GLEN CANYON DAM ADAPTIVE MANAGEMENT PROGRAM
TECHNICAL WORK GROUP MEETING
JANUARY 22, 2021

Start Time: 8:31 AM Pacific Standard Time (PST)
Conducting: Seth Shanahan, Technical Work Group (TWG) Chair
Meeting Recorder: Carliane Johnson, SeaJay Environmental LLC

Welcome and Administrative: Seth Shanahan, TWG Chair

- **Introductions and Determination of Quorum (16 members) [Seth Shanahan, Southern Nevada Water Authority (SNWA) and TWG Chair]** Quorum reached with at least 16 TWG members or their alternates in attendance. Vineetha Kartha (former TWG vice-chair) is no longer with the State of Arizona and will be severely missed.
- **Adoption of Prior Meeting Minutes [Seth Shanahan, SNWA and TWG Chair]**. Ben Reeder had provided comments, which were incorporated. No additional changes or objections to their adoption were heard regarding the June or October meeting minutes.
- **Next Meeting Date(s): April 13-14, 2021 [Seth Shanahan, SNWA and TWG Chair].** This will be a webinar. The next Annual Reporting meeting is planned for January 11-13, 2022. **[Clarence Fullard, Reclamation]** Confirmed the dates do not conflict with other meetings.
- **Ad Hoc Group Membership and Updates [Seth Shanahan, SNWA and TWG Chair].** Please review the Ad Hoc Group List (January 11) and let Tara know which groups you would like to volunteer for or if there are any changes. **[Larry Stevens, Grand Canyon Wildlands Council (GCWC)]** Plans to schedule a Species of Management Concern Ad Hoc Group meeting next week and will send out a meeting notification. **[Seth Shanahan, SNWA and TWG Chair]** One of the action items from last month was to convene an AHAHG [Administrative History Ad Hoc Group] meeting to provide an update. Appreciates efforts to make material 508 compliant. **[Craig Ellsworth, Western Area Power Authority (WAPA) and Budget Ad Hoc Group (BAHG Chair)]** Also looking for others to become more involved and help with the Wiki page.
- **Review Action Items, Motions, and Votes Form [Seth Shanahan, SNWA and TWG Chair]**. This form replaces the Action Item Tracking form.
- **Update on Activities Impacted Due to COVID-19 Restrictions** [DOWNLOAD] **[Mark Wimer, U.S. Geological Survey's (USGS) Grand Canyon Monitoring and Research Center (GCMRC)].** A list of planned trips and postponed or cancelled trips was presented. **[Seth Shanahan, SNWA and TWG Chair]** Are there any trips being impacted by COVID between now and April? **[Scott VanderKooi, USGS Southwest Biological Science Center (SBSC)]** This list is what is proposed going forward. GCMRC is looking at procedures and protocols based on experience from last year. It was fortunate no one in the field contracted COVID and want to keep that record going. **[Randy VanHaverbeke, U.S. Fish and Wildlife Service (USFWS)]** USFWS is planning a spring monitoring trip in the Little Colorado River (LCR), but this is contingent on Navajo Nation's boat policy. **[Jan Balsom, National Park Service (NPS)]** Navajo just extended their stay-at-home order to February 15 and Havasupai Tribe is still closed as well. **[Scott VanderKooi, SBSC]** GCMRC will have approval from the tribes before entering tribal lands. Any deviations will also be posted. Will continue to adapt as things change and vaccines are rolled out. **[Larry Stevens, GCWC]** Have

there been any problems with COVID outbreaks on private trips? **[Ben Reeder, Grand Canyon River Guides (GCRG)]** Have not heard of any problems on private and none on commercial trips. The protocols have been working well. **[Jan Balsom, NPS]** NPS has not had any problems or reports from non-commercial side. Guides have been tested, but no transference. **[Scott VanderKooi, SBSC]** On the science trips, GCMRC has been recommending that everyone wear a mask whether that is during the transportation in the boat or on the river.

- **Updates on Items of Interest That Are in Consideration for Implementation Before Next TWG Meeting [Scott VanderKooi, SBSC]** Lee sent out an email about staffing changes at GCMRC. Dave Lytle at SBSC, which is GCMRC's administrative home, took a position with the Forest Service. Scott stepped into the role as the center's Acting Director. The GCMRC Acting Chief is now Mark Wimer, who will be on a 120-day detail. **[Mark Wimer, GCMRC]** Is the wildlife program manager at USGS in Reston, VA. Has been a biologist at USGS for 20 years.

Update on Hydrology, Operations, and Reservoir/Release Conditions: Heather Patno, Bureau of Reclamation (Reclamation)

Presentation [DOWNLOAD]

[Heather Patno, Reclamation] As of January 20, 2021, we're seeing decreasing storage and expect that to continue until the spring runoff. Snow conditions for the Upper Basin are very dry. It is one of the driest periods on record. There is a 90% probability that inflows will be below average this year. A shift into Balancing could still occur with the addition of storms and an increase in unregulated inflows. Under the Long-Term Experimental and Management Plan (LTEMP), there is operational flexibility for resource-related issues. WAPA has requested a slight deviation from the LTEMP release pattern, which will be included in the February 24-Month Study.

In terms of elevations in Lake Powell, under the minimum probable, Powell decreases below 3525 feet, which is the critical threshold outlined in the Drought Response Operations Agreement (DROA). The initial critical threshold is met beginning in March 2022. Notifications went out to the Basin States and the Upper Colorado River Commission informing them of this projection, which requires enhanced monitoring and coordination. Will now receive monthly min/most/max notifications as opposed to the min and max probable studies being published four times a year. The minimum probable is the "radar" with no changes in operations until the most probable projection is below 3525 feet and a Drought Response Operations Plan has been developed and approved by the Secretary of the Interior. Lake Mead elevations look similar with shortage conditions projected in WY2022.

For the unit outages, transformer replacements continue. September outage is for annual maintenance that will continue into 2022. Smaller outages shown are the regular maintenance for all the units. Shaded areas are the HFE months. Peak capacity is decreasing into the future. No update from January is available for water quality so December's hydrology was used instead. Grand Canyon water temperature projections using the most probable indicate that temperatures in the Grand Canyon are expected to reach 12 degree Celsius (^{o}C) threshold for humpback chub growth and some portions of the river will reach the 16^{o} C threshold that is needed for humpback chub to spawn. LTEMP has 14^{o} C as its target at Little Colorado River within the Low Steady Flow experiment. The last 7.48 maf release occurred in WY2014 with almost average inflows after the two driest consecutive years on record inflows (2012 and 2013) decreased elevation projections into the Mid Elevation Release Tier. Keep in mind that the observed elevations are different than the August projections that set the tier

determination under the 2007 Interim Guidelines. Water coming in was higher than expected in the 24-month study during the average year runoff in WY2014. There is a similar pattern of decreasing elevations reaching the Mid Elevation Release Tier in WY2022. A decrease in dissolved oxygen (DO) was noticed in 2019 and was being monitored. Not seeing the concerns related to DO this year unless there is a large spring runoff that increases the elevation.

Are There Important Resource Outcomes That Might be Expected From a Potential 7.48 Million Acre-Feet Release in WY2022?

[Seth Shanahan, SNWA and TWG Chair] Heather showed future operations projections. This item is in response to that and whether there are things that were learned in the last 7.48 maf. **[Craig Ellsworth, WAPA and BAHG Chair]** For background, this item came from Vineetha because she wanted to discuss what happened during the last 7.48 maf. In 2014, everyone was in the middle of LTEMP. Vineetha wanted to ask whether the research and monitoring are in place to observe potential resource impacts. **[Peggy Roefer, Colorado River Commission of Nevada (CRCN) and Flow Ad Hoc Group (FLAHG) Chair]** Was looking at the information that Heather shared, and it appeared that the lake completely de-stratified in 2014. Would like a limnologist to look at this and whether this happened because it was a 7.48 maf year. This has implications for mixing the whole water column. **[Larry Stevens, GCWC]** The prospects of a low lake create even higher water temperatures, which affects everything from nutrient transport to decomposition of the macrophyte beds and increasing benthic anoxia. This is described in a paper that will be published soon in Advances in Ecology and Environmental Sciences. The effects translate to the entire trophic system to trout and perhaps to downstream resources, as well. During the 1977 drought, there were emergency criteria to lower the releases to 1,000 cubic feet per second. **[Seth Shanahan, SNWA and TWG Chair]** Requests that Craig organize this panel. A request was made to everyone about what issues should be explored with this panel. Send those to Craig. **[Craig Ellsworth, WAPA and BAHG Chair]** What happened to razorback and humpback chub in the Western Grand Canyon is a good example of learning from these opportunities to better understand what is going on.

Annual Fiscal Year (FY)2020 Reporting on Expenditures: Lee Traynham, Reclamation and Scott VanderKooi, GCMRC

Presentation [DOWNLOAD]

[Lee Traynham, Reclamation] Twenty percent of the total program budget is intended to support four main project areas (AMWG and TWG, program administration, permitting and compliance, and management activities). Most of the work is done by partners. There is money left over from 2020. There is an action item for FY2021 to develop budget prioritization criteria and lay out a path on how to spend remaining end-of-year funds. Many people had questions about the savings from the cancellation of in-person meetings. This was about $100,000 in unspent budget (travel, hotels, etc.). Also had savings due to vacancies and limited expenditures from the Experimental Management Fund. Cultural resources expenditures (Project D) had some staffing constraints (Reclamation archeologist vacancy) and several Tribes had declined to move forward on associative value studies. Reclamation has committed to its tribal partners that a portion of that funding would be applied to Reclamation Project D.10, the contingency fund for National Historic Preservation Act (NHPA) Section 106 compliance.

Presentation [DOWNLOAD]

[Scott VanderKooi, GCRMC] The pie chart shows the distribution of GCMRC's FY2020 funding by the various projects. One thing that is different is that the logistics costs are split out of the budget (refer to the small table below the pie chart). This is how things have been split in recent years. Table shows all the projects in the workplan as to what was budgeted and the actual spending with red numbers that is described in more detail in the following tables. A lot of funds were moved from 2019 to 2020 for a couple of different reasons. GCMRC had a couple of challenging budget years. One reason was the establishment of a new five-year, interagency agreement between Reclamation and USGS that was put in place in August 2019. This created complexity and challenges for projects that occurred over multiple years. Nevada and CREDA submitted comments, which have been addressed in this presentation, but the intent is to respond to their comments in detail in a letter. If they agree, GCMRC will share those responses with others.

Discussion

[Peggy Roefer, CRCN and FLAHG Chair] It looks like the greenhouse gas work that was done was funded by EPA. Was that a separate pot of money? **[Scott VanderKooi, SBSC]** Yes, that was outside funding that Bridget received to do that work.

Long-Term Experimental and Management Plan Biological Opinion Conservation Measures Updates: Kerri Pedersen, Reclamation; and Scott VanderKooi, GCMRC

Presentation [DOWNLOAD]

[Scott VanderKooi, GCMRC] There is a requirement in the Biological Opinion (BO) to report out on conservation measures each January. There are two different tiers and action triggers that could be initiated if certain population levels are reached of different size classes of humpback chub. Tier 1 level looks at adult abundance at the Little Colorado River confluence and the LCR itself, and it looks at subadults in the LCR and in the Juvenile Chub Monitoring (JCM) reach. The adult numbers are above the threshold levels even though they have dropped. There had been low levels of juvenile survival in the Lower Colorado River, which is being carried forward into the next size class of fish. The expectation is that a reduced number of adults will be seen in the next couple of years. **[Kerri Pedersen, Reclamation]** Tier 1 emphasizes conservation actions, which are taken as soon as a decline is noticed. This is designed as an early intervention. The 3-year average of subadults in the JCM reach in fall was 600, which is below the trigger level of 810. Now that the trigger has been reached, discussions have begun with the USFWS, and will continue until a response is implemented.

Coincidentally, this is now the time to begin the five-year review of the proposed action triggers management plan. The same group of people that developed this initial plan will be assembled to discuss the response and any updates to the plan. Lack of detection of larval razorback suckers was due to no trips occurring in April and May when razorback suckers are typically identified.

Discussion

[Kirk Young, USFWS] A meeting is planned to get the experts together who drafted the trigger document. Then brainstorm and consider the options for the response actions at Tier 1. Later in the year the trigger document will be reviewed. Some of those options include: should the number be increased

moving up to Chute Falls, should a hatchery component be considered, should fish be pulled from places where they are doing well?

[Scott VanderKooi, GCMRC] Regarding Leslie's question in the chat about this broader population, our objective with the tiered approach was to look at the complexity of the species, with multiple size classes, and get early indications on what is going on. This seems to be working. This range expansion was unanticipated and unexpected. It is of interest to track and there are full blown efforts to understand what is going on. This should also be part of the discussions. This is probably the biggest event that has happened over last five or six years. It is very encouraging. **[Kirk Young, USFWS]** USFWS is not likely to move dramatically away from relying on the Little Colorado River as a foundation for recovery and conservation because it has served as a backdrop against extinction. Western Grand Canyon population is increasing so quickly and wondering how quickly this could recede, as well. It is something to think about going forward. **[Dave Rogowski, AZGFD]** Triggers were previously at LCR and maybe another tier could be added. These are all options to consider for monitoring humpback chub.

[Seth Shanahan, SNWA and TWG Chair] What is the immediate action? Tier 1 response triggers have been met. What is the next thing that needs to occur and when? **[Lee Traynham, Reclamation]** For Reclamation, the first step is to formally provide notification to USFWS, which is a requirement of the BO. The conversations have already started. The next step is for the agencies to talk about the appropriate response action. It may not be immediate but expect it to influence the fieldwork this year. **[Kirk Young, USFWS]** Reclamation has already scheduled the first meeting (February 23) and can probably develop a short list very quickly for implementation this year.

[Randy VanHaverbeke, USFWS] There has been good production of Age 0 fish in 2019 and 2020 in the LCR. It is unlikely that a trigger in the next 3-4 years is going to be a problem. The math does not work that way. In the mainstem, that portion of the trigger will depend on how many juveniles move into the mainstem. "*Don't freak out*." **[Seth Shanahan, SNWA and TWG Chair]** We have met a trigger and the document requires certain actions. There are things that will be done, but maybe it is just a couple of choices that are available, then a more detailed conversation later. Is this correct? **[Kirk Young, USFWS]** That is right. Randy is saying that there might be more urgency if the same thing was happening in the Little Colorado River, too. Something will be done, and a number of ideas are being considered, but the list is not restrictive. All tradeoffs and risks will be considered. Maybe accept fewer risks since things are not critical and we should not be panicking. **[David Rogowski, AZGFD]** Should also consider the humpback chub translocated to Bright Angel as a response to the conservation actions, which were not included in the triggers. **[Brian Healy, GCNP]** That is a good point. It seems it would be worth a comprehensive look. **[Kirk Young, USFWS]** When this plan was being put together, certain things were not known, such as the Western Grand Canyon population might be as much now as in the Little Colorado River. It is a good time to rethink that and see how it fits. **[David Rogowski, AZGFD]** We have information on the translocations and picking up those fish in the mainstem. This year, we picked up ten humpback chub that had been translocated from Havasu five to six years ago up until two years ago. There are ways to count those translocations as additional conservation actions that can offset some of the trigger responses. **[Brian Healy, GCNP]** The goal of modeling this year was to understand the greater population. One approach is included in the paper on the Chute Falls translocation.

[Larry Stevens, GCWC] Should these translocations be regarded as 10.J populations and how is that considered? **[Kirk Young, USFWS]** None of the translocations are 10.J populations nor could they be.

They have the same protections as any other endangered species in the Grand Canyon. **[Larry Stevens, GCWC]** How does that play out with other endangered species in the region such as California condor, which was a 10.J population. May need to discuss this further. **[Kirk Young, USFWS]** Don't see how that fits. Happy to talk with Larry about this. **[Seth Shanahan, SNWA and TWG Chair]** These USFWS conversations about the trigger do not constitute any changes to the terms of the BO. Is that correct? **[Kirk Young, USFWS]** That is correct.

Discussion About Possible Experimental and Management Actions That May be Implemented in the Next 12 Months and Any Budgeting Issues: Lee Traynham, Reclamation and Clarence Fullard, Reclamation

Presentation [DOWNLOAD]

[Lee Traynham, Reclamation] This presentation is to provide Administration and Program updates that may inform the discussion on experiments. Secretarial Order 3395 was issued yesterday, which suspended delegated authority, federal register notices and certain hiring. This is likely to be temporary. A Federal Register notice announcing new membership opportunities is on hold until Department approval is received. Still have vacancies with archaeologist and tribal liaison positions. A new facilitator with Kearns and West will be joining in February. The science advisor contract is expected to be issued and awarded by this summer. The Consolidated Appropriations Act for 2021 was signed into law. There is language in the bill directing $21 million in hydropower revenues to be transferred from WAPA. This means full funding is anticipated for the program. There is long-term uncertainty with hydropower revenues that will not support the three environmental programs at current levels. Funding support will be reduced by half in 2023. Other emerging issues include the humpback chub recruitment, the recently completed 7.D Review Report, discussions of the new Interim Guidelines, and planning for Drought Operations.

Presentation [DOWNLOAD]

[Clarence Fullard, Reclamation] This presentation summarizes potential experiments and management actions in 2021 that are under consideration. As of right now, sediment conditions do not warrant a Spring HFE, but it is still on the table. The Planning and Implementation Team (PI Team) decided to defer deliberation of a fourth year of Bug Flows until February. Trout Management Flows (TMFs) are not being considered for implementation in 2021. Kerri Pedersen (Reclamation) is working with GCMRC and others on a white paper to summarize the current state of the science. Consultation with the Tribes would be required to consider a TMF. Both things need to happen before implementation is considered. Notifications were made to Tribes regarding the spring disturbance flow and the PI Team is drafting a technical recommendation report. This could lead to a possible implementation on March 15, which is to fit with the maintenance and dive team schedules.

Discussion

[Mark Wimer, GCMRC] Does the Leadership Team meeting reflect the final decision? **[Lee Traynham, Reclamation]** No. Technical recommendation report will be provided to the Secretary's Designee and the Leadership Team. The meeting is to review the technical recommendation and for the Secretary's Designee to hear the perspectives and any concerns the Leadership Team may have. Following the meeting, the Secretary or Secretary's Designee will make a determination and issue a decision memo.

[Larry Stevens, GCWC] GCWC is working closely with Glen Canyon and Grand Canyon to proceed with the rehabilitation of Paria Reach riparian stand that will be taking place this year and next couple of years.

[Leslie James, CREDA] Please clarify what was said about timing of the Bug Flow Experiment. **[Clarence Fullard, Reclamation]** The GCMRC Principal Investigators strongly support a fourth year, but some stakeholders wanted a pause to consider the past three years of experiments. The PI Team plans to discuss Bug Flows beginning in February.

Potential Spring High Flow Experiment, Spring Disturbance Flow (i.e., FLAHG Hydrograph), Spring Overflight Flow Opportunity, and Bug Flows: Mike Moran, GCMRC; Ted Kennedy, GCMRC; and Clarence Fullard, Reclamation

Overview [DOWNLOAD]

[Ted Kennedy, GCMRC] Four different flows are being considered for this spring: spring HFE, overflight data collection effort, spring disturbance flow, and bug flows. Right now, we see a negative sand balance, and we are nowhere near triggering a spring HFE. If it does occur, certain monitoring will occur as outlined in the Triennial Work Plan. **[Joel Sankey, GCMRC]** The overflight is planned for May 28 through June 3, 2021. The presentation describes the details on how that will be implemented. There is a narrow timeframe (10 AM to 2 PM) when the plane can fly to avoid shadows on the stream, but weather conditions might also alter this timing and the project duration.

Discussion

[Joel Sankey, GCMRC] There will be the same impacts from COVID 19 as for other field work. For example, in advance of the overflight, control panels will be placed in the field, and people will be operating GPS receivers during the overflight. Nothing is different than what is being dealt with now. As to weather, the second aircraft could help in collecting data. Will need others, such as Reclamation, to take part in conversations about what might be the longest duration. **[Larry Stevens, GCWC]** If there is a fire, especially on North Rim, smoke can fill a canyon. If it is a 7-day, 8,000 CFS flow, are there plans for specific research during that window? **[Ted Kennedy, GCMRC]** Our group did a lot of research during last overflight in 2013 such as light traps and sticky traps and new approaches for drift. That may be considered again. Will look at the old data but nothing had jumped out at the time. Maybe something can be seen now in the 2013 data to see if it is worth studying again.

Spring Disturbance Flow

[Ted Kennedy, GCMRC] The spring disturbance flow (GCMRC Project O) is planned for March 15-26. It has the potential to result in benefits to tribal resources, natural resources, and recreational experience. Brown trout are fall spawners and lots of literature suggests flow disturbance during early life stages can disadvantage these young fish. Spring timing is believed to disadvantage brown trout. The Project O elements are interdisciplinary and collaborative to evaluate multiple resources during this spring disturbance flow if it is approved and funded.

Discussion

[Brian Healy, GCNP] GCNP is also working with Reclamation and other cooperators to release sonic tagged razorback suckers to gain movement data. **[Ted Kennedy, GCMRC]** This flow could trigger movement or spawning by native fish.

[Leslie James, CREDA] Any hydrology change since initial cost estimates were developed? **[Craig Ellsworth, WAPA and BAHG Chair]** We have not done an impact analysis on this overflight. The 2013 overflight cost about $74,000. For the spring disturbance, there is a 2019 report going out on the cost numbers. Two things were assessed: 1) the impact of the apron repair (and given that is a maintenance action, a sunk cost), which was about $8,000, 2) then if the spring disturbance flow was added on top of that, the costs increased by about $4,000. These are "less than modest" impacts and are based on current prices.

Bug Flows [DOWNLOAD]

[Ted Kennedy, GCMRC] The goal of bug flow experiment was to give insects the weekends off to improve egg survival and minimize the impact on hydropower resources. This has been tested for the last three years at Glen Canyon Dam. Seeing other benefits such as higher emergence of midges and an increase in gross primary production because of greater light penetration on the weekends. This was not an expected benefit of the experiment, but it may positively affect the target organism. Caddisfly responses (400% increase in two of three years) might have been because of really low sediment loads in fall 2019 that caused high survival. Cannot say for certain that the bug flow experiment was the driver. The 2018 increase could not have occurred from bug flows because they would have been derived from eggs laid in 2017. There is evidence that low flows allow for better emergence of midges (which live for about a day), but this cannot be determined for caddisfly (which can live for days to weeks), and that cannot be seen over a weekend alone. It also cannot be determined that bug flows are not a factor. There are many drivers. A fourth year of bug flows could still teach us about the ecosystem such as whether the insect increases are propagating up to humpback chub. This would be done in Project F, a one-year diet study on humpback chub at the Juvenile Chub Monitoring sites using non-lethal methods. The food base is one of the more critical considerations for a fourth-year study, but there are other benefits if bug flows is tested in 2021 that would reduce uncertainties.

Discussion

[Jessica Neuwerth, Colorado River Board of California (CRBC)] If low steady flows may increase insect emergence, would we expect to see more emergence during the apron repair, or is it too early in the season? **[Jeff Muehlbauer, GCMRC]** We're doing our best to recruit private boaters right now to set out light traps so we can look into that. It's before the commercial season, so we can't rely on our typical roster of river guide citizen scientists. My initial thought is it's probably too early for caddisflies, but maybe not for midges. They emerge earlier in the year, so the apron repair might just be late enough. **[Ted Kennedy, GCMRC]** That may actually give us a clearer signal as to whether caddisflies are responding to these steady flows because it would give a longer block of steady flows. **[Seth Shanahan, SNWA and TWG Chair]** Do you have the detection capabilities at the right time of the year because of citizen science limitations? **[Ted Kennedy, GCMRC]** The commercial river guiding season starts in April and no one knows what the future holds. This means lots of light traps out there by May when the overflights occur. Also planning to revisit the 2013 data, which had a bunch of sampling in Glen Canyon. Don't have the resources to deploy a lot of crew for an overflight this year, unless something really

important is seen. That will be considered, if needed. Have begun reaching out to private outfitters to get light traps deployed by mid-February to catch the apron repair.

[Seth Shanahan, SNWA and TWG Chair] What are bug flow costs to hydropower? **[Craig Ellsworth, WAPA and BAHG Chair]** Have done impact analysis every year to bug flows on costs. It is probably $200,000 to $300,000 per year. This is almost a million dollars for the first three years. WAPA continues to have concerns about a fourth year of bug flows. Will try to resolve those concerns by February when these discussions will occur.

[Rob Billerbeck, NPS] Looking forward to these discussions in February but have also discussed this with technical staff at Glen Canyon and Grand Canyon who share concerns about the complexity of flows and the overflight. NPS would like to see bug flows suspended to determine effects on native and non-native fish, and to make sure the data are fully analyzed. That is also WAPA's viewpoint.

[Jim Strogen, Fly Fishers International (FFI)/Trout Unlimited (TU)] Are you seeing more caddisflies in the river in larval stages as well as a result of the bug flows? [**Ted Kennedy, GCMRC**] Those samples have not been fully processed yet. Drift river trips occur in the spring and fall, which were started before bug flows. **[Seth Shanahan, SNWA and TWG Chair]** What about prior years? [**Ted Kennedy, GCMRC**] There are two datasets: monthly for Glen Canyon (those samples are current) and in Grand Canyon (these are the ones that have not been fully processed). **[Jeff Muehlbauer, GCMRC]** A decision was made to process data at a minimal level to cover a longer period of time. This prioritized high value samples which resulted in not having a full dataset. **[Seth Shanahan, SNWA and TWG Chair]** If this occurs again next year, will there be the capacity to run all the samples? **[Jeff Muehlbauer, GCMRC]** Yes, we are so close.

[Randy VanHaverbeke, USFWS] What are your current views on the foodbase in Western Grand Canyon being able to support the large populations of fish we see? **[Ted Kennedy, GCMRC]** The food base there is adequate to support suckers because they can make use of the lower quality resources (detritus and algae). Humpback chub have different feeding habits, which tend to be more insectivorous and they take advantage of terrestrial inputs during flooding. Looking forward to finding out what the humpback chub are eating down there.

[Jim Strogen, FFI/TU] Is the larval expectation for caddis more likely to occur in the Glen Canyon set which I think you said you have done? **[Ted Kennedy, GCMRC]** Only see them occasionally in light traps in Lees Ferry. It is rare. If bug flows are successful, the caddisflies seem to have a foothold in Western Grand Canyon. The hope is that these populations will eventually colonize upstream reaches all the way into Glen Canyon.

[Larry Stevens, GCWC] Have you been able to detect larval Hydropsyche in the lower canyon on the underside of rock? It would be interesting to know what depth the retreats are detected. **[Ted Kennedy, GCMRC]** Have not done benthic sampling for several years. When this drift dataset is available, it is definitely one of the things to look for. Now that there is a date for the spring disturbance flow, the PIs are in conversation about pooling resources to do a single, collaborative, interdisciplinary river trip that would stop at a given site to sample before, during and after the flow. Would absolutely do benthic collections and surveys because of the unprecedented opportunity. Benthic surveys have not been done in a long time.

[Seth Shanahan, SNWA and TWG Chair] On January 25 there's a webinar on the spring disturbance flow with AMWG colleagues. The bug flow discussion will not occur until February, then it is assumed there will be a webinar for AMWG and TWG resulting from these conversations. Once a decision is made on the spring disturbance flow, this becomes a sunk cost. What are everyone's thoughts on this? **[Craig Ellsworth, WAPA and BAHG Chair]** WAPA is heading into a couple of lean years and impacts to basin funds are going to be at the forefront. WAPA is under the gun to make good recommendations with the environmental programs. All experiments will be under a higher level of scrutiny within WAPA. **[Larry Stevens, GCWC]** What information do we stand to lose if we stop bug flows? What can be contrasted under these conditions such as can light trap data continue or are there other ways to approach this data collection gap? **[Ted Kennedy, GCMRC]** GCMRC will continue to monitor with light traps and drift trips are planned regardless of what flow experiments are implemented.

[Seth Shanahan, SNWA and TWG Chair] Do other hydropower stakeholders have perspective on this? **[Leslie James, CREDA]** Concurs with Craig's comments. There is concern about watching every dollar that will impact the basin fund and the potential for cost recovery charges. Given what was seen last summer in California, the weather is also going to be a factor. Adding all these things together, with dates of steady flows for the overflight as well as the spring disturbance flow, this is a cumulative effect, especially with this hydrology year. CREDA is interested in a synthesis of the last three years of bug flows. Every time there is a presentation, more data is analyzed, and more is learned. It would be good to take time to put all this together and see what the actual results look like.

[Ben Reeder, GCRG] Is there an end goal of making more natural flows that are part of the flow regime and not just an experiment? **[Ted Kennedy, GCMRC]** If bug flows are turned off this year, less algae production is expected. May still see high caddisfly numbers if fall sediment is the ultimate driver although instinct suggests that bug flows are influencing those numbers because it seems to be too much of a coincidence. Can this experiment be considered a management action? That is more appropriate for Lee and others to consider. **[Seth Shanahan, SNWA and TWG Chair]** One of the wisest parts of LTEMP is this process of adaptive management. Maybe it would be good for Ted to think through these predictions, if bug flows do not occur, and then consider monitoring actions based on those predictions.

Incentivized Harvest Program Implementation Update: Ken Hyde, NPS

Presentation [DOWNLOAD]

[Ken Hyde, NPS] The presentation provides details on the program's funding and the media outreach. A registration site is set up each morning at the Navajo Bridge Visitor Center. From November 11 to December 31, a total of 72 fish were harvested from 31 anglers ($1,800 paid out). There were quite a number of walk-in anglers, especially the first week, but interest has dropped off with the rest coming from boaters. The data is being made available immediately to GCMRC, which will help inform pit-tagged fish. Will continue to build interest in the program and build a different pool of anglers. One guide indicated that his clientele had caught nearly 300 BT last year. One angler retained their fish because it was well over 30 inches and was not interested in the $25. Will continue to work with everyone and get pictures to increase interest.

Discussion

[Ken Hyde, NPS] Hoping to catch 2,500 adult fish this year with another 1,000 of the smaller age classes to lead to a decline. Because of COVID, were not able to have the tournament. Maybe others also stayed home because of that. It has also been cool weather. Fifty percent of the brown trout population would have been 2,500. If the population continues to go up, the 2,500 might be only 30-35% of the adult spawning population. Indications suggest BT is becoming a bigger part of the population. If 2,500 can be harvested, this should be seen in the data. **[Larry Stevens, GCWC]** Do you make recommendations for lure types? **[Ken Hyde, NPS]** Have spoken with AZGFD staff. Are aware of those who are doing a lot of fishing to see if they can provide a video on what they are using and what depths. That information can be gathered with more data.

[Craig Ellsworth, WAPA and BAHG Chair] Has GCMRC looked at what the harvest rate would need to be to turn the population? How might you convince more guides and others to participate in the program to avoid more aggressive treatments. How can we help you get that message out? **[Ken Hyde, NPS]** Jim Strogen did a great job talking with a number of the angling and fly-casting groups, but it probably will not change their perspectives. Instead, we are trying to entice new anglers who find this a new sporting opportunity. No one wants to go to the more aggressive treatments. **[Craig Ellsworth, WAPA and BAHG Chair]** Are fish being scanned for tags at the processing stations? **[Ken Hyde, NPS]** No, the gut piles and heads are being scanned at the freezer. The scanner will be run through the water below the dock and around the ground where the processing stations are located to make sure tags are not falling out of the fish during cleaning. **[David Rogowski, AZGFD]** The creel technicians also scan but they are there only six days each month.

[Leslie James, CREDA] Everything heard over the past three days is inter-related with a lot of complexity. One of the things that makes WAPA's job more complex with respect to the Glen Canyon resource is that the Colorado River Storage Project is operated as an integrated system. This means that the dams are operated in tandem. WAPA has agreements from all of those resources. It makes it quite a bit more complicated because in other forums, there are similar conversations for experiments. Impacts on funds and experiments are part of a bigger integrated project. WAPA has to take into consideration what is going on in the rest of the system. **[Larry Stevens, GCWC]** Leslie has the benefit of being apprised of what is going on with these other programs, while the rest of the group does not. Maybe it would help to have more engagements with these other programs? **[Leslie James, CREDA]** That is a good suggestion. Reclamation and WAPA are in the middle of all these programs. Maybe when the GCDAMP meets, there can be an update. Happy to help with that. **[Lee Traynham, Reclamation]** Reclamation is trying to make these connections and integrate better. At the last couple AMWG meetings, had Tom Chart and others from the Recovery Programs and the Lower Colorado River Multi-Species Conservation Program will be sharing at the next AMWG meeting. These are also public meetings. Would encourage others to attend those meetings and get on their mailing lists to better understand what they are doing.

Annual Reporting is Over, Now What?: TWG Members

[Seth Shanahan, SNWA and TWG Chair] What do we need to do with the information presented at the Annual Reporting Meeting? There is an awareness about our stakeholders and what issues they're facing. Leslie is seeing pressures across the entire system that are affecting power for customers, and we need to know this with respect to what is being considered on those resources. This might be the same

for any resource (endangered species, recreation). It is not just what is going on, but how it changes perspectives. **[Larry Stevens, GCWC]** It would be advantageous to know about the invasive species issues in the Upper Basin and how that might affect the Grand Canyon. **[Scott VanderKooi, GCMRC]** GCMRC has worked to engage more with the Upper Basin such as their annual researchers' meeting, which was held last week. There was also a lot of interactions with the USFWS Recovery Team on humpback chub and the species status assessment for humpback chub and razorback suckers. More frequent engagement would be a positive thing. **[Brian Healy, GCNP]** There had also been good discussions with the Upper Basin experts on the pikeminnow field trip. They were surprised at the low numbers of non-natives in Grand Canyon. **[Melissa Trammel, NPS]** It might be great to have a joint session on these various issues that overlap and where they differ.

[Seth Shanahan, SNWA and TWG Chair] How do we encourage the conversations? Maybe we host a meeting. Are there more institutional ways? Do we require people to talk with each other? There are methods and techniques that could be transferrable. **[Larry Stevens, GCWC]** Does the Secretary of the Interior oversee the entire basin? **[Seth Shanahan, SNWA and TWG Chair]** Certainly the operations of dams crosses both the Upper and Lower basins. **[Helen Fairley, GCMRC]** About 10 years ago, GCMRC worked with the Water Smart Program and put on a significant conference that was designed to bring in people from both the Upper and Lower basins. **[Seth Shanahan, SNWA and TWG Chair]** Let us add this as an issue to track.

[Seth Shanahan, SNWA and TWG Chair] One thing we cannot ignore are the panel presentations that Kurt Dongoske had organized. There are still issues with the Western Science approach a need to consider other perspectives more appropriately. One way we have been trying to address tribal perspectives is a reporting on life that is taken. **[Scott VanderKooi, SBSC**] [Taking of Life Inventory: **DOWNLOAD**] This is a request made to GCMRC from tribal representatives. There is incidental mortality when sampling is done. GCMRC does its best to minimize this and recognize it is a concern. The totals include mortalities from the GCDAMP participants such as USFWS and AZGFD. It also includes fish that were required to be euthanized under the NPS monitoring program. Maybe we need to add bluegill. Sunfish totals do not include those removed from the -12 Mile Slough. The majority of mortalities are rainbow trout and most are small individuals. Same is true of humpback chub. The numbers are also reported to AZGFD as part of the scientific collection permit and the Endangered Species Act take permit to USFWS. GCMRC also reports on collections of invertebrates and a small number of plants from the vegetation studies.

[Cliff Barrett, Utah Municipal Power Agency (UMPA)] It is not just our program. The Tribes have concerns with all the programs around them. It is a mistake to not acknowledge and deal with this in a better way. The issues go much deeper than a report. It is a totally different mindset that needs to be recognized. Maybe we could put together a group to start having these discussions. This needs to be dealt with in a more effective way. **[Larry Stevens, GCWC]** With all due respect, the conversation that Cliff is talking about, is difficult. There is a feeling of being blamed for all the ills that have befallen the Tribes and the resources. It makes it uncomfortable to formulate the criticism. Having this conversation might be productive, although it might be good to have it facilitated. **[Cliff Barrett, UMPA]** It won't be easy, but it might be helpful, and probably need facilitation on it. **[Brian Healy, GCNP]** This is an important topic. During COVID, it was heard that tribes had difficulty responding to the agencies on consultations. **[Peter Bungart, Hualapai Tribe]** All the tribal cultural departments are still operating with skeleton crews and with stay-at-home orders in place. They are also being consulted on a myriad of

issues. There needs to be patience. Like a lot of things with this program or any situation with many stakeholders, things move slowly to get results. Yesterday's session at the Annual Reporting meeting was phenomenal with a lot of positive comments. Need to keep that momentum going and ask that folks keep an open mind. Many tribal practices continue to occur on the river (giving reverence, offerings) that may not get noticed. **[Jakob Maase, Hopi]** Hopi would very much like to meet with people but there are still a lot of COVID difficulties. Hopi are in strict quarantine. Sadly, many Hopi Cultural Resources Advisory Task Team (CRATT) members have passed and there is a need to fill those spots. Also, there are still no CRATT meetings while the reservation remains in quarantine. The CRATT members encompass 16 villages and multiple clans, which are all different. The logistics for travel are also difficult with elderly members. It would be better for members to visit the Hopi. There is no internet and there are different levels of power and data availability in the buildings. Not everyone has access to new technologies. **[Leslie James, CREDA]** Probably all of us were impacted by yesterday's presentation. Reflecting back to 1999, when the first AMWG river trip occurred, was very impactful because of time spent with Arden and other tribal folks. Those AMWG river trips might not be feasible, but maybe there could be TWG, Ad Hoc, or other meetings held on the reservations when things open back up. One thing about the trip that struck home was the sense of place and not worrying so much about checking boxes and getting processes done. The program needs to regroup and see if there are ways to improve.

[Seth Shanahan, SNWA and TWG Chair] Everyone is interested in learning from each other's values and perspectives and being respectful. It can be difficult when the same information results in different conclusions. That is hard when there are fundamentally different ways to view the world. Everyone is trying and that is a great place to start. **[Michelle Garrison, Colorado River Conservation Board]** This year in particular with the program, combined with the presentations regarding tribal views on natural resources, it would be beneficial to have more discussions on how these resources fit together. Understanding the positive effects and getting holistic views from the tribes, would be critical when this work is being considered especially when there are detrimental impacts to other resources. We need more knowledge assessments.

[Helen Fairley, GCMRC] The TWG has made changes in its operating procedures in direct response to tribal input. It would be helpful to make sure to recognize the compromises that have been made along the way. **[Jan Balsom, NPS]** Everyone has struggled with having better and more meaningful dialogue. There is an expectation that tribal partners just show up at meetings, but they have jobs and are not being compensated. At Grand Canyon National Park, there is a system of an honorarium to provide support for people to help work with the park and to better integrate their concerns. It has taken generations to get here so it is going to take a long time to change how we do business. These conversations are important. There is a need to work on building this capacity. There are ways to support this including financially. **[Seth Shanahan, SNWA and TWG Chair]** It is a sign of respect to have more awareness of these different viewpoints and a willingness to do things differently. There is also the issue of capacity that needs to be solved systemically.

[Seth Shanahan, SNWA and TWG Chair] How are goals achieved and measured? There is still a struggle on understanding tradeoffs to achieve these goals especially when considering new information or new ways of doing something. **[Larry Stevens, GCWC]** The modeling is a critical way to move forward. The program is at a point to look back and this needs to be repeated every five years to see what has been learned with the models and where LTEMP needs to go. For example, modeling silt versus sand might be

a benefit to better understanding nutrient dynamics. **[Jim Strogen, FFI/TU]** There are also new ways of modeling that have come up after LTEMP. **[Craig Ellsworth, WAPA and BAHG Chair]** Over the next couple of years, there will be budgetary issues and probably will not be able to say that everything is important. For this program, there is a need to prioritize this work. **[Brian Healy, GCNP]** In general, it would be useful to have a framework of structuring the decision-making. **[Jeff Muehlbauer, GCMRC]** After so many years, with 20 years of data, there are core elements that need to be continued. But there might be jumping points from projects to continue to make these connections such as a soil study that might be important for fish. **[Seth Shanahan, SNWA and TWG Chair]** One example of this is idea of fertilizing the river with phosphorus. Is this concept at the point at which the tradeoffs can be considered? Which resources are not having enough of a positive response that suggests it should be done? **[Rob Billerbeck, NPS]** This process needs to be considered very carefully and NPS would need to carefully consider the action. **[Seth Shanahan, SNWA and TWG Chair]** The point is that maybe the tradeoffs have been thought about but not everyone else has this same information. Nor are the predictions known. Experimentation is fundamental to the program, but it is important to have some tools to make judgements on whether to do something or not.

[Seth Shanahan, SNWA and TWG Chair] Another item is Pearce Ferry Rapid, which seems to be an important barrier to limit non-natives. What are thoughts on this? **[Larry Stevens, GCWC]** Lake Mead is in a low lake condition. Fisheries development in these conditions may be vastly different than in a full lake. humpback chub were not there during a full lake. It may not be appropriate to consider humpback chub as anything other than a peripheral population that may disappear. Loss of that population would precipitate legal ramifications. Where are the fish spawning if young fish are there? They are not all coming from Havasu and there would be different decisions to be made depending on what is valuable to them. **[Jessica Neuwerth, CRBC]** The Pearce Ferry barrier was interesting information and a possible factor in the resurgences of native fish species. It is important to understand this barrier and how it interacts with Lake Mead levels, what conditions that barrier might remain, and what we might be able to do to maintain it.

[Jim Strogen, FFI/TU] David Ward's poster about common carp eating eggs of native fish is a topic that probably needs to be included in the future. **[Larry Stevens, GCWC]** Seconds this suggestion. Dave's work is fantastic and so informative to understand the damage to native fish. **[Seth Shanahan, SNWA and TWG Chair]** The strengths that were shown in these relationships in the conceptual models were also very useful.

Discussion of Emerging Issues and Request for Agenda Items for Next Meeting: Seth Shanahan, SNWA and TWG Chair

[Seth Shanahan, SNWA and TWG Chair] Anyone interested in serving as Vice Chair, should contact Seth Shanahan. Please send Craig topics to consider for the 7.48 maf release panel. Other topics of interest include: the status of the Tier 1 trigger and the actions being contemplated for humpback chub; Drought Operations planning; development of monitoring metrics; and tribal values.

[Ryan Mann, AZGFD] Impacts on long-term monitoring will be important as those funding timeframes get closer. **[Seth Shanahan, SNWA and TWG Chair]** Should one of the Ad Hoc groups tackle this? **[Ryan Mann, AZGFD]** Perhaps but not having funding for the program is going to impact all of the issues just discussed.

[Clarence Fullard, Reclamation] Reclamation funded a technology search for temperature control devices. Connie Svoboda, TSC, has agreed to present that results through the lens of Glen Canyon Dam.

[Larry Stevens, GCWC] David Topping reported on the export of sand without regenerating it. Would it be helpful to have a conversation on preemptive sand storage during drought conditions? Could consider whether there is a time to hold a planned high flow to prevent losing more sand. This could be answered with models but need a discussion about it.

[Kirk Young, USFWS] The Colorado pikeminnow feasibility study is undergoing an expert review and could be reported out during the June meeting.

[Sinjin Eberle, American Rivers] Requests a conversation around the interim guidelines. While participating in the 7.D Review, it was noticed there was not a lot of conversation from the other agencies about the health of the Grand Canyon being considered in the 2026 interim guidelines. This may not be an agenda item, but these decisions will impact the canyon over the next 30 years. If the program has information that could help guide the decision-makers, it should be considered how to get it in there. **[Lee Traynham, Reclamation]** Reclamation cannot get out in front of the new Administration with those new guidelines conversations. Through the course of the 7.D Review, received a broad range of input from stakeholders including the need to incorporate more of the environmental considerations as well as the modeling work from this program. Those conversation are happening. **[Seth Shanahan, SNWA and TWG Chair]** It is not for us to advocate, but to provide information that is valuable. The experts studying the issues now are probably going to be the same ones tapped by DOI to study the effects on the resources in this other decision. Vetting the confidence of our understanding on how the system works is going to be very important and it is not lost on people that the science monitoring results are relevant to that.

[Bill Persons, FFI/TU] Can there be an update on how to go about achieving objectives in the different resource areas? **[Lee Traynham, Reclamation]** Reclamation has been talking about metrics in two parts: 1) How do we track progress in a quantifiable way and consistently report that information? 2) Are we making progress towards the LTEMP goals to be achieved? That first part should be nailed down this year, and then will look to the second part. **[Seth Shanahan, SNWA and TWG Chair]** Could an ad hoc group help this conversation? **[Lee Traynham, Reclamation]** Great suggestion. Would definitely be interested in that but would defer to GCMRC on when because the PIs need to weigh in. **[Scott VanderKooi, GCMRC]** GCMRC is starting to think about this and would like to discuss it internally before it gets rolled out. There is an important role for all the stakeholders and for an ad hoc group to get engaged in this after these internal considerations.

Public Comment

No comments provided.

Adjourned at 4:02 PST.

TWG Members and Alternates

Jan Balsom, NPS
Cliff Barrett, UMPA
Peter Bungart, Hualapai Tribe (Alternate)
Leslie James, CREDA (Alternate)
Jakob Maase, Hopi Tribe
Ryan Mann, AGFD

Kelly Burke, GCWC (Alternate)
Carrie Cannon, Hualapai Tribe
Shane Capron, WAPA
William "Bill" Davis, CREDA
Kurt Dongoske, Pueblo of Zuni
Craig Ellsworth, WAPA
Charlie Ferrantelli, State of Wyoming (Alternate)
Clarence Fullard, Reclamation (Alternate)
Michelle Garrison, CWCB
Jessica Gwinn, USFWS (Alternate)
Paul Harms, State of New Mexico
Brian Healy, NPS (Alternate)
Ken Hyde, NPS-GLCA
Craig McGinnis, ADWR (Alternate)
Jessica Neuwerth, CRBC
Bill Persons, FFI/TU
Ben Reeder, GCRG
Peggy Roefer, CRCN (Alternate)
David Rogowski, AGFD (Alternate)
Seth Shanahan, TWG Chair and SNWA
Larry Stevens, GCWC
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Jeff Arnold, NPS
Rob Billerbeck, NPS
Daniel Bullets, Kaibab Band of Paiute Indians
Kevin Bulletts, University of Arizona
Michael Carpenter
Kevin Dahl, NPCA
Sinjin Eberle, American Rivers
Ed Gerak, Arizona Power Authority
John Jordan, FFI/Trout Unlimited
Carliane Johnson, SeaJay Environmental
Steve La Falce, TU
Sara Larsen, Upper Colorado River Commission
Scott McGettigan, State of Utah
McKenna Murray, State of Utah
Michael Pillow, USFWS
Sara Price, CRC
Shana Rapoport, CRBC
David Rozema
Amy Schott, NPS
Gene Seagle, NPS
William "Billy" Shott, NPS
Erik Skeie, State of Colorado
Emily Omana Smith, NPS-GRCA
Gary Tallman, Northern Arizona University
Melissa Trammel, NPS
David "Randy" VanHaverbeke, USFWS
Pilar Wolters, USFWS

Abbreviations

AHAHG - Administrative History Ad Hoc Group
AMWG – Adaptive Management Work Group
AZDWR - Arizona Department of Water Resources
AZGFD – Arizona Game and Fish Department
BAHG – Budget Ad Hoc Group
BO - Biological Opinion
CRATT - Cultural Resources Advisory Task Team (Hopi Tribe)
CRBC - Colorado River Board of California
CREDA – Colorado River Energy Distributors Association
CRCN – Colorado River Commission of Nevada
DO - dissolved oxygen
DOI – Department of the Interior
EO - Executive Order
FFI – Fly Fishers International
FLAHG – Flow Ad Hoc Group
FY – fiscal year
GCD - Glen Canyon Dam
GCDAMP – Glen Canyon Dam Adaptive Management Program
GCMRC – Grand Canyon Monitoring & Research Center
GCNP – Grand Canyon National Park
GCWC—Grand Canyon Wildlands Council
HFE – High Flow Experiment
JCM-West – Juvenile Chub Monitoring-West
LCR – Little Colorado River
LTEMP – Long-Term Experimental and Management Plan
maf – million acre-feet
NHPA - National Historic Preservation Act
NPCA - National Parks Conservation Association
NPS – National Park Service
PI Team – Planning and Implementation Team
PIs - Principal Investigators
PST – Pacific Standard Time
Reclamation – Bureau of Reclamation
RFC – River Forecast Center
SBSC - Southwest Biological Science Center
SNWA – Southern Nevada Water Authority
TMF – Trout Management Flows
TSC - Technical Service Center
TU - Trout Unlimited
TWG – GCDAMP Technical Work Group
UMPA – Utah Municipal Power Agency
USFWS – United States Fish & Wildlife Service
USGS – United States Geological Survey
WAPA – Western Area Power Administration