

# Sustaining Rivers through Instream Flows

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Rivers occupy a unique position in the long-running public conversation about natural resource conservation and the question of who, exactly, has responsibility for the condition of ecosystems. The truth is that New Mexico has no policy, or only a de facto policy, to guide the future condition of our rivers. That there is no single agency or institution, no "Department of Rivers" or "Bureau of River Management," may be attributed to the fact that rivers are our primary source of water, a commodity with particular importance to both the economic aspirations of the human species and the survival of every other living thing.

Rivers have real economic value, too: they supply water to cities, industries, and farms. In their natural channels, they perform environmental services: transporting sediments and contaminants, cycling nutrients to nourish the agro-ecosystem, and recharging aquifers. Such services have tangible benefits to New Mexico, determinable as the dollar-cost of replacing these river services.

But I want to suggest that what is most important about rivers, what should command our greater attention to their condition, is deeply intangible. Rivers like the Rio Grande, the Pecos, the San Juan, and the Gila are icons in our home landscape. They are the bedrock of indigenous cultures, a miraculous treasure of water coursing across rich valleys and stark canyons, flowing through our interior lives. We find in rivers the peace and beauty of natural processes expressing themselves to our senses, adding value to our lives.

Perhaps New Mexico might make greater progress in protecting rivers if we could simultaneously embrace the notion of water as a private good, alongside the notion of a public interest in water, rivers as "hydrologic commons." I'll talk about two projects I'm engaged in to try to advance the cause of environmental flows in this state.

## Statewide Assessment of Hydrologic Alteration

In the 2008 Legislative Session, House Joint Memorial 3, sponsored by Rep. Mimi Stewart, directed the water cabinet agencies, that is, Game and Fish, Environment, Agriculture, Energy and Natural Resources, and the State Engineer/ Interstate Stream Commission to cooperate in a study of the effects of flow alteration on various ecosystem values, explicitly including agriculture. Its final form and eventual unanimous passage by the State House of Representatives owes a great deal to cooperation from agricultural leaders. In addition to requesting a study that would assess New Mexico Rivers' vulnerability to streamflow alteration, it made the following policy statement:

"NOW, THEREFORE, BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF NEW MEXICO that the policy of the state of New Mexico be to use scientifically derived information appropriate to each stream system in managing stream flows so as to protect the environmental integrity of its rivers and riparian areas while

maintaining the viability of the surrounding agricultural lands and compliance with legal mandates.”

Unfortunately, the legislative session expired before the Senate could consider the measure, but it unanimously passed the Senate Rules and Conservation Committees on its way to the floor. After the session, the agencies agreed to cooperate and make the relevant data available to project proponents, which included the Wildlife Federation, Audubon, Nature Conservancy, and the Santa Fe Watershed Association, if these private parties wished to conduct the called-for assessment without fiscal appropriations from the state.

This past March 15, a one-day workshop sponsored by the UNM-Utton Transboundary Resources Center, Nature Conservancy, Conservation Voters New Mexico Educational Fund, Tetra Tech Center for Environmental Studies, Trout Unlimited, and Rio Grande Restoration convened to explore alternative approaches to the issue of Environmental Flow protection in New Mexico. The 125 participants, including legislators, water users, and agencies, heard from water administrators in Texas and Colorado about their recently implemented programs to appropriate or acquire rights to water for the benefit of their states’ river environment. A proceedings of that conference will be published in the near future.

A dozen or so participants volunteered to serve on a NM Environmental Flows Technical Team, to complete the HJM 3 study. Significantly, the Environment and Game and Fish Departments and the Interstate Stream Commission remain engaged in this work. Essentially, the Tech Team will conduct Index of Hydrologic Alteration analyses on some 30-40 U.S. Geological Survey stream gauges, representing a long history of streamflow data in the Rio Grande, Pecos, San Juan, Gila, and Canadian Rivers and some other key tributaries, in an effort to compare pre-development flows with the present, developed condition.

The IHA index was developed by the Nature Conservancy’s Freshwater Conservation Initiative and has been used widely as a building block to restoring key elements of the natural flow regime of rivers. This model uses mean daily discharges and calculates 32 indices that describe the hydrologic regime for that station. The thirty-two indices generated by IHA consist of five major categories: (1) magnitude; (2) magnitude and duration of annual extreme conditions; (3) timing of annual

extreme conditions; (4) frequency and duration of high and low pulses; and (5) rate and frequency of changes in conditions. In essence, the model evaluates changes in both minima and maxima, and also synthesizes and groups these two extremes over several temporal scales (1-day, 3-day, 7-day, 30-day, and 90-day).

As many of you may know, environmental flow science has been advancing over the past 30 years, so that it is now possible to link the river ecosystem’s biological and geomorphic responses with these larger departures from a stream’s “natural hydrograph.” IHA can help to discover the critical elements that might point to the presence of factors that indicate risk of the kind of ecological collapse that has afflicted many rivers.

For example, a 30 percent loss in average flood peaks could indicate that a river might have become disconnected from its floodplain. Similar-scale changes in the timing of the large flood events might indicate loss of reproduction opportunities for native riparian or aquatic species, even to the peril of indicator and keystone species. Loss of 2-3 year reoccurrence interval flows could lead to a river being unable to transport effectively its sediment load and, in the extreme case, a river might fail to maintain its channel. And so on.

And consequently, water managers might be positioned to recreate these keystone processes, using reservoir releases and/or water acquired from water rights holders. And the cost in water to human water users might be quite small. Efforts to ensure river flows in other states and countries have demonstrated a wide range of policy options which, it is hoped, can help inform New Mexico decision makers to consider new river protection measures here.

So, for the Statewide Assessment, an Index of Hydrologic Alteration will be compared, geospatially, with existing or obtainable inventories of observed conditions in: Aquatic Species of Concern, Water Quality, Riparian Condition, Upper Watershed Condition, Geomorphic Alteration, Groundwater to Surface Water Connection, Agro-Ecosystem Health and so forth. Some of the data sources to be used include: magnitude, magnitude and duration of annual extreme conditions, timing of annual extreme conditions, frequency and duration of high and low pulses, and rate and frequency of changes in conditions.

The product will be a report, hubbed by a series of maps, which will be circulated to policy makers

to suggest river reaches or regions with significant problems with or opportunities for Environmental Flow enhancement. The U.S. Environmental Protection Agency has pledged initial funding for the project, under their new “Healthy Watersheds Initiative.”

During the vetting of HJM 3, Tanya Trujillo, the ISC’s General Counsel asked us, “Why not conduct a test case on a stream to demonstrate the viability of the concept in New Mexico?” Thus was conceived...

### **The Rio Chama Flow Optimization Project**

The Rio Chama is one of only two National Wild and Scenic Rivers in New Mexico and a sparkling gem in the crown of outdoors New Mexico. The Wild and Scenic segments comprise about 30 river miles from the outlet of El Vado Reservoir, whose principal purpose is to store and release irrigation water at the call of the Middle Rio Grande Conservancy District, to the head of Abiquiu Reservoir, whose authorized purposes are flood water retention and water supply storage for the Albuquerque Water Utility Authority. This thoroughly plumbed river system offers a near-perfect opportunity to release water from El Vado for some instream purpose and capture it at Abiquiu for its primary offstream use.

Unlike many another dam-controlled rivers, the Chama has the benefit of substantial tributary inputs of sediment. It also receives that rarest of attributes for a southwestern river, augmented flows. The Chama receives a 50 percent bonus of water, 100,000 acre-feet diverted through the Continental Divide from the San Juan River, into Heron Reservoir, where it is regulated for the use of contractors, which include the cities of Albuquerque and Santa Fe as well as the Conservancy District and several tribes.

Since the construction of El Vado in 1936, the Chama has adjusted to reduced peak flows and increased base flows, which has changed the river dynamics that form and maintain in-channel and riparian habitats. The macrophytic food base that supports fish and bird populations has apparently declined in richness and abundance. Nevertheless, it remains a lovely stream, much prized for river boating, a pursuit available whenever El Vado is releasing water.

Water releases, of course, do not always occur at the times and in the amounts desired by the pre-dam fauna and flora or even by the boaters.

And the tailwater fishery promoted by the clear cold releases of other dams like Navajo are, on the Chama, much less productive of big trout.

All in all, the Chama is a prime candidate for improved management: lots of controls, an enhanced water supply and economic importance to residents, visitors, distant water users, and a small hoard of resource managing authorities including the BLM, Forest Service, Bureau of Reclamation, Corps of Engineers, the State of New Mexico, several large cities, irrigation, and conservancy districts. It is subject to the terms of the Rio Grande Compact, water rights administration by the State Engineer, Indian Prior and Paramount claims, and the Congressional authorizing mandates of several reservoirs.

If this welter of users with claims on the Chama seems to be inevitable competitors, they are also cooperators who have acquired some sense of balance between their own desires and entitlements and those of others. They communicate regularly, formally through the Upper Rio Grande Water Operations Review process and the Bureau of Reclamation’s Annual Reservoir Operating Plan, and informally in phone calls and a process akin to family wrangling. The principal constraint on cooperation to achieve a proverbial win-win situation is patently psychological: the desire of water suppliers to hurry “their” water into storage, and gain the highly desired feeling of security in their property, as if any party could be truly secure in the desert Southwest. The requisite cooperation is not impossible but does promise to be hard-won.

A few weeks ago, a partnership among the BLM, ISC, Rio Grande Restoration, and some concerned ecologists, fluvial geomorphologists, hydrologists, engineering modelers, and university scholars, received word that the Rio Chama Flow Optimization Project had been awarded a River Ecosystem Restoration grant from the state.

The stated goal, “Optimization,” is something a bit different from “Restoration.” The Chama project is an attempt to improve irrigation storage and delivery practices while achieving some explicit ecological goals, enhancing fishing, whitewater recreation, and maybe even hydropower.

To get to an end game of changing Chama river management, we perceive a need to systematically accomplish certain markers of progress.

- Understand the present workings of the system: a conceptual model of the physical system and a parallel assessment of the management practices and legal constraints and the choices that they suggest.
- Acquire baseline data on the macroinvertebrates, sediment flux, geomorphology, groundwater and populations of higher order biota, linking these data to flow regimes.
- Use the data to model ecological flow criteria.
- Engage all the stakeholders: a series of meetings with the interests to “take their pulse” on how much cooperation they can safely offer and arrange a series of workshops to bring together the interests to grapple with a common understanding of Chama realities.
- Let each stakeholder set their own rules. Mediate resulting conflicts.
- Use optimization modelling to integrate the several parties’ desired outcomes.

Last, vet the modelled hydrograph to determine whether the suggested regime can be accepted.

After all, a system that functions more effectively in accommodating many values benefits everyone. My hope is that by these means, New Mexico may be able to sustain its legacy of living rivers, while continuing to protect water rights holders.