## GCMRC Project Narratives for Fiscal Year 2004

### Terrestrial Ecosystem Activities

A.1. Monitoring & Inventory of Terrestrial Resources & Tribal Participation: Integrated biological monitoring of vegetation linking birds, food base and vegetative structure on reach and river-wide scale, using bird patch size as minimum sampling unit. Also linking hydrology to vegetation composition change and implementing sampling scheme for long-term monitoring of status and trends. New RFP in FY04. Reduced funding will eliminate all sampling for insects, herpetological fauna, and mammals. Reduced sampling for vegetation and avifauna. Emphasis on data synthesis and reporting of results for FY 2001-2003.

Tribal Participation: One-year continuation of work begun in FY 2001 and continued in FY 2002-03. All five participating tribes to work with biologists on terrestrial monitoring to incorporate tribal perspectives within biological monitoring project.

A.2. Monitoring Kanab Ambersnail: Sampling and estimating population status of snails at Vaseys Paradise. Includes measurement of habitat. Logistics support for supplemental population surveys included. Eliminate estimation of habitat and snails above 100,000 cfs.

A.3. Cultural Data Base Plan: Development of cultural resource database plan as stipulated in the PEP recommendation and a component of the Historic Preservation Plan stipulated in the PA agreement. Plan development was postponed due to development of other HPP components.

A.4. Terrestrial Habitat Mapping and Inventory: Project involving remote sensing approach using digital color infrared imagery to create comprehensive canyon wide vegetation map for river corridor. Originally scheduled for completion in FY03-has been extended in FY04 for ground truthing and correction of maps if needed. Unused funds will be used to supplement TEM project.

A.5. Kanab Ambersnail Taxonomy (Year 1): First year of multi-year project to resolve taxonomic issues associated with *Oxyloma* complex. Funding of $100,000 additional per year from USGS appropriated funds. New RFP probable to obtain best available science.

New Terrestrial Research: Research depending on information needs and strategic planning (funding and project eliminated in FY04).

Holocene Mapping: Purpose of this project was to document Holocene deposits within the Canyon to define the area potentially affected by dam operations relative to sediment deposits, cultural and recreational resources. Would haveimplemented a cultural PEP recommendation. (Project deferred.)

### Aquatic Ecosystem Activities

B.1. Foodbase Monitoring: Data collection and analysis of algae, benthos, drift and organic carbon flux to measure response to operations. Increased emphasis may be in Glen Canyon and in association with gauging stations in Grand Canyon. Program is responsive to aquatic PEP report.

B.2. Monitoring Downstream Fish: New RFP to be issued in FY04. Data collection and analysis of fish populations in the mainstem and Little Colorado River likely involving 4 LCR trips and mainstem trips that include 2 trips for estimates of trout (rainbow, brown)- and trips to develop native fish abundance estimates and for synoptic surveys to detect distribution changes. Native fish trips reduced from 3 to 2.

B.3. Monitoring Lees Ferry Trout: New RFP in FY04 involving population estimates for Lees Ferry trout fishery including proportional stock density and condition factor of fish.

Native and Non-native Fish Interactions Research: Projects will include predator/prey interactions, competition, and bioenergetics model development. Design and technical assistance with non-native fish control. Project eliminated-subsumed in experimental flow program and non-native fish control.

B.4. IWQP Downstream Activities: Water quality monitoring downstream within the intention of expansion of parameters measured as per PEP recommendations. Monitoring plan is under development. Elimination of WRD contract and increased temperature monitoring in anticipation of TCD.

**Integrated Activities**

C.1. Fine-Sediment Storage Monitoring & Research: This project's main objective is to measure changes in the area, volume and grain-size characteristics of sand bars above and below the 8,000 cfs flow elevation, supports Goal 8, MO's 8.1 through 8.5. This is an ongoing project in 2001-2005, with review and revision of monitoring protocols for fine-sediment storage in FY05 and implementation of long-term monitoring in FY06. Budget reductions mean that only 8 of 11 reaches will be monitored in FY04.

C.2. Fine-Sediment Mass Balance (Influx vs. Efflux): The main objective of this project is to measure high-resolution changes in mass flux of sand and fines under range of dam operations and tributary inputs, supports Goal 8, MO's 8.1 through 8.5. The project is ongoing in 2001-2005, with review and revision of monitoring protocols for fine-sediment storage in FY05 and implementation of long-term monitoring in FY06. Budget reductions mean that Glen Canyon gage is eliminated in FY04, and errors in efflux below Phantom remain unresolved.

C.3. Coarse-Sediment Inputs & Impacts Monitoring & Research: The objective of this project is to measure area, volume and grain-size characteristics of coarse sediment inputs from tributary debris flows and stream floods, along with changes in physical habitats under range of dam operations, supports Goal 8, MO's 8.6 through 8.7. The project is ongoing in 2001-2005, with review and revision of monitoring protocols for coarse-sediment storage in FY05 and implementation of long-term monitoring in FY06. Budget reductions mean less emphasis on physical habitats and integration in FY04.

C.4. Fine-Sediment Transport Modeling and Sand-Bar Evolution: The objective of this research project is to develop a predictive capability for estimating the fate of fine-sediment inputs from Paria River, as well as simulation of multidimensional sand-bar evolution under range of dam operations and sand-supply conditions, supports Goal 8, MO's 8.1 through 8.5. The project is ongoing in 2002-2004, with project completion and review in FY04, followed by model verification in FY05 and FY06. The budget remains nearly whole in FY04, so that research project can be completed as proposed. Some field efforts are eliminated in the third and final year.

**Other Research Activities**

D-1. Unsolicited Proposals: The GCMRC proposes to retain funds is support of unsolicited proposals that will allow for flexibility in the program and help ensure that GCMRC can address critical issues in a timely fashion. It will also provide GCMRC the ability to fund truly outstanding proposals that addresses a key concern that may be overlooked in the research planning process. All unsolicited proposals will be discussed with the TWG and will undergo independent, external peer review prior to funding.

D-2. AMWG/TWG Requests: GCMRC budgets funding that can be used in support of requests that arise from the AMWG and TWG during the course of the year.

D-3. In-house Research: The GCMRC supports in-house research by GCMRC Program Mangers and scientific staff. In-house research is supported as a means of ensuring that GCMRC program managers and scientific staff remain subject area experts in their respective fields through the conduct of their own research on the Colorado River ecosystem. This also ensures that they are able to provide the highest quality of technical assistance in the form of expert analysis, opinion, and advice to the Chief, TWG and the AMWG as requested. In-house research may be in the form of original research or synthesis. In all cases, GCMRC in-house research proposals undergo the same independent external review as all GCMRC proposals.

D-4. Tribal Training, Science/Tribal Perspectives Integration/Tribal Interns: Follow-on workshops for tribal training, science/tribal perspective integration workshop implementation, and use of tribal student interns. Purpose of work is to increase tribal participation within AMP for project development and implementation.

D-5. Public Outreach Involvement Plan Implementation: Implementation of public outreach/involvement plan developed during FY 03 as stipulated in the PA agreement and recommended by the cultural PEP. Originally recommended as cultural plan, but as recommended by several stakeholders expanded to include all AMP resources.

D-6. Cultural Resources Synthesis and Status Report: Incorporates data and reports developed by AMP cultural representatives to provide a general synthetic knowledge gained from projects and integrated across resource areas. Developed in-house by GCMRC with collaboration with AMP cultural representatives. Project provides current information within SCORE report.

D-7. Cultural Affiliation Study: An ethnographic project that is a companion plan to the Research Design Plan contracted in FY-01. This project forms a component of the Historic Preservation Plan and provides information on tribal histories and affiliation to the project area.

**Administrative and Management**

E-1. Administrative Operations: The Administrative Operations budget provides for Center leadership, facilities, various operating expenses, and other direct administrative costs for GCMRC activities.

E-2. Program Planning and Management: These costs are for salary and travel in support of program planning and management in the areas of Biological, Physical, and Cultural Resources, and Information Technologies.

E-3. AMWG/TWG Participation: These costs are to cover salary and travel to attend and prepare for AMWG and TWG meetings.

E-4. Independent Review Panels: Independent external review is at the heart of GCMRC's approach to program management and implementation. Independent external peer-review ensures the quality and objectivity of GCMRC's programs. All proposals, reports, programs, etc., are subject to independent peer review according to GCMRC's peer-review protocols. These costs cover all of the expenses related to the peer-review process, the Science Advisors, Protocol Evaluation Panels and the salary of the Review Coordinator. The Review Coordinator reports directly to the Chief.

**Technical Support Services**

F-1. Geographic Information Systems: The GIS is a core information technology used by the GCMRC. Its purpose is to provide spatial analysis capabilities to GCMRC staff and stakeholders and maintain a library of GIS thematic coverages of the study area. The GIS is an important analytical tool for change detection of biological, cultural, and physical data relating to the operations of Glen Canyon Dam.

F-2. Data Base Management: The purpose of the DBMS is to store and deliver tabular and other electronic data pertaining to the CRE. The need for a comprehensive database for maintaining this information was recognized by the National Academy of Sciences in their initial review of the GCES Program in 1987, and reinforced during a second review in 1990. Extensive data and information currently exists in the GCMRC collections relating to resource conditions, quality, and relationships to other resources. Potentially equal amounts of data and information exist within museums, universities, agencies, etc. However, much of this information has not been organized, managed or integrated into an analysis of the interrelationship among various resources and dam operations. The GCMRC data base management systems will, to the extent possible, integrate these vast and disparate data sets into a single ecologically integrated database that can be accessed by stakeholders, scientists, and the public interested in analyzing data pertaining to the Colorado River Ecosystem.

F-3. Library Operations: Library operations are a core information technology used by the GCMRC ITP. Its purpose is to facilitate research by providing a centralized repository for hard copy information such as books, reports, maps, photography, and videos. The scope and purpose of the library is to collect, archive and deliver those materials that assist the center in its efforts to administer long-term monitoring and research.

F-4. Survey Operations: The Survey department's mission is to provide survey support for spatial measurement and referencing of scientific data collected in the Colorado River ecosystem by GCMRC programs. This support may be in the form of precise measurement of geographic

coordinates of a sample collected in the Canyon or in the generation of topographic maps used for erosion monitoring of terraces adjacent to the Colorado River. The Survey department is also responsible for establishing and maintaining accurate geographic control in the Canyon that is essential for accurate geo-referencing of remotely sensed data and change detection of resource data using modern image processing and GIS technologies. These technologies are critical to the integration and analysis of the diverse scientific data that have been collected in the Canyon over the past 15 years.

F-5: Systems Administration: The GCMRC computing environment is a complex system of servers, workstations, laptops, printers, plotters, modems, routers, hubs, switches, copy machines, FAX's, and telecommunications equipment networked together using 100baseT networking media. Most of the computers are of the PC type running the Windows NT/2000 operating system. In addition, over 50 applications are utilized by GCMRC scientists and support personnel in carrying out the collective mission of the GCMRC. Applications are primarily off-the-shelf products but in many cases are highly specialized. The system administrator develops, implements, and troubleshoots the infrastructure necessary to support the complex computer environment at GCMRC.

F-6: Aerial Photography:

(a) The GCMRC has been collecting annual aerial photography of the CRE for over ten years in support of biological, cultural, and physical research and monitoring activities related to the operations of the Glen Canyon dam. Until recently, the photography product delivered has been a nine-by-nine-inch contact prints of black and white or color infrared film at an approximate scale of 1/4800. Photographs have been delivered without any rectification or geopositioning information While useful for many past monitoring and research activities in the CRE, these products are largely being supplanted by high resolution multispectral digital products that include pointing and positioning parameters that allow convenient rectification and geopositioning. These products have much more utility and allow improved image analysis using automated computerized techniques. In addition, with the addition of LIDAR equipment, high accuracy topographic information can be acquired simultaneously in areas where volume information is desired.

(b) The Grand Canyon Monitoring and Research Center's library collection includes almost 32,000 aerial photographs of the Colorado River spanning a period of 65 years. Presently, the photo collection is at risk because it is not stored under fireproof and waterproof conditions. Transferring these images into a digital format will provide greater accessibility to researchers and better preservation of the original media. Photographs, including both black and white and color infrared images would be selected, scanned, compressed, and archived onto GCMRC electronic data systems and DVD.

F-7. Logistics: GCMRC provides all logistical support for monitoring and research projects conducted by contracted Principal Investigators whose work is administered by GCMRC Program Managers in physical, biological and social-cultural resource programs. GCMRC staff initiate some of their own in-house scientific activities, which require logistical support, including; the Integrated Water Quality Program, administrative trips for groups such as the TWG, AMWG, Science Advisors and program PEP panels. The GCMRC also supports logistical needs for the Bureau of Reclamation's activities conducted by Native American groups under the Programmatic Agreement program and activities conducted to meet Reclamation's needs concerning endangered species. In addition, GCMRC provides logistics support for any contingency plans or experimental floods. GCMRC logistics costs are accounted for under the specific projects, which they support.