

Flooding - On Purpose?

The presence of the Glen Canyon Dam upstream from the Grand Canyon on the Colorado River (figure 1) has caused profound changes in dynamics of the river's flow through the Grand Canyon. The dam was built largely for irrigation and generation of hydroelectric power; therefore, a large volume of water was deliberately impounded in Lake Powell, the

artificial reservoir behind the dam. The reduced water flow downstream from the dam not only reduced flooding and sediment transport through the Grand Canyon; it reduced annual fluctuations in water temperature, thereby allowing non-native animal (fish) species to compete with native species, and vegetation to encroach on the river channel, changing the nature of habitats along the river.



Figure 1 - An unintended consequence of the Glen Canyon Dam (upper right) is considerable reduction of water flow through the Grand Canyon.

Source: U.S. Geological Survey.

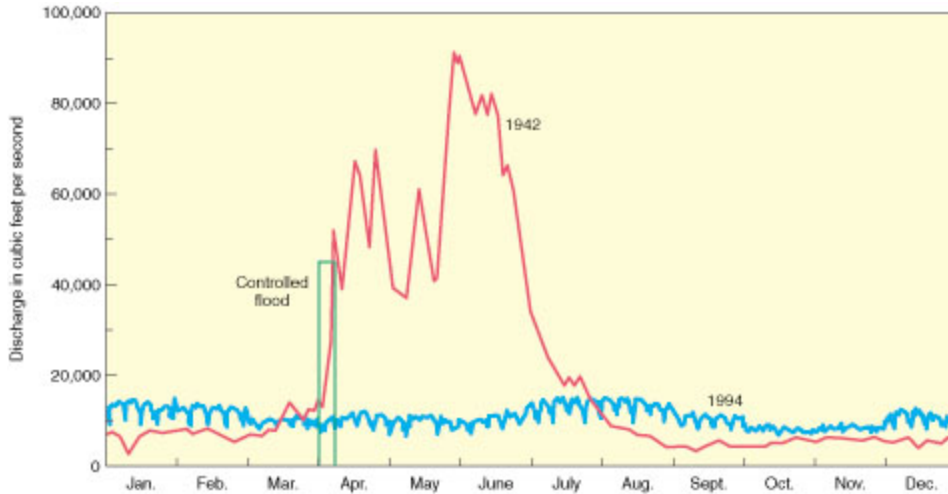


Figure 2 - The first of a planned series of controlled floods involved discharges well above modern levels, but below historic flooding of 1942.

A controlled flood, much larger than typical modern streamflow but well below the largest pre-dam floods (figure 2), was planned for early March 1996. Among the many objectives were the redistribution of sediment, restoration of higher-elevation sand bars and camping beaches, provision of water to higher-elevation vegetation, disruption of life cycles of non-native fishes, and habitat restoration of native fishes.

Stream gages recorded the deliberate flooding (figure 3; note the time-lag of the flood pulse reaching successive gages along the stream), and later studies of channel cross sections (figure 4), and aerial photographs, suggested that many of the objectives had been accomplished. Sediment was redistributed, vegetation scoured out of the channel, beaches restored. Assuming that post-flood studies indicate that the objectives were achieved with

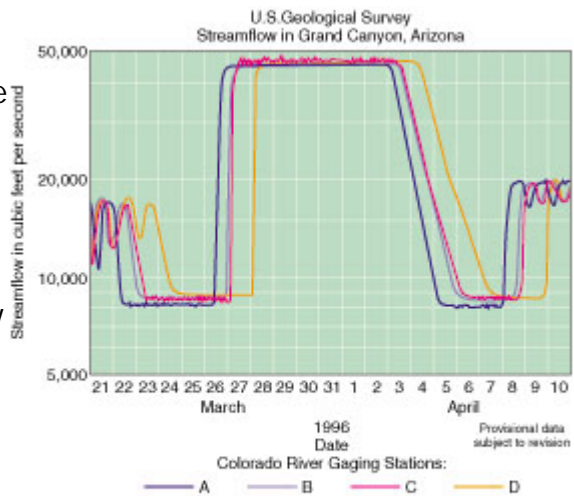


Figure 3 - The controlled flood on hydrographs; station locations shown in figure 1.

Source: U.S. Geological Survey.

minimal negative effects, additional periodic deliberate floods will be carried out to maintain the desired effects.

For a more complete description of the rationale for the flooding and the post-flood investigations planned, see http://h2o.usgs.gov/public/wid/FS_089-96/FS_089-96.html

Real-time streamflow data for the gaging stations in the Grand Canyon shown in figure 1 can be found at http://wwwdaztcn.wr.usgs.gov/gc_rtsw.html

Post-flood effects on beaches are described at <http://wwwdaztcn.wr.usgs.gov/beach.html>

Ongoing investigations of the impacts of the flooding are being conducted, not only by the U.S. Geological Survey, which provided the data for figures in this box; various results will be reported on the Glen Canyon Environmental Studies (GCES) page: <http://phantom.uc.usbr.gov>

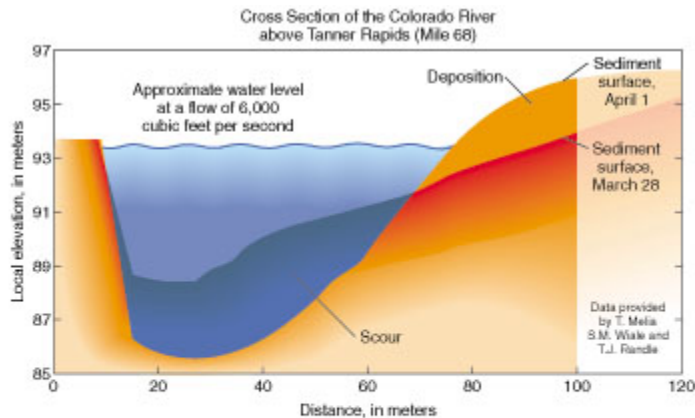


Figure 4 - Sample cross section after flooding shows some objectives achieved: Higher water levels allowed point-bar/beach buildup at higher elevations, while higher discharge and faster stream flow during flooding scoured the channel deeper.

Source: U.S. Geological Survey.

The purpose of the flooding is further explored at <http://phantom.uc.usbr.gov/pbf.html>

The GCES site includes links to before-and-after views of selected sites along the river, showing beach changes.