

ABSTRACT

Title: Current status and trends of Lake Powell and Glen Canyon Dam release water quality

Author: William S. Vernieu-Presenter, Grand Canyon Monitoring and Research Center, US Geological Survey, 2255 N. Gemini Dr., Flagstaff, AZ 86001, phone 928-556-7051, email: bvernieu@usgs.gov, web site: www.gcmrc.gov.

As of March 18, 2005 Lake Powell's surface elevation was 3557 feet above mean sea level, its lowest level since May 9, 1969. The reservoir is currently 143 feet from its full pool level of 3700 feet. Current storage is approximately 10.0 million acre-feet (MAF), 38 per cent of total capacity (33% of active capacity). The reservoir has dropped 27 feet and has lost 2.2 MAF, 9% of its capacity, in the past year. Reservoir elevation is projected to reach a low point of 3556 feet by the end of March 2005. Despite recent increased precipitation in the Colorado River Basin the reservoir continues to drop and will continue to do so until the end of the current experimental flow releases, which will end April 8, 2005.

As a result of these low reservoir levels, Glen Canyon Dam release temperatures increased in 2003 and again in 2004 to the warmest levels since August 1971, after which, filling of the reservoir resulted in consistently cool releases from the hypolimnion. On October 5, 2004, a maximum temperature of 15.5°C (60°F) was observed, 6.8°C above the historic mean for that date from the period 1988 to 2003. In 2003, a maximum release temperature of 13.2°C (56°F) occurred on November 13, 2003. Release temperature appears to be a function of warming at depth, associated with antecedent spring inflow volume, depth of penstock with changing reservoir levels, and degree of influence with convectively mixed surface water during winter cooling. Release temperatures are expected to increase again in 2005, possibly reaching 16° to 17°C by late September.

Associated with the reservoir drawdown, large volumes of deltaic sediment deposits in the tributary inflow areas have been exposed, resuspended, and deposited further into the reservoir. For example, at least 10 feet of sediment were aggraded at the mouth of Farley Canyon, 6 miles downstream of Hite Marina, during each of the past two years. Organic materials in this sediment create a severe oxygen demand in the receiving strata of the reservoir. The projected volume of this year's spring runoff is expected to continue this resuspension process and result in an anoxic inflow plume flowing through the reservoir and reaching Glen Canyon Dam by late September. Depending on the depth at which this plume flows, there is a potential for this water to be entrained in Glen Canyon Dam releases before it undergoes winter convective mixing. Nutrient release associated with the deltaic resuspension may have beneficial effects to the Lake Powell sport fishery. 2005 marks the seventh consecutive year of a winter underflow density current that freshens the low-dissolved oxygen water in the hypolimnion of the reservoir.

Salinity levels in Glen Canyon Dam releases, as represented by specific conductance measurements, have increased during the last several years with maximum levels occurring in mid-April. Maximum salinity of reservoir releases is projected to be near 1000 uS (650 mg/L TDS) in April 2005.

An interesting feature of the reservoir drawdown is the rechannelization of the inflow tributaries in the exposed delta areas. A small waterfall has been documented in the Piute Farms area of the San Juan River, due to sedimentation of the old river channel and development of a new channel over a resistant geological stratum. The Colorado River upstream of Hite Marina is currently flowing over a shallow layer of sandstone and is beginning to form a small waterfall upstream of the current takeout as reservoir levels continue to decline. Recently, a larger rapid has appeared between the former Hite Marina and Farley Canyon.