

### **WEEK 3: APRIL 30 - MAY 6**

#### **1. Water Budget Implementation**

No Water Budget flow augmentation was requested for this week for the mid-Columbia and the Snake rivers as of April 26. Rapidly changing passage conditions in the Snake River required continuous attention and prompted in-week reassessment of Water Budget flow augmentation needs by the FPC and its Advisory Committee on Monday, April 30 and Thursday, May 3. The decision reached on both of those dates, for reasons described below under Supporting Rationale, was to continue this week without a Snake River Water Budget flow augmentation request.

In regards to shapeable Water Budget in the Snake River, the BPA/IPC agreement on Brownlee reservoir participation apparently was not clear on the use of the volume equivalent of BPA-stored energy in Brownlee reservoir. BPA believed that the 30,000 acre-feet involved should be added to the IPC commitment of 150,000 acre-feet, whereas IPC took the position that the BPA storage was included in the 150,000 acre-feet commitment. This difference in interpretation represented about a one-day difference in the length of time that Snake River flows then occurring could be augmented to a desirable level with the Water Budget.

#### **2. Supporting Rationale**

##### **a. Streamflow and Water Supply**

Reservoirs were filling or holding during the previous week, with Dworshak reservoir at elevation 1573 and Grand Coulee reservoir at 1263 on April 27 (Figure 2). Flood control requirements were being adjusted daily because of fluctuating runoff conditions. During the previous week, streamflows averaged 158 kcfs at Priest Rapids Dam, 67 kcfs at Lower Granite Dam, and 233 kcfs at The Dalles Dam (Table 4).

The COE projected average flow greater than 135 kcfs for this week at Priest Rapids Dam, whereas the SSARR projection made on April 25 was for a weekly average of 145 kcfs.

Ten-day SSARR projections for the Snake River at Lower Granite Dam indicated a steady increase in uncontrolled runoff that would result in continuous daily flow increases between April 30 and May 6. That, coupled with the fact that augmenting the current April 26 flows to meaningful levels would exhaust the Water Budget in four or five days, provided some of the reasons for the FPC decision to get new SSARR projections and reassess conditions on Monday, April 30. The ten-day SSARR projections of April 30 indicated that flows at Lower Granite Dam would steadily increase from 60 kcfs to 90 kcfs by May 10, ten days later. The FPC decision was to continue day-by-day monitoring to see if the projected flows materialized, and to reassess flow conditions, along with other factors (discussed below) and options for Water Budget use on Thursday, May 3. On May 3, the ten-day SSARR projections showed Lower Granite flows reaching 100 kcfs on May 9 due to the

need to increase Dworshak Dam outflow to 10 kcfs on that date, and remaining for several more days near 10 kcfs to provide flood control space in anticipation of increased runoff. Flows after May 9 were projected to drop at a rate of about 5 kcfs per day through May 13, the 10th day out. On May 3, the FPC decision for most effective use of the Water Budget was to wait until the flows reached the projected 100 kcfs, and then use it to maintain flow at that level as long as possible. This decision was to be reassessed on Monday, May 7.

**b. Smolt Monitoring**

Total hatchery releases of spring migrants above Bonneville Dam as of April 26 was about 51.9 million fish, which was 90% of the planned spring outmigration releases. About 2.9 million spring migrants had been transported by April 26, mostly from Lower Granite Dam.

Snake River index counts for all species at Lower Granite Dam increased dramatically to more than 308,000 fish on April 23, and remained high with more than 246,000 fish reported on April 26 when the first Snake River Water Budget decision was made for this week (Figure 3). Yearling chinook and steelhead passage at Little Goose and Lower Monumental dams also increased greatly during the previous week. On April 30, when the assessment of passage conditions was made, it appeared that migrating fish were in good condition, except for descaling levels 2-3% above normal at Lower Granite Dam, likely due to the trash racks requiring cleaning. Spring chinook made up about 27% of the total collection at Lower Granite Dam on that date. PIT tag data indicated that wild spring chinook were arriving at Lower Granite Dam along with the hatchery fish, the largest numbers of marked wild chinook passing from April 19 to 25. Considering all factors, a decision was made on April 30 to release Dworshak Hatchery steelhead on May 3 and 4. Several days later at the May 3 assessment of passage conditions, these items were noted: (1) ATPase levels were following the trend for past years; (2) spring chinook migration was nearing the end at Lower Granite Dam; (3) steelhead median passage at Lower Granite Dam was expected during the week of May 10-16; and (4) wild chinook migration at Lower Granite peaked on April 23 and 24, based on PIT-tag data.

Mid-Columbia passage indices for yearling chinook at Rock Island Dam reached their first peaks last week on April 23 and 24, as large numbers from Leavenworth Hatchery passed the project. Spring chinook from Winthrop and Entiat hatcheries were also passing the project by the end of the previous week.

Lower Columbia passage indices followed an increasing trend last week at McNary and John Day dams (Figure 3). Brand recoveries at McNary Dam indicated that both mid-Columbia and Snake River smolts were entering the lower river. Coho, followed closely by spring chinook, was the dominant species at Bonneville Dam during the previous week.

### **c. Water Quality**

Water temperatures remained nearly the same over the previous two weeks and, by April 29, were near normal at most locations for this time of year. Dissolved gas levels also did not show much change over that period.

### **d. Other Considerations**

Cooler, wetter weather had increased the April precipitation nearer to normal by April 25, reaching 60% of normal above Grand Coulee Dam, 95% above Ice Harbor Dam, and 68% above The Dalles Dam. The forecast was for a few more days of temperatures below normal and precipitation above normal, with the snow level dropping to elevation 3,000 or lower, followed by a warming trend. These forecasted conditions, if held, would increase the anticipated uncontrolled runoff in the Snake drainage during the next week, thereby increasing the effectiveness of contemplated Water Budget flow augmentation.

## **WEEK 4: MAY 7 - 13**

### **1. Water Budget Implementation**

No Water Budget flow augmentation was requested for the mid-Columbia for this week. That decision, made on May 3, also applied to the Snake River Water Budget but was changed on Monday, May 7 because of both the failure of projected Snake River flow levels to occur and the status of the smolt migration, as described below under Supporting Rationale. The COE Reservoir Control Center was notified early on May 7 of the decision for Water Budget flow augmentation in the Snake River. The request was for flow augmentation to 90 kcfs at Lower Granite Dam, starting May 8, and continuing until the shapeable Water Budget was used or until otherwise notified by the FPC. The COE implemented the request about six hours after receiving it, bringing Dworshak Dam outflow to 25 kcfs by 1800 hours on May 7. Because additional time was needed for IPC to make power marketing arrangements, the use of Water Budget from Brownlee reservoir did not occur until May 9. Brownlee Dam outflow reached 29 kcfs by 1300 hours on that date.

### **2. Supporting Rationale**

#### **a. Streamflow and Water Supply**

Flood control rule curves, based upon April 30 data, allowed for increased storage in May, except at Grand Coulee reservoir. These rule curves were subject to change when the official May runoff forecast became available later during this week. Until then, Grand Coulee reservoir was to be held at its May 4 level (Figure 2). Dworshak reservoir was to be held 10 feet below full pool; this would require increasing outflow to full powerhouse capacity by the middle of this week. Brownlee reservoir was nearly full on May 4. In response to recent rains and the aforementioned flood control

operations, streamflows increased during the previous week to averages for the week of about 161 kcfs at Priest Rapids Dam, 61 kcfs at Lower Granite Dam, and 223 kcfs at The Dalles Dam.

The COE provided an average flow projection of greater than 135 kcfs for this week at Priest Rapids Dam, and the May 7 SSARR projections, which took planned power operations into account, were for a weekly average of 164 kcfs.

In contrast, the increased uncontrolled runoff and accompanying streamflow projected on May 3 for the Snake River for this week did not materialize. Lower Granite flow was 21 kcfs below that anticipated, reaching only 71 kcfs on May 7. The May 7 SSARR projections showed a continuing decrease to 40 kcfs below the earlier anticipated 100 kcfs by May 11. Those declining flow projections, coupled with other factors discussed below, prompted the request for Water Budget flow augmentation this week.

#### **b. Smolt Monitoring**

Hatchery releases above Bonneville Dam of spring migrants reached 54.0 million fish on May 3, which was 93% of the planned spring outmigration release. About 5.4 million juvenile fish had been transported by that date; 3.7 million from Lower Granite Dam, 0.8 million from Little Goose Dam, and 0.9 million from McNary Dam.

Snake River index counts for all species declined at Lower Granite Dam along with decreasing flows through the start of this week, reaching a low during that period of about 146,000 fish on May 1 and 2 (Figure 3). Counts dramatically increased to more than 383,000 fish by May 9, the second day of Water Budget flow augmentation. For the remainder of this week, counts remained near or above 200,000 fish per day; flows were held above 81 kcfs, compared to the requested 90 kcfs flow level. Passage indices also increased with the higher flows at Little Goose and Lower Monumental dams.

Mid-Columbia passage indices increased at Rock Island Dam this week, reflecting the movement of several hatchery releases, and the influence of the relatively high flow of 188 kcfs on May 8.

With the exception of substantial increases in sockeye salmon passage this week at John Day, The Dalles, and Bonneville dams, lower Columbia passage indices remained fairly uniform with occasional spikes. As in the mid-Columbia River, the relatively high flow of 276 kcfs on May 9 produced a passage peak at McNary Dam.

#### **c. Water Quality**

Water temperatures dropped as low as 46°F for several days in the Snake River, 49°F in the mid-Columbia, and 51°F in the lower Columbia River. This was cooler than normal for this time of year at all locations. Dissolved gas was below 105% saturation in the lower Snake River, and ranged from 110-115% in the mid- and lower Columbia rivers.

**d. Other Considerations**

Late April precipitation resulted in small increases in the official May forecasted January-July runoff at most locations, except for a sizeable decrease in the Brownlee watershed which, in turn, decreased runoff measured at Lower Granite Dam. Precipitation through May 8 was only 22% of average for the month above Grand Coulee Dam, 13% above Ice Harbor Dam, and 23% above The Dalles Dam. This further worsened the runoff volume potential, adding to the difficulty of securing adequate flows in the lower Snake River, and increasing the importance of judicious Water Budget use.

**WEEK 5: MAY 14 - 20**

**1. Water Budget Implementation**

The FPC requested Water Budget flow augmentation for 140 kcfs average for this week at Priest Rapids Dam. The lower Snake River Water Budget flow augmentation request made on May 7 remained in effect until May 15, when all of the shapable Water Budget volume was used. During that 9-day period, 305,000 acre-feet of Water Budget was provided from Dworshak reservoir and 144,000 acre-feet from Brownlee reservoir. Daily accounting of the use of the 1990 Snake River Water Budget is detailed in Table 5. To counteract the sudden drop in flows to the low 40's that followed the end of shapable Water Budget use, the FPC requested continued flow supplementation from Dworshak and Brownlee reservoirs. Continued flow supplementation at this time would be of the greatest benefit to migrating fish, rather than immediately filling the reservoirs and later releasing excess water after the fish migration had tailed off. The COE advised the FPC that additional water could not be provided from Dworshak reservoir because the refill probability at that time had dropped to 86%.

**Table 5. 1990 Snake River Water Budget accounting**

Date	LGR flow kcfs	Base flow		Outflow		WB used	
		kcfs		kcfs		ksfd	
		DWR	BRNin	DWR	BCD	DWR	BCD
M 5/7	70.9	9.50	—	13.90	—	4.40	—
T 5/8	86.0	9.50	—	24.90	—	15.40	—
W 5/9	84.2	9.50	11.18	25.00	20.41	15.50	9.23
T 5/10	88.6	9.50	11.49	22.50	27.45	13.00	15.96
F 5/11	83.2	2.20	13.89	21.60	24.95	19.40	11.06
S 5/12	85.0	2.20	7.55	25.00	21.49	22.80	13.94
S 5/13	81.1	2.20	10.73	24.80	21.46	22.60	10.73
M 5/14	83.5	2.20	10.49	24.70	17.85	22.50	7.36
T 5/15	77.9	2.20	10.45	20.70	14.90	18.50	4.45
						Σ 154.10	Σ 72.73
						= 305 kaf	= 144 kaf

LGR = Lower Granite Dam; DWR = Dworshak Dam; BCD = Hells Canyon Dam

## **2. Supporting Rationale**

### **a. Streamflow and Water Supply**

The May runoff forecast did not result in revised flood control rule curve elevations and most reservoirs continued filling. Grand Coulee reservoir was at elevation 1260 on May 11, compared to a May 31 flood control rule curve elevation of 1265. Drawdown of Dworshak and Brownlee reservoirs (13 and 10 feet, respectively) for Water Budget flow augmentation created enough storage space below their flood control rule curves to put them in a refill mode after the Water Budget was exhausted (Figure 2). During the previous week, streamflows averaged about 139 kcfs at Priest Rapids Dam, 83 kcfs at Lower Granite Dam, and 237 kcfs at The Dalles Dam (Table 4). The flow averages for the Snake and lower Columbia rivers incorporate the effect of Water Budget flow augmentation.

On May 10, the COE projected average flow greater than 110 kcfs for this week at Priest Rapids Dam, whereas the SSARR projection of May 11, which incorporated the Water Budget request, indicated that the weekly average would be 144 kcfs. SSARR projections showed a rapid drop in flows to the 40's at Lower Granite Dam following Water Budget implementation.

### **b. Smolt Monitoring**

Only 320,600 hatchery spring migrants were released during the previous week.

Snake River index counts for all species at Lower Granite Dam once again decreased sharply as flows decreased. They dropped from 197,340 fish on May 12, when flows were 85 kcfs with Water Budget augmentation, to only 59,250 on May 17, when flows dropped to 46 kcfs following the May 15 end of Water Budget augmentation. The number of steelhead entering Lower Granite reservoir still remained high, based on collections at the Snake River and Clearwater River traps.

Mid-Columbia smolt movement past Rock Island Dam remained fairly constant during the previous week for all species except steelhead. Steelhead passage indices decreased each day.

Lower Columbia passage indices also were fairly constant for most species. Steelhead passage at McNary Dam was increasing and was expected to continue increasing as the middle of the migration approached. It was estimated that 50% of the spring chinook run was past McNary Dam and in the lower river. Snake River and mid-Columbia spring chinook hatchery stocks were at both McNary and Bonneville dams during this week.

### **c. Water Quality**

Water temperatures increased steadily during the previous week, reaching 54°F in the lower Snake River, 52°F in the mid-Columbia, and 55°F in the lower Columbia River. This was near normal for that time of year (Figure 4). Dissolved gas continued at about 110-115% saturation in the mid-Columbia River, and below 110% in the Snake and lower Columbia rivers.

#### **d. Other Considerations**

The mid-month runoff forecasts in May showed an additional drop in both the January-July and April-July runoff volumes at all locations. These forecasts reflected the below normal precipitation so far in May, and assumed 70% of normal precipitation for the remainder of the month. Precipitation through May 15 was 72% of average for the month above Grand Coulee Dam, 60% above Ice Harbor Dam, and 65% above The Dalles Dam. The short-range outlook was for continuation of cooler-than-normal weather, which would keep the freezing level below elevation 6,000 feet and continue to slow the rate of snowmelt.