Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
February 3-4, 2010

Agenda Item

Science Advisors Progress Report on Assessment of Criteria for Management Actions

Action Requested

√ Feedback requested from AMWG members.

Presenter

David Garrett, Executive Coordinator, Science Advisors

Previous Action Taken

√ By TWG: In order to build a common understanding of what other adaptive management programs from around the country have done in moving from Science to Management Actions, TWG made the following request to the Science Advisors via a motion in March 2009 that passed on a vote of 11-3, 2 abstaining:

> The TWG requests that the Science Advisors develop a report on Management Actions from other programs which describe the transition from research to management. This should be developed in coordination with the TWG Chair, TWG Co-Chair, and Chief of GCMRC. The report should be provided to the TWG at its next meeting and a presentation should be provided. The SAs should also be available to present this to AMWG at their late summer meeting (likely in August).

This request would provide a place for the TWG to start in understanding the technical arguments and considerations of management actions and that further work would need to be done. TWG felt that given the current budget implications, it was necessary to begin work in order to inform the budget discussion. TWG has no experts in this area and thus asked the Science Advisors for support in this limited capacity. As part of the second motion passed by consensus on this subject, detailed below, TWG requests that AMWG (a) consider the topic of Management Actions and (b) request TWG to further consider the technical aspects of making these decisions, as well as potentially participating in the policy discussions, as appropriate.

> The TWG requests that AMWG consider the policy implications of management actions. This could look similar to an in-and-out committee, involving interested parties that are familiar with the legal and policy framework of the program. This could either be a TWG or AMWG committee and could involve a mix of individuals from all parts of the AMP. We are looking to AMWG for guidance on how to, and if we should, further pursue the question of management actions.

√ By AMWG: At its September 2009 meeting, AMWG passed the following motion: The AMWG requests that the Science Advisors survey other adaptive management programs and develop a

report which describes their definitions of criteria for defining science-based management actions and the transition from research to management. The report should be provided to the TWG and AMWG members, and TWG should review the report and forward to AMWG options for AMWG to consider with regard to how GCDAMP should handle these issues.
Motion passed by consensus.

Relevant Science

√ N/A

Background Information

Based on the AMWG request for an assessment of Management Actions Criteria, in the Science Advisors developed a proposal for the assessment (attached) for review by GCMRC and the TWG. All input on the proposal from TWG was obtained by November 1, 2009. The Science Advisors will provide progress reports to the TWG at their January meeting and to AMWG at their February 3-4, 2010 meeting. An SA final report on this issue will be submitted in February 2010. The SAs will work with the TWG and GCMRC on TWG recommendations to the AMWG.

PROSPECTUS
EVALUATION OF TRANSITION OF SCIENCE TO MANAGEMENT ACTIONS IN ADAPTIVE MANAGEMENT PROGRAMS

BY
GCDAMP SCIENCE ADVISORS
September 2, 2009

INTRODUCTION

The Glen Canyon Dam Adaptive Management Program (GCDAMP) was established to implement requirements of the 1992 Grand Canyon Protection Act and Glen Canyon Dam EIS as follows: "Operate Glen Canyon Dam and exercise other authorities in such a manner as to protect, mitigate adverse impacts to and improve 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, and subject to water allocation and development provisions of existing statutes and laws (GCPA, 1992)." The EIS requires the Secretary to, "Initiate a process of adaptive management whereby the effects of dam operations on downstream resources would be assessed and the results of those resource assessments would form the basis for future modifications of dam operations. The concept of adaptive management is based on the recognized need for operational flexibility to respond to future monitoring and research findings (GCDEIS 1996)".

One area identified as needing improvement involves determining when science has sufficiently reduced uncertainty regarding outcomes from a proposed activity, so that policy makers and managers can define a management action that would require limited future science activity presumably, subject to long term monitoring, but not further research. The GCDAMP web site www.usbr.gov/uc/rm/amp/amwg includes the following two statements related to management actions (emphasis added):

- *The scientific information obtained under the Adaptive Management Program is used as the basis for recommendations for dam operations and management actions.*
- *Through the Adaptive Management approach, scientific experimentation is integrated into resource management actions. Over time, as more is learned about the complexities of the downstream ecosystem, the goal of enhancing and improving downstream resources and dam operations can be realized.*

Information developed by TWG and other GCDAMP entities includes the following discussions on management actions. The concept of management actions was brought forward in development of a Long-Term Experimental Plan (LTEP during deliberations of the Science Planning Group (an AMWG ad hoc group) in 2005 through 2006. Management actions were contrasted with experiments in the development of an experimental design for an LTEP. That design was designated the "hybrid" design because it accommodated both experiments and management actions. Definitions used at that time held that both experiments and management actions are purposeful manipulations of the system flow or nonflow treatments. Appropriately developed management actions were considered to have known, positive effects, however, and therefore would be implemented and maintained as needed to attain the desired resource conditions; experimental actions having more uncertain effects might be purposefully

turned on and off, or implemented in different states, as treatments to determine those effects.

Neither the Strategic Plan nor any of the other guiding documents in the GCDAMP clearly describe what management actions are, how they should be developed in relation to science, or what funding should be used to implement them. For example, there is a critical need to implement compliance activities within the program. And, some could be addressed as management actions or science experiments.

In developing the FY 2010-11 workplans and budgets, it has become clear that the GCDAMP should consider the implications of management actions. An example is the mechanical non-native fish removal project along the mainstem, which, as a compliance measure could be implemented as a management action or scientific research depending on its application. The removal program was included in a 2008 Biological Opinion issued by the US Fish and Wildlife Service as a necessary conservation measure. The science entity (GCMRC) has completed its charge of assessing protocols for achieving desired levels of coldwater species (specifically rainbow trout (RBT)) control, so trout removals can be implemented as a management action. However, the proposed LTEP approach to determine whether the control of RBT has positive (or possibly even negative) effects on HBC has been terminated at present. As such, if coldwater species control (specifically, nonnative salmonids) is continued, should it be continued as a management action, science program, compliance activity or some combination (hybrid)?

Fundamental questions arise from the above and other examples in the GCDAMP.

- What does it mean in adaptive management programs to move from scientific experimental research to management action or conservation measures?
- Can we learn from examples of other adaptive management programs?
- Where does monitoring fit?
- Do management actions fall on a continuum of how much "science" is involved in their implementation and monitoring?
- What are the important considerations in defining criteria for management actions?
- How do we determine who is responsible for funding and implementation?

These questions will be investigated by TWG with the support of the Science Advisors and the GCMRC to make technical recommendations to AMWG. The first step will involve the Science Advisors evaluation of examples of the transition from science to management actions in other programs. It is intended to provide a starting point of conversation for discussions by the Secretary Designee, AMWG and TWG.

REQUESTED SCIENCE ADVISOR (SA) INPUT TO GCDAMP

The following motion was passed by the AMWG by consensus on August 13, 2009 reflecting their desire to continue to develop information on this issue:

> "The AMWG requests that the Science Advisors survey other adaptive management programs and develop a report which describes their definitions of criteria for defining science-based management actions and the transition from research to management. The report should be provided to the TWG and AMWG members, and TWG should review the report and forward to AMWG options for AMWG to consider with regard to how GCDAMP should handle these issues."

SA PROCEDURE TO RESPOND TO AMWG REQUEST

This prospectus describes the SAs approach for responding to the AMWG's request. The SA's, in keeping with their operating protocols, will only address issues of a scientific and technical nature. The Science Advisors protocol and operating procedures do not permit assessments of policy or legal interpretations of USDOI decision processes, or decision processes of the GCDAMP FACA committee. The request by the AMWG asks for a survey of information from other programs that utilize adaptive management or similar processes and have implemented management actions or similar practices. This request is an activity that conforms to SA protocols.

The SA charge for this specific project will be confined generally to the following objective: **The SAs will (a) survey federal and state adaptive management and related programs and gather information on how these programs managed a transition from science inquiry to management actions or similar practices on specific issues, projects or activities, and (b) based on that survey identify criteria or guidelines that assist scientists, managers and stakeholders to move from science to management actions .**

The project is not intended to create an explicit definition for either a science activity or a "management action". Nor is it intended to determine when GCDAMP science programs should be transitioned to management actions or similar activities. However, it should provide information to the Secretary, GCDAMP managers and stakeholders to assist in this determination.

The general approach taken for information development will be a case study methodology. Cases will be selected that have similar characteristics to the GCDAMP as follows:

- Federal and/or state directed programs
- Utilize adaptive management or similar processes
- Long term programs with legal, policy, or regulatory authorities to resolve landscape level issues involving natural resource and social resource conflicts
- Science learning to reduce uncertainty of related impacts from management activities is significant program thrust
- Implementing management actions to assure appropriate protection and or management of natural and social resources is significant program thrust
- Sufficient science success exists in reducing uncertainty of outcomes of management activities to define additional investments in science unnecessary or limited
- Defined needs exist or have existed to transition to management actions or activities with reduced science need.

In addition, the Department of the Interior's 2007 technical guide for adaptive management will be revisited for any guidance it may contain relating to the subject of transitioning from scientific experimental research of ecosystems to approval and implementation of management actions. Particular attention will be focused on identifying relevant guidance provided in this document provided in Chapter 5, entitled *Other Operational Issues*, including sections 5.1. *Uses of Information in Natural Resource Management, 5.2. Accounting for Uncertainty in Adaptive Management and 5.3. The Measurement of Learning.* Several of the case studies included in the DOI

technical guide will also be reviewed (as listed below) for evidence of transitions between scientific studies and management actions.

There are many federal and state directed natural resource programs that use elements of adaptive management processes. Some programs have fully developed science and management programs that are explicitly structured to conduct policy experiments and develop through time fully informed management actions from their science investigations. Our survey will screen a set of programs and focus on those that have similar characteristics to the GCDAMP program, i.e. developed science and management programs conducting on going policy experiments.

A cross section of adaptive management programs will be evaluated to isolate subsets that reflect accomplishment in implementing management actions or similar activities that have limited uncertainty in outcomes. An effort will be extended to incorporate programs that are directed at providing the science and management basis for recovery of endangered fish in western riverine settings.

Following are examples of programs that may be screened in the assessment.

- Trout Creek Mountains Restoration, U.S. Department of the Interior, Bureau of Land Management, Vale District, and the U.S. Fish and Wildlife Service
- Adaptive Waterfowl Harvest Management; USDI/FWS
- Sonoita Valley Planning Partnership**,** Bureau of Land Management-Tucson Field Office, U.S. Fish and Wildlife Service-Arizona Ecological Services, Coronado National Forest, Natural Resource Conservation Service**s,** Colorado
- Bully Creek Landscape Area Management Project; U.S. Department of the Interior, Bureau of Land Management, Vale District,
- Interagency Bison Management Plan; National Park Service, Yellowstone National Park,
- Ponderosa Pine Forest Restoration on Turnbull; U.S. Fish and Wildlife Service,
- Five Rivers Landscape Management Project; U.S. Department of Agriculture, U.S. Forest Service,
- Kissimmee River; Florida
- Columbia River; PNW
- Cal-Fed; California
- Adaptive Fisheries Harvest; Northwest
- Platte River; Colorado/Nebraska
- Trinity River; California
- South Florida Restoration Task Force; Florida
- Northwest Forest Plan; PNW
- Northeastern States Research Cooperative
- Lower Colorado River Multi-Species Conservation Program; SW
- Tahoe Science Consortium
- Chesapeake Bay Program
- Upper Colorado River Recovery Implementation Program
- Bridge River of British Columbia - flow experiments and BC Hydro operational strategies,
- Bill Williams River, AZ– operational strategies for Alamo Dam,

Several case studies within the Colorado River Basin may also be of particular relevance to the issue of how management actions (primarily, daily to annual release strategies, but other treatments also) have been recently implemented as DOI policies: 1) scientific basis for MLFF rules for Glen Canyon Dam operations approved as ROD in 1996, 2) science information used as basis for current Flaming Gorge Dam operations on the Green River under the ROD implemented in 2006, 3) science basis for Navajo Dam operations on the San Juan River under current ROD, 4) scientific basis for proposed Aspinall Unit operations on the Gunnison and Colorado Rivers in anticipation of future ROD. In each case, we assume that the management actions are implemented on the basis of scientific information and other legal mandates intended to achieve specified resource objectives. The question remains: "How were the current operating policies at the above facilities identified and then transitioned from the focus of research evaluation to management actions?"

The survey and case study assessments will be directed at identifying (1) several specific examples where activities have transitioned from science to management, and (2) criteria and guidelines and other information that will be helpful to managers in identifying management activities that have sufficient certainty in predicted outcomes to no longer require significant science investments. The need for certainty in implementing management actions has its basis in several areas of science. Criteria and guidelines can be developed to assist managers and policy makers in understanding general levels of certainty that are associated with taking management actions. And, case studies can be very helpful in demonstrating the workability of these criteria and guidelines.

In the end, defining when a specific management action requires or does not require additional investments in research and monitoring to reduce further uncertainty is a management decision. And, organizations and managers willingness to accept risk varies with many factors, i.e. time, issue, social and environmental conditions, etc. Much of the process, therefore, is greatly influenced by value judgments and willingness to take risk.

REQUIREMENT AND SCHEDULE

The Science Advisors approach will involve three primary steps in the fall 2009 as follows:

- Evaluation of science literature for specific findings that can contribute criteria, guidelines, models and information to clarify opportunities for movement from a science activity to a management action.
- Screen 20 to 30 adaptive management programs, and select an appropriate subset (5-10) to evaluate as case studies.
- Based on the case studies, identify criteria, guidelines, models, information, management experience, etc. that may assist managers in moving from science to management actions.

The Science Advisors will complete the above assessments from September 15, 2009-December 15, 2009. A report of findings of the science advisors will be submitted to GCMRC and the TWG by December 21, 2009. The Science Advisors Executive Coordinator will present the science advisors findings to the TWG at their January, 2010 meeting and to the AMWG at their spring 2010 meeting.

Evaluating Criteria Guiding Transition of Science Activities to Management Actions in Adaptive Management Programs

GCDAMP
Science Advisors

Adaptive Management Work Group Meeting

Phoenix, AZ
February 3-4, 2010

Proposed Activities

- Nov, 2009 obtain input from GCMRC and TWG on project prospectus
- January 2010, report progress at TWG meeting
- February 3-4, 2010, report progress at AMWG meeting
- February 28, 2010, submit final report to TWG/AMWG/GCMRC

Project Objectives

Literature Review:

- Evaluate adaptive management literature for guidance on criteria to transition from science to management actions

Review Existing AM Programs:

- Survey active adaptive management programs for criteria being utilized

Adaptive Management Conservation Programs Reviewed

- Adaptive Water Fowl Harvest Management
- Kissimmee River Program
- Columbia River Program
- Cal-Fed Program
- Bridge River Restoration Program
- Trinity River Restoration Program
- Klamath Basin Restoration Programs
- Platte River Program

Adaptive Management Conservation Programs Reviewed (con't)

- San Juan River Recovery Implementation Program
- Northwest Forest Plan; Oregon, Wash
- Jornada Experimental Range; NM
- East Cascades Greater Forest Ecosystem
- South Florida Restoration Task Force
- Upper Colorado River Recovery Implementation Program
- Chesapeake Bay Program
- Lower Colorado Multispecies Conservation Plan

Observations

Impetus for AM Development; 1960s-1070s

- Need to address complex natural resource management programs under significant uncertainty
- Need to incorporate broad stakeholder group input
- Need to conduct policy experiments using management actions and monitoring

Observations

AM Development

- AM is a relatively new approach in management science
- Development of approaches in 1970s to 1990s
- Incorporates both passive and active approaches
- Utilizes concepts from several science areas
  - Management science
  - Probability theory
  - Risk and uncertainty
  - Decision theory
  - Ecosystem science

Observations

Difference in Traditional Science Model and Adaptive Management Model

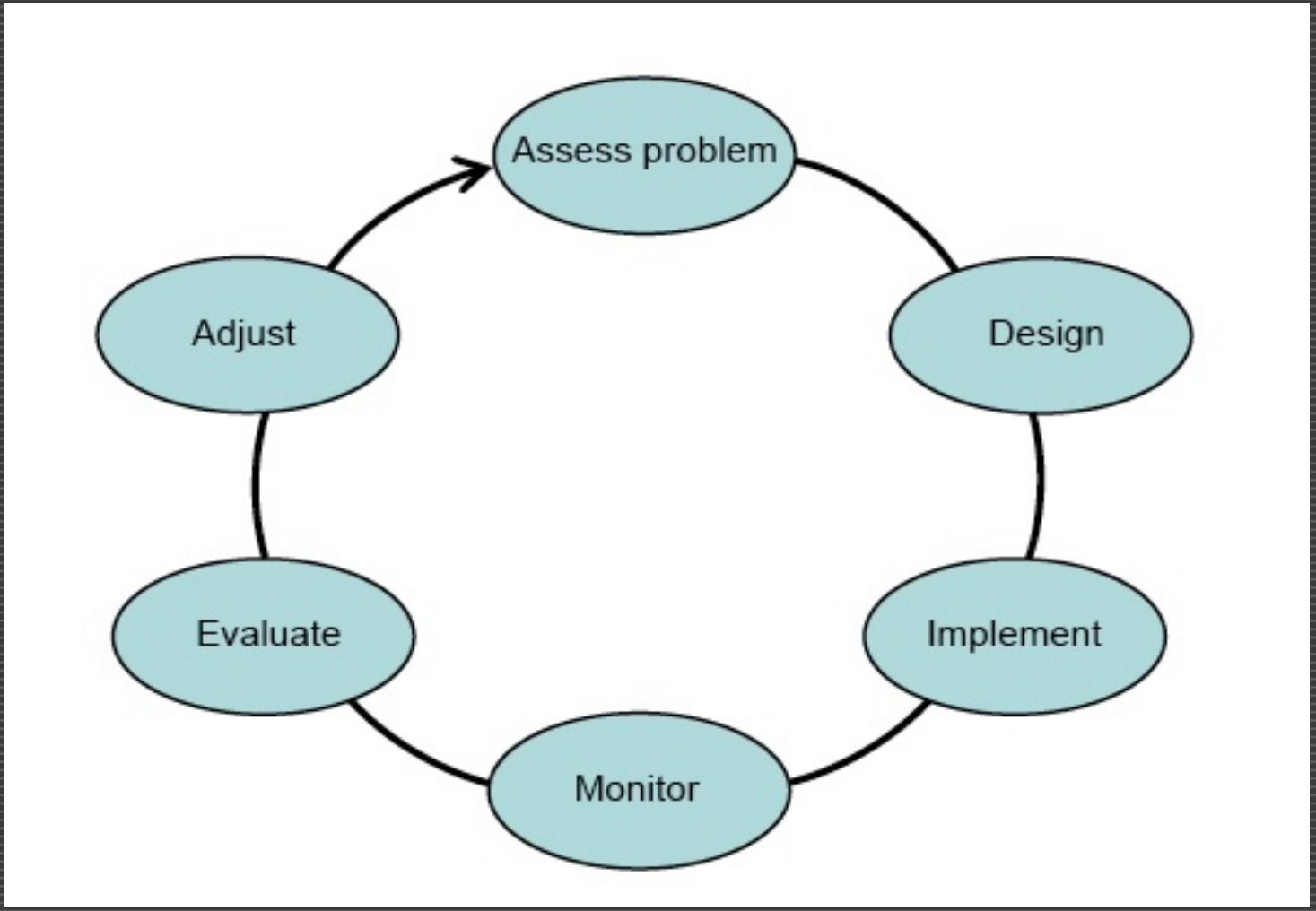
Traditional Science Model: Focus on learning through controlled experimentation

- Science Questions →
  - Test Hypothesis →
  - Controlled Experiment→
  - Science Proof →
  - Pilot Test →
  - Management Action →

Observations

GCDAMP Model: Focus on Improving Resources and Learning With Management Actions

- Problem: Beaches →
- Design: MLFF; multiple management actions →
- Implement Management Actions: HFEs (1996) →
- Monitor and Evaluate: GCMRC Research and Monitoring →
- Adjust Management Action: 2004/2008



Adaptive Management Model

Observations

AM Theory and Practice Does Not Identify Expressed Need to Establish Criteria to Move from Science Activity to Management Action

- AM accepts the reality that we cannot resolve uncertainty in many complex natural resource programs
- AM is a management model adapted to issues of continued high uncertainty where traditional science paradigms have limited effectiveness
  - Complex multi-objective large scale natural resource issues with high variability and uncertainty
- Smaller scale experiments to establish proofs for pilot tests have limited system effectiveness
- AM approach is “learning by doing management”, i.e. implement management actions; monitor results; revise management actions
- AM must embrace uncertainty in the decision process and make greater use of risk analysis, probability theory, Bayesian statistics, tradeoff analysis, etc. to respond to managers willingness to accept risks

Observations

GCDAMP concern over science transition to management actions may relate to GCDAMP emphasis on science in first decade

- Design of GCDAMP post EIS emphasized aggressive science program to develop baseline information, science basis for LTEP, management actions, etc
- GCDAMP program structure, strategic science plan, budget, etc. reinforced science focus
- Implementation of first decade GCDAMP has focused strongly on learning
- Increased emphasis shifting toward management actions in 2004-2009 period

Observations

Shifts to Expanded Management Actions Requires Improvements in Areas of Management and Policy

- GCDAMP Strategic Plan (DFCs)
- Science Advisor Review of GCDAMP (DFCs, management actions, funding)
- Science Planning Group (SPG) Review (DFCs, management actions, funding)
- Reports on GCDAMP Roles and Responsibilities; (Improved policy and management guidance)
- GCMRC Strategic Science Plan (Tradeoff models, decision models)

SA Request to Present Findings at 2010 Summer AMWG in Following Areas

- Appropriateness of AM model to GCDAMP
- Important roles of management actions and science in GCDAMP
- Improving the AM model for GCDAMP
  - Improved policy and management leadership in refinement of goals, management objectives, desired future conditions, management protocols, budget planning, etc.
  - Improved management and science leadership in design of policy experiments, management actions, science and management questions, monitoring approaches
  - Improved management tools for evaluating risk and uncertainty, conducting resource tradeoffs, structured decision processes