

Glen Canyon Dam Adaptive Management Program

Technical Work Group Meeting

July 9-10, 2024

Day 1: Tuesday July 9, 2024

Start Time: 10:03 AM PDT

Conducting: Seth Shanahan, State of Nevada and TWG Chair

Designated Federal Official: Daniel Picard (Bureau of Reclamation)

Meeting Recorder: Beccie Mendenhall, SeaJay Environmental LLC

Welcome and Administrative

- **Introductions and Determination of Quorum (16 members)** A quorum was reached.
- **Prior Meeting Minutes** notes approved and posted prior to meeting.
- **Next Meeting Date(s)** Next TWG tentatively October 29-30, 2024, in Phoenix. Also, propose to move the Annual Reporting meeting to Feb 4 – 6, 2025 to allow more time to develop reporting.
- **Ad Hoc Group Membership and Updates**
Seth Shanahan (Chair) There will be updates later in the meeting, will defer until then. Anyone who wants to join an ad hoc, send us an email and we will get you added.
- **Review Action Items, Motions, and Votes Form** Review completed.
- **Upcoming Monitoring and Research Trips**
Mark Anderson (GCMRC) Lots of active trips remain from July through October 2024. Reference the document link in meeting agenda and on web site. **Jeremy Hammen (BOR)** This information is also included in the Rapid Response minutes produced by Melissa Trammel. **Seth Shanahan** There was a trip that they were looking for help, did that get addressed? **Jakob Maase (Hopi Tribe)** Yes, that trip is out now with support from the Hopi tribe. **Seth Shanahan** Thanks, I want to point that out as there may be more opportunity for people to provide support. **Andrew Schultz (GCMRC)** Yes, we will probably need to do that a little more for the next work plan because we have less science dollars.

TWG Chairperson and Vice-Chairperson Election:

Jeremy Hammen This is the meeting each year when we elect the chair and vice-chair positions. First, thank you to Seth and Michelle for all their work in 2024. Both have volunteered to continue for another term. Any other nominations? (None offered)

Motion:

The TWG elects Seth Shanahan to the position of Chairperson and Michelle Garrison to the position of Vice-Chairperson to the Glen Canyon Dam Technical Work Group for Fiscal Year 2025.

Larry Stevens (GCWC) I motion to accept.

Jakob Maase I second the motion.

Jeremy Hammen Anyone opposed? (No) Motion accepted unanimously.

Hydrology, Glen Canyon Dam Operations, and Water Quality Conditions in Lake Powell and Below Glen Canyon Dam:

Heather Patno (BOR) Hydrology: Upper Basin Storage is still increasing in some reservoirs; others have reached peak and are decreasing. Almost 200% above average in the San Juans which is helping. Lake Powell is 42%, higher than expected in the June forecast, but expect it to peak soon. Snowpack is

complete for the year, peaking on May 3 at 113%, lower than average but better than recent drought years. **Reference slides for additional water forecast details.** Lake Powell will operate at the Mid Elevation Release Tier. July operations include the LTEMP SEIS ROD considerations but will not see much change in the 24-month release levels with these operations. Lake Powell CRIMMS forecast does not drop below 7 maf in any scenarios for 2025, so the LTEMP SEIS ROD will not be implemented. Expect to continue in mid elevation release tier. We are also above the 3525ft pool elevation trigger for Drought monitoring (DROA). Lake Mead forecast shows level 1 shortage conditions for next year, again not meeting drought response conditions. Reference slides for more details.

Q&A and Discussion

Larry Stevens (GCWC) Has the range of variability, the distance between min and max, changed in recent decades? In other words, are we seeing a climate change signal within the predictability of the system? **Heather Patno (BOR)** Yes, where we see the differences is when the CBRFC updates its third-year average with more than a million acre feet decrease between the last 2 measures. **Larry Stevens** Would it be possible to graph the change in range of variability of the predictions? **Heather Patno** Yes, I will get with the RFC to get predictability of the system over time and range in distance between min and max.

Seth Shanahan (Chair) CBRFC website has verification statistics, that gets to some of your questions. Also, Reclamation has a reference D memo that talks about the spread of projections and forecasting as you move through time, another potential reference to answer these questions.

Leslie James (CREDA) Could you clarify, at one point you said LTEMP SEIS was included, then on the CRIMMS projections you said it was not included? **Heather Patno** The LTEMP SEIS did not get signed until July 3, so it was not included in the June 24 month study. However, the LTEMP SEIS does not change the annual release volumes. So even after it is incorporated, you are not going to see a lot of changes to the monthly volumes. **Seth Shanahan** Can we have a follow up on that point? What will change if the annual volumes will not? **Heather Patno** LTEMP SEIS has the implementation of the SMB experiment and change in HFE account windows. Annual release volumes are part of the interim guidelines. SMB may change the hourly but not the monthly. And the HFE may impact a specific monthly volume, but again not the annual. **Seth Shanahan** Thanks, that is helpful.

Heather Patno GCD Operations: Transformer replacements were completed in March 2024. Bypass tube recoating will start in August 2024. On October 21, 2024, there is a dive operation to inspect the tail rays that will require a release of 4000 cfs during daytime hours. This is scheduled for only one day but may require a second day, pending day one assessment. Reference slides for Dam Maintenance schedule details through September 2025.

Q&A and Discussion

Larry Stevens The maintenance schedule in November and March/April have actions close together. Do you schedule a few days in between operations to leave opportunity for an HFE? **Heather Patno** There is a few days in between normal maintenance just in case there needs to be an extension of the maintenance. If there is an opportunity for an HFE we will have further discussions to determine the availability of 8 units to schedule the HFE.

Leslie James Will there be two bypass tubes operating at any one time? **Heather Patno** There should be three. **Seth Shanahan** Leslie, is that specific to bass flows or just normal operation? **Leslie James** Both, because of the recoating and bass flows. Between August 2024 and July 2025, you will sequence maintenance on the four tubes? **Heather Patno** Correct. **Leslie James** When was the last inspection done of the tail race? I am interested in the condition following these new and different operations. What is the change over time. **Heather Patno** I don't have the specific date, but it has been fairly recently. There has been physical modeling as well as inspection of the tail race. **Leslie James** I assume you have very good

records of what the tubes look like now before the new and different operations start. **Heather Patno (BOR)** Correct. Inspection of the tubes themselves was done last year.

Christina Noftsker (State of New Mexico) Is there a schedule for regular tail race inspections now given the concerns? **Heather Patno** Not at this time, we will have to get back to you for that question.

Seth Shanahan (Chair) I like how you added the river outlet works to the schedule. Can you update the titles better reflect the meaning of capacity for this new information? **Heather Patno** Yes.

Heather Patno A lot is happening in July due to the SEIS ROD. SMB flows are starting today due to the temperature trigger being met. We are doing a weekly review of temperatures at Lees Ferry and RM61 to make decisions on continued SMB flows. We are planning to provide a weekly update to the flows. Reference slides for details on hourly release patterns.

Leslie James (CREDA) Can I tell from this chart how much energy is not being generated during the SMB flows? **Heather Patno** No, this is just the bypass release volumes. **Leslie James** Craig, can you tell me how much energy is not being generated? **Craig Ellsworth (WAPA)** It is just an equation, you plug in the hourly bypass volume times the conversion factor and it gives you Mega Watts. **Leslie James** Can we add this information to the reporting on this topic? Or tell us how much power you have to go out and buy because of the bypass operation? **Craig Ellsworth** We could provide the monthly ops call how much energy WAPA has to buy in order to maintain energy requirements. **Leslie James** Can you report this to the TWG since they are not on the operations calls? I think that is a really important number, especially in the extreme summer heat. **Craig Ellsworth** Like Heather said, this is all new. We are having weekly coordination calls for these flows and this is one of the things we plan to discuss, what the cost is. **Leslie James** I assume the TWG would like to know that information. **Leslie James** When did WAPA get notified? **Bill Stewart (BOR)** We had three weeks of calls with WAPA knowing this was coming. We were waiting to see if the temperature trigger or the ROD signature hit first. There will be more to come on this topic tomorrow.

Deb Williams (USFWS) Can you explain the SMB flows and explain why the daily min doesn't go down to 7000 cfs and why the daily max increases? **Heather Patno** WAPA is increasing capacity during the day to mitigate some of the impact of the bypass flow. In terms of the schedule, we are just starting this procedure. We will monitor and adjust the patterns as we go. **Craig Ellsworth** You cannot reduce the flow through the generators to zero during the flow. You have to maintain a certain level of flow through the generators. That bumps up the nightly minimum.

Ryan Mann (AZGFD) I am trying to understand how this manifests to conditions at Lees Ferry on the river. Total flow is going down in the area of Lees Ferry reach? **Heather Patno** That is correct. **Larry Stevens (GCWC)** This is the release at the dam, the shape of the wave changes dramatically as you move down the stream. It might be interesting to see the hydrograph changes as it moves down the river. **Heather Patno** You will see that in the water quality presentation that is next.

Bryce Mihalevich (BOR) Water Quality: We exceeded the 15.5°C trigger for SMB flows at RM 61 starting on June 29th. As of July 3, 2024, bypass water temperature was 8.9°C while water out of the dam was 12.8°C. On July 7th, Lees Ferry measured 13.3°C, so we are already seeing reduced temperatures aligned with the SMB flow. It takes about a day for water to reach RM 61, so we hope to see the temperatures start to go down there soon. Note that RM 30 stays under the trigger without bypass flows, but not RM 61. We will save bypass flow modeling until the presentation tomorrow.

Q&A and Discussion

Melissa Trammell (NPS) On slide with bypass volumes, why is there such fluctuation, thought it would be steadier? **Heather Patno (BOR)** We are trying to minimize impacts to hydropower. In order to do that, WAPA has limited it to 4 changes in volume per day. **Seth Shanahan (Chair)** Since we are trying to reach a temperature target, this fluctuation does not impact or disadvantage the temperature goals correct? **Heather Patno** That is correct. All of the patterns meet the modeling for the LTEMP SEIS targets. **Craig Ellsworth (WAPA)** There was also a concern by the fish biologists not to have big swings in temperature on a daily scale. Agreed not more than 4 degrees change, which also impacts the flow pattern.

Larry Stevens (GCWC) Shoreline can be a much different temperature profile than the mainstream where we measure. Do we have any predictions of the warming shoreline? Is there a report on this? **Bryce Mihalevich (BOR)** That is a great question. We do not have a model for the shoreline locations. I believe there have been some studies, we could look for that. **Seth Shanahan** Who is the right person to ask that question? Is that USGS or Park Service? **Andrew Schultz (GCMRC)** Is there anyone online from GCMRC that can help with that information? **Charles Yackulic (GCMRC)** There was a plan to put in monitoring at Lees Ferry around that question. Park Service has temperature loggers in the slough. There are also some published reports on this data. **Ryan Mann (AZGFD)** We had discussed in the first Triennial workplan understanding low DO in certain parts of the river because we know it is not homogeneous across the channel. I do not believe those studies were funded, reference Bridget Deemer. I think it is important, we may need to consider for further studies. **Seth Shanahan** The existing temperature sondes that are out there are not in the middle anyway, right? **Ryan Mann** Yes, they are in mixed zones, intended to be representative of the main stem. **Melissa Trammell** I think we do have some sensors in areas that we expect to have higher temperatures. **Bud Fazio (NPS)** Aside from the -12 mile slough, we have temperature loggers at the dam slough, also 4 or 5 more that will be placed with the artificial nesting structures. There will be more on this at the presentation tomorrow. **Ryan Mann** Outside of the slough, I think the majority of areas we are worried about spawning are going to be represented by the current sensors. **Larry Stevens** Reproduction is one thing, rearing is another. The young fish probably move into those warmer areas. **Seth Shanahan** If we measure the colder parts, then we are not being conservative enough? **Ryan Mann** No matter what, we should acknowledge that reduced temperatures will reduce risk for establishment of SMB.

[Report Out and Recommendation from the Budget Ad Hoc Group for the Triennial Budget and Work Plan Fiscal Years 2025-2027:](#)

Erik Skeie (State of Colorado) There were 46 BAHG members and 16 meetings getting us to where we are now. Spoiler alert: We have not been able to come to a recommendation yet. A BAHG report was sent to everyone in advance of the meeting. A list of points to consider for evaluation was provided with the report which included 5 projects to be considered for further reduction, a few other projects to consider and some suggestions. Reference the slides for details. In closing, they also want to suggest for future TWP process improvement to 1) allow more time for the process and 2) see if USGS can support the GCMRC salaries.

Q&A and Discussion

Christina Noftsker (State of New Mexico) Can we add consideration for inflation index in the future?

Erik Skeie Absolutely. **Seth Shanahan (Chair)** We should start a list of all the items we want to consider or bring into the next TWP planning. **Kathy Callister (BOR)** Because of the government funding processes, indexing for inflation is difficult. You can possibly handle this through over target funding but there is no guarantee on these funds. **Seth Shanahan** Thanks, that is great, immediate feedback.

Seth Shanahan The next step is for GCMRC / BOR to present the latest information on the budget.

Bill Stewart (BOR) Highlighting here changes in this latest draft for the \$2.5M Reclamation part of the potential \$12.5M budget. This is an increase from the previous workplan which was \$11.36M split 80/20 across GCMRC and Reclamation. This program was funded through power revenues for a long time. The intent now is to fund the program through appropriations for the next 3 years.

Project 3: Program Management

3D Program Evaluation - Originally had costs starting in FY26 but decided to spread it out across all three years and start in FY25.

Project 4: ESA Compliance

4A Integrated Stakeholder Trip – increased funding from \$50K to \$65K plus a TWG trip in 2026

4C Experimental Fund – increased with any surplus funding we found in the budget

4G Hydropower Monitoring and Research – we moved up from FY 26 to FY25

Project 5: NHPA Compliance

No changes in these line items but reviewed them again to highlight new tribal projects and DOI funding.

Jakob Maase (Hopi Tribe) We are looking forward to the future. The 80/20 budget split is not legally binding, it was an old agreement that can be changed. We may want to consider other ratios in the future.

Andrew Schultz (GCMRC) We had a few BAHG meetings before the holiday break, then worked really hard over the holiday weekend trying to bring this as close as possible before our meeting. I want to note there are changes that have been made since the third draft sent to everyone on June 28th. The main point is that the new grand total is \$30,234,000, only \$234K over budget. Before the holiday we were \$1.462M over the budget, so big progress. Looking at % change last TWP to current across all projects, the changes are across the board only a few % different. Key adjustments since the third draft:

Project E – reduced salary for Bridget, produce one paper instead of two, reduced travel and training

Project F – reduced the logistics, no river trip in FY25 and shorter in FY26-27

Project I – BOR water quality group provided \$272K, then removed this from GCMRC budget

Project J – Cooperative agreements were removed

Project L – Cooperative agreement removed from L1, 40% reduction in staffing and science effort.

Impact: High elevation sand project reduced, will not report on LTEMP performance metric 7.3 - High elevation sand deposited by HFE, will not report on LTEMP goal 2 - Total vegetation cover, C4/B4 data

Project M – reductions related to labor rate

Adjustments to labor rate factors – shaved a small amount

Adjustments for permanent staff that are still largely uncovered

Cost Increases

- DOI overhead rate increased 7.5%
- Cost of living 2024 = 5.2%
- Increase in logistics costs = 10%
- Budgets adjusted for inflation

Ted Kennedy (GCMRC) The DOI overhead rate doubled, and the effective rate increased by 50%?

Andrew Schultz It is the special rate. This is what USGS would charge, which is zero, and there is a DOI rate, which is the one that doubled. Then there is the facility rate set by the government which changes yearly.

Development of Budget Recommendation to the Adaptive Management Work Group:

Proposed motion language:

The Technical Work Group recommends that the Adaptive Management Work Group recommend for approval to the Secretary of Interior, the Triennial Budget and Work Plan Fiscal Years 2025-2027 document presented to the Technical Work Group on July 9, 2024

Seth Shanahan (Chair) Our task as a TWG is to develop a budget recommendation to the AMWG. This is one of our core duties to provide our AMWG representative with something to consider and for them to

then consider to the Secretary. One of the contours is for us to recommend something that is within the budget we were given. This may require further consideration. I know there have been some issues and frustrations around the workplan development process. Creating an action item list for things we would like to do differently or improve in the next TWP planning will be beneficial. Our operating procedures require us to seek consensus. This has been a fantastic goal for us over time and we will try to get there today. The backup plan is to take a vote. The way this works is that the DOI agencies do not have a vote. The first step in this process is to open a discussion for members to make comments or ask questions about the budget.

Jamescita Peshlakai (BOR Tribal Liaison) I am presenting a statement on behalf of the tribes. During the BAHG meeting last week, tribal members requested additional information. GCMRC hosted a meeting yesterday at USGS with the tribes for that purpose. Four tribes participated: Navajo, Hopi, Southern Paiute Consortium, and Hualapai, Zuni was not present. The outcome from that meeting is that the four tribes are in strong support of C1.2, J3, C4, D4, D5. They do not have any preference as to where the funding comes from, but they do want to see these specific projects funded. They would add a stipulation that the funding for these projects does not have a negative impact to other tribal project funding, or that the tribes themselves are involved in decisions around the funding changes.

Edward Wemytewa (Pueblo of Zuni) I was at another meeting yesterday so was not able to attend the GCMRC meeting for Zuni. However, I do have a statement on behalf of Zuni. Zuni would like to submit our response in writing per the government-to-government protocols. **Malcom Bowekaty (Pueblo of Zuni)** We asked Jamescita to provide a breakdown of priorities for the projects. We have concerns about the Aeolian sands and would like to respond to that in writing by the full Tribal Council. In our understanding, in government-to-government consultation the directors of the agencies come to Zuni or participate via zoom so the council members can provide direct feedback. Working through tribal liaisons is not what we consider to be government to government consultation. We definitely want to support projects that look at the habitat on the river. We want to invite the working groups to come visit on our Grand Canyon River trips. We want to develop relationships. It pains us to see vandalism on the sacred sites. We would like to propose restrictive boundaries to combat the vandalism. We do support a lot of the biology that is taking place but want to balance that with protection of the sites. **Jakob Maase (Hopi Tribe)** The Hopi tribe agrees with the projects we are funding as long as it does not set a precedent for the long term of projects being thrown under the bus for alternative funding methods. L1, which is connected to C4, is apparently not being funded, so we need both of them now. Looking at the 30-year history of this program, we are failing the Grand Canyon Protection Act as a whole despite these large budgets. Big conversations need to happen in 2027 to determine how to best accomplish this. Some of these goals are old. It is time to create new goals and rearrange planning in the future. **Rob Billerbeck (NPS)** I want to respond for the Park Service to some of the concerns raised by the Zuni councilmen. We would welcome another joint site visit. We hear and share your concerns about vandalism. We welcome ideas on how to prevent vandalism and protect these resources. **Larry Stevens (GCWC)** We support the perspective that we need to move into a habitat concern level. We appreciate the budget is not accomplishing all the goals. But it is moving us in the right direction for the goals. It is unfortunate that this program is not very visible to the public. Riparian restoration may be an area we can improve this. I would also like to address spring mapping. We are proposing to map and document the springs in the LCR, working with NPS, to identify the water quality and source of the water for each spring. We would be happy to provide support for this activity at no cost to the program.

Erik Stanfield (Navajo Nation) First, on springs mapping in the LCR, one of the complaints you have heard repeated is the disproportionate funding. What Larry is proposing would be a way to get more out of the fish projects in the LCR. The Navajo Nation would be very interested in learning more about the

springs, and very supportive of that project. I want to repeat for the record, as we looked at the projects that got cut, we were disappointed that some of the vegetation projects were not funded.

C1 - Vegetation monitoring has an important component related to a Navajo project.

C3 - Predictive modeling of vegetation response to dam operations

D4 - eDNA project

D5 – Monitoring petroglyphs and pictographs

J3 - Lucas' tribal resources research

These are currently not funded but these are important projects for the tribes. The proposal is to fund these through Reclamation. We appreciate that but it is disappointing that these were not seen as priorities. And we do not want these projects to get lost if they move to a different category in the Reclamation Budget. **Helen Fairley (GCMRC)** I believe it was C4 that the tribes were focused on because that is the project with cross disciplinary efforts to integrate vegetation, flows and sediment to understand how that is changing the dynamics of the river corridor. **Seth Shanahan (Chair)** Are you guys feeling we need to put these projects in now? And therefore, look for ways to make the budget balance? Or wait until we have several of these changes to consider? **Erik Skeie (State of Colorado)** In my opinion, it would be better to wait until the end.

David Ward (USFWS) Fish and Wildlife Service has concerns about project G2. Fall sampling in the LCR was removed from all 3 years of the workplan. We have concerns about the ability to gather information needed to fulfill the requirements in the biological opinion if those trips are removed.

Andrew Schultz (GCMRC) Maria just came back and talked to us about that, that was a decision made by the PL, we will be discussing it further. **Seth Shanahan** It is a mark, recapture study. If you don't have the September recapture trip, you don't have the study, right? **David Ward** There are multiple ways to estimate fish populations. The mark / recapture is the most precise. But there are options based on estimates of catchability based on previous trips. The problem is that this lack of precision will impact the ability to determine what is going on with the HBC population. **Seth Shanahan** Looking at the numbers, cutting one trip only removes \$50K from a \$500K budget. Doesn't seem like it is a big benefit. **David Ward** That is true, but if you were going to cut one trip, that is the one that made the most sense. It makes sense from a logical standpoint if you are trying to cut costs. But we have concerns about the impact to the data that we need for the biological opinion. **Seth Shanahan** Do we have enough information to conclude on this? **David Ward** I think we have the information. **Andrew Schultz** Within G, if you de-emphasize other areas in G can you keep the trip here? **David Ward** That is really tricky. We are getting to the place in this budget process where there is no good place to cut. **Jeremy Hammen (BOR)** This is a major concern for Reclamation as well. We have some suggestions. I spoke with Maria, and she has some suggestions as well. **Seth Shanahan** Another item to consider, the LCR MSCP program is obligated to pay \$250K for HBC conservation. They wait for the service to direct them where the money is to go. That may be an option. **David Ward** Thanks, that is good to remember. **Emily Omana Smith (NPS)** Is finding alternative funding the only option we have at this point for items that were cut? **Andrew Schultz** No, it is still open for discussion. **Seth Shanahan** When we identify projects that we want to add funding, we should be making efforts to think about where we would take away. We are already \$240K over budget.

Bill Persons (Trout Unlimited) You mentioned reducing F3 and F4, fish parasite and pathogen work. Is that a reduction in sample collection? There was a substantial cooperative agreement for extracting DNA from those samples. Can you tell me specifically what is being cut? **Ted Kennedy (GCMRC)** We will reduce the scope of that trip a little bit. Shorter trips, fewer people, less time in tributaries. **Bill Persons** Can you work with other fish sampling trips to collect those fecal samples? **Ted Kennedy** Yes, we will be

looking at that, seeing how we can leverage our fish collaborators to bring our sampling back up to desired state.

Bill Persons If you can collaborate with other fish cooperators you think you can still complete the project and keep the cooperative agreement in place? **Ted Kennedy** We will definitely keep the cooperative agreement in place, just a reduction in scope. **Bill Persons** Can other people collect those fish samples for you? **Ted Kennedy** It is possible, but it is cumbersome to have other groups pick this up. **Seth Shanahan (Chair)** You guys are talking about F3 – Aquatic Invertebrate monitoring? **Ted Kennedy** Both F3 and F4, they are interrelated with the river trip cost split across both elements. **Seth Shanahan** And the cooperative agreement has been reduced? **Ted Kennedy** The cooperative agreement in Project F did not get reduced.

Shana Rapoport (State of California) Can you tell us the status of bug flows analysis and how close that is to publication? I am curious if the publishing is covered under this workplan. **Ted Kennedy** The focus for me in 2025 is retaining staff that have analytical and writing skills. At the end of 2025 we will have very little ability to process samples. I hope to get some good papers out.

Bill Persons I have a question about Project I. You mentioned you removed environmental DNA work from Lake Powell, and we may lose some information on entrainment. Will that impact I2 or only I3? **Andrew Schultz (GCMRC)** It is only I3 that is impacted. **Bill Persons** Glad to hear that. Project J you mention cutting back brown trout incentivized harvest analysis? **Lucas Bair (GCMRC)** We removed the cooperative agreement for the brown trout incentivized harvest. We will continue to work that on the back burner. **Bill Persons** Then there will be no future investigation? You will just wrap up what was done? Maybe that is enough. **Lucas Bair** Yes, well said.

Rob Billerbeck (NPS) It seems like we are missing the changes made since Revision 3. It would be helpful to see the current revision on the screen so we can see the numbers. **Seth Shanahan** Andrew – is that something you have element by element? **Andrew Schultz (GCMRC)** Yes, I can share it on my screen. **Rob Billerbeck** One key point, I agree with Jakob's earlier point, we need to make sure we are meeting the goals of the Grand Canyon Protection Act. We have worked through this process really well as a group. But I think it is important in this last round that we stay focused on the key products and science that we need to protect the resources on the ground. **Bill Persons** You reminded me park service has also been doing work on a brown trout incentivized harvest program. Are you funded for a few more years to continue that project? **Rob Billerbeck** Yes, we have funding for 2 more years. **Bill Persons** Could you use that to supplement data for Lucas' project? **Rob Billerbeck** Possibly, but we need to see the latest revisions of what is removed or delayed. **Bill Persons** Can we carve out some of Lucas' time in FY27 to work on this? **Lucas Bair** Realize that the work will continue, just not at the same pace. If we focus on concluding the brown trout program we will pay less attention to the recreational modeling. It all comes down to what the programs priorities are.

Shana Rapoport (State of California) We haven't yet touched on what the effectiveness monitoring looks like for non-native fish projects. I hope that work is fully funded. **Seth Shanahan (Chair)** I believe those projects are likely to be funded through the Experimental Fund. **Jeremy Hammen (BOR)** Yes, that is essentially what we are planning for the Experimental Fund. And that is why we bumped up the budget for that fund. **Bill Stewart (BOR)** I just want to add, there are a lot of line items that will help evaluate effectiveness of the SMB flows. Experimental Funds are some of it, elements of Project I, Rapid Response efforts at the **Park**. All of this information helps evaluate the success or failure of these flows. **Shana Rapoport (State of California)** Yes, agree with all that. But with the timing of the ROD, I just want to make sure the effectiveness is addressed. **Seth Shanahan (Chair)** Project I5 and I6 are about evaluating the bass flow experiments. How does what the Interior acknowledges as the monitoring plan in

the ROD relate to I5 and I6? Is it the same? **Bill Stewart (BOR)** It is the same plan to look at effectiveness. Taking the efforts within and outside the program and trying to answer some key questions. **Kim Dibble (GCMRC)** Is Drew in the room? He has done a good job of laying out the science questions and determining how we will answer the effectiveness questions. In TWP Project I, Figure 6 ties all the different monitoring efforts together. **Drew Eppehimer (GCMRC)** The 2024 Science monitoring plan that was presented at AMWG is the same structure that we saw in the ROD. We will be looking at it again tomorrow during a brief talk. It encompasses the long-term inter-agency monitoring that has been going on as well as targeted response efforts that have popped up to address effectiveness questions. **Ryan Mann (AZGFD)** The analysis of effectiveness relies on programs that we have identified. When we start cutting things from the programs, I do still have concerns that we may impact ability to draw conclusions. **Shana Rapoport** What Ryan was saying is my fear. That we put efforts into slough modification and other SMB actions but have no ability to conclude effectiveness and impact of the actions taken. **Drew Eppehimer** Ryan brings up a great point. We are collecting data, but if we are reducing and removing data, there is nuance. It may be a delay in detection or in analysis options based on a later collection time. But we feel like we do have a framework that allows us to still answer the questions to the best of our ability with the data we have available. **Jeremy Hammen (BOR)** Reclamation is very concerned with understanding if these flows are successful. We are going to be very focused on effectiveness measures. **Shana Rapoport** I appreciate hearing that. **Leslie James (CREDA)** I appreciate the comments Jeremy made about making sure we understand the impact of what we are doing. In 2000, this program did a very expensive and impacting low summer study flow experiment, but we did not know until 10 years after the fact the impacts this experiment had. We weren't clear in advance what all would be measured. It is a real concern that we understand the impact of the experiment started yesterday. When we reduce the power generation, it means we are purchasing thermal power, which then increases CO2 and impacts.

Rob Billerbeck (NPS) I want to flip back to a question on the vegetation project. What Andrew presented this morning was potentially combining three separate vegetation projects into one. NPS also feels strongly that the vegetation projects need to be prioritized. **Andrew Schultz (GCMRC)** I did not present that, it was a point of discussion presented by Erik, but that change has not been made.

Christina Noftsker (State of New Mexico) In prior TWP negotiations was sending a recommendation that is over budget by \$240K acceptable? **Craig Ellsworth (WAPA)** It is worse than \$240K, that was only the annual average **Andrew Schultz (GCMRC)** No, that figure is for the total 3-year funding. In fact, the first year is under budget. **Seth Shanahan (Chair)** The best case is to be under budget. Have we ever gone over budget before? Yes, and usually we presented it with suggestions on how to cover the additional funding. **Larry Stevens** In my experience with this program GCMRC usually has rollover funds at the end of each year. Is that a possibility? **Andrew Schultz** We are having discussions about that, but there is nothing solid right now. **Ryan Mann** To help answer Larry's inquiry on roll over funds, a lot of that was funds for the new building which never came to fruition. **Bill Stewart** Historically, there is always some level of carryover funds. **Jeremy Hammen** But let's not count on that for this planning. It is too unpredictable, consider it a bonus. **Seth Shanahan** How close do you think we are with this version? Are we close? **Bill Stewart** Yes, I think the dollar amount is very close.

Seth Shanahan Can we make a motion to adopt the budget?

Andrew Schultz (GCMRC) We made some changes to the budget, this will have corresponding changes in the work plan. We will need more time to work on those details.

Edward Wemytewa (Pueblo of Zuni) We would like to move forward by having the Zuni tribe invite Andrew Schultz and his delegation for a formal government-to-government meeting with Zuni. **Andrew Schultz** I would welcome that.

Craig Ellsworth (WAPA) We have requested language addition to the Reclamation side, we would like a status on that. **Jeremy Hammen (BOR)** We are working on final touches of that before we send it out to the group for review.

Erik Stanfield (Navajo Nation) We brought up the 5 projects that tribes requested to be fully funded. We cannot vote on the recommendation until we have assurances about how this will happen. **Seth Shanahan (Chair)** OK let's take it as a proposal to add those to the budget. **Jakob Maase (Hopi Tribe)** C4 was related to L1 which is no longer funded. Need that added to the list as well. **Seth Shanahan** Does the work for these need to be done every year? Is that another way to reduce the impact yet still keep these projects funded? **Jakob Maase** I am not the investigator of these projects. We need to make sure the measurements are healthy. Not necessarily needed every year, but need the scientist to weigh in. **Jamescita Peshlakai (BOR)** I just want to state from the tribes there was strong support for all of these projects. There was no prioritization of which is most critical, only that they strongly support ALL to be funded. They did say they would be open to discussing what is most critical. **Seth Shanahan** Is everyone OK with this as the recommendation? **Erik Stanfield (Navajo Nation)** Is reclamation OK with the numbers? **Daniel Picard (BOR)** The way this would work, the added budget would be put in as an over budget item. You then have no guarantee that these will be funded each year. **Bill Stewart (BOR)** There will have to be tradeoffs. If we propose these additional funds, then we need to go back and reduce something else. Or we put it in an over budget request and leave the project as is. **Seth Shanahan** Is that preferred rather than going through another subtraction exercise? **Mel Fegler (State of Wyoming)** Is that already where we are at with the \$240K overage? **Seth Shanahan** We have guidance from Bill that with this number probably not. **Bill Stewart** Even if we put this into the category of over budget funding, we need to prioritize the projects. We can't have them all equal, because it likely would not all be funded at once. **Jamescita Peshlakai** I would just like the 5 tribes to have an opportunity to meet and prioritize the projects they want to fund. **Seth Shanahan** Overnight task for the tribes will be to prioritize the elements they want to see funded.

Jeremy Hammen (BOR) We recommend removing I.2.4 or I.3.2 one or the other, not both projects for population measurements. **Bill Persons (Trout Unlimited)** I don't want to see you remove I2. We still want to know where the fish come from. **Jeremy Hammen** We are not talking about removing I2, only one component related to population measurement. **Kim Dibble (GCMRC)** The point was to find out if this measurement method will be transferable to SMB. **Jeremy Hammen** We need G2 to be included in the TWP for ESA Compliance. This is a must, not a should. **Ryan Mann (AZGFD)** Given the population estimates in western Grand Canyon, is that really necessary? **Jeremy Hammen** We need to do a review to make that assessment.

Seth Shanahan One more bullet that supports Edward's request. Add the point about the GCMRC meeting with Zuni tribal council prior to the August AMWG. **Deborah Shirley (BIA)** The tribal request does need to be in writing, requesting a consultation, which the government then responds. It is a documented process with actions on both sides.

Mel Fegler (State of Wyoming) I don't think there is any harm in adding a bullet that recognizes we are over budget and prioritizes the items that follow. **Kathy Callister (BOR)** I am concerned about words like allocated or appropriated. This is only projected until the government funds it. **Ryan Mann**

(AZGFD) I suggest that a group meets tonight to finish wordsmithing the recommendation and bring it back to the group for approval tomorrow.

Seth Shanahan (Chair) Let me just check the pulse of the group. Any major objections to what we are working on today that would prevent you from voting on this? We want to walk out of this meeting with a recommendation. **Shana Rapoport (State of California)** I have been mulling the effectiveness monitoring. I think the SBAHG is picking that up, but what if they have some recommendations for changes in funding in the fall? I would like to add this as a bullet as well.

Seth Shanahan Here are the action items for tonight:

Mel Fegler (State of Wyoming) Add bullet addressing the \$264K overage

Ryan Mann Work on wording related to the SMB effectiveness monitoring and impact on budget

Erik Stanfield (Navajo Nation) Work out prioritization for the tribal project funding request

Public Comment:

Emma Wharton (GC Youth): The budget for our partners and youth programs was cut as part of the process this year. We have helped 750 youth through our programs. There is a youth trip going out today. We want to discuss creative ways we can work with you to continue funding this important work.

Meeting adjourned at 5:17 PM PDT

Day 2: Wednesday, July 10, 2024

Start Time: 9:02 AM PDT

Conducting: Seth Shanahan, Southern Nevada Water Authority (SNWA) and TWG Chair

Designated Federal Official: Daniel Picard (Bureau of Reclamation)

Meeting Recorder: Beccie Mendenhall, SeaJay Environmental LLC

Welcome and Administrative

- **Introductions and Determination of Quorum (16 members)** A quorum was reached.
- **Unresolved Issues from Yesterday's Meeting** Brief revisit of updated meeting dates, then moved into continuation of budget recommendation work.

Continued: Development of Budget Recommendation to the AMWG

Seth Shanahan (Chair) We will start the day with a continuation of the discussion on our TWP budget recommendation. **Ryan Mann (AZGFD)** There was a small group of us that worked on the language in the recommendation. Our goal was to do wordsmithing without changing intent. The final bullet on tribal project prioritization may still need some edits. **Seth Shanahan** Erik, do you want to walk through what is still needed for the tribal project section? **Erik Stanfield (Navajo Nation)** We did a simple scoring system to rank the 5 tribal project requests. We are just waiting for scores from one tribe. **Kurt Dongoske (Pueblo of Zuni)** I am not sure asking Zuni to score those is appropriate. Zuni will not support J3 or D4 being funded until GCMRC has a meaningful conversation with the Zuni tribal council. J3 was developed with no input from Zuni. There are fundamental issues with how these projects were developed which need to be resolved before any funding. **Malcom Bowekaty (Pueblo of Zuni)** I have spoken with the tribal council and have some feedback. We are not here to oppose, but to have you guys listen to us. In 2015, Zuni sent a written response to Reclamation on Zuni world views which has never been incorporated in the documentation. We took a river trip a few weeks ago with tribal leaders. I did not see any dichotomy between what we learned from western science and Zuni tribal knowledge. We have a direct cultural association with the Grand Canyon. Trying to extract DNA from the deposits would make us happy if you understood the context of that. Zuni are not making any scoring remarks right now. They support all of the tribal projects except J3. **Seth Shanahan** How can we still get to a recommendation for the budget today given your comments? **Malcom Bowekaty** Zuni will support approving the budget, but will expect that after the consultation with GCMRC, there will be some modifications to projects in the budget based on the Zuni input. In terms of moving this plan forward, just make note that we do not support J3 the eDNA study. And document the consultation requirement, with potential updates to follow. **Ryan Mann** There is a bullet point acknowledging the consultation with Zuni. Should we add that Zuni tribal council will submit comments on the TWP post this meeting? **Kurt Dongoske** Yes, please add that. **Seth Shanahan** I have not been a part of the program as long as Kurt but have been for a decade. Some of these issues have been going on since then, so I can see how that is frustrating. But what is positive to me is that people are still working to overcome them. **Jamescita Peshlakai (BOR)** For a point of clarity, of the original 5 elements being reviewed by the tribes, there are now 3 elements D4, C1.2, and C4 that they will move forward. **Erik Stanfield** I was going to suggest some additional language about seeking consent, but it seems we now do not need to do that. **Leslie James (CREDA)** I want to make sure this reflects what Jamescita said. Didn't she mention it was now only 3 elements to be moved forward? But we still have all 5 listed. **Seth Shanahan** I think it was agreed to keep them all, but in prioritized format. **Jamescita Peshlakai (BOR)** Let me clarify again. J3 was not supported by any of the 5 tribes. The other elements were supported by 4 tribes, but not the Zuni tribe.

Seth Shanahan (Chair) I want to read through what we have right now. After that we will see if we can entertain the motion. **Jeremy Hammen (BOR)** One suggestion, do we need the dollar signs on the

projects when we don't really know what those mean? **Seth Shanahan** I think that is a really good point. In fact, these numbers are only year one and do not reflect the three-year TWP. **Larry Stevens (GCWC)** I can imagine that if this does pass, seeing a cost overrun might be alarming. But the overage is only 0.8%. Maybe it would be good to include that in the language. **Bill Stewart (BOR)** I am glad you said that. I think recognizing the small amount is important. **Seth Shanahan** One of the conversations I was involved in during the break, folks were concerned with the loose ended nature of some of these items. **Andrew Schultz (GCMRC)** GCMRC has been working to cover the \$63K for G3, we can provide specifics soon. **Seth Shanahan** Still, people are concerned with the unknowns, and a desire to bring a firm and complete package to the AMWG and not a list of uncertainties. Here is what I would like to propose:

- 1) a motion to adopt the recommendation as written
- 2) schedule a virtual TWG on July 31 or Aug 1 where we have a check in with more information and allow us to decide if we make changes to the recommendation or leave as is.

Larry Stevens So this will be labeled as a draft motion? **Seth Shanahan** I would say that is not needed. But if that is helpful to allow people to adopt it, we could. **Mel Fegler (State of Wyoming)** Wyoming would be far more comfortable accepting it today as a draft motion. **Seth Shanahan** OK, then we will guarantee ourselves a meeting.

Larry Stevens I make a motion that we accept this as a draft recommendation.

Ryan Mann (AZGFD) I second the motion.

Craig Ellsworth (WAPA) Between now and our virtual meeting, will we receive an updated version of the work plan? **Seth Shanahan** Yes, that is necessary in order to make our assessment in advance of the meeting. **Craig Ellsworth** Can we get it enough in advance to have time for review? **Seth Shanahan** Yes, the day before would not be helpful. **Shana Rapoport (State of California)** We also need the supporting information from GCMRC to understand the changes. **Andrew Schultz** Are you referencing what has been cut since draft 3 or since we started in the beginning? **Shana Rapoport** Is that reasonable? **Andrew Schultz** If it is truly needed, we can. But our staff time is limited and there is a lot they still need to do. **Shana Rapoport** I want visibility to the things we should monitor in case additional funding becomes available. **Andrew Schultz** That is visible in the non-funded details of the plan. **Seth Shanahan** The BAHG table updated with changes since revision 3 should provide you with most of the information you are looking for. But the partial funding maybe is not as visible. **Shana Rapoport** Whatever is possible to provide would be helpful. **Andrew Schultz** We want to be as transparent as possible, but we also have to meet these deadlines. **Christina Noftsker (State of New Mexico)** I have the same concerns as Shana. **Mel Fegler (State of Wyoming)** We support California in this concern and also want details on the \$63K.

Bill Persons (Trout Unlimited) In the next version will we see the detailed budget information that was provided in earlier drafts? Will you have time to do that in 2 weeks? **Andrew Schultz** Yes, we will provide all the details we provided in the past. Also trying to add extra information such as how the data is being used. We will have a price tag on the funded items, unfunded items, and the experimental fund. **Bill Persons** A thought about the motion. I am tempted to ask if we just table it until after we see the draft. I am hesitant to approve a workplan that we have not seen yet. **Seth Shanahan** You are not wrong, but this is now a draft motion. I want us to be successful today. **Bill Persons** Can we be successful without the motion? **Seth Shanahan** We have a lot of momentum here today.

Leslie James (CREDA) Will you be addressing in the SMB agenda item the specifics of how BOR will determine efficacy? I want to make sure there is a very clear path to efficacy and success. **Bill Stewart (BOR)** This might also address Shana, there is Figure 6 in the workplan that identifies the effectiveness.

Drew put this together as part of the monitoring plan. It has red bullets that talk about which projects address specific questions. I found this table very helpful in understanding where results are coming from.
Leslie James Thank you, I will go back and relook at that.

Jeremy Hammen (BOR) As I am listening, I just want to make sure all are on the same page time wise. The final presentation to AMWG is Aug 22. GCMRC, how much time do you need to prepare that final? Are we going to miss our deadline with the proposed delay and added review meeting? **Andrew Schultz (GCMRC)** It will force us to change the Aug 7th date. We need 7 working days to take it all the way through processing. **Jeremy Hammen** We need to look at the timeline again then. Bill, is it a problem with AMWG if the recommendation is postponed? **Bill Stewart (BOR)** I think that depends on how well TWG members inform their AMWG reps. Also remember, there may be more changes from the AMWG.

Seth Shanahan (Chair) Are there objections to passing the motion by consensus? None presented. Motion passed by consensus. Reference Actions and Motions document for final language.

Discussion on when to hold a Special Virtual meeting of the TWG to finalize the draft recommendation
Wed July 31 - 9 AM PST / 10 AM MST

Deb Williams (USFWS) There is a fish panel on Jul 31, fish biologists will not be available. **Seth Shanahan** The fish biologists are not required for the vote. Maybe we can have your input in advance. **Craig Ellsworth (WAPA)** Can we set a date to see the final draft prior to the July 31st meeting? **Andrew Schultz** I don't like to set a date without staff input, but I will set a tentative date of July 29th. I want to make sure we are focusing on the changes since version 3. **Christina Noftsker (State of New Mexico)** Can we include the GCMRC comments to the Science Advisors report? **Andrew Schultz** Yes. We could also put together a shorter document that is just the changes made since Version 3. We could get that out much sooner. **Bill Persons (Trout Unlimited)** That is fine if it is easier. But it cannot replace the final full workplan version. **Shana Rapoport (State of California)** Can we get cuts prior to the SBAHG meeting? **Seth Shanahan** Drew, can you get together with Shana and work on those details?

Announcement

Seth Shanahan We have an announcement from Erik before we go back to the agenda.

Erik Stanfield (Navajo Nation)

We applied for a grant for vegetation restoration in the Little Colorado River. We passed the first submission, now working on round two. It would be very helpful if we could get letters of support from this group. I have suggested language in a template format which I will send to everyone. Our submission is due July 18th. I know this is a short turnaround but would appreciate your support.

Planning Considerations for the Potential Implementation of Alternatives Described in the Long-Term Experimental and Management Plan (LTEMP) Supplemental Environmental Impact Statement (SEIS):

Bill Stewart For the government, this initiative has moved at light speed. I want to acknowledge that there has been lots of controversy as well. This is one of the most unique experiments that has happened in this program. We will learn a lot in this first year. The slides share a brief statement of the SMB problem and the history of water temperature to underscore the urgency. The timeline slide shows the milestones and dates from EA Aug 2022 to ROD July 2024. There were 4 cold water alternatives analyzed and one disruptive flow. The ROD defined Operational Flow and updated the HFE protocol. The preferred alternative for 2024 is cool mix. The ROD also provided guidance specific to 2024, which included trigger temperature to initiate the Cool Mix alternative. Reference slide for details. Trigger measurement is made at RM 61. We hit the trigger at the end of June 2024. The P&I team process will be used to analyze year one results and make decisions for future years. Fish and Wildlife recommended that

temperature changes $> 4^{\circ}\text{C}$ per hour can have negative impacts on HBC. The flows are designed to operate within that range. The next slides shared results from the operation triggered this week (July 9th), first the release pattern and then the resulting temperature reductions measured at Lees Ferry. The final slide looks at the revised HFE protocol.

Q&A and Discussion

Leslie James (CREDA) Can you provide an explanation of the P&I process and how it provides recommendations for off ramping? **Bill Stewart (BOR)** The P&I team is made up of federal agencies, WAPA, the seven basin states and AZGFD. There is a technical leadership team that meets regularly, with the first kick off meeting this Friday July 12th. We will be discussing the off ramping, the costs to hydropower and other factors. In the fall we will add sediment accounting. **Leslie James** How is this experiment going to fit with the upcoming Flaming Gorge experiment? **Bill Stewart** I am not sure. **Leslie James** There will be impacts there too. Because there are going to be impacts to the utility cooperating agencies, I suggest you include them in the P&I team.

Larry Stevens (GCWC) The temperature chart shows daily fluctuations of 1 to 1.5 degrees. **Bill Stewart** It is largely a day/night change, although some of it was also related to flows. **Larry Stevens** Reflecting on the long history of attempts at temperature management in this system, getting to .5 degree thermal resolution is exquisite.

Rob Billerbeck (NPS) This has been an incredible amount of work for Reclamation. You implemented this in the nick of time for this summer and it will make a big difference in efforts to protect the HBC. **Bill Stewart** Be careful with the timeline expectation, how quickly we put this together was a special effort. **Craig Ellsworth (WAPA)** Being able to reduce the impact to daytime releases is good (10%), but it does not remove the impact to hydropower and the grid. **Bill Stewart** Thanks, we read all the comment letters and are well aware of the impact. **Rob Billerbeck** Some of the Flaming Gorge experiment may produce more hydropower, interesting to see if that helps to offset the reductions here.

Ryan Mann (AZGFD) We won't be able to go back in time and know exactly what effect this change in temperature had. But we think it is hugely valuable in supporting native fish. There is also a benefit for the rainbow trout fishery in lowering the water temperature.

Kurt Dongoske (Pueblo of Zuni) I will be the one voice to criticize Reclamation for your failure to incorporate the Zuni information presented in this EIS process. You failed to contextualize it in the EIS, and you provided responses that did not consider the Zuni comments. I submit that these failures put all the rest of the science into question as well. **Bill Stewart** I understand your concerns. We did our best to incorporate all the comments. We have multiple tribes and multiple stakeholders. We have to try and balance among them all, it is a hard role. **Kurt Dongoske** I don't find that an acceptable response. To say it is complicated and there are multiple tribes is not acceptable. All you did was copy our letter into the document. Then stated there were no Indian Trust assets being affected. Congress designated agencies to do the "hard work" associated with NEPA compliance. This is further evidence of a symptomatic problem within this program that continues to disenfranchise Tribes. In 2000, a Peer Evaluation Panel reviewed the cultural resource program within GCMRC and the 1994 Programmatic Agreement that was the responsibility of Reclamation. This PEP recommended the development of the "Tribal Consultation Plan." The Hualapai Tribe was contracted by Reclamation to draft the Tribal Consultation Plan and Hualapai contracted Dean Suage to draft the plan. The Hualapai draft Tribal Consultation Plan was over 40 pages long and incorporated many different aspects of the GCDAMP where tribal consultation was needed. After 15 years and the same number of draft tribal consultation plan iterations, what the DOI agreed to was a 7 and a half page document that was merely a policy statement on tribal consultation and did not hold the federal agencies or the DOI accountable for anything. **Seth Shanahan (Chair)** I have a suggestion, maybe Reclamation can join the GCMRC visit to Zuni council.

Charles Yackulic (GCMRC) There was a conversation yesterday about warming on the side versus the middle of the channel. That data is visible on the charts of the water data web site. The “buoy” is in the middle of the river, the numbered sensors are on the side. Currently there is only .1-degree difference between these. In the fall you might find a larger difference. **Jeremy Hammen (BOR)** It might help to clarify the difference between real time measures at Lees Ferry versus the RM measures which transmit via satellite at a slower frequency.

[Report from the Smallmouth Bass Ad Hoc Group \(SBAHG\) Including a Report About Warmwater Nonnative Fish Status and Actions, Effectiveness of Actions Including Rapid Response Actions, the -12 Mile Slough, Artificial Spawning Beds, Smallmouth Bass Flow Monitoring Plan, and Other Related Items:](#)

Emily Young (State of Arizona, SBAHG Chair) We have had 3 meetings so far, the first meeting to discuss our goals and charge, subsequent meetings to clarify specific stakeholder requests. Notes are available for the meetings on the website. For Project I we had discussions around validity and feasibility of I.2 and I.3, which led to the SBAHG language in the motion today. Our next step will be further discussion around the TWP recommendation. The next meeting is July 22, 2024. Beyond that our focus will be on establishing an annual report and effectiveness criteria. We are proposing a workshop in the fall to include other stakeholders in those discussions.

Seth Shanahan (Chair) I asked Drew to provide updates on SMB monitoring as it was an area of concern in this meeting. **Drew Eppheimer (GCMRC)** Update on SMB so far this year: 76 captures in 2024, lowest at RM 6.9, with no YOY fish found. 79% of the fish captured came from NPS led removal efforts. The majority of captures this year were right at the dam. A histogram of fish size shows them all to be 1 to 2 years of age. The final slide presents the research questions they are trying to answer with an overlay of the specific measures and TWP projects for each. There is more detailed information on the monitoring in the LTEMP ROD. **Seth Shanahan** Thank you, and just to clarify for people, the experimental elements in this project are funded for FY2024.

Q&A and Discussion

Colleen Cunningham (NMISC) I appreciate the presentation, it helps clarify some of the work, but I think the graphic is a little misleading about recruitment. In the lower water levels, we are getting SMB through entrainment. So, I don't think recruitment comes only through reproduction. **Seth Shanahan** Is immigration a better term to use? **Charles Yackulic (GCMRC)** I think Colleen has a good point, potentially we could move the recruitment box. Also, if it is cool enough the fish may spawn but never recruit to year one.

Leslie James (CREDA) Given Rob's comment that we are barely doing this in the nick of time, are you confident we have sufficient monitoring of the Chub to measure impact on that population as well as the SMB? **Drew Eppheimer** I am confident Chub are able to handle the lower temperatures, their recruitment temperature is lower than SMB at 13°C.

Larry Stevens (GCWC) Flow varies, habitat varies, are you getting to a point you can map where recruitment is happening? **Drew Eppheimer** Great question. There is a slow viscosity model for Lees Ferry that is well accepted and adopted for predicting spawning locations. Down river those models are not yet available, but the majority of fish are coming from Lees Ferry.

Craig Ellsworth (WAPA) There may be other factors that impact SMB. Are you tracking other factors like turbidity and tributary inflows? **Drew Eppheimer** The model currently is looking at temperature suitability only. We are looking into a model with more factors, including turbidity and tributaries. There

has also been diet analysis, which impacts the growth of the fish. **Craig Ellsworth** That is important because prey availability is not equal in all parts of the canyon. **Drew Eppheimer** Certainly, and we are working on it. **Seth Shanahan** Item I4 in the workflow references a lot of these factors, Craig you may want to look there.

David Ward (USFWS) We have orders of magnitude more Green Sunfish in the system than SMB. Have you looked at analyzing reproduction in this fish as well? **Drew Eppheimer (GCMRC)** Great point, due to time constraints I did not go over those numbers. They are not equivalent to SMB, but it is worth investigating.

Ryan Mann (AZGFD) I want to make sure people are thinking about this in the greater context. Entrainment is not new to the system. We have been detecting fish below the dam. From a fish biologist's perspective, water temperature is the primary driver that determines what is happening with these warm water fish populations. **Leslie James (CREDA)** Aren't you saying entrainment also needs to be addressed? **Ryan Mann** Yes, we do not know if entrainment has increased or decreased. I would still advocate for measures to limit entrainment, which I think BOR is still analyzing in the forebay. It is part of the context of these discussions.

Seth Shanahan (Chair) Is there anything of an urgent nature people want to know right now about SMB that they can't wait until the SBAHG meeting in a few weeks?

Craig Ellsworth (WAPA) We talk a lot about SMB and a little about Green Sunfish, but I am also hearing about Walleye coming into the system. I want to make sure we are not so focused on SMB that we miss the Walleye. **Drew Eppheimer** One of the slides we skipped over showed 17 Walleye captured this year. **Craig Ellsworth** Is anyone looking at where those fish are coming from? **Charles Yackulic (GCMRC)** The Park Service has provided some funding, hoping we can use this to look into the Walleye questions. That will be funded outside the TWP. We have seen adult Walleye under the dam for 10 years but none downstream. In 2022 we started to see babies farther down the river. That was also the coldest year for water temperature. One theory is that was a trigger for the Walleye to spawn.

Larry Stevens (GCWC) What is the relative risk of SMB impact on rainbow trout? **Charles Yackulic** Based on data from other systems, we would expect the SMB to eat and impact rainbow trout, also the brown trout. **Ryan Mann** Per capita, the risk from SMB is higher than the other species.

Jeremy Hammen (BOR) This entrainment issue is something we really want to understand. Capturing SMB at the forebay is very difficult. How far are you extending into Lake Powell to capture SMB? **Kim Dibble (GCMRC)** We have talked about partnering with anglers for sampling in the lake as well as UDWR and the Park Service. We have not yet identified which trips will help that effort.

Rainbow Trout Status Update:

Brian Healy (GCMRC) I am using the presentation provided in April with new data and trends added through June 2024. We are trying to determine if we are meeting the LTEMP goal of achieving a healthy Rainbow Trout fishery in the Glen Canyon Reach. Angler data shows capture rates below the AZGFD one fish per hour target for the last several years, but data is not beyond similar trends over the 30 year history. Looking at fish growth, we have seen a positive rebound in growth rates in the recent measures. Rating overall condition of both rainbow and brown trout show an increase in fish condition as well. There seems to be a drop in survival rates of adult fish. The theory is the lower DO in the fall was a factor reducing survival rates. Spring 2024 growth and fish condition however suggest a possible rebound. Proposing to develop a Structured Decision Making (SDM) process for rainbow trout management.

Q&A and Discussion

Seth Shanahan (Chair) When we went through SDM during LTEMP, folks were concerned about using the term “decision making” because we do not make the decisions. Instead, we used “Structured Decision Analysis”. **Brian Healy** That is a good point, thanks.

Bill Persons (Trout Unlimited) Thank you for a clear picture of what we think we know. A few of us are talking about reconvening the Trout AHG. I think adding a structured decision making tool would be a benefit to this program. We are talking about options for what might be done to try and recover and sustain that fishery. **Ryan Mann (AZGFD)** I think it is clear that we are not meeting the LTEMP goals for Rainbow Trout. I like the idea of reconvening the rainbow trout AHG and the SDM tools. This would allow us to explore topics that we just don’t have time to pursue here. **Bill Persons** One of the first things we would do is come up with a charge for the Trout AHG.

Brian Healy (GCMRC) Natural Resource decision making is difficult due to the trade off between values and uncertainty in predictions. There are several papers published by Mike Runge using SDM for management purposes in the GCDAMP program. One key point is that it incorporates values into the model. That is enough for an introduction. **Seth Shanahan (Chair)** I suggest we have a workshop on SDM to share the concepts with others.

Seth Shanahan I think reactivating the Trout AHG is a great idea. The AHG are a good way to deep dive into topics and discussions we don’t have time for during the TWG meetings. First we will need a chair and a charge. Any objections? None raised. Is there anyone that would like to volunteer to be the Chair? **Ryan Mann (AZGFD)** I think we need additional discussions about that.

Larry Stevens (GCWC) I am totally in favor of having a Trout AHG. It might be good to have an AHG for each of the LTEMP objectives. **Seth Shanahan** We are almost on that path aren’t we. **Brian Healy** Realizing we have less funding for staff, can we reduce the reporting requirements for these groups? **Michelle Garrison (Vice Chair)** One thing the Upper Colorado Recovery Programs have done to save money is switch to biannual reporting. **Ryan Mann** Where are the obligations for that reporting written? **Jeremy Hammen (BOR)** It is in the operating procedures, not sure if it is stipulated in the LTEMP. **Bill Stewart (BOR)** We rely on the annual reports to provide a report to congress as stipulated in the GC Protection Act. **Ryan Mann** I suggest we table this for a future meeting, but I think it is important to pursue options to reduce reporting, if it is affecting budgets and is determined to be overly burdensome. **Christina Noftsker (State of New Mexico)** We were wondering if the submissions could just be shortened to save time. **Andrew Schultz (GCMRC)** We have been talking to people a little about this. It is important to identify what the flexibility is around this.

Informational Updates

- **Dissolved Oxygen Monitoring Below Glen Canyon Dam and Options for Managing Low Dissolved Oxygen Conditions:**

Jeremy Hammen (BOR) (presenting for Alex Walker, BOR) We have seen very low DO, potentially lethal levels, in Glen Canyon (near the dam) in the last few years. This year is trending similar to prior years, with low DO hitting in late summer to early fall. One note, we have not seen evidence of the mortality expected by the low DO. But that doesn’t mean it is not happening. The proposal is to augment DO (inject oxygen) in the water column as it goes through the penstock. Initial testing was done in Sept 2023 using existing dam structures, but we did not measure any downstream increase in DO. Conclusion is that modifications are required to the dam in order to have the desired impact on DO. We are working on options with Dam operations to incorporate commercial DO injectors. We are also having discussions with the Pacific Northwest National Laboratory for 3D modeling to assist with protocol design.

Bill Persons (Trout Unlimited) Will you expect lower Lake Powell elevations to cause the lower DO?
Jeremy Hammen I think yes, does GCMRC want to comment? **Charles Yackulic (GCMRC)** Yes, lower elevation means higher likelihood of low DO. I support that. You will see DO is 2 – 3 mg/liter higher due to the cool mix release. Now there may be concerns about too much DO. **Ryan Mann (AZGFD)** There is a ton of research in the Columbia River Basin looking at super saturation below the dams causing gas bubble disease. But they are at more high sustained gases than this system. I noticed that the DO gauge is at RM -8. Even marginal increases in low DO can have significant benefits for fish mortality. We are really focused on the first 5 miles below the dam, so it may be a suggestion to move that gauge a little higher. **Seth Shanahan (Chair)** Is that gauge collecting data right now? **Charles Yackulic (GCMRC)** There is a gauge at RM -8, which gets downloaded every 6 weeks or so. **Ryan Mann (AZGFD)** One more comment, the risk of these low DO plumes is higher in the large inflow years, which makes them hard to predict. Even in years with favorable water conditions we may have low DO. **Charles Yackulic** I agree with Ryan. It's elevation and inflow strength. There is always lower DO in a high inflow year.

Larry Stevens (GCWC) In the modeling there is a cross sectional influence because there is dense macrophyte development in the eddies. At night that may be sucking all the DO out of the eddies. **Jeremy Hammen (BOR)** I can't speak to the model itself, but I do believe that Bridget looked at the DO variation across the river last year. **Larry Stevens** Could the drainage catchment canal water be redirected to add oxygen? **Jeremy Hammen** I would have to refer to Clarence and his group on that.

Rob Billerbeck (NPS) I am hoping we can figure out how much improvement the SMB flows has on the oxygenation and if that helps to address the trout conditions. **David Ward (USFWS)** Most commercial trout fisheries add liquid oxygen in low head injection systems to maintain enough DO for higher populations of fish. Is that something they are pursuing here? **Jeremy Hammen** Yes, I believe there is a report evaluating liquid oxygen. **Ryan Mann** I think they evaluated it, but it is very expensive for the water volume under consideration.

- **Report from the Socioeconomic Ad Hoc Group:**

Jeremy Hammen (presenting for Ben Reader, GCRG) We had one meeting since the last TWG, looking at 2 main questions. First, is the screening tool proposed in J1 valuable? The team agreed yes. Second, is there value in using the hydropower workshop proposed in Reclamation 4.G? Also agreed yes. We recommended a language change to J.1 which was included in the BAHG report. Also have a language change for BOR project 4.G which they plan to have done before the next iteration of the TWP.

- **Possible Experimental and Management Actions in the Next 12 Months:**

Jeremy Hammen Reference slides for a timeline graph with Potential Experiments for the next year based on the recently signed LTEMP SEIS. The Planning and Implementation team (P&I) discusses each flow and recommends the actions.

Craig Ellsworth (WAPA) If a fall HFE is triggered, we would want to have the discussion around if the HFE executes in the fall or wait and defer until Spring. Then power can start planning monthly volumes.

Jeremy Hammen Yes, that is a great plan. We want to inform everyone as soon as possible. **Larry Stevens** Given that this has not taken place yet, is there any format for making that decision? **Jeremy Hammen** We are focused on the SMB flows now, but very soon will start the process for fall HFE planning. **Larry Stevens** What type of compliance is required for a “deferred” HFE? **Bill Stewart (BOR)** Good question, we will have to define that.

- **Bucket 2 Funding Update:**

Bill Stewart

I spoke with Justin Record from our project management group. We put this on the agenda because we thought there might be an announcement, but it is not quite ready. They will post the funding announcement on the website as soon as it is released, probably in the next 2 weeks. It will be open until the end of September. There will be a \$300K minimum project size but no maximum size. They intend to have a webinar about one month after it is announced.

Seth Shanahan (Chair) Getting external funding for the program would be very useful. It might be nice to have someone that looks at all these grants and is focused on the grant writing. Going after money takes a lot of time. I will take this as an action item.

- **Razorback Sucker Stocking in the Little Colorado River:**

Hannah Chambless (NPS) (for Emily Omana-Smith) This is a pilot project aimed at reversing population declines of razorback sucker. It is a 3 year augmentation study which started in 2023. There were 866 fish released in Havasu Creek in 2023, 790 released into LCR in 2024. There has been minimal monitoring but in May this year there were 7 recaptured. The park leverages existing monitoring for this study. During the translocation trip in 2023 the NPS team was able to connect with Pueblo of Zuni stakeholders in Havasu Creek.

Craig Ellsworth (WAPA) Can you describe protocols that were followed to ensure no diseases were introduced in these fish? **David Ward (USFWS)** They were placed in isolated pools just off the mainstream. There has been no flooding, so they are still where they were released. All of the fish were disease certified before release. They are sourced from broodstock at Dexter National Fish Hatchery, not live catch from Mojave. **Craig Ellsworth** Can we get an update on the assessment for reintroduction of Pike Minnow? And also, translocation plans for HBC in the canyon. Action Item taken.

Larry Stevens (GCWC) Razorbacks hybridization, how much has that been considered in these releases? **David Ward** These two species prefer different water patterns, one likes flows, the other sedentary. Hybridization is not of enough concern to warrant analysis. **Larry Stevens** It seems the imprinting takes place at the very early stages in fish development. Can we imprint them on LCR water at Dexter? **David Ward** Imprinting is an important piece of releasing these fish. We are not currently doing that. **Ryan Mann (AZGFD)** Dexter fish are captively bred and raised, they are not from wild collected larvae. **Seth Shanahan** Following up on the hybridization, shouldn't we just expect it? **David Ward** These species always hybridized a little. As we modify these systems, we might be increasing that.

Salt River Project Perspectives on Resource Planning and Related Hydropower Issues:

Dan Schaefer (Salt River Project) I work in the planning group at Salt River Project (SRP), looking at new resource acquisition and existing resource retirement. I was asked to provide an overview of how the SRP approaches resource planning. "Resources" is our term for power plant. We are one of the fastest growing utilities in the country because we service the Phoenix area. SRP delivers both water and electricity and is one of the largest public power utilities in the country. Demand is accelerating magnitudes for the energy system as a whole. The previous 100 year increase will be repeated in 10 years. Intermittent power generation is driving significant changes in operations and planning. Traditional power generation was linear, from production to distribution to customer. But today it is all mixed, customers are more involved in decisions and use energy differently. Electric usage is going up rapidly while at the same time we are working to reduce carbon. Our power comes from different types of energy sources across a wide geographic area. The daily operation of the grid is evolving rapidly. Today, the graph showing the type of power used at different points across the day illustrates the complexity of balancing these resources. They are currently 45% carbon free, targeting 75% by 2035.

Q&A and Discussion

Leslie James (CREDA) No question, just a big appreciation for this presentation. I wanted to have SRP because WAPA is a wholesaler, not a utility company that delivers directly to retail customers. **Seth Shanahan (Chair)** I am curious where your carbon goals come from. **Dan Schaefer** Years of working with our customer base and balancing that against tradeoffs of decarbonizing. There is a cost component and a risk component. We bring this to our board; they have the final say as they are publicly elected. **Dan Leavitt (USFWS)** Pumped hydropower is a fascinating resource. What are the most ideal conditions for pumped hydro? And can our dams be considered for this technology? **Dan Schaefer** Ideally pump storage is essentially a battery. For the past 100 years, there was no excess energy in the system. Now that we have renewable energy that we cannot control when it generates, pump storage is ideal in systems with excess energy. Pump storage requires two reservoirs at different elevations. Because of our water shed management, we have access to build a large resource that is unique to SRP. LA looked at using Hoover for a pump storage system and it was untenable. Pump storage has been around for over 100 years and per our assessment it will be around for another 100. **Dan Leavitt** I assume there is less evaporation with pumped storage. We see a lot of evaporation of our reservoirs, around half a million per reservoir per year. **Dan Schaefer** Our experience is a much lower evaporation number, 2-3%. That includes all the way through the delivery system. **Jamescita Peshlakai (BOR)** I wanted to remind the TWG that not everyone has equal access to resources. Our tribal members living next to the Grand Canyon do not have electricity or running water. **Dan Schaefer** Thank you for the comment about equity. SRP is involved in a project “light up Navajo” which is looking to bring power to the Navajo Nation.

Discussion of Emerging Issues, Updates on Items of Interest That Are in Consideration for Implementation Before Next TWG Meeting, and Request for Agenda Items for Next Meeting:

Seth Shanahan (Chair) Setting context, the agenda item requests here will be for the October meeting.

Shana Rapoport (State of California) Is it possible to get an update on how the Environmental Compliance process is going for the 12 mile slough? **Bud Fazio (NPS)** We are on track for the one year time frame we discussed in the January meeting. We should conclude the EA by Dec 1, 2024. That will allow the implementation for Jan or Feb 2025, about 4 months in advance of the native fish spawning. We plan to hold some scoping sessions in Page and Lees Ferry this month seeking local feedback from those using the river.

Christina Noftsker (State of New Mexico) I have an agenda item. Can we talk about the western Grand Canyon population numbers for HBC and how biological opinion requirements might change if those numbers are high enough? Also, if Lake Mead water level comes up, what do the biologists expect will happen with those fish? **Seth Shanahan** Can we add to that an update on Pierce Ferry Rapid as a barrier?

Public Comment:

Dave Foster (Fishing Guide at Lees Ferry) Before this meeting a member had informed me TWG had little interest in trout fishery. I was excited to hear today the suggestion about starting the Rainbow Trout AHG. Then I was disappointed to find that I was not allowed to be the Chair. I want to share information that the number of people visiting Lees Ferry has grown. Visitation last year jumped to 1.2 million, mostly kayakers, many with fly and fishing rods. Their needs should be addressed. I want to make one other comment about the increased electrofishing. I am told it is over 100 nights per year now. I want to read excerpts from an article on the impact of electro fishing on cutthroat trout. Reference the cited article 1989, Mason Shrek, Transactions of the American Fisheries Society. Impacts on wild fish include general lethargy for up to 24 hours. At 100 nights per year, this has a huge impact on the fish.

John Berry (Pima county resident) My concern is the degradation of the fishery from Lees Ferry up to GCD. I oppose any type of human removal be it electro fishing, netting, chemical. I have noticed these policies and procedures reduce the quality of the fishery. Somebody needs to design an experiment that improves the fishery, not destroy it. I have followed many of these work groups and meetings. The amount of dollars being spent is a lot. I have a family member who is a chief of staff in the House of Representatives who sits on the Appropriations Committee. It concerns me where this money is going and what we are doing to these fisheries. I would have Arizona Game and Fish take the lead in the management of this fishery. It seems to me someone could take all the things we are doing here and put it together to improve the fishery at Lees Ferry.

Harry Lodge (Fisherman, Lees Ferry) I have been fishing Lees Ferry close to 40 years. Over the years I have seen nothing but a downhill trend. In the meeting today I have not heard any goals that protect rainbow trout. I believe your charter and management plans for the dam include the fishery. Why didn't we have an ad hoc committee on trout in the previous 50 years? I agree that there needs to be a lead group. Arizona Fish & Game should be that lead and stop getting stepped upon by other groups that are doing repetitive things that don't accomplish the goals. I am a resident of California. I drove here today because when I join your meetings via Zoom, I am immediately muted. I don't appreciate not being able to be heard. Today I am here to promote AZGFD to take a bigger role. I hope these other groups understand the importance of the fishery and open your ears to the public comments.

Seth Shanahan (Chair) Thank you for your comments. All of our TWG meetings have a Public Comment period at the end. You are always welcome to come and speak.

Dan Valentine (Angler, Phoenix) I represent several hundred if not thousands of people that share my opinion at strong support that Lees Ferry be managed aggressively and maintained as a Blue Ribbon trout fishery. These challenges have been in the press for a long time. Why is it taking so long to formulate solutions to those challenges? If meaningful solutions had been implemented sooner, would we be in the condition we are right now with the fish at Lees Ferry?

Fred Brown (Ops Manager, Marble Canyon Lodge) Fishing has made an impact on the people that visit Marble Canyon. In addition to not being able to host fishing days, it also impacts our employees, most of whom are from the neighboring Navajo nation. In 2022 we had a monumental year, primarily due to the COVID revenue travel. We have seen that decline hugely since then. Fishing for us is an off season thing. Without that off season income, it has further effect, not just on the sports fisherman but the entire surrounding community.

Dave Tremble (Lees Ferry Fishing Guide 25 years) Disgust is a good word to describe how I feel about how the fishery has been managed. There is plenty of data to show there are problems. There are also solutions, but like the guy before me said, nothing is being done. The graph in the trout talk earlier today showed a 9 year decline in the catch rate. And that is supposed to be acceptable? The Park Service does not care at all about the trout fishery. And the game and fish for their lack of management is completely spineless. They need to step up and do their job to take care of the fishery at Lees Ferry. Not for just myself but also for the recreational angler, the hotels and the Navajo nation who relies on tourism. People need to be held accountable for not doing their job. The Park Service needs to lay off on the electrofishing. They are chasing something one out of four days which is hammering our fishery when it is near collapse. Something needs to be done.

Seth Shanahan (Chair) Those comments reflect topics that are top of mind for several folks around this table. I appreciate that you made the time to come and speak to this group.

Jeremy Hammen (BOR) I just want to make sure everyone is clear on what is coming out in the next few weeks.

- BAHG will send an updated budget report (done)
- GCMRC will be sending a document with the adjustments made since Draft 3
- GCMRC will also be working on a full report to be sent by July 29th
- GCMRC will be sending responses to the scientific advisors

The meeting was adjourned at 4:22 PM PDT.

Participants

TWG Members, Alternates, and Leadership

Betsy Morgan (State of Utah)
Bill Persons (Trout Unlimited)
Brent Powers (Navajo Nation)
Brian Hines (BOR) Bud Fazio (NPS-GLCA)
Carrie Cannon (Hualapai Tribe)
Christina Noftsker (State of New Mexico)
Cliff Barrett (UMPA)
Colleen Cunningham (State of New Mexico)
Craig Ellsworth (WAPA)
Dan Leavitt (USFWS)
Dani Greene (State of Nevada)
Daniel Bulletts (Southern Paiute Consortium)
David Brown (GCRG)
David Rogowski (AZGFD)
David Ward (USFWS)
Deb Williams (USFWS)
Emily Omana Smith (NPS-GRCA)
Emily Young (State of Arizona)
Erik Skeie (State of Colorado)
Erik Stanfield (Navajo Nation)
Hannah Chambless (NPS-GRCA)
Jakob Maase (Hopi Tribe)
Jeremy Hammen (BOR)
Kelly Burke (GCWC)
Kurt Dongoske (Pueblo of Zuni)
Larry Stevens (GCWC)
Leslie James (CREDA)
Mel Fegler (State of Wyoming)
Michelle Garrison (State of Colorado)
Rob Billerbeck (NPS-GLCA)
Rudy Keedah (BIA)
Ryan Mann (AZGFD)
Scott McGettigan (State of Utah)
Seth Shanahan (State of Nevada)
Shana Rapoport (State of California)
Sinjin Eberle (American Rivers)
Stewart Koyiyumptewa (Hopi Tribe)
Ted Rampton (CREDA)

Other GCDAMP Members and Interested Persons

Andrew Schultz (GCMRC)
Brian Healy (GCMRC)
Charles Yackulic (GCMRC)
Clay Allred (GCMRC)
David Dean (GCMRC)
Drew Eppheimer (GCMRC)
Emily Palmquist (GCMRC)
Eric Scholl (GCMRC)
Erica Byerley (GCMRC)
Gerard Salter (GCMRC)
Helen Fairley (GCMRC)
Joel Sankey (GCMRC)
Kate Behn (GCMRC)
Kathryn Thomas (GCMRC)
Kim Dibble (GCMRC)
Lauren Tango (GCMRC)
Lucas Bair (GCMRC)
Maddy Kelley (GCMRC)
Maria Dzul (GCMRC)
Beccie Mendenhall (SeaJay Env)
Cassandra Reed (NPS)
Christina Kalavritinos (DOI)
Conor Clancy (NPS)
Craig McGinnis (SRP)
Dan Schaefer (SRP)
Dan Valentine (Angler)
Dave Foster (Fishing Guide)
Dave Tremble (Fishing Guide)
Dave Worthington (Grand Canyon Conservancy)
Deborah Shirley (BIA)
Edward Wemytewa (Pueblo of Zuni)
Emma Wharton (Grand Canyon Youth)
Fred Brown (Marble Canyon Lodge)
Harry Lodge (Fisherman, Lees Ferry)
Jess Newton (USFWS)
Jim Stroger (Trout Unlimited)
John Berry (Resident)
John Jordan (Trout Unlimited)

Mark Anderson (GCMRC)
Matt Kaplinski (GCMRC)
Meredith Hartwell (GCMRC)
Morgan Ford (GCMRC)
Shannon Sartain (GCMRC)
Ted Kennedy (GCMRC)
Tom Gushue (GCMRC)
Amanda Becker (Reclamation)
Bill Stewart (Reclamation)
Bryce Mihalevich (Reclamation)
Daniel Picard (Reclamation)
Dave Speas (Reclamation)
Genevieve Johnson (Reclamation)
Heather Patno (Reclamation)
Jamescita Peshlakai (Reclamation)
Kathy Callister (Reclamation)
Matt O'Neill (Reclamation)
Melynda Roberts (Reclamation)
Teo Melis (Reclamation)
Zachary Nelson (Reclamation)
Alyx Richards (UCRC Commission)

Josh Korman (Ecometric Research)
Julie Carter (AZGFD)
Kevin Bulletts (Southern Paiute Consortium)
Kevin Garluck (UMPA)
Kierstin Bissell (Marble Canyon Lodge)
LaShwn Couey
Malcom Bowekaty, (Pueblo of Zuni)
Marc Wicke (Salt River Project)
Mary Plumb (NPS)
McKenna Carlson (student)
Megan Osborne (UNM)
Melissa Trammell (NPS)
Michelle Kerns (NPS)
Mike Pillow (USFWS)
Nicki Gibney (NPS)
Pilar Wolters-Rinker (USFWS)
Sarah Graham (student)
Shea Meyer (SRP)
Susan Wood (NPS)
Warren Turkett (CRCNV)

Acronyms

ACHP - Advisory Council on Historic Preservation	GCWC—Grand Canyon Wildlands Council
ADWR – Arizona Department of Water Resources	HFE – High Flow Experiment
AHAHG – Administrative History Ad Hoc Group	KAF - Thousand Acre Feet
AHG - Ad Hoc Group	LCR - Little Colorado River
AMWG – Adaptive Management Work Group	LTEMP – Long-Term Experimental and Management Plan
AZGFD – Arizona Game and Fish Department	MAF - Million Acre Feet
BAHG – Budget Ad Hoc Group	mm – millimeter
BIA – Bureau of Indian Affairs	MOU – Memorandum of Understanding
BO - Biological Opinion	NEPA – National Environmental Policy Act
BOR – Bureau of Reclamation	NMISC – NM Interstate Stream Commission
C° – degrees Celsius	NPS – National Park Service
CBRFC - Colorado Basin River Forecast Center	NPS-GLCA – NPS Glen Canyon National Recreation Area
CFS – Cubic Feet per Second	NPS-GRCA – NPS Grand Canyon National Recreation Area
CRBC – Colorado River Board of California	P&I Team – Planning and Implementation Team
CRCNV – Colorado River Commission of Nevada	PDT – Pacific Daylight Time
CREDA – Colorado River Energy Distributors Association	Reclamation – Bureau of Reclamation
CRSP – Colorado River Storage Project	RM - River Mile
CWCB – Colorado Water Conservation Board	ROD - Record of Decision
D.O. – dissolved oxygen	SEAHG – Socioeconomic Ad Hoc Group
DOI – Department of the Interior	SEIS – supplemental environmental impact statement
DROA – Drought Response Operations Agreement	SHPO - State Historic Preservation Office
DSA - Deliverable Sales Amount	SMB – smallmouth bass
DWR – Department of Water Resources	SNARRC – Southwestern Native Aquatic Resources and Recovery Center
EA – environmental assessment	SNWA – Southern Nevada Water Authority
EIS – environmental impact statement	SWE - Snow Water Equivalent
FFI – Fly Fishers International	TRGD – Trout Recruitment and Growth Dynamics
FLAHG – Flow Ad Hoc Group	TWG – GCDAMP Technical Work Group
FY – Fiscal Year	TWP - Triennial Work Plan
GCD - Glen Canyon Dam	UCRC – Upper Colorado River Commission
GCDAMP – Glen Canyon Dam Adaptive Management Program	UMPA – Utah Municipal Power Agency
GCMRC – Grand Canyon Monitoring & Research Center	USFWS – United States Fish & Wildlife
GCPA – Grand Canyon Protection Act	USGS – United States Geological Survey
GCRG – Grand Canyon River Guides	USU – Utah State University
GCROA - Grand Canyon River Outfitters Association	WAPA – Western Area Power Administration
	WY - Water Year
	YoY – Young-of-Year