Glen Canyon Dam Technical Work Group Meeting
September 29-30, 2009

Conducting: Shane Capron, Chairperson

September 29, 2009
Convened: 9:30 a.m.

Committee Members/Alternates Present:

Mary Barger, WAPA
Charley Bulletts, So. Paiute Consortium
Kerry Christensen, Hualapai Tribe
William Davis, CREDA
Kurt Dongoske, Pueblo of Zuni
Jay Groseclose, NM Interstate Stream Comm.
Norm Henderson, NPS/GCNRA
Leslie James, UAMPS (alternate for C. Barrett)
Rick Johnson, Grand Canyon Trust
Dennis Kubly, USBR
Steve Mietz, NPS/GRNP
John O'Brien, Grand Canyon River Guides
Emily Omana, Grand Canyon Wildlands Council
Don Ostler, UCRC (alternate for WY)
Bill Persons, AGFD
D. Randolph Seaholm, CWCB
Sam Spiller, U.S. Fish and Wildlife Service (alternate)
Jason Thiriot, Colo. River Comm./NV
Bill Werner, ADWR
Michael Yeatts, the Hopi Tribe

Committee Members Absent:

Cliff Barrett, UAMPS
Christopher Harris, Colo. River Board of California
Amy Heuslein, BIA
Robert King, UDWR
Glen Knowles
John Shields, WY State Engineer
Mark Steffen, Federation of Fly Fishers
Larry Stevens, GCRG

Interested Persons:
Matthew Andersen, GCRMC/USGS
Mike Berry, Bureau of Reclamation
Marianne Crawford, Bureau of Reclamation
Jerry Cox, Grand Canyon River Guides
Alan Downer, Navajo Nation
Helen Fairley, USGS/GCMRC
Dave Garrett, Science Advisors
Pamela Garrrett, M^3Research
Mike Gozzle, University of Florida
John Hamill, USGS/GCMRC
Ted Kowalski, Colo. Water Conservation Board
Clayton Palmer, WAPA
Tom Ryan, Bureau of Reclamation
Gaylord Staveley, Canyoneers, Inc.
Curtis Yazzie, Navajo Nation

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. He mentioned the e-mail he sent out on Sept. 23rd which provided more background information on some of the agenda items (***Attachment 1***).

Approval of July 16-17, 2008 Minutes. Without objection, the minutes were approved.

Approval of the March 16-17, 2009 Minutes. The following errors were noted: 1) Steve Mietz voted as an "abstention" for the HEC-RAS motion, 2) Helen Fairley said the correct number of sites was 232 sites and should be changed on page 22, line 6, 3) Bill Werner said on page 5, the "fish should be coming up from Lake Mead." Pending corrections to be made, the minutes were approved.

Approval of June 22-23, 2009 Minutes. Without objection, the minutes were approved.

Next TWG Meeting. Shane distributed copies of the TWG workplan (***Attachment 2***) and said the next TWG meeting would be a one-day meeting on January 21, 2010 following the Annual Reports Meeting on January 19-20 in Phoenix. He asked the members to send him suggestions for agenda items. He also

reminded them of the Core Monitoring and Socio-Economic Workshops to be held December 1-3, 2009, at ADWR.

Action items. The TWG reviewed the current action items (***Attachment 3***). Norm mentioned one item that was on a previously posted version relative to Reclamation providing updates to the TWG on the status of several reports. Linda said that particular document was removed because she included it as an action item but not being a TWG member, she couldn't make that commitment. She said Dennis wasn't here at the time the action items were discussed at the last meeting. Norm said he felt that someone needs to make that update. Dennis said he would address this under "old business." Norm renewed his request that he wanted this to be reviewed on a regular basis. Shane committed to keeping this under "old business" so it doesn't get lost. Norm asked what the difference was between an action item and something carried under old business. Shane said he saw the action item list as something that directly relates to the TWG that they've been asked for whereas the reports that Norm mentioned are for general information purposes.

Chair Update from the AMWG meeting. Shane reported there was a letter sent from Anne Castle (***Attachment 4a***) which included the two motions forwarded to the Secretary. However, he suggested all the motions be sent to the TWG. He said there were two very interesting issues: 1) the HBCCP was passed and sent to the Implementation Committee, and 2) the management actions were passed. He reviewed the other motions (***Attachment 4b***) and said further discussion will occur at this meeting.

Old Business.

BOR Reporting Update. 1) Dennis Kubly said this item didn't deal so much with financial reporting but the delivery of products. He introduced Marianne Crawford and said she was hired to track those reports/deliverables and has already developed a spreadsheet going back to 2008 to track the deliverables in the work plans and tracking BOR, GCRMC, and any entities doing contracting work so the TWG would have a better idea of how they're doing the science. 2) With regard to Norm's request on the reports, Dennis said the process for completing those reports is underway and being managed directly from Interior with the assistance of the DOI agencies. He didn't know if a BOR representative would have any more access to the process than the other DOI agencies but said Reclamation would commit to providing feedback as necessary.

Norm was concerned with the following reports: 1) Annual Plan of Operations, 2) Annual Report to Congress, 3) 5-year Review of the Operating Criteria, and the Monthly Volumes. Norm said that Rick had a list of probably nine reports that he was also interested in.

Randy Seaholm noted for the record that some reports being monitored and tracked are okay to report on but some of them are clearly outside the scope of the TWG. He felt there needs to be some consistency between what reports the TWG can review and keep those that are outside the program *outside* the program. He said the Annual Operating Plan and determination of the monthly volumes are not part of the TWG's scope. Shane said the TWG should be provided status updates on the reports but not be involved in how they're developed.

Dave Garrett said one of the concerns the Science Advisors has had for a number of years is determining the best way to inform the Secretary relative to various assessments and implications of actions taken in the GCDAMP as the program moves forward with integrating science and science with management.

Dennis said Reclamation will send out URL addresses pertaining to technical documents/reports. Policy issue documents/reports will be dealt with at the AMWG level and URL addresses will be sent to them as required.

Mechanical Removal Update – Dennis Kubly distributed copies of the Draft Agenda for the Govt-to-Govt consultation meeting with the DOI agencies and the Pueblo of Zuni (***Attachment 5***). Presentations were

made to the tribe and the commitments the agencies have in Govt-to-Govt consultations was discussed. He thought it would be helpful to hear from Kurt Dongoske about the first meeting. Kurt said the biggest thing was to have the DOI understand the Zuni perspective. They were given a tour of the Zuni Museum and history of the Zuni. During the meeting they heard from the Zuni Tribal Council and the Zuni religious leaders. The leaders don't differentiate between native and non-native fish but consider death of the fish as one thing. This is the beginning of the process. The one thing not discussed was Section 106 for approval of mechanical removal in 2010. The mechanical removal is an adverse impact seen by the Zuni. They anticipate further consultation on how those mitigative activities may be developed.

Matthew reported there are two removal trips scheduled for 2010 which will occur in May or late summer. Bill Persons reminded Matthew that the trips have to mesh with other schedules. Kurt said one mitigative measure discussed was taking the trout out of the LCR and putting them in the Lees Ferry Reach.

Farewell to Randy Seaholm. The TWG congratulated Randy on his retirement from the Colorado Water Conservation Board after 36 years of service. He was presented with a picture of Glen Canyon Dam, an In-Out Burger shirt, and a goody bag. The TWG presented him with a farewell card and the group enjoyed coffee and cake (courtesy of Shane and Leslie respectively). Randy said he has thoroughly enjoyed working with every member. While they've had some healthy discussions, they have always been done them in a very meaningful manner in order to advance the program.

New Business

Nomination of TWG Chair for FY2010. Shane was asked to leave the room while the TWG accepted nominations for TWG Chair. There was consensus Shane was doing a good job and should continue as TWG Chair for FY2010.

Final Tribal Consultation Plan. Mike Berry said the Tribal Consultation Plan has been finalized. It was a joint effort among DOI, DOE and the tribes. Helen asked what the difference was between the plan and the guidelines. Mike said it's not a native tribal plan but provides guidance for how DOI and DOE will do consultation.

Litigation Update. Sam Spiller said they're in the process of complying with the court order relative to the Grand Canyon lawsuit. Rick Johnson said the court order is coming back with a response to the judge's request on the 2004 and the 2008 biological opinions. The FWS response is due the end of October and should be out to the public by December.

Action Item: TWG members interested in serving as chair of the HBC AHG should let Shane or Linda know as soon as possible.

GCMRC Updates (***Attachment 6***) Shane said that since the updates were made available to the members ahead of time, he asked if there were any questions for GCMRC staff. Steve Mietz said he wanted to provide an update on the Shinumo Translocation first.

Shinumo Translocation Update. Steve Mietz reported they just completed their second monitoring trip and captured 116 translocated chubs during the September trip. Two chub were found above the falls on the highest pool they put the fish in. There were 178 recaptured if all translocations are counted. They're showing growth of approximately 22 milimeters between the July and September trips. He said 13 of 116 fish were caught below Shinumo Falls. They also did a little bit of backwater seining between river mile 115 and 120. Out of that they were able to find 8 YOY HBC in seven different backwaters. They also found one 223 milimeter chub in the backwater from river mile 162. The average temperature for the backwaters was 18.1 C as compared to the mainstem which was 15.7 C so there was significant warming in the mainstem. Also noteworthy was they sampled hundreds of bluehead and mostly flannelmouth suckers in the backwaters.

Senior Ecologist Update. Shane said he thought the last sentence in the second paragraph was pretty interesting. It reads, "in conjunction with estimates of HBC juvenile abundance in the nearshore ecology program, it now appears that a substantial portion up to 30% of the net recruitment of HBC adult population may soon becoming from mainstem rearing." Rick said he also found the paragraph intriguing and wondered how they could get more information on the conclusions. John said Carl Walters will be working with GCMRC staff and other cooperators in doing some modeling. The intent is to refine the modeling outputs in March and then share with the TWG at an April workshop.

Under the biological update on page 4, Shane read the last sentence on the page, "Will be meeting with TWG to review the implications of the analyses of the FY11 is anticipated for February 2010." He asked if GCMRC is anticipating a workshop with the TWG in February 2010 on the PEP implementation. Matthew said that was correct. Shane will update the TWG meeting schedule.

Dennis said that since Lew Coggins will be leaving GCMRC within the next month or so, he asked GCMRC whow they complete their analyses. Matthew said some of it will probably be done by AGFD and F&WL. They expect Lew will help them get started on the ASMR analyses but he'll be leaving in mid-November so some work will be contracted out.

Annual Reporting Requirements. John Hamill said a copy of the "Fiscal Year 2009 Project Report for the Glen Canyon Dam Adaptive Management Program" (***Attachment 7***) was sent to everyone via e-mail. He said this was an outline of the report they used last year and is meant to be a fairly concise summary of what has been accomplished and what was intended to be accomplished. Steve said he felt some type of tracking needs to occur from the Annual Reports Meeting where the good ideas are captured particularly synthesis between some of the studies. He suggested using the Comment/Response table to capture those ideas. John said they won't be able to provide answers to some of the key questions until some of the studies are completed but #5 will attempt to provide that information.

Norm said he didn't know what "key" meant and wondered if they could get a list of all the strategic science questions and then fill in the blanks. John said "key" is refers to the key strategic science questions and everything is listed that may be relevant to the study. He said some are the main focus of the study while others are more ripple-related. His thought was to focus on the really key ones rather than the whole laundry list of items. Norm advocated for a whole list of the projects.

Shane said he felt the responses should be in the SSQs. Norm felt a summary of knowledge was needed. John said it happens in the knowledge assessment. John reiterated the annual reports are snapshots in time. Norm said if it shows up as an SSQ in that project, then information for other projects should also brought into the process. Dennis said if you looked at comments and responses on the two plans they're going to be reviewing, there is a pretty consistent call for identification of the hypothesis. He said one of the problems related to getting to the SSQ is it is high enough that there is a subset of unaddressed hypotheses under NEPA that might help get down to focusing on hypotheses or SSQ's that are being addressed in the project. Dennis said it's almost like it is missing. Mary said it would be nice to see if and when there is a shift in the workplan. John said he would add a note in item #4. He said the next step is to produce the reports. They did a survey of what people wanted to know about last year and worked with Shane to figure that out this year. The idea was to include the DOI agencies, tribes, etc. and see what presentations are wanted. John said the meeting in January would be to give a full reporting on what was learned in 2008.

Dennis asked how the group intends to prioritize projects based on the new budget process. This could also include a discussion of things that haven't been done and should be done. He said it makes sense to use the form and Reclamation could assist in developing the workshop. Shane will work with Reclamation and other parties who want to be involved.

Defining Management Actions. Dr. Dave Garrett gave a PPT, "Evaluation of Transition of Science to Management Actions in Adaptive Management Programs" (***Attachment 8a***). He said numerous examples

were included in the prospectus, "Evaluation of a Transition in the Roles of Science and Management During the Evolution of Adaptive Management Program" (***Attachment 8b***). There was a discussion between Norm and Dave on what is considered an adaptive management program. Don said he would like to make sure that Dave's techniques, questions, and screening methods are based on existing law. Don said he was interested in the funding issues going from science to management actions and the effect it would have on some stakeholders financially. Bill Persons said it really falls on the managers and the TWG needs to assess how much risk it is willing to take and that they have the science to do the action. Sam said he wants the thoughts from Don to be incorporated into Dave's document.

John O'Brien said when the SAs were tasked to this, he wasn't sure the group had gone from science to management actions or management actions to science. The HFE was done through an EA. The same for MLFF. They came up with an MLFF and then are looking at whether it can be done. He stated that when moving to management actions, stakeholders are impacted. Dave said it has occurred in many cases and when some agencies tried to do that, they ended up in litigation. He said it depends on managers who are willing to accept risk. Dave said they agreed to take this on without adding more funding for it. There will be four people involved.

Norm asked about the input from management agencies and feels there needs to be direct contact with the SAs and the managers also need to be involved.

Shane said the TWG is supposed to be review the report and incorporate their concerns. Dave will provide the report on December 31. Dennis said in regard to Don's request, he felt if Dave put out a list of criteria, then it could be given to the TWG. Dave said he wants all comments to him by November 1, 2009.

Jay Groseclose feels the information won't be available to provide to the AMWG. Shane said it will be provided in a TWG Chair report to the AMWG as there won't be a formal presentation by the SAs. Jay suggested this be included in a conference call. However, Shane didn't feel there would be time as they would need the report and it would be too late to incorporate into the AMWG process.

ACTION ITEM: Dr. Garrett will send the criteria the SAs are using to the TWG (via Linda) and will need comments back to him by as soon as possible but no later than November 1, 2009.

Geoarchaeology Project. Joel Pedersen gave a PPT on the "Grand Canyon Geoarchaeology Project" (***Attachment 9***). He said the cooperating agencies on the multi-year project were Reclamation, the Park Service, and USU contractors. He said there are 54 sites to be treated in Western Canyon. He said there were some major personnel changes: Dr. Kenneth Cannon as the project manager, Dr. Ted Neff as the Archaeology PI, Kimberly Spurr as the Field Director/co-PI, and Dr. Emily Jones who will provide tribal perspectives.

***Q**: When you were here the last time, you talked about the dichotomy between science and management. You're working on a treatment plan that's compliance with NHPA Section 106, right? So my question is: Do you feel you can do research inside a compliance activity? Clearly you believe you can do research inside a compliance action. I think that's important if you're working for these folks. (Kubly)*
***A**: Yes, this project which is compliance driven, but also presents an unbelievable opportunity for me to do fantastic science. This project represents something that is going to a seminal contribution. (Pederson)*
***Q**: Yesterday there was a PA meeting and Joel called in at one point to talk about the selection of sites for 2010. There was some discussion on whether we should use the flow lines for a site selection or site mitigation. They did do a ranking study. Jonathan Damp had written a research design that ranks the sites from 10 to 4 with 10 being the most erosive and with the most information potential. We asked for the flow lines to be added. This happened at an AMWG meeting and a number of TWG meetings and at the August AMWG meeting it was agreed that Reclamation would take a look at that. At the March meeting, Mike Berry said that we would do that. I'll read what he said: "After discussing this Reclamation staff, they would like to work their way back up from the bottom, the bathtub ring, as they determine which sites will be excavated in any given year." So they would apply that HEC-RAS model that we talked about in the past. But for this project, the site criteria was based on the ranking data of 4 to 10 and that at least one*

large scale site would be chosen and for logistical reasons sites might be grouped. There was nothing provided for the flow lines. At the meeting yesterday I provided some data on the HEC-RAS model as to where the sites were and what flows lines they were because some of this stuff we talked about in here was that it's intuitive that we would do sites closer to the river and secondly should we ever be allowed to have a larger flow, it would be good to have those sites mitigated. So the sites proposed for 2010 are at the 125 and above line. There are sites on the list below that. I would like to make a recommendation that the site selection for 2010 be re-done to include the flow line evaluation. At this time they haven't started the work plan for these sites so it's preliminary enough that we can do that. The second piece that came out of the meeting. and Kurt might want to address, is that they wanted to have a tribal perspective included in how the sites would be mitigated, not just a tribal presence during mitigation. That is what Western is recommending. (Barger)

***R**: The wonderful thing about science is that everyone understands it's a learning experience. We have learned that many sites are actually sealed by alluvial sediment as are destroyed by them. This leads us to really question the utility of HEC-RAS data and the flow lines and current HEC-RAS data are simply not quantitatively applicable to this kind of consideration. That's how this evolved and we hope to continue learning as we go along. Joel has made a great presentation here in telling us a lot that we never knew about Holocene archaeology in the canyon and that's what we're really after. That's part of the plans process. I'll follow Dennis' comment on whether you can do science in a management context. Of course we can. All management actions are constrained by regulations and every regulation of which I'm aware calls it one way or another for the best available science to be used. We can do that in-house or we can outsource it. In this case we've outsourced it to USU. Management is still the primary consideration. (Berry)*

***C**: I'm not questioning the science and Joel has done a good job but what I'm saying is that we had agreed over the last year and a half to incorporate this as a prioritization for the sites and try to choose the sites that are closer to the river that are more at threat in terms of the ranking. That was all that we had asked for. There was an agreement at an AMWG meeting between Larry Walkoviak and Brad Warren to do this and then there was an agreement at the last TWG meeting and it is in the March meeting minutes. So now they're proposing not to include that and I don't understand why there would be a switch because I'm not proposing any change to the science. I'm just saying that should be used as a prioritization. I understood the TWG agreed to that and the budget was approved based on that. (Barger)*

***R**: Just to clarify what Mary said. At first these sites in a given year that we're going to study have been chosen in the first couple of years of a project by specifically following a 2007 treatment plan that was developed for all the sites. In that there are two obvious scientific criteria by which we were selecting which sites to work on first and one of them was how acute or damaging their erosional state was and that makes sense as we try to recover information before it's lost. The second criteria was how archaeologically informative that given site might be. So if a site has the potential to tell us an incredible amount scientifically and it is acutely eroding, disappearing quickly, then those are the two tactile scientific criteria we're using to do some work. From the science end of it, Western's suggestion to also utilize flow lines is a difficult one for me because scientifically it's not clear to me how that relates in the sense that erosion and information potential scientifically are easy to grasp and the problem with using the flow lines is that it hasn't been clear. Of course, there is a long history of science in the adaptive management program getting at what is driving the erosion of archaeological sites and how does it relate to operations of the dam and discharges. The third criteria Mary is proposing is problematic because I don't understand scientifically how it relates to include it in the decision process. (Pederson)*

***Q**: Can you briefly overview how the geoarchaeology, these Holocene deposits, reflect on archaeology and vice versa? (Mietz)*

***A**: Geology and geomorphology have been incorporated in archaeological studies a lot. In the case of Grand Canyon, one of the driving research questions is where there is human subsistence and how they utilize the river corridor potentially for agriculture for example. There has been previous work in Grand Canyon that has found evidence of cotton, wood, corn, pollen and early agricultural uses out of the river bottom corridor. The behavior of the river, in terms of flooding and the nature or landscape of that floodplain and how it's changed through time as people would live there and why I'm using it as an example to how people would use that. So one of the things we're getting at this longer, sort of environmental history of the river is how is that river flooding in the past. How did that floodplain look like in the past? Has it changed the Holocene in time? Would it change how people are adapting to that landscape and using it when they were doing agriculture and when they weren't doing agriculture and things like that. (Pederson)*

***Q**: One question on now using flow lines to decide what you're going to work on. It seems like it would be important to know which sites might be inundated by high flows from the dam and assess those as to whether they should be protected earlier, sooner rather than later. I don't understand not going through that thought process of using the flow lines. (Ostler)*

***A**: I've talked about flow lines a couple of times. First of all I'm not saying those data are not useful. In fact when it comes to interpreting sites and the integrity or context of the artifacts that we find, that's one of the datasets that we're using and saying where does this fall? I'm speaking from a longer scientific context here. My lab has done research in*

the last 5 years to deliver products to GCMRC and Mike also has mentioned that if you actually look at the population of cultural sites along the river corridor, the spatial and statistical correlation between acute erosion problems and those flow lines, is not a good one. In terms of the physics or mechanics of geomorphology, there's not a clear connection there either. When it comes to understanding what places are the most acute problems that need to be taken care of, the science is unclear about the connection between the inundation and damage and in fact if you look spatially and statistically at the population of sites, those that have the biggest problems don't necessarily have any significant correlation to a flow stage. (Pederson)

Shane asked if people could meet during lunch to find a resolution as he didn't think there would be time in the meeting.

Randy said the issue goes as much to cost and who pays so he feels joint funding is needed to do the work. He doesn't have a problem with Joel's approach, but it's a problem with who pays and how much resource that takes away from the program to do other things.

Shane asked Mary if she had any suggestions to get to a resolution. He said the decision making process is outside the TWG and is a Reclamation decision. Mary said the agreement was that 2009 would be the last year. She reiterated that she doesn't understand how someone can commit to something verbally in a meeting and then just say they don't want to do it for whatever reason and then it doesn't come back to the table. She said Mike and Joel were both aware that Western wanted that to happen and didn't apply the criteria but Ted and Kim who met with Jen Dirker did it without knowing about the critieria. No one had told them that this is criteria. She said they were surprised at the meeting that they might be asked to do this. They offered to look at additional sites but as she understood it, the decision was <u>not</u> to change the sites at that time. She said Western would like to see Reclamation reconsider this because they haven't written a work plan and haven't proceeded any further than preliminary selection of sites. The tribes had some strong concerns yesterday about how to mitigate involving tribal perspectives so it sounded like there was more to it. She said a meeting might be in order but she couldn't speak to how that would work if Reclamation is not willing to talk about it. Shane said the TWG could make their concerns known to Reclamation and if that doesn't work, then another request should be made to the AMWG. Mike said there are two issues going on: 1) who pays for it and, 2) who needs to be in compliance with NHPA. He said this program, as it is currently constituted, is in compliance with NHPA. This program controls the funding but this body doesn't control the science. He said Reclamation has its own compliance responsibilities as the lead agency. Shane suggested they talk more about how to resolve this issues outside the TWG meeting.

<u>New Alternate for CWCB</u>. Randy Seaholm introduced his replacement on the TWG, Ted Kowalski. He said Ted has worked with him for several years on a number of Colorado River issues and said he would be a very able replacement for him.

<u>Study Plan: Fall Steady Flows</u>. Shane said today's task was to with GCMRC in making additional changes with the hope of a doing a review in late November in order to give to AMWG for their February 2010 meeting. Matthew Andersen said that since the nearshore ecology program is so new, they asked Dr. Josh Korman to talk about it since he is one of the principle investigators. Matthew said he also wanted Dave Garrett to provide the science advisor comments and responses.

Josh Korman said he is a fish biologist working out of Vancouver. He said the primary objective of the study is to understand how river flow, through its interaction with physical habitat structure, influences mainstem survival rates of juvenile native fish in the Grand Canyon. He gave a PPT presentation, "Nearshore Ecology of Juvenile Native Fish in Grand Canyon: Central Objectives and Key Challenges. (***Attachment 10a***). He concluded with the following summary points:

1. Flow-dependent incubation losses of 25-50% in experimental flow years likely not large enough to reduce abundance of age-0 trout because of strong compensation.
2. Some age-0 trout migrate from low-to-high-angle shorelines. Use of high-angle shorelines is considerable, and may buffer impacts of low variation.

3. Age-0 growth over the summer and fall was very similar across habitat types, reasonably similar across years, and showed little density-dependence.
4. Apparent age-0 mortality rates over summer and fall were similar between 2003-2007, but were much higher in 2008. Density-dependent mortality displacement?
5. Apparent age-0 mortality was highest during periods when sudden changes in flow occurred (Aug-Sep, Nov. '04). Flow-dependent mortality or displacement?
6. More years of data are needed to better separate effects of flow, density, and natural variation on early survival rates.

***Q**: Geographically, do you perceive this in areas like 30-mile and nearshore ecology in regard to specifically in geographical 30-mile aggradation? (Spiller)*
***A**: Currently this is focused from the LCR down to just above Lavachuca but there is no reason why some of these techniques couldn't be applied elsewhere. We had to pick an area to see if this would even work. (Pederson)*
***Q**: We have significant aggradations in that area so that area will be included in this type of study? (Spiller)*
***A**: The other thing is all this micro chemistry that we'll be able to sort out if there is any mainstem reproduction, recapture of juvenile. It sounds like it will be important whether that was borne in the mainstem or the LCR. That could speak to the 30-mile aggradation. (Pederson)*
***Q**: You mentioned you're going to be doing this determining of growth and survival by reach and yet you keep talking about various habitats. I'm trying to understand the detail that you're trying to get into here. (Davis)*
***A**: We have about 3 km sections below the LCR, 3 reaches and those we would estimate the abundance at survival among those three reaches. Within each of those reaches they are broken up at the 50 mm sections and in those they will estimate something more modest, presence or absence basically at each of those 50-meter sites based on the physical science program. And then we'll have to relate presence and absence to occupancy. It would be nice to relate it to abundance but that gets difficult to estimate those. (Pederson)*
***Q**: Regarding the geographic piece, you would be establishing these areas independent of whether you necessarily have seen fish in there. You'd be establishing these study sites or the backwaters that you'd be evaluating? (Henderson)*
***A**: This 10 km zone was established beforehand and as basically this an area from all the mechanical effort and stuff and it's sort of high native fish abundance, juvenile native fish abundance. So the notion is that if you're going to do this kind of study, let's work where we know there are some animals to work with. (Pederson)*
***C**: This is the 1996 Parker, et. al paper that establishes a 90% HBC population there. (Andersen)*
***Q**: Help me with understanding the assumptions on survival. I think I understand the LCR and track the fish that are coming in but what about the emigration? How do you treat a fish that leaves that reach relative to survival? (Kubly)*
***A**: The idea behind the three reaches and each of those is marked there. They're all bordering each other. Each one is given a unique mark for each trip. So we'll be able to evaluate movement and this potential loss of fish based on the proportion of marks from this reach either on this trip or the next trip. You will get a sense of the movement just by the different tags caught in different areas. Also, there is some radio telemetry work being done. (Pederson)*
***Q**: So the LCR monsoonal floods completely impacted? (Kubly)*
***A**: Yes. Basically a bunch of abundance comes in and all of a sudden you had a big immigration but that's if we had a permit to sample. We could say we took 40 fish from that trip and 90% of them came out of the LCR two weeks ago. And the other we're addressing is that a lot of marking is being done in the LCR and so we'll be able to track the proportion of LCR marked fish caught in the mainstem. It's going to be a confounding factor either way but we have a couple of plans to try to account for. The other way of getting survival is by just tracking tagged fish in the mainstem from one trip to the other so you don't really care about the overall abundance. You just say you had 100 tags here in July and now I estimate there are 50 tags in August so survival is 50%. The reason we don't want to just rely on that is because you don't get that many recaptures across trips. (Pederson)*
***Q**: My question is for Center: Because this work is being done at the confluence, I'd like to know what your record of consultation with the tribes has been regarding the fall steady flows study plan and for implementing activities like this that are directly taking place in the confluence. The Zuni's concerns aren't just limited to mechanical removal. It's a sacred place. And why aren't you consulting with all the tribes on these types of activities? (Dongoske)*
***A**: What's the top river mile? 61 I want to say. Kurt, my question for you is that is an area you would consider of concern to you, 61.5? (Andersen)*
***Q**: What Josh was telling us was that it was from the confluence 10 kilometers downstream, correct? (Dongoske)*
***R**: I wasn't specific enough. I'm not exactly sure about the upstream location. It isn't right at the confluence. It is downstream of the confluence. (Pederson)*
***R**: The short answer to your question is that we have not conducted a specific consultation on this topic. (Andersen)*
***R**: I would like you to do such. (Dongoske)*

***C**: We did meet with the tribes last February as a group and maybe this doesn't constitute formal consultation by any means but we did meet with the tribes and we went through a description of the projects that were in our workplan specifically to solicit feedback from the tribes about issues they had. To my knowledge this project was not identified as a project for which there were issues. Clearly, the mechanical removal project was the one where there were concerns expressed and what we were going to do with the disposition of the remains of the fish and the general sacred nature of that area. I don't want to give you the impression that we weren't sensitive to the tribes' concerns in this process. If you're suggesting we need to have more formal consultation, I guess that's something we can follow up on. (Hamill)*

***C**: I am suggesting you need more formal consultation and also if I remember correctly because I was at that meeting and brought up a concern about mechanical removal at the LCR but also as I recall, it was recommended by the tribes that there be sensitivity training for GCMRC staff and I haven't seen any effort toward that. I would like you to consider those aspects. (Dongoske)*

***Q**: You recognize Kurt that we're not, with limited exceptions, there are no taking of fish in this project? Is that your understanding? (Andersen)*

***Q**: I'm going to interject a question here to get some clarification. For FY10, you don't have a permit to collect HBC and you're going to work with flannelmouth. Is that correct? (Capron)*

***A**: This year we have a permit to take a small limited amount of flannelmouth to look at those fish and then it's up to the Service and others to decide. (Korman)*

***Q**: So you would have to apply for a permit? So there is the potential that you could work two years but that would be the most within your current permit. (Capron)*

***Q**: I appreciate your rationale for working in the LCR reach but I think I heard from Steve that they were finding YOY HBC downstream of Shinumo Creek. Is there any other sampling that's going on in the river that may be able to pick up YOY in backwaters or in the nearshore further down in the river? (Johnson)*

***A**: In 2009, the Park and cooperators have sampled as you described. In 2010, if the PEP recommendations are supported and carried through with those, we'll probably have a total of four mainstem trips that would sample through the river, electrofishing in the spring, one trammel net in the fall, one seining in the fall, so a total of those four trips that would go through the mainstem over different seasons in future years. I think that the fall seining trips will most likely to capture young chub in backwater habitats. (Andersen)*

***Q**: I assume from your choice of this reach that you believe that the results and conclusions that you can draw from this reach would be applicable to other reaches within the Grand Canyon? (Johnson)*

***A**: We need to understand the efficacy of the methods and those were the two rationales as opposed to it being representative of areas further downstream. For example, areas that are warmer downstream might have a different response to steady flows. I hate to over extend but I think this is a great place to start and it's pretty significant effort logistically. It doesn't rule out sampling other areas in the future but it just seems like a great place to focus our initial attention to get things figured out and at the same time working on a really important aggregation and how much we can extrapolate. (Korman)*

***C**: The biggest portion of the population is here. This is where we expect to learn the most. (Andersen)*

***Q**: Would it help if you got data some more of what we just collected that you can get on an ad hoc basis as we're on the river and other back waters and around other aggregations downstream? Would that help fit into your study? (Mietz)*

***A**: I think it would be good even if we were doing more detail and more recapture type of analyses now. If you could use the same type of effort pattern for example in other backwaters, then we would have a way of calibrating your data with our data. (Korman)*

***C**: This is an impressive amount of work. It's also kind of scary how much uncertainty there is given we're trying to do an experiment on an already pre-packaged management flow. What occurs to me is we've heard there is potential of equalization flows which would take us from an 8.23 maf to maybe a 10 maf year or even a 13 maf year. That has to be even more confounding, doesn't it, in a 3-year study? (O'Brien)*

***R**: When would those flows be released? It depends when the flows would come. If they came in the middle of the winter, our studies are focused on summer and fall so we can keep the discharges the same over last year so I would say it's not a big deal. (Korman)*

***R**: Right now under most probable hydrology, we would go into equalization and I think the annual release goes up to about 1025 to 6,000 maf and in the plan of operation it's still conserved at 10,000 cfs flow in Sept-Oct time frame calendar year 2010. There would be obviously larger volumes throughout the year, roughly a maf in most times. (Ryan)*

***C**: Your point is well taken that something not anticipated could spoil this plan. For example, the warming trend that has happened seems to be potentially a really important factor or the mechanical removal efforts. That was a wild card that came in and had a big effect and what you're describing is another one of those and that's the difficulty in conducting these large scale field experiments. (Korman)*

Science Advisor Comments and Responses. Dr. Dave Garrett distributed copies of the "Executive Summary: A Review of the 'Grand Canyon Non-Native Fish Control Plan I: Short Term Monitoring and Research Actions'" (***Attachment 10b***). He said this was reviewed in mid-July and incapsulates about four or five studies: the temperature work, the HBC ASMR work, the RBT, nearshore ecology and foodbase. They were concerned about a system-based experimental design. This is a proposal for a biology program design. They were concerned within that biology program direction that there was integration and merging of experimental approaches in the five different components. He said in GCMRC's defense, these programs have been staged over time so they couldn't occur both in the same time and space. He encouraged the members to read the Science Advisors' Review which follows the executive summary. The review concluded with proposed revisions for the GCMRC plan and stated "the proposed planning of resource requirements and budget needs for implementation of the program should address the transition required from science activity to management actions. It should clarify individual agency program authorities and budget responsibilities, and how to resolution of this issue would enhance program success."

Q*: Have the SAs taken a look at the revised plan based on your input and gotten feedback from them? (Henderson)*
A*: No, we have not. The SAs generally do one review. I think we had a phone call and a discussion of this particular one in which we suggested some changes be done. We do not do a second review of document, meaning a review or a revision unless there is agreement we should do so. (Garrett)*

Fall Steady Flows Science Plan. Matthew Andersen distributed copies of his memo dated Sept. 18, 2009, along with the Fall Steady Flows Comment Table (***Attachment 10c)***. He displayed a diagram and said Ted Kennedy had presented this at the last AMWG meeting showing how which linkages and resources are addressed. He didn't feel the plan should go back for another SA review but that the group should try and resolve with the TWG.

Shane said the objective of the discussion was to give recommendations to GCMRC for the next rewrite of the document. Matthew said if they accepted the comments already provided, GCMRC could probably send a revised document before Thanksgiving. Dennis said the number of respondents was low but the number of comments was high so he asked Shane if he was seeking new comments because he didn't feel it is was a very broad representation of the TWG. Shane said there were a number of comments that were accepted by GCMRC and those will be integrated into the revision while some comments need further discussion and agreement among the members. He also said that some members didn't provide comments and he would be willing to have those brought forward for discussion.

The following comments were captured by John Hamill:

1. Sam Spiller wants clarification from Tribe about aspects of the Plan that need tribal consultation.
2. Steve Mietz:
   - Concerned that meaningful conclusions about the effects of FSF can be drawn given all the confounding factors—plan overstates what can be concluded
   - NPS wants to work with GCMRC to provide additional downstream backwater seining to supplement NSE work in the LCR reach
3. Norm Henderson:
   - Tribal consultation needs to be part of the plan
   - GCMRC did not respond to SA comments
   - Needs another review by the SA
   - Wants clear set of hypotheses that will be addressed by each study
4. Shane Capron
   - Wants a more rigorous examination of how SSQs will be addressed/answered by a study—R. Seaholm agrees
     a. Shane will provide an example—see foodbase section
5. Dennis Kubly stated it's difficult to develop effective experimental design based on existing studies

6. Bill Persons would like to see revised plan before making final judgments on the plan at this time.
7. Clayton Palmer:
    - Transition flows – stranding not an issue in the BO, but maintains it is an issue with BOR and FWS and is part of ongoing S-7 consultation. As such it should be part of the FSF science plan
        a. Dennis—stranding is an issue but its also experimental
        b. GCMRC will discuss issue further with FWS and BOR and develop element if the work plan if appropriate
        c. WAPA requests feedback on results of those discussions

December Workshop: Economics and CMP Planning Discussion. Helen Fairley passed out copies of the Workshop Prospectus (***Attachment 11a***) and gave a PPT, "Upcoming Workshops: General Core Monitoring and Socioeconomic Workshop" (***Attachment 11b***). Helen asked for any comments from the group.

- *The prospectus looks good. A valuable outcome will be the discussion on economic tradeoffs associated with implementing management actions and future experiments as well. I appreciated seeing the direct resources that relate to this program. My main concern is we won't come out looking at 10 years of developing tools for tradeoff analyses. It could go into a much broader direction than this program should be looking at in terms of direct resource impacts and concerned about the time table as well. The longer this effort, the more funding will be required. (James)*
- *Need to keep discussion to direct impacts and benefits to the power, fishing guides, without going all over the place. Have the sideboards in those discussions. On core monitoring discussion, I would like to see what kind of research needs to be done following status and trends. And how do we take the information and factor that into the comprehensive model? We need some linkage and not just reporting the data. (Seaholm)*
- *If we don't include non-use benefits, then let's save money and not do workshop. (Johnson)*

Helen said she would like feedback from the TWG in terms of what has been proposed to do. She feels there definitely needs to be some economic data for the program because what they have right now is out of date.

***Q**: You say that you think Phase I is going to take 3-5 years and wonder how you came up with that number. That seems like an extended period of time. (Mietz)*
***A**: That's something we can discuss in this workshop and identifying the funding to do studies so we already have a 2010 and 2011 plan so then there's the question of funding needs and what projects are the highest priorities, identify the funding for those projects, implement the project, and get the results. Perhaps there is one, two or more projects or perhaps phasing in projects. It's a ballpark estimate. (Fairley)*
***C:** The emphasis in Phase I is on direct benefits. Western supports the idea that if an experiment occurs, BHBF, it would be helpful in the decision making process to know what the local impact is on fishing guides and hotels in the Lees Ferry area in order to consider the decision and in order to consider possible mitigation measures. The question of what further investigations need to occur in Phase II will be the subject of the TWG feedback during that workshop and what questions related to decision making do TWG members represent in their interest groups think need to be developed. From that, there will be 5 years of figuring out how to develop a process to answer these questions for these stakeholders. (Palmer)*
***Q**: I completely understand the points of view mentioned about the non-use values but if we kick that can 3-5 years down the road, I feel like we're missing part of the point of doing this workshop right now. Is there any way to start Phase II before Phase I? It just seems a long way away. (Mietz)*
***A**: There is no way to do some of these other things without having better foundational economic data so there is that consideration regardless of what priorities you may decide. The whole idea of this workshop is to articulate those kinds of priorities and try to work them out. It's going to be challenging. (Fairley)*
***Q**: Part of this workshop is going to be an update on what's going on with current research and the cooperator work, etc., and just to bring that to people's attention is the Park Service is engaged right now with an economic value study of the Colorado River in general, specifically the parks along the Colorado River. A key component of that study is going to be non-use values so we're actively involved in that right now and we would certainly encourage how we might be able to cooperate to develop these things further for Grand Canyon. Our charge is to protect are basically non-use values for the American public so they're very important resources to us. With regard to the CMP, is there going to be a discussion about providing information, analyses if you will, on a real-time basis for key resources?*

Modeling results, like sediment and potentially other resources that might have models that GCMRC has developed that we need real-time information on to make recommendations for management? (Henderson)
***A**: We can talk about that in a general sense. Some of the monitoring data are key inputs to models that we want to run in this program and are running in some cases. We'll try to make that linkage and the necessity of those and interaction in the plan. (Fairley)*
***Q**: Is there a statistics section anywhere in here? This covers the analyses and the modeling, but somewhere in the CMP there has to be a decision about costs, doesn't there? There has to be a decision about whether the budget drives the size of the core monitoring program or information needs up to the full extent of the budget just as extremes. I don't see anything in here where GCMRC is going through that kind of analysis to say that if we want this level of precision, this is what it's going to cost. Theoretically you could have a high, medium, and low in every one of these, couldn't you? I just wonder what your philosophy is and how you're approaching that? (Kubly)*
***A**: We don't provide a low, medium, or high level of accuracy or reliability in terms of the costs. That is not in the plan. We've identified the CMINs, the SSQs that have been presented in the MRP, and how we're proposing to address them with the funding that we have. (Fairley)*

Shane said this is something he has thought about and how the TWG is going to deal with reacting to the CMP and integrating those types of questions. He's not quite sure how the TWG tackles those questions in real-time with the development of the Core Monitoring Plan.

John Hamill said the costs that are going to appear in the plan are largely based on the costs that are being expended on those programs to date or some projection of what they think those research and development costs will translate to in terms of a long-term monitoring program. In the case of HBC monitoring, there are pretty good cost estimates of what it costs to do a program based on the PEP recommendations where the Sediment Program is pretty well costed out based on a plan the TWG has already seen. They have some projections on what a long-term foodbase program would be. Based on the assumption that what is paid to develop, there is going to be some reflection of what the TWG wants done in the longrun. He said the power analysis or precision analysis tradeoff is probably going to be done in the context of a much more detailed plan. He said they're trying to give the TWG a big picture of what will be needed to do long-term core monitoring for the 12 goals based on what has been funded up to date.

Public Comments: None

Adjourned: 4:55 p.m.

Glen Canyon Dam Technical Work Group Meeting
September 29-30, 2009

Conducting: Shane Capron, Chairperson

September 30, 2009
Convened: 8:12 a.m.

Committee Members/Alternates Present:

Mary Barger, WAPA
Charley Bulletts, So. Paiute Consortium
Chris Harris, Colo. River Board of Calif.
Kerry Christensen, Hualapai Tribe
William Davis, CREDA
Kurt Dongoske, Pueblo of Zuni
Jay Groseclose, NM Interstate Stream Comm.
Norm Henderson, NPS/GCNRA
Leslie James, UAMPS (alternate)
Rick Johnson, Grand Canyon Trust
Dennis Kubly, USBR
Steve Mietz, NPS/GRNP
John O'Brien, Grand Canyon River Guides
Emily Omana, Grand Canyon Wildlands Council
Bill Persons, AGFD
D. Randolph Seaholm, CWCB
Sam Spiller, U.S. Fish and Wildlife Service (alternate)
Jason Thiriot, Colo. River Comm./NV
Bill Werner, ADWR
Michael Yeatts, the Hopi Tribe

Committee Members Absent:

Cliff Barrett, UAMPS
Charley Bulletts, Southern Paiute Consortium
Christopher Harris, Colo. River Board of Calif
Amy Heuslein, BIA
Robert King, UDWR
Glen Knowles
John Shields, WY State Engineer
Mark Steffen, Federation of Fly Fishers
Larry Stevens, GCRG

Interested Persons:
Matthew Andersen, GCRMC/USGS
Mike Berry, Bureau of Reclamation
Marianne Crawford, Bureau of Reclamation
Jerry Cox, Grand Canyon River Guides
Alan Downer, Navajo Nation
Helen Fairley, USGS/GCMRC
Dave Garrett, Science Advisors
Pamela Garrrett, M^{3}Research
John Hamill, USGS/GCMRC
Ted Kowalski, Colo. Water Conservation Board
Clayton Palmer, WAPA
Tom Ryan, Bureau of Reclamation
Curtis Yazzie, Navajo Nation

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.

Non-native Management Plan. Matthew said he would talk about the TWG comments and responses. The revised plan would be done in November.

Science Advisor Comments. Dr. Garrett distributed copies of his PPT, "Review of the Grand Canyon Non-native Fish Control Plan: Short Term Monitoring and Research Actions (1/09) (***Attachment 12a***). He said the review brought up several issues and concerns and also cited contributions of the plan, i.e.

- Plan strategy emphasizes science over management
- Two step planning process does not appears necessary
- Well development assessment of knowledge for cold water fishes
- Significant revision recommended

Randy agreed that managers should be more involved but the TWG doesn't have a process about how to move from experimental/science actions to management. He asked Dave how that fit in with his comments. Dave said he agreed and said the reason the SAs are organized the way they are is because many of the SAs don't have the benefit of attending all the meetings and the transitional approaches that occur so they don't have the background knowledge. He said one of the problems the TWG has not addressed is how to deal with programmatic direction on science planning that is now not just science planning but management science planning. It's the same problem they're having with management actions. With this particular plan, Dave said he thought there would've been a similar *SPG* TWG sub-group to represent managers and that group would've worked with GCMRC to develop the management side of this or at least give the management side of this to GCMRC so they would've had priorities and actions the TWG felt should have been addressed through a science programmatic direction.

Bill Persons said he had hoped this plan would've given guidance on what the priorities should be. He can't prioritize control until he has a risk assessment or understands where the biggest threats are going to come from. Dave said he agreed with Bill and said that what he thought happened was the managers did not do what they should've done. The science community should've been told that a risk assessment needed to be developed first before a plan is developed and then the SAs would help develop a strategy to incorporate the managers and the science perspective needs based on best available knowledge today.

Larry asked Dave to outline a strategy for where they are now. Dave said the two fish biologists who did the review said there is enough knowledge as managers and scientists to implement selected strategy. He said if there isn't enough knowledge right now on RBT issue, then there probably never will be. He said a risk assessment would've been the next step or they could've set two management actions and then completed the risk assessment and then added both species of concern and their locations in the river. He said those two things are very important in a control plan. There needs to be a determination on what they're going to control and where they're going to control. Dave said Dr. Kitchell advised that these kinds of groups and programs marginally increase their knowledge and management ability through time. He said that whatever they know should be implemented and moved forward in the transition. The last thing the SAs want the group to do is not to implement a control plan at this time.

Non-native Management Plan. Matthew Andersen said he summarized some of the comments from the science advisors and the TWG and their responses to them. He passed out copies of his memo with the Final Response Table (***Attachment 12b***) and gave a PPT presentation, "Nonnative Fish Control Plan: Responses to Reviews" (***Attachment 12c***).

John Hamill said that when they first started this program in 2005, it called for the development of a non-native fish plan and it was five years out when the plan would be available. He felt it was important to have a short-term plan that would create a bridge until the long-term plan was ready. Unfortunately the short-term plan took them almost three years to develop. One of the SA comments was that you have to stop the planning and get on with implementation and proceed adaptively. He said they recognized that a risk assessment is a critical element to the whole program, but it just wasn't practical to develop that within the time frame of the short-term plan. This has now morphed into one plan that's supposed to meet both the long and short-term needs of the program. Consequently, they are proceeding without the benefit of the more detailed risk assessment that he saw as one of the major problems people had.

Shane asked Matthew for more clarification on the next step for the risk assessment, additional background information, and what the approach will be. Matthew directed the TWG to Goal 12. There is an ecosystem modeling project in the FY2010-11 workplan for a modeling effort that Carl Walters will do. He said most of GCMRC's biology program is involved in this along with their cooperators who are working on the aquatic foodbase project and the nearshore ecology project. Carl is leading the charge to try and answer as many questions as possible with a bioenergetics modeling approach. Carl wants to gather a lot of the scientists in an offsite meeting (February) and convene a panel with the TWG in March/April.

***C**: Some of the threats to fish and the tamarisk beetle are all elements that may change the dynamics of the system. This plan must include the changing dynamics and changing non-native composition that are non-fish as well. (Stevens).*
***C**: The original impetus for the plan was concern for drought conditions and warming was from GCD and the potential for invasion of other warm water non-native species. I thought this plan was focused on coming up with a plan for warm water non-native fish control. I'm afraid if we add too many things, it's going to take another five years to develop the plan. (Persons)*

Sam read the following statement: "**The Fish and Wildlife Service will be asking Bureau of Reclamation, in coordination with other DOI AMP participants and through the AMP, to continue efforts to assist NPS and AMP in controlling cold and warm water nonnative in both the mainstem and tributaries. In regard to and consistent with the conservation measures for implementing nonnative control as necessary. In doing this, FWS wants to fully meet tribal consultation responsibilities as we know there are tribal concerns, as expressed by the Pueblo of Zuni. The involvement of the AZGFD is especially important in this nonnative fish control program due to their responsibilities**." He said the FWS sees the need for management that effectively carries out the conservation measures for non-native control in a manner that fully meets tribal concerns.

Steve said he supported what Sam said. He still doesn't see the integration of management agencies and that it has been built into this process. He'd like GCMRC to come up with something more concrete on how that's going to be done. He also concurred with what Bill said but would add that the program needs to look at all emerging threats and not just warm water non-native fish. (Mietz)

In response to a question regarding how the integration would be done and included in the next iteration of the plan, John Hamill said the biggest threat is from warm water fishes invading the system. He said that's partially addressed in the plan but the notion is that GCMRC is going to have a non-native fish management plan that's going to identify what the greatest species of risk are under a warm water scenario and then they're going to actively manage those through mechanical removal or some genetics plan. The one thing that would allow them to control warm water non-native fish is their ability to regulate water temperatures from GCD. He said that's going to be the driving variable for an invasion of warm water fishes. He said that issue is partially addressed in the plan, but he thinks it's a lower priority item. The ability to regulate water temperatures is the one key variable they need to get a handle on and right now they don't have a handle on it. He thinks the central issue that the program needs to start planning for is how to regulate water temperatures from GCD.

***C**: If we were to have a TCD with both warm and cold water capability, I think we would still need to have the capability to control cold water and warm water non-native species in the event that we get into conditions where the TCD can't carry it out. I request that GCMRC include the managing agencies especially those responsible for fish and wildlife resources into this management plan. (Spiller)*
***R**: Our primary strategy for trying to integrate management and science in this program was through these annual review meetings and I think Matthew indicated that we're going to put some more meat on that bone as to how that process would work. One of the key things missing here is it doesn't adequately assign responsibilities for doing things. We don't see that as being GCMRC's job. In fact, it's perilous for us to go down that route. I think that's something the management agencies need to take on and figure out how to divide up the responsibilities inherent with implementation of this plan. We intend to provide a forum for that but it needs to be jointly chaired between science and management. I think science plays a role in that and managers need to step forward and lead the way in that process and we help inform them. We're working with the DOI agencies to better define that process. We're going to kick that off this year with a non-native fish planning meeting which will bring together management and science agencies to start looking at the data and figure out what that means for next year's program. We see that as the primary strategy for bringing that integration together. (Hamill)*
***C**: Regarding John's comment to controlling fish certainly flow fluctuations might be a way if we don't have the temperatures. (Barger)*

Shane said he wanted the group to talk about specific changes to be made to the document before they discuss other issues.

***C**: I would like to see this plan as specifically conceptual as possibly. We need to specify what we need to do for these resources. We need to project for 2010 what we're going to do for cold water and we may need to split out warm water to various species of non-native fish species and address crayfish. We don't have that specificity from the management agencies and we need that. I think the recommendations need to be at the end of the document. I would like ½ day or so to discuss and respond back to the science as what needs to be done in 2010 and AMP processes. (Spiller)*

***C**: From the perspective of the State of Arizona and other management agencies, the revised statutes must be taken into consideration. Some agencies wear several hats in this program and need to avoid the provisions of ARS17309, the prohibitions on take. That needs to be very clear. From a process standpoint, how much money we spend on monitoring and how much money parked for contingency. Obviously we had trouble maintaining the funding for those things. If we want this to get funded, we need to figure out how much we're willing to dedicate to it and really do that. If the contingency fund is the first thing that we spend, then it gets drained. This is a broader question but is something we need to think about. One thing I was pondering when we were talking about an annual meeting is just when that would be relative to our budget development so we make sure the timing is appropriate and everything gets integrated. (Werner)*

***C:**. Just so the SAs are clear on position. This is a control plan. The science agencies do not have authorities for control of resources so there are elements of this plan that the science community should not be writing. The associated actions cannot be mitigated and/or regulated by a science agency. They can be handled by the tribes and management agencies. It's necessary in the strategy and the scope that management agencies play a major role in defining what that's going to be. I liked your posture of a 3-year rolling thunder as it were to try our best to set up three years and see what we can do in a strategy and that has many alternatives but then it's scaled down as Larry has identified and may or may not include other issues. We were clear in our review that even though we strong;y this annual activity, you want to give yourself enough time on both your management strategy and your science response to be sure that you're seeing what you're seeing. You do not want to be turning this upside down every year, but maybe look at it for three years. On the TCD, the science community met three times over the past four years and every time we thoroughly reviewed the knowledge assessment in the work on the LTEP and the SPG. We were trying to look at what are our capabilities to control the variable that would most influence these non-native fish – flows, ATCD. We reported that if a TCD were to be implemented, it should be able to control both cold and warm water outflows. In one meeting the science community was pressed very hard to decide if is there an alternative to controlling that temperature where we could be positive we could control and regulate temperature in a way that we could do the things in non-native fish control. That was not supported. The only way we could do that was through a TCD that had warm and cold water capabilities. So the SAs in three reviews said you need to have this in the strategy because that's the only way you can do this. (Garrett)*

***C**: For me non-native fish control is about science AND management. Fortunately because of the work GCMRC has done, we know a good bit about cold water trout fish control. With regard to non-native fish control, we're going through the Dave Garrett growing pains – we're trying now how to implement management. We need to be involved as parties and co-signers on your document if you want to talk about management. You need that in there so we could have that as the strength of having those management projections for the first three years for example and then the next 5 years constantly, scientifically criticize as we get new information each year and as we address other needs, such as the cultural concern. (Spiller)*

***C**: I agree totally that the management agencies need to be folded into this plan completely and I might just suggest a way to do that as Sam suggested by being signatories on the plan. However, either in the plan or as a separate document we need to have the roles of the various management entities clearly defined. I think something similar to that for this process with the role of AGFD, FWS, NPS, in the implementation or management of these exotic fish is a suggestion I would make, either part of the plan or a separate document to implement the plan. Another comment I have is that while the plan recognizes the Lees Ferry fishery, there is no suggestion that one of the possibilities for control of cold water fish is different management strategies for the trout fishery in Lees Ferry. I'm not a fish biologist and I don't know what those strategies might be, but there may be some alternatives there from our current goals and activities that would prevent us from not having to go down and mechanically remove these fish at the LCR. If it's true these fish are primarily coming from Lee's Ferry, that is if we can control that movement in some fashion, then we don't have to mechanically control it. It gets to some of the tribal concerns. There are a lot of options so I think the plan should address those. (Henderson)*

***C**: I think what's really coming out here is the need for more interaction. This is not just a once a year interaction. This is a planning process involving a combination of management agencies and the research group. It could be very healthy for the program and it's definitely related to what you're doing on defining management actions. It can't continue as a GCMRC charge with the occasional help from the managers. It's really got to be evolved into a partnership. (Kubly)*

***C**: We feel this plan should evaluate the live removal in both warm and cold water species to address the tribal concerns. (Christensen)*
***C**: I think it would be important to have the tribal concerns expressed in this document. At least that way it will always be on the table and we won't lose sight of it. As I read this plan, I didn't find was a cogent summary of the scientific research and data that substantiated that the RBT were a predacious threat to the HBC populations and so I saw it completely lacking in the document. The document reads as though it was written for people with a different level of knowledge about the biology of the Colorado River than I had because some of these scientific assumptions were not laid out, but I think it sort of assumed that the reader understood the research behind what motivates the mechanical removal and that it's shared by all the readers. That's not true. I would like to see some type of summary of the research that suggests that the RBT, other than just being the most prolific non-native in the system, is really a threat to the HBC (Dongoske)*
***C**: It looks like we're going to put a lot of hope in these annual meetings to address problems. I'm not sure that last year's meeting was effective. If we're going to try and prioritize projects, I'd like to see a better discussion of what those criteria might be. If it's going to be a vote, I'd like to see a better description of the process. (Persons)*
***C**: So once again we're at loggerheads here, how we approach and incorporate management vision and what science can do with that. I agree with Kurt and disagree a little bit with Sam in that we know a lot about trout apparently in the LCR reach but I still haven't see an explanation of why the trout were declining so strongly in the sampling period, in that initial 4 years of removal and maybe that's something we need a little more attention to as well. If we understood what the fluctuations of the trout were about, we wouldn't have to spend so much time killing them to answer those flow fluctuations. In a perfect world, we might have a czar here, a river czar, who had the goods and services and ecosystem integrity of this whole array of resources associated with the Dam, that should be the Secretary of the Interior, however we don't have that so we're struggling here with how to figure out how to take information and an approach that has been developed by the science representatives which we can't interact directly with. We don't really have meetings where we actually hammer out the details of species X should deserve what kind of treatment on these three years. We don't get to those levels of detail in any of these meetings. It's all being done through our scientists which we can't directly interact with so if we don't have a workshop clearly set up to address the issues of non-native species management in the system, do we need to set up a committee either in the AMWG to do that? We've got to have a clear understanding of the goals, objectives, approaches, and the opportunities for more ingenuous ways of approaching some of these problems than we've got. At some point we need to get our managing agencies here, to sit down and say we want these five things and here they are. We don't have that mechanism right now. Maybe Dave can advise the right framework for that is. (Stevens)*

Shane said he has participated in the Upper Basin annual meetings for several years and feel their process if pretty effective by allowing everyone to come together, to share their information, and really work through the issues of funding and doing the work.

***C**: A well articulated workshop to respond to a revision, if it could be revised, to actually walk through that revision and say here's the manager's response. I think it could be accomplished as you've laid it out. That would be our response. (Garrett)*
***R**: Just a response to Larry, AGFD has had a couple of meetings with other management agencies to at least discuss planning for non-native in outyears in seeking funding for those efforts. It was pretty informal today but I'm sure all the management agencies have been invited to come and participate or be on a conference call and we've also invited GCMRC so we're trying to move down that road, recognizing that we need some lead time to get funding because eventually we're going to run up against that whole funding problem. (Persons)*
***C**: I think it's obvious that we're trying to make that move from an activity that is not science. For science we go to GCMRC as we should. We're talking management here so we're going to have a workshop in January and the first part is going to give us an update on where we're at, new information, others' advice. When we get that management, we're going to ask what Larry is talking about. We're going to have our committee right there. To me, it's a leap for this group. I think we should be planning to be effective. Let's use that as an opportunity. That so-called panel of managers that is set up and Dave you've had a lot of overall involvement with this. You've made recommendations. I think it would be good to have Dave facilitate that management part because it gives us a marriage as we move into a new field into management from science. (Spiller)*
***Q**: Shane, in the Upper Basin process, how far ahead are you at looking in your annual meeting, one year, multiple years because there are a couple of difficulties that we have to deal with at some level. One is being nimble enough to respond to emerging threats at the same time we've all been through the flavor of the month problem, you know whatever the crisis of the month is plagues the whole field of wildlife management, fish management. But the other is the time needed either to secure funding or to complete any needed compliance. A year is not a very long time. It*

strikes me if you're looking ahead a couple of years but still have the ability to change. I was just wondering what the approach was in the Upper Basin? (Werner)
***A**: I'm going to answer that because I'm the WAPA member on the Management Implementation Committee in the Upper Basin RIP. The Upper Basin RIP has an action plan and the action plan is for long-term. From that action plan, specific studies, research, and field work are done. The interesting thing about that that is different here is that the annual meeting the researchers come and actually present data from the field the previous season. So prior to the time it is published. Part of the time it's even put together in the researcher's analysis of the data. It's imminently nimble in the regard that if it looks like this research is leading somewhere or not leading somewhere, the next field season is changed. That's an interesting difference between that program and this program. (Palmer)*

Shane asked John what he thought would happen next. John said what they tried to do was provide a strong, scientific, and technical basis for where they need to go recognizing that there's lots of institutional and management issues that need to get addressed in the process. Clarifying roles and responsibilities and management authorities is a difficult task, one that GCMRC is probably best suited to do and it would significantly delay finalization of this plan. He said in clarifying those roles and responsibilities it is critically important but he liked Norm's idea of having that clarified in an MOU or some agreement between the management agencies that says here is how we're going to do business in this context. He said he was sympathetic to getting the plan done this year so they start implementation, both from a management and a science standpoint. He feels they need to move it forward and agree to work adaptively and collaboratively to address the broader issues. (Hamill)

***C**: We need to have the AMWG charge included in the purpose of the plan. We may be overstepping of what they want. (Persons)*
***C**: One of the things in this document is the concept of non-native fish invasions from the tributaries. I just don't know if that's been dealt with very much in this plan as far as that being a potential threat and if it is, how we deal with it. Matthew, maybe you can show me where it is. (Henderson)*
***R**: You probably won't see a lot of examples of what the mechanical control would be or other strategies would be because that's not terribly well known so the actions are more about pursuing the available information on what these sources are and bringing that together in a single document which turns out that AGFD has done one-half or ¾ of that work already. There should be more than one mention of bringing together available data on what those sources are and again for consideration of the management agencies and how would they proceed with that, stocking programs, engineering solutions, removal programs, how would that be approached but this program has not worked extensively in the tributaries so we don't have lots to report on. (Andersen)*
***C**: It seems like this report should pull together that broad scale strategies of what else has been done, where in the world it's worked, control, the same flows we're getting from the tributaries and the mainstem. It should be part of the plan. There are variety of other tributaries and maybe it's part of our risk assessment. (Mietz)*
***C**: I'm going to recommend that you put in the document an acknowledgement that the implementation of some of these management actions, because of their location, could trigger a section 106 compliance responsibility for a federal agency. (Dongoske)*

Shane said the revision should be sent out to the TWG by mid-November, same as the Fall Steady Flow Plan, and then he's looking at holding a web conference call to consider a recommendation to AMWG. Following that, the TWG will need to consider the next steps.

Biennial Budget Process. Shane distributed copies of the AIF (***Attachment 13***) and said the assignment before the TWG is to develop a two-year rolling budget and also provide a written description of the process to the AMWG at their February 3-4, 2010, meeting. He put together a rough start based on the description of the budget process that was in the 2001 Strategic Plan and used that as a template.

Dennis said this was a recommendation to the BAHG and therefore suggested Shane take the lead in preparing the document. John Hamill said he, Dennis, and Shane could probably develop a *strawman* document for the TWG to review.

Norm expressed concern that it makes assumptions of the various roles on the AMWG. He wondered if some clarification from the Secretary's Designee was needed or does the group just make assumptions on the various roles. He noted there have been discussions among the DOI agencies which could impact the

TWG budget. Rick suggested the BAHG take on this assignment and stated there hasn't been a formal budget process for the hydrograph.

Dennis said he would advocate John and Shane develop a budget process and bring it to the TWG for review. The BAHG could then review it and report back to the TWG.

ACTION ITEM Shane Capron and John Hamill will prepare a document describing the 2-year budget process and how it will be done. They will report back to the TWG at the next meeting.

There was some uncertainty about which members were on the Budget AHG. Dennis said there was an original group but others have joined in at various times. Shane read the list of current BAHG members: Dennis Kubly (chair), Mary Barger, Cliff Barrett, Kerry Christensen, Norm Henderson, Rick Johnson, Bill Persons, Glen Knowles, Steve Mietz, Don Ostler, Larry Stevens, Bill Werner, and Mike Yeatts.

ACTION ITEM: TWG members interested in serving on the Budget Ad Hoc Group should send their names to Linda or Dennis by November 2, 2009.

Fall Steady Flows→ Question. Norm said there is a section on supplemental water temperature monitoring in the FSF report. Matthew said they don't have current funding for those at this time. Norm asked when the priorities would be set and asked if the temperature measurements vetted in some of the others would give them an overview at temperature differences between mainstem, backwater relationships, etc.. He said John indicated that in his presentation and so he doesn't see the relationship between this and the other temperature measurements. Matthew said it was an omission from yesterday's presentation. He said one of the projects is smaller and more affordable and all the projects take temperature measurements and gather data in a more consistent manner. Shane said this was on page 25 of the FSF Plan. The first Scope of Work was for $20K and the second one was $35K per flight plus some other times. Shane said the question came up on whether these should be funded and how should they be implemented through the budget process. Norm asked John Hamill if he would be asked the TWG to re-evaluate the budget funding or working outside the process to make that happen. John said that if the TWG agrees the project should be funded, then they would look for the $35K. John said permitting is more difficult. He can put it off until FY11 so there is some flexibility on when it gets done.

ACTION ITEM: GCMRC will report back to the TWG on the feasibility of doing the flow monitoring work for the fall steady flows project, if funding can be secured, and if permitting will be available.

Status of TCD and Sediment Augmentation Projects and TWG Consideration for a recommendation to the AMWG. He reviewed the AMWG August 2009 motion in which they requested an update on the temperature control device and sediment augmentation. He said he wanted to deal with the temperature question first and then look for the history of concern over cold temperatures released from Glen Canyon Dam. Dennis Kubly gave a PPT, "Selective Withdrawal and Sediment Augmentation Update" (***Attachment 14***).

Rick asked what Reclamation sees as the next steps. Dennis said that it should be considered part of the the LTEP process. It was in all the alternatives for LTEP so LTEP is on hold until compliance is finished under the existing plan. Dennis said Reclamation hasn't been talking about the next steps but assumes they will come in conjunction with any decision on whether or not to re-engage in LTEP which may not be until post 2012. There has been no additional feasibility investigation or follow-up on that proposal. He said the TCD investigations were precipitated by the SA's risk assessment and the AMWG recommendation to move forward on the compliance. Dennis said it's more prudent to look at two units at $100 million particularly since there is more fear about warm water.

Rick expressed concern that both the TCD and the LTEP processes have been put on hold and he feels pretty anxious to get these two projects going for conservation and native fish. He said he wanted to hear

from Sam and some from the Park Services in terms of support for moving forward with this and the compliance activities that would be needed.

Sam said that Reclamation is responsible for compliance. With regard to the TCD, he said the FWS continues to be very concerned that if we have a TCD and causes that expenditure of capital, they will use it or want to use it. They fear that they wouldn't have enough cold water which would cause an abundance of catfish, smallmouth, green sun fish, to the extent there wouldn't be enough cold water to really have a detrimental effect on those non-natives to move from the mainstem. He thinks Reclamation and GCMRC can develop the capability to model this going back to the year 2000 and for each of those years look at if they had a TCD with warm water and cold water capability. He questioned what the model might show if they had an explosion of warm water fish. With regard to sediment, he thinks they're going to find out that it's more important for chub because sediment was a factor in determining that aquatic ecosystem, the pre-dam aquatic system of the canyon. They can't target anything that would positively respond to benefitting HBC.

Shane said there are two types of recommendations the TWG could make, one on the science side – what things are known or need to be synthesized or what things they don't know yet and need to be made a higher priority related to TCD or sediment augmentation. The other side might be related to moving forward on further planning which might be a TCD or an in-depth risk assessment or something like that. He asked Rick where he thinks it needs to move forward. Rick said there are some legitimate concerns but perhaps there are other things they could do to test a TCD. If there's no way the FWS is going to agree to do this, then it should be considered a bad idea and leave it.

Clayton said he likes the idea of the TWG developing a recommendation for further planning. He said Western has had the position that they should move forward on planning for the TCD. He said a major reason for that is because warmer the water below GCD can happen through a TCD or through steadier flows. They don't think steadier flows should be used if it's possible that a TCD would work as a substitute. He supports Rick's thoughts on moving forward with planning.

Randy said look at some planning for the TCD is appropriate. With respect to sediment augmentation, he said he didn't know how people in the Lower Basin would feel. He thinks it's a crazy idea and questioned why a water provider would support the idea of putting additional sand down into a critical reservoir that takes care of the entire southwest. Furthermore, he feels Pat Mulroy would question putting additional sand down in a reservoir when she's worried about her water supply and spending $1 billion to put an outlet in the bottom of the reservoir. He said the TWG should just make a recommendation to the AMWG that sediment augmentation is something that makes no sense and it shouldn't be pursued.

John said he thought there should be some expression of a need to deal with the DFCs and what they're really trying to manage. One of the critical issues that remains unresolved is the role of the mainstem and HBC conservation and whether or not they're trying to create just conditions that are going to promote survival and recruitment of fish that are spawned primarily or actually they're trying to establish a self-sustaining population in the mainstem. If it's the latter, he doesn't see there a lot of options for establishing that second mainstem population without going to a TCD. (Hamill)

Shane said that depending on the scope, the recovery goals are a good place to look. There could be more clarity in the goals where they've reached the demographics. This does get back to DFCs and recovery goals and questioned whether it's enough to have a larger population sustained by more mainstem spawning. He said the TWG will have to rely on the FWS although the program could go beyond those requirements and look at options with larger populations that would reduce risk over the long-term and those are difficult questions for the program if they get to recovery or the demographic criteria from the FWS but he thinks the TCD is an important part of the whole discussion. He said an important part of this is having the AMWG develop the DFCs.

Dennis said Reclamation will be doing a Sufficient Progress letter by the end of the year so they will try and summarize once again what they've learned and what needs to come next.

Steve Mietz said the Park is generally supportive of the ideas and recognizes the concerns the FWS has and feels the next step is probably doing a risk assessment on the projects.

MOTION proposed by Clayton Palmer, seconded by Rick Johnson: The TWG moves the AMWG recommend that Reclamation begin the planning for a temperature control device, one that would both support warm water releases and cold water releases. The TWG also moves that the AMWG recommend that Reclamation support further, more detailed investigation in the construction/operation of a sediment augmentation device.

Shane reminded Clayton that the AMWG can't tell Reclamation what to do. The Secretary of the Interior has that purview.

MOTION proposed by Clayton Palmer: The TWG moves the AMWG recommend that SOI ~~Reclamation~~ begin the planning for a temperature control device, one that would both support warm water releases and cold water releases. The TWG also moves that the AMWG recommend that Reclamation support further, more detailed investigation in the construction/operation of a sediment augmentation device.

Rick said he would prefer to see Reclamation develop a risk assessment for both a TCD and sediment augmentation using that as the next step and then deciding from there with a risk assessment whether the TWG wants to go further in the planning process.

Bill Persons said he felt using "risk assessment" was a pretty broad term and that he would still argue for an EA.

Rick said he meant something along the lines as "to develop a risk assessment to begin planning for both a TCD and sediment augmentation" and then the rest would fall off. His concern is that sediment augmentation may well be a tool to deal with warm water non-native fish that might be stimulated by the TCD but he feared that people might say they don't have the tools and need to control non-natives. Then they would have to go through the other process of sediment augmentation for turbidity purposes. He argued for putting the two together in a risk assessment. Using that information they could decide whether to go through more planning to adjust the TCD or put the TCD and sediment augmentation together.

Clayton said he had no problem with overlapping a risk assessment that includes both of them. However, he did want to move forward on environmental planning with a TCD for sure.

There were concerns expressed by separating Clayton's motion into two separate motions. Bill Davis cited the Tim Randle report which goes into a lot of detail about what's involved, where the stuff would come from, how to transport it, what the risks are in doing all of that, etc. He said he didn't understand why they want to do what's already been done and suggested people read the Randle report.

Rick said he saw the two as potential tools and needing to be together. He also said they needed to add the tool of turbidity to the river in order to deal with the potential for non-native explosions that might occur. He didn't want to go through the process of planning for the TCD and getting to the end and having the people dealing with compliance feel uncomfortable with it because if there are increases of non-natives, then they don't have tools to deal with it. That's why he wanted the two together.

Randy said he would vote against the motion and the inclusion of sediment augmentation. He thinks it's one of those options that doesn't have a chance of moving forward and is a tool that isn't needed. He felt it was a waste of money that would be better spent on other endeavors.

Shane asked Clayton where he was in making a decision on whether part of the planning process might be a NEPA document or an EA and in the EA it might include the decisions he was talking about.

Clayton said it was his opinion that a risk assessment doesn't have to be included in a NEPA document, that what his motion does is it says a risk assessment will be done so you're going to move forward with the TCD and of course through the NEPA process you can choose not to do it based on the information from the risk assessment. The NEPA process itself will identify if it's too risky to continue. Referencing Randy's comment on cost, Clayton said he found it difficult to imagine the Department of the Interior would actually build it but he doesn't see any problem with conducting a risk assessment that looks at the TCD and looks at sediment augmentation together to see how or whether they would interact. The reason he supports just that part of it because he understand that the FWS is worried about the risks of building a TCD and that is part of the reason why it's not moving forward. His main purpose for putting forward a TCD is something that could be used to help control exotic species in the main channel and the alternative to a TCD has been and continues to be steady flows out of the Dam. He wants to see the planning move forward as aggressively as possible because it provides an alternative to the FWS requiring that they meet the needs of recovery of HBC through steadier flows of the Dam.

Bill Davis said he talked with Carl Walters about the idea of using turbidity to protect the fish and Carl said there is no basis for saying fish can be helped out by creating turbid conditions. He felt the group needs to establish whether this could be done or if it has been done some place else and was it effective in reducing predation before they do what Clayton is recommending.

Kurt said he didn't object to this motion and thinks the TCD could effectively retard non-natives reproduction without having to kill them and felt the Pueblo of Zuni would support it. However, he said he was baffled because when they were asked to develop the DFCs by Randy Peterson and Dave Garrett convened the SPG, the group wrestled with DFCs for sediment and after long deliberation, put together a motion to AMWG that AMWG never saw. The Secretary's Designee tabled the DFCs for sediment and HBC. He feels there is something the group is missing here by talking about sediment augmentation. He doesn't understand why they're asking for sediment augmentation as if they already have a defined future condition for sediment.

Shane suggested that perhaps the group table the motion and talk amongst themselves over the next month or so. He's going to hold a conference call in January and perhaps a motion could be crafted at that time for presentation to the AMWG at their February meeting.

MOTION (Proposed by Clayton Palmer, seconded by Rick Johnson): The TWG moves the AMWG recommend that the SOI develop a risk assessment and Temperature Control Device and sediment augmentation, and if warranted, begin the planning for a Temperature Control Device, one that would support both warmer water releases and colder water releases.

Representative	Stakeholder Entity	Vote	Representative	Stakeholder Entity	Vote
Bill Persons Andy Makinster	Arizona Game & Fish Dept.	A	Rick Johnson	Grand Canyon Trust	Y
Amy Heuslein	Bureau of Indian Affairs	absent	Larry Stevens	Gr. Canyons Wildlands Council	Y
Dennis Kubly	Bureau of Reclamation	A	Mark Steffen	Federation of Fly Fishers	absent
Mike Yeatts	Hopi Tribe	Y	John O'Brien	Grand Canyon River Guides	Y
Kerry Christensen	Hualapai Tribe	absent	Bill Werner	State of Arizona	N
Steve Mietz	NPS-GRCA	A	Christopher Harris	State of California	absent
Norm Henderson	NPS-GLNRA	A	Randy Seaholm	State of Colorado	N
VACANT	Navajo Nation	Vacant	**Jason Thiriot**	State of Nevada	N
Kurt Dongoske	Pueblo of Zuni	N	Jay Groseclose	State of New Mexico	N
VACANT	San Juan Southern Paiute	Vacant	Robert King	State of Utah	absent
Charley Bulletts	Southern Paiute Consortium	absent	**Don Ostler**	State of Wyoming	absent
Sam Spiller	U.S. Fish & Wildlife Service	A	Bill Davis	CREDA	N

Clayton Palmer	Western Area Power Admin.	Y	**Leslie James**	UAMPS	N
NOTE: Abstentions count toward the quorum, but not the vote. For example, if 20 TWG members are present, then a quorum is present (quorum = 16). If the vote is 3-0-17 (that is 3 yeas, 0 nays, and 17 abstentions), the motion passes because abstentions are non-votes for all purposes other than to establish a quorum. To explain further, the simple majority or two-thirds majority is based on all votes minus the abstentions.				**Total Yes**	**5**
				Total No	**7**
				Total Abstain	**5**
				Total Voting	**12**
				Motion Fails	

Shane said the group is still left with making a response back to the AMWG as far as a recommendation. As such, he'll add this as an agenda item for the conference call.

Bill Persons said he would rather send a consensus recommendation to the AMWG rather than a split vote.

Shane asked Tom if he had any guidance from the Department on the status of the DFCs. Tom said that they continue work on them and at some point will interface with the AMP.

Bill Werner said there were a lot of documents prepared in the past and many of them are on the UC website. He suggested people review those documents before the next conference call. He thought Reclamation could send out the links to those documents. Dennis said he wasn't sure how large that group could be but said Reclamation could send out some links.

ACTION ITEM: Reclamation will send out links to the TWG regarding past TCD and sediment augmentation documents which have been prepared.

Tamarisk Leaf Beetle. Larry Stevens said non-native species continue to plague the CRE and that a leaf beetle was introduced into the Grand Canyon to help control tamarisk. In 1999, after both NEPA and ESA compliance was completed, the beetles were released into cages in several locations across the Rocky Mountains and Great Plains; however, the beetle was not to be released within 200 miles of SWFL habitat. The beetle was introduced by private individuals and southern Utah counties, and is rapidly moving towards the Grand Canyon region. The beetle may eliminate a large portion of the riparian habitat in Grand Canyon. Larry gave the following PPT presentation, "Tamarisk Leaf Beetle Invasion into the Colorado River Ecosystem Downstream from Glen Canyon Dam" (***Attachment 15***).

Teresa (From LC region, brought in by Bill Werner): We're going to meet here in a couple of hours with a guy by the name of Michael Keene and he is doing some bird studies and the birds around some of the ____ area. He's doing some bird monitoring, some nest monitoring and I believe they're also doing some vegetation monitoring in association with this so bird and non-restorative (?) areas to try get when the beetles come through how much of an effect in a non-restored area there is in comparing it to a restored area. The restored areas that they have up there are very sparse in effect so I don't know how good a comparison that will be. I know that that Tom Dudley and a lot of his researchers are doing some other research up in that area and hopefully I can find out a little bit more information on that when I meet with Michael. As far as the Virgin River is concerned, the beetles have gotten through the Narrows and all the way down to Littlefield and below Littlefield. They're approximately 5-6 miles north of a SWFL site that we have. That will be the first that we've done the lower part of the Virgin River and one of the SWFL sites that Reclamation is monitoring. From the Mesquite (?) site down to the Mormon Mesa site, that's probably another 10-15 river miles before it gets to that site. Our Mesquite Flycatcher site only has about 15%, 20% tamarisk in it but our Mormon Mesa site is about 70-75% tamarisk. Once it gets there, it will really figure out what's happening with the Flycatcher habitat. I am funding a study in St. George with their flycatcher habitat and that will begin this next summer. We were hoping to kick it off this summer but unfortunately the money was coming from stimulus funds and we couldn't quite get the stimulus funding through all of our contracting processes before so that we could get I awarded in time to do the surveys this summer. That delayed our project by up to a year.

Steve said the GCNP has been working with the tamarisk coalition to do extensive monitoring of the Tamarisk leaf beetle throughout the river corridor. A river trip just got off two weeks ago and they're doing half mile sites to RM 14 and then one mile sites after that when they're sweeping for beetles at these sites. On this river trip they discovered there are beetles at RM 14 and also found some directly underneath the Navajo Bridge. So the beetles have arrived in Grand Canyon at this time. The Park Service is developing a restoration plan. They see it as more of an opportunity to work with their partners to actively restore the native riparian ecosystem in Grand Canyon and are working on that process right now and hopefully reach a conclusion by the end of this annual year. The Park Service is actively engaged with their partners and welcome any input from others.

Randy said he was glad to hear the Park is working on this because he feels this has been a very frustrating issue to deal with. And now with the addition of the beetle, he thinks it's even more critical the DFCs be established.

Matthew said there was a proposed FY10-11 project that had to be deferred because of funding. It was for hydrospectral imaging and GCMRC felt it would be a good tool for doing remote sensing and would provide a lot of information for just this kind of purpose.

Life Cycle Assessment. Clayton Palmer said WAPA markets hydroelectric power. In 1998 President Bill Clinton introduced an executive order requiring that federal agencies acquire 15% of their total electrical resources from renewable energy. He said WAPA has a program to facilitate federal agencies getting and transferring on their transmission lines some renewable energy in order for the federal agencies to meet that requirement. One of the parts of the EO indicated what renewable resources were considered renewable by the executive branch of the Government and they didn't include hydropower on there. He said he was on detail in D.C. at the time and knows that the person at DOE who wrote the EO that President Clinton signed and he had his favorite renewable resources and then he had some he didn't like. It became obvious to him that with the issue of renewable energy resources or even environmentally preferential electrical resources, nobody was using science to address the question of whether an electrical generator was renewable or whether an electrical generator actually accomplished anything environmentally. WAPA looked around for someone who was engaged in the question of scientific impacts for electrical generating technologies including those that were classified as a renewable and they found a researcher who was engaged in this topic. He had a scientific method that was based on international standards and could be reproducible by anybody to look at any electrical generating device and assess it against a set of standards to see if it met conditions for green or renewable electrical energy. What they didn't know was whether this method was applicable in the field and WAPA wanted to field test it. They sponsored some research on using a scientific method to make determinations and declarations of green power that would be reproducible scientifically. They sponsored the research to see if it would work in the field and what problems one might be encountered in the field. They chose several electrical generating devices as case studies, one of which was Glen Canyon Dam. This study is a companion study to a Canadian study in which the Canadians took five different electrical generating technologies in five different provinces and compared them using basically the same scientific method. WAPA is currently working with an American Standards Board to develop a standard by which state governments, policy makers, and the Federal Government could potentially evaluate electrical generators to see how they stack up using this method. This study was sponsored by WAPA but had funding from Tri-state Generation and Transmission Cooperative, the Bureau of Reclamation, and by the Electrical Power Research Institute.

Clayton introduced Mr. Bill Carsell who previously worked for WAPA and had retired from Reclamation. He now works for the consulting firm which WAPA hired to research this question and was one of the authors of the report. Mr. Carsell passed out copies of the "Life Cycle Impact Assessment (LCIA) of Renewable Electrical Generation Technologies Compared to the WECC Baseline Report" (***Attachment 16***).

Adjourned: 3 p.m.

Documents distributed at the meeting but not formally presented:

Attachment 17: Memo from Clayton Palmer dated 9/25/09 submitting the final report for the "Annotated Bibliography for the Humpback Chub (Gila cypha) with Emphasis on the Grand Canyon Population" prepared by Argonne National Laboratory.

Respectfully submitted,

Linda Whetton
U.S. Bureau of Reclamation
Upper Colorado Region

Glen Canyon Dam Technical Work Group Conference Call
January 5, 2010

Conducting: Shane Capron, Chairperson **Convened:** 9 a.m. (MT)

Committee Members/Alternates Present:

Mary Barger, WAPA
Cliff Barrett, UAMPS
Charley Bulletts, So. Paiute Consortium
Kerry Christensen, Hualapai Tribe
William Davis, CREDA
Kurt Dongoske, Pueblo of Zuni
VACANT, NM Interstate Stream Comm.
Christopher Harris, Colo. River Board of California
Norm Henderson, NPS/GCNRA
Amy Heuslein, BIA
Glen Knowles, USFWS
Dennis Kubly, USBR
Andy Makinster, AGFD
Steve Mietz, NPS/GRNP
Andre Potochnik, GCRG (alternate)
Larry Stevens, Grand Canyon Wildlands Council
Jason Thiriot, Colo. River Comm./NV (alternate)
Bill Werner, ADWR
Michael Yeatts, The Hopi Tribe

Committee Members Absent:

Robert King, UDWR
John O'Brien, Grand Canyon River Guides
John Shields, WY State Engineer
Larry Stevens, GCRG

Other Participants:

Matthew Andersen, GCMRC
Deanna Archuleta, DOI
Dave Garrett, M3Research
John Hamill, GCMRC
Kara Hilwig, GCMRC
Leslie James, CREDA
Arden Kucate, Pueblo of Zuni
Bill Persons, GCMRC
Sam Spiller, USFWS
Pam Sponholtz, USFWS

Meeting Recorder: Linda Whetton, USBR

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Welcome and Administrative. Shane welcomed the TWG members and alternates. He said the today's call would focus on GCMRC's report, "Nonnative Fish Control Plan: Summary of Primary Revisions from TWG Review," a related discussion on the technical issues of the plan, and a discussion on the Zuni Tribe's concerns with reference to the e-mail message Kurt Dongoske sent this morning.

Kara Hilwig gave the following PPT, "Nonnative Fish Control Plan: Summary of Primary Revisions from TWG Review" (***Attachment 18***). The TWG were also given a copy of the GCMRC response to TWG comments dated Sept. 18, 2009 (***Attachment 19***).

Mary asked why they waited to do the risk assessment. Matthew said they recognized it was very important but they needed time and data. Kara has been working on this for over a year in between breaks of working on the plan. This is the final version. He said he realized it wouldn't take just a month or two. He said a lot of the work will be accomplished at the Modeling Workshop and will include more information from the aquatic foodbase PEP. Mary asked for a description of the workshop. Matthew said it's an attempt to use available biology information for use on nonnative fish and the risks they present. He said they have also been struggling with HBC increased numbers and feel that modeling will help them understand those increases. Warmer water temperatures and nonnative removal may have contributed to the increased numbers. He said the workshop will be held at Saguaro Lake April 13-15, 2010.

In reference to slide #14, Kara said she would be happy to review the issues with the members. However, Shane said he wanted the members to have an opportunity to ask some clarification questions on some

slides and then wanted to deal with the more technical issues. He said it was his hope to approve the plan today in order to make a recommendation to the AMWG at their February meeting.

Clarification questions.

***Q**: How well do we know the fish in Lake Mead? How well is that being monitoried? (Stevens)*
***A**: AGFD and Nevada FWL has a sport fish in place. Some of the captures that came across in the literature, small and large mouth bass, tilapia, channel catfish. As far as GCMRC's monitoring program, it goes down of Separation Canyon. They have discovered and catfish in that reach. (Hilwig)*
***Q**: Is your plan robust enough to be incorporated in your plan? (Stevens)*
***A**: Yes. One of this year's task was to get at the sources of some of these nonnative fish. One thing that might help you is looking at a figure within the document, page 11, figure 2, and you can see how the composition changes. The nonnative fish component definitely increases. (Hilwig)*
***Q**: How often is that information updated? (Stevens)*
***A**: Think about Fish PEP recommendations and we've been looking at fish captures and they thought it would be more valuable to shift our emphasis to the mainstem and look for more nonnatives. He said the information from the aquatic foodbase said there are food limitations and that all the fish down there are using fish productivity. The conditions of the system right now is not very good to attract nonnatives. (Andersen)*
***C**: One of the recommendations was to improve monitoring – tributary inflows, things coming into the dam, getting a handle on upstream fish coming from Lake Mead. (Hilwig)*
***C**: It would be nice to have a list included in the document. I heard Norway salmon fisherman talk about throwing a net around the eddies and think it might be creative a way of keeping the fish. It's important to do fish work in the field. (Stevens)*
***C**: One of the questions was to assess the vulnerability size of the fish and find out what is the most vulnerable size of the nonnative fish. There is work being done in the upper basin but the larval stage is the most vulnerable to predation. Look at the vulnerability of native fish as well. (Davis)*
***R**: We have broken those out and have articulated those. Right now we don't know who is causing the most threats. Until better information is available, we can't make an assessment. (Hilwig)*
***Q**: When this is completed in 2010, is there an intent to incorporate what is posing the greatest threat? (Hendersen)*
***A**: The most important part will be the risk assessment. (Andersen)*

John Hamill said the report may require some revisions but they're not sure it's wise to put the plan on hold until they have all their information but rather just deal with it adaptively.

Discussion on the workshop.

John said they have been getting people involved and have a facilitated discussion with managers and scientists. They're trying to develop a design for managers and scientists and then turn it over to the managers and say this is where we want to go. At this point they are trying to come up with a strong agenda and the role the facilitator will play in the function. There is a process in place for you to have input. They're trying to get this done in the next week to 10 days.

Bill Werner read a motion about starting a workshop (Sept 2004) and an action item for TWG that GCMRC will develop a non-native fish control plan to be presented to the AMWG at their October 2004 meeting. He questioned whether this document has been responsive to the original motion and whether it's ready to go to the AMWG. Shane said this activity was called out in the conservation measures and asked Sam to speak to it. (Sam's response was very difficult to hear). Dr. Garrett said in reference to the motion, the SAs felt that GCMRC was to take the lead and with TWG and the managers to develop a plan and that's what the SAs included in their review. He said he interviewed the people and believes that was the charge.

Bill Davis said one of the areas in the HBC Comprehensive Plan had little to do with dam operations and AMP responsibilities and in the same way there are many areas that have nothing to do with dam operations so he thinks it's important to recognize that with non-native fish. The other part that needs to be included is a look at the cost effectiveness of the methods and feels it's very expensive to change the operation of the dam. As they look at methods, they may have to go to something more difficult but cheaper

to do. He said it hasn't been established that the GCDAMP has any control for non-native fish management. While it was GCMRC's mandate to write the plan, he questioned whether implementation of it might fall to others. It's an issue that needs to be addressed and should be included in the workshop discussion because it's not clearly presented in the Plan. John said it was their intent to lay out a plan but not identify who was going to do it. There were issues the In/Out AHG addressed and thinks that will be addressed in this case. They can add some text that would have to be addressed down the road.

Dennis asked how GCMRC is going to segregate the concerns that have been expressed. John said this is reminiscent of the science plan in which they had a lot of policy and management questions and they were able to separate the concerns and referred them to the AMP Policy Group. Dennis said he sees this process going down the same route because they fall outside the purview of GCMRC and those should be identified to the AMWG.

Cliff said he fundamentally agreed with the report and that it's not intended to address the policy questions and who should be doing what. He suggested John write a disclaimer on it and then the TWG could include their concerns.

Shane reviewed the list of concerns:

- Dam operations
- Cost effectiveness
- When do these become management actions?
- Coodination between entities (AMWG/TWG)
- Development of flow manipulations to suppress nonnative fish populations
- Tributaries that were used or not used. Need a discussion before the plan is finalized

Zuni Tribal Concerns

Kurt Dongoske sent an e-mail this morning (***Attachment 20***) stating that no one has come to the tribes to discuss this plan and questioned which DOI agency is going to present this to the tribes in Govt-to-Govt consultation requirements. Mike Berry said Reclamation has taken a lead on these consultations and if it's going to be a 106 issue, then it's their role to take the lead.

Deanna Archuleta said she and Kurt spoke about his and she also talked with Arden Kucate this morning. There is more work that needs to be done on the plan and she feels that after it is heard by the AMWG, those consultations will occur. She said a meeting is scheduled for January 13 on how that consultation should take place. A pretty comprehensive plan was laid out, but they need to talk about who is the primary agency to take the lead and how the other bureaus are will be involved in consultation. Today's plan allows them the Department to move forward and halting it based on consultation won't break the plan today. There is a meeting also scheduled for January 12th for all the tribes to talk with DOI. She hoped knowing that would allay some of Kurt's concerns. She asked to hear from other tribal members.

Arden Kucate said it's evident there are a lot of areas of concern that are very unclear as to what AMWG has done in management related and science issues. It's very unclear to him how they're being implemented. He said the Zuni Tribe is in the process of trying to complete their govt-to-govt consultation which was implemented last September and they would like to get a good understanding of the biological opinions on native and nonnative fish. Hopefully, they can come together on what has to be done. He said they will utilize the consultation measures to the fullest extent as per the Presidential Executive Orders.

Mike Yeatts said he echoed Kurt's concerns. Regarding more management aspects, he feels it's premature to make decisions because they're just beginning consultation. The Hopi tribe had concerns about the mechanical removal when it was started because they didn't address the issue of humpback chub. They support the development of the plan but it needs to be a long-term plan. The biggest concerns are from research and monitoring to identifying where there are changes in population and then moving into

management actions. This does get into bigger issues and the Hopi Tribe questions the AMWG's role, either by funding or by agency. The mechanical removal issue is a big concern to the Hopi Tribe. It's a big issue that the AMWG and DOI will have to wrestle with.

Amy Heuslein echoed her support for the tribes' concerns and said the Department has started a good dialogue and would like to work through those issues so they have a voice in this communication. Hopefully the issues can be resolved and everyone can support the plan.

From a technical perspective, Shane said he wasn't sure how moving the plan forward at this time is the right thing to do. There are flows and other things to be considered. John said that in the workplan there is a project that talks about controlling fish below the Paria and other locations outside the LCR. There is a provision in the FY10 workplan, however, they're not sure of what the scope is and how it would be accomplished with the other DOI agencies.

Kurt said the plan is iterative and will have revisions. It doesn't sufficiently recognize the cultural conflicts that are inherent in the plan. This plan becomes a guiding document for working with nonnatives. It's late and hasn't addressed the tribal concerns before implementing action.

Deanna said there that while the plan is being prepared, there is a lot of time to working with the managers, scientists, and action agencies. There is that time window and the group needs to find a way to clarify the language. She said if an amendment to the AMWG motion wasn't enough then perhaps Kurt could provide some language that would give them the comfort they need to endorse the plan so it is more concretely implemented. Referring to page 37 where it references the SHPO and endangered species, she would be happy to change the language.

Kurt said that language referred to tribal reservations and boundaries, but it doesn't speak to the issue of taking life. It doesn't address this conflict of tribal values.

Deanna suggested working on language that would address his concerns in the plan.

Loretta Jackson-Kelly said she believed that since the mechanical removal had its conception back in 2003, things have really changed out there. During TWG and AMWG meetings they've talked about the pros and cons of that activity. As time has moved along, things have changed so much that this isn't the plan they hooked up with initially. She supported Kurt's concerns and said they need full consultation with the DOI agencies and the tribal consultation is very important for a basis to move ahead with what this plan will look like. She said she looks at the words "adaptive" and "science" and feels there needs to be a greater effort to make it more adaptable. She expressed concerns for all traditional values and recognized that Hualapai's neighbors on the east, west, north, and south of them have been left alone so those who need to eat the fish are able to do so. There are also tribes that extend further south that use the fish. As times change, the message is still very alien in how they see it. She strongly supports tribal consultation occurs first before the plan is voted on as there are a lot of elements that need to be reviewed. She didn't see how it delaying progress on the plan can be hurt until the tribes can come to an agreement on the plan.

Mike said adding some language may be appropriate but feels that including the words "consultation will occur in the future" isn't accurate because they often don't take that first step toward consultation. They need to make sure they're consulting on the plan or actions because mixing the two is where they get into difficult issues.

Kurt said he thought it would be wise to wait until after the meeting on Jan. 13 to see what happens. In the meantime, Kara said she could work with Kurt on making language changes to the plan. Kurt said he would like other tribes to work with him in the process as well.

Shane said if there are any concerns to let him know. Due to the time constraint of the call he didn't feel they could resolve all the issues surrounding the plan.

John Hamill said they could have those discussions. He reminded the TWG that the plan has been on the agenda for over 1 ½ years and the TWG and AMWG have been told about the scope of the plan. It has morphed into what it is from comments received along the way. He's still concerned about what information is going to be taken out. He feels GCMRC has kept the TWG informed and at this point in time doesn't know what they should do. However, he feels a broader discussion with the TWG and AMWG will be helpful to reaching agreement on the plan.

Shane said the issues will be taken up again at the January 21 TWG meeting.

John provided a copy of the agenda for the Annual Reports Meeting (***Attachment 21***).

Concluded: 12:02 p.m.

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