP
MEETING NO. 491**

1. ATTENDANCE

The following met at 9:30 a.m. on Tuesday, April 14, 1998, in the Custom House, Portland, OR

Members or Alternates Present

Ted Day, US Bureau of Reclamation, Chair
Peter Brooks, Corps of Engineers - NWD-NP
Nancy Stephan, Bonneville Power Admin
Tom Fero, National Weather Svc-RFC
Ed Hubbard, US Geological Survey - Portland
Dan Moore, Nat'l Resources Conservation Svc
Walter Boyle, Federal Energy Regulatory Comm
Roger Ross, Corps of Engineers - NPD

Others Present

Eric Weiss, BC Hydro
Don Druce, BC Hydro
Nengjin Liu, Idaho Power
Dušica Jevremović, Fish Passage Center
Dana Reedy, NW Power Pool

Others Present - Continued

Jon Lea, Nat'l Resources Conservation Svc
Kyle Martin, National Weather Svc-RFC
Cathy Hlebechuk, Corps of Engineers - NWD-NP

Members Not Present or Represented

Doug McChesney, Washington Dept of Ecology
, Nat'l Marine Fisheries Svc
Jack Gakstatter, US Environ'l Protection Agy
Bruce McCammon, US Forest Service
Marvin Yoshinaka, US Fish and Wildlife Svc
Bill Brooks, Bureau of Land Management
Barry Norris, Oregon Dept of Water Res
Mike Turnipseed, Nevada State Engineer
Gordon Fassett, Wyoming State Engineer
Jack Stults, Montana Dept of Nat'l Res/Cons

2. WEATHER SUMMARY

Weather in British Columbia for the first half of the water year has been warm as typified by the 9°C (48°F) on Christmas Day at Cranbrook, BC, according to Eric Weiss, and despite the wet October and March the weather has been dry with November averaging only 60% of normal precipitation. The October - March accumulated precipitation is 77% of normal.

Highly variable weather conditions prevailed over the US portion of the Columbia Basin during March, with the exception of central and southern Idaho and southern Oregon receiving below normal precipitation (Enc 1). According to Tom Fero, mean temperatures departed 1.1°F above normal for 30-stations with individual stations ranging from -2.1°F to +4.3°F from normal. Although record daily rainfalls occurred at Astoria (23rd, 1.00") and Eugene (21st, 1.21") the main thrust of the Pacific storms was into California with only the storm edges reaching southern border of the Columbia Basin.

Monthly precipitation was 113% of normal for the Columbia River above Grand Coulee; 104% of normal for the Snake Basin above Ice Harbor; and 100% for the basin above The Dalles. The Willamette Valley averaged 95% while the Rogue averaged 129%. **Seasonal** precipitation (Oct-Mar) was 83% of normal for the Columbia River above Grand Coulee; 93% of normal for the Snake Basin above Ice Harbor; and 89% for the Basin above The Dalles. The Willamette Valley averaged 97% while the Rogue averaged 115%.

3. SNOWPACK

In the Columbia Basin in BC the snowpacks are averaging between 70% and 100% of normal, accumulation since March 1 has been below normal, and the snowpacks below 1500 m (~5000 ft) are extra light due to the slow but continuous snowmelt caused by the warm winter. Eric Weiss reported 75 - 90% snowpacks above 1500 m.

During March the individual snowpack in most sub-basins across the Columbia Basin did not change much from last month. On April 1st most of the sub-basin had snow water equivalent from 75% to 95% of normal while the southern Oregon range is from 100% to 130%. The snowpack across the Columbia Basin averages 83% of normal (Enc 2) according to Dan Moore.

4. SWSI

The April 1 Surface Water Supply Index for Oregon (Enc 3) generally remained similar to last month, with some slight decreases, as reported by Jon Lea. All regions had less water than last year at this time.

5. STREAMFLOW

Streamflows in BC were 15% to 50% above normal with the Arrow Lakes Local 150%. Eric Weiss stated that this high runoff was the result of the warm winter weather and the melting low elevation snowpacks.

Streamflow conditions throughout the US Pacific Northwest are indexed at 14 long term stations. During March they were generally near normal; ranging from a low of 90% in central Idaho and western Montana to a high of 128% for the Snake River headwaters, according to Ed Hubbard (Enc 4). Total seasonal runoff (Oct-Mar) was also near normal for the index stations. A composite chart of average monthly discharge at these stations shows that after an initial period of high runoff in October the subsequent five months have had near normal discharge.

Charts were presented of accumulated monthly runoff for five selected station for 1998, 1997, and normal. They show that the Umpqua River is having a below normal year, the Skykomish River is slightly below normal, the Clark Fork has been near normal for the first five months as it was last year but now is starting to lag behind, the upper Snake and Columbia rivers are mirroring normal but are increasingly farther behind the 1997 runoff. A bar chart of combined flows of the index stations, expressed as a percentage of the 30-year normal shows that these composite flows ranged from 120% to 180% of normal.

6. RUNOFF VOLUME FORECASTS

Flood forecasts in British Columbia are near normal; Mica 91%, Arrow 92%, Duncan 96%, and Kootenay Lake 89%, according to Eric Weiss. The sink holes found in Williston Dam on the Peace River have been repaired and the project can be filled to its normal full pool this year; its forecast runoff will be near normal.

Tom Fero reported that the forecasts were lower (by up to 9% in the Snake Basin) this month due to lower precipitation but still varied from highs of 121% of normal in central Oregon to lows of 64% in portions of Idaho and western Montana (Enc 1). Key basin forecasts in maf are:

	Jan-Jul	Apr-Jul	Apr-Sep
Columbia at Grand Coulee	55.6 (88%)		55.9 (86%)
Snake at Lower Granite	25.0 (84%)	25.2 (83%)	
Columbia at The Dalles	90.8 (86%)		82.1 (83%)
Libby	5.32 (83%)		5.52 (82%)
Hungry Horse	1.72 (76%)		1.62 (74%)
Dworshak	1.75 (65%)	1.87 (65%)	2.51 (71%)

The official Dworshak inflow forecast method for Apr-Jul, accepted by the Corps, computed a forecast of 1.633 maf (Enc 5) while the RFC forecast 1.75 maf.

Spring peak flows are still forecast to be low. On the uncontrolled streams the high end of the probable range of flood peak discharge is equal to or less than the established flood stage (Enc 1). Flood peaks above the flood stage are remotely possible on the Henrys Fork (a perennial floodier), Payette, and Clark Fork at Missoula.

Labh Sachdev submitted a report stating that the Skagit snow survey suggests that the forecast runoff with normal precipitation from April 1 on is 84% of normal (Enc 6). The forecast runoff for snow alone is almost 77% of normal. Water content of the snowpack is 19.0 inches, which is about the same as in March. The snowpack is 5.6 inches below the April normal of 24.6 inches.

7. RESERVOIR OPERATION

The wet weather of October resulted on a 200-year inflow to Mica which exceeded the projects discharge capacity and necessitating spill. Spilling was a concern because of downstream flow restrictions at Arrow Lakes which is being operated to keep the trout eggs wet in the reach below Keenleyside Dam. Kootenay Lake was operated to maintain the lake level just below the IJC rule curve. After the spring freshet Mica is expected to fill to 2460 ft and Arrow to 1750 ft.

Irrigation supply is "plentiful" for the upcoming irrigation season according to Ted Day (Enc 7). **Grand Coulee** is filling after completion of drum gate modifications and **Hungry Horse** is expected to fill this year while

Owyhee may not fill. Active content available on March 31 at 52 irrigation reservoirs (excluding Grand Coulee and Hungry Horse Dam) was 7,502,300 af--81% of capacity, 949,800 af more than last year, and 927,400 af more than normal. Active content available at **Franklin D. Roosevelt Lake** (behind **Grand Coulee Dam**) was 2,797,900 af--54% of capacity, 1,491,500 af more than last year, and 1,270,000 af more than normal. Active content of **Hungry Horse** was 1,877,900 af--63% of capacity, 897,700 af more than last year, and 260,200 af more than normal. Reclamation's teacup plots are on the internet: <http://www.pn.usbr.gov/hydromet/boitea.gif>.

Cathy Hlebechuk reporting on Corps project operations (Enc 8) stated that **Libby** outflow during March was at minimum because a high voltage power line was being worked on and generation needed to be high to prevent a voltage drop. Minimum outflows should continue until the freshet begins. This is the second year of a three year study during which Lake Pend Oreille (**Albeni Falls Dam**) winter draft will be to only 2055 ft (vice 2051 ft) to see if kokanee will spawn at higher elevations in clear gravel. The project will pass inflow until the freshet. The **Dworshak** grouting contract has been completed and the pool is slowly filling, at minimum outflow, to its flood control level. This operation is expected to continue until the Salmon Managers request flow augmentation water for Lower Granite. The **Lower Snake Projects, (Lower Granite, Little Goose, Lower Monumental, and Ice Harbor)** were drafted to their minimum operating pool between 6 and 9 April. Nighttime spill started on all these projects on 6 April. Oregon and Washington states have granted waivers in the allowable dissolved gas levels from 110% to 120%, to permit spilling to flush juvenile fish downstream past the dams. All **Willamette Basin projects** are continuing to fill on or slightly above their refill curves. Some forecasts indicate that **Lookout Point** and **Cougar** may not completely fill. **Foster** has been drafted to 614.0 ft to aid juvenile steelhead downstream migration through the reservoir. The pool will be refilled by the Memorial Day beginning of the recreation season.

Brownlee is on target for meeting the required flood control level and is meeting the downstream fish flow requirements, according to Nengjin Liu.

Ross is more than four feet below last year's elevation at this time, due to heavy drafting in March to make room for an anticipated early runoff. With normal weather the pool should refill quite easily, according to Sachdev's report (Enc 6).

8. POWER OPERATIONS

Nancy Stephan reported that on March 31 the Federal System of reservoirs was at 37.7% of full storage capacity and the Coordinated System was 38.8% of full. The net monthly energy deliveries over the Pacific Northwest/Southwest intertie was from the north to south with net deliveries of 1,751,663 MWh. System firm loads ran near the estimate 98.4% (after correction for temperature deviation from normal).

The power system is expected to refill to 98% of capacity, according to Dana Reedy. Normal system refilling is to 90%.

9. FISHERIES

As reported by Dušica Jevremović fish-related activities are beginning for the year (Enc 9). Requests from the NMFS to the Oregon DEQ and the Washington DOE have been granted for waivers to the dissolved gas standard for the spring and summer juvenile salmon migration. The returning adult salmon have begun their runs with spring chinook and steelhead starting their up-river journey. End of March hatchery releases in the Snake Basin total over 1.5 million yearling spring chinook, yearling coho, sockeye, and other yearling chinook. In the mid Columbia reach 539 thousand yearling chinook have been released while in the lower Columbia over 17 million yearling spring and fall chinook, coho, and sub-yearling spring chinook have been released. By the end of the third week of April another 19.2 million smolts will be released.

10. OTHER

Walt Boyle said that there are lots of projects that are due for re-licensing in the next few years and that they will be producing less energy due to new fishery, cultural, habitat, and historic constraints. In the Northwest the two most vulnerable projects for decommissioning are the Elwah and Condit dams.

The Blue Book (the annual water management report) is complete and should be on the website within a week. No hard copies will be mailed this year.

The Corps of Engineers Northwestern Division North Pacific Office has a new web page site for project data and CRWMG agenda, minutes, and reports like the Blue Book: <http://www.nwd-wc.usace.army.mil>.

The web site with hourly data from Reclamation projects will be found on www.pn.usbr.gov/hydromet.

11. NEXT MEETINGS

The May 12 meeting will be in the Custom House, Room 118 in Portland, OR.

Roger L. Ross
Secretary

Enclosures

1. Weather Summary
 - a. Streamflow Forecast Maps
2. Snowpack Summary
 - a. Columbia Basin Snowpack Summary
 - b. Mountain Snow Water Equivalent Map
 - c. Sub-Basin Snowpack Graphs
3. SWSI Oregon
4. Streamflow Summary
5. Dworshak Forecast
6. SCL Operation Forecast
7. USBR Project Summary
 - a. Upper Snake Teacup
 - b. Boise Teacup
8. COE Project Summary
9. FPC Report and Hatchery Release Data

US GEOLOGICAL SURVEY, WATER RESOURCES DIVISION

Oregon District

COMPARATIVE FLOW TABLE FOR MARCH, 1998

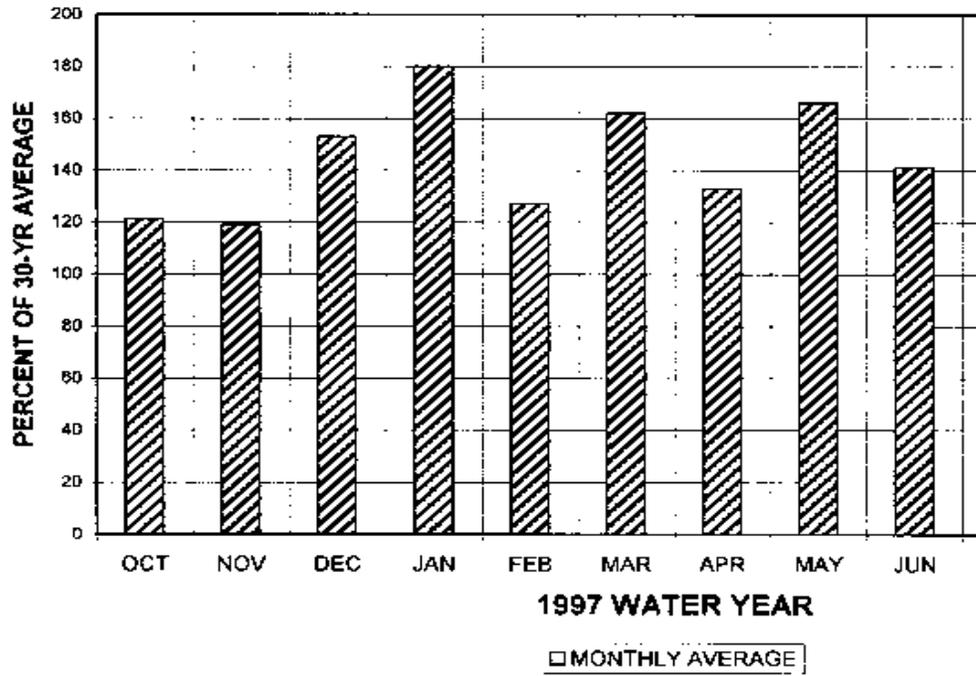
Station	----- Monthly mean discharge -----		Change in dis- charge from previous month (percent)	----- Discharge near end of month -----		----- Accumulated Runoff ----- Oct-Dec Percent of Average
	Cubic feet per second	Percent of average		Cubic feet per second	Date	
John Day River at Service Creek, OR	4,383	111	+96	4,170	31	86
Wilson River nr Tillamook, OR	1,618	91	-19	977	31	119
Umpqua River nr Elkton, OR	14,166	113	+12	11,630	31	89
Columbia River at The Dalles, OR	142,930.(a)	103	+40	197,000	31	113
Willamette River at Salem, OR	38,570.(a)	106	-1	23,750	31	93
Chehalis River nr Grand Mound, WA	4,712	102	-2	3,100	31	119
Skykomish River nr Gold Bar, WA	3,524	108	+29	3,120	31	111
Spokane River at Spokane, WA	9,116.(a)	96	+37	13,260	31	100
Snake River at Heise, ID	4,070.(a)	128	+16	4,690	31	121
Snake River at Weiser, ID	27,034	111	+27	28,970	31	109
Salmon River at White Bird, ID	6,751	113	+48	8,560	31	106
Clearwater River at Spalding, ID	13,977	90	+49	17,350	31	95
Clark Fork at St. Regis, MT	4,120	90	+43	5,710	31	89
MF Flathead River nr West Glacier, MT	894	98	+95	1,620	31	91

Percent of Average computed using 30-year base period, Water Years 1961-90

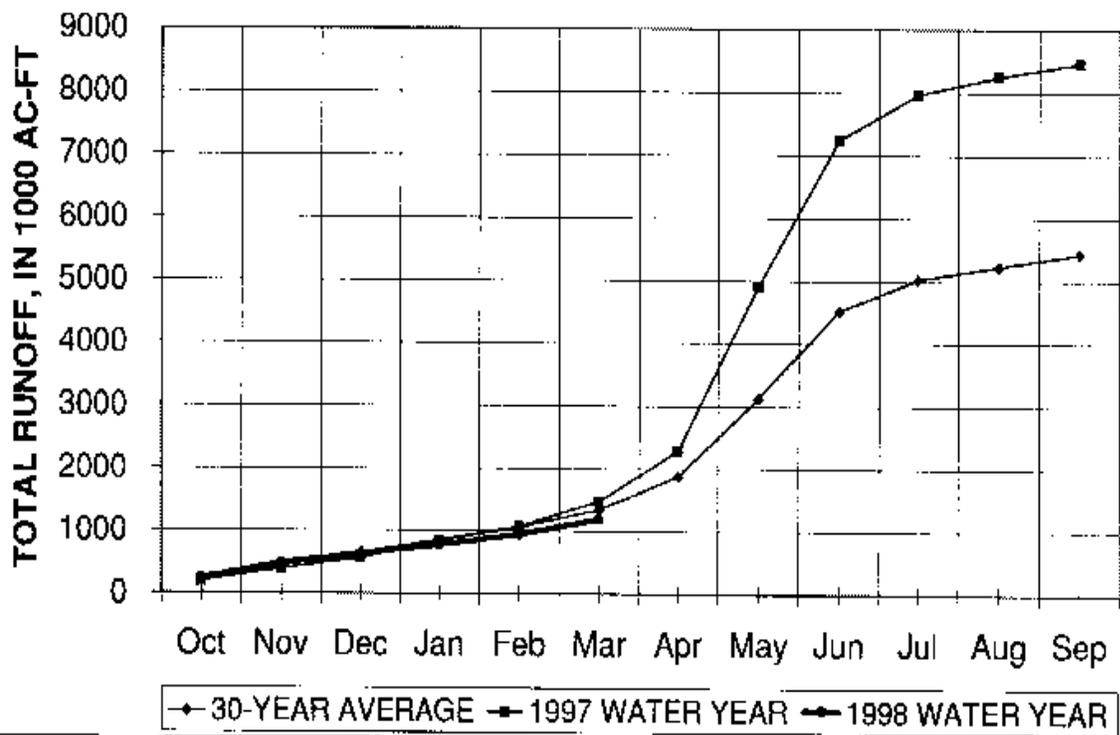
(a) adjusted for upstream storage

04/06/98

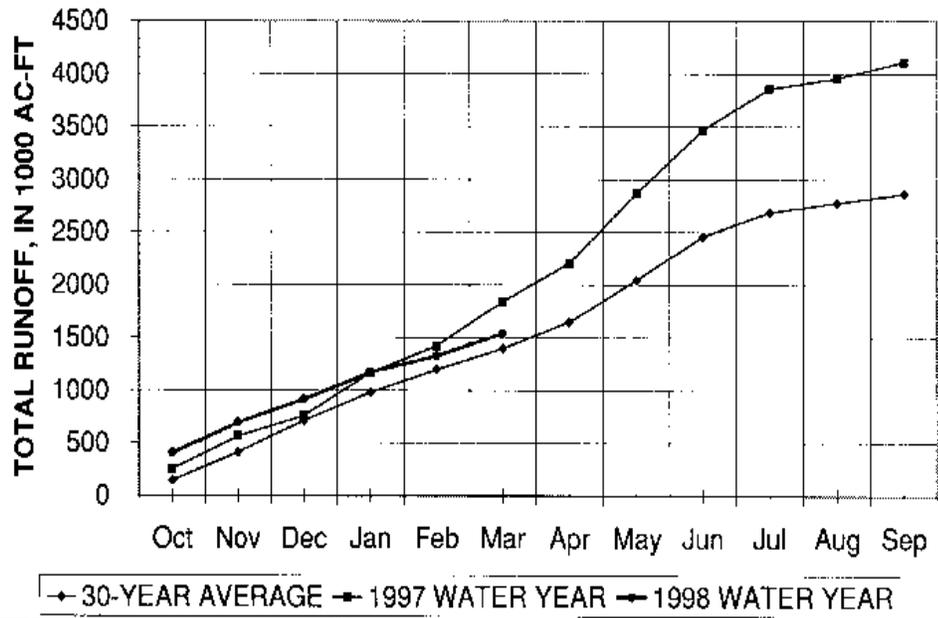
PERCENT OF FLOW AT INDEX STATIONS



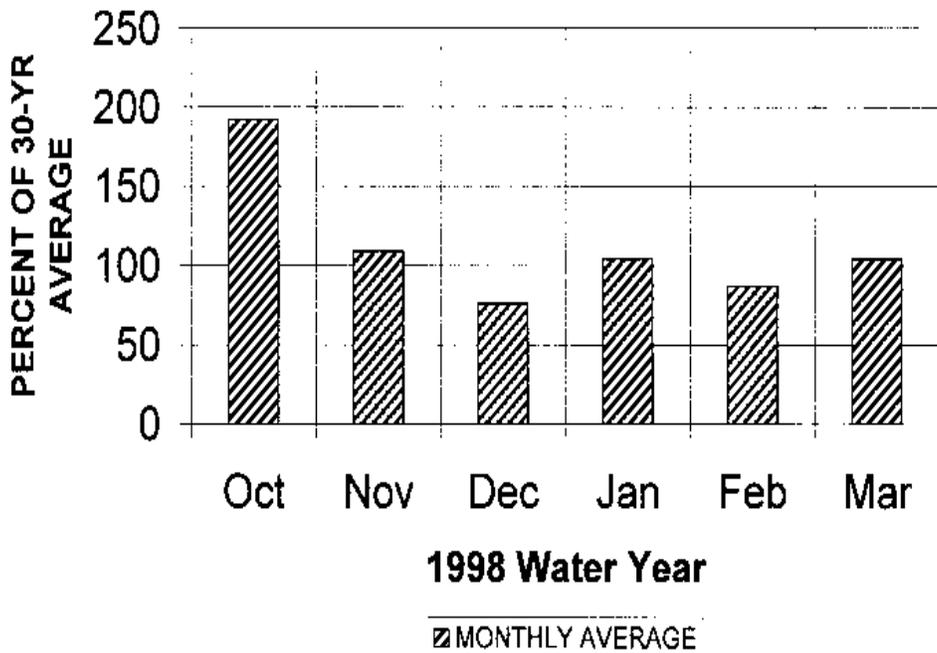
CLARK FORK AT ST REGIS, MT



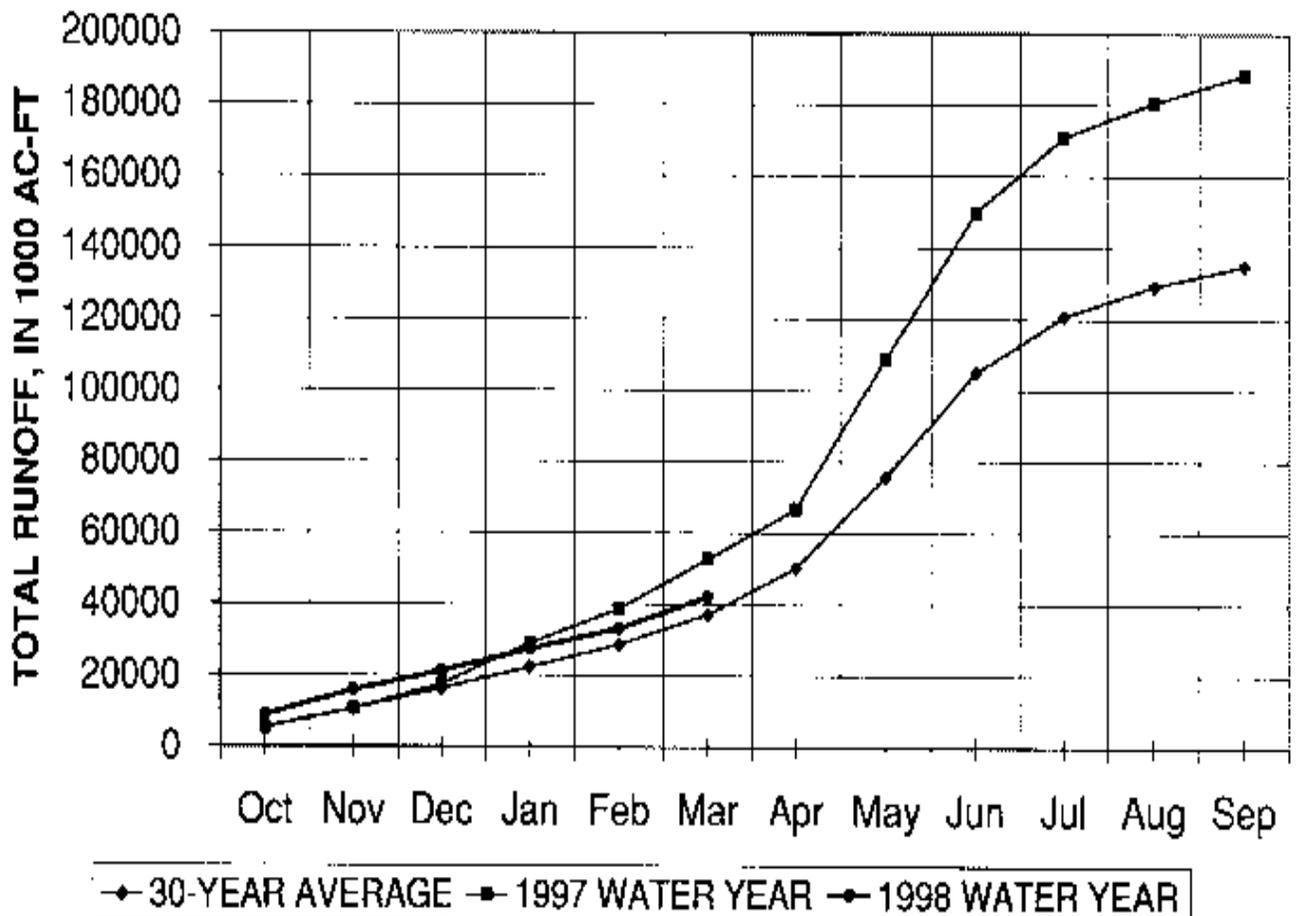
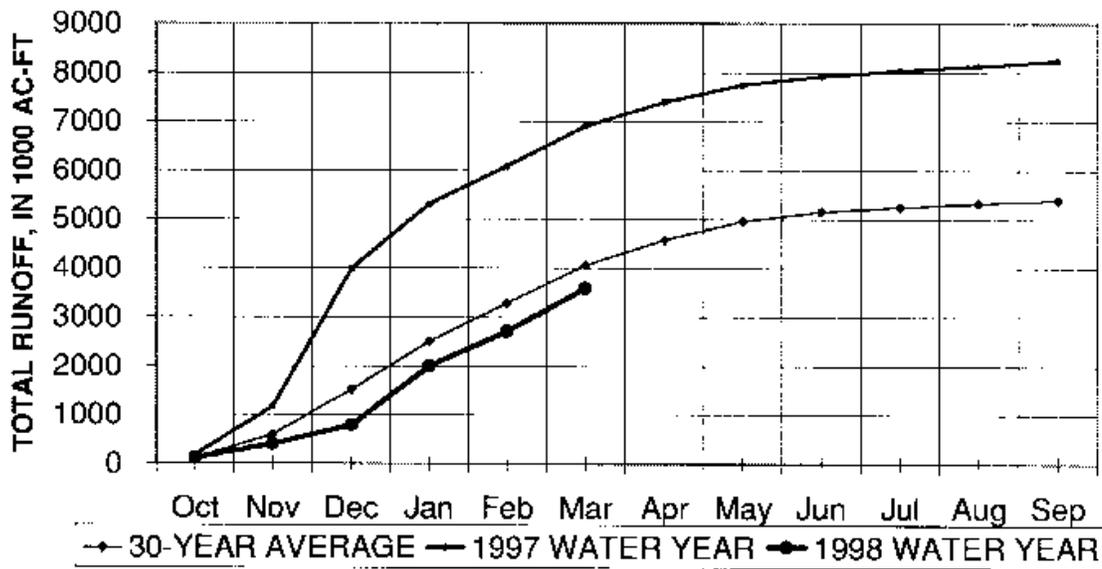
SKYKOMISH RIVER NEAR GOLD BAR, WA



PERCENT OF FLOW AT INDEX STATIONS



UMPQUA RIVER NEAR ELKTON, OR



COLUMBIA RIVER WATER MANAGEMENT GROUP

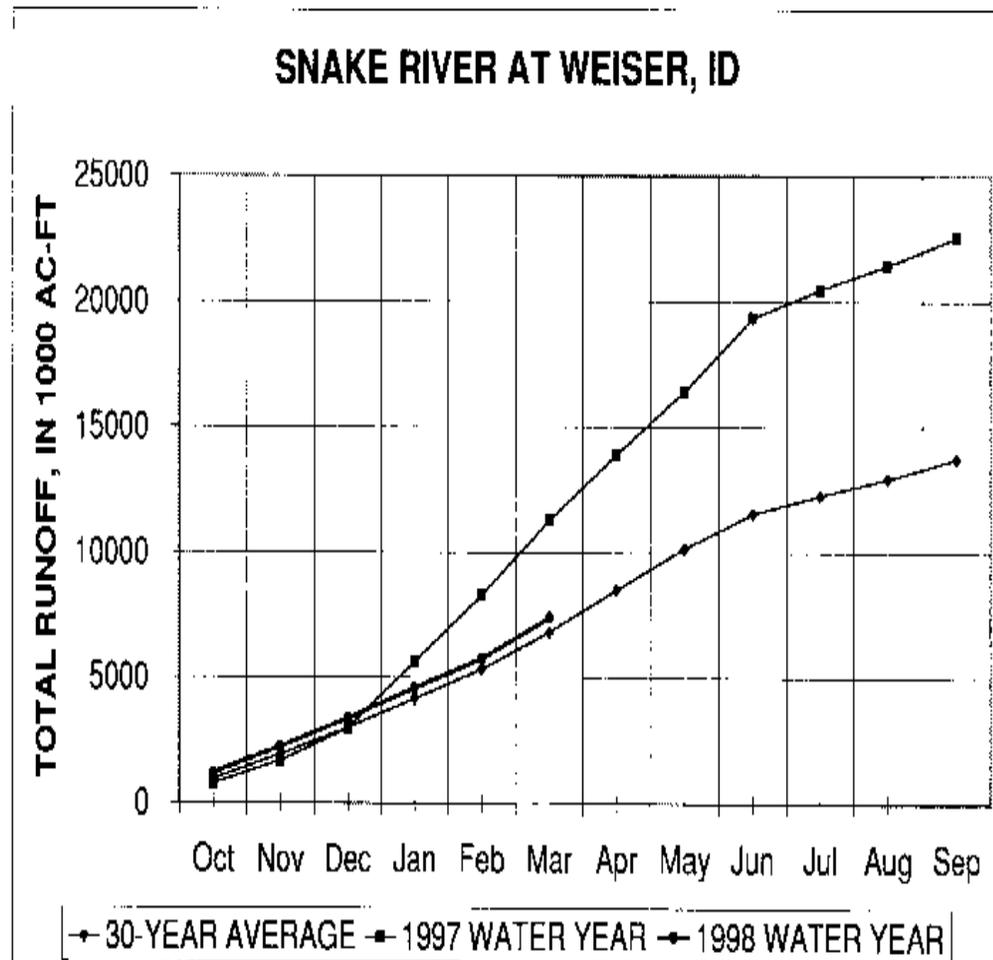
Streamflow Conditions April 14, 1998

Streamflow for the long-term index stations were generally in the normal range for both the month of March and the 1998 Water-Year to-date. March streamflow ranged from a high of 128 percent of average for the Snake River at Heise, ID to a low of 90 percent of average for the Clearwater River at Spalding, ID and Clark Fork at St. Regis, MT. For the water year to-date, flows range from a high of 121 percent of average for the Snake River at Heise, ID to a low of 86 percent for the John Day River at Service Creek, OR.

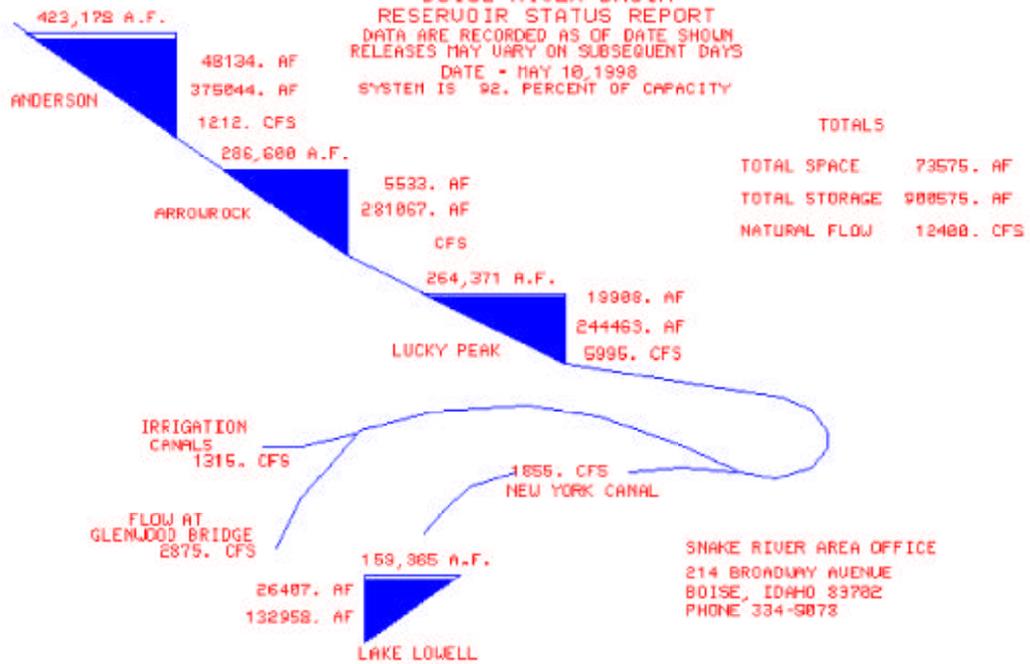
All index stations reported flows well above average for the 1997 water year. Flows for the water year ranged from a high of 176 percent of average for the Middle Fork of the Flathead River near West Glacier, MT to a low of 129 percent of average for the Wilson River on the northern Oregon coast. During the 1997 water year, greatest runoff occurred during January when observed flows were reported as follows: John Day River, 316%; Spokane River, 211%; Snake River, Weiser, 229%; and the Salmon River, 248%.

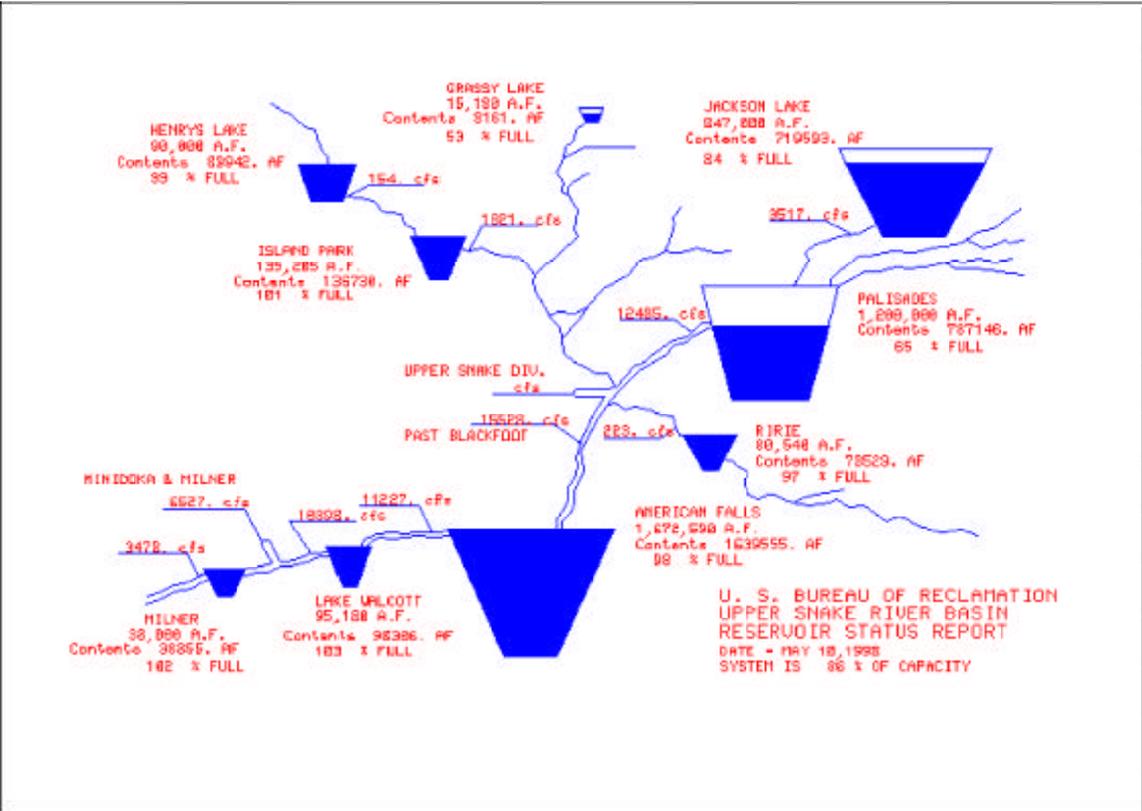
At the beginning of the 1998 water-year, streamflow continued to be above average, due in part to the above average flows of the past year coupled with early fall storms west of the Cascades. Typical percent of averages for October, 1997 were: Wilson River, 479%; Willamette River, 222%; Chehalis River, 368%; and Skykomish River, 281%.

By December, flows had returned to normal with several stations reporting critical flows, especially in Oregon: John Day River, 36%; Wilson River, 69%; Umpqua River, 41%; and the Willamette River, 48%.



U. S. BUREAU OF RECLAMATION
 BOISE RIVER BASIN
 RESERVOIR STATUS REPORT
 DATA ARE RECORDED AS OF DATE SHOWN
 RELEASES MAY VARY ON SUBSEQUENT DAYS
 DATE - MAY 10, 1998
 SYSTEM IS 92. PERCENT OF CAPACITY





CORPS OF ENGINEERS, NORTH PACIFIC DIVISION
REPORT FOR APRIL 1998 CRWMG MEETING

Libby.

The reservoir began March at elevation 2392.7 feet. The average outflows for the month of March were 4.3 kcfs. From 1 – 6 March, the project was operating above minimum flow because the end of March target elevation based on the February final forecast was 2389.5 feet. The end of March flood control objective based on the March final volume forecast increased to 2413.2 feet so flows were reduced to 4 kcfs (minimum flow) on 7 March. The actual elevation at the end of March was 2391.6 feet. There were also a couple days in the middle of March the project was releasing more than minimum flow because a line was being worked on and generation needed to be high to prevent a voltage drop. The project is expected to release minimum flow through the month of April and into May. Flows will be increased in May if it is determined a sturgeon pulse is needed. The USFWS has indicated they will request one pulse when the water temperature increases at Bonners Ferry if the May final volume forecast ranks above the bottom 20 of the 60 year period of record. Inflows in the month of March averaged 3.7 kcfs, 103 percent of normal. The April final volume forecast for April – August is 5.2 MAF, which is 81% of normal.

Albeni Falls.

In September, Lake Pend Oreille started drafting from full (2062.5') to 2055' by mid-November. This is the second year of a three year study during which Lake Pend Oreille will only be drafted to 2055' rather than 2051' to see if kokanee will spawn at higher elevations in cleaner gravels. The current operating range as of 1 January is 2055' - 2056'. This is the expected range of operation through April. The average outflows in March were 15.2 kcfs. The unregulated inflow to Lake Pend Oreille in March was 15.2 kcfs, 88% of normal. The April final volume forecast for April – August is 9.51 MAF, 69% of normal.

Dworshak.

Dworshak elevation reached 1500' at the end of August and remained at this elevation through 1 December to facilitate grouting work to slow down seepage through the dam. Outflows have been at minimum flow (1.3 kcfs) since 1 December and are expected to remain at this level until the Salmon Managers request flow augmentation water for Lower Granite. The flood control objective based on the March final volume forecast was 1578 feet for 31 March. Actual elevation was 1529.4 feet. Inflow in March was 4.02 kcfs, 87% of normal. The April final volume forecast for April – July was 1.63 MAF, 60% of normal. The 15 April target flood control elevation is 1595.4.

Lower Snake Projects.

Lower Granite March inflows were 55.1 kcfs, 100% of normal. Lower Granite, Little Goose, Lower Monumental and Ice Harbor were drafted to Minimum Operating Pool (MOP) between 6 and 9 April, and are operating at MOP + 1' (733' – 734', 633' – 634', 537' – 538', and 437' – 438'). Night time spill started on all Lower Snake projects the evening of 6 April. Between 6 and 9 April, IHR spill was limited to 110% because the state of Oregon's 120% dissolved gas waiver was not effective until 10 April. Spill at LWG, LGS and LMN were 120% started 6 April, the effective date of the state of Washington dissolved gas waiver. . Unregulated inflow in March was 55.1 kcfs, 100% of normal. The April final volume forecast (April – July) for Lower Granite was 17.4 MAF, 80% of normal.

Willamette Basin Projects.

All Willamette projects are continuing to fill. The snow water equivalent has decreased to 80% of normal, while precipitation is about 97% of normal. The majority of the projects are on, or slightly above, their fill schedule. Cougar is 2% below the fill schedule, and Lookout Point has fallen farthest behind at 15% below the fill schedule. The NRCS April 1 forecast is showing the lake 10' low at Lookout Point and 2' low at Cougar. The rest of the projects are expected to fill. Foster has been drawn down to winter pool (elevation 614.0') to aid in the downstream migration of wild juvenile steelhead. The project will be held there from 15 April - 19 May. Using storage from Green Peter, Foster will be full by May 22 for Memorial Day weekend.

COLUMBIA RIVER WATER MANAGEMENT GROUP

Portland, April 14, 1998

Fishery Report: (Fish Passage Center)

Spill: Upon request from the National Marine Fisheries Service the Oregon Department of Environmental Quality and the Washington Department of Ecology have granted waivers to the dissolved gas standard for the spring and summer migration. Spill will be allowed up to total dissolved gas super-saturation levels of 120% at the tailrace monitors and 115% at the downstream forebay monitors. System Operational Request 98-09 asked for spill to begin on April 6, 1998 at the Snake River projects, coincident with drawdown of the Snake projects to minimum pool. Spill was implemented as requested. Spill at Lower Granite was initially limited to 30 kcfs on a 24 hours, due to restrictions placed on spill by the US COE because of barge moorage concerns. Spill at Little Goose and Lower Monumental Dam has been provided up to the 120% total dissolved gas cap from 1800 hours to 1600 hours. Spill at Ice harbor Dam has been provided on a 24-hour basis. Gas Bubble Trauma monitoring was initiated at projects during the first week of April. Few fish are being observed with less than 1% of an area.

Adult Fish Passage: At Bonneville Dam, the cumulative spring chinook count was 3579 through April 9. This total was only 52% and 48% of the respective 1997 and 10-year average through April 9. The number of fish passing upstream projects has increased at all lower Columbia River Projects, with 986 spring chinook past the Dalles Dam, 333 past John Day Dam and 113 past McNary Dam. Priest Rapids should begin counting adults next week.

Adult steelhead continue passing the projects in fairly high numbers with daily counts generally exceeding 100 per day through the past week at Lower Granite Dam. The total count at Lower Granite Dam since March 15 was 3311, of which 529 were "wild" origin. This compares with 2880 in 1997 and 4881 for the 10 year average. Normally, the spring portion of the upstream steelhead run will peak in March and April.

Hatchery Releases: (mid March-mid April period)

Snake River:

Yearling spring chinook from Clearwater hatchery were released below Hells Canyon Dam in the Snake R. Yearling coho salmon were released into Lapwai Creek and Potlatch River.

Sockeye were released into the upper Salmon River lakes during the fall and a percentage of them will be migrating this spring from Red Fish, Pettit and Alturas lakes.

Dworshak NFH finished planting about 1 000 000 yearling chinook on March 26.

Yearling chinook from the Tucannon Hatchery began migrating voluntarily from the acclimation ponds in mid-March and should continue to emigrate through mid-April.

About 485 000 coho salmon have been released in the Clearwater River basin by the end of March.

Mid Columbia:

About 539 000 of yearling chinook was completed through the end of March from Similkameen hatchery located in the Okanogan River basin.

Lower Columbia:

Yearling spring and fall chinook were released into the Umatilla River from Imeques and Thornhollow acclimation ponds.

Yearling spring chinook was released into the Klickitat River from Lewis hatchery.

7.7 million sub-yearling fall chinook were released from Spring Creek NFH

About 350 000 sub-yearling spring chinook were released in the Big White Salmon River.

Coho have been released in the Umatilla and Klickitat Rivers during the last two weeks of March.

Sub-yearling spring chinook released in Big White Salmon River.

During the last week of March and first week of April hatcheries in the Columbia River drainage above Bonneville began releasing 9.2 million smolts and by the end of the third week of April these hatcheries will begin releasing another 19.2 million smolts.

Hatchery Release Summary
Schedule for Last Two Weeks
From 03/27/98 to 04/09/98

Hatchery	Species	FPC Code	Number Released	Release Dates		Release Site	River Name
				Begin	End		
IDFG							
Clearwater	SP Chinook	98004	8,900	04/01/98	04/15/98	Selkow R	Clearwater River, Main Fk
	SP Chinook	98002	236,000	04/07/98	04/10/98	Crooked R Acad Pd	S Fk Clearwater River
	SP Chinook	98003	51,630	04/07/98	04/07/98	Red River Acadm Pd	S Fk Clearwater River
Magic Valley	SU Steelhead	98118	50,000	04/01/98	04/01/98	Squaw Cr Acadm Pd	Salmon River
McCall	SU Chinook	98009	370,000	03/31/98	04/08/98	S Fk Salmon R	Salmon River
	SU Chinook	98010	24,900	04/01/98	04/15/98	S Fk Salmon R	Salmon River
Niagara Springs	SU Steelhead	98120	660,720	03/23/98	04/06/98	Hells Canyon Dam	Snake River
	SU Steelhead	98122	29,400	04/07/98	04/07/98	Pine Bar/Salmon R	Salmon River
	SU Steelhead	98123	141,980	04/05/98	04/10/98	Hammer Cr	Salmon River
Powell	SP Chinook	98001	244,800	04/08/98	04/08/98	Powell Acadm Pd	Lochsa River
Rapid River	SP Chinook	98007	680,240	03/16/98	04/10/98	Rapid River H	Little Salmon River
Agency Total:			2,684,800				
Naz Perce Tribe							
Lyons Ferry	FA Chinook	98044	135,710	04/01/98	04/15/98	Cpt John Acad Pd	Snake River
	FA Chinook	98043	78,671	04/01/98	04/15/98	Clearwater R	Clearwater River, Main Fk
	FA Chinook	98042	147,585	04/01/98	04/15/98	Pittsburg Landng	Snikau River
Agency Total:			361,966				
ODFW							
Big Canyon	SU Steelhead	98104	97,600	03/31/98	03/31/98	Big Canyon H	Grande Ronde River
	SU Steelhead	98103	97,500	04/01/98	04/15/98	Big Canyon H	Grande Ronde River
Cascade	Coho	98054	1,500,000	04/01/98	04/10/98	Joneston R	Umatilla River
Innaha	SU Chinook	98098	33,100	04/06/98	04/07/98	Innaha Acadm Pd	Innaha River
Irigoien	SU Steelhead	98089	230,000	04/08/98	04/08/98	Grande Ronde R	Grande Ronde River
	SU Steelhead	98100	62,500	04/09/98	04/09/98	Catherine Cr	Grande Ronde River
Lookingglass	SP Chinook	98097	283,000	04/05/98	04/10/98	Lookingglass H	Grande Ronde River
Round Bay	SU Steelhead	98129	162,000	04/06/98	04/08/98	Bel. Pellan Dam	Deschutes River
Wallowa	SU Steelhead	98101	188,100	03/25/98	04/08/98	Wallowa Acadm Pd	Grande Ronde River
Agency Total:			2,181,700				
USFWS							
Enlist	SP Chinook	98063	360,784	04/01/98	04/15/98	Enlist H	Entiat River
Hagerman	SU Steelhead	98057	605,000	03/31/98	04/30/98	Sawtooth H	Salmon River
	SU Steelhead	98065	60,000	03/31/98	04/30/98	Sawtooth H	Salmon River
Koonsee	SP Chinook	98013	77,000	03/30/98	02/30/98	Koonsee H	Mid Fk Clearwater River
Warm Springs	SP Chinook	98076	865,000	03/25/98	04/15/98	Warm Springs H	Deschutes River
Agency Total:			1,757,784				

Hatchery Release Summary
Schedule for Last Two Weeks
From 03/27/98 to 04/09/98

Hatchery	Species	FPC LOID	Number Released	Release Dates		Release Site	River Name
				Begin	End		
WDFW							
Chewuch	SP Chinook	98025	32,500	04/05/98	04/20/98	Chewuch R	Methow River
East Bank	SU Chinook	98016	624,000	04/01/98	05/15/98	Oryden Acad Rd	Wenatchee River
	SP Chinook	98015	15,000	04/01/98	04/30/98	Chewuch R	Wenatchee River
Lyon's Ferry	FA Chinook	98041	450,000	04/01/98	04/15/98	Lyon's Ferry H	Snake River
Methow	SP Chinook	98026	78,000	04/05/98	04/20/98	Tweed R	Methow River
	SP Chinook	98024	202,000	04/05/98	04/20/98	Methow H	Methow River
Ringold	SP Chinook	98139	450,000	04/01/98	04/04/98	Ringold Springs H	Mid-Columbia River
Tucannon	SP Chinook	98039	15,000	03/12/98	04/15/98	Tucannon H	Tucannon River
	SP Chinook	98038	49,000	03/12/98	04/15/98	Curl Lake	Tucannon River
	SP Chinook	98040	15,000	04/03/98	04/03/98	Tucannon R	Tucannon River
Agency Total:			1,990,500				
Warm Springs Tribe							
Oak Springs	SU Steelhead	98133	60,000	04/05/98	04/10/98	Hood R	Hood River
Round Butte	SP Chinook	98134	62,000	04/05/98	04/13/98	Hood R	Hood River
Agency Total:			122,000				
Yakama Tribe							
Last Creek	Coho	98147	99,270	03/30/98	03/31/98	Naches R	Yakama River
Agency Total:			99,270				
Total Release:			9,208,709				

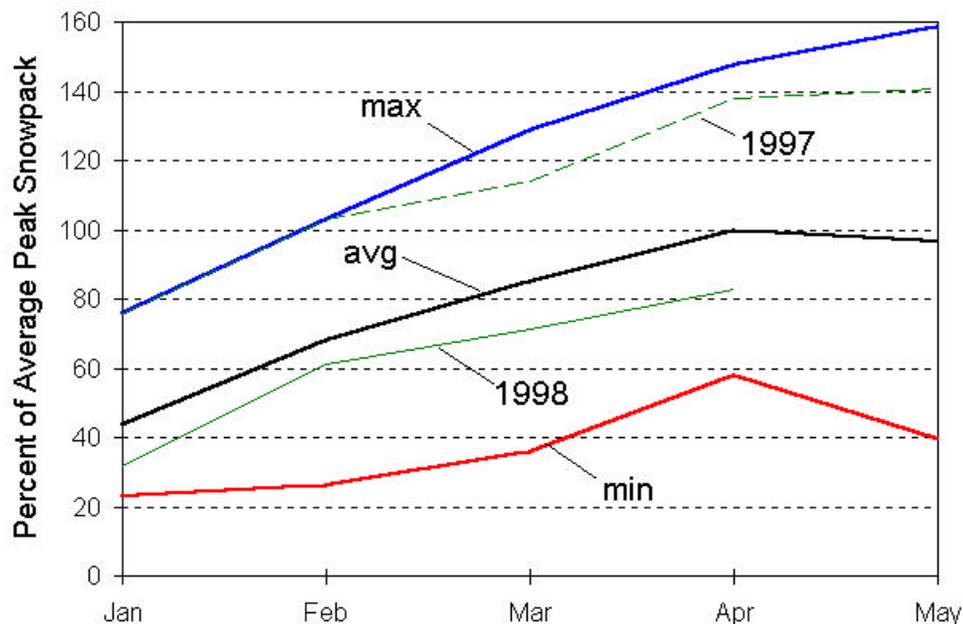
**Hatchery Release Summary
Schedule for Next Two Weeks
From 04/10/98 to 04/23/98**

Hatchery	Species	FPC LotID	Number Released	Release Dates		Release Site	River Name
				Begin	End		
IDFG							
Cleaverwater	SU Steelhead	98004	237,900	04/20/98	04/20/98	Clear Cr	Cleaverwater River, Main Fk
Magic Valley	SU Steelhead	98006	285,000	04/13/98	04/15/98	Little Salmon R	Salmon River
	SU Steelhead	98112	144,000	04/15/98	04/16/98	Mosby/Salmon R	Salmon River
	SU Steelhead	98113	150,000	04/16/98	04/17/98	Bruno/Salmon	Salmon River
	SU Steelhead	98117	120,000	04/20/98	04/21/98	Lenth R	Salmon River
	SU Steelhead	98114	292,000	04/21/98	04/23/98	N Fk Salmon R	Salmon River
Niagara Springs	SU Steelhead	98119	930,000	04/12/98	05/02/98	Pahumerai H	Pahumerai River
Pahumerai	SU Chinook	98011	65,100	04/15/98	04/25/98	Pahumerai H	Pahumerai River
Sawtooth	SP Chinook	98012	43,200	04/10/98	04/22/98	Sawtooth H	Salmon River
	Agency Total:		2,137,200				
ODFW							
L Sheep	SU Steelhead	98109	82,000	04/23/98	04/23/98	L Sheep Accum Pd	Imnaha River
Round Butte	SP Chinook	98130	50,000	04/13/98	04/14/98	Bel. Pelton Dam	Deschutes River
	SP Chinook	98128	280,000	04/20/98	04/23/98	Bel. Pelton Dam	Deschutes River
	Agency Total:		412,000				
Umatilla Tribe							
Bonifer	SU Steelhead	98057	50,000	04/10/98	04/20/98	Bonifer H	Umatilla River
Minthorn	SU Steelhead	98053	50,000	04/10/98	04/20/98	Minthorn Accum Pd	Umatilla River
Thornhollow	SP Chinook	98050	100,000	04/10/98	04/20/98	Thornhollow Accum Pd	Umatilla River
	FA Chinook	98046	225,000	04/10/98	04/20/98	Thornhollow Accum Pd	Umatilla River
	Agency Total:		425,000				
USFWS							
Carson	SP Chinook	98059	1,733,500	04/15/98	04/15/98	Carson H	Wind River
Dworshak	SU Steelhead	98060	520,000	04/20/98	04/20/98	S Fk Clearwater R	Cleaverwater River, Main Fk
	SU Steelhead	98061	380,000	04/20/98	04/20/98	Kooskiu H	Cleaverwater River, Main Fk
Hagerman	SU Steelhead	98066	361,000	04/13/98	04/30/98	Little Salmon R	Salmon River
Leavenworth	SP Chinook	98065	1,720,000	04/20/98	04/20/98	Leavenworth H	Wenatchee River
Little White Salmon	SP Chinook	98070	1,070,000	04/15/98	04/15/98	Little White Salmon H	Little White Salmon River
Spring Creek	SP Chinook	98057	150,000	04/16/98	04/16/98	White Salmon R	Columbia River
	FA Chinook	98074	4,200,000	04/20/98	04/20/98	Spring Creek H	Columbia River
Willard	Corey	98077	1,900,000	04/15/98	04/15/98	Little White Salmon R	Columbia River
Winthrop	SP Chinook	98078	325,500	04/14/98	04/14/98	Winthrop H	Wenow River
	Agency Total:		12,239,500				

**Hatchery Release Summary
Schedule for Next Two Weeks
From 04/10/98 to 04/23/98**

Hatchery	Species	FPC Code	Number Released	Release Dates Begin End		Release Site	River Name
WDFW							
East Bank	SU Steelhead	98020	115,000	04/15/98	05/05/98	Wenatchee R	Wenatchee River
Klickitat	Coho	98085	1,000,000	04/20/98	06/10/98	Klickitat R.	Klickitat River
Lyons Ferry	SU Steelhead	98033	80,000	04/15/98	04/30/98	Lyons Ferry rd	Snake River
	SU Steelhead	98036	160,000	04/15/98	04/30/98	Tulachon R	Snake River
	SU Steelhead	98034	100,000	04/15/98	04/30/98	Goldenwood Acad Pd	Grande Ronde River
	SU Steelhead	98035	140,000	04/15/98	04/30/98	Dayton Accum Pd	Walla Walla River
	SU Steelhead	98037	135,000	04/15/98	04/30/98	Walla Walla R.	Walla Walla River
Methow	SU Chinook	98017	340,000	04/10/98	04/10/98	Cannon Acc Pd	Methow River
Angels	SU Steelhead	98141	180,000	04/15/98	04/30/98	Angels Springs rd	Mid-Columbia River
Turtle Rock	SU Chinook	98023	207,000	04/10/98	04/20/98	Turtle Rock R	Mid-Columbia River
	SU Steelhead	98018	148,300	04/10/98	05/05/98	Wenatchee R	Wenatchee River
Wells	SU Chinook	98027	357,000	04/15/98	04/30/98	Wells R	Mid-Columbia River
	SU Steelhead	98028	50,000	04/15/98	05/05/98	Symington Accum Pd	Okanogan River
	SU Steelhead	98029	50,000	04/15/98	05/05/98	Okanogan R	Mid-Columbia River
	SU Steelhead	98030	58,000	04/15/98	05/05/98	Elfy Bridge	Melroe River
	SU Steelhead	98031	100,000	04/15/98	05/05/98	Methow R	Mid-Columbia River
Agency Total:			3,771,200				
Warm Springs Tribe							
Oak Springs	WU Steelhead	78131	20,000	04/13/98	04/19/98	E Flk Hood R	Hood River
Round Butte	SP Chinook	78135	62,000	04/20/98	05/02/98	Hood R	Hood River
Agency Total:			92,000				
Yakama Tribe							
Lewis River	Coho	98143	138,000	04/15/98	04/30/98	Klickitat R	Klickitat River
Agency Total:			138,000				
Total Releases:			19,216,000				

Columbia Basin Snowpack Summary



April 1, 1998

Snowpack percents of average across the Columbia Basin did not change much from last month in most sub-basins. A north-south pattern is observable, however, with Canada and the Kootenay increasing 2-3 percent, the Pend Oreille holding steady with no change, and drops in percent of average from the Spokane Basin on south. The largest drops were in the John Day, down 15% to 73 percent of average and Eastern Oregon Snake basins, down 13% to 95.

For the northern portions, Canada, Montana, and the Idaho Panhandle, only Canada, with 88 percent, is above the 70-80 percent range. The Washington Cascades, however, retain the best snowpacks in the Columbia, with 104% for the North Cascades, and 112% for the Yakima. The Clearwater, at 69%, holds the lowest percent of average in the Columbia this month.

The Boise and Payette Basins may have started an early runoff, dropping 9% to 82 percent of average. The Snake Headwaters saw little change, dropping 1% to 91. The sub-basins draining into the Snake from the south side also took losses during the month, down from 7 to 17 percent. The Owyhee Basin aerial markers showed considerable loss of snowpack between last month and this. Five of eleven are melted out, including three which were over 150 percent of average last month.

Overall, the snowpack for the Columbia above the Dalles is 83 percent. The current El Niño strength is very similar to the situation in 1994, but the snowpack that year was 76% on April 1.

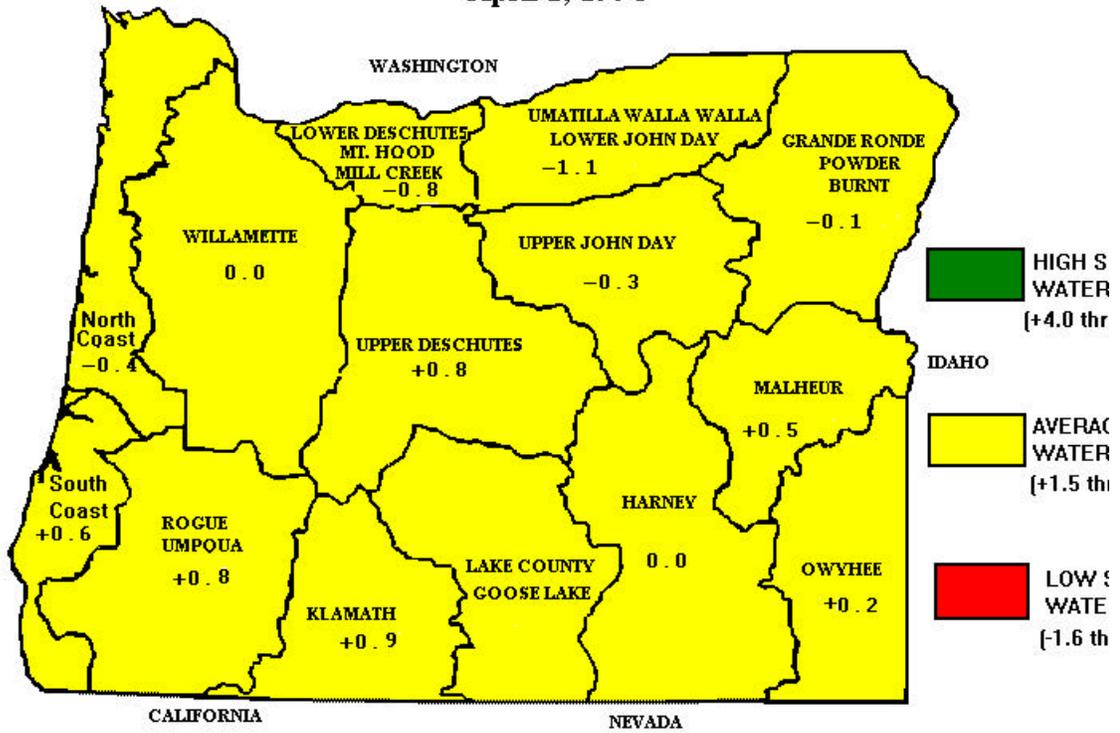
Dan Moore
 Columbia River Basin Hydrologist
 Natural Resources Conservation Service
 National Water and Climate Center
 101 SW Main Street, Suite 1600
 Portland, OR 97204-3224
 (503) 414-3054

dmoore@wcc.nrcs.usda.gov

SURFACE WATER SUPPLY INDEX

(SWSI)

April 1, 1998



DWORSHAK APRIL-JULY INFLOW FORECAST

Run Date is 16 APR 1998

	1NOV	1DEC	1JAN	1FEB	1MAR	1APR	1MAY	1JUN
ELBI ELK BUTTE	.2	5.2	9.8	20.5	25.3	27.0		
HEMI HEMLOCK	.3	6.8	13.0	23.9	28.5	32.0		
HOOM HOODOO BASIN	.3	7.8	12.3	23.6	27.3	31.4		
PIRI PIERCE RG S			3.2	6.0	6.0			
SHAI SHANGHI SUM	.2	4.9	9.4	18.1	21.8	20.8		
LSLI LOST LAKE	4.3	10.3	15.5	29.0	33.9			
EKRI ELK RIVER 1S			3.4					
DWR AVERAGE KAF	137	193	171	223	370	370		
ASOI July-Aug SOI	-3	-3	-3	-3	-3	-3		
SSOI July-Sep SOI	-5	-5	-5	-5	-5	-5		
OSOI July-Oct SOI	-6	-6	-6	-6	-6	-6		
NSOI July-Nov SOI		-8	-8	-8	-8	-8		
DSOI July-Dec SOI			-9	-9	-9	-9		
DWORSHAK FC SPACE			700	730	600	100		
DWORSHAK FC ELEV			1558	1556	1565	1595		
DWORSHAK FOM ELEV	1500	1500	1505	1513	1524	1545		

ELBI = ELK BUTTE ACCUMULATED SWE IN INCHES (snotel) elev 5550
HEMI = HEMLOCK ACCUMULATED SWE IN INCHES (snotel) elev 5810
HOOM = HOODOO BASIN ACCUMULATED SWE IN INCHES (snotel) elev 6050
PIRI = PIERCE RANGER STATION ACCUMULATED SWE IN INCHES (snow course)
LSLI = LOST LAKE ACCUMULATED SWE IN INCHES (snotel) elev 6110
EKRI = ELK RIVER 1S ACCUMULATED MONTHLY PRECIP IN INCHES elev 2910
DWRI = MONTHLY DWORSHAK INFLOW (KAF)
JD = JANUARY DWORSHAK INFLOW (KAF)
FD = FEBRUARY DWORSHAK INFLOW (KAF)
MD = MARCH DWORSHAK INFLOW (KAF)
AD = APRIL DWORSHAK INFLOW (KAF)

FORECAST EQUATIONS:

01OCT=276.4*ASOI+2690
01NOV=191.5*SSOI+2667
01DEC=144.2*OSOI+2687
01JAN=12.7*ELBI+15.3*HEMI+13.3*HOOM+63.3*PIRI+89.7*NSOI+17.1*EKRI+1539
01FEB=18.6*ELBI+15.6*HEMI+18.5*HOOM+44.1*PIRI+20.3*DSOI+.8*JD+540
01MAR=14.2*ELBI+14.7*HEMI+15.5*HOOM+33.4*PIRI+21.8*DSOI+.9*JD+.2*FD+369
01APR=15.1*ELBI+15.4*HEMI+14.6*HOOM+15.9*SHAI+22.6*DSOI+.8*JD+.3*FD+.3*MD-168
01MAY=14.1*ELBI+12.3*HEMI+12.6*HOOM+13.9*SHAI+.3*AD-201
01JUN=8.2*ELBI+7.3*HEMI+8.4*HOOM+5.7*LSLI+183

April-July Average inflow 2700 KAF

given value	% Chance that OBSERVED will be > than					
	1%	5%	20%	50%	80%	95%
99%						
01Oct April-July Forecast 1833 KAF 3539 3034 2448 1833 1218 632 127						
01Nov April-July Forecast 1786 KAF 3412 2931 2372 1786 1200 641 160						
01Dec April-July Forecast 1764 KAF 3419 2929 2361 1764 1167 599 109						
01Jan April-July Forecast 1587 KAF 2907 2516 2063 1587 1111 658 267						
01Feb April-July Forecast 1943 KAF 2926 2635 2297 1943 1589 1251 960						
01Mar April-July Forecast 1765 KAF 2593 2348 2063 1765 1467 1182 937						
01Apr April-July Forecast 1633 KAF 2275 2085 1864 1633 1402 1181 991						

The given forecast values are to be considered the Corps of Engineers Official Forecast for Dworshak. If you have questions on this report, contact:
 Jim.D.Versteeg@nwd01.npd.usace.army.mil
[</per>](#)



DATE: April 6, 1998
TO: Gary Zarker, Superintendent
FROM: Paula Green, Power Management Director
SUBJECT: Skagit Snow Survey - April 1998

Original Signed By
Paula S. Green

The April 1, 1998, Skagit snow survey suggests that the forecast runoff with normal precipitation from snow on is about 84 percent of normal. The forecast runoff for snow alone is over 77 percent of normal. Actual Skagit runoff will depend on the extent of continued precipitation during the runoff season. Water content of the snow pack is 19.0 inches, which is about the same as in March. However, this is 5.6 inches below the normal 24.6 inches using comparable numbers of snow course data from previous years.

The elevation at Ross Reservoir at the end of March is 7.7 feet above the Variable Energy Content Curve. Ross lake elevation this year is more than 4 feet below last year at this time, due to heavy drafting during March to make room for an anticipated early runoff. The Ross combined storage volume forecast for the season is over 89 percent of normal. This is approximately 11 percent less than in March, due to aggressive drafting and continued dry conditions in the Skagit basin in March. Ross should still refill quite easily this year, unless the dry weather pattern continues between now and the end of the runoff season.

Attachments

e-mail cc:	Green	Gunn	Mohamed, I
	Mulder	Coates	Suchdev
	Whaley	Rough	Sinowitz
	Hennett	Tinker	Kjostes
	Whitney	Lolos	Dadashi
	Clayton	Reading File	

City of Seattle City Light Department

Newitt River Snow Survey April 1, 1988

course	elev feet	Inches of Water Content														avg.	
		1952	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982		1983
Harts Pass	6500	45.6	46.6	41.1	47.9	55.3	70.1	58.7	61.0	22.0	47.4	31.9	39.6	30.6	45.1	42.7	
Blackwall Peak	6365	22.0	27.1	47.5	56.9	25.2	49.1	35.3	47.0	15.4	16.9	24.4	30.4	22.4	35.1	34.5	
Brown Top Mt	6000	41.0	34.4	57.2	63.9	34.0	67.2	51.0	65.0	21.7	43.0	32.1	37.1	29.0	45.4	38.6	
Devils Pack	5300	****	****	84.6	97.2	50.0	90.2	71.6	96.0	30.4	55.0	36.6	47.2	39.0	65.6	53.2	
Rainy Pass	4780	42.6	31.3	57.6	65.6	30.8	63.2	46.4	54.2	22.8	43.4	28.0	33.0	23.1	42.0	35.4	
Thunder Basin	4200	25.6	15.3	32.3	35.9	15.5	35.8	29.2	24.9	11.5	18.4	19.9	13.4	5.2	24.4	18.5	
Lightning Lake	4090	14.4	12.8	19.9	24.4	7.9	18.1	11.3	19.0	5.5	10.3	10.8	12.6	5.9	15.1	10.3	
Kieslikwa (BC)	3799	15.4	9.2	25.4	31.1	6.8	21.5	21.5	30.6	1.4	5.0	9.1	9.3	0	19.9	7.9	
Beaver Pass	3680	41.3	26.6	50.6	49.7	19.0	55.1	31.6	43.9	9.9	20.9	18.1	22.6	5.7	46.2	28.6	
Granite Creek	3500	****	****	24.4	31.4	11.4	24.6	22.2	27.4	9.6	17.8	13.8	14.3	6.4	20.2	15.8	
Freezeout Cr Tr	3430	14.2	15.3	23.8	21.3	9.2	19.2	15.4	17.6	4.8	5.9	11.1	9.8	0	14.6	8.7	
Fozzween Lake	2633	12.5	6.5	21.4	13.4	1.1	17.8	15.0	18.3	4.1	4.7	10.8	10.2	0	12.7	6.8	
New T/Summit R	2633	14.5	5.8	22.7	20.6	1.6	17.6	20.0	21.6	7.1	8.5	14.1	11.2	0	14.1	4.5	
Beaver Cr Tr	2233	22.1	2.1	21.1	15.9	1.6	18.2	22.8	25.5	3.6	4.2	13.1	8.9	0	15.4	6.3	
Meadow Cabins	1933	8.0	0	11.4	14.4	1.0	2.8	10.1	12.9	1.1	1.5	5.9	1.6	0	6.0	0	
Average		25.7	17.2	36.2	41.6	17.3	37.9	31.7	37.4	12.1	21.0	18.5	19.0	11.2	27.5	20.7	
course	elev feet	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	avg.
Harts Pass	6500	23.1	33.9	34.4	35.1	33.7	36.7	40.9	54.4	34.4	29.4	30.7	46.9	44.0	47.1	37.7	41.0
Blackwall Peak	6365	24.0	26.1	32.6	32.7	****	33.6	****	56.4	26.4	21.7	23.2	33.7	34.0	42.5	26.3	33.9
Brown Top Mt	6000	27.6	34.6	41.4	37.0	26.1	36.4	45.2	65.9	44.2	39.6	51.4	66.2	52.8	76.4	55.6	46.2
Devils Pack	5300	46.8	50.8	37.6	51.4	51.4	51.4	61.2	84.3	44.6	29.2	22.2	48.4	42.8	55.0	35.0	55.5
Rainy Pass	4780	30.0	34.0	33.6	35.6	17.0	33.8	40.8	47.2	38.6	25.8	31.0	42.4	53.3	45.5	30.0	39.9
Thunder Basin	4200	10.6	2.7	11.4	11.4	****	10.1	13.2	16.1	7.8	3.6	6.1	11.2	13.2	18.2	10.7	13.1
Lightning Lake	4090	7.5	10.1	8.4	11.1	****	10.1	13.2	16.1	7.8	3.6	6.1	11.2	13.2	18.2	10.7	13.1
Kieslikwa (BC)	3799	1.3	3.0	2.4	7.8	15.3	14.6	13.5	14.6	0	4.8	2.9	4.8	1.0	20.8	5.2	12.8
Beaver Pass	3680	17.9	29.9	21.6	26.5	26.2	25.4	29.4	25.3	13.0	10.6	23.4	32.4	15.7	41.0	30.3	31.8
Granite Creek	3500	9.2	17.6	11.2	12.2	16.0	15.0	19.0	20.6	9.0	11.0	12.6	15.2	13.9	27.8	11.6	16.6
Freezeout Cr Tr	3430	4.3	13.7	7.1	11.2	10.6	10.0	12.3	15.5	1.4	8.1	6.8	9.3	4.8	20.0	8.2	12.3
Fozzween Lake	2633	1.5	12.5	****	7.8	10.5	9.2	9.8	12.7	0	7.0	5.7	6.2	4.3	20.2	6.3	9.8
New T/Summit R	2633	1.9	14.3	9.4	13.7	13.1	12.6	15.7	15.6	0	6.6	7.5	9.4	0	20.6	4.3	10.0
Beaver Cr Tr	2233	1.2	10.3	6.1	4.4	9.0	6.1	11.8	9.4	0	9.9	4.8	13.4	4.8	17.9	6.8	12.4
Meadow Cabins	1933	0	5.9	0	0	0.3	5.6	6.5	1.3	0	0	0	0	0	14.3	0	5.1
Average		13.9	21.5	19.8	20.6	22.5	21.7	24.4	30.6	15.1	15.3	17.4	21.5	10.5	34.5	13.0	

Runoff Forecast at Diablo for 1996

568538 Weighted avg snow runoff
 278562 1947-1997 precip equivalent
 848258 Total runoff forecast, avg precip
 April-August

Snow Runoff Forecast

2685288 1237 %/510% of 51 yr avg (1947-1997)
 119812

Total Runoff Forecast with Snowfall Forecast

City of Seattle - City Light Department

Runoff Pattern Five Months

April through August
51 yr. avg. 1947-97 inclusive

Month	Ross (1947-97 avg.)		Diablo (1947-97 avg.)	
	std	c/c	std	c/c
April	102673	11.94	114281	11.27
May	247447	28.78	225634	22.20
June	278188	32.36	318070	31.49
July	180455	18.66	201958	19.92
August	70950	8.25	102507	10.12
Total	959714	100.00	1013375	100.00

Ratio of Ross runoff to Diablo runoff = .64837

Skagit River Snow Survey April 1, 1998
1998 Runoff Forecast Distributed in Same Pattern
Average Precipitation

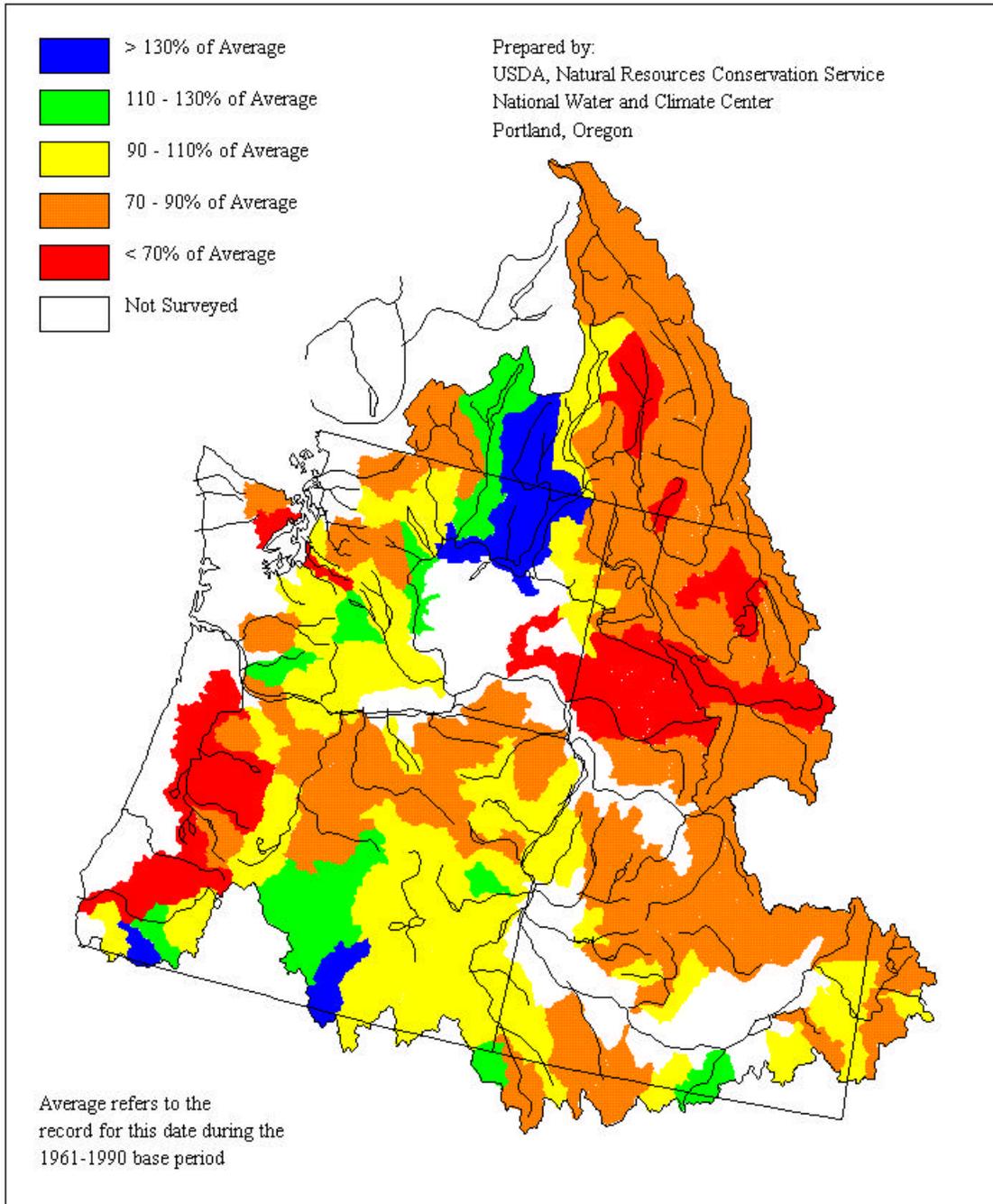
month	Ross			Diablo		
	1947-97 c/c	1998 runoff est. SPD	1998 CFS	1947-97 c/c	1998 runoff est. SPD	1998 CFS
April	11.94	82907	2004	11.27	55575	3185
May	28.78	207069	6680	22.20	230675	7441
June	32.36	232815	7760	31.49	267011	8901
July	18.66	134285	4111	19.92	165020	5190
Sub-Total:		660177			762709	
August	8.25	59378	1915	10.12	85788	2757
Total	100.00	719499	4702	100.00	848096	2757
		153 days			153 days	

CX-1999

PREDICTED STORAGE FROM SNOW SURVEY (1988) PRELIMINARY

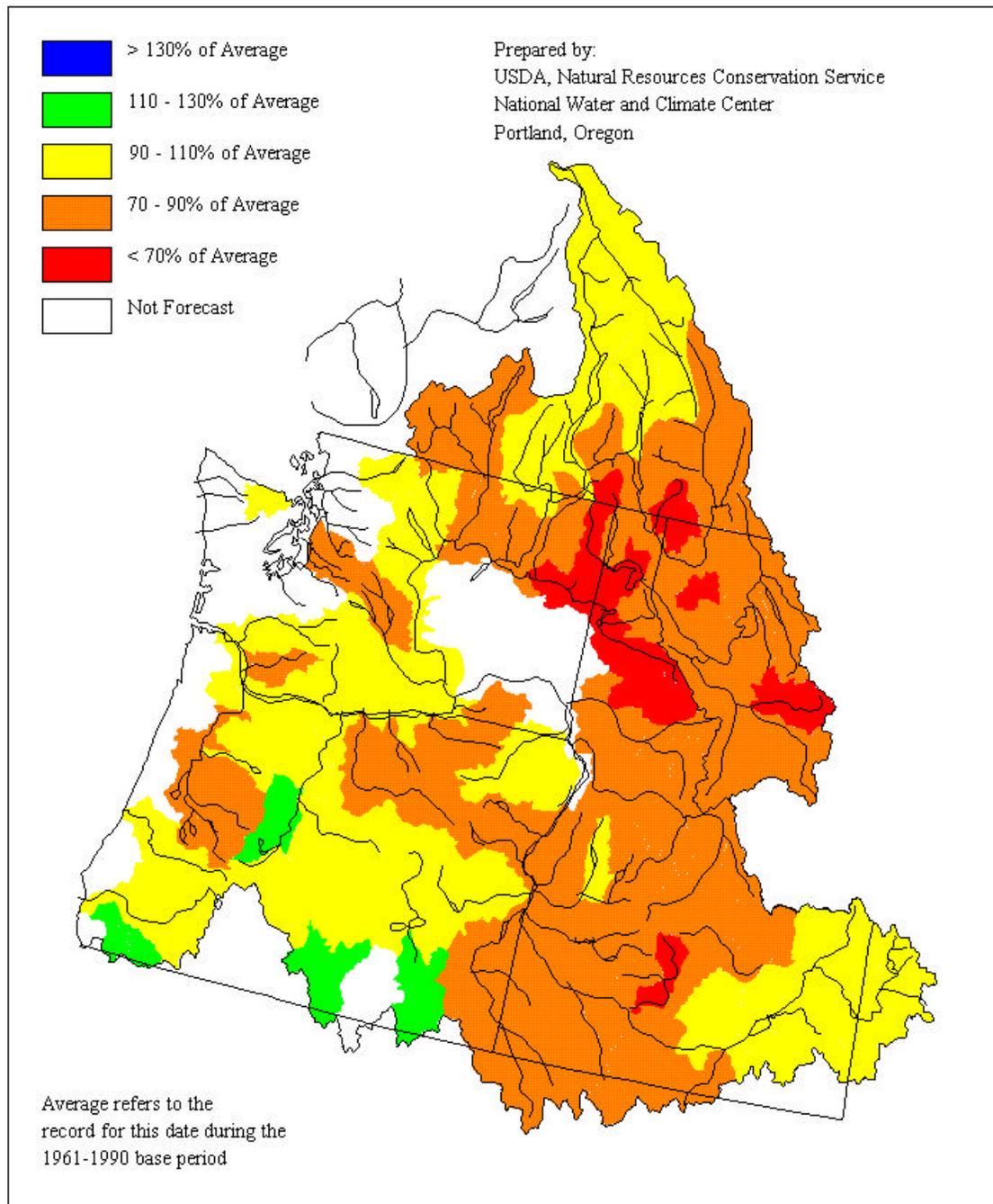
	JAN	FEB	MAR	APR
Feb - Mar (normal runoff)		104,849	54,281	-
Apr - Aug (forecast runoff - snow survey)		798,554	744,716	719,499
Sept (normal)		41,531	41,531	41,531
Ross Actual Storage (Prv Month End)		497,208	429,972	353,438
Ross ECC (Prv. month end)		362,823	326,265	323,695
TOTAL PREDICTED STORAGE		1,079,217	844,235	790,773
Normal Storage for same period		988,892	938,324	884,043
% OF PREDICTED TO NORMAL		109.13%	100.63%	89.45%
Elevation on last day of month				
Ross actual (ft)	1580.53	1546.02	1527.83	
Ross ECC/VECC (ft)	1530.2	1520.8	1520.1	
Diff (ft)	30.33	25.22	7.73	

Mountain Snow Water Equivalent as of April 1, 1998 (in relation to the average for this date)



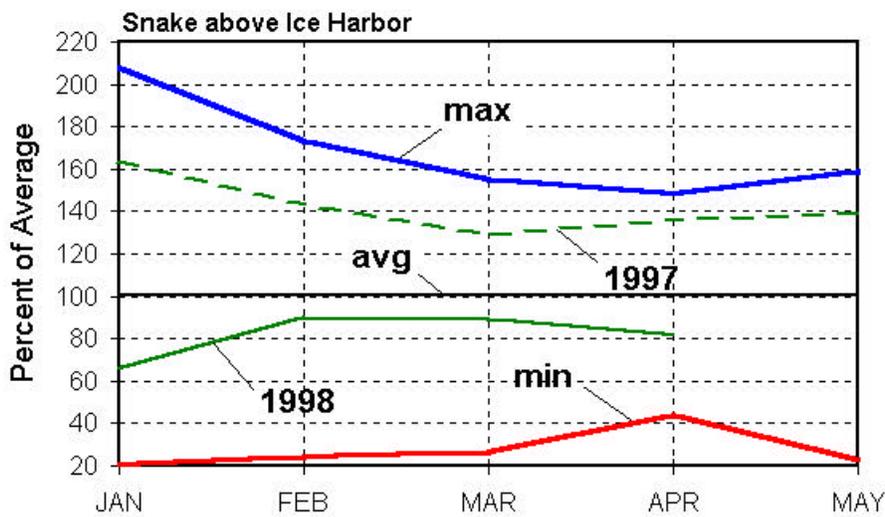
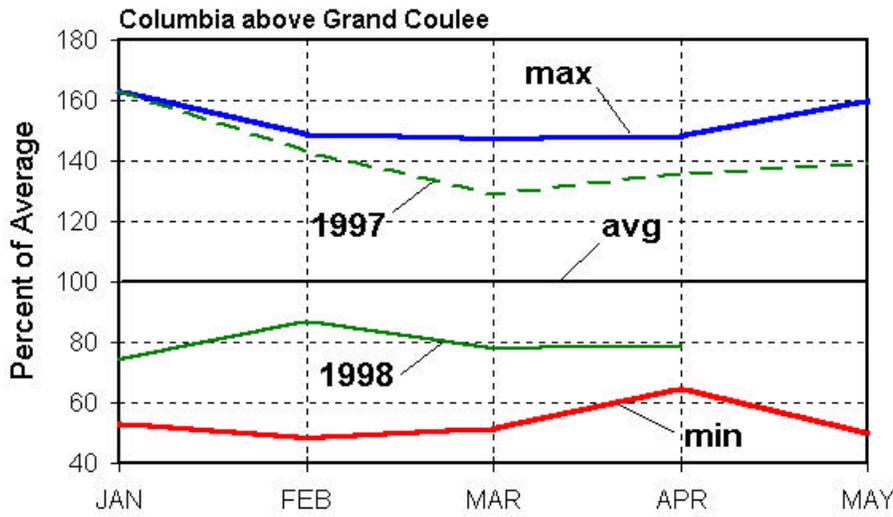
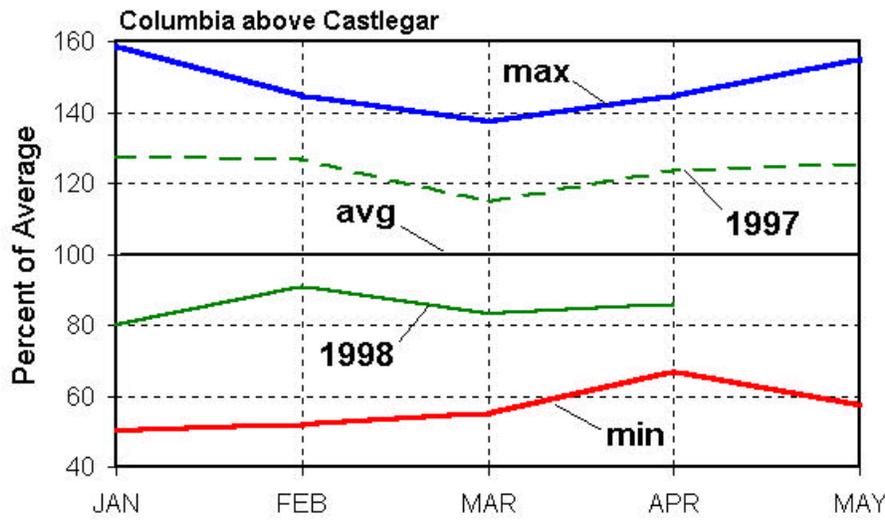
United States Department of Agriculture -- Natural Resources Conservation Service
in cooperation with
The Province of British Columbia -- Ministry of the Environment

Spring and Summer Streamflow Forecasts as of April 1, 1998 (in relation to the average for this date)



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in cooperation with
United States Department of Commerce, NOAA -- National Weather Service

Columbia Sub-Basin Snowpack Graphs - April 1, 1998



Dan Moore