Glen Canyon Dam Technical Work Group Meeting
October 15-16, 2008

Conducting: Shane Capron, Chairperson

October 15, 2008
Convened: 9:30 a.m.

Committee Members Present:
Cliff Barrett, UAMPS
Charley Bulletts, Southern Paiute Consortium
Kerry Christensen, Hualapai Tribe
William Davis, CREDA
Jay Groseclose, NM Interstate Stream Comm.
Norm Henderson, NPS/GCNRA
Amy Heuslein, BIA
Rick Johnson, Grand Canyon Trust
Robert King, UDWR
Glen Knowles, USFWS
Dennis Kubly, USBR
Steve Mietz, NPS/GRNP
John O'Brien, GCRG
Don Ostler, UCRC
Clayton Palmer, WAPA (alternate)
Scott Rogers, AGFD (alternate)
D. Randolph Seaholm, CWCB
Mark Steffen, Federation of Fly Fishers
Larry Stevens, Grand Canyon Wildlands Council
Bill Werner, ADWR
Michael Yeatts, The Hopi Tribe

Committee Members Absent:
Mary Barger, WAPA
Steven Begay, Navajo Nation
Christopher Harris, Colo. River Board of Calif.
Anthony Miller, Colo. River Comm./NV
Bill Persons, Arizona Game and Fish Dept.
John Shields, WY State Engineers Office

Interested Persons:
Matthew Andersen, GCRMC/USGS
Jan Balsom, NPS/GRCA
Glenn Bennett, USGS/GCMRC
Mike Berry, USBR
Helen Fairley, USGS/GCMRC
David Garrrett, Science Advisors/M^{3}Research
John Hamill, USGS/GCMRC
Loretta Jackson-Kelly, Hualapai Tribe
Leslie James, CREDA
Barbara McKenzie, USGS/GCMRC
Ted Melis, USGS/GCMRC
Clayton Palmer, WAPA
Catherine Parker, NPS/GRCA
Barbara Ralston, USGS/GCMRC
Tim Steffen, Federation of Fly Fishers

Meeting Recorder: Linda Whetton, USBR

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Welcome and Administrative. The Chairman welcomed the TWG members, alternates, and interested persons. Attendance sheets were distributed. Shane said he is looking forward to working as the TWG Chair and thanked Kurt Dongoske (in abstentia) for his service over the last three years.

Approval of Draft Minutes from April 8-9, 2008 Meeting. Pending a few minor edits, the minutes were approved without objection.

Action Items (*Attachment 1*) and Additional Notes:

Item 2006.11.8-9: In response to an Executive Order requiring Federal agencies to get a portion of their electrical power from renewable resources and excluding hydropower from the list of renewable resources, Clayton Palmer asked a group of scientists that worked for a consulting firm if they could devise a way of establishing scientifically the environmental effect of different types of electrical power and compare them against renewable claims (green power claims specifically). The peer reviewed report will be sent to Argonne National Laboratories and WAPA expects to have it available in one month as a final report. He said Glen Canyon Dam was used as their example of a hydropower facility and have assessed the environmental impacts of running GCD against a wind farm, a coal plant, and some other hydropower plants. The report also addresses the question when modifications or restrictions are made to the operation of GCD, what replaces it, and what the environmental impacts are of replacing GCD load following power with some other load following facility. He's not sure what will happen to the report once it's completed but

he intends to provide it to the AMWG and TWG and possibly have the researchers make a presentation. When questioned whether the report was "in or out" of the AMP, Clayton said he considered it "out" because if it had been "in," they would've notified the AMP.

Item No. 2008:04.08-09 (2): Hydropower Economics. Norm said he was concerned about the hydropower economics comments he made at the last AMWG meeting getting to Larry Walkoviak. Tom Ryan said he would send an e-mail to Larry outlining Norm's concerns.

Clayton Palmer said the report WAPA prepared on the four options was finalized and sent to GCMRC for a peer review. GMCRC completed that task and sent their comments back to Clayton. Clayton discovered an error in one of the tables and sent a note back to Dave Garrett indicating that one of WAPA's engineers fixed the problem. Clayton sent the report back to Dave Garrett. Dennis asked GMCRC if the four options were ever completed. John Hamill said the intent was to leave it in draft format and that he didn't see a need for finalizing it if it wasn't going to be used for the program. Dave Garrett said the full option assessments were not finalized. John said he thought final action was taken by giving it to the AMWG. John said they never took all the comments back from the TWG and that would've been an easy job to finalize. John said he thought USBR used it as a basis for the LTEP process. Helen Fairley asked if it was an economics or a financial report. Clayton said it was a full economics report.

Old and New Business: Shane went over the motions that were passed by the AMWG and in particular the one requesting GCMRC and TWG to work on the relationship of flow lines to historical sites. He said the TWG would address the issue tomorrow along with GCMRC's report.

Annual Operating Plan. Norm Henderson said the Park participated in the development of the AOP and has reviewed the monthly volume allocation specified for 2009. They made a request of GCMRC to evaluate what the differences would be on least one resource between what is projected for 2009 now through the draft AOP for monthly volumes and what potentially would happen if reallocation was made and it equalized the monthly volume allocation. NPS received a report back from GCMRC which showed some relatively positive impacts up to 40%. He thinks the average is 20% as far as sediment retention in the Grand Canyon as a result of equalizing the monthly volumes. This is something the NPS is contemplating through the AOP process and he wanted to bring it to the attention of the TWG to see what they thought about the proposal and potential effects to other resources. He can provide more detail on the specific proposal and welcomes input from the TWG and feedback on that proposal because it is occurring right now with regard to the AOP process.

There was a lengthy discussion on what steps the AMWG or TWG should have been involved in having this work done and specifically if the Park Service can go directly to GCMRC and request them to do a particular task. Norm said they asked GCMRC to do an analysis based on the formulas and modeling that had already been done by GCMRC. As the science arm of the Department of the Interior, John Hamill said they have an obligation to respond to DOI agency requests. He added that if it had involved a significant expenditure of funds and resources, he wouldn't have authorized the work to be done. He said the work utilized existing data in an existing model and was not a major commitment of time or resources on GCMRC's part.

There were quite a few concerns expressed:
***C**: Not comfortable with GCMRC providing analysis to DOI agencies just because they're an arm of the Department. That would be okay if they're paying for it, but if GCMRC is a science body that is also available to the DOI, then they should pay for it. WAPA might have a concern because the Park Service is proposing something that's an affront to their resource and doing it on behalf of the Dept of Interior and not the AMP. (Palmer)*
***C**: Concern if the work was done ad hoc, quality of the analysis, and whether the report has been distributed. It's also a digression from how GCMRC normally distributes studies. Because this is modeling and predicts an outcome, it already has a 10-40% bound on it which could be a huge difference, both in sediment conservation, and in the effects on hydropower. There is no corollary resource analysis that looks at hydropower effects on other resources. It's singular. A peer review process should be performed before the report is disseminated to the TWG. (Kubly)*

***C**: The AOP process is going into its third meeting and there has been no mention of the volume idea from the Park Service. It's ingenuous and it's something that GCMRC, Reclamation, and the other Interior agencies need to be sensitive to. (Seaholm)*
***C**: In the SPG assessment report Option B included the concept of equal monthly volumes. Even though there are concerns about what might've been done, the draft report probably still has some merit because it talks about sediment and other resources under the Option B test. It was a proposed test that came out of the SPG three or four years ago so it's something to look at now in evaluating all resources. (Melis)*

Dennis asked if people would agree that the report is going to be sent out but can the TWG also agree at the next meeting that GCMRC will identify what the process is to finalize this report and will there be any other resource analyses that are going to be done to compare the costs and benefits to the spectrum of resources as opposed to just sediment. John said the report started out as a fairly simple data request from the NPS and he thought Reclamation was aware of these types of requests. Dennis said he didn't know anything about it. John said it was Dennis' boss who was aware the analysis was being done. He added that if it's going to grow into something bigger than this, then they all need to sit down and discuss. He reiterated that GCMRC was asked if they could do a simple analysis of what the possible effects of equalized monthly volumes would be on sediment resources and they said it could be done. They provided a short, written report to the NPS and that was the end of it. If this is going to grow into some major AOP analysis, John said he would need to step back and figure out how they're going to interact in that kind of environment.

ACTION ITEM: John Hamill will send out the NPS proposal requesting GCMRC to do a separate analysis on modeling data that GCMRC had collected along with the draft report to the TWG.

New Business:

1. Rick Johnson announced that Joe Feller recently published a paper in the Nevada Law Journal having to do with the GCDAMP. The title is "***Collaborative Management of Glen Canyon Dam: The Elevation of Social Engineering Over Law***" (http://www.law.asu.edu/?id=1419). There is another article in the same Journal by Alejandro E. Camacho, entitled, "***Beyond Conjecture: Learning About Ecosystem Management from the Glen Canyon Dam Experiment***" (http://ssrn.com/abstract=1270743).

2. Rick Johnson reiterated that the TWG Operating Procedures state meeting materials will be made available to the members 15 business days in advance of the meeting and he'd like to see a greater commitment to meet that schedule. As the new TWG Chair, Shane said he is committed to meeting those deadlines.

3. Helen Fairley requested TWG meetings be scheduled at least a year in advance. Shane said he's planned out a year of assignments and dates which is on tomorrow's agenda. He is hopeful that AMWG, TWG, and GCMRC can coordinate their schedules to plan a year out.

Strategic Science Plan and Monitoring and Research Plan. Shane said that John Hamill sent out a letter on October 9, 2008, along with review drafts of the "Strategic Science Plan to Support the GCDAMP, Fiscal Years 2009-12" (***Attachment 2a***) and the "Monitoring and Research Plan to Support the GCDAMP, Fiscal Years 2009-12" (***Attachment 2b***). He said John is asking for TWG comments on these documents by October 31, 2008. He advised the TWG to focus their discussion primarily on concerns with changes as requested by AMWG. He said he read through all the changes and doesn't think there are any really big issues. He expressed concern about the comment period and suggested that it be discussed after John's presentation.

John said the MRP was originally approved by the AMWG in December 2007. It was done with the understanding that it would be updated upon completion of the Long Term Experimental Plan recognizing that when the MRP was originally drafted, it was done so without having an LTEP in place and there was recognition that a LTEP would certainly have a significant influence on the MRP. In May 2008, after the EA

and the BO were finalized in March, the AMWG passed a motion directing the TWG to work with GCMRC to update the MRP to reflect the new direction provided in the EA and BO. After considering that motion, John said he made the changes based on the two documents and the directions that were brought from the EA and BO. In addition, since the foundation document for the MRP is the Strategic Science Plan, he felt it would be appropriate to update it as well and so he attached similar changes to that document. He made a presentation to the AMWG in August 2008 on what the scope of the overall changes would be and clearly the focus remained on updating the documents to reflect changes coming forward through the EA and BO. There have also been some new developments in the tribal monitoring programs and they've had some dialogue with the tribes over the last several months about how to better integrate the tribal monitoring efforts into the overall monitoring and research effort that GCMRC runs. He felt it would be appropriate to update that section of the MRP as well. In addition, there have been two work plans that have been finalized since the MRP was adopted. The FY08 and FY09 work plans and some of the schedules and tasks and projects seem to be appropriate to update and reflect those as well. John said he thought there was an assumption when the MRP was developed that one of the main things they were going to focus on over the next five years was evaluation of a temperature control device but that seems to have been dropped based on the current EA and is no longer a major emphasis within the program. That was also one of the five AMWG priority questions – how to operate a TCD, what would be the implications of a TCD, etc., and so he de-emphasized that area in this update. The changes were highlighted in yellow. He suggested the TWG spend the remaining time to talk about general concerns about the MRP and SSP and then allow the TWG until the end of the month to provide written comments back to GCMRC so they can produce another version. He asked for general comments and questions.

- Even though the NPS is the lead agency in the Canyon, GCMRC should follow work being done with regard to implementation of conservation measures or other activities and consolidate the information for the whole program.
- With regard to the status of the TCD, John said the driving force behind the original MRP was the five high priority AMWG questions that were adopted in an August 2004 workshop by the AMWG. The fifth question related to what would happen if a TCD was built and how it should be designed and evaluated. There is a whole section that addresses the effects of warming and how that could ultimately inform some decisions related to the TCD but there are no immediate plans to design or construct a TCD. If one is talking about Reclamation's proposed action and the current BO, the TCD is not part of the proposed action. For the five-year period that Reclamation's currently operating under now, there's no intention of beginning or conducting further analysis on the TCD. The FWS feels there is a need for more assessment but that's not part of Reclamation's proposed action.
- On page 6 of the SSP, there is a flow chart that focuses on GCMRC's collaborative science planning and implementation process, a box should be added regarding consultation with the tribes. Also, on page 11 it talks about improving science administrative effectiveness with DOI, DOE, AMWG and TWG, but it doesn't mention the tribes.
- The schedules are different in the MRP and SSP for some of the goals. For example, in the MRP some of them have 2007 and 2011 and then in the SSP, it will say 2008 to 2012. Also, on page 8, regarding the HFE, there is a comment in there about "additional HFEs will be conducted if the Secretary approves these" and wonder if those aren't off the table.
- Under Table 2 the study says GCMRC is going to measure backwater habitats and sample some fish in the spring and fall. How is that going to be meshed with the nearshore ecology study to make sure you have a like or similar effort for both of these so you don't measure one way more than the other? You're measuring nearshore habitats, not necessarily backwaters, and this is one targeted to backwaters and so in order to make your efforts and data compatible, you don't de-emphasize or over-emphasize one versus the other. How are you going to coordinate?
- At the end of that table 2 in the charge part, it talks about the September-October steady flows that you may come to a decision point on whether to continue, discontinue, or disband those studies and the basis for that decision is determining some action, in other words cause and effect. Will the ASMR model be used to evaluate the potential for initiating the ESA consultation to determine whether the flows should be continued, discontinued? (Davis)

Shane said the requirement in the Biological Opinion is to do an annual assessment of HBC to determine if the reconsultation trigger has been met and has nothing specific to do with HFE.

***C**: No, this is regarding the steady flow work.There has been some question as to whether or not this is going to be of any value. This seems to be addressing that issue. In other words, if you do your ASMR work, you may decide*

somewhere along the line to continue, discontinue, or expand the September-October work. That's what this paragraph seems to be addressing. What if we get into this a year or two and you can't establish that relationship? What do you do with the steady flow? Do you continue doing it?
***R**: I think that's an issue for the FWS and Reclamation to work out. This was a BO requirement that if anything happens to the population, the periods of steady flows could be expanded or they could be taken away. All we're committing to do is basically provide the data on what happens with the fish population and then it's up to the FWS to determine whether some course of action is warranted based on that information. (Hamill)*
***C**: Both the SSP and MRP should integrating full economic analysis for the steady flow experiment so it seems like some projection or some ideas about how or what types of studies will be appropriate over the next five years for the experiment and for the implementation of the other MRP items would be useful. (Henderson)*
***R:** The MRP revisions allude to the fact that we're going to be developing a fall steady science plan but the scope of that fall steady science plan has not been fully established at this point in terms of what resources to address in that plan. There's going to be a big focus on HBC. Whether or not it addresses economics, to me it isn't a deciding matter at this point or whether it's going to address trout or other resources as well. That's one of the things we'll have to explore this year. (Hamill)*
***C**: Having just hydropower economics identified is not appropriate. I'd also like to request a discussion on the integration of the Core Monitoring Program with the NPS I&M for how this program is going to intersect with the I&M program for the NPS. (Henderson)*
***Q**: You mentioned the nearshore ecology study and then you identified September-October steady flow science plan and nearshore ecology is funded in the 09 budget largely through Reclamation's appropriated dollars as satisifying conservation measure. Do you really intend to have two separate science plans or is the September-October time framea component of the nearshore ecology? Some people may be seeing two separate plans, two separate studies. On page 9, the first full paragraph: It reads: "In coordination with the Nearshore Ecology Study" It sounds like they're two separate projects. Some clarification is needed. (Kubly)*
***Q**: Page 31, regarding mechanical removal. There is some discussion about the causative mechanism for the HBC that we're finding in the river right now, whether it may be mechanical removal, warm water, or whatever. If we continue as we are with mechanical removal for the next five years, is your sampling method sufficiently sensitive enough to detect a fluctuating temperature regime that may be affecting numbers of fish? If that warm water is the mechanism for survival and we keep mechanical removal steady, then you should be able to see a fluctuation with the temperature. I'm wondering if your data are going to be sufficiently sensitive to pick that up. (Davis)*
***A**: Certainly all those data are collected. This makes me think of the conversation that we had at the April 7 workshop with the scientists who were gathered to talk about the LTEP and we recognized that if we totally abandon any mechanical removal, any kind of non-native control and we had warmer waters continuing, that would give us some ability to say something more definitive about cause and effect. (Andersen)*
***C**: That's a variable. You never know when you're going to get warm water or cold water, but you do have control over mechanical removal and that's going to be kept steady for the next fives years so it seems to me you need to have a sampling regime sensitive enough to pick up the changes you're going to get in random temperature events if that in fact is the causative mechanism. And if you don't, you still have a concern whether or not its temperature. If you get no change and you're sensitive enough, then you have to say it's mechanical removal. We don't know. Right now we're trying to sort out which of those two variables is the one that's really helping us. (Davis)*
***R**: And so the point I was making about the workshop was that there was an opportunity to just look at temperature alone but the scientists did recommend that we do not abandon removal of non-natives in that critical LCR reach because of the risk to the native species. They said you might be able to learn more but you greatly increase the risk of doing damage to that population. So that's some of the basis for continuing to implement some non-native removal in that reach. We'll certainly be collecting those temperature data and I think we're getting to what you're talking about. If there is continued removal of non-natives in the LCR reach, we are going to be able to correlate the population numbers to temperatures. I think we are getting to what you're talking about. (Andersen)*
***C**: There's no doubt that it's confounded just by the nature of the fact that FWS in their opinion pretty much concluded we want to keep non-native fish populations low. (Hamill)*
***R**: I agree and think it should be, but if you're then going to try to determine if warm water is in fact helping or not, then it seem to me that your monitoring program needs adjustment. (Davis)*
***C**: And then we have steady flows on top of that so we have several confounding factors here that we're going to have difficulty in the end. I think this was a cautionary note provided several times that people shouldn't have unrealistic expectations about how much we're going to be able to discriminate about what's causing what as the result of the design we have here. This isn't a design we created. It's one we basically inherited and we're going to study it whether or not at the end we'll be able to make definitive conclusions. Is it steady flows? Is it temperature? Is it non-native? I can't tell you with certainty that we're going to be able to give you clear answers to those because it's not a traditional block design where we turn one thing on, we turn one thing off, and so we'll do the best we can to inform you about what those cause and effect relationships are. I think the primary goal here is to make sure the resource gets taken*

care of by not allowing non-native fish to proliferate and certainly a lot of non-native fish that proliferate in warm water we'd be able to give you a better understanding of what happens to the fish population. (Hamill)
***Q**: If you continue mechanical removal over this duration, five years or whatever and you continue to see an increase in HBC, even though all these other factors are fluctuating, then I think you can attribute it to mechanical removal. (Davis)*

Matthew said mechanical removal exists in the plan because of the conservation measure. It was their attempt to be as responsive as possible but they weren't able to fit all of them into the work plan. This is something that AGFD and GCMRC will need to talk about because they have the experience and capability to accomplish this conservation measure.

Dennis asked if GCMRC could make a presentation to the TWG on the subject of mechanical removal because he doesn't believe all the questions have been answered: How is it being treated? Is it research? Is it a management action? What's the brown trout metric? He feels there are a lot of loose ends and things people don't understand. Matthew said they've given several presentations about mechanical removal as part of the non-native control process but he'd be happy to talk to Dennis about this some more.

Scott said it going to be really difficult to try and predict when and how and what statistical significance you're going to be able to tease up. Temperature plays a large part and can't be predicted because Mother Nature throws a lot of ringers. That's one of the reasons it's a little difficult to discontinue the removal of non-native species in there because it looks like something may be happening. The evidence that Lew Coggins has presented here is that there are some promising things for HBC and native fish. The problem is that you can't develop a block design. They can't predict what the temperature of the water is going to do so the safest thing to do at this point is to continue while things are looking promising. To try to say that they're going to be able to predict to what statistical significance they're going to be able to tell you whether or not warm water or non-native removal is responsible is impossible without being able to predict the water temperatures or if you put together a study design to try and do that.

Dennis said they had a discussion on the TCD and no one asked the question if you increase the predictability of temperature, how would it benefit your research design. Reclamation estimated a TCD would cost $100 million. If the only way you can determine the effects of temperatures is to allow those random temperatures to occur and perhaps have steady flows, there's another cost on the hydropower side. He thinks the assessments are exactly what the program should be doing. So if you have control over temperature, you take away some of the problems that you identified, right? You improve the research design but at a cost.

Dave Garrett commented that in 2002 the science advisors looked at 2002 and 2003 risk assessments of the TCD and they were writing a conclusion that in looking at past data was that temperature is very likely to be a controlling factor with this particular species, the native fishes. However, it has pluses and minuses. The plus of the TCD is that it allows one to actually manipulate the system and determine if in fact temperature is a very dominant variable. The cautionary comment was that if you start confounding that, you better hope that Mother Nature continues that temperature relief because the noise in the system, the variance in it alone, will prevent teasing out these various defectors.

Mike Yeatts urged GCMRC to try to do everything they can to identify what the cause and effect relationships are because the Hopi Tribe has concerns about the killing of trout or other non-natives if they're not causing the problems.

Shane said there are some big questions that aren't going to be solved easily but wondered if getting the non-native removal program in the plan is the right place. He asked if there were any other comments.

Amy Heuslein noted on page 73 of the MRP, there is a discussion about GCMRC reporting and their objective of timely reporting of the science accomplishments and findings. It just only mentions that final reports and papers to be presented orally to TWG and AMWG and then posted on the GCMRC website.

She asked that if the tribes are interested if they could request that the findings be presented to the tribes or through tribal consultation. She also said on page 74 it talks about bridging science and management and the scientific information in the adaptive management process and there are some factors that are listed there regarding the ability of GCMRC to design studies or work with the science and managers, but this is based on a western science perspective. She feels that the traditional aspects and knowledge of the tribes is another part of collaboration to be recognized.

Dennis asked if she thought the tribes would be willing work on a unified concept that GCMRC could respond to other than western science, how they perceive the canyon, its resources' responses to actions taken by the program. Amy said the tribes can't be lumped into one answer because they all come from different perspectives and cultural backgrounds. Kerry said that information would come from their tribal monitoring reports.

Loretta Jackson-Kelly said that at the next science symposium they are going to present a collaborative effort between Paiute, Zuni, and Hualapai about their individual perspectives and may even use mechanical removal of the non-native fish as an example. She added the structuring of their individual tribal governments are so different and have different variances in cultural and sovereignty issues that it's impossible to reflect the same voice.

John said they did prepare a new write-up on tribal monitoring and included a couple of new pages on the bottom of page 7 that might address some of Amy's concerns. Loretta suggested John also cite some references after the discussions on pages 7 and 8.

Shane asked if the TWG felt it was acceptable to mark in the minutes that the plan is generally okay and the TWG is okay with them and that they're going to provide detailed comments that will be looked at by GCMRC and responded to and let the process go forward or whether the TWG feels it needs a more formal approval process or not. Hearing no objection, John will send out the Comment/Response table form for the TWG to provide their comments and then GCMRC would respond back to them.

Norm expressed concern on how core monitoring is going to be integrated with the NPS I&M program. That's a fairly significant deal that was brought up before. He'd like to have a chance to review that before it's presumed the TWG is okay with it. John said he anticipates they could add some language regarding the intent of GCMRC to coordinate with NPS on integrating monitoring programs.

Dennis said he sees acceptance of the document as a failure on the part of the TWG. One of the complaints AMWG has made is that the TWG doesn't sufficiently resolve and bring issues to conclusion.
Randy said he would observe there was a new biological assessment and a new set of monitoring activities to implement and that was the charge from AMWG and he thinks the TWG owes John acknowledgement that he responded to the changes the TWG asked for. Randy added that he thought the TWG should comment back on the changes and see if there is agreement that the changes were implemented appropriately. He said he hadn't looked at the min detail but at rough glance it seemed like that had been accomplished.

Shane said that goes back to what the TWG first started and keeping their comments specific to the updates that were made with response to the AMWG request. He said he read through them all and was fairly confident that GCMRC did exactly what they were asked to do and it all seems very appropriate. If TWG members have other concerns, the appropriate place to bring those up might be with the AMWG. As far as the technical process, he hasn't heard anything related to the changes that have been made that makes him think that what GCMRC has done is really inappropriate or couldn't be modified by some minor changes. If that's the case, then he would like the TWG to move forward and accept this and knowing that their response to comments will be made in a table that will available to this group and their AMWG member. If they feel for some reason that their comments wasn't responded to appropriately, they can bring up to the AMWG. There was a general feeling of agreement with what Shane had said.

ACTION ITEM: John will send out the Comment/Response table for the TWG members to use in sending their comments to him. The TWG will provide comments on the GCMRC Strategic Science Plan to John Hamill by October 31.

Sediment AHG Report. Shane said that based on the MRP, there is a requirement the TWG would approve all core monitoring plans so the task today is whether they're ready to approve the Core Monitoring Plan. As far as the PEP review goes, the sediment transport modeling review workshop, that was in front of the group but there is no requirement for the TWG to officially review or approve that and actually by approving the sediment core monitoring plan, he thought that takes into consideration that the PEP review and everything else that went into the Core Monitoring Plan was approved as well. He asked John O'Brien to talk about the Sediment AHG's report.

John O'Brien said the group could not achieve total consensus on a recommendation within the Sediment AHG. He didn't think anyone discovered or at least mentioned any technical shortcomings in the core monitoring proposal, but brought up two items that Shane had already touched upon and that was the proposal is approximately $1.5 million for sediment monitoring per year. There was a feeling that since it was the first project out the gate, they would be locked into spending the $1.5 million that year thereby leaving nothing for any other resources. The other issue was raised by Mary Barger in that whether they were ready to do sediment core monitoring as so many things were changing. John said the group questioned whether they were in a paradigm shift and knowing the purpose of sediment monitoring as it relates to the whole program. He said those concerns weren't shared by all the members but he wanted the TWG to be aware of them.

Shane said he thought the TWG had some legitimate concerns about this program and what projects are going to be implemented and how they're going to be considered in the budget. He proposed separating the two issues for now and putting them on the agenda over the next few meetings through FY09 to have the needed discussions. He suggested the group consider moving forward with sediment core monitoring unless there were technical issues for approval it.

Norm said he agreed but would just make a statement that the group recognize what the Park Service is doing and make some statement on how they're going to integrate the core monitoring with what NPS is doing. With regard to the Park Service I&M program, they have protocols and a whole system developed for monitoring resources in general throughout the Park Service so he would like those incorporated into this document as well.

John said members can submit proposed changes to GCMRC and they'll consider them as the document is finalized.

Clayton said WAPA feels it's premature to approve the sediment monitoring as proposed. As he understands it, the Core Monitoring Program being considered today is a $1.2 million budget item. The TWG has seen it but the comments from the TWG haven't been considered or addressed. The SAs did a quick review of the Plan and expected that they would do their standard review of the Sediment Core Monitoring Program but haven't done that yet. The TWG doesn't have the full consideration of the SAs with respect to the core monitoring. He said WAPA would like to see the full package with the sediment core monitoring program included rather than approve core monitoring programs ad hoc and potentially come up with a monitoring program for all resources that doesn't integrate well.
John said the general core monitoring is kind of programmatic assessment of all the monitoring that is anticipated including what certain general objectives are, the schedule for development, and approximate costs. He would agree that the MRP is a three-step process and that the core monitoring plan evolved quicker than in the overall plan.

Dennis asked if the science advisors could help the TWG put together a core monitoring program, one component at a time especially when they know eventually the budget is going to become constrained. He

thought they could consider accepting this as provisional core monitoring. Helen remembers what they did in the SPG, they had a provisional core monitoring plan and for one reason or another that single work helped them get by the impasse.

Dave said it was the SPG that triggered John's very movement to go back and build this overall approach so that GCMRC could look more at that budget and some of those issues brought up in the SPG. He knows those recommendations came from both the science advisors and the TWG representatives there so it did get a little out of sync. You had the sediment work ready so some policy issues can't be resolved until this other document is completed. Dave said the most difficult areas to deal with are in biology because there is so much variance.

Randy said he would second what Dennis had said and call this provisional because of the dollar issues that have been raised and how they're going to be implemented into the program as a whole and suggested looking at it in terms of scope. He pointed to page 8 where it talks about recommended long-term monitoring protocols relative to surface water measurements. Then admittedly a lot of those surface water measurements have probably already been made but a lot of them go up to tributaries much farther than is necessary. So one of the things to consider in trying to adjust costs would be to look at the scope and break it down into how much water or how much sand is coming to the canyon from these tributaries without having to go all the way up to tributaries to obtain that information. He thinks it would be good to call this provisional and give the science advisors and others a chance to look at it, not only with respect to perhaps some of the things that have already been mentioned with precision and costs but also within the scope of the effort.

John O'Brien said one quick fix would be to revisit the sediment core monitoring when the second resource, core monitoring protocols, are ready to come online which might just be a good fit for starting to look at integration. It might be a little artificial to do it at the third year or the fourth year until the program knows when that next resource of core monitoring protocol will come online and that might be the most beneficial time to take a look at how will these match up and at the same time look at costs, precision, what we'll get for that money, but at the same time it would allow these four core monitoring protocols for sediment to be in place for maybe three years. If something else is ready to come online, maybe four or five years.

Mike said that while he agrees the group may need to revisit the protocols, when they looked at it on the Sediment AHG, they were evaluating it from the standpoint of the research questions that are identified and whether they thought the protocols would address them and those research questions which he thought were derived directly from what this group and the AMWG wanted to know about sediment. He suggested looking at the questions that have been asked and seeing whether those are still the questions that are appropriate because he thought the protocols technically were adequate to address them.

Shane said he was hearing motion language that "TWG provisionally adopts the Core Monitoring Plan for FY08-10 with a three-year review as described in the MRP to occur after FY10 is completed."

Dennis said he thought that was too convenient for the TWG. He hears the TWG giving their responses to GCMRC over and over again. If this is going to be done in three years, he asked what the TWG would be doing in the interim. What do managers say they want from research? Are we asking them to identify a relationship? He's doesn't see the TWG defining their responsibilities.

Shane said he thinks there are two parts the TWG is dealing with: 1) the technical protocols which have been implemented, and 2) how does this fit in with the larger program? He posed additional questions: How are we going to make decisions about budget? Are we really getting the efficiency from this program that we need? Are we spending too much? Do we need to decrease or increase the types of data we're getting as far as the accuracy of precision? He thinks they need to have a separate process that goes forward with TWG where over the next year they look at those issues but not hold up the program. He thinks the TWG can work on two things: 1) Recognizing that we have a pretty good plan, moving forward with the

provisions, asking for a review in three years instead of five, and 2) then doing the hard work of talking about these issues over the next year in conjunction with the general core monitoring plan that GCMRC will bring forward.

MOTION (proposed by Clayton Palmer): TWG provisionally adopts the Core Monitoring Plan for FY08-10 with a three-year review as described in the MRP to occur after FY2010 is completed.
Seconded: John O'Brien.
Passed by Consensus (17 members) with two abstentions (Norm Henderson and Steve Mietz)
Norm Henderson: There are some fundamental things here for us.
Steve Mietz: I saw it more as I had some disagreements with it, but I don't want to hold up the process.

Dennis said he wanted to clarify what an "abstention" means. He thought it was important because it means a member really gives up his/her vote. In other words, it doesn't really hold a place for the individual to come back later and say, "well, I really didn't agree." It truly is giving up your vote.

GCMRC Updates.

Vegetation Remote Sensing. Dr. Barbara Ralston presented a PPT, "Vegetation Monitoring: Remote Sensing of Vegetation" (***Attachment 3a***) which was completed this summer. This project was an outcome of the Protocol Evaluation Panel convened in March 2000. The PEP recommended river-wide GIS coverage of vegetated area for habitat analysis. In May 2002, a digital CIR flown for river corridor occurred and a vegetation mapping project was initiated in March 2003. Limitations of remote sensing include 1) it only provides area cover of general categories and, 2) change detection at class level is dependent on image quality. The final open file report was completed in July 2008. The FY09 vegetation mapping activities will should complete mapping of 2005 vegetation classes with accuracy assessment in May 2009 (coinciding with 2009 overflight), compute change detection of 2002-2005 vegetation classes, and develop a draft report by summer/fall 2009.

Natal Origins of Trout. Dr. Matthew Andersen distributed copies of his PPT presentation, "The Natal Origins of Rainbow Trout in Grand Canyon: A Lines of Evidence Review" (***Attachment 3b***). He said this approach is a way to identify where RBT are produced in the system. He feels it's important to understand where the fish are produced, primarily for 1) helps them understand how they are managing that recreational fishery in the Lees Ferry Reach, and 2) it's also important for them to understand where RBT are coming from as they try to conserve the native fishes that are downstream. His primary reason for putting this on today's agenda was for workplan prioritization. He wants the TWG to determine whether or not this is information is important and whether more information should be developed to understand this better or to decide whether they have developed sufficient information and are fairly competent in their conclusions. He gave his PPT presentation and concluded that most likely the majority of rainbow trout in Colorado River in Glen, Marble, and Grand Canyons is produced in Glen Canyon/Lees Ferry reach. His recommendation was not to pursue additional research into natal origin of rainbow trout at this time. He feels there are higher priorities to work on rather than pursue this because the majority is between Lees Ferry and Glen Canyon Dam.

***Q**: I think that in some ways some of this is obvious because most of us know that there are geomorphological differences in the riverbed in Marble Canyon than there are at Lees Ferry. I certainly believe that fish habitat is better in the Glen Canyon area than it is in the Marble Canyon area, however, that doesn't mean that there are not certain parts of Marble Canyon. Marble Canyon is longer and I would guess there might be just as much total good fish habitat in those 65 miles than there is the 15 miles of Lees Ferry. It's just a little more spread out and there are some pretty barren spots. I would just expect that there would be more spawning in Glen Canyon on average per mile that there would be in Marble Canyon but that's more like a comment. I don't know if you need to respond to that but I think it's a point worth making that the geomorphological differences are there and so that can account for perhaps you not finding as many YOY in a particular area throughout the whole area. Has anyone ever counted Redds? Have you witnessed or looked for any trout spawning because I know when Josh looked, the riverwas muddy so he didn't find any. Has anyone actually gone in and counted redds in Marble Canyon? Is any part of our conclusion based on actually counting redds? (Steffen)*

***A**: This is based on counts of YOY observed so I think that has been very anecdotal. I sure have talked to people, yourself included, who have seen redds in Marble Canyon so certainly they exist. I think it's a pretty limited extent. (Andersen)*
***Q**: Do you have any lines of evidence that would allow you to draw any conclusions on the natal origins of other non-native fish, particularly channel catfish, bullheads, or carp? Do we have any idea of where they might be coming from? (Steffen)*
***A**: I think those data are really limited and that is something we're trying to pursue in our line items for the non-native control and I think we really need to pursue that. I think that's terribly important. I would point to one thing that's published is Dennis Stone's work on the non-natives that are present upstream in the Little Colorado system and some of those specific distribution so that is one piece of evidence that does talk about the origins of some of these others. That's identified in our non-native control plan as something that we need to get more information on to help us be more responsible. (Andersen)*
***C**: Well, it's like we had the presentation on the impact of trout on HBC to predation and my comment on that was the same thing that it would be nice if we knew the impact of chubs from other non-native fish which apparently we don't have any knowledge of that yet. I guess we don't know where the other non-native fish come from either so I feel I little bit discriminated against and don't believe that all non-native fish are being treated fairly here that trout are sort of singled out as a focus of evil or whatever. (Steffen)*
***R**: I definitely agree. We have, because of the numbers, focused on one species and we need to broaden that focus. (Andersen)*
***Q**: Most of your emphasis is on RBT but you had one slide on brown trout. So what you're saying about RBT isn't really true of brown trout, right? What's the most likely source of brown trout? (Kubly)*
***A**: Bright Angel Creek. (Andersen)*
***C**: We have ongoing removal of brown trout from Bright Angel Creek, right? (Kubly)*
***A**: I don't think that's current. (Andersen)*
***Q**: How do you know that? (Steffen)*
***Q**: When was it ever identified that it was ended? We funded the Park Service in 2003 to initiate control of brown trout in BAC. The AMWG agreed to it and now we're hearing that it's been discontinued. Where I was going with my question was, is the other graph that shows that we're down, has there been any documentation in the number of brown trout eminating from BAC? We know that brown trout are a real piscivor of HBC. I like to ask that we more formally hear that this has been discontinued, if that's the case? Let me tell you why. The Bureau of Reclamation is held responsible for the effects of native fish in conservation measures and biological opinions, but there are tributary populations of some of these fish like brown trout that are not under the authority of the Bureau of Reclamation and the Bureau of Reclamation shouldn't be held responsible for their predation on HBC. It's important to us that these ancillary projects continue. I think it should be important to the whole program that they continue. What I'm really asking for is bring it to the group. (Kubly)*
***Q**: I thought it was the Park Service dollars that was used for that? (Davis)*
***A**: We initiated. We paid for the weir with appropriated dollars. (Kubly)*
***Q**: Wasn't it NPS dollars in the second or third years or beyond? I thought it was always Park Service and AGFD and FWS was working – (Andersen)*
***A**: It was SWCA and then the FWS (Kubly)*
***Q**: So FWS did the last removal? Didn't Pam give a presentation to the TWG about a year ago asking for money to continue this work and we haven't acted on that. (Capron)*
***R**: I don't think it's the program's responsibility to control brown trout in BAC. As I said, we didn't use power revenues, we used appropriated dollars to get the Park Service started. (Kubly)*
***C**: The Park Service has made the pitch to get money for that. (Capron)*
***C**: That's a different question than the regulatory responsibilities that we all have. If there's predation on an endangered fish in Grand Canyon by brown trout, then I'm interested in who is responsible for it and I hope we're all paying attention to that. (Kubly)*
***C**: Dennis, those brown trout are being killed when they get around the LCR. Why don't you go down to Lake Mead and kill all the catfish too? Or go to the LCR and kill the catfish there. Why don't you go into the LCR and kill the carp? Why don't you go in there and kill the red shiners that are in there? Those are the fish that could very well be a serious problem. In fact, I think this program is irresponsible in not going harder after those channel catfish, carp, red shiners, and the fathead minnows. The fact that we have not been going after those is irresponsible. You want to spend all your money, go up to the LCR. Kill those fish. There are no chubs in BAC. (Steffen)*
***R**: That's fine. You and every person around this table has a vote when it comes time to determine what the budget is going to be used for. I'm not going to argue with you but I am saying that brown trout are an identified piscivor, much moreso than rainbow trout. It eminates from the LCR. If it's outside this program, then we need some assistance in controlling it. (Kubly)*

***Q**: Do you know what life stage when migration occurs? Is it very small fish that are moving downstream or do they get larger when they move downstream? (Hamill)*
***A**: I think the data suggests it's just when they're larger. (Andersen)*
***Q**: Does this have any implications for how we go about non-native control and where it's most effective to control non-native fish? In other words, it makes sense to me to start moving control upstream and prevent them from going downstream because logistically it would be a whole lot easier, if you do it around Lees Ferry versus down at the LCR. (Hamill)*
***A**: We can consider that. If we could be just working in those reaches, 0-10, 10-20, something like that, but I know there is sport fishing that does occur farther down so perhaps we have to get farther down before you're not impacting the recreational fishery. There could be less expensive ways to go about doing that. (Andersen)*
***C**: Our highest density at least this year are actually down around Badger so this represents an array of a lot of years but this varies between years. This is a nice average. But on any given year, it doesn't look like that. (who?)*
***Q**: Are you suggesting that this multi-year data has an extremely high variance? (Garrett)*
***A**: It has just changed over time. You end up with some anomalies …we had a tremendous amount of what looked to be 2007 near (inaudible) and that was prior to the flood. Just keep in mind this was an average over a lot of years. (who?)*
***Q**: Between River Mile 20-30 and 30-40, it looks like you have a real dropoff in the populations? (Seaholm)*
A: I think because it's over a long period of time and that's average. I would say there isn't a lot of difference in that. (Andersen)
***C**: That's less than the lower 20's. It's hard to sample especially if you're tremendously close. You're looking at capture probabilities there as much as anything in habitat in terms of the total number of fish and that can also be representative of a loss of small fish if you can't get in there. Capture probabilities can change the philosophy of the river that you're sampling and they can be size-dependent to some degree. We try to do the best we can in the areas we sample. (Who?)*
***Q**: Is that kind of the demarcation in the trout removal efforts from say River Mile 30 on down to the LCR? (Seaholm)*
***A**: No. Let's keep it where it is. (Steffen)*

Low Steady Summer Flows 2000 Synthesis Report. Dr. Ralston gave a review of the "Low Steady Summer Flows 2000 Synthesis Report" via a PPT presentation (***Attachment 3c***). The experiment happened in 2000 and in 2007 the AMWG requested a synthesis of the information. Two workshops were held in August and October in 2008 and Dr. Ralston offered conclusions from those workshops. She reviewed the following:

- New Synthesis Topics:
  - Quantify a real extent of warm near shore habitats associated with Thermal Infrared Data
  - Quantify ponding at mouth of LCR
  - Reanalyze fish capture data to clarify effects of fall 31k spike
  - Synthesize fish and water temperature data (incorporate more recent monitoring data)
  - Vegetation effects on the ecosystem
  - Use the Bishop model to estimate willingness to pay & provide explanation of limitations of analysis
  - Look at AGFD creel survey to look at angler response past 2000
  - Incorporate safety and the ability to learn over time into discussion

She concluded that it would take $80K to finish the project in 2009 and the bulk of it would be for publication costs. The said the FTP site has the synopsis as well as the previous slides from the workshops.

***Q**: Did you go through the hypotheses that were in the study plan and identify which of them were addressed, what the outcome was? It was supposed to be an experiment and there is a lot of synthesis but what about hypothesis testing? Was this successfully done? (Kubly)*
***A**: The intention was to use the introduction to reintroduce those hypotheses and in the synthesis component and conclusions and identify which hypotheses were not addressed. (Ralston)*
***Q**: So that's coming out of the report? (Kubly)*
***A**: Right. In terms of the workshop, the questions that were asked was to identify those components – was there an immediate response to resources that could be measured, was there a sustained response that could be measured, and I don't recall the third one, but to focus on the discussions. (Ralston)*
***R**: There will be a chapter than addresses those questions you are talking about. (Andersen)*
***C**: Just a quick correction. On the bullet "use Bishop model …" We agreed to that and just a subtle distinction. Willingness to pay is not non-use. So what we agreed to was to look at the issue of willingness to pay and provide*

some explanations as to how that might be used further and then bring that to the stakeholders and ask them if this is the kind of stuff you want to see. And again, that's a measurement of the quality measured in dollars of anglers and river runners in the canyon and that's different from an economic evaluation of people who don't use a canyon at all. That's the non-use value. We didn't agree to do any of that. (Palmer)

Near Shore Ecology Pilot Update. Dr. Matthew Andersen said his PPT, "Update: Near Shore Ecology Project" (***Attachment 3d***) would provide an update on the planning and implementation of studies associated with the near shore ecology project and the fall steady flows study as well. In the interest of time, he went over new data from work completed this past summer. He concluded with the schedule for completing the NSE/SF Studies:

- Cooperator (Jan 2009)
- LSSF synthesis draft plans (Feb 2009)
- GCMRC draft fall steady flows science plan (April 1, 2009)
- SA and TWG review of plan (Apr – Jun 2009)
- Finalize plan (July 2009)

Science Symposium. Dr. Ted Melis passed out copies of a preview of the "November 18-20, 2008 Colorado River Science and Resource Management Symposium" and then gave a PPT with other details (***Attachment 3e***). He encouraged the members to register as soon as possible. He is hopeful the final program will be posted this Friday on the Water Education Foundation's web site.

2008 Temperature and Sediment Conditions. Dr. Dave Topping gave a PPT, "October 2008 sediment update." (***Attachment 3f***). He said March-October 2008 was one of the lowest tributary sediment-supply seasons on record. During this period the Paria River supplied ~210,000 (±20%) and the Little Colorado River supplied ~140,000 (±30%) metric tons of sand. He said that realtime acoustic sediment-transport data would be available online in December from mile stations 30, 61, the Grand Canyon Gauging Station, and mile 166 in Diamond Creek. He also provided two temperature slides stating that "Normal" post-dam August-October water temperature at Lees Ferry ranged between 9 and 10 degrees Centigrade. Because of warmer dam releases, water temperature ranged between 11 and 13 degrees Centigrade at Lees Ferry during August-October 2008. Temperature data can be found at: http://www.gcmrc.gov/products/other_data.

Integrated Flow Temperature & Sediment Model. Dr. Melis said he was making the presentation for Paul Grams. He passed out copies of the Integrated Modeling Workshop notes held Sept. 11, 2008 along with a PPT, "Update on 2009 Modeling Project: recent workshop and next steps" (***Attachment 3g***). He concluded with the future of the modeling project:

- Modeling project should not be considered "over" once ongoing model developments are finished (likely in the next 2-3 years).
- Development will result in an integrated "toolbox" of models. The "tools" require maintenance and updating, and staff who know how to use them.
- For example, as new monitoring and research flow data become available, models should incorporate improved understanding of system dynamics.
- Thus, modeling project should continue in a scaled back version alongside Long-Term Core Monitoring.

Steve Mietz asked how Ted would like to receive information. Ted said that it would be better to have information come through the TWG so all the stakeholders are aware of what's going on and receive updates at the same time.

Archaeological Comments. Ms. Loretta Jackson-Kelly said she wasn't aware that the agenda item on river stage and archaeological sites had been moved to tomorrow and she wanted to provide some information. expressed concern about the report and believes the proposed model needs to be reviewed closely by the tribes in the AMP program. She thought the polygon location sites were revealing archaeological locations and information that have affiliations that might be sacred. She said that when people look at those, they might not mean anything to them but they mean something to her. She can read the topography of the land and knows where those areas are on the river. She is worried about that if the

program is releasing archaeological site information into a public forum such as this, there is a breach because she knows in studying the NHPA that archaeological sites are protected by law. Theoretically, she feels Reclamation should've been consulting with the tribes before the site information got released to GCMRC. The report also states that the Park Service released site locations to GCMRC and using the information in this proposed model didn't allow the Federal agencies any time to discuss any types of concerns or issues that they might have about that and in the manner in which it's being used. She also feels the proposed model needs to be reviewed closely by the AMP tribes and it shouldn't be in the form of coming to the TWG. She said she knows what the AMWG motion said and that the motion was supposed to come to the TWG for review. She really stressed that there isn't any member of the TWG that can help mitigate the sites unless they can consult and attend a council meeting with her tribe about mitigating their ancestral sites. She feels people need to think about that when in the future they're concerned about the archaeaology sites. She said Reclamation has a responsibility under Section 106 consultation and there's a process already in place and she believes the Programmatic Agreement Group and the CRAHG need to review the proposed model and discuss the issues and then would come back to the TWG to generate a recommendation to the AMWG. She is still trying to deal with the AMWG motion in September and the issues involved but she does believe that people need to step back with this model and asked the members to think about the things that she is concerned about. She doesn't know what the exact intentions of the model is supposed to define for them but she wants to make sure that Reclamation and the other Federal agencies involved in this will consult with the tribes and come to some type of agreement for how they can protect archaeological sites and need to work together in mitigation or avoidance. That's a decision for the PA through the 106. That's a decision the TWG members aren't going to make.

Clayton said that since WAPA proposed the motion at the last AMWG meeting he wanted to help her better understand why the motion was made. He said WAPA never intended to violate any principles and asked they could talk more about this. Loretta told him she lives in Peach Springs, Arizona, and she would like him to come there and explain to the tribal elders as well.

Public Comments: None

Adjourned: 5 p.m.

Glen Canyon Dam Technical Work Group Meeting
October 15-16, 2008

Conducting: Shane Capron, Chairperson

July 16, 2008
Convened: 8:05 a.m.

Committee Members Present:

Mary Barger, WAPA
Cliff Barrett, UAMPS
Charley Bulletts, Southern Paiute Consortium
Kerry Christensen, Hualapai Tribe
William Davis, CREDA
Jay Groseclose, NM Interstate Stream Comm.
Norm Henderson, NPS/GCNRA
Amy Heuslein, BIA
Rick Johnson, Grand Canyon Trust
Robert King, UDWR
Glen Knowles, USFWS
Dennis Kubly, USBR
Steve Mietz, NPS/GRCA
John O'Brien, GCRG
Don Ostler, UCRC
Scott Rogers, AGFD
D. Randolph Seaholm, CWCB
Larry Stevens, Grand Canyon Wildlands Council
Bill Werner, ADWR
Michael Yeatts, The Hopi Tribe

Committee Members Absent:

Steven Begay, Navajo Nation
Christopher Harris, Colo. River Board of Calif.
Anthony Miller, Colo. River Comm./NV
Bill Persons, AGFD
John Shields, WY State Engineers Office
Mark Steffen, Federation of Fly Fishers

Interested Persons:

Matthew Andersen, GCRMC/USGS
Jan Balsom, NPS/GRCA
Glenn Bennett, GCMRC/USGS
Mike Berry, Bureau of Reclamation
Garry Cantley, BIA
Kurt Dongoske, Pueblo of Zuni
Helen Fairley, GCRMC/USGS
David Garrett, Science Advisors/M^{3}Research
John Hamill, GCRMC/USGS
Leslie James, CREDA
Barbara McKenzie, GCMRC/USGS
Ted Melis, GCMRC/USGS
Clayton Palmer, WAPA
Catherine Parker, NPS/GCNP
Barbara Ralston, GCMRC/USGS

Meeting Recorder: Linda Whetton, USBR

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Welcome and Administrative. The Chairman welcomed the TWG members, alternates, and interested persons. Attendance sheets were distributed.

GCMRC Updates. Dennis said that yesterday GCMRC made a presentation on natal origins of rainbow trout and ended with a conclusion and a recommendation and the recommendation was that they now pursue additional research into natal origins. He found their evidence equivable. He said he knows from personal experience that it doesn't cover the full range of the information that is available. It doesn't cover studies under GCES Phase I and II. It doesn't cover genetic studies that were done on the origins of trout in the Grand Canyon. He said the management implications for this determination is very important both with regard to our ability to manage the Lees Ferry Trout Fishery independently of native fish downstream, i.e., and questioned if a line could be drawn in the river and segregate it that way if we knowingly have RBT coming out of Lees Ferry. He crafted a fairly lengthy draft motion because irrespective of what is decided that the TWG shouldn't let this recommendation just drop off the table, that it needs to be addressed and the TWG needs to be given feedback and this is just his proposed

beginning to that. John asked Dennis what the management implications were to the work. Dennis said the ability to maintain a trout fishery at Lees Ferry; the FWS has a responsibility for endangered fish in Grand Canyon. They assign take statements where there is known loss of fish as an instance of management actions. He said that if RBT are emanating out of Lees Ferry and they're preying on HBC downstream, that's not the responsibility entirely of this program nor should the cost of it be borne entirely by this program. It part, it's the responsibility of the agency that is managing that resource. In like manner if brown trout are being spawned and are recruiting out of BAC, then moving into the mainstem, and preying on HBC, that's a partial responsibility of the NPS that has a sport fishery in BAC. He said he didn't know if there were take statements for either of those two agencies as a result of those management actions that they're taking. The natal origins is a very important part of this equation as to whose responsibility it is to control these non-native fish that are taking endangered fish in the Grand Canyon. The cost to be borne of addressing that is an issue that gets addressed depending on who has the authority and responsibility. That's directly related to one of the conservation measures in the BO where it says the Bureau of Reclamation will work with the AMP to address those conservation measures which is to control the non-native fish. Dennis said this was only a PPT presentation, no report has been prepared or peer reviewed, and he didn't find it that conclusive. He feels it has real implications for the AGFD and the future of the Lees Ferry Fishery. Matthew said he did cite peer reviewed reports in his PPT presentation. Dennis said the conclusions that Matthew drew yesterday were likely not identified in any of those reports and that would be the important part of the peer review process to see whether the conclusions Matthew drew from that work are agreed to by other peers. Matthew said those conclusions were based on Lew Coggins' dissertation and other panels. Dennis said that Lew's dissertation is not considered a peer reviewed document. Dennis said he talked with Scott and it's costly to do natal origins work so he would like to see a cost estimate of what it would entail to further pursue this. The first thing that can be done is bring in the additional work that has been done but then there should be a cost estimate on what should be proposed to pursue and that should be looked at against the benefits and the management implications. He said the management implications that he tried to lay out haven't been discussed by the TWG. Dennis said the research should be part of the FY2010 budget. John said Dennis' concerns could be addressed in the MRP and that Lew's work could be peer reviewed and published. Dennis said he would like to hear from other TWG members as well. The following motion was proposed:

MOTION: Whereas the Glen Canyon Dad Adaptive Management Program strategic plan goals 2 and 4 identify desired futures for native fish and rainbow trout above the Paria, and

Whereas there is well documented evidence that rainbow trout, brown trout and other non-native fish prey upon native fish in the Colorado River, and

Whereas RBT, BT, and other predaceous non-native fish reproduce and recruit in the Colorado River and several of its tributaries in Grand Canyon, and

Whereas the Grand Canyon Monitoring and Research Center has presented evidence that the primary and natal origin of RBT is the Glen Canyon reach and the primary natal origin of BT is Bright Angel Creek, and

Whereas this evidence is equivocal and needs to be supplemented by results of other studies to determine the most appropriate and effective means of controlling these non-native fish in Grand Canyon,

The Technical Work Group requests that the Grand Canyon Monitoring and Research Center program additional research to more conclusively identify the natal origins of non-native piscivorous fish in the Colorado River below Glen Canyon Dam, and

The Technical Work Group requests that the findings of these studies be used in the development of research, monitoring, and management actions to implement conservation measures identified in the 2007 and 2008 biological opinions regarding the control of non-native fish in the Colorado River and its tributaries.

Comments:

- *I feel trout is the right species to be going after at this point in time but I would like to see some discussion about that as compared to some of the other species in there in terms of is there ny evidence that trout is indeed one of the primary predators of HBC. (Johnson)*
- *Isn't some of this evaluation part of the non-native control plan that GCMRC has underway right now? Wouldn't that be part of the evaluation of that? (Henderson)*
- *The non-native control plan is really sweeping and there are lots of recommendations in there. I'm trying to prioritize those things to where we need to be most quickly. My point in bringing the information yesterday is that this should be a lower priority and I would make the same comment about the non-native control plan. There are a lot of things that need to be done. (Andersen)*
- *If the report is published, do we really benefit from things like genetics analysis which are expensive and probably not going to produce the smoking gun but evidence? Is it worth more evidence and at what cost? (Rogers)*

Shane said he thought it made sense as a first step to get a publication out of Lew's dissertation and go from there and then that will inform the process as to what to do next.

ACTION ITEM: GCMRC will develop a journal article on the source of trout downstream of Lee's Ferry.

Dr. Garrett said the science advisors brought this up and people need to start paying attention to what they say. The group is now moving science while management activities are starting at the same time. Management activities can get ahead of the science. Parts of science can be taken and start management activities prematurely but this program now seems ready to go but it doesn't have all the pieces together. He said the real lesson to be learned is the responsibility bearing on some of the actions that may be taken without full science and who gets the blame when that occurs if it went through this process. He thinks the non-native control plan is a blending of science and management where you can start looking at some of those issues.

Shane asked if there were any objections to adding this to the TWG's list to GCMRC with regard to modifying the Draft MRP. The TWG was in agreement that they disagreed with the recommendation made in yesterday's PPT presentation that they want RBT removed from the MRP and that Dennis will provide a detailed comment to GCMRC reflecting the specifics of his position.

River Stage and archaeological sites.

AMWG Motion passed August 10, 2008: To direct the Technical Work Group to review the flow levels (as indicated by the currently available shorelines of the HEC-RAS model) associated with each of the 158 archaeological sites that have been identified for monitoring and/or mitigation of impacts, and to report this information and any recommendations with regard to how these data would fit into the process of making choices of sites to be monitored and/or impacts mitigated to the AMWG at its next meeting, with the provision that any recommendation will not alter the choice of sites selected for impacts mitigation in FY09.

Mary Barger said WAPA made the motion in order to run the HEC-RAS model to look at where the sites were that are being monitored and sites proposed for treatment. They just wanted the data to incorporate some new information to look at how sites are being treated and monitored. There were some issues that came up yesterday from Loretta Jackson-Kelly. She has some real concerns about the report that was prepared and handed out to the TWG. She felt it was sharing information that was protected and sensitive. As a result, Loretta recommended that this be remanded to the CRAHG, not to be dealt with by

the TWG, but that the CRAHG would take a look at it and then make a recommendation to the TWG in order to protect that sensitive information. She also wanted the PA group to be invited to work with the CRAHG on this. She wondered if there could just be general consensus from the TWG that the AMWG motion would be remanded to the CRAHG. Mary said Brad Warren talked about that at the AMWG meeting and he originally said to remand it to the CRAHG, but he was reminded that the CRAHG was a TWG ad hoc group so he only remand it to the TWG, and the TWG would have to remand it to the CRAHG. Mary said she would like to make that as a recommendation. Loretta requested it not be discussed at the TWG level and that it go directly to the CRAHG and PA Group for action. Shane didn't feel a recommendation was needed but just wanted to make sure there was clear direction to the CRAHG to do that. Shane said he saw two major steps with the motion. The first step is part of the first motion which is "reviewing flow levels related to sites and report on technical considerations such as reliability, uncertainty, and estimates that relate to the technical application of the model and the outputs from the model." The second part starts with "and to report this information and any recommendations" and Shane said this deals with regard to how the data would fit into making choices about which archaeological sites get treated. This would be a very difficult issue for the TWG to deal with and he wasn't sure how they would deal with the second part of the motion.

There was a lot of discussion regarding relevance of the 97,000 stage elevation to which sites would be mitigated, how the TWG should resolve the technical issues, sensitivity on the part of the tribes for having the sites being discussed, the Federal agencies consulting with the tribes, and the studies that have already been done on mitigation. to do 106 compliance with the tribes, the studies that have been done on the mitigation.

As a representative for the Pueblo of Zuni and as the Acting Director for the Zuni Heritage and Preservation Office, Kurt Dongoske said they carry out consultation with Federal agencies at times, but he wouldnot consider a meeting with the CRAHG as consultation with the Dept. of the Interior if that's the intent of the agencies. He also reminded the agencies that not only do they have a responsibility to consult on NHPA but in this case they would also have to consult under the religious freedom restoration Act and Executive Order 13007.

The CRAHG and DOI agencies held a 20-minute caucus.

The TWG gave the following charge to the CRAHG:

The CRAHG will review the revised virtual shoreline analysis, in relation to archaeological sites, and bring recommendations to the TWG at its next meeting focusing its review on the first part of the AMWG motion (below) assessing the utility of flow lines as simulated (with uncertainty) by the HEC-RAS model and other error sources.

***AMWG Motion passed August 10, 2008**: To direct the Technical Work Group to review the flow levels (as indicated by the currently available shorelines of the HEC-RAS model) associated with each of the 158 archaeological sites that have been identified for monitoring and/or mitigation of impacts, and to report this information and any recommendations with regard to how these data would fit into the process of making choices of sites to be monitored and/or impacts mitigated to the AMWG at its next meeting, with the provision that any recommendation will not alter the choice of sites selected for impacts mitigation in FY09.*

Science Advisors Annual Report. Dr. Dave Garrett distributed copies of his report, "GCD AMP Science Advisors Rapid Response Review: A Draft Report to the Technical Work Group of the Glen Canyon Dam Adaptive Management Program: Recommended Protocols for Core Monitoring of Sediment" (***Attachment 4a***). He also gave a PPT presentation, "Science Advisors Report on Accomplishments and Proposed FY 2009 and FY 2010 Program" (***Attachment 4b***). He concluded with the following recommendations for the SA program changes in FY 2009/2010:

- Evaluate opportunities for joint support activities to GCMRC/TWG
- Increase SA advisory contributions to GCMRC/TWG as possible
- Evaluate Science Advisor discipline balance: Revise to GCRMC/TWG/AMWG needs
- Refine the SAs focused rapid review strategy
- Pursue methodologies with GCMRC/TWG/AMWG to increase integrated science/management effectiveness in AMP

Extirpated Species. Dr. Larry Stevens began his presentation by saying that very little time had been focused on Goal 3, however, goal 3 is something the AMP initially agreed to in 1999 and without progress on goal 3, the program won't be able to fulfill its mission as an adaptive management program. He said there have been some very interesting discussions lately about what is meant by restoration at several different levels and kinds of restoration. Past nature is the pristine condition. He questioned if the group was focused on restoring to the pristine condition or are they trying to restore to a present natural condition which has humans in the picture and the ecosystems naturalized. There is also future restoration and they do nothing and just let it go and that's also a direction for ecosystem restoration. In the latter situation, we're faced with the *silent forest syndrome* where habitats can be recreated but without the species in it. It will be a silent forest or in this case a silent river. He distributed copies of his PPT presentation, "Revisiting Goal 3: Issues and a Preliminary Analysis of Extirpated or At-Risk Species in the Colorado River Ecosystem Downstream from Glen Canyon Dam" (***Attachment 5***).

Larry concluded with a proposed plan to address goal 3:

- Evaluate extent of knowledge (overview) – add task to GCMRC
  - 5-year MRP, with work to be conducted in FY2010
- TWG review report; assess potential for reintroduction of extirpated species –TWG Ad Hoc and AMWG-GCMRC-SA discussions
- Address information gaps, reintroduction strategies, responsibilities: TWG Ad Hoc and AMWG-GCMRC-SA discussions
- Acquire funding and implement restoration activities
  - From AMP if relevant and advisable
  - And/or from other agencies and other sources

Larry said he is planning to make a presentation to the AMWG at their next meeting because the TWG can't tell AMWG that they need to look at goal 3 issues but it has to trickle down from information requests and the interaction with GCRMC has to be by recommending to the Secretary that GCRMC help the program work on the topic and move towards assembling the information needed to reliably refute the reintroduction possibility or if there's good discussion about the possibility about reintroduction, then finding the funding sources. He stated the funding sources don't have to come from this program and said many NGOs are willing to put money into restoration of species and habitats in the Grand Canyon and not part of this program.

Randy said that when the AMWG discussed what was "in and out" of the AMP, this was one of the things that was put in as a goal and done so with the idea that it would be considered. Randy said it was listed as a goal but not to specifically be worked on because it was something that was outside the scope of the program.

Rick said he disagreed with Randy and said that wasn't the case. Rick said it was his recollection that this goal was put in as a placeholder with a determination to be made at a later date because there were a lot of other issues that needed to be worked on before looking at this one. Rick said he never recalled a decision made that it was "outside" the program and if there was documentation, then he wanted to see it. Randy said there were extensive discussions and that was something that was clearly decided outside the scope of the program.

Larry said it wouldn't be a costly endeavor and perhaps a person could be used half-time for 4-5 months. He recommended that it be included in the MRP and GCMRC is the logical entity to use it.

Shane said he thought it was something important and should be brought up to the AMWG. Randy said he feels it's the perfect project for the Park Service to work on independently but doesn't think it fits with what the adaptive management program has been chartered to do.

John said he thought the place to look at this is in the FY2010 budget. He thinks a comprehensive assessment would provide what the habitat conditions are today in the Canyon and how that relates to habitat conditions of species that have been extirpated. That's a fairly straightforward exercise and someone could be assigned to pull that together but he recommended it be treated as a project with a specific set of deliverables as opposed to making it a committee exercise. There is a process for bringing those new initiatives forward to the AMWG. He suggested throwing it in the mix and having further discussion.

TWG Facilitation and Biennial Budget and Work Plan. Shane said there were some people who had concern about the Budget Ad Hoc Group coming up with a biennial budget. There are a number of background documents and he feels the TWG needs to talk about the budget process. He said it's really unclear how a biennial budget works. He distributed copies of a spreadsheet, "TWG/AMWG Biennial Budget and Workplan Development Approach for 2010/11" (***Attachment 6a***).

Dennis explained that with a 2-year rolling budget process each year the second year of the budget would be updated which would then become the first year of the next 2-year budget cycle. In looking at Shane's spreadsheet, Dennis didn't get the impression that it was doing the same thing. The other thing is that it doesn't include the reviews of expenditures that are now done typically in March and December. That wouldn't complicate the process but it should be shown on here because that's an element of the whole budget process. In the old budget process we were looking forward to seeking appropriations so there was the development of a 5-year outlook, which we've never done, but the idea behind that and that's where these ancillary projects come in is that if you ever went to Congress, you would need to show what's being expended in the Grand Canyon Reach and on the river and not just this program because you're arguing that you've got insufficient funds so there are those three elements to it. His biggest concern is getting agreement from the AMWG to go to this process. Dennis said it was the BAHG who agreed to this process and he wanted to hear concerns from the TWG members. He presented a second spreadsheet (***Attachment 6b***) and said this was presented to the science advisors on a river trip. Norm was on that trip and together they explained the process.

Dennis said the schedule is the same but now the TWG would be developing two years of budget in each cycle (***Attachment 6c***) so let's just say you look at this graph, if you look at the color codes, you're starting out with the 06 and 07 budget. You develop them together. In the next iteration you're developing the 07-08 so you still have a budget process every year but the second year which you develop with the knowledge which you have is going to likely have to change. You're going to have to tweak it here and there. So your second year became much easier because you don't have that intensive process. You're going to lay out again a new second year but it's a perspective second year so every year you're rolling forward, bringing in a new second year and you're finalizing the first year. We call it a rolling 2-year budget process. He advised them to look at the color codes to see how the coupling of the years occurs. The months are done the same way that Shane did them and the time frame is pretty much the same except remember that GCMRC wanted us to finish the budget process faster and we sort of fell into the August-September as we couldn't get it done any faster. We were always trying to push back and get it done earlier and that's why this ends in January which may not be doable, maybe 4 years of experience tells us that we just can't get it done.

John said one of his concerns was that a 30-day review needs to be factored in for the AMWG and 10 days for the TWG. He wanted to go through this in more detail instead of having it just month by month. He suggested putting some real time frames in when these things are going to happen. A lot of this depends on when the AMWG meets and that's been a major frustration for a lot of people.

Shane said he had a different perspective on why we would want to do a 2-year budget after listing to what was going on in the BAHG and what he thought he was hearing was that if we did a 2-year budget, it allows us to do most of the work in one year and the second year we don't have as much of a workload to rehash all the budget issues so in the second year it allows us to just review what was going on. Every year you look at the science to make sure you're doing the right things and the only things that need to be opened up in the second year are changes because you've got a program that's gets dropped or you've got some extra money and you go in with the scapel versus the hatchet to deal with things.

Ted cautioned there was a period when they had projects in line items in the budget that were unfunded initially that would be done if additional appropriations could be secured. They went through several cycles of that where they never got funded and then realized they'll never get funded because they can't even pursue getting additional dollars so they just dropped whole projects. Ted said there are projects people are proposing that they want to pursue in that old strategy that tie into this that make it really, really, necessary that the approval process happen at a certain day so that those folks can pursue these funds for that project, whatever it may be and he doesn't see that happening right now.

Cliff said he supported the idea of a rolling 2-year budget and extending it in some part of 5-year program so that you have an opportunity to look forward to what you're going to be doing but not being locked into it. It's a rolling process of review of what you're actually accomplishing factored into what you want to accomplish for the next year. Cliff said that perhaps the best thing to do at this point in time is to facilitate some discussion amongst Dennis, Shane, BAHG members, and John Hamill before they try to make a wholesale changes to the budget process.

John said they're not going to produce a budget in the next 6 weeks. He thinks they could get a preliminary budget out sometime in January. He doesn't a 2-year budget as being much more complex or complicated than what they've been doing and there is an advantage of having some sort of advance planning and knowing what they're going to do in the following years so they can start working on contracts ahead of time. As such, he sees having a 2-year budget much more efficient. John added that he is already putting together a 2-year workplan.

Dennis said that one of the questions for the TWG is whether the whole TWG wants to be involved or do they want to create a technical ad hoc group for the budget process in that way they've got a group that's ready when John has his annual reports meeting.

Shane said he sees a great open in the schedule. Instead of having a winter meeting, the TWG would have this winter time period where these reports were given out, GCMRC would hold the workshop, one to two days, etc., where those are reviewed. It's basically a TWG meeting but it wouldn't be official. He also would like to have a technical group that was tasked with looking at all this stuff and reporting back to the TWG at the February meeting on any technical issues that they felt should be advised to the TWG as opposed to just letting reports pile up. He said GCMRC is committed to giving reports in December and he feels this should be firmed up in the workplan. In talking about this year, there's a commitment from John to bring forward a 2-year budget in January that the TWG could review in February. Shane said he thought it seems reasonable to ask the BAHG to look at a 2-year budget process and bring forward a new or revised proposal, just clarification on what we're going to do as a far as a 2-year budget and tackle that in February 2009. He asked how people felt about that.

Dennis said he wanted to get the budget process started right away. He doesn't want to wait for a decision in February as that's really late for the BAHG to start getting engaged.
John said he would need a little time to work with the BAHG after they produce a draft and then incorporate their suggestions into the draft after it goes to the TWG. Those are the kinds of things they can work out and schedule. It's a good sign the BAHG will work with them and flesh out the budget in more detail.

Dennis asked if the GCMRC and the BAHG Chair could get together in November via a conference call to kick things off. John said he was agreeable to that.

TWG One-Year Workplan for 2008-09. Shane said they didn't get a chance to talk about the TWG One-year Workplan for 2008-09 (***Attachment 6d***) but said he is generally going to plan for meetings in February, June, and September of each year with a December meeting devoted to dealing with responding the annual reports.

Shane said he wanted to talk about a lot of things but would really like some support from the TWG in constantly updating the annual work plan, to get ideas from people, and then have a backstop for him to bounce ideas off as the workplan is developed. They also didn't to talk about having a facilitator but had a recommendation from a Facilitator AHG to look into using a facilitator and one of the main stumbling blocks there is that the funding for the Chair didn't get returned to be able to be used for a facilitator so there is money available potentially. However, approval for that still needs to come from the AMWG to use the TWG Chair money for that purpose.

Don complimented Shane on his facilitation skills at this meeting and I though he interceded in a lot of the discussions based upon his knowledge of policy and technical background that has effected how the discussions have gone. He viewed a facilitator as having facilitation skills but not a knowledge of the program and the technical aspects and he questioned how different this meeting would've been whether it had been facilitated. His feeling was that there are plenty of places to spend the money we have and we're not funding everything that we want to fund and he was pondering how a facilitator would've made this meeting better. Even though the TWG discussions can get messy, he feels the TWG should use the money programmed for the TWG Chair somewhere else.

Adjourned: 12 noon

Respectfully submitted,

Linda Whetton
U.S. Bureau of Reclamation
Upper Colorado Regional Office

General Key to Adaptive Management Program Acronyms

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

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

Updated: 2/3/09