

**Summary Statistics and Survey Documentation:
Tech for Trade Water Management Survey**

By

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About this document

To better understand water management in some key watersheds in eastern Washington, Washington State University and the State of Washington Water Research Center conducted a survey of water rights holders and irrigation district growers in the Okanogan, Methow, Walla Walla and Yakima river basins. The survey was conducted between December 2020 and March 2021 with the help of Pacific Market Research, a survey research firm. The survey asked people about their use of weather forecasts, basic information about their operations, their views on water management policies, and their views and experience with water transactions. In total, 248 people responded. The survey was part of a larger project that is exploring the development of information technologies that could enhance water use now and in the future.

The first section of this report provides additional documentation on the sampling procedures and response rates. The remainder of the report combines the actual survey text shown to respondents with summary statistics and graphs of the results.

A copy of the original survey given to water rights holders is available at:
<https://s3.wp.wsu.edu/uploads/sites/354/2020/12/water-rights-holders.pdf>.

A copy of the original survey given to irrigation district growers is available at:
<https://s3.wp.wsu.edu/uploads/sites/354/2020/12/irr-district-growers.pdf>

Those reading this report who have questions about the results are encouraged to contact Joe Cook, the survey lead, at joe.cook@wsu.edu.

Additional documentation on sampling, response rates and survey protocol

The survey elicited responses from two groups within the Walla Walla, Yakima, Okanogan and Methow Watersheds. The first group is water rights holders (**WRH**) who have a water right registered with the Department of Ecology. The second group is landowners who own a parcel within an irrigation district, whom we refer to as “irrigation district farmers” (**IDF**). This report includes data from a) a pretest of n=14 conducted in March 2020, and the “main” survey conducted in December 2020 -February 2021 (n=235). The survey questionnaires changed very little across these survey phases; changes are noted.

Two responses were provided by citizens who contacted the research team wishing to participate, rather than being randomly selected. Because of the possibility of selection bias, we have NOT included the responses from those two surveys here in tabulated responses.

Our sampling strategy was driven by the goal of obtaining a representative sample of our two populations of water rights holders (WRH) and irrigation district farmers (IDF) in the Naches, Lower Yakima, Upper Yakima, Walla Walla, Okanogan, and Methow Water Resource Inventory Areas (WRIAs). We constructed two pools, or “sample frames”, of potential subjects. IDFs are owners of parcels within irrigation district boundaries that also have an irrigated crop. These were determined by matching geospatial data on land parcels (from county assessors), irrigation district boundaries (from the Washington State Department of Ecology, Ecology), and irrigated crop boundaries (from the Washington State Department of Agriculture, WSDA). WRHs are owners of active water rights from a surface source or owners of land associated with that water right. These were identified from records of water rights from Ecology’s Water Rights Tracking System (WRTS) and Geospatial Water Information System (GWIS), which contains a spatial identification of each water right’s place of use that was matched to land parcels to estimate a current owner name and address. We excluded from the group of water rights holders those with water rights smaller than 4 acre-feet per year and those that did not have an irrigation purpose of use. Table 1 shows the universe of potential contacts by WRH/IDF and Basin, excluding those who had been randomly-selected to participate in the March 2020 pretest.

Table 1: Available records from which the survey sample was drawn

Basin	Irrigation districts	Irrigation district farmers	Water Rights Holders
Methow	2	114	378
Okanogan	5	766	399
Walla Walla	21	223	696
Yakima (Naches, L. Yakima, U. Yakima WRIAs)	27	6,088	813
Total	55	7,191	2,186

Note: addresses contacted as part of the March 2020 pretest (also a random sample) are excluded.

Budget constraints restricted the number of survey solicitations (“contacts”) that we could make to n=1,598. Because most of the key questions in our survey were targeted at water rights owners, we devoted more contacts to WRH than IDF, even though IDF are more numerous (see Table 1). Specifically, we drew 70% of our sample from WRH according to population (i.e. simple random sample of 70% of the universe of rights >4 AF and not already pretested), and 30% of our sample from IDF. We apportioned this 30% of the 1598 contacts (n=532) equally to the Yakima, Walla Walla, and Upper Columbia (Okanogan and Methow WRIAs) regions. We then drew roughly 160 records at random from the total eligible IDFs in each basin (**Table 2**). Note that this oversamples IDFs in Walla Walla (e.g. 162 of 223 eligible IDFs were contacted) compared to IDFs in Yakima (163 of 6,088 were contacted). The team decided that it was preferable to receive a reasonable number of IDF surveys from each of the three regions rather than receive a predominance of responses from Yakima IDFs.

Table 2. Distribution of contacts

	Methow	Okanogan	Walla Walla	Yakima
IDF	23	138	162	163
WRH	144	202	365	401

A private survey research firm, Pacific Market Research, implemented the survey. They first mailed each contact an introductory postcard (with WSU and Water Research Center branding) alerting the respondent to a survey coming soon. The postcard also asked

“Do you want more flexibility in your water use in the future?” and “Do you wonder why water rights can’t be bought and sold as easily as a house?”. One week later, PMR mailed an introductory letter with a printed version of the survey. The introductory letter included a weblink for the respondent to complete the survey on the web if they preferred and an inbound phone number for respondents who preferred to complete the survey on the phone. A \$2 bill was also included in envelope. PMR sent a reminder postcard with weblink and in-bound phone number to those who had not responded after seven days. A second reminder postcard with weblink and in-bound phone number was sent to non-respondents in week 3 as a final reminder.

Table 3 and Table 4 show the response rates, calculated for the December 2020 - March 2021 main survey.

Table 3. Overall responses rates

Disposition	Freq.	Percent
Complete – Mail	210	13
Complete - Online	23	1
Incomplete	38	2
Ineligible	84	5
No response	1,093	68
Remove from list/Refuse	33	2
Undeliverable	121	8
Total	1,602	100

Removing the “ineligible” and “undeliverable” contacts, **the overall response rate was 233/1397 = 16.7%**. (“Ineligible” refers to answers for the screening questions (1.1. and 1.2 below) that told the respondent they were sent the survey in error.). The response rate in the March 2020 pretest was much lower: 1.3% among IDF and 5.1% among WRH. We suspect this was because this pretest only provided respondents with a link to an online survey, rather than mailing them a printed questionnaire.

Note that throughout the report we include completed questionnaires from the March 2020 pretest, so our **main sample size is 248**. Similarly-calculated responses rates by basin and IDF/WRH are below in Table 4.

Table 4. Response rate by basin and IDF

Basin	WRH	IDF	<i>Overall</i>
Methow	15.6%	23.8%	16.8%
Okanogan	14.4%	4.9%	10.6%
Walla Walla	17.5%	16.3%	17.1%
Yakima	18.1%	23.8%	19.7%
<i>Overall</i>	16.9%	15.9%	16.6%

We can examine whether our sample is representative of the broader population based on the variables we observe in either the property tax or water rights data. Table 5 reports test statistics for a two-tailed test of difference in proportions. It shows that there were no statistically significant differences between respondents and the population they were drawn from for most variables, including the size of the water right, land value, and water right status (certificate vs. claim). We do, however, see that owners with out-of-basin addresses, owners with water right priority dates before 1900, and larger growers (those with above-median crop acreage) were less likely to respond. Overall, this analysis suggests that the responses were fairly representative, but with some caveats.

Table 5. Comparing respondents to the general population

test	Different Response?	Fraction (General population)	Fraction (Respondents)	p-value
Size of water right (given>4AF)	No	0.1627	0.1474	0.445
Owner address in basin	Yes	0.1672	0.1128	0.016
Address is PO Box	No	0.1387	0.1628	0.283
Crop acres above median	Yes	0.1863	0.1333	0.025
Land value above median	No	0.1757	0.1459	0.218
Crop value above median	No	0.1615	0.1416	0.575
WR is a Certificate	No	0.2075	0.1559	0.369
Priority after 1899	Yes	0.1352	0.1820	0.040
Priority after 1917	No	0.1457	0.1632	0.503
Priority after 1945	No	0.1436	0.1625	0.511

Original survey with response statistics

Notes and analysis which were not in the original questionnaire are shown with *italicized, blue font*.

Section 1: Introduction

Before you begin, we want to make sure that our information is correct. As we mentioned, this survey is being sent to people who have surface water rights or farm within irrigation districts.

1.1 Do you or a member of your household or business have a surface water right filed with the State? When we refer to a “water right”, we are referring to a claim, permit, or certificate.

(1) Yes

(2) No

1.2 Do you irrigate your farm or operation with water provided by a water purveyor, such as an irrigation district, irrigation company or irrigation association?

(1) Yes

(2) No

If you answered **No for both of these questions**, we seem to have sent you a survey in error. You do not need to complete the remainder of the survey, but please do send it back in the enclosed envelope. Thank you for your time.

Landowners can sometimes have “stacked” rights, meaning a property can have associated water rights registered with the state (typically older, creek rights) but also be within the boundaries of an irrigation district and thus receive district water as a customer. It is possible that we sent a survey to someone as an IDF (because their plot was within an irrigation district) but they actually have a stacked water right (yes to both question 1.1. and 1.2). It is also possible that the respondent owns one piece of ground with water rights and a second plot within a district. The web survey was programmed to deliver the WRH version whenever question 1.1 was “yes”, regardless of the answer to 1.2. We had 7 respondents who were sent surveys as IDFs but answered yes to 1.1. and completed the WRH version of the questionnaire. This flexibility was not possible with the printed version. We had 1 respondent who completed the IDF version of the survey but was actually a water rights holder (answered yes to both 1.1 and 1.2)

1.3 Where are your surface water rights? (**CHECK ALL THAT APPLY**)

- (1)___ Walla Walla Basin
- (2)___ Okanogan Basin
- (3)___ Methow Basin
- (4)___ Yakima Basin

Table 1.3 Survey responses by Basin and WRH/IDF (includes both pretests)

<i>Basin</i>	<i>WRH</i>	<i>IDF</i>	<i>Total</i>
<i>Walla Walla Basin</i>	<i>56</i>	<i>23</i>	<i>79</i>
<i>Okanogan Basin</i>	<i>33</i>	<i>7</i>	<i>40</i>
<i>Methow Basin</i>	<i>20</i>	<i>4</i>	<i>24</i>
<i>Yakima Basin</i>	<i>72</i>	<i>33</i>	<i>105</i>
<i>Total</i>	<i>181</i>	<i>67</i>	<i>248</i>

1.4 Where is your **largest** surface water right?

- (1)___ Walla Walla Basin
- (2)___ Okanogan Basin
- (3)___ Methow Basin
- (4)___ Yakima Basin

Table 1.4 shows we did not have trouble with landowners owning property in multiple basins: the owners reported that their largest water right was in the Basin we contacted them about.

Table 1.4 Location of largest surface right

<i>BASIN \ Q1.4</i>	<i>Walla Walla Basin</i>	<i>Okanogan Basin</i>	<i>Methow Basin</i>	<i>Yakima Basin</i>
<i>METHOW/OKANOGAN</i>		<i>31</i>	<i>23</i>	
<i>WALLA WALLA</i>	<i>73</i>			
<i>YAKIMA</i>				<i>97</i>

Note: row shows the location we contacted the respondent at, and column shows the response to question 1.4

When the survey refers to “your Basin”, please think about the Basin where you have the largest surface water right.

Section 2. Water management tools: long-range forecasting

We would now like to ask a series of questions about “long-range” forecasts. By “long-range forecasts”, we mean forecasts of precipitation, snowpack, temperature, and water availability for the coming 1 to 7 months.

2.1 Do you plan to use long-range forecasts to make production decisions about planting, irrigating, and pesticide application for the upcoming 2021 growing season?

(1) **31%** Yes (*skip the next question*)

(2) **69%** No

Notes: (n=180 WRH, n=65 IDF)

The percent who said they planned to use a forecast was somewhat higher (39%) among IDF respondents than WRH respondents (27%).

2.2 Why do you not plan to use forecasts for the upcoming growing season? (*check all that apply*)

(1) **55%** My production decisions don't depend on weather-related factors.

(2) **10%** The forecasts are not accurate enough.

(3) **8%** The forecasts are not provided for the measures or metrics that matter for me.

(4) **2%** Forecasts are not available covering the period of time that matters to me.

(5) **34%** Other, specify: _____

Notes: Of n=162 responses; 2 respondents answered this question after answering Yes to q2.1, their responses are excluded; 10 respondents didn't answer this question after answering No to previous question)

**SKIP TO
SECTION 3**

2.3 Forecasts relevant to irrigated agricultural production are provided for various metrics. From the list below, choose two metrics that are most important to you.

- Water for irrigation (All **74%**; WRH **74%**; IDF **73%**)
- Frost (All **16%**; WRH **13%**; IDF **24%**)
- Precipitation (All **57%**; WRH **62%**; IDF **48%**)
- Temperature (All **41%**; WRH **41%**; IDF **43%**)

Notes: (Of n=141 responses. In 2020 pretest, frost was not an option and temperature referred to “average temperature”.

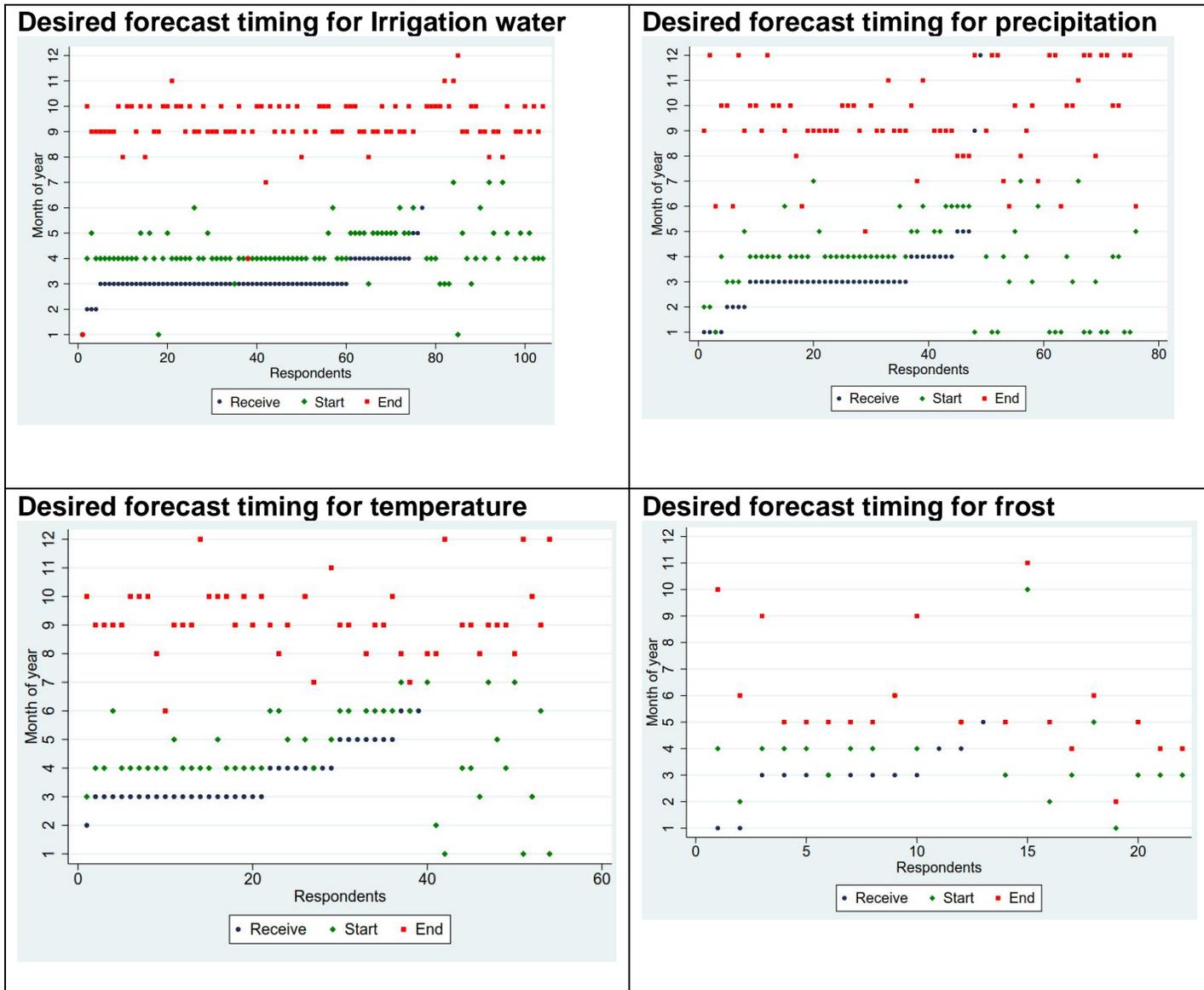
Write those two metrics into the first column. Then, for each of these top two metrics, circle the month you would like to receive the forecast and draw a box around the months you would like the forecast to apply to. The example below shows how you would fill the table in if you want a forecast in March for irrigation water availability from April through September.

Example:

Forecast Receive Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

In the graphs below, each survey respondent’s answers are shown individually as one vertical slice. For example, respondent 1 for irrigation water timing wanted to receive a forecast in February (month 2) that would start in April (month 4) and end in January (month 1). If respondents didn’t say when they would like to receive a forecast, we have still provided the beginning and end dates they would like.

Figure 2.3 Desired forecast timing for four measures



2.4 What forecasting resources do you use for production planning? *Mark all that apply.*

	IDF	WRH	
(1)	80%	86%	Public sector/government services (e.g. National Weather Service, NW River Forecast Center, Dept. of Ecology)
(2)	31%	28%	WSU AgWeatherNet or WSU Decision Aid System
(3)	7%	6%	Professional forecasting consultants
(4)	72%	70%	Your own expertise, knowledge, and observations
(5)	0%	11%	Other, specify: _____

Notes: n=46 WRH, n=29 IDF. Columns sum to more than 100% because multiple options permitted. Many (88) respondents answered “no” to question 2.1 but still answered this question, though they should have skipped it. Their responses are NOT included here. When they are included, the pattern is the same but the percentage yes is just lower across the board.

2.5 How satisfied are you with the current accuracy of available forecasting resources that you use?

- (1) **7 %** Very Unsatisfied
- (2) **7 %** Unsatisfied
- (3) **31%** Neutral
- (4) **52%** Satisfied
- (5) **4%** Very Satisfied

Notes: n=75. Many respondents answered “no” to question 2.1 but still answered this question, though they should have skipped it. Their responses are NOT included above. When they are included, the percentage “satisfied” drops somewhat and the percentage “neutral” increases.

2.6 How satisfied are you with the timing of forecasts (what time of the year it is made available) from available forecasting tools that you use?

- (1) **3 %** Very Unsatisfied
- (2) **5 %** Unsatisfied
- (3) **35%** Neutral
- (4) **51%** Satisfied
- (5) **7%** Very Satisfied

Notes: n=75. Many respondents answered “no” to question 2.1 but still answered this question, though they should have skipped it. Their responses are NOT included above. When they are included, the percentage “satisfied” drops somewhat and the percentage “neutral” increases.

2.7 There is always uncertainty in a forecast, and this uncertainty can be communicated in different ways. Using the chance of rain as an example, which of the formats shown below do you prefer?

- (1) **91 %** There is an 80% chance of rain tomorrow
- (2) **1 %** There is a 4 in 5 chance of rain tomorrow
- (3) **0 %** Odds are 4 to 5 that it will rain tomorrow
- (4) **7%** There is a strong likelihood of rain tomorrow
- (5) **3%** Other, specify:_____

Notes: n=75. Many respondents answered “no” to question 2.1 but still answered this question, though they should have skipped it. Their responses are NOT included here. The “other” response was “Anytime its above 20%, it rains.”

2.8 Rank the following improvements to current water availability forecasts from most important to least important. Write `1` next to the most important improvement and a `3` next to the least important.

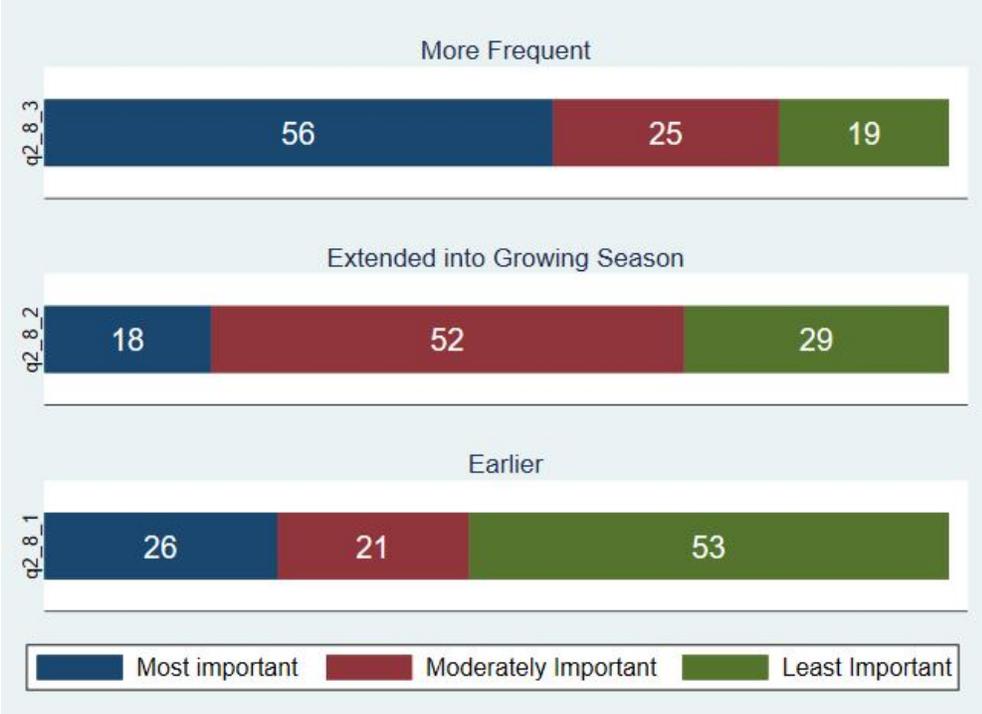
- (1) _____A forecast made earlier in the year
- (2) _____A forecast that extends further into the growing season
- (3) _____A forecast made more frequently

Table 2.8. Ranking forecast improvements

	<i>Rank 1</i>	<i>Rank 2</i>	<i>Rank 3</i>
<i>A forecast made earlier in the year</i>	<i>26%</i>	<i>21%</i>	<i>53%</i>
<i>A forecast that extends further into the growing season</i>	<i>18%</i>	<i>52%</i>	<i>29%</i>
<i>A forecast made more frequently</i>	<i>56%</i>	<i>25%</i>	<i>19%</i>

n=66

Figure 2.8 Forecast ranking



2.9 Is there some other aspect of the forecast that is important to you that you would like to tell us about? If so, please tell us below.

Section 3: Estimating consumptive use

3.1 Do you estimate your consumptive use? (note that CU measurement is not necessarily the same as metered diversions).

- | | IDF | WRH | |
|-----|-----|-----|---|
| (1) | 26% | 17% | Yes |
| (2) | 17% | 15% | No, but I would be interested in estimating this (<i>skip next two questions</i>) |
| (3) | 42% | 51% | No, and I am not interested in estimating this (<i>skip to SECTION 4</i>) |
| (4) | 15% | 18% | I don't know what consumptive use is (<i>skip to SECTION 4</i>) |

(Notes: n=66 IDF and n=169 WRH. By basin, percent "yes": 8% Methow, 11% Okanogan, 19% Walla Walla, 25% Yakima)

3.2 How do you estimate consumptive use? *Check all that apply*

- (1) 7% Washington Irrigation Guide
- (2) 11% Weather-based Evapotranspiration estimates
- (3) 27% Soil water balance using soil moisture sensors
- (4) 40% Assume consumptive use is applied irrigation or a fraction of it (e.g application efficiency)
- (5) 0% Consulting firm that uses drones or other aerial images
- (6) 16% Other, specify:_____

(Notes: N = 45. Some respondents who did not answer "yes" to 3.1 answered this question incorrectly. Their answers are NOT included here.)

3.3 What is the most important reason you are estimating consumptive use?

- (1) 60% To improve on-farm water use efficiency (*skip next question*)
- (2) 2% To establish water use history in preparation for a possible future transfer (*skip next question*)
- (3) 31% To establish water use history to maintain current water right (*skip next question*)
- (4) 7% Other, specify:_____

(Notes: N=45. Some respondents who did not answer "yes" to 3.1 answered this question incorrectly. Their answers are NOT included here.)

3.4 What is the most important way that estimates of consumptive use could help you?

- (1) 64% Improving irrigation scheduling over growing season
- (2) 24% Improving uniformity of irrigation application
- (3) 7% Identifying irrigation systems issues (e.g. plugged emitters, low pressure areas)
- (4) 5% Other, specify:_____

(Notes: n= 58 (Includes responses who answered yes or no to q3_1)

Section 4: Water Transfers

One approach to managing droughts is the transfer of water rights from one water user to another, including within irrigation districts. There are many variations in the form that these transfers might take, including temporary leases and permanent sales.

4.1 How would you describe your current level of comfort buying, selling, or leasing water?

- (1) **10%** Very comfortable
- (2) **23%** Somewhat comfortable
- (3) **42%** Not comfortable at all
- (4) **25%** Don't know

Notes: n = 240; WRH 174, IDF 66.

Table 4.1.1 *Comfort with markets, by respondent type*

	WRH	IDF
<i>Very comfortable</i>	9%	12%
<i>Somewhat comfortable</i>	19%	33%
<i>Not comfortable at all</i>	44%	38%
<i>Don't know</i>	28%	17%

Table 4.1.2 *Comfort with markets, by basin*

q4_1	Upper Columbia	Walla Walla	Yakima
<i>Very comfortable</i>	0%	10%	16%
<i>Somewhat comfortable</i>	21%	23%	24%
<i>Not comfortable at al</i>	48%	48%	34%
<i>Don't know</i>	31%	18%	27%
<i>Total frequency (N=240)</i>	<i>N=62</i>	<i>N=77</i>	<i>N=101</i>

4.2 For each type of water transfer in the table below, please report whether you are familiar with this type (Column A), and whether you have ever participated in this type of transfer (Column B). If you have participated, please tell us approximately how many transactions you have participated in over the course of your career (Column C).

	Col A. Familiar? (Percent Yes)	Col. B. Ever participated? (Percent Yes)	Col. C. Approx. # of transactions
a. Leases (full-season or split-season leases, including to environmental uses)	36%	6%	
b. Permanent transfers of water rights	51%	20%	
c. Mitigation Bank participation	24%	9%	
+ d. Legally changing the place of use of your right to move it to other fields you operate.	34%	11%	
e. Moving water to other fields you operate <i>without</i> legally changing place of use.	23%	5%	
Complete this section if you also operate within an irrigation district, company or association (a “stacked right”) in the Basin			
f. Permanent transfers of an irrigation allotment	28%	12%	
g. Pooling (moving water to other fields you farm in a different part of the district)	19%	8%	
h. Rotational agreement (you and neighbor combine allotments; you use on even days, neighbor uses on odd days, split season or something similar)*	32%	16%	
i. Other, describe:	6%Yes	6% Yes	0 (3 responses)

*Notes: *All but parts (h) and (i) from above table represent responses of WRH only; part (h) and (i) include responses from IDF respondents also.*

IF YOU HAVE NEVER PARTICIPATED IN A WATER TRANSFER (No to all questions in column B), SKIP TO QUESTION 4.6

4.3 You mentioned that you have participated in a water transfer. Please think about your most recent water transfer. How were you connected with the buyer or seller for that transfer?

	IDF	WRH	
(1)	38%	31%	Buyer/seller approached me directly
(2)	0%	9%	Found buyer/seller through a consulting firm or broker
(3)	0%	0%	Found buyer/seller through a water rights attorney
(4)	23%	20%	Found buyer/seller through word of mouth
(5)	0%	0%	Found buyer/seller through a listing posted on a physical bulletin board or online
(6)	38%	40%	Other, specify: _____

Notes: n = 48 (WRH=35, IDF = 13) responded to this question out of total n = 72 respondents (WRH= 52, IDF = 20) who responded having ever participated in water transaction in column B. Two IDF respondents (ID 2037 and 2061) didn't participate yet answered this question, and hence have been excluded. All figures are shown as column percentages representing within responses from each group. In the pretest, this was asked as open-ended question, and the responses are not included above. Pretest responses are merged below in comments.

4.4 How satisfied were you with the transaction?

	IDF	WRH	
(1)	8%	23%	Very Unsatisfied
(2)	8%	10%	Somewhat Unsatisfied
(3)	15%	26%	Neutral
(4)	38%	13%	Somewhat Satisfied
(5)	31%	28%	Very Satisfied

Note: n = 50 (WRH = 37; IDF = 13). Excludes those who responded even after not participating in transactions. All figures are shown as column percentages representing within responses from each group.

4.5 What were the main challenges you have faced in conducting that transfer? (*check all that apply*)

- | | % Yes | |
|------|--------------|---|
| (1) | 34% | Regulatory hurdles |
| (2) | 27% | Risk of water rights relinquishment |
| (3) | 17% | Professional/legal costs |
| (4) | 22% | Quantification of water right |
| (5) | 27% | Pricing or understanding the value of water rights |
| (6) | 20% | Supply risk/uncertainty in water availability |
| (7) | 12% | Identifying an interested party to transfer with |
| (8) | 2% | Participation in grower contract that limits my flexibility |
| (9) | 0% | Constraints from my lender |
| (10) | 5% | Don't know; I have never attempted any water rights transfers |
| (11) | 7% | Don't know; I used the services of a third-party consultant |
| (12) | 5% | Uncertainty about how to quantify and document my consumptive use |
| (13) | 10% | Other, please specify: _____ |

Notes: n = 41. Options 10 and 11 were not available in IDF pretests. Option 13 wasn't included in WRH pretests.

4.6 Looking forward in time, if you were to explore acquiring or selling a water right, whom would you contact to help you find other buyers and sellers? (*check all that apply*)

- | | IDF | WRH | |
|-----|------------|------------|--------------------------|
| (1) | 42% | 28% | Neighbors |
| (2) | 89% | 33% | Your irrigation district |
| (3) | 12% | 30% | Water lawyer |
| (4) | 0% | 3% | Local elected official |
| (5) | 8% | 13% | Consulting firm |
| (6) | 9% | 12% | Other, specify: _____ |
| (7) | 3% | 24% | Don't know |

Notes: n=172 WRH, n=66 IDF

Different people have different opinions about water markets and water transfers. Please evaluate the next two statements for whether you agree or disagree. There are no right or wrong answers.

4.7 Water should be put to use according to the desires of the owners of water rights.

	IDF	WRH	
(1)	3%	12%	Strongly disagree
(2)	8%	5%	Disagree
(3)	10%	15%	Neither agree nor disagree
(4)	46%	38%	Agree
(5)	33%	31%	Strongly agree

Note: n= 228 (WRH: 165, IDF: 63) This question was not asked in pretest.

4.8 Water transfers that involve water leaving the County should be prohibited, regardless of how valuable the water may be to users outside the Basin.

	IDF	WRH	
(1)	6%	9%	Strongly disagree
(2)	14%	8%	Disagree
(3)	17%	19%	Neither agree nor disagree
(4)	33%	24%	Agree
(5)	33%	40%	Strongly agree

Note: n = 242 (WRH: 176, IDF: 66)

Table 4.8 Cross-tabulation of attitudes towards water markets

		4.8 Prohibit out of County transfers				
		<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither</i>	<i>Agree</i>	<i>Strongly Agree</i>
4.7 Protect desires of property right owners	<i>Strongly Disagree</i>					
	<i>Disagree</i>	2.7%	1.3%	2.2%	1.3%	2.2%
	<i>Neither</i>	0.4%	1.8%	0.4%	1.3%	1.8%
	<i>Agree</i>	0.4%	0.4%	4.4%	4.4%	3.6%
	<i>Strongly Agree</i>	0.9%	4.4%	6.2%	17.3%	11.1%
	<i>Strongly Agree</i>	4.0%	2.2%	4.0%	3.1%	17.8%

Note: Cells in table add to 100%. 49% of respondents agreed or strongly agreed with both 4.7 and 4.8 (shown in bold).

Receiving information about water transfers

4.9 In what format would you prefer to receive information about water buying, selling, and leasing opportunities?

	IDF	WRH	
(1)	46%	57%	Printed, mailed materials
(2)	9%	8%	In the offices of the Irrigation district or Department of Ecology
(3)	20%	20%	Internet website (i.e. on irrigation district website or Grower's Association)
(4)	17%	14%	Email
(5)	5%	0%	Smartphone application
(6)	3%	0.6%	Other _____

Note: n = 233 (WRH: 168, IDF: 65)

4.10 Who would you trust to help you with water transfers? Rank the types of institutions you trust most to least, where 1 represents no trust, and 5 represents complete trust.

Institutions	No Trust <i>(circle)</i> Complete Trust				
	1	2	3	4	5
a. Non-profits, including environmental non-profits	1	2	3	4	5
b. For-profits (e.g. consulting companies, software companies, or real estate brokers)	1	2	3	4	5
c. Water/irrigation districts	1	2	3	4	5
d. Dept of Ecology	1	2	3	4	5
e. Conservation districts	1	2	3	4	5
f. Attorneys	1	2	3	4	5
g. Community member or neighbor who has experience with water transfers	1	2	3	4	5
h. Other, who? _____	1	2	3	4	5

Notes: The pretest had option d and e for Dept of Ecology and Conservation District as one option under "State agencies". It also included "universities" as an option. Pretest responses were therefore discarded for those answer codes in the analysis below..

Table 4.10.1 Trust, among water rights holders

WRH	No Trust = 1	2	3	4	Complete Trust = 5	N
a. Non-profits, including environmental non-profits	34%	22%	20%	17%	7%	167
b. For-profits (e.g. consulting companies, software companies, or real estate brokers)	33%	24%	29%	11%	4%	169
c. Water/irrigation districts	7%	11%	33%	33%	15%	171
d. Dept of Ecology	29%	19%	19%	21%	10%	154
e. Conservation districts	8%	12%	32%	32%	15%	152
f. Attorneys	17%	9%	33%	30%	11%	168
g. Community member or neighbor who has experience with water transfers	10%	15%	31%	34%	10%	169
h. Other, who? _____	50%		25%		25%	8

Note: Doesn't include pretest responses for options d and e.

Table 4.10.2. Trust, among irrigation district farmers

IDF	No Trust = 1	2	3	4	Complete Trust = 5	N
a. Non-profits, including environmental non-profits	27%	15%	42%	13%	3%	60
b. For-profits (e.g. consulting companies, software companies, or real estate brokers)	25%	32%	32%	10%	0	59
c. Water/irrigation districts	3%	5%	21%	40%	30%	62
d. Dept of Ecology	25%	11%	25%	30%	11%	57
e. Conservation districts	5%	16%	23%	39%	16%	56
f. Attorneys	28%	22%	25%	23%	2%	60
g. Community member or neighbor who has experience with water transfers	7%	10%	40%	31%	12%	58
h. Other, who? (Federal Agencies; Don't have other)			50%	50%		2

Note: Doesn't include pretest responses for options d and e.

4.11 How much **money** have you spent on professional services (legal or consulting) fees to maintain, secure, lease, sell or trade your largest water right in the past five years?

	IDF	WRH	
(0)	75%	62%	Nothing, zero
(1)	14%	22%	\$1 to \$10,000
(2)	2%	3%	\$10,001 to 20,000
(3)	0%	0%	\$20,001 to 30,000
(4)	0%	0.6%	\$30,001 – 50,000
(5)	0%	1%	\$50,001- 100,000
(6)	0%	2%	\$100,000 or greater
(7)	6%	5%	Don't know
(8)	3%	4%	Would prefer not to say

Notes: N = 242 (WRH:176, IDF: 66). The pretest had different values in the option. Maximum value amounts to \$10,000 in pretest while in final survey it was \$100,000. It affects 3 out of 14 responses from WRH_pretest.

Now we would like to ask a few questions about finding out what a “fair” price for a water right in your area would be. By “fair” price, we mean a price that most buyers would expect to pay and most sellers would expect to receive. The transaction could be for a permanent sale or a temporary lease.

4.12 How would you rate the difficulty in knowing what a “fair” price for a water right in your Basin is?

	IDF	WRH	
(1)	0%	0%	Very easy to know what a fair price is
(2)	12%	3%	Easy to know what a fair price is
(3)	9%	5%	Neither easy nor difficult to know what a fair price is
(4)	26%	23%	Difficult to know what a fair price is
(5)	17%	18%	Very difficult to know what a fair price is
(6)	36%	50%	No experience, don't know

Notes: (n=66 IDF, n=177 WRH) Among those with experience, two thirds said it was difficult or very difficult (among both IDF and WRH).

4.13 Who might you ask to learn more about the fair market value of water in your local area?

	IDF	WRH	
(1)	41%	43%	Community members or neighbors with experience
(2)	73%	42%	Your irrigation district
(3)	27%	48%	Water lawyer
(4)	3%	2%	Local elected official
(5)	6%	11%	Other, specify: _____

Notes: (n=63 IDF, n=175 WRH. Percentages sum to >100% because multiple answers permitted)

Next, please consider a hypothetical scenario. Suppose the Board of Directors of your irrigation district was considering implementing a program that would allow growers to fallow ground on a temporary basis and lease the pooled water to other users *outside* the district. The program would be voluntary. Growers could opt-in to fallow all or part of their land, and would receive a set price per acre fallowed. The program would involve one-year leases only and would NOT involve permanent sales or transfers of water rights. On March 1st of each year, you could choose to participate for the upcoming growing season. Assume you would not need any legal approvals, and the Board would negotiate contracts with outside users on your behalf to get the best possible price.

4.15 Given the information you have about the program, how would you advise your Board representatives to vote on this program?

- (1) **57%** Vote yes to create the program (*SKIP NEXT QUESTION*)
- (2) **43%** Vote no; do not create the program

Notes: N = 60. There were insufficient number of IDF responses (n=9) in Methow or Okanogan to tabulate. In Yakima, 50% of respondents voted yes. In Walla Walla, 67% of respondents voted yes.

4.16 What is the main reason you would vote against the program? (*open-ended*)

Table 4.16 Main reason why not

Water should not go outside the district.
Not allowed more Negation District Piu by laws.
Water should be retrieved- if not used by the holder of the water right it should go back into the river.
Keep water in own district. Dont want district selling water out from under us.
Our district by laws prohibit moving water out of the district.
First choice should go to uses within district that dont have all water they need. Leases are okay, but most users making decisions prior to March 1, and water typically already being applied by then in some years.
Our district has junior water rights in our basin and i would want to keep the water in my district and not allow it to go outside the district. Irrigation districts are adding more acreage and they do not have enough water to cover all of it.
While I am not absolutely opposed to moving water outside the district-in general- It is not the best plan.
Would not like neighboring lots to die from vegetation, Dust and weed growth.
Water should never leave the district
Could be unfairly used.

Does not fit my permanent crop situation.
Because my senior water can be used by junior members for beneficial use.
I dont have enough information to vote yes.
Mistrust in irrigation district board
I would prefer to establish the best possible price. Negotiate the contract with a lessor on my own like a land lease.
no new programs needed
Because the river is so low now even at the first of summer.
We tend to be tight on water already I see this as making water use more difficult for the people that are still trying to use their water.
Lowers the water table in the district.
I have both surface and ditch water. I only care to sell my ditch water so would not want to 'fallow'.
No one lets their ground sit fallow unless dry farming and that is the first step in rationing water or losing your water and letting others decide about your water.

4.17 Suppose the program was implemented and the offered price was attractive. How likely is it that you would participate?

- (1) **3%** Very likely
- (2) **23%** Somewhat likely
- (3) **6%** Neither likely nor unlikely
- (4) **14%** Somewhat unlikely
- (5) **48%** Very unlikely
- (6) **6%** Would prefer not to answer

Notes: N=65. There were insufficient number of IDF responses (n=10) in Methow or Okanogan to tabulate. In Yakima, 25% of respondents said they were somewhat or very likely to participate. In Walla Walla, 39% of respondents were somewhat or very likely to participate (with most of those responding “somewhat likely”?). Feelings were strong on the negative side: 53% in Yakima were “very unlikely; 35% in Walla Walla were very unlikely.

Now suppose there was a similar program that paid participants a retainer fee regardless of whether the land was fallowed or not, with an additional payment if land was fallowed. This program would be a five-year “dry year option” contract. Rather than making a decision each year, you would commit to the program for five years. As a participant, for each of the next five growing seasons you would commit to fallow ground whenever the March 1st water supply forecast fell below a pre-specified target. You would receive the retainer payment regardless of whether you had to fallow land, and a second payment in years when you fallowed land. This “strike price” would be negotiated at the beginning of the five years, not in the middle of the drought.

4.18 How would you advise your Board representatives to vote on this program?

- (1) **44%** Vote yes; create program (*SKIP NEXT QUESTION*)
- (2) **56%** Vote no; do not create program

Notes: N=62. There were insufficient number of IDF responses in Methow or Okanogan to tabulate. In Yakima, 32% of respondents advised a yes vote to their representative. In Walla Walla, 62% of respondents advised a yes vote.

4.19 What is the main reason you would vote against the program? (*open-ended responses*)

Too much government 'interference'. just being compensated by choosing to keep land fallow for a year is enough government inclusion.
Don't trust it.
Same as before. Do not trust irrigation district board of anything.
Mistrust in irrigation board members.
The programs Games the system to the favor of large corporate farms.
no new programs needed
Dont like long term decisions.
Too big of a commitment. 5 years is a long time.
I would't make a 5 year commitment
Five years is a long time to be committed to the program.
Too long (5 yrs.) things change.
Who is getting my water in district or out of district. Would need more facts to participate.
Again moving water outside of the district is not the best option.
Water should never leave the irrigation district. Once it leaves, someone will find a way that it never returns.
Permanent crops. Cannot fallow.

I have both surface and ditch water. I only care to sell my ditch water so would not want to 'fallow'.	
We are in a desert region and would become a dust town without water and weeds would be a huge problem. I would rather have more reservoirs so we would have more water available and not have to fallow land.	
Not enough specifics.	
Not enough information to make an informal opinion.	
Wineries already using far too much irrigation.	
I need water for pasture. There are lots of orchards here.	

Note: Two respondents who answered this question after answering Yes to previous question are excluded.

4.20 If the program were implemented and assuming the offered price was attractive, how likely is it that you would participate?

- (1) **2%** Very likely
- (2) **22%** Somewhat likely
- (3) **11%** Neither likely nor unlikely
- (4) **13%** Somewhat unlikely
- (5) **46%** Very unlikely
- (6) **6%** Would prefer not to answer

Notes: N = 63. There were insufficient number of IDF responses (n=10) in Methow or Okanogan to tabulate. As with the earlier question, there was more opposition to this idea in Yakima: 13% of Yakima respondents were somewhat or very likely, and 58% were very unlikely. In Walla Walla, 45% of respondents were somewhat or very likely; 27% were "very unlikely"

Water Rights Holders (WRH) Version only

In the state of Washington, a water lease or transfer must be approved by the State and the change of use information is public record. However, the sale or lease price is usually not disclosed. Transfers of water allotments within irrigation districts do not need State approval, and prices are also not typically disclosed.

Contrast this with the market for real estate. Both the record of the transaction and the transaction price are publicly-disclosed in many states, including Washington. Parties to a transaction lose privacy when transaction prices are disclosed, but disclosure provides useful information to other potential buyers and sellers (e.g. appraisers use the M.L.S. system).

4.14 Overall, do you think a policy of requiring price disclosure in water markets would encourage or discourage you from participating in a market transaction?

- (1) **37%** Encourages me - more likely to participate knowing prices are disclosed
- (2) **56%** Neither encourages nor discourages me - not a factor
- (3) **7%** Discourages me - less likely to participate knowing prices are disclosed

Notes: N=174

	<i>Methow</i>	<i>Okanogan</i>	<i>Walla Walla</i>	<i>Yakima</i>
<i>Encourages</i>	40%	22%	35%	46%
<i>Neither</i>	55%	69%	58%	48%
<i>Discourages</i>	5%	9%	7%	6%
<i>N =</i>	20	32	55	67

4.15 Starting in 2016, Washington State required that water banks (sellers) disclose the price they charge for a “mitigation” water right (RCW 90.42.130). Did you know that the state required price disclosure for water banks used for mitigation water?

- (1) **6%** Yes
- (2) **94%** No

Notes: N= 175. By basin: 0% were aware in Methow or Okanogan, 7% were aware in Walla Walla and 10% were aware in Yakima.

Now imagine the State was considering required price disclosure for **all** water transfers that involved a change in ownership.

This policy change, however, would apply to all water market transactions, not just those involving mitigation water banks. Suppose that the State wanted to put the policy change up for a referendum vote in the counties in your Basin. If more than 50% voted in favor of the policy, Ecology would require prices be disclosed for all water

transactions, including leases, in the future. If 50% or less voted for the policy change, prices would continue to be private except for mitigation banks.

Even though this is a hypothetical question, please think carefully about how you would answer if this were a real, binding vote. Some people say they would vote in favor of the change because it would make it easier to get timely information about water prices in their basin and participate in markets. Some people say they would vote against the change because they value the privacy of the status quo.

4.16 How would you vote in the referendum?

- (1) **60%** Yes, vote in favor of requiring price disclosure
- (2) **40%** No, vote against the proposal and keep the status quo of private prices

Notes: N=172. The proposal carried majority support in Methow (89% yes), Walla Walla (65% yes), and Yakima (60% yes). A minority supported it in Okanogan (36% yes).

4.17 Would you be more or less likely to buy, sell, or lease water if local, timely water market transaction price, volume, date, and watershed-level information were publicly available, but public disclosure of your water transaction price and volume data (but not identifiable buyer/seller information) were required?

- (1) **7%** Much more likely
- (2) **30%** More likely
- (3) **56%** No change
- (4) **2%** Less likely
- (5) **6%** Much less likely

N=174. By basin, the percentage who were “somewhat likely” or “very likely” were: 32% in Methow, 22% in Okanogan, 39% in Walla Walla, and 44% in Yakima.

Section 5. Rules and regulations for water management

5.1 Are you familiar with Washington State’s relinquishment law (RCW 90.14.160) that requires a water right to be put to beneficial use at least one year in any consecutive five year period since 1967 or risk loss of the right (“use-it-or-lose-it” relinquishment law)?

- | | IDF | WRH | |
|-----|------------|------------|-----|
| (1) | 61% | 81% | Yes |
| (2) | 39% | 19% | No |

(n=67 IDF and n=177 WRH). By basin (among WRH only), percentages yes varied between 75% (Methow) to 83% (Yakima)

5.2 Relinquishment is a controversial policy. Critics argue that relinquishment increases unnecessary water use, weakens investment in efficient irrigation systems, and may limit water market transactions. Supporters argue that relinquishment prevents water speculation, encourages use of unused water, and protects water availability for junior rights holders. In your opinion, should the state keep the relinquishment law or repeal it?

- | | IDF | WRH | |
|-----|------------|------------|--|
| (1) | 37% | 18% | Keep the relinquishment law. |
| (2) | 63% | 82% | Repeal the relinquishment law; “use-it-or-lose-it” should no longer apply. |

Notes: (N = 218; 159 WRH, 59 IDF) Doesn't include pretest responses.

*By basin (among WRH only), the percentage who wished to **repeal** was 79% (Methow), 72% (Okanogan), 88% (Walla Walla), and 83% (Yakima).*

5.3 Does the relinquishment rule affect your irrigation decisions? (*asked of WRH only*)

- | | | |
|-----|------------|--|
| (1) | 62% | No, I don't change my water use in response to relinquishment risk. |
| (2) | 28% | Yes, I use more water than I would in order to help secure my right. |
| (3) | 4% | Yes, I place some or all of my water right into the trust program to help secure my right. |
| (4) | 6% | Yes, other (please explain:_____) |

Notes: (n=156) Doesn't include pretest responses.

5.4 Has your water right ever been reduced by Ecology, Court proceeding, or other regulatory action?

- | | | |
|-----|------------|--|
| (1) | 80% | No |
| (2) | 8% | Yes, Ecology reduced my water right as part of a change authorization |
| (3) | 4% | Yes, Ecology reduced my water right as part of a permit extension, order, or other regulatory action |
| (4) | 8% | Yes, an Adjudication, or other Court proceeding reduced my right |

Note: N=159. Not asked in the pretest.

5.5 What other water laws, rules, and regulations affect the security of your water right and your ability to use your water right most effectively? In what way do they affect you? Use the box below to give us your thoughts: (*open-ended*)

Section 6. About You

It is helpful for our research to know something about you and your farming operation (if you farm) to connect with your answers to the earlier questions. Although they are all important for us, please skip any questions you are uncomfortable answering.

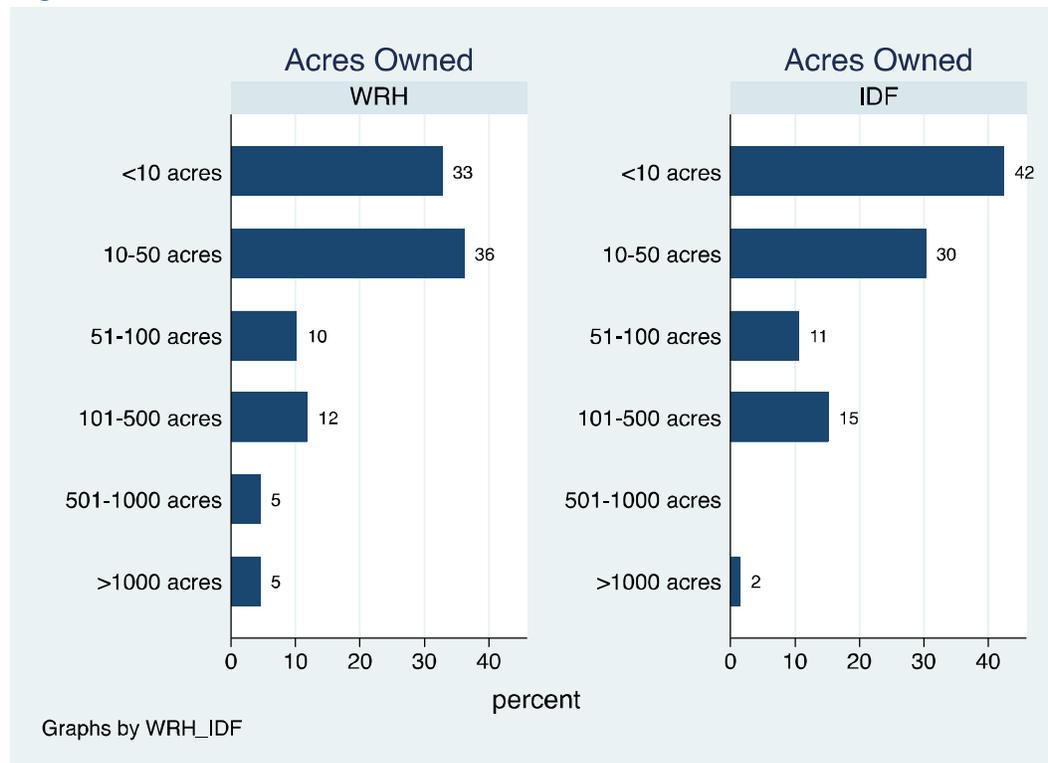
For the next four questions, only consider land within your Basin (recall this is the Basin where you have the largest water right).

6.1 How many acres in irrigated crops or pasture do you **own** within the Basin?

- (1) **35%** <10 acres
- (2) **35%** 10-50 acres
- (3) **10%** 51-100 acres
- (4) **13%** 101-500 acres
- (5) **3%** 501-1000 acres
- (6) **4%** >1000 acres

Notes: N=241

Figure 6.1



6.2 Of those acres, what fraction did you lease out to other farmers in 2020 within the Basin?

- (1) **77%** None, 0%
- (2) **3%** 1-9%
- (3) **3%** 10-25%
- (4) **1%** 26-50%
- (5) **5%** 51-75%
- (6) **11%** 76-100%

Note: N=241, pretest mentions previous year 2019

6.3 Did you rent or lease from other landowners as part of your farm or ranch operation in 2020 within the Basin?

- (1) **17%** Yes
- (2) **83%** No (**SKIP NEXT QUESTION**)

Note: N= 242. Not asked in 2020 pretest.

6.4 Of the total acres you operate (owned and leased), what fraction did you rent or lease?

- (1) **5%** None, 0%
- (2) **20%** 1-9%
- (3) **28%** 10-25%
- (4) **20%** 26-50%
- (5) **20%** 51-75%
- (6) **7%** 76-100%

Note: (n=40; WRH 27, IDF 13). Doesn't include 37 responses that answered 'No' in q6.3 and yet answered this question when they were not supposed to.

6.5 If you leased to or from others, what type of rental agreement did you primarily use? (Check multiple if used about equally)?

- (1) **24%** Fixed Cash
- (2) **2%** Flexible Cash (include hybrid)
- (3) **10%** Crop share
- (4) **7%** Free
- (5) **57%** Not applicable; did not lease to or from others

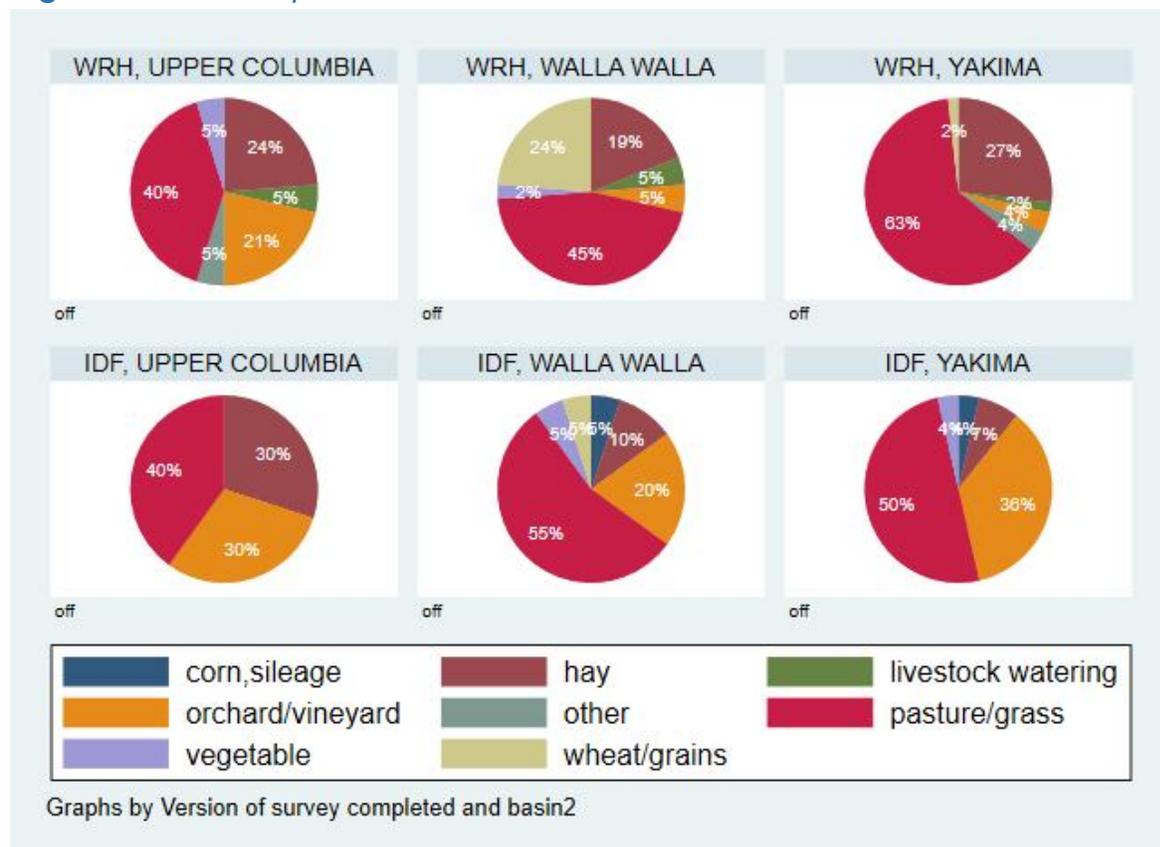
Note: (n=207) Option 5 was not available in 2020 pretest.

6.6 In the 2020 growing season, on the land you operate with the use of your water right, which irrigated crops did you grow? Please fill in the following table about the irrigated crops on the land you operate with the use of your water right in the 2020 growing season.

a. CROP [examples, Timothy hay, livestock watering, pasture]	b. PERCENT OF TOTAL ACRES
Example: Timothy hay	

We focus here on the “main” crop – the crop that has the highest percentage of ground. Of our 248 respondents, 197 reported crops. Figure 6.6 reports the distribution of “main” crops. It combines responses from the Methow and Okanogan Basins into the “Upper Columbia”. These results are discussed in more detail in Section 6.

Figure 6.6 Main crop



6.7 Do you use grower contracts? For example, an agreement to produce corn to sell to a dairy at a pre-determined price, or hops production under a contract with a hops processor.

- (1) **4%** Yes, always or nearly always
- (2) **5%** Yes, occasionally or with some crops I produce
- (3) **91%** No

Notes: N = 240

6.8 What is your gender?

- (1) **77%** Male
- (2) **23%** Female

Notes: N=237

6.9 What is your age?

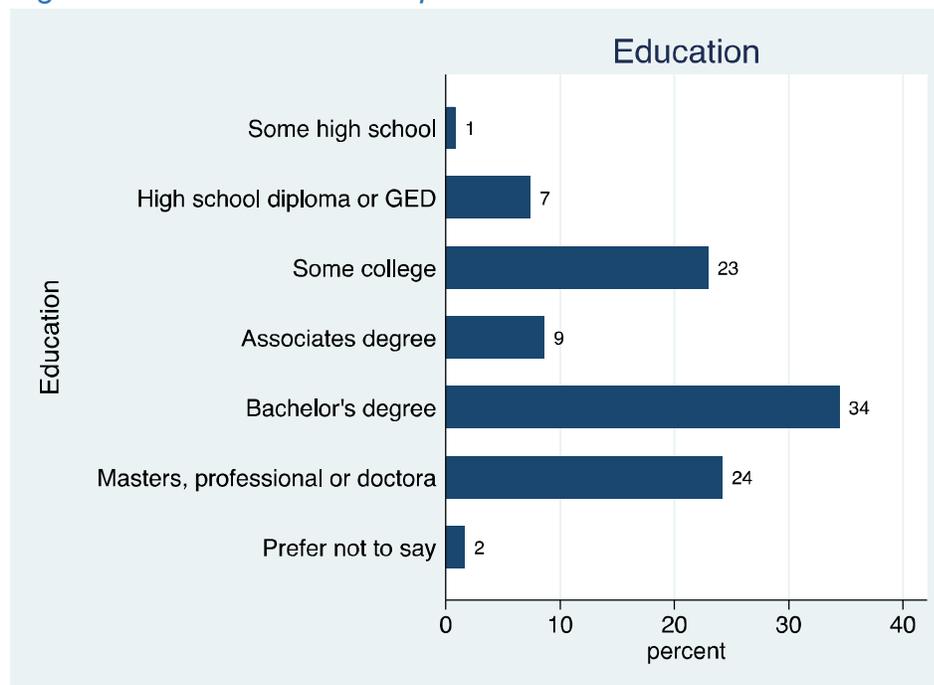
- (1) **<1%** 18-29
- (2) **3%** 30-39
- (3) **4%** 40-49
- (4) **15%** 50-59
- (5) **37%** 60-69
- (6) **30%** 70-79
- (7) **9%** >80
- (8) **2%** Prefer not to say

Notes: n=243

6.10 What is the highest level of education you have completed?

- (1) ___ Some high school
- (2) ___ High school diploma or GED
- (3) ___ Some college
- (4) ___ Associates degree
- (5) ___ Bachelor's degree
- (6) ___ Masters, professional or doctorate
- 95 ___ Prefer not to say

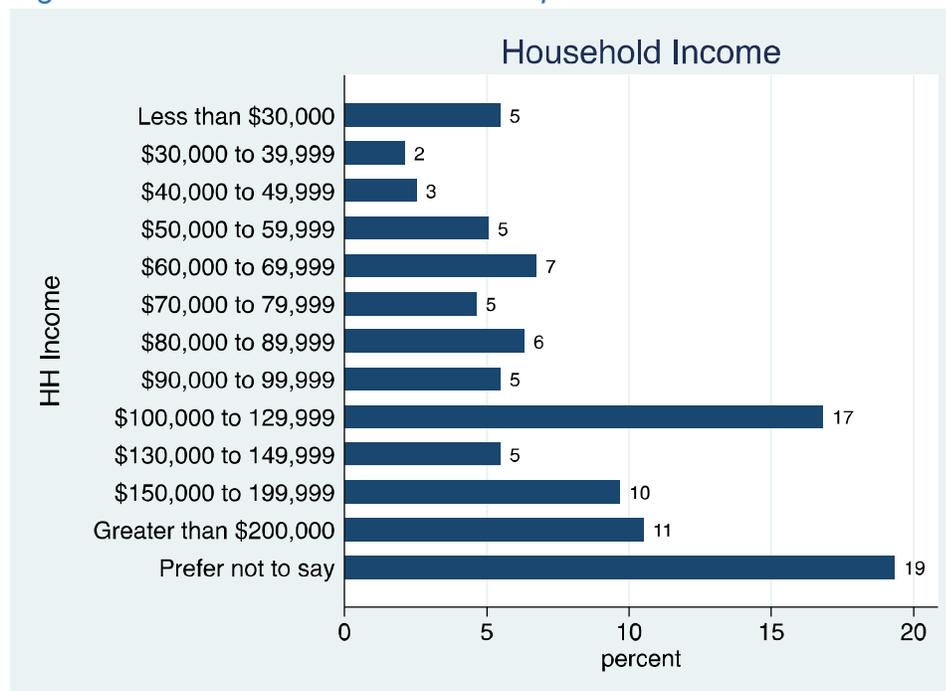
Figure 6.10 Education of respondents



6.11 Which category best describes your total household income from all sources?

- (1)___ Less than \$30,000
- (2)___ \$30,000 to 39,999
- (3)___ \$40,000 to 49,999
- (4)___ \$50,000 to 59,999
- (5)___ \$60,000 to 69,999
- (6)___ \$70,000 to 79,999
- (7)___ \$80,000 to 89,999
- (8)___ \$90,000 to 99,999
- (9)___ \$100,000 to 129,999
- (10)___ \$130,000 to 149,999
- (11)___ \$150,000 to 199,999
- (12)___ Greater than \$200,000
- (-99)___ Prefer not to say

Figure 6.11 Household income of respondents



6.12 Does your household have sources of income besides the money you make from farming?

- (1) **90%** Yes
- (2) **10%** No

Notes: N=228

6.13 (If you are over age 55): Do you have family members who are interested in farming this land?

- (1) **36%** Yes
- (2) **64%** No

Notes: N=212

6.14 How comfortable are you with using computers?

- (1) **54%** Very comfortable
- (2) **33%** Somewhat comfortable
- (3) **13%** Not comfortable at all

Notes: N=242

6.15 Do you own a smartphone?

- (1) **85%** Yes
- (2) **15%** No (skip next question)

Notes: N=242

6.16 How comfortable are you with using smartphones, for example to receive forecasts of weather or water availability?

- (1) **66%** Very comfortable
- (2) **25%** Somewhat comfortable
- (3) **9%** Not comfortable at all

Notes: N=209

6.17 Please provide any additional comments on our research, or on water management in your Basin, in the space below. (*open-ended*).

THANK YOU FOR YOUR PARTICIPATION IN THE SURVEY!