

**GLEN CANYON DAM ADPATIVE MANAGEMENT PROGRAM  
TECHNICAL WORKGROUP - AD HOC LAKE POWELL ADVISORY GROUP  
CATEGORIZATION OF MANAGEMENT OBJECTIVES AND INFORMATION NEEDS**

January 25, 1999

The AMWG approved a list of MO/INs for the Glen Canyon Dam Adaptive Management Program on July 21, 1998. From this list, two MOs (and associated INs ) were adopted for Lake Powell. On January 13, 1999, the AMWG asked the TWG to separate the Lake Powell MOs and INs into two categories: those directly related to downstream resources and those that mostly relate only to the lake itself (gray and black categories). Once approved by the TWG, the GCMRC will develop a monitoring and research program for both the long-term strategic plan and the FY-2000 work plan to address those INs in the downstream category.

Below is a suggested split of MO/INs for Lake Powell based on my understanding of the effects on downstream resources. Please review and be ready to discuss at our meeting on 2/4. Based on the comment received at that time, I'll revise and be ready to present a final list for the 2/18 TWG. (All MOs and INs are written verbatim in order to minimize reader confusion.)

*in if affecting downstream →*

**Gray category - Lake Powell Management Objectives and information needs related to downstream resources**

MO 1 relates to resources within Lake Powell that have been shown to directly influence downstream biology and water quality. MO 1 reads as follows:

**Prevent impacts that adversely affect the water quality (physical, chemical, biological) of Lake Powell due to dam operations and ensure that fully informed AMWG decisions are possible both now and in the future.**

MO 1 includes the following Lake Powell INs that directly influence downstream water quality and aquatic ecology:

**Physical/Chemical (Limnology)**

**IN 1.1 Determine the effect of current dam operations (under approved operating criteria) on reservoir water quality, including but not limited to the following:**

- a. Determine near-dam hydrogen sulfide levels (and other hazardous chemical constituents) within the hypolimnion occurring under current dam operating under current dam operating criteria.
- b. Determine the dynamics of lake stratification and advective flows and their effects on chemical constituents.
- c. Determine/quantify the dynamics of major cations, anions, and

*White areas are funded out of Am.*

*Full need by O&M under water quality item. Not funded out of Am*

nitrate/phosphate ratios resulting from dam operations

d. Determine the effects of dam operations (under approved operating criteria) on the physical/chemical dynamics of Lake Powell side channels and embayments.

e. Quantify/model the heat budget for Lake Powell to determine near-term and long-term (monthly/weekly and annual summaries respectively) effects on a selective withdrawal system.

f. Determine the effects of current dam operations on reservoir levels of selenium.

### **Biological**

**IN 1.1** Determine the impacts of dam operations and resulting water quality on primary and secondary productivity of Lake Powell, including:

- a. algae (phytoplankton)
- c. zooplankton

### **Black category - Management Objectives and information needs related mostly to Lake Powell**

MO 2 relates mostly to Lake Powell aquatic ecosystem with little or no connection to downstream resources. It reads as follows:

**Protect Lake Powell aquatic ecosystem (fishery) from adverse impacts due to dam operations and subsequent effects, including but not limited to: temperature, reservoir surface elevations, elevated selenium levels, advective flow patterns, predator/prey relationships, and fish movements.**

The INs associated with MO 2 that are believed to have relevance mostly to the Lake Powell aquatic ecosystem:

**IN 2.1** Determine the effects of water temperature caused by dam operations.

**IN 2.2** Determine the effects of fluctuations in the reservoir surface elevations caused by dam operations (under approved operating criteria)

**IN 2.3** Determine the effects of elevated selenium levels caused by dam operations (under approved operating criteria)

**IN 2.4** Determine the effects of advective flow patterns on the Lake Powell aquatic ecosystem caused by dam operations (under approved operating criteria)

**IN 2.5** Determine the effects of predator/prey relationships caused by dam

*not part  
of AMP  
but still  
information  
desired  
(i.e. TCD)*

operations (under approved operating criteria)

**IN 2.6 Determine the effects of fish movements caused by dam operations**

In addition, the following IN associated with MO-1, relates mostly to the Lake Powell aquatic ecosystem with minimal effect downstream are the following:

**Biological**

**IN 1.1** Determine the impacts of dam operations and resulting water quality on primary and secondary productivity of Lake Powell, including:

- a. algae (periphyton)
- b. macrophytes
- d. macroinvertebrates

**IN 1.2** Quantify levels of selenium and describe effects of these levels on primary and secondary productivity, fish and waterfowl, and human consumption.

Then goes to ⑤ to develop  
Annual Plan for AMWG approval  
in July. approved by AMWG  
out to AMWG by June 21.

Serenas

Rev. 2-23-99

TWG  
Feb 23-24, 1999  
N. Henderson

### SCHEDULE

#### FY-2000 Integrated WQ Monitoring and Research Plan and Budget

February 22, 1999

Attachment 6

Step	Target Dates	Activity
1.	2/12	TWG Ad hoc group separates Lake Powell MO/INs into the three categories (white, gray, and black).
2.	2/24	TWG recommends adoption of split
3.	2/25 - 4/1	GCMRC develops a draft FY-2000 GCMRC Integrated WQ Monitoring and Research Plan and Budget (WQ work plan and budget) addressing TWG recommended MO/INs.
4.	4/2	GCMRC sends draft WQ work plan and budget to BOR and the other members of the Lake Powell group for input and activity coordination.
5.	4/15	Comments due from BOR and members of Lake Powell group.
6.	4/16 - 5/7	GCMRC incorporates appropriate input into a revised WQ work plan and budget.
7.	5/8 - 6/7	GCMRC obtains formal external peer review (using GCMRC protocols) on revised WQ work plan and budget.
8.	6/8 - 6/20	GCMRC revises draft of WQ work plan and budget incorporating appropriate peer review comments.
9.	6/21	TWG sends final draft WQ work plan and budget to AMWG to be considered at 7/21 meeting, and to TWG.
10.	6/22 - 7/15	TWG sends final comments to GCMRC. <i>GCMRC revises the plan as appropriate.</i>
11.	7/20	TWG recommends adoption of final WQ work plan and budget.
12.	7/21-22	AMWG recommends adoption of WQ work plan and budget. BOR makes appropriate changes to O&M budget. <i>"placeholder" of \$325k exists now; not sure about changes.</i>
13.	7/22 +	GCMRC may modify final WQ work plan and budget based on additional MO/INs recommended by TWG/AMWG.

Add TWG \*

Add TWG \*