VII. OPERATING PLAN FOR 1997-98

Each year the regulation of the Columbia River Basin reservoir system is unique in many details but similar in seasonal characteristics. While most of this annual report describes the unique features of the past year's operation, this chapter briefly describes the general operating plan for the coming water year for major reservoirs.

A. GUIDELINES AND RULE CURVES

Seasonal operational guidelines were established either on a permanent basis in preconstruction documents or were developed, based on studies of historical stream flows that were adjusted for current conditions. These guidelines for the major reservoirs are given in Table 34. They were established on a continuing basis and are not changed each year, whereas other guidelines are recomputed annually or seasonally to meet varying conditions. These operating guidelines, or "rule curves," give a schedule of reservoir elevations that are desirable and provide guidance in meeting project functions: to assure adequate space is available for flood control, to assure adequate water to meet electric power demands by using storage and natural flow efficiently, and also to reasonably assure reservoir refill. The guidelines shown do not reflect special regulations under the ESA for fisheries.

The PNCA provides that prior to the start of each operating year (from August 1 through July 31), a reservoir operating and storage schedule be developed to provide the optimum firm energy load carrying capability (FELCC) for each reservoir in the coordinated system. System regulation studies are to define reservoir elevations as critical rule curves (CRC) on a monthly basis to ensure that adequate firm energy will be available from the coordinated system if there is a recurrence of any critical flow conditions.

Assured Refill Curves (ARC), consisting of monthly reservoir elevations, are also determined to limit reservoir drafts for secondary energy and guide the refill of reservoirs. These curves provide a high degree of assurance that a reservoir will refill by the end of the operating year. In some cases, refill target elevations are recomputed each month during the refill season based on the latest snowpack and precipitation measurements, and these are called variable energy content curves (VECC).

Each individual reservoir has several sets of curves. A listing of either monthly upper rule curve or flood control rule curve elevations, monthly critical rule curve elevations, and monthly base energy content curve elevations is given for some major reservoirs in Table 35. The values in this table indicate a range of mid-month and month-end elevations which are used as a guide in regulated individual reservoirs, as well as the total reservoir system. Obviously, operations must be flexible and deviations must be made from exact planned elevations to provide for changes in weather, inflows, load demands, plant outages, usual general seasonal considerations, and changing social priorities.

B. SPECIAL REGULATIONS UNDER ESA

Under the Endangered Species Act (ESA) two biological opinions were prepared, one for the white sturgeon and the other for Snake River salmon. The sturgeon biological opinion focuses on Libby's operation and attempts to replicate the pre-project spring runoff flow regimen. On the other hand, the biological opinion for salmon focuses on increasing spring and summer flow to assist juvenile downstream migration. To accomplish this, flow targets for the lower Columbia River at McNary Dam and the Snake River at Lower Granite Dam were developed, based on the forecasted runoff volume. Spring flow targets at McNary range from 220 to 260 kcfs, and the summer target is 200 kcfs. While at Lower Granite, spring flow targets range from 85 to 100 kcfs, and in the spring range from 50 to 55 kcfs.

Libby operates under the sturgeon and salmon biological opinion which requires the project to be on

minimum flow unless flood control evacuation requires a higher release. However, modifications have been made to project operations because the IJC order or flood control requirements cannot be violated. The special ESA operational guidelines are:

- April 15-30: Increase discharge to attain a flow of 15 kcfs at Bonners Ferry.
- May 1-19: Maintain a flow of 15 kcfs at Bonners Ferry.
- May 20-June 30: Increase discharge to support a flow of 35 kcfs at Bonners Ferry, without spilling.
- July 1-21: Decrease discharge to maintain a flow of 11 kcfs at Bonners Ferry.
- July 22-31: Decrease project discharge to four kcfs minimum flow.
- August 1-31: Increase project discharge to support McNary flow target, without spilling, if the reservoir is above 2439 ft.

The salmon biological opinion operation at Hungry Horse Dam requires the project to be at its flood control level on April 20 and draft to support the McNary flow target in August. Minimum elevation the reservoir would be drafted to, in order to support the flow target, is to between 3550 ft and 3540 ft, for August 15 and August 31, respectively.

There is a three-year test operation at Albeni Falls which is intended to maintain the reservoir at 2055 ft during the winter through April 29. The test operation will be concluded in April 1999.

Grand Coulee salmon biological opinion operation requires the reservoir to be at flood control elevation on April 20 and support McNary flow target through August 31. A reservoir draft limit of 1280 ft was used to support target flows.

To support the salmon biological opinion, Dworshak was operated on minimum flow unless a higher release is required for flood control evacuation and supported Lower Granite target flows through August 31. The reservoir augmented target flows down to 1520 ft while not exceeding a discharge of 14.0 kcfs.

Lower Malad flume entrance. The entrance to the Lower Malad powerhouse flume is located in the Upper Malad afterbay. The flow into the flume is controlled by a flume gate and the river gate structure. Note that the flume gate is closed (powerplant is out of service), diverting the water back into the river. US 30 bridge is in the background.

Table 34

PROJECT SEASONAL OPERATIONAL GUIDELINES

	LIBBY	DUNCAN	KOOTENAY LK	MICA	ARROW	HUNGRY HRS	
JL	Complete filling and hold full as long as possible subject to ESA operation.	Complete filling and hold full as long as . possible	Hold Lake elev in accordance with IJC.	Complete filling and hold full as long as possible.	Complete filling and hold full as long as possible.	Complete filling and hold full as long as possible subject to ESA operation.	JL
AU							AU
SE	Optional draft.	Optional draft.	Fill to normal full and hold as streamflows permit.	Optional draft.	Optional draft.	Optional draft. limited by ESA.	SE
OC					Optional draft.		OC
NO	Mandatory draft.				Optional draft.		NO
DE		Mandatory draft.			Mandatory draft.		DE
JA	Draft for flood control or on minimum flow	Draft for flood control a/o pwr requirements is dependent upon volume inflow forecasts.	Draft Lake in accordance with IJC Order.	Draft for flood control a/o power requirements is dependent upon volume inflow forecasts.	Draft for f/c a/o power requirements is dependent upon volume inflow fcst.	Draft for flood control or on minimum flow.	JA
FE							FE
MR		Fill as required for flood control or assured refill.					MR
AP	ESA sturgeon and salmon operation.		Operate in accordance with IJC Order. Lake on free flow once spring runoff begins.	Fill as required for flood control or assured refill.	Fill as required for flood control or assured refill.		AP
MY						ESA salmon operation.	MY
JU							JU

	ALBENI FALLS	GRAND COULEE	BROWNLEE	DWORSHAK	JOHN DAY	WILLAMETTE	
JL	Complete filling and hold full as long as possible.	Complete filling and hold full as long as possible subject to ESA operation.	Complete filling and hold full as long as possible.	Complete filling and hold full as long as possible subject to ESA operation.	Generally hold pool in a 3-ft operating range elevation 265-268 ft.	Reservoirs kept as full as possible, but meeting minimum flow is primary.	JL
AU							AU
SE	Optional draft.	Reservoir generally operated in top five ft.	Optional draft.	Mandatory draft.		Mandatory draft for winter flood control regulation.	SE
OC	Mandatory draft.			Mandatory draft limited to 1.3 kcfs over inflow.			OC
NO				Mandatory draft.	Generally hold pool between 263-265 ft. Flood control may require draft to 257 ft and filled to 268 ft.		NO
DE	Hold reservoir near level.	Optional draft limited by ESA.		Optional draft.		Operate to control winter floods.	DE
JA	Refill permitted to 2060 ft but must be at or below 2056 ft by Mar 30. Draft not permitted below Dec 1 level. Must to be at or abv 2054 ft by April 30.	Draft for flood control or on minimum flow.		Draft for flood control or on minimum flow.			JA
FE			Req at or below elev 2077 ft by Feb 29.			Generally fill from snowmelt & rainfall runoff.	FE
MR			Var flood cntl draft based on vol inflow.				MR
AP			Regulate as required by runoff conditions.				AP
MY	Fill as required for flood control.	ESA salmon operation.	Fill as required for flood control or assured refill.	ESA salmon operation.		Hold near full for summer recreation.	MY
JU	Normally try to fill by mid- June.						JU

Table 35

1997-98 MONTHLY OPERATING PLAN RESERVOIR RULE CURVES

PROJECT	1997							1998						
	JUL	AUG 15	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR 15	APR	MAY	JUN
MICA			Normal full pool 2475.0 ft					Minimum pool 2320.0 ft						
MRC		2469.8	2469.8	2469.8	2467.9	2467.9	2467.9	FCRC	FCRC	FCRC	FCRC	FCRC		
ECC	2469.8	2469.7	2469.8	2469.8	2469.8	2469.8	2469.8	2463.4	2453.9	2441.3	2435.6	2430.5	2432.5	2452.6
CRC1	2452.0	2465.3	2466.2	2462.8	2458.0	2448.6	2437.8	2414.7	2403.2	2397.3	2394.5	2395.1	2394.6	2422.9
CRC2	2439.6	2469.5	2469.8	2469.8	2466.0	2455.2	2440.4	2419.7	2406.6	2393.8	2389.9	2388.1	2395.8	2422.1
CRC3	2430.4	2458.8	2462.2	2461.5	2456.8	2447.5	2436.9	2414.5	2397.5	2395.5	2396.1	2394.4	2394.1	2414.1
CRC4	2393.8	2431.6	2431.5	2425.4	2416.5	2403.3	2393.9	2394.1	2393.8	2393.8	2393.8	2393.8	2393.8	2393.8
ARROW			Normal full pool 1444.0 ft					Minimum pool 1377.9 ft						
MRC		1444.0	1444.0	1444.0	1442.1	1442.1	1436.2	FCRC	FCRC	FCRC		FCRC		
ECC	1444.0	1444.0	1444.0	1443.3	1441.9	1439.7	1430.0	1412.6	1400.9	1406.6	1407.8	1409.5	1423.1	1439.1
CRC1	1435.7	1441.7	1441.2	1440.3	1435.8	1426.9	1414.1	1395.5	1382.4	1382.6	1380.1	1386.2	1392.8	1418.3
CRC2	1444.0	1440.7	1439.4	1436.2	1429.3	1423.8	1413.1	1391.5	1377.9	1383.6	1384.1	1385.5	1391.4	1421.9
CRC3	1415.5	1439.4	1438.6	1439.0	1434.8	1425.7	1412.0	1397.8	1380.2	1381.7	1381.0	1380.2	1392.9	1404.1
CRC4	1377.9	1416.1	1411.7	1411.1	1406.8	1404.5	1396.2	1386.2	1377.9	1377.9	1377.9	1377.9	1377.9	1377.9
DUNCAN			Normal full pool 1892.0 ft					Minimum pool 1794.2 ft						
MRC		1892.0	1892.0	1892.0	1892.0	1892.0	1868.6	FCRC	FCRC	FCRC	FCRC	FCRC		
ECC	1892.0	1892.0	1892.0	1890.5	1884.7	1868.4	1856.9	1838.9	1833.6	1838.8	1839.8	1837.7	1850.7	1843.0
CRC1	1824.1	1874.4	1867.2	1853.7	1826.5	1799.0	1798.7	1796.6	1797.6	1795.4	1798.2	1794.4	1794.2	1831.8
CRC2	1845.4	1881.4	1872.4	1861.3	1834.7	1806.9	1801.2	1797.5	1796.4	1795.4	1797.1	1794.4	1794.2	1836.0
CRC3	1819.1	1816.1	1823.2	1824.2	1796.9	1796.8	1796.4	1796.8	1796.6	1796.0	1797.3	1795.2	1807.2	1830.2
CRC4	1794.2	1805.0	1795.7	1794.8	1794.6	1794.2	1794.2	1794.2	1794.2	1794.2	1794.2	1794.2	1794.2	1794.2
LIBBY			Normal full pool 2459.0 ft					Minimum pool 2287.0 ft						
MRC		2459.0	2459.0	2459.0	2459.0	2448.0	2411.0	FCRC	FCRC	FCRC	FCRC	FCRC		
ECC		2459.0	2459.0	2447.0	2443.2	2430.9	2424.2	2421.7	2419.0	2416.3	2415.5	2413.8	2433.7	2456.5
CRC1	2442.7	2454.0	2453.4	2443.7	2435.2	2405.3	2368.7	2359.1	2356.1	2352.3	2355.7	2367.7	2400.4	2423.5
CRC2	2427.8	2438.3	2439.0	2433.6	2430.3	2419.7	2411.0	2406.9	2403.5	2400.2	2398.9	2397.0	2413.2	2415.9
CRC3	2400.6	2456.5	2453.9	2445.4	2445.2	2426.0	2390.3	2363.9	2331.3	2301.9	2300.2	2300.0	2345.2	2387.0
CRC4	2287.0	2396.4	2397.3	2378.4	2373.8	2366.8	2362.9	2303.6	2287.0	2287.0	2287.0	2287.0	2287.0	2287.0
HUNGRY HORSE			Normal full pool 3560.0 ft					Minimum pool 3336.0 ft						
MRC		3560.0	3560.0	3560.0	3560.0	3560.0	3560.0	FCRC	FCRC					
ECC	3560.0	3560.0	3560.0	3560.0	3560.0	3560.0	3559.7	3555.1	3551.8	3548.4	3545.0	3535.3	3552.1	3560.0
CRC1	3476.1	3552.8	3544.2	3517.8	3496.1	3484.7	3455.6	3401.9	3390.1	3369.7	3392.6	3424.0	3468.1	3468.9
CRC2	3558.1	3550.0	3540.1	3535.1	3529.1	3522.7	3515.5	3507.3	3499.5	3490.7	3488.3	3493.7	3529.3	3552.5
CRC3	3443.6	3526.6	3517.0	3488.7	3468.6	3460.7	3428.8	3390.2	3380.0	3358.1	3358.1	3358.1	3436.1	3453.7
CRC4	3336.0	3446.2	3439.5	3432.5	3423.9	3413.4	3390.8	3340.9	3336.0	3336.0	3336.0	3336.0	3336.0	3336.0
FLATHEAD LAKE			Normal full pool 2893.0 ft					Minimum pool 2883.0 ft						
MRC		2893.0	2893.0	2893.0	2893.0	2893.0	2893.0							
ECC	2892.7	2893.0	2893.0	2893.0	2892.4	2889.7	2889.0	2887.1	2885.2	2883.6	2884.8	2884.8	2890.0	2893.0
CRC1	2893.0	2893.0	2893.0	2893.0	2892.2	2890.1	2889.3	2889.3	2886.0	2883.9	2884.0	2886.2	2890.0	2893.0
CRC2	2893.0	2893.0	2893.0	2892.4	2891.9	2889.0	2886.9	2885.4	2884.2	2883.0	2883.0	2883.1	2890.0	2893.0
CRC3	2893.0	2893.0	2893.0	2893.0	2891.9	2890.9	2889.6	2888.2	2885.0	2883.7	2883.7	2884.4	2890.0	2893.0
CRC4	2883.0	2892.7	2892.7	2892.7	2891.0	2887.9	2885.3	2884.2	2883.0	2883.0	2883.0	2883.0	2883.0	2883.0
ALBENI FALLS			Normal full pool 2062.5 ft					Minimum pool 2049.7 ft						
MRC		2062.5	2062.5	2062.5	2060.0	2056.0	2056.0	FCRC	FCRC	FCRC				
ECC	2062.0	2062.5	2062.5	2060.0	2054.0	2051.0	2051.0	2051.0	2051.0	2051.0	2054.0	2057.0	2062.0	2062.0
CRC1	2062.0	2062.0	2062.0	2060.0	2054.0	2051.0	2051.0	2051.0	2051.0	2051.0	2051.0	2054.0	2057.0	2062.0
CRC2	2062.5	2062.5	2062.5	2060.0	2054.0	2051.0	2051.0	2051.0	2051.0	2051.0	2054.2	2056.0	2057.0	2062.5
CRC3	2062.0	2062.0	2062.0	2060.0	2054.0	2051.0	2051.0	2051.0	2051.0	2051.0	2051.0	2054.0	2057.0	2062.0
CRC4	2049.7	2062.0	2062.0	2060.0	2054.0	2051.0	2051.0	2051.0	2049.7	2049.7	2049.7	2049.7	2049.7	2049.7
GRAND COULEE			Normal full pool 1290.0 ft					Minimum pool 1208.0 ft						
MRC		1290.0	1290.0	1290.0	1290.0	1290.0	1290.0	FCRC	FCRC	FCRC		FCRC		
ECC	1290.0	1290.0	1290.0	1288.3	1288.3	1288.3	1288.1	1289.3	1289.9	1269.0	1281.4	1282.4	1245.6	1285.1
CRC1	1290.0	1289.9	1288.0	1288.0	1288.0	1289.7	1288.1	1280.6	1274.3	1245.6	1253.0	1267.3	1265.5	1290.0
CRC2	1280.1	1280.1	1280.1	1282.3	1284.1	1285.1	1279.3	1288.8	1289.9	1283.1	1278.4	1280.1	1283.1	1282.1
CRC3	1289.6	1290.0	1289.8	1289.2	1288.4	1288.2	1288.4	1290.0	1290.0	1265.9	1264.9	1257.8	1261.7	1289.8
CRC4	1208.0	1289.3	1290.0	1290.0	1289.2	1283.3	1259.1	1241.3	1208.0	1208.0	1208.0	1208.0	1208.0	1208.0
DWORSHAK			Normal full pool 1600.0 ft					Minimum pool 1445.0 ft						
MRC		1600.0	1600.0	1587.7	1581.9	1568.9	1558.2	FCRC	FCRC	FCRC	FCRC			
ECC	1600.0	1569.7	1569.9	1569.4	1570.6	1568.9	1558.2	1556.8	1556.1	1562.9	1577.5	1588.9	1593.2	1600.0
CRC1	1563.9	1574.6	1574.4	1573.5	1573.2	1568.9	1558.2	1556.9	1562.0	1573.7	1578.4	1584.2	1575.8	1589.5
CRC2	1532.8	1519.9	1519.3	1518.2	1516.4	1514.6	1514.1	1511.6	1510.2	1514.1	1523.2	1523.6	1552.7	1560.5
CRC3	1598.3	1592.0	1591.6	1586.0	1581.9	1568.9	1558.2	1559.8	1562.2	1576.7	1589.0	1583.1	1587.6	1597.1
CRC4	1445.0	1588.1	1587.1	1583.5	1580.0	1568.9	1538.9	1494.4	1445.0	1445.0	1445.0	1445.0	1445.0	1445.0