SUMMARY OF COMMENTS RECEIVED

To: Colorado River work group for sediment management objectives below Glen Canyon dam.

From: Andre Potochnik, Adaptive Management Work Group Strategic Plan ad hoc committee for Sediment Management Objectives

Date: 11/27/00

A) Which data set should be used to quantify the current and target levels for each objective? Bear in mind that the Strategic Plan emphasizes the importance of managing for "native biodiversity" (Vision-Mission), "range of natural variability" (Principle 6), and takes an "ecosystem management" approach (Principle 4). See Strategic Plan Glossary (below).

1) Current levels:

a) February 1996- pre "experimental flood" data,
b) October 2000- most current data,
d) a range of the above,
c) other. Why?

Comment: Current level is "depleted" (voluminous literature).

Comment: To date, studies of fine sediment flux through the river corridor have ignored two contributing sources that may prove to be significant: 1) fluvial/eolian mining (canibalization) of the remaining pre-dam high terraces described in the literature (the work of Hereford et. al., Lucchitta et. al., Thompson et. al., etc.); and, 2) eolian sand transport into the Glen Canyon reach from the dune fields on the rims and slopes of Glen Canyon. To my knowledge, eolian transport to and from fluvial sand bars has been completely ignored in GC river studies to date, even though it is widely recognized in the geosciences as a primary means of fine sediment re-distribution on the land surfaces. Anyone who has been down the river will readily attest to the incessant influence of the wind and the numerous wind dunes throughout the river corridor. Although modeling eolian sand flux may be difficult, continued ignorance of this fundamental process in sediment transport models is a serious omission in the GCMRC research program.

Comment: My main comment on the materials you sent us is that there may have been too much emphasis on trying to define a static condition for sediment resources - either in terms of sediment storage or sandbar area/size/morphology. We may also want to consider sediment deposits as dynamic features and have goals for sediment processes. For example, we could have goals to: (1) Maintain sandbars as dynamic features that erode and redeposit on an annual basis, and (2) Optimize, given current constraints in sediment supply, the

redistribution of sediment from the main channel to eddy zones and sandbars."

I'm less sure about targets and metrics, and may have to acknowledge that more research is needed to define them. That being said, I think we need to develop a long-term monitoring record for: (1) tributary sediment input on an annual basis; (2) sediment storage at selected channel, eddy and sandbar locations (area/volume?) on Jan. 1; and (3) sediment storage on July 1. With this information, we would be in a position to better evaluate increases and decreases in sandbar size as a function of sediment input, sediment storage, and hydrology. This is the sort of information that feeds directly into figuring out how best to design BHBF's (and post-BHBF flows) - which is the main tool we have for managing sediment.

Comment:
1. Ongoing measurements and analyses of deposit morphology, suspended sand transport, major tributary inputs, and aerial photos are the best tools we currently have for assessing the state of the system.
2. My understanding is that the current state of sand deposits has declined since the '96 test flow. I don't know how it compares to conditions prior to the test flow.

Comment: Sand bar and rapid (debris fan) sizes.

Comment: Some combination of the data sets should probably be considered. Measurements around the '96 test flow are probably more complete and more thoroughly characterized the system status. More recent and ongoing measurements may provide indications of trends since then.

Comment: Current Level: This metric should describe current conditions (as of FY 2001) rather than try to assume or determine some type of baseline from which to measure. Therefore, the most current data should be used.

Comment: I do want to ensure that metrics and targets do not reinforce the belief that filling in arroyos will protect archaeological sites. Also, our targets should be based on what sediment is available, not on what the area looked like pre-dam. I want us to be realistic in our goals.

Comment: We should not ignore any data sets, but need to focus on the new analysis which provides a basis for a change in triggering criteria.

Comment: I know that the comments I am providing are not specifically what you want for the specific sediment questions, but because we recently disccussed the following issues in the Native Fish Work Group, and I think that they apply here also, I will bring them up.

I think that we are attempting to define too many mangement objectives for many of the base and intermediate resources and valuing them on the same level as the primary resources. By base and intermediate level resources, I mean those that are really of value to managers because of their assumed role in maintaining or effecting the primary resources. The primary resources are those that are the ones that the managers are concerned about (ie. legally protected, of "economic" value like trout or beaches for recreationists, resources with a specific interest group, etc,). Sediment (as well as hydrology, the lower trophic level resources, etc) fall into this secondary resource level and probably shouldn't have specific management objectives associated with them. After all, is there the best amount of sediment independant of the other resources? Said another way, would anyone care about the amount of sediment if these other resources didn't exist?

Instead, it seems to make more sense to condense the management objectives into those that are the the "big ones", the ones that generate the letters and calls to the managers (or lawyers) when there is a problem, and then focus on creating matrices of the factors and lower level resources that effect these major ones. In this way, appropriate levels or values can be provided for a given resource that directly relates to the desired state of the higher valued resource (and missing information/knowledge of linkages can be highlighted). Additionally, compromises don't have to be hardwired into to base resources by elevating them to the status of a primary resource.

What then are my comments after this rant? Well I guess I would suggest not having specific base levels for sediment as a resource category on its own. Instead, the resources to which it relates should specify appropriate levels. Then when these don't match across resource catagories, it will point out to the managers where compromises may need to be made. I'm not trying to argue that sediment is not important to monitor or that quantity measurements shouldn't be determined, it is just that at this point, I don't think that sediment needs to be maintained as a separate resource category apart from the other ones that you refer to.

2) Target levels:

a) May 1965- first good air photos of river corridor and best proxy for natural setting,
b) October 1984- largest known flood sand redistribution in post dam period,
c) April 1996- most studied flood sand redistribution in post dam period,
d) a range of the above,
e) other. Why?

Comment:
I apologize that I do not have time to participate fully in this process

now, but there are substantial streamwise spatial gradients in sediment grain size, areal extent, etc. that are neglected in your revised MO's. Also, channel margin environments are composed of sand with a grain-size distribution more like that in eddies than that in the channel.

Comment: Agree that the metric is volume (m3). LF and GC gages have most sed data and are crucial data sets to measure this. Target level could be a trend, rather than a particular volume. Suggest using Rubin's newly-emerging "beta" factor to quantify targets for sand size concentration (volume estimates) of the RNV.

Comment:
1) Target levels for area of exposed sand and debris fan morphology should be based on a 'range of natural variability' (RNV) taken from air photo sets: 1934, 1950's, 1965, 1984. It should be broken-out based on the "fine-sediment reaches" we developed during our phone conference of Nov. 15. These reaches are delimited by the following river miles: -15, 1, 39, 61, 87, 143, 239, 278 (see faxed chart).

2) Target levels for sediment flux and concentration should be based on historical grain size data from the Lees Ferry and Grand Canyon gages, as is currently being done. Then, it should be interpreted and applied to the "fine sediment reaches" specified above.

3) By doing the above, the range of natural variability of pattern and process for fine and coarse sediment can be established as a benchmark to constrain other ecosystem goals that depend on sediment (recreation, trout, terrestrial biota, backwater and other nearshore acquatic habitats).

Comment: Target level is 1963-1965 sizes.

Comment: USBR needs to take sediment augmentation seriously.

Comment: We need to be realistic as to what can be done in the canyon based on predicted sediment availability.

Comment: We need to do an experiment with a larger BHBF under optimal sediment conditions to determine if cultural site erosion can be mitigated by dam operations. If not, then sediment augmentation needs to be investigated.

Comment: The target levels are another kettle of fish. One of the things that has puzzled me since my involvement with Grand Canyon research began is that there has not been, as far as I know, a coherent picture of what the overall goals for the river corridor are. Instead, the approach has been piecemeal -- bigger sand deposits, save the snails, more or less salt cedar, save the chub, save the trout, etc. -- and some of these goals are clearly in conflict. Has the Park Service ever put together a vision of what the Park should look like or set priorities? I could offer an opinion, but it's just a matter of personal preference.

What will it take to turn talk into action? What will it take to have another high flow? I believe one of the top priorities should be to set the stage for more high flows. I agree with Randy Peterson's comments about options for future releases. Timing high flows to coincide or shortly follow tributary flows would be ideal and Topping and Rubin have given the value of this approach a solid scientific basis. However, the impression that anything less is not constructive is unwarranted. At the time, the '96 test flow was generally regarded as having been successful at rebuilding sand bars (e.g. Jack Schmidt's summary in the AGU Monograph).

Another issue that should be given some visibility, even if it's in the background, is the importance of eolian processes. I know you and Kate understand the potential importance of wind-blown sand, but it seems it is more generally rarely given serious consideration. Margie and I sent a copy of our draft report to you and Kate at the SWCA address. We argue in the report as an aside that there is plenty of evidence that wind transport plays an important role in the formation and longevity of sand deposits as well as in the change in the character of the river corridor after the dam closed. The issue isn't paramount, but it shouldn't be forgotten altogether.

Comment: The target level should reflect a condition that protects/enhances/benefits the downstream resources (thus the logic of the sediment group discussions following the work of the other small groups). Since we don't have input from the other groups, it may not be possible to guess what contributions from sediment retention and redistribution they assumed in their discussions. However, the target levels should meet our collective vision of what the Adaptive Management Program believes the Grand Canyon ought to look like. From what I heard of other of the small groups, there are still unresolved questions regarding the clarity of that vision. Here are some core questions that I have considered in trying to reconcile this issue:

1 - What is our desired condition regarding OHWZ, sand beaches and marshes? If we expect that we could have all these in the canyon, what would be the resulting/desired BHBF impacts? Do we want BHBFs > 90,000 cfs in order to create bare sand beaches, but at the expense of marshes? Or do we want much lesser magnitude BHBFs in order to limit the effect on the NHWZ? If we want the latter, are we saying that recreational campsite availability is a lower priority than the NHWZ ecosystem components?

2 - What is our expectation regarding nutrient loadings in beaches thus created? Previous GCMRC response to this question (Larry Stevens) was that if we wanted beaches relatively free of vegetation, then coarse grained deposits were "better" than those contained silts and clays, thinking that less nutrients in the sand deposits would discourage vegetative growth.

3 - What is the need for nutrients in the backwater/channel margin areas, specifically related to aquatic productivity? Is the retention of silts and clays important for the food chain, and if so, what are the relative benefits of BHBFs vs. HMFs? If our goal is to enhance the native fish community, what are the results of the stable isotope analyses

which define the relationship between food base and native fish? Is the current mainstem food chain for the native fish broken?

4 - Are we realistic about the "filling in of arroyos" through BHBFs? What percentage of eroding arroyo deposits would be affected by BHBFs of even 90,000 cfs? What are the tradeoffs to other resources if BHBFs of that magnitude were required? Where are the locations of those sites with respect to tributary inputs, i.e. are the sites far enough below the Paria and LCR to have sufficient sediment supply to produce the desired result? With respect to this canyon longitudinality, what were the results of the 1983 flood, i.e., were Upper Marble Canyon sand bars the source of the large deposits downstream?

5 - An evolving conclusion of the Rubin/Topping papers was that BHBFs should be conducted as soon after tributary inputs as possible, or that dam releases should be minimized (< 8,000 to 10,000 cfs) until a BHBF could occur. The goal of these actions is to enhance the conservation of sediment, at least in the eddies if not the main channel. This assumes that dam releases could be modified to limit flows to a low magnitude in the fall and winter, or that the hydrologic triggering criteria could be eliminated or modified to allow fall BHBFs. Without addressing the politics of these ideas, it seems to me that there are many other possible operational and management actions that could be taken to bring us to our vision of the canyon besides those raised in the recent WRR articles by Rubin and Topping, although their raising of these concerns has truly been helpful in refining our understanding of sediment processes. Do these issues affect the target levels for sediment?

I suggest that we as the sediment small group first come to terms with the first four of these questions, synthesizing the output from the other groups, and produce a reconciliation of the various canyon resources. Then we could address the metrics and targets for the existing MOs. Can we do this only through email, or do we need a conference call or meeting? Can we proceed without the products of the other groups?

B) Second; based on your response to the questions above, please "fill in the blanks" for Sediment Management Objectives, MO21-MO23:

MO21: Maintain or attain fine sediment in the main channel up to power plant capacity:

a) abundance

metric:

current level:

target level:

comments:

b) grain-size

metric:

current level:

target level:

comments:

c) distribution

metric:

current level:

target level:

comments:

MO22: Maintain or attain fine sediment in eddies up to power plant capacity:

a) abundance

metric:

current level:

target level:

comments:

comments: This metric should reflect the new studies showing that the 1996 flow indicated the sand came from eddies.

b) grain-size

metric:

current level:

target level:

comments:

c) distribution

metric:

current level:

target level:

comments:

MO23: Maintain or attain fine sediment along shorelines between power plant capacity and maximum Beach Habitat Building Flow:

d) abundance

metric:

current level:

target level:

comments: The cultural metric of filling in arroyos may not be appropriate since it has not been proven. Certainly retaining existing recreational beaches in order to keep campers and hikers off of archaeological sites is important.

comments: focus should be below the LCR

a) grain-size

metric:

current level:

target level:

comments:

b) distribution

metric:

current level:

target level:

comments:

Note 1: The target is enough sediment to achieve biological, recreational, and cultural goals. Given limited sediment inputs, we need to retain enough sediment in the system to achieve ecosystem patterns in Goals 1-4, 7-10, and 12.
Note 2: What are the levels of sediment needed to achieve the biological, recreational, and cultural goals, and how do we maintain those levels? For the biological goals, the purposes are habitat and nutrient storage. For the cultural goal, the purposes are plant habitat and preserving sites through filling in arroyos. For recreational goals, the purposes are camping beaches and trout spawning habitat. Linkages: Recreational, biological, and cultural goals: 1-4, 7-10, and 12.
Note 3: If the metric or values asked for below are unknown, list it as an IN (information need).