

Trout Ad Hoc Group (TAHG)

Established 10/20/2015

Background

At the August 2015 Adaptive Management Work Group (AMWG) meeting the recreational fishing representatives from the International Federation of FlyFishers, Trout Unlimited, and Theodore Roosevelt Conservation Partnership presented the Lees Ferry Recreational Trout Fishery Management Recommendations (Recommendations). Their report provided 15 recommendations for stakeholders to consider. During the meeting, AMWG passed a motion by consensus requesting:

The Secretary's Designee direct Grand Canyon Monitoring and Research Center (GCMRC) to conduct a technical review of the Lees Ferry Recreational Trout Fishery Management Recommendation and report its findings to the TWG, and directs the Technical Work Group (TWG) to evaluate the GCMRC review at their October 2015 meeting, and report its findings to AMWG at its February 2016 meeting.

GCMRC provided an initial technical review on six of the Recommendations which were presented to TWG during the October 20-21, 2015 meeting. During the TWG meeting stakeholders asked GCMRC to provide points of clarification on their review of the Recommendations and to provide additional feedback on the remaining nine recommendations. Additionally TWG developed a Trout Ad Hoc Group (TAHG) to evaluate the GCMRC technical review and provide recommendations to the TWG:

TAHG charge – The TAHG will evaluate the GCMRC technical review of the Lees Ferry Recreational Trout Fishery Management Recommendations per the AMWG motion on 8/27/2015, and make a recommendation to the TWG at our January 2016 meeting. The TWG will consider the recommendation and make findings to the AMWG at its February 2016 meeting.

TAHG Members – Bill Stewart (Chair), Seth Shanahan, Brian Healy, Mark Anderson, Chris Budwig, Joe Miller, Craig Ellsworth, Jessica Neuwerth, Paul Harms, Kurt Dongoske, Kerry Christensen, John Jordan, Vineetha Kartha

Additional direction from the Department of Interior (DOI) was for GCMRC to go back and look at the Recommendations again, and make the distinction between a science review and a policy or management consideration and that policy considerations shouldn't be discussed at this venue, since it is outside the scope of the TWG.

The TAHG met on three separate occasions (November 9th, December 7th and, January 14) to discuss the charge and provide comments on the GCMRC review of the Recommendations. Notes from these meetings are provided in appendix A. In the December 9, 2015 "Technical review of the Lees Ferry Recreational Trout Fishery Management Recommendations" memo to the TWG chair, GCMRC submitted an updated and final review in response to comments and suggestions received from the TWG regarding points of clarifications and topics that were not included in their initial review. This final review was limited to scientific and technical matters, and for recommendations where no scientific or technical information was presented, GCMRC limited their comments.

TAHG members were provided with comment forms and given one month to evaluate the GCMRC technical review of the Lees Ferry Recreational Trout Fishery Management Recommendations per the TWG charge. TAHG member comments are provided in appendix B.

There was uniform agreement by the TAHG membership that the GCMRC technical review is comprehensive. In addition, the TAHG respondents found GCMRC's review either supported or was neutral / non-committal on thirteen of the fifteen individual recommendations. There was not uniform agreement on the GCMRC review conclusions on two of the recommendations: (1) Minimum Flows and (2) Stocking in the Event of a Catastrophic Fishery Failure. The TAHG concluded that while both Minimum Flows and Stocking are subjects for future discussion the Stocking issue is substantially determined by the provisions of the Park Service's comprehensive Fishery Management Plan and the Arizona Game and Fish Department's Fisheries Management Plan Colorado River – Lees Ferry (2015-2025).

Conclusions

1. The TAHG review concluded that GCMRC review is generally comprehensive although it could be expanded in some areas.
2. Additional discussion/clarification is needed by the TWG and GCMRC on the scientific basis of the minimum flow recommendation and the need for stocking in the event of a catastrophic failure of the Lees Ferry trout fishery
3. The TWG should identify outstanding research questions that should be addressed to better inform any implementation of the Lees Ferry Recreational Trout Fishery Management Recommendations.

Recommendation

The TAHG recommends that the TWG recommend that the AMWG accept the GCMRC technical review of the Lees Ferry Trout Fishery Management Recommendations based on the TAHG evaluating the GCMRC technical review of the Recommendations and finding the review to be comprehensive and the review to be supportive, neutral or noncommittal on the individual recommendations with two exceptions. One exception being the Minimum Flow recommendation with agreement that research should continue to evaluate the effects of lower flows and to develop scientifically based minimum flows. The other exception being Stocking In the Event of a Catastrophic Failure and the impact on the dependent economic community be included in the determination for stocking and with the understanding that stocking is substantially determined by the provisions of the Park Service Comprehensive Fishery Management Plan and the Arizona Game and Fish Department's Fisheries Management Plan Colorado River – Lees Ferry (2015-2025).

In addition the TWG requests that the AMWG, with the acceptance of the Lees Ferry Recommendations, instruct the TWG to consider the requirements for any implementation of the Recommendations including additional research that should be included in the work plan.

Appendix A

Trout Ad Hoc Group Meeting November 9, 2015, 2-3:30 MDT, 1-2:30 PDT

Phone #: 1-877-932-7704

Passcode: 8410783

MEETING MINUTES

Attendees: Bill Stewart, Marianne Crawford, Scott Vanderkooi, John Jordan, Seth Shanahan, Brian Healy, Joe Miller, Craig Ellsworth, Jessica Neuwerth, Paul Harms, Vineetha Kartha

- **Introduction** **Bill Stewart**
Bill welcomed everyone and provided a recap of the the 8/27/2015 AMWG motion and the Oct 20, 2015 charge of the Trout Ad Hoc Group.

- **Review of 15 angler recommendations/GCMRC Comments** **Bill/Scott**

Bill provided a summary of the 15 trout fishery recommendations, and Scott V. provided a summary of the GCMRC technical review of the recommendations that was originally provided at the 10/20/2015 TWG meeting. GCMRC had comments on 6 of the 15 recommendations.
Since there was a lot of discussion at the TWG, particularly on items that GCMRC did not provide a review on, further direction was needed from DOI.

- **Direction form Camille/Additional GCMRC Review** **Vineetha/Scott**

The direction from Camille is for GCMRC to go back and look at the recommendations again, and make the distinction between a science review and a policy or management consideration. Policy considerations shouldn't be discussed at this venue, since it is outside the scope of the TWG.
It will take GCMRC about a month to complete the new review, likely by the end of November. It won't be an extensive review, will keep it brief.
Brian Healy – Some items are outside of the scope of the AMWG, since some are management considerations.

- **Next Steps/Report to TWG/Tasks for Dec Meeting** **All**
Bill - The TAHG is supposed to evaluate the GCMRC review of the fishery recommendations, and parse out the technical/policy and management considerations of it. There are some with overlapping aspects for eg: the Bug Flows, repatriation of EPT.
Marianne – Management considerations should be considered by the respective agencies
Brian – Developing a business opportunity in Marble Canyon has to go through a long process, has to establish whether it is an appropriate use of the resources. Volunteer fishing trips are approved through CFMP, but commercial trips are not.

Joe – Are rafting trips through Grand Canyon commercial? Understands that guided fishing isn't forbidden, but has to go through a process.

Bill – It is important to let folks know of the reasons, what regulations exist and what sort of a process is necessary?

Craig – This will be very helpful information and should be part of the TAHG report to the TWG.

Seth – Trying to understand what the objective is, are we looking at components that are science based, but also have the management agencies provide considerations?

John – That would be a Phase II. Currently we are looking for GCMRC to determine if the recommendations have a scientific base, and the TAHG to identify which management agency.

Joe – Every one of these 15 items would require a scientific or technical component if implemented. The agency responsible for the implementation of these would require some technical base. GCMRC would identify the scientific base, and if there is none, recognize it as such.

Bill – Agencies can identify each review as their area. This will be part of the report. Phase II could address the details. GCMRC takes the first cut, and the TAHG will go through the review.

ACTION ITEM: Go through the GCMRC review (6 out of 15) that was provided at the Oct 20th TWG. Each agency to go through and provide comments.

The 6 recommendations that GCMRC had comments on are:

1. Aquatic food base enhancement through experimental repatriation and “bug flows” (1 in TFR)
2. Minimum Flows (3 in TFR)
3. Experimental Trout Management Flows (5 in TFR)
4. Marble Canyon Trout Fishery (8 in TFR)
5. Stocking in the event of a catastrophic fishery failure (10 in TFR)
6. Monitoring and measurement of management triggers (15 in TFR)

ACTION ITEM : Scott to provide the rest of the 9 reviews end of November. TAHG will go through and provide the same sort of review at the next meeting

Next Meeting:

Dec 7th, 2:00 – 3:30 PM MDT

Jan 7th – 2:00 – 3:30 PM MDT

Trout Ad Hoc Group Meeting
December 7, 2015, 2-3:30 MDT, 1-2:30 PDT

Phone #: 1-877-932-7704

Passcode: 8410783

MEETING MINUTES

Attendees: Bill Stewart, Marianne Crawford, Scott Vanderkooi, John Jordan, Seth Shanahan, Brian Healy, Joe Miller, Chris Budwig, Craig Ellsworth, Jessica Neuwerth, Paul Harms, Vineetha Kartha

• **Introduction** **Bill Stewart**

Bill welcomed everyone and reminded everyone to send comments to him.

• **Follow-up of 6 recommendations – additional comments** **Bill**

He has received comments from only a couple of stakeholders. He will be sending another comment form out with the updated GCMRC review of all the 15 recommendations.

Craig E – Comment form is a little unclear.

Seth S – Should we be reviewing GCMRC’s recommendations, and also add my agency’s recommendations?

Vineetha – Review GCMRC’s recommendations, do not add agency’s recommendations. Such detail is likely Phase II of the TAHG group. Keep it simple.

• **GCMRC Review of additional 9 recommendations** **Scott**

Scott V. reiterated the direction from Camille which was for GCMRC to go back and look at the recommendations again, and make the distinction between a science review and a policy or management consideration. If the recommendations were not technical or scientific, GCMRC made a note and commented. He went briefly over the updated review:

1. Aquatic food base enhancement though experimental repatriation and bug flows.
There is support for taking an experimental approach to bug flows
2. Dam Operations
No scientific or technical information regarding MLFF. Also currently being reevaluated under LTEMP EIS.
3. Minimum Flows-little scientific support for any particular minimum, more research needed
4. Fall & Spring HFE experiments
Fall & Spring HFEs are important in aquatic foodbase and improvement in trout recruitment. Any changes from the HFE protocol is a policy matter and is being addressed through LTEMP EIS.
5. Experimental Trout Management Flows
Experimental design for TMF is really important

- Joe M – No proof of concept yet. Success of TMFs hasn't yet been demonstrated.*
Scott – Need to set out a hypothesis and have a robust experimental design. Effort to dewater redds in 2004 did not work well. Lots to learn here
The approach of forward titration is a conservative approach.
6. Equalization Flows
2011 equalization flows appear to have contributed to the boom and bust cycle of the trout population. Any changes are a policy matter.
Marianne – Katrina said that 2011 was an unusual equalization year, had to push a lot of water out in a short amount of time.
Scott V – Margin habitats were inundated for Spring, summer and fall. Ideal conditions for higher survival rates. Reason being the high and steady nature of the flows.
ACTION ITEM – Have a presentation on equalization flows by Katrina Grantz
7. Fishing regulations
Amount of harvest is unlikely to have an effect and is under the purview of NPS and AZGFD
8. Marble Canyon Trout Fishery
Chris B – Need to be on the same page as far as defining a “quality fishery.
Brian H – Metrics and objectives have been there for quite a few years
Bill S – AZGFD calls it a blue ribbon trout fishery. However goals and objectives were not defined when the DFCs were created. This year AZGFD established goals and objectives in their Fisheries Management Plan Colorado River-Lees Ferry 2015-2025.
9. Riparian Vegetation Restoration
Could be a positive benefit, but response would be too small and hard to detect.
10. Stocking in the event of catastrophic fishery failure
Joe M. – GCMRC has perhaps misunderstood that the recommendation was for a catastrophic failure, rather than a population surge or decline. Agree with GCMRC that Marble Canyon may not be a source for fish to be relocated from.
Scott V.– Looking at it broadly, started receiving calls to stock during last year's decline. Wanted to make the point that a lot of the changes that you see are cyclical from the perspective of population management.
Developing a broodstock – understanding the timing of collapse may be difficult
Marianne – How does whirling disease play into all this?
11. Low Dissolved oxygen response protocol
GCMRC doesn't have real-time access to data from the dam. Also currently there is an impasse with BOR water quality monitoring. Proposal has been put on hold since Bill Vernieu's retirement and Lake Powell water quality monitoring is being reviewed. Dam data is in database that can be shared upon request. Is it technically feasible to maintain DO levels at the dam and operate accordingly?
DO levels are collected at the dam, monthly profiles in the forebay and at 15-min intervals in the penstocks and tailrace. This data is not currently available in real-time or online.
ACTION ITEM - This could be a question for the upcoming PEP panel

12. Temperature Control device – *Implementation is a policy matter. Temperature control would provide a means to experimentally manage for desired species or against unwanted species*
13. Bypass tube electrical generation
Implementation is a policy matter. When water is moved through the jet tubes, it does oxygenate the water, Because there is a noticeable change in the DO with respect to HFEs. Also affects temperature due to location of intakes.
Marianne – This was looked at when the study on TCD was done. There is a report out somewhere.
14. Introduce turbidity
Definitely influences predation according to lab studies, but field studies show otherwise. Need additional research. Implementation is a policy and engineering matter.
15. Monitoring and measurement of management triggers
Need to carefully design the surveillance plan for invasive species.

- **Next Steps/Report to TWG/Tasks for Jan Meeting** **All**

Bill to send out a comment form with all the 15 recommendations.

ACTION ITEM - Comments are due by January 3, 2016. Bill to compile and send to the group by January 5, 2016. Discussion by the entire group on January 7th.

Next Meeting:

Jan 7th – 2:00 – 3:30 PM MDT, Phone #: 877-932-7704, Passcode: 8410783

Trout Ad Hoc Group Meeting
January 14, 2016, 2-3:30 MDT, 1-2:30 PDT

Phone #: 1-877-932-7704

Passcode: 8410783

MEETING MINUTES

Attendees: Bill Stewart, Marianne Crawford, Katrina Grantz, Mark Anderson, Scott Vanderkooi, John Jordan, Brian Healy, Joe Miller, Chris Budwig, Craig Ellsworth, Jessica Neuwerth, Paul Harms, Vineetha Kartha

- **Introduction** **Bill Stewart**
Bill welcomed everyone and reviewed the agenda.

- **Review of the comments received** **Bill**

Bill thanked everyone that sent in the comments and noted that based on the rating scale that he had sent out, everyone was kind of in agreement regarding the GCMRC review. We need not discuss 10 out of the 15 recommendations. There were 5 recommendations where there were differences (Experimental trout management flows, fishing regulations, Stocking in the event of catastrophic failure, Temperature control device). There were some good comments that can be discussed down the road.

Paul H – There has been some confusion where we were asked to support GCMRC.

Bill – The rating scale was based on whether the stakeholder thought if GCMRC review supported the recommendation.

Craig E – TWG charged the TAHG with evaluating the GCMRC review, not to interpret. We are supposed to look at whether GCMRC missed anything. Were the anglers misunderstood ? For example one of the reviews did not bring up navigation and safety, but one of the commenters brought it up.

Scott V – I believe TAHG has met the charge. The comments ask a lot of good questions and already identifies what was missed by GCMRC

Vineetha – Agree with Scott. TAHG has met the charge. The TAHG needs to clarify in the report to TWG whether GCMRC did a comprehensive review, and identify areas where there might be more questions.

Chris B – Appreciate the work that has been done on this. No comments on the bug flows. Feels like anglers were misunderstood on the trout stocking recommendations as far as the GCMRC review is concerned.

Joe M – Evaluation indicated opportunity for additional data gathering or science.

Chris B – Catastrophic failure could mean a type of event that stresses the system in a manner that we haven't seen before. What is a viable timeline? Is stocking a viable way of getting the system to recover?

Scott V – Many examples of stocking success exist. It's really important to define what you mean by catastrophic failure.

Chris – TMFS – didn't want to do it unless the system is stable. What are the triggers? Unstable means really low population.

Brian H – NPS standpoint is that we won't wait for the trout fishery to recover on its own. We would like to make sure that we don't add triploids to a falling population as soon as we see a decline, which might make it worse.

Craig E – Add TMFS and emergency stocking for clarification in the TAHG report.

Marianne – Who is in charge of stocking in a time of catastrophic failure?

Bill – AZGFD is. It is under our management plan.

Joe- what would happen in case of a chemical spill? Historic stoking included large numbers of fertile fish.

Bill – There are a suite of triggers that we would look at for stocking. Really goals rather than triggers. Triggers are identified in the NPS CFMP. We have triggers in case of a catastrophic event such as a chemical spill.

Joe – We are just looking to make sure whether science and technology provide data when an agency is looking to make decisions.

Craig – We probably should look at minimum flows as well. Someone identified navigation and safety as something that GCMRC did not address.

- **Sideboards**

Vineetha

Vineetha briefly reviewed why the sideboards were important. At the October TWG meeting there was a lot of discussion on some subjects that seemed to be the most concerning for the stakeholders. It is important to identify these concerns in the TAHG report and clarify that the TAHG review was done with these sideboards in mind:

1. Lees Ferry Trout Fishery Recommendations (Recommendations) must be fully consistent with the “Law of the River.”
2. Recommendations that fall under the purview of management agencies such as NPS, AZGFD or USFWS will require additional evaluation with these management agencies for further consideration.
3. Recommendations that address dam operations may be diverted to current Long Term Experimental and Management Plan Environmental Impact Statement for further consideration and evaluation.

Vineetha explained that comments are invited on the sideboards and that this language might also have to be included in the motion.

- **Next Steps/TWG report meeting**

All

Bill will work on the TAHG report to the TWG and have it finalized by Monday, January 25th.

Vineetha – asked if there was any way we could have something that could be uploaded to the google drive for TWG stakeholder to access. Can the compiled comments be uploaded or will it cause confusion.

Joe – It will cause confusion. This can be solved by writing a couple of quick sentences.

Craig – will write up a quick paragraph

ACTION ITEM – Craig E will write up a couple of paragraphs (with input from Joe Miller) and will have it to Vineetha by afternoon of Friday January 15.

Appendix B

Comments from TAHG members

TAHG Charge: The TAHG will evaluate the GCMRC technical review of the Lees Ferry Recreational Trout Fishery Management Recommendations per the AMWG motion on 8/27/2015, and make a recommendation to the TWG at our January 2016 meeting. The TWG will consider the recommendation and make findings to the AMWG at its February 2016 meeting.

Below are comments from the TAHG members on each of the 15 angler recommendations. TAHG members were instructed to comment on the GCMRC review of the angler recommendations and to indicate if from the TAHG member's reading, GCMRC's review either (a) supports, (b) is neutral or noncommittal, or (c) opposes the individual recommendation. The level of support (a, b c) categories for each recommendation are summarized for each recommendation in blue.

In general most of the TAHG members that responded were in agreement of the GCMRC review. There were following recommendations likely warrant further discussion.

- Experimental trout management flows (5)
- Fishing regulations (7)
- Marble Canyon trout fishery (8)
- Stocking in the event of a catastrophic fishery failure (10)
- Temperature control device (12)

The above list are the recommendations where TAHG members indicated a different level of support.

1. Aquatic Food Base Enhancement through Experimental Repatriation and "Bug Flows" (a = 4, b = 0, c = 0)

Colorado River Board of California

Is there data which indicates that the Lees Ferry reach invertebrate community is nutrient-limited and could be improved by stream fertilization?

New Mexico Interstate Stream Commission

GCMRC does not necessarily think that bug flows or translocations will succeed in enhancing the food base, but they support trying these as experiments.

State of Nevada

GCMRC correctly identified the key limitations to our current understanding of how to improve growth of rainbow trout in Lees Ferry. Specifically, their evaluation highlighted how it is unclear if an increase in EPT is the only way to increase trout growth since other conditions, such as higher abundances of existing macroinvertebrates, may also increase trout growth. For this and other reasons, GCMRC concludes that experimentation of bug flows would be helpful to improve an understanding of the factors that control productivity. I concur with GCMRC's evaluation of the recommended action but I believe additional review is necessary.

Much recent fanfare has been given to the lack of EPT in Lees Ferry and the EPT metric as a tool for measuring the condition of the trout fishery; but hasn't EPT been absent in Lees Ferry for a period of 25 or more years, a period that overlaps with periods of Blue Ribbon status? Many other metrics exist for measuring biological condition such as those listed in the EPA's 1999 report entitled, Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. It would be helpful for GCMRC to present a comparison of the current macroinvertebrate assemblage with the historical assemblage using EPT and other metrics of biological condition.

Noticeably absent from GCMRC's review is an evaluation of the repatriation component of the recommended action. Clearly, it is inappropriate for GCMRC to advocate for or against experimental repatriation since the decision to implement such an experiment would implicate responsibilities beyond those given to the GCMRC, but GCMRC should review the scientific merits and potential ecological consequences of a repatriation experiment.

Recreational Fisheries Representatives

We agree with GCMRC's support of conducting experimental flows but felt one point should be addressed. The LFRs clearly outline the characteristics of a quality (blue ribbon) fishery and it was from this perspective that we state that the current foodbase is insufficient. Therefore GCMRC's statement that our position on the inadequacy of the foodbase is subjective because it depends on how a quality fishery is defined, is unclear. We did provide a definition that we believe is achievable. Viewing the quality of LF from the perspective of the metric outlined in the LFR, scientific data clearly shows that the bar was not reached on multiple occasions. The reason for this are not entirely clear. However, a hypothesis has been offered from GCMRC that the quality of the food web in Lees Ferry is low in comparison to other tail waters and rivers and that this is contributing to the instability of the system. Initial research published by GCMRC on this subject supports this idea although further research is needed.

2. Dam Operations (a = 3, b = 1, c = 0)

State of Nevada

GCMRC correctly stated that decisions regarding revisions to dam operations are a matter of policy, therefore, they did not comment on this recommendation. I agree with GCMRC's review.

3. Minimum Flows (a = 3, b = 0, c = 1)

New Mexico Interstate Stream Commission

GCMRC says that there is not enough evidence to support the selection of any particular minimum flow. As always, however, GCMRC supports further research on this issue.

State of Nevada

GCMRC observed normal rainbow trout growth and recruitment during a historical period when flows were lower than 8,000 cfs, which they use to conclude that little scientific evidence exists to support a minimum flow. I agree with GCMRC and the anglers that additional studies are needed to develop a scientifically based minimum flow.

Two important components of the recommended action that went unreviewed by GCMRC were related to how low flows may reduce nearshore habitats and affect safety/navigation. GCMRC should provide a supplementary evaluation regarding how low flows may or may not reduce nearshore habitats with specific attention given to the likely consequences of a reduction in nearshore habitats. Although GCMRC serves in a scientific capacity, they also have extensive boating and fishing experience, for which they should rely upon to comment on how low flows may affect safety/navigation. Assessments of aerial imagery may be useful to understand the extent of navigational concerns.

4. Fall and Spring High Flow Experiments (HFEs) (a = 3, b = 1, c = 0)

Colorado River Board of California

Is there data on the benefits or impacts of using spring HFEs to boost trout populations rather than allowing for an unmanaged trout response?

New Mexico Interstate Stream Commission

GCMRC is interested in experimenting with future spring HFEs, but they do not explicitly support or oppose the anglers' recommendation to add trout conditions as another trigger for spring HFEs.

State of Nevada

I agree with GCMRC that the 2008 spring HFE enhanced the aquatic food base in Glen Canyon which resulted in improvements of the trout fishery. GCMRC correctly states that Spring HFEs are allowed under the current HFE protocol if sand input triggers from the Paria River are met and that modification to the existing protocol is a matter of policy. The current operating criteria for Glen Canyon Dam authorize controlled floods up to 45,000 cfs, which means that the powerplant capacity may be exceeded under some operating conditions. The 2012 HFE EA protocol acknowledged the explicit reservations of positions and rights concerning releases exceeding the powerplant capacity.

5. Experimental Trout Management Flows (a = 2, b = 2, c = 0)

Colorado River Board of California

Is the increase in recruitment described at the bottom of the first paragraph expected to have a destabilizing influence on the trout population?

Is there evidence available on whether TMFs are expected to have “collateral damage” (Fishery recommendation 5, paragraph 1) on the aquatic food base or native fish?

New Mexico Interstate Stream Commission

GCMRC does not oppose TMFs, but they disagree with the anglers on when they should be used.

State of Nevada

The recommended action cites two unintended consequences from TMF’s including damage to the aquatic food base and native fish. It would be helpful for GCMRC to provide review of these two concerns.

Recreational Fisheries Representatives

An unstable fishery may be characterized as having a population too high to be sustained by the system. This appears to have been the case in 2011, where a large increase in recruitment resulted in a population which declined through 2014. In these instances we agree with GCMRC that a trout flow, if proven effective, could be used to cut the bottom off of the population and thereby bring the system back into balance. However, an unstable or unhealthy fishery could also be characterized by trout levels which are below the metrics outline in the LFRs. This appears to have been the case in 2012-2014. It is in these instances that we want to avoid TFs because if they are indeed

proven effective they might delay the recovery of the system or possibly push it farther into decline.

We are recommending that the effectiveness and actual impact of TMFs be established by careful study with controlled experiments conducted in stable conditions.

6. Equalization Flows (a = 3, b = 1, c = 0)

Colorado River Board of California

This section could be expanded to note that not all equalization flows may be similar to the 2011 flow and flows can therefore vary in the type and magnitude of biological response.

State of Nevada

GCMRC correctly states that deviations from the current operational guidelines as they relate to operations in the Lake Powell Equalization Tier are a matter of policy.

7. Fishing Regulations (a = 2, b = 2, c = 0)

State of Nevada

I agree with GCMRC that the fishing pressure necessary to reduce the recently observed high trout abundances would be mostly ineffective. Although modifying fishing regulations may not achieve reductions in trout populations, it could be a useful tool to elicit public awareness and support for sustainably managing the trout fishery.

New Mexico Interstate Stream Commission

GCMRC somewhat opposes this in that they think it would be numerically ineffective.

8. Marble Canyon Trout Fishery (a = 2, b = 2, c = 0)

New Mexico Interstate Stream Commission

GCMRC somewhat opposes this in that they think it would be numerically ineffective.

State of Nevada

GCMRC clearly reviewed the scientific merits of increasing angling pressure in Marble Canyon as a method for reducing downstream emigration. I agree with their conclusion that increasing trout harvest would likely be numerically ineffective.

Given GCMRC's research on the economic benefits of the trout fishery, it would be helpful for GCMRC to provide some review on the likely benefits to employment and business opportunity as described in the recommended action.

9. Riparian Vegetation Restoration (a = 3, b = 1, c = 0)

Colorado River Board of California

What volume of woody material would be needed to create a detectable or significant effect on trout populations or the aquatic foodbase?

State of Nevada

I agree with GCMRC that the establishment of streamside riparian vegetation or the addition of vegetation into the stream channel may not benefit the trout fishery in a significant way but it may represent a component of an overall strategy to improve conditions and a complimentary strategy for improving riparian songbird habitat.

New Mexico Interstate Stream Commission

GCMRC would be interested in experimenting with riparian vegetation, but they are less sanguine than the anglers about its effects. They appear not to support the anglers' contention that this should be a high priority.

10. Stocking in the Event of a Catastrophic Fishery Failure (a = 1, b = 1, c = 2)

(a) supports___ (b) is neutral or noncommittal___ or (c) oppose___

Colorado River Board of California

I'm not sure if this would be considered a management decision, but it would be good to note the presence of whirling disease as a barrier to the establishment of a trout broodstock.

New Mexico Interstate Stream Commission

GCMRC cautions against the anglers' stocking proposal, noting that the fishery has recovered several times without stocking and that the difficulty in timing a stocking may result in the effort actually making the problem worse.

State of Nevada

GCMRC acknowledged that there are no criteria for defining catastrophic failure in the Lees Ferry fishery, therefore, development of such criteria would be informed by

science but based on value judgments. It would be helpful if GCMRC provided examples of stocking criteria from similar areas for comparative purposes.

Recreational Fisheries Representatives

GCMRC is correct that there is no criteria for defining a catastrophic failure and this may be a question that we want to address in the future. Having said that, GCMRC goes on to use historical data to illustrate the resiliency of the system as reason for discounting stocking. It is true that the system has been stressed in the past but we do not believe that these instances represent catastrophic events.

So the first technical question is if there is any scientific reason for anticipating conditions that could lead to a catastrophic event greater than anything we have seen in the past. We believe that the projected continuance of the drought coupled with higher temperatures warrant concern for increased frequency and intensity of high temperature/low oxygen events. This concern is compounded by the lack of a TCD at the intake. In short, we have no contingency plan should there be a dramatic die-off. The next technical question is whether stocking has been successfully used in the past to rebuild a collapsed fishery. The answer to this is yes. There are many examples. A notable one is the Lahonton Cutthroat Trout in Pyramid Lake in Nevada. Considered exterminated, but now restored with discovery of a remnant population from a small remote stream. So from a technical standpoint stocking is a viable option for rebuilding a fishery. That is not to say that there should not be considerable discussion on triggers and condition targets before the protocol is finalized.

One final comment. It is important to recognize that there are at least two perspectives on viable timelines. From the ecologist standpoint, it would be hard to argue that the fishery would not eventually recover from a catastrophic event given enough time and a few remaining fish. From the recreational standpoint, this amount of time could be catastrophic to the business and recreational interest. As we move forward, we believe it is important to keep these two perspectives in mind.

11. Low Dissolved Oxygen Response Protocol (a = 3, b = 1, c = 0)

Colorado River Board of California

How far downstream of the dam does the DO zone typically extend? Do low DO releases threaten the majority of the trout population, or just the upper reaches of it?

New Mexico Interstate Stream Commission

GCMRC notes that management protocols are the responsibility of management agencies.

12. Temperature Control Device (a = 2, b = 2, c = 0)

Colorado River Board of California

I think it should also be noted that, in the absence of a boom in invasive species, many native species can be aided by the presence of warmer dam releases.

New Mexico Interstate Stream Commission

GCMRC somewhat supports this in that they think a TCD could be valuable, but they decline to explicitly support the recommendation that USBR immediately implement a TCD.

13. Bypass Tube Electrical Generation (a = 3, b = 1, c = 0)

New Mexico Interstate Stream Commission

GCMRC notes that this is a policy matter, but they do agree that use of the bypass tubes can help with oxygenation and cooling.

14. Introduce Turbidity (a = 3, b = 1, c = 0)

New Mexico Interstate Stream Commission

GCMRC somewhat opposes this for now, citing ambivalent research results.

15. Monitoring and Measurement of Management Triggers (a = 3, b = 1, c = 0)

New Mexico Interstate Stream Commission

GCMRC supports some of the ideas presented under this topic, but opposes others.

State of Nevada

GCMRC acknowledged that there is not a consensus as to the best approaches and methods for monitoring the Lees Ferry fishery. Though, it would be helpful if GCMRC would provide more detail on the utility of each type of monitoring approach/method so that the TAHG can fully understand the strengths and weaknesses of each approach/method. It was also helpful if GCMRC would comment on the adequacy of existing aquatic invasive species monitoring activities in Lees Ferry.

Recreational Fisheries Representatives

We believe GCMRC's extensive discussion of the various monitoring approaches

clearly indicates the importance of continuing research and methods development in this area.

We further believe that methods, models and tools suitable and necessary for Research are not necessarily appropriate for the routine, on-going, even long-term data collection for Management of the resource. Management tools must be derived from and verifiable with Research methods, but will likely be of lower cost, and have short application time cycles.

APPENDIX C

Supplemental information

Through the TAHG discussions, additional items were captured that need further consideration as it relates to the Recommendations. Based on discussions at the TWG, it was brought up by a number of stakeholders that sideboards are needed for an evaluation of the Recommendations.. An initial list was developed but should be vetted by all stakeholders.

1. Any actions resulting from the Recommendations must be fully consistent with the ‘Law of the River’ and DOI policy considerations.
2. Recommendations that fall under the purview of water and natural resource management agencies such as Bureau of Reclamation, National Park Service, United States Fish and Wildlife Service and Arizona Game and Fish Department will require additional evaluation with these management agencies for further consideration.
3. Recommendations that address dam operations are expected to be considered and evaluated in the ongoing Long Term Experimental and Management Plan Environmental Impact Statement.

Additionally, several of the comments received from TAHG members identified information needs and could be considered during the next triannual work planning process. Those questions include:

1. It would be helpful for GCMRC to present a comparison of the current macroinvertebrate assemblage with the historical assemblage using EPT and other metrics of biological condition.
2. Is there data which indicates that the Lees Ferry reach invertebrate community is nutrient-limited and could be improved by stream fertilization?
3. Is there data on the benefits or impacts of using spring HFEs to boost trout populations rather than allowing for an unmanaged trout response?
4. Is there evidence available on whether TMFs are expected to have “collateral damage” (Fishery recommendation 5, paragraph 1) on the aquatic food base or native fish?
5. The recommended action cites two unintended consequences from TMF’s including damage to the aquatic food base and native fish. It would be helpful for GCMRC to provide review of these two concerns.
6. What volume of woody material would be needed to create a detectable or significant effect on trout populations or the aquatic foodbase?
7. How far downstream of the dam does the DO zone typically extend? Do low DO releases threaten the majority of the trout population, or just the upper reaches of it?