Alternative Transfer Methods in Colorado

Status Update, Framework for Continued Support, and Recommendations for CWCB Action

Perry E Cabot
Nora E Flynn
Blake Osborne
Reagan M Waskom
Colorado Water Center

Colorado State University,
Colorado Water Center

Brett Bovee
West Water Research, LLC

Dan Brown
Fischer, Brown, Bartlett
& Gunn, PC

Luke Gingerich
J-U-B Engineers, Inc

August 2020

CoWC Special Report No. 34

Acknowledgements

The authors would like to thank the Colorado Water Conservation Board for their financial support of this project. Alexander Funk of the Colorado Water Conservation Board provided tremendous support and guidance throughout the project. We appreciate the various comments and feedback received from Basin Roundtable members, Advisory Committee members and others.

Disclaimer:

This report was financed by the Colorado Water Conservation Board. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the State of Colorado Government.

Additional copies of this report can be obtained from the Colorado Water Center, Colorado State University, E102 Engineering Building, 1033 Campus Delivery, Fort Collins, CO 80523-1033, 970-491-6308 or downloaded as a PDF file from http://www.watercenter.colostate.edu.

Colorado State University is an equal opportunity/affirmative action employer and complies with all federal and Colorado laws, regulations, and executive orders regarding affirmative action requirements in all programs. The Office of Equal Opportunity and Diversity is located in 101 Student Services. To assist Colorado State University in meeting its affirmative action responsibilities, ethnic minorities, women and other protected class members are encouraged to apply and to so identify themselves.

Colorado Department of Natural Resources
Colorado Water Conservation Board
DQ1 PMAA 2020*0166

July 2020

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Alternative Transfer Methods in Colorado

Status Update, Framework for Continued Support, and Recommendations for CWCB Action

Photo Credit: Bill Cotton

WestWater Research LLC
COLORADO WATER CENTER
COLORADO STATE UNIVERSITY
J·U·B ENGINEERS, INC.
FISCHER, BROWN, BARTLETT & GUNN, PC

Alternative Transfer Methods in Colorado

Status Update, Framework for Continued Support, and Recommendations for CWCB Action

Project Purpose: Recommendations from the 2019 Technical Update to the Colorado Water Plan, along with CWCB objectives leading up to the next Colorado Water Plan update, prompted this ATM Support Project. This project was designed to assess the progress made to date on ATMs and to develop a framework for CWCB and broader state consideration of ATMs moving forward. The project provides perspective on the role ATMs play in achieving Water Plan goals and how additional actions beyond ATMs are advised to address the reduction of irrigated lands in Colorado.

Project Description: The ATM Support Project was a collaborative effort involving Colorado Water Conservation Board (CWCB) staff and the following contractors: WestWater Research, LLC (prime), Colorado Water Center including staff in Fort Collins, Pueblo, and Grand Junction, J-U-B Engineers, Inc., and Fischer, Brown, Bartlett & Gunn, PC. The project was funded by a CWCB grant. The project spanned approximately seven months from November 2019 through May 2020. Project outreach activities took place in January and February, followed by a literature review and data compilation in March and April, and report writing in April and May.

Report Organization: A 7-page executive summary is provided as the first section of the report, which provides a high-level summary of our findings and recommendations. The main report is organized into the following sections:

- Introduction: Background context on water transfers in Colorado and historical summary on ATMs.
- Status Assessment. This section provides an inventory of ATM projects in Colorado and summarizes the outreach activities conducted as part of this project. Outreach included Basin Roundtable meetings, phone interviews with municipal water providers, phone interviews with participants in past ATM projects, and meetings with an ATM Advisory Committee. The status of ATMs is evaluated in two parts: (1) the volume of ATM projects relative to the 2015 Water Plan goal of 50,000 acre-feet, and (2) progress in overcoming well-known barriers to ATM adoption.
- ATM Framework. This section provides a framework for continued CWCB analysis of ATMs in the future. The framework considers a definition for ATMs related to Water Plan goals, incentives and benefits of ATM transfers, the role of policy changes, and recommended metrics for tracking progress.
- Recommendations. This section provides a set of recommendations for CWCB to consider with regard to ATMs. The recommendations are focused on aspects that CWCB can control and actions items that CWCB can implement. Recommendations are categorized as: funding, policy, and education & outreach.

Summary Recommendations: The project team recommends continued investment in ATMs because they serve an important purpose in Colorado in providing a flexible and creative approach to avoid permanent dry-up where possible and to provide state support to various Water Plan goals achieved through ATM water transfers. Even with continued investment in ATMs, permanent dry-up is likely to continue in Colorado because of the various reasons dry-up occurs (such as land development, groundwater regulation, and others) and because ATMs are not likely to supplant permanent transfers as the dominant form of municipal water supply acquisition. The following is a short-list of recommendations for CWCB actions:

- Funding. Maintain the ATM grant program in place since 2007 but also fund and support non-ATM actions that are targeted at the same objective of reducing the loss of irrigated lands. It will also be important to leverage other funding sources, such as Federal grants and non-profit support.
- Policy. Create a formal definition of ATMs for funding grants and tracking progress based on a set of minimum criteria. Continue to implement policies that reduce regulatory uncertainty and transaction costs. Establish a more coordinated understanding of ATM objectives and policies among state agencies.
- Education & Outreach. Create an ATM-focused website as a centralized online resource. Expand and formalize partnerships with local facilitators. Work with the Basin Roundtables to craft local ATM projects and objectives.

CONTENTS

EXECUTIVE SUMMARY

Background & Purpose

In the early 2000s, a significant drought and continued population growth prompted the water community to consider alternatives to "buy and dry" practices that have been a standard process for municipal water supply acquisition and land development. Starting in 2004, the Colorado Water Conservation Board (CWCB) began exploring and then encouraging various alternative water transfer concepts through planning reports and grant funding. The objective was to demonstrate the feasibility of alternative water transfer methods that could address water supply needs while minimizing associated socioeconomic impacts of more traditional "buy and dry" water transfers. The term **Alternative Transfer Methods** or **ATMs** was created to refer to the various methods and concepts by which new supplies could be made available without the permanent dry-up of irrigated lands. The CWCB has continued to encourage ATMs as part of a comprehensive approach to water management and funded this project to chart a future path for ATM support.

The role of ATMs in Colorado continues to evolve as the water community both defines challenges and creates solutions. While ATMs emerged in direct response to "buy and dry" resulting from municipal growth, alternative water transfer concepts are being considered as a piece of the solution for many water challenges in Colorado, including enhancing environmental flows and recreational opportunities and maintaining compliance with interstate compact obligations. The CWCB is taking a fresh look at ATMs in Colorado to understand what role they should serve in state planning efforts and to define actions that can be taken to support ATM development and implementation. This report provides a status assessment of ATM efforts in Colorado over the past decade and recommends a future framework for the role that ATMs can play in addressing Colorado's water challenges.

Status Assessment

A status assessment on ATMs is included in this project because significant state investment, research, and policy development has occurred over the last 13 years, and it is important to evaluate what has resulted from these efforts. It is also important to evaluate perspectives on ATMs, from the water community, the municipal sector, and past participants in ATM style transactions. Now that people in Colorado have been exposed to ATM concepts, their opinions should be evaluated. The status assessment is both a quantitative assessment based on available data and metrics on ATM transactions, and a qualitative assessment of progress on and attitudes towards ATMs over the past decade. This status assessment was conducted in three parts:

1. A compilation of ATM projects and literature in Colorado, which represents the knowledge base and experience upon which further ATM strategy development is built.
2. Outreach efforts to survey 5 Basin Roundtables, 43 municipal water providers, and 14 past ATM participants on their views towards water supply planning, irrigated land loss, and ATM efforts.
3. Analysis of information developed under the two above-listed parts and summarized as a status assessment on the Colorado Water Plan and on progress in overcoming barriers to ATM adoption.

Status Relative to Colorado Water Plan ATM Goal. For the purpose of understanding the status of ATM efforts, an inventory was compiled that included water transactions meeting one of the following criteria: (1) labeled as an ATM by one of the participating parties, (2) received ATM grant funding support from CWCB, or (3) cited as an ATM example in reports and studies. There are estimated to be 16 ATM water transfers in Colorado, including 12 active, 2 pending, and 2 completed projects. The inventoried ATM projects are located in various river basins and were enacted to serve multiple purposes. The total annual contract volume of these 16 ATM transfers is estimated to be approximately 30,600 acre-feet per year. Some of these contracted projects were pilots that have expired, and the volume of active contracted ATMs is estimated to be approximately 18,100 acre-feet per year. The lack of qualifying criteria complicates the evaluation of which projects and associated volumes count towards the 50,000 acre-feet goal set by the Colorado Water Plan. Our estimated volume of active and completed ATM projects indicates that the Water Plan goal of 50,000 acre-feet is still a significant way off, with potentially 32,000 acre-feet of new ATM contracts needed in the next 10 years.

Status on Overcoming ATM Barriers. The ATM literature is filled with descriptions of barriers to greater utilization of ATMs in Colorado. This fact alone points to the reality that ATM agreements are not an obvious choice for water users, regardless of whether the water use is agricultural, municipal, or industrial. The following bullet points provide a brief summary of current status on overcoming known barriers:

- Transaction Costs. There will always be tension between the desire to reduce transaction costs and the desire to ensure protection of other water rights against injury. Administrative tools are available to reduce transaction costs for temporary (short-term) water transfers and there may be cost savings by implementing standard tools such as the Lease Fallow Tool (LFT). The value of such efforts is dependent upon widespread acceptance by local stakeholders. Additional efforts such as establishing presumptive engineering factors might hold promise for reducing transaction costs in specific localized areas but will require upfront development costs and local support. If transaction costs are going to remain as significant costs in the future, then the ATM grant program and other assistance funds will continue to be a valuable resource for assisting with transaction costs of ATM projects.
- Regulatory Uncertainty. One of the most common barriers cited in the literature review and interviews was regulatory uncertainty. The type of regulatory uncertainty is considered to vary depending on specifics of a water transaction, including location, amount, type of agricultural conservation measures, type of water rights, and even the particular parties involved in the transfer. Progress on reducing regulatory uncertainty has mostly come in the form of example ATM projects demonstrating viability and certainty in the regulatory process.
- Permanence of Municipal Demand. Agricultural producers are reluctant to commit to perpetual deals, while municipal water providers often demand permanence. This simple disconnect on the term of an agreement is a barrier that will be hard to overcome. Some progress has been made by ATM projects in overcoming this barrier: (1) a permanent ATM agreement was secured between Larimer County and the City of Broomfield in 2017, and (2) municipal partners in the Lower Arkansas River Basin have shown a willingness to lease water supplies for a multi-year term as a piece of their overall water portfolio.
- Infrastructure Needs. The water rights available from Front Range irrigated agriculture are often not easily physically transferred or exchanged up to the municipal treatment plants. This spatial barrier and the associated infrastructure needed to overcome it are found in nearly every Front Range river system. Progress is being made in addressing this barrier in at least 3 instances within Colorado: (1) the Lower Arkansas Valley Water Conservation District (LAVWCD) exchange right for ATM projects precludes the need for costly infrastructure to move water upstream to locations of municipal demand, (2) the Northern Integrated Supply Project (NISP) aims to secure agricultural conservation easements on roughly 20,000 irrigated acres in order to secure an exchange supply in-perpetuity, and (3) the South Platte Regional Opportunities Working Group (SPROWG) feasibility study included ATMs as a component of the supply portfolio to utilize exchange rights and pipeline infrastructure.
- Crop Production Impacts. The CWCB has provided ATM grant funding to analyze production impacts on both the Front Range and Western Slope. There are obvious crop production impacts when water is transferred out of agricultural use, but also the business relationships, contracts, and labor that a producer has organized to successfully manage a farm business are significantly impacted if operations are reduced. Adequate compensation, above and beyond the value of the crop lost by reduced irrigation, is the primary way to overcome this barrier.
- Economics. The economics of the primary transaction between a municipal buyer and agricultural seller are considered to remain a significant barrier to extensive ATM adoption in Colorado. It is important that the CWCB and other water stakeholders provide examples and resources in the form of grants and incentives. For non-municipal water use sectors, the economics of the primary transaction can be favorable and many successful examples have been developed over the past decade. Significant progress has been made over the past decade on developing public information on the secondary benefits of ATM-type water transactions. Research studies have focused on various impact categories.

ATM Framework Development

This section provides a framework for continued CWCB analysis of ATMs in the future. The framework considers a definition for ATMs related to Water Plan goals, incentives and benefits of ATM transfers, the role of policy changes, and recommended metrics for tracking progress.

ATM Definition. It is difficult to define ATMs because the water community has varied opinions on their objectives and purposes and the term ATM has evolved to include projects with diverse intended outcomes. The primary reason for clearly defining an ATM is to assist both CWCB staff and the broader water community in (1) evaluating projects for ATM grant funding and (2) tracking progress made on ATMs. The project team developed the criteria in **Table ES-1** to define ATMs. A particular water transfer or activity is classified as an ATM if it meets all of the required criteria and at least three of the five preferred criteria.

Table ES-1: Criteria to Define ATM Transactions

	Item	Criteria	Context
Required	Activity	Water transfer that reduces the permanent dry-up of agricultural lands	ATM projects must be a water transfer that reduces permanent irrigation dry-up. Two requirements are in this statement.
	Purpose	Meets a defined objective in the Colorado Water Plan	ATM projects must provide water to a new use in a manner that advances progress on goals & objectives in the CO Water Plan.
Preferred	Term	Secures a water transfer to a new use for a term of 10 years or more.	ATM projects are distinguished from annual leasing activity by their term. ATM projects should seek to secure long-term contracts for a water transfer. Pilot projects are helpful to explore new concepts and develop proof of concepts.
	Ownership	Water right ownership retained in whole or in part by agricultural sector	ATM projects can benefit agriculture by ensuring that ownership of the water rights and management of the water source remains with agriculture, while providing for non-agricultural uses.
	Transfer Frequency	Water should remain in agricultural use as much as possible, but ideally no less than 5 out of 10 years, or an equivalent % of irrigation on an annual basis.	ATM projects can be structured to provide water to an alternative use in multiple years. The goal is to keep a particular farm operating in as many years as possible. An approximate threshold is maintaining agricultural use in 5 out of 10 years.
	Target At-Risk Areas	Avoidance of permanent dry-up should focus on lands that face a risk of dry-up (i.e., those beneficial for other uses).	ATM projects that directly prevent the dry-up of irrigated lands at high-risk of dry-up in the next decade should be prioritized over projects that prevent a conceptual dry-up of low-risk lands or that indirectly prevent dry-up of lands in a broad region.
	Agriculture Benefit	Provides a net economic benefit to agricultural working lands & rural communities	ATM projects should be beneficial to agriculture & rural communities, otherwise there is no clear dividing line between ATMs and other water transactions

ATM Incentives & Motivations. ATMs are often driven by motivations other than strictly the water transfer. The buyer and/or seller under an ATM transfer are often interested and motivated to see continued agricultural production for benefits such as open space, water quality, environmental health, rural economic health, and others. Therefore, the framework for facilitating ATMs should be built with an understanding that it is not solely the water transfer that incentivizes parties to construct ATM agreements. The following list outlines primary ATM incentives, outside of the water transfer, indicated by our outreach and research:

- Open Space & Community Buffers. These features improve the quality of life in Colorado, and municipalities are motivated to maintain them. ATMs can alleviate the financial barrier associated with the acquisition or

conservation cost of farmland and water rights. ATMs motivated by open-space benefits can also be appealing to the agricultural sector, by diversifying income and maintaining the working landscape.

- Agricultural Heritage & Economic Prosperity. Irrigated agriculture is an important component of the state's history, culture, economy, and environment. Viable irrigated agriculture is important not only to rural communities that depend on the economic activity generated by irrigated agriculture, but also to the urban centers in Colorado. There is potential for ATM transactions to assist in maintaining a critical mass of agricultural production amongst the shareholders within a ditch system to continue to justify and can help to fund the continued maintenance and use of shared conveyance infrastructure. ATM transactions potentially provide a competitive advantage to agricultural producers in Colorado, by providing an alternative revenue stream, insulated from commodity price fluctuations.
- Instream Flows for Environmental Health & Recreation. Instream flows help provide environmental benefits to aquatic ecosystems by maintaining stream flows during critical periods. Secondary water quality benefits can also be achieved. Instream flow benefits can also include recreational water uses such as whitewater parks or enhanced fishing opportunities. As noted in several examples, ATMs can provide direct benefits to environmental water uses or such uses may enjoy benefits from an ATM that was designed to accomplish other purposes.
- Risk Reduction in Municipal & Agricultural Sectors. One of the dominant barriers to ATM adoption found in our research was the risk and uncertainty that many water users associate with ATMs. Contrary to this, there is also a view that ATMs can actually help to reduce risk by providing a valuable water supply source that is distinctly different from other sources. ATMs can be valuable to both the municipal and agricultural sectors if they are structured to meet a specific need and if they represent an economic benefit.

Many of these incentives and motivating factors are public benefits, and it should be recognized that ATM development and growth will be difficult to achieve without consideration of such public benefits. These factors support continued investment by CWCB in facilitating ATMs in the public's interest. These factors also highlight a potential disconnect between municipal water managers and broader community goals. Many of the public benefits listed above are not often considered by municipal water managers in making water supply development and acquisition decisions.

Policy Changes. ATMs have been a CWCB objective for over a decade and CWCB has supported several policies over that time that have been intended to facilitate ATM adoption. Policy change focused on regulatory barriers has not resulted in significant interest in ATMs. Instead, policy change should be broadened to motivate actions beyond the regulatory process and expanded to include policies at multiple levels of government. The following points provide project team ideas on facilitating ATMs and reducing the permanent dry-up of agricultural lands:

- Changes to Facilitate Water Transfers. There have been approximately 22 laws passed since 2002 to develop new water transfer regulatory mechanisms and reduce regulatory barriers to water transfers. Some of these new transfer mechanisms have been used and some have not. The most successful changes in regulating water transfers have been policies developed for a specific project, as opposed to policy changes that intended to spur development of new projects. Moving forward, policy changes should be addressed and undertaken when they appear to be restricting an ATM project from being implemented. One policy that was identified several times during this project is the pursuit of administrative tools or presumptive factors that reduce the analytical burden (and points of disagreement) associated with water transfers. Also, continued education and outreach efforts to build trust and understanding on ATMs is important, because distrust results in relatively high regulatory costs.
- Rethinking Dry-Up Agreements. In a water right change case in court, the dry-up of irrigated agricultural lands is intended to meet long-standing legal principles of non-injury to other water users and non-expansion of a water right. Dry-up agreements are the easiest ("tried and true") method of proving to other parties that the change will not result in an expansion of use and thereby proving no injury. However, the state might consider greater support for continued irrigation on lands with transferred water rights and for ensuring that continued irrigation is allowed in court decrees. Policies around dry-up agreements could involve ATM transactions in cases where a municipality (or other new user) retains agricultural use of the water rights under a dual-use

decree or retains irrigation use on the original lands in some fashion. These types of policy efforts are focused less on bringing a new type of water supply to market, but instead working to minimize the permanent dry-up of agricultural lands by intentionally seeking flexible decrees or by creatively finding other water supply sources to continue irrigation.

- Municipal Water Acquisitions. For the purposes of facilitating greater adoption of ATM water supplies by the municipal sector and/or avoiding the permanent dry-up of agricultural lands, the following municipal policy changes might be considered and supported: (1) utilizing Cash-in-Lieu (CIL) policies for developer water dedication requirements, which is considered a basic step toward greater use of ATM water supplies in the municipal sector, (2) considering development water dedication amounts in light of the success in municipal water conservation efforts, and (3) structuring long-term lease-back contracts to be more favorable to the agricultural sector.

Tracking & Metrics. The metrics shown in Table **ES-2** were developed based on feedback and analysis. The metrics are divided into two groups: (1) those indicating progress on ATMs and associated objectives, and (2) those indicating progress on reducing ATM barriers. The identified metrics should receive further review and are expected to evolve over time, but should lay a solid data foundation for assessing progress on ATMs into the future.

Table ES-2: Proposed Metrics to Track Progress on ATMs

Category	Sub-Category	Metric		Potential Data Source(s)	Estimated Current Value	Proposed Target Value by 2030
Progress on ATMs	**ATM activity *(track by basin & water use sector)***	**Number of active / contracted ATMs**		**ATM Inventory**	**12**	**35**
		Contract volume of active ATMs		**ATM Inventory**	**18,100**	**50,000**
		Irrigated acres involved in active / contracted ATMs		**ATM Inventory**	**13,700**	**40,000**
	Avoid permanent dry-up	Irrigated acres in Colorado		USDA Census of Agriculture	2,761,173	2,750,000 or more
	Expand municipal interest	Number of municipal water providers with ATM contracts		ATM Inventory	8	25
	Target Areas	Percent of contracted ATMs in predominantly agricultural counties		CO Dept. of Revenue sales tax data & USDA Census of Agriculture	50%	80%
				OMB and Census designated rural counties in Colorado	75%	80%
	Target Sectors	Volume of contracted ATMs by use	Municipal	ATM Inventory	4,423	20,000
			Industrial		12,300	20,000
			Environmental		1,404	10,000
			Compact Compliance		0	None Defined
Barriers to ATMs	Regulatory Uncertainty	Percent of contracted ATM projects that utilize administrative approval (not water court)		ATM Inventory	33%	50%
		Approval time when utilizing administrative approval mechanisms		ATM Inventory, CDWR	4 months	3 months
	Permanence of Municipal Demand	Percent of statewide municipal supply portfolio that is sourced from ATM supplies		USGS Water Use Data & ATM Inventory	0.5%	1%
	Infrastructure	Number of water supply projects with ATMs in their scope		None Defined	1	3
	Crop Production Impacts	Annual dollars spent on research and education related to agricultural alternatives for generating ATM water supplies		Colorado Water Center, CWCB	$0.5M	$2.0M
	Economics	Compensation for ATM participation, expressed as average unit lease payment ($/AF) divided by average Cash In Lieu (CIL) rate or water resources portion of new connection rate for 10 largest CO cities, also expressed in $/AF units.		ATM Inventory, Municipal Websites	4.4%	None Defined

Notes: (1) Blue shading indicates the core progress metrics that should be tracked by river basin, water use sector, and statewide.

Recommendations

The Role of ATMs. It is important for CWCB to have the right perspective on what ATMs are capable of achieving based on the past decade of investment. We believe that it is likely that Colorado will continue to see new ATM development, but we also believe that such ATM development alone will not significantly reduce overall dry-up of irrigated lands in Colorado. Permanent dry-up is likely to continue, even with ATMs, because of the various reasons dry-up occurs (such as land development and groundwater regulation) and because ATMs are not likely to supplant permanent transfers as the dominant form of municipal water supply acquisition. The project team recommends continued investment in ATMs because they serve an important purpose in Colorado in providing a flexible and creative approach to avoid permanent dry-up where possible and because they help achieve various other Water Plan goals.

Expand the Toolkit. The project team has developed a set of recommendations that aim to expand the use of ATMs in Colorado but also address other water-related factors that impact the permanent loss of irrigated lands. The project team believes that expanding the toolkit to include other initiatives and programs besides ATMs will be the best course of action to minimizing the permanent loss of irrigated lands. The recommendations in this section are focused on aspects that CWCB can control and actions items that CWCB can implement.

Funding. One of the greatest facilitation tools provided by the CWCB since 2007 has been the ATM grant program, which has funded 36 projects focused on ATM research, development, and implementation. The following recommendations are made with regard to CWCB funding:

- Maintain ATM Grant Program. The project team recommends that the CWCB continue to fund an ATM grant program, and to focus grant funding on project implementation. The criteria-based definition and scoring metrics developed in this report should be used to develop a scoring method for the evaluation of grant applications. Some flexibility in funding ATM projects will need to be maintained in order to encourage creative projects and take advantage of unique opportunities.
- Fund & Support Other Activities. The CWCB should consider utilizing Water Plan grants or the Water Supply Reserve Fund, or developing a source of new state funding, for non-ATM actions that are targeted at the same objective of reducing the loss of irrigated lands. The project team has identified the following activities that would benefit from state funding support: (1) municipal policy changes that reduce or customize water dedication requirements, (2) county land use planning that focuses on maintaining community buffers and agricultural conservation, (3) agricultural conservation easements that allow for ATM agreements, (4) greater adoption of "dual use" water court decrees and long-term municipal leaseback contracts, (5) efforts to re-irrigate high quality agricultural lands that have previously been dried up but remain viable for irrigation, (6) studies to improve our understanding of secondary impacts from temporary water transfers.
- Incentivize ATM Projects under Existing CWCB Funding Programs. The CWCB could provide financial incentives for projects that include ATM evaluation and implementation, in the form of greater funding, higher ranking, or more favorable loan terms.
- Leverage Other Funding Sources. The CWCB should develop and maintain an inventory of alternative funding sources for project applicants to consider during initial project development. Some of the alternative funding sources identified during our research include: (1) U.S. Bureau of Reclamation WaterSMART Water Marketing Strategy grant program, (2) environmental and conservation non-profit support, (3) U.S. Department of Agriculture (USDA) and Natural Resource Conservation Service (NRCS) programs, and (4) pairing ATMs with agricultural conservation easements for tax benefits.

Policy. The following recommendations are made with regard to CWCB policies:

- Define ATMs. The act of defining ATMs serves to clarify state objectives, and also provides a clear basis for making grant-funding decisions and for tracking progress on ATMs. We recommend that ATM projects be defined as those that meet minimum criteria (see Table ES-1).
- Reduce Regulatory Uncertainty. Water transfers are inherently complicated because of the number of water rights and users on a river system and because ensuring non-injury is a detailed and contentious process in

Colorado. We have identified the following actions that can be taken to reduce regulatory uncertainty: (1) continue the development of local presumptive factors for use in water court change cases and administrative approvals, (2) allow agricultural lands involved in ATM agreements to qualify for state policies that preserve the historic consumptive use (HCU) volumes for conservation projects, (3) encourage flexible dry-up agreements to allow for continued irrigation of properties with alternative water sources, (4) allow agricultural water rights participating in non-permanent ATM projects to gain regulatory approval and utilize transferrable volumes that will not be established as precedence for a historical consumptive use (HCU) analysis in future water court applications involving the rights.

- Municipal Review of Water Dedication Policies. If the CWCB wants municipal water conservation to positively influence agriculture, then it is important that municipal water dedication requirements reflect the success of conservation. The CWCB should consider or study the possibility that municipal water providers revisit their water dedication requirements as part of water efficiency plans and evaluate dedication requirements relative to water conservation successes.
- Support Flexible Water Transfers in Agriculture. The CWCB should consider advocating for favorable policies towards temporary and flexible water transfers in the next U.S. Department of Agriculture Farm Bill. In particular, providing clarity on crop insurance for limited irrigation fields and financially supporting ATM development.
- State Agency Coordination. The surveys indicated that a lack of coordination and communication among state agencies has been a frustration for water users pursuing ATM projects. It is recommended that staff from the CWCB and CDWR (and perhaps other agencies) meet on a recurring basis to consult on ATM efforts and protocols. In addition, it is recommended that CWCB staff provide education to each of the seven Water Division Engineers on ATM projects and state objectives.

Education & Outreach. The CWCB has done a good job at publicizing its ATM grant program and ATM objectives among the water community. Continued education and outreach efforts are recommended to transition from awareness of ATMs to broader consideration of ATMs. The following recommendations are made with regard to CWCB education and outreach efforts:

- ATM Website. Provide a centralized online resource for learning about ATMs. The website should include past project stories and contact information, tracking on ATM objectives, an ATM inventory, and educational resources on public benefits of ATMs. The CWCB should create a formal process and define state agency responsibilities for maintaining and managing the ATM inventory.
- Local Facilitators. The CWCB should consider expanding and perhaps formalizing partnerships with various organizations that have local connections to water users, and also with ATM past participants, with the goal of these partners facilitating more ATM projects and building relationships and trust among water users.
- Municipal Water Planning Resources. Municipal interest in ATMs has been a limiting factor and the CWCB has limited tools to increase municipal interest moving forward. The CWCB may consider the following ideas: (1) develop educational materials on adopting cash in lieu (CIL) water dedication policies and effectively using a portfolio view of water supply sources, (2) develop educational materials on municipal water providers that have entered into ATM agreements with information on the water supply benefits and considerations given to alternative sources, and (3) continue to encourage cooperative water and land use planning in municipalities and develop educational materials on how ATMs can provide additional benefits such as open space, recreation, and preservation. These educational materials should reach both municipal water managers and elected officials who often consider the multi-faceted aspects of community decisions.
- Basin Roundtables. The CWCB should assist Basin Roundtables in developing and adopting appropriate ATM metrics and protocols for tracking progress on ATMs and awarding ATM grants in their basin and for developing ATM educational materials and outreach support for local water stakeholders. The Basin Roundtables might consider the development of a local ATM task force that could serve to: (1) identify and facilitate projects, (2) share information with water users, (3) review grant-funding requests, and (4) assist state agencies with the ATM inventory and ATM metrics tracking.

INTRODUCTION

The State of Colorado faces many water-sector challenges in the coming decades. These challenges include climate change impacts on water supply, groundwater overdraft, environmental health of our river and riparian systems, nutrient pollution and emerging contaminants, and many others. A leading challenge is meeting the water demands of our growing state population. Over the past 30 years, Colorado has added about 2.5 million residents and has seen its population nearly double. A similar number of new residents are expected over the next 30 years, with a 2050 projected population of roughly 8 million[1]. The population growth that Colorado expects to see is likely to result in continued economic, social, and environmental changes that impact agriculture and urban-rural interfaces. Colorado is faced with an ongoing challenge to accommodate the projected population growth and its associated economic benefits without losing the state's cultural roots and rural economic vitality.

Population growth in Colorado municipalities has been supported by the development of municipal water supply projects and also through municipal acquisition of agricultural water rights. In Colorado, the right to use the state's water resources can be bought and sold similar to real estate, and municipal water right acquisitions have been and continue to be voluntary transactions between willing parties. After acquiring water rights, municipalities then seek to change the use from agriculture to municipal through a water court regulatory process. A common element of a water court change approval is to have permanent dry-up of the original agricultural lands associated with the water right[2]. Over the decades, these individual water transactions and transfers have resulted in a significant scale of cumulative irrigated land loss in Colorado, and particularly along the Front Range. Some of this decline is due to the development of irrigated farm properties (often referred to as urbanization) and some has been due to the municipal acquisition of water supplies for transfer to a use separate from the original irrigated farm property. This latter category of water transfers is often referred to as "buy and dry".

Colorado has also lost irrigated lands because of state efforts to manage groundwater sustainably and conjunctively with surface waters. Sustainable groundwater management and compliance with interstate water compacts has resulted in irrigated acreage reduction in the Republican and Rio Grande basins, with additional loss projected in the future[3]. Conjunctive groundwater management has resulted in the adoption of hundreds of well augmentation plans across the state but has also resulted in the loss of groundwater irrigated acres. The groundwater management changes that Colorado has undertaken over the past couple decades are beneficial to the state's future economy and water management objectives, but they have resulted in the loss of irrigated lands and threaten additional lands in the future.

Urbanization, municipal transfers, and groundwater management have collectively resulted in significant loss of irrigated lands in Colorado. Over the past 30 years, Colorado has lost approximately 8% of its irrigated lands statewide[4]. Irrigated land loss has been most significant along the Front Range, with a decline of approximately 14% from 1987 to 2017[5]. The Technical Update to the Colorado Water Plan indicates that where municipal land development occurs, irrigated agriculture is likely to be lost. This urbanization could result in the loss of more than 150,000 irrigated acres by 2050.[6] Additionally, planned agricultural to municipal and industrial (M&I) water transfers could result in a loss of up to 76,000 acres of agriculture along the Front Range.[7] Without changes to historical water transfer practices and new ideas related to how we accommodate population growth and land development additional irrigated land loss is projected to occur along with the socio-economic impacts associated with reduced irrigated agriculture production.

[1] Colorado State Demography Office. https://demography.dola.colorado.gov/population/
[2] The permanent dry-up of original irrigated lands is often required to ensure that use of the water right is not expanded and to protect other water right holders in the same river system.
[3] The 2019 CWCB Technical Update to the Colorado Water Plan estimates future irrigation reduction due to groundwater management of 45,000 acres in the Rio Grande Basin and 135,400 acres in the Republican River Basin.
[4] USDA Ag. Census. https://www.nass.usda.gov/Publications/AgCensus/2017/index.php
[5] USDA Ag. Census data for 17 Front Range counties. From 764k acres in 1987 down to 658k in 2017.
[6] CWCB Technical Update to the Colorado Water Plan, 2019
[7] CWCB, Technical Update to the Colorado Water Plan, 2019.

In the early 2000s, a significant drought and continued population growth prompted the water community to consider alternatives to "buy and dry" practices that have been a standard process for municipal water supply acquisition and land development. Starting in 2004, the Colorado Water Conservation Board (CWCB) began exploring and then encouraging various alternative water transfer concepts through planning reports and grant funding. The objective was to demonstrate the feasibility of alternative water transfer methods that could address water supply needs while minimizing associated socioeconomic impacts of more traditional "buy and dry" water transfers. The term **Alternative Transfer Methods** or **ATMs** was created to refer to the various methods and concepts by which new supplies could be made available without the permanent dry-up of irrigated lands. The CWCB has continued to encourage ATMs as part of a comprehensive approach to water management and funded this project to chart a future path for ATM support.

The role of ATMs in Colorado continues to evolve as the water community both defines challenges and creates solutions. While ATMs emerged in direct response to "buy and dry" resulting from municipal growth, alternative water transfer concepts are being considered as a piece of the solution for many water challenges in Colorado, including enhancing environmental flows and recreational opportunities and maintaining compliance with interstate compact obligations. The CWCB is taking a fresh look at ATMs in Colorado to understand what role they should serve in state planning efforts and to define actions that can be taken to support ATM development and implementation. This report provides a status assessment of ATM efforts in Colorado over the past decade and recommends a future framework for the role that ATMs can play in addressing Colorado's water challenges.

Water Transfers in Colorado

ATMs are unique styles of water transactions that are an alternative to historical methods of transferring water to new uses. Historically, market-based transactions of water rights in Colorado have been dominated by two categories: (1) permanent sales of high-value water rights and (2) single-year leases of surplus water rights. Permanent sale transactions have had a negative impact on irrigated lands[8] and typically involve a municipal buyer and agricultural seller, whereas surplus leases have typically benefitted irrigated lands with the municipal owner as the lessor and agricultural user as the lessee. The concept of ATMs was created as a third type of water transaction, an alternative to historical methods, which provides for the transfer of water to a new use but is neither a permanent sale nor an annual surplus lease, and importantly avoids the permanent dry-up of agricultural lands. As described later in this report, ATMs can be structured in a variety of ways and the specific objectives of each deal will likely result in unique terms and characteristics to suit the needs of all parties to the transaction.

This section provides a brief description of water transfers in Colorado to provide a baseline understanding of where ATMs fit into Colorado's established and active water market. This information is important to understand how ATMs are an alternative to the status quo and to frame the issue on the role that ATMs should play as a new type of transaction.

Data on Water Transfers in Colorado

There is no central repository of water right transactions and transfers but available data clearly indicates that Colorado, and particularly the Front Range, has an active water market with consistent annual trading of water rights and multiple parties involved. On a regular basis, willing buyers and sellers come together and reach agreement for the sale or lease of water rights, providing the ability for that water right to serve a new use. The sections below provide a summary of various data sources that help to quantify water market activity in Colorado.

[8] There are many studies evaluating economic impacts of permanent water transfers from agriculture. Two examples: (1) CO Water Resources Research Institute. Completion Report No. 207. Thorvaldson and Pritchett. December 2006. *Economic Impact Analysis of Reduced Irrigated Acreage in Four River Basins in Colorado*. (2) JAWRA. October 2003. Howe and Goemans. *Water Transfers and Their Impacts: Lessons from Three Colorado Water Markets*.

Water Right Transfers

Colorado is unique among Western U.S. states in its establishment and use of a water court system to review and approve permanent changes of water rights. Most other Western states utilize an administrative system, run through a state water agency, to evaluate proposed water right changes. A review of water court change applications shows that transfers are quite common in Colorado. In 2019, the seven division water courts in Colorado saw roughly 900 change applications filed and of these approximately 200 (20%) were associated with a change of use. Most of these change applications were filed on the Front Range as summarized in **Table 1**. There are permanent water right transfers in Colorado that occur outside of the water court system and are not included in the **Table 1** data, such as groundwater right transfers in designated groundwater basins, share transfers in private ditch and reservoir companies[9], and contract transfers in water supply projects[10]. Temporary changes of water rights can be administratively approved, outside of the water court system, through Substitute Water Supply Plans (SWSPs). **Figure 1** summarizes annual SWSP filings for the period 2003-2019[11]. Over the last five years, approximately 190 SWSPs per year were submitted for approval across the 7 Water Divisions in Colorado. Approximately half of all SWSPs over the last five years have an associated water court change case number, indicating that the SWSP was likely filed as a temporary action while a permanent change of use was pursued in water court. The overall downward trend in annual SWSP filings over the past decade likely reflects that the water community has worked through a back-log of required augmentation plans coming out of the early 2000s drought and associated state policy changes.

Table 1: Water Court Change Applications in 2019

Water Division	Type of Water Court Application					TOTAL
	Change	Diligence	New Filing	Order	Relief	
1	69	131	94	1	11	306
2	36	40	33		3	112
3	23	2	3			28
4	20	93	35			148
5	39	140	18			197
6	14	21	18			53
7	13	50	20			83
TOTAL	**214**	**477**	**221**	**1**	**14**	**927**

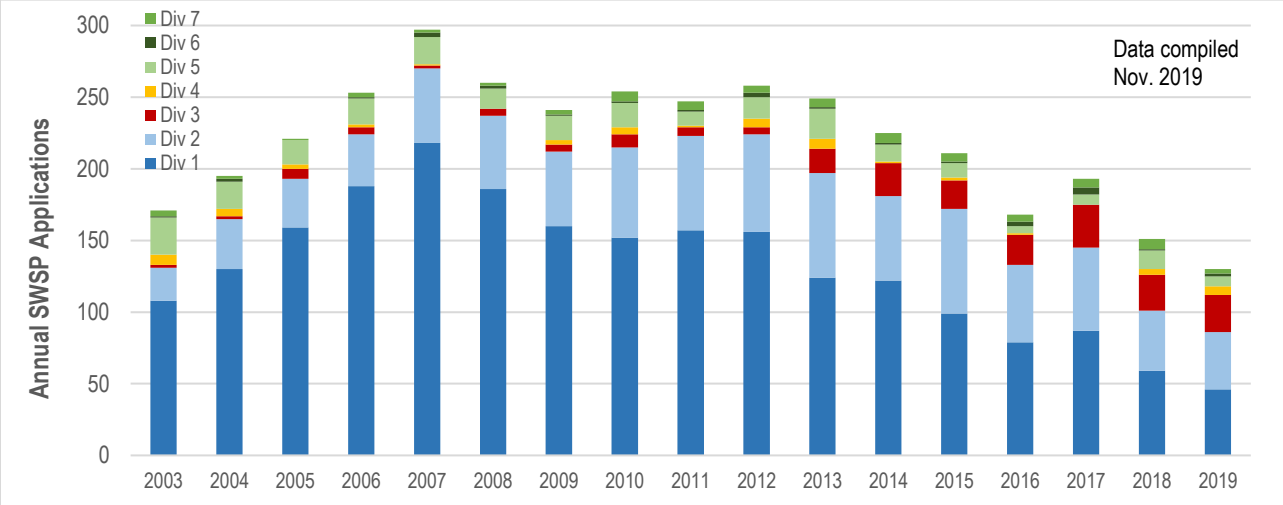
Table Note: Data compiled from monthly water court resumes published by each Division Water Court. Types of applications were categorized as shown based on the general purpose of the application. Diligence type applications include both applications for finding of diligence and applications to make a conditional water right absolute. New filings include new conditional water rights, new Denver Basin or other non-tributary adjudication, and other applications to establish a new water right.

[9] Share transfers are a private transfer within a ditch company and do not have a public record. In many cases, a buyer will proceed with a water court change application that becomes public record when filed.

[10] The most notable example is transfers of project units in the Colorado-Big Thompson (CBT) project in Northern Colorado. The CBT project has seen significant transfer activity over the last few decades transitioning from 85% agricultural ownership in 1960 to 30% agricultural ownership in 2018.

[11] Data on SWSPs provided by CDWR in November 2019.

Figure 1: Annual Substitute Water Supply Plan Applications



Water Right Transactions

Available information on private water transactions[12] is summarized in **Table 2**. The last decade has seen average annual water rights trading in Colorado of approximately 45,000 acre-feet per year (AFY) with an associated value of over $90 million per year. In terms of volume, water leases make up approximately 75% of annual trading, while water sales make up about 90% of the annual trading value. The Front Range sees about 65% of the state's annual water trading by volume and 95% by value. **Table 3** summarizes the seller and buyer water use categories to understand how water trading impacts water uses in Colorado. Approximately 58% all permanent sales are agricultural to municipal transfers, which were an original focus of ATM efforts. Another 17% of sales are municipal acquisitions from a non-agricultural user. Water leases see more varied participation among water use sectors. Leases sourced from a municipal user comprise about 60% of annual leasing activity, and leases from agriculture represent about one-third of annual leases by volume. The fact that the municipal sector is both the dominant buyer category and the dominant lessor category is a function of: (1) municipal water acquisition policies focused on dry-year reliability, (2) differences in water supply security between old and new municipalities, and (3) localized service areas resulting in competition between water providers[13].

Table 2: Average Annual Water Rights Trading over Past Decade (2010-2019)

	Sales	Leases	Total Trading
Annual Number of Trades	104	84	188
Annual Trading Volume (AFY)	11,100	34,600	45,700
Annual Trading Value	$83,400,000	$8,900,000	$92,300,000

[12] Data for this section was compiled from *Waterlitix*, a proprietary database of water transactions maintained by WestWater Research. Data in this section is focused on private (often two-party) market trades of water rights separate from land, and excludes several types of water transactions seen in Colorado, including: (1) municipal lease-backs to agriculture, (2) regional water pool programs such as the CBT Rental Pool, and (3) intra-ditch transfers, and (4) conservation programs, such as the System Conservation Pilot Program (SCPP) in the Colorado River Basin.

[13] Many other metropolitan areas in the Western U.S. are serviced by local water districts with raw water supplies provided in whole or in part by a broad regional water authority. Examples include the Metropolitan Water District of Southern California, Southern Nevada Water Authority, Central Utah Water Conservancy District, and Central Arizona Water Conservancy District. The distributed nature of municipal water providers on the Colorado Front Range results in a competitive and active water market.

Table 3: Water Use Sectors in Colorado Water Transactions
Values represent the percentage of average annual water trading by volume

SALES	New Water Use				
Previous Water Use	Agriculture	Municipal	Industrial	Environmental	TOTAL
Agriculture	10%	58%	6%	9%	83%
Municipal	0%	9%	0%	0%	9%
Industrial	0%	8%	0%	0%	8%
TOTAL	10%	75%	6%	9%	100%
LEASES	**New Water Use**				
Previous Water Use	Agriculture	Municipal	Industrial	Environmental	TOTAL
Agriculture	4%	10%	3%	16%	33%
Municipal	18%	15%	13%	13%	59%
Industrial	2%	1%	2%	0%	5%
Environmental	1%	<1%	0%	<1%	2%
TOTAL	26%	27%	18%	29%	100%

The Colorado water market has historically been defined by permanent sales on the Front Range to serve municipal growth, and this remains the dominant market driver. There are several emerging categories of water transactions in recent years that illustrate a more diverse water market in the future:

- On the Colorado Western Slope, relatively large volume leases have taken place to provide instream flow as an environmental benefit. These leases are funded by Federal endangered species recovery programs, the CWCB instream flow program, and non-profit support.
- The Front Range has seen an expansion of water leasing activity to support groundwater well augmentation plans. The source of supply is often municipal treated effluent discharged to a river or surplus supplies that have been decreed for augmentation use. Augmentation leases support all categories of water use, including agricultural, municipal, and industrial wells.
- Relatively small municipal water districts have been leasing a portion of their water supply portfolio from larger (and older) municipalities for a short period of time. These leases often act as bridge supplies until a more permanent water supply source is established for the water districts.

In addition to the data on private water transactions described above, there are significant annual volumes of surplus water supplies that are leased out on a regular basis. Municipal water providers often acquire water rights in advance of when those water rights will be required to meet municipal demands, and also often acquire water supplies sufficient to meet demands during drought periods. The result is that municipalities can and do hold more water rights than needed in a typical water year. This situation is particularly true for older and larger municipalities that have been acquiring water rights for decades. In many cases, a municipality is interested in leasing out these annual surplus water supplies and these surplus supplies are often leased to the agricultural sector for direct use or well augmentation. **Table 4** summarizes five examples of municipal lease-backs over the past five years. Collectively, these six examples total close to 90,000 acre-feet per year of annual surplus water leasing.

Table 4: Five Examples of Municipal Lease-Backs and Surplus Leasing
(all values in units of AFY)

Year	Aurora	Fort Collins	Greeley	Pueblo	CO Springs	CBT Regional Pool	Total
2015	25,103	11,767	23,728	11,805	9,000	20,000	**101,403**
2016	6,305	13,541	20,614	21,732	11,534	15,000	**88,726**
2017	7,077	15,391	23,899	14,048	4,629	12,300	**77,344**
2018	16,340	18,086	29,326	7,765	5,164	15,000	**91,681**
2019	11,617	13,525	25,684	14,304	7,975	12,500	**85,605**

Table Notes: (1) Aurora volumes are estimates for farms that have not undergone a change case and also includes Arkansas Basin leases. (2) Greeley volumes include ditch share rentals, farm lease-backs, and CBT rentals. (3) Pueblo volumes represent successful bids from annual auction. (4) The Regional Pool Program is a temporary transfer program operated by Northern Water to auction off annual surplus CBT project water supplies during years when it is available.

Water leases have become an important aspect of the Colorado water market, serving various purposes that are not well matched to or sufficiently funded for permanent water sales. In the context of ATMs, it is important to recognize that water leasing is occurring at significant scale each year in Colorado. Municipal water acquisitions remain focused on permanent sales, in part because there remains a market[14] for such permanent acquisitions and in part because there remains a preference for municipal ownership of water supply sources.

ATM Origins & Development

A primary driver of ATM development in Colorado was the significant drought from 2002-2005. This drought caused changes in groundwater administration in the South Platte River Basin and stressed municipal water supplies, both of which resulted in unique water transfer agreements[15]. The drought also prompted state planning efforts starting in 2004 under the State Water Supply Initiative (SWSI) which showed undesirable projections about the loss of irrigated lands in the South Platte and Arkansas river basins due to continued municipal growth. In addition, the local socio-economic fallout in Crowley County resulting from significant permanent water transfers from agricultural lands was motivating local agricultural leaders to explore alternatives to more "buy and dry"[16].

The 2004 SWSI planning study was a broad statewide water assessment that provided projections of irrigated land loss due to urbanization, municipal transfers, and groundwater management actions. The 2004 SWSI (also known as SWSI I) predicted that Colorado would see a loss of approximately 6% to 14% of its irrigated acreage by 2030. Half or more of this loss was projected to occur in the South Platte River Basin. The 2004 SWSI study provided many options for addressing future shortages, one category of which was agricultural water transfers as summarized in **Table 5**. The 2004 SWSI ranked new supply options using a multi-criteria scorecard and rotational transfers were one of three options that ranked high across all seven basins in Colorado[17]. One of many recommendations outlined in the 2004 SWSI was to foster cooperation between the agricultural and municipal sectors, in part by identifying and using more non-permanent transfers of water from agriculture.

[14] In this context, a market refers to the fact that there are willing sellers of water assets that are attractive to a municipal buyer. There are examples of municipal water providers in Colorado turning to leased sources of supply when permanent acquisition options are limited, signaling that in such cases a permanent acquisition market is less active.
[15] Two specific examples include the Aurora agreements with High Line Canal farms and the North Sterling Irrigation District agreement with Xcel Energy. See example ATMs later in this report for more information.
[16] Two reference studies: (1) Howe, Lazo, Weber. 1990. *The Economic Impacts of Agriculture-to-Urban Water Transfers on the Area of Origin: A Case Study of the Arkansas River Valley in Colorado*. American Journal of Agricultural Economics. (2) Honey Creek Resources. 2010. *A Proposed Method for Incorporating Rural Population-Business Thresholds or "Tipping Points" in Water Transfer Evaluations*. Prepared for CWCB.
[17] The other two high-ranking options across all basins were: (1) new reservoir storage to firm existing rights and (2) enlargement of existing storage. Interruptible transfers were ranked high in 2 out of 7 basins. Permanent transfers ranked high in 0 basins.

Table 5: Agricultural Water Transfers Considered in SWSI 2004

Transfer Option	Benefits	Issues / Concerns
Permanent Transfers	High certainty, Good reliability and less storage required than new junior-priority rights, Simpler permitting than large storage projects, No increase in basin depletions, Reuse of return flows, Low environmental impact	Local economic impacts, Reduced tax assessments, Costly water court process, Difficult to revegetate dry-up lands, Reduced public open space benefits, Reduced wetland & riparian habitat, Requirement for storage to provide year-round reliable supply, Potential impacts on local groundwater.
Interruptible Transfers	Target non-permanent needs, Reduced need to build storage to meet dry-year demands, Income to agricultural users	Limited benefit for meeting long-term demands, Source rights need dry-year reliability, Complicated transfer process, Farm management (soils, weeds, labor, markets) in lease years.
Rotating Transfers with Storage	Improved reliability, Stable income to agricultural sector, Reduced negative on-farm effects, Complements non-tributary groundwater sources.	Requires commitment from agricultural sector in-perpetuity, Difficult economics (more expensive for buyer, lost opportunity for seller), High transaction costs, Difficult for some crops, Farm management in water lease years.
Water Bank Transfers	Allows alternative uses on interim basis, New income for agricultural sector, Flexibility in water management.	Availability of bank supplies when needed, Transferable volume complications, Challenges in starting the bank market.

Following the release of the 2004 SWSI, four Technical Roundtables were established to address different implementation aspects of the plan, one of which was formed to analyze "*Alternative Agricultural Water Transfer Methods to Traditional Purchase and Transfer*". The findings of this roundtable were published in a 2007 SWSI update, (known as SWSI II), which contained an entire report section devoted to alternative agricultural water transfer methods. The alternatives section expanded upon the benefits and concerns listed in **Table 5** and provided a description of five example types of alternative water transfers[18]. The 2007 SWSI also provided 7 examples in Colorado (as well as out of state examples in California) of alternative water transfers, several of which were examples of a permanent sale followed by a long-term water lease back to agriculture. The recommended role for the state to play with regard to alternative water transfers was to "level the playing field" by providing incentives to municipal and industrial water users to utilize alternative transfer methods. The CWCB grant program (described below) was developed based on the Technical Roundtable findings and recommendations.

Another SWSI update in 2010 also included alternative agricultural transfer methods and was one of the first planning reports to use the term ATM. The 2010 SWSI update characterized ATM concepts as still emerging and challenged by several hurdles, such as: (1) high transaction costs, (2) water rights administration and accounting issues, and (3) certainty and permanence of supply. Several recommendations were made to advance ATM implementation, focused on research, education, and policy development.

The Colorado Water Plan was released in 2015 and continued to promote the development and use of ATMs, building on past state water planning efforts. Section 6.4 of the Water Plan addresses ATMs directly and lists 11 action items for ensuring that ATMs are successful (see **Table 6** below). The 2015 Water Plan was the first instance of the state setting a measurable objective for ATMs noted below:

"*...agricultural economic productivity will keep pace with growing state, national, and global needs, even if some acres go out of production. To achieve this objective, the State will work closely with the agricultural community, in the same collaborative manner that has produced agricultural transfer pilot projects, to share at least 50,000 acre-feet of agricultural water using voluntary alternative transfer methods by 2030.*"

[18] The five examples were: (1) interruptible water supply agreements, (2) rotational fallowing, (3) water banks, (4) reduced consumptive use, and (5) purchase and lease-backs under defined conditions.

Table 6: ATM Action Items in 2015 Colorado Water Plan

No.	Action / Option
1	Monitor current and future legislation necessary for the implementation of ATMs, including enhanced sharing opportunities and system agility.
2	Encourage funding grants that focus on implementing on-the-ground ATM projects, data collection, agile administration practices, ATM affordability, basin-specific ATM projects, and infrastructure modernization.
3	Support appropriate fallowing-leasing pilot projects, such as the Catlin Canal pilot project, by responding to and processing applications in a timely manner under House Bill 13-1248 (C.R.S 37-60-115). The ATM grant program could further support these projects. To proactively cultivate these projects, the CWCB will work with partners or co-sponsors to organize and conduct regional workshops. These events will enable stakeholders to share lessons learned on actual ATM projects, and to garner additional interest by discussing program benefits.
4	Encourage adaptive strategies that capture a "learning by doing" concept for pilot programs and other on-the-ground ATM applications
5	Continue to provide ATM leadership as well as technical and financial support to basin roundtables during the development of their BIPs.
6	Assess quantitative information related to agricultural dry-up in SWSI 2016, including evaluating lessons learned and monitoring the effects of ATMs in reducing permanent agricultural dry-up.
7	Explore financial incentives through a stakeholder process as part of the funding Section 9.2 describes. These incentives or grants could include new and ongoing revenue streams and tax incentives at the local and state level.
8	Work with the South Platte, Metro, and Arkansas Basin Roundtables to explore a WSRA or an ATM grant, with municipal and agricultural stakeholders, which could lead to the formation of one or more pilot regional water sharing cooperatives. The mission of a cooperative would be to facilitate water-sharing arrangements. The cooperative could include ways to determine initial start-up costs necessary to reach stated goals. For instance, methods may include acquiring funding needed to reduce barriers associated with the high transaction costs of water-rights transfers and working through water court to make a water right more agile.
9	Continue collaborating with water users to develop tools and models that can be used as an approved common baseline for water court litigants and parties. Administrative change cases could rely upon these for conservative yet streamlined estimates of consumptive use, return flows, and injury.
10	Seek to help stakeholders understand the benefits and social barriers of ATMs and how they can function under existing and future law
11	Interact with the Colorado water community and decision makers to consider the following options in support of ATM goals:
11a	Continue to monitor basin-level work and explore options to develop agility in the use of certain agricultural water rights for multiple purposes.
11b	Implement tools Senate Bill 15-198 (C.R.S. 37-60-115) provides that broaden pilot-project end uses that House Bill 13-1248 (C.R.S. 37-60-115) sets forth. Such pilot projects could demonstrate agricultural transfers that meet environmental, recreational, industrial, or compact needs in addition to urban needs. The CWCB will encourage pilot projects to test the latest concepts or meet multiple benefits.
11c	Reduce barriers, such as high transaction costs associated with water-rights transfers and water-rights accounting uncertainties, through continued exploration of pilot projects and other voluntary transactions that demonstrate a streamlined approach or provide financial support.
11d	After a thorough outreach and stakeholder process, consider legislation to protect existing municipal, transferred water-rights owners that choose to undergo the court process to demand that their permanent agricultural transfers operate as ATMs. Such legislation could help ensure that a water-rights owner could revert to its previously adopted stipulations, if the water court process for an ATM option yields an unfavorable outcome.
11e	Strengthen recognition for new types of legal beneficial uses, such as leased or agile-use water.
11f	Identify and develop a request for a multi-basin WSRA grant through the basin roundtables. The goals of a potential grant would be to compile ATM data, identify actions to encourage irrigators to enter agreements, analyze barriers, and increase program awareness.
11g	Research benefits and challenges of "buy and supply," which could preserve local irrigated agriculture and associated benefits. The concept of "buy and supply" is that M&I water users purchase irrigated lands with associated water rights, establish a conservation easement for future farming, and then supply a full amount of water for a certain number of years within a 10-year period. The M&I user could then receive water supply in the remaining non-farming years.
11h	Explore the possibility of third parties providing assistance in funding ATMs to ensure that farmers are appropriately compensated and that water suppliers pay a reasonable incremental cost for firm yield. In this case, the third party would essentially assist in the effort to uphold the value of continued viable agriculture.
11i	Support research into the benefits and challenges of temporary rotational "idling" of crops, deficit irrigation, and split-season irrigation.
11k	Incorporate improved water-use data into decision-making processes in a way that reduces uncertainty for water managers, and develop basin-specific models for use in water court cases to help reduce transaction costs.

Following the 2015 Water Plan, a Technical Update was recently completed in 2019 that revisited several water supply and demand estimates, similar to what had been previously done under the SWSI studies. ATMs were evaluated as part of the 2019 Technical Update with several recommendations on next steps for ATM development in Colorado (see Project Purpose section below).

With the early 2000s drought, state planning projections on additional loss of irrigated lands, and some successful examples in both Colorado and California as the backdrop, ATMs were conceived as a way to accommodate continued population growth and economic development in Colorado municipalities, and potentially providing new economic opportunities for agricultural producers, without seeing historic levels of permanent agricultural dry-up. From early-stage thinking on ATMs, research and pilot projects have shown both possibilities and significant hurdles to greater use of ATMs by the Colorado water community. The next section provides a data perspective on projected loss of irrigated lands in Colorado from state water planning studies, followed by a description of the CWCB ATM grant program that has been in place since 2007.

Projections of Irrigated Land Loss in Colorado

The SWSI 2010 analysis provided projections of irrigated land loss that have been widely cited in support of ATM development over the last decade. As shown in **Table 7**, approximately 44% of the estimated loss in irrigated lands in Colorado was attributed to municipal transfers. The remaining 56% of irrigated land loss was estimated to result from urbanization (land development), lack of augmentation to support irrigation wells, and regulatory constraints associated with groundwater overdraft and interstate compact compliance.

Table 7: Estimated Loss of Irrigated Lands in SWSI 2010 Report

		Low Estimate	High Estimate	Average	Percent of Total Loss
Current Irrigated Acres		**3,466,000**	**3,466,000**	**3,466,000**	**-**
Loss Factor	Urbanization	115,100	154,600	134,850	22%
	Other Reasons (lack of augmentation, groundwater overdraft, interstate compact compliance)	203,000	203,000	203,000	34%
	Planned Ag to Muni Transfers	26,200	26,200	26,200	4%
	Future Ag to Muni Transfers (2010-2050)	146,000	334,000	240,000	40%
	Total Loss	**490,300**	**717,800**	**604,050**	
Future 2050 Irrigated Acres		**2,975,700**	**2,748,200**	**2,861,950**	**-**

A similar analysis of irrigated land loss was recently conducted for the 2019 Technical Update to the Colorado Water Plan. The Technical Update provides updated estimates for irrigated land loss in Colorado by the year 2050. **Table 8** shows that less total irrigated acreage is predicted to be lost over the next 30 years, with 13% of the estimated loss due specifically to planned municipal water transfers. A much greater percentage of irrigated land loss is attributed to urbanization[19] and groundwater sustainability actions. However, the Technical Update notes that previous SWSI 2010 projections of potential loss of irrigated acreage could still occur based on how Basin Roundtables update their suite of identified projects and processes to address projected water demand-supply gaps[20].

[19] Urbanization in the Technical Update may also include municipal transfers. Irrigated land loss due to urbanization was calculated based on irrigated lands within or intersecting current municipal boundaries.

[20] The 2019 Technical Update did not include forecasts of future municipal transfers, similar to what was provided in the 2010 SWSI report, resulting in less overall irrigated land loss in the 2019 report. If the SWSI 2010 estimate of 240,000 acres lost to future municipal transfers is added to the 2019 total, then the total irrigated land loss in 2019 increases to 677,270 acres and is similar to the 2010 value. Future municipal transfers may result in irrigated land loss based on the Basin Roundtables planning.

Table 8: Estimated Loss of Irrigated Lands in 2019 Technical Update

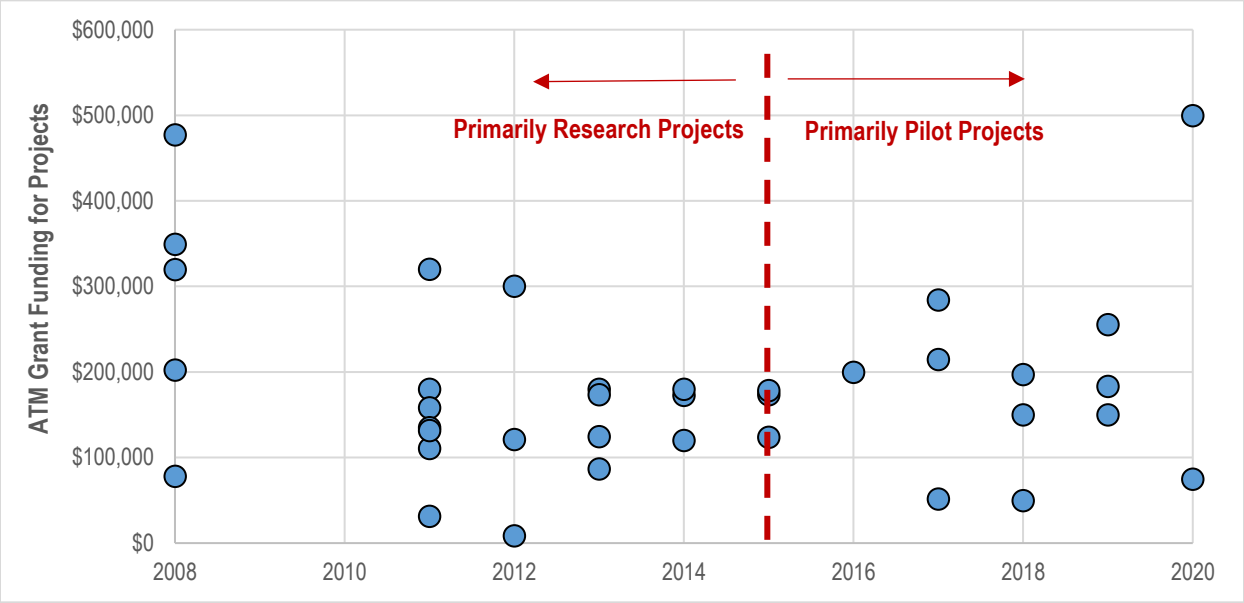
Basin	Current Irrigated Acres	Urbanization	Planned Municipal Transfers	Groundwater Sustainability	Total Loss	Percent Loss
Arkansas	445,000	7,240	12,600	44,500	64,340	14%
Colorado	206,700	13,590	0	0	13,590	7%
Gunnison	234,400	14,600	0	0	14,600	6%
North Platte	113,600	40	0	0	40	0%
Republican	578,800	1,410	0	135,420	136,830	24%
Rio Grande	515,300	4,010	0	45,000	49,010	10%
South Platte / Metro	854,300	105,900	42,500	4,800	153,200	18%
Southwest	222,500	3,800	0	0	3,800	2%
White	28,100	360	0	0	360	1%
Yampa	78,900	1,500	0	0	1,500	2%
TOTAL	**3,277,600**	**152,450**	**55,100**	**229,720**	**437,270**	**13%**
Percent of Irrigated Land Loss		35%	13%	53%		

Table Notes: Irrigated land losses for Groundwater Sustainability reasons utilized the "business as usual" scenario.

CWCB ATM Grant Program

The State Legislature passed SB 07-122 in 2007, which provided initial funding for the CWCB ATM grant program. Since its initial appropriation in 2007, the ATM grant program has continued to receive state support and has provided approximately $6.7 million in grant funding for 36 projects to date. **Figure 2** provides a scatter-plot of grant-funded projects over the past 13 years.

Figure 2: CWCB ATM Grant Projects



Prior to 2015, most grant funding was utilized by research projects that explored agricultural water conservation, administrative solutions, concept feasibility, and various barriers. Since 2015, most funding has been used as seed money for pilot projects to implement ATMs around the state. The state's investment has produced a wealth of knowledge and analysis of ATM concepts in Colorado, as well as 3 successful projects and 8 projects currently in development. A full list of projects funded by the CWCB ATM grant program is provided in **Appendix A**. The following

five projects are notable because they have collectively represented close to half of all ATM grant funding to date, and they represent the diversity of investigations and efforts that have occurred since 2007:

- Colorado River Water Bank: The Colorado River Water Bank has been an ongoing project since 2011[21]. The water bank concept was developed to reduce the risk of an administrative curtailment order on trans-basin diversions (and other post-1922 rights) by facilitating voluntary water transactions through a water bank structure. Projects have included a Phase 1 feasibility study in 2011, a Phase 2 case-study analysis in 2013, several agricultural demonstration projects, and support for the System Conservation Pilot Program efforts from 2015-2018. The water bank concept has largely been superseded by current demand management discussions in the Colorado River Basin, but the underlying research and development efforts remain very relevant.

- Lower South Platte Irrigation Research & Demonstration Project: This project was a partnership between Parker Water & Sanitation District (PWSD) and Colorado State University to evaluate specific on-farm methods to provide transferrable water from agriculture while maintaining viable farming operations. The project included a demonstration project on a farm in Logan County owned by PWSD to examine the feasibility of quantifying partial consumptive use savings through deficit irrigation when lands continue to be irrigated. Later stages of the project looked at on-farm economic feasibility and third-party impacts of ATM type water transfers.

- FLEX Market: The project started with an engineering analysis of major ditch companies in the South Platte River Basin, summarizing potential transferable water available to ATM projects. The project name refers to a concept of developing flexible water rights through water court that could be more easily transferred on a temporary basis. A FLEX Market type of contract was developed. Later stages of the project conducted outreach and attempted to develop specific pilot projects of the FLEX Market type of transaction. The FLEX Market report findings helped inform the development of the Agricultural Water Protection Water Right (see **Table 14**).

- Lower Arkansas Valley WCD Fallow-Leasing Pilot Projects: The Lower Arkansas Valley Water Conservation District (LAVWCD) has been a champion of ATMs from the start and was the first CWCB grant award in 2008. The LAVWCD originally developed a concept for a broad rotational fallowing program involving multiple ditch companies on the Lower Arkansas River that would be managed by the Super Ditch Company. This effort ran into regulatory hurdles and was scaled down to a pilot project on the Catlin Canal in 2015 using new HB13-1248 legislation for administrative approval of a rotational fallowing project. The Catlin Canal project is continuing to operate. The LAVWCD also recently secured another rotational fallowing lease with Colorado Springs Utilities and received funding in 2019 to develop tools to expand Super Ditch operations and fund infrastructure to scale up ATM projects in the Lower Arkansas Basin.

- Northeast Colorado Water Cooperative: This project was motivated by the existence of excess augmentation recharge credits in the Lower South Platte River and evaluating the demands for such credits. The project started as an assessment of an ATM-style mechanism for moving augmentation credits from plans with excess credits into plans with replacement deficits. The project led to the formation of a water cooperative in northeast Colorado that plans to facilitate the transfer of augmentation credits.

[21] https://www.coloradoriverdistrict.org/water-banking/

Project Purpose

The 2019 Technical Update to the Colorado Water Plan included a review of ATMs in Colorado, with the following recommendations on next steps:

- "*Develop better guidance as to what types of projects and processes further Water Plan goals related to maintaining or enhancing agricultural viability, while meeting potential new demands and addressing other water resource management issues.*
- *Continue funding for ATM development through CWCB's grant program and other sustainable funding mechanisms.*
- *Assess institutional support of ATMs and evaluate progress made on addressing the primary barriers to ATM development and implementation and broaden outreach to potential ATM participants such as government open space programs and elected officials.*
- *Develop additional pilot projects for the varying types of ATM programs and engage in thoughtful monitoring of their effectiveness.*
- *Work with basin roundtables to consider how ATMs can play a role in addressing basin needs and priorities.*
- *Further pursue the collection of the recommended monitoring data for ATMs as they are developed and share this information through existing platforms such as CDSS or new platforms such as an ATM data clearinghouse.*"

The above recommendations, along with CWCB objectives leading up to the Colorado Water Plan update, prompted this ATM Support Project. The project was designed to assess the status made to date on ATMs and to develop a framework for CWCB and broader state consideration of ATMs moving forward. The project provides a relatively broad view of ATMs, both in terms of what role they may play in achieving state water plan objectives and in terms of how other actions can address the original goal of reducing the loss of irrigated lands in Colorado.

Report Organization

This report is organized into the following sections:

- **Status Assessment**. This section provides an inventory of ATM projects in Colorado and summarizes the outreach activities conducted as part of this project. Outreach included Basin Roundtable meetings, phone interviews with municipal water providers, phone interviews with participants in past ATM projects, and meetings with an ATM Advisory Committee. The status of ATMs is evaluated in two parts: (1) the volume of ATM projects relative to the 2015 Water Plan goal of 50,000 acre-feet, and (2) progress in overcoming well-known barriers to ATM adoption.

- **ATM Framework**. This section provides a framework for continued CWCB analysis of ATMs in the future. The framework considers a definition for ATMs related to Water Plan goals, incentives and benefits of ATM transfers, the role of policy changes, and recommended metrics for tracking progress.

- **Recommendations**. This section provides a set of recommendations for CWCB to consider with regard to ATMs. The recommendations are focused on aspects that CWCB can control and actions items that CWCB can implement. Recommendations are categorized as: funding, policy, and education & outreach.

STATUS ASSESSMENT

Approach

A status assessment on ATMs is included in this project because significant state investment, research, and policy development has occurred over the last 13 years, and it is important to evaluate what has resulted from these efforts. It is also important to evaluate perspectives on ATMs, from the water community, the municipal sector, and past participants in ATM style transactions. Now that people in Colorado have been exposed to ATM concepts, it is important to evaluate their opinions. This status assessment was conducted in three parts:

4. A compilation of ATM projects and literature in Colorado, which represents the knowledge base and experience upon which further ATM strategy development is built.
5. Outreach efforts to survey Basin Roundtables, municipal water providers, and past ATM participants on their views towards water supply planning, irrigated land loss, and ATM efforts.
6. Analysis of information developed under the two above-listed parts summarized as a status assessment on the Colorado Water Plan goal of 50,000 acre-feet of ATM transfers, and on progress in overcoming barriers to ATM adoption.

The status assessment is both a quantitative assessment based on available data and metrics on ATM transactions, and a qualitative assessment of progress on ATMs over the past decade.

ATM Projects in Colorado

Any inventory of ATM projects in Colorado must first establish a definition for ATMs. There are many water transactions that occur in Colorado each year, and water transactions naturally vary in their structure, terms, and objectives. Deciding on what water transactions qualify as an ATM transaction requires the establishment of a dividing line based on a definition. Recommendations for such a definition are provided in the next chapter of this report under establishing an ATM Framework for the future. For the purpose of understanding the status of ATM efforts, an inventory was compiled that included water transactions meeting one of the following criteria: (1) labeled as an ATM by one of the participating parties, (2) received ATM grant funding support from CWCB, or (3) cited as an ATM example in reports and studies. **Table 9** summarizes active, pending, and completed ATM projects in Colorado that fit these criteria. Several ATM projects[22] are currently under development in Colorado that are not reflected in **Table 9**.

There are estimated to be 12 active, 2 pending, and 2 completed ATM water transfers in Colorado. The inventoried ATM projects are located in various river basins and were enacted to serve multiple purposes. The total annual contract volume of these 16 ATM transfers is estimated to be approximately 30,600 acre-feet per year[23]. The majority of these ATM transactions, both in terms of number and volume, were contracted before the 2015 Colorado Water Plan. In terms of location and use, the example ATMs can be grouped as serving municipal demands in the Arkansas Basin, environmental and compact compliance purposes on the West Slope, groundwater augmentation needs in the Rio Grande Basin, and a mix of municipal and industrial uses in the South Platte Basin.

The example ATMs utilized a variety of agricultural supply methods that represent the variation in the type of water supply and the purpose that the ATM was serving. Example supply methods have included various fallowing programs, deficit irrigation in water-short systems[24], and infrastructure investments. There has been less variability in the type of transfer method, with most example ATMs utilizing either a lease contract or an interruptible water supply agreement (IWSA), also sometimes known as an option contract.

[22] The list of projects that have recently been provided ATM grant funding from CWCB are listed in Appendix A and provide information of some of the ATM projects under development.
[23] This volume represents the sum of annual contract volumes for the 16 ATM agreements. The volume does not represent the volume contracted in any one year, and does not represent the volume of water actually transferred under the agreement.
[24] The term "water short" refers to a system or situation in which the average available water supply is less than the demand of an agricultural crop, such that supply is the limiting factor in defining water use.

Table 9: Inventory of ATM Projects in Colorado

Basin	Project Name	New Use	Buyer	Seller	Contract Year	Term (Years)	Supply Method	Transfer Method	Annual Contract Volume (AF)
Arkansas	Catlin Canal Pilot Project	Municipal	City of Fountain, Security Water District, Town of Fowler	Lower Arkansas Valley Water Conservancy District	2014	10	Rotational Fallowing	Lease Contract	500
Arkansas	Rocky Ford Highline Interruptible Supply	Municipal	City of Aurora	Rocky Ford High Line Canal Company	2004	2	Full-Season Fallow	Lease Contract	8,500
Arkansas	Rocky Ford Continued Farming Program (Phase II)	Municipal	City of Aurora	Rocky Ford High Line Canal Company	2007	Perpetual			1,100
Arkansas	LAWMA Project	Municipal	Colorado Springs Utilities	Arkansas River Farms LLC, Lower Arkansas Water Management Association	2018	Perpetual	Infrastructure/Irrigation Fields to Greenhouses	IWSA/Option Contract	1,000
Arkansas	CSU Fallow-Leasing Pilot Project	Municipal	Colorado Springs Utilities	Lower Arkansas Valley Water Conservancy District	2018	10	Rotational Fallowing	IWSA/Option Contract	1,000
Arkansas	City of Fountain 2019 IWSA	Municipal	City of Fountain	Lower Arkansas Valley Water Conservancy District	2018	30	Rotational Fallowing	IWSA/Option Contract	150
Colorado	Yost Ditch/Deep Creek	Environmental	CWCB	Coyote River LLC	2012	10	Full-Season Fallow	IWSA/Option Contract	429
Colorado	Conserved Consumptive Use Project	Conservation	U.S. Bureau of Reclamation (SCPP)	Grand Valley Water Users Association Members	2017	2	Fallowing & Deficit Irrigation	Lease Contract	2,995
Gunnison	McKinley Ditch ATM	Environmental	CWCB	CO Water Trust	2014	Perpetual	Split-Season Fallow	Purchase Contract	772
Gunnison	Coats Bros Ditch/Tomichi Creek	Environmental	CWCB (through CO Water Trust and Trout Unlimited)	Irrigator	2015	10	Split-Season Fallow	IWSA/Option Contract	203
Rio Grande	Cactus Hill	Municipal	City of Alamosa	Cactus Hill Farm	2019	Perpetual			40
South Platte	Fort Morgan-Xcel Energy	Industrial	Public Service Company of Colorado (Xcel Energy)	Fort Morgan Ditch Company	1993	40	Deficit Irrigation	IWSA/Option Contract	2,500
South Platte	Point of Rocks I	Industrial	Public Service Company of Colorado (Xcel Energy)	Point of Rocks Water Company	2005	25	Deficit Irrigation	IWSA/Option Contract	3,000
South Platte	Point of Rocks II	Industrial	BNN Energy	Point of Rocks Water Company	2016		Deficit Irrigation		6,800
South Platte	Little Thompson Farm ATM	Municipal	City of Broomfield	Larimer County Natural Resources Department	2017	Perpetual	Deficit Irrigation	IWSA/Option Contract	56
South Platte		Municipal	Fort Collins Utilities		2015	Perpetual	Full-Season Fallow	Court Decree for Two Uses	1,617
TOTAL									**30,662**

Table Notes: (1) Green shading indicates project approval is pending. (2) Grey shading indicates project is completed and no longer active. (2) For Aurora Rocky Ford and GVWUA Conserved CU projects, the annual volume in the table represents the average of the 2-year projects.

In addition to the ATM projects summarized in **Table 9**, a relatively large volume of unique water transfers took place from 2015 to 2018 under the System Conservation Pilot Program (SCPP) in the Colorado River Basin. The SCPP was a 4-year pilot program designed to explore and learn about the effectiveness of temporary, voluntary, and compensated measures that could be used, when needed, to help maintain water levels in Lake Powell necessary to protect Colorado River compact entitlements and hydroelectric power production. One of these projects involving the Grand Valley Water Users Association was funded by CWCB ATM grant money and is included in the ATM inventory table. There were an additional 17 projects in Colorado over the four years that the program was active resulting in an estimated 3,000 acre-feet of conserved consumptive use for system-wide benefit. The Colorado SCPP projects are summarized in **Table 10**. The Colorado Water Plan states that ATMs can be used to "*reduce demands on a water system*" therefore, the SCPP projects could be considered as ATM examples in Colorado, based on the type of agricultural conservation activities that were conducted and the intent of the SCPP program[25]. The SCPP projects are identified separately in this inventory effort because they have not been previously cited as ATM examples and because it represented a temporary, unique program.

Table 10: System Conservation Pilot Projects in Colorado

Water Source	Farm ID	Year	Acres	Consumptive Use Savings (AF)	Activity
Colorado River	CO1	2015-2017	200	1,002	Full Season Fallow
S.F. Eagle River	CO2	2016	-	200	Municipal Conservation
East River	CO3	2016	106	98	Partial Season Fallow
Little Cimarron River	CO4	2016	195	170	Partial Season Fallow
Milk Creek	CO5	2016	94	84	Partial Season Fallow
Surface Creek	CO6	2016	67	125	Partial Season Fallow
Tomichi Creek	CO7	2016	165	100	Partial Season Fallow
	CO8	2018	214	193	Partial Season Fallow
	CO9	2018	139	125	Partial Season Fallow
	CO10	2018	131	97	Partial Season Fallow
	CO11	2018	33	30	Partial Season Fallow
	CO12	2018	209	209	Partial Season Fallow
	CO13	2018	283	200	Partial Season Fallow
Uncompaghre River	CO14	2016-2018	5	30	Alternative Crop
			5	30	Alternative Crop
	CO15	2015	23	46	Full Season Fallow
		2016	23	29	Alternative Crop
	CO16	2016-2018	12	72	Alternative Crop
Yampa River	CO17	2015	193	188	Partial Season Fallow
TOTAL				**3,028**	

Notes: (1) Project information from Upper Colorado River Commission. (2) Inventory does not include the GVWUA Conserved Consumptive Use Project which is included in Table 8 but was included in the SCPP program during 2017.

Another group of unique water transfers have been developed in the Rio Grande Basin in order to manage groundwater resources and address interstate compact obligations. The Rio Grande Water Conservation District (RGWCD) started to develop a variety of water management tools in 2015 in response to changes in state administration of groundwater wells. These water management tools have included forbearance agreements with senior-priority surface water users, direct leases for exchanges or meeting streamflow criteria, temporary fallowing agreements, and others. The District's annual replacement plans indicate that these tools have reduced or offset an average of 60,000 acre-feet per year of net groundwater pumping in Sub-District 1[26], and 20,000 acre-feet per year in Sub-District 3[27].

[25] Colorado Water Plan, pg 6-116
[26] https://rgwcd.org/sd-1-annual-replacement-plan
[27] https://rgwcd.org/sd3-arps

This inventory of ATM projects in Colorado is considered to be complete based on available information but it is possible that there are additional ATM style water transfers that exist in Colorado which are not included in this inventory. One of the recommendations moving forward is for the CWCB to maintain an inventory of ATM examples, for both tracking and education purposes.

Literature Review

The project team completed a review of literature related to ATMs. The purpose of the literature review was to compile information on water sharing policy and transactions, alternatives to agricultural buy-and-dry, and agricultural water conservation, specifically as they relate to Colorado's Alternative Transfer Method (ATM) program. Resources for this review were collected through a search of peer-reviewed literature, available project reports, and other published materials directly from water planning entities or water policy experts. The literature review was based on research conducted in the State of Colorado or the Colorado River Basin states. In total, the project team reviewed 54 studies and reports related to ATMs[28]. The literature review focused on barriers to ATMs and recommendations for additional action. **Table 11** summarizes findings from the literature review. Barriers to ATMs were found to stem from cost, complexity, and lack of interest or feasibility.

Table 11: Summary of Barriers & Recommended Actions from Literature Review

Barrier	Recommendations
High Transaction Cost	(1) Funding partnerships to share costs, (2) Existing public funding for conservation could be directed to ATMs, (3) Share costs among all economic sectors, (4) Collaborate on simultaneous agreements.
Lack of Information	(1) Educate water users through direct efforts, outreach programs, workshops, outreach materials, (2) Compile information in accessible database on conservation practices and ATM transactions
Legal Impediments	(1) Expedite regulatory approval process, (2) Consider specific changes to state rules & laws.
Community Impact Concerns	(1) ATM methods should be vetted in consideration of local impacts, (2) Create a transfer fee for out of county use, (3) Increase standards for re-vegetation.
Lease Term Disparity	(1) Support water bank legislation to encourage short-term municipal interest, (2) Support appropriate compensation for long-term leases.
Lack of Infrastructure	(1) Identify existing storage that could facilitate ATMs, (2) Identify new infrastructure that could facilitate ATMs.
Social Considerations	(1) CWCB continue to promote and facilitate agreements, (2) Increase local & regional leadership on ATMs, (3) Consider proper compensation for voluntary farmer participants (4) Consider financial incentives to represent the public economic benefit, (5) Focus engagement on certain municipal providers with limited water supply options, (6) Encourage irrigation districts to be involved in creation of ATMs.
Agricultural Production Limits	(1) Research on feasibility & limits of deficit irrigation, (2) Identify new crops & rotations, (3) Expect multiple design approaches, (4) Support coupling of conservation easements with IWSAs, (5) Adopt soil health measures in concert with ATMs.
Measurement & Monitoring	(1) Adopt standards & practices for regional remote-sensing programs, (2) Funding for updated CU estimates, (3) Shift burden of no-injury to objectors[29], (4) Support efforts to reduce administrative costs and burdens.

The literature also identified a broad objective of realizing multiple Water Plan goals simultaneously by using ATMs as a tool in water supply planning. Benefits of achieving this objective were cited as: (a) agricultural productivity and farmer prosperity, (2) ecological and recreational values, and (3) sustainable and resilient municipal supply planning. Several key areas for further study were identified during the literature review, as follows:

- Quantification of consumptive use and return flows under ATMs is expected to clarify potential injury concerns among other water users, and in the process accelerate administrative and legal proceedings.

[28] This is notable because there appear to be far more studies and reports discussing ATMs than there are identified ATM projects in Colorado

[29] It is noted that shifting the no-injury burden to objectors is an area of pushback on ATMs.

- Proper compensation for irrigators involved with ATMs merits further study, including indirect costs and long-term effects on agricultural productivity.
- Evaluating the impact of ATMs on regional economic prosperity, potentially through models, to illustrate the financial and water supply risks of various water transfer options, including ATMs.

Outreach Efforts

Outreach to the water user community was established as an important piece of the ATM Support Project because the project team wanted to document opinions and compile recommendations for future actions on ATMs. We wanted to understand why more ATMs have not been established in Colorado despite state support. We also wanted to leverage the experiences and perspectives of a broader and more diverse group in forming our recommendations.

Roundtable Meetings

In Colorado, Basin Roundtables were established in 2005 to facilitate discussion on water planning and generate local solutions to water challenges. Since then, the Basin Roundtables have become a key component of how the Colorado water community communicates and collaborates on water issues. Project team members attended Basin Roundtable meetings in January and February 2020, and also emailed a survey, in order to gather input from a cross-section of water users and stakeholders in various geographies[30]. In addition to feedback at the Roundtable meetings, we received 18 email responses. A copy of the survey and a report on survey findings are attached in **Appendix B**.

Survey respondents stated a range of familiarity with ATMs. All respondents agreed that agricultural dry-up is problematic with primary concerns related to aesthetic and cultural values, economic impact, and food production (see **Figure 3a**). Respondents further indicated that the Colorado Water Plan update should take these externalities into account. Respondents indicated that ATMs are suitable to address a variety of water needs, such as drought planning, instream flow agreements, water for growth and development, and augmentation supplies. Respondents identified that a lack of information, the unknown impact on farming, general risk and uncertainty, and distrust as the most common barriers to completing ATMs (see **Figure 3b**). To address these barriers and to reduce agricultural dry-up, respondents suggested four critical actions:

1. Provide more information and educational materials on ATMs
2. Fund ATM projects and infrastructure (particularly water storage) that facilitate ATMs
3. Enact legislative and policy changes to reduce the regulatory burden of ATMs
4. Improve leadership and water user social connectivity

In terms of future Roundtable involvement with ATMs, respondents had split opinions. For those in favor of roundtable involvement, they suggested Roundtables should be a source of advice and information, collect data on ATMs, facilitate dialogue, provide funding, and assess community support for potential projects. For those who believe that Roundtables have no role in ATMs, they suggested that ATMs should be managed at a more local level, such a water or conservation district.

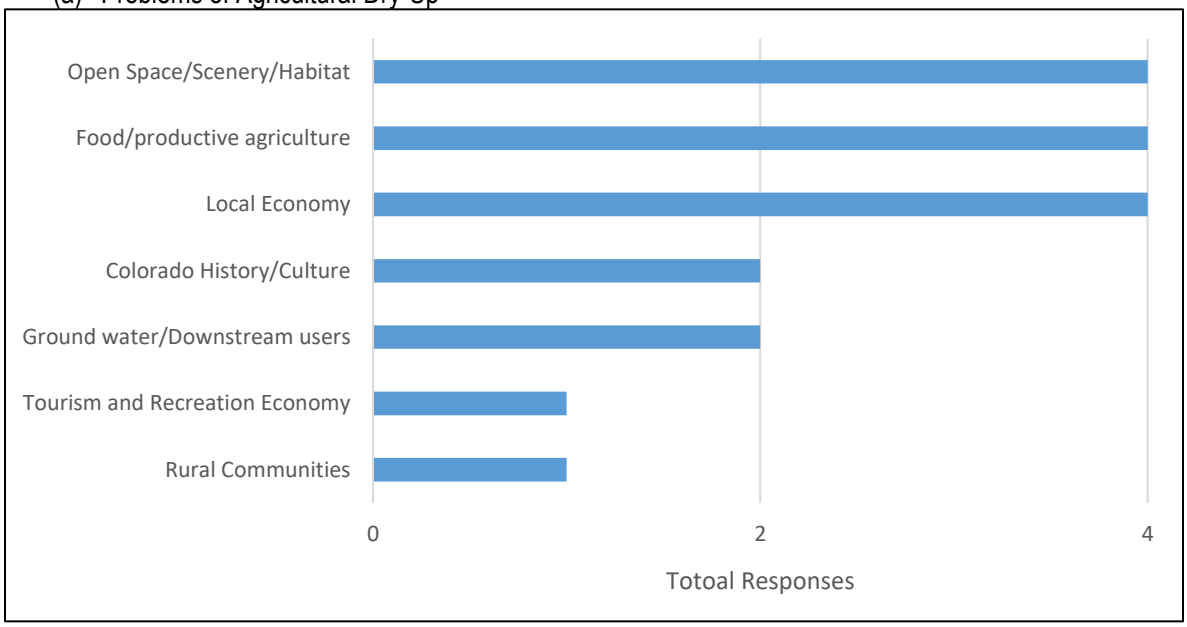
In general, West Slope Roundtables feel less pressure to implement ATMs as they experience less municipal demand growth and projected shortage relative to existing water supplies. For the West Slope, ATMs for interstate compact compliance, and recreational and environmental flows are deemed more relevant, as is the need for upgraded agricultural infrastructure and storage. The need for infrastructure and storage was also voiced on the East Slope, but as part of an overall strategy that includes ATMs. It was noted that Roundtable members reiterated the point that ATMs represent a cultural shift for an agricultural producer to give up water and there is just not a lot of present interest from producers. A general frustration around the lack of progress of ATMs was expressed by Roundtable members and a general sentiment was expressed that greater adoption of ATMs will be difficult and buy and dry activities will continue.

[30] We attended the Rio Grande Basin on January 14, Gunnison Basin Roundtable on January 20, Arkansas Basin Roundtable on January 23, Colorado Basin Roundtable on January 27 and the joint South Platte and Metro Basin Roundtable on February 11, 2020

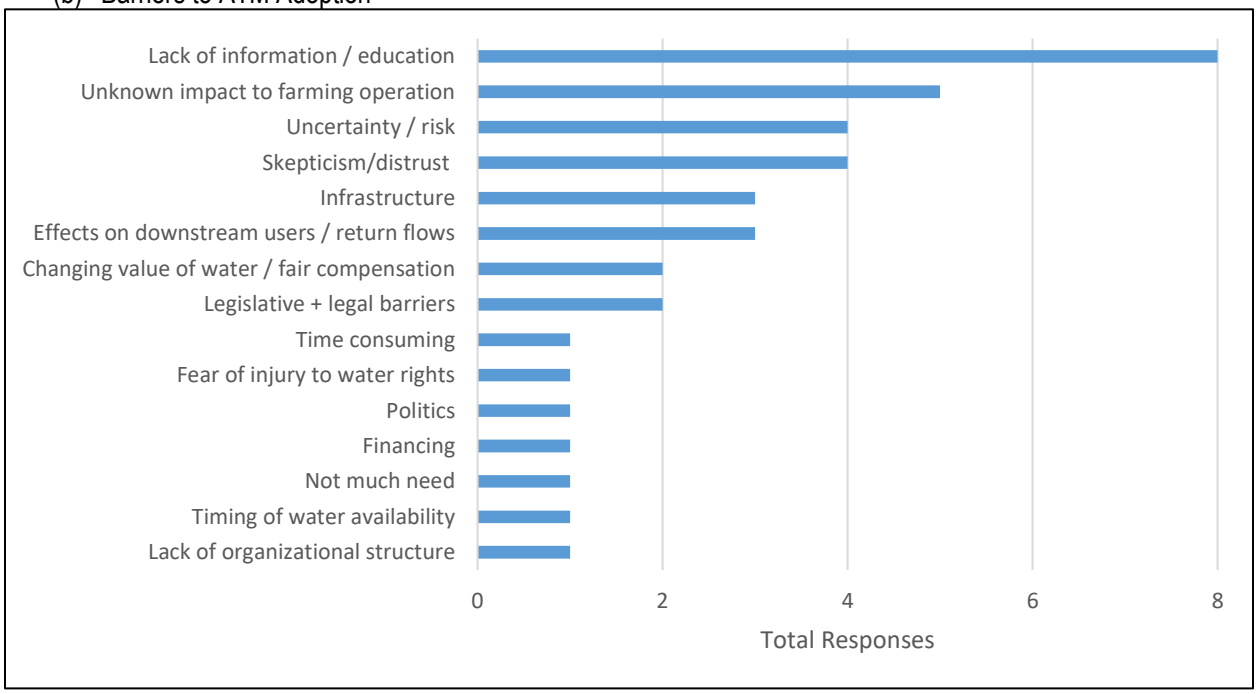
When queried about the definition of ATMs it was stated by some Roundtable members that the definition should be broadly construed to include any methods that are not strictly buy and dry.

Figure 3: Select Feedback from Roundtable Meetings & Survey

(a) Problems of Agricultural Dry-Up



(b) Barriers to ATM Adoption



As discussed in later sections, feedback from the Roundtables was incorporated into an evaluation of barriers, opportunities, and recommendations for moving forward with ATMs. In addition, the following feedback was received:

- ATM Metrics. Metrics to track, evaluate, and fund ATM projects are a consideration of this project and a piece of future recommendations. Roundtable members thought that each Roundtable should develop its own metrics that are representative of the Basin and desired an articulation of the different types of ATM benefits. Several comments pointed to the intended agricultural support of ATMs, with metrics such as irrigated lands over time, agricultural economic output, and perhaps acres of dry-up avoided. The diverse benefits of ATMs were also noted, with support for tracking separate volumes of ATMs by type of benefit. Another potential metric is the municipal adoption of ATM water supplies, and the fraction of the municipal supply portfolio that is leased instead of permanently acquired[31].
- State Consistency. Several comments focused on the need for State agencies to provide consistent policies. One example is developing ATM policy in concert with other Colorado Water Plan actions (funding, education, stream management plans). Another example is regulatory policy on water transfers and municipal water oversight by the Colorado Division of Water Resources.
- Beyond State Actions. In addition to state agency actions and recommendations, there was support for developing ideas on municipal land and water policies as well. In addition, the concept of storytelling was voiced because ATMs are partly an effort to shift cultural norms and behaviors towards water supply acquisition and development by municipalities.

Interviews with ATM Participants

From the ATM inventory presented in **Table 9**, representatives of both the buyer and seller parties were contacted with a set of survey questions focused on their particular ATM transactions and about ATMs more broadly. A total of 14 people were interviewed, representing approximately 60% of the buyers and sellers in **Table 9**. The survey questions asked to ATM participants and a summary of their responses is provided in **Appendix C**. The following list summarizes notable findings from this survey:

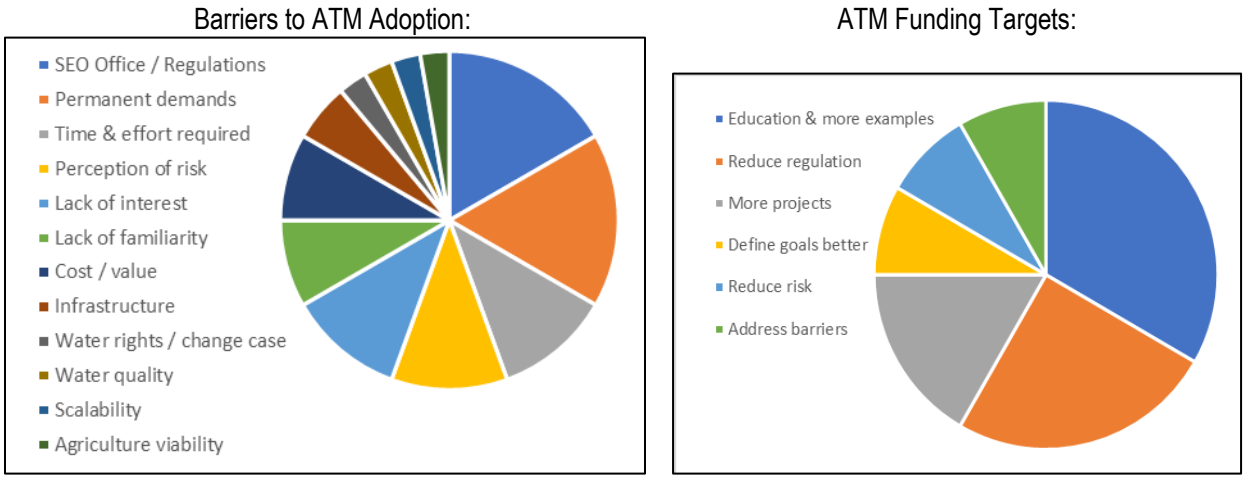
- The reasons that the participants got involved in an ATM transaction varies among the following: (1) looking for alternative water supplies, (2) approached by a buyer or seller with an offer, (3) actively looking to reduce the impacts of water transfers and to test new concepts, or (4) political pressure to pursue innovate strategies. This variety is instructive and aligns with other outreach findings that the Colorado water community comes to ATMs with diverse views and motivations.
- The seller was most likely to have been grant-funded to develop an ATM transaction and grant funding was involved in all cases where the seller initiated an offer and deal terms. In projects where there was no grant funding, the buyer initiated the offer and deal terms. This observation indicates the continued need to incentivize ATM transactions in order to find success, and also indicates that if buyers want to find new ATM water supplies, they usually have the tools and financial resources to do so.
- Most participants stated that the ATM met their initial objectives. Three participants responded that "time will tell" if their original objectives will be met through the ATM, as it has not yet been exercised. Most participants also stated that they think the ATM transaction represented a fair deal and that they would consider pursuing another ATM transaction in the future.
- Roughly one-third of participants said that they had mixed feelings on whether the loss of irrigated farmlands is a problem in their area. The other two-thirds said that they do see the loss of irrigated lands as a problem.
- All of the participants favored continued state investment in developing ATM concepts.

Many ideas were provided by ATM past participants on the barriers to ATM adoption, as summarized in **Figure 4**. The most common cited barriers were: regulatory requirements to complete an ATM, the need for meeting permanent demands in the municipal sector, the time and effort required to complete an ATM water deal, the perception of risk

[31] An example was given of renewable energy, where Colorado required energy providers to meet certain renewable energy mandates in the future and now a significant percentage of Colorado energy utilities portfolio is renewable. A notable difference in the energy sector is that the renewable energy percentage is tracked against a legal mandate, which is not the case for water.

associated with ATM transfers, and a lack of interest in ATM water supplies. The ATM past participants generally thought that overcoming these barriers would require more motivation by both parties and additional education and outreach efforts. The most common ideas for how the state should make future investments in ATMs were education and outreach, reduced regulation, and continued efforts to develop more ATM projects. Several past participants in ATM projects stated that they thought ATMs do not need state investment and should happen under free-market conditions and/or that the state should focus its efforts only on permanent ATM water transfers.

Figure 4: Responses from Past Participant Survey



Note: Barriers and investment targets are listed with the most common responses at top of list and fewest responses on bottom.

Interviews with Municipal Water Managers

Municipal and utility water leaders were contacted by phone between January and March 2020 and asked to respond to a prepared set of questions regarding their service area's water supply planning, interest in ATMs, and feedback for improving Colorado's ATM grant program. A total of 43 phone interviews were completed representing perspectives from all areas of Colorado. Summaries of municipal responses by subject area are provided below.

Municipal Water Supply Planning

Of the 43 persons interviewed, 34% said that they would be seeking additional water supplies in the next 10 years, with new water supply development ranging in volume between 1,000 and 8,000 acre-feet (AF) and an average of 3,900 AF. Over a longer time-frame of 20-30 years, 21% said they would seek additional water supplies in the range of 5,000-25,000 AF, averaging 11,344 AF. The top reason cited for these additional supplies was population growth and land development, followed by planning for drought years, diversifying the water portfolio, and transitioning from non-tributary groundwater to renewable water supplies. To supply water to new development, respondents indicated that developers often pay cash-in-lieu or tap fees to receive water service. Respondents explained that this is largely because many utilities and municipalities have acquired enough water supply to serve estimated build-out demand. In cases where developers dedicatee water rights in exchange for water service, most municipalities require those water rights to be very reliable and to easily fit into the current municipal water system (i.e., senior rights or CBT contract units). A majority of municipal respondents indicated that 100% of their current water portfolio is owned; however, 23% indicated that a portion of their water portfolio is a leased supply. In most of these lease situations, the water is under carefully crafted, long-term, or perpetual lease agreements with another municipal water provider, which is for all intents and purposes a permeant water supply. Years with excess water supply is a common occurrence for 86% of respondents. This excess water is sometimes leased to agriculture or other non-agricultural water uses but can also be left in the river system, stored in a reservoir, or used for aquifer recharge (see **Figure 5a**). Leases of surplus water supplies to agriculture consisted of both long-term and annual contracts, but the lease payment is almost always kept to a minimum by charging enough to cover assessment or other fees.

Municipal Interest in ATMs

When asked if they would pursue an ATM in the next 5 to 10 years, most municipal respondents indicated "No" (23) while some responded "Maybe" (11) and a few said "Yes" (5). Interest in ATMs for the next 20-30 years was similar with most respondents indicating "No" (18), some said "Maybe" (15) and a few said "Yes" (6). In general, there was more interest in pursuing an ATM in areas with a significant agricultural presence. For many respondents who answered "No," it was because they did not feel an ATM was needed or could fit well in their water system. For those who indicated "Maybe" they often cited more pressing needs such as increasing storage and infrastructure or realizing capacity of reuse supplies. Storage and infrastructure have often been stated as necessary to implement ATMs because of the discrepancy in the timing and location of water availability relative to demands. To increase general municipal interest in ATMs, respondents suggested that being presented with opportunities to maintain open space, serve environmental needs, or promote agricultural neighbors would be appealing. However, we point out that respondents had little experience with pursuing these types of opportunities. Respondents felt strongly that interest in ATMs would increase if ATM water supplies were already developed and available for consideration, if there were more successful examples of ATMs, or if their organization's drought planning revealed a need for more supplies (see **Figure 5b**). Respondents were very clear on why they believed that more ATMs have not occurred in Colorado. Many stated that there is little demand for ATMs because there are still better and cheaper options for sourcing new water supplies, and also that paying for permanent supply acquisition was still favorable to paying (potentially less) for a temporary lease. For many, the hassle of water court, fear of known and unknown risks, and lack of political will or education about ATMs has thwarted their acceptance (see **Figure 5c**).

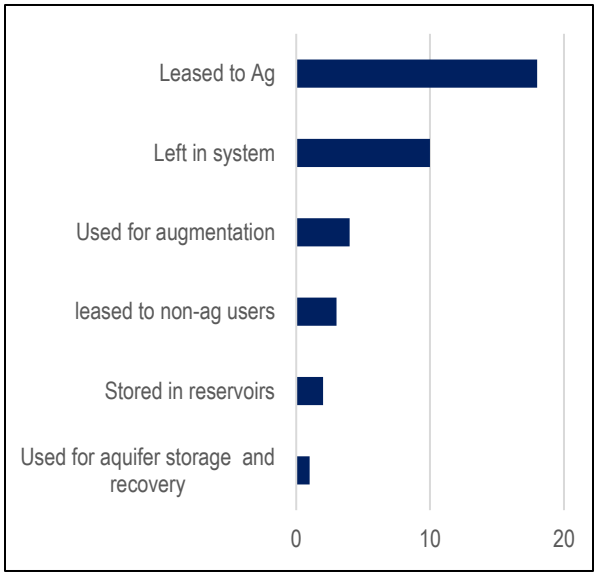
Among many Western Slope communities, municipal water supplies are generally firm and when water supply development is needed, efforts are usually directed at improving access to existing owned supplies through infrastructure projects. A majority of communities interviewed on the West Slope believe that they have adequate supplies for projected growth and will not need to pursue ATM style transactions for supply. However, a few communities have expressed interest in ATM style transactions for enhancing instream flows through their communities or as the lessor during periods with excess water supply.

Municipal Ideas for Improving ATM Efforts

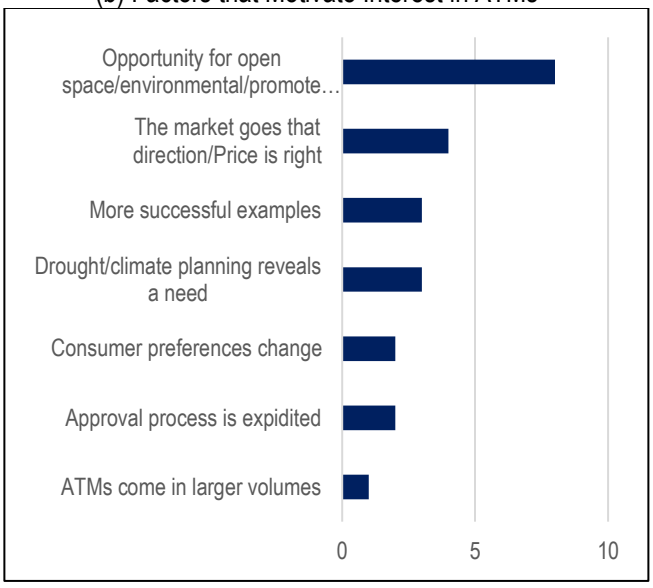
It is important to note that while many respondents indicated they might never take part in an ATM, they supported continued state investment in pursing ATMs (35 out of 42). Only one respondent was opposed to continued state involvement in ATMs while the rest (6) remained neutral. Interviewees suggested several key areas for future state investment in the ATM program, including continued funding for projects, education of both potential buyers and sellers, and reducing regulatory hurdles (see **Figure 5d**). For education, respondents indicated that a workflow diagram of the ATM approval process and a study of locations suitable for ATMs would be particularly useful. Also, local work groups that could be supported by the local Basin Roundtables would offer more flexibility and practicality for developing ATM projects that meet local needs and recognize local constraints. The most important legal aspect of pursuing an ATM for respondents was ensuring no negative consequences to valuable water rights assets. Several respondents were adamant that if preventing buy-and-dry is a shared goal, no one economic sector should bear the burden alone.

Figure 5: Municipal Interview Responses

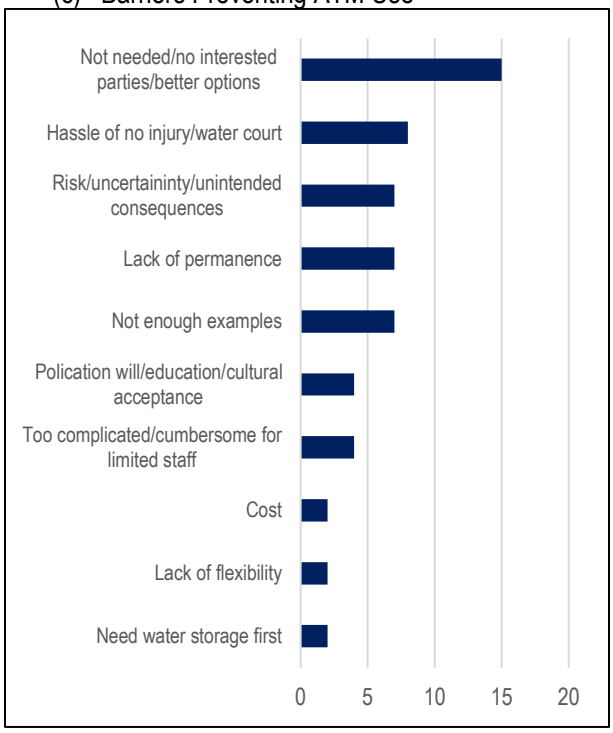
(a) Use of Annual Surplus Water Supplies



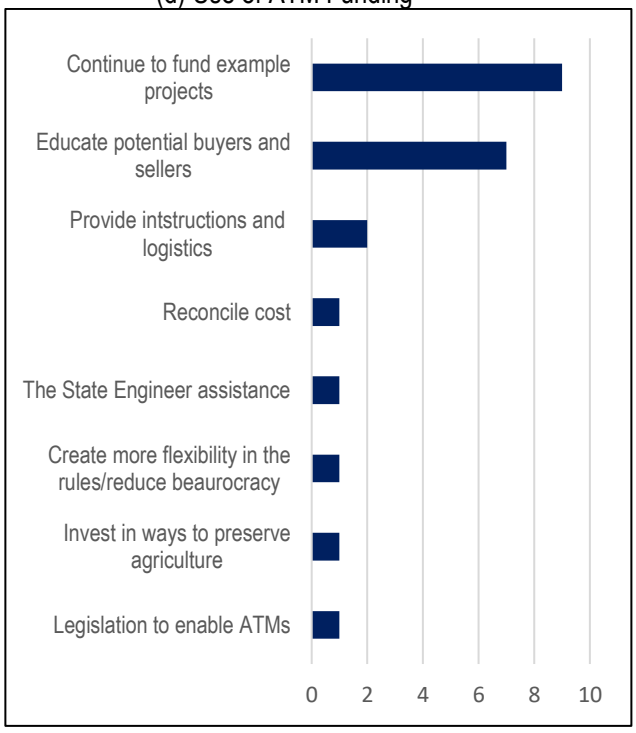
(b) Factors that Motivate Interest in ATMs



(c) Barriers Preventing ATM Use



(d) Use of ATM Funding



Previous Surveys of Agricultural Sector

The ATM Support project did not include extensive outreach to the agricultural sector, which does not minimize the importance of the agricultural sector to ATM agreements. As shown in **Table 9**, all example ATMs have involved an agricultural source of water supply. Funding for this project was targeted at the municipal sector because there have been similar ATM surveys of the agricultural sector in recent years. These past agricultural-sector surveys include the following:

- 2007 mail-in survey of 329 farmers in the South Platte River Basin by Colorado State University researchers. The survey found that 63% were willing to consider a fallowing program as part of their crop rotation if sufficiently compensated, which was estimated for most (77%) respondents to range from $225 to $575 per acre. This survey was conducted as part of the Lower South Platte Demonstration ATM Project[32].

- 2016 survey of 266 agricultural producers who own or lease water rights in 48 Colorado counties conducted by the Colorado Cattleman's Association[33]. The survey found that producers prefer that their obligations under an ATM are simply to manage reduced water deliveries, and that soil quality and forage stand viability were the greatest deterrents to consideration of a water lease. When asked if they would participate in a water lease, approximately 20% of respondents said yes, 30% said no, and 40% said maybe.

- 2018 survey of 21 Grand Valley Water Users Association (GVWUA) Conserved Consumptive Use Pilot Project cooperators. The survey found that compensation received by farmers for a reduction in consumptive use was utilized for debt service (5 of 21, 24%) or operating capital (16 of 21, 76%). The vast majority of cooperators (18 of 21, 85%) responded that the project was of marginal or significant financial benefit while only 2 cooperators responded that the project was a financial detriment to their operations. The vast majority of cooperators (19 of 21, 90%) responded that they would participate in a similar project under similar terms and all 21 would recommend participation to a neighbor or family member with eligible acres.

In addition to the above-listed surveys, most of the original ATM grant funding provided by CWCB prior to 2015 went towards research and communication about the agronomic and economic effects of ATM-style water transfers from agriculture.

Input from Advisory Committee

As part of the ATM Support Project, an ATM Advisory Committee was formed to help provide input on both the draft report and on ATM efforts following completion of the ATM Support project. A list of ATM Advisory Committee members is provided as **Appendix F**. The Advisory Committee met in January 2020 at the outset of the project and provided feedback on this report in June 2020.

Status: Water Plan Volume Goal

One of the status assessment metrics evaluated by the project team is the volume of ATM projects in Colorado relative to the 2015 Water Plan goal of 50,000 acre-feet. The goal of sharing 50,000 acre-feet through ATMs by 2030 is fraught with uncertainty around how to measure this goal. The following questions need answers to evaluate the current status of ATMs relative to the Water Plan goal:

- Is the goal based on active contracts in any one year or does it include completed (expired) contracts?
- Should the goal only include ATM transfers since adoption of the 2015 Water Plan?
- Should the goal reflect the volume of water under contracts or the actual volume of water being transferred under those contracts?
- What types of water transfers should be included, or in other words, how should ATM be defined?

[32] https://issuu.com/coloradowater/docs/coloradowater_29_1.
Published journal article: https://www.jstor.org/stable/30225886?seq=1
[33] https://www.agwaternetwork.org/Media/Documents/2016%20Ag%20Water%20Survey%20Results%20Report.pdf

- Is the goal a cumulative number for water transferred or contracted through ATMs, with each year of a multi-year agreement counting towards the volume goal?

Based on the simple criteria of being labeled as an ATM, the inventory in **Table 9** shows 16 example ATMs with a contract volume of approximately 30,600 acre-feet. Removing the two pending examples reduces the total contract volume to 29,600 acre-feet. Considering the questions listed above, this volume from **Table 9** is considered to be a high-end estimate[34]. **Table 12** provides a breakout of various ATM volume estimates depending on the responses to the questions listed above.

Table 12: Volume Estimates for Assessing Water Plan Goal

Question	Response Volumes (AF)	
Include completed projects?	Active	Completed
	18,100	11,500
Since 2015 Water Plan?	Prior to 2015	2015 & After
	16,800	12,800
Only quantify water transferred?	Est. Water Transferred	Under Contract
	19,800	29,600
How to define ATM?	Temporary	Permanent
	26,100	3,500
Cumulative volume?	Est. Annual Water Transferred	Est. Cumulative Volume Transferred
	19,800	47,700

The volume estimates in **Table 12** indicate that, if quantified as contracted and active projects, the Water Plan goal of 50,000 acre-feet is still a significant way off, with potentially 32,000 acre-feet of ATM contracts needed in the next 10 years. Recent activity since the 2015 Colorado Water Plan indicates that this goal will require new and expanded efforts. As evidenced in the table, recent ATM efforts have yielded an average of 2,500 acre-feet of new ATM contracts per year over the past five years. Additional perspectives on the 2015 Water Plan objective and recent efforts to achieve it are provided below:

- The goal of 50,000 acre-feet of ATMs, if defined as an annual volume, is a significant fraction of the known water market in Colorado. **Table 2** indicates approximately 45,000 acre-feet of annual water trading in Colorado under private market transactions. There are known to be larger volumes of water transfers through municipal lease backs, intra-ditch trades, and conservation programs, but even considering these additional water transfers, 50,000 acre-feet of ATMs would represent a significant fraction of the Colorado water market.

- The majority of example ATM projects in **Table 9** have not been directly supported by the CWCB ATM grant program. The CWCB provided ATM grant funding support for 4 out of the 16 example projects. An additional 2 projects were not directly funded but involve the Lower Arkansas Valley Water Conservancy District (LAVWCD), which has received ATM grant funding support. It is encouraging to see the water community pursue ATM opportunities without receiving grant-funding support, and it supports a view that ATMs can be developed under free-market principles.

- The state has invested roughly $2 million over the past five years[35] with 12,800 acre-feet of ATM contracts being completed since the Water Plan. As stated above, the majority of these recent ATM contracts have

[34] As stated previously, this estimate is based on a relatively loose definition for ATM; however the estimate does not include the SCPP projects, Rio Grande groundwater management transfers, and potentially other ATM water transfers in the state.
[35] The CWCB has focused on funding pilot projects in the last 5 years. Development of ATMs takes time from the date of initial grant funding. The estimated $2M funding over 5-year period is consistent for years 2013-2017, 2014-2018, and 2015-2019.

not received CWCB grant funding. Looking at the 4 projects that have received CWCB grants, the equivalent unit grant cost ranges from $70 to $4,000 per acre-foot (contracted), with an average over the small sample size of $2,000 per acre-foot.

- The origin of the ATM program, and the primary goal, is to reduce the extent of permanent loss of irrigated lands due to municipal water transfers or other market-based acquisitions of water rights from agriculture. In reviewing the example ATMs in **Table 9**, it is estimated that approximately 10,700 acre-feet of ATM contracts (about 35% of total) helped to avoid a permanent dry-up of irrigated acreage. Applying a unit irrigation consumptive use value of 1.5 acre-feet per acre results in an estimated 7,100 acres of irrigated lands that remain in production due to the ATM agreements. For perspective, approximately 188,400 irrigated acres were lost in Colorado between the 2010 SWSI report and the 2019 Technical Update.

Status: Overcoming Barriers

The ATM literature is filled with descriptions of barriers to greater utilization of ATMs in Colorado. This fact alone points to the reality that ATM agreements are not an obvious choice for water users, regardless of whether the water use is agricultural, municipal, or industrial. The one water use sector that has embraced ATMs is the environmental sector, for reasons of cost and type of demand. This section provides a short description of the dominant barriers and discusses progress that has been made to overcome the barrier over the last 13 years since the ATM grant program started and state ATM efforts were initiated.

Transaction Costs

Transaction costs can refer to various costs associated with organizing, participating in, and implementing actions in a market. For property transfers, transactions costs are typically more narrowly defined as regulatory costs, which is how they are usually interpreted in the Colorado water market. Transaction costs in Colorado are a significant concern for entities acquiring water rights and are an important factor for a buyer's interest in a particular water right. The water court system in Colorado has been praised for its transparency and equity, but it is costly as well. Recent research[36] in Colorado estimated transaction costs to vary based on the volume being transferred[37] and the extent of the regulatory process. An expected transaction cost for a 100 acre-feet water transfer that is settled prior to court trial is approximately $2,000 per acre-foot on the Front Range and $1,000 per acre-foot on the West Slope. Importantly, these transaction costs could potentially represent half or more of the water right purchase costs.

For ATMs, transaction costs have been a barrier for the following reasons:

- Transaction costs for ATMs are considered to be at least as expensive as transaction costs for permanent water right transfers, because ATMs are unique water transfers that attract scrutiny and perhaps skepticism and also because Colorado has inherently complex water systems that require significant effort to ensure baseline legal principles[38] are upheld.
- Transaction costs do not scale linearly with volumes and frequency of water use. Therefore, it is expected that transaction costs for a small-volume transfer might be ten times higher on a unit ($ per acre-foot) basis relative to a median volume-transfer. In addition, transaction costs are expected to be the same if the applicant is transferring the water for use every year or only in 3 of 10 years. Therefore, transaction costs can escalate per unit of water use gained by the applicant under many ATM structures.

Progress on the transaction costs barrier has occurred and may continue to occur. The following points summarize progress on reducing transaction costs associated with ATMs:

[36] P. Womble and M. Hanemann. *Water Markets, Water Courts, and Transaction Costs in Colorado*. Water Resources Research. https://doi.org/10.1029/2019WR025507

[37] Transaction costs do not scale on a unit basis, such that transaction costs are estimated to be similar for taking 10 acre-feet to water court or for taking 1,000 acre-feet to water court, resulting in different $/AF costs.

[38] The basic legal principles that are often debated in water court are typically "no injury to other water users" and "no expansion of a water right's use".

- The CWCB funded the development of the Lease-Fallow Tool (LFT)[39], which was designed to model water use under baseline and ATM conditions for use in planning and regulatory proceedings. The LFT model has been applied to a few ATM transfers in the Arkansas Basin where the tool was developed. It is not known to have been used outside of the Arkansas Basin. The LFT provides a useful tool to reduce transaction costs if it is accepted into the regulatory process and if it gains trust from the water community.

- The CWCB grant program on ATMs has funded engineering work for some pilot ATM projects, and the grant funding is considered to have been critical to establishing the projects it funded. Transaction costs are likely to have prevented these example ATMs from being pursued or completed without financial assistance from the CWCB.

- Several laws have been passed since 2002 to allow temporary changes of water rights with administrative approval by the Colorado Division of Water Resources (CDWR) instead of water court approval (see **Table 14**). A review of regulatory approval times for the example ATM projects in **Table 9** shows an average of 4 months to complete an administrative approval process compared to almost 4 years to complete a water court change of use process. Therefore, expanded use of administrative tools is expected to reduce transaction costs for water transfers, recognizing that administrative approvals are typically temporary while water court approvals are permanent.

Despite a broad desire to reduce transaction costs associated with water transfers, transaction costs are not expected to significantly reduce over the next few decades. As stated above, administrative tools are available to reduce transaction costs for temporary (short-term) water transfers. Also, there may be cost savings by implementing standard tools such as the LFT but the value of such efforts is dependent upon widespread acceptance by local stakeholders. Additional efforts such as establishing presumptive engineering factors[40] might hold promise for reducing transaction costs in specific localized areas but will require upfront development costs and local support. Additionally, the U.S. Bureau of Reclamation water marketing strategy grant program has been utilized by 5 entities within Colorado since 2017 to further market-based water transfer concepts with significant overlap to ATM concepts. If transaction costs are going to remain as significant costs in the future, then the ATM grant program will continue to be a valuable resource for assisting with transaction costs of ATM projects.

Regulatory Uncertainty

One of the most common barriers cited in the literature review and interviews was regulatory uncertainty. The type of regulatory uncertainty is considered to vary depending on specifics of a water transaction, including location, amount, type of agricultural conservation measures, type of water rights, and even the particular parties involved in the transfer. In general, the agricultural sector faces regulatory uncertainty in the quantification of transferable water, often calculated as the historic consumptive use associated with the water rights being transferred. For water rights that have never been subjected to critical review in a transfer process, there is significant uncertainty and potential risk[41]. The municipal sector, typically representing the buyer and end user of an ATM, also faces regulatory uncertainty in the legal or administrative process and such uncertainty is reflected in the transaction costs section above. Municipalities may feel that a permanent transfer case in water court will yield more predictable results compared to an ATM project. For administrative approvals by CDWR, there may be uncertainty in how transfers will be reviewed in the future and therefore municipalities may see uncertainty and risk in administrative approvals for temporary (non-permanent) transfers.

[39] https://www.colorado.gov/pacific/cdss/lease-fallow-tool

[40] Presumptive factors refer to specific inputs into engineering analysis of water right transfers that would be agreed-upon by the local water community and regulatory body for all local water transfers. The goal of establishing presumptive factors is to reduce debate and argument over relatively small changes to engineering inputs and assumptions.

[41] An often-cited example is Case No. 09SA133. *Burlington Ditch, Reservoir, and Land Co. v. Englewood*. In this case, historical use of agricultural water supplies was reduced due to legal corrections discovered during the case.

Permanence of Municipal Demand

Municipal water providers seek relatively firm water supplies that fit well within their existing infrastructure and portfolio of water rights. The municipal sector demands low-risk water supplies, which is true for water rights that they seek to develop and acquire directly and for water rights that they accept as dedications in exchange for water service. Water managers are seeking water supply that can be modeled, managed, and fit within an appropriate planning horizon or that can satisfy a known increase in demand resulting from a specific development project. ATM supplies could potentially be utilized as a portion of a municipal water portfolio and easily modeled within a current system to demonstrate their efficacy in supplying water during dry years. However, a known barrier is that municipal water providers typically have little appetite for uncertainty in their water supply sources. While there are exceptions, most municipal water providers want secure water supplies that are either owned or are contracted in perpetuity. This permanence of municipal demand presents several challenges for utilizing ATM water supplies:

- The agricultural sector has historically been hesitant to commit to perpetual contracts. The reasons for this are economic, agronomic, and possibly cultural. A perpetual contract effectively removes the full sale value of the water rights and it's a difficult decision to take this future value off the table, particularly because Colorado has active water markets[42]. The long-term agronomic effects of fallowing or other water conservation activities bring uncertainty and potential impact to the baseline agricultural operation.
- As discussed above, it is apparent that the transaction costs of ATMs are difficult to justify given that the supply "purchased" under an ATM is limited in time, yet the transaction costs may be similar to an outright purchase of the resource. At the initial planning stages, an ATM may appear as a poor financial decision unless viewed as bringing increased value to the community for reasons other than water supply, which may be difficult for certain organizations to justify, especially those organized as water districts.
- Specifically for new development water demands, and for municipal water providers that do not have a built-up surplus in most years, there is a disconnect between ATM goals of not permanently transferring water out of agriculture while also meeting a (new) permanent demand. There are some ATM structures that can meet this type of demand, but it typically requires commitment from a significantly larger block of acreage than a permanent transfer, which presents both cost and logistical challenges.

This significant barrier has stressed ATM efforts in the past and will continue to make ATM agreements difficult in the future. The simple disconnect between agricultural producers and municipal water providers around permanence and the term of an agreement is barrier that will be hard to overcome. Some progress has been made by ATM projects in overcoming this barrier:

- A permanent ATM agreement was secured between Larimer County and the City of Broomfield in 2017. This permanent contract was possible because the farm property was acquired by Larimer County specifically for developing an ATM project.
- Municipal partners in the Lower Arkansas River Basin have shown a willingness to lease water supplies for a multi-year term as a piece of their overall water portfolio. The willingness of these municipal water providers to lease water supplies is likely a reflection of: (1) the exchange capacity into Pueblo Reservoir that comes with the lease, (2) a relatively limited set of water supply alternatives, and (3) the facilitation provided by the LAVWCD, and (4) proximity to the permanent dry-up effects in Crowley County.

Infrastructure Needs

Infrastructure presents a barrier to ATMs just as it does to nearly all water transactions. Even transfers within the agricultural sector often require some investment in infrastructure to enable the new user to capture the economic benefit of the resource. Further, agricultural lands rich in water are often not conveniently located near municipal treatment infrastructure. This particular infrastructure barrier presents itself often on the Front Range, where irrigated lands tend to be located to the east and downstream of communities while water treatment infrastructure tends to be located west and upstream of the communities. The water rights available from Front Range irrigated agriculture are

[42] A representative from the land conservation community noted that there may be an opportunity to work with properties that have already secured conservation easements, because these landowners have shown a willingness to make long-term commitments.

often not easily physically transferred or exchanged up to the municipal treatment plants. This spatial barrier and the associated infrastructure needed to overcome it are found in nearly every Front Range river system.

Progress is being made in addressing this barrier in at least 3 instances within Colorado:

- Lower Arkansas Valley. A significant value that the LAVWCD ATM projects contain is the ownership of an exchange right necessary to exchange water from lower valley agricultural uses to Pueblo Reservoir (upstream) for municipal providers in need of supply. The exchange right precludes the need for costly infrastructure to move water upstream to locations of municipal demand.
- Poudre River Basin. The largest water infrastructure project currently being developed in the Cache la Poudre River Basin is the Northern Integrated Supply Project (NISP). The NISP project is intended to provide new water supplies to 15 participant municipalities and water districts. Approximately half of the new water supplies will be developed through the use of spring snowmelt flows and a junior-priority diversion right, and the other half will be developed through an exchange of supply with two of the largest irrigation ditch companies in the basin. The NISP project aims to secure agricultural conservation easements on roughly 20,000 irrigated acres in order to secure this exchange supply in-perpetuity.
- South Platte Basin. The South Platte Regional Opportunities Working Group (SPROWG) was established to explore infrastructure solutions for the South Platte Basin[43]. A feasibility study was recently completed to evaluate regional infrastructure projects that could provide municipal supplies in Northern Colorado. An important component of the feasibility study was the evaluation of river exchange potential and the development of pipelines conveying water from east to west, and from agricultural uses to municipal demand. The SPROWG feasibility study included ATMs as a component of the supply portfolio.

The infrastructure barrier to ATMs also highlights the need to scale water supplies in order to make them affordable. Most new municipal water projects involve multiple partners and relatively large volumes of supply development. This points to the fact that single (one-off) ATM transfers are difficult to justify if infrastructure is required to physically move the supply to the location of demand or unless the volume of the single ATM transfer is significant. The ability to scale-up water supplies is an attractive characteristic for any new demand sector.

Crop Production Impacts

A variety of studies have been performed that evaluate the crop production impacts of temporary water transfers and/or reduced diversion activities. The CWCB has provided ATM grant funding to analyze production impacts on both the Front Range and Western Slope.

- Front Range. Studies of agricultural production impacts on the Front Range have focused on methods such as rotational fallowing and limited irrigation to meet increased municipal and industrial water demands. Long-term studies by Colorado State University researchers have shown that the productivity and profitability of rotational fallow systems can be increased by implementing no-till and reducing the occurrence of fallow to once out of every 3 to 4 years. Crops most suitable for rotational fallow systems are wheat, millet, sorghum, forage, and corn. Limited irrigation has been implemented in several different ways, including irrigation based on: (1) a set volume per season, (2) a percent of evapotranspiration (ET) needs, or (3) growth stage-specific crop demands. Yet some areas of the Front Range may not be suitable for rotational fallowing or limited irrigation due to deficient rainfall and poor soil conditions. Sufficient water storage and timing of water deliveries have also been noted as critical for maximizing crop yield under limited irrigation.

- Western Slope. Studies of agricultural production impacts on the Western Slope have focused on broad efforts to evaluate demand management and potential response to inter-state compact actions. Alfalfa hay may be ideal for inclusion in water-sharing agreements as it is one of the primary crops using agricultural water on the Western Slope and may have a greater ability to withstand water stress in comparison to other crops. A

[43] https://southplattebasin.com/

study of partial irrigation on low-elevation alfalfa hay fields found that reduced irrigation resulted in significantly reduced yields but possible improvement in forage quality[44]. Recovery of alfalfa hay fields in the following year was found to vary depending on the length and severity of reduced irrigation. To date, limited research has been done on the effects of reduced irrigation on high-elevation grass pastures[45]. It is anticipated that production impacts will depend upon variables such as grass species, naturally-occurring precipitation during the growing season, and the duration of reduced irrigation.

There are obvious crop production impacts when water is transferred out of agricultural use, and it is the reason that producers need to be compensated under ATM transactions. The annual crop production impact is only part of the story, however, as the farm business is also impacted by reduced crop production. The business relationships, contracts, and labor that a producer has organized to successfully manage a farm business is significantly impacted if operations are reduced in some years due to an ATM water transfer. Adequate compensation, above and beyond the value of the crop lost by reduced irrigation, is the primary way to overcome this barrier. Compensation under an ATM agreement allows a producer to reinvest in the farm business, with the goal of creating a more financially sound agricultural operation despite the impacts caused by reduced irrigation.

Economics

The economics of ATMs can be divided into two components: (1) the economic perspective of the two (or more) parties directly involved in a water transaction, and (2) the economic perspective of the broader spatial area and related interests who may be impacted by the transaction. The first component is critical to getting a deal done, and the second component is often referred to as the externalities or secondary effects of the deal. These two categories are discussed below.

Primary Transaction

The buyer and seller perspectives in an ATM water transaction are primarily shaped by economics. Each side wants to get a fair deal. In most ATM transactions, the supplier or seller will be currently using the water in irrigated agriculture. There are significant economic implications of temporary fallowing farm and ranch lands, as detailed above. The agricultural producer is faced with productivity (yield) impacts and market relationship impacts. Under perpetual agreements, an agricultural seller is also faced with the decision of foregoing the full-market sale value of the water rights. The buyer or demand-side also faces economic challenges with ATM agreements. As shown in past ATM studies[46], leasing water supplies can be more expensive than buying water supplies over long time frames. This is particularly true at the present time with low interest rates. An additional economic challenge in the municipal sector is that there is minimal economic incentive to explore alternative water transfers if water right dedications or cash-in-lieu of water rights are being provided by each new water user on the system.

The economics of ATM transactions looks much better for short-term and/or periodic water demands. For instance, environmental water demands have often looked to ATM-style transactions as a cost-effective method to improve streamflow during critical times and in specific river reaches. Also, groundwater augmentation needs can be intermittent and dependent upon annual water supply conditions, which makes such needs well matched to IWSAs or option contracts. Periodic municipal demands might also be well suited to ATM supplies, so long as baseline demands are not expected to continue to increase.

[44] Brummer et al (2016) reported the neutral detergent fiber (NDF) for grasses on water-limited plots averaged 5.5% lower and crude protein (CP) was 42% greater, both indicating higher quality. Forages with low NDF percentages are more desirable. Water-limited plots had NDF and CP averaging 51.9% and 10.8% respectively. A cautionary point here that the increased protein levels may be an improvement that is easily offset monetarily by the yield reductions.

[45] Brummer et al (2016) conducted a study of several "high elevation" sites ranging from about 6,000 to 8,000 feet. These sites were subject to reduced irrigation for one complete season, and then were returned to fully irrigated conditions. The yield reductions averaged 70% (range 24% to 93%) during the year of complete fallow. Yields then averaged 48% (range 13% to 83%) below fully irrigated after one year of recovery. For those fields where it was possible to evaluate recovery in the second year, yields averaged 7% (range 0% to 13%) lower.

[46] https://www.edf.org/sites/default/files/alternative-water-transfers-colorado.pdf

The economics of the primary transaction between a municipal buyer and agricultural seller are considered to remain a significant barrier to extensive ATM adoption in Colorado. It is absolutely true that ATMs can make economic sense for both parties, as evidenced by the example ATM transactions in **Table 9** and additional examples in other Western states. In terms of progress on this economic barrier, it is important that the CWCB and other water stakeholders provide examples and resources[47]. It would be a significant step forward if most municipal water providers in Colorado considered ATM water supplies as part of their planning process. Direct state subsidies for the acquisition costs of ATMs are considered to be a relatively expensive policy decision, and it would be imperative to define clear metrics for the extent and reason for such subsidies on each ATM transaction. For the non-municipal sectors, the economics of the primary transaction can be favorable and many successful examples have been developed over the past decade by the Colorado Water Trust, System Conservation Pilot Program, Rio Grande Water Conservation District, environmental non-profits and local conservation organizations, and others.

Secondary Effects

The secondary economic effects of a water transaction are those effects outside of the buyer and seller perspectives. Secondary effects of water trades are often evaluated in the following impact categories: (1) local economic, (2) land conservation, (3) environmental, both in river systems and on the landscape, (4) habitat and recreation, (5) municipal, and (6) water quality. Specific water transfers may impact other categories. A primary driver of state investment and action on ATMs is to reduce the secondary costs resulting from continued dry-up of agricultural lands. In other words, the state is using public funds to provide for public benefits in local areas. In reviewing the example ATMs in **Table 9** and surveying ATM past participants, many ATMs in Colorado are motivated as much by the secondary economic benefits as they are by the economics of the primary transaction. An example of this is Larimer County's investment in an irrigated farm specifically to accomplish an ATM transaction. A review of the economics of this investment shows the significant value placed on agricultural open space and demonstrating ATM concepts, which are secondary benefits beyond the compensation received for ATM water supply[48].

Incorporating and considering the secondary benefits of ATMs are a critical piece for future progress on ATMs. For the municipal sector, it is quite possible that new ATM transactions will only be realized if secondary benefits are a significant component of the decision. For the West Slope, current state initiatives on demand management in the Colorado River Basin[49] should add to the existing body of literature and provide important perspective on ATM water transfers as compared to permanent water transfers.

Significant progress has been made over the past decade on developing public information on the secondary benefits of ATM-type water transactions. Research studies have focused on each of the impact categories listed above[50]. A significant challenge is that secondary economic impacts are typically not directly transferable from one location to another. Thus, while examples and research studies are important for perspective, each community or region should consider their own impacts from water transfer decisions. Continued progress on incorporating secondary benefits into water supply decision-making and as motivation for ATMs in Colorado could include:

[47] For agricultural producers, the Agriculture Lease Evaluation Tool (AgLET) was developed jointly by Harvey Economics and CSU. See Pritchett and Cabot. CSU Extension Team. *AgLET: A Water Leasing Decision Tool* in Jan./Feb. 2011 edition of Colorado Water newsletter. CSU previously hosted AgLET but no active links were found. For the municipal sector, no broadly applicable tools are known to exist for evaluating the economics of water transfers.

[48] An approximate analysis of the ATM deal terms show a return on investment (ROI) of 0.7% to 1.7% depending on inputs and assumptions about how the ATM will operate. This scale of ROI may be not attractive for private irrigators but may be acceptable for public organizations such as a county natural resource department.

[49] https://cwcb.colorado.gov/demand-management

[50] Recent research search studies focused on secondary impacts of water transfers in Colorado have been conducted by the Colorado River Water Bank Working Group, Colorado River District, Colorado Open Lands, The Nature Conservancy, Colorado State University, and others.

- Developing of a generic worksheet or template for communities to conduct a high-level analysis of secondary impacts from water transfer decisions. The purpose of the worksheet would be to identify areas of concern rather than inform specific transaction terms.
- Providing land use planning tools at various levels of government (municipal and county in particular) that show future scenarios under various water transfer frameworks. Online mapping tools are particularly effective and easy to use.
- Requiring the consideration or mitigation of secondary impacts of large-scale and long-distance water transfers[51]. Consideration could include a type of environmental impact assessment such as that required for many Federal permits, which includes an economic analysis. Mitigation could include a tax or payment to compensate for the economic impacts of a water transfer[52]. It is important to recognize that these concepts (either consideration or mitigation) would increase the transaction costs of a water transfer, which are already high in Colorado. These concepts would also influence the market value of water rights, impacting agricultural water right owners in particular.

[51] As shown in Table 14, SB03-115 is an existing law requiring mitigation for large-volume (1,000 AF or more) water transfers between counties.

[52] It is expected that these consideration and mitigation concepts would only apply to out-of-basin or out-of-region water transfers. Many water transfers involve a fairly localized transfer of water that is tied to the development a farm property, in which case there are limited future alternatives to consider and the net economic effect is typically positive.

ATM FRAMEWORK

Defining ATMs

It is difficult to define ATMs because the water community has varied opinions on their objectives and purposes and the term ATM has evolved to include projects with diverse intended outcomes. Such varied opinions and definitions for ATMs are reflected in the results of our surveys. When asked to define ATMs, there were dozens of responses, with the most common responses focused on water sharing, water leasing, non-permanent water transfers, and alternatives to buy and dry[53]. The water community also has varied opinions on whether ATMs should even have a definition. When asked whether the CWCB should strictly define ATMs, survey respondents were roughly split, with about half stating that a strict definition is critical and the other half stating that a strict definition would be detrimental.

We think it is important for the CWCB to grapple with this question of "*what is an ATM?*" and come to a conclusion for the water community if ATMs continue to be part of Colorado's water policy objectives. The primary reason for clearly defining an ATM is to assist both CWCB staff and the broader water community in (1) evaluating projects for ATM grant funding and (2) tracking progress made on ATMs. Beyond this primary purpose, an ATM definition is considered to have less importance.

This section provides some context for how the project team has considered and debated an ATM definition. The following paragraphs discuss several attributes that help to define ATMs, and **Figure 6** summarizes our conceptual thinking regarding an ATM definition. We have developed a criteria-based definition that allows continued flexibility in defining ATMs while also identifying and focusing the purpose of ATMs. One of our recommendations is for the CWCB to review and modify our criteria and consider adopting this type of approach to defining ATMs for funding and progress-tracking purposes.

Purpose of ATMs

The Introduction section of this report provides a history of ATM development through state water planning activities. The genesis of ATMs was clearly the result of concerns about permanent loss of irrigated lands, and particularly dry-up resulting from municipal water transfers. As shown previously, there is a significant amount of irrigated land loss that is projected to occur due to groundwater management and urbanization. In early planning studies, ATMs were not considered outside of the municipal sector. As ATM grant funding has been used for research and pilot studies, additional purposes have been identified, such as for interstate compact compliance, environmental instream flows, and groundwater management. Moving forward, ATMs can likely serve multiple purposes and objectives outlined in the 2015 Colorado Water Plan and we recommend a relatively broad definition in terms of the purpose or end use that an ATM is serving. An important and defining characteristic of ATMs is that they serve a water supply objective while avoiding the permanent loss of irrigated land.

ATMs are Water Transfers Distinguished from Other Water Transfers

The loss of irrigated lands is influenced by a multitude of policy and economic factors (see below). In terms of agricultural-to-municipal water transfers, the loss of irrigated lands is heavily influenced by municipal water dedication policies and municipal land use policies and individual decisions on land developments. It is stressed that these local policy decisions have just as much (and perhaps more) influence on the loss of irrigated lands as do municipal decisions on sourcing new water supplies. For the purpose of defining ATMs, it is important to focus ATMs as water transfers to distinguish ATMs from other policy decisions affecting water transfer quantities. Additional discussion on municipal water dedication policies is provided in a later section.

It is also important to understand why water transfers result in the permanent loss of irrigated lands. Permanent water transfers must be approved (decreed) in water court and obtaining such approval has typically included a dry-up agreement that legally assures that the agricultural lands from which the water is being transferred will not be irrigated

[53] See Appendices B,C, and D for particular responses to the question of defining ATMs.

with the source of water supply being transferred. This assurance is intended to meet long-standing legal principles of non-injury to other water users and non-expansion of a water right. Therefore, the only reason dry-up agreements are necessary is to help a water court applicant meets its burden of proof in proving non-injury in a water right change case in court. Dry-up agreements are the easiest ("tried and true") method of proving to other parties in a change case that the change will not result in an expansion of use and thereby proving no injury. This context leads to two important realities relating water transfers and irrigation dry-up: (1) water transfers can occur without permanent dry-up if the applicant can provide evidence (to the satisfaction of its objectors in the court case) that no expansion or injury will occur, and (2) the agricultural lands served by the water right being transferred can continue to be irrigated from a water source distinctly different from the water being transferred. Therefore, there are legal and policy actions that can be taken to allow water transfers to occur without permanent loss of irrigated lands. A water right change case that permanently transfers a water right to a non-agricultural use but retains irrigation on the original lands would meet our definition of an ATM[54].

As discussed in the Introduction section, Colorado has an active water rights market and water trades are regularly occurring as permanent sales and temporary leases. These water transactions are occurring without state involvement and incentives. Therefore, it is important to distinguish ATMs from other water transactions, which will ensure that state funds and efforts are not leveraged to assist water transactions that would happen on their own and that ATM water transactions are serving intended purposes. The criteria-based definition we have outlined below is intended to assist with distinguishing ATMs from other water right transfers, but the reality is that some amount of judgment is required to assess whether a particular water transaction or transfer is an ATM.

ATMs are Intended to Benefit Agriculture and Rural Communities

The original and continued purpose of ATMs is to reduce the permanent dry-up of irrigated lands in Colorado. This purpose is motivated by the fact that productive agricultural lands remain the economic backbone of Colorado's rural communities in many parts of the state. It is important to recognize that ATM efforts alone will not preserve farm and ranch lands or sustain rural economic viability in Colorado. Water is one of many issues facing agriculture and rural communities, and these other issues are important to address if there is a desire to maintain irrigated lands on the landscape.

The CWCB should continue to focus its ATM efforts on the water supply aspects of agriculture, while acknowledging these other factors that affect rural economic viability. From a water supply perspective, ATMs could include aspects such as infrastructure improvements, conservation easements, new farmer recruitment by lowering initial costs, operational upgrades, and other measures that improve agricultural operations and represent a net benefit to agricultural working lands.

Criteria-Based Definition

The project team developed the criteria in **Table 13** to define ATMs. A particular water transfer or activity is classified as an ATM if it meets all of the required criteria and at least three of the five preferred criteria. Applying this criteria-based definition to the example ATMs in **Table 9**, all of the listed projects would likely be defined as ATMs. Several survey respondents indicated that basin-specific definitions should be crafted for ATMs. If this were undertaken, then perhaps the project purpose (a required criteria) could be modified to fit basin-specific goals.

[54] Two examples of this occurring: (1) Fort Collins Utilities received a court decree for a change of Water Supply & Storage Co. shares with two uses allowed – municipal and agricultural, which allows the city utility to annually determine for which use the water right will be applied. (2) Aurora Water developed a permanent agreement with High Line Canal Co. farms that transferred the ditch shares for municipal use while utilizing augmented groundwater wells for continued irrigation of the farm properties.

Figure 6: Conceptual Elements of Defining ATMs

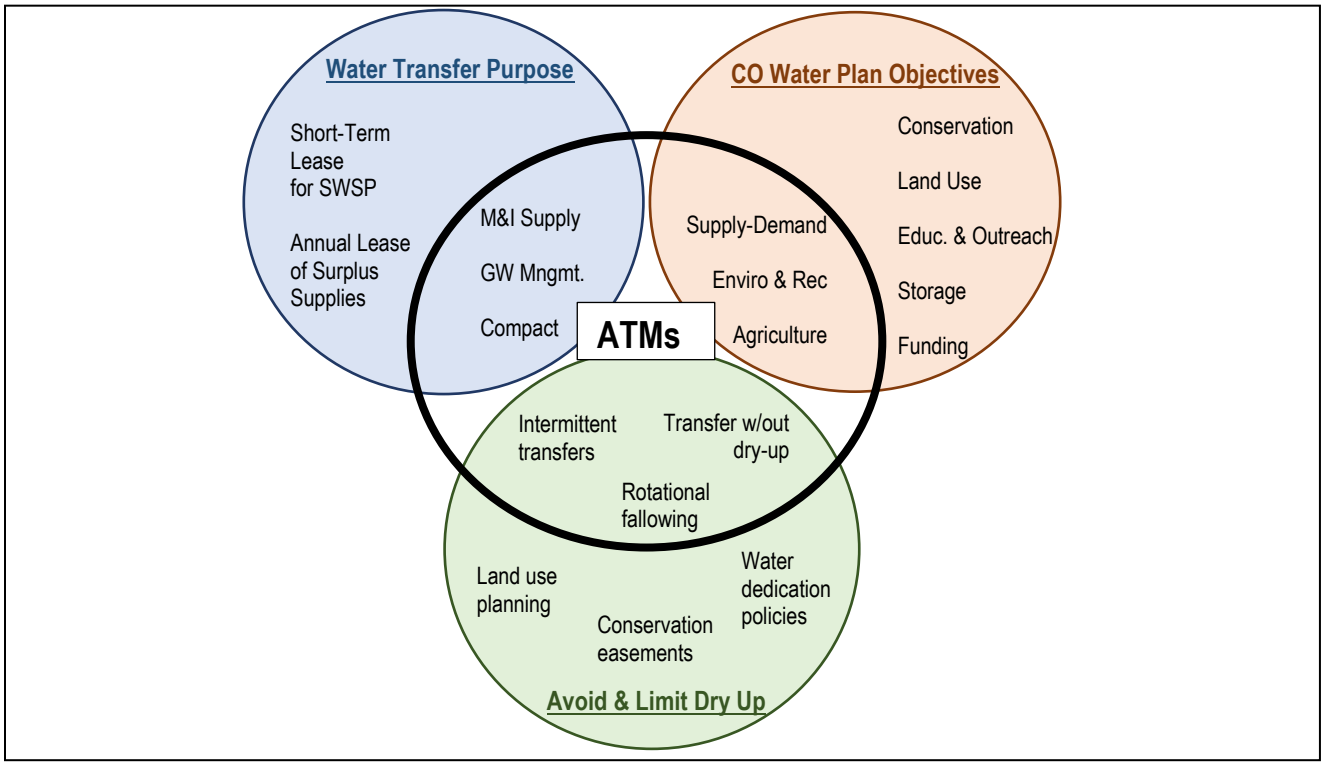


Table 13: Criteria to Define ATM Transactions

	Item	Criteria	Context
Required	Activity	Water transfer that reduces the permanent dry-up of agricultural lands	ATM projects must be a water transfer that reduces permanent irrigation dry-up. Two requirements are in this statement.
	Purpose	Meets a defined objective in the Colorado Water Plan	ATM projects must provide water to a new use in a manner that advances progress on goals & objectives in the CO Water Plan.
Preferred	Term	Secures a water transfer to a new use for a term of 10 years or more.	ATM projects are distinguished from annual leasing activity by their term. ATM projects should seek to secure long-term contracts for a water transfer. Pilot projects are helpful to explore new concepts and develop proof of concepts.
	Ownership	Water right ownership retained in whole or in part by agricultural sector	ATM projects can benefit agriculture by ensuring that ownership of the water rights and management of the water source remains with agriculture, while providing for non-agricultural uses.
	Transfer Frequency	Water should remain in agricultural use as much as possible, but ideally no less than 5 out of 10 years, or an equivalent % of irrigation on an annual basis.	ATM projects can be structured to provide water to an alternative use in multiple years. The goal is to keep a particular farm operating in as many years as possible. An approximate threshold is maintaining agricultural use in 5 out of 10 years.
	Target At-Risk Areas	Avoidance of permanent dry-up should focus on lands that face a risk of dry-up (i.e., those beneficial for other uses)	ATM projects that directly prevent the dry-up of irrigated lands at high-risk of dry-up in the next decade should be prioritized over projects that prevent a conceptual dry-up of low-risk lands or that indirectly prevent dry-up of lands in a broad region.
	Agriculture Benefit	Provides a net economic benefit to agricultural working lands & rural communities	ATM projects should be beneficial to agriculture & rural communities, otherwise there is no clear dividing line between ATMs and other water transactions

ATM Incentives & Motivations

Various elements of the ATM status assessment presented previously support the idea that ATMs are typically driven by motivations other than strictly the water transfer. The buyer and/or seller under an ATM transfer are often interested and motivated to see continued agricultural production for benefits such as open space, water quality, environmental health, and others. Therefore, the framework for facilitating ATMs should be built with an understanding that it is not solely the water transfer that incentivizes parties to construct ATM agreements. The following paragraphs provide a summary of the primary ATM incentives, outside of the water transfer, indicated by our outreach and research.

Open Space & Community Buffers

Many Front Range municipalities recognize the value of open space and community buffers. The added benefits of open space and community buffers include:

- Recreation,
- Opportunities to observe, conserve, and interpret native species of Colorado,
- Maintenance of the historical and cultural spirit of conservation,
- Connecting residents to agriculture and the origin of food, and
- Visual corridors that preserve a sense of place and sensory relief amid the expanding urban boundaries.

All these features improve the quality of life in Colorado, and municipalities are motivated to maintain them. However, in many instances, the acquisition or conservation cost of farmland and associated water rights can be cost-prohibitive for municipal governments, which inhibits the establishment of open space and community buffers. ATMs can alleviate this financial barrier[55]. ATMs motivated by open-space benefits can also appealing to the agricultural sector, by diversifying income and maintaining the working landscape.

Agricultural Heritage and Economic Prosperity

Irrigated agriculture is an important component of the state's history, culture, economy, and environment. It is important not only to rural communities that depend on the economic activity generated by irrigated agriculture, but also to the urban centers in Colorado. "Eat local" movements and business enterprises continue to gain market share and many urban dwellers look to the surrounding rural irrigated landscape as an important aesthetic component of life in Colorado[56]**.** The importance of irrigated agriculture carries into ATM decision-making. Several example ATMs in **Table 9** are known to have been primarily motivated by simply maintaining irrigated agriculture on the landscape.

The right to divert water is not the only consideration for agricultural producers when contemplating water supply and continued viability of irrigated agriculture. Shared conveyance infrastructure is common across Colorado including mutual ditch companies, water users' associations, and other formal and informal organizations controlling shared infrastructure. There is potential for ATM transactions to assist in maintaining a critical mass of agricultural production amongst the shareholders within a ditch system to continue to justify the continued maintenance and use of shared conveyance infrastructure. Additionally, agreements that require continued agricultural production potentially bring municipal interest and resources into shared infrastructure issues that support agricultural production.

ATM transactions potentially provide a competitive advantage to agricultural producers in Colorado. Many agricultural areas within our state are dominated by commodity crop or livestock production that is increasingly competing in a global marketplace. Distance to markets, global over-production and foreign trade issues increasingly put financial pressure on Colorado agricultural producers. Water supply is only one of multiple decision criteria that agricultural producers must contend with when competing in a global marketplace. However, alternative revenue streams associated with ATMs have the potential to provide an additional, and more stable, revenue stream for agricultural

[55] For example, Larimer County and Broomfield pioneered a perpetual lease to preserve a working farm and share water for a municipal use. The agreement includes an Interruptible Water Supply ATM that allowed Larimer County to conserve a viable 211-acre farm in perpetuity and Broomfield to acquire a dependable water supply without utilizing buy-and-dry.

[56] Thorvaldson et al. 2010. *Western Households' Water Knowledge, Preferences, and Willingness to Pay*. Water users are willing to pay for reallocation programs, particularly those aimed at keeping irrigated farms in production

producers in Colorado. Such a unique revenue stream potentially provides a more sustainable business model for consideration by the agricultural sector.

Instream Flows for Environmental Health & Recreation

Since 1973, Colorado has recognized instream flows as a beneficial use of water. At the time of passage, the Colorado General Assembly noted the "*need to correlate the activities of mankind with some reasonable protection of the natural environment*". Instream flows help provide environmental benefits to aquatic ecosystems by moderating stream flows during critical periods. Secondary water quality benefits can also be achieved such as moderating water temperatures, dissolved oxygen, or pollutant constituents. Since the early days of the state's instream flow program, instream flows have expanded to include recreational water uses such as whitewater parks or enhanced fishing opportunities.

Much like consumptive water uses, instream flow rights can be impacted by the sale, lease, or transfer of water. Any flow modification has the ability to affect aquatic ecosystems and recreation opportunities and could change the magnitude of benefits realized from an instream flow right. For example, a lease agreement between an upstream irrigator and a downstream water user could result in more water in the stream channel between the original diversion structure and the new place of use during the lease period. Conversely, if water lease agreements are structured to remove water from certain reaches of stream, this could negatively affect non-consumptive uses. It is important for consumptive and non-consumptive waters users to understand the environmental and recreational tradeoffs of a lease agreement on stream flows as some ATMs could result in either net positive or net negative impacts for environmental or recreational uses. We encourage the state to support ATMs that maximize benefits to uses prioritized in the Colorado Water Plan, including environmental and recreational interests.

Examples of ATMs used to enhance environmental water uses include:

- The Colorado Water Trust established a split-season ATM on McKinley Ditch, which provides instream flow benefits in the lower reach of the Little Cimarron River. In 2014, the Colorado Water Trust purchased shares in McKinley Ditch and subsequently worked with the CWCB to convert the water right to include instream flow uses. The water is now shared between agriculture, which uses the water right to irrigate almost 200 acres in the spring and early summer, and environmental uses when the water is left in the stream during late summer and early fall. This is a temporary or split-season fallowing model and provides a good example of how environmental uses and agricultural water uses are not always mutually exclusive.
- The Coats Bros Ditch/Tomichi Creek agreement between private irrigators and the CWCB shows how a split-season fallowing program can yield environmental benefits. This ATM is a 3-in-10 year agreement with an expected yield of about 200 AFY in the years it operates.
- The Grand Valley Water Users Association (GVWUA) Conserved Consumptive Use pilot project provided additional flow to the 15-mile reach of the Colorado River, a section of critical habitat for 4 endangered fish species. The environmental benefit of the project was a secondary consideration, but project scoping and operational planning allowed the addition of this environmental benefit.

In some cases, like those listed as examples above, ATMs can provide direct benefits to environmental water uses. In other cases, the environmental or recreational water uses may enjoy benefits from an ATM that was designed to accomplish other purposes. For example, an agricultural to municipal water transfer may involve capturing and storing the newly leased municipal water in a reservoir. This could enhance fish and aquatic habitat or decrease pollutant concentrations. However, as mentioned earlier, environmental and recreational benefits are not guaranteed under all ATM agreements.

Risk Reduction in Municipal & Agricultural Sectors

One of the dominant barriers to ATM adoption found in our research was the risk and uncertainty that many water users associate with ATMs. Contrary to this, there is also a view that ATMs can actually help to reduce risk by providing a valuable water supply source that is distinctly different from other sources. ATMs can help municipal water providers deal with severe droughts or climate change uncertainty, without the expense of a permanent water supply acquisition.

In particular, ATMs can be well suited to municipal water providers that serve a relatively built-out service area and that hold sufficient base supplies in average water supply years. For agricultural producers, ATMs can provide a more diverse income to help alleviate fluctuations in agricultural commodity markets and weather-related impacts. Perhaps stating the obvious, ATMs can be valuable to both the municipal and agricultural sectors if they are structured to meet a specific municipal need and if they represent a net economic benefit to the agricultural sector.

Many of these incentives and motivating factors are public benefits, and it should be recognized that ATM development and growth will be difficult to achieve without consideration of such public benefits. These factors support continued investment by CWCB in facilitating ATMs in the public's interest. These factors also highlight a potential disconnect between municipal water managers and broader community goals. Many of the public benefits listed above are not often considered by municipal water managers in making water supply development and acquisition decisions. The framework for ATM development and facilitation moving forward should include education and outreach to water users and managers about the public benefits of ATMs and technical assistance on identifying public benefits for individual projects, at least to the extent that such assistance is a key consideration and motivation for specific ATM projects.

Policy Changes

Governments modify and advance policies to motivate certain actions and ultimately pursue certain objectives. ATMs have been a CWCB objective for over a decade and CWCB has supported several policies over that time that have been intended to facilitate ATM adoption. Most of this policy change has focused on developing new administrative tools to approve a water transfer outside of water court and reducing the transaction costs and uncertainty associated with ATM water transfers. Looking forward, it is likely that policy change will continue to be an important tool in how the state advances ATMs, but policy change focused on regulatory barriers has not resulted in significant interest in ATMs and this is not expected to change. Instead, policy change should be broadened to motivate actions beyond the regulatory process and expand to include policies at multiple levels of government. This section discusses some of the policy changes that might facilitate ATMs, and includes policy changes that are not directly tied to ATMs but are parallel ideas on reducing the permanent dry-up of agricultural lands.

Past Legal Changes to Facilitate Water Transfers

Over the past decade or more, policy efforts to facilitate ATMs and water transfers more broadly have focused on changes to Colorado state law. **Table 14** summarizes recent laws that have been passed to advance more flexible water transfers with a reduced regulatory process[57]. It should be recognized that numerous bills aimed at developing alternative and flexible water transfers, in addition to those listed in **Table 14**, have been introduced into the Colorado legislature over the past decade but were not successfully passed into law[58].

There have been approximately 22 laws passed since 2002 to develop new water transfer regulatory mechanisms and reduce regulatory barriers to water transfers. Some of these new transfer mechanisms have been used and some have not. The most successful changes in regulating water transfers have been policies developed for a specific project, as opposed to policy changes that intended to spur development of new projects. Moving forward, this can be instructive to targeting efforts on ATMs. Policy changes are unlikely to spur new ATM development, but policy changes should be addressed and undertaken when they appear to be restricting a specific ATM project from being implemented. If policy change continues to be targeted at regulatory barriers, **Appendix E** provides a list of additional regulatory changes that were identified in the literature review for consideration.

One policy change associated with the regulatory process of water transfers that was identified several times during this project is the pursuit of administrative tools or presumptive factors that reduce the analytical burden (and points of

[57] The descriptions in the table were copied from Appendix B in EDF *Alternative Water Transfers in Colorado*. https://www.edf.org/sites/default/files/alternative-water-transfers-colorado.pdf

[58] For example, several proposed but unsuccessful bills over the period 2000-2015 are listed Appendix 1 in *Improving the Viability of Alternative Water Transfer Methods (ATMs) in Colorado: A Synthesis of Research Findings from the Getches-Wilkinson Center, 2014-2015*. Compiled by D. Kenney.

disagreement) associated with water transfers. The objective of such efforts is not to change the regulatory process, but instead to make the process easier by having agreed-upon values for certain factors such as historic consumptive use (HCU) and return flows and not analyzing such factors from scratch. As stated previously, there continue to be efforts to develop such tools[59], which should be beneficial to ATM development if they are approved and adopted. The CWCB might also work in close cooperation with CDWR to evaluate broader use of and public trust in these tools, and other accessible and low-cost tools, for reducing the regulatory burden of water transfers.

Related to the above point about presumptive factors and agreed-upon tools is a broader recommendation or change that would help to facilitate water transfers, which is increased trust in the water community. A large degree of the cost and burden of securing a water transfer stems from the distrust between water users and the fear of impact. There is a possibility that education and outreach in local areas can reduce the amount of distrust and thereby reduce the cost and complexity of a proposed water transfer, particularly new types of water transfers such as ATMs. In addition, seeing example ATM projects in operation is instructive and beneficial to building trust. Therefore, continued education and outreach efforts to build this trust and understanding is important, and the CWCB should look to leverage local facilitators and stakeholders in such efforts.

Rethinking Dry-Up Agreements

The section on defining ATMs included the following paragraph regarding dry-up agreements:

Permanent water transfers must be approved (decreed) in water court, and obtaining such approval has typically included a dry-up agreement that legally assures that the agricultural lands from which the water is being transferred will not be irrigated with the source of water supply being transferred. This assurance is intended to meet long-standing legal principles of non-injury to other water users and non-expansion of a water right. Therefore, the only reason dry-up agreements are necessary is to help a water court applicant meet its burden of proof in proving non-injury in a water right change case in court. Dry-up agreements are the easiest ("tried and true") method of proving to other parties in a change case that the change will not result in an expansion of use and thereby proving no injury. This context leads to two important realities relating water transfers and irrigation dry-up: (1) water transfers can occur without permanent dry-up if the applicant can provide evidence (to the satisfaction of its objectors in the court case) that no expansion or injury will occur, and (2) the agricultural lands served by the water right being transferred can continue to be irrigated from a water source distinctly different from the water being transferred. Therefore, there are legal and policy actions that can be taken to allow water transfers to occur without permanent loss of irrigated lands.

In particular, the state might consider greater support for continued irrigation on lands with transferred water rights and for ensuring that continued irrigation is allowed in court decrees[60]. Policies around dry-up agreements could involve ATM transactions in cases where a municipality (or other new user) retains agricultural use of the water rights under a dual-use decree or retains irrigation use on the original lands in some fashion. These types of policy efforts are focused less on bringing a new type of water supply to market, but instead working to minimize the permanent dry-up of agricultural lands by intentionally seeking flexible decrees or by creatively finding other water supply sources to continue irrigation.

[59] An example is the Lease-Fallow Tool (LFT) developed in the Arkansas Basin. https://www.colorado.gov/pacific/cdss/lease-fallow-tool

[60] DiNatale Water Consultants and CSU. 2013. *Alternatives to Permanent Dry Up of Formerly Irrigated Lands*. This report provides a good review of the potential for dryland and limited irrigation farming for select Front Range counties. The report notes that dryland farming and limited irrigation farming may not be practical or economically viable for many Front Range locations. The existing regulatory process is also not well designed to accommodate continued water use on lands associated with transfers. http://www.dinatalewater.com/files/ECCV_Alternatives.pdf

Table 14: Past Legal Changes to Facilitate Water Transfers (1 of 2)

Category	Year	Identifier	Name	Description
Substitute Water Supply Plans	2002	HB 02-1414	Substitute Water Supply Plans	Provides the State Engineer with the authority to approve a one-year Substitute Water Supply Plan (SWSP) for out-of-priority diversions, as long as the SWSP replaces all out-of-priority depletions to prevent injury to other water rights. The SWSP may be renewed annually for up to 5 years. Legislation concerning State Engineer authority to approve of SWSPs and associated water uses was also passed in 2003 as SB 03-073 and in 2009 as SB 09-147.
Water Banks	2003	HB 03-1318	Creation of Water Banks	Authorized the creation of water banks within each of the State water divisions. The water banks must be requested and administered by a water conservancy or conservation district, with water bank rules developed by the State Engineer. The rules shall authorize the lease, exchange, or loan of storage water to uses within a water division
Instream Flow Leases	2003	HB 03-1320	Administer Temporary Instream Flows	Stated that is lawful for water right holders on the same ditch or stream to exchange water with, and loan water to, each other for a limited time with notice provided to the division engineer. If a drought emergency has been declared for the basin or county, water right holders may also loan water to the CWCB for instream flows for up to 120 days
Interruptible Water Supply Agreements	2003	HB 03-1334	Temporary Operation of IWSAs	Allows the loaning of water between two or more water right holders as an option agreement. The State Engineer is authorized to approve and administer an IWSA without adjudication. IWSAs were permitted to be exercised only in calendar years with a drought or other emergency in the county, and the calendar years following such a declared drought or emergency.
Water Transfers	2003	SB 03-115	Authority of Local Govts. To Protect In-Basin Use	Defined two terms: "Removal of Water" was defined as a change in the type and place of use of an irrigation water right from irrigation use in one county to a use not primarily related to agriculture in another county; and "Significant Water Development Activity" was defined as any Removal of Water that results in the transfer of more than 1,000 acre-feet per year of HCU by a single applicant or its agents. For Significant Water Development Activities, the applicant in a water court change case faces additional requirements and obligations, including: (1) retained jurisdiction by the local government, (2) terms and conditions to accomplish revegetation and weed management on the associated lands, (3) mitigation payments and bonded indebtedness payments which are equal to the total reduction in local government revenues for a period of 30 years due to the water right change. The payment obligations do not apply: (1) to any water rights owned by applicants prior to the bill date, (2) to water right changes undertaken by a water conservancy district, water conservation district, special district, ditch company, other ditch organization, or municipality, or (3) to change cases where the new place of use is within a 20-mile radius of the historic place of use. Also gave counties the ability to levy a special sales tax of up to 1% and to create a county water fund for the purposes of purchasing, adjudicating changes of, leasing, using, banking, and selling water rights that have been decreed for use within the county
Interruptible Water Supply Agreements	2004	HB 04-1256	Expansion of IWSA Period	Allows an IWSA to be operated or exercised for up to 3 out of 10 years. Previously IWSAs could only operate in single-year periods during and immediately following drought or emergency conditions.
Water Transfers	2004	SB 04-032	Authorize Loans of Irrigation Water Rights	Allows an irrigation water right holder to loan all or a portion of the water right to another irrigation water right holder located within the same stream system for a period of up to 180 days per calendar year, if such a loan is approved by the Division Engineer and does not cause injury to other water rights. A loan may also be made to the CWCB for instream flow purposes.
Water Transfers	2005	SB 05-133	Conditions to Overcome Abandonment	Allows land and water conservation activities to be undertaken without risk of abandonment of the underlying water right(s). Non-use of a water right shall not be considered in determining abandonment if the water right is part of: (1) a Federal land conservation program, (2) a water conservation program, (3) a land fallowing program, or (4) a water banking program
Water Transfers	2006	SB 06-1124	Adjudication of Rotational Contract	Provides that owner(s) of irrigation water rights may implement a change of use by foregoing irrigation of the historically irrigated lands and the non-irrigated lands may be rotated. The proposed contract must be decreed by a water court, and in doing so, the court should look at HCU separately for each of the rotation land parcels.
Instream Flow Leases	2007	HB 07-1012	Protection of Water Rights Loaned to CWCB	Stated that any water court proceedings on determining HCU shall exclude periods of time when the subject water right was loaned to CWCB for instream flow purposes
Instream Flow Leases	2008	HB 08-1280	Protection of Water Rights Used by CWCB	Requires that the CWCB do the following for instream flow leases: (1) adopt criteria regarding proposed lease agreements for instream flows, (2) keep records of water use during the lease term, and (3) obtain a decree that quantified HCU of the water right.
Interruptible Water Supply Agreements	2013	HB 13-1130	Extended Operation of IWSAs	Modifies the previous IWSA legislation to allow the State Engineer to approve of up to two additional 10-year periods for the IWSA. Previously only one 10-year period was allowed. Other conditions include: (1) that multiple IWSAs may not be relied upon as a primary source of supply,(2) a water right may not be enrolled in two or more simultaneous IWSAs.

Table 14: Past Legal Changes to Facilitate Water Transfers (2 of 2)

Category	Year	Identifier	Name	Description
Water Transfers	2013	HB 13-1248	Pilot Projects for Leasing Water to Municipal Use	Authorizes the Colorado Water Conservation Board (CWCB) to approve up to 10 pilot projects to test fallowing-leasing. Each project can last up to 10 years and no more than 3 pilot projects may be located in any one of the major river basins. The CWCB may approve of pilot projects only after the State Engineer has determined that there is no issue of injury to other water rights. The pilot project cannot include the following: (1) fallowing the same land for more than 3 out of 10 years, (2) fallowing more than 30% of a single farm for more than 10 consecutive years, (3) the transfer of water across the continental divide or out of the Rio Grande Basin, or (4) including any land or water that is part of a SWSP or IWSA. In 2015, under SB 15-198, this pilot program was expanded to include other (not municipal) uses, including agricultural, environmental, industrial, or recreational uses.
Water Transfers	2013	SB 13-019	Promotion of Conservation Measures	Applies only to Water Divisions 4, 5, and 6 on the West Slope. The bill provides that a determination of HCU may not consider years in which the water right, or the land appurtenant to the water right, was enrolled in a government conservation program. More specifically, the bill says that HCU will not be decreased because of the following: (1) the land was enrolled in a Federal land conservation program, (2) reduced use of the water right for up to 5 out of 10 years because the water right was involved in a water conservation program, a land fallowing program, and/or a water banking program.
Water Transfers	2015	SB 15-183	Quantification of HCU	Clarified details about how water court makes determinations on HCU, stating that the analysis must be based on the actual historical use of the water right for its decreed purposes, and must be based on a representative study period that: (1) includes wet, dry, and average years, (2) excludes un-decreed water uses, (3) may not include every year of the subject water right history. Further, the bill states that once an HCU is quantified in an approved change of use case, subsequent change of use cases may not re-quantify the HCU associated with the water right
Water Transfers	2016	HB 16-1228	Agricultural Water Protection Water Right	Allows a decreed irrigation water right located in Water Divisions 1 and 2 (Colorado Front Range) to be changed to an "agricultural water protection right" with 50% of the HCU portion of the changed right available for lease to other (unspecified) uses at approved points of diversion. The change process is handled by rules promulgated by the State Engineer outside of water court, and the water right must be part of an approved SWSP and the associated lands must be enrolled in an agricultural conservation program. The term of the lease and associated SWSP is limited to one-year, with two renewals allowed.
Water Transfers	2017	HB 17-1219	Extension of Agricultural Water Leasing Pilot Program	Expands HB 13-1248 by allowing the CWCB to authorize up to 15 lease-fallow pilot projects, with a maximum of 5 projects per river basin. Applications must be received by December 2023 and projects completed by 2034.
Water Transfers	2017	HB 17-1233	Protection of HCU for Water Rights in Conservation Program	Previously SB 13-019 protected HCU from participation in conservation programs. Expands the application of the rule to Divisions 1 & 2 and includes water conservation pilot programs.
Water Transfers	2017	HB 17-1289	Streamlined Rules for Determining HCU	Directs the IWRRC to study whether State Engineer should adopt streamlined methods for determining HCU.
Instream Flow Leases	2020	HB 20-1037	Augmentation of Instream Flows	Provides CWCB with the authority to augment stream flows with water rights previously decreed for augmentation use.
Instream Flow Leases	2020	HB 20-1157	Loaned Water for Instream Flows	Expands the number of years that water rights can be loaned to CWCB from 3 to 5 years, within a 10-year period, but limited to 3 consecutive years. Also allows renewal for up to 2 additional 10-year periods.
Instream Flow Leases	2020	HB 20-1159	Confirm Existing Uses	Directs the State Engineer to confirm water right claims of use if such claims were not previously confirmed by court order or decree, specifically for evaluation of CWCB appropriations for instream flow purposes.

Municipal Water Acquisitions

There are two predominant processes by which municipal water providers acquire water rights, and these processes are important to understand in the context of ATMs and the Colorado water market. New water demands are served by a municipal water provider through incremental additions tied to specific land development projects. For each new home that seeks to have potable water service provided, there is a one-time transaction that takes place between the housing developer and the municipal water provider. The developer provides water or money to the municipal water provider in exchange for the perpetual commitment to serve the new home(s). The amount of water and/or money required to receive municipal water service is typically set by local municipal or water board policy and can adjust over

time to respond to changes in water demands[61] and market prices for water rights[62]. In most cases, the water rights supporting new homes (and businesses) are forever secured through this one-time transaction before the homes are ever occupied. Local municipal policies usually allow for one or both of the following actions in exchange for municipal water service:

- Developer Dedication. Some policies require that water rights be acquired by a land developer and dedicated to the municipality in exchange for water service. The municipality typically requires a developer to dedicate specific types of water rights that it deems useable with the current infrastructure. In general, acceptable water rights for dedication are often located higher up in local river basins for both conveyance and water quality reasons. For several Northern Front Range municipalities, there is only one or two acceptable water rights for dedication which has caused significant price appreciation in these specific water assets[63]. Policies that require water right dedications for specific land developments are less flexible to accommodate new types of water supply such as ATMs because the new demands are tied directly to the supply being dedicated.

- Cash-in-Lieu of Water Rights. Some policies require (or allow) cash to be paid by a land developer in lieu of dedicating water rights. These cash-in-lieu policies are intended to provide sufficient money to a municipality to acquire new water rights or develop planned water supply infrastructure projects. The unit cost of cash-in-lieu rates paid by developers reflects local water market conditions. Municipalities that accept cash payments for new water service can often take a broader portfolio view of its existing and new water supplies and can better accommodate new types of water supply such as ATMs because new demands are not tied directly to the money paid by the new development.

For the purposes of facilitating greater adoption of ATM water supplies by the municipal sector and avoiding the permanent dry-up of agricultural lands, the following municipal policy changes might be considered:

- Utilizing Cash-in-Lieu Policies. A developer dedication of water rights is not conducive to ATM development in the municipal sector, because this form of dedication basically trades permanent water rights for permanent water service. Developer dedications do not typically consider the broader municipal water portfolio. Therefore, greater use of cash-in-lieu (CIL) policies by municipal water providers is considered a basic step toward greater use of ATM water supplies in the municipal sector.

- Revisiting Water Dedication Amounts. Water conservation policies and programs have been widely successful in the municipal sector, with per-person municipal water use rates falling almost every year since 1985 from nearly 250 gallons, per-capita, per day (gpcd) down to 150 gpcd[64], a drop of 40%. In addition, most new home designs use relatively less water than comparable historical homes. For water right dedications, this success in water conservation means that we should be seeing an associated decline in the required water right dedications for new home development. It should be recognized that progress on reducing water dedication amounts has a direct impact on the number of irrigated acres facing permanent dry-up to support new land development.

- Exploring Long-Term Lease-Back Contracts. Most municipal water providers acquire water rights and supplies based on the ability to serve customers under dry-year conditions. The result is that many municipal water providers hold excess water supplies under their water right portfolio in most years (see Table 4). Therefore, lease-backs from municipalities to agriculture will continue and may expand with greater municipal water

[61] Most Colorado municipalities have experienced significant reduction in per-capita water use rates such that the amount of water required for a new single-family home is less today than it was 30 years ago.
[62] Most Colorado municipalities require new development to "pay its own way" such that the money or water rights dedicated by a new development must be equal in volume to the expected water demands of the new development.
[63] Examples include several communities that are primarily or solely served by the Colorado-Big Thompson (CBT) project.
[64] Statewide data from USGS Water Use Estimates, published every 5 years. https://water.usgs.gov/watuse/data/

acquisitions. Structuring these lease-back contracts to be more favorable to the agricultural sector would be a positive development, separate and apart from ATM development.

Tracking & Metrics

The metrics shown in **Table 15** were developed based on feedback and analysis. The metrics are divided into two groups: (1) those indicating progress on ATMs and associated objectives, and (2) those indicating progress on ATM barriers. The identified metrics should be further reviewed and are expected to evolve over time but should lay a solid data foundation for assessing progress on ATMs into the future.

Table 15: Proposed Metrics to Track Progress on ATMs

Category	Sub-Category	Metric		Potential Data Source(s)	Estimated Current Value	Proposed Target Value by 2030
Progress on ATMs	**ATM activity *(track by basin & water use sector)***	**Number of active / contracted ATMs**		**ATM Inventory**	**12**	**35**
		Contract volume of active ATMs		**ATM Inventory**	**18,100**	**50,000**
		Irrigated acres involved in active / contracted ATMs		**ATM Inventory**	**13,700**	**40,000**
	Avoid permanent dry-up	Irrigated acres in Colorado		USDA Census of Agriculture	2,761,173	2,750,000 or more
	Expand municipal interest	Number of municipal water providers with ATM contracts		ATM Inventory	8	25
	Target Areas	Percent of contracted ATMs in predominantly agricultural counties		CO Dept. of Revenue sales tax data & USDA Census of Agriculture	50%	80%
				OMB and Census designated rural counties in Colorado	75%	80%
	Target Sectors	Volume of contracted ATMs by use	Municipal	ATM Inventory	4,423	20,000
			Industrial		12,300	20,000
			Environmental		1,404	10,000
			Compact Compliance		0	None Defined
Barriers to ATMs	Regulatory Uncertainty	Percent of contracted ATM projects that utilize administrative approval (not court)		ATM Inventory	33%	50%
		Approval time when utilizing administrative approval mechanisms		ATM Inventory, CDWR	4 months	3 months
	Permanence of Municipal Demand	Percent of statewide municipal supply portfolio that is sourced from ATM supplies		USGS Water Use Data & ATM Inventory	0.5%	1%
	Infrastructure	Number of water supply projects with ATMs in their scope		None Defined	1	3
	Crop Production Impacts	Annual dollars spent on research and education related to agricultural alternatives for generating ATM water supplies		Colorado Water Center, CWCB	$0.5M	$2.0M
	Economics	Compensation for ATM participation, expressed as average unit lease payment ($/AF) divided by average Cash In Lieu (CIL) rate or water resources portion of new water connection rate for 10 largest CO cities, also expressed in $/AF units.		ATM Inventory, Municipal Websites	4.4%	None Defined

Notes: (1) Blue shading indicates the core progress metrics that should be tracked by river basin, water use sector, and statewide.

RECOMMENDATIONS

The project team recognizes that significant efforts have been undertaken over the past decade to advance the use of alternative methods of transferring water rights to avoid the permanent dry-up of irrigated lands. From these efforts, we see significant research reports evaluating and addressing challenges, and more recently we see several successful examples of ATM transactions occurring in Colorado. Recognizing past efforts but also recognizing that further progress on ATMs will continue to be challenging, the ATM Support project was initiated to assess the status made to date on ATMs and to develop a framework for CWCB and broader state consideration of ATMs moving forward.

Role of ATMs. It is important for CWCB to have the right perspective on what ATMs are capable of achieving based on the past decade of investment. We believe that it is likely that Colorado will continue to see new ATM development, but we also believe that such ATM development alone will not significantly reduce overall dry-up of irrigated lands in Colorado. Permanent dry-up is likely to continue, even with ATMs, because of the various reasons dry-up occurs (such as land development and groundwater regulations) and because ATMs are not likely to supplant permanent transfers as the dominant form of municipal water supply acquisition. The project team recommends continued investment in ATMs because they serve an important purpose in Colorado in providing a flexible and creative approach to avoid permanent dry-up where possible and because they help to achieve various other Water Plan goals.

Expand the Toolkit. The project team has developed a set of recommendations that aim to expand use of ATMs in Colorado but also address other water-related factors that impact the permanent loss of irrigated lands. The project team supports ATM facilitation by CWCB and expansion of ATMs as a flexible tool to allow water transfers while preserving agricultural benefits. The project team also believes that expanding the tool-kit to include other initiatives and programs besides ATMs will be the best course of action to minimizing the permanent loss of irrigated lands. The recommendations in this section are focused on aspects that CWCB can control and actions items that CWCB can implement. Recommendations are categorized as: funding, policy, and education & outreach.

Funding

One of the greatest facilitation tools provided by the CWCB since 2007 has been the ATM grant program, which has funded 36 projects focused on ATM research, development, and implementation. The following recommendations are made with regard to CWCB funding:

- **Maintain ATM Grant Program**. The project team recommends that the CWCB continue to fund an ATM grant program, and to focus grant funding on project implementation. Many survey respondents wanted to see more pilot and example projects to increase comfort with the process and benefits of ATMs. The CWCB should continue to evaluate what state grant funds are intended to accomplish, and it is recommended that the criteria-based definition (**Table 13**) and scoring metrics (**Table 15**) developed in this report be used to develop a scoring method for the evaluation of grant applications. Some flexibility in funding ATM projects will need to be maintained in order to encourage creative projects and take advantage of unique opportunities. Pilot projects are important for exploring new concepts and developing proof for concepts. The CWCB should also commit resources for tracking and reporting ATM metrics on a regular basis.

- **Fund & Support Other Activities**. The CWCB should consider utilizing Water Plan grants or Water Supply Reserve Fund, or developing a source of new state funding, for non-ATM actions that are targeted at same objective of reducing the loss of irrigated lands. The project team has identified the following activities that would benefit from state funding support:
    - Municipal policy changes that effectively reduce the quantity of irrigated acres required for dry-up to support a new water service tap. Funding could be provided for municipal policy changes that either: (1) reduce water dedication requirements to a relatively low amount (such as the lowest quartile) or

(2) create water right dedication requirements that are tailored to estimated water needs of specific developments.

- County land use planning that focuses on maintaining community buffers and agricultural conservation between urbanized areas or open space policies in general.
- Agricultural conservation easements involving irrigated lands that allow for some flexibility in water use, such as ATMs, without allowing permanent dry-up of the lands.
- Municipal water sharing agreements that provide a source of new water supply to municipal water provider(s) from a municipal water provider[65]. These types of municipal water sharing agreements recognize that Colorado municipalities have a diverse range of water supply portfolios and are intended to offset the acquisition of agricultural water rights to meet municipal demands.
- Engineering & legal analysis towards greater adoption of "dual use" water court decrees, that provide for both agricultural and municipal use. These types of dual-use decrees would remove any legal barrier to maintaining long-term agricultural use of water rights. Related to this, state funding could support improvement to municipal lease-back agreements by securing such leases under long-term contracts and considering agricultural ownership. As shown in this report, the annual volume of municipal water leasing back to agriculture is significant and worthy of improvement efforts.
- Develop a state program to fund efforts to re-irrigate high quality agricultural lands that have previously been dried up but remain viable for irrigation. Such lands could include properties that have a dry-up covenant as part of a water transfer but are able to use alternative sources of water supply for irrigation[66].
- The state should consider investing in studies, practices, and projects that address the positive and/or negative ecological and economic impacts of temporary water right transfers to improve our understanding of secondary impacts from these transfers.

- **Incentivize ATM Projects under Existing CWCB Funding Programs**. The CWCB provides grant funding for various studies and initiatives[67], and also provides low-interest loans to assist with funding for water projects[68]. Both of these funding activities could be utilized to support ATM investigations and implementation efforts. During initial project conception under feasibility and planning studies, the CWCB grant programs could provide an incentive for projects that include ATM evaluation, in the form of greater funding or higher ranking. For construction of water projects, the CWCB loan program could provide a marginally reduced repayment obligation or reduced interest rate for projects that include an ATM project component.

- **Leverage Other Funding Sources**. As stated in this report, ATMs are often motivated by factors beyond the transferred water. Local efforts targeted at open space, recreation, and environmental stewardship may provide additional funding sources for ATM project development. The CWCB should develop and maintain an inventory of alternative funding sources for project applicants to consider during initial project development. Some of the alternative funding sources identified during our research include: (1) U.S. Bureau of Reclamation WaterSMART Water Marketing Strategy grant program, (2) environmental and conservation non-profit support, (3) U.S. Department of Agriculture (USDA) and Natural Resource Conservation Service (NRCS) programs such as EQIP and RCPP, and (4) pairing ATMs with agricultural conservation easements for tax benefits.

[65] The WISE partnership between the South Metro water districts and Denver & Aurora is an example municipal water sharing agreement.
[66] An interesting recent project is the located on the Bessemer Ditch near Pueblo, providing a unique approach to substitution of prime farmland with more marginal land as part of a water court change decree.
[67] https://cwcb.colorado.gov/grants
[68] https://cwcb.colorado.gov/loans-grants/water-project-loan-program

Policy

A major focus of ATM facilitation over the past decade has been the expansion of administrative tools and reduction of legal barriers associated with alternative water transfers. Our research identified over 20 laws passed since 2002 that were focused on facilitating water transfers and reducing legal barriers. Policy work on ATMs will continue to be important, but we recommend that policy actions be targeted at legal and regulatory hurdles that are encountered as part of developing a specific ATM project, and not be aimed at encouraging parties to consider an ATM. The following recommendations are made with regard to CWCB policies:

- **Define ATMs**. Our surveys and research indicate that adopting a formal definition for ATMs is an important next step for CWCB. The act of defining ATMs serves to clarify state objectives, and also provides a clear basis for making grant-funding decisions and for tracking progress on ATMs. We recommend that ATM projects defined as those that meet a minimum number of elements from a pre-defined list of criteria (see **Table 13**).

- **Reduce Regulatory Uncertainty**. Water transfers are inherently complicated because of the number of water rights and users on a river system and because ensuring non-injury is a detailed and contentious process in Colorado. These complications are not likely to change unless there is widespread local support for simplicity. Our survey indicates that many Colorado water users would like to reduce the regulatory uncertainty around water transfers as an avenue to expanding consideration of ATM agreements. We have identified the following actions that can be taken to reduce regulatory uncertainty:
    - Continue the development of local presumptive factors for use in water court change cases and administrative approvals. The state's efforts may include: (1) CDWR and CWCB providing public support for these factors once approved, and (2) CDWR providing technical support to parties interested in utilizing presumptive factors in their regulatory process.
    - Allow agricultural lands involved in ATM agreements to qualify for state policies that preserve the historic consumptive use (HCU) volumes for conservation projects (for example SB 13-109)[69].
    - Encourage flexible dry-up agreements to allow for continued irrigation of properties with alternative water sources. Encouragement might take the form of new legislation requiring such allowances or policies that educate and identify such allowances as desirable. The CWCB needs to work with the Attorney General's Office and CDWR to better recognize and administer alternative agricultural practices for lands associated with a water court transfer application.
    - Allow agricultural water rights participating in non-permanent ATM projects to gain regulatory approval and utilize transferrable volumes that will not be established as precedence for a historical consumptive use (HCU) analysis in future water court applications involving the rights.

- **Municipal Review of Water Dedication Policies**. The CWCB has supported and required municipal water conservation efforts for decades, and these efforts have been widely successful. If the CWCB wants municipal water conservation to positively influence agriculture, then it is important that municipal water dedication requirements reflect conservation success. The CWCB should consider or study the possibility that municipal water providers revisit their water dedication requirements as part of water efficiency plans and evaluate dedication requirements relative to water conservation successes. This recommendation is focused on the demand side of dedication policies, such as the required volume per single-family equivalent (SFE), and is not associated with the supply side of dedication policies, such as the volume yield of a particular source.

- **Support Flexible Water Transfers in Agriculture**. The CWCB should consider advocating for favorable policies towards temporary and flexible water transfers in the next U.S. Department of Agriculture Farm Bill. In particular, providing clarity on crop insurance for limited irrigation fields and financially supporting ATM development.

[69] This issue has been previously stated in the SPROWG ATM Survey and the Nichols et al. DU law article on ATMs.

- **State Agency Coordination**. The surveys indicated that a lack of coordination and communication among state agencies has been a frustration for water users pursuing ATM projects. It is recommended that staff from the CWCB and CDWR (and perhaps other agencies) meet on a recurring basis to consult on ATM efforts and protocols. In addition, it is recommended that CWCB staff provide education to each of the seven Water Division Engineers on ATM projects and state objectives.

Education & Outreach

The CWCB has done a good job at publicizing its ATM grant program and ATM objectives among the water community. Most survey respondents were aware of ATMs and state initiatives. Continued education and outreach efforts are recommended to transition from awareness of ATMs to broader consideration of ATMs. The following recommendations are made with regard to CWCB outreach efforts:

- **ATM Website**. The water community would benefit from a centralized online resource for learning about ATMs. The website should include a complete list of past projects along with supporting documentation, contact information, and story narratives about the origination and benefits of ATM agreements. The website could also provide up-to-date tracking on ATM objectives and provide an ATM inventory. The CWCB should create a formal process and define state agency responsibilities for maintaining and managing the ATM inventory[70]. In addition, the website should provide educational resources on the public benefits often associated with ATMs[71].

- **Local Facilitators**. The CWCB should consider expanding and perhaps formalizing partnerships with various organizations that have local connections to water users, with the goal of these partners facilitating more ATM projects and building relationships and trust among water users. Organizations could include agricultural advocacy groups, environmental non-profits, and land trusts. In particular, the project team believes that conducting additional outreach to the land trust and land conservation community would be beneficial[72]. The CWCB might also consider outreach to water-dependent recreational groups as facilitators to see if ATMs could be used to enhance recreational opportunities[73]. Past ATM participants should also be included as local facilitators to increase the opportunities for peer-to-peer learning and possibly address cultural barriers.

- **Municipal Water Planning Resources**. Municipal interest in ATMs has been a limiting factor and the CWCB has limited tools to increase municipal interest moving forward. The CWCB may consider direct outreach and education on municipal water planning and also incorporating concepts into existing programs such as *Growing Water Smart* workshops[74]. The following ideas may help municipal water providers adjust their water supply planning efforts to consider ATM water supplies:
  - Develop educational materials on adopting cash in lieu (CIL) water dedication policies and effectively using a portfolio view of water supply sources.
  - Develop educational materials on municipal water providers that have entered into ATM agreements with information on the water supply benefits and considerations given to alternative sources.
  - Continue to encourage cooperative water and land use planning in municipalities and develop educational materials on how ATMs can provide additional benefits such as open space, recreation, and

[70] The ATM inventory could be housed on the ATM website or linked to an inventory maintained by CDWR similar to SWSP applications or as CDSS water transactions with a special designation. The CWCB may need additional capacity and assistance from CDWR or other parties in tracking ATMs and managing the ATM inventory.
[71] A list of public benefits is provided in the ATM Incentives & Motivations section in this report.
[72] A representative from the land conservation community noted that there are over 4,000 landowners with conservation easements in Colorado, which indicates a willingness on their part to consider a permanent agreement.
[73] ATMs have not previously been explored to support recreational water uses. The water developed from an ATM could be legally protected in specific reaches defined by Recreational In-Channel Diversion (RICD) water rights.
[74] https://sonoraninstitute.org/resource/growing-water-smart-workbook/

preservation. These educational materials should reach both municipal water managers and elected officials who often consider the multi-faceted aspects of community decisions.

- **Basin Roundtables**. The CWCB should assist Basin Roundtables in developing and adopting appropriate ATM metrics and protocols for tracking progress on ATMs and awarding ATM grants in their basin. The Basin Roundtables should be assisted by CWCB staff and potentially local facilitators in developing locally appropriate ATM educational materials and outreach support for local water stakeholders to use in determining the feasibility of ATM projects for their use. The Basin Roundtables might consider the development of an ATM task force that could serve to: (1) identify and facilitate projects, (2) share information with water users, (3) review grant-funding requests, and (4) assist state agencies with the ATM inventory and ATM metrics tracking.

APPENDIX A: LIST OF CWCB GRANT FUNDED ATM PROJECTS

Year	Applicant	Project	Amount
2008	Lower Arkansas WCD	Rotational Land Fallowing	$320,000
2008	Colorado Corn Growers Assoc.	Measures for Preservation of Colorado Irrig. Ag.	$349,650
2008	FRICO	Alternative Agricultural Water Transfer	$202,500
2008	Parker WSD	Lower South Platte Irrig. Research	$477,500
2011	Colorado River WCD	Compact Water Bank	$180,000
2011	East Cherry Creek WCD	Maintaining Ag. Productivity on Former Irrig. Lands	$111,030
2011	Colorado Corn Growers Assoc.	FLEX Market	$158,365
2011	Lower Arkansas WCD	Farm Financial Planning	$31,633
2011	CO Water Innovation Cluster	Lake Canal Demonstration	$135,105
2008	CO State University	Land Fallowing in Arkansas	$78,489
2011	The Nature Conservancy	ATMs to Meet Needs in Yampa	$132,000
2010	Parker WSD	Lower South Platte Irrig. Research	$320,166
2013	Lower South Platte WCD	Water Cooperative	$300,477
2011	Upper Arkansas WCD	Tools for Lease Fallowing	$121,500
2013	CO State University	Sub Surface Drip Alfalfa	$8,841
2013	Conejos WCD	ATMs for Conejos Basin	$124,124
2013	CO State University	Implementation of Deficit Irrigation	$124,734
2014	CO State University	Poudre Basin Water Sharing	$86,940
2013	Ducks Unlimited	FLEX Water Market	$120,250
2013	CO River WCD	Water Bank Phase 2	$180,000
2013	Lower South Platte WCD	NE CO Water Coop	$173,900
2014	CO River WCD	No Chico Brush	$173,080
2014	CO River WCD	CO Water Bank Work Group	$180,000
2015	CO State University	Field Studies of Saved CU	$180,000
2015	Lower Ark Valley WCD	Rotational Catlin Canal	$173,782
2015	Larimer County	Open Space Pilot	$178,425
2016	Grand Valley WUA	Water Bank Pilot	$200,000
2017	CO Open Lands	South Platte ATM	$284,500
2017	New Cache Irrig. Co	Water Market Strategy	$214,957
2018	Heart J Center	Sylvan Dale Ranch	$197,250
2018	Rio Grande Headwaters Trust	Cactus Hill ATM	$150,000
2018	Dept. of Water Res.	LFT Tool	$50,000
2017	Upper Roaring Fork	Aspen ATM	$183,356
2019	Palmer Land Trust	Bessemer ATM	$150,000
2020	CO Basin Roundtable	CCU in Upper Basin	$500,000
2020	Lower Ark Valley WCD	Ag Muni Conservation Easement	$170,810

APPENDIX B: RESULTS OF BASIN ROUNDTABLE SURVEY

A survey was sent to all roundtable members to further comment on the project framework and objectives. We received eighteen total responses representing views from the Arkansas, Colorado, Gunnison, South Platte, and Metro Roundtables. We received no response from the Rio Grande Roundtable. Responses are summarized here with parentheses indicating the number of times a subject/comment was repeated by participants.

1. *How familiar are you with alternative transfer methods?*
   Of the 18 respondents, 11 were fairly to very familiar with ATMs while 7 were not very to somewhat familiar with ATMs.

2. *The success of ATMs is dependent upon willing parties to enter into water transfers arrangements while preserving agriculture for the long-term. Willing buyers need to comfortable acquiring a unique water supply. Willing sellers need to be comfortable changing their operations in some years.* ***Who should we try to interview in your basin*** *as part of this project to gain perspective on the willingness of sellers and buyers?*
   - Ranchers and Farmers (x5)
   - Water managers (x3)
   - Colorado Cattlemen's Association (x2)
   - DARCA membership (x2)
   - Landowners
   - State water rep for all the counties
   - Jay Winner
   - Farm Bureau
   - UAWCD
   - Augmentation groups
   - Soil conservation district members
   - City of Aspen regarding their pilot project
   - NGOs
   - Grand Valley Farmers

3.
   a. *The term ATM is fairly new in the water community vocabulary, but unique water transfers have been occurring for a long time in Colorado, and before there were state efforts to promote alternative water transfers.* ***Are there examples of water transfers in your basin*** *that provide a new source of water supply but do not permanently dry-up agricultural lands?*
      - UAWCD is working on a couple of potential projects
      - Pueblo Board leasing program
      - Colorado Springs/LAWMA deal
      - Colorado Springs/AGUA water trade agreements
      - Sterling Res./Public Service
      - Bill Fales/Colorado Water Trust instream flow on the Crystal River
      - Grand Mesa exchange decree
      - WISE partnership
      - Coordinated Reservoir Operations

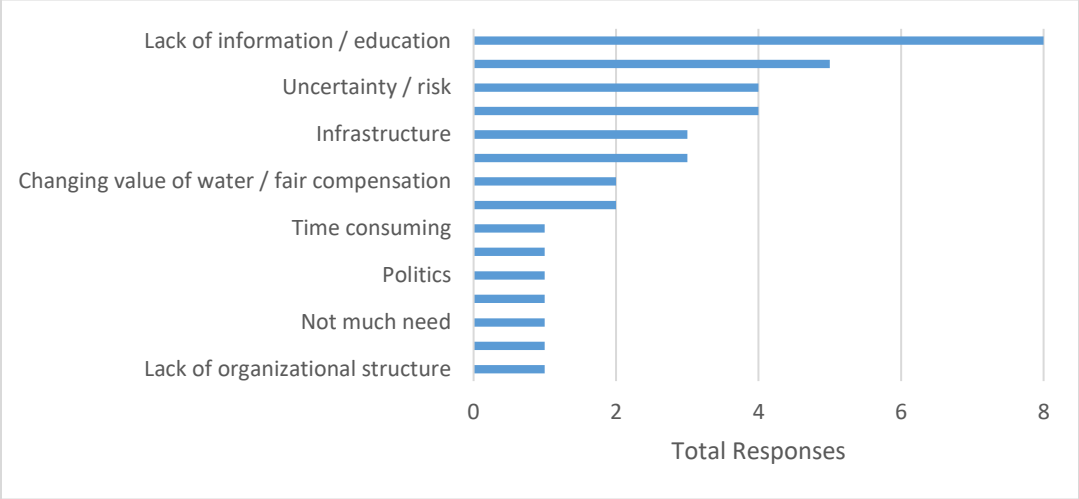
   b. *Are there* ***unique circumstances of issues in your basin*** *that could potentially be addressed by an ATM or water marketing agreement?*
      - Drought Planning (x3)
        - Colorado River drought contingency planning. There are water short and water long times for any given system. Water long systems can help meet the gap.
        - Meeting Cameo call and other important senior calls during low-flow periods

- In stream flow agreements (x3)
- Meeting 15-mile reach obligations
- Development and population growth (x2)
- Augmentation water for Crystal Valley (x2) and UAWCD
- Solving dry up of Crowley County
- SPROWG – a major project that has ATMs as a critical water supply source

c. *Are there **unique considerations or perspectives in your basin** to consider in facilitating ATM projects moving forward?*
- Impact of ATMs on streamflow (x2)
  - Address dry up on the south Arkansas river
  - Tailor changed delivery to best achieve flow management objectives
- Protect Private property rights, fear of water court (x2)
- Long term damages from buy and dry (short term is not apparent)
- Economic drivers and risks of ATMs
- Use of ATMs in connection with augmentation plan
- Resistance to moving water out of the drainage
- Longer term funding
- Fair compensation for farmers

4.

a. *There are barriers to ATM adoption and development. It is helpful to better understand these barriers from various perspectives. **What do you consider the 3 most difficult barriers to ATM adoption?***



b. ***How would you assess past efforts** by the State of Colorado, basin roundtables, or broader water community to address these barriers?*
- Past efforts are meager, not very good, lots of talk, does not work (x6)
- Efforts are good, helpful (x3)
- ATMs need a sustained voice and/or sustained funding in CO (x2)
- Pilot ATMs have supported education on ATMs (x2)
- Promoting ATMs is difficult (because of independence, history, tradition, resistance to chance)
- Basin Roundtables are a good boots-on-the ground approach
- Other state agencies need to get on board, not just DWR
- There are no big "buyers" of an ATM supply, no market

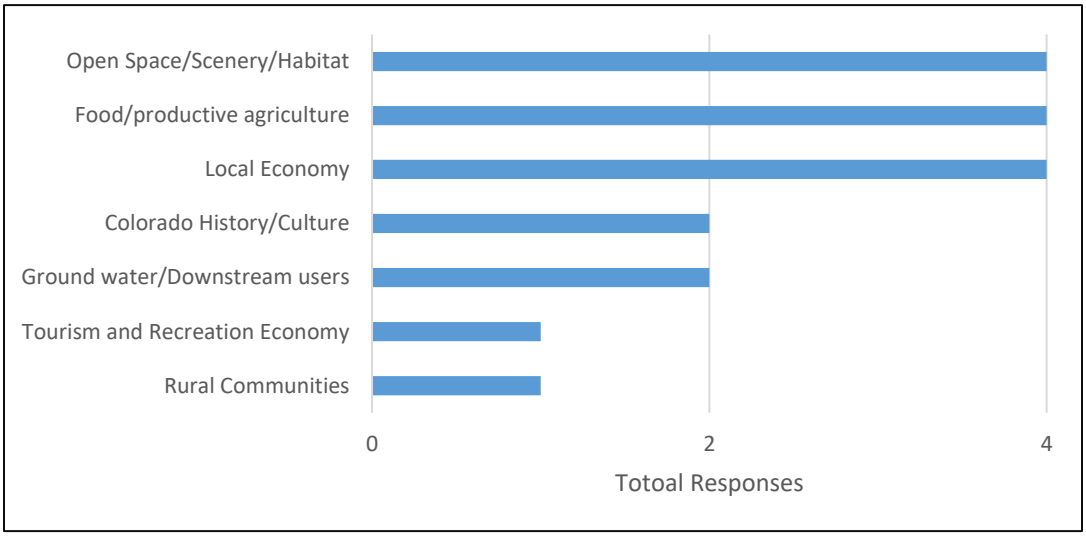
- Basin roundtables reflect the needs and fears of communities, their families and farms, this does not translate into money. For all the conversation about the noble effort to save agriculture, Colorado cities are looking for the cheapest way out.

c. *Do you have any ideas on how the State of Colorado or broader water community could continue to* ***address these particular barriers?***
   - More information and education (x4)
     - Pilot projects, education
     - Look at how other states are handling water transfers
     - More complete data sets on how split season or total dry-up affects different crops
     - Population centers will only understand this when water doesn't come out of the tap
   - Funding and Financial (x4)
     - Make funding available
     - Give proper value to what all sides bring to the table
     - Create a flexible option for owners of senior water rights
     - How about the ATM "buyer" offer augmentation water for the farm well(s) in return.
   - Legislative fixes (x3)
     - for long-term leases between water right owners and the ISF program (or even a designated reach w/out an ISF)
     - Protect downstream water rights
     - Stop passing legislation that circumvents the water court system- agriculture does not trust this
   - Storage (x2)
     - More storage now will show agriculture they do have a future in Colorado
     - Recognize that only secure water comes from storage of excess flows
   - Leadership needs (x2)
     - Leaders must build bridges together with a long-term vision for our future
     - Let individual drainage handle each case

d. *What is the* ***role of Basin Roundtables*** *in promoting alternative water transactions if any?*
   - If yes, the Roundtable should:
     - Be a source of legal advice, and information (x2)
     - Collect data and information about ATMs (x2)
     - Facilitate dialog, moderate discussions (x2)
     - Be a leader in ideas and options
     - Be a sounding board
     - Play a major role
     - Assess community support
     - Financially support pilot programs
     - Promote flexible policies through state relationships
   - If no, then:
     - Roundtables should have no role in ATMs (x2)
     - Some local agency is need to handle funds, prioritize projects, monitor results, verify saved water on the ranch and in stream flows. Ag must prove the return on investment. This is best done within a conservation district/water district model
     - ATMs should be handled by drainage
     - Roundtables should not be promoting or get in the way of ATMs

5.

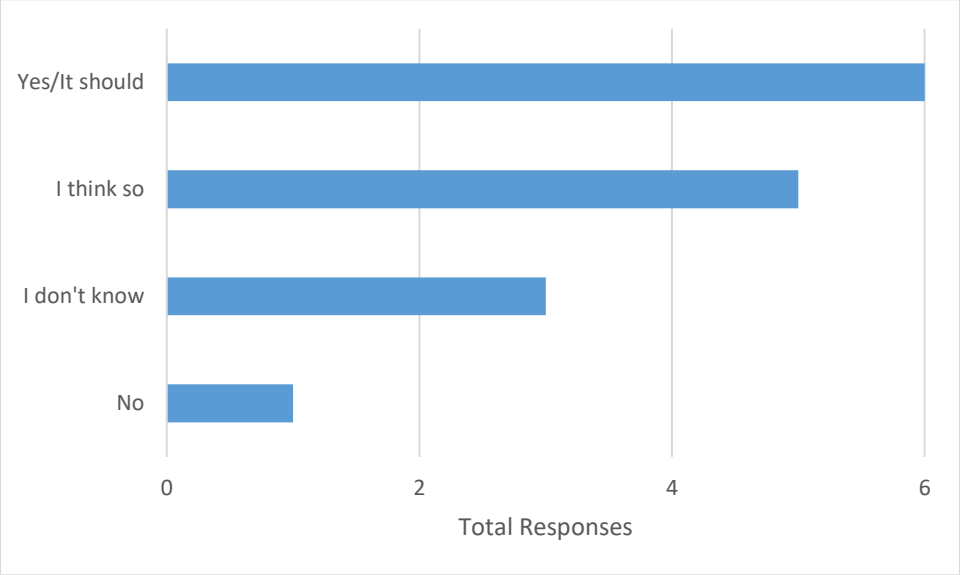
a. *The root motivation for state investment in ATM development has been a desire to minimize the permanent loss of irrigated agricultural land and the negative externalities/third-party impacts associated with traditional water transfers.* ***Do you think permanent agricultural dry up and the associated socio-economic impacts are problematic****? Why or why not?*



b. *What are your ideas on* ***how the state can best address/invest resources to reduce permanent agricultural dry up*** *and the associated negative externalities/third party socio-economic impacts?*

- Policy and projects (x4)
  - Continue refining the guidance and expectations for ATMs based upon lessons learned.
  - Is it possible to set up a water bank to work some of the projects out? (like middle park conservancy district does with their windy gap water)
  - Utilize market forces. Agriculture has water and needs money to rebuild infrastructure. Municipal and industrial need water and have money/ability to tax and raise utility rates.
  - Need to understand what type of dry up is occurring the CO basin, is it "off-site" dry-up or "build-on" dry up. These come with different problems.
- Increase water storage (x2)
- ATMs (x3)
  - Keep working lands thriving, payments for ecosystem services, conservation easements.
  - Each ATM needs to be considered independently
  - Need to ask ag producers what they see is beneficial about ATMs.
- Proper oversight (x3)
  - Government causes more problems than they solve/ infringe on property rights (x2)
  - Not certain the state is the best player to do this.
- Education (x2)
  - Educate people about where their food comes from.
  - Educate people about how conservation and efficiency doesn't create more water.

c. *Does the Basin Roundtable intend to include ATM concepts or projects in their forthcoming BIP update?*



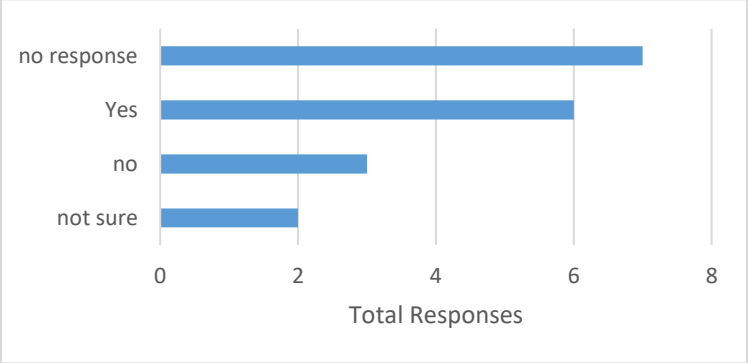
d. ***Should minimizing negative externalities and socio-economic impacts*** *of permanent reductions in irrigated acreage remain a state water resource priority in the update to the Colorado Water Plan? Why or why not?*

- Yes (x14)
  - Local economy (x3)
  - Irrigated lands are important for productivity and biodiversity (x2)
  - Need to address rural communities needs
  - Irrigated acreage is directly related to food supply
  - Critical for Colorado's image
  - Just look at Crowley County
- Not sure (x2)
  - There may be good reasons to dry up marginal agricultural lands that contribute a lot to pollution issues.
  - Stop having the irrigated acreage conversation and look at economic output. Greenhouse production could replace irrigated acreage without negative consequences to the basin.

e. *Are there* ***specific measurable objectives or actions*** *that should be highlighted in the new Colorado Water Plan that support continued ATM implementation?*

- Money for local communities to develop pilot projects and more permanent funding (x2)
- No, unless the definition of ATMs utilized is broadened and some promise of enabling rules/legislation makes it a little more nimble to implement.
- Yes, but currently the ag gap is over inflated which only goes to pit agriculture and municipalities against each other – it doesn't give us solutions that benefit the basin.
- Make it a goal to maintain irrigated farms

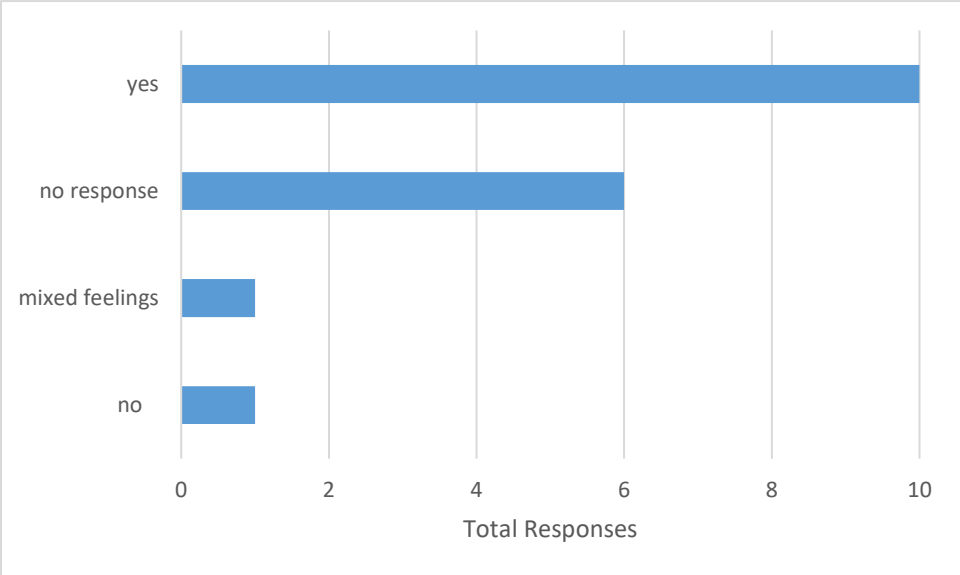
f. *Should the state have a **strict definition of an ATM** for funding and tracking purposes? What is your definition of an ATM?*



- It should be broad (x2)
- It gives value to the buy and seller with no negative economic impacts (x2)

6.

a. *The state has invested in ATMs for roughly a decade, with some success in getting projects in place as examples or pilots. You may have worked on ATM projects or heard about them for many years now, or you may be hearing about ATM concepts for the first time. Whatever your background, **do you generally favor or disfavor continued state investment in ATM concepts?** If yes, what other tools/resources/incentives could the state employ to promote more alternative transfer methods and water marketing programs generally?*



b. *What other tools/resources/incentives could the state employ to promote more alternative transfer methods and water marketing programs generally?*
- Water storage (x2)
- Legal and work with legislators (x2)
- Outreach to agricultural producers (x2)
- More studies
- Money
- DWR needs to be a part of the discussion.

- Long term evaluations must be done.
- Improve based on lessons learned.

c. *If no, is there a more **appropriate entity that could encourage more ATM** development? What, if any, is the appropriate role for the state in facilitating ATM development (e.g. administration, tracking)?*
   - Provide incentives for the development of ATM projects generated at the local level.
   - Water user's association for the drainage.

*7. Please provide any **additional thoughts/ideas/feedback** on ATMs that would be helpful to share through this project.*

- If you don't have willing landowners, you don't have ATMs
- This should be driven by agricultural producers at the local level with state incentives
- Address the long-term implications and the not so apparent consequences
- Try more high mountain storage of water in wet years to take care of needs in dry years
- Look beyond 3 in 10 lease fallowing, it may not be the answer for our future
- Know the history, make good decisions

APPENDIX C: RESULTS OF THE ATM PAST PARTICIPANT SURVEY

Questions for ATM Past Participants
This series of questions was for parties who have previously been involved in a completed ATM project. The questions were asked over the phone. Responses were anonymous.

1. What prompted your involvement in an ATM?

2. What was your personal role in completing the ATM?

3. Separating the two parties to the ATM agreement into buyer and seller, please assign these parties to the following questions:
   a. Who initiated the ATM? Why?
   b. Who received grant funding or other outside support?
   c. Who was more motivated to develop an ATM? Why?
   d. Who offered the initial deal terms?
   e. Who was responsible for regulatory approvals?

4. How did the parties involved in the ATM find each other?

5. How many different organizations were contacted to identify an ATM partner?

6. How many alternative sources / opportunities were in play for your organization when this ATM was completed? Alternatives can be ATMs but don't have to be.

7. Do you think your organization met its objectives under the ATM? Do you think your organization got a fair deal?

8. Would you want to pursue another ATM project? Why or why not?

9. The root motivation for state investment in ATM development has been a desire to minimize the permanent loss of irrigated agricultural land and the negative externalities and third-party impacts associated with traditional water transfers.
   a. Do you think permanent agricultural dry up and the associated socio-economic impacts are problematic in your area? Why or why not?
   b. Are there specific measurable objectives or actions that should be highlighted in the new Colorado Water Plan that support continued ATM implementation?
   c. Should the state have a strict definition of an ATM for funding and tracking purposes? What is your definition of an ATM?

10. There are barriers to ATM adoption and development. It is helpful to better understand these barriers from various perspectives.
    a. What do you consider the 3 most difficult barriers to ATM adoption?
    b. How would you assess past efforts by the State of Colorado or broader water community to address these barriers?
    c. Do you have any ideas on how the State of Colorado or broader water community could continue to address these particular barriers?

11. In order to encourage ATM implementation, the state has established several procedures and processes by which ATMs may be approved via a streamlined, administrative process or hybrid approval process. Did you utilize an administrative approval process for the water transfer in your ATM?
    a. If yes, what were some of the benefits and/or drawbacks of utilizing this administrative method? Was the water transfer process a critical consideration of the ATM project?

12. The state has invested in ATMs for roughly a decade, with some success in getting projects in place as examples or pilots. Do you generally favor or disfavor continued state investment in ATM concepts?
    a. If yes, what other tools/resources/incentives could the state employ to promote more alternative transfer methods and water marketing programs?
    b. If no, is there a more appropriate entity that could encourage more ATM development? What is the appropriate role for the state in facilitating ATM development (e.g. administration, tracking)?

13. Please provide any closing thoughts/ideas/feedback on ATMs that would be helpful to share through this project.

A summary of responses is provided in the tables below.

Responses to Survey of ATM Past Participants

Respondent ID	- Represent	1 Prompted involvement	2 Personal role	3a Who initiated	3b Who grant funded	3c Who more motivated	3d Who offered deal	3e Who regulatory	4 Parties find	5 Different orgs contacted	6 Alternative sources / opportunities	7a Met objectives	7b Fair deal
1	Buyer	Looking for water supply alternatives	Buyer representation	Seller	Seller	Both	Seller	Seller	Seller reached out	Not sure	Alternatives always evaluated	Yes	Yes
2	Seller	Buyer approached	Seller representation	Buyer	Neither	Buyer	Seller	Seller	Buyer reached out	0	Several alternatives specifically evaluated	Yes	Yes
3	Seller	Reduce impacts of water transfers	Seller representation	Seller	Seller	Seller	Negotiated over period	Seller	Match maker	4	Several alternatives specifically evaluated	Yes	Yes
4	Seller	Reduce impacts of water transfers	Seller participant	Seller	Seller	Seller	Seller	Seller	Match maker	10	-	Yes	Yes
5	Seller	Political pressure	Not involved	Seller	Seller	Seller	Seller	Seller	Seller reached out	12	None	Time will tell	No
6	Buyer	Looking for water supply alternatives	Not involved	Buyer	Neither	Buyer	Negotiated over period	Seller	Match maker	Not sure	Not sure	Yes	Yes
7	Seller	Reduce impacts of water transfers	Seller representation	Seller	Seller	Seller	Seller	Seller	Match maker	30	None	Yes	Yes
8	Buyer	Seller approached	Buyer participant	Seller	Seller	Seller	Seller	Seller	Seller reached out	Not sure	A few	Yes	Yes
9	Buyer	Seller approached	Buyer representation	Seller	Seller	Seller	Seller	Seller	Seller reached out	Not sure	A few	Yes	Yes
10	-	Looking for water supply alternatives	Not involved	-	Neither	-	-	-	-	-	Several alternatives specifically evaluated	Yes	Yes
11	Buyer	Test concepts	Buyer representation	Buyer	Buyer	Both	Seller	Neither	RFP Process	Not sure	-	Yes	Yes
12	Seller	Test concepts	Not involved	Seller	Seller	Seller	Seller	Seller	-	Not sure	None	Time will tell	-
13	Buyer	Looking for water supply alternatives	Buyer representation	Buyer	Neither	Buyer	Buyer	Buyer	Buyer reached out	50	Several alternatives specifically evaluated	Yes	Yes
14	Buyer	Looking for water supply alternatives	Buyer representation	Buyer	Seller	Buyer	Seller	Both	Buyer reached out	10	A few	Time will tell	-

Responses to Survey of ATM Past Participants

Respondent ID	8 Pursue another	9a Dry up problem	9b Measurable objective #1	9b Measurable objective #2	Measurable objective #3	9c Strict definition	9c What is ATM	10a Barrier #1	10a Barrier #2	10a Barrier #3
1	Yes	Yes	Amount of irrigated acres	Percent of municipal portfolio that is leased	Financial support to the Ag. sector	Loose definition	Share water between ag & non-ag uses	SEO Office / Regulations	Cost / value	Perception of risk
2	Yes	Yes	Separate different types & locations of ATMs	-	-	Yes	Alternative to buy and dry	Infrastructure	Water quality	Permanent demands
3	Yes	Yes	Water quality benefits	-	-	Yes	Rotational fallowing	SEO Office / Regulations	Water rights / change case	Lack of interest
4	Yes	Yes	Land involved in ATMs	-	-	Yes	Rotational fallowing	SEO Office / Regulations	Cost / value	Infrastructure
5	No	Mixed	-	-	-	Not sure	-	Scalability	Permanent demands	Lack of interest
6	Yes	Mixed	Measurable objectives are premature	Separate different types & locations of ATMs	-	No	Sharing water	Perception of risk	Cost / value	Permanent demands
7	Yes	Mixed	Pilot project funding	-	-	Yes	Alternative to buy and dry	Time & effort required	Lack of familiarity	Lack of interest
8	Yes	No	Amount of irrigated acres	Separate different types & locations of ATMs	-	No	-	Perception of risk	Water rights / regulatory	SEO Office / Regulations
9	Maybe	Yes	-	-	-	Not sure	Alternative to buy and dry	SEO Office / Regulations	Time & effort required	Permanent demands
10	Yes	Yes	Quantify permanent ATMs	-	-	Yes	Alternative to buy and dry	Permanent demands	SEO Office / Regulations	Time & effort required
11	Maybe	Yes	Quantify permanent ATMs	Financial support to the Ag. sector	-	No	-	Permanent demands	Perception of risk	Time & effort required
12	Yes	Yes	Quantify permanent ATMs	Separate different types & locations of ATMs	Quantify wet water transferred	No	Sharing water	Lack of interest	Lack of familiarity	Agriculture viability
13	Yes	Mixed	Amount of irrigated acres	-	-	Yes	Alternative to buy and dry	Lack of familiarity	-	-
14	Yes	-	-	-	-	-	-	-	-	-

Response to Survey of ATM Past Participants

Respondent ID	10b	10c	11	12	12a	12b	13
	State efforts	How to address barriers	Admin approval	Favor	Yes - investments	Why not	Ideas
1	-	Motivation on both sides	Yes	Yes	Education & more examples	-	Improve irrigation efficiency to free up water for municipal use
2	-	-	No	Yes	Reduce risk	-	Deals will happen with our without state investment & involvement
3	-	Give State more flexibility	Yes	Yes	Reduce regulation	-	Steer resources to difficult ATMs that prevent ag. dry up. Create a change application for everyone. Make it easier for those who want to do it.
4	-	-	Yes	Yes	-	-	-
5	-	-	No	Yes	Define goals better	-	Better understand the purpose. Do not pursue ATMs for the sake of ATMs
6	-	Motivation on both sides	No	Yes	Education & more examples	-	ATMs in place have not needed state investment. 10 years of investment have not yielded results.
7	State gone above & beyond	Education & outreach	No	Yes	Education & more examples	-	ATMs need advocacy
8	Funding helpful	Education & outreach	No	Yes	Reduce regulation	-	Worked b/c of flexibility and had time available. Optimum size of 100-200 AF.
9	-	-	Yes	Yes	Reduce regulation	-	Proponent of free market - do not require ATMs
10	-	-	No	Yes	Address barriers	-	Focus on permanent deals
11	Good first steps	Motivation on both sides	No	Yes	Education & more examples	-	Understand practical & real world motivations
12	Good outreach	-	No	Yes	More projects	-	-
13	-	-	No	Yes	More projects	-	-
14	-	-	No	-	-	-	Utilities actually preferred a water court process for its stability and certainty.

APPENDIX D: RESULTS OF MUNICIPAL SURVEY

Questions for Municipality and Utility decision-makers

This series of questions was for parties who represent municipal water organizations. The questions were asked over the phone. Responses were anonymous.

1. Generally describe your position and how long you have been doing this job.

2. What type of water supplies does you or your organization seek to acquire or have you previously sought to acquire? (Groundwater, Ditch shares, Storage contracts, etc.)

3. What volume (in acre-feet) of additional water supplies do you think your organization will seek to acquire in the next 10 years? How about in the next 20-30 years?

4. If you are seeking additional water supplies, why? Is it to meet future needs related to growth or to firm supplies in dry-year periods?

    a. For new development (new taps), do you accept cash, water rights, or both?
        i. Do you have specific policies / criteria for accepting or acquiring new water supply sources?
        ii. Do you ever purchase water rights merely because it is a "good deal" even if it doesn't necessarily fit your current system?
        iii. Have you ever declined a water rights offer solely because of the asking price and for no other reason?
        iv. Does the cost of water rights influence your plans for acquiring or selecting new water supplies?

    b. Do you typically seek out specific water rights as a buyer, or do people typically bring water rights or dedicate water to you for water service?

    c. Do you ever lease water supplies to meet any of your water needs?
        i. Why or why not?
        ii. Do you have any temporary or intermittent (drought) water needs that might make sense to lease rather than own new water supplies?

    d. Do you have years when you have excess water supplies?
        i. What do you do with excess supplies? Do you ever lease excess water supplies to irrigators?
        ii. What is the process for such leases? Do you have formal rules & requirements for lease backs?
        iii. Do you have any long-term (over 10-year) water leases with irrigators?

5. Prior to this call, were you aware of state interest and investment in alternative water transfer concepts?
    a. If yes – where did you hear about alternative transfers?
    b. If no – are you surprised that the state has made such investments?

6. What is your understanding of what an alternative water transfer is?

7. Do you think your organization will pursue an alternative water transfer supply in the next 5-10 years? How about in the next 20-30 years?
    a. If no –

i. Is this something you will consider?
ii. What would it take to raise your interest level in pursuing this type of supply (such as price reduction, good public relations, meeting open space requirements?)
iii. Are there specific issues or concerns that make ATM considerations particularly problematic for you? (Some examples: risk issues, ownership issues, water dedication policies, financial considerations)

b. If yes – is it a specific ATM supply that is already available or a new ATM supply that you are hoping becomes available?
    i. If specific ATM – which one? What are the primary drivers why your organization is pursuing an ATM supply?
    ii. If a new ATM – what did you have in mind? Any specific thresholds that need to be met such as minimum volume, term of the agreement, and frequency that the supply is available?
    iii. Have you utilized or are you planning to utilize an administrative approval of the water transfer instead of water court approval? Why or why not?

8. Do you have any further thoughts as to why such water agreements are not occurring more spontaneously and what could be done to facilitate these transactions?

9. Do you generally favor or disfavor continued state investment in ATM concepts?
    a. If yes – what type of investments should the state be making?
    b. If no – why not?

10. Please provide any final thoughts, ideas, and feedback regarding ATM planning for our project.

A summary of responses is provided in the tables below. Answers were edited or shortened for space and anonymity considerations.

	1	2	3		4	4a	4ai	4b
Respondent ID	Describe position	Water type of water supplies?	Volume in next 10 years	Volume in next 20-30 years	Why new supplies	New development acceptance: Cash/Tap fees, water rights or both	Specific policies	How is new water brought into your portfolio? Seek out, others bring and dedicate or mix of both
1	Deputy Water Resources Director	All of the above	3,500	22,000	Growth	Both	Yes	Mix of both
2	Water District General Manager	Storage / Project contracts	4,000	7,500	Growth	Cash	No	Seek out supply
3	General Manager	All of the above	0	0	Growth	Water rights	Yes, must be very senior	Bring and dedicate
4	Public Works Director	Surface Water, CBT	0	0	Growth	Cash	No	
5	Water Resources and Quality Manager	Surface Water	0	5,000	Growth	Tap Fees	No	Seek out supply
6	Assistant Director of Utilities	All of the above	3,000	10,000	Growth	Both		Mix of both
7	Water Resource Manager	Groundwater and surface water	7,000	0	Growth, Diversify			
8	Water Resource manager	surface water	4,000	0	Growth	Tap fees	3 AF/acre	Mix of both
9	Water Resources Director	Ditch shares	0	0	-	Tap Fees	No	Mix of both
10	Legal consult	CBT	0	10,000	Growth	Cash	No	Bring and dedicate
11	Director of Utilities	renewable water	3,000	0	Growth	no	no	Bring and dedicate
12	Water Resource manager	renewable water	1,000	1,000	Growth, Firm supplies	no policy	no	Mix of both
13	General Manager	renewable water	5,000	0	Growth	Both	no	Mix of both
14	Water Resource manager	renewable water			Firm supplies for dry years	Tap Fees or CBT	no	Mix of both
15	District manger	renewable water, CBT				Tap fees	no	Mix of both
16	Water Resource manager	renewable water	0	0		Tap Fees	No	Bring and dedicate
17	Water Resource manager	non-trib ground water	1,000	0	Firm supplies for dry years	Water rights	yes, must be renewable water	Bring and dedicate
18	Water Resource Manager	CBT	0	0	Firm storage	Cash	no	Mix of both
19	City Attorney	groundwater	0	0		mostly Tap fees	Yes, must be specific layer of groundwater	Mix of both
20	General Manager	renewable water	0	0		Tap fees	no	bring and dedicate
21	Water Resources Manager	Surface water	0	0		Cash	no	Mix of both
22	Director of public works	surface water	0	0				
23	supervisor	surface water			Growth	tap fees	no	Mix of both
24	general manager	surface water	8,000		Growth and Drought	both	yes	Mix of both
25	Water resources planning manager				Reservoir expansion, Aquifer recovery	fees	no	Mix of both
26	Senior Project Manager	mixed portfolio	5,000	25,000	Growth, Firm supplies	no policy	Permanency is paramount	mix of both
27	General Manager	well decrees, agricultural water, direct flow rights	0	0	NA	NA	Somewhat	
28	Water Department Manager	Both groundwater and surface water	0	0	Growth	-	none	
29	Water Supply Manager and Plant Operator	direct flow rights, previously purchased ditch shares	0		Long-term security	other	not officially	bring
30	Water Superintendent	Both groundwater and surface water, irrigation canals,	4,000		Growth and Firming existing supplies	mix	location is important and exchange capacity	seek
31	Water Resources Manager	mixed portfolio	0	0	an	none	none	mix, a lot of offers
32	Utilities General Manager	all of the above	0	0	Firm supplies for dry years	Cash	no	bring and dedicate
33	Water District Manager	all of the above	0	0	Firm supplies for dry years	Cash	no	Bring and dedicate
34	General manager	direct flow/ storage	0	3,600	Growth	Cash	no	Seek out supply
35	Water District General Manager	direct flow/ ditch shares	3,000	11,000	Growth	Cash	no	Seek out supply
36	Public Works Director	ground water, ditch shares, direct flow	0	0	Growth	Both	yes	NA
37	District manager	Groundwater	0	0	growth	Cash	yes	Bring and dedicate
38	General Manager	ditch rights and direct flow, storage	0	0		both	no	Bring and dedicate
39	Utilities	all of the above	0	0	Firm supplies for dry years	Both	yes	bring and dedicate
40	Water district manager	Groundwater	0	0		Cash	yes	Seek out supply
41	Utilities Director for Aspen	direct flow	4,000	8,000	Firm supplies for dry years	Both	yes	Bring and dedicate
42	Director of public works	direct flow	3,000	0	Growth and firm supplies	Cash	no	Seek out supply
43	Consultant to Water Providers	Groundwater	0	0	Growth	-	No	Bring and dedicate

	4c	4ci	4cii	4d	4di	4dii	4diii	5	5a
Respondent ID	Does your muni or utility ever lease water supplies?	Why or why not lease?	Do you have temporary needs suited for leasing or ATMs?	Do you ever have excess supply?	What do you do with excess supplies?	Do you have formal rules for leases	Do you have long term leases?	Aware of state interest in ATMs	Where have you learned about ATMs?
1	No	Adequate current supply	No	Yes	Lease back to Ag	Yes	Yes	Yes	Lots of places
2	No	Too uncertain	No	Yes	Lease back to Ag	No	No	Yes	CO Water Plan
3	Yes	adequate current supply	Yes, have wells can rely on during drought	No	Aquifer Storage Recovery	No	No	Yes	Basin Roundtables, media and news
4	No	Not needed	Yes	Yes	Leave it in reservoirs	No	No	No	
5	Yes	carefully crafted, in perpetuity	Yes, especially drought recovery	No	Leave it in system	No	Very few, lease-backs	Yes	Water Congress
6	No	Too uncertain	No	Yes	Leave it in system	No	No	No	On the Job
7									
8	no	Not needed	yes	yes	Lease back to Ag	yes	yes	yes	On the Job
9	No	Too risky	No	Yes	Lease back to Ag	No	Yes	Yes	On the Job
10	No	Risky	No	Yes	Lease back to Ag	No	Yes	Yes	On the Job
11	yes	permeant lease	Maybe	yes	Leave it in the system	no	no	yes	Basin Roundtables
12	no		Maybe	Yes	Lease back to Ag	no	no	yes	On the Job
13	no	lack of permanence	Maybe	yes	storage	no	no	yes	on the job
14	no		Maybe	yes	Lease back to Ag	no	no	yes	On the Job
15	no		maybe	yes	Lease back to Ag	no	no	yes	Lots of places
16	no	Not needed	no	Yes	Lease to Coors	yes	No	Yes	Conferences
17	yes	permanent from Denver	Yes	yes	Leve it in the system	no	No	yes	Word of mouth
18	no		no	yes	Lease back to Ag	no	no	yes	Basin Roundtables
19	yes	long term lease	maybe	yes	lessor retains water	yes	yes	yes	on the job
20	yes	perpetual lease	no	no		no	no	yes	Lots of places
21	no	lack of permanence	Maybe	yes	Lease back to Ag	yes	no	yes	on the job
22	no	not needed	not needed	no				yes	on the job
23	yes	drought	yes	yes	Lease back to Ag	no	no	yes	on the job
24	no	yes	Maybe	yes	Lease back to Ag	no	no	yes	on the job
25	no	not needed		yes	leases, spot sales, lots of contracts to lease out	yes	yes	yes	on the job
26	No	Drought timing and ATM paperwork timescales do not match	Yes, typically 7 out of 10	yes	typically goes to famers.	Open to Consideration			
27	occasionally	Unclear	No	Yes, 9/10 years	lease excess to farmers and well augmentation companies	Not really	No	Unsure	involvement in the water community and board appointments
28	no	-	no	Yes	no lease to farmers, yes lease to augmentation companies	renewed yearly	No	yes	Colorado water congress
29	no	-	no	yes	lease back to ag, lease to CPW	yes formal rules, but each lease is different	mix of long and mid-term(5 yr.).	yes	water presentations and following water cases
30	yes	yes,	yes,	yes, but rarely (1/10 years)	lease back to augmentation group CWPDA	-	no	yes	involvement with CWCB
31	no	No, lead up time for leasing is too long. Drought timing and ATM paperwork timescales do not match	no	9/10 years	most gets leased back to irrigators but they also lease to municipalities and mining operations	first priority is long term (10-15 year leases), most ag leases are fewer years than this due to cost of water	yes	yes	roundtables
32	no	adequate current supply	no	yes	Leave it in the system	no	no	little bit	Basin RT
33	no	adequate current supply	no	yes	Lease Back to Ag	yes	yes	yes	Basin RT
34	no	not needed	no	yes	no	NA	no	NA	no
35	no	adequate current supply	yes	yes	no	NA	no	yes	no
36	no	NA	NA	no	yes	no	NA	no	NA
37	no	not needed	no	yes	Leave it in the system	NA	no	NA	no
38	no	adequate current supply	no	yes	Leave it in the system	NA	NA	NA	Basin RT
39	yes	adequate current supply	no	yes	yes	yes	yes	no	
40	yes	Lack of performance	no	yes	Leave it in the system	NA	yes	no	
41	no	too risky	maybe	yes	Leave it in the system	NA	yes	yes	CWCB
42	no	not needed	no	yes	yes	no	no	yes	Basin RT
43	No	Not needed	Yes	Yes	Leave it in the system	No	No	Yes	Basin planning

	6	7	7	7ai	7aii	7aiii	7aiii	8	8	9	9a
Respondent ID	What is ATM	Pursue ATM in next 5-10 years	Next 20-30 years	Will consider	How to raise interest level	Concerns for you	Concerns #2	Why not occurring	Why not occurring #2	Do you favor continued state investment in ATMs?	Yes - investments
1	Share water between ag & non-ag uses	Yes	Yes	-	-	-	-	Lack of permanence	Regulatory / water court	Yes	Educate sellers (ag)
2	Alternative to buy and dry	No	Maybe	Maybe	Change consumer preferences	Unintended consequences	Too complicated	Uncertain	Cost	Yes	Address barriers
3	Something that happens in the Ark	No	No	No		Too complicated	Injury paranoia	Not needed	No examples	yes	Pilot Projects
4	Never heard of them before	No	No	No	If desperate (unlikely)	Lack of permanence		Not needed	lack of permanence	Neutral	
5	Lease-fallow agreement	Maybe	Maybe		less time consuming	Too complicated	Legal concerns	Lack of resources (staff, financial)	city council has to be on board	Yes	More flexibility, address barriers
6	Share water between ag & non-ag uses	Maybe	Maybe	Maybe	If the market goes that direction	Lack of permanence	Cost	Lack of permanence	Not needed	Neutral	More flexibility, address barriers
7								water court	education	yes	story telling, pilot projects
8	non permanent transfer of water	maybe	maybe	yes	meeting open space requirements	certainty	ownership	lack of permanence		yes	invest in ways to preserve ag
9	Water lease arrangement	Maybe	Maybe	Yes	All the above	Lack of permanence		lack of flexibility	Water court	Yes	Legislation
10	Water lease arrangement	No	No	No	Open space	Lack of permanence	Not needed	Risk	not needed		
11	Water lease arrangement	no	no	no		noon needed	better options available	not needed	lack of permanence	yes	education & more examples
12	share water between ag & non-ag uses	maybe	maybe	yes	if lease-backs are an option	cumbersome		need storage first	more flexibility	yes	flexibility
13	Water share between ag & non-ag uses	no	no	no	buffer supplies	risk, permanence	uncertain	uncertain	lack of permanence	yes	reduce bureaucracy
14	share water between ag & non-ag uses	yes	yes					uncertain	need storage first	yes	education & more examples
15	water lease agreement	no	no	maybe	environmental or drought	infrastructure	water court	need two willing parties		yes	
16	share water between ag & non-ag uses	no	no	maybe	open space, be good neighbor	injury	lack of permanence	risk	not needed	yes	More examples
17	water lease agreement	maybe	maybe	yes			cost	not sure		yes	instructions and logistics
18	share water between ag & non-ag users	maybe	maybe	maybe	planning for climate change	not needed		not needed	Regulatory / water court	yes	create flexibility
19	prevent ag dry up	no	no			no needed	lack of permanence	Political atmosphere	cultural	yes	State engineer could help?
20	share water between ag & non-ag users	no	no	no	political will to preserve agriculture			no examples	better options available	yes	education
21	share water between ag & muni	maybe	maybe	maybe	expedite approval process	slow, cumbersome		rules are cumbersome	Water court	yes	expedite approval process
22		no	no		open space, environmental			not needed			
23	share water between ag & non-ag users	maybe	maybe	maybe	Larger volumes of water, drought			farmers don't want to	cumbersome	yes	flexibility
24	share water	no	no	no	increased water costs	can't sell taps on leased water	complicated	too complicated	native water is still cheaper	yes	reconcile hidden costs
25	anything other than buy and dry	maybe	maybe		close to metro, low annual payment	perpetuity		water court		yes	road map for potential users
26											
27	lease of water from farms to cities	No	Yes, plan is unclear	yes	an	an	an		NA		NA
28	way to alternatively supply water to cities	no	no	yes	an	an	an		none	yes	none
29	municipal need in times of drought and in times of a lot of water, water can then be stored	no	Likely not, but maybe	yes	-	-	-	an	an	yes	an
30	-	Open to it, but no plans	open to it	yes	-	atm does not count towards firm yield	unforeseen circumstances create need	time and cost	regulatory hoops	yes	
31	lease backs are a part of it	no	no	-	no need	no		Legal questions.	Exchanging water can be a barrier.	Yes	
32	share water between ag & non-ag uses	no	no	no	NA	Injury paranoia	No examples	not needed	NA	yes	NA
33	Alternative to buy and dry	no	no	NA	More examples	Injury paranoia	Better options Available	not needed	Regulatory / water court	yes	Regulatory / water court
34	Non Permanent Transfer of Water	no	maybe			Injury paranoia		No examples		yes	
35	Don't know	yes	yes	no				Regulatory / water court		yes	
36	Water Lease Arrangement	yes	yes	NA	NA	NA	NA	No examples	Cost	yes	Cost
37	Don't know	no	no	no	NA	NA		No examples		no	NA
38	share water between ag & non-ag uses	no	maybe	yes	More examples	no		not needed		yes	
39				maybe	Change consumer preferences	Ownership Issues					
40	Don't know	no	no	NA	Good PR			Lack of permanence		yes	
41	Alternative to buy and dry	yes	yes					Uncertain	no examples	yes	no examples
42	Non Permanent Transfer of Water										
43	Water lease arrangement	No	No	No	Open space	Injury paranoia	-		Education & more examples	-	Education & more examples

	10
Respondent ID	Ideas
1	Create checklist & work flow diagram of how to do ATM to help approval process. Steps that state recommends
2	-
3	Think outside the box. No one size fits all.
4	Maybe interested in exploring water-sharing, novel practices when own water supply is secure
5	Study the locations where ATMs can more easily be accomplished because of existing conveyance and infrastructure.
6	If the state could buy the water and do long term leases back to ag. But many farmers probably don't want the state interfering with their business. Municipalities spend resources as efficiently as possible so they won't do ATMs until they are the more affordable, easiest path forward.
7	Use ATMS for aquifer recharge? ATMs will probably find more traction in the coming years as the water market evolves. Need more infrastructure to make ATMS possible. Need ways to work with timing of availability and timing of need.
8	Perpetual ATMs could slow down buy and dry. Interested in conservation agreements. Need more storage so that munis don't compete with ag.
9	New legislation to allow more flexibility, not put assets at risk. Fear of hurting valuable assets if open up change case. There is room for both models (muni ownership and ag ownership). Plumbing(conveyance is a big issue). Escalator clause for price of water to make it more palatable for farmers. Ag property stewardship program to land back in the hands of local producers (hay production, comes at a great cost).
10	Could be ideal for maintaining open space in drought years. Could be ideal as a bridge supply until storage is firmed up. There needs to be political will for open space or supporting ag community.
11	we need more data on where it's possible, reduce fears to injury etc.
12	need flexibility with river exchanges.
13	ATMs as a bridge supply while increasing storage
14	Need water that is easily transferable. It helps when city council has the political will to support it. It could be a good idea to marry water conservation with land easements.
15	
16	Cities can do a lot to decrease their water use even while population is increase (infrastructure, conservation outreach etc.) We can't share or conserve our way through this without storage.
17	
18	communities and ag need to work together. CBT water seems like a natural fit for ATMs. Storage is the most important things right now, more than acquiring more water rights. Need a place to store the water that you do have because timing is important.
19	Cultural considerations are very important
20	There is no "one size fits all" we've studied them extensively, now we need to start doing them. We need to recognize that there is no cheap water left. ATMs will probably be driven by a desire to preserve ag. We need to work on this together in Colorado so that "no one sector of the economy bears the burden alone."
21	there's still water to be had so it's not needed. Maybe ATM will be desirable when the system is more stressed. will consider ATMs after reuse is looked at. Some of the climate change scenarios they have show that there will be not be enough water in some climate scenarios, so maybe ATMs could be a good use for that.
22	
23	Need big enough groups of farmers to offer a large amount of water, 1,000 AF would make it worth it to do the transaction. It's important for the municipality to own the land so that it doesn't turn into dust and weeds. Dislike that when you change water from ag use to municipal it cannot go back.
24	There are still so many hidden costs to farmers, it's not worth it for them. Use ATMs to fill reservoir in drought recovery scenario, good idea, not sure it's worth the cost. Farmers don't want to be tied to long term contracts, don't want to loose out on value of water.
25	most interested in the type of ATM that has low annual payments with larger payments for year used. There needs to be risk sharing between the municipality and the producer.
26	
27	
28	yes - outreach and disperse state action to roundtables
29	every tool is important
30	any water provider can find a place in their portfolio for interruptible supplies, definitely a place for them, Not always need firm supply.
31	Future flexibility is good and state should invest in it.
32	Education & More Examples. Biggest thing is education showing how it works and encouraging how it works. Protection of water rights, address risk aversion.
33	Education & Examples
34	education and more examples, build trust. education and awareness, demand is there to move water around but managers don't know what is possible.
35	Education & Examples
36	Education & Examples
37	Let the parties work out in their community
38	Educate sellers (ag)
39	Education & Examples
40	Address barriers
41	address barriers
42	
43	-

APPENDIX E: LITERATURE REVIEW OF ATMS

Executive Summary

The purpose of this literature review is to compile information about previous projects and studies on water sharing policy and transactions, alternatives to agricultural buy-and-dry, and agricultural water conservation as they relate to Colorado's Alternative Transfer Method (ATM) program. Resources for this review were collected through a search of the above-listed topics and restricted to peer-reviewed literature, available project reports, and other published materials directly from water planning entities or water policy experts. This literature review was based on research conducted in the State of Colorado or the Colorado River Basin states. This literature review summary is focused on barriers to ATMs and recommendations for additional action. Barriers to ATMs were found to stem from cost, complexity, and lack of interest or feasibility. Motivations and recommendations for the continued pursuit of ATMs include deriving economic benefits for agricultural producers and support of rural communities.

ATM Barriers

High Transaction Cost

The high transaction cost associated with ATMs is often stated as one of the most significant barriers inhibiting ATMs in Colorado. These costs include hiring lawyers and experts to develop and support water right change cases through an often lengthy approval process. The burden of no-injury often produces expensive litigation or generates costly concessions by the change proponent, which further discourages interest in temporary transfers.[75] The time and cost of ATMs have effectively priced out small transactions in favor of larger, simultaneous water-sharing agreements, which limits the pool of potential participants[47]. To make ATMs more appealing, short of incentives, or significant political will, ATMs need to become more cost-effective than permanent acquisition.[76] Ideally, farmers should be empowered to derive economic benefits from their water rights without shouldering costs alone.

Recommendations:

- Pursue funding partnerships to share in technical costs (and benefits).[77]
- Support public funding for conservation-related ATMs.[78]
- Share the costs associated with preserving agriculture among all sectors of the economy, not agriculture or M&I providers alone.[79,80]
- Collaborate on simultaneous agreements across multiple owners to reduce administrative processing costs[50].

Lack of Information for Decision Makers

Water leasing is a common procedure for many agricultural producers and municipal water providers; however, ATMs are a relatively new concept, and decision-makers may not be as familiar with the additional management, resources, and motivations required for ATMs.

Recommendations:

(Targeted decision-makers or groups are underlined)

- Educate Water Users:

[75] Peter Nichols, Anne Castle, Zach Smith, Andrew Jones and Aaron Derwingson (2019) Standardizing Temporary Water Transfer Procedures in Colorado, Denver Water Law Review.

[76] Anne Castle, MaryLou Smith, John Stulp, Brad Udall, Reagan Waskom (2017) Where now with ATMs in Colorado?

[77] Agriculture Water Conservation, Productivity and Transfers Workgroup (2015) Agricultural Water Conservation, Productivity and Transfers.

[78] Colorado Open Lands (2018) Sharing Water to Save the Farm.

[79] Farmers Reservoir & Irrigation Company (2012) Water Partnerships, An Evaluation of Alternative Agricultural Water Transfer Methods in the South Platte Basin.

[80] Charles Howe, Jeffrey Lazo, Kenneth Weber (1990) The Economic Impacts of Agriculture-to-Urban Water Transfers on the Area of Origin: A Case Study of the Arkansas River Valley in Colorado.

- Water leaders should educate the municipal water community about water leasing opportunities and support pilot projects to build a higher level of comfort and informed perspective on ATMs.[81]
- Create an outreach program to educate western slope irrigators on the potential of water bank operations, long-term effects of deficit irrigation, the importance of dealing with potential future water shortages.[82]
- Convene workshops for state-level policy-makers and on-the-ground practitioners.[53]
- Create outreach materials on water transfers and policy options for state decision-makers and water managers.[53]
- Continue to educate municipal and industrial water users on lesser-known alternative transfer methods such as limited irrigation and shared water banking which may not be currently well understood but present possible future supplies.[51]

- Compile Information in Accessible Databases:
  - Agricultural water conservation and efficiency practices, including cost effectiveness and applicability, across areas receiving Colorado River water. This will assist irrigation districts in assessing and developing management plans and identify opportunities for ATMs.[83]
  - Previous water transactions in the Western US. We need consistent, comprehensive data to quantify the timing, location, and volume of water transfers to improve our understanding of the status and trends in water transfers.[84]

Legal impediments to ATMs

The Colorado water law system poses significant barriers to creative or temporary changes in water use as it primarily works to protect existing users than facilitate new uses.[85] Water right owners may fear the administrative and legal process associated with ATMs because of the high level of scrutiny and anxiety around the measurement of historic consumptive use.[86] The various temporary transfer statues have inconsistent provisions and processes which create confusion and unnecessary complexity and compartmentalization.[87]

Recommendations:

- Expedite the regulatory approval process.
  - Lawmakers should allow agricultural water-sharing agreements to be handled administratively, requiring applicants to use conservative measurement tools to prevent injury. Utilize the authority of the state engineer to approve agricultural water sharing terms and conditions to similarly prevent injury.[88]
  - Find ways to expedite the review process of ATMs while protecting third parties (who tend to delay the approval process with objections).[89]
  - Simplification and consolidation of temporary transfer procedures.[47]
- Suggested changes to rules or laws
  - State agencies, including the division engineer and attorney general, should allow dry land and limited-irrigation farming on formerly irrigated lands both for implementation in substitute water supply plans and interruptible water supply agreements.[90]

81 WestWater Research and EDF (2016) Alternative Water Transfers in Colorado: A Review of Alternative Transfer Mechanisms for Front Range.
82 MWH (2012). Colorado Water Bank Feasibility Study.
83 Agriculture Water Conservation, Productivity and Transfers Workgroup (2015) Agricultural Water Conservation, Productivity and Transfers.
84 Tom Iseman and Carlee Brown (2012) Water Transfers in the West.
85 Peter Nichols, Leah Martinsson and Megan Gutwein (2016) All We Really Need to Know We Learned in Kindergarten: Share Everything (Ag Water Sharing to Meet Increasing Muni Water Demands)
86 Adam Schempp (2009) Western Water in the 21st Century: Policies and Programs that Stretch Supplies in a Prior Appropriation World
87 Peter Nichols, Anne Castle, Zach Smith, Andrew Jones and Aaron Derwingson (2019) Standardizing Temporary Water Transfer Procedures in Colorado.
88 Peter Nichols, Leah Martinsson and Megan Gutwein (2016) All We Really Need to Know We Learned in Kindergarten: Share Everything (Ag Water Sharing to Meet Increasing Muni Water Demands)
89 Adam Schempp (2009) Western Water in the 21st Century: Policies and Programs that Stretch Supplies in a Prior Appropriation World
90 DiNatale Water Consultants (2013) Alternatives to Permanent Dry Up of Formerly Irrigated Lands.

- Support changes to CRS 39-1-103, which governs property valuation, or the accompanying Land Valuation Manual prepared by the Department of Local Affairs, Division of Property Taxation, to allow for a different property valuation for limited irrigation farming.[62]
- Support legislation that will improve the Colorado Water Bank to facilitate temporary, voluntary water transfer transaction.[61]
- Make time, place, and use of water more flexible. This means that water can be put to its regular use longer until it is needed and requires less dependence on forecasting.[61]
- The CWCB should consider supporting the modification of the Interruptible Water Supply Agreement (IWSA) statute by allowing an IWSA to be approved by the State Engineer for more than one 10-year period. If multiple 10-year periods could be allowed, it may encourage municipal water providers to pursue an IWSA with irrigated landowners that would give them a firm water supply during dry conditions with the limitation that it is 3 years in 10.[91]
- The CWCB should consider supporting amending Colorado Revised Statute § 37-92-305 to "grandfathering in" usages made within 50 years of entry into a decree. This would recognize the longstanding use and restore certainty and help support the water rights market.[63]
- Colorado law should provide a limited exception to the anti-speculation doctrine to implement the ATM policies outlined in the Colorado Water Plan.[47]
- Short-term transfers for emergency purposes should not require notification.[47]
- Build legislation to link conservation easements and ATMs.[51]
- Legislation to allow for instream protection of irrigation water saved through efficiency improvements[92]
- Legislation that would reduce the costs and increase the options for an irrigator to temporarily transfer water to another beneficial use without risk of abandonment.[65]
- Rethink “beneficial use” to include compact compliance and risk reduction.[48]

Concerns about externalities of water trades

Beyond impacts on growers and landowners, there are concerns about the effects of ATMs on rural communities, including businesses dependent on agriculture, environmental aesthetics, and consequences for tourism and recreation.[55,93]

Recommendations:

- Mechanisms developed for ATMs should be vetted in consideration of local economies.76·84
- Create a fee per acre-foot of water transferred outside of the original county of use.[94]
- Increase standards for revegetation to ensure aesthetic quality.94

Lease term disparity

Municipalities must provide certainty and minimize risk for the citizens they serve and have thus far preferred permanent acquisition. 81 However, shorter leases are favorable to agricultural producers because it allows them to respond to escalating water values and economic volatility in the farming sector.[95] This disparity in the desired lease term limits the pool of parties interested in ATMs.

Recommendations:

- Support legislation for a water bank. Creation of a water bank could reduce transaction costs and motivate participation by municipal users by reducing lease terms.[6]
- Determine appropriate compensation for agricultural producers that would increase their interest in longer-term leases.

[91] CDM Smith and CWCB (2012) Technical Memorandum: Alternative Agricultural Water Transfer Methods Grant Program Summary and Status Update
[92] CDM Smith (2014) Yampa Basin Alternative Agricultural Water Transfer Methods Study.
[93] Kristin Gangwer (2011) Challenges in Prospective Temporary Fallowing of Irrigated Agriculture in the Upper Colorado River Basin.
[94] Lawrence J. MacDonnell (2008) Protecting Local Economies: Legislative options to protect rural communities.
[95] DiNatale Water Consultants (2017). Use of Alternative Transfer Methods to Increase Water Supplies for Conejos Basin Agriculture, Municipal and Environmental Purposes.

Lack of infrastructure

Lack of infrastructure and the timing of water availability and water demand presents a barrier to ATMs. Storage is vital for times of high water availability, and infrastructure is needed to deliver water between willing lessors and lessees at the right time in the right amount but is often lacking.[96] In some areas, river water exchange potential is maxed out which limits the feasibility of ATMs.

Recommendations:

- Identify existing storage that could facilitate ATMs.76
- Identify potential new and shared infrastructure that could facilitate ATMs. 76

Social Considerations

A power imbalance exists between the agriculture sector and the municipal & industrial sector in terms of access to resources and information about ATMs.[97] This perceived disadvantage creates distrust and presents a large barrier to collaboration on ATMs between these sectors.93 Policy makers and water managers may have a lack of understanding of what drives the decision making of irrigators.[98] Perceived risk and uncertainty also limit the pool of potential ATM participants. For the water right owner, there may be a perceived risk of reduction in the quantity and value of a water right if it is put through water court proceedings, and historic consumptive use is evaluated.75,78 There is also significant uncertainty in how ATMs impact farm sustainability and profitability. The importance of connecting water users should not be overlooked as finding willing participants key to the acceptance and adoption of ATMs.

Recommendations:

- CWCB should continue to promote and facilitate agreements between the agricultural and municipal sectors.91
- More local, basin or regional leadership on ATMs may be favorable over state oversight because local leaders are trusted more, and water-sharing agreements tend to be unique to each area and cannot be easily replicated elsewhere. [99,100]
- ATMs need to include proper compensation and protection for the water rights owner and no adverse impact on the water rights of others.93
- Financial incentives may be required for municipalities to see the long-term economic benefit of ATM water supplies compared with permanent water acquisition options.81
- Lawmakers should authorize the CWCB to establish and operate a water bank to connect willing irrigators and interested water users.85
- Focus engagement efforts toward the demand side to increase interest in the participation of municipal and industrial water users and environmental organizations. Efforts on municipalities should be geared towards municipalities with limited options for new water supplies.81
- Irrigation districts have connections, power, and the ability to influence water sharing agreements and should therefore be heavily involved with the creation of ATMs.98,101

Agricultural Production Limitations

The feasibility of ATMs can be limited by the climatic or management constraints of an agricultural producer. Some irrigated land is not suitable for participation in ATMs because of very low rainfall or poor soil conditions which creates higher consequences to crop production from reducing irrigation.102 . Reducing irrigation has negative impacts on crop growth, soil health and it is difficult to quantify and proper monetary compensation for these negative consequences. Many famers have high operating costs on yearly basis no matter what their irrigation regime is, including ongoing debt payments, cost of replacing hay not grown on a pasture, maintenance costs of machinery and

[96] CDM Smith (2014) Yampa Basin Alternative Agricultural Water Transfer Methods Study.

[97] Colorado Corn Growers, Ducks Unlimited, Aurora Water, Lower South Platte Water Cooperative (2011) Completion Report: Development of Practical Alternative Agricultural Water Transfer Measures for Preservation of Colorado Irrigated Agriculture

[98] H. Bjornlund, W. Xu and S. Wheeler (2014) An overview of water sharing and participation issues.

[99] CO Ag Water Network (2019) Survey of Colorado Agricultural Producers on Watershed and Stream Management Plans.

[100] Brad Udall and Greg Peterson (2017) Agricultural Water Conservation in the Colorado River Basin: Alternatives to Permanent Fallowing Research Synthesis and Outreach Workshops.

[101] Michael O'Donnell and Bonnie Colby (2010) Water Banks: A Tool for Enhancing Water Supply Reliability. University of Arizona.

irrigation structures, and the impact to productivity in years following fallow period. Additionally, pastures cannot be completely fallowed. Perennials still utilize precipitation and require in field management. Crop insurance often restricts coverage based on a specific volume of irrigation or specific practices which makes switching to an alternative practice risky.[102] Property tax classifications are not flexible enough to accommodate practices necessary for maintaining a farm under alternative practices.

Recommendations:

- More research on the feasibility and practical limits of deficit irrigation in the climate zones and crop types prevalent to the western slope.82
- In areas where reduced irrigation is appropriate, new crops and crop rotations need to be identified based on regional conditions such as local rainfall patterns, market, and processing capabilities.102
- We should not expect to find a "one size fits all" design that can be applied in the same way everywhere.[103]
- The CWCB should continue its support of coupling conservation easement with interruptible supply agreements, which has the potential to provide a reliable source of water and preserve agricultural productivity in perpetuity.
- Soil health measures could be adopted in concert with ATMs to address concerns about agriculture sustainability.83

Measurement, Monitoring and Technology adoption

Measuring historic consumptive use poses a major hurdle to ATMs.[104] As preferred and accepted methods of measuring consumptive use evolve, there may be difficulties with adoption and subsequent issues with data continuity, which may pose technical or legal challenges. The costs of instrumenting and monitoring on-farm water use may be prohibitively expensive. [105] There can be a burdensome amount of terms and conditions and monitoring required in an ATM project.97

Recommendations:

- Adopt standards and practices for regional, remote sensing programs that aid in streamlined, voluntary water transactions, irrigation and productivity decision making, and basin-wide water accounting.83
- Provide funding for updated CU estimates for lands no longer irrigated.100
- Need development of more accurate tools and models for determining supply availability and diversion shortages.92
- Shift the burden of no-injury to objectors
- Complete the study by the Upper Arkansas Water Conservancy District (UAWCD) to develop a set of tools (Administration Tool) to simplify the engineering and reduce the costs related to a rotational fallowing ATM. When completed, support the promulgation of rules to determine how the Administration Tool can be applied in administrative approvals and/or water court cases.**Error! Bookmark not defined.**

Knowledge Gaps

Several key areas for further study were identified during this literature review:

- **Quantification of consumptive use** under ATMs needs to be studied and widely agreed upon with built consensus among producers and those involved with water court. Specifically, the **impact of alternate irrigation practices on return flows** needs to be clarified to understand potential injury, or lack thereof, to other water users. This information would also accelerate administrative and legal proceedings.
- While several reports mention concerns about the impact of ATMs on **water quality,** there has been little research on this topic, and few recommendations exist.

[102] Brad Udall and Greg Peterson (2017) Agricultural Water Conservation in the Colorado River Basin: Alternatives to Permanent Fallowing Research Synthesis and Outreach Workshops.
[103] Lisa Dilling, John Berggren, Jennifer Henderson, Douglas Kenney (2019) Savior of rural landscapes or Solomon's choice? Colorado's experiment with alternative transfer methods for water (ATMs).
[104] Ryan McLane and John Dingess (2014) The Role of Temporary Changes of Water Rights in Colorado. DU Water Law Journal.
[105] Manijeh Mahmoudzadeh Varzi and Neil Grigg (2019) Alternative Water Transfer Methods: Review of Colorado Experiences.

- P**roper compensation for irrigators** involved with ATMs merits further study. This includes quantification of "unseen costs," such as weed management and debt payments, in addition to insurance and property tax adjustments. Long term research on the effect of ATMs on agricultural productivity is also desirable to increase our **understanding of ATMs, farm sustainability, and food security**.
- Evaluating the **impact of ATMs on the economic prosperity** of a region is difficult. However, the development of operational and financial models that can illustrate to irrigators and M&I providers the financial, water supply impacts and risks of various alternative ATMs vs. traditional agricultural water acquisition is critical to the acceptance of ATMs.79

Benefits of ATMs

The Colorado Water Plan should discuss the benefits of reinvesting in agriculture, which includes but is not limited to, the ATM program. It is possible to realize multiple Water Plan goals simultaneously by using ATMs as a tool in water supply planning.

- **Agricultural productivity and farmer prosperity.** ATMs provide a mechanism for agricultural producers to gain additional operational flexibility and generate revenue.

- **Ecological and recreational values.** ATMs can provide ecological and recreational benefits, including enhanced stream flows and wetland recharge.

- **Sustainable municipal supply planning.** ATMs can facilitate drought resilience and climate change adaptation without requiring municipalities to acquire permanent, abundant, expensive water rights.

APPENDIX F: ATM ADVISORY COMMITTEE MEMBERS

Name		Affiliation
Anne	Castle	Getches-Wilkinson Center at CU-Boulder
Kathleen	Curry	Gunnison Basin Roundtable Chair
Alex	Davis	Aurora Water
Todd	Doherty	Western Water Partnerships
Sara	Dunn	Balcomb Green
Joe	Frank	Lower South Platte Water Conservancy District
Mark	Harris	Grand Valley Water Users Association
Brian	Jackson	Environmental Defense Fund
Adam	Jokerst	City of Greeley
Dave	Kanzer	Colorado River District
Tracy	Kosloff	Colorado Division of Water Resources
Cindy	Lair	Colorado Department of Agriculture
Scott	Lorenz	Colorado Springs Utilities
Peter	Nichols	Berg Hill Greenleaf Ruscitti
Mickey	O'Hara	Colorado Water Trust
Carrie	Padgett	Harris Water Engineering
Sarah	Parmar	Colorado Open Lands
Kelly	Romero-Heaney	City of Steamboat Springs
Cleave	Simpson	Rio Grande Water Conservation District

APPENDIX G: WATER TRANSFERS IN OTHER STATES

During the ATM Support project, graduate students from the University of Colorado Masters of the Environment (MENV) program reviewed a few example water transfer programs in other Western states and provided a summary review for the project team. The following provides a list of the students' recommendations regarding ATMs in Colorado.

MENV Preliminary Recommendations

Education and Outreach

- Consider creating mechanisms for stakeholder input such as through public comment on an ATM website. An ATM website could also provide online access to information about current or proposed projects in addition to past projects. More access to information could refine the process and provide transparency and opportunity for stakeholders during regulatory approval.
    - AZ conducts 30-day public comment period and public meetings. Anyone can pose comments
    - CA conducts 30-day public review period where potentially affected parties can file public comment
    - WA makes public all water banks' contact info, water balance sheets, trust water agreements, charges/fees, and geographic suitability maps and updates quarterly

- Consider using established bodies like the Basin Roundtables and/or the IBCC to facilitate outreach or serve as forums for public comment and deliberation regarding transfers
    - WA's Advisory Group on Water Trust, Banking, and Transfers will hold six public meetings in 2020 and release a policy recommendation report to the legislature
    - UT's task forces (i.e. Utah Water Task Force, Ag Water Optimization Task Force) are comprised of representatives from stakeholder groups and meet monthly to discuss issues, report to the legislature, comment on bills, and allocate grants

Environmental and Economic Considerations

- Investigate methods for analyzing economic, cultural, and societal impacts of transfers on rural communities
    - For example, California Water Code § 1745.05[b], any transfer from irrigated agriculture must not exceed 20% of the water that would have been used or stored unless a hearing is conducted. This provision is intended to limit economic impacts on rural communities, which could disproportionately affect different local governments via tax revenue loss, unemployment, etc.
    - Consider consultation with Colorado Parks and Wildlife/NGOs regarding the potential effects of the proposed transfers on environments and communities

APPENDIX H: GLOSSARY OF TERMS

The water sector has many terms that are not intuitively defined or understood. This appendix provides a few selected terms used in this report. We have not attempted to define everything.

Acre-foot – A volumetric measurement to indicate the amount of water that will cover one acre of land at one foot depth, equivalent to 325,851 gallons of water

Agricultural conservation easement – A voluntary deed restriction placed on a property to protect and preserve agricultural land, typically excluding the possibility of future development of the land.

Agricultural infrastructure – The diversion structures, canals, pipelines, delivery gates, storage reservoirs, and other structures that provide for the diversion of water from a natural source and convey the water to farm fields.

Agricultural Water Protection Water Right – A decreed irrigation water right located in Water Divisions 1 and 2 (Colorado Front Range) with 50% of the historical consumptive use portion of the changed right made available for lease to other (unspecified) uses at approved points of diversion. The associated lands must be enrolled in an agricultural conservation program.

Alternative Transfer Methods (ATMs) – Various methods and concepts by which new water supplies can be made available without the permanent dry-up of irrigated lands.

ATM grant program – Established in 2007 to make grant funding available to support projects seeking to investigate solutions to ATM barriers and to facilitate the development and implementation of ATM projects.

Augmentation – A legal court-approved method to utilize a water right out of priority, when otherwise the water right would be curtailed, by providing an alternative water supply to a water source that mitigates for any consumptive use of the water right and effectively makes the water source whole. Augmentation is most commonly used to allow wells to pump out-of-priority without injuring senior water rights downstream.

Augmentation leases – Water leases that provide an alternative water supply to a water source and allow an approved augmentation plan to be implemented.

Basin Roundtables – Stakeholder groups formed by the Colorado Water Conservation Board that facilitate discussions on water issues and encourage locally driven collaborative solutions. These Roundtables represent each of the state's eight major river basins and the Denver metropolitan area.

Beneficial use – The use of a reasonable amount of water necessary to accomplish the purpose of a water right appropriation, without waste. Some common types of beneficial use are: domestic, irrigation, municipal, wildlife, recreation, and mining.

Buy and dry – The practice of buying an irrigated farm, transferring the irrigation water rights to another use through water court, and placing a dry-up covenant on the original farm that often precludes any future irrigation of the property using the same water rights that have been transferred.

Cash-in-Lieu (CIL) policies – Policies established by municipal water providers allowing parties seeking new water service to provide cash to the water provider instead of (in lieu of) providing water rights to support the new water demand represented by the new service.

Colorado Water Conservation Board (CWCB) – An agency of the state government tasked with protecting Colorado's streams and lakes, flood mitigation, watershed protection, stream restoration, drought planning, water supply planning, and water project financing.

Colorado Water Plan – A 2015 document that unified many decades of water management research, policy, relationship-building, and statewide visioning.

Compact compliance – Compliance with any of Colorado's interstate water agreements (often called compacts) with neighboring and regional Western states. Intestate water compacts often provide specific conditions on allowable water use from a river system in the upstream or headwaters state.

Consumptive use – The part of water withdrawn that is evaporated, transpired, incorporated into products or crops, consumed by humans or livestock, or otherwise not available for immediate use.

Conserved consumptive use – A portion of historical consumptive use that is saved by a change in management or delivery of the water right and represents a net increase in water present in a stream system relative to historical conditions.

Deficit irrigation – The intentional irrigation of crops at a level below the full crop water demand.

Dry-up agreements or Dry-up covenants– A legal agreement that provides limitations on the water rights and uses of a historically irrigated property. The agreement is a standard method of proving to other parties in a water right change proceeding that the change will not result in an expansion of water use and thereby proving no injury.

Dual-use water court decrees – A decree in water court that will allow two (or more) uses of a particular water right, and herein specifically referring to a decree that allows for both irrigation and municipal use of a water right.

Evapotranspiration – The sum of transpiration from plants and evaporation from the Earth's surface.

Fallow – Cropland, tilled or un-tilled, and/or pastureland that is allowed to lie idle and is not irrigated during all or part of the growing season.

Instream flow – Water flowing in a natural stream bed. Water required for maintaining adequate stream flows in a stream system that contributes to healthy ecosystem functions, such as water temperature regulation and wildlife habitat.

Instream flow right – Water right that is subject to the priority system and contributes to minimum stream flows or natural surface water levels or volumes in lakes to preserve the natural environment to a reasonable degree.

Interruptible water supply agreement (IWSA) - Allows for the transfer of water between two or more uses as an option agreement. In Colorado, IWSAs are permitted to be exercised only in calendar years with a drought or other emergency in the county, and the calendar years following such a declared drought or emergency.

Lease-Fallow Tool – A computer software program that is used to evaluate projects involving short-term or intermittent water transfers from irrigated land to other uses. The tool was developed to simplify and streamline the evaluation of historic depletions (consumptive use) and return flows from irrigation.

Limited irrigation – Occurs when available water supplies cannot meet full evapotranspiration demands of a crop.

Municipal leaseback – Occurs when a municipality has purchased an irrigation water right but continues to lease the purchased water back to agricultural users on an annual or multi-year basis.

Municipal water-sharing agreements – Agreements between municipal water providers wherein one of the water providers is agreeing to provide a water supply to the other water provider under specific terms and conditions. These agreements result when the supplying water provider has a water supply surplus and the other provider has a shortage.

Net economic benefit – A calculation of the total revenues minus total costs, representing profit or remaining benefit.

Prior appropriation – The doctrine of water allocation amongst competing uses that is applied in the Western states. The doctrine includes recognition of seniority as well as beneficial use and continued use of the water right.

Return flow- The net amount of water that reaches a surface or groundwater source after it has been diverted from a natural water source and applied to a beneficial use, and thus becomes available for further uses downstream.

Rotational fallowing – The practice of fallowing a group of farm fields in rotational cycle, such that no single field is fallowed for more than a small number of consecutive years.

Split-season irrigation – A water conservation strategy that prescribes full irrigation during one part of the growing season and no or low irrigation during the other part. It is often applied to irrigated alfalfa.

Surplus water right – A water right held by a municipality that is not needed to satisfy current municipal demands.

Substitute Water Supply Plan – A temporary change in water use approved by the State Engineer that allows for use of a water right outside the terms of its original decree for a short period of time. SWSPs are often used while waiting for the Colorado Water Court to issue a permanent decree approving for a change of use.

State Water Supply Initiative (SWSI) – A technical analysis of the water supply and demand forecasts for a wide variety of water uses across Colorado.

Technical Update – A technical update to the Colorado Water Plan published in September 2019.

Transaction costs – The costs associated with a transfer and change of a water right, typically referring to the legal and engineering consulting fees associated with a water right change of use proceeding.

Water bank – A mechanism in which a water right holder can "deposit" a water use entitlement with a private or public entity, and that entity then makes the water entitlement available for some type of “withdrawal” by another water user, which is often a temporary lease.

Water dedication requirements – The water rights or water supplies that are required to be permanently provided (dedicated) by a developer or other party seeking new municipal water service, in order to gain approval for new water service. The dedicated water rights are often currently and historically used in irrigated agriculture.

Water transfer – There are typically two parts to a water transfer, and either or both may be referenced in use of the term. Part one is a voluntary transaction that results in a temporary or permanent transfer of the use provided by a water right to a new use and new user. Part two is a legal or administrative process that seeks to change the type, time, or place of water use of a water right. Water transfers can occur between agricultural, municipal, industrial, and environmental uses and can be in the form of a sale, lease, or donation.