

12-1-2005

Drinking Water Issues in the Pacific Northwest

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Recommended Citation

Mahler, R. L., Simmons, R., & Sorensen, F. (2005). Drinking Water Issues in the Pacific Northwest. *The Journal of Extension*, 43(6), Article 14. <https://tigerprints.clemson.edu/joe/vol43/iss6/14>

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December 2005 // Volume 43 // Number 6 // Research in Brief // 6RIB6



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Drinking Water Issues in the Pacific Northwest

Abstract

This article contains drinking water information from a region-wide survey designed to collect base line data about water issues in the Pacific Northwest. The major findings were: (1) over 90% of survey respondents feel that their home drinking water is safe for consumption, (2) minerals were the most often cited pollutants in drinking water supplies, (3) approximately 25% of residents have installed filters on their sink faucets to improve water quality, and (4) over 25% of residents use bottled water for drinking purposes. These survey results will be used to develop relevant drinking water educational programs for citizens of the Pacific Northwest.

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Introduction

Water is our most important natural resource. Consequently, the United States Department of Agriculture (USDA), land-grant universities, and Extension have treated water quality as a priority issue since the 1980s (Shepard, 2002; Huter, Mahler, Brooks, Lolley, & Halloway, 1999). In 2000, the USDA-CSREES national water quality program was refocused to emphasize regional rather than state-by-state education of our clientele. This change resulted in the land-grant institutions in the Pacific Northwest region of the U.S. (Northwest Indian College, Oregon State University, University of Alaska, University of Idaho, Washington State University) morphing into a region to address water quality needs. Consequently, the water quality coordinators in these states developed a region-wide needs assessment survey instrument for water issues in 2002 (Mahler, Simmons, Sorensen, & Miner, 2004).

Many scientists, policy makers, and educators believe that they are in the best position to identify the most important issues facing the public. However, many developed programs based on this premise do not effectively enlighten clientele (Mahler, Simmons, & Sorensen, 2005). Consequently we decided to survey the public about their needs prior to developing regional educational programs using established procedures (Dillman, 2000; Salant & Dillman, 1994).

The results of the regional needs assessment survey indicated that the public considered drinking water the most important water resource issue (Mahler, Simmons, Sorensen, & Miner, 2004). In addition, the majority of respondents cited the need for educational opportunities to improve their drinking water literacy. Because drinking water was cited as the most important water issue, we went back into the survey data to learn more about public attitudes and literacy about drinking water in the Pacific Northwest. This article is a summary of the most important drinking water aspects of the 2002 survey.

Materials and Methods

A 50-question survey was designed in 2002 to assess public attitudes about water issues in the Pacific Northwest. The nine survey questions about drinking water evaluated in this paper were as follows:

Q-1. Where do you get your drinking water?

- a. Well (individual well)
- b. Community well system
- c. River, pond, stream, lake, or ice
- d. City water system
- e. I don't know

In your opinion, are any of the listed pollutants problems in your or your neighbors' drinking water? (circle one answer for each question)

	Pollutants	Not a problem	A minor Problem	I don't know	A noticeable problem	An extreme problem
Q-2.	Bacteria	N	M	?	P	E
Q-3.	Nitrates	N	M	?	P	E
Q-4.	Pesticides	N	M	?	P	E
Q-5.	Heavy metals	N	M	?	P	E
Q-6.	Industrial pollutants	N	M	?	P	E
Q-7.	Minerals	N	M	?	P	E

Q-8. Do you feel that your home drinking water is safe to drink?

- a. Yes
- b. No

Q-9. Please check all of the boxes that apply to your home drinking water system.

- Have water softener
- Have water filter on sink
- Purchase 5 gallon containers of drinking water
- Use bottled water for drinking
- Never buy bottled water
- Satisfied with drinking water
- Not satisfied with drinking water
- Drinking water system is separate from water supply system.

Based on statistical advice, a target of 900 residents of the Pacific Northwest was set as the sample size population. Surveys were sent to residents of Alaska, Idaho, Oregon, and Washington on a proportional population basis. Residents from each state were randomly selected from phonebooks and switchboard.com.

Surveys were actually sent to 1,888 residents; however, 114 were returned by the post office as being undeliverable. Consequently, the actual sample population was 1,774. The survey process was designed to receive a completed survey return rate in excess of 50%. If more than 877 surveys were returned completed, then sampling error can be assumed to be less than 5% (Dillman, 2000; Salant & Dillman, 1994).

Three mailings were used to achieve this return rate. The first mailing, which took place in January 2002, included the water issues survey form, a business reply envelope, and a cover letter that: (1) identified the survey's authors; (2) explained the purpose of the survey; (3) assured the

respondent of anonymity; and (4) asked the respondents to fill out and return the survey via the business reply envelope.

The second mailing occurred 5 weeks later (March 2002) and consisted of a postcard that stressed the importance of the survey, and a reminder to the respondent to fill out and return the survey sent out in the first mailing. Five weeks later (May 2002), the third mailing was sent to residents who did not respond to the first or second mailing. This mailing included a reminder letter, another copy of the water issues survey, and a business reply envelope.

Data Analysis

Survey answers were coded and entered into Microsoft Excel. The data were then copied to SPSS, a statistical software package (Norusis, 1986). Missing data were assigned the number nine on the coding system and excluded from the analysis.

The data were analyzed at two levels using SPSS (Norusis, 1986). The first level of analysis was a basic data summary. This analysis showed both the total number and percentage of respondents that answered each question with a specific answer. The second level of analysis involved using cross-tabulation, or contingency tables, to isolate how specific subgroups of survey respondents (e.g., demographic groups such as gender and education level) related to specific questions. Significance was tested using a chi-square distribution (Babbie, 1983). The significance level deemed valid in this study was 0.05.

Results and Discussion

The survey methodology used in the study was not designed to be unique, but rather to be used as a tool to ascertain useful information. Appropriate drinking water education programs will be developed for our Pacific Northwest audience based on this information.

The water issues survey achieved a return rate of 52.3% (928 either fully or partially completed and returned out of 1,774). The individual state response ranged from 50.6 to 57.6% (Table 1). Fifty-six percent of the survey respondents were male. Over 32% of survey respondents lived in communities of more than 100,000 people. Conversely, 18% of respondents lived in towns with less than 7,000 people. Thirty-five percent of respondents had lived in the Pacific Northwest all of their lives. Ninety-one percent of survey respondents were high school graduates. Overall, the demographics of the survey respondents (except for gender) closely reflected the actual demographics of the region. Consequently, when coupled with the low sampling error of the survey, respondents are often equated to residents in the following discussion.

Table 1.
Statistical Data About Water Issues Survey Sample Size and Completion Rate
by State

State	Sample Size	Completed	Return Rate
Alaska	232	120	51.7%
Idaho	278	160	57.6%
Oregon	506	256	50.6%
Washington	758	392	51.7%
Total	1,774	928	52.3%

Almost 70% of the surveyed residents of the Pacific Northwest received their water from a city water system (Table 2). Individual wells followed by community well systems were the next most common domestic water sources. Less than 2% of the population got their water directly from a river, lake, pond, or stream. The demographic factors of occupation, education level, gender, age, and length of residence in the Pacific Northwest did not affect a person's water source. However, the demographic factors of community size and state of residence did impact drinking water source.

Table 2.
Identified Primary Water Sources by Residents of the Pacific Northwest in
Water Issues Survey

Source of Water	Percentage of Respondents
City water system	69.8
Individual well	19.1
Community well system	8.4
River, lake, stream	1.2
Don't know	1.5

As would be anticipated the larger the community size of residence the greater the likelihood of obtaining water from a city water system (Table 3). Conversely, as community size decreased, a larger percentage of residents relied on individual wells and/or community well systems.

Table 3.

The Influence of Community Size on Primary Residential Water Source Based on the Water Issues Survey

Source of Water*	Community Size				
	>100,000	25-100,000	7-25,000	3.5-7,000	<3,500
	Percentage of Respondents				
City water system	83	76	68	49	32
Individual well	10	16	18	31	51
Community well system	5	6	10	16	2
River, lake, stream	0	0	3	0	2
Don't know	2	2	2	3	1
* Within a source of water a difference of 4.0% is significantly different at the 0.05 level.					

State of residence also significantly affected the local water source (Table 4). Residents of Oregon and Washington were more likely to get their water from a city water system than people living in Alaska or Idaho. This is probably due to the fact that a higher percentage of Oregon and Washington residents live in urban communities. From a statistical standpoint, state of residence did not affect the likelihood of obtaining water from a community well system or from private surface water sources.

Table 4.

The Influence of State of Residence on Primary Residential Water Source Based on the Water Issues Survey

	State of Residence

Source of Water*	AK	ID	OR	WA
	Percentage of Respondents			
City water system	60	64	73	73
Individual well	31	24	17	17
Community well system	6	9	8	9
River, lake, stream	3	1	1	1
Don't know	0	2	1	0

* Within a source of water a difference of 4.0% is significantly different at the 0.05 level.

To evaluate potential pollution problems in drinking water responses of "not a problem" and "a minor problem" were pooled, as were "a noticeable problem" and "an extreme problem." Public responses to potential pollutants in drinking water were similar (Table 5). Less than 5% of survey respondents considered bacteria, nitrates, pesticides, heavy metals, or industrial pollutants as a noticeable or significant problem in drinking water supplies. More significant was the observation that a majority of respondents did not consider any of the pollutants listed below to be a problem (Table 5). The most important observation shown in Table 5 is that 4 out of 10 respondents do not have enough information about potential pollutants to have an opinion about risk. Demographic factors did not affect responses to bacteria, nitrates, pesticides, heavy metals, and industrial pollutants.

The response to minerals as a pollutant in drinking water were significantly different from the other potential pollutants (Table 5). Almost 24% of respondents felt that minerals (i.e., calcium, iron) were a noticeable or significant problem in their home water supply. Females were more likely than males to cite minerals as problems in their water supply. Other demographic factors did not affect responses to minerals in household water supplies.

Table 5.
Perceptions of Drinking Water Contamination Problems in the Pacific Northwest
by Respondents to Water Issues Survey

Pollution	Problem		
	No/Minor	Noticeable/Significant	Don't Know
	Percentage of Respondents		
Bacteria	59.6	3.5	36.9
Nitrates	52.0	3.9	43.0
Pesticides	54.9	3.4	41.7
Heavy metals	54.6	3.9	41.5
Industrial pollutants	56.4	4.2	39.5

Minerals	43.5	23.2	33.2
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Ninety-one percent of survey respondents felt that their home water source was safe to drink (Table 6). The demographic factors of state of residence, community size, age, education, and occupation did not affect answers about the safety of drinking water. However, gender and length of residence in the Pacific Northwest did affect answers (Table 6). Females were less likely than males (88% vs. 94%) to consider their home drinking water safe. Also, people who have resided in the Pacific Northwest for a minimum of 10 years were more likely to consider home drinking water safe than people who have lived in the region fewer than 10 years.

There was a significant interaction between drinking water source and concern about specific drinking water pollutants (data not shown). In general, people obtaining water from city water systems were more likely to suspect pollutants being present in their drinking water supply. However, in reality, because of safeguards required by the Safe Drinking Water Act, people receiving their drinking water from city systems should have a much lower vulnerability to pollutants identified in this survey being present than rural residents. This notion should be addressed in educational programs developed as a result of this survey.

Table 6.

Responses to the Survey Question: "Do you feel that your home drinking water is safe to drink?"

Parameter	Response	
	YES	NO
	Percentage of Respondents	
Overall	91	9
Demographic: Gender*		
Female	88	12
Male	94	6
Demographic: Time in PNW		
All life	92	8
> 10 years	93	7
5 to 9 years	84	16
< 5 years	85	15
* Within a demographic a difference of 5.0% is significantly different at the 0.05 level.		

Over two-thirds of Pacific Northwest residents are satisfied with their drinking water (Table 7). Even with this high level of satisfaction, there is room for improvement, as 27% of residents use bottled water for drinking and 25% of survey respondents have water filters on faucets on their sinks (Table 7). Only 15% of respondents are not satisfied with their drinking water.

Table 7.

Responses to the Survey Question: "Please check all of the boxes that apply to your home drinking water system."

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Item	Percent Checking
Satisfied with drinking water	67
Never buy bottled water	28
Use bottled water for drinking	27
Have water filter on sink	25
Not satisfied with drinking water	15
Have water softener	12
Purchase 5 gallon containers of water	7
Drinking water is separate from water supply system	5

The demographic factor of age often had an impact on how people responded to questions about their home drinking water system (Table 8). Respondents over 60 years of age were less likely to have water filters on faucets on their sinks and to buy bottled water for drinking purposes. Conversely, people in the 60+ age categories were more likely to be satisfied with the quality of their drinking water.

Table 8.

The Influence of the Demographic Factor Age on Responses to Questions About Drinking Water

Question	Age	Percent Checking
I have a water filter on my sink.		
	< 30	25
	30 - 39	39
	40 - 49	30
	50 - 59	25
	60 - 69	16
	70+	15
I often use bottled water for drinking purposes.		
	< 30	33
	30 - 39	31

	40 - 49	32
	50 - 59	29
	60 - 69	20
	70+	13
I never buy bottled water.		
	< 30	26
	30 - 39	20
	40 - 49	21
	50 - 59	24
	60 - 69	42
	70+	42
I am satisfied with my drinking water (piped in house).		
	< 30	61
	30 - 39	65
	40 - 49	61
	50 - 59	65
	60 - 69	76
	70+	76

The demographic factor of gender also often affected responses to questions about home drinking water systems (Table 9). Females were more likely than males to buy bottled water for drinking purposes. Conversely, males were more likely to be satisfied with their drinking water (Table 9).

Table 9.

The Influence of the Demographic Factor Gender on Responses to Questions About Drinking Water

Question	Gender	Percent Checking
I often use bottled water for drinking purposes.		

	Female	31
	Male	24
I never buy bottled water.		
	Female	21
	Male	32
I am satisfied with my drinking water (piped in house).		
	Female	61
	Male	70

Summary and Conclusions

The answers to the drinking water related survey questions indicate that most residents of the Pacific Northwest are satisfied with the quality of their drinking water. The data also indicate that a significant number of residents need more information about potential drinking water pollutants. The drinking water portion of the water issues survey provided us with a wealth of knowledge about public attitudes and aptitudes in the Pacific Northwest. Response differences due to state of residence were minimal indicating uniformity about drinking water issues across the region. Consequently, drinking water educational programming on a regional basis would be both logical and efficient in the Pacific Northwest. The drinking water education programs that we will develop will address public concerns and will also link current public perceptions about drinking water with the existing scientific data about drinking water quality.

The key findings of this survey included:

- A large majority of residents in the Pacific Northwest feel that their drinking water is safe to drink. The majority of residents get their water supply from a city water system.
- Almost 4 in 10 respondents do not have enough information to determine if bacteria, nitrates, pesticides, heavy metals, industrial pollutants, or minerals are a threat to their drinking water supply.
- Minerals (calcium, iron) were the most often cited pollutants in residential drinking water supplies.
- Approximately 25% of residents have a water filter on their sink to improve drinking water quality.
- Over 25% of Pacific Northwest residents use bottled water for drinking purposes.
- Residents in the 60+ age group are more likely to be satisfied with home drinking water quality. They are less likely to purchase bottled water or have a filter on their sink.
- Females are more likely than males to use bottled water for drinking purposes and are less likely to be satisfied with the quality of their home water supply.

Based on this survey, the following are key recommendations that should be used in the development and/or content of drinking water educational programs:

- Drinking water educational programming on a regional basis would be both logical and efficient in the Pacific Northwest.
- The potential health and aesthetic impacts and associated treatment of minerals (i.e., calcium, iron) in drinking water should be addressed as part of an educational program.
- The impact of provisions of the Safe Drinking Water Act (SDWA) on the presence of pollutants should be addressed in urban areas (city and community water systems).
- Programs should address the use of bottled water since a significant portion of the public use it for at least a portion of their consumed drinking water.

- Public perceptions about drinking water quantity should be linked (or uncoupled) to the existing scientific data at the local level.

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