

## SUPPLEMENTAL DATA

*ASCE Journal of Water Resources Planning and Management*

# Arid Inland Community Survey on Water Knowledge, Trust, and Potable Reuse. I: Description of Findings

Lauren N. Distler and Caroline E. Scruggs

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## **Figure S1: Community Survey**

The survey instrument included below asks 26 questions covering six major themes (in sequential order): (1) level of concern with water-related issues, (2) water supplies and climate change, (3) water use at home, (4) acceptance of potable reuse and reasons for support or concern, (5) trust in institutions, and (6) demographics. This survey instrument was originally published in Lauren Distler's thesis (Distler 2018).

Please note that the survey was mailed to potential respondents in booklet format, which is different from the format shown here. The format shown in Figure S1 has been adapted to single column format for ease of electronic viewing.

Also note that there are four versions of page 5 in the survey. Three versions of page 5 contain half a page of educational materials on different topics with two follow up survey questions, and one version contains only the survey questions. As discussed in a separate publication by the same authors, these materials were tested to determine their impact on acceptance of two reuse scenarios. The materials were not found to have any significant impact on level of acceptance of either reuse scenario. The version of page 5 that served as the "control", containing only the two survey questions, is shown within the survey. The other three versions of page 5 containing educational materials are included at the end of the survey.

# Community Survey

## Water Scarcity and Reuse: What do you think?



Planning for our future water supply is important. Public opinion is important in shaping how water resources are managed. By responding to this survey, your opinion will be heard. It should take *between 10 and 15 minutes* of your time.

***Your opinion matters- we thank you for your response***



This survey was created by researchers at the University of New Mexico and is funded by the National Science Foundation

## Your Thoughts on Local Issues

1) How concerned are you about the following issues in Albuquerque/Bernalillo County? Circle your level of concern for each issue.

<b>Drought/ Water Shortage</b>	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned
<b>Quality of Public Education in Local Schools</b>	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned
<b>Population Growth and Development</b>	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned
<b>Jobs and the Local Economy</b>	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned
<b>Crime Rate</b>	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned
<b>Amount Paid in Local Taxes</b>	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned
<b>Local Drinking Water Quality</b>	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned
<b>Amount Paid on Water Bill</b>	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned

# Our Water Supply

**2) In your opinion, do you think water is a limited resource in Albuquerque?** *Check one.*

- Yes
- No
- I don't know

**3) From what source or sources does the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) get the water it serves to customers?** *Check all that apply.*

- River
- Groundwater aquifer (e.g., well water)
- I don't know
- Other

**4) Do you believe that the impact of climate change on the water cycle will make it more difficult for ABCWUA to meet our community's water needs in the next 10 to 40 years?** *Check one.*

- Yes
- No
- I don't know

**5) Do you believe that bottled water is safer (higher quality) than Albuquerque tap water?** *Check one.*

- Yes
- No
- I don't know

**6) What type of water do you most often drink at home?** *Check one.*

- City tap water
- City tap water filtered at home (e.g., sink, pitcher, or fridge units)
- Water from a private well
- Bottled water (e.g., 12 or 16 oz bottles)
- Purified water from dispenser at a store (e.g., 3 or 5 gal containers)
- Other

**7) Which of the following are you currently doing at home?** *Check all that apply.*

- Xeriscaped land/yard
- I don't water my land/yard
- Water saving fixtures (e.g., faucets, toilets)
- Water efficient appliances (e.g., dishwasher, washing machine)
- Rainwater harvesting (e.g., rain barrel)
- Simple conservation measures (e.g., turning off water when brushing teeth)
- None of the above

**8) Generally speaking, how aware are you of water scarcity issues in New Mexico? Circle one.**

Not at all aware	Slightly aware	Moderately aware	Very aware	Extremely aware
1	2	3	4	5

**9) Are you aware of the concept of purifying wastewater and reusing it for drinking water?**

*Check one.*

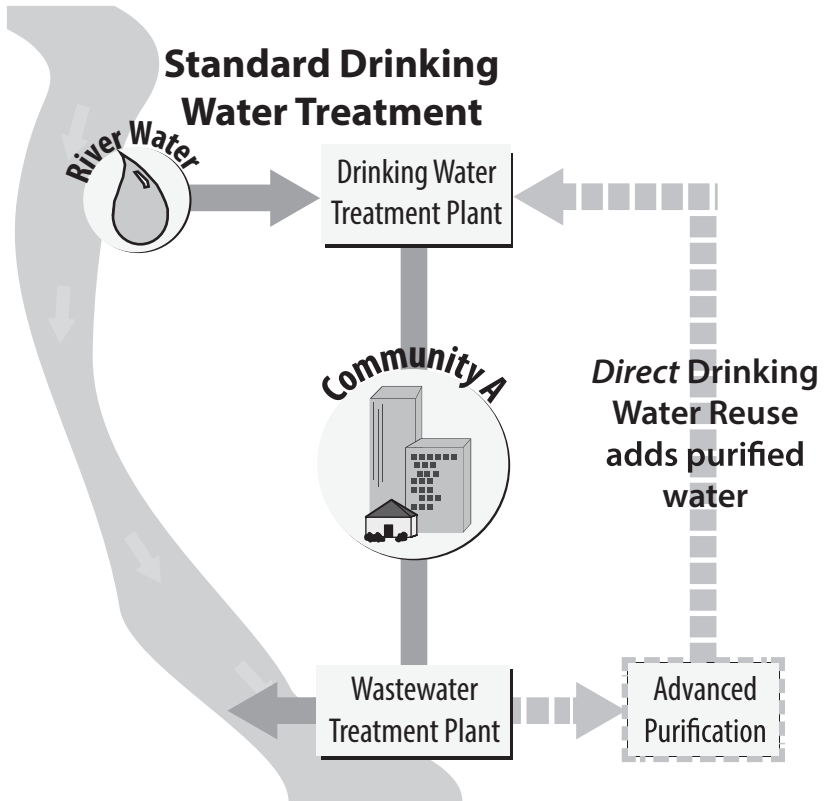
Yes

No

**On the next few pages, we'll talk about 2 different forms of water reuse. We refer to water reuse that supplements the drinking water supply as "drinking water reuse".**

# Direct Drinking Water Reuse

The diagram below shows how *Direct Drinking Water Reuse* would change the typical drinking water treatment process in “Community A”.



All water is tested and monitored 24/7 by trained staff to meet strict water quality standards

Instead of putting treated wastewater back into the river, **some of the treated wastewater is purified to drinking water quality or better** and combined with the regular water supply.

The combined water is treated at the drinking water treatment plant and distributed to homes and businesses for all uses -- including drinking.



Direct drinking water reuse has been successfully and safely implemented in two United States cities. More facilities are being planned and built in the US.

**10) How willing would you be to drink the city tap water in Community A? Circle one.**

Refuse to Drink	Prefer to Avoid	Neutral	Generally OK	Very Willing to Drink
1	2	3	4	5

**11) For what reason(s) would you be willing to drink the city tap water in Community A?**

*Check all that apply.*

- Not applicable - I would **not** be willing to drink the water
- Water shortage, drought, and limited supply
- Reduces waste; efficient use of resources
- Purified water is safe to drink and is safely consumed in other US cities
- I trust the purification technologies
- Other: \_\_\_\_\_

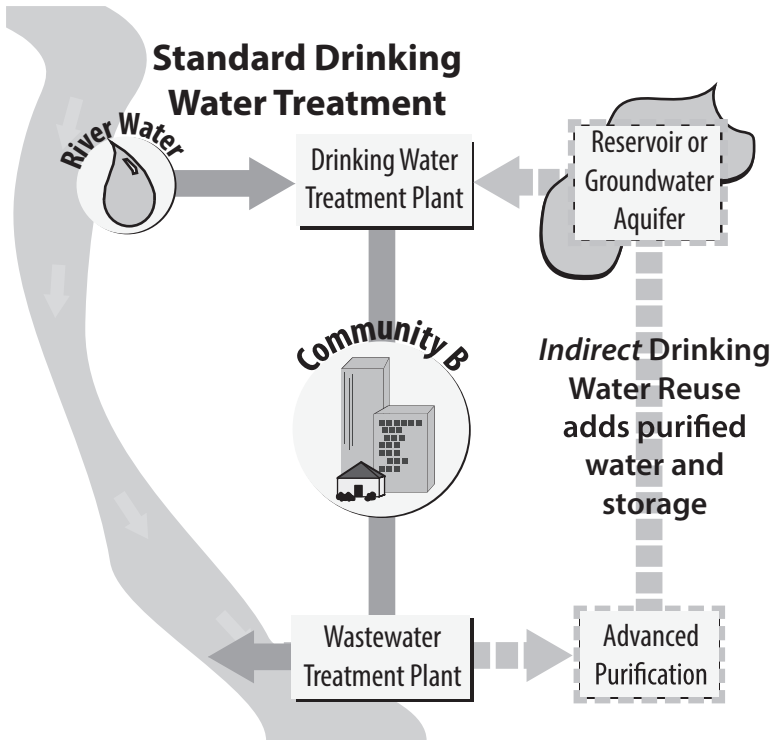
**12) What concern(s) might you have about drinking the city tap water in Community A?**

*Check all that apply.*

- No concerns
- I don't trust the purification technologies
- I'm not confident the water is safe; health concerns
- I don't trust the government or water utility
- I would expect a bad taste/smell or discoloration of the water
- Other: \_\_\_\_\_

# Indirect Drinking Water Reuse

This diagram shows that *Indirect* Drinking Water Reuse is the same as *Direct* Drinking Water Reuse, but **with one additional step -- storage in the environment.**



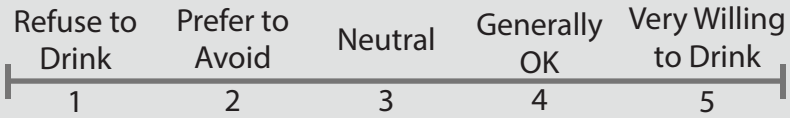
All water is tested and monitored 24/7 by trained staff to meet strict water quality standards

Instead of putting treated wastewater back into the river, some of the treated wastewater is purified to drinking water quality or better, **stored in a reservoir or groundwater aquifer for some time**, and then combined with the regular water supply.

The combined water is treated at the drinking water treatment plant and distributed to homes and businesses for all uses -- including drinking.

*Indirect* drinking water reuse has been successfully and safely implemented for many years in communities across the United States and around the world.

**13) How willing would you be to drink the city tap water in Community B? Circle one.**



**14) For what reason(s) would you be willing to drink the city tap water in Community B?**

*Check all that apply.*

- Not applicable - I would *not* be willing to drink the water
- Water shortage, drought, and limited supply
- Reduces waste; efficient use of resources
- Purified water is safe to drink and is safely consumed in other US cities
- I trust the purification technologies
- The water passes through the environment before it is treated and used again
- Other: \_\_\_\_\_

**15) What concern(s) might you have about drinking the city tap water in Community B?**

*Check all that apply.*

- No concerns
- I don't trust the purification technologies
- I'm not confident the water is safe; health concerns
- I don't trust the government or water utility
- I would expect a bad taste/smell or discoloration of the water
- Other: \_\_\_\_\_

As shown on the past few pages...

The only difference between *Direct* Drinking Water Reuse and *Indirect* Drinking Water Reuse is that *Indirect* Drinking Water Reuse includes storage of the advanced purified water in a reservoir or groundwater aquifer.

**16) Based on the information provided, with which of the following statements do you *most* agree?**

*Check one.*

- I'm more willing to accept *Direct* Drinking Water Reuse
- I'm more willing to accept *Indirect* Drinking Water Reuse
- Both types of reuse are equally acceptable to me
- Neither type of reuse is acceptable to me

17) Please indicate how much you would trust each of the following entities to

provide you with accurate information on water reuse and the safety of drinking water reuse. *Circle the appropriate answer for each.*

<b>Local Water Agency</b>	Mostly Distrust	Somewhat Distrust	Neutral	Somewhat Trust	Mostly Trust
<b>Elected Local Officials</b>	Mostly Distrust	Somewhat Distrust	Neutral	Somewhat Trust	Mostly Trust
<b>State and Federal Regulators (e.g., NMED, EPA)</b>	Mostly Distrust	Somewhat Distrust	Neutral	Somewhat Trust	Mostly Trust
<b>Academic Researchers (e.g., UNM Professors)</b>	Mostly Distrust	Somewhat Distrust	Neutral	Somewhat Trust	Mostly Trust
<b>Public Health Professionals (e.g., NM Dept of Health)</b>	Mostly Distrust	Somewhat Distrust	Neutral	Somewhat Trust	Mostly Trust
<b>Local Media</b>	Mostly Distrust	Somewhat Distrust	Neutral	Somewhat Trust	Mostly Trust
<b>Environmental Nonprofit Organizations</b>	Mostly Distrust	Somewhat Distrust	Neutral	Somewhat Trust	Mostly Trust
<b>Friends and Family Members</b>	Mostly Distrust	Somewhat Distrust	Neutral	Somewhat Trust	Mostly Trust

# About You and Your Household

Only a fraction of ABCWUA customers were randomly selected to complete this survey. Thus, **we need to know how similar you and other survey respondents are to ABCWUA customers.** Your answers to the following questions will help us to do this. All the information collected in this survey will be kept completely confidential. No individual results will be reported.

## 18) What is your age?

<input type="text"/>	<input type="text"/>	Years
----------------------	----------------------	-------

## 19) What is your gender? *Check one.*

- Male
- Female
- Other

## 20) Do you have children younger than 18 years old living in your household? *Check one.*

- Yes
- No

## 21) Have you lived in New Mexico for most of your life? *Check one.*

- Yes
- No

## 22) Are you of Spanish/Hispanic/Latino ethnicity? *Check one.*

- Yes
- No

**23) The previous question dealt with ethnicity while this one deals with race. Please check the race(s) you consider yourself to be. These categories are the standard categories used by the Census Bureau. Check all that apply.**

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Pacific Islander
- Other

**24) What is the *highest* degree or level of education you have completed? Check one.**

- Less than high school
- Completed some high school
- High school graduate/ GED
- Completed some college (no degree)
- Technical or Associate degree or Specialized Certificate
- Bachelor's degree (BA, BS)
- Master's degree (MA, MS, MBA)
- Doctorate/Professional degree (PhD, JD, EdD, MD, DDS)

**25) With which political party do you primarily identify? Check one.**

- Democrat
- Republican
- Independent
- Libertarian
- Green
- No Affiliation

**26) Which range best describes your total household income before taxes in 2016?**

*Check one.*

- Less than \$14,999
- \$15,000 to \$24,999
- \$25,000 to \$34,999
- \$35,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 to \$199,999
- \$200,000 or more



## ***Thank you for your response!***

**Do you have any concerns about drinking water reuse that have not been discussed here? If so, please describe them below.**



If you'd like to know more about the following topics, follow the links below or use your phone to scan the QR codes.

### **Drinking Water Quality Standards**



<https://www.epa.gov/dwstandardsregulations>

### **Water Reuse & Advanced Purification Technologies**

[www.werf.org](http://www.werf.org)



<https://watereuse.org/water-reuse-101/videos/how-reuse-works/>



If the return envelope has been misplaced, please send the completed survey to:

Professor Caroline Scruggs  
University of New Mexico  
School of Architecture and Planning  
George Pearl Hall - MSC04 2530  
Albuquerque, NM 87131

# Water Sources and Reliable Supplies

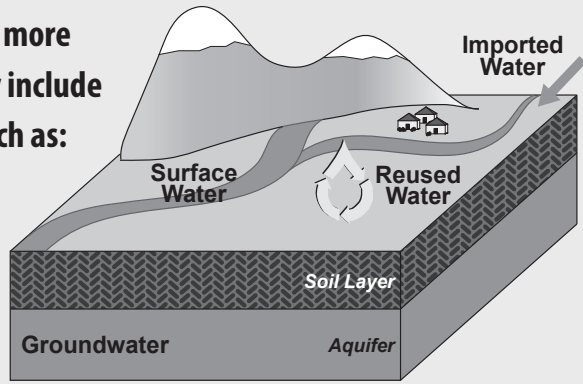
**Increasing temperatures in the southwest will cause<sup>1</sup>:**

- Increased variability of rainfall
- Increased frequency and severity of drought
- Increased evaporation from reservoirs and rivers
- Decreased snow pack, which provides ~50% of the surface water in NM

*Higher Temperature → Increased Variability → Less Reliable Water Supplies*

**Water supplies are more reliable when they include several sources, such as:**

- Surface water
- Groundwater (aquifers)
- Imported water
- Reused water



<sup>1</sup>Gutzler, D. S. 2013. Regional climatic considerations for borderlands sustainability. *Ecosphere* 4(1):7. <http://dx.doi.org/10.1890/ES12-00283.1>

**8) Generally speaking, how aware are you of water scarcity issues in New Mexico? Circle one.**

Not at all aware	Slightly aware	Moderately aware	Very aware	Extremely aware
1	2	3	4	5

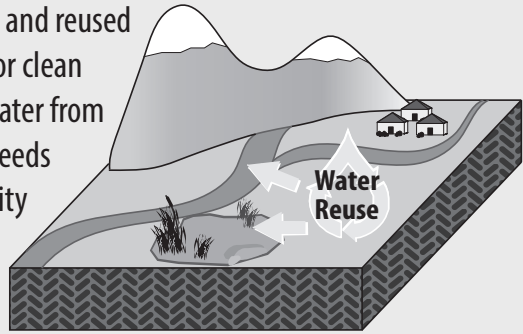
**9) Are you aware of the concept of purifying wastewater and reusing it for drinking water? Check one.**

- Yes
- No

**On the next few pages, we'll talk about 2 different forms of water reuse. We refer to water reuse that supplements the drinking water supply as "drinking water reuse".**

# Environmental Benefits of Water Reuse

Wastewater can be purified and reused to help meet the demand for clean water. Advanced purified water from reuse facilities meets or exceeds federal drinking water quality standards and is suitable for all uses.



## Water reuse benefits the environment by:

- Leaving more water in the environment by decreasing water diversions from sensitive ecosystems
- Increasing the availability of water to enhance stream and wetland habitats
- Replenishing groundwater supplies

## 8) Generally speaking, how aware are you of water scarcity issues in New Mexico? *Circle one.*

Not at all aware	Slightly aware	Moderately aware	Very aware	Extremely aware
1	2	3	4	5

## 9) Are you aware of the concept of purifying wastewater and reusing it for drinking water? *Check one.*

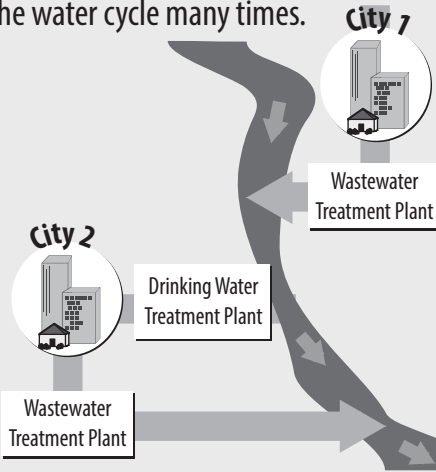
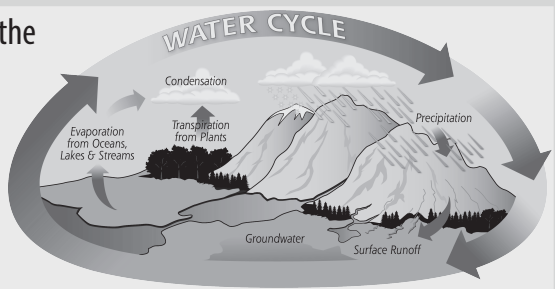
*Check one.*

- Yes  
 No

**On the next few pages, we'll talk about 2 different forms of water reuse. We refer to water reuse that supplements the drinking water supply as "drinking water reuse".**

# The Urban Water Cycle

The **water cycle** refers to the continuous movement of water between the oceans, air, and land. Every drop of water on earth has been through the water cycle many times.



The **urban water cycle** incorporates human activity into the traditional cycle. For many cities located along rivers, this may involve some amount of *defacto* water reuse. *Defacto* reuse occurs when an upstream community (City 1) discharges treated wastewater into a water supply used by a downstream community (City 2).

**8) Generally speaking, how aware are you of water scarcity issues in New Mexico? Circle one.**

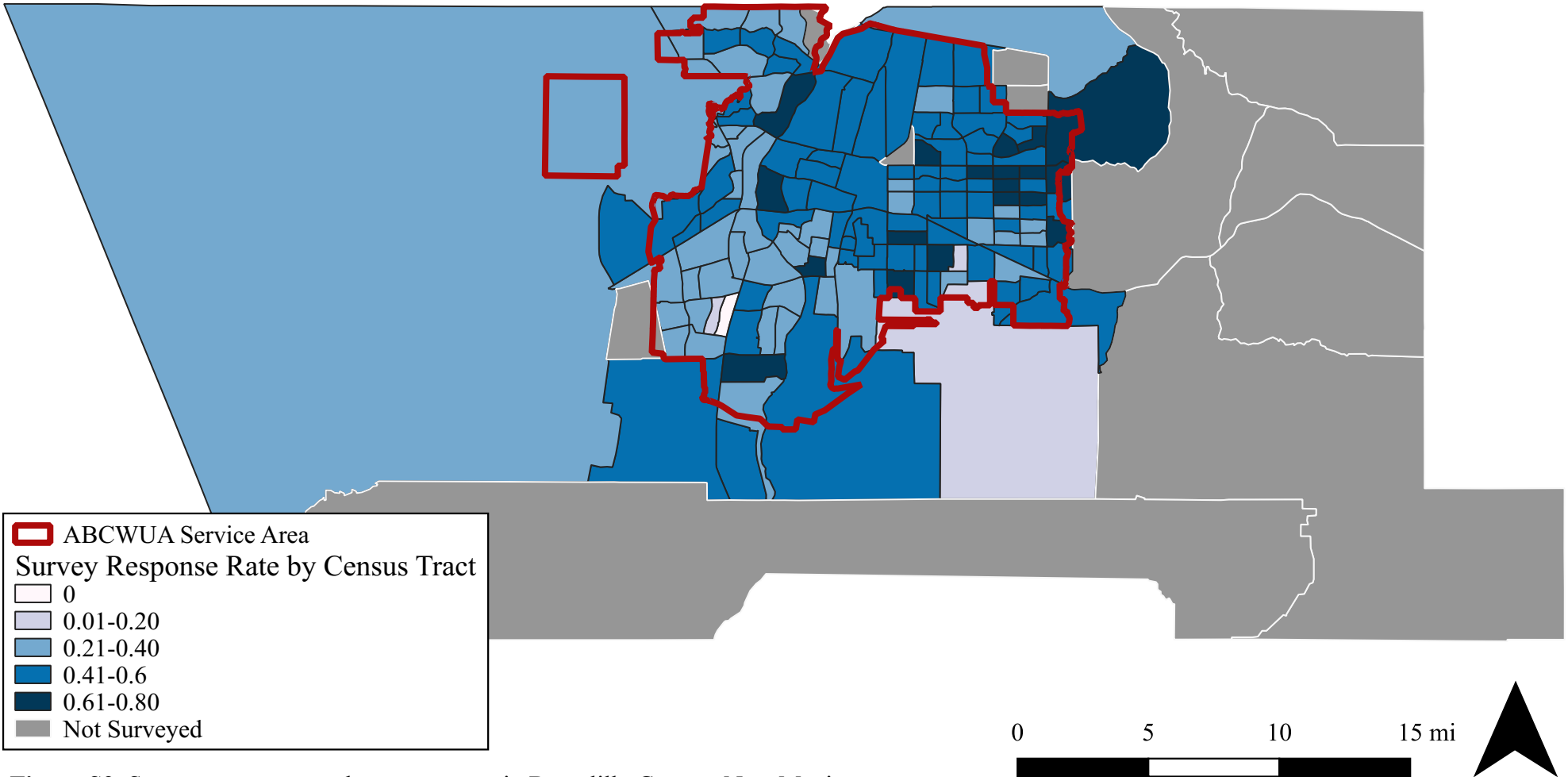
Not at all aware	Slightly aware	Moderately aware	Very aware	Extremely aware
1	2	3	4	5

**9) Are you aware of the concept of purifying wastewater and reusing it for drinking water? Check one.**

Check one.

- Yes
- No

**On the next few pages, we'll talk about 2 different forms of water reuse. We refer to water reuse that supplements the drinking water supply as "drinking water reuse".**



**Figure S2.** Survey response rate by census tract in Bernalillo County, New Mexico

**Table S1.** Demographic Summary of Survey Respondents

Demographic Variables	n <sup>a</sup>	% Total Respondents	NA	% Total Respondents
Age				
18-24	26	1.5%		
25-44	396	22.5%	72	3.9%
45-64	733	41.7%		
65+	604	34.3%		
Gender				
Female	944	53.1%		
Male	832	46.8%	52	2.8%
Other	3	0.2%		
Children at Home (<18 y/o)				
Yes	469	26.4%	52	2.8%
No	1310	73.6%		
Long-term NM resident				
Yes	1275	71.4%	46	2.5%
No	510	28.6%		
Ethnicity (Spanish/Hispanic/Latino)				
Yes	595	34.1%	87	4.8%
No	1149	65.9%		
Race (Ranked by frequency)				
White	1391	80.4%		
Other	188	10.9%		
Mixed Race	58	3.4%		
Black	33	1.9%	101	5.5%
American Indian	31	1.8%		
Asian	25	1.4%		
Pacific Islander	4	0.2%		
Education Level				
High school degree or less	246	13.9%		
Some college	583	32.9%	57	3.1%
College degree	436	24.6%		
Advanced degree	509	28.7%		
Political Affiliation (Ranked by frequency)				
Democrat	802	46.4%		
Independent/No Affiliation	476	27.6%	104	5.7%
Republican	395	22.9%		
Other (Libertarian, Green)	54	3.1%		
Annual Household Income				
Less than \$14,999	81	4.9%		
\$15,000 - \$24,999	133	8.1%		
\$25,000 - \$34,999	143	8.7%		
\$35,000 - \$49,999	221	13.4%		
\$50,000 - \$74,999	371	22.5%	179	9.8%
\$75,000 - \$99,999	251	15.2%		
\$100,000 - \$149,999	256	15.5%		
\$150,000 - \$199,999	97	5.9%		
\$200,000 or more	99	6.0%		

<sup>a</sup> n will not be equal to 1831 for each variable due to non-response (no answer = NA).

**Table S2.** Demographic Survey Data Compared to Bernalillo County Data and Bernalillo County Householder Data from the 2013-2017 American Community Survey 5-Year Estimates

Variable	Category	<i>A</i>	<i>B</i>	<i>A - B</i>	<i>C</i>	<i>A - C</i>
		Survey Respondents n=1831	Bernalillo County (18+) <sup>a</sup> n=521922	$\Delta$	Bernalillo County Householders (18+) <sup>b</sup> n=165608	$\Delta$
Age	18-34	10.8%	31.6%	-20.8%	11.7%	-0.9%
	35-44	13.2%	16.2%	-3.0%	15.8%	-2.6%
	45-64	41.7%	33.2%	8.5%	42.5%	-0.8%
	65+	34.3%	19.0%	15.3%	30.0%	4.4%
Gender	Female	53.1%	51.6%	-	ND	-
	Male	46.8%	48.4%	-	ND	-
	Other	0.2%	ND	-	ND	-
Ethnicity (Spanish/Hispanic/Latino)	Yes	34.1%	45.5%	-11.3%	40.8%	-6.7%
	No	65.9%	54.5%	11.3%	59.2%	6.7%
Education Level	High school degree or less	13.9%	35.8%	-22.0%	26.8%	-13.0%
	Some college	32.9%	33.9%	-1.0%	31.3%	1.6%
	College degree or higher	53.3%	30.3%	22.9%	41.9%	11.4%

Note: ND = no data available.

<sup>a</sup>Educational Attainment (Table S1501), Age and Sex (Table S0101), Sex by Age (Hispanic or Latino) (Table B01001I) from the 2013-2017 American Community Survey 5-Year Estimates.

<sup>b</sup>Demographic Characteristics for Occupied Housing Units (Table S2502) from the 2013-2017 American Community Survey 5-Year Estimates.



## **References**

Distler, L. N. (2018). "Potable Water Reuse in Albuquerque, NM: A Large Scale Community Survey to Understand Public Perceptions and the Impact of Educational Materials on Acceptance." University of New Mexico. [https://digitalrepository.unm.edu/arch\\_etds/76](https://digitalrepository.unm.edu/arch_etds/76).