Glen Canyon Dam Technical Work Group Meeting
June 14-15, 2016

Summary of Actions Taken

The TWG reached consensus on the following actions during this meeting:

Motion: TWG recommends that the AMWG recommend to the Secretary of the Interior her approval of the GCDAMP FY17 budget as described in the two tables (attached) from the Bureau of Reclamation and the Grand Canyon Monitoring and Research Center. TWG further requests that AMWG give TWG the opportunity to further review the FY17 budget after issuance of the LTEMP ROD, to determine if the budget and/or work plan changes may be needed as a result of the ROD. Further, tribal representatives will work with Bureau of Reclamation on the implementation of its budget items D.2.5 through D.2.8.

Motion: TWG recommends the AMWG recommend to the Secretary of the Interior her approval of the DOI-DOE Proposed Hydrograph for Water Year 2017 as follows:

- Annual Release Volumes will be determined by the 2007 Interim Guidelines and shall be reviewed and adopted through the normal annual operating plan process (in consultation with the Basin States as appropriate).
- Monthly Release Volumes are anticipated to shift depending upon: (1) the projected Annual Release Volume, (2) power plant capacity, and (3) the magnitude of a potential High Flow Experiment.
- Monthly Release Volumes may vary within the targets identified below. Any remaining monthly operational flexibility will be used for existing power production operations under the Modified Low Fluctuating Flow (MLFF) alternative selected by the 1996 ROD and contained in the 1995 FEIS and in compliance with all applicable NEPA compliance documents (HFE EA, NNFC EA, 2007 Interim Guidelines). Monthly release volumes proposed in this hydrograph will not affect operating tier determinations for Lakes Powell and Mead under the 2007 Interim Guidelines.
- Release objective for June is:
    - 600 to 650 kaf for annual releases below 9.0 maf
    - 800 kaf for annual releases of 9.0 maf to less than 9.5 maf
    - 900 kaf for annual releases of 9.5 maf to less than 10 maf
    - Greater than 900 kaf for annual releases 10 maf and greater
- Release objective for August is:
    - 800 kaf for annual release below 9.0 maf
    - 900 kaf for annual releases of 9.0 maf to less than 10 maf
    - Greater than 900 kaf for annual releases 10 maf and greater
- Release objective for September is:
    - 600 kaf for annual releases below 9.0 maf
    - 700 kaf for annual releases of 9.0 maf to less than 10.0 maf
    - 800 kaf or greater for annual releases of 10.0 maf or greater; up to power plant capacity for high equalization releases
- Monthly Release Volumes will generally strive to maintain 600 kaf levels in the shoulder months (spring and fall) and 800 kaf in the December/January and July/August timeframe.

Additionally, the Bureau of Reclamation will continue to apply best professional judgment in conducting actual operations and in response to changing conditions throughout the water year. Such efforts will continue to be undertaken in coordination with the DOI/DOE agencies and in consultation with the Basin States as appropriate, to consider changing conditions and adjust projected operations in a manner consistent with the objectives of these parameters as stated above and pursuant to the Law of the River.

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Date: June 14, 2016 **Start Time**: 9:30 a.m.

Conducting: Vineetha Kartha, TWG Chair
Shane Capron, TWG Vice-Chair (phone)
Facilitator: Mary Orton, The Mary Orton Company, LL

C**ommittee Members/Alternates Present**:

Melinda Arviso-Ciocco, Navajo Nation
Jan Balsom, NPS/GRCA
Cliff Barrett, UAMPS
Kerry Christensen, Hualapai Tribe
Kevin Dahl, National Parks Conservation Assn. (phone)
Bill Davis, CREDA
Craig Ellsworth, WAPA
Katrina Grantz, U.S. Bureau of Reclamation
Paul Harms, State of New Mexico
Jeffrey Inwood, State of Arizona
Robert King, State of Utah
Joe Miller, Int'l Federation of Fly Fishers/TU
Jessica Neuwerth, State of California (phone)
Peggy Roefer, UCRC/Nevada
Dave Rogowski, Arizona Game & Fish Dept. (phone)
Randy Seaholm, State of Colorado
Larry Stevens, Grand Canyon Wildlands Council
Rosemary Sucec, NPS/GLNRA
Michael Yeatts, Hopi Tribe
Kirk Young, U.S. Fish and Wildlife Service

Committee Members Absent:
Charley Bulletts, Southern Paiute Consortium
Chris Budwig, Int'l Federation of Fly Fishers/TU
Kurt Dongoske, Pueblo of Zuni
Chris Harris, State of California
Chip Lewis, Bureau of Indian Affairs
Ben Reeder, Grand Canyon River Guides
Steve Wolff, State of Wyoming

Grand Canyon Monitoring and Research Center:
Helen Fairley, Program Manager
Kyrie Fry, Communication
Joel Sankey, Scientist (Phone)
Scott VanderKooi, Center Director

Interested Persons
David Braun, Sound Science LLC (phone)
Jennifer Crandell, State of Nevada
Marianne Crawford, U.S. Bureau of Reclamation
Paul Davidson, U.S. Bureau of Reclamation
Jessica Gwinn, U.S. Fish and Wildlife Service
Joseph Holway, SSI
Dawn Hubbs, Hualapai Tribe
Leslie James, CREDA (phone)
John Jordan, Int'l Federation of Fly Fishers/TU (phone)
Dr. Sarah Rinkevich, DOI Federal Liaison
Seth Shanahan, SNWA

Meeting Recorder: Linda Whetton

Welcome and Administrative: Ms. Kartha welcomed the members and the public.

1. Introductions were made and a quorum determined.
2. Approval of April 19-20, 2016, Meeting Minutes. Motion to approve proposed by Mr. Stevens, seconded by Mr. Christensen. Pending one edit, the minutes were approved by consensus.
3. Review of Action Items (***Attachment 1***).
4. LTEMP Update – Ms. Grantz. The comment period closed on May 9. The co-leads continue to meet with the cooperating agencies and tribes in drafting responses to the approximately 3,000 comments. The Final EIS is on target for completion in mid-August and the ROD should be signed in September.
5. Update on Species of Management Concern – Mr. Stevens. Information on the Shallow Hyporheic Anoxia (SHA) pilot study will be provided later this morning

TWG Chairperson Election – Ms. Kartha. The floor was opened for nominations. Mr. Stevens nominated Mr. Shanahan, seconded by Mr. Seaholm. Hearing no objections, Mr. Shanahan was unanimously voted in as the TWG Chair for Fiscal Year 2017. Seth is originally from Atlanta, Georgia. He has a bachelor's degree from the University of Georgia in Forestry Resources. Upon graduation, he and his wife moved to Las Vegas and have been there for 18 years. He continued his studies at the University of Las Vegas and received an M.S. in Water Resources Management. He began working for

the Southern Nevada Water Authority 15 years ago and was involved in an adaptive management program focused on improvements in the river that flows out Las Vegas Valley which ultimately got expanded into a watershed-wide adaptive management program.

Hydrology and FY17 Hydrograph (***Attachment 2***) – Mr. Davidson. There was good snow accumulation through February and then the basin dried up until the end of April. Snowpack peaked at 94% on April 2nd followed by a sharp decline. The Lake Unregulated inflow for April-July was June Most Probable at 6.5 maf (91%), April Minimum Probable at 3.85 maf (54%) and April Maximum Probable was 7.65 maf (107%). The average for the 30-year period (1981-2010) was 7.16 maf. The operating tier was set in August 2015 with an April adjustment for balancing. The goal is to balance the contents of Lake Powell and Lake Mead by the end of the water year with a potential release of 8.23 maf – 9.0 maf. Currently they're projecting a 9.0 maf release.

Ms. James said there could be impacts to GCD operations with the closure of the Aliso Canyon natural gas plant. Current discussions are focused on impacts to the grid as a result of emergency situations if brownout/blackout situations occur in California. As temperatures continue to rise, notifications will be provided. The NPS has begun notifying people of the potential impacts to people visiting the parks.

FY17 Hydrograph – Mr. Davidson. The 2017 operating tiers look to operate in the upper elevation balancing tier with the Minimum Probable at 8.23 maf, Most Probable at 9.0 maf, and the Maximum Probable at 11.91 maf. A projected April adjustment to balancing would be somewhere between the 8.23 maf and 9.0 maf releases. The Maximum Probable would also be starting in the upper elevation balancing tier with a projected April adjustment to equalization. The current 2017 proposal is:

Annual Release Volume	June	August	September
Less than 9.0 maf	600 kaf – 650 kaf	800 kaf	600 kaf
9.0 maf – less than 9.5 maf	800 kaf	900 kaf	700 kaf
9.5 maf – less than 10 maf	900 kaf	900 kaf	700 kaf
10 maf and greater	900 kaf or more	900 kaf or more	800 kaf or more

There is significant uncertainty in how the hydrology develops through the year and they don't know if we'll be in a really high release year until well into the year. They will continue to coordinate with the TWG and AMWG in developing a recommendation to the Secretary at the August AMWG meeting.

Motion (Proposed by Craig Ellsworth, seconded by Kevin Dahl): TWG recommends the AMWG recommend to the Secretary of the Interior her approval of the DOI-DOE Proposed Hydrograph for Water Year 2017 as follows (refer to first page of minutes for entire motion).

Science Advisor Program Charter and Protocols (***Attachment 3***) – Ms. Grantz. Reclamation has received two formal requests for government-to-government consultation with two tribes and is in the process of arranging those meetings. Until consultation occurs, it's not appropriate to take action on this agenda item today. If those meetings occur in sufficient time, the TWG could hold a webinar and prepare a recommendation for the AMWG's consideration at their August meeting.

Species of Management Concern (***Attachment 4***) – Dr. Stevens. This is a pilot study being funded by WAPA through Argonne Labs and the Museum of Northern Arizona. This is a one-year project consisting of two tasks, 1) compile and evaluate existing information on CRE regional aquatic macroinvertebrate diversity and water quality requirements, and 2) map the distribution of Shallow Hyporheic Anoxia (SHA) and conduct field experiments on its development and impacts. They've been impressed with the number of species that occur in the region that don't occur in the river. There isn't much EPT (stoneflies, mayflies, caddisflies) in the mainstem, but in the region they've actually seen some of the highest diversity known from the Western United States. The work is focused at looking at their presence in the

Colorado River drainage and trying to understand the water quality requirements of this vast array of species.

Q&A, Comments:

- *In the past we've always seen the massive growth of cladophora in the upper Lees Ferry area reach and not below there that much, could this be a possible source of the organic material you're talking about?*
    - *There's little doubt that organic growth and the bread basket effect there at the Clearwater Reach is probably related to it. It's a 30-fold drop in standing mass as you go from Lees Ferry Reach to below the Paria. There's a very rapid transition there with just a little bit of mud coming in from the Paria River is enough to turn out the lights and therefore stop benthic primary production.*
- *Can you expand on the Western funding and what sources of funding are you looking at in the future?*
    - *Funding is by Western through Argonne and NAU at $72,000 for the year. It's not part of the present budget and work plan, but it could emerge as an element to look at in the future.*
- *The fishing community looks forward to the integration of this study with the proposed bug flows and EPT studies and would be happy to assist in any way.*

FY17 Budget and Work Plan (***Attachment 5a***) – Mr. Capron. The GCDAMP Budget Process Paper created on 5/6/10 and amended on 3/20/11 (Table 1) is currently being revised for a triennial work plan. The Budget Ad Hoc Group held two recent conference calls and the results of those were captured in a report to the TWG (***Attachment 5b***). He highlighted some of the issues discussed and how they were resolved.

Clarifying Concerns:

1. Project D.2.5 was originally for tribal synthesis but now seems subsumed into the SAP review of the cultural program.
2. There were some other smaller projects under the cultural budget that were also not carried forward, a river trip and some smaller projects.
3. What are the other cultural projects – their status, was work ever started, and the timeline?
4. Temperature driven fishery concern and the use of the bypass tubes. Colorado cannot agree to creating beaches and making other changes as a result of temperature conditions.

Reclamation Budget (***Attachment 5c***) – Ms. Grantz. The FY2015-17 TWP is based on the four desired future conditions, TWG recommendations, and being responsive to the LTEMP EIS. The challenge in preparing a 3-year budget is using the standard 3% CPI rate when the actual CPI rate won't be known until later in the year. Fiscal Year 2016 is tracking at 0% CPI and Reclamation has decided to use 0% CPI for the FY17 budget which breaks down to: **Overall Budget = $10,755,000 / Reclamation $2,083,000 / GCMRC $8,672,000**. Other line items of interest:

- Experimental Flow Fund. Because HFEs were done infrequently, it was necessary to build a reserve fund to pay for the extra monitoring, boats, and staff labor costs. Using a 3% CPI rate, it comes out to $530K each year. If the money isn't used, then it goes for the Native Fish Conservation Contingency Fund which supports any emergency actions or doing non-native removal for conservation. The current balance is about $1.06 million. There are some elements in Projects 6 slated to use the NFCCF to pay for studies on HBC aggregations, a pilot project on portable PIT-TAG work, and mainstem activities with FWS. In Project 7 some of money would go toward work looking at juvenile HBC and their movements in relation to monsoon activities and when they move out of the mainstem, a smaller study to look at spawning substrates, and some work to develop a non-lethal tool to determine the physiological condition of HBC. The program has never decided what the appropriate level is for the two funds and perhaps this should be considered going forward into the FY18-20 work plan.
- Cultural Resources. This is includes Reclamation's administrative oversight on the Programmatic Agreement and various projects. Remaining concerns:
    - Tribal Synthesis (D.2.5). The BAHG had discussed passing the money through to the SAP as part of their evaluation of cultural resources but more discussion is needed. If there is work that fits within this project, the tribes should send scopes of work to BOR.
    - Annual Integrated River Trip (D.2.6). It's unlikely a river trip will be conducted this year so the money could be allocated to something else that focuses on cultural values.
    - NNF Removal Consultation (D.2.7). In conjunction with LTEMP work, more money may be needed in FY16 and into FY17.
    - Tribal Preparation (D.2.8). Ms. Crawford said that Loretta Jackson and Peter Bungart came to Reclamation to start the process, but it didn't get done. Ms. Sucec said this topic came up at a recent PA meeting and the feeling was that the CRAHG and the agencies should discuss further. The $20K is available if needed.

Melinda will take the lead on moving this forward to the CRAHG's attention.

GCMRC Budget (***Attachment 5d***) – Mr. VanderKooi.

- Project 1. BOR was funding water quality work for Lake Powell but not with AMP dollars. After a review period, BOR decided to pull this project back under their control. GCMRC still uses the information and wants to keep that information moving as well as having instrumentation in the dam operational. GCMRC has some carryover money from this project and can use that to keep the instruments in the water.
- Project 2. This project monitors quantity and quality of water in the canyon and tributaries and also sediment transport. It supports information provided on GCMRC's website.
- Project 3. This project does repeat surveys and photography of fixed sites with sandbars to determine what happens before and after HFEs and during normal operations.
- Project 4. This is looking at interaction between hillslope processes and the river corridor and what happens with HFE sand as it gets moved. The BAHG had a fair amount of discussion about this project. Funding is on GCMRC's side of the budget with some money from the cultural program. This will continue through FY17.
- Project 5. There were a number of studies proposed for the first part of the work plan that had started to sunset out. They're more literature surveys and also some work that was funded by WAPA to do some comparative work in conjunction with Utah State researchers to look at the aquatic foodbase downstream of other dams in other sections of the Colorado River. Much of the work is sunsetting going into FY17.
- Project 6. There are several studies focused on fish. This is work that GCMRC, USFWS, and AZGFD does. Some work is sunsetting or weren't funded at all in the work plan. A lot of this is HBC, mainstem aggregations, PIT-TAT antennas and picking up some creel fishery work.
- Project 7. This is focused on HBC in the Little Colorado River. Much of the work is continuing into FY17 and includes looking at spring and fall abundance estimates, work at the confluence, out migration estimates and the population modeling that Charles Yackulic and his group does.
- Project 8. The PEP is scheduled for this year and so only funded in FY16. These are experimental actions intended to increase native fishes in the GRCA and tributaries. A couple of things ramping up in FY17 some surveillance of invasive species in the LCR watershed and looking at some HBC genetics in the lower basin.
- Project 9. This is largely RBT work in Glen and Marble Canyons. A big chunk of this project has been the natal origins study. Some of these components sunset in FY16 but work will continue. He failed to properly fund the follow-up natal origins study and didn't include in the FY17 budget, but they've found some funding to cover that work.
- Project 10. This is an interdisciplinary study looking at substrate in Glen Canyon and relating that to responses in fish and the aquatic foodbase.
- Project 11. One of these studies was completed in FY15, a workshop to look at some of the successes and challenges in vegetation in the Colorado River and the Rio Grande. This was funded by the USGS WaterSmart Program and are proposing to continue the work with a person to fill behind Daniel Snarr.
- Project 12. This project is not funded in FY17. It's the work being led by Helen Fairley to look at culturally important plants. Any activity on this will need to be done with carryover funds.
- Project 13. This is the socio-economics work being led by Lucas Bair. The first portion is sunsetting in FY16 and then ramping up with 13.2. This is well underway and Lucas has been working with the tribal representatives.
- Project 14. This is ongoing GIS work.
- Project 15. This is Administrative support.

He presented a pie chart on how the work is split among the projects. The amount approved in the workplan was $9,286,900. GCMRC's move into the new facility is delayed until early 2018. Right now they're projecting a 12% overhead rate for FY17 for a proposed budget of $9,060,000 based on a 0% CPI. They feel confident there will be enough money, including the additional fisheries work, to cover all the projects.

Q&A, Comments:

- *Can you break down where the carryover amounts came from and add a column to show what was expended?*
  - *Reclamation can provide a report at the TWG October meeting. GCMRC currently provides an annual report every December.*
  - *In the Lower Basin MSCP, that information isn't provided until February and that time frame is very sensible.*
- *What was the cost of handling the Green Sunfish issue?*
  - *The AMP did fund part of the work. GCMRC had an agreement with AZGFD to do a higher level effort to remove RBT from the Paria River down to Badger Rapid. Right before the contract was in place and work was to begin, whirling disease was detected in GLCA in that trout population. It was illegal to remove those*

trout out of the river and that project was put on hold in perpetuity. When the GSF issue came up, GCMRC talked with Reclamation about revising that agreement to broaden the scope. They made that revision and AZGFD's participation was covered through funds obligated in 2011 and some funds are still available. Since GSF will likely occur again, it might be good to consider something more permanent and be ready when that happens. It may be worth considering as a conservation measure under the LTEMP. A reminder that dealing with emergency situations involves NEPA and there are methods in contracts to do that.

- *What's the potential carryover for Experimental Flows Funds?*
    - *There will be $500K added in for FY17 and there is still some money in the NFFCF. Reclamation is not proposing to use the EFF or the NFCFC in FY17 so there will be approximately a $2.01 million balance.*

Mr. Seaholm advised the TWG to revisit the "Loveless" guidance document (***Attachment 6***) and offered the following motion:

TWG recommends that the AMWG recommend to the Secretary of the Interior her approval of the Final FY2015-17 Triennial Budget and Work Plan from the Bureau of Reclamation and the Grand Canyon Monitoring and Research Center for implementation in FY2017, with the following caveats:

- Following issuance of the LTEMP ROD, the TWG requests the opportunity mid-year to reassess whether any adjustments should be recommended to the FY17 budget, specifically whether the findings to date of any given project justify continued funding, and whether the project satisfies conditions in the 1992 Grand Canyon Protection Act as guided by the "Glen Canyon Dam Adaptive Management Program, AMWG FACA Committee Guidance" document prepared by Scott Loveless and found in the April 20, 1999 TWG Minutes. TWG requests concurrence from AMWG on this process and seeks direction from the AMWG on whether to include this process long term by incorporating it into the triennial budget development process.

There are many documents that help guide the budget and Ms. Kartha felt it would be better addressed in the budget process and not included in the FY17 budget motion. She asked for comments.

Q&A, Comments:

- *Having the Loveless document in previous 1999 meeting minutes doesn't give it any greater status as many other documents have been issued since that time (CFMP of 2014). This motion needs to be carefully documented and referenced. Consider having the BAHG discuss and prepare a motion for TWG to consider.*
- *The LTEMP ROD will kick off a major assessment of what projects must be done with the resulting BO and BA. Having the ROD signed and the FY18-20 budget planning process occurring at the same time seems like duplicative efforts and could distract from the 2017 work.*
- *Consider including language that "we recommend that future years be re-evaluated using the Loveless document and other appropriate documents" for every budget cycle.*
- *The adverse effects and mitigation to natural and cultural resources is also in the GCPA and can see where the socioeconomics being directly correlated to one of the projects mentioned earlier in terms of environmental and economic justice. Where would that portion of this motion goes in terms of the cultural and natural resources and mitigation and practices?*
    - *Randy: The cultural and natural resource issues are covered in the motion and can certainly be addressed. Using AMP funding to look at those issues and if there are things we can do through modifying dam operations, then we should go ahead and do those things. There are many legal authorities to address socioeconomic and cultural issues. I'm just trying to cut to the chase and say this is what we do with AMP funding and there are other legal authorities that Reclamation, NPS, etc., can use to address many issues.*
    - *The focus should be on FY17 and going into the FY18-20 budget cycle. The Department will provide direction on when to implement the LTEMP ROD. Reluctant to point to one guidance document and would prefer to use the actual legislation rather than a document that describes the legislation.*
    - *Revisiting the Loveless document confuses and complicates trying to approve the FY17 budget when ongoing projects are already in place.*
    - *There's been a lot of information gathered since 1999 and we should wait to see what the new LTEMP looks like. We should be talking about how the resources are doing and improving conditions downstream which is what the GCPA was set up to do.*
    - *Put a period after the FY17 budget and consider two motions, one to approve the FY17 budget and the second one to review the budget process.*

Mr. Seaholm withdrew his motion. Knowing the comments were captured in the minutes, he suggested this issue be addressed in a future TWG meeting.

Proposed motion language by Mr. Barrett: TWG recommends that the AMWG recommend to the Secretary of the Interior her approval of the GCDAMP FY17 budget as described in the two tables (attached) from the Bureau of Reclamation and the Grand Canyon Monitoring and Research Center subject to further review following the LTEMP ROD issuance.
Comments:

- *Don't want to depend on the ROD to change the budget.*
- *Add "TWG further requests that AMWG give TWG the opportunity to further review the FY17 budget after issuance of the LTEMP ROD, to determine if changes are necessary as a result of the ROD."*
- *If the budget tables are attached, then the dollar amounts don't need to be inserted.*
- *Need to address the budget line items that haven't been expended "CRAHG will provide … implementation on D.2 and D.5.I*

FINAL MOTION: Proposed by Cliff Barrett, seconded by Paul Harms. TWG recommends that the AMWG recommend to the Secretary of the Interior her approval of the GCDAMP FY17 budget as described in the two tables (attached) from the Bureau of Reclamation and the Grand Canyon Monitoring and Research Center. TWG further requests that AMWG give TWG the opportunity to further review the FY17 budget after issuance of the LTEMP ROD, to determine if the budget and/or work plan changes may be needed as a result of the ROD. Further, tribal representatives will work with Bureau of Reclamation on the implementation of its budget items D.2.5 through D.2.8. Passed by consensus.

Ms. Kartha said there would be more discussion on the budget process motion tomorrow.

Agenda Update – Ms. Orton. Two items have been cancelled on tomorrow's agenda: 1) Programmatic Agreement Update by Mr. Chada at 9 a.m., and 2) Linkages between Lake Powell Reservoir and the Colorado River Below Glen Canyon Dam at 10 a.m. These will be rescheduled for a future meeting.

GCMRC Deputy Chief Update – Mr. VanderKooi. The vacancy announcement for the Deputy Chief at GCMRC was posted on USAjobs yesterday (https://www.usajobs.gov/GetJob/ViewDetails/441635700/). It will close on July 12, 2016.

Public Comment: None

Adjourned: 4:47 p.m.

June 15, 2016

Start Time: 8:30 a.m.

Conducting: Vineetha Kartha, TWG Chair
Shane Capron, TWG Vice-Chair (phone)
Facilitator: Mary Orton, The Mary Orton Company, LLC

Committee Members/Alternates Present:

Melinda Arviso-Ciocco, Navajo Nation
Jan Balsom, NPS/GRCA
Cliff Barrett, UAMPS
Kerry Christensen, Hualapai Tribe
Kevin Dahl, National Parks Conservation Assn. (phone)
Bill Davis, CREDA
Craig Ellsworth, WAPA
Katrina Grantz, U.S. Bureau of Reclamation
Paul Harms, State of New Mexico
Jeffrey Inwood, State of Arizona
Robert King, State of Utah
Joe Miller, Int'l Federation of Fly Fishers/TU
Jessica Neuwerth, State of California (phone)
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Dave Rogowski, Arizona Game & Fish Dept. (phone)
Randy Seaholm, State of Colorado
Larry Stevens, Grand Canyon Wildlands Council (phone)
Rosemary Sucec, NPS/GLNRA
Michael Yeatts, Hopi Tribe
Kirk Young, U.S. Fish and Wildllife Service

Committee Members Absent:

Charley Bulletts, Southern Paiute Consortium
Chris Budwig, Int'l Federation of Fly Fishers/TU
Kurt Dongoske, Pueblo of Zuni
Chris Harris, State of California
Chip Lewis, Bureau of Indian Affairs
Ben Reeder, Grand Canyon River Guides
Steve Wolff, State of Wyoming

Grand Canyon Monitoring and Research Center:

Helen Fairley, Program Manager
Kyrie Fry, Communication
Joel Sankey, Scientist
Scott VanderKooi, Center Director

Interested Persons

David Braun, Sound Science LLC (phone)
Jennifer Crandell, State of Nevada
Marianne Crawford, U.S. Bureau of Reclamation
Paul Davidson, U.S. Bureau of Reclamation
Jessica Gwinn, U.S. Fish and Wildlife Service
Dawn Hubbs, Hualapai Tribe
Leslie James, CREDA (phone)
John Jordan, Int'l Federation of Fly Fishers/TU (phone)
Dr. Sarah Rinkevich, DOI Federal Liaison
Seth Shanahan, SNWA

Meeting Recorder: Linda Whetton

Welcome and Administrative: Ms. Kartha welcomed the members and the public.

Budget Process – Mr. Capron. The BAHG has been working on revising the budget process since passage of the last TWP. With instruction to do a 3-year budget and work plan in the last budget cycle, there was also guidance from Anne Castle to revise the internal budget process. The TWG isn't far enough long to recommend a process to the AMWG for approval at this point in time. He pointed out that Section 2.1, budget principles, is the place to describe the appropriate guidance that the program should be follow and what needs to be considered in approving future budgets. In the newer version (***Attachment 7a***) they focused on removing some of the older documents such as replacing the Strategic Science Plans with the DFCs. In the DFCs Appendix, there's a section that talks about compliance responsibilities and all of the regulations. The budget process has also been discussed by the Steering Committee AHG and they feel it's time to refer it to the BAHG for a more thorough review and bring something forward at the October meeting for the TWG to review. He suggested developing a list of the issues for the BAHG to consider.

Based on yesterday's discussion and confidence in Mr. Capron as the BAHG Chair, Ms. Kartha tasked the BAHG to work on the budget process guidance document and asked each stakeholder to offer their

concerns (see ***Attachment 7b***). Mr. Capron pointed out that the AS-WS asked the AWMG and TWG to revise the 2-year budget process to a 3-year budget process. She was very specific in the task and while the group can consider changes they'd like to make, there will need to be input sought directly from the Department of the Interior since those instructions came from AS-WS Anne Castle.

Water Quality Monitoring (***Attachment 8***) – Mr. Radtke. There were originally 12 water quality sampling stations but new stations were added in-between those to the current 26 stations. The only things that have changed are the inflow sites going from Hite Ridge to the Dark Canyon area but with the recent downtrend of the reservoirs, the Hite Marina no longer exists. They used to go up the Escalante River to the inflow, but they can no longer get to the area because it's now mostly sediment and shallow water. The stations they visit now are sampled on a quarterly basis. Instrumentation has changed over time and he shared pictures of current sampling methods. They're currently using a seabird instrument which goes down through the water column and has an actual pump that when descending will pump water through some of the probes and sensors. Historically temperature, dissolved oxygen, pH and conductivity were being monitored back in the 1960-70s because the instruments didn't have the ability to have other sensors added onto them. Once the seabird is brought up to the water surface, they're able to connect it directly to the computer and can present a graph of the changes of those parameters and determine where water samples will be taken. Water samples are always taken at the surface in the bottom and if there is an interflow or a unique water body within the water profile, then they can determine if that's where they want to take a sample also. They always make sure the water is not in a situation where it is not consistent as they want well-mixed water. They do quality control to make sure that the samples sent to the lab are repeatable and have validity. They also have the ability to test for hydrogen sulfide while on the boat. Lab water quality analyses is performed to test for major ions, pH, conductivity, Chlorophyll, alkalinity, nutrients and plankton. They also sample inside the dam at the draft tube for the penstock, taking the same water sampling. In front of the buoy line in front of the dam a thermistor string and temperature mod units are set for one hour temperature readings. He presented graphs with results from the Lake Powell Forebay TDS 1964-Aug 2015 and Lake Powell TDS August 2014. Reclamation is committed to continuing the water quality monitoring into the future and have interagency agreements with the USGS and the NPS.

Q&A, Comments:

- *How are the data being manipulated? If there's a change in reduced regimes out of the dam and more water released out of the bypass tubes, how would that affect the chemistry within the reservoir? Are others looking at modeling to determine how that would change?*
    - *Reclamation has the CE-QUAL W2 model which was used in the past to model specific changes that we wanted to look for. In the mid-2000s when the DO was coming through, we saw that in the inflow areas and there was another flow of DO and one of our employees had modeled that and saw that what was coming of the dam would show low DO below the dam. They do have the model but it isn't generally run unless there is something unique that signals a red flag.*
- *I believe Bill Stewart and Dave Rogowski with AZGFD showed slides at January AR meeting with the outflow temperatures of the dam approached 20°C. We raised the concern that we're gathering data that could be very useful in predicting whether or not we would approach water temperatures or DO levels of concern for the fish in the Lees Ferry Reach. We should be making use of this information and something in place to take action if necessary to prevent impact on one of the resources, specifically the RBT.*
    - *Scott: The data is information that Bill Vernieu was from instruments down below the dam that we have to get access to but has posed a challenge. Bill would generate plots of that data and provide that to AZGFD. In terms of real-time data, we have that available at Lees Ferry and is updated online every 15 minutes through GCMRC's website.*

Update from Grand Canyon National Park – Ms. Balsom. The following updates were provided on work in Bright Angel Creek:

- There's been a 62% reduction in BT so our projection is that by year 5, which is the end of the project, we will have reached our goal of 80% reduction in the numbers.
- For RBT, there's been a 68% reduction. All the fish that are removed from the Canyon are put to beneficial use, either for human consumption or the smaller fish are going to the aviaries.
- The native fish abundance has been increasing and distribution expanded throughout the system - Speckled Dace,

Flannelmouth Sucker. Juvenile Flannelmouth were found overwintering the first time in 2016.

- The biomass, total weight and average size of trout species has declined.
- Colorado River range inflow data analysis is still in process.
- Weir hatcheries have been low which is associated with fewer trout coming up in the creek.

Work in Havasu Creek has been working out as well with translocations:

- The goal is to maintain at least 200 adult HBC
- Just completed another monitoring trip where they saw spawning and reproduction in Havasu.
- There have two age classes, fish producing 2014 and 2015.
- Untagged juvenile HBC were captured, 20 individuals at this point
- Released another 300 juvenile HBC on May 18. That project is moving along well.
- Have a project working with the USGS on the water quality partners program doing a post-____ fire waterfall, aquatic habitat monitoring program in Shinimo Creek. Just received notification that we're getting funding and the project being done with physical scientist and USGS out of Fort Collins. This is a project outside the program but will provide useful information as we move translocations into the future.

Q&A, Comments:

- *The smaller forms of RBT that are fingerling size are the ones that are actually going to be problem for young HBC as they spawn. Are you doing any kind of work to look into that aspect?*
    - *We're not seeing more spawning going on. We're seeing all the non-native numbers go down. We're not looking at chub spawning in BAC at this point in time and won't be doing any translocations into BAC.*
    - *Marianne Crawford: Part of making this successful is there's a weir blocking fish coming in so if spawning isn't occurring, it slows the removal effort. It tends to remove the larger fish and then those fish that have been spawned there are in higher numbers but because of this spawning being blocked by the weir, that's not as big a problem as it could be.*
    - *Dave Rogowski: In a recent trip into BA Reach five miles above and five miles down in April, we caught six RBT. We could see the effect of what NPS is doing from the removal from BAC. We can model that and show that the removals are having an effect in the mainstem. This is a complete reversal from 5-10 years ago when 60-80% of fish were non-native and now almost 90% are native fish.*

GCMRC Updates

- Briefing on Conditions and Processes Affecting Sand Resources at Archaeological Sites in the Colorado River Corridor (***Attachment 9a***) – Dr. Joel Sankey. The USGS publication can be found at https://pubs.er.usgs.gov/publication/pp1825). Tis study examined links among fluvial, aeolian, and hillslope geomorphic processes that affect archeological sites and surrounding landscapes in the Colorado River corridor downstream from Glen Canyon Dam, Arizona. The scientists assessed the potential for Colorado River sediment to enhance the preservation of river-corridor archeological resources through aeolian sand deposition or mitigation of gully erosion. By identifying locally prevailing wind directions, locations of modern sandbars, and likely aeolian-transport barriers, they determined that relatively few archeological sites are now ideally situated to receive aeolian sand supply from sandbars deposited by recent controlled floods. Whereas three-fourths of the 358 river-corridor archeological sites examined include Colorado River sediment as an integral component of their geomorphic context, only 32 sites currently appear to have a high degree of connectivity (coupled interactions) between modern fluvial sandbars and sand-dominated landscapes downwind. This represents a substantial decrease from past decades, as determined by aerial-photograph analysis. Thus, they infer that recent controlled floods have had a limited, and declining, influence on archeological-site preservation.

  Within the study area, overland-flow (gully) erosion is less severe in sand landscapes with active aeolian sand than in landscapes that lack aeolian transport; gullies terminate more commonly in active sand (sand that is mobile by wind rather than stabilized by biologic soil crust). We infer that these characteristics largely result from aeolian sand transport being an effective gully-limiting and gully-annealing mechanism. Aeolian sand activity in the river corridor varies substantially as a function of reach morphology and dominant wind direction relative to the river-corridor orientation, factors that control accommodation space for river-derived sand and the modern sand supply to aeolian dunes. These attributes, together with an inverse correlation between aeolian sand activity

and gully occurrence, define varying degrees of net long-term gully-erosion risk for sediment deposits and associated archeological sites in different regions of the river corridor. Over most of the river corridor, including some of the archeologically richest regions, sand is too inactive with respect to aeolian transport to anneal gullies effectively. Having found no differences in weather patterns to suggest greater erosive forcing in Glen Canyon, and no conclusively influential differences in the slope or watershed area contributing to gully formation, they attribute the greater erosion at the Glen Canyon sites to a combination of inherent geomorphic context (high terraces that do not receive modern sediment supply) and pronounced effects of post-dam sediment-supply limitation.

Conclusions:

- Most of the river-corridor archeological sites are not ideally situated to receive Aeolian sand supply from sandbars deposited by recent controlled floods from Glen Canyon Dam, and therefore are at elevated risk of net erosion under present dam operations.
- For archeological sites that depend upon river-derived sand, they infer elevated erosion risk owing to a combination of reduced sand supply (both fluvial and Aeolian) through: (1) the lower-than-natural flood magnitude, frequency, and sediment supply of the controlled flooding protocol protocol; (2) reduction of open, dry sand area available for wind redistribution under current normal (non-flood) dam operations, which do not include flows as low as natural seasonal low flows and do include substantial daily flow fluctuations; and (3) impeded Aeolian sand entrainment and transport owing to increased riparian vegetation growth due to high base flows and in the absence of larger, more-frequent floods.

Possible solutions to increase the preservation potential for sand-dependent resources include: sediment-rich high flows above 45,000 cfs, and/or seasonal low flows below 8,000 cfs, and/or riparian vegetation removal. They have been developing a monitoring protocol to monitor the effects of flow and non-flow actions to mark conditions of archeological sites.

Q&A,Comments:

- *One slide showed the exposed area of the sand pre-dam and post-dam. Was that because we used to have much higher flows and therefore when you have a really high flows, you didn't have as much sand exposed and when you had really low flows. You had a lot, right?*
  - *Exactly and that's work that is currently underway and will be working on in 2017.*
- *You mentioned one possible way to deal with trying to develop more sand would be more frequent HFEs, one right behind the other. Frequent HFEs don't allow the foodbase to recover. Is there any way to deal with that apparent conflict?*
  - *We would have to be better integrated with the aquatic foodbase work to make sure that the recommendations are consistent and could be done relative to other important resources.*
    Scott: We agreed to provide evaluation of the HFE effects on the aquatic foodbase. Having not gone into that in great detail, we haven't seen much of a response in the fall events one way or another. Ted Kennedy's opinion is we haven't seen results to the degree that was after the 2008 event.

- Update on Fisheries Program Protocol Evaluation Panel (***Attachment 9b***) – Mr. Scott VanderKooi. He and Dr. Braun are seeking opinions on this PEP. The fisheries program comprises approximately 40% of the budget and is grappling with how to plan future monitoring and research activities in light of recent advances in our scientific understanding, proposed management actions, and financial constraints. The PEP is currently scheduled for August 1-5, 2016. The objective is to observe quality and relevance of the fisheries science being conducted by GCMRC and its cooperators. They want the panel to make recommendations around the scope and direction of the program and provide evaluation and recommendations for future work with respect to the level of efforts, study design, and relevance of individual research activities.

Dr. Braun provided the names of those individuals who would comprise the PEP. The ended up with a list of 29 names throughout North America, and of those they wanted to select five people. Those individuals would have experience in large rivers and the kinds of fisheries monitoring issues that come

up with GCDAMP, experience with adaptive management programs in general, and have very high levels of professional credibility and recognition. They ended up with the following five individuals:

- Andrew Casper (http://wwx.inhs.illinois.edu/directory/show/afcasper) – serves as Director of the Illinois River Biological Station. He is a member of a large river fish monitoring forum that members of GCMRC are also involved with.
- Keith B. Gido (https://www.k-state.edu/fishecology/gidoCV.pdf) – is from Kansas State University. He has a long work history in the Upper Colorado River Basin as well as in the Western Plains. He works on a wide variety of issues in conservation of aquatic systems, evaluation patterns and processes, regulating species diversity and habitat associations, interactions between native and non-coevolved fishes and fish assemblages.
- Donald Jackson (http://www.eeb.utoronto.ca/people/d-faculty/Jackson.htm) – is from the University of Toronto and is a worldwide expert recognized for his work on ecology and fish populations, ecosystems, theoretical and computational biology, structured composition of ecological community and aquatic ecosystems.
- James T Peterson (http://fw.oregonstate.edu/content/james-peterson) – is from the USGS Argonne Cooperative Fish and Wildlife Research Unit at Oregon State University. He has a wide diversity of experience with large river systems and monitoring adaptive management of regulated rivers.
- Frank J. Rahel (http://www.uwyo.edu/zoology/people/rahel.html) – is from the University of Wyoming and possesses expertise throughout the Western United States in fish ecology, fisheries management, impacts of climate change in basin species interactions, fish and habitat movement patterns and a expertise in monitoring.

Dr. Braun said they tried to find women to expand the diversity of the group because there are differences and perspectives, but the field of fisheries biology does not seem to be very popular for women. Initial plans include taking people up to Lees Ferry and into Glen Canyon for an overnight campout to give them a sense of being out on the river and provide more time for interactions with other scientists.

Q&A, Comments:

- *Having a panel of five white professors isn't very balanced. How successful was the previous PEP and were those suggestions incorporated into this program to better understand how this process has been working?*
    - *Dr. Braun: We looked at the previous fish PEP and the aquatic foodweb PEP and this is very much going to be an update on both of those. This PEP will update what is understood and deal with the efficiency of monitoring and research from resources to see if there are ways to better synchronize field activities to free up resources and avoid duplication of efforts.*
- *Will these scientists deal with nonnative fish issues? We need to be able to convey the constraints of doing experiments, i.e., removal of RBT at the mouth of the LCR and that it's no longer an accepted method. We need to be cognizant of what suggestions are made to the PEP. We have two reservoirs of fish upstream and downstream and wondering if the PEP is going to be dealing with both the reservoirs as well as the river in some fashion or are they going to be strictly looking at monitoring and research within the river system itself?*
    - *Dr. Braun: The scientists will be reviewing monitoring and research methods and the questions being asked. Policy decisions that lead to these questions come from a different level within the GCDAMP. It's a delicate matter to ask people who are not familiar with the GCDAMP and not part of the decision-making process to come and provide advice on alternative management practices. They can address questions having to do with whether the causes and effects that lead to these management decisions are being effectively monitored and understood in order to guide management. It's a balancing act and I don't expect this panel to offer recommendations for alternative management practices. They're going to be a given a fair amount of background material to read and suggest the TWG attend the introductory discussions in Flagstaff and help these panelists some of the complexities of the issues that the GCDAMP is trying to grapple with.*
    - *Scott: In terms of review of the entire reservoirs, I'd say no but in terms of how they're a potential source or influencing factor on what's going on in the river, I would think that's fair game.*
- *Is the specific reference to BAC on one of your slides really by way of example or is that really a major focal point of that review portion? Will the materials being provided to the panel be made available to the TWG?*
    - *Scott: That's intended as an example of an experimental management action. Yes, the charge materials will also be provided to the TWG.*
- *Because there aren't any tribal fisheries people on the panel, I would ask that the tribes be allowed to do make some presentations on some of the cultural concerns for the fish. The reviewers need to hear that these fish have life value..*
    - *Scott: I want to make sure the panel has a lot of freedom and latitude and be careful about getting into policy and management issues because this is a science panel. There will be sessions that will be open to all TWG members including the tribes. Documentation and other materials should be sent to myself and Dr. Braun.*
- *Appreciate that you're starting out with a narrow set of questions for the panel.*
- *Suggest including the DFCs in the background material.*

- *Even though the PEP is specific to research and methodologies and studies performed in terms of the fisheries, it's still coming from the context of a mainstream world view. It would be really good if the cultural and tribal perspectives were of importance, then we would've been part of the discussion in terms of what Scott's mentioning how to implement some of the tribal ideas to the panel. I see the panel as being very limited right terms of the kinds of things that they'll be able to effectively review because they are not going to be getting all of the information in terms of the materials and documentation because as we all know to us as tribes we do go down to the Canyon and we do our own monitoring and it is a different approach. In terms of LCR and the HBC measurements and quantitative context, it will limiting to them if you don't have anything from the tribes in that representation of the sacredness and the extent of our longevity as people. I don't think written material does justice to anything that would happen in person.*
    - *Scott: We would like your input on how to present tribal views here. We have time constraints with this panel and need to find the right balance.*
- *Encourage you to include one or two tribal members at night in the Canyon and NPS can help you with that. The Comprehensive Fisheries Management Plan needs to be included in the background information.*
- *We should not be asking the PEP what we should be monitoring. The anglers came up with they want the fisheries to be. AZGFD came up with a management plan for Lees Ferry so I think the question to the PEP should be a lot more specific. They're way too broad and that was one of the criticisms from the last PEP panel. The directives were way too broad and there were no goals or objectives in what we had tasked them to do.*
- *The CRAHG does form a lot of issues that feed into the program. Let's not lose sight of Western Grand Canyon.*
- *As part of their NEPA process, the National Forest Service no longer uses the term "desired future conditions" but rather "desired conditions." It takes away the issue of something for the future.*
- *It's important that the vision and mission of the AMWG involves not just the scientific values but also the spiritual, cultural, physical, recreational resources, and that these can be accomplished through long-term partnerships. Partnerships take time to nurture and develop. There has to be time made for tribal input and a willingness to be flexible to allow for other perspectives.*

Action Item: Additional comments need to be sent to Scott VanderKooi and David Braun by June 24.

Next TWG Meeting – October 18-19. The meeting may be held at the new ADWR location or possibly the Pera Club. More details to follow.

Farewell to Outgoing TWG Chair – Ms. Grantz thanked Vineetha for serving as TWG Chair for the past two years and is pleased to continue on as the TWG Vice-Chair. Vineetha thanked Shane for his all his help as TWG Vice-Chair and the TWG members for their support and enthusiasm.

Public Comment: None

Adjourned: 12:22 p.m.

Respectfully submitted,

Linda Whetton
Upper Colorado Region
Bureau of Reclamation

Next Meeting: Oct 18-19, 2016 in Phoenix

Key to Glen Canyon Dam Adaptive Management Program Acronyms

ADWR – Arizona Dept. of Water Resources
AF – Acre Feet
AZGFD – 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 Ctr
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 & 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
SAP – Science Advisors Program
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
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