



LESSONS LEARNED FROM COLORADO EXPERIENCES WITH INTERSTATE COMPACT ADMINISTRATION

The lessons explored in this report represent the analysis of interviews with individuals from three basins in Colorado who have had to adjust water supplies and management to achieve compact compliance.

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Arkansas, Rio Grande and Republican River Basins in Colorado

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Overview

As water users who depend on the Colorado River grapple with how to prevent or prepare for curtailment under the Colorado River Compact, it's worth remembering that this is not an entirely new dilemma for our state. The Arkansas, Rio Grande, and Republican River Basins have all experienced compact administration. In each of these experiences, choices made by water users and regulators impacted how required adjustments in water use impacted people and communities.

For example, in the Arkansas Basin, where the available water supply was reduced by one third and Colorado had to pay Kansas over \$30 million in damages, one water manager reflected, "That's the first lesson in how not to do compact compliance: do not wait to be sued because [then you lose] the flexibility to do stuff the right way."

Through interviewing experts and community members who lived through the experience of compact administration in each of these three basins, we have distilled the following lessons that transcend differences in hydrology and compact terms and may provide useful insights and conversation starters for Colorado Basin water users.

Lessons Learned

Going to Court is Hazardous

Colorado, as an upstream state, does not have a successful track record in court when it comes to compact compliance. Going to court reduces communities' options for how to achieve compliance, and the longer the cases go on, the further the options are reduced.

Confronting Limits is Painful but Unavoidable

The experience of curtailment is startling for water users and communities in two ways: materially and emotionally. Materially, it reduces the amount of water available to a user, changing the dynamics of agricultural production. Emotionally, it strips away beliefs around what was available, what will be available, and what should be available. Confronting the reality of limited water availability is a difficult but necessary step for making the most of what water is available.

TABLE OF CONTENTS

- Overview3
- Lessons Learned.....3
- Report Structure and Applicability to the Colorado Basin4
- Arkansas Basin.....5
- Rio Grande Basin.....10
- Republican River Basin17
- Conclusion.....24
- Methods25
- Authors.....26
- Acknowledgments.....27



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Photos provided by Jack Goble, P.E., General Manager, Lower Arkansas Valley Water Conservancy District

Cover: John Martin Dam on the Arkansas River in southeastern Colorado.

a Special Master appointed by the US Supreme Court required an inventory of all the wells and augmentations for stream depletions.

While surface irrigators felt that their concerns might finally be dealt with, the municipal water manager recalled that there was resistance from well users.

The well users [were] thinking, no wait a second, I've always done this legally. I built my livelihood off of this well. And now they felt like they were getting that taken away from them... So you've got the animosity already there. Now it's being built upon because well augmentation groups are going and buying surface water rights and drying up the land to do it.

In the end, the available water supply was reduced by one third, and Colorado paid Kansas over \$30 million in damages.

The Role of Measurement

According to several interviewees, one of the issues that caused Colorado trouble in the lawsuit brought by Kansas was the fact that Colorado didn't have good data on what was happening with wells. In the aftermath of the court decision, the State required comprehensive measurement and reporting on water use from both wells and surface water. In addition to benefiting the state, enhanced measurement has also improved water management at the individual and ditch level, as well as the deeper understanding of the system that was necessary to develop the efficiency rules.

An experienced water lawyer suggested that measurement is important for Colorado to be able to make its own case to other states in disputes.

“ One of the things that crippled Colorado initially was lack of data on water use. Without knowing how much water is being used and by whom, you can't make any assessments of where you are relative to your rights under the compact. So you have to have rigorous measurement of both surface and groundwater diversions, because when you're challenged by another state, you have to be able to show what your diversions and consumption of water are. People hate it, because measuring devices are expensive. They say, "But I don't take very much water," but you get 2,000 people that don't take very much water, and that's a lot of water.

While there was initial resistance to rules requiring water measurement, interviewees provided numerous examples of the ways it has facilitated improved water management and group decision-making.

One Arkansas Basin farmer described the level of detail he can see about how water is moving through the system:

“ The first thing that I do every morning is I look at the Division 2 website. Not only because I'm an irrigator but I'm also on the board of [-- Canal]. So, I am looking every day at what is going on in my river. I know with some reasonable sense of security who's diverting, what they're diverting, I can even find out what color of water they're diverting: the project water, winter water, leased water, native water. I can then look at certain gages that tell me how far off I am from my water right getting in [to my ditch]. I am not the only person doing that every morning.

He recounted how the availability of this data not only impacts individuals' knowledge and management capacity, but also facilitates system-wide understanding.

“ During the irrigating season, there are daily meetings between the engineers, the water commissioners and the canal superintendents. Everybody is looking at everybody else, and if something funky happens, nobody feels any compunction about calling the water commissioner or river manager and asking what the hell is going on.

Several interviewees noted that the ability to see how water moves and is being used also builds trust and accountability, essential elements for the cooperation that is necessary to keep the system working and develop innovations in water management.

Scaffolding for Proactive Solutions

Factors that appear to have enabled the proactive development of locally-designed compact compliance measures included leadership by the State to convene stakeholders, lots of time to process and discuss, and a local organization that could participate in the discussion and help implement the solution.

One interviewee, a water manager, recalled the process in detail, starting with the role of the State Engineer.

“ In the mid 2000s, the state of Colorado identified that there was a potential issue that could eventually be raised to the level of a lawsuit between Kansas and Colorado as you had more efficient irrigation methods being adopted. The State Engineer convened a working group, and it was a very big one. The very first one must have had 200 farmers in a room. And you had the State Engineer at the time telling them, "Hey, the center pivots you're putting in or drip irrigation systems you're putting in, you're going to have to buy augmentation water for them..." [The State] has the backstop of saying, "If we don't deal with this, our concern is that we're going to end up in another lawsuit. We're going to lose the lawsuit and we're going to have a solution imposed upon us. We don't want to do that."

He described how, after that initial prompting, local water users engaged in a long, sometime contentious process of discussing what to do.

“ From the large group of people, you get floated to the top the best representatives of folks that were most interested. Some of them hated the idea of being proactive and some of them loved the idea, but you got a smaller working group, and they worked over a very long period of time. It was over several years that they worked to come up with the solution. If you were to talk to farmers today, they would grumble about it and say, "Yeah, it's not the ideal solution." But it's nowhere close to the reaction they had against the well use rules.

Venting frustration was part of the process, but importantly, with effective organization and leadership, it didn't stop there.

“ I'll admit I was one of the skeptics to the stakeholder process, just because I saw that first meeting was a lot of negativity about what was going to happen. But over time everybody got to vent their frustration. And at some point it just became, "No, let's roll up our sleeves and actually build the solution for this."

The end product was the basin's efficiency rules, which allow substantial flexibility for how to repay additional river depletions resulting from efficiency improvements and maintain compliance with the compact.

Another experienced water lawyer noted that the Lower Arkansas Water Conservancy District played an important role in facilitating the creation and implementation of solutions:

“ They [the farmers] responded well to the District; they responded horribly to the Division and State Engineers. They thought they were crazy. The District was the man in the middle and said, "Okay, we'll try and work something out on behalf of the farmers and ranchers who are down there that is workable," and got some changes in the proposed rules, including the ability to put together package plans that would involve lots of different farmers and ranchers.

Clear leadership, motivation, time, and institutional capacity all appear to have been important to developing workable and acceptable rules to keep Colorado in compliance with the compact.

Relationships and Trust

Several interviewees pointed out that relationships and trust between water users, managers and officials at various levels were also important for developing and implementing compact compliance measures, as well as ongoing water management.

One farmer who was involved in the lawsuit and efficiency rules described how relationships and trust are central to managing constrained water supplies:

“ People are figuring things out. The Arkansas is an amazing framework of formal and informal communications and relationships that have been formed over many decades to deal with shortages so that the system continues to function. I mean the flow management program that keeps water in the river between Buena Vista and Cañon City... Then there's obviously coordination between how cities release waters from higher reservoirs into Pueblo. It just goes on and on and on, how we kind of change and trade and all those types of things.

A state water official described how collegiality between compact partners, as well as neighbors, is also beneficial:

“ It has been very important to establish a good working relationship with our compact partner. Kansas and Colorado have fought like cats and dogs for a century.... So, a lot of bad blood between the states and it took a lot of effort as we began to comply.

You have to learn to develop people-to-people relationships with folks, because they're trying to do their job, and we're trying to do our job. We may not always agree on how we measure success in doing those things. But by having relationships develop and understanding each other better, the states have worked through a number of agreements that help clarify, and take some of the guesswork out of it, so that we're not just pointing fingers at each other and you have a lot more measurable outcomes that both states can agree to. That's been really helpful and it's helped us in other negotiations we've had to do.

Multiple interviewees discussed how essential diverse partners were for improving water management. Several people talked about how agricultural stakeholders work with municipalities to solve water management problems. For example, they recounted how agreements between urban water systems and augmentation groups for augmentation water help with compact compliance.

Carrots and Sticks

In discussing the effectiveness of “carrots and sticks” to spur action on compact compliance, one experienced water lawyer noted the usefulness of a big stick in recounting how the judge dealt with the first well owner in court over noncompliance with the new well rules:

“ The judge listened to the evidence and basically told the guy that he was going to levy a huge fine on him for noncompliance. If he failed to continue to comply, he was going to send him to jail. Then [the judge] said, “Now I know there are many others of you here who are set for hearing. If you would like to talk to the Attorney General before the hearing, I'm happy to take a recess.”

I think he took the number of protests from in the mid 50s or 60s down to one or two by knocking the first guy really hard in the head and saying, “Pal, you're done. The rest of you, you saw what happened to him. Think about how you want to proceed.”

On a larger scale, the “stick” of curtailment has been effective in encouraging water users to proactively engage in developing alternative solutions to remaining in compliance with the compact. Having learned from the prior experience with that stick, the community has successfully mobilized to seize the “carrot” of the opportunity to develop their own rules, with options that better suit local conditions.

Conclusion

Colorado is currently in compliance with the Arkansas Basin Compact, and basin water users, managers and regulators appear to have developed a broadly accepted approach to keep it that way. Confronting the reality that water supplies and usage were out of balance was a painful lesson. But, the development of a strong, shared system for measuring and tracking water movement through the basin and the ability of water users and both states to communicate and coordinate with each other appear to be key factors in the basin's successful compliance. These factors may not have come together in this manner, however, without the previous painful experience of being found out of compliance and forced to curtail and augment wells. Farmers and ranchers are able to manage their irrigation with more flexibility now that the initial burden of curtailment has passed.

Sources (in addition to interviewees)

- Lower Arkansas Water Conservancy District website: <http://www.lavwcd.com/>
- Water Education Colorado. Citizen's Guide to Colorado's Interstate Water Compacts, Third Edition. Denver, June 30, 2021. <https://www.watereducationcolorado.org/publications-and-radio/citizen-guides/citizens-guide-to-colorados-interstate-compacts/>

Arkansas Basin Timeline

- 1880s: Arkansas Basin fully appropriated.
- 1948-9: Arkansas Basin Compact completed and ratified, following decades of litigation. John Martin Reservoir is a crucial element.
- 1950 – 1996: Well pumping changes flow regime, reducing water availability to Kansas.
- 1985: Kansas alleges well-pumping is depleting the river.
- 1995: US Supreme Court rules that Colorado is at fault for allowing well-pumping to deplete the river.
- 1996: Colorado's Division 2 Water Court orders pumpers to replace surface depletions in Colorado and at the state line; Colorado pays Kansas \$34.5 million in damages for prior river depletions.
- 2011: Efficiency rules established, which allow various options for repaying depletions that result from efficiency improvements.

Rio Grande Basin

The Rio Grande Basin faced the dual but related challenges of compact compliance and the need, in some parts of the Basin, to bring groundwater use down to sustainable levels.

Compact Compliance

The Rio Grande Compact was ratified in 1938, with delivery obligations based on each year's flows in the Rio Grande and Conejos River Basins. From the 1940s to the early 1960s, increases in the efficiency of surface water use and the resulting decreases in irrigation water returning to the river, along with a lack of compact administration, led to Colorado routinely failing to meet its annual compact obligations. This in turn led to a 1967 lawsuit from Texas and New Mexico to force Colorado's compliance with the compact. To settle this lawsuit, in 1968 Colorado agreed to meet its annual compact obligations each year until the debt was repaid. To achieve compliance, the Colorado Division of Water Resources began to actively curtail surface water use on the Rio Grande and Conejos Rivers in order to send water downstream to the lower compact states. This active curtailment of water rights for compact compliance was something that had not previously been done. This led to daily curtailment of surface water rights during the irrigation season, almost all of which were senior to the compact, while newer wells were able to keep pumping, contributing to social divisions in the Rio Grande Basin.

The Closed Basin Project, which withdraws shallow groundwater from a hydrologically "closed basin" and delivers it to the Rio Grande River, was built in the 1980s in order to help with compact compliance. This project was expected to deliver 60,000 acre-feet/ year, but has never delivered more than 40,000 acre-feet/ year and has averaged 17,300 acre-feet/ year, with amounts diminishing over time.

The wet period in the 1980s brought Colorado into compliance with the compact when Elephant Butte Reservoir in New Mexico spilled.

Groundwater Sustainability

The drought of 2002 and subsequent dry years have brought concerns of over-use of the aquifers and impacts to river flows by groundwater use to the forefront. In 2004, authorized by state legislation, locally-developed efforts began to form subdistricts, each with its own plan to address well depletions. Water users in the region known as Subdistrict #1 initiated a system to replace and prevent injurious depletions to senior surface right holders and restore depleted aquifers to an agreed-upon sustainable use level. This first subdistrict charges irrigators a fee for each acre foot of groundwater they pump and uses the payments generated by pumping, along with federal conservation program funding, to pay other irrigators to fallow their land or to purchase water rights and land. This brought some initial success at recovering the depleted, unconfined aquifer of the Closed Basin. However, a combination of renewed drought, high commodity prices that make fallowing payments less competitive, along with other social factors have reversed these gains. The other five subdistricts have developed and are implementing their plans for groundwater management. If the subdistricts' efforts fail to make sufficient progress in recovering the aquifer, the State Engineer can disapprove the annual replacement plans, resulting in the curtailment of wells.

Experiences

Veterans of the Rio Grande Basin's efforts to develop its own solutions for balancing water supply and demand and avoiding state-mandated curtailments point to several factors that have contributed to the



degree of success experienced so far. These include foresight, leadership, and the capacity to develop and implement home-grown solutions. They also note that more options would have been available if action had been taken earlier.

Confronting Limits

Interviewees reported that it took time for the basin's water users to come to terms with the limits of their surface water supply when compact administration first occurred. One interviewee, a farmer, remembered that,

“ In 1969, '70, and '71 people that had been [farming with surface water] were not happy. “The state is curtailing my senior water right to make compact delivery and I'll never survive this!” We kind of worked through it and figured out too how to survive it. Probably depends on your perspective... But it set the stage for those crucial conversations going forward between groundwater [users], surface water [users], and the state on interconnectivity between all of those and then layer in compact delivery.”

Interviewees explained that the initial confrontation with limits was painful, as water had always been perceived as plentiful. Curtailment was also painful because it forced irrigators to change their relationship with their water supply and instead of seeing possibility in the abundant water, to watch water flow by, which one interviewee described as “the cost of irrigating in an upstream state.”

As the previous quote illustrates, compact administration set the stage for future conversations about interconnectivity between surface and groundwater. A farmer and water manager described the hard reality Subdistrict #1 is facing.

“ The community we live in is just out of balance from a water perspective, where you consume more than is supplied. For 20 years, since 2002, it's been on a pretty steady decline. And it's so challenging, given [that] in the Rio Grande Basin, our economy, our culture, our communities are all built around irrigated agriculture. How do you survive?”

In a public talk called “A Tale of Two Rivers,” Rio Grande Water Conservation District (RGWCD) General Manager and Colorado State Senator Cleave Simpson described the subdistrict process as a time of “rebalancing,” bringing use back in line with availability of supply as our knowledge and understanding has increased.

One farmer and water manager noted that once the state announced in 2015 that its models were sophisticated enough to reasonably assess the impacts of groundwater withdrawals on surface water, the realization began to set in that the state now had the tools to justify turning wells off, if necessary. This helped turn water users' attention towards developing solutions.

“ Most of us have reached the point [of recognizing], undeniably, that what we pump out of the aquifer system has an impact on the surface water system. And when people came to that realization, it was like, “All right, let's figure out how we fix it and kind of move forward.”

Energy that had been spent on denying or fighting the need to manage water differently could then be channeled into developing new management strategies.

Role of Measurement

Improving the measurement and tracking of both surface and groundwater use has helped water users develop an understanding of their own water use, as well as the impacts of the use on the system as a whole. For surface water users in his part of the Basin, a farmer and ditch manager, explained:

“ In 2009, we were operating exactly like we did when the river was running in 1909. We had not advanced, we had not moved. And quite frankly, you can’t manage what you don’t measure. So we began a very comprehensive grant and loan [program], and we started putting telemetry and good, accurate measurement on all the head gates along our river to help the Division of Water Resources, because it was easy to blame them for messing up. But [before we installed the new devices] we weren’t doing anything to give them any better data.

He described getting better data through measurement as important for both improving water management and limiting disputes.

“ The device doesn’t lie. You put that weir or that clock in there, and you start measuring water. Now you’re going to make better decisions as a farmer, as a manager, as anybody. We have noticed that the more measurement, the better we’re managing. Honestly, we have less arguments about decisions because we have data to back up why we’re doing what we’re doing. Before, it was all speculative.

Another farmer, the 5th generation of his family on the land, described both coming to terms with limits and having accurate measurements of water use as vital to the valley’s future.

“ If we’re going to continue meeting compact obligations and avoid a lot of issues, one of the things that we need to do is just really, really start thinking about how we make the best of a limited water supply. So we can continue to meet obligations but keep our economy going.

He mentioned several ideas for managing with less water while still safeguarding the local economy, including optimizing water management and growing less thirsty crops.

The enhanced understanding of water use and supply conditions provided by accurate measurement is an important foundation for both individual and collective decision making.

Hazards of Delaying Action/ Going to Court

Interviewees expressed regret that their options for how to comply with the compact had been limited by waiting until a lawsuit forced the issue. Having learned from this experience regarding surface water, water users are now working to develop their own solutions ahead of state mandates for wells.

The farmer and ditch manager quoted above said that between 1938 and 1969, there was an assumption in his area that return flows would always pay the compact – which no longer held true after surface water use management became more efficient.

“ You had all of that time between 1938 and ‘69, that we lollygagged and got ourselves in a bind. And then, from 1969 on, basically, New Mexico had their foot on our throat and we had to comply. We messed up by not starting from the beginning and complying. A million acre feet on a river that totally only runs 220,000, that’s insurmountable.

He continued, noting that inaction was its own kind of decision:

“ All of the water users voluntarily, by inaction, subjugated their rights to the Division of Water Resources on how that compact would be administered... It didn’t have to be curtailment. We could have bought up some junior rights... we could have set some regulations on how much efficiency we would allow in our ag applications.

The fifth-generation farmer echoed the preference for locally-developed solutions, which requires action ahead of a state mandate.

We would much rather solve our problems ourselves than have the State step in. And I think what happens, the State steps in, and a lot of times one solution solves the problem. They’ll cut everybody back 5%, 10%, 20%. But it shouldn’t be like that.

He was speaking from the perspective of working on one of the subdistrict plans to keep groundwater use at sustainable levels, working proactively to develop measures to reduce water use while keeping the region’s agricultural economy strong.

Scaffolding for Proactive Solutions

When the Rio Grande Basin has made progress in developing its own solutions for balancing water supply and demand, it appears to have been at least in part because the basin had the scaffolding in place for developing proactive solutions. This scaffolding included the community will to develop their own solutions, the confidence from previous experience that they could succeed, and a strong organization with the capacity to convene people to develop and implement the solutions.

A state employee involved in water management recalled that the community’s desire for a solution was intensified by the extremely dry conditions in 2002 and 2003, after earlier attempts at developing groundwater rules in the 1970s had failed to produce results.

“ I can remember going to big water meetings in 2002 and 2003 where we had a lot of farmers and ranchers in there and just talking about the drought situation and just that we needed to do something differently, not only for groundwater... but surface water flows too. [It was] just [a] really bad situation.

A farmer and water manager also recalled the role of the 2002 drought, as well as a strong desire among the community to take a hand in guiding their own future.

“ I admire the constituents in what’s now sub-district one coming together when they didn’t have to, from a state regulatory perspective. They came together because their supply of water took such a huge hit in 2002, and they recognized that, “Look, if we don’t actively come together and think about how we manage this aquifer system, we’re just going to pump it to the bottom. And then either the folks with the deepest pockets or the deepest wells are going to be the only ones left here, if we’re not careful.”

When it came to coming together to develop the subdistrict plans for groundwater sustainability, interviewees referenced the basin’s previous experience with organizing to resist water exportation as an important precedent that had built relationships, trust and the confidence that they could prevail. Also important was the existence of forward-looking leadership and a well-organized and effective organization to support the development of a home-grown solution: the Rio Grande Water Conservation District (RGWCD).

The farmer and water manager quoted above described the RGWCD’s stance and ability to encourage work towards preventing the traumatic well shut-offs imposed on other basins like the Arkansas and South Platte.

“ The Rio Grande Water Conservation District board watched that and said, “We got to find a different path... At some point in time, that’s going to come here, let’s get out in front of this as a community and see if we can come together and build a solution on our own.”

The state employee involved in water management reflected that it took extreme patience and time to make sure all the water users could learn about the issues and why developing their own plan mattered when it came to avoiding state mandates. He said it was also important that the state left the details up to local stakeholders.

“ It wasn’t saying that we need to do X or Y, it was basically saying something needs to be done, what do you think? Do people have any ideas? And that really, I think, was where the subdistrict concept came from.

The state was able to leave the details up to the local stakeholders because they were already taking steps to address the issue. The RGWCD was then able to nurture and support these ideas, facilitate and advocate for them, and then build and harness support amongst the community to get it off the ground.

Relationships and Trust

As noted above, interviewees reported that water users and other stakeholders in the Rio Grande Basin have gotten to know and trust each other as a result of working together to defeat various schemes to export water from the valley. It wasn't always this way, and past contentious relationships and lack of trust sometimes stood (and sometimes still do stand) in the way of effective action. Important elements of building trust and productive relationships have included working together on mutually beneficial projects and thoughtful framing of issues to encourage productive discussions.

Historically, according to several interviewees, there was a lot more conflict and contention around water management. A farmer who is well over 60 and a 4th generation farmer and rancher described how the culture of conflict over water is fed. He explains that "every ranch has a history of conflict over the priority system. It's in the blood. We know one another by their water rights."

A farmer and ditch manager also reported that the history of in-fighting and conflict were detrimental to addressing the "alleged" debt in the 1960s because,

“ They didn't take the time to understand the compact and didn't discipline themselves to live by it... You can trace back to hard feelings that started from non-compliance, the hammer coming down and trying to find someone besides yourself to blame. A lesson learned there is, when that compact comes in, don't screw around. Stay on top of it... but if you screw around and argue and fight, you can find yourself behind fast.

It's taken a long time to heal that. We're over that now, but 1969 til now is 50 years. That's too high a price to pay for a community to progress, advance, and do good projects.

He then went on to describe how the Rio Grande Basin Roundtable has played an important role in building trust and relationships, which in turn has expanded people's ideas about what they can accomplish.

“ On the Rio Grande, we have what we call the STP principle. It's the "Same Ten People." So when you are the guy on the Conejos, and you're also on the Roundtable, and you're the lady on the San Luis Valley Water Conservancy, and you're also on the Roundtable, you start realizing these are good people and we can help projects go. And once we all started to help each other's projects, it's like there's no gravity. We can do anything we want.

In addition to getting to know others with similar and different approaches and perspectives through repeated interaction, productive relationships have been built from allowing space for solutions to emerge. An interviewee who used to work in water management at the Basin level and is "not a big climate change person," talked about the importance of focusing on what would move the conversation forward towards addressing problems. In a couple of different ways, he described how it was less important to focus on whether Colorado's Rio Grande debt was legitimate or on whether climate change is human-caused than it was to focus on being prepared for the worst-case scenarios.

“ We better be prepared and we better put the best minds, thoughts, and ideas forward in preparation. If it doesn't happen, what have we lost? But if it does happen, if we get caught without having done some preparation, I think it's going to be ugly.

By re-focusing conversations away from whether the "alleged" debt was legitimate or whether climate change is human-caused or cyclical, and towards how to be prepared, space was created for solutions to emerge and be discussed.

Carrots and Sticks

According to a farmer and water manager, watching other basins' experiences with having wells turned off, as well as the Rio Grande Basin's own experience with compact administration, provided a powerful incentive for water users in the Rio Grande Basin to develop their own program to achieve sustainable groundwater use, chasing the "carrot" of local control and avoid the "stick" of state action.

“ We as a community watched the state with a heavy hand regulate groundwater withdrawals, particularly in the South Platte, and the draconian, and again, nothing against the state and what they did, they were doing exactly what they were prescribed to do, but the draconian efforts and the huge financial and cultural impacts from turning off several thousand wells in the South Platte.

Although the groundwater subdistricts were a home-grown solution developed by learning from their own and other basins' experiences, achieving sustainable levels in Subdistrict #1 has remained elusive. Carrots and sticks that encourage water users to modify their water use have not been entirely effective. The locally-developed program in Subdistrict #1 of charging well-pumping fees that are then used to pay others to fallow land had some early success but was then overwhelmed by renewed drought that drastically cut surface water supplies and decreased aquifer recharge. This drove producers to rely more heavily on groundwater, and the fee imposed on pumping topped out and wasn't enough to disincentivize pumping as commodity prices were high, further diminishing the effectiveness of the program. As the other subdistricts develop their programs, they are trying to learn from this experience.

Conclusion

Rio Grande Basin water users were able to draw from their collective experiences with previous compact administration, resisting water exportation, existing organizational support, and leadership to work together proactively to develop their own solutions to water supply challenges. Whether their locally-developed system of incentives will be sufficient to achieve groundwater sustainability in the subdistricts facing depletion, however, remains to be seen. In spite of all of the community's shared experiences with curtailment and working together to develop locally-based solutions, successfully coordinating these efforts remains a major challenge.

Rio Grande Basin Timeline

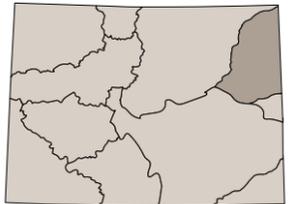
- 1906: Rio Grande Treaty with Mexico; Elephant Butte Dam built in New Mexico.
- 1939: Rio Grande Compact ratified, with Colorado's delivery obligations based on runoff levels in the headwaters.
- 1950s – 60s: Colorado violates Rio Grande Compact due to increased surface water consumption and lack of compact administration.
- 1967: Lawsuit by Texas and New Mexico against Colorado for compact violations.
- 1968: Colorado committed to meet delivery requirements; compliance achieved by administering surface water rights and banning new wells.
- 1972: Closed Basin Project authorized.
- 1980s: Closed Basin Project finished.
- 1980s – 90s: Plentiful precipitation.
- 1985: Elephant Butte spills, erasing Colorado's water debt under the compact.
- 2002: Drought leads to renewed conversations about groundwater depletion.
- 2004: Senate Bill 2004 – 222 authorizes water users in the Rio Grande Basin to develop a self-regulating system to restore groundwater levels and replace and prevent injury to senior surface rights holders.
- 2006: Subdistrict #1, which overlays the Closed Basin, recognized as a legal entity to help restore the balance between water supply and use.
- 2012: First year of operation for Subdistrict #1.
- 2016-18: Subdistricts 2-6 formed as legal entities.

Sources (in addition to interviewees)

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Republican River Basin

The Republican River must meet compact obligations in two ways, (1) overall for Colorado and (2) on each of the individual tributaries of the Republican River that leave Colorado: the Arikaree, North, and South Forks. In addition to the need to come into compliance with the compact, irrigators in the basin are mining the groundwater, contributing to the decline of the Ogallala Aquifer.



Colorado



Republican River Basin

Initial Steps Towards Compliance

The Republican River Compact, ratified in 1943, was established to provide access to federal funding for flood control reservoirs and irrigation projects. Apportionment of water between the states was based on 1929-1938 flows, with the potential for adjustments. The advent of intensive groundwater pumping, beginning in the 1950s, began the process of taking Colorado out of compliance. However, the negative impacts of this development didn't hit water users in Colorado until 2000, in the aftermath of a lawsuit filed by Kansas against Nebraska. The Special Master, appointed by the US Supreme Court to administer the compact, required that compact accounting must include groundwater withdrawals that impacted surface flows.

Drawing lessons from the lawsuit in the Arkansas Basin, in 2004 the Colorado legislature created the Republican River Water Conservation District (RRWCD) to help bring the state into compliance with the compact at a more local level. The RRWCD began acquiring and retiring wells using federal conservation programs.

However, from 2003-2007, Colorado water users were still pumping 10,000 acre-feet/year above their allocation, with the effects on the river compounded by the delayed effects of past depletions. The RRWCD built a pipeline to deliver pumped water from retired wells located in a deep part of the aquifer to just above the measurement gage near the Nebraska state line, a short-term, "band-aid" compliance measure that brought the state overall into compliance. This temporary measure allows pumping to continue as the RRWCD works to retire wells, providing time to build "softer" landings for many well users.

Well totalizing flow meters were installed in 2010. The RRWCD has a Water Use Fee that is assessed per acre of irrigated land. The funds generated are used to compensate people who retire wells. The RRWCD does not have jurisdictional authority and cannot set limits set on the quantity of water that could be withdrawn. The Colorado Division of Water Resources and groundwater management districts have that authority. To date, pumping reductions are still insufficient to prevent groundwater decline.

Subsequent Measures

In 2011 the Colorado State Engineer, after attempts to negotiate with Kansas were rejected, was forced to order the draining of Bonny Reservoir, the only recreational water body in the region. Both the Arikaree and the North Fork drain into Nebraska and generally remain in compliance. The South Fork, however, enters Kansas, and was not in compliance. Evaporation and seepage losses from Bonny Reservoir, on the South Fork, had been charged against Colorado's allocation and Kansas would only accept additional water in the stream, which forced the State Engineer to call for Bonny to be drained.

In 2016, a series of agreements with Kansas and Nebraska gave Colorado 100% credit for the water delivered to the North Fork Republican by the Compact Compliance Pipeline. This resolution also required the retirement of an additional 25,000 acres of irrigated land along the South Fork. The process of retiring this land is still underway.

Experiences

Interviewees in the Republican Basin described the painful experience of coming into compliance with their compact, after feeling "surprised" by the compact suit. While the RRWCD was created to help manage curtailment, well users felt little local control over how to manage initial compliance and little trust in the process, which hampered their ability to work together. The RRWCD has worked to overcome these challenges and is currently focused on how to soften the blow of continued well retirements to bring the

South Fork into compliance and find longer-term solutions for overall compliance and the sustainability of the basin's communities.

Hazards of Delaying Action/ Going to Court

A water manager in the Republican River Basin recalled that water users weren't even aware of the compact as initial compliance measures kicked off. "Back in 2004, 2005, 2008, the compact and the Republican River District were not very well-received. Nobody knew about the compact."

Farmers described the experience as a tremendous loss and a feeling of being "broad-sided with no warning." Some interviewees explained that it was impossible to imagine a future in which things would change, because they did not have to consider their impact to the aquifer before, and there was a sense that there was enough water because it had not previously been an issue.

Farmers also noted that there were missed opportunities for less painful measures due to a lack of understanding of the role the state would take in the process. The belief that things probably wouldn't change considerably was upended when the state made it clear that compliance would be achieved over everything – including what people perceived as their "private property rights." Some described the delay caused by resistance to the state's actions as potentially leading to solutions enacted by the state that were more harmful to them in the long run than if water users had taken a more proactive stance early on to help shape solutions.

Confronting Limits

One interviewee described the challenge facing the Republican as twofold, stating that there was compact compliance – or wet water at the state line – but that the bigger threat to farming and the communities in the basin was groundwater depletion. "How do we sustain nature and economic activity beyond simply complying with the compact?" this person asked. The limits faced by irrigators in the Republican Basin are comprised not only of limits imposed by compact compliance, but also the limited lifespan of a shrinking aquifer.

Initially told that retiring 30,000 acres would bring the basin and the state into compliance with the compact, the RRWCD focused on retiring that amount of ground with help from federal conservation programs. When they got close to that target, however, improved analysis indicated that more drastic action would need to be taken.

One interviewee recounted what it felt like when the RRWCD's water engineer reported that new analysis indicated that to achieve compliance, they would need to shut down every well (except for household wells) in the district for 30 years. "That would implode everything. Everything would have to go back to pasture. We wouldn't be able to sustain anything." The feeling of sacrificing to reach a goal, only to discover it wouldn't be enough, was disheartening to many. Based on the new analysis, the RRWCD increased the irrigated acreage fee, instituted a municipal well and water storage fee, and built the Compact Compliance pipeline to deliver water to the North Fork Republican as the fastest way to overall compliance.

The RRWCD is focusing on well retirement to address both compact compliance and groundwater depletion. A person involved with the district explained why they have taken on both tasks.

“ We have got to prolong the lifespan of our economic engine out here. It was state and federal law that we had to abide by the compact, but we will not survive in this area if we don't slow down the depletions.

Multiple interviewees explained that farmers with heavier soils could shift or return to dryland farming, but they also pointed out that this would support many fewer employees and businesses than irrigated agriculture and bring in much less tax funding to local governments. Some interviewees talked about the fear of planning for the long-term, not knowing what the future will hold in terms of compliance and aquifer supplies. However, this awareness has led some farmers to consider and others to try more drought-resistant crops.

A water manager noted that a growing wind energy sector could provide an alternate source of economic support, but, "we've got to elongate this resource as long as possible, so our communities can adapt to being without irrigated tax dollars or what irrigation can bring into our communities."

Scaffolding for Proactive Solutions

Social and organizational scaffolding to support the ability to create a proactive, locally-developed solutions was minimal in the Republican Basin when the lawsuit first emerged. Previous collective organizational experience was lacking, as was a general awareness or knowledge of the compact. An additional challenge facing the RRWCD is the separateness of each of the tributaries of the Republican and the fact that the area did not have a common cause to unify around.

Organizational Challenges

State legislators created the RRWCD to help with compact compliance. However, interviewees reported that its initial formation and efforts to organize action towards compact compliance were rushed and thus, public acceptance of the RRWCD and its ability to help develop flexible local control were hampered.

Members of the RRWCD board are not democratically elected, but rather chosen and approved by the various entities represented on the board. As one interviewee noted, "[The RRWCD] struggled... the Board had to make tough decisions that were not a vote of the people." This has led to a sense that the board is not always accountable to the population it represents. However, it also insulates the members when they must make unpopular decisions.

Also, in the haste to create the RRWCD, important components of its mission were left out. According to interviewees, it has taken time to build out the district to better meet the needs of its constituents and achieve its objectives, as well as identify objectives that were missing in the initial haste to create it. For example, one interviewee explained that the district's mandate was originally limited to compact compliance and did not include conservation, although the district has since added conservation actions.

Further undermining the RRWCD's effectiveness was the fact that its initial boundaries left out wells that drew from the aquifer, but lay outside the geographic basin. This required a later adjustment to bring in irrigators who had been contributing to the compliance problem but weren't covered by previous compliance measures or fee requirements.

Cultivating Public Engagement

Once the RRWCD was formed, there was a considerable amount of work to be done to develop understanding and implications of the compact. "It took a lot of education," said one interviewee.

“ ...public meetings, people coming to the meetings, complaining. I'm amazed how many times [the RRWCD] had to tell the same story to one person. And you may have to tell that same person three or four different years in a row the same reasons that we have to be in compact compliance.

Educating didn't necessarily have an immediate impact, according to one interviewee, but repeating the same message clearly over time helped many well users understand the few options they still had and the opportunity to capitalize on the remaining opportunities for local control.

Creating public meeting spaces to express frustration and anger was just as important. These appear to have assisted in building cohesion and giving space for people to react to this perceived dramatic change. Over time, this process built acceptance as it became more clear that there were few other options.

Working to create a sense of community togetherness is a challenge in the area due to the geographic separation of the three tributaries and the lack of perceived interconnection that well pumping creates when compared to mutual ditch operations. The RRWCD has spent time working to build a sense of cohesion amongst the different tributaries. One interviewee, who works in water management in the area, elucidated.

“ Unification is a huge thing.... We’re all in this together. The state engineer has made it vividly clear that if ‘you don’t continue to be in compact compliance, I will shut down the basin.’ It’s not one mile, three miles [from the river] it’s the entire basin. That makes us all work together.

In spite of different conditions in each of the tributaries, the RRWCD operates under a belief that cohesion amongst disparate elements will help in working towards long-term compliance. The work on unification within the Basin builds scaffolding for future efforts at proactive solutions because the residents of the Basin have a more developed sense of togetherness, interconnection, and recognition of a common purpose: avoiding a total shut down.

Relationships and Trust

With a perceived abrupt start to compact compliance and little foreknowledge of the compact among the general community, there was little initial trust in the process and the RRWCD. The fledgling district implemented several actions to build trust, including creating space for community members to vent their frustration, repeatedly explaining the implications of the compact and emphasizing the importance of unity within the Basin to focus on the common enemy: total shut down. Operating transparently and helping to coordinate tangible projects have also built trust and fostered relationships.

An interviewee involved with the RRWCD spoke about the high value the district places on transparency, stating,

“ We have got to let people know what we’re doing. And every action that is taken is taken during a public comment or during a public meeting. There’s very few times in a board meeting we’ll have an executive session – only if there is no other option.

Working on projects with visible, immediate impacts and improvements together has also enhanced trust. One interviewee described the importance of these activities, stating,

“ Trust building is based on tangible stuff. You gotta go out and do the tangible, maybe that’s not super exciting or super cool and it’s only got a marginal contribution to the solution, but it’s got a huge contribution to the relationships you need.

This interviewee provided several examples of tangible projects and events that built trust and relationships. Early on in the process of working towards compliance, a trusted person recommended working with a well-known environmental group based on his experience with them in another context. This led to an initial tenuous partnership between the RRWCD and the environmental organization that produced positive outcomes for farmers and compact compliance. An additional, surprising outcome of this partnership, according to one interviewee, was a building of confidence that led to working towards more daunting goals.

An interviewee involved in the process of building partnerships provides some cautions.

“ You can only build those relationships if everybody is willing to take some initial steps and try something different and new.... [The well users in the Republican] are all at real risk economically, community wise, socially and we’ve been able to do some things that matter and build trust but you know, communities need to step up or they won’t have the partners and relationships to find the big solutions.

The tangible work to build relationships has begun to produce real outcomes. In response to the draining of Bonny Reservoir and a profound sense of loss in the community, several local landowner groups and organizations began working to improve conditions on all three tributaries. Work has been done to remove invasive vegetation, like Russian Olive trees, in alluvial areas. Groups are also working together to apply for grants to rejuvenate sections of Bonny Reservoir, restore stream flow, and contribute to compact compliance.

For the current effort to retire enough additional irrigated acreage to get into compact compliance and the longer-term effort to prolong the viability of the aquifer, a more locally-driven approach seems to hold some promise. One interviewee pointed to a joint taskforce made up of representatives from all of the groundwater districts in the RRWCD that is working to create a template that can be used for reducing depletions in all the groundwater districts, but tweaked by each one to match local conditions.

Measurement

Like in the other basins in this report, well users all initially resisted measurement devices. This interviewee, who works in water management, describes what happened in the Republican.

“ Initially the state said you will have measurement devices installed on all of your wells. A lot of people pulled back... “We don’t want the government knowing what we are doing! We don’t want you in our business, we aren’t hurting anything, it’s our water.” Well, no, it actually belongs to the state.

However, measurement is not just about data collection and perceived government intrusion. The disagreement over measurement devices is a proxy for contention around who can own a resource that is accessible to multiple parties and individuals. Installing a measurement device brings awareness to usage rates and practices by the well owner. Some interviewees described how, though they view the measurement as a necessary evil, it has made them far more aware of the amount of water they use and how they use it. This can make well users feel vulnerable or powerful, as it becomes impossible to hide from the actual amount of water used and shift blame onto others for the impacts, but can also create a deeper sense of certainty for what one actually has to work with.

Carrots and Sticks

Interviewees described large sticks in the process of compact administration, with carrots only emerging recently after time and learning that limits would be enforced.

One interviewee, who worked with other farmers, landowners, and environmental groups described the initial stick.

“ Ultimately this is administered by a Special Master assigned by the Supreme Court of the United States. I don’t know if that person has ever been to the basin. They look at the law and what does the law say and they don’t have to deal with the physics or the reality, community, economic or environment. That faceless person has God-like power over the Basin if they don’t comply. If Colorado put its head in the sand, walked away and just said, “stick it!” Fine, there’s unfunded curtailment that is ultimately enforceable and they would force the state to do it. They’d just turn wells off.

That initial, very large stick has had a lasting impact in the Basin. The lawsuit revealed how poorly understood the compact and the impacts of pumping were. Not to mention how uncomfortable it was to have the future of the compact be interpreted and administered by a Special Master who “didn’t even know what a circle was.” However, the threat of a completely unfunded shut off of all wells was enough incentive for the state and legislature to act to prevent that worst-case scenario.

When the state came out with rules to achieve compliance in the aftermath of the Special Master’s findings, one interviewee involved in water management detailed what it felt like,

“ [The State said] “We are going to adopt basin rules and if you don’t get into compliance with these basin rules, we will shut you down. We will start with the wells within one mile [of the river], three, 10, 15, then we will take up the rest of the basin.”

You could consider it a threat, but that was the reality from the state of Colorado if you didn’t find ways to get into compliance.

In light of the Basin rules, the RRWCD has worked to alleviate pressure on individual well users in a variety of ways. The district now levies an irrigated acreage assessment, which is viewed as a necessary, but unliked stick by some. They've worked to bring the overall Basin into compliance with the compact through the pipeline project on the North Fork Republican. Additionally, the RRWCD offers incentives like payments for well retirement, which assist farmers in transitioning from irrigated agriculture.

One interviewee described some of the more intangible carrots and sticks as "existential." This person questioned what would be here for them and their community if they were no longer able to meet their basic needs for survival, much less their economic livelihood, because they drew the aquifer down too far. "How do we comply in the short-term," they asked, "[meeting] the needs of today and design for the needs of the future as wisely as possible?"

Another interviewee described how families want to be here, and there are kids who want to come back and continue farming. This person recounted a conversation they had with a farmer, who asked "what's the point of doing all of this?"

 I said, "you have kids who want to farm. Even if it's only for five years, that's five years they get to do that with you."

These existential carrots and sticks are, for many in the Basin, relate to maintaining a way of life and heritage as long as possible.

Conclusion

After a rocky start, the Republican River Basin appears to be on a path towards compliance. However, even successful efforts are bittersweet, because they still involve loss – just a softer landing. Building an organizational structure that is able to facilitate not only compliance, but also greater community cohesion and common purpose, took time and is still a work in progress. New understandings about the compact, the relationship between ground and surface water, and the impacts of groundwater pumping to the sustainability of the aquifer were consciously cultivated. Additionally, relationships and trust have been nurtured over time, which is enabling the ongoing work of reducing pumping and maintaining long-term compliance today.

Republican River Basin Timeline

- 1943: Republican River Compact formed in order to obtain federal funding for dams and irrigation districts. Apportionment is based in 1929-1938 river flows, with the potential for adjustments.
- 1950's – 1990's: Groundwater pumping leads to river depletions.
- 1998: Kansas vs. Nebraska lawsuit over alleged compact violations.
- 2000: Special Master appointed by the US Supreme Court requires compact accounting to include groundwater pumping that impacts surface flows.
- 2004: Colorado creates the Republican River Water Conservation District (RRWCD), and is charged with bringing the Basin into overall compact compliance and compliance on each of the individual tributaries.
- 2005: RRWCD holds first meeting. Eventually they began acquiring and retiring wells, using federal conservation funding programs.
- 2003 – 2007: Colorado water users continued pumping 10,000 acre-feet over their allocation. River flows were also diminished by delayed depletions from earlier pumping.
- 2010: Well meters are installed with a fee per acre feet of land, although there is no pumping limit.
- 2011: Colorado's State Engineer orders the draining of Bonny Reservoir, because Colorado was being charged for evaporation and seepage losses from the reservoir.
- 2014: RRWCD purchases 13,500 acre-feet of historic consumptive use that is far enough away from the North Fork of the Republican River to minimize streamflow impacts, and pipes it into the river to help with compact compliance.
- 2016: Compact agreements regarding the Colorado pipeline and agreement to retire an additional 25,000 acres of land.
- 2019: RRWCD is expanded to cover the full area contributing to compact compliance problems.

Sources (in addition to interviews)

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Conclusion

The purpose of this report was to mine the recollections of people who experienced compact administration first hand in the Arkansas, Rio Grande and Republican River Basins in order to see what insights might be useful for users of Colorado Basin water as they contemplate the potential for compact administration, mitigation measures and other water supply challenges.

Interviewees were very generous in reflecting on their communities' experiences with compact administration and ongoing efforts to come into and remain in compliance. While each basin has its own unique history, compact and hydrology, the following lessons transcend these differences:

- Letting compact issues get settled in court is risky and hazardous. Each of the basins came out of court cases with requirements to cut water use in ways that were very difficult for their communities and very constrained options for how to do so.
- Confronting the limits of a water supply is a painful experience. Learning that water is not as available as previously thought forces people to change their mindset, which provokes resistance. This is not easy, but it is a necessary step to minimize the negative impacts of compact compliance. In the Republican River Basin, a widespread lack of awareness of compact obligations initially hindered movement towards compliance, reducing the community's options as legal conflict continued.
- For communities to be proactive in developing their own solutions to address issues with compact compliance, certain conditions needed to be in place. These included the will and confidence to act, strong leadership, and organizations with the capacity to facilitate the development and implementation of solutions. In the Rio Grande Basin, prior experiences of working together to defeat water exports helped build the will, confidence, and organizational capacity to work together on compact compliance and groundwater sustainability issues.
- Relationships and trust within the community of water users, between water users and officials, and between different compact parties are all necessary for the parties to be able to work together towards mutually beneficial solutions. In all the basins, extensive communication and collaborating on tangible projects helped lay the groundwork for ongoing work together on compact compliance issues.
- Precise measurement of water use provides transparency, accountability, and a common understanding of how water systems work. This lays a foundation for addressing problems and making improvements. In the Arkansas Basin, this has been very important for identifying ways to augment streamflows depleted by efficiency enhancements.
- Carrots and sticks, or incentives and penalties, have both played important roles in guiding each of the basins towards compliance. Past experiences with the stick of forced curtailment has strongly motivated communities to work proactively towards the carrot of self-determination.
- Across each of the basins, earlier action to address potential compact and supply issues has enhanced the control communities have to develop and choose their own, less painful, options.

“ When asked directly what advice they would share with others concerned about the potential for compact curtailment, interviewees echoed the themes that emerged when talking about their own experiences. Several reflected that the earlier communities confronted the need to act, the more options and local control they could have. They also underscored the benefits of good measurement and working with partners to solve problems and make the most of limited water supplies.

One farmer and ditch manager in the Rio Grande Basin urged confidence in the capacity of those who know the local context best to take the lead. Describing his own situation, he recounted,

“ I always told my board, “I can't think of a better board to make a decision than ours. So let's step out and do it. I mean, let's make it work for us. Let everybody else follow.”

It is our hope that this report can help spark and inform conversations among users of Colorado Basin water about how they can build upon the advantages they already possess and lay additional groundwork for working together, taking the lead in guiding their own water future.

Methods

The purpose of this report was to explore the lessons learned and important takeaways from going through compact compliance as experienced by water users and managers in the Arkansas, Republican, and Rio Grande Basins.

The lessons explored in this report represent the analysis of interviews with individuals from three basins in Colorado who have had to adjust water supplies and management to achieve compact compliance. Analysis consisted of reviewing interviews, noting and coding for thematic elements that presented themselves as lessons learned. This process of allowing themes to emerge meant that no theme was the opinion or experience of one individual, but that of many individuals. Thus, the lessons in this report are both generally supported across all three basins and are not the viewpoint of the authors of the report or any other entity. Additionally, the report is not a complete catalogue of all possible lessons learned, nor is it a formula for correct action in the Colorado River Basin.

Interviews were conducted by Kelsea MacIlroy of MacIlroy Research and Consulting, LLC. Each interview lasted between 45 minutes and one and half hours. The majority were conducted over Zoom during the months of March and April in 2021 with analysis conducted by Kelsea in April and May 2021. Interviews were generally conversational, though a specific interview schedule was used. Questions focused on: 1) the background and experience of the interviewee in relation to a basin's compact administration and compliance; 2) Compact compliance measures, unintended and intended impacts to farmers, ranchers, communities, and water management operations; 3) Interviewee's advice related to their experience with compact compliance and general concerns in terms of water in the state of Colorado.

In total 20 individuals were interviewed. These interviewees represented all three basins in a variety of ways and effort was made in each basin to reach a diversity of perspectives relative to experience with compact administration and compliance. Interviewees included farmers, ranchers, ditch managers, well augmentation specialists, conservation district managers, state employees, municipal employees, environmental NGO employees, and water lawyers. Since we were concerned with people who had experience with compact compliance, interviewees ranged in age from late 30s to 70s. The majority were male and white, with three female participants.

In order to provide context for the interviewee narratives included in the report, sections on each basin include a short history of compact administration issues in the basin, as well as a brief timeline. Sources for this material are provided at the end of each section.

The report was jointly written by Kelsea MacIlroy, MacIlroy Research and Consulting, LLC and Hannah Holm, Director of the Ruth Powell Hutchins Water Center at Colorado Mesa University.

Authors

Both authors of the report have many experiences related to water in the state of Colorado that shape their perceptions, interpretations, and findings.

Kelsea Maclroy, Maclroy Research & Consulting, LLC

Kelsea is a PhD Candidate in Sociology at Colorado State University. As a sociologist, Kelsea examines how people's values, beliefs, and experiences shape their response to problems, particular when it comes to water. Her report, *Exploring Perceptions of a Voluntary Agricultural Water Conservation Program on the Western Slope of Colorado*, is based on interviews with farmers, ranchers, and water managers on the Western Slope in 2019. From 2014-2018 Kelsea was a Research Assistant with the Colorado Water Institute, working on their *Moving Forward with Agricultural Water Conservation* USDA grant. She traveled throughout the Colorado River Basin conducting interviews with a diversity of stakeholders to understand the barriers and opportunities that exist in agricultural water conservation. The result was the publication of *Every Ditch is Different: Barriers and Opportunities for Collaboration for Agricultural Water Conservation in the Colorado River Basin*. Prior to that she completed her master's thesis in her former home of the San Luis Valley during the implementation of the first groundwater subdistrict looking at how people framed their willingness and objections to support and participate in the voluntary program. Kelsea has a master's degree in Sociology from Colorado State University, a master's degree in Secondary Education from Adams State University in Alamosa, CO, and a bachelor's degree in History from Gordon College in Wenham, MA.



Kelsea Maclroy



Hannah Holm, Ruth Powell Hutchins Water Center at Colorado Mesa University

Hannah directs the Ruth Powell Hutchins Water Center at Colorado Mesa University, which promotes research, education and dialogue to address the water challenges facing the Upper Colorado River Basin. While working with the Center, which she co-founded in 2011, Hannah has organized numerous water conferences and educational seminars and worked with the Colorado and Gunnison Basin Roundtables on educational activities, as well as authored dozens of newspaper columns on current water issues. She has also taught classes on water science and policy, with an emphasis on the Colorado River Basin. Hannah previously facilitated the Grand Valley and Lower Gunnison Wise Water Use Council, advocated for stronger drinking water protections with Western Colorado Congress, and served on her local watershed group board in Pennsylvania. Earlier in her career, Hannah worked for the North Carolina General Assembly, where she staffed committees on the Environment, Natural Resources, Sustainable Agriculture and Smart Growth. Hannah has a joint Master's degree in Community & Regional Planning and Latin American Studies from the University of Texas at Austin and a Bachelor's degree in Anthropology from Macalester College in St. Paul, MN.



Hannah Holm



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