

**Glen Canyon Dam Adaptive Management Work Group**  
**Informational Item**  
**March 15-16, 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 March 15-16, 2009.

---

---

Preparers

John Beeman, Acting Biology Program Manager, GCMRC  
Ted Melis, Deputy Chief, Grand Canyon Monitoring and Research Center (GCMRC)  
Helen Fairley, Socio-Economic Program Manager, GCMRC

---

---

Previous Action Taken

N/A

---

---

Relevant Science

N/A

---

---

Background Information

**I. 2009 PROTOCOL EVALUATION PANEL FOR FISH MONITORING PROGRAMS**

The following is an update on activities since the fish program Protocol Evaluation Panel (PEP) in 2009:

Data compilation and analyses are underway following PEP recommendations. Some changes are being implemented in FY10, other recommendations require further analysis before making changes in longstanding (5+ yr) sampling programs. Those analyses are underway, and where possible will be scheduled for implementation in FY11 after analysis, review and approval. Thrust of most recommendations was to shift some resources from the most robust monitoring programs to the least robust ones, as the level of precision from some existing programs may not be necessary. Summaries of programs, PEP recommendations, and current status are below.

**a. Little Colorado River**

- i. PEP recommendation: Shift resources to mainstem sampling
  1. No firm conclusions yet, analyses ongoing
  2. Any recommended changes in sampling program will be subject to external peer review, SA and TWG review

**b. Lees Ferry**

- i. PEP recommendation: Reduce number of trips and eliminate fixed sample sites

1. Implement in FY10 and redirect resources to non-native surveillance efforts.  
Non-native study plan being developed
- ii. Early life history (recruitment) monitoring to continue through 2010. (EcoMetric to AGFD transition); to be considered for inclusion in FY11-12
  1. Recommend inclusion depending on experimental actions
  2. Ongoing modeling (Walters and others) offers promise of tracking early recruitment signals based on length-frequency analysis.
- c. **Mainstem Colorado river**
  - i. PEP recommendation: Reduce electrofishing trips from two to one.
    1. Rejected for FY10, to be considered in FY11 and FY12.
    2. May lose most of entire year's data if only one trip is conducted under very turbid conditions. Two trips reduce that possibility. Good data on RBT status and trends at mouth of LCR seems important to managers.
  - ii. PEP recommendation: Increase efforts toward HBC and nonnative fishes.
    1. One fall mainstem "aggregation" netting trip to be implemented in FY10, considered for inclusion in FY11-12. (Motor trip)
    2. One fall mainstem multi-gear trip to be implemented in FY10, considered for inclusion in FY11-12. (Non-motor trip).

## **II. 2000 LSSF SYNTHESIS REPORT, by B. Ralston**

[Draft report entered internal GCMRC review process February 24, 2010, external peer review expected in April 2010, anticipated availability August/September 2010 as a U.S. Geological Survey Open File Report]

### **a. Sections include the following:**

- i. Specific resources/variables covered
- ii. Mainstem & shoreline temperatures and habitats
  1. Sediment response incorporated into portions here
- iii. Fish downstream of Lees Ferry and in Glen Canyon
  1. Sediment response incorporated into portions here
- iv. Aquatic food base in Glen Canyon
- v. Riparian vegetation
- vi. Recreation safety and perceptions
  1. Sediment response incorporated into portions here
- vii. Economics – financial costs, regional costs (jobs, equipment replacement)
- viii. Knowledge gained and opportunities to incorporate into future planning

## **III. NONNATIVE FISH TECHNICAL REPORT**

"Nonnative Fish Control Options and Recommended Monitoring and Research Activities" by Kara D. Hilwig, Matthew E. Andersen, and Lewis G. Coggins, Jr. [report has undergone several reviews, finalization is awaiting non-native fish workshop in late March 2010 and results of

Ecopath/Ecoism modeling workshop in early March and subsequent workshop for TWG members in mid-April (Saguaro Lake Ranch) described below. Planned U.S. Geological Survey Open File Report].

#### IV. NONNATIVE FISH WORKSHOP, MARCH 30-31, 2010

Draft agenda in review, location not set yet (Flagstaff, or Phoenix). Day one planned for science topics and day two planned for management topics.

#### V. 2008 HIGH FLOW EXPERIMENT REPORTS & PUBLICATION STATUS

The following reports have been in preparation since fall 2009:

- a. **Suspended-Sand Transport & Budgeting** – Project 1.A - “Sediment transport during three controlled-flood experiments on the Colorado River downstream from Glen Canyon Dam, with implications for eddy-sandbar deposition in Grand Canyon National Park” by David J. Topping, David M. Rubin and others [availability anticipated by March 30, 2010 as a U.S. Geological Survey Open File Report],
- b. **Sandbar Modeling** - Project 1.B - “Hydro-morphodynamics of two large eddies and associated sandbars along the Colorado River during high flow” by Scott A. Wright and Matt Kaplinski [Journal of Geophysical Research article, anticipated publication date - Spring 2010],
- c. **Sandbar Changes** - Project 1.C - “Sandbar Response Following the 2008 High-Flow Experiment on the Colorado River in Marble and Grand Canyons, Arizona” by Joe E. Hazel Jr., Paul E. Grams, John C. Schmidt and Matt Kaplinski [currently available at: [www.gcmrc.gov](http://www.gcmrc.gov) and [www.usgs.gov](http://www.usgs.gov) as U.S. Geological Survey Scientific Research Investigations Report 2010-5015],
- d. **Sandbars and Cultural Sites** - Project 1.C - Aeolian reworking of sandbars from the March 2008 Glen Canyon Dam high-flow experiment in Grand Canyon by Draut, A.E., Hazel, J.E., Jr., Fairley, H.C., Brown, C.R. [in press, *in* Melis, T.S., Hamill, J.F., Coggins, L.C., Jr., Grams, P.E., Kennedy, T.A., Kubly, D.M., and Ralston, B.E., eds., Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008: U.S. Geological Survey Circular, anticipated availability June 2010],
- e. **Sandbars and Cultural Sites** - Project 1.C – “Weather and aeolian sand-transport data from the Colorado River corridor, Grand Canyon, Arizona” by Draut, A.E., Sondossi, H.A., Hazel, J.E., Jr., Andrews, Timothy, Fairley, H.C., Brown, C.R., and Vanaman, K.M. [currently available at [www.gcmrc.gov](http://www.gcmrc.gov) and [www.usgs.gov](http://www.usgs.gov) as U.S. Geological Survey Open-File Report 2009-1190, 98 p. Link: [www.gcmrc.gov/research/high\\_flow/2008/documents.aspx](http://www.gcmrc.gov/research/high_flow/2008/documents.aspx) <http://pubs.er.usgs.gov/usgspubs/ofr/ofr20091190>],
- f. **Sandbars and Backwaters** - Project 1.D - “2008 High-Flow Experiment at Glen Canyon Dam: Morphologic Response of Eddy-Deposited Sandbars and Associated Aquatic Backwater Habitats along the Colorado River in Grand Canyon” by Paul E. Grams, John C. Schmidt, Matthew E. Andersen [currently available at [www.gcmrc.gov](http://www.gcmrc.gov) and [www.usgs.gov](http://www.usgs.gov) as U.S. Geological Survey Open File Report 2010-1032],

- g. Riparian Vegetation** - Project 2 - “Riparian Vegetation Response to the March 2008 Short-Duration, High-Flow Experiment—Implications of Timing and Frequency of Flood Disturbance on Nonnative Plant Establishment along the Colorado River below Glen Canyon Dam” by Barbara E. Ralston [currently available at: [www.gcmrc.gov](http://www.gcmrc.gov) and [www.usgs.gov](http://www.usgs.gov) as a U.S. Geological Survey Open File Report 2010-1022],
- h. Aquatic Food Production** – Project 3 - “Short-Term Effects of a High-Flow Experiment on Macroinvertebrates in the Colorado River below Glen Canyon Dam” by Emma J. Rosi-Marshall, Theodore A. Kennedy, Dustin W. Kincaid, Wyatt F. Cross, Holly A.W. Kelly, Katherine A. Behn, Tyler White, Robert O. Hall Jr. and Colden V. Baxter [currently available at: [www.gcmrc.gov](http://www.gcmrc.gov) and [www.usgs.gov](http://www.usgs.gov) as USGS Open File Report 2010-1031],
- i. Rainbow Trout Spawning & Survival** – Project 4.A - “Effects of High-Flow Experiments from Glen Canyon Dam on Abundance, Growth, and Survival Rates of Early Life Stages of Rainbow Trout in the Lees Ferry Reach of the Colorado River” by Josh Korman, Matthew Kaplinski and Theodore S. Melis [currently available at: [www.gcmrc.gov](http://www.gcmrc.gov) and [www.usgs.gov](http://www.usgs.gov) as U.S. Geological Survey Open File Report 2010-1034],
- j. Rainbow Trout Downstream Movement** – Project 4.B - “Evaluating effects of an HFE on rainbow trout: Using acoustic telemetry and relative abundance measures” by Kara Hilwig and Andy Makinster [in press, within U.S. Geological Survey Circular, Proceedings of the November 2008 Colorado River Science and Resource Management Symposium, anticipated availability in June 2010],
- k. Lake Powell & Glen Canyon Water Quality** - Project 5 - “Effects of 2008 High-Flow Experiment on Water-Quality in Lake Powell and Glen Canyon Dam Releases, Utah-Arizona” by William Vernieu [anticipated availability, March 30, 2010, as a U.S. Geological Survey Open File Report],
- l. 2008 HFE Summary** - U.S. Geological Survey Fact Sheet – “2008 High-Flow Experiment at Glen Canyon Dam Benefits Colorado River Resources in Grand Canyon National Park” by Theodore S. Melis, David J. Topping, Paul E. Grams, David M. Rubin, Scott A. Wright, Amy E. Draut, Joseph E. Hazel, Jr., Barbara E. Ralston, Theodore A. Kennedy, Emma Rosy-Marshall, Josh Koran, Kara D. Hilwig, and Lara M. Schmit, [available at: [www.gcmrc.gov](http://www.gcmrc.gov) and [www.usgs.gov](http://www.usgs.gov) as U.S. Geological Survey Fact Sheet 2010-3009],
- m. Kanab Amersnail Conservation Measure** – Project 6 – KANAB AMBERSNAIL HABITAT MITIGATION FOR THE 2008 HIGH FLOW EXPERIMENT by Jeff A. Sorensen [cooperator report to GCMRC, available upon request to Mary Daugherty ([mdaugherty@usgs.gov](mailto:mdaugherty@usgs.gov))],
- n. HFE Synthesis** – Project 7 – “Synthesis of High Flow Experimental Results Associated with 1996, 2004 and 2008 Tests at Glen Canyon Dam, AZ” by John C. Schmidt, Richard A. Valdez and others [in development during 2010 with anticipated availability in December 2010 as a U.S. Geological Survey Circular].

## **VI. PROPOSED APRIL 13-15, 2010 INTEGRATED MODELING WORKSHOP AT SAGUARDO 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 13<sup>th</sup>) 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 is also collaborating with 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.

**DRAFT AGENDA**

**Saguaro Lake Ranch  
13020 Bush Highway, Mesa, AZ 85215**

Tuesday April 13<sup>th</sup>

Integrated Physical Modeling Update & Stakeholder Interactions (Scott Wright, Paul Grams and others w/ Josh Korman and Ted Melis, facilitators)

“Integrated Temperature, Flow & Sediment Modeling – Status & Next Steps?”

09:00 AM Introductions

Topic #1 - Shifting rating curve model for sand transport -- Explanation of model and example applications. Example application 1: use of model to predict relative sand retention magnitude for given tributary input volumes and a range of alternative dam-operation scenarios. Example application 2: potential use of model in development of high-flow trigger criteria.

10:00 AM Topic #2 - Three-dimensional modeling of eddies -- Explanation of model and example application in assessing various options for peak flow magnitude and duration.

11:00 AM Discussion on potential applications for flow and sediment transport models.

12:00 PM **Lunch**

01:00 PM Topic #3 - Monthly average temperature model -- Explanation of model and example application.

02:00 PM Topic #4 - Unsteady temperature model -- Explanation of model and example application for evaluating potential use of a temperature control device.

03:00 PM Topic #5 - Two-dimensional temperature model -- Explanation of model and example application for predicting water temperature for near-shore areas in support of near-shore ecology project.

04:00 PM Discussion on temperature and habitat models with possible discussion on the potential for development of a habitat suitability model for trout in Glen Canyon.

05:00 PM **Adjourn**

06:30 PM **Dinner**

Wednesday April 14 – 15<sup>th</sup>

Integrated Ecosystem Modeling Workshop & Stakeholder Interactions (Carl Walters and others w/Josh Korman and Ted Melis, facilitators)

“Outcomes of the March 2010 Ecosim Modeling Workshop at Cedar Key, FL”

**Wednesday April 14<sup>th</sup>**

08:30 AM – Introductions & Background

09:00 AM – Topic #1 - General methods and findings about structure of the GC aquatic food web

10:30 AM - **Break**

11:00 AM --Topic #2 - Alternative hypotheses for changes in food web productivity in the Lees Ferry reach: impacts of long term changes in minimum flows, BHBF flows, and Lake Powell levels

NOON – **Lunch**

01:00 PM – Discussion with stakeholders on topics #1 and #2

03:00 PM – **Break**

03:30 PM – Topic #3 - Causes of variation in recruitment and growth of Lees Ferry rainbow trout, linkage of trout changes with downstream abundances changes of native fish

05:00 PM – **Adjourn**

06:30 PM - **Dinner**

**Thursday April 15<sup>th</sup>**

08:30 AM – Summary of Day 1 topics & outcome

09:00 AM – Topic #4 - Dynamic changes in the aquatic ecosystem near the LCR; mechanisms that have caused recent dramatic increases in native fish abundance; policy implication for native fish recovery of linkages between trout and flow regulation, minimum requirements for non-native fish control to maintain continued recovery of native fishes

10:30 AM - **Break**

11:00 AM – stakeholder interactions on topics 3 & 4

NOON – **Lunch**

01:00 PM – **Adjourn**

NOTE - Information about reserving accommodations and taking meals at Saguaro Lake Ranch – there are 27 cabins available on a first-come first-serve basis that can accommodate up to 54 persons (sharing rooms) or 27 (all with single accommodation). Please see the letter below and call the Ranch to make your reservations. They will also ask you about which meals you may want to take while at the workshop. Ask about alternative accommodations when you call if they are fully booked or you desire to stay off site at another location.

Saguaro Lake Ranch  
13020 Bush Highway, Mesa, AZ 85215  
Phone: 480-984-2194 Fax: 480-380-1489  
saguarolakeranch.com

November 25, 2009

Ted Melis  
[tmelis@usgs.gov](mailto:tmelis@usgs.gov)

Dear Ted-

Thank you for your phone call and request for information about the possibility of having two conferences here in 2010. The first conference would be a small group of 10 attendees for the two nights of January 20<sup>th</sup> and 21<sup>st</sup>. **The second group would be a larger group of 30-40 for the three nights of April 12<sup>th</sup>, 13<sup>th</sup> and 14<sup>th</sup>.** We currently have both dates available.

Our daily conference rate is \$150 per person, double occupancy, and \$175 for a single. This includes lodging, three meals, meeting space and beverage/snack breaks. State sales tax of 7% and optional gratuities or activities would be additional. We have several rooms in the lodge as well as an outbuilding which we use for meetings. If you need to break down the daily rate for the federal per diem rates, the single rate of \$175 is \$115 for room and \$60 for food, the double rate of \$150 is \$90 for room and \$60 for food.

The ranch enjoys a spectacular location, offers comfortable accommodations and delicious food as well as a unique atmosphere conducive to education and team building. We appreciate your interest in our facility and look forward to providing your groups with all of the amenities important to creating a successful learning experience. Please contact me with any further questions and we hope to hear from you soon.

Sincerely,

Stephen V. Durand  
General Manager

## **VII. UPDATE ON STATUS OF THE CULTURAL MONITORING R&D PROJECT**

In 2008 and 2009, the Grand Canyon Monitoring and Research Center (GCMRC) was not permitted to continue evaluating the use of LIDAR technology as a monitoring tool for tracking status and trends at archaeological sites within Grand Canyon National Park (GRCA). GRCA has now agreed to issue a permit to allow the project, including the continuing evaluation of LIDAR technology, to occur at 10 sites in 2010. In February, GRCA and GCMRC staff worked together to collaboratively identify the sites that will be the focus of 2010 fieldwork, and a final list was determined. GRCA is now in the process of issuing a permit for the 2010 fieldwork, which is scheduled to commence on April 9, 2010. A geomorphic workshop and an analysis of the archaeological site database will also be conducted later this year, and the results will be used to help determine a representative sample of sites for the Phase II (pilot monitoring) portion of this project starting in 2011. In the current (03/02/10) version of the draft FY2011-2012 budget, proposed funding for the pilot program has been substantially reduced from what was originally planned and requested. The current proposed budget is now approximately 50% less than what is needed to complete the pilot project in a three year time frame; therefore, if the project budget remains at its current reduced funding level, at least 50% more time will be required to complete the pilot phase of this project.

**Technical Work Group  
Informational Update  
March 15-16, 2010**

---

---

Agenda Item

Grand Canyon Monitoring and Research Center (GCMRC) Updates – **Sediment**

---

---

Action Requested

√ These items are for information and discussion. Opportunity for questions will be provided at the meeting on March 15-16, 2010.

---

---

Preparer

David Topping, Hydrologist, GCMRC or Paul Grams, Supervisory Hydrologist, GCMRC

---

---

Previous Action Taken

N/A

---

---

Relevant Science

N/A

---

---

Background Information

- **Current Temperature and Sediment Conditions**

Mainstem river temperatures peaked at about 18° C at Diamond Creek in late July 2009. Temperatures at this location have been similar for the past 4 years, which is lower than the peak temperatures of approximately 19° to 20° C reached in the 2000-2005 period.

Mass-balance sand budgets have been computed for the period beginning immediately after the March 2008 high flow extending through January 2010 for 3 mainstem reaches: (1) Upper Marble Canyon (0-30 mile), (2) Lower Marble Canyon (30-61 mile), and (3) Eastern Grand Canyon (61-87 mile). Mass balance sand budgets may be available by the time of the TWG meeting for the two additional mainstem reaches: (1) Central Grand Canyon (87-166 mile), and (2) Western Grand Canyon (166-225 mile). The completed computations show that net sand export occurred in Upper Marble Canyon and Eastern Grand Canyon and that the budget is indeterminate but trending negative in Lower Marble Canyon. Tributary sediment inputs were small in 2008, 2009, and, to date, have been negligible in 2010. Multiple moderate tributary input events or a single large input would be required to move the system to a condition of significant positive sand mass balance.

Sediment modeling applications, as presented at the January 2010 Annual Reporting meeting will also be reviewed and discussed.

The high-resolution sediment-transport data used to construct these sediment budgets is posted on the GCMRC website: [http://www.gcmrc.gov/products/other\\_data/gcmrc.aspx](http://www.gcmrc.gov/products/other_data/gcmrc.aspx).