Glen Canyon Dam Technical Work Group
Agenda Item Information
January 21, 2010

Agenda Item

Temperature Control Device (TCD) and sediment augmentation

Action Requested

✓ Recommendation to AMWG

Presenters

Shane Capron and Dennis Kubly

Previous Action Taken

✓ By AMWG:
August 12-13, 2009 motion: The AMWG recommends to the Secretary of the Interior that Reclamation report on the status of the TCD and Sediment Augmentation projects to the TWG. The TWG will make a recommendation to the AMWG for consideration at the spring 2010 AMWG meeting. *Motion was passed by consensus*

Background Information

Dennis Kubly provided a presentation on TCD and sediment augmentation to the TWG at our September 2009 meeting (see presentation). The TWG worked on a motion but could not find a solution that had enough support to pass. The major issue seemed to be that there was support for continued research on a TCD but that there was much less support for continued work on sediment augmentation. Thus, a combine motion was problematic with the group. One solution was to pass a motion that dealt with the two issues separately, or separate motions.

A starting point for conversation may be the following, based on the conversation at the TWG and the issues that were brought up (see TWG minutes):

> The TWG recommends that the AMWG consider a recommendation to the Secretary of Interior to develop a risk assessment for the implementation of a Temperature Control Device and Sediment Augmentation system that considers the following: (a) incorporates a TCD design with both warm and cold-water release options and with a combination of 2,4, 6, and 8 units, (b) considers concerns that new warm-water non-natives might become established in the CRE, and (c) considers if the development of a TCD is prudent without the ability to increase turbidity of the river. The goals of the action would be to support recovery of native fish and to meet the Desired Future Conditions for sediment in the CRE.

RECLAMATION

Managing Water in the West

Selective Withdrawal and Sediment Augmentation Update

Dennis Kubly

Bureau of Reclamation

Technical Work Group Meeting

September 30, 2009

U.S. Department of the Interior

Bureau of Reclamation

AMWG Motion: August 2009

- **MOTION:** The AMWG recommends to the Secretary of the Interior that Reclamation report on the status of the TCD and Sediment Augmentation projects to the TWG. The TWG will make a recommendation to the AMWG for consideration at the spring 2010 AMWG meeting.
- Motion was passed by consensus.

Water Temperature: History of Concern

1978 Jeopardy Biological Opinion

"It is our opinion that the major reason for the decline of both listed fish species (Colorado squawfish and humpback chub) in this reach of the Colorado River has been the abnormal water conditions that result from the operation of Glen Canyon Dam. The foremost problem has been the cold, hypolimnic waters from Lake Powell."

Water Temperature: History of Concern

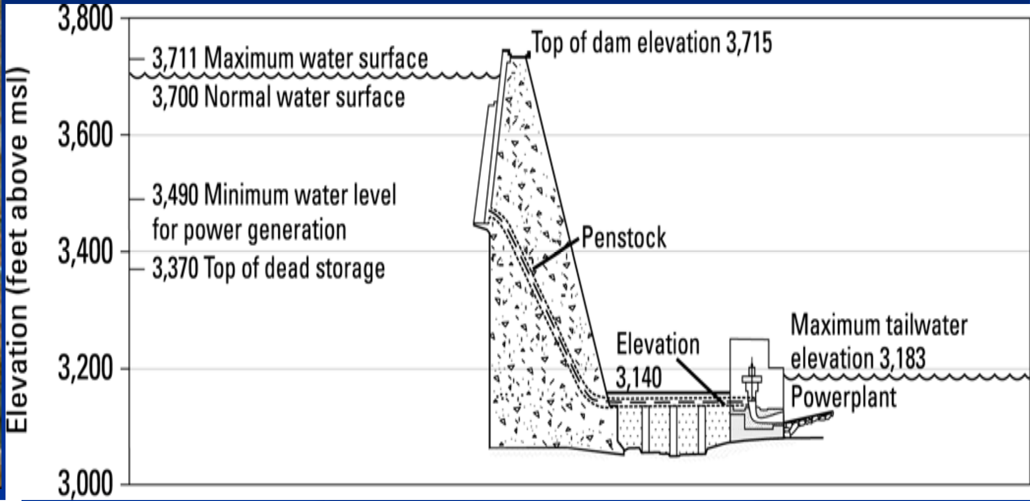
1995 Jeopardy Biological Opinion

"The preferred alternative (without a selective withdrawal structure) does not remove the issue of coldwater temperatures on reproductive success in the mainstem; thus, most eggs or developing larvae would not be expected to survive in the Colorado River below Glen Canyon Dam."

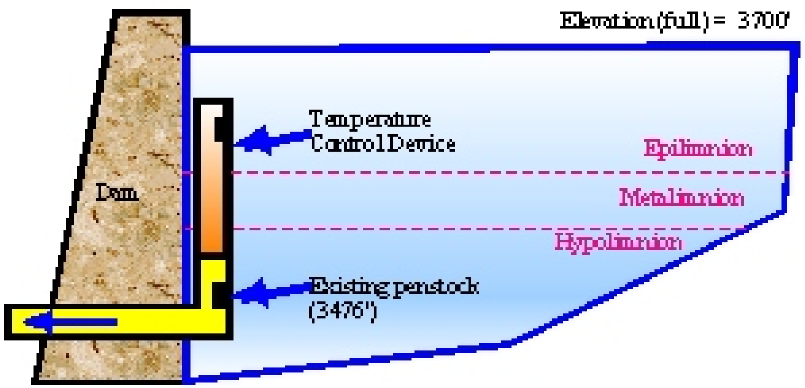
"Reclamation shall implement a selective withdrawal program for Lake Powell waters and determine feasibility using the following guidelines."

Glen Canyon Dam and Powerplant

Without Selective Withdrawal



With Selective Withdrawal



- Concrete Arch Dam
- 710 feet high
- 27 MAF Storage
- Eight Francis turbines
- 1,320 MW capacity

RECLAMATION

Selective Withdrawal History

- 1999—Draft EA completed by Reclamation on single inlet, fixed elevation design; rescinded
- 1999 and 2001—Planning workshops; reports to AMWG
- 2003—Reclamation survey of selective withdrawals, SA risk assessment and AMWG recommendation to begin compliance
- 2005—2-unit external frame selective withdrawal evaluated; withdrawal range 3700-3520' elevation
- 2006—Draft EA for 2-unit external frame device; discontinued; begin LTEP
- 2007—LTEP draft alternatives all contain selective withdrawal; discontinued, reinitiate consultation; Reclamation biological assessment identifies it is feasible to construct and operate a selective withdrawal on Glen Canyon Dam; testing under adaptive management necessary to determine effects
- 2008—LTEP put on hold; 5-year experiment initated; Fish and Wildlife Service in biological opinion views selective withdrawal risk as too high; advocates for more testing

Selective Withdrawal Findings

- 2-unit external frame cost ~$100 million
- Control available from full reservoir to 30' above penstocks (180' of reservoir elevation)
- Release temp increase begin late April; ~3°C average; up to 7°C late summer to early autumn
- Major advantage likely to native fish dispersing from tribs, but also to mainstem reproduction
- Concern exists for unintended consequences: ability to return to cold water; native vs nonnative fish--modeling unlikely to resolve, requires experiments under AM

Fine Sediment: History of Concern

- 1978 biological opinion: No concern expressed for the role of fine sediment in endangered fish ecology.
- 1988 GCES Phase I: Concern for flood (>31,500 cfs) releases causing significant and irreversible degradation…of the sand deposits.
- 1995 biological opinion: Fine sediment must be available for development and maintenance of backwaters and other channel margin habitats.
- 2007 biological opinion: Continued call for monitoring effect of sediment transport on humpback chub habitat.

Fine Sediment: Investigations

- 1995 GCD EIS: Modeling predicted sediment accumulation under MLFF.
- 1996 BHBF: Yes we can, but only for awhile.
- 2002: Rubin et al. EOS—The EIS hypothesis is false; sand inputs exported in weeks to months.
- 2004 BHBF: We do better with sediment triggers, but effects are mixed downriver.
- 2005 SCORE: Research and monitoring conclusively demonstrate a net loss of fine sediment under MLFF.
- 2007 Melis et al.: Continued erosion under 1996 ROD
- 2008 Wright et al.: Flow only? Short-term yes with large constraints on load-following hydropower; long-term ??

Improving Sediment Conservation

- One possibility is augmenting the sand available from tributaries with sand trapped behind Glen Canyon Dam (Randle and others, 2007).
- Alternatively, the sand supply might be indirectly increased through the use of short-duration high flows following each average to large tributary input of sand (Topping et al. 2006)
- Another possibility is constraining dam releases following tributary sand inputs for a period of time until a high-flow release can be carried out (Melis et al. 2007), a movement toward the Wright et al. 2008 "best case scenario."

Sediment Augmentation

- Identified in the HBC Comprehensive Plan (Project 5) for turbidity control and habitat maintenance/restoration
- A major consideration is building and maintenance of beaches for recreation purposes
- Beaches also serve as substrate for riparian vegetation, which provides habitat and food for wildlife species

Randle and others 2007

- This appraisal-level study provides the necessary information to facilitate making decisions on whether or not to proceed with a detailed study and evaluation of any alternative. Purposes of augmentation:
  - 1. Seasonally increase the turbidity of the Colorado River to provide cover for native and endangered fish during the months of May through December. This is the period when young-of-the year humpback chub emerge from the Little Colorado River and then rear in the Colorado River (U.S. Department of the Interior, Bureau of Reclamation, 1995). These native fish evolved in a turbid environment and may use it for cover from potential predators.
  - 2. Annually increase the sand supply to the Colorado River during beach-building flows to build larger sandbars, especially in Marble Canyon, through fluvial processes.

Randle and others 2007

- Assumptions and Objectives:
  - Turbidity concentration 500 ppm silt/clay = 3.8 million tons in 8 months
  - 1 million tons (0.9 million Mg) of sand prior to the beach/habitat-building flow.
  - The total annual sediment supply requirement would be 4.8 million tons.
  - Augmentation required in most years, even with Paria River input

Randle and others 2007

- Sediment source areas (Navajo Canyon)
- Sediment delivery locations (below GCD or near Lee's Ferry)
- Sediment collection methods (clamshell dredge)
- Sediment delivery methods and alignments (slurry pipeline)
- Sand storage areas (CR in Glen Canyon or terrestrial site near Lee's Ferry)

Randle and others 2007

- Conclusions: Technically feasible to construct and operate sediment augmentation; 5 alternatives evaluated
- Cost Estimates: $140-430 million construct; $3.6-17 million annual to operate
- Should be considered in conjunction with selective withdrawal