

Presentation
of the
Long-term Monitoring and Research Strategic Plan
(Working Draft #2 - 1/2/97)

to the
Transition Working Group

by

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Long-term Monitoring and Research Strategic Plan

Outline of Presentation

I. Introduction

Adaptive Management

-- Attributes

-- Elements

RFPs and Peer Review

GCMRC Peer Review Guidelines

GCMRC Science Advisory Board

Monitoring and Research

-- Definitions

-- Linkages

-- Standards and Protocols

Geographic and Institutional Scope

II. GCMRC approach to developing the plan

Approach adopted by GCMRC

Review of past monitoring activities

Conceptual Modeling

III. Individual Programs

Resource Areas

Physical Resources

Cultural Resources

Biological Resources

Socio-economic Resources

Information Technologies

Budget

I. Introduction

ADAPTIVE MANAGEMENT

Attributes

Iterative process;

Treats management actions as experiments subject to modification;

Management actions/experiments used to develop an enhanced scientific understanding;

Uniqueness of adaptive management approach is the use of an explicit experimental design.

An Adaptive policy is one that is designed from the outset to test clearly formulated hypotheses about the behavior of an ecosystem being changed by human use. In most cases these hypotheses are predictions about how one or more important species will respond to management actions. (Lee 1993)

ADAPTIVE MANAGEMENT

Begins with stakeholders definition of management objectives;

Management actions reflect “state-of-the-science” and are implemented as “experiments”;

Monitoring to see if ecosystem responds as predicted;

Research program to discern the nature of the cause and effect relationships;

Learning occurs as a result of the monitoring and research activities;

Future management actions are based on new knowledge.

Reliable knowledge comes from two procedures: controls and replication. A control matches what one is changing (the treatment) to a companion case in which that same factor is left unchanged (the control). The use of controls permits insight into whether it is the treatment that is causing the effect one sees, rather than something else such as a change in the weather. Replication is essential because if knowledge is reliable it can be shown to work more than once; real relationships between cause and effect will show up consistently. (Lee 1993)

RFPs AND PEER-REVIEW

GCMRC long-term monitoring and research program will be implemented through a competitive peer-reviewed process.

Following approval of the long-term monitoring and research program, a request for proposals (RFP) will be issued.

Proposals will be screened by the program managers for their responsiveness.

All qualified proposals will undergo an independent and objective scientific peer-review.

Based on the results of peer-review and GCMRC program managers review, awards will be made.

GCMRC PEER REVIEW GUIDELINES

GCMRC peer-review guidelines consistent with the “U.S. Department of Interior Guidelines for Scientific Peer Review of Research” issued by the Secretary of Interior.

GCMRC peer-review guidelines incorporate the following principles:

- objectivity and impartiality of reviews
- reviews will be conducted by true scientific peers, as judged by demonstrable scientific achievements
- independence of peer reviewers
- provision of constructive feedback to the investigators
- anonymity of peer-reviewers, unless waived
- periodic evaluation of the effectiveness of the peer review process

GCMRC SCIENCE ADVISORY BOARD

GCMRC proposes to establish an independent Scientific Advisory Board (SAB).

The SAB will be an advisory and not a decision-making body.

The SAB will:

- ensure that GCMRC programs are unbiased, objective, and scientifically sound;
- provide advice on the long-term monitoring and research program; and
- periodically review the results of the long-term monitoring and research program.

GCMRC SCIENCE ADVISORY BOARD

The SAB will be an interdisciplinary board, composed of scientists qualified, on the basis of demonstrable scientific achievements.

Scientists will be selected for their disciplinary expertise.

Members will be selected for a three-year term, renewable for one consecutive three-year term.

Initial members will be selected for staggered one, two, and three year terms.

MONITORING AND RESEARCH

Definitions

Inventorying is the measurement of environmental attributes at a given point in time to determine what is there.

Monitoring is the measurement of environmental attributes over an extended period of time to determine status or trends in the environmental attribute being monitored.

Research is the measurement of environmental attributes to test a specific hypothesis.

An ***environmental attribute*** may be any biotic or abiotic feature of the environment which can be measured.

Linkages between monitoring and research

When properly designed, monitoring data can be analyzed as part of a research program.

Similarly, the results of a properly designed research program will suggest changes to be made in monitoring activities.

MONITORING AND RESEARCH

Standards and Protocols

Ensure compatibility of measurements over time.

Standard protocols will be established through implementation of the land-term plan.

Changes in protocols must respond to data comparability through time.

Monitoring must ensure data linkages across resources.

Monitoring must be designed with flexibility and contingency plans.

THE GEOGRAPHICAL AND INSTITUTIONAL SCOPE

Primarily the Colorado River corridor between Glen Canyon Dam and Lake Mead reservoir.

Extent of monitoring and research effort is defined by processes and conditions influenced by “the effects of the Secretary’s actions”.

II. GCMRC approach to developing the plan.

APPROACH TO DEVELOPING LONG-TERM PLAN

Stakeholder management objectives and information needs are the basis for the long-term plan.

Develop conceptual model to provide framework for understanding the system.

“State-of-the-science” assessments to synthesize and integrate existing knowledge.

Use the conceptual model to select initial attributes thought to be key drivers of resource change.

Ensure space and time dependence of attribute measurements.

Long-term monitoring designed to provide regular feedback for adaptive management.

REVIEW OF PAST MONITORING ACTIVITIES

Deficiencies

Reviews of past environmental monitoring have identified the following deficiencies:

- minimal foundation in current ecological theory / knowledge
- lack of a conceptual model
- inadequate understanding of associations and causation
- weak linkages between monitoring and research programs
- inadequate time to develop a long-term monitoring program
- weak definition of ranges of natural variability
- inability to distinguish signal from noise in monitored attributes
- weak linkages to stakeholder objectives and information needs

CONCEPTUAL MODELING

Why utilize a modeling approach?

Define and focus what one monitors; limits research activities to critical questions.

Models are simplifications which contain only the level of complexity needed to describe the behavior being modeled.

Process of model building permits testing assumptions and development of a shared view among scientists and managers.

Conceptual models are precise, consistent and explicit so they can be criticized and understood by anyone.

III. Individual Programs

**RESOURCE AREAS FOR IDENTIFICATION
OF
STAKE HOLDER INFORMATION NEEDS**

- WATER RESOURCES
- SEDIMENT RESOURCES
- CULTURAL RESOURCES
- RIPARIAN AND TERRESTRIAL VEGETATION RESOURCES
- FISH AND AQUATIC RESOURCES
- NATIVE TERRESTRIAL WILDLIFE RESOURCES
- RECREATION RESOURCES

PHYSICAL RESOURCES

IDENTIFICATION OF STAKE HOLDER INFORMATION NEEDS

PHYSICAL RESOURCES

- Monitor water quality changes with time
- Monitor water quality as compared to state and federal standards
- Measure water composition and temperature and their changes over time
- Characterize sandbar/backwater baselines and return channel structures
- Define target backwater ecosystems and associated flow regimes
- Define character and structure of all beaches and backwaters in system after 1996 test flows
- Define historical and current (character and structure) levels of river stored sediment in system and associated flow regimes
- Determine baseline conditions

PHYSICAL RESOURCES PROGRAM

Monitoring and research efforts will concentrate on four aspects of these physical resources as follows:

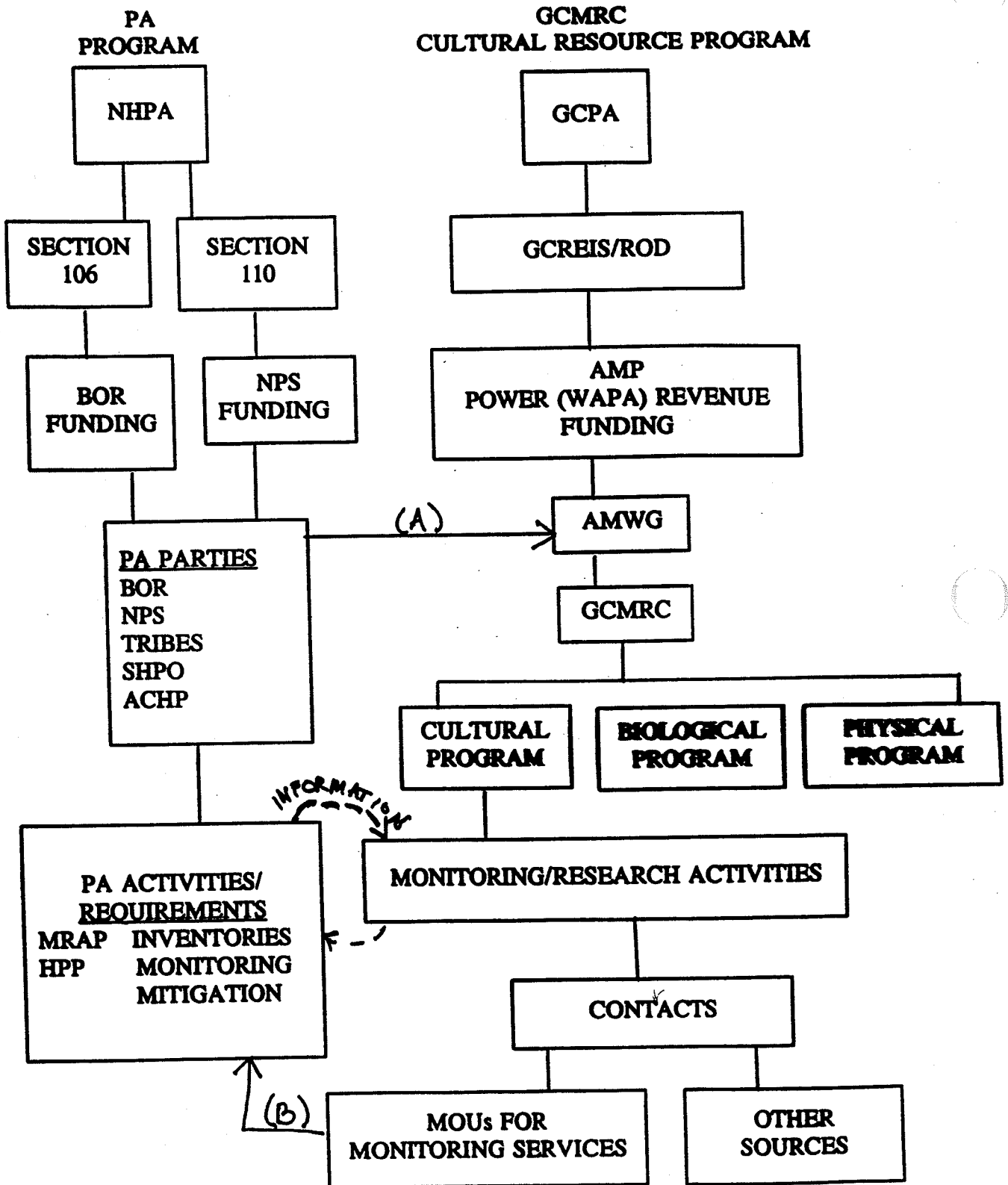
1. Dam discharges and instream flows.
 - Synthesis
 - Pilot monitoring
2. Sediment balance and process.
 - Synthesis
 - Pilot monitoring
3. Interrelationships of mainstem water and sediment and side channel inflows.
 - Synthesis
4. Interaction of mainstem water and sediment and Lake Mead Resources.
 - Synthesis

CULTURAL RESOURCES

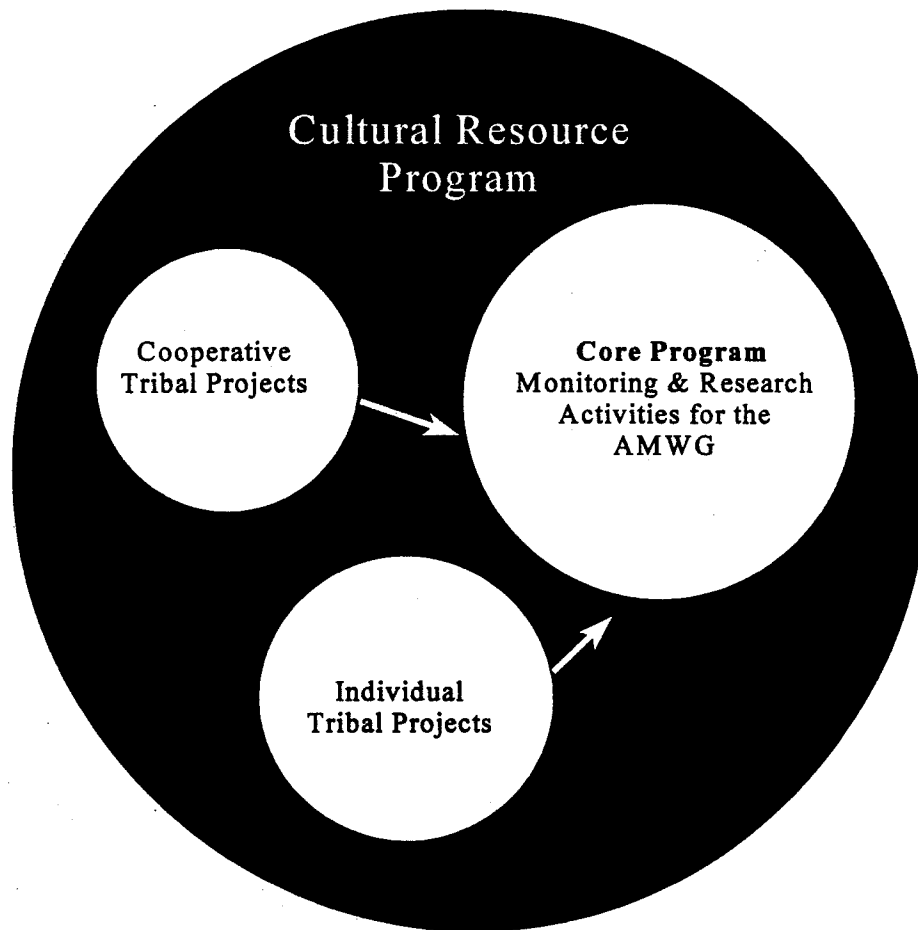
IDENTIFICATION OF STAKE HOLDER INFORMATION NEEDS

CULTURAL RESOURCES

- Develop data and monitoring systems to assess impacts to cultural resources
- Develop predictive model of geomorphic processes related to archaeological site erosion
- Assess potential affects to resources from various flow regimes
- Characterize through scientific study and data development all assumed historical and current values of resources to tribal nations and to general public
- Characterize historic and current religious associations of all sites associated with impacts of dam operating criteria
- Characterize all cultural resource sites as to the specific associated management/research needs, i.e.; preservation, stabilization, documentation, etc.; under alternative operating criteria
- Develop Tribal monitoring programs for evaluation of resource impacts
- Develop mitigation strategies relative to documented site impacts
- Design and develop integrated data systems to support management and research goals while ensuring protection and confidentiality of sensitive data



Primary Components of the Cultural Resources Program



PROPOSED MONITORING AND RESEARCH ACTIVITIES

1. Develop data and monitoring systems to assess impacts.
2. Develop data to assess risk of damage and loss from varying flow regimes.
3. Develop tribal monitoring programs for the evaluation of impacts to cultural resources.
4. Develop a predictive model of geomorphic processes that are related to archaeological site erosion.
5. Characterize resource values through scientific study.
6. Develop appropriate data systems and related technologies for restricted and sensitive information.

BIOLOGICAL RESOURCES

IDENTIFICATION OF STAKE HOLDER INFORMATION NEEDS

BIOLOGICAL RESOURCES (Examples)

- Define current and historic food base character and structure
- Determine adult humpback chub population levels and evaluate population level trends
- Determine levels of recruitment of humpback chub in the mainstem and Little Colorado River
- Develop criteria for self sustaining populations of humpback chub
- Determine historic and current character and structure of native species populations
- Determine ecosystem requirements, population character and structure to maintain populations of Trout
- Define criteria for healthy trout populations
- Define areas and conditions of current and future existing and potential native and non-native fish interactions
- Determine historical (pre-dam) natural composition of riparian and upland vegetation communities
- Define and specify ecology of native terrestrial wildlife resources
- Determine population changes in special status species

THE BIOLOGICAL RESOURCES PROGRAM

Program Goals

- Address stakeholder objectives and information needs.
- Develop information about the structure and function of the ecosystem.
- Predict ecosystem responses.

Ecosystem degradation is not inevitable; it is simply cheaper and easier for some in the short term. Ecosystem health is also not inconsistent with economic imperatives and political realities. In fact, a healthy environment is the basis for a healthy economy. (Likens, G.E. 1992)

POTENTIAL MONITORING AND RESEARCH ACTIVITIES

Fish and Aquatic Resources.

- a. aquatic food base
- b. reproduction, recruitment and growth of native fishes
- c. reproduction, recruitment and growth of non-native warm water and cool water fishes including trout
- d. habitat condition and availability
- e. competition and predator-prey interactions

Riparian Vegetation.

- a. area and species composition of woody riparian plants
- b. area and species composition of emergent marsh plants

Wildlife and wildlife habitat.

- a. area and species composition of riparian habitat for associated vertebrates and invertebrates
- b. aquatic food base for wintering waterfowl

Threatened and endangered species.

- a. humpback chub
- b. razorback sucker
- c. bald eagle
- d. peregrine falcon
- e. Southwestern willow flycatcher
- f. belted kingfisher
- g. Kanab ambersnail
- h. Other federal and state species of concern

**SOCIOECONOMIC
AND
RECREATION RESOURCES**

IDENTIFICATION OF STAKE HOLDER INFORMATION NEEDS

SOCIOECONOMIC RESOURCES

- Maximize power resources within legal and policy guidelines

RECREATION RESOURCES

- Determine criteria and aspects that are important to or detract from wilderness experience
- Determine adequate beach quality, character and structure for camping throughout the system
- Determine if operating criteria maintain safe and adequate powercraft navigability in Glen Canyon and upper Lake Mead
- Determine flow regimes necessary to maintain fish populations of 100,000 adult Trout (age class II plus)
- Define pattern of waterfowl and other wildlife use and conflicts to other uses

PROPOSED MONITORING AND RESEARCH ACTIVITIES

SOCIOECONOMIC RESOURCES

- Develop a cost benefit analysis model for evaluating “the effects of the Secretary’s actions” on environmental and socioeconomic resources

RECREATION RESOURCES

- Determine if recreation is enhanced and safety improved over impacts resulting from historical dam operations
- Determine if changes in recreational patterns resulting from selected dam operations have an effect on the Canyon’s downstream resources
- Incorporate existing information on use and changes resulting from recreation at two year intervals
- Monitor beaches using aerial/video photography every other year
- Monitor recreationalists values and concerns on a five year basis or following unusual events

INFORMATION TECHNOLOGIES RESOURCES PROGRAM

Several areas of focus will be implemented in the information technology programing, including the following:

1. Development of protocols for data collection, processing and use.
2. Development of extensive databases across all resources and a database management system
3. Development of a robust geographic information system to accommodate multiple layers associated with all resources of interest to stakeholders
4. Development of databases associated with remotely sensed data, here to date not incorporated in the GCES database system.
5. Stakeholder direct access to selected data and information in the database management system and GIS.
6. Development of outreach programs to transport data and information to stakeholders.

BUDGET FOR GCMRC

Proposed FY 1998-2002

Fiscal Year

<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>
7.0	7.0	8.0	7.5	7.0

Budget Allocations (000 of \$)

AMP	-----	.300
GCMRC	-----	
Personnel	-----	1.200
Physical resources	-----	.800
Biological resources	-----	1.600
Cultural resources	-----	1.300
Socioeconomic resources	-----	.200
<u>Materials and service support</u>	-----	<u>1.600</u>
		7.000

