

GCDAMP Science Advisors Executive Coordinator Review of Reclamation FY18-20 Triennial Plan Draft of June 30, 2017

*Sound Science LLC
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The Glen Canyon Dam Adaptive Management Program (GCDAMP), Science Advisors Executive Coordinator's office has reviewed the "Second Draft" Reclamation Triennial Budget and Work Plan (TWP) for FY 2018-2020, dated June 30, 2017. Our review consists of the present document, which provides comments on individual project elements under Project C, Program Administration, ESA Compliance, and Management Actions, and Project D, Cultural Resources Program. Our review also includes comments on Projects C and J in the third draft of the Grand Canyon Monitoring and Research Center (GCMRC), distributed on July 3, 2017, because these two GCMRC projects intersect significantly with Reclamation Projects C and D.

Read Me First: Guiding Framework for Comments

We approached our review of the Reclamation second draft in the same way we approached our review of the second draft of the GCMRC TWP in June. The following paragraphs summarize our overall approach, which strongly informs our specific comments.

The TWP for FY 2018-2020 will be the first work plan implemented under the 2016 *Glen Canyon Dam Long-Term Experimental and Management Plan* (LTEMP) and the December, 2016, U.S. Department of the Interior (DOI) Record of Decision (ROD) on the LTEMP Environmental Impact Statement. The ROD includes the U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BO) on the LTEMP. Release of the ROD was accompanied by the release of a *Scientific Monitoring Plan in Support of the Selected Alternative of the Glen Canyon Dam Long-Term Experimental and Management Plan*, prepared by the GCMRC. The TWP for FY 2018-2020 also is the first work plan implemented following a rapid Knowledge Assessment, November 2016-April 2017, carried out by expert teams at the request of the GCDAMP Technical Work Group. The purpose of the Knowledge Assessment was to identify critical uncertainties in the knowledge that the GCDAMP will use, under the LTEMP and its BO, to inform its recommendations on adaptive management of dam operations and other actions stipulated in the Record of Decision.

The LTEMP and ROD identify eleven "priority resources" and twelve types of experimental dam operations, non-flow management actions, and other actions for implementation. For quick reference, we have appended to the end of this document the list of priority resources and the LTEMP objectives for these resources. We have also appended to the end of this document the list of LTEMP experimental dam operations and non-flow management actions. These eleven priority resources and twelve actions together define a large number of topics about which Reclamation, the GCMRC, and partner institutions must carry out investigations concerning the effects of Action "A" on Resource "X".

Together, the LTEMP (including its full suite of priority resources and actions), the ROD and its accompanying BO, the Scientific Monitoring Plan, and the Knowledge Assessment should guide the TWP to *ensure that it effectively addresses five broad questions*:

- 1) What monitoring, modeling, or laboratory information is needed to guide decisions on *when* several types of experimental dam operations and other management actions should take place?
- 2) What monitoring, modeling, or laboratory information is needed to guide decisions on *where and how* certain non-flow management actions should be carried out?
- 3) What monitoring and data analyses (including comparative studies), with what accuracy and precision, over what time frames, are needed to evaluate the effects of routine and experimental dam operations and other management actions on priority resources?¹
- 4) Many uncertainties exist in present understanding of how dam operations, both routine and experimental, other management actions, and other factors (*aka* “drivers”) affect priority resources. Which among these many uncertainties have the most significant bearing on decisions concerning dam operations and other management actions?
- 5) What *learning actions* – e.g., monitoring studies, modeling studies, and experiments – are needed, with what priorities and over what time frames, to ensure timely answers to Questions 1-4, and how should these learning actions be designed to ensure maximal effectiveness?

We reviewed the Reclamation second draft TWP (and, previously, the GCMRC second draft TWP) with an emphasis on how well the plans for individual projects in the TWP address these five questions wherever appropriate. As part of this effort, we considered whether the proposal for each project element makes a good case that the proposed work will be the best (most efficient, timely, cost-effective) approach among potential alternatives, and whether the investigators considered the possibility that the proposed work could have adverse impacts on other resources and values. Additionally, we evaluated whether and how well the plans for each individual project indicate the time frame over which the project needs to be implemented. The LTEMP covers a twenty-year period, 2017-2036. Over the course of these twenty years, implementation of the LTEMP is intended to generate information on the impacts of its various experimental dam operations and non-flow management actions as well as on the impacts of base operations at the dam. However, the LTEMP breaks this twenty-year period into two parts, with a “pause” after ten years. The purpose of this pause is to allow all parties to step back, assess what has been learned through implementation of the LTEMP, and assess any management implications of these findings. That ten-year review will come after the completion of three triennial work plans. Our review takes the position that the work carried out under these three triennial work plans – *starting with the plan for FY 2018-2020* – should focus tightly on the needs for the ten-year review.

Our review of the second-draft Reclamation TWP focused on Reclamation Projects C and D. These cover topics on which the Science Advisors Program should comment, and on which we provided feedback based on the first draft of the Reclamation TWP in April, 2017.

¹ The LTEMP identifies a subset of priority resources that each flow and non-flow action is expected or intended to affect, by design. For example, Trout Management Flows are specifically intended to affect rainbow trout. In addition, the LTEMP explicitly states that all actions implemented under its terms must avoid “... long-term unacceptable adverse impacts on the [priority] resources...”

Reclamation Project C.7. Experimental Vegetation Treatment

Our comments on this project expand on our comments on the first draft in April. Our overarching concern here is that river regulation has created hydrologic and geomorphic conditions that differ significantly from pre-regulation conditions, including differing significantly in their constraints on riparian vegetation. Prior to river regulation, patches of riparian vegetation along the Colorado River Ecosystem (CRE) appear to have been small, sparse, and subject to frequent scour, except in a few protected settings including along tributaries and at their confluences. The hydrologic and geomorphic conditions that maintained this vegetation pattern no longer exist. As a result, it is not at all clear what overarching goals are appropriate for riparian vegetation management along the CRE. Do the NPS, Tribes, and AMP want vegetation communities that persist and change in this novel hydro-geomorphic system without significant human intervention – other than (perhaps) to control non-native species and maintain camping areas – even if that results in vegetation communities that don't look like anything that's existed here before? Or do the NPS, Tribes, and AMP anticipate a need for other ongoing, more aggressive interventions to create and maintain some specific set or mix of desired states. In either case, terms such as “restoration” or “revegetation” may be misleading, as the existing vegetation communities are emerging in places and under conditions outside of historic norms.

We recognize that the LTEMP included this effort as mitigation for dam operations. However, the objectives listed for this project are “action” objectives, not “learning” objectives. That is, they do not indicate where the “experimental” lies in each objective, what needs to be learned, and how the proposed actions will lead to that learning. The descriptions of the planned work do not indicate what uncertainties exist that the work in FY 2018-2020 will try to clear up, under each of the project's five action objectives. For example, under Objective 1, are there uncertainties about what treatment methods will work best? If so, how will the project be designed to evaluate effectiveness or costs versus benefits among treatments?

The first step under each of the five action objectives consequently should be a full review of its learning objectives. The plans for each action objective should then explicitly include the design of the “experimental” aspects of the work. The design also should explicitly identify the uncertainties to be addressed and provide an estimate of how long (seasons, years) it could take to resolve key issues while vegetation matures and successional processes play out. We suggest that each action objective should have a plan for how and when these priorities will be established, and who will be involved. This information clearly needs to be specified in close coordination with GCMRC Project C, because the monitoring systems needed for Reclamation Project C.7 appear to be the responsibility of the GCMRC. The descriptions of Reclamation Project C.7 and GCMRC Project C should explicitly identify their reciprocal linkages with each other, both in terms of learning objectives and in terms of monitoring efforts.

We also have the following more specific comments:

- Management of riparian vegetation could affect the availability of “potential habitat” for Southwestern Willow Flycatcher and Yuma Ridgway's Rail, the subject of Project C.10 (see below). These implications should be explicitly recognized and carefully addressed in the design of Reclamation Project C.7.

- With the altered hydrology and fluvial geomorphic dynamics of the CRE, and with climate change, the “learning team” here should consider what native riparian species – and what locally adapted varieties of these species – might be fostered along the CRE. For example (hypothetically), should the team consider propagating its stock from varieties extant along the Lower Colorado, Virgin, or Bill Williams River, or other more southerly settings where the local varieties are adapted to hotter, drier conditions?
- The description of Objective 3 refers to “highly invasive exotic riparian species.” We assume this should refer only to invasive *plants*. Also, for better alignment with Objective 1, we suggest that the focus of Objective 3 should be on identifying species that are not only highly invasive but also likely to have “significant... effects on native vegetation and wildlife.”
- The description of Objective 5 incorporates assumptions about how strongly wind-blown sand from riparian sites affects specific sites, and whether/how vegetation can inhibit these effects under some conditions. However, technically, it is an open question whether the proposed removal of vegetation will provide much benefit to specific archaeological sites. As a result, this objective needs to be addressed as a strict experiment, with appropriate monitoring and controls, to determine how much benefit actually accrues from such removals, and how variation in removal (positioning, extent, etc.) might affect these outcomes.

Reclamation Project C.8. Evaluation of Means to Prevent Fish Passage through GCD

Our comments on this project, in the present draft, are limited and fairly specific:

- Is the mandate for this project limited to fish passage, or does it cover the entire issue of biological throughput, including quagga mussel, or even plant propagules?
- Is the S&T Program part of the Technical Services Division?
- Reclamation has significant experience with these same issues in other parts of its systems around the U.S. We recommend that Reclamation bring that expertise to bear, in providing advice on what’s been learned elsewhere and how this project should be implemented. WAPA presumably also has internal expertise here, as does the Army Corps of Engineers. We encourage Reclamation to work with a steering committee of AMP member institutions with the right expertise to guide this project.

Reclamation Project C.9. Evaluation of Temperature Control Methods at GCD

Our comments on this project, in the present draft, are limited and fairly specific:

- The first paragraph notes that the project stems from concerns about the effects of “... potential extremes in hydrological conditions due to climate conditions.” We suggest expanding this to “... potential extremes in hydrological conditions due to climate conditions *and due to lake-level variation, which has always been substantial even without the impact of climate change*” [italics included just to show what we suggest adding].

- As we asked vis-à-vis Project C.8, is the S&T Program part of the Technical Services Division?
- Similar to our last comment concerning Project C.8, Reclamation has significant experience with these same issues in other parts of its systems around the U.S. We would recommend that Reclamation bring that expertise to bear, in providing advice on what's been learned elsewhere and how this project should be implemented. WAPA presumably also has internal expertise here, as does the Army Corps of Engineers. We encourage Reclamation to work with a steering committee of AMP member institutions with the right expertise to guide this project.

Reclamation Project C.10. Southwestern Willow Flycatcher and Yuma Ridgway's Rail Surveys

The project description states that “The purpose of these surveys is to determine if potential habitat is occupied by breeding birds.” This purpose implies a need for a survey design that will produce spatially and temporally representative data on (1) the distribution of these two species along the CRE and (2) the distribution of “potential habitat” for these two species. Consequently, there is a substantial need to coordinate this survey project with riparian vegetation monitoring efforts (see GCMRC Project C) and to identify criteria for “potential habitat” for both species. Are these needs adequately addressed in the riparian vegetation monitoring plans? Also, at least the Southwestern Willow Flycatcher has been reported to use mature tamarisk stands as breeding habitat. As a result, we would ask, How is the riparian vegetation experimental project (Reclamation Project C.7, above) going to address the potential conflicts that could arise vis-à-vis the Southwestern Willow Flycatcher when mature tamarisk is removed in favor of native riparian vegetation? This conflict will be particularly acute for the first several years following tamarisk removal at any single site, because the resulting early-successional native riparian vegetation will take years to reach a state of stand maturity that Southwestern Willow Flycatchers might find suitable as habitat.

Reclamation Project D. NHPA Compliance and Cultural Resources Program Management

Our comments here cover Project Elements D.3, D.4, D.5, D.6, D.7, D.9, and D.11, and also may have implications for other elements of Reclamation Project D. These comments also bear on GCMRC Project J.

The LTEMP and ROD include a specific objective to “[m]aintain the integrity of potentially affected National Register of Historic Places (NRHP)-eligible or listed historic properties in place, where possible, with preservation methods employed on a site-specific basis.” As a program of adaptive management, the AMP cannot address this objective or assess the impacts of LTEMP actions on this priority resource (as also required by the ROD), without *specific information on relevant indicators*.

Reclamation Project D includes funding the National Park Service (both Glen Canyon and Grand Canyon units) for monitoring for “[c]ompliance with the National Historic Preservation Act (NHPA), Section 106... The ultimate goal of the long-term monitoring program is to collect data to support the evaluation of impacts to historic properties; and, as appropriate, to help identify

mitigation measures to remediate sites damaged by the operations of Glen Canyon Dam.” As documented in the 2017 Knowledge Assessment, the Park Service maintains archaeological site data for historic properties in Glen Canyon and Grand Canyon through its Archeological Sites Management Information System (ASMIS). These data include several indicators of site physical (e.g., depositional) integrity. Reclamation Project D.11 also includes funding “... to implement Native American monitoring protocols that were developed in FY 2007 and recommended by the TWG as part of efforts to develop a core-monitoring program... [T]he five GCDAMP Tribes (Hopi Tribe, Hualapai Tribe, Kaibab-Paiute Tribe, Pueblo of Zuni, and Navajo Nation) will work with Reclamation and the NPS to implement monitoring of historic properties in Glen and Grand Canyons.” The description of Project D.11 further states that “Annual reports will be prepared detailing activities, findings, and monitoring data that result from implementing core-monitoring protocols for historic properties. Condition monitoring data will be provided to Reclamation to assist in prioritization of historic properties for treatment in subsequent years.”

We recommend that, as is done with monitoring data for all other priority resources, the AMP (TWG) should receive an annual report on a critical set of indicators of the status of NRHP-eligible and listed historic properties. This reporting will allow the TWG to assess not only overall property conditions, but how dam operations and other management actions may be directly or indirectly affecting these conditions. This would allow the AMP to explicitly keep track of the “Archaeological and Cultural Resources” priority resource and the effects of LTEMP actions on this resource. The indicators addressed in the 2017 Knowledge Assessment for this priority resource presumably provide or are the start of such a critical set of indicators.

The LTEMP and ROD also include a specific objective to “[m]aintain the diverse values and resources of traditionally associated Tribes along the Colorado River corridor through Glen, Marble, and Grand Canyons.” Again, as a program of adaptive management, the AMP cannot achieve these objectives or assess the impacts of LTEMP actions on these priority resources (as also required by the ROD), without *specific information on valued conditions and indicators*. However, neither the draft Reclamation TWP nor the draft GCMRC TWP addresses this need.

The AMP does not have a history of collecting or reviewing systematic information on any such valued conditions and indicators. However, we would argue that it is entirely feasible to establish such an effort within the time frame of the FY 2018-2020 Triennial plan. Tribal presentations and videos over the past few years, and the documentation prepared by the Hopi Tribe and the Pueblo of Zuni in support of nominations for Traditional Cultural Property (TCP) designation under NHPA Section 106, have clearly identified numerous such valued conditions and indicators. Examples of such conditions/indicators mentioned in tribal presentations to the TWG, AMWG, and Fisheries PEP over the past year alone include: · the ease with which tribal members can find plants, animals, and minerals that they traditionally found in these canyons, to collect for traditional cultural practices; · the frequency with which tribal members, upon visiting associated historic places in the canyons, find these places damaged by other visitors; · the ease with which tribal specialists and/or initiates in specific cultural practices can carry out these practices in the canyons without interference or impediments resulting from others’ actions or dam operations; · the frequency and extent of killing of aquatic life forms as a result of AMP-associated decisions or actions; and so forth. Each GCDAMP Tribe potentially would have its own list of such valued conditions/indicators.

LTEMP implementation has begun. We therefore suggest that it is urgent that the five GCDAMP Tribes, Reclamation, the Park Service, and the GCMRC quickly (i.e., in FY18) develop at least an initial set of explicit indicators by which they and the AMP overall can evaluate the impacts of LTEMP actions on traditionally valued conditions in the canyons. This list can and necessarily will evolve. For example, Reclamation Project D.5, “Traditional Cultural Property (TCP) Documentation for Hualapai, Navajo and Paiute Tribes,” will assemble additional information on potential such indicators, as also may GCMRC Project J.1, and these efforts will take time. Further, although the U.S. as a whole does not have deep experience with systematically tracking indicators of conditions traditionally valued by Native Americans, guidance and examples are available. The federal Advisory Council on Historic Preservation and presumably other groups have developed guidance that may be relevant and will take time to review. And, as noted above, TCP documentation necessarily will assemble substantial information on the subject, but this preparation also will take time. As a result, it may take a little time and experimentation to arrive at a stable set of indicators of traditionally valued conditions for each Tribe, and to begin regularly assessing these indicators. Nevertheless, as noted above, we think enough information has already been presented to create an initial list of such indicators for each Tribe, on which to build. The selection of such indicators of traditionally valued conditions should require no more documentation than the selection of indicators for any other priority resource. Without such indicators and explicit, systematic efforts in place soon to record and report on their status, the AMP will not have the information it needs for *effective adaptive management of traditionally tribally valued conditions* in the canyons under LTEMP.

Appendixes

LTEMP Priority Resources and Associated Objectives

1. *Archaeological and Cultural Resources*. Maintain the integrity of potentially affected National Register of Historic Places (NRHP)-eligible or listed historic properties in place, where possible, with preservation methods employed on a site-specific basis.
2. *Natural Processes*. Restore, to the extent practicable, ecological patterns and processes within their range of natural variability, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems.
3. *Humpback Chub*. Meet humpback chub recovery goals, including maintaining a self-sustaining population, spawning habitat, and aggregations in the Colorado River and its tributaries below the Glen Canyon Dam.
4. *Hydropower and Energy*. Maintain or increase Glen Canyon Dam electric energy generation, load following capability, and ramp rate capability, and minimize emissions and costs to the greatest extent practicable, consistent with improvement and long-term sustainability of downstream resources.
5. *Other Native Fish*. Maintain self-sustaining native fish species populations and their habitats in their natural ranges on the Colorado River and its tributaries.
6. *Recreational Experience*. Maintain and improve the quality of recreational experiences for the users of the Colorado River Ecosystem. Recreation includes, but is not limited to, flatwater and whitewater boating, river corridor camping, and angling in Glen Canyon.
7. *Sediment*. Increase and retain fine sediment volume, area, and distribution in the Glen, Marble, and Grand Canyon reaches above the elevation of the average base flow for ecological, cultural, and recreational purposes.
8. *Tribal Resources*. Maintain the diverse values and resources of traditionally associated Tribes along the Colorado River corridor through Glen, Marble, and Grand Canyons.
9. *Rainbow Trout Fishery*. Achieve a healthy high-quality recreational rainbow trout fishery in Glen Canyon National Recreation Area (GCNRA) and reduce or eliminate downstream trout migration consistent with National Park Service (NPS) fish management and Endangered Species Act (ESA) compliance.
10. *Nonnative Invasive Species*. Minimize or reduce the presence and expansion of aquatic nonnative invasive species.
11. *Riparian Vegetation*. Maintain native vegetation and wildlife habitat, in various stages of maturity, such that they are diverse, healthy, productive, self-sustaining, and ecologically appropriate.

LTEMP Experimental Dam Operations and Non-Flow Management

1. Fall High Flow Experiments (HFEs) > 96-hr duration ($\leq 45k$ cfs, in October or November)
2. Fall HFEs ≤ 96 -hr duration ($\leq 45k$ cfs, in October or November)
3. Humpback chub translocation
4. Larval humpback chub head-start program
5. Macroinvertebrate production flows
6. Mechanical removal of invasive fish species
7. Mechanical removal of rainbow trout from LCR reach
8. Proactive Spring HFEs $\leq 45k$ cfs in April, May, or June
9. Riparian vegetation restoration
10. Spring HFEs $\leq 45k$ cfs in March or April
11. Trout management flows
12. Summer Low Flow Experiments (LFEs) (*second decade only*)