

Glen Canyon Dam Adaptive Management Work Group
December 5-6, 2006

Conducting: Mark Limbaugh, Secretary's Designee
Facilitator: Mary Orton

Date: December 5, 2006
Convened: 9:30 a.m.

Committee Members:

Joe Alston, NPS/GCNP
Darryl Beckmann, USBR
Steven Begay, Navajo Nation
Charley Bullets, Kaibab Band of Paiute Indians
Jay Groseclose, NM Interstate Stream Comm.
Amy Heuslein, BIA
Loretta Jackson-Kelly, Hualapai Tribe
Leslie James, CREDA
Rod Kuharich, State of Colorado
Phillip S. Lehr, Colorado River Comm./NV
Andre Potochnik, GCRG

Ted Rampton, UAMPS
Nikolai Ramsey, Grand Canyon Trust
John Shields, WY State Engineers Office
Sam Spiller, USFWS
Mark Steffen, Federation of Fly Fishers
Larry Stevens, Grand Canyon Wildlands Council
Dennis Strong, UDWR
Bruce Taubert, AGFD
Brad Warren, WAPA
Bill Werner, ADWR
Gerald Zimmerman, State of California

Committee Members Absent:

Carleton Albert, Jr., Pueblo of Zuni

Leigh Kuwanwisiwma, The Hopi Tribe

Interested Persons:

Andrea Alpine, USGS
Jason Alberts, DOI
Matthew Andersen, USGS/GCMRC
Jan Balsom, NPS/GCNP
Mary Barger, WAPA
Cliff Barrett, UAMPS
Christine Beard, USGS/GCMRC
Mike Berry, USBR
Bob Broscheid, AGFD
Brenda Burman, USBR
Gary Burton, WAPA
Kerry Christensen, Hualapai Tribe
George Carr, Colorado River Comm./NV
Tara Conrad, Office of the AS-WS DOI
Jennifer Crandall, Colorado River Comm./NV
Jonathan Damp, Pueblo of Zuni
William Davis, CREDA
Kurt Dongoske, TWG Chair
Helen Fairley, USGS/GCMRC
Dave and Pam Garrett, M³Research
Roxanne George, Sierra Club/Flagstaff
Lynn Hamilton, GCRG
John Hamill, USGS/GCMRC
Burt Hawks, WAPA/SLC
Norm Henderson, NPS
Doug Hendrix, USBR

Jeff Humphrey, USFWS
Pamela Hyde, Member of the Public
Rick Johnson, Grand Canyon Trust
Robert King, UDWR
J.D. Kite, USGS/GCMRC
Dennis Kubly, USBR
Paul Li, Bob Lynch and Associates
Robert Lynch, Attorney
Ken McMullen, GCNP
Ted Melis, USGS/GCMRC
Don Ostler, Upper Colorado River Comm.
Clayton Palmer, WAPA
Bill Persons, AGFD
Randall Peterson, USBR
Ken Rice, USBR Glen Canyon Dam
Larry Riley, AGFD
Tom Ryan, USBR
Dave Sabo, USBR
D. Randolph Seaholm, CWCB
Bob Snow, DOI
Barbara Steffen, Federation of Fly Fishers
John Weisheit, Living Rivers
Linda Whetton, USBR (Meeting Recorder)
Barry Wirth, USBR
Scott Wright, USGS/GCMRC
Mike Yeatts, The Hopi Tribe

Introductions and Administrative Items.

Mr. Limbaugh welcomed the members, alternates, and members of the public. He introduced the newest AMWG member, Charley Bullets, who represents the Kaibab Band of Paiute Indians; and Bob Broscheid, who will represent the Arizona Game and Fish upon Bruce Taubert's retirement. He also recognized Kurt Dongoske, who will continue serving as Chair of the Technical Work Group for FY 2007; and Ted Melis as the new Deputy Chief at GCMRC. He stated that the Secretary of the Interior has officially appointed all but two AMWG alternate members and thanked Tara Conrad for her assistance in expediting those appointments. He asked all present to introduce themselves.

Retirement of Bruce Taubert. Mr. Limbaugh thanked Bruce Taubert for his years served on the AMWG and wished him well in retirement. Sam Spiller read a letter of appreciation to Mr. Taubert from the Fish and Wildlife Service regional director. Darryl Beckmann presented a plaque to Mr. Taubert on behalf of the Bureau of Reclamation in recognition of his long-standing commitment and support to the AMWG.

Approval of the March 6-7, 2006, and September 6, 2006, Meeting Minutes. Bill Werner moved and Darryl Beckmann seconded the motion to approve the March and September 2006 minutes. Pending two minor corrections, the minutes were approved by consensus.

Action Item Tracking Report. Mr. Limbaugh said that the one open action item, regarding the budget reporting format, would be addressed during the budget discussion.

Legislative Updates. Dennis Kubly provided updates on two sections of the Energy Act of 2005. Section 1834 required a report of all Reclamation studies where no facility was built and the unbuilt project had hydroelectric potential. That report, completed in late 2005, is available on Reclamation's web page (<http://www.usbr.gov/power/data/sec1840.pdf>). Section 1834 required the Secretaries of Energy, Army, and Interior to report on the hydroelectric potential of existing facilities where no hydrogeneration was installed, as well as the potential to expand existing units. They were given 18 months to complete that study, with the report due to Congress in February 2007. The report is in draft and currently being reviewed by the agencies.

Mr. Kubly reported that Reclamation is operating under a Continuing Resolution through December 8. The CR is expected to be extended, possibly through January 2007.

Responses to Recommendations to the Secretary. Mr. Limbaugh distributed a copy of the memorandum (**Attachment 1**) sent to Secretary Kempthorne forwarding the AMWG's recommendation to approve the FY2007 budget, workplan, and hydrograph as presented on the Sept. 6, 2006, conference call. He stated the Secretary had approved those documents.

Old & New Business.

Strategic Plan. Mr. Limbaugh said he would like to have the Strategic Plan revised and updated (**Attachment 2** - AMP Strategic Plan updated January 17, 2002, with corresponding e-mail message sent to AMWG on 12/15/06 with corresponding documents). He asked that any comments on the plan be provided to Mary Orton by March 1, 2007. Suggested revisions would then be presented to the AMWG at their spring meeting to proceed with the revision.

ACTION ITEM: Members should provide comments on the AMP Strategic Plan to Mary Orton (mary@maryorton.com) by March 1, 2007.

Re-establishment of Roles Ad Hoc Group. Mr. Limbaugh announced the re-establishment of the Roles Ad Hoc Group with the following members: Randy Peterson (AMWG), Kurt Dongoske (TWG), John Hamill (GCMRC), and Dave Garrett (Science Advisors). He asked the group to review the Roles Ad Hoc Group Report (**Attachment 3**) and prepare a recommendation for AMWG's consideration at their next meeting relative to how the AMWG, TWG, GCMRC, etc. should function.

ACTION ITEM: The Roles Ad Hoc Group will prepare a recommendation report for AMWG's consideration at the next [spring] meeting.

DOI Policy Group Update. Mr. Limbaugh said the DOI Policy Group is comprised of assistant secretaries and bureau directors who manage the federal agencies involved in AMWG and who represent the Secretary on issues AMWG addresses. They will meet on December 19 in Washington, DC, and Mr. Limbaugh will brief them on the outcome of this meeting and other issues.

Programmatic Agreement Update. Mike Berry stated the primary purpose of the Programmatic Agreement (PA) is to comply with Reclamation's NHPA Section 106 responsibilities. To that end, Reclamation has entered into agreements with the Navajo Nation Archeological Department, Utah State University, and the Zuni Cultural Resource Enterprise in order to develop treatment recommendations for a set of endangered historic properties in Glen Canyon and the Colorado River in Grand Canyon. The draft recommendations will be available later this month, with final deliverables due no later than April 1, 2007. The remainder of FY07 will focus on consultation with Native American groups, the National Park Service, the Arizona State Historical Preservation Office, and the Advisory Council on Historic Preservation. The product of this consultation will be the development of a memorandum of agreement for the mitigation of adverse effects to historic properties. This will entail a multi-year design with annual budget requests.

Tribal Consultation Plan. Mike Berry reported that representatives from the Department of the Interior and the Department of Energy conducted two workshops to review and revise the draft Native American consultation plan. Following a solicitor's review, the Plan was sent to the tribes several months ago for their comment. To date, only one tribe has responded. Mike said it is of critical importance that the tribes fully participate in development of this Plan. Completion of the Tribal Consultation Plan is scheduled as a major agenda item for the January 2007 PA meeting.

Science Planning Group Accomplishments Report (Attachment 4)

Dr. Dave Garrett explained that a year ago, then-Secretary's Designee Mike Gabaldón asked that a group of technical and science specialists develop a set of GCMRC planning documents. It involved the Draft GCMRC Strategic Plan, a monitoring and research plan, the 2007 GCMRC annual work plan and budget, and a set of experimental options. The charge was to involve a broad cross-section of individuals, complete the plans, and terminate the group within a year. He believes the group accomplished its goals, and the Science Planning Group disbanded on October 1, 2006. However, he recommended that a similar group be created to resolve one or more of the following five critical issues:

1. Develop improved methods and/or procedures for managers to establish and articulate priorities for specific 3-5 year time intervals.
2. Develop improved methods for managers and scientists to permit effective tradeoff assessments.
3. Develop more effective scientist/managers collaborative working procedures.
4. Implement methods to monitor and improve the adaptive management process.
5. Implement methods to define future conditions for the CRE resources of concern.

Mr. Limbaugh directed the Roles Ad Hoc Group to review Dr. Garrett's recommendations and be prepared to make suggestions at the next AMWG meeting on how those could be accomplished.

GCMRC Completed Science Projects and Reports. (Attachment 5a)

Matthew Andersen provided updates on two humpback chub projects and Ted Melis provided information on sediment projects.

Humpback Chub Projects Update. After giving a PowerPoint presentation, Matthew Andersen added that Lew Coggins has developed an age-structured mark-recapture model (ASMR) that has been peer-reviewed. The findings were published in two separate articles, including a conclusion that this model is appropriate for measuring the HBC population in the Grand Canyon.

Question: Is there a mortality factor associated with tagging fish? (Zimmerman)

Andersen: There probably is, and we hope that it is minimal. Our FY08 protocol evaluation panel will be asked about the tolerance of the fish to tagging.

Q: *Was the population biologically stable in 1989? (Spiller)*

Andersen: We do not know.

Q: *Why do you think they were at that level in 1989? (Spiller)*

Andersen: We think that HBC may be forty live to about four years old. The dam has been closed for over 40 years so we may have lost the oldest fish by that point. There is also a theory, difficult to test, that perhaps the Little Colorado River can support 5,000 fish.

C: *Tom Czapla from the USFWS told us at the August TWG meeting that he thinks many tags were shed, and his guess is the number was 10,000 or less. (Steffen)*

Q: *The HBC below the dam appear to be distinguishable from those above the dam, which eliminates the possibility of replacing below-dam HBC with fish from above the dam. I thought this report would assist in understanding where fish come from if we put them in refugia. Was there analysis conducted that attempted to differentiate molecularly among the HBC in the eight locations where they are found, and if so, what were the results of that? (Taubert)*

Andersen: Yes, and generally, we found that within the canyon, it is quite a homogeneous population. Almost all are dependent on the reproduction in the LCR and so are closely related throughout the canyon. The possible exception is the 30-mile population above the LCR, which may be more closely related to the population above the dam. However, they had a very small sample size so the findings were not conclusive.

Q: *How do we use these results to ensure we are taking fish representative from throughout the canyon when we develop a refugium? (Taubert)*

Andersen: That effort is underway, including the development of a genetics management plan, for which more samples will be needed. The HBC group and I have requested management direction for moving fish to a refuge.

Q: *Over a year and a half ago, this group recommended that fish be put in refugia because of the population declines. It just seems that we are fiddling here while the data indicate Rome is burning. (Kuharich)*

Andersen: I would say the fire trucks have arrived. With population stabilization and the genetics study underway, there is action. We are closer to moving fish into a refuge than a year ago.

Q: *Is there any evolution of molecular structure in the population? (Zimmerman)*

Andersen: We do not have data on that question.

Q: *What about hybridization? (Steffen)*

Andersen: The Douglas' found evidence of previous hybridization with roundtails and a small amount with bonytails, so they are closely related.

Sediment Projects Update (Attachment 5b – AIF, PPT) – Ted Melis gave a PowerPoint presentation on sediment and physical science projects since 2001. He said the peer-reviewed reports on transport modeling should go to the TWG and the Sediment Ad Hoc Group sometime this winter or spring, for consideration of a long-term monitoring and research plan and process.

The sediment augmentation feasibility study reviewed five design options to transport sediment from Navajo Creek to below Glen Canyon Dam, and found that it is technically feasible. The Bureau of Reclamation construction costs estimate was \$100-400 million. Several additional steps were recommended in the report. The final report and presentation should come back to the TWG and Sediment Ad Hoc Group in 2007 for consideration and recommendation back to the AMWG.

Q: *Will your model compare tributary sand contribution between unsteady and steady flows? (Unsteady means that the flow is continually varying as it does typically in a daily pattern.) (Spiller)*

Melis: We have some ability to do that now. Because this system has had only a few periods of stable flows, most of the emphasis is on having an unsteady flow model for sediment transport.

Q: *What is the status of your report on the 2004 BHBF? (Taubert)*

Melis: We will give you a comprehensive update on the 2004 experimental outcome tomorrow morning. Some reports are completed and have been presented to you. Others were not scheduled for completion until this month.

C: *These flow experiments are among the largest, perhaps the largest ecosystem experiments ever conducted on earth in intentional scientific fashion. I request that GCMRC considers producing a report on the total effects of the events. Scientifically, that is the right way to do it. (Stevens)*

Q: *Please elaborate on the new sediment mass balance methods the PEP is supporting, and the concerns about the status of the sand transport model in the main channel. I thought we were trying to get to a situation where we could evolve an equilibrium of sediment through management options. (Kuharich)*

Melis: I emphasized in my presentation the so-called "sand storage component," which is in the process of being reported and evaluated. The other, more complete, project involves testing of conventional versus surrogate methods for measuring suspended sediment (area and volume) and suspended sand mass flux (how sand is actually moving through the system).

The PEP reviewed both the mass balance project and the use of both hydroacoustics and laser diffraction technologies (which have only become available during this phase of research and development). These are considered cutting edge techniques. The PEP was quite impressed by the results and the fact that we have the ability to monitor, in real time, the detail of sediment flux.

The question was what meets the needs of this program. The PEP concurred that (1) the methods are solid and they are being done in conjunction with conventional measurements so we can compare them to accepted standards, and (2) that level of capability in monitoring would certainly meet what they understood to be the program's need in the sediment-triggered events and experiments. That is the first part.

The second part is the model. When the PEP reviewed the simulation outcomes with our extensive dataset from the test, they felt the models were not simulating reality in a way we could really depend on, especially for long-term simulations of more than a year. Perhaps it would suffice for a few weeks to a month, but beyond that, the model has problems tracking history. They recommended a focused workshop on this issue alone.

I think two complicated elements of the model need to be connected. These are, first, eddy simulation – how does a sandbar evolve or erode within an eddy, in a system characterized by hundreds, if not thousands, of eddies. The second is to couple those kinds of simulation responses in a way that interfaces with the mainstem downstream sand transport. For example, we have sinks and sources potentially by the hundreds as a gauntlet. Sand grains come in from a tributary and travel downstream where they could end up in an eddy for one to 10 years or longer, or they could be coming out of eddies and moving downstream. That simulation capability turns out to be quite complicated, especially under steady flows.

Q: *Is this a good argument for not doing a flood, so that you can monitor the progress of the recent sediment inputs to verify your model? (Steffen)*

Wright: A spring flood that would allow us to monitor what happened to these tributaries through December, January, and February. Also, a flood would be a good test of other models.

Mark Limbaugh asked Dr. Melis and John Hamill for their thoughts on the earlier recommendation for a comprehensive report on the flow experiments. Melis said it would take some work and some resources, but would be fruitful and should be done. He also noted that GCMRC would give a comprehensive inventory tomorrow on the reports since the 2004 experiment, and that reports on the results of the 2000 and 2004 experiments were made at two GCMRC science symposia. Other stakeholders supported the idea, and requested a report to AMWG on the experiments. Melis said they would be happy to do so whenever the AMWG wished.

FY06 Final Expenditures

USBR. Dennis Kubly noted some last minute corrections to his handout. The "sum" on the last line in the column labeled "Expenditure," changed from \$596,605 to over \$800K. The line "HBC Genetics Management Plan" under "Other," changed from zero to \$50,000. Those funds have been obligated and that contract has been let, but it has not yet been expended. Dennis said the document would be revised and posted to the AMWG meeting web page. (Refer to **Attachment 6a** for corrections made following the meeting.)

Mr. Kubly reviewed sources of funding, totaling almost \$11 million:

- Hydropower revenues from the Basin Fund, about \$9,262,000.
- USGS appropriations, about \$1 million, to offset some of the USGS burden.
- CRSP Section 8 Funds, appropriated dollars from the Bureau of Reclamation, \$200,000.
- Appropriated funds from the five DOI agencies, \$95,000 each for a total of \$495,000, for tribal support.

USBR administered about \$2 million of the total in several categories:

- Reimbursements to some AMWG and TWG members for lodging and travel for the meetings.
- Administration of a set of contracts, and funding to contracting staff for that function.
- Compliance responsibilities, when we take an action that has not had NEPA or ESA coverage.
- The programmatic agreement, covering Section 106 NHPA.
- Tribal consultation.

He noted they had done what they could to show a closeout at the end of the year, but said there are billings that come in even after 90 days after the fiscal year, when they typically close out contracts. Those billings can come in for up to 5 years after the close of contract, so it is not possible to say these are the final end-of-year numbers.

He reviewed specific line items for the members:

- The AMWG category expended less than budget (\$42,710) because there was a conference call in September instead of a meeting.
- The Technical Work Group category also expended less than budget (\$19,631), but the travel line is slightly over budget because of meetings of the Science Planning Group.
- Sediment Augmentation Feasibility ("Other" category) went over budget by about \$25,000.
- Integrated tribal resource management funds are not yet expended. We agreed to provide the tribes with \$25,000 each to develop their monitoring needs in a report to the TWG. An additional sum is provided in FY07, when they bring those reports and funding requests to the TWG and the AMWG.

He reminded the group that unexpended funds at the end of the year are moved to the Experimental Flow Fund, in order to fund future experiments. The amount in the Experimental Flow Fund (under "Other") at the end of FY06 is about \$425,000, and the approved FY07 budget adds another \$500,000. This is a total of about \$925,000 available for the discussion of a possible BHBF tomorrow.

Mr. Kubly clarified that, while it appears that \$1.1 million is unexpended (the figure in the lower right-hand corner), that includes more than \$400,000 in experimental flow funds that will be used in the next experiment, and we have invoices for about \$340,000 additional for the tribal appropriations line. The latter are not on a fiscal year basis, though they are moving in that direction.

Mr. Taubert said he wanted to make a motion the next day, under discussion of the HBC plan, to use some of the unexpended dollars for priority items in the HBC plan, and asked if the motion were better made here or the next day. Mr. Limbaugh suggested the group discuss the HBC the next day.

GCMRC. J.D. Kite distributed a copy of a memo John Hamill sent to the AMWG dated Nov. 15, 2006 along with a new handout for his budget presentation (**Attachment 6b**). He noted his budget form was consistent with BOR's, as requested by AMWG, except he added one column to show the GCMRC contribution ("USGS Budgeted Amount"). He said that the DOI audited the GCMRC contract with almost ten staff samplings, and they found no discrepancies.

He noted that the report reflects each project balance by program, and two reflect unexpended funds. The first, the Bioscience Program, had a carryover of \$178,000 primarily from Aquatic Foodbase, which had a carryover from FY05. The second was for about \$57,000 in administration under "AMWG and

TWG requests,” where there were fewer requests than anticipated. To decide how to expend these funds, GCMRC will use the process outlined in the Draft Roles Ad Hoc Group Report:

- GCMRC will make a recommendation to the Secretary’s Designee and the Budget Ad Hoc Group (BAHG) (12/15/06)
- The BAHG will make a recommendation that will be forwarded to the TWG Chair, who will decide whether to involve the full TWG in a formal review (1/15/07)
- The TWG Chair will communicate the final recommended action to the Secretary’s Designee, TWG, and AMWG (2/1/07)
- If GCMRC disagrees with the recommendation from TWG, the GCMRC Chief will raise the issue with the Secretary’s Designee, who can affirm the recommendation, make a different decision, or consult with TWG, AMWG, or other entities.

AMWG members clarified that these are true carryover funds, as the projects they were associated with have been completed. One stakeholder suggested the funds be returned to the Basin Fund. Some concern was expressed about the BAHG meeting over the holidays, and Mr. Kite said they could be flexible with the timing. Other stakeholders wanted input into the allocation of the carryover funds in addition to their input through their TWG member. Darryl Beckmann noted that there was \$300,000 in FY06 unliquidated obligations that have not yet been accounted for, and that no “unexpended” funds should be obligated until that issue is cleared up. Mr. Limbaugh suggested that he, John Hamill, Kurt Dongoske, and Dennis Kubly would get together over lunch to develop a process to resolve this issue.

The group agreed that the one open Action Item, budget format changes, was complete.

The group took a break for lunch. When they returned, Mr. Limbaugh invited attendees who did not introduce themselves in the morning to do so now.

Mr. Limbaugh said that the group had reached a consensus over lunch about the process for allocating any carryover funds. Before announcing that, however, he reminded the group of the letter he sent to them earlier in his tenure as Secretary’s Designee, in which he asked the AMWG to focus on broad issues and policy implications in giving the Secretary guidance. He said that he hoped the group could vote on budget issues only once a year. He asked Mary Orton to review the consensus process.

Ms. Orton said that the group had agreed to use the process outlined in the draft Roles Ad Hoc Group report. This requires GCMRC to make recommendations to the BAHG for whatever dollars there are available, and the BAHG confers with the TWG Chair. She noted that Mr. Dongoske had announced his intention not to make a unilateral decision but rather to convene the TWG, so TWG members can expect an inquiry about a TWG meeting in the near future. She said that the Secretary’s Designee had also requested that the BAHG make a recommendation to the Roles Ad Hoc Group on this process. Finally, she said that the Secretary’s Designee would like this process to be used for any carryover funds from GCMRC’s FY06 budget as well as from the Bureau of Reclamation.

One AMWG member indicated that he would like the AMWG to be more involved in the process, and Mr. Limbaugh emphasized that he felt this was properly a TWG function, and the AMWG involvement should be through their TWG members.

Action on Science Plans (AIF-Attachment 7a).

John Hamill referred the group to two documents in the packets: “Strategic Science Plan to Support the Glen Canyon Dam Adaptive Management Program” (**Attachment 7b**) and “Monitoring and Research Plan to Support the Glen Canyon Dam Adaptive Management Program, Fiscal Years 2007-11” (**Attachment 7c**). He gave an overview of both plans (**Attachment 7d**) and noted these documents were products of the Science Planning Group on which Dave Garrett reported earlier in the meeting.

He specifically referenced Table 2.1 in the MRP, which includes the goals and the specific monitoring and research activities proposed for the next five years. He pointed out the strategic science questions and information needs that will be addressed, and the various core monitoring, research and development, and long-term experimental activities that would be implemented to address those questions and information needs. The table also links the AMWG priority goals with strategic science questions and specific monitoring and research and long-term experimental activities.

Sam Spiller offered to convene a meeting to develop what should be addressed in the interdisciplinary TCD workshop scheduled for this fiscal year. He said he was particularly interested in temperature benefits to HBC; response of the trout fishery at Lees Ferry; and AMWG's response to possible positive reactions from warm water piscivorous fish, diseases, or parasites. He is also interested in modeling for the type of temperature benefits from a low Lake Powell, a full Lake Powell, and a middle fill of Lake Powell. Mr. Hamill said he would welcome the input. He noted that the purpose of this workshop would primarily be to develop a science plan, not to debate whether we need it or what the pros or cons are.

Larry Stevens commended GCMRC for finally treating the Colorado River ecosystem with an ecosystem approach. He expressed concern that we still do not understand how the river ecosystem works, but the approach just presented should move the program in that direction.

Loretta Jackson-Kelly said she felt that there is no representation from a tribal perspective in the science studies. She asked how they could incorporate a traditional perspective of these resources, and how to determine if the Native American values are the same as the science values. Mr. Hamill said that when the tribes have defined their monitoring needs, they would be better able to determine if and how to incorporate them into the science plans. The planning process will continue, and he hoped the tribal perspective will be more fully integrated in the next iteration.

Rod Kuharich congratulated the Center for progress with the monitoring program. He said that funding for the TCD will not be easy, and said he thought the group might be relying too much on that project. He noted that the sediment augmentation project would be \$100 – 500 million. If the program did not make these huge capital expenditures, it could take other management actions, as the upper basin has, such as eradication of introduced species and reintroduction of the target species.

TWG Chair Report on Science Plans. Kurt Dongoske described how the TWG addressed this issue, and noted that a Minority Report (**Attachment 7e**) had been distributed to the attendees. He gave a presentation (**Attachment 7f**) and referenced comments from the TWG (slide 2). He said several TWG members agreed the MRP has some shortcomings, but they felt the need to move forward and not to re-draft the MRP. They suggested using it as a working document that can be revised in the future.

He said the TWG passed the following motion by a vote of 16 yes, 6 no, and 2 abstain at its November 2006 meeting: "TWG recommends to the AMWG (a) acceptance and implementation of the September 13, 2006, draft of the Monitoring and Research Plan and (b) the Monitoring and Research Plan be amended to incorporate the long-term experimental plan once it is finalized by the AMP/DOI."

Mr. Dongoske also said that the TWG, by consensus at its May 25, 2006 meeting, recommended approval by AMWG of the Strategic Science Plan with slight modifications. He said he believed GCMRC had made those requested changes.

Mr. Limbaugh asked for a motion to approve the Strategic Science Plan.

Motion: AMWG recommends to the Secretary of the Interior to accept the GCMRC Strategic Science Plan dated October 27, 2006.

Motion by Bruce Taubert, seconded by Bill Werner.

Mr. Limbaugh asked for further discussion and public comment, and there was neither. The motion was approved by consensus.

Mr. Limbaugh asked for a motion on the MRP.

Motion: AWMG approves the Monitoring and Research Plan (MRP) as a working document to help guide preparation of the FY08-09 workplan and budget; and recommends to the Secretary that GCMRC be charged with (1) addressing the concerns listed in the TWG minority report in a final FY07-11 document, and (2) to bringing that document to the AMWG for further consideration in summer 2007. Motion by Rod Kuharich, seconded by Larry Stevens.

Mary Orton said that the Secretary’s Designee had asked that, after a motion and a second has been placed on the floor, that the group attempt to build consensus for the motion. She said that Mr. Limbaugh had asked her to manage that discussion. After discussion, it was determined that there was not consensus, and a vote was taken.

Motion: AWMG approves the Monitoring and Research Plan (MRP) as a working document to help guide preparation of the FY08-09 workplan and budget; and recommends to the Secretary that GCMRC be charged with (1) addressing the concerns listed in the TWG minority report in a final FY07-11 document, and (2) to bringing that document to the AMWG for further consideration in summer 2007. Motion by Rod Kuharich, seconded by Larry Stevens.

Member or Alternate	Agency Name	Vote
Albert, Carleton	Pueblo of Zuni	absent
Alston, Joe	National Park Service	Y
Beckmann, Darryl	Bureau of Reclamation	Y
Begay, Steven	Navajo Nation	Y
Bullets, Charley	Kaibab Band of Paiute Indians	Y
Groseclose, Jay	New Mexico	Y
Heuslein, Amy	Bureau of Indian Affairs	Y
Jackson-Kelly, Loretta	Hualapai Tribe	N
James, Leslie	Colorado River Energy Distributors Assoc.	Y
Kuharich, Rod	Colorado	Y
Kuwanwisiwma, Leigh	Hopi Tribe	absent
Lehr, Phil	Nevada	Y
Stevens, Larry	Grand Canyon Wildlands Council	Y
Potochnik, André	Grand Canyon River Guides	abstain
Rampton, Ted	Chris Associated Municipal Power Systems	Y
Ramsey, Nikolai	Grand Canyon Trust	Y
Shields, John	Wyoming	Y
Spiller, Sam	U.S. Fish and Wildlife Service	Y
Steffen, Mark	Federation of Fly Fishers	Y
Strong, Dennis	Utah	Y
Taubert, Bruce	Chris Game and Fish Department	abstain
Warren, Brad	Western Chris Power Administration (DOE)	Y
Werner, Bill	Arizona	Y
Zimmerman, Jerry	California	Y
	San Juan Southern Paiute Tribe	absent
Voting Results: Yes: = 19 No = 1 Abstaining = 2 Total Voting = 20 2/3 = 14		
Motion passes.		

The group took a break. When they returned, Ms. Orton noted that, because they were running an hour late, they would skip some of the afternoon presentations.

Power Rate Setting:

Clayton Palmer said his presentation, which was a result of a request at an earlier AMWG meeting, would cover three areas: (1) rate setting for electrical power produced at Glen Canyon Dam, (2) cash flow and the CRSP Basin Fund, and (3) the relationship between these two things and the economic evaluation that was done for the options. He made a PowerPoint presentation (**Attachment 8**).

In answering questions, Mr. Palmer clarified that loan for the construction of Glen Canyon Dam is paid for through the rate charged by WAPA. The Basin Fund holds revenues for O&M expenses and non-reimbursable expenses. The balance in the Basin Fund is independent from the WAPA rates, which are set to repay the construction of Glen Canyon Dam. The construction loan was a 50-year loan at 3.222%, which is scheduled to be re-paid in 2014.

Q: Will that repayment substantially change the amount of money in the Basin Fund and can it be used for this program? (Stevens)

Palmer: When Hoover Dam was paid for, there was anticipation that rates would be lowered, but Congress obligated additional payments to other programs from the Hoover Dam rate. I would anticipate that in 2014, or some year close to that, repayment of Glen Canyon Dam would lower the slip rate unless other activities were to come into play that would change it.

Brad Warren said that they do not expect any change in the rate by paying off an investment until after 2025.

Experimental Options - Discussion and Recommendation to the Secretary (Attachment 9a).

Ms. Orton noted that, in order to get back on schedule, they would skip presentations on the long-term experimental plan options and go directly to questions.

NEPA Process for Long-Term Experimental Plan. Randy Peterson introduced the NEPA process the Bureau of Reclamation initiated a few weeks ago with a Federal Register Notice (**Attachment 9b**). That notice said that BOR would be starting an environmental impact statement (EIS) on the AMP's long-term experimental plan.

He said today's meeting builds on over a decade's worth of scientific monitoring and research and public input into this process. He said any comments given by the public today will be part of that record. In addition, they will host public meetings on January 4, 2007, in Phoenix and January 5 in Salt Lake City, which will give the public additional opportunity to provide input and comments. He also invited written comments. He stated a Federal Register notice would be published within the next two weeks, including an address and an e-mail address for providing comments. He expects the written comment period will extend through the end of February 2007. It will also include the locations of the public meetings. Mr. Peterson continued that the experimental options the SPG and TWG developed, and the AMWG discussions and possible recommendations that would occur today, would be part of the process.

Q: Will the outcome of this process change the ROD? (Potochnik)

Peterson: I think that is the question of the day. The scope of this effort is the long-term experimental plan. My understanding is that you have been discussing for about a decade some type of combination of flow and non-flow actions that would form the core of this experimental plan. That would then be the scope, rather than a revision of the 1996 ROD. It is not a supplemental EIS. It is not a re-work of a different EIS but it is rather directed specifically at the action that this group proposes to take, this long-term experimental plan.

Mr. Peterson said that the effort would build on all the science, monitoring, and NEPA compliance that the AMP has done the 1996 ROD, and the 2002 and 2004 environmental assessments. He noted that

the environmental assessment (EA) for the selective withdrawal structure (SWS) would be included in this effort. The SWS will be part of each of the options to be evaluated in the EIS.

He said the purpose and need is not only to increase the scientific understanding of the downstream resources, but also to protect the downstream resources. This will be clearly defined by the time of the public meetings and in the Federal Register notice.

He said that Federal agencies with jurisdictional responsibilities would be invited to be cooperating agencies. State, federal, tribal, and other agencies that have special expertise will also be invited to be cooperating agencies. BOR will ask them to assist with development of data analyses that will feed into the EIS and address some of the issues in the EIS. He proposed to give updates and conduct cooperating agency business within AMWG meetings. He said it would be a Spartan EIS with a small budget of as much as \$1 million. The timeframe is a couple of years. The length of the long-term plan is still an open question.

Mr. Peterson continued that the EIS would build on the EA on the selective withdrawal structure, the shortage EIS, the previous EAs, and GCMRC's analysis of the effects of the options that TWG and SPG developed. GCMRC may be able to assist with additional analyses, as well.

Q: *Do you anticipate that the alternatives that are developed in this EIS will read as management plans or will they read as scientific experiments? (Potochnik)*

Peterson: You will note that the proposal is for a long-term experimental plan. So I think science is a part of that and there may be some actions that can be viewed as management actions. Specific actions will be taken over the course of the plan, whether it be 10 years or longer, for scientific understanding and resource protection.

Q: *Will you make presentations to the Tribal Councils? (Jackson-Kelly)*

Peterson: We can and would be happy to receive any requests from the tribes to do that.

He reviewed the schedule (see the bottom of Attachment 8c):

March 2007	Publish scoping report
Apr-Dec 2007	Prepare impact analysis
Apr 2008	Publish Draft Environmental Impact Statement
May-Jun 2008	Public comment on Draft Environmental Impact Statement
Oct 2008	Publish Final Environmental Impact Statement
Dec 2008	Sign Record of Decision

Q: *From where are you drawing information to develop the purpose and needs for the EIS? (Potochnik)*

Peterson: That resulted mostly from listening to the SPG discussions about the purpose of doing the experiment.

Q: *I want all four options reviewed by TWG evaluated in EIS. (Taubert)*

Peterson: We view those all as input to the EIS. Whether they will all be evaluated will be decided after we go through our public hearings and see what the public wants as well.

Limbaugh: Obviously, the AMWG will be considered in this process.

Q: *How do we assure the public that we have a scientifically credible process here, rather than a wish list by different entities of what they want for the Grand Canyon? (Stevens)*

Orton: This is probably a question you mean for discussion by the AMWG so we'll hold that for a second.

Q: *Is there a special role for our science advisors or will they also be treated simply as the public? (Taubert)*

Peterson: I can see how their help would be valuable in terms of the impact analysis, particularly with GCMRC's efforts.

Q: *Is this EIS part of the resolution of the litigation? (Potochnik)*

Peterson: The settlement agreement mandates that we undertake NEPA compliance prior to the end of January. It is our intent that this will fulfill that requirement.

Q: *The options do not include a lot of specificity for BHBFs, such as how and frequency and so on. How are the public to be able to understand thoroughly the options without that definition? (Lynn Hamilton)*

Peterson: If specificity needs to be added to the options for them to be fully analyzed in the EIS, we will do that during the development of alternatives. We hope that the AMWG, the TWG, and the SPG will work on that, as well.

Q: *Will your Federal Register Notice ask questions on the scope, and suggest sideboards in terms of the scope of the proposed science plan? (Zimmerman)*

Peterson: The purpose of scoping is to receive the public comments on what we are proposing to do. The scope is part of that. Again, what is the proposed action? It is the development and enactment of a long-term science plan.

Q: *At the January 4-5 scoping meetings, will you present to the public the four options that we have developed, along with GCMRC's analysis? (Steffen)*

Peterson: Yes, we will. Some of that is a little premature because that is the purpose of an EIS, to present alternatives and the assessed impacts of those alternatives. Often in a NEPA process, we are expected to have all the answers with respect to resource impacts. However, if you are going to do an experiment, you are admitting that you do not have the answers. So be prepared for some admission or recognition of uncertainty on the expected outcomes, which is our assessment of what GCMRC did in their impacts assessment.

Beckmann: I do not think we should be tied up on just these four alternatives because we will solicit input from the public on other options.

Mr. Limbaugh asked for a motion from AMWG.

Motion: **AMWG recommends that the Secretary of the Interior consider (both scientifically and for management purposes) all four options, without any ranking by AMWG, including the MLFF, for development of a long-term experimental plan.**

Motion by André Potochnik, seconded by Darryl Beckmann.

Randy made it clear that these four options and MLFF will be a part of the EIS process.

Discussion by AMWG members:

- *They all limit the scope. The scope may very well go beyond these alternatives. The AMWG is one part of the public. A larger public will speak and help generate alternatives beyond these four. (Ramsey)*
- *I think it would be more productive if we could address the scope instead of the four options. We have identified within those options certain assumptions about our recommended scope of the process, such as the TCD and mechanical removal. Can we generalize this and say that the Secretary should look at, for example, non-flow options? That way, we would be focusing the scope of this EIS process rather than directing at options that do not really address what we believe the appropriate scope is. Options or alternatives come at a later stage. (Zimmerman)*
- *The challenge is how to bring science into the realm of the options presented, which seem more like "Christmas trees" to me. This motion does not provide the Secretary with the main topics that will limit the scope. We could list those pretty clearly: steady vs. fluctuating flows, TCD, climate variability, and the economics of the situation. That would actually benefit the Secretary in terms of narrowing the scope. This does not really do much other than confuse the Secretary's process. (Stevens)*
- *Why does the motion specify, "without any ranking by AMWG?"*
Because there was a second motion by TWG that does rank the options and which a number of us feel was inappropriate and pre-decisional. The TWG vote was accompanied by 10 abstentions, 40% of the members present. Nobody from Interior voted and I feel it is not a good idea for us to rank at this early stage in the game. (Potochnik) (Attachment 9c is Minority Report from several stakeholders)

- *I don't feel it is inappropriate for AMWG to provide its sense of where we want to head to the Secretary and for that reason I don't support the "without any ranking" language.
The TWG exercise that was conducted in the ranking of these options was an exercise in policy, not a technical procedure, and therefore was out of the purview of the TWG. If AMWG wants to do its own ranking, then maybe that is a good point, but that is up to this group and if it wants to go through a ranking exercise. (Potochnik)*
- *It is problematic to include a ranking. It will preclude the federal agencies from voting on that motion because it would be pre-decisional for them. We would get a biased and partial vote. (Ramsey)
From my perspective, this group does not have any higher standing than any member of the public does in the EIS process. The SPG and the TWG have identified four options that could be considered in a long-term experimental plan and we should get them all in the process and evaluated. I do not see the big deal in just including them without ranking. (Beckmann)*
- *If we accept what Darryl said as being the case, then I think we ought to also ask that the Secretary develop and implement a long-term experimental program or alternative LTEP that is focused on the implementation of non-flow actions intended to improve the status of the HBC population in the Grand Canyon, in such a way that we maintain the balance of benefits to the resources in the Grand Canyon that were anticipated in the original GCD EIS Record of Decision. (Shields)*
- *Are the Interior agencies prohibited from voting on this as a recommendation to the Secretary? (Stevens)
Limbaugh: I think that for a federal agency with jurisdiction over the resource to vote on a ranking would be inappropriate at this time because it would pre-judge an outcome. However, this motion does not prejudice an outcome, because it refers to a range of options and does not include ranking.*

Potochnik: I would amend this motion right after the word "MLFF," to put in a comma and add "among others."

Mr. Beckmann agreed with the motion change. Revised motion:

Motion: AMWG recommends that the Secretary of the Interior consider (both scientifically and for management purposes) all four experimental options and the MLFF, among others, for development of a long-term experimental plan, without any ranking by AMWG.

Comments by members of the public:

Lynn Hamilton (Grand Canyon River Guides):

My initial thought is to talk on the ranking motion. At the TWG meeting motion #1 which was basically this initial motion before we amended it today was in my view kind of pre-empts and makes moot the motion #2 which was the ranking motion because we did not also include the MLFF which it was my understanding from John Hamill at the TWG meeting that the MLFF which obviously is the no action alternative should be included in its own right. If you're only ranking the four that came up, well three came up through the SPG and one from the TWG, and not including the MLFF, then you really haven't ranked the full range of what's going to be out there. In my view it's pre-decisional anyway. Also, as far as these five options are concerned what I would really like to bring home is sort of a broad philosophical point in regards to the Grand Canyon Protection Act and in my view the GCPA really indicated a societal shift that ecosystem management was a major, major concern. It was enacted because there was a problem to fix and that's why you guys have been sitting here for over ten years. I'm sure it seems like that today too, but in general terms, that's why you're here doing what you do and so I'm hoping that the options that come out of this will really be viewed in a very focused light as far as the GCPA is concerned. Thank you.

Roxane George (Sierra Club, Grand Canyon Chapter)

I haven't been very involved with this process but we certainly have been involved with this issue and so I would like to just say that a lot of what Lynn said about the GCPA and ecosystem resource protection is also I would say about our concerns and when I hear the talk about balance at this table, I'd just like to state for the record that the Sierra Club would like to see a priority as opposed to balance or equality of concerns and obviously there is a restoration problem here that has to be addressed. It's why you're

going through this EIS process so we hope that you will prioritize and that this process will prioritize ecosystem restoration. Thank you.

Pamela Hyde, member of the public

I'm here today as member of the public, not representing anybody except myself. First of all, I'll commend Reclamation for putting this into a NEPA process because I think there is a tendency here to move along politicized lines and that essentially that takes it back out of the politicization of the AMWG process and I certainly know a little bit about that. What Randy was saying was that the purpose and need is to increase scientific knowledge and to protect downstream resources. And so I think that's where we need to start and that's where the Secretary and Reclamation need to start from this. We need to go from what the best available data that we have on this ecosystem. We have to use the best known available scientific processes for developing hypotheses based on the available data, figuring out what it is we want to test that gives us the best set of potential experiments over a long period of time. I haven't followed how these options really have been developed very carefully but it seems to me, like Randy says, they're just individual interests, Christmas trees that have been developed and that's not really how we should do the work for Grand Canyon. We all kind of know that but we all kind of get entrenched in our own positions on this. I'm going to suggest to Reclamation and I was going to suggest in the context of what the AMWG decides to recommend to the Secretary, that we consider going back to how do we go back to use the best available data, the best scientific processes to develop a scientific experimental plan that actually works for Grand Canyon. Thank you.

After further discussion, and lack of consensus, the Secretary's Designee asked that interested parties work on a consensus motion for presentation in the morning.

The meeting adjourned for the day at 5:00 p.m.

Glen Canyon Dam Adaptive Management Work Group
December 5-6, 2006

Conducting: Mark Limbaugh, Secretary's Designee
Facilitator: Mary Orton

Date: December 6, 2006
Convened: 8 a.m.

Committee Members:

Joe Alston, NPS/GCNP
Darryl Beckmann, USBR
Charley Bulletts, Kaibab Band of Paiute Indians
Jay Groseclose, NM Interstate Stream Comm.
Amy Heuslein, BIA
Loretta Jackson-Kelly, Hualapai Tribe
Leslie James, CREDA
Rod Kuharich, State of Colorado
Phillip S. Lehr, Colorado River Comm./NV
Andre Potochnik, GCRG
Ted Rampton, UAMPS

Nikolai Ramsey, Grand Canyon Trust
John Shields, WY State Engineers Office
Sam Spiller, USFWS
Mark Steffen, Federation of Fly Fishers
Larry Stevens, Grand Canyon Wildlands Council
Dennis Strong, UDWR
Bruce Taubert, AGFD
Brad Warren, WAPA
Bill Werner, ADWR
Gerald Zimmerman, State of California

Committee Members Absent:

Carleton Albert, Jr., Pueblo of Zuni
Steven Begay, Navajo Nation
Leigh Kuwanwisiwma, The Hopi Tribe

Interested Persons:

Andrea Alpine, USGS
Jason Alberts, DOI
Matthew Andersen, USGS/GCMRC
Jan Balsom, NPS/GCNP
Mary Barger, WAPA
Cliff Barrett, UAMPS
Christine Beard, USGS/GCMRC
Perri Benemelis, ADWR
Mike Berry, USBR
Bob Broscheid, AGFD
Tom Burke, USBR (LC Region)
Brenda Burman, USBR
Gary Burton, WAPA
George Caan, Colorado River Comm./NV
Kristin Carden, Grand Canyon Trust
Kerry Christensen, Hualapai Tribe
Tara Conrad, Office of the AS-WS DOI
Jennifer Crandall, Colorado River Comm./NV
Jonathan Damp, Pueblo of Zuni
William Davis, CREDA
Kurt Dongoske, TWG Chair
Helen Fairley, USGS/GCMRC
Roxanne George, Sierra Club/Flagstaff
Lynn Hamilton, GCRG
John Hamill, USGS/GCMRC
Burt Hawkes, WAPA/SLC
Norm Henderson, NPS

Doug Hendrix, USBR
Jeff Humphrey, USFWS
Pamela Hyde, Member of the Public
Rick Johnson, Grand Canyon Trust
Robert King, UDWR
J.D. Kite, USGS/GCMRC
Glen Knowles, USFWS
Dennis Kubly, USBR
Paul Li, Bob Lynch and Associates
Ken McMullen, GCNP
Ted Melis, USGS/GCMRC
Don Ostler, Upper Colorado River Comm.
Clayton Palmer, WAPA
Bill Persons, AGFD
Ken Rice, USBR Glen Canyon Dam
Larry Riley, AGFD
Dave Rubin, USGS
Tom Ryan, USBR
Dave Sabo, USBR
Mark Schmeeckle, Arizona State University
D. Randolph Seaholm, CWCB
Bob Snow, DOI
Barbara Steffen, Federation of Fly Fishers
John Weisheit, Living Rivers
Barry Wirth, USBR
Scott Wright, USGS/GCMRC
Mike Yeatts, The Hopi Tribe

Meeting Recorder: Linda Whetton, USBR

Introductions and Administrative Items. Mr. Limbaugh welcomed the members, alternates, and members of the public, and asked everyone to introduce themselves.

Departing Remarks: Bruce Taubert made some parting remarks to the group. He discussed the history of his work on the Colorado River. He praised the progress to date and urged the group to continue to make progress. He introduced Bob Broscheid who would replace him. The group applauded Mr. Taubert, thanked him for his service, and presented him with a retirement card.

Experimental Options – Discussion and Recommendation to the Secretary (continued)

Mr. Limbaugh called on Mr. Potochnik, who withdrew his motion in favor of a new motion that was crafted since the close of yesterday's meeting. Mr. Limbaugh called for a motion.

Larry Stevens with Brad Warren introduced a motion. He said the motion would honor the science planning process of the past 18 months, and will give to the Secretary something that would actually help him in planning the EIS. He said that the following people had assisted in the development of the motion: Mary Barger, Cliff Barrett, Jay Groseclose, Clayton Palmer, Andre Potochnik, Ted Rampton, John Shields, Mark Steffen, Brad Warren, Bill Werner, and Jerry Zimmerman, along with Bob Snow and Tara Conrad who stopped in to observe the process. He said that they worked until about 9 p.m. and would not have succeeded without Mary Orton's assistance.

Mr. Warren read the following motion:

Motion: AMWG recommends that the Secretary of the Interior consider the following scope in developing the Long Term Experimental Plan EIS:

The alternatives should maintain the balance of benefits to all resources as described in the ROD of the Glen Canyon Dam EIS, while focusing on humpback chub and sediment resources. Insofar as they are consistent with this balance and focus, the elements of the alternatives should:

- **Include a range of flow events, patterns, and timing**
- **Include non-flow experiments**
- **Be based on credible science planning**
- **Maximize hydropower capacity and flexibility to the extent possible.**

The experiments in the plan should be of adequate (but not excessive) duration to allow the determination of actions needed to sustain and, where possible, improve key resources and the balance of benefits to all resources.

The AMWG also forwards to the Secretary for consideration, four options ¹ and the Modified Low Fluctuating Flow regime from the Glen Canyon Dam EIS ROD, as examples of mixtures of flow and non-flow experiments that have been rigorously debated within the Glen Canyon Dam Adaptive Management Program.

¹ GCMRC, 2006, Assessment of the Estimated Effects of Four Experimental Options on Resources below Glen Canyon Dam, table E.1, page 3. USGS, Flagstaff.

Motion by Brad Warren, seconded by Larry Stevens.

Mr. Limbaugh asked if there was consensus. The following points were made in discussion.

- *The motion should include something about cultural resources. The GCD EIS had envisioned a specific balance of resources and since then, we have learned significantly different information about HBC and sediment. HBC have not been helped to the point anticipated in the ROD. The sediment paradigm has been shown to have been incorrect in the original EIS and so those two were the significant areas of different information. That is why the group called out only those two resources. (Warren)*
- *The motion should include the responsibility to tribes and specifically the trust responsibility to tribes. (Heuslein)*

- *I think that the fact that we put “benefits to all resources” as the first sentence to that second paragraph covers most of our concerns. I think the sense of it is that we are having struggles with HBC and sediment and that is why they were brought up to focus the attention. (Taubert)*
One of the things the group discussed was the fact there are issues with each of the resources in some manner and that throughout this EIS process all of us will have the opportunity to provide our specific concerns into the process. That is why we tried not to be all-inclusive to list every specific concern and be more general in nature. (Warren)
- *How about deleting “while focusing on HBC and sediment resources” and not mentioning cultural resources? (Jackson-Kelly)*
I think that would be difficult considering the time that the dozen or so people spent trying to develop this last night and agreed to at this point. (Warren)

Tribes and federal agencies caucused. After the caucus, Mr. Limbaugh asked Ms. Orton to read a compromise motion. After some discussion, Mr. Limbaugh confirmed that there was consensus on the motion.

Motion: AMWG recommends that the Secretary of the Interior consider the following scope in developing the Long Term Experimental Plan EIS:

The alternatives should maintain the balance of benefits to all resources as described in the ROD of the Glen Canyon Dam EIS, while focusing on humpback chub and sediment resources. Insofar as they are consistent with this balance and focus, the elements of the alternatives should:

- **Include a range of flow events, patterns, and timing**
- **Include non-flow experiments**
- **Be based on credible science planning**
- **Maximize hydropower capacity and flexibility to the extent possible.**
- **Address tribal and cultural resources.**

The experiments in the plan should be of adequate (but not excessive) duration to allow the determination of actions needed to sustain and, where possible, improve key resources and the balance of benefits to all resources.

The AMWG also forwards to the Secretary for consideration, four options¹ and the Modified Low Fluctuating Flow regime from the Glen Canyon Dam EIS ROD, as examples of mixtures of flow and non-flow experiments that have been rigorously debated within the Glen Canyon Dam Adaptive Management Program.

¹ GCMRC, 2006, Assessment of the Estimated Effects of Four Experimental Options on Resources below Glen Canyon Dam, table E.1, page 3. USGS, Flagstaff.
Motion passed by consensus.

Sediment Input Update.

Ted Melis made a brief presentation on sediment input (**Attachment 10**, slides 9-12) in preparation for the full presentation on the BHBF. He presented information produced by the USGS and GCMRC on recent sediment inputs from the Paria River, the Little Colorado River, and other ungauged tributary sources for sand inputs below the dam.

Dr. Melis said there were significant storm events in early October, with quite significant sediment inputs below the dam. He said they believe the channel is two to three times more sand-enriched than the period preceding the November 2004 high flow experiment. Because of this, they believe there is potential to increase bar size if a high flow test were to occur again. There is also evidence from 2004 that the influence of a BHBF can, at least for a short time, suppress subsequent sand export.

He concluded that the experimental research opportunities to study beach habitat building flows under the current sand enrichment in this case are relatively rare, occurring statistically only about 20% of the time.

Beach/Habitat Building Flow in FY2007

Dr. Melis referred the group to the printout of his PowerPoint presentation "Beach/Habitat Building Flow in FY2007: Overview of Science Recommendations & Status of Science Planning" (**Attachment 11**). He noted that the group is discussing sediment conservation and the concept of BHBFs because sandbars are important elements in river restoration programs, and it is in AMWG's top five priorities. The geomorphic framework of the river is primarily dictated by the areas where the sandbars are actually maintained and stored. They also influence terrestrial habitat, aquatic habitats, backwaters and other near-shore habitats that may support any fish early life recruitment of juvenile development, and *in situ* preservation of archeological sites. Recent studies have shown that many archeological sites are buried in aeolian deposits that may have originally derived from fluvial deposits. Sediment is also important as campsites for boaters and backpackers.

He continued that without enriched BHBFs, without new sand supplies, archeological sites along the Colorado River will continue to deteriorate, the habitat will degrade, and there will be significant and negative visitor impacts. One way to mitigate this problem is to replace the sand supply locally and perhaps at higher elevations. The only way that sand supplies can be restored into that environment is through wind transport or if it is available for redistribution. Dr. Melis summarized the recent science recommendations for a BHBF from Dave Rubin and his colleagues.

TWG Chair Report. Kurt Dongoske presented the TWG Chair report, which included passage of the following motion by a vote of 14 yes, 11 no, and 0 abstain, during the TWG meeting in November 2006: "The TWG recommends to the AMWG that the Secretary of the Interior implement a BHBF in the timeframe from mid-January 2007 to March 2007 in accordance with a science plan that will be developed by GCMRC, approved by the TWG, and funded from the experimental fund."

Discussion:

Q: *Is this a replication of the 2004 experiment? It appears to be a new experiment. And if it is a new experiment, then what are the associated hypotheses? (James)*

The concept of replication was intended to allude to the idea of an enriched sand condition rather than a specific timing. We said conditions should be as enriched or more enriched than they were in 2004. What we're trying to do, of course, is modify these tests in ways that we think are scientifically credible and also are more informative to you as managers, but keep as many of the parameters the same as we can for comparison purposes. So for instance, the peak magnitude in 2004 was about 41,500. We would maintain that element of the hydrograph if possible. We know the antecedent conditions of sand supply are different and we cannot control that, but the good news is that we have two or three times as much sand, so if there is a positive result, it might be even greater than what was recorded two years ago. (Melis)

Q: *What about the issues we discussed in 2004: a take or an impact issue on young or juvenile HBC, some potential negative impacts on the foodbase, and the economic impact analysis prepared by Western that shows the economic impact could be as high as \$3.4 million. We have not heard about any of these issues and I think the tradeoffs need to be discussed.*

Andersen: Regarding foodbase, there are competing hypotheses about how these floods may or may not impact the foodbase, and one of the potential benefits of conducting such a test is to clean or refresh the system. I am sorry we did not have time this morning; I had some more slides that illustrated this. Vegetable matter that has been in the system for a while can become old and lose its nutritional value. A flood at this time of the year has the potential to get rid of that susnecessant or old vegetable matter and allows for growth of new algae and associated diatoms in the spring. We did not test this in 2004.

C: *Concern about the complexity of cumulative effects of various treatments.*

C: *Concern about is the time frame necessary to put together a credible science plan that includes other stakeholders. I also want to hear about the finances.*

Andersen: No question we are talking about a fast track. It is going to require lots of effort. Our staffing looks good to accomplish that in this time frame but there are unknowns in terms of how the resource agencies may respond. I think we have the time to make it happen in that timeframe.

Hamill: We are always going to be faced with the situation of where we have a limited amount of money, and we intend to build a workplan around the available funds. The primary focus will be to answer some of the sediment questions and we believe we can also address some of the biological and cultural questions. We can put together a credible, peer-reviewed plan for you. It will not address every question that everybody has; it is going to be focused on what we think are your highest priorities. We believe we can learn a lot from this test.

C: *Concern about spending too little on this test. It cost \$1.2 million before. If we do it on the cheap now, we will not have that money to do it properly next year.*

Andersen: The reason for the difference in the costs of the two tests is the overflight in 2004.

Hamill: In addition there are cost savings and we have monitoring programs that are already out in place. We are not starting from scratch so we can be more cost effective than in 2004.

C: *Concern about costs to the Basin Fund. Also, we have an approved FY07 workplan and budget that do not include a BHBF experiment. There will be tradeoffs when we drop things that are in the current plan and conduct a BHBF. Finally, we should not be asked to approve a BHBF before the science plan is completed.*

Motion: **AMWG recommends to the Secretary of the Interior to charge GCMRC to develop a science plan for a BHBF that addresses the concerns raised at the AMWG meeting on Dec. 6, 2006, and AMWG further charges the TWG to work with GCMRC to review the Draft Science Plan and make a recommendation to the AMWG for a January 2007 conference call.**

Motion made by Darryl Beckmann, seconded by Bruce Taubert.

Discussion by AMWG:

- *Business owners at Marble Canyon are concerned because their businesses have suffered from the last flood. He wrote out 11 reasons (**Attachment 12a**) why he doesn't support a BHBF right now. He would support a flood perhaps as part of the LTEP but not in 07 for these reasons. (Steffen)*
- *There needs to be an adequate economic analysis done on the design of the proposal. (James)*
- *Concern about time constraints – holidays are approaching, other meetings are coming up. (Kuharich)*
- *After BHBFs, Hualapai get a lot of sediment past Diamond Creek that causes problems for our economic ventures with river running. Also, an archeological site below the Glen Canyon Dam will be blown away. You need a plan for that site. We would like to see a more thorough review of potential impacts to the cultural resources. (Jackson-Kelly)*
- *In order to do our jobs properly, we should have a science plan that is on the shelf that could be used for this kind of effort, and enough money for research that we need to undertake. (Stevens)*

Andre Potochnik distributed copies of "Talking Points for a Sediment-Triggered BHBF Test in WY07, New Information and Need for Reconsideration and Recommendation to the Secretary of the Interior (**Attachment 12b**)"

Discussion by the public:

- *Science should inform policy. That is the essence of this program. The TWG supported this motion because they thought it was the right thing to do. There will always be time-crunch considerations. We are in a situation now where we have optimal conditions and hope the AMWG can listen to the TWG and science and be adaptive, and be able to act under these conditions and act accordingly. (Lynn Hamilton)*
- *I think the schedule in that motion is unrealistic. (Kurt Dongoske)*
- *It seems like an inefficient way of moving or relocating sand. Suggest have all the river rafters to carry sand downstream and build the beaches you want. (Jerry Nelson)*

Mr. Limbaugh determined that there was not consensus on the motion, and asked that a vote be taken.

Motion: AMWG recommends to the Secretary of the Interior to charge GCMRC to develop a science plan for a BHBf that addresses the concerns raised at the AMWG meeting on Dec. 6, 2006, and AMWG further charges the TWG to work with GCMRC to review the Draft Science Plan and make a recommendation to the AMWG for a January 2007 conference call.		
Member	Agency Name	Vote
Albert, Carleton	Pueblo of Zuni	absent
Alston, Joe	National Park Service	Y
Beckmann, Darryl	Bureau of Reclamation	Y
Begay, Steven	Navajo Nation	N
Bulletts, Charley	Kaibab Band of Paiute Indians	abstain
Groseclose, Jay	New Mexico	N
Heuslein, Amy	Bureau of Indian Affairs	abstain
Jackson-Kelly, Loretta	Hualapai Tribe	N
James, Leslie	Colorado River Energy Distributors Assoc.	N
Kuharich, Rod	Colorado	N
Kuwanwisiwma, Leigh	Hopi Tribe	absent
Lehr, Phil	Nevada	N
Stevens, Larry	Grand Canyon Wildlands Council	Y
Potochnik, André	Grand Canyon River Guides	Y
Rampton, Ted	Utah Associated Municipal Power Systems	N
Ramsey, Nikolai	Grand Canyon Trust	abstain
Shields, John	Wyoming	N
Spiller, Sam	U.S. Fish and Wildlife Service	Y
Steffen, Mark	Federation of Fly Fishers	N
Strong, Dennis	Utah	N
Taubert, Bruce	Arizona Game and Fish Department	Y
Warren, Brad	Western Area Power Administration (DOE)	N
Werner, Bill	Arizona	Y
Zimmerman, Jerry	California	N
	San Juan Southern Paiute Tribe	
Voting Results: Yes = 7 No = 12 Abstaining = 3 Total Voting = 19 2/3 = 13		
Motion fails.		

Motion: AMWG recommends to the Secretary of the Interior to charge GCMRC to develop a science plan for a BHBf that addresses the concerns raised at the AMWG meeting on Dec. 6, 2006, and AMWG further charges the TWG to work with GCMRC to review the Draft Science Plan and make a recommendation to the AMWG.

Motion by Jerry Zimmerman, seconded by Leslie James.

Mr. Zimmerman said he felt the program needed a science plan in place, with all of the entities and all of the parties participating in its development, so that the concerns are addressed as a science plan are prepared. Then, when the next opportunity presents itself, we are ready with a plan.

Mr. Limbaugh asked for a vote on the motion.

Motion: AMWG recommends to the Secretary of the Interior to charge GCMRC to develop a science plan for a BHBf that addresses the concerns raised at the AMWG meeting on Dec. 6, 2006, and AMWG further charges the TWG to work with GCMRC to review the Draft Science Plan and make a recommendation to the AMWG.		
Member	Agency Name	Vote
Albert, Carleton	Pueblo of Zuni	absent

Alston, Joe	National Park Service	Y
Beckmann, Darryl	Bureau of Reclamation	Y
Begay, Steven	Navajo Nation	Y
Bulletts, Charley	Kaibab Band of Paiute Indians	Y
Groseclose, Jay	New Mexico	Y
Heuslein, Amy	Bureau of Indian Affairs	Y
Jackson-Kelly, Loretta	Hualapai Tribe	Y
James, Leslie	Colorado River Energy Distributors Assoc.	Y
Kuharich, Rod	Colorado	Y
Kuwanwisiwma, Leigh	Hopi Tribe	absent
Lehr, Phil	Nevada	Y
Stevens, Larry	Grand Canyon Wildlands Council	Y
Potochnik, André	Grand Canyon River Guides	Y
Rampton, Ted	Utah Associated Municipal Power Systems	Y
Ramsey, Nikolai	Grand Canyon Trust	abstain
Shields, John	Wyoming	Y
Spiller, Sam	U.S. Fish and Wildlife Service	Y
Steffen, Mark	Federation of Fly Fishers	Y
Strong, Dennis	Utah	Y
Taubert, Bruce	Arizona Game and Fish Department	Y
Warren, Brad	Western Area Power Administration (DOE)	Y
Werner, Bill	Arizona	Y
Zimmerman, Jerry	California	Y
	San Juan Southern Paiute Tribe	
Voting Results: Yes = 21 No = 0 Abstaining = 1 Total Voting = 21 2/3 = 14		
Motion passes by consensus.		

Mr. Limbaugh confirmed with the group that they agreed that this vote would replace the recommended motion from the TWG. The group took a break for lunch.

When they reconvened, Ms. Orton announced that the plan for the afternoon was to take the three action items first: 1) Public Outreach Ad Hoc Group, 2) HBC Recovery Consultation Ad Hoc Group, and 3) Science Advisors Annual Report. After those three, they will get to as many of the non-action items as possible.

Public Outreach Ad Hoc Group (*Attachment 13= AIF, Fact Sheets, and PPT*)

Darryl Beckmann suggested that the materials were self-explanatory and non-controversial, and he hoped the group could move forward without a long presentation.

Motion: AMWG recommends that the Secretary approve as final the content of the public outreach website at www.gcdamp.gov.

In addition, AMWG recommends that the Secretary approve the proposed Website Modification Process for determining what future content or materials for posting to the site need AMWG review and approval.

Finally, AMWG recommends that the Secretary approve the following six fact sheets as final for public distribution:

- 1. Lees Ferry Trout Fishery**
- 2. Historical Native Fishes of Glen and Grand Canyons**
- 3. Glen Canyon Dam Temperature Control Device**
- 4. Colorado River Storage Project**

5. Endangered Species

6. Sand Bars in the Grand Canyon

Motion by Darryl Beckmann, seconded by Bill Werner.

Mike Yeatts said all the Fact Sheets had been reviewed except the Sediment Fact Sheet. This fact sheet was derived from the sediment display at the Dam, which had been reviewed in detail by the group.

During discussion, two issues were raised with regard to the Colorado River Storage Project (CRSP) fact sheet. One was whether the live capacity of Lake Powell, shown as 20,876,000 acre-feet, was accurate. The other was a stakeholder who indicated that his comments about the fact sheet had not been addressed. The group agreed to remove that fact sheet from the motion, and it was passed by consensus.

Amended Motion: AMWG recommends that the Secretary approve as final the content of the public outreach website at www.gcdamp.gov

In addition, AMWG recommends that the Secretary approve the proposed Website Modification Process for determining what future content or materials for posting to the site need AMWG review and approval.

Finally, AMWG recommends that the Secretary approve the following six fact sheets as final for public distribution:

- 1. Lees Ferry Trout Fishery**
- 2. Historical Native Fishes of Glen and Grand Canyons**
- 3. Glen Canyon Dam Temperature Control Device**
- 4. Endangered Species**
- 5. Sand Bars in the Grand Canyon**

Motion by Darryl Beckmann, seconded by Bill Werner.

Motion passed by consensus.

HBC Recovery Consultation Ad Hoc Group Update.

Sam Spiller referred to the AIF on the HBCRC Ad Hoc Group (**Attachment 14a**) and reminded the AMWG that the group was formed during the March 2006 AMWG meeting, with the charge to make a recommendation of whether the initiation of recovery actions for the HBC was appropriate. He noted that the consensus recommendation of the Ad Hoc Group was in their packet, with several words in bold. He explained that the words in bold were his additions to the consensus recommendation. The additions were suggested by committee members, and some members who were not present at the meeting did not agree.

He also told the group that in June 2006 the regional leadership of the Upper Basin and Lower Basin Regions of the Bureau of Reclamation, and of the Fish and Wildlife Service in Denver and Albuquerque, participated in a conference call to address the feasibility of developing a Lower Colorado River RIP. This was in some ways in response to the AMWG action, and Mr. Spiller has been leading that effort.

Motion: Recommendation to the Secretary of the Interior: That the Department of the Interior develop a Lower Colorado River Recovery Implementation Program (LCRRIP) led by the Fish and Wildlife Service, to include Bureau of Reclamation, National Park Service (NPS), and appropriate Colorado River Basin State fish and game agencies to address big river listed fish concerns with initial priority focus on the humpback chub generally located in Marble and Grand Canyons. In recognition of the on-going conservation and planning efforts of the Glen Canyon Dam Adaptive Management Work Group (AMWG), including the Humpback Chub Comprehensive Plan; NPS conservation actions for native fish; the Colorado River Fish and Wildlife Council State Agencies; the Upper Colorado River Recovery Implementation Program (UCRRIP); the San Juan Recovery

Implementation Program (SJRIIP); the Recovery Implementation Plan Scientific Work Group (RIPSWG); and the Lower Colorado River Multi-Species Conservation Program (LCRMSCP); these entities should be advised of this effort. Past, present and on-going conservation efforts, funding, and accomplishments should be recognized and, as appropriate, credited toward the implementation of the LCRRIP.

Motion by Sam Spiller, seconded by Bill Werner.

After a significant amount of discussion, and working with the wording to attempt to develop language that the group could adopt by consensus, the following motion was developed and passed by consensus:

Motion: Because the lack of a recovery program for the HBC is impeding the progress of the GCDAMP, AMWG recommends that the Secretary of the Interior charge the Fish and Wildlife Service to lead the development of a Lower Colorado River fish recovery implementation program (LCRRIP) to include the humpback chub below Marble and Grand Canyons by the end of 2008.

Motion passed unanimously with one abstention (Hualapai Tribe).

Development of the HBC Refuges for the Lower Colorado River.

Sam Spiller referred the group to the agenda item form (**Attachment 14b**). He read the item to the group, and noted that this agenda item was for information only. He said that the Fish and Wildlife Service and the National Park Service are proposing a programmatic long-term humpback chub conservation initiative, implementing off-site refuges and rearing facilities as well as on-site translocations.

After reviewing the agenda item form, he said that generally speaking, they would be taking fish from the river in June or July before monsoonal activity increases turbidity in the tributaries, transporting those fish by helicopter to tribal facilities, and testing and assessing the feasibility of rearing these fish. This is in order to be prepared in the event that warming from low water conditions in Lake Powell or the TCD would result in some negative response to the HBC. This experiment would be done within the framework of the guidance they receive from the Genetics Management Report.

During discussion, Mr. Spiller clarified that the Fish and Wildlife Service would share the results of the experiment with the AMP.

Motion: The AMWG recommends that the Secretary of the Interior aggressively develop refugia to assist in the conservation of the Grand Canyon population of humpback chub. Developing these refugia needs to be a priority effort, among the actions taken for this conservation. Further development and operation of refugia will be led under the auspices of a lower Colorado River fish recovery implementation program when this program is underway. The AMWG further recommends that \$90,000 be made available in FY2007 to continue design and other efforts toward this end. These monies will be administered jointly by the U.S. Fish and Wildlife service and the Arizona Game and Fish.

Motion by Bruce Taubert, seconded by Larry Stevens.

After a significant amount of discussion, and working with the wording to develop language that the group could adopt by consensus, the following motion was developed and passed by consensus:

Motion: The AMWG recommends that the Secretary of the Interior support development of refuges to assist in the conservation of the Grand Canyon population of humpback chub. Developing these refuges needs to be a collaborative effort, among the actions taken for this conservation. Further development and operation of refuges will be led under the auspices of a lower Colorado River fish recovery implementation program when this program is underway.

Motion passed by consensus.

After consensus on the motion was passed, Loretta Jackson-Kelly, indicated that she wished to abstain.

HBC Comprehensive Plan Ad Hoc Group

Mr. Limbaugh noted that they would not have time to address the HBC Comprehensive Plan Ad Hoc Group report (**Attachment 14c**). He asked the AMWG members to read the materials about this information item in their packets.

GCMRC 2007 Research Calendar:

John Hamill said that he had extracted major milestones from the FY07 workplan and put them in the draft calendar (**Attachment 15**), in order to identify especially those activities with implications for either the AMWG or the TWG. He invited questions about the calendar and the activities. He noted that the AMP Effectiveness Workshop would involve AMWG members. He said he would create a workgroup of representatives from the AMWG, TWG, the Science Advisors, and GCMRC to guide that effort.

Comments:

- *If there is going to be a schedule commitment, we need to know as soon as possible. Months out is generally appropriate for anything that is over a day. (Werner)*
- *Items 8, 9, and 10, the LTEP and the TCD, need to be moved up as part of the EIS process. (Beckmann)*

FY08 Budget Development

ACTION ITEM: Dennis Kubly requested feedback on three questions by the end of the month to guide the FY08 budget development process (refer to **Attachment 16**).

Final Comments

Mr. Limbaugh asked for any final comments or questions.

- *Please clarify where we are with BHBF recommendations for this year. Does the motion that passed preclude a BHBF in FY2007? (Stevens)*
 - *Orton: The AMWG voted down the motion to prepare for a BHBF in FY2007. However, AMWG could meet again and authorize a BHBF in FY2007.*
- *We ignored a TWG recommendation to do a 07 BHBF by substituting a separate motion that does nothing to address the TWG's motion. (Potochnik)*
 - *Mr. Limbaugh noted that he asked at the time if that motion replaced the TWG motion, and there was no disagreement voiced. Ms. Orton noted that proposed motions from TWG are recommendations that the AMWG can choose to act upon or not. TWG cannot compel an AMWG member to make a motion that was recommended by TWG.*
- *We need to think about meeting longer or more often, and maybe we can do some by conference call. We had to rush through a lot of important agenda items this meeting. (Heuslein)*
- *I would like to give an update on the Bright Angel Fish Weir. Printed copies of the FONSI on the EA are available in the room. In addition, we officially identified a source of funding for the Shinumo Creek refuge for the experiment. (Alston)*
- *What happened to all of the recommendations that came up at the retreat? (Taubert)*
 - *Orton: The major recommendations that came out of the Retreat were assigned to the Roles Ad Hoc Group, because the major concerns of the Retreat had to do with role, function, responsibilities, and relationships. The Roles Ad Hoc Group worked for about a year and produced a report in January 2006. That report was sent up to Mike Gabaldón. Your new Secretary's Designee has asked that the Roles Ad Hoc Group, the heads of the four entities, SAs, TWG, AMWG, and GCMRC, review and finalize the document. A number of other items were brought up at the Retreat, but the vast majority had to do with role, function, responsibility, and relationships. I have recommended to John Hamill that he integrate what happened at that Retreat with the planning of the AMP Effectiveness Workshop.*

Science Advisors Annual Report and Workplan

Ms. Orton noted that Dave Garrett had a family emergency and had to leave the meeting, and asked if the group was comfortable addressing his proposed Science Advisors work plan for the next two years

without his presence. They were. She noted that the Science Advisors Operating Protocols call for them to give to AMWG, before the annual budget meeting, a workplan and budget for the next two years. She referred the group to the workplan and budget in Dr. Garrett's report (**Attachment 17**).

Motion: AMWG accepts and approves the Science Advisors' FY 2007-08 Review and Advisory Services Program.

Motion made by Darryl Beckmann, seconded by Bill Werner.

Mr. Limbaugh determined that there was consensus on the motion.

Motion: AMWG accepts and approves the Science Advisors' FY 2007-08 Review and Advisory Services Program.

Motion made by Darryl Beckmann, seconded by Bill Werner.

Motion passed by consensus.

Basin Hydrology. This item was not presented at the meeting, but the PPT (**Attachment 18**) is included.

Public Comment

Mr. Limbaugh asked if there was any public comment, and there was none. He asked for another round of applause for Bruce Taubert, and adjourned the meeting.

UPDATE following the meeting. Mr. Limbaugh sent a memorandum (**Attachment 19**) to the AMWG via e-mail on February 2, 2007, regarding the status of a spring 2007 Beach Habitat Building Flow.

Respectfully submitted,

Linda A. Whetton
U.S. Bureau of Reclamation

Adjourned: 3:00 p.m.

General Key to Adaptive Management Program Acronyms

ADWR – Arizona Dept. of Water Resources	LTEP – Long Term Experimental Plan
AF – Acre Feet	MAF – Million Acre Feet
AGFD – Arizona Game and Fish Department	MA – Management Action
AGU – American Geophysical Union	MLFF ≙ Modified Low Fluctuating Flow
AIF ≙ Agenda Information Form	MO – Management Objective
AMP – Adaptive Management Program	MRP ≙ Monitoring and Research Plan
AMWG – Adaptive Management Work Group	NAAO – Native American Affairs Office
AOP – Annual Operating Plan	NAU – Northern Arizona University (Flagstaff, AZ)
BA – Biological Assessment	NEPA – National Environmental Policy Act
BAHG – Budget Ad Hoc Group	NGS – National Geodetic Survey
BE – Biological Evaluation	NHPA – National Historic Preservation Act
BHBF – Beach/Habitat-Building Flow	NPS ≙ National Park Service
BHMF – Beach/Habitat Maintenance Flow	NRC ≙ National Research Council
BHTF – Beach/Habitat Test Flow	NWS ≙ National Weather Service
BIA – Bureau of Indian Affairs	O&M ≙ Operations & Maintenance (USBR funding)
BO – Biological Opinion	PA ≙ Programmatic Agreement
BOR – Bureau of Reclamation	PEP ≙ Protocol Evaluation Panel
CAPA – Central Arizona Project Association	POAHG ≙ Public Outreach Ad Hoc Group
GCT ≙ Grand Canyon Trust	Powerplant Capacity = 31,000 cfs
CESU – Cooperative Ecosystems Studies Unit	PPT ≙ PowerPoint (presentation)
cfs – cubic feet per second	Reclamation ≙ United States Bureau of Reclamation
CMINs ≙ Core Monitoring Information Needs	RBT – Rainbow Trout
CRBC – Colorado River Board of California	RFP ≙ Request For Proposals
CRAHG - Cultural Resources Ad Hoc Group	RINs ≙ Research Information Needs
CRCN – Colorado River Commission of Nevada	ROD Flows ≙ Record of Decision Flows
CRE ≙ Colorado River Ecosystem	RPA ≙ Reasonable and Prudent Alternative
CREDA – Colorado River Energy Distributors Assn.	SA ≙ Science Advisors
CRSP – Colorado River Storage Project	Secretary ≙ Secretary of the Interior
CWCB – Colorado Water Conservation Board	SCORE = State of the Colorado River Ecosystem
DBMS – Data Base Management System	SHPO – State Historic Preservation Office(r)
DFCAHG ≙ Desired Future Conditions Ad Hoc Group	SPAHG – Strategic Plan Ad Hoc Group
DOE ≙ Department of Energy	SPG ≙ Science Planning Group
DOI – Department of the Interior	SSQs ≙ Strategic Science Questions
EA – Environmental Assessment	SWCA ≙ Steven W. Carothers Associates
EIS – Environmental Impact Statement	TCD ≙ Temperature Control Device
ESA – Endangered Species Act	TCP ≙ Traditional Cultural Property
FACA – Federal Advisory Committee Act	TES ≙ Threatened and Endangered Species
FEIS – Final Environmental Impact Statement	TWG ≙ Technical Work Group
FRN – Federal Register Notice	UCRC ≙ Upper Colorado River Commission
FWS – United States Fish & Wildlife Service	UDWR ≙ Utah Division of Water Resources
FY – Fiscal Year (October 1 – September 30)	USBR ≙ United States Bureau of Reclamation
GCD – Glen Canyon Dam	USFWS ≙ United States Fish & Wildlife Service
GCT ≙ Grand Canyon Trust	USGS ≙ United States Geological Survey
GCMRC – Grand Canyon Monitoring & Research Ctr.	WAPA ≙ Western Area Power Administration
GCNP – Grand Canyon National Park	WY – Water Year (a calendar year)
GCNRA – Glen Canyon National Recreation Area	
GCPA – Grand Canyon Protection Act	
GLCA – Glen Canyon National Recreation Area	
GRCA ≙ Grand Canyon National Park	
GCRG ≙ Grand Canyon River Guides	
GCWC ≙ Grand Canyon Wildlands Council	
GUI – Graphical User Interface	
HBC – Humpback Chub (endangered native fish)	
HMF – Habitat Maintenance Flow	
HPP – Historic Preservation Plan	
IEDA ≙ Irrigation & Electrical Districts Assoc. of Arizona	
INs – Information Needs	
IT – Information Technology	
KA ≙ Knowledge Assessment (workshop)	
KAS – Kanab Ambersnail (endangered native snail)	
LCR – Little Colorado River	
LRMCP – Lower Colorado River Multi-Species Conservation Program	

Q/A/C/R = Question/Answer/Comment/Response