Spokane County Residential Water Use Survey

June 30, 2010

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WRIA 55/57 Watershed
Implementation Team
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Funding provided by:
Washington Department of Ecology
G1000123

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1.0 Executive Summary

A residential water use survey was conducted in Spokane County to assess the differences in water use characteristics of residences on public water systems and those that are self supplied. The survey was conducted between October 2009 and April 2010 with 1,249 responses to the survey. Since outdoor water use is often the largest component of residential water use the comparison focused on the amount of irrigated landscape reported by the survey respondents. Other outdoor water uses and indoor water use was also evaluated. The following are the primary conclusions from analysis of survey results:

- The average amount of irrigated landscape of suburban and rural residences in Spokane County is approximately 8,000 square feet which equates to approximately 997 gallons per day during summer months.
- There is not a significant difference in the average amount of irrigated landscape between public supplied and self supplied residences.
- Public supplied residences were more likely to have an in-ground sprinkler system, water during the early morning, water more days a week, and water for shorter durations than self supplied residences.
- The average watering time per week was not significantly different between self and public supplied residences.
- There are variables that correlate with the amount of irrigated landscape at self supplied residences:
    - Self supplied residences with well yields below 5 gpm have on average half the average amount of irrigated landscape that those with well yields above 5 gpm. Above 5 gpm the well yield does not impact the amount of irrigated landscape.
    - The setting of self supplied residences does correlate with the amount of irrigated landscape. Residences in forested areas had 25% less irrigated landscape than average.
    - The lot size of a self supplied residence does not correlate with the amount of irrigated landscape.
    - The size of a self supplied residence does correlate with amount of irrigated landscape.
- There are variables that correlate with the amount of irrigated landscape at public supplied residences:
    - Lot size does correlate with the amount of irrigated landscape at public supplied residences.
    - Residence size does correlate with the amount of irrigated landscape at public supplied residences.
    - Homes identified as within a city or city neighborhood have on average less area of irrigated landscape.
- Approximately 20% of self supplied residences have at least one livestock.
- The percentage of residences with a pool is 11% for both self and public supplied residences.
- Approximately 47% of self supplied residences and 35% of public supplied residences have gardens.
- Self supplied and public supplied residences have similar numbers of indoor water use fixtures and appliances.

2.0 Introduction

This report describes the process and results of the Spokane County Residential Water Use Survey (Survey). This project was completed with funding from Washington Department of Ecology (Ecology) Grant G1000123 and is a component of the Spokane County Water Use Inventory and Demand Forecast project. The objective of this survey project is to identify differences in water use characteristics of residences supplied with public water and residences supplied with an individual well.

Rural residential development within Spokane County is an important component of overall water use, yet there is little information on which to base estimates, either locally or statewide. Most rural residences are supplied by individual wells located on the same property as the residence. These wells, often called domestic exempt wells because they are exempt from the state permitting requirements of larger water withdrawals, are for the most part not metered and there is currently no reporting requirement of water usage from these residences to any government entity. Consequently there are no actual water use records to characterize water use for rural residences.

In most water use inventories and water demand forecasts these residences, called self supplied residences, are assumed to use the same amount of water as publicly supplied residences in the same vicinity. Is this a valid assumption? It may or it may not be. One water use study conducted in New Hampshire by the United States Geological Survey (USGS) and the New Hampshire Department of Environmental Services (NHDES) addressed this question. The study concluded that the estimated mean per capita indoor water demand was 67 gallons per day (gal/d) for self supplied residences and 69 gal/d for publicly supplied residences (USGS, 2008). Data collected for the study was not adequate to address outdoor water use. Data used for the USGS/NHDES study was generated from water use surveys of the residents within the study area.

There are two issues with using the conclusions of the USGS/NHDES study for a study of water use in Spokane County: 1. It does not address outdoor water use, the largest component of overall water use which occurs during the critical time for stream flow, and 2. There is a large difference in climate between Spokane County and New Hampshire which would make a comparison of outdoor water use between the two locations invalid. The study did, though, demonstrate the use of a survey to analyze the difference between self supplied and public supplied residences.

This project utilized the same methodology as the USGS/NHDES study. A survey was created to characterize household water use. The survey was distributed to both self supplied and publicly supplied residences within Spokane County. The results of each group were analyzed to determine if statistically significant differences exist between the two groups. If differences are found they can be utilized in conjunction with metered data from publicly supplied systems to estimate usage of self supplied residences.

3.0 Water Use Survey Development

The Residential Water Use Survey was developed by Spokane County Water Resources staff. The survey is based on the survey used in the USGS/NHDES study and a survey used in an American Water Works Association study entitled *Residential End Uses of Water*. A draft survey was presented to an advisory group comprised of local water purveyors, Ecology Water Resources staff, and planning staff from local municipalities. Comments from the group were incorporated into the final survey. A copy of the survey is in Appendix A.

4.0 Survey Distribution

Distribution of the survey began in October 2009 and extended until April 2010. Two mechanisms were used to distribute the survey. The first was distribution of surveys in conjunction with a class presentation on water resources. During the 2009-10 school year Franklin and Spokane County Conservation Districts partnered to implement the "Water on Wheels" education program in Spokane County schools. Water on Wheels is a hands-on water, soil, and energy conservation program teaching students critical-thinking skills geared toward natural resource conservation. The Water on Wheels Educator explained and distributed the water use survey during each Water on Wheels lesson conducted in the county. Students brought the survey home and filled it out with their parents. A water conservation kit was provided as an incentive to return the survey. The Water on Wheels program was presented to 204 classrooms with a total of 4,763 students. A list of schools and classrooms where the survey was distributed is located in Appendix B. This method of survey distribution was borrowed from the USGS/NHDES study described in the introduction.

The second method of gathering survey data was to send a post card to county residences not on a public water supply requesting that they take the survey online. A total of 15,000 post cards were sent. The post card described the water use inventory and demand forecast project and requested that they fill the survey out online or call and request a hard copy. A copy of the post card is in Appendix C.

5.0 Survey Response

A total of 1,249 survey responses were collected of which 450 were the result of the post card and 799 from the classroom presentations. The goal of the survey was to collect data that is representative of single family residences within the entire county. The United States Census Bureau estimates there were 197,319 housing units in Spokane County in 2008 and 75.9% of those units were single family. Therefore in 2008 there were approximately 150,000 single family housing units in Spokane County. A representative sample of a population of 150,000 with a 99% confidence interval and a 3.75% error rate is 1,174 samples collected randomly.

The manner in which this survey was distributed and responded to was not random. Distribution of surveys via the classroom exercise emphasizes families with children and respondents to the survey from the post card mailing may emphasize some households over others such as household with a water quality or quantity problem may be more likely to respond or a household with an interest in water conservation may be more likely to respond. A

comparison of demographic data of survey respondents to data from the entire county can be used to determine if the survey data may be biased and how that bias may impact study conclusions.

Table 5-1 Comparison of Survey Respondents to All County Residences

Residence Characteristics	All County	Survey Respondents
Household Size (persons)	2.46	3.7
% of Households with persons under the age of 18	35%	68%
Average Year Built	1963	1985
Average Assessed Value	$146,308	$196,191
Average Residence Size (sq ft)	1,268	1,513

Clearly the method of survey distribution favored homes with children. There is also a bias towards larger, newer homes. This is attributable to minimal response from households within the City of Spokane city limits. Homes within the city limits tend to be smaller and older than those in suburban and rural areas, which was the focus of this study. Figure 5-1 shows the location of survey respondents.

The objective of the study was to determine differences in water use between self supplied residences and public supplied residences. Below is a comparison of the survey respondents of each category to the entire county for each category.

Table 5-2 Comparison of Self Supplied and Public Supplied Respondents

Residence Characteristics	Self Supplied		Public Supplied	
	Survey	*All County*	*Survey*	*All County*
Average Year Built	1981	1978	1985	1961
Average Assessed Value	$197,460	$165,837	$194,838	$141,179
Average Residence Size (sq ft)	1,635	1517	1,401	1230

The average characteristics of self supplied respondents is closer to the characteristics of all county self supplied residents, while the public supplied respondents show a bias towards larger, bigger homes. This is due to the focus on suburban areas outside the city limits as discussed above. Analysis done in the Water Use Inventory and Demand Forecast project shows larger, newer homes with a higher assessed value have increase water use, therefore the bias of survey respondents is toward residents with increased water use. This will be considered in the discussion of survey results.

6.0 Discussion of Survey Results

The objective of this study is to determine similarities and differences in water use characteristics between residences with publicly supplied water and residences with self supplied water. The main focus of the following discussion is landscape irrigation because it is the largest component of residential water use within Spokane County. Other water use such as livestock, pools, gardens, and indoor use is also evaluated and discussed. The primary measure of landscape irrigation water use utilized in this study is area of landscape. Table 5-3 shows the

relationship of area of irrigated landscape to water use. The table is based on the Natural Resources Conservation Service (NRCS) Lawn Irrigation Guide recommendation of 1 inch of water every 4-7 days. Irrigation is assumed to occur between May 15 and Sept 15.

Table 5 –3: Landscaped Area and Water Use

Irrigated Area (sq ft)	Irrigation Water Use [1]	% of annual water use that is outdoor use[2]
2,000	249	29%
4,000	499	45%
6,000	748	56%
8,000	997	63%
10,000	1,247	68%
12,000	1,496	71%

1- gallons per day per residence May 15-September 15
2- indoor water use estimate of 200 gallons per day per connection

The main tool to evaluate survey responses is a comparison of the average area of irrigated landscape between groups distinguished by a particular variable. For example a comparison of the average area of irrigated landscape of public supplied and self supplied residences. For each group the number of samples, the average, and the standard deviation is determined. An independent two sample t-test for samples of unequal size and unequal variance is conducted to determine if there is a statistically significant difference at the 95% confidence interval between the average areas of irrigated landscape between two groups, i.e. public supply and self supply.

Prior to conducting analysis of the survey data there was one issue to resolve. The average area of irrigated landscape of self supplied survey respondents is 7,646 square feet (sq ft). A study conducted by Spokane County in 2009, the *WRIA 56 Landscape Irrigation Study*, found the average area of irrigated landscape of a self supplied residence is 11,325 sq ft. This discrepancy raised concerns regarding the validity of the survey responses.

To assess the validity of the survey responses a random sample of 106 self supplied residences was evaluated with aerial photos to determine the area of irrigated landscape. There are approximately 14,000 self supplied residences within the County. A sample of 106 has a 9.5% error at a confidence interval of 95%. The average landscaped area of the random sample is 8,310 sq ft with a standard deviation of 5,399 sq ft. There is not a statistically significant difference between the average landscaped area of self supplied residences as determined from the survey and as determined from the random sample. Therefore there is a discrepancy with the average area of irrigated landscape determined from the WRIA 56 Landscape Irrigation Study. The objective of the WRIA 56 Landscape Irrigation Study was to determine if a correlation existed between the area of landscape irrigation and assessor data such as lot size, home value, etc. To meet this objective landscapes were chosen that were easily identifiable and excluded residences with little or no landscaping. This likely resulted in the average biased to lawns greater in size than average

In addition to the following analysis a full summary of survey results is presented in Appendix D.

6.1 Public Supply vs. Self Supply

The first comparison addresses the basic objective of the study; is there a difference in water use depending on the source of water, public supply or self supply. At a 95% confidence interval the difference in average landscaped area between public supply and self supplied households is not statistically significant.

Table 6 –1: Public vs. Self Supplied - Average Irrigated Landscape

Group	Average Landscaped Area (sq ft)	Standard Deviation	Sample Size	Significant Difference
Public Supply	8358	8110	550	No
Self Supply	7646	9372	486	

In addition to the area of irrigated landscape the methods, duration, number of days a week and time of day of irrigation was evaluated. Figures 6-1 through 6-4 show a comparison of self and public supplied residences. In general public supplied residences were more likely to have an in-ground sprinkler system, water during the early morning, water more days a week, and water for shorter durations.

Figure 6-1: Water Methods – Public vs. Self Supplied Residences

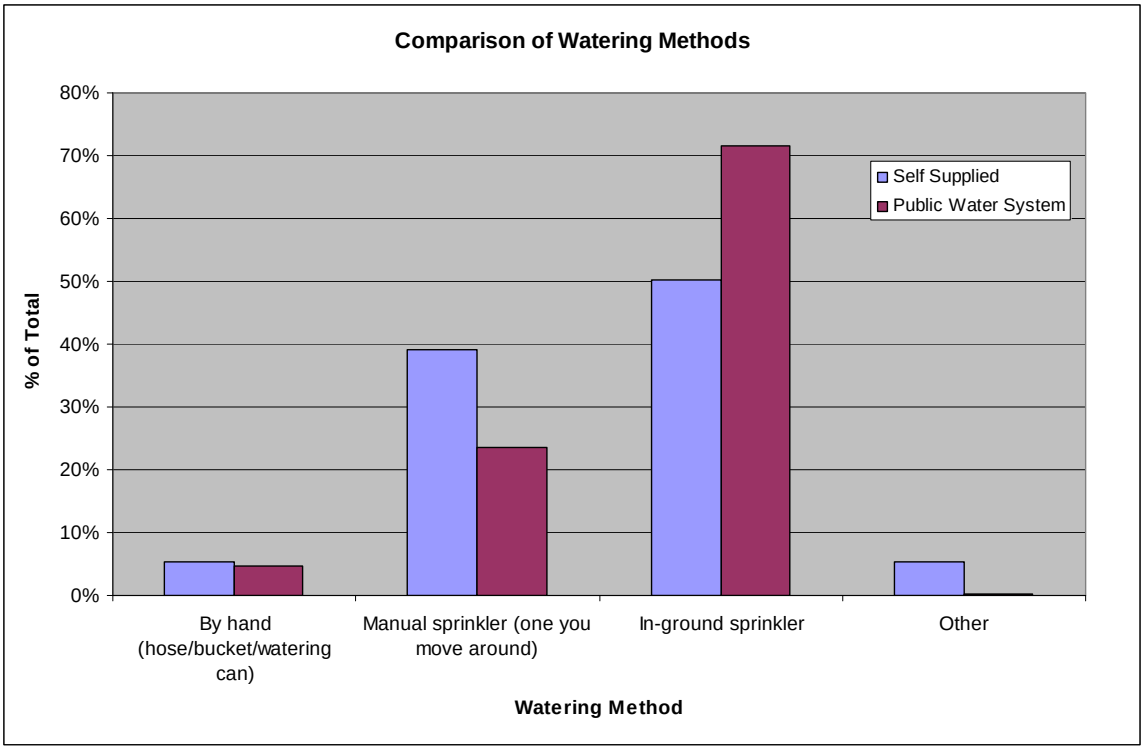


Figure 6-2: Water Duration – Public vs. Self Supplied Residences

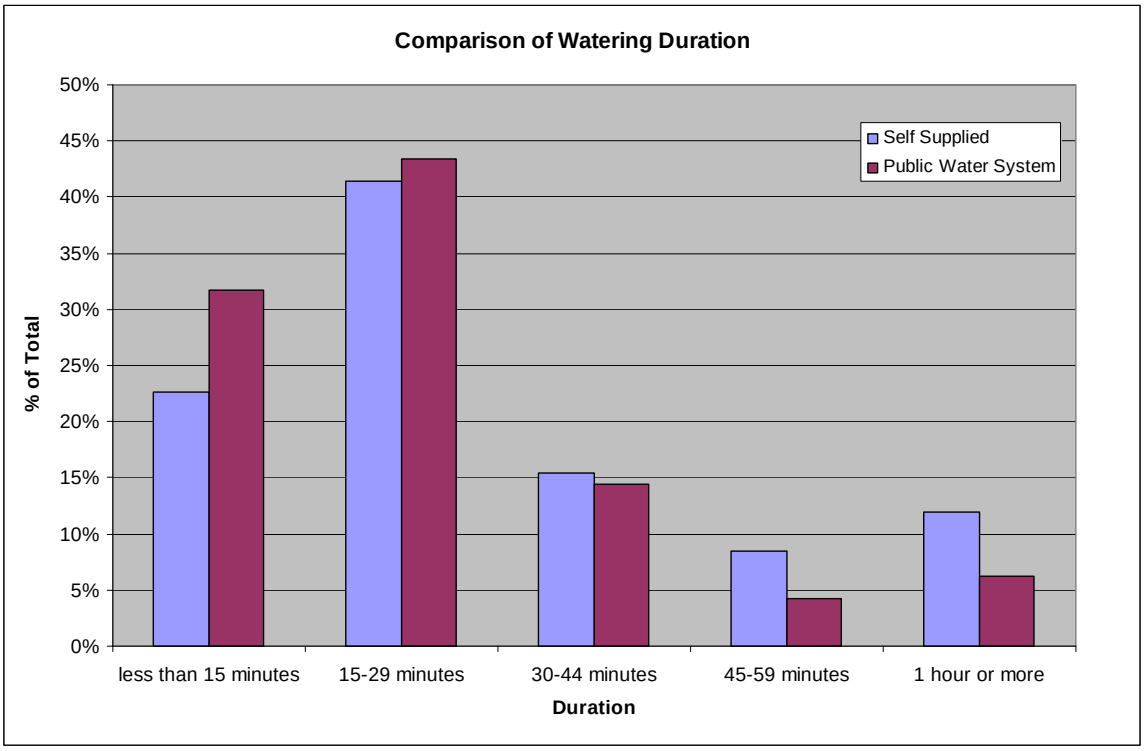


Figure 6-3: Water Time – Public vs. Self Supplied Residences

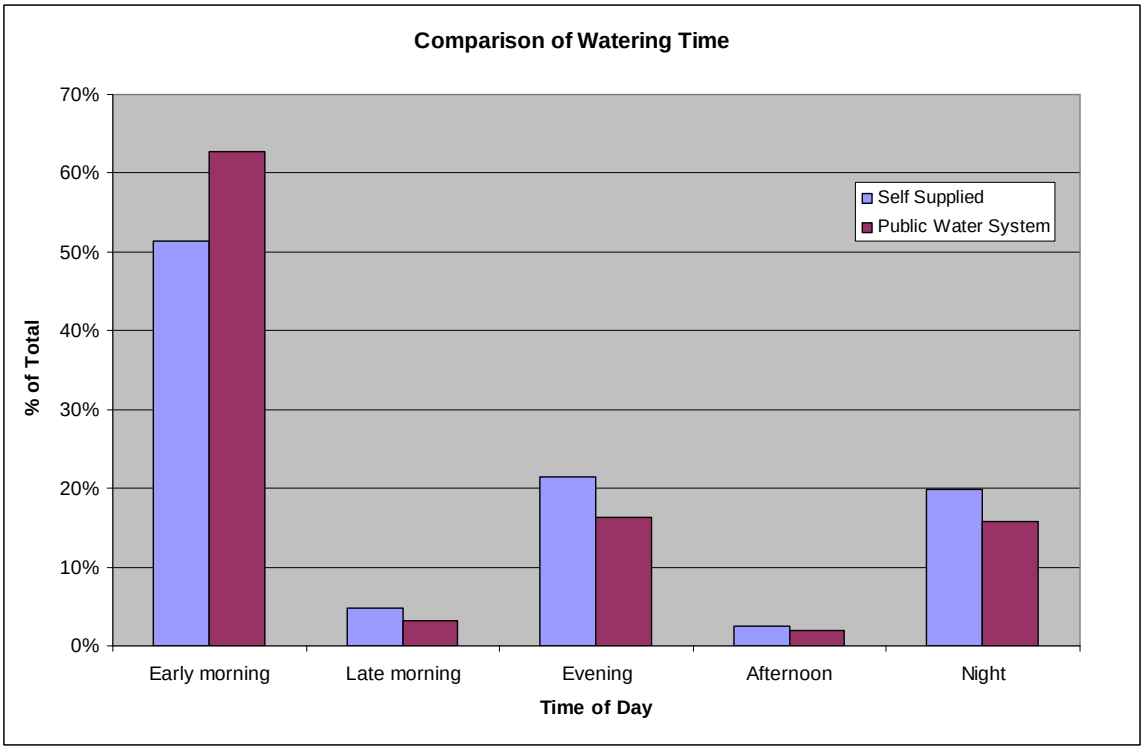
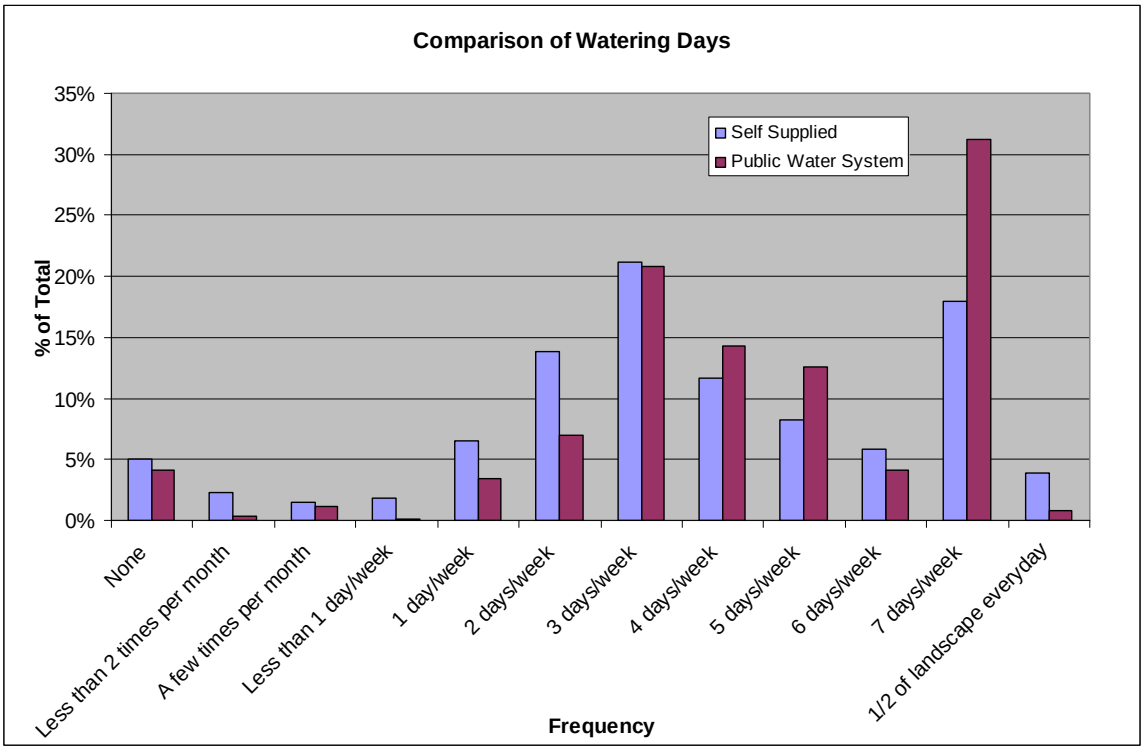


Figure 6-4: Water Days – Public vs. Self Supplied Residences



Even though there are differences in irrigation characteristics between self and public supplied residences the total watering time per week is very similar. From the days per week and watering duration a total watering time per week was calculated. For example a response of 3 days per week and 30-45 minutes per day is 1.875 hours per week. There is not a statistically significant difference between average watering time per week between self and public supplied households.

Table 6-2: Watering Time Per Week-Public vs Self Supplied

Group	Watering time per week (hours)	Standard Deviation	Sample Size	Significant Difference
Public Supply	1.32	1.25	606	No
Self Supply	1.40	1.41	502	

6.2 Factors that influence Self Supplied Landscape Irrigation Water Use

A secondary objective of this study was to determine what factors do influence the amount of irrigated landscape, the largest single component of overall water use, of a self supplied residence. Four factors were analyzed: 1. well yield, 2. residence setting, 3. lot size, and 4. home size. The survey responses were grouped by the variable of interest and the average landscape size was compared between groups in a manner similar to the public vs. self supply comparison.

6.2.1 Well Yield

Survey responses were segregated into four groups by well yield. The only statistically significant difference is between residences reporting less than 5 gallons per minute (gpm) and all other groups. In essence 5 gpm is a threshold beyond which self supplied water use is not significantly impacted. Table 6-3 shows the average landscaped area per well yield grouping, and Table 6-4 shows which groupings have a statistically significant difference in average landscaped area.

Table 6 - 3: Well Yield and Average Area of Irrigated Landscape

Well Yield Range	Average Landscaped Area (sq ft)	Standard Deviation	Sample Size
Less than 5 gpm	3,684	6,094	76
5 – 15 gpm	8,770	10,321	158
15 – 40 gpm	8,538	8,987	145
Greater than 40 gpm	10,652	12,455	23

Table 6 -4: Well Yield Grouping Significance Testing

Well Yield Range	Less than 5 gpm	5 – 15 gpm	15 – 40 gpm
Less than 5 gpm	-		
5 – 15 gpm	***Significant***	-	
15 – 40 gpm	***Significant***	Not Significant	-
Greater than 40 gpm	***Significant***	Not Significant	Not Significant

6.2.2 Residence Setting

Survey responses were segregated into three groups by residence setting. The survey offered five choices: 1. city, 2. city neighborhood, 3. suburban neighborhood, 4. rural-pasture/agriculture, 5. rural forested. City and city neighborhood was not selected by any self supplied respondents. Analysis of the results shows that there is a statistically significant difference between residences located in rural-forested settings and rural-pasture agricultural.

Table 6 -5: Residence Setting and Average Area of Irrigated Landscape

Residence Setting	Average Landscaped Area (sq ft)	Standard Deviation	Sample Size
Rural-Forested	6,135	8,514	206
Rural Pasture-Agricultural	8,827	9,969	246
Suburban Neighborhood	8,628	9,784	25

Table 6 –6: Residence Setting Significance Testing

Residence Setting	Rural-Forested	Rural Pasture-Agricultural
Rural-Forested	-	
Rural Pasture-Agricultural	***Significant***	-
Suburban Neighborhood	Not Significant	Not Significant

6.2.3 Lot Size

Survey responses were segregated into 7 groups by lot size. There were no self supplied residence responses with a lot size less than 1 acre. Residential development with lot sizes less than 1 acre generally require a public water system. Table 6-6 shows the average area of landscape for each lot size grouping. A table indicating groups that have a statistically significant difference is not included because there were no significant differences between groups.

Table 6 -6: Lot Size and Average Area of Irrigated Landscape

Lot Size	Average Landscaped Area (sq ft)	Standard Deviation	Sample Size
1 – 2 acres	8,068	8,885	22
2 – 5 acres	6,474	9,180	49
5 – 9 acres	7,338	8,525	133
10 – 19 acres	8,717	10,138	161
20 – 39 acres	7,950	10,154	60
40 – 99 acres	8,520	10,939	24
100 acres or greater	4,923	8,971	13

6.2.4 Home Size

Survey responses were segregated into 4 groups by home size. The groupings were chosen to best distribute the responses. Analysis of the results shows that there is not a statistically significant difference between the two middle groupings but there are significant differences between the first group, the two middle groups and the fourth group. Table 6-7 shows the average area of landscape for each grouping, and Table 6 - 8 shows which differences are significant.

Table 6 - 7: Home Size and Average Area of Irrigated Landscape

Home Size	Average Landscaped Area (sq ft)	Standard Deviation	Sample Size
Less than 1600 sq ft	5,014	7,101	108
1600 – 2400 sq ft	7,974	9,513	153
2400 – 3600 sq ft	7,415	8,626	141
Greater than 3600 sq ft	11,253	11,960	77

Table 6 - 8: Home Size Significance Testing

Home Size	Less than 1600 sq ft	1600 – 2400 sq ft	2400 – 3600 sq ft
Less than 1600 sq ft	-		
1600 – 2400 sq ft	***Significant***	-	
2400 – 3600 sq ft	***Significant***	Not Significant	-
Greater than 3600 sq ft	***Significant***	***Significant***	***Significant***

6.3 Factors that influence Public Supplied Landscape Irrigation Water Use

Analysis of public supplied water use was conducted in similar manner to self supplied water use. Three factors were analyzed: 1. residence setting, 2. lot size, and 3. home size. The survey responses were grouped by the variable of interest and the average landscape size was compared between groups in a manner similar to the public vs. self supply comparison.

6.3.1 Residence Setting

Survey responses were segregated into five groups by residence setting. The predominant response was suburban neighborhood which was expected given the geographic focus of the study and the types of areas usually within public water service areas. Analysis of the results shows that there is a statistically significant difference between residences located in city environments as compared to residences located in suburban and rural environments. This is likely due to typical lot sizes in these areas.

Table 6 - 9: Residence Setting and Average Area of Irrigated Landscape

Residence Setting	Average Landscaped Area (sq ft)	Standard Deviation	Sample Size
City	3,543	3,707	23
City Neighborhood	5,834	5,794	122
Suburban Neighborhood	8,768	8,238	357
Rural-Forested	9,962	10,632	35
Rural Pasture-Agricultural	8,967	9,568	39

Table 6 - 10: Residence Setting Significance Testing

Well Yield Range	City	City Neighborhood	Suburban Neighborhood	Rural-Forested
City	-			
City Neighborhood	***Significant***	-		
Suburban Neighborhood	***Significant***	***Significant***	-	
Rural-Forested	***Significant***	***Significant***	Not Significant	-
Rural Pasture-Agricultural	***Significant***	***Significant***	Not Significant	Not Significant

6.3.2 Lot Size

Survey responses were segregated into 8 groups. Analysis of the results shows that residences on lots approximately ¾ acres in size have the maximum average landscaped area. Lots ½ acre in size are similar to the average landscaped area and are not significantly different than lots greater than 2 acres in size. The average area of landscape for publicly supplied systems is impacted by lot size.

Table 6 - 11: Lot Size and Average Area of Irrigated Landscape

Lot Size	Average Landscaped Area (sq ft)	Standard Deviation	Sample Size
Less than ¼ acre	4,708	4,196	126
¼ acre	6,841	4,307	150
½ acre	8,725	6,284	117
¾ acre	17,191	10,340	36
1-2 acres	14,941	12,393	55
2-5 acres	9,275	11,508	20
5-9 acres	9,057	10,652	27
10 – 99 acres	4,526	9,211	19

Table 6 - 12: Lot Size Significance Testing

Lot Size	< ¼ acre	¼ acre	½ acre	¾ acre	1-2 acres	2-5 acres	5-9 acres
< ¼ acre	-						
¼ acre	***Significant***	-					
½ acre	***Significant***	***Significant***	-				
¾ acre	***Significant***	***Significant***	***Significant***	-			
1-2 acres	***Significant***	***Significant***	***Significant***	Not Significant	-		
2-5 acres	***Significant***	***Significant***	Not Significant	***Significant***	***Significant***	-	
5-9 acres	***Significant***	***Significant***	Not Significant	***Significant***	***Significant***	Not Significant	-
10 – 99 acres	Not Significant	***Significant***	***Significant***	***Significant***	***Significant***	Not Significant	Not Significant

6.3.3 Home Size

Survey responses were segregated into 4 groups by home size. The groupings were chosen to best distribute the responses. Analysis of the results shows that there is not a statistically significant difference between the two middle groupings but there are significant differences between the first group, the two middle groups and the fourth group. Table 6 - 13 shows the average area of landscape for each grouping, and Table 6 - 14 shows which differences are significant. The results are similar to the results of the self supplied residences, except there is a larger difference between each group.

Table 6 - 13: Home Size and Average Area of Irrigated Landscape

Home Size	Average Landscaped Area (sq ft)	Standard Deviation	Sample Size
Less than 1600 sq ft	4,245	6,034	127
1600 – 2400 sq ft	8,242	7,411	160
2400 – 3600 sq ft	8,780	7,687	211
Greater than 3600 sq ft	12,023	10,644	81

Table 6 - 14: Home Size Significance Testing

Home Size	Less than 1600 sq ft	1600 – 2400 sq ft	2400 – 3600 sq ft
Less than 1600 sq ft	-		
1600 – 2400 sq ft	***Significant***	-	
2400 – 3600 sq ft	***Significant***	Not Significant	-
Greater than 3600 sq ft	***Significant***	***Significant***	***Significant***

6.4 Comparison of other outdoor water use: livestock, gardens, pools, and fire protection

In addition to outdoor irrigation characteristics the survey inquired about other outdoor water uses including livestock, gardens/greenhouses, pools, and use of landscape for the purpose of fire protection. Table 6 - 15 presents the results. Livestock and the use of landscape for fire protection are far more prevalent at self supplied residences than public supplied residences, while pools and gardens are similar. Table 6 - 16 shows the average number of livestock at each residence that has livestock. Both the average and median are presented because the average of the self supplied users is skewed by a few households with large amounts of livestock.

Table 6 - 15: Comparison of other outdoor water use

Type of water use	**Public Supply**		**Self Supply**	
	#	**%**	**#**	**%**
Total Households	662		579	
Households with Livestock	9	1.36	117	20.21
Horses only	6	0.91	89	15.37
Cattle only	3	0.45	15	2.59
Cattle and Horses	0	0	13	2.25
Households with Garden or Greenhouse	233	35.20	310	53.54
Garden only	226	34.14	268	46.92
Greenhouse only	2	0.30	7	1.21
Both	5	0.76	35	6.04
Size of landscape related to fire protection				
Yes	135	20.39	390	58.91
No	198	29.91	100	15.11
Wild fires not a concern	287	43.35	46	6.95
Pool	74	11.18	62	11.00

Table 6 - 16: Number of Livestock at Households with Livestock

Households with livestock	Public Supply	Self Supply
Households with only horses		
Average # of Horses	3.33	3.43
Median # of Horses	4	2
Households with only cattle		
Average # of Cattle	1.67	7.67
Median # of Cattle	1	4
Households with both		
Average # of Horses	0	3
Median # of Horses	0	2
Average # of Cattle	0	38.46
Median # of Cattle	0	9

6.5 Comparison of indoor water use

Table 6- 17 shows a comparison of fixtures and appliances that utilize water between self and public supply. They are very similar in nature which is consistent with what was found in the USGS/NHDES study discussed in section 1, that indoor use is similar between public and self supplied households. This is not a comparison of water use. The driver of indoor water use is persons per household. It is interesting to note that self supplied households were more likely to have front load clothes washing machines, low flow toilets, and low flow shower heads. This is likely a reflection of the difference in average year built between self and public supplied residences.

Table 6 - 17: Comparison of Indoor Fixtures & Appliances

Fixture/Appliance	Self Supplied sample size = 563		Public Supplied sample size = 653	
	Average	Standard Deviation	Average	Standard Deviation
Toilets	2.6	1.0	2.6	0.9
Bathtub with shower	1.3	0.8	1.4	0.7
Bathtub only	0.3	0.6	0.3	0.5
Shower only	1.0	0.8	0.9	0.8
Whirlpool bathtub with jets	0.2	0.4	0.2	0.5
Bathroom sink	2.9	1.2	2.7	1.1
Kitchen faucet	1.1	0.3	1.1	0.3
Indoor utility/garage sink	0.6	0.6	0.4	0.5
Garbage disposal	0.4	0.5	0.7	0.5
Top-load clothes washing machine	0.6	0.5	0.6	0.5
Front-load clothes washing machine	0.5	0.5	0.4	0.5
Dishwashing machine	0.9	0.4	1.0	0.3
Showers with low flow head	1.6	1.2	1.2	1.1
Toilets with 1.6 gallons per flush or less	1.9	1.4	1.8	1.3

6.6 Identified Self Supplied Water Quantity and Quality Problems

Several survey questions were targeted at identifying water quality and quantity problems at self supplied residences. The questions included:

1. Have you ever had a water quality or quantity problem with your well?
2. Do you have a holding tank or cistern?
3. Have you ever had to haul water in the past?
4. Does your water source limit the way you use water in any way?

Question 1 also allowed for a description of the problem. Those descriptions are presented in Appendix E. The following table shows the number of responses to each question, and figures 6-1 show the geographic distribution of the responses.

Table 6 - 18: Number of Water Quality or Quantity Issues Identified

Total Self Supplied Households	579
Quantity or Quality Problem	151
Quantity Problem identified	54
Quality Problem identified	61
Both Problems identified	10
Holding tank or cistern	175
Haul water	58
Water source limitations	181

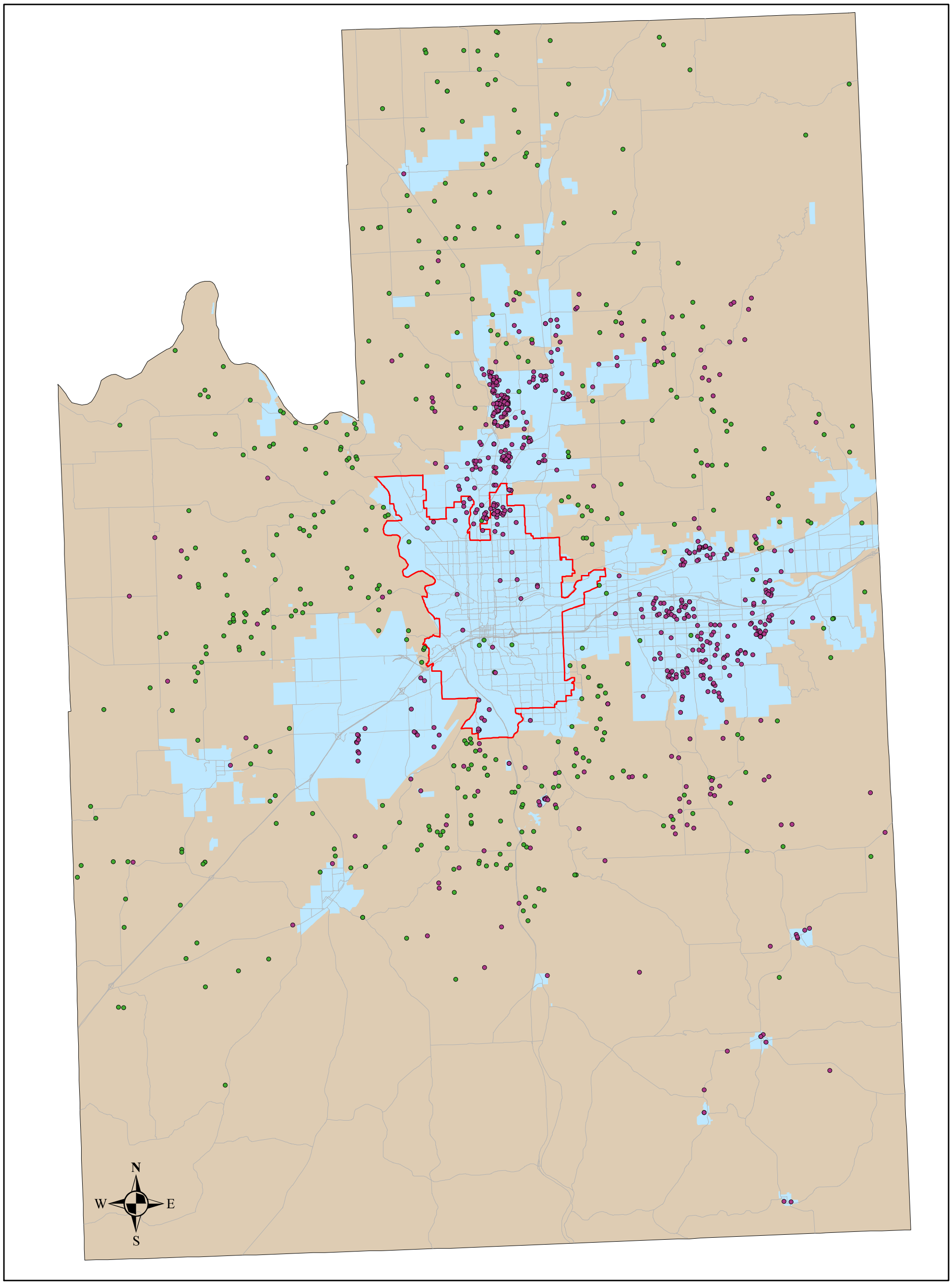


Figure 5-1
Survey Respondent Locations

0 1.5 3 6 9 12
Miles

Survey Distribution Method

- Part of a school activity
- Received postcard in the mail
- City of Spokane
- Public Water System Service

SPOKANE COUNTY
WATER RESOURCES

Spokane County Residential Water Use Survey

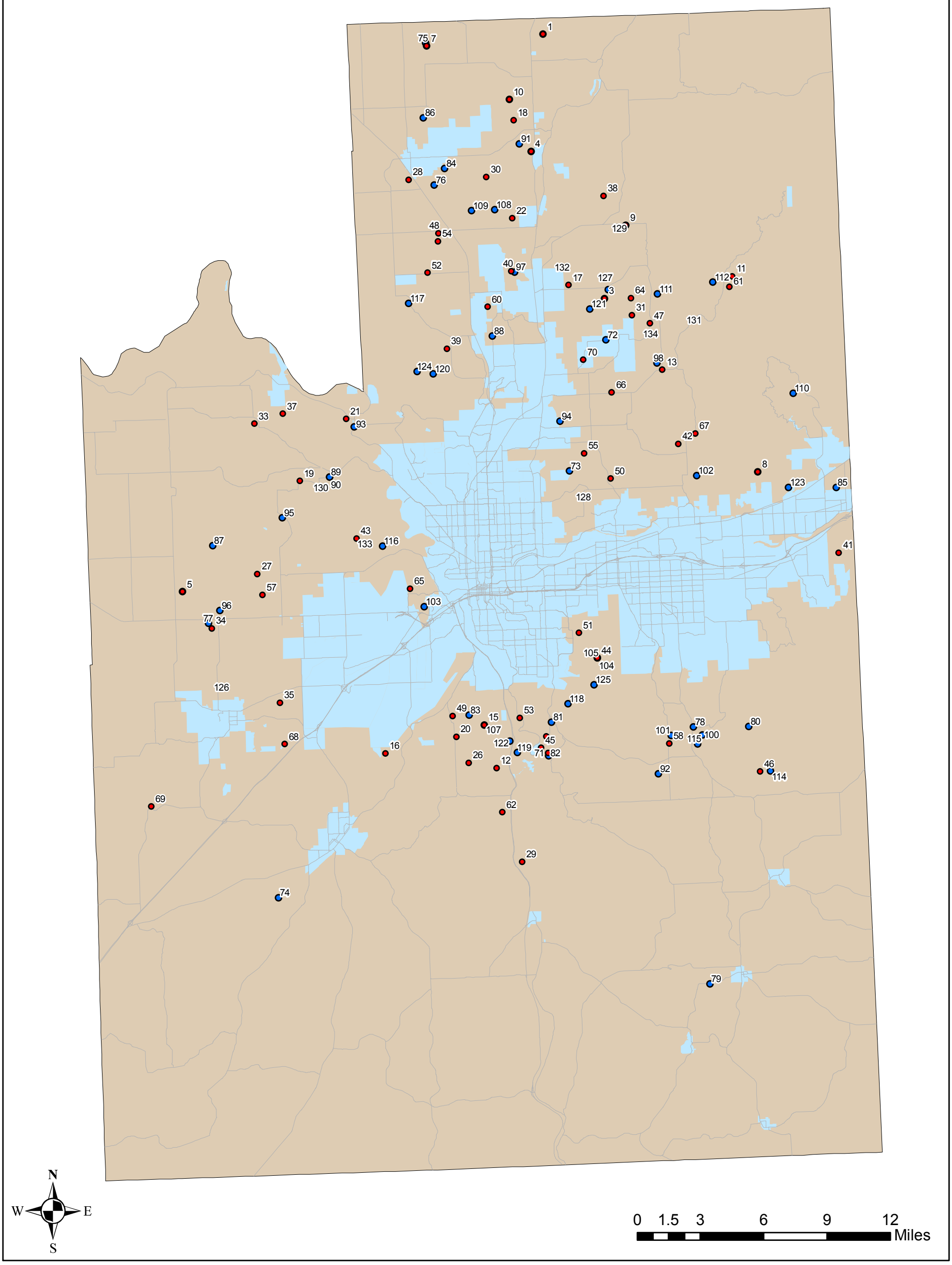


Figure 6-1
Survey Respondents - Water Quality/Quantity Problems

- Survey respondents that identified a water quality problem
- Survey repondents that identified a water quantity problem
- Public Water System Service

Numbers corespond with problem descriptions presented in Appendix E

SPOKANE COUNTY
WATER RESOURCES

Spokane County Residential Water Use Survey

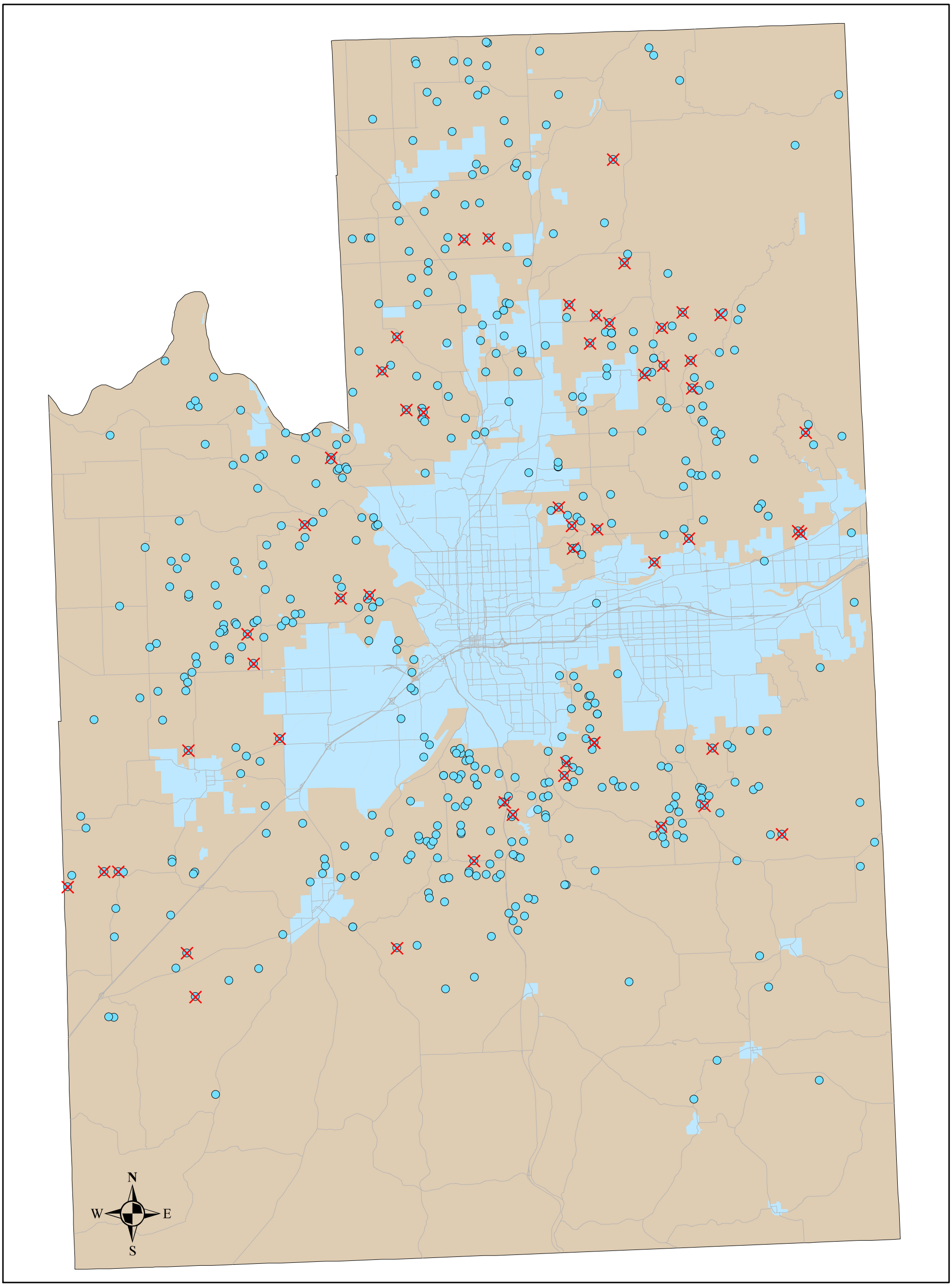


Figure 6-2
Survey Respondents - Hauled Water

Respondents that report hauling water at sometime

Survey Respondents with Private Well

Public Water System Service

0 1.5 3 6 9 12 Miles

SPOKANE COUNTY
WATER RESOURCES

Spokane County Residential Water Use Survey

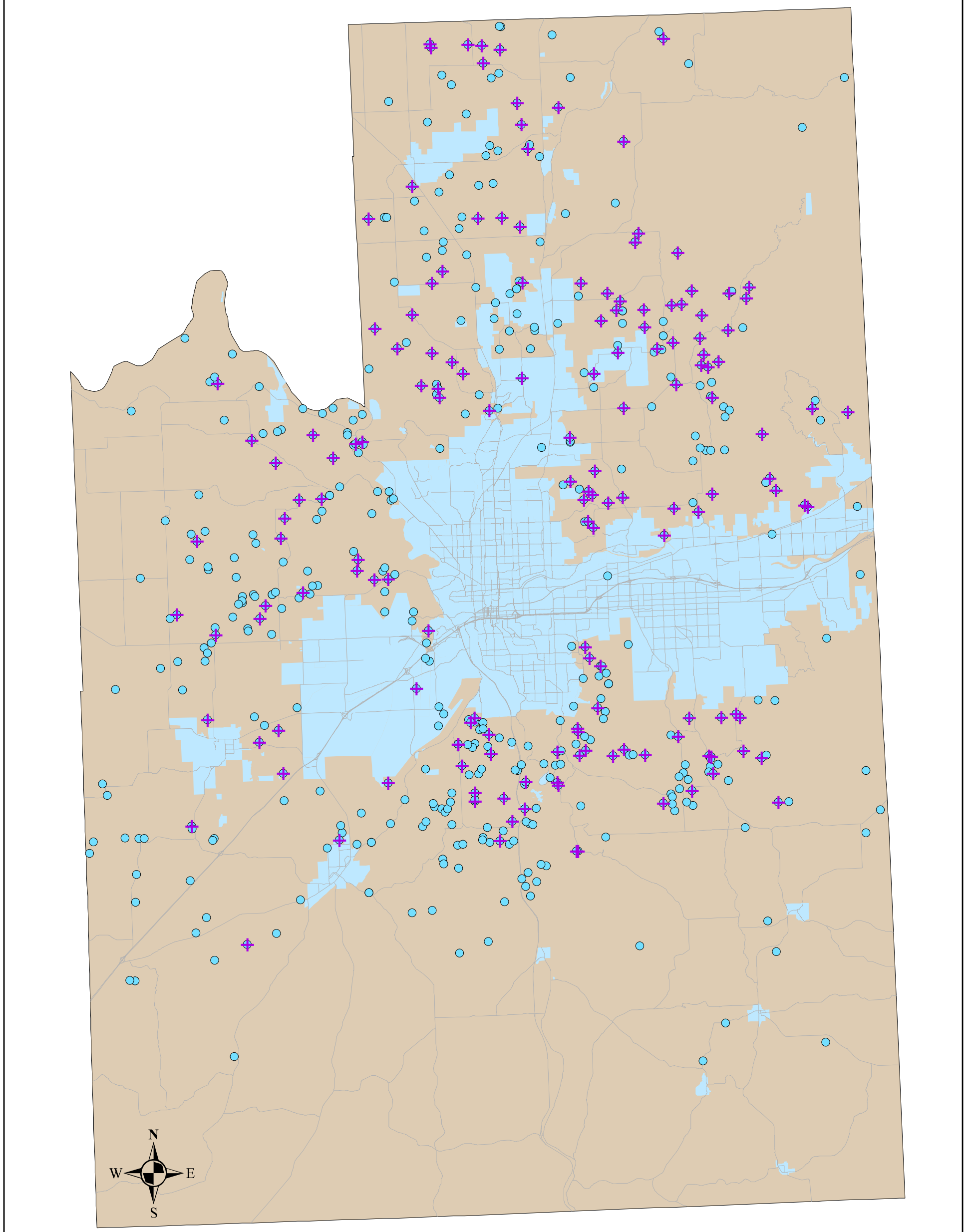


Figure 6-3
Survey Repondents - Water Source Limits Water Use

Survey repondents that said their water source limits the way they use water

All Respondents with a private well

Public Water System Service

0 1.5 3 6 9 12 Miles

SPOKANE COUNTY
WATER RESOURCES

Spokane County Residential Water Use Survey

Appendix A
Residential Water Use Survey

Regional Residential Water Use Survey

To help better assess current water needs and plan for the future, please answer each of the following questions. This information is being collected for **research purposes only** by Spokane County Water Resources. Results of this survey will be reported only in **anonymous summary form**. Thank you for taking the time to help us compile this important information. If you have any questions regarding this survey please call (509) 477-7260.

This survey can be completed online at www.spokanecounty.org/watersurvey. Please print the page that is displayed at the completion of the survey and provide that to your teacher to receive the water conservation kit

INFORMATION ABOUT YOUR HOUSE

1. Address – Please note this information will be utilized to evaluate the difference of outdoor water use by location; i.e. How is water use different in the southern portion of the County where there is less rainfall?

Street

City **ZIP**

2. Please indicate the type of residence you live in.

○ Single-family house ○ Duplex/Triplex ○ Apartment ○ Mobile/manufactured home

3. How many people reside full-time at this address (Enter the number of individuals in each age group)

____ Adults (18+) ____Teenagers (13-17) ____Children (under 13)

4. Approximately, what year was your residence built?

○ Before 1960 ○ 1975-1979 ○ 1990-1994 ○ 2004-present
○ 1960-1969 ○ 1980-1984 ○ 1995-1999
○ 1970-1974 ○ 1985-1989 ○ 2000-2004

5. Please give your best estimate of the total number of square feet of living space in your house (including finished basements).

○ Less than 800 sq ft ○ 1600-1999sq ft ○ 2800-3199 sq ft ○ More than 4,000 sq ft
○ 800-1199 sq ft ○ 2000-2399sq ft ○ 3200-3599 sq ft
○ 1200-1599 sq ft ○ 2400-2799sq ft ○ 3600-3999 sq ft

6. Is your home located on a parcel (lot) or combination of parcels that is 5 acres or greater?

○ No *(If no skip to question 7)* ○ Yes

6a. Please indicate the size of the parcel or combination of parcels on which your residence is located

○ 5-9 acres ○ 20-39 acres ○ 100 acres or greater
○ 10-19 acres ○ 40-99 acres

7. Is your home located on a parcel that is less than 5 acres

○ No *(If no skip to question 8)* ○ Yes

7a. Please indicate the size of the parcel

○ Less than ¼ acre ○ ½ acre ○ 1-2 acres
○ ¼ acre ○ ¾ acre ○ 2-5 acres

8. Indicate the setting that best describes where your residence is located.

○ City ○ Rural – Pasture/Agricultural
○ City neighborhood ○ Rural – Forested
○ Suburban Neighborhood

9. Source of Water

○ Private Well ○ Public Water System (if yes skip to question 16)

10. What is your well yield in gallons per minute?

○ Less than 1 ○ 2.5-4.99 ○ 10-14 ○ 20-49 ○ 100 or greater
○ 1-2.49 ○ 5-10 ○ 15-19 ○ 50-99 ○ Don't Know

11. What is the depth of your well?

○ Less than 50 ft ○ 100-199 ft ○ 300-399 ○ 500 ft or more
○ 50-99 ft ○ 200-299 ft ○ 400-499

12. Have you ever had a water quality or quantity problem in your well?

○ Yes ○ No If yes, what was the problem:

13. Do you have a holding tank or cistern?

○ Yes ○ No

14. Have you had to haul in water in the past?

○ Yes ○ No

15. Does your water source limit the way you use water in any way?

○ Yes ○ No

16. Is your water use metered?

○ No ○ One meter for all water use ○ One meter for indoor use and a second meter for outdoor use

17. How do you dispose of wastewater from indoor uses?

○ Sewer System ○ Onsite Septic System or other onsite method

INDOOR WATER USE

1. Indicate how many of the following types of water-using appliances or fixtures you have in or around your home?

a. Toilets	○ 1	○ 2	○ 3	○ 4 or more
b. Bathtub with shower	○ 1	○ 2	○ 3	○ 4 or more
c. Bathtub only	○ 1	○ 2	○ 3	○ 4 or more
d. Shower only	○ 1	○ 2	○ 3	○ 4 or more
e. Whirlpool bathtub with jets	○ 1	○ 2	○ 3	○ 4 or more
f. Bathroom sink	○ 1	○ 2	○ 3	○ 4 or more
g. Kitchen faucet	○ 1	○ 2	○ 3	○ 4 or more
h. Indoor utility/garage sink	○ 1	○ 2	○ 3	○ 4 or more
i. Garbage disposal	○ 1	○ 2	○ 3	○ 4 or more
j. Top-loading clothes washing machine	○ 1	○ 2	○ 3	○ 4 or more
k. Front-loading clothes washing machine	○ 1	○ 2	○ 3	○ 4 or more
l. Dishwashing machine	○ 1	○ 2	○ 3	○ 4 or more

2. How many of the showers in your home have low-flow (2.5 gallons per minute or less) showerheads?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 or more

3. How many of the toilets in your home were installed after 1993 (1.6 gallons per flush)?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 or more

OUTDOOR WATER USE

1. What is the size of your landscaped area at your house? Landscape area includes area which may be covered with grasses, trees, shrubs, flower beds, etc.

*Answer in square feet **or** percentage*

○ 0	○ 5,000-9,999 sq ft	○ 20,000-29,999 sq ft
○ Less than 2,000 sq ft	○ 10,000-14,999 sq ft	○ 30,000-39,999 sq ft
○ 2,000 – 4,999 sq ft	○ 15,000-19,999 sq ft	○ 40,000 sq ft or greater

○ No landscape	○ 31-40%	○ 71-80%
○ 1-10%	○ 41-50%	○ 81-90%
○ 11-20%	○ 51-60%	○ 91-100%
○ 21-30%	○ 61-70%	

2. What portion of your landscape area is lawn?

○ No lawn	○ 31-40%	○ 71-80%
○ 1-10%	○ 41-50%	○ 81-90%
○ 11-20%	○ 51-60%	○ 91-100%
○ 21-30%	○ 61-70%	

3. When you water (irrigate) your landscape, what percent of your landscape area do you typically tend to water?

○ None	○ 31-40%	○ 71-80%
○ 1-10%	○ 41-50%	○ 81-90%
○ 11-20%	○ 51-60%	○ 91-100%
○ 21-30%	○ 61-70%	

4. How long do you leave the sprinkler on at each area of your landscape?

○ less than 15 minutes	○ 30-44 minutes	○ 1 hour or more
○ 15-29 minutes	○ 45-59 minutes	

5. During the summer (June-August) how many days each week do you typically water your landscape?

○ None	○ 1 day/week	○ 5 days/week
○ Less than 2 times per month	○ 2 days/week	○ 6 days/week
○ A few times per month	○ 3 days/week	○ 7 days/week
○ Less than 1 day/week	○ 4 days/week	○ ½ of landscape every day

6. During the spring (May) and fall (September) how many days each week do you typically water your landscape?

○ Same as summer, but lest time	○ 1 day/week	○ 5 days/week
○ None	○ 2 days/week	○ 6 days/week
○ Less than 2 times per month	○ 3 days/week	○ 7 days/week
○ Less than 1 day/week	○ 4 days/week	○ 2-3 days per week as needed

7. When do you irrigate your landscaping?

○ Early morning ○ Late morning ○ Afternoon ○ Evening ○ Night

8. What is the main way you irrigate your landscaping?

○ By hand (hose or bucket)	○ Manual Sprinkler (one you move around)
○ In-ground sprinkler	○ Other (please specify):

9. If you have an irrigation system how is it activated?

○ Turn on by hand ○ Timer ○ Automatic controller

10. If you have an in-ground sprinkler system controlled by an automatic time clock, does the system also have an override shut-off device such as a soil moisture sensor or rain sensor?

○ No in-ground sprinkler
○ No override shut off device
○ Yes, soil moisture sensor installed
○ Yes, rain sensor installed
○ Yes, both soil moisture and rain sensor installed
○ Controller has rain shutoff function, but it is manually activated

11. Do you utilize drip irrigation for any portion of your landscaping?

○ Yes ○ No

12. On a scale of 1 to 5, with 5 being best, please judge the overall appearance, level of care, and maintenance provided your landscape.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

13. Do you use a secondary source of water for your outdoor water needs?

○ No additional sources of water used
○ Well
○ Stream/river
○ Pond/Lake
○ Spring

14. Do you have a garden or greenhouse?

○ Garden ○ Greenhouse ○ None

15. Do you have livestock at your residence?

○ None ○ Horses How Many ○ Cattle How Many

16. On average, how often are cars washed at home?

○ Rarely ○ Once a month ○ Once a week
○ Less than once a month ○ Twice a month ○ More than once a week

17. On average, how often is a hose used to clean the sidewalks or driveways around your residence?

○ Rarely ○ Once a month ○ Once a week
○ Less than once a month ○ Twice a month ○ More than once a week

18. If your home has a swimming pool, please estimate the pool dimensions in feet.

○ No swimming pool Diameter (round pools) Length Width Average Depth

19. Do you limit how much water you use for any of these reasons? (Mark all that apply)

○ Not sure well has enough water
○ Keep electrical bill down
○ Keep water bill down
○ Not sure septic system can handle all wastewater
○ Want to conserve water to protect the resource
○ Other, please specify:

20. Have you done any of these actions to conserve water? (Mark all that apply)

○ Take shorter showers
○ Installed low-flow plumbing fixtures(s)
○ Reduced landscape area irrigated
○ Changed the time of day you water
○ Installed or upgraded to a water efficient irrigation system
○ Other, please specify

21. Is the size of your landscaping related to providing a "defensible space" from wildfires?

○ Yes ○ No ○ Wildfires are not a concern at our residence

Thank you – your participation is appreciated!

Please return in the self addressed stamped envelope.

Appendix B
Survey Distribution – List of Schools

Appendix B - Survey Distribution List of Schools

School	Teacher	County	# Students	# Teachers	Lessons taught	Grade	Date Taught
Liberty Elementary	Perry Bresnahan	Spokane	18	1	Amazing Soils	5	9/28/2009
Liberty Elementary	Perry Bresnahan	Spokane	18	1	Transporting Energy	5	9/28/2009
	September Totals		36	2			
Midway Elementary	Janice McQuilkin	Spokane	21	1	Rock Exploration	1	10/2/2009
Midway Elementary	Jen Tobiason	Spokane	21	1	Rock Exploration	1	10/2/2009
Midway Elementary	Fleeta Holcomb	Spokane	18	1	Rock Exploration	1	10/2/2009
Midway Elementary	Marcia Peters	Spokane	23	1	Rock Exploration	1	10/2/2009
Colbert Elementary	Karen Christopher	Spokane	27	1	Amazing Soils	5	10/8/2009
Colbert Elementary	Suzi Slaton	Spokane	30	1	Amazing Soils	5	10/8/2009
Brentwood Elementary	Teresa Buddington	Spokane	120	1	Enviroscape	6	10/15/2009
Lake Spokane Elementary	Rosemary Clocherty	Stevens	20	2	Water Everywhere	1	10/16/2009
Lake Spokane Elementary	Janet Swenland	Stevens	21	1	Water Everywhere	1	10/16/2009
Lake Spokane Elementary	Julie Pomante	Stevens	20	2	Water Everywhere	1	10/16/2009
Michael Anderson Elementary	Linda Portwood	Spokane	19	1	Rock Exploration	1	10/19/2009
Michael Anderson Elementary	Mrs. Shellabarger	Spokane	24	2	Rock Exploration	1	10/19/2009
Michael Anderson Elementary	Ms. Vickrey	Spokane	21	1	Rock Exploration	1	10/20/2009
Michael Anderson Elementary	Mrs. McMillan	Spokane	23	2	Rock Exploration	1	10/20/2009
Windsor Elementary	Melissa Browne	Spokane	21	1	Exploring Habitats	1	10.23/2009
Windsor Elementary	Stephanie Fromm	Spokane	23	1	Exploring Habitats	1	10.23/2009
Windsor Elementary	Sue McAdam	Spokane	22	2	Exploring Habitats	1	10.23/2009
Windsor Elementary	Ina Larson	Spokane	23	1	Exploring Habitats	1	10.23/2009
Farwell Elementary	Chris Bontrager	Spokane	30	1	Enviroscape	6	10/26/2009
Farwell Elementary	Cindy Perdue	Spokane	30	1	Enviroscape	6	10/26/2009
Farwell Elementary	Jennifer Stauffenburg	Spokane	29	1	Enviroscape	6	10/26/2009
Trentwood Elementary	Mrs. Hogan	Spokane	23	1	Soil Magic	1	10/27/2009
Trentwood Elementary	Mrs. Gillett	Spokane	21	2	Soil Magic	1	10/27/2009
	October Totals		630	29			
Trentwood Elementary	Lynette Andreasen	Spokane	20	1	Water Everywhere	2	11/9/2009
Trentwood Elementary	Mrs. Caldwell	Spokane	21	1	Water Everywhere	2	11/9/2009
Trentwood Elementary	Mr. McGowen	Spokane	21	1	Water Everywhere	2	11/9/2009
Farwell Elementary	Mary Himley	Spokane	26	3	Water in our World	5/6	11/10/2009
Farwell Elementary	Marcy Gallinger	Spokane	30	1	Water in our World	5	11/10/2009
Farwell Elementary	Melissa Martin	Spokane	30	2	Water in our World	5	11/10/2009
Farwell Elementary	Mary Himley	Spokane	26	3	Water Journey	5/6	11/12/2009

School	Teacher	County	# Students	# Teachers	Lessons taught	Grade	Date Taught
Farwell Elementary	Marcy Gallinger	Spokane	30	1	Water Journey	5	11/12/2009
Farwell Elementary	Melissa Martin	Spokane	30	2	Water Journey	5	11/12/2009
Farwell Elementary	Roger Widmer	Spokane	31	1	Water in our World	5	11/12/2009
Farwell Elementary	Mary Himley	Spokane	26	3	Does Watershed	5/6	11/13/2009
Farwell Elementary	Marcy Gallinger	Spokane	30	1	Does Watershed	5	11/13/2009
Farwell Elementary	Melissa Martin	Spokane	30	2	Does Watershed	5	11/13/2009
Farwell Elementary	Roger Widmer	Spokane	31	1	Does Watershed	5	11/13/2009
Evergreen Elementary	June Lamberd	Spokane	23	1	Water in our World	3	11/16/2009
Evergreen Elementary	Lindsay Rockefeller	Spokane	22	1	Water in our World	3	11/16/2009
Evergreen Elementary	Debbie Greenman	Spokane	23	1	Water in our World	3	11/16/2009
Evergreen Elementary	June Lamberd	Spokane	23	1	Water Journey	3	11/17/2009
Evergreen Elementary	Lindsay Rockefeller	Spokane	22	1	Water Journey	3	11/17/2009
Evergreen Elementary	Debbie Greenman	Spokane	23	1	Water Journey	3	11/17/2009
Evergreen Elementary	June Lamberd	Spokane	23	1	Does Watershed	3	11/18/2009
Evergreen Elementary	Lindsay Rockefeller	Spokane	22	1	Does Watershed	3	11/18/2009
Evergreen Elementary	Debbie Greenman	Spokane	23	1	Does Watershed	3	11/18/2009
Farwell Elementary	Meg Baker	Spokane	23	2	Water Everywhere	1	11/19/2009
Farwell Elementary	Kim Thomas	Spokane	23	1	Water Everywhere	1	11/19/2009
Farwell Elementary	Maile McFarland	Spokane	24	1	Water Everywhere	1	11/20/2009
Farwell Elementary	Jenny Price	Spokane	22	1	Water Everywhere	2	11/23/2009
Farwell Elementary	Charlotte Streit	Spokane	24	2	Water Everywhere	1/2	11/23/2009
Farwell Elementary	Keri Manfred	Spokane	23	1	Water Everywhere	2	11/24/2009
Farwell Elementary	Kari Sand	Spokane	24	1	Water Everywhere	2	11/24/2009
	November Totals		749	41			
Midway Elementary	Janice McQuilkin	Spokane	22	1	Water Everywhere	1	12/4/2009
Midway Elementary	Jen Tobiason	Spokane	22	1	Water Everywhere	1	12/4/2009
Midway Elementary	Fleeta Holcomb	Spokane	21	1	Water Everywhere	1	12/4/2009
Midway Elementary	Marcia Peters	Spokane	23	1	Water Everywhere	1	12/4/2009
Shiloh Hills Elementary	Val Laiho	Spokane	23	1	Water Everywhere	2	12/8/2009
Shiloh Hills Elementary	Stephanie Flaherty	Spokane	23	1	Water Everywhere	2	12/8/2009
Shiloh Hills Elementary	Lauren Posey	Spokane	24	1	Water Everywhere	2	12/8/2009
Shiloh Hills Elementary	Alia Simonson	Spokane	24	1	Water Everywhere	2	12/8/2009
Farwell Elementary	Mary Himley	Spokane	26	3	Enviroscape	5/6	12/10/2009
Farwell Elementary	Marcy Gallinger	Spokane	30	1	Enviroscape	5	12/10/2009
Farwell Elementary	Melissa Martin	Spokane	30	2	Enviroscape	5	12/10/2009

School	Teacher	County	# Students	# Teachers	Lessons taught	Grade	Date Taught
Farwell Elementary	Roger Widmer	Spokane	31	1	Enviroscape	5	12/10/2009
5 Mile Prairie Home School Co-op	Janelle Hildahl	Spokane	14	2	Rock Exploration	1-4	12/11/2009
5 Mile Prairie Home School Co-op	Janelle Hildahl	Spokane	14	3	Soil Magic	1-4	12/11/2009
	December Totals		327	20			
Liberty Elementary	Perry Bresnahan	Spokane	21	1	Water in our World	5	1/5/2010
Liberty Elementary	Linda Neihart	Spokane	20	1	Water in our World	3	1/5/2010
Liberty Elementary	Tiffany Buys	Spokane	20	1	Water in our World	4	1/5/2010
Colbert Elementary	Debbie Schmick	Spokane	24	1	Water in our World	3	1/7/2010
Colbert Elementary	Natalie Wilkes	Spokane	22	1	Water in our World	3	1/7/2010
Sunrise Elementary	Justin Collyer	Spokane	23	1	Transporting Energy	4	1/8/2010
Sunrise Elementary	Rachelle Ahumada	Spokane	21	2	Water in our World	5	1/8/2010
Sunrise Elementary	Linda Stumbough	Spokane	22	1	Water in our World	5	1/8/2010
Sunrise Elementary	Jan Tyson	Spokane	22	1	Water in our World	5	1/8/2010
Farwell Elementary	Keri Manfred	Spokane	23	1	Exploring Habitats	2	1/11/2010
Farwell Elementary	Charlotte Streit	Spokane	24	1	Exploring Habitats	1/2	1/11/2010
Farwell Elementary	Kim Thomas	Spokane	23	1	Exploring Habitats	1	1/11/2010
Farwell Elementary	Sue Ouellette	Spokane	22	1	Exploring Habitats	1	1/11/2010
Liberty Elementary	Perry Bresnahan	Spokane	21	1	Water Journey	5	1/12/2010
Liberty Elementary	Linda Neihart	Spokane	20	1	Water Journey	3	1/12/2010
Liberty Elementary	Tiffany Buys	Spokane	20	1	Water Journey	4	1/12/2010
Farwell Elementary	Jenny Price	Spokane	22	1	Water Everywhere	2	1/13/2010
Farwell Elementary	Kari Sand	Spokane	24	1	Water Everywhere	2	1/13/2010
Colbert Elementary	Debbie Rose	Spokane	23	1	Water in our World	3	1/14/2010
Colbert Elementary	Natalie Wilkes	Spokane	22	1	Water in our World	3	1/14/2010
Liberty Elementary	Perry Bresnahan	Spokane	21	1	Does Watershed	5	1/19/2010
Liberty Elementary	Linda Neihart	Spokane	20	1	Does Watershed	3	1/19/2010
Liberty Elementary	Tiffany Buys	Spokane	20	1	Does Watershed	4	1/19/2010
Skyview Elementary	Mr. Dickenson	Spokane	28	1	Water Everywhere	5	1/20/2010
Skyview Elementary	Mrs. Daly	Spokane	27	1	Water Everywhere	5	1/20/2010
Sunrise Elementary	Judy Froehle	Spokane	24	1	Water Everywhere	4	1/20/2010
Colbert Elementary	Debbie Rose	Spokane	23	1	Water Journey	3	1/21/2010
Colbert Elementary	Natalie Wilkes	Spokane	22	1	Water Journey	3	1/21/2010
Liberty Lake Elementary	Chris Berard	Spokane	25	1	Amazing Soils	5	1/25/2010
Liberty Lake Elementary	Kay Anderson	Spokane	25	2	Amazing Soils	5	1/25/2010
Liberty Lake Elementary	Colleen Mick	Spokane	24	1	Amazing Soils	5	1/25/2010

School	Teacher	County	# Students	# Teachers	Lessons taught	Grade	Date Taught
Liberty Lake Elementary	Barry Conklin	Spokane	24	1	Amazing Soils	5	1/25/2010
Liberty Lake Elementary	Karen Allen	Spokane	25	1	Amazing Soils	5	1/25/2010
Adams Elementary	Judy Leise	Spokane	21	2	Water Everywhere	2	1/26/2010
Adams Elementary	Stiles	Spokane	21	1	Water Everywhere	2	1/26/2010
Adams Elementary	Janelle Pierce	Spokane	24	1	Water Everywhere	2	1/26/2010
Skyview Elementary	Mr. Dickenson	Spokane	27	1	Water Journey	5	1/27/2010
Skyview Elementary	Mrs. Daly	Spokane	27	1	Water Journey	5	1/27/2010
Sunrise Elementary	Judy Froehle	Spokane	24	1	Does Watershed	4	1/27/2010
Colbert Elementary	Debbie Rose	Spokane	23	1	Water Journey	3	1/28/2010
Colbert Elementary	Natalie Wilkes	Spokane	22	1	Water Journey	3	1/28/2010
	January Totals		936	44			
Skyview Elementary	Mr. Dickenson	Spokane	25	1	Enviroscape	5	2/3/2010
Skyview Elementary	Mrs. Daly	Spokane	27	1	Enviroscape	5	2/3/2010
Colbert Elementary	Debbie Schmick	Spokane	24	1	Does Watershed	3	2/4/2010
Colbert Elementary	Natalie Wilkes	Spokane	22	1	Does Watershed	3	2/4/2010
Chester Elementary	Annette Lamon	Spokane	28	1	Water in our World	5	2/8/2010
Chester Elementary	Christine Admire	Spokane	27	1	Water in our World	5	2/8/2010
Chester Elementary	Annette Lamon	Spokane	30	1	Water Journey	5	2/9/2010
Chester Elementary	Christine Admire	Spokane	29	1	Water Journey	5	2/9/2010
Colbert Elementary	Debbie Rose	Spokane	23	1	Does Watershed	3	2/11/2010
Colbert Elementary	Linda Cameron-Jokinen	Spokane	23	1	Does Watershed	3	2/11/2010
Greenacres Elementary	Shelly Mahn	Spokane	28	1	Water in our World	5	2/16/2010
Greenacres Elementary	Ms. Moll	Spokane	27	1	Water in our World	5	2/16/2010
Greenacres Elementary	Ms. Jensen	Spokane	27	1	Water in our World	5	2/16/2010
Greenacres Elementary	Jessica Freeman	Spokane	26	2	Water in our World	5	2/16/2010
Colbert Elementary	Debbie Schmick	Spokane	24	1	Amazing Soils	3	2/18/2010
Colbert Elementary	Natalie Wilkes	Spokane	22	1	Amazing Soils	3	2/18/2010
Tekoa Elementary	Bobette Rambo	Whitman	18	1	Rock Exploration	K	2/19/2010
Tekoa Elementary	Tina Mueller	Whitman	11	1	Terrific Trees	1	2/19/2010
Tekoa Elementary	Kristen Stinson	Whitman	10	1	Terrific Trees	3	2/19/2010
Tekoa Elementary	Rebecca McHargue	Whitman	11	1	Water Everywhere	2	2/19/2010
Broadway Elementary	Darren Herndon	Spokane	25	2	Water in our World	3	2/22/2010
Broadway Elementary	Sue Henderson	Spokane	23	1	Water in our World	3	2/22/2010
Broadway Elementary	Leisa Lybbert	Spokane	23	1	Water in our World	3	2/22/2010
Greenacres Elementary	Shelly Mahn	Spokane	27	1	Amazing Soils	5	2/23/2010

School	Teacher	County	# Students	# Teachers	Lessons taught	Grade	Date Taught
Greenacres Elementary	Ms. Moll	Spokane	28	1	Amazing Soils	5	2/23/2010
Greenacres Elementary	Ms. Jensen	Spokane	28	1	Amazing Soils	5	2/23/2010
Greenacres Elementary	Jessica Freeman	Spokane	26	2	Amazing Soils	5	2/23/2010
Colbert Elementary	Debbie Rose	Spokane	21	1	Amazing Soils	3	2/25/2010
Colbert Elementary	Linda Cameron-Jokinen	Spokane	19	1	Amazing Soils	3	2/25/2010
Tekoa Elementary	Kim Schulz	Whitman	12	1	Amazing Soils	4	2/26/2010
Tekoa Elementary	Tim Dater	Whitman	16	1	Transporting Energy	5	2/26/2010
Tekoa Elementary	Tammy Mendoza	Whitman	14	1	Enviroscape	6	2/26/2010
	February Totals		724	35			
Chester Elementary	Christine Admire	Spokane	27	1	Amazing Soils	5	3/1/2010
Chester Elementary	Annette Lamon	Spokane	24	1	Amazing Soils	5	3/1/2010
Greenacres Elementary	Shelly Mahn	Spokane	27	1	Terrific Trees	5	3/2/2010
Greenacres Elementary	Ms. Moll	Spokane	27	1	Terrific Trees	5	3/2/2010
Greenacres Elementary	Ms. Jensen	Spokane	26	1	Terrific Trees	5	3/2/2010
Greenacres Elementary	Jessica Freeman	Spokane	27	2	Terrific Trees	5	3/2/2010
Adams Elementary	Allysa Roibal	Spokane	17	1	Rock Exploration	1	3/5/2010
Adams Elementary	Lindsay Wing	Spokane	18	1	Rock Exploration	1	3/5/2010
Adams Elementary	Janelle Stolp	Spokane	22	1	Rock Exploration	1	3/5/2010
Reardan Elementary	Christy Budd	Lincoln	19	2	Water Everywhere	1	3/9/2010
Reardan Elementary	Phyllis Addington	Lincoln	20	1	Water Everywhere	1	3/9/2010
Reardan Elementary	Cynthia Cooper	Lincoln	22	2	Water Everywhere	1	3/9/2010
Reardan Elementary	Linda Orcutt	Lincoln	17	2	Water Everywhere	1	3/9/2010
Reardan Elementary	David Besterci	Lincoln	21	5	Transporting Energy	1	3/11/2010
Reardan Elementary	Darla Hall	Lincoln	23	5	Transporting Energy	1	3/11/2010
Reardan Elementary	Teresa Daniel	Lincoln	17	3	Terrific Trees	1	3/11/2010
Reardan Elementary	Mike Kreuch	Lincoln	20	3	Terrific Trees	1	3/11/2010
Reardan Elementary	Jacqueline Culver	Lincoln	21	4	Water in our World	2	3/12/2010
Reardan Elementary	Jason Baldwin	Lincoln	24	6	Water in our World	1	3/12/2010
Reardan Elementary	Lynette Peterson	Lincoln	22	4	Water in our World	1	3/12/2010
Reardan Elementary	Brian McComas	Lincoln	23	6	Water in our World	2	3/12/2010
Broadway Elementary	Darren Herndon	Spokane	23	1	Water in our World	3	3/15/2010
Broadway Elementary	Sue Henderson	Spokane	24	1	Water in our World	3	3/15/2010
Broadway Elementary	Leisa Lybbert	Spokane	23	1	Water in our World	3	3/15/2010
Sunset Elementary	Harvey Curtis	Spokane	21	1	Water in our World	3	3/16/2010
Sunset Elementary	Judy Jamison	Spokane	22	1	Water in our World	3	3/16/2010

School	Teacher	County	# Students	# Teachers	Lessons taught	Grade	Date Taught
Sunset Elementary	Anita Maurer	Spokane	21	1	Water in our World	3	3/16/2010
Sunset Elementary	Harvey Curtis	Spokane	22	1	Water Journey	3	3/18/2010
Sunset Elementary	Judy Jamison	Spokane	22	1	Water Journey	3	3/18/2010
Sunset Elementary	Anita Maurer	Spokane	23	1	Water Journey	3	3/18/2010
Sunset Elementary	Harvey Curtis	Spokane	20	1	Does Watershed	3	3/23/2010
Sunset Elementary	Judy Jamison	Spokane	21	1	Does Watershed	3	3/23/2010
Sunset Elementary	Anita Maurer	Spokane	23	1	Does Watershed	3	3/23/2010
	March Totals		729	65			
Broadway Elementary	Darren Herndon	Spokane	22	2	Water in our World	3	4/5/2010
Broadway Elementary	Sue Henderson	Spokane	24	1	Water in our World	3	4/5/2010
Broadway Elementary	Leisa Lybbert	Spokane	23	1	Water in our World	3	4/5/2010
Seth Woodard Elementary	Jeannie Semler	Spokane	27	1	Water Everywhere	1	4/6/2010
Seth Woodard Elementary	Mindy Shulkin	Spokane	25	1	Water Everywhere	1	4/6/2010
Greenacres Elementary	Porter	Spokane	25	1	Water Everywhere	2	4/12/2010
Greenacres Elementary	Zimmerman	Spokane	25	2	Water Everywhere	2	4/12/2010
Greenacres Elementary	Solberg	Spokane	23	1	Water Everywhere	2	4/12/2010
Adams Elementary	Judy Leise	Spokane	24	1	Water Everywhere	2	4/13/2010
Adams Elementary	Gini Stiles	Spokane	24	1	Water Everywhere	2	4/13/2010
Adams Elementary	Janelle Pierce	Spokane	23	1	Water Everywhere	2	4/13/2010
Greenacres Elementary	Mrs. Ball	Spokane	17	1	Water Everywhere	2-Jan	4/15/2010
Greenacres Elementary	Ms. Parker	Spokane	18	3	Water Everywhere	2	4/15/2010
Opportunity Elementary	Stephanie Lancaster	Spokane	23	1	Exploring Habitats	1	4/20/2010
Opportunity Elementary	Jan McDonald	Spokane	22	1	Exploring Habitats	1	4/20/2010
Opportunity Elementary	Mary Kenna	Spokane	23	1	Exploring Habitats	1	4/20/2010
Mobius Kids	Kristy Luntzel	Spokane	12	4	Water Everywhere	K-3	4/22/2010
Trentwood Elementary	Mrs. Caldwell	Spokane	16	1	Exploring Habitats	2	4/26/2010
Trentwood Elementary	Mr. McGowen	Spokane	19	1	Exploring Habitats	2	4/26/2010
Trentwood Elementary	Mrs. Andreason	Spokane	16	1	Exploring Habitats	2	4/26/2010
Liberty Elementary	Marcea Newton	Spokane	21	2	Exploring Habitats	1	4/27/2010
Liberty Elementary	Sasha Deyarmin	Spokane	22	1	Soil Magic	2-Jan	4/27/2010
Trentwood Elementary	Mrs. Hogan	Spokane	21	1	Exploring Habitats	1	4/28/2010
Trentwood Elementary	Mrs. Wellington	Spokane	23	1	Exploring Habitats	1	4/28/2010
Seth Woodard Elementary	Kierstan Shelby	Spokane	26	2	Water in our World	3	4/29/2010
Seth Woodard Elementary	Susan Holmes	Spokane	24	1	Water in our World	3	4/29/2010
Opportunity Elementary	Scott Krentel	Spokane	20	1	Enviroscape	5	4/30/2010

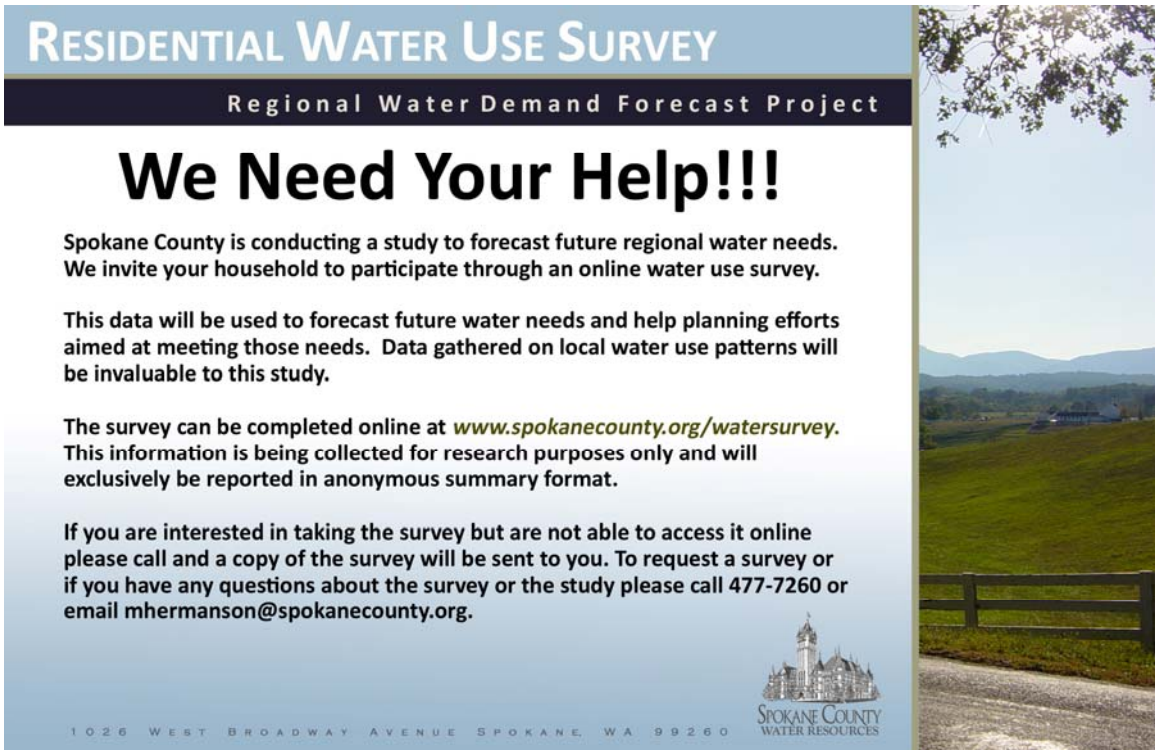
School	Teacher	County	# Students	# Teachers	Lessons taught	Grade	Date Taught
Opportunity Elementary	Dina Murphy	Spokane	22	1	Enviroscape	5	4/30/2010
Opportunity Elementary	Karen Carpenter	Spokane	22	1	Enviroscape	5	4/30/2010
	April Totals		632	38			
Seth Woodard Elementary	Cathy Williams	Spokane	24	1	Water in our World	4	5/11/2010
Seth Woodard Elementary	Cathy Williams	Spokane	24	1	Water Journey	4	5/11/2010
Seth Woodard Elementary	Sara Kobs	Spokane	24	2	Water in our World	5	5/11/2010
Seth Woodard Elementary	Sara Kobs	Spokane	24	2	Transporting Energy	5	5/11/2010
Greenacres Elementary	Shelly Mahn	Spokane	26	1	Transporting Energy	5	5/14/2010
Greenacres Elementary	Ms. Moll	Spokane	27	1	Transporting Energy	5	5/14/2010
Greenacres Elementary	Ms. Jensen	Spokane	26	1	Transporting Energy	5	5/14/2010
Greenacres Elementary	Jessica Freeman	Spokane	27	1	Transporting Energy	5	5/14/2010
University Elementary	Tori Hendricks	Spokane	22	1	Water Everywhere	1	5/20/2010
University Elementary	Cathy Walter	Spokane	23	1	Water Everywhere	1-Jan	5/20/2010
Moran Prairie Elementary	Rick Severns	Spokane	22	2	Water in our World	3	5/24/2010
Moran Prairie Elementary	Sue Trautman	Spokane	21	1	Water in our World	3-Jan	5/24/2010
Moran Prairie Elementary	Barbara Stern	Spokane	19	1	Water in our World	3-Jan	5/24/2010
South Pines Elementary	Mrs. Kalstad	Spokane	22	1	Water Everywhere	2	5/26/2010
South Pines Elementary	Mrs. Bonney	Spokane	21	2	Water Everywhere	2	5/26/2010
South Pines Elementary	Amber Parvianinen	Spokane	22	1	Water Everywhere	2	5/26/2010
Deer Park School District	Wendy Largent	Spokane	16	1	Macros/Water Quality	6	5/27/2010
Deer Park School District	Wendy Largent	Spokane	14	1	Macros/Water Quality	6	5/27/2010
Deer Park School District	Wendy Largent	Spokane	17	2	Macros/Water Quality	6	5/27/2010
Deer Park School District	Wendy Largent	Spokane	15	1	Macros/Water Quality	6	5/27/2010
	May Totals		436	25			
Opportunity Elementary	Scott Krentel	Spokane	21	1	Enviroscape	5	6/4/2010
Opportunity Elementary	Dina Murphy	Spokane	21	1	Enviroscape	5	6/4/2010
Opportunity Elementary	Karen Carpenter	Spokane	22	1	Enviroscape	5	6/4/2010
Lake Spokane Elementary	Janie Johnson	Stevens	19	1	Water in our World	4	6/7/2010
Lake Spokane Elementary	Sandi Mead	Stevens	22	1	Water in our World	4	6/7/2010
Lake Spokane Elementary	Alisa Torgerson	Stevens	22	1	Water in our World	4	6/7/2010
Lake Spokane Elementary	Kathy More	Stevens	21	1	Water in our World	4	6/7/2010
Lake Spokane Elementary	Janie Johnson	Stevens	20	1	Water Journey	4	6/8/2010
Lake Spokane Elementary	Sandi Mead	Stevens	23	2	Water Journey	4	6/8/2010
Lake Spokane Elementary	Alisa Torgerson	Stevens	22	1	Water Journey	4	6/8/2010

Appendix B - Survey Distribution List of Schools

School	Teacher	County	# Students	# Teachers	Lessons taught	Grade	Date Taught
Lake Spokane Elementary	Kathy More	Stevens	21	1	Water Journey	4	6/8/2010
Lake Spokane Elementary	Janie Johnson	Stevens	20	1	Does Watershed	4	6/9/2010
Lake Spokane Elementary	Sandi Mead	Stevens	23	2	Does Watershed	4	6/9/2010
Lake Spokane Elementary	Alisa Torgerson	Stevens	22	1	Does Watershed	4	6/9/2010
Lake Spokane Elementary	Kathy More	Stevens	22	1	Does Watershed	4	6/9/2010
	June Totals		321	17			
	Program Total		**5836**				

Appendix C
Survey Postcard

The postcard below was distributed to 15,000 residences in Spokane County that likely have a private well for their water supply.



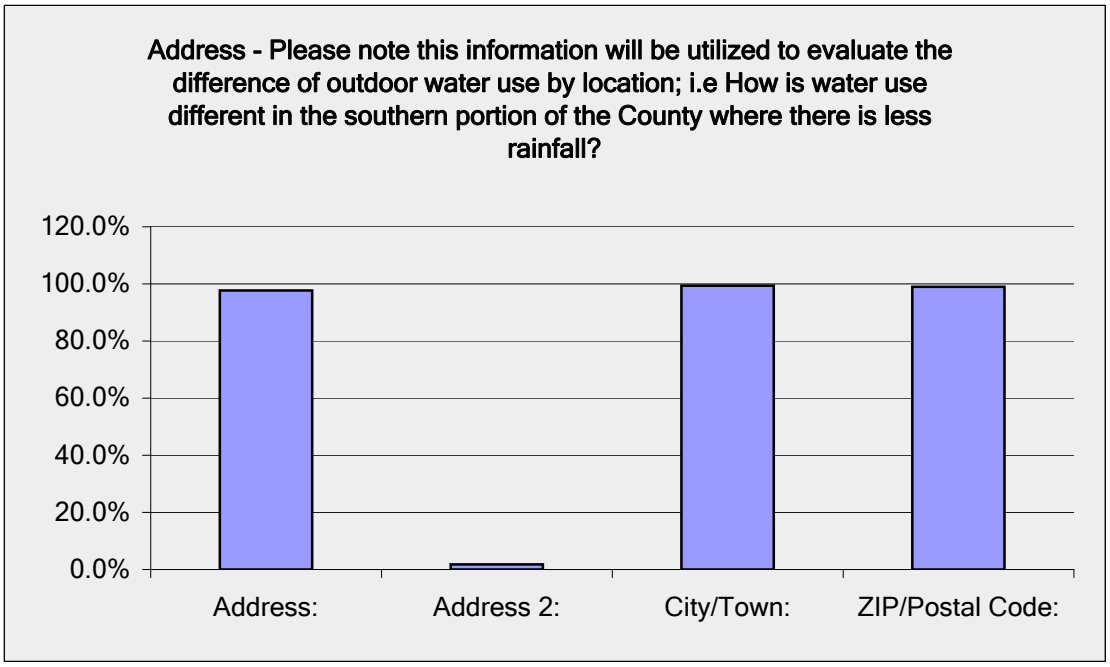
Appendix D
Summary of Results

Regional Residential Water Use Survey:

Information About Your House - Question 1

Address - Please note this information will be utilized to evaluate the difference of outdoor water use by location; i.e How is water use different in the southern portion of the County

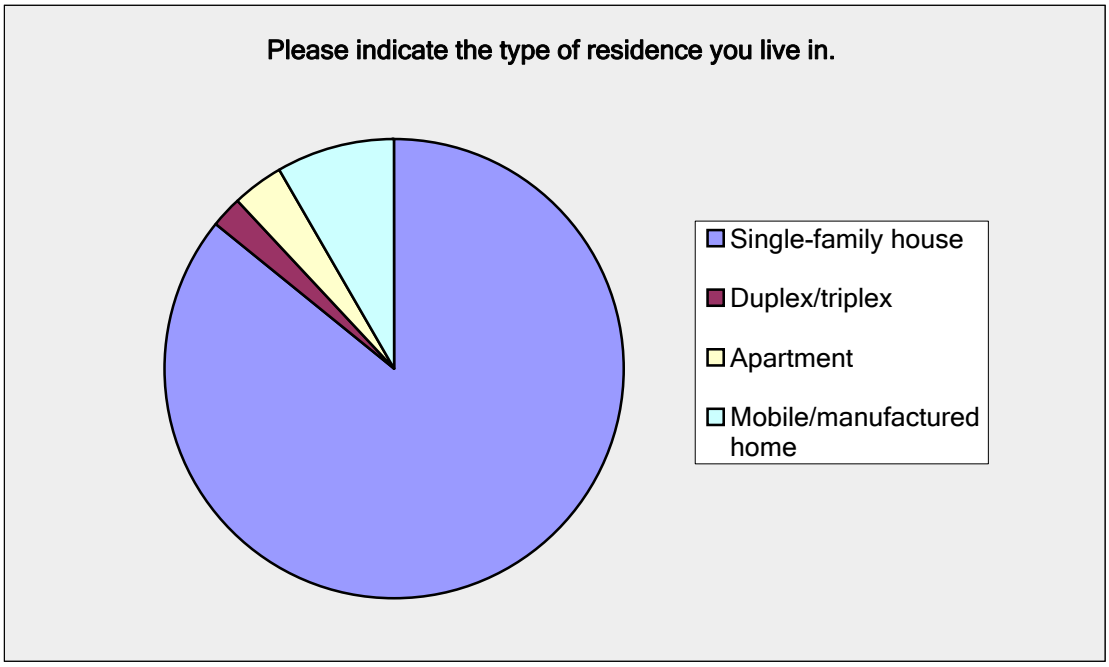
Answer Options	Response Percent	Response Count
Address:	97.7%	1222
Address 2:	1.8%	22
City/Town:	99.4%	1243
ZIP/Postal Code:	99.0%	1238
	answered question	1251
	skipped question	25



Regional Residential Water Use Survey:
Information About Your House - Question 2

Please indicate the type of residence you live in.

Answer Options	Response Percent	Response Count
Single-family house	85.8%	1084
Duplex/triplex	2.1%	27
Apartment	3.8%	48
Mobile/manufactured home	8.2%	104
	answered question	1263
	skipped question	13

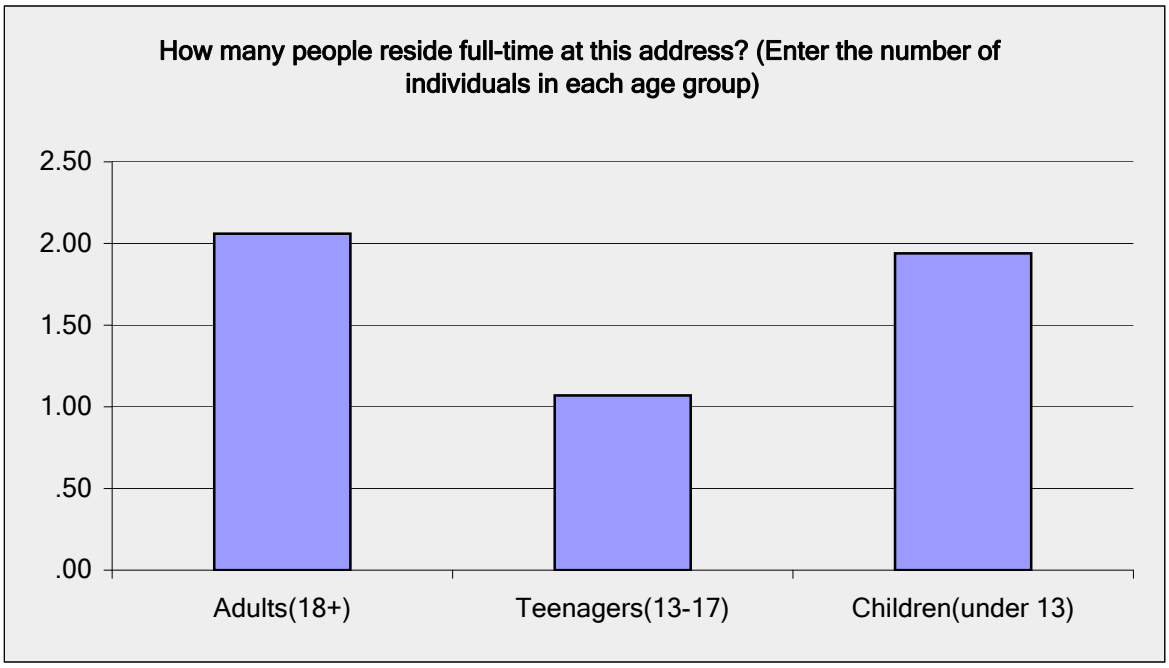


Regional Residential Water Use Survey:

Information About Your House - Question 3

How many people reside full-time at this address? (Enter the number of individuals in each age group)

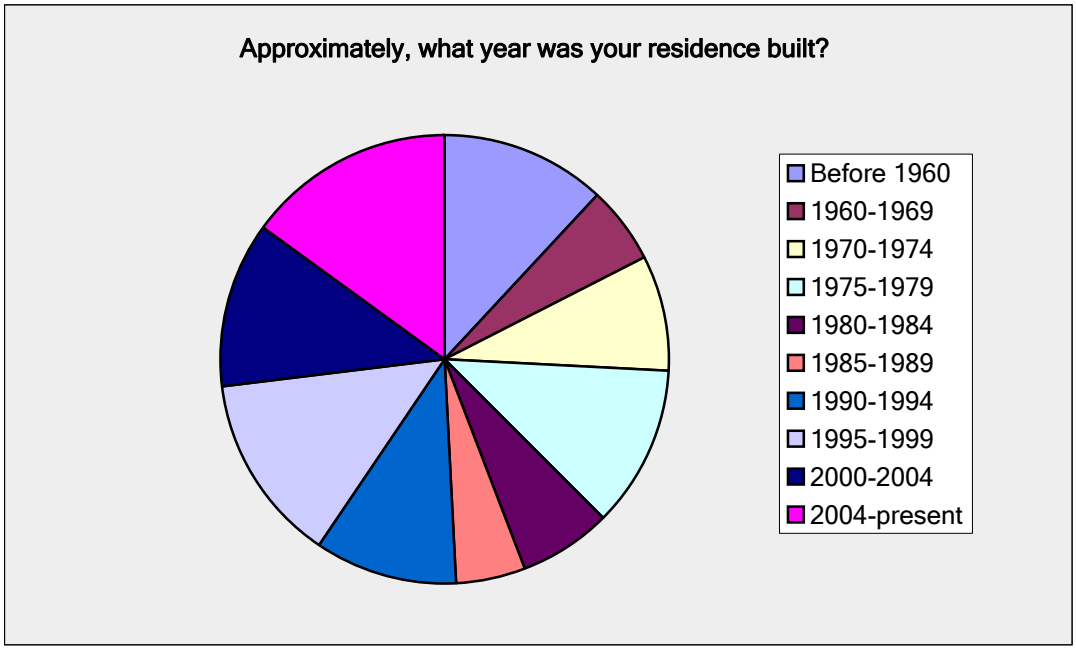
Answer Options	Response Average	Response Total	Response Count
Adults(18+)	2.06	2,567	1248
Teenagers(13-17)	1.07	404	377
Children(under 13)	1.94	1,742	899
		answered question	1254
		skipped question	22



Regional Residential Water Use Survey:
Information About Your House - Question 4

Approximately, what year was your residence built?

Answer Options	Response Percent	Response Count
Before 1960	12.0%	150
1960-1969	5.4%	67
1970-1974	8.4%	105
1975-1979	11.6%	145
1980-1984	6.7%	83
1985-1989	5.1%	64
1990-1994	10.2%	127
1995-1999	13.5%	168
2000-2004	12.1%	151
2004-present	14.9%	185
answered question		1245
skipped question		31

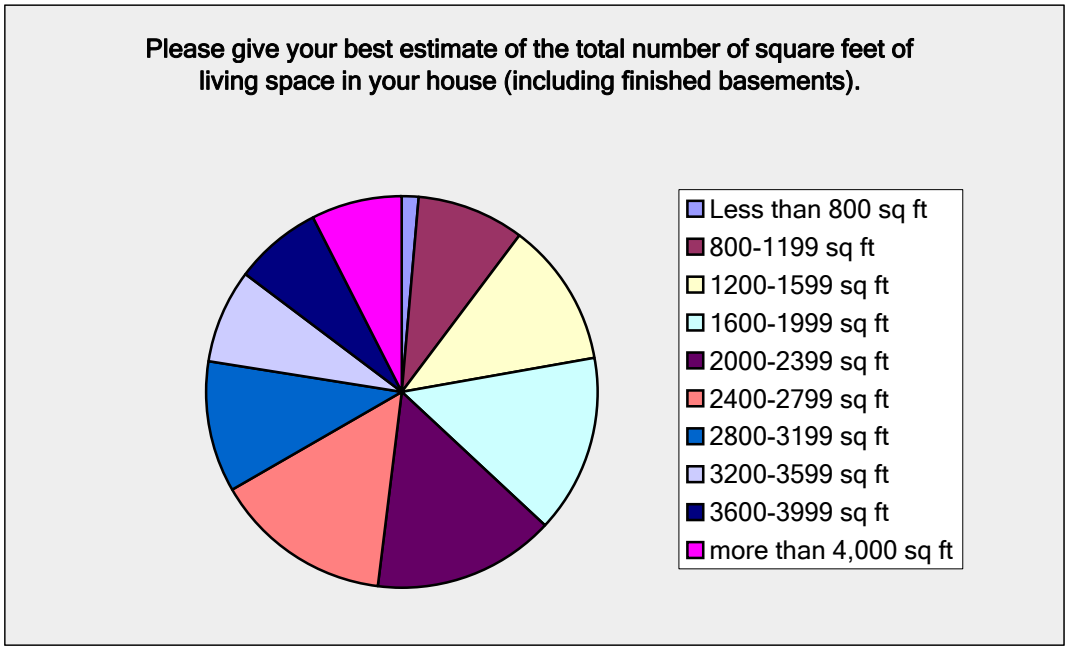


Spokane County Residential Water Use Survey
Summary of Results

Regional Residential Water Use Survey:
Information About Your House - Question 5

Please give your best estimate of the total number of square feet of living space in your house (including finished basements).

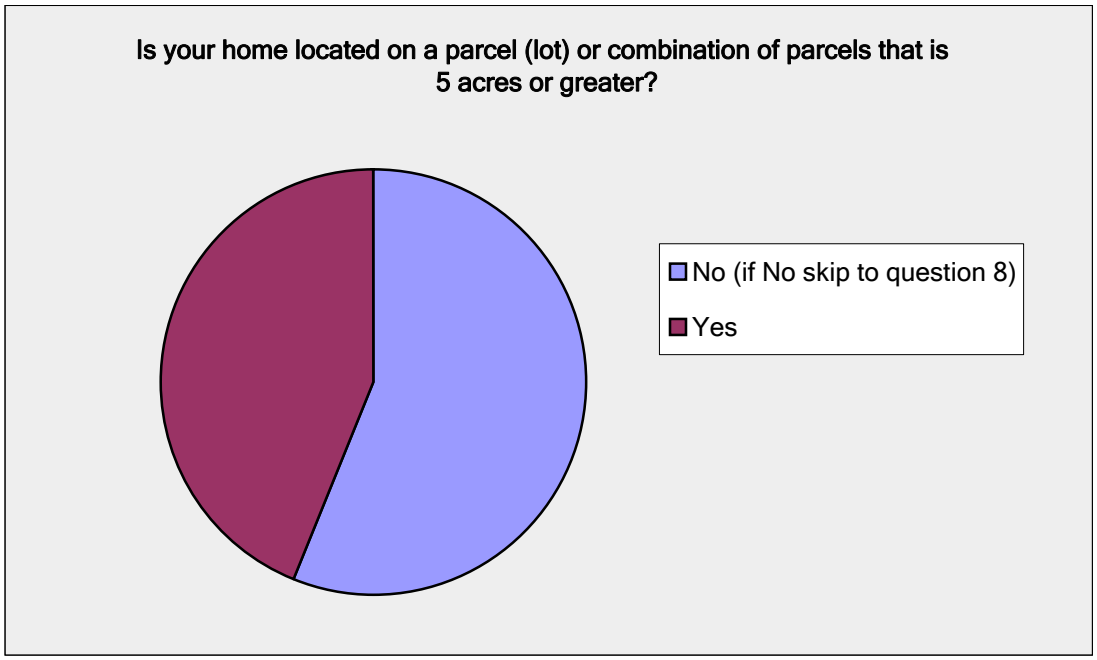
Answer Options	Response Percent	Response Count
Less than 800 sq ft	1.4%	17
800-1199 sq ft	8.8%	109
1200-1599 sq ft	12.1%	150
1600-1999 sq ft	14.5%	180
2000-2399 sq ft	15.2%	188
2400-2799 sq ft	14.7%	182
2800-3199 sq ft	10.7%	133
3200-3599 sq ft	7.8%	97
3600-3999 sq ft	7.3%	91
more than 4,000 sq ft	7.4%	92
	answered question	1239
	skipped question	37



Regional Residential Water Use Survey:
Information About Your House - Question 6

Is your home located on a parcel (lot) or combination of parcels that is 5 acres or greater?

Answer Options	Response Percent	Response Count
No (if No skip to question 8)	56.2%	698
Yes	43.8%	543
	answered question	1241
	skipped question	35

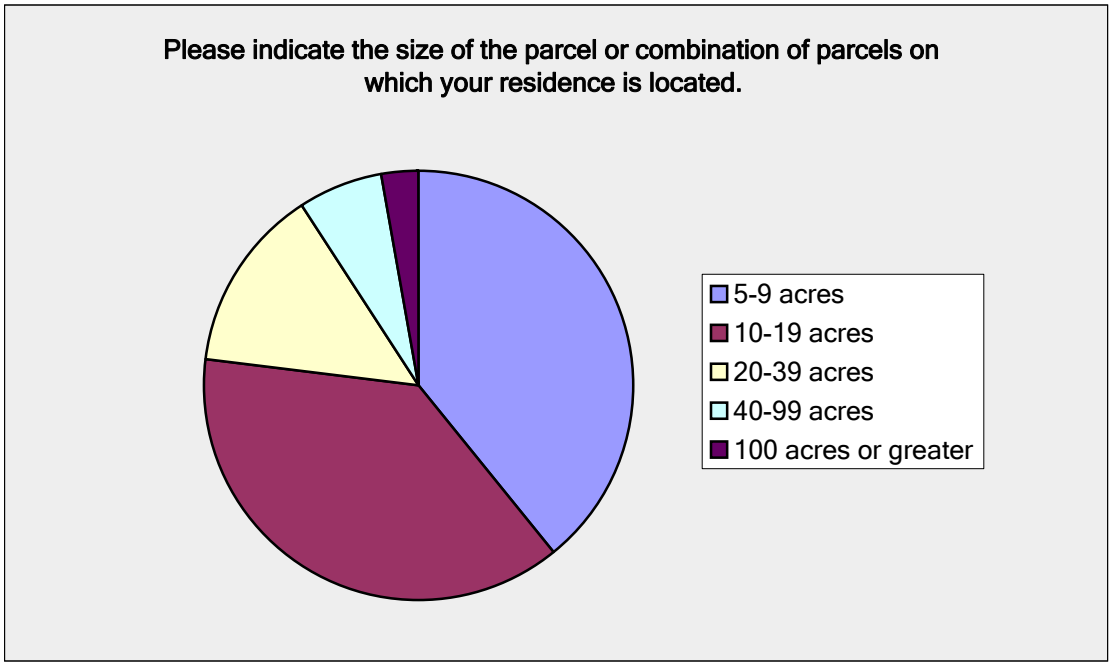


Regional Residential Water Use Survey:

Information About Your House - Question 7

Please indicate the size of the parcel or combination of parcels on which your residence is located.

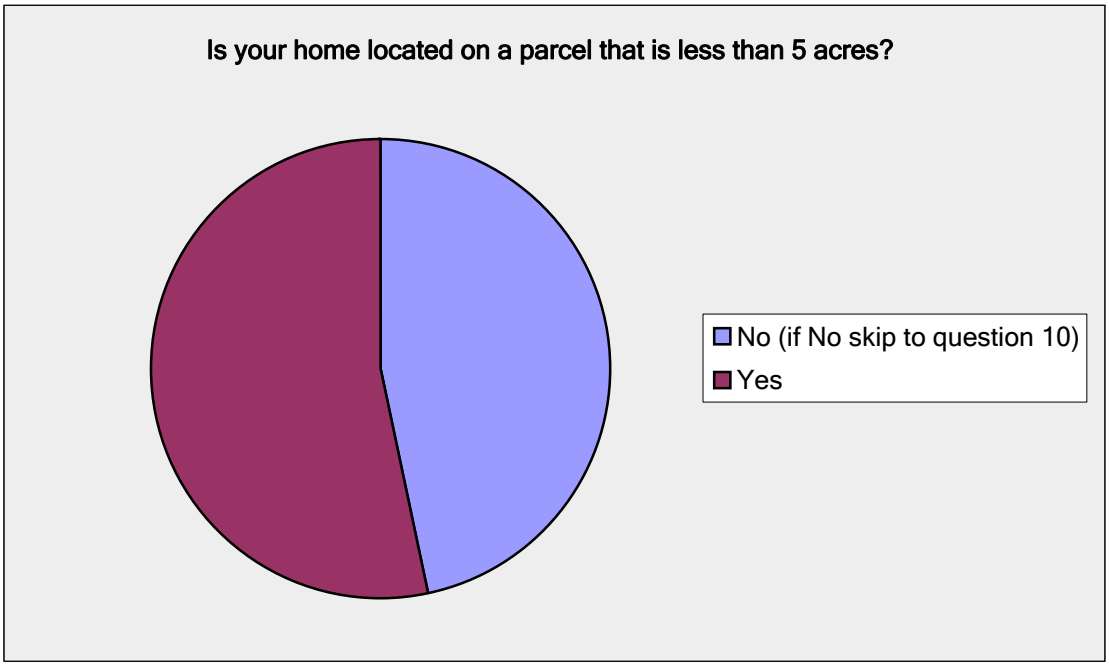
Answer Options	Response Percent	Response Count
5-9 acres	39.2%	210
10-19 acres	37.7%	202
20-39 acres	13.8%	74
40-99 acres	6.5%	35
100 acres or greater	2.8%	15
	answered question	536
	skipped question	740



Regional Residential Water Use Survey:
Information About Your House - Question 8

Is your home located on a parcel that is less than 5 acres?

Answer Options	Response Percent	Response Count
No (if No skip to question 10)	46.6%	549
Yes	53.4%	630
	answered question	1179
	skipped question	97

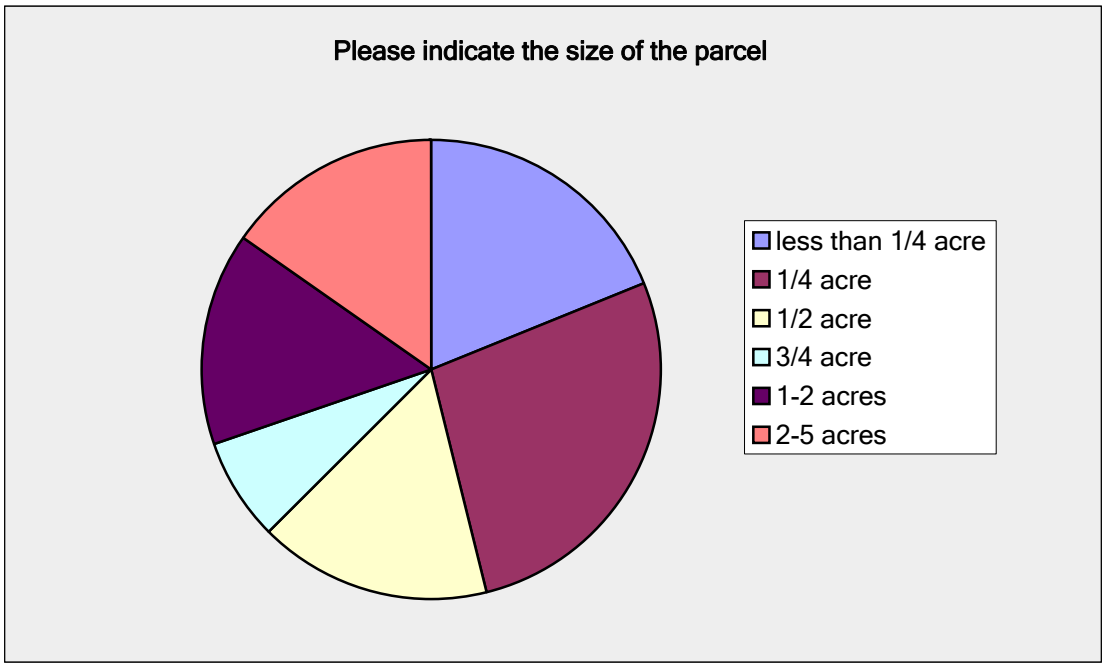


Spokane County Residential Water Use Survey
Summary of Results

Regional Residential Water Use Survey:
Information About Your House - Question 9

Please indicate the size of the parcel

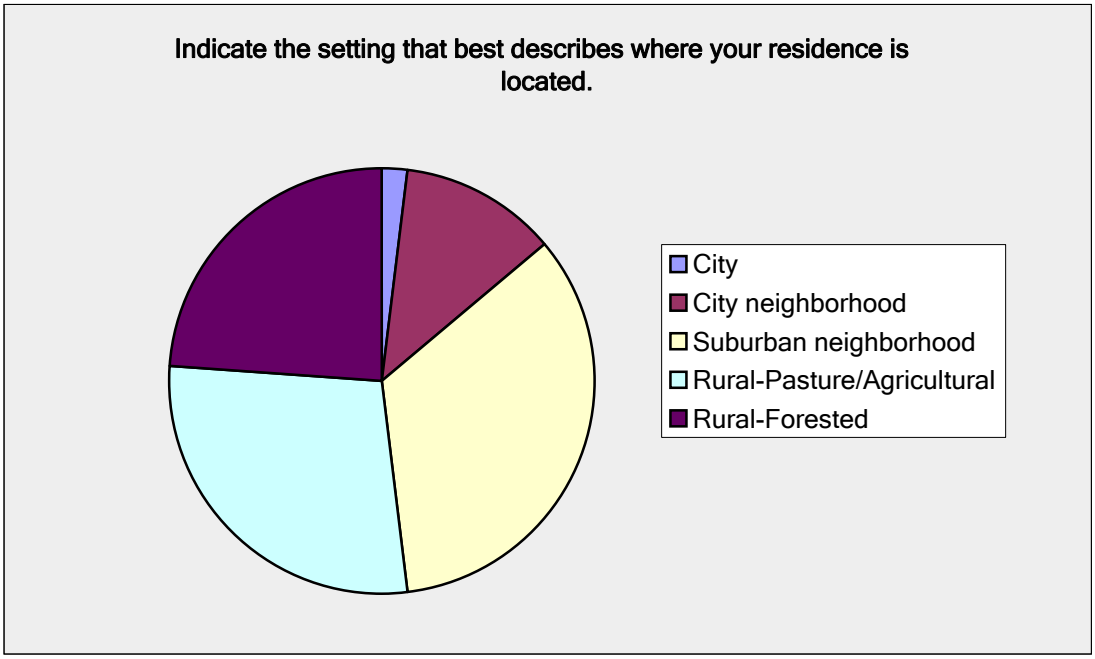
Answer Options	Response Percent	Response Count
less than 1/4 acre	19.0%	113
1/4 acre	27.1%	161
1/2 acre	16.3%	97
3/4 acre	7.2%	43
1-2 acres	15.2%	90
2-5 acres	15.2%	90
answered question		594
skipped question		682



Regional Residential Water Use Survey:
Information About Your House - Question 10

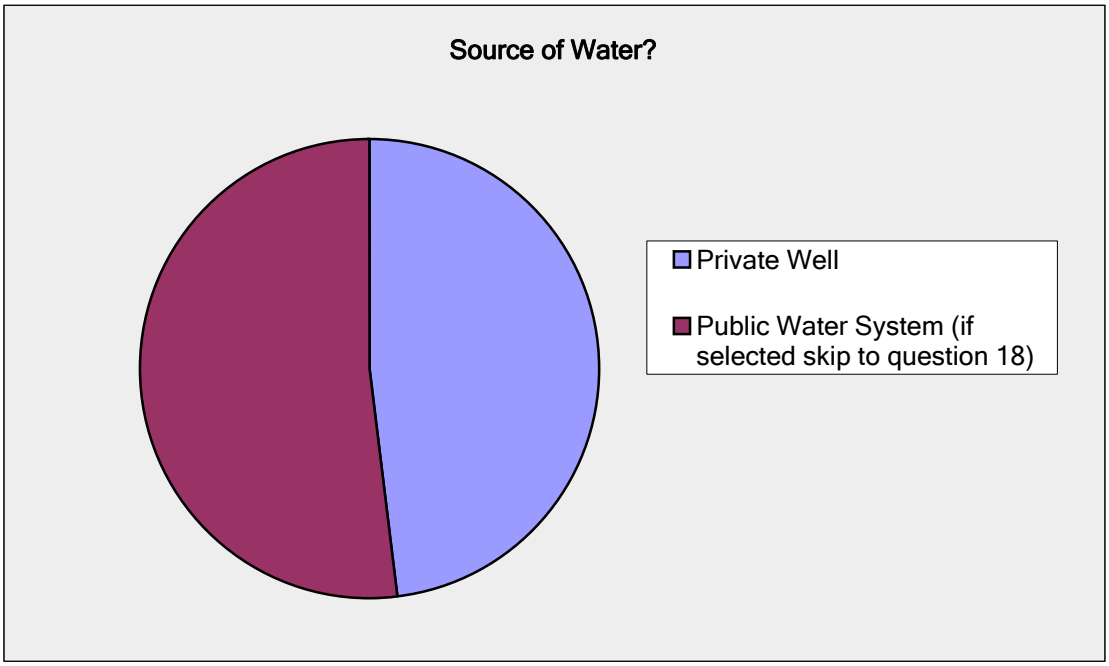
Indicate the setting that best describes where your residence is located.

Answer Options	Response Percent	Response Count
City	2.0%	25
City neighborhood	11.8%	146
Suburban neighborhood	34.3%	424
Rural-Pasture/Agricultural	28.1%	347
Rural-Forested	23.8%	295
answered question		1237
skipped question		39



Regional Residential Water Use Survey:
Information About Your House - Question 11

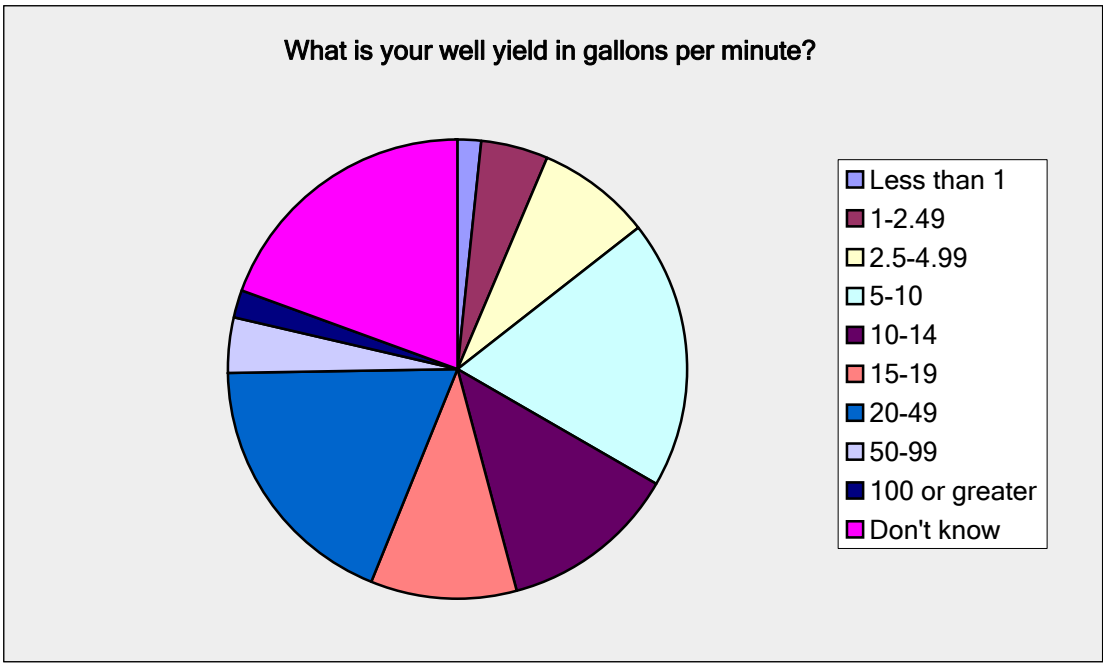
Source of Water?		
Answer Options	**Response Percent**	**Response Count**
Private Well	48.1%	604
Public Water System (if selected skip to question 18)	51.9%	651
	answered question	1255
	skipped question	21



Regional Residential Water Use Survey:
Information About Your House - Question 12

What is your well yield in gallons per minute?

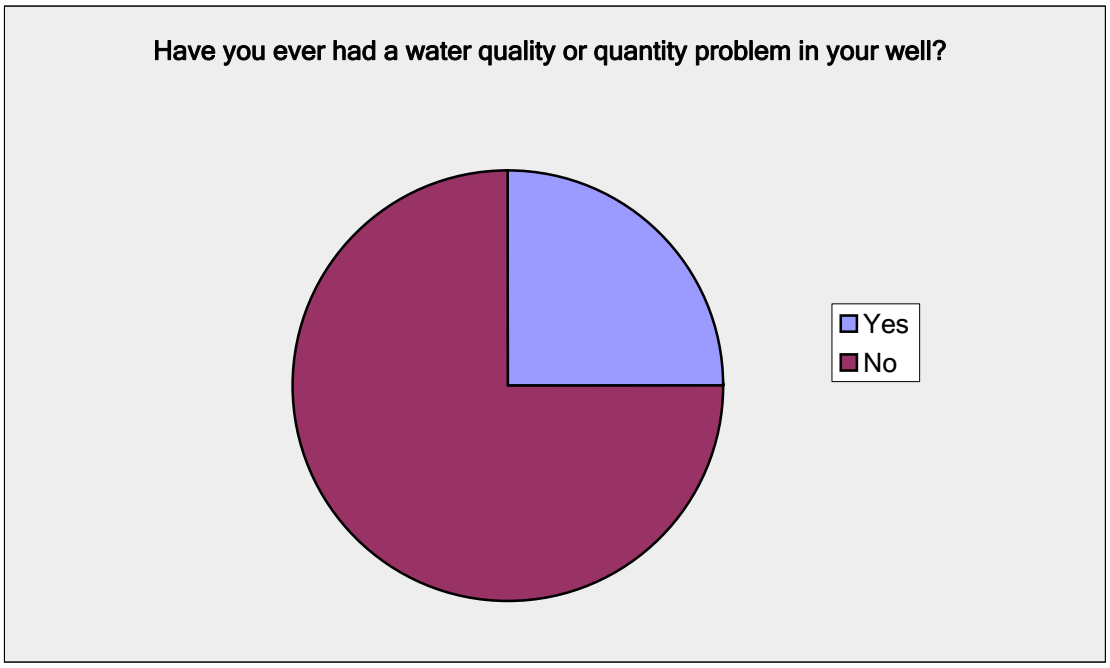
Answer Options	Response Percent	Response Count
Less than 1	1.8%	11
1-2.49	4.7%	29
2.5-4.99	7.9%	49
5-10	18.8%	116
10-14	12.6%	78
15-19	10.2%	63
20-49	18.6%	115
50-99	3.9%	24
100 or greater	1.9%	12
Don't know	19.4%	120
answered question		617
skipped question		659



Regional Residential Water Use Survey:
Information About Your House - Question 13

Have you ever had a water quality or quantity problem in your well?

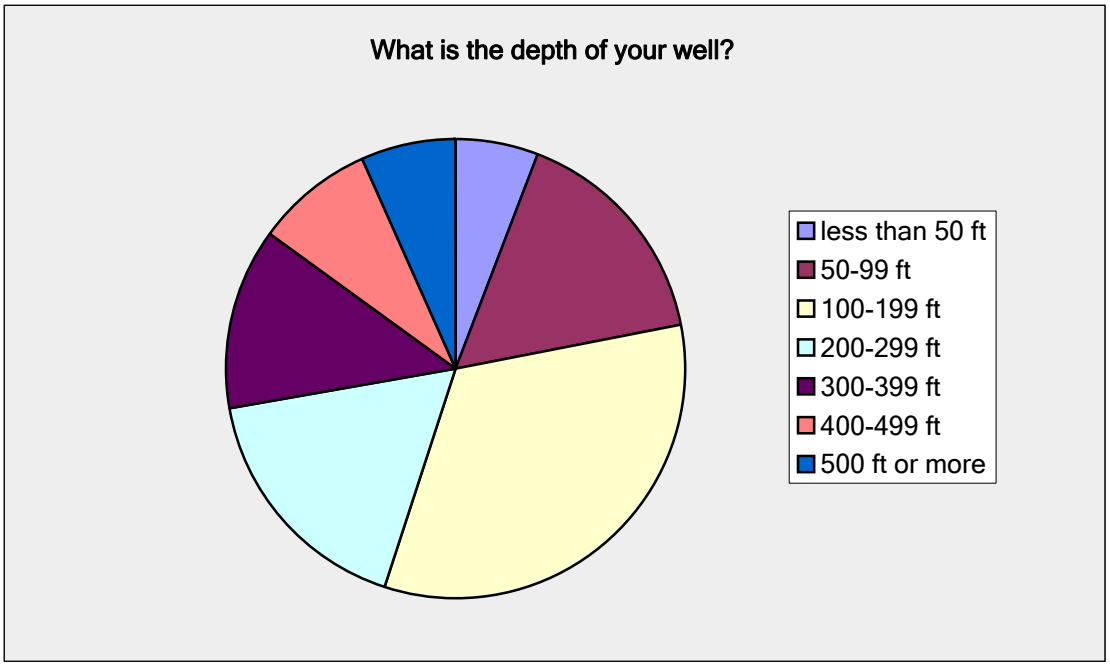
Answer Options	Response Percent	Response Count
Yes	25.0%	154
No	75.0%	463
if yes, what was the problem		139
	answered question	617
	skipped question	659



Regional Residential Water Use Survey:
Information About Your House - Question 14

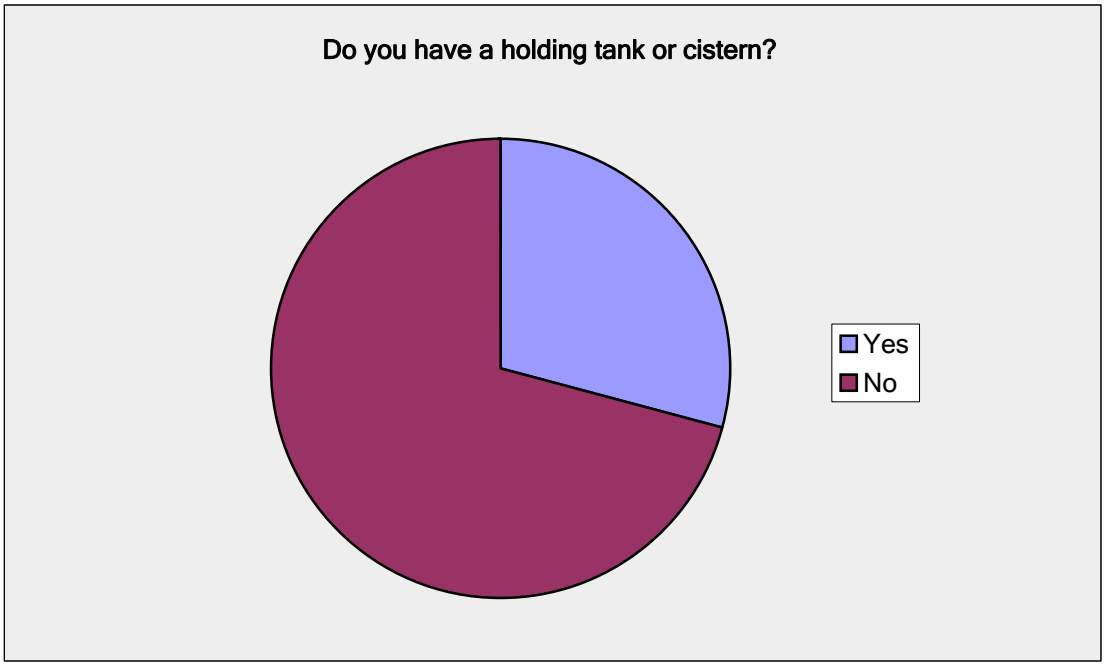
What is the depth of your well?

Answer Options	Response Percent	Response Count
less than 50 ft	5.9%	32
50-99 ft	16.1%	88
100-199 ft	33.0%	180
200-299 ft	17.4%	95
300-399 ft	12.8%	70
400-499 ft	8.1%	44
500 ft or more	6.8%	37
answered question		546
skipped question		730



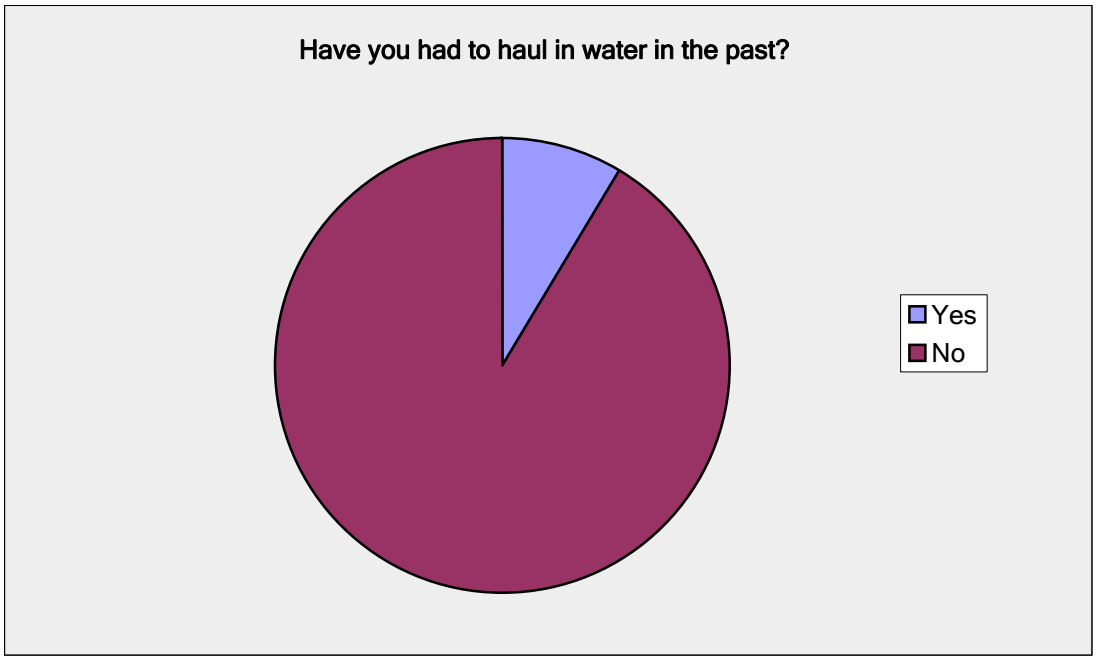
Regional Residential Water Use Survey:
Information About Your House - Question 15

Do you have a holding tank or cistern?		
Answer Options	**Response Percent**	**Response Count**
Yes	29.2%	186
No	70.8%	451
	answered question	637
	skipped question	639



Regional Residential Water Use Survey:
Information About Your House - Question 16

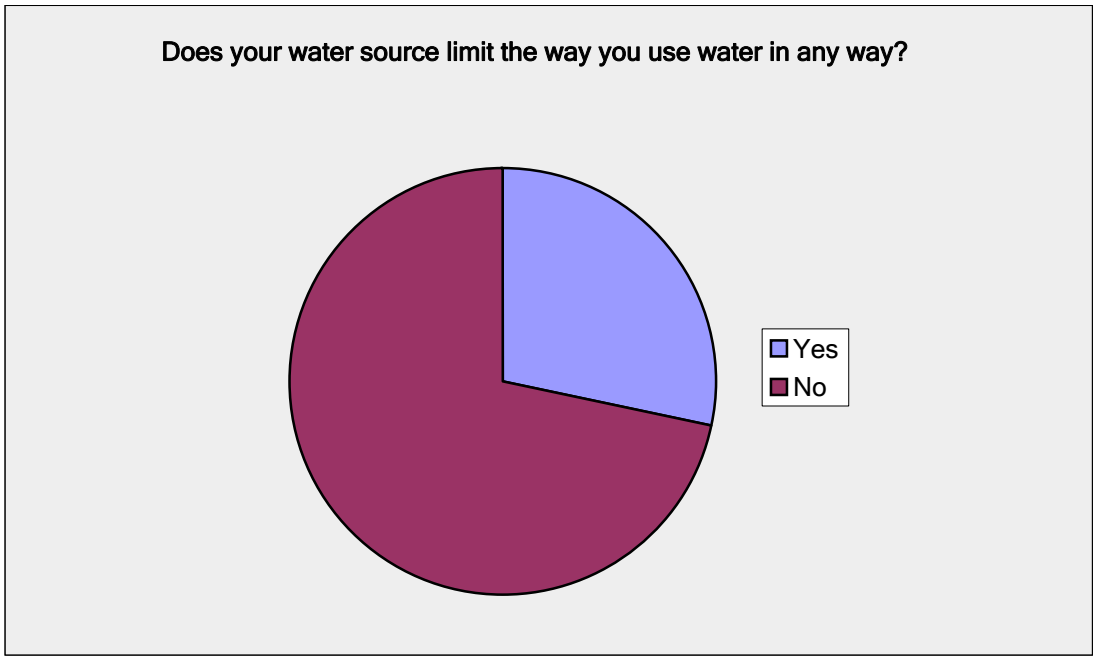
Have you had to haul in water in the past?		
Answer Options	**Response Percent**	**Response Count**
Yes	8.6%	57
No	91.4%	605
	answered question	662
	skipped question	614



Regional Residential Water Use Survey:
Information About Your House - Question 17

Does your water source limit the way you use water in any way?

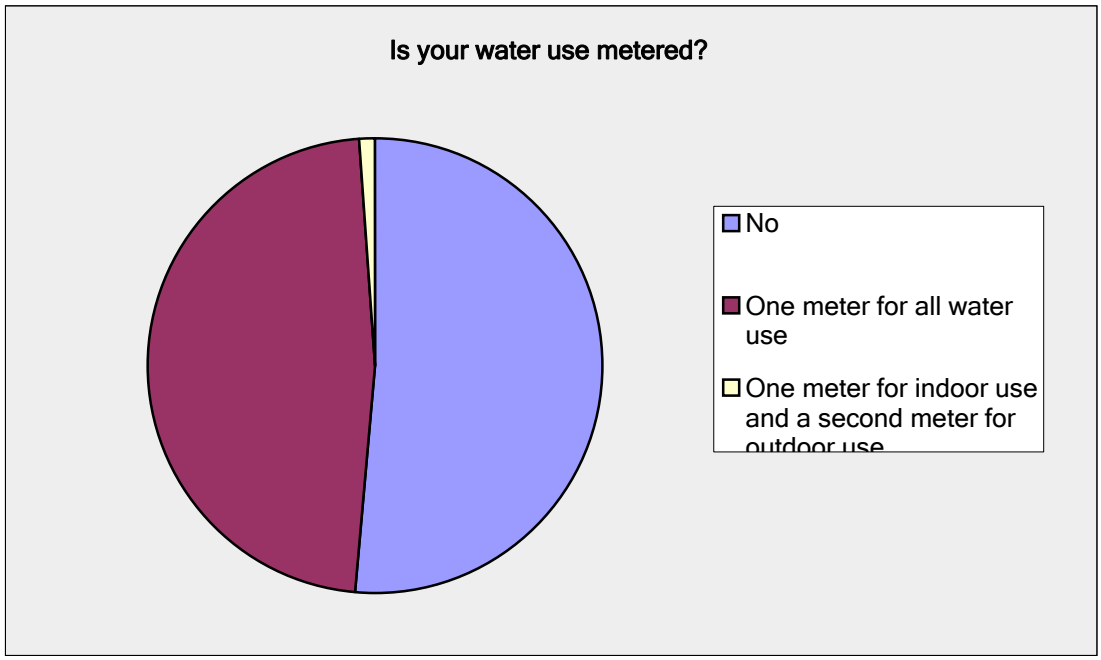
Answer Options	Response Percent	Response Count
Yes	28.3%	189
No	71.7%	479
	answered question	668
	skipped question	608



Regional Residential Water Use Survey:
Information About Your House - Question 18

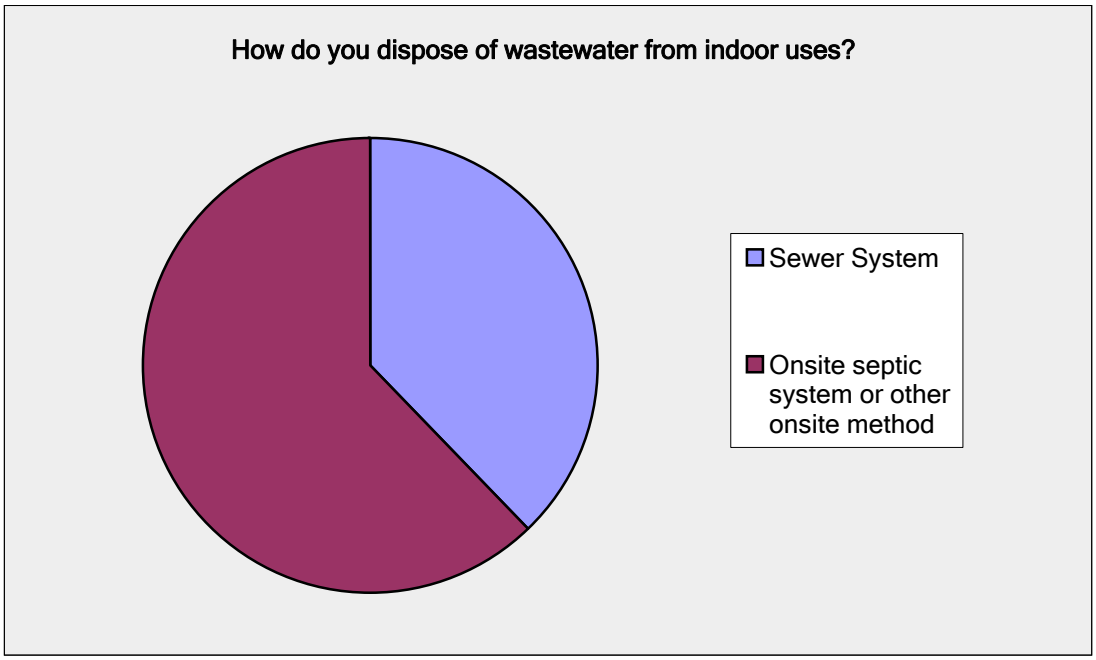
Is your water use metered?

Answer Options	Response Percent	Response Count
No	51.4%	621
One meter for all water use	47.6%	575
One meter for indoor use and a second meter for outdoor	1.1%	13
answered question		1209
skipped question		67



Regional Residential Water Use Survey:
Information About Your House - Question 19

How do you dispose of wastewater from indoor uses?		
Answer Options	**Response Percent**	**Response Count**
Sewer System	37.8%	465
Onsite septic system or other onsite method	62.2%	765
	answered question	1230
	skipped question	46



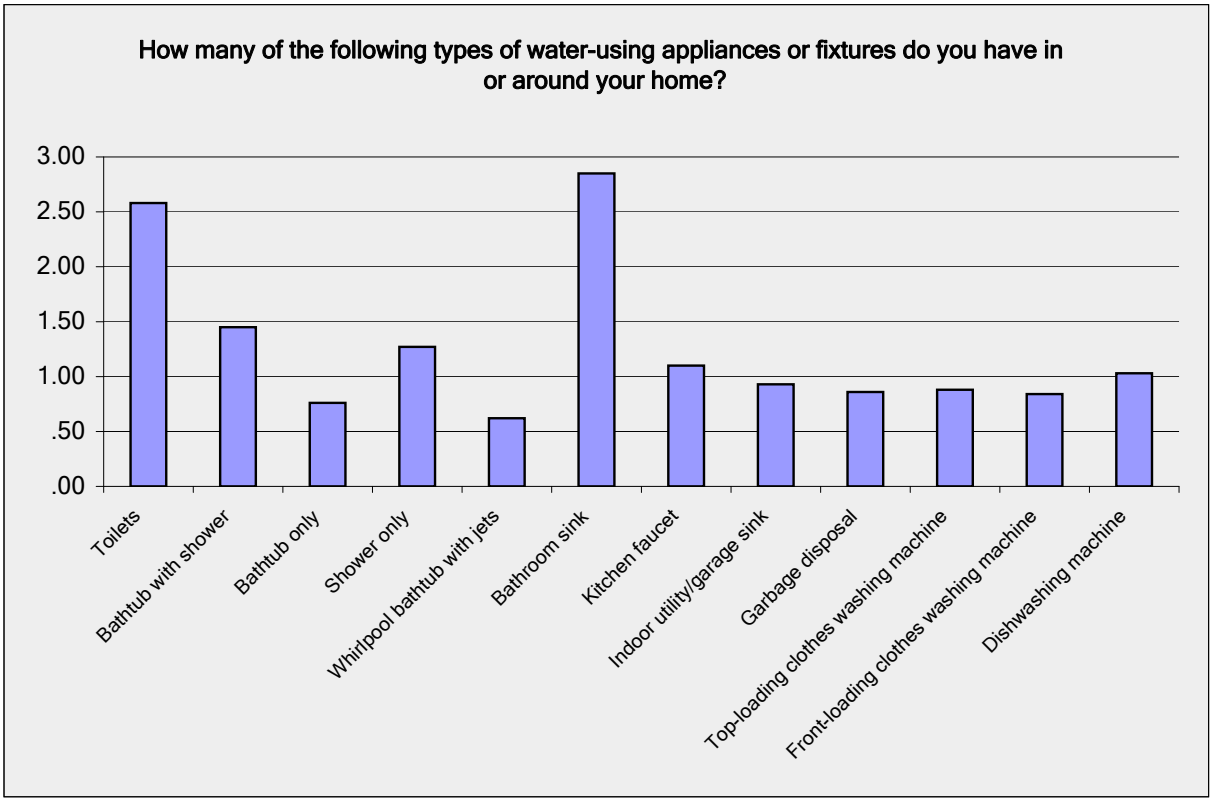
Spokane County Residential Water Use Survey
Summary of Results

Regional Residential Water Use Survey:

Indoor Water Use - Question 1

How many of the following types of water-using appliances or fixtures do you have in or around your home?

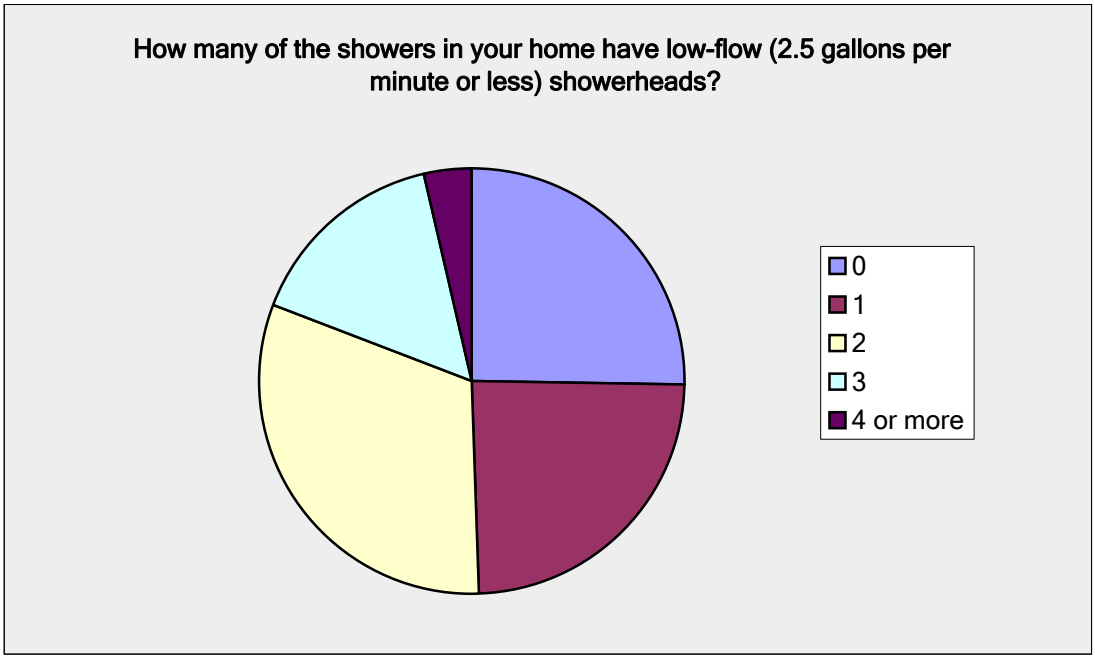
Answer Options	Response Average	Response Total	Response Count
Toilets	2.58	3,213	1243
Bathtub with shower	1.45	1,700	1176
Bathtub only	.76	379	497
Shower only	1.27	1,150	902
Whirlpool bathtub with jets	.62	254	411
Bathroom sink	2.85	3,512	1231
Kitchen faucet	1.10	1,360	1232
Indoor utility/garage sink	.93	618	667
Garbage disposal	.86	691	800
Top-loading clothes washing machine	.88	736	832
Front-loading clothes washing machine	.84	543	650
Dishwashing machine	1.03	1,200	1164
		answered question	1244
		skipped question	32



Regional Residential Water Use Survey:

Indoor Water Use - Question 2

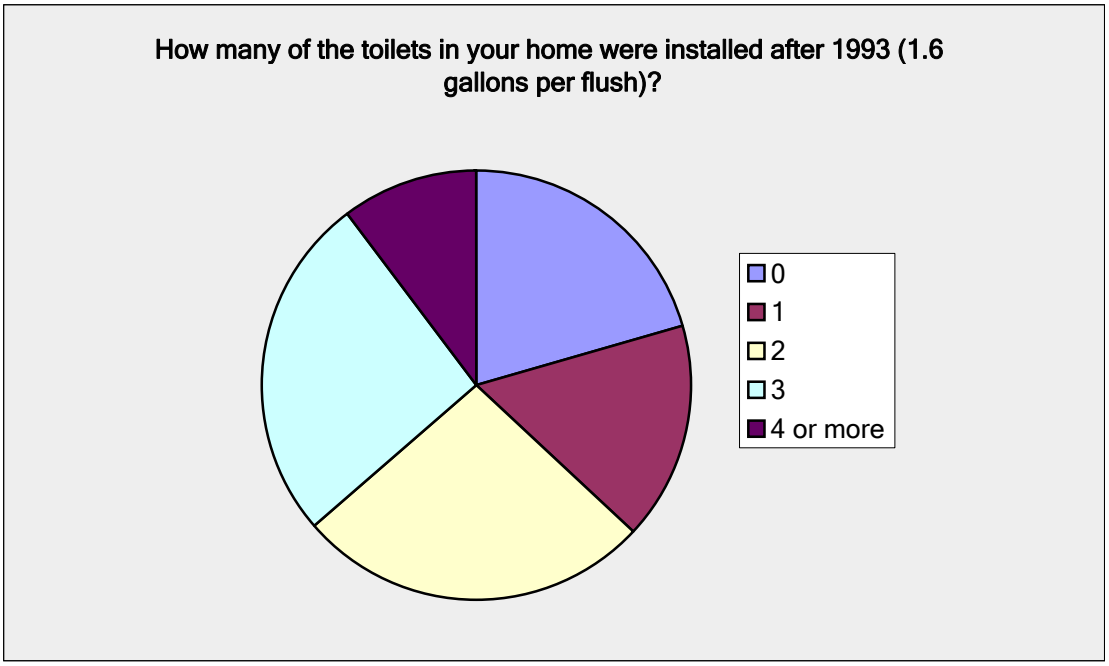
How many of the showers in your home have low-flow (2.5 gallons per minute or less) showerheads?		
Answer Options	**Response Percent**	**Response Count**
0	25.3%	302
1	24.2%	289
2	31.3%	373
3	15.7%	187
4 or more	3.5%	42
	answered question	**1193**
	skipped question	**83**



Regional Residential Water Use Survey:

Indoor Water Use - Question 3

How many of the toilets in your home were installed after 1993 (1.6 gallons per flush)?		
Answer Options	**Response Percent**	**Response Count**
0	20.6%	251
1	16.3%	198
2	26.6%	324
3	26.1%	317
4 or more	10.4%	126
	answered question	1216
	skipped question	60

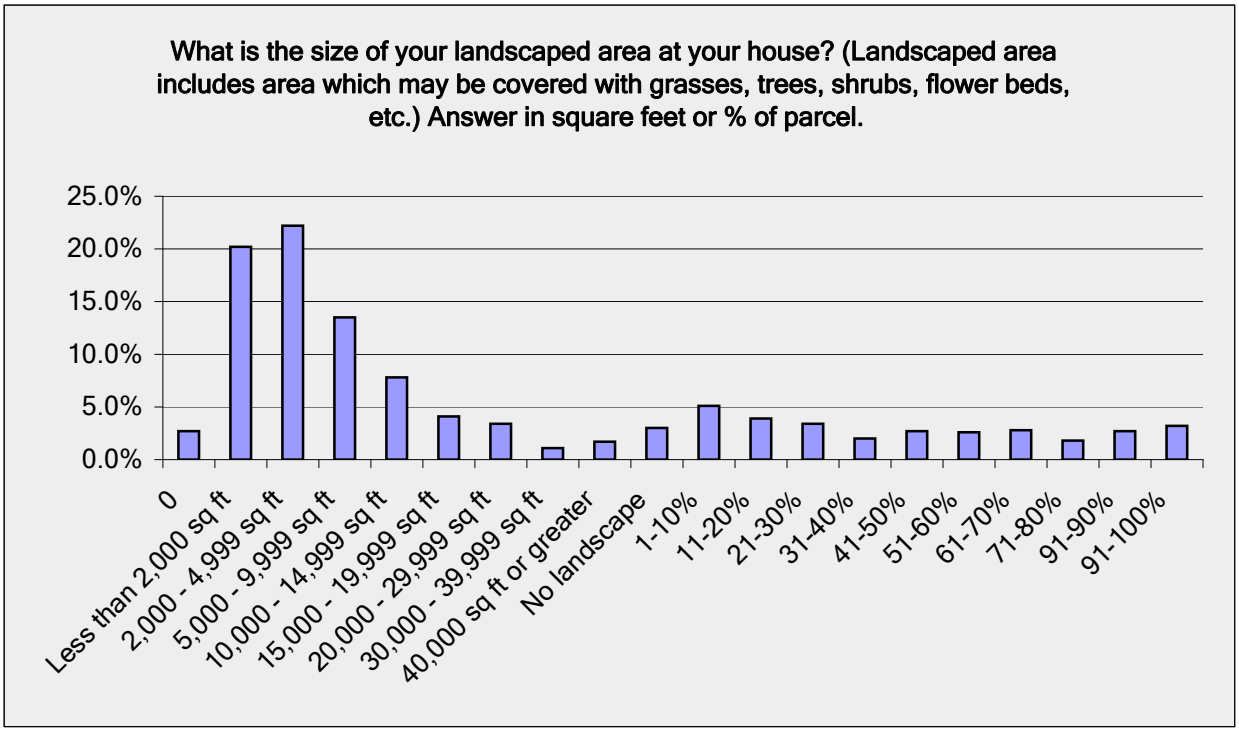


Regional Residential Water Use Survey:

Outdoor Water Use - Question 1

What is the size of your landscaped area at your house? (Landscaped area includes area which may be covered with grasses, trees, shrubs, flower beds, etc.) Answer in square feet

Answer Options	Response Percent	Response Count
0	2.7%	32
Less than 2,000 sq ft	20.2%	237
2,000 - 4,999 sq ft	22.2%	261
5,000 - 9,999 sq ft	13.5%	159
10,000 - 14,999 sq ft	7.8%	92
15,000 - 19,999 sq ft	4.1%	48
20,000 - 29,999 sq ft	3.4%	40
30,000 - 39,999 sq ft	1.1%	13
40,000 sq ft or greater	1.7%	20
No landscape	3.0%	35
1-10%	5.1%	60
11-20%	3.9%	46
21-30%	3.4%	40
31-40%	2.0%	23
41-50%	2.7%	32
51-60%	2.6%	31
61-70%	2.8%	33
71-80%	1.8%	21
91-90%	2.7%	32
91-100%	3.2%	37
	answered question	1174
	skipped question	102

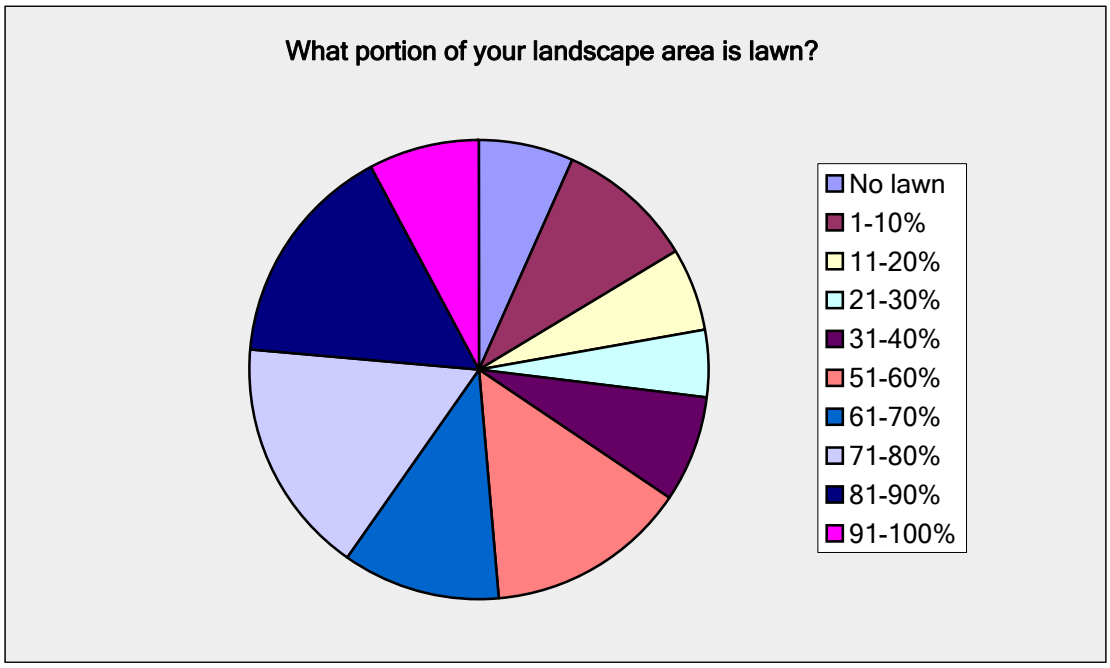


Regional Residential Water Use Survey:

Outdoor Water Use - Question 2

What portion of your landscape area is lawn?

Answer Options	Response Percent	Response Count
No lawn	6.6%	79
1-10%	9.9%	118
11-20%	5.8%	69
21-30%	4.8%	57
31-40%	7.4%	88
51-60%	14.2%	170
61-70%	11.2%	134
71-80%	16.6%	199
81-90%	15.8%	189
91-100%	7.8%	93
	answered question	1196
	skipped question	80

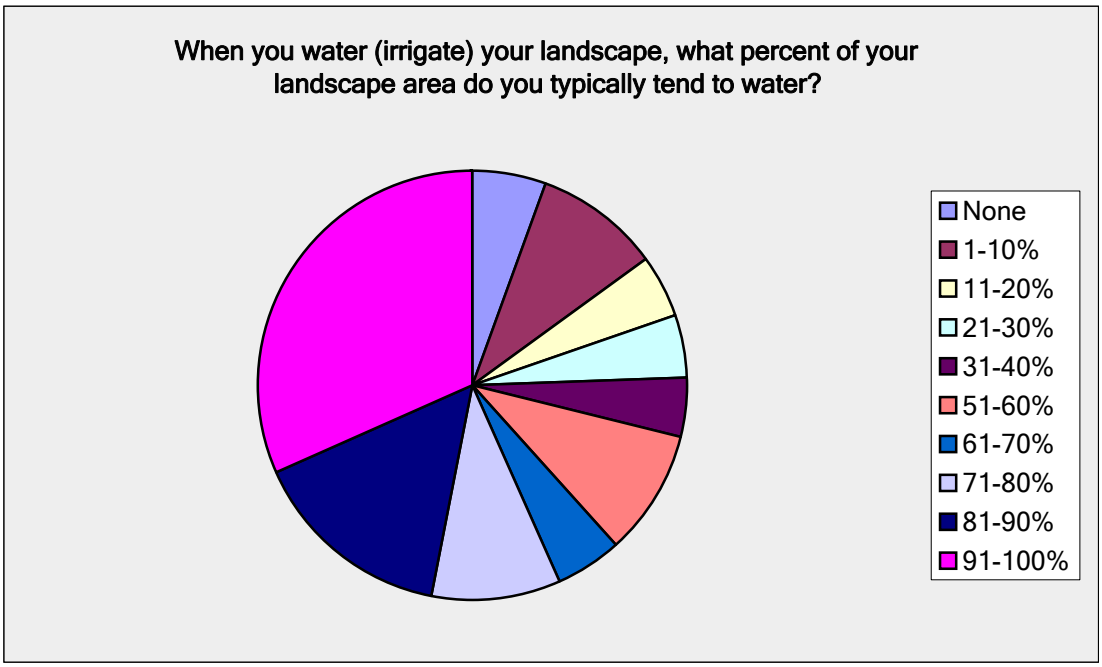


Regional Residential Water Use Survey:

Outdoor Water Use - Question 3

When you water (irrigate) your landscape, what percent of your landscape area do you typically tend to water?

Answer Options	Response Percent	Response Count
None	5.7%	68
1-10%	9.4%	112
11-20%	4.6%	55
21-30%	4.7%	56
31-40%	4.6%	55
51-60%	9.5%	113
61-70%	4.9%	58
71-80%	9.8%	117
81-90%	15.2%	181
91-100%	31.7%	378
	answered question	1193
	skipped question	83

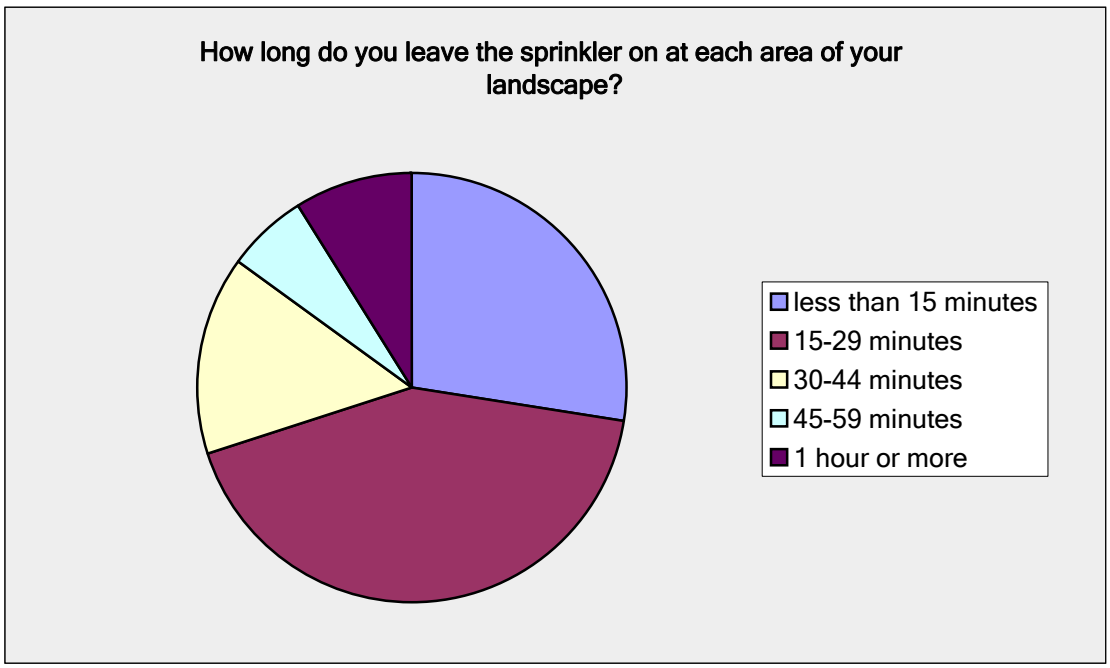


Regional Residential Water Use Survey:

Outdoor Water Use - Question 4

How long do you leave the sprinkler on at each area of your landscape?

Answer Options	Response Percent	Response Count
less than 15 minutes	27.4%	317
15-29 minutes	42.4%	490
30-44 minutes	15.2%	175
45-59 minutes	6.1%	71
1 hour or more	8.8%	102
	answered question	1155
	skipped question	121

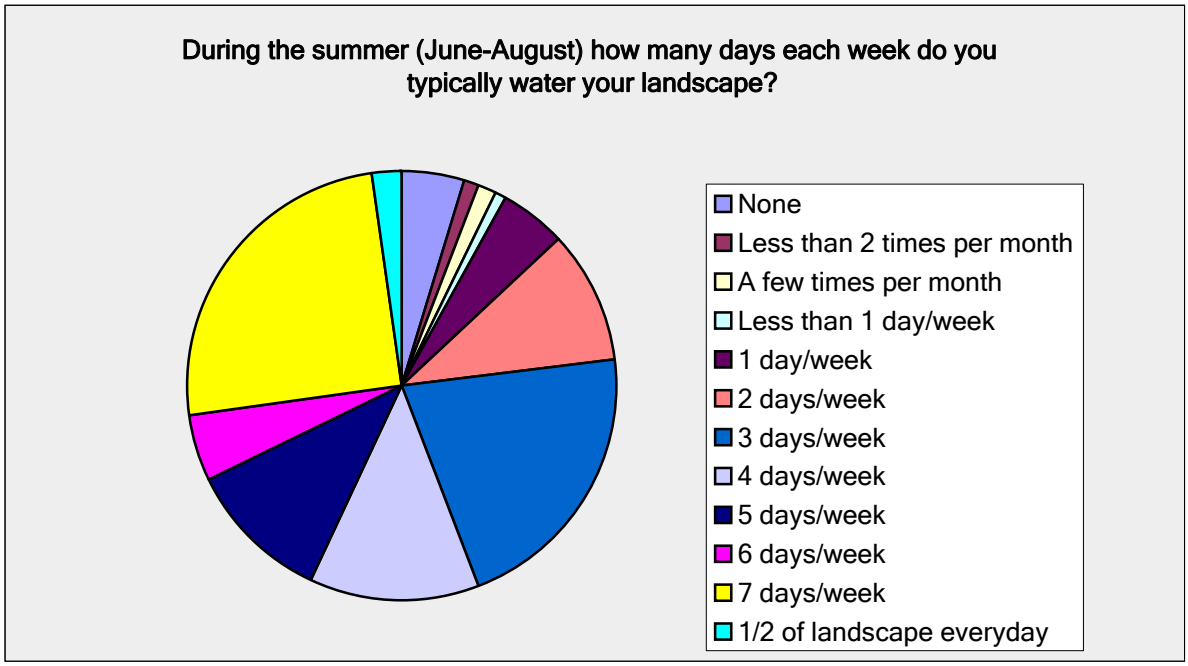


Regional Residential Water Use Survey:

Outdoor Water Use - Question 5

During the summer (June-August) how many days each week do you typically water your landscape?

Answer Options	Response Percent	Response Count
None	4.6%	55
Less than 2 times per month	1.2%	14
A few times per month	1.3%	15
Less than 1 day/week	0.9%	11
1 day/week	5.0%	59
2 days/week	10.2%	121
3 days/week	21.1%	251
4 days/week	12.8%	153
5 days/week	10.7%	127
6 days/week	5.0%	59
7 days/week	25.1%	299
1/2 of landscape everyday	2.3%	27
	answered question	1191
	skipped question	85

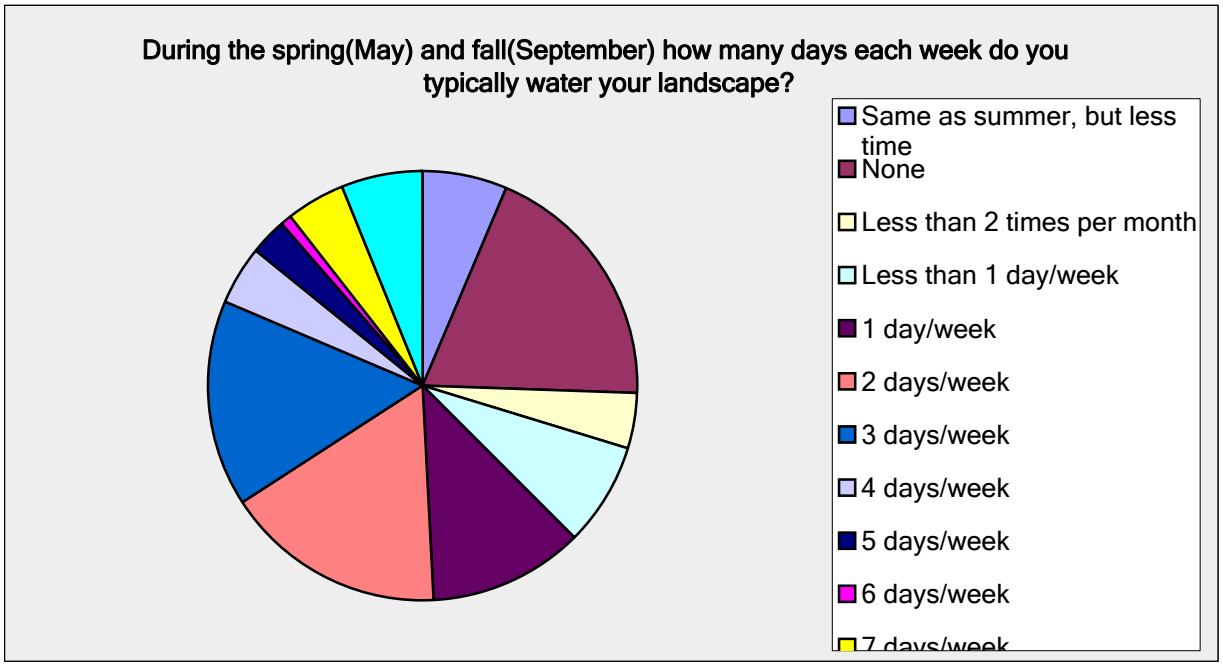


Regional Residential Water Use Survey:

Outdoor Water Use - Question 6

During the spring(May) and fall(September) how many days each week do you typically water your landscape?

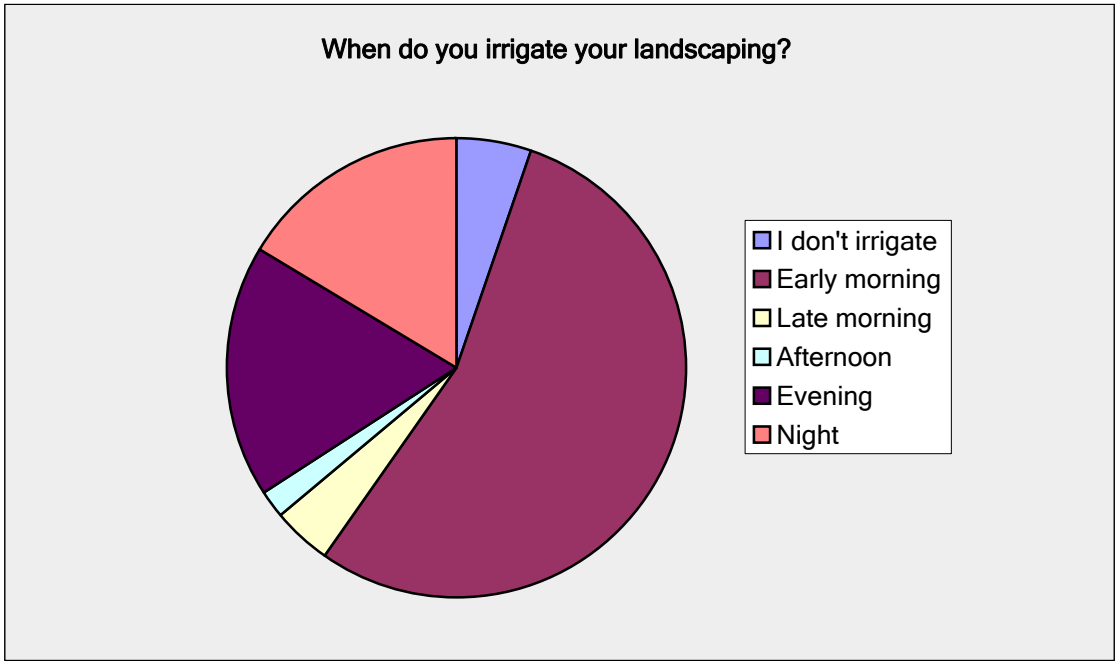
Answer Options	Response Percent	Response Count
Same as summer, but less time	6.5%	77
None	19.0%	226
Less than 2 times per month	4.3%	51
Less than 1 day/week	7.8%	93
1 day/week	11.6%	138
2 days/week	16.6%	198
3 days/week	15.6%	186
4 days/week	4.4%	52
5 days/week	2.9%	34
6 days/week	0.8%	9
7 days/week	4.4%	52
as needed; 2 to 3 times per week	6.2%	74
	answered question	1190
	skipped question	86



Regional Residential Water Use Survey:

Outdoor Water Use - Question 7

When do you irrigate your landscaping?		
Answer Options	**Response Percent**	**Response Count**
I don't irrigate	5.2%	61
Early morning	54.6%	635
Late morning	3.9%	45
Afternoon	2.2%	25
Evening	17.6%	205
Night	16.4%	191
	answered question	1162
	skipped question	114

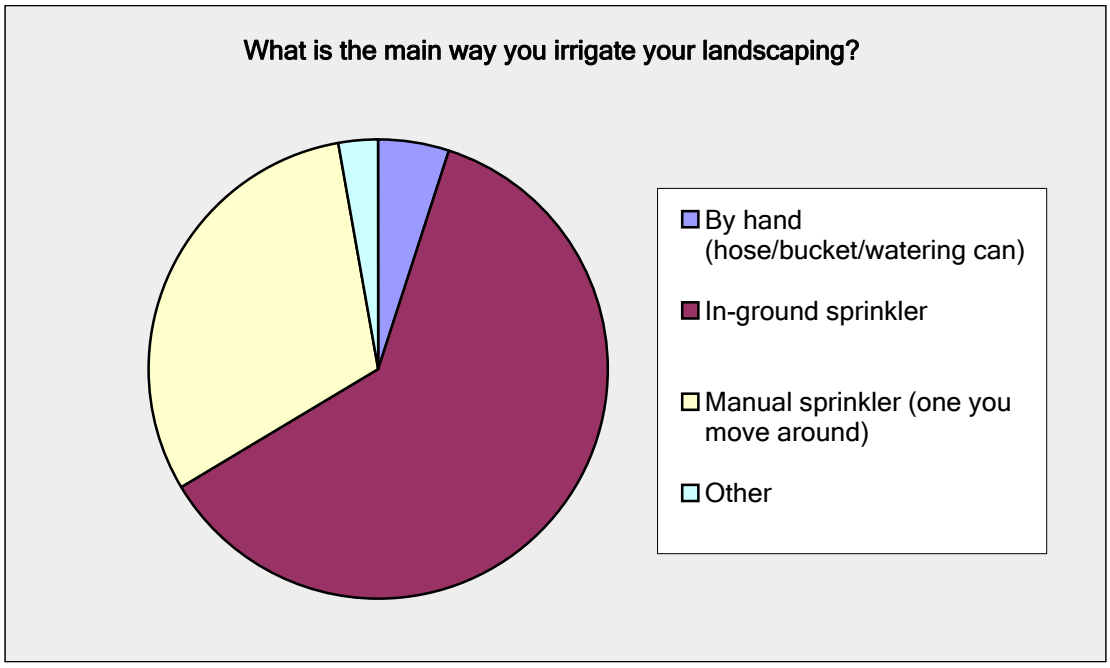


Regional Residential Water Use Survey:

Outdoor Water Use - Question 8

What is the main way you irrigate your landscaping?

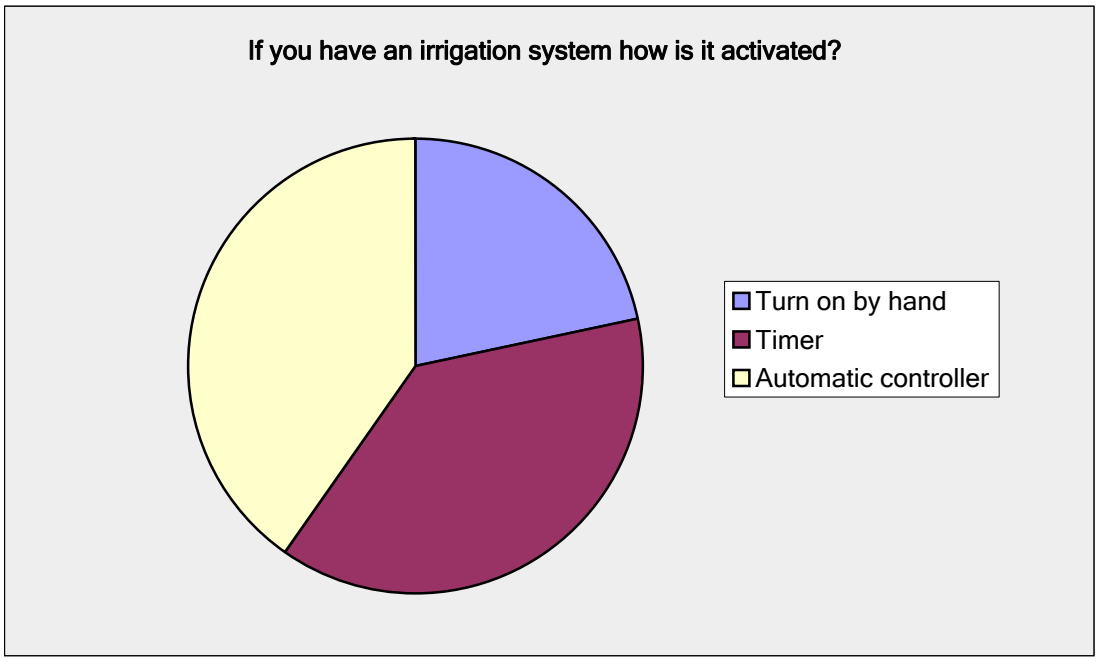
Answer Options	Response Percent	Response Count
By hand (hose/bucket/watering can)	4.9%	56
In-ground sprinkler	61.5%	700
Manual sprinkler (one you move around)	30.8%	351
Other	2.7%	31
Please specify other irrigation method:		67
	answered question	1138
	skipped question	138



Regional Residential Water Use Survey:

Outdoor Water Use - Question 9

If you have an irrigation system how is it activated?		
Answer Options	**Response Percent**	**Response Count**
Turn on by hand	21.6%	196
Timer	38.0%	344
Automatic controller	40.4%	366
	answered question	906
	skipped question	370

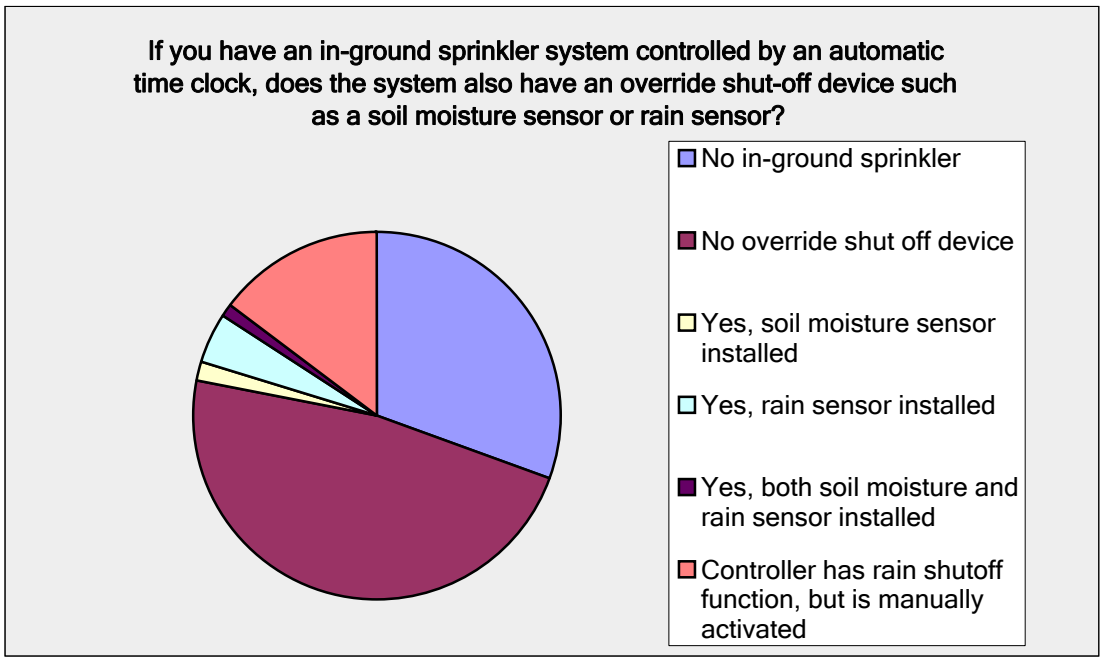


Regional Residential Water Use Survey:

Outdoor Water Use - Question 10

If you have an in-ground sprinkler system controlled by an automatic time clock, does the system also have an override shut-off device such as a soil moisture sensor or rain

Answer Options	Response Percent	Response Count
No in-ground sprinkler	30.5%	290
No override shut off device	47.5%	451
Yes, soil moisture sensor installed	1.7%	16
Yes, rain sensor installed	4.4%	42
Yes, both soil moisture and rain sensor installed	1.2%	11
Controller has rain shutoff function, but is manually	14.7%	140
answered question		950
skipped question		326

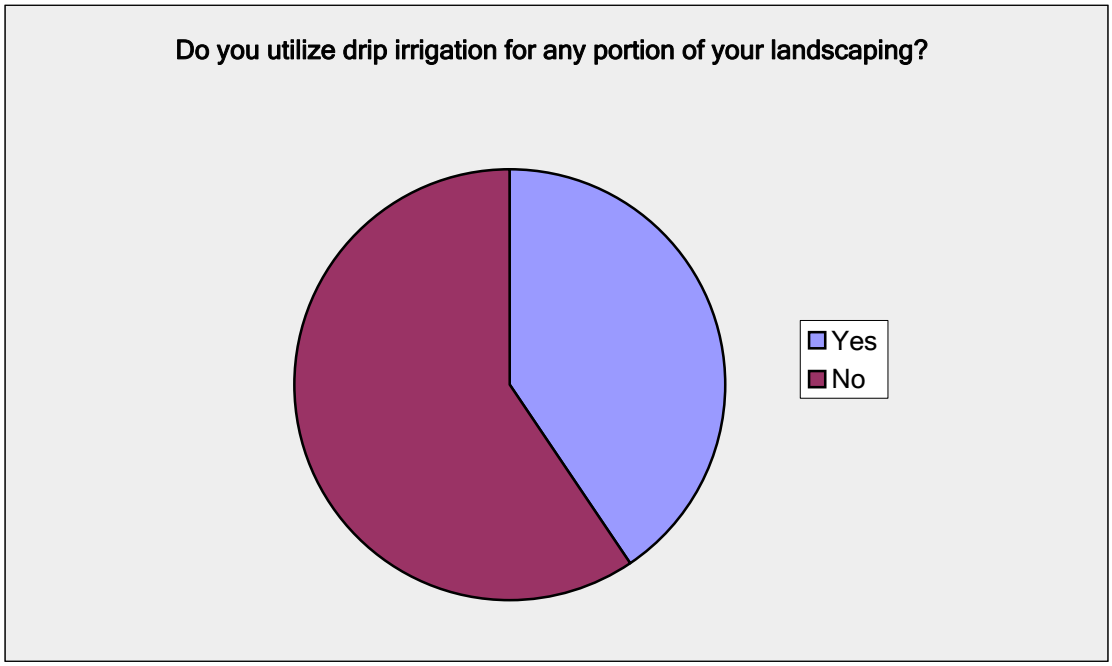


Regional Residential Water Use Survey:

Outdoor Water Use - Question 11

Do you utilize drip irrigation for any portion of your landscaping?

Answer Options	Response Percent	Response Count
Yes	40.6%	460
No	59.4%	673
	answered question	1133
	skipped question	143

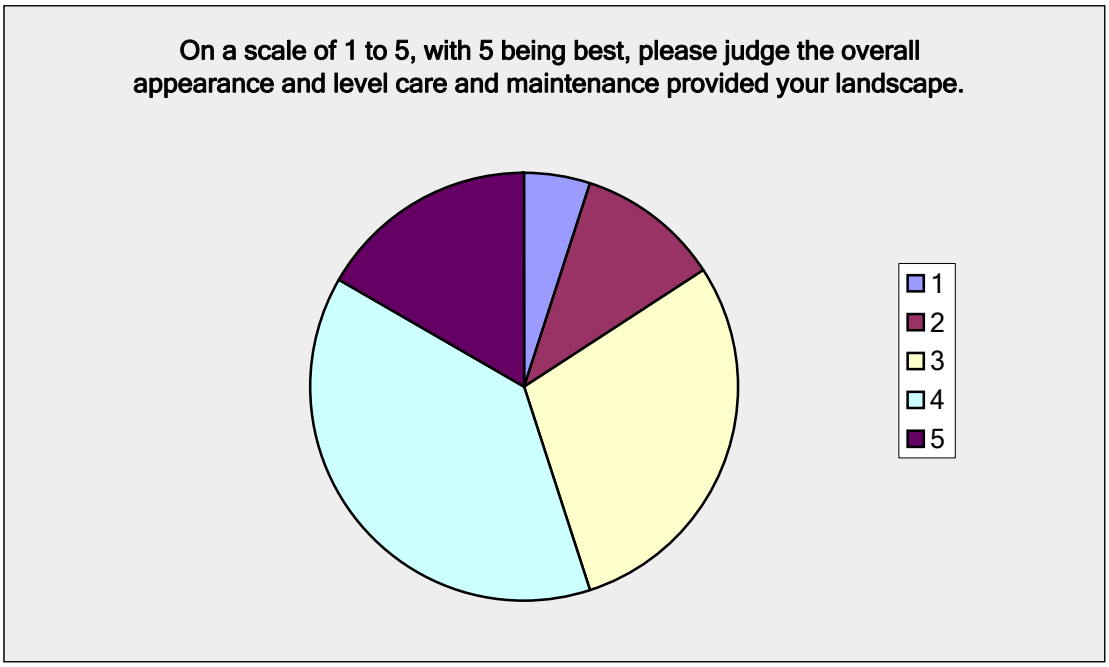


Regional Residential Water Use Survey:

Outdoor Water Use - Question 12

On a scale of 1 to 5, with 5 being best, please judge the overall appearance and level care and maintenance provided your landscape.

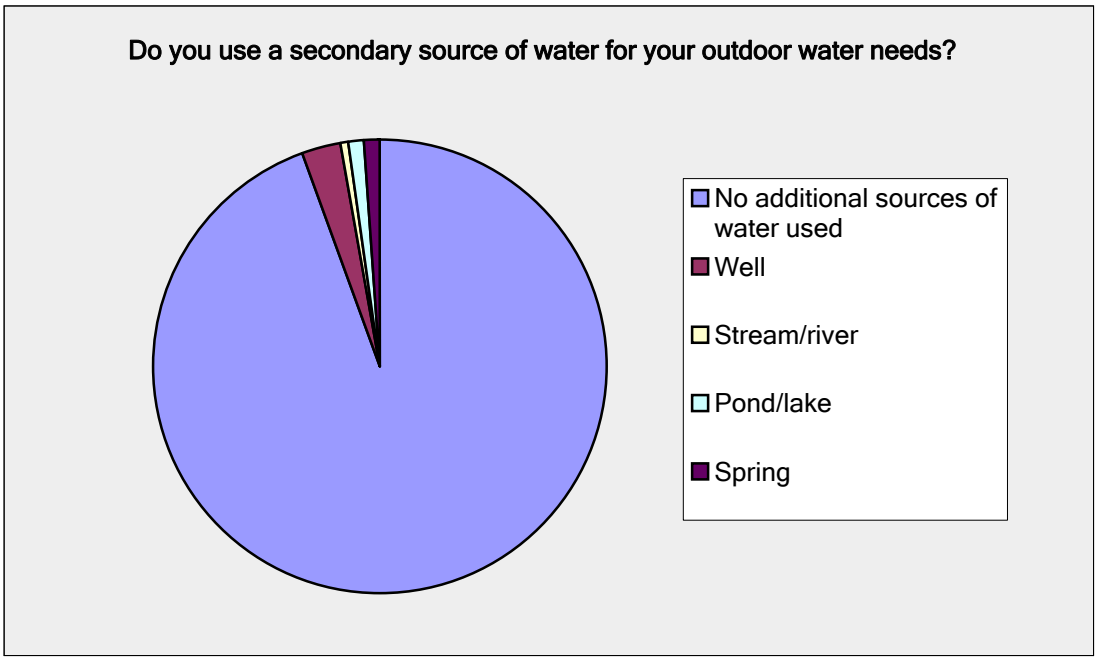
Answer Options	Response Percent	Response Count
1	5.0%	58
2	10.7%	125
3	29.2%	341
4	38.4%	449
5	16.7%	195
	answered question	1168
	skipped question	108



Regional Residential Water Use Survey:
Outdoor Water Use - Question 13

Do you use a secondary source of water for your outdoor water needs?

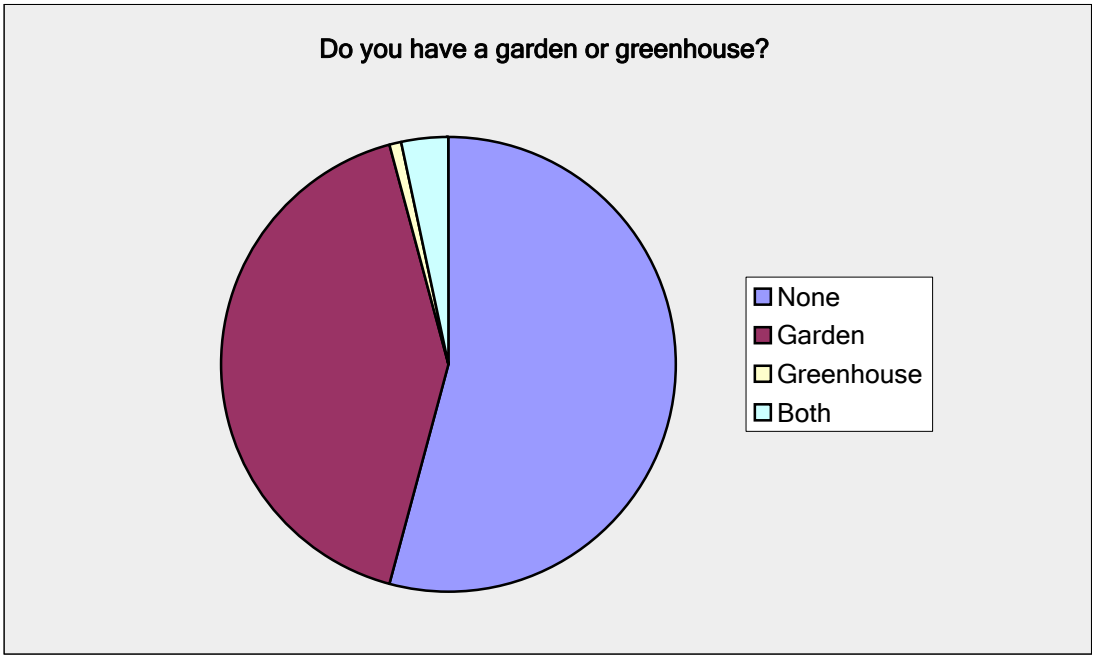
Answer Options	Response Percent	Response Count
No additional sources of water used	94.4%	1116
Well	2.7%	32
Stream/river	0.7%	8
Pond/lake	1.1%	13
Spring	1.1%	13
answered question		1182
skipped question		94



Regional Residential Water Use Survey:

Outdoor Water Use - Question 14

Do you have a garden or greenhouse?		
Answer Options	**Response Percent**	**Response Count**
None	54.1%	653
Garden	41.6%	502
Greenhouse	0.9%	11
Both	3.4%	41
	answered question	1207
	skipped question	69

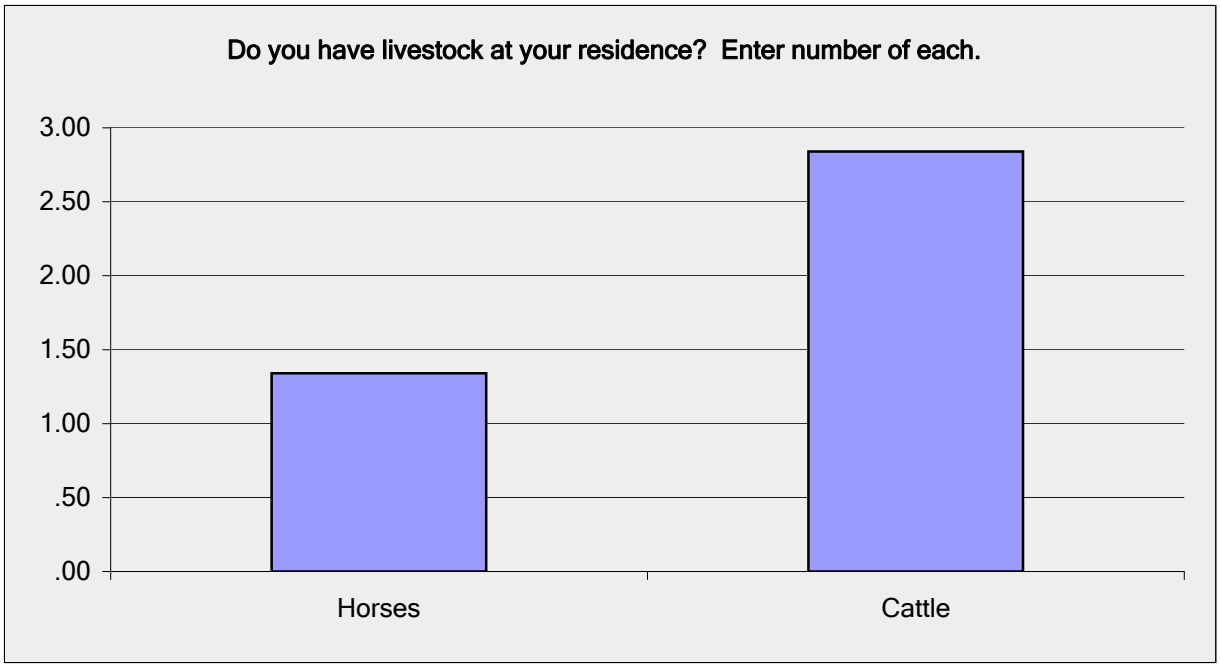


Regional Residential Water Use Survey:

Outdoor Water Use - Question 14

Do you have livestock at your residence? Enter number of each.

Answer Options	Response Average	Response Total	Response Count
Horses	1.34	369	276
Cattle	2.84	620	218
		answered question	291
		skipped question	985

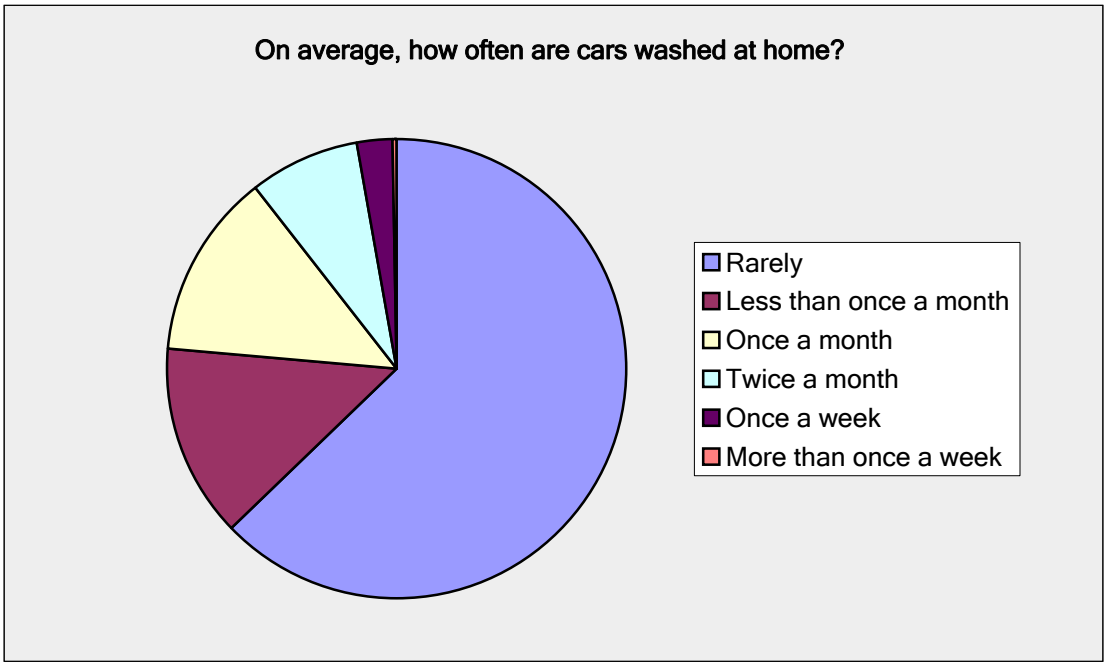


Regional Residential Water Use Survey:

Outdoor Water Use - Question 15

On average, how often are cars washed at home?

Answer Options	Response Percent	Response Count
Rarely	62.9%	759
Less than once a month	13.5%	163
Once a month	13.1%	158
Twice a month	7.6%	92
Once a week	2.7%	32
More than once a week	0.2%	3
	answered question	1207
	skipped question	69

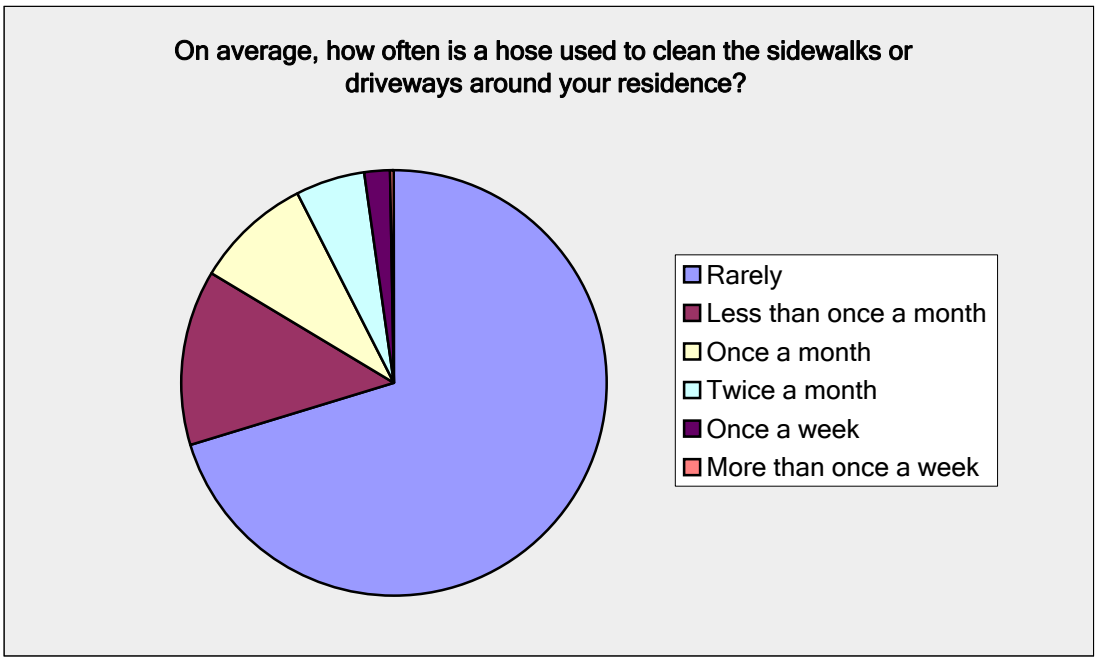


Regional Residential Water Use Survey:

Outdoor Water Use - Question 16

On average, how often is a hose used to clean the sidewalks or driveways around your residence?

Answer Options	Response Percent	Response Count
Rarely	70.3%	841
Less than once a month	13.4%	160
Once a month	8.9%	107
Twice a month	5.2%	62
Once a week	1.9%	23
More than once a week	0.3%	4
	answered question	1197
	skipped question	79

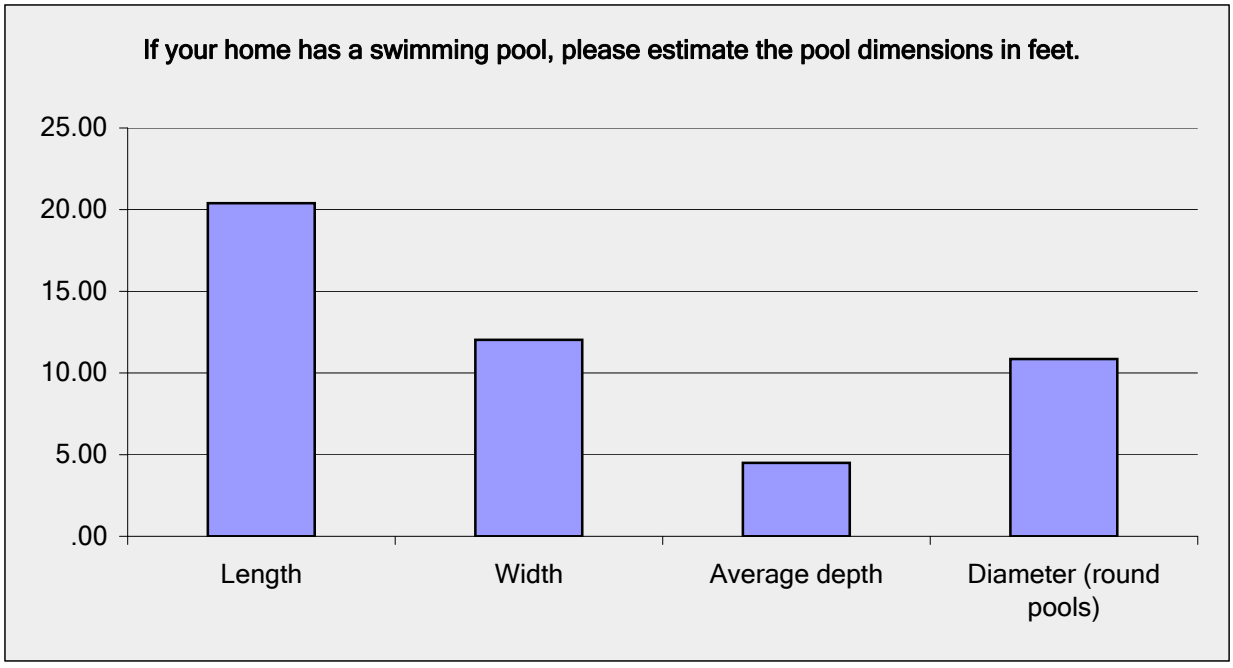


Regional Residential Water Use Survey:

Outdoor Water Use - Question 17

If your home has a swimming pool, please estimate the pool dimensions in feet.

Answer Options	Response Average	Response Total	Response Count
Length	20.40	2,366	116
Width	12.03	1,371	114
Average depth	4.50	621	138
Diameter (round pools)	10.85	738	68
		answered question	161
		skipped question	1115

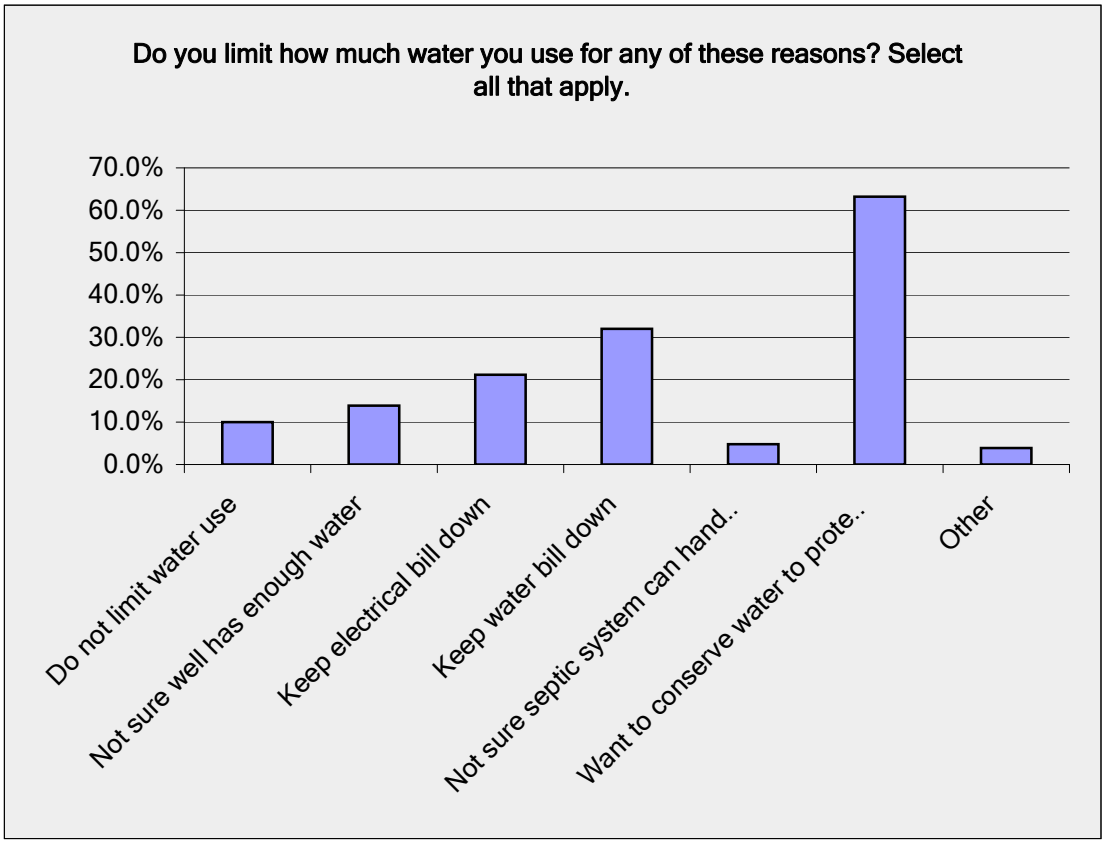


Regional Residential Water Use Survey:

Outdoor Water Use - Question 18

Do you limit how much water you use for any of these reasons? Select all that apply.

Answer Options	Response Percent	Response Count
Do not limit water use	10.0%	105
Not sure well has enough water	13.9%	145
Keep electrical bill down	21.2%	222
Keep water bill down	32.0%	335
Not sure septic system can handle all wastewater	4.8%	50
Want to conserve water to protect the resource	63.2%	661
Other	3.9%	41
Other (please specify)		55
answered question		1046
skipped question		230

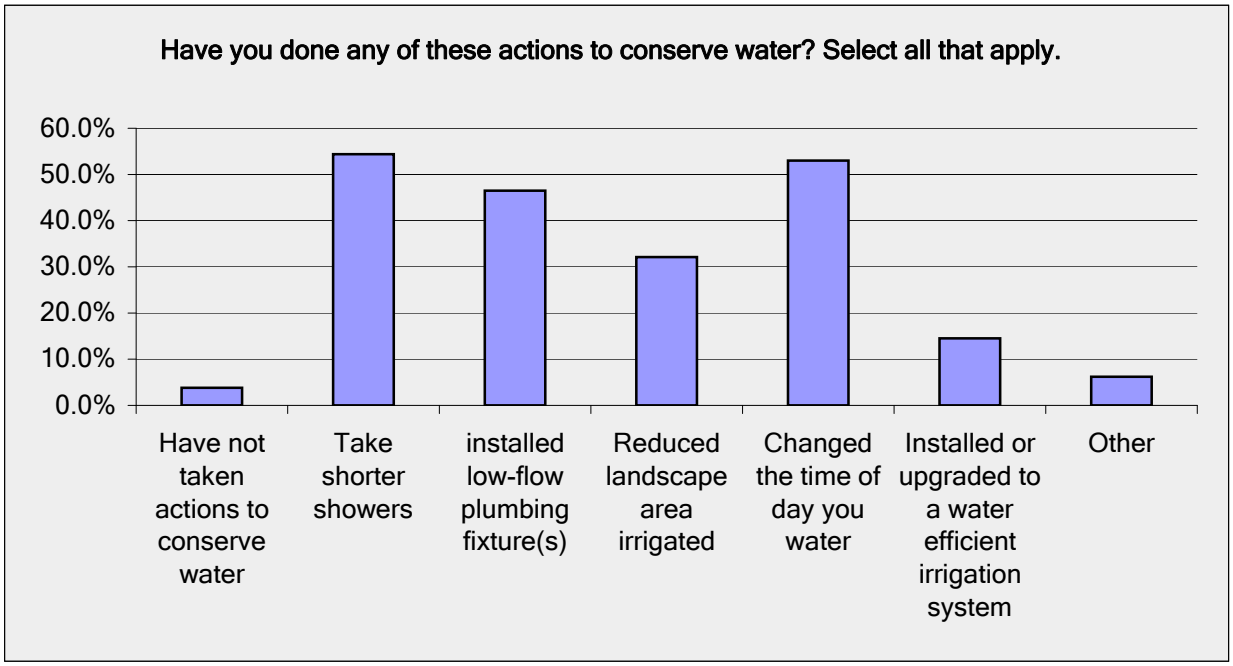


Regional Residential Water Use Survey:

Outdoor Water Use - Question 19

Have you done any of these actions to conserve water? Select all that apply.

Answer Options	Response Percent	Response Count
Have not taken actions to conserve water	3.8%	41
Take shorter showers	54.4%	580
installed low-flow plumbing fixture(s)	46.5%	496
Reduced landscape area irrigated	32.1%	343
Changed the time of day you water	53.0%	566
Installed or upgraded to a water efficient irrigation system	14.5%	155
Other	6.2%	66
Other (please specify)		95
answered question		1067
skipped question		209

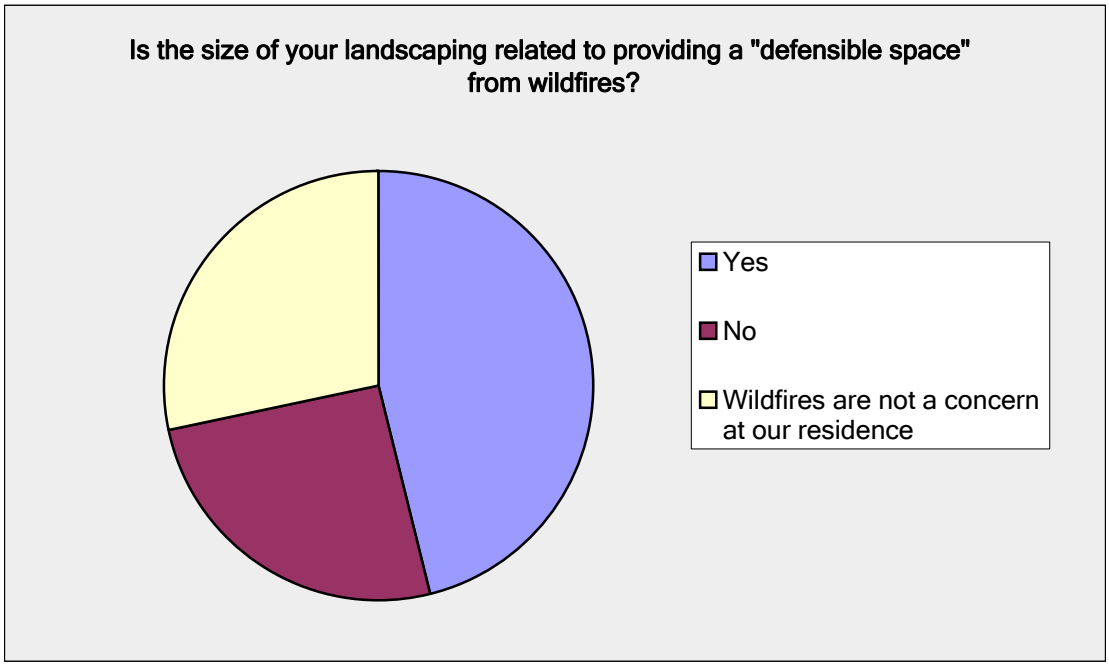


Regional Residential Water Use Survey:

Outdoor Water Use - Question 20

Is the size of your landscaping related to providing a "defensible space" from wildfires?

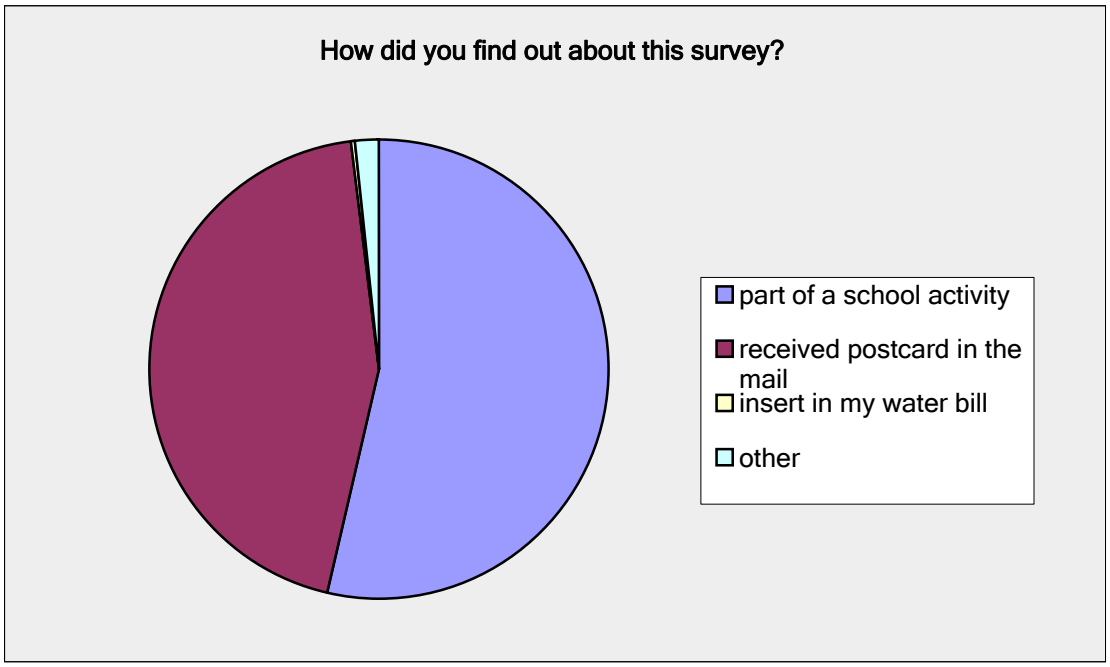
Answer Options	Response Percent	Response Count
Yes	46.0%	543
No	25.6%	302
Wildfires are not a concern at our residence	28.4%	335
	answered question	1180
	skipped question	96



Regional Residential Water Use Survey:
Outdoor Water Use - Question 21

How did you find out about this survey?

Answer Options	Response Percent	Response Count
part of a school activity	53.5%	509
received postcard in the mail	44.6%	425
insert in my water bill	0.3%	3
other	1.6%	15
Other (please specify)		16
answered question		952
skipped question		324



Appendix E
Identified Water Quality & Quantity Problems

Appendix E - Identified Water Quality and Quantity Problems

Problem ID	Problem Description
1	1. Very hard water; 2. In summer, sometimes water level is low
2	5 gpm in summer, rust
3	hard & with nitrates. Ran out of water seveeral times
4	High arsenic. Former dug well ran out of water in late summer.
5	high iron content and low flow
6	It failed quality test for drinking and quantity for watering garden and lawn. Purchase drinking water since well failed test at County Health Dept
7	Lack of water and contamination
8	Loaded with iron; sometimes runs low in late summer
9	Quality - Have to have an extensive filtration system for minerals; Quantity - Water must be managed or low pressure results.
10	Water pressure poor; color of water yellowish
11	a light brown tinted in a rainy spring
12	bacteria
13	Bacteria in Water
14	Brown Water
15	Clay (heavy)
16	Coliform bacteria
17	Coliform bacteria, sulphur smell, high iron content
18	coloform
19	Contamination
20	DID NOT PASS SPOKANE CO TESTING
21	disoloration in the spring, no problem with quantity
22	ground water contamination
23	hard water
24	hard water, high iron
25	heavy iron
26	heavy iron content
27	Hi iron
28	high in nitrates (farming/agriculture, wheat fields surround property); spring melt sometimes darkens water for very short while (few days)
29	High Iron
30	high iron content
31	High iron content, utilize filter
32	High iron levels. Filtering necessary so fixtures are not stained
33	High Iron makes drinking unpalatable we have to filter
34	high mineral...iron
35	High Nitrates (9-11 mg/l) in the 90's, most recently 5.5 mg/l
36	High Nitrite Level
37	Iron
38	Iron
39	iron
40	iron
41	Iron
42	iron
43	iron bacteria 2009
44	Iron in the water
45	iron in water
46	iron in water.
47	Lots of Iron
48	low water,especially in summer. Have tried to find another well sourse but there is none.

Problem ID	Problem Description
49	mineral deposits
50	mineral deposits
51	mineral deposits
52	Nitrate level 16.2 (MCL 10) Installed Reverse Osmosis Drinking Water Filtration System
53	Nitrates
54	nitrates
55	Nitrates
56	nitrates
57	nitrates & bacteria
58	nitrates/nitrites
59	Quality is dubious. We filter.
60	Rocket fuel in the water
61	Rust
62	Rust
63	sand
64	Sand and clay in water
65	Slightly elevated nitrate level
66	some contamination needing chlorox treatment
67	Some rust algea
68	to much iron
69	Water basic High iron
70	water is heavy with iron...requires filtration for household use.
71	Well at one time in 1991 had to be chlorinated.
72	1973 well went dry in 1989, new well drilled
73	AUG, SEPT-OCT, IF PUMP RUNS MORE THAN 15 MINUTES, IT STARTS PULLING AIR
74	Cloudy water and slow delivery when neighbor was watering heavily
75	Diminished flow in very dry years
76	Drop in water level required well to be drilled deeper.
77	First well went dry after 5 yrs new well is fine and was drilled in Aug of 2009
78	Flow is not adequate for needs, therefore we have water hauled in from time to time.
79	Former well went dry
80	Hard to sprinkle lawns garden at same time
81	I can over pump the well and it will reduce the quantity from 6gpm to less than 2gpm
82	July through September we sometimes have to haul water in. There are times we get less than 1 cup per minute.
83	Lack of water
84	lack of water during summer monthes
85	Lack of water in late summer
86	late summer can have quantity limits
87	Less than 2 gal. before fracturing
88	less water per minute
89	Low production - main water source is spring that feeds to cistern next to house
90	Low water
91	LOW WATER VOLUME
92	no water
93	no water
94	not enough water for lawns, garden and fruit trees
95	not enough water, low and no pressure, large sediment

Problem ID	Problem Description
96	Old well, drilled in 1976 @ 408 ', went dry
97	Poor percolation
98	quantity
99	Quantity
100	quantity- at the end of summer pressure goes down
101	Quantity due to new homes and wells nearby
102	quantity problems watering grass in summer. Quality after snow melt in holding tank (which has been resolved)
103	quantity, sometimes runs out
104	Quantity-outside water use is limited to 45 minutes at a time or water draws down below pump.
105	RAN WELL DRY
106	Recently had new well dug due to lack of water
107	Recovery rate
108	reduced flow requiring new well be drilled
109	Some iron, cannot run water for any length of time to water yard
110	Some times in late summer early fall we have a quantity problem when watering the garden and yard.
111	sometimes runs low.But nothing serious.We always have water
112	Summer and Fall Dry
113	The last five years we have went completely dry multiple times! Had to replace our pump twice because of no water. Lowered out pipe twice.
114	Unable to water a lawn for extended periods of approx greater than 8 hours during dry periods.
115	very slow refill - unable to run sprinkler system without running out of water - fine with 3000 gal holding tank we installed - house use only is fine has always been ok
116	Water level has dropped about 35 feet in the 20 years. Iron bacteria is in the water
117	water table goes lower each year, soon I will have to dig deeper for water
118	we are careful to not use too much so that we don't run out
119	We stop watering the yard durning dry periods
120	we used to water a lawn and would sometimes run out of water
121	Well gallonage fell from 13 to 4 gpm
122	well goes dry inspite of hydrofracturing x 3
123	Well ran dry had to dig new well
124	Well was pumped dry once.
125	well went dry in Dec. 2005
126	Colliform after submersible pump pulled; was treated; is ok now.
127	Filter at end of casing plugged up. Had to have raked to bring flow back up.
128	First well clogged with mud and had to re-drill a second one
129	Muddy Water
130	not sealed correctly by previous owner- tested and corrected
131	Our first well clogged with dirt. We had to re-drill at another location
132	Sediment
133	The pump wore out, needed to be replaced
134	When there was no seal cover on the well, a mouse fell in the well and contaminated the water