Operating Criteria for Glen Canyon Dam
In accordance with the
Grand Canyon Protection Act of 1992

These Operating Criteria are promulgated in compliance with section 1804 of Public Law 102-575, the Grand Canyon Protection Act of 1992. They are to control the operation of Glen Canyon Dam, constructed under the authority of the Colorado River Storage Project Act. These Operating Criteria are separate and apart from the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs prepared in compliance with the Colorado River Basin Project Act of 1968.

1. Annual Report

As required in the Grand Canyon Protection Act, a report shall be prepared and submitted to Congress annually that describes the operation of Glen Canyon Dam for the preceding water year and the expected operation for the upcoming water year. Included in this report shall be a review by the Secretary of the Interior of the Operating Criteria then in place to determine if, as the result of actual operating experiences, the Operating Criteria should be modified to better accomplish the purposes of the Grand Canyon Protection Act. Such a review shall be made in consultation with the Governors of the Colorado River Basin States, representatives of academic and scientific organizations, environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam.

The annual plan of operations shall include such detailed rules and quantities as are required by the Operating Criteria contained herein. It shall provide a detailed explanation of the expected hydrologic conditions for the Colorado River immediately below Glen Canyon Dam.

2. Specific Operational Constraints

The plan of operations will follow the description of the preferred alternative (Modified Low Fluctuating Flow) in the Operation of Glen Canyon Dam Final Environmental Impact Statement and its Record of Decision. The specific criteria are as follows:

Minimum Releases-- 8,000 cfs between 7 a.m. and 7 p.m. 5,000 cfs at night

Maximum Releases-- 25,000 cfs. Several circumstances warrant exception to this restriction. These are the Beach/Habitat Building Flows and the Habitat Maintenance Flows (both described below) and the release of large volumes of water to avoid spills or floodflow releases from Glen Canyon Dam. These latter releases would most likely result from high snowmelt runoff into Lake Powell; if such high releases above 25,000 cfs are required, they shall be made at constant daily flow rates.

Allowable Daily Flow Fluctuations-- 5,000 cfs/24 hours for monthly release volumes less than 600,000 acre feet; 6,000 cfs/24 hours for monthly release volumes of 600,000 to 800,000 acre feet; and 8,000 cfs/24 hours for monthly release volumes over 800,000 acre feet.

Maximum Ramp Rates-- 4,000 cfs/hour when increasing, and 1,500 cfs/hour when decreasing.

Emergency Exception Criteria--Normal powerplant operations will be altered temporarily to respond to emergencies. These changes in operations typically would be of short duration (usually less than 4 hours) and would be the result of emergencies at the dam or within the interconnected electrical system. Examples of system emergencies include:

- Insufficient generating capacity
- Transmission system: overload, voltage control, and frequency
- System restoration
- Humanitarian situations (search and rescue)
- Dam and powerplant maintenance
- Spinning reserves

Flood Frequency Reduction Measures-- The frequency of unanticipated flood flows in excess of 45,000 cfs will be reduced to no more than 1 year in 100 years as a long-term average. This will be accomplished initially through the Annual Operating Plan process and eventually by raising the height of the spillway gates at Glen Canyon Dam 4.5 feet.

Habitat Maintenance Flows-- Habitat maintenance flows are high, steady releases within powerplant capacity (33,200 cfs) not to exceed 14 days in March, although other months will be considered under the Adaptive Management Program. Actual powerplant release capacity may be less 33,200 cfs under low reservoir conditions. These flows will not be scheduled when projected storage in Lake Powell on January 1 is greater than 19,000,000 acre feet, and typically would occur when annual releases are at or near the minimum objective release of 8,230,000 acre-feet. Habitat maintenance flows differ from beach/habitat-building flows because they will be within powerplant capacity, and will occur nearly every year when the reservoir is low.

Beach/Habitat-Building Flows-- These controlled floods will occur as described in the EIS (steady flow not to exceed 45,000 cfs, duration not to exceed 14 days, up-ramp rates not to exceed 4,000 cfs/hour, and down-ramp rates not to exceed 1,500 cfs/hour) except instead of conducting them in years in which Lake Powell storage is low on January 1, they will be accomplished by utilizing reservoir releases in excess of powerplant capacity required for dam safety purposes. Such releases are consistent with the 1956 Colorado River Storage Project Act, the 1968 Colorado River Basin Project Act, and the 1992 Grand Canyon Protection Act.

Glen Canyon Dam 1997 Annual Plan of Operations
prepared in accordance with the Operating Criteria
developed for the Grand Canyon Protection Act (GCPA)

Under most probable inflow conditions in water year 1997, Glen Canyon Dam is expected to release about 10.2 MAF through the Grand Canyon to Lake Mead. This is about 2 MAF greater than the minimum objective release and is the result of storage equalization with Lake Mead as required under the 1968 Colorado River Basin Project Act. Lake Powell is expected to peak at elevation 3686 feet, 14 feet from full.

Monthly release volumes from Glen Canyon Dam during 1997 are expected to range from 600,000 AF to 1,200,000 AF as discussed in the 1997 Annual Operating Plan prepared under the 1968 Colorado River Basin Project Act . Projected daily allowable fluctuations therefore will be 6,000 cfs or 8,000 cfs (see criteria). With the projected monthly release volumes, it is likely that peak daily releases will exceed 20,000 cfs only during the months of July and August, when monthly release volumes are at their highest for the year. Minimum releases of 5,000 cfs at night and 8,000 cfs during the day and ramping rates of 4,000 cfs/hr increasing and 1,500 cfs/hr decreasing will be followed. All of the above is outlined in the Record of Decision implementing the preferred alternative of the Glen Canyon Dam Environmental Impact Statement.

Since the hydrologic condition of the Colorado River basin and the projected operation of Lake Powell are not expected to create a dam safety condition this year (i.e. no flood releases), a beach/habitat building flow is not planned in 1997. In addition, every measure will be taken to prevent a powerplant bypass this spring in order to preserve the environmental enhancement accomplished by the beach/habitat building flow test in April 1996. Water year 1997 will have a January 1, 1997, Lake Powell storage content of greater than 19 MAF, therefore a beach/habitat maintenance flow of powerplant capacity is also not planned.

This plan is prepared in conformance with Section 1804(c)(1)(A) of the GCPA. Any changes to the plan would require reconsultation in accordance with this Act. Because this is the initial year for this plan of operations, it will be implemented on December 1, 1996, and run through September 30, 1997.

GLEN CANYON TEMPERATURE CONTROL
ENVIRONMENTAL ASSESSMENT

Proposed Alternatives to be Evaluated:

No Action
Addition of a Temperature Control Device

Proposed Impacts and Risks to be Assessed:

Costs
- No Action
- Temperature Control Device
  - Construction
  - Post-project testing

Lake Powell
- Water Temperature
- Dissolved Oxygen
- Trace Elements
- Sport Fishery
- Forage Fish
- Reservoir Evaporation
- Nutrients
- Salinity
- Primary Productivity
- Recreation
- Native Fish
- Power Production

River below GCD
- Water Temperature
- Dissolved Oxygen
- Trace Elements
- Native Fish
- Recreation
- Air Temperatures
- Nutrients
- Salinity
- Primary Productivity
- Non-Native Fish
- Evaporation

Lake Mead
- Water Temperature
- Dissolved Oxygen
- Trace Elements
- Fishery
- Reservoir Evaporation
- Nutrients
- Salinity
- Primary Productivity
- Recreation

Other
- Section 7 Consultation (ESA)
- 404 Permit

Progress Review - Implementation of the Glen Canyon Dam Operations Biological Opinion

1 - Adaptive Management Program

Prior to the Secretary of the Interior signing the Record of Decision (ROD) on the Glen Canyon Dam Environmental Impact Statement, Reclamation organized the Transition Work Group (TWG). This group meets regularly, in much the same fashion as the future Adaptive Management Work Group (AMWG) will meet. Steve Magnussen has been named as the Secretary's designee to the TWG. Numerous drafts of the Adaptive Management Workgroup Charter have been circulated for comment, and the final version is currently in Washington D.C. for approval and signature. The ROD was signed on October 9, 1996, formally adopting the preferred alternative, including the AMP and the Grand Canyon Research and Monitoring Center (Center). Activities to staff and house the Center are ongoing.

1A - A Program of Experimental Flows *

The RPA recommends that experimental flows include high steady flows in the spring, and that studies of high steady flows in spring may include habitat building and habitat maintenance flows. A habitat/beach building flow of 45,000 cfs, including appropriate up and down ramps, was conducted in March, 1996. The final reports analyzing the effects of the habitat/beach building flow are due on or before December 31, 1996. Final analysis and integration of the data will require approximately one additional year and should be available in late 1997. Conducting this experimental flow required preparation of an environmental assessment (February, 1996), and a Biological Assessment (November, 1995) for consultation under the Endangered Species Act. Following analysis, a finding of no significant impact was issued. A symposium to discuss the results of the experimental flow is currently scheduled for April 2-3, 1997.

The BO also recommended: "... testing of low steady flows in summer and fall during low water years. Information from final GCES endangered fish reports, researchers who conducted those studies, and other knowledgeable individuals are to be used to develop hypotheses and studies to accompany those flows. Design of the experimental flows and associated studies will begin as soon as possible and be targeted for completion by October 1996". The BO recommended experimental flows be initiated in April, 1997. If sufficient progress and good faith effort is occurring toward initiating experimental flows, implementation of experimental flows may occur later in 1997. If the FWS believes there is not sufficient progress, Glen Canyon Dam would be operated as Seasonal Adjusted Steady Flows during spring through fall (April to October) beginning in 1998.

The Annual Operating Plan for water year 1997, prepared in accordance with the Colorado River Basin Project Act, does not contain requirements to conduct these flows during this water year. This decision is based upon Reclamation forecasting water releases greater than 8.23 maf. Under this release condition, the BO allows implementation of the preferred alternative.

* A copy of the RPA is attached for reference.

Reclamation accepted Fish and Wildlife Service's (FWS) recommended RPA in an April 6, 1995, response to the BO. This letter of response indicated how Reclamation would implement the RPA. In this response, Reclamation articulated that: implementation of experimental flows are to be coordinated through the AMP; the flow experiments will include scientifically based peer reviewed criteria to measure and evaluate their impacts on downstream resources; the research would be managed and administered through the Center; and that appropriate staff and funding levels needed to be identified. Delays in the signing of the ROD have resulted in only partial implementation of the AMP; however, as previously stated, Reclamation has managed to keep these processes moving forward. Dr. Garrett, Center director, has conducted multiple meetings to formulate research needs and is continuing to progress toward a long term research and monitoring plan which will evaluate the flows.

1B - Selective Withdrawal Program for Lake Powell

Funding has been programmed to continue working toward a decision regarding selective withdrawal. Studies of the macro invertebrates below the dam are ongoing, and the final report is scheduled for completion in May, 1997. Studies on chlodophora and gammerous have been completed by Dean Blen. A model which will be used to evaluate the effectiveness of a selective level withdrawal is being set up and calibrated by Reclamation's Denver office. The study will be completed in 1997.

1C - Determine responses of native fish to various temperature regimes and river flows (future research program)

Contracts for certain fish studies have been renewed to preserve a long term data base, avoiding gaps in the data. A large amount of research was conducted during the experimental flow as well. Future research and long term monitoring will be conducted through the Center.

2 - Protect humpback chub population and habitat in LCR by being instrumental in developing of a management plan.

Reclamation contracted with the Navajo Nation to prepare the plan. The Navajo Nation contracted with SWCA consulting firm to produce the document. A preliminary draft was prepared, and Reclamation and the Navajo Nation met to discuss modifications. Reclamation will provide final comments to SWCA by the end of November, 1996. It is anticipated the draft will be completed shortly thereafter. The draft will be circulated to FWS and any other interested party for comment and finalized upon incorporation of the comments. The final LCR Management Plan will then be transmitted to FWS and other parties with the jurisdiction and authority to implement it. Reclamation is willing to participate in the process in accordance with responsibilities under Section 7(a)(1) of the Endangered Species Act.

3 - Sponsor razorback sucker workshop

Reclamation sponsored a workshop on the endangered razorback sucker on January 11 and 12, 1996. Representatives of State and Federal agencies from the seven Basin states, the environmental community, and water and power interests attended. Recognized native fish experts outlined the ecology, genetics, and threats to the razorback in the Colorado River system. The status of the razorback sucker population and a photographic tour of habitat in Glen and Grand Canyons was then presented. The workshop participants engaged in an active discussion, attempting to answer the questions: Should we manage for razorback suckers in this reach of the Colorado River; Can we manage them here; and, What specific actions should be taken in the next three to five years? Although many differing opinions were expressed, overall the group believed razorback suckers could, and should, be managed in Glen and Grand Canyons. Improved communication/dissemination of data, continued research, and investigating the control of non-native fish were the three major actions identified as being needed. The results of the workshop were sent to participants, including the FWS, on February 12, 1996.

The FWS will now recommend a course of action and develop a Memorandum of Understanding.

4 - Establish a second spawning population of humpback chub

Limited activities have taken place on this element. Some evaluation of the tributaries to determine suitability have been undertaken by the FWS through Reclamation funding. Additional work will be conducted through the Center.

Other work related to endangered species

A biological assessment is being prepared to evaluate the effects of the preferred alternative on the southwestern willow flycatcher. The draft is scheduled for completion by the end of November, 1996, and the final by the end of January, 1997. The expected outcome is a request for formal consultation.

Habitat and life history data have been collected on Kanab ambersnails (KAS), and populations were monitored during the experimental flow. Reclamation staff are participating regularly on a KAS working group. One of the activities recently initiated is the evaluation of the potential use of the grassy roof area of Glen Canyon Dam and power plant as a location to establish plant communities needed by KAS. It is thought that if a plant community could be established that possibly an experimental population or 'seed source' population could be used in the establishment of other populations.

Fish Data Integration Work

There are three individual efforts underway regarding native fishes, all of which contribute to the requirements of the Biological Opinion.

A. Arizona State University Summary - This is a summary of all information from GCES Phase II. It includes information on all resources and is similar to the 1988 report put out by Reclamation. It will also include information on what studies were conducted during the Beach/Habitat Building flow. The work is being done by a post doctoral student under W.L. Minkley.

B. Data Integration - During GCES Phase II, the fishery research was divided into four contracts, one each to BioWest; Arizona State University; Arizona Game and Fish; and the FWS. These 4 data sets will be linked and integrated by FWS (Owen Gorman).

C. Synthesis and Risk Analysis - Reclamation awarded a contract for this work through a competitive bid process. Steven W. Carothers and Associates were the successful bidders. SWCA will synthesize existing peer reviewed data and published data on flows and temperature, etc., related to native and non-native fishes to test the hypothesis that the benefits of steady flows to native fish outweigh the benefits to non-natives.

A final step in this process will be synthesis of other data, such as sediment resource data, with fish data.