Reducing some water flow rates may bring environmental gains

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Conservation projects often attempt to enhance the water-based transport of material, energy, and organisms in natural ecosystems. River restoration, for example, commonly includes boosting maximum flow rates. Yet in some highly disturbed landscapes, restoration of natural water flows may cause more harm than good, according to a study published in the January 2010 issue of *BioScience*.

The study, by C. Rhett Jackson and Catherine M. Pringle of the University of Georgia, analyzes a wide variety of examples in which creating or maintaining reduced flows can create ecological benefits. The presence of nonnative fishes in a river, for example, can argue for maintaining the isolation of some habitats that are separated from the main channel, because the nonnative species may imperil naturally occurring species. In other cases, novel vegetation that has grown up below a dam may be host to terrestrial animal populations, including endangered birds. Restoring natural water flows can lead to a change in the vegetation that is detrimental to the animals.

Awareness of the potential benefits of maintaining low "hydrologic connectivity" has extended to the creation of artificial barriers to protect species at risk. The endangered native greenback cutthroat trout, for example, is protected from nonnative brook trout moving upstream by the placement of small dams in stream headwaters in the Colorado River basin. Expensive attempts are also being made to deter exotic nuisance species such as bighead carp and silver carp from invading Lake Michigan via the Chicago Sanitary and Ship Canal. Experts disagree on

whether the multimillion-dollar electric dispersal barriers now being constructed on the canal will succeed, and some authorities have argued that only permanently disconnecting the canal will protect Lake Michigan.

Many urban streams represent particular challenges when attempts are made to restore natural flows. Expensive restoration efforts in streams in Seattle, for example, led to high pre-spawning mortality of salmon, possibly because they were exposed to copper pollution. Maintaining low flows can also mitigate the effects of pollution on ecosystems when ponds and lakes sequester sediments and nutrients that would otherwise be more widely dispersed. The sediments may contain toxic elements that could cause widespread harm to wildlife.

This insight raises another challenge, however: several National Wildlife Refuges have suffered high mortality of fishes and birds as a result of the concentration of toxic substances in lakes. What is clear is that restoring natural flows can bring pros and cons. Jackson and Pringle conclude that "a major challenge is to develop a more predictive understanding of how hydrologic connectivity operates in intensively developed landscapes."

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