Wetland Action Plan

Comanche Creek Watershed

Prepared by:

QUIVIRA COALITION

education, innovation, restoration—
one acre at a time

Justification and Credits

This Wetlands Action Plan was prepared in partnership with the New Mexico Environment Department's Surface Water Quality Bureau Wetlands Program, with additional support from the Questa Ranger District, Carson National Forest. The Wetlands Action Plan was written to satisfy the grant objectives of a U.S. EPA CWA Section 104(b)(3) Wetlands Grant (Assistance Agreement No. CD#00F434-01-0B (FY2011)), entitled "Innovative Design and Restoration of Slope Wetlands in the Comanche Creek Watershed, New Mexico."

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Since 2001, the Quivira Coalition has had the pleasure of working with many dedicated individuals to improve water quality, habitat for the Rio Grande cutthroat trout, and land health with watershed-wide restoration activities. The Comanche Creek Working Group was formed early during this effort and is a collection of stakeholders working to stabilize and restore wetlands and improve water quality and habitat for Rio Grande cutthroat trout in the Comanche Creek Watershed. Stakeholders in this watershed group have changed over the years; however, George Long, Wildlife Biologist, Questa Ranger District, Carson National Forest, has consistently been an active partner in restoration of the watershed.

Maryann McGraw, Karen Menetrey, and Michelle Barnes from the Wetlands Program, and Abe Franklin from the Watershed Protection Section of the New Mexico Environment Department Surface Water Quality Bureau, have supported restoration efforts in many ways over the years. Talented restoration professionals and volunteers have been integral in working to stabilize this ecosystem. This Wetlands Action Plan is the product of many years of collaboration between all partners of the Comanche Creek Working Group.

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Acronyms

Acronym	Full Name
CCW	Comanche Creek Watershed
CCWG	Comanche Creek Working Group
CE	Categorical Exclusion
CNF	Carson National Forest
CWA	Clean Water Act
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
FGDC	Federal Geospatial Data Committee
LLWW	Landscape position, Landform, Water flow path and Water body
NEPA	National Environmental Policy Act
NFF	National Forest Foundation
NM	New Mexico
NMCHAT	New Mexico Critical Habitat Assessment Tool
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMHPD	New Mexico Historic Preservation Division
NR	Not Rated
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
MUSYA	Multiple Use Sustained Yield Act
ONRW	Outstanding National Resource Waters
RERI	River Ecosystem Restoration Initiative
RGCT	Rio Grande Cutthroat Trout
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
TMU	Target Mapping Unit
TU	Trout Unlimited
US	United States
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VVGA	Valle Vidal Grazing Association
WAP	Wetland Action Plan
WAP-CCW	Wetland Action Plan for the Comanche Creek Watershed

Executive Summary

Problem Statement

The Wetland Action Plan for the Comanche Creek Watershed (WAP-CCW) provides a plan for stabilizing, rehabilitating, and restoring wetlands in the watershed. The information in this WAP-CCW is based upon historical records, available data from the Carson National Forest (CNF), and restoration efforts beginning with the first meeting of the Comanche Creek Working Group (CCWG) in 2001.

Heavy land use in the last century—including logging, mining, and overstocking of the range—led to the formation of large headcuts and channel downcutting in the upper tributaries that flow into Comanche Creek. Due to the legacy of extractive industries in the Comanche Creek Watershed (CCW) and the resultant degradation of riparian and wetland ecosystems, many actions are necessary to achieve the following.

1. Improve wetland, riparian and upland habitat conditions;
2. Improve soil water storage in headwater slope wetlands;
3. Manage the watershed as a whole; and
4. Serve as a demonstration site showcasing multiple-use management practices that are effective in restoring and maintaining wetlands on public lands.

Action Summary

Various innovative restoration techniques for storing water in wetland soils in the face of a hotter and dryer Southwest (Zeedyk and Clothier 2009, and Quivira and Zeedyk 2014) are being tested in the watershed. The conservation efforts employed by CCWG in the watershed focus on establishing resilient wildlife habitat and enhanced ecosystem functioning in the CCW by increasing baseflow, stabilizing and restoring the existing degraded wetlands, and helping to rebuild soil moisture in dry upland basins. Specifically, the innovative restoration techniques:

1. Treat erosional headcuts;
2. Restore dispersed surface flow;
3. Remediate eroding channel banks;
4. Deter large ungulates from overgrazing wetlands.

The CCWG has prioritized wetland restoration by tributary watershed (Table 5) by weighting the need for restoration with the costs, logistics of treatment, probability of success, and estimated ability to fund stabilization and restoration. Tributary wetland systems are ranked from A-C, with A having the greatest need and high potential for successful stabilization and restoration. Some tributary wetland systems are not yet rated (NR) because of the existence of

Rio Grande cutthroat trout in the tributary stream that will require collaboration with New Mexico Game and Fish and the United States Fish and Wildlife Service to determine how to balance the goals of Rio Grande cutthroat trout habitat and slope wetland stabilization and restoration.

The Comanche Creek Working Group (CCWG) will continue to raise funds to complete restoration activities on the ground which will remediate and restore the damaged hydrological function of wetlands in the Comanche Creek Watershed.

Introduction

This WAP-CCW is a summary of available information about the wetlands and riparian resources of the CCCW, Carson National Forest, Taos County, New Mexico.

Purpose

The purpose of the WAP-CCW is for the CCWG and its collaborators to propose and oversee a plan for stabilizing, rehabilitating, and restoring wetlands in the watershed. Currently, the CCWG acts as the watershed association for the CCW. The stakeholder group consists of the Quivira Coalition's Land and Water Program Director, representatives of the Carson National Forest's Questa Ranger District, members of the Valle Vidal Grazing Association (VVGA), the Truchas Chapter and Enchanted Circle Chapters of Trout Unlimited (TU) and TU's national organization, representatives of the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB), restoration professionals, and interested volunteers. The WAP-CCW will provide guidance to stakeholders to engage in future action initiatives for the stabilization and restoration of wetlands in the CCW. Future actions include:

1. Improving wetland, riparian and upland habitat conditions;
2. Improving soil water storage in headwaters wetlands;
3. Managing the watershed as a whole; and
4. Serving as a demonstration site showcasing multiple-use management practices that are effective in restoring and maintaining wetlands on public lands

The WAP-CCW includes background information and a prioritization of wetland areas in the Comanche Creek watershed where stabilization and restoration activities should be planned when funds become available. Some data and information are currently unavailable, and therefore part of the goal of this WAP is to identify and attempt to fill these information gaps in order to inform future planning activities. The development and periodic revision of the watershed WAP will be an ongoing process.

The information in this WAP-CCW is based upon historical records, available data from the Carson National Forest (CNF), and restoration efforts beginning with the first meeting of the CCWG in 2001. Restoration and monitoring to date have been accomplished with available grant funding obtained from many different sources over the years. There remain significant information gaps for the condition of many wetlands within the watershed because of the nature of grant funding that dictates that projects be completed in discrete and defined areas. This WAP-CCW will both identify areas where information gaps exist and identify wetland areas where stabilization and restoration should be prioritized, based on existing knowledge.

Quivira Coalition and Comanche Creek Working Group Restoration Efforts

Founded in 1997 by two conservationists and a rancher, the Quivira Coalition is a nonprofit organization based in Santa Fe, New Mexico. Quivira's mission is to build resilience by fostering ecological, economic, and social health on western working landscapes through education, innovation, collaboration, and progressive public and private land stewardship. Since 2001, the Quivira Coalition, in partnership with numerous organizations and agencies, has led a habitat restoration project on the CCW. Different innovative restoration techniques (designed by Bill Zeedyk and many other restoration professionals) for storing water in wetland soils in the face of a hotter and dryer Southwest (Zeedyk and Clothier 2009 and Quivira and Zeedyk 2014) are being tested in the watershed. Establishing resilient wildlife habitat and enhanced ecosystem functioning in the CCW by increasing baseflow, stabilizing and restoring the existing degraded wetlands, and helping to rebuild soil moisture in dry upland basins is the goal of the CCWG.

The CCWG currently consists of individuals representing the groups shown in Table 1. Members of the CCWG established baseline monitoring points throughout the watershed. Many points are designated for monitoring vegetation conditions in the watershed, while there are many other monitoring locations that are based on pre- and post-project monitoring for grant reports and United States Army Corps of Engineers (USACE) monitoring obligations. The Quivira Coalition is in the process of cataloguing all monitoring data and data from the many grant-funded projects and making them publicly available.

Table 1. Comanche Creek Working Group Members

Partner	Contact Person(s)	Partner Role
Carson National Forest	George Long, Greg Miller, Michael Gatlin, Jack Lewis, John Littlefield and Ezequiel Rael	Access permission, technical assistance
New Mexico Department of Game and Fish	Jacob Davidson	Project advisor
Surface Water Quality Bureau Wetlands Program, New Mexico Environment Department	Maryann McGraw, Karen Menetrey, and Emile Sawyer	Project funding through grant awards, technical assistance
Quivira Coalition	Mollie Walton	Project coordinator, grant writer, project management
Restoration Professionals	Jeffrey Adams, Steve Carson, Craig Sponholtz, Bill Zeedyk	Project design and implementation
Trout Unlimited	Toner Mitchell, Art Vollmer	Public education, volunteer recruitment, matching funds
United States Fish and Wildlife Service	Stephen Davenport, Jason Davis	Partner for in-stream fish passage barrier removal
Valle Vidal Grazing Assoc.	Mark Torres	Project cooperation

Early restoration efforts in the CCW have been designed to directly address water quality issues in the mainstem of Comanche Creek, as well as to ensure adequate habitat for New Mexico's state fish, the Rio Grande cutthroat trout *(Oncorhynchus clarki virginalis*). Currently, restoration efforts are being concentrated in the upper tributaries and headwater wetlands in order to stabilize these systems at the highest elevation source of ground and surface water.

Restoration Need and Proposed Actions in the Watershed

Due to the legacy of extractive industries in the watershed and the resultant degradation of riparian and wetland ecosystems, many actions are necessary to achieve the following.

1. Improve wetland, riparian and upland habitat conditions;
2. Improve soil water storage in headwater slope wetlands;
3. Manage the watershed as a whole;
4. Serve as a demonstration site showcasing multiple-use management practices that are effective in restoring and maintaining wetlands on public lands

To attain these goals, the CCWG will continue to raise funds to complete restoration activities on the ground which will remediate and restore the damaged hydrological function of wetlands in the CCW.

Comanche Creek Watershed Site Description

Comanche Creek is located in Northern New Mexico's Sangre de Cristo Mountains in the Upper Rio Grande River Basin (United States Geological Survey (USGS) Hydrologic Unit Code (HUC) 13020101015) (Figure 1). The entire watershed lies within the Valle Vidal Unit, Questa Ranger District, Carson National Forest, Taos County, New Mexico. The CCW contributes 27,430 acres or 43 square miles to the Costilla Watershed (Pittenger 2002). The average elevation of headwater tributaries to Comanche Creek is roughly 10,400 feet. All of the waters within the watershed are designated as Outstanding National Resource Waters (ONRWs).

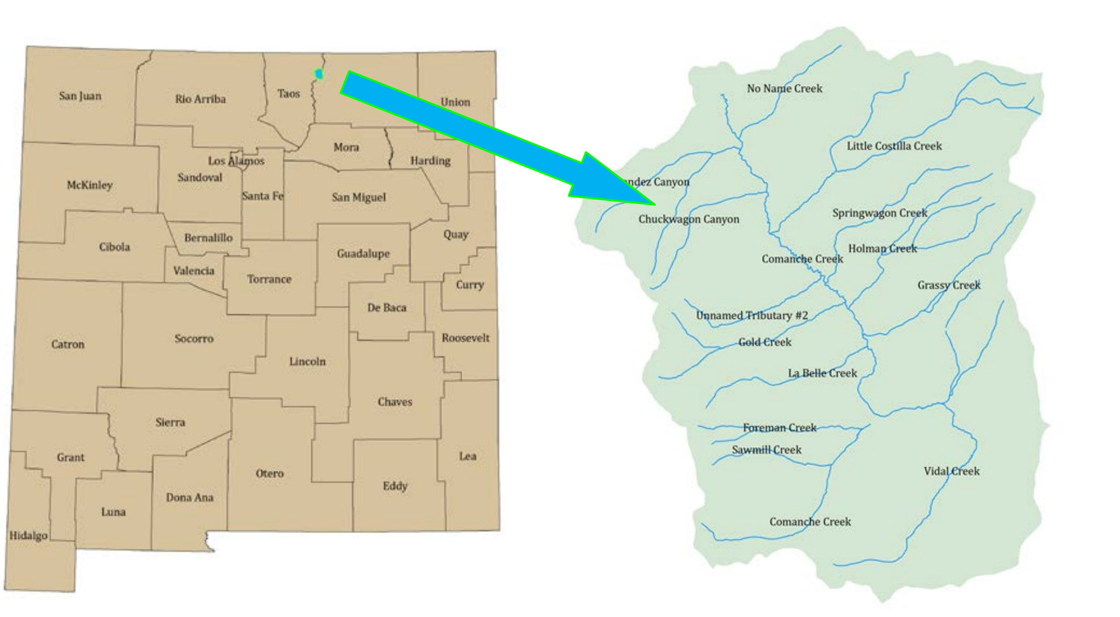


Figure 1. Location of Comanche Creek Watershed, Questa Ranger District, Carson National Forest

Land Use

Historic

The CCW is one part of the larger Valle Vidal Unit in the Carson National Forest (CNF). The Valle Vidal Unit was donated to the United States Forest Service (USFS) by Pennzoil in 1982 in exchange for a tax debt (Valle Vidal Deed 1982). The land area has been heavily used by human populations throughout recorded history. The land belonged to the Jicarilla Apache and others before them (Montoya 2002). Colonization of the area by the Spaniards in the 1500s brought more settlers to the area. At one time, under the Maxwell Land Grant, granted by the Mexican government and then recognized by the United States (US) Government, the owner, Lucien Maxwell, employed more than 500 people who cultivated many acres and also ran large herds of sheep and cattle. Mining was also a common activity in the watershed after gold was discovered in the late 1800s in the Maxwell Land Grant. Figure 2a and Figure 2b show examples of legacy land use impacts in the CCW. Creek names such as Sawmill Creek and Gold Creek give insight into the extent of extractive land use in the watershed.

Figure 2a. Placer mining in nearby La Belle, New Mexico between 1890 and 1910 (Denver Public Library, Western History Collection, Aultman, Otis A., 1874-1943. CHS.A646); Figure 2b. Land impacted by livestock grazing in what is now Philmont Scout Ranch (photographers unknown).

Timber rights were in a third-party ownership and did not belong to Pennzoil to be transferred with the surface ownership. The rights belonged to a logging company with lumber mills in both Amalia and Cimarron. The CCW was logged using the “jammer logging” method, which uses a cable and winch system to drag or skid logs uphill to a collection and loading area (Stokes et al. 1989). Jammer cables have a limited reach of 100 to 300 feet; therefore requiring the construction of closely-spaced roads— in this instance, every 150 feet. Timber harvesting and the subsequent construction of many logging roads further impacted the watersheds of the Valle Vidal. Logging road construction resulted in changed water drainage patterns throughout the watershed. These road networks are clearly visible in aerial photos (Figure 3). More than 700 miles of abandoned logging roads were drained and closed to traffic in the two years following acquisition of the Valle Vidal Unit by the USFS.

Figure 3. Aerial photograph from September 8, 1974 showing logging roads in the southernmost portion of the watershed

The current condition of CCW creeks, wetlands, and wet meadows, and of its tributaries, is a product of past human land use within the watershed. This historical use has contributed to a significant amount of soil erosion, increase in sediment load in the stream, increases in stream water temperature, and overall degradation of the riparian and wetland ecosystems. When the USFS gained ownership of the Valle Vidal, and within it the CCW, there was much to do to improve upon and reverse the impacts of the legacy land uses. Considerable restoration activities occurred after the USFS acquired the property in 1982, including the reduction of livestock numbers from 2,500 to less than 1,000 and a shift from season-long to rotational grazing in pasture systems. Grazing management, logging road closures, and improved road drainages all had a considerable positive impact in the watershed.

Present

Under management of the USFS, the Valle Vidal Unit is administered for multiple use and sustained yield after the Multiple Use-Sustained Yield Act of 1960 (MUSYA 1960), as modified by the National Forest Management Act. This law authorizes and directs the Secretary of Agriculture to develop and administer the renewable resources of timber, range, water, recreation, and wildlife on the national forests for multiple use and sustained yield of products and services (USFS, Carson National Forest 1982).

The Valle Vidal Grazing Association uses the Comanche Creek Watershed and other pastures in the Valle Vidal Unit for summer grazing. Firewood harvesting permits are issued annually. A large elk herd managed by the New Mexico Department of Game and Fish (NMDGF) brings many wildlife viewing and hunting enthusiasts into the watershed. The area is a popular hiking and camping location and is also a well-known destination for back country horseback groups. People also come to the CCW for catch and release fishing of Rio Grande cutthroat trout.

Since 1981, a concerted and innovative effort has been made to heal the CCW by the USFS, the grazing permittees, and various conservation organizations. In 2012, the CNF identified the watershed as a priority for stabilization/restoration work. Currently a draft "Watershed Action Plan" is under review.

Landscape Characteristics

Geology

Comanche Creek is an upper tributary to Costilla Creek, which delineates the boundary between the Culebra Range and the Taos Range of the Sangre de Cristo Mountains. The Sangre de Cristo Mountains are a north-trending chain of mountains that runs from northern New Mexico to southern Colorado and rises between the Rio Grande depression on the west and the Raton Basin on the east. The Culebra Range includes predominantly volcanic, conical peaks with narrow ridges of outwardly radiating dykes. Peaks of the Taos Range vary from 12,000 to more than 13,000 feet and include Wheeler Peak (elevation 13,173 feet), the highest point in New Mexico (Clark 1966).

The original uplift of the Sangre de Cristo Mountains and the Raton Foreland Basin was driven by and related to tectonic contraction of the Laramide Orogeny, from about 70 Ma to 40 Ma. The Rio Grande rift caused subsequent uplift and faulting of this area. Surficial deposits within the Comanche Creek Basin include valley alluvial deposits, mass-wasting, and middle Pleistocene to Holocene-aged, glacially deposited terraces. Geology of Comanche Creek Basin is dominated by Lower and Middle Santa Fe Group (Tsf), Tertiary-aged, coarse grained, mixed clastic rock, unconsolidated, and plutonic rock of the Lower Proterozoic (Xg). Other rock units found in the study watershed include Tuv, Tertiary-aged volcanic, and some volcaniclastic rock; Ti, Tertiary plutonic, and silicic to intermediate intrusive rock; Tvs, Tertiary sedimentary, and volcaniclastic rocks; Xvm, Lower Proterozoic mafic metamorphic rock; and Xs, Lower Proterozoic-aged metasedimentary rock (Clark 1966).

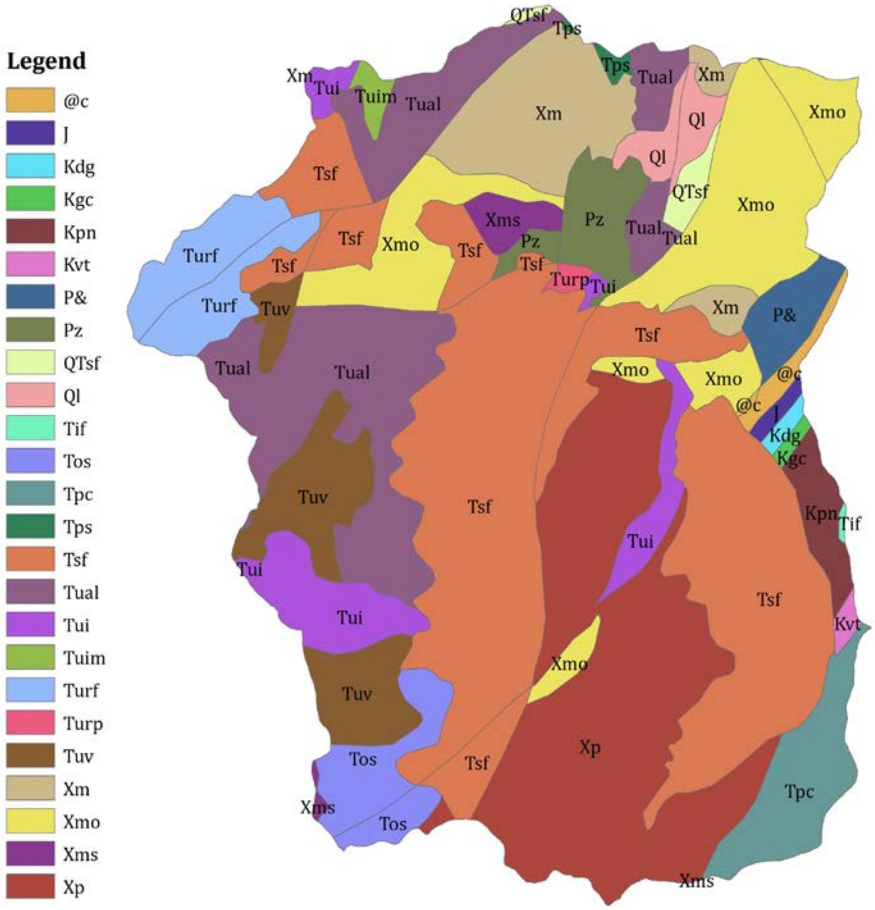


Figure 4. Geology of the Comanche Creek Watershed

There are limited small scale geologic maps available for this region of northern New Mexico and none available which include the entire Comanche Creek Watershed (Fridrich et al. 2012). Figure 2 shows the generalized geologic setting of the Comanche Creek Watershed. The image is an excerpt from a 1:500,000 scale New Mexico geologic map published by New Mexico Bureau of Geology and Mineral Resources. For the legend key to the geologic map, see https://geoinfo.nmt.edu/publications/maps/geologic/state/home.cfml#download.

Soils

Soils in the CCW (Figure 3) are dominantly Nambe cobbly loam (NaF), Wellsville-Ess association (WEF), and Marosa-Nambe association (MTE). Cryoborolls-Cryaquolls complex (CTC) are deposits weathered from granite found along stream channels in the valley bottoms. For additional soil descriptions, a complete Custom Soil Resource Report for the CCW may be generated by the National Cooperative Soil Survey (USDA NRCS Web Soil Survey).

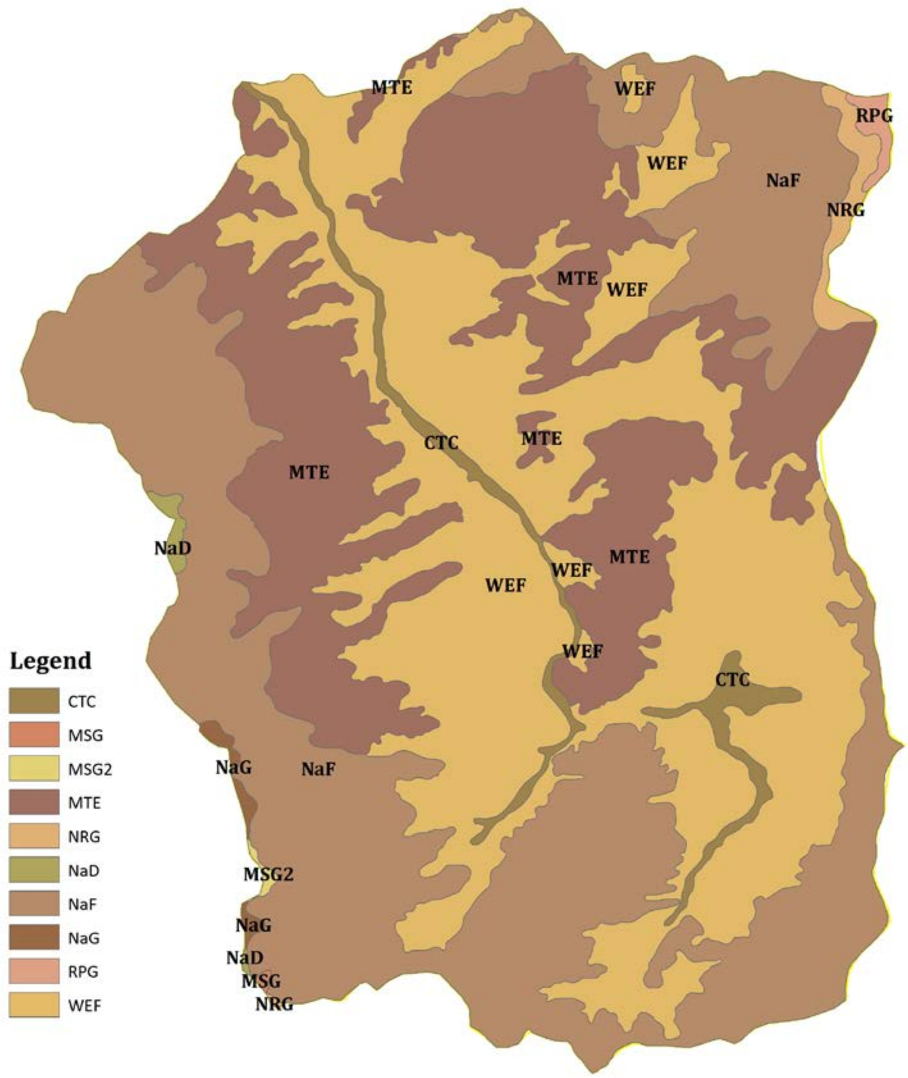


Figure 5. Soil types in the Comanche Creek Watershed

Hydrogeology and Surface Hydrology

The CCW hydrology is shallow, high elevation groundwater storage, feeding ephemeral and perennial channels (Figure 6). The hydrological cycle is driven by snowmelt runoff in the early spring, monsoon rains in July and August, and springs where groundwater emerges at the surface. The upper basins are home to extensive wetland meadows, fens, and springs. Faulting and porous rock layers (aquifers) that expel water in the form of springs in the valley walls or floor often dictate the location of slope wetlands.

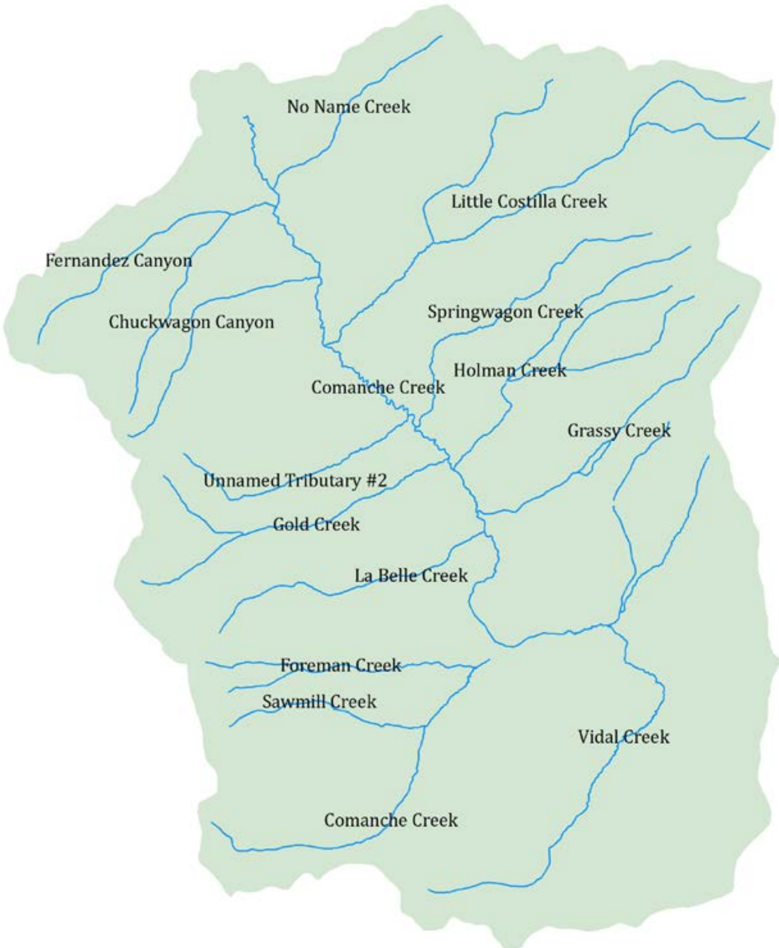


Figure 6. Surface water in the Comanche Creek Watershed

Riparian wetlands and slope wetlands are found within the tributary watersheds that make up the larger CCW. Wetlands classified in 2012 and 2013 according to the methods described below (Tiner 1997) are shown in Figure 7.

In 2013, wetlands in the Canadian River Basin were delineated as part of an Environmental Protection Agency (EPA) grant to the NMED/SWQB, Wetlands Program. In this effort, the wetlands within the CCW (in the Lower Rio Grande Basin) were also delineated. The *Mapping and Classification for Wetlands Protection, Northeastern New Mexico Highlands and Plains Project* relies on the subjective interpretation of wetland boundaries and wetland classification characteristics from a primary aerial image source supported by consultation with collateral spatial data.

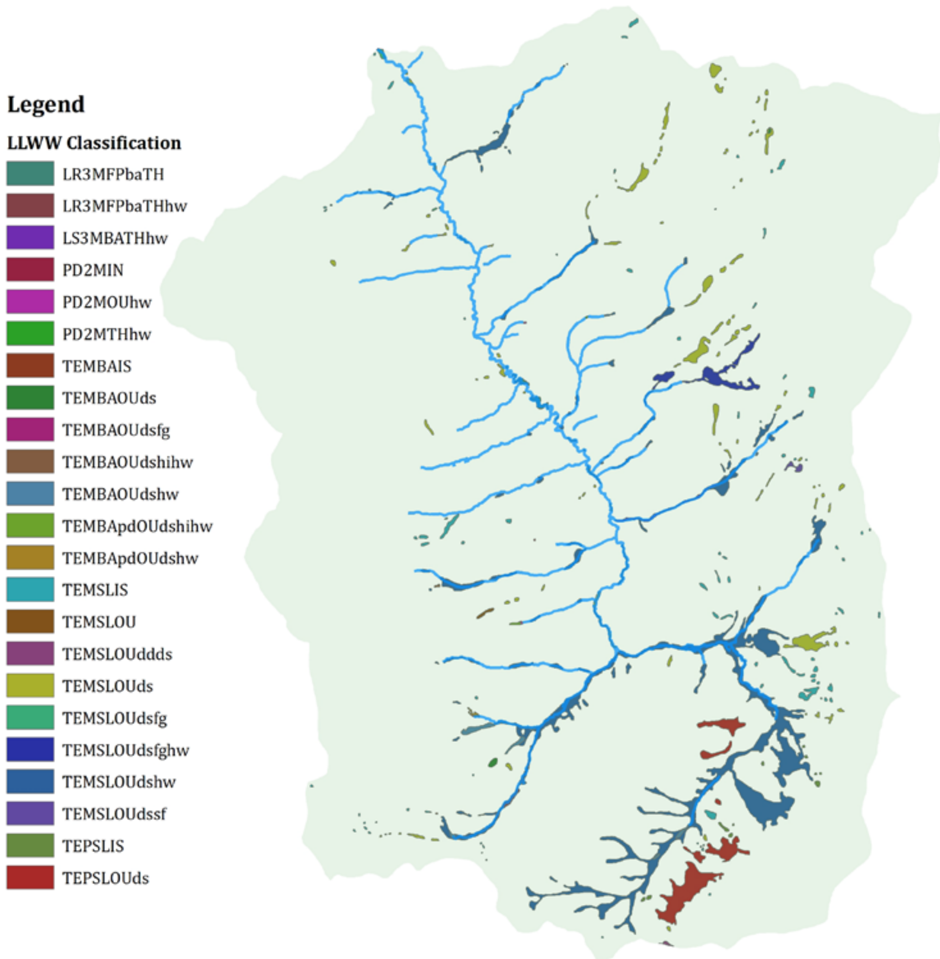


Figure 7. Landscape position, landform, water flow path, and water body *(*LLWW) classification of wetlands in the Comanche Creek Watershed

The entire watershed was mapped for wetlands following the National Wetland Inventory (NWI) mapping conventions using the Cowardin System (USFWS 1992) for classifying wetlands and the System for Mapping Riparian Areas in the Western United States (USFWS 2009); classification of wetlands using the LLWW functional assessment classification, which considers landscape position, landform, water flow path, and water body types (Tiner 2003); development of wetland classes and subclasses according to hydrogeomorphic characteristics (Brinson 1993); wetland photo interpretation from a variety of input image and collateral data sources; and field verification. All mapping was completed with at least 1:12,000 resolution—with a target mapping unit (TMU) of 0.5 acres or better—and complies with the National Wetlands Mapping Standard of the Federal Geospatial Data Committee (FGDC). The results of this wetland identification and classification effort will help guide planning for wetland restoration efforts in the CCW as identified in this CCW-WAP.

Water Quality

Substrate analyses conducted on Comanche Creek by NMED/SWQB in the 1990s recorded a high frequency of small particle size classes (NMED 1996). NMED states that the origin of these fine sediments comes from the following sources:

- Erosion from hillslopes with unconsolidated soils
- Destabilization of stream banks along the Comanche Creek mainstem
- Transport of fine sediment from tributaries to Comanche Creek
- Road-cuts and road-banks with unconsolidated soils
- Culverts and bridges that altered flow and increased erosion
- Roads without proper drainage
- Headcutting in Comanche Creek and tributaries that increased erosion, and
- Vegetative cover problems related to wildlife use (elk), livestock grazing, and human land use

The current condition of Comanche Creek and its tributaries is clearly a product of past human land use within the watershed. Since 1982, when the area was acquired by the USFS, the hydrologic condition and channel stability of the Comanche Creek mainstem have been improving. Comanche Creek has been monitored as part of the Total Maximum Daily Load (TMDL) process for exceedances of New Mexico Water Quality Standards. Even though conditions are improving, the TMDL process has identified exceedances of stream bottom deposits, aluminum, and temperature standards in Comanche Creek.

In the 2011 NMED TMDL Report, many sections of Comanche Creek were successfully delisted from the 2006 report in response to restoration efforts in the watershed. However, portions of La Belle Creek, Holman Creek, and Gold Creek are still listed for TMDL temperature exceedance (Table 2). Additional work is necessary to stabilize and restore wetlands in order to address temperature exceedances in the watershed in these three tributaries, but also in tributaries which are in a degraded condition but are not listed in the 2011 NMED TMDL Report. Wetland stabilization and restoration efforts are believed to have positive impacts on water quality as measured in tributaries downslope of wetland treatment activities. In future restoration projects in the CCW, the CCWG plans to collect data that will substantiate this belief.

Table 2. Water quality impairments in the Comanche Creek Watershed as of 2011

Impaired Creek	Impairment	Probable Sources
Gold Creek	Temperature	Channelization, drought related impacts, forest roads and low water crossing, natural sources, and rangeland grazing
LaBelle Creek	Temperature	Channelization, drought related impacts, forest roads and low water crossing, natural sources, rangeland grazing, and wildlife other than waterfowl
Holman Creek	Temperature	Channelization, drought related impacts, forest roads and low water crossing, natural sources, rangeland grazing, and wildlife other than waterfowl

Ecoregions and Vegetation Communities

The CCW is within the Southern Rockies Ecoregion 21, has broad, open valleys within high mountain peaks (Figure 8) and is further broken down into the regions labeled in

Figure 9 (EPA 2011). The vegetation community is dependent upon both the soils and the combined amount of surface and groundwater available at a particular site.

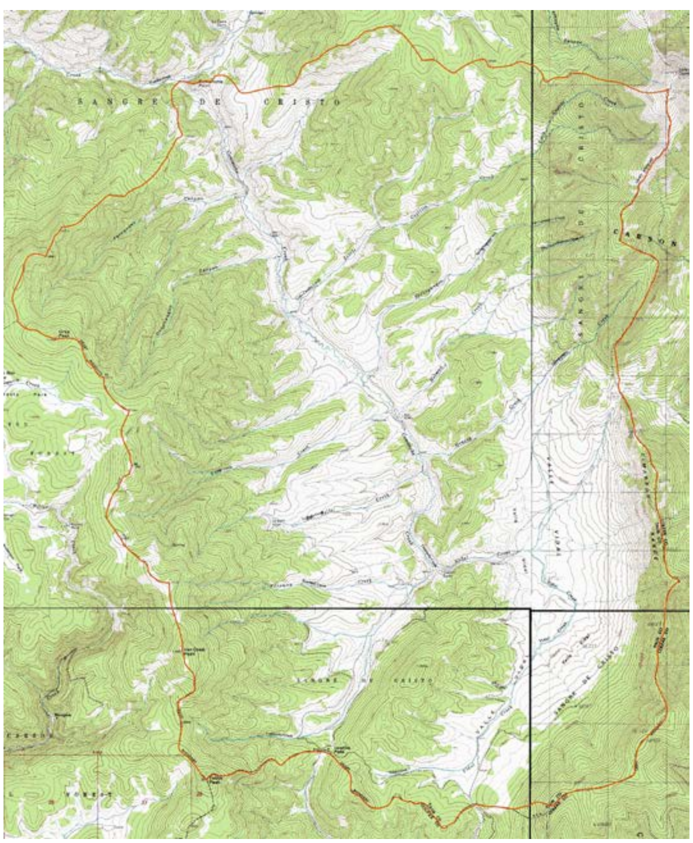


Figure 8. Topographic map of the Comanche Creek Watershed

Grassland Parks is the ecoregion type in the CCW where most of the larger slope wetland complexes occur (

Figure 9). These are high intermontane valleys with sufficient water availability to support grasslands and wet meadows. Bunchgrasses are the dominant vegetation type, with few and scattered shrubs and subshrubs. Bunch grasses include Parry's oatgrass (*Danthonia parryi)*, Arizona fescue (*Festuca arizonica)*, Idaho fescue (*Festuca idahoensis)*, Thurber fescue (*Festuca thurberi)*, mountain muhly (*Muhlenbergia montana)*, bluebunch wheatgrass (*Pseudoroegneria spicata)*, needle-and-thread grass (*Hesperostipa comate)*, Junegrass (*Koeleria macrantha*), and slender wheatgrass (*Elymus trachycaulus)* (Griffith et al. 2006).

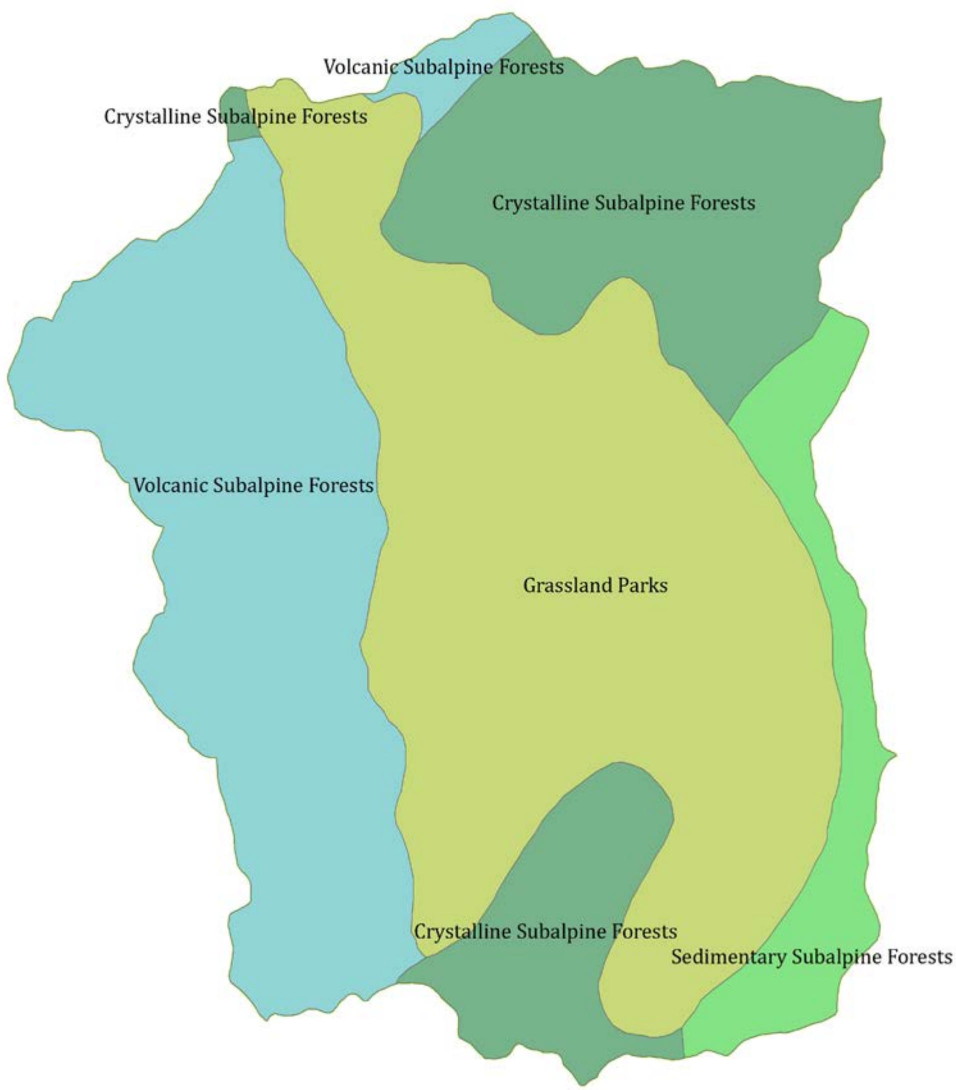


Figure 9. Subecoregions within the Southern Rockies Ecoregion 21 for the Comanche Creek Watershed (EPA 2011)

In slope wetlands that are not affected by degradation, vegetation is dominated by sedge species (*Carex* Spp.). In slope wetlands that have begun to degrade as the result of a change from dispersed flow to channelized flow, the vegetation will change to a mix of sedge with an increased component of species that can tolerate the dryer soil conditions. The change in vegetation species composition begins with a change from dispersed flow to channelized flow. Facultative wetland species start to dominate as the wetlands dry. Plant species in the Comanche Creek Watershed that are indicative of this drying condition include redtop (*Aragrostis gigantea*), timothy (*Phleum pretense*), Kentucky bluegrass (*Poa pratensis*), and common yarrow (*Achillea millefolium*). At some stage in this process, the slope wetland is converted to a wet meadow.

Noxious weed species in the CCW include yellow toadflax (*Linaria vulgaris*), musk thistle (*Carduus nutans*) and Canada thistle (*Cirsium arvense*). Of these three species, Canada thistle is of the greatest concern as it can be spread by heavy machinery and shovels if not cleaned before moving from a contaminated area to an area free of the invasive weed species. Kentucky bluegrass (*Poa pratensis*) is prevalent throughout the watershed and displaces more desirable vegetation in the wetlands and wet meadows. It is a turfgrass species and does not have the root structure to hold the soil in the face of high precipitation runoff events. With restoration, often Kentucky bluegrass is replaced by *Carex* species which can tolerate wetter soil conditions than Kentucky bluegrass.

Soil surface roughness (created in part by vegetation) favors sheetflow when the surface is of a relatively similar elevation. If the surface is very rough with large differences in surface elevation within a small area, the lowest places will intercept dispersed flow. Water will then flow to the lowest place on the landscape and begin to form a system in which surface roughness no longer facilitates dispersal, but instead favors channelized flow (Figure 10). Channels are not a component of healthy slope wetland systems. Dispersed flow is integral to the formation and continuing function of slope wetland complexes. The presence of channels, and particularly incised channels, is a sign of degradation in these systems.

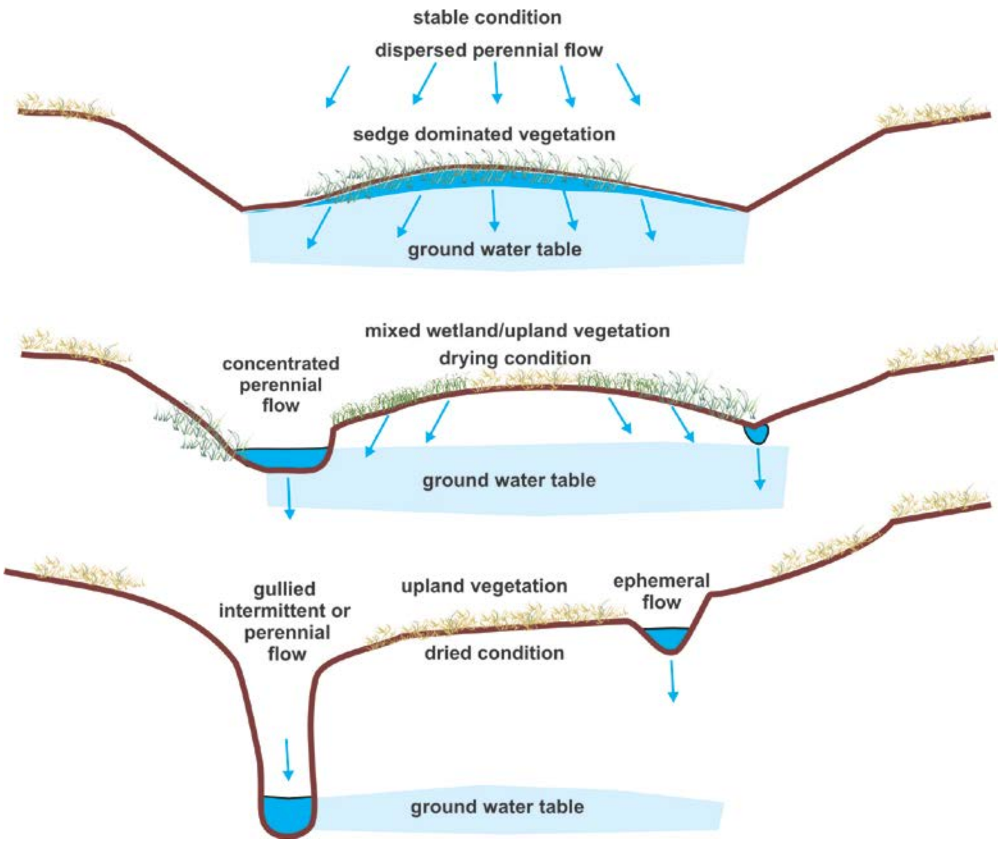


Figure 10. Wetlands in stable condition feature dispersed (sheetflow) over the channelized flow of a degraded wetland system.

Once a slope wetland complex has dried and is no longer continually saturated, or even seasonally saturated, the vegetation will transition to a combination of facultative and upland species. In the Comanche Creek Watershed, these species include both cool and warm season upland grasses (*Muhlenbergia* Spp., *Elymus* Spp., and *Bouteloua* Spp.), a diversity of upland forbs, subshrubs such as fringed sagewort (*Artemisia frigida*), and upland shrubs, such as rabbit brush (*Ericameria* Spp.). Once these species are dominant, the wetland and its associated ecosystem services are effectively gone. Depending on site conditions, it may or may not be possible to reverse this transition and reestablish a wetland or a wet meadow.

Wildlife Habitat

The CCW is home to a variety of large mammals including mule deer, elk, black bear, and mountain lion. There are also many species of smaller animals, native Rio Grande cutthroat trout, and song birds. The New Mexico Crucial Habitat Assessment Tool (NMCHAT) is a web-based map tool, designed to aid early landscape-level planning, with spatial information on sensitive species and habitats across New Mexico (http://nmchat.org/). It is intended for conservation managers, industry, and the public to identify priority habitat. The website is a collaboration between the NMDGF and Natural Heritage New Mexico. Table 3 contains a list of wildlife Species of Concern for Taos County, New Mexico. Of the species in this table, only the RGCT occur in the CCW. Most of the restoration work in the watershed affects the Rio Grande cutthroat trout. Figure 11 shows the critical habitat for RGCT.

Table 3. Wildlife Species of Concern for Taos, County, New Mexico

Group	Name
Birds	Yellow-billed Cuckoo (*Coccyzus americanus*)
Birds	Mexican spotted owl (*Strix occidentalis lucida*)
Birds	Southwestern willow flycatcher (*Empidonax traillii extimus*)
Fish	Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*)
Mammals	Black-footed ferret (*Mustela nigripes*)
Mammals	Canada Lynx (*Lynx canadensis*)

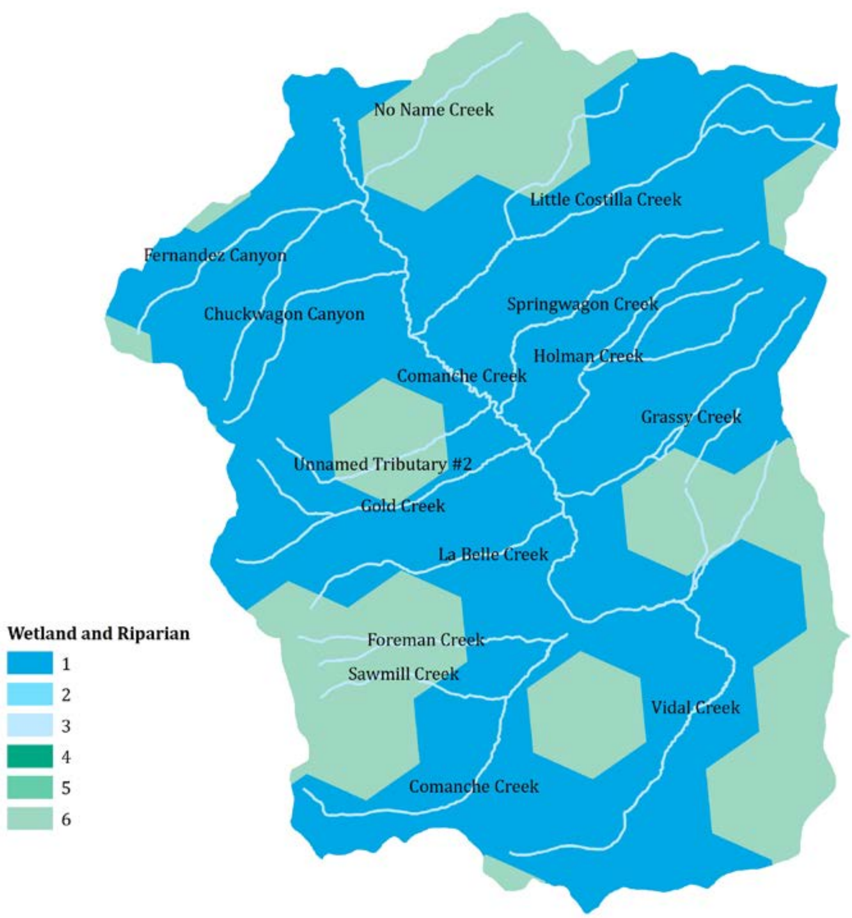


Figure 11. Critical riparian and wetland habitat exist within the CCW for the Rio Grande cutthroat trout (1 is the most critical and 6 is the least critical habitat designation).

The CCW is protected from high risk of degradation to the habitat's freshwater integrity (Figure 12) because of the protective management of the USFS, CNF and the designation waters within the Valle Vidal as ONRWs. This level of protection is ideal going forward with wetland restoration as it helps to ensure the success of any restoration project. However, it does not address the existence of the legacy degradation issues or the current and projected problems associated with climate change.

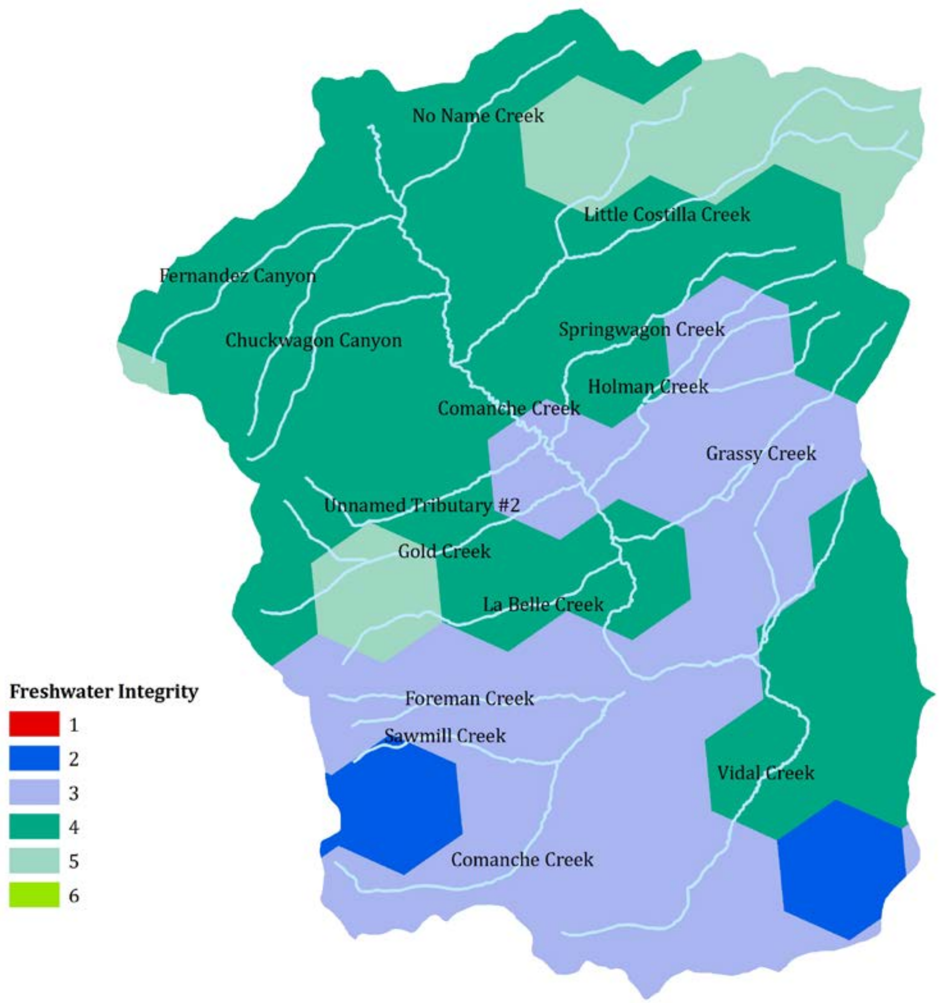


Figure 12. The freshwater integrity of the watershed is mostly at low risk for degradation (1 is at highest risk and 6 is at least risk of degradation). Nonnative fish species have been removed from the majority of the watershed by efforts of the NMDGF.

Climate and Climate Change

Current understanding of the local effects of global warming include a significant increase in the severity and duration of drought, the severity and intensity of precipitation events, increased stream water temperatures, and earlier snowpack runoff, all of which will increase stress on riparian and wetland systems and put them at risk (Garfin et al 2013, Intergovernmental Panel on Climate Change 2014, and Potter et al. 1998). Impacts of climate change in northern New Mexico and the American Southwest in general are appearing as rising temperatures (Figure 13), drying streams and droughts (Figure 14 and 15), larger and more severe wildfires, and large-scale forest dieback (Groisman and Easterling 1994). The area is already experiencing lower precipitation rates and less winter snowfall, which means less groundwater recharge for the CCW.

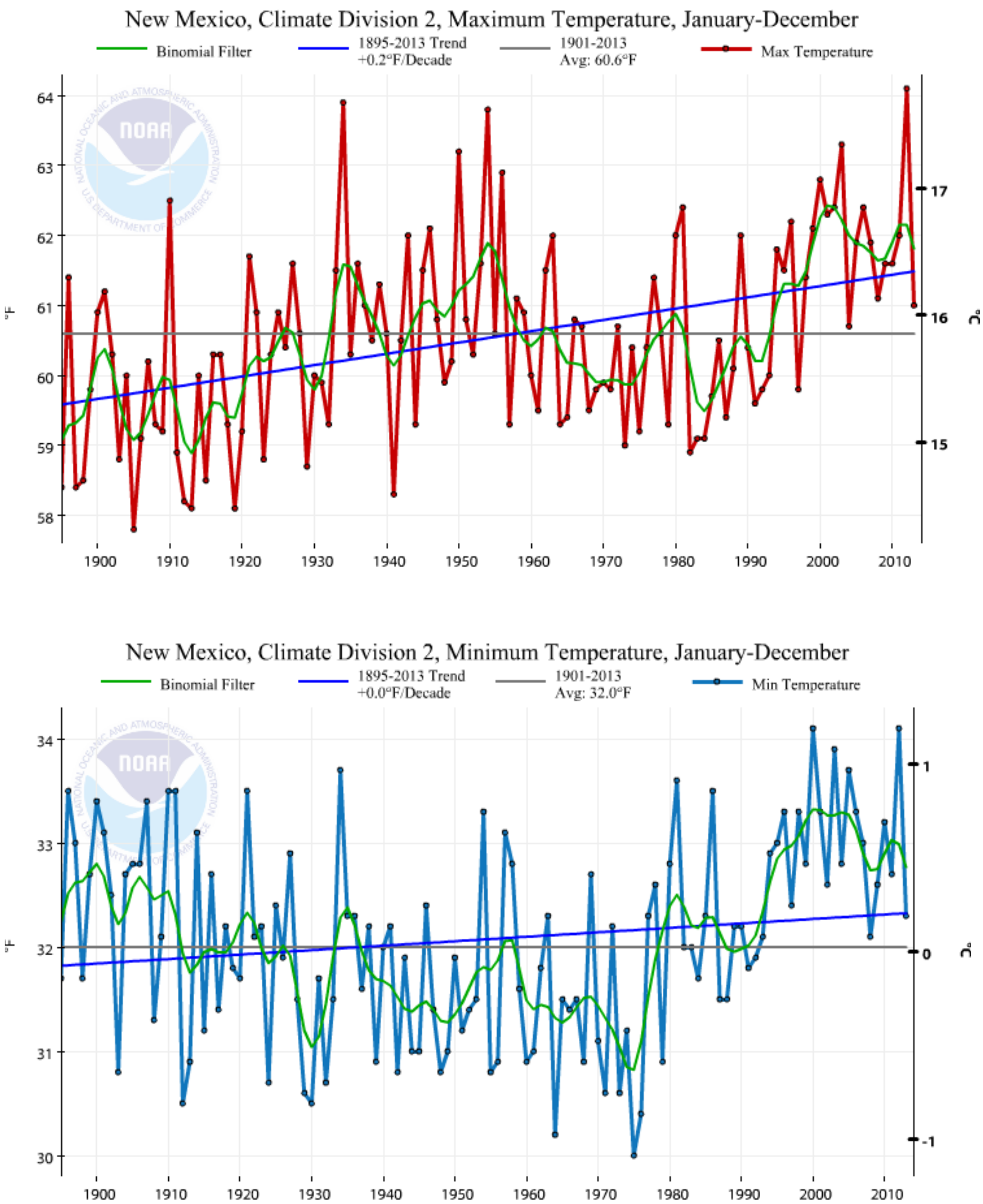


Figure 13. The trend from 1900 to 2010 is rising temperatures.

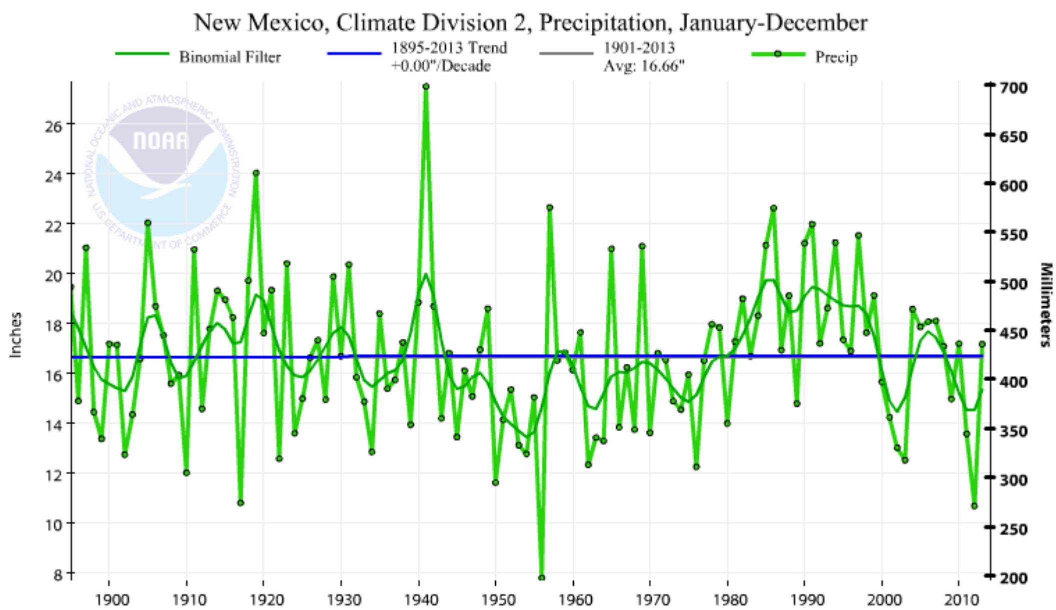


Figure 14. The last decade has shown mostly lower than average precipitation rates in New Mexico.

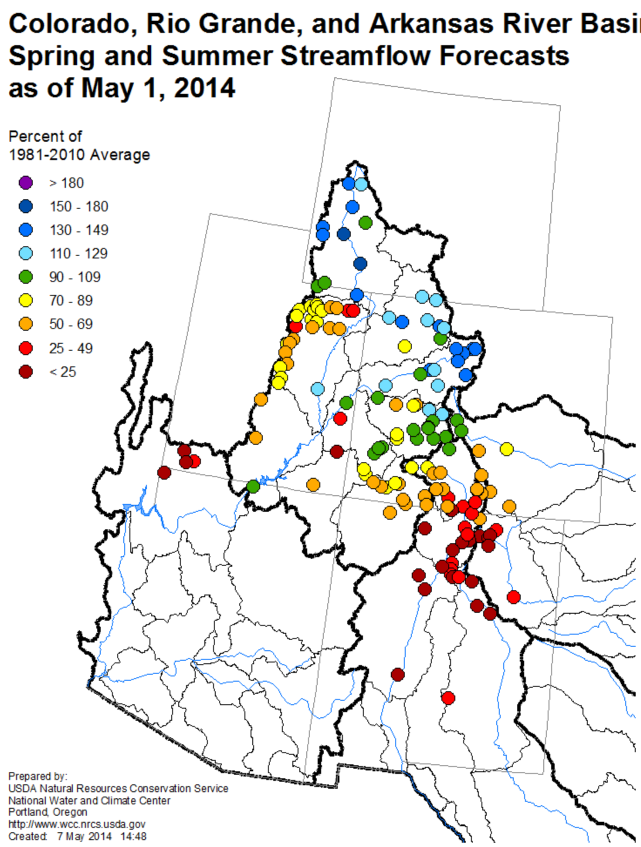


Figure 15. Spring and summer streamflow forecast for 2014 show lower than average streamflow predictions.

Global climate change has a significant effect on stream baseflow and wetland areas (Schaake and Chunzhen 1989, Liebscher 1983, Telis 1990). High elevation basins can store and transmit significant quantities of water to downstream alluvial basin aquifers (Earman et al. 2004). If higher elevation ecosystem declines are not addressed in a proactive manner, the effects of decline move downstream to larger waterways in the form of less baseflow (Smakhtin 2001, Wiess 2008).

Need

Heavy land use in the last century—including logging, mining, and overstocking of the range—led to the formation of large headcuts and channel downcutting in the upper tributaries that flow down into the Comanche Creek mainstem. Initial nick points in wetland surfaces, such as a road or other stressor, over time turn into headcuts (Figure 16).

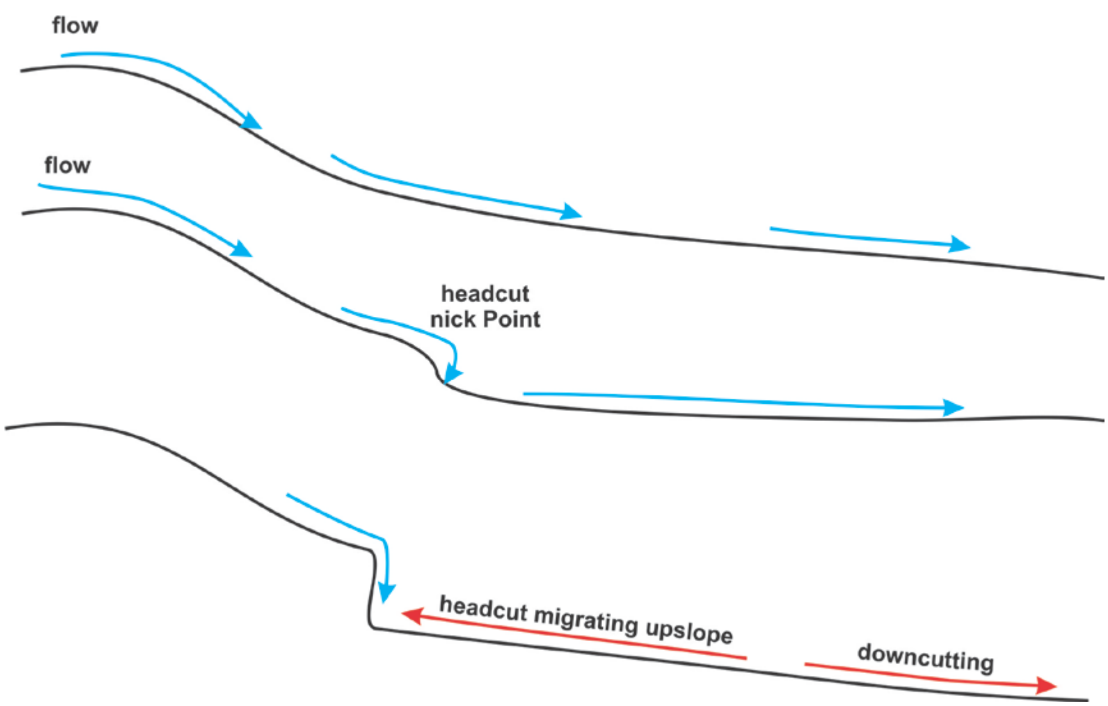


Figure 16. Schematic illustrates the evolution of a headcut through a wetland.

The headcut causes an incision on the wetland surface. This incision concentrates flow and accelerates flow velocity, which increases shear stress and results in the downcutting of the channel bed. The presence of the channel changes the system to one in which channelized flow replaces dispersed flow across the wetland surface. Channelized flow reduces the supply of water available to the surface of the wetland. The water table drops as a result of the downcut channel. Downcut channels move water through the system faster and cause less water to be stored in the banks of the streams and the surrounding wet meadows. These areas become drier and less productive (fewer and less vigorous plants) and store less water in the soil. Less water stored in the surrounding soil means less wetland vegetation, which means higher erosion and water moving through the system even faster. A river responds to base level decrease with vertical incision (Schumm 2005). This becomes a feedback loop and the system keeps drying (Figures 17a and 17b).

Figure 17a. Headcut in an upper tributary to Comanche Creek Figure 17b. Downcutting channel through a slope wetland in the Springwagon Creek drainage

Drying conditions in headwater watersheds not only have the effect of reducing the adaptive capacity of the immediate ecosystem; they also have cascading negative effects moving through the larger, downstream ecosystems (Figures 18a and 18b). The CCWG will concentrate restoration efforts in the headwaters wetlands in upper tributaries by utilizing strong partnerships, grant funds and private donations, volunteer labor, and many talented restoration professionals in order to restore soil water storage and habitat connectivity on a watershed scale.

Figure 18a. Erosion and channel incision in the mainstem of Comanche Creek dries the adjacent floodplain and associated riparian wetlands; Figure 18b shows the same area with post vanes installed to stabilize the stream banks.

As wetlands dry up, the decomposition rates of organic-rich soils increase, which can lead to the system becoming a carbon source rather than a carbon sink. The implications of wetland restoration and preservation go beyond the local watershed scale. Climate change vulnerability assessment guides us to put our efforts into high elevation, mesic systems in the larger restorable landscape in order to have the best chances for success and the greatest impacts on biodiversity in a warming ecoregion**.**

Wetland Action Plan

Funding Sources

Quivira and the CCWG will continue to seek grant funds for ongoing assessment and restoration work in the CCW. Quivira has obtained grant funding from the NMED/SWQB, Wetlands Program to work in the Carson National Forest through October 2016. Coca Cola® funded work in 2015 through a donation to the National Forest Foundation (in collaboration with TU). In order to continue the stabilization and restoration work in the watershed, funding options will have to be aggressively pursued.
Table 4 is a summary of potential funding sources.

The VVGA has an Environmental Quality Incentive Program (EQIP) project that in part funds improving upland watering sources for livestock. The VVGA is active in working with the CCWG to ensure that restoration efforts are successful. Even with improved grazing management in the watershed, it is still necessary to protect restoration work from cattle and elk by building exclosures. Exclosures will be built with the approval of the CNF and with concurrence from the VVGA to exclude livestock and elk from sensitive wetland areas to allow for recovery.

In 2013, an electricity transmission company approached Quivira and the CNF about completing a wetland mitigation project in the CCW. The project was initiated in the summer of 2013. While this was a small project to protect a wetland within the Springwagon Creek drainage, the concept of using mitigation monies to restore and protect wetlands within the CCW may become more important as other grant fund sources are exhausted.

Monies from the USFWS Fish Passage Program were used in the CCW to identify and prioritize removal of barriers to fish movement in the watershed. The greatest threat to fish passage in the Valle Vidal today is water availability. Given that the high elevation wet meadows and slope wetlands in the CCW are the best possible water storage mechanism to maintain adequate stream base-flow, restoration of these water storage areas is a priority for the CCWG in order to protect existing viable trout populations by restoring headwater and riparian wetlands.

Table 4. Potential Funding Sources

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
County	Taos Soil and Water Conservation District	
Private	New Mexico Water Trust Board Grants	
	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	

In addition to obtaining funding to implement restoration work, education/outreach, monitoring, and permitting are all components of what the Quivira Coalition and the CCWG are accomplishing the watershed. All are necessary to implement wetland and riparian restoration projects.

Education and Outreach

Each year, the Quivira Coalition organizes at least one volunteer work weekend. The volunteer labor results in many acres of stabilized wetland per workshop, as well as nearly one mile of stabilized riparian area per each volunteer work weekend (Figure 19).

Figure 19. Annual volunteer restoration work weekend in Upper Grassy Creek, 2014

Monitoring

In addition to CNF, NMED and NMDGF monitoring of conditions in the watershed, Quivira and volunteers have amassed a large amount of vegetation and geomorphology data since 2001 (Figure 20). The CNF has monitoring data for the upland vegetation communities. NMED has water temperature data loggers installed at many locations in the watershed. Fish population data has been collected by NMDGF in order to reduce the numbers of nonnative invasive fish species and to monitoring population trends of pure genetic populations of RGCT. Quivira has before and after photographs for restoration structures installed since 2001. Rosgen Level II monitoring (without the Wolman pebble count) has been completed at project locations to monitor the effectiveness and stability of installed restoration structures. There is a need to consolidate and share data from all these different sources with all members of the CCWG. A database could then be shared with all watershed stakeholders.

Figure 20. Pre-project monitoring in Lower Grassy Creek at the Quivira Coalition 2012 Volunteer Workshop

Permitting

The wetland and riparian restoration work in the Valle Vidal is covered under a current Categorical Exclusion (CE) (as a component of the National Environmental Policy Act (NEPA) process) from the CNF (http://environment.fhwa.dot.gov/projdev/docuce.asp). In order to obtain a CE for restoration work, any concerns about potential effects of restoration work on endangered species has been addressed by the CNF. In order to complete restoration work in any water of the United States, additional permitting has to be completed. Permitting includes archaeological clearances (State Historic Preservation Division (NMHPD)) and completion of U.S. Army Corps of Engineers (USACE) Clean Water Act (CWA) Section 404 permit and State of New Mexico CWA Section 401 certification. The designation of waters of the Valle Vidal as an ONRW provides an extra level of oversight to restoration work with the NMED/SWQB. In order to be able to begin restoration implementation, permitting tasks need to be initiated at least one year prior to any planned implementation.

Implementation

Headcut Remediation

For a detailed discussion of degradation and potential restoration treatments, please see *Technical Guide 2: Characterization and Restoration of Slope Wetlands in New Mexico: A Guide for Understanding Slope Wetlands, Causes of Degradation and Treatment Options* which is downloadable from this link:
https://www.env.nm.gov/swqb/Wetlands/TechnicalGuides/02/SlopeWetlandTechnicalGuide02.pdf
An example of a treatment found in the guide shows large headcuts treated using boulders to create Zuni Bowls (Zeedyk and Clothier 2009 and Quivira and Zeedyk 2014). Figure 21a and 21b show a large headcut in Grassy Creek that was monitored as a volunteer project in 2011. In 2013, the headcut was remediated using grant funds from the 2011 River Ecosystem Restoration Initiative (RERI) grant (Figure 21b) in the lower portion of Grassy Creek. In the Springwagon Creek wetlands (Figure 22a and 22b), log rundowns and sod are used to stabilize the channel and return dispersed flow to the surrounding wetlands.


Figure 21a. Cross section measurement of headcut in Grassy Creek; Figure 21b. Zuni bowl remediation of large headcut in 2013.


Figure 22a. Smaller headcuts are remediated using logs and sod; Figure 22b shows the headcuts filled with native materials obtained from onsite.

Restoring Dispersed Surface Flow

Restoring dirpersed flow to the wetland surfaces is critical for the health and functioning of slope wetlands. For detailed descriptions of treatments for stabilizing slope wetlands and restoring dispersed flow over wetland surfaces, see Quivira and Zeedyk 2014. The wetland surface shown in Figure 23 was resaturated by blocking the incised channel, which caused water to back up behind the sod plug and flow onto the wetland surface.

Figure 23. Sod plug blocking incised channel and resaturating wetland

Eroding Channel Bank Remediation

Eroding banks of stream channels accelerate water flow through the system and contribute to the subsequent drying of the associated riparian wetland. Stabilizing banks allows vegetation to anchor the system and slow the movement of water (Figure 24).

July 2008 September 2010 August 2012

Figure 24. Bank stabilization using post vanes in the Comanche Creek mainstem

Any recovery can be set back by disturbance. This makes maintaining the CCWG partnerships with the VVGA one of the most important aspects of the WAP-CCW process.

Exclosures

Elk range across the CCW throughout calving season and the summer months but spend most winters on the eastern side of the mountains depending upon snow depths (Michael Catanach, NMGF 2003). Elk grazing, browsing, and trailing in riparian vegetation along Comanche Creek, in addition to that by cattle, may contribute to TMDL exceedances of temperature and geomorphological instability. Some success lowering the water temperature along the mainstem of Comanche Creek may be due to the installation of elk and cattle exclosures to allow willow, alder, and cottonwood regrowth on the banks of the creek (Figure 25 and 26) as well as protecting fens, springs and other vulnerable locations that are important to the functioning of healthy wetlands.

Figure 25. Volunteers repairing elk exclosures to protect willows along Comanche Creek

Figure 26. Degree of willow growth that occurs when willows in the lower reaches of Comanche Creek are protected from browsing by large ungulates

Action Plan for Comanche Creek Wetlands

All of these planned restoration techniques will be implemented as project funds become available. The CCWG has weighted the need for restoration with the costs, logistics of treatment, probability of success, and estimated ability to fund stabilization and restoration and prioritized wetland restoration by tributary watershed (Table 5). The table lists tributary wetland systems by the priority ranking assigned by the CCWG as having the greatest need and high potential for successful stabilization and restoration. Some tributary wetland systems are not yet rated (NR) because of the existence of RGCT in the tributary stream that will require collaboration with NMDGF and the USFWS to determine how to balance the goals of RGCT habitat and slope wetland stabilization and restoration. Photographs and a brief description of site conditions from each tributary wetland system follow Table 5.

Table 5: Prioritization of wetland areas for stabilization and restoration

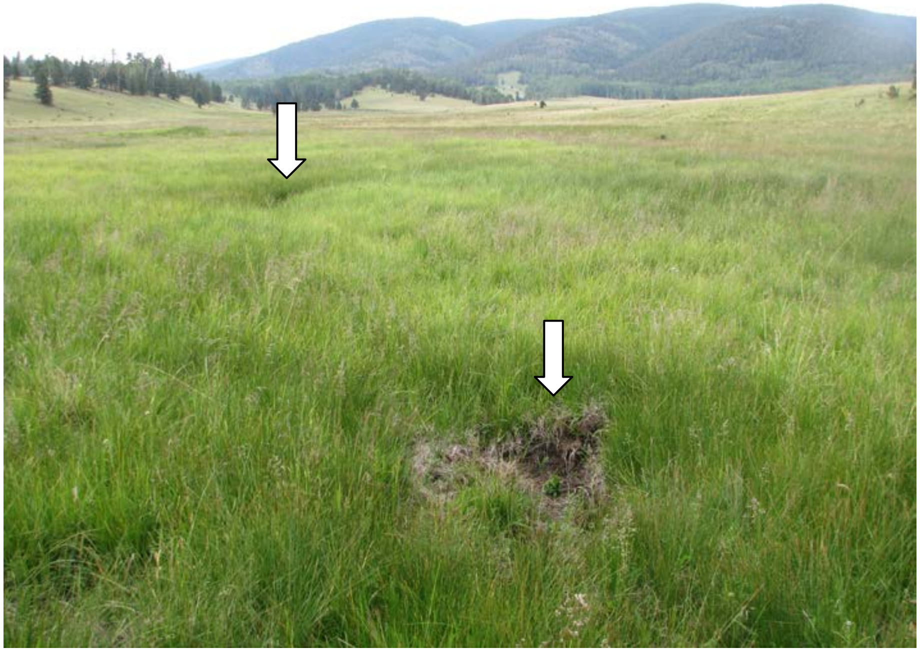
Tributary Watershed	Watershed Area (acres)	Wetland Acres	Priority Ranking	Restoration Status
Holman Creek	1412	106	A	Restoration started
Upper Comanche Creek Floodplain Wetlands (south of confluence with Vidal Creek)		67	A	
Sawmill Creek	722	52	A	
LaBelle Creek	1108	59	A	
Foreman Creek	660	20	A	
Gold Creek	1408	50	A	Restoration ongoing
Little Costilla Creek	3442	119	A	Some potential for restoration very high in watershed (access issues), Rio Grande cutthroat trout stream
Fernandez Canyon	1690	20	A	Some potential for restoration high in watershed, Rio Grande cutthroat trout stream
No Name Creek	1120	38	B	
Vidal Creek	6380	687	B	Would rank very high, but needs larger grant dollars than are currently available
Comanche Creek Floodplain Wetlands (north of confluence with Vidal Creek)		186	C	Wetland expansion dependent upon creek restoration and Rio Grande cutthroat trout habitat needs
Chuckwagon Creek	713	6	C	Low potential for wetland expansion, Rio Grande cutthroat trout stream
Unnamed 1		26	NR	Low potential
Unnamed 2		18	NR	Low potential
Unnamed 3		3.5	NR	Low potential
Springwagon Creek	1217	71	NR	Restoration ongoing
Grassy Creek	1169	92	NR	Restoration ongoing

* NR means not ranked because Wetland restoration potential is dependent upon creek restoration and Rio Grande cutthroat trout habitat needs, which are pending discussion with New Mexico Department of Game and Fish.

Holman Creek

There are three tributaries to Holman Creek, each with associated expansive wetlands. There is a large fen (white arrow) just below the place where a road crosses the wetland complex with the highest priority for stabilization. The bright green in the photo below shows the fen and a large headcut (white arrow) which is draining the wetland complex. In 2015, restoration treatments were started in this area using the Coca Cola funding.

Above the road, there are expansive slope wetland areas that are currently drained by large headcuts and incised channels and converting to wet meadows. Some of these headcuts were treated in 2015 with Coca Cola funding.



Below the road, where the valley narrows as Holman Creek drains into its confluence with Comanche Creek, there are a few locations where slowing the water flow through the system would result in rewetting now abandoned slope wetlands.

Upper Comanche Creek Floodplain Wetlands (south of confluence with Vidal Creek)

There are extensive wetlands, including large fen complexes, in the upper part of Comanche Creek that would benefit from restoration. Some of these headcuts were treated in 2015 with Coca Cola funding.

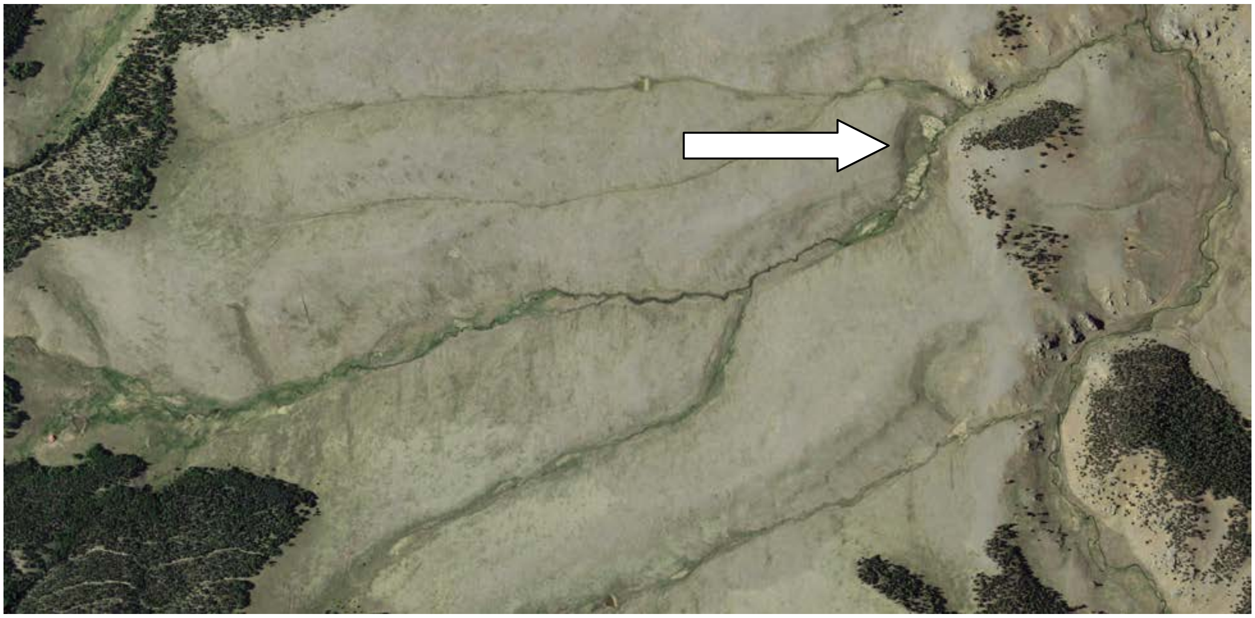
In the upper area of the watershed, there are large headcuts as the uppermost part of Comanche Creek moves up into the tree line and the gradient become steeper. Site access might be an issue for restoration contractors and volunteers.

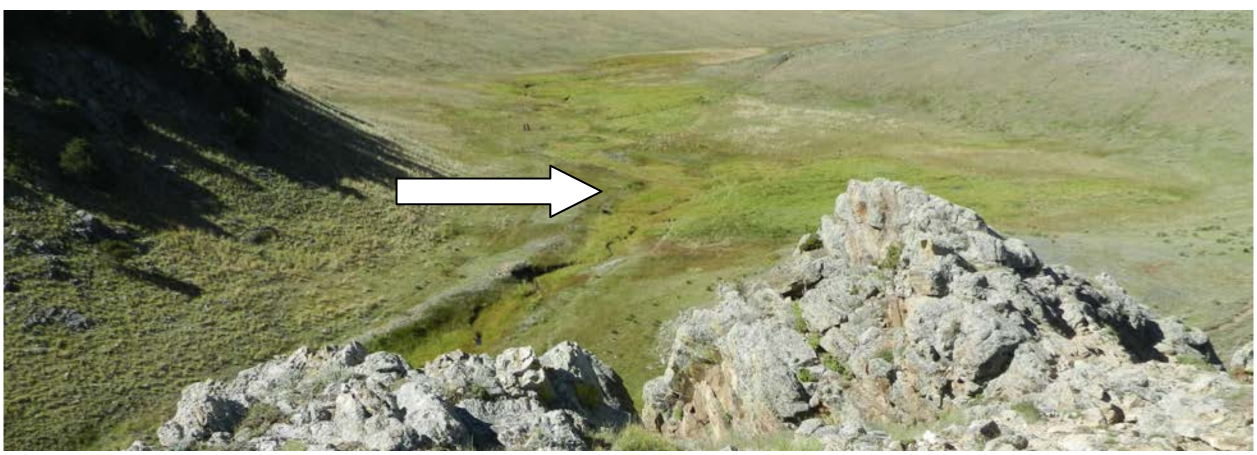
Sawmill Creek

There are two tributaries to Sawmill Creek with wetlands that have good potential for stabilization and restoration. Archaeological clearances might be an issue because of the location of the old Sawmill. Above the slope wetlands on the map as the gradient becomes steeper there are substantial headcuts which are degrading the system. There are significant groundwater inputs to the slope wetlands in this drainage, which increases the potential for successful restoration once the headcuts and incising channels are stabilized. Canada thistle is a concern at the confluence with Comanche Creek.

La Belle Creek

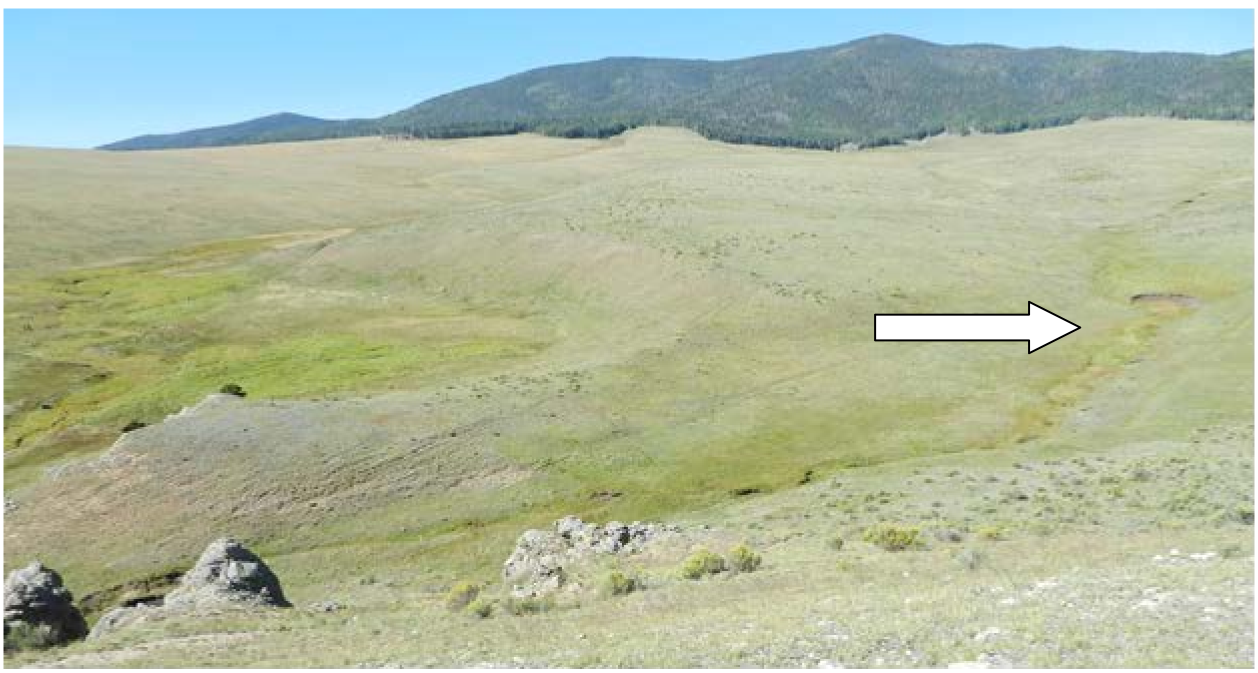
La Belle Creek has good potential for stabilization and restoration. A large fen complex is in need of stabilization (white arrows). The upper component of La Belle Creek includes very degraded slope wetlands where land ownership transitions into land owned by the Vermejo Park Ranch.





Headcuts are severe and are draining the fen. Stabilizing the large fen complex should be the highest priority in this drainage.

Several smaller tributaries to La Belle Creek have migrating headcuts that are easily seen in the photo below (white arrow). Addressing these could potentially result in increased slope wetland acreage in this tributary to La Belle Creek.

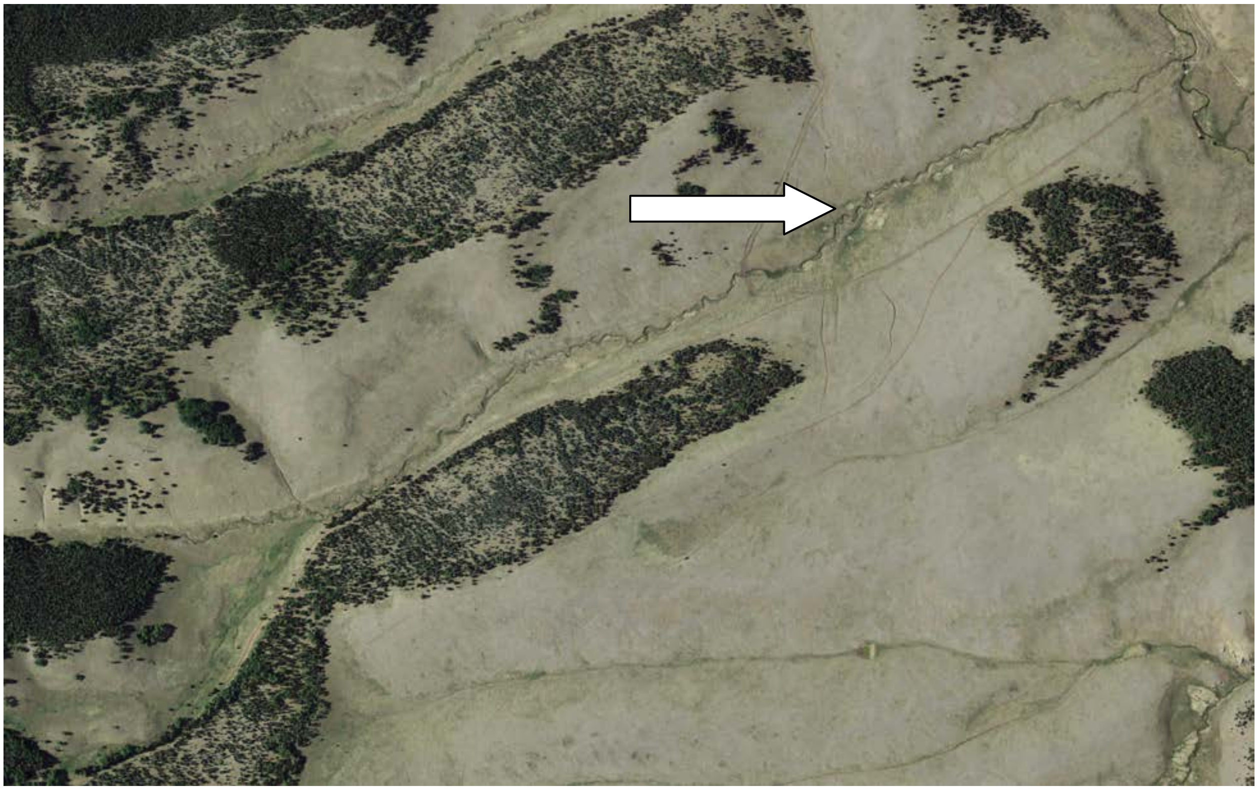


Foreman Creek

Foreman Creek has good access and a large slope wetland complex that is in need of stabilization. Restoration potential is high and access is good; however, the restoration material source might be an issue.

Gold Creek

Gold Creek has some scattered fens that should be stabilized, but most of the riparian wetlands exist only in the narrow and incised bands along Gold Creek.



Little Costilla Creek

There are large slope wetland complexes in the very highest portions of the Little Costilla Watershed. The lower portions of Little Costilla Creek have high potential as Rio Grande cutthroat trout habitat. Restoration of these wetlands needs more consideration weighing factors of access and logistics as well as the potential implications for Rio Grande cutthroat trout habitat with stabilization and restoration of these headwater wetlands.

Restoration work in the creek to prevent further down cutting or bank erosion will help stabilize the existing riparian wetlands and prevent further drying of wetland vegetation and conversion to wet meadow or upland vegetation types.

Fernandez Canyon

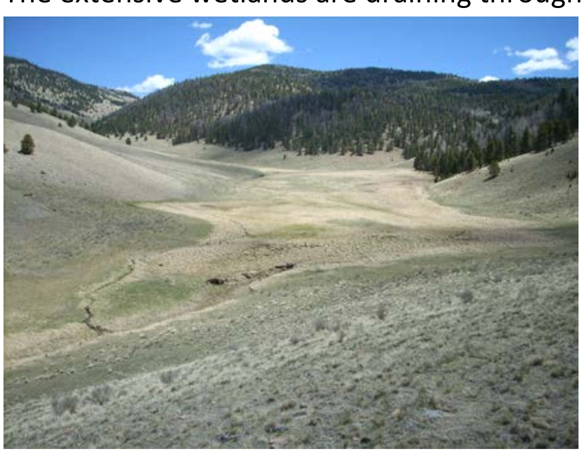
Fernandez Canyon has potential for wetland restoration and is currently Rio Grande cutthroat trout habitat.

High in the watershed, there are places (white arrow in aerial photograph) where former slope wetlands have become dry meadows. The restoration potential of these former slope wetlands should be balanced against the potential impacts on Rio Grande cutthroat trout habitat. Restoration of these upper slope wetlands might be beneficial to the Rio Grande cutthroat trout habitat in the lower sections of the tributaries leading down to Comanche Creek.

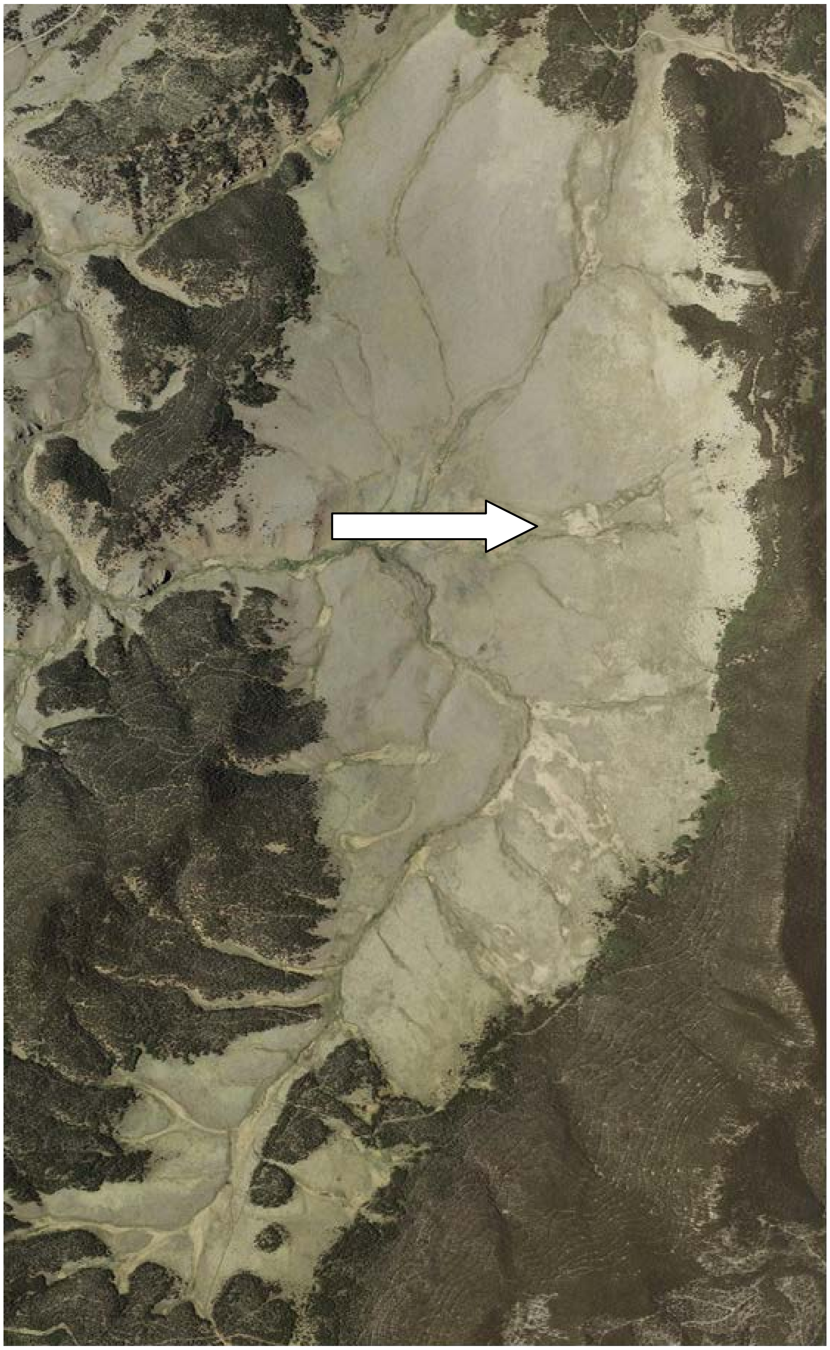
No Name Creek

No Name Creek has some of the best quality and most extensive slope wetlands. Access may be an issue for restoration contractors and volunteers, as may a source for adequate restoration material.

The extensive wetlands are draining through large headcuts and incised channels.



Vidal Creek



The scale of the Vidal Creek Watershed along with its importance for both elk calving habitat and Rio Grande cutthroat trout habitat complicate restoration activities. If requisite grant funding became available and allowed for the extensive collaboration necessary between all stakeholder parties, stabilization and restoration of the Vidal Creek Watershed would become the highest priority in the Comanche Creek Watershed.

Springs feed many of the slope wetland complexes in the Vidal Creek Watershed. The picture above faces in the direction of the white arrow in the aerial image. The presence of groundwater augmentation increases the likelihood of restoration success once downcutting channels have been stabilized and the restoration treatments have returned the system to dispersed flow. Headcuts that are travelling up valley, illustrated by the photo below, are causing the wetlands to degrade in this watershed.

Upper Comanche Creek (north of confluence with Vidal Creek)

While the Comanche Creek channel has been the subject of many restoration treatments, less work has been focused on the riparian wetlands in the floodplain. Areas where slope wetlands intersect with the riparian wetlands should get priority for restoration attention, due to the higher quality of existing wetland and the high potential for restoration success because of the presence of groundwater that augments riparian hydrologic flow.

Chuckwagon Creek

Chuckwagon Creek is a fairly narrow valley tributary to Comanche Creek and contains few wetland areas. This creek contains Rio Grande cutthroat trout. Minor stabilization efforts should be considered, but in terms of wetland area, the drainage ranks low in regard to wetland acres to be gained by stabilization and restoration activities.

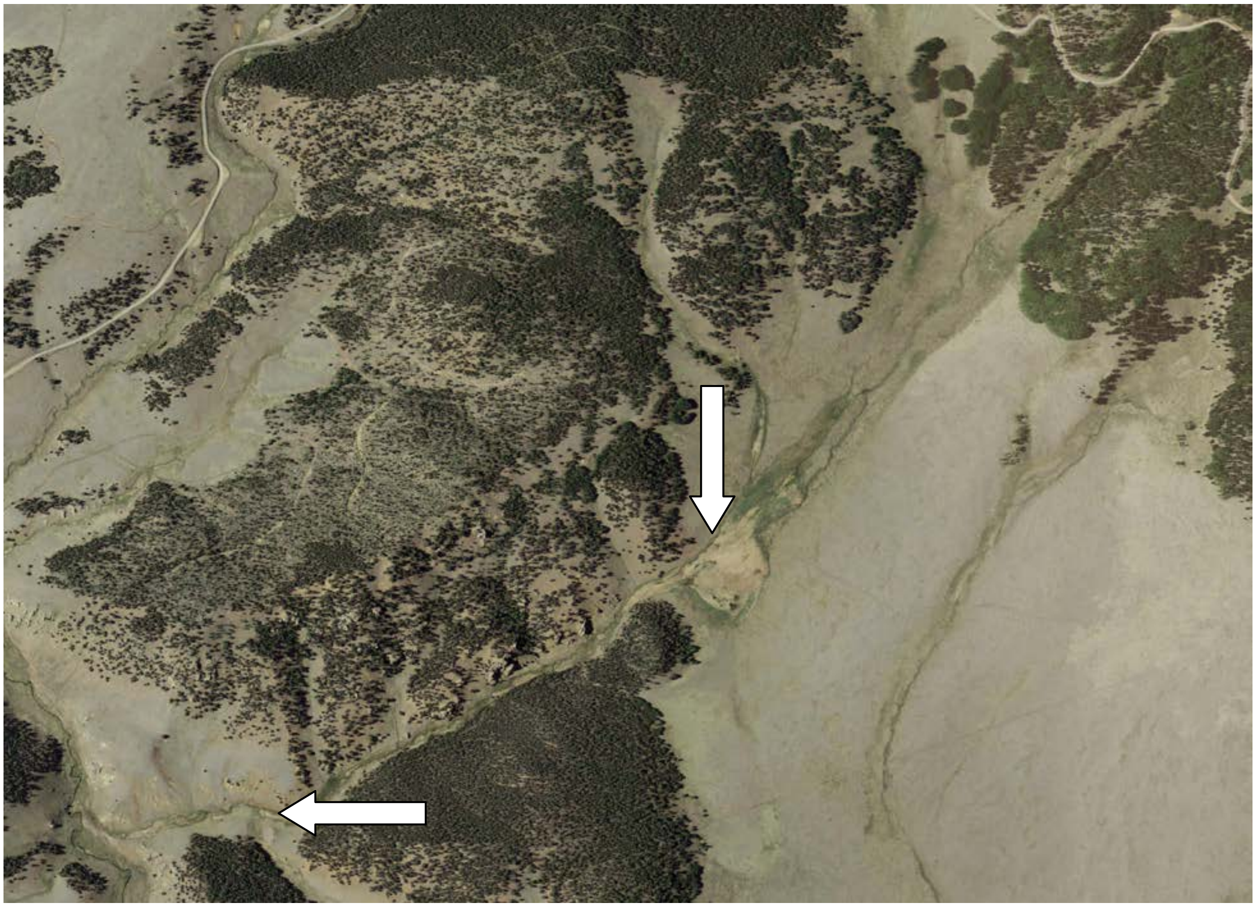
Unnamed Tributaries 1, 2, and 3

Unnamed Tributaries 1 and 2 (South to North) have a small watershed area and very little flow, and they are fairly incised. Restoration potential is low for 1 and 2. Unnamed Tributary 3 may have potential for restoration, but is likely an archaeological site due to the cabin and the existence of scattered debris. Where Unnamed Tributary 3 nears Comanche Creek, there is a large spring-fed slope wetland where the white arrow is pointing in the aerial photograph. This area should be considered for restoration treatment.

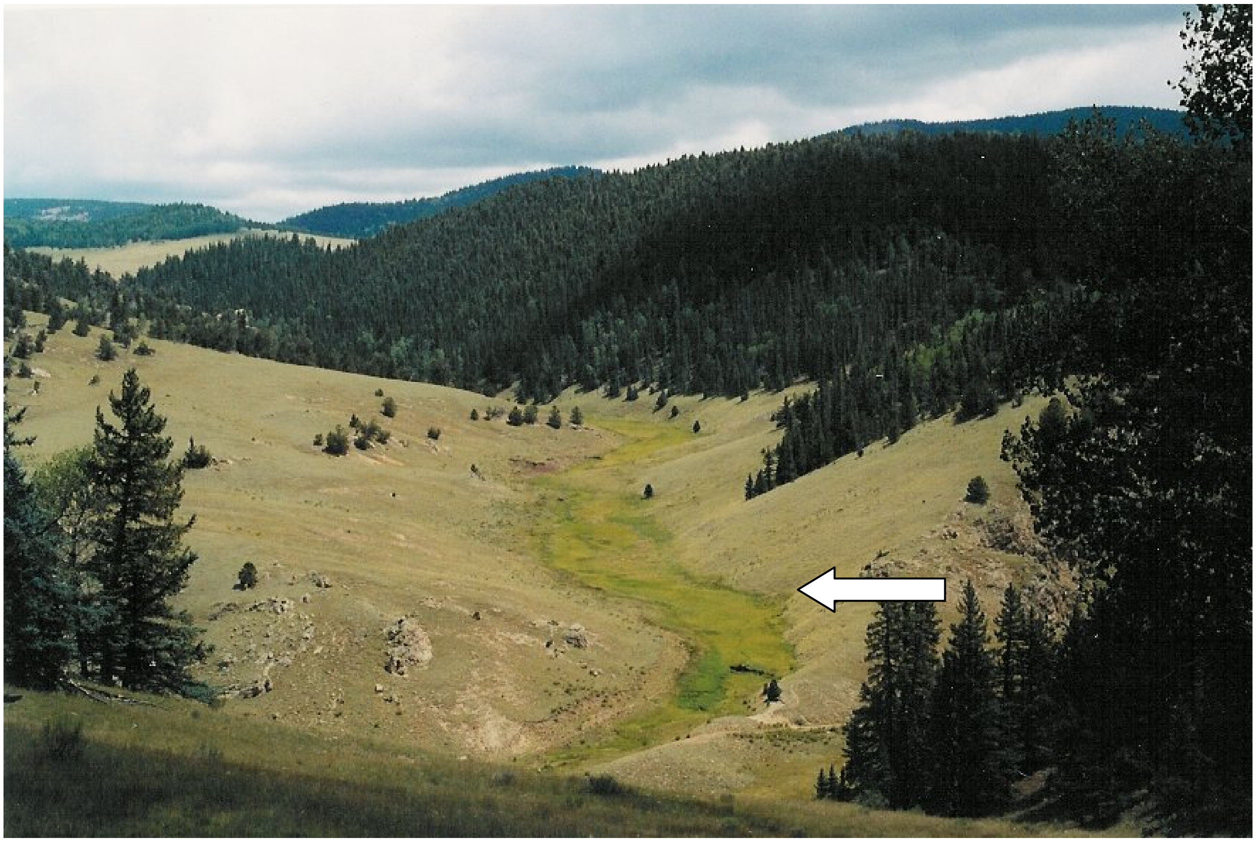
Springwagon Creek

The slope wetlands visible in the aerial photograph were treated in 2013 and 2014. Over time, it is hoped that the lower wetland (white arrow) will once again expand across the entire valley.

Grassy Creek



Both the upper portion of Grassy Creek (vertical white arrow in aerial photograph) and the lower portion (horizontal white arrow) have been treated using RERI and NMED Slope wetland grant funds.


http://alookatthelife.blogspot.com/2011/01/our-kind-shall-not-pass-this-way-again.html

Summary

All wetland restoration work in the CCW is contingent upon successful grant writing and the associated probabilities of receiving grant funding. Therefore, a Wetland Action Plan for the Comanche Creek Watershed is broadly based upon achieving the following goals:

1. Improve wetland, riparian and upland habitat conditions;
2. Improve soil water storage in headwater slope wetlands;
3. Manage the watershed as a whole;
4. Serve as a demonstration site showcasing multiple-use management practices that are effective in restoring and maintaining wetlands on public lands

All restoration priorities as outlined in this WAP-CCW will be considered, along with any data analyses based upon the results of the LLWW wetland mapping, the analysis of monitoring results from data collected since 2001, and the assessment and prioritization of habitat based on the results of the potential fish passage barrier inventory. Collaborative input from the Carson National Forest, New Mexico Department of Game and Fish and the United States Fish and Wildlife Service will be valuable as the CCWG continues to work toward a healthier wetland and riparian landscape in the Comanche Creek Watershed.

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