

GLEN CANYON DAM ADAPTIVE MANAGEMENT PROGRAM
TECHNICAL WORK GROUP MEETING
JANUARY 13, 2022
DRAFT MINUTES

Start Time: 8:33 AM Pacific Standard Time (PST)

Conducting: Seth Shanahan, Technical Work Group (TWG) Chair

Meeting Recorder: Carliane Johnson, SeaJay Environmental LLC

Welcome and Administrative

- **Introductions and Determination of Quorum (22 members):** [Seth Shanahan, Southern Nevada Water Authority (SNWA) and TWG Chair] Introductions were made, including to Jamescita Peshlakai who is the new Bureau of Reclamation (Reclamation) tribal liaison.
- **Glen Canyon Dam Adaptive Management Program (GCDAMP) Vision Statement:** [Larry Stevens, Grand Canyon Wildlands Council (GCWC)] Provided GCDAMP background and read the vision statement.
- **Adoption of Prior Meeting Minutes:** [Ben Reeder, Grand Canyon River Guides] Requested a change to include his comment on the October minutes. With that change made, there were no objections to adopting the TWG meeting minutes from June 16-17 and October 13-14, 2021.
- **Next Meeting Date(s): April 12-13, 2022:** [Seth Shanahan, SNWA and TWG Chair] Virtual.
- **Ad Hoc Group Membership and Updates** [Seth Shanahan, SNWA and TWG Chair] A few member changes were received. Refer to the updated document on the [website](#).
 - [Craig Ellsworth, WAPA and Budget Ad Hoc Group (BAHG) Chair] Provided an update on the BAHG, which had a call December 8 about budget prioritization and the Triennial Work Plan (TWP). A strategy is being developed now to involve everyone in the next TWP. Erik Skeie, State of Colorado, is helping as the BAHG co-chair.

[Seth Shanahan, SNWA and TWG Chair] As a reminder, mid-work plan adjustments will be considered at the April TWG. Next month, the BAHG, tribes, and other agencies will meet to discuss adjustments and other changes to the third Fiscal Year (FY) of the TWP based on criteria adopted by the Adaptive Management Work Group (AMWG). As early as next month, the BAHG, federal and state agencies, the tribes, and others will start meeting to consider some of those work plan adjustments. The BAHG work should continue through March in preparation for the April TWG meeting. Then, at the June meeting, the TWG will recommend the TWP for FY2023.

- [Seth Shanahan, SNWA and TWG Chair] Steering Committee Ad Hoc (SCAHG) group continues to meet in support of the TWG. There will be another meeting after this TWG. The SCAHG now also discusses emerging issues and rapid information exchange. The SCAHG has discussed information such as temperature trends in Lake Powell, releases at the dam, dissolved oxygen (D.O.) trends, and the detection last fall of a small mouth bass near River Mile (RM) 270. SCAHG concluded these did not require immediate action, and that TWG members would hear about these issues as part of the presentations during the Annual Reporting Meeting (ARM) and this TWG meeting.
- [Larry Stevens, GCWC] What is the status of the Flow Ad Hoc (FLAHG) group? What about reactivating them for a spring HFE? [Seth Shanahan, SNWA and TWG Chair] The FLAHG is currently inactive after completing their current charge related to the spring disturbance flow. A later agenda item will involve a discussion around some of the issues that need to be

addressed for spring and summer flow experiments. There is also a proposed motion for the AMWG to consider at the February meeting to charge the FLAHG to consider these topics.

- **[Leslie James, CREDA]** In some of the ARM presentations, particularly work by Lucas Bair (Grand Canyon Monitoring & Research Center [GCMRC]), there is a nexus with the Socioeconomics Ad Hoc Group (SEAHG), but there has not been any discussion with them about that work. Recommends that the SEAHG meet with Lucas to discuss. **[Ben Reeder, GCRG]** Does the SEAHG need a charge? **[Seth Shanahan, SNWA and TWG Chair]** It is best practice to write a charge, which could be done quickly.
- **Update on Program Funding: [Lee Traynham, Reclamation]** Reclamation is under a Continuing Resolution (CR), which complicates the GCDAMP funding. FY22 base funding is anticipated to be received as an appropriation, which is different than past years when the program was funded with hydropower revenues. The challenge is that the CR requires Reclamation to proceed the same as it did in the prior year until Congress gives it new funding direction. Because of the hydropower revenues received last year, and appropriations that are expected this year, this means there is currently no funding for FY22 for the GCDAMP or for the endangered fish recovery program. The current CR ends mid-February. It is hoped that the appropriation bill will be passed by March. Reclamation staff is in conversation with its partners especially as the field season starts. **[Seth Shanahan, SNWA and TWG Chair]** Is the appropriation request for both FY22 and FY23? **[Lee Traynham, Reclamation]** This is for FY22 only. The FY23 budget is in draft, but details cannot be discussed until it is publicly available. An update on FY22 will be provided at the February AMWG meeting.
- **Update on Activities Impacted Due to COVID-19 Restrictions: [Michael Moran, GCMRC]** GCMRC did not have any impacts in 2021 due to COVID. Office work remains at 25% capacity, but everything is getting done. **[Scott VanderKooi, GCMRC]** GCMRC had been on a plan to incrementally return to the office, but this has been postponed until at least the end of January. **[Brian Healy, NPS]** NPS is on the same track with telework, but it is not affecting work. A vegetation treatment trip is scheduled for January, an archeological site monitoring trip in March, and two more vegetation trips are scheduled in March and April. No issues seen at this time due to COVID. Brown trout monitoring is continuing for a few more weeks. There is no more funding for these trips. **[Kirk Young, U.S. Fish and Wildlife Service (USFWS)]** USFWS is coordinating closely with Navajo on permits to conduct work in Little Colorado River. Not expecting any changes but will not know until those permits are received. Planning for a full field schedule. **[Ryan Mann, Arizona Game and Fish Department (AZGFD)]** AZGFD has been able to continue its work with most staff still teleworking. **[Erik Stanfield, Navajo Nation]** Navajo Nation and some schools are having some targeted short-term shutdowns but not seeing anything larger than that. **[Jakob Maase, Hopi Tribe]** Hopi is considering some shutdowns. The river trips are still slated for May. **[Daniel Bullets, Southern Paiute Consortium]** The Southern Paiute Consortium is still open and not impacted.
- **Update on Monitoring and Research Trips to Occur From Today Until Next Meeting: [Mike Moran, GCMRC]** discussed upcoming trips through April. Will have quite a few of the Lees Ferry brown trout monitoring trips. The first water quality and sediment monitoring trip will occur in mid-February. AZGFD will have its mainstem fish monitoring trip in April. Channel mapping in East Central Grand Canyon (Project B) trip is scheduled for this spring, which had been scheduled in late 2020 but was postponed due to COVID.

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

[Heather Patno, Reclamation] [PRESENTATION] Current conditions in the reservoirs range from 27-77% of storage. New historic lows are forecasted to continue at Lake Powell. October precipitation was above average monsoonal moisture that increased soil moisture and decreased the deficit as compared against 2020. November precipitation was among the lowest on record and then December had some of the highest precipitation increasing snowpack 80% from minimum historic levels. Soil moisture conditions are much better now across the basin compared to last year. Current stormwater equivalent levels are tracking with the 2017 basin year, which was a wet year. Drier conditions with less snow are being seen in the modeling through the season; however, there is a significant range in the predictions with uncertainty in the precipitation outlook. The January 24-month study will be released on January 14. The Drought Response Operations Agreement (DROA) continues through 2026 except for recovery of DROA water released. The Drought Response Operations Plan is to be finalized in April. 1:36:00 The adjusted release pattern versus the standard Long-Term Experimental and Management Plan (LTEMP) release pattern was also described that holds back 350 kaf of water during January through April and shifts it to later in the year. This pattern change began on January 1, 2022. The summer monthly volume release pattern is a placeholder while continued discussions occur regarding the best distribution later in the year. December most probable elevations show decreases below the critical elevation of 3,525 feet. The minimum probable December elevations drop below minimum power pool of 3,490 feet. The unit maintenance schedule shows 6 units available through 2023 as the transformer replacements of all units continue. The hourly release schedules for January through March incorporating the adjusted monthly release patterns were discussed.

[Jeremiah Drewel, Reclamation] 1:52:00 PRESENTATION showed the spring 2022 HFE modeling results. It is important to note that the big negative numbers (-103 kton for the Glen Canyon Dam adjusted LTEMP pattern, and the -143 kton for the Glen Canyon Dam standard LTEMP pattern) are the lowest sediment balances that will occur because it assumes zero input at this point. Temperatures in the forebay are about equal with the penstock getting closer to the lake surface. Lake Powell release temperatures have been highly variable in the monthly modeling, so it is best to look at that as a range of possibilities from 18-26 °C depending on the snowpack and lake elevation. The same is seen in the canyon's river temperatures. Dissolved oxygen levels out of the penstock are currently around 7 milligrams/liter.

Q&A and discussion

1:42:00 **[Rob Billerbeck, NPS]** Do these graphs include the Glen Canyon Dam adjustments and not the Upper Basin DROA? **[Heather Patno, Reclamation]** The December 24-Month Study graphs do not include the Glen Canyon adjustments because those were not implemented until January. These graphs show the LTEMP pattern in December. The January 24-month study will include the Glen Canyon adjustments and the previous December elevation graphs show the increase in elevation with the adjustments for Powell and Mead as a sensitivity study.

[Jim Strogon, Fly Fishers International/Trout Unlimited (FFI/TU)] Do you see a concerning window for D.O. this year? How much lead time do we need for mitigation opportunities? **[Jeremiah Drewel, Reclamation]** Yes, if there is a near-normal inflow with large sediment deltas around the lake, this entrains sediment and biological material. Usually by the June trip, there is a good sense of where the D.O. plume is at the penstock. From June to late September or October is the amount of time that would be available to look at that.

[Larry Stevens, GCWC] Have you calculated the percent of times the actual unregulated annual inflow (UAI) at different winter and springtime months has fallen below the predicted UAI? In other words, how often have predicted UAI values over-estimated the actual UAI? It might be another way to illustrate uncertainty in the UAI prediction. **[Heather Patno, Reclamation]** See [VERIFICATION LINK](#). By January, it is 26-27% when UAI can be seen. Reclamation can use the Colorado River Mid-term Modeling System (CRMMS) model projections to follow each inflow trace, which can be used to see the potential range of operations given the full suite of forecast scenarios. Changes will happen month-to-month as new information is received.

[Larry Stevens, GCWC] With D.O. threats and the monthly updates, is it possible to install a sensor at the upstream end of the forebay to quickly inform the TWG as to the D.O. urgencies? How quickly are the monthly results reported? **[Jeremiah Drewel, Reclamation]** Monthly profiles are occurring now that gives D.O. information throughout the whole depth. Installing one sensor would only capture D.O. measurement at one specific depth in the lake. A sensor string could be deployed, which is what is in front of the dam now but can access that data only irregularly. To get a string upstream from the forebay would require a floating, transmitting station, which would have to be adjustable to lake elevation changes to best understand what is seen in the data. The water is not moving that fast, so the monthly visits are able to capture when that slug is coming. To get more information sooner, another upstream profile would be needed, but do not think staffing levels are available to do this. The monthly data is immediately accessible after the trips within a few days and the trips are reported out. The data from the quarterly and monthly trips are reported at the Glen Canyon Dam operations meetings. **[Seth Shanahan, SNWA and TWG Chair]** These are monthly discussions that Reclamation hosts to share this information, which is what the SCAHG members would bring back to the TWG. The framework is in place and this is an item that the SCAHG needs to discuss with the TWG.

[Brian Healy, NPS] It is understood that 3,490 feet is a crucial level for turbine production, but is there some elevation above that also creates an engineering risk? How is it decided to send discharge through the bypass tubes? **[Heather Patno, Reclamation]** The minimum power pool of 3,490 feet had been designated as the “safe elevation.” An analysis showed potential vortices could form and entrain air in the penstock. Reclamation is considering the elevation more closely because of this.

[Mike Moran, GCMRC] Is the D.O. thermistor string still near the dam face, and if so, are the data being downloaded continuously or monthly? **[Bridget Deemer, GCMRC]** This is usually done every six months, but it has been as long as nine months. Those batteries are good for more than a year.

[Seth Shanahan, SNWA and TWG Chair] Regarding the slide on the *Potential Lake Powell Monthly Release Volume Distribution*, it is important to point out later discussions on spring and summer flow opportunities. There is a hydrological problem with a desire to keep Lake Powell elevations high by not releasing water in the spring, but later in the summer. This contradicts a high release in the spring. The space of opportunity is very narrow but understanding this is also changing.

[Peggy Roefer, Colorado River Commission of Nevada (CRCN)] The annual report referred to funding for Lake Powell water quality monitoring (only one more year left) and that there is also uncertainty about boat use. What does this mean? **[Clarence Fullard, Reclamation]** There is every indication that the water quality monitoring work will continue so this likely relates to the contract cycle. **[Jeremiah Drewel, Reclamation]** There have been issues using NPS boats and cannot always get the usual boat,

which means dropping people from the team. It would be nice to have some consistency in a boat that can sustain the group for several days.

[Cliff Barrett, Utah Municipal Power Agency (UMPA)] Regarding the water temperature slide, there is a decrease in temperature between the outlet tubes and penstock as the elevation goes down. How much colder will it be at the river outlet? **[Jeremiah Drewel, Reclamation]** The bypass release is about 100 feet lower than the penstock elevation. If there is water discharged through the bypass, the water temperature out of the dam will be a lot cooler. The slide in the presentation showed the temperature differences during wintertime. It will be a lot more drastic in summertime. Eventually, as reservoir elevation goes below the penstock, the thermocline will follow the water elevation down and will get warmer as the thermocline approaches the penstock.

LTEMP Biological Opinion Conservation Measures Updates Including a Discussion About the Non-Native Fish Passage and Temperature Control Measures

[Kerri Pedersen, Reclamation] [PRESENTATION](#) on Tier 1 and Tier 2 Incidental Take Action Triggers for humpback chub. The trigger was reached last year due to a decline of subadults. It is expected this will happen again this year. Responses were enacted because of the trigger and can expect to have response actions in 2022, which will be addressed after a larval assessment is completed this spring. The [5-YEAR TRIGGER REVIEW](#) is complete and is available on the GCDAMP Wiki page. Updates on the Southwestern willow flycatcher (SWFL) surveys; temperature control devices; fish passage through the dam; and the October 2021 Lake Powell sampling trip, were also discussed in the presentation.

[Leslie James, CREDA] Would the study be an appraisal-level study to refine cost estimates, or would it strive to include some value planning to better understand potential benefits? **[Lee Traynham, Reclamation]** That is still to be determined. If the study moves forward, the objectives would be to accomplish both the cost estimate and a value assessment to ensure that the options are considering the tradeoffs to benefit environmental and hydroelectric resources. At the August AMWG, Nick Williams provided information on this study with costs around \$1 million and that it would take about nine months to complete. Refer to the [DRAFT AUGUST AMWG MEETING MINUTES](#) on page 11 to see Nick's remarks regarding bypass generation.

[Craig Ellsworth, WAPA] Are the SWFL reports posted anywhere? **[Brian Healy, NPS]** Will check on the possibility of posting the report. Since they are an endangered species, there might be concerns about publishing their locations.

[Larry Stevens, GCWC] What was the catch rate of green sunfish and is electrofishing an adequate method? If no sunfish were detected in the forebay, how are they getting through the dam? **[Kerri Pedersen, Reclamation]** The amount of effort in each of the locations should be the same for all fish. In Antelope, it was 12 fish in 14 hours; forebay was 12 fish in 13 hours; and Wahweap was 39 fish in 40 hours. **[Clarence Fullard, Reclamation]** The method to catch those fish in the forebay included gill netting; did not use electrofishing. Green sunfish are below the dam, but there is no evidence they have gone through the dam. That is what the project will be looking into as to how that is happening. Maybe there are fish in Lake Powell that are not being caught by this gear. The data are preliminary. **[Larry Stevens, GCWC]** The sampling design would be critical especially as the reservoir is at its lowest and fish

might be passing through. Is the sampling designed for this? What kind of monitoring is happening below the dam, and can that be improved to get a better understanding of what could be passing through? **[Clarence Fullard, Reclamation]** The next sampling trip will be in early March when reservoir levels will be as low as they get. The crew will go out quarterly at times they believe they can best capture those fish. There was a discussion at the October TWG meeting with Brian Healy about detections downstream. All that data is contained in a centralized GCMRC database, which is accessible to the Utah State University project team. Anyone who detects non-native fish in the Lees Ferry stretch should report it and provide those fish to the project team to collect otoliths or fin clips. **[Charles Yakulic, GCMRC]** Over the last decade, combined agency efforts usually caught ~2-3 walleye in Lees Ferry per year, ~1-2 striped bass, and ~1 smallmouth bass. There has not been any clear trend in the data or in the elevation. All walleye were caught within five miles of the dam while the others were in various locations.

[Ben Reeder, GCRG] When was the last time the slough was monitored for green sunfish? **[Jeff Arnold, NPS]** The last time was in October 2020. NPS did not remove green sunfish in 2021 because there was no high flow event. The plan is to collect fish in February for a health analysis and do a removal in early May. **[Pilar Wolters Rinker, USFWS]** Game and Fish does yearly sampling looking for fish that go through the dam. **[David Rogowski, AZGFD]** AZGFD samples for non-natives in the lower slough each July and end of September, below the dam to look for walleyes and smallmouth bass, and then samples in the lower slough as well as spring systems and back eddies. The sampling includes Lees Ferry. Non-natives are typically caught in the lower slough and at the dam. Will occasionally catch green sunfish in and around the slough. **[Ryan Mann, AZGFD]** Two green sunfish were caught in the lower slough during the fall monitoring. **[Clarence Fullard, Reclamation]** Reclamation is working with the Utah State research team to utilize pressure sensors at Glen Canyon Dam to assess the physical conditions fish would be subjected to as they pass through the dam and turbines (pressures, velocities, etc.). More information will be available about that and the likelihood of fish survival.

[Laura Tennant, GCMRC] During brown trout monitoring last week, two green sunfish were caught by electrofishing around RM -12 and -13. **[David Ward, GCMRC]** A trap to catch green sunfish in the slough is being designed and hope to have that in place this summer.

[Seth Shanahan, SNWA and TWG Chair] What can the TWG do to be most helpful to Reclamation on these conservation measures? **[Brian Healy, NPS]** Related to the smallmouth bass model, we might need to figure out how to respond to warmwater species below the dam. The proposed work is good, but there might need to be more urgency to have the tools available to respond. There is already a good monitoring program currently in place. We need to think about the actual logistics of responding to a particular scenario such as a green sunfish outbreak in a certain place. The SCAHG has also discussed smallmouth bass detection, how to report these quickly, and what that reporting system might look like. Because of these discussions, language has been added to the NPS's fish permits that says high-risk, non-natives should be reported within a few days of returning from a trip to help inform a rapid response.

[Seth Shanahan, SNWA and TWG Chair] What does the group think about going through a tabletop exercise that would reflect all the stakeholders' interest? **[David Ward, GCMRC]** Supports this. The current monitoring system is sufficient to detect non-native fish, but the problem is what to do if they do show up. Thinking through this could be helpful. **[Kirk Dongoske, Pueblo of Zuni]** Whatever route or

means through which non-native fish enter the system, it is important that this program be more proactive in identifying the origin and addressing those entry points. To continue with the past reactive actions that involve lethal management will continue to do violence to Zuni psychologically and emotionally.

[Jim Strogon, FFI/TU] It is frustrating that the presentation noted that 1978 was the first time Reclamation started talking about temperature control devices to help with this problem. We need to find these strategies to make this work and move forward. **[Larry Stevens, GCWC]** One reason is that there might not be consensus about what should be done. TWG can offer up those solutions.

Power Generating Units in the Glen Canyon Bypass Tubes

[Larry Stevens, GCWC] PRESENTATION on the history of the jet tubes in the Glen Canyon Dam. The jets could help with temperature control and power production. A draft motion to AMWG was also provided. The issues to be discussed include design, costs/benefits, the National Environmental Policy Act (NEPA) and other compliance, timing for testing, contingency issues, and any other issues.

Q&A and Discussion

[Michelle Garrison, CWCB] What would be the budget source for the \$2 million? **[Lee Traynham, Reclamation]** The draft motion is meant to provide flexibility. Reclamation has requested funding to support this effort, but it would be good to have as many options as possible.

[Michelle Garrison, CWCB] Preliminary estimates show that a hydro unit in the bypass would reduce capacity of those values from 15,000 to 7,000 cubic feet per second (CFS). Would there be some loss of capacity below 3,490 feet? **[Lee Traynham, Reclamation]** There is a valve on the existing tubes. If the flow were to be directed through the bypass tubes with generation installed, their capacity is reduced from 15,000 CFS to an estimated 7,000 CFS. The 15,000 CFS is required for dam safety. There could be times during the year when that valve would need to be shut and construction of another valve would be needed to still allow that 15,000 CFS capacity, creating a bypass on the bypass. There is a visual to show this second set of outlet tubes just adjacent and slightly downstream of the current tubes.

[Jim Strogon, FFI/TU] Agrees with the motion but D.O. needs to be included in the wording. **[Larry Stevens, GCWC]** Yes, that has been added as well as the increased flexibility of funding.

[Seth Shanahan, SNWA and TWG Chair] What could come back to the TWG is a predictive effects-type of assessment, perhaps using tools such as Charles' temperature modeling work to understand how that influences fish by having this option available. **[Larry Stevens, GCWC]** That assessment should also include the post implementation testing to test the effects, if it is constructed.

[Seth Shanahan, SNWA and TWG Chair] Can GCMRC respond to how this might affect them? **[Joel Sankey, GCMRC]** A predictive effects assessment is not built into the TWP or current projects, but Project O with the disturbance flows is an example of how to carve out the time to do this. The sooner GCMRC knows it will be asked to do this, the better.

[Craig Ellsworth, WAPA] WAPA can also help with staff support. WAPA worked out some of the details with Reclamation about this idea and a lot of groundwork has been started. **[Seth Shanahan, SNWA and TWG Chair]** Was WAPA's perspective part of the appraisal-level study and infrastructure, or on temperature conditions and its usefulness to resources? **[Craig Ellsworth, WAPA]** It was more focused

on whose responsibility and how it would get funded between Reclamation and power users. **[Seth Shanahan, SNWA and TWG Chair]** The reason for the distinction is because what comes back to the TWG may look more like monitoring while encouraging Reclamation to continue.

[Kirk Young, USFWS] USFWS supports this. There are some limits as to how cool the water can be kept but thinks there is modeling on smallmouth bass that suggests it might not be needed 24/7. Maybe it is only needed overnight or at specific times of the year to disadvantage the non-natives and maintain refuge for salmonids. The long-term benefits are there. **[Larry Stevens, GCWC]** Recall that the benthic anoxia study grew Chara algae at different temperature and D.O. levels. Cooler temperatures and higher D.O. reduced growth rates of Chara. This could be another benefit.

[Joel Sankey, GCMRC] There is a research need to support the development of these models to provide the simulations for the different scenarios. **[Seth Shanahan, SNWA and TWG Chair]** This might be something to add to the TWP discussion, if changes need to be made. There is a lot to think about as to what the TWG can do to help. TWG relies on GCMRC and others for that expertise. Members should also consider how the TWG can be most useful as a forum for that process.

Discussion About Possible Experimental and Management Actions That May be Implemented in the Next 12 Months and Any Budgeting Issues:

[Lee Traynham, Reclamation] PRESENTATION on the approaches to and the process for the LTEMP experiments. There are a number of flow experiments being considered for 2022, which need to preserve lake levels and compliment the Drought Response Operations that will be occurring at Glen Canyon Dam (refer to last week's [PRESS RELEASE](#)). There will also be consultation with the tribes on trout management flows (TMF), which will kick off in January, and Reclamation's review of the LTEMP planning/implementation process, which will be part of the discussions at the February AMWG meeting. The sand budget is negative because of export under operations. Model results with and without DROA were shown.

[Joel Sankey, GCMRC] PRESENTATION on potential spring HFEs for FY22. There were no significant sand inputs from the Paria River during the spring accounting period (starting December 1st). There was only one big event in December, but the cumulative sand load is only 29,959 metric tons (MT). Mass balance is in negative values for Upper Marble Canyon. Lower Marble Canyon is in positive zero bias value of 22,000 MT. These inputs are not enough to trigger a spring HFE, but conditions could change.

[Rob Billerbeck, NPS] LTEMP vegetation management work at Glen Canyon and Grand Canyon are good to go this year. Will be meeting with GCMRC and the tribes about specific sites and activities. Will also be updating the appendix to the vegetation plan in February or March to reflect work that was done last year and to show what is planned for this year.

Q&A and Discussion

[Seth Shanahan, SNWA and TWG Chair] When would the Planning & Implementation Team (PI Team) webinar occur to get that input related to spring decision-making? Can we put that date on our calendars? **[Lee Traynham, Reclamation]** It would likely occur a week or two following the February AMWG information session. As a reminder, the implementation window for a spring HFE is March and April. The process and decisions need to be made about four weeks in advance of this date.

[Jim Strogen, FFI/TU] Is the negative load reflective of a restart for the spring or does it account for a heavier load prior to that? **[Lee Traynham, Reclamation]** The counter for the sand budget model resets to zero under LTEMP on December 1. New inputs are after that point. GCMRC feels the system is still under a sediment enriched condition. **[Joel Sankey, GCMRC]** This is what the mass balance would look like if it kept running from July 1, 2021, to June 30, 2022. This was from Paul Grams' ARM presentation on January 12. **[Jim Strogen, FFI/TU]** Even though we are not in a year for an HFE because of the negative balance; in reality, this suggests we are in a year with sufficient sediment inputs to consider it. **[Joel Sankey, GCMRC]** Yes, it is a sediment enriched condition, but with the accounting period and resetting the number, the spring accounting does not reflect that. **[Larry Stevens, GCWC]** This is another example in which the sediment accounting budget process is not supportive of the Grand Canyon Protection Act because of poorly framed criteria in the LTEMP for the triggers. GCWC has requested that the FLAHG be reauthorized to conduct a study of options for springtime flow events. Would like to propose that as a motion to the AMWG.

[Craig Ellsworth, WAPA] Are we focused on the most critical things and the time involved or missing what is most pressing? **[Larry Stevens, GCWC]** Doing correctly timed flows for ecosystem function is the most important thing. **[Seth Shanahan, SNWA and TWG Chair]** Not everyone agrees with that natural flow as the base flow.

Opportunities for Spring and Summer Flow Experiments and a Discussion of the Bug Flow Synthesis and Workshop

[Ted Kennedy, GCMRC] PRESENTATION on why bug flows were done to mitigate impacts from hydropower flows to egg-laying aquatic insects and the findings. Also discussed the science advisor review of the experiment, which expressed that it was successful and offered some improvements. LTEMP experiments for spring and summer were also shown.

Q&A and Discussion

[Ben Reeder, GCRG] What are the steps that need to be taken and how do we move this conversation forward with the AMWG? There seems to be more momentum and the stakeholders seem to be more interested in a spring HFE. The accounting period has always been the biggest obstacle. **[Seth Shanahan, SNWA and TWG Chair]** Is there agreement that this is the fundamental problem that needs to be solved? **[Kelly Burke, GCWC]** The importance of spring HFEs is not only in the Grand Canyon Protection Act, but in the LTEMP itself. It emphasizes these flows early on in the accounting period. **[Craig Ellsworth, WAPA]** A heavy lift like this or looking at a bypass generator system takes a lot of time. As a program, the most important things need to be identified. **[Rob Billerbeck, NPS]** Agree, but the whole reason for the TWG is to address experiments that might take a long time or that might be difficult. This is the reason for the Grand Canyon Protection Act. It is a difficult time, but the priorities are specified in the act and the LTEMP Record of Decision. **[Leslie James, WAPA]**. It is the responsibility of the TWG to establish priorities, and not to debate our mandates, which are very broad. With respect to the bug flow report and the reviewer's comments on hydropower impacts, there might have been a difference in interpretation about the impacts to customers, particularly the tribes.

[Bill Persons, FFI/TU] How much flexibility do we have in the LTEMP and the opportunity to conduct experiments that are not specifically spelled out in the LTEMP? It seems to allow that. Refer to Table 4,

Page B-14, Footnote a, which says: *Triggers will be modified as needed during the 20-year LTEMP period in an adaptive manner through processes including ESA consultation and based on the best available science utilizing the experimental framework for each alternative.* Can we use this to help address the accounting period trigger and not have to go through the full NEPA process?

[Dave Lytle, Oregon State University] The types of models being used, and the types of analysis being conducted are very hungry for any data that might be available, particularly for any kind of flow event. One thing that is really lacking is data on invertebrate responses to spring HFEs.

[Larry Stevens, GCWC] More important issues keep over-topping our capacity over time. Discussion of power generation in the jet tubes has been going on for 40 years. It is important to face these situations. The FLAHG should be reauthorized for both the practicalities and the policy issues related to the appropriate timing for floods.

[Seth Shanahan, SNWA and TWG Chair] There seems to be tension between a need for experiments this spring and summer and next spring and summer. Even with the “magic language” that Bill pointed out in LTEMP table, the practicality of doing something big like changing the accounting window to trigger a spring HFE in just a couple of months is impractical. What are the opportunities now? **[Ben Reeder, GCRG]** This is why we brought this up in October because of how long it takes to do a spring HFE, to address the accounting period, or to charge the FLAHG. We are again missing the opportunity with no FLAHG charge and no way to address the accounting period. What can we do to move this forward? **[Rob Billerbeck, NPS]** There might be differences between short-term and long-term, but this is a unique year. There are opportunities to address some of the big problems with resources in the canyon this year. The biggest NPS concerns are non-natives getting through dam (and related temperature issues) and the condition of sediment resources. There is alignment and maybe the differences are with the process. It is also very important to continue this forum to talk about the science experiments, learning, and management. **[Larry Stevens, GCWC]** Regarding the language that Bill Person showed says that “triggers will be changed, as needed, during the LTEMP.” The proactive spring HFE is only based on years with high inflow. For this year, we are anticipating two years of low flow. With a spring HFE, even if only in short duration, it might be able to mobilize the abundant sediments and store them over the next years of low flow. Maybe the focus is on the triggers for a proactive springtime HFE.

[Shane Capron, WAPA] Regarding the bug flow experiments, we do not always agree, but the point is to experiment and to learn things. From WAPA’s perspective, after a year off, there will likely be a significant bug flow this year. It is not too hard to implement, and we can learn more from it. We have been thinking about this and have ideas about it. The river is more productive with disturbances. WAPA is excited to engage in bug flows this year.

[Sinjin Eberle, American Rivers] From American Rivers’ perspective, the benefits of HFEs, supported by the science, are strong. Sediment programs, bug programs, and fish programs all rely on the input of sediment into the system and moving that sediment downstream. In late 2021, there was a huge input of sediment into the system, yet the HFE was denied due to political, economic, and public relations reasons. But the sediment budget in the canyon continues to degrade, and as scientist after scientist said over the past few days, disturbance flows work. We need to do whatever we can to implement one as soon as possible. The preservation of the ecosystem in the canyon is the most important thing we are responsible for managing.

[Brian Healy, NPS] A priority for NPS leadership at Grand Canyon is how the tribes feel about these resource decisions. It is important to hear their perspectives and have that as part of the conversation.

[Jakob Maase, Hopi Tribe] The only way to learn from bug flows is to do more of them. Science and data validation are based on repetition. **[Erik Stanfield, Navajo Nation]** Also supports spring HFEs. There are issues but there are also clear benefits and the possibility to mimic historical flows.

[Seth Shanahan, SNWA and TWG Chair] Under the current LTEMP process, is it practical to separate some of the timing issues to be able to meet the goals? **[Joel Sankey, GCMRC]** As a reminder, the sediment trigger was met last fall for a fall HFE. Even though it is still a long way off to meet the trigger for a spring HFE, things could change, and we could meet that trigger, but there might not be the desire for an HFE due to policy issues or other hydrology concerns in the basin.

[Larry Stevens, GCWC] The likelihood of ever meeting the winter criteria is low and seems to be getting lower. There is the belief that a springtime HFE needs to be tested as soon as possible to better guide the LTEMP process and at its conclusion. This year is an ideal time to do that.

[Seth Shanahan, SNWA and TWG Chair] The press release from Reclamation referred to planned lower monthly flows out of Lake Powell in January through April. What hydrology might be available in the spring? **[Ben Reeder, GCRG]** If water is being held back now under a 7.48 MAF release year, wouldn't this give us more flexibility for a higher flow in May or June when inflows of Lake Powell are going to be higher? **[Seth Shanahan, SNWA and TWG Chair]** That water has to be distributed at some point in the year. **[Jim Strogon, FFI/TU]** Another option is to reduce the flow as was done during the apron repair in the March-April timeframe, and then release that water after the extended dry out period, which would not cost the system much. **[Joel Sankey, GCMRC]** Can Reclamation recap whether there would be a window of time this spring or summer when all of the units would be online? Are there constraints on how large a flow could be? During last spring's disturbance flow, the powerplant capacity and lower flows did not help rebuild the sandbars or move sand out. **[Lee Traynham, Reclamation]** Plan to have six units available for 2022, There might be a small opportunity in June or July for eight units, but it would be highly uncertain and should not be scheduled around.

[Shana Rapoport, Colorado River Board of California (CRBC)] A lot of good feedback was received from the peer reviewers. Is there a process as to how to incorporate that in future experiments as well as if it is worthwhile to revise reporting in the current summary or future reports? **[Ted Kennedy, GCMRC]** There were many good ideas to make the report better and more rigorous. Based on that, the report will be revised. Would also look to Reclamation as to their expectations. Not sure if the revisions will make the decisions any easier.

[Larry Stevens, GCWC] Strong resource impacts in Grand Canyon were not expected last year's HFE, but the findings from yesterday's presentations indicated there was a rejuvenation of the fisheries and the food base. Also learned quite a bit from the event about ecosystem processes. It was a successful experiment although perhaps not in terms of sediment movement. It did remove the sediment anoxia. Regarding bug flow issues, developing an experimental strategy might be a way to get at some of the answers the reviewers brought up. **[Joel Sankey, GCMRC]** The focus on the spring disturbance flow was on the high flows, but much was also learned from the low flows. For 2022, the higher pulses as well as the lower flows need to be part of this discussion.

Annual FY21 Reporting on Expenditures

[Lee Traynham, Reclamation] PRESENTATION showed that FY21 expenditures were close to budget expectations. There was about \$100,000 in savings mainly because of reduced travel for meetings. Project C (program administration) had some overage associated with contract work costs in C.5 for spring disturbance flows and additional processing of bug flow samples. Funds remaining in Project D were due to not having the archaeologist position and the cancelled trips. Other funds not used are already obligated. Refer to the “walk-up” table for the reallocation of funding.

[Joel Sankey, GCMRC] [PRESENTATION] In the work plan, logistics is budgeted within each project and this presentation shows it separately, which has caused some confusion. Except for logistics support, GCMRC was under-budgeted on all projects.

Q&A & Discussion

[Bill Persons, FFI/TU] What about the new building overhead estimates? **[Joel Sankey, GCMRC]** GCMRC had anticipated higher burden rates for the new building in FY22 and FY23. That whole project has been put on hold. The GCDAMP can now be thinking about use of these funds, too.

Informational Updates

- **Trout Management Flow White Paper:** **[Kerri Pedersen, Reclamation]** This paper is currently being drafted. TMFs are one of the experiments in the LTEMP biological opinion to reduce recruitment of rainbow trout and prevent their movement downstream. The paper is not a decision-making document but to support the process. While the focus of the white paper is on rainbow trout brown trout are also included due to concerns with the increasing population. **[Bill Davis, CREDA]** Is TMF being considered for brown trout control? **[Kerri Pedersen, Reclamation]** Reclamation does not currently have compliance to conduct a TMF specifically for brown trout within the parameters of LTEMP since the timeframe would need to be adjusted.
- **Razorback Sucker Expert Panel:** **[Kerri Pedersen, Reclamation]** A planning committee was tasked with assembling an expert science panel to review razorback suckers in Lake Mead and the Grand Canyon. An expert science panel was convened to address specific questions about razorback suckers and whether there is connectivity between the Lake Mead and Grand Canyon populations. Main topics were related to extent of hybridization and potential impacts on augmenting the populations, impacts of non-natives, sustainability of population in Lake Mead, and the connectivity between the two populations. The facilitators are currently working on a report that will include possible management actions. The final document should be available in about six months. The report is not meant to be a decision document and does not include impacts to other resources from implementation. **[Seth Shanahan, SNWA and TWG Chair]** Was the consideration of augmentation a prior conservation measure from the Glen Canyon Dam biological opinion? **[Kerri Pedersen, Reclamation]** Yes, it was in the 2011 Biological Opinion, but was not specifically included in the 2016 Biological Opinion.
- **Green Sunfish Status and Incentivized Harvest Program Implementation:** **[Jeff Arnold, NPS]** NPS did not do any removals in 2021 because there was no high flow event. Probably will do a removal between mid-April to mid-May. In March 2021 during the low flow (4,000 CFS) event, carp were moved to the upper slough. While there might be fewer green sunfish, the carp also spawned. Will find out more about what happened in the spring. The brown trout incentivized harvest program

started November 11, 2020. Had more than 640 brown trout harvested and a total of \$30,000 in rewards to approximately 250 anglers. Three short videos were prepared with one of the anglers who had been the most successful. **[Seth Shanahan, SNWA and TWG Chair]** What was the strategy to introduce carp to prey on green sunfish? **[Jeff Arnold, NPS]** That was the idea, and was not too worried about them spawning because the young-of-the-year grow faster so they are larger and easier to remove. The problem with the pump down when the green sunfish are removed is that many of the smaller sunfish stay tucked up under the rocks.

- **Colorado Pikeminnow:** **[Kirk Young, USFWS]** This was a conservation recovery project for the Colorado pikeminnow that was funded by USFWS (and NPS). There has been a lot of interest about this from the TWG. We took a phased and transparent approach. The first phase was the biological review to assess whether there is habitat in Grand Canyon that can provide for recovery. There was some habitat components present and some missing. The expert panel believes there is enough potential in GC to move into the second phase which is to assess and conduct research to answer some of these critical questions before consideration of phase 3, which would involve reintroductions into Grand Canyon (if warranted). No operational changes will occur as part of this process. The habitat is there in part because of operations in consideration of humpback chub. If those conditions are maintained, then we think Colorado pikeminnow would be fine. The third phase would be conducted so as not to require operational changes or require new program funding to manage pikeminnow. **[Bill Davis, FFI/TU]** Is the Colorado pikeminnow proposal strictly an experimental, nonessential effort? **[Kirk Young, USFWS]** That is one of the options. It is possible a 10(j) non-essential population could work, but the species is currently considered threatened when it occurs on park lands. This will need to be explored in Phase 3. **[Larry Stevens, GCWC]** GCWC strongly endorses this approach. It is important to bring back top predators. Did you learn lessons from the California condor reintroductions, which involved a lot of outside support and long-term monitoring? **[Kirk Young, USFWS]** That might be a lesson for a 10(j) approach especially with the level of stakeholders involved. **[Shane Capron, WAPA]** WAPA had commented on the draft document. WAPA is supportive of recovery efforts and understands the reason for looking at Colorado pikeminnow in Grand Canyon, but the hydropower resource will be directly affected by movement of pikeminnow into the canyon where there is marginal habitat. Operations might need to be modified to improve that habitat. Is there a way to do this that does not involve changing operations of the dam? The recovery plan for pikeminnow does not currently consider a Lower Basin population and moving fish into Grand Canyon. As this goes forward, would like to see more coordination with the Lower Basin and the recovery planning process. **[Kirk Young, USFWS]** This is why it is important to reiterate that the USFWS does not want to require any changes in operations if recovery activities go forward. There have been significant declines in the Upper Basin population, and there are concerns about this fish occurring in only three areas. This would allow an option for a backup population. **[Ben Reeder, GCRG]** Can you explain the attributes that are beneficial to the ecosystem and other elements that are lacking? **[Kirk Young, USFWS]** Some of the thermal characteristics that were initially thought would be hard to meet were decent for the Lower Grand Canyon. There is also published literature about whether the temperature units are adequate for growth. Experts were also impressed by the lack of non-natives. A big thing that is missing is juvenile rearing areas because of hardly any backwaters in the Grand Canyon. **[Kim Dibble, GCMRC]** Osmundson's** approach was used to analyze the annual thermal units (i.e., the amount of heat needed in a system for positive growth). It was

surprising to find that the thermal regime is currently suitable for the growth of this species, and it continues to improve as Lake Powell levels decline. Lack of backwater habitat could be an issue that could lead to lack of recruitment. This could also be assessed during experimentation. This document was never meant to be an action document and it will be revised accordingly. (***Osmundson, D. B. 2011. Thermal regime suitability: assessment of upstream range restoration potential for Colorado pikeminnow, a warmwater endangered fish. River Research and Applications 27:706–722*)

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 Meetings

[Ryan Mann, AZGFD] There is concern at AZGFD about low numbers of rainbow trout and discussions about possible management options. Nothing has been finalized yet, but these conversations are occurring. **[Seth Shanahan, SNWA and TWG Chair]** Is the number one issue stocking? **[Ryan Mann, AZGFD]** It will be one of the management actions. **[Peggy Roefer, CRCN]** One of the items approved by BAHG was to look at aquatic vegetation removal to help with the brown trout problem. That was number three on the list of things to be funded that could work. **[Joel Sankey, GCMRC]** It was discussed at GCMRC related to budgeting and planning. One thought was that the implementation plan needed to be more fully developed before funds were found to support it. **[Ryan Mann, AZDFG]** Met with Ken Hyde in September to talk about options but then he retired. Have not made any progress since then, but it might be a good option. **[Charles Yackulic, GCMRC]** From the science monitoring side, this is not something that needs much money because the monitoring program is already robust. The funds would be needed for the removal. There are concerns about what to do with the vegetation that is removed that needs to be thought out. **[Peggy Roefer, CRCN]** How do we move this forward? **[Charles Yackulic, GCMRC]** There might also be compliance issues and will need Glen Canyon NPS managers involved in this. It is not an issue related to funding.

[Shana Rapoport, CRBC] Is there a plan to have a management river trip this summer? **[Clarence Fullard, Reclamation]** Reclamation is in the contracting and planning process for that. GCMRC has some tentative dates: July 13-22 and June 22-July 1. An update will be provided at the AMWG's February meeting.

PUBLIC COMMENT

None.

Meeting adjourned at 4:05 P.M. PDT

TWG Members and Alternates

Cliff Barrett, UMPA
Rob Billerbeck, NPS-GRNP (Alternate)
Kelly Burke, GCWC (Alternate)
Carrie Cannon, Hualapai Tribe
Shane Capron, WAPA
William "Bill" Davis, CREDA
Kurt Dongoske, Pueblo of Zuni
Craig Ellsworth, WAPA (Alternate)
Michelle Garrison, CWCB (Vice-chair)
Brian Healy, NPS-GCNP
Leslie James, CREDA (Alternate)
Jakob Maase, Hopi Tribe
Ryan Mann, AZGFD
Scott McGettigan, State of Utah

Craig McGinnis, ADWR (Alternate)
Betsy Morgan, State of Utah (Alternate)
Christina Noftsker, State of New Mexico (Alternate)
Emily Omana Smith, NPS-GRCA (Alternate)
Bill Persons, FFI/TU (Alternate)
Shana Rapoport, CRBC (Alternate)
Ben Reeder, GCRG
Peggy Roefer, CRCN (Alternate)
David Rogowski, AZGFD (Alternate)
Seth Shanahan, TWG Chair and SNWA
Erik Stanfield, Navajo Nation
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David Braun, Sound Science LLC
Daniel Bullets, Southern Paiute Consortium
Kevin Bullets, Southern Paiute Consortium
Julie Carter, AZGFD

John Jordan, FFI/TU
Edward Keable, NPS
Josh Korman, Ecometric
Mark Lamb, USFWS
Dave Lytle, Oregon State University
Kevin McAbee, USFWS

Martina Dawley, Hualapai Dept of Cultural Resources
Laura Dye, CRCN
Sinjin Eberle, American Rivers
Mel Fegler, State of Wyoming
Derek Fryer, WAPA
Alicyn Gitlin, Sierra Club
Sarah Haas, NPS
Emily Halvorsen, Colorado Attorney General's Office
Sky Hedden, AZGFD
Carliane Johnson, SeaJay Environmental
Kristen Johnson, ADWR

Jessica Neuwerth, CRBC
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Taryn Preston, NPS-GLCA
Sara Price, CRCN
Ted Rampton, CREDA
Pilar Wolter Rinker, USFWS
Eric Scholl
Gene Seagle, NPS
Erik Skeie, State of Colorado
Gary Tallman, Northern Arizona University
Melissa Trammel, NPS

Abbreviations

ADWR - Arizona Department of Water Resources
ARM - Annual Reporting Meeting
AZGFD - Arizona Game and Fish Department

AMWG - Adaptive Management Work Group
BAHG - Budget Ad Hoc Group
CFS - cubic feet per second
CR - Continuing Resolution
CRBC - Colorado River Board of California
CREDA - Colorado River Energy Distributors Association
CRCN - Colorado River Commission of Nevada
CRMMS - Colorado River Mid-term Modeling System
CRSP - Colorado River Storage Project
CWCB - Colorado Water Conservation Board
D.O. - dissolved oxygen
DROA - Drought Response Operations Agreement
FFI - Fly Fishers International
FLAHG - Flow Ad Hoc Group
FY - fiscal year
GCDAMP - Glen Canyon Dam Adaptive Management Program
GCMRC - Grand Canyon Monitoring & Research Center
GCRG - Grand Canyon River Guides
GCWC - Grand Canyon Wildlands Council
GLCA - Glen Canyon National Recreation Area

GRCA - Grand Canyon National Park
HFE - High Flow Experiment
kton - 1,000 tons
LTEMP - Long-Term Experimental and Management Plan
MT - metric tons
NPS - National Park Service
PDT - Pacific Daylight Time
PI Team - Planning & Implementation Team
Reclamation - Bureau of Reclamation
RM - River Mile
SCAHG - Steering Committee Ad Hoc Group
SEAHG - Socioeconomics Ad Hoc Group
SNWA - Southern Nevada Water Authority
TMF - Trout Management Flows
TWP - Triennial Work Plan
TU - Trout Unlimited
TWG - GCDAMP Technical Work Group
UAI - unregulated annual inflow
UMPA - Utah Municipal Power Agency
USFWS - United States Fish and Wildlife Service
USGS - United States Geological Survey
WAPA - Western Area Power Administration