# Upper Rio Grande, New Mexico
# Rinconada, Embudo, Velarde and Alcalde
# Watershed Management Plan

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# Table of Contents

# Section 1. Introduction

This plan addresses watershed management issues within the Upper Rio Grande Valley, New Mexico, but more specifically the Rio Grande Valley from Rinconada to North Border of Ohkay Ohwingeh. It includes the communities of Embudo, Velarde, Alcalde, El Guique, La Canova, La Joya and Los Luceros.

This document is a result of a collaborative effort to identify local watershed health issues and concerns and formulate possible solutions for long term management options to conserve the natural resources, cultural, social and economic integrity of the region.

This information presented in this document comes from watershed groups meetings, outreach to individuals and institutions in the community. A multitude of various stakeholders have been identified and engaged throughout the outreach process.

This document was funded by US EPA Clean Water Act funding, section 319, administered by the New Mexico Environment Department, Surface Water Quality Bureau, for addressing non-point source contamination into surface water bodies.

Water and its relationship to the landscape are so deeply entwined within the culture and the spirit of the community, when concepts of watershed management are brought up, dialogue emerged about many issues effecting the health and integrity of the communities. This document seeks to address watershed management from a holistic point of reference acknowledging the interdependence of ecological, cultural and societal elements.

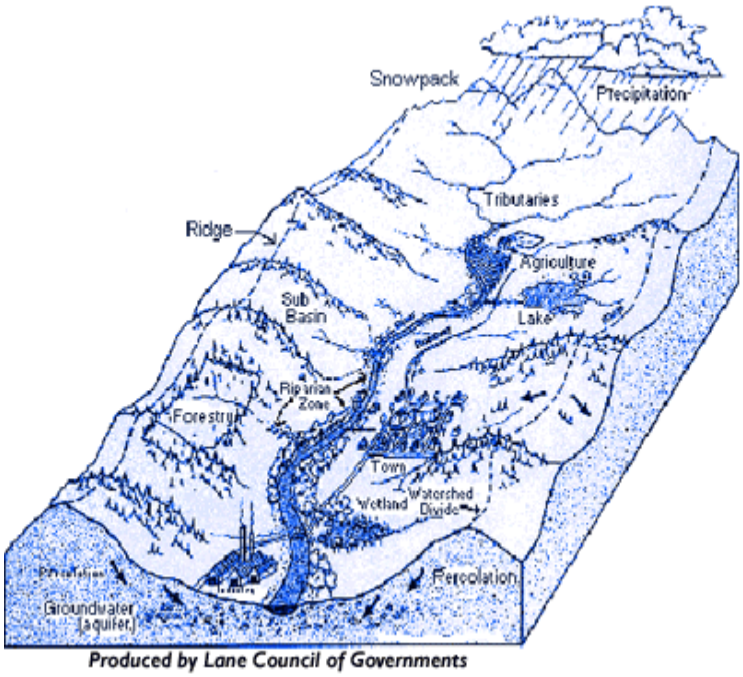
In addition, this document seeks to understand the current day as a point of reference, before we can move forward into the future we must examine and attempt to understand the historical activities in the watershed that have contributed to the current status of the watershed. We believe that through an examination of traditions that have endured through years of history in the region, we can learn valuable lessons that sustained local people for millennia.

We also acknowledge that we are not insulate, our community is deeply effected by decisions and actions made at State, Federal and Global levels. Our communities must deal with the repercussions and the direct effects from actions that take place elsewhere. Therefore, we have to acknowledge and embrace the future with a willingness to adapt and overcome the changes that happen on a daily basis.

It is with this philosophy and intent that we present this document.

## What is a Watershed?

A watershed is an area of land where all the waters drain into a common place. We are all part of a watershed. Sometimes they are very large, others can be small. Watersheds are based on topography of a landscape and are not determined by political boundaries. Watersheds have become a framework by which communities can evaluate the health of local water bodies and the health of their local ecosystems.




## Watershed Description

U.S. Geological Survey
Hydrologic Unit Code [HUC] 13020101
North Central New Mexico

The headwaters of the Rio Grande originate in Southern Colorado; extend down through the Rio Grande Gorge, then the mesas open up creating a wide valley floor at Velarde. The Upper Rio Grande Watershed is quite large, covering more than 7,500 square miles. Although the actual watershed is much bigger, it has been broken up into smaller sections that are more manageable in terms of creating plans.

The northern boundary of the planning area is the Rio Arriba County line; the southern boundary is created by the Pueblo of Ohkay Ohwingeh, a sovereign nation. The highest

point on the Black Mesa by which all waters would drain east into the Rio Grande basin creates the western boundary. The eastern boundary is the highest point in the Sangre de Cristo's by which all waters would drain west into the Rio Grande basin.

The Rio Grande from Rio Arriba county line downstream to the Velarde diversion dam has been designated as a Wild and Scenic River Area and is managed by the BLM. Recreators use this stretch of the river for rafting, kayaking, swimming, painting, introspection, and fishing. Private homes exist along the corridor, generally upland of the river's floodplain, in small traditional community settings. Small family farms and several orchards are in production in this area. Embudo Station is the last settlement before the Velarde diversion dam and is present on the National Registry of Historic Places as being the oldest intact narrow gauge railroad station in the region. Embudo Station is now a restaurant and is also used by recreators as a boating take-out, swimming hole, and fishing spot.

From the Velarde diversion dam downstream to the northern boundary of Ohkay Owingeh, the valley opens up into orchards and agricultural fields. Land management is, for the most part, private and many traditional agricultural lands have been subdivided and sectioned into small lots onto which mobile homes and small residences have been erected. There is a desire in these traditional agricultural communities to keep the cultural ties to the land and food production alive and active, even as properties become further subdivided and the natural function of the land continues to change.

Ohkay Ohwingeh has been continually occupied since about 1,300 AD. Presently, the pueblo includes approximately 12,213 acres, including 1,800 acres of irrigated lands. The historical village is built of adobe and includes two plazas. Traditionally families maintained two houses, one for winter and one in the higher above the fields for summer.

The Rio Grande Corridor is an important ecosystem within the area, a migratory bird pathway and is home to many riparian and wetlands areas. The area has extensive acequia systems; these acequias define a green belt within the valley floor and contribute to the hydrological and agricultural systems. The main agricultural products of the valley are alfalfa, hay and various fruit orchards, including apples.

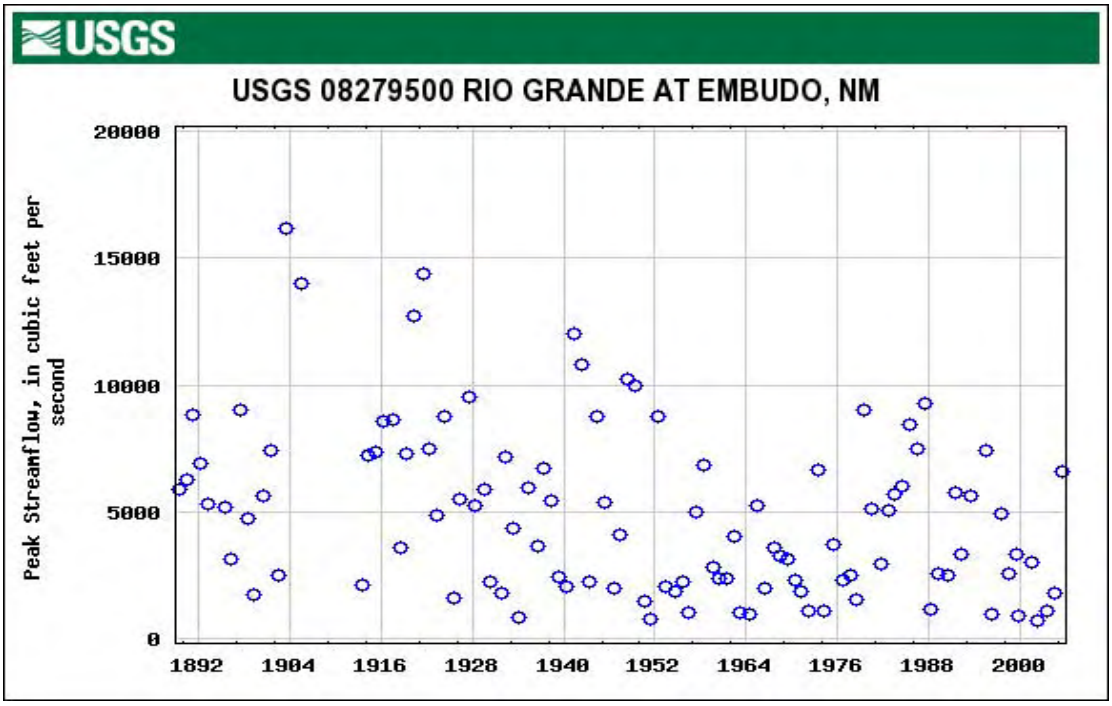
This area has a rich cultural and landscape history that still has endured to the present day. It has been stated that maintaining and honoring these traditions is an important part of managing the landscape and the water resources of the area.

**Land Ownership-** The federal government, including, the Bureau of Land Management and the US Forest Service, manage the majority of the lands within the watershed. New Mexico State, Pueblo and private individuals own the remaining lands. The diversity of interests within the planning area shows the importance of creating dialogue and collaborative planning for the future of the resources of the region.

**Surface Water-** The Rio Grande is the main surface water body in the watershed, the Rio Embudo meets the Rio Grande at Embudo, it is feed by innumerable tributary streams that carry water from the headwaters in the Sangre de Cristo mountains.

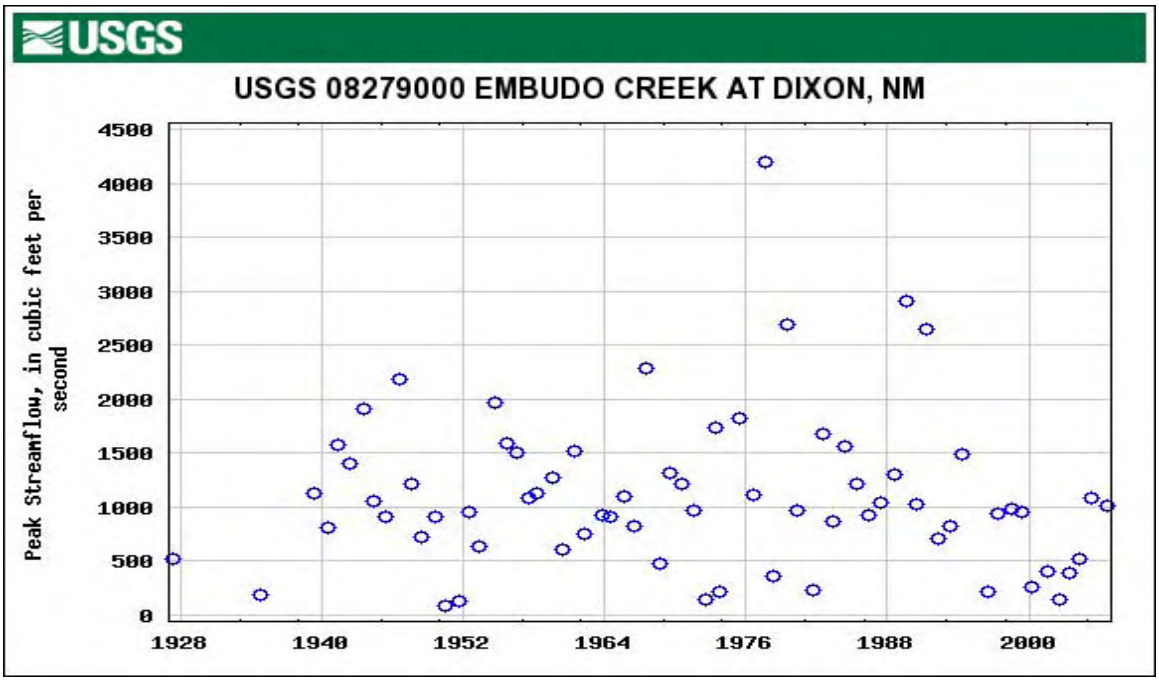
2 USGS surface water gages exist within the planning area. (**USGS 08279500 Rio Grande at Embudo, NM)** and **(USGS 08279000 Embudo Creek at Dixon, NM)**

This gage at the Embudo Station is the oldest surface water gage in the United States, with annual data collected since 1892. As shown in the graph below, the peak flow in the Rio Grande is highly variable, being dependent on yearly snow pack and associated precipitation.




USGS Graph showing peak stream flow in cfs for years 1892-2007**.** Available at http://www.usgs.gov

The surface water gage at Embudo Creek measures the Rio Embudo just east of hwy 84 before it enters the Rio Grande. This gage has been in operation since 1928. As expected the annual peak stream flow at the Rio Embudo is also highly variable.



USGS Graph showing peak stream flow in cfs for years 1928-2007. Available at http://www.usgs.gov

**Intermittent Streams /Arroyos**-Rio de Truchas and Cañada de las Entrañas are intermittent streams that drain from the Truchas Peaks. Many arroyos drain water from the lower elevations, including Arroyo del Pueblo, Arroyo Ocote, Cañada Ancha, Arroyo del Palacio, Arroyo de los Chavez, Arroyo del Ranchitos and Arroyo de los Borregos. Another large drainage in the Embudo area, Cañada Comanche, drains waters from the Black Mesa and may be causing some potential problems.

Many of these arroyos have been highly modified by development and are currently being used as roadways or to channel floodwaters away from communities; subsequently some of the function and capacity of the drainage ways have been compromised.

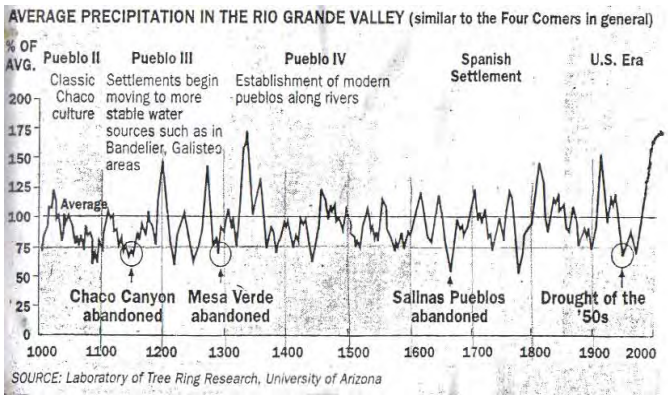
**Geology-** The watershed lies at the northern end of the Española Basin. The sediments that make up the Española Basin are collectively referred to as the Santa Fe group. The Black Mesa to the west of the Rio Grande is made up of basalt and andestite, which are embedded with sand and gravel. The river incised a deep canyon until Velarde though the basalt. Alluvial deposits cover the river valley. To the east of the river, the Sangre de Cristos are comprised mostly of Precambrian metamorphic rocks.

**Topography-** An unnamed point near the Truchas Peaks form the highest point in the watershed with an elevation of 11,903 ft, gentle slopes cascade down into the Rio Grande valley with an elevation of 5,560 ft.

**Vegetation-** Mixed Conifer forests are found only in the highest elevations of the Sangre de Cristo Mountains. Ponderosa Pine forests are found between elevations of 7,000 and 11,600 feet. Piñon and Juniper woodlands are found between elevations of 5,000 and 7,000 feet. Agricultural lands including pasture, row crops, orchards and riparian bosque are found at lowest elevations of the watershed, along the river and river valleys.

**Climate and Precipitation-** The average temperature at Alcalde is a low of 33.0˚ F and high 70.1˚ F and the average precipitation for the area is 10.35 inches per year according to the Rio Arriba County Soil Survey produced by the NRCS.

The precipitation for this region can be highly variable resulting in periodic floods and droughts. University of Arizona has studied tree ring data for the area to reconstruct precipitation events for at least 1000 years in the past. Graph below shows extreme variance among annual precipitation. Droughts have been common in the southwest as concluded by reconstructed tree ring data.




Tree ring data to reconstruct precipitation events. University of Arizona.

**Climate Change-** The University of Arizona operates CLIMAS, Climate Assessment for the Southwest, a research institute dedicated to the investigation of climate change and it's effects on the water resources and ecosystems of the southwest region of the United States, modeling done by the institute predicts a rise in temperatures of 4- 5° F by the year 2050 for the Upper Rio Grande area.

It can be reasonably expected that if we do experience warming trends as predicted, we would also see an increased demand for water resources do to increased temperatures and a reduction in soil moisture. Precipitation predictions are not nearly as consistent for climate change models, but there seems to be consensus around the fact that more frequent and severe droughts are likely.

It is expected that the southwest region will continue to have a decline in snow pack and earlier snowmelt which will surely impact the greater watershed, and may influence surface water inflows and outflows in the region.

Some predictions allude to more frequent monsoon like storms that could fuel flooding episodes like the one seen in 2006. Infrastructure should be built to be able to capture these storm events and allow infiltration into the aquifer. Onsite rain catchments in the form of cisterns or rain barrels could also help alleviate some of the flooding concerns as well as meeting some of the outdoor water demand in the summer months.

## Intent of this document

The New Mexico Environment Department performs surface water quality sampling periodically to determine if the surface waters are meeting water quality standards as prescribed by the New Mexico Water Control Commission. (*Important to note: the Pueblos of Ohkay Ohwingeh and Santa Clara are sovereign nations and are to be treated as a state, which means that they determine their own water quality standards which can be more stringent than New Mexico Water Quality standards*.) The standards are determined by the ability of the water body to support designated uses within the stream segment, such as irrigation, livestock watering, wildlife habitat, primary contact, marginal coldwater fishery or warm water fishery.

If a stream segment does not meet water quality standards for its particular designated use it is placed on the list of impaired waters for the state and given a priority ranking. The designated uses that are impaired within this stretch of the Rio Grande include marginal coldwater fishery and warmwater fishery.

In this case, the water quality impairment, Turbidity, has been determined to be from non point sources that could include activities such as loss of riparian habitat, natural sources, highway/road/bridge runoff, irrigated crop production and rangeland grazing. Non-point source (NPS) pollution comes from unknown sources throughout the landscape and it is a directive of this planning process to determine possible solutions to reduce these pollutants.

Goals of the watershed management activities such include; restoring and maintaining the chemical, physical and biological integrity of the water resources, maintain base flow in streams, stabilize streambanks, and minimize non point sources pollutants delivered into streams.

This document serves to provide a framework by which multiple parties can seek to form collaborative solutions for non point source pollution into water bodies and other common problems affecting the larger watershed. Individual actions on part of landowners, governments and agencies contribute to the health of the landscape and the accompanying water resources. By acknowledging that we are all part of an ecosystem we can use creative solutions to determine how, as a community, we can create actions that contribute to the well being of our watershed and land base.

**This is a voluntary and a living document; it is intended to only present an introduction to the issues. There still remains a need for further partnerships, outreach, planning and action.**

## Process used to create this document

Through watershed group discussions many issues were brought to the table that contribute directly and indirectly to the health of the watershed, such as education, immigration, economics, politics and technology. The discussions sometimes became a forum for community town hall style dialogue. Over time, we were able to focus our attention on how all of these different elements affect the health of the landscape.

The following were identified as valued features of the watershed:

**Landscapes, acequias, agriculture, ranching, food security, tradition, low density development, open space, wildlife, birds, fish, recreation, spiritual nurturing, clean drinking water, hunting, fishing and rafting.**

The group determined seven distinct, yet highly interrelated, issues to be examined in the management plan.

- **Arroyos/Drainages**
- **Wetland/Riparian Areas**
- **Agriculture/Acequias**
- **Rangeland Management**
- **Illegal Dumping**
- **Mining**
- **Education/Outreach**

All of the issues are connected, yet it is easier to view them individually and examine as each as a module that can fit together to complete a larger picture, to view the watershed as a holistic system and determine how the desired actions can take place.

The main focus of the project was to create a management plan that reflected the concerns and the desires of the community. It has repeatedly emphasized that the plan be developed in a non-technical format, one that is easily understood, one that can actually be utilized by the community through effective partnerships and collaborative solutions.

# Section 2. Watershed Challenges and Recommendations

## *Arroyos/Drainages*

Rio de Truchas when running at Velarde, NM. 2005. J. Johnston.

Arroyo function has been identified as a watershed concern and affects the health, integrity and aesthetics of our watershed.

Recent flooding events had caused excess water, sediments, and garbage to be displaced onto local roads, and into acequias and rivers. These events have caused damage to infrastructure and threaten water quality.

Arroyos are ephemeral surface channels, which mean that they do not flow all year round. They can develop characteristics of perennially flowing streams, such as riparian areas and active floodplain, but are subject to extreme behavior in dry/flood times. In addition, arroyos allow infiltration of stormwater, rain and snowmelt back into the aquifer, when functioning properly

There are many factors that can affect arroyo function. Some of these factors are related to the nature of the landscape such as climate and soil conditions, and some factors are related to the health of the landscape such as, range conditions, roadways, channelization, and development.

## *Objectives*

Our land base and accompanying waterways have been identified as valued features within the watershed. The health and proper function of the land base and the waterways is a priority for the Upper Rio Grande Watershed Community. Projects that address restoration of arroyos to proper functioning condition to mitigate erosion, control sedimentation and provide infiltration of stormwater runoff are reasonable objectives for the watershed community.

## *Challenges*

***Multi Jurisdictional-*** The landscape does not recognize political and private boundaries and, as such, if one landowner corrects a problem it could cause further destruction downstream. The development of partnerships to address the health of the entire landscape during planning is important.

***Climate-*** Natural drought cycles in this arid region can limit the growth of vegetation and grasses that slow water runoff, increase soil permeability, and hold soil in place. Lack of vegetative cover can also greatly increase the potential for flash flooding.

***Range Conditions-*** Poor range conditions contribute to the potential for destructive flash flood events by reducing vegetation and grasses that slow water runoff. Good management practices on grazing allotments can help to improve the health and vitality of the landscape and reduce erosion.

***Roads-*** Road development can contribute to increased runoff. In addition, culverts that have displaced natural drainage systems speed up and divert run off exacerbating the intensity of the flow. Many roads either cross arroyos, or run in conjunction with arroyos in certain places, this can contribute to an increase in erosion, cause destabilization of the arroyo bottom, and destroy riparian vegetation that provides waterway stability.

***Vehicles-*** Undesignated use of off road recreational vehicles such as ATVs can be destructive to vast expanses of sensitive landscape. Many undesignated sites run through arroyos and this can cause problems such as changing the landscape, loss of vegetation, and disturbing soils, which increases erosion.

***Channelization-*** Because arroyos are subject to intense run off, they are also susceptible to becoming like a water chute instead of a meandering watercourse. This creates a similar effect to driving in the arroyos.

***Development-*** Land that is cleared for development reduces vegetation and grasses that slow water runoff and hold soils in place. Development also creates hard and impermeable surfaces such as roofs and paved lots. This speeds up water velocity and decreases potential for infiltration. Development within the arroyo or its flood plain can also cause erosion and channelization.

***Soils-*** Highly erosive soils, such as those found in the Upper Rio Grande Valley, are more susceptible to erosion and therefore will load sediments into arroyos, acequias and streams.

Arroyo as it enters Rio Grande at Alcalde, NM. 2007. J. Johnston.

## *Recommendations*

Encourage people to build outside of the arroyo and/ or the floodplain; this can be implemented through a zoning ordinance.

Upgrade development ordinances to reduce impervious surfaces, possibly implement water collection systems onsite i.e. rain catchments systems and mandatory drainage plans for building on slopes.

Possibly use land conservation tools to designate an arroyo as an open space or public domain/public infrastructure.

Examine how infrastructure is affecting the system- when possible roadways should be designed to accommodate the channels, or avoid the channel i.e. bridges.

Encourage projects on uplands that mitigate unnecessary erosion- range improvements, restricted ORV use and close or upgrade severely degraded roads.

Use established BMP's that reduce stormwater and associated pollution.

Best Management Practices (BMP**):** Conservation practices or management measures, which control soil loss and reduce water quality degradation caused by nutrients, animal wastes, toxins, sediment, and runoff.

Examine possible use of traditional methods on smaller arroyos that drain into acequias, such as one-rock dams and terracing methods.

Investigate how large-scale sediment dams that are found throughout the area have functioned to see if they would be effective in the current day.

Direct federal funding from emergency measures to prevention strategies.

US Army Corp of Engineers, and the Pueblos of Ohkay Ohwingeh, Santa Clara and San Ildefonso have partnered on a project to assess the feasibility of restoring functioning conditions to the Rio Grande Corridor, south of the planning boundaries. The watershed group hosted an informational session with Ronald Kneebone from the USACE to determine if the project could possibly be extended to cover this watershed. It seems like they may have the technical and fiscal resources to take on a project of this magnitude. The group presented the proposition to Rio Arriba County for support. Rio Arriba County has to make a formal request to the USACE. This project would require a substantial contribution of money and resources in the form of a cost share from the county to implement.

Arroyos are probably one of the most complicated issues the community has to deal with because of the multitudes of individuals and agencies that are involved with the uses along just one drainage. It is clear that a task force will have to be developed that can truly asses and determine a proper solution.

Suggested participants for task force would include, representatives from Rio Arriba County, Watershed Group, local Acequia Associations impacted by the drainages, Department of Transportation, Bureau of Land Management, NRCS and FEMA.

## *Potential Funding Sources*

New Mexico Environment Department

- CWA 319
- River Ecosystem Restoration Initiative

New Mexico Water Trust Board

Capital Infrastructure Improvement Planning

Federal Emergency Management Agency

- Emergency resources including acequia restoration from arroyo flood damage.

- 406 FEMA Funds, Limited mitigation, generally localized – aimed at preventing damage to a specific site.
- 404 FEMA Funds, Mitigation, limited discretionary funds based on percentage of 406 funding to specific programs. Primarily to be targeted to mitigation point and non-point source watershed issues.

US Army Corp of Engineers

- Section 206 Aquatic Stream Restoration
- Section 1135 Project Modifications To Improve The Environment
- Section 14 Emergency Streambank And Shoreline Protection
- Section 205 Small Flood Damage Reduction Projects
- Challenge 21 Flood Hazard Mitigation and Riverine Ecosystem Restoration Project

## *Wetlands and Riparian Areas*

Wetlands along the Rio Grande at Alcalde, NM. 2006. J. Johnston.

Wetland and Riparian areas have been identified as valued features within the watershed. The health of these areas has a direct impact on water quality, water quantity, and the overall well being of the watershed communities. Degraded wetland and riparian conditions have been identified as a watershed concern and affect the health, integrity and aesthetics of our watershed communities.

Riparian areas occupy less than 1% of the New Mexico landscape, but provide the most biodiversity of plant, wildlife, and macroinvertebrae species. Riparian areas serve important ecological functions within the watershed including stream bank stabilization, flood control, ground water (aquifer) recharge, wildlife habitat, spiritual nurture, and recreational opportunities.

Wetlands are areas that support plant life that thrives in saturated soils either ephemerally or perennially. Wetlands serve important functions within the watershed that include wildlife habitat for all or part of the year, water filtration, nutrient processing, water storage, aquifer/groundwater recharge, flood control, stream bank stabilization, plant buffers, spiritual nurture, and small scale atmospheric maintenance.

Extensive human interference has altered the conditions of wetland and riparian areas in the watershed. Activities such as river channelization, development in the floodplains, loss of native vegetation and introduction of invasive plant and tree species have changed the functions of these areas

Current conditions of many of the watershed's wetland and riparian areas present a fire hazard and do not allow for the natural function of the landscape to operate at full capacity.

## *Objectives*

Our land base and accompanying waterways have been identified as valued features within the watershed. The health and proper function of the land base and the waterways is a priority for the Upper Rio Grande Watershed Community. Projects that address restoration, enhancement, protection, and creation of wetland and riparian zones, and a plan for long-term maintenance of these areas are reasonable objectives for the watershed community.

## *Challenges*

***Multi Jurisdictional-*** The landscape does not recognize political and private boundaries and, as such, neighboring properties directly impact other landowner's property. The development of partnerships to address the health of the entire landscape during planning is important

***River Channel Alteration-*** Alteration of the original river channel has caused severe degradation of the streambanks, unhealthy distribution of the water's energy flow, and loss of riparian vegetation. Extensive study of the river channel needs to be done in order to determine the possibility of any restoration of the original channel.

***Development-*** Many homes and businesses have been built in the original river channel and accompanying floodplains. This severely limits restoration possibilities.

***Invasive Species-*** The introduction of invasive species, many as a means of erosion control, has severely degraded the function of wetland and riparian areas. Invasive species alter the makeup of the soils, increase the risk of wildfire, choke native species, provide poor habitat, and are difficult to remove or control effectively.

## *Current Efforts*

***Northern New Mexico College (NNMC)*** - The Upper Rio Grande Watershed Group has formed a partnership with Northern New Mexico College to include Environmental Science Students in restoration projects. In the spring of 2006, students participated for 16 weeks in understanding and identifying the functions and values of local wetlands and participated in the NMED sponsored Wetlands Restoration Project, at Cottonwood Ranch in Alcalde, New Mexico. In the fall, of 2006, students participated in a Wetland and Riparian Restoration Project sponsored by the State Lands Office, at Rio Ojo Sarco in Cañoncito, New Mexico.

***New Mexico Environment Department (NMED)*** - NMED has received funding to create a Wetlands Action Plan within the watershed, along with completing two demonstration restoration sites. Two large-scale wetland restoration projects are currently being undertaken in the watershed.

***State Land Office (SLO)*** - State Lands Office has funded a wetlands and riparian restoration project on leased lands on the Rio Ojo Sarco. This work began in the autumn of 2006, with the watershed group and NNMC participating.

***Various Private Landowners***- There have been various restoration projects that have been completed or are ongoing on private lands, funded by the US Partners for Fish and Wildlife

***Ohkay Ohwingeh and Santa Clara Pueblos***- Both Ohkay Ohwingeh and Santa Clara Pueblos have wetland and riparian restoration projects that are ongoing.

***Bureau of Land Management (BLM)*** – BLM is currently conducting a riparian restoration project at Orilla Verde Recreation Area. This project ends at the north boundary of our planning area, but is important for two reasons: 1) invasive species and their seed source are being eradicated upstream 2) serves as a pilot project to continue the work on BLM lands further down stream. Many of the riparian corridors within the Upper Rio Grande Watershed including Rio Arriba County line south to Velarde and much of the Rio Embudo are under the jurisdiction of the BLM.

## *Recommendations*

Protect remaining wetland areas

Restore under functioning wetland areas

Recreate Wetland/riparian area that have been lost

Initiate and plan for river corridor invasive species removal; salt cedar, tamarisk

Land use ordinances such as wetlands ordinance/floodplain ordinance /stream buffer/acequia ordinance

Implement the use of land conservation tools that have been identified in other watersheds that could be used to protect valuable bosque lands, such as Acquisition, Purchase or Transfer of Development Rights and Conservation Easements.

*Acquisition*- Land acquisition would be the outright acquisition of title to selected lands by a municipality, land trust or other non-profit organization. This is an expensive way to protect lands, but guarantees long-term protection from development.

*Purchase or Transfer of Development Rights (TDR's)* - This land use management technique transfers development potential from environmentally sensitive areas such as riparian areas to specific areas designated for growth. TDR's are based on a market-driven, incentive program where it is possible to sell development potential (zoned density) without buying or selling land. Landowners in preservation areas are compensated for lost development potential whereas conventional rezoning deprives landowners of this potential value

*Conservation Easements* - Conservation easements are conveyances of development rights from a property's landowner to a municipality, land trust or other non-profit organization. The easement may be purchased or donated and typically allows the seller a tax benefit. The landowner still retains use, occupancy and ownership of the land itself, but is limited in the ability to develop the land for the term of the easement (may be permanent or may expire after a specified number of years). The terms of the easement may also dictate what types of activities are allowable on the land, and the easement is transferable with the land if sold.

Investigate the possibility of USACE establishing a wetlands mitigation bank within the Upper Rio Grande Corridor.

Investigate the possibility of USACE participation in producing a feasibility study to recreate river floodplain connection.

## *Possible Funding Sources*

New Mexico Game and Fish- Habitat Stamp

East Rio Arriba Soil and Water Conservation District – State funding to remove invasive species on private lands.

NMED-

- CWA 319
- Wetlands Program
- River Ecosystem Restoration Initiative

US Fish and Wildlife Service- Partners For Fish and Wildlife

USDA - Farm Service Agency

USDA- CFRP

USDA-NRCS Cost Share Programs

US Army Corp of Engineers

- Section 206 Aquatic Stream Restoration
- Section 1135 Project Modifications To Improve The Environment

- Section 14 Emergency Streambank And Shoreline Protection
- Section 205 Small Flood Damage Reduction Projects
- Challenge 21 Flood Hazard Mitigation and Riverine Ecosystem Restoration Project

## *Agriculture/Acequias*

Agricultural lands irrigated by the acequia at Los Luceros. 2005. J. Johnston.

The agricultural base and accompanying acequias have been identified as a valuable resource that is threatened within the Rio Grande Watershed between Velarde and Ohkay Owingeh. Irrigated agriculture has been part of the cultural landscape in Española Valley for hundreds if not thousands of years. Prior to the arrival of Juan de Oñate and the settlers that came with him under the Spanish Crown, Ohkay Owingeh people had used the watershed for irrigated agriculture, foraging for edible plants, fruits, and medicinal herbs as well as hunting. With the arrival of Oñate and his settlers in 1598, the Española Valley was introduced to another form of agriculture, a more intensive agriculture based on the acequia system and small kitchen gardens.

At present there are 9 major *acequias madres* in this part of the Rio Grande corridor. They have organized themselves as *Las Nueve Acequias*, and they irrigate land on both sides of the Rio Grande. Each acequia is autonomous, managed by a three-member commission and a mayordomo, who is in charge of managing the water on a daily basis. Each acequia elects its own commission and mayordomo who serves for two years and can be re-elected for as many terms as the community desires.

Though more land is producing food in the corridor than in the Lower and Upper Embudo, it doesn't compare with what was growing fifty years ago. Velarde is still a big producer of orchard crops and there are some farms producing substantial market produce which is sold in the local farmers markets. Ohkay Owingeh has some of the most fertile lands on both sides of the river, but only a minuscule amount is under cultivation.

## *Objectives*

Our land base and accompanying waterways have been identified as valued features within the watershed. The health and proper function of the land base and the waterways is a priority for the Rio Grande Corridor Watershed Community. Projects that protect the agricultural lands and traditions and the accompanying acequias from abandonment or degradation are reasonable objectives for the watershed community.

## *Challenges*

***Degrading Infrastructure Systems*** – Acequias have historically been maintained as a worker-owned coop, where the owners of the irrigated land, called *suertes*, cleaned the acequias annually during the spring and did any repairs as needed during the irrigation season, from April to October. As people's attention has been diverted to activities outside of the watershed such as outside employment, the acequias have suffered.

***Loss of Parciantes*** – A *parciante* is a landowner who has water rights within a certain acequia. Possibly one of the biggest drawbacks in maintaining the system is *parciante* availability and age. Most of the *parciantes* are already in their 50s, 60s and 70s, and whereas in the past there was the extended family to count on, now the families are smaller, and many younger people have moved away, meaning there are less workers available to do the work, and many of the new property owners have no interest in agriculture.

***Invasive Species*** –The Rio Grande on both sides of river between Velarde and Española have been taken over by Russian Olive and Salt Cedar. Also, because, certain lands are not worked or maintained, the agricultural lands are rapidly disappearing as they are been taken over by invasive species. Those that do farm have a growing problem on their hands, since every time they water their fields, the seeds of these invasive species and noxious weeds spread.

***Development*** – Population growth is another threat to the agricultural land, as both the native people and the new land owners are building new houses or putting new mobile homes on agricultural lands. People are now building on flood plains, in the middle of arroyos, a few feet from the river, without any regard to the landscape. Velarde and Alcalde are prime examples of where the agricultural land has been taken over by housing developments, thus destroying the best lands and taking them out of production and in the long run water rights can be lost.

***Taxes, Land Values and Economic Returns***– In the past 40 years land values have risen dramatically, mostly due to the building boom and also because of land speculators that have driven the price of land to astronomical prices. Agricultural land in the Española Valley is now selling upwards of $65,000 an acre and around Española for as much as $100,000 per acre. Thus as a piece of land changes hands, the property values go up and

so do the taxes, forcing traditional people to sell because they cannot keep up with the tax increases. Current agricultural land prices are prohibitive to anyone who would like to be an agricultural producer.

***Water Commodification /Protecting Historical Water Rights*** – As the competition for water resources has intensified by new growth and urban demands, water markets have developed. With the price of a water right at an all time high, water is subject to become a commodity that can be sold to the highest bidder, instead of a community resource. Some people view acequias and their associated water rights that are used for agriculture as a low value use for water.

## *Recommendations*

Support local agriculture. If the agricultural lands and the acequias are to continue to be used for the production of food, the communities have to be more involved in supporting the acequias and the local growers. Growers also need to make the food they grow more affordable. Growers and consumers both have to support each other and treat each other as co-growers, for that is the only way to grow the community.

*Parciantes* have to become more proactive and participate by attending annual acequia meetings and also supporting their elected commissioners and mayordomo. They also have to become better educated as to their role within the acequia community and the larger community and to put their water rights to beneficial use so the community won't lose their water rights. *Parciantes* have to become more conscious of their role as owners of agricultural land and water rights.

Create an acequia needs assessment for each acequia to determine improvements that may be necessary.

Create a strong organizational structure for each acequia including by- law development, water banking system and compliance with the open meetings act, to protect water rights, assistance can be provided by the New Mexico Acequia Association or the Rio Arriba Acequia Liaison.

Implement the use of land conservation tools that have been identified in other watersheds that could be used to protect valuable agricultural lands.

*Acquisition*- Land acquisition would be the outright acquisition of title to selected lands by a municipality, land trust or other non-profit organization. This is an expensive way to protect lands, but guarantees long-term protection from development.

*Purchase or Transfer of Development Rights (TDR's)* - This land use management technique transfers development potential from environmentally sensitive areas such as riparian areas to specific areas designated for growth. TDR's are based on a market-

driven, incentive program where it is possible to sell development potential (zoned density) without buying or selling land. Landowners in preservation areas are compensated for lost development potential whereas conventional rezoning deprives landowners of this potential value

*Conservation Easements* - Conservation easements are conveyances of development rights from a property's landowner to a municipality, land trust or other non-profit organization. The easement may be purchased or donated and typically allows the seller a tax benefit. The landowner still retains use, occupancy and ownership of the land itself, but is limited in the ability to develop the land for the term of the easement (may be permanent or may expire after a specified number of years). The terms of the easement may also dictate what types of activities are allowable on the land, and the easement is transferable with the land if sold.

## *Potential Funding Sources*

Interstate Stream Commission – Technical Assistance and low interest loans.

Army Corp of Engineers – Loans on projects over $250,000.

USDA NRCS – Mostly technical assistance, especially in planning water systems but they also offer help to individual property owners.

Infrastructure Capital Improvement Plan

## *Range Management*

Example of gully erosion from a road, BLM lands, Alcalde, NM. 2007. J. Johnston.

Grazing is a major land use activity within the watershed area on the BLM lands that parallel the Rio Grande Corridor. Improving range management conditions can improve vegetative cover and water adsorption into soils thereby reducing sheet, rill and gully erosion, this can lead to a reduction of erosion and sediment into the Rio Grande.

There are four large allotments on BLM lands to the East of the Rio Grande; Cuarteles, Arroyo Del Palacio, Sebastian Martin Grant and Cañada Ancha. The US Forest Service has one large allotment, TCLP, to the West of the Rio Grande.

***Objectives-*** Improve range conditions by increasing vegetative cover, reducing erosion and improve animal production.

### *Challenges*

Unrestricted access to the land

Excessive Off Road Vehicle (ORV) use is damaging vegetative cover

Illegal Dumping

Many of the roads in the area are badly deteriorated and contributing to major erosion problems.

### *Recommendations*

Complete Travel Management Plan for the BLM lands in question, many roads are unnecessary or could be upgraded.

Restrict access to permitees or those who would like to enjoy the area by foot or horseback. It was suggested that the ballpark area could be used as a parking area.

Adopt an Area- many local people who visit the area for recreation have suggested an adoption of this area for clean up, maintenance and potential for service learning projects in conjunction with the local elementary school.

Assist the permitees in applying for funds to install best management practices or range improvement, such as pasture fencing, brush removal (cholla, one seeded juniper, sage, prickly pear), seeding (range plantings) and additional stock tanks (water distribution systems).

Identify appropriate Best Management Practices for erosion control that can be used to improve range conditions such as contour terracing, sediment dams and road improvements.

Contour Terracing on BLM lands, Alcalde, NM. 2007. J. Johnston.

## *Current Efforts*

**TCLP Allotment** -The TCLP livestock grazing allotment is located on the Tres Piedras Ranger District and within the Carson National Forest, New Mexico.

This allotment lies within two watershed groups: the Rio Chama Watershed Group and the Upper Rio Grande Watershed Group.

The grazing permitees of this allotment have been pro-active in seeking financial assistance; with the goals of improving their existing planned grazing system.

They met with the Tres Piedras Ranger District, Natural Resources Conservation Service (NRCS), the New Mexico Environment Department (NMED) and the Northern Rio Grande Resource Conservation and Development Council, Inc. (NRG-RC&D). The

purpose of their meeting was to explore funding opportunities for rangeland practices on federal lands.

The NRCS manages the Federal Environmental Quality Incentives Program (EQIP), which was approved for this allotment. This is a federal cost-share program of 60-40, with 40% being match or in-kind and/or both.

The NMED manages the 319 Grant Program, which was also approved for this allotment. This is a state cost-share program of 60-40, with 40% being cash match or in-kind and/or both.

The Tres Piedras Ranger District is responsible for the NEPA process to be followed. The will secure all the NEPA requirements and clearances, and will over see the project.

The Northern Rio Grande RC&D Council, Inc., will be the fiscal agent for the 319 Grant and will be the facilitator for all the agencies and groups involved.

## *Potential Funding Sources*

Bureau of Land Management - Range Betterment Program

Carson National Forest – Range Betterment Program

EPA Clean Water Act 319- On the Ground Projects For Non Point Source Pollution

East Rio Arriba Soil and Water Conservation District

Natural Resources Conservation Service- EQIP Funds

New Mexico Game and Fish- Habitat Stamp Program

Rocky Mountain Elk Foundation

## *Illegal Dumping*

Illegal dumpsite in Alcalde, BLM lands, 2006. J. Johnston.

Illegal dumping in the watershed has been identified as a watershed concern and stands in the way of positive change on the part of the community and environment that we live in by affecting the health, integrity and aesthetics of our watershed communities.

The garbage that has been illegally dumped poses a water quality concern by being washed directly into the waterways. Water quality can also be compromised by contaminant seepage into the underground aquifers and streams that connect to local waterways.

Because of the topography of the local environment, many of the dumpsites are in arroyos, which are the natural drainage systems of the area. Arroyo runoff during heavy rains causes trash to wash down onto roads, fields, and eventually into acequias and surface water bodies.

Local illegal dumpsites are a mixed bag; some contain household waste, appliances, building materials, mattresses, tires and dead animals. In some instances, the garbage is from many generations past such as old cars, in others the dumping appears to be more recent. Many of the dumpsites are currently located on Bureau of Land Management lands.

## *Objectives*

Our land base and accompanying waterways have been identified as valued features within the watershed. The health and proper function of the land base and the waterways

is a priority for the Upper Rio Grande Watershed Community. Initial clean up of public lands and private lands, annual community clean up days of areas targeted by our watershed groups, and a plan for long term maintenance of areas are reasonable objectives for the watershed community.

## *Challenges*

***Breaking a habit that has been carried on for generations-*** Historically, community dumps were common in the Upper Rio Grande area. Trash collection services were not provided until more modern times. Unfortunately, the tradition has continued in some areas of the watershed, as it has been more convenient to dump in an inconspicuous area, than travel sometimes very long distances to landfills.

***Convenience-*** Convenience and transfer stations need to be easily accessible, controlled, and well known. Trash services must be convenient and remain affordable, operating when the community needs access, such as weekend hours.

***Education-*** Everyone in the community needs to be aware of the services offered by the NCSWA, hours of operation, and the items that are accepted at the transfer stations.

Alcalde Illegal Dump Site BLM Lands, 2007. J. Johnston.

## *Current Efforts*

The watershed group is currently planning a Public Lands clean up day in conjunction with the BLM.

## *Recommendations*

Transform the Alcalde transfer station into a convenience station for simplicity and cleanliness.

Work to improve curbside service as has already been set forth.

Encourage recycling/ bring curbside recycling containers to each community.

Organize an annual community clean up day.

Restrict vehicular access to BLM lands to prevent further dumping.

Monitor BLM lands for illegal dumpers.

Design signs prohibiting illegal dumping and place them in the most prominent areas.

Create an educational program for the community focused on illegal dumping.

## *Potential Funding Sources*

Public Lands

Keep New Mexico Beautiful

## *Mining*

Open Pit Gravel Mining Site at Velarde, NM. J. Gilbert. 2007.

Mining is occurring at several sites within the watershed area. There is a concern within the watershed community that proper precautions are not taking place at these operations to limit effects to water quality of the Rio Grande. In addition these mining sites affect the health, integrity and aesthetics of our watershed communities. The mining operations create dust, excessive noise and diesel emissions.

### *Objectives*

Our land base and accompanying waterways have been identified as valued features within the watershed. The health and proper function of the land base and the waterways is a priority for the Upper Rio Grande Watershed Community. Projects that address restoration of mining sites are reasonable objectives for the watershed community.

### *Challenges*

***Multi Jurisdictional-*** The landscape does not recognize political and private boundaries and, as such, neighboring properties directly impact other landowner's property. The development of partnerships to address the health of the entire landscape during planning is important.

## *Current Efforts*

Vecinos Del Rio is looking at designating the community as a "Traditional Community", this is a legal entity may influence the activities that can happen within the community.

## *Recommendations*

Enforce the Rio Arriba Sand and Gravel Mining Ordinance to ensure that proper precaution to the health and safety of the community and the environment are taking place in operational sites.

Remediation for previous mine sites to ensure safety and stormwater runoff controls.

## *Education and Outreach*

NNMC students participating in restoration project at Alcalde. 2006. J. Johnston.

Education and outreach has been identified as a watershed concern for they are the principal means that we possess to impart our knowledge, training, and visions of the watershed to others.

The health of the watershed is increasingly dependent upon the stewardship of human beings. Unquestionably, the future well being of the watershed will be a function of human ability to understand and to intelligently support and interface with the complex interrelationships that are ever-present and ever changing in the watershed. Major keys to accomplishing this are:

- Education – the ability to gather and to impart information, foster inquiry and to stimulate productive attitudes and actions with regard to watershed status and watershed management.
- Outreach – education leads to sharing. Sharing is realized by interacting with others. Our tools are communication, organization, information, linking, and most importantly, the spirit of good will**.**

## *Objectives*

Our land base and accompanying waterways have been identified as valued features within the watershed. The health and proper function of the land base and the waterways is a priority for the Upper Rio Grande Watershed Community. Projects that stimulate

educational opportunities and outreach to the larger watershed community are reasonable objectives for the watershed community.

## *Challenges*

Communication and organization are essential to create any activities that can help the watershed.

There is currently not an organization to handle the responsibilities of the watershed groups to provide technical and organizational assistance, gather information or provide fiscal support for projects.

Communication networks are fragmented. Various mechanisms exists for communicating within the watershed, some are comfortable with computers and others don't own computers, there is a need for streamlining communication mechanisms so that everyone has access to the same information.

Awareness of the watershed issues presents information that can be somewhat complicated.

Learning a new vocabulary.

Encouraging responsibility within the watershed community includes empowerment of the community.

Educating a new generation of land stewards, this should include a coordination of new technologies and traditional methods of land stewardship

## *Recommendations*

Watershed/environmental programs in schools K-12

Service learning projects at the elementary, high school and college level.

Continued partnerships with Northern New Mexico College and Environmental Science curriculum/ Environmental Student Organization

Continue to provide workshops/educational programs that can lead to dialogue and positive action on the part of the communities

Continue engagement of stakeholders

Develop useful communication networks that are accessible to everyone in the community

Continued evolution of group structure

Promote grassroots planning and decision making/ avoiding a top down approach

Develop/ maintain partnerships with local governments/agencies and other groups actively involved in similar projects.

Development of the institute/other organization
Obtain space and resources
Obtain 501c3
Development of clearing house to keep track of project, needs, funding and information
Develop a database

Comprehensive inventory- In order to properly evaluate the entire watershed, and best determine the restoration and protection needs of the watershed, an inventory of all watershed resources should be created. Current and previous projects could be identified using GIS technology.

Monitoring program to identify successes -As part of long-term success it is important to identify which restoration methods have been successful in the area. It is important to monitor goals to make sure overall project objectives are being met such as water quality, aquifer recharge, acres of wetlands restored, and wildlife populations.

## *Possible Funding Sources*

Mc Cune Foundation

Sierra Club

Santa Fe Foundation

## Implementation Schedule

| Objectives | Recommendations | Potential Partners |
|---|---|---|
| Restore arroyos to proper functioning condition | Form an arroyo management task force | Rio Arriba County, local Acequia Associations, Department of Transportation, Bureau of Land Management, NRCS and FEMA |
| Restore arroyos to proper functioning condition | Investigate previous use of large sediment dams | Watershed Group, BLM, Upper Rio Grande Water Control Group |
| Restore arroyos to proper functioning condition | Encourage projects on uplands that mitigate unnecessary erosion-range improvements, restricted ORV use and close or upgrade severely degraded roads | BLM, Watershed Group, Permitees, Recreationalists |
| Restore arroyos to proper functioning condition | Evaluate the possibility of extending USACE Rio Grande Corridor Project | Rio Arriba County, Watershed Group, USACE |
| Restore arroyos to proper functioning condition | Land Development ordinances such as floodplain, reduced impervious surfaces | Rio Arriba County, Watershed Group |
| Restore arroyos to proper functioning condition | Possibly use land conservation tools to designate an arroyo as an open space or public domain/public infrastructure. | Rio Arriba County, Watershed Group, Taos Land Trust |
| Restore, protect wetland and riparian resources | Evaluate the possibility of extending USACE Rio Grande Corridor Project | Rio Arriba County, Watershed Group, USACE |
| Restore, protect wetland and riparian resources | Land use ordinances such as wetlands ordinance/floodplain ordinance /stream buffer/acequia ordinance | Rio Arriba County, Watershed Group |
| Restore, protect wetland and riparian resources | USACE establish a wetlands mitigation bank within the Upper Rio Grande Corridor | USACE, Watershed Group |
| Restore, protect wetland and riparian resources | Land conservation tools: Acquisition Purchase or transfer of | Rio Arriba County, Watershed Group, Taos Land Trust |

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|---|---|---|
| | development rights<br>Conservation easements | |
| Restore, protect wetland and riparian resources | River corridor invasive species removal; salt cedar, tamarisk | East Rio Arriba<br>Soil and Water Conservation District, Watershed Group, private landowners, NMED, USFWS, BLM, NRCS |
| Restore, protect wetland and riparian resources | Recreate wetland/riparian areas that have been lost | NMED, USFWS, Watershed Group, private landowners, BLM, NRCS |
| Protect the remaining agricultural lands and traditions | Support community agriculture | Community, Farmers, Watershed Group |
| Protect the remaining agricultural lands and traditions | Agricultural lands ordinance | Rio Arriba County, Watershed Group |
| Protect the remaining agricultural lands and traditions | Land conservation tools:<br>Acquisition<br>Purchase or transfer of development rights<br>Conservation easements | Rio Arriba County, Watershed Group, Taos Land Trust |
| Protect the remaining agricultural lands and traditions | River corridor invasive species removal; salt cedar, tamarisk | East Rio Arriba<br>Soil and Water Conservation District, Watershed Group, private landowners, BLM, NRCS |
| Protect the remaining agricultural lands and traditions | Create an acequia needs assessment for each acequia to determine improvements needed. | Rio Arriba County, Watershed Group, NMAA, Individual acequias |
| Protect the remaining agricultural lands and traditions | Create strong organizational structure for each acequia including by law development, water banking system and compliance with the open meetings act. | NMAA, Individual acequias, Watershed Group, Rio Arriba County |
| Improve range conditions | Complete Travel Management Plan | BLM, Watershed Group, Permitees, Recreationalists |
| Improve range conditions | Best Management Practices on Rangelands such as sediment dams and contour terracing | BLM, Watershed Group, Permitees, NRCS |
| Improve range | Range Improvements | BLM, Watershed Group, Permitees, NRCS |

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| conditions | such as fencing, brush removal, seeding and additional stock tanks | |
| Improve range conditions | Adopt a BLM Area Plan | BLM, Watershed Group, Permitees |
| Clean up/prevent illegal dumping | Create an educational program for the community focused on illegal dumping | Local schools, Watershed Groups, BLM |
| Clean up/prevent illegal dumping | Design signs prohibiting illegal dumping and place them in the most prominent areas | Local schools, Watershed Groups, BLM |
| Clean up/prevent illegal dumping | Organize an annual community clean up day | Local schools, Watershed Groups, BLM |
| Clean up/prevent illegal dumping | Restrict vehicular access to BLM lands to prevent further dumping | Watershed Groups, BLM |
| Clean up/prevent illegal dumping | Monitor BLM lands for illegal dumpers | Watershed Groups, BLM, Permitees, Recreationalists |
| Clean up/prevent illegal dumping | Adopt a BLM Area Plan | BLM, Watershed Group, Permitees, Recreationalists |
| Clean up/prevent illegal dumping | Work to improve curbside service as has already been set forth | Watershed Groups, North Central Solid Waste Authority |
| Clean up/prevent illegal dumping | Encourage recycling/ bring curbside recycling containers to each community | Watershed Groups, North Central Solid Waste Authority |
| Education/Outreach | Watershed/environmental programs in schools K-12 | Watershed Group/Local School Districts |
| Education/Outreach | Service learning projects at the elementary, high school and college level | Watershed Group/Local School Districts |
| Education/Outreach | Continue to provide workshops/educational programs that can lead to dialogue and positive action on the part of the communities | Watershed Group |
| Education/Outreach | Continue engagement of stakeholders | Watershed Group |
| Education/Outreach | Develop useful communication networks that accessible to everyone in the | Watershed Group |

| | | |
|---|---|---|
| | community | |
| Education/Outreach | Continued evolution of group structure | Watershed Group |
| Education/Outreach | Promote grassroots planning and decision making/ avoiding a top down approach | Watershed Group |
| Education/Outreach | Develop/ maintain partnerships with local governments/agencies and other groups actively involved in similar projects. | Watershed Group |
| Education/Outreach | Development of the institute/other organization<br>Obtain space and resources<br>Obtain 501c3 | Watershed Group |
| Education/Outreach | Development of clearing house to keep track of project, needs, funding and information<br>Develop a database | Watershed Group |
| Education/Outreach | Comprehensive inventory | Watershed Group |
| Education/Outreach | Monitoring program to identify successes | Watershed Group |

# Appendix A. Clean Water Act Regulation

Adapted From EPA Clean Water Act Module


The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. (The Act does not deal directly with ground water nor with water quantity issues.) The statute employs a variety of regulatory and nonregulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

## Brief Overview of Key CWA Elements

First, water quality standards (WQS) consistent with the statutory goals of the CWA must be established. Then waterbodies are monitored to determine whether the WQS are met.

The designated uses (DUs) of a waterbody are those uses that society, through various units of government, determines should be attained in the waterbody. The DUs are the goals set for the waterbody. In some cases, these uses have already been attained, but sometimes conditions in a waterbody do not support all the DUs.

Water quality criteria (WQC) are descriptions of the conditions in a waterbody necessary to support the DUs. These can be expressed as concentrations of pollutants, temperature, pH, turbidity units, toxicity units, or other quantitative measures. WQC can also be narrative statements such as "no toxic chemicals in toxic amounts."

WQC can be divided up for descriptive purposes in many ways. For instance, numeric criteria (weekly average of 5 mg/L dissolved oxygen) can be contrasted with narrative criteria (no putrescent bottom deposits). Criteria can also be categorized according to what portion of the aquatic system they can be applied to: the water itself (water column), the bottom sediments, or the bodies of aquatic organisms (fish tissue). The duration of time to which they apply is another way of dividing WQC, with those dealing with short-term exposures (acute) being distinguished from those addressing long-term exposure (chronic).

If all WQS are met, then antidegradation policies and programs are employed to keep the water quality at acceptable levels. Ambient monitoring is also needed to ensure that this is the case.

EPA publishes recommended water quality criteria corresponding to a number of key designated uses. For aquatic life uses, criteria for both short-term (acute) and long-term (chronic) exposures are provided. Different criteria for freshwater systems and marine (saline) systems are often provided. Most human health criteria, except certain pathogens, address chronic exposures.

States, tribes, and territories are not required to adopt the exact numbers that EPA has published, but once EPA has issued a criterion for a parameter, they must adopt a corresponding criterion. Such criteria must provide the same level of protection as EPA's, and state/tribe must document that this is the case.

Unfortunately, most states do not have the funding required to carry out ambient monitoring on the scale needed to keep close track of the condition of our nation's surface waters. Most of the waters in the United States are not monitored several times a year or even once over a period of several years. A high degree of uncertainty, therefore, is associated with what can be said about the condition of most rivers, lakes, bays, and other surface waters.

In order to be virtually certain that WQS are being met, instruments capable of performing continuous monitoring and analysis would need to be employed. Unfortunately, this is rarely the case, particularly for certain types of pollutants like synthetic organic chemicals. Consequently agencies are usually able to make only statistical inferences -- often at high levels of uncertainty -- as to whether a waterbody is actually meeting WQS."

States, tribes, and territories are required to provide the results of their monitoring efforts in the form of two reports, submitted to EPA and made available to the public. These reports are generally submitted on April 1 of every even-numbered year (i.e., biennially).

The first report is the "305(b) Report," after the requiring section of the CWA. It should include all that which the state, tribe, or territory knows about all its waters -- healthy, threatened, and impaired.

The second is the "303(d) List" and should include only those waters that are either threatened or impaired. (Waters attaining WQS should not be on the list).

Starting in 2002, EPA is asking states, tribes, and territories to submit the information previously contained in separate 305(b) and 303(d) reports in one consolidated format. Under this new approach, all waters would be placed in one of five categories. These categories are defined by the amount of information available regarding a waterbody and the condition of the waterbody

If monitoring and assessment indicate that a waterbody or segment is impaired by one or more pollutants, and it is therefore placed on the 303(d) list, then the relevant entity (state, territory, or authorized tribe) is required to develop a strategy that would lead to attainment of WQS

If the waterbody is not meeting WQS, a strategy for meeting these standards must be developed. The most common type of strategy is the development of a Total Maximum Daily Load (TMDL). TMDLs determine what level of pollutant load would be consistent with meeting WQS. TMDLs also allocate acceptable loads among sources of the relevant pollutants.

TMDLs are required for "pollutants," but not for all forms of "pollution." Pollutants include clean sediments, nutrients (nitrogen and phosphorus), pathogens, acids/bases, heat, metals, cyanide, and synthetic organic chemicals. As noted previously, pollution includes all pollutants but also includes flow alterations and physical habitat modifications.

At least one TMDL must be done for every waterbody or segment impaired by one or more pollutants. TMDLs are done pollutant by pollutant, although if a waterbody or segment were impaired by two or more pollutants, the TMDLs for each pollutant could be done simultaneously.

EPA is encouraging states, tribes, and territories to do TMDLs on a "watershed basis" (e.g., to "bundle" TMDLs together) in order to realize program efficiencies and foster more holistic analysis. Ideally, TMDLs would be incorporated into comprehensive watershed strategies. Such strategies would address protection of high quality waters (antidegradation) as well as restoration of impaired segments (TMDLs). They would also address the full array of activities affecting the waterbody. Finally, such strategies would be the product of collaborative efforts between a wide variety of stakeholders

The first element of a TMDL is "the allowable load," also referred to as the pollutant "cap." It is basically a budget for a particular pollutant in a particular body of water, or an expression of the "carrying capacity." This is the loading rate that would be consistent

with meeting the WQC for the pollutant in question. The cap is usually derived through use of mathematical models, probably computer based.

The CWA requires that all TMDLs include a safety factor as an extra measure of environmental protection, taking into account uncertainties associated with estimating the acceptable cap or load. This is referred to as the margin of safety (MOS).

Once the cap has been set (with the MOS factored in), the next step is to allocate that total pollutant load among various sources of the pollutant for which the TMDL has been done. Although ideally, load allocations should be assigned to individual nonpoint sources, this is often not practical or even scientifically feasible; hence, loads can be assigned to categories of nonpoint sources (all soybean fields in the watershed, for example), or to geographic groupings of nonpoint sources (all in a particular subwatershed).

Even though the CWA provides no federal authority for requiring nonpoint sources to reduce their loadings of pollutants to the nation's waters, the Act does require states (and authorized territories and tribes) to develop TMDLs for waters where nonpoint sources are significant sources of pollutants. TMDLs do not create any new federal regulatory authority over any type of sources. Rather, with regard to nonpoint sources, TMDLs are simply a source of information that, for a given waterbody, should answer such questions as the following:

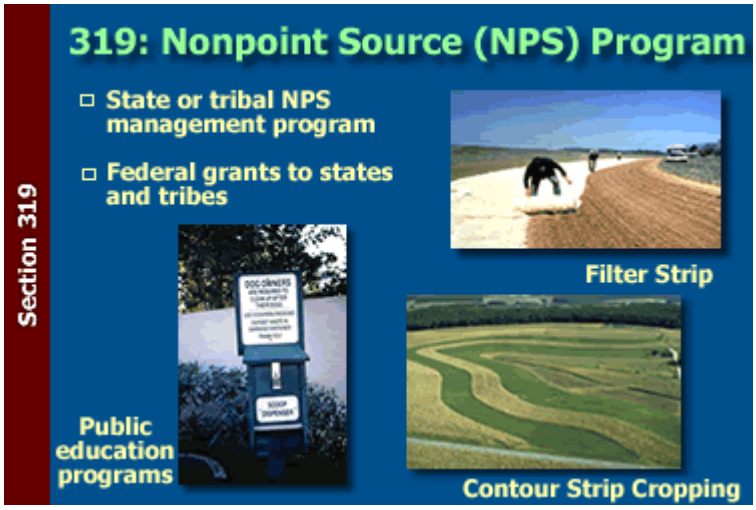
- Are nonpoint sources a significant contributor of pollutants to this impaired waterbody?
- What are the approximate total current loads of impairment - causing pollutants from all nonpoint sources in the watershed?
- What fraction of total loads of the pollutant(s) of concern come from nonpoint sources vs. point sources?
- What are the approximate loadings from the major categories of nonpoint sources in the watershed?
- How much do loads from nonpoint sources need to be reduced in order to achieve the water quality standards for the waterbody?
- What kinds of management measures and practices would need to be applied to various types of nonpoint sources, in order to achieve the needed load reductions?

TMDLs are not "self-implementing." Hence, other authorities and programs must be used to implement the pollutant reductions called for by a TMDL or other strategy to achieve water quality standards. The exact authorities and programs a state, territory, or authorized tribe uses will depend on the type of sources present, as well as on social, political, and economic factors.

A variety of federal, state, local, and tribal authorities and programs can be brought to bear, together with initiatives from the private sector.

Necessary reductions in pollutant loading are achieved by implementing strategies authorized by the CWA, along with any other tools available from federal, state, and local governments and nongovernmental organizations. Key CWA tools include the following:

- **NPDES permit program**
  Covers point sources of pollution discharging into a surface waterbody.
- **Section 319**
  Addresses nonpoint sources of pollution, such as most farming and forestry operations, largely through grants.
- **Section 404**
  Regulates the placement of dredged or fill materials into wetlands and other Waters of the United States.
- **Section 401**
  Requires federal agencies to obtain certification from the state, territory, or Indian tribes before issuing permits that would result in increased pollutant loads to a waterbody. The certification is issued only if such increased loads would not cause or contribute to exceedances of water quality standards.
- **State Revolving Funds** (SRF)
  Provides large amounts of money in the form of loans for municipal point sources, nonpoint sources, and other activities.




**Section 319: Nonpoint Source Program**

Nonpoint source pollution (NPS) represents the most significant source of pollution overall in the country. According to states' 305(b) and 303(d) reports, more miles of rivers and acres of lakes are impaired by overland runoff from row crop farming, livestock pasturing, and other types of nonpoint sources than by industrial facilities, municipal sewage plants, and point source runoff from municipal storm sewer systems

and storm water associated with industrial activity. The most recent set of 303(d) reports indicated that more than 40 percent of all impaired waters were affected solely by nonpoint sources, while only 10 percent of impairments were caused by point source discharges alone.

The CWA does not provide a detailed definition of nonpoint sources. Rather, they are defined by exclusion -- anything not considered a "point source" according to the Act and EPA regulations. All nonpoint sources of pollution are caused by runoff of precipitation (rain and/or snow) over or through the ground. However, as noted previously numerous types of precipitation-induced runoff are treated as point sources rather than as nonpoint sources under the CWA -- including stormwater associated with industrial activity, construction-related runoff, and discharges from municipal separate storm sewer systems.

Atmospheric deposition is also a form of nonpoint source: pollutants discharged into the air and returned directly or indirectly to surface waters in rainfall and snow, as well as so-called dry deposition between precipitation events. (Of course, "smokestack industries" such as fossil-fueled electric generating plants could be considered "point sources of air pollution". But the diffuse deposition of pollutants emitted by such facilities is a form of nonpoint source in the context of water pollution.)

Pollutants commonly associated with NPS include nutrients (phosphorus and nitrogen), pathogens, clean sediments, oil and grease, salt, and pesticides

Congress chose not to address nonpoint sources through a regulatory approach, unlike its actions with "point" sources. Rather, when it added Section 319 to the CWA in 1987, it created a federal grant program that provides money to states, tribes, and territories for the development and implementation of NPS management programs.

Under the Clean Water Act Section 319, states, territories, and delegated tribes are required to develop nonpoint source pollution management programs (if they wish to receive 319 funds).

Once it has approved a state's nonpoint source program, EPA provides grants to these entities to implement NPS management programs under Section 319(h). Section 319 is a significant source of funding for implementing NPS management programs, but there are other federal (e.g., Farm Bill), and state, local, and private programs.

States and tribes must identify waters that are impaired or threatened by nonpoint sources of pollution, develop short and long-term goals for cleaning them up, and identify the best management practices (BMP) that will be used. The state and tribal NPS programs must also have a monitoring and evaluation plan, which is usually tied into the state 305(b) assessment and reporting program.

The BMP section of the plan requires identification of the most common types of stressors, the categories of sources of those stressors, and the types of BMPs that will be both effective and affordable in addressing the identified stressors and sources in general.

(Stressors include pollutants, flow alteration, channel modification, invasive species, and others.) BMP efforts include both "statewide" and targeted elements. The former involves efforts to get a baseline level of BMPs implemented in all land uses that can generate nonpoint source pollution -- farms and forestry operations, for example. Targeted BMP efforts are aimed at having additional amounts and types of BMPs employed in the drainage of impaired or threatened waters.

Nonpoint source management plans also identify strategies for working with other agencies and private entities. For example, the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture is an extremely valuable partner in farm country, since NRCS has access to technical staff and significant cost-share funding under the Conservation Reserve Program and the Environmental Quality Improvement Program and other programs authorized in the 2002 Farm Bill.

Management plans also include the identification of federal lands and activities, which are to be managed in a manner consistent with program objectives of the 319 management plan.

Early in the life of the 319 program, EPA emphasized development of management strategies, combined with deployment of BMPs for education, demonstration, and research purposes. Recently, EPA has increased emphasis on evaluation of program effectiveness, including attempts to document the water quality benefits of BMPs and other program elements. Also, the Agency has notified some states that, starting in FY 03, a sizeable portion of 319 funds should be spent on on-the-ground BMPs only if they are related to a holistic watershed plan or a TMDL specific to the area in which they are located.

# Appendix B. Non Point Source Pollution/Impacts and Controls

Adapted from EPA Website on Non Point Source Pollution

**What is Non Point Source Pollution?**

Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. These pollutants include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas;
- Oil, grease, and toxic chemicals from urban runoff and energy production;
- Sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks;
- Salt from irrigation practices and acid drainage from abandoned mines;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems;

Atmospheric deposition and hydromodification are also sources of nonpoint source pollution.

*What are the effects of these pollutants on our waters?*

States report that nonpoint source pollution is the leading remaining cause of water quality problems. The effects of nonpoint source pollutants on specific waters vary and may not always be fully assessed. However, we know that these pollutants have harmful effects on drinking water supplies, recreation, fisheries, and wildlife.

*What causes nonpoint source pollution?*

We all play a part. Nonpoint source pollution results from a wide variety of human activities on the land. Each of us can contribute to the problem without even realizing it.

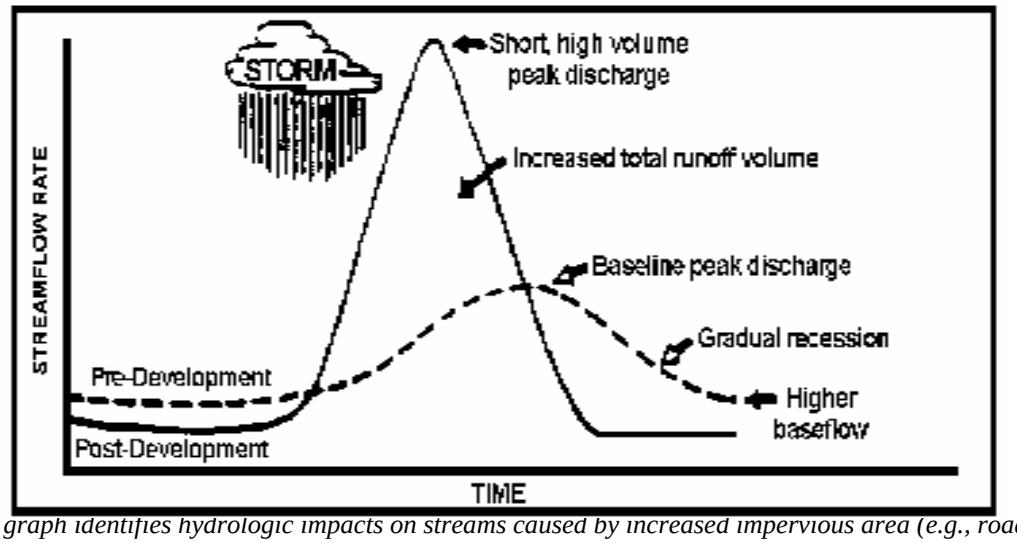
*What can we do about nonpoint source pollution?*

We can all work together to reduce and prevent nonpoint source pollution. Some activities are federal responsibilities, such as ensuring that federal lands are properly managed to reduce soil erosion. Some are state responsibilities, for example, developing legislation to govern mining and logging, and to protect groundwater. Others are best handled locally, such as by zoning or erosion control ordinances. And each individual can play an important role by practicing conservation and by changing certain everyday habits.

**Non Point Source Pollution Impacts and Controls**

Development causes changes and impacts to the environment and our communities. Many effects of development are positive, such as new places for people to live and work, increased recreational opportunities, and economic growth. However, some of the impacts might be negative if they are not handled with foresight.

These impacts include increased frequency of flooding and peak flow volumes, increased sediment loadings, loss of aquatic/riparian habitat, changes in stream physical characteristics channel width and depth), decreased base flow, and increased stream temperature.



*This graph identifies hydrologic impacts on streams caused by increased impervious area (e.g., roads, driveways, parking lots, and rooftops) in development areas. EPA, 2007.*

Development also leads to loss of pervious areas (porous surfaces) that allow rainwater to soak into the ground. This can increase the amount and velocity of rainwater flowing to streams and rivers. This increased speed and volume of water can have many impacts, including eroded stream banks, increased turbidity and pollution, increased stream water temperature, and increased water flow. All of these can have an adverse effect on the fish and other organisms living in the stream and the receiving waters. When rainwater cannot soak into the ground, the result can be a loss of drinking water because many areas of the country rely on rainwater soaking into the ground to replenish underground drinking water supplies.

"Best management practices," or BMPs, help address these impacts. BMPs are designed to help reduce the amount of pollution in stormwater runoff. Some help to control the volume and speed of runoff before it enters receiving waters. Many help to increase the amount of rainwater that soaks into the ground to restore groundwater. There are two general types of BMPs: structural and nonstructural. Structural controls involve on the ground projects while non-structural controls would include policy or ordinances that contribute to watershed health.

# Appendix C. Water Quality Impairments/Load Reductions

## Water Quality Impairments and Load Reductions

This document has identified and recommend uses of both structural and non structural BMPs to mitigate non point source pollution into waterbodies as well as to contribute the overall watershed health of our community.

The main non point source pollutant of concern at this time for the Rio Grande is turbidity. Based on data collected in 2001.

The NMED has sampled at three stations in the watershed, including Rio Grande above Española at Valdez Bridge, Rio Grande at Embudo Station and Rio Grande at Hwy 74 near Ohkay Ohwingeh. Only one water quality standard was exceeded.

| Pollution Source | Measured load (lbs/Day) | Location | Potential Sources |
|---|---|---|---|
| **Turbidity** | **1,031,591** | **Rio Grande (non-pueblo Santa Clara to Embudo Creek)** | **Loss of Riparian Habitat, Highway/Road /Bridge Runoff, Natural Causes, Irrigated Crop Production, Grazing** |

The general narrative for according to New Mexico Water Quality Standards (20.6.4 NMAC) for turbidity reads:

*Turbidity: Turbidity attributable to other than natural causes shall not reduce light transmission to the point that the normal growth, function, or reproduction of aquatic life is impaired or that will cause substantial visible contrast with the natural appearance of the water.*

Turbidity is a measurement of suspended sediments in the water body. The sediments will accumulate at the bottom of the watercourse where small aquatic insects and fish species breed and live. In addition, an increase in suspended sediments impedes the penetration of light into the stream reducing photosynthesis. The sediments can also physically damage algae and other plant species in the watercourse.

Suspended sediments within a stream vary with the flow of a river. Since flow in the river varies throughout the year, permissible limits of suspended sediments will also vary. Turbidity exceedances are generally attributable to actions such as soil erosion, excess nutrients, and displacement of materials within the watercourse during high flow events such as peak flow. The data collected by the NMED shows that turbidity in this stretch

of the Rio Grande is exceeding state standards and impairing the designated uses of marginal warmwater fishery and coldwater fishery.

NMED has developed a TMDL for Turbidity, for this stretch of the Rio Grande (non-pueblo Santa Clara to Embudo Creek). Estimates have been made in the Total Maximum Daily Load document that calculate the necessary reduction of these pollutants into the watercourse, so that the water quality conditions of this stretch of river can improve and hopefully, eventually meet water quality standards.

Their calculations are as follows:

| **Location** | **Load Allocation (lbs/Day)** | **Measured Load (lbs/Day)** | **Load Reduction (lbs/Day)** |
|---|---|---|---|
| **Rio Grande (non-pueblo Santa Clara to Embudo Creek).** | **332,554** | **1,031,591** | **699,047** |

So, a goal for restoration projects in the watershed would be to reduce these loads of sediments into the river from, 1,031,591 lbs/day to 332,544 lbs/day, this is a reduction of 699,047 lbs/day. For a complete explanation of how these values were calculated please refer to the TMDL document.

Total Maximum Daily Load for the Upper Rio Grande Watershed (Part 2) Cochiti Reservoir to Pilar, NM. Final Approved. June 02, 2005.

# Appendix D. Watershed Land and Water Use History
## By Estevan Arellano

### Ohkay Owingeh pre settlement

Known as San Juan de los Caballeros as christened by don Juan de Oñate when he first came to the Española Valley in 1598, last year the Indian village at the confluence of the Río Chama and the Río Grande reverted to its original name of Ohkay Owingeh (The Village of the Strong People). The village is located in north-central New Mexico at the northern end of an area called the Tewa Basin. It is situated on an eroded alluvial remnant about one mile east of the Rio Grande and has been continually occupied since about 1300 A.D. At present the reservation covers about 12,213 acres, including about 1,800 of irrigated farm land. It is situated 28 miles north of Santa Fe and 43 miles south of Taos.

Prehistoric plant remains reveal the Pueblo IV Rio Grande inhabitants grew a short cob of 10-12 row corn, common beans, bottle gourds, two species of squashes and cotton. They also gathered piñon nuts, prickly pear cactus, yucca fruits, juniper berries, pigqeed, goosefoot seeds and purslane. Purslane appears to have been a green that is native to both sides of the atlantic, as it is also consumed in the Mediterranean area.

Located on the Upper Sonoran life zone, to the east are the Sangre de Cristo Mountains, while the Jemez Mountains are situated to the west. Elevation is 5, 660 ft. The historic village is built of adobe and forms two plazas. Besides the house in the village, families also maintain a summer home in the agricultural fields. The language spoken is Tewa, and Ohkay Owingeh is considered the mother village; it is a sub-family of Tanoan, a family in the Uto-Aztecan stock.

Representatives of two of the first three major expeditions under the Spanish Crown, Capt. Francisco de Barrionuevo, scouting for Coronado in 1541, and Rodriguez-Chamuscada,1580, reached Ohkay Owingeh. Only Espejo in 1582 did not go there. The first successful colonization in the Rio Grande area was under Juan de Oñate at Yungue Oweenge renamed San Francisco, which a year later was renamed San Gabriel.

### Juan de Oñate/Establishment of San Gabriel

With the arrival of Oñate and his colonists, which included 129 families who were either peninsular, criollos and mestizos, there also came 400 tlaxcaltecan families who came under contract with the Spanish Crown. The tlaxcaltecan were contracted to do the layout of the acequias and develop the agriculture of the area. It is an undeniable fact that there arrival brought along ecological implications by changing the ecosystems and also forcing the Tewa to new economic adjustments.

Oñate signed a contract, in fact the first proposal for economic development in what was to become New Mexico in 1595. The inventory done in Santa Barbara, Chihuahua (Española's Sister City) in 1596 and 1597 is most informative. Oñate had procured 312 fanegas of corn, some 12 fanegas of beans, and 500 fanegas of wheat seed, though most of these might have been consumed during the expedition's subsequent delay. What did survive was the medicine box which contained benas, barley and lentils, most likely in flour form, for plasters. The medicinal herbs contained were camomile, dill, rue, estafiate (a Mexican herb) and malvas. Domestic animals which could provide food and also be used for breeding stock included 846 goats, 198 oxen, 2517 sheep, 383 rams, 96 colts, 101 mares, and 41 mules and jackasses. The new settlers, in other words, introduced the plants, animals, and tools that could quickly alter the landscape. Thus the ecology of the upper Río Grande would be changed forever. The same as the anglo culture sees the world through different lenses than the Indo-hispano today, so did the settlers and Tewa see the world through different cultural glasses then.

Whereas the Tewa, who were subsistence farmers and foragers, and hunters instead of herders had learned to adjust to unexpected weather changes; agriculturalists, though not immune from climatic change, they can often regulate the ecosystem by raising crops in favorable locations and alter nature by artificial irrigation and terracing. Their ecological relationships are illustrative of different strategies for survival, that over 400 years have blended into one, though differences still persist.

According to Oñate's historian Villagra, in his History of New Mexico, he wrote the new settlers gave the Pueblos lettuce, cabbage, peas, garbanzo, cumin-seed, carrots, turnips, garlic, onions, artichokes, radishes and cucumbers. Four hundred plus years later, these same crops are still grown in the area.

Oñate and a group of advanced scouts arrived in Ohkay Owingeh, or at the confluence of Río Grande and Chama on July 11, 1598. Even before the others arrived on Aug. 18, and irrigation canal, i.e., an acequia, was constructed with the assistance of 1500 Indians. Oñate wrote, "On the 11th we began work on the irrigation ditch. . ." This proves that the first thing the settlers did was to construct an acequia, for without water they couldn't do anything. Then "On the 23rd (of August) the building of the church was started, and it was completed on Sept. 7," and the blessing took place on Sept. 8. The acequia was imperative for the wheat harvest the following year in order to replenish their depleted stores. They also brought seed for kitchen gardens (huertas) and orchards, both unknown to the Tewa. The plants, animals and tools – especially the iron ax – would soon change the landscape. The following year the new neighbors demonstrated a new technology that the Indians would soon adopt: plowed fields, irrigated wheat and kitchen gardens for their vegetables and herbs. Kitchen gardens were a new

innovation and their polyculture added variety to the Tewa diet, complementing the wild plants they gathered. Orchards were also established either as hedge-rows or on the irrigated land.

A letter sent from San Gabriel in 1601 and cited by Torquemado, stated: "Irrigation water [from the acequia] was used for fields of wheat and barley and maize. . . and all other things that were planted in gardens because in that land are . . . cabbages, onions, lettuces, radishes and other small garden stuff . . . many good melons and sandias [watermelons] . . . wheat, maize, and Mexicn chile all do well."

When Fray Benavidez came through New Mexico in 1625 (he wrote his Memorias in 1630) lentils, habas (broad beans), lima beans and vetches. Plums, peaches and apricots were mentioned specifically; not mentioned were apples. Benavidez also observed, "so fertile is the land that it has been seen to harvest a 120 and a 130 fanegas to each fanega sown of wheat." When melons and watermelons came to the upper Río Grande is not known for certain. But the large fruit and sweet taste were symbols of a prosperous harvest. One witness at the valverde inquest stated, "The people devote themselves to agriculture, growing maize, beans, calabashes, fine melons and watermelons."

In 1599 Oñate noted, "There are fine grape vines, rivers, and woods, with many oak and some cork trees' there are also fruits, melons, grapes, watermelons, Castilian plums, capulins, piñon, acorns, native nuts, corolejo which is a delicate fruit, and other wild plants. There are also many fine fish in this Río del Norte and other streams." Oñate wrote in 1601, "Our wheat has been sown and harvested; it does extremely well in that land. The Indians devote themselves willingly to its cultivation."

Besides the Mexican and European (many from North Africa and the Middle East) plants, kitchen gardens (huertas) were introduced as a new method to grow vegetables. Besides the European cultigens, the new settlers also introduced a number of plants domesticated elsewhere in the Americas. Among them chile, including a new variety of corn such as the large cob, Cristalina de Chihuahua corn and the high-rowed Mexican dent from highland Mexico. This corn was more productive and was adopted by the Tewa but according to their color categories They also brought Hubbard squash, known as calabaza mexicana, from South America as revealed by seeds from Picuris. Also introduced was the non-food plant, tobacco or punche as it is known in Spanish.

Herd animals became a double-edged sword, on the one hand they became a source of meat, textile material and beasts of burden. On the other hand, they overgrazed the grass, trampled the young trees and compacted the soil. By 1601 the breeding stock grew to 3,000 sheep and cattle. Probably what caused more ecological change was the metal ax, for instead of only gathering dead limbs for

fire, huge trees were felled. On the plus side of what the new settlers brought, there was a several fold increase in domesticated plant species which provided for a more beneficial and secure subsistence base. Draft animals permitted easier access to distant sources for wood, and riding animals opened new hunting grounds. The new plants and animals safeguarded against ecological disaster and it might have provided cultural continuity, in that it might have prevented them from migrating to another location. In a sense it anchored them to a specific site, where they have remained for over 400 years, alongside their neighbors.

**Camino Real**

What came to be known as the Camino Real de Tierra Adentro (the Royal Road of the Inner Province), has been used by the people in the Americas since pre-historic times. During the Spanish epoch, the road stretched from Mexico City to Taos, though most historical accounts have it ending in Santa Fe. The only problem is that Santa Fe didn't exist when Oñate made his way up north since he settled in San Gabriel, on Ohkay Owingeh land. Until the Santa Fe Trail came into existence all trade and migration into northern New Mexico was from south to north. The Camino Real followed what is known as the "camino del medio" between Ohkay Owingeh and Velarde (then La Joya). It then made it's way to the Plaza del Embudo (Dixon today) following the southside of the Mesita, the Arroyo de la Mina, then made it's way following the Apodaca Trail where it forked, with one road going to Picuris and the other to Taos.

**Land grants in the Embudo Watershed: Sebastián Martin, Embudo, Santa Barbara and Trampas**

There are several mercedes or land grants within the Embudo Watershed and the present-day Española Valley. The most important ones for this project are the Sebastián Martín, the Embudo, Santa Bárbara and Trampas and what makes these grants significant is that someway or another the settlers were all related to the Martín Serrano clan. They are all descendents of Hernán Martín Serrano, a native of Zacatecas, who was 40 years old when he made the trek up the Camino Real with don Juan de Oñate in 1598. Of all the settlers that traveled with Oñate, the family that undoubtedly made the biggest impact in the Española Valley was the Martín Serrano, today known as Martínez. When we look at the grants within the prevue of this work, all of the four grants mentioned above were squeezed between the Ohkay Owingeh and Picurís land grants. The Martín Serranos, it must be mentioned considered themselves indios. It is said that once two first Martín Serrano cousins wanted to marry and the church wouldn't allow them. Their

response, “We are Indians and don’t have to follow church law,” and they got married.

After the reconquest by Don Diego De Vargas in 1692, the Martín Serranos returned to their ancestral lands in Santa Cruz and present-day Los Luceros. It’s here where Sebastián Martín, the most famous of all the clan, was awarded the Sebastián Martín land grant in 1703, then reissued in 1712, and it went from the boundary with the Ohkay Owingeh grant all the way to La Joya (present-day Velarde) and extended all the way to Ojo Sarco, including what became the Trampas grant. Then in 1725 the Embudo grant, whose boundary on the south was the Sebastián Martín grant, was given to Francisco “el Ciego” Martín, Sebastián’s younger brother. It’s boundary to the east was the dry arroyo before one climbs up to present-day Cuestecitas. The north and west boundary was the Río del Norte, today the Río Grande.

In 1751, the Trampas grant was carved out partly from the Sebastián Martín grant. The reason that Sebastián gave up part of his grant to a group from the Barrio de Analco, the Tlaxcalta settlement in Santa Fe, might have been relatives were married to some of the original settlers. Then in 1796 the Santa Bárbara grant was awarded to Valentín Martín, grandson of Francisco. From this brief sketch it can be seen, that by 1800 all of the lands between Ohkay Owingeh and Picuris were controlled one way or another by descendents of the Martín Serrano clan. Today the most prominent name in the area is Martínez, and many who are not Martínez have a mother or grandmother who are Martínez. Within the Embudo grant, most if not all, of the acequias were constructed by members of the Martín clan.

**Landscape and Cultural History of the valley: Anatomy of land grant y acequia**

Under the Laws of the Indies, the land was divided into what we know today simply as commons and the irrigated lands. What divides the one from the other is a rigid line formed by the acequia, the channel that delivers the water and gives life to all the land below it. Above the acequia is the dry land, which is more in tune with how the land was managed in Northern Europe prior to the arrival of the Arabs in the Iberian peninsula in 711 and who stayed there until 1492. When the Moors were kicked out of Spain, how they managed the land did not disappear, in fact it resurfaced in the “indies” under the guise of different ordenanzas, which were finally codified as the Laws of the Indies, the laws under which the Spanish land grants were made to settlers.

Many people in the Río Arriba region when referring to the commons think of ejidos, known as estancias from 1598 to the Pueblo Revolt in 1680, which simply supplanted the word latifundia here. Latifundia refers to big expanses of land, in the thousands of acres, whereas minifundias were small land holdings of only a few acres. And ejido simply means “exitus,” or the place which is at the outskirts of a village, which is neither planted nor worked and is common to all. It’s from the latin verb exeo, exis, to exit, to leave. There are four main divisions within an ejido, or the commons even though they blend into each other:

* Sierras
* Montes
* Dehesas
* Solares

Sierras provided the early settlers -and still today the descendents of these early pobladores, like their ancestors before them -a place to harvest firewood, vigas and latillas for constructing houses and other buildings which needed to be built for their survival. When the mercedes or land grants were awarded, building materials for living quarters were dragged from the sierra and monte using animal power; today trucks are employed for this type of labor. They also combed the lands for wild fruits, capulín (choke cherries), chatacow (elderberries), moras silvestres de matas y de suelo (wild raspberries, alpine strawberries), piñon, and beyotas (acorns). Wild herbs, such as oshá, oregano de la sierra, altamisa, poleo, yerbabuena, were and are also harvested today. Each village has and still have their place where certain essential herbs are grown and harvested; many of these sites are kept secret; since the coming of the Flower Children or hippies, many of these sites have been raided to the point of near extinction as they started harvesting the herbs to sell commercially.

Curanderas who is the past readily told others of where they got their “remedios” or herbs, today are cautious as to who they divulge their secret gathering places, whether in the high sierras, the juniper and piñon montes, or the high desert dehesas that produce the chimajá (or wild parsley) in the spring. Though those familiar with the language know that most landscapes are named to signify where certain raw materials are found. For example, el llanito del zacate de la escoba, meant broom grass grew there, while el arroyo del barro identified the site as there being a clay deposit. Place names also related to the local environment, Costilla for example meant the mountains looked like ribs, and Questa signified going up or down the side of the mountain or costilla. Embudo means a funnel because the watershed is in the form of a funnel.

Like the allocated lands, these communal lands or ejidos were broken down into sierras, montes, dehesas and solares where the houses were built. But the commons were also crisscrossed by cañadas and veredas.A cañada can be

described as a “camino mesteño,” wild road, since they were used to move the livestock, mostly sheep and goats, from the winter to summer pastures and vice versa which meant moving the livestock from the dehesas to the sierras.A cañada is usually defined as a space between two high peaks or lomas (hills) and cuchillas (mountain ridges) that had water holes or abrevaderos and vegetation for animals to eat and they are at least 90 varas (a little less than a yard; around 33 inches), wide used to move livestock. Besides abrevaderos, cañadas also had spaces where the livestock rested which were called descansaderos or majaderos, which referred not only to a resting place but also where manure was deposited. Also part of the commons were the veredas, or trails which were more narrow but usually a minimum of 25 varas or yards and usually used by horses or to move smaller flocks or herds of livestock. There is a dicho, or saying, which says, “Quien deja el camino real por la vereda, piensa atajar y rodea,” he who leaves the royal road for the trail, thinks he will make a short cut but instead makes the road longer. Both cañadas and veredas are common roads. It’s from the cañadas reales that the term dehesa might have originated, according to some scholars, since this caused a conflict between those moving livestock and the inhabitants of the villages through where the animals were moved twice a year. From there the term defendere, which means permission, dehesa is though to have come about, since the king had to intercede and grant permission. All of these concepts eventually made their way into the Laws of the Indies and thus to New Mexico.

Sierra, is a mountainous terrain whose features resemble the teeth of a saw, but can also be from the Arab, which refers to a rugged high desert. In Spain the word applies to high, saw tooth mountains and it was appropriately transferred to the Southwestern ranges by the Spanish colonists. It’s in the sierra where the cuencas, watersheds, form and they act as the keepers of the water because the snow melts slowly thus providing not only the irrigation water for the acequias but also feed the aquifers that feed the norias (another Arabic word, from anora) or wells that provide the water for domestic uses.

Monte is derived from the latin, mons, tis tierra alta, high ground while montaña is tierra alta, áspera y habitata; that is, highlands, harsh but habitable. There is a verse that says:

It is said that the mountains are pregnant because of its huge “rumores y hinchazones.” They appear pregnant because of the swellings and bulges that make up the mountain. Tienen tambien cabeza y es su cima y espaldas y sus vertientes llamamos faldas, aunque no ande vestido, y dicen comunmente falda de un monte; they also have a head -the summit -and also shoulders -the slope of the watershed which are called skirts, even though they are not dressed and are commonly called the skirts of the mountain. Mountains also have cejas, or eyebrows.

The non-irrigated lands of the mercedes, especially those lands known as secano, used for dry farming, are usually on the lower reaches of the dehesas, known as “tierras de pasteo,” or pasture lands. In latin the dehesa is called pascua, and it is a place where the livestock is grazed. It could very well come from the Roman custom of establishing latifundias in marginal lands. But the term does not appear until the year 924 in the dictionary Corominas, though the term is also found in the laws of the Visigoth, known as pratum defensum, as noted by the Romans. According to Covarrubias it is an Arab term that means, “a low land, full of weeds where it is hard to walk, from the moisture in the soil and thick with weeds.” Covarrubias says the word comes from dehisetum, from the verb dehesa, “que vale espesar y estrechar.” But he says it could also be Jewish, from “dese, herba,” for the deshesa is nothing more than “a piece of land full of weeds.” A dehesa is a semi natural ecosystem where there is usually a certain amount of human involvement. In New Mexico this meant that the piñon trees were pruned to the extent of removing what is known as “piñon blanco,” the dead piñon branches that have gotten a gray patina and are treasured by the ladies when they relied on fire wood for cooking and heating for it is seasoned wood. Also this type of piñon tree is the one that usually produces the best piñon nuts and because it has been taken care of the nuts are easier to harvest.

A dehesa is also a space that conserves a great number of both flora and fauna; it also has great economic and social importance. Regardless of its original meaning, whether it has latin roots, Arabic or Hebrew, it is understood to be as an agroforestal system with poor soil and a harsh climate where man has intervened to make it somewhat productive. Some scholars say that a dehesa is not very ecological due to the economic pressures of grazing more livestock than what it can sustain. Today most of the dehesas, previously belonging to the different land grants, are now managed by the Bureau of Land Management; the State Land Office and the Forest Service. It is usually a type of pasture with scattered trees of evergreen and deciduous oaks, piñon and juniper (cedro y sabina) and in the past grains were often grown under the sparse tree covers. The space then between the dehesa and the solar is what was used for dry farming, known as secano, which was always above the rigid line made by the acequia, which separated the commons from the private. A dehesa can be better understood as a mosaic because of its different uses; it’s also part monte, but also used for grazing and even dry farming. It’s an agroforestry system with the joint production of trees and agricultural crops and/or animals it can also be called an agrosilvopastoral system.

Besides the sierras, montes and dehesas, though private and to a certain extent part of suertes, and usually above the acequia, are the solares where the houses were commonly built. A solar comes from the word “suelo,” to make a floor as in constructing a house on a plot of ground. But a solar is not only the site

where the house is built, it also is the space between the acequia and the commons where the settlers built their corrals, gallineros, trochiles and leña, that is, the space where the corrals, chicken coop, pig pens and wood pile was kept. The house, if away from the town plaza, was constructed following an L-shape or U-shape, same as the Moorish houses on the alquerias. Also part of the house complex included the dispensa, utility room, and soterrano or root cellar where people kept their food supplies.

**Acequias: The lifeblood of the Villages**

The acequia, then, is what forms a rigid line that divides the common lands from the appropriated lands, or suertes which are the irrigated parcels of land. And to understand an acequia, or ditch, one has to understand the human body and how blood flows.

Acequia systems are based on land-based environmental ethic that work within basic geographical and ecological limits of watersheds. Following contours of the land, a traditional acequia will water a variety of locally adapted crops. They also support the biodiversity of riparian vegetation, birds, and other wildlife and recharge local groundwater and natural streamflow. There is no more water for irrigation than what comes from the mountain snowpack, and over many generations of living on and learning from the land, skilled acequia farmers know how to use the water with great care. This is a strong incentive for maintaining healthy watersheds, from the top of the mountain to the forests, to the last ditch in the village.

Rooted in local knowledge, long practice and a deep respect for the land, acequia culture represents a sustainable environmental ethic that works with nature rather than against it.

Here in northern New Mexico an acequia is also used to delineate property boundaries, and such acequias are known as linderos or acequias secundarias (to differentiate from the acequia madres or mother ditch). From them run the brazos or cequiecitas menores,, and from them the ramos, and eventually all the water comes together at the desagüe (outlet) in order to move the water to the next parciante (water rights owner) or to the river. The acequia system resembles the human body and how the blood moves through the veins, arteries and capillaries. A desagüe is also an emergency outlet at the onset of the acequia, near the presa, used to clean the acequia of unwanted silt or to let the water into the river when the arroyos run or during the spring runoff; or if there is a break in the acequia and the water needs to be diverted back to the river.

One of the most misused terms in understanding an acequia is sangria (bloodletting; drainage), which a lot of people, but mostly those born outside the acequia culture, confuse with a small cequiecita. A sangria is indeed a small ditch, but it is used to drain a ciénaga, or marsh land, in order to use that piece of land for cultivation. And like a lot of the concepts pertaining to acequias, this one is also derived from the human body. When a person smashes a finger, or has a tumor, that needs to be drained to relieve the pain one sangrars (drains) the injury. The same is done with a piece of land that has too much water; it's drained by using what is known as a sangria.

Briefly, the anatomy of an acequia madre system consists of a presa, or azud (al-sudd), then a desagüe (outlet) about 200 feet from the presa. A presa is a diversion dam, which diverts the water from the river to the acequia madre. Where the water is diverted from the river it is known as the toma, or “place” where the water is taken from, whereas the structure that diverts the water is the presa. Usually, there is another desagüe, another 200 feet from the first desagüe. The reason for the second desagüe is, for in case there is a lot of water in the river, like when the arroyos run in the summer or during the spring runoff, the water can be regulated. Some acequias have a third desague about a quarter mile from the second, again for an emergency, but it is hardly ever used. Usually after an arroyo, if it happens to run into the acequia, like they do in many acequias, another desagüe is needed to clean the acequia of silt.

On the acequia madre the parciantes then install their compuertas or regaderas (head gates) to get the water to their property. If a property does not border the acequia (no colinda), then an acequia secundaria also called a lindero (lateral), brings the water from the acequia madre to the property of the parciante. These acequias secundarias or secondary ditches do not fall under the jurisdiction of the comisión and mayordomo of the acequia madre. Once the water enters the parciante's property, from there it is spread out via brazos which take the water to the different terrances: bancales if on slopes, bancos if on valleys and ancones if by the river and finally through smaller cequiecitas called ramos and finally hijuelas or carreritas.

The person in charge of the water in the Rio Arriba bioregion is known as the mayordomo, and he is either appointed by the three comisionados, (commissioners), or elected along with the comisionados by the parciantes. Either way he is under the direction of the comisión. In earlier times he was known as the cequiero (sahib al-saqiya or zabacequiero), he is the one who divides the water, for he acts as the “barmaid,” making sure everyone has water.

The mayordomo is always referred to as one who is “digno de confianza” (worthy of being trusted), “el que es fiel” (he who is faithful), or “el fiel del agua” (faithful with the water).

Water is always divided based on the amount of land in each acequia, then based on the number of peones each parciante has under that particular acequia, and based on the amount of water in the river. The amount of water in a river is measured in surcos. And here is where the old concepts of measuring water come into place. One of the most used concepts is sulco, or surco. In northern New Mexico a surco de agua is the amount of water that can flow through the buje, or opening in the center of a cartwheel in a carreta (cart). That is no longer the case because as land has been divided or sold the same equation has not been followed.

At times parciantes try to apportion more peones than what they have by subdividing the land into more pieces of land than water rights. Example, dividing a four acre plot into four one acre plots when they have only half a peon; and thus they can only divide the land into two, two acres plots, so that each parcel of land can have at least one-quarter peon. Dividing into smaller portions than one-quarter peon would turn into a nightmare for the mayordomo and comisión to manage. The repartimiento de agua is based on the Moorish concept of equidad. This concept, regardless of the amount of water in the river, is based on equality and the number of acres under cultivation. It is based on custom and tradition and is always passed down orally, not in written form. When the repartimiento goes into effect, the water in the river is first divided by the number of acequias (in the Río Embudo 8 acequias), then the water in each acequia is divided by the number of acres based on the number of peones, or shares. Example, in the Acequia Junta y Ciénaga there are approximately 80 acres under irrigation with 80 quarter-peones (shares) and at present 32 parciantes (water rights owners), with some having only one-quarter peon (or share) and others up to two peones (or 8 shares).

In years of drought, the water, once apportioned by surcos in the river, is divided into filas (or hilas, hilos here in northern New Mexico). These filas, or hilos are known as tandas or turnos, here called papelitos, and they are based on the amount of land, which should correspond to the number of peones, and supposedly to the number of acres. In times of extreme drought the water “se jaricaba,” that is, several hilos of water were grouped into one so that there would be enough water to irrigate, as was done in 2002 in the Embudo Valley, one acequia at a time, with half the time, or one hour per peon but with a full flow. A hilo de agua usually corresponded to one hour of water use. The problem here is that usually the big acequias end up losing irrigation time because the division is not done equally since the peones in one acequia don't represent the same amount of land (in terms of acreage) in every acequia. And when the water is divided by the upper and lower acequias, the upper three days and the lower four days, again they are all not equal when it comes to acreage so the smaller acequias end up getting more watering time per peon.

In times when there is plenty of water, nobody really cares about measuring the water and how much water an acequia uses, though with water adjudication now a reality, sooner than later water will be quantified. But in times of drought, like in the 1950s and in 2002, acequias have had to fall back on the ancient tradition of adhering to the repartimiento de agua, or the sharing of water, based on “la palabra del hombre” (the oral word) and equality. When the repartimiento was in force, the comisionados and mayordomos would figure how many surcos were in the river at that time and then divide the number of surcos among the different acequias based on the number of peones (which should correspond to acreage) each acequia had. For centuries this system has worked, but during the summer of 2002 some of the newcomers didn't want to follow the custom and tradition, and how long it continues no one knows.

Two other very important concepts, in terms of the philosophy of the sharing of water are sobrante (which is the excess water) and auxilio (which is sharing, or coming to the rescue of those who don't have enough water). Usually when a new piece of land was exploited, it was watered with the sobrante from an already established acequia. Again in the Embudo Valley, the farmland in la Naza, water with the sobrante from the Acequia Junta y Ciénaga. But the sobrante can also be applied to in times of drought, when there might be more than enough water for one or two acequias who might have the water for that particular turn, or turno. If after two acequias are surtidas (or full to capacity) then the excess water is known as the sobrante and the next acequia in line to get the water can capitalize on this water. But once it enters the acequia then it is up to the mayordomo to follow the turnos established in terms of irrigating with that sobrante. Meanwhile, an auxilio is when a certain acequia doesn't have water, and the gardens are drying up, then the comisión from that particular acequia can petition the comisión of the acequia that has water for an auxilio (usually a one time help), to let them have some water to save their gardens. The water that is shared in times of need (auxilio) is not a sobrante, or excess water, though New Mexico law does not recognize sobrante since the water is already over appropriated. If an acequia has plenty of water, instead of desaguando the water into the river at the end of that acequia, the water has to be allowed to run into the other acequia so they can use it, but first rights belong to the upper acequia. Also, such as in the case of the Acequia Junta y Ciénaga and the Acequia de la Naza, both are independent of each other, with separate comisiones and mayordomos. Acequias, which appear easy to understand, in essence are very complex to comprehend and manage.

**Suertes: The irrigated lands**

The history of the long-lots, known as suertes, because they were allotted by “lottery” go back to the land patterns of Spain as defined by the Laws of the Indies of 1681 and even further to the way the Arabs saw the land.

First time visitors to northern New Mexico are intrigued by the division of

the landscape, especially the long-lots that are so much a part of the historic vernacular landscape as are the adobe houses and hornos. The history of the long-lots go back to the land patterns of Spain and even further to the way the Arabs saw the land, which comes as a surprise to most people even the native born.

One of the most neglected aspects of northern New Mexico history is the influence of the Arab world, which is etched not only in the language and landscape but also in the fruits and vegetables that grow in this semiarid land which is given life by the flow of water from the acequias. When people think about northern New Mexico, most think of the Spanish influence without realizing that the Castillian nation was born on the same year as Columbus made his famous journey across the Atlantic

The reason these pieces of land became known as “suertes,” was because they were given to the settlers of the land grants based on a lottery, or “suerte,” which is luck. The suertes, especially under Spanish law (Mexican grants seemed to have operated different, i.e., the Sangre de Cristo land grant in southern Colorado), were those lands that fell below the acequias, and were therefore the irrigated pieces of land.

The reason for the suertes, or long-lots, was so everyone could have access to the river and to the commons; this type of land distribution made sure everyone had good land for growing crops but also land for the domestic animals such as a milk cow including grazing a few sheep close to home. Suertes were then divided into the altitos, or highlands where fruit trees were planted; then below were joyas from the Tuscan word gioia, which means happiness but also something very precious such as a jewel. Translated to land this meant the most fertile lands where people usually plant their chile and other vegetables for home use or in those days to trade for what they didn’t have. The barter form of trade is known as cambalache.

Velarde in the Española Valley was originally known as La Joya due to its fertile lands. There is also a Joya by Belen. Below the joya was the vega, which can be used for planting, but in New Mexico is most commonly used for pasture for the domestic animals and below the vega was the ciénaga, or the marshland. Ciénagas can also be used for growing crops if they are drained, or sangradas.

This type of land division was not oriented towards growing for a market, but rather to provide for the community, which was usually a very tightly knit society based on familial ties. In a way it was an intentional community, which is now the rave among the rich in the Santa Fe area. But this intentional communities

were composed of “campesinos” or rural people, farmers whose pieces of land were rather modest of only a few acres. These land holdings were known as minifundias compared to the land holdings of northern Spain known as latifundias, which were very extensive and usually used for livestock grazing.

In Spain these minifundias when under the care of the Moors could feed a family of four, but when taken over by the Castillians who were unfamiliar with this type of irrigated farming could barely feed one person.

But as this type of land holdings are sold to people outside the family, conflicts arise, because the traditional land patterns based on familial ties are now being bought by outsiders, not only from outside the merced, but also from a totally different cultural background and orientation. As a result the suertes are disintegrating as the traditional land divisions of the long-lots are now divided horizontally where the altitos, joyas, vegas and ciénagas are sold separately and thus those pieces of land are becoming land locked and being destroyed by housing and roads.

The traditional land divisions served a purpose. Altitos were usually where the fruit trees were planted since they were less susceptible to freezes due to the cold settling at the bottom towards the river. Also, each one of these land divisions has a different microclimate and the traditional land owners knew exactly what could or could not be grown. Another important factor was that the irrigated land was never used for housing but now since a lot of the land grants are no longer intact and the Bureau of Land Management and Forest Service now own a lot of the common lands and the population has grown, the cultivated lands are now becoming residential suburban style lots.

Traditionally these lands were used for growing food, that is, the huertas or large vegetable gardens and jardines or small gardens were planted in these strips of irrigated land also known as tablas. The term huerta comes from the latin hortus, from the verb orior, oriris meaning to be born, in that there is where the vegetables and fruits are born and from there the term hortelano, he/she who works the land for food. Jardin, or flower garden, from riardin is more tied to the Arab concept of garden. Others say it’s from the German and from there adopted by the French as jardin. But in northern New Mexico we added the concept of milpa, from mesoamerica, referring to a cornfield.

Thus the joya was where the huerta de chile and milpa de maíz were planted but also the melonar, or where melons and watermelons were planted in sandy soil. But to understand the joya and how it is understood by those who work it, the joya was further broken down into melgas, from the word mielga, which came from Italy from the region of Media, a corruption of the words medica herba which was a common pasture plant for animals. The Arabs called the plant alfalfasat or alfalfa. Here this cultivated mielga became a piece of land where alfalfa was

planted. In New Mexico, this type of land has become known as strips of land that have been broken down into manageable parcels of usually fifty feet in length and the width of the suerte. A melga when it is part of the joya can further be broken down into eras as a water conservation strategy. There are two types of eras, one is for threshing wheat or other grains and that is located in the commons, and the other is in the form of a sunken bed. Among the Zunis these type of beds are known as waffle gardens.

An era usually refers to the place the hortelano plants lettuce, radishes, and other vegetables, and it is also known as an Afghan garden, which looks like a comb. Today they are still found in parts of the Embudo Watershed.

Vega, then, refers to a low land that is humid and level, or llano, and comes from the word a vigore, because it's vigorous and fertile. In Arab it signifies, "a tierra de labor puesta en llano," or a level land that is worked, or planted. In New Mexico it refers more to an irrigated pasture whereas in Andalucía it's where food is grown, such in the Vegas of Granada, Valencia and Murcia. And ciénaga comes from the word cieno, which is usually a black mud, smelly and soft, which is neither mud nor water and without draining can only be used marginally for grazing.

Ideally most suertes would be composed of altitos, joyas, vegas and ciénagas but not all contain all four types of land, especially now a days, as the land is broken up into smaller and smaller parcels and the concept of the land with its origins in the Middle East is all but forgotten.

Suertes, it must be understood, were arranged in terraces, with the altito being the highest terrace, followed by the joya, vega and finally the ciénaga being the lowest of the terraces, along the river bank. Also, there are different types of terraces or terrazas, also known as bancos or bancales, and ancones. There are terraces along the valleys and on slopes, and those by the meandering of a river are known as ancones. Terraces are watered by diverting water from the acequias, therefore it is the acequias because of their rigid design which give birth to the suertes.

Historically the suertes, as mentioned earlier, went from the acequia to the river but there are also places in the Río Arriba bioregion, such in the San Luis Valley of southern Colorado, where the suertes extend above the acequia. In San Luis these long-lots are known as extensiones, or extensions.

But this type of agroecosystem whose roots can be traced to the Fertile Crescent, with modifications made in southern Spain, then in Mexico and finally arriving in New Mexico in 1598 is now on the verge of disappearing. Very few people now know how this type of system operates; and less know about its origins.

Acequia waters flow gently across the land, working with the simple force of gravity, to nourish communities and fields like the blood that flows through our bodies. Predecessors of acequias, developed thousands of years ago in the Indus Valley of South Asia were based on the human circulatory system. Larger arteries split into smaller vessels and eventually into capillary flows to water ever corner of farmland.

**Water Rights and the Treaty of Guadalupe Hidalgo**

There is probably no more misunderstood and misinterpreted section of the New Mexico State Constitution than Article II [Rights under Treaty of Guadalupe Hidalgo preserved] when it comes to water rights. Hundreds of thousands, if not millions, of dollars have been spent paying scholars and lawyers to clarify what rights we have under the treaty.

Any attempt to understand what those rights are, in reference to the use of water for irrigation, come from the Romans, Visigoths and Arabs.

The first reference, or attempt, at any form of water law is found in the Fuero Juzgo of 654 A.D., adopted by the Visigoth, which deal more with penalties for the abuse of water.

"El Fuero Viejo de Castilla," refers only to the use of running water for the functioning of grist mills and for fishing purposes. It was not until the 13th century that we encounter a series of laws dealing with water. The use and distribution of water for irrigation purposes was based on the ancient Roman law. This monumental task of codifying all existing ordinances up to 1256 was the work of King Alfonso X, known as "The Wise." They became known as Las Siete Partidas.

The publication of said laws signaled a step in the right direction in the cultural evolution of Europe and Spain. Though they were influenced by the Romans, they didn't acquire any influence until the Ordenamiento de Alcalá in the middle of the 14th century.

In the Tercera Partida, the laws declares "common things" "the flood waters and the use of the rivers." It also stipulates that "the headwaters that are found there," are common property.

Another very important concept, relative to the "right of way" of easements for the acequias is also addressed: "which right-of-way will be twice as wide as the measurement of the bed of the ditch, or four pasos de Salomón (according to Spanish historian don José Antonio Crespo Frances y Valero a "paso de Salomón" is equivalent to 75 cm. instead of 65 cm for a regular paso), measured on each side of the bank of the acequia, of which right-of-way no person can claim, for it is

community property".

This is very important, for it defines legally for the first time, the rights acequias have through private property. Today many property owners try to block the mayordomo or peones from going through their property during spring cleaning. The banks of the acequias were also used as roadways by the villagers.

In New Spain, including New México, the new legislation pertaining to land and water that starts to emerge follows what is contained in the Siete Partidas.

These dispositions, ordinances and instructions end up being called the Recopilación de las leyes de los reinos de las indias or the "Laws of the Indies," which were compiled in 1681.

For example, it stipulates that "the pasture, mountains and water shall all be communal." Others deal with administrative mandates, like the naming of Water Judges (today called mayordomos) so that they can distribute the waters used for irrigation by the Indians.

Yet others give the viceroys and courts the administration of the waters in terms of "justice and equality" relating to managing the water. This is where the custom of sharing the water in times of shortages comes from.

In paper, at least, the interest and respect the Crown had for the "Indians" is evident in several laws. It orders that the laws should respect the water rights the Indians had. And that the waters should be shared equally among the Indians and Spanish settlers.

For northern Mexico (which of course included New Mexico) the court in charge of administering the law was in Guadalajara. In the ninth edition of the Laws of the Indies, in 1788 King Charles III included language concerning the construction of new acequias where needed for irrigation purposes.

Protecting the communal right over the individual right as established by Las Siete Partidas and Recopilación, not only in general terms, but in specific cases, we find a Royal Order by Charles IV, dated November 18, 1803 and confirmed four years later: "that the settler of such city is the true and only owner of the waters that run through public pipes, as long as the public needs them." This is also repeated in the "Plan de Pitic," of 1783.

To understand the rights claimed under the Treaty of Guadalupe Hidalgo people need to know what those rights are.

Las Siete Partidas, the Laws of the Indies and the Plan de Pitic are three very important documents that people need to understand if they want to know what rights were guaranteed by the Treaty of Guadalupe Hidalgo.

**Statehood**

Towards the end of the territorial period, in 1907, which is why Gov. Bill Richardson declared 2007 as the Year of Water, New Mexico's water code was revamped. Though the 1907 Territorial Water Code recognizes acequias as a distinct class of water rights protected by the Treaty of Guadalupe Hidalgo and governed according to Spanish and Mexican water law and local custom, it also allowed for the separation of water from the land. Prior to 1907 water could not be sold separately from the land; in essence the new water code made water a commodity. In 1912 when New Mexico joined the Union, the New Mexico State Constitution confirmed all pre-existing water rights.

**Chile Line**

The Denver and Rio Grande Western Railroad was affectionately called the Chile Line because of all the chile and fruit that it took from the Española Valley to the San Luis Valley and is still remembered by this name. From 1887 until abandonment in 1941, passenger service in Española was generally daily except Sunday.

Española was founded in the 1880's as a stop on the Denver and Rio Grande Railroad. The railroad has disappeared, but the city has grown and prospered as the commercial center for the Valley's smaller villages.

From the 1923 "Official Roster No. 11 of the Denver and Rio Grande Western Railroad System and the Rio Grande Southern Railroad Company". The Narrow Gauge was at its zenith when this roster was issued.

**Los Alamos**

Two years after the Chile Line became history, the "Secret City," on top of the Pajarito Mesa was born. More than anything else, since Oñate and his settlers arrived in the Española Valley, Los Alamos had profound effects on the land and water in the valley. Prior to Los Alamos most of the villagers in the Española Valley and the Embudo Watershed survived of the land by maintaining their acequias or working the railroad, as sheep-herders or migrants in Colorado, Utah and Wyoming. With the advent of Los Alamos, most of the men returned to their villages and became wage earners, though as the lowest paid employees since most were uneducated. As their earning power increased and Los Alamos grew, Española grew and it became the hub for all the surrounding villages. The first food store, Fairview Foods was established in the mid-50s. The first fast-food establishment, Lota Burger was setup ten years later. And as Española grew, as a result of the expansion in Los Alamos, less and less people tended their farms and acequias. The people in the valley went in one generation from a pastoral economy to a post-industrial economy, by-passing the industrial epoch almost completely. Their only contact with the industrial epoch was the short lived romance with the Chile line.

## Appendix E. Watershed Group Participants

Many thanks to those who have participated in creating this document!

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Esta Gutierrez- San Juan Pueblo
Wilfred Gutierrez-Velarde
Hari Nam Simran Khalsa- Northern New Mexico College- Environmental Science Teacher
Helen Hall- Alcalde
James Harmon- Bureau of Land Management-Range Manager
Suzi Havenez- Bureau of Land Management-Travel Planner
Melvin Herrera-US Forest Service-Range Manager
Pamela Herrera-Olivas- Bureau of Land Management-Wildlife Biologist
Patrick Herrera-Española
Pat Herrera-Dixon
Ben Nye- San Juan Pueblo
Lisa Jensen-Nye- San Juan Pueblo
Agnes Jaramillo- BLM Permittee
Ronald Kneebone- US Army Corp of Engineers- Special Projects/Tribal Liaison
Thaddeus Kostrubala-New Mexico State Land Office- Hydrologist
Susan Kramer- Velarde
Joseph Lewandowski-North Central Solid Waste Authority- Director
Yvonne Lehman- Northern New Mexico College- Environmental Science Student
Charles Lujan- Ohkay Ohwingeh-Environment Department
JP Lujan- Embudo
Louis Lujan-City of Española- Waste Water Treatment Operator
Lou Malchie-Embudo
David Manzanares-US Department of Agriculture- Resources Conservation and Development Service
Steve Martin-Alcalde
Felipe Martinez- Rio Arriba County- County Commissioner
Nicole Martinez- Northern New Mexico College- Environmental Science Student
June McCall- Northern New Mexico College- Environmental Science Student
Olivar Martinez-Alcalde
Maryann McGraw- New Mexico Environment Department- Surface Water Quality
Paul Michel-Velarde
Greg Miller -US Forest Service- Hydrologist
D. Moet- Alcalde
Alfredo Montoya- Rio Arriba County- County Commissioner
David Morgan- Consultant-La Calandria
Shel Neymark- Embudo
Roz North-Dixon
Charlie Nylander-Los Alamos National Laboratory-Water Resources Technical Assistance Office
Jason Ortega- Northern New Mexico College- Environmental Science Student

Lucia Ortiz y Garcia - Alcalde
Robert Padilla- US Bureau of Reclamation-Hydrologist
Allan Pasteris- New Mexico Environment Department- Surface Water Quality
Amanda Quintana- Northern New Mexico College- Environmental Science Student
Michael Quintana-New Mexico State Land Office
David Rigsby- Embudo
Linda Rigsby-Embudo
Betty Romero-Alcalde
Joe Romero-Alcalde
Matt Romero-Dixon
Emily Romero-Dixon
Sivilano Romero-Embudo
Hilario Rubio-Office of the State Engineer- Acequia Liaison
Sandra Rudy- Alcalde
Stephen Rudy-Alcalde
Zyrus Sameii- City of Española- Planning Department
Beth Sanchez-Alcalde
Lucia Sanchez-Alcalde
Michael Sanchez- Alcalde
Joshua Sandoval- Northern New Mexico College- Environmental Science Student
Denise Smith-US Fish and Wildlife Service-
Brian Suazo-Santa Clara Pueblo- Environment Department
Delbert Trujillo- New Mexico Environment Department- Surface Water Quality
Joseph Bruce Tafoya-Santa Clara Pueblo
Angela Valdez-Velarde
Levi Valdez-Velarde
Ruben Valdez-Alcalde
Tony Valdez-Alcalde
Daniel Valerio-Alcalde
Marvin Varela- City of Española
Chuck Voltz-Velarde
Jim Ward- Velarde
Kathy Warren-Velarde
Kay Wiener-Embudo
Valerie Williams- Bureau of Land Management
George Zellers-Dixon
Kathy Zellers-Dixon
Adele Zimmerman-Rinconada

# Appendix F. Programs and Funding Opportunities

*US ENVIRONMENTAL PROTECTION AGENCY (EPA)*

***Clean Water Act State Revolving Fund***

Grant monies to states to aid in the development of State Revolving Funds. These monies are then made available from States in the form of loans or other types of financial assistance to municipalities, individuals, and others for high-priority water quality activities.

*Projects that can be funded through this program*:

- Build or improve wastewater treatment plants
- Agricultural, rural, and urban runoff control
- Wetland and estuary improvement projects
- Wet weather flow control such as including stormwater and sewer overflows
- Alternative treatment technologies.

*Type of assistance*: Low interest loans through States up to four percent below market rates. Some small and economically disadvantaged communities may be eligible for lower rates from some states.

*Who is eligible*: Municipalities, individuals, communities, citizen groups, and non-profit organizations. Eligibility is decided by the States.

*Contact information*

U.S. EPA
Office of Wastewater Management
1300 Pennsylvania Avenue,
Washington, DC 20460
Phone: (202) 260-7360 or (202) 260-2268
Fax: (202) 260-1827
E-mail: srfinfo.group@epa.gov
Web Site: http://www.epa.gov/OWM

***Five-Star Restoration Program***

This program aims to promote community-based wetland and riparian restoration projects.

*Projects that can be funded through this program*:

- Projects with strong on-the-ground habitat restoration components that
    - provide long term ecological, educational, and/or socio-economic benefits to the people and their communities.

*Type of assistance*: EPA provides a matching contribution of approximately $10,000 on average. Projects must have partners, ideally at least five, that will provide matching funds, land, technical assistance, labour, or other in-kind services.

*Who is eligible:* Partners may include

- citizen volunteer organizations
- corporations
- private landowners
- local conservation organizations
- youth groups
- charitable foundations
- federal, state, tribal agencies and local governments.

*Contact information*
Five-Star Restoration Program,
US EPA, Wetlands Division (4502F),
100 Pennsylvania Ave., N.W.,
Washington, DC 20460
Phone: (202) 260-8076 #55
Fax: (202) 260-2356
E-mail: pai.john@epa.gov
Web Site: http://www.epa.gov/owow/wetlands/restore/5star/

***Nonpoint Source Implementation Grants (319 Program)***
These monies are provided to help States, Territories, and Tribes develop and implement programs to prevent and control nonpoint source pollution.

*Projects that can be funded through this program*:
State, Territories, and Tribes receive grant money who will distribute to local groups to support a large variety of activities such as:

- technical assistance, financial assistance,
- technical programs, education, training,
- demonstration projects that implement best management practices
- monitoring specific to nonpoint source implementation.

*Type of assistance*: Grants are first awarded to state agencies through which local organizations can apply for grants. There is a 40% non-federal match requirement for the entire project budget. This can be provided through matching funds (non-federal), labour, equipment, technical services, or other in-kind services.

*Who is eligible?*

- State, local, and tribal governments,
- nonprofit and local organizations

*Contact information*
U.S. EPA,
Office of Wetlands, Oceans, and Watersheds,
1300 Pennsylvania Avenue,
Washington, DC 20460

Phone: (202) 260-7100
Fax: (202) 260-7024
E-mail: ow-general@epa.gov
Web Site: http://www.epa.gov/owow/NPS

*DEPARTMENT OF AGRICULTURE (USDA)*

***USDA - Forest Service***

***Taking Wing***
The intent of this program is to create and enhance partnerships for the management of wetland ecosystems benefiting waterfowl and wetland wildlife. This should coexist with a variety of recreational opportunities on the National Forest System lands.

*Projects that can be funded through this program*:
- On-the-ground wetland enhancement and restoration
- Assessment and analysis with a focus towards on-the–ground projects

*Type of assistance*:
Funds are allocated to Forest Service units through an internal budget process.

*Who is eligible*:
- Non-federal entities and individuals
- Projects that are on National Forest System lands or provide benefits to those lands.

*Contact Information*
Cynthia Ragland,
One Waterfowl Way,
Memphis, TN 38120
Phone: (901) 758-3722 #56
Fax: (901) 758-3850
E-mail: cragland@ducks.org
Web Site: http://www.fs.fed.us/outdoors/wildlife

***Southwest Sustainable Forest Partnership***
SWSFP is developing sustainable community based enterprises capable of addressing the utilization of small diameter trees harvested from forest restoration and fire mitigation projects. Goals of the partnership are:
- Provide technical transfer opportunities that promote the science of healthy forest ecosystems and the acceptable practices for reducing hazardous forest fuels.
- Provide business and marketing expertise opportunities for wood use to build sustainable forest and wood product enterprises.
- Promote sustainable, community-based forest and wood product enterprises.

*Projects include but are not limited to:*

- Projects that use wood biomass as a renewable natural resource to provide clean, readily available energy suitable for use in heating or power systems for public schools, public facilities or commercial buildings or that
- develop sustainable forest practices, markets, and infrastructure in Arizona and New Mexico.

*Who is eligible?* State, tribal and local governments, communities, small businesses, and non-profit organizations can apply. In addition applicants must meet the following criteria:

- Projects must take place in or be directly beneficial to tribes and/or communities within Arizona and New Mexico.
- Projects must be eligible for Economic Action Program funding as set out by the USDA Forest Service and illustrate a collaborative approach to implementation among individuals and groups within the project's regional community who are interested in restoring the diversity and productivity of forest ecosystems.

*Cost and match requirements*

- Indirect costs may not exceed 10% of the total project budget.
- Projects must contain a _non-federal cash and/or in-kind match of at least 20% of the total project cost. (Example - $50,000 (request) x 20% divided by 80% $12,500 match required. Total cost of project = $62,500.)
- Applying organizations or businesses must have the ability to ensure fiscal accountability.
- The contract period lasts for approximately 18 months.

For the Notice and RFP: http://www.emnrd.state.nm.us/forestry/
*Contact Information*
For more information you can contact one of the following coordinators:*

Kim Kostelnik
Program Manager
New Mexico Forestry Division
P.O. Box 1948
Santa Fe, NM 87504
Email: kim.kostelnik@state.nm.us <mailto:kim.kostelnik@state.nm.us>
(505) 476-3337

Tribal: John Waconda
BIA-Southwest Region
(505) 563-3360
johnwaconda@bia.gov mailto:johnwaconda@bia.gov

***Collaborative Forest Restoration Program***

The Collaborative Forest Restoration Program (CFRP) is a new approach to building agreement among people and organizations that care about New Mexico's public forestland. The Program provides grants for projects that restore forests on public or tribal land and improve the use of small trees thinned from those lands. Organizations that have often been in conflict are encouraged to collaborate on the design, implementation, and monitoring of projects that value local and traditional knowledge, create healthy and productive forests and watersheds, and build ownership and civic pride. The CFRP provides an alternative to appeals and litigation over the management of our public forestlands. By working together, small business owners, conservation and environmental organizations, community groups, tribes, colleges, universities and other organizations can qualify for CFRP grants for forest restoration projects that reduce the threat of wildfire, improve watershed conditions, and provide jobs and training to local communities.

*What is the purpose of CFRP?*

- Promote healthy watersheds and reduce the threat of large, high intensity wildfires, insect infestation, and disease
- Improve the functioning of forest ecosystems and enhance plant and wildlife biodiversity by reducing the unnaturally high number and density of small diameter trees on Federal, Tribal, State, County, and Municipal forest lands
- Improve communication and joint problem solving among individuals and groups who are interested in restoring the diversity and productivity of forested watersheds
- Improve the use of, or add value to, small diameter trees
- Encourage sustainable communities and sustainable forests through collaborative partnerships, whose objectives are forest restoration
- Develop, demonstrate, and evaluate ecologically sound forest restoration techniques.

*What are the objectives of the grant program?*

- Reduce the threat of large, high intensity wildfires and the negative effects of excessive competition between trees by restoring ecosystem functions, structures, and species composition, including the reduction of non-native species populations.
- Re-establish fire regimes approximating those that shaped forest ecosystems prior to fire suppression.
- Replant trees in deforested areas if they exist in the proposed project area.
- Create local employment or training opportunities (including summer youth jobs programs) within the context of accomplishing forest restoration objectives.

*Who is eligible?*

- State, local and tribal governments
- educational institutions
- landowners
- conservation organizations

*Projects that can be funded through this program*
Restoration projects must be entirely on, or on any combination of federal, tribal, state, county, or municipal forestlands in New Mexico. The program does not provide grants for the treatment of private land, but CFRP grants can be used for processing facilities on private land that use small trees from thinning projects on public land.

*What level of funding is available?*
Cost share grants of up to $360,000 are available for projects up to 4 years in length. The federal share is limited to $120,000 per year. A 20% non-federal match is required for all federal funds.

*For further information, contact:*
Walter Dunn Program Manager
Collaborative Forest Restoration Program
USDA Forest Service Southwestern Region
333 Broadway Blvd. SE Albuquerque, NM 87102
(505) 842-3425
Email: wdunn@fs.fed.us

COLLABORATIVE FOREST RESTORATION PROGRAM
New Mexico Forests Rural Community Assistance Coordinator:

National Forest Coordinator
Carson
Ignacio Peralta
P.O. Box 558 Taos, NM 87571
505-758-6344

***USDA - Farm Service Agency***

*Conservation Reserve Program*
The purpose of this program is to establish long-term resource-conserving covers on eligible cropland that will conserve soil, water, and wildlife.

*Projects that can be funded through this program*:
Landowners plant cover on marginal cropland either by

- receiving rental payments or
- entering into a costshare restoration agreement while maintaining private ownership

*Type of assistance*: Contracts are typically 10-15 years in length and provide three options for landowners.

- receive annual rental payments of up to $50,000/year
- receive payment of up to 50% of cost to establish cover
- receive payment of up to 25% of cost for wetland hydrology restoration.

*Who is eligible*:

- Individuals, states, local governments, tribes, or any other entity who has owned private land for at least 1 year that is:
    - cropland planted with a crop in 2 of the last 5 crop years
    - marginal cropland that is enrolled in the Water Bank program or suitable to be used as a riparian buffer.
- The land must be either:
    - highly erodable land,
    - cropped wetland
    - devoted to highly beneficial environmental practices
    - subject to scour erosion
    - located in a CRP priority area
    - cropland associated with or surrounding non-cropped wetlands.

*Contact Information*
Contact your local or state Farm Service Agency office
(see"http://www.fsa.usda.gov/dapdfo/")
Department of Agriculture,
Farm Service Agency,
Conservation Reserve Program Specialist,
Stop 0513,
Washington, D.C. 20250-0513
Phone: (202) 720-6221
E-mail: info@fsa.usda.gov
Web Site: http://www.fsa.usda.gov/pas/publications/facts/pubfacts.htm

***USDA - Natural Resources Conservation Service***

***Emergency Watershed Protection Program***
The purpose of this program is to protect lives and property threatened by natural disasters such as floods, hurricanes, tornados, and wildfires.

*Projects that can be funded through this program*:
Includes but is not limited to:

- Clearing debris from clogged waterways,
- Restoring vegetation
- Stabilizing river banks
- Restoring wetland flood retainers.

*Type of assistance*:

- Some funds cover up to 75% of costs to restore the natural function of a watershed.
- Land can be offered for a floodplain easement that would permanently restore the hydrology of the natural floodplain as an alternative to traditional attempts to restore damaged levees, lands, and structures. These funds can cover up to 100%

of the agricultural value of the land, costs associated with environmental measures taken, and costs associated with establishing the easement.

A sponsor must assist in applying for funds. Sponsors can be any legal subdivision of state, local, or tribal governments, including soil conservation districts, U.S. Forest Service, and watershed authorities.

*Who is eligible*: Owners, managers, and users of public, private, or tribal lands if their watershed area has been damaged by a natural disaster.

*Contact Information*
Contact your local or state National Resources Conservation Service office (see "http://www.ncg.nrcs.usda.gov/perdir.html
Department of Agriculture,
National Resources Conservation Service,
Watersheds and Wetlands Division
P.O. Box 2890
Washington, D.C. 20013
Web Site: http://www.nhq.nrcs.usda.gov/CCS/ewpFs.html

***Environmental Quality Incentives Program***
The purpose of this program is to install or implement structural, vegetative, and management practices in priority areas.

*Projects that can be funded through this program*:
Conservation practices such as:

- grassed waterways
- filter strips
- manure management facilities
- capping abandoned wells
- any practices important to improving and maintaining water quality and the general health of natural resources in the area
- land management practices such as nutrient management, manure management, integrated pest management, irrigation water management, and wildlife habitat management.

*Type of assistance*:

- Cost sharing may pay up to 75 percent of the costs of certain conservation practices.
- Incentive payments may also be made to encourage a producer to perform land management practices for up to three years.
- Offers 5-10 year contracts.
    - Maximum of $10,000 per person per year and $50,000 for the length of the contract.

*Who is eligible*: Eligibility is limited to persons who are engaged in livestock or agricultural production.

*Contact Information*
Contact your local or state National Resources Conservation Service office (see "http://www.ncg.nrcs.usda.gov/perdir.html")
Department of Agriculture,
National Resources Conservation Service
P.O. Box 2890,
Washington, D.C. 20013
Phone: (202) 720-1873 or (202) 720-1845
Web Site: http://www.nhq.nrcs.usda.gov/OPA/FB96OPA/eqipfact.html

***Watershed Protection and Flood Prevention***
Works through local government sponsors to help participants voluntarily plan and install watershed-based projects on private lands.

*Projects that can be funded through this program*:
Projects include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, fish and wildlife habitat enhancement, wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres.

*Type of assistance*: Provides technical and financial assistance. Funds can cover:

- 100% of flood prevention construction costs,

50% of costs associated with agricultural water management, recreation, and fish and wildlife habitat

*Who is eligible*:

- Local or state agencies
- County, municipality, town or township,
- Soil and water conservation districts
- Flood prevention or flood control district
- Tribe or tribal organizations
- Nonprofit agencies with authority to carry out, maintain, and operate watershed improvement works.

*Contact Information*
Contact your local or state National Resources Conservation Service office (see "http://www.ncg.nrcs.usda.gov/perdir.html")
Department of Agriculture,
National Resources Conservation Service,
Watersheds and Wetlands Division,
P.O. Box 2890,
Washington, D.C. 20013
Phone: (202) 720-3527
Web Site: http://www.nrcs.usda.gov/NRCSProg.html

***Wetlands Reserve Program***
The purpose of this program is to protect and restore wetlands, riparian areas and buffer zones.

*Projects that can be funded through this program*:
Voluntary program where landowners may sell a conservation easement or enter into a cost-share restoration agreement, while maintaining private ownership.

*Type of assistance*: This program provides three options for landowners:

- Permanent easement - USDA purchases easement (payment will be the lesser of: the agricultural value of the land, an established payment cap, or an amount offered by the landowner) and pays 100% of restoration costs
- 30-year easement - USDA pays 75% of what would be paid for permanent easement and 75% of restoration costs
- Restoration cost share agreement - 10-year minimum agreement to restore degraded habitat where USDA pays 75% of restoration costs.

*Who is eligible*: Individuals, states, local governments, tribes, or any other entity who owns private land. The land must have been owned for at least 1 year and be restorable and suitable for wildlife.

*Contact Information*
Contact your local or state National Resources Conservation Service office (see "http://www.ncg.nrcs.usda.gov/perdir.html")
Department of Agriculture,
National Resources Conservation Service,
Watersheds and Wetlands Division,
P.O. Box 2890,
Washington, D.C. 20013
Phone: (202) 690-0848
E-mail: RMisso@usda.gov
Web Site: http://www.nhq.nrcs.usda.gov/OPA/FB96OPA/WetRule.html or http://www.nhq.nrcs.usda.gov/OPA/FB96OPA/WRPfact.html (fact sheet)

***Healthy Forest Reserve Program*** (HFRP)
The Healthy Forests Reserve Program (HFRP) is a voluntary program established for the purpose of restoring and enhancing forest ecosystems to: 1) promote the recovery of threatened and endangered species, 2) improve biodiversity; and 3) enhance carbon sequestration.

*Benefits*
Restoring and protecting forests contributes positively to the economy of our nation, provides biodiversity of plant and animal populations, and improves environmental

quality. Safe Harbor will be made available to landowners enrolled in the HFRP who agree, for a specified period, to restore or improve their land for threatened or endangered species habitat. In exchange, they avoid future regulatory restrictions on the use of that land protected under the Endangered Species Act.

*Enrollment Options*
The Program offers three enrollment options:
1) A 10-year cost-share agreement; for which the landowner may receive 50 percent of the cost of the approved conservation practices,
2) A 30-year easement, for which the landowner may receive 75 percent of the market value of the enrolled land plus 75 percent of the cost of the approved conservation practices, or
3) An easement of not more than 99-years, for which landowners may receive 75 percent of the market value of the enrolled land plus the cost of the approved conservation practices.

*Who is Eligible?*
To be eligible for enrollment, land must be private land which will restore, enhance, or measurably increase the likelihood of recovery of a threatened or endangered species, must improve biological diversity, or increase carbon sequestration.

***Wildlife Habitat Incentives Program***
The purpose of this program is to develop and improve fish and wildlife habitat on private lands.

*Projects that can be funded through this program*:
Preparation of a wildlife habitat development plan in consultation with the local conservation district. The plan should describe the landowner's goals for improving wildlife habitat and include a list of practices and a schedule for installing them. Plan should show in detail the steps necessary for maintenance.

*Type of assistance*:
- Technical assistance and cost-share agreements where NRCS pays up to 75% of cost of installing wildlife practices.
- Typically 5-10 year contracts.

*Who is eligible*: Those who own or have control of the land which cannot be enrolled in other programs with a wildlife focus, such as the Wetlands Reserve Program, or use the land for mitigation. Other restrictions may apply.

*Contact Information*
Contact your local or state National Resources Conservation Service office (see "http://www.ncg.nrcs.usda.gov/perdir.html")
Department of Agriculture,
National Resources Conservation Service,
P.O. Box 2890,

Washington, D.C. 20013
Phone: (202) 720-3534
Web Site: http://www.nhq.nrcs.usda.gov/OPA/FB96OPA/WhipFact.html

## ***DEPARTMENT OF INTERIOR (DOI)***

### *DOI - Fish and Wildlife Service*

#### ***North American Wetlands Conservation Act Grant Program***

The purpose of this program is to promote long-term conservation of North American wetland ecosystems and the wildlife that depend on them.

*Projects that can be funded through this program*:

- On-the-ground wetland and wetland-associated acquisition, creation, enhancement, and/or restoration.

*Type of assistance*:

- Regular Grant Program (over $50k) and Small Grant Program ($50k or less)
- 1:1 non federal match is required as well as the formation of public-private sector partnerships

*Who is eligible*: Public-private sector partnerships.

*Contact Information*
Department of Interior,
U.S. Fish and Wildlife Service,
North American Waterfowl and Wetlands Office
4401 N. Fairfax Drive, Room 110
Arlington, VA 22203
(Attn: specific grant program)
Phone: (703)358-1784
Fax: (703)358-2282
E-mail: R9ARW_NAWWO@MAIL.FWS.GOV
Web Site: http://www.fws.gov/r9nawwo/nawcahp.html

#### ***Partners for Fish and Wildlife Program***

The purpose of this program is to conserve, protect, and enhance fish and wildlife and their habitats.

*Projects that can be funded through this program*:

- Restoring wetland hydrology
- Planting native trees and shrubs, and planting native grasslands
- Installing fencing and off-stream livestock watering facilities
- Removal of exotic plants and animals
- Prescribed burning
- Reconstruction of in-stream aquatic habitat.

*Type of assistance*: Financial and technical assistance available with a minimum 10-year contract.

- The landowner may perform the restoration and be reimbursed directly for some or all expenses
- A service may hire a contractor to complete the work, or may complete the work itself.

A dollar-for-dollar cost share is sought on a project-by-project basis. In some states where the program is very popular, however, a 50:50 cost share is required.

*Who is eligible*: Although the primary partners are private landowners, anyone interested in restoring and protecting wildlife habitat on private or tribal lands can get involved in the Partners for Fish and Wildlife Program, including other federal, state and local agencies, private organizations, corporations, and educational institutions.

*Contact Information*
Contact your state office for assistance. National, regional and state contacts are listed at http://www.fws.gov/r9dhcpfw/CONTACTS/altcont.html;
U.S. Fish and Wildlife Service,
Division of Fish and Wildlife Management Assistance and Habitat Restoration,
4401 N. Fairfax Drive, Room 400,
Arlington, VA 22203
Phone: (703) 358-2161
Fax: (703) 358-2232
Web Site: http://www.fws.gov/r9dhcpfw/

*NATIONAL FOREST FOUNDATION*

***Matching Awards Program***
The National Forest Foundation (NFF), a private, nonprofit 501(c)(3) organization, chartered by Congress, engages America in community-based and national programs that promote the health and public enjoyment of the 192-million-acre National Forest System, and administers private gifts of funds and land for the benefit of the National Forests. The NFF believes that communities should play a significant role in determining the future of National Forests and Grasslands. By matching federal funds provided through a cooperative agreement with the US Forest Service to non-federal dollars, the NFF Matching Awards Program (MAP) is able to effectively double the resources available to nonprofit partners to implement projects that directly benefit our National Forests and Grasslands.

*Project Emphasis:*

- Wildlife Habitat Improvement
- Recreation
- Community-Based Forestry
- Watershed Health and Restoration.

The NFF is mainly interested in collaborative projects that address the rising demand for outdoor recreation in National Forests and Grasslands through projects activities such as:

- Restoration of impacts of excessive or inappropriate use in sensitive areas
- Improvement of recreational resources through trail restoration and maintenance.

The NFF will support watershed restoration and enhancement projects, especially those initiatives that include diverse perspectives and address critical issues such as non-point source pollution and fish habitat enhancement through project activities such as:

- Sediment reduction through slope stabilization and contouring
- Planting of native species in damaged riparian areas
- Removal of invasive exotic species
- Culvert replacement to improve fish passage.
- Community-based Forestry

The NFF believes that communities can work to improve natural resources, while providing local economic and social benefits. The aim of community-based forestry is to empower those who work, live and recreate in the woods to work together and strive towards a common set of goals. The NFF will make strategic investments in community-based forestry projects, particularly those that focus on forest health and restoration. Projects should address the need for greater collaboration in community-based forestry projects. Local constituencies should be included in the decision-making process through ecological restoration activities and action-oriented training, conservation and restoration projects that support economically sustainable natural resource use, and address wildfire risk reduction and response through project activities such as:

- Collaboratively developed and implemented fuel reduction projects;
- Fire recovery efforts, involving re-seeding, erosion control, and/or riparian restoration;
- Citizen-based monitoring and/or fuels reduction efforts, especially in the wildland/urban interface.

*Match Requirement*- a 1:1 non federal match is required

*Who is eligible?* Applications will be considered from non-federal partners, community-based organizations, Native American tribes and other nonprofit 501(c)(3) organizations doing on-the-ground conservation work on or around National Forests or Grasslands.

***Community Assistance Program***

The NFF established the Community Assistance Program (CAP) to promote

the creation of locally-based, collaborative natural resource partnerships which seek to build ecological, social and economic sustainability. The program will support newly-forming or re-organizing nonprofit organizations that are in need of start-up funds for capacity building that intend to proactively and inclusively engage the local community in forest management and conservation issues on and around National Forests and Grasslands.

CAP awards provide collaborative groups with start-up grants of $5,000 to $15,000, as well as basic tools and guidance, to enable them to resolve differences and play a more active role in the sustainable management of nearby National Forests, Grasslands and surrounding communities. CAP will support the organizational and technical assistance needs of newly forming or reorganizing, multi-party collaborative groups that act as problem-solvers, bringing diverse members of the community together to address specific issues related to community-based forest stewardship, recreation, watershed restoration, and wildlife habitat, through constructive dialogue and hands-on involvement.

Organizations applying for funding through CAP will be considered based on need, and will not be required to match the NFF funds. CAP funds can be used for a wide range of tools, including: technical assistance, training, consultants, community outreach, obtaining 501(c)(3) status, group facilitation, basic start-up and operating costs, materials and equipment, program development, nonprofit management skill building, and communications. If an organization does not have 501(c)(3) status, they must use a nonprofit fiscal sponsor organization with that designation.

*Who is eligible?*
Applications will be accepted from organizations that:

- are newly forming or reorganizing collaborative community-based nonprofit entities;
- are in need of capacity building and start-up organizational and technical assistance; and wish to proactively engage in natural resource issues on and around National Forests and Grasslands.
- Applicants must have 501(c)(3) nonprofit status, or utilize a fiscal sponsor organization with that designation.
-

*Contact Information*
Please contact Adam Liljeblad at (406) 542-2805, ext. 12 with any questions or concerns.

*Forestry Division of the Energy, Minerals and Natural Resources Department (EMNRD)*

***New Mexico Forest ReLeaf Program***
Grant emphasis will be on tree planting conservation projects including:

- street plantings
- windbreaks
- park plantings
- living snow fences

- riparian rehabilitation
- energy conservation
- community green belts
- wetland rehabilitation
- reforestation
- erosion control.

ReLeaf grants can be used for partial funding of larger projects but cannot be used to maintain existing projects. Projects will only be designated for public land and must show substantial public benefit. The Forestry Division reserves the right to require easements or leases to assure public access.

*Contact Information*

George Duda
Santa Fe Office
New Mexico Forest ReLeaf Coordinator
1220 S. St. Francis Drive

Forestry Division Santa Fe Office
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## Appendix G. Resources

**New Mexico Environment Department, Surface Water Quality Bureau,** for information on state watershed and wetland programs, TMDL's, 303d lists, water quality standards and monitoring and assessment.
http://www.nmenv.state.nm.us/SWQB/index.html

**Environmental Protection Agency**, an invaluable website with information on everything water, watersheds, wetlands and ecological restoration. My favorites include:

*Clean Water Act Module*
http://www.epa.gov/watertrain/cwa/index.htm

*Principles for the Ecological Restoration of Aquatic Resources*
http://www.epa.gov/owow/wetlands/restore/principles.html

*Non Point Source Pollution*
http://www.epa.gov/owow/nps/

*Ecological Restoration*
http://www.epa.gov/owow/nps/Ecology/

*Total Maximum Daily Load for the Upper Rio Grande Watershed (Part 2) Cochiti Reservoir to Pilar, NM. Final Approved. June 02, 2005.*
http://www.epa.gov/waters/tmdldocs/11424_URG_Pt2TMDLs.pdf

**New Mexico Office of the State Engineer**, for information on water quantity, water rights, adjudications and water regulation
http://www.ose.state.nm.us/

**Natural Resource Conservation Service Programs**, for extensive listing of available programs
http://www.nrcs.usda.gov/programs/

**Rio Arriba County** now has a website said to be updated daily, some county ordinances are currently available, including a sand and gravel mining ordinance, worth checking out.
http://www.rio-arriba.org

*Mitigating the Effects of Gravel Mining upon Rural New Mexico*
http://www.raintreecounty.com/Recycle.html

**New Mexico Acequia Association**, a good website for acequia matters especially by law creation, water banking, assistance with the open meetings act, technical assistance and workshops
http://www.lasacequias.org/

**United States Geological Survey**, for information on large-scale water measurements such as streams, rivers and some aquifers.
http://www.usgs.gov

**CLIMAS**, for information on climate assessment in the southwest.
http://www.ispe.arizona.edu/climas/

**University of Arizona,** for information on tree ring research.
http://www.ltrr.arizona.edu/resources.html

**Jemez y Sangre Regional Water Plan**, for information on regional water planning.
http://www.dbstephens.com/project_plans/