

## Thinking Like the Rio Chama Watershed

Somewhere along an ephemeral tributary stream of the Rio Chama, a wild locust in full bloom is sending its exotic scent into the sunlight. Carpenter bees as well as a few imported Italian honeybees, a scolding Tassel-eared squirrel, and a dueling pair of copper-feathered Rufous hummingbirds create a soundscape along the stream corridor that is uniquely beautiful to this small but essential piece of what we know as the Rio Chama Watershed. A short distance from the stream bank, in the dirt under a plastic clothes line near a renovated adobe house, a tiny Pueblo Indian arrowhead catches the light in its dense black obsidian. It is a reminder of the original inhabitants here in the Rio Chama Valley and their need for proximity to these life-sustaining waters in our semi-arid landscape.

The final and perhaps most enduring piece of our first look at our watershed is the man-made *acequia* ditch traveling at a distance above the stream, delivering these life giving waters to the ranchers, farmers and gardeners along its course as it descends into the local village and then, by design, returns again into the stream where it was born.

As current day inhabitants of the Rio Chama valley we are all a part of this culturally and physically rich and unique bioregion. The solutions to our watershed's current challenges are to be found within the land, and within all of us, as we learn to know how the watershed works and what it needs to sustain itself and its diverse inhabitants.

### What does it mean to “think like a watershed”?

*“Even more, if we do acknowledge that we are water, that we are hydrologic systems ourselves, we have the hope of seeing and honoring our oneness with the larger systems within which we live and that sustain us.”*

— Rina Swentzell, Santa Clara Pueblo

The idea of “thinking like a watershed” comes from an essential book of our times and region entitled, *Thinking Like a Watershed: Voices From the West* edited by Jack and Celestia Loeffler. The Loefflers were inspired by the land ethic of the one-armed explorer John Wesley Powell, who believed the expanding movement of Anglo-Europeans from the east to the “barren” west after the Civil War and the beginning of the Industrial Revolution would fare better, culturally and economically, if organized and governed within individual “geophysical cradles”

or watershed commons. Powell's genuine, if dusty, interactions with Indigenous Americans and Spanish settlers during his travels impressed on him the importance of the relationship between people and the shared watersheds they inhabited. He felt that governance of the west would be most effective if the westward movement of people were organized around the watershed commons they would inhabit and depend upon instead of within artificial state or county boundaries.

Powell foresaw that transfers of water from one watershed to another in a desert landscape would only encourage living beyond our means in places where water was a scarce commodity. He believed that in the end, water is best managed and cared for by the culturally cohesive and watershed-knowledgeable residents of the watershed itself. He envisioned a mosaic of watersheds on and near the dry Colorado Plateau that would function under self-governance, not government administered from afar.

The Chama Watershed is somewhat unique in that it is almost entirely situated within the political boundary of Rio Arriba County. We are fortunate to have a cohesive government entity to which we may address our watershed concerns. Many voices appear in Rio Arriba County Plan documents, including the Rio Arriba County Oil and Gas Ordinance, and Regional Water Plans. Thankfully, these modern day documents seem to echo in part both Powell's land ethic and the Indo-Hispano cultural beliefs around shared watersheds. "Thinking like a watershed" helps us realize the interdependence of those cultures who share the physical water resource itself as well as their relationship with the plants and animals that inhabit the ecosystem they depend on.

### **How do watersheds function?**

*A watershed is "that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community."*

-John

Wesley Powell

A watershed can be described physically as a drainage basin that drains water from the mountains to a specific river, ocean or body of water.

The survival of all living things in a watershed ecosystem is dependent upon the cycling of water and nutrients. Plants and animals rely on chemical nutrients

found in the soil to survive and it is the energy from the sun that supplies what is needed for plant photosynthesis and also for evaporation, which is essential for feeding the hydrologic cycle. Water moving through a watershed can cycle not only needed nutrients but pollution as well.

The water cycle begins when heat from the sun causes water to evaporate. This water vapor eventually condenses and returns to earth in the form of rain or snow. Next, gravity moves the water downhill over land and through the ground, or as part of rivers or streams, which can feed lakes or oceans for long-term storage. Groundwater aquifers are formed when rainwater percolates through the soil until it hits an impermeable layer of rock or clay. The “water table” refers to the uppermost limit of the aquifer.

### **What are the components of the Rio Chama Watershed?**

The late Juan Estavan Arellano, an unsurpassed and beloved researcher, journalist and writer of our region and our watershed who passed away last year, explains our watershed using the Spanish words that describe the shapes of our very own bodies. The mountains in a watershed are thought to be pregnant due to their *rumores* and *hinchazones* (bulges and swellings) and this is where the story of our physical watershed begins.

In the Rio Chama Watershed our headwaters begin from natural springs in high elevation basins in the San Juan Mountains in the far northern watershed near the Colorado border and eventually drain into the Chama River, an eventual tributary to the “exotic” Rio Grande River, which travels through a basically dry landscape to finally empty into the Gulf of Mexico. Our watershed is considered a sub-basin within the Upper Rio Grande Basin. The western edge of our watershed is defined by the Continental Divide, which separates our watershed (which geologically speaking is a platform, not a basin) from the San Juan Basin, while the southern boundary of the watershed extends to the Cerro de la Garta Ridge of the northern Jemez Mountains’ Valles Caldera. The eastern boundaries are the Tusas Mountains and Black Mesa. The watershed is cradle shaped and is almost entirely within the political boundaries of Rio Arriba County, with only a small portion extending over the Colorado border.

In all, the watershed covers 3,075 square miles and includes Ohkay Owingeh and Santa Clara pueblos in the south, portions of the Jicarrila Apache Indian Nation in the north, as well as the towns of Vallecitos, El Rito, Abiquiu, Coyote, Canjilon, Cebolla, Canones, Tierra Amarilla, and Chama. All of these towns, reservations,

reservoirs, forests and tributaries are considered integral to the watershed ecosystem.

The Rio Chama watershed differs geologically from the San Juan Basin due to the fact that our watershed is, geologically speaking, a raised platform above the San Juan Basin. The potable water aquifers in the Morrison formation in the Rio Chama watershed sit right below the Mancos Shale, which are the targeted geologic formations that the oil and gas industry are interested in developing. There are not thousands of feet of impermeable rock separating the two. The oil and gas industry would in all likelihood be pursuing what is known as “shallow shale fracking” and this would contaminate the aquifers in the formations directly beneath the Mancos Shale.

Our watershed, like all watersheds, has a unique combination of habitats. Within our watershed we have Piñon-Juniper forests, Ponderosa forests, Spruce and Douglas Fir and finally Aspen forests with grassland meadows at the higher elevations near Chama. We have 13 larger tributaries draining into the Chama River (Canones Creek, the Rio Brazos, Rito de Tierra Amarilla, Rio Nutrias, Rio Cebolla, Rio Gallina, Rito de Canjilon, Rio Puerco de Chama, a second Canones creek, El Rito, Rio del Oso, Abiquiu Creek, and the Rio Ojo Calliente which is itself fed by the Rio Vallecitos and the Rio Tusas) and many smaller, more ephemeral creeks and streams that are a part of the hydrology of our watershed.

Our watershed has a particular soil composition as well, as the water brings soil with it as it moves through the watershed during various flow cycles. About 30,000 acres in the valley bottoms are used for irrigated agriculture. While much of this is for the cultivation of alfalfa, more than a few small family farms are bringing their produce and farm products to local markets.

Although hydrologic information is scarce in the Rio Chama area, we do know that our water comes primarily from precipitation, as there are no conclusive groundwater flows into the region. The Rio Chama Platform/ Watershed recharges water over 9000 feet while, for example, lower down around the Rio Cebolla it is currently dry because of the ongoing drought. The current institutional understanding of the watershed suggests that the ground water we use is connected to surface water, not untapped ground water in deep aquifers. However, there appear to be significant water deposits in underground geologic layers within the watershed that very much warrant further study and attention. For example, USGS maps show springs discharging above Abiquiu Dam.

Our actions, as inhabitants of this watershed ecosystem, have a profound effect on its health and the ability of the watershed to provide not only for us, but for the larger hydrologic basin we are a part of. About 90% of the water that originates in the Rio Chama watershed flows out of the region for downstream use while the 10% we use within the watershed is for domestic and agricultural, as well as evaporation and riparian purposes. Practically speaking, we are the direct beneficiaries, as well as the gatekeepers, for this precious water resource as it travels south to Espanola, Santa Fe and Albuquerque.

### **Is the Rio Chama Watershed functioning as an ecosystem?**

We have ongoing problem stretches of the river that show e-coli as well as excessive temperature and nutrient loads according to the Surface Water Quality Board responsible for collecting samples. Non-point sources of pollution can be directly related to land-use practices such as grazing, fertilizing, and logging and are generally caused by rainfall or snowmelt moving over and through the ground. Effluent discharges from the point source, 30 year-old Waste Water Treatment Facility in Chama, have been an ongoing, serious problem for the community of Chama as well as downstream users. However, the city has recently been awarded funding from the state to build a brand new wastewater treatment plant, which is currently scheduled for completion in 2017.

We have three man-made reservoirs, Abiquiu, Heron and El Vado, which have altered the hydrological cycle of water within our basin. The Chama River is considered one of the most regulated stretches of river in the west and the timed water releases from these dams have altered the riparian habitat along the river course in an unnatural way. The diversion of water from the San Juan Mountains into the Chama River via the San Juan-Chama Trans-Mountain Diversion for use in the southern part of the state also affects our watershed as water is moved through and stored in our area for the benefit of downstream users. However, due to our ongoing drought, Heron Reservoir is now dry for the first time in four decades. Efforts have been made via the Rio Chama Flow Project, studying the designated Wild and Scenic stretch of the river below El Vado Dam and above Abiquiu Reservoir, to return a more natural flow to the river that is more conducive to a healthy river ecosystem that can sustain native biodiversity and the river ecosystem.

There is currently no heavy industry operating in the central Rio Chama Watershed. However, there are 143 capped oil and gas wells, with only 12 of

these wells ever reporting production. Approximately 400 oil and gas wells have been developed east of the Continental Divide.

### **What cultural influences have operated on the watershed historically?**

The original inhabitants of the Rio Chama Valley were Indigenous Anasazi Puebloan seed gatherers and hunters from the Chaco area who arrived here as long ago as 3,000 B.C. By the 1300s villages appeared in the southern watershed. The name Chama comes from an Indian pueblo called *Tsama* near Abiquiu along the north side of the river near its confluence with the El Rito creek. In the Tewa language, *Tsama* is defined as “wrestling place” or “fighting around place”.

Agriculture in the area began with the planting of corn in floodplains where the water table was higher or on terraces above the river using a dry-land farming technique. Little if any engineered irrigation by official canals or ditches was practiced, although methods of using runoff from mesas, rock-lined mulching and rocks used to direct water, was put to advantage. Larger pueblos raised squash, beans, and pumpkins as well as corn and even cotton. Puebloan cultures have profound religious beliefs around this life sustaining water and even today, practice religious dances and ceremonies to insure its arrival. By the 1500s the Apachean or the people we call the Navajo also formed settlements in the upper Chama valley. The name Navajo may come from a Tewa phrase that means “place where they plant fields”. These Indigenous Nations and Pueblos hold “first rights” to water.

The next arrivals in the valley were Spanish settlers. Between 1590-1846, these settlers (largely with the subjugated labor of the Pueblo Indians in the case of the southern watershed’s largest acequia project) built hundreds of community irrigation ditches called *acequias* and began to modify the terrain of the watershed, planting vegetables, grains and fruit (our first apples!) and introducing livestock into the watershed commons. Multiple origins and influences are evident in the acequias of today and include traditions from the Roman period, the influence of Arabic culture from the Moorish occupation of Spain, and finally, and importantly, the influence of Pueblo Indian culture and their watering and irrigation techniques. With these original Spanish settlers and this system of acequias came strong land and water ethics in the form of a Spanish document called the *Laws of the Indies*, which dictated ethical land-use practices. These ethics were also a part of the Spanish and Mexican land-grants which came with requirements for healthy land use. Estevan Arellano, in his studies of agropastoral farming and acequia culture on the upper Rio Grande,

concludes that the *Laws of the Indies* reinforced the relationship of water, land and culture that evolved in our region.

Many acequia villages in our watershed are unincorporated and the acequia institutions themselves are the only real local governance. Despite the local grievances associated with the management of the acequias, the physical watershed and its intricate biological system benefit in numerous ways from this system of irrigation. Among these benefits are water conservation due to principles of sharing water resources, extension of riparian zones around the acequias as rivers and creeks are broadened and elongated, an increase of local biodiversity of plants and animals, and protection of the hydrologic integrity of the watershed. Cultural integrity within the watershed benefits as well, as this system of sharing water binds inhabitants together and reinforces local traditions.

### **How would fracking for oil and gas impact our watershed?**

Because the geology of our watershed, in particular the geologic layer called the Morrison Formation, has not been thoroughly studied by the Bureau of Land Management, the exact repercussions of Shallow Shale Hydraulic Fracturing (commonly referred to as fracking) within the watershed are unknown. It makes sense that we would want to know, in detail, the impact of an action on our relatively pristine watershed before that action is taken. And since we are the “gatekeepers” to this precious resource of water as it flows for use to the southern part of the state, we have a profound obligation to be skeptical of anything that would limit or damage it.

Oil and gas is an industry that can come into operation in an area zoned for agriculture and is not required to have the zoning changed. These same companies can purchase water rights when leasing land for fracking.

Governor Cuomo of New York State recently declared a statewide ban on fracking after he commissioned a lengthy study on the potential health effects of hydro-fracking on the people in his state. The state health commissioner conducting the study concluded that he personally would not want his own family anywhere near this industry.

This is what we know about the potential harm from the oil and gas extraction method commonly known as fracking that is being proposed for our watershed. It could potentially affect our water, our air and our soil:

- **The amount of water used per fracking well** continues to go up as oil and gas companies must drill deeper and wider to find the last remaining amounts of finite fossil fuels embedded in geologic formations underground. Between two and five million gallons of water are used per well for horizontal drilling of a fracking well and this water would in all likelihood come from our watershed. The state of New Mexico is experiencing a long-term drought. As water resources dry up in the southern part of the state, the water coming from our watershed has infinite value for the survival of cities like Santa Fe and Albuquerque. Also, because the water used for fracking is permanently contaminated it is not viable to return it to the hydrologic cycle that keeps our watershed healthy.
- **The potential health effects of chemicals used in fracking** are many. Oil and gas companies are not required to divulge the list of chemicals that are commonly used for fracking, asserting that the list is “proprietary”. Our own US House of Representatives reported that at least 650 of these chemicals contain known carcinogens (see the Web Resource list below for a basic list of chemicals and what they are used for). These carcinogens would potentially end up in the water we use for drinking, growing food and watering livestock to say nothing of the potential for contamination to the water our watershed is supplying to the southern part of the state.
- **A methane cloud over the Four Corners** area of the state has been spotted from space and is attributable to oil and gas extraction primarily in the San Juan Basin on the other side of the Continental Divide west of our watershed. If fracking is allowed in our watershed we can assume that methane cloud will only grow larger. Methane gas is a common byproduct of fracking that is typically leaked or vented from well drilling activities. Methane is considered by environmental scientists to be one of the worst contributors to global warming.
- **Spills from fracking wells** in New Mexico hit a record in 2012 with nearly 700 self-reported accidents. Inspections of these wells are infrequent as the fracking industry grows beyond its ability to regulate itself. At least 30 reported spills during 2011-2012 impacted a waterway or a groundwater supply. BLM has not indicated how they will address the issue of toxic wastewater and where it will go. Used fracking fluid has historically been held in “ponds” or re-injected back into the earth. Migrating birds have

been known to land in these “ponds” and ultimately die in this chemical stew.

- **Our soil would potentially be compromised** as heavy traffic from big rigs, erosion caused by roads and construction of drilling pads, and potential chemical spills could cause serious damage to our delicate and dry desert soil. There is also the potential for **increased earthquake activity**. The Abiquiu Reservoir and Heron Lake are placed near several known fault lines. Injection wells, which are often used to dispose of waste-water, as well as degradation of bedrock, are known to scientists to cause seismic activity.

### **The Alternatives**

If we are truly “thinking like the Rio Chama Watershed”, we will want to keep informing ourselves about how the watershed works, what it needs from us to be healthy, and how we can protect it from misuse. The confluence of cultures operating in our watershed is profoundly beneficial because diverse and creative approaches to managing the watershed only increase our chances of succeeding in protecting this precious water resource. Supporting local farmers and acequia associations in their efforts to sustain all of us within the watershed is essential. Mitigation of non-point sources of pollution from grazing, fertilizing and logging by informed, local, land-based residents seems like a viable solution to a lot of the watershed’s non-point pollution problems. And with a new wastewater treatment plant scheduled for Chama, we can hope for an even more pristine watershed to protect.

Fracking is a potentially devastating industry that we are facing but there will be other challenges in the future that will need our attention. “Thinking like a watershed” will help us face these challenges with our community spirit and our knowledge of the watershed guiding us.

That green ribbon of beauty tracing its bloodlines through the watershed is ours to protect as we depend on it to continue to provide the “lifblood of the land”.

## Book Resource List

**Thinking Like a Watershed: Voices from the West** edited by Jack Loeffler and Celestia Loeffler. Published by University of New Mexico Press, 2012.

**Watersheds: A Practical Handbook for Healthy Water** by Clive Dobson and Gregor Gilpin Beck. Published by Firefly Books, 1999.

**Acequia Culture: Water Land, & Community in the Southwest** by José A. Rivera. Published by University of New Mexico Press, 1998.

**Chicano Culture, Ecology, Politics: Subversive Kin** by Devon G. Peña. Published by University of Arizona Press, 1998.

**Rio Arriba: A New Mexico County** compiled and edited by Robert J. Tórréz and Robert Trapp. Published by Rio Grande Books, 2010.

**Reining in the Rio Grande: People, Land and Water** by Fred M. Phillips, G. Emlen Hall, Mary E. Black. Published by University of New Mexico Press, 2011.

**Dividing New Mexico Waters 1700-1912** by John O. Baxter. Published by University of New Mexico Press, 1997.