Wetland and Riparian Management Plan
Alcalde/Velarde Valley, Upper Rio Grande, New Mexico

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Committee Approval

The Master of Water Resources Professional Project Report of **Jessica C Johnston**, entitled **Alcalde/Velarde Wetlands Management Plan**, is approved by the committee:

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Abstract

In New Mexico, riverine wetlands are generally associated with riparian areas found in the floodplains or once floodplains, of the Rio Grande and associated tributaries. Riverine wetlands are supported with water provided by over bank flow from the river, connection to the shallow groundwater, and/or acequia systems. Wetland and riparian areas are impacted by land uses, hydromodification and other activities that occur within a watershed. Wetland and riparian areas play an important role within a watershed by providing many beneficial environmental functions. This paper examines watershed issues affecting the quality of remaining wetland and riparian resources in the valley and proposes a strategy for managing these resources within a watershed context for the Alcalde/Velarde valley located in the Upper Rio Grande Watershed in Northern New Mexico. The Alcalde/Velarde valley community may provide a unique opportunity to protect existing wetland and riparian areas, and to restore degraded or former wetland and riparian areas that have been lost to development and channelization, and to reinstate the functions that wetland and riparian areas once served in this river valley.

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Introduction

The Alcalde/Velarde valley is located in the Upper Rio Grande Bioregion. The valley begins at the lower end of the Rio Grande Gorge where jagged rock faces soften into flat-topped mesas and a wide valley floor expands. The Rio Grande flows along the bottom of the valley in a sea of vegetation, an oasis in this sparse and arid landscape. Large cottonwoods fill the bosque that follow the river's path. Lush fields of alfalfa and orchards create a patchwork in this valley, which has been settled for several centuries.

This valley is one of the oldest inhabited places in the United States. Settlement in this arid landscape has been dependent upon the waters of the Rio Grande and its tributaries. Pueblo people of Ohkay Ohwingeh have been diverting the water from the river to maintain agricultural customs for centuries. The Spanish settled within the valley in 1598, and organized a more formal irrigation system, acequias, which are still intact today. "Water has formed social organization and provided sustenance in this unique culture". (Rio Arriba County, 2007)

Extensive human interference has altered the conditions of wetland and riparian areas in this valley. Activities such as development in the floodplain, channelization and introduction of invasive plant and tree species have changed the functions of these areas.

The river ecosystem has been under pressure in recent years, as the need for housing has increased. Lands available for development in this area are limited because the valley is land locked by federal managed lands; the uplands that were once held by

land grants under the crown of Spain were later converted to federal land. The result has been development of irrigated lands, floodplains and riparian areas.

Land values have risen so dramatically that many families have chosen to abandon agricultural activities and sell the land for profit, and as families grow, land is subdivided for family members. Agricultural activities are still a major activity in the area and there has been a movement to sustain these cultural traditions even in light of rapid modernization occurring at the fringes. A county agricultural land ordinance was put into effect in 2002, in an attempt to curtail fragmentation of the riparian and agricultural lands. (Rio Arriba County, 2000)

Activities including subdivision, development and lack of infrastructure have led to many problems for the community, including nitrate contamination of drinking water supplies by numerous or poorly operating septic tanks, flooding and erosion from building with the floodplain and drainage corridors.

The valley experienced multiple flooding events in the mid 1900's, prompting the Bureau of Reclamation to install a channelization project, altering the hydrologic regime in the area; subsequently many diversion projects were installed.

Wetland and riparian areas have been severely compromised by these activities. It is now assumed that many of the currently existing wetlands, riparian areas and the floodplain are not hydrologically connected to the river due to the down cutting of the river channel after the channelization projects. The river has incised below the floodplain in many places and is completely separated from the valley by an earthen

levee in other areas.

In this valley, acequia seepages and resultant shallow groundwater flows that somewhat mimic the hydrologic activities of the floodplain now define the extent of the riparian vegetation. (Fernald and Guldan, 2004)

Invasive species including tamarisk, Siberian elm and Russian olive have overtaken the bosque, overgrown conditions pose a significant fire risk and limit recreational opportunities. (USDA, 2005)

Protecting valuable wetland and riparian resources and restoring these areas that have been destroyed or have compromised function through development and channelization of the river corridor can reclaim and reinstate many of the ecological functions that wetlands once served within the valley. These functions may include: flood control, ground water and surface water recharge, and improved water quality by capturing sediments, processing nutrients and may provide many secondary benefits such as aesthetics, recreational opportunities and wildlife habitat. (USEPA, 2001)

Among the most important ecosystems on earth, wetland and riparian areas provide critical nesting, rearing, feeding, and stop-over habitat for bird and other wildlife populations in watersheds across the nation. (National Audubon Society, 2007) The valley is home to the federally endangered southwestern willow flycatcher, potential habitat for federally threatened meadow jumping mouse, and a breeding range for federal species of concern, such as the yellow billed cuckoo. The bald eagle also inhabits the area. (USFWS, 2007)

Wetlands and riparian areas are invaluable resources for the community ecologically and culturally. They provide the signature beauty of the Rio Grande Valley in a rather arid and sparse landscape and offer an oasis for wildlife. 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 river valley ecosystems.

In 2004, the New Mexico Environment Department was awarded an EPA wetlands grant to perform wetland and riparian restoration in the Alcalde/ Velarde Valley, to build awareness around wetland and riparian issues and to create an action plan to further develop strategies for improvement of these areas. This plan is the accumulation of all the aspects of the project and is meant to serve as a tool for landowners and management agencies in the watershed interested in improving wetland and riparian conditions.

Planning Area Description

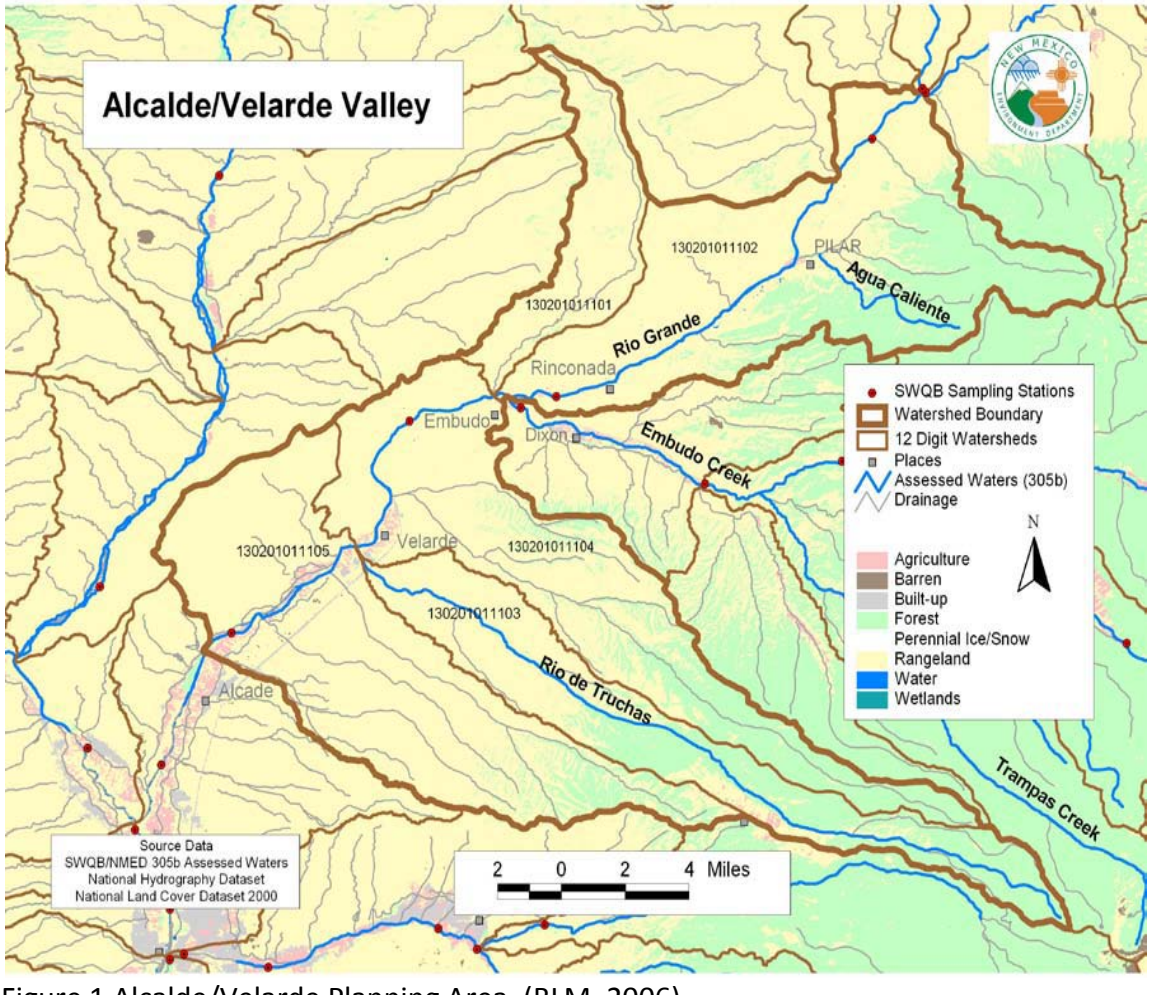

Figure 1 Alcalde/Velarde Planning Area. (BLM, 2006)

The headwaters of the Rio Grande originate in Southern Colorado and extend down through the Rio Grande Gorge. The mesas open up creating a wide valley floor at Velarde (Figure 1). 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. (USDOI, 2000) Recreationalists use this stretch of the river for rafting, kayaking, swimming, painting, introspection, and fishing. Embudo Station is the last settlement before the Velarde diversion dam and is on the National Registry of Historic Places as the oldest intact narrow gauge railroad station in the region. Embudo Station is now a restaurant and is also used as a boating take-out, swimming hole and fishing spot.

From the Velarde diversion dam downstream to the northern boundary of Ohkay Ohwingeh, the valley opens up into orchards and agricultural fields (Figure 2). This area is famous for its fruit production; peaches, apricots, apples, plums and nectarines, although much of the agricultural land is now producing alfalfa. This valley is predominantly privately owned.

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. (Arellano, 2007)

Figure 2 Alcalde/Velarde Valley looking north. (McGraw, 2005)

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. (Fernald and Guldan, 2004) The main agricultural products of the valley are alfalfa, hay and various fruit orchards, including apples.

Extensive human involvement has altered the condition 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. (USDA, 2005)

This area has a rich cultural and landscape history that still has endured to the

present day. 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. (Johnston, 2007)

Stakeholders in the area have repeatedly emphasized that maintaining and honoring these cultural traditions is an important part of managing the landscape and the water resources of the area. (Johnston, 2007)

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. The state of New Mexico, Ohkay Ohwingeh Pueblo and private individuals own the remaining lands. The diversity of landowners each with their own interests and mandates within the planning area shows the importance of creating dialogue and collaborative planning for the future of the resources in the region. (Figure 5)

Surface Water

The Rio Grande is the main surface water body in the watershed; The Rio Embudo meets the Rio Grande at Embudo. The Rio Grande is fed by innumerable tributary streams that carry water from the headwaters in the Sangre de Cristo Mountains.

Two 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 Figure 3 below, the peak flow in the Rio Grande is highly variable, being dependent on yearly snow pack and associated precipitation.

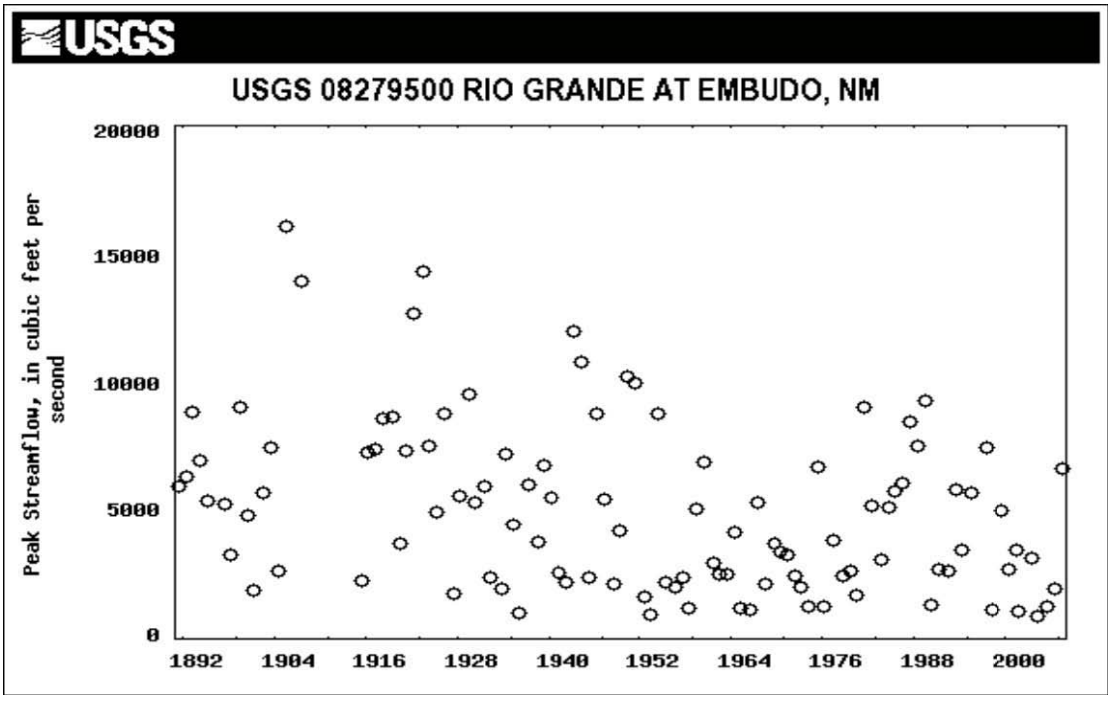

Figure 3 USGS graph peak streamflow 1892-2007

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. The annual peak stream flow at the Rio Embudo is also highly variable (Figure 4).

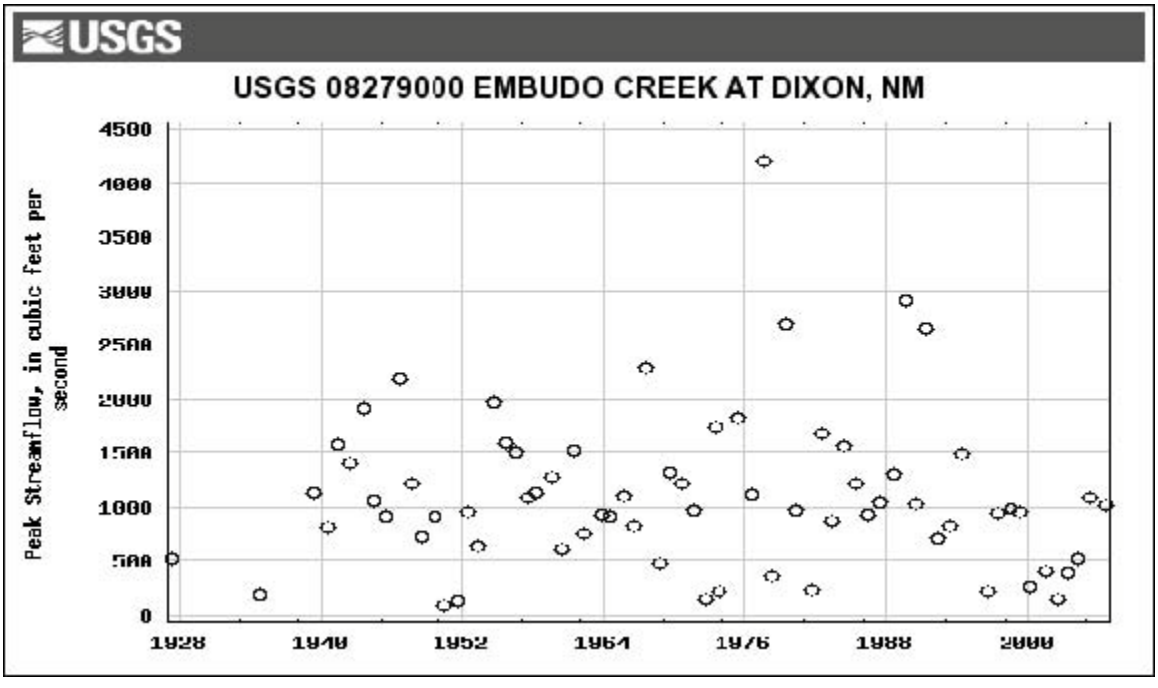

Figure 4 USGS Graph peak stream flow 1928-2007

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.

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 arroyos continue to down cut their channel, are highly erosive and can become severely modified with a large storm (Figure 5). These drainages carry large amounts of sediments and floodwaters into the communities

washing out roads and other infrastructure along the way. These drainages lack vegetation to slow the water or adsorb any of the sediments or other pollutants that might be traveling with the storm water.

Figure 5 Flooded arroyo in Alcalde. (Johnston, 2007)

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 at the lowest point.

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 low temperature at Alcalde is 33.0˚ F and the average high temperature is 70.1˚ F. The average precipitation for the area is 10.35 inches per year according to the Rio Arriba County Soil Survey produced by the NRCS. (USDA NRCS, 2005)

Surface Water Quality

The New Mexico Environment Department periodically samples surface water quality of waters of New Mexico (NM SWQB, 2006). The agency selects designated monitoring stations to characterize the water quality of selected stream reaches.

The NMED has sampled at three stations in the watershed, including The Rio Grande

above Española at Valdez Bridge, Rio Grande at Embudo Station and Rio Grande at Hwy 74 near Ohkay Ohwingeh (See Figure 6 below).

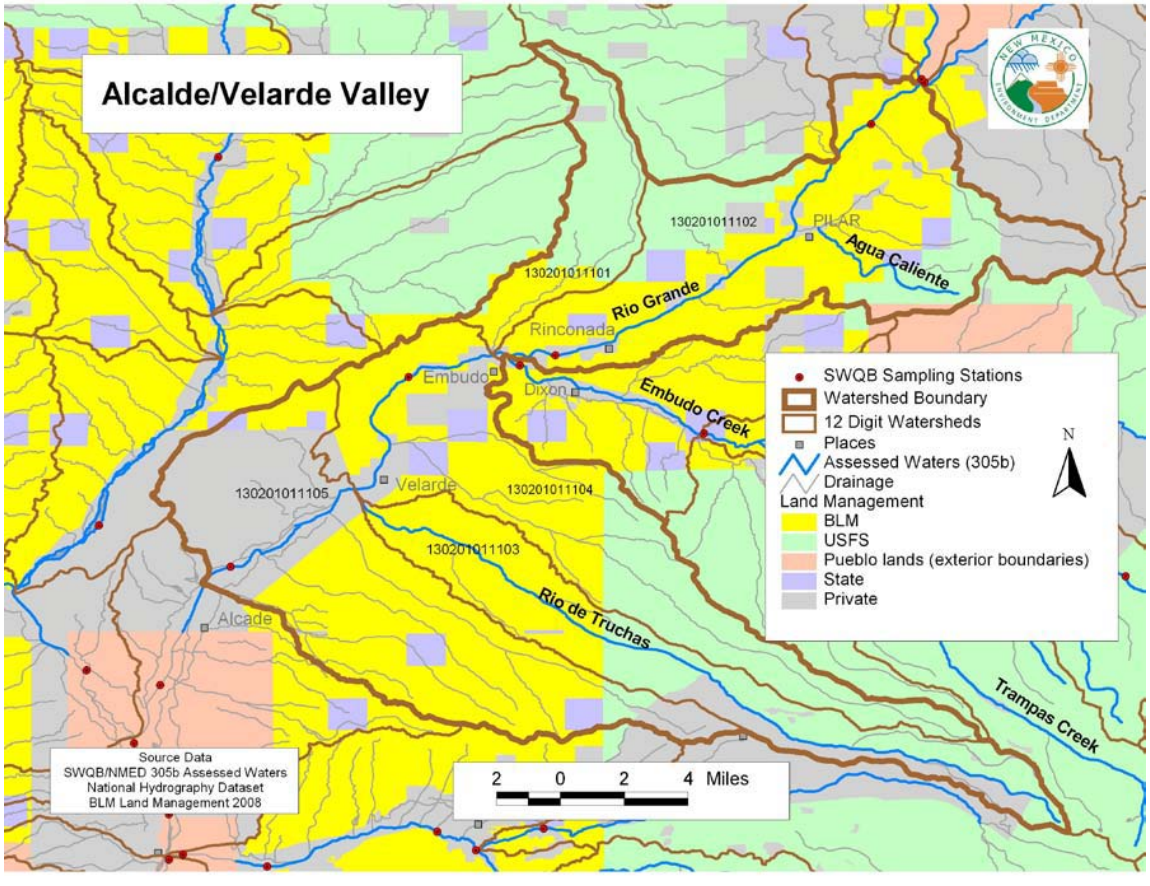

Figure 6 Alcalde/Velarde Land Ownership and NMED Sampling Stations. (BLM,2008)

Data collected by the NMED show that turbidity in this stretch of the Rio Grande (non-pueblo Santa Clara to Embudo Creek) is exceeding state standards and impairing the designated uses of marginal warm water fishery and coldwater fishery. (NM SWQB, 2006) see Table 1.

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**

Table 1 Pollution Source, Measured Load, Location and Potential Sources. (NM SWQB, 2006)

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 accumulate at the bottom of a 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 also vary. Turbidity exceedances are generally attributable to impacts such as soil erosion, excess nutrients, and displacement of materials within the watercourse during high flow events.

Total Maximum Daily Load (TMDL) calculations are developed for stream reaches not meeting New Mexico water quality standards. NMED has developed a Total Maximum Daily Load for turbidity. Estimates have been made in the TMDL document that calculate the necessary reduction of these pollutants into the watercourse, improve and hopefully, eventually meet water quality standards. (NM SWQB, 2006) Their calculations are as follows (Table 2):

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**

Table 2 Location, Load Allocation, Measured Load and Load Reduction. (NM SWQB, 2006)

Planning and Outreach

Efforts to improve surface water quality impairments from non point sources are facilitated through non-regulatory watershed management plans that are developed with participation from stakeholders within a given community. The premise behind this initiative is that the pollutants can be highly varied from multiple and sometimes unknown sources. In many instances the pollution is coming from numerous properties or places and requires participation across political boundaries. There is not a regulatory program in place to control non point source pollution, so we are dependent on voluntary community wide participation to identify potential sources and implement watershed projects that will improve the health of the watershed with the underlying goal of improving water quality.

Funding is provided from the US EPA to the states that distribute CWA 319 funds to communities that are facing surface water quality impairments. Funding is provided to organize watershed groups and limited funding is provided to implement on the ground projects as determined through the planning actions of the group. As a watershed group becomes more organized and fiscally responsible, there is a wide range of funding opportunities available to address other watershed issues as determined by the stakeholders of the community.

A primary directive of a watershed management plan is to seek remedy for water bodies not meeting water quality criteria and that have a TMDL calculation in place. A watershed plan is a planning document that is created by the stakeholders in a watershed to identify potential non point source pollution sources and other problems

within a watershed area and to seek corrective measures though identification of remediation projects for these and other ongoing watershed issues. The Alcalde/Velarde watershed management plan was released in 2007, after two years of work sessions with stakeholders in the area including farmers, ranchers, landowners, and federal, state and local government representatives to identify and prioritize local concerns. (Johnston,2007)

Major issues pinpointed for remedy within the watershed included arroyos and drainages, as well as severe erosion in the uplands that has lead to major flooding problems in the valley. Many of the arroyos discharge directly into the Rio Grande washing major amounts of sediment down the watercourse. All of the drainages flow through the valley, across roadways and some directly into the Alcalde acequia. Illegal dumping, although it is not directly related to water quality impairment, was an issue the community felt was significantly important as it could lead to future water quality issues. Stakeholders repeatedly emphasized the importance of maintaining and expanding agricultural customs and to retain water quality and quantity within the acequia systems. Stakeholders, especially those with leased grazing lands, are interested in improving the quality of the range lands and preventing erosion. Mining, illegal ATV use and development, all factors causing erosion, were also concerns. Wetland and riparian areas were key concerns in the watershed area due to many of the issues presented in introduction. (Johnston, 2007)

In addition to the non-point source planning, this area had also been selected by the NMED in a separate project as a target area for wetland restoration and wetland action

plan development. (McGraw, 2004) Although the greater watershed plan addressed many of the issues affecting wetland and riparian areas, the intent was to create a separate action plan to address restoration and specific river valley issues. A focus group of stakeholders convened various times to discuss their vision for the wetland and riparian resources in the valley. Some had wetlands that needed to be restored, others had restoration projects completed by US Fish and Wildlife service, Partners for Fish and Wildlife program and some just had a keen interest in protecting the magnificent beauty of the valley. The wetlands group met several times to discuss concerns and opportunities. In addition to the information generated for this report, an educational component was created and further interested property owners were identified for potential restoration projects.

Outreach for this project was imitated in the summer of 2005, with community networking to introduce the project and build support for the effort. Initially, outreach involved coffee with community members, presentations at various public meetings and meetings with local representatives. Stakeholders were very enthused and utterly gracious through extending invitations to visit their homes and tour their properties.

Once enough support and awareness was built, a project initiation meeting was held on October 16, 2005, at the Embudo Station. The meeting purpose was twofold, one purpose, to get everyone in the same room and officially introduce the project, and the other, to identify private landowners who were interested in having restorations done on their property. Representatives from the NMED Wetlands department and the

US Fish and Wildlife service, Partners for Fish and Wildlife program came to make official presentations of services they offered. Maryann McGraw of the NMED began with a presentation on wetlands restoration (figure 7). She gave the attendees information on the benefits of wetlands intercepting non- point source pollution as well as showing slides of various restoration projects. Denise Smith of Partners for Fish and Wildlife followed with her presentation on the programs for restoration offered by US Fish and Wildlife. She presented various funding opportunities for landowners interested in wetlands and riparian restoration. The meeting was quite successful with 26 people participating (figure 7).

Figure 7 Wetland and Riparian Town Hall Meeting, Embudo Station. (Johnston, 2005)

The second meeting of the wetland and riparian restoration group occurred December 2005, at the Onate Center in Alcalde. A presentation was given by David

Morgan of La Calandria and associates, a wetland and riparian restoration specialist, who had done extensive work at the Pueblo of Ohkay Ohwingeh and who was also the contractor for this project (Figure 8). His presentation was very informative and educational; he discussed reasons for ecosystem decline and restoration methods used in the valley.

Figure 8 Dave Morgan, Presenting to Wetlands Focus Group. (Johnston, 2005)

An environmental science class from Northern New Mexico Community College joined the wetlands group to learn about wetlands in the community and to participate in hands- on learning opportunities. The student group met weekly throughout the spring of 2006 to examine values and issues associated with the wetland and riparian areas in the valley. The students participated by completing general wetland and riparian research, by interviewing elders in the community about the changes in landscape over time, visiting NMSU Agricultural Science Station to talk with local water

researchers about the field work taking place in the valley and attending a lecture session with a wetland restoration contactor who gave them an overview of the issues in the valley. They participated in a wetland restoration project at the Cottonwood Ranch, which included planting 20 cottonwood poles and 50 native shrub species (Figure 9).

Figure 9 NNMC Students, Yvonne Lehman and Joshua Sandoval Participating in Wetlands Restoration Project. (Johnston, 2006)

The students were very excited to participate in the exercise and generated a presentation to share their findings with the larger community. In May, students made

final class presentations and a poster display about wetland restoration in the Alcalde/Velarde valley to environmental science students, the greater NNMC community and to Espanola High School students (Figure 10).

Figure 10 NNMC Students, Yvonne Lehman, Joshua Sandoval and Elias Griego, Presenting Results of Restoration Project. (Johnston, 2006)

The final component of the outreach efforts were four wetland and riparian restoration projects completed within the valley to serve as demonstration sites. The projects were all done on private property and included the Cottonwood Ranch, the Maestas property, La Estancia Allegra Ranch and Los Luceros. Restoration projects will be discussed in detail later in document.

What are Wetlands and Riparian Areas?

The federal Clean Water Act defines wetlands as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (USEPA, 2004)

"Wetland" is a generic term for all the different kinds of wet habitats where the land is wet for some period of time each year but not necessarily permanently wet. They may not always be wet but they are lands, “which are subject to periodic or permanent wetness, or saturation in which the soil composition may become hydric (*hydric soil is means that it does not have enough oxygen for some plants to grow*), and the development of hydrophytes (*water loving plants*) may form”. (Tiner, 1999) Many different types of wetlands have formed around the world. Wetland types will vary within each region but will generally form “where surface water is pooled or groundwater discharges sufficiently enough to create waterlogged soils…but wetlands do not need to be permanently flooded”. (Tiner, 1999)

Along the Rio Grande Corridor, wetlands are most commonly found within the river valley in relatively flat low-lying areas of the floodplain and shallow diversions for acequias. Riparian habitats commonly referred to as a *bosque* in New Mexico, include “wetlands and non-wetlands whose pheatophytic vegetation depends on river (acequia) or groundwater for growth and reproduction”. (Tiner, 1999) Some riparian habitats in arid regions fail to meet the hydrologic component that defines a wetland, yet when

rainfall does occur these areas provide many of the wetland functions. The riparian zone includes the once former floodplain where the river used to migrate back and forth.

Common services that wetlands provide are related to their place in the landscape. In the case of the Alcalde/Velarde Valley, wetlands are riverine type or found in the floodplain and riparian corridor of large streams and rivers. (Tiner, 1999) Functions and values include water purification, flood conveyance and storage of floodwaters, stream bank protection and erosion control, aquifer recharge, fish and wildlife habitat, recreation, social and cultural activities.

Wetland and Riparian Functions and Values in the Watershed

Functions

Water Quality

"Wetlands have important filtering capabilities for intercepting surface water runoff from higher dry land before the runoff reaches open water" (USEPA, 2008) "As the runoff water passes through, the wetlands retain excess nutrients and some pollutants, and reduce sediment that would clog waterways and affect fish and amphibian egg development" (USEPA, 2008)

Local wetlands and riparian areas can help to improve water quality in several ways. Water, as it moves through the landscape towards the main water body picking up sediments along the way, is slowed by wetlands, which allows the suspended sediments to drop to the wetland floor. Nutrients from agricultural fields and leaking septic tanks that are dissolved in the water are processed by microorganisms in the soil or taken up by plant roots and used in their growth process; soil particles also attract and absorb certain pollutants. Wetlands can be extremely effective in removing most of the water's nutrient and pollutant load. (USEPA, 2001)

Wetlands treat water in a variety of ways and could be considered to operate like a biological filter. Most wetlands support a dense growth of vascular plants that are adapted to specific conditions. "Flood tolerant plant species, hydrophytes, have evolved to overcome a variety of stressors that would ultimately destroy other upland plants". (Campbell and Ogden, 1999)

Flood Control

Wetlands store and release water from storm events or peak flow events. They can provide storage capacity to reduce downstream flood volume. “An acre of wetlands can hold between 1-1.5 million gallons of water”. (USEPA, 2001)

Stream bank Protection

Wetland and riparian areas in the floodplain, when functioning correctly, provide a buffer zone on which flood waters can be adsorbed and dispersed, the water that is adsorbed does not remain in the river channel will lessen the impact of down cutting and erosion on the river banks and in the channel.(USEPA, 2006)

Aquifer Recharge

Wetlands can maintain shallow groundwater levels through seepage into the aquifer and in this case possibly base flow to the Rio Grande. This is important in the Alcalde/Velarde Valley where residents rely on groundwater as a sole source water supply.

Wildlife Habitat

Many species, including federally threatened or endangered species, are dependent on local wetland and riparian ecosystems for forage, nesting and perching, and breeding for either all or part of the year. Rio Grande corridor is an important migratory bird corridor and critical habitat for the Southwestern willow fly catcher, a federally endangered species. The valley is potential habitat for federally threatened meadow jumping mouse, and a breeding range for federal species of concern the yellow-billed cuckoo. The bald eagle also inhabits the area. (USFWS, 2007)

"In the Rocky Mountains, wetlands occupy only one percent of the landscape but support 81 percent of the area's migratory bird populations". (National Audubon Society, 2007) An immense variety of species of microbes, plants, insects, amphibians, reptiles, birds, fish, and mammals can be part of a wetland ecosystem (Figure 11).

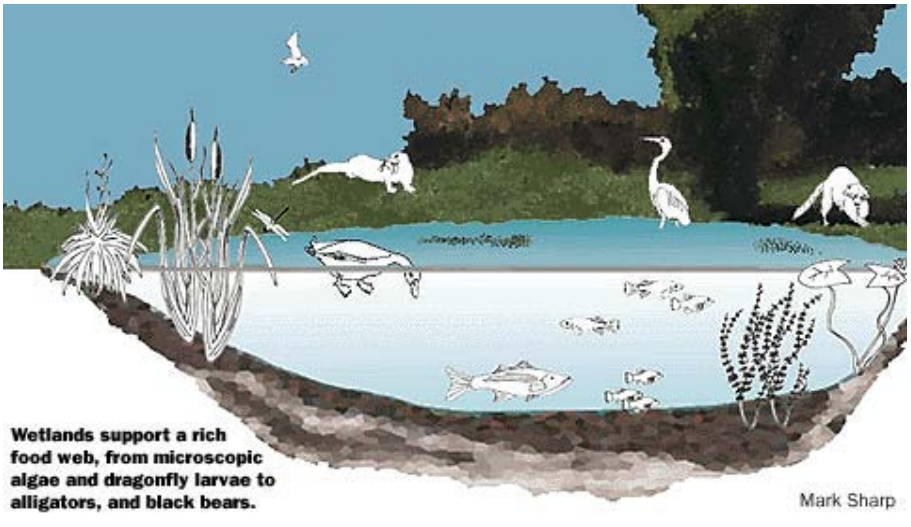

Figure 11 Illustration of a Food Web. (USEPA, 2007)

The National Audubon Society has named this valley as an Important Bird Area (IBA). IBA's are sites that provide essential habitat for one or more species of bird. IBA's include sites for breeding, wintering, and/or migrating birds. Bald eagles, bank swallows and wood ducks have been seen along the Rio Grande in the area.

Additional species of conservation concern that have been seen at Los Luceros (National Audubon Society, 2007); American dipper, back-throated gray warbler, Clark's

nutcracker, cordilleran flycatcher, vermillion flycatcher, eastern bluebird, Grace's warbler, gray flycatcher, green-tailed towhee, Macgillivray's warbler, Osprey, piñon Jay, prairie falcon, red-naped sapsucker, sage thrasher, Virginia's warbler, Williamson's sapsucker, and yellow-billed cuckoo.

Figure 12 vermillion flycatcher (Pyrocephalus rubinus) (Niemeyer, 2005)

Values

Wetlands and riparian areas along the Rio Grande in this valley are some of the greatest community assets that the residents enjoy. The bosque provides outstanding opportunity for recreational activities. Public and private lands provide many recreational activities including river access, fishing, boating, birding and sightseeing. Fishing is year round and includes opportunities for game fishing rainbow trout, brown trout, northern pike, catfish, and small mouth bass. (USDOI, 2000) This segment of the Rio Grande is also popular with river rafters.

"The scenic and cultural value of the Rio Grande bosque is considered unique in this area." (USDOI, 2000)

Economics

The economic value of wetlands and riparian areas is seldom considered when these areas are destroyed or modified. It is expensive, if not impossible, to recreate the some of the functions that riparian and wetlands areas (Table 3). Water treatment facilities, storm water management and flood control structures are just some examples of infrastructure that has to be recreated to compensate for functions that are lost. Additionally, other external costs are passed on to taxpayers, such as, an increase in flood frequency and intensity as wetlands and buffer zones in the bosque disappear resulting in reoccurring property and infrastructure damage, as seen in the Alcalde/Velarde valley. The actual costs to replace these services and repair the ongoing destruction are expensive and burdensome. The ecological services that are provided by wetland and riparian areas are lost as acreages disappear or their function is compromised. This can trigger additional federal requirements such as the TMDL developed for the Rio Grande in this area. Static and manipulated conditions in the bosque have created a loss of biodiversity and degraded wildlife habitat.

Wetland/Riparian Function	Necessary Remedy
Water filtration	Water treatment facilities
Stormwater capture	Stormwater infrastructure
Attenuation of flood waters	Flood control structures
Water infiltration	Costly well drilling/alternate supply

Table 3 Wetland and Riparian Function vs. Remedies required when function is lost. (Cappiella et al., 2006)

When discussing economic value we cannot ignore the potential of healthy wetland and the bosque areas to produce revenue thru passive activities such as hunting, bird watching and fishing, not to mention the value of such priceless activities as cultural legacy and further research opportunities. According to the EPA, in 1991 ecotourism activities related to wetlands such as hunting, fishing, bird watching and photography contributed fifty nine billion dollars in to the national economy. (EPA, 2001) The valley is economically depressed and has long sought solution to economic development that is appropriate to the landscape and the resources of the region. Ohkay Ohwingeh at the southern boundary of this project has operated fishing lakes, just north of Española, which are actually a series of wetlands. The lakes are enjoyed by residents and tourists alike, generating income for conservation as well as necessities like gas, food and services.

As we lose these important areas to development or neglect we see a “reduction in recreational, educational opportunities and aesthetics and open space affecting the quality of life for watershed residents”. (Cappiella et al., 2006)

Why Manage Wetland and Riparian Corridors in a Watershed Context?

Watersheds are defined by hydrologically connected drainage areas that cross political boundaries and include private and public lands. (Briggs, 2003) A watershed perspective that considers ecological conditions is critical for developing recovery strategies for bottomland ecosystems such as riparian and wetland systems". (Briggs, 2003) We need to understand current and former ecosystem conditions in order to understand reasons for ecosystem decline and to determine possible outlooks when considering "restoration". In the same fashion, wetlands and riparian systems are not isolated phenomena, they are a piece of an ecosystem and they are a linkage in the larger picture.

Upland watershed conditions determine how water is conveyed to the lower points in the watershed. Watersheds that have past land abuse such as overgrazing, clear cutting or unlimited development often develop unstable channel systems including gully systems. These systems channel increased runoff and sediment loads. Vegetation regulates sediment by slowing water and dissipating energy so that water infiltrates into the soil. Disturbances in this valley such as development, drought, overgrazing, wildfires and mining all have an effect on the vegetative cover in the watershed. Addressing watershed issues from the top of the watershed will allow for an inventory of all indirect impacts to the river valley areas. (Briggs,2003)

It is important to view wetland and riparian systems within a watershed-planning context for maximum allowable benefits. The proportion of the values that wetland

areas provide is proportional to the area of these landforms. Continuous unfragmented areas are necessary: “Research suggests that continuous, ecologically functioning riparian corridors have beneficial effects on water quality, wildlife and fish habitat, overall ecosystem function and landscape aesthetic quality.” (Forman and Godron, 1986) Wetlands provide the maximum value to the ecosystem when they are continuous and the most value to wildlife when they are connective corridors.

“Communities need to manage wetlands on a watershed basis rather than an individual basis to maximize the value of wetland services.” (Cappiella et al., 2006) Riparian and wetland ecosystems serve as an interface between the land and the water. “Riparian ecosystems provide critical ecological functions that serve to mitigate the impacts of land use activities” (Dwire and Lowrance, 2006) Healthy wetland and riparian areas can serve to minimize pollution coming from upland activities and provides many other ecological services in the watershed.

Watershed Activities Affecting Wetlands- Direct and Indirect Impacts

Wetlands are found in the lowest point in the landscape and are affected by all land use activities within the watershed or contributing drainage area. They are subject to impacts from direct activities such as filling in a wetland for development and from indirect activities such as disturbances within the watershed, alteration of hydrology and invasive species.

Direct Impacts

"Direct impacts to wetland would include draining, dredging, filling and flooding within a wetland boundary". (Cappiella, 2005) These activities are currently regulated under Section 404 of the Clean Water Act. "Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill materials into the waters of the United States, including wetlands" (USEPA, 2004)

The U.S. Army Corp of Engineers issues both regional and individual, section 404 permits. Regional permits are issued as a blanket for activities that are routinely needed and cause minimal or no adverse impact. The purpose of this regional permit is to "streamline the permitting process for minor, non-controversial projects, which are substantially similar in nature and cause only minimal individual and cumulative environmental impacts". (USACE, 2002)

"A regional permit currently exists for the headwaters of the state of New Mexico, activities covered under this permit are commonly performed channel modification

activities including stream bank stabilization, channelization, channel lining, drop structures, energy dissipaters, detention dams and ponds, channel shaping, bank reshaping, grade control, channel in culverts or storm drains, diversions, maintenance excavation and soil bioengineering, and excludes,

1) Projects located in riparian zones immediately adjacent to waters of the United States.

(2) Special aquatic sites, including wetlands, in or adjacent to, waters of the United States.

(3) Perennial waters of the United States or perennial reaches of intermittent waters of the United States.

(4) Projects located within 1 stream linear mile of any other channel modification project". (USACE, 2002)

An action that would fall in the exclusion would require an individual permit. Individual permits are also issued by the USACE. "A permit applicant must demonstrate that they have taken steps to avoid impacts to a wetland, minimized any potential impacts and preformed mitigation to compensate for any avoidable wetland impacts to the extent practicable". (Cappiella, 2005)

An inquiry was made to the USACE office in Albuquerque to establish individual permit statistics for the watershed. This information is unavailable at this time as the database is not set up to accommodate specific area requests that are at the scale of the project area. (Borda, 2007)

The authority provided under the section 404 program is limited and only provides regulation for individual wetlands. New decisions by the Supreme Court have also left some wetlands vulnerable as they cannot be regulated if they are isolated or lack connectivity to navigable waters of the US, as outlined in the recent Supreme Court decisions *SWANCC v. US Army Corp of Engineers (2001)* and *Rapanos v. United States (2006).*

As outlined above, any activities occurring within the watershed are covered by the regional permit. The permits do not consider the cumulative effect that wetland degradation has within a watershed. The permit procedure does not protect wetlands from indirect impacts that are occurring in the watershed.

Indirect Impacts

Watershed disturbances in the valley have indirect impacts on the wetland and riparian areas. Long term federal management practices and climatic conditions have a produced the elements present in the watershed today, the very elements that determine the upland conditions of the watershed that are conveyed the lower parts of the watershed via drainage corridors. At the highest parts of the watershed are the forested areas, fire suppression as created overgrown conditions that are potential wildfire catastrophe. At the piñon- juniper area, drought and past grazing practices have determined the landscape (Figure 13). At the lowest areas of the valley mining and

development have occurred. All these activities have a cumulative effect on the Rio Grande, the riparian areas and the wetlands. (Johnston, 2007)

Figure 13 Erosion in the piñon-juniper region of the valley. Alcalde, NM. (Johnston, 2007)

Land Use

Land uses along the valley include irrigated row crops, pasture, bosque and residential communities. This reach of the valley has been under tremendous development pressure in recent years. In many cases, farmland has been subdivided and sold for home-sites.

New Mexico State University Agricultural Science Center has completed an analysis of land use change over the time period of 1962- 2003 to measure impacts to water resources for the Alcalde area. (Ortiz et al., 2007) (Table 4)They separated land use into six categories: residential, riparian, orchard, undistinguished row crops, pasture and fallow.

Land Use	1962	1997	2003	% Change
Residential	139.1	639.49	908.8	+553%
Riparian	436.9	382.29	420.5	-3%
Orchard	289.3	100.40	88.3	-69%
Row crops	415.2	207.50	193.0	-53%
Pasture	422.2	607.90	621.90	+47%

Table 4 Land Use Change for Alcalde, 1962-2003 units in acres. (Ortiz et al., 2007)

Orchards have declined possibly due to the age of the trees or conversion from row crops and orchards that require high labor input- pruning, planting, watering, weeding, pest control and harvest and are extremely vulnerable to a late frost, to pasture a comparatively low labor input which involves periodic plantings, watering and mechanical harvesting, can be stored and sold at later date. These trends are also a reflection of global economics, dependence on fossil fuels and change in regional

economics.

Table 4 shows a 3% decline in the total riparian area, which is expected because the initial results of this study are post channelization, creating a relatively static environment in the bosque. This study was conducted after the settlement of agriculture fields.

We can see that there has been a substantial rise in residential areas since 1962. The total acres in residential areas in 1962 were 139, as compared with 2003 when there were 908 acres of residential land. (*Ortiz et al., 2007*) As land is developed for housing and roads, the vegetative cover is lost and land surfaces become impervious. As imperviousness increases in the watershed there is increased runoff and non-point source pollution in the form of sediments into the rivers and acequias. The soils in the valley tend to be highly erodible and land forms have completely washed away when hard surfaces were created.

Impacts from imperveriousness 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. (USEPA, 2006)

River Channelization

Flooding used to be a common occurrence on the Rio Grande. As development increased in New Mexico people who inhabited the floodplain were becoming increasingly frustrated by damages to properties and agricultural lands. The Middle Rio Grande project was authorized by congress to relieve some of these stresses. “The Reclamation project extends along the Middle Rio Grande Valley from the Velarde area south to the backwaters of Elephant Butte Reservoir.” (USBR, 2008)

The Bureau of Reclamation channelized the Alcalde/Velarde reach of the Rio Grande during this project. (Figure 14) “River realignment and improvement work between Velarde and the mouth of the Rio Puerco was begun in 1954 and completed in 1962”.(USBR, 2008) The Rio Grande in this area of the valley has incised dramatically since the river was channelized. This has resulted in a decrease in over bank flooding, lowering of the water table and indirect changes to the habitat biodiversity.

“Channelization of a river may lead to higher velocities of the water due to increased channel slope and decreased friction with the riverbank and river bed”.(USEPA, 2006) These higher velocity waters are causing stream bank erosion, and could potentially lead to higher rates of flooding. “Channelization also impacts biological, physical habitat including decrease in pool rifle structures decrease in canopy increase in solar radiation, channel incision and increases in sediment”. (USEPA, 2006)

Channelization of the river corridor and loss of wetlands has also decreased the

ability of the river to adsorb unusually high flows that occur intermittently, which has led to bank degradation and instability. Wetlands act as a sponge able to absorb excess waters and slowly release and distribute the energy of a water body as well as providing a buffer zone of plant life that can be an effective means of erosion control and bank stabilization.

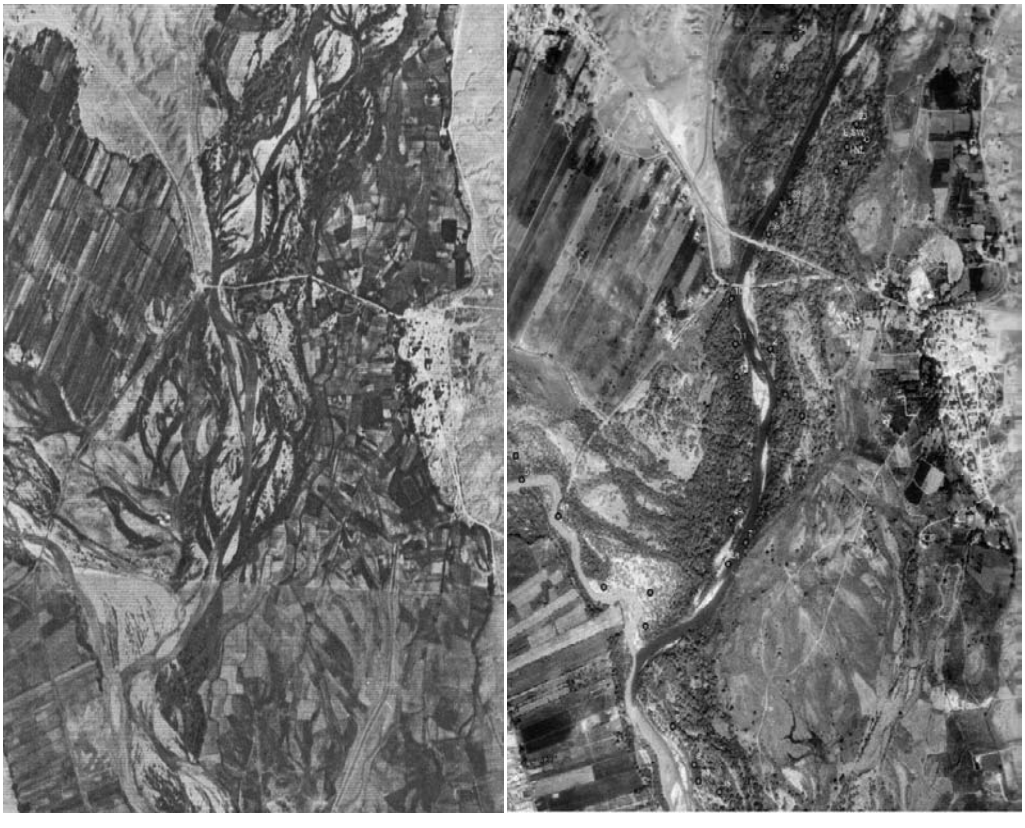

Figure 14 Aerial photographs depicting pre- channelization (1934) and post-channelization (2002) of the Rio Grande in the Alcalde/Velarde Valley. (USGS 1934 and 2002)

Flood control structures have limited or prevented natural flooding events in the area. The levees, diversions and channelization has constrained the natural flood plain

and restricted the natural meanders of the Rio Grande. These events have altered the sediment deposition and hydrologic conditions necessary for regeneration and maintenance of cottonwood bosques. (Dressen, 2003) Without these elements in place the composition of the bosque has changed to higher salinity levels in the soil, many invasive species present and an over accumulation of woody debris as seen in the valley.

The life cycle of many riparian plants (hydrophytes) including cottonwood and willow trees are dependent on annual flooding that would generally happen in the spring. (Figure 15) “They produce seed only in this short period, the flood coinciding with seed dispersal scours away existing vegetation and creates a germination site”. (Stromberg, 2003) To germinate the seeds require moisture until the roots can reach the shallow water table.

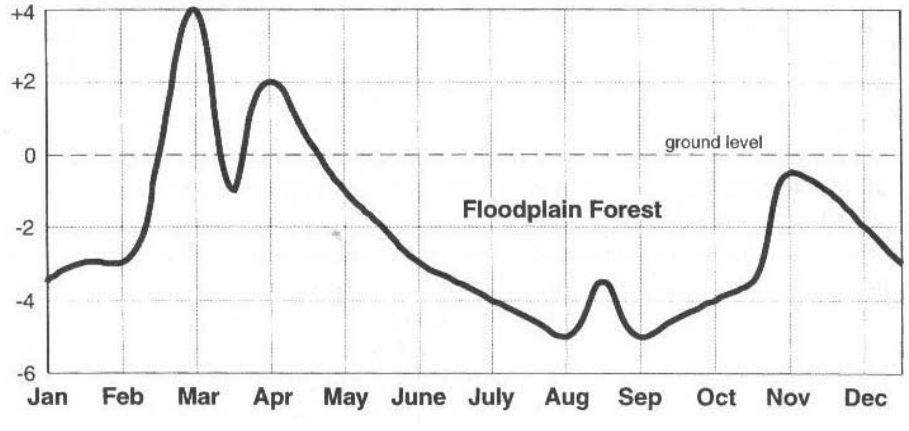

Figure 15 Hydrograph for typical riverine type riparian and wetland area (Tiner, 1999)

In addition, the flooding serves the very important process of flushing out salts,

sediment and debris. If it were not for the diversions of the acequias, we would probably see a lot less riparian vegetation in the valley. Cottonwood and willow species are drought intolerant. Conversely, many non-native species are better adapted to the static conditions caused by the channelization of the river. (Figure 16)

Figure 16 Earthen levee (left) separates river from the bosque at Alcalde, NM. (Johnston, 2007)

Invasive Species

Exotic phreatophytes have invaded the bosque and the agricultural lands of the Rio Grande in the Alcalde Valley. Dense stands of exotic trees have limited recreational opportunities and increased the risk of wildfire. "Saltcedar (*Tamarisk spp*) and Russian Olive (*Elaeagnus angustifolia L.*) were originally introduced for erosion control". (USDA, 2005) Salt cedar increases groundwater consumption, soil salinity, decreases wildlife habitat and proliferates bosque fires. "The salt cedar has a very deep root system and is able to survive even when ground water tables began falling". (Stromberg, 2003)

Salt cedar excretes salts from its leaves and can tolerate the soil salinity it produces, including the soil salinity caused from buildup of salts that occur when flooding does not occur. These conditions can produce a monoculture, which can lead to loss of biodiversity within this riparian ecosystem. Removal of these exotic trees is the goal of many management plans, but removal of the trees without addressing the underlying reasons why these species are flourishing is problematic. These trees are considered robust and are readily adaptable to the riparian conditions we have created, but studies from the University of Arizona have concluded that native riparian vegetation can be restored when hydrologic changes in the river are restored to "normal", because the "cottonwood seedlings can physically dominate the salt cedar by shading out seedlings". (Stromberg, 2003) So, one of the major reasons that the exotics have proliferated, is due to the new conditions that are more favorable to exotic vegetation. (Figure 17)

Figure 17 Invasive species in the bosque at Alcalde, NM. (Johnston, 2007)

Salt cedar has become a nesting site for the Southwestern willow flycatcher as an alternative to native species, because of species failure. This has created some entanglements when restoration plans are created because when you damage the habitat of an endangered species you may be liable for a “taking” under the Endangered Species Act.

Wetland and Riparian Restoration Projects Completed as Part of this Project

Four wetland and riparian restoration sites were chosen for restoration as part of this project; Cottonwood Ranch, Las Estancias Allegra Ranch, Historic Los Luceros property and the Maestas property. (Figure 18)The demonstration projects in the watershed were selected based on landowner willingness to participate in the project, to have their private lands restored and to donate time or services such as excavation or labor. All four projects were completed by the NMED and contractors. The demonstration projects were highly successful and resulted in bigger lessons applicable to wetland and riparian restoration in the valley.

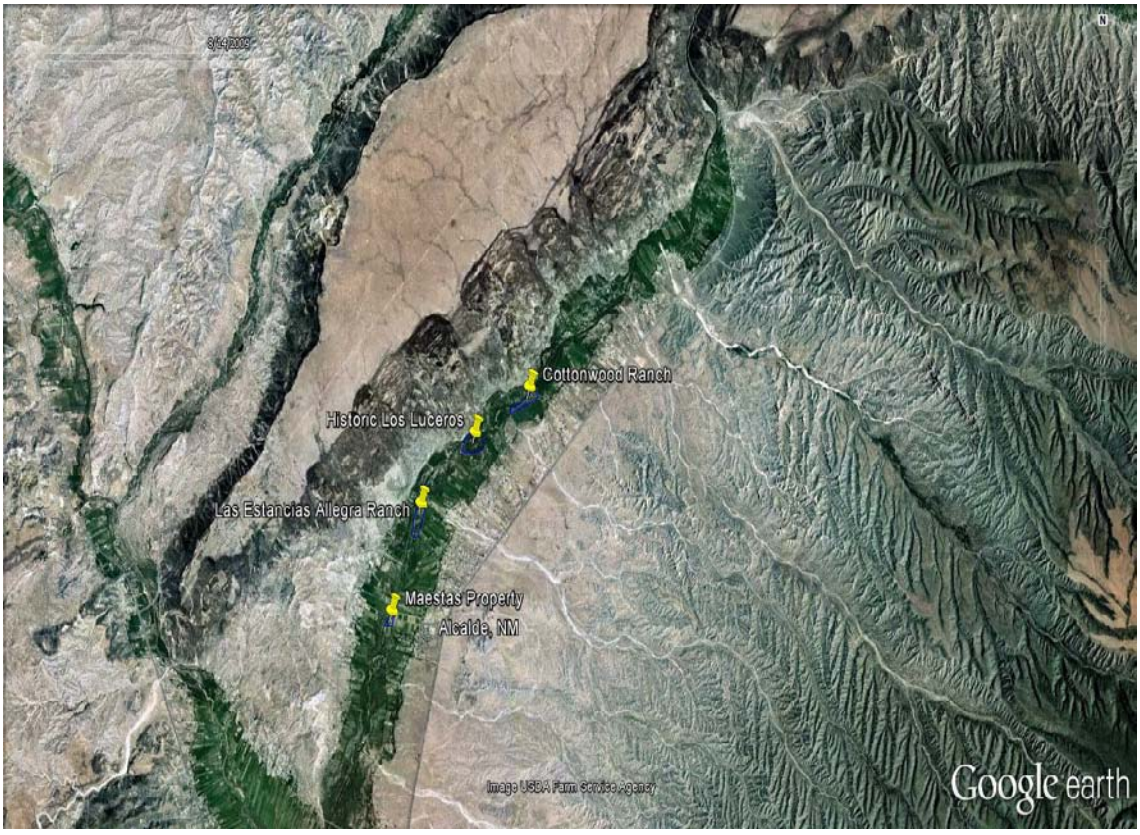

Figure 18 Map of Alcalde/Velarde Wetland and Riparian Restoration Sites.

Las Estancia Allegra Ranch

Figure 19 Map of Las Estancia Allegra Restoration site

The restoration project includes 18 acres of bosque and riverfront land on the west bank of the Rio Grande near the Village of la Villita. (Figures 19-24)

Wetland and riparian restoration included:

- Removing non-native invasive Russian olive and Siberian elm trees and root sprouts, either by cutting or pulling with a backhoe, chipping or burning slash piles.
- Planted cottonwoods, willows and box elder along banks of the Rio Grande to stabilize banks and prevent recruitment of non-native Russian olive and Siberian elm.
- Flatten west side of existing wetland swale in select areas and planted native wetland emergent vegetation, and willows.

- Planted groupings of New Mexico olive, native plum, 3-leaf sumac, native willows and other native shrubs as buffers between ditches and trails to stabilize soil and reduce nutrients from entering ditches.
- Seeded with native wildflowers and wetland emergent vegetation seed mix around existing pond and in buffer zones near ditches.
- Seeded bare low-lying areas with wet meadow seed mix.
- Constructed chicken wire enclosures around some mature cottonwoods to prevent damage by beaver.
- Experiment with barley straw bales to reduce algae growth within the flowing ditch.

Figure 20 Aerial photo of LEA Ranch Bosque Restoration area.

Figure 21 Las Estancia Allegra Ranch, pre restoration, swale was expanded and edges were flattened. (McGraw, 2007)

Figure 22 Las Estancia Allegra Ranch, vegetation plugs being planted. (McGraw, 2007)

Figure 23 Las Estancias Allegra Ranch, flooded wetland site in October 2007. (McGraw,2007)

Figure 24 Las Estancia Allegra Ranch, post restoration (McGraw, July 2008)

Cottonwood Ranch

Figure 25 Map of Cottonwood Ranch Restoration Site

Cottonwood Ranch is a fifteen acre site on the west bank of the Rio Grande near the village of Lyden, NM in the Alcalde/Velarde watershed. Part of the bosque had burned prior to restoration. (Figures 25-30)

Restorations at this site included:

- Flatten south side of existing swale and plant native wetland emergent vegetation and shrubs.
- Plant groupings of native shrubs including New Mexico olive, native plum, 3-leaf sumac, etc. in moist areas.
- Remove non-native invasive weeds and shrubs.

- Plant wetland emergent vegetation and trees around existing ponds and upper end of swale.
- Install culvert at eroding jeep trail where it crosses existing swale. Use cobble and sandy fill removed from the construction, and use wetland riparian plantings to stabilize the crossing.
- Seed bare low-lying areas on the property with wet meadow seed mix.
- Plant willows along banks of the Rio Grande to stabilize banks and prevent recruitment of non-native Russian olive.
- Increase area and density of coyote willow around swale to provide habitat for Southwestern Willow Flycatcher

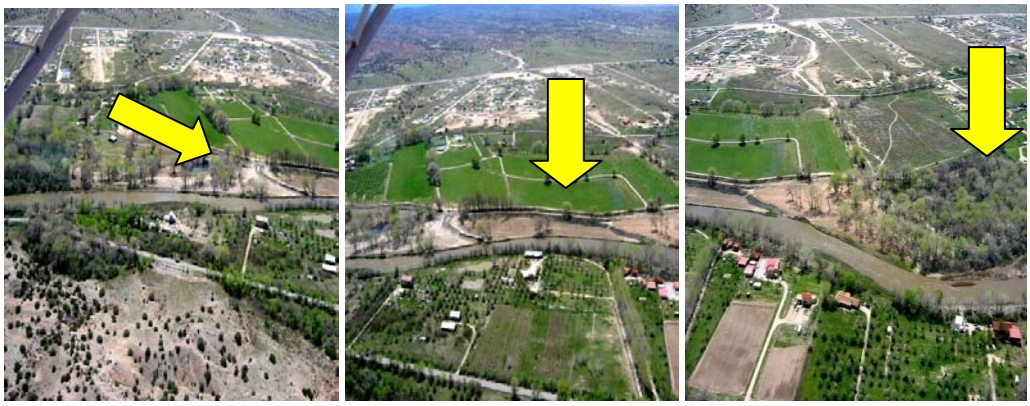

Figure 26 Aerial photos of Cottonwood Ranch (McGraw, 2005)

Figure 27 Cottonwood Ranch post bosque fire, pre restoration. (McGraw, 2005)

Figure 28 Cottonwood Ranch, existing swale, pre restoration (McGraw, 2005)

Figure 29 Cottonwwood Ranch, post restoration. (McGraw, 2005)

Figure 30 Wetland Restoration Project at Cottonwood Ranch, Alcalde, NM. (Johnston, 2007)

Los Luceros

Figure 31 Map of Los Luceros Restoration Site

Los Luceros is a historic landmark in the Alcalde Valley. (Figures 31-34) A large working ranch that was once privately owned is now a State of New Mexico, Cultural Affairs property. This property was a favorite place for wildlife viewing by the Audubon society, who have held annual bird counts, at one of the only public assessable places in the valley. The final design of this wetlands restoration project includes the removal of invasive trees over 40 acres of Rio Grande Bosque.

Restoration completed at this site included:

- Remove Russian olive, tamarisk, and Siberian elm trees from the site by mulching in place. Some cut trunks were left on the ground to create wildlife habitat.
- Train landowner's staff to treat any remaining stumps, roots, or sprouts with an approved herbicide, if desired, to prevent resprout under the supervision and authority of the landowner.

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Figure 32 Los Luceros pre restoration, note juniper and cacti present in the bosque. (McGraw, 2009)

Figure 33 Los Luceros pre restoration, note natural spring on property. (McGraw, 2009)

Figure 34 Los Luceros, post restoration, note chipped trees as mulch on ground. (McGraw, 2009)

Maestas Property

Figure 35 Map of Maestas Property Restoration Project

Maestas Property is an 8 acre lot located on the west bank of the Rio Grande near the village of Alcalde and the northern border of Ohkay Ohwingeh. (Figures 35-39) This restoration was a collaborative project between the NMED and the NM partners for fish and wildlife.

The following wetland and riparian restoration improvements were implemented on this property:

- Removal of non-native invasive Russian olive and Siberian elm trees and root sprouts, either by cutting or pulling with a backhoe, chipping or burning slash piles.
- Flattening the east side of the existing wetland swale in select areas and planted native wetland emergent vegetation, and willows.

- Planted cottonwoods, willows and box elder, and groupings of New Mexico olive, native plum, 3-leaf sumac, and other native shrubs in buffer zone adjacent to swale and along banks of an existing swale to stabilize banks and prevent recruitment of non-native Russian olive and Siberian elm.
- Seeded with native wildflowers and wetland emergent vegetation seed mix around existing swale.
- Seeded bare low-lying areas with wet meadow seed mix.
- Constructed chicken wire enclosures around some mature cottonwoods to prevent damage by beaver.

Figure 36 Maestas property, pre restoration. (McGraw, 2008)

Figure 37 Maestas property, chipper removing understory invasive species (McGraw, 2008)

Figure 38 Maestas Property, wetland swale excavation. (McGraw, 2008)

Figure 39 Maestas property, invasives removed and excavation completed, but prior to planting. (Mc Graw, 2009)

Lessons Learned from Completed Demonstration Projects

Natural flooding of the bosque is prevented by levees installed by the Bureau of Reclamation and Army Corps of Engineers. Wetland marsh habitat that intercepts rising water tables of the Rio Grande is helpful to restore habitat lost due to channelization and levees. Natural overbank flooding is needed to restore the health of the Rio Grande.

Continued maintenance is needed at the restoration site. Weeds and other invasive plants, shrubs and trees need to be removed until the native vegetation can establish. This requires hand pulling or application of herbicides. Many times the landowner was not able to distinguish between wanted and unwanted plants. Several solutions were found including appropriately flagging planted shrubs or other plants for identification and training the landowner or property manager in the proper techniques to ensure removal. A booklet *"Healthy Streamside Wetlands"* was created specifically to address the educational need of wetland and riparian owners in the state. A guide to stewardship and understanding our unique southwestern ecosystems, it includes sections on how rivers work and a photo identification guide for commonly found bosque plants.

Because this restoration was funded by grants sometimes maintenance needed to occur outside of the grant period, landowner agreements were to be amended to include an agreement for maintenance.

Recommendations for Management Measures to Protect or Enhance Wetlands and Riparian Areas

Because wetlands and riparian areas are affected by all activities in a watershed, inclusion of protection actions will be most effective if included into community and watershed based planning activities. There are several mechanisms that can be used at this level, and as discovered throughout the country, can be extremely effective at providing protection that is not provided be any other means. These mechanisms include land conservation tools, land use planning, watershed stewardship, and wetland/ riparian inventory and assessment.

Land Conservation Tools

There are several land use conservation tools including acquisition, transfer of development rights, and purchase of development right /conservation easements that have been identified in other watersheds that could be used to protect wetland and riparian areas in this watershed. These mechanisms have been highly effective across the nation in protecting valued areas within watersheds such as places of historical or ecological significance. In general, most of these mechanisms are facilitated by a land trust.

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. Lands acquired could become

a nature preserve or a park for public enjoyment. (Cappiella, et al., 2005) The Los Luceros property recent purchased by the State of New Mexico ensures long term protection and benefits for the people of New Mexico and visitors alike. Large scale acquisitions are highly unlikely due to the numerous private property owners and their cultural and historic ties to the valley.

Transfer of Development Rights (TDR's)

This land use management technique transfers development potential from environmentally sensitive areas such as riparian areas or agricultural 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. (AFT, 2008) Landowners in preservation areas are compensated for lost development potential whereas conventional rezoning deprives landowners of this potential value. This is a problem in the valley because the riparian corridor is the only private land in the area. The Bureau of Land Management, the US Forest Service and State of New Mexico own the remainder of the lands within the watershed. The use of this technique would probably require negotiation for federal transfer of uplands, although development may not be appropriate use of these uplands which are highly erodible. The use of this technique was examined by the Community and Regional Planning department of UNM in the La Cienega community, a small village on the outskirts of Santa Fe. Like the Alcalde/Velarde valley, La Cienega faces development pressures on traditional farmland, acequias and highly sensitive riparian zones. They had found through community interviews that the ecological and cultural values associated with preserving open space and agricultural traditions were highly valued. When the residents were asked if they

would voluntarily support a TDR program to promote conservation, many of the responses were favorable although there was skepticism about the effectiveness of such a program and a general need for more information. (Fleming, et al., 2001) This technique is still new to New Mexico but has been used widely in other parts of the southwest including Texas, Colorado and Arizona.

Purchase of Development Rights/ Conservation Easements

Conservation easements are transference of development rights from a property's landowner to a municipality, land trust or other non-profit organization. (Cappiella, et al., 2005) The easement may be purchased or donated. Some areas around the nation have issued bonds to purchase development rights in highly sensitive or otherwise prized areas such as places of historic significance. In New Mexico, the donation of development rights has been a popular option for preserving landscapes. There are currently significant tax benefits associated with donating a conservation easement including New Mexico State Land Conservation Tax Credit, Federal income tax deduction and potential Federal estate tax reduction. The New Mexico State Land Credit is transferable under current legislation these tax benefits may now have a market value if the landowner cannot directly use the credit. The Federal income tax deduction allows the market value of the easement to be treated as a donation to a charitable organization and is tax deductible. The IRS allows a 40% reduction in value for a property with a conservation easement. (Taos Land Trust, 2011)

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. The owner can reserve selected home sites for family members and does not have to allow access to the public. The terms of the easement will ultimately dictate what types of activities are allowable on the land, and the easement is transferable with the land if sold. (Byers and Ponte, 2005)

This technique is probably the most practicable out of the three for the area. The owner retains the land, can continue the current uses and is generally compensated monetarily for preserving open space. This has become popular option especially for farms and ranches, because it provides a mechanism by which the agricultural enterprises can be maintained through financial support by conservation rather than subdivision of the land. This tool can be utilized to serve multiple objectives of the watershed management plan. The conservation of land within the river corridor will maintain acequia traditions, provide further economic opportunities in agriculture, maintain open space and viewscapes, provide aquifer recharge and maintain wildlife habitat.

Wetland Protection Ordinance

Rio Arriba County could develop a land use ordinance to effectively protect remaining wetland and riparian areas. Buffer widths, vegetation, selective clearing, allowable uses and maintenance are all factors that would influence protection of wetland and riparian areas in the ordinance. Local governments have more influence in protecting wetland areas than State or Federal entities, because the local government, in this case Rio Arriba County, has

jurisdiction over the surrounding land uses as well as actually reaping the ecological benefits of protecting such resources.(Cappiella, et al. 2005)

A wetland protection ordinance could provide a more stringent protection for existing wetlands beyond the federal regulation. It could provide for a greater range of wetland types including those that may not be protected under current law and to a designated boundary or buffer area, for example prohibiting building within 100-300 ft of the wetland. "It is estimated that more than 5,000 communities have adopted local wetland ordinances". (Kusler, 2006) There is not a standalone ordinance in any county of New Mexico; they are intertwined in the other land use codes. The applicability of such a distinct ordinance would have to be further examined as inventory of wetland resources is developed.

USACE River Corridor Feasibility Study

A feasibility study project is being conducted on the Rio Grande Corridor, by The US Army Corp of Engineers, Ohkay Ohwingeh, Pueblo of Santa Clara and Pueblo of San Ildefonso. (Rio Grande Sun, 2006) The area to be studied will extend from north of Velarde to south of San Ildefonso Pueblo. "The study will include the feasibility of removing non-native species from the bosque, planting native species, moving people out of floodplain areas, reditching and rechanneling the Rio Grande to irrigate parts of the bosque that aren't getting enough water to support wetland/riparian areas. Additional objectives of the study include raising bridges, creating recreational trails and facilities and improving levees". (Rio Grande Sun, 2006) The

watershed group initiated an effort to expand the boundaries of this project to include the corridor north to Velarde. (Johnston, 2007) A presentation was made to Rio Arriba County to ask for an official request to the USACE, who is the project lead. There was unanimous support for this project among the commissioners, and a motion was granted. The status of this project is unknown at this time.

Watershed Stewardship

Upland management, range improvements, forest thinning and controlled burning are all needed activities within the watershed, where most of the land in this watershed is managed by federal land management agencies including BLM and the US Forest Service, so they will require federal funding and participation. These areas need improvement and projects that can improve the landscape and should be a priority for health of the watershed. Please see Alcalde/Velarde Watershed Management Plan (2007) for more detailed discussion.

River Corridor Invasive Species Removal

The magnitude of this project will require a substantial amount of collaboration between private landowners, who own most of the bosque and agriculture lands north of Ohkay Ohwingeh. Limited funding currently is available through the East Rio Arriba Soil and Water Conservation District, but it will require more. Currently two plans exist at the state level to address this issue, which is a problem statewide. The *New Mexico Non Native*

Phreapotye/Watershed Management Plan by the Tamarisk Coalition, a multi agency collaborative group, and the *Strategy for Long Term Management of Exotic Trees in Riparian Areas for New Mexico's Five River Systems* by the USDA Forest Service, both documents have good suggestions but no real plan for action or mentionable funding sources.

The Alcalde/Velarde Valley is currently an unmanaged segment along the Rio Grande for invasive species removal. To the north the BLM manages most of the river valley and is currently working on an invasive species removal project termed "Orilla Verde Riparian Restoration Project". To the South the Ohkay Ohwingeh pueblo has been working on a long term project to completely eradicate the invasive species from their bosque, similar efforts have been initiated by Santa Clara pueblo, south of Ohkay Ohwingeh on the Rio Grande.

Manipulated Flooding and Acequia Irrigation

A study done at the NMSU Agriculture Science Center has found that "some aspects of traditional irrigation agriculture may resemble natural flood plain hydrologic processes, processes which are now restricted due to river alterations including channelization and flood control structures" (Baker, et al., 2007) The expansive acequia system that covers that valley floor follows the high water mark of the flood plain, the large laterals and diversions of the system now sustain the riparian vegetation of the valley and may maintain some of the ecological processes of riparian/wetland areas.

Planned continual manipulated flooding including creation of new side channels to

augment wetland habitats can regenerate the dominant riparian trees and vegetation including cottonwood and willow, assist in decomposition in accumulated woody debris, reducing fuel loads and adding in nutrient cycling. (Dressen, 2003)

Continued use of the acequia systems is critical to provide shallow groundwater seepages to support the riparian and wetland areas. This concept has now been further documented by a NMSU graduate student that conducted a research project at the Alcalde center. The results of her study concluded that there is sufficient lateral seepage from the irrigation ditches to maintain riparian plantings. (Cusack, 2009)

Wetland and Riparian Restoration Projects

Continue individual wetland and riparian restoration projects by the NMED wetlands program and the US Fish and Wildlife Service, by identifying opportunities for further wetland conservation, protection and restoration.

Because we do not have more specific information at this time the recommendations are very general tools that can provide broad based protection for wetland and riparian resources. To adapt these tools to provide more stringent protection, we will need to know exactly what resources that we have so that we can devise additional steps to target specific conservation and restoration activities. Described in the next section are the actions that need to be taken for further planning initiatives.

Recommendations for Further Actions

Without knowing the exact acreages, the locations or the conditions of wetland and riparian resources in the watershed, it will be impossible to create any further comprehensive planning. To maximize this process we need to create a baseline inventory of the resources so further assessment of size, placement and quality can be made. Additional evaluations can be made once a bigger picture is created as to the actual extent of watershed issues affecting the wetlands like acreages of invasive species, sediment loading from arroyos or creation of side channels to flood the bosques. It will also be possible to track gains or losses in the resources as well. Most of this can be done off site using a mapping system such as GIS, and further investigation will be necessary to ground truth and to get more site specific detail. Although as previously discussed, the majority of the land in the river valley is privately owned, so the field work would have to be done on a case by case basis. The overall study would be useful to illustrate to the individual landowners how important their piece of land is in the overall health and integrity of the ecosystem as well as providing buy in to address some of the bigger watershed issues that are occurring. The following activities could be used in the next planning phase:

Create an Inventory of Wetland and Riparian Resources

An inventory of the wetlands and riparian areas in the watershed should be created using a GIS system. Currently the National Wetlands Inventory (NWI) digital vector data is not available for the Upper Rio Grande area, and 1:100,000-scale (not-geo-referenced) NWI maps exist but are 1980's era data. The New Mexico Resource Geographic Information System (RGIS)

has digital ortho photo quads (DOQs) for the project area flown in 2005, at a scale of 1 meter resolution. These DOQs can be used as a base map, wetland indicator layers such as aerial photos and soils maps can be used to identify wetlands and riparian resources. Layering these images will provide information that may be missing from the NWI such as drained or filled wetlands, wetland connectivity, invasive species encroachment and invasive species removal, wetland creation, recreation ponds, wetlands sustained by acequias and irrigated fields. Wetland acreages restored by the US Fish and Wildlife Service, NMED, private landowners and other sources should be identified. Wetlands losses to development can also be tracked.

Estimate Historical Wetlands Coverage

Using wetland indication layers in a GIS platform it may be possible to determine historical wetlands coverage. NRCS hydric soils, Federal Emergency Management Agency floodplain maps, USGS topography, state vegetation maps and aerial photos are all potential indicators of historical wetlands. Utilizing these indicator subsets will assist in determining where potential restorations sites are, such as former vegetated wetland areas and under functioning existing wetland areas impaired by hydro modification, channelization, impoundment or diversion. Historical accounts from long-term residents may provide further information.

Estimate Wetland Function in the Watershed

Wetlands provide beneficial ecosystem functions in the landscape such as flood control, water pollutant removal and groundwater recharge. It is important to estimate what utility is

being offered in order to understand what functions wetlands are providing at watershed scale. Remote assessments are necessary to for evaluating functions at a watershed scale. It also provides a way to determine the next steps necessary for on site or field assessment. A field assessment will be necessary to provide an accurate evaluation of wetland function, but the remote assessment provides a way to screen the entire watershed. Estimates of wetland function may be determined off site using hydro geomorphic wetland classification system. (Vance, Kudray and Cooper, 2006) This technique employs the hydro geomorphic factors determined by NWI, topographical maps and aerial photos. Specific functions are associated with the hydro geomorphic factors. Each classification type of wetland has generalized associated common functions and values. Based on preliminary assessment the majority of the wetland type present in the area is a riverine class.

Estimate Wetland and Riparian Area Condition

An estimate of condition is necessary to evaluate how well these areas are providing ecological function. If the condition is impaired, the wetland cannot perform the function at capacity. Watershed scale estimates of wetland condition are done by the assumption that a greater number of landscape disturbances will have a derogatory effect on wetlands. Disturbances include hydrologic alterations such as impounded, drained excavated wetland areas, number of vegetation classes in a wetland, buffer condition of the wetland including the width and composition of the buffer, and surrounding land uses and land cover in the contributing drainage area.

On Site Assessment

All of the above baseline assessments are meant to only provide an offsite general assessment of wetland coverage function and condition. Since the information is provided only by mapping data, it is limited in nature. The system is meant to provide a starting point each application can be built upon as more information becomes available. On site assessments are needed to verify the information accuracy. There are accessibility issues in some cases due to the fact that most of the wetlands on private land. Also as identified by the participants at a New Mexico/Colorado symposium on wetlands restoration, a universal method for field assessment is needed so data can be compared throughout the Upper Rio Grande Region for collaborative purposes. "Currently, over 40 different methods for field wetland assessments are being employed around the country". (Cappiella et al, 2006). It is a hope that this project could lead to on site assessment in collaboration with the local University or with volunteer monitors from the watershed group. Data generated by this project can provide awareness, outreach and education and may possibly lead to funding opportunities and further prospects for partnerships.

Identification of Potential Wetland Conservation Sites

Using the information generated by the GIS platform, such as condition and function, it should be possible to identify wetland sites that are in need of conservation. Other criteria will be applicable such as a willing landowner and cultural significance.

Identification of Potential Wetland Restoration Sites

Through the off site assessment it should be possible to determine potential wetland restoration sites using factors such as soils, connectivity, feasibility, functional capacity and willingness of the landowner to participate in restoration activities. The watershed group can develop a local set of criteria to evaluate potential projects in the watershed, such as areas that rank the highest for biological diversity, for reference wetlands, for conservation of species or for waterfowl and other migratory bird habitat.

The NMED Wetlands Program is currently working with UNM Natural Heritage program to develop an assessment method that will provide information on the condition of New Mexico's riverine wetlands. It is called the New Mexico Rapid Assessment Method. The method will evaluate the ecological condition of wetlands and their associated riparian areas, by using a set of observable field and landscape indicators. (NMED, 2010) The method includes the above GIS and field measurement tasks, but includes a set of detailed metrics to provide scores for the evaluation and on site assessment. The assessment method is still under development. The NMED will be holding workshops to introduce the assessment methodology once finished, so that stakeholders can be trained and can apply it to their area.

Conclusion

Although many of the recommendations presented in this document can assist in protecting and maintaining existing wetland and riparian areas, it is understood that the underlying reasons for decline must be addressed to appreciate the full function of the ecosystem.

Because people currently inhabit the floodplain, it may be impracticable to reinstate the natural hydrograph for the area, and allow for an annual springtime flood. While the actions taken in the past in an attempt to control nature were done in good faith to provide progress and better services for humans, unfortunately many of these actions have consequences that we are just now realizing actually create more problems than they were originally perceived to fix.

It will probably be more costly to replace ecological services and functions that have been lost through manipulation of our natural environment. We are still learning in the age of industrial society will learn from our mistakes slowly. We have to make choices about what we want and what is important to the community, what environment we want to live in and what conditions we want our children to inherit.

The most important component of this project is collaboration and local leadership for the project. It is crucial that this be a stakeholder driven process given that the majority of lands in question are privately held. Understanding the multi disciplinary and multi jurisdictional

nature of the planning effort involved, it will be necessary to include all stakeholders in continual planning and implementation efforts. The main stakeholders in the region include Northern New Mexico College, New Mexico Environment Department, State Land Office, US Fish and Wildlife, NM Game and Fish, Ohkay Ohwingeh Pueblo, Bureau of Land Management, NMSU Agricultural Science Center, US Department of Agriculture, Rio Arriba County and the residents, agricultural producers and ranchers of the valley.

Encouraging partnerships and collaborative efforts is key in future successes. It would be advisable for the watershed group to partner with an organization that has technical capacity, such as Rio Arriba County, or NMSU Agricultural Science Center at Alcalde to complete further evaluation and to seek out adequate funding to implement the project.

Appendix A- Potential Programs for Wetland Restoration Projects

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

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 erodible 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

<u>Emergency Watershed Protection Program</u>

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)

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

<u>North American Wetlands Conservation Act Grant Program</u>

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.

<u>Contact Information</u>

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/

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