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GRAND CANYON MONITORING AND RESEARCH CENTER**

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IMPACTS OF THE 3-5 NOVEMBER 1997 31,000 cfs TEST FLOW

Introduction

The Bureau of Reclamation and the Grand Canyon Monitoring and Research Center conducted a test of a "Habitat Maintenance" style flow from Glen Canyon Dam on 3-5 November 1997. The flow peak reached approximately 30,600 cfs for this 2-day test. This memo outlines the impacts of that flow event on resources through Grand Canyon.

Physical Resource Impacts

GCMRC coordinated pre- and post-event videography of the river corridor, and those images are being examined for backwater habitat changes.

Using the methods of Parnell et al. (1996), detailed topographic surveys of 35 sand bar monitoring sites were conducted immediately following the November 1997 test flow by members of the Northern Arizona University Department of Geology sand bar studies office. Information gathered from these surveys is compared to previous surveys conducted in August 1997 in order to quantify sand bar change. Based on this preliminary data, the November test flow benefitted the sediment resources by depositing sediment at higher elevations. The higher elevation areas of sand bars contain critical riparian habitats that are of particular interest to management agencies. Following the 1996 45,000ft³/s test flow, erosion has steadily decreased the volume of sediment contained in the upper elevations of sand bars. Preliminary results show that the November 1997 test flow slightly increased the volume of sand bars (above the 20,000 ft³/s stage elevation), calculated as a percentage of the pre-1996 test flow, from 87% to 91%. High flows above powerplant capacity are the only means by which the volume of the upper levels of sand bars can be maintained.

The U.S. Geological survey (G. Fisk, D.Topping, D.Rubin and S.Weile) monitored mainstream streamflow and suspended sediment at the Lees Ferry, Above Little Colorado River, Grand Canyon and Diamond Creek gauges once/day before, during and after the flow event. Bedload sampling was conducted in the mainstream and in eddies at selected sites following the high flow. Bar sedimentology, grain size, deposit thickness was conducted with the NAU effort immediately following the high flow.

Biological Resource Impacts

On November 6, 1997 the Arizona Game and Fish Department (AGFD) surveyed cobble bars in the Lee's Ferry reach to assess rainbow trout stranding post downramp. AGFD evaluated stranding by dividing each cobble bar examined into quadrants and obtaining a total count of stranded fish by examining total area of the bars. AGFD also noted stranding of macroinvertebrates. Cobble bars selected for evaluation were representative of this habitat type in the Lees Ferry reach and were in areas which receive preferential use by fishing guides and fishermen. Observations: At RM -14, no stranding of rainbow trout and no apparent stranding of *Gammarus lacustris* or other macroinvertebrates was observed. At RM -12.8, one dead rainbow trout (60mm) was observed to have been stranded and low concentrations of *Gammarus* were observed stranded in a few shallow pools, no other stranded macroinvertebrates noted. At RM -8, two live rainbow trout (90 mm and 400 -500 mm) were observed stranded in a large pool, *Gammarus* ($\geq 1,000$) of diverse size range were observed stranded in one small pool, and several thousand snails (Physidae) were observed stranded on two small sand habitats associated with sedges nearshore. At RM -2.5, one dead adult flannelmouth sucker (*Catostomus latipinnis*) was observed in approximately 3 ft of water just inside mouth of backwater. This was judged not to be a stranding-related mortality.

Concern over endangered species, particularly endangered Kanab ambersnail, prompted development of a U.S. Fish and Wildlife Service Biological Opinion on this federal action. A 2-3 October 1997 habitat and population survey at Vaseys Paradise revealed that 29.8 m² of potential KAS habitat lay downslope from the 934 m³/s (33,000 cfs) flood stage. Five habitat patches were predicted to be inundated and potentially scoured by the planned November Test Flow, but it was considered unlikely that the inundated vegetation would be completely eliminated. The habitat in the flood zone was estimated to support approximately 181 KAS (<1% of the estimated total population). Immediately prior to the November Test Flow, the Arizona Game and Fish Department salvaged habitat and 14 KAS from the inundated zone and is presently holding that material at the Phoenix Zoo. A GCMRC survey crew reported new sand and driftwood on the inundated habitat patches immediately following the event. Although losing 14.4% of the flood zone habitat to scour, the Test Flow did not completely eliminate vegetation in the habitat patches of concern. No impacts were anticipated or observed on endangered southwestern willow flycatcher habitat. Impacts on endangered humpback chub were not considered to be detectable, and hence no effort was made to monitor that species.

Conclusions

These preliminary results indicate that top-of-powerplant flows can be used to rebuild low-lying sand bar platforms, and result in little disruption of terrestrial endangered species. A flow of this magnitude is probably insufficient to create or substantially rejuvenate backwater habitats, which serve as nursery habitats for native and non-native fish. Although some sand bars increased in area and volume, this flow may not have been of sufficient duration to maximize sand bar rebuilding.

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