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*Lower Pecos River
Watershed Alliance
Strategy Plan*



DeBaca County in 2003 along the Pecos River.

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Lower Pecos River Watershed Alliance Strategy Plan

Preface

This Lower Pecos River Watershed Strategic Plan was prepared to assist in guiding the decisions of the Lower Pecos River Watershed Alliance in an effort to improve the overall health of the watershed. The plan recognizes major concerns and sets priorities for watershed restoration actions. The watershed strategy allows for member entities and non-member entities a mechanism to present plans to the alliance committee to be selected for funding and or support. The alliance forum will assist in acquiring funds for the project(s) and guidance and technical assistance.

Forward

The Lower Pecos River Watershed Alliance was initiated in 2004 to attempt to bring all of the entities working on watershed health and restoration programs together, to better coordinate all activities in the boundaries of the alliance.

The Conservation Technology Information Center (CTIC) contacted the Pecos River Non-Native Phreatophyte Management Program's steering committee in the spring of 2004 for assistance in setting up a meeting with interested parties to explore the possibility of establishing a watershed coalition or alliance on part of the Pecos River and its tributaries. The participants at the first meeting selected the Pecos River watershed from the Santa Rosa Reservoir to the Texas/New Mexico state line as the area to be considered for inclusion in the watershed coalition.

Prepared for:

Lower Pecos River Watershed Alliance

Prepared by:

*Members of the Alliance
Conservation Technical Information Center (CTIC)
John Hassell and Karen Scanlon*

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Lower Pecos River Watershed Alliance Strategy Plan

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Mission

The Lower Pecos River Watershed Alliance formed to serve the citizens and users in the watershed area of the lower Pecos River from Santa Rosa Dam to the Texas state line. Our mission is to protect and improve the watershed health for all users/uses of the Pecos River watershed by identifying watershed health concerns including, but not limited to, water quality and water quantity by developing strategies to address those concerns and seeking resources to implement practices that resolve the concerns of the watershed.

Alliance Goals

The Alliance has chosen three main resource areas of concern in the watershed area. They are water quality and quantity; range and grass lands; and forest land. Various landowners and agencies throughout the watershed have done, or are in the process of, various watershed improvement projects. The Alliance has developed strategies for improvement in the areas of concern in the Lower Pecos River watershed. These strategies follow the examples of work that are being done in the watershed that have shown a positive improvement.

Function

The Lower Pecos River Watershed Alliance will function as a sponsor to projects working in the Pecos River watershed and are guided by a Memorandum of Understanding (MOU) with each entity seeking membership signing the MOU. Those member entities, signed under the MOU, with 501(c)3 statuses will be able to provide a conduit for funding prospects and assist with grant writing. A steering committee of the alliance will be formed and consist of members (or a representation of the membership) signed under the MOU and function as lead sponsors and supporters of projects endorsed by the alliance. The alliance will provide support for both ongoing projects and new projects brought to the steering committee. As projects are presented by the members, they will be reviewed and assessed by the steering committee for recognition of following the alliance goals and objectives. Projects that meet the goals and objectives of the alliance or can be modified to meet alliance goals will receive support of the alliance group. The alliance may refer the project to different entities and agencies for technical assistance and funding opportunities.

Background

(The following contain excerpts from the Lower Pecos River Regional Watershed Plan)

The planning area for the Lower Pecos River Watershed Alliance is in DeBaca, Chaves, Eddy, Guadalupe, Lincoln, and Otero Counties located in southeastern portion of New Mexico. The planning area includes the Pecos River reach from Santa Rosa Dam in Guadalupe County in the north and extends to the Texas/ New Mexico state line in southern Eddy County. The largest area of drainage lies west of the Pecos River Basin and extends to the watershed divide in Lincoln and Otero Counties. The eastern boundary of the planning area coincides with the eastern county lines of DeBaca, Chaves, Eddy, and Guadalupe Counties.¹

Diverse terrain is prevalent throughout the Lower Pecos River Watershed Alliance boundaries with elevations ranging from 12,000 feet above sea level to 2,870 feet above sea level where the Pecos River crosses into Texas. The western portion of the boundary is wooded mountainous terrain, while the southern and eastern portions contain desert, and grasslands. The northern portion contains gentle hills with grasslands and woodlands.

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Large populations of wildlife are found throughout the Alliance boundaries including elk, deer, antelope, quail, dove, and waterfowl. Non-game species are also found in the boundaries as well. Fisheries both warm and cold are found along the Pecos River and on a few of the ponds and tributaries.

The climate throughout the alliance boundaries vary with the landscape. The forest lands have a short growing season with mild days and cool nights, while the southern areas have warm days and mild nights. The northern boundaries contain a mix of climatic features and vary within the seasons.¹

The economic base of the planning area is primarily mineral resource development, agriculture-based businesses, recreation, and tourism while a few larger communities are experiencing industry moving in. Recreation opportunities have been developed in the forest lands and have proven to be a very positive opportunity for these communities. Many state parks and public lands also attract seasonal tourism.¹

Land ownership falls under a wide array of owners and uses. The northern part of the watershed is comprised mostly of privately-owned lands with some state and federally controlled sections. The land-ownership patterns become more diverse in the central and southern portions with the Bureau of Land Management (BLM) controlling the majority of this portion. The southern portion of the watershed is occupied by the larger urban centers. The National Park Service manages Carlsbad Caverns National Park in the southwestern portion of the area and the U.S. Bureau of Reclamation (BOR) controls lands along the Pecos River. A large portion of the forest lands in the western area is controlled by the U.S. Forest Service. The Mescalero Apache Indian reservation occupies 500 square miles in the Sacramento Mountains on the west-central portion of the watershed. Other land uses include recreation in state parks and mineral developments. Within the vast array of landownership, occur uses such as grazing for livestock and wildlife and irrigated agriculture.¹

The following represents the land ownership within the Alliance boundaries:

Owner	Area (Mi ²)
Private	8713
Bureau of Land Management (BLM)	4700
State	2574
U.S. Forest Service	1251
Tribal	489
National Park Service	73
NM Game and Fish	55
Fish and Wildlife Service	38
Bureau of Reclamation (BOR)	37
State Parks	7
Military	6
Total	17,943

Water users in the watershed rely on water supplies from both surface and groundwater sources. Surface waters are diverted from the Aqua Negra, Rio Hondo, Rio Ruidoso, Rio Peñasco, Black River, Rio Bonito, and the Pecos River. Surface waters are stored in Santa Rosa Reservoir, Sumner

¹ Lower Pecos River Regional Watershed Plan, Section IV: Background Information

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Reservoir, Brantley Reservoir, and Avalon Dam. Ponds and intermittent streams also provide waters for irrigation use, wildlife, and livestock watering.

Water has been a critical resource in the planning area as evidenced by the historic and prehistoric sites developed around permanent water sources. The early population used water resources for domestic purposes and for watering livestock. They developed some irrigation along the river valleys where they could divert the water. As additional settlers moved into these valleys they began to expand the existing irrigation systems and to construct new ones. The earliest record of irrigation in the mountain valleys is in the early 1800's.^{1,2}

Irrigation is prevalent throughout the Pecos River and major tributaries. Irrigation is done by diverting flows from the Pecos River and tributaries via canals, irrigation ditches, and wells. One of the major diversions on the Pecos River is at Fort Sumner, constructed in the 1860's by Native Americans. The largest diversion still in existence is the Carlsbad Project which all main reservoirs along the Pecos River (Santa Rosa, Sumner, Brantley, and Avalon Reservoirs) hold irrigation waters for Carlsbad Irrigation District. Irrigation by use of groundwater began in Artesia and Roswell in the late 1870's using springs and later artesian wells. Groundwater supplies the majority of water demands in the alliance boundaries. All water, surface and groundwater, is impacted by water rights and the Interstate Stream Commission for Pecos River Compact obligations between Texas and New Mexico. Large amounts of time and money have been put into the process of adjudication of water rights within the Pecos River for issues facing the Compact. This process is still ongoing.

Section 303(d)

The original objective of the watershed alliance was to form to assist in meeting the standards of the EPA's section 303(d) listed Total Maximum Daily Loads (TMDLs). The federal Clean Water Act requires each state to identify surface waters within its boundaries that are not meeting, or expected to meet, water quality standards. Section 303 further requires the states to prioritize their listed waters for development of Total Maximum Daily Loads (TMDLs). A TMDL can be best described as a waterbody, watershed or basin-wide budget for pollutant influx to a watercourse. The TMDLs for the Lower Pecos River basin are not scheduled for development until sometime in 2006. The surface water quality survey occurred in 2003 in which surface water samples and other related data were collected. To date this data has not been assessed.

The Surface Water Quality Bureau of the New Mexico Environment Department has been delegated the task of preparing Section 303(d) listings by the New Mexico Water Quality Control Commission. Federal regulations [40CFR130.7 (d)] require the list be reviewed and submitted to the US Environmental Protection Agency (USEPA) for approval every two years. The 2004-2006 of the §303(d) list has been adopted by the NM Water Quality Control Commission and approved by the USEPA. Surface water quality issues identified in this document (Appendix A) lists impaired surface waters in the State of New Mexico. When the TMDL's for the Lower Pecos Watershed are developed and become final, this information will be incorporated in this document. This will include estimated loads for pollutants and proposed load reductions. The Lower Pecos River Watershed Alliance through this detailed strategic plan and master schedule will further evaluate causes and sources of identified water quality impairments.

¹ Lower Pecos River Regional Watershed Plan, Section IV: Background Information

² *Brief History of the Pecos River in New Mexico- Author Unknown*

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Table 1. Pecos River – Impaired Reaches Identified on 2004-2006 – 303d list

Assess Unit	Designated Use	Cause of Impairment
Pecos River (Santa Rosa Dam to Fort Sumner Reservoir)	Warmwater Fishery	Sedimentation/Siltation
Pecos River (Black River to Tansil Lake)	Warmwater Fishery	Sedimentation/Siltation
Pecos River (Tansil Lake to Avalon Reservoir)	Warmwater Fishery	Low Flow Alteration
Pecos River (Texas border to Black River)	Warmwater Fishery	Sedimentation/Siltation
Santa Rosa Reservoir	Warmwater Fishery	Sedimentation/Siltation
Fort Sumner Reservoir	Warmwater Fishery	Sedimentation/Siltation
Avalon Reservoir	Warmwater Fishery	Sedimentation/Siltation

Table 2. Pecos River Tributaries – Impaired Reaches Identified on the 2004-2006 – 303d list

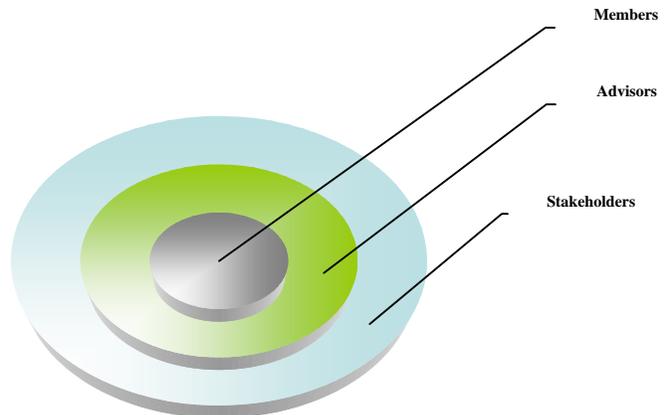
Assessed Unit	Designated Use	Cause of Impairment
Black River (Pecos River to Headwaters)	Warmwater Fishery	Unknown
Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spring)	Warmwater Fishery	Sedimentation/Siltation, Fecal Coliform
Eagle Creek (Alto Reservoir to Mescalero Apache Boundary)	High Quality Coldwater Fishery	Low Flow Alteration
Rio Bonito (Angus Canyon to Headwaters)	High Quality Coldwater Fishery	Low Flow Alteration
Rio Bonito (Rio Ruidoso to Angus Canyon)	Coldwater Fishery	Low Flow Alteration, Sedimentation/Siltation
Rio Hondo (Perennial reaches Pecos River to Rio Ruidoso)	Coldwater Fishery	Unkonwn
Rio Ruidoso (Rio Bonito to Seeping Springs Lake)	Coldwater Fishery	Sedimentation/Siltation
Rio Ruidoso (Seeping Springs Lake to Mescalero Apache Boundary)	High Quality Coldwater Fishery	Sedimentation/Siltation, Temperature, Turbidity
Rio Peñasco (Hwy. 24 to Headwaters)	Coldwater Fishery	Sedimentation/Siltation
Rio Peñasco (Pecos River to Hwy. 24)	Warmwater Fishery	Sedimentation/Siltation

Endangered Species

Endangered Species throughout the Pecos Watershed vary from aquatic vertebrates (e.g. Pecos Blunt nosed shiner and Pecos pupfish) to flora (e.g. Gypsum buckwheat and Pecos sunflower) in and along isolations throughout the watershed. A listing of these species is available at the Carlsbad Soil and Water Conservation District office for listing, classification, and location. Consideration of the endangered species is given by the alliance for non-disturbance and compliance of the Endangered Species Act for all projects sponsored by the alliance.

Structure

The following flow chart shows the structure and organization of the alliance. Stakeholders are the entities and individuals in which benefit from the projects of the alliance. Advisors aid in the decisions of the members on projects; monitoring, evaluation, etc. Members are signed entities of the MOU which implement projects.



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Stakeholders/Members

All entities listed below are stakeholders with the potential of becoming a member by signing the Memorandum of Understanding. Stakeholders within the alliance are entities or special interest groups which have an interest in the projects. Individual landowners are grouped under a category of landowners as these are too numerous to list individually. Member Entities are those that have expressed interest and are signatories to the plan. The following are a list of stakeholders and members of the Watershed Alliance:

Federal Agencies -

- Bureau of Land Management (BLM)
 - Roswell
 - Carlsbad
- Bureau of Reclamation (BOR)
- Natural Resources Conservation Service (NRCS)
 - Alamogordo
 - Carlsbad
 - Carrizozo
 - Ft. Sumner
 - Roswell
 - Santa Rosa
- Resource Conservation and Development Councils (RC&D)
 - Sureste
 - South Central Mountain
- Sandia National Laboratories
- US Army Corp of Engineers
- US Fish and Wildlife Service
- USDA Forest Service
 - Guadalupe Ranger District
 - Sacramento Ranger District
 - Smokey Bear Ranger District

Other Agencies -

- Chaves County Flood Control
- Cities and Villages
- Counties (Eddy, Chaves, Lincoln, Otero, DeBaca, Guadalupe)
- Irrigation Districts
 - Carlsbad
 - Ft. Sumner
 - Hagerman
 - Hope Community Ditch
 - Puerto de Luna
- Mescalero Apache Tribe
- Pecos Valley Artesian Conservancy District (PVACD)

State Agencies -

- NM Environmental Department (NMED)
- New Mexico Game and Fish
- New Mexico Soil and Water Conservation Districts
 - Border
 - Carlsbad
 - Central Valley
 - Chaves
 - DeBaca
 - Guadalupe
 - Hagerman/Dexter
 - Otero
 - Peñasco
 - Upper Hondo
- New Mexico State Engineer's Office
- New Mexico State Forestry Division
- New Mexico State Land Office
- New Mexico State Parks
- New Mexico State University
 - Agriculture Experimental Station
 - Department of Agriculture (NMDA)
 - Extension Service

Organizations –

- New Mexico Association of Conservation Districts (NMACD)
- New Mexico Farm Bureau
- New Mexico Watershed Coalition
- Pecos River Non-Native Phreatophyte Management Program
- Ruidoso River Association
- Water Resources Application Project (WRAP)
- Walthall Environmental, LLC
- Various Environmental Organizations

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Water Quality and Quantity

Goal

The Pecos River Watershed will maintain an adequate base flow that meets the needs of the users and uses with water that meets the water quality standards by 2025.

Resource Concern	Strategies for Change
Water Quality & Quantity	<ul style="list-style-type: none">• Improve vegetation management• Improve water quality (reduce sedimentation) and stream bank protection• Improve water retention for base flow and streams• Improve groundwater retention and storage in major aquifers

Background

Historical records indicate the Pecos River and many of its tributaries maintained a substantial flow during the entire year, which yielded an adequate water supply to meet the demands of a developing area. As agriculture increased and communities began to grow, the demand for water soon exceeded the supply and the stream flows began to decline. The flow regime of the river and some tributaries was changed with the construction of diversion dams and major storage reservoirs. The development of irrigation wells in the Roswell, Artesia, and Carlsbad areas began a significant impact on the major aquifers in the watershed that ultimately impacted stream flow in the Pecos River. Also, the development of community water systems in the upper reaches of the watershed has affected the flow of the tributaries.

Major changes in vegetation patterns and density coupled with the introduction of non-native species have increased the consumptive use and evapotranspiration of the water supply thus impacting the base flow in the river and its tributaries. The installation of landscaping, parks, and golf courses have added to the problem of overuse of a limited water supply.

The quality of the water in the Pecos River has always declined as the river flows to the South. This decline has been the result of increased salinity levels. The major tributaries produced fairly high quality water that was affected by sedimentation from overland flow and arroyo flooding during heavy rains.

The decrease in the base flow in the streams has caused salinity levels to increase. The quality of the surface water has been negatively impacted by vegetation changes, which has allowed for sediment load increases. Several reaches of the Pecos River naturally add to the water quality impacts such as saline springs at Malaga Bend, New Mexico and are reflected in the 303(d) list of impaired waters.

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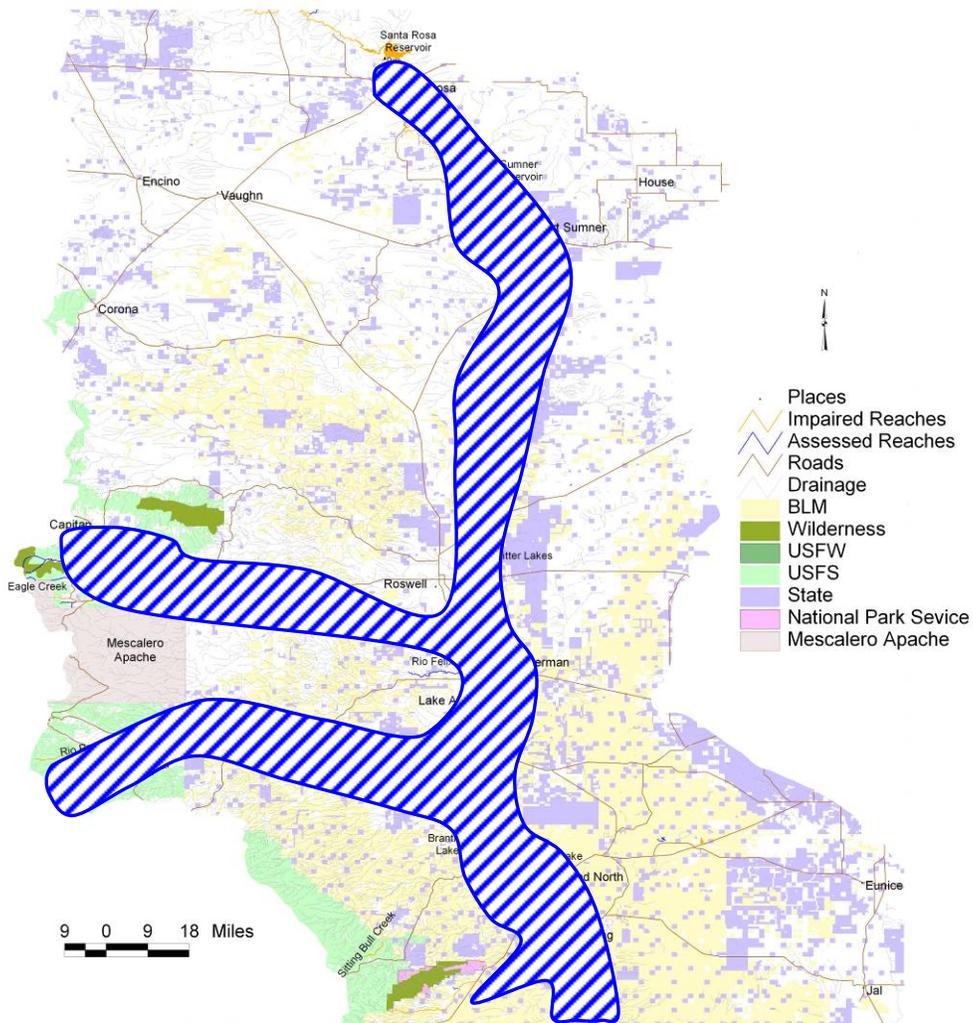
Water Quality and Quantity cont'd.

Priority Geographic Areas

Resource Concern	Geographic Area of Concern
Water Quality & Quantity	<ol style="list-style-type: none"> 1. All uplands (Cloudcroft and Ruidoso land development) 2. Well pumping in Roswell area 3. Supplement pumping in Carlsbad area 4. Macho Creek and Delaware River

The following map indicates areas identified as a water quality and quantity resource concern. All areas identified for this resource concern are identified in blue.

Lower Pecos River Basin



Map courtesy of NMED Al Pasteris.

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Water Quality and Quantity cont'd.

Concerns

Problem	Current Condition	Location of Problem	Source of Problem(s)
Low base flows: Overall lack of water quantity in the Pecos River Watershed.	80% less available water for the Watershed.	Lower Pecos River	Reduced water infiltration from watershed Increased ground water pumping. The groundwater pumping has historically lowered the groundwater table in the Pecos River Basin, which has decreased the amount of groundwater discharge to springs, rivers, and the lower Pecos River and its tributaries. Many springs and rivers, which had perennial flow into the Pecos River 100 years ago are now, dry springs and dry riverbeds. Increased woody vegetation
Low water quality	High salinity during low flows. High sediment loading during floods.	Lower Pecos River	Lower base flows than 100 yrs ago, thus increasing salinity Increased sediment loads from overland soil erosion and increased stream bank destabilization Lack of vegetation to hold stream bank in place during floods Existing dead salt cedar on stream bank



This picture was taken south of Carlsbad near Malaga, New Mexico. The majority of the river channel in the Pecos River is represented by medium to steep sandy loam banks, with dense non-native vegetation lining the edges. Most of the water quality concerns are attributed to high amounts of erosion into the rivers in the boundaries of the Pecos River watershed.

Photo courtesy of the Carlsbad SWCD.

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Water Quality and Quantity cont'd.

Changes

Need	Location of Change	Standard of Measure
Improve vegetation management	Uplands, riparian areas	Vegetation studies Monitor water quality & quantity
Improve water quality (reduce sedimentation) and stream bank protection	Entire watershed	Monitor base flow quality/quantity
Improve surface water retention for base flow and streams	Entire watershed	Monitor base flow quality/quantity
Improve groundwater retention and storage in major aquifers	Entire watershed	Monitor base flow quality/quantity

Ideal Condition

Maintain adequate base flows that meet the needs of the users and uses of water and that also meets the water quality standards.



This picture was taken near Ft. Sumner, NM after an aerial application of herbicide treatment for salt cedar in 2002. Removing non-native plants such as the salt cedar aide in improving water quality by eliminating the salt secreted by the plant. The native vegetation is moving back into the treated areas, and will assist in reduced sediment loading into the Pecos River improving the water quality.

Photo courtesy of Walthall Environmental, LLC. for the Pecos River Non-Native Phreatophyte Management Program.

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Water Quality and Quantity cont'd.

High Quality Areas

A single high-quality area lies within the Pecos River Watershed. This area should continue to be maintained and controlled for water quality.

High Quality Areas	What Factors Contribute to the High Quality?
Mescalero Reservation	Use of brush control and proper fire use provides increased grass cover and reduced woody vegetation. Thus increasing water infiltration
No natural high quality areas exist on lower Pecos River	There are projects working toward a higher quality area.



This picture was taken in 2004, in DeBaca County following aerial treatment of salt cedar along the Pecos River in 2002. Notice the native grasses re-establishing in areas where salt cedar once occupied. The grass will not only assist in bank stabilization, it will reduce sediment loading as well.

Photo courtesy of Walthall Environmental, LLC for the Pecos River Non-Native Phreatophyte Management Program.

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Range and Grasslands

Goal

The range and grasslands of the Pecos River Watershed will support diverse native plant communities that resist brush invasion, abate erosion, increase infiltration, enhance groundwater recharge and stream flow, provide habitat for wildlife and livestock, and sustain rural and urban economies by the year 2025.

Resource Concern	Strategies for Change
Range/Grass Lands	<ul style="list-style-type: none">• Education of public to show benefits of rangeland health• Increase collaboration on diverse ownership-promote management by watershed boundaries• Funding for assistance on Range Best Management Practices and Implementation – get earmarked funds to implement - focus on priority areas• Brush reduction to increase rain capture through improved infiltration, therefore making more water available, reduces sediment load, increases native vegetation, diversifies wildlife habitat• Tracking changes and progress of improvement in range land health

Background

During the settlement period of New Mexico, the upland or grassland areas of the Pecos River Watershed consisted of various grasses with few scattered shrubs and trees mainly along the waterways. The plant community in the Northeastern part of the watershed was composed of tall grasses with scattered shrubs such as sumac, yucca, and shinnery oak. The larger part of the planning area was a mid to short grass grassland with shrubs and trees scattered throughout the area.

The Southern end supported a desert grassland plant community, mixed with desert succulents such as Spanish dagger, lechiguilla, and various other cacti. Trees and shrubs were found along waterways and low areas known as playas.

The floodplain of the river and its major tributaries supported a plant community of several species of taller grasses that were adapted to the wetter conditions and occasional flooding such as the Sacatons, bluestems, and switchgrasses. Inland saltgrass and a few other short grasses were also present. Trees and shrubs were scattered throughout these areas, but not in large quantities or dense stands. Aquatic vegetation grew along the river’s edge and in pools near the river and streams. It is reported that the Native Americans frequently burned these areas during hunts, driving out the game for an easier kill and to produce fresh green grass for their horses.

The first changes to the uplands and riparian or bottomland areas began to occur when large herds of cattle and horses moved through the area heavily grazing the area. Ranchers also settled the area and maintained large numbers of livestock in the watershed, creating intense grazing pressure on the plant communities.

Several other factors, such as controlling fire, managing river and stream flows through dams and diversions, and removing water from surface and ground water supplies for agriculture and other uses; drought, and the introduction of non-native species have played a major roll in changing much of the grassland area into a plant community dominated by woody species.

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Range and Grasslands cont'd.

Much of the upland is now occupied by stands of mesquite, shinnery oak, creosote/tarbush, sumac, and catclaw. Some of the desert succulents such as lechuqilla and cholla cactus have created dense stands that are difficult to enter. The non-native species of tamarisk and Russian olive have created monotypic-type stands which have crowded out most native species. These vegetation changes have had a negative impact on water quality and quantities.

These present conditions have been recognized as having an impact on the economy of the area as well as New Mexico's ability to meet its water delivery obligations interstate. Federal, state, and local agencies, as well as individuals have initiated programs to restore plant communities that are more adaptive to the needs of the watershed. These changes may or may not be similar to the natural or historical plant communities, but will accomplish the mission of improving water quality and quantity. Programs such as the Mescalero's forest thinning project, the Pecos River Non-Native Phreatophyte Management program, and others are being used to meet these goals.

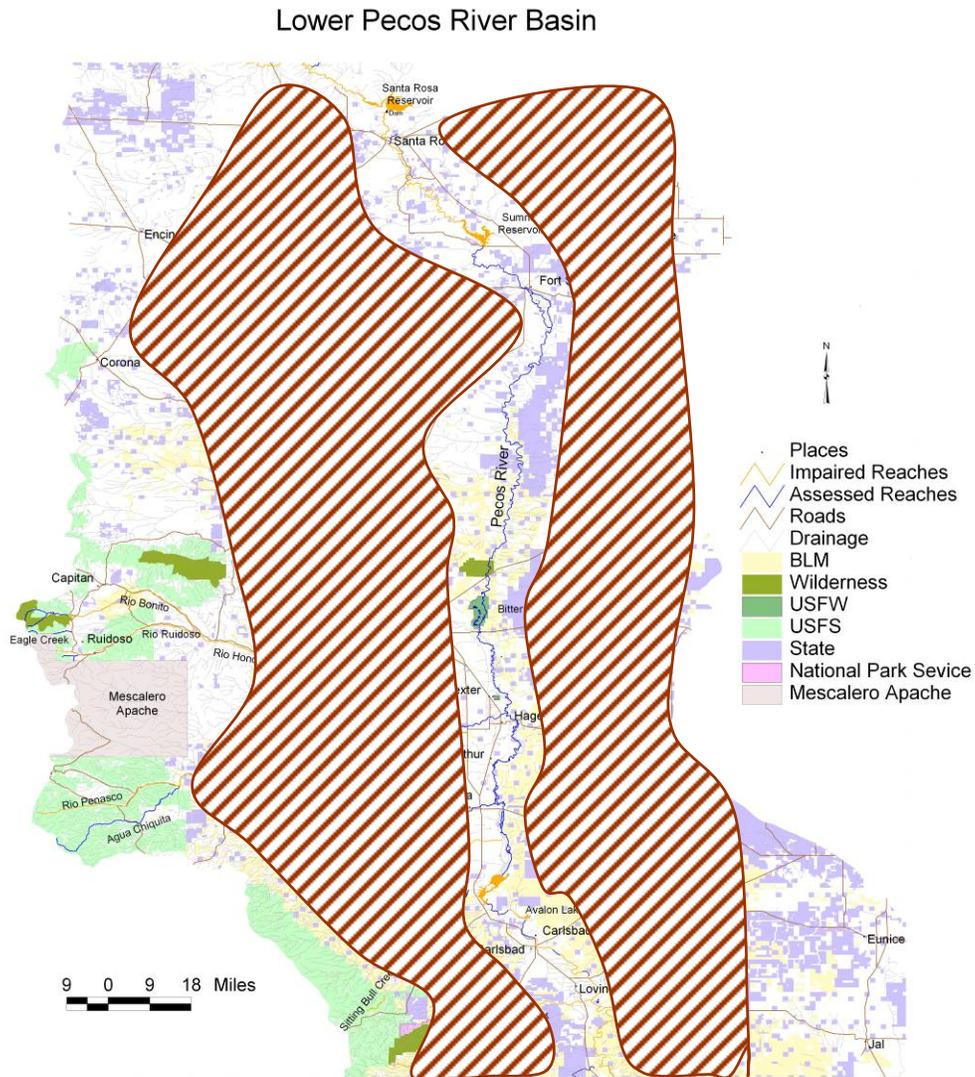
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Range and Grasslands cont'd.

Priority Geographic Areas

Resource Concern	Geographic Area of Concern
Range/Grass Lands	<ol style="list-style-type: none"> 1. Lower Pecos River (salt cedar and mesquite) 2. West of Pecos River (mesquite and juniper) 3. Mountains west of Pecos River (piñon and juniper) 4. Macho Creek and Delaware River

The following map indicates areas identified as a range and grassland area concern. All areas identified for this resource concern are identified in brown.



Map courtesy of NMED Al Pasteris.

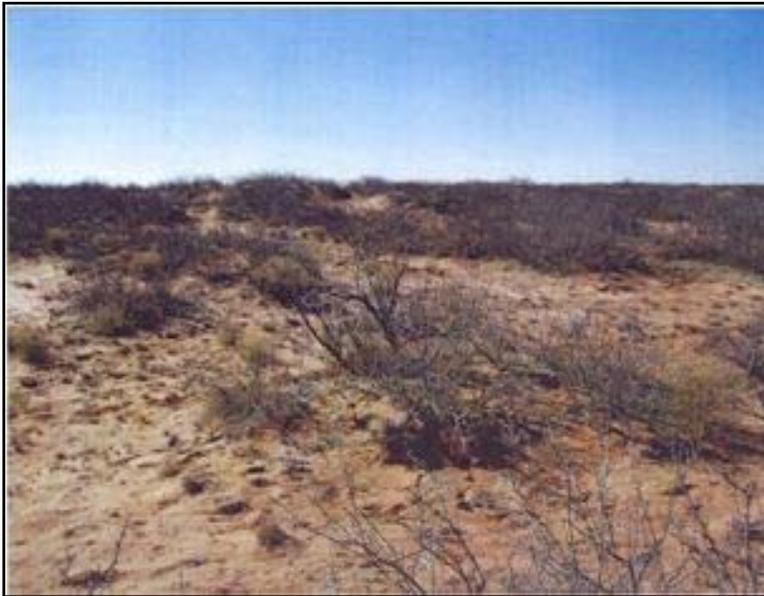
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Range and Grasslands cont'd.

Concerns

Problem	Current Condition	Location of Problem	Source of Problem(s)
Overgrowth of brush and infestation of noxious weeds	Severe throughout the watershed	Occurs on approx. 62% of lands in the watershed	Loss of fine fuels and lack of prescribed fires.
Erosion problems, due to wind and water, decreases water infiltration and causes excessive runoff	Moderate to severe	Occurs on approx. 85% of the lands in the watershed	Drought in the last decade has taken toll on most of the grasses needed for erosion prevention. This has also played a role in increased sedimentation into the Pecos River.
Overuse of the lands during drought	Moderate to severe	Widespread throughout	Improper management and misuse of lands during the drought coupled with poor weather conditions.
Economics	Moderate	Widespread throughout	Poor weather and rangeland conditions have caused many to reduce or sell off livestock forcing alternatives for both land and lifestyle.



This site is located on a ranch approximately 30 miles north of Carlsbad. Persistent drought and grazing have allowed heavy brush infestations. Wind and water erosion problems occur as well.

Photo courtesy of BLM Carlsbad, NM.

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Range and Grasslands cont'd.

Changes

Need	Location of Change	Standard of Measure
Increase collaboration on watershed management	Watershed wide	Range productivity Infiltration
Brush reduction	From top work down to bottom of watershed	Before & after pictures Improved grasses/soils & water quantity Vegetation inventory
Education	Public acceptance of needed practices	Less restrictions from environmental groups, etc.
More funding for assistance on range practices & implementations	Various agencies	More implementation of range practices

Ideal Condition

Limited woody brush species and noxious weeds, along with optimum grass cover with species diversity through proper range management: fire, grazing, other uses such as brush and erosion control while sustaining wildlife habitat diversity utilizing long-term management plans.



This picture is taken in the same location 30 miles north of Carlsbad after mesquite treatment was done. Notice the sand hummocks are smoothing out and wind erosion is much less. The grasses allow better infiltration during rainfall.

Photo courtesy of BLM Carlsbad, NM.

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Range and Grasslands cont'd.

High Quality Areas

High-Quality Areas	What Factors Contribute to the High Quality?
Upper Capitan range – Sid Goodloe	Brush control & fire management
Limestone hill country (upper range 5,000 ft elev) – Rio Felix	Rotation & proper range and drought management
East of Pecos river(scattered) – BLM ranches	Brush control & fire management
Walnut Creek – Richard Champion	Brush & erosion control and rotation



This picture is taken in the Capitan area showing Blue Gramma in proper grazing and brush removal of Juniper. Proper fire management will play a vital role in this area for a maintained grass stand.

Photo courtesy of NRCS Carrizozo, NM

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Forest Land

Goal

The forest community within the Pecos River Watershed will have a suitable number of stems/acre and adequate ground cover (i.e. perennial grasses) to sustain the economy/ecology and keep perennial streams flowing by 2015.

Resource Concern	Strategies for Change
Forest Land	<ul style="list-style-type: none">▪ Change public perception of what a healthy forest is and what it looks like▪ Increase/improve management practices: chemical treatment and prescribed burns; thinning; grazing; responsible harvest and wildlife management

Background

The forest and woodland areas in the Lower Pecos River Watershed are located in the western portion of the watershed. The forest lands are composed of conifers such as Ponderosa pine with scattered stands of Aspen. The woodlands are composed of piñon pine and various species of Juniper. Historical photographic documentation and records show most of the forests were open stands of trees with large meadows along streams and low lying areas. The woodlands of today were mostly grasslands with scattered stands of trees. The trees and shrubs occupied the steeper ridges and hills and consisted of a more open canopy along with adequate ground cover. The mesa tops and gentle sloping lands consisted of a savannah aspect.

Several changes in the management of the forests and woodlands have greatly impacted this part of the watershed and created major changes in the vegetation. One of the first major impacts was the introduction of larger herds of domesticated livestock that were not confined by fences. With the movement of hunters, trappers, and settlers into the area, a major decline in populations of some of the wildlife species occurred and is still occurring today. Wildlife habitat degradation is occurring in both woodland and forest areas and is forcing species to compete with one another.

The beginning of fire control and the reduction of fire because the fine fuels were being consumed, removed the ability of nature to control the plant population. The halting of timber industries, coupled with development of private land in these areas aided in the changes.

As areas of the conifer forests were harvested, open areas were left behind where seedlings of trees and shrubs quickly re-established. The absence of fire allowed the seedlings the ability to quickly populate and dominate areas. This led to stands of trees in numbers of 3,000 trees per acre today.

The open meadows in the forests were heavily grazed and tree and shrub species began to invade and close the meadows. The woodland savannah areas responded in a similar manner with piñon and Juniper occupying most of the area with a closed canopy causing further depletions of open ground for grass cover. Today, most of the mountain communities have developed into recreational areas that attract large numbers of people year-round. These changes have created greater usage of the available water resources through evapotranspiration, ground water pumping, and surface water impoundment. Much of the area now experiences annual water shortages. Ground water levels have dramatically dropped and stream flow has greatly declined.

Restoring the forest and woodland areas to a more open stand or something closer to the historical conditions is now a major focus of those that own and manage lands. The Mescalero have demonstrated what can be accomplished with an aggressive restoration program. Some landowners have also taken on the task of thinning tree densities; improving ground cover and reducing erosion.

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The Forest Service is also carrying out forest and woodland projects to reduce fire hazard through programs such as the Wildland Urban Interface program and others.

These are before pictures taken in the Sacramento Mountains where the US Forest Service is doing thinning projects. Notice the heavy understory of small diameter timber growth.

Before



After



Photos courtesy of US Forest Service Sacramento Mountains Ranger District.

Theses are after pictures from the Sacramento Mountains US Forest Service showing proper thinning and reduction of small diameter timber. The reduction of timber allows the floor underneath the pine trees sunlight where grasses establish.

Before



After



Photos courtesy of US Forest Service, Sacramento Mountains Ranger District.

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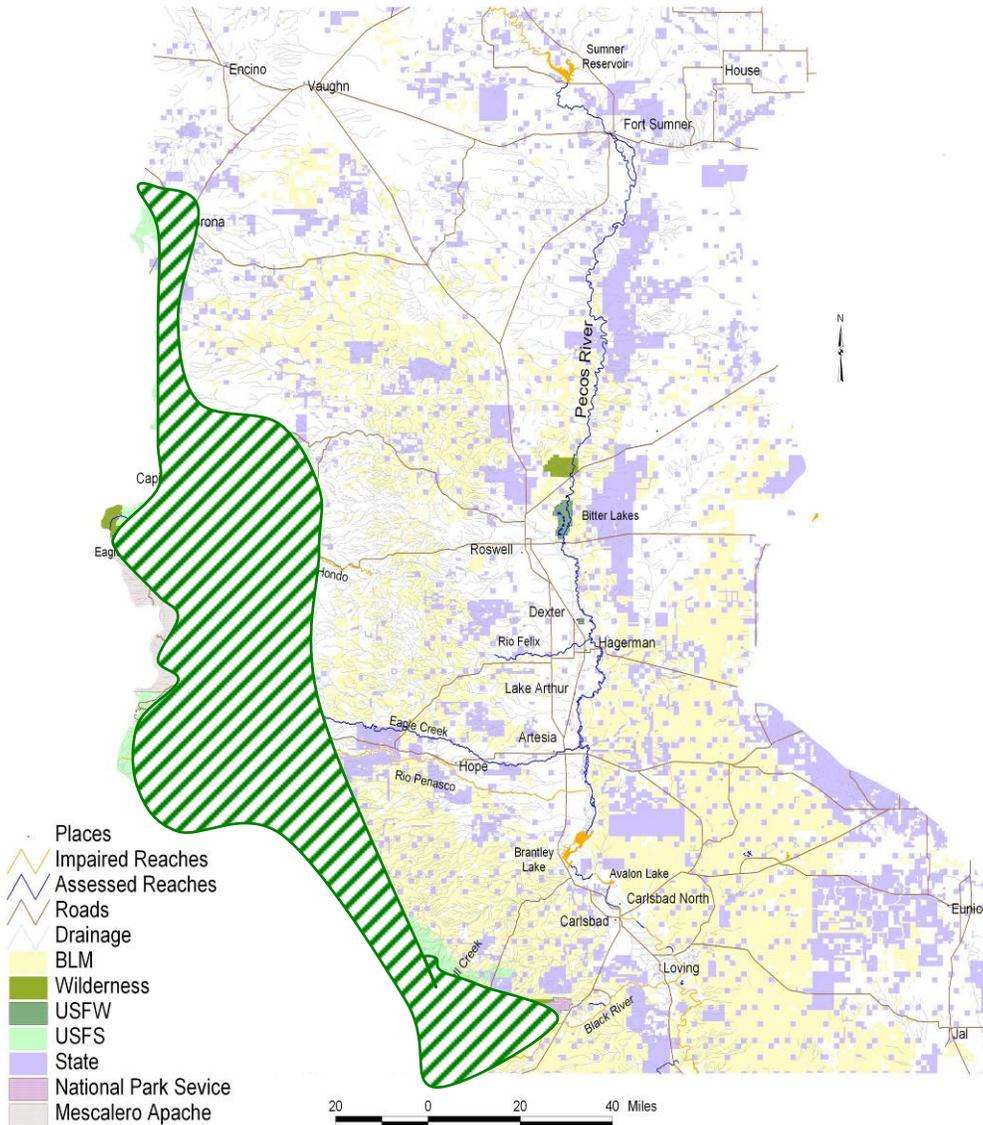
Forest Land cont'd.

Priority Geographic Areas

Resource Areas	Geographic Area of Concern
Forest Land	1. Penasco River (Pecos River compact issue) 2. Hondo River (high visibility) 3. Rio Felix

The following map indicates areas identified as a forest land areas. All areas identified for this resource are identified in green.

Lower Pecos River Basin



Map courtesy of NMED Al Pasteris.

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Lower Pecos River Watershed Alliance Strategy Plan

Forest Land cont'd.

Concerns

Problem	Current Condition	Location of Problem	Source of Problem(s)
Fire suppression in heavily wooded areas has created forest overgrowth	Moderate	Forest wide	Fire suppression and restrictions on forest service personnel to properly approach the problem.
Low infiltration, high runoff, and higher sediment load	7/10 (worst)	Forest wide	Brush invasion and lack of beneficial ground cover.
Soil erosion from misuse of forest lands	severe	Forest wide	Off road vehicles not following forest service rules for trail use.
High tree densities have caused overgrowth of forest areas	3,000+/-acre tree numbers	Forest wide	Lack of fire suppression has caused many of the Ponderosa Savannah to become piñon/ juniper thickets.
Reduced timber harvest	Moderate	Forest wide	Endangered species act has stopped timber harvests of large quantities of trees.
Decrease in grass cover	Severe	Forest wide	Increased grazing and decreased fires resulting in forest overgrowth.



This picture was taken outside of Capitan, NM showing Juniper overgrowth in the background. To the right the landowner has been removing the brush allowing the grass to return. Heavy infestations such as seen in the background require intensive treatment and follow up due to the plant densities and seeds they produce.

Photo courtesy of NRCS, Carrizozo, NM.

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Lower Pecos River Watershed Alliance Strategy Plan

Forest Land cont'd.

Changes

Need	Location of Change	Standard of Measure
Change public perception of what a healthy forest is and what it looks like	Forest wide	Thinned forest, with increased wildlife diversity and increased grass cover.
Increase/improve management practices: chemical treatment and prescribed burns; thinning; grazing; responsible harvest and wildlife management	Forest wide	Trend measurements using various studies/measurements, monitoring and overall visual forest health.

Ideal Condition

A conifer forest having open stands of mixed trees with small areas of closed canopy stands. A good ground cover of native grasses and some shrubs will be present. Open meadows will be present along live streams. The piñon/juniper woodlands will be open savannahs with native grasses, forbs, and scattered shrubs providing good ground cover.



This picture was taken in the Sacramento mountains and demonstrates proper fuel reduction. The forest canopy is open allowing grasses to establish as the understory.

Photo courtesy of NRCS, Carrizozo, NM.

Lower Pecos River Watershed Alliance Strategy Plan

Forest Land cont'd.

High Quality Areas

High-Quality Areas	What Factors Contribute to the High Quality?
Portions of Mescalero Indian Reservation	Timber management/harvest; Brush control; Noxious weed control
Private land owners (Hightower & Goodloe)	Wood cutting; Grazing practices; Fire use; Noxious weed control
USFS-Cloudcroft & Queen areas	Grass bank; Prescribed burns; Road closures; Noxious weed control; Urban interface thinning



This is an after picture on the Mescalero Apache Indian Reservation showing proper thinning and grasses starting to establish underneath the pine trees. Thinning also allows prescribed fires to keep the small diameter timber under control.

Photo courtesy of the NRCS Carrizozo, NM for the Mescalero Apache Indian Reservation.

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Lower Pecos River Watershed Alliance Strategy Plan

Master Schedule

Resource Concern: Water Quality and Quantity

Strategy of Change item 1): Improve vegetation management

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify 8-digit HUC in the Watershed	1 st month	3 rd month	\$100		Develop map of watershed with 8-digit HUCs identify and labeled		Sureste RC&D (Juan Guana)
Determine watershed boundaries' ownership	1 st month	3 rd month	\$100		Develop map identifying land ownerships		NMED (Al Pasteris)
Identify diverse landowners with the same objectives or problems	1 st month	3 rd month	\$1000		Develop list or database of landowners in each 8-digit HUC	Need to Identify objectives/problems and landowners in each 8-digit HUC.	Central Valley SWCD (Don Alam)
Identify all sources of funding (Ongoing activity)	1 st month	3 rd month	\$1000		Develop list of grant sources (public and private), types of projects funded and contacts		Carlsbad SWCD (Judy Bock)
Develop message Monitoring results Current condition Healthy range land What needs to be done (proposed action) What has been done Revise and update message	1 st month	3 rd month	\$2500		Develop Educational workshop that tells the story	Identify/Collect data on water quality/quantity, vegetation types and condition, acres to be treated and treatments, what has been done and how has it worked all by the 8-digit HUC. Identify good land managers in each HUC that have had success.	Central Valley SWCD, South Central RC&D, Sureste RC&D (Don Alam /Dick Shaw/Juan Guana)

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Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Target audience	1 st month	3 rd month	\$500		Develop mailing list from database		Carlsbad SWCD (Judy Bock)
Deliver message	4 th month	6 th month	\$2500		Hold 10 informational meetings or field tours throughout watershed		Chaves County Flood Comm. (Dick Smith)
Identify most critical areas where action should be taken (Prioritize)	4 th month	6 th month	\$2000		Identify 3 critical areas in each HUC. Prioritize 1,2, 3	Based on Inventory below	Central Valley (Don Alam)
Inventory to develop baseline data Densities Erosion rates Annual growth estimates Photo points, etc.	4 th month	6 th month	\$2500		Develop map that identifies vegetation condition, erosion rates, invasive species etc. by HUC	This action step could be part of developing the message	Central Valley and Sureste RC&D (Don Alam and Juan Guana)
Identify areas of infestation on key geological areas	4 th month	6 th month	\$1000		Part of the above inventory, include on map	Also part of delivering the message	Central Valley SWCD (Don Alam)
Inspect in detail the degree and condition of brush to determine application process and rate	4 th month	6 th month			Part of the above inventory process	Further inspect will be part of planning process with individual landowners	Walthall Environmental, LLC. (Mark Walthall)
Monitor actions and need in critical areas to establish baseline and inventory	4 th month	6 th month	\$5000		Monitoring Plan that addresses needs For baseline	Develop monitoring protocol, determine what it is you want to establish baseline for	Walthall Environmental, LLC. (Mark Walthall)
Identify types of application methods to be employed	7 th month	9 th month	\$500		Develop list of applications types that includes at least 2 non-chemical approaches	Inventory	Carlsbad SWCD (Aaron Curbello)
Contact landowners and hold meetings to determine interests	7 th month	9 th month	\$1000		Evaluate education efforts and address needs	We have already started to hold meetings	NMDA Regional Representative (Roy Todd)

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Lower Pecos River Watershed Alliance Strategy Plan

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Evaluate education efforts	7 th month	9 th month	\$1000		Make recommendations and implement	Hold meeting with watershed group to evaluate	NMDA Regional Representative (Roy Todd)
Inform public of programs (local actions) available	7 th month	9 th month	\$1000		Implement recommendations	Discuss as part of watershed meeting to evaluate education	NMDA Regional Representative (Roy Todd)
Encourage groups through Coordinated Resource Management to identify problem areas (Ranking Process)	7 th month	9 th month	\$1000		Attend local working group meetings to address watershed plan and priorities		South Central RC&D and Sureste RC&D (Dick Shaw and Juan Guana)
Take advantage of CSP on critical areas in watershed	7 th month	9 th month	\$500		List of HUC's and year CSP will be implemented to prioritize and match efforts	We have inventoried needs and critical areas by HUC	South Central RC&D and Sureste RC&D (Dick Shaw and Juan Guana)
Establish and recognize groups in critical areas to get work done.	7 th month	9 th month	\$1000		List natural resource groups by HUC, Government and NGOs	We have inventoried needs and critical areas by HUC	Carlsbad SWCD (Judy Bock)
Establish one-stop shopping for grants, programs, etc. available in Pecos Watershed	10 th month	12 th month	\$2000		Develop spreadsheet of grants, programs (sources of funding), what the fund (types of projects), time frame for applying and where to apply (contact name)		DeBaca SWCD (Allen Sparks)
Obtain letters of interest or commitment prior to writing a grant	10 th month	12 th month	\$1000		Letters from appropriate groups		Carlsbad SWCD (Judy Bock)
Evaluation of funding and sources for year	10 th month	12 th month	\$500		Update funding sources spread sheet annually		DeBaca SWCD (Allen Sparks)

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Lower Pecos River Watershed Alliance Strategy Plan

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Develop monitoring plan and needed tasks	10 th month	12 th month	\$1000		Evaluate Monitoring Plan and Update	Have a monitoring plan	Walthall Environmental, LLC. (Mark Walthall)
Apply for cooperative grants on joint projects	10 th month	12 th month	\$1000		Apply for 2 Grants for joint projects	Have targeted areas, groups and projects	Carlsbad SWCD (Bill See)
Acquire funding to implement improvements	10 th month	12 th month	\$3000		Acquire funding through state legislature	Identify other sources of funding other than grants and state or federal programs	Carlsbad SWCD (Bill See)
Establish a forum to communicate activities and methods of stakeholders	10 th month	12 th month	\$500		Update message	Evaluate success of message with watershed group	NMDA Regional Representative (Roy Todd)
Create WEB site with watershed map, show where work being done, critical areas, funding, etc.	1 st year	1 st year	\$1000		Website created		Carlsbad SWCD (Aaron Curbello)
Gain broader support for existing projects (salt cedar, wild land urban interface)	1 st year	1 st year	\$1000		Develop strategy and implement	Evaluate success of message	Carlsbad SWCD (Bill See)
Develop plans/contracts with individual landowners	2 nd year	2 nd year	\$10,000		Plans/contracts developed with 45 individual landowners treating 500,000 acres		Central Valley SWCD (Don Alam)
Establish monitoring points or locations	2 nd year	2 nd year	\$2000		Update Monitoring plan		Walthall Environmental, LLC (Mark Walthall)
Monitor actions and need in critical areas to establish baseline	2 nd year	2 nd year	\$5000		Develop annual monitoring report		Walthall Environmental, LLC (Mark Walthall)
Write/provide annual reports	2 nd year	2 nd year	\$3000		Annual Report		DeBaca SWCD (Allen Sparks)
Solicit bids for having brush removed and select contractor	2 nd year	2 nd year	\$1000		Select Contractor of Contractors	Develop and advertise RFP	Chaves County Flood Comm. (Dick Smith)

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Lower Pecos River Watershed Alliance Strategy Plan

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Develop plans range management system	2 nd year	2 nd year	\$10,000		Develop 15 Plans		BLM Carlsbad (Ray Keller)
Initiate application of herbicide on priority or targeted plants	2 nd year	2 nd year	\$2M		Implement Developed plans		Carlsbad SWCD (Aaron Curbello)
Implement methods for control	2 nd year	2 nd year	\$1M		Implement Developed plans		BLM Carlsbad (Steve Daly)
Apply deferred grazing and grazing management - Grass Production - Reseeding - Post treatment	2 nd year	2 nd year	\$500K		Implement Developed plans		BLM Carlsbad (Steve Daly)
Allow or let natural control by fire happen	3 rd year	Ongoing	\$1000		Part of developed plans, Update message		NMDA Regional Representative (Roy Todd)
Implement erosion control (i.e., range pitting, water spreading) - Erosion control - Practices implemented Pre and post treatment	2 nd year	2 nd year	\$200K		Implement developed plans		BLM Carlsbad (Ray Keller)
Monitor for political and monetary reasons	2 nd year	2 nd year	\$1000		Update monitoring plan		Walthall Environmental, LLC. (Mark Walthall)
Collect annual measurements	3 rd year	3 rd year	\$10,000		Input data collected into monitoring report		Walthall Environmental, LLC. (Mark Walthall)
Evaluated and identify needed changes to monitoring plan	3 rd year	3 rd year	\$1000		Update monitoring plan		Walthall Environmental, LLC. (Mark Walthall)

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Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Report findings of monitoring	3 rd year	3 rd year	\$2000		Annual Monitoring Report		Walthall Environmental, LLC. (Mark Walthall)
Write/provide final report	4 th year	Ongoing	\$4500		Annual Final Report		DeBaca SWCD (Allen Sparks)

Priority Resource: Water Quality and Quantity (Continued)

Strategy of Change Item 2): Improve water quality (reduce sedimentation) and streambank protection

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify and coordinate with groups (local) working on projects i.e. watershed plan at Ski Apache	1 st month	3 rd month	\$2500		List and status of all ongoing projects		Group Heads: WRAP-Dick Shaw PRSCCP (Bill See) Mescalero Tribe (Thora Padilla)
Contact NMED for stream monitor training: Ongoing & USGS re-establish	1 st month	3 rd month	\$1500		Number participants eligible to test water	Equipment, establish training, report results	Group Heads to coordinate volunteers
Use NMED TMDL Survey as baseline	1 st month	3 rd month	\$150		Data accumulation	Use acquired data to establish baseline	Walthall Environmental, LLC (Mark Walthall)
Identify causes of impairment (water quality)	1 st month	3 rd month	\$12,000		GPS, maps, reports, common database	Include findings into a common database	Coordinator
Identify/:Inventory <u>at risk</u> areas susceptible to erosion/impairment	4 th month	6 th month					Coordinator
Inventory streams	4 th month	6 th month	\$40,000		Complete report on stream conditions	Combine ID & Inventory together	Coordinator
Develop treatment strategy	7 th month	9 th month	\$5000		Complete strategy	Combine with management plan	Coordinator

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Lower Pecos River Watershed Alliance Strategy Plan

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify sources of funding	7 th month	9 th month			Long term funding		Coordinator
Prioritize critical watershed treatment areas	7 th month	9 th month	\$1200		Areas ready for treatment		Group Heads
Coordinate conservation activities between land management agencies and private land users	10 th month	12 th month	\$1200		Common methods to be used by all agencies		Group Heads and coordinator
Monitor natural revegetation and water quality	10 th month	12 th month	\$20,000		Inventory and pictures of areas	Long-term follow up	Walthall Environmental, LLC (Mark Walthall)
Acquire funding to implement program	2 years	2 years	\$100K		Sustained funding for long term projects		Group heads and coordinator
Broad education/promotion: schools, radio, TV, ads, organizations	2 years	2 years	\$50,000		Catchy ads and announcements		P.R. Coordinator
Implement vegetation corridors (reduce sediment loads)	2 years	3 years	\$100K		Reduced sediment		Project Coordinator
Develop landowner agreements and individual inventories/plans	2 years	3 years	\$15,000		Signed landowner agreements and plans		Project Coordinator
Improve public awareness of local concerns	2 years	3 years	\$10,000		Public acceptance		P.R. Coordinator
Optimize conditions for improved revegetation	2 years	3 years			Improved vegetation		Mother Nature
Establish long term funding sources	3 years	4 years			Sustained funding		Project Coordinator

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Lower Pecos River Watershed Alliance Strategy Plan

Priority Resource: Water Quality and Quantity (Continued)

Strategy of Change item 3): Improve surface water retention for baseflow and streams

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify partners	1 st month	3 rd month	\$500		Complete list	Contact and arrange for meeting	Carlsbad SWCD (Bill See)
Ensure gauging stations are available to establish & monitor baseline data	1 st month	3 rd month	\$500		Identify types and locations Identify areas where additional monitoring is needed		NMED (Allan Pasteris)
Review compacts & contracts governing stream flow	1 st month	3 rd month	\$1000		Understand what can legally be done		Chaves Co. Flood Comm. (Dick Smith)
Establish conservation education programs	1 st month	3 rd month	\$2000		Establish a curriculum	Identify all other educators/project Establish training & workshops	South Central RC&D and Sureste RC&D (Dick Shaw and Juan Guana)
Identify areas of streams where we have water losses and gains	4 th month	6 th month	\$2500		Develop a map identifying areas		Central Valley SWCD (Don Alam)
Inventory phreatophyte distribution	4 th month	6 th month	\$2500		List has been established to ID & map		Carlsbad SWCD (Aaron Curbello)
Identify critical areas in-flows	4 th month	6 th month	\$2500		Develop a map identifying areas		Central Valley SWCD (Don Alam)
Treat natural spring areas so they will flow again	4 th month	6 th month	\$350K annually		Springs are flowing	Identify springs and develop treatments	Central Valley SWCD (Don Alam)
Encourage hydro/geology studies in watershed	4 th month	6 th month	\$300K		Receive funding through Legislatures for study		Otero SWCD (Rick Biasch)
Utilize TerreSim ecological model to predict H ₂ O availability from forest thinning	7 th month	9 th month		X	Copy of model or results from model		Forest Service Sacramento District (Frank Martinez)

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Lower Pecos River Watershed Alliance Strategy Plan

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify sources of funding	7 th month	9 th month	\$2000		Develop spreadsheet of grants, programs (sources of funding), what the fund (types of projects), time frame for applying and where to apply (contact name)		Carlsbad SWCD (Bill See)
Formulate projects/apply for grants	7 th month	9 th month	\$5000		Apply for 2 Grants that Improve surface water retention for base flow and streams	Identify targeted areas and groups	Carlsbad SWCD (Aaron Curbello)
Promote BMP's	10 th month	12 th month	\$2000		Develop Strategy to promote and implement	Update Education Program	NMDA (Roy Todd)
Monitor stream bank groundwater hydrology	10 th month	12 th month	\$3000		Implement	Update Monitoring plan	Walthall Environmental, LLC. (Mark Walthall)
Promote conservation tillage (i.e. no-till) for better water infiltration into soil	10 th month	12 th month	\$1000		Develop Strategy to promote and implement	Update Education Program	Sureste RC&D (Juan Guana)
Recommend stricter monitoring and metering of ditch users.	10 th month	12 th month	\$1000		Develop Strategy to promote and implement	Update Education Program	Chaves Co. Flood Comm. (Dick Smith)
Concentrate vegetation improvements on main aquifer recharge areas	10 th month	12 th month	\$2000		Prioritize recharge areas for planning purposes and put on map of watershed	Identify recharge areas	Central Valley SWCD (Don Alam)
Stream channel restoration	2 years	2 years	\$250K		Implement plans	Develop plans for 2 stream channel restoration projects	NMED (Al Pasteris)
Debris basin detention	2 years	2 years	\$50,000		Implement plans	Develop plans for 10 Debris basin detentions	Carlsbad BLM (Ray Keller)
Thin forest	2 years	2 years	\$1M		Treat 50,000 acres/year	Develop forest thinning plans to treat 50,000 acres/year	South Central RC&D (Dick Shaw)

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Lower Pecos River Watershed Alliance Strategy Plan

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Restore function of wetlands	2 years	2 years	\$100K		Implement Plan	Develop wetland restoration project	Carlsbad BLM (Ray Keller)
Restore plant & animal species composition (i.e. remove non-natives & restore naturals)	2 years	2 years	\$500K		Implement plans on 100,000 acres	Develop 25 range management system plans	Sureste RC&D (Juan Guana)
Remove invasive plant species	2 years	2 years	\$2.5M		Treat 100,000 acres	Prioritize by critical recharge areas	Central Valley SWCD (Don Alam)
Restore fire regime	2 years	2 years	\$10,000		10 controlled fires occur, alliance highlights the burn	Include in all plan development	South Central RC&D (Dick Shaw)
Increase irrigation technologies	2 years	2 years	\$500K		Improve irrigation efficiencies by 50 % on 50,000 acres	Develop plans with 25 crop producers that address irrigation system improvements	Sureste RC&D (Juan Guana)
Increase retention storage in surface depressions	3 years	3 years		X	25 range management systems plans will implement practice	Promote as part of range management systems	Carlsbad BLM (Steve Daly)
Improve range land conditions to promote favorable vegetation (i.e. more grass & forbs)	3 years	3 years	\$550K		Implement plans to improve 100,000 acres	Develop 25 range management system plans	Carlsbad BLM (Steve Daly)
Identify & repair deep channel ravines to slow sediment load	3 years	3 years	\$150K		Implement 2 stream restoration projects in deep channel ravines	Promote stream restoration techniques	Chaves Co. Flood Comm. (Dick Smith)
Protect (stabilize) stream banks along all streams, within watershed	3 years	3 years	\$200K		Implement 10 stream bank stabilization Projects	Develop plans to stabilize stream banks	Chaves Co. Flood Comm. (Dick Smith)
Establish protocol to maintain areas that have been repaired	4 years	4 years	\$2000		Protocol Established and used		Carlsbad SWCD (Aaron Curbello)

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Lower Pecos River Watershed Alliance Strategy Plan

Priority Resource: Water Quality and Quantity (Continued)

Strategy of Change item 4): Improve groundwater retention and storage in major aquifers

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Inventory and ID all aquifer sources (i.e. GIS map)	1 st month	3 rd month	\$2,000		Aquifer identified and mapped	Hydrological/geological study	Central Valley SWCD (Don Alam)
Identify alternative water sources (i.e. produced H2O)	4 th month	6 th month	\$500		Report summarized project initiated	NEPA study	Sureste RC&D (Juan Guana)
Create or utilize existing funding sources for improved irrigation practices.	7 th month	9 th month	\$1M		EQIP contracts developed		NRCS – SE Area (Hollis Fuchs)
Encourage development strategies and programs that reduce water use in cities.	7 th month	9 th month	\$10,000		Marketing program development		Sureste RC&D (Juan Guana)
Develop water conservation education or borrow it	10 th month	12 th month	\$20,000		Classroom presentations; brochures		Local SWCD's
Improve irrigation practices and efficiencies by 15% by 2015	2 years	2 years	\$5M		Center-pivots installed		NRCS – SE Area (Hollis Fuchs)
Maintain erosion control – to de-gully the gullies	3 years	3 years	\$3M		Diversions & flood control installed		NRCS – SE Area (Hollis Fuchs)
Install irrigation flow meters on all wells within Pecos River Watershed.	5 years	Plus	\$500K		Meters installed		NRCS – SE Area (Hollis Fuchs)
Re-establish forest and range to a desired ecological state. Maintain conditions through the use of appropriate management tools.	5 years	Plus	\$5M per year		Acres treated	Additional funding	NRCS – SE Area (Hollis Fuchs) USFS & BLM

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Lower Pecos River Watershed Alliance Strategy Plan

Priority Resource: Range and Grasslands

Strategy of Change item 1): Education of public to show benefits of range land health

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Develop message - Monitoring results - Current condition - Healthy range land - What needs to be done (proposed actions) - What has been done - Revise and update message	1 st month	3 rd month	\$2000		Success will be measured by having developed the message and identified the target audience. By 5 th month have created the method to deliver the message (i.e., brochure, film, etc.)	Software to help in developing brochures, etc. Might need help from a professional photographer and design person.	P. R. Coordinator
Target audience	1 st month	3 rd month	\$2000		The audience within the first three agencies or organizations that have a direct impact to the watershed (i.e., FS, BLM, NRCS, etc.) Get feedback from these entities to help improve the video, brochure, etc. and with the improved material start a landscape wide campaign to reach public, schools, etc.		P. R. Coordinator
Deliver message	4 th month	6 th month	\$3000		By 6 th month brochures are out and film developed based on the upgraded versions following step from above		P. R. Coordinator
Evaluate education efforts	7 th month	9 th month		X	On 7 th month develop evaluation criteria and by 9 th month start evaluation process		P. R. Coordinator

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Lower Pecos River Watershed Alliance Strategy Plan

Priority Resource: Range and Grasslands (Continued)

Strategy of Change item 2): Increase collaboration on diverse ownership-promote and manage by watershed boundaries

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Determine ownership of watershed boundaries	1 st month	3 rd month		No	Product will be a map		NMED (Al Pasteris) Already done
Identify diverse landowners with a same objective or problem	1 st month	3 rd month	\$3000		Problems will be identified on the map above		Alliance could do this at one of their meetings
Determine where treatment will make a difference (Prioritize)	4 th month	6 th month		No	Problems identified above will be prioritized		Alliance could set priorities at one of our meetings
Contact landowners and hold meeting to determine their interests	7 th month	9 th month	\$3500		Number of public meetings held		Alliance presentation team
Encourage groups through Coordinated Resource Management to identify problem areas (Ranking Process)	7 th month	9 th month		No	Review problems and priorities at local coordination meetings		Alliance members, BLM, NRCS, USFS, SWCD's in watershed
Obtain letters of interest or commitment prior to writing a grant	10 th month	12 th month	\$2000		Agreements of memorandums of understanding signed		Alliance members

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Lower Pecos River Watershed Alliance Strategy Plan

Priority Resource: Range and Grasslands (Continued)

Strategy of Change item 3): Funding for assistance on Range Best Management Practices and Implementation – get earmarked funds to implement-focus on priority areas.

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify all sources of funding (Ongoing activity)	1 st month	3 rd month	\$2000		Develop spreadsheet of grants, programs (sources of funding), what the fund (types of projects), time frame for applying and where to apply (contact name)		Carlsbad SWCD (Bill See)
Evaluation of funding and sources for year	10 th month	12 th month	\$500		Update funding sources spread sheet annually		Carlsbad SWCD (Judy Bock)
Apply for cooperative grants on joint projects	10 th month	12 th month	\$1000		Apply for two Grants for joint projects	Have targeted areas, groups and projects	Carlsbad SWCD (Aaron Curbello)

Priority Resource: Range and Grasslands (Continued)

Strategy of Change item 4): Brush reduction makes more water available, reduces sediment load, increases native vegetation, diversifies wildlife habitat, and increase rain capture by improving infiltration

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify areas of brush infestation on key geological areas	4 th month	6 th month	\$2,000		Maps and GPS locations of target areas		Central Valley SWCD (Don Alam)
Inspect in detail the degree and condition of brush to determine application process and rate	4 th month	6 th month	With above		Within the target areas, identify application rates and type of chemical	Follow up check out on treatment areas.	Technical Assistance (Keith Duncan, etc.)
Monitoring baseline and inventory	4 th month	6 th month	\$10,000		Develop baseline report of results	Follow up on areas treated	Walthall Environmental, LLC

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Lower Pecos River Watershed Alliance Strategy Plan

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify types of application methods to be employed	7 th month	9 th month	\$2,000		Research or visit areas of previous treatment methods		Technical Assistance (Keith Duncan, etc.)
Hold public comment periods for treatment plans and areas (Education)	10 th month	12 th month	\$3,000		Public sign up that did not sign up before		P. R. Coordinator
Develop plans/contracts with individual landowners	2 nd year	2 nd year	\$10,000		Complete plans and signed contracts		Project Coordinator
Solicit bids for having brush removed and select contractor	2 nd year	2 nd year	\$5,000		Successful contractor and brush being removed	Follow up on any regrowth	Project Coordinator
Develop plans for range management system	2 nd year	2 nd year	\$15,000		Plan in place for range management		Project Coordinator
Implement methods and initiate application of herbicide on priority or targeted plants	2 nd year	2 nd year	\$1M		Number of acres treated		Project Sponsors
Apply deferred grazing and grazing management	2 nd year	2 nd year		\$500K In-Kind from landowner	<ul style="list-style-type: none"> - Grass production - Reseeding - Any post-treatment needed 		NRCS, EQIP, or WHIP contracts
Implement erosion control (i.e., range pitting, water spreading)	2 nd year	2 nd year		Same as above	<ul style="list-style-type: none"> - Erosion control - Practices implemented - Pre and post treatment 		Project Coordinator
Reduce brush implement methods of treatment	2 nd year	2 nd year			Measure after initial treatment	Follow up treatments	Solicited Contractor
Allow or let natural brush control by fire happen	3 rd year	Ongoing	\$10,000		Successful burn	Encourage it to help keep original treatment of brush under control	Solicited Contractor

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Lower Pecos River Watershed Alliance Strategy Plan

Priority Resource: Range and Grasslands (Continued)

Strategy of Change item 5): Tracking changes and progress/improvement in range land health

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Inventory to develop baseline data: - Brush densities - Erosion rates - Annual growth estimates - Photo points, etc.	4 th month	6 th month	\$30K		Peer reviewed with detailed report		Carlsbad SWCD (Bill See); Sureste RC&D (Juan Guana); Carlsbad BLM (Ray Keller)
Develop monitoring plan and needed tasks	10 th month	12 th month	\$30K		Peer reviewed detailed plan		Walthall Environmental, LLC
Establish monitoring points or locations	2 nd year	2 nd year	\$80K		Map, GIS locations and photos of points		Walthall Environmental, LLC
Implement monitoring for obtaining desired results	2 nd year	2 nd year	\$50K		Preliminary review of data and evaluation of its ability to meet objectives		Walthall Environmental, LLC
Write/provide annual reports	2 nd year	2 nd year	\$20K		Peer reviewed annual report		Walthall Environmental, LLC
Monitor for political and monetary reasons	2 nd year	2 nd year	\$5K		Determine whether monitoring answers politically "hot" questions		Carlsbad SWCD (Bill See); Sureste RC&D (Juan Guana); Carlsbad BLM (Ray Keller)
Collect annual measurements	3 rd year	3 rd year	\$150K		Evaluate thoroughness of collected data and data quality		Walthall Environmental, LLC
Evaluate and identify needed changes to monitoring plan	3 rd year	3 rd year	\$5K		Determine whether monitoring answers politically "hot" questions		Carlsbad SWCD (Bill See); Sureste RC&D (Juan Guana); Carlsbad BLM (Ray Keller)
Report findings of monitoring	3 rd year	3 rd year	\$20K		Present findings for public comment		Walthall Environmental, LLC
Write/provide final report	4 th year	Ongoing	\$20K/yr		Peer reviewed annual report		Walthall Environmental, LLC

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Lower Pecos River Watershed Alliance Strategy Plan

Priority Resource: Forest Land

Strategy of Change item 1): Increase/improve management practices: prescribed burns; thinning; grazing; chemical; responsible harvest, wildlife management, and hunt management

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Identify who is doing what now where and when	1 st month	3 rd month	\$5K		A report that includes this data		South Central RC&D (Dick Shaw)
Inventory needed and anticipated results	1 st month	3 rd month	\$10K		Inventory made available to project leaders		South Central RC&D Mescalero Apaches US Forest Service
Inventory funding available for ongoing projects	1 st month	3 rd month		No	Inventory will identify projects		South Central RC&D
Encourage and develop new partnerships to work across ownership boundaries	1 st month	3 rd month	\$5K		Number of new projects with new partners will be monitored		Project Coordinator
Start large scale planning of watersheds (i.e. environment analysis, public involvement)	4 th month	6 th month	\$50K		Final plans are presented		US Forest Service RC&D's, NRCS, and SWCD's
Identify science needed & effective practices (Methodology)	4 th month	6 th month		No	Included in large scale plan		US Forest Service RC&D's, NRCS, and SWCD's
Promote cost effective practices	4 th month	6 th month		No	Included in large scale plan		US Forest Service RC&D's, NRCS, and SWCD's
Prioritize projects	7 th month	9 th month	\$2K		Evaluate the continuity of projects and overall success in the watershed		Alliance Members Project Coordinator
Coordinate practices, specs, activities between agencies (CRM)	7 th month	9 th month	\$10K		Evaluate continuity and effectiveness of projects		Project Leaders Alliance Members

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Lower Pecos River Watershed Alliance Strategy Plan

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Work to remove political barriers in selection of treatment practices (to include local involvement and decisions)	7 th month	9 th month	\$2K		Number of plans that address entire problem area and best practices to address the problem		Project Coordinator Technical Advisors Alliance Members
Implement practices in critical areas	10 th month	12 th month	\$2M		Monitor effectiveness of practices in protecting critical areas		Project Coordinator Project Leaders Landowners
Assimilate work accomplished acreage, location, maps (annually)	2 years	2 years	\$1K		Availability of completed annual accomplishment report		Project Coordinator Project Leaders
Implement monitoring plan(outcome, successes, water yield)	2 years	2 years	\$50K		Annual monitoring report with science based evaluations		Walthall Environmental, LLC
Use adaptive management – adjust as needed to improve plan	2 years	2 years	\$5K		Determine if monitoring answers relevant questions		Walthall Environmental, LLC
Seek additional funding for program activities	3 years	3 years	\$10K		Review of additional funding received		Project Coordinator Alliance Members
Get funding for sustainable funds to complete plan	4 years	4 years	\$5K		Review of funding sustainability		Project Coordinator Alliance Members

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Lower Pecos River Watershed Alliance Strategy Plan

Priority Resource: Forest Land (Continued)

Strategy of Change item 2): Change public perception of what a health forest is and what it looks like

Action Step	Time Frame		\$\$/Funding Needed?		How will you measure success? (Measurement Tool)	Anything else needed?	Person Responsible
	Start	Finish	Yes (-\$)	No (+\$)			
Promote changes to Endangered Species Act	1 st month	3 rd month	\$1000		ESA reauthorized with changes	Identify specific changes that will facilitate good management	South Central RC&D (Dick Shaw)
Get funding to hire personnel to develop documentaries, brochures, web sites	1 st month	3 rd month	\$1500		Funding in hand to hire personnel	Solicit funds from partners and stakeholders	Carlsbad SWCD (Judy Bock)
Develop an outreach program (all ages)	1 st month	3 rd month	\$4000		Outreach plan		Carlsbad SWCD (Judy Bock)
Hire a sales, media, public relations coordinator	4 th month	6 th month	\$100K		Have a Public Relations coordinator		Steering committee of watershed alliance
Hold trainings that cover media	4 th month	6 th month	\$20,000		All involved agencies that have an employee trained	Follow up training as needed	Public Relations Coordinator
Arrange public tours of completed projects	4 th month	6 th month	\$12,000 (\$3K/tour)		How many people attend tours	Brochures and literature of tours	Public Relations Coordinator
Educate the public through constant media coverage on projects and programs	7 th month	9 th month	\$150K/yr		Identify eliminated management restrictions		Public Relations Coordinator
Require a Natural resource curriculum in schools	10 th month	12 th month		No	Curriculum in place in school systems	Curriculum outline	Public Relations Coordinator
Create demonstration areas of self-guided tours for the public	10 th month	12 th month	\$30,000 (\$6K/area)		Five demonstration areas throughout the watershed	Signage	Public Relations Coordinator
Interview people who have lost their homes/property due to lack of management practices	10 th month	12 th month		No	Four interviews on news media		Public Relations Coordinator
Arrange public tours of ongoing projects	2 years	2 years	\$12,000 (\$3K/tour)		Number of tours and number of participants	Handouts	P. R. Coordinator Project managers
Show success of management practices (video)	2 years	2 years	\$75,000		Three videos		P. R. Coordinator

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Lower Pecos River Watershed Alliance Strategy Plan

Budget Summary

The following represents an estimated budget for the phases of this strategic plan by years:

Item	1st year	2nd year	3rd and 4th year	Total
Water Quality And Quantity	\$ 1,825,250	\$ 5,000,000	\$ 5,000,000	\$ 11,825,250
Range and Grasslands	98,000	1,000,000	180,000	1,278,000
Forest Lands	2,402,500	143,000	15,000	2,560,500
TOTAL	\$ 4,325,750	\$ 6,143,000	\$ 5,195,000	\$ 15,663,750

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Appendix A

2004 State of New Mexico

303(d) List of Impaired Surface Waters

(Table of Contents of "Category 5" waters on the following
Integrated 303(d)/305(b) List)

HUC: 11040001 **Cimarron Headwaters**
Dry Cimarron River (Perennial reaches OK bnd to Oak Creek)
Long Canyon (Perennial reaches abv Dry Cimarron)

HUC: 11080001 **Canadian Headwaters**
Caliente Canyon (Vermejo River to headwaters)
Chicorica Creek (Canadian River to Raton Creek)
Lake Maloya
Raton Creek (Chicorica Creek to headwaters)
Stubblefield Lake
VanBremmer Creek (HWY 64 to headwaters)
York Canyon (Vermejo River to headwaters)

HUC: 11080002 **Cimarron**
Eagle Nest Lake
McCrystal Creek (North Ponil to headwaters)
Middle Ponil Creek (South Ponil to headwaters)
Ponil Creek (Cimarron River to confl of North & South Ponil)
Springer Lake

HUC: 11080003 **Upper Canadian**
Charette Lake (Lower) Conchas Reservoir

HUC: 11080004 **Mora**
Coyote Creek (Mora River to Black Lake)
Little Coyote Creek (Black Lake to headwaters)
Mora River (Canadian River to USGS gage east of
Shoemaker)
Mora River (HWY 434 to headwaters)
Mora River (USGS gage east of Shoemaker to HWY 434)
Morphy (Murphy) Lake

HUC: 11080006 **Upper Canadian-Ute**
Reserv
Ute Reservoir

HUC: 11100101 **Upper Beaver**
Clayton Lake

HUC: 12050002 **Blackwater Draw**
Green Acres Lake

HUC: 12080001 **Lost Draw**
Lane Salt Lake

HUC: 13010005 **Conejos**
Rio de los Pinos (New Mexico reaches)
Rio San Antonio (Montoya Canyon to headwaters)

HUG: 13020101 **Upper Rio Grande**
Bitter Creek (Red River to headwaters)

Comanche Creek (Costilla Creek to Little Costilla Creek)
Costilla Creek (Diversion abv Costilla to Comanche Creek)
Embudo Creek (Canada de Ojo Sarco to Picuris Pueblo bnd)
Embudo Creek (Rio Grande to Canada de Ojo Sarco)
Goose Lake
Guaje Canyon (San Ildefonso bnd to headwaters)
Little Tesuque Creek (Rio Tesuque to headwaters)
Los Alamos Canyon (San Ildefonso bnd to Los Alamos Rsvr)
Los Alamos Reservoir
Pioneer Creek (Red River to headwaters)
Placer Creek (Red River to headwaters)
Pojoaque River (San Ildefonso bnd to Pojoaque bnd)
Pueblo Canyon (Los Alamos Canyon to headwaters)
Red River (Placer Creek to headwaters)
Red River (Rio Grande to Placer Creek)
Rendija Canyon (Guaje Canyon to headwaters)
Rio Chiquito (Picuris Pueblo bnd to headwaters)
Rio Chupadero (USFS bnd to headwaters)
Rio Fernando de Taos (Rio Pueblo de Taos to headwaters)
Rio Grande (non-pueblo Santa Clara to Embudo Creek)
Rio Grande (Red River to CO border)
Rio Grande del Rancho (Rio Pueblo de Taos to HWY 518)
Rio Hondo (Rio Grande to USFS bnd)
Rio Pueblo (Picuris Pueblo bnd to headwaters)
Rio Pueblo de Taos (Arroyo del Alamo to R Grande del
Rancho)
Rio Pueblo de Taos (R Grande del Rancho to Taos pueblo bnd)
Rio Pueblo de Taos (Rio Grande to Arroyo del Alamo)
Rio Quemado (Santa Cruz River to headwaters)
Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd)
Santa Cruz River (San Juan Pueblo to Santa Cruz Dam)
Tesuque Creek (Little Tesuque Creek to confl of forks)

HUC: 13020102 **Rio Chama**
Abiquiu Creek (Rio Chama to headwaters)
Canones Creek (Abiquiu Reservoir to headwaters)
Cecilia Canyon Creek (Rio Capulin to USFS bnd)
Chavez Creek (Rio Brazos to headwaters)
Clear Creek (Rio Gallina to headwaters)
El Vado Reservoir
Heron Reservoir
Hopewell Lake
Poleo Creek (Rio Puerco de Chama to headwaters)
Polvadera Creek (Canones Creek to headwaters)
Rio Brazos (Rio Chama to Chavez Creek)
Rio Chama (Rio Brazos to Little Willow Creek)
Rio Chamita (Rio Chama to CO border)
Rio Nutrias (Rio Chama to headwaters)
Rio Puerco de Chama (Abiquiu Reservoir to Poleo Creek)
Rio Puerco de Chama (Poleo Creek to headwaters)
Rio Tusas (Rio Vallecitos to headwaters)
Rio Vallecitos (Rio Tusas to headwaters)
Rito de Tierra Amarilla (Rio Chama to HWY 64)
Rito Resumidero (Rio Puerco de Chama to headwaters)

HUC: 13020201 **Rio Grande-Santa Fe**
Capulin Creek (Rio Grande to headwaters)
Galisteo Ck (Perennial reaches abv Santo Domingo bnd)

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Lower Pecos River Watershed Alliance Strategy Plan

Las Huertas Creek (Placitas to Capulin Canyon)
Mortandad Canyon (San Ildefonso bnd to headwaters)
Pajarito Canyon (Rio Grande to headwaters)
Rio Grande (Cochiti Reservoir to San Ildefonso bnd)
Rito de los Frijoles (Rio Grande to headwaters)
Sandia Canyon (San Ildefonso Pueblo bnd to headwaters)
Water Canyon (Rio Grande to headwaters)

HUC: 13020202 **Jemez**

Calaveras Creek (Rio Cebolla to headwaters)
Fenton Lake
Jaramillo Creek (East Fork Jemez to headwaters)
Jemez River (East fork)
La Jara Creek (East Fork Jemez to headwaters)
Redondo Creek (Sulphur Creek to headwaters)
Rio Guadalupe (Jemez River to confl with Rio Cebolla)
Rito de los Indies (San Antonio Creek to headwaters)
San Antonio Creek (East Fork Jemez R to headwaters)
Sulphur Creek (Redondo Creek to headwaters)

HUC: 13020204 **Rio Puerco**

Nacimiento Creek (USFS bnd to San Gregorio Reservoir) Rio Puerco (Rito Olguin to headwaters) Rito Leche (Perennial reaches above Rio Puerco) San Pablo Canyon (Rio Puerco to headwaters)

HUC: 13020207 **Rio San Jose**

Bluewater Creek (Navajo Nation bnd to headwaters)
Bluewater Creek (Rio San Jose to Navajo Nation bnd) Rio Moquino (Laguna Pueblo to Seboyettia Creek) Rio Paguante (Laguna Pueblo bnd to headwaters)

HUC: 13020211 **Elephant Butte Reservoir**

Alamosa Creek (Perennial reaches abv Monticello diversion)
Elephant Butte Reservoir

HUC: 13030101 **Caballo**

Caballo Reservoir
Percha Creek (Perennial reaches Caballo R to M Fork)

HUC: 13030102 **El Paso-Las Cruces**

Rio Grande (Texas border to Leasburg Dam)

HUC: 13030202 **Mimbres**

Bear Canyon Reservoir
Mimbres R (Perennial reaches downstream of Willow Springs)
Mimbres R (Perennial reaches Willow Springs to Cooney Cny)

HUC: 13050003 **Tularosa Valley**

Three Rivers (Perennial prt HWY 54 to USFS exc Mescalero)
Tularosa Creek (HWY 54 to Mescalero Apache bnd)

HUC: 13060001 **Pecos Headwaters**

Beaver Creek (Porvenir Creek to headwaters)
Bull Creek (Cow Creek to headwaters)
Cow Creek (Bull Creek to headwaters)
Cow Creek (Pecos River to Bull Creek)
Gallinas River (Las Vegas Diversion to headwaters)

Gallinas River (San Augustin to Las Vegas Diversion)
Glorieta Creek (Pecos River to headwaters)
Pecos River (Alamitos Canyon to Willow Creek)
Pecos River (Canon de Manzanita to Alamitos Canyon)
Pecos River (Santa Rosa Reservoir to Tecolote Creek)
Pecos River (Sumner Reservoir to Santa Rosa Reservoir)
Pecos River (Tecolote Creek to Canon de Manzanita)
Santa Rosa Reservoir
Sumner Reservoir
Tecolote Creek (I-25 to Blue Creek)
Willow Creek (Pecos River to headwaters)
Wright Canyon Creek (Tecolote Creek to headwaters)

HUC: 13060008 **Rio Hondo**

Alto Lake
Rio Bonito (Rio Ruidoso to Angus Canyon)
Rio Hondo (Perennial reaches Pecos R to Rio Ruidoso)
Rio Ruidoso (Rio Bonito to Seeping Springs Lake)
Rio Ruidoso (Seeping Springs Lake to Mescalero Apache bnd)

HUC: 13060010 **Rio Penasco**

Rio Penasco (HWY 24 to headwaters) Rio Penasco (Pecos River to HWY 24)

HUC: 13060011 **Upper Pecos-Black**

Avalon Reservoir
Black River (Pecos River to headwaters)
Brantley Reservoir
Laguna Gatuna
Laguna Quatro
Laguna Tres
Laguna Uno
Pecos River (Black River to Tansil Lake)
Pecos River (TX border to Black River)
Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spr)
Tansil Lake (Carlsbad Municipal Lake)

HUC: 14080101 **Upper San Juan**

Gallegos Canyon (San Juan River to Navajo bnd) Navajo Reservoir
San Juan River (Animas River to Canon Largo) San Juan River (Canon Largo to Navajo Reservoir)

HUC: 14080104 **Animas**

Animas River (Estes Arroyo to CO border) Animas River (San Juan River to Estes Arroyo) Lake Farmington (Beeline Reservoir)

HUC: 14080105 **Middle San Juan**

La Plata River (San Juan River to CO border)
San Juan River (Navajo bnd at Hogback to Animas River)

HUC: 15020003 **Carrizo Wash**

Quemado Lake

HUC: 15020004 **Zuni**

McGaffey Lake
Rio Nutria (Zuni Pueblo bnd to headwaters)

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HUC: 15040001

Upper Gila

Gila River (Middle Fork)

Gila River (West Fork below Gila Cliff Dwellings)

Gilita Creek (Middle Fork Gila R to Willow Creek)

Lake Roberts

Taylor Creek (Beaver Creek to Wall Lake)

Taylor Creek (Perennial reaches abv Wall Lake)

Turkey Creek (Gila River to headwaters)

Wall Lake

HUC: 15040004

San Francisco

Centerfire Creek (San Francisco R to headwaters) Negrito

Creek (Tularosa River to confl of N and S forks)