Moreno Valley Wetland Action Plan

Prepared by

Joanne Hilton, P.G.

in cooperation with

the Cimarron Watershed Alliance

and the

New Mexico Environment Department (NMED)

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EXECUTIVE SUMMARY

The Moreno Valley is located in the Sangre de Cristo Mountains at the headwaters of the Cimarron River Watershed in western Colfax County, New Mexico. Numerous wetland resources have been identified along riparian corridors, slopes, and at other locations within the Moreno Valley.

The purpose of this Wetlands Action Plan (WAP) is to define strategies for protecting and restoring wetlands in the Moreno Valley and to supplement the Watershed Based Plan (WBP) for the Cimarron Watershed, which addressed water quality impairments in the Moreno Valley, including *Escherichia (E.coli)* bacteria, plant nutrients, temperature, sediment and turbidity. The protection and restoration of wetlands in the Moreno Valley will continue to support improved water quality conditions throughout the valley.

The Moreno Valley is a high altitude valley with a semi-arid climate. This valley includes three perennial drainages, all flowing into Eagle Nest Lake, a major supply reservoir for northeastern New Mexico. Shallow groundwater also generally flows toward Eagle Nest Lake. The Moreno Valley contains mountain grasslands in lower elevations, and forests of both conifer and aspen at higher elevations. The principal fish species, as recognized and supported by the New Mexico Department of Game and Fish, are Kokanee Salmon, Rainbow Trout, Northern Pike, and Yellow Perch. Landownership includes a mix of public (Eagle Nest State Park and a small amount of National Forest) and private. Much of the private development is related to recreational resources in the valley.

The mapping of wetlands in the Moreno Valley was recently completed as part of a larger mapping effort in northeast New Mexico by Saint Mary's University of Minnesota and the New Mexico Environment Department Surface Water Quality Bureau (NMED SWQB). Wetlands for the project area were mapped and classified using on-screen digitizing methods established in the GIS. Aerial imagery, combined with soils, topographic, hydrologic, and land cover data sets, was used as a base map. This mapping is consistent with the National Wetland Inventory (NWI), which classifies wetlands by system, and was correlated to the Hydrogeomorphic (HGM) system that is used by the SWQB. The HGM classification system is based on geomorphic settings and includes five classes of wetlands in the Moreno Valley: riverine, lacustrine fringe, depressional, slope and palustrine fringe. The majority of mapped wetlands in the Moreno Valley consist of slope wetlands.

A key objective of the WAP is to identify potential impairments to wetlands and to identify protection and restoration measures. Key potential impairments to wetlands in the Moreno Valley include:

- ***Roads.*** Numerous unpaved roads throughout the Moreno Valley traverse the slope wetlands, causing fragmentation and dewatering of the wetlands due to the interruption of subsurface flow.

- ***Grazing***. Large Elk herds and other wildlife may impact wetlands by disturbing soil and overgrazing in riparian areas. Wetlands may also be affected by livestock grazing.

- ***Diversion ditches***. Ditches that move water away from the head of slope wetlands to water other areas can cause drying of the wetlands downgradient.

- ***Earthen stock tanks***. Tanks excavated into slope wetlands capture and impound the water. Although some of the water infiltrates the earthen dam, the water downstream is reduced, resulting in drying of the wetland.

Other potential impairment may result from historic mining and timber activities, poorly planned development, domestic wastewater, and disruption of beaver habitat. Poorly designed roads or drainage, poorly managed grazing, poorly placed diversion ditches and/or earthen stock tanks, wildfires, other upland land disturbances, or any combination of these impairments can lead to headcuts, channelized flow (disconnection from the floodplain), and sediment loading. Potential protection and restoration measures include:

- Poorly designed roads may be restored through realignment, porous fill for road crossing, proper drainage, and other methods.

- Grazing exclosures may be used to prevent access to important areas for protection. Livestock best management practices, such as rotation and alternate water sources, can be used by ranches in the area to minimize impacts to wetlands.

- In some cases there may be historic diversion ditches and stock tanks that are no longer needed and can be de-commissioned in order to restore slope wetlands.

- Development planning can help to avoid future impairment of wetlands.

- Restoration measures for degraded streams may include in-channel measures, such as post vanes, baffles, one rock dams, media lunas, willow planting or other measures that will improve bank stability, slow and redistribute flows, and reconnect channels with floodplains to prevent erosion and sedimentation in wetland areas.

- Fuel reduction by private landowners and local governments can help reduce the risk of catastrophic wildfires, which could cause additional water quality impairment, particularly turbidity, sedimentation, and temperature. Fuel reduction projects are protective of long-term water quality and wetland resources in the Moreno Valley.

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List of Acronyms

Acronym	Full Name
AIH	Aquatic Invertebrate Habitat
AMO	Atlantic Multidecadal Oscillation
BISON-M	Biota Information System of New Mexico
BSS	Bank and Shoreline Stabilization
CCW	Comanche Creek Watershed
CCWG	Comanche Creek Working Group
CE	Categorical Exclusion
CS	Carbon Sequestration
CWA	Cimarron Watershed Alliance
DWS	Domestic Water Supply
E.coli	*Escherichia coli*
ECOS	Environmental Conservation Online System
EQIP	Environmental Quality Incentive Program
FGDC	Federal Geospatial Data Committee
FH	Fish Habitat
GIS	Geographic Information System
GR	Groundwater Recharge
HGM	Hydrogeomorphic
HQCAL	High Quality Cold Water Aquatic Life
in/hr	Inches per hour
IPaC	Information for Planning and Conservation
IPCC	Intergovernmental Panel on Climate Change
Ksat	Saturated Hydraulic Conductivity
LLWW	Landscape position, Landform, Water flow path and Water body
MCAL	Marginal Cold Water Aquatic Life
NM	New Mexico
NMDGF	New Mexico Department of Game and Fish
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMHPD	New Mexico Historic Preservation Division
NMISC	New Mexico Interstate Stream Commission
NMOSE	New Mexico Office of the State Engineer

NMRPTC	New Mexico Rare Plant Technical Council
NMSU	New Mexico State University
NRCS	Natural Resources Conservation Service
NT	Nutrient Transformation
ONRW	Outstanding National Resource Waters
OWH	Other Wildlife Habitat
PDO	Pacific Decadal Index
SC	Secondary Contact
SM	Streamflow Maintenance
SR	Sediment and Other Particulate Retention
SWD	Surface Water Detention
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
U.S.	United States
UNM	University of New Mexico
USACE	United States Army Corps of Engineers
USFS	U.S. Forest Service
USGCRP	U.S. Global Change Research Program
WAP	Wetland Action Plan
WBIRD	Water Bird Habitat
WBP	Watershed-Based Plan
WLA	Waste Load Allocation
WSS	Web Soil Survey
WUI	Wildland Urban Interface
WWAL	Warm Water Aquatic Life

1. Introduction

The Moreno Valley is located in the headwaters of the Cimarron River Watershed in western Colfax County, New Mexico (Figure 1-1) and bounded by the Sangre de Cristo Mountains to the north, west, and south. Eagle Nest Lake, a major water supply storage reservoir for eastern New Mexico, is on the east side of Moreno Valley. There are numerous wetland resources along riparian corridors, slopes, and at other locations within the Moreno Valley.

The purpose of this Wetlands Action Plan (WAP) is to define strategies for protecting and restoring wetlands in the Moreno Valley. This WAP is intended to supplement the Watershed Based Plan (WBP) for the Cimarron Watershed, which was completed in December of 2012. The Cimarron WBP defined strategies to address documented water quality impairments in the Cimarron Watershed and water quality impairment within the Moreno Valley, including sediment, turbidity, temperature, and *Escherichia coli* (*E.coli)* bacteria. The protection and restoration of wetlands in the Moreno Valley will continue to support improved water quality conditions throughout the valley.

The Cimarron Watershed Alliance (CWA), in conjunction with Joanne Hilton of Global Hydrologic Solutions, LLC contracted with the New Mexico Environment Department (NMED) to complete this WAP for the Moreno Valley (WBP, 2012). The CWA, a 501(c) (3) non-profit group, is focused on watershed health and addresses water quality issues in the Cimarron watershed. The CWA holds a monthly stakeholder meeting which is open to the general public.

This Moreno Valley WAP includes:

a) a general description of the watershed including climate, soils, geology and groundwater, surface water, water quality, vegetation, wildlife, and land use (Section 2);

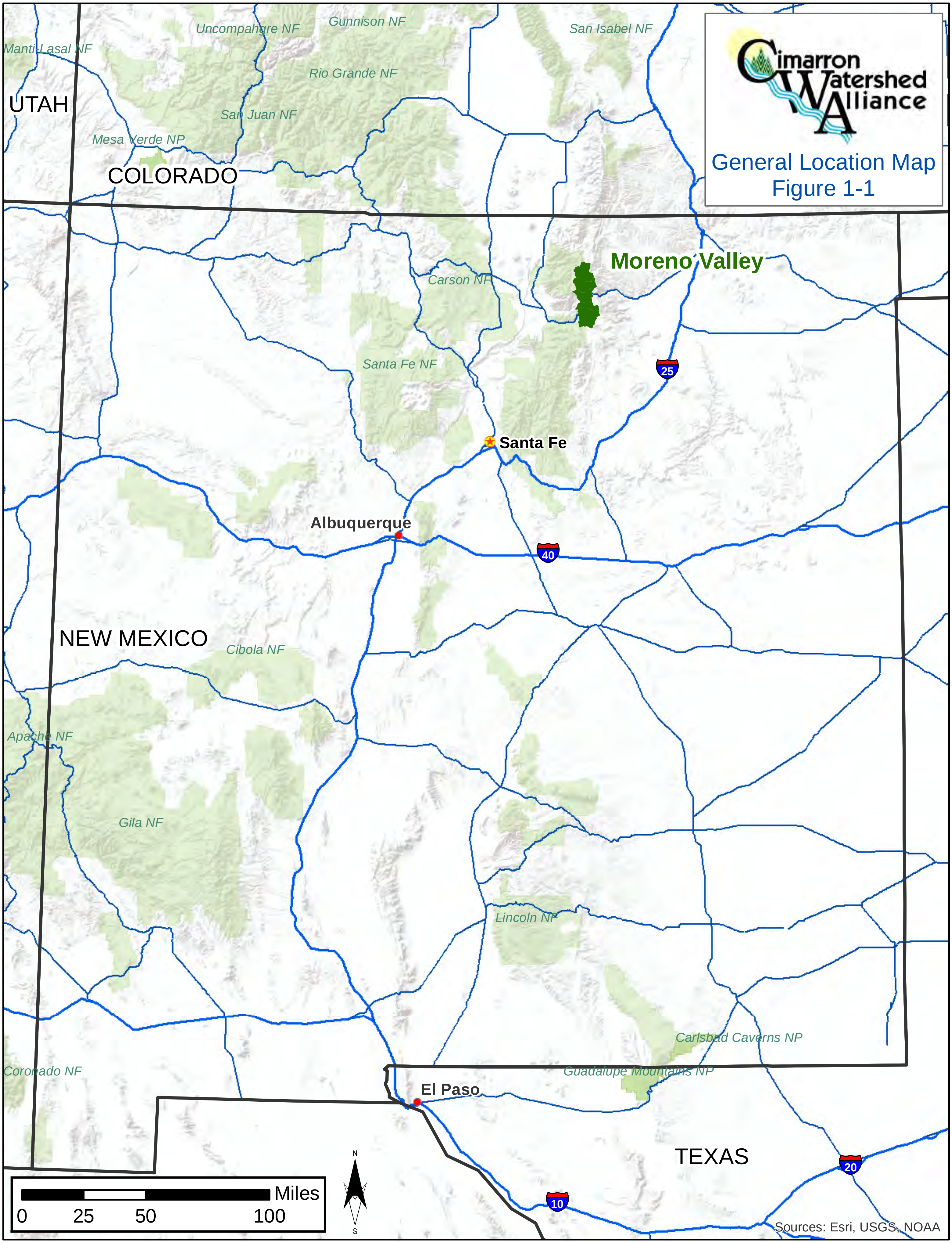
b) a resource analysis including an inventory of wetlands based on previously completed mapping (Section 3);

c) identification of threats and impairment to wetlands (Section 4); and

d) a recommended action plan that identifies measures to protect and restore wetlands (Section 4).

This plan has been developed in an open-public process in accordance with a public involvement strategy, as discussed in Section 5.

This WAP was developed based on currently available information. The development and refinement of the Moreno Valley WAP will continue to be an ongoing process.



Cimarron Watershed Alliance
General Location Map
Figure 1-1
Uncompahgre NF
Gunnison NF
San Isabel NF
Manti-Lasal NF
Rio Grande NF
UTAH
San Juan NF
Mesa Verde NP
COLORADO
Moreno Valley
Carson NF
Santa Fe NF
25
Santa Fe
Albuquerque
40
NEW MEXICO
Cibola NF
Apache NF
Gila NF
Lincoln NF
Carlsbad Caverns NP
Coronado NF
Guadalupe Mountains NP
El Paso
TEXAS
20
10
N
S
Miles
0
25
50
100
Sources: Esri, USGS, NOAA

2. Moreno Valley Watershed

The Moreno Valley elevation ranges from about 8,000 to over 10,000 feet above mean sea level at Eagle Nest Lake. The Moreno Valley includes 3 perennial drainages and riparian corridors:

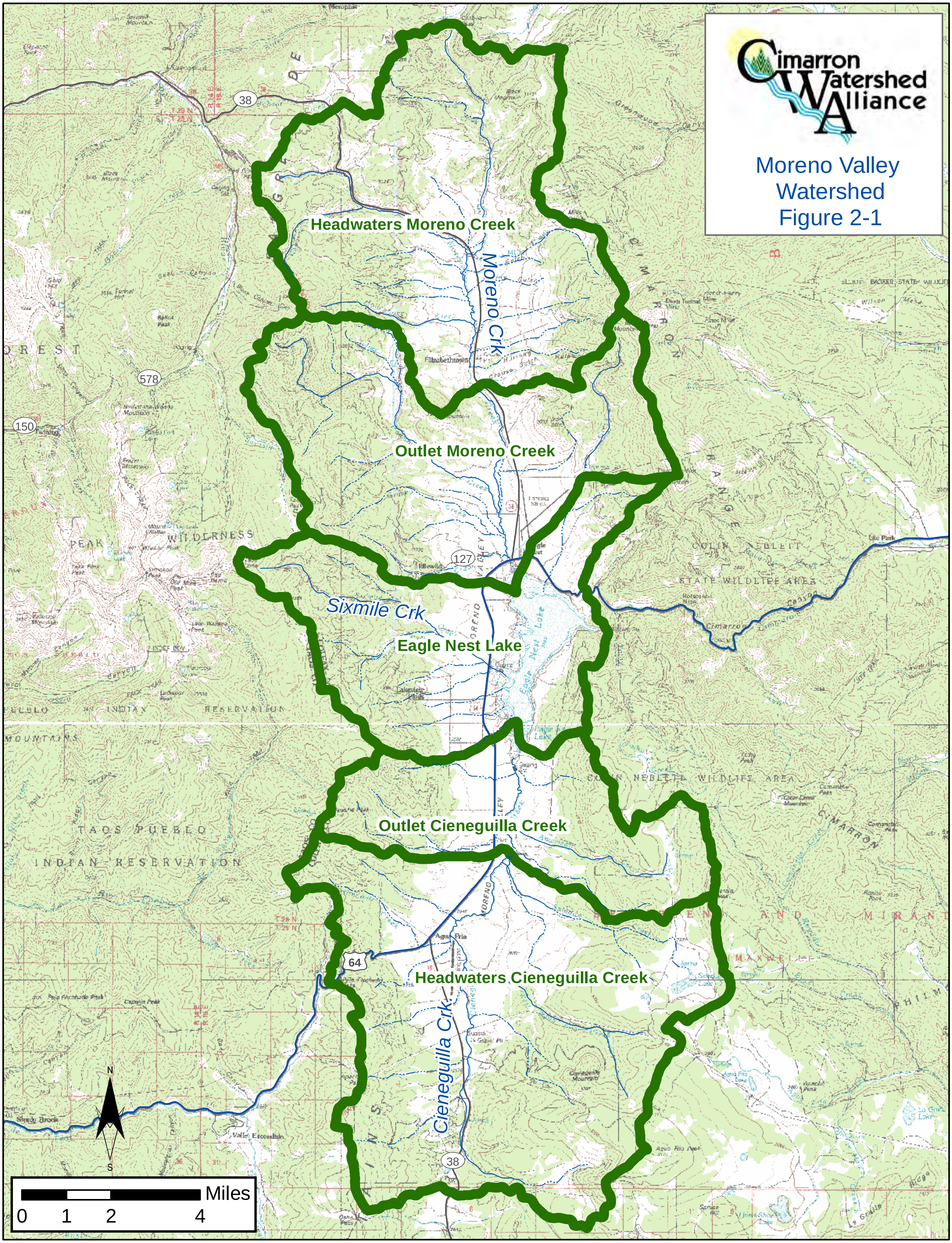
- Moreno Creek
- Sixmile Creek
- Cieneguilla Creek

These tributaries are all headwater drainages that flow into Eagle Nest Lake from the south, west, and north, respectively. The Moreno Valley watershed is divided into five sub-watersheds, from north to south: Moreno Creek Headwaters, Moreno Creek Outlet, Eagle Nest Lake, Cieneguilla Creek Outlet, and Cieneguilla Creek Headwaters (Figure 2-1). Eagle Nest Lake, one of the oldest reservoirs in New Mexico, is a key resource in the Moreno Valley.

2-1. Climate

The Moreno Valley climate is semi-arid. At the Eagle Nest Climate Station, the long-term average annual precipitation is about 15 inches per year, with annual precipitation varying from below 10 inches to more than 20 inches. Long-term average annual temperatures are about 40 degrees; and daily minimum and maximum temperatures average between 22 and 58 degrees, respectively, on an annual basis. This climate is characterized by extreme temperatures. The combination of the high elevation, along with the short growing season, creates agricultural challenges in the Moreno Valley.

The New Mexico climate is historically variable with cycles of drought along with short-term storm events; conditions that are influenced by natural cycles such as el Niño/la Niña, the Pacific Decadal Index (PDO) and the Atlantic Multidecadal Oscillation (AMO). Additionally, recent assessments indicate that the warming of climate systems is unequivocal, and that all current climate models project significant warming trends over continental areas in the 21st century (IPCC, 2013). In the United States, regional assessments conducted by the U.S. Global Change Research Program (USGCRP) have found that temperatures in the southwestern United States have increased and are predicted to continue to increase (USGCRP, 2009). Predictions of annual precipitation are subject to greater uncertainty.


Cimarron Watershed Alliance
Moreno Valley Watershed
Figure 2-1
Headwaters Moreno Creek
Moreno Crk
Outlet Moreno Creek
Sixmile Crk
Eagle Nest Lake
Outlet Cieneguilla Creek
Headwaters Cieneguilla Creek
Cieneguilla Crk.
38
578
150
127
64
N
S
Miles
0
1
2
4

The effects of climate change that are likely to occur in the Moreno Valley and throughout New Mexico include (NMOSE/NMISC, 2006, USGCRP, 2009):

- Temperature is expected to continue to rise, resulting in increased evaporation and evapotranspiration.
- Precipitation is expected to be more concentrated and intense, so that increases in the frequency and severity of flooding are also projected.
- Streamflow is projected to decrease overall due to lower snowpack and higher evapotranspiration, and peak runoff will occur earlier and be diminished.
- During drought periods, forests are increasingly susceptible to insects, forest fires, and desiccation. Higher temperatures increase insect survivability as well as risk of fires.

Additional stresses on wetlands due to increasing temperatures, evaporation, and intense precipitation events magnify the importance of protecting and restoring wetland resources.

2-2. Soils

The Moreno Valley soils were first characterized during the initial watershed-based planning effort for the Cimarron Watershed (Huerta, 2012). The Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS) (websoilsurvey.nrcs.usda.gov/) was used to define soil properties, elevations, landscape characteristics, and precipitation near the three perennial creeks. The following descriptions pertain to the soil structure of flood plain areas; however, this information does not reflect the soil structure for the entire course of these three perennial creeks (Huerta, 2012), (NRCS/WSS 2010):

- Cieneguilla Creek courses through an elevation of 8,000 to 10,500 feet. The Cieneguilla Creek bed is mainly composed of 65% gently sloping (1-5%) Frolic association, with 30% Cumulic Haplaquolls and similar soils. The creek area is moderately well-drained. The capacity of the most limiting layer to transmit water (Ksat) is moderately high to high (0.60 to 2.00 in/hr). This drainage system is subject to occasional flooding. The Cumulic Haplaquolls soils profile consists of 0 to 15 inches of very fine sandy loam, and 15 to 35 inches of loam; with 35 to 42 inches of fine sandy loam, and 42 to 60 inches of silt (NRCS/WSS 2010). Typically, the run-off in Cieneguilla Creek is loaded with fine soil particulates.

- The Moreno Creek bed is mainly composed of Morval and similar soils at 55%; with Moreno and similar soils at 35%; sloping at 1 to 5%. The capacity of the most limiting layer to transmit water (Ksat) is moderately high to high (0.60 to 2.00 in/hr). The depth to the water table is more than 80 inches. The Morval/Moreno soils profile is 0 to 57 inches of clay loam; with 57 to 60 inches of gravelly sandy clay loam; and 60 to 70 inches of stony clay loam (NRCS/WSS 2010).

- The Six Mile Creek bed is similar to that of Moreno Creek at 35%; with Moreno and similar soils; and 55% Morval soils, sloping at 1 to 5%. The capacity of the most limiting layer to transmit water (Ksat) is moderately high to high (0.60 to 2.00 in/hr). The Morval Moreno soil profile is 0 to 57 inches of clay loam; with 57 to 60 inches of gravelly sandy clay loam; and 60 to 70 inches of stony clay loam (NRCS/WSS 2010).

2-3. Geology and Groundwater

The Moreno Valley is a glacial valley. The surficial geology of the Moreno Valley consists primarily of alluvium in the lower elevations of the valley, and carbonates, sandstone, and metamorphic rocks at the higher elevations, with some mafic volcanic rocks outcropping east of Angel Fire (Hilton et. al, 2012, UNM 2010).

There are 4 types of water-bearing zones in the Moreno Valley (DBS&A, 2000):

- Unconsolidated Tertiary valley fill, composed of interbedded red and brown clays, sands and gravels;

- Tertiary dikes and sills, composed of fractured quartz porphyry;

- Mesozoic and Paleazoic sandstone and siltstone, including the Madera Group, Sangre de Cristo Formation, Triassic sequence, Entrada Sandstone, Morrison Formation, and the Dakota Sandstone;

- Precambrian crystalline rocks, mainly composed of faulted and fractured granite gneiss; however, these rocks only provide significant water resources where fracturing and faulting is sufficient to transmit flow.

The primary source of groundwater for the Moreno Valley is the Mesozoic and Paleozoic sandstone and siltstone water-bearing zone (Saye, 1990). The valley fill alluvium also supplies numerous domestic wells. Both the Village of Angel Fire and the Village of Eagle Nest receive their water supply from groundwater. The Sangre de Cristo Formation, a complex, interbedded mix of conglomerates, sandstones, siltstones, clay shales, and nodular limestones, provides the primary source of water for the Village of Angel Fire.

Groundwater levels in Moreno Valley wells are relatively shallow and the groundwater generally flows toward Eagle Nest Lake. From a legal and water rights standpoint, the groundwater in the Moreno Valley is considered to be stream-connected. According to the *Agreement for settlement of pending litigation and other disputes concerning State Engineer Permit 71*, groundwater users in the Moreno Valley must curtail pumping and account for conveyance losses in the same manner as surface water users during years when there is not a full water supply.

2-4. Surface Hydrology

The three drainages in the Moreno Valley include Cieneguilla Creek, Moreno Creek and Sixmile Creek. Sixmile creek has long-term gaging records, which indicate annual streamflow ranging from about 700 to 3400 acre-feet per year, with a median streamflow of about 1300 acre-feet per year (ISC, 2016). Moreno Creek is gaged, however, due to frequent periods of missing data, long-term annual statistics are not available. Cieneguilla Creek is not gaged.

The perennial surface drainages also show seasonal variability, with peak streamflow occurring between April and June during the snowmelt runoff season. In some years, between July and September, there may be a secondary peak due to monsoon runoff.

Eagle Nest Lake is impounded by a concrete dam which was completed in June of 1918. The purpose of the dam was to store irrigation water derived from the three perennial streams that feed the lake (WBP, 2012). The storage capacity of Eagle Nest Lake is about 98,000 acre-feet; and the elevation of Eagle Nest Lake is about 2,500 meters (8,200 ft.) above mean sea level, making Eagle Nest Reservoir the highest of the larger lakes in New Mexico.

2-5. Water Quality

The Cimarron Watershed Based Plan indicated that water quality impairment in the Moreno Valley includes *E.coli* bacteria, plant nutrients, temperature, sediment and turbidity as shown in Table 2-1.

Table 2-1. Causes of Stream Water Quality Impairment in the Moreno Valley

Location	2010 TMDL	Continued Impairment [(a)]	Not supporting[(b)]
Cieneguilla Creek (Eagle Nest Lake to headwaters)	E.coli, plant nutrients, temperature	turbidity, sediment/siltation	HQCAL, SC
Moreno Creek (Eagle Nest Lake to headwaters)	plant nutrients, temperature		HQCAL
Sixmile Creek (Eagle Nest Lake to headwaters)	E.coli, plant nutrients, temperature	turbidity	HQCAL, SC

a) Impairment is based on earlier assessment, listed as continued impairment in 2010 Total Maximum Daily Load (TMDL) document

b) As identified in NMED 2010b. DWS=Domestic Water Supply; HQCAL= High Quality Cold Water Aquatic Life, MCAL = Marginal Cold Water Aquatic Life; WWAL = Warm water aquatic life; SC = Secondary Contact

The WBP reported information from a source tracking study conducted by the CWA to understand the source and distribution of the *E. coli* bacteria. This study indicated that wildlife, specifically waterfowl, has been the dominant contributor to the presence of this bacteria (NMSU, 2010). Using standard methodology, samples were collected from Cieneguilla and Moreno Creeks over a two-year period near the points where they drain into Eagle Nest Lake. Results of the bacterial source tracking study indicated seasonal variability, with *E.coli* concentrations highest in the summer, intermediate in the fall, and lowest in the spring. Levels of stream-water turbidity followed the same seasonal trends as *E. coli* occurrence in Cieneguilla Creek, but not in Moreno Creek. These results indicate that differing runoff and/or land use patterns impact these two creeks.

As shown in Table 2-1, sedimentation/turbidity and temperature are also causes of water quality impairment in the Moreno Valley. The protection and restoration of wetlands can help to improve water quality caused by these impairments. Wetlands retain water in the subsurface, releasing cooler water to streams. Wetlands vegetation such as sedges, rushes and willows can also reduce stream temperature by shading a stream. Sediment and turbidity impairments can be mitigated when sediment is trapped and filtered in wetlands instead of being washed into a stream.

The CWA has participated in a project to restore bank stability along Cieneguilla Creek to improve water quality. Post vanes were installed to deflect water from cut banks. Wildlife exclosures have also been established to allow for revegetation in a section of the creek that is upstream from Eagle Nest Lake (WBP, 2012). These types of projects, intended to protect water quality, can also benefit the wetlands. Section 4 includes additional discussions of potential projects.

Eagle Nest Lake was purchased by the State of New Mexico, Department of Game and Fish, in 2002 and is now managed by the New Mexico State Parks Division. Studies of water quality in Eagle Nest Lake were conducted by NMED (2005), as reported in the Cimarron WBP (December 2012). These studies indicated some issues with dissolved oxygen and arsenic, and recommended follow-up sampling.

Eagle Nest Lake is listed as not supporting categories of use either for the domestic water supply or for the high-quality cold water aquatic life categories. However, Eagle Nest Lake is fully supportive of other categories of use including irrigation, livestock watering, wildlife habitat, municipal and industrial water supply, and secondary contact (NMED, 2010b). Further assessments for arsenic and dissolved oxygen are scheduled for the year of 2017.

2-6. Vegetation and Wildlife

The Moreno Valley contains mountain grasslands in the lower elevations, and forests of both conifer and aspen at the higher elevations. None of the floral species in the Moreno Valley are officially threatened or endangered. Five rare plants have been documented in Colfax County (NMRPTC, 2016). The high elevations support rare ecosystems, such as alpine tundra as well as rare species, such as bristlecone pine.

Among various species that utilize resources in the Moreno Valley, the State of New Mexico and the U.S. Fish and Wildlife Service have designated the following 20 species as threatened or endangered: 12 species of birds, 4 species of mammals, 2 species of fish, and 2 species of mollusks (IPaC, 2016) (Table 2-2). Within Colfax County, six species of animals have been listed as federally threatened or endangered, while the State of New Mexico has identified an additional three species as endangered, and 11 species as threatened (BISON-M, 2016). The species listed are for all of Colfax County, and the Moreno Valley has not been specifically differentiated. In addition to these species of concern, at least 27 species of migratory birds visit the Moreno Valley seasonally (IPaC, 2016), and approximately 758 species of animals have been recorded in Colfax County. Among the most diverse groups are birds (266 species), moths and butterflies (166), and mammals (83), followed by grasshoppers (73), mollusks (33), and fish (31) (BISON-M, 2016).

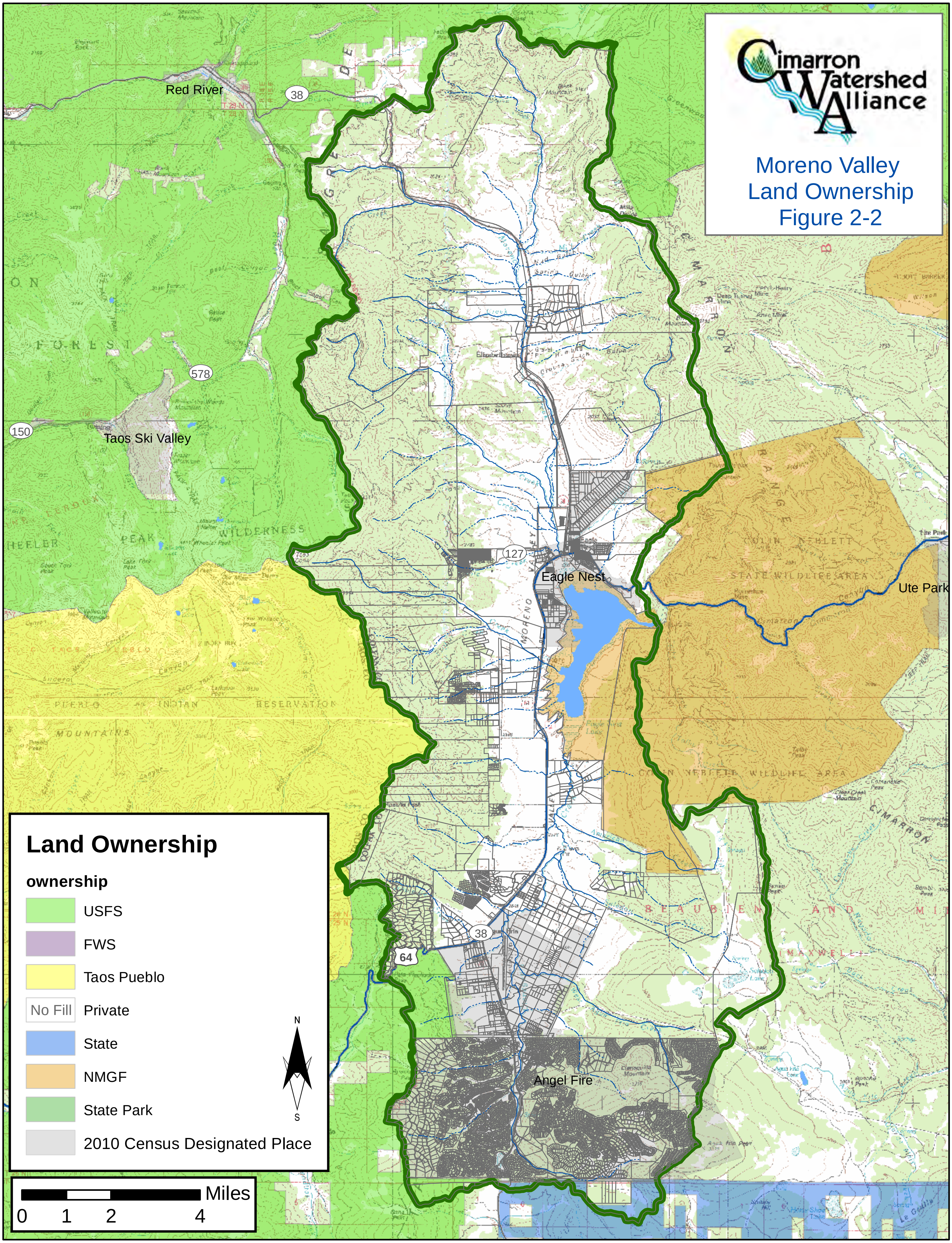
The principal fish species, as recognized and supported by the New Mexico Department of Game and Fish, are Kokanee Salmon, Rainbow Trout, Northern Pike, and Yellow Perch (NMDGF, 2016).

Table 2-2. Threatened and Endangered Species in Colfax County, NM

Threatened and Endangered Species in Colfax County, NM			
	Common Name	**Scientific Name**	**Status**
Mammals	Canada Lynx	Lynx canadensis	**Federal: Threatened**
	Black-footed Ferret	Mustela nigripes	**Federal: Endangered**
	American Marten	Martes americana	State NM: Threatened
	Meadow Jumping Mouse	Zapus hudsonius luteus	**Federal: Endangered** State NM: Endangered
Birds	White-tailed Ptarmigan	Lagopus leucura	State NM: Endangered
	Brown Pelican	Pelecanus occidentalis	State NM: Endangered
	Common Black Hawk	Buteogallus anthracinus	State NM: Threatened
	Bald Eagle	Haliaeetus leucocephalus	State NM: Threatened
	Peregrine Falcon	Falco peregrinus	State NM: Threatened
	Arctic Peregrine Falcon	Falco peregrinus tundrius	State NM: Threatened
	Piping Plover	Charadrius melodus	**Federal: Threatened** State NM: Threatened
	Neotropic Cormorant	Phalacrocorax brasilianus	State NM: Threatened
	Boreal Owl	Aegolius funereus	State NM: Threatened
	Mexican Spotted Owl	Strix occidentalis lucida	**Federal: Threatened**
	Southwestern Willow Flycatcher	Empidonax traillii extimus	**Federal: Endangered** State NM: Endangered
	Baird's Sparrow	Ammodramus bairdii	State NM: Threatened
Fish	Southern Redbelly Dace	Phoxinus erythrogaster	State NM: Endangered
	Suckermouth Minnow	Phenacobius mirabilis	State NM: Threatened
Mollusks	Star Gyro	Gyraulus crista	State NM: Threatened
	Lake Fingernailclam	Musculium lacustre	State NM: Threatened
Federal Threatened and Endangered Species found in the Moreno Valley, NM*			
Sources:			
BISON-M: Biota Information System of New Mexico, NM Department of Game and Fish (bison-m.org)			
ECOS: Environmental Conservation Online System, U.S. FWS (ecos.fws.gov)			
*IPaC: Information for Planning and Conservation, U.S. FWS (ecos.fws.gov/ipac)			

2-7. Land Use and Ownership

Historic land use in the Moreno Valley has included mining, ranching, and some farming. Land ownership in the Moreno Valley is a combination of public and private (Figure 2-2, Land Ownership in the Moreno Valley). Both the Taos Pueblo and Sandia Pueblo own and manage land in the Moreno Valley. A small amount of land belonging to Carson National Forest is located west of Angel Fire. New Mexico State Parks manage the Eagle Nest State Lake State Park. Originally, the land in the area of Angel Fire was part of the Maxwell Land Grant which was formed in 1844. This land grant was divided and changed hands several times; then, in 1966, several thousand acres were obtained by the Monte Verde Corporation, which began developing the ski resort and golf course. These recreational facilities, along with visitors to the State Park, have contributed to an influx of visitors and residents into the Moreno Valley. Numerous roads in the valley, associated with development, have also affected drainage patterns.



Cimarron Watershed Alliance
Moreno Valley
Land Ownership
Figure 2-2
Red River
Taos Ski Valley
Eagle Nest
Ute Park
Angel Fire
38
578
150
127
64
Land Ownership
ownership
USFS
FWS
Taos Pueblo
No Fill
Private
State
NMGF
State Park
2010 Census Designated Place
N
S
Miles
0
1
2
4

3. Wetland Inventory

To develop plans that protect and restore Moreno Valley wetlands, an inventory of existing wetland resources is essential. This WAP is being developed based on the most recent mapping and classification of these wetlands, as described in Section 3.1.

Under the Clean Water Act, wetlands are defined, for regulatory purposes, 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" (EPA, 2016).

Wetlands exhibit one or more of the following characteristics (1) at least periodically, the land predominantly supports hydrophytes (plants dependent on saturated soils or a water medium); (2) the substrate predominantly consists of undrained hydric soil; and (3) at some period during the growing season of each year, the substrate is non-soil and either saturated with water or covered by shallow water.

This WAP also considered riparian areas as well as buffer zones. Riparian ecosystems are characterized by the presence of both phreatophytic and mesophytic vegetation and by habitats that are associated with bodies of water. These ecosystems are also dependent on the existence of surface and subsurface drainage, either perennial, intermittent, or ephemeral. Although water requirements in the wetlands areas are strict, they are not as drastic in riparian ecosystems as in other areas.

--American Creek with woody riparian vegetation

To protect wetlands and riparian areas from the impacts of stormwater, pollutants, or other impacts from adjacent land, it is essential to establish buffer zones as areas where natural vegetation is maintained. There are only a few areas with abundant woody riparian vegetation in the Moreno Valley.

--Woody riparian vegetation along Moreno Creek

3-1. Wetland Mapping and Classification

The mapping of wetlands in the Moreno Valley was recently completed as part of a larger mapping effort in Northeast New Mexico. Though many wetlands programs rely on the National Wetland Inventory, previous wetland mapping in northeastern New Mexico was sparse and dated. Hence the NMED, in 2011, identified the need to conduct additional current Geographic Information System (GIS) based mapping, and contracted with Saint Mary's University of Minnesota to complete the effort. A report titled "Mapping and Classification for Wetlands Protection, Northeastern New Mexico Highlands and Plains" was completed in 2015 (Robertson et al., 2015).

Wetlands for the project area were mapped and classified using on-screen digitizing methods established in the GIS. Aerial imagery, combined with soils, topographic, hydrologic, and land cover data sets, was used as a base map (Robertson et al., 2015). The mapping performed by Saint Mary's University is consistent with the Wetlands and Deepwater Habitats Classification used for the National Wetland Inventory (NWI), which classifies wetlands by system.

Three systems are present in the New Mexico mapping area:

- The Riverine System includes deepwater habitats and mostly non-vegetated wetlands that are contained in natural or artificial channels. Either periodically or continuously, these channels contain flowing water that forms a connecting link between two bodies of standing water. Examples of the riverine systems include rivers, streams, creeks, arroyos, washes, or ditches.

- The Lacustrine System includes both wetlands and deepwater habitats. This system is defined by all the following characteristics: deep water that is situated in a topographic depression or in a dammed river channel; wetland areas lacking trees, shrubs, or persistent emergents; wetland areas consisting of emergent mosses or lichens with greater than 30 percent aerial coverage; wetland areas that exceed 20 acres; or wetland areas that total less than 8 hectares and, at low water, are deeper than 6.6 meters. Examples of these wetlands include lakes, reservoirs, or intermittent lakes, such as playa lakes.

- The Palustrine System includes all nontidal wetlands that are dominated by trees, shrubs, emergents, mosses or lichens, and by all wetlands that occur in tidal areas where salinity due to ocean-derived salt is below 0.5 ppt. An estimated 95 percent of all wetlands in the U.S. are freshwater, palustrine wetlands. As a result, these wetlands will predominate in most wetland mapping efforts. No Subsystems exist in the (P) Palustrine System. Examples of Palustrine wetlands found in the New Mexico project area include marshes, swamps, shoreline fringe, bogs, fens, or ponds.

After the Systems are classified, NWI describes wetland characteristics in a hierarchal order including:

- Subsystem (with the exception of the Palustrine System)
- Class
- Subclass (only required for Forested, Scrub-Shrub, and Emergent Classes)
- Water Regime
- Special Modifiers (only required where applicable).

Detailed mapping for each of these NWI classifications is available (Robertson et al., 2015).

In addition to the NWI system, other systems of wetlands classifications are commonly used to distinguish various types and characteristics between wetland resources. The SWQB Wetlands Program uses Brinson's Hydrogeomorphic (HGM) wetland classification (Brinson, 1993) for the Wetlands Action Plan process. Saint Mary's University correlated their more detailed classification system with the HGM system. The HGM classification system, based on geomorphic settings, water sources, and hydrodynamics, results in 6 wetlands classifications based on these 3 essential functions (NMED, 2016). Five of these systems are present in the Moreno Valley:

Riverine wetlands occur in floodplains and riparian corridors in association with stream channels. Dominant water sources consist of either overbank flow from the channel or from subsurface hydraulic connections between the stream channel and the wetlands. Additional water sources may consist of interflow and return flow from adjacent uplands; the occasional overland flow from adjacent uplands; from tributary inflow; and from precipitation.

--Riverine wetlands limited to narrow bands where creek is not incised

Lacustrine fringe wetlands are adjacent to lakes where the water elevation of the lake maintains the water table in the wetland. Both precipitation and groundwater discharge provide additional sources of water. Surface water flow is bidirectional and is usually controlled by water level fluctuations in the adjoining lake. Lacustrine wetlands lose water by water flow that returns to the lake after flooding, by the saturation of surface water flow, and by evapotranspiration.

--Lacustrine fringe wetland shown at right where Cieneguilla Creek enters Eagle Nest Lake

Depressional wetlands occur in topographic depressions with a closed elevation contour that allows surface water to accumulate. Precipitation, groundwater discharge, and interflow from adjacent uplands are the dominant sources of water for these wetlands. Since water normally flows from the surrounding uplands toward the center of the depression, the depressional wetlands may consist of any combination of inlets and outlets, or may lack them completely.

--Depressional wetland (pond)

Depressional wetlands may also lose water through intermittent or perennial drainage from an outlet or through evapotranspiration. If they are not receiving groundwater discharge, these wetlands may slowly contribute to the accumulation of groundwater and will often vary with the seasons. Prairie potholes are a common example of depressional wetlands. Playas are also considered to be depressional wetlands.

Slope wetlands are normally found where there is a discharge of groundwater to the surface of the land. Elevation gradients may range from steep hillsides to gentle slopes. Principal water sources are usually from the return flow of groundwater, interflow from surrounding uplands, and precipitation. If groundwater discharge is a dominant water source, slope wetlands can occur in nearly flat landscapes.

--Slope wetlands upstream of pond

--Slope wetlands with headcut

Slope wetlands lose water primarily by saturation of the subsurface, through surface flows, and by evaporation. Springs are an example of slope wetlands in New Mexico. Slope wetlands are the most prevalent wetlands in the Moreno Valley.

--Slope wetlands west of Eagle Nest Lake

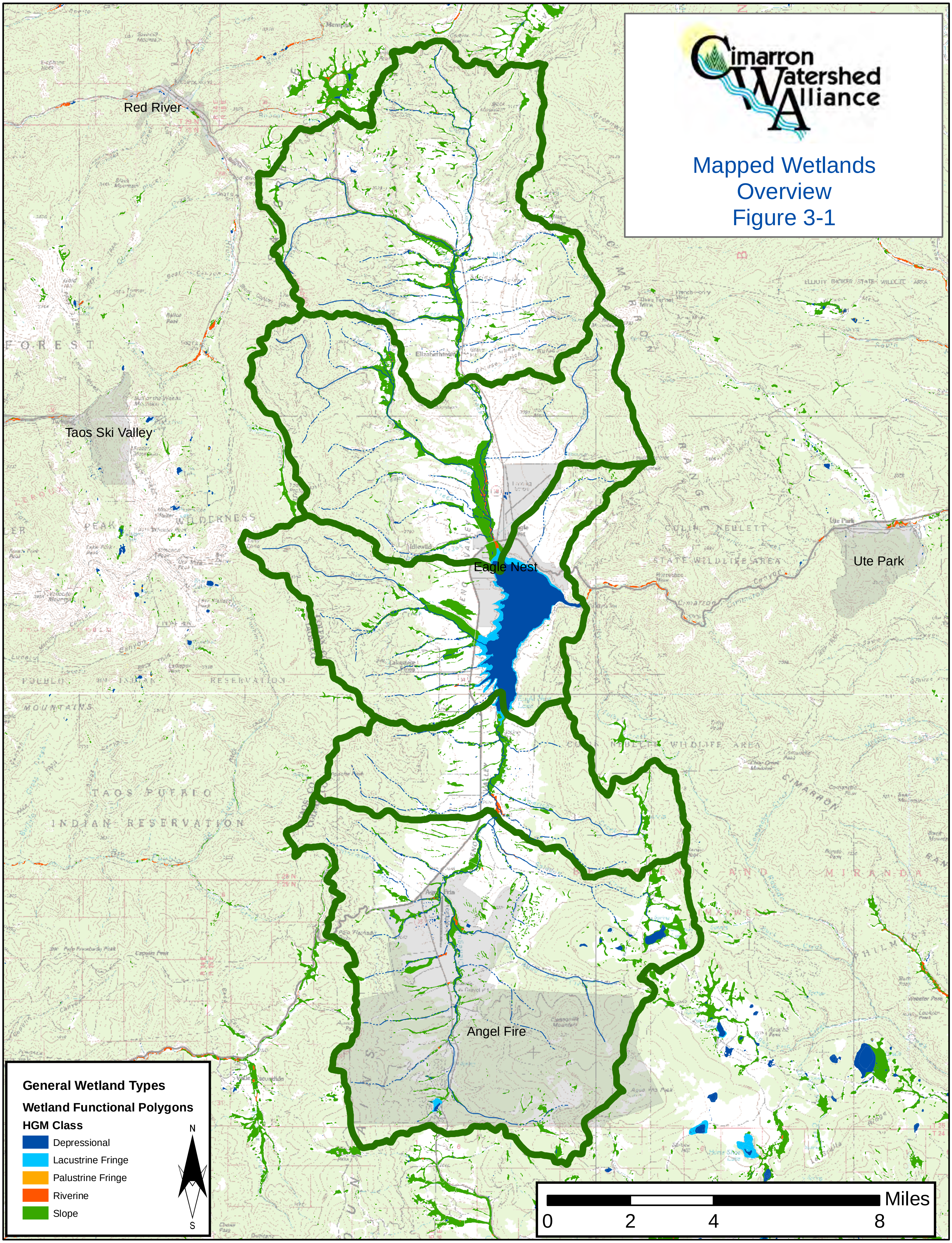
--Slope wetlands along a tributary to Moreno Creek

Palustrine fringe wetlands are adjacent to ponds where the water elevation of the pond maintains the water table in the wetland.

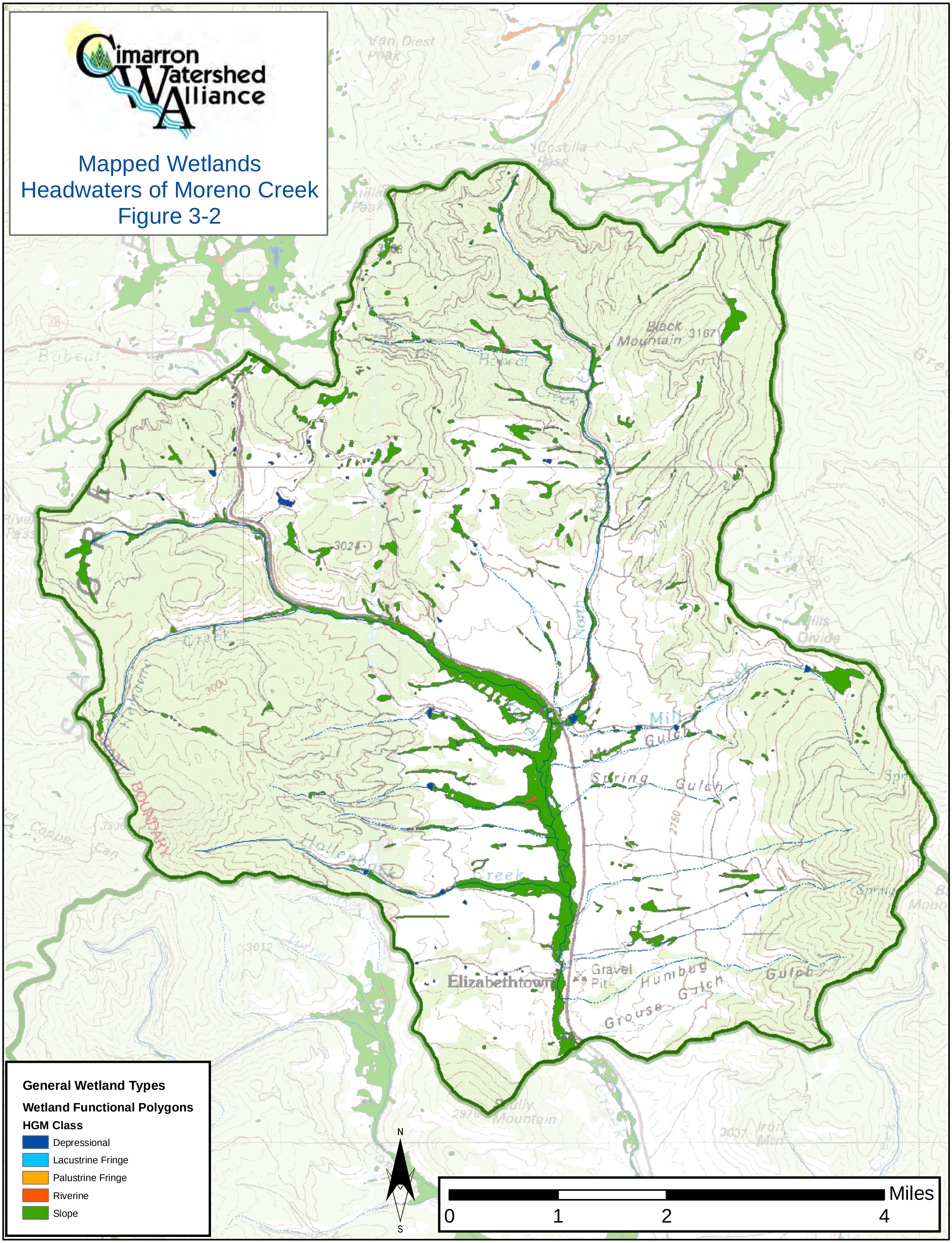
An overview of the mapped wetlands using the HGM classification system is shown in Figure 3-1. More detailed maps of the 5 subwatersheds in the Northern (Moreno Headwaters and Moreno Outlet Subwatersheds), Central (Eagle Nest Lake Subwatershed), and Southern areas (Cieneguilla Outlet and Cieneguilla Headwaters Subwatersheds) of Moreno Valley are shown in Figures 3-2 through 3-6.

--Palustrine fringe on perimeter of pond

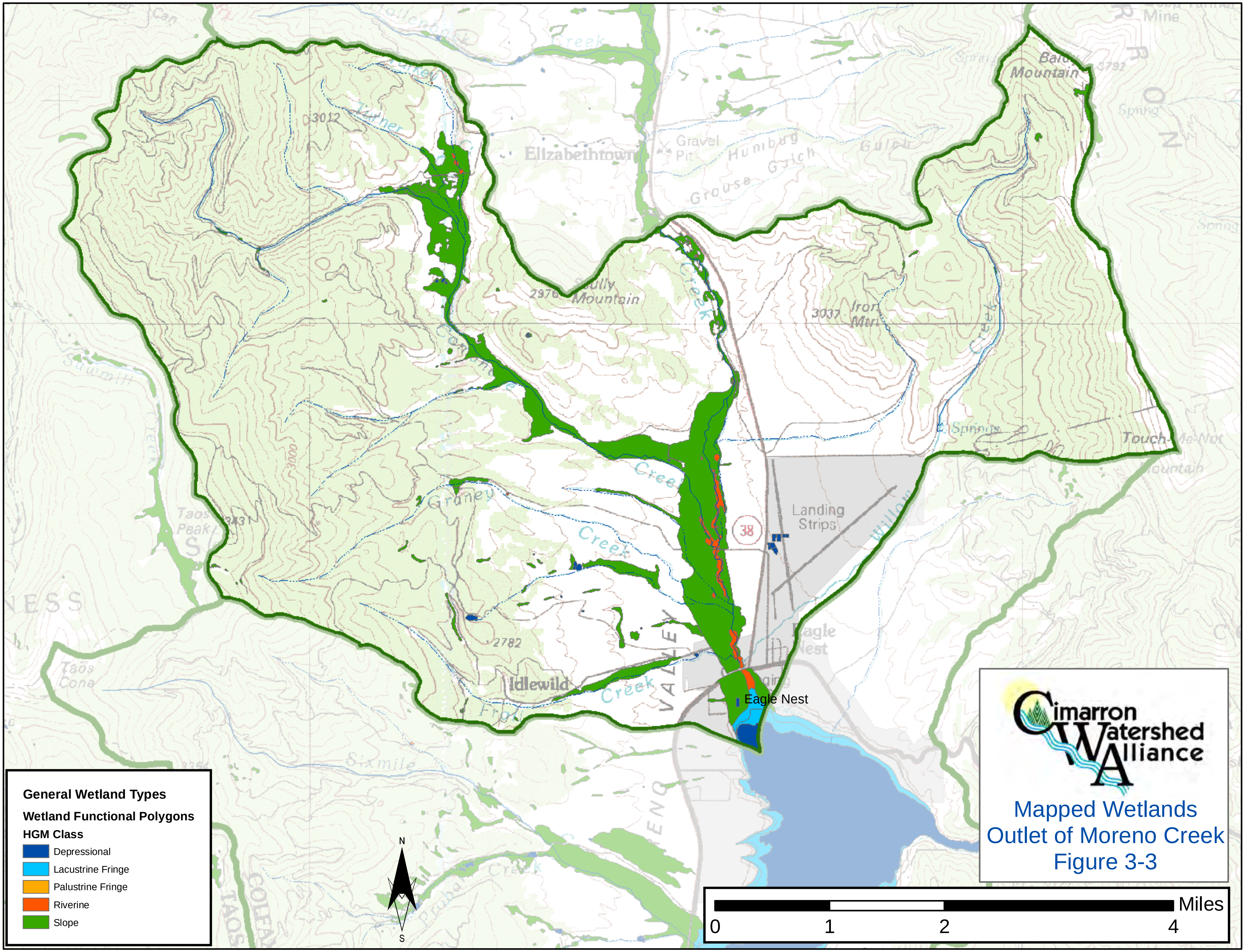
A total of 8,288 acres of wetlands were mapped in the Moreno Valley. Figure 3-7 shows the number of acreage and relative percentages of HGM classes of wetlands. The majority of the wetlands in the Moreno Valley are slope wetlands (5,541 acres- 67%) that occur on hillsides or on the valley floor. Depressional wetlands (2,139 acres- 26%) include Eagle Nest Lake and Black Lake and numerous small ponds located throughout the watershed. Lacustrine fringe wetlands (479 acres- 6%) are on the perimeters of Eagle Nest Lake and Black Lake. Riverine wetlands (71 acres- 1%) occur sparsely along Cieneguilla and Moreno Creeks and other small tributaries. Palustrine wetlands (1 acre- <1%) occur around the small ponds.



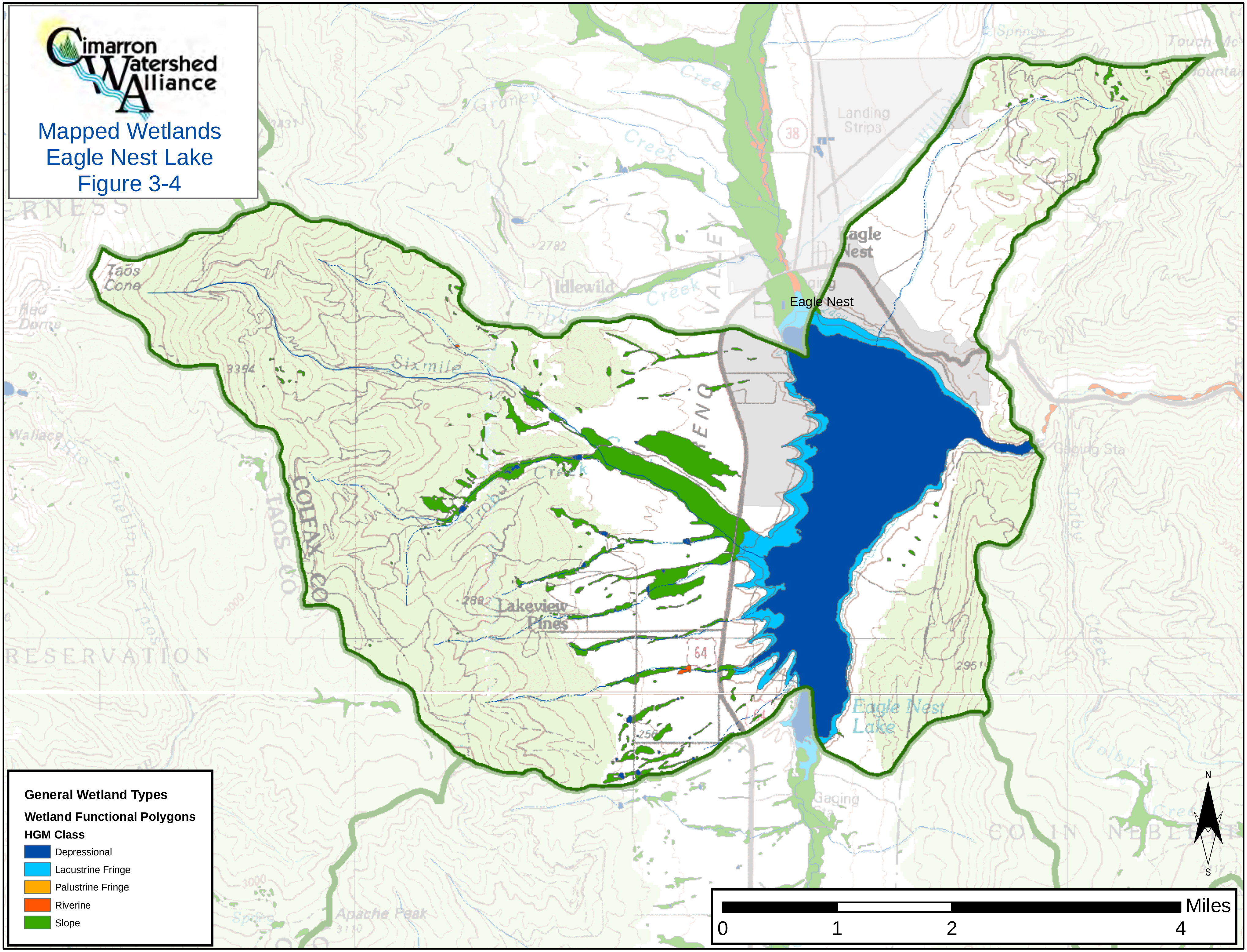
Mapped Wetlands
Overview
Figure 3-1
Red River
Taos Ski Valley
Eagle Nest
Ute Park
Angel Fire
General Wetland Types
Wetland Functional Polygons
HGM Class
Depressional
Lacustrine Fringe
Palustrine Fringe
Riverine
Slope
N
S
0
2
4
8
Miles

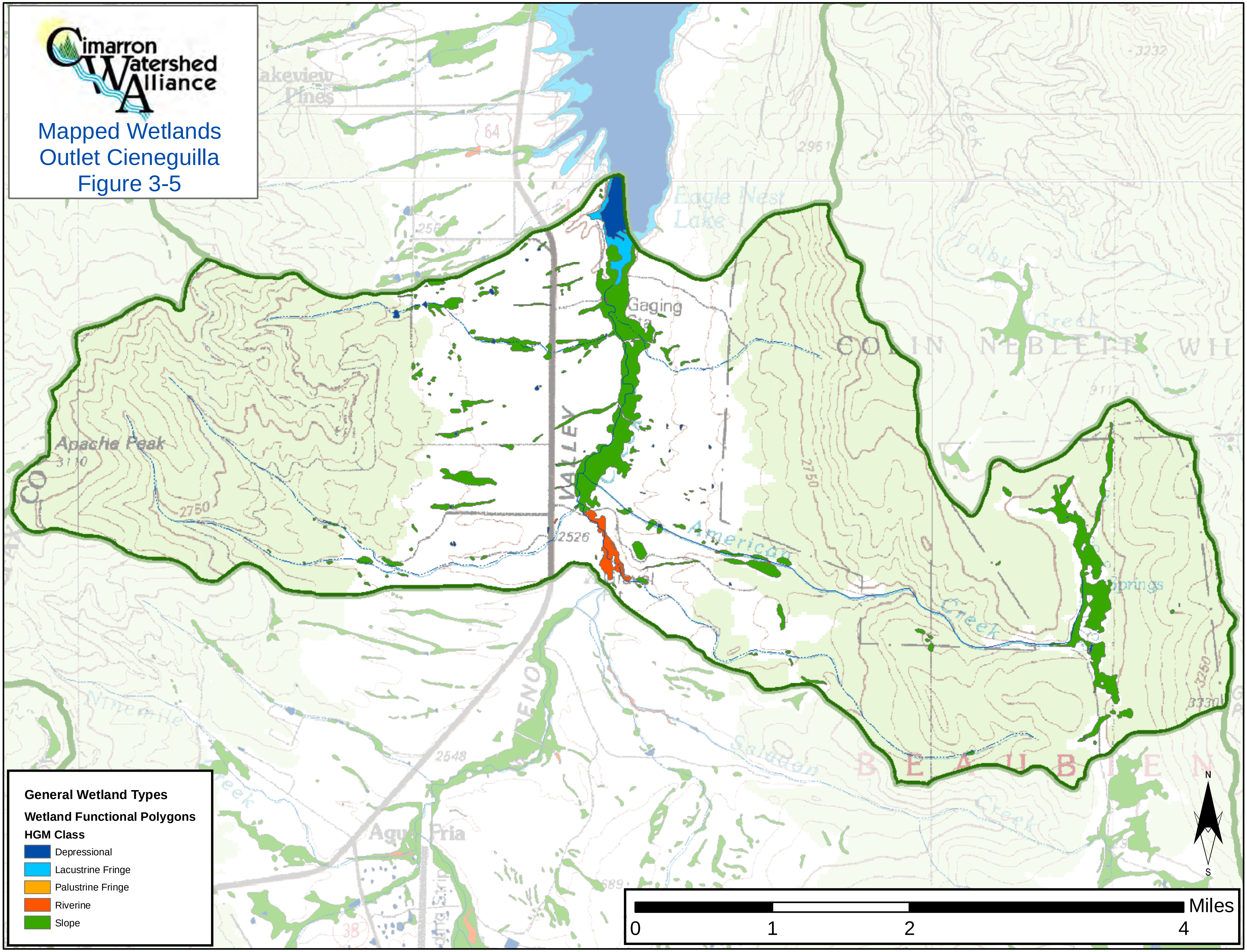


Mapped Wetlands
Headwaters of Moreno Creek
Figure 3-2

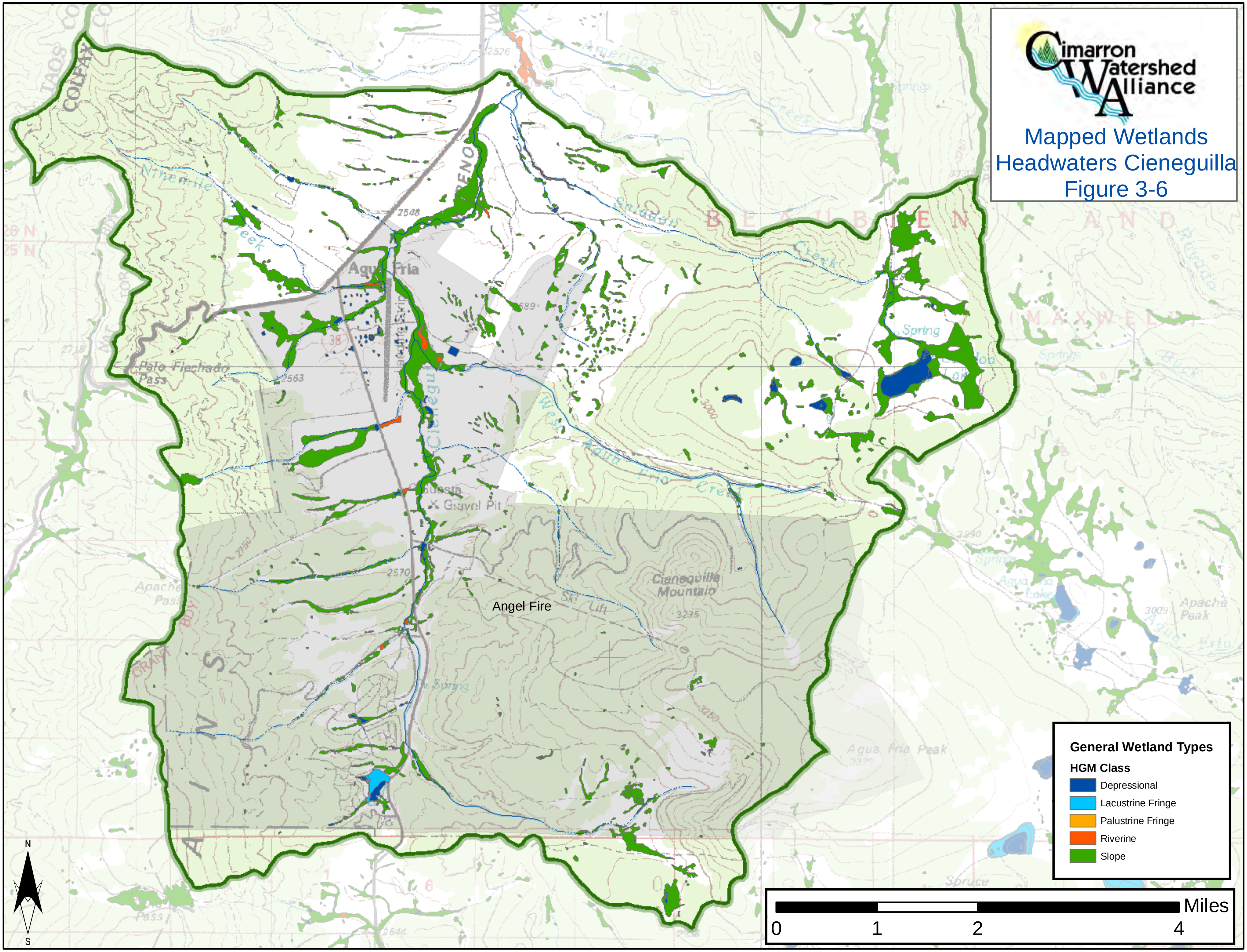


Mapped Wetlands
Outlet of Moreno Creek
Figure 3-3


Cimarron Watershed Alliance
Mapped Wetlands
Eagle Nest Lake
Figure 3-4
General Wetland Types
Wetland Functional Polygons
HGM Class
Depressional
Lacustrine Fringe
Palustrine Fringe
Riverine
Slope
Eagle Nest
Landing Strips
Idlewild
Lakeview Pines
Sixmile
Taos Cone
Eagle Nest Lake
Apache Peak
Gaging Sta
38
64
N
S
0
1
2
4
Miles

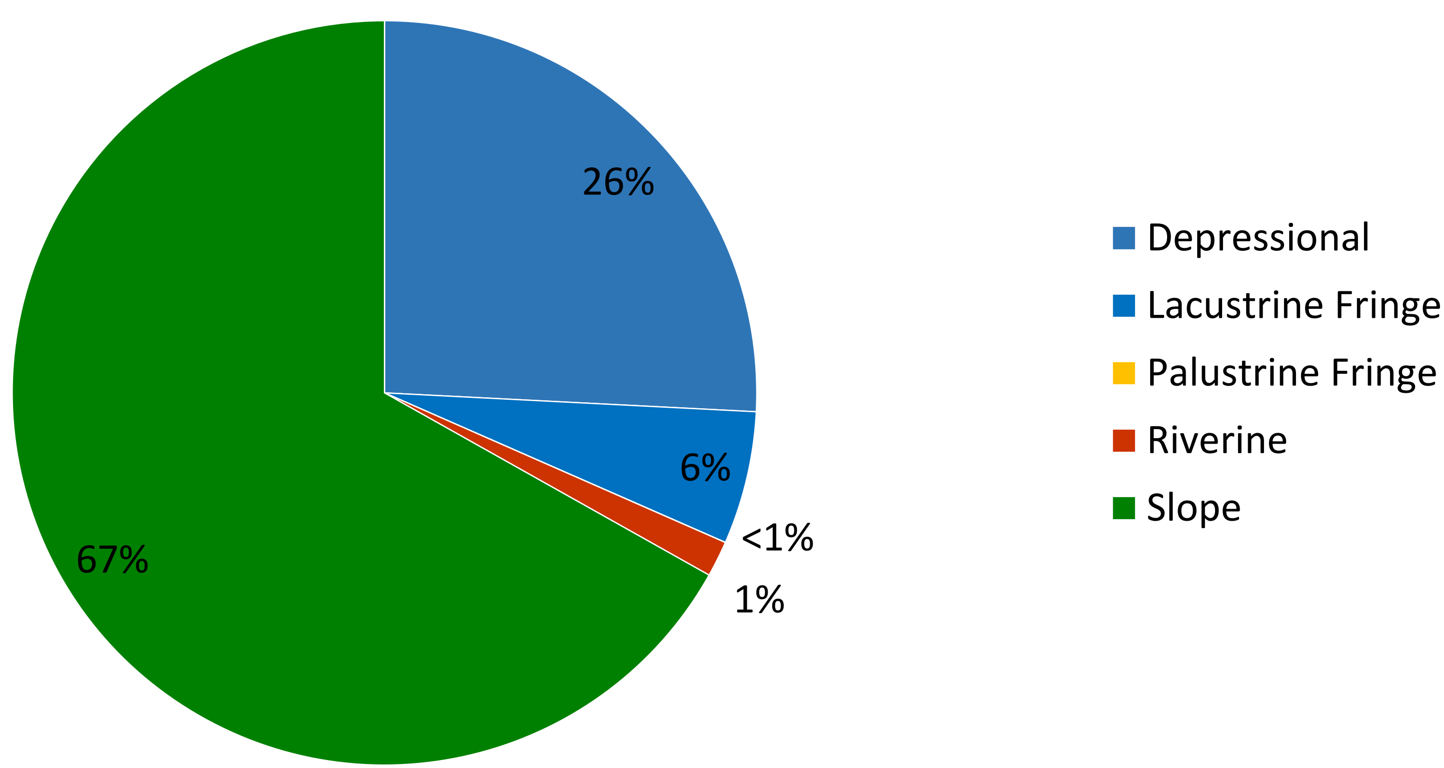


Mapped Wetlands
Outlet Cieneguilla
Figure 3-5



Cimarron Watershed Alliance
Mapped Wetlands
Headwaters Cieneguilla
Figure 3-6
General Wetland Types
HGM Class
Depressional
Lacustrine Fringe
Palustrine Fringe
Riverine
Slope
Miles
0
1
2
4
N
S
Angel Fire
Agua Fria
Cieneguilla Mountain
Palo Flechado Pass
Gravel Pit

Figure 3-7 Hydrogeomorphic Classes/Moreno Valley



3-2. Wetland Functional Assessment

A wetland functional assessment was completed as part of the St. Mary's mapping program. Wetland functions that were assessed within the project study areas include the following items (Robertson et al., 2015):

- Aquatic Invertebrate Habitat (AIH) – provides habitat for aquatic invertebrates
- Bank and Shoreline Stabilization (BSS) – wetland plants help bind soil to limit or prevent erosion
- Carbon Sequestration (CS) – serves as carbon sinks that trap atmospheric carbon
- Fish Habitat (FH) – habitat for a variety of fish, including a special category containing factors that maintain cold water temperatures for certain species, including trout
- Groundwater Recharge (GR) – sustaining sub-surface water storage and supporting baseflows
- Nutrient Transformation (NT) – breaking down nutrients from natural sources, fertilizers, or other pollutants, essentially treating the runoff
- Other Wildlife Habitat (OWH) – habitat for other wildlife (resident and migratory)
- Sediment and Other Particulate Retention (SR) – acting as filters to physically trap sediment particles before they are carried further downstream
- Streamflow Maintenance (SM) – providing a source of water to prevent streams from drying up during periods of drought conditions or low discharge
- Surface Water Detention (SWD) – storage of runoff from rain events or spring melt waters which reduce the force of peak flood levels downstream
- Unique, Uncommon, or Highly Diverse Wetland Plant Communities
- Waterfowl and Water Bird Habitat (WBIRD) – habitat for waterfowl and other water birds.

Results from the wetland functional assessment indicated that Groundwater Recharge, Waterfowl and Water Bird Habitat, and Other Wildlife Habitat were the most commonly occurring wetland functions in the project area, and these functions were performed by most wetlands. The least common function performed was the Unique, Uncommon, or Highly Diverse Wetland Plant Communities Function.

3-3. Information Gaps

The primary data gap related to the Moreno Valley wetlands is the current lack of detailed field assessments. Previous wetlands mapping included sufficient field checking to verify that the digital mapping correctly reflected current wetland types and locations, but did not include a detailed field assessment of wetland conditions. Information that might be useful to better assess and understand wetland conditions includes:

- An aerial review of each wetland, using available aerial photography to zoom in closely enough to view roads, culverts, or other areas and identify problematic issues.
- An overhead flight with sufficient equipment to view and photograph key wetlands.
- Surface ground surveys to observe and evaluate wetlands conditions, including plant surveys, hydrological surveys, and the assessment of wetland threats.

Additionally, it would be helpful to extend more efforts toward outreach to stakeholders, alliances, and various landowners to stimulate and encourage interest in participating with the protection and restoration of wetlands in the Moreno Valley. These efforts would provide all interested parties with valuable information regarding additional wetlands projects and plans. As discussed in Section 5, some local landowners participated in wetland planning; however, additional outreach and further discussion will be needed to conduct more wetland restoration projects.

4. Wetland Impairment and Actions to Protect and Restore Wetlands

A first step in planning for appropriate wetland protection and restoration measures is to identify land use and other practices that may affect wetland conditions. General conditions that can lead to degraded wetland conditions, along with potential treatment options, were summarized in the 2014 NMED slope wetlands characterization and restoration publication shown in Table 4-1.

Table 4-1. Harmful Conditions and Treatment Options*

Harmful Condition or Situation	Degraded Condition	Treatment Options
Roads, foot paths, ATV trails, wagon trails and livestock trails currently in use	• Captured water • Channelized flow • Headcutting • Gully formation • Bisected shallow aquifers • Lowers water table both upslope and downslope • Compacted soils • Increased sediment transport	• Porous fill for road crossings • Hardened road crossings or waterways • Proper drainage • Barricades • Relocation/realignment of roads • Drift fence
Abandoned roads	• Drying of wetland area (depending upon placement)	• Reconnection of wetland to water source
Road ditches: lead-in, lead- out, barrow	• Channelized flow accelerating bed and bank erosion	• Reduction of spacing intervals • Drainage
Culverts/pipes	• Headcutting • Drying of wetland below due to blocked culvert	• Appropriately sized and placed elevated culverts (minimum of 18 inches diameter) • Porous fills and low water crossings
Berms	• Drying of wetland area (depending upon placement)	• Reconnection of wetland to water source

Harmful Condition or Situation	Degraded Condition	Treatment Options
Stock tanks	• Loss of flow down meadow • Channelization	• Lowered berm • Redesigned/relocated spillway • Remove tank, develop upland water sources • Relocate tank out of wetland
Poorly managed livestock grazing and supplement block placement	• Hoof-sheer • Compaction • Loss of vegetation and root structure • Reduced water infiltration • Drying of fens • Bed and bank erosion • Reduced soil water storage/lower water table	• Managed timing, intensity and duration of grazing • Supplement blocks moved to uplands, away from wetland soils • Development of upland water sources
Poor upland range health	• Sediment loading • Channelized flow	• Managed timing, intensity and duration of grazing • Uplands rested for one entire growing season on a rotational basis (or longer in the event of drought conditions)

* (NMED, 2014)

Common activities in the Moreno Valley with the potential to impact wetlands, and actions to minimize those impacts, are discussed below.

Roads. Roads are not harmful to wetlands in all cases; however, poorly constructed or unpaved roads may affect drainage and sedimentation. There are numerous unpaved roads throughout the Moreno Valley that traverse the slope wetlands and cause fragmentation and dewatering of the wetlands due to the interruption of subsurface flow. In 2009, Rangeland Hands conducted a field survey of the Taos Pines subdivision west of Angel Fire to assess conditions and develop cost estimates for road improvements that would mitigate erosion and sedimentation. This assessment indicated that road conditions were extremely poor due to the clay-base soil type, poor original design, a road width that is wider than necessary, poor maintenance and management practices, plugged culverts, and system overloading from driveway runoff and steep grades (Rangeland Hands, 2009).

--Moreno Valley road

In addition, this road system is hydraulically connected in numerous locations via wheel tracks, ruts, and improperly maintained road ditches, culverts, and driveways as well as old roads. In these locations, water is trapped on the road surface for hundreds of consecutive feet. Similar road drainage issues may be affecting wetlands elsewhere in the Moreno Valley.

--Slope wetlands dried below road

--Poorly placed culverts can accelerate erosion

There are a number of simple techniques that can be used to minimize the impacts of roads. Poorly designed roads may be restored through realignment, porous fill for road crossing, proper drainage, and other methods (NMED et al., 2014; Zeedyk, 2006).

--Presence of shrubby cinquefoil is an indicator of slope wetlands drying below road and culvert

--*Slope wetlands dewatered from extensive headcuts*

Grazing. Large Elk herds and other wildlife may impact wetlands by disturbing soil and overgrazing in riparian areas. Wetlands may also be affected by livestock grazing. Overgrazing reduces wetlands vegetation and initiates or exacerbates erosion.

--*Elk and cattle in slope wetland along Cieneguilla Creek*

-- *Elk exclosure near Eagle Nest Lake*

Grazing exclosures may be used to prevent access to important areas for protection. Elk exclosures have been installed on the south side of Eagle Nest Lake. Livestock best management practices, such as rotation and alternate water sources, can be used by ranches in the area to minimize impacts to wetlands. Education and financial assistance may help local ranches to implement grazing best management practices.

Potential Wildfire and Sedimentation. Wildfire has the potential to impact the Moreno Valley. Fuel reduction by private landowners and local governments can help reduce the risk of catastrophic wildfires, which could cause additional water quality impairment, particularly turbidity, sedimentation, and temperature. Fuel reduction projects are protective of long-term water quality and wetland resources in the Moreno Valley.

--Bank erosion along Cieneguilla Creek

Diversion Ditches and Earthen Stock Tanks. Diversion ditches that move water away from the head of slope wetlands to water other areas can cause drying of the wetlands downgradient. Earthen stock tanks excavated into slope wetlands capture and impound the water. Although some of the water infiltrates the earthen dam, the water downstream is reduced, resulting in drying of the wetland. In some cases, there may be historic diversion ditches and stock tanks that are no longer needed and can be de-commissioned in order to restore slope wetlands.

--Stock pond built on slope wetlands

Poorly designed roads or drainage, poorly managed grazing, diversion ditches, and/or stock tanks, wildfires or other upland land disturbances, or any combination of these impairments can lead to headcuts, channelized flow (disconnection from the floodplain), and sediment loading. Restoration measures may include in-channel measures, such as post vanes, baffles, one rock dams, media lunas, willow planting or other measures to improve bank stability, slow and redistribute flows, and reconnect channels with floodplains to prevent erosion and sedimentation in wetland areas (Zeedyk and Clothier, 2009).

--Riverine wetlands on incised Cieneguilla Creek

Additionally, upland land management such as grazing rotation and managed intensity, relocating stock tanks and alternative water sources, redirecting drainage from abandoned roads or ditches, and addressing road crossing can help to reduce erosion and sedimentation reaching the stream channel and can support wetland restoration (NMED et al., 2014).

--Post vanes to mitigate bank cutting along Cieneguilla Creek

Other issues in the Moreno Valley include:

Domestic Wastewater. Both the Village of Angel Fire and the Village of Eagle Nest treat their domestic wastewater. Angel Fire discharges their domestic wastewater near Cieneguilla Creek, which flows into Eagle Nest Lake about ten miles north of the wastewater facility. There are two inactive sewage lagoons southwest of the Village of Eagle Nest that are in need of remediation. There are also many homes scattered throughout the Moreno Valley that rely on septic tanks. Continued monitoring to ensure compliance with water quality standards will help to protect wetlands in the Moreno Valley.

--Angel Fire Airport constructed in Cieneguilla Creek riverine wetland

Development. As new homes and commercial enterprises are developed in the Moreno Valley, recognizing locations of wetlands and protection measures for those wetlands is important. For example, the Angel Fire airport was constructed in a wetland. Ensuring proper location of developments, as well as proper septic tank installation and maintenance, will protect shallow groundwater quality.

Mining. There are small legacy hardrock mining operations in the upper watershed that may be contributing to elevated arsenic levels in Eagle Nest Lake (NMED, 2012). The Town of Elizabeth, which no longer exists, once had as many as 7,000 residents involved in gold mining near Baldy Mountain on the north side of the Moreno Valley.

Beaver Habitat. Beavers were present historically in the Moreno Valley and beaver trapping was an historic economic activity. Efforts to re-establish beaver populations and habitat can help to slow stream flow and support wetland resources.

Monitoring and Tracking. A long-term objective of this WAP is to acquire funding for wetland monitoring and tracking. Potential partnerships with New Mexico University professors and graduate students may be beneficial to provide and support ongoing wetland research in the Moreno Valley.

Specific issues that have the potential to cause impairment, as well as actions to protect and restore Moreno Valley wetlands are shown in Table 4-2. Potential funding sources for wetlands restoration actions are shown in Table 4-3.

Table 4-1 Moreno Valley Wetland Threats/Impairment and Actions

Threats/Impairment	Recommended Actions
Moreno Valley (Overall Area)	
Historic Impacts: • Abandoned irrigation ditches • Poorly constructed stock ponds or fishing ponds • Poorly designed/drained roads and/or roads crossing wetlands • Beaver trapping • Overgrazing • Mining • Timber Harvest Current Impacts: • Low density housing development • Poorly designed/drained roads and/or roads crossing wetlands • Septic Systems • Utility Corridors • Overgrown forests • Potential for catastrophic wildfire • Lack of grazing management in some areas • Elk grazing • Irrigation • Loss of beaver habitat • Some systems in degrading state due to historic impacts (drying wetlands and meadows)	Road Improvements: Work with Colfax County and NM Department of Transportation (NMDOT) on road planning possibilities to relocate roads to reduce impacts, proper culvert placement and design and/or porous fills for roads where they cross wetlands. Grazing management – Potential projects might include: establishing off channel water sources, installing riparian fences to facilitate grazing management, and/or hosting short courses about grazing management for livestock producers in the Moreno Valley. Beaver re-introduction – Assistance for landowners who are interested in beaver re-introduction and supportive of efforts to revisit the NMGFD “Beaver Rule” which would enable land owners more flexibility for beaver re-introduction, thereby reducing landowner commitment from five miles to one or two miles. Forest thinning – There are potential projects for thinning throughout the Moreno Valley. Potential projects should focus on forest health to open the canopy, thereby reducing the threat from catastrophic wildland fires and improving the base flow of a healthier forest ecosystem which in turn would support wetlands. Identification of Wetlands at Risk – Seek funding for an evaluation of existing wetlands using GIS and remote sensing. This project would entail using the wetlands data collected by NMED/St. Mary’s University as a starting point; reviewing the identified wetlands and any potential threats; and then ranking areas of concern. Outreach to landowners where there are extensive wetlands along Comanche Creek, Moreno Creek, and Frolic Creek just north of the Village of Eagle Nest to explore restoration options. A long-term objective of this WAP is to acquire funding for wetland monitoring and tracking. Potential partnerships with New Mexico University professors and graduate students may be beneficial to provide and support ongoing wetland research in the Moreno Valley.

Northern Sub-area	
Historic Impacts: • Mining • The Big Ditch – a large diversion ditch constructed for hydraulic mining, circa 1900. • Timber Harvest • Water quality impacts from gold mining around Elizabeth Town and Baldy Mountain, e.g. Deep Tunnel Current Impacts: • See area wide list of current impacts	Dirt stock tanks – There is an opportunity for improving existing on-channel dirt stock tanks to reduce their impacts on riverine and slope wetlands, specifically: upgrades to spill ways that would reduce concentrated flow and potential erosion; lower berm / dam heights; utilize spreader ditches for tank outflows to distribute flow across existing wetlands; and assure that inflows to dirt stock tanks are not causing head-cuts. Field assessment - Conduct more detailed field biologic assessment water quality sampling to better determine if historic mining activity is affecting wetlands. Detailed assessment of impairment -Review aerial photographs followed by field checks to determine if historic diversions are leading to channelized flow and headcutting at specific locations.
Central Sub-area	
Historic Impacts: • Timber Harvest Current Impacts: • Watershed and ecosystem health are primary issues for Taos Pueblo Land in the central subarea • The Village of Eagle Nest has two inactive sewage lagoons on State Park property just south of the Hwy 64 and Hwy 38 intersection. • To the east and south of Lakeview Pines subdivision, numerous wetlands are located along streams that run west to east down towards the southern end of Eagle Nest Lake. Nearly all these wetlands are intersected by private, county, state, and federal roads.	Taos Pueblo representatives expressed interest in wetland restoration on their lands, particularly in the Probar Creek and Six Mile and watersheds where there are numerous wetlands. The Village of Eagle Nest would support an effort to seek funding for reclamation of inactive sewage lagoons near the Village, including design of restoration efforts to maximize benefits to wetlands. The Village of Eagle Nest is also open to improving the wetlands that are shown near their current sewage lagoons north of the village near the landing strip, if funding and support would be available. Explore restoration options of wetlands to the east and south of Lakeview Pines subdivision through field assessment and outreach to landowners.

Southern Sub-area	

<u>Girl Scout Camp</u>
1. Meadow is drying out. Why?
    a. Blue flowers typically bloom in this meadow, but they are no longer blooming.
2. Stock pond is largely full of silt
    a. Six years ago was approximately 6ft deep. Now it is approximately 2ft deep. The levee is still present.
<u>Other areas</u>
 	
Issues include stock pond management, fen management, grazing management, and development in the Angel Fire area.
	Apply for a Wildland Urban Interface (WUI grant) for forest thinning uphill from the meadow on the Girl Scout property.
	
	Apply for a grant to use "Water For Wildlife" techniques to restore stock tanks to dual purpose wetland and stock water functions.
	
	Would like to cross-fence the Girl Scout Camp meadow for grazing rotation (possible Farm Bill funding source); this would serve as privacy for participants as well as allow grazing in multiple meadows to maintain the health of each area.
	
	Since the causes for some issues at the Girl Scout Camp are unknown, a local field wetland assessment would be helpful to determine root causes uphill of the affected areas. The land uphill of the camp belongs to the Forest Service; therefore, a number of activities occur in that area. Whatever measures are taken, the camp would like to include the participants as much as possible, because they value the educational component and would like to see that knowledge utilized as much as possible.
	
	Other potential restoration actions in the southern sub-area include:
	
	• Restoring slope wetlands that increase base flow to American Creek and Six Mile Creek and thus to Cieneguilla Creek would contribute to the spawning of trout in the deltas of Eagle Nest Lake.
	• Implementing porous roadfill at slope wetland crossings along the Lake View Pines Rd.
	• American Creek headwaters (CS Ranch): road improvements, culverts too low, possibilities for beaver reintroduction, close out some stock ponds.
	• Flying Horse Ranch may be interested in beaver reintroduction also.
	• Angel Fire Ski Area and Halo Homeowners Association are stakeholders along W. Aqua Fria Creek.
	• Work along Cieneguilla Creek: address steep banks, plant woody vegetation in some areas, instream structures to aggrade creek to increase base flow.
	• Village of Angel Fire (and resort) stormwater management because Cieneguilla Creek gets very muddy every time it rains.
	• Generally, treating the slope wetlands would have more impact to reduce temperature in Cieneguilla Creek than shading the mainstem with woody vegetation.

Table 4-3. Potential Funding Sources for Wetland Restoration

Source	Agency	Grant
Federal	Environmental Protection Agency	Clean Water Act Section 319 Watershed Restoration Grants
		5 Star Restoration Challenge Grant Program
		Environmental Education Grants
	Natural Resource Conservation Service	Environmental Quality Incentive Program (private lands cost-matching)
		Wildlife Habitat Incentive Program
		Wetland Reserve Program
	U.S. Fish and Wildlife Service	North American Wetland Conservation Act
		Fish Passage
	U.S. Forest Service	Collaborative Forest Restoration Program
		Collaborative Forest Landscape Restoration Program
State	State of New Mexico	River Stewardship Program
	NM Game and Fish Department	Potential matching monies for other grants
	New Mexico Community Foundation	NM River Conservation & Restoration Fund
	New Mexico State Forestry	New Mexico Forestry Division Watershed Restoration Project
	New Mexico Water Trust Board Grants	Grants can be used for watershed restoration
County	Colfax Soil and Water Conservation District	
	Patagonia 1% for the Planet Grant and World Trout Initiative	
	Western Native Trout Initiative	
	Orvis Conservation Grant Program	
	National Fish and Wildlife Foundation	
	Trout Unlimited	
	Wildlife Conservation Society	
	Mitigation Funds	
	Private Donors	
	Volunteer Labor	

5. Local, Public Involvement Strategy

This wetlands action plan relies on the voluntary actions of willing landowners to protect and restore the wetlands. The NMED SWQB Wetlands Protection Program does not rely on any mandatory regulatory measures for wetland protection. Consequently, the participation of landowners and land managers is a critical component to complete and implement an effective WAP.

The Cimarron Watershed Alliance has been actively involved in watershed restoration projects along Cieneguilla Creek in the Moreno Valley (WBP, 2012). Moreno Valley residents have also been members of the CWA Board. Through these prior efforts, this group was familiar with many landowners and land managers in the Moreno Valley, and invited them and others to participate in the effort.

Four meetings were held in the Moreno Valley during the course of this planning effort. Cimarron Watershed Alliance members, as well as those who expressed interest in the planning effort, were notified of the meetings via the CWA email list. Additionally, the CWA members called local landowners to invite them to meetings; flyers with meeting announcements were also posted in public locations for the third and fourth meetings. These meeting dates and content included:

- August 26, 2015. A general overview of the WAP guidelines and objectives was provided. The remainder of the meeting focused on identifying individuals, agencies, and organizations that would have an interest in wetland planning and inviting them to participate in the effort.

- September 23, 2015. Since a larger group was in attendance, an overview of the WAP guidelines and objectives was again presented. Karen Menetrey of the NMED Surface Water Quality Bureau presented an overview of wetlands mapping and classifications in the Moreno Valley.

- March 2, 2016. Mollie Walton of the Quivira Coalition provided a presentation on wetland restoration in the Comanche Creek watershed. Participants broke into subgroups to discuss issues and potential projects related to lands that they either own and/or manage.

- May 3, 2016. Local landowners and managers continued to discuss plans for wetlands protection and restoration.

Continued outreach efforts to involve the Moreno Valley residents will be a key component for the successful implementation of the WAP.

6. References

Agreement for settlement of pending litigation and other disputes concerning State Engineer Permit 71. http://www.ose.state.nm.us/Planning/RWP/Regions/09_Colfax/2016/Reg%209_Section_5%20Water_Supply.pdf

BISON-M, 2016. Biota Information System of New Mexico, The New Mexico Department of Game & Fish, and The Fish & Wildlife Information Exchange (Conservation Management Institute, VA Tech, Blacksburg, VA. http://bison-m.org/speciesreports.aspx

Brinson, HGM, 1993. A Hydrogeomorphic Classification for Wetlands, technical report by Brinson. http://www.water.ncsu.edu/watershedss/info/wetlands/hgm.html

Cimarron Watershed Alliance, 2012. *Cieneguilla Creek Riparian Ecosystem Restoration Project 2012 Final Report.* Prepared by Implementation Task Manager: William "Hoot" Gibson and Monitoring Coordinator: Alan Huerta.

Colpitts, R.M. and C.T. Smith, 1990. Geology of the Moreno Valley, Colfax County, New Mexico, pp. 219-228. In Bauer, P.W. G=S.G. Lucas, C.K. Mawer, and W.C. McIntosh (eds) Tectonic development of the southern Sangre de Cristo Mountains, New Mexico. New Mexico Geologic Society Forty-first Annual Field Conference, September 12-15, 1990.

DBS&A, 2000. Daniel B. Stephens & Associates. Village of Angel Fire 40-Year Water Plan. *www.dbstephens.com/uploads/directory/.../Alternatives_Analysis.pdf*

ECOS: Environmental Conservation Online System, U.S. Fish and Wildlife Service http://ecos.fws.gov/ecp/

EPA, 2016. United States Environmental Protection Agency Section 404 of the Clean Water Act: How Wetlands are Defined and Identified. http://www.epa.gov/cwa-404/section-404-clean-water-act-how-wetlands-are-defined-and-identified

WBP, 2012. Hilton, Joanne, Cimarron Watershed Alliance and Quivira Coalition, December 2012. Cimarron Watershed-Based Plan.

Huerta, 2012. Personal Communication between Alan Huerta, Cimarroncita Ranch and Joanne Hilton, February, 2012.

IPaC, 2016. Information for Planning and Conservation, U.S. Fish and Wildlife Service (M15PG0041). https://ecos.fws.gov/ipac/

IPCC, 2013. Intergovernmental Panel on Climate Change. Climate Change 2013: The Physical Science Basis. http://www.ipcc.ch/report/ar5/wg1/

ISC, 2016. Interstate Stream Commission 2016 Region 9 - Colfax Regional Water Plan. http://www.ose.state.nm.us/Planning/RWP/region_09.php

New Mexico Department of Game and Fish, 2016. 2016 Statewide Fisheries Management Plan. http://www.wildlife.state.nm.us/download/commission/public-comment/NM-Fisheries-Management-Plan-2016-SCG-Approved.pdf

New Mexico Environment Department Surface Water Quality Bureau, 2005. Water Quality Assessment for Selected New Mexico Lakes. http://www.nmenv.state.nm.us/swqb/Surveys/LakeWaterQualityAssessments2005.pdf

NMED, 2010b. New Mexico Environment Department Surface Water Quality Bureau July 29, 2010b. 2010-2012 State of New Mexico Clean Water Act §303(d)/§305(b) Integrated Report.

NMED, 2012. New Mexico Environment Department Surface Water Quality Bureau March 13,2012. 2010-2012 State of New Mexico Clean Water Act §303(d)/§305(b) Integrated Report; Water Quality Control Commission Approved.

NMED, 2014. Characterization and Restoration of Slope Wetlands in New Mexico: A Guide for Understanding Slope Wetlands, Causes of Degradation, and Treatment Options. NMED, Quivira Coalition (Mollie Walton and Tamara Gadzia) and Zeedyk Ecological Consulting (Bill Zeedyk).

NMED, 2016. New Mexico Environment Department Surface Water Quality Bureau Watershed Protection Section Wetlands Program:Types of Wetlands in New Mexico. https://www.env.nm.gov/swqb/Wetlands/types/index.html

New Mexico Office of the State Engineer (NMOSE) / New Mexico Interstate Stream Commission (NMISC). 2006. *The impact of climate change on New Mexico's water supply and ability to manage water resources.* July 2006. Available at <http://www.nmdrought.state.nm.us/ClimateChangeImpact/completeREPORTfinal.pdf> Accessed March, 2016.

NMSU, 2010. New Mexico State University, 2010. Smith, Dr. Geoff; GBS Environmental, LLC and NMSU Biology Department. *Bacterial Source Tracking Study in the Cimarron New Mexico Watershed*; in cooperation with CWA board members and local Angel Fire High School students.

NMRPTC, 2016. New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. (Latest update: 20 April 2015). http://nmrareplants.unm.edu

NRCS/WSS, 2010. United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey (WSS) http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Rangeland Hands, 2009. Taos Pine Roads Field Survey (2009).

Saye, 1990. Saye, J.A., III. 1990. Hydrogeology of the Moreno Valley, an overview. Pp. 62-66 In Bauer P.W. G=S.G. Lucas, C.K. Mawer, and W.C. McIntosh (eds) Tectonic development of the southern Sangre de Cristo Mountains, New Mexico. New Mexico Geologic Society Forty-first Annual Field Conference, September 12-15, 1990.

SMU, 2012. St. Mary's University, November, 2012. A Landscape Level Approach to Wetland Functional Assessment, Wetland Mapping and Functional Assessment, Canadian River Watershed, New Mexico. Association of State Wetland Managers, November, 2012. http://www.aswm.org/pdf_lib/robertson.pdf

Robertson, A. G., Stark, K.J., Anderson, J. C., Maffitt, B. L., Rokus, D. D., Hutchins, H.H., 2015. Mapping and Classification of Wetlands for Protection: Northeastern New Mexico Highlands and Plains. Saint Mary's University of Minnesota. Winona, Minnesota.

UNM, 2010. University of New Mexico Water Resources Program, July 2010. Water Resources Assessment of the Cimarron River and Evaluation of Water Quality Characteristics at the Maxwell National Wildlife Refuge, Dr. Bruce Thomson and Dr. Abdul-Mehdi Ali, editors.

United States Department of Agriculture Forest Service, September, 2015. Assessment Report of Ecological, Social, and Economic Conditions, Trends, and Sustainability, Carson National Forest, New Mexico. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3838333.pdf

USDAFS, 2015. United States Department of Agriculture Forest Service, May, 2015. Draft Assessment Report of Ecological/Social/Economic Sustainability Conditions and Trends, Carson National Forest New Mexico.
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3838333.pdf

United States Environmental Protection Agency. Wetlands Overview. http://water.epa.gov/type/wetlands/upload/2005_01_12_wetlands_overview.pdf accessed October, 2015.

United States Environmental Protection Agency. Section 404 of the Clean Water Act: How Wetlands are Defined and Identified. http://www.epa.gov/cwa-404/section-404-clean-water-act-how-wetlands-are-defined-and-identified accessed February, 2016.

USGCRP, 2009. U.S. Global Change Research Program (USGCRP) 2009. *Global Climate Change Impacts in the United States: 2009 Report.* <http://nca2009.globalchange.gov/southwest>