Chapter 1. Introduction to the Core Monitoring

Plan

Establishment and implementation of a long-term monitoring program has been identified by the Canyon Dam Adaptive Management Program (GCDAMP) as a critical program need since the inception of the program in 1996. Since then, the focus has been on the development of a "core" monitoring program to meet the environmental and monitoring commitments of the Glen Canyon Dam Environmental Impact Statement and Record of Decision (ROD) and comply with the Grand Canyon Protection Act of 1992. The GCDAMP Strategic Plan (GCDAMP, 2003) defines core monitoring as follows:

Consistent, long-term, repeated measurements using scientifically accepted protocols to measure status and trends of key resources to answer specific questions. Core monitoring is implemented on a fixed schedule regardless of budget or other circumstances (for example, water year, experimental flows, temperature control, stocking strategy, nonnative control, etc.) affecting target resources.

This document describes a general plan and framework for the development of a core monitoring program for the GCDAMP during federal fiscal years 2010 through 2015. Detailed core monitoring plans with explicit methodologies for each resource category will be developed as outlined in this plan over the next several years. The proposed process is consistent with the strategies and objectives described in the Grand Canyon Monitoring and Research Center's (GCMRC) Monitoring and Research Plan (U.S. Geological Survey, 2007), and the GCDAMP Strategic Plan as amended by the Adaptive Management Work Group at their August 2003 meeting (AMWG written comm., 2003, hereafter cited as GCDAMP, 2003).

Monitoring is a fundamental requirement of the adaptive management process (Walters, 1986; Walters and Holling, 1990). The Department of the Interior (DOI) Adaptive Management Technical Guide (Williams and others, 2007) identifies four primary purposes for monitoring within an adaptive management program:

1. To evaluate progress towards achieving management objectives
2. To determine resource status in order to identify appropriate management action
3. To increase understanding of resource dynamics via the comparison of predictions against field observations
4. To enhance and develop models of resource dynamics as needed

In 1995, the Grand Canyon Monitoring and Research Center (GCMRC) was created to fulfill the mandate in the 1992 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.

Since its inception, many of the GCMRC activities have focused on continuing certain monitoring tasks previously established under the Glen Canyon Environmental Studies program (termed here as “Legacy” monitoring), conducting field experiments, and developing technologies in support of development of a core monitoring program. Implementation of a long-term core monitoring program will require a significant commitment of qualified personnel to ensure that the program is implemented in a sustainable and timely manner. With a few exceptions, much of the data collection is proposed to be performed by cooperating agencies and contractors as discussed below; however, some monitoring, such as quality of water and sediment monitoring that has historically been part of the USGS mission, is proposed to continue internal to the GCMRC and the Water Resources Discipline within USGS.

1.1 Purpose and Scope of the General Core Monitoring Plan

The Monitoring and Research Plan (MRP) describes a four-step process for defining and refining core monitoring projects associated with various GCDAMP goals and key resources based on the best currently available information. As described in the MRP, the four steps are (1) develop a general core monitoring plan (this document), (2) conduct information needs workshops with the Technical Work Group (TWG) in advance of convening independent protocol evaluation panel (PEP) reviews, (3) conduct PEPs for each resource goal, and (4) prepare final core monitoring program reports for each resource goal. This is then followed by review and approval by TWG and AMWG (see Appendix B).

This general Core Monitoring Plan (CMP) is the first step in this four-step process of implementing the Core Monitoring Program for the GCDAMP. The CMP identifies the general goals, objectives, scope, schedule, and funding level for each proposed core monitoring project as well as the program as a whole. The scope of the CMP is based on the core monitoring information needs (CMINS) defined by AMWG in the 2003 Strategic Plan, as modified and prioritized by the 2005 Science Planning Group (SPG). The CMP takes into account the feasibility of developing monitoring protocols to meet those needs while including a flexible approach for incorporating risk assessments and trade-off analyses to support decision making related to the scope and elements of the monitoring programs. The CMP also identifies the process and strategies which will be used to develop and finalize individual core monitoring program plans.

This CMP is responsive to most of the higher priority CMINS, however given the scope of the information needs and funding limitations to develop monitoring programs, it does not currently account for all of them. Development and implementation of the core monitoring program for the GCDAMP will consume a large percentage of the current GCDAMP science budget based on the CMINS. The CMP includes initial estimates for costs and timeframes for program implementation but recognizes that a practical decision-making process will be needed by TWG to decide on a final core monitoring program that meets stakeholder needs within available budget constraints. Those budget constraints cannot be articulated here as needs for management actions and other compliance needs are changing, but appear to be taking a larger percentage of the budget than in recent years. Without specific policy guidance on cost, TWG will be using a review and approval process to evaluate and make recommendations on individual plans to AMWG. That process is described in Appendix B.
In general, TWG has requested that GCMRC develop individual cor monitoring plans for each AMP goal that contain 3 levels of funding commitment, for analysis by TWG within a trade-off framework:

- "High" – would implement the CMINs for that goal to the extent practicable and represent as close to full implementation as can be obtained with current resources.
- "Medium" – would implement modest reductions in spending (about 10-30%) to implement the higher priority CMINs. (The projects as described in Chapter 4 of this plan generally represent medium level monitoring programs.)
- "Low" – would implement substantial reductions in spending (about 40-50%) to implement only the highest priority CMINs.

The trade-off analysis would not only show the reductions in cost, but the ability of the program to respond to CMINs (i.e., the ability to answer critical questions), and the rationale for those choices. These tradeoffs would be considered by TWG and a recommendation made to AMWG to consider the policy implications of those choices and to approve a plan that is both technically sound and well considered within our long-term financial limitations. This process would allow for a scientifically driven review of different funding scenarios and provide the decision-makers with the information necessary to make difficult policy decisions. It is inevitable that at current funding levels the Glen Canyon Dam Adaptive Management Program cannot support robust monitoring capable of responding to all of the CMINs during the next 10 years. A serious review of all core monitoring programs is critical to supporting long-term funding needs of the GCDAMP. Given future funding constraints due to increasing and competing needs for support from a capped budget, a carefully structured review process (Appendix TWG) must include methods to elicit a clear understanding of the monitoring abilities and associated information which will be lost and which resources would be affected. In previous core monitoring discussion scope of the program was considered. The 2004 the Core Monitoring Team indicated that an appropriate size would be 40-60% of the GCDAMP budget. The current program as described in this plan, is about 60% of the overall budget and about 75% of the current GCMRC expenditures.

1.2 Legislation, Statutes, Policy, and Strategic Planning

The Colorado River is managed and operated under numerous compacts, federal and state laws, court decisions and decrees, contracts, treaties, and regulatory guidelines, collectively known as the Law of the River. This collection of documents apportions the water among the seven Colorado River basin states and Mexico, and regulates the flows of the Colorado River (Adler, 2007).

The Glen Canyon Dam Adaptive Management Program and Grand Canyon Monitoring and Research Center were established in 1996–97 to meet the environmental and monitoring commitments identified in the Glen Canyon Dam Final Environmental Impact Statement (EIS; U.S. Department of Interior, 1995) and Record of Decision (ROD) (Department of the Interior, 1996), and to comply with the Grand Canyon Protection Act (GCPA) of 1992. Specifically, the GCMRC was created to fulfill the GCPA mandate for the "establishment and implementation of a long-term monitoring and research program to ensure that Glen Canyon Dam (GCD) is operated in a manner that protects the values for which Grand Canyon National Park (GRCA) and the Glen Canyon National Recreation Area (GLCA) were created." This program includes necessary research and monitoring to determine the effects of dam management on the natural, recreational, and cultural resources downstream of Glen Canyon Dam.