



**Water for the Future:  
Farmer, Rancher and Manager Perspectives  
on Agricultural Water in the Colorado River Basin**

**Synthesis of Interviews**

**USDA “Addressing Water for Agriculture” Planning Grant Project**

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**1. Introduction**

The Colorado River is one of America’s major rivers, providing water for the diverse needs of 38 million people, including crucial support for agricultural production and for complex and sensitive ecosystems throughout the West. Today the Colorado River faces unprecedented and diverse stresses with growing demands being made on a river system that as a whole is widely considered to be over-allocated. The Bureau of Reclamation’s recent Supply and Demand Study warns that with population growth and predicted climate change, we face a significant future gap between water supplies and increasing demands. Agricultural water users hold rights to as much as 85% of the River’s flows. Reclamation's supply and demand study states that it will be necessary to obtain up to one million acre-feet of water from agriculture to meet future demands for a growing range of purposes (2012). How are these pressures to be managed in ways that recognize the importance of the irrigated agriculture supported by the River while addressing the needs of the growing diversity of the West’s people and environments?

The authors of this report believe that efforts to address the growing and diverse needs of the basin's peoples and environments would benefit from a better understanding of how agricultural water users see the situation. The USDA-supported “Addressing Water for Agriculture in the Colorado River Basin” project aimed to find out how farmers, ranchers and water managers view the challenges agricultural water faces today. What are the most important pressures they experience? How are they dealing with them? How do they see the future of agriculture and agricultural water in the West?

During the summer and early fall of 2012, our Colorado State University team did 60 in-depth, semi-structured exploratory telephone interviews with farmers, ranchers, and agricultural water managers in the seven states of the Colorado River Basin. Fifty-three were men; seven were women. Twenty-seven identified themselves primarily as farmers and ranchers; thirty identified themselves primarily as professional water managers; 3 were extension agents, county officials or water attorneys. It's important to note that many of the professional water managers have agricultural backgrounds and that many of the producers are also local water leaders. We worked closely with our partners in the CRB's seven land-grant universities (Figure 1) to identify where important irrigated agriculture in each state exists and to identify potential people to interview (see Figure 2). Our interviewees live and work along the mainstem Colorado River and many of its most important tributaries (see Figure 3), in remote rural communities, in ex-urban areas being overtaken by development and near towns and small cities where water providers manage water for multiple use, including agriculture, municipal and industrial needs. We had a very high positive response rate to our requests for telephone interviews, thanks in large part to the support of our university partners and to agricultural water users' strong interest in talking about the water issues that shape their lives and their futures.

## **2. Major pressures and threats to agricultural water**

According to our interviews, many farmers across the Colorado River Basin are feeling significant uncertainty about the security of their water supply. This is especially evident among more junior water rights holders. Nevertheless, uncertainty also exists even among more senior rights holders, as in California's Imperial and Coachella Valleys.

Uncertainty is created and exacerbated by extended drought that in many areas has dramatically reduced water supplies, by intensifying regulatory pressures that constrain producers' decision-making and by increasingly diverse demands for water for municipal, industrial, environmental, recreation and other purposes. Our interviews often spoke of these pressures in the larger context of a possible Lower Basin compact call and for many, concerns that pressures may mount to effect significant changes in how water is currently allocated. That said, agricultural water users' experiences of and responses to these pressures vary, according to the seniority of their rights, the strength of their agricultural operations, proximity to urban areas and other factors. Effective responses to agricultural water insecurity will need to take account of these varying local contexts. No one size-fits all solutions are likely to be adequate. On the positive side, the very diversity of agricultural water's experience generates many creative local responses that increase the sector's capacity to manage change effectively.

Below, we briefly summarize what our interviewees told us about their perceptions of the most important challenges facing agricultural water in the CRB, including drought and climate change and related compact concerns; growing regulatory pressures, often fueled by negative public perceptions of irrigated agriculture; increasingly complex return flow and groundwater issues; and growing competing demands for water by non-agricultural uses. We then discuss a range of responses that agricultural water users and managers report making in response to these challenges, including efforts to develop additional storage; improvement of the technical efficiency of water delivery systems; market-based water transfers, and efforts to manage the competing interests of the increasingly diverse agricultural water stakeholders. We will

conclude with discussion of how interviewees viewed the future of agriculture and agricultural water, their experience with the land grant university system, and some thoughts on future research, education and outreach activities that might help support agricultural water.

**a. Uncertain supplies, drought and climate change**

Interviewees in each CRB state expressed strong concern about extended drought in the summer and fall of 2012. Agricultural water users in Arizona and New Mexico were among the hardest hit. According to an Arizona cotton grower on the Gila River:

with the drought. this year we had the lowest. Most of our river comes from snowmelt out of New Mexico, we haven't had any winters in years. Our aquifers are starting to deplete for the first time in history and our community went into water restrictions. We have no surface water to irrigate with and we started using pumped water....Everybody had a real hard time. This all cost money. It puts more economic stress on the whole system.

A rancher on New Mexico's San Francisco River remarked that "people have water rights, but not enough water to use the rights they've got." A water manager on the Gila River in New Mexico reported "tremendous uncertainty" related to water available for irrigation, observing that there had been no runoff and no rise in the river in 2012. His counterpart on the Gila in Arizona reported there was "no snowpack this year" and that most groundwater wells have dropped at least 20% in production. Nevertheless, some agricultural water users elsewhere, especially where they hold the most senior rights on the River, reported less immediate concern about the drought. In California's Coachella Valley, one water manager remarked, "availability of water is not a concern. We have water. Price is a concern for us." A Coachella fruit grower said, "I'm not looking at the system as a patient on the table taking its last breath. It's in pretty good shape. Hopefully, long droughts won't happen. We're not in such bad shape." Nevertheless, even the most



senior of rights holders we interviewed in California remarked that severe drought and water shortages on the Colorado River pose important indirect and longer term challenges for their operations and their resource rights.

Most interviewees saw the drought as very severe, but not necessarily unprecedented. Very few spoke of current conditions as being related to climate change. Exceptions included a tribal water manager in Colorado, who remarked that “climate change is a threat, regardless of the cause. We are seeing earlier, faster spring runoff. It changes the whole equation of water availability.” A Wyoming water manager also attributed runoffs’ arrival 2-3 weeks earlier than usual to climate change, a development with important impacts for local agriculture that relies directly on snow melt. Another tribal water manager in Nevada spoke of the uncertainty climate change poses. “No way can you plan for that. How much will it warm up? Will we have longer frost free seasons?”

Many interviewees spoke of the broad ranging implications of severe drought. A cattle rancher on Colorado’s Gunnison River said:

I have fears about keeping ag for the future – we hear about the over-allocation and shortage of water – during the drought year there was definitely a shortage – this year they were only able to deliver 70% of the water. We need to meet the Basin Compact and to stay in compliance with regulations like the Clean Water Act and ESA.

A Wyoming rancher predicted that

when the call on the river comes, [junior rights] people will suffer the first shortages. But no way in the world you can shut those cities down. The industrial sector in Wyoming is about a fourth of the state’s tax base...they’ll have to come to agriculture to get that water.

Numerous interviewees across the CRB spoke of their fears that as water supply is reduced and demand increases, pressures could mount to change how water is allocated.

An Arizona nut grower south of Tucson remarked on a “public belief that agriculture is wasting a lot of water. This is a constant struggle. People feel they need to keep agriculture from wasting water.” A rancher on Colorado’s North Fork River observed that “we have quite a legal structure that protects all that and keeps it in balance. But ultimately, the votes are what is going to carry it.” A water manager in southeast Utah similarly remarked: “I have seen on the state level that water laws change to accommodate pressures.” A rancher in Delta County, Colorado said,

It's been pointed out to me that when there are enough householders in Las Vegas that turn on their faucet and no water comes out, it doesn't make any difference what kind of compact or law there is. They are going to get water.

#### **b. Increasing regulatory pressures**

Agricultural water users in the CRB routinely deal with complex, often overlapping regulatory frameworks operating from local to the federal levels. Yet a common thread throughout the interviews was that many producers see their regulatory burden becoming greater as pressure on agricultural water becomes more intense, and as public concerns related to the environment push federal and state agencies to more closely regulate agriculture and agricultural water. Though it is in practice difficult to separate regulation related to water from regulation of other aspects of farm and ranch operations, such as grazing permits, pesticide controls, food safety, labor rules, etc., here we briefly discuss interviewees’ views on what they see as an increasing regulatory burden for agricultural water.

Agricultural water users in the CRB participate in a wide range of local and regional organizations that deliver and manage their agriculture water. An indepth analysis of the varying histories, purposes and functions of these CRB water governance

organizations is not possible here. Interviewees, however, often spoke of the importance of local water governance organizations including mutual ditch and irrigation companies, tribal councils, water user associations, irrigation districts, water conservancy and water conservation districts. Though interviewees occasionally complained about local water organizations' procedures and decisions, they generally spoke in positive terms about the role of local water organizations in supporting water users. According to interviews, some ditch and irrigation companies and irrigation and water districts directly hold water rights and distribute water shares to members who may be exclusively agricultural or include municipal and industrial users as well. Other local organizations deliver water according to members' individually held rights. In many cases, interviewees' local water organizations operate under contract with the Bureau of Reclamation to deliver water from federal projects. The functions and authorities of Conservancy Districts vary across the Basin, but often include the exercise of taxing authority, support of effective delivery of water directly or through local organizations, planning and development of new supplies, helping users comply with state and federal regulations and generally aiming to represent and protect the interests of water users.

By contrast, many interviewees saw an increased state and federal regulatory burden as one of the most significant pressures on their agricultural water. An alfalfa producer using CAP water in Arizona remarked that "people have no idea of the things we deal with that are regulatory in nature." A fruit grower in Coachella Valley said:

We are so heavily regulated, it's almost a joke. Before I retire, I want to write a book called "It's Illegal to Farm in California." We're breaking so many laws farming in California. There's always a threat that someone's going to knock on the door. The regulatory environment in California is crazy. There's a rule against almost everything we do.

Interviewees spoke most often about water-related state and federal regulations related to the environment, water quality and groundwater management.

### **Environmental protection**

When interviewees talked about water regulation, across the CRB they frequently spoke of the impact of environmental protection measures on their agricultural water operations, especially the federal Endangered Species Act. A Wyoming water manager near the Little Snake River remarked that his region's isolation attracts preservation attention because of a full complement of warm and cold water aquatic species that exists only there; "we have a bulls-eye on our backs," he said. In Coachella Valley, California, the need to protect birthing areas for bighorn sheep influences urban water reservoir management. In the Imperial Valley, farmers face pressures to help protect fish and wildlife in the Salton Sea. A New Mexico water manager in the San Juan River basin spoke of the challenges of trying to maintain minimum flows for critical habitat for endangered fish during the 2002 drought.

Agricultural water users expressed mixed feelings about requirements that agriculture take on environmental goals. A Utah rancher on the Virgin River observed that fish screens installed to keep endangered minnows out of irrigation canals have slowed down the flows farmers need. In New Mexico's Gila River basin, an irrigation leader stated, "They're drying us up because of little minnows....They've been here forever and they'll be here forever." A rancher nearby suggested that "the minnows have become more important than agriculture," despite, he said, agriculture's contribution to return flows that support riparian areas and bird populations. In Arizona, an irrigation leader spoke candidly of local producers' involvement in the Multi-species Conservation

Program: “all of us pay in. In return they’re not picking on us about our diversions or return flow. We pay them, they do their thing and they stay out of our business.” A Delta County, Colorado rancher remarked

the EPA, federal government through ESA may look at shutting down water use in this area, simply to recover the fish population. That would affect not only ag but would affect municipal. We have real concern about having to confront something like Klamath Basin or Central Valley in California. We would be best off if we were left alone, but we don't have that option. That is what scares us.

By contrast, an Upper Colorado River irrigation leader remarked that he doesn't fight the government on the ESA. Endangered Fish Recovery Program activities in his area have generated funds for capital improvements that protect fish and enhance water delivery efficiency. A Utah water manager on the Green River reported that though his organization has invested much time and money in modifying pump station operations to avoid impacting endangered fish, they've found “mutually beneficial relationships” with fish and wildlife agencies.

Many interviewees suggested that environmental and other regulation is a necessary and inevitable part of what they do, but several pointed out that certainty was a key to successful coexistence with environmental regulation. A rancher near Colorado's Gunnison River suggested that the regulatory certainty influences producers' investment in infrastructural improvements such as diversion structures, spillways, and headgates. “Are you in a regulatory environment that gives you enough certainty to make those long term investments?” he asked.

### **Water quality**

Agricultural water users and managers across the CRB spoke of the constant challenges of managing threats to water quality, including salinity and selenium, coliform

bacteria, naturally occurring arsenic, invasive species such as quagga mussels, and others. Interviewees reported cooperating closely with state and federal programs to comply with water quality regulations. They also work proactively with their own resources and state and federal support to manage water quality problems. Yet the cost of compliance with water quality regulation has risen in recent years, in money and in time invested.

According to a Kane County, Utah water manager, “all the EPA regulations are much stricter than 20 years ago. Arsenic limits have gone from 5 parts per million to 5 parts per billion. The cost of making sure water is clean is higher.”

Interviewees throughout much of the CRB described salinity as one of the most serious and highly regulated water quality problems. This is not surprising given the forty plus years experience in the Basin with the Colorado River Salinity Project. According to an Imperial Valley extension agent, “Every grower has to work on management measures to clean the water from salt and sediment. This is done through the Farm Bureau and is working really great.” A grain grower in Imperial Valley remarked that the State Water Quality Board is greatly concerned with impacts of salt and other contaminants in irrigation runoff on fisheries supported by the Salton Sea. Growers in the Valley have been transitioning into sprinkler systems to reduce salinity. In Wellton-Mohawk, Arizona agricultural water users have a well known history of salinity control efforts, and have invested heavily to comply with international agreements to reduce the salinity of water delivered to Mexico. A Wellton-Mohawk area water manager reported that salinity levels have been reduced, from 6,500 ppm to 2,600-2,700 ppm, by improving irrigation infrastructure, taking highly saline farms out of production and construction of their drainage bypass. In central Arizona, a rancher raising alfalfa using Central Arizona

Project (CAP) water reported that increasingly saline water from nearby urban populations to the east precludes cultivation of more profitable vegetables. In Colorado's Grand Valley, irrigation leaders work together to monitor and manage water quality problems "without involving the EPA." In the Uncompahgre Valley in Colorado, agricultural water users reported working to comply with federal ESA, Clean Water Act and State Water Quality Commission salinity and selenium regulations by improving piping and drainage systems with support from the Colorado River District and federal Reclamation and EQUIP funds. A Gunnison River rancher remarked that "everyone is trying very hard" and have taken down the selenium load significantly. "Nobody's objected to reducing the selenium load if it's artificially created," he said.

But if we're required to take it below background level, that would be cost prohibitive in anyone's regime. It wouldn't seem to serve any long term benefit other than a regulatory burden."

### **c. Increasingly complex return flow and groundwater issues**

Interviewees in several CRB states spoke at length about the conjunctive management of groundwater with their Colorado River water as a key challenge. In Arizona and California especially, there is growing pressure to link ever more closely the management of surface and groundwater, for municipal and environmental purposes. Farmers spoke of navigating an increasingly complex regulatory environment governing agriculture's use of groundwater. In some cases, the relationship between surface and groundwater has sparked legal battles, as in Arizona. In both states, state and local water district programs encourage and require farmers to replenish groundwater and limit the expansion of agricultural activities in the future. Many farmers spoke of how these

groundwater regulations and concerns shape their cropping and other production decisions.

Groundwater in many areas is managed by local water organizations, regulated by state law or both. For most, but not all interviewees who talked about conjunctive use, groundwater is managed as a supplemental supply to surface water by individual producers or by water management organizations serving areas where surface water cannot be delivered easily. As drought has become extended, supplies become shorter, and conflicts develop over groundwater and surface water interactions, conjunctive management in some areas of the CRB emerges as a daunting challenge.

In California's Coachella Valley, interviewees talked about their irrigation district's efforts to encourage producers to use surface water rather than groundwater and dedicate the latter to urban needs. "Urban water comes all from wells in the Coachella Valley Water District," reported one fruit grower. "We use almost no wells [in agriculture]." This has created a unique situation that supports good stewardship for agriculture and urban development, he commented, explaining that "because groundwater is used for urban needs, the connection is not really direct. Every new house is not taking our water away." To encourage agricultural users to employ surface rather than groundwater where feasible, fees for groundwater are around \$100/af, with \$60/af dedicated to the District's aquifer replenishment efforts.

According to a Coachella Valley water manager, the District has had a groundwater replenishment program in the upper valley since 1980. The Coachella Valley where irrigation occurs has two aquifers separated by a clay layer, with agricultural and urban water coming from the lower aquifer. As agricultural return flows



cannot reenter the lower aquifer, they are drained to the Salton Sea. The replenishment program has included an agreement in which the District has provided Metropolitan Water District with State Water Project water and has received hundreds of thousands of acre feet of Colorado River water that have entered its groundwater replenishment facility.

Arizona's state and local water leaders have also been working for many years to manage groundwater more sustainably, a challenge exacerbated in recent years by extended drought. One New Mexico irrigation leader near the state line remarked that because of drought and overdrafting, "in Arizona, wells are having problems. They don't have the surface water to depend on so they are totally dependent on their wells....Arizona is cracking down." According to Arizona's Department of Water Resources (ADWR 2013), the state depends on groundwater for forty percent of its water. Although our Arizona interviewees use Colorado River water, in some cases delivered through the Central Arizona Project, many of them manage groundwater and surface supplies conjunctively.

Producers and water manager interviewees spoke of their efforts to replenish groundwater as part of their operations. The state's Groundwater Management Act of 1980 designated four Active Management Areas in which groundwater users are required to seek a safe yield balance between groundwater used and that naturally and artificially replenished. One CAP alfalfa producer reported that in his area farmers receive water from CAP in lieu of pumping groundwater, but it is costly. "We have a water duty for each water right parcel. It's a complication. It takes a day to fill out water right reports."

The same farmer reported that Arizona's groundwater law precludes any expansion of irrigated farming in Central Arizona beyond those existing in 1980.

Developers are required by Assured Water Supply rules to show a 100 year water supply for new projects but, he reported, state law allows developers to earn recharge credits in one area and drill wells in another without them being hydrologically linked. “The cheapest recharge mechanism you can have is the off button on the pump. Just don’t remove it in the first place” he remarked. Groundwater regulations, together with urbanization, in his view have led to a significant decline in irrigated agriculture in his area. Similarly, one Arizona nut grower reported that his company was in the process of moving much of their operations to another part of the state because of their fears about the future of groundwater supply and regulation at their current location.

According to our interviewees, producers and water managers managing water conjunctively face the problem that the relationship between surface and groundwater is often unclear and sometimes hotly contested. A cattle rancher near Colorado’s Gunnison River wondered aloud whether conservation practices really recharge aquifers. “We know the water can be reduced considerably from diversions but will that affect aquifer recharge?” In Arizona, a tribal water manager said:

There is a battle going on regarding the definition of groundwater. Groundwater is a tricky question. Traditionally one would say groundwater results from recharging from rainwater and is not coming from the Colorado River. Reclamation has come out with a study that by decree said anything you take from the ground, lowering the Colorado River level, is river water. This is debatable. ... We get 2 inches of rainfall a year here. But after 150 years of irrigation, the river is now a drain rather than a recharge.

Similarly, an alfalfa producer on New Mexico’s Gila River spoke at length about tensions with neighboring tribal groups over the impact of groundwater pumping. “Return flows have a big impact on the wells....If there is no more surface water to call, if we don’t get

that, we start pumping. They're going to decide we can't pump. They'll say it's surface water and that they own the sub flows."

#### **d. Growing, competing demands for water from nonagricultural users**

Across the CRB, growing demands from urban, environment, recreation and other interest groups create both intense conflicts over agricultural water and opportunities for new kinds of cooperation.

#### **Urban pressures**

According to interviewees, growing urban demand for agricultural water affects agriculture in two ways: first, by bringing water to cities by separating agricultural water from farming and in many cases, from the land itself, and second, by bringing the cities to agricultural lands as suburban development repurposes the land to grow houses rather than crops. An Imperial Valley grain grower remarked

Our biggest threat comes from outside the Valley—urban areas. Cities are able to spend a lot more money for water....The challenges come from the municipalities. There are close to 4 million people less than 200 miles away. They think they should get the water and put pressure on Reclamation which is in charge of the River.

A New Mexico water manager said:

The biggest challenge for agriculture is the M&I water. As cities grow, they naturally demand more water. Only place they're going to get it is to buy irrigation rights. Any industry has to do the same. Farmer Joe is getting older, tired, and has no children for a hobby farm. Selling those rights is the wave of change.

The dramatic differences in the market value of urban as opposed to agricultural water is a powerful driver of change in water and often, land use. "Cities have been willing to pay the farmer for the water" said a Utah water manager near the Spanish Fork River.

Another water manager in Utah reported that water on the Virgin River was selling for

\$40,000 a/f three years ago. “It was incredible, expensive water.” A rancher in Wyoming’s Piney Front area said:

It takes 5 acre feet of water for an acre of hay. If water prices are going for \$3,000 a/f, when the older farmer is ready to hang up his irrigation boots, the kids go, ‘your water rights are worth X million dollars. Not many want to go out and follow as farmers.

Across the CRB, the legal and the *de facto* relationships of agricultural water to agricultural land that structure water transfers vary greatly but, according to interviewees, generally allow for and often facilitate water transfers, at least on non-Bureau projects. A State of Utah water manager remarked:

There’s quite a bit of political movement in the area of water laws that is making it more convenient, easier for the transition to occur. Policies are being changed that facilitate transfer...For example, any shareholder can make a change application to change water to urban use. Irrigation companies, even though it’s their water right, are legally bound to consider and give good reasons not to let that transfer happen.

In California’s Imperial Valley, water is held in trust by the Irrigation District but is not legally tied to the land; temporary fallowing agreements now underway send agricultural water to San Diego for urban use. In Colorado, a well developed water market drives a trend to “buy and dry” farms, mostly on the Eastern Slope, that leaves behind abandoned lands and significant ecological and social problems. Our interviews suggested that buy and dry has been less common on Colorado’s portion of the Colorado River, though at least one interviewee spoke about the impacts of purchase and dry up of ranches on the Upper Fraser River. In Nevada, an alfalfa rancher near the Virgin River remarked that state law has allowed water to be separated from the land and sent to urban areas,

Most places, water is tied to land. Here it's not. Most people kept land and sold the water. Lots of people think water should have stayed with the land. The land is not that valuable. The water is what's valuable. Now we have a dry valley and

most of the water is gone. I don't like that. It upsets me because I'm interested in agriculture.

In other states such as Arizona and Wyoming, according to interviewees, water cannot be easily separated from the land but a variety of legal mechanisms exist nonetheless to rededicate agricultural water to urban uses. An Arizona water manager on the Gila River remarked, "Water is attached to the land, tied to the land. Unless you physically remove it through the courts, or the Gila decree." In Wyoming, reported a cattle rancher, "water is tied to the land, unless [a change] is permanent and done through legal procedure set up by legal statute."

The second way in which agricultural water faces urban demand pressure is through expansion of suburban development, which occurs in each of the CRB states, albeit in different forms. A Mesa County, Colorado irrigation leader remarked that "subdivisions love the open field the farmer worked his butt off for. The open ag environment is priceless. It's aesthetically pleasant. ...Make something nice, then people come." An Imperial Valley water manager said: "We're migrating to golf courses and housing developments. We're becoming more and more a municipal water district except on the east side. A lot of farming has been converted. It's not as prominent as it once was." An attorney in Utah's fast growing Washington County reported that "up until the crash and a bit afterwards, alfalfa fields were rapidly converting to residential development." Since the recession, suburban development has slowed in most locations; nevertheless, a Virgin River alfalfa producer remarked that the pressures have not disappeared: "Vegas is starting to come back. This valley is a bedroom community, only 60 miles from Vegas. Most people who live here work in Vegas and commute."

Not all interviewees saw suburbanization as a pressing problem. Interviewees in Wyoming, Utah and Colorado attributed the lack of development pressure to their distance from large urban areas or to the recession. In the Gunnison Valley of Colorado, a well developed conservation easement program protects many ranchers. “Out this way, there is more chance to stay in agriculture and stay undeveloped. Easements are a big part of that” said one rancher.

Nevertheless, other interviewees spoke a great deal about the impacts suburban development has had on their farming and their communities. A rancher on Colorado’s Crystal River remarked,

Most subdivisions like to name themselves after the people they've run off the land. They don't really bother us. But the two ranches we used to lease with my father in law are now golf courses and housing development. Those lands are now out of production. It's gone. I hate it personally.

Development has increased the cost of remaining in farming. “Water runs uphill to money.” said a water manager on Utah’s Spanish Fork River.

That’s the way things have gone. There were orchards in Salt Lake City and they came down here. They’ll be pushed out by development. We can’t afford to keep farming with the price of land. You can’t buy a farm and make it produce any money.

An alfalfa producer on New Mexico’s San Juan River lamented that suburbanization threatened to change the nature of their community. “One farmer subdivided his farm into four parcels” he said. “Each of these was divided later into four parcels each. We may end up as a big suburb, like any big city. It may look like Salt Lake City.”

Other interviewees talked about the increase in amenity or hobby farming brought by suburban development. A rancher in Wyoming remarked about wealthy newcomers: “Up here we have many ranches being bought by absentee owners, millionaires...

Sometimes they have intercourse with the community, often they don't and keep to themselves." A Dolores River area rancher in Colorado spoke of part time amenity farmers with significant non-farm income:

So many smaller farmers, they're going, "we're Montezuma ag." But you and your ten acres are not really Montezuma agriculture. You don't pay huge property taxes. You don't pay production inputs. You don't go buy \$ 5,000 of corn feed, \$10,000 of alfalfa feed, center pivots, tractors, fuel, those things that keep our community going.

Significantly, some agricultural water users saw benefits for farmers in development. A Utah rancher on the Virgin River remarked that he has benefitted from development demand for his water.

One half of the agricultural ground has gone to houses in the last 25-30 years. Water is worth more than land. I kept my water and sold my land. Water was going for \$100,000 a/f from farm ground and I sold 130-140 acres over 5 years...I have other ground.

A fruit grower in Coachella Valley, California argued that development can be good for the farming business.

If your values and assets are going up, that helps strengthen your business. It gives you more options. You can sell part of the land or mortgage it to borrow operating capital to manage your business. I've always been in favor of development... with real estate as bad as it is, it's an opportunity to buy land.

### **Environmental demand for water**

Agricultural water users also face pressures from environmental and recreation interests, which though they have different interests in the resource, often concur in wanting more water to stay in the stream and river.

Most of our interviewees spoke at some length about increasing demands on agricultural water for environmental purposes. A water manager in Arizona said: "I don't mean to bash anybody. I'm a member of the TNC. One of pressures is from the

environmental community. It's almost like they feel we should never have been here along the Gila River." "The environmental community has a tremendous voice in everything," remarked a rancher in Wyoming's Piney Front. They get in the middle of things and push for uses of water for environmental purposes" said an Imperial Valley grain grower. Many interviewees complained that environmental groups' first resort is too often litigation. One California fruit grower remarked that

When water arrived in Los Angeles, the first environmentalists filed the first lawsuits. Not one thing can be done with water that doesn't generate twelve lawsuits. Their goal is inaction, to have nothing happen. Litigation is their method.

According to our interviewees, environmental groups across the CRB have strongly promoted leaving more water in the river system. They have often opposed the way agricultural water users manage the river, and often litigated rather than negotiate. Nevertheless, many interviewees said they see themselves as environmentalists, share many of the same values and goals and have frequently cooperated with environmentalists to improve the river's health and environment.

Several interviewees in California talked about pressures on farmers to take responsibility for mitigating ecological problems in the Salton Sea habitat, which was created by irrigation drainage. The irrigation district deals directly with environmental groups on farmers' behalf to develop mitigation measures. An Imperial Valley water manager pointed out that theirs is a closed basin.

Our inefficiency does not go back to the river, but to Salton Sea, a salt sink. It doesn't have an outlet. That's why for us it's even more important to maximize irrigation efficiency because water is not utilized, not used by somebody else, but by the environment.

Many farmers are more ambivalent. An Imperial Valley extension agent explained that "the Salton Sea cleaning up is a big concern. Putting fresh water into the Sea is not silly.



But the idea of restoration, bringing it back to the way it was fifty years ago doesn't make sense to everybody.” According to an Imperial Valley grain grower,

from the farmer perspective, it is good to have a river full of water while it's being delivered. It provides environmental habitat for fish, birds, whatever. Fine. But when environmentalists say here, let's run water into the ocean, water is scarce from the farmer's point of view.

According to several interviewees, though California's state government has committed to support restoration of the Salton Sea, the Salton Sea's needs are likely to be far in excess of the resources already committed. “They haven't done a plan. People say, if they're not coming up with a plan, it's not even a budget issue” remarked an Imperial Valley water manager.

In other CRB states, agricultural water users face diverse pressures to leave more water in the rivers and streams. Since Colorado's Instream Flow law was established in 1973, state government-held minimum instream flows have been established across the state with, however, priority junior to previously established, senior rights. Wyoming's 1986 instream flow law, according to a rancher interviewee, codifies instream flows as a beneficial use even without a diversion and belong to the state. A water manager in Kane County, Utah explained that his state does not allow for protection of non-consumptive water uses, but in practice his water organization is working with Trout Unlimited “to expand that a little bit and give credit where people are allowing for instream flows.”

As with the Salton Sea issue, agricultural water users express ambivalent reactions to instream flows. One water manager on Utah's Green River related a conversation with one of his county commissioners:

He'd been approached by Trout Unlimited to put water in a stream here for year-round flow. I said I'd be glad to visit. The answer to that is a reservoir that will hold water in the spring so we can release it year round. Otherwise, you're looking

at taking water from agriculture and letting it flow down the crick. I'm not against that idea. I'm against taking ground out of production and running it down the crick. I'm against that.

A Colorado Rancher near the San Miguel River spoke at length of opposition in his area to the Colorado Water Conservation Board's proposal to establish an instream flow for the San Miguel River. "Our water is pretty safe unless we change one part of our diversions or use. Then we run into problems with CWCB that will in future affect our water...for the last ten years there hasn't been that amount of water and the fish are doing just fine." A New Mexico farmer similarly opposed U.S. Fish and Wildlife Service's recent designation of areas along the Gila River as critical habitat.

They'll even have the opportunity and responsibility to even go so far as to establish a low flow level in the river. If that is reached, irrigation gets shut down and the minnows have the priority. There is something wrong with that picture. If you are depending on water from the river as we are in our operation... you're faced with a tremendous uncertainty about whether you're going to have it.

Nevertheless, other agricultural water users expressed support for instream flows. In Colorado's Grand Valley, an Historic Users' Pool of water users has for more than a decade met weekly by telephone during irrigation season with water managers across the state to negotiate river flows for multiple uses, including irrigated agriculture and endangered fish recovery efforts. A Gunnison River rancher remarked that there are secondary benefits to keeping water in the stream, "not just direct production, but wildlife habitat, aquifer replenishment, things like that." A tribal water manager in Colorado reported that his community was in talks with the Environmental Defense Fund regarding the possibility of more flexible management including instream flow enhancement. In Wyoming, a Little Snake River water manager described cooperation with Trout Unlimited, U.S. Fish and Wildlife and state agencies to build fish passages and diversions

to address endangered fish losses. In Arizona, a Colorado River water manager remarked that his growers might be interested in summer fallowing of sedan grass for environmental purposes if commodity prices were not so high.

Elsewhere, environmentalists have objected to how agricultural water users are managing the river itself. A Utah water manager remarked that farmers and ranchers “look at the land as something to improve, increase production through grazing, development of the water resource. The environmental community looks at it as wilderness.” Alfalfa producers on New Mexico’s Gila River spoke of environmentalist objections to flood control efforts involving tree removal along their canals. One New Mexico irrigator saw environmentalists’ preference for a “wild river” as a threat to his livelihood:

There is an element in this area that is bound and be damned that the river will continue to be free-flowing, wild and meandering. Nearly none of them live along the river. They have no economic, vested interests other than they want to be what they want to be. When we have floods, and it destroys part of our farming operations with bank erosion, it’s no big deal to them. It’s a very big deal to us.

A Dolores River rancher in Colorado had a similar perspective.

They are not financially dependent on the water the way I am... When they sit there making these plans, they say, we could go rafting more days, raise more native fish, raise more trout. They can do that anywhere the water flows. We cannot farm anywhere. They don't have any skin in the game.

Nevertheless, many interviewees suggested that there are potential overlapping interests among agricultural water users and environmentalists. “If you ask a lot of farmers,” said a Coachella Valley, California fruit grower, “ they’d say they’re environmentalists. I’m trying to run a business, yet it’s vitally important to be a good steward of the water.” An alfalfa grower in Imperial Valley remarked that the local Audubon Society people “understand that they have the diversity of wildlife because of

us.” A Gunnison Valley rancher in Colorado reported that his water board has environmental representatives. “That brings a thorough understanding of the issues so we can have discussion at the major league level and not the minor level.” An Animas River rancher in Colorado reported that he is active with the non-profit Quivera Coalition in New Mexico on sustainable agriculture issues.

Our interviews suggested that there is significant support for environmental values on the part of agricultural water users and managers that, despite the many legal and practical obstacles that seem to pit users against each other, may create opportunities for fruitful collaboration on the CRB system. As a manager on Colorado’s Yampa River put it,

When I came to Colorado, nobody could hold instream flow rights. Environment was locked out of Colorado water law even though it had its own regulatory mechanisms. I would say that what we’re trying to do here is work with our constituents and the Roundtables since we are not in the same situation as South Platte or Arkansas where every drop is spoken for, so we can come up with a vision for the river that meets both consumptive and non consumptive needs.

### **Recreational demand for water**

Agricultural water also faces growing demands for water for recreation. Farmers, ranchers and water managers across the CRB deal with water users such as sport fishers and boaters who are often seeking river flow levels, intensities and timing at odds with those needed by irrigated agriculture. Managers in many areas of the CRB where water organizations serve diverse users find themselves managing water for recreational needs, including those of fishing, boating, golf and ski industries. These recreational pressures have become more prominent as the importance of tourism and recreation grows in areas whose economies were once driven mainly by agriculture. A water manager in Kane

County, Utah observed that “our population is the fastest growing in the nation. We will need water for homes, manufacturing, tourism and recreation. There will be a big demand for water.” A Grand County, Colorado official remarked that “our economy is now recreation as well. Water in the stream is essential to our economy. Recreation and tourism now are the biggest direction we’re taking, with the Winter Park ski area, lots of commercial guided fishing, whitewater rafting.”

These recreational pressures often result in tensions with agricultural water users and managers. A Coachella Valley, California fruit grower reported that boaters have introduced the Quagga mussel into Coachella Lake. A New Mexico water manager remarked that the sailing club on the Navajo Reservoir and rafters along the San Juan River

have completely conflicting opinions on how much to release. Sailing says none. Rafting says, all we can get. When I got beat up in a meeting, I’d go home and my wife would say, ‘you know you’re doing a good job operating a reservoir when everybody is equally upset with you.

A tribal water manager in Colorado spoke of trespass issues resulting from fishers wanting access to streams on the reservation and rafters, access to landings. The tribe tries to manage these problems by issuing fishing permits and working directly with recreational companies. Also in Colorado, several interviewees spoke of the impact of non-native sport fisheries on endangered species, an ESA-related problem for which many farmers share responsibility on the Colorado River.

Recreational water users in some areas have purchased significant agricultural water rights and are now among those served by local water districts and companies. A Nevada rancher on the Virgin River reported that shares in his water district have been leased for most of the last twenty years to golf courses that serve the growing retirement

community. Several interviewees spoke of their water organizations' direct investment in golf courses and other recreational facilities. A tribal water manager in Nevada reported that in addition to farming, the tribe has developed an 18 hole golf course, 300 room resort hotel and several related housing developments. On Colorado's San Miguel River, one rancher described the influence of ski recreation interests on water management.

"They are not farm and ranch type people. People are coming in here and have different thoughts on water use, land use. They have big pots of money, they don't have to make a living off the forest."

Nevertheless, several interviewees expressed support for recreational water use. A Green River manager in Utah pointed out, "in a lot of instances, we have the same goals, like open areas, enjoying wildlife, enjoying the ambiance. Most of us enjoy fishing." A rancher on Colorado's Gunnison River commented: "even though we're involved in agriculture and use water to raise crops, we still have a conservation hat that we wear. We want the aesthetic value, we want to go fish, we want the fish to be available. It's not that if it's not ag it's not valuable."

Significantly, Recreational In Channel Diversions (RICDs) have been established in some areas in Colorado, as on the Colorado River near Grand Junction, on the Animas River near Durango, and on the Yampa River near Steamboat Springs. According to interviews, RICDs can provide benefits beyond recreation, by increasing flows that benefit riparian habitats and in some cases, helping protect farmers and ranchers' water supplies. A water manager on the Yampa explained:

The RICD right prevents any significant trans-basin diversion above it. There is nothing junior to the RICD in Steamboat. It has no legal power to actually make water, but will prevent anyone without a senior conditional right from developing storage upstream of it or trans-basin diversions.

### **3. Responses to pressures on agricultural water**

Interviewees across the CRB spoke of efforts to deal with the growing demands on agricultural water within the existing prior appropriation system. As we will discuss below, many interviewees are working to promote additional storage. They are investing in improvements in the technical efficiency of their delivery systems to conserve agricultural water. They are participating in a range of market-based approaches to transfer water both temporarily and permanently in ways that bring mixed results for the agricultural sector and rural communities. And they are pursuing, again with mixed results, more effective cooperation with other water sectors.

#### **a. Storage opportunities and obstacles**

According to the Colorado River District's General Manager Eric Kuhn in a recent "State of the River" presentation in Grand County, the Colorado River's reservoir system allows storage of four times the river's annual flow and has helped managers cope with decreased flows in an over-allocated river (Kuhn 2013). Not surprisingly, many agricultural water users and managers we talked with spoke of the need for additional storage. Storage, they argued, would help alleviate continuing uncertainties caused by drought. "In the San Juan Basin" said a New Mexico water manager, "if Lake Powell hadn't been there in 2002, there'd have been a lot of people without water, a lot of problems." Other interviewees believed that storage can provide more resources and flexibility to satisfy multiple demands on the water, including agriculture, environment and recreation, energy and others. A New Mexico rancher on the San Francisco reported

We traveled through Colorado to Wyoming. Anywhere we saw a dam, there was an economy boost... You can see what it does to an area, increasing interest for

people to come, for fishing, tourism or something else. It gives people work. On the water side, it helps the farmers downstream. They'd know how much water they'd have in future if it's impounded ahead of time.

A water manager on New Mexico's Gila River said about efforts to create an additional storage capacity in his district:

[the flow] is continuing to decline. You see it in the river, in the water in the ditch. That uncertainty is very great. If we could store that 14,000 acre feet, if we could store more than that, then release it into the river on as needed basis, I'm just naive enough to believe it would take care of irrigation and environmental concerns, endangered species concerns, provide more stable recreation opportunities. The bottom line is that everybody could have what they want.

Our interviewees, nevertheless, recognized the high costs, regulatory barriers and public opposition to creating new storage today. A rancher on Colorado's Gunnison River outlined some of the financial obstacles his district faced in considering additional local storage.

The cost was prohibitive for what we're doing in agriculture. The users can't afford it and to have some sort of local taxpayer subsidy of an ag project isn't going to fly in this basin....Ag is not the primary industry. It's in the top 3-4, but people just aren't going to raise their taxes to pay for this. If it were large enough, Front Range municipalities might help to pay for it, with ag benefitting. But that would be highly controversial in this area and I'm not sure I would support that either.

"We'd like to do more. But it's hard to do given today's issues about storage" said a water manager on Wyoming's Green River. A Wyoming rancher argued

In order to build storage you have to have the feds and environmental community supporting before you can even start. There would be enough money to build storage if the regulations were easier. The environmentalists back the regulations. As long as food is in the stores, they don't care. Storage would relieve pressures and could help state economies. With climatic conditions and increases in demands, at some point you run out. It will take every tool in the toolbox—absolutely.

An attorney for a water district near the Virgin River suggested that opposition to water development is often linked to no-growth strategies. "Anything we do today has a



significant opposition, regardless of merit. We are the water district, one big project for no-growth environmental groups. No-growth aims to prevent water from being made available.” Significantly, a water manager in Wyoming suggested that opposition to storage may also come from farmers and ranchers. “The agricultural community always says they want more storage, but they want it in somebody else’s backyard. The state really doesn’t want to exercise eminent domain. It’s hard to put together support.”

Barriers notwithstanding, some interviewees, most evident in Utah and Wyoming, talked about successful, recently completed projects or of plans to create new or enlarge existing storage. A manager in Kane County, Utah reported that his district recently finished a 4,000 acre foot project that includes hydroelectric generation as well as storage, and that they are planning another 7,000 acre foot project. Another Utah water manager in San Juan County, whose district depends on mountain runoff, reported on past successful projects, some of which took 25 years to complete. “Today we probably wouldn’t be able to build them because of environmental problems.” Nevertheless, his district is working on a 650 acre foot enlargement project on nearby forest land, to be used for fire suppression as well as production. Near Wyoming’s Green River, a water manager spoke of early stage plans to enlarge Meeks Cabin Dam, but acknowledged the challenges of funding the project at a time when federal funds for storage are scarce.

#### **b. Agricultural water conservation and efficiency improvements**

A common theme throughout many interviews was the mounting pressure across the CRB to use agricultural water more efficiently and to conserve water that can be dedicated to municipal and other purposes. An Arizona nut grower remarked on a public idea that “agriculture is wasting a lot of water” in a state in which 75% of water is used

by one percent of the population. Though many interviewees stated that farmers are not wasting resources but using water as efficiently as possible, several spoke of the problem of deferred maintenance as rates, assessments and budgets have not kept with the needs of aging water infrastructure. A Coachella Valley fruit grower observed

All the infrastructure, canal system, distribution system was built 60 years ago. Some of it is coming to the end of its useful life. We are going to need a plan and money to replace the infrastructure. The price of canal water has been kept so low, that replacement funding for infrastructure repair and improvements is not there.

A New Mexico water manager on the San Juan commented that systems “have been relying on a good flow of water to divert. That water is going to be stretched out. Their systems need to be more efficient to utilize the water they’re entitled to.” Nevertheless, many farmers and agricultural water managers across the CRB talked about investments they had made or are making in their irrigation technology to make their systems more efficient and to conserve water. These included lining of canals, piping ditch water, conversion from flooding to sprinkler systems, and incorporation of high-tech monitoring systems such as SCADA—Supervisory Control and Data Acquisition.

Some interviewees reported accessing state and federal grant funds to help support these new capital investments, for example, from the Bureau of Reclamation, the USDA’s EQIP and NRCS programs and others. In Colorado’s Grand Valley, Reclamation, US Fish and Wildlife, the Colorado River District and the Colorado Water Conservation Board are collaborating with agricultural water users to put in \$16 million in delivery system improvements to generate water that will be available for endangered fish in the 15 Mile Reach. Elsewhere, improvements have been financed by local irrigation and water districts through operating budgets, member assessments, and individual producers investing their own funds. In other cases, agricultural water users

and their organizations have established cooperative agreements with nearby municipalities and state government agencies. For example, in California's Imperial Valley, the Metropolitan Water district has invested in the past in system-wide improvements such as canal lining and makes annual payments to the District and contributes to covering conservation operational costs. A rancher near Colorado's Gunnison River described a partnership with the state wildlife division, his water conservancy district and ranchers to improve a diversion.

On our ditch below Gunnison that diversion was ours and we needed to redo it. It cost almost \$100,000. We had a photo of a rafter over the top, with salmon on the steps of the diversion work. One ditch, one location....the question was how to get other beneficiaries of that water in the system to help pay for it.

According to interviewees, many farmers actively seek out opportunities to improve their systems. "Farmers want to farm. They want to make improvements. They need funding to do so" stated a water manager in the Imperial Valley. Others are reluctant. A Utah grain grower on the Virgin River said, "I have 300 acres in sprinkler irrigation. Other people still want to use flood irrigation and they criticize me for using sprinklers." He attributed this perspective in part to many farmers' view that the government is telling them to change what they are doing. "People say, this is our life, our water, our own possessions.... Sprinklers are much more effective in helping you get the salt out.... I jumped through all the government hoops. Some others would just as soon the canal company go back to flood irrigation."

However, many of our interviewees made it clear that reluctance to invest in agricultural water conservation is not just caused by producers' resistance to change. Agricultural water conservation is shaped by varying incentives and disincentives across the basin. Some agricultural waters users find themselves in situations where water

conservation brings direct benefits to them. In California's Imperial Valley, state regulation has obligated agricultural water users to cooperate with cities for conservation. "They said, you will transfer the water willingly and have partners and get paid, or we'll come and take it. We didn't have a lot of choice. It needed to work for California" said one water manager. But, he said, "conservation improvements will make us more efficient and make it difficult to take more water [from us]." An Imperial Valley alfalfa grower remarked that the conservation transfers have "been good in some ways. By having the transfer agreement, we are getting costs covered to implement conservation and make water more efficient on the farm." In Colorado's Grand Valley, the efficiency improvements described above at the 15 Mile Reach will both provide more water for endangered fish and give Historic Users Pool irrigators more predictability and uniformity of water flows.

Elsewhere, interviewees observed that agricultural water conservation does not make sense and can even hurt their interests, especially when water laws do not support farmers' rights to conserved or salvaged water. A Gunnison River rancher in Colorado remarked, "We're talking about a lot of dollars. The benefits are out there. We haven't tied the financial benefits from that savings to provide the economic incentive to do it, and then gone back and built the efficiencies to do it." Others mentioned fears about conservation's impact on water rights based on consumptive use. The same Colorado rancher continued. "The water rights my family holds are an asset to our ranch company, a major asset. What economic incentive is there for us to provide those efficiencies and benefit those other users down the river?" A Colorado water manager on the Colorado

River pointed out that it is “hard to see water conservation because [farmers] are concerned about use it or lose it.” A Utah water manager argued that

For almost every group of water uses except ag, there is great benefit in the conservation of water. [As an urban supplier] if I can add more individuals to the system, the overall cost is less. If I’m ag, my duty is 5 a/f and I go from flood to sprinkler, to a center pivot line to conserve water, I don't get the benefit of that. I could actually lose some of my water rights.... There has to be an incentive. Otherwise, [farmers] are going to want to hang on to their water rights.

Several interviewees expressed concerns about the market value of their water rights, especially if they had no heirs to continue working the farm and anticipated selling their operations to help fund their retirement.

Interviewees also talked about the technical production conditions that shape the rationality of agricultural water conservation. The potential for significant water savings varies according to climate, soil conditions, the crops cultivated, and the type of irrigation technology employed. In Colorado’s Grand Valley, according to a water manager, orchards established on former hay ground take less water and have higher yields because of more uniform water application through drip irrigation. By contrast, a Wyoming rancher pointed out that “at 8,000 feet, I’ve seen some years with no frost free days. We’re limited in the crops we can grow and those are high water consumers. Climatically, it’s very hard to keep people still in agriculture.” An Imperial Valley extension agent observed that the Irrigation District found years ago that because of the region’s heat and evaporation rates, sprinkler irrigation did not conserve as much water as hoped. “Yields went up, but conservation wasn’t significant” he said. “Theories to accomplish conservation don’t always work in practice” remarked an Imperial Valley grain grower. “In theory, you could shut water off to reduce water runoff.” But because alfalfa land is

divided into strips and the lower end ends up with water for a shorter time period, “in practice it doesn’t work.”

Interviewees also spoke of complications that conservation can pose for return flows. According to a Colorado rancher on the North Fork River,

The rub there is ....there is no wasted water. Water that basically seeps out of a ditch goes into groundwater and comes up elsewhere and ultimately sustains a riparian ecosystem. So some years back, someone local published a book of photographs, old photos and pictures of what it looks like in the modern era. It used to be much more of a desert, not it is quite green. People would not like it now if there was no ag there. It would mess up the view, mess up green space.

An Imperial County extension agent remarked that there is “no way to conserve and not have an impact on the Salton Sea. If you’re sending water to San Diego or Los Angeles by using drip irrigation and runoff recovery systems, you’re sending less drainage water to the Salton Sea.”

Finally, interviewees spoke about the relationship between pressures to conserve agricultural water and their cultural values and their communities. “I wasn’t well received when trying to deliver that [conservation fallowing] message” said an Imperial Valley water manager. I couldn’t come to grips with it either. We thought water should be used for feeding people. There was some room for conservation in the cities.” An Imperial Valley grain grower argued that fallowing is disruptive to the community. “If you fallow, you don’t need workers, don’t spend money in down times. It’s difficult for the entire economy in the region. It privileges conservation over jobs and land.” Other interviewees, nevertheless, spoke of new generations of farmers who see water conservation as the norm. “Things have evolved over time...I’m not completely happy with our position, but we’re beginning to see younger people prepared to work with other groups, who

understand the need for water conservation more than those of us in our age group did” said an Imperial Valley water manager.

### **c. Market-based voluntary water transfers**

Perhaps the most widespread response to the pressures on agricultural water has involved market-based, permanent and temporary transfers of water from agricultural to other uses, mainly municipal. Faced with the dramatic disparity between agricultural and urban water prices, the market makes an argument for transfer that is hard to resist.

Referring to Southern Nevada Water Authority, one alfalfa grower on Nevada’s Virgin River said,

We get along with them pretty good. They are all good friends of mine. They paid a big price for the water and they took it.... No fight, they just offered a lot of money. They didn't force anybody. Some think it was forced. I don't think it was forced, but I don't think we should have sold.

“They need more water. They know where it’s at. They just need to know the price”, said an alfalfa grower on Arizona’s Gila River. Permanent transfers occur as “buy-and-dry” or “buy and change” trends that separate water from the farm operation and rededicate it to urban needs, purchases of irrigation water shares by municipalities and water districts, and state mandated transfers involving city-agricultural conservation partnerships. Many agricultural water rights holders have entered into diverse temporary arrangements, including leasing and experimentation with water banking. Interviewees across the Basin expressed real concern about the negative impacts of these transfers on farming and on rural communities and spoke of efforts to protect agriculture and mitigate the effects of transfers.

### **Buy-and-Dry and Buy-and-Change**

Colorado's well developed water rights market drives a buy-and-dry trend, until now mainly on the Eastern Slope, that separates water from the land, sends it to urban users and according to critics, leaves behind abandoned land, new ecological problems and weakened communities. Though buy and dry has slowed down since 2008 with the Recession and recent favorable commodity prices, it is still a concern for many farmers, policymakers and others across the state because its underlying basic market realities still exist. Our interviews suggest that the buy and dry trend has been less pronounced in the state's portion of the Colorado River, though numerous interviewees spoke of their fears of the ability of economically powerful interests to buy West Slope water. Indeed, the Greeley Tribute (2013) recently reported that the price of a Colorado Big Thompson share has doubled since January to more than \$18,000. In general, the agriculture-urban water use relationship in Colorado is shaped greatly by trans-basin transfers between the West Slope, which has 80% of the state's water and 20% of its population, to the East Slope where 80% of the population resides. A Grand County official remarked that with the historic Colorado Cooperative Agreement between Colorado's West and East Slopes,

Eighty-two percent of water in Grand County will leave at the Colorado and Frazier Rivers' confluence. Right now, 68% is leaving [to Colorado's East Slope]. We can say no, but population and demand are working against us.

Where water cannot be easily separated from the land, agricultural land is often purchased with the water and its use changed via development, though this trend slowed down during the Recession. A Colorado rancher on the Animas River remarked that in his area, water decrees are tied to the land. "We have some of the original rights from 1870-1880" he said. Nevertheless, agricultural lands are being sold for subdivisions.



“Lands end up being so valuable, it’s hard to own it and remain in agriculture.” Referring to the Salt River Project, a CAP alfalfa grower reported, “Inside the SRP, they have the right to a certain amount of water. They guard it so that there is no need to dry up ag lands, because they can shift from ag to urban without drying up any land. Instead of buying and drying, they’ve bought the ag land and converted it to urban.”

### **Municipal buy-up of agricultural water**

In Arizona and Nevada, some interviewees reported on purchase/lease back arrangements in which municipalities buy farmers’ water and allow them to continue to use the water or farm the land through leases. An Arizona water manager on the Gila River reported that before the recession, farmers that sold their farms got them back on leases. “They went from an 80% landowner base to 80% leasing their farms. One alfalfa grower who sold then leased back his water on Nevada’s Virgin River remarked,

I wish I hadn't sold it now. I'm getting old. I was a school teacher for 30 years, I've been retired for 25 years. My kids would like to keep going. They've lost a lot of their water. I sold about half of our water. They won't be able to keep farming.

Elsewhere in the CRB, irrigation water shares have been bought up by municipalities or in some cases, by water districts that serve multiple constituencies. The way permanent transfers occur varies according to how the water rights are held--by individual producers or by irrigation companies. An alfalfa grower on Nevada’s Virgin River reported that Las Vegas had bought half the stock of his irrigation company from its members. “I sold a little, but I kept a good share of my water.” He continued,

before Vegas started buying you could buy a share of eight acre feet from about \$4,000 a share. Vegas came in. When they got serious about it, they offered \$50,000 a share. Pretty soon, the water was gone.

Near Utah's Spanish Fork River, a water manager reported that the city has paid farmers for their water and their voting rights and the canal company now delivers the water to urban users. In San Juan County, a Utah water manager reported that in the early nineties, a local city "aggressively sought irrigation water from older people getting out of farming." He said, "the city had money to put into it. [The farmers] had money at present, and then the city took it over after 10 years. There were those who cheered it on and those who cursed it deeply." Another Utah manager remarked that in nearby Washington County, municipalities have purchased "entire irrigation companies and all their users." In his county, the water district itself serves urban and rural users and has purchased water rights from agricultural users. "As growth comes", he stated, "that seems to be the water that is available." However, a Utah rancher in San Juan County argued that the city is buying water not just for growth, but as insurance for drought years. A water manager in SE Utah agreed: "[Cities] have public money to influence the market. They will buy water to hedge up against drought. They end up owning more water than they need." A rancher on Utah's Virgin River summed up his perspective on these water transfers:

Farmers can't offer to buy it and get on it. They're just holding the price down so the Conservancy District and municipalities can buy it out. You only plant homes one time. It kind of makes you sick. But what can you do? They call it progress.

### **California's QSA and agricultural water conservation partnership**

In California's Imperial and Coachella Valleys, agricultural-urban water transfers been significantly shaped over the last decade by a federal mandated water conservation partnership, the Quantification Settlement Agreement (QSA). Though the QSA does not involve permanent water rights transfers, interviewees reported that the agreement quantifies allocations for Colorado River agricultural water users for the first time and

provides for transfers up to the year 2045. Building on experience in the late eighties with a partnership with Metropolitan Water District that funded delivery system improvements in the Imperial Valley, the QSA is actually a collection of over 40 agreements. According to a local water manager, the Imperial Irrigation District initially resisted the agreement but eventually acquiesced under pressure from federal authorities and the courts. The QSA authorizes annual transfers up to 200,000 a/f of water to San Diego by 2021 and 100,000 a/f to Coachella Valley Water Conservancy District (SDCWA 2013). According to interviewees, the QSA also introduces usage caps for some users, requires payback of overused Colorado River water from 2000-2003, and provides for enhanced flows to the threatened habitats in the Salton Sea. Water for these transfers is eventually to be produced via “efficiency-based conservation”, but until 2017 it is being created through a mandatory fallowing program. For Imperial Valley participants, according to a Colorado River grain grower, the QSA calls for fallowing of 60,000 a/f/year. The District recruits volunteers each year via fallowing pricing incentives; according to another interviewee, 30-40% of the District’s farmers are participating in fallowing.

One Imperial Valley grain grower commented that if the program is successful, “we will have improved efficiency beyond anywhere else in the world. It will be a bold move beyond where any man has gone before.” Nevertheless, numerous interviewees spoke of the unpopularity of the fallowing program, despite the fact that fallowing can yield significant revenue for farmers, especially when commodity prices are low. One Imperial Valley water manager remarked that there is “quite a bit of animosity on the transfer agreement....After 15 years of fallowing, the ‘f’ word, growers are not happy.” This interviewee also pointed to negative multiplier effects on seed companies, hay

bailers and others, “We’re an ag community. People didn’t want to do fallowing. Other than teaching and prisons, it’s our only industry.” A grain grower stated that

For a farmer, it’s an inconvenience. He doesn’t make anything on it. He makes no rent, isn’t producing anything from this fallow land. Water is a resource to make a profit. Fallowing is not anything you want to do.

An alfalfa grower remarked that

There is a pretty general feeling among Imperial Valley farmers that they should have fought harder and not given into the pressures. But we have to live with it now. ...It has been good in some ways. By having the transfer agreement, we are getting costs covered to implement conservation and make water more efficient on the farm. That was the intent.

Nevertheless, an extension agent expressed concern that fallowing is intended to end in 2017. “The water for San Diego has to come from somewhere else, like on-farm conservation practices. But I don’t think we have anything in place right now to prepare for that.” Some farmers have called for creation of storage in the area, which currently does not exist, that could collect possible future “under-run” water to be used for their own future obligations instead of letting it go free of charge to MWD.

### **Temporary leasing and water banking**

A variety of temporary arrangements also exists to lease agricultural water temporarily. In Nevada, a Virgin River rancher said that his water had been leased by the city for a ten year period. “Will they extend the lease? If not, we’ll go back to farming” he said. In SE Utah, a water manager reported that his water district identified shareholding families who were not using their agricultural water. “We took all of those [shares] sitting on the books and leased water from those people. We created a pool of water not being used anywhere else and turned around and contracted to the cities.” In Colorado, farmers have the legal option to temporarily lease agricultural water for

instream flow purposes without fear of abandonment of their water rights. The Colorado Water Trust, for example, has issued calls for temporary leases of agricultural water for instream flows during drought periods.

As the arrangements for agricultural water leases vary, so does their perception by farmers and ranchers, many of whom express concerns about the implications for future cropping, or about the security of their water rights. One Colorado rancher on the Dolores River spoke of their irrigation company turning down an environmental lease offer because of fears about jeopardizing agricultural water rights. Another Colorado rancher on the Crystal River commented,

There's been a lot of talk of leasing water in dry years to municipalities. My brain can understand that if growing a corn crop or annual crop. If you are growing a perennial like alfalfa, or hay, I don't see how you give away or sell your water for a year because it will do long term damage....I just don't see how it would work if you are growing a perennial crop.

Interviewees across the CRB talked about their experience with or interest in water banking to transfer and pool water to allow for more effective management for current and future needs. Most of the cases interviewees spoke of involve internal, often informal arrangements to deal with surpluses and shortages within a district's service area. An Arizona water manager on the Colorado River reported that their district has purchased agricultural land and placed its water in an internal reserve bank that can be used for farming or district-owned development anywhere in its service area. A water manager near Colorado's Dolores River described an internal banking arrangement that shifts water from users not using all their entitlement to those who need more. "The water banking concept is a work in progress for us. We've been operating with caps as the tool but are really thinking about moving into contracts" he reported. An alfalfa grower in

Imperial Valley reported that in his area a water bank has been designed, but never implemented, that could trade water among farmers or within a single farm unit. In New Mexico, a water district manager near the San Juan River described a well-functioning water bank within their district but reported that it operated informally and that it was uncertain how it would fare with formal adjudication. A different San Juan Basin water manager remarked that recent state legislation authorizes a water bank but that discussions were just beginning; A Colorado tribal water manager reported that his members were pursuing talks with Reclamation about options such as water banking. Another Colorado interviewee reported that the Colorado River District is working with a broad range of stakeholders to study the possibility of a water bank initiative. He said,

A big thing is supporting the Colorado River District and the water banking idea. We'd like to see that pursued some more. We've had some small projects here to provide water, but there wouldn't have been a project big enough to deal with our water needs this year.

The design, implementation and possible sizing up of water banking initiatives face significant technical, legal and social challenges. Water rights in the CRB include a diverse mix of private and federal project water rights with complex relationships between land and water. Issues of seniority and return flows under prior appropriation arise with the prospect of exchange of water over time and place, as do questions of how flow rights might be converted to storage rights. "You can't make new water. The water bank water will have to come from somewhere....They get space to store the water, it's not new water" remarked a San Juan basin water manager. The span and scope of a water banking effort needs to be worked out, as well as agreements linking participants and remunerating and charging them for their participation.

### **Protecting agriculture and agricultural water**

Many interviewees talked about efforts in their districts to implement water transfer policies that protect agriculture. A CAP alfalfa grower in Arizona remarked that his Farm Bureau is working hard to protect agriculture. A Utah water manager on the Green River reported that “my board is trying to limit what moves out of agriculture. It’s vital not just to the economy, but to the atmosphere, our rural feel, the openness. If we don’t have water, it’s desert here.” His organization contracts to move water from one drainage with a surplus to another with a shortage. A Washington County, Utah water attorney whose district services multiple users stated that “over time, we are not pressuring agriculture, but want to support it. The canal company we’re involved with has a two-tier arrangement. If water is for agricultural use, you pay half the rate.” Significantly, the interviewee continued, “ultimately, this will be a willing buyer-willing seller situation.”

It’s important to note that many interviewees defended the right of current agricultural water rights holders to sell those rights in future if they wished. For some farmers, market transfers of their water rights are part of business strategies aimed at staying profitable. Others, especially those without new generations to take over the farm, are counting on the high value of those water rights to fund their retirement.

#### **d. Conflict and cooperation among competing users for agricultural water**

Growing competing demands for agricultural water have created both significant conflicts across the basin and, arguably, opportunities for new cooperation. Litigation is common and has long been a major way in which agricultural water-related competition

and conflict are resolved, but many interviewees remarked that litigation is costly, lengthy and uncertain. Tensions among diverse demands on agricultural water are now also being addressed throughout the Basin, with mixed results, with coordination and cooperation, for example with multi-use management by some water districts and multi-stakeholder negotiation efforts.

### **Courts and attorneys**

Many interviewees spoke of agricultural water-related litigation that they and their water companies and districts have been or are involved in and spoke about the costs and uncertain outcomes. An alfalfa grower near the Gila River in Arizona remarked that “legal decisions may not necessarily result in a fair agreement...but one that favors those with the most money to fight with.” Referring to legal conflicts with neighboring tribal groups, an alfalfa grower on New Mexico’s Gila River stated, “It’s lawyers and money doing illogical things, causing confusion. Some people say it’s not worth it and quit.” A New Mexico water manager commented,

Businesses, industries, maybe even your universities are being strangled by regulations, lawyers, lawsuits, all of those things. It becomes more and more difficult to do things and to convince people that this is the right way to go. We seem to have a completely different mindset and in my perspective, it’s headed in the wrong direction.

Agricultural water users spoke most about litigation they’ve been involved in with environmental interests. A Wyoming rancher said, “whatever we do, there’s resistance. The environmental community has a tremendous voice in everything....What bothers me is that the industrial complex of America is basically funding these environmental groups.” In the Imperial Valley, a grain grower spoke of the legal issues of dealing with



the Salton Sea's environmental problems. At a state government public hearing, he reported,

People presented their positions. There was a pickup load of documents presented by the parties. 8-10 environmental groups, Imperial Irrigation District, farmers, other entities. All the sides understood and decisions were made. There was no lack of understanding of what was at stake. Somebody had to make a decision. We disagreed with putting fresh water into the Salton Sea. There were real differences in perspectives. The environmental movement has a different set of priorities than farmers do.

A rancher on the San Miguel River described a conflict with the Colorado Water Conservation Board, which planned to implement an instream flow for the lower San Miguel. "It's really hard to fight the CWCB, which has all the money in the world" he said. "They're trying to make a living, hiring lawyers. They seem to have the power to do almost anything they want to."

Several interviewees in New Mexico and Arizona described difficult litigation between tribal and non-tribal water users. An Arizona water manager on the Gila River described recent legal conflicts with nearby tribes over how historic water rights are to be physically applied under current conditions. From the non-tribal agricultural perspective,

Some of the 1930 maps used for allocation decrees were vague....An individual can irrigate 29/40 acres. The map did not show where those 29 acres were. Twenty-nine of the 40 was wherever the farmer says it is....The Indians and the federal government backing them are now saying that farmers are not irrigating where they are supposed to be irrigating. Also the parcels have changed over the years as hills been removed, filled up and smoothed out.... In the past we were able to transfer water from one individual location to another. When floods come in, water decrees are now in the riverbed. We want to move it up to a piece of ground that didn't have water rights. Farmers thought they could do that. The judge says no.

A cotton grower on the Gila reported that according to legal agreement with tribal interests, farmers are allowed to file on "hot lands" irrigated with pumps, but tribal

groups are protesting this practice. An alfalfa grower on the Gila River in New Mexico said,

We can't transfer our water rights around our property like we used to. According to the [Globe Equity Decree] agreement, we have the right to do that but now we can't because there are too many protests. They claim that part of this is river water, not groundwater. In some areas we can still pump water. They're questioning others.

A tribal water manager on the Colorado River in Arizona explained that tribal water rights are legally established by the Winters Doctrine of 1908 and a 1964 Supreme Court decree that quantified tribal rights based on historical use, expected growth and future use. "We recognize that tribal rights are senior but we are trying to be good neighbors. Everyone will be having the need for water." On New Mexico's San Juan River, a water manager remarked that tensions between tribal and non-tribal groups over water are a "very very sensitive and highly politicized subject." The current administration, he said, is focusing on resolving long standing claims on the River and finally living up to the United States' obligations. "Everybody has their opinions on the reservation system and what it has done to the Native American people. The bottom line is that the U.S. made a commitment to resolve these water rights claims."

Interestingly, several interviewees described experiences with informal negotiation among diverse water user groups outside the courts, sometimes to share water or shortages. A New Mexico water manager on the San Juan River described an informal water sharing group formed in the severe drought of 2002-2003. The group, which included Reclamation, power plants, several of the main ditch companies and two tribes, worked out a shortage sharing agreement that has been renewed annually.

This was driven by the fact that the Agreement was coming, so some of the participants were probably willing. Plus, the state could not administrate the river.

People were willing to get together to help share [shortages]. We left out the lawyers and made a really good agreement. ...everybody took a percentage of days that they would not divert water. We ended up not facing a shortage, but we did divert a week later to help offset the shortage for other users. Things can get done if there are less lawyers. They complicate things.

Many interviewees spoke of their reluctance to formalize such informal arrangements as they face an uncertain fate if submitted to formal legal water rights procedures.

### **Multi-stakeholder negotiation and cooperation**

As an alternative to litigation, many interviewees in each state across the basin spoke of positive experiences with multi-stakeholder negotiation and cooperation in the context of multiple use of water.

### **Multiple use water suppliers**

In parts of Utah, Arizona and California, agricultural water management is embedded within multiple-use water management organizations. These water organizations are set up to manage water not only for agriculture, but also for urban and other uses, so multi-stakeholder coordination occurs within a single, diversified institutional structure. Their governance arrangements vary, but in some cases at least, as pointed out by interviewees in Coachella Valley, this multiple use management can minimize conflict. “The Coachella Valley is unique” said a fruit grower, because it supplies multiple services and has surface water for agriculture and groundwater for urban users. A Coachella water manager remarked that “we provide different services and we control all of them. We can try to balance competing interests and deal with overuse.” An Imperial Irrigation District manager remarked that because their neighboring CVWD manages diverse water uses and has both groundwater and surface water, “it is easier for them overall to manage and solve problems. They have more tools

to do that with. We are limited to one water source, one water use. Everything's magnified. It makes a difference." Similarly, in Arizona, a tribal water manager on the Gila River reported that his organization strives to keep suburban development from harming agriculture but is positioning itself over the long term to provide water for urban needs. "We intend to make sure that development doesn't hurt us. When there is no farming left, then we will supply water to urban."

### **Multiple-use river and watershed management and planning**

Numerous interviewees across the CRB spoke of relatively positive experiences with multi-stakeholder negotiation. These experiences have tended to emerge in response to water management problems that involve many interests and pose potential for significant conflict, including endangered species mitigation, water conservation and quality problems, and water development initiatives. Other stakeholder groups have been established to provide forums for discussion or for policy lobbying on behalf of water users.

In Colorado and Arizona, interviewees talked at length about negotiation and cooperation to protect endangered species while addressing the needs of agricultural water users. In Colorado's Grand Valley, irrigators, environmental groups, state and federal regulatory agencies and reservoir operators have been cooperating for more than twenty years to provide water from several nearby reservoirs for endangered fish in the critical 15 Mile Reach while providing regulatory and supply certainty for water users. A water manager who participates in weekly telephone conferences to coordinate releases during irrigation season evoked a cooperative communication process:

They haven't thrown their swords down on the table. They've been ladies and gentlemen....[they say] 'I can take a little bit of pressure here, so you have to cough up a little bit of pain and anguish, too.' You don't damage yourself any more than you have to.

On Arizona's Gila River, several interviewees participate in the Multi-Species Protection program. The Bureau of Reclamation and US Fish and Wildlife, representatives from the states of Arizona, California and Nevada, the Central Arizona and Salt River Projects, major municipalities and irrigation districts coordinate mitigation of threats to threatened birds, fish and reptiles. "The program has run amazingly well. There have been a few contested issues, but in general it runs smoothly" said an attorney representing several irrigation districts in southwest Arizona. However, environmental groups stopped participating early on, he reported. "They considered it a 'zoo' approach," "I believe that [the MSP] is an important project:" remarked an alfalfa grower on Arizona's Gila River. "We contribute in our district money every year. These issues are concerning. The environmental folks are not happy but they got a lot of habitat protection....It hasn't been great, but has been good." Referring to cooperation with US Fish and Wildlife to protect threatened fish, a Nevada manager on the Green River said, "we have to do wildlife mitigation. We just deal with it. We just do it, we don't battle it. We try to keep things reasonable. And so far, I think we've had great success with it."

Elsewhere, interviewees reported positive experiences in multi-stakeholder negotiation for water conservation and quality. A nut producer in Arizona reported that his group represents the interests of agriculture on the Safe Yield Task Force with the Agricultural Management Area (AMA) in Tucson. It also works with local environmental groups seeking mitigation of mining-related pollution. On Colorado's Gunnison River, a

rancher reported working with a water quality working group including county and municipal officials, environmental groups and agriculture to address county standards.

In Colorado, historically conflictual water development and trans-basin diversions have recently produced an unusual new cooperation between West and East slope interests. Nearly complete negotiations of the Colorado River Cooperative Agreement have resulted in an unprecedented accord between Front Range and over 30 West slope water user and environmental groups. Although the water in Grand County diverted to East Slope water suppliers will increase from the current 68% to over 80%, the complex agreement provides new mitigation of old problems, additional storage for Grand County and the retiming of reservoir releases to put more water in the streams when irrigators and habitats need it. “Grand County has played the cards well with the hand they were dealt” remarked one county official. “We can say no, but we will get hit. Population, demand and political power are against us.....We continue to advocate for the strongest mitigation we can, but will live with the decision that has been made.”

Other interviewees spoke of positive outcomes from taking a watershed approach to negotiation and collaboration. In Wyoming, interviewees spoke of innovative watershed planning efforts that bring together diverse water users to solve water quality problems and develop successful storage improvement projects. On the Little Snake River, a water manager described productive collaboration with environmental groups, US Fish and Wildlife, Wyoming’s Game and Fish Department and others to study hydrology and habitat fragmentation and develop fish passages and diversions. In Arizona, a water manager on the Gila River spoke of positive efforts by the Gila Watershed Partnership, a twenty year old group that involves local people in addressing

local water issues. “ Our group tries to look at the whole, social, economic and environmental side. All these issues associated with a watershed. All the social issues associated with small communities.”

Finally, interviewees spoke of developing multi-stakeholder groups as forums for discussion and conflict mitigation and for lobbying of policymakers. In Colorado, the Dolores River Dialogue was established in 2004 to provide a forum for farmers and ranchers, environmentalists and the recreation industry, state and federal agencies and others to discuss river flow problems. A spinoff group called the Lower Dolores Working Group formed to develop an alternative to federal Wild and Scenic River designation. A water manager accounted for the group’s relative success as a forum.

Everybody has realized that their interests are intertwined and that by cooperating they can keep from burning resources fighting. The District has an obligation to all the players. People have learned that if you don’t deal with environmental issues you can end up with a federal mandate, so they want to deal with it proactively. Relationships start to develop even though the world views of the players are quite different. But once you find the overlapping interests, relationships form, there are more open lines of communication and gradual development of trust.

Also in Colorado, legislation in 2008 established a series of Roundtables in each of the state’s eight river basins, to provide a regular forum for diverse water users to identify problems and propose solutions. A Gunnison River rancher on his basin’s roundtable reported that the group is trying to ensure their future water supply given growing shortages, the possibility of a compact call from the Lower Basin and more trans-basin diversions. “Most of that talk comes in the roundtable—more so than in the Association. The roundtable has been a big help. It gets the whole state involved.” In New Mexico, the Gila Basin Irrigation Commission, according to an interviewee, organizes political action by irrigation companies, but includes ex-officio members including environmental, real

estate and other business interests. In Wyoming, the Coalition for Natural Resources Conservation brings together agriculture, oil and gas, and industry to protect water, address environmental issues and provide groups affected by state management plans opportunities to have a say. They also have met with environmental groups, “trying to get on the right page...Otherwise, money has the clout” he said.

### **Problems of multi-stakeholder negotiation**

Despite these kinds of positive experiences, many interviewees spoke of difficulties and frustrations associated with multi-stakeholder negotiation around water, particularly their experience with environmental interests. Interviewees spoke of investing many hours in negotiations with no acceptable outcome. A New Mexico water manager near the Gila River described his frustration :

We spent from 2007 clear up to six months ago at meetings. And we had since 2001 over two hundred public meetings. You know, I assume you know, that most of us in agribusiness depend at minimum in part and in many cases in total, on successful operations at home. That doesn't include wasting time in meetings. Environmental groups have paid employees who go to those meetings all the time.

A water manager on Wyoming Green River pointed to the irony that the very nature of farmers' work gets in the way of protecting their livelihoods. “ People are so tied up in their work, they can't go to all the meetings. They can't protect what they have because of the nature of what they're protecting. Others are paid to come to the meetings. It's their jobs.”

Some interviewees expressed doubts about the good faith of other groups involved in negotiations. A water manager in Utah expressed doubts about organized environmental groups:



I've had a lot of experience with environmental groups. The administrators of environmental groups really don't care about the environment. The masses that contribute money, they do. They are very concerned. They think they are going to achieve something. But when you talk to the ones who are the organizers, they are more concerned with making a living and keeping everyone excited than they are about solving problems.

Similarly, a rancher on Colorado's Gunnison River remarked, "I will tell you that there are some other groups, their methodology seems to be to file court action and issue threats. They may get a short term court order, but not long term results in the interests of habitat and resources." The Gila River water manager stated,

the tactic of environmental groups, one of them, is to delay, delay and wear people out. And they're good at it. You start out with a group of agriculturalists gung ho about getting a situation taken care of and after the eighth or tenth meeting and the frustrations that go with it, they drop out.

A Wyoming rancher was pessimistic about the possibility of negotiation: "whatever we do, there's resistance. The environmental community has a tremendous voice in everything. Until they start to get thirsty and hungry, they will continue to resist with every means they've got."

For some interviewees, the interests of negotiating groups are too often polarized and groups' positions on issues too inflexible. Referring to efforts to cooperate with regulatory agencies, a Utah attorney remarked that "regulations are black and white. They have the force of law. State employees are often agents of those regulations. They can see your point but their hands are tied. Referring to environmental groups and a recent land use controversy, a Kane County, Utah water manager observed,

the environmental community has done a lot of good things, but they've gotten off track. The polarization comes from them. The Monument thing has done a lot of damage. They tore out the movie lot, trying to obliterate human footprints. But those are my ancestors, the people who settled this region.

A tribal water manager in Colorado suggested that such differences are inevitable.

“Water issues exist anywhere, no system is flawlessly operated. Somebody is always at the end of the ditch.”

Much of this polarization, according to interviewees, comes from differences in values, gaps of understanding and a resulting lack of trust among contending groups. An Arizona nut grower pointed out that, “what you value in a water decision is not the same for all.” A Kane County, Utah water manager explained that ranchers and farmers see the land as something to improve through grazing and water development, while the environmental community sees the land ideally as unused wilderness. “I’ve had a lot of interaction that’s not positive with the environmental community. I believe if people came to my ranch and saw how we’ve done things, they’d have a different view” he said. At the same time, a Wyoming manager on the Green River pointed to farmers’ own cultural barriers. “Agricultural people come up by the bootstraps. They’re very prideful in their accomplishments and prefer not to have someone else show them the way. They have to do it their own way.” In similar fashion, a Utah water manager said

Farmers are generally going it alone. In each area, each situation it’s at their own direction, their own solutions. All of them have the same problems with a little different solution. They don’t see much into the future.

Several interviewees suggested that the lack of knowledge and understanding of the agricultural perspective makes fruitful negotiation difficult. A Green River water manager in Wyoming explained

It’s always a struggle. Environmental issues might be totally opposite to grazing and water development....Some people are pretty narrow minded. It doesn’t always work well. When they don’t know each other, it doesn’t work. They need to get together more and get to know each other.

A grain grower on Utah's Virgin River argued that environmentalists don't understand that irrigated farming has positive environmental impacts.

Environmentalists say 'leave it wild.' They say, 'this is a beautiful wild area.' They don't realize that it would not be there except for what I've done. Now there are 1,400 thousand acres with four times as many wild animals on it, including the Greater Sage Grouse, which is threatened.

For many of our interviewees, the obstacles to effective negotiation appear to be discouragingly high.

### **Lessons from positive multi-stakeholder experiences**

These doubts and negative experiences notwithstanding, in nearly every state interviewees spoke about what they had learned from their efforts to cooperate across water sectors.

#### **Ensure sufficient motivation for cooperation**

The context for cooperation needs to be right, with sufficient motivation for diverse water users to collaborate. "People need to recognize that water is not going to be like the gold in Gold River. It's getting less. There needs to be a realization that we can't play the game like we used to. To keep agriculture, agriculture, recreation and tourism have to talk together" said a Grand County, Colorado official. In Utah, an attorney accounted for her district's significant successes at cooperation across sectors:

Why is this possible? We are in a desert area. All the easy water was developed. Municipalities used their springs, drilled their wells and they're growing at a very rapid rate. They had to figure it out. ....Others don't have the same pressures. Water supplies are ample so they don't have the motivation to get off their own turf.

A Gunnison River, Colorado rancher remarked: "Agriculture is a very small part of the whole. The other attractions to Gunnison wouldn't be here if we didn't have a strong

agricultural influence. Our open meadows, our open spaces are there because we have agricultural water. That's what attracts our recreation people to the area, the openness of the valley.”

### **Seek out potentials for win-win situations**

Cooperation across water sectors is more successful when people with diverse interests seek areas of common ground when win-win situations are possible through compromise. “Agriculture has to understand that it is a complement of the future economy” remarked a Colorado county official. “Environmentalists have to realize you can't have it all your way if you're going to do something that's positive, not 'my way or the highway.' You never get everything you want.” In similar fashion, a Gila River alfalfa grower in Arizona said

You have to have some people who don't hesitate to state concerns for the organization they represent, but who are visionary enough to know that they won't get hundred percent. We'll have to make some concessions to get an agreement. [You need] people who fight for what they are about, but are able to find middle ground.

“Let's bury the hatchet and see what we can do” said a Wyoming Green River manager. To do this, an Arizona producer on the Gila River stated, a generalist approach is helpful. “We look at the whole. We need all the parts and have to be willing to work across the board with all kinds of issues throughout all the watershed.”

### **Focus on recruiting people, not institutions**

Several interviewees spoke of the importance of getting the right individuals involved, rather than just the right agencies. Reach out to people with different points of view but who are willing to work with you, suggested a Utah attorney on the Virgin River. A Little Snake River manager went further:

Trying to work with agencies is a waste of time. You have to find those individuals in those agencies who want to work with you. I've been twenty-one years in this work and for ten years I hated working with the agencies. And then I started working with individuals who were progressive within those agencies.... Don't ask for the letter from the director. Keep low on the food chain. More people way down on the feeding chain are gung ho. Then after you get results, the people high up pay attention.

A manager on Utah's Green River reported that he works hard on building relationships across agencies that can help him apply pressure when needed to reach agreement.

"Building relationships is way overlooked" he said. Several interviewees spoke of avoiding turf struggles. "Avoid bad, turf-oriented people" said the Little Snake River manager. "That can kill a process/project. Those people surface really quick with their rules, statutes, etc....If you can't give up a little authority, time and money, then this won't work." However, "it can take decades" cautioned the Utah Virgin River attorney. "Sometimes certain individuals have to leave".

### **Invest time in developing trust**

One of the most frequently discussed characteristic of successful multi-stakeholder negotiation was the need to invest time and effort in building trust. A Green River manager in Utah commented that "we look across the street and see someone as our enemy and not our friend. If we cross that street, we'll see that we have more in common than we know." But a Little Snake River manager in Wyoming remarked that "trust is built over a period of time. Respect is earned not demanded." Trust develops over time as people work together and experience successes together. "When you start to find overlapping interests, how to work together, you start developing human relationships that open lines of communications, more respect, and you gradually develop trust" suggested a Dolores River manager in Colorado. "It's not easy to do this together"

reported a rancher on Colorado's Animas River. "I do lots of face-to-face time with rafting companies. I go to a lot of meetings, explaining face-to-face. Once I get a few folks understanding, that conversation gets easier."

### **Develop the right kind of leadership**

An Arizona attorney commented that in Western water, there usually exists a small, limited group with access to decision-making in municipalities, irrigation districts, communities. Nevertheless, successful negotiation among water sectors, according to our interviewees, requires committed, visionary leadership that has, as a Green River manager in Wyoming put it, "the fortitude to do things differently" but who can also draw in others. A Gunnison River, Colorado River rancher attributed local successes in conservation easement activities to leaders who had "the vision to craft workable solutions" that reached out to people on the environmental, recreation and landowner sides. A Little Snake River manager in Wyoming says individual leaders are necessary, but with a strong support system, "...people who will stand behind you, like my board. It's tremendously important to have a leader, but it's too much to put on any one person. Nobody can do it by themselves. "

### **Generate successes, even small ones, quickly**

Finally, several interviews talked about the importance of producing successes quickly, even if they are modest. A Green River manager in Utah spoke of the importance of being pragmatic and generating results.

You have to recognize that here are the facts. Here is what you have to work out. If you have the political clout to go back to Washington DC to change the ESA, you'd better get after it. But if you don't, you have to work within the parameters you've got to make things happen

“Plans are an absolute travesty. Plans will plan you right into missing opportunities....

You have to show members success. Too often collaboration does not get things done.”

insisted a Little Snake River, Wyoming water manager.

You must demonstrate success. If in one place, you can put a diversion structure, you start to get understanding. If you can't demonstrate results, walk and talk the talk, it won't work. You only have what some study says it wants. You say, ‘results take a long time?’ This is a fallacy. Results don't have to be some grandiose thing. It's not that difficult. It's not just long-term. Put one foot after the other.

## **5. Visions of the future of agricultural water**

When we asked our interviewees about the future of agricultural water in the Colorado River Basin, we found that it is impossible to separate the future of agricultural water from the future of agriculture. It was also clear that farmers, ranchers and water managers saw the future very differently. Their views varied from optimistic to apprehensive to pessimistic, depending on their location, water rights, production and market conditions and other factors shaping their operations. But almost all saw important change on the horizon. “You can't go back into the old ways anymore” said a Green River water manager in Wyoming. “Water is going to become like oil if it hasn't already” stated a water manager on Wyoming's Green River. “Water will become tougher and tougher. You won't believe how hard this is going to get.” “You have to protect yourself from the world that's getting so much smaller.” A Grand County, Colorado county official observed, “it's always a challenge operating based on the past. The future is not going to be like the past.”

**a. A bright future?**

Our interviewees generally described the future of their agriculture and agricultural water as most positive where geographic and climatic conditions allow for highly productive agriculture with year-round, high-value commercial cropping. Water users with the most senior water rights are more cushioned from the uncertainties of an intensively used river and of supplies threatened by extended drought and predicted climate change. Though having urban areas nearby generally results in significant pressures from non-agricultural water demands, transportation and communication infrastructure also mean lower production and marketing costs. Significantly, it is in these areas that interviewees spoke more consistently of new generations of young people entering farming, ranching and related agribusiness.

“The future of agriculture here is very good” said a water manager in California’s Coachella Valley. “We are pretty well priced.... We have the perfect climate for growing crops all year round.” “Farmers in California have a bright future because of the need to feed the world—they are the most productive” remarked a Coachella Valley fruit grower. “Yuma has a lot of water, lots of sunshine, good and very good soils, and senior water rights” remarked an Arizona water attorney. A alfalfa grower in the Yuma area echoed this optimism:

we have 12 month a year agriculture here. Lots of places don't have that. We have good soil and climate...good access to the interstate highway We have lots of strengths and better potential for economic feasibility. I see the future as solid. We have a unified voice. Our water is staying here.

In Colorado, some ranchers and water managers on the Gunnison and Dolores River reported that production and agricultural water rights are stable and new generations of producers emerging. “We have a pretty stable family set-up, with young farmers coming



online” said a Dolores River water manager. An Animas River rancher explained that his family is planning for a new generation. “We've had a lot of discussions. We've structured our family organization legally to make sure land remains in agriculture. We're keeping the land open and in agriculture.”

Other interviewees were more cautiously optimistic but still upbeat about the future of agriculture and agricultural water. “People are getting a better idea of the importance of food. People across the country are still trying to keep food on the table. This is a way of life for farmers. It's in their blood” said a Nevada rancher on the Virgin River. “As long as we don't have a major drought or restriction, we should be able to keep prices reasonable. If the CAP doesn't increase its prices three times, Arizona agriculture can still keep going for 15-20 years. I'm optimistic there will continue to be agricultural water” stated a cotton grower. On Colorado's Crystal River, a rancher remarked, “I'm pretty optimistic by nature.” He continued,

the one thing that development has done here is it has created a local market for local demand and because it's fairly high end development, there's a lot of demand with dollars behind it for local foods. We sell all our calves, local grass fed beef and we get a premium for that. It's been very valuable. ...I hope there's always farming and ranching so at least land will be available for production. My crystal ball is cloudy. I have two girls, 23 and 26. I don't know what they'll do.

**b. An uncertain future?**

By contrast, in areas of the CRB where geographic, climatic and soil conditions pose higher obstacles to productivity such as shorter growing seasons and greater isolation from markets, agricultural water users face more formidable challenges in adapting to new water pressures. More of these interviewees expressed concern and sadness about the decline of agriculture in their regions and saw an uncertain future for their agricultural way of life and rural communities. Several spoke poignantly about their

children's decisions to seek their futures outside of agriculture. These decisions are driven by more diverse urban employment opportunities than in the past, declining profitability in many areas and barriers to entry posed by the high land and capital investment costs.

A rancher on Colorado's San Miguel River expressed apprehension about the future of agriculture and water in his area:

The future ? It's hard to see the future. I see ranching and farming as being harder and harder to do, not just here, but in all areas. There's pressure to take water off the Western slope to put it in the Colorado River Compact, to take more water off the Western slope to go to the Eastern slope where there are more people.

A rancher on Colorado's North Fork River shared similar fears about the impacts of trans-basin diversions. "There's an analogy used here. Western Colorado is sitting on the tracks between the Lower Basin and the Front Range. We expect to get run over. It's probably a matter of time and how that happens." On New Mexico's San Francisco River, a rancher predicted that her water supply would be restricted in future. "Our farming will go downhill if we don't do something to get the water. It's difficult to irrigate fields without enough water. Most ranchers around here feel the Forest Service agenda is to do away with ranchers, so they don't have to deal with us." On Utah's Spanish Fork River, a water manager said, "I fear for agriculture in our areas. Two cattle ranches went out of business and two firms that purchased grain have gone with them." A tribal water manager on Arizona's Gila River remarked, "most people are trying to talk kids out of farming. How do you then pass on the farm? Farmers are getting older and they don't have kids to take it over" said. He continued,

how do you stay in business? We're going to an economy in which we import all of our food. It's shortsighted. We are taking lots of ground out for subdivisions. Southern California and Yuma have a unique climate and infrastructure. They have winter lettuce and the oldest water rights. They're very senior in priority and the last to be cut. That makes a difference.

“We don’t really have a future here” said a rancher on Utah’s Virgin River.

Our canal company won’t exist in 20 years. The cities already have 40% of the [water] shares. They are holding the price up and it’s too expensive to stay into farming. Farmers have no other source to sell it to other than the cities, so it is inevitable that it will go for cities.

Whether they experience favorable or unfavorable conditions, envision a bright future or one of a struggle to preserve their farming way of life and communities, our interviewees across the CRB made it clear that they are not giving up. On the contrary, they expressed deep commitments to what is in many cases multi-generational investments in the land, water and agricultural way of life. They also expressed a strong commitment to finding ways to support a future for irrigated agriculture that can continue to provide safe and secure food for the nation.

### **c. Need to increase public support for agricultural water**

Many farmers and ranchers called for efforts to increase public understanding of and support for irrigated agriculture. Most members of the public, many of our interviewees told us, do not understand the multi-faceted and crucial contributions that irrigated agriculture makes to our society’s food system, economy and environment. A water manager on Arizona’s Gila River remarked:

We are being asked to produce more and more for our country: cotton, recreation, kitschy little towns with ice cream. riparian areas with birds to look at, nice places to hunt and camp, [enjoy] endless resources, ride motorcycles and act as an idiot. We're asked to do these things as a watershed, but we're not paid for it. There isn’t enough money to pay for all this stuff.

Many interviewees spoke about the need for the public to better understand the importance of domestic food security, which is in their view threatened by moves to take water out of the agricultural sector. “Folks are wanting water, water that is now being

used for agriculture. They don't seem to care when they go to market if their food is produced in the United States or not" complained an alfalfa grower on Arizona's Gila River. Municipalities are pressuring to use water for golf and swimming pools, a Green River water manager in Wyoming remarked. "Do they forget that you still have to sit down to eat three times a day? How you get that without agriculture?" "The nation that can't feed itself is worse than one that can't defend itself" insisted a Wyoming rancher. Interestingly, an Imperial Valley grain grower in California pointed out that few people understand that urban people use agricultural water too.

Almost everybody knows how much they use in their households. One acre-foot is needed for four families. No one knows how much more water they use indirectly when they sit down to eat....Three fourths of an acre foot per person per year is used indirectly in our own food consumption.

Some interviewees suggested that the public has begun to understand the importance of agriculture more than in the past. "A few years ago", remarked an Imperial Valley alfalfa grower, "we were being told that we could get food cheaper abroad. After 9/11, we see things have to be produced here to be safe and healthy." A rancher near Nevada's Virgin River agreed: "as food prices go up, they seem to be aware. The more we use good farm land for houses, the more difficult it will be to come up with land for food in the future."

Many interviewees spoke about the importance of irrigated agriculture to the economy. In some areas, as in California's Imperial and Coachella Valleys and Arizona's Yuma and Wellton-Mohawk areas, this importance is direct, via a significant contribution to GNP. But interviewees expressed concern that agriculture's indirect importance to the economy is not widely understood. In Colorado, a rancher on the Dolores River remarked that "it's really important for our community to figure out how important that water is for

our entire valley. They don't really.....They don't see how we're all tied together with the big commercial cattle and hay operations.”

Other interviewees spoke eloquently of irrigated agriculture's contribution to the environment and to the recreation sector. “We farmers are the first level of people concerned about the environment” insisted an alfalfa grower on Arizona's Gila River. “Ag people consider themselves environmentalists. We have to be. If we ruin our environment, we have nothing” agreed a rancher on Colorado's North Fork River. Beyond their commitment to stewardship, farmers and ranchers spoke of irrigated agriculture's contribution to the environment and recreation. “There is a huge community benefit to keeping these lands open and productive” argued a rancher on Colorado's Crystal River. “We produce crops, a view shed, a watershed, and a wildlife habitat. We only get paid when we sell our crop.” Wyoming water manager remarked that storage is

one of those things environmentalists don't understand, especially if they are newcomers. They look at what seems to be wild, free-flowing streams. Without the dam and reservoir, they wouldn't be seeing that stream running year-round.

A Gunnison River, Colorado rancher pointed out that there are “secondary benefits [of irrigated agriculture] that people don't understand, not just direct production, but wildlife habitat, aquifer replenishment, things like that.” As a Wyoming rancher on the Green River put it, “this is an oasis in the high desert. But God didn't make the oasis. It's man-made. It takes lots of water, diverted regularly in almost impossible quantities to keep it that way.” These open spaces and return flows that are also produced by irrigated agriculture are also key to recreation opportunities. “A lot of people rely on agriculture to provide open space. They don't realize that it doesn't come free. If open space is

important to you, agriculture should be important” argued an official in Grand County, Colorado.

## **6. The role of the land-grant university**

We asked our interviewees what, in their view, can land-grant universities charged with research, outreach and teaching missions do to help support agricultural water in the CRB? Many interviewees across the Basin reported having had positive interactions with the land grant universities in their areas, mainly through extension and Experiment Station activities related to agricultural water practices and irrigation technology improvements, crop-related science studies and trials, and educational and information dissemination programs. A few interviewees provided critiques of past and current university activities, sometimes expressing concerns that the land grant institution has moved away from its historic commitment to agriculture. Interestingly, although most of our open-ended questions about the agricultural water community’s challenges stimulated discussion of issues that were largely political, economic, social and cultural in nature, relatively few respondents had experience with universities helping with these issues. This suggests to us that land-grant universities have an opportunity to bring to bear new kinds of social science research and outreach on the problems facing agricultural water users and managers, in addition to their traditional strengths in natural science and more technical disciplines.

### **Research activities**

Many of our interviewees talked about positive benefits in the past with land grant university research directly related to agricultural production and irrigation technology.

For example, a Coachella Valley fruit grower reported working closely with University of California-Riverside on plant breeding, weather monitoring, and water quality problems. A water manager on Arizona's Gila River spoke of drawing on the University of Arizona for knowledge about new drip irrigation techniques appropriate for their river conditions. A Colorado rancher on the Gunnison talked about Colorado State University's past accomplishments in irrigation technology, most notably in developing the Parshall Flume. In California, an Imperial Valley grain grower remarked that universities are in a position to help test new irrigation technology and practices. "Farmers are economic animals" he said. "They respond to economics. They also avoid risk. Technology needs to be reliable, does it work? Farmers can adapt technology instantly when those conditions exist, or be skeptical." A New Mexico water manager on the San Juan River reported similar collaboration with New Mexico State University to educate farmers about new farming techniques. On Utah's Virgin River, a water manager spoke of university contributions through science:

Universities have done a lot for us in chemistry, biology, improving soil masses. Universities teach proper multiple uses of lands. It gets back to my Christian ethic. God said, 'Adam, multiply and replenish.' He did not say abuse it and use it up. The United States of all countries should be an example of quality range and watershed management.

### **Outreach activities**

Numerous respondents reported positive experiences with land grant university-based extension services. An Arizona tribal water manager on the Colorado River reported close involvement with University of Arizona extension services. "Extension has been very useful and helpful" he said. A New Mexico manager on the San Juan River reported helpful extension-organized hands-on training and education. An Imperial

Valley water manager remarked that extension agents have been assisting them with field metering and measuring techniques. “Extension often tries them first for the farmers” he said. A tribal water manager in Colorado remarked that “Extension matters! – we have not been kind to extension – technical outreach is really helpful.” “We’re looking for that expert” stated a water manager on Wyoming’s Green River. “More people come to a meeting if you have a person from the university there,” he continued. Others talked about collaboration with their land grant university’s experiment station. An Arizona water manager on the Gila River spoke of working closely with University of Arizona’s experiment station on practices appropriate for their unique soil and cropping situation. An alfalfa grower on Nevada’s Virgin river said he’d worked on alfalfa pests on the experiment station in Logandale. Finally, a rancher on Utah’s Virgin River reported he’d worked with Colorado State University’s experiment station in Loma, Colorado.

### **Education activities**

Many interviewees described past and current support of their land grant universities’ educational mission. Many are alumni or have children and grandchildren studying at the university. “The path to a good future is an educational process” remarked a Wyoming rancher on the Green River. A water manager on Wyoming’s Green River pointed to the university role in educating about changes in farming’s current direction. Several spoke of the benefits of university sponsorship of local 4H programs. “Yuma has a wonderful extension program” a cotton grower on Arizona’s Gila River said. “They do a lot of exposure [of agricultural issues] for urban kids and their families.” A rancher on Colorado’s Animas river described his local 4H program as “fantastic” and spoke the



program's "carcass contest" that educates young people on more healthy raising animal raising techniques.

### **Critique of the land grant university role**

Several interviewees, nevertheless, expressed concern about the land grant university's current direction. A Wyoming water manager talked about a past disconnect between the land grant university's research and the needs of water users, a situation that has improved recently, he said. A water manager on New Mexico's Gila River said that though his children were alumni, he felt the land grant universities are "always behind the curve." He remarked, "I haven't seen the progressiveness in land grant universities in these areas that I feel like needs to be provided, with leadership that would attract folks to say we need these folks to help us because they know what's going on and they can help us." Other interviewees commented that they believe that the land grant university has moved away from its historic commitment to agriculture. An Arizona cotton grower using CAP water reported:

When I was going to school in 1965-1970s, the University of Arizona played an important role in plant breeding, plant genetics. We've gotten away from that. There's not as much emphasis [on those problems] as before. To keep agriculture viable in Arizona, we need more research. We need new approaches. It all starts with universities. They need to get more involved in the field where the strong agricultural base is.

In similar fashion, a water manager on Utah's Green River reported that he studied at Utah State University, "the best school in the state." He commented that the university seemed to have forgotten its roots and focuses now on other areas such as engineering and business. He believed that the land grant university needs to play a major role in helping agriculture figure out how to deal with urban encroachment, and farming and water management methods appropriate to smaller operations and farm plots.

Several interviewees pointed out that problems with the land grant university are related to larger political and financial constraints. “Most of our state government is cutting back its monetary contribution [to the university]. They don’t see the benefits in increasing food production efficiency” commented an Imperial Valley, California grain grower. In Nevada, an alfalfa grower reported, “They tried to shut down the College of Ag at the University of Nevada. People rose up and stopped that.” The University’s new president, he continued, “wants to get agriculture going again.”

### **Interviewee suggestions for land grant universities**

Our interviewees offered suggestions for what research and outreach land grant universities may offer to better support agriculture and agricultural water. An Imperial Valley water manager spoke of the urgency of modernizing a one hundred year old irrigation system. He saw opportunities for the university to help test, implement and educate on new ideas. A rancher on Nevada’s Virgin River stated that support for improved seeds and fertilizer techniques that employ less intensive water application “to grow more with less water” would be beneficial. An Arizona nut grower using groundwater called for universities to help develop “new ways to increase efficiencies in water use that have a direct impact on cost.” An Animas River, Colorado rancher called for assistance with high-altitude agriculture. A Utah water manager on the Spanish Fork River, an alfalfa grower in the Imperial Valley and a water manager on Colorado’s Dolores River each pointed to the need for help with water conservation technology and techniques. “Right now, my board is keen on the issue of conservation” the latter said. “The time is ripe now if we had a structure to work more in depth with our farmers on these conservation issues.”

With regard to education, many interviewees called for a greater emphasis on educating young people and the public about agriculture and water, especially with regard to where their food and water come from. These suggestions emerged out of the conversations described above about the need to increase public understanding and support of irrigated agriculture's many contributions to the economy and the environment. A Wyoming rancher observed that young people are more environmental than before. Conservation easements and land transfers are transforming the way of life of rural communities, he said, but young people lack an agriculture point of view. Similarly, a New Mexico rancher on the San Francisco River remarked that "people don't realize how important agriculture and water are in their lives. It's about food and other products too, including toothpaste, lipstick and other things." A water manager on Wyoming's Little Snake River, interestingly, argued for a more generalized curriculum to prepare young people for understanding the complexity of our agricultural water challenges:

You need to understand water, water policy, the endangered species act, the public regulatory framework. To be successful, you have to build a broader program and have less specialization... We need people with broad perspectives to manage landscapes more with a generalized view. And we can hire a few specialized people as needed. Would this be difficult to fund? The money for this kind of thing should come from state allocations rather than research grants. There are huge benefits for masters and doctoral programs in a generalist approach.

### **Future opportunities for social science research, education and outreach**

Most of our interviewees spoke of social, political and economic pressures on their water and their operations. Yet very few had any experience with land-grant universities providing support in the study and development of responses to these threats. This could be viewed as a critique of the university's role, but it almost certainly also

highlights opportunities for land-grant universities to provide social science research and outreach support of agricultural water in an increasingly uncertain era.

Indeed, many interviewees identified specific needs for social science research and outreach. Several called for more research on the restructuring of agriculture, water and rural communities caused by increasing agriculture-urban water transfers, urban encroachment and demographic changes such as the rise of amenity or hobby farming. How might capacity be built at the local community level to help people deal with the social and cultural dimensions of such change? asked a Colorado water manager on the Dolores River. Other interviewees called for more attention to the relationship between the market and agricultural water. A Nevada alfalfa grower on the Virgin River remarked that elevated market prices for agricultural water lead urban water managers to conclude that “it’s a waste of water to raise alfalfa when the water could go into homes.” But, he stated, “we still have to eat....water is the valuable thing in the West. It’s driving everything.” On the other hand, a rancher on Wyoming’s Green River suggested that the market might help keep water in agriculture and called for investigation of the potential of regional payments for ecological services as a way to bring environmental and landowner interests together. Finally, several interviewees talked about the need to explore new opportunities for cooperation among diverse water users. “Each side has to understand the other and how to help each other” suggested a Grand County official in Colorado. “We’re trying to blend groups of really independent people who don’t travel. The land grant university can help with this.”

## **7. Concluding remarks**

The Addressing Water for Agriculture in the Colorado River Basin research initiative emerged out of our strong sense that current discussions of the future of Western water could benefit from greater understanding of agricultural water users' experiences and perspectives. Our interviews showed that many farmers across the CRB are feeling significant uncertainty about the security of their agricultural water supply and its future. This uncertainty is most evident among more junior rights holders and in areas where agriculture faces the greatest obstacles; nevertheless, even senior rights holders express concern about the future of the Colorado River.

The farmers, ranchers and agricultural water managers we interviewed talked most often about pressures they share in common, including extended drought, intensifying regulatory pressures, and increasingly diverse competing demands for water for municipal, environmental, recreation and other purposes. Our interviewees are responding actively to these pressures, for example, by seeking to develop additional storage, making technical improvements in their delivery systems, participating in market-based transfer and sharing arrangements, and working, often in highly innovative ways, to manage the competing interests of agricultural water's increasingly diverse stakeholders.

It's important to note that agricultural water users across the CRB are highly diverse. Their experiences of the pressures on their water and their responses to those pressures vary greatly according to factors such as the seniority of their water rights, the strength of their agricultural operations as shaped by geographic and climatic conditions, their proximity to urban areas, the challenge of a new generational transition and others.

This complexity and diversity of the agricultural water experience are defining features of the sector's challenges to seek to safeguard and support irrigated agriculture's many contributions while confronting the changing needs of the West's people and environments. Effective response strategies will need to take account of varying local contexts. However, the interviews also suggest strongly that that very complexity and diversity may also offer resources to draw upon, as they generate creative local capacity to manage change on the River effectively. A New Mexico water leader described his view of the task at hand:

we have an obligation to our kids, to our grandkids, to those who come after us, to ensure that that water is available. The greatest compliment we might get twenty, thirty, forty years down the road, will be the 'thank goodness that those folks were wise enough and ensured that this water was available for us to use today.'

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**Figure 1**  
**Land Grant University Partners**



**Figure 2**  
**Geographic Location of Interviewees**



NOTE: Points indicate where interviews were conducted with agricultural water managers, users and their respective agricultural water supply organizations.



**Figure 3**  
**Colorado River and tributaries**  
**represented in the interviews**

Animas River (Colorado)  
Central Arizona Project (Arizona)  
Coachella Canal (California)  
Colorado River main stem (Arizona, California, Colorado, Nevada)  
Crystal River (Colorado)  
Dolores River (Colorado)  
Gila River (Arizona, New Mexico)  
Green River (Utah, Wyoming)  
Gunnison River (Colorado)  
Little Snake River (Wyoming)  
North Fork River (Colorado)  
Pine River (Colorado)  
San Francisco (New Mexico)  
San Juan River (New Mexico)  
San Miguel River (Colorado)  
Spanish Fork River (Utah)  
Virgin River (Nevada, Utah)  
Yampa River (Colorado)