Clearing the Waters Newsletter

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EPA Recognizes Comanche Creek Project as Clean Water Act Success Story

By Dan Guevara, Watershed Protection Section

The U.S. Environmental Protection Agency has recognized Comanche Creek as a Success Story for the Clean Water Act (CWA) Section 319 Nonpoint Source Pollution Prevention Program. Comanche Creek was nominated because of water quality improvements from projects conducted by the Carson National Forest, Quivira Coalition, New Mexico Environment Department (NMED), and other partners.

Comanche Creek is a scenic trout stream in the Valle Vidal unit of the Carson National Forest in northern New Mexico. Historical overgrazing by cattle and elk herds damaged riparian areas and streambanks along Comanche Creek. Water quality surveys in 2000 and 2002 documented that Comanche Creek was failing to support its high-quality coldwater aquatic life designated use because of excessive sediment and temperature, which prompted NMED to add the creek to the state's CWA 303(d) list of impaired waters. Management changes and stream restoration projects described below improved water quality. In response, NMED removed sedimentation as a cause of impairment of Comanche Creek in 2008. Although the creek is still impaired because of temperature, data show significant improvements.

A restored section of Comanche Creek in the Valle Vidal unit of the Carson National Forest, 2012.

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In 1991, NMED and Carson National Forest cooperated on a 319 project that stabilized erosion along Comanche Creek. In addition, the Forest Service has closed approximately 300 miles of unpaved access road in the Valle Vidal area. In 2001 and 2004, NMED awarded 319 grants to the Quivira Coalition (a nonprofit organization) and the Taos Soil and Water Conservation District to implement restoration work in Comanche Creek. The project work included installing more than 50 small exclosures to restrict elk and cattle grazing, 130 post vanes (a series of posts pounded into the streambed to direct water flow away from the streambank), several Zuni bowl rock structures (rock-lined step pools) to arrest headcut migration, and 75 upland structures to control erosion. Project partners also improved drainage and culverts on eight miles of road, planted willows and sedges, and conducted planning, design, coordination, and monitoring. The Quivira Coalition conducts annual workshops that engage volunteers in maintaining the exclosures and other structures. In 2008, similar restoration work in Comanche Creek continued under the state River Ecosystem Restoration Initiative (RERI). The Quivira Coalition initiated a new project in 2012 to improve and protect wetlands on slopes within the headwaters of Comanche Creek. The Comanche Creek watershed restoration projects have been conducted in the context of two watershed-based plans developed by the Quivira Coalition. Other partners included the Albuquerque Wildlife Federation (contributed volunteers for restoration work), New Mexico Game and Fish Department, Trout Unlimited (contributed volunteers), the Santa Clara Fire Crew, and the Gallup Youth Conservation Corps.

These restoration projects have improved water quality and habitat for the native Rio Grande cutthroat trout, which were reintroduced to Comanche Creek by the NM Game and Fish Department. The creek was surveyed in 2000 and again in 2006. Pebble counts showed that percent fine sediment decreased over that period, indicating significant sediment load reductions. Benthic macroinvertebrate surveys were also conducted, and these surveys showed a change from an "impaired" category before restoration to a "non-impaired, full support" category after restoration. Furthermore, comparisons of cross sections before and after restoration show a statistically significant decrease in bankfull width and width-to-depth ratio, indicating a decline in bank erosion. On the basis of these data, NMED removed sedimentation as a cause of impairment for Comanche Creek on the 2008 CWA section 303(d) list. Although Comanche Creek still exceeds the water quality standard for temperature, statistical analysis has indicated that summer maximum temperatures in Comanche Creek have decreased, and temperature will continue to be monitored for trend analysis and standard attainment.

EPA nominates nonpoint source success stories to allow states to highlight restoration efforts that result in water quality improvements in nonpoint source impaired waterbodies. For more information on this and other EPA Success Stories, visit http://water.epa.gov/polwaste/nps/success319.

A cut bank on Comanche Creek before treatment (left), and after installation of post vanes (right).

City of Santa Fe River Ecosystem Restoration Initiative Project

By Karen Menetrey, Watershed Protection Section and Wetlands Program

"Hey, there's my tree! I planted that one!" exclaimed an eight year old while taking a nature walk with his class along the Santa Fe River. He was one of the children that had planted native riparian plants as part of a River Ecosystem Restoration Initiative (RERI) project. As a result of the river enhancement project, Santa Fe residents are feeling a greater sense of connection and ownership of this urban river.

Throughout much of its city reach, the Santa Fe River is constrained by private property on both banks. The river bed is disconnected from its historic floodplain, channelized under roads and bridges, and in one area is incised up to 20 feet. The banks and bed are subject to strong erosive forces from stormwater that rushes in from a now paved, impermeable floodplain. Two years ago the river between Camino Alire and Frenchy's Field was nearly devoid of riparian vegetation. Previous attempts to control downcutting had left the bed strewn with chunks of concrete, cobbles and jagged wire from failed gabions.

Volunteers planting native vegetation with WildEarth Guardians at Frenchy's Field on the Santa Fe River. Photo by WildEarth Guardians.

The City of Santa Fe undertook a major effort to improve the physical appearance and ecological function of the Santa Fe River between 2009 and 2012. The City obtained $2.3 million in municipal capital improvement bonds to extend the Santa Fe River Trail, a paved bike path along the river, and to stabilize the river bed along the same reach. The City also obtained $234,000 in RERI funds to plant native riparian vegetation and construct a storm drain demonstration project. The New Mexico Legislature appropriated $8.2 million to RERI over a four year period to fund 48 different projects that restored instream ecosystem function and watershed health to rivers statewide (www.nmenv.state.nm.us/swqb/RERI). Like most RERI projects, the City of Santa Fe utilized the RERI funding to complement and enhance a project that was already being planned, which provided jobs and local involvement in the restoration efforts.

The overall objectives of the City's project were to stabilize the river laterally, arrest downcutting, widen the floodplain, increase sinuosity, enhance a wildlife and recreation corridor, improve water quality, and promote infiltration to groundwater. The Santa Fe River Trail construction and bank stabilization were completed in spring 2012, and successfully connected the project area to downtown two miles away along a paved pedestrian and bike path. The river bed was graded and stabilized by boulder cross vanes that allowed the river to step down gradually. The banks had been gently sloped, or shored up with boulder walls where necessary to protect the bike path and private property. But the river still appeared as a dry arroyo with no vegetation. The river needed vegetation to hold sediment in place, improve water quality and infiltration, and provide shade, beauty and wildlife habitat.

Using RERI funds, the City subcontracted with WildEarth Guardians to plant 90,000 coyote willow stems, 1,000 cottonwood poles, and 150 New Mexico privet, skunkbush sumac, and Goodding's willow along the river reach. All of the planting was done in early spring 2012 while the plants were dormant. The willows

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and cottonwoods were harvested on private lands along the Rio Grande. WildEarth Guardians used augers mounted on skidsteers to drill eight-foot holes in the sand and cobble. A crew of planters pushed 6 to 10 willow stems or a single cottonwood pole into the hole as deep as possible, and back-filled the hole with shovels and tampers. In addition to the paid work crews, WildEarth Guardians also organized volunteer planting days bringing in schoolchildren from local schools and inviting residents for a neighborhood planting day. Another contractor, Santa Fe Permaculture, also planted native plants through a separate city contract. The 1.3 mile reach now has abundant vegetation along the banks which has survived a full growing season with minimal plant mortality.

The Calle Don Jose drain is one of many culverts along the Santa Fe River that collect water from a neighborhood and drain it directly to the river. The drain receives a significant volume of rain and snowmelt runoff from city streets. Below the culvert outlet, there was only a concrete pad to protect the underlying sediment from erosion. Decades of runoff had created an arroyo at least six feet deep. The City and its contractors saw an opportunity to create a demonstration drain at Calle Don Jose. Contractor River Source measured precipitation at the site to assist in design, and contractor Dryland Solutions designed and constructed a new drain structure with three boulder-lined plunge pools at the outlet of the drain. The lower two plunge pools are connected to cobble-filled French drains lined with geo-textile, and water that overflows from the pools sheet flows over an alluvial fan at the base of the structure. The plunge pools slow down the churning runoff, and filter out sediment and water pollutants, whereas the French drains help the water infiltrate. The drain demonstration structure was enhanced by the planting of native trees, grasses, and wildflowers. The result is a beautiful park setting with an attractive and functional storm drain.

A critical ingredient for any river is water. For the past several decades, nearly all of the water in the Santa Fe River has been impounded in upstream reservoirs for municipal, domestic and agricultural use. Flow occurred primarily in response to summer monsoon storm events and occasionally from rapid snowmelt following a winter storm. The city council considered and approved reservoir bypasses on an annual basis. However, in 2011 the City gathered together stakeholders to debate and negotiate a flow prescription to provide permanent seasonal instream flows to the Santa Fe River. In February 2012, the city council passed an ordinance that mandates reservoir management practices to support "target flows." The "target flows" provide for up to 1,000 acre feet of river water to be passed downstream from the city's reservoirs in years with good runoff. In years when the projected watershed yield from snow decreases below 75% of the thirty-year average, the flow commitment will be pro-rated, but not below 300 acre-feet in the driest of years.

The completed Calle Don Jose drain. Stormwater runoff flows from the neighborhood in the background. Photo by City of Santa Fe.

These days the Santa Fe River bed is a meeting place for neighborhood residents, a place for children to ride bikes, play in the sand and water (when it is flowing), walk dogs, and watch birds. Although the Santa Fe River has not been restored to its full hydrologic function due to development and water quantity limitations, the RERI project has shown that some ecological function can be restored to this urban river and it can be a pleasant place to enjoy nature. With sufficient funding, this type of restoration can be replicated for several miles downstream.

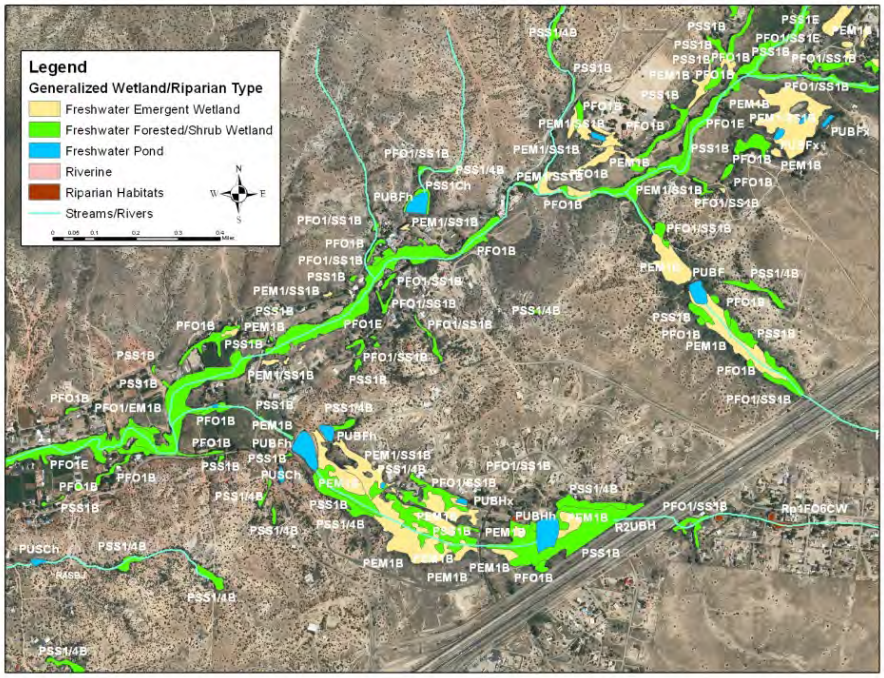
Exploring Springs and Wetlands and their Relationship with Surface Flows, Geology, and Groundwater in the La Cienega Area

By Maryann McGraw, NMED and Jan Willem Jensens, Ecotone

As part of the project "Comprehensive Wetland Protection and Restoration in Santa Fe County" funded by Clean Water Act (CWA) Section 104(b)(3) Wetlands Program Development Grant, the SWQB Wetlands Program initiated a hydrogeological study of the La Cienega Area in Santa Fe County. The La Cienega Area is characterized by the confluence of surface and groundwater flows that have supported the existence of extensive wetland areas including seeps, springs, slope wetlands and cienegas (Spanish for marsh). There is a concern that these wetlands have been degraded by a variety of stressors, including development, surface water diversion, groundwater withdrawal, agricultural practices, hydro-modification in stream channels, and ecological changes. Projected development surrounding Santa Fe, and potential changes in surface water flows and increased groundwater use could threaten the presence and condition of wetlands in the La Cienega Area. Wetlands provide many chemical, physical and biological ecosystem services including streamflow maintenance, flood attenuation, native plant and wildlife habitat, and nutrient and carbon cycling. The loss and drying of wetlands would constitute a serious loss of these ecosystem services as well as important community values.

Spring-fed wetlands at the Leonora Curtin Wetland Preserve, Santa Fe County. Photo by Maryann McGraw.

In order to carry out this comprehensive study, the "La Cienega Geohydrology Group" was formed, comprised of SWQB Wetlands Program, Earth Works Institute (and later Ecotone), New Mexico Office of the State Engineer, New Mexico Bureau of Geology and Mineral Resources, Santa Fe County Public Works, and the U.S. Fish & Wildlife Service, to study springs and wetlands and their relationship with surface flows, geology, and groundwater in the La Cienega Area. The purpose of this study is to improve the understanding of surface and groundwater sources that sustain wetlands in the La Cienega Area. The intention is to provide information that is helpful for future wetland and water management in the La Cienega Area, to identify areas for longterm monitoring, to inform future actions for wetland restoration and protection, and to assist with future simulation of La Cienega spring flow in groundwater models for the Santa Fe Group aquifer. To accomplish this, wetlands were mapped, streamflows (in reaches downstream of wetlands) were evaluated, local geology was investigated, and groundwater levels and chemistry were studied. The full report can be found on the SWQB website (www.nmenv.state.nm.us/swqb/Wetlands/projects/LaCienega), but a synopsis of the findings is provided on the following pages.



A sample of mapped wetlands in the La Cienega Area.

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Wetlands Mapping

The study includes detailed wetlands mapping by Jim Dick, Southwest Regional Wetlands Coordinator, US Fish and Wildlife Service, for the La Cienega Area between Cieneguilla and Bonanza Creek based on 2009 geo-spatial data, with an identification of wetland types and their approximate location in the landscape. Of the 116,449 acres that were covered by the mapping study, 680 acres of wetland habitat were identified.

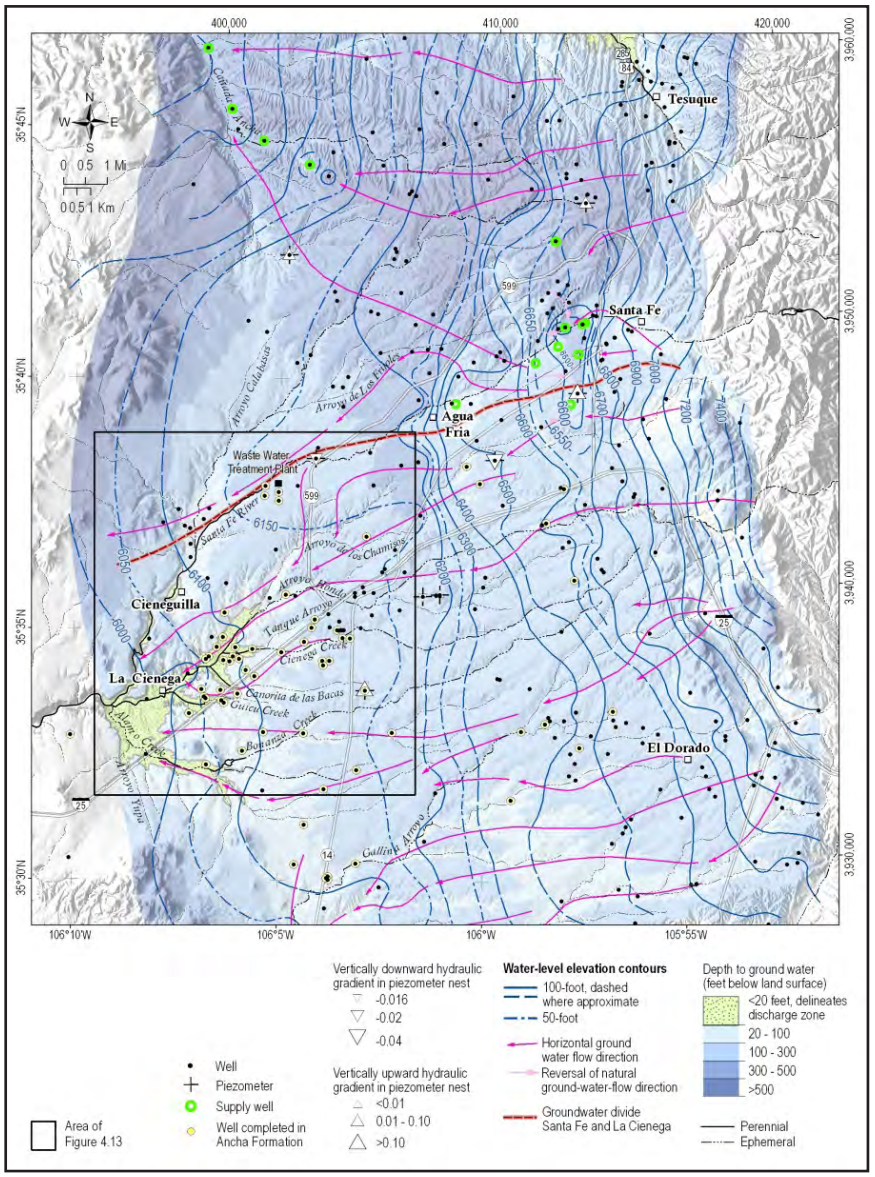
Surface Flows

Based on a study by NM Hydrologic, LLC and New Mexico Office of the State Engineer (NMOSE), Cienega Creek streamflow increased in a downstream direction in the late winter prior to the irrigation season. In late February 2012, the total flow in Cienega Creek just above the confluence with the Santa Fe River (when adding the streamflow measurement from Alamo Creek) was 1.9 to 2.0 ft^3/s. Limited historical data exist to identify streamflow trends over time and conditions during the historical data collection may not be known. Streamflow variability during the non-irrigation season appears to occur not only month to month, but on an annual basis as well. Future monitoring and additional study of streamflow in the La Cienega Area is needed to better understand streamflow variations over time.

Hydrogeology

Peggy Johnson, Daniel Koning and Stacy Timmons, New Mexico Bureau of Geology and Mineral Resources, contributed a groundwater flow study with an overview of the hydrogeology of the area, including the geological setting and history, a description of the geological units in the La Cienega Area and their hydrological significance, and a stratigraphic and hydrological explanation of the Santa Fe Group. The exploration of springs and wetlands in La Cienega reveals a complex, three-dimensional groundwater system wherein groundwater discharge from multiple flow pathways in the Santa Fe Group regional aquifer sustains the wetland environment. The location of the wetlands is controlled by the geologic setting. Their sustenance depends on an adequate and stable water supply. The La Cienega wetlands water budget is dominated by groundwater inflow and surface water outflow, with seasonal water level and water storage fluctuations controlled by changes in evapotranspiration between growing and dormant periods.

Groundwater sustaining springs and wetlands originate from the Santa Fe Group regional aquifer system, which consists of the deeper sandy strata of the Tesuque Formation and the shallow, sand and gravel deposits of the Ancha Formation. As the Santa Fe Group aquifer becomes thin and pinches out over underlying low-permeability strata, groundwater is forced



Regional groundwater flow conditions in the Santa Fe Area for 2000 to 2005 (Johnson, 2009).

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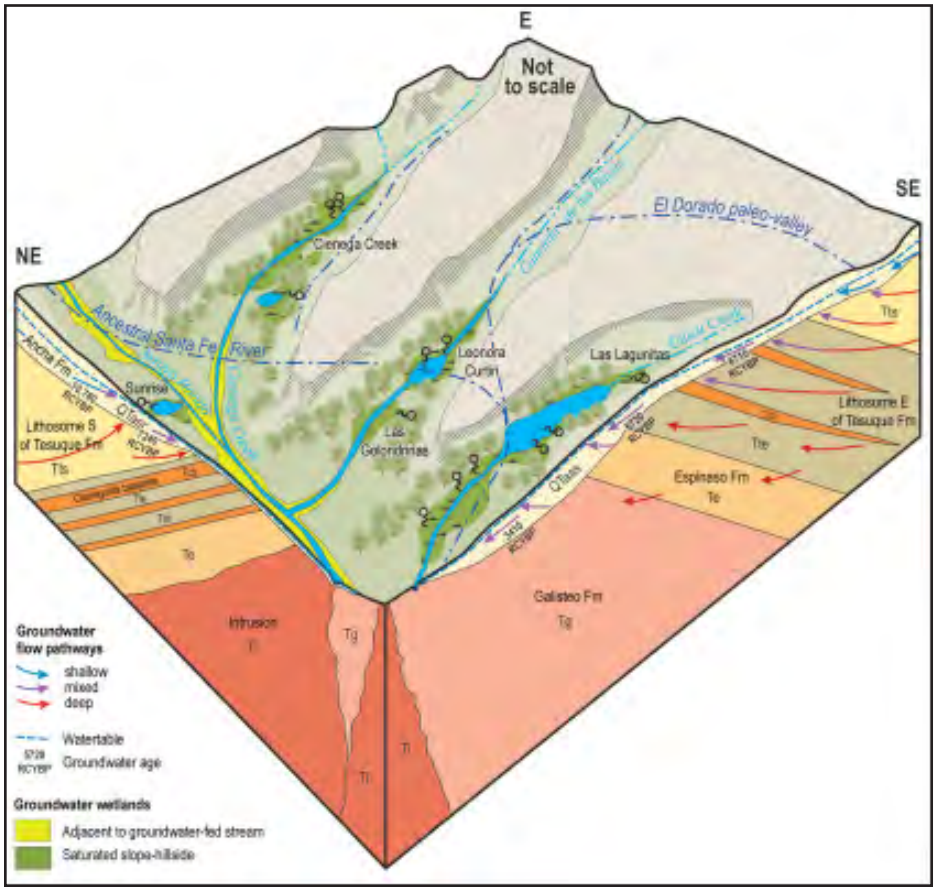
to the surface to discharge in spring and wetland zones and associated drainages. The Ancha Formation directly feeds most spring and wetland zones. Storage of groundwater and saturation of the Ancha Formation is controlled by three factors: (1) permeability contrasts between the Ancha and pre-Ancha Formations; (2) the topography of the erosion surface at the base of the formation; and (3) sources of recharge or inflow to the formation. Paleo-valleys incised at the structural base of the Ancha Formation provide elevation-dependent drains that gather groundwater and concentrate groundwater flow and discharge to wetland and spring zones.



Hydrogeologic conceptual block diagram of spring zones in the La Cienega Area illustrating the geologic controls for groundwater discharge and source waters for springs and wetlands (Johnson, Koning, and Timmons, this report).

A water-table map of 2012 groundwater conditions shows groundwater entering the study area from the east and flowing westward toward the Santa Fe River and the Rio Grande. Flow-path analysis demonstrates groundwater discharge to wetland areas in Cienega Creek, Arroyo Hondo, Guicu Creek, the Santa Fe River, and Canorita de las Bacas. Aquifer recharge and discharge areas interpreted from the groundwater map are generally consistent with the stream losses and gains measured by NM Hydrologic LLC and the NMOSE. The 2012 water-table map delineates a recharge mound beneath the Santa Fe River that extends from its confluence with Arroyo Calabasas, upstream past the City of Santa Fe's current Paseo Real Wastewater Treatment Plant, and beyond SR 599. Flow-path analysis indicates that groundwater flows from the recharge mound southward toward La Cienega and westward toward the Rio Grande. Southerly groundwater flow diverges at a paleo-topographic high on the Tesuque Formation east of Cieneguilla (delineated in mapping of the structural base of the Ancha Formation), where it either flows southward toward seeps and springs along Arroyo Hondo or westward towards the Rio Grande or the Santa Fe River canyon.

Groundwater chemistry

Peggy Johnson and Stacy Timmons, New Mexico Bureau of Geology and Mineral Resources also completed a chemical characterization and age-dating of groundwater that evaluates major ion chemistry, water-type, isotopic characteristics, and groundwater residence time. Chemistry, isotope, and age (^{14}C and tritium) characteristics of groundwater verify that mixtures of multiple groundwater sources with distinct chemistries and residence times feed wetland zones east and west of Cienega Creek. Mixing occurs in various proportions between groundwater from deep regional flow paths through the Tesuque Formation and groundwater from local to intermediate flow paths within the Ancha Formation and uppermost Tesuque Formation. Wetlands east of Cienega Creek have notably younger ages, with greater amounts of modern recharge, than do springs and wetlands west of Cienega Creek and Arroyo Hondo. Wetland zones and stream valleys are areas of both discharging and recharging groundwater, which indicate that local hydrologic processes, such as bank storage during storm events and local recycling of discharged groundwater and surface flows, play an important role in wetland function.

GET INVOLVED!

August 16-18, 2013 - Albuquerque Wildlife Federation. Valles Caldera Volunteer Restoration Weekend. For more details, see http://abq.nmwildlife.org/.

August 16-18 - Quivira Coalition. Valle Vidal Unit of the Carson National Forest Volunteer Restoration Weekend in Grassy Creek with Craig Sponholtz and Steve Carson. For more details and registration, see http://quiviracoalition.org/Land_Water_Program/2013_Restoration_Workshops/index.html

September 13-15 - Albuquerque Wildlife Federation. Limestone Canyon in San Mateo Mountains Volunteer Restoration Weekend. For more details, see http://abq.nmwildlife.org/.

September 19-22 - 9th Annual Gila River Festival "The Gila River is in Our Hands." For more details, see www.gilaconservation.org/wp/?page_id=1004.

October 15-17 - New Mexico Rural Water Association Fall Conference (North). Taos Convention Center. For more details, see www.nmrwa.org/conference.php.

October 19 - Albuquerque Wildlife Federation. Local day project with the Sandia Ranger District. For more details, see http://abq.nmwildlife.org/.

November 12-14 - New Mexico Rural Water Association Fall Conference (South). Las Cruces - Hotel Encanto. For more details, see www.nmrwa.org/conference.php.

November 13-15 - Quivira Conference "Inspiring Adaptation." Albuquerque. For more details, see http://quiviracoalition.org/2013_Quivira_Conference_/index.html.

November 21-22 - 58th Annual New Mexico Water Conference - NM Water Resources Research Institute "New Water Realities: Proposals for Meaningful Change." Embassy Suites Albuquerque. For more details, see http://2013.wrri.nmsu.edu/.

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