



**FROM:** Grand Canyon Wildlands Council, Inc., P.O. Box 1594 Flagstaff, AZ 86002;  
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**TO:** Bureau of Reclamation; National Park Service – Grand Canyon  
**RE:** Scoping comments on the Glen Canyon Dam Long-term Experimental and  
Management Plan  
**DATE:** 30 January 2012

## **INTRODUCTION**

Thank you for the opportunity to comment on scoping issues for the LTEMP EIS, involving the potential socio-environmental impacts of alternative Glen Canyon Dam operating protocols, experimental opportunities, and other management actions. The EIS will be designed to meet the obligations of the Grand Canyon Protection Act (1992) to protect Colorado River resources affected by Glen Canyon Dam for future generations, conserve species listed under the Endangered Species Act, and protect American Indian Tribal interests, while meeting water delivery obligations and generating hydroelectric power.

Grand Canyon Wildlands Council, Inc. (GCWC) is a 501(c)(3) not-for-profit conservation organization dedicated to the conservation and restoration of native species and natural ecosystems throughout the Grand Canyon ecoregion (GCE), which includes Glen Canyon National Recreation Area and the drainage basin of Grand Canyon on and near the southern Colorado Plateau. The community of members we serve includes citizens who treasure this ecoregion for its native biological diversity as well as its cultural and geographic complexity. Many actively hike and raft in Grand Canyon for recreation, creative pursuits, or scientific research and ecological restoration purposes. For more information about our organization, please see our website at [www.grandcanyonwildlands.org](http://www.grandcanyonwildlands.org).

GCWC staff serve on the Adaptive Management Work Group (AMWG) FACA committee representing conservation interests, and we strongly emphasize the need to base dam and the Colorado River stewardship on clearly defined desired future conditions, high quality scientific understanding, well-reasoned planning, and conscientiously conducted management experiments. With more than 40 years of experience in the region and more than 50 peer-reviewed scientific publications on the ecology and management of the Grand Canyon ecoregion by our staff, we offer these scoping comments from both the standpoints of science and management. We present policy and science scoping issues that appear to us to be important considerations for the Bureau of Reclamation and the National Park Service as those organizations undertake the development of this EIS. We also generally support the recommendations presented by our colleagues among the Grand Canyon River Guides, the Grand Canyon Trust, the National Parks and Conservation Association, participating Native American Tribes, and other organizations whose intent is to incorporate the best scientific knowledge to improve sustainable natural resource stewardship of Grand Canyon and the Colorado River.

We encourage Reclamation and the National Park Service (NPS) to reconsider the scope of this effort and include not only the 1996 Record of Decision study area from the forebay of Lake Powell to Lake Mead, but all of Lake Powell and the tributaries that are useful to scientific research and monitoring, or that are affected by the river running public. It is this that we regard as the Colorado River ecosystem throughout these comments.

## LTEMP EIS SCOPING

### Issues

The LTEMP is being developed to address the array of socio-environmental issues facing Reclamation and the NPS in their efforts to improve stewardship of the Colorado River and associated ecosystems, including but not limited to: hydrology/water delivery, sediment transport, deposition, and erosion; riparian and terrestrial ecology, including native, non-native, and endangered species; aquatic ecology, including native, non-native, and endangered species; historic properties; Tribal resources and cultural concerns; wilderness issues; recreation (fishing, rafting, camping); and hydropower production. Below we group our comments into the over-arching categories of policy and science.

### Policy

1. **Ensure that CRE stewardship is in full and active accord with the Grand Canyon Protection Act (GCPA; 1992).** Make sure that the LTEMP EIS fulfills the directives of the GCPA and is an active, responsive, “living document” that continues to integrate new information to improve stewardship of Glen Canyon Dam and affected Colorado River, both upstream and downstream from the dam.
2. **Expand the scope of the project area to include all of Lake Powell, Cataract Canyon, the lower San Juan River, as well as the downstream river to Lake Mead.** Failing to include Lake Powell and its major tributaries, particularly Cataract Canyon, means that less attention has been paid to the sources of water and nutrients, as well as important scientific controls for understanding and predicting changes in Grand Canyon, such as anoxic hypolimnial waters, system-wide nutrient flux, zooplankton delivery, invasive species (e.g., quagga mussel) threats, and recreation (boating, fishing, etc.) use and economics. It is this larger spatial scope that we subsequently refer to below as the Colorado River ecosystem (CRE). Eventually we hope that stewardship of the entire Colorado River will be integrated, rather than bisecting it into upper and lower basins and having numerous federal entities managing different parts (e.g., MSCP, AMWG, Upper Basin Fisheries Program, etc.).
3. **Ensure, continue, and refine adaptive ecosystem management of the CRE** through a reinvigorated Adaptive Management Program (AMP), with increased integration with the Annual Operating Plan process, and through refinement of adaptive management processes generated from in-depth review of the AMP, as well as increased transparency and emphasis on improved public and Tribal trust.
4. **Complete and present to the public the desired future conditions for the CRE** that qualitatively and quantitatively frame desired resource conditions for the future of species, ecosystems, ecological and societal processes, including timelines for restoration of missing and declining species and natural ecosystems, and clearly embrace Native American concerns.
5. **Clarify and resolve policy conflicts and prioritize management responsibilities between the “Law of the River” and the GCPA.** This policy review is long overdue, and its absence perpetuates long-standing agency management conflicts associated with efforts to balance economic and environmental stewardship of Glen Canyon Dam. Such a policy review should be undertaken by highly qualified individuals and should be reviewed by the Solicitors of the Department of the Interior and the Department of Energy, and perhaps other federal departments. One of many long-standing debates is where hydroelectric power generation falls in relation to environmental and societal

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objectives for the operations of Glen Canyon Dam. Another policy issue is whether the AMP should fund restoration of rare or missing taxa in the river corridor.

6. ***Develop an independent scientific advisory committee to coordinate CRE science activities and ensure integration of information into improved stewardship.*** An independent scientific advisory committee is needed to oversee and advise science efforts and help integrate the findings into appropriate management activities. Such a panel would help ensure that the scientific activities being conducted are of high quality, are reported to the public and the scientific community, and are applied to improvement of CRE stewardship. The Adaptive Management Program Science Advisors (AMP-SA) could be tasked with review of science planning and science credibility of the combined GCMRC and NPS programs, but that panel has not played a substantial role in advising NPS or other agency-level managers about how to integrate scientific findings into improved CRE stewardship. Thus, if the AMP-SA is employed for this purpose, its scope and funding would have to be expanded and the membership reconfigured to undertake a stewardship advisory role for the LTEMP. However, leaving these tasks in the hands of the agencies will contribute to programmatic inefficiency, lack of attention to important issues, and failure to meet public and Native American trust obligations.
7. ***Develop an annotated administrative history of CRE management.*** This is a practical suggestion presently under consideration by the AMWG to help new participants in the CRE AMWG and related management programs more readily understand the history of core issues (e.g., temperature control devices, program scope, native fish population health, administration structure, etc). In addition, such an administrative history will help clarify decisions about key program issues, such as the development of desired future conditions, steady vs. non-steady flow issues, and resource monitoring efforts. This administrative history would best be developed by an independent team of historians to avoid agency bias from dominating the document(s).
8. ***Native American concerns about the CRE deserve more rigorous attention.*** As a participant in the AMWG process, we have observed that Native American concerns about the CRE are presently pigeon-holed into archeological site protection, monitoring, and excavation, missing the central importance of the health and well-being of the Canyon to their cultures. These are complex issues that the White world little understands. A more respectful, more rigorous commitment to communication about such issues with the participating Native American cultures is warranted.
9. ***Improve federal communications with non-federal constituents, partners, and stakeholders.*** Fishing guides are interested in collaborating on fisheries management; however, this constituency has not received sufficient attention from the AMP. Such offers to participate should be respected, fostered, and supported by the federal government.
10. ***The AMP, NPS, and GCMRC should be more collaborative.*** Information sources external to the AMP can be engaged to help improve understanding of the CRE, yet in-house agency processes largely eliminate such collaboration. In its original formulation, GCMRC was to be a small, highly collaborative set of program managers and limited staff; however, the program has increased greatly above that original intent. Nonetheless, much basic inventory and monitoring has not been undertaken, and external collaborators can provide service to the AMP at no cost to the program.

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Assistance from such collaborators should be considered and engaged where advantageous to AMP objectives.

11. ***Improved outreach to the public is needed***, as the AMP has made little direct attempt to outreach to the public, which supposedly is receiving the benefits of CRE stewardship actions. However, the low participation of the public in this LTEMP process is evidence that public outreach has been insufficient. A goal of this EIS should be to have the visiting public educated as to the extent of the high quality scientific understanding of the ecosystem, and a public that is confident that such scientific information is being used to inform and direct stewardship appropriate to a World Heritage Site like Grand Canyon. Engagement of a professional, non-federal public relations advisor might help bring this important program to the attention of the public.
12. ***Continue to engage a professional facilitator in adaptive management meetings***. The success of the present program is due not only to the recent, excellent coordination by the Department of the Interior to this program, but also to the engagement of a highly skilled, dedicated, and knowledgeable facilitator. Such assistance is essential for the federal government to communicate with often fractious stakeholders.

### Science

1. ***The LTEMP should adopt an ecosystem approach to the stewardship of the Colorado River affected by Glen Canyon Dam***. Ecosystems include the interacting biotic and abiotic domains, species, and ecological processes within a defined area, including human uses, goods, and the services provided by the ecosystem. The CRE, including the Colorado River and its tributaries, including Cataract Canyon, Lake Powell, lower Glen Canyon, Grand Canyon, are human-dominated river systems, ones that have been highly altered by flow regulation and other human activities (e.g., the introduction of non-native species and visitor impacts), activities that have simplified ecosystem structure and composition. We suggest that adoption of an ecosystem approach would help improve CRE stewardship. Such an approach would include linking several models together, including:
  - a) flow-sediment model (largely completed)
  - b) a nutrient dynamics model for carbon, nitrogen, and phosphate
  - c) water quality, including temperature, inorganic constituents, and microbes
  - d) an aquatic foodbase model (under construction)
  - e) a coupled river continuum and landscape-based river corridor habitat model
  - f) a wetland and riparian vegetation development model
  - g) population models of trophically significant biota
  - h) a trophic relations model
  - i) a human goods and services model, including cultural concerns, hydroelectric and recreational economics, and non-use values
  - j) an administrative model that tracks stewardship goals, objectives, projects, and costs in relation to the overall CRE model.

Such a linked ecosystem model would identify information gaps and allow testing of management scenarios without having to commit the entire CRE to potentially harmful experiments, such as occurred in Year 2000.

2. ***Integrate scientific activities between GCMRC and the NPS.*** The USGS Grand Canyon Monitoring and Research Center presently organizes and conducts scientific adaptive management activities in the CRE, including non-native fish removal, and the National Park Service conducts resource monitoring and native fish translocations in the river corridor in Grand Canyon in relation to its most recent Colorado River Management Plan. However, there appears to be little discussion between these two agencies about monitoring, overlapping efforts, or how to integrate scientific planning and information incorporation into improved stewardship.
3. ***Improve the inventory, monitoring, and restoration of rare taxa.*** By our estimate, at least 85 taxa (including some large groups of species) have been extirpated from the CRE since 1963 (Stevens 2011). Of these, the loss of four of eight native mainstream fish is well known, but many terrestrial and some other aquatic taxa also have been lost, including Sonoran river otter, badger, endangered southwestern willow flycatcher, and other riparian vertebrates. Population status information is lacking for a large number of rare plant, invertebrate, and vertebrate taxa, and more species are likely to be lost from the river corridor in the near future.
  - a. ***Continue to inventory, particularly for rare and declining species.*** Detailed inventory of the population status and causes of decline of missing and declining CRE aquatic, wetland, and riparian plant, invertebrate and vertebrate species is needed immediately and over the course of this EIS to understand existing biodiversity, ecosystem structure, population status and responses to dam operations, and to prevent future biodiversity losses.
  - b. ***Reintroduce and restore missing and declining species.*** Decades of fruitless discussion and agency inertia have failed to reintroduce razorback sucker, a species that could easily be reintroduced into the river. Initiate reintroduction of razorback sucker immediately, and move forward on prioritizing and restoring the other missing or declining CRE species. Our report to the NPS on the location of pre-dam Goodding's willow and Fremont cottonwood (GCWC 2009) was written to assist the NPS plan vegetation restoration prior to the arrival of the non-native tamarisk leaf beetle. Those are sites in which the NPS can quickly move to revegetate and provide native habitat and seed sources for replacement of non-native tamarisk.
  - c. ***Restore missing and altered habitats in the CRE.*** Such habitats include healthy native stands of wetland and riparian vegetation, limiting population growth of keystone (strongly interacting) native and non-native species that restrict population growth of native assemblages (e.g., beaver, *Molothrus* cowbirds, non-native minnows, brown trout, etc.).
  - d. ***Restore the range of native fish species to the entire flowing portion of the CRE.*** Predam springtime floods created large pools of quiet, clear, warm, and highly productive water at tributary mouths. Minckley (1973 and pers. communication) reported that humpback chub were abundant at the mouth of the Paria River; however, cessation of large, long-duration floods and the loss of tributary mouth habitat led to the loss of HBC, pikeminnow, and razorback sucker from that area. We suggest the managing agencies work together to consider construction of Paria River mouth rearing ponds to experimentally attempt to restore the range of HBC and other native fish to lower Glen Canyon and upper Grand Canyon.

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4. ***The LTEMP should be firmly based on a high quality scientific approach.*** Scientific adaptive ecosystem management relies on several components to be effective: a credible conceptual scientific approach to research, inventory, assessments, implementation, and monitoring (Science Point 1 – above); high quality, independent scientific review of research (including monitoring) methods, and implementation of stewardship activities (Policy Point 6 – above); use of scientific controls for understanding differences among treatments and changes over time; a rigorous information management system that is well designed for archival, accessibility, and inquiry; a rigorous peer-reviewed publication program, so that studies conducted are submitted to independent review and are communicated to the scientific community; monitoring that is directed towards model testing and validation within a larger ecosystem conceptual model; and integration of new knowledge into improved stewardship.
  - a. ***Include Cataract Canyon as a scientific control study area.*** One of the most glaring inadequacies of the existing AMP science program is the failure to understand the ecosystem ecology of Cataract Canyon in southern Utah as a scientific control, against which to evaluate expectations for improved management of the CRE downstream from Glen Canyon Dam. Cataract Canyon is the only large, relatively free-flowing section of the Colorado River, and has most of the attributes of the pre-dam Colorado River downstream from Glen Canyon Dam, including relatively natural geomorphology, high sediment flux, and seasonal water temperature variation. A thorough ecological inventory of Cataract Canyon, and testing of Grand Canyon type models against end points in Cataract Canyon are needed to ground understanding of whether desired future conditions in Grand Canyon will achieve basic resource management needs. Among the many comparative tests to be made are those related to native fish stewardship, river running recreation, and water quality safety, and other ecosystem attributes.
  - b. ***Develop an in situ experimental study site at Lees Ferry.*** Small-scale, *in situ* experiments are needed to resolve a host of ecological questions about dam impacts on river ecosystem processes, such as competitive and predatory impacts of small non-native fish, water temperature impacts on foodbase, water clarity impacts on foodbase and fish predation, and many other experiments. We suggest that an open-air experimental arena be developed in the gravel pits near the mouth of the Paria River to conduct such experiments. The experimental arena should use water piped or channeled to study ponds from both the mainstream Colorado River and the Paria River. Ponds and channels could be experimentally manipulated as outdoor flumes and used to test numerous important concepts that limit our present understanding of ecosystem management. Such an experimental arena would be easy to access, construct, and monitor, would create jobs, and would provide evidence to the public that scientific understanding is critical to federal management of the CRE. Such a site should be jointly managed by the NPS, the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, and Reclamation.
  - c. ***Improve understanding of the range of variability of flow.*** We recognize the exponential relationship between flow and sediment transport, and we support efforts to understand and manage the sediment budget to support sandbars.

However, we also are concerned that restoration of this ecosystem involves better understanding of flow variability over time and impacts on biological resources. The unregulated Colorado River was renown for its extreme variability in flow, with 2-3 orders of magnitude difference in flow annually. Historical flow records show that although pre-dam within-day flow variability was low, between-day, within-week, and within-month variability expanded progressively. We believe it is important to recognize this inter-day variability and consider how flow steadiness affects the remaining native species, habitats, and the many non-native taxa that have been introduced. We recommend consideration of experimental testing of the effects of flow variations at 2-day, 4-day, week-long, and month-long intervals. A great deal is now known about flow and sediment relationships, but nutrient spiraling is poorly understood and little is known about biological responses to inter-day variability.

5. ***Increase the magnitude of high flows for experimental sediment, geomorphology, and vegetation management, when the Lake Powell water supply permits.*** Present high flow experiments are not sufficiently large. Experimental high flows are needed to better understand flows  $\geq 60,000$  cfs for development and refinement of sediment, geomorphological, and vegetation models, and for ecosystem stewardship. Such flows are still far lower than those that occurred nearly every year in pre-dam times. Our direct observations of high flows of those magnitudes in the early 1980's suggested thresholds in riparian vegetation scouring, sandbar rejuvenation, ponding of tributary mouths, mobilization of debris fan boulders, and many other factors, thresholds that yet to be recognized by the existing AMP high flow experiment program. An experimental  $\geq 60,000$  cfs release could have been conducted during 2011, rather than squandering several years of stored sediment under poorly planned reservoir equalization flows. We recognize that such flow experiments will only be possible in years with sufficient inflow to bring the pool elevation high enough to use one or both of the spillways; however, the EIS should recognize and take advantage of the importance of such rare opportunities.
6. ***Improve information on river corridor visitation, visitor safety, and accident frequency.*** Too few data are readily available on many aspects of visitation and visitor safety in Grand and Glen Canyons, and adequate data for understanding visitor safety and the types and severity of CRE visitor accidents are not readily available (Myers et al. 1999). Accident types and frequency are not adequately reported, and trip-threatening water quality and disease issues are poorly understood and under-reported. The adequacy of existing data on visitation and visitor safety data quality should be independently reviewed and the lead agencies should develop, or collaboratively develop, an easy-to-access database on river running visitation and safety.

## **SUMMARY AND CONCLUSIONS**

We hope these comments contribute to improving the scoping process for the Glen Canyon Dam LTEMP, and we are most interested to see this important process succeed. Please feel free to contact us if you have questions about these comments or wish copies of our scientific publications or reports on the CRE.

## **REFERENCES CITED**

## Scientific Controls in Adaptive Management, continued

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