

Ms. Sarah Bucklin
Regional Environmental Coordinator
Compliance and Water Resources, UC-443
125 State Street
Salt Lake City, UT 84138
sbucklin@usbr.gov

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Ms. Bucklin:

Grand Canyon Wildlands Council (GCWC) herein provides stakeholder comments on the Environmental Assessment for Glen Canyon Dam Operational Flexibilities "...to reduce the threat of warmwater invasives below Glen Canyon Dam". GCWC has participated as a GCDAMP stakeholder for the past two decades as an environmental voice, and we are intimately familiar with the environmental, cultural, and economic trade-offs of Glen Canyon Dam management on the Colorado River ecosystem (CRE) downstream. We thank Reclamation staff for recognizing the need for NEPA assessment and inviting commentary from Glen Canyon Dam Adaptive Management Program (GCDAMP) stakeholders. Recent increases in non-native smallmouth bass (SMB), Green sunfish, brown trout, and other species in the Glen Canyon Dam tailwaters, as well as non-native invasive aquatic mollusks and fish diseases constitute critical threats to the CRE and its native species.

We note that the title and stated purpose of this document does not restrict the effort to non-native fish, but to "nonnative invasives", which could include aquatic and wetland non-native plants, macroinvertebrates (e.g., quagga mussel, New Zealand mudsnail, and two or more species of crayfish), nearly 20 species of exotic warmwater fish, and one salamander. If this is not the intent of this document (which is perhaps more clearly stated in the Background), then the title and the Purpose should be changed to make it more specific.

While we recognize the need for this EA to focus on operational alternatives/actions to disadvantage specific non-native invasive species, we remain concerned that primary focus on SMB in the forebay and Glen Canyon reach tailwaters may have unintended consequences related to other natural resources, as well as to other nonnative invasive species that also pose severe threats to the downstream river (e.g., other non-native fish, several non-native invertebrate taxa, etc.). Unintended consequences can lead to exacerbating threats to native species and natural CRE processes, greater costs to remediation and monitoring, and potentially limiting future management options. Therefore, it is important to carefully evaluate potential negative effects of alternatives, and develop robust contingency plans to cope with issues that arise unexpectedly from the pursuit of the desired alternative. There may be unexpected interaction effects among the various treatment options, requiring careful consideration including assessment in this EA and in the field during implementation.

Given its stated objective, this environmental assessment (EA) includes four overarching alternatives: 1) no change in management, 2) Glen Canyon Dam discharge management ("flow-only") options; 3) non-discharge-related ("non-flow") management options; and 4) combined flow and non-flow options. *Status quo* management (Alternative 1) stands to critically threaten the native fish the Adaptive Management Program (AMP) has worked so hard to protect over the past four decades. However, each of the other alternatives are likely to involve a mixture of treatments, with magnitude, frequency, duration, and timing subject to monitoring the success of the action. All alternatives will require monitoring and feedback to improve management in perpetuity. While the emphasis in this document is on flow-related options (Alternative 2), achieving the goal of preventing establishment of non-native SMB and other fish in the CRE almost assuredly will require both flow and non-flow actions.

Thus, of these four overall alternatives, we support Alternative 4 to allow the greatest flexibility in the use of all available approaches and tools.

Attachment F of the SMB Strategic Plan provides a list of non-flow options, which deserve consideration in relation to the various flow options proposed by the Grand Canyon Monitoring and Research Center. We ranked the non-flow options based on simple numerical scoring of estimated cost, time, compliance, and implementation (low or short-term=1, medium = 2, high or long-term = 3) and simple summing of those scores (Table 1). Our analysis indicated that physical barrier screens, in-reservoir nets, floating barriers, turbine mortality, and electrofishing are all equally easy, cheap, short-term (emergency) options. If all are undertaken simultaneously, these may be the best collective strategy considered to reduce the likelihood of SMB establishment. The deeper water withdrawal and sorting facility options are intermediate management options, having higher cost or greater complexity, respectively. The lowest ranked long-term solutions are installation of an air bubble screen and/or an acoustic barrier, with greater management costs to the implementation of multi-stimulus, CO₂, and energy dissipation, and with electrical barrier as the most costly and difficult to implement option.

Table 1: Numerical scoring and summation of non-flow-related, non-native fish management options at Glen Canyon Dam.

Treatment	Cost	Time	Compli	Implem	Total Rank Score	Result
Physical Barrier Screens	1	1	1	1	4	Easy, cheap, short-term
In-Reservoir Net	1	1	1	1	4	Easy, cheap, short-term
Floating Barriers	1	1	1	1	4	Easy, cheap, short-term
Turbine Mortality	1	1	1	1	4	Easy, cheap, short-term
Electrofishing	1	1	1	1	4	Easy, cheap, short-term
Deeper Water Withdrawal	3	1	1	1	6	Intermediate cost, time, medium time
Sorting Facility	2	2	1	2	7	Intermediate cost, time, medium time
Air Bubbles	2	2	2	4	10	More difficult & costly, long-term
Acoustic Barriers	3	2	1	4	10	More difficult & costly, long-term

Treatment	Cost	Time	Compli	Implem	Total Rank Score	Result
Multi-Stimulus Barriers	3	2	2	4	11	More difficult & costly, long-term
Carbon Dioxide Barriers	3	2	2	4	11	More difficult & costly, long-term
Energy Dissipating Valve	3	2	2	4	11	More difficult & costly, long-term
Electrical Barriers	3	3	3	4	13	Difficult, expensive, long-term

Two options were not considered in the SMB Plan analysis. Rotenone treatment of the forebay and tailwaters could be accomplished at a moderate cost on a short-to-medium-term timeframe for which medium-high compliance would be needed, and would therefore have moderate implementation difficulty. This option would produce a maximum possible ranked score of “9”, placing its accomplishment difficulty between implementation of a sorting facility and construction of an air bubble net. Another unconsidered option would be propagation and release of a large number of mature, predatory Colorado River pikeminnow. This option would require low cost in a medium-to-long-term timeframe, with medium levels of compliance, and low implementation cost, leading to a maximum possible ranked score of “7”, tying it with implementation of a sorting facility. All options will require continued monitoring, likely in perpetuity. We also recommend that cost-analysis of the various flow options proposed by GCMRC should be included in this table as well.

Another category that should be added to each component of the alternatives in this EA is the level of uncertainty of its success. We encourage Reclamation to recognize and acknowledge that uncertainty is substantial in all of these management options. As such, 1) the most successful alternative is likely to be a combination of two or more options. 2) Also, contingency planning is also of paramount importance for consideration. If for some or several reasons the preferred alternative fails (whichever that is), cannot be accomplished due to unforeseen costs, complications, or resource (i.e., water supply) limitations, thoroughly considered “Plan B” and “Plan C” alternatives should also accompany this EA.

We note that threats of non-native fish invasion into the CRE in Glen and Grand canyons are multi-directional. The warmer river water temperatures also allow striped bass and other non-native fish to uprun the river from Lake Mead, and perhaps may allow other non-native species to invade through the Little Colorado River drainage. Therefore, we recommend that monitoring be conducted in the lower Colorado River and Little Colorado reaches as well.

Coupling treatments that control undesirable resource elements while benefiting desired natural resources, such as sandbar and beach habitats, is core to adaptive ecosystem management, and should play a strong role in prioritization of alternatives for this EA. It has repeatedly been shown that single-species management is ineffective as an ecosystem management approach due to the complexity of habitat X species X assemblage interactions. Therefore, we emphasize the importance of evaluating whole-system impacts of each alternative, and that the preferred alternative is designed to provide the

greatest benefit to ecosystem and program integrity, such as prevention of SMB establishment along with other resource benefits, particularly those related to improvement or enhancement of habitat, such as sandbar rejuvenation.

The Scope of Work and following sections describe the duties of a contractor, without justifying how and why a contractor, rather than one or more of the participating AMP agencies is to conduct the work. With the detail included in the Project Management section, this makes the document appear to be more of a Request for Proposals than an EA. The list of tasks does not reassure us that consideration of alternatives will be integrated across the range of issues, potential consequences, and AMP priorities, not that the alternatives proposed will be sufficiently comprehensive to solve the problem. A rationale for this approach for the EA should at least be attempted in the document.

Non-native fish management has been and will continue to be an on-going challenge at Glen Canyon Dam, a challenge that requires well-trained and committed staff. We recommend that, rather than a simple “informed consent” approach to cultural compliance, Reclamation and the participating agencies develop a fisheries monitoring education program for Native American students. Such a program will build a future workforce that is technically capable, consonant with federal trust obligations, and would be a program that would directly benefit the Tribes.

We thank Reclamation for the opportunity to respond to this suite of ideas about how to prevent or reduce the threat of SMB invasion into the CRE, and we are available to answer any questions that Reclamation may have about these comments.

Sincerely,

A handwritten signature in black ink, appearing to read "L. Stevens", with a horizontal line extending from the end of the signature.

Dr. Larry Stevens
Senior Ecologist, GCWC AMWG Representative

A handwritten signature in black ink, appearing to read "Kelly Burke", written in a cursive style.

Ms. Kelly Burke
Director, GCWC AMWG Alternate