

Glen Canyon Dam Adaptive Management Work Group  
Ad Hoc Committee on Goals  
Report to AMWG, September 1999

The following principles are embraced by the Glen Canyon Dam Adaptive Management Work Group. They guided development of the goals of the Adaptive Management Program, and the development and implementation of the management objectives we will use to attain the goals. These principles include:

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***Category A: Riverine Ecosystem***

**Goal 1. Emphasizing native biodiversity, protect or improve the aquatic foodbase so that it will support viable populations of species at higher trophic levels.**

MO 1. (BRMO 1) Maintain and enhance the aquatic food base in the Colorado River ecosystem to support desired populations of native and non-native fish. At a minimum, maintain continuously inundated areas for Cladophora and aquatic invertebrates at or above 5,000 cfs discharge levels from Glen Canyon Dam.

**Goal 2. Maintain viable populations of humpback chub and remove jeopardy.**

MO 2. (BRMO 3) Enhance the Little Colorado River population of HBC above 1987 levels determined by April/May hoop-net monitoring in the lower 1,200 meters of the Little Colorado River. (Focused at fish >200mm, and should include a fish health assessment.) Maintain or enhance levels of recruitment of HBC in the Little Colorado River.

MO 3. (BRMO 4) Maintain or enhance levels of recruitment of HBC in the mainstem as indexed by size frequency distributions and presence and strength of year-classes. (Focused at young-of-year and juvenile fish, and should include a fish health assessment.)

MO 4. (BRMO 5) Remove jeopardy for the HBC in the Colorado River ecosystem.

MO 5. (BRMO 6) Establish a second spawning aggregation of HBC downstream of Glen Canyon Dam.

**Goal 3. Maintain viable populations of razorback sucker and remove jeopardy.**

MO 6. (BRMO 7) Remove jeopardy for the Razorback Sucker in the Colorado River ecosystem.

**Goal 4. Maintain viable populations of flannelmouth sucker.**

MO 7. (BRMO 8) Achieve healthy, self-sustaining populations of flannelmouth sucker, bluehead sucker, and speckled dace in the Colorado River ecosystem, with special emphasis on flannelmouth sucker in Glen Canyon based upon the capability of the habitat to support those fishes.

**Goal 5. Maintain viable populations of bluehead sucker.**

MO 8. (BRMO 8) Achieve healthy, self-sustaining populations of flannelmouth sucker, bluehead sucker, and speckled dace in the Colorado River ecosystem, with special emphasis on flannelmouth sucker in Glen Canyon based upon the capability of the habitat to support those fishes.

**Goal 6. Maintain viable populations of speckled dace.**

MO 9. (BRMO 8) Achieve healthy, self-sustaining populations of flannelmouth sucker, bluehead sucker, and speckled dace in the Colorado River ecosystem, with special emphasis on flannelmouth sucker in Glen Canyon based upon the capability of the habitat to support those fishes.

**Goal 7. Establish population of Colorado pikeminnow.**

**Goal 8. Establish viable populations of river otter.**

**Goal 9. Maintain a wild reproducing population of rainbow trout above Lees Ferry, to the extent practicable and consistent with the maintenance of viable populations of native fish and removal of jeopardy of endangered fish.**

MO 10. (BRMO 2) In the Colorado River downstream of Glen Canyon Dam to the confluence of the Paria river, sufficient ecological conditions (such as habitat, foodbase and temperature) should be maintained, which in conjunction with management by Arizona Game and Fish will produce a healthy self-sustaining

population of at least 100,000 Age II+ rainbow trout that achieve 18 inches in length by Age III with a mean annual relative weight (Wr) of at least 0.90.

**Goal 10. Minimize competitive and predatory interactions by non-native species on native species.**

MO 11. (BRMO 10) Minimize, to the extent possible, competitive and predatory interactions between native and non-native fishes.

**Goal 11. Establish water temperature, chemistry, and flow dynamics, emphasizing patterns within the range of natural variability, to achieve ecosystem goals.**

MO 12. (BRMO 9) Attain riverine conditions, including appropriate habitat, that support all life stages of endangered and native fish species.

MO 13. (WRMO 2) Maintain water quality at levels appropriate to support physical, biotic, and human resource needs of various ecosystems downstream of Glen Canyon Dam as mandated by the Grand Canyon Protection Act and incorporated into the Record of Decision.

MO 14. (RMO 4) Maintain flows (under approved operating criteria) and habitat suitable for quality cold water fishery opportunities in Glen Canyon.

MO 15. (RMO 5) Maintain flows (under approved operating criteria) and habitat suitable for waterfowl sport hunting and wildlife viewing opportunities in Glen Canyon.

MO 16. (LPMO 1) Prevent impacts that adversely affect the water quality (physical, chemical, biological) of Lake Powell due to dam operations and ensure that fully informed AMWG decisions are possible both now and in the future.

MO 17. (LPMO 2) Protect Lake Powell aquatic ecosystem from adverse impacts due to dam operations and subsequent effects, including but not limited to: temperature, reservoir surface elevations, elevated selenium levels, advective flow patterns, predator/prey relationships, and fish movements.

**Goal 12. Increase fine sediment storage within the main channel and along shorelines to mimic historic spatial distribution.**

MO 18. (BRMO 9) Attain riverine conditions, including appropriate habitat, that support all life stages of endangered and native fish species.

MO 19. (SRMO 1) Maintain a long-term balance of river-stored sand to support maintenance flow (in years of low reservoir storage), beach/habitat-building flow (in years of high reservoir storage), and unscheduled flood flows. Maintain system dynamics and disturbance by annually (in years which Lake Powell water storage is low)

redistributing sand stored in the river channel and eddies to areas inundated by river flows between 20,000 cfs and maximum power plant capacity.

- MO 20. (SRMO 2) As a minimum for each reach, maintain the number and average size (area and thickness) of sandbars and backwaters between the stages associated with flows of 8,000 and 45,000 cfs that existed during the 1990/91 research flows.
- MO 21. (SRMO 3) Periodically increase the average size of sandbars above the 20,000 cfs river stage and number and average size of backwaters to the amounts measured during the high period of 1990/91 or the 1996 test of the beach/habitat-building flow in as many years as reservoir and downstream conditions allow.
- MO 22. (SRMO 4) Maintain system dynamics and disturbance by redistributing sand stored in the river channel and eddies to areas inundated by river flows up to 45,000 cfs in as many years as possible when BHBF hydrologic and resource criteria are met.

Suggested MO 1. Delineate baseline for fine sediment storage.

**Goal 13. Prevent any further human-induced extirpation or extinction of native riverine species.**

***Category B: Riparian Ecosystem.***

**Goal 14. Maintain viable populations of Kanab ambersnail and other endemic spring species.**

- MO 23. (BRMO 14) Sustain populations of Kanab ambersnail wherever they currently exist within the Colorado River ecosystem.
- MO 24. (BRMO 15) Establish or discover and ensure the continued existence of a second population of Kanab Ambersnail in Arizona.

**Goal 15. Emphasizing native biodiversity, protect or improve the biotic riparian communities, and reduce or eliminate invasive nonnative species.**

- MO 25. (BRMO 11) Protect, restore, and enhance survival of native and special status species (federal, tribal, and state designations). Ensure that the required habitat for these species is preserved.
- MO 26. (BRMO 12) Maintain a natural age-class distribution of wildlife species throughout the majority of natural range in Glen and Grand Canyons, emphasizing the need to recruit into breeding age classes.

MO 27. (BRMO 16) Maintain, enhance or restore vegetative communities made up of diverse groups of native riparian and upland species with special emphasis on preservation of unique plant communities and special status species at different stages of succession and at different elevations above the water line.

Suggested MO 2. Identify specific unique areas to protect.

**Goal 16. Protect the presence of Southwestern willow flycatcher in a manner consistent with biotic riparian community goals.**

MO 28. (BRMO 13) Protect, restore, and enhance survival of native and special status avifauna.

Suggested MO 3. habitat

Suggested MO 4. parasitism

**Goal 17. Prevent any further human-induced extirpation or extinction of native riparian species.**

***Category C: Socio-cultural Resources***

**Goal 18. Protect or improve the size, number, quality, and distribution of camping beaches, consistent with native ecosystem goals.**

MO 29. (RMO 1) Provide quality recreation experiences consistent with other resource objectives.

MO 30. (RMO 2) Maintain flows (under approved operating criteria) and sediment processes that create an adequate quantity, distribution and variety of beaches for camping, as long as such flows are consistent with management of natural recreation and cultural resource values (other natural resource values).

Suggested MO 5. periodic restoration

Suggested MO 6. periodic stripping of vegetation, consistent with native ecosystem goals

**Goal 19. Maintain or increase power and energy generation within the framework of adaptive management program goals.**

MO 31. (SEMO 1) Maximize the value of long-term power and energy generation within the criteria and operating plans established by the Secretary under Section 1804 of the Grand Canyon Protection Act.

Suggested MO 7. Explore installing turbines on outlet tubes.

Suggested MO 8. Investigate load following capability.

**Goal 20. Protect, mitigate adverse impacts to, interpret, or record knowledge of cultural sites and traditional cultural properties in consultation with affiliated tribes.**

- MO 32. (CRMO 1) Conserve in situ all the downstream cultural resources and take into account Native American cultural resource concerns in the Colorado River ecosystem.
- MO 33. (CRMO 2) If in situ conservation is not possible, design mitigative strategies that integrate the full consideration of the values of all concerned tribes with a scientific approach.
- MO 34. (CRMO 3) Protect, and maintain physical access to and use of traditional cultural properties and other cultural resources, where such access and use may be impacted by dam operations.
- MO 35. (CRMO 4) Maintain and integrate all appropriate cultural data recovered from monitoring, remedial, and mitigative action and incorporate these data into the evolving research designs and mitigative strategies for understanding the human occupation and use of the Colorado River ecosystem.

**Goal 21. Operate Glen Canyon Dam for beneficial consumptive use consistent with existing law and policy.**

- MO 36. (WRMO 1) The Secretary shall Operate Glen Canyon Dam in a manner fully consistent with the Record of Decision and subject to the "Law of the River," including but not limited to the following: Grand Canyon Protection Act of 1992, the Colorado River Compact, the Upper Colorado River Basin Compact, the Water Treaty of 1944 with Mexico, the decree of the Supreme Court in Arizona vs. California, and the provisions of the Colorado River Storage Project Act of 1956, and the Colorado River Basin Project Act of 1968 that govern allocation, appropriation, development, and exportation of the waters of the Colorado River Basin

**Goal 22. Maintain navigability of rapids, consistent with native ecosystem goals.**

- MO 37. (RMO1) Provide quality recreation experiences consistent with other resource objectives.
- MO 38. (RMO3) Maintain flows (under approved operating criteria) that minimize impacts to navigability by authorized water craft and for boaters, waders, and campers in the

riverine corridor.

***Category D: Administration***

**Goal 23. Maintain a high quality monitoring, research and adaptive ecosystem management program.**

MO 39. (EAMO 1) Develop a conceptual model of the Colorado River ecosystem.

MO 40. (GISMO 1) Management Objective to be added.

Suggested MO 9. Maintain outside peer review of research proposals, reports, and other products produced by GCMRC and its contractors.

Suggested MO 10. Build an effective Science Advisory Board.

Suggested MO 11. Maintain an effective Technical Work Group and Adaptive Management Work Group process.

Suggested MO 12. Develop an efficient and effective monitoring and research program.

Suggested MO 13. Develop an effective metric to measure progress toward achieving adaptive management goals.

Suggested MO 14. Maintain an objective experimental approach to adaptive management.

Suggested MO 15. Utilize the National Research Council to conduct a five-year review of the effectiveness of the adaptive management program and processes.

Suggested MO 16. Maintain an adequate level of high quality staff to accomplish adaptive management program goals.

Suggested MO 17. Maintain independence of roles and parity among TWG, AMWG, and GCMRC (see NRC pg. 46-47)

Suggested MO 18. Develop an experimental flows research program and implement it within a specific timeframe.

Suggested MO 19. Re-evaluate goals and strategic plan every five years.

**Goal 24. Build a broad, effective outreach program.**

Suggested MO 20. Develop public support through information and education programs.

Suggested MO 21. Develop an effective program for educating the AMWG and TWG on ecosystem knowledge and issues.

**Goal 25. Broaden the revenue base to achieve adaptive management program**

**goals and objectives.**

- Suggested MO 22. Raise funds from foundation and corporate sources.
- Suggested MO 23. Encourage outside researchers to work in the Grand Canyon, capitalizing on our extensive research and monitoring foundation.
- Suggested MO 24. Seek appropriations for research and monitoring programs.
- Suggested MO 25. Maintain strong financial support from power revenues.
- Suggested MO 26. Seek funding from other federal and state agencies.

**Goal 26. Respect and enhance the unique aesthetic value of the Grand Canyon, and the diverse perspectives and spiritual values of the stakeholders.**

- Suggested MO 27. Conduct meetings to ensure inclusion of diverse perspectives.
- Suggested MO 28. Ensure monitoring and research activities are conducted in such a way as to minimize impacts on the aesthetic and spiritual values.
- Suggested MO 29. Fund tribal participation in the adaptive management program.