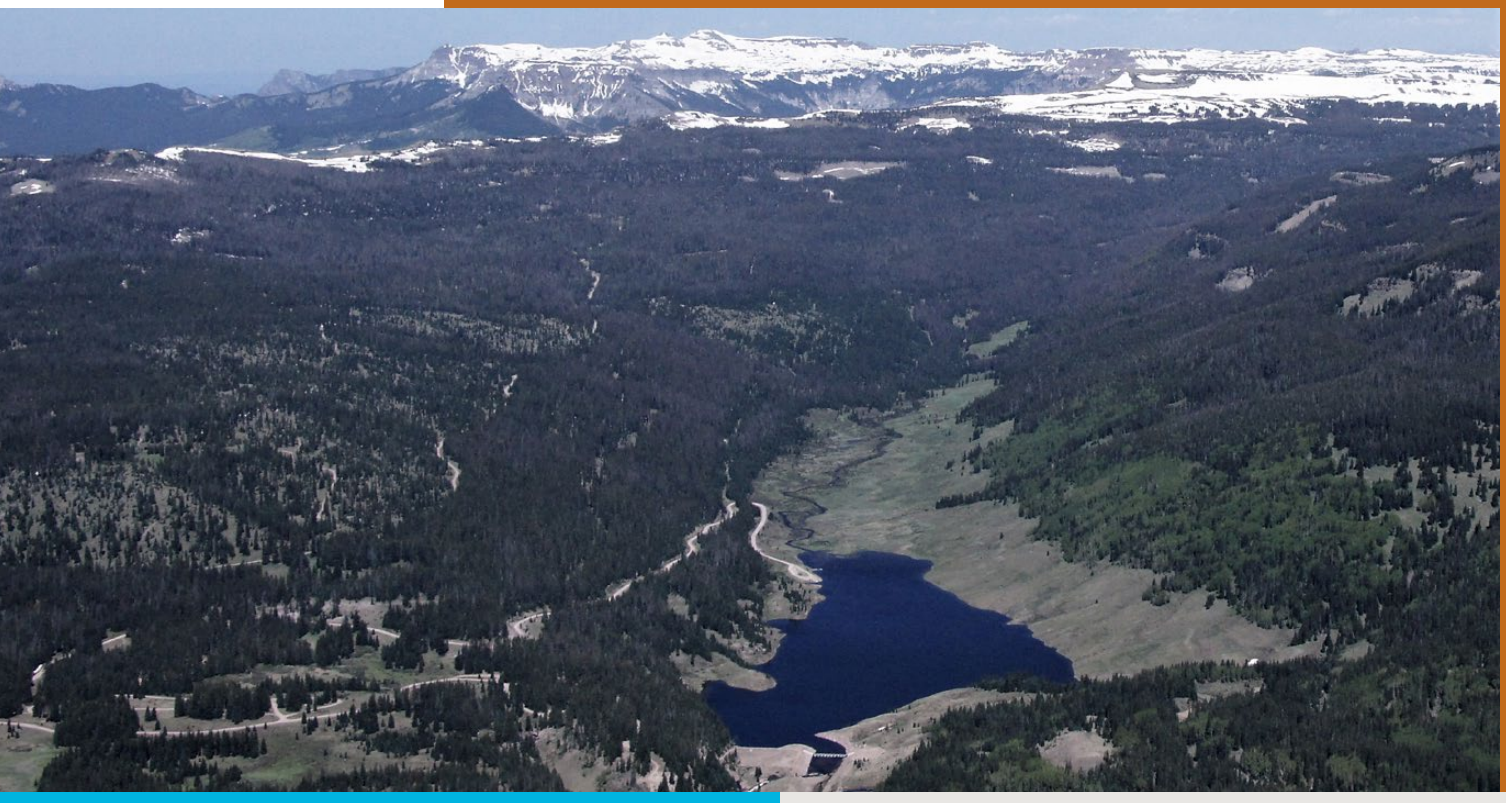
Use of Alternative Transfer Methods to Increase Water Supplies for Conejos Basin Agriculture, Municipal, and Environmental Purposes

Executive Summary



Trujillo Meadows Reservoir
Photo by Dick Stenzel

Prepared For Conejos Water Conservancy District
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DiNatale WATER CONSULTANTS

Platoro Reservoir. Photo by Dick Stenzel

Overview

The primary objective of the Trujillo Meadows Reservoir Alternative Agricultural Transfer Mechanism (TMR Study) is to investigate the feasibility of a unique Alternative Transfer Method (ATM) that involves enlarging Trujillo Meadows to provide intra-year regulation of water supplies including direct flow storage and storage of other agricultural and augmentation water rights for agricultural users diverting from the San Antonio. The local towns, Manassa, Romeo, Sanford, Conejos, Antonito, Ortiz, and San Antonio plus nearby La Jara (Towns) will need to replace well-pumping depletions under the pending Well Rules and Regulations. The Towns will likely look to agricultural water resources within the basin as a potential replacement source as there is not sufficient water supply available for appropriation under a new water right. The enhancement of agricultural supplies through the use of Trujillo Meadows Reservoir could lead to the San Antonio agricultural users leasing their Platoro Project water to the local Towns for use in replacing well-pumping depletions, thus reducing the need for dry-up of irrigated lands.

In addition, the TMR Study evaluated other potential multiple-objective benefits, such as enhanced recreational opportunities at Trujillo Meadows and retiming of releases from Trujillo Meadows for environmental benefits. Potential indirect benefits include retimed streamflows on the Conejos River below Platoro Reservoir (Platoro).

The Conejos Water Conservancy District

The Conejos Water Conservancy District (CWCD) is in Conejos County in southern Colorado in the Rio Grande Basin (Water Division 3). The CWCD includes 88,000 acres of irrigated agriculture and the towns of Manassa, Romeo, Sanford, Conejos, Antonito, Ortiz, and San Antonio.

The CWCD provides multiple services within its boundaries:

- Allocation of Project Water stored in the Platoro Reservoir
- Operations and maintenance of Platoro Reservoir
- Monitoring and measuring groundwater and surface water
- Forecasting snow water equivalent for the Conejos portion of the Rio Grande Compact (Compact) deliveries
- Water rights protection via involvement in water court proceedings, State Engineer rules and regulations, and other legal proceedings

Existing agricultural situation

The Los Pinos River flows into the San Antonio River near the New Mexico-Colorado state line, flowing north to the confluence with the Conejos. Runoff on the Los Pinos and San Antonio generally occurs too early in the season for optimizing beneficial use by irrigated agricultural users diverting from the San Antonio, as the peak growing season and corresponding irrigation needs occur after the peak of the runoff as shown in Figure ES 1. There is no reservoir active storage to better manage the runoff and store water for use later in the irrigation season. Between 1980 and 2008, agricultural users diverting from the Los Pinos and San Antonio were short an average of nearly 24,000 acre-feet (AF). Some of this shortage is met by groundwater pumping, while much of the shortage is unmet, resulting in lower crop yields.

Figure ES 2 shows the Los Pinos, San Antonio and Conejos Rivers, Trujillo Meadows, Platoro Reservoirs, and the Towns.

Well-pumping rules

Well-pumping Rules and Regulations for existing uses of groundwater in Division 3, as required by Colorado Senate Bill SB 04-222, are to prevent injury to water right holders; provide for sustainable groundwater supplies; and prevent interference with the Compact. Proposed rules, which may be finalized in early 2018, will require all well owners to meet one of the following criteria:

- Join a Groundwater Management Subdistrict
- Have an approved Plan of Augmentation for their well
- Cease use of their well

Once the Rules are finalized, the Towns must replace approximately 17% of groundwater pumping. The source of replacement water will most probably be through acquiring and transferring agricultural water resources within the basin.

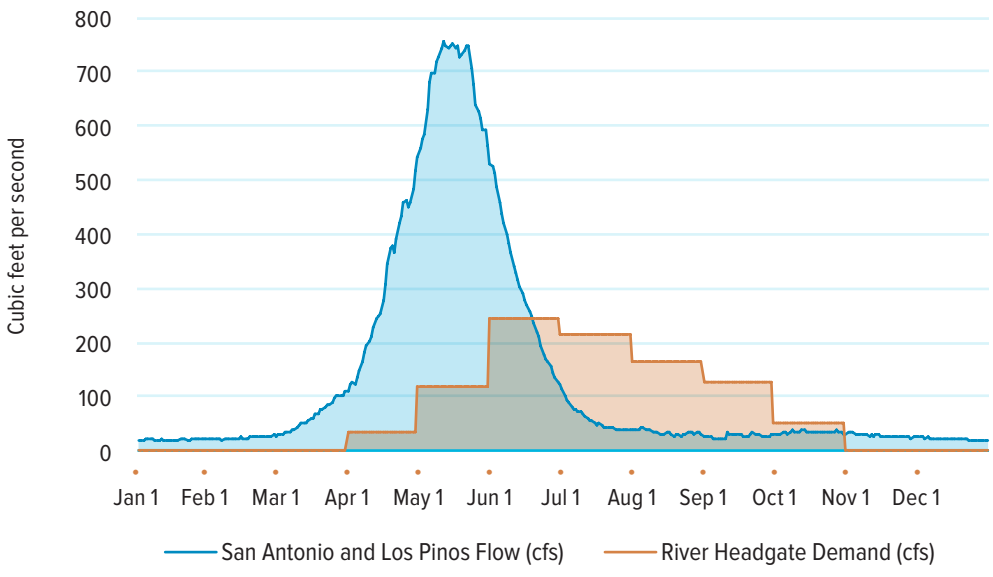
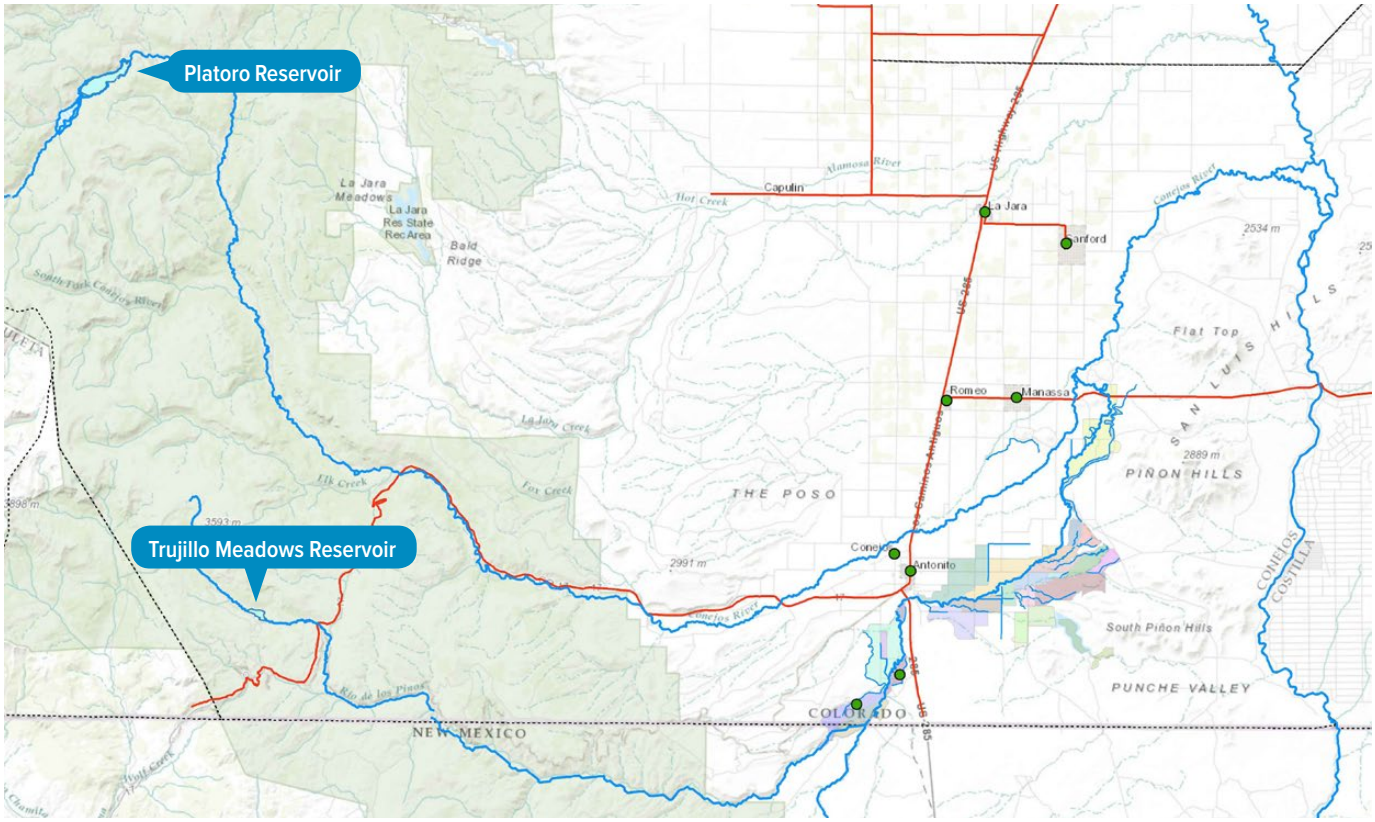


FIGURE ES 1.

San Antonio and Los Pinos Flows v. Irrigation Water Requirement

FIGURE ES 2. Trujillo Meadows Location Map



Towns' water needs

Estimate of pumping

DiNatale Water assessed potential future municipal augmentation demand for projected well pumping by Towns in the CWCD. Table ES 1 provides estimated pumping, consumptive use (CU), and return flow for the selected Towns and rural residential areas for 2013 and 2050.

Estimate of well replacements

The Towns within the CWCD are not currently required to replace their well-pumping depletions. However, they will be required to do so once the rules and regulations requiring augmentation of pumping depletions are adopted. Table ES 2 shows the amount and location of estimated well-pumping replacements that will be required of the Towns based on projected 2050 well pumping.

Estimate of dry-up acres

With the current water resources and operations in the Conejos watershed, agricultural water rights are a potential source of water for meeting municipal well-pumping augmentation requirements. Based on the projected augmentation requirement and assuming that storage volume is not a limiting constraint, it is estimated that between 660 and 1,900 irrigated acres would be required to be dried up to meet the Towns' required well-pumping replacements. The variation in dry-up acres is dependent upon the location and seniority of the agricultural water right and availability of storage.

TABLE ES 1.

Estimate of Pumping by Towns in Conejos County

			2013 Acre-Feet			2050 Acre-Feet		
County	Towns and Rural Residential	CU Factor	Pumping	CU	Return Flow	Pumping	CU	Return Flow
Conejos	Manassa	0.507	614	311	303	658	334	324
	Sanford	0.507	601	305	296	644	327	317
	La Jara	0.507	450	228	222	482	244	238
	Antonito	0.507	230	117	113	246	125	122
	Romeo	0.507	70	35	35	75	38	37
	Rural Residential (Conejos, Ortiz, San Antonio, etc.)	0.218	704	153	551	754	164	590
	Total		**2,669**	**1,150**	**1,519**	**2,860**	**1,230**	**1,230**

TABLE ES 2. Conejos and Alamosa-La Jara Response Areas Projected Augmentation for 2050 Pumping per Stream Reach

	Conejos Response Area							
	Conejos above Seledonia/ Garcia	Conejos below Seledonia/ Garcia	Rio Grande Del Norte-Excelsior	Rio Grande Excelsior-Chicago	Rio Grande Chicago-State Line	Alamosa River	San Antonio River	Total
Town	2.87%	12.03%	0.32%	0.47%	1.67%	0.42%	-0.41%	
Manassa	18.9	79.1	2.1	3.1	11.0	2.7	-2.7	114.2
Sanford	18.5	77.5	2.1	3.0	10.7	2.7	-2.7	111.7
Antonito	7.1	29.6	0.8	1.2	4.1	1.0	-1.0	42.8
Romeo	2.2	9.0	0.2	0.4	1.3	0.3	-0.3	13.0
Rural Residential (includes San Antonio, Conejos, and Ortiz)	21.6	90.7	2.4	3.5	12.6	3.1	-3.1	130.9
Total	**68.2**	**286.0**	**7.6**	**11.1**	**39.7**	**9.9**	**-9.8**	**412.6**

	Alamosa-La Jara Response Area						
	Conejos above Seledonia/ Garcia	Conejos below Seledonia/ Garcia	Rio Grande Del Norte-Excelsior	Rio Grande Excelsior-Chicago	Rio Grande Chicago-State Line	Alamosa River	Total
Town	0.21%	5.72%	2.69%	3.60%	-0.71%	0.76%	
La Jara	1.0	27.6	13.0	17.3	-3.4	3.7	59.1

Evaluation of Trujillo Meadows Reservoir enlargement

We analyzed the feasibility of enlarging Trujillo Meadows Reservoir. Analyses included:

- Estimation of inflows into Trujillo Meadows and flows in the Los Pinos River
- Federal reserved water rights on the Los Pinos
- Summarizing Rio Grande Compact issues
- Wetlands, biological, and other environmental investigations
- Environmental permitting requirements
- New Mexico's use of water on the Los Pinos before it flows back into Colorado

History of dam construction and repairs

The Trujillo Meadows dam, originally constructed in 1956, has had excessive and chronic seepage problems since the initial reservoir filling, mainly through the landslide deposits on the left dam abutment. In the 1990s, repairs were made to the dam to reduce seepage. The seepage from the reservoir through the landslide deposits continued to be excessive after the repairs. Nearly six cubic feet per second (cfs) of seepage (2,700 gallons per minute) was measured by flume in 2004 and the dam and reservoir were placed under a storage restriction by the State Engineer. Additional sections of the left abutment, including the spillway channel, were lined several years later with a synthetic PVC liner to reduce the seepage. During the synthetic liner construction in 2010, large sink holes developed in the spillway channel. Following this development, additional lining work was completed in the spillway channel. Seepage remains a concern. Figure ES 3 shows a sinkhole in the dam spillway channel.

Enlargement cost and geotechnical evaluation

Two options were considered for increasing Trujillo Meadows storage:

Option 1, constructing a new, higher dam at the existing location, will have an estimated cost of $17,330,000, or $4,700 per AF (2017 dollars), increasing the total reservoir storage to approximately 4,300 AF. We anticipate that extensive work will be required to reduce the potential for seepage through the landslide deposits on the left abutment. Even with this work, there will be significant risks for excessive seepage, shown in Figure ES 4.

FIGURE ES 3. Sinkhole in Trujillo Meadows Spillway Channel

FIGURE ES 4. Measurement of Seepage From Left Abutment in June 2017

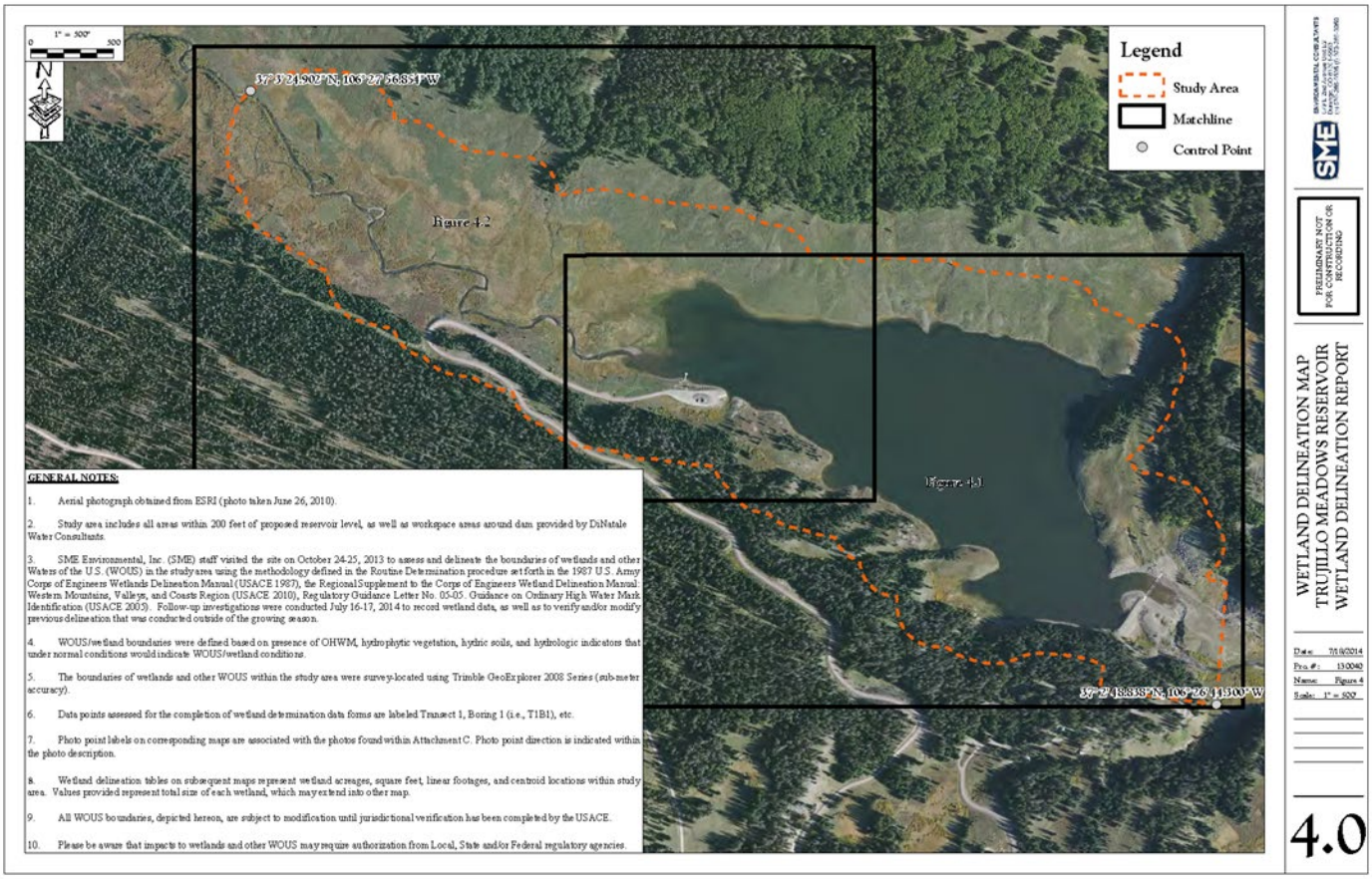
Option 2, constructing a new dam upstream and away from the landslide, requires a much larger embankment but appears to have fewer technical issues and could address the ongoing seepage concerns. A dam with a structural height of approximately 80 feet will store approximately 5,750 AF. Cost estimates for this option are approximately $22,600,000, or $3,400 per AF (2017 dollars).

Environmental and permitting evaluation

Environmental analysis of the dam and reservoir enlargement area included 55 acres of wetlands, 70 acres of open water, and 8,775 linear feet of stream (4 acres) in the study area, shown in Figure ES 5. Results of the environmental surveys revealed the following:

- Approximately 40 acres of wetlands in the Trujillo Meadows area would be potentially impacted by the maximum reservoir enlargement under the new dam option.
- No fens, which are high quality organic soils that have special protection requirements, were located.
- The project would not qualify for a general (nationwide) U.S. Army Corps of Engineers (USACE) 404 permit.
- Authorization from the USACE would be required under an Individual Permit in three steps:
  - Pre-application consultation
  - Formal permit application
  - Decision making

FIGURE ES 5. Trujillo Meadows Study Area for Environmental Surveys



Impacts of Federal Reserved Water Right on ability to store water

Water Court approvals will be required to obtain a new storage right or direct flow storage right in Trujillo Meadows Reservoir. The Federal Reserved water right on the Los Pinos limits the opportunity to store water in Trujillo Meadows. As shown in Table ES 3, in total between 1980–2014, Trujillo Meadows would have opportunity to store in December, January, and February only 6% of the time due to the senior Federal Reserved right. Rio Grande Compact Article VII restrictions will at times also limit the winter storage opportunity under a new storage right since Trujillo Meadows is a post-Compact reservoir.

Stakeholder Outreach

1. Federal and state agencies met on a field trip to Trujillo Meadows on September 22, 2015 for discussions about impact and benefits from a potential enlargement. A second meeting on October 31, 2017 updated United States Forest Service (USFS) staff on the project and potential operations. USFS staff provided input on the evaluation of the Federal Reserved Water Right on Los Pinos.
2. Agricultural stakeholders that have rights diverting from Los Pinos or San Antonio Rivers met June 5, 2017 at the CWCD office to discuss the TMR Study and potential concerns, comments, and ideas.
3. The Division Engineer was consulted on potential Rio Grande Compact, direct flow storage, and other water rights and administration issues.
4. Representatives of the Towns within the CWCD boundaries met at the CWCD office on October 31, 2017 to discuss the TMR Study, the pending well-replacement rules, and plans for the Towns to meet the replacement requirements.

TABLE ES 3.

Estimated Days Per Month Flow at QP 22H Above Federal Instream Flow Right

	Number of days flow at QP 22H above monthly base flow			
	Total 1980-2014	Dry Year (25%, 1988)	Avg Year (50%, 1999)	Wet Year (75%, 1997)
Jan	5%	0%	0%	0%
Feb	5%	0%	0%	0%
Mar	14%	0%	32%	52%
Apr	28%	70%	38%	43%
May	19%	13%	23%	32%
Jun	15%	30%	17%	0%
Jul	34%	19%	79%	71%
Aug	24%	23%	50%	48%
Sep	24%	13%	35%	70%
Oct	30%	3%	21%	68%
Nov	23%	0%	42%	63%
Dec	9%	0%	19%	10%

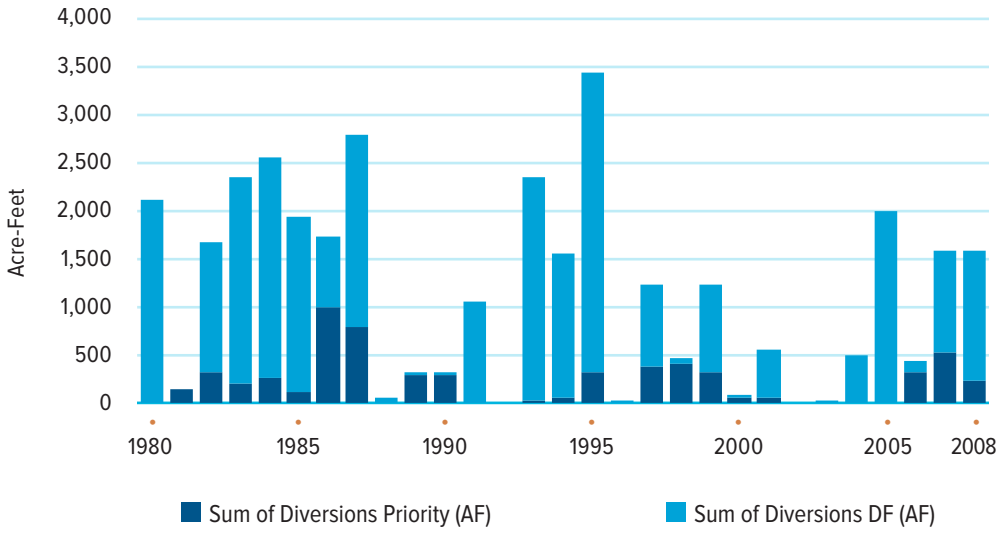


FIGURE ES 6.

Modeled Diversions to Trujillo Meadows From 1980–2008

- Under Priority Storage (2,000 AF of Storage Space)
- Direct Flow Storage (DF) (2,000 AF of Storage Space)
- Federal Reserved Instream Flow Right Modeled

Water operations model

We developed a water operations model for this study and incorporated it into the existing RiverWare Rio Grande Basin Planning model developed as part of the Rio Grande Basin Implementation Plan. Flexibility in the RiverWare modeling platform allows for simulation of variable reservoir operations and administration of the Rio Grande Compact.

The model allows for the following analyses:

- Tracking Trujillo Meadows Reservoir storage and releases for meeting existing uses, reducing agricultural shortages, and revealing changes to streamflows below Trujillo Meadows
- Evaluating potential changes to Platoro operations to meet augmentation demands
- Implementing Rio Grande Compact requirements and ensuring compliance with the Compact
- Replacement of Colorado Parks and Wildlife's (CPW's) obligations for replacement of Trujillo Meadows evaporation.

Modeling indicates that the Federal Reserved Water Rights significantly limits the ability to retime water in Trujillo Meadows. Even if there was unlimited storage space, the ability to store water under a new priority storage right would only exceed 2,000 AF in extremely high flow years as shown in Figure ES 6. The modeling of flow retiming reveals that although a priority storage water right may be beneficial, a maximum of 2,000 AF of storage is needed in most years. According to modeling, having new active storage in Trujillo Meadows for both priority and direct flow storage water rights does allow greater releases of supplemental irrigation water in mid-summer.

Multiple benefits of the project

Although the goal of the TMR Study is to evaluate if an enlargement of Trujillo Meadows could provide for an improved irrigation supply for San Antonio agricultural users and reduce the need to dry up irrigated land to meet the Towns' well-replacement requirements, the study found multiple benefits.

A schematic describing the components of the ATM operations and benefits is shown in Figure ES 7.

Improved agricultural deliveries and minimizing dry up of irrigated lands

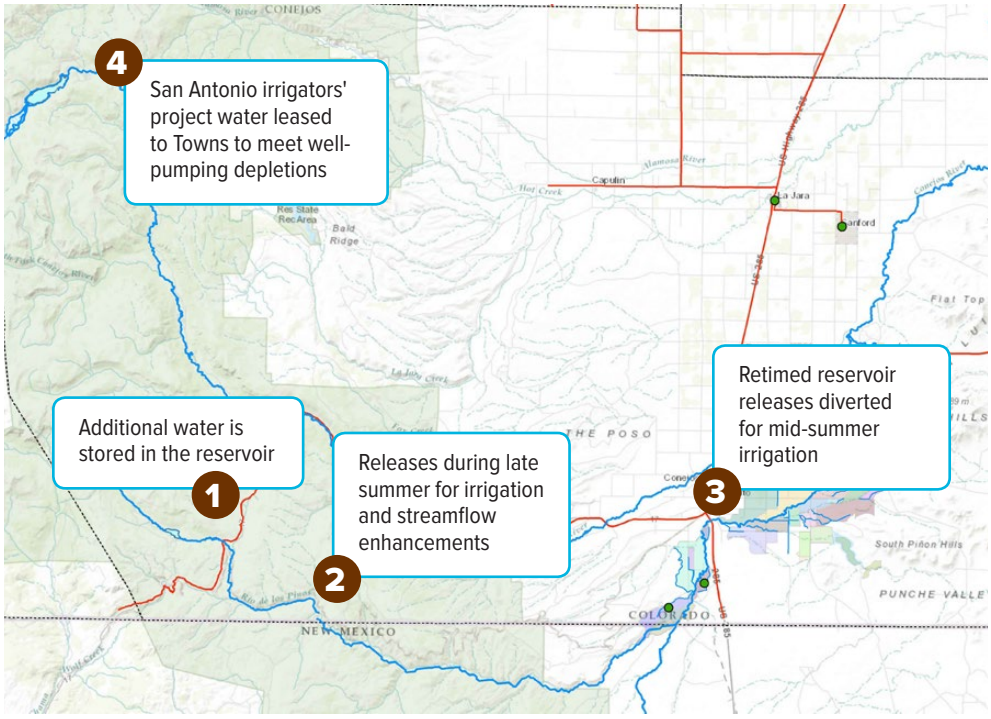
The San Antonio and Los Pinos Rivers peak runoff is much earlier in the year than is optimal for irrigation purposes, causing the peak flow to run downstream prior to about June 15 and leaving irrigators short after about June 15. Providing storage that can be filled with either a new storage right and/or through direct flow storage would much more equitably spread the burden of the Rio Grande Compact to all water users on the Conejos system. The addition of late-summer reservoir water would help bridge the gap of agricultural shortages and potentially allow another cutting of hay, a common crop on the San Antonio and Los Pinos systems. The Federal Reserved Water Right limits the ability to use direct flow storage in every year. A lower reservoir near Ortiz would provide better opportunities to use direct flow storage.

Improved Rio Grande Compact and river administration

A reservoir enlargement and dynamic operation of stored water in the enlarged reservoir provides regulation to the previously unregulated Los Pinos and San Antonio River systems as well as an opportunity for water rights holders to trade Platoro Project Water that has previously been unusable to them for storage on Los Pinos. In addition, providing Compact storage space accessible to the Division Engineer can reduce the risk of over-and under-delivery of the Compact.

FIGURE ES 7.

Schematic of Trujillo Meadows Project



Flooding minimization

The ability to store water in Trujillo Meadows, while situated high in the basin, could still reduce flows near San Antonio and reduce the risk of flooding in the spring. A lower reservoir near Ortiz would provide better flood control benefits since it could capture more of the basin flows.

Supply to meet towns' well-replacement requirements

Additional direct flow and priority storage for agricultural users will improve water supplies to agricultural users. With support for funding for the development of additional storage, the agricultural users could lease their Platoro Project water to the Towns to meet a portion of the Towns' well-replacement requirements. This water could be provided to Subdistrict No. 3 for partial payment of the Towns' contribution for well-pumping replacement.

Enhanced mid-summer flows

Additional releases of water in mid-summer will enhance stream and riparian values through a prolonged release of additional flow after the peak runoff, improving aquatic habitat quality and species diversity downstream due to prolonged stream volume, lower temperatures, and higher levels of dissolved oxygen.

Enhanced CPW operations

An active storage pool in Trujillo Meadows would provide an additional location for CPW to store and regulate its transmountain water supplies. Storage of CPW's transmountain supplies in Trujillo Meadows would increase total usable storage in the San Luis Valley, improving the yield of these water rights and allowing CPW to directly enhance streamflows in the Los Pinos and San Antonio Rivers. An enlargement of Trujillo Meadows would also result in increased surface acres and shoreline miles that would provide benefits for wildlife use and wildlife-related recreation (fishing, hunting, wildlife watching) and boating.

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Conclusion

Building a new dam at Trujillo Meadows Reservoir will provide active storage for retiming supplies and enhancing streamflows, improve dam safety, and reduce potential flooding. This TMR Study found no environmental fatal flaws, and the project could be permitted. However, the Federal Reserved Water Rights significantly limit the ability to store water and thus re-operate the reservoir.

Recommendations

An analysis of a storage site near Ortiz should be prepared and compared to the benefits of a Trujillo Meadows Reservoir enlargement. Coordinated operations between reservoir(s) on Los Pinos/San Antonio and Platoro Rivers could provide multiple benefits including enhanced riparian habitat and streamflows on these river systems. An alternative site located near Ortiz would not be impacted by Federal Reserved Water Rights and have a better ability to store water and also would provide greater flooding minimization than an enlargement of Trujillo Meadows Reservoir.

El Coda Lateral Canal

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Deere & Ault Consultants and SME Environmental Consultants performed investigations integral to this report.