

# *The Rio Chama Flow Project*

**Improving River  
Management for  
People & Wildlife**



# River, Land & People

The Rio Chama is a river of both beauty and significance that rises in the San Juan Mountains and flows 130 miles to its confluence with the Rio Grande.

It runs through spruce and pine-clad slopes, colorful sandstone mesas and rich farming valleys. As the largest tributary in the upper Rio Grande basin, its flows have long supplied water to ancient pueblo people, traditional acequias and modern users, here and throughout the Rio Grande Valley.

During the past century, the river became the subject of intensive water development. El Vado (1935), Abiquiu (1963) and Heron (1974) reservoirs captured the abundance of spring runoff to regulate water supplies throughout the year. Legal regimes have thus grown up to govern the division of the Chama's water, transforming the river from dependency on local and natural forces to one whose flows now respond to a complex of distant administrative mandates. These institutions enforce the on-going alteration of the river's basic, life-sustaining processes.

A river's natural flow regime - its seasonality, volume and duration of its rise and fall over time - sustains native biodiversity and the integrity of aquatic and riparian ecosystems. Flow is the key process that supports a healthy river, enabling a river to provide valuable services - clean water, flood storage, groundwater recharge, abundant wildlife, healthy riparian forests and recreation. As river flows benefit both human society and nature, the Chama Flow Project proposes to enhance the operation of El Vado Reservoir to optimize the river's benefits both to man and nature.

Certainly, people have derived great benefits from the control of the water. Material wealth and security have been chief among these values while others, including fish and wildlife habitats, have been diminished. Could better understanding and wiser management



*Rio Chama Watershed*

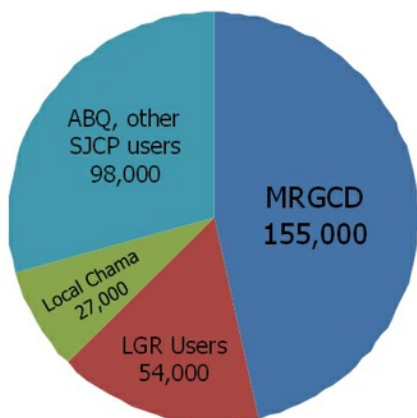
serve to maintain today's socio-economic benefits? Could they fulfill some of the river's unrealized potential, while also recovering a measure of its lost values in the El Vado to Abiquiu reach?

There is a growing understanding throughout the West that regarding a river primarily as a water resource has led to decline in its equally important value as an ecosystem. As society seeks to address the challenge of finding an appropriate balance of human and natural values in water, the Rio Chama provides a promising opportunity to embrace positive change.

Significantly, the Rio Chama derived its name from a Tewa word meaning "wrestling place," and "Rio Chama" is interpreted by Keres speakers as "the river tomorrow." The scientists and policy specialists of the Chama Flow Project regard it as "the wrestling place of tomorrow." We invite its far-flung dependents to join in the process.

The Chama has long satisfied the economic, cultural and spiritual needs of its inhabitants. Now it is time to recognize our mutual dependence on the river, to reconnect with nature and our neighbors and work together to shape a better future for all.

## How The Chama Divides Up



# River Management

Though short in length, the Rio Chama is among the most regulated stretches of river in the West.

Three dams control the river's flow. Each spring, El Vado and Abiquiu reservoirs capture snowmelt from the southern Rocky Mountains and hold back much of the water until it is needed downstream. Adding to the mix, supplemental water from San Juan-Chama trans-mountain diversion project makes the Chama one of a very few Southwestern rivers that has more water in it today than it did historically.

More than a dozen downstream water users lay claim to most of the water in the Rio Chama. The largest are the Albuquerque-Bernalillo Water Utility, the Middle Rio Grande Conservancy District and the tribal nations of Cochiti, Santo Domingo, San Felipe, Santa Ana, Sandia and Isleta Pueblos - all in the Middle Rio Grande. Local water rights-holders - Rio Chama Acequia Association and Ohkay Owinge Pueblo - are very senior.

Nonetheless, most Rio Chama water is simply passing through to downstream users.

An important water resource for the entire Upper Rio Grande, the Chama can provide reservoirs with storage of up to four years' water production. Middle Rio Grande irrigators, including Pueblos, own a majority of the water rights. The river is managed primarily to serve downstream needs.

Let's see how that happened.

After the Civil War, the United States government granted minerals, rangelands, timber and irrigated farmlands to anyone who could successfully develop them. Large dams were essential for this policy.

In New Mexico, Elephant Butte Reservoir came online in 1916 to store Rio Grande waters for irrigation in the Las Cruces, El Paso and Juarez valleys. On the Rio

Chama, El Vado Dam went into operation in 1935 as storage for Middle Rio Grande Conservancy District irrigators. In 1963, Abiquiu Dam began holding back floodwaters and, in 1974, Heron Dam started storing San Juan-Chama Project water.

This long history of regulated flow in the Rio Chama has benefited downstream users, but it has had a deep impact upon the condition of the river between El Vado Dam and the Rio Grande confluence.

Spring floods that annually revitalized natural floodplain, river bank and channel processes essentially ended in 1935. The 100-year flood estimates dropped from nearly 14,000 cfs to under 6,000 cfs. Summer and fall flows are higher than before. Winter flows fluctuate widely in response to legal constraints imposed by Pueblo Prior Paramount rights, the San Juan-Chama Project and Rio Grande Compact.

This erratic pattern of releases has produced hydrographs with sudden rises and drops that have reduced the reliability of flows for local irrigators, boaters and anglers, and for the support of natural processes.

Today, many of the institutional entities within the Rio Chama Basin believe that healthier rivers are good for everyone. The Bureau of Reclamation, Army Corps of Engineers and the State of New Mexico have expressed support for improving the system's efficiency for a wider variety of uses. Support for the Project among local citizens is widespread.

Since 2010, the Rio Chama Flow Project team has been meeting with Rio Chama water stakeholders to explain the intent of the Project and gain their support.

## Heron Lake

*CAPACITY:* 401,320 ac-ft

*PURPOSE:* Storage

*SUPPLY:* San Juan-Chama Project

*OPERATOR:* U.S. Bureau of Reclamation

*STORAGE RIGHTS:* Firm yield for SJ-C Project

## El Vado Reservoir

*CAPACITY:* 196,500 ac-ft

*PURPOSE:* Storage, hydropower

*SUPPLY:* Native flow, SJ-C

*OPERATOR:* U.S. Bureau of Reclamation

*STORAGE RIGHTS:* MRG Conservancy District

## Abiquiu Reservoir

*CAPACITY:* 729,665 ac-ft (including storage of 186,000 ac-ft)

*PURPOSE:* Flood control, storage

*SUPPLY:* Native flow, El Vado releases, SJ-C

*OPERATOR:* Army Corps of Engineers

*STORAGE RIGHTS:* Albuquerque Water Utility

# Flow & Ecology

The plants, animals and processes that compose the Rio Chama ecosystems evolve in response to seasonal flow patterns.



In particular, flood disturbances are required for the rejuvenation and creation of diverse habitats within the floodplain and river channels.

In Northern New Mexico, a river gets its character from high flows during spring snowmelt, and declining flows for the rest of the year - spiked occasionally by thunderstorms. The vegetation along a river's banks shifts and grows with this cycle, as do the aquatic and terrestrial creatures who feed upon the river's bounty.

Ideally, a Southwestern river periodically rises high enough to overflow its banks and create floodplains. Such overbank flows perform a number of tasks that reinforce the health of the river basin, including:

- Spreading organic material that rejuvenates soils with essential minerals.
- Carrying seeds up onto the floodplain where they may germinate.
- Mobilizing the sediments to flush accumulated fines and organic matter from the bed.
- Scouring the banks and permitting river meandering where there is a sufficiently wide floodplain.
- Resupplying groundwater as flood waters soak into aquifers.

In fact, it is flood disturbance that organizes river-related ecosystems, and accounts for its complexity of habitat relationships and its diversity of species.

As flows recede, the river's renewal becomes apparent. There may be pooling on the benches, a larger gravel bar in the channel or more undercutting of banks. Each of these features provides habitats for a diversity of flora and fauna.

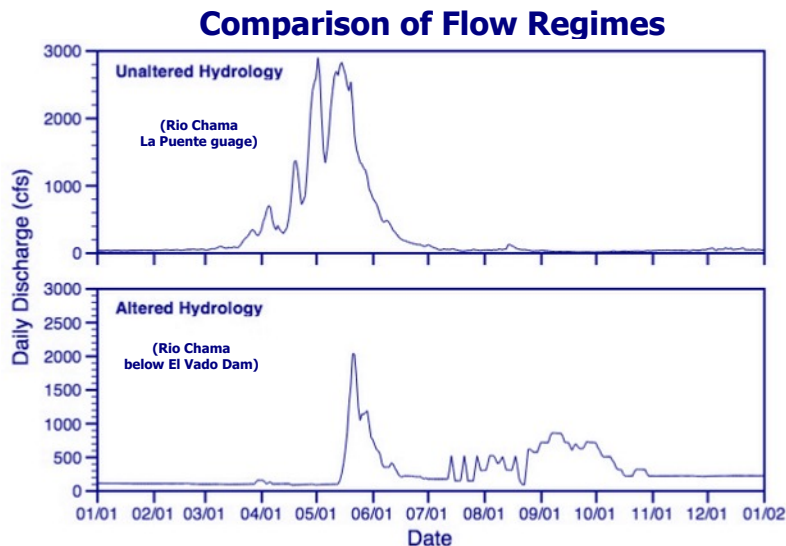
The plants and animals, too, settle into their post-flooding rhythms. Trout lay their redds in pool tails and riffles. Amphibians and reptiles bury their eggs in the softened ground. Grasses, forbs, shrubs and trees gain strength in replenished soils. Small invertebrates at the base of the food web proliferate in and out of the channel.

In the ideal world, these rhythms repeat themselves in a succession of low and high snowpack years. Overbank floods flush the system and cycle its energy. Slow but steady decline follows, and then the river's ecology stabilizes into a new but familiar state.

Managing for natural disturbance patterns mean more species have a chance to take hold in the river's ecosystem; the variety of flora and fauna grows in diversity and strength as the river achieves its natural state of punctuated equilibrium. It is full of life, fortitude and resilience.

The upshot is this: The plants and animals in a river system depend upon natural flow patterns for their establishment, survival and propagation.

In the Rio Chama, conditions diverge from this ideal. Reservoirs have held back spring runoff for delivery





# Natural Hydrograph

later in the year and also retain sediment. Managed release programs, keyed to downstream demands, have knocked both the high and low extremes off the river's seasonal hydrograph - and created patterns that didn't happen in pre-dam times.

As expected, the river and its dependents have adapted, but in ways that narrow the river's biological potential. In dam-controlled rivers, the power to produce a dynamic aquatic and floodplain landscape is often significantly reduced. Instead of a constant "shifting mosaic" of habitats, the channel and floodplain habitats below dams often become stabilized, providing less diverse habitats and fewer niches for native species throughout the biological food web. After 75 years of unnatural flows, it is believed that the Chama has suffered a substantial loss of its pre-dam biological diversity.

The Rio Chama Flow Project is working with water managers to reserve a certain amount of available water to provide environmental flow releases (e-flows) to better support river ecology. While Project members know the Rio Chama is a highly regulated system, it is exactly those circumstances that hold promise of a river that is that much sweeter for everyone.

In several ways, the Rio Chama is an ideal candidate for suggesting improvements to the flow regime. In most years, there are 96,000 acre-feet of San Juan-

Chama Project water that must pass down the channel to fulfill downstream obligations. That means there's extra water in the system to provide some potential for greater flexibility in the timing, duration and magnitude of releases from Heron reservoir. Despite what El Vado Dam holds back, nearly 80 percent of the natural sediment loading still comes from downstream tributaries.

And, there's an opportunity for Abiquiu Reservoir to act as a storage basin for managed releases from El Vado.

It's clear that relatively minor shifts in the timing, duration or magnitude of releases from El Vado Dam can affect noticeable changes in the ecosystem. For instance, if Bureau of Reclamation managers can attenuate and stabilize winter releases of San Juan-Chama and Rio Grande Compact water, the spawning conditions for brown trout can be improved.

Any e-flow changes must take into consideration the needs of people who use this water: consumers in downstream communities, acequias below Abiquiu Dam, and boaters and anglers in the Wild & Scenic Rivers reach.

Science has firmly established the relationship between a river's flow and the condition of its ecology. The Rio Chama Flow Project intends to better manage that relationship in order to improve the health of the river for all who use it.

## What Happened at 6,000 CFS

*May 8-10, 2009: El Vado managers release 6,000 cfs to avoid damage to an aging spillway. Among those on the river was Paul Bauer, Principal Geologist for New Mexico Bureau of Geology and Mineral Resources. Here are some of his observations:*

"It has fully filled its channel, and is high enough so that few rocks are navigational hazards. Mostly, we drift rapidly downriver without the need for paddling ... (We cover) 10 miles in two hours ... The swelling river has entrained huge amounts of riverside wood. Usual campsites are flooded.

"The river has become a fully operational fluvio-sedimentary system. Over most of the canyon, the river is bank full, thoroughly occupying its historic floodplain for the first time since 1985. In the lower canyon, where steep, sedimentary cutbanks line almost every bend, erosion is clearly occurring. Fresh scars dot the banks, and dozens of cutbank trees and shrubs have either dropped into the river or hang by their roots ... In places, we hear submerged pebbles and cobbles rolling, sliding and saltating as the bed load is reconfigured for this more energetic flow regime. On the next trip a few weeks later, with much lower water, the redesigned bars and channels are easily identified."



Paul Bauer

# *E-Flow & The Economy*

There are lots of people who rely upon the Rio Chama for their financial livelihoods.

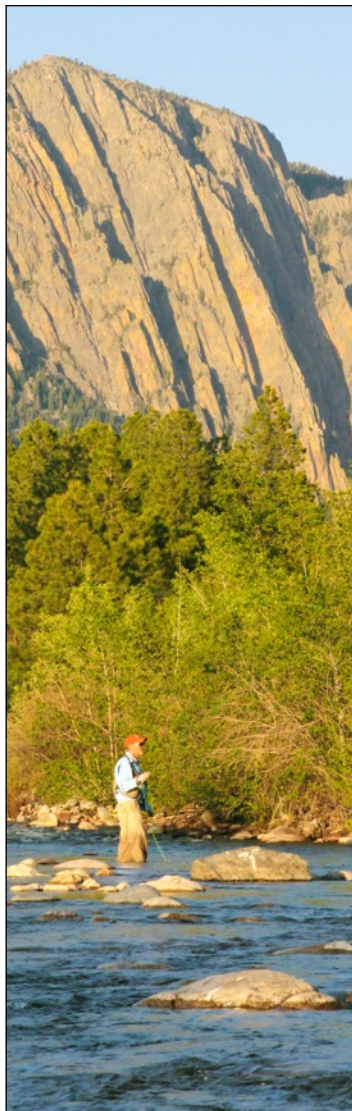
Farmers and ranchers, business owners, hunting and fishing guides, rafting companies, and valley residents all share in an economy that is fueled by the presence of the river.

Critical to their survival and success are the thousands of

people who come to the Chama Valley every year to enjoy the river and reservoirs. Some come to fish, hunt or raft. Some put up a tent or rent a cabin. Still others simply drive up for the day to sit on the bank and watch the river flow. In recent years, more than a quarter-million people have visited the valley each year. Heron Lake and El Vado state parks alone average nearly 200,000 visitors a year.

These visitors spend money in the Rio Chama Valley. Some of those dollars are spent on goods - groceries or farm-fresh produce, gasoline or two-cycle oil, live bait or lures, a dinner out, a few beers at the bar. Others go for services - a guided hunting trip, a raft trip, repair of an outboard engine. Still others put out cash for an overnight stay or entrance fees to El Vado and Heron Lake state parks.

Individual businesses, from Abiquiu to Chama, rely upon these seasonal tourists to turn a profit. Through the gross receipts taxes collected on most commercial purchases, the proceeds of these enterprises spread out to support the greater Chama Valley - the villages of Chama, Abiquiu, Tierra Amarilla and rural Rio Arriba County



As an example of the importance of gross receipt taxes, more than half of the Village of Chama \$1.7 million budget in 2010-2011 was funded by these gross receipts taxes. The majority of these taxes come into village and county during the July-December period - the prime fishing, hunting, boating and tourist season.

Lodgers taxes are collected on every overnight stay at hotels, motels, campgrounds and RV parks in the area. They too peak during the busy tourist season. Revenues from this tax are used to promote and support tourist attractions and facilities - and help to defray their operating costs. The valley's lodgers put more than \$100,000 each season into attracting visitors.

So, in a real sense, the river is the lifeblood of the people who live and work in this valley.

As the river goes, so goes the economic fortunes of the Rio Chama Valley. Everyone has a stake in making the Rio Chama a healthier river.





# About the Project

Over the years, many have talked about how the natural conditions of the Rio Chama could be improved by a shift in how the river's flow is managed.

Now, the Rio Chama Flow Project is working to turn that talk into action. Funded by state and nonprofit sources, the project team hopes that success on the 30-mile Wild & Scenic River stretch below El Vado Dam and above Abiquiu Reservoir will create a template for management of the entire Rio Chama – and other disturbed river systems in the Southwest.

The project's objective is straightforward: to suggest alterations in water operations at Heron, El Vado and Abiquiu reservoirs that will improve the health of the river's natural environment while fulfilling institutional water storage and delivery requirements. Essentially, the Project team suggests ways for including "environmental flows" into the operating plans of dam managers.

The project depends upon support of stakeholders who have interests in the river's water. So, from start to finish, team members have sought them out to describe the project, hear their concerns and solicit support.

It is understood that any proposed flow regimes must undergo rigorous review by all with an interest, and that there must be a firm monitoring component. And, since the river exists in an ever-changing environment, the project will employ adaptive management principles acknowledging that conditions change – and so do the best-laid plans.

The team's scientists know that their work must be grounded in an objective analysis of the river's current geomorphology and ecology, and fully cognizant of the legal and operational restraints on dam operations.

Riparian ecologists, geomorphologists and aquatic biologists are collecting sufficient data to construct an assessment of conditions in and along the river channel. Concurrently, civil engineers are interviewing dam operators and gathering historical flow data.

Then, the team's modelers will crunch the numbers and come up with a variety of management scenarios – with flows of various magnitudes, timings and durations – and suggest timing of releases that would improve the ecology of the river corridor while accommodating all constraints. These



proposed flow regimes go to an Advisory Council of water managers and stakeholders for a thorough critique and concurrence.

Then, and only then, will these scenarios be played out on the river itself – with the support of water users and managers.

A critical part of the project will be monitoring, which will indicate what's working and what can be changed by employing adaptive management tools.

So far, the upshot of the Rio Chama Flow Project has been more dialogue, more action and more interest in the future of the Rio Chama. Which can only be good for the Chama.

## The Project Team

Mike Harvey, *Fluvial Geomorphology*

Todd Caplan, *Riparian Ecology*

Greg Gustina, *Fish Biology*

Dick Kreiner, *Reservoir Management*

Nabil Shafike, *Hydrology/Modeling*

Melinda H. Benson, *Adaptive Management*

Mark Stone, *Hydrological Modeling*

Laura Crossey, *Hydrogeology*

Ryan Morrison, *Hydraulic Modeling*

Dagmar Llewellyn, *Hydrology*

Steve Harris, *Project Management*

# Sharing the River

The prime directive for human relationships with rivers is the control of the water.

The river supports such a variety of uses - drinking water, irrigation, hydropower generation, cultural and spiritual values, fish and wildlife, and recreation - that competition and conflict seem almost inevitable.

To borrow a well-worn phrase, "Water's for fighting over."

However, by beginning to think more deeply about the river, we rapidly discover that the would-be competitors are connected together in surprising and complex ways: upstreamers with downstreamers, citizens with managers, large urban utilities with small-scale irrigators, anglers with boaters, and healthy habitats with water consumers throughout the Chama Basin.

Experience in watershed work throughout the world is beginning to demonstrate that water conflicts can be reduced or resolved through better understanding of both the physical processes involved and the values of the people who depend upon the river.

The Rio Chama Flow Project is aiming at improving the ecological health of a 30-mile reach between El Vado and Abiquiu reservoirs by making water management more responsive to all its users.

We believe that if cooperative, adaptive management of El Vado Dam proves successful, the project could provide a model for resolving other, more difficult problems the river faces in water rights administration, water quality impairment, water use efficiencies and watershed conservation.



Developing a powerful, inclusive Rio Chama Partnership to guide the project requires us to bring together and protect the interests of many.

Stakeholders include local landowners, acequias and land grants, Pueblo and tribal communities, the villages of Chama, Tierra Amarilla, Abiquiu and others - along with large Middle Rio Grande water users (e.g., Albuquerque-Bernalillo Water Utility Authority and Middle Rio Grande Conservancy District), San Juan-Chama Project contractors and Rio Grande Compact signatories.

The present project implementation team is comprised of land and water management agencies (Bureau of Reclamation; Bureau of Land Management, New Mexico Interstate Stream Commission, U.S. Army Corps of Engineers); local landowners; private environmental and engineering consultants; University of New Mexico's engineering, geography and law school faculty; and conservation organizations (Trout Unlimited and Rio Grande Restoration).

**For video information on the Project, go to <https://www.youtube.com/watch?v=cw5av0-k1bg>**

## Join in the Flow: Help Support Rio Chama Project

The Rio Chama Flow Project is a long-term process to involve Rio Chama water users, residents and managers in collecting and understanding information on river flows, and creating alternative management scenarios that improve conditions for the river and its water users. **Your support (and participation) is critical to our success.**

- \_\_\_ "Partner" (Donation of \$500 or more. All donations are tax-deductible.)
- \_\_\_ "Supporter" (\$100-\$499. All donors receive periodic info on the Project.)
- \_\_\_ "Friend" (\$20 annual membership)

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