HANGING IN THE BALANCE

Why Our Rivers Need Water and Why We Need Healthy Rivers

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Audubon NEW MEXICO

"…rivers have, throughout time, supported and been essential to economic prosperity, water supply, agricultural production, food security, cultural diversity, community viability and the health of people and ecosystems; …"

HJM3, 2009

This brochure includes a brief overview of the study recently completed by the EPA on the magnitude of manmade changes in natural flows on New Mexico's rivers and illustrations of current projects underway to restore environmental flows.

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Environmental Flows For New Mexico Rivers

A river's natural flow regime, its seasonality, volume, duration, regularity and its rise and fall over time—drives many ecological processes and physical conditions of a river system that benefit both people and nature. These "environmental" flows are nature's tools, working to provide clean water, flood storage, groundwater recharge, abundant game and wildlife, healthy riparian forests, and recreation.

Over the last century, New Mexicans have developed the state's water supply for crop irrigation, drinking water and industrial use. While the benefits from development are substantial, it often results in major changes to the natural flow pattern of New Mexico's rivers and streams or what scientists refer to as "hydrologic alteration."

What's at stake is loss of riparian forests and wetlands, spread of invasive species, decline in the abundance of fish and wildlife, and increased water pollution. Cumulatively, these impacts result in not only environmental costs, but in economic loss due to decreased recreation value and decline of ecosystem function and services like mitigating floods and breaking down pollutants.

Especially in times of economic difficulty, the significant contribution that rivers make to our outdoor recreation economy should not be overlooked. According to the Outdoor Industry Foundation, active outdoor recreation, including activities such as fishing, paddling, and wildlife viewing that are directly related to river health, supports 47,000 jobs and contributes $3.8 billion dollars annually to New Mexico's economy. Bird watching alone contributes over $500 million dollars annually to our state.

PHOTO: Dennis O'Keefe

The Gila River near Silver City, one of New Mexico's healthiest rivers.

The good news is we can reverse the ecological decline of our state's streams and rivers.

Impacts Of Water Use On The Health Of Our Rivers

Throughout New Mexico's history water has often been a contentious issue, but not until recently have the consequences of our water use on river health been given serious consideration. In early 2009, the New Mexico House of Representatives unanimously passed House Joint Memorial 3 (HJM3), formally recognizing the critical role that New Mexico's rivers play in the health of our ecosystems and economy. The resolution called for a study of rivers and streams at risk from hydrologic alteration.

Although the New Mexico Senate adjourned before taking up House Joint Memorial 3, the ad-hoc"Environmental Flows Technical Team" continued to meet on the health of our rivers and commissioned an EPA - funded study to evaluate the impact of hydrologic alterations on New Mexico rivers and to examine solutions for enhancing flow. The resulting report titled the "Evaluation of Hydrologic Alteration and Opportunities for Environmental Flow Management in the State of New Mexico" was finalized in October of 2011 and found that:

- **Hydrologic alteration is widespread throughout New Mexico rivers;**
- **A broad range of stream types from high-elevation headwater streams to major river systems have been affected; and**
- **Alteration is not limited to streams impacted by large-scale water management projects.**

The good news is we can reverse the ecological decline of our state's streams and rivers. The report concludes that the long-term viability of river ecosystem health will depend on restoration and protection of key components of a river's natural flow patterns.

The Rio Grande near Socorro, a top priority for environmental flow restoration.

PHOTO: USFWS

PHOTO: TNC

The San Juan River

A Collaborative Model for Environmental Flow Recovery

The San Juan River and its tributaries flow through the states of Colorado, New Mexico, Arizona and Utah and the Jicarilla Apache, Navajo, Southern Ute, and Ute Mountain Indian Reservations before ending in Lake Powell. This diverse watershed provides habitat for migratory song birds while supporting over 40 rare or imperiled plant and animal species, 35 rare plant communities, and large expanses of intact riparian and aquatic ecosystems in the Upper Colorado River Basin.

An Ecosystem under Threat

Over the past 50 years, the San Juan River has undergone extensive development by humans, including multiple large dams, diversions for irrigated lands, and interbasin water transfers.

The construction of the Navajo Dam and Reservoir in 1962 had a particularly large impact on the San Juan's natural flow regime and river ecology. The dam essentially eliminated the natural snowmelt-driven flow regime downstream and acted as a sediment trap resulting in major modifications to the river channel.

Operations of the dam combined with diversions for agriculture have had an impact on native fish and riparian vegetation in the San Juan River by altering the timing and amount of water flow. In fact, two native fish species, the Colorado pikeminnow and the razorback sucker, are now endangered.

Recent evaluations of the San Juan River indicate that the integrity of the ecosystems are being threatened by many additional factors, including invasive non-native fish and plant species, and decreased water quality due to pollution from a wide variety of sources.

Besides threats to natural ecosystems, other unintended impacts that often accompany flow alteration and water quality degradation are the loss of recreational opportunities. Impacts on recreation include reductions in fishing, swimming, and boating/rafting areas, and reduced birding opportunities from riparian and wetland habitat loss.

Colorado pikeminnow

PHOTO: USFWS

A Plan for Recovery

In response to water depletion impacts on the endangered Colorado pikeminnow and razorback sucker, the San Juan River Basin Recovery Implementation Program was formed through a partnership between multiple state governments, federal agencies, Native American tribes, water users and conservation interests. In 1991, the Program initiated a seven-year study which yielded modified Navajo Dam operations mimicking natural conditions as well as flow recommendations that were ultimately adopted by the U.S. Bureau of Reclamation (the dam operator). The Program has also worked with water users to secure environmental flow supplies during periods of drought, and continues monitoring of the San Juan to evaluate the effectiveness of environmental flow management for native fish recovery.

The long-term vision for the San Juan focuses on the conservation of a dynamic river system that provides both economic and environmental services. Environmental flow recovery has allowed for a healthy balance of agricultural, municipal and industrial uses, while supporting native fish recovery and the renowned rainbow trout fishery.

PHOTO: TNC

River channel restoration on the San Juan River.

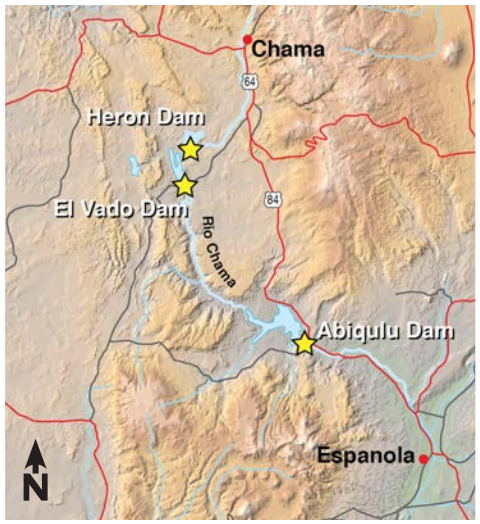
PHOTO: Staci Stevens

Rio Chama

A Community Driven Model for Environmental Flow Recovery

The Rio Chama, the largest tributary to the Upper Rio Grande, flows eastward from the Southern San Juan Mountains until it meets the Rio Grande near Espanola.

Humans have a long history of using the Rio Chama for irrigation (47,000 acres today), but it wasn't until the 20th century that New Mexicans significantly altered the river by constructing three large dams—El Vado Dam, Abiquiu Dam, and Heron Dam. These three dams have had a dramatic effect on the overall health of the Rio Chama.



Unintended Trade-offs from Dams

The construction of three major dams on the Rio Chama, though largely beneficial for the middle Rio Grande Valley, has resulted in many unintended trade-offs for the health of the Rio Chama Valley.

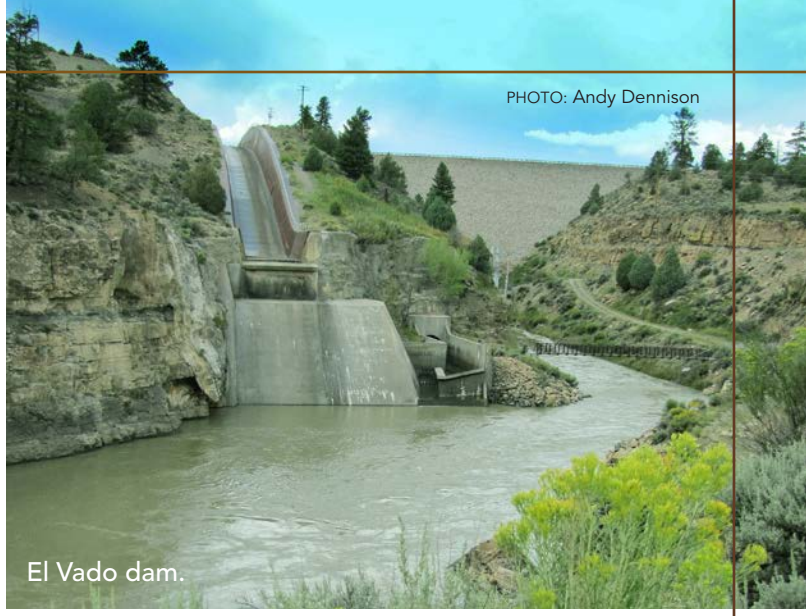
To help New Mexico comply with the Rio Grande Compact, El Vado dam captures, stores and releases flows from the Rio Chama in a pattern designed to meet the needs of Pueblo and other farmers on the main-stem Rio Grande 100 miles away. As a result, these dam releases stabilize river flows on the Rio Chama making peak-flows lower and low-flows higher. Unintended trade-offs include: river channel deepening and water table lowering, reduction of riparian areas, decline in the food-base for fish and wildlife, and challenges for fall breeding fish. The flow patterns have also impacted local agriculture, whitewater and angling economies and hydropower generation.

The Abiquiu Dam is a flood control dam which captures high flows and releases them as flood conditions recede. Undesirable downstream impacts on the Rio Chama include soil losses in farm fields from "sediment starved" irrigation water, and impaired water quality from non-point sources including eroding soils.

Working Towards a Healthier River

Can improved environmental flows coexist with water supply requirements? Since 2011, a team of water managers and scientists has been assembling data that links Rio Chama hydrology to ecological criteria (channel dynamics, water quality, riparian and aquatic habitats) in an attempt to "optimize" El Vado dam releases. The team plans to develop models of the river that protect existing water rights and other legal requirements, while simultaneously improving the ecological health, recreational opportunities and hydropower production of the Chama.

PHOTO: Andy Dennison



El Vado dam.

Scientists and water managers are evaluating possible changes in dam operations including: increases in spring peak flows to redistribute sand, gravel and cobble; stabilization of late season flows for brown trout spawning; and moderation of flow to increase the survival and recruitment of aquatic insects and fish. Experimental dam releases may begin as early as 2013.

For example, on the Rio Chama, better streamflow management could yield a healthier trout fishery, more reliable flows for whitewater recreation, adequate water for Chama Valley acequias in late season, and improved hydro-electric power generating capacity for local utilities.

Collaborative approaches to flow management are beginning to pay dividends on other western streams like the San Juan (New Mexico), Deschutes (Oregon), Truckee (Nevada), and Trinity (California) Rivers. The success of the Chama project, however, will depend upon the willingness of downstream municipal and irrigation stakeholders to work cooperatively with local communities, recreational users and water management agencies.

PHOTO: www.loeflyfishing.com

Fly fishing on the Chama.

PHOTO: Steve Harris

Paddling on the Chama.

Evidence Of Rivers In Peril

Fish mortality on the middle Rio Grande.

PHOTO: USFWS

Dams, reservoirs, off-channel diversions, levees and channelization are all tools used by humans to alter the natural flow of a river to maximize water for crop irrigation, drinking water and industrial use. While the benefits from development of our water resources are substantial, it often results in major changes to the natural flow pattern of New Mexico's rivers and streams or "hydrologic alteration."

The EPA-commissioned 2011 report on hydrologic alteration on New Mexico streams looked at 32 stream sites within the Rio Grande, Pecos, Canadian, San Juan, and Gila watersheds. The report ranked the extent of water development upstream of each stream site, and then analyzed the impact of development on the stream's high and low flows.

The majority of sites demonstrate at least one change in the magnitude, duration, frequency or timing of historic high or low flows. Studies show that these types of flow alteration are commonly associated with adverse changes in aquatic life and riparian condition.

18 of the 32 sites from the report have been identified as high priority sites for environmental flow restoration.

This group includes sites where upstream human activities have likely driven streamflow change.

Sites were ranked on the ecological and hydrologic vulnerability of aquatic and terrestrial ecosystems. The tables to the right list the top five sites in each category.

Ecological vulnerability was based on four measures of watershed health that reflected current ecological stress, including: species of greatest conservation need, water quality impairment, riparian health, and saline soils.

Hydrologic vulnerability was based on projected climate change and human development data, and current water use within study watersheds.

Watershed Health And River Flows Are Linked

Watershed health both affects and is influenced by streamflow. Their interdependence can be measured and are called flow-ecology relationships. They can be determined for classes of streams and inform efforts to restore watershed health. Below are a few key indicators of watershed health and their relationship to changes in streamflow.

Volunteers working to enhance watershed health.

PHOTO: Ken Stinnett

Aquatic species of concern: Healthy watersheds have abundant and diverse fish and aquatic life. Variable streamflow in time and space is directly related to diversity of aquatic life. Thirty-seven percent of the state's fish are identified as species of greatest conservation need.

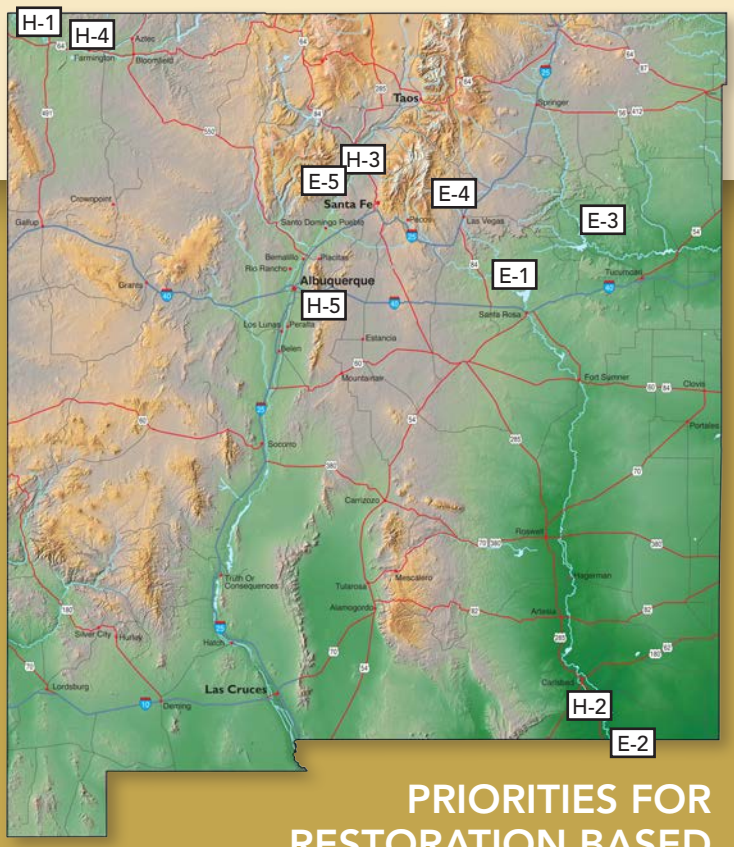
Poor water quality: Healthy watersheds have clean water. Changes in streamflow can affect the physical and chemical nature of water like temperature and nutrient concentrations. Flow alteration is listed as a direct or contributing cause of impairment on almost 900 miles of rivers and streams in New Mexico.

Riparian condition: Healthy watersheds have abundant and diverse native riparian vegetation. Lack of flow, groundwater pumping, and reduction in high flows contribute to a loss of abundance, diversity and different age classes of vegetation. Invasive exotic species, like saltcedar, can dominate flow-altered stream systems.

Agro-ecosystem health: Healthy watersheds support productive farm lands. Poor water quality can affect the productivity of irrigated farm land by increasing salinity of soil. Expanded groundwater pumping can reduce the amount of streamflow available for irrigation. Saline soils are located throughout the EPA study watersheds.

TOP FIVE SITES BASED ON ECOLOGICAL VULNERABILITY	
E-1	Gallinas River near Colonias
E-2	Pecos River at Red Bluff
E-3	Canadian River near Sanchez
E-4	Mora River at La Cueva
E-5	Rio Grande at Embudo

TOP FIVE SITES BASED ON HYDROLOGIC VULNERABILITY	
H-1	La Plata River near Farmington
H-2	Black River above Malaga
H-3	Rio Grande at Embudo
H-4	San Juan River at Farmington
H-5	Rio Grande at Albuquerque



PRIORITIES FOR RESTORATION BASED ON WATERSHED HEALTH METRICS

HEALTHY RIVERS MEAN BUSINESS

Environmental flow restoration resulting in healthy riparian and aquatic ecosystems can form the foundation for a beneficial coexistence of ecological and economic uses of New Mexico's rivers.

According to the Outdoor Industry Foundation, active outdoor recreation contributes $3.8 billion annually to New Mexico's economy while supporting 47,000 jobs across the state. Hundreds of thousands of New Mexico residents participate in outdoor recreation each year.

PHOTO: Lance Cherry

PHOTO: New Mexico Kayak Instruction

PHOTO: www.loeflyfishing.com

The Festival of the Cranes at the Bosque del Apache National Wildlife Refuge contributes more than $2.2 million to the region over its six days.

PHOTO: USFWS

Hunting: More than 100,000 participants annually • Fishing: Nearly 200,000 participants annually
Rafting: More than 66,000 participants annually • Wildlife Viewing: 469,000 participants annually

Recommendations For Restoring Environmental Flows On New Mexico Rivers

The health of our rivers hangs in balance. Restoring elements of a natural flow pattern on New Mexico rivers is essential to their health and our water-based economy. If future generations of New Mexicans are to enjoy the benefits we get from flowing freshwater, success depends on:

- ADVANCING RIVER SCIENCE. Build on the recent EPA statewide assessment of hydrologic alteration of New Mexico rivers by developing flow-ecology relationships for streams in New Mexico. These flow-ecology relationships can inform citizens, water users and water managers about the trade-offs between water development, economic development, and ecologically sound rivers.
- SECURING FEDERAL AND STATE FUNDING FOR WATERSHED RESTORATION AND PROTECTION. Watershed restoration and protection efforts have the potential to mitigate or prevent many of the negative ecological effects of flow alteration on the state's rivers while providing private sector jobs.
- PROTECTING FLOW IN OUR HEALTHIEST RIVERS. Healthy rivers with little human influence are high-priority streams for environmental flow protection.
- INTEGRATING ENVIRONMENTAL FLOWS INTO NEW MEXICO'S REGIONAL WATER PLANNING AND MANAGEMENT. Establish a state program to identify opportunities to develop environmental flow standards and restore natural flow patterns at high priority sites in collaboration with farmers and ranchers, river-based cities and towns, industry, wildlife viewers, sportsmen, and recreational users.
- REVITALIZING THE STRATEGIC WATER RESERVE. Four years ago, the state legislature enacted a program to re-water the state's rivers to meet compact deliveries and to avoid additional listings of federally endangered and threatened fish and wildlife. The legislature should consider appropriating funds for the Reserve on a recurring basis.
- ENACTING LAWS TO AUTHORIZE VOLUNTARY WATER RIGHTS TRANSFERS TO RESTORE STREAMFLOWS. Over a decade ago, the New Mexico Attorney General opined that the New Mexico constitution, statutes and case-law would support a change of use of an existing water right to streamflow. Nature tourism and outdoor recreation support 47,000 jobs and contribute $3.8 billion dollars a year to New Mexico's economy. With these economic benefits in play, New Mexico should explicitly authorize voluntary transfers for streamflow.

PETER WIRTH, *State Senator*

"Healthy rivers are a key component of any water planning in New Mexico. Understanding the scientific basis for environmental flows gives legislators the information we need to pass laws that allow future generations of New Mexicans to continue using our rivers for multiple purposes."

NATE GENTRY, *State Representative*

"Healthy rivers and watersheds support New Mexico's economy. I look forward to working with my colleagues in the New Mexico legislature to advance legislation that maintains the health of our state rivers and watersheds."

KENT SALAZAR, *Former New Mexico State Game Commissioner*

"This study provides us valuable information about human alteration effects on New Mexico's rivers which are critical to our area's economy and environment. It provides us with a good basis to work together with all stakeholders to move forward with integrating environmental flows into regional water planning and management."

KATHY MILLER, *Business Owner, New Wave Rafting Company*

"Protecting environmental flows will support not only rafting businesses statewide but will also bolster New Mexico's tourism industry and thriving outdoor recreation economy."

Background documents including House Joint Memorial 3 and the recent EPA study cited throughout this brochure are available online at the University of New Mexico's School of Law Utton Transboundary Resource Center:
http://uttoncenter.unm.edu/projects/E-Flows.php

We would like to thank the following partners for their contribution to this publication and their efforts to restore environmental flows to New Mexico rivers:

Rio Grande Restoration, The Nature Conservancy, Trout Unlimited.

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