

DEPARTMENT OF THE INTERIOR AND DEPARTMENT OF ENERGY  
OPERATING HYDROGRAPH RECOMMENDATIONS  
FOR GLEN CANYON DAM  
July 23, 2010  
[With August 23, 2010 Edits](#)

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**Introduction:** The Federal agencies involved in the Glen Canyon Dam Adaptive Management program have jointly drafted this recommendation for the projected operation of Glen Canyon Dam in 2011. This recommendation is consistent with the Law of the River and the Grand Canyon Protection Act, which states that the Secretary of Interior will operate Glen Canyon Dam “in such a manner as to protect, mitigate adverse impacts to, and improve the 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.” This recommendation is designed to enhance protection of downstream resources. It can be implemented consistent with existing environmental and operational limitations applicable to Glen Canyon Dam, the annual release requirements of the 2007 Interim Guidelines, applicable operating limitations for Glen Canyon Dam, and the 1996 Glen Canyon Dam Record of Decision (ROD). This approach to operations does not modify the Interim Guidelines, operating criteria or ROD and is an adaptive management-based experimental approach to 2011 operations that falls within the parameters of the Modified Low Fluctuating Flow alternative adopted in the ROD.

The National Park Service and U.S. Fish and Wildlife Service provided the initial draft of the operational concepts included in the recommendation to enhance protection of downstream resources. The Bureau of Reclamation provided technical support, clarifications, and refinements to assure these operational concepts would be consistent with the annual release requirements of the Interim Guidelines and applicable operational limitations for Glen Canyon Dam. The Bureau of Indian Affairs has had the opportunity to participate in the development of this recommendation and has reviewed the drafts. The USGS Grand Canyon Monitoring and Research Center has reviewed this recommendation and added its comments. Western Area Power Administration has evaluated the recommendation, participated in discussions concerning its operational impacts, and supports it.

It is Interior’s intention to share this proposed recommendation with stakeholders in the Glen Canyon Dam Adaptive Management Work Group prior to the beginning of the 2011 water year, so as to provide an opportunity for input from the participating AMWG stakeholders. It is also Interior’s intention to include a projected operation for Glen Canyon Dam during the 2011 water year in a Draft 2011 Annual Operating Plan for Colorado River Reservoirs at the earliest appropriate opportunity. In addition, language will be added to the 2011 Annual Operating Plan to reference the ongoing NEPA process

to develop an Experimental Protocol for High-Flow Releases from Glen Canyon Dam, and such language will note that pending completion of the ongoing NEPA process, if a high-flow release is undertaken in Water Year 2011, projected operations of Glen Canyon Dam will be modified consistent with the final experimental protocol. A draft of the information proposed to be added to the Draft 2011 AOP is attached as Attachment 1 to this summary.

**Purpose:** To develop recommendations for operational 2011 hydrographs based on anticipated possible annual release volumes for Water Year 2011 from Glen Canyon Dam consistent with Section 1802 of the Grand Canyon Protection Act. The operational hydrographs are within the framework of the 1996 Record of Decision and Modified Low Fluctuating Flow (MLFF) operation, consistent with balancing other resources, including power production, and recognize the variability of possible annual release volumes from Glen Canyon Dam under the 2007 Interim Guidelines.

The concept is to apply sound science principles within the framework of adaptive management to adjust the timing of water deliveries to protect and restore flow-dependent resource conditions. The fundamental principle is conservation of the sand resource in order to minimize sand export to Lake Mead and degradation of sandbar resources within the Colorado River ecosystem (CRE). (Note: Recently, a new sand routing model was developed for the CRE [Wright and others, 2010] that evaluates a variety of operational hydrographs from Glen Canyon Dam [including typical MLFF releases] using average annual sand production from both the Paria and Little Colorado Rivers.)

Two scenarios are presented below based upon the range of probable 2011 water year releases from Glen Canyon Dam. It is anticipated that the annual release volumes would likely fall within two sets of annual operations as described below. The agencies expect that the projected releases will be modified as the year progresses to address changing conditions in the same manner as typically occurs. Proposed parameters for such ongoing operational modifications are also provided.

#### **Water Year Scenario #1: 8.23 – 9.0 million acre feet (maf) — Balancing**

**Objective:** To implement reasonable measures to minimize export of tributary sand inputs delivered to the main channel so as to benefit the lower elevation ecosystem of Grand Canyon National Park, including the ecological processes and functions that affect native flora and fauna, archeological and cultural resources, recreation uses, and other values for which Grand Canyon National Park was established.

**Science Principles:** For any given annual volume of water released from the dam, sand export is known to be minimized by reducing daily/monthly/seasonal variations in dam [3](#)

releases. (Rubin and others, 2002; Wright and others, 2005; Wright and others, 2008; ASCE, 1975; USDOJ, 1995; Topping and others, 2006).

Proposed Operating Parameters:

- Monthly Release Volumes will be adjusted each month based on the most current forecast of the annual release required by the 2007 Interim Guidelines.
- Monthly Release Volumes will vary within a range of +/- 100,000 acre-feet from the Average Monthly Release Volume over the water year (defined in the next bullet). This monthly operational flexibility will be used for existing power production operations under the Modified Low Fluctuating Flow (MLFF) alternative selected by the 1996 ROD and contained in the 1995 FEIS. Modifications of monthly release volumes will be made in consultation with Western Area Power Administration.
- Average Monthly Release Volumes will be the amount of remaining water to release for the water year divided by the remaining months in the water year (excluding the September/October steady flows).
- Daily peaks are anticipated to not be ~~will be no~~ greater than 16,000 cubic feet per second (cfs), with all other flow parameters of the current MLFF in place. [It is important to note that there may be limited operational circumstances where releases may be higher than 16,000 cfs due to circumstances such as: unusually high equalization requirements \(e.g. above 13 maf\); unusually late or efficient runoff \(i.e. snowpack that melts quickly and results in a larger proportion of runoff\); unexpected system outages or unanticipated maintenance.](#)
- Additionally, the Bureau of Reclamation will continue to apply best professional judgment in conducting actual operations and in response to changing conditions throughout the water year. Such efforts will continue to be undertaken in coordination with the DOI/DOE agencies to consider changing conditions and adjust projected operations in a manner consistent with the goals of these parameters.
- Steady flows in September and October per the 2008 HFE Environmental Assessment (EA), with monthly volumes of approximately 500,000 to 600,000 acre feet (about 8,000 to 10,000 cfs).

Expected Resource Results: Under this scenario, at the lower release volume of 8.23 maf, accumulation of some portion of new tributary sand inputs would likely occur in both Marble and Grand Canyons (Wright and Grams, 2010), but it is less certain that any new sand inputs would accumulate at the higher 9.0 maf volume. Recreational camping beaches would be expected to continue to degrade at previously reported rates associated with MLFF, with perhaps lower erosion rates of camps in summer and winter months

(Kaplinski and others, 2005). It is not expected that there would be an increase in size and distribution of camping beaches throughout the river corridor; recreational rafting safety would be unaffected. Terrestrial and river edge aquatic riparian habitats, archaeological sites and historic properties would show no improvement. With lower summer peaks associated with this scenario there may be some vegetation encroachment on sand bars and camping beaches.

## **Water Year Scenario #2: Above 9.0 million acre feet (maf) – Equalization**

Objectives: To implement reasonable measures to minimize erosion of sandbar deposits for purposes of reducing degradation to the lower elevation ecosystem of Grand Canyon National Park, including the ecological processes and functions that affect native flora and fauna, archeological and cultural resources, recreation uses, and other values for which Grand Canyon National Park was established.<sup>4</sup>

Science Principle: For any given annual volume release of water, sandbar erosion and sediment transport is minimized by reducing both daily/monthly/seasonal variations in volume releases, and by minimizing subsequent daily variations in discharges. (Rubin and others, 2002; Wright and others, 2005; Wright and others, 2008; ASCE, 1975; USDOJ, 1995; Topping and others, 2006).

Proposed Operating Parameters:

- Monthly Release Volumes will be adjusted each month based on the most current forecast of the annual release required by the 2007 Interim Guidelines.
- Monthly Release Volumes will vary within a range of +/- 100,000 acre-feet from the Average Monthly Release Volume over the water year (defined in the next bullet). This operational flexibility will be used for existing power production operations under the Modified Low Fluctuating Flow (MLFF) alternative selected by the 1996 ROD and contained in the 1995 FEIS. Modifications of monthly release volumes will be made in consultation with Western Area Power Administration.
- Average Monthly Release Volumes will be the amount of remaining water to release for the water year divided by the remaining months in the water year (excluding the September/October steady flows).
- Daily peaks are not anticipated to be ~~will be no~~ greater than 22,000 cfs, with all other flow parameters of the current MLFF in place (including daily range in fluctuating flows up to 8,000 cfs), including the fall steady flows required in the 2008 High Flow Experiment Environmental Assessment (2008 HFE EA). It is important to note that there may be limited operational circumstances where releases may be higher than 22,000 cfs due to circumstances such as: unusually high equalization requirements (e.g. above 13

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maf); unusually late or efficient runoff (i.e. snowpack that melts quickly and results in a larger proportion of runoff); unexpected system outages or unanticipated maintenance.

• Additionally, the Bureau of Reclamation will continue to apply best professional judgment in conducting actual operations and in response to changing conditions throughout the water year. Such efforts will continue to be undertaken in coordination with the DOI/DOE agencies to consider changing conditions and adjust projected operations in a manner consistent with the goals of these parameters.

• Steady flows in September and October per the 2008 HFE Environmental Assessment (EA).

Expected Resource Results: Under this scenario, loss of recreational camping beaches would be reduced to the extent possible by minimizing sediment transport (Wright and Grams, 2010). Recreational rafting values may benefit from the more limited fluctuations. Terrestrial and aquatic river edge riparian habitats and archaeological sites may continue to degrade, but the amount of loss may be reduced under this recommended flow regime.

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