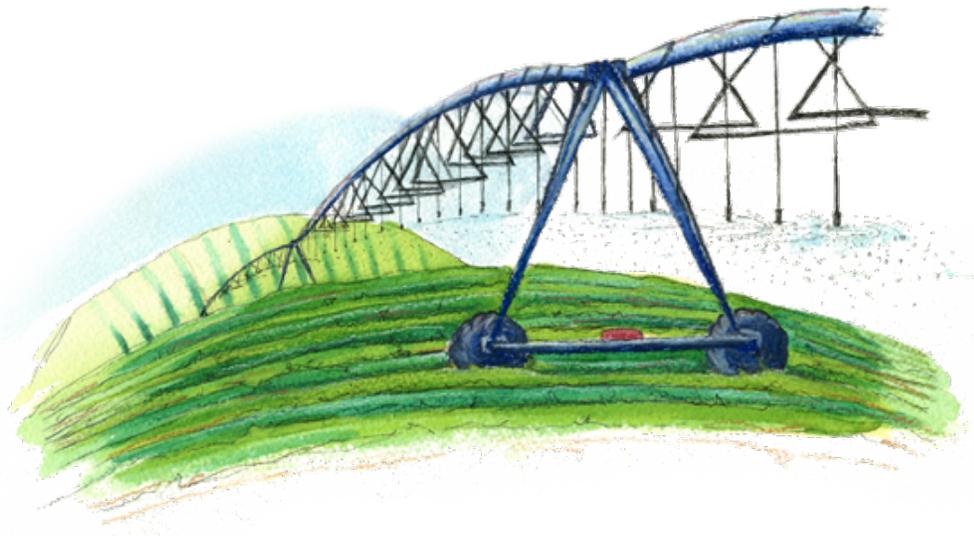


**UNDERSTANDING BELIEFS AND PREFERENCES OF IRRIGATORS TOWARDS
THE USE AND MANAGEMENT OF AGRICULTURAL WATER
IN THE COLORADO RIVER BASIN**

Ag Water User Survey Results
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OVERVIEW

In November 2012, an online survey was administered to agricultural (ag) water users in select counties of Arizona and Colorado who use water from the Colorado River system. Over 350 farmers and ranchers offered their opinions, beliefs, and preferences towards the following topics:

- pressures placed on ag water and their preferences for addressing pressures
- beliefs about water availability and management, storage, and water law/policy
- preferences for meeting future ag water demands
- their interest and involvement in temporary transfers arrangements and working cooperatively with other stakeholders
- how land-grant universities (LGUs) can best assist water users with the challenges they face

Response Rate

The survey was completed by 354 individuals (N=3,324), resulting in an 11 percent response rate. The three Colorado counties, Delta (n=107), Garfield (n=45), and Mesa (n=147) had an overall response rate of 10.7 percent. The three Arizona counties, LaPaz (n=1), Mohave (n=2), and Yuma (n=16) had an overall response rate of 3.4 percent. Thirty-six respondents did not report their zip code.

Demographics

Males were the primary operators of their farm/ranch (n=210), and 35 females indicated themselves as the primary operator of their farm/ranch. Sixty-eight operations have both a male and female as the primary operators. Forty-one respondents did not report their sex. The mean age of the primary operator was 61 years old (range= 20-91). On average, respondents have been farming/ranching for 27 years (range= 1-70), while previous generations of their family have been farming/ranching for 53 years on average (range= 0-250).

Across all respondents, 20 percent make their living by farming, 11 percent make their living by ranching, and 62 percent indicated that their farming/ranching operation provides a supplemental

income. Fifty percent of the respondents reported a gross value of all agricultural products sold from their primary operation in 2011 to be less than \$9,999. Twenty-four percent reported a gross value of products sold above \$50,000.

Eighty-seven percent of respondents own their water rights or ditch company shares and 12 percent use rented or leased water for their operation. Fifty-six percent of respondents are surface water users and 11 percent use groundwater as their primary source for irrigation.

Sixty percent of respondents use furrow irrigation and 26 percent use surface flooding as their primary method of irrigation. Twelve percent use solid set and permanent systems, 12 percent use sideroll sprinklers or other mechanical move systems, 18 percent use drip, trickle, or micro irrigation (including sub-surface drip) systems, and seven percent use a center pivot system. Only three percent use a subirrigation method.

Grass hay, pasture, and alfalfa were the predominant crops grown (n=217, 176, and 174 respectively) by survey respondents. In addition, nearly 30 percent (n=105) produce some type of fruit, nut, or vineyard crop and 18 percent produce vegetables (n=65). Cow-calf production and keeping/raising horses are the main types of livestock operations found in the region (n=104, n=100 respectively). Thirty-three feeding/fattening cattle operations were reported, along with 28 poultry, 19 stockers and yearlings, 19 sheep (including ewes and lambs), 13 back-grounding heifers, and 11 hog and pig operations. No dairy operations were reported. Other types of livestock operations reported by respondents included: elk, alpacas, bison, and honeybees.

STUDY FINDINGS

Agricultural Water Pressures

Study participants identified the different pressures they are experiencing on their ag water supplies. The top three included drought (87 percent), growing urban and suburban areas (65 percent), and local, state, and federal water policies and regulations (62 percent) The pressure that is being experienced the least is demand from the industry sector (20 percent), and 11 percent of respondents are not feeling any pressure on their ag water supply (Figure 1).

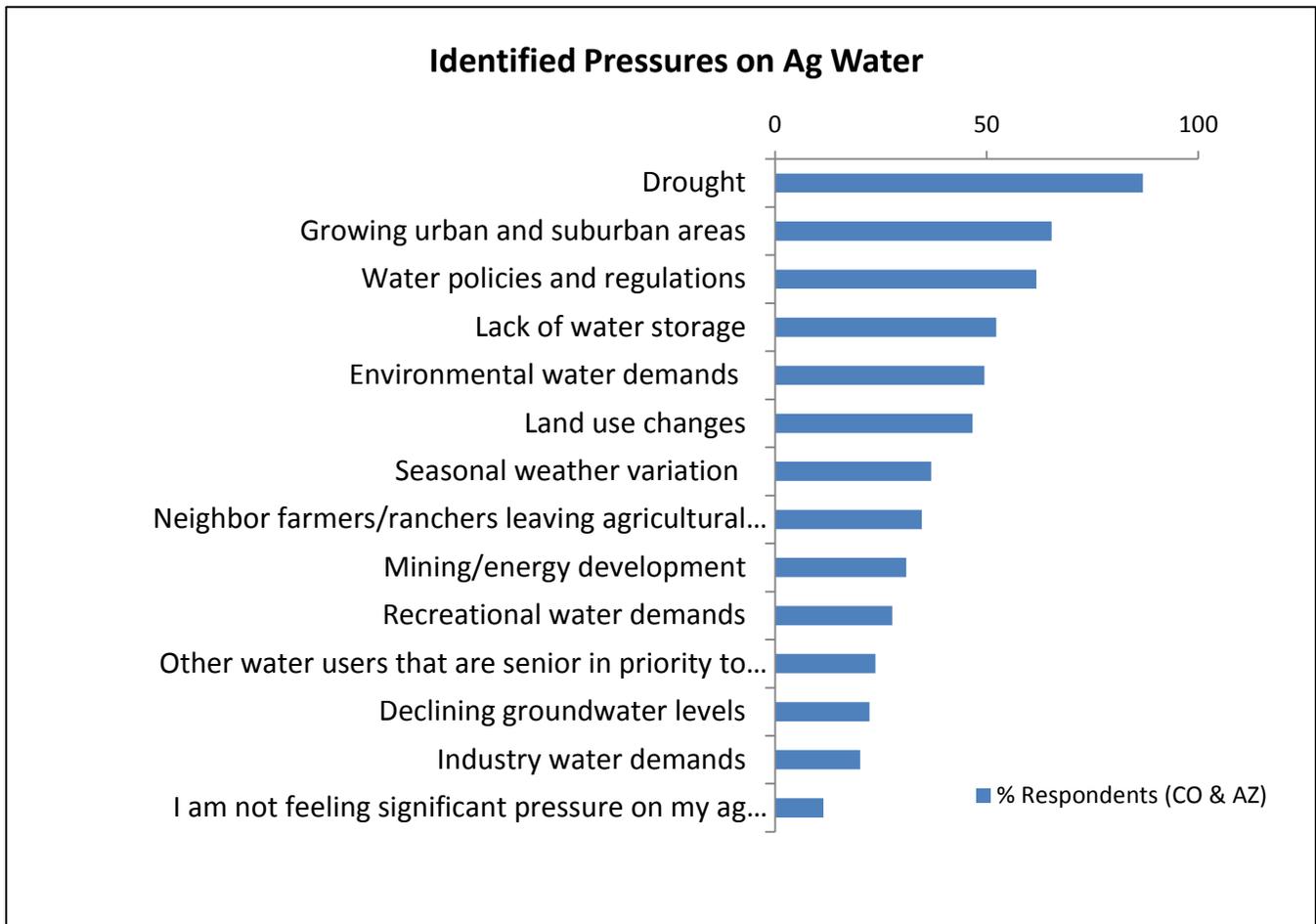


Figure 1. Percent of respondents indicating a particular pressure(s) is impacting the way they farm and/or ranch. Percent total is greater than 100% because survey respondents were allowed to indicate more than one selection.

The most prevalent option for responding to these identified pressures is to leave field(s) fallow (46 percent) in times when water is scarce. Secondly, producers would prefer to alter their water management practices (e.g., installing different irrigation equipment or implementing a new irrigation method) (42 percent). Thirty-six percent of producers would retire as a means of addressing the pressures they are facing. The least popular response to dealing with the pressures they are experiencing is to change their type of operation (Table 1).

Table 1. Options most likely pursued by survey respondents if their agricultural water availability were to significantly decrease due to drought or other pressures they might be experiencing. Percent total is greater than 100% because survey respondents were allowed to indicate more than one selection.

Response to Pressures	Percent (%)
Leave fields fallow	46
Alter water management (e.g., through different irrigation equipment or method)	42
Retire from farming/ranching	36
Explore opportunities to acquire and purchase more water	23
Plant different crops	21
Change the location of farm/ranch (buy or lease/rent land elsewhere)	13
Grow different varieties of the same crops	6
Change to a livestock operation	3
Change to a crop operation	2

Beliefs about Agriculture

Survey respondents were presented with a series of belief statements regarding agriculture in general. They were asked to indicate the extent to which they agreed or disagreed with the statements based on a scale of -2 (strongly disagree) to +2 (strongly agree). Overall, the survey respondents moderately believe their services are valued by the general public ($M=0.95$) and 77 percent strongly believe that ag plays a central role in their area. Almost half of the respondents indicated that there is a subsequent generation of their family with plans to continue their operation in the future (Table 2).

Table 2. Mean scores and percentages for beliefs about agriculture.

I believe ...¹	<i>M</i>¹	Disagree (%)	Neither (%)	Agree (%)
my services as a farmer/rancher are valued by the general public	0.95	16	8	77
agriculture no longer plays a central role in my area	-1.13	77	4	19
the influx of new people in my area is influencing how I manage my water	0.50	22	19	59
there is another generation of my family that plans to continue farming/ranching in the future	0.35	25	27	48

¹ Response ratings were coded on a 5 point scale ranging from -2 (strongly disagree) to +2 (strongly agree). *M* reflects the mean score on a -2 to +2 scale.

Overall percent (%) for Disagree, Neither and Agree may total more than 100% due to rounding.

Beliefs about Water Availability

Survey respondents were asked to agree or disagree with a series of belief statements regarding water availability and management. Sixty-eight percent of survey respondents agreed that there will not be sufficient water for ag in the future in the CRB ($M=0.73$) and 57 percent feel as though there will not be enough water for ag in their area ($M=0.38$). Respondents only moderately disagree that water will not be affordable in the future to continue their operation ($M=-.08$), but moderately agree that it is too expensive to adopt improved irrigation management practices ($M=.27$) (Table 3).

Table 3. Mean scores and percentages for beliefs about water availability and management.

I believe ...¹	<i>M</i>¹	Disagree (%)	Neither (%)	Agree (%)
there will not be enough water for ag <i>in the CRB</i> in the future	0.73	22	10	68
there will not be enough water for ag <i>in my area</i> in the future	0.38	31	12	57
water availability is not a concern on my farm/ranch at the present	-0.51	63	8	29
I hold senior water rights so I am not usually concerned about shortage of water	-0.31	46	28	27
I can't plan ahead since my water supply is too uncertain	-0.28	45	29	26
water will not be affordable in the future for me to continue my operation	-0.08	35	34	31
it is too expensive to adopt improved irrigation management practices	0.27	31	21	49
my water management is impacted by inadequate irrigation infrastructure	-0.03	38	24	38
the deliver time of my irrigation water is an issue I am concerned about	-0.07	38	29	33

¹Response ratings were coded on a 5 point scale ranging from -2 (strongly disagree) to +2 (strongly agree). *M* reflects the mean score on a -2 to +2 scale.

Overall percent (%) for Disagree, Neither and Agree may total more than 100% due to rounding.

Beliefs about Water Storage

Survey respondents were asked to agree or disagree with a series of belief statements regarding water storage. Seventy percent believe additional storage projects are needed and should be initiated in order to allow for better utilization of water resources. However, 59 percent feel as though existing storage should be expanded before initiating new storage. Almost three-quarters of respondents think it is possible for different sectors to work together to develop storage projects that meet multiple needs (Table 4).

Table 4. Mean scores and percentages for beliefs about water storage.

I believe ...¹	<i>M</i>¹	Disagree (%)	Neither (%)	Agree (%)
there is adequate water storage in my area and additional projects are not needed	-0.85	70	12	18
new storage projects should be initiated to allow for better utilization of the water	0.77	14	20	66
existing storage should be expanded before initiating new storage	0.64	13	29	59
it is possible for different sectors (such as ag, urban, and environmental) to work together to develop storage projects that meet multiple needs	0.80	13	14	73
storage projects are under appreciated for their value as a reliable year-round water supply	1.01	9	16	75
the return on investment is insufficient to pay for the costs of additional water storage	-0.27	44	30	27

¹Response ratings were coded on a 5 point scale ranging from -2 (strongly disagree) to +2 (strongly agree). *M* reflects the mean score on a -2 to +2 scale.

Overall percent (%) for Disagree, Neither and Agree may total more than 100% due to rounding.

Beliefs about Water Policy and Law

Survey respondents were asked to agree or disagree with a series of belief statements regarding water policy and law. Sixty percent of survey respondents believe that policymakers do not understand the importance of ag in their area ($M=-0.48$). Almost half of respondents moderately agree that current water law and administration allow them to make the best choices for their operation ($M=-0.18$) (Table 5).

Table 5. Mean scores and percentages for beliefs about water policy and law.

I believe ... ¹	M ¹	Disagree (%)	Neither (%)	Agree (%)
policy makers understand the importance of ag in my area	-0.48	60	7	33
current water law and administration allow me to make the best choices for my operation	0.18	30	24	47
there are too many water quality and quantity regulations already in place that make it difficult to manage my water	0.19	28	35	38

¹ Response ratings were coded on a 5 point scale ranging from -2 (strongly disagree) to +2 (strongly agree). M reflects the mean score on a -2 to +2 scale.

Overall percent (%) for Disagree, Neither and Agree may total more than 100% due to rounding.

When asked about water law and policy, several respondents agreed that current water law is sufficient and should not be changed. Others indicated that they would like to see less federal involvement from agencies including the U.S. Environmental Protection Agency and the U.S. Corp of Engineers in the process. Others agreed that policy needs to allow for water to remain in its basin of origin. Some examples of specific responses to the question “if you could change one aspect of water policy (at any level), what would it be” include:

“More involvement of the water users in managing the supply. If the water is there the users don't get involved, and should.”

- *Orchard farmer from Delta county, CO*

“The Colorado River Compact needs to be modified so upper basin states are required to deliver a percentage of annual flow, not a fixed amount. Drought years create an unfair burden on upper basin states.”

- *Rancher from Delta county, CO*

“I would prohibit the severing of water from productive agricultural land. I would prohibit the conversion of productive ag land to fuel crops. I would support farmers to utilize the most water efficient technologies and I would enable them to use the water they save through conservation.”

- *Producer from Delta county, CO*

“Current water law seems to be fine for our current operation. It would be valuable to all stakeholders if there were more flexibility. The law seems to discourage common sense. There should be more options for financial gains to transfer water use.”

- Farmer/Rancher from Garfield county, CO

Meeting Future Water Demands

Survey respondents shared their preferences for meeting future ag water demands in the basin. Water conservation and efficiency were ranked the highest (77 percent) and working towards public policy that supports keeping land and water in ag was ranked second highest (75 percent). Alternative water transfer methods (e.g., dry year leases, purchase lease back arrangements, rotational fallowing, and water banking) and deficit irrigation were ranked the lowest (14 percent and five percent respectively) (Table 6).

Table 6. Preferences for meeting future agricultural water demands. Percent total is greater than 100% because survey respondents were allowed to indicate more than one selection.

Preference	Percent (%)
Water conservation and efficiency	77
Public policy that supports keeping land and water in agriculture	75
New storage infrastructure	58
Expansion of existing storage infrastructure	43
Improved agricultural management practices	41
Technological innovations	34
Alternative water transfer methods	14
Deficit irrigation	5

Beliefs towards Water Transfers

Survey respondents were presented with a series of belief statements about the permanent and temporary transfer of ag water to non-ag water uses. Results indicated that 87 percent of respondents are opposed to the *permanent* transfer of water from ag to any other use and 78 percent are opposed to the *temporary* transfer of water from ag to any other use. Eleven percent have been involved in a

permanent or temporary transfer and only six percent are considering (or have considered) a transfer of their ag water right to a non-ag water user. Sixty eight percent are concerned about the possibility of losing their water right, even in a *temporary* transfer arrangement (Table 7).

Table 7. Mean scores and percentages for beliefs toward temporary and permanent water transfers.

I ... ¹	M ¹	Disagree (%)	Neither (%)	Agree (%)
am opposed to the permanent transfer of water from agriculture to any other use	1.46	9	4	87
am opposed to the temporary transfer of water from agriculture to any other use	1.06	14	9	78
am concerned about the possibility of losing my water right, even in a temporary transfer arrangement	0.88	14	18	68
have been involved in a permanent or temporary water transfer	-0.47	35	54	11
am considering (or have considered) a permanent or temporary transfer of my agricultural water right to a non-agricultural water user	-1.20	67	28	6

¹Response ratings were coded on a 5 point scale ranging from -2 (strongly disagree) to +2 (strongly agree). *M* reflects the mean score on a -2 to +2 scale.

Overall percent (%) for Disagree, Neither and Agree may total more than 100% due to rounding.

The top three barriers to *temporary* water transfers between ag and non-ag water users are lack of information regarding the advantages and disadvantages of water transfers (46 percent), state regulations, policies and/or laws (35 percent), and a temporary transfer doesn't make sense for an overall financial or management perspective (34 percent) (Table 8).

Table 8. Identified barriers to *temporary* water transfers between agricultural and non-agricultural water users. Percent total is greater than 100% because survey respondents were allowed to indicate more than one selection.

Barrier	Percent (%)
Lack of information regarding the advantages and disadvantages of water transfers	46
State regulations, policies, and/or laws	35
A temporary transfer doesn't make sense from an overall financial or management perspective	34
Length and complexity of administrative process	31
Federal regulations, policies, and/or laws	29
The amount of money offered to farmers and ranchers for their water	29
High transaction costs (for example, administrative fees, legal and engineering costs)	22

Examples of comments received by respondents regarding water transfers include:

“Temporary transfers set a precedence that the water isn't really needed and is ripe for the taking.”

- *Rancher from Yuma county, AZ*

“Make it easier to temporarily or permanently transfer water rights for recreational and/or environmental uses.”

- *Farmer from Delta county, CO*

“Concern that such transfers represent yet another attempt to weaken the farmer’s water right, perhaps in a way that cannot be appreciated at the outset. (i.e. setting a precedent that is, in the future, used to impose a new restriction on the farmer's water, or fostering a dependency on transferred water such appeals to the "greater good" make the transfer de facto permanent.”

- *Fruit/Vegetable farmer from Delta county, CO*

“Any temporary transfer of water rights creates a dependency that will result in future litigation.”

- *Farmer from Mesa county, CO*

“I have lived in the Rifle, CO area all my life, and my feelings are that if Denver needs more water, Dry Up the No. Platte, not the Colorado River. The flow of the Colorado continually gets less each year. I know that snow and rain fall has a factor, but Denver and the Front Range is the most contributing factor to this problem. The Colorado River is to flow to the West not East.”

- *Producer from Garfield County, CO*

Beliefs towards Water Banks

Survey respondents were presented with a series of belief statements about water banks. For purposes of this study, water banks are broadly defined as arrangements that facilitate the temporary and voluntary transfer of various types of surface, groundwater, and storage entitlements based on market conditions.

Twenty-seven percent of respondents are familiar with the concept of a water bank; however, 48 percent indicated they are not familiar with the concept and 50 percent are interested in learning more

about them. Only four percent indicated they would be willing to participate in a water bank. Sixty-two percent indicated that they are concerned about the possibility of losing their water right if they were to participate in a water bank and 67 percent are concerned that agriculture in their area would be jeopardized if other agricultural water users were to participate in a water bank (Table 9).

Table 9. Mean scores and percentages for beliefs towards water banks.

I ... ¹	<i>M</i> ¹	Disagree (%)	Neither (%)	Agree (%)
I am familiar with the concept of a water bank	-.41	48	25	27
I am interested in learning more about water banks	.23	28	22	50
I would be willing to participate in a water bank	-.50	57	39	4
I have been involved in water bank	-.99	35	54	11
I am concerned about the possibility of losing my water right if I were to participate in a water bank	.80	14	24	62
I am concerned that agriculture in my area would be jeopardized if other farmers/ranchers were to participate in a water bank	.88	12	21	67

¹Response ratings were coded on a 5 point scale ranging from -2 (strongly disagree) to +2 (strongly agree). *M* reflects the mean score on a -2 to +2 scale.

Overall percent (%) for Disagree, Neither and Agree may total more than 100% due to rounding.

The main barriers for agricultural water users to participate in a water bank include not wanting to move water out of agriculture (67 percent), lack of information regarding the advantages and disadvantages of water banks (46 percent), state regulations, polices, and laws (23 percent), and length and complexity of administrative process (also at 23 percent) (Table 10).

Table 10. Identified barriers to agricultural water users participating in a water bank. Percent total is greater than 100% because survey respondents were allowed to indicate more than one selection.

Barrier	Percent (%)
I do not want to move water out of agriculture	67
Lack of information regarding the advantages and disadvantages of water banks	46
State regulations, policies, and/or laws	23
Length and complexity of administrative process	23
Federal regulations, policies, and/or laws	22
High transaction costs	17
I do not want to depend on the market to get the best price for my water	16
I farm high value perennial crops	16
Loss of market share for commodities	13

Examples of comments received by respondents regarding water banks include:

“I have seen how transfer of agricultural water to other uses (as has happened in the Arkansas Valley of CO and the San Luis Valley) has had permanent negative effects on agricultural use.”

- *Rancher from Delta county, CO*

“I think water banks are just a step closer to having ag water rights removed from the farmers.”

- *Rancher from Delta county, CO*

“With an average rain fall of 8 inches we don't have this option”

- *Farmer from Mesa county, CO*

“I think a water bank will set a precedence that will make it easier for politicians and developers to seize water rights for public growth in agriculture areas.”

- *Rancher from Colorado River Basin*

“Once another entity is involved, there is going to be more red tape and regulations so that others may take a piece of the pie.”

- *Farmer from Mesa county, CO*

“Our farming is very predictable and so is our water needs. we do not have the ability to pick and choose when we water the crops, the crops dictate the schedule so i am not sure what good a water bank would do me.”

- *Farmer from Yuma county, AZ*

Working Cooperatively with Non-agricultural Stakeholders

Respondents indicated the extent to which they agreed or disagreed to a series of statements about their current level of involvement and willingness to work cooperatively with other ag and non-ag stakeholders (such as urban and environmental) to address water issues (Table 11). The data indicates that 58 percent recognize the fact that they need to coordinate with other sectors in order to stretch limited water supplies. In fact, 66 percent believe ag and environmental stakeholders share many of the same interests, such as preserving open space and wildlife habitat, and think they need to find a way to

work together to manage water supplies for mutual benefit. Fifty-three percent are active in making decisions in their local irrigation district/ditch company and over half of respondents feel as though farmers and ranchers in their area have been able to effectively organize and cooperate with each other to deal with existing and/or anticipated pressures on their ag water. Twenty-five percent have been involved in some type of collaborative process with a non-ag stakeholder.

Table 11. Mean scores and percentages for current level of involvement and willingness to work cooperatively with other agricultural and non-agricultural stakeholders.

I believe ...¹	<i>M</i>¹	Disagree (%)	Neither (%)	Agree (%)
farmers and ranchers in my area have been able to effectively organize and cooperate with each other to deal with existing and/or anticipated pressures on our agricultural water	0.23	29	19	53
I am active in making decisions in my local irrigation district/ditch company	0.43	23	24	53
the agricultural sector should coordinate with other sectors (such as municipal, industrial, and energy) to stretch limited water supplies	0.33	28	14	58
agricultural and environmental stakeholders share many of the same interests, such as preserving open space and wildlife habitat. I think we need to find a way to work together better to manage our water supplies for mutual benefit.	0.65	21	13	66
I have been involved in some type of collaborative process with non-agricultural stakeholders	-0.32	40	35	25

¹ Response ratings were coded on a 5 point scale ranging from -2 (strongly disagree) to +2 (strongly agree). *M* reflects the mean score on a -2 to +2 scale.

Overall percent (%) for Disagree, Neither and Agree may total more than 100% due to rounding.

The three main barriers preventing cooperation between different water users for developing solutions that address competing demands are diverse views about how water should be allocated or managed, competition for resources (e.g., land, water, and capital), and conflicting federal, state, and local water policies (Table 12).

Table 12. Barriers to cooperation between different water users for developing solutions that address competing demands. Percent total is greater than 100% because survey respondents were allowed to indicate more than one selection.

Barrier	Percent (%)
Diverse views about how water should be allocated or managed	70
Competition for resources (for example, land, water, and capital)	49
Conflicting federal, state, and local water policies	35
Lack of effective leadership to get organized	33
Some parties end up resorting to litigation	32
Different types of water rights holders (for example, senior, junior)	31
Different types of irrigation and production practices	29
Location (in the state, basin, valley, etc.)	28
Limited financial resources	28
Different types of water users (for example, surface water, groundwater)	28
Limited time	16

Respondents agreed that cooperation between ag and non-ag water stakeholders is best accomplished at the water district or basin level (32 percent and 20 percent respectively). Only 12 percent agree that cooperation is most effective at the state level.

The Role of Land-Grant Universities

The survey asked how LGUs can best assist farmers and ranchers with the challenges they face. The data largely indicated that there is a need for LGUs to educate the general public about ag water use (77 percent) and to provide research, outreach, and assistance with ag water conservation (58 percent) (Table 13).

Table 13. Types of assistance land-grant universities can provide ag water users to help address the challenges they face or will face in the future. Percent total is greater than 100% because survey respondents were allowed to indicate more than one selection.

Type of Land-grant University Assistance	Percent (%)
Educate the public on ag water use	77
Provide research, outreach and assistance with ag water conservation	58
Share what has been successful to collaboratively address water issues	51
Provide research, outreach, and assistance with alternative water transfer arrangements between ag and non-ag water users (i.e. dry year leases, purchase lease back arrangements, deficit irrigation, rotational fallowing, water banks)	38
Organize focused discussion groups with other ag and non-ag stakeholders	29

Open Ended-Responses

The following opinions were shared by respondents throughout the survey regarding several different topics. The concern that was raised most frequently is that our society is not prioritizing the best use of our water resources. Respondents indicated that once non-ag sectors demonstrate that they are using their water in the most efficient and productive way, they will then be open to discussions regarding the use of ag water for other beneficial uses. Two specific quotes received include:

“I know I will be pushed out of my ranch operation within the next ten years if water is not allocated to farm and ranch operations BEFORE it is allowed to be used to water yards.”

- *Rancher from Mesa county, CO*

“When conservation measures (i.e. low flow toilets, xeriscaping, fixing the leaks, etc.) have been mandated, implemented and exhausted, then come talk to me about transferring water. I am unlikely to be receptive to pleas for additional water to fill swimming pools and hot tubs, or to keep Kentucky Bluegrass alive in the desert.”

- *Fruit/Vegetable farmer from Delta county, CO*

Many respondents voiced their dissatisfaction towards environmental regulations and their hindrance to developing water projects. Specifically mentioned were the U.S. EPA and the U.S. COE. Many feel as though these agencies’ policies should not undermine local decision making. Survey respondents stated:

“The environmental groups need to also be willing to work with us, and in my experience, that is simply not the case. They have a very extreme agenda and they are quite unwilling to compromise in the least.”

- *Farmer from Garfield county, CO*

“The structure of Colorado water law (prior appropriation doctrine) makes it very difficult to achieve consensus in the agricultural community. The environmental community simply resorts to litigation or threat thereof.”

- *Organic vegetable farmer from Delta county, CO*

“Environmental regulation has gotten entirely out of control. Federal and state agency regulations often conflict and the cost of meeting the myriad regulatory requirements for any project, whether rehabilitation of existing structures or new construction, is simply staggering. The EPA and US Army Corps of Engineers are the absolute worst offenders, and I can provide the contact information for a myriad of city and county officials, engineers, water resource consultants, and irrigation companies that will echo my sentiment and provide a staggering number of first-hand examples.”

- *Farmer from Garfield county, CO*

A fourth concern that was expressed was the increasing demand of water used for oil and gas development and its potential impact on water quality. Some respondents feel as though water used for oil shale development could eventually consume the majority of water that is currently used for irrigation. One survey respondent indicated:

“The biggest threat to our water is oil and gas development, followed closely by urban sprawl and attempts to buy water and move it from the western slope to the eastern slope. We need this to be stopped completely before it destroys agriculture in our area.”

- *Farmer/Rancher from Delta County, CO*

Water quality issues, mainly increased salinity and silt concentrations were another issue expressed by respondents. Survey participants stated:

“The salinity of the water is getting worse, with the drought, and the increased usage from the eastern slope. Since there is so much sulphur in the water from Glenwood Springs, and reduced flows in the river, we will continually see the water quality go down and affect our agricultural practices in a negative way.”

- *Vegetable farmer from Mesa county, CO*

“The specific irrigation system from which I receive my water is in jeopardy due to a silt problem in the reservoir. There has been much discussion about possible solutions to this problem with the Paonia reservoir and the Fire Mountain Canal, but nothing viable has so far been discovered. Many farmers and ranchers in this area depend upon a solution in order to preserve their lifestyle and livelihood.”

- *Producer from Delta county, CO*

Comments regarding the future of agriculture in the CRB were wide-ranging from hopeful to doubtful. The following are a few examples of both:

“I have been fortunate to be able to farm under the Colorado River system for these many years. I have been able to raise a family on a small operation that was possible to farm year round with a variety of crops. I sincerely hope that there is no great drought in the future, but come what may I have seen the two basins over these years come together to manage the River in an outstanding way.”

- *Farmer from Yuma county, AZ*

“The Colorado River Basin is in serious trouble. For far too long we've fooled ourselves about how much water was actually available for all the uses that are demanded on by numerous entities. The future looks very bleak without a day of reckoning that addresses actual water available versus water that is demanded or filed on and expected to be there upon demand.”

- *Producer from Mesa county, CO*

“New people in my area do not understand the issues surrounding water in the West.”

- *Farmer/Rancher from Garfield county, CO*

“Without the availability of water for crop production, I believe that surrounding communities would indeed suffer at least to a degree of slowly dying out.”

- *Farmer from Yuma county, AZ*

“We need infrastructure built. Not studies that take waste limited money or are just used as PR events. This is nationwide problem hay prices here are affected by problems from other areas. Time is not on our side we need to start a piping network ASAP. Those flood waters could help areas to maintain farming.”

- *Rancher from Mohave county, AZ*

“My area has senior water rights on the Colorado River. So unless politicians make shady deals we are fine.”

- *Rancher from Yuma county, AZ*

“I hope there is sufficient water for our next generations to continue farming and ranching. We feel environmentalists have more influence on water usage or non-use than people that have been here for generations that have produced and cared for land.”

- *Farmer from Mesa county, CO*

CONCLUSION

The results of this study indicate that agricultural water users face a myriad of pressures on their water supplies with drought and urban growth topping the list. A majority of participants agree that there will not be enough water for agriculture in their area, or in the CRB. Most agree that more water storage is needed to address uncertainty; however, new storage projects should be expanded before initiating new projects. The data indicates strong opposition towards agricultural water transfers, even those of temporary nature due to the concern of possibly losing their water right. The same holds true for water banks and respondents are interested in learning more about them. Overall, agricultural water users agree that they need to partner with non-agricultural water users (preferably at the district or basin level) in order to address the challenges they face or will face in the future. Moreover, survey respondents believe agricultural and environmental stakeholders share many of the same interests, such as preserving open space and wildlife habitat, and they should find a way to work together to manage water supplies for mutual benefit.

When implementing changes in water management, policy, or developing cooperative partnerships with other water stakeholders, it will be extremely important to consider their salient beliefs throughout the process.

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Welcome

Dear Agricultural Water User,

We would like your help. You have been randomly selected from a national agricultural statistic database to provide your insights on the future of water for agriculture in the Colorado River Basin. The USDA has funded this study to better understand:

- what you think about the current and future state of your water supplies and the associated challenges you are or might be facing
- your opinions as how to address competing water demands and whether there might be opportunities to find solutions with other stakeholders
- what changes in water policy would help you to make decisions that are best for your operation and community
- your interest and involvement in temporary water transfers or other mechanisms that may be useful in keeping irrigated agriculture viable in the Colorado River Basin
- whether you feel land-grant universities can better assist you with the agricultural water challenges you confront

The respondent to this survey should be the person responsible for making water management decisions on your farm/ranch. If you are not this person, we kindly request that you pass it along to the appropriate person in your operation. No personal or identifiable information will be collected and your responses will be summarized with others' responses in our reports.

The survey will take no more than 30 minutes to complete. You are encouraged to complete the entire survey; however, you may choose to skip any questions that you do not wish to answer. Results from this survey will be summarized and posted on the project's website www.CRBwater.colostate.edu in the spring of 2013.

Thank you in advance for your time and participation.

Sincerely,

Dr. Reagan Waskom
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Colorado State University
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Dr. Sharon B. Megdal
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ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

If you have questions about your rights as a participant in this study, please contact Janell Barker, CSU Institutional Review Board Coordinator at 970-491-1655 or at janell.barker@colostate.edu

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

1. Does your operation use water from the Colorado River system for agricultural purposes?

- Yes
- No (by selecting 'No' you will be able to exit the survey upon clicking the NEXT button below).
- I don't know

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Opinions About Irrigated Agriculture

2. Your opinions about agriculture on your farm, in your community, and throughout the Colorado River Basin are important to address agricultural water challenges. Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Moderately Disagree	Neither	Moderately Agree	Strongly Agree
As a farmer/rancher, I believe my services are valued by the general public	<input type="radio"/>				
Agriculture no longer plays a central role in my area	<input type="radio"/>				
The influx of new people in my area is influencing how I manage my water	<input type="radio"/>				
There is another generation of my family that plans to continue farming/ranching in the future	<input type="radio"/>				

Please share any comments you may have regarding agricultural water or agriculture in general

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Pressures on Agricultural Water

3. Please check any of the following boxes that identify pressures you believe may be impacting the way you farm/ranch.

- Local, state, and/or federal water policies and regulations
- Lack of water storage
- Drought
- Seasonal weather variation (for example, earlier planting of crops, changes in the time of water delivery)
- Land use changes
- Growing urban and suburban areas
- Mining and energy development
- Industry water demands
- Recreational water demands (for example, fishing and rafting)
- Environmental water demands (including endangered species)
- Declining groundwater levels
- Neighbor farmers/ranchers leaving agricultural production
- Other water users that are senior in priority to me
- I am not feeling significant pressure on my agricultural water

Other (please specify)

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

4. If your agricultural water availability were to significantly decrease due to drought or other pressures you might be experiencing, which of the following options would you most likely pursue (you can select more than one)?

- Plant different crops
- Grow different varieties of the same crops
- Leave fields fallow
- Alter water management (for example, through different irrigation equipment or method)
- Explore opportunities to acquire and purchase more water
- Change to a livestock operation
- Change to a crop operation
- Change the location of farm/ranch (buy or lease/rent land elsewhere)
- Retire from farming/ranching
- None of the above

Other (please specify)

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Opinions About Irrigation Water Security and Management

5. Please share your opinions about your irrigation water security and management by indicating the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Moderately Disagree	Neither	Moderately Agree	Strongly Agree
There will be enough water for agriculture in the Colorado River Basin in the future	<input type="radio"/>				
There will be enough water for agriculture in my area in the future	<input type="radio"/>				
At present, water availability is not a concern on my farm/ranch	<input type="radio"/>				
I hold senior water rights so I am not usually concerned about a shortage of water	<input type="radio"/>				
I can't plan ahead since my water supply is too uncertain	<input type="radio"/>				
Water will not be affordable in the future for me to continue my operation	<input type="radio"/>				
It is too expensive to adopt improved irrigation management practices	<input type="radio"/>				
My water management is impacted by inadequate irrigation infrastructure	<input type="radio"/>				
The delivery time of my irrigation water is an issue I am concerned about	<input type="radio"/>				

Please share any comments you may have regarding the security of your irrigation water

6. What water management improvements have you made (if any) at your operation within the past five years (for example, new/different irrigation scheduling, equipment, diversion structures, or monitoring devices)?

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Meeting Future Water Demands

7. When you think about future agricultural water supplies in your area, what mechanism(s) do you think farmers/ranchers should most rely on to help keep irrigated agriculture viable?

- New storage infrastructure
- Expansion of existing storage infrastructure
- Water conservation and efficiency
- Deficit irrigation
- Public policy that supports keeping land and water in agriculture
- Alternative water transfer methods (for example, dry year leases, purchase lease back arrangements, rotational fallowing, water banking)
- Technological innovations
- Improved agricultural management practices
- None of the above

Other (please specify)

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Opinions About Water Storage

8. Please share your opinions about water storage by indicating the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Moderately Disagree	Neither	Moderately Agree	Strongly Agree
There is adequate water storage in my area and additional projects are not needed	<input type="radio"/>				
New storage projects should be initiated to allow for better utilization of the water	<input type="radio"/>				
Existing storage should be expanded before initiating new storage	<input type="radio"/>				
It is possible for different sectors (such as agriculture, urban, and environmental) to work together to develop storage projects that meet multiple needs	<input type="radio"/>				
Storage projects are under appreciated for their value as a reliable year-round water supply	<input type="radio"/>				
The return on investment is insufficient to pay for the costs of additional water storage	<input type="radio"/>				

Please share any comments you may have regarding water storage

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Opinions About Water Transfers

9. Please share your opinions about the permanent or temporary transfer of agricultural water to non-agricultural water uses by indicating the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Moderately Disagree	Neither	Moderately Agree	Strongly Agree
I am opposed to the permanent transfer of water from agriculture to any other use	<input type="radio"/>				
I am opposed to the temporary transfer of water from agriculture to any other use	<input type="radio"/>				
I have been involved in a permanent or temporary water transfer	<input type="radio"/>				
I am considering (or have considered) a permanent or temporary transfer of my agricultural water right to a non-agricultural water user	<input type="radio"/>				
I am concerned about the possibility of losing my water right, even in a temporary transfer arrangement	<input type="radio"/>				

Please share any comments you may have regarding water transfers

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

10. What do you think are the main barriers to temporary water transfers between agricultural and non-agricultural water users?

- State regulations, policies, and/or laws
- Federal regulations, policies, and/or laws
- High transaction costs (for example, administrative fees, legal and engineering costs)
- Length and complexity of administrative process
- Lack of information regarding the advantages and disadvantages of water transfers
- The amount of money offered to farmers and ranchers for their water
- A temporary transfer doesn't make sense from an overall financial or management perspective
- None of the above

Other (please specify)

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Opinions About Water Banks

11. Transfer of water among agricultural and non-agricultural users can also be accomplished through a water bank. For purposes of this study, water banks are broadly defined as arrangements that facilitate the temporary and voluntary transfer of various types of surface, groundwater, and storage entitlements based on market conditions.

Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Moderately Disagree	Neither	Moderately Agree	Strongly Agree
I am familiar with the concept of a water bank	<input type="radio"/>				
I am interested in learning more about water banks	<input type="radio"/>				
I would be willing to participate in a water bank	<input type="radio"/>				
I have been involved in a water bank	<input type="radio"/>				
I am concerned about the possibility of losing my water right if I were to participate in a water bank	<input type="radio"/>				
I am concerned that agriculture in my area would be jeopardized if other farmers/ranchers were to participate in a water bank	<input type="radio"/>				

Please share any comments you may have regarding water banks

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

12. What would keep you from participating in a water bank?

- State regulations, policies, and/or laws
- Federal regulations, policies, and/or laws
- High transaction costs
- Length and complexity of administrative process
- Loss of market share for commodities
- Lack of information regarding the advantages and disadvantages of water banks
- I do not want to depend on the market to get the best price for my water
- I farm high value perennial crops
- I do not want to move water out of agriculture
- None of the above

Other (please specify)

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Water Law and Policy

13. Please share your opinions about water policy, law, and administration and how they affect the decisions you make about your water by indicating the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Moderately Disagree	Neither	Moderately Agree	Strongly Agree
Policymakers understand the importance of agriculture in my area	<input type="radio"/>				
Current water law and administration allow me to make the best choices for my operation	<input type="radio"/>				
There are too many water quality and quantity regulations already in place that make it difficult to manage my water	<input type="radio"/>				

Please share any specific examples you may have of regulations impacting your ability to exercise your water rights

14. If you could change one aspect of water policy (at any level), what would it be?

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Working with Other Stakeholders

15. Please share your opinions about working with other agricultural and non-agricultural stakeholders (such as urban and environmental) to address agricultural water issues. Indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Moderately Disagree	Neither	Moderately Agree	Strongly Agree
Farmers and ranchers in my area have been able to effectively organize and cooperate with each other to deal with existing and/or anticipated pressures on our agricultural water	<input type="radio"/>				
I am active in making decisions in my local irrigation district/ditch company	<input type="radio"/>				
The agricultural sector should coordinate with other sectors (such as municipal, industrial, and energy) to stretch limited water supplies	<input type="radio"/>				
Agricultural and environmental stakeholders share many of the same interests, such as preserving open space and wildlife habitat. I think we need to find a way to work together better to manage our water supplies for mutual benefit.	<input type="radio"/>				
I have been involved in some type of collaborative process with non-agricultural stakeholders	<input type="radio"/>				

Please share any comments you may have regarding working with other agricultural and non-agricultural stakeholders

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Working with Other Stakeholders

16. What do you think are the main barriers preventing cooperation between different water users for developing solutions that address competing demands?

- Conflicting federal, state, and local water policies
- Limited time
- Limited financial resources
- Lack of effective leadership to get organized
- Competition for resources (for example, land, water, and capital)
- Diverse views about how water should be allocated or managed
- Different types of water users (for example, surface water, groundwater)
- Different types of water rights holders (for example, senior, junior)
- Different types of irrigation and production practices
- Location (in the state, basin, valley, etc.)
- Some parties end up resorting to litigation
- None of the above

Other (please specify)

17. At which level do you think cooperation between agricultural and non-agricultural water stakeholders would be most effective?

- Ditch
- District
- Valley
- Basin
- State

Other (please specify)

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Working with Land-Grant Universities

18. We would like to know how you think land-grant universities (such as the University of Arizona and Colorado State University) can best assist farmers/ranchers with the challenges they are facing, or will be facing with their water. Please check one or more of the following that you think your land-grant university may be able help with.

- Organize focused discussion groups with other agricultural and non-agricultural stakeholders
- Share what has been successful to collaboratively address water issues
- Provide research, outreach, and assistance with alternative water transfer arrangements between agricultural and non-agricultural water users (i.e. dry year leases, purchase lease back arrangements, deficit irrigation, rotational fallowing, water banks)
- Provide research, outreach and assistance with agricultural water conservation
- Educate the public on agricultural water use
- None of the above

Please specify other ways in which you feel your land-grant university researchers, educators, Extension agent/staff can assist you with your agricultural water

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Background Information About You and Your Operation

Lastly, we would like to know a little more about your background to better understand your opinions. You may skip any of the following questions that you do not feel comfortable answering.

19. Please check one or more of the following that best describe what type of water user you are.

- I own the water rights or ditch company shares I use to farm/ranch
- I use rented/leased water to farm/ranch
- I am a surface water user
- I am a groundwater user

Other (please specify)

20. Please check one or more of the following irrigation methods you currently use.

- Surface flood
- Controlled flood (between borders or within basins)
- Furrow irrigation
- Center pivot sprinkler
- Solid set and permanent systems
- Sideroll sprinkler or other mechanical move systems
- Drip, trickle, or micro-irrigation, including sub-surface drip
- Subirrigation (water seepage, or use of a drainage system to maintain aquifer table at a predetermined depth)

Other (please specify)

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Background Information About You and Your Operation

21. Please check each crop type you typically grow.

- | | |
|---|---|
| <input type="checkbox"/> Alfalfa | <input type="checkbox"/> Cotton |
| <input type="checkbox"/> Grass hay | <input type="checkbox"/> Rice |
| <input type="checkbox"/> Pasture | <input type="checkbox"/> Sorghum |
| <input type="checkbox"/> Wheat | <input type="checkbox"/> Other small grains (barley, oats, rye, etc.) |
| <input type="checkbox"/> Beans | <input type="checkbox"/> Vegetables (onions, carrots, potatoes, melons, etc.) |
| <input type="checkbox"/> Corn for grain or seed | <input type="checkbox"/> Fruit, vineyards, and nuts |
| <input type="checkbox"/> Corn for silage | <input type="checkbox"/> Trees/ornamental/turf |
| <input type="checkbox"/> Sweet corn | <input type="checkbox"/> I do not grow crops |

Other (please specify)

22. Please check each commercial livestock enterprise that you typically operate.

- | | |
|---|---|
| <input type="checkbox"/> Cow-calf | <input type="checkbox"/> Sheep (ewes and lambs) |
| <input type="checkbox"/> Backgrounding heifers | <input type="checkbox"/> Hogs and pigs |
| <input type="checkbox"/> Dairy | <input type="checkbox"/> Goats |
| <input type="checkbox"/> Stockers and yearlings | <input type="checkbox"/> Poultry (all types) |
| <input type="checkbox"/> Feeding/fattening cattle | <input type="checkbox"/> Keep/raise horses |
| <input type="checkbox"/> Feeding/fattening lambs | <input type="checkbox"/> I do not participate in a livestock enterprise |

Other (please specify)

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Background Information About You and Your Operation

23. Over the past few years, what percent (%) of your land has typically been under some form of irrigation?

Irrigated land owned

Irrigated land rented or leased from others (including federal, state, and railroad land)

Irrigated land rented or leased to others (including federal, state, and railroad land)

24. Over the past few years, what percent (%) of the following land types have been under some form of irrigation?

Cropland

Pastureland

Orchard

Other

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Background Information About You and Your Operation

25. The primary work that provides income for my family is (select all that apply):

- Farming
- Ranching
- My farm and/or ranch activities provide a supplemental income and are not the source of my primary income

Other (please specify)

26. What was the gross value of all agricultural products sold from your primary operation in 2011?

- \$0-\$9,999
- \$10,000 - \$24,999
- \$25,000 - \$49,999
- \$50,000 - \$99,999
- \$100,000 - \$249,000
- \$250,000 - \$499,999
- \$500,000 - \$999,999
- Over \$1,000,000

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Background Information About You and Your Operation

27. What is the zip code and county of your operation that uses water originating from the Colorado River for agricultural purposes?

Zip code

County

28. About how many years have you been farming/ranching your operation?

Years you have been farming/ranching

Years previous generations of your family have been farming/ranching

29. What is the age of the primary operator of your farm or ranch?

Age of primary operator

Age of additional primary operator

30. Is the primary operator(s) of your farm/ranch male or female (select all that apply)?

- Male
- Female

ADDRESSING WATER FOR AGRICULTURE IN THE COLORADO RIVER BASIN

Additional Thoughts

31. We sincerely appreciate the time and effort you have put into completing this survey. If you have any additional thoughts or comments about the questions or topics addressed in this survey, please provide them in the space below. They can be specific to your farming/ranching operation, state, sub-basin, or the Colorado River Basin as a whole.

