Five Ditches: Rio Grande Diversion and Headgate Improvement Project

Final Report prepared for CWCB – May 2020

Colorado Rio Grande Restoration Foundation
Rio Grande Headwaters Restoration Project

The Mission of the Rio Grande Headwaters Restoration Project is to restore and conserve the historical functions and vitality of the Rio Grande in Colorado for improved water quality, agricultural water use, riparian health, wildlife and aquatic species habitat, recreation, and community safety while meeting the requirements of the Rio Grande Compact

Colorado Rio Grande Restoration Foundation
Rio Grande Headwaters Restoration Project

Final Report Executive Summary
Project Title: Five Ditches: Rio Grande Diversion and Headgate Improvement Project
CWCB WSRA Grant Contract Number: POGG1 2018-971

Project Start Date: November 15, 2017 **Project Completion Date:** April 30, 2020

FUNDING

CASH	
CWCB WSRF - #POGG1 2018-971	$ 980,000.00
CWCB WSRF - #POGG1 2017-1000	$ 90,000.00
Landowner Contributions	
Rio Grande #2 Shareholders	$ 14,000.00
Consolidated Ditch CWCB Loan	$ 805,919.00
SLV Canal CWCB Loan	$ 196,463.06
Centennial Ditch CWCB Loan	$ 226,792.20
NRCS - Cash	$ 434,705.00
NAWCA Grant – Cash	$ 50,500.00
Subtotal Cash	*$ 2,798,379.50*
IN-KIND	
Natural Resources Conservation Service	$ 180,000.00
Landowners	$ 6,000.00
RGHRP	$ 6,000.00
Subtotal In-kind	*$ 192,000.00*
TOTAL FUNDING	**$2,990,379.50**

EXPENDITURES

Expenditures of CWCB WSRF Funds	$980,000
Expenditures of CWCB Loan Funds	$1,229,174.50
Other Expenditures	$781,205.00
TOTAL EXPENDITURES	**$2,990,379.50**

Summary Accomplishments

The Five Ditches: Rio Grande Diversion and Headgate Improvement Project (Project) was a diversion dam and headgate replacement project completed through a partnership with the Rio Grande Headwaters Restoration Project (RGHRP) and five ditches. The goal of the Project was to replace aging and inefficient diversion infrastructure for the five ditches at four sites on the Rio Grande, while improving streambank and channel conditions at each site. The Project included construction of three diversion dams and three headgates. In addition to replacing infrastructure, the Project included the stabilization of 4000 feet of streambank adjacent to the diversion sites. Throughout project implementation the RGHRP gave tours, developed outreach materials, and provided updates to community groups as part of outreach and education. The RGHRP will continue to give tours and complete long-term monitoring to ensure that the project objectives stand the test of time. Benefits of the Project include improved diversion efficiencies and reduced maintenance, enhanced water quality, improved riparian condition, increased capacity for sediment transport, improved aquatic and wildlife habitat, improved public safety and recreation opportunity, and increased public involvement in water improvement activities.

INTRODUCTION and BACKGROUND

The Colorado Rio Grande Restoration Foundation (Foundation) is the fiscal agent for the Rio Grande Headwaters Restoration Project (RGHRP). The RGHRP was formed to implement the recommendations of the 2001 Study. The 2001 Study was prompted by a group of citizens who were concerned that the Rio Grande had been impaired. The 2001 Study, sponsored by the San Luis Valley Water Conservancy District and funded by the Colorado Water Conservation Board, analyzed 91 miles of the Rio Grande from South Fork to the Alamosa/Costilla County line. This reach was identified as the portion of the Rio Grande in Colorado that has been most impacted by human intervention over the past 100 years. The 2001 Study analyzed the vegetation, human impact, agricultural disturbance, geomorphology, hydrology, wildlife habitat, condition of structures, and aquatic habitat within the 91-mile study reach.

Since 2001, the RGHRP has accrued a successful record of working with landowners, and local, state, and federal entities to improve the condition and function of the Rio Grande. To date, the RGHRP has completed 10 cost-share restoration projects on 62 sites to improve the condition of over 11 miles of streambanks on the Rio Grande. These projects reduce sediment loading by stabilizing the streambanks, improve the riparian and upland habitat by increasing willow and riparian vegetation cover, enhance the fishery, increase the capacity of the Rio Grande to transport sediment, and recover the condition of wetlands located throughout the riparian area. In 2010, the RGHRP began working with ditch companies to address concerns surrounding aging and inefficient diversion and headgate structures. The first of these projects was the Plaza Project in the Sevenmile Plaza area of Rio Grande County, which included planning efforts in the region followed by the replacement of the McDonald and Prairie Ditches' headgates and diversion dams.

The Five Ditches: Rio Grande Diversion and Headgate Improvement Project continues to improve the health of the Rio Grande. The project area is located throughout Rio Grande County, from just downstream of Del Norte, CO to almost the county line. The Project includes four diversions that serve five ditches: the Rio Grande #2 Ditch, the Consolidated Ditch, the Pace Ditch, the San Luis Valley Canal, and the Centennial Ditch. These ditches each suffered inefficiencies and labor-intensive, dangerous maintenance as a result of aging infrastructure. Headgate and diversion structures at several of the sites had been constructed in the early 1900s. While these structures served their ditches well, over time they began to suffer decreased functionality, which impacted the ditches' ability to divert water. The Five Ditches Project addressed these issues by replacing three diversion dams and three headgates and installing trash racks and deflectors. The Project also restored riparian areas, shaped the channel, and maintained or improved fish and boat passage as appropriate at each site. All elements of the Project were completed by Spring 2020.

PROJECT OBJECTIVES, TASKS, and ACTIVITIES

The proposed objectives of the Project were to:

1. Improve diversion efficiency and reduce maintenance by replacing the aging Rio Grande Ditch #2 diversion dam and headgate;
2. Improve diversion efficiency and reduce maintenance by replacing the aging Consolidated Ditch and Pace Ditch headgates, installing automated water gates, and replacing the Consolidated and Pace Ditch diversion dam;
3. Improve diversion efficiency and reduce maintenance by replacing the aging San Luis Valley Canal headgate and installing automated water gates
4. Improve diversion efficiency and reduce maintenance by replacing the aging Centennial Ditch diversion dam;
5. Enhance water quality by reducing erosion and sediment input;
6. Improve riparian condition by stabilizing up to 3,500 feet of streambanks in the project area;
7. Increases the capacity of the Rio Grande to transport sediment;
8. Improve aquatic and wildlife habitat;
9. Improve local recreation by including fish and boat passage in the new diversion structures where applicable;
10. Promote public involvement in water improvement activities through public outreach and education.

The following passages detail how these objectives were met, modified, and in some cases exceeded, through the completion and planned completion of Project Tasks.

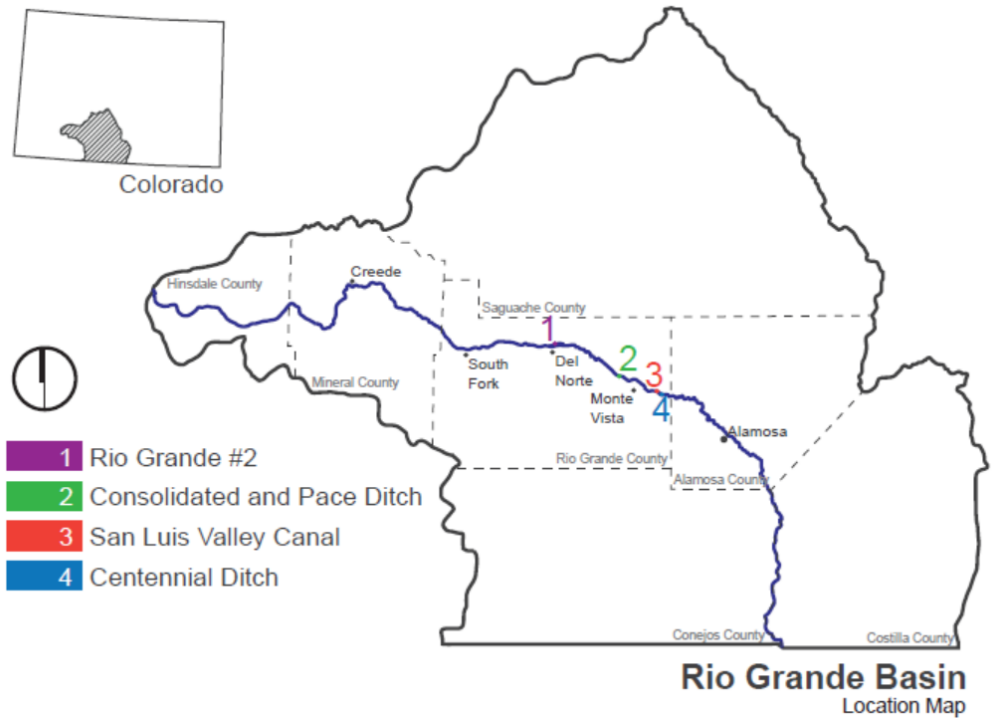

Figure 1. Five Ditches Project location in the Rio Grande Basin.

Task 1: Complete Design of Project Elements

Description of Task: Complete final designs and permitting for the project elements, which include the Consolidated and Pace headgates, diversion dam, and surrounding streambank stabilization; the Rio Grande #2 diversion dam, headgate, and surrounding streambank stabilization; the San Luis Valley Canal headgate and surrounding streambank stabilization; and the Centennial Ditch diversion dam and surrounding streambank stabilization.

Activities: Riverbend Engineering was hired to complete designs and permitting for the Rio Grande #2, San Luis Valley Canal, and Centennial Ditch project elements. Final designs and permitting for the Rio Grande #2 and Centennial Ditch elements were completed in Fall 2017. Designs and permitting for the San Luis Valley Canal elements were completed in Fall 2018. The Natural Resource Conservation Service (NRCS) partnered with the RGHRP to complete the final designs and permitting for the Consolidated and Pace Ditch project elements. Designs for the headgate and trash rack structures, along with the permitting for all Consolidated and Pace Ditch elements, were completed in Fall 2017. At the request of Colorado Parks and Wildlife and the Consolidated Ditch Company, modifications were made to the original concrete diversion designs. Final designs for the Consolidated and Pace diversion dam were completed in Fall 2018.

Figure 2. Site visits with project partners and engineers during the design process.

Task 2: Rio Grande #2 Diversion and Headgate Construction
Description of Task: Replace the Rio Grande #2 diversion with a stacked rock cross weir that maintains fish and boat passage; replace the headgate with a new steel headgate box and sluice way; install a rock trash deflector; and implement channel shaping, streambank stabilization and riparian and aquatic habitat improvements upstream and downstream of the diversion site.

Activities: The Rio Grande #2 shareholders and the RGHRP hired Cooley & Sons Excavating in January 2018 to complete all construction, as designed by Riverbend Engineering. Mackey Construction Company was hired to fabricate the new steel headbox. Cooley & Sons mobilized in February 2018, hauling rock, placing rock for the new cross vein diversion, placing rock for the trash deflector, and installing the new headgate box. Cooley & Sons also completed channel shaping, 750 feet of bank stabilization and restoration, and revegetation with willow transplants upstream and downstream of the diversion during this construction period. Construction was completed in March 2018.

Figure 3. *Top Left*: Old diversion structure. *Top Right:* Old headgate sturcutre. *Middle:* Placing rocks for the new diversion dam. *Bottom:* Completed concrete diversion structure, headgate, and trash deflector.

TASK 3: Consolidated and Pace Diversion and Headgate Construction

Description of Task: Replace the existing Consolidated and Pace diversion with a concrete diversion dam with a radial sluice gate and a fish ladder. The new diversion will maintain existing boat passage. Replace the Consolidated headgate with a concrete headgate that includes automated gates. Replace the Pace headgate with a manual slide gate and pipe to deliver water to the Pace Ditch. Implement channel shaping, streambank stabilization, and riparian habitat improvements upstream and downstream of the Consolidated and Pace diversion and headgate structures.

Activities: The Consolidated Ditch Company and RGHRP hired Robins Construction to complete the headgate and dam replacement and bank improvements in October 2017. The new trash rack, Consolidated and Pace headgates, and sluice were completed in March 2018, and were operational for the 2018 irrigation season. Robins Construction re-mobilized in November 2018, constructing a coffer dam around the diversion site, removing the old dam, and constructing a new concrete diversion dam with two Obermeyer gates for fine control and sediment flushing and a fish ladder. The dam was completed in May 2019. Robins also reshaped streambanks upstream and downstream of the diversion, revegetating with willow transplants. A rock barb was added just upstream of the trash rack to aid in trash deflection. This work was completed April 2019. In Fall of 2019 additional channel shaping, streambank stabilization and riparian restoration was completed upstream of the new diversion dam.

Figure 4. Before and after pictures of the Consolidated headgates and diversion dam.

TASK 4: San Luis Valley Canal Headgate Construction
Description of Task: Replace the San Luis Valley Canal headgate with a concrete headgate that includes automated gates. Implement channel shaping, streambank stabilization, and habitat improvements up and downstream of headgate structure.

Activities: The San Luis Valley Canal Company and RGHRP hired Cooley & Sons to replace the Canal headgate in October 2018. Cooley & Sons mobilized in December 2018, building a coffer dam, beginning earthwork, and dewatering the site. The concrete structure was framed and poured throughout the winter. The surrounding banks were shaped and revegetated with willows and the gates and floating pipe trash deflector were installed. The project was completed in March 2019.

High water during Summer 2019 washed out the bank downstream of the new headgate, bypassing the headgate and causing damage to the streambank and ditch. The new headgate was not damaged during the high water. Following the high water, the project engineer and contractor planned for and implemented repairs that included rebuilding the damaged streambank, raising the elevation of the bank and installing additional rock bank protection to prevent similar bank failure in future high flows bank. This work was completed in Fall 2019.

Figure 5. Before and after pictures of the San Luis Valley Canal headgate.

Figure 6. Streambank stabilization downstream of the San Luis Valley Canal Headgate.

TASK 5: Centennial Ditch Diversion Construction
Description of Task: Replace the Centennial Ditch diversion with a grouted rock diversion. Implement channel and streambank stabilization and habitat improvements up and downstream of headgate structure.

Activities: The Centennial Ditch Company and RGHRP hired Robins Construction to replace the diversion dam in October 2017. Robins Construction mobilized in January 2018, building a coffer dam and dewatering half of the channel. After completing earthwork on the southern half of the channel, they placed rocks for the diversion, grouted them with concrete, and installed an Obermeyer gate. Then, they removed the coffer dam and built a new one on the north side of the channel, completing the other side of the dam by March 2018. Channel shaping was completed upstream and downstream of the site and the area was revegetated with willow transplants. In Spring 2020, Robins Construction built a concrete measuring structure in the ditch to improve the measurement accuracy.

Figure 7. Before and after pictures of the Centennial diversion dam.

Figure 8. Obermeyer gate installed in the Centennial diversion dam.

TASK 6: Project Monitoring
Description of Task: Monitor each project site for two years using the RGHRP Sampling and Analysis Plan (SAP).

Activities: Project engineers with NRCS and Riverbend Engineering in partnership with the RGHRP completed pre-construction surveys, cross section transects, photographic documentation, and visual stream assessments for each project site. Post-construction as-built surveys of for each of the new diversion and headgate structures and surrounding area have been completed by project engineers. These surveys, along with long-term monitoring will map locations and features of the streambanks, diversion and headgate, and riparian areas over time. Photo documentation will be used to track conditions of the riparian and shoreline plant communities, bank stabilization, and overall visual condition of the Project area. Project engineers will complete a biannual inspection that classifies the condition and function of the headgate and diversion structures. The RGHRP will be responsible for the long-term monitoring of the Five Ditches Project.

TASK 7: Outreach and Education
Description of Task: Conduct public outreach and education to raise awareness of Project activities and the RGHRP efforts and encourage other landowners to participate in future projects.

Activities: The RGHRP developed visual aids and written materials showing the specific sites and work. This included a project video made by Moxiecran Media (https://vimeo.com/364411112), which was used in presentations at local meetings and events as well as a presentation at the Sustaining Colorado Watersheds Conference. Education materials were used during tours of the site, which were given before, during and after project construction with groups including the Rio Grande Basin Roundtable, Water Education Colorado, Intermountain West Joint Venture, college classes, community groups and others. Presentations and project updates were made at meetings of the Rio Grande Water Conservation District, San Luis Valley Water Conservancy District, the Rio Grande Water Users, and other public meetings. The RGHRP also shared construction updates in newsletters, social media, and local press. These outreach efforts met the objective of promoting public involvement in water improvement activities.

Figure 9. Five Ditches site visit during Water Education Colorado's Rio Grande Basin Tour.

TASK 8: Project Management and Administration
Description of Task: Complete project oversight, management, and partner coordination. Complete all necessary contracts, status reports, and internal and external documents. Ensure tasks are completed within approved costs and timelines.

The RGHRP managed and administered Five Ditches Project. This included coordinating project partners; securing project funds; completing contracts with the CWCB, project partners, landowners, and contractors; obtaining the necessary permits; soliciting bids and working with each ditch company to hire contractors; managing budgets and reimbursement requests; and completing semi-annual and final reports. Additionally, the RGHRP performed project oversight, making certain project design and implementation was timely and accurate. The RGHRP organized outreach and education efforts and will complete long-term site monitoring.

FIVE DITCHES BUDGET

Project Tasks	Total	Sources of Funds - Cash Contribution					In-kind Contributions			Total
		CWCB WSRF #POGG1 2018-971	CWCB WSRF #POGG1 2017-1000	NRCS	Landowners (CWCB Loans & Cash)	NAWCA Grant	NRCS	Landowner	RGHRP	
Task 1: Complete Design of Project Elements										
Survey, design, and permitting for Task 2	$ 16,000.00	$ -	$ 16,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,000.00
Survey, design, and permitting for Task 3	$ 180,000.00	$ -	$ -	$ -	$ -	$ -	$ 180,000.00	$ -	$ -	$ 180,000.00
Survey, design, and permitting for Task 4	$ 32,000.00	$ -	$ 32,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ 32,000.00
Survey, design, and permitting for Task 5	$ 28,000.00	$ -	$ 28,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ 28,000.00
Total Task 1	$ 256,000.00	$ -	$ 76,000.00	$ -	$ -	$ -	$ 180,000.00	$ -	$ -	$ 256,000.00
Task 2: Rio Grande #2 Diversion and Headgate Construction										
Diversion and Headgate Replacement	$ 67,800.82	$ 47,800.82	$ -	$ -	$ 14,000.00	$ -	$ -	$ 6,000.00	$ -	$ 67,800.82
Channel Shaping and Riparian Restoration	$ 12,000.00	$ 12,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,000.00
Control	$ 5,000.00	$ 5,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000.00
Total Task 2	$ 84,800.82	$ 64,800.82	$ -	$ -	$ 14,000.00	$ -	$ -	$ 6,000.00	$ -	$ 84,800.82
Task 3: Consolidated and Pace Diversion and Headgate Construction										
Headgate and Trash Rack Replacement	$ 663,394.82	$ 161,209.78	$ -	$ 225,000.00	$ 277,185.04	$ -	$ -	$ -	$ -	$ 663,394.82
Diversion Replacement	$ 862,525.20	$ 238,791.00	$ -	$ 95,000.00	$ 528,734.20	$ -	$ -	$ -	$ -	$ 862,525.20
Channel Shaping and Riparian Restoration	$ 114,705.00		$ -	$ 114,705.00	$ -	$ -	$ -	$ -	$ -	$ 114,705.00
Total Task 3	$ 1,640,625.02	$ 400,000.78	$ -	$ 434,705.00	$ 805,919.24	$ -	$ -	$ -	$ -	$ 1,640,625.02
Task 4: San Luis Valley Canal Headgate Construction										
Headgate Replacement	$ 332,071.25	$ 168,774.94	$ -	$ -	$ 163,296.31	$ -	$ -	$ -	$ -	$ 332,071.25
Channel Shaping and Riparian Restoration	$ 79,375.00	$ 14,726.25	$ -	$ -	$ 14,148.75	$ 50,500.00	$ -	$ -	$ -	$ 79,375.00
Control	$ 40,000.00	$ 20,982.00	$ -	$ -	$ 19,018.00	$ -	$ -	$ -	$ -	$ 40,000.00
Total Task 4	$ 451,446.25	$ 204,483.19		$ -	$ 196,463.06	$ 50,500.00	$ -	$ -	$ -	$ 451,446.25
Task 5: Centennial Ditch Diversion Construction										
Diversion Replacement	$ 384,950.20	$ 200,174.00	$ -	$ -	$ 184,776.20	$ -	$ -	$ -	$ -	$ 384,950.20
Channel Shaping and Riparian Restoration	$ 44,200.00	$ 22,984.00	$ -	$ -	$ 21,216.00	$ -	$ -	$ -	$ -	$ 44,200.00
Control	$ 40,000.00	$ 19,200.00	$ -	$ -	$ 20,800.00	$ -	$ -	$ -	$ -	$ 40,000.00
Total Task 5	$ 469,150.20	$ 242,358.00		$ -	$ 226,792.20	$ -	$ -	$ -	$ -	$ 469,150.20
Task 6: Project Monitoring										
RGHRP Staff	$ 2,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,000.00	$ 2,000.00
Total Task 6	$ 2,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,000.00	$ 2,000.00
Task 7: Outreach and Education										
Five Ditches Film - Moxiecran Media	$ 5,250.00	$ 5,250.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,250.00
Total Task 7	$ 5,250.00	$ 5,250.00		$ -	$ -					$ 5,250.00
Task 8: Project Management and Administration										
RGHRP Staff	$ 77,107.21	$ 63,107.21	$ 14,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ 77,107.21
Office and Staff In-kind support	$ 4,000.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,000.00	$ 4,000.00
Total Task 8	$ 81,107.21	$ 63,107.21	$ 14,000.00	$ -	$ -	$ -	$ -	$ -	$ 4,000.00	$ 81,107.21
TOTAL BUDGET	$ 2,990,379.50	$ 980,000.00	$ 90,000.00	$ 434,705.00	$ 1,243,174.50	$ 50,500.00	$ 180,000.00	$ 6,000.00	$ 6,000.00	$ 2,990,379.50
	Percent of Project Cost	33%	3%	15%	42%	2%	6%	0%	0%	100%

LESSONS LEARNED & FUTURE PROJECT RECOMMENDATIONS

RGHRP is continuing to implement the recommendations of the 2001 Study, 2007 Watershed Strategic Plan, and the recent completed Rio Grande Stream Management Plan by administering additional projects in the project area and in other reaches of the Rio Grande. The Five Ditches was the culmination of years of planning, coordination and fundraising that wouldn't have been possible without the collaboration of each ditch company, landowner, funder, and partner. Lessons learned from the planning and implementation of this project include:

- Communication between partners is critical to project success. Maintaining clear communication with project engineers, contractors, and partners throughout all stages of project implementation allows partners to address any unforeseen challenges or delays before they impact the project objectives, budget, and timelines.
- Secure the support of all surrounding landowners during the project planning phase and before construction begins. Landowner buy-in allows project partners to address streambank instability surrounding each diversion site in a wholistic fashion.
- Allow flexibility in both time and funding for contingency plans in the case of unexpected challenges, such as high river flows and extreme weather conditions.
- For all instream infrastructure projects, consult Colorado Parks and Wildlife at the beginning of the design process to ensure aquatic considerations fit with CPW's management goals for the stream reach.
- Build robust partnerships and community support. The RGHRP worked hard to build community support and engagement from the very beginning of the Five Ditches Project. This support helped move the project forward when there were road bumps.
- Continue to organize a variety of tours and volunteer events to provide opportunities for community involvement and ownership in Projects.
- Track all project timelines and complete needed reports in advance of deadlines.

The Five Ditches Project improved water diversion and management efficiency on the Rio Grande for five ditches. There are many other diversions and headgates in need of repair or replacement throughout the Rio Grande identified in the 2001 Study and the Rio Grande Stream Management Plan (SMP). Additionally, irrigation infrastructure improvements and riparian restoration is needed along the Conejos River and Saguache Creek as identified in the Conejos River and Saguache Creek SMP. Additional ditch companies on the Rio Grande and Conejos River have been working with the RGHRP to coordinate structural and riparian restoration plans. Lessons learned throughout the Five Ditches Project will be applied to future projects implemented by the RGHRP.

ACKNOWLEDGMENTS

The successful completion of the Five Ditches Project is a testament to hard work, collaboration, and coordination with landowners, project partners, stakeholders and funders. Project partners include the Rio Grande #2 shareholders, Consolidated Ditch and Headgate Company, Pace Ditch, San Luis Valley Canal Company, Centennial Irrigating Ditch Company, National Resource Conservation Services, Riverbend Engineering, Robins Construction, Cooley and Sons Excavating, Colorado Parks and Wildlife, Colorado Division of Water Resources, the Rio Grande Inter-Basin Roundtable, Colorado Water Conservation Board, and others.

Special thanks to the Colorado Water Conservation Board for providing grant and loan funds for the continued efforts to improve the overall condition of the Rio Grande. This great project would not have been possible without your support!

For More Information, Contact
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