

C. 1990 WATER BUDGET IMPLEMENTATION CHRONOLOGY

The following chronology summarizes the Water Budget flow augmentation decisions made going into each weekly Water Budget period, and the rationale and other considerations used in determining whether or not to submit a Water Budget request for a particular week. The discussion for a given week centers on events, circumstances, and information available at the beginning of the week. Any changes in conditions from what was anticipated when decisions were made for the week in question are also discussed.

Mid-Columbia River flow augmentation with the Water Budget is implemented in weekly time increments. Snake River flow augmentation with the Water Budget can be on a day-by-day basis because of the relatively small shapeable² Water Budget volume available. In either case, decisions on Water Budget usage are based on the information available at the time the decisions are made. Supporting smolt monitoring data for the discussions that follow appear in Section IV of this report.

A series of figures and tables are presented in the week-to-week chronology; they will be useful references for the discussions to follow. Figure 2 illustrates reservoir elevations from April 1 through June 30 for Dworshak, Brownlee, and Grand Coulee reservoirs, and the Water Budget use days for their respective river reaches, and illustrates the impact of the Water Budget on these reservoirs. Figure 3 shows the relationship between flows and smolt index counts in the Snake, mid-Columbia, and lower Columbia rivers, requested flow levels with Water Budget flow augmentation, and the Water Budget use days during the spring migration period. Figure 4 illustrates daily water temperatures from March through August, compared to the average for 1981 through 1989. Tables 4 and 5 summarize Water Budget requests and responses in the Columbia and Snake rivers, respectively. Detailed supporting data for statements regarding the levels of streamflows and smolt indices appear in corresponding Weekly Reports published by the FPC during the migration season. Plots of smolt migration timing at monitoring sites appear in Appendix E.

WEEK 1: APRIL 16 - 22

1. Water Budget Implementation

No Water Budget flow augmentation was requested for this week. Based on the 1990 Water Budget CPO guidelines, Dworshak reservoir was to provide 308,000 acre-feet of Water Budget shapeable by the FPC and 307,000 acre-feet for firm power base flow. Idaho Power Company (IPC) committed Brownlee reservoir participation to 150,000 acre-feet.

² The term "shapeable" was adopted by the COE to identify the volume of Water Budget stored in Dworshak that is controlled by the fish passage manager in terms of the timing and rate of its use to augment flows.

2. Supporting Rationale

a. Streamflow and Water Supply

Streamflows during the previous week averaged about 139 kcfs at Priest Rapids Dam, 47 kcfs at Lower Granite Dam, and 190 kcfs at The Dalles Dam. The COE projected average flows greater than 130 kcfs at Priest Rapids Dam for this week, and the computer simulation of system streamflow and reservoir regulation (SSARR) indicated an average flow of 143 kcfs at Priest Rapids for this week. The SSARR projection also indicated that Snake River flows at Lower Granite would continue at about 49 kcfs for the week.

Reservoirs were at, or near, April 30 flood control rule curve elevations (Figure 2). Therefore, additional drawdowns resulting in significant flow increases were not expected. The sizeable drop in forecasted runoff volume indicated by the April forecast could lead to reduction of flood control requirements. Planned reservoir operation at this time was to maintain Grand Coulee reservoir no lower than its April 30 flood control rule curve elevation of 1257.6 feet, and to operate Dworshak Dam at 4600 cfs outflow, which is full load on the two small units, for the remainder of April. Dworshak reservoir inflow at this time was about 17,000 cfs. This would keep more water in storage for later flow augmentation with less impact on refill probability. At the start of this week, BPA had stored the energy equivalent of about 30,000 acre-feet in Brownlee reservoir under its 1990 agreement with IPC for the Water Budget contribution from Brownlee reservoir.

b. Smolt Monitoring

Hatchery releases of spring migrants above Bonneville Dam totaled 33 million fish as of April 12 (including fall 1989 and early spring 1990 releases). This was 57% of the planned 57.8 million hatchery fish released for outmigration in the spring of 1990. Another 23.2 million hatchery summer migrants would not begin to be released until closer to mid-May, for a total of approximately 81 million hatchery fish being released for outmigration in 1990.

By the end of this week, hatchery releases of spring chinook in the Snake River drainage were nearing completion, totaling more than 15 million fish, while about 10 million hatchery steelhead still remained to be released. Smolt index counts at Lower Granite Dam exhibited a steady, rapid increase last week from about 8,000 on April 9 to nearly 71,000 on April 15 (Figure 3). Spring chinook from Lookingglass Hatchery dominated the branded recoveries, followed by spring chinook from Rapid River Hatchery. Wild steelhead ranged from 80 to 94% of the juvenile steelhead collected at Lower Granite Dam. Collections at Lower Monumental Dam continued at low levels. Transportation of juveniles collected at Lower Granite Dam was under way, with small numbers transported by truck until the run size increased and barging started on April 11. It was estimated that the Snake River migration at Lower Granite Dam reached the 10% point during the previous

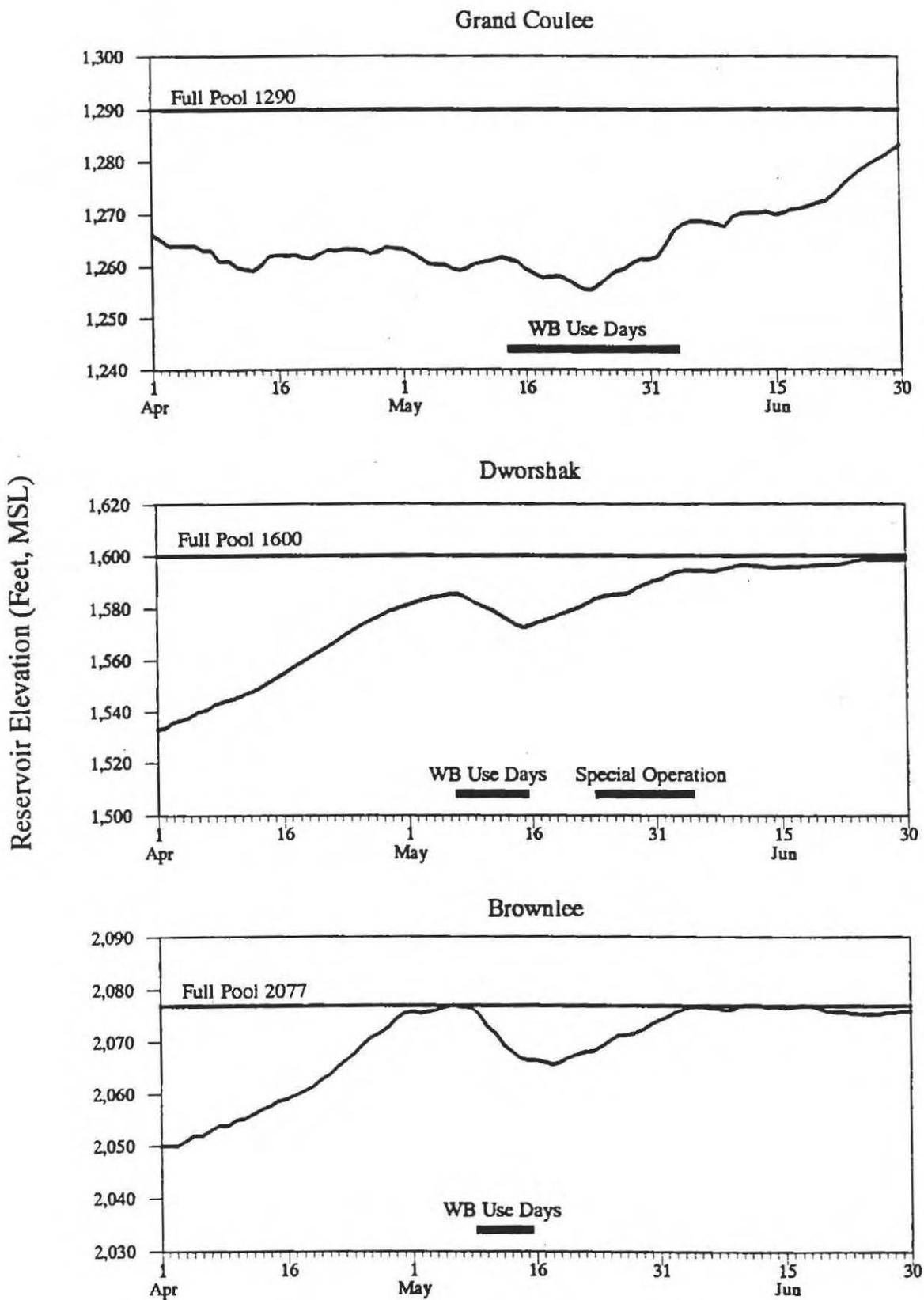


Figure 2. 1990 Reservoir elevations and Water Budget use days.

week.

During the previous week, hatchery releases in the mid-Columbia River drainage totaled only about 2 million fish, and collections at Rock Island Dam were low (Figure 3). Most of the planned spring chinook releases from mid-Columbia hatcheries were scheduled for this week.

Lower Columbia River hatchery releases totaled more than 11 million fish last week, with the second of three planned releases from Spring Creek Hatchery taking place on April 12. This required special operations at Bonneville Dam to increase smolt survival in the lower river. Most of the spring chinook releases from lower Columbia hatcheries were completed by the end of this week. About one-half of the Ringold Hatchery spring chinook releases had been accounted for at McNary Dam by April 13. Smolt transportation from McNary Dam was under way at that time.

c. Water Quality

Water temperatures were holding at about 49°F during the previous week throughout the system. This was about two or three degrees above normal for that time of year (see Figure 4). Dissolved gas data were not yet available for the 1990 season.

d. Other Considerations

Precipitation through April 19 had been only 46% of normal for the month above Grand Coulee Dam, 16% above Ice Harbor Dam, and 30% above The Dalles Dam. The 6 to 10-day weather forecast, however, indicated cooler, wetter weather, which could increase uncontrolled runoff and streamflows without the need for flow augmentation. Countering this possibility of natural increases in streamflow over the next 10 days was the fact that recent dry, warm weather with air temperatures from 10 to 15°F above normal had removed most of the low elevation snowpack, thereby reducing the residual runoff volume.

WEEK 2: APRIL 23 - 29

1. Water Budget Implementation

No Water Budget flow augmentation was requested for either the mid-Columbia or Snake rivers.

2. Supporting Rationale

a. Streamflow and Water Supply

Reservoirs continued to be operated at outflow rates needed to keep reservoir elevations within flood control rule curve requirements. Dworshak and Brownlee reservoirs continued to fill during the previous week and Grand Coulee reservoir held fairly constant at elevation 1263 (Figure 2). During the previous week, streamflows averaged 133 kcfs at Priest Rapids Dam, 65 kcfs at Lower Granite Dam, and 209 kcfs at The Dalles Dam (Table 4). The COE projected average flows greater than 140 kcfs at Priest Rapids Dam for this week, and the SSARR projections indicated that the

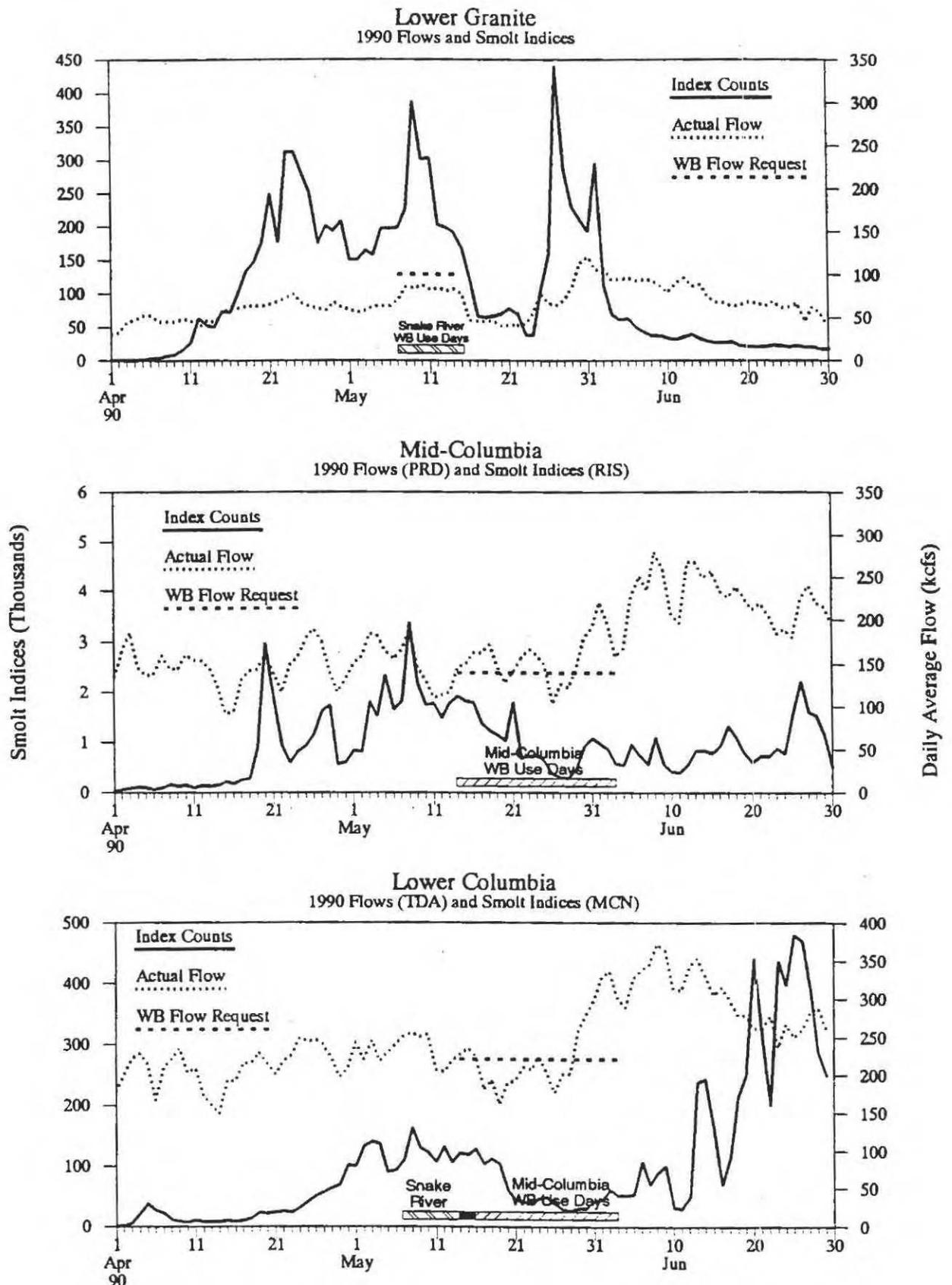


Figure 3. 1990 Smolt indices, flows, and Water Budget use days.

Water Temperature

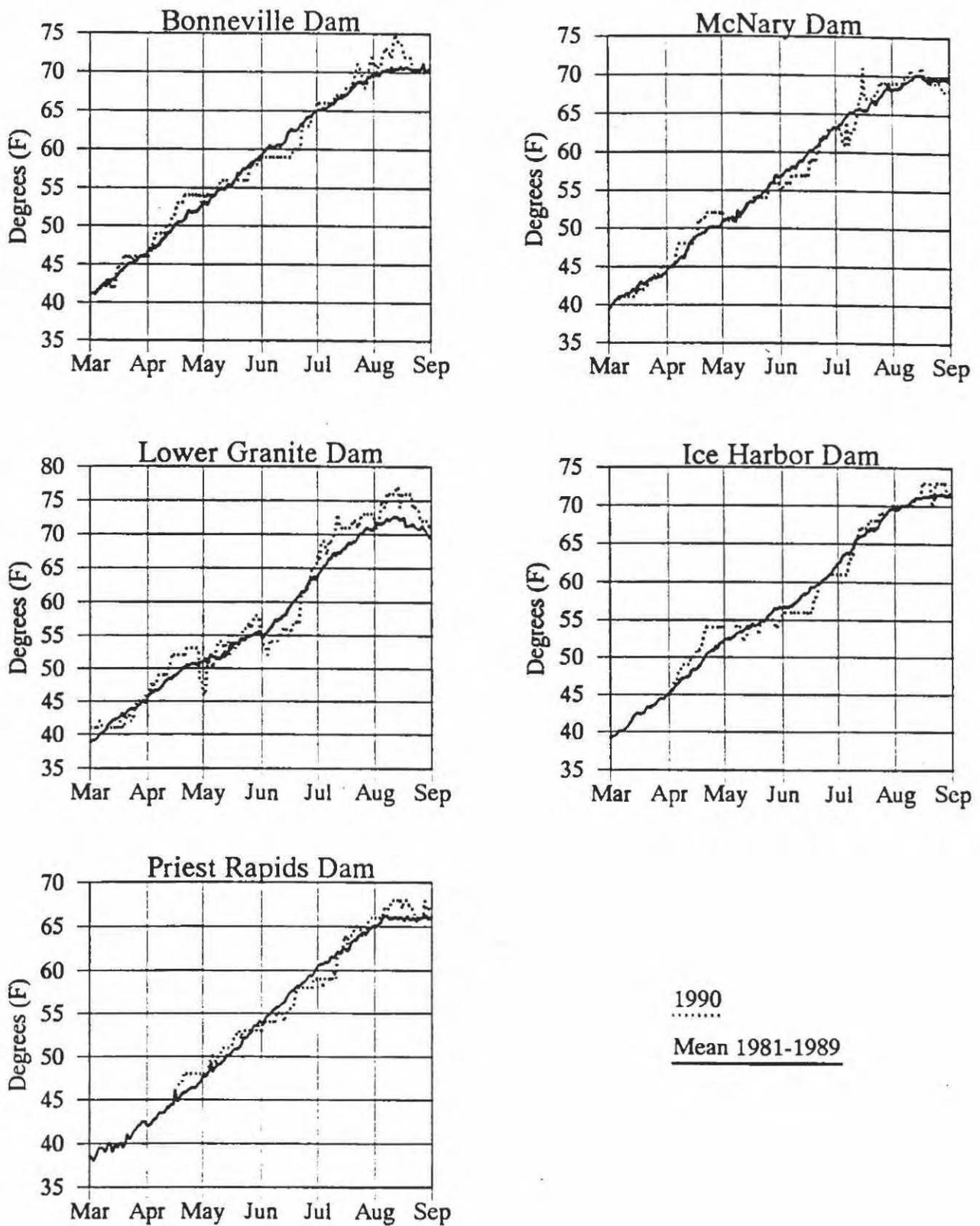


Figure 4. 1990 River temperatures at key hydroelectric projects.

Table 4. 1990 mid-Columbia Water Budget accounting and control point streamflows.

MID-COLUMBIA					
	PRD flow <u>kcfs</u>	WB use <u>MAF</u>	WB sum <u>MAF</u>	TDA flow <u>kcfs</u>	LGR flow <u>kcfs</u>
<u>APRIL 16 - 22:</u>					
1. FP Mgrs Request	No WB				
2. Projected w/o WB	130				
3. Actual	133	0.00	0.00	209	65
4. Weekday Ave.	135		209		
5. Weekend Ave.	128		207		
6. % Wkend/Wkday	95		99		
<u>APRIL 23 - 29:</u>					
1. FP Mgrs Request	No WB				
2. Projected w/o WB	>140				
3. Actual	158	0.00	0.00	233	67
4. Weekday Ave.	170		236		
5. Weekend Ave.	128		225		
6. % Wkend/Wkday	76		95		
<u>APRIL 30 - MAY 6:</u>					
1. FP Mgrs Request	No WB				
2. Projected w/o WB	>135				
3. Actual	161	0.00	0.00	223	61
4. Weekday Ave.	162		223		
5. Weekend Ave.	161		223		
6. % Wkend/Wkday	99		100		
<u>MAY 7 - 13:</u>					
1. FP Mgrs Request	No WB				
2. Projected w/o WB	>135				
3. Actual	139	0.00	0.00	237	83
4. Weekday Ave.	149		250		
5. Weekend Ave.	116		205		
6. % Wkend/Wkday	78		82		
<u>MAY 14 - 20:</u>					
1. FP Mgrs Request	140*				
2. Projected w/o WB	>110				
3. Actual	153	0.89	0.89	206	55
4. Weekday Ave.	159		217		
5. Weekend Ave.	138		177		
6. % Wkend/Wkday	87		82		
<u>MAY 21 - 28 (Mem. Day Wkend):</u>					
1. FP Mgrs Request	140*			220	
2. Projected w/o WB	110				
3. Actual	141	1.01	1.90	201	58
4. Weekday Ave.	155		206		
5. Weekend Ave.	117		193		
6. % Wkend/Wkday	76		94		
<u>MAY 29 - JUNE 3:</u>					
1. FP Mgrs Request	140*			220	
2. Projected w/o WB	100				
3. Actual	182	0.76	2.66	283	105
4. Weekday Ave.	184		259		
5. Weekend Ave.	177		332		
6. % Wkend/Wkday	96		128		
<u>JUNE 4 - 10:</u>					
1. FP Mgrs Request	No WB				
2. Projected w/o WB	>140				
3. Actual	234	0.00	2.66	333	91
4. Weekday Ave.	235		319		
5. Weekend Ave.	232		367		
6. % Wkend/Wkday	99		115		
<u>JUNE 11 - 15:</u>					
1. FP Mgrs Request	No WB				
2. Projected w/o WB	>140				
3. Actual	248	0.00	2.66	331	88

* Basis for Water Budget accounting

weekly average would be about 161 kcfs at Priest Rapids Dam, 63 kcfs at Lower Granite Dam, and 235 kcfs at The Dalles Dam.

b. Smolt Monitoring

As of April 19, hatchery releases of spring migrants above Bonneville Dam totaled 47.9 million fish, 82.9% of the planned 57.8 million fish to be released for the springtime migration period.

Snake River collections of spring chinook showed large increases during the previous week at Lower Granite, Little Goose, and Lower Monumental dams. The daily index count for all species at Lower Granite Dam had increased from about 71,000 fish on April 15 to nearly 172,000 fish on April 22 (Figure 3). Physiological monitoring of fish collected at Lower Granite Dam on April 19 showed ATPase levels (a smoltification indicator) approach half the maximum level observed last year for spring chinook and a quarter of the maximum for steelhead. At Dworshak Hatchery, the steelhead were in good health and behaviorally appeared ready to migrate. Steelhead in Oregon hatcheries were also in excellent health. Continuous monitoring of streamflows, fish condition and ATPase level was important at this stage in the migration, to protect as many groups of fish as possible. These factors and the decision as to when to release Dworshak Hatchery's 1.2 million steelhead were to be reassessed on Monday, April 30.

Mid-Columbia passage indices at Rock Island Dam increased sharply on April 19 (Figure 3) due to the arrival of Leavenworth Hatchery spring chinook.

Lower Columbia collections at McNary Dam were dominated during the previous week by spring chinook from the mid-Columbia River drainage. McNary Dam shifted from full transport to partial bypass on April 20. Unit 5 at John Day Dam, which contained the airlift sampler, was out of service from April 16 through 18, creating a smolt monitoring gap at an important time during the spring chinook migration in the lower Columbia River.

c. Water Quality

During the previous week, water temperatures continued to be about three degrees above normal for that time of year, and reached 54°F in the lower Snake River on April 22 (Figure 4). Dissolved gas was below 110% saturation in the Snake and lower Columbia rivers, and slightly above 110% in the mid-Columbia River.

d. Other Considerations

Continuation of water temperatures above normal increased the importance of physiological monitoring, because temperature influences the rate of smoltification. Flow augmentation actions were being considered because of the influence of warmer water temperature on smoltification, fish health, and increased predator activity.