

Glen Canyon Dam Adaptive Management Work Group
Informational Item
February 3-4, 2010

Agenda Item

Grand Canyon Monitoring and Research Center (GCMRC) Updates

Action Requested

√ These items are for information and discussion. Opportunity for questions will be provided at the meeting on February 4, 2009.

Preparers

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Previous Action Taken

N/A

Relevant Science

N/A

Background Information

Near Shore Ecology/Fall Steady Flow Plan Update

Previously reported on by Lew Coggins, AMWG meeting, August 12, 2009.

The 2008 Biological Opinion on the operation of Glen Canyon Dam identifies conservation measures necessary to conserve and protect the endangered humpback chub (*Gila cypha*). Experimental flows described in the BO were recently implemented that include a two-month period of steady discharge during fall (September and October) over the next five years (2008-2012). A study program called the Near Shoreline Ecology (NSE) project was developed in 2008 to better understand how these experimental flows, through their interaction with physical habitat structure, influence the survival rates of juvenile native and non-native fishes in the Colorado River ecosystem below Glen Canyon Dam. Findings from this study will provide information to better understand how flow and habitat management can be used to cultivate and enhance survival of juvenile native fish, and guide future GCDAMP recommendations for the Department of the Interior to consider as management or experimental actions. The primary focus of this research project is to address two key research questions:

- 1) Do steadier flows during summer and/or fall increase survival rates of juvenile native and non-native fish?
- 2) To what extent do physical habitat structures (e.g., sand bars and backwaters), in conjunction with flows during these periods, influence survival rate?

To implement the NSE, the Grand Canyon Monitoring and Research Center (GCMRC) developed a competitive solicitation to identify partners to accomplish the research goals by a cooperative agreement. An extensive NSE review process was conducted for all submitted proposals, which

resulted in an award being made in early 2009 to the University of Florida. The research questions will be addressed by linking results to a proposed conceptual model for humpback and other native and nonnative fish. This approach will assess shifts in fish density and source populations of juvenile native fish by tracking habitat-specific abundance and survival of native and non-native fish in response to changing nearshore habitat availability related to and created by the 2008-12 fall steady flow experiment.

Following a pilot study in fall 2008, four monthly research trips were conducted in 2009 (July through October) to compare and contrast differences in fish community response to fluctuating and steady flows. These trips provided the design framework to estimate growth, survival, and abundance by habitat type. This study design is based on a robust mark-recapture approach that would estimate habitat-specific abundance for each trip using closed models, and relax the assumption of population closure between sampling trips. Data collected in 2009 are currently being incorporated into the GCMRC's Oracle database so that analyses can begin in January 2010.

Fall Steady Flow Science Plan

Previously reported on by Lew Coggins, AMWG meeting, August 12, 2009

In response to a request from the AMWG, GCMRC has been working to develop a Fall Steady Flow Science Plan to evaluate the biological effects of the September –October steady flows that will be released from Glen Canyon Dam in 2008-2012. The plan was drafted in the summer of 2008 and has undergone review by the Science Advisors and the TWG. The plan is currently undergoing final editing at GCMRC and will be sent to the TWG in mid January 2010. The TWG will provide its final review and recommendation to the AMWG at their spring 2010 meeting. An Executive Summary of the final plan follows:

Executive Summary – Fall Steady Flow Science Plan

Steady releases from Glen Canyon Dam in September and October of each year from 2008 to 2012 (fall steady flows) were prescribed by the 2008 Environmental Assessment of the Operation of Glen Canyon Dam and associated Biological Opinion. In response to direction from the Glen Canyon Dam Adaptive Management Work Group, and to address the need to learn from this large-scale experiment, the Grand Canyon Monitoring and Research Center has prepared this science plan. Four existing projects are collecting data that will be used to assess possible impacts of these flows on biological resources. These projects are the near-shore ecology project, stock assessment of native fish populations, aquatic food base monitoring, and monitoring of early life stages of rainbow trout. Given uncertainties regarding the extent and degree of near-shore warming that will occur in the fall during steady flow operations, we propose new water temperature data be collected in association with these flows. We also propose to collect observational data relative to potential fish stranding in isolated backwaters caused by transition flows. Finally, these physical and biological data will be integrated and synthesized using an ecosystem model to evaluate whether this management action had impacts on the ecosystem as a whole. We have not included descriptions of the sediment monitoring program in this document. However, the effects of discharge regime on sediment resources are well understood and the physical sciences program could evaluate and report on the response of sediment resources to fall steady flows, should it be of interest to managers.

The GCMRC has been asked to make flow recommendations since the Environmental Assessment and Biological Opinion did not prescribe specific release rates for the fall steady flows. We recommend discharging 10,000 cubic feet per second in each remaining month

(September and October 2008-12) of the fall steady flow experiment to minimize the number of confounding factors that may complicate interpretation of data, especially those data regarding native and nonnative fish. If water releases must be moved into other months of the year to accommodate these steady flows, it is recommended that releases in July and August not be increased as daily peak discharges during these months are already relatively high; further increases will increase sediment transport and sandbar erosion, an undesirable side effect. We also propose an abrupt flow transition from August to September with concomitant observations on fish stranding. If stranding can be demonstrated with an abrupt transition then a more linear decline in transition could be considered by the Adaptive Management Program. This approach attempts to demonstrate that abrupt transitions are having a significant impact before developing flows that would mitigate for stranding and also impact hydropower.

February 2010 Non-native Fish Workshop

Previously reported on by Kara Hilwig, AMWG meeting, August 12, 2009.

Fish Cooperators from Arizona Game and Fish Department (AGFD), the U.S. Fish and Wildlife Service (Service), and the Grand Canyon Monitoring and Research Center (GCMRC) met on December 17, 2009, to discuss and review trends in nonnative fish capture data from Lees Ferry, the mainstem, and the Little Colorado River (LCR) monitoring programs. These science cooperators determined that in 2009, there were no nonnative fish data from these monitoring programs which warranted new and immediate management response such as initiation of a targeted removal program or a shift in monitoring priorities. Of most significance, captures of channel catfish significantly increased in the lower section of the LCR (3 captures in 2008 to 45 captures in 2009). Trend data indicate that the recruitment of this species has been sporadic in the LCR since the early 1980's. Increases in channel catfish have previously been observed in the lower section of the LCR (8 captures in 1988 and 41 captures in 1989), however the following year scientists captured only 2 channel catfish (1990) and numbers remained low for several years. Scientists indicated the success of the 2009 cohort will likely be detected with current monitoring programs and recommended reevaluating the status of channel catfish in 2010. Rainbow trout relative abundance throughout the river has increased since 2006 and catch rates in 2009 were similar to those observed in 2001 (prior to the initiation of mechanical removal). A similar trend was detected in rainbow trout relative abundance in the LCR reach during 2009. This preliminary assessment supports the nonnative fish related activities planned in the FY10-11 Workplan (BIO 2.R17.10-11, Nonnative Control Plan Science Support), which includes an assessment of habitat use by non-native fishes and the relative risks to native fish from nonnative species in Grand Canyon.

On Feb 23-24, 2010, GCMRC will convene a Nonnative Fish Workshop in cooperation with the Service to present nonnative fish-related data and discuss implementation strategies for future nonnative fish control projects among scientists and managers. GCDAMP stakeholders are encouraged to attend. The objectives of this workshop are to:

- Report current information related to the status of nonnative fish in the CRE,
- Identify any new nonnative fish issues of concern requiring immediate action,
- Identify any new nonnative fish monitoring and research needs related to nonnative fish management or control in the CRE,
- Discuss project prioritization processes and identify a preferred method to utilize for nonnative fish projects in Grand Canyon,
- Identify management agency roles related to nonnative fish control in the CRE,

- Identify high priority nonnative fish control actions in the CRE that should be implemented in FY 2010 – 12.

Nonnative fish related activities identified in the FY 2010-11 workplan might be subject to change depending upon the outcomes of the workshop.

The 2009 Fishery PEP Review - Next Steps in Development of Core Monitoring Plan below Glen Canyon Dam

Previously reported on by Lew Coggins, AMWG meeting, August 12, 2009.

The Protocol Evaluation Panel (PEP) issued their report on the fish monitoring program in September 2009. In response to the report, Arizona Game and Fish Department (AGFD), U.S. Fish and Wildlife Service (Service) and the Grand Canyon Monitoring and Research Center (GCMRC) have been conducting analyses and data reviews on mainstem and Little Colorado River datasets. The GCMRC will submit a response to PEP report to TWG by March 1, 2009. Based on the fish PEP report and subsequent analyses and input from the TWG, this document will also include recommended changes for the fish monitoring program to be included in the 2011 work plan. A more detailed report that incorporates this response as well as TWG input will be prepared as described in Step 4 for Core-Monitoring Reports in the draft Core Monitoring Plan (2009) by the end of FY10.

The AGFD conducted analyses of PEP recommendations for the Lees Ferry and mainstem fish monitoring programs, and proposes to implement several recommendations during the 2010 sampling season in cooperation with the GCMRC including:

1. Reduce electrofishing in the Lees Ferry reach to 2 trips per year (spring & fall),
2. Conduct summer sampling aimed at warm water nonnatives in the tail waters,
3. Continue assessing dam operation influence on trout redds and early life stages,
4. Continue two mainstem electrofishing trips in spring to assess status and trends of trout, flannelmouth and bluehead suckers, and common carp.

The Service and AGFD are collaborating to compare and contrast catch per unit effort (CPUE) indices, species composition of catches, and size distributions of fishes collected by the lower 1,200 meters monitoring effort and the lower 15 kilometer monitoring effort in the LCR. CPUE data will also be compared with the Service's closed population estimates and the Age Structured Mark Recapture Model (ASMR). Dr. Steve Martell (University of British Columbia, Vancouver) has agreed to compare different modeling scenarios to help determine what elements of the LCR monitoring program can be reduced or eliminated while maintaining defensible modeling efforts via the ASMR. The intent of this evaluation is to eliminate any redundancy within LCR sampling so that resources can potentially be directed toward mainstem humpback chub aggregations and nonnative fishes.

Another important fishery PEP recommendation was development of a standard reporting framework that would be updated yearly in cooperation with Grand Canyon researchers. The framework would identify information needs and analysis required for managers to assess population status relative to management objects, and develop a consistent reporting format combining data and results from different cooperating agencies and contractors. An outline of the framework will be developed by GCMRC and the Fish Cooperators and will be distributed in spring 2010 for external review.

Proposed April 13-15, 2010 Integrated Modeling Workshop at Saguaro Lake Ranch, AZ

As elements of the DOI-approved GCDAMP work plans and budgets, the GCMRC initiated research projects in FY 2008-10, on Integrated Flow, Sediment, and Temperature modeling (led by Dr. Scott Wright, USGS) and advanced aquatic ecosystem modeling (led by Dr. Carl Walters, University of Florida) of the Colorado River ecosystem below Glen Canyon Dam. During FY 2008-09, significant progress has been made in both interrelated research projects and the GCMRC has worked with scientists from both teams to foster integration of the modeling advances. In March 2010, members from both research teams will join forces in a science workshop held in Cedar Key, Florida, specifically to further advance the aquatic ecosystem modeling, which was first initiated in the late 1990s with development of the Grand Canyon Ecosystem Model. Following is a short prospectus on the March 2010 ecosystem modeling workshop:

Cedar Key Aquatic Modeling Workshop Prospectus – Facilitated by Dr. Carl J. Walters, University of Florida

The aim of the March 2010, Cedar Key aquatic ecosystem modeling workshop will be to continue development of **Ecopath/Ecosim** ecosystem mass balance models for the Lees Ferry tail waters and Little Colorado River confluence reaches of the Colorado River ecosystem below Glen Canyon Dam. These models will incorporate information from previous and ongoing food web and fish studies on production processes and trophic flows, and will extend food web assessments developed by food web researchers to make dynamic predictions over time using **Ecosim**. One key aim of the model-based analysis will be to identify and quantify a set of precise alternative hypotheses for the recent decline of the Lees Ferry trout population, its prospects for recovery, and possible linkages between productivity in the Lees Ferry reach and previous experimental high flows released from the dam (key input to the current 2010 HFE synthesis). A second aim will be to evaluate the hypothesis that recent increases in humpback chub juvenile abundance and apparent successful rearing in the Colorado River mainstem owes to reduced competition with and predation by rainbow trout, and that nearshore warming may result in replacement of negative trout effects with comparably negative effects by warmwater, exotic fishes. Thus, the aquatic ecosystem models will be used not only to integrate available ecological production data, but also to identify key uncertainties about possible dynamic responses of key aquatic resources to continuing experimental manipulations like high flows from the dam and mechanical removal of exotics.

Following the Cedar Key workshop, the GCMRC proposes convening a second modeling workshop at Saguaro Lake Ranch, Arizona in April; one specifically designed to allow TWG members to interact with both the Integrated Modeling Project (April 13th) and Ecosystem Modeling (April 14-15) researchers to learn more about the status of advances made by both teams over the last two years. The GCMRC has also enlisted Dr. Josh Korman (Ecometric Research) to facilitate the April workshop and encourages all TWG members to take advantage of this unique opportunity to interact with the modelers as they work to develop the FY 2011-12 work plans and budgets for the GCDAMP.