

Strategic Plan

Glen Canyon Dam Adaptive Management Program

Final Draft

August 17, 2001

New Final Draft Strategic Plan-August 17-jk

1 INTRODUCTION

This strategic plan describes the adaptive management approach that the Glen Canyon Dam Adaptive Management Program uses in making recommendations to the Secretary of the Interior regarding management of the Colorado River ecosystem (see Glossary). This strategic plan presents the vision, mission, principles, goals, management objectives, information needs, and management actions of the Glen Canyon Dam Adaptive Management Program. As the main planning document of the Adaptive Management Program, this plan has been prepared based on consultation and coordination among those organizations, institutions, and individuals with interests in the operation of Glen Canyon Dam and its effects on the Colorado River ecosystem.

The plan presents the background and history of the Glen Canyon Dam Adaptive Management Program, the scope of the program, the program members or stakeholders, the statutory and organizational framework, and the details of how the Adaptive Management Program operates. The plan details the specific management objectives needed to realize the vision and goals of the program, and whether they are achieved through the Adaptive Management Program or supplemented by funds outside the Program. Supporting documents are provided in a series of appendices.

ADAPTIVE MANAGEMENT PROGRAM ORGANIZATIONAL FRAMEWORK

What is Adaptive Management?

Adaptive management has gained widespread acceptance in resource management since Holling (1978) developed the concept. Lee (1993:9) defines adaptive management with a simple imperative: “policies are experiments; *learn from them.*” Other characteristics (as described by Nyberg 1998; Walters 1986; Taylor et al. 1997) include:

- A focus on ecosystems;
- Experimentation and manipulation of managed ecosystems;
- A time scale based on the biological generation or longer;
- Acknowledgement of uncertainty about what policy or practice is best for a particular management issue;
- Careful implementation of a plan of action designed to reveal the critical knowledge;
- Monitoring of key response indicators;
- Analysis of outcomes in consideration of original objectives; and
- Incorporation of results into future decisions.

Glen Canyon Dam Adaptive Management Program Defined

Due to the significant levels of uncertainty surrounding the resources of the Colorado River ecosystem and the effects of dam operations on those resources, the Glen Canyon Dam Environmental Impact Statement stipulated an adaptive management approach. This approach allows for scientific experimentation that adds to the knowledge base of effects of the operation

of Glen Canyon Dam, primarily on downstream resources, and results in the development of recommendations to the Secretary of the Interior regarding additional operational changes.

The adaptive management approach being taken to manage Glen Canyon Dam operations and the resources affected by dam operations is as follows:

- The Adaptive Management Program focus is on the Colorado River ecosystem;
- Models are developed to reveal the potential effects of policies, activities, or practices that are being considered for implementation;
- Questions are formulated as testable hypotheses regarding the expected responses or linkages of the Colorado River ecosystem to dam operations and other management actions;
- Questions are formulated as testable hypotheses;
- Experiments are conducted to test hypotheses and answer questions;
- Management activities reveal, through monitoring and evaluation of results, the accuracy or completeness of the earlier predictions; and
- New knowledge and information produced through experimentation are incorporated into management discussions and recommendations to the Secretary of the Interior.

Organizations and Positions Within the Glen Canyon Dam Adaptive Management Program

With the signing of the Record of Decision for the Glen Canyon Dam Environmental Impact Statement (Reclamation 1996), the Glen Canyon Dam Adaptive Management Program was established, along with the following positions or organizations:

- Secretary of the Interior's Designee
- Adaptive Management Work Group
- Technical Work Group
- Independent review panels
- Grand Canyon Monitoring and Research Center

The roles, functions, and relationships of these positions and organizations are graphically depicted in Fig. 1 and are described in detail below based on the descriptions in the Glen Canyon Dam Environmental Impact Statement (Reclamation 1995) and Record of Decision (Reclamation 1996).

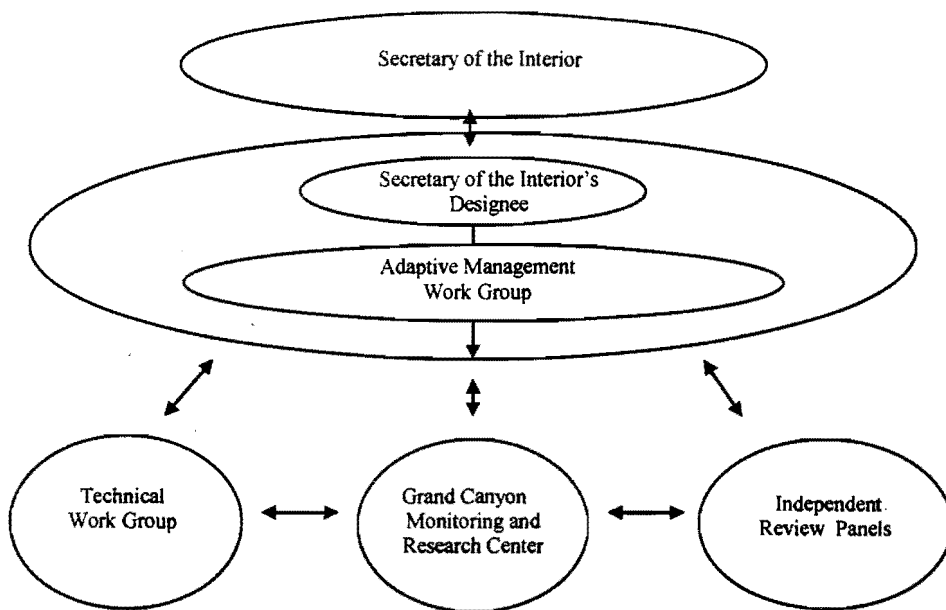


Figure 1. Organizational components of the Glen Canyon Dam Adaptive Management Program.

Secretary of the Interior's Designee

The Secretary of the Interior's Designee serves as the principal contact for the Glen Canyon Dam Adaptive Management Program and as the focal point for issues and decisions associated with the program. Responsibilities of the position include:

- Chairs the Adaptive Management Work Group;
- Ensures that the Department of the Interior complies with its obligations under the Grand Canyon Protection Act and Record of Decision for the Glen Canyon Dam Environmental Impact Statement;
- Ensures that the Department of the Interior fulfills its trust responsibilities to American Indian tribes with interests or assets affected by the program; and
- Reviews, modifies, accepts, or remands recommendations from the Adaptive Management Work Group in making decisions about any changes in dam operation and other management actions and forwards the approved recommendations to the Secretary of the Interior.

Adaptive Management Work Group

The Adaptive Management Work Group is a Federal Advisory Committee that includes representatives from the stakeholder tribes, organizations, and institutions listed below. The Secretary of the Interior appoints the Adaptive Management Work Group members. Responsibilities of the Adaptive Management Work Group as delineated in the Glen Canyon Dam Environmental Impact Statement (Reclamation 1995:36) are:

- Provides the framework for Glen Canyon Dam Adaptive Management Program policy, goals, direction, and priorities;
- Develops recommendations to the Secretary of the Interior for modifying operating criteria and other resource management actions, policies, or procedures;
- Facilitates coordination and input from interested parties;
- Reviews and forwards the annual report to the Secretary of the Interior and his/her designee on current and projected year operations;
- Reviews and forwards annual budget proposals; and
- Ensures coordination of operating criteria changes in the Annual Operating Plan for Colorado River Reservoirs and other ongoing activities.

Note that “dam operations” refers to the operation of the power plant and other release structures, such as bypass structures, spillways, and, potentially, a temperature control device, among others. Their uses conform to applicable law. The Adaptive Management Work Group develops recommendations for all of the dam’s structures to further the purposes of the Grand Canyon Protection Act, the Glen Canyon Dam Environmental Impact Statement, and Record of Decision. This is done within the limits of the Record of Decision and through experimentation.

Representatives from the following tribes, organizations, or interest groups are presently included in the Adaptive Management Work Group:

- Arizona Department of Water Resources
- Arizona Game and Fish Department
- Bureau of Reclamation
- Bureau of Indian Affairs
- Colorado River Board of California
- Colorado River Commission of Nevada
- Colorado River Energy Distributors Association
- Colorado Water Conservation Board
- Grand Canyon River Guides
- Grand Canyon Trust
- Hopi Tribe
- Hualapai Tribe
- National Park Service
- Navajo Nation
- New Mexico State Engineer’s Office
- Pueblo of Zuni
- Southern Paiute Consortium
- Southwest Rivers
- Trout Unlimited
- U. S. Fish and Wildlife Service
- Utah Associated Municipal Power Systems
- Utah Division of Water Resources
- Western Area Power Administration
- Wyoming Interstate Streams Engineer

Technical Work Group

The Technical Work Group is comprised of technical representatives of Adaptive Management Work Group members and operates at the direction of the Adaptive Management Work Group. The Technical Work Group's main function is to provide technical assistance to the Adaptive Management Work Group. Technical Work Group functions may include (Reclamation 1995:37):

- Developing, with the Grand Canyon Monitoring and Research Center, criteria and standards for monitoring and research programs and providing periodic reviews and updates of these;
- Developing, with the Grand Canyon Monitoring and Research Center, resource management questions (i.e., information needs);
- Reviewing and commenting on the scientific studies conducted or proposed by the program;
- Provide a forum for discussion by Technical Work Group members, external scientists, the public, and other interested persons;
- Providing information as necessary for preparing annual resource reports and other reports as required by the Adaptive Management Work Group; and
- Reviewing strategic plans, annual work plans, long-term and annual budgets, and other assignments from the Adaptive Management Work Group.

Grand Canyon Monitoring and Research Center

The Grand Canyon Monitoring and Research Center was created to fulfill the mandate in the Grand Canyon Protection Act for the "establishment and implementation of a long-term monitoring and research program to ensure that Glen Canyon Dam is operated in a manner that protects the values for which the Grand Canyon National Park and the Glen Canyon National Recreation Area were created." The Grand Canyon Monitoring and Research Center serves as the science center for the Glen Canyon Dam Adaptive Management Program. The Grand Canyon Monitoring and Research Center leads the monitoring and research of the Colorado River ecosystem and facilitates communication and information exchange between scientists and members of the Technical Work Group and Adaptive Management Work Group. Other functions of the Grand Canyon Monitoring and Research Center are:

- Advocate quality, objective science, and the use of that science in the adaptive management decision process;
- Provide scientific information about resources in the Colorado River ecosystem;
- Support the Secretary of the Interior's Designee and the Adaptive Management Work Group in a technical advisory role;
- Develop research designs and proposals for implementing (by the Grand Canyon Monitoring and Research Center or its contractors) monitoring and research activities in support of information needs;
- Coordinate review of the monitoring and research program with independent review panels;
- Coordinate, prepare, and distribute technical reports and documentation for review and as final products;
- Prepare and forward technical management recommendations and annual reports, as specified in Section 1804 of the Grand Canyon Protect Act, to the Technical Work Group;
- Manage data collected as part of the Adaptive Management Program and serve as a repository for other information about the Colorado River ecosystem;
- Administer research proposals through a competitive contract process, as appropriate;

- Develop, with the Technical Work Group, criteria and standards for monitoring and research programs; and
- Develop, with the Technical Work Group, resource management questions (i.e., information needs).
- Produce the State of the Colorado River Ecosystem Report.

Independent Review Panels

Independent Review Panels, as called for in the Glen Canyon Dam Environmental Impact Statement (Reclamation 1995:38), are comprised of qualified individuals not otherwise participating in the long-term monitoring and research studies. The panels include peer reviewers, science advisors, and protocol evaluation panels whose primary responsibility is to assess the quality of research, monitoring, or science being conducted by the Adaptive Management Program and to make recommendations to improve it. Responsibilities of the panels include:

- Reviewing Glen Canyon Dam Adaptive Management Program monitoring and research programs and protocols;
- Providing reports based on their review to the Grand Canyon Monitoring and Research Center, Technical Work Group, and Adaptive Management Work Group;
- Making recommendations and providing advice to the Adaptive Management Work Group, Technical Work Group, and Grand Canyon Monitoring and Research Center regarding science activities;
- Assessing proposed research plans and programs, technical reports and publications, and other program accomplishments; and
- Conducting five-year reviews of Grand Canyon Monitoring and Research Center monitoring and research protocols.

History of the Glen Canyon Dam Adaptive Management Program

This strategic plan and the Glen Canyon Dam Adaptive Management Program cannot be understood without referencing key events since completion of Glen Canyon Dam in 1963. The plan and program arose from the Bureau of Reclamation's proposal to install additional generators on the bypass tubes and to rewind and uprate the existing generators at Glen Canyon Dam. This proposal resulted in the establishment of the Glen Canyon Environmental Studies that existed from 1982 through 1996.

Glen Canyon Environmental Studies

While the National Park Service, Native Americans, river runners, and scientists had noticed that some beaches were disappearing and that plant and animal life along the Colorado River were changing since Glen Canyon Dam was completed in 1963, the Glen Canyon Environmental Studies program of the Bureau of Reclamation was the first systematic effort to investigate the effects of dam operations on downstream resources. The program began in 1982 and lasted through 1996. The Glen Canyon Environmental Studies did identify a mix of positive and negative consequences of dam operations on the downstream environment. In response to substantial public concern over the findings of the Glen Canyon Environmental Studies, in 1989 the Secretary of the Interior announced that an environmental impact statement would be completed to evaluate the operation of Glen Canyon Dam. With this announcement, the Glen

Canyon Environmental Studies focused on providing specific data for use in the Glen Canyon Dam Environmental Impact Statement (Reclamation 1995).

Grand Canyon Protection Act

The Grand Canyon Protection Act (Appendix A) was enacted on October 30, 1992. Section 1802 states:

(a) **IN GENERAL.**—The Secretary shall operate Glen Canyon Dam in accordance with the additional criteria and operating plans specified in Section 1804 and exercise other authorities under existing law in such a manner as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, including, but not limited to natural and cultural resources and visitor use.

(b) **COMPLIANCE WITH EXISTING LAW.**—The Secretary shall implement this section in a manner fully consistent with and subject to the Colorado River Compact, the Upper Colorado River Basin Compact, the Water Treaty of 1944 with Mexico, the decree of the Supreme Court in *Arizona vs. California*, and the provisions of the Colorado River Storage Project Act of 1956 and the Colorado River Basin Project Act of 1968 that govern allocation, appropriation, development, and exportation of the waters of the Colorado River Basin.

(c) **RULE OF CONSTRUCTION.**—Nothing in this title alters the purposes for which the Grand Canyon National Park or the Glen Canyon National Recreation Area were established or affects the authority and responsibility of the Secretary with respect to the management and administration of the Grand Canyon National Park and Glen Canyon National Recreation Area, including natural and cultural resources and visitor use, under laws applicable to those areas, including, but not limited to, the Act of August 25, 1916 (39 Stat. 535) as amended and supplemented.

The Secretary of the Interior was also directed to establish and implement long-term monitoring programs and activities to ensure that Glen Canyon Dam is operated in a manner consistent with the Grand Canyon Protection Act. These programs include necessary research and studies to determine the effect of management of the dam on the natural, recreational, and cultural downstream resources. These actions will also be undertaken in consultation with other federal agencies, the Governors of the Basin States, Indian Tribes, and the general public, including representatives of academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of federal power produced at Glen Canyon Dam. To accomplish these requirements, the Glen Canyon Dam Adaptive Management Program was established.

Glen Canyon Dam Environmental Impact Statement

The Glen Canyon Dam Environmental Impact Statement (Reclamation 1995) was completed in March 1995. Its purpose was to “determine specific options that could be implemented to minimize—consistent with law—adverse impacts on the downstream environmental and cultural resources and Native American interests in Glen and Grand Canyons.” The Glen Canyon Dam

Environmental Impact Statement analyzed nine alternatives to allow the Secretary of the Interior to balance competing interests and to meet statutory responsibilities for protecting downstream resources and producing hydropower, and to protect affected Native American interests. The preferred alternative was the Modified Low Fluctuating Flow Alternative.

Record of Decision on the Operation of Glen Canyon Dam

On October 9, 1996, the Secretary of the Interior signed the Record of Decision that presented the rationale for choosing the Modified Low Fluctuating Flow Alternative. As noted in the Record of Decision:

The goal of selecting a preferred alternative was not to maximize benefits for the most resources, but rather to find an alternative dam operating plan that would permit recovery and long-term sustainability of downstream resources while limiting hydropower capability and flexibility only to the extent necessary to achieve recovery and long-term sustainability. [Reclamation 1996:10]

The Record of Decision (Appendix G) included seven environmental and monitoring commitments:

- Adaptive Management
- Monitoring and Protection of Cultural Resources
- Flood Frequency Reduction Measures
- Beach/Habitat-Building Flows
- New Population of Humpback Chub
- Further Study of Selective Withdrawal
- Emergency Exception Criteria

The commitments are explained in detail in the Record of Decision (Reclamation 1996; Appendix G) and in the Glen Canyon Dam Environmental Impact Statement (Reclamation 1995:33-34); however, it should be noted that subsequent work of the Technical Work Group and Adaptive Management Work Group have altered some commitments (Technical Work Group 1998) with Endangered Species Act and National Environmental Policy Act compliance.

Statutes, Policies, and Resolutions

The Colorado River is managed and operated under numerous compacts, federal and state laws, court decisions and decrees (including Native American water claim settlements), contracts, treaties, and regulatory guidelines collectively known as the Law of the River. This collection of documents apportions the water among the seven Basin States and Mexico, and regulates and manages the river flows of the Colorado River. Some of the statutes included within the Law of the River that have a major impact on dam operations are the Colorado River Compact of 1922, the Upper Colorado River Basin Compact of 1948, the Colorado River Storage Project Act of 1956, the Colorado River Basin Project Act of 1968, and the Grand Canyon Protection Act of 1992. In addition to Colorado River specific legislation, the Endangered Species Act of 1973 and court decrees including *Arizona v. California* affect the extent to which water developments

and diversions can be utilized in the Colorado River Basin. The Law of the River and this additional legislation control and influence the Adaptive Management Program.

Additional laws, Acts of Congress, executive orders, policies, tribal resolutions, etc., that control or influence the Adaptive Management Program include the National Park Service Organic Act, enabling legislation for Grand Canyon National Park and Glen Canyon National Recreation Area, and Executive Orders that established reservation boundaries for the Navajo Nation and the Hualapai Tribe. In addition, Section 204 of Title II of Public Law 106-377 controls the level of funding of Adaptive Management Program activities from Colorado River Storage Project power revenues. The Federal Advisory Committee Act controls operation of the Adaptive Management Work Group and the Technical Work Group.

Environmental laws and regulations are important to the Adaptive Management Program. These include, but are not limited to, the Endangered Species Act, National Historic Preservation Act of 1966, and National Environmental Policy Act of 1969. Adaptive Management Program compliance with these statutes, regulations, policies, directives, etc., is described in a later section.

Guidance Document for the Adaptive Management Program

Since the Adaptive Management Program became fully operational in 1997, questions and uncertainties have arisen over the relationships of program elements, compliance priorities, and other legal matters. Answers were sought from a Department of the Interior Solicitor. The questions posed and answers received from the Department of the Interior's Solicitor (Loveless 2000) are called the "Guidance Document for the Adaptive Management Program." This document is provided as Appendix B.

Summary of the Glen Canyon Dam Adaptive Management Program

The Adaptive Management Program was developed and designed to provide an organization and process for a collaborative, science-based integration of monitoring and research information to make formal recommendations to the Secretary of the Interior. These recommendations must recognize the environmental commitments of the Glen Canyon Dam Environmental Impact Statement and Record of Decision, and comply with the Grand Canyon Protection Act. The Adaptive Management Program must also remain in compliance with the Law of the River and relevant environmental statutes, regulations, and policies. With all these demands, the Adaptive Management Work Group devised a vision and mission statement and principles to guide its activities and decision making.