

## GCMRC UPDATES

MARCH 16-17, 2009, TWG MEETING  
PHOENIX, ARIZONA

### **Science Symposium Proceedings**

The GCMRC is currently working with its cooperators at Northern Arizona University (Lara Schmit and others), the Bureau of Reclamation and other USGS staff to compile, review and publish a proceedings from the November 18-20, 2008 Colorado River Science and Resource Management Symposium, held in Scottsdale, AZ. Approximately 40 papers (of 120 total presentations made at the symposium) were submitted to the publication team for external peer review and consideration. Careful budgeting and cost controls implemented by the symposium planning committee, with the help of the Water Education Foundation, resulted in a post-conference budget sufficient to produce a USGS Circular as the venue for the proceedings, including color illustrations. The timeline for completion of this publication is set for late summer 2009, with a limited printing for distribution to all registered symposium participants.

The circular will also be available to the public online through the USGS website.

GCMRC contact: Ted Melis ([tmelis@usgs.gov](mailto:tmelis@usgs.gov); 928-556-7282)

### **Modeling**

The team of researchers that is working on the modeling project for 2009-2010 are all currently engaged in the project and are in the process of finalizing a formal project proposal that will be peer reviewed and shared with the TWG this summer. The primary modeling tools that will be worked on are (1) a detailed site-based model to help determine optimal high flow release magnitude and duration, relations between site characteristics and deposition, and nearshore temperature dynamics; (2) a bar stability model to help determine the effect of downramping rates on bar erosion; and (3) larger scale models to help determine the relative effect of alternative operating regimes on sand storage. Many of the questions posed by stakeholders at the 2008 modeling workshop, including the monthly volume-daily regime matrix, are within the scope of the current efforts and will be addressed within the time frame of the two year project. We plan to continue the interaction with AMP stakeholders with a meeting to occur during or around the summer 2009 TWG meeting and again in the fall 2009. The material covered in the summer would include a review and synopsis of the fall 2008 workshop, a presentation of the final modeling project proposal, and opportunity for discussion. The intention for the fall meeting would be to present preliminary findings.

John O'Brien raised three specific questions:

1. Is the analysis (monthly volume-daily regime matrix) possible with current analytical tools, or will additional research/methods need to be developed?

The tools under development in the current project are designed to address these questions. Current tools can do it (like Grams did last fall), but with high uncertainty.

2. Would there be an additional cost to analyze the matrix proposed by John O'Brien? Time for analysis? Would additional funds be necessary to perform this analysis?

This analysis is within the scope of the current project and funding levels – 2-year timeframe with possibility of preliminary results in fall 2009.

3. Do you see utility in this analysis, i.e. is the modeling robust enough to inform us or is the uncertainty too high to be of much use in making predictions?

The analysis will provide managers and stakeholders with an objective tool to help understand the relative impact of different operating scenarios on sand transport. The modeling approach will include assessments of uncertainty. It is likely that some of the scenarios modeled will differ beyond the level of uncertainty and that some will not differ significantly.

*Request for consideration: 1 to 1.5 hrs for modeling presentation and discussion at next TWG meeting.*

## **Experimental Update – 2008 High Flow Projects**

**Project 1a:** Processing of suspended sediment samples is nearly complete. The project is on schedule for draft report in June or July 2009.

**Project 1b:** Daily survey data and measurements of flow velocity are processed and being analyzed. The project is on schedule for a draft report between May and July 2009.

**Project 1c:** Data processing is ongoing and analyses are in progress. The project is on schedule for a draft report in August or September 2009.

**Project 1d:** Data processing is complete and analysis is set to begin. The project represents the largest new effort of the project 1 components and involves developing new methods for analysis. We believe that the project is still on schedule for a draft or preliminary report in August 2009.

**Project 1 Synthesis:** USGS cooperator Jack Schmidt of Utah State University is currently compiling historical photographs of selected study sites and comparing those images with photos taken during and following the 2008 high-flow experiment. These photographs will help scientists, managers, and stakeholders evaluate the present condition of sandbars and vegetation relative to the condition prior to the onset of regular monitoring, which began in the early 1990s. These photos are available on the GCMRC website:

([http://www.gcmrc.gov/research/high\\_flow/2008/science.aspx](http://www.gcmrc.gov/research/high_flow/2008/science.aspx))

GCMRC contact: Paul Grams ([pgrams@usgs.gov](mailto:pgrams@usgs.gov), 928-556-7458)

**Project 2:** Effect of HFE on native/non-native riparian vegetation: Data processing is essentially complete and analyses are in progress. A poster of some results was presented at the Colorado River Basin Science Symposium in November 2008. Results that were presented showed that plant species richness was similar between vegetated and non-vegetated sites following the HFE. Cover had returned to values recorded in September 2007 for vegetation located above 31k cfs at vegetated sites. The most common non-native species encountered was Russian thistle, which requires spring water for germination, possibly supplied by the HFE. Its continued growth is independent of operations. Some of these results were incorporated into a paper submitted to

symposium proceedings which is in review. The project is on schedule for a draft report in September 2009. A final report is expected by January 2010.

GCMRC Contact: Matthew Andersen ([mandersen@usgs.gov](mailto:mandersen@usgs.gov), 928-556-7379)

**Project 3:** All benthic invertebrate, drift samples, and algal biomass samples collected during the BHBF have been processed. Preliminary results from Lees Ferry and LCR flood sampling locations were reported on at the November Science Symposium (Presenter: Rosi-Marshall, CTS1, Title: 'Effects of the 2008 BHBF on invertebrates in the Colorado River below Glen Canyon Dam'). Processing and analysis of metabolism and invertebrate growth indicators (RNA) samples collected during the BHBF is ongoing. We are on schedule for a comprehensive draft report in September 2009.

GCMRC Contact is Ted Kennedy: ([tkennedy@usgs.gov](mailto:tkennedy@usgs.gov), 928 556-7374)

**Project 4a:** Evaluation of 2008 High Flow Experiment on Survival Rates for Early Life Stages of Rainbow Trout in the Lees Ferry reach As a extension of the rainbow trout early life stage survival project (RTELSS) in the Lees Ferry reach, which began in the winter of 2003, we evaluated the effects of the March 2008 HFE on survival rates of two annual cohorts of age-0 trout: 1) age-0 fish that were the progeny of adults that spawned primarily between February and April 2007 and that hatched in 2007 (the 2007 cohort); and 2) age-0 fish that were the progeny of 2008 spawners that hatched in 2008 (the 2008 cohort). The effect of the HFE on the 2007 cohort was evaluated by comparing age-0 population estimates immediately before (Feb. 19-21) and after (March 24-25) the HFE. The effect of the HFE on the 2008 cohort was evaluated by comparing the ratio of age-0 abundance in June 2008 to total egg deposition in 2008, as determined by redd counts, with ratios from other years.

There was little effect of the HFE on the abundance of the 2007 cohort of age-0 trout in the Lees Ferry reach. Populations estimates for age-0 trout in February 2008 were 16,000 and 15,000 based on catch data from 20 index sites only, and from 20 index sites and first pass catches from mark-recapture experiments (MR), respectively. Population estimates for March were 15,000 (index only) and 17,000 (index + MR). Post-flood estimates were 0.9- and 1.2-fold different than pre-flood estimates for index and index+MR values, respectively. Although we have not yet computed uncertainty in these population estimates, the average coefficient of variation of estimates from other years is approximately 0.3, and it is therefore very unlikely that pre- and post-flood abundance estimates are significantly different. The minimal effect of the HFE in 2008 on the 2007 age-0 cohort differs from what was observed for the 2004 BHBF. The age-0 population estimate in December, after the 2004 BHBF test, declined by three-fold relative to the estimate determined just before the flood in mid-November, 2004.

Survival of the 2008 age-0 cohort, which hatched and emerged in April through June, 2008, was very high relative to others years of RTELSS sampling (2003, 2004, 2006, 2007). Estimates of the total number of redds deposited in 2007 and 2008 were 1,215 and 2,047, respectively. The age-0 population estimate for June 2008 (546,000) was five-fold higher than the estimate in June 2007 (107,000). Survival between egg deposition and the first few months from emergence, based on the abundance of age-0 fish in June, was more than two-fold higher in 2008 compared to 2007 and previous years. Continuation of sampling in 2009 will provide an additional year for this comparison. Final results will be available by December 2009.

GCMRC Contact: Matthew E. Andersen ([mandersen@usgs.gov](mailto:mandersen@usgs.gov), 928-556-7379) or Josh Korman ([jkorman@ecometric.com](mailto:jkorman@ecometric.com), 604-737-8314)

**Project 4b:** Trout Movement during the HFE. GCMRC presented preliminary results of the trout movement study during the November 2008 Science Symposium. Since the symposium, GCMRC completed and finalized the data analysis with the assistance of our DASA staff. A draft final report was submitted for publication as part of the Science Symposium Proceedings in February. This report is currently being reviewed and is expected to be finalized in June 2009. Abundance indices in combination with acoustic telemetry results indicate that the March 2008 HFE did not cause significant downstream displacement of adult and juvenile rainbow trout in the Lees Ferry. Other evidence suggests that populations of very young trout were not impacted by the March 2008 HFE. However, a three fold decrease in population size of very young trout was observed during the November 2004 HFE. These data suggest the need for further studies to track the fate of very small rainbow trout and other factors which may cause movement during future HFEs.

GCMRC contact: Matthew E. Andersen ([mandersen@usgs.gov](mailto:mandersen@usgs.gov), 928-556-7379)

**Project 5:** GCMC will bring this update to the TWG meeting.

**Project 6:** Kanab ambersnail. One of the terms of the 2008 Biological Opinion required that Kanab ambersnail habitat, primarily cardinal monkeyflower, be moved in advance of the March 2008 experimental high flow. Personnel from AZGFD, USFWS, and BOR participated in conducting this conservation action, moving snail habitat to higher ground for the duration of the high flow. Habitat/vegetation that was moved was replaced following the return to normal dam releases. This vegetation was surveyed again in September 2008. Vegetation had recovered well, becoming reestablished and expanding. Additional surveys to evaluate longer-term condition of this habitat are planned for 2009.

**Project 7:** Synthesis of High Flow Sediment Research Findings from 1996 through 2008 (tentatively, scheduled for FY2010). Following completion of 2008 High Flow Test sediment reporting by GCMRC staff and cooperating scientists (set for late 2009), the GCMRC intends to pursue development and publication of a comprehensive synthesis on results from the 1996, 2004, and 2008 sediment experiments, task requested by the Glen Canyon Dam Adaptive Management Work Group in 2008. The synthesis report will involve a comprehensive summarization of all previously published results from these three experimental flows, as well as findings from other related sediment research that resulted from tests of Habitat Maintenance Flows in November 1997 and May and September 2000 (as part of the Low Summer Steady Flow experiment). This synthesis activity is contingent upon funding availability as approved in the FY2010 work plan/budget for the GCMRC and would be completed by the end of 2010.

GCMRC contact: Ted Melis ([tmelis@usgs.gov](mailto:tmelis@usgs.gov); 928-556-7282)

## Near Shore Ecology/Fall Steady Flow Science Plan

Following an open competition period of 60 days, three proposals for the Near Shore Ecology (NSE) project were received. An independent panel of five external scientists from around the country reviewed the proposal and recommended one to GCMRC. GCMRC accepted this recommendation and is in the final steps of awarding the cooperative agreement to a group of

five scientists lead by Dr. William Pine from the University of Florida. The UF group expects to conduct sampling of small-bodied fishes in the Little Colorado River reach of the mainstem Colorado River during the months of July, August, September, and October in 2009, 2010, and 2011, finalizing and reporting on their results to complete the project by September 2012. The GCMRC aquatic food base is decreasing their full river trips at this time, but intends to maintain basic sampling efforts to continue to collect data during steady and fluctuating flow periods 2009-2012. The aquatic food base program anticipates additional sampling collections during the steady flows associated with the overflight to be conducted in May 2009. May is a month of high primary productivity, so these data should be valuable. Fisheries and aquatic ecology scientists at GCMRC and among our cooperators will be working together this spring to determine how best to meld work being conducted in aquatic food base and fisheries.

GCMRC contact: Matthew E. Andersen ([mandersen@usgs.gov](mailto:mandersen@usgs.gov), 928-556-7379)

### **Humpback Chub Stock Assessment**

GCMRC has been actively working to update an assessment of the Grand Canyon humpback chub population with data from 2007 and 2008. This assessment will be an update of the Age-Structured Mark-Recapture (ASMR) model of Coggins and co-authors. GCMRC scientist Lew Coggins has initiated the ASMR model runs, which require large amounts of computing time. As our individual sampling efforts have suggested, it appears that the Grand Canyon humpback chub population continues to remain strong. Because of the high visibility of this model result, we are conducting additional review of the model runs, are reviewing problematic data, and are submitting the results to external peer review. We have been able to line up one qualified peer reviewer and are seeking another. We expect that the review process will be complete in time to prepare a USGS Open File Report, or other appropriate reviewed document, in time to distribute an updated estimate at the April AMWG meeting.

GCMRC contact: Matthew E. Andersen ([mandersen@usgs.gov](mailto:mandersen@usgs.gov), 928-556-7379)

### **Cultural Monitoring R&D Project**

The cultural monitoring R&D project continues to make headway towards development of a pilot monitoring program for cultural resources, despite the fact that GCMRC was unable to get into the field last year to complete planned Phase I work due to NPS permitting issues. Three posters and one oral presentation about the project were provided at the November 2008 Science Symposium in Tempe, Arizona. Since the start of FY2009, we have completed several additional reports that are either now published or in process towards being published. We have also compiled and analyzed all the weather data collected in 2007 and 2008 and caught up on processing a backlog of sand samples. Dr. Jack Schmidt from USU is currently working with the project to compile existing GIS data pertaining to the Holocene deposits and geomorphic settings of cultural sites in the CRE, and Dr. Keith Kintigh from ASU is assisting GCMRC in clustering geomorphic and archaeological data for future sampling purposes. Below is a list of publications and presentation that have been either completed and published in FY2009 or are currently undergoing review or final editing in advance of final publication. In addition to these products, GCMRC re-submitted a substantially revised research proposal to Grand Canyon National Park for permitting of field work planned for April-May 2009, and project cooperators are in the process of developing several additional reports (e.g., an OFR on 2008 weather data, an analysis

of topographic change in relation to the 2007 weather data, and a synthetic monograph on Phase I results) that we anticipate will be finalized in latter part of FY2009 and first half of FY2010. GCMRC contact: Helen Fairley ([hfairley@usgs.gov](mailto:hfairley@usgs.gov), 928-556-7285)

### **FY2009 Products and Presentations:**

Collins, B.D., Brown, K.B., and Fairley, H., 2008a. Evaluation of Terrestrial LIDAR for Monitoring Geomorphic Change at Archaeological Sites in Grand Canyon National Park, Arizona: U.S. Geological Survey, Open File Report 2008-1384, 60 p.  
[<http://pubs.usgs.gov/of/2008/1384/>].

Collins, B.D., Kayen, R., Minasian, D., and Fairley, H., 2008b. Terrestrial Lidar Topographic Change Monitoring At Archaeological Sites Along The Colorado River Corridor Of Grand Canyon National Park, Arizona. Oral presentation at *Coming Together: Coordination of Science and Restoration Activities for the Colorado River Ecosystem Conference*, November 19, 2008, Tempe, Arizona.

Collins, B.D., Minasian, D., and Kayen, R., (in press). Topographic Change Detection at Select Archaeological Sites in Grand Canyon National Park, Arizona, 2006-2007: U.S. Geological Survey, Scientific Investigations Report 2009-XXX, 97p.

Draut, A. E. Andrews, T., Fairley, H. C., and Brown, C. R., (in press), 2007 Weather and Aeolian Sand-Transport Data from the Colorado River Corridor, Grand Canyon, Arizona; U.S. Geological Survey, Open-File Report 2009-XXX.

Draut, A. E. Hazel, J. E. Jr., Fairley, H. C., and Brown, C. R., 2008, Aeolian Reworking Of Sediment Deposits From The March 2008 Grand Canyon High-Flow Experiment. Poster presented at *Coming Together: Coordination of Science and Restoration Activities for the Colorado River Ecosystem Conference*, November 19, 2008, Tempe, Arizona.

Fairley, H.C. and Sondossi, H., 2008, Applying an Ecosystem Framework to Evaluate Archaeological Site Condition along the Colorado River in Grand Canyon National Park, Arizona. Poster presented at *Coming Together: Coordination of Science and Restoration Activities for the Colorado River Ecosystem Conference*, November 19, 2008, Tempe, Arizona.

Leap, L., n.d., Fiscal Year 2007 Report for Interagency Agreement between National Park Service, Grand Canyon National Park, and the U.S. Geological Survey, Grand Canyon Monitoring and Research Center to Collaborate in the Development of Long-Term Monitoring Protocols for Archaeological Resources of the Colorado River Corridor in Grand Canyon that may be Affected by the Operation of Glen Canyon Dam. Draft report submitted October 3, 2008 to U.S. Geological Survey Grand Canyon Monitoring and Research Center, Flagstaff.

O'Brien, G. and Pederson, J., 2008, Soil infiltration, shear strength, and gully erosion measured along the Colorado River – what is responsible for the erosion of cultural sites? Poster

presented at *Coming Together: Coordination of Science and Restoration Activities for the Colorado River Ecosystem Conference*, November 19, 2008, Tempe, Arizona.

O'Brien, G. and Pederson, J., n.d. (in review), Geomorphic Attributes Of 232 Cultural Sites Along The Colorado River In Grand Canyon National Park, Arizona. Final draft report dated November 15, 2008 by Department of Geology, Utah State University, Logan, to U.S. Geological Survey, Grand Canyon Monitoring and Research Center, Flagstaff.

O'Brien, G. and Pederson, J., n.d. (in review), Gully Erosion Processes and Parameters at Six Cultural Sites Along the Colorado River in Grand Canyon National Park, Arizona. Final draft report dated November 23, 2008, submitted by Department of Geology, Utah State University, Logan, to U.S. Geological Survey, Grand Canyon Monitoring and Research Center, Flagstaff.