

1 Chapter 1. Introduction to the Core Monitoring

2 Plan

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

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

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

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

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

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34 In 1995, the Grand Canyon Monitoring and Research Center (GCMRC) was created to fulfill the mandate
35 in the 1992 Grand Canyon Protection Act for the

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37 *establishment and implementation of a long-term monitoring and research program to*
38 *ensure that Glen Canyon Dam is operated in a manner that protects the values for which*

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1 the Grand Canyon National Park and the Glen Canyon National Recreation Area were
2 created.

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

13 1.1 Purpose and Scope of the General Core Monitoring Plan

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

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

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33 This CMP is responsive to most of the higher priority CMINS; however given the scope of the
34 information needs and funding limitations to develop monitoring programs, it does not currently account
35 for all of them. Development and implementation of the core monitoring program for the GCDAMP will
36 consume a large percentage of the current GCDAMP science budget based on the CMINS. The CMP
37 includes initial estimates for costs and timeframes for program implementation but recognizes that a
38 practical decision-making process will be needed by TWG to decide on a final core monitoring program
39 that meets stakeholder needs within available budget constraints. Those budget constraints cannot be
40 articulated here as needs for management actions and other compliance needs are changing, but appear to
41 be taking a larger percentage of the budget than in recent years. Without specific policy guidance on cost,
42 TWG will be using a review and approval process to evaluate and make recommendations on individual
43 plans to AMWG. That process is described in Appendix B.

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1 ~~In general, TWG has requested that GCMRC develop individual core monitoring plans for each AMP goal~~
2 ~~that contain 3 levels of funding commitment, for analysis by TWG within a trade-off framework:~~

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

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

26 1.2 Legislation, Statutes, Policy, and Strategic Planning

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

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