An Analysis of the Monthly Release Volumes Temporally Adjacent to a Beach Habitat Building Flow Triggered by the Recently Developed Triggering Criteria

Background

When the 1996 Annual Operating Plan was issued containing the agreement between the Secretary of the Interior and the Basin States regarding Beach/Habitat Building Flows (BHBF's), there were some concerns about the magnitude of monthly release volumes during other months in years when BHBF's would occur. The greatest concern focused on potential sediment transport and the erosion of beach deposits, particularly if flows in the months following a BHBF were near powerplant capacity (~33,200 cfs).

During the last few months, as the triggering criteria were developed to completely define the 1996 agreement, all parties involved attempted to define criteria that reflected a reasonable risk or certainty that a spill would occur later in the spring. Under this criteria, when the reservoir was at its target storage level of 21.5 MAF on January 1 there is about a 1 in 3 chance of a BHBF being triggered sometime between January and June. This report analyzes both the monthly releases expected to occur at the time such a BHBF was triggered and the monthly releases that actually occurred.

Expected Releases

In order to achieve a reasonable level of risk of a spring spill, the subgroup believed a BHBF would need to be triggered prior to the scheduling of maximum powerplant releases for the remainder of the runoff season, i.e., before a spring spill became an absolute certainty. With Reclamation's monthly release scheduling philosophy, releases have been aggressively increased when there is a high potential for a spring spill. Therefore, if an inflow forecast were to indicate the potential for high releases to avoid spills, releases during the current month would likely be at 25,000 cfs or greater even though future months may only have 20,000 cfs scheduled. Such practice reflects this aggressive spill avoidance and results in the current frequency of actual spills every 1 in 10 years on average. Less aggressive release patterns would result in a greater frequency of uncontrolled spring spills. However, the desire to limit sediment transporting flows to less than 25,000 cfs moderates to some degree the desire to avoid spills in all situations.

When the BHBF subgroup worked to develop BHBF criteria, it modeled releases using a more moderate release philosophy, trying to keep the monthly release volumes less than 1.5 MAF until the risk of an uncontrolled spring spill became unreasonably large, but at the same time trying to avoid anticipated spills. Table 1 lists the 10 modeled years when BHBF's would have been released, under the assumption of a January 1 Lake Powell storage content of 21.5 MAF. The boxed numbers are the month in which the BHBF would have occurred. The top half of Table 1 shows that the average monthly release volume from the time a BHBF was triggered though the month of July was expected to be 1.35 MAF (about 22,500 cfs) at the time a BHBF was triggered. If the extreme years of 1983 and 1984 and the high forecast error year of 1995 were excluded, the average monthly release was expected to be 1.30 MAF (about 21,700 cfs).

Actual Releases

The bottom half of Table 1 shows these actual releases for the 10 BHBF years modeled by the subteam. In 90 percent of these modeled cases the actual ex post facto release volumes during these BHBF years were greater than was expected when the BHBF occurred. This is likely a result of forecasting procedures that tend to underforecast high runoff years; therefore, BHBF years have a tendency to have higher than expected releases after the BHBF occurred. This is further validation that the triggering criteria recommended by the AMWG properly identifies a significant risk level of uncontrolled spills. Despite the fact that future releases are not expected to be at powerplant capacity when a BHBF occurred, subsequent actual releases are higher than expected as a result of increases in the forecasted spring runoff and an increased risk of uncontrolled spills.

From Table 1, the actual average monthly releases through July following BHBF's were 1.64 MAF (about 27,300 cfs). Excluding the high flood and forecast error years of 1983, 1984, and 1995 the average is 1.46 MAF (about 24,300 cfs). Of the total months through July following a BHBF, 83 percent had release volumes greater than 1.2 MAF (about 20,000 cfs) and 46 percent had release volumes greater than 1.5 MAF (about 25,000 cfs).

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Table 1

Spike Flow Years - Proposed Criteria

Expected Releases at Time of Spike Flow Decision

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	following months ave rel (month)	# following months	following months (act/exp) %
1973	1200	1106	855	719	938	2425	1209	1209	1	164%
1979	1200	1587	1312	1287	1250	1212	1100	1232	5	113%
1980	882	1097	1474	1214	1118	1781	1296	1296	1	94%
1983	1200	799	699	800	1111	4219	1100	1100	1	338%
1984	1500	1598	1598	1565	1765	1332	1366	1537	6	148%
1985	1500	1625	1625	1325	1319	1212	1100	1368	6	107%
1986	1200	1253	1727	1219	1319	1171	1223	1233	4	130%
1993	935	979	1540	1240	1212	1184	1228	1216	4	109%
1995	929	790	867	778	1208	2107	1971	1971	1	129%
1997	1500	1635	1535	1435	1326	1217	1100	1375	6	105%

Actual Releases

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	following months ave rel (month)	# following months
1973	1200	1106	855	719	938	2425	1988	1988	1
1979	1200	1587	1667	1231	1239	1427	1417	1396	5
1980	882	1097	1474	1214	1118	1781	1218	1218	1
1983	1200	799	699	800	1111	4219	3723	3723	1
1984	1500	1740	1588	1165	2128	2559	2437	1936	6
1985	1500	1695	1158	1184	1453	2013	1302	1467	6
1986	1200	1253	1727	1219	1955	1834	1379	1597	4
1993	935	979	1540	1182	1571	1366	1194	1328	4
1995	929	790	867	778	1208	2107	2546	2546	1
1997	1500	1494	1786	1000	1482	1646	1252	1443	6