Attachment 13b TWG 11-5-97 DG

GRAND CANYON MONITORING AND RESEARCH CENTER

FY99 CONCEPTUAL MODELING ACTIVITIES

Activities Continued From FY98

- **CONCEPTUAL MODELING**
  - Completion of contract.

New Activities for FY99

- **CONCEPTUAL MODELING**
  - Further model or sub-model development or other recommended activities resulting from the completion of this project.

DO 1.25

GCMRC - FY98 CONCEPTUAL MODELING PROGRAM

FY98 RFP: DEVELOP A CONCEPTUAL MODEL OF THE COLORADO RIVER ECOSYSTEM FROM THE FOREBAY OF GCD TO THE WESTERN MOST BOUNDARY OF GRAND CANYON NATIONAL PARK

ESTIMATED COST RANGE: $150,000 - $250,000 / 15 months.

GCMRC OBJECTIVE(S):

This conceptual model will be used to: (1) guide monitoring and research planning, (2) more clearly define critical attributes and linkages within and between resource categories, (3) promote improved understanding of key factors that drive change in the system, (4) make qualitative assessments of resource change resulting from alternative dam operations, and (5) provide information to stakeholders and managers regarding the potential impacts of alternative dam operations on the Colorado River ecosystem and associated resources.

PROJECT OBJECTIVES:

1) **State of the science synthesis of data needed for development of the conceptual model and identification of key information gaps, as well as priorities for monitoring and research.**

2) **Scoping meeting to define the scope of the problem, design first modeling workshop, develop list of participants.**

3) **Develop, using a workshop approach, a working conceptual model of the Colorado River ecosystem that can be run on an appropriate software platform and which identifies critical relationships that structure the ecosystem.**

4) **Revision of the conceptual model, through a second workshop, to the level of a strategic model which assigns numeric values to key parameters in the model and which can be used to test alternative assumptions and hypotheses regrading changes to the ecosystem and associated resources from alternative dam operations.**

PROJECT DURATION: Fifteen months - October 1, 1998 to March 31, 1999.

FY1999 GCMRC - Physical Program "Monitor/Research"

Program Goal: *Tracking Sandbar Evolution*

Title: "Monitoring Changes in Fine-Grained Sediment Deposits Throughout the Colorado River Ecosystem"

Cost Ceiling: $110,000
Project Completion: Sept. 30, 1999, [Ongoing FY98 Work]

Minimum Objectives:

- Report Annual Changes in Sandbars Relative to Baseline
- Relate Sandbar Changes to Changes in Backwaters
- Identify Appropriate Criteria for Campsite Evaluation
- Changes in Above Campsite Availability Criteria
- Changes in Pre-Dam River Terraces

FY 1999 GCMRC - Physical Resources "Research"

Program Goal: *Improve System-Wide Sediment Budgeting*

Title: "Estimating Sediment Flux From Ungaged Tributaries of the Colorado River Ecosystem"

Cost Ceiling: $15,000
Project Completion: June 30, 1999, [Ongoing FY98 Work]

Minimum Objectives:

- Estimate Sediment Input From ALL Ungaged Tributaries
- Generate Estimates By Minimum of Two Methods
- Evaluate Impact of Climatic-Variability
- Assess Impact of Debris-Flows on Mainstem Ecosystem

FY1999 GCMRC - Physical Program "Monitor/Research"

Program Goal: *Monitor Flow, Sediment and Water Quality*

Title: "Monitoring and Research of Streamflow, Suspended-Sediment Flux, Changes in Mainstem Sediment Storage, and Water Quality of the Colorado River Ecosystem"

Cost Ceiling: $450,000
Project Completion: Sept. 30, 1999 [Ongoing FY98 Work]

I. [Monitoring Tasks] Minimum Objectives:

- Unit Streamflow Data From Mainstem, Paria and LCR
- Mainstem Sediment Transport (Volume/Size)
- Paria/LCR Sediment Transport (Volume/Size)
- Mainstem Sediment Storage
- Mainstem Water Quality

FY1999 GCMRC - Physical Program "Monitor/Research"

Program Goal: *Research Flow and Sediment Transport*

Title: "Monitoring and Research of Streamflow, Suspended-Sediment Flux, Changes in Mainstem Sediment Storage, and Water Quality of the Colorado River Ecosystem"

Cost Ceiling: $450,000
Project Completion: Sept. 30, 1999 [Ongoing FY98 Work]

II. [Research Tasks] Minimum Objectives:

- Relate Dam Releases to Sediment Storage Changes
- Identify Key Geomorphic Settings for Sediment Storage
- I.D. Optimal ROD Releases For Sediment Storage
- Define Sediment Budget for Marble Cyn. (Paria to LCR)

FY1999 GCMRC - Physical Program "Research"

Program Goal: *Flow/Sediment Model - LCR Inputs*

Title: "Developing Predictive Capabilities for Estimating Fine-Sediment Inputs From the LCR to the Colorado River Ecosystem"

Cost Ceiling: $15,000
Project Completion: June 30, 1999, [Ongoing FY98 Work]

Minimum Objectives:

- Compile ALL existing Flow and Sediment for the LCR

- I.D. Key Patterns of Flood Frequency and Sediment Flux

- Develop Numerical Model Linking Flow to Sediment Input

FY1999 GCMRC - Physical Program "Research"

Program Goal: *Synthesis of Geomorphology Data*

Title: "Synthesis of Geomorphology and Historical Changes in Sediment Resources of the Colorado River Ecosystem"

Cost Ceiling: $100,000
Project Completion: Sept. 30, 1999, [Ongoing FY98 Work]

Minimum Objectives:

- Compile ALL Historic Data on Sediment and Flow

- Summarize and Interpret Patterns of Significant Change

- Propose Conceptual Model to Explain Patterns Identified

FY1999 GCMRC - Combined Program "Research"

Program Goal: *Evaluate Physical Monitoring Protocols*

Title: "Evaluating Monitoring Protocols [Sediment, Sediment-Related Features, and Streamflow], Within the Colorado River Ecosystem"

Cost Ceiling: $30,000 [From Physical FY99 Budget]
Project Competion: Dec. 15, 1998, [Ongoing FY98 Work]

Minimum Objectives:

- Identify and Evaluate ALL Previously Used Protocols
- Evaluate the Validity of ALL Presently Used Protocols
- Identify and Evaluate New or Improved Protocols
- Identify Monitoring Strategies Using Ideal Protocols

FY1999 GCMRC - Combined Program "Research"

Program Goal: *Conceptual/Simulation Model Development*

Title: "Developing a Conceptual/Simulation Model for the Colorado River Ecosystem"

Cost Ceiling: $50,000 [Contribution from Physical Program FY99 Budget]

Project Competion: Mid-Year, 1999, [Ongoing FY98 Work]

GRAND CANYON MONITORING AND RESEARCH CENTER

FY99 BIOLOGICAL RESOURCES MONITORING AND RESEARCH ACTIVITIES

Activities Continued From FY98

- **AQUATIC FOOD BASE**
  - Second year of two year contract.

- **NATIVE FISH**
  - Second year of two year contract.

- **RAINBOW TROUT FISHERY**
  - Second year of two year contract.

- **WETLAND AND RIPARIAN VEGETATION**
  - Second year of two year contract.

- **KANAB AMBERSNAIL**
  - Second year of two year contract.

- **SOUTHWESTERN WILLOW FLYCATCHER AND OTHER AVIFAUNA**
  - Second year of two year contract.

New Activities for FY99

- **AQUATIC FOOD BASE**

- New activities pertain to: (1) lower level interactions such as nutrient cycling (phosphorous availability) in the mainstem and primary productivity, (2) the microbial contributions to organic processing in this system, and (3) recruitment mechanisms associated with Cladophora (i.e., zoospore vs fragmentation), a keystone species in the aquatic food base. The role of temperature on each of these issues will be considered as management begins to examine seasonally adjusted steady flows and selective withdrawal scenarios.

- **NATIVE FISH**

- New activities pertain to: (1) quantifying and understanding the causes and significance of overwintering mortality to HBC; (2) review the feasibility of, and develop a plan for the establishment of a second population of HBC; and (3) the design of experimental seasonally adjusted steady flows.

- **RAINBOW TROUT FISHERY**

- New activities pertain to results of GCMRC sponsored workshop to examine the science and understanding of tailwater, cold water fisheries in the western United States.

- **WETLAND AND RIPARIAN VEGETATION**

  - In order to further the linkages and develop interdisciplinary efforts between vegetation and the river corridor, research efforts should be directed toward evaluating the current monitoring sites and determining if the present sites are sufficient to characterize the status riparian vegetation (i.e., do more sites that coincide with fish, aquatic food base and terrestrial vertebrate study need to be added?).

- **KANAB AMBERSNAIL**

  - New activities pertain to: Kanab ambersnail genetics and taxonomy research to resolve issues regarding the status of the species.

- **SOUTHWESTERN WILLOW FLYCATCHER AND OTHER AVIFAUNA**

  - Second year of two year contract.

- **OTHER**

  - Based on the availability of funds, the following work will be considered: (1) review and development of monitoring and research protocols for all biological resources, (2) state-of-the-science assessments, (3) limited scoping studies to better define appropriate monitoring and research activities, and (4) unsolicited proposals relevant to management objectives.

GCMRC - FY98 BIOLOGICAL RESOURCES PROGRAM

FY98 RFP: MONITOR THE AQUATIC FOOD BASE OF THE COLORADO RIVER ECOSYSTEM

ESTIMATED COST RANGE: $125,000 - $175,000 / yr.

MANAGEMENT OBJECTIVE(S):

-- Maintain and enhance the aquatic food base in Glen and Grand Canyons.

PROJECT OBJECTIVES:

Monitoring

1) **Determine impacts alternative operating criteria have on the food base.**

2) **Monitor community structure, density, distribution, and composition of algae, macrophytes and macroinvertebrates along the mainstem and tributaries in a manner compatible with research and monitoring activities on fish.**

3) **Identify key parameters (i.e., nutrient levels, water quality, community structure) associated with the maintenance and enhancement of aquatic food base for long-term monitoring.**

4) **Data collections that enable distinction between the effects of dam operations and natural variation on the aquatic food base and previous monitoring efforts.**

5) **Linkages between nutrient levels, water quality and community structure (benthos, drift, etc.) in relation to dam operations, Lake Powell input and tributary influences.**

Research

1) **Determine if and at what densities the standing aquatic food base in Glen Canyon is a limiting factor in higher trophic level productivity in association with different operating criteria.**

2) **Determine the effects of large fluctuations associated with dam releases on the aquatic food base in Glen and Grand Canyons and associated fish resources.**

PROJECT DURATION: One Year - FY98, renewable for one additional year.

FY98 RFP: MONITOR NATIVE FISH OF THE COLORADO RIVER ECOSYSTEM

ESTIMATED COST RANGE: $450,000 - $525,000 / yr.

MANAGEMENT OBJECTIVE(S):

--Maintain or enhance existing population of HBC in lower 1,200 meters of the LCR.

--Maintain levels of recruitment of humpback chub in the mainstem and LCR.

--Verify the status of and management for healthy, self sustaining populations of: (1) flannelmouth sucker, bluehead sucker, and speckled dace in the mainstem Colorado River in Grand Canyon and its tributaries; and (2) native fish in Glen Canyon based upon the capability of the habitat to support those fishes.

-- Minimize, to the extent possible, interactions between native and non-native fishes.

-- Evaluate through monitoring and research the reasonable and prudent alternatives specified by the US Fish and Wildlife Service.

PROJECT OBJECTIVES:

1) **Establish linkages among dam operations and the resulting flow regimes and related abiotic (e.g., temperature, turbidity) and biotic (e.g., food base) parameters on spawning, reproductive success, larval transport, recruitment, habitat use, food availability and diet.**

2) **Monitoring to annually evaluate the status and trends of native fish populations, especially humpback chub and flannelmouth sucker, in the Colorado River ecosystem. Monitoring activities should consider parameters such as: abundance, age structure, growth rates, condition, year class strength, distribution (i.e., spatial patterns of abundance) reproductive success and overall recruitment in response to dam operations. Monitoring activities should utilize PIT tags to augment existing databases, as appropriate.**

3) **Competitive and predator-prey interactions with non-native fish and the influence of dam operations, including potentially increased water temperatures, on these competitive and predatory interactions, if any.**

FY98 RFP: MONITOR THE RAINBOW TROUT FISHERY OF THE COLORADO RIVER DOWNSTREAM FROM GCD TO LEES FERRY, IN GLEN CANYON NATIONAL RECREATIONAL AREA

ESTIMATED COST RANGE: $100,000 - $125,000 / yr.

MANAGEMENT OBJECTIVE(S):

-- In the Colorado River corridor below Glen Canyon Dam to the confluence with the Paria River, natural reproduced fish should compose at least 50% of the Age III rainbow trout. Sufficient suitable spawning habitat should be maintained to reach this objective.

-- The total populations of rainbow trout (age II plus) in this reach should be maintained at approximately 100,000 fish as determined from population estimation.

-- Rainbow trout should achieve 18 inches in length by Age III with a mean relative weight (Wr) of at least 0.80.

PROJECT OBJECTIVES:

1) **Synthesize existing information (published and unpublished data) on the Glen Canyon/Lees Ferry trout fishery and determine the fishery's likely response (growth, reproduction, recruitment population structure, size and distribution) to dam operations.**

2) **Monitoring activities for determining population size, structure, growth, distribution, reproductive success and overall recruitment in response to dam operations.**

3) **Develop methods for estimating the proportion of natural reproductive success in combination with stocking quantities and rates to determine desired levels of recruitment balanced against the carrying capacity for a range of dam operations.**

4) **Develop evaluation criteria for, and measure and assess the health and condition of the rainbow trout population.**

5) **Evaluate changing health and condition factors in relation to changes in the aquatic foodbase and nutrient levels as determined in the aquatic food base RFP.**

PROJECT DURATION: One Year - FY98, renewable for one year.

FY98 RFP: MONITOR WETLAND AND RIPARIAN VEGETATION ALONG THE COLORADO RIVER ECOSYSTEM

ESTIMATED COST RANGE: $60,000 - $80,000 / yr.

MANAGEMENT OBJECTIVE(S):

-- Preserve or restore (where possible) natural species composition and abundance within riparian and upland communities affected by dam operations.

-- Emphasize the preservation of unique plant communities and any special status species (Federal, Tribal, and State designations) to ensure their perpetuation within the system.

PROJECT OBJECTIVES:

1) **Monitor the community response (i.e., community structure, diversity, density, distribution, and extent of riparian and marsh vegetation) to dam releases along the Colorado River ecosystem.**

2) **Compare 1998 riparian and marsh vegetation data with historical monitoring data to evaluate change over time (i.e., the spread and contraction of communities, change in species composition, etc.), in relation to dam operations.**

3) **Monitor non-native/invasive vegetation with respect to recruitment, spread and survivorship.**

4) **Examine habitat integrity and composition as it is related to threatened and endangered species (e.g., Southwestern Willow Flycatcher, Kanab ambersnail), and linkages between vegetation, aquatic food base, fish habitat, and sediment-related resources.**

PROJECT DURATION: One Year - FY98, renewable for one-year.

FY98 RFP: MONITOR THE ENDANGERED KANAB AMBERSNAIL AT VASEYS PARADISE, GRAND CANYON NATIONAL PARK

ESTIMATED COST RANGE: $30,000 - $50,000 / yr.

MANAGEMENT OBJECTIVE(S):

-- Protect, restore, and enhance survival of native and special status species (Federal, Tribal, and State designations). Ensure that the required habitat for these species is preserved. Maintain native faunal components of the ecosystems for the benefit of threatened and endangered species.

-- Maintain a natural age-class distribution through out the majority of their natural range in Glen and Grand Canyons, emphasizing the need to recruit into breeding age classes.

-- The population of Kanab Ambersnail should be inventoried and maintained near current levels. Efforts to establish additional population center should be guided by the recovery plan for the species.

PROJECT OBJECTIVES:

1) **Relate food availability, habitat patch composition, area of cover, and condition at Vaseys Paradise to the historic and recent condition of those patches, and population requirements for sustainability.**

2) **Determine and statistically compare the historic (1995-97) and current population distribution, abundance, age-class/size distribution, population density, and condition (i.e., occurrence of Kanab ambersnail trematode parasite) of Oxyloma haydeni kanabensis at Vaseys Paradise as it relates to natural variation and to the local stage-discharge relationship.**

3) **Monitor abundance and food habits of Peromyscus predator at Vaseys Paradise.**

PROJECT DURATION: One Year - FY98, renewable for one year.

FY98 RFP: MONITOR RIPARIAN AVIFAUNA ALONG THE COLORADO RIVER ECOSYSTEM, WITH PARTICULAR EMPHASIS ON THE ENDANGERED SOUTHWESTERN WILLOW FLYCATCHER

ESTIMATED COST RANGE: $60,000 - $90,000 / yr.

MANAGEMENT OBJECTIVE(S):

-- Protect, restore, and enhance survival of native and special status species (Federal, Tribal, and State designations). Ensure that the required habitat for these species is preserved. Maintain native faunal components of the ecosystems for the benefit of threatened and endangered species.

-- Maintain a natural age-class distribution through out the majority of their natural range in Glen and Grand Canyons, emphasizing the need to recruit into breeding age classes.

-- Evaluate the viability of food chain(s) for native fauna, including the Peregrine Falcon, Southwestern Willow Flycatcher, and other special status species.

-- In as much as such management is not deleterious to naturally occurring ecosystem components, consider and mitigate impacts to special status species that may use the river corridor opportunistically (Bald Eagle). Maintain self-sustaining fish populations as forage to provide opportunities for bald eagles. Monitor for nesting.

PROJECT OBJECTIVES:

Grand Canyon Riparian/Aquatic Avifauna

1) **Collect and interpret data on the current and historic distribution and population densities of wintering and spring and summer avifauna, and their relation to habitat patches, within the Colorado River ecosystem (River Miles -15 to 278).**

2) **Relate habitat structure/composition of survey areas to dam discharges and river flows during the study period, to breeding bird distribution and density.**

Endangered Southwestern Willow Flycatcher

1) **Collect detailed monitoring data of southwestern willow flycatcher habitat condition, habitat use and nesting success, and nesting fidelity, including the dynamic nature of its colonizing behavior through the study period and in comparison with previous data and other SWWF monitoring programs.**

FY 99 CULTURAL RESOURCES MONITORING AND RESEARCH ACTIVITIES

ACTIVITIES CONTINUED FROM FY 98

- MAINSTEM MODELING AND SEDIMENT DYNAMICS CONTRACT
  - Second year of two year contract

- TEST AND APPLY GEOMORPHIC MODEL RELATED TO EROSION OF PRE-DAM TERRACES
  - Second year of two year contract

- NPS AND TRIBAL PROGRAMMATIC AGREEMENT PROPOSALS SUBMITTED TO AMWG AND TRANSMITTED TO GCMRC

- TRIBAL PROPOSALS SUBMITTED TO GCMRC
  -Unsolicited proposals related to GCMRC program areas

- CONTINUATION OF DEVELOPMENT OF TRIBAL TECHNOLOGY/PROCEDURES FOR DISSEMINATION AND ACCESS TO GCMRC DATA
  -Cooperative development of data protocols for GCMRC data
  -Investigation of technological capabilities for data access

NEW ACTIVITIES FOR FY 99

- PROVISION FOR RESEARCH PROJECTS RESULTING FROM CONCEPTUAL MODELING PROJECT
  -Dependent upon information generated during modeling process relative to cultural resources.
  - Project implementation contingent upon priortization, funding availability, and stakeholder objectives.

GCMRC - CULTURAL RESOURCES MONITORING AND RESEARCH PROGRAM

FY 1998 RFP: A REQUEST FOR PROPOSALS TO CONDUCT A CULTURAL RESOURCE DATA SYNTHESIS WITHIN THE COLORADO RIVER ECOSYSTEM

COST CEILING: $ 60,000

PROJECT OBJECTIVES:

Synthesize the following:

- Existing NPS and Tribal data bases from the GCMRC project area on all inventoried resources and their impacts resulting from dam operations that have been monitored and/or managed to date

- Isolated occurrences

- NPS and Tribal resource management activities conducted to date at all sites

- Results of ancillary studies such as geomorphic studies, ethnobotany, mapping and evaluate this work relative to objectives of the PA Program

- Public information and education efforts accomplished to date through the PA Program and make recommendations for future efforts

- Evaluate available management data relative to the long-term management goals developed under the PA Program

- Results of data recovery conducted to date at river corridor sites. Evaluate these data relative to the research domains identified developed under the PA Program and make recommendations for the data recovery program that improve utility to meet program objectives

PROJECT DURATION: One Year - FY 98

GCMRC - CULTURAL RESOURCES MONITORING AND RESEARCH PROGRAM

FY 1998 RFP: A REQUEST FOR PROPOSALS TO MODEL MAINSTEM FLOW AND SEDIMENT DYNAMICS AT SELECTED CUTLURAL RESOURCE LOCATIONS

COST CEILING: $ 160,000

PROJECT OBJECTIVES:

- Model stage-discharge relationships for varying flow regimes in selected reaches containing cultural resources up to the approximate elevation associated with the 100,000 cfs discharge
- Model flow and sediment-transport dynamics at these resource locations up to the 100,000cfs discharge elevation
- Apply predictive flow and sediment modeling capabilities to specific river-terrace locations containing cultural resources to evaluate results of flow and sediment-transport model scenarios
- Provide recommendations on scenarios that optimize depositional rates along terraces or within arroyo confluences where cultural resources are located

PROJECT DURATION: Two Years - FY 98 and FY 99

GCMRC - CULTURAL RESOURCES MONITORING AND RESEARCH PROGRAM

FY 1998 RFP: A REQUEST FOR PROPOSALS TO TEST AND APPLY A GEOMORPHIC MODEL RELATED TO EROSION OF PRE-DAM RIVER TERRACES IN THE COLORADO RIVER ECOSYSTEM CONTAINING CULTURAL MATERIALS

COST CEILING: $ 160,000

PROJECT OBJECTIVES:

- Incorporate and evaluate data from previous geomorphic work on river- and terrace-based arroyos, existing archaeological monitoring data, and relevant research from sedimentation and climatological studies

- Test and evaluate the validity of the geomorphic hypothesis, refine and revise model as needed to improve predictive utility in determining how, when and where terrace-based erosion is likely to impact cultural resources

- Identify most threatened resources, prioritize remedial action needs, and make management recommendations based on findings

PROJECT DURATION: Two Years - FY 98 and FY 99

FY 99 SOCIO-ECONOMIC RESOURCES
MONITORING AND RESEARCH ACTIVITIES

ACTIVITIES CONTINUED FROM FY 98

- USE OF PAST MONITORING, RESEARCH AND COOPERATIVE STUDIES TO DEVELOP SYNTHESIS OF CAMPSITE BEACH CHANGE ASSOCIATED WITH DIFFERING FLOW REGIMES

- RESEARCH USER PREFERENCE AND ATTITUDES ASSESSING WILDERNESS EXPERIENCE RELATIVE TO DIFFERING FLOW REGIMES
  - Second year of 15 month contract

- MONITOR TROUT ANGLERS USE AND SATISFACTION THROUGH CREEL CENSUS AND COOPERATIVE MONITORING PROGRAM WITH FISHING GUIDES AND TROUT UNLIMITED

- EVALUATE EFFECTIVENESS OF NEW MONITORING PROTOCOLS FOR LONG-TERM ASSESSMENTS OF CAMPING BEACH CHANGE FROM DIFFERING FLOW REGIMES

- MONITORING BEACH CHANGES AND USER PREFERENCES THROUGH COOPERATIVE PROGRAMS WITH BOATING GUIDES

NEW ACTIVITIES FOR FY 99

- NONE PROPOSED AT THIS TIME

GCMRC - SOCIO-ECONOMIC RESOURCES MONITORING AND RESEARCH PROGRAM

FY 1998 RFP: A REQUEST FOR PROPOSALS REGARDING RECREATION USER ATTITUDE/PREFERENCE ASSESSMENTS

COST CEILING: $ 70,000

PROJECT OBJECTIVES:

- From current users, determine current preferences and attitudes toward recreation opportunities in the Colorado River ecosystem. Assessments include all existing opportunities and can encompass opportunities presently not available. Survey schedules are to be developed cooperatively with agency managers

- Evaluate changing preferences and attitudes of users through use of surveys and/or other methodologies

- Evaluate commonality and disparity of current user preferences/attitudes to proposed managment directions of NPS and other agencies

PROJECT DURATION: Fifteen months - FY 98 and a portion of FY99

INFORMATION TECHNOLOGY PROGRAM

Database Development

Assess historical data collection activities – FY98
Assess present and near-term future data collection activities – FY98
Develop and program database structure
Populate the database
Develop database interfaces

Data Collection and Verification Protocols

Develop standard operating procedures for data collection - FY98
Develop database verification protocols

Data Distribution Protocols

Identify sensitive data and develop protection mechanisms – FY98

Data Standards Protocols

Develop data standards - FY98

Geographic Information System Services

Set up GIS laboratory - FY98
Catalog and organize GCES holdings – FY98
Develop Web access to holdings

INFORMATION TECHNOLOGY PROGRAM

(Continued)

Computer Systems Administration

Develop GCMRC computing strategy – FY98
Standardize GCMRC computing environment – FY98
Train uses in effective use of the environment

Library

Assess the state of the library – FY98
Define the future scope of the library – FY98
Develop plan to provide library services – FY98

Outreach

Develop instructions and training in the use of database interfaces
Provide assistance in the application of information technology

Website

Design and implement website consisting of a general, technical, AMWG, TWG specific pages - FY98