By John C. Schmidt

Choices to make in the Grand Canyon

The issue of how to operate Glen Canyon Dam to best protect the downstream environment of the Grand Canyon is not one that simply divides people into the white hats and the black hats—the environmentalists versus the power producers. During the past ten years of study, we have learned that there is no one right way to proceed. Instead, the applicable question is, "Which part of the environment do you want to help?"

Since the construction of the dam in 1963, the Colorado River's annual cycle of sediment-loaded spring runnoff and warm summer flows has been changed to year-round flows of clear, cold water with daily peaks in response to power demand. The historical environment of the canyon has suffered as a consequence. The canyon's once expansive sandbars, which provide campsites for boating parties and are the foundation for its biological communities, have shrunk. The humpback chub, an endangered native fish, survives in only a few places, including a part of the canyon near the Little Colorado River, and other native fish, such as the Colorado squawfish, have been lost from the canyon entirely.

But the clear, cold water has produced a blue-ribbon trout fishery that attracts anglers from throughout the world. As a result of the lower, more steady flows, a new riparian community flourishes. Grand Canyon ecologist Larry Stevens estimates that the post-dam riparian vegetation that has colonized the canyon exceeds the area of vegetation lost beneath Lake Powell reservoir. Management of the federally endangered Southwestern willow flycatcher further illustrates the dilemma of river management. This endangered bird has dispersed into new riparian areas since dam completion, and required protection of this newly occupied habitat will constrain dam operations. Other rare riparian bird species, such as Bell's vireo, have expanded their range into the Grand Canyon. The vegetation along the post-dam river that supports this biodiversity would be jeopardized by flow regimes that mimic the past.

As scientists strive to refine their understanding of the flow dependence of different resources, we as citizens must open a debate on the objectives of river management. A healthy debate on the priorities of river values will also lead us to realize that the interests of many elements of downstream river protection may even be achievable within the constraints of power and water-supply concerns.

Rafting in the Grand Canyon. *Photo by Curt Smith.*

If we want a river that is as biologically diverse as possible, we can be content with only modest floods, perhaps within the limits of the dam's power plant. Such modest floods will supply some needed disturbance to the riparian corridor, yet not dramatically disturb most vegetation. But such an objective also requires restriction on the range of hourly fluctuation in river discharge, because fluctuations put stress on riparian plants and may accelerate streambank erosion. Restraint of daily fluctuations costs power users money.

On the other hand, if our objective is to return the river corridor toward the pre-dam condition, then larger floods are necessary. These floods will build more abundant and larger high-elevation sandbars and will scour streamside vegetation. But floods must at times bypass the power plant in order to achieve sufficient magnitude, resulting in a loss of power revenue. There may be a tradeoff, however, because if we can achieve higher rates of building sandbars, we may be able to accept higher rates of erosion.

The ultimate flexibility of dam operations is determined by the available sediment supply. Presently, only the sediment from the undammed Paria and Little Colorado rivers provides us with that flexibility. But if we are to break out of a continuing cycle of endless environmental review and detailed manipulation of dam releases, we should consider increasing the sediment supply. To do so would require transfering some of the sediment trapped in the San Juan arm of Lake Powell reservoir, via slurry line or barge, past the dam and on downstream. With the additional sediment, floods of higher magnitude and duration could resupply sand to eddies. Though the process would be costly, the resulting sandbars could withstand wider ranges in daily fluctuations for peaking power, and thereby generate more revenue.

If we add temperature modification to the mix, we could even more closely approximate pre-dam conditions and thereby help endangered fish.

Or we might opt for managing the river as the cold, clear, "naturalized" and biologically diverse place that it now is.

Scientists, however, cannot decide such value-laden issues. Only you can. ❖

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