COLORADO OPEN LANDS

RIO GRANDE HEADWATERS LAND TRUST

Groundwater Conservation Easements for Aquifer Recovery in the San Luis Valley

Rio Grande Water Conservation District

San Luis Valley Water Conservancy District

Conejos Water Conservancy District

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

GOCO
GREAT OUTDOORS COLORADO

Yale SCHOOL OF THE ENVIRONMENT

GATES FAMILY FOUNDATION

TRINCHERA BLANCA FOUNDATION

Project Partners

Colorado Open Lands

Colorado Open Lands is a statewide land trust which has permanently conserved over 500,000 acres since 1981. Our commitment is to strategically conserve the state's critical land and water resources forever through creative conservation techniques and statewide conservation leadership. COL's work in the San Luis Valley is led by Judy Lopez, a long time resident and current Vice Chair of the Rio Grande Basin Roundtable.

Rio Grande Headwaters Land Trust

Rio Grande Headwaters Land Trust is a regional land trust that serves the entire San Luis Valley. RiGHT is committed to working with private landowners, public agencies, and other conservation organizations to preserve the natural beauty and wildlife habitat of the area and to promote a sustainable agricultural way of life.

Rio Grande Conservation District

The District was created to protect, enhance, and develop water resources in the Rio Grande River basin. The District encompasses a five county region, which includes Alamosa, Rio Grande, Conejos and portions of Saguache and Mineral Counties within the Rio Grande River basin, including the Closed Basin.

San Luis Valley Water Conservancy District

The San Luis Valley Water Conservancy District provides leadership to the San Luis Valley water community, a forum for learning and development, and the service of well augmentation in five counties in the San Luis Valley.

Conejos Water Conservancy District

The Conejos Water Conservancy District provides water services to approximately 100,000 acres in the Southern San Luis Valley.

The Project Partners would like to thank the following contributors and participants of the working group who brought their knowledge, expertise, and creative thinking to bear on this challenge. We would especially like to thank Peter Nichols and Allan Beezley for their services in developing a groundwater conservation easement template and templates for the alternative tools identified in this report and Kevin McCarty for developing an appraisal methodology for this new type of conservation easement.

Craig Cotton, Division of Water Resources
Heather Dutton, San Luis Water Conservancy District
Nathan Coombs, Conejos Water Conservancy District
Cleave Simpson, Rio Grande Water Conservation District
Amber Pacheco, Rio Grande Water Conservation District
Chris Ivers, Rio Grande Water Conservation District
Marisa Fricke, Rio Grande Water Conservation District
Peter Nichols, Berg Hill Greenleaf Ruscitti, P.C.
Allan Beezley, Allan C. Beezley, P.C.
Pete Ampe, Hill and Robbins, P.C
Shimon Anisfeld, Yale School of the Environment

Groundwater Conservation Easements for Aquifer Recovery in the San Luis Valley

Executive Summary

Groundwater depletion is a critical issue in Colorado's south-central San Luis Valley; groundwater pumping for irrigation beyond the recharge capacity of the basin is causing injurious depletion to senior surface water rights holders and may be impacting riparian ecosystems. In the San Luis Valley, irrigated agriculture is important because it drives the majority of the region's economic activity and creates food sources and habitat for migrating birds and wildlife.

To avoid direct state intervention in the form of well shutdowns, irrigators from six groundwater subdistricts of the Rio Grande Water Conservation District and one subdistrict of the Trinchera Water Conservancy District are participating in voluntary programs to reduce groundwater pumping. To achieve pumping reductions, the subdistricts currently utilize the Conservation Reserve Enhancement Program (CREP) and short-term fallow programs and drought contracts. However, in the context of recent droughts and given the necessary volume of recharge, the scale of these efforts is insufficient to achieve basin sustainability as quickly as needed.

In 2018, Colorado Open Lands and the Rio Grande Headwaters Land Trust began conducting a groundwater pumping reduction feasibility study in collaboration with the Rio Grande Water Conservation District, San Luis Valley Water Conservancy District, and Conejos Water Conservancy District. This effort explored how traditional land conservation tools could be applied to groundwater pumping. The analysis was refined during working group discussions among land trusts, attorneys, appraisers, and groundwater subdistricts. Tools already in use, including CREP and drought contracts, were compared to additional tools such as a lease of nonuse, the purchase of partial undivided interest in a water right or well permit, a covenant on the use of water, and a conservation easement. These tools vary in their longevity, enforceability, basis in law, administration, value, enforcement mechanisms, and funding sources. Conservation easements, in particular, are eligible for unique funding sources — including state and federal tax benefits — and represent perpetual groundwater conservation. The working group developed and analyzed a conservation easement model that specifically restricts groundwater pumping. Research and expert interviews with groundwater managers in overdrafted basins in Nebraska and California revealed the functionality of conservation easements when applied to groundwater and affirmed the economic value of groundwater. Groundwater conservation easements are one important instrument within a larger suite of voluntary tools that groundwater subdistricts in the San Luis Valley can use to reduce groundwater pumping while maintaining community vitality.

This report was written by Abbey Warner
with contributions from Kevin McCarty and editing by Sarah Parmar.

It was reviewed by Judy Lopez, Peter Nichols and Allan Beezley.

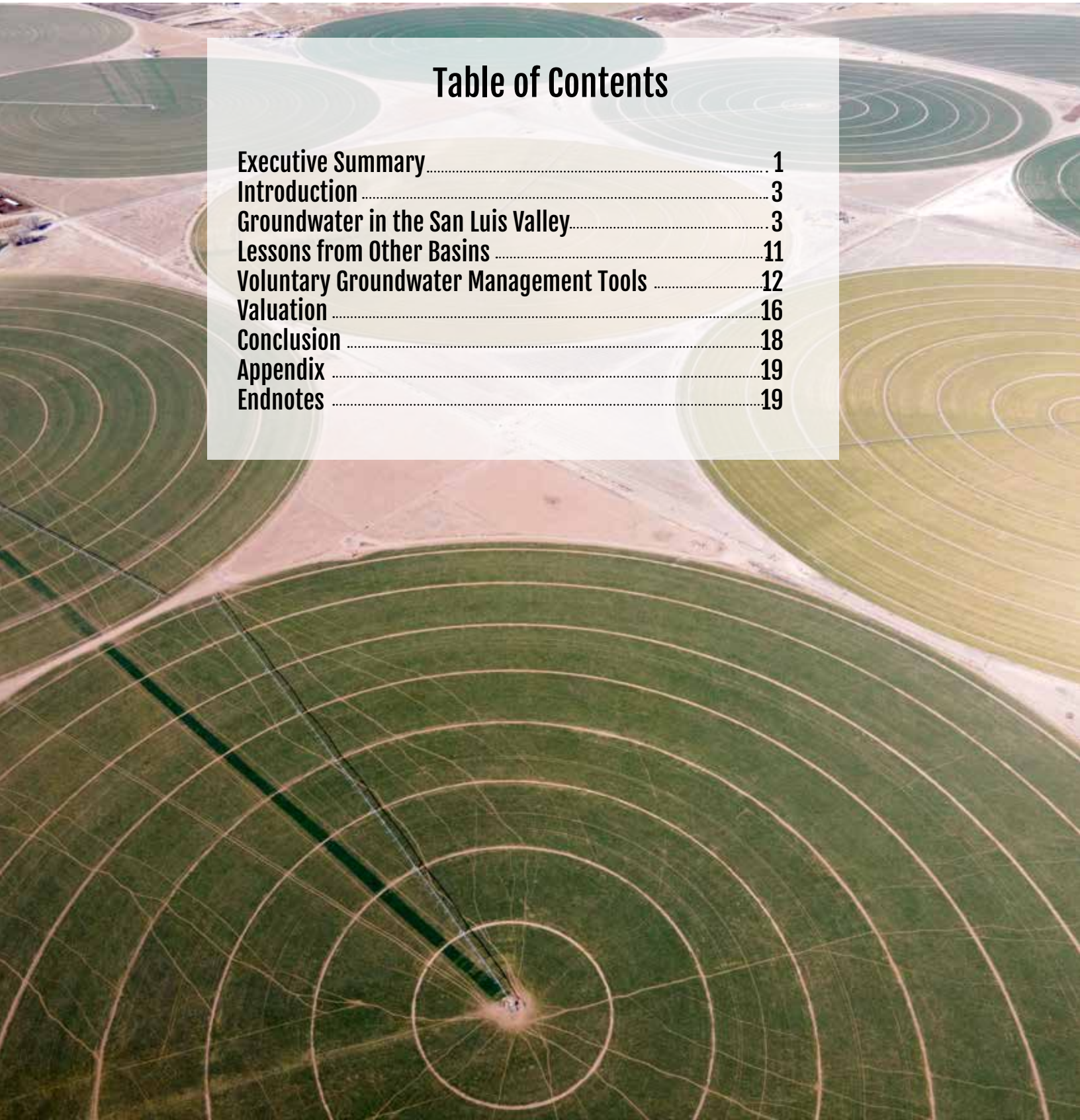


Table of Contents

Introduction

Groundwater overdraft is a critical issue in Colorado's San Luis Valley, where groundwater pumping for irrigation beyond the recharge capacity of the Rio Grande Basin impacts surface water rights holders. At the same time, both the local economy and the ecological health of the region rely on agricultural groundwater use. To self-regulate groundwater use, six groundwater subdistricts of the Rio Grande Water Conservation District (RGWCD) and one subdistrict of the Trinchera Water Conservancy District were formed. If irrigators in the San Luis Valley are not able to recharge the two aquifers to the level mandated by the state, then the State Engineer will likely shut down wells.

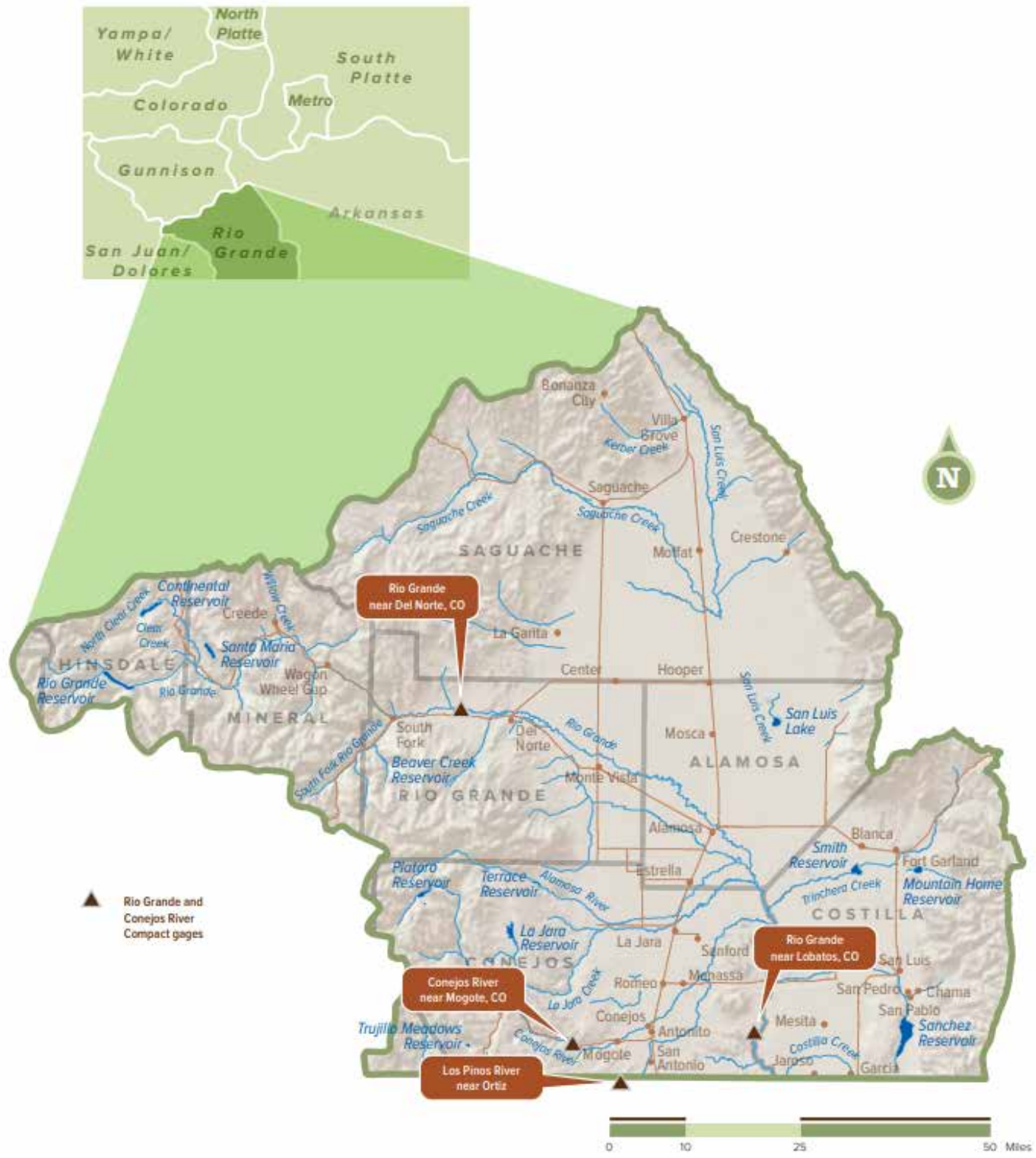
To support the work of the groundwater subdistricts, a feasibility study was conducted to evaluate the needs of irrigators in the San Luis Valley and additional voluntary tools, including a conservation easement, that could be used to achieve reductions in groundwater pumping. This analysis was conducted through stakeholder outreach and input, interviews with groundwater managers in overdrafted basins, legal and valuation analysis, and working group meetings. The purpose of this report is to summarize the main findings of the feasibility effort.

Groundwater in the San Luis Valley

For water users in arid geographies facing variable climate conditions, groundwater is generally considered more "drought-proof" than surface water and thus represents a valuable source for drinking water and irrigation. Currently, rural agricultural communities across the western United States are struggling to cope with the reality of decades of groundwater overextraction and increased urban water demand for municipal and industrial uses. Groundwater depletion, defined as declines in water level over long timescales created by sustained pumping, has been increasing in the United States since 1950, particularly in the Southwest and High Plains region.[i] Groundwater overextraction is a concern because it can lead to land subsidence, declining water tables, surface water impacts, water quality degradation, loss of storage capacity, and increased pumping costs.[ii]

One region currently facing such pressures is the San Luis Valley, Colorado, where surface water and groundwater support agricultural, industrial, municipal, and environmental uses through a complex system of water rights. Much of the local economic activity - farming, ranching, and tourism - is heavily dependent on water, as is the local ecology. The region receives less than eight inches of precipitation each year and averages 7,500 feet in elevation. Water that falls in the mountains ringing the San Luis Valley – the San Juan Mountains to the west and the Sangre de Cristo range and Culebra Mountains to the east – seeps into two groundwater aquifers and feeds the streams and rivers, including the headwaters of the Rio Grande.[iii] *Figure 1* is a map of the Colorado portion of the Rio Grande Basin.[iv]

Figure 1: Map of the Colorado portion of the Rio Grande Basin



The San Luis Valley is home to a vibrant agricultural community that drives the region's economy, supporting 70 percent of local income and worth approximately $300 million per year.[v] The climatic conditions are especially well-suited to potato, barley, and alfalfa production. The San Luis Valley is the second-largest potato growing region in the United States, and most of the barley grown there is purchased by Molson Coors Beverage Company and other brewers.[vi] Groundwater is a precious resource in the San Luis Valley, and involuntary curtailment of use for irrigated agriculture would negatively impact the local economy and community vitality. Already, the median household income in the San Luis Valley is much lower than that of the average household in Colorado – 60% lower in 2010.[vii] In 2013-2014, the child poverty rate was twice the child poverty rate across the state.[viii] Water underpins the agricultural economy in the San Luis Valley and its regulatory restriction would pose grave socioeconomic challenges for the community.

Similarly, the ecological health of the San Luis Valley relies upon surface water and groundwater resources. Wetlands and riparian areas provide a number of essential functions, from pollutant filtration and flood attenuation to erosion control and aquifer recharge.[ix] In Colorado, it is estimated that over 80% of species require wetlands and riparian zones during some point in their lifecycle.[x] Both ecosystems provide important habitat and food sources for wildlife and aquatic species. The unique habitat of the San Luis Valley serves as an important stopping point along migratory bird flyways, including that of sandhill cranes. This area is a priority landscape across several national bird conservation plans.[xi] Its crucial water-reliant ecosystems are intertwined with agricultural practices in the San Luis Valley, where the majority of wetlands occur on private property and are often irrigated meadows or sloughs used for irrigation water delivery. Agriculture in the San Luis Valley has impacted the local hydrologic regime in a complex way; while drought, groundwater overdraft, and irrigation development have negatively impacted aquatic ecosystems by reducing seasonal flows, complete cessation of pumping and fallowing of fields may actually harm wildlife by reducing the irrigation water that is currently contributing to these natural ecosystems. In fact, grain production and irrigation development in the San Luis Valley have likely impacted waterfowl and sandhill cranes positively.[xii] Thus, addressing groundwater depletion requires creative solutions in order to maintain resource availability for wildlife.

The Aquifers

There are two groundwater aquifers in the San Luis Valley, one stacked on top of the other. The upper aquifer is a 30-100-foot-thick unconfined aquifer, recharged by precipitation, streamflow, canals, and agricultural return flows. The vast majority of well water used for agriculture in the San Luis Valley (85%) comes from the unconfined aquifer.[xiii] The northern part of the unconfined aquifer is an endorheic basin known as the Closed Basin because it does not drain into the Rio Grande.[xiv]

The second and lower aquifer is a confined aquifer under artesian pressure, separated from the unconfined aquifer by blue clay and basalt. The confined aquifer is recharged around the edges of the San Luis Valley. *Figure 2* illustrates the hydrologic dynamics of the two aquifers[xv] and *Figure 3* shows their boundaries.[xvi]

Figure 2: San Luis Valley aquifer dynamics

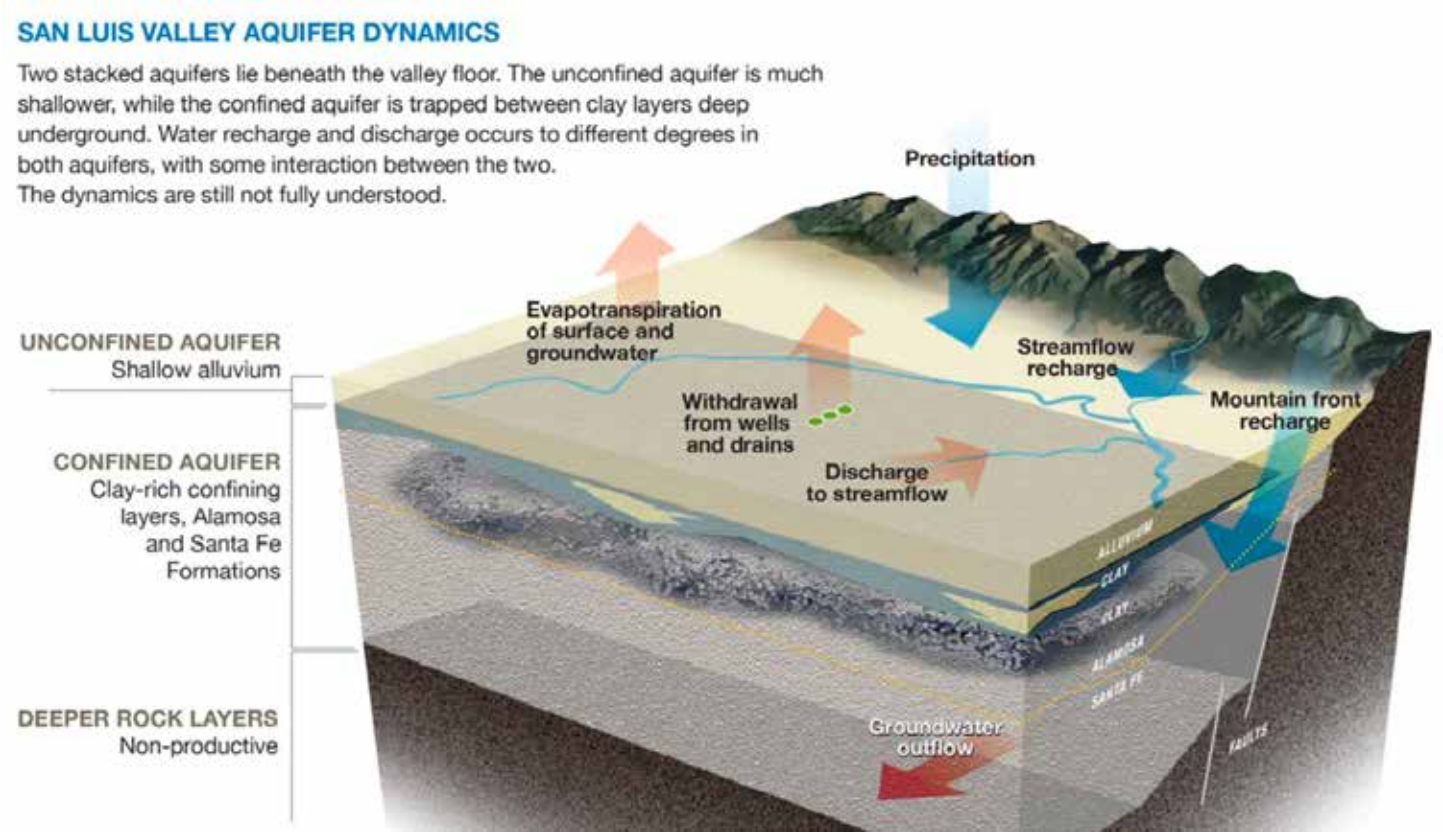
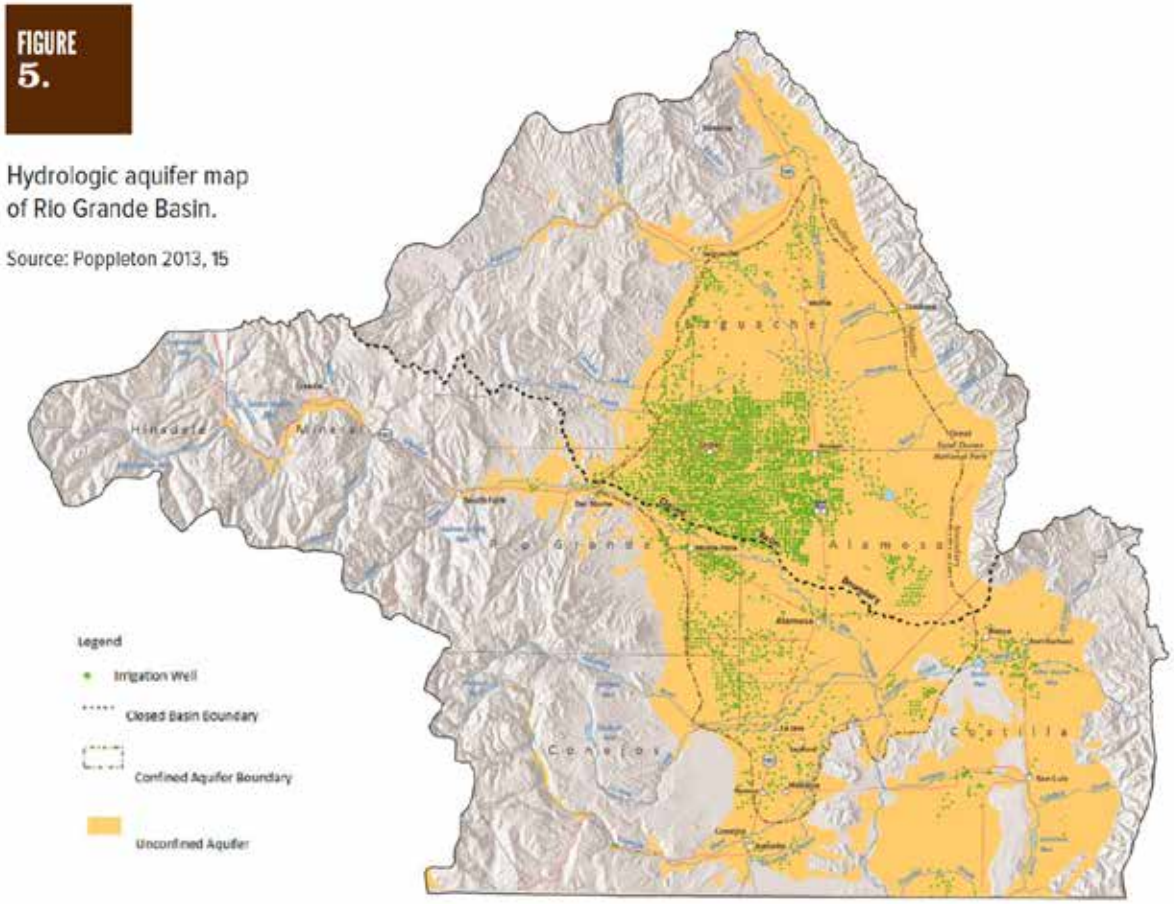


Figure 3: Hydrologic aquifer map of the Colorado portion of the Rio Grande Basin



Groundwater Development and Threats to Aquifer Sustainability

Surface water development for irrigation in the San Luis Valley expanded during the second half of the 19th century. By the start of the 20th century, all of the streams in the basin were over-appropriated. Consequently, groundwater development of the confined aquifer began in 1887 and the first irrigation well in the unconfined aquifer was drilled in 1903. By 1972, there were thousands of wells in the San Luis Valley and the State Engineer announced a moratorium on the issuance of well permits for new groundwater appropriations within the confined aquifer and the part of the unconfined aquifer outside of the Closed Basin. In 1981, the State Engineer placed a moratorium on the issuance of well permits for new groundwater appropriations in the Closed Basin3.[xvii] Agricultural producers in the San Luis Valley today continue to rely on groundwater for irrigation, and as a result both aquifers have been over-pumped to unsustainable levels.

Aquifer sustainability occurs when "withdrawals from the aquifer match recharge to the aquifer from all sources so that mining of the aquifer is not occurring on a long-term basis," as defined by the Rio Grande Water Conservation District.[xviii] Starting in 1998, the State Engineer and Colorado Water Conservation Board created the Rio Grande Decision Support System (RGDSS) groundwater model to collect data about the aquifers, evaluate the hydrology of the region, and inform management decisions.

In 2002, a severe drought hit Colorado. The resulting decrease in streamflow prompted a heavier reliance on groundwater without corresponding natural recharge, causing decreases in both groundwater and surface water levels. This prompted new laws for the protection of surface water and groundwater resources. The Colorado General Assembly enacted SB 04-222, which added a new subsection to the statutes governing the use of underground water in the Rio Grande River Basin. This new law gave Colorado's State Engineer "wide discretion to permit the continued use of underground water consistent with preventing material injury to senior surface water rights" while ensuring sustainable groundwater supplies in both aquifers, fluctuations in the artesian pressure of the confined aquifer within a certain range, and no unreasonable interference in the state's ability to fulfill its obligations under the Rio Grande Compact.[xix]

In order to protect senior surface water rights impacted by injurious groundwater withdrawals, six groundwater subdistricts of the Rio Grande Water Conservation District and one within the Trinchera Water Conservancy District were established to allow for self-regulation of groundwater use for irrigation.[xx] Formation of the subdistricts allows for self-governance in order to avoid state intervention, which would ultimately cause the shutdown of a majority of wells. The Districts' well permit holders have the option to join a groundwater management subdistrict, create their own well augmentation plan, or cease pumping. The seven subdistricts were delineated based on similarity in community interest and hydrology.[xxi] *Figure 4* is a map of the RGWCD Subdistricts[xxii] and *Figure 5* provides more information about each subdistrict.

Figure 4: Rio Grande Water Conservation District Subdistricts map.

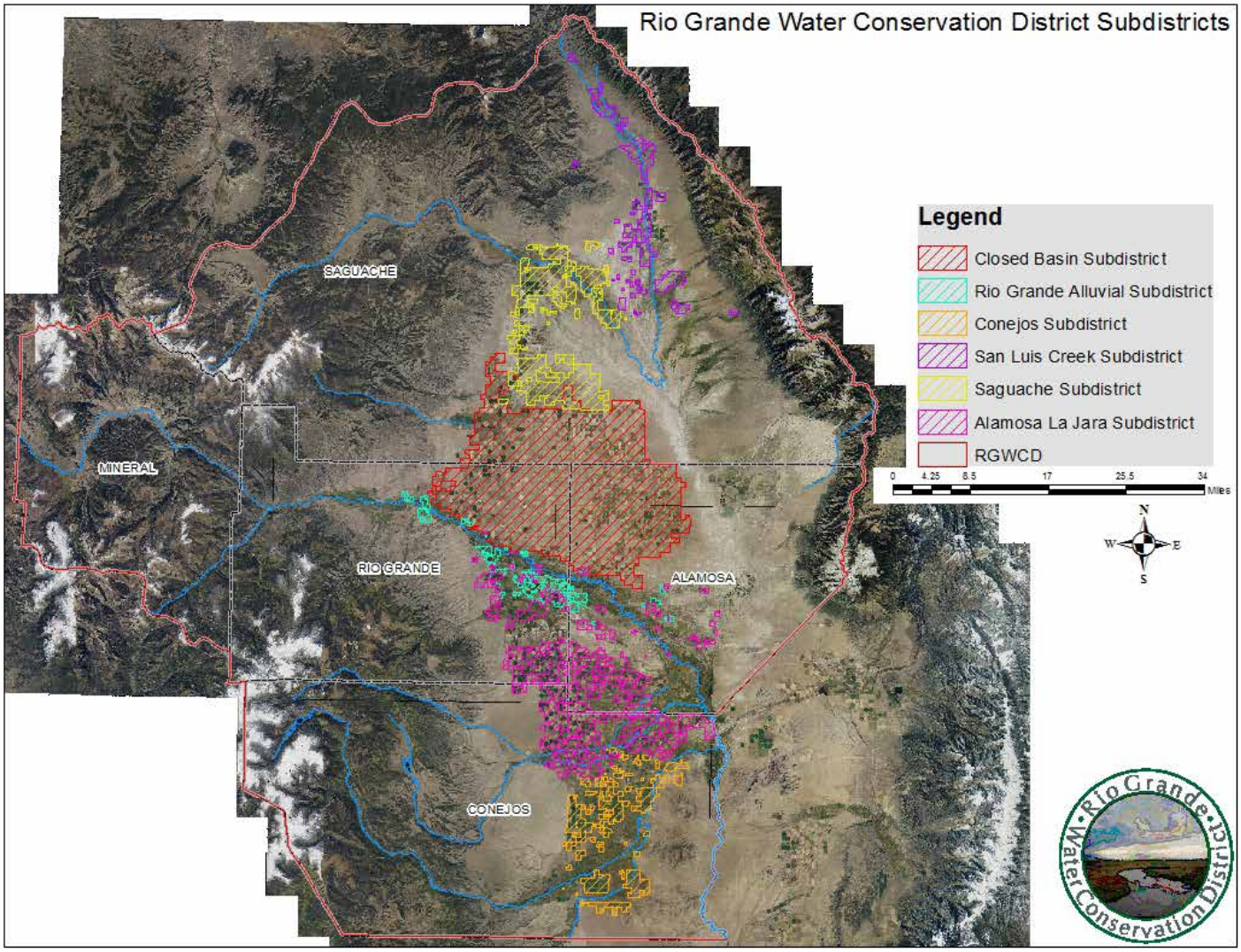


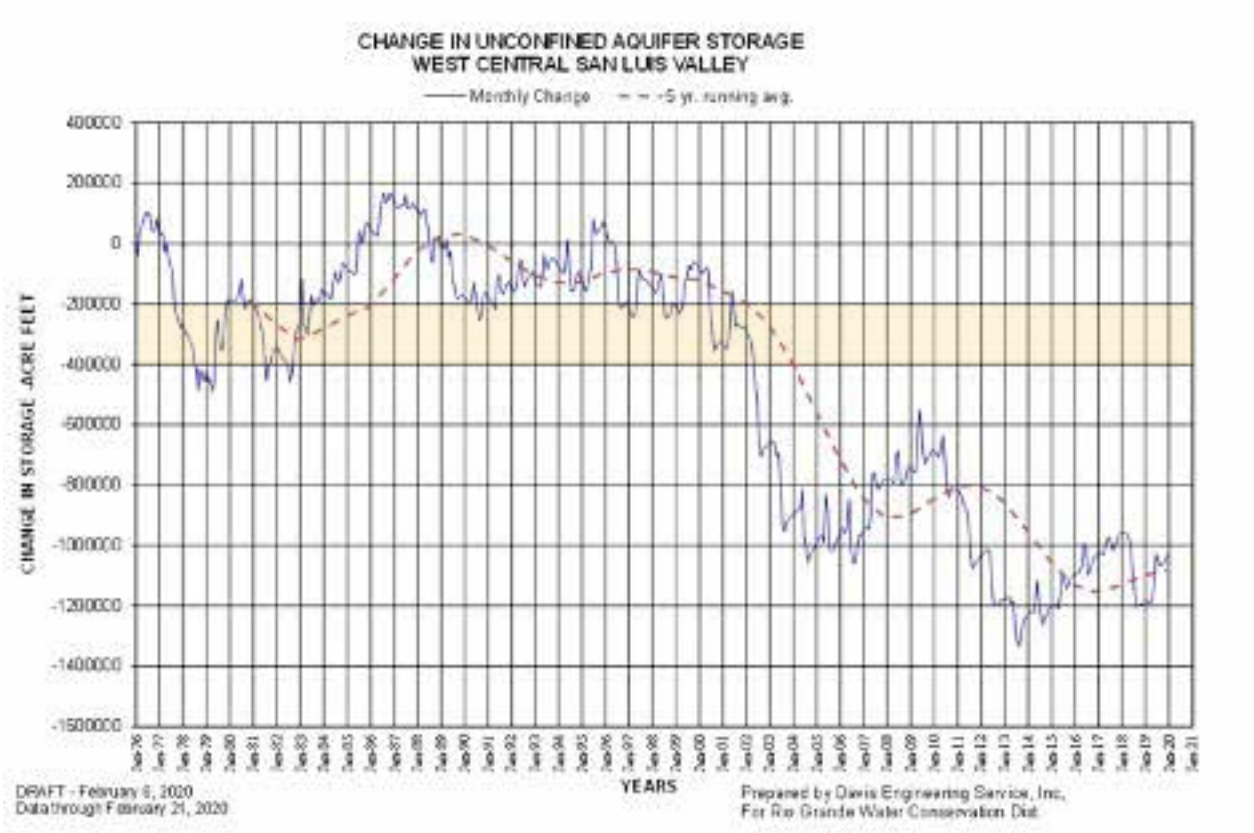
Figure 5: Groundwater Subdistricts in the San Luis Valley as of July 28, 2020

Subdistrict	Established	Annual Replacement Plan (ARP) Status	Wells
1 (Closed Basin)	2006	Operating under approved ARP since 2012	3,481
2 (Rio Grande Alluvial)	2016	Operating under approved ARP since 2019	244
3 (Conejos)	2017	Operating under approved ARP since 2019	158
4 (San Luis Creek)	2017	First ARP must be approved by March 15, 2021	100 petitioned
5 (Saguache)	2017	First ARP must be approved by March 15, 2021	180 petitioned
6 (Alamosa-La Jara)	2018	First ARP must be approved by October 1, 2020	443 petitioned
Trinchera	2008	First ARP must be approved by March 15, 2021	151 petitioned

Sources: Rio Grande Basin Implementation Plan, State of the Basin Symposium 7/28/20, RGWCD website

If the subdistricts are unable to reach sustainable levels of groundwater through voluntary programs, then the State Engineer will likely impose limitations on the use of wells. For heavily irrigated Subdistrict 1, located in the Closed Basin to the north of the Rio Grande, achieving recovery of the unconfined aquifer by 2031 means reaching between 200,000 and 400,000 acre-feet below the aquifer storage volume projected to exist in 1976.[xxiii] Unfortunately, the 2002-2003 drought and recent dry years have led to a decreasing trend in storage (see *Figure 6* below[xxiv]), and Subdistrict 1 would need to average 82,786 acre-feet year-1 in net groundwater recharge to meet its goal. While less heavily irrigated than Subdistrict 1, the other subdistricts also have Annual Replacement Plans that are approved, or are in the process of being approved, by the State Engineer in order to bring groundwater use into balance.

Figure 6: Change in Unconfined Aquifer Storage in West Central San Luis Valley (Subdistrict 1) with the goal for 2031 shaded in yellow.



An additional threat facing water users in the San Luis Valley is the potential for groundwater export to the growing Front Range urban corridor. In the late 1980s, American Water Development, Inc., (AWDI) purchased the Baca Ranch with plans to pump 200,000 acre-feet of water each year out of the confined aquifer to serve the growing Front Range metro area. Citizens for San Luis Valley Water and a coalition of opponents to the plan fought AWDI in court until 1994, when the Colorado Supreme Court upheld a district court ruling that the pumping would harm shallow aquifers and surface water rights. The Baca Ranch was then sold to the founder of Stockman's Water, whose plan to send 150,000 acre-feet year-1 of water to the Front Range was also unsuccessful. More recently, the company Renewable Water Resources has made clear its plan to pipe 20,000 acre-feet year-1 to the Denver metro area.[xxv]

Voluntary Aquifer Recharge Efforts

Amidst the challenge of declining aquifer levels, variable climate change impacts, and a history of speculative water export proposals, the groundwater management subdistricts and producers in the San Luis Valley have implemented several key efforts to restore the aquifers. Efforts include self-taxation to incentivize reduced pumping and the establishment of funds to pay landowners to voluntarily cease irrigation. For example, in 2012 Subdistrict 1 started charging pumping fees and fallowed 8,300 acres.[xxvi] In 2020, there were over 13,000 acres enrolled in conservation programs in Subdistrict 1.[xxvii]

Programs in the San Luis Valley that pay producers to fallow land in order to curtail pumping include the Colorado Rio Grande Conservation Reserve Enhancement Program (CREP) and fallow or drought contracts. The U.S. Department of Agriculture's Farm Services Agency and Subdistrict 1 of the RGWCD fund and run the CREP program, which pays enrolled farmers annually to fallow their land under a 15-year contract.[xxviii] CREP was authorized in 2012 for $140 million and 40,000 acres across parts of Alamosa, Rio Grande, and Saguache counties.[xxix] In addition the RGWCD also implements a fallow program and drought contracts which are short-term commitments to the RGWCD, typically used in very dry years to appeal to landowners who are interested in fallowing for a season but are unwilling to commit to fallowing in the long term. For example, the 2021 Fallow Program allows irrigators to fallow 1, 2, or 4 field(s) for 4, 2, or 1 year(s), respectively.[xxx] The contract value is $200 for each acre previously irrigated by center pivot sprinkler and $144 for each acre previously irrigated by flood irrigation. These existing mechanisms – CREP and fallow or drought contracts – focus on dry-up of land. As intended, this prevents groundwater extraction during the contract period. However, neither option creates a perpetual savings of groundwater nor allows the producer to use their water to farm under reduced irrigation across the acreage enrolled in the program.

Despite these proactive and collaborative measures to restore the aquifer, a significant gap remains and the new export threat looms. Against this backdrop, there is a need to create new opportunities for landowners while providing tools to the groundwater subdistricts to address groundwater overdraft.

Feasibility Study

In 2018, Colorado Open Lands and the Rio Grande Headwaters Land Trust, two Colorado non-profit land conservation organizations focused on land and water conservation in the San Luis Valley, began conversations with the Rio Grande Water Conservation District, San Luis Valley Water Conservancy District, and Conejos Water Conservancy District to explore whether and how traditional land conservation tools, especially conservation easements, might be modified to focus on groundwater depletion. A feasibility effort was funded by the Colorado Water Conservation Board and a consortium of conservation funders facilitated by the State Board of the Great Outdoors Colorado Trust Fund, a quasi-governmental state entity. This project involved researching other groundwater basins to understand whether and how conservation easements had been used to address groundwater overdraft; stakeholder outreach to the subdistricts and a variety of producers to identify the factors that would make additional tools successful; and legal and valuation analysis of the conservation easement and other potential tools. The project team relied throughout on a working group of land trusts, attorneys, appraisers, and subdistricts to provide feedback and help refine the tool analysis.

The stakeholder meetings revealed general consensus on several needs for a conservation easement-based tool: provide flexibility to producers by allowing percentage reductions across a farming operation and allowing rotation of conserved water through the farm; act as a permanent or long-term part of the solution; and augment the funding source that subdistricts provide to incentivize fallowing. Using conservation easements to restrict groundwater usage would allow producers to reduce crop acreage in order to keep other fields in irrigation, and would provide them the flexibility to choose where and how to continue farming.

Lessons From Other Basins

Since groundwater management is a challenge in many regions across the United States, surveying the current state of voluntary groundwater management tools used in other basins may provide lessons that are applicable to the San Luis Valley. While the specifics of groundwater challenges vary across basins, there were commonalities in management experiences identified for basins in Nebraska, California, and Colorado. In general, conservation easements were shown to be an effective and enforceable tool, and groundwater nonuse was shown to be valuable in a market context.

In Nebraska's Central Platte basin, the Central Platte Natural Resource District (CPNRD) utilizes two main tools – CREP and conservation easements – to manage groundwater use with the primary goal of protecting endangered and threatened species that rely on the Platte River and its ecosystems by maintaining instream flow requirements during the irrigation season. The aquifer itself is generally above pre-development level due to adequate precipitation and a short growing season. The CPNRD utilizes the Farm Service Agency's CREP to enroll producers in temporary fallowing.

In addition, the district has acquired more than 30 perpetual conservation easements to retire groundwater wells, with parcels consisting of about 160 acres each. In general, the experience of the CPNRD has been that landowners will approach the district with interest in putting their land under easement, often as a result of low corn prices. The district then negotiates the value of the easement based on agricultural land values and proximity to the Platte River. Easements are funded by the district itself as well as state lottery funds, not by tax incentives. During the easement process, the county and zoning commissions must also approve the easement. Producers tend to grow grass or dryland corn once the conservation easement has been placed on their property, and the district provides a list of acceptable crops. To date, the CPNRD has not faced any enforcement issues.

In 2014, the state of California passed the Sustainable Groundwater Management Act (SGMA) to create a framework for groundwater management. SGMA requires priority groundwater basins to halt groundwater overdraft and come to balanced levels of groundwater pumping and recharge.[xxxi] This regulatory shortage incentivizes producers in medium and high priority basins to seek innovative solutions to their water supply challenges. In addition, the value of land in overdrafted groundwater basins increasingly reflects water availability and reliability of supply.[xxxii] In the "critically overdrafted" Oxnard basin in western Ventura County, pumping amounts may need to decrease as much as 35% to meet the sustainable yield for the basin as mandated by SGMA.[xxxiii] At requests from growers in the region, the Fox Canyon Groundwater Management Agency (FCGMA) collaborated with The Nature Conservancy, California Lutheran University's Center for Economic Research and Forecasting, and the Farm Bureau of Ventura County to design a groundwater market for groundwater users to trade allocations. Growers indicated that in the absence of a water market, having to fallow in order to comply with groundwater allocations for the basin would have negative financial impacts.

The market uses a cap-and-trade model with fixed groundwater allocations for each well. The groundwater allocations are set according to historic use and sum to the sustainable yield cap requirement. Allocations were determined in this manner because a market requires defined and transferable allocations to function well. Previously, FCGMA used efficiency-indexed allocations that correspond to crop type. Under the two pilot phases of the market, producers could opt in to using "fixed" allocations to participate in the market.[xxxiv] Participants have the ability to sell unused water allocations, and users (including non-allocation holders) can lease water allocations, though not on a permanent basis due to land use change concerns. To give groundwater users time to transition to the sustainable yield, FCGMA chose a ramp-down approach to reduce each user's allocation gradually over 20 years. The financial incentive to reduce groundwater use may motivate producers to switch to crops that require less water or update their irrigation technology. FCGMA provided additional flexibility to groundwater users by allowing unused water allocations to carry over, up to 100% of the individual's current annual allocation.

Planning began in 2016, and after pilot testing and iteration the market opened in March 2020. Preliminary results indicate several important enabling conditions: water scarcity, fixed groundwater allocations, agricultural stakeholder support, market design expertise, and capacity and funding availability.[xxxv] This producer-led effort to establish a groundwater market and the sales that have occurred so far demonstrate the clear value of groundwater to users, and the ability of growers to use their water rights to create alternative revenue streams. The Fox Canyon groundwater market can serve as a case study for other groundwater basins interested in reducing groundwater withdrawals while providing flexibility to producers.

Voluntary Groundwater Management Tools

To support the subdistricts in achieving the mandated aquifer recovery, the feasibility project explored an expanded set of tools to reduce groundwater pumping. Existing tools such as CREP and drought contracts were compared to new potential tools for restricting groundwater extraction (see Figure 7 below). Potential additional tools intended to reduce groundwater withdrawal include a lease of nonuse, the purchase of partial undivided interest in a water right or well permit, a covenant on the use of water, and a conservation easement.

Figure 7: Existing and Potential Tools to Effectively Reduce Groundwater Pumping

Tool	Administrator	Legal Defensibility	Agreement Duration	External Funding	Price/Value Determination	Enforcement Mechanism
CREP	Subdistrict/ RGWCD	High	Varies	Yes	Varies; based on whether term or perpetual and also based on location	FSA enforces; contract specifies repayment with interest, liquidated damages
Drought contract	Subdistrict/ RGWCD	High	1 year	No	Set by administrator or negotiated	RGWCD enforces; no penalty specified but enforceable under contract law
Lease of nonuse	Subdistrict/ RGWCD	High	Short term to long term	No	Set by administrator or negotiated	RGWCD enforces; enforceable
Purchase of partial undivided interest in water right/ well[a]	Subdistrict/ RGWCD	High	Perpetual	No	Set by administrator or negotiated	RGWCD enforces; enforceable
Covenant restricting use	Subdistrict/ RGWCD	Moderate[b]	Perpetual[c]	No	Could be set or negotiated price[d]	RGWCD enforces; established by lease terms
Conservation easement that restricts pumping	Land trust w/ subdistrict input	Moderate[e]	Perpetual[c]	Yes	Appraisal	Land trust enforces but could add enforcement rights for RGWCD; remedies include injuction and damages

[a]agreement sets out how the two owners share use/nonuse of water

[b]existing covenants, untested in court

[c]unless otherwise agreed upon

[d]appraisal used if seeking tax benefits

[e]high generally, but groundwater is a new use

Shaded regions of the table denote existing tools.

These tools differ in their administration, basis in law, agreement duration, funding sources, value determination, and enforcement mechanisms. Each program would be administered by the RGWCD and its associated subdistricts except for the conservation easement, which would be held by a land trust with input provided by the subdistrict. With the exception of the conservation easement, they would all be funded primarily by the subdistricts.

The *lease of nonuse* is a short-term agreement whereby the landowner agrees to lease groundwater to the RGWCD or subdistrict for a term of years which could be renewed. The leaseholder would not pump groundwater and would leave the water in the aquifer. The value of the water would be set at the offset, and could be adjusted or renegotiated at a certain point. The lease could be made long-term depending on the number of years specified.

Purchase of a partial undivided interest in a water right or well permit provides more security than a lease because ownership is easier to enforce than the terms of a lease, at least in perception. In addition, purchase of a partial undivided interest would be a perpetual solution as long as the buyer continues to hold the partial interest with the groundwater use restriction in mind. The amount specified could be a percentage of the right or a specific volumetric amount of water. One advantage of the undivided interest is that the landowner and subdistrict would each have the right to use the entire water right to the extent the other is not using their share, meaning that any water beyond what the landowner uses from their share could be left in the aquifer and used by the subdistrict to replace injurious stream depletions. A water use agreement would outline when the owner and purchaser each have the right to use their share of the water right or well permit as well as the operation and maintenance responsibilities.

A *covenant restricting the use of water* is similar to a conservation easement, but is based on the common law, rather than statute, like a conservation easement. A covenant may apply only to the water and not to the land, in contrast to a conservation easement that must encumber land in order to encumber water. To be legally enforceable, the (nonuse) covenant must be drafted to burden the property encumbered by the covenant and benefit a party benefited by the restriction (e.g. the subdistrict). Depending on whether the covenant is made long term with extensions of time and whether appropriate provisions were included, it could qualify for state and federal charitable income tax deductions, although not for Colorado conservation easement tax credits.

An *option agreement* or *right of first refusal* was not included within the table of tools but it could be combined with any of the other tools to give RGWCD or another rights holder the opportunity to enter into another agreement at a later date. This may be useful, for example, if there are properties that Renewable Water Resources is more likely to target for water exports and if the subdistrict would like to prevent that outcome.

The primary focus of the feasibility work was developing a *conservation easement* to restrict groundwater pumping on a parcel of land. The conservation easement is a legal tool that restricts certain uses of a property. In Colorado, conservation easements may include both land and water rights that have been put to beneficial use on that land. Traditionally, conservation easements have required continued historic use of the land and water (often irrigation) and protect the public benefit of the land and water rights. To address overuse of groundwater, however, the conservation easement would place restrictions on the use of groundwater related to the needs of the landowner to continue in agricultural operations and the subdistrict to reduce pumping. Restrictions on water use could be partial or complete, although working group discussions suggest that a 30% reduction would be the

minimum amount considered. In addition, each easement can be tailored to the specific operation in a way that supports the landowner and the subdistrict, and it may also protect other conservation values on the property. Requiring the creation of a linked management plan ensures that land management under a reduced irrigation scenario follows best practice in order to promote multiple benefits, such as soil health, wildlife habitat, agricultural production, and other conservation values.

During working group discussions regarding the feasibility and design of a conservation easement to restrict pumping, several options were considered for the structure of the restrictions. One key question was whether restrictions should be based on average groundwater pumping withdrawal or historical consumptive use. There was consensus that using historical consumptive use would be difficult to monitor and enforce, and that using the average pumping amount would also achieve the goal of leaving water in the aquifer with an easier enforcement mechanism (i.e., reading the well meter). In addition, producers have the ability to know what amount of water they are working with and choose how to use it on their property; practices such as switching crops or updating irrigation technology would not impact the amount of water they could use but could allow them to modify their agricultural operations in the future, such as in response to market forces.

Another point of discussion was whether to consider the on-farm average groundwater use or the decreed-for use amount of water on the well permit when conducting the "before" evaluation of the property value. While the latter might inhibit water export companies like Renewable Water Resources from attempting to use those wells to replenish the supplies that they would pump out of the basin, the former better addresses the working group's main goal of keeping the amount of water that would normally be pumped out of the aquifer within it to increase the groundwater level.

Finally, irrigators expressed the desire to be able to use more water if aquifer conditions improved over time. It is unlikely that conditions would improve to such an extent, particularly in the near future. One benefit of the conservation easement is its perpetual nature, which enables subdistricts and producers to be able to confidently conduct long term planning rather than facing unpredictable management scenarios.

In contrast to the other tools available to restrict groundwater pumping, the conservation easement model leverages multiple funding sources. In the San Luis Valley, this could include the Natural Resources Conservation Service, Great Outdoors Colorado, Colorado Water Conservation Board, foundations, federal tax deduction, and the Colorado income tax credit. For the landowner, incentives to place an easement on their property include both the partial purchase of a conservation easement (cash payment) and the donated value of the easement (tax benefits). The tax benefits available to landowners in Colorado include federal income tax deduction, federal estate tax reduction, federal estate tax exclusion, transferrable state income tax credit, and local assessment treatment. To qualify for any state or federal tax benefits (and most other funding sources as well), a conservation easement must be perpetual. Another benefit to utilizing the conservation easement model is that land trusts have access to insurance for legal fees incurred in the defense of an easement.

Under Colorado's conservation easement enabling statute, a conservation easement is the only legal tool that is statutorily permitted to be perpetually enforceable. In this context, the conservation easement would be monitored and enforced by the land trust. Land trusts have a variety of legal options available, such as injunction, to enforce the easement when a violation occurs. For this groundwater conservation easement, the working group will be including language that directs payment of liquidated damages if the landowner pumps against the permitted limit. If the violation is ongoing or particularly egregious, the subdistrict may remove the wells in

violation from its Annual Plan of Replacement that is submitted each year to the State Engineer. The Colorado Division of Water Resources has the right to then issue a cease-and-desist order to stop that well from pumping.

When implementing new tools to restrict groundwater pumping, it is crucial to ensure that water left in the aquifer by reduced pumping is not considered abandoned and that the water is not usable by another irrigator or water user. Colorado law considers a water right[1] to be abandoned when there is intent to permanently discontinue use of all or part of a water right , so there is a concern that the permanent restriction of the use of a water right for irrigation may lead to an interpretation of abandonment. In Colorado, the State Engineer has removed water rights from the abandonment list because of their inclusion in a conservation easement, which demonstrates an intent to keep the water rights intact. However, given that groundwater easements are specifying non-use of all or a portion of the groundwater, the working group agreed that it would be prudent for the Rio Grande Water Conservation District to create and adopt a formal conservation program that recognizes that water rights restricted by a groundwater conservation easement are in use for the purposes of aquifer sustainability and may not be tolled for abandonment.

Valuation

Contributing author: Kevin McCarty (McCarty Land & Water Valuation, Inc.)

Of the tools mentioned above, most are valued by an administrator or negotiated with the landowner with the exception of the conservation easement. In order to better understand the valuation of conservation easements restricting groundwater pumping in the San Luis Valley, Colorado Certified General Appraiser Kevin McCarty outlined a proposed valuation methodology to address the challenges of valuing this new type of easement.[xxxvi]

The value of a conservation easement which would qualify for federal or state tax credits is determined through appraisal. In a standard appraisal procedure to assess the value of conservation easements, the appraiser would conduct a sales comparison by identifying market transactions of properties similar to the parcel in question with conservation easements that have sold in the past. Comparing the sale price of those properties to the sale price of similar properties without conservation easements helps determine the value of the conservation easement.

Since restricting groundwater pumping would be a novel easement requirement in the San Luis Valley, there are no sales available subject to such a conservation easement. There are a few properties that are water short by virtue of decreed pumping limitations. However, this involves a limited number of properties and sales of these properties are rare. There are also a small number of sales which are water short by virtue of geologic conditions that limit water yields. Water short sales can be examined in order to begin to draw conclusions about the market value impact of pumping restrictions. However, there are only a few sales with these conditions available, even when the market is examined over an extended time period. As a result, care must be taken in making conclusions from such a small pool of data. One complicating factor relating to the currently available market data is that many of the water-short properties sold in recent years were purchased by uninformed buyers from outside of the county, specifically during a brief time period when investors were exuberant about the prospect of excessive returns from hemp production. Market value definitionally requires an informed buyer, so those sales do not meet the definition of market value and are particularly suspect now that hemp prices have dropped precipitously and those farmers are struggling with the prices they paid for those farms.

1 CRS 37-92-103(2) and 37-92-402(11)

In conclusion, there is very little existing market data for water short groundwater irrigated properties in the San Luis Valley. It will be important for appraisers to continue to examine any water short sales and in time sales subject to groundwater pumping conservation easements will hopefully begin to supplement that data, providing a more definitive picture of the impact of these restrictions. However, in the meantime, the limited volume of data means that appraisers will need to rely on a methodology that will reasonably predict how the market will respond to groundwater pumping restrictions. The most important measure beyond examining water short comparable sales is to consider the financial impact of pumping restrictions. Because the market for irrigated properties in the San Luis Valley is directly related to agricultural income, determining lost income associated with groundwater pumping easements is a reasonable approach to determining value loss. Even if an adequate number of sales become available at some point in the future, an income approach to value should remain as an important tool in valuing groundwater pumping easements.

Crop water requirements play a pivotal role when considering the financial impact of irrigation water restrictions. The reduction in available water only begins to impact income when crop water requirements are not met. Thus, a percentage reduction in groundwater pumping does not have the same financial implications across properties, even within the same area and growing the same crop. For example, a property with excess water may not see a change in income under a 25% reduction, whereas a property only just meeting crop water requirements previously may see a significant change in income under the same pumping reduction. The impact on potential farm income would be reflected in the market value of the property.

As a result, income analysis based on crop water requirements is proposed as the current methodology to assess the value of a conservation easement restricting groundwater pumping. The appraiser would begin with a normal "before" appraisal to establish current market value of the property. The appraiser would then utilize a composite crop water requirement corresponding to the groundwater subdistrict, crop, and acreage to generate production estimates and calculate the expected change in income under a given reduced pumping scenario.

For example, for hypothetical Property A the "before" value of a pivot irrigated quarter is assigned at $500,000. Property A may have excess water, but adjustments to the market value only begin below 2.0 acre-feet according to a hypothetical composite benchmark crop water requirement of 2.0 acre-feet per irrigated acre. The completely non-irrigated value of the quarter section would be $50,000. So, the percentage value loss equals the percentage pumping reduction (below 2.0 acre-feet) between the $500,000 and the $50,000 value. Thus, a 50% reduction in pumping would create a $225,000 value loss, creating an after value of $275,000 for Property A and a conservation easement value of $225,000.

It would be important to establish a composite benchmark crop water requirement based on scientific data for the San Luis Valley in order to support the appraisal process. Historic crop water requirement data exist for surface and sprinkler irrigation of pasture, potatoes, alfalfa, barley, and several other crops in the San Luis Valley as collected by Agro Engineering and Davis Engineering Service (see appendix for a summary of historic irrigation water requirement data from the San Luis Valley).[xxxvii] These estimates, while not comprehensive over time, demonstrate the differences in irrigation water requirement by crop, site location, and irrigation method. There may be further differences as compared to current irrigation water requirements as a result of updates to irrigation technology, agricultural practices, and crop varieties.

Conclusion

Without expanding voluntary action to restore the aquifers in the San Luis Valley to sustainable levels according to the state's mandate, there is serious risk that regulatory action to shut down thousands of wells is imminent. Previous well shutdowns in the South Platte River basin exemplify the willingness of Colorado's State Engineer to curtail pumping without financial compensation. A similar regulatory action in the San Luis Valley may lead to aquifer recovery but would likely have negative socioeconomic impacts as well as harm wetland ecosystems reliant on irrigation water.

The land and water conservation community in the region can work to continue implementing existing tools- such as CREP and drought contracts – while developing innovative ways to expand the scale of groundwater pumping restrictions. Pilot programs of newer tools – such as conservation easements that restrict pumping, a lease of nonuse, purchase of partial undivided interest in water right/well, or a covenant restricting use/option agreement- will be important to showing potential for success using these newer tools.

Pursuing conservation easements coupled with groundwater irrigation limitations is one way to leverage state and federal tax credits in particular to help fund aquifer recovery while ensuring the viability of the agriculture-based economy. There is a clear opportunity for land trusts, subdistricts, and landowners to collaborate on groundwater pumping conservation easements to avoid dry-up and continue agricultural production in the San Luis Valley.

Appendix

1. PDF memo from Kevin McCarty re: valuation
2. Crop Water Requirements Summary Table
3. Groundwater Conservation Easement Template

Endnotes

i USGS, "Groundwater Decline and Depletion."
ii USGS.
iii Colorado State University, "Groundwater Resources."
iv Rio Grande Basin Roundtable and DiNatale Water Consultants, "Rio Grande Basin Implementation Plan."
v RGWCD and SLV Water Conservancy District, "Factsheet: Economic Contributions of Agriculture to the San Luis Valley."
vi RGWCD and SLV Water Conservancy District.
vii Early Childhood Council of the San Luis Valley, "Community Assessment of the San Luis Valley."
viii Early Childhood Council of the San Luis Valley.
ix Wetland Dynamics, LLC, "SLV Wetland and Wildlife Conservation Assessment."
x Wetland Dynamics, LLC.
xi Wetland Dynamics, LLC.
xii Wetland Dynamics, LLC.
xiii Smith, "San Luis Valley Water: Below the Surface."
xiv Rio Grande Basin Roundtable and DiNatale Water Consultants, "Rio Grande Basin Implementation Plan."
xv Sangre De Cristo National Heritage Area, "Sangre De Cristo National Heritage Area."
xvi Rio Grande Basin Roundtable and DiNatale Water Consultants, "Rio Grande Basin Implementation Plan."
xvii Rio Grande Basin Roundtable and DiNatale Water Consultants.
xviii RGWCD, "Plan of Water Management Special Improvement District No. 1 of the Rio Grande Water Conservation District."
xix Colorado Judicial Branch, "Background of the Rules Governing New Withdrawals of Groundwater in Water Division 3 Affecting the Rate or Direction of Movement of Water in the Confined Aquifer System."
xx Paddock, "Implementation of Integrated Surface and Groundwater Administration under the 1969 Act in the Rio Grande Basin, Water Division No. 3."
xxi Salazar Rio Grande del Norte Center at Adams State University, Rio Grande State of the Basin Symposium.
xxii Rio Grande Water Conservation District, "Rio Grande Water Conservation District Subdistrict Map."
xxiii Salazar Rio Grande del Norte Center at Adams State University, Rio Grande State of the Basin Symposium.
xxiv RGWCD, "Plan of Water Management Special Improvement District No. 1 of the Rio Grande Water Conservation District."
xxv King et al., "Water Exports and the San Luis Valley in Colorado: Understanding the History and Current Regulatory Framework."
xxvi Carswell, "Farmers Agree to Tax Those Who Deplete Groundwater."
xxvii Salazar Rio Grande del Norte Center at Adams State University, Rio Grande State of the Basin Symposium.
xxviii Walton, "Food vs. Water: High Commodity Prices Complicate Aquifer Protection in Colorado's San Luis Valley."
xxix Rio Grande Water Conservation District, "Subdistrict #1 of the Rio Grande Water Conservation District & CREP."
xxx Rio Grande Water Conservation District, "SD #1 Announcements."
xxxi CA Department of Water Resources, "SGMA Groundwater Management."
xxxii WestWater Research, LLC., California Ag Land and Water Market Outlook: The Decade Ahead.
xxxiii Heard et al., "SGMA's First Groundwater Market: An Early Case Study from Fox Canyon."
xxxiv Heard et al.
xxxv Schumacher.
xxxvi McCarty, "Pumping Reduction and Value Loss."
xxxvii "Water Usage for Crops."