# Glen Canyon Dam Adaptive Management Program

# Technical Work Group: Budget Ad Hoc Group

Conference Call #3, March 16, 2017 – Meeting Notes

## Attendees

The following people identified themselves as being on the call.

Cliff Barrett, UAMPS

David Braun, Sound Science

Carlee Brown, Colorado

Shane Capron, WAPA and BAHG chair

Marianne Crawford, Reclamation

Laura Durning, GCMRC

Craig Ellsworth, WAPA

Helen Fairley, GCMRC

Paul Harms, New Mexico

Christopher Harris, California

Leslie James, CREDA

John Jordan, Anglers

Vineetha Kartha, Arizona

Ryan Mann, AGFD

Mike Moran, GCMRC

Clayton Palmer, WAPA

Emily Palmquist, GCMRC

Peggy Roefer, Nevada

Seth Shanahan, TWG Chair

David Ward, GCMRC

Mike Yard, GCMRC

Mike Yeatts, Hopi

The following were not on the call:

Melinda Arviso-Ciocco, Navajo Nation

Janet Balsom, NPS

Chris Budwig, Anglers

Kathleen Callister, Reclamation

Kerry Christensen, Hualapai

Kurt Dongoske, Zuni

Helen Fairley, GCMRC

Katrina Grantz, Reclamation

Brian Healy, NPS

Jessica Neuwerth, California

Don Ostler, New Mexico and Wyoming Jenny Rebenack, NPS

Ben Reeder, GCRG

Dave Rogowski, AFGD

Chris Schill, USGS

Randy Seaholm, Colorado

Larry Stevens, GCWC

Rosemary Sucec, NPS

Scott Vanderkooi, GCMRC

Kirk Young, USFWS

Mary Orton of The Mary Orton Company, LLC attended as facilitator.

Chairman Shane welcomed everyone to the Budget Ad Hoc Group (BAHG) meeting. He said he intended to keep the current meeting schedule. He assumed Technical Work Group (TWG) members would receive the Reclamation and Grand Canyon Monitoring and Research Center (GCMRC) draft budgets on April 10, in time for adequate review in advance of the April 20-21 TWG meeting and to use as a focal point of discussion at that meeting. He reminded the members to be sure to set aside time to review the budget before the TWG meeting.

He said today is the BAHG’s chance to hear from Reclamation and GCMRC on their budget ideas in three resource areas: Other Native Fish Species (other than humpback chub [HBC]), Rainbow Trout (RBT) Fishery, and Non-native Invasive Species. After presentations, the BAHG members would be invited to discuss the budget at a high level. He wanted to make sure the members start to understand critical information needs (INs) in these project areas. He hoped they could ask questions, learn from each other, and have the scientists understand the members’ ideas, concerns, and input. He said he didn’t think today would be the time to make recommendations, but rather to learn and exchange ideas.

He said he asked Mary Orton to help facilitate today, to help the group stay away from the details and to stay at a high level, mostly at the INs level with only a little project-level detail. He invited others to do the same.

## Other Native Fish Species (other than HBC)

David Ward noted that there were no proposed projects in the area of Other Native Fish Species, and that this subject is tied in with routine ongoing monitoring. Shane noted that the resource areas used by the BAHG are organized as was the Long-Term Experimental and Management Plan (LTEMP) Record of Decision (ROD), and that the group was interested in monitoring as well as projects.

In discussion, members noted that the Triennial Budget and Work Plan (TWP) might not be organized in the same way as the ROD. Craig, who developed the budget table for the BAHG, said the LTEMP has identified “other native fish species” as an important resource the program should be working on, and according to the table, there are some projects regarding these other native species, mostly geared toward razorback sucker. There was not a lot of work on other such species even though it was identified as resource area in the ROD.

David Ward said GCMRC funds Arizona Game and Fish Department (AGFD) for ongoing monitoring from Lees Ferry to Lake Mead, so they can note trends in native and non-native fish populations. They are proposing to do more monitoring for other native fish near the upper end of Lake Mead that used to be lake and is now river. It is a continuation of existing monitoring, just extending further because the river now extends further.

Marianne said that the San Juan Recovery program, in an effort to determine the extent of razorback reproduction upstream, is monitoring small-bodied fish. They are picking up small razorback and larvae at the outflow so they moved into the lower Grand Canyon where they are also picking up HBC and other species.  Reclamation receives this information through the SJRIP reports that are also shared with GCMRC, NPS and others. She said they have discussed continuing this work in the GCDAMP, continuing further upriver and for more species. It may be that Reclamation would direct some funding towards this monitoring in this work plan.

Mike Yard said that during the HBC aggregation trip, they catch other native fish which can inform the program of their abundance. Also, while AGFD does system-wide electrofishing geared to RBT, the secondary catch includes native and non-native fish. This is informative over time to assess native fish populations. He noted that hoop netting tends to do a better job catching native fish. Also, for the juvenile chub monitoring project, Charles Yackulic is proposing to establish a site in lower western Grand Canyon focused on chub and other native fish monitoring similar to the Little Colorado River (LCR) reach juvenile chub monitoring (JCM) project.

A member asked about the Biological Opinion (BO) for the LTEMP Environmental Impact Statement (EIS), and the requirement that the program assess the triggers for potential removal of RBT, brown trout (BNT), and other species that put predation pressure on HBC. Is the existing monitoring adequate, given that BNT are difficult to monitor? David Ward said that monitoring for those trigger requirements is accomplished through routine monitoring and HBC monitoring at the LCR confluence. They had not considered separate monitoring activities; rather, that the data needs for the triggers would be filled through ongoing monitoring. Mike Yard said the main purpose of the juvenile chub monitoring project is to determine abundance of HBC and abundance estimates of trout in the LCR area. The methodology used allows them to quantify RBT numbers. They have been unable to provide population estimates of brown trout (BNT) because captures have been too low. However, if there were a change in BNT numbers, GCMRC believes it could be detected.

David Ward said all the fish projects are interwoven. It is hard to discuss them in discrete pieces because they all provide information to others. Mike Yard said the trips were primarily driven by logistics and efforts to be cost-effective. They partition the trips based on their focus, but there is also incidental information gained on every trip.

## Rainbow Trout Fishery

Mike Yard said that the salmonid monitoring and research projects involve RBT and BNT; however, when other native or non-native fish are caught, they capture those data to inform the managers. The main purpose of this area of work is to determine the effects of flows identified in the ROD on trout. There are two general components:

1. Overall ongoing monitoring elements. This includes:
	1. The AGFD system-wide electrofishing, from Lees Ferry downstream. While this is principally electrofishing, AGFD is starting to use additional gear like hoop nets to obtain more information on native fish.
	2. Glen Canyon monitoring, which gives us a good idea of the relative abundance and distribution of trout and other fish.
	3. The Lees Ferry creel survey. This is public outreach effort where we interact with anglers to get an idea of their catch.
2. New proposed research: evaluating the LTEMP EIS flows and addressing cause and effect relationships. There are four objectives:
	1. Understanding the effects of Trout Management Flows (TMF) on age-0 trout recruitment and dispersal.
	2. Understanding the effect of stable flows, equalization or other, on trout recruitment and dispersal.
	3. Understanding the effect of fall high flows on juvenile survival or reduced egg deposition driven by decrease in growth.
	4. Understanding the effect of spring high flows on recruitment, growth, and dispersal.

These four research elements are designed to assess impacts of flows on RBT and BNT. GCMRC is currently focused on RBT because they are dominant; however, they recognize that BNT have started to spawn and they are becoming more common in Glen Canyon, so they want to be able to address how both species are changing in relationship to flow.

In the past, monitoring of early life state RBT survival was included. That is not included here; the protocols need to be restructured so they capture recruitment events as well as become more quantitative. This realignment will be the most useful tool in understanding whether flows change recruitment. So they are changing the spatial design and integrating it into the mark-recapture design. This is similar to the natal origins project, but it will not be from the dam to Lees Ferry. It will give an overall idea of what is going on with young fish and how they recruit into juvenile and adult fish.

RBT recruitment project: A number of factors influence recruitment of trout. GCMRC needs a model that could predict the years when there would be high or low recruitment. This project would assess data collected as part of long-term monitoring, and data collected in the natal origins project, as well as the ongoing proposal of experimental flow assessment.

They are uncertain whether there will be actions controlling BNT in Glen Canyon. If there are, they will take the opportunity to use otoliths to back-calculate hatch dates, spawning dates, and general grown patterns.

Other research ties into the creel survey and would measure angler catchability. Of their catch, what proportion was smaller or larger? AGFD has proposed a citizen science project in which they would pay guides to measure the length of fish of their customers to determine length and size distribution of the catch over time, to give an idea of the quality of catch, not just the numbers.

The call was opened to questions and comments by BAHG members.

* There is a need for a science plan. The LTEMP EIS says TMF will be needed to reach the trout goals, and it models one type of TMF. It may be that experimenting with different TMF starts with that type. It will require field experiments to know whether a flow regime has the desired effect on trout. We are interested in having a rigorous and significant science plan that is drawn up using standard scientific methods, examines the flow regime, gives quick feedback on whether it has the desired effects, and permits changes that allow for managing trout without destroying the Lees Ferry fishery.
	+ Mike Yard: The experimental flow assessment project proposal is the type of qualitative framework that will assess flow effects. It will be reach-based and work with actual abundance, so we can compare the different effects of flows based on habitat types. It should quantify how well a TMF strands fish and also look at the long-term effect. A TMF could remove half of the recruits in a year, but fish compensate for losses by changes in density. So it might end up having a short-term effect but no long-term effect. Mark-recapture will allow us to track survival through time as the age-0 cohort recruits into the adult population. For the experimental flow assessment the RBT early life stage survival (RTELSS) will be restructured to a multi-reach mark-recapture. The original RTELSS project erred on large recruitment events and changes in survival, so we are restructuring it to make it more quantitative and more precise.
* Is the multi-reach mark-recapture the same as before?
	+ Yes, except for the location. Instead of the dam downstream, there will be three sites. The sites will have low and high elevation shoreline characteristics, and will be where we know there is high reproduction and where young trout use the bars for habitat. In Glen Canyon, there are three reaches with low-elevation bars. If the TMF are effective, we can determine to what degree there was stranding there. The natal origin concept is used as framework to put RTELSS in. Sampling trips would allow us to compare and contrast the fall high flows effect on recruitment, or changes in condition to adult fish that negates reproduction later through the spring. Guides have expressed concerns that high flows negatively affect the trout fishery, so we want to address multiple questions.
* What about the bioenergetics or condition of the trout fishery?
	+ There will be many metrics collected. To do the mark-recapture, we will PIT tag a lot of fish and track growth and condition. We are working on a bioenergetics model.
* Is what we are hearing here what we will see in the budget?
	+ We’ve been asked to give you a verbal description of the different projects. We have also been working on a generalized extended abstracts. Those abstracts are general; they don’t get into the details. Eventually, we will give you more detailed abstracts as we have in the past.

## Nonnative Invasive Species

David Ward said that the priority in the LTEMP EIS and Biological Assessment (BA) was to decrease the impact, presence, and expansion of invasive aquatic species. There are three areas of focus for the TWP:

1. Increase early detection efficiency and surveillance, especially in three areas: Lees Ferry, in the LCR, and near the Lake Mead inflow.
	1. Lees Ferry: The proposal is to do additional monitoring in the summer on a monthly basis, and identify locations where invasives pass through the dam. The idea is to address them early before they become established.
	2. Little Colorado River: The concern is new species coming to where the HBC live, so there will be surveillance on the watershed. The FWS is doing that this year. The proposal is more monitoring between Blue Springs and Grand Falls. When the LCR floods, lots of invasives come downstream and stay in pools in that area, where there is an opportunity for them to spawn. The goal is to prevent a few smallmouth bass to turn into hundreds, and then come downstream during flooding. The project would proactively keep fish from entering the Grand Canyon. This preemptive approach is more cost-effective in small isolated areas, before the species spreads into the LCR.
	3. Lower end of the Colorado River: The goal is to detect invasive species coming out of Lake Mead and going upstream with water samples and eDNA analysis. They are hoping to employ this within the LCR for smallmouth bass and in the lower river for flathead catfish.
2. Assess and quantify the risk warmwater invasive fish pose to HBC. GCMRC has assessed the risk of RBT and BNT on HBC, and how temperatures affect risk. Now, they want to quantify warmwater species predation impacts on HBC in a laboratory setting, including common carp, smallmouth bass, flathead catfish, channel catfish, and small bodied invasives like killifish and flathead minnow.
3. Develop action plans with evaluations of existing management strategies. If there are established invasive species, there is little anyone can do about it. This would be an exploration of emerging technologies that can be used to control them. For example, a new technology being used for invasive brook trout is to treat juvenile brook trout, cause them to have YY (not XY) chromosomes, and release them. When they breed, they produce sterile males in the population and can cause the population to crash. GCMRC is not proposing this, but wants to evaluate the utility of the approach. How might they be employed in this system? In this TWP, there would be an evaluation of options for their potential.

Shane asked BAHG members for questions and discussion.

* For the action plan, are you also looking at emerging technology to manage chub; that is, to improve native species or not just decrease non-native fish?
	+ We have some ideas about that. That would be in the HBC section of the work plan.
* What would be the spatial design in the LCR?
	+ The initial thought would be Grand Falls to Blue Springs. This year, FWS will do surveillance on the entire upper LCR watershed. Depending on what is found, the proposed spatial scope might change.
* For early detection, will you be doing actual fish sampling in addition to eDNA? If yes, how will that relate to the fish sampling by AGFD system-wide?
	+ Simultaneously, AGFD will employ hoop nets at the lower end of river, mostly to look for new HBC and native fish; this could also turn up invasive species. We hope eDNA would give us more power to detect rare species; hoop netting could capture and detect new invasives as well.
* There are other requirements in the BO regarding non-native fish that are not included in these three elements, such as investigating the possibility of treating Bright Angel Creek and Shinumo Creek with piscicide and other tools. Who will address those? How do we get those requirements fulfilled?
	+ Marianne: Those are not yet decided. The Bright Angel Creek action would have to have additional NEPA. We have to decide whether it is feasible. Also, is it a management action or research?
* Will the conservation measures be in the TWP or funded outside the program?
	+ Marianne: Reclamation funds conservation measures through a different fund. If someone else does the work, it would not be in the TWP.
	+ David: We would be eager to work on a chemical renovation of tributaries.
* BAHG should make sure program funds are focused on the Programmatic Agreement, BO requirements, and LTEMP experiments.
* It needs to be clear where those requirements are being addressed, so we don’t have to search for them.

## Riparian Vegetation

Emily Palmquist said she invited Laura Durning to the call because she has a large role in the riparian vegetation program. Riparian vegetation has two ongoing complementary monitoring components: ground-based and image-based.

In the ground-based component (10.1), they look at smaller plants on an annual time scale. The image-based component (element 2 in the previous workplan and the upcoming workplan) looks at woody vegetation and change over longer timeframes. The latter is great at assessing slower-growing vegetation like tamarisk. Those two components complement each other: one on an annual and the other on a 5-20 year timescale.

They have proposed four additional components. The first is to revisit Stevens et al. (1995) which examined how marsh vegetation changed since the dam was built. The Stevens study, published before the 1996 ROD, showed that the large fluctuations in flows from the dam had increased marsh vegetation. This was useful for many other resources, produced increased complexity, and was deemed a benefit of dam operations. That research was important in the western regulated river scene as it showed positive outcomes of a dam. Since 1996, flows have changed and there has been significant change in marshes, but this has not been quantified. It would be good to do so before the flows change again. They have received some positive feedback from NPS on this idea and some tribes might be interested. That project would have ground- and imagery-based components.

In the second proposed element, they want to model how LTEMP flows would impact riparian vegetation.

The third proposal would address experimental vegetation mitigation and removal that Grand Canyon and Glen Canyon are implementing. GCMRC has talked with NPS about their intentions: removing dead tamarisks, removing other non-native species of interest, and planting strategically-placed native species in certain areas. GCMRC could help in the design of the project by modeling where they might be most successful as well as best practices to increase successful outcomes. This would include monitoring results.

The fourth proposal is to expand the photo matches, which have proven to be useful throughout the Southwest when looking at longer time scales and vegetation. It provides a better understanding of pre-dam conditions.

All this work would be done on the mainstem in Glen and Grand canyons. All the projects are tied to the LTEMP ROD and determining how the new flows would impact riparian vegetation distribution and composition, tied to the management goal of maintaining native vegetation and wildlife habitat. The experimental vegetation removal and planting is also dictated in one of the ROD documents.

Laura Durning said they were proposing another overflight May 2020. As they did for the 2013 overflight, the plan is to set aside some funding each fiscal year so the budgetary impact is not significant in any one year. The resulting high-resolution imagery is used in almost every other project. She offered to give more detail as requested.

The floor was opened to members for questions and discussion.

* For the photo-matching project, is there was an opportunity to draw from the Webb work and other photo matching that is already done? Is that useful for vegetation work?
	+ Helen: Yes, that dataset exists and will be used. The point here is to create a baseline record for the next 20 years of LTEMP, and there are great resources already available. By doing it now, the baseline visual record at the start of ROD will be available so we can compare the changes 20 years from now.
* In the Knowledge Assessment spreadsheet, you noted the possibility of looking at Cataract Canyon as potential reference site. Is that going to be included? Also, have you defined functional guilds or does that yet need to be done?
	+ Emily: We referenced Cataract because that is the most similar area we know of for riparian vegetation. If we were to start work in Cataract, it would be in collaboration with an Inventory and Monitoring group there and would be funded separately. Tributaries in Grand Canyon, while interesting and unique, are probably not the best references for the mainstem: they are smaller, have more vegetation than the mainstem, and have a dissimilar flow regime. Regarding the guild work, we have not had a riparian ecologist for 18 months, so we have been trying to get it done elsewhere with a person in Ft Collins. That paper is not yet published though the manuscript is in prep. Regarding guilds, we will use them in other efforts, e.g., to identify successful areas for rehabilitation work. We want to use guilds to model how these different LTEMP flows will impact different groups of vegetation. They could also be used to identify species to use in restoration. We are still working on integrating guilds into what we are doing.
* Is the model in the LTEMP the model you are proposing to work on?
	+ Emily: The State and Transition Model is great, but coarse. We’d like to use statistical modeling—a hierarchical Bayesian model or other model—to statistically model change over time, and we are exploring which would be best. We want to use statistical models for prediction, and then improve the State and Transition Model using the statistical models and ground-based monitoring.
* Regarding the mapping project, is there already a similar database created by Barb Ralston?
	+ Laura: Yes, there is a wonderful existing database from the 2002 dataset that we want to build on. That is a snapshot in time, from 2002, and we will have that again for 2013. The latter is in process; we are building that database for woody plants. Our proposal is to do another overflight in 2020 for another time snapshot, all of which would build on that Ralston dataset.
* The overflight project was not included in the last work plan because of concerns about utility and expense. We were waiting to see an evaluation of the 2013 overflight. Are we still looking at utility?
	+ Laura: The 2013 results have been published and are available. I can email it to you and we can talk about that more in detail. When the overflight system was set up, it was recommended to repeat every four years. We said we didn’t need to do it in 2017 because of the cost in money and time. However, we do think it is important and valuable to periodically get these high-resolution datasets, and we think the time is right.
	+ Emily: Many products are developed off this imagery. It is also our best way to look at tamarisk defoliation and death over time. The ground-based component gives of some of that information, but that is only a sample. Some pockets of tamarisks are defoliating and others are not. So because it is discontinuous, imagery will do a better job of seeing how they are dying over time than would ground-based monitoring.
	+ Laura: The one-meter resolution digital elevation model developed from overflights is used in flow models, channel bathymetry, models from the bottom of river to terraces, and the surface model. It helps with a lot of information we are interested in.

## Budget Development Process

There being no further questions or discussion, the discussion turned to the budget development process. Shane said that there would be two more BAHG calls, both of which would involve hearing from GCMRC. It might be best for the ad hoc groups (cultural, socioeconomic, and trout) to consider their deliberations after seeing the April 10 draft, and come to TWG with some discussion about that draft. He noted this is evolving process.

He also noted that GCMRC is getting feedback on the work plan through this informal process of dialogue with GCMRC and Reclamation staff: we hear from them, we ask questions, we give them some initial input. At this point, people are getting up to speed about the various budget components and figuring out how all the pieces come together. The table is helpful in some areas and maybe not others. We are having good discussions now, leading up to an important discussion at the April TWG meeting. From there, we need to have input on the second draft document: we will be leaving out projects that don’t make the cut, focusing on where we are over budget, and getting the next level of project detail. We’ll need enough detail early enough so we can make a BAHG recommendation before the June TWG meeting, when the TWG will make a recommendation to AMWG.

Comments and questions from BAHG members:

* There are two big differences now: LTEMP, and a desire to have the TWP detail the science plan for experiments under LTEMP.
* Is the dialogue between BAHG and GCMRC all verbal?
	+ Shane: We will have meeting notes and share them with GCMRC. The back and forth discussion has been effective. We have always worked on a kind of handshake deal with GCMRC, asking them to consider our ideas. We cannot task the GCMRC to do anything. If we have a disagreement, we will raise it with Katrina and try to work it out.
* This is a great opportunity for BAHG to voice their issues and bring up areas of concern with the principal investigators. Don’t lose this opportunity to state your opinions about what you have heard.
* We need to organize the work plan so we can see that all the important requirements are addressed.

Mike Moran noted this was his first budget process. He was concerned that there was not much time between the April and June TWG meetings. He has encouraged the GCMRC staff to start working on their extended abstracts now. Marianne said she would talk to Linda about rescheduling the TWG meeting for later in the month, and said that it can be difficult to find the needed facilities.

The meeting adjourned.