

Chapter Five

Conclusions

Introduction

The Corps undertook this AAR to examine the 2006 operation of Libby Dam, which resulted in a flood event in the Kootenai River Valley, and to inform future decision making. The Corps has many responsibilities to fulfill when making operational decisions for Libby Dam and throughout the Columbia River Basin. The multiple objectives for the planned 2006 Libby Dam operations included system and local flood damage reduction through use of VARQ FC Operating Procedures, provision of recommended flows for the ESA listed Kootenai River white sturgeon using “stacked flow” operations, providing summer flow augmentation for ESA listed salmon by targeting Libby reservoir refill, and providing for resident fish below Libby Dam by managing releases within powerhouse capacity. While the seasonal runoff volume for the 2006 water year was slightly above average, the shape and magnitude of the runoff in mid-May was unusual as a result of record temperatures in the basin and above-normal rainfall during the second half of May and early June. Peak releases from Libby Dam were 55,000 cfs on June 17, and the peak flood stage of the Kootenai River as measured at Bonners Ferry, Idaho was reached on June 18 at elevation 1766.6 feet. Emergency actions were taken by both the Corps and local officials to protect local communities in and around the towns of Libby and Troy, Montana, and Bonners Ferry, Idaho.

This chapter summarizes what occurred in the spring of 2006, the key “Lessons Learned,” and the way forward. The Lessons Learned will assist the Corps in moving forward in future decision-making. The following summary addresses Libby Dam Water Management Operations, Emergency Management Operations, and Public Affairs and Communications. A more detailed discussion of the Lessons Learned and recommended actions are identified in Appendix Y - Lessons Learned.

I. Libby Dam 2006 Water Management Operations

During January through March, Libby Dam was operated to achieve system-wide and local flood control objectives, using the VARQ Flood Control Drawdown Guidance, and the end-of month upper flood control elevations.

In April, to meet objectives listed above, the Corps did not release 16.4 kcfs - the flows identified in the VARQ Refill Guidance. Instead, the Corps released minimum flows of 4,000 cfs, based on a determination at the time that the risk associated with delaying higher releases was somewhat low and therefore acceptable given the following:

- The seasonal Water Supply Forecast issued in April was 6.076 MAF. This was 97.2% of normal.
- The calculated end of April flood control upper limit for the Libby Dam reservoir was elevation 2417 feet. As the end of month elevation was expected to be at a lower

elevation, releasing minimum outflows did not appear to pose a risk to local flood control. The actual end of April reservoir elevation was 2413.2 feet - 3.8 feet below the end of April flood control elevation.

- The Corps evaluated the risk associated with shaping the VARQ Refill Guidance outflows using Libby Dam inflow forecasts and other modeling tools. This information indicated that the risk was low that local flooding would occur.

In addition, the following also factored into the Corps' decision:

- In late April, the Columbia River was operated for system-wide flood control as a result of high flows in the lower Snake River. From a system flood control perspective, therefore, additional inflow to the Grand Coulee reservoir from upstream projects, such as Libby Dam, was not advisable.
- The ongoing regional discussions with the federal and state agencies had not reached resolution on which sturgeon operation to implement to achieve the habitat attributes for sturgeon as described by the USFWS 2006 BiOp – stacked flows or powerhouse plus 10,000 cfs.

Thus, based on the information available to the Corps in April, the decision to shape flows was considered to have minimal risk to cause local flooding (or other problems), and would assist in meeting objectives for system and local flood control, sturgeon flow operations, summer flow augmentation for listed salmon, and managing releases within powerhouse capacity for resident fish below Libby Dam.

On May 14th, with an agreement concerning the “stacked flow” operation for sturgeon, Libby releases were ramped up to reach 25,000 cfs, or full powerhouse, on May 17. However, because of record warm temperatures in mid-May resulting in rapid snowmelt, the peak inflow into Libby Dam was 77,000 cfs on May 21. The river stage at Bonners Ferry on May 21 was 1763.65 feet. The Corps continued releasing approximately 25,000 cfs through the remainder of the month of May to slow refill and allow for uncertainty in projected inflows in June. At the end of May, the Libby reservoir was at elevation 2449.8 feet, 9.2 feet from full.

The June final Water Supply forecast increased to 6.766 MAF, which was 108% of normal. The information available in early June, including inflow forecasts, indicated that the Libby reservoir could draft while continuing to release 25,000 cfs. However, significant thunderstorm activity resulted in greater than forecasted inflows, and spill was initiated on June 8. Inflows to the Libby reservoir increased over the next few days because of continuing thunderstorm activity with record rainfall in June of up to 266% of normal in the basin upstream of Libby. On June 18, the reservoir was near full and the spill was increased to 31,000 cfs, for a total outflow from the dam of 55,000 cfs. Libby reached elevation 2459.10 feet on June 18 for approximately 24 hours and the river stage at Bonners Ferry peaked at elevation 1766.6 feet. By June 20th, inflows and river stage levels began to recede, and spill levels were reduced slowly to minimize sloughing of levee embankments downstream. Spill was stopped on June 27th.

As a result of the spill event, monitoring of effects on species was conducted. Preliminary results indicate that gas bubble disease (GBD) symptoms were detected in almost all resident

species after two weeks of sustained spill due to increased total dissolved gas (TDG) supersaturation levels in the river below Libby Dam to above Kootenai Falls. More will be known in the next two to three years concerning whether or not the flows in 2006 led to successful sturgeon reproduction, however, at this time we know that at least five tagged sturgeon moved upstream of the Highway 95 bridge this year. Further, sturgeon eggs were found near Bonners Ferry, not far downstream of the highway bridge, and spawning in the Shorty's Island reach was documented by capture of eggs on egg mats.

II. Post Flood Event Analyses

As part of its review of the 2006 flood event, the Corps conducted post-event analyses that are described in this AAR. The analyses indicated that no spill would have occurred in 2006 if the Corps had been operating in strict accordance with the VARQ Refill Guidance, i.e. without utilizing flexibility to shape flows to accommodate operational objectives for system-wide flood control and for listed sturgeon and salmon, and assuming the same stacked flow operation would be implemented.

Also, preliminary review and analysis of interim VARQ in water years 2003 to 2005 indicates that without exercising flexibility or shaping releases to take into account other factors, the objective of refilling the Libby reservoir to provide summer flow augmentation for salmon would have been compromised. However, the review of the 2006 year indicates that exercising flexibility in the implementation of VARQ resulted in releasing 55,000 cfs and spilling from Libby Dam.

These analyses point to the need for the Corps to conduct further evaluation of the risks associated with exercising flexibility to shape flows identified in the VARQ Refill Guidance, as well as evaluating risks associated with constraining this flexibility. The Corps will take a hard look at the procedures and the effects of implementing VARQ to provide for the desired objectives for listed species as expressed by the USFWS and NOAA Fisheries, while also addressing system and local flood damage reduction. The Corps will provide this information to the USFWS, NOAA Fisheries, stakeholders, and the public.

Having the best available information on water supply conditions and weather forecasts is important to making informed decisions in the operation of Libby Dam. In 2006, the Corps utilized a variety of tools and models, such as the ESP forecasts and EPS HYSSR, to assess operations and analyze the risks associated with shaping flows. As a result of the 2006 flood event, the Corps will reevaluate the use of these tools, and analyze other methodologies upon which to make in-season management decisions. The National Weather Service's RFC is undergoing an extensive review of the available tools (See Appendix W) and the Corps will cooperate with the RFC in their review.

To improve the assessment of risk in decision-making, the Corps will address a wide-range of potential adjustments needed for a variety of considerations including system-wide flood damage reduction, levee erosion, transmission line restrictions, unit outages, listed species operations and/or other unforeseen circumstances.

In addition, the Corps will assess the information derived from the 2006 event and factor into decisions about near-term and long-term Libby Dam operations. As to a decision on adoption of an alternative in the Final Upper Columbia Alternative Flood Control and Fish Operation EIS, information such as: the condition of the levees near Bonners Ferry; the impacts to resident fish below Libby Dam as a result of the spill in 2006; sturgeon response to flows; risks to the probability of reservoir refill; risk to flood damage reduction and spill when exercising flexibility in implementation of VARQ Refill Guidance; and, other impacts from VARQ implementation as observed in 2003 to 2006 will be considered before signing a Record of Decision. In particular, the Corps will clarify the anticipated range of operational flexibility contemplated with VARQ implementation, with a review of the effects, and an articulation of residual risk conveyed to the public and stakeholders prior to a decision on whether to adopt implementation of VARQ Flood Control in the long-term.

III. Emergency Management Operations

Public safety remains the Corps' first priority. During the 2006 flood event, the Corps provided assistance in flood damage prevention and/or reduction services to the citizens of northwestern Montana and northern Idaho through its operation of Libby Dam and emergency response operations. Emergency response activities to this year's event began when the Kootenai River was below the flood stage of 1764.0 feet as measured at Bonners Ferry and when areas in the City of Bonners Ferry were threatened by flooding.

The Corps will review internal processes to ensure that the appropriate actions required for flood damage reduction related to project operations are taken. In particular, it will review funding of flood response when the project is being operated for multiple purposes such as meeting power demand or meeting ESA responsibilities. The Corps will develop a plan to evaluate options for reducing the risk of flood damages while also providing for other project purposes. Options could include emergency response assistance and consideration of outflow reductions at the dam. This assessment will be fully coordinated with local emergency officials so they can plan accordingly.

The effect of operations at Libby Dam on damages prevented at downstream locations in the Kootenai River Valley is determined by comparing regulated (conditions with Libby Dam in operation) and unregulated (conditions without Libby Dam) river stages at selected sites. This year damages prevented are estimated at \$27 to \$45 million, but this estimate does not include the cost of flood fighting, damage to non-federal levees, and seepage damage, nor any impacts in Canada.

Flood damage reduction in the Kootenai Valley depends upon both Libby Dam operations and a system of non-federal levees. While the Corps will continue to provide emergency flood response along the Kootenai River as authorized, the local levee districts are strongly encouraged to provide regular maintenance and repair to the local levee system to help reduce the effects of any future high flows upon the local communities. In June, 2006, Boundary County and the City of Bonners Ferry requested Corps evaluations of their levees for inclusion in the PL 84-99 non-federal levee program. Seattle District has initiated the levee evaluations and plans to have the initial levee reports completed by January 2007. The intent of the evaluations is

to assess the current condition of the levees, provide levee improvement and maintenance recommendations to the sponsors, and to determine if the levees meet the eligibility standards for the Corps non-federal levee rehabilitation program. If the levees are included in the Corps' rehabilitation program, the Corps can assist the City and County with future flood damage repairs.

In the meantime, the Corps has begun collecting information about the current condition of the non-federal levees and will provide this and other information about the 2006 event to the National Weather Service for their use in reviewing the flood stage at Bonners Ferry. If the National Weather Service recommends a different flood stage at Bonners Ferry, the Corps will examine what effect, if any, the recommended change in the Bonners Ferry flood stage may have upon future Libby Dam operations.

IV. Public Affairs/Communications

During the high flows from Libby Dam, the Corps worked with local officials, citizens, radio stations and other media to inform the public of any changes in the outflow from the dam and in downstream conditions. The Corps' message focused on protecting lives and property, responding to local and state governments' requests for assistance, and managing the water resources in coordination with other federal and state agencies. Means of public communication included telephone conference calls, news releases, posting updated information on the Corps' Seattle District Web Site, discussions with Corps' field personnel as well as coordination calls with the Libby Project, Seattle District and RCC.

The Corps' Emergency Management Team communicated effectively with the impacted Counties and communities during the emergency response. However, a review of the Corps' communication processes indicated areas in need of improvement, such as external communication with the local, county, and state emergency offices, as well as the Corps' internal communications processes. There were also instances of miscommunication or incomplete coordination on modifications to water management actions or changing field conditions within the Corps (emergency responders, Libby Dam staff, Seattle District and Northwestern Division).

The Corps will review and revise existing processes for communicating risk management concerning potential operational decisions with the public and within the agency. One step toward this will be improved dissemination of data the District and Division teams during emergency response events. Another step will be augmenting Libby Dam project staff on-site with Public Affairs staff to enhance effective communications with the public during major events.

The Way Ahead

The Corps is committed to providing safe and reliable operations at Libby Dam to fulfill its responsibilities to meet congressionally authorized uses. This AAR was prepared to factually report the events leading up to and resulting in the 2006 flood event, and to identify lessons learned so that decision-makers will have the benefit of this information for future operational decisions.

As a result of the Corps' initial assessment of the implementation of the VARQ Flood Control Operating Procedures and the Lessons Learned addressed in this AAR, a number of recommended actions have been identified. Such actions include improving how the Corps performs risk analyses, a review of the tools the Corps utilizes to perform risk assessments, and communication of identified risks to stakeholders and the public. Additionally, the Corps will assess the information garnered from the 2006 flood event concerning the current condition of the local levee system, the effects of high flows and spill on resident fish below Libby Dam, operations for listed species, and system and local flood damage reduction.

The Corps will use the information and products developed in response to the 2006 flood event and the post event actions and analyses to determine near-term and long-term Libby Dam operations. For Libby Dam operations in 2007, the Corps will consider all available information and public input before making a decision on the appropriate flood control operations. This process will be completed by December 2006.

For the long-term decision on Libby Dam operations, the Corps is committed to thoroughly examining the array of analyses, factors, and considerations necessary to make a decision on adoption of an alternative in the Final Upper Columbia Alternative Flood Control and Fish Operation EIS.