Glen Canyon Dam Adaptive Management Program
Adaptive Management Work Group Meeting
August 17-18, 2022

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Wednesday, August 17, 2022

Start Time: 8:30 AM Pacific Standard Time (PDT)
Conducting: Wayne Pullan, Secretary's Designee to the Adaptive Management Work Group (AMWG) and AMWG Chair.
Recorder: David McIntyre, SeaJay Environmental, LLC.
Facilitator: J. Michael Harty, Kearns & West, Inc.

Welcome and Administrative

Opening Remarks

[Wayne Pullan, AMWG Chair] Provided opening remarks.

Introductions and Determination of Quorum

[Michael Harty, Kearns & West] Roll call taken, and a quorum was reached with 22 members represented.

Approval of May 18, 2022, Meeting Minutes

[Wayne Pullan, AMWG Chair] The draft minutes were distributed on August 8, 2022. No edits or proposed changes were received.
May minutes approval moved by: Larry Stevens, Grand Canyon Wildlands Council (GCWC); **Seconded by:** Jim Strogen, Fly Fishers International (FFI)/Trout Unlimited (TU). The minutes from the May 18, 2022 meeting were approved by consensus.

Review of May Meeting Evaluation

[Terra Alpaugh, Kearns & West] Five respondents provided input on the May AMWG Meeting. They were pleased overall with the organization though some felt the traditional half-day meeting was too short. Would like to see a return to in-person meetings. The following issues were identified as critical topics for the Glen Canyon Dam Adaptive Management Program (GCDAMP) attention:

- Native fish protection and metrics for monitoring those populations,
- Establishing baselines of endangered populations given drought conditions,
- Drought and climate change issues with a focus on hydrology, maximizing water in Lake Powell, and assuring water quality, and
- Expanding scope of the GCDAMP to include areas around Lake Powell and associated wildlife and socioeconomic conditions.

Similar themes were suggested as agenda topics for upcoming meetings, including warmwater invasive threats, native fish protection, associated timelines for mitigation strategies, socioeconomic impacts of drought on tribes, information on terrestrial wildlife, and the ability to consider a broad scope of options while considering National Environmental Policy Act (NEPA) compliance.

Administrative Updates

- **AMWG Membership Status, Nominations and Reappointments**
- **[Tara Ashby, Reclamation]**. Update provided on GCDAMP membership.
- Action Item Tracking **[Clarence Fullard, Reclamation]** Updates were provided on the following on-going action items:
    - The Grand Canyon Monitoring and Research Center (GCMRC) developed **draft Monitoring Metrics** and will provide presentations with the 2022 Annual Reporting Meeting. Feedback has been solicited at AMWG and TWG Meetings and will continue to be collected into 2023.
    - Latest **Budget Prioritization** update in May identified high priority activities that support compliance. Budget Ad Hoc Group (BAHG) leadership, including the outgoing and incoming chairs, will meet in October; the meeting will provide Interior leadership with the opportunity to discuss the budget priorities to inform the BAHG going into Calendar Year (CY) 2023.
    - **Operational Alternatives** is an open item to get feedback during this meeting.
- **AMWG Nominations:** Federal Register Notice (FRN)
- **Post-2026 Colorado River Reservoir Operational Strategies** FRN. [**Wayne Pullan, AMWG Chair]** This is pre-scoping to replace interim guidelines for Lake Powell and Lake Mead that would be implemented in post-2026 guidelines effort. **ACTION:** Input requested on the operational strategies process. Deadline for comments is September 1, 2022.

AMWG 101

PRESENTATION **[Rod Smith, DOI Solicitor's Office]** Provided a high-level review of the AMWG program including the charter and AMWG authorities – Federal Advisory Committee Act (FACA) and Grand Canyon Protection Act. Key topics included review of the GCDAMP objectives, including monitoring and research, the decision-making process in which the Interior Secretary is the final decision maker, AMWG duties and standard operating procedures as established by the 1996 Glen Canyon Dam Environmental Impact Statement (EIS) and now LTEMP EIS and ROD, and the role of GCDAMP in informing the program.

Q&A and discussion

[Larry Stevens, Grand Canyon Wildlife Council (GCWC)] What aspects of the GCDAMP are the most problematic for the Solicitor's office? **[Rod Smith, DOI Solicitor's Office]** No aspects are problematic. It can be challenging that the Grand Canyon Protection Act calls for the Interior Secretary to do multiple good things for the Grand Canyon, and sometimes these things do not mesh well. When AMWG settles on something, that also needs to mesh within the laws and other activities.

[David Brown, Grand Canyon River Guides (GCRG)] How does membership in the AMWG relate to LTEMP, including decision-making for the high flow experiments (HFEs)? **[Rod Smith, DOI Solicitor's Office]** The HFE protocol in LTEMP began through an environmental assessment (2012), which was then incorporated into the 2016 protocol. These were the ground rules with caveats for what to do when there is enough sediment and to ensure HFEs do not have adverse effects on other resources in the canyon. LTEMP created the technical team that evaluates this and provides recommendations to the Leadership Team, which is currently comprised of state and federal members but not AMWG members.

[Jim Strogen, FFI/TU] Could you highlight the interface of DROA and the GCDAMP? **[Rod Smith, DOI Solicitor's Office]** DROA can affect up to four facilities in the Upper Basin; Glen Canyon is one of them. Glen Canyon has AMWG, and the others have their own groups but not all are as formal as AMWG. Key area of DROA's interface with GCDAMP is not how much water shows up at Glen Canyon, but what happens to that water afterwards.

[Rod Buchanan, FFI/TU]: Clarify the LTEMP's role in AMWG's work? **[Rod Smith, DOI Solicitor's Office]** LTEMP is the road map to accomplish the LTEMP goals, which are derived from desired future conditions (DFCs).

[Kelly Burke, GCWC] Where in the LTEMP process and the Grand Canyon Protection Act does adaptive management fit in—steps such as identifying needs, providing technical information, advising the Secretary, and recommending when to change management? **[Rod Smith, DOI Solicitor's Office]** LTEMP and the Grand Canyon Protection Act require doing good things for the canyon. Interior has done that since 1996 using an adaptive management program. The 1996 EIS had this flexibility; LTEMP has this flexibility. Warm water and smallmouth bass are an example of what needs to be adaptively managed. The last AMWG meeting identified this as a topic of importance, as well as what should be assessed. Next step is how to effectuate those things. Do they fit into an LTEMP box or do we need another box?

[Larry Stevens, GCWC] What is the relationship of the GCDAMP vision and mission statement to the program structure? **[Rod Smith, DOI Solicitor's Office]** This is within Section A, B, C and Subsection D of the Description of Duties section of the charter.

Basin Hydrology, Water Quality, and Operations

PRESENTATION **[Heather Patno, Reclamation]** Upper Basin Storage as of August 14 shows: Fontenelle 96% full, Flaming Gorge 75%, Blue Mesa 43%, Navajo 56%, and Lake Powell 26%. Expect all will decrease until next spring. Overall storage in Colorado River is quite low. Peak was March 2022 at 96% of median, which was two weeks early. Started the year close to 2002 hydrology, the driest year on record. Some snow filled the moisture deficit, but it is still very dry. Monsoonal activity occurred in July, and more is anticipated. Mountain snowpack drives the upper basin. Hydrology is much lower than normal and it is anticipated to continue in 2023, comparable to what has been seen since 2020. There is significant uncertainty for Water Year (WY) 2023 inflows. August is the operational decision month to set operating tiers for Lake Powell and Lake Mead. Lake Mead will be in shortage condition II. Lake Powell will be consistent with 2007 Interim Guidelines with elevation projected to be less than 3,525 feet. The upper Colorado basin hydropower maintenance schedule for August and September will have six units available. November 2022 and March/April 2023 are HFE months. Only four units will be available in March; all eight units will be available in May, July, and August. Releases were also reviewed. Higher temperatures are anticipated until mid-September when temperatures start to decrease.

Q&A and discussion

[Leslie James, Colorado River Energy Distributors Association (CREDA)] Which probability was the consideration of balancing based on for the 3,525 elevation? Is there temperature monitoring (as well as modeling) underway? **[Heather Patno, Reclamation]** Will look at balancing in the April study if elevation is above 3,525. This is also reviewed monthly. Temperatures are monitored at the dam.

[Jim Strogen, FFI/TU] How long is dissolved oxygen (DO) anticipated to be a problem? **[Heather Patno, Reclamation]** Not sure how long these DO levels will be seen. More will be known next week after taking measurements, but better DO conditions are expected as the reservoir cools for the winter. Reclamation will be monitoring DO more closely at Lake Powell because of the critical elevations.

Aridification of the West and the Adaptive Management of The Colorado River Ecosystem Downstream from Glen Canyon Dam: Facilitated Discussion

Discussion AMWG members were invited to discuss how the AMP responds to ongoing aridification and how to improve engagement on this issue in the future.

[Larry Stevens, GCWC] There are challenges in the management of the Colorado River. GCWC has recommended that riparian restoration be done in a more active way.

[Ed Keable, National Park Service (NPS) Grand Canyon Recreation Area (GCRA)]: One of the challenges with aridification is the combination of dust impacts and ash from wildfires. Is there a holistic approach to wildfire management activities? Congress has passed wildfire funding. Scientific research might be needed on where to do controlled burns and potential effects on water resources. There has been some research on this, which NPS has looked into a little bit. **ACTION:** Consider a briefing on this topic and to look at funding opportunities. **[Joel Sankey, GCMRC]** USGS has done a lot of research on wildfire impacts to water in the West, but this science has not been asked for by the GCDAMP. **ACTION:** Will contact NPS staff about this work and potential opportunities.

[Larry Stevens, GCWC] GCWC is overseeing a project on infiltration of groundwater effects from forest treatments on the Southern Colorado Plateau involving monitoring of 56 springs where thinning and controlled burning are occurring (28 in treatment areas and 28 outside treatment areas). Report out next year. These are long term studies, but present work is constrained due to funding. More than half of the Colorado River flow is from groundwater. The Grand Canyon contributes 5 to 7% of the total flow.

[Wayne Pullan, AMWG Chair] There is concern among AMWG members that Reclamation is not fully considering the impacts of climate change and that it needs to consider impacts of aridification in its work. ACTION: Reclamation to catalog a list of issues to consider as to what work will be affected if reservoir elevations continue to decline.

[Jim Strogen, FFI/TU] Are the wildfire concerns related to the Glen Canyon corridor or on water delivered through Lake Powell and into the system? **[Ed Keable, NPS-GRCA]** The whole basin is susceptible to wildfire, which has impacts on aridification and water distribution throughout the system.

[Larry Stevens, GCWC] One issue is the ongoing debate about how best to manage the river for food base related issues. We don't know the outcome from fluctuating flow practices on the Colorado River. It would be interesting to compare the food base story in the tailwaters below the Glen Canyon Dam with what's going on below Hoover Dam where we have real hydropower peaking in place. What's the structure of the food base down there? It would be interesting to understand fluctuating flows in a natural system by comparison with some river system that enters into the ocean where the fresh water is subject to natural daily tidal flows. An example would be the Bay of Fundy.

[Jim Strogen, FFI/TU] More effort is needed to conserve water in all basin states, and this will not improve until GCDAMP takes it more seriously.

[David Brown, GCRG] The term aridification seems to imply a gradual process but it is happening quickly. AMWG recommendations move slowly. Some of these changes require nimbleness. DROA and other actions taken show that where there is a will there can be a way. If lake levels go below the penstocks, then it is important for GCDAMP to consider conserving flows. Need to start studies to evaluate a different regime to get water around the dam to address these challenges, particularly considering funding challenges.

[Kelly Burke, GCWC] Would like to have a summary presentation of research on impacts to riparian areas and aquatic ecosystem and integrate these questions as well as the research findings into forecasts and modelling that will inform GCDAMP's thinking.

[Wayne Pullan, AMWG Chair] There are huge challenges ahead with respect to aridification and the need to identify affected resources and processes. The AMWG needs to consider what will happen with HFEs during low reservoir levels. What is the minimally affected flow and timing? Is one large flow every four years better than two small flows every other year? What becomes of the resource values downstream of Glen Canyon Dam during the months when elevations may be below 3,490? How can Reclamation anticipate those effects and can they be mitigated? It is outside AMWG's purview and Reclamation's authority to go upstream to get more water into Lake Powell, but this can be considered as a future agenda topic.

Fish Exclusion Technologies Report and Dissolved Oxygen State-of-Practice Report

[Connie Svoboda, Reclamation] At lower reservoir elevations, the risk of fish entrainment increases because the epilimnion where the fish are is near the penstock. Reclamation is looking at options to limit fish escapement. Different technologies were reviewed and assessed for their applicability to Glen Canyon Dam, and none appear able to fully eliminate fish escapement at Glen Canyon Dam. Preferred solutions would limit impact to power production, operations, maintenance, and recreation while maintaining environmental protection. Three options that may have merit from a technical perspective are:

- In-reservoir barrier net
- In-reservoir multi-stimulus barrier (i.e., bubble, sound, light)
- Deeper water withdrawal

A final report will be submitted to Reclamation by mid-September 2022. Next steps should be to convene a group of subject matter experts to review these options.

Q&A and discussion

[Sara Price, State of Nevada] Are nets below the dam less effective than in the reservoir? **[Connie Svoboda, Reclamation]** They are not less effective, but there are additional issues. They are easier to inspect and maintain in the reservoir. An option for nets downstream with one at the outfall of the penstock was considered but is not very viable: there is poor access until Lees Ferry, which would have recreation impacts because the net would have to span the channel and the fish sorted onshore.

[Jim Strogen, FFI/TU] Any ideas on how to expedite implementation of the preferred alternative? **[Connie Svoboda, Reclamation]** This is a problem Reclamation wants to solve sooner rather than later. Some options can go in faster than others. Options that go in the reservoir require dam safety risk

analysis. Other assessments might be required such as if a net gets dislodged. This is an important part when considering which options to advance.

[Leslie James, (CREDA)] The analysis should also include the cost of the turbine runner replacements, which gained some efficiency, compared to what efficiency would be lost now. **[Connie Svoboda, Reclamation]** Good point.

PRESENTATION **[Mike Horn, Reclamation]** The Technical Services Center reviewed a wide range of possible technologies to address DO effects on the rainbow trout fishery. There are different levels of DO concentrations in the epilimnion, metalimnion, and hypolimnion. There are no short-term fixes; all would require significant engineering analysis and feasibility study. Highest chances of success are hypolimnetic aeration and turbine aeration.

Non-Native Fish Observations and Actions Above and Below Glen Canyon Dam

[Brian Healy, NPS-GRCA] Provided an update on the captures of rare and high-risk non-native fish that threaten the trout fishery in Lees Ferry and native fish downstream in Grand Canyon. Data are from monitoring efforts that are not distributed evenly through space and time: more monitoring was done in Lees Ferry than in other parts of Grand Canyon, and data does not include incidental observations from the public but does include angler observations verified by Arizona Game and Fish Department (AZGFD). There was a total of 232 captures – 90% from Lees Ferry and 10% from downstream, which included green sunfish, smallmouth bass, striped bass, walleye, yellow bullhead, black crappie, and juvenile carp. Tens of thousands of juvenile carp were captured or observed within the slough at River Mile (RM)-12. While many of these fish are rarely captured below the dam, smallmouth bass have been seen reproducing this year in the slough. Also found bluegill, sunfish, and green sunfish in the slough and below the dam.

[Rob Billerbeck, NPS] Discussed operations at lower slough in Glen Canyon and next steps. NPS has been finding smallmouth bass in Glen Canyon, and there is evidence they are breeding in the lower slough in RM-12. NPS is implementing chemical treatments in lower slough and possibly also the upper slough to eliminate downstream dispersal of smallmouth bass and green sunfish. Only have a short period of time to do this. Sent letters to tribes in June that NPS may be moving to higher tier actions. NPS is working with Reclamation, USGS, AZGFD, and the U.S. Fish and Wildlife Service (USFWS).

[Bud Fazio, NPS Glen Canyon National Recreation Area [GLCA]] NPS-GLCA is working with agency partners, including GCMRC and the Western Area Power Administration (WAPA), and tribes to understand the best time to treat, which is likely in September. To date, NPS has internally approved a pesticide use plan and is doing regular monitoring with fisheries biologist. Have found 10 young-of-the-year (YOY) in Lower Slough at RM-12 that represent first breeding. While green sunfish have been identified in the upper slough, now seeing them breed in lower slough. Looking at both species as significant new event in breeding in lower slough.

[Clarence Fullard, Reclamation] Provided an update on behalf of Utah State University (USU): Reclamation contracted this study with USU; it has included a variety of sampling since August 2022. Challenges have included technical difficulties with sending a pressure device through the penstocks to collect data on conditions. There are three places being monitored: Horseshoe at Glen Canyon Dam (forebay), Wahweap Confluence, and Wahweap proper. At Wahweap, the catch is gizzard shad, striped

bass, and smallmouth bass. At Wahweap Confluence, the catch is gizzard shad and smallmouth. At the forebay site, the catch is mostly smallmouth bass and striped bass. Minnow trapping catches green sunfish.

Q&A and Discussions

[Wayne Pullan, AMWG Chair] Why has only one fish been tagged? Have fish been tagged that are of the size that would likely be entrained and survived? Are there plans to check for those fish downstream? [**Clarence Fullard, Reclamation]** There was a lack of taggable-sized fish in August, and the equipment didn't catch larger bass due to seasonal changes. The tiny ones are unlikely to be entrained and survive. The monitoring is designed for the larger ones that can swim away.

[Jim Strogen, (FFI/TU)] Have the fish that have been caught responded to temperature? Is it temperature that is of concern or their proximity? What is driving them to different depths? **[Clarence Fullard, Reclamation]** They typically reside in the epilimnion and do not go into deeper, darker, colder waters. A research question is to understand the distribution of these fish in the forebay area, which is probably because of habitat and food availability.

Technical Work Group Chair Report

PRESENTATION **[Seth Shanahan, TWG Chair]** The TWG met in June and will meet again in October. A non-native fish tabletop exercise was conducted in April and discussed in June, which was very positively received because it allowed people to discuss the *What Ifs* and how this group can respond. Key concerns are prioritizing prevention over detection, having capabilities to detect quickly, identifying thresholds for action, agency consultations that have management responsibilities with GCDAMP, funding limitations, and staff and equipment availability. Smallmouth bass are elevating these concerns.

TWG also has interests in the monitoring metrics, which are being updated. Next steps are to develop Final Draft Metric Descriptions for all goals. A draft on riparian vegetation is available. TWG looked at growth rates in rainbow trout. There have been limited effects of annual implementation of bug flows or fall HFEs on lifetime growth of trout. Water temperature effects from drought conditions were noted for trout. The TMF white paper is an interim step in trying to understand trout management flows. It is not a decision document, nor a substitute for tribal consultation. TWG also discussed the Adopt-a-Beach Program, which has been around since 1966 to research long-term trends on beaches in the Grand Canyon. In October, TWG will kick off its triennial work plan and budget process.

Q&A and Discussions

[Sara Price, State of Nevada] Is the small effect from bug flows because the flows did not work or because there has not been enough time to determine effects? Was there a measurable goal going into the bug flows? If not, is enough known now to better define one? **[Seth Shanahan, TWG Chair]** The focus on the slides was from Lees Ferry where bug flows are not expected to have an impact. Not an unusual finding. **[Ted Kennedy, USGS]** Uncertainty is because the effect size of bug flows on rainbow trout is not large (small or moderate) and because of the small number of intervals in the 10-year study when bug flows were conducted. This is an excerpt from Korman's manuscript summarizing the findings: "*The small positive effect of bug flows on growth rate (e.g., 0.6%·mo-1 for a 300 mm trout) was uncertain (CV=0.47), in part due to confounding with the effect of soluble reactive phosphorous*

concentration (SRP)." The current thinking is there will not be big effects in Lees Ferry due to complexity of hydropeaking waves downstream. Bug flows won't improve things everywhere.

Update on the Strategy and Operational Alternatives Directive from the Secretary's Designee

PRESENTATION **[Seth Shanahan, TWG Chair]** Initial conversations don't represent a consensus or recommendations, which are still in process because the TWG hasn't had the opportunity to discuss these topics. Up to four alternatives are being discussed. TWG has stood up a Smallmouth Bass Ad Hoc Group (SMBAHG), which is developing a Strategic Plan defining the operational alternatives and what is the most important use of time to avoid duplication of effort. The overarching goal is to prevent the introduction and spread of high-risk nonnatives by implementing early detection and rapid response to try to stay in front of the invasive species invasion curve. Implementation timeline includes early detection (ongoing throughout life of project), interim prevention, and permanent prevention. Strategic Plan Progress: have developed outline, compiled existing management actions and monitoring activities, are identifying implementation needs and gaps, and have drafted introduction and guiding principles sections. Regarding Operational Alternatives Progress: Stakeholder input has been sought, their ideas have been discussed, the top four ideas are being analyzed by GCMRC, and alternatives will be included in the final strategic plan.

PRESENTATION **[Charles Yackulic, GCMRC]**

Operational alternatives were developed with a goal of preventing establishment during a transition period to more long-term solutions while minimizing effects on other resources. For the purposes of visualization, we choose a specific set of conditions under which all alternatives were displayed; however, the exact nature of each alternative depends on conditions, including the monthly volume, water temperatures near the penstock and jet tubes, and the degree of warming expected in the river based on the month of the year. For these visualizations, jet tube releases are assumed to be 11 degrees Celsius (^{o}C) and penstock are 18 ^{o}C. There were four alternatives analyzed and tradeoffs associated with each one. Alternative 1 is highly effective with high certainty but leads to a substantial amount of bypass. The amount of bypass could be reduced through changes in monthly allocation and/or by switching to full bypass in some months. Alternative 2 has no by-pass and is unlikely to prevent establishment although it may moderately slow establishment and/or lower carrying capacity for smallmouth bass. Alternative 3 could be effective but has more uncertainty than Alternative 1. Alternative 4 has a slightly higher chance of prevention than Alternative 3 because of the flow spike.

PRESENTATION **[Seth Shanahan, TWG Chair]** Immediate needs: Begin NEPA process now so operating alternatives could be available for next year. This is not an endorsement of the current alternatives and should not eliminate other options. Continue to rigorously evaluate other near-, mid- and long-term options.

Q&A and Discussions:

[Sara Price, State of Nevada] This is a huge subject with lots of variables. There seem to be big impacts on hydropower. Likes idea of initiating NEPA and exploring these options to be able to act when needed. Being prepared will make it easier to target funding that is available right now. How can effects be mitigated to move these actions forward?

[Kelly Burke, GCWC] If we can move forward with compliance, it will be important to have these tools in the toolbox. **[Brian Sadler, WAPA]** There are concerns and questions including what is the coverage for taking actions other than Alternative 2. Is this an experiment or a management action? That affects WAPA in many ways. There is also an effect on WAPA's operations under most of these alternatives. Funding revenues also come from 150 customers including three tribes. No generation at Glen Canyon Dam would drop WAPA generation around 80 percent, which could overload certain transmission lines, cause prices to rise, create emergency energy considerations, and have black out service implications. **[Kelly Burke, GCWC]** To what degree can the focus be on reducing impacts to power and other resources from project design? Are concerns about the currently proposed alternatives related to not wanting to do the compliance? **[Sara Price, State of Nevada]** WAPA raises concerning issues, and it's complicated with unprecedented changes that might need to be addressed legislatively or structurally. Reclamation's leadership is needed to take steps in a direction toward the possibilities.

[Ed Keable, NPS-GRCA] Agrees that it makes sense to start NEPA. What does it mean conceptually to pursue opportunities that minimize hydropower impact? How would that affect the NEPA process? Is Reclamation ready to do NEPA now? Has anyone looked at the cost to hydropower compared to the costs to managing fish under a regulatory scheme if smallmouth bass cannot be stopped? **[Charles Yackulic, GCMRC]** GCMRC has calculated some of the costs of mechanical removal, which could cost tens of millions of dollars and have no guarantee of success. It has had mixed success in the Upper Basin with some good years and others bad. Mechanical removal also creates tribal concerns. There are also substantial costs to letting smallmouth bass and other warmwater fish establish in the system. The opportunities to minimize hydropower costs could include tweaks to monthly allocation or ways to do less bypass during certain months; i.e., under Alternative 1 there are certain conditions in terms of temperatures in certain months of the year where you could bypass less if the bypass happens that day as opposed to mixed water. It is also assumed under Alternatives 3 and 4 that 11,250 cubic feet per second (CFS) would be bypassed with three tubes open. It could be less in some months while more water could be moved in June and July. **[Ed Keable, NPS-GRCA]** Hydropower interests are important but are not the only interests at play. There are holistic challenges facing the basin. **[Seth Shanahan, TWG Chair]** The framing of this at the technical level is not either/or, it's both. Tools need to be potentially available while also looking at other things that can be done.

[Clarence Fullard, Reclamation] Reclamation recently hired a new NEPA person who could consider this.

[Leslie James, CREDA] Responding to Ed's comments, there are a lot of potential impacts and interests besides hydropower. The landscape was different when previous NEPA was done. With the energy transition going on in the west, the value and use of hydropower has changed dramatically. Hydropower is an important backstop for intermittent resources as they come on. It's a black-start capability for Palo Verde Nuclear Generating Station. When an assessment of impacts is done, it will reflect significantly changed circumstances including system impacts and direct customer impacts. When LTEMP was done, there was a completely different rate paradigm. The assessment done for LTEMP used for those assumptions, which have changed dramatically. When NEPA is undertaken, there will be different assumptions and parameters given the big changes in the western interconnected system and the structural changes in the rate that place the risk and obligation onto customers. Previously, they were more indirect. There is a lot of urgency to get something done next summer but hydropower impacts will need to be considered broadly– not just the financial impacts but also the availability of

replacement resources given that the western grid is very tight. It's a big issue when Glen Canyon is not operating. Bypass impacts availability, affordability, and grid stability.

[Brian Sadler, WAPA] Some non-natives like striped bass are in the western part of the canyon, but the ability to affect temperature only extends to the Little Colorado River. Are there other alternatives to address those fish? [**Charles Yackulic, GCMRC]** Striped bass require eggs in the water for 2-3 days. Striped bass spawning is not as much of a concern as smallmouth bass. Establishment in Lees Ferry increases potential to move downstream. A couple of fish are not a big deal; a bigger concern is when there are thousands of fish downstream that are spawning tens of thousands further downstream. This is about the stages of invasion. There are more opportunities to manage smallmouth bass if they are not established downriver.

[Jessica Neuwerth, Colorado River Board of California (CRBC)] Main concern is that this is a problem that once established is irreversible. If that happens, there will be a different ecosystem than now. This is the window to act while keeping as many actions on the table as possible. There are painful tradeoffs and want to be sensitive to those, but this needs to move forward.

[Kristin Johnson, Arizona Department of Water Resources (ADWR)] There is a tight timeframe. Operational alternatives can be evaluated in the NEPA process. There will be questions about tradeoffs, but these concerns can be addressed through scoping and public comment. Would like to see Reclamation take ownership to move this along and help guide the process forward.

[David Brown, GCRG] Definitely supports starting NEPA. There is a small cushion before there may not be hydropower. Those issues need to be studied separately and aggressively. There have been suggestions of other places to generate hydropower. Flows reduced to 2,000 CFS will have significant impacts to boaters, but willing to discuss it if the science demands it.

[Kelly Burke, GCWC] NEPA can help get us out of binary thinking to find options that don't amount to a total meltdown of one resource or another. Understands there is uncertainty about bypass tubes in a below power pool situation where all the water has to go through them for an extensive period of time. Whatever we might end up doing in terms of an operational experiment, would this contribute to our understanding of how bypass tubes could perform under certain conditions? We're talking a lot about smallmouth bass but at the end it also involves increasing endangerment to humpback chub. This is another sideboard to pay attention to.

[Wayne Pullan, AMWG Chair] Requested that Reclamation respond by tomorrow morning (Day 2 of the August 2022 meeting) about NEPA associated with smallmouth bass and dam operations.

GCMRC Science Updates

PRESENTATION **[Ted Kennedy, USGS]** Daily tides from hydropower production affect abundance of midges. More broadly, insect diversity is negatively related to the magnitude of hydropower fluctuations in 18 different tailwaters across the West. Insects lay eggs at the waterline, but when the waterline drops, the egg dry and die. Bug flows are trying to mitigate this egg mortality by giving bugs a weekend off to allow for more natural processes. The bug flows experiment has led to additional 100 metric tons of algae production in Grand Canyon per year. Other analyses show increases in gross primary production (GPP), which led to higher growth rates for flannelmouth sucker. Similar models are needed for humpback chub. Bug flows appear to be a useful tool for enhancing natural processes.

PRESENTATION **[Joel Sankey, USGS]** High-resolution image and topographic data collection from GCDAMP's May 2021 overflight is the most recent in a rich archive of aerial imagery from 1935 to 2021 that is used to track changes of the Colorado River in the Grand Canyon. The earliest imagery are black and white prints acquired from an airplane in 1935 and 1965. The first data collection similar to the May 2021 overflight (high spatial resolution digital multispectral imagery and digital topography (Digital Elevation Model, DEM)) occurred in May 2002 and was then repeated in 2004, 2005, 2009, 2013, 2021. Imagery and derivative data products from overflight remote sensing are used by every science project to address every resource goal of the LTEMP. GCMRC will publish the 2021 overflight digital topography (DEM) and imagery datasets in 2022 and 2023, respectively. However, the preliminary imagery and DEMs are currently being used by science projects at GCMRC and NPS..

PRESENTATION **[Paul Grams, USGS]** This paper on sandbar monitoring is based on a 30-year record of 45 long-term monitoring sites (one in Glen Canyon, 20 in Marble Canyon, and 24 in Grand Canyon). Monitoring spans the entire period of restricted powerplant operations that began with interim flows in 1991. There was net erosion between 1990 to 2003; net deposition occurred from frequent HFEs from 2004 to 2020. Data collection used total station and survey rods. Sandbar monitoring metrics include sandbar volume and normalized sandbar volume. Long-term monitoring provides a good representation of overall sandbar response. There are significant differences seen between the sand depleted period and the sand enriched period.

Public Comment

[Lynn Hamilton, GCRG]. It is clear how galvanized the group is and ready to meet the challenges upon us and ahead of us. There are severe consequences for inaction, put forth two of them. First is smallmouth bass and everything associated with that. Don't forget we have a tool for replenishing sediment in the system (i.e., HFEs). Like to hear tomorrow about the sediment load. There was a flash flood July 25th, and there could have been more since then.

Meeting adjourned at 4:09 P.M. PST

Thursday, August 18, 2022

Start Time: 8:30 AM PDT
Conducting: Wayne Pullan, AMWG Chair.
Recorder: David McIntyre, SeaJay Environmental, LLC.
Facilitator: J. Michael Harty, Kearns & West, Inc.

Welcome and Administrative

Introductions and Determination of Quorum **[Michael Harty, Kearns & West]** Roll call taken and a quorum reached with 19 members represented.

Federal Agency Updates

- **WAPA Glen Canyon Dam Emergency Exception Criteria [Brian Sadler, WAPA]** Glen Canyon Dam had emergency exception criteria two years ago but none last year, and none are anticipated this year. Basin Fund status balance is $9 million and going up to $15 million by end of

September. Bipartisan Infrastructure law will provide $40 million to use for the Basin Fund. Expect funds to run out by 2023. Lots of unknowns about what will happen next year.

- **ESA Update: Humpback chub, Razorback sucker [Kirk Young, USFWS]** Humpback chub were downlisted in November 2021. There are concerns about the future, but they have been successful so far. Razorback sucker were proposed for downlisting. Comments ended in September. Region 6 colleagues are now fully staffed and one of the highest priorities is to pick up where the previous FR left off. May include an SSA update as well. Hope to hear more about the status in the next year.

- **Non-native Aquatic Species Management Plan [Taryn Preston, NPS-GLCA].** The brown trout incentivized harvest program remains steady with 110 fish turned in during June and 120 in July. NPS pump out for green sunfish in the Upper Slough was not done in the spring but is planned for the last week of August. Trying to do smallmouth bass monitoring every other week with 12 juveniles captured over last couple of weeks. Fishing guides are seeing 12 to 18-inch smallmouth bass near RM-14. Working on a possible Rotenone application in the slough in September. The NPS-GLCA fish biologist is setting up a block net and doing more intensive netting with baited traps and minnow traps. Will try to use the block net to keep fish in the slough and remove them. In addition to smallmouth bass, also catching bluegill and crappie in lower slough, and green sunfish are reproducing in the lower slough. Flannelmouth suckers and trout are released below the block net.
- **LTEMP Litigation [Rod Smith, DOI Solicitor's Office]** LTEMP litigation was filed about three years ago. The fight over the administrative record has been resolved. Since AMWG's last update in February, all briefs are now complete, and Interior is waiting on when the court will hear oral arguments.
- **Bureau of Indian Affairs (BIA), GCMRC, Reclamation [Garry Cantley, BIA]** Nothing to add.
- **[Scott VanderKooi, USGS Southwest Biological Science Center]** Trying to hire chief for GCMRC. Position was announced in June. Currently reviewing applications.
- **[Michael Moran, GCMRC]** Regarding water quality study for Lake Powell which was part of the directive from the February AMWG, GCMRC is working on CE-QUAL-WS model. Hope to predict water quality conditions in the lake such as temperature, concentration of nutrients, and DO. Might be challenging to do DO since it involves biological activities that are hard to model. Adding bathymetry to model through which will help make model more accurate.
- **[Kathy Callister, Reclamation]** Hoping to hire group chief by mid-September. Looking to bring on new NEPA coordinator for the Region on September 11.
- **[Arden Kucate, Pueblo of Zuni]** Comments on NPS plan for non-native species. The understanding is there was a determination that Rotenone is the only viable option for smallmouth bass in lower slough. Trying to figure out how tribal government can get a better picture of how this process has been evolving. Learned this area was treated in 2015 with Rotenone. Thinks notification to tribal partners was similar to the discovery of the green sunfish. Tribe still concerned about it. Received letter June 23 about opening a dialogue on this invasive fish. Have not been able to meet due to timeline and need for immediate action. Also been reported that with the use of Rotenone it would be detoxified immediately after treatment. NPS put out word that they are open to any request from tribal members for field visit in advance of this application process, and Zuni would like to look further into this. However, when we do

schedule meeting, it looks like it will be after the fact. **[Ed Keebler, NPS]** Aware of the interest by tribal partners in the use of chemicals. Been communicating with tribal members. Had a meeting scheduled with Zuni but canceled. Want to continue discussion and trying to schedule tribal leaders to Glen Canyon to meet. Previous Rotenone treatments have been successful and had no long-lasting effects. NPS is trying to use all tools available to address tribal concerns.

- **[Larry Stevens, GCWC]** Concerns about longer term effects could be done by e-DNA sampling. Might also show what other species are in the system.

Report Out from the 2022 Stakeholder River Trip

PRESENTATION **[Peggy Roefer, Colorado River Board of Nevada).** Purpose of trip was to hear from tribal representatives and other stakeholders. Learned about the Zuni emergence story. Heard from the co-leads that canyons are different environments from the river. Saw salt accumulations above Little Colorado River. Saw humpback chub. River is considerably warmer than in the past. Discussed updates to current GCDAMP Strategic Plan and its principles. Talked about the importance of Grand Canyon from the perspective of tribal partners. Talked about kinship and management of the Colorado River under current aridity condition, how to modify management of water supply to meet 21st century water supply realities, management methods to address smallmouth bass, the tribal perspective, and suggestions to improve AMWG and TWG.

Q&A and Discussion

[Larry Stevens, GCWC] Tributaries to the Grand Canyon will be affected by invasive species. These are among the last pristine streams left in the country. At Elve's Chasm, saw New Zealand mud snail several hundred meters up the channel at the first waterfall. This is an example of a non-native that has moved up the tributary. Need to protect the river corridor to protect these pristine streams. Need to clarify objectives and revise the principles of the GCDAMP Strategic Plan.

[Sara Price, State of Nevada] Trip was effective given past Covid restrictions, the number of new people, and how complicated the program is. Grateful to tribal leaders who widened participants' perspectives on the river. Good time to reevaluate principles and goals.

[David Brown, GCRC] One of the big challenges with the HFE is the lack of water and challenges with aridification. Encourage decision makers to do a river trip to understand why this place is so valuable.

Update on the Meeting of the Parties to the LTEMP Programmatic Agreement

PRESENTATION **[Zachary Nelson, Reclamation]** The inaugural Glen Canyon LTEMP Annual Cultural Programmatic Agreement (PA) meeting was held August 4-5. A list of action items was developed for Reclamation and others to help cultural mitigation compliance.

[Jamescita Peshlakai, Reclamation] Cultural Sensitivity Training was a large, complex discussion with five tribes and the Southern Paiute consortium. The participants discussed starting a work group on the cultural sensitivity training portion of the PA. First meeting will be September 29 that will include all tribal members and Helen Fairley. This is the beginning of meeting the PA requirements.

[Zachary Nelson, Reclamation] Reviewed action Items from the Annual meeting. Need to close the black hole to promote dialogue. Need to ask BIA about involvement with tribes on LTEMP and whether to discuss monitoring more frequently. Reclamation will follow the monitoring report process in HPP. An

internal tribal discussion about what level of TCP documentation they want and how they want it shared and disseminated is needed. Reclamation should ensure that a transparent process occurs during GCDAMP, especially for environmental decision making: e.g., how are Tribal comments being incorporated into decision making and are they being transmitted to the Secretary? Follow HPP/PA process for monitoring recommendations. Cultural sensitivity training workgroup is established and will be meeting soon. Reclamation need to prioritize stipulations in the LTEMP PA (a prioritized list was included in the revised report). Big topics are cultural sensitivity training, non-native fish, and understanding the effects of HFEs on cultural resources.

[Jamescita Peshlakai, Reclamation] Reclamation and partners need to make sure they are working with tribes to be more effective, efficient, and transparent. Suggest quarterly meetings that include tribal funding/budget training and education to guide tribal stakeholders in using and reporting funds.

[Larry Stevens, GCWC] Heard from the tribes that their interest is not just about compliance within the framework of LTEMP but that the entire canyon has significance for each tribe. Will this program incorporate that larger perspective? **[Kathy Callister, Reclamation]** The tribes were invited to write the preamble of the LTEMP PA, which is very powerful. The tribes need a larger voice in the process. Direction from the Interior Secretary is to better represent tribal actions.

[Wayne Pullan, AMWG] Reclamation has asked for help in understanding what specific approaches need to be taken to reflect tribal ecological understanding and knowledge in decision making. It is important for Reclamation to know the tribal viewpoints. There needs to be enough time to go through process to ensure Reclamation knows status of each tribe on the issues.

[Kathy Callister, Reclamation] Would also be helpful to know if we are overwhelming tribes with information and how best to coordinate.

[Larry Stevens, GCWC] A TWG committee could also provide more clarity on objectives related to other tribal values. For example, all tribes value amphibians but we know almost nothing about them in the river corridor.

[Jamescita Peshlaki, Reclamation] Reclamation hears the tribes and agrees compliance is not enough. Cultural sensitivity training and starting the work group is putting tribes in the lead to develop and create larger narrative than before.

[Erik Stanfield, Navajo Nation] TCP nominations are derived from National Register nominations, which were originally for historic buildings and archaeological sites so people would understand how to maintain a building in a state reflecting its historical significance. This is an awkward fit for the Grand Canyon landscape. Problem is how to operationalize this. Need to start figuring out the TCP nomination process based on other ethnographic studies that have been done. TWG should consider an ad hoc group to identify these studies and put actions to them.

Tribal Partners Report and Perspectives

[Jakob Maase, Hopi Tribe] All resources are cultural resources to the Hopi tribe, not just archaeological resources. Tamarisk and fish get the most attention; natives and reptiles get overlooked. Would like to see a study on their health and more climate change research. LTEMP got in trouble a few years back over climate change. Water management between states and programs is essential. Hopi are very concerned about this. Hopi do not have much independent funding besides grants so can only do

monitoring allowed by them. Budget is 30 years old and not adequate. There were discussions on transparency between organizations and ensuring reports get implemented. Always present on Hopi monitoring trips but don't get responses back from the government. Is anything being implemented? Consultation is not consent. Current administration has taken a more positive approach than previous administration.

[Erik Stanfield, Navajo Nation] Navajo Nation is in its election season, which changes the focus of many elected officials and affects how administrative work is done. This means positions could change. Navajo Nation is very much like a state given its size and interests in the region including power generation, water rights, and storage. Encourages NPS and Reclamation to view Navajo Nation and other tribes as at least equal to or higher than other states. As a sovereign nation, it should be viewed on a higher level. Agrees with Jamescita on a clear schedule of meetings. Would like to meet regularly to strategize, pool resources, and improve participation. Annual monitoring trips over 30 years have generated lots of reports that need to be reviewed. Navajo would like to integrate more wildlife like big horn sheep into consideration. Elevate work on vegetation management and restoration, which is one of the more important issues historically and to maintain TCP integrity.

[**Daniel Bulletts, Southern Paiute Consortium**] Root of problem is human beings. People who go down there are disrupting a lot of things. Monitoring has been going well but don't receive feedback from Reclamation; only from NPS. Would like to have input from both and address issues in the tribe's reports.

[Arden Kucate, Zuni] Zuni had primaries and general election in December. Need transparency and continuity on how to best represent the Zuni. Zuni outlook is that Grand Canyon is homeland to some and sacred to many. Resources and natural processes need to be in harmony with stewardship. Alternatives that benefit one resource but damage another are things that need to be discussed. Give leeway to understand federal trust responsibilities to tribes, and it keeps us in compliance with applicable laws. This needs to continue with next administration, and everyone needs to understand implications of ongoing dialogue. Zuni is largest pueblo in New Mexico. Zuni have been most vocal about humpback chub and inception of management initiatives regarding predatorial non-native fish. Primary example is how to look at long-term management issues related to non-native fish linked to MOAs and ongoing PAs, etc. Zuni did emphasize in governor's letter equity for traditional and underserved communities including GCDAMP.

[Ed Keeble, NPS] NPS Director Chuck Sans was at Grand Canyon yesterday to speak at Emergent Summit, which is to extend socioeconomic opportunities to the tribes. Tribes are the third sovereigns after federal and state governments. NPS been working to that effect for a while. Question is what does sovereignty look like in the AMWG? Perhaps convene an ad hoc group to discuss? **[Erik Stanfield, Navajo Nation]** It is worthwhile to discuss that separately and have short agenda item in future.

[Arden Kucate, Zuni] Agree that the tribes should revaluate and look at long-term lifespan of the Grand Canyon. **[Wayne, AMWG Chair]** Would like tribal representatives to say how they would like to proceed based on what Ed has stated. **[Erik Stanfield, Navajo Nation]** Don't know if it needs to be a formal ad hoc group. Tribal representatives of AMWG will meet to discuss sovereignty within AMWG. **[Wayne, AMWG Chair]** Jamescita has agreed to take the lead on this.

[Kurt Dongoske, Pueblo of Zuni] The National Historic Preservation Act and NEPA were never intended to deal with the effects of colonialism on tribes. Yet, compliance with these two laws by federal agencies is one effective method for tribes to express their concerns to the federal government about the ongoing and cumulative effects of federal actions that negatively impact and disenfranchise tribal people from their cultural landscapes. Sovereignty means respect and equity, both political and knowledge sovereignty.

The Role of AMWG in the DROA Process:

PRESENTATION **[Rod Smith, DOI Solicitor's Office]** Discussed the authorities for the DROA and its language. Knew by summer 2021 that some emergency DROA actions would need to be executed. The 2022 DROA Plan is based on a framework that doesn't change but year-to-year attachments do change. Idea behind DROA is to protect critical elevations at Lake Powell with the 3,525 foot threshold used to protect the elevation of 3,490 feet, which is the lowest point that all eight tubes can be used to generate power. Water supply for Paige, Arizona, and consequently the Navajo Nation, comes from here. Before water can be pulled from upstream units, first have to look at readjusting monthly volumes at Lake Powell. If water is held back, the annual volume still needs to be maintained. LTEMP allows for responding to low reservoir conditions. Six Upper Basin tribes asked for greater seat at the table, and they provided input on DROA meetings. Once there was enough to discuss, a meeting was convened of all 30 tribes in the basin. Hydrograph for the 2022 plan was designed with USFWS to decide how much more water could be sent from Flaming Gorge: large flow in the beginning was used to help listed fish, followed by a flow spike to disadvantage smallmouth bass, and then elevation of baseflows.

Q&A and Discussion

[Larry Stevens, GCWC] Will the Secretary request an opinion from GCDAMP, or will it be left to individual stakeholders to respond? **[Rod Smith, DOI Solicitor's Office]** Haven't crossed that bridge for 2023 yet. If AMWG can rally around an idea, that would be great.

03:24[Kurt Dongoske, Pueblo of Zuni] Does DROA affect the Lake Powell Pipeline (LPP) Project? **[Rod Smith, DOI Solicitor's Office]** If the LPP goes into effect, it would be a new draw from the system. Goal of DROA is to work with "unspoken" water. If LPP goes forward, then that water is off the table.

[Wayne Pullan, AMWG Chair] Our meeting for the one and one-half days has been very productive and has driven home some truths about our work now and in the future. I am highlighting eight truths below that represent my vision and position as the Secretary's Designee. They do not necessarily represent the vision of all the AMWG members:

1. The effects of aridification are upon us and its effects are emerging quickly and will require focused and decisive responses.
2. The drive for greater conservation on the river is not guaranteed to facilitate our efforts. In fact, if in the future releases from the Upper Basin to the Lower Basin are tied to inflow, we may have less water to work with than we do now.
3. With aridification water becomes more valuable and diverting it from one use to another results in greater impacts. This is true of all uses, including when water is diverted from hydropower. It is important to keep in mind the large swath of the west that is dependent on Glen Canyon power as well as the impacts of reduced power supplies on families, farms, communities, and tribes.

4. One of the impacts of aridification is lower reservoir elevations. Those lower elevations lead to increasing temperatures of water released, increasing risk of entrainment of non-native species, and the appearance of smallmouth bass in the river below Glen Canyon Dam. This issue places us at a critical juncture at which action is necessary to help ensure we do not face similar viability issues of listed species that we are seeing in the Upper Basin.
5. With respect to the threat of the non-native fish, we may have to act in two stages—taking short-term actions to mitigate the threat while we are pursuing longer term responses. For example, we may need to make operational changes to discourage establishment while we are planning for how to exclude the fish from entrainment.
6. The actions that need to be taken will exceed our previous vision, mission, and principles and it will require us to think creatively and on a larger scale. We will need to consider taking actions that we have not considered before because the conditions and resource impacts we are facing are novel. As I mentioned yesterday, we need to work together to reach compromise and consensus as consensus recommendations are much more powerful in the message they send.
7. The actions that need to be taken will likely strain our processes. Research, development, planning, deliberation, and decision-making for actions may not be able to proceed at the pace it has in the past. Our velocity must increase. We will need to act on the best available science—with the emphasis on the scientific studies and work already available at the time we need to act. We need to ensure adaptive management is one of our primary tools in addressing the challenges we are face.
8. Future actions will also strain our human and capital resources. Some redistribution of funding may be necessary. We will likely need to hire additional staff and contract a large portion of work to others. One bright spot is the possibility that we may be able to access funding under the Bipartisan Infrastructure Law and the Inflation Reduction Act. These resources may give us access to resources to do things we considered out of reach before.

With that introduction, I would like to describe five proposed actions—two associated with low reservoir elevations/lower flows and three associated with non-native fish. The information I will provide on each is preliminary and we are seeking the input of the AMWG on each. After I introduce these, we will take some time for questions and discussion. Please understand that, given the unfolding nature of these issues, we may not have many of the answers during this meeting.

1. **Evaluation of High-flow Experiments under Low-elevations/Low-flows** – The first of the low-elevation/low flow actions is to task GCMRC with developing and presenting to the leadership team an analysis of how to optimize HFEs in the current environment. Specifically, this would include evaluating whether less-frequent/higher-flow HFEs are preferable to more-frequent/lower-flow HFEs in a low water environment. Among other issues, this evaluation may consider: What are the minimal frequency, flow, and duration that would be effective? Are there other alternatives to what we have considered for meeting the objectives of HFEs? How do we time and design HFEs to minimize the hydropower impacts? GCRMC is likely to be able to complete this analysis relatively quickly and with minimal budget impact as much of this has already been considered. If possible, we would seek this presentation before a decision needs to be made about implementing any HFE proposal that may be developed for 2022.
2. **Evaluation of Downstream Resource Impacts under Low-Elevations/Low-flows** – The second of the LE/LF actions is to task GCMRC with developing a proposed schedule and budget for evaluating the potential downstream impacts to LTEMP resources of water surface elevation at Lake Powell dropping below minimum power pool and below dead pool for any period greater

than three months. We would ask that the proposed schedule and budget be completed by October 15, 2022 to seek additional funding from Reclamation. GCMRC will need to coordinate with Reclamation modelers on results that may be available to blend into coupled-modeling activities. In other words, taking the CRMMS probabilistic results and using them in GCMRC's temperature, water quality, and fish models to determine impacts for each resource under the Adaptive Management Program.

3. **Nonnative Fish Strategic Plan** – The first of the non-native fish actions is simply to ask the TWG, GCMRC, and Reclamation to continue the draft non-native fish strategic plan and have it ready for distribution as soon as possible. This includes incorporating the next steps and prioritizing activities, equipment, and budgets for short-, mid- and long-term actions as discussed during the first day of AMWG deliberations. In turn, these will be combined into future project management plans within the GCDAMP program.
4. N**EPA Compliance for Operational Flexibilities to Address Nonnative Fish –** The second of the non-native fish actions is to task Reclamation with developing a project management plan that includes a budget and schedule for initiating a NEPA process associated for operational alternatives /actions to disadvantage SMB and other non-native fish, which may require further refinement from GCMRC. We ask that the schedule be aimed at completing a NEPA decision document in time for possible implementation in the late spring/early summer of 2023. I encourage Reclamation to analyze the degree to which such compliance can be tiered off the LTEMP FEIS and ROD. It will be important to maintain a focused scope for this effort and to avoid inclusion of ancillary actions and issues to ensure the process can meet a possible spring/summer 2023 implementation. This NEPA analysis must not become a vehicle for addressing the range of concerns about the LTEMP FEIS and ROD, but should rather give us possible tools that we can implement in a timely manner to address the non-native fish challenges we are currently facing. I propose that the project management plan, be shared with the GCDAMP partners by October 14, 2022.
5. **Planning to Evaluate Exclusion Projects –** The third of the non-native fish actions is to task Reclamation with initiating a planning effort to evaluate options for avoiding entrainment of non-native fish resulting in a recommendation of options to be included in a feasibility study. The intent is to select the most effective option for excluding non-native fish from establishing below Glen Canyon Dam.

Q&A and Discussion

[Brian Sadler, WAPA]: Is there clear interpretation of how the Inflation Reduction Act (IRA) and the Bipartisan Infrastructure Law (BIL) funds can be used? Can we think outside the box for proposals? **[Wayne Pullan, AMWG Chair]** BIL is fairly prescribed; IRA is not very prescribed. It gives Reclamation $4 billion to address issues with drought. Will need to go through prescribed authorities under BIL to find money.

[Sara Price, State of Nevada] With all the funding becoming available, will there be a coordinated effort within Interior to address implementation of funding allocations? **[Wayne Pullan, AMWG Chair]** No decisions have been made about process.

[Heather Patno, Reclamation] Other bureaus in Interior may have access to IRA funds and could coordinate to bring resources together for a larger purpose. Also, would prefer to use of term climate change rather than aridification. That's our driver and challenge. Aridification and drought are the shorter-term impacts of climate change. **[Wayne Pullan, AMWG Chair]** Tries to stay away from the word

drought because it connotates a temporary situation, but operations must continue as if it is not temporary.

[Leslie James, CREDA] CREDA board had substantial discussion about smallmouth bass and other issues. Appreciates Wayne pushing ahead as there are a lot of issues that need vetting. CREDA is doing its best to be supportive regarding actions that need to be taken about this threat. **[Wayne Pullan, AMWG Chair]** Intention is to move things forward to flesh out and expose those issues so we can deal with them directly.

[Leslie James, CREDA] Yesterday's discussion was about bypass, what that means, and hydropower impacts. Couple years ago, CREDA tried to get one of its power customers on the agenda to talk to AMWG about what hydropower means to rural and tribal communities and the impacts they are seeing from drought. **ACTION:** Would like to get tribal and rural customers to discuss. **[Wayne Pullan, AMWG Chair]** Should put a panel together for future discussion to hear from individual customers. **[Alli Effati, New Mexico Interstate Stream Commission (NMISC)]** Don't see these as actions. These are similar to previous items assigned to AMWG and TWG for more information to be brought back to AMWG for consideration. **[Larry Stevens, GCWC]** Hearing from tribal and agricultural customers could be arranged as a TWG mini symposium, after which the TWG could report back to AMWG.

LTEMP Experiments: PRESENTATION

04:57 [Clarence Fullard, Reclamation] The accounting window for a fall HFE started July 1. Reclamation will facilitate deliberations starting in one week. The Planning and Implementation Team (P&I Team) acknowledges resource uncertainties. Weekly meetings were held to discuss smallmouth bass as they related to bug flows. Non-consensus recommendation was to offramp from bug flows due to smallmouth. A decision from Interior was to continue the experiment through August as originally planned.

[Mike Moran, GCMRC] It was hard to know in the 2022 sediment accounting period if there will be sufficient sand to trigger an HFE. It's been an active monsoon season, which may continue. There is still time for accumulation to hit a trigger before the implementation period.

[Clarence Fullard, Reclamation]. Received a lot of sediment inputs recently. Will be updating sand budget model with most recent data. Current model indicates no HFE this fall, but this is being updated constantly.

Q&A and Discussion

[Erik Stanfield, Navajo Nation] Can a tribal member be involved in the P&I Team discussions to learn more about how these things work and how tribes can be more engaged? **[Rod Smith, DOI Solicitor's Office]** Reclamation will discuss and get back to you on that question. **[David Brown, GCRG]** Support Erik's recommendation. Last year conditions were similar but the P&I Team elected not to do an HFE. It was concerning that this could establish a precedent. **[Larry Stevens, GCWC]** These decisions need to be more broadly and openly made with a wider group of AMWG constituents. **[Clarence Fullard, Reclamation]** There was an opportunity to submit comments last year, which included participation in a TWG/AMWG webinar. Comments were forwarded to the Secretary's designee along with the recommendation from the leadership team.

[Brian Sadler, WAPA] Wayne said at the last session that GCMRC and others would review HFE options prior to a fall HFE? Can this be clarified? **[Wayne Pullan, AMWG Chair]** There have been expressions of concerns about establishing a precedent. The challenge to GCMRC is what can be done in low flow, low reservoir elevation times. How can the benefits to resources be maximized with hydrology that is so different now? If there are new insights, would like to see them considered this year. We will consider ways to include tribal and NGO member involvement in the P&I Team.

FY 2023 Budget and Work Plan Recommendation

PRESENTATION **[Seth Shanahan, TWG Chair]** The TWG and BAHG completed the process that started in January to identify any changes to the budget. Their recommendation was approved by consensus in a June TWG motion to adopt the budget worksheets.

PRESENTATION **[Clarence Fullard Reclamation]** Total annual budget $11.36 million (80% to GCMRC and 20% to Reclamation). TWG is making recommendation to AMWG to adopt the 2023 budget. No changes recommended for FY2023 from FY2021-2023 triennial work plan other than some additional work.
PRESENTATION [**Mike Moran, GCMRC]** Reviewed budget table from work plan. This is budget for 2023. The total requested for next fiscal year is a little more than anticipated. Hope to get the difference from anything left over from FY 22. Anticipate $400K from FY 2022. Should have enough funds to do this.

[Seth Shanahan, TWG Chair] Reviewed the TWG Budget Motion.

Q&A and Discussion

[Heather Whitlaw, USFWS] What is the native fish conservation contingency fund, and can it be replenished? **[Clarence Fullard, Reclamation]** The fund was built up from hydropower revenues in the past, which are intended to be used for Biological Opinion conservation measure actions in case a Tier 1 or Tier 2 trigger action needs to be taken. There is about $1.7 million in the fund. Now that the program is funded through appropriations, it will be harder to replenish once spent. Project C5 is for experimental management actions such as HFEs.

[Sara Price, State of Nevada] Under Priority 1, could boats be purchased as an example? Is that addressed under Priority 1? That might be moving us along on non-native fish issues. **[Seth Shanahan, TWG Chair]** The concept during TWG discussions wasn't that it was so narrowly specific to a particular item (TWG didn't discuss exact examples), but if a specific example popped up, then those would be the kind of projects that could receive Priority 1 type funding.

[Heather Whitlaw, USFWS] Priorities 2 through 7 or 8 have dollar amounts in the worksheets, does Priority 1 have an estimated dollar amount and is that in the worksheet. Or is Priority 1 a blank check? **[Seth Shanahan, TWG Chair]** In some ways it is a blank check. There are some limitations, but it is not a specific dollar amount. Due to rapid nature of threat, TWG members wanted to ensure there was flexibility.

[Heather Whitlaw, USFWS] Are approval of budget worksheets covered in Priorities 2 through 7? **[Mike Moran, GCMRC]** There is a table that shows amounts requested for Priorities 2 through 7. When there are carryover funds, they are not listed. Table shown is the routine monitoring work for next year. These were additional items. Priority 2 is the JCM-West monitoring in 2023 that was eliminated in the work plan due to budgetary constraints. Idea behind priority was to restore that, but it's not in the table. **[Mike Harty, Kearns and West]** Priorities 2 through 7 are intended to be different than what's shown in

budget table. **[Mike Moran, GCMRC]** This list was formulated with the idea that excess funds could go towards these items. We do have some, which relate back to the building that wasn't constructed. The idea was to focus on how to best use end of year funds.

[Wayne Pullan, AMWG Chair] Requested motion to approve after additional wording changes were made. **MOTION: [Sara Price, State of Nevada]** Makes motion to approve with changes made today. **[Larry Stevens, GCWC]** Seconded. **[Wayne Pullan, AMWG Chair]** No opposition heard; motion approved by consensus.

The Adaptive Management Work Group (AMWG) recommends for approval to the Secretary of the Interior, the Fiscal Year 2023 budget as shown on the budget worksheets presented to the Adaptive Management Work Group (AMWG) on August 18, 2022; furthermore, as additional funds become available, the Adaptive Management Work Group recommends those funds are used to fund the work items listed below in priority order:

Priority 1 – Given the historic release temperatures from Glen Canyon Dam and the possibility of invasive fish establishment in the Colorado River ecosystem (CRE) with the potential to harm Endangered Species Act listed fish and the rainbow trout fishery, the Department of the Interior should prioritize such additional funds, in combination with, if necessary, other funding sources including but not limited to, the Reclamation C.6 Native Fish Conservation Contingency Fund and the C.5 Experimental Management Fund. The Department of the Interior should in expending these funds prioritize activities such as evaluation of operational alternatives and other CRE management and monitoring, to address this concern. These activities might require budgetary adjustments. The Glen Canyon Dam Adaptive Management Program sees the potential establishment of nonnative fish as an emergency situation that warrants swift and decisive mitigation action. Reclamation should continue to coordinate with the TWG and AMWG on activities related to this Priority.

Priority 2 – Continue Project Element G.6, Juvenile Chub Monitoring-West

Priority 3 – Continue sampling at two sub-reaches for Project Element H.2, Experimental Flow Assessment of Trout Recruitment

Priority 4 – Begin the Grand Canyon portion of the water quality synthesis requested by the Adaptive Management Work Group at their February 9-10, 2022 meeting

Priority 5 – Investigate an aquatic vegetation removal pilot project in Lees Ferry to reduce brown trout habitat

Priority 6 – Continue two monitoring trips for Project Element C.1, Ground-based Riparian Vegetation Monitoring

Priority 7 – Continue Project Element B.5, Streamflow and Sandbar Modeling

Motion made by Sara Price, Colorado River Commission of Nevada. Seconded by Larry Stevens, Grand Canyon Wildlands Council. To adopt the motion as written above on 8/18/2022. The motion was approved by consensus.

Stakeholder Updates

States:

- **[Kristin Johnson, ADWR]** Desire for states and stakeholders to share information more than is done traditionally. Lower Basin will be operating in a Tier 2 shortage. In 2022 in addition to required reductions, ADWR has secured additional conservation water.
- **[Julie Carter, AZGFD]** Coordinating with rapid response team on smallmouth bass and lower slough treatment. **[Dave Rogowski, AZDFG]** Spent one day doing search for non-native fish in Lees Ferry Reach. Tried to monitor at Pearce Ferry Rapid but couldn't because of low flows. Next trip is Lees Ferry in October and sampling up from Pearce Ferry Rapid in November. Have ongoing concerns with rainbow trout in Lees Ferry. Continue to do surveys 6 times per month.
- **[Jessica Neuwerth, CRBC]** The big issue in California is drought. State Water Project has been in drought multiple years. Don't have as much storage there. Reservoirs are low with health and safety water only. Agriculture districts decreased demand over summer.
- **[Michelle Garrison, CWCB]** On behalf of all upper basin states, Colorado has committed to 5-point plan going forward.
- **[Alli Effati, NMISC]** New Mexico supports all elements in that 5-point plan. Since 2000 when drought started, upper division states taking significant shortages. These occur annually in San Juan River Basin, which includes Animas and La Plata tributaries. San Juan Chama project is major diversion project that has experienced significant water supply issues. New Mexico is in process of final touches for 50-year water plan, focused on looking at impacts of climate change. Will provide actions to decision makers and hope to post this in near future.
- **[Sara Price, CRCN]** One customer has a diversion point above lake level. Took some work to get our industrial customers connected to a water supply. Industrial customers also reduced water use by 50%. But Nevada does not have the ability to make huge contributions. Doing what they can to reduce water use. Everything has repercussions.
- **[Candice Hasenyager, Utah Department of Water Resources (DWR)]** July was the hottest month in Salt Lake City history. Salt Lake dropped below 4,190 feet and will continue until October. Working with Governor's office on Utah Coordinated Action Plan for Water. DWR appropriated $250 million for secondary metering grants and $190 million for installation of those meters, which is anticipated to save 54,000 acre-feet. Turf replacement project going in. Also $70 million for agriculture optimization which trying to encourage as much as possible. Spring grant period and 140 applications approved. Cost was $96 million with 32% water savings. Hosting smart water workshops.
- **[Charlie Ferrantelli, State of Wyoming]** Wyoming has been hot and dry this year. Not just in the west but in other places. Very dry in headwaters. The 5-point plan is keeping everyone busy. In last year, Governor appointed a working group for the Green River and Little Snake River basin. Working with the public and ways to inform constituents on what's happening in the Colorado River. Spending lot of time planning for post 2026.

Tribes:

- **[Jakob Maase, Hopi Tribe]** Findings of river trip to be published in February; pending funding for two ethnographic and historic synapsis projects.

- **[Arden Kucate, Pueblo of Zuni]** Looking forward to seeing results of last river trip. Want to build on understanding what impact projects will have on Zuni.
- **[Daniel Bulletts, Southern Paiute Consortium]** River trip in June went well, report pending in next few weeks.

NGOs:

- **[Larry Stevens, GCWC]** Continue to work on the Paria Beach restoration project. Wrapping up analysis of dynamic macrophyte and epiphyte in the Glen Canyon Reach and should report in January. Focused on springs and groundwater conditions in four corners states.
- **[Matt Rice, American Rivers]** No update.
- **[Leslie James, CREDA]** Lot of discussion in CREDA about what happens if Glen Canyon goes to zero power or doesn't generate. With the changed rate structure WAPA employed last year, the key objective was to protect and maintain the Basin Fund. Have varying capability to access supplemental resources to replace hydro. Some customers trying to get renewables going, but there are supply chain issues. In all of the recent funding bills, there isn't any capacity for assisting federal reclamation projects. This infrastructure is getting old.
- **[Kevin Garlick, Utah Municipal Power Agency]** Current drought has reduced hydropower energy allocation by 40%. Two new solar projects were added this past year to try to lower carbon footprint. Drought has resulted in getting natural gas or coal to meet demands for electricity, which is not producing environmental benefits. Working with WAPA to try to find resources to offset these issues.
- **[Jim Strogen, FFI/TU]** Recreational fish monitoring shows climb in water temperature and low DO levels. Looking at potential impacts on fishery.
- **[Dave Brown, GCRG]** Continuing Adopt-a-Beach program. Distributing smallmouth bass information. Feedback is that people are surprised there is as much water as there is.

Public Comment

[Lynn Hamilton, GCRG] AMWG river trip happened at a critical juncture, and it provided a deeper understanding than you can get with a regular meeting format. Relationships that were built and the trust has brought everyone together and will help us with challenges going forward.

Next AMWG meeting dates

- January 24-25, 2023
- February 15-16, 2023
- May 17, 2023 (webinar)
- August 16-17, 2023

Meeting adjourned at 3:22 PM PST

Meeting Attendees

AMWG Members, Alternates, and Leadership

Cliff Barrett (UMPA)
Richard Begay (Navajo Nation)
Rod Buchanan (FFI/TU)
Arden Kucate (Pueblo of Zuni)
John McClow (State of Colorado)
Scott McGettigan (State of Utah)

Kelly Burke (GCWC)
Charlie Ferrantelli (State of Wyoming)
Kevin Garlick (UMPA)
Michelle Garrison (State of Colorado)
Candice Hasenyager (Utah DWR)
Leslie James (CREDA)
John Jordan (FFI/TU)
Daniel Picard (Reclamation)
Wayne Pullan (Reclamation)
Brian Sadler (WAPA)
William "Billy" Shott (NPS-GLCA)
Larry Stevens (GCWC)
Jim Strogen (FFI/TU)

Department of the Interior

Christina Kalavritinos
Rodney Smith (Solicitor's Office)

TWG Members and Alternates

Colleen Cunningham (NMISC)
Kurt Dongoske (Pueblo of Zuni)
Craig Ellsworth (WAPA)
Charlie Ferrantelli (State of Wyoming)
Clarence Fullard (Vice Chair and Reclamation)
Michelle Garrison (State of Colorado)
Brian Healy (NPS - Grand Canyon)
Jakob Maase (Hopi Tribe)
Ryan Mann (AZGFD)
Jessica Neuwerth (CRBC)
Christina Noftsker (State of New Mexico)
William "Bill" Persons (FFI/TU)
Peggy Roefer (CRCN)
David Rogowski (AZGFD)
Seth Shanahan (TWG Chair and SNWA)
Erik Skeie (State of Colorado)
Erik Stanfield (Navajo Nation)
Larry Stevens (GCWC)
Kirk Young (USFWS)

USGS/GCMRC Staff

Lucas Bair
Ann-Marie Bringhurst
Bridget Deemer
Drew Eppehimer
Helen Fairley
Paul Grams
Thomas Gushue
Meredith Hartwell
Ted Kennedy
Keith Kohl
Michael Moran
Emily Palmquist
Joel Sankey
Scott VanderKooi
David Ward
Charles Yackulic

Reclamation Staff

Amee Andreason (Upper Colorado Basin)
Becki Bryant
Kathy Callister
Nate Clifton
Valerie Deppe
Ted Dunn
Jenny Erickson
Dale Hamilton
Aung Hla
Teo Melis
Bryce Mihalevich
Zachary Nelson
Heather Patno
Kerri Pedersen
Jamescita Peshlakai
Alex Pivarnik
Ernie Rheaume
Connie Svoboda

Mike Horn
Dave Isleman
Dagmar Llewellyn (Reclamation)
Shana Tighi
Chris Watt
Nick Williams

Interested Persons

Terra Alpaugh (Kearns & West)
Edward Andrechak
Rodney Bailey (WAPA)
Eric Balken (Glen Canyon Institute)
Rob Billerbeck (NPS)
Mark Braden
David Braun (Sound Science)
David Brown
Emily Bryant
Daniel Bulletts (Southern Paiute Consortium)
Kevin Bulletts (Southern Paiute Consortium)
Kelly Burke (GCWC)
Garry Cantley (Bureau of Indian Affairs)
Shane Capron (WAPA)
Julie Carter (AZGFD)
Heather Cole (Arizona Power Authority)
N Coulam
Bonnie Currey
Brooke Damon (Northern Arizona University)
Dennis Delaney
John Dillon
Laura Dye (State of Nevada)
Ali Effati (State of New Mexico)
Sheri Farag (SRP)
Bud Fazio (NPS)
Jordan Garcia (Los Alamos County New Mexico)
Laverne Garnenez
Joe Giddens
Alicyn Gitlin (Sierra Club)
Emily Halvorsen (State of Colorado)
Lynn Hamilton (GCRG)
Michael Harty (Kearns & West)
Rosemary Henry (Wyoming Municipal Power Agency)
Emily Higuera (ADWR)
Kristen Johnson (ADWR)
Ricky Penketewa Sr (Pueblo of Zuni Governor's Office)
Edward Keable (NPS)
Trent Keller (Western River Expeditions Inc.)
Hunter Kennedy (University of Chicago)
Michelle Kerns (NPS)
Josh Korman (Ecometric)
Mark Lamb (USFWS)
Sara Larsen (Upper Colorado River Commission)
Diego Leal
Dan Leavitt (USFWS)
Miche Lozano
Melissa Mata (USFWS)
David McIntyre (SeaJay Environmental)
Taylor McKinnon (Center for Biological Diversity)
Lisa Meyer (WAPA)
Betsy Morgan (State of Utah)
McKenna Murray (State of Utah)
RJ Neff
Amy Ostdiek (State of Colorado)
Brittany Peterson
Brent Powers (Navajo Nation Dept of Fish and Wildlife)
Taryn Preston (NPS)
Sara Price (CRCN)
Ted Rampton
Shana Rapoport (CRBC)
Matt Rice (American Rivers)
Gene Seagle (NPS)
Elyssa Shalla (NPS)
Gary Tallman (Northern Arizona University)
Lauren Tango (Northern Arizona University)
Melissa Trammell (NPS)
Crystal Tulley-Cordova (Navajo Nation DWR)
Morgan Wagoner
Heather Whitlaw (USFWS)
Yuqi Zhao (Logan City Light and Power)
Jack (Glen Canyon Institute)

Acronyms and Abbreviations

°C	degrees Celsius
ADWR	Arizona Department of Water Resources
AZGFD	Arizona Game and Fish Department
AMWG	Adaptive Management Work Group
BIL	Bipartisan Infrastructure Law
BO	Biological Opinion
BAHG	Budget Ad Hoc Group
BIA	Bureau of Indian Affairs
CFS	cubic feet per second
CRBC	Colorado River Board of California
JCM	Juvenile Chub Monitoring
CREDA	Colorado River Energy Distributors Association
CRCN	Colorado River Commission of Nevada
CRMMS	Colorado River Mid-term Modeling System
DWR	Department of Water Resources
CWCB	Colorado Water Conservation Board
CY	Calendar Year
DFCs	Desired Future Conditions
D.O.	dissolved oxygen
DROA	Drought Response Operations Agreement
EIS	Environmental Impact Statement
FACA	Federal Advisory Committee Act
FFI	Fly Fishers International
FRN	Federal Register Notice
GCDAMP	Glen Canyon Dam Adaptive Management Program
GCMRC	Grand Canyon Monitoring & Research Center
GCRG	Grand Canyon River Guides
GPP	gross primary production
GCWC	Grand Canyon Wildlands Council
GLCA	Glen Canyon National Recreation Area
GRCA	Grand Canyon National Park
HFE	High Flow Experiment
HPP	Historic Preservation Act
IRA	Inflation Reduction Act
LTEMP	Long-Term Experimental and Management Plan
MAF	million-acre-feet
NEPA	National Environmental Policy Act
NGOs	non-government organizations
NPS	National Park Service
PA	Programmatic Agreement
PST	Pacific Standard Time
P&I Team	Planning & Implementation Team
Reclamation	Bureau of Reclamation
RM	River Mile
ROD	Record of Decision
SMBAHG	Smallmouth Bass Ad Hoc Group
SNWA	Southern Nevada Water Authority
TCPs	traditional cultural properties
TMF	Trout Management Flows
TU	Trout Unlimited
TWG	GCDAMP Technical Work Group
USU	Utah State University
UMPA	Utah Municipal Power Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WAPA	Western Area Power Administration
WY	Water Year
YOY	young-of-the-year