Glen Canyon Dam Technical Work Group Meeting
January 28, 2016

Conducting: Vineetha Kartha, TWG Chair
Shane Capron, TWG Vice-Chair

Convened: 8:15 a.m.

Committee Members/Alternates Present:
Melinda Arviso-Ciocco, Navajo Nation
Jan Balsom, NPS/GRCA
Cliff Barrett, UAMPS (phone)
Charley Bulletts, Southern Paiute Consortium
Chris Budwig, Int'l Federation of Fly Fishers/TU
Kerry Christensen, Hualapai Tribe
Jennifer Crandell, State of Nevada
Marianne Crawford, U.S. Bureau of Reclamation
Kevin Dahl, National Parks Conservation Assn.
Bill Davis, CREDA
Kurt Dongoske, Pueblo of Zuni
Craig Ellsworth, WAPA
Katrina Grantz, Bureau of Reclamation
Paul Harms, State of New Mexico
Robert King, State of Utah (phone)
Ted Kowalski, State of Colorado
Joe Miller, Int'l Federation of Fly Fishers/TU
Jessica Neuwerth, State of California
Ben Reeder, Grand Canyon River Guides
Larry Stevens, Grand Canyon Wildlands Council
Bill Stewart, Arizona Game and Fish Department
Rosemary Sucec, NPS/GLNRA (phone)
Don Ostler, State of Wyoming
Michael Yeatts, Hopi Tribe
Kirk Young, U.S. Fish and Wildllife Service

Committee Members Absent:
Evelyn Erlandsen, State of Arizona
Chris Harris, State of California
Chip Lewis, Bureau of Indian Affairs
Steve Wolff, State of Wyoming

Grand Canyon Monitoring and Research Center:
Helen Fairley, Program Manager
Kyrie Fry, Communications Coordinator
Paul Grams, Program Manager (phone)
Scott VanderKooi, Center Director

Interested Persons
Mark Anderson, NPS/GLNRA
Mike Anderson, AZGFD
Rob Billerbeck, NPS
David Braun, Sound Science LLC (Science Advisors)
Kathleen Callister, U.S. Bureau of Reclamation
Bill Chada, U.S. Bureau of Reclamation
Jerry Lee Cox, Grand Canyon River Guides
Tom Czapla, U.S. Fish and Wildlife Service
Brian Healy, NPS/GRCA
Beverley Heffernan, U.S. Bureau of Reclamation (phone)
Dawn Hubbs, Hualapai Tribe
Leslie James, CREDA
John Jordan, Int'l Federation of Fly Fishers/TU
Lisa Meyer, WAPA (phone)
Peggy Roefer, UCRC/Nevada
Seth Shanahan, SNWA
Melissa Trammell, NPS (phone)
Bob Unnasch, Sound Science LLC (Science Advisors)
Rich Valdez, SWCA (phone)
Randy VanHaverbeke, FWS
Felicia Monair (WAPA)?

Meeting Recorder: Linda Whetton

Welcome and Administrative: Ms. Kartha welcomed the members and the public. Introductions were made and a quorum determined. Guidelines for participating in the webinar were reviewed.

- Approval of October 20-21, 2015, Meeting Minutes. Motion to approve by Larry Stevens, seconded by Kevin Dahl. Pending two edits, the minutes were approved by consensus.
- Review of Action Items. Due to time constraints, this will be discussed at April meeting along with an update on the Tribal Consultation Plan.
- Programmatic Agreement Update. Mr. Chada said they met with the tribes and the Arizona SHPO to discuss the PA. A meeting will be scheduled as soon as possible.
- Reclamation Adaptive Management Group Chief. Ms. Katrina Grantz was selected for this position.
- GCMRC Deputy Chief Position. Mr. VanderKooi received a Certification List earlier this year and have been reviewing the resumes. Phone interviews will begin tomorrow. From that group, in-person interviews and webinar presentations wil be scheduled in mid-February. If is interested in participating in those interviews, contact Scott (svanderkooi@usgs.gov)
- LTEMP EIS. The Draft LTEMP EIS was published on January 8 with comments due April 7, 2016. There are two webinars (Feb 16 and March 1) and two public meetings (Feb 22 in Flagstaff, Feb 25 in Tempe) currently scheduled. In response to a question from cooperators to extend the comment review period by

an additional 60 days, Mr. Billerbeck said DOI is still considering the request but are more than willing to hold meetings but want to get targeted milestones built into the schedule.

- 2016 Spring HFE. Currently there isn't sufficient sediment to run an HFE this year, but they have until mid-March to accumulate the sediment in order to have the time for planning an HFE. If there were to be one this spring, it would likely occur in the beginning of April. Even without more sediment, the sand budget model looks at normal dam operations witihout an HFE and also at sediment that comes into to make sure the sand mass balance is not negative. It's already -200 kilotons and would need that much more plus the amount required for a minimum HFE, around the range of 400 kilotons. Trout numbers are lower than they have been in the last 10 years which also must be factored into a spring HFE.

Annual Reporting Update. Mr. Shane Capron. He complimented GCMRC and others who provided information at the Annual Reporting meeting the past two days. The April meeting will focus on what modifications need to be considered for the FY17 workplan.

- Mr. VanderKooi thanked everyone who participated in yesterday's meeting and the poster session. He was very pleased with all the presentations and the good interactions with his staff, cooperators, and the TWG. The FY2015 GCMRC Annual Report (***Attachment 1a***) was distributed. and if there are any questions or feedback, send those to Scott. CREDA submitted some detailed questions and GCMRC provided its response (***Attachment 1b***).
- As follow-up to the AR meeting, Ms. James suggested people re-read the Desired Future Conditions memo (***Attachment 1c***) from Anne Castle to the AMWG on 8/19/11. It addresses many of the questions raised on the first day of the AR meeting.
- Ms. Kartha asked the TWG for thoughts of holding a workshop as a precursor to the PEP panel.
    - Excellent Idea. Having a TWG webinar or meeting with the PEP panel might keep ideas fresh.
    - The old M&R plan recognized the need for a workshop to pose questions to the panel.
    - Include a day in the field with the panel. Guides could assist with transportation.
    - This is an opportunity for deep immersion into the fishery program.
    - It helps to have an interactive approach to presentations and the workshop is a good idea.

Humpback Chub Recovery Team Update. (***Attachment 2***) – Dr. Rich Valdez. In an effort to identify activities necessary for species conservation, a new Humpback Chub Recovery Team was appointed by U.S. Fish and Wildlife Service last November. The Team consists of a Team Leader (Rich Valdez), Agency Lead (Tom Czapla), a Science Subgroup, an Implementation Subgroup, and a Writing Subgroup, for a total of 22 Team members. The Team is expected to meet five times and the meetings will be open to the public. A comprehensive recovery plan is expected to be delivered to the Regional Director for signature by July 2017. The Recovery Team has responsibility for producing three reports: 1) Species Status Assessment, 2) Recovery Plan, and 3) Implementation Plan. The intent of the Team is to acknowledge the biological reality of the species and put forward management actions that will reduce and minimize the threat to the species and establish a demographic and recovery criterium.

Q&A, Comments:

- *Where will the issue of distinct population segments be raised in this process?*
    - *The distinct population segment is a FWS policy that enables a recovery team to consider separating different groups of populations of the same species to be considered fundamentally as different recovery entities. That consideration will be undertaken during the deliberations.*
- *The implementation subgroup has Councilman Phillip Vicenti identified as a member. You may want to check with the tribal council about his continued participation. Also, is there any consideration for tribal values or objection to some adverse actions that you might recommend? . The Pueblo of Zuni would like to be able to comment on any recommended actions that they might find culturally offensive or at least compromising their cultural sensibilities.*
    - *Hoping to have input from non-tribal values through the the Implementation Subgroup. They will involve individuals who represent those interests in the team itself. During the review stage there will hopefully be ample opportunity for comments on values. Recent findings of many small chub in the lower portion of Grand Canyon, but not finding adults there – that lack of knowledge might influence the decision-making here. Encourage you to remember what we don't know about chub as well as what we do know in this process.*
- *Need to think what GCDAMP roles will be with outcome of this process.*

- *The FWS want recovery plans to be guidance documents, not prescriptive documents which allows latitude for the different programs to implement those actions that the FWS feel are necessary to conserve the species.*

Dam Operations During Equalization (**Attachment 3**) – Ms. Katrina Grantz. There are four operating tiers in Lake Powell and the equalization tier is, Lake Powell at its fullest state, and is projected to be higher by the end of the water year. Equalization occurs when Lake Powell's elevation is projected to be at or above the equalization level. If projected above, more than 8.23 maf will be released. The amount released depends on what the hydrology is and what the reservoir elevations are. Releases must be monitored and the releases are adjusted throughout the whole water year until one of the four conditions occurs: 1) Powell storage equals Mead storage, or 2) mead elevation equals 1,105 feet, or 3) Powell elevation equals equalization level minus 20 feet, or (4) Powell elevation is equal to the equalization level. If Lake Powell is high and Lake Mead is low, water will be released to bring their levels closer but with constraints. With each passing year, the reservoir has to be "more full" to trigger equalization. Currently, 9 maf is expected to be released but if things get really dry, then we might not end up triggering that April adjustment to equalization or to balancing. However, if things are wetter than the maximum probable inflow scenario, the April adjustment would be to equalization releases. Lake Powell isn't as high as its been in past years so if Lake Powell were at a greater elevation to start out the water year, the amount to trigger equalization would be lower. The amount of water than can physically fit through the dam depends on maintenance and how many units are actually online at any given time. Currently there are seven units available and about 20,000 cfs could be released or about 1.3 maf.

Each month assessments are made to determine whether equalization will be triggered in April after all the snow has fallen. In January 2011, they thought there would be equalization so releases were increased. By March there was a 97% chance that equalization would be triggered, so the releases were bumped it quite a bit in January and February. There was maintenance in March so they couldn't release as much and couldn't fluctuate as much because the ability to move water and fluctuate throughout the day was also impacted by maintenance. Typically under equalization, normal fluctuations will be done early in the year but if they're in a super wedp situation, there's a chance they may have to not be able to fluctuate as much as they would otherwise. In 2011 as much water was released couldgo through the powerplant. It maxed out through mid-December until they achieved equalization and then retruned to normal fluctuations. Historical hydrologies were reviewed from 1906 into the future through 2060, the probability of having releases greater than 8.23 maf is between 70-80%. The probability of having releases greater than 9.0 maf is in the 30-40% range. The probability of having releases greater than 10 maf is in the 10-20% range in any given year.

Q&A, Comments:

- *Could we change the water year from Oct-Oct to April-April and spread out equalization over 12 months instead of 3-5 months?*
  - *The water year is well established in science and is set up for the irrigation season as well. There are a lot of laws and regulations that would have to be changed to change the water year. To change dam operations would be even more challenging.*
- *You talked about moving part of the equalization flow into December and the implication was that you were continuing equalization flows into the next water year. I thought that was forbidden.*
  - *In that year we were equalizing as best we could given what was available. We maximized to the extent we could until we were done.*
- *The Upper Colorado River Basin Compact is tied to our compact compliance obligations and in the 2007 Interim Guidelines the languages recognizes getting the water delivered within the water year.*
- *Is there a way to to run such flows that does not damage the sediment mass balance that we're working so hard to achieve in this program?*

HFE Protocol Sediment Trigger (**Attachment 4a**) – Mr. Scott VanderKooi. As plans were being discussed to have a potential HFE last fall, they encountered the Green Sunfish (GSF) problem and couldn't proceed even though conditions were suitable for an HFE.

- Sediment Input Update. Dr. Paul Grams said two things factored into implementing the 2008 HFE EA Protocol: 1) the sediment flux monitoring program, and 2) the shifting rating curve sand routing model. The HFEs follow historical timing of Paria and Little Colorado River Floods in Fall and Spring. The Fall inputs are much larger than the Spring inputs but Spring inputs on the Paria can happen. The implementation window is March and April. These accounting periods are treated entirely independently as an operational not a scientific based decision. Historical, flows have been highest in May and June. Since the the first HFE, accorcing to the Protocol there has been enough sand to trigger one per year. The Protocol anticipated there could 4-8 Fall HFEs in a 10-year period and 3-6 HFEs Spring HFEs in a 10-year period. In the LTEMP analysis, there could be17-25 HFEs in 20 years with a maximum of 40 and 77% of those in the Fall. From 2012-2014 HFE's were triggered with accumulations of 600,000 to 2,000,000 metric tons. Mr. Vanderkooi said the logic of re-zeroing on the accounting periods was to avoid going into a deficit to the point that an HFE couldn't be run.
- Introduction of Motion for Springtime HFEs (***Attachment 4b***) – Dr. Larry Stevens. Science is about reason, using logic to make intelligent decisions while politics is about reasons sometimes contrary to scientific reason. The GCDAMP is designed to preserve the sandbars of the Grand Canyon for fish, recreation, archaeological resources, etc. There are about ten reasons why Springtime HFEs are more advantageous to this program than Fall HFEs. Those ten reasons include; the effects of an HFE on the sediment resources diminish within about six months, having one before the recreational, growing, and wind seasons makes sense in terms of preserving resources, etc. Springtime HFEs might pose risks in terms of promoting trout recruitment, but as scientists, having one example of a Springtime HFE and it happened in relation to the equalization flows in 2011, it's difficult to understand whether there is cause and effect between Springtime HFEs and trout population expansion. The TWG should consider a motion to test Springtime HFEs and not implement them as a management program but simply to learn whether or not to include them as a continuing experiment. The following motion language was offered for consideration:

  Therefore, the TWG requests that AMWG recommend the Secretary clarify the HFEP to allow for springtime HFEs by: 1) including consideration of unused sediment supplies following autumn HFEs, or 2) in the case in which an autumn HFE is not conducted and sufficient sand exists on the channel bed, that the accounting period for sediment supplies be relaxed to permit a springtime HFE to be conducted. AMWG recognizes that existing legal authorizations, caveats, uncertainties, and trade-offs exist regarding springtime HFEs. These issues should be considered, experimentally tested, and evaluated before springtime HFEs are accepted as a management practice. Clarification of the HFEP is in keeping with the intent of the Grand Canyon Protection Act (1992) and the mission and vision of the Glen Canyon Dam Adaptive Management Program."

Q&A, Comments:

- *The most appropriate venue for consideration of HFEs is within the LTEMP EIS alternatives.*
- *Reluctant to open HFE Protocol EA for environmental compliance, let's handle through LTEMP EIS*
- *The springtime HFE in 2008 seemed to stimulate trout, but am reluctant to support a motion that might trigger trout suppression flows which would result in taking of young life and stranding them. Zuni religious leader are against a management action produced by humans that conflicts with their tribal values.*
- *The 10-year HFE Protocol is in place until it's subsumed into the LTEMP ROD.*
- *We need to put some support behind re-evaluating the concept of sound accounting within the LTEMP EIS. Concerned we rely on the hope that out of the public comment process, the issue will be addressed.*
- *We don't have the information today to know the impacts of what we're considering.*
- *This is more of a policy issue that the AMWG should consider.*

Non-native Invasive Species Update (***Attachment 5a***) – Ms. Rosemary Sucec recognized the people involved who responded so quickly to removing GSF and said that interagency and tribal collaboration is now a national model for other agenices to follow.

- Green Sunfish Removal (***Attachment 5b***). Mr. Mike Anderson provided a timeline for the activities involved beginning with the AZGFD capturing 43 GSF on July 6 and ending with removal on November 12-13. They only used 11 liters of Rotenone. In order to open up the area again to the public, they had to monitor water quality and get it back to baseline levels or allow the public re-entry at less than 90 parts per billion (ppb). Treatment was at 100-150 parts ppb. For drinking water, it's less than 40 ppb. It's strongly suspected the fish came through GCD.

  Prior to the treatment, Mr. Mark Anderson said they gathered as many non-targeted fish from the area and supplied them to the Zuni Aviary. The use of Rotenone limits the fish from being used for food or feed and fish exposed to Rotenone were frozen for future research efforts. It is suspected that the GSF came through Glen Canyon Dam. As Lake Powell elevation levels decline, the incidence of escapement is likely to increase. To avoid doing treatments every year, other options are being considered including opening the upper end of the side channel to make it flow through Impacts to recreation and other resources will be considered. Ms. Trammell added that some GSF may have gotten through before they could block or treat the slough, but right now that habitat is pretty barren of GSF.

- Glen Canyon National Recreation Area (***Attachment 5c***) – Mr. Brian Healy. A reproducing population of GSF was detected in a warmwater slough within GCNRA in early July 2015 by AZGFD. The slough is located on river left, approximately 12 miles upstream of Lees Ferry. Fisheries biologists and managers were concerned that the species would disperse from the slough and colonize warmwater areas that are critical habitat for native fish species, including endangered HBC. Following two unsuccessful eradiction efforts using mechanical methods, it was determined that the installation of a barrier may help to contain the species while additional eradication methods were evaluated.

Q&A, Comments:

- *We need to make some adjustments in our monitoring program, either to what's coming out of the dam or when the fish come through the system.*
- *Need to get ahead of the monitoring and not lose sight of an early indication of a systemwide change as a result of the warm waters that have been present in the last decade.*
- *In the fisheries management plan, NPS developed a list of species that were considered high risk predators and BT was definitely one of them. They inserted a rapid response protocol into the fish plan that tiered off of the GSF treatment. The response is based on seeing either existing an high risk predator, a new one, or an increase in abundance. If there is an expanding population establishing in Lees Ferry, this could be a game changer for potential piscivory on chub.*
- *It's difficult for agencies to administratively handle crises. All who participated in the GSF crisis had to drop everything else to ensure action was immediately take for the preservation effort. The Indian tribes provided lots of ideas to help them and one thing they emphasized is the need for long-term planning to address the change in the system and potential for more invasives.*
- *The GSF crisis was a real surprise and the system often sees a 'surprise' every year or two. There was one week of real work done while two months of associated paperwork. The paperwork version could easily overwhelm us in these situations.*

Brown Trout Update Lees Ferry (***Attachment 6***) – Mr. Bill Stewart. Differences in the life history of Brown Trout and Rainbow Trout include spawning times, the distances they move and BT's susceptibility to whirling disease. Typically BT are not often caught in Lees Ferry. Since early to mid-1990s, BT numbers have gone up even though their monitoring effort has remained relatively the same. In the last two years, more BT have been caught than in the past. The natal origins work corroborates that BT are increasing. The AZGFD is not managing for BT in the system and have no limits on the take of BT or other non-native or warm water species. 1) Why have BT populations remained low? and, 2) Why is there an increase in BT at Lees Ferry. Questions: temperature effects, the numbers of RBT competing with potentially juvenile BT for the same resource, and do fall HFEs create spawning habitat for BT. One of the benefits of the monitoring program is changes can be detected.

Trout Ad Hoc Group (TAHG) Report (***Attachment 7a, and PPT***) – Mr. Bill Stewart. There were 15 recommendations presented in the Lees Ferry Recreational Trout Fishery Management Recommendations report (***Attachment 7b***) at the AMWG meeting in August 2015. From that, GCMRC conducted a technical review of the report and presented six of those recommendations for the TWG's consideration on the technical merits. The TAHG was established in October 2015 with the charge to evaluate the GCMRC review and report back to the TWG. The TAHG held several meetings and had more discussion with GCMRC which led to GCMRC issuing a final memo to the TWG on Dec. 9, 2015 (***Attachment 7c***). The TAHG offered the following conclusions:

1. The GCMRC review is generally comprehensive although it could be expanded in some areas.
2. Additional discussion/ clarification is needed by the TWG and GCMRC on the scientific basis of the minimum flow recommendation and the need for stocking in the event of a catastrophic failure of Lees Ferry trout fishery.
3. The TWG should identify outstanding research questions that should be addressed to better inform any implementation of the Recommendation.

The TAHG offered the following motion for the TWG's consideration:

The TAHG recommends that the TWG recommend that the AMWG accept the GCMRC technical review of the Lees Ferry Trout Fishery Management Recommendations based on the TAHG evaluating the GCMRC technical review of the Recommendations and finding the review to be comprehensive and the review to be supportive, neutral or noncommittal on the individual recommendations with two exceptions. One exception being the Minimum Flow recommendation with agreement that research should continue to evaluate the effects of lower flows and to develop scientifically based minimum flows. The other exception being Stocking In the Event of a Catastrophic Failure and the impact on the dependent economic community be included in the determination for stocking and with the understanding that stocking is substantially determined by the provisions of the Park Service Comprehensive Fishery Management Plan and the Arizona Game and Fish Department's Fisheries Management Plan Colorado River – Lees Ferry (2015-2025).

In addition the TWG requests that the AMWG, with the acceptance of the Lees Ferry Recommendations, instruct the TWG to consider the requirements for any implementation of the Recommendations including additional research that should be included in the work plan.

Ms. Kartha said there was a lot of confusion when the TAHG reviewed of the GCMRC technical review because they weren't sure what the TWG was supposed to evaluate. There were a lot of opinions that the TWG shouldn't question the science so that was captured as a sideboard. When the TAHG reviewed the GCMRC's technical review, they were looking at what was missing. All the stakeholders were in agreement on most of the recommendations except the minimum flows and whether the technical review was comprehensive and whether more science review was needed on those exceptions.

Q&A, Comments:

- *The angling community respected the sideboards and looked at how they might fit in the overall scheme of the AMP and the anticipated LTEMP EIS. The objective is to see a healthier, more robust, stable system with a good, healthy world class fishery on the level of a Blue Ribbon fishery as it was in the past.*
- *GCMRC conducted a technical and scientific review to determine if there was technical and scientific support behind the recommendations, but had to remain neutral on management recommendations.*
- *There are two places in motion that the word "support" is used. Suggest it be replaced with "GCMRC recognizes the scientific merit in conducting experimental bug flows …"*
- *Don't see a description of what TWG's recommendation is based on the TAHG review and TWG's charge from AMWG.*
- *The word "accept" was used instead of "review and consider" at that level. Because what we were discussing was the acceptance of the review, not the acceptance of the recommendations.*

The TWG continued to revise the motion, resulting in the following:

Motion (Proposed by Kevin Dahl, seconded by Ted Kowalski): The TWG has reviewed the Dec. 9, 2015, GCMRC Technical Memo (Memo) of the Lees Ferry Trout Fishery Reommendations (Recommendations) and finds it to be comprehensive. The TWG recommends that the AMWG accept the Memo subject to the following:

1. **Any actions resulting from the recommednations must be fully consistent with the "Law of the River" and DOI policy considerations.**
2. **Recommendations that fall under the purview of water and natural resource management agencies such as the Bureau of Reclamatoin, National Park Service, United States Fish and Wildlife Service, and Arizona Game and Fish Department, and appropriate Tribes will recquire additional evaluation with these management agencies for further consideration.**
3. **Recommendations that address dam operations are expected to be considered and evaluated in light of the ongoing Long Term Experimental and Management Plan Environmental Impact Statement.**

In addition, the TWG requests that the AMWG direct the TWG to consider these recommendations and the Memo as future work plans are developed.

Science Advisors Workplan (***Attachment 8a and PPT***) – Dr. David Braun. The Bureau of Reclamation has contracted with Sound Science LLC for Dr. Braun to serve as the executive coordinator for the Science Advisors Program for the GCDAMP. Sound Science has reviewed past Science Advisor Executive Coordinator (SA-EC) annual work plans and program procedures to ensure program continuity. From this, they envision accomplishing four things: 1) address "open" action items requested by the AMWG and TWG in previous fiscal years; 2) address additional needs identified by AMWG, TWG, and GCMRC for independent science reviews based on prioritization of such requests; 3) address additional needs for independent science reviews recommended by the SA-EC, subject to prioritization and approval; and 4) establish guidelines for preparing the work plan for the next subsequent fiscal year. However, Sound Science has determined that the FY16 SA work plan must depart from this typical situation because it hasn't been involved in development of the FY16 work plan nor been able to consult with the AMWG, TWG, and GCMRC. Sound Science proposes that the SA-EC work plan for the remainder of FY16 focus on:

1. Reviewing the mission of the SA-EC program, its operating procedures, and is functional relationships with GCMRC and TWG and proposing recommendations to Reclamation and the AMWG.
2. Reviewing GCDAMP archives and engaging with the AMWG to identify both short-term priorities for FY17 and long-term needs and expectations for the SA-EC program.

The SA-EC will also assist GCMRC in implementing the Fisheries Research, Monitoring, and Management Actions Protocol Evaluation Panel.

Q&A, Comments:

- *Do you have any vision or ideas of the SA, in working with other scientists, might be able to help move this program forward?*
  - *My thoughts are evolving daily. When Bob Unnasch and I met with GCMRC in October we felt it necessary to emphasize to GCMRC that the SA program is not a watchdog program. It's not there to look over the researcher's shoulders and say you're not doing that. It's something that is supposed to enhance the power of the AMP. External review is a way not to just verify to you that yes the scientific teams are doing their jobs well, but it is to bring in an outside and a larger perspective on ways that the program could be strengthened.*
- *You were going to assist with rewriting the SA Charter. What do you need from the TWG?*
  - *I need a counterpart ad hoc group within TWG with which I can work to draft.*
  - *Vineetha – should we created a charter group or do you think the steering committee will stand well as the point of contact?*
  - *Shane – great idea and if anyone wants to join the SCAHG, let Vineetha know.*
- *The SCAHG is typically for the purpose of putting TWG meetings together. If we're going to include as an element, then we probably need to have meetings that aren't so focused on that.*

Public Comment: None

Ms. Kartha thanked everyone for their attendance and participation. She mentioned the following:

- If you want to participate in the Steering Ad Hoc Group (SCAHG), let Vineetha or Linda know.
- If you're interested in serving as the FY17 TWG Chair, let Vineetha or Shane know.
- Proposed dates for FY17 TWG meetings are:
    - January 25-26, 2017 AR/TWG Meeting
    - April 18-19, 2017 TWG Meeting
    - June 20-21, 2017 TWG Meeting
    - October 24-25, 2017 TWG (webinar?) meeting

Adjourned: 2:50 p.m.

Respectfully submitted,

Linda Whetton
Upper Colorado Region
Bureau of Reclamation

Future TWG Meeting(s):
(Tue-Wed) April 19-20, 2016
Arizona Dept of Water Resources
3550 N. Central Avenue
Phoenix AZ 85012

(Tue-Wed) June 14-15, 2016
Bureau of Reclamation
125 S. State Street, Room 8102
Salt Lake City UT 84138

Key to Glen Canyon Dam Adaptive Management Program Acronyms

ADWR – Arizona Dept. of Water Resources
AF – Acre Feet
AGFD – Arizona Game and Fish Department
AIF – Agenda Information Form
AMP – Adaptive Management Program
AMWG – Adaptive Management Work Group
AOP – Annual Operating Plan
ASMR – Age-Structure Mark Recapture
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
BIA – Bureau of Indian Affairs
BO – Biological Opinion
BOR – Bureau of Reclamation
BWP – Budget and Work Plan
CAHG – Charter Ad Hoc Group
CAP – Central Arizona Project
GCT – Grand Canyon Trust
CESU – Cooperative Ecosystems Studies Unit
cfs – cubic feet per second
CFMP – Comprehensive Fisheries Management Plan
CMINS – Core Monitoring Information Needs
CMP – Core Monitoring Plan
CPI – Consumer Price Index
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
CWCB – Colorado Water Conservation Board
DAHG – Desired Future Conditions Ad Hoc Group
DASA – Data Acquisition, Storage, and Analysis
DBMS – Data Base Management System
DOE – Department of Energy
DOI – Department of the Interior
DOIFF – Department of the Interior Federal Family
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
GCES – Glen Canyon Environmental Studies
GCT – Grand Canyon Trust
GCMRC – Grand Canyon Monitoring & Research Center
GCNP – Grand Canyon National Park
GCNRA – Glen Canyon Nat'l Recreation Area
GCPA – Grand Canyon Protection Act
GIS – Geographic Information System
GLCA – Glen Canyon Nat'l Recreation Area
GRCA – Grand Canyon National Park
GCRG – Grand Canyon River Guides
GCWC – Grand Canyon Wildlands Council
HBC – Humpback Chub (endangered native fish)
HFE – High Flow Experiment
HMF – Habitat Maintenance Flow
HPP – Historic Preservation Plan
IG – Interim Guidelines
INs – Information Needs
KA – Knowledge Assessment (workshop)
KAS – Kanab Ambersnail (endangered native snail)
LCR – Little Colorado River
LCRMCP – Lower Colorado River Multi-Species Conservation Program
LTEMP – Long-Term Experimental and Management Plan
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
NAU – Northern Arizona University (Flagstaff, AZ)
NEPA – National Environmental Policy Act
NHPA – National Historic Preservation Act
NNFC – Non-native Fish Control
NOI – Notice of Intent
NPCA – National Parks Conservation Association
NPS – National Park Service
NRC – National Research Council
O&M – Operations & Maintenance (USBR Funding)
PA – Programmatic Agreement
PBR – Paria to Badger Creek Reach
PEP – Protocol Evaluation Panel
POAHG – Public Outreach Ad Hoc Group
Powerplant Capacity = 31,000 cfs
R&D – Research and Development
RBT – Rainbow Trout
RFP – Request for Proposal
RINs – Research Information Needs
ROD Flows – Record of Decision Flows
RPA – Reasonable and Prudent Alternative
SA – Science Advisors
Secretary – Secretary of the Interior
SCORE – State of the Colorado River Ecosystem
SHPO – State Historic Preservation Office
SOW – Statement 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
TEK – Traditional Ecological Knowledge
TES – Threatened and Endangered Species
TMC – Taxa of Management Concern
TMF – Trout Management Flows
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