

INTEGRATED AQUATIC AND
TERRESTRIAL ECOSYSTEM
MONITORING AND RESEARCH

Fiscal Year 2003 Budget

Section V. C 1-10

GCMRC

C-1 & C-10: Long-Term Monitoring Of Fine-Grained Sediment Storage Throughout The Main Channel

Purpose: Fine-grained sediment deposits (sand and finer) of the main channel constitute a major storage component of the Colorado River ecosystem's sediment budget. Glen Canyon Dam operations influence fine deposits in ways that affect aquatic and terrestrial habitats over both short and long periods. The emphasis of this long-term sediment monitoring project shall be to document system-wide changes in fine-grained deposits relative to dam operations and natural inputs, with emphasis on key storage settings within a series of sub-reaches chosen on the basis of integrated resource concerns. Monitoring shall occur on a biennial schedule for reach-based storage changes of fine sediment volume, area and grain-size characteristics, while a subset of recreational campsite sand bars shall be monitored annually. The project provides data: (1) to managers who need to assess the status of near-shore aquatic and terrestrial habitats where vegetation and associated fauna, socio-cultural resources are of management concern; (2) on the availability of fine-grained sediment that can be periodically manipulated through controlled floods to preserve and sustain downstream resources dependent on fine sediment; (3) that allow identification and interpretation of linkages between dam operations and changes in physical habitats and related ecosystem resources. This project was originally approved and implemented through a competitive award in FY 2001.

Objectives:

- 1-Monitor system-wide relative changes in the morphology, volume and grain-size characteristics of fine-sediment deposits in aquatic and terrestrial settings of the main channel within selected sub-reaches.
- 2-Provide additional data for verification of system-wide fine-sediment mass balance related to changes in channel storage.

FY 2003 Products:

- Annual data delivery and progress reports describing achievement of goals.
- Annual GIS data sets related to change detection analyses related to main channel storage of fine sediment.
- Annual technical presentations at GCMRC Science Symposia and (or) Technical Workgroup meetings.

Fiscal Year 2003 Cost: \$550,000.00 (Modification of Management Agreements with USGS, and Cooperative Agreements with Utah State University and Northern Arizona University; Including camping area and high-elevation topography at all NAU sites measured annually, plus continuation of "Adopt-a-Beach" program; C-1 and C-10 combined.)

	2001	2002	2003	2004	2005
RFP Development/Release in October 2000	Awarded 3 Agreements in Summer 2001	Renewed in October 2002	<i>Renewed in October 2003</i>	Renewed in October 2004	Renewed in October 2005
Data Collection/Analysis	Annual to Biennial	Annual to Biennial	<i>Annual to Biennial</i>	Annual to Biennial	Annual to Biennial
Report/Data Delivery	Annually by December 31	Annually by December 31	<i>Annually by December 31</i>	Annually by December 31	Annually by December 31
Project Review/Evaluation	Annually by GCMRC	Annually by GCMRC	<i>Annually by GCMRC</i>	Annually by GCMRC	Externally Reviewed
Completion	Progress Report	Progress Report	<i>Progress Report</i>	Progress Report	Final Reports January 2006

C-2: Long-Term Monitoring Of Stream flow and Fine-Sediment Transport in the Main Channel Colorado and its Tributaries

Purpose: This is the core of the long-term monitoring effort for sediment and stream flow. The project extends time series for: (1) stage changes associated with discharges from Glen Canyon Dam at a site immediately downstream of the dam; (2) stream flow and fine-sediment inputs entering the Colorado River ecosystem from the Paria and Little Colorado Rivers; (3) stream flow and fine-sediment transport along the main channel at the existing stream gages at Lees Ferry, Grand Canyon near Phantom Ranch, and above the confluence of Diamond Creek near Peach Springs; (4) geomorphically based model estimates of fine-sediment inputs from the Paria and Little Colorado Rivers; (5) major tributary modeling reach characteristics before and after major tributary floods; (6) floods occurring in lesser drainage areas of Glen and Marble Canyons.

Objectives:

- Monitor fine-sediment mass balance of the ecosystem; relating seasonal inputs to export.
- Support development of a 1-dimensional model for routing fine sediment downstream.
- Provide physical data for interpreting trends in biological, cultural and recreational areas.

FY 2003 Products:

- Annual data on stream flow and sediment transport downstream of Glen Canyon Dam.
- Semi-annual and annual summary reports describing trends in fine-sediment mass balance. I
- Final report on relationships between operations and sediment transport conditions of the main channel.
- Annual technical presentations at GCMRC Science Symposia and (or) Technical Workgroup meetings.

Fiscal Year 2003 Cost: \$625,000.00 (Modification of USGS – GS & WRD Management Agreements with Rubin, Topping and Hornewer et al.)

	2001	2002	2003	2004	2005
RFP Development/Release in October 2000	Awarded Management Agreement in August 2001	Renewed as Modification in October 2002	<i>Renewed as Modification in October 2003</i>	Renewed as Modification in October 2004	Renewed as Modification in October 2005
Data Collection/Analysis	Daily to Weekly, with Ongoing Analysis	Daily to Weekly, with Ongoing Analysis	<i>Daily to Weekly, with Ongoing Analysis</i>	Daily to Weekly, with Ongoing Analysis	Daily to Weekly, with Ongoing Analysis
Report/Data Delivery	Semi-annual and Annual	Semi-annual and Annual	<i>Semi-annual and Annual</i>	Semi-annual and Annual	Semi-annual and Annual
Project Review/Evaluation	Monthly to Annually	Monthly to Annually	<i>Monthly to Annually</i>	Monthly to Annually	Externally Reviewed
Completion	Annual Progress	Annual Progress	<i>Annual Progress</i>	Annual Progress	Final Reports March 2006

C-3: Long-Term Monitoring Of Coarse-Grained Sediment Inputs, Storage And Impacts To Physical Habitats

Purpose: Monitoring Glen Canyon Dam operations and their interactions with coarse-grained sediment deposits that structure the geomorphic framework of the Colorado River ecosystem. Specifically, interactions between coarse-sediment deposits introduced to the main channel by tributary debris flows and Glen Canyon Dam operations, relative to system-wide distributions of aquatic and terrestrial habitats. This sediment monitoring activity consists mainly of change detection with respect to coarse-sediment inputs and channel features that support physical habitats, such as debris fans, cobble bars, and channel-bed topography and distribution of channel-bed coarse-sediment substrates. Coarse-grained sediment deposits (composed of particles larger than sand-sized) are influenced by dam operations, and are also linked to biological, physical and recreational resources. Monitoring tributary debris-flow impacts and resulting coarse-sediment deposits, with respect to operations of Glen Canyon Dam, provides data on: (1) changing physical-habitat conditions related to coarse sediment that influence biological resources (such as the food base and spawning habitats for fish) and are of interest to scientists conducting related monitoring projects; (2) changing navigational conditions of whitewater rapids; (3) degradation of camping areas owing to erosion and (or) burial by coarse debris; (4) system-wide influences of flow regulation on the geomorphology of the main channel with respect to potential distribution and storage of fine sediment deposits.

Objectives:

- Document changes in the distribution and abundance of coarse sediments throughout the ecosystem.
- Identify impacts to quality of recreational campsites and navigational conditions in rapids.
- Identify changes related to settings for fine-sediment storage in pools above rapids and eddies.

FY 2003 Products:

- Semi-annual progress reports on status of project, and annual reports describing achievement of goals.
- Annual data on coarse-sediment inputs to main channel that result from tributary events.
- Annual GIS data for change detection analyses related to inputs and related impacts of coarse-sediment.
- Annual technical presentations at GCMRC Science Symposia and (or) Technical Workgroup meetings.

Fiscal Year 2003 Cost: \$135,000.00 (Modification of USGS – WRD Management Agreement with Webb et al.)

	2001	2002	2003	2004	2005
RFP Development/Release (October 2000)	Awarded Agreement in Spring 2001	Renewed in October 2002	<i>Renewed in October 2003</i>	Renewed in October 2004	Renewed in October 2005
Data Collection/Analysis	Annually in Fall	Annually in Fall	<i>Annually in Fall</i>	Annually in Fall	Annually in Fall
Report/Data Delivery	Annually by December 31	Annually by December 31	<i>Annually by December 31</i>	Annually by December 31	Annually by December 31
Project Review/Evaluation	Annually by GCMRC	Annually by GCMRC	<i>Annually by GCMRC</i>	Annually by GCMRC	Externally Reviewed
Completion	Progress Report 12/01	Progress Report 12/02	<i>Progress Report 12/03</i>	Progress Report 12/04	Final Report 12/05

C-4 and C-5 (combined): Streamflow And Suspended-Sediment Transport Modeling Within The Colorado River Ecosystem

Purpose: A two-fold research project that includes: 1) Development of a sediment-transport model capable of predicting 3-dimensional sand bar evolution under a range of dam operations and sediment supply conditions in selected geomorphic reaches of the main channel, and 2) development of a 1-dimensional numerical method for simulating the fate of tributary fine sediment inputs (sand and silt/clay), once they enter the Colorado River ecosystem and are subjected to the influence of Glen Canyon Dam operations. The multi-dimensional component shall be developed in a way that results in predictions of reach-averaged sand bar responses within geomorphic reaches identified by GCMRC and Ecometric Research, Inc., in advance of the project (FY 2000 activity). The model will also be able to simulate changing bar conditions at specific sites of concern, provided that high-resolution channel geometry is available for the reach or site of interest. The 1-dimensional component of the modeling effort shall focus on routing fine-sediment through the ecosystem; a capability that is needed to track the fate of channel-stored sediment over short periods following tributary floods from the Paria and Little Colorado Rivers.

Objectives:

- A 1-dimensional sediment routing model that links streamflow to suspended transport.
- Reach-averaged estimates of multi-dimensional sand bar responses under varied sediment and flow.
- Advance understanding of sediment and flow processes to support management decision making.

FY 2003 Products:

- Progress report on model development relating fine-sediment storage changes to dam operations.
- Numerical model code and documentation on 1-D routing model development.
- Preliminary model results for 1- and multi-dimensional sediment-transport simulations.
- Preliminary graphical user interface (GUI) for both models.

Fiscal Year 2003 Cost: \$325,000.00 (Award anticipated in October 2001)

	2002	2003	2004	Project Ended
RFP Development/Release (October 2000)	Award Agreement in Fall 2001	<i>Renewed in October 2003</i>	Renewed in October 2004	
Data Collection/Analysis	Annually in Fall or Winter	<i>Annually in Fall</i>	Annually in Fall	
Report/Data Delivery	Annually by December 31	<i>Annually by December 31</i>	Annually by December 31	
Project Review/Evaluation	Annually by GCMRC	<i>Annually by GCMRC</i>	Externally Reviewed	
Completion	Progress Report 12/02	<i>Progress Report 12/03</i>	Final Report 12/04	

C-6: Advanced Conceptual Modeling Of Coarse-Grained Sediment Inputs Related To Evolving Physical Habitats And Aquatic Processes

Purpose: Development of advanced simulations to predict long-term impacts of river regulation and inputs of coarse-grained sediments from ungaged tributaries at hundreds of sites along the main channel. Since closure of Glen Canyon Dam in 1963, local geomorphic changes have continued to occur at sites along the main channel owing to coarse-grained sediment inputs that result from debris flows in ungaged tributaries. Because of the reduced flood frequency imposed by the dam, the natural level of reworking of coarse sediments in the main channel is drastically reduced compared with pre-dam annual floods. However, the 1996 controlled flood experiment was shown to be an effective means of partially reworking rapids and debris fans aggraded by recent debris flows. Inputs of coarse sediments to the system-wide sediment budget of the ecosystem have been shown to have implications for enhanced storage of fine sediment in upper pools and eddies, as well as for increasing navigational hazards in rapids. In addition, coarse-grained deposits generally bury or degrade sand bars used by recreational camping, while at the same time adding to coarse substrates on which the food base relies (benthic organisms). Simulation of long-term trends in physical habitats related to coarse sediments and ongoing inputs shall provide information on how biological and socio-cultural resources are likely to respond to increased storage of coarse sediments along the main channel under regulated flows.

Objective:

- Develop a geomorphic sub-model of the main channel that simulates long-term trends in local and reach-averaged changes in fine-sediment storage settings, physical habitats such as cobble bars and debris fans that support the food base, and degradation of recreational camping areas that result from continued inputs of coarse-grained sediments (debris flows).

FY 2003 Products:

- Final Report on coarse-grained model development.
- Revised GCM with coarse-grained input/impact submodel.
- Graphical User Interface revised within GCM.

Fiscal Year 2003 Cost: \$102,000.00 (Cooperative Agreement with Ecometric Research, and Modification of Management Agreement USGS – WRD with Webb et al.)

	2001	2002	2003	Project Ended
RFP Development/Release (October 2000)	Modified Agreements in Fall 2000	Modified Agreements in Fall 2001	<i>Renewed in October 2002</i>	
Data Collection/Analysis	Annually in Fall	Annually in Fall or Winter	<i>Annually in Fall</i>	
Report/Data Delivery	Annually by December 31	Annually by December 31	<i>Annually by December 31</i>	
Project Review/Evaluation	Annually by GCMRC	Annually by GCMRC	<i>Externally Reviewed</i>	
Completion	Progress Report 12/01	Progress Report 12/02	<i>Final Report 12/03</i>	