

Beach Habitat Building Flow Science Plan Update and Future Steps

by

John Hamill and Ted Melis
Grand Canyon Monitoring and Research Center
USGS

Adaptive Management Work Group
August 30, 2007



Overview

- Review USGS Fact Sheet re: Research related to conservation of sand bars (Ted Melis)
- Background and Status of BHBF Science Plan
 - Review AMWG questions about a future BHBF test
 - Review non-technical concerns related to a BHBF (John Hamill)
- TWG Report (Kurt Dongoske)
- Plan next steps (Mary Orton)



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Overview of Key Statements
Value of Sediment Resources

“Throughout Grand Canyon, sandbars create habitat for native plants and animals, supply camping beaches for river runners and hikers, and provide sediment needed to protect archaeological resources from weathering and erosion.”



Research Furthers Conservation of Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

**Sandbars Support both Aquatic, Terrestrial Habitats and
Recreational Campsites**



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

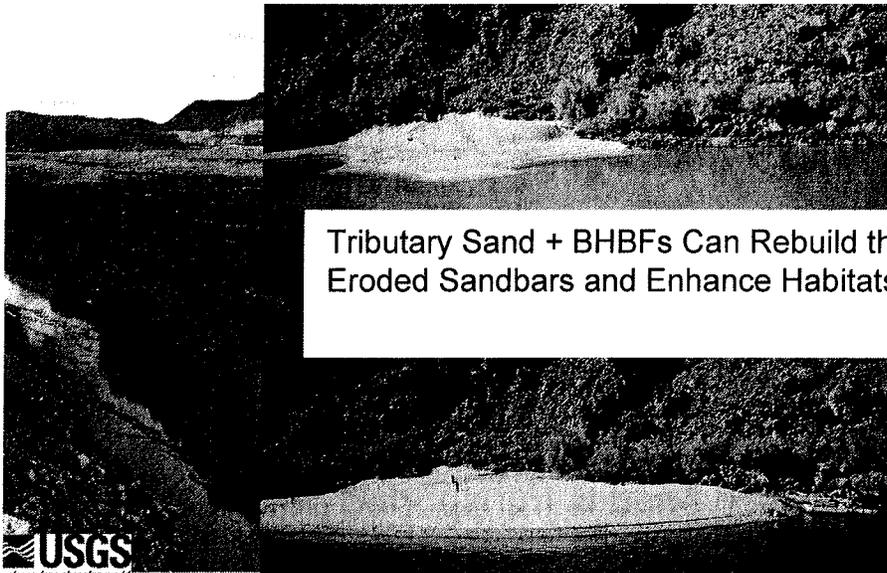
Overview of Key Statements
Limited Sand Supply

“Tributaries to the Colorado River below Glen Canyon Dam, such as the Paria and Little Colorado Rivers, provide the only new inputs of sediment that can be used to maintain sandbars in the Colorado River ecosystem in the post-dam era.”



Research Furthers Conservation of Grand Canyon Sandbars

USGS Fact Sheet 2007-3020



Tributary Sand + BHBFs Can Rebuild the Eroded Sandbars and Enhance Habitats



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Overview of Key Statements
Science Support for GCDAMP

“Extensive research and monitoring during the past decade have resulted in the identification of possible alternatives for operating Glen Canyon Dam that hold new potential for the conservation of sand resources.”



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Key Point #1

Challenge = Shifting Rating Curves

“Sand on the riverbed becomes finer when tributaries add fine sediment to the river and coarser when higher releases from the dam wash finer sand downstream. These changes in the grain size of sand affect the rate at which sand is transported downstream.”



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Key Point #2

Loss of New Sand Inputs

“As a result of [MLFF] dam operations and decreased sand supply, the Colorado River now typically transports more sand downstream than tributaries supply on a seasonal to annual basis.”



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Key Point #3

High Flows Without Sand?

“During these two experiments [1996 BHBF and 2000 HMF], conducted when the Colorado River was relatively sand depleted, the erosion of low-elevation sandbars actually resulted in a net reduction in overall sandbar size.”



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Critical Finding

Synthesis of Historical Data

“This sediment deficit has resulted in progressive erosion of channel and sandbar deposits from Marble and Grand Canyons since 1963. This erosion of channel and sandbar deposits has continued despite constraints placed on releases from the dam by the 1996 Record of Decision.”



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Critical Finding

Value of Experimental Learning

“A second important finding is that during the high-flow releases in 1996 and 2000, the primary sources of sand for building high-elevation sandbars were the low-elevation parts of the same sandbars and not sand that had accumulated on the riverbed, as had been hypothesized.”



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Key Point #4
2004 Results

“In November 2004, a high-flow release was timed to follow tributary floods for the first time on the Colorado River. *This experiment resulted in an increase in sandbar total area and volume in the upper half of Marble Canyon.*”



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet 2007-3020

Key Point #5
Complex 2004 Response

“Further downstream, where sand was less abundant, a net transfer of sand out of eddies occurred that was similar to that observed during the 1996 and 2000 experiments.”



USGS Fact Sheet 2007-3020
"Take Home Points"

- For the BHBF strategy to be viable, BHBFs must be conducted under sand enriched conditions, such as exist now
- Under moderate and higher release years, the sand export from the CRE typically exceeds the available tributary sand supply downstream from the dam
- Under 8.23 MAF releases & above average sand inputs significant quantities of sand are retained for longer periods of time



USGS Fact Sheet 2007-3020
"Take Home Points"

- BHBFs – are the only operational means of transferring sand from lower elevations of the channel to higher shoreline locations: without sand-enriched floods, beaches erode
- Under average annual sand inputs from the tributaries, there will not be enough new sand available to rebuild sandbars throughout the CRE from a single BHBF - multiple BHBFs may be needed to build bars incrementally through time



USGS Fact Sheet 2007-3020
"Take Home Points"

More sand supply can be achieved in 3 ways:

- A) Release enriched BHBFs more frequently
(hypothesis to be tested)
- B) Further constrain dam releases over longer
periods of time, perhaps years (known)
- C) Sediment augmentation from upstream
sources - Lake Powell (known)



"Research Furthers Conservation of
Grand Canyon Sandbars"

A New USGS Fact Sheet 2007-3020

Available at:

GCMRC web site

Under "Products"

Thank You For Your Attention!



Overview

Review USGS Fact Sheet re: Research related to conservation of sand bars (Ted Melis)

- Background and Status of BHBF Science Plan
 - Review AMWG questions about a future BHBF test
 - Review non technical concerns related to a BHBF (John Hamill)
- TWG Report (Kurt Dongoske)
- Plan next steps (Mary Orton)



Recent Action on BHBF

AMWG Recommendation (December 5, 2007)

- “AMWG recommends to the Secretary of the Interior to charge GCMRC to develop a science plan for a BHBF that addresses the concerns raised at the AMWG meeting on Dec. 6, 2006, and AMWG further charges the TWG to work with GCMRC to review the Draft Science Plan and make a recommendation to the AMWG.”

Guidance provided by DOI in the February 2, 2007 memo from Mark Limbaugh to the AMWG:

- “In accordance with the AMWG’s recommendation, staff at the GCMRC have been working since the December meeting to prepare a draft science plan regarding additional BHBFs. ...it is my hope that we can work effectively together to have well-considered, approved, ‘off-the-shelf’ action plans to take advantage of these types of important research opportunities in the future.”



Current Status and Schedule

- Jan-Apr 2007. 1st Draft BHBF Science Plan
 - DOI, WAPA, AGF Preliminary Review
 - Science Advisors Review
 - April LTEP Planning Workshop Scientist Review
- May-Jul 2007. 2nd Draft Plan
 - Written TWG Review/GCMRC response
 - TWG meeting and discussion
- Aug-Sep 2007. 3rd Draft Plan
 - TWG ad hoc committee review (Sediment and Desired Future Conditions)
- October 2-3, 2007. Final TWG Review/Recommendation



10 AMWG Questions

1. What are the pros and cons of a BHBF?
2. What hypotheses would be tested?
3. Why replicate the 2004 BHBF test?
4. What are the pros and cons of a shorter-duration BHBF?
5. What is the risk to humpback chub?
6. Are sufficient funds available for a BHBF test?
7. Will there be an impact to the aquatic food base?
8. What will be the hydropower and other economic impacts?
9. What are the impacts to the Hualapai Nation lands and archaeological sites in Glen Canyon?
10. Will planned maintenance at GCD affect timing of a BHBF?

Responses included in draft BHBF Science Plan and AMWG AIF



Policy Comments

1. Lack of desired future conditions or criteria for evaluating success of a BHBF:
 - Target river reaches (Marble Canyon vs. downstream reaches)
 - Target resources (backwater habitats, aquatic food base, camping beaches, sand bars, riparian vegetation, etc.).
2. Conducting multiple BHBF tests as a means of evaluating cumulative increases in system-wide sandbar response
3. Conducting a BHBF as a “stand-alone” activity before the Long Term Experimental Plan is completed.
4. The need for additional decision criteria for conducting future BHBF tests including ESA compliance, NPS permitting requirements, cost and availability of funds, and whether specific resource targets have been realized.
5. The legality of doing a BHBF test when the reservoir is not full.



BHBF Comment Summary

- 197 written comments received from TWG/AMWG members:
 - o Bureau of Reclamation – 28
 - o NPS (Glen Canyon NRA) – 20
 - o AZ Department of Water Resources – 7
 - o AZ Game and Fish Department - 16
 - o CREDA – 63
 - o Western Area Power Administration – 45
 - o U.S. Fish and Wildlife Service – 18
- **18 stakeholder groups did not comment**



BHBF Science Costs

- Estimated cost is over 2 years
 - Year 1: \$1.41
 - Year 2: \$0.47

Total: \$1.88 million

 - Option to reduce cost by funding a portion of proposed studies
-
- Available Funds (Experimental Fund)
 - FY 08: \$1.4 million
 - FY 09: \$1.9 million



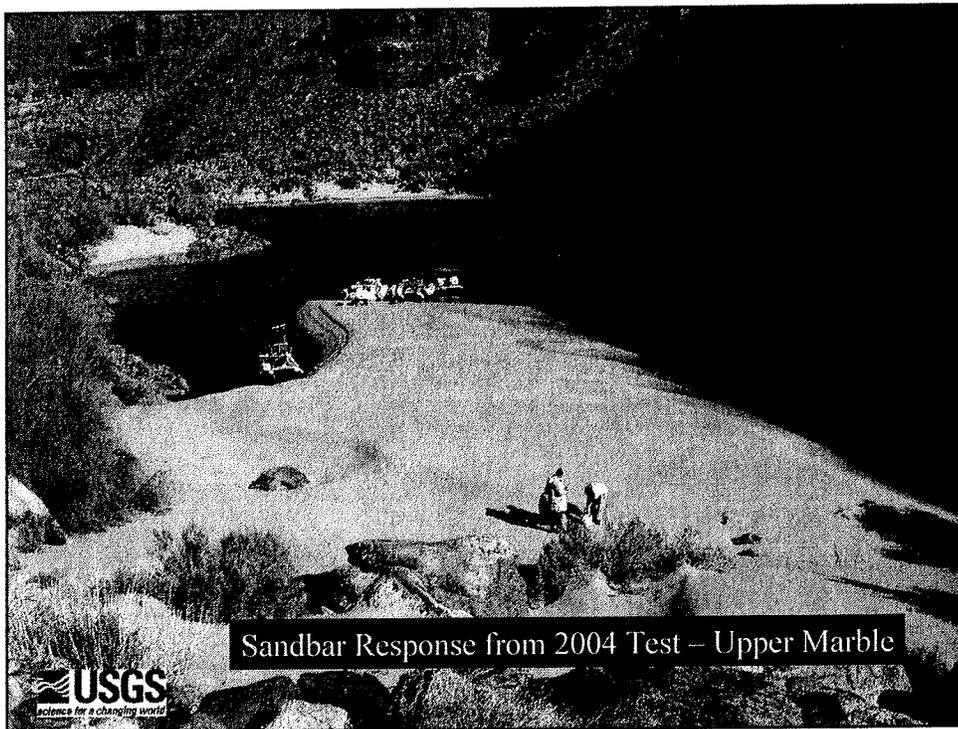
Water Year 2008 BHBF?

- Sediment trigger has been met
- Decision needed by early November to meet logistical and compliance requirements



Next Steps

- August 30, 2007: AMWG/DOI develop a process to address policy issues prior to consideration of a decision to implement the BHBF science plan in Water Year '08
- September 14, 2007: The Sediment and DFC Ad Hoc Groups will provide comments on the Draft Plan to the TWG
- Mid-September: (proposed) AMWG provides comments on GCMRC responses to AMWG concerns (appendix B)
- October 3, 2007: The TWG will review the BHBF science plan and provide a recommendation to the AMWG
- Early November 2007: (proposed): AMWG meeting or conference call to consider approval of the BHBF Science Plan and a possible BHBF test in the winter of 2008



Sandbar Response from 2004 Test – Upper Marble



Overview

- Review USGS Fact Sheet re: Research related to conservation of sand bars (Ted Melis)
- Background and Status of BHBF Science Plan
 - Review AMWG questions about a future BHBF test
 - Review non technical concerns related to a BHBF (John Hamill)
- TWG Report (Kurt Dongoske)
- Plan next steps (Mary Orton)



Overview

- Review USGS Fact Sheet re: Research related to conservation of sand bars (Ted Melis)
- Background and Status of BHBF Science Plan
 - Review AMWG questions about a future BHBF test
 - Review non technical concerns related to a BHBF (John Hamill)
- TWG Report (Kurt Dongoske)
- Plan next steps (Mary Orton)



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet #2007-3020

Value of Sediment Resources

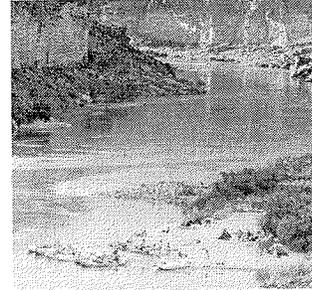
"Throughout Grand Canyon, sandbars create habitat for native plants and animals, supply camping beaches for river runners and hikers, and provide sediment needed to protect archaeological resources from weathering and erosion."



Research Furthers Conservation of Grand Canyon Sandbars

USGS Fact Sheet #2007-3020

**Sandbars Support both Aquatic, Terrestrial Habitats and
Recreational Campsites**



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet #2007-3020

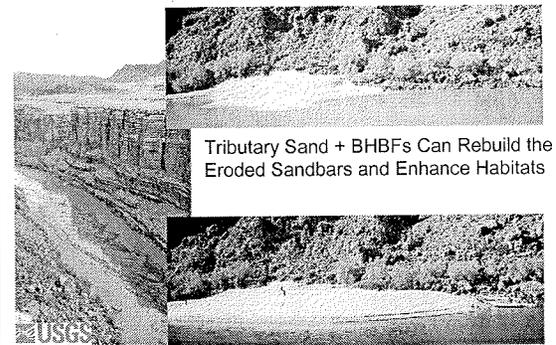
Limited Sand Supply

"Tributaries to the Colorado River below Glen Canyon Dam, such as the Paria and Little Colorado Rivers, provide the only new inputs of sediment that can be used to maintain sandbars in the Colorado River ecosystem in the post-dam era."



Research Furthers Conservation of Grand Canyon Sandbars

USGS Fact Sheet #2007-3020



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet #2007-3020

**Critical Finding
Synthesis of Historical Data**

"This sediment deficit has resulted in progressive erosion of channel and sandbar deposits from Marble and Grand Canyons since 1963. This erosion of channel and sandbar deposits has continued despite constraints placed on releases from the dam by the 1996 Record of Decision."



Research Furthers Conservation of Grand
Canyon Sandbars
USGS Fact Sheet #2007-3020

**Critical Finding
Value of Experimental Learning**

"A second important finding is that during the high-flow releases in 1996 and 2000, the primary sources of sand for building high-elevation sandbars were the low-elevation parts of the same sandbars and not sand that had accumulated on the riverbed, as had been hypothesized."



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet #2007-3020

Science Support for GCDAMP

"Extensive research and monitoring during the past decade have resulted in the identification of possible alternatives for operating Glen Canyon Dam that hold new potential for the conservation of sand resources."



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet #2007-3020

Challenge = Shifting Rating Curves

"Sand on the riverbed becomes finer when tributaries add fine sediment to the river and coarser when higher releases from the dam wash finer sand downstream. These changes in the grain size of sand affect the rate at which sand is transported downstream."



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet #2007-3020

2004 BHBF Test Results

"In November 2004, a high-flow release was timed to follow tributary floods for the first time on the Colorado River. *This experiment resulted in an increase in sandbar total area and volume in the upper half of Marble Canyon.*"



Research Furthers Conservation of
Grand Canyon Sandbars
USGS Fact Sheet #2007-3020

Complex 2004 Response

"Further downstream, where sand was less abundant, a net transfer of sand out of eddies occurred that was similar to that observed during the 1996 and 2000 experiments."



USGS Fact Sheet #2007-3020
"Take Home Points"

- For the BHBF strategy to be viable, BHBFs must be conducted under sand enriched conditions, such as exist now
- Under moderate and higher release years, the sand export from the CRE typically exceeds the available tributary sand supply downstream from the dam
- Under 8.23 MAF releases & above average sand inputs significant quantities of sand are retained for longer periods of time



USGS Fact Sheet #2007-3020
"Take Home Points"

- **BHBFs** – are the only operational means of transferring sand from lower elevations of the channel to higher shoreline locations: without sand-enriched floods, beaches erode
- Under average annual sand inputs from the tributaries, there will not be enough new sand available to rebuild sandbars throughout the CRE from a single BHBF - multiple BHBFs may be needed to build bars incrementally through time



USGS Fact Sheet #2007-3020
"Take Home Points"

More sand supply can be achieved in 3 ways:

- A) Release enriched BHBFs more frequently
(hypothesis to be tested)
- B) Further constrain dam releases over longer
periods of time, perhaps years (known)
- C) Sediment augmentation from upstream
sources - Lake Powell (known)



"Research Furthers Conservation of
Grand Canyon Sandbars"

A New USGS Fact Sheet #2007-3020

Available at:

GCMRC web site

Under "Products"

Thank You For Your Attention!

