

Glen Canyon Dam Adaptive Management Program Priority Setting Workshop

Questions from Stakeholders **To Help Design GCMRC Budget and Workplan**

Updated August 8, 2004

“Imagining yourself an AMWG member, what questions do you need to have answered in order to make recommendations to the Secretary of the Interior on the management of the Colorado River ecosystem in Grand Canyon?”

A. Why are the Humpback chub not thriving, and what can we do about it?

1. What is limiting chub reproduction, recruitment, and survival in the Upper Basin where they have
a) more sediment, b) larger temperature swings, and c) more nearly normal hydrology?
2. RIN 2.1.3 What are the sources of mortality for humpback chub (i.e., predation, cannibalism, other) in the LCR and the mainstem?
3. Is cold water the most limiting factor for HBC in the CR?
4. Do HBC prefer muddy water to clear water? Are HBC physiologically better adapted than other fish to live in muddy water? How?
5. What is the role of catfish, carp, and bass as warm water predators/competitors of the Humpback chub (in Grand Canyon and in Upper Basin)?
6. Are predatory and competitive non-native fish (Carp, Bullheads, Channel Catfish, Shinnerys, Fathead Minnows, etc.) being adequately “removed” from the LCR?
7. How can we reduce the influx of non-native fish into Grand Canyon from Lake Mead?
8. RIN 2.2.9 Is humpback chub augmentation a viable and advisable management strategy to establish mainstem spawning aggregations?
9. Are young-of-year (YOY) humpback chub lost to predation at the mouth of the Little Colorado River? And if so, what can be done? (E.g., shouldn't we rear some YOY chubs off site as a precautionary measure?)
10. Should we rescue some of the several hundred thousand YOY HBC flushed by floods from the warm water of the LCR to their death in the cold water of the CR?
11. What is the carrying capacity of the LCR for humpback chub?
12. Is it possible to attain and maintain viable populations of native fish, including humpback chub, in the CRE without eliminating nonnative fish? If not, is it possible to eliminate nonnative fish?
13. What limits Native recruitment- Temp, Flow, Predation, tributary flows, other?
14. Did destruction of the CR aquatic food base from EIS LSF's for aerial photos cause the HBC decline in the early 90's?

B. How many Humpback chub are there and how are they doing?

15. How many humpback chub are in the mainstem and in the LCR? Is the estimate adequate for USFWS recovery criteria purposes?
16. What is the Humpback chub population and how are they doing?
17. What are the current humpback chub numbers and how are they doing?

18. At the July 1, 2004 TWG meeting, Carl Walters reported that, based on his June 2004 river trip, the HBC are less in danger of extirpation than we had thought. Is this true?
19. RIN 2.2.4 What is the relationship between the HBC "aggregations" in the mainstem and LCR? Are mainstem aggregations "sinks" of the LCR? Are aggregations real or due to sampling bias?
20. What, if any, responses have been observed in the humpback chub population resulting from mechanical removal of trout and implementation of higher fluctuating flows?
21. How comparable are population estimates of humpback chub made with mark recapture methods and the preferred ASMR method?
22. Are the sampling techniques used by Carl Walters in his June 2004 trip more effective?
23. How should we monitor and measure the humpback chub?
- C. What will happen when we test or implement the TCD? How should it be operated? Are safeguards needed for management?**
 24. RIN 2.2.7 Is implementation and operation of a TCD and/or steady flows a technically feasible, ecologically sustainable, and practical option for establishing mainstem HBC spawning?
 25. What are impacts of temperature modification on native fish recruitment, survival (predation), trout growth, and invertebrate species colonization?
 26. Should the TCD be operated to create a daily temperature fluctuation?
 27. Should extirpated aquatic insects and plants be re-introduced after implementation of the TCD or even now with current warmer water releases due to the low lake level?
- D. How can we best manage for what appear to be competing resources - a quality recreational fishery in Glen Canyon upstream of the Paria River and viable native fish populations in lower Marble and Grand Canyon?**
 28. Is it possible to attain and maintain viable populations of native fish, including humpback chub, in the CRE while managing for trout in the Lees Ferry reach?
 29. How do we encourage angler harvest of exotic fish in Grand Canyon both for recreation and to contribute to conservation?
 30. If experimental Trout suppression flows are continued, when will it be necessary to resume Trout stocking to maintain the Lees Ferry Trout fishery?
- E. How can we best understand and protect the aquatic foodbase?**
 31. How does the quantity and composition of available food base play a limiting role in the higher trophic levels of aquatic fauna?
 32. What are fluctuating flow impacts on food availability and growth of Trout and Native fish?
 33. Has the long-term drought, lack of sediment inputs and longer periods of clear water increased the productivity of the CR aquatic food base and benefited HBC?
 34. What is the current status of the New Zealand Mud Snail in the CRE?
 35. Would turbidity augmentation have a negative effect on the productivity of the CR aquatic food base and CR fish?
- F. How can we best protect water quality?**
 36. RIN 7.2.4 What are the water-borne pathogens that are a threat to human health? How should they be monitored? Where and how often?
- G. What is the impact of sediment loss and what should we do about it?**
 37. How has the loss of sediment in the CRE since construction and operation of the dam altered the ecosystem? How have those changes constrained our ability to meet the goals of the AMP Strategic Plan?

38. Is it possible to attain and maintain a positive sediment budget in Grand Canyon through dam operations and/or other management actions?
 39. How can we promote beaches and backwaters without promoting Tammies?
 40. Given constraints in the operation of the dam, how are we going to replenish sediment supplies in Grand Canyon?
 41. Is dredging a viable option for increasing the size of beaches in the Grand Canyon?
- H. How can we create and/or protect recreational fisheries elsewhere than in the Glen Canyon reach?**
42. Are the Apache Trout in upper Kanab creek native?
 43. Can we prove that Trout are NOT native in Bright Angel Creek and the CRE?
 44. Should native beavers be re-introduced in lower Bright Angel Creek to restore and improve fish habitat and to minimize damage from snow melt floods?
- I. What are the necessary components of a core monitoring program?**
45. How should we monitor and measure the flow regimen?
- J. What is the combined effect of sediment loss and vegetation encroachment on the recreational experience in the CRE?**
- K. How do we quantify and integrate the full range of socio-economic concerns into dam re-regulation, in addition to hydropower concerns?**
- L. What are the status and trends to terrestrial flora and fauna?**
- M. Which cultural resources, including TCPs, are within the APE, which should we treat, and how do we best protect them? What are the status and trends of cultural resources and what are the agents of deterioration?**
46. What is the area of potential effect (APE) of hydropower operations on cultural resources vs. the APE from dam emplacement and the APE from reservoir operations? How do these differences affect hydropower's financial responsibility for mitigating impacts under the AMP?
 47. What are the direct and indirect effects of dam operations on terraces canyon wide, in particular those terraces containing cultural resources? What is the relationship between the erosion and loss of lower terraces and the erosion and loss of upper terraces?
 48. Have dam operations played a role in the loss of terrace deposits?
 49. What are the basic processes which have resulted in the formation and modification of river terraces? How similar are these processes between the Glen and Grand Canyons? Does the way the terrace was formed or maintained have any relationship to its potential for erosion?
 50. How old are terraces at selected locations along the river corridor? What is the most effective way to date terraces?
 51. What is the stratigraphic profile of terraces containing clusters of archeological sites?
 52. Where sites are located in dune fields which are undergoing erosion, what has been the rate of that erosion over the last 50 to 100 years? What is the potential for buried cultural materials in dune areas which have not yet eroded but are otherwise similar to areas containing cultural materials?
 53. Is every cultural site unique with respect to its geomorphic setting, deposition, and erosion patterns, or is it the case that broad similarities can be found with respect to these variables?

54. How has replenishment of terraces occurred in the past? What processes have been involved? Is there a relationship between the location of sandbars and long-term preservation of cultural sites in terraces?
55. Is it possible to compile a photographic record of selected sites along the corridor which could help date the formation of large arroyos and deflation of terraces?
56. Have sites located at the openings of side canyons been subjected to the same depositional and erosional processes as those along the river corridor?
57. What is the geomorphic setting, erosional history, and potential for buried materials at each cluster of sites along the river corridor?

N. What is the best flow regime?

58. How important were various aspects of the natural hydrograph (spring floods, fall and winter low flows, variability, etc.) to the ecosystem as a whole and to its specific components? What elements of the natural hydrograph, if any, are necessary to meet the goals of the AMP Strategic Plan?
59. Is the MLFF flow regime achieving the desired ecosystem results? If not, why not?
60. If the MLFF flow regime is not achieving the desired ecosystem results, what other flow regimes have a likelihood of achieving those results and should be tested?
61. What flow regime is best for sediment conservation in the Grand Canyon while still delivering 8.23 maf annually to the Lower Basin?
62. What is the best flow regimen within the Compact criteria for the canyon?
63. What different ramping rates (up and down) are feasible that would recover lost generation capacity while protecting beaches?
64. How do we ensure the use of beach habitat building flows immediately following sediment inputs to optimize the limiting resource, fine sediment, in the river ecosystem?
65. How can we operate the dam to improve vegetation communities in Grand Canyon?
66. How much benefit would be gained in reduction of trout recruitment by an extension of months with higher fluctuating flows?
67. Is the CR aquatic food base more available to fish with HFF (High Fluctuating Flows) and a tidal stirring action, than with MLFF or steady flows?

O. Can we achieve the goals of the AMP Strategic Plan by actively managing for some ecosystem elements but not all of them? If so, which elements should we actively manage for and how do those management actions indirectly benefit other ecosystem elements?