

City of Maple Valley

Follow-up Assessment of Citizen Understanding and Adoption of Targeted Stormwater Behaviors

January 15, 2016

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Research Goals and Objectives

Research Goal

According to the Phase II permit, section S5C1, the goal of the education program is to reduce or eliminate behaviors and practices that cause or contribute to adverse stormwater impacts. The minimum measures to achieve this include educational outreach to improve the target audience's understanding of the problem and what it can do to solve it. The Maple Valley residents are cited as the top priority target audience for education. Each permittee is required to measure the understanding and adoption of target behaviors of its citizens and to use measurement to direct the application of education and outreach resources in the most effective manner. Specifically, this research will reflect the changes to the NPDES Permit Requirements that was revised in 2013.

Objectives

Content areas for the research included:

- General impacts of stormwater flows into surface waters
- Knowledge of the benefit of previous surfaces
- Source control BMPs and environmental stewardship actions and opportunities in the areas of pet waste, vehicle maintenance, and landscaping
- BMPs for use and storage of automotive parts, hazardous cleaning supplies, carwash soaps and other hazardous materials
- Knowledge of what constitutes an illicit discharge and how to report it
- Yard care techniques relating to protecting stormwater quality and knowledge of what constitutes pollution
- BMPs for use and storage of pesticides and fertilizers
- BMPs for the disposal of carpet cleaning fluids
- BMPs for auto maintenance
- Determined the success of the adoption of SWMP's education and outreach program designed to reduce or eliminate behaviors and practices that cause or contribute to adverse stormwater impacts and encourage the public to participate in stewardship activities. These programs include the following:
 - The education and outreach program for the area served by the MS4. The program was designed to educate target audiences about the stormwater problem and provide specific actions to minimize the problem
- Determined the adoption and success of the programs meant to build general awareness. The target audience of the programs and the subject areas include the following:
 - The general public, including school age children and businesses
 - General impacts of stormwater on surface waters
 - Impacts from impervious surfaces
 - Impacts of illicit discharges and how to report them

- Low impact development (LID) principles and LIB BMPs
 - Opportunities to become involved in stewardship activities
- Determined the adoption and success of the programs designed to effect behavior change. The target audience of the programs and subject areas include the following:
 - The general public
 - Use and storage of automotive chemicals, hazardous cleaning supplies, carwash soaps, and other hazardous materials
 - Equipment maintenance
 - Prevention of illicit discharges
 - Residents, landscapers, and property managers/owners
 - Yard care techniques protective of water quality
 - Use and storage of pesticides and fertilizers and other household chemicals
 - Carpet cleaning and auto repair and maintenance
 - Vehicle, equipment and home/building maintenance
 - Pet waste management and disposal
 - Principles and LID BMPs
 - Stormwater facility maintenance
 - Dumpster and trash compactor maintenance
- Determined the adoption and success of each permittee creating stewardship opportunities and/or partnering with existing organizations to encourage residents to participate in activities such as stream teams, storm drain marking, volunteer monitoring, riparian plantings, and education activities.

Research Methodology

Sampling Frame

A list containing over 1,500 randomized telephone numbers of city residents was purchased from a commercial list company. The list company maintains a record of all telephone numbers appearing in all phone books in the United States. Using the zip codes covering the study area, the list company drew a random sample of phone numbers. High density areas have more phone numbers and, by randomly drawing from the list, the high and low density areas are properly proportioned. The resulting list for the city was loaded into Hebert Research’s CATI (Computer-Aided Telephone Interviewing) system which randomly selects phone numbers as required during the interviewing process. Phone numbers were called up to five times at different times during the day and evening. This helped to assure that the survey was administered to both those who are easy to reach and those who are more difficult to contact. Similar to the previous two research projects, Hebert Research sampled 103 residents of Maple Valley, which were weighted back to the 2010 U. S. Census data by age and gender.

The following table represents the sample sizes for years 2010 through 2012 and 2015.

Sample Totals	
Year	Sample Size
2010	106
2011	100
2012	100
2015	103

Questionnaire

The survey was created for administration to the general public within the city of Maple Valley. Research questions were developed by Hebert Research with input from the city. The survey consisted of 31 variables, 28 of them relating directly to knowledge about stormwater issues and practices respondents had adopted, which protect the quality of stormwater. The remaining three questions dealt with an overall assessment of surface water quality, where illicit discharges should be reported, and which of stewardship activities that Maple Valley residents have heard of or participated in within last year. There were 4 new questions added to the research of 2015. Of the 4 questions, three questions dealing with knowledge about low impact development practices, the remaining question dealing with stewardship activities measurement. Hebert Research completed all interviews using the same interactive voice (telephone) survey methodology that was utilized in the 2010, 2011 and 2012 assessment for Maple Valley.

Research Controls

Hebert Research applied a variety of controls to help ensure that the research and analysis reached the highest quality that can be provided. The primary research controls employed in this study included the following:

Interviewer Training

All interviewers participated in a special training session for this study. During this training session, the questionnaire was read and a discussion was held regarding the objectives of the study, screening questions, skip patterns, and techniques for handling potential problems. Interviewers raised questions and provided their professional feedback regarding potential interviewing issues.

Pre-test the Survey

After the questionnaire was programmed in our CATI system, it was rigorously tested to assure all questions were asked and that data was accurately recorded. Thirty surveys were conducted during the pretest. The programming was deemed to be valid.

Conduct Interviews

Following a successful pretest of the questionnaire, telephone interviews were conducted using Ci3 CATI software from Sawtooth Software, a recognized leader in computer-aided interviewing. Potential respondents were called on weekdays at various times throughout the afternoon and evening until 9:00 pm. An appointment and callback procedure was used when necessary to minimize refusals and allow respondents to complete the survey at a convenient time. Interviews were conducted in English.

Monitoring

Telephone interviews were regularly monitored by the data collection supervisor and were found to be properly conducted.

Internal Peer Review

Hebert Research uses an internal review process called “CERA” (create, edit, review, approve) which is similar to academic peer review to ensure that each study meets or exceeds rigorous quality control standards. Through this process, several analysts review the statistical findings and offer critical feedback designed to increase the utility of the research and produce a clear and insightful report.

Margin of Error, Incidence and Response Rates

A total of 103 surveys were completed by adults living within the zip codes of Maple Valley. At the 95% confidence level, the maximum margin of error for a sample size of 103 respondents is $\pm 9.6\%$. This margin of error means that if the survey was

repeated 100 times, the resulting percentages for each response for the city would be within $\pm 9.6\%$ (the margin of error) in 95 out of 100 cases for each question.

Over 1,500 phone numbers of residences in the city were included in the sampling frame. When a resident answered the phone and contact was made, we asked the respondent to participate in the survey. The *incidence rate* represents the percent of individuals we spoke to who were qualified to take the survey, meaning they spoke English and reported living within the city. The *response rate* represents the percent of qualified individuals we spoke to who agreed to participate and who completed an interview. Response rates above 50.0% are higher compared to other community-wide surveys and serve to increase confidence in the survey's validity and reliability. The incidence rates of the surveys were 68.2% in 2010, 76.6% in 2011, 73.6% in 2012 and 94.5% in 2015; the response rate changed from 56.5% in 2010, to 54.6% in 2011, to 53.9% in 2012 and to 45.25% in 2015.

Statistical Weighting

Statistical weighting is a technique that is commonly used in research to reduce sampling error. During the process of data collection, demographic data from the U.S. Census was obtained to identify population parameters for the survey. Sample demographics—specifically, gender—was compared with distributions in the population within each city. Using the same weighting methodology utilized for the survey of 2010, 2011 and 2012, the collected data was run through a statistical procedure and found that there is no significant difference between weighted and un-weighted data. Data in the report for 2015 uses the unweighted data.

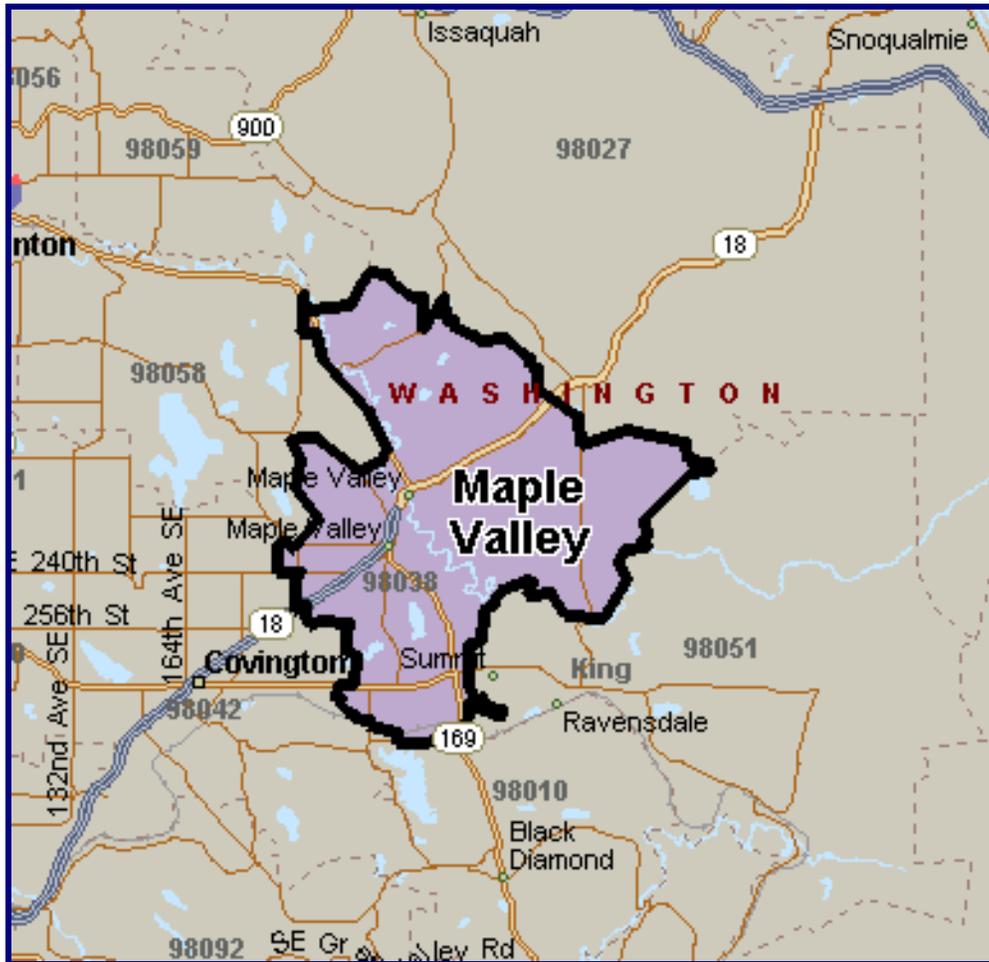
Use of Findings

Hebert Research has made every effort to produce the highest quality research product within the agreed specifications, budget and schedule. The customer understands that Hebert Research uses those statistical techniques, which, in its opinion, are the most accurate possible. However, inherent in any statistical process is a possibility of error, which must be taken into account in evaluating the results. Statistical research can reveal information regarding community perceptions only as of the time of the sampling, within the parameters of the project, and within the margin of error inherent in the techniques used.

Evaluations and interpretations of statistical research findings and decisions based on them are solely the responsibility of the customer and not Hebert Research. The conclusions, summaries and interpretations provided by Hebert Research are based strictly on the analysis of the data gathered, and are not to be construed as recommendations; therefore, Hebert Research neither warrants their viability nor assumes responsibility for the success or failure of any customer actions subsequently taken.

Geographical Map of Surveyed Area

The map below shows the geographic area covered by ZIP code 98038 for the City of Maple Valley. The survey was administered within the sampling fractal defined by the incorporated area city boundary of Maple Valley.



Explanation of Multivariate Analysis

The data for the research were analyzed using the chi square statistic to examine differences between respondents on a regional basis according to gender. Responses for the knowledge questions were first categorized as being either a correct response or an incorrect response. The incorrect response category was made up of wrong answers plus responses classified as “need more information,” “don’t know/refused,” and “not applicable.” Following classification, the chi square test was executed. For the questions dealing with the actions of the respondents, those who said the action did not apply to them were eliminated from the data set. Following their removal, the categories were classified as being “correct” or “incorrect” with the “incorrect” classification consisting of the collapsed categories as described above. The statistical test was run using these two categories.

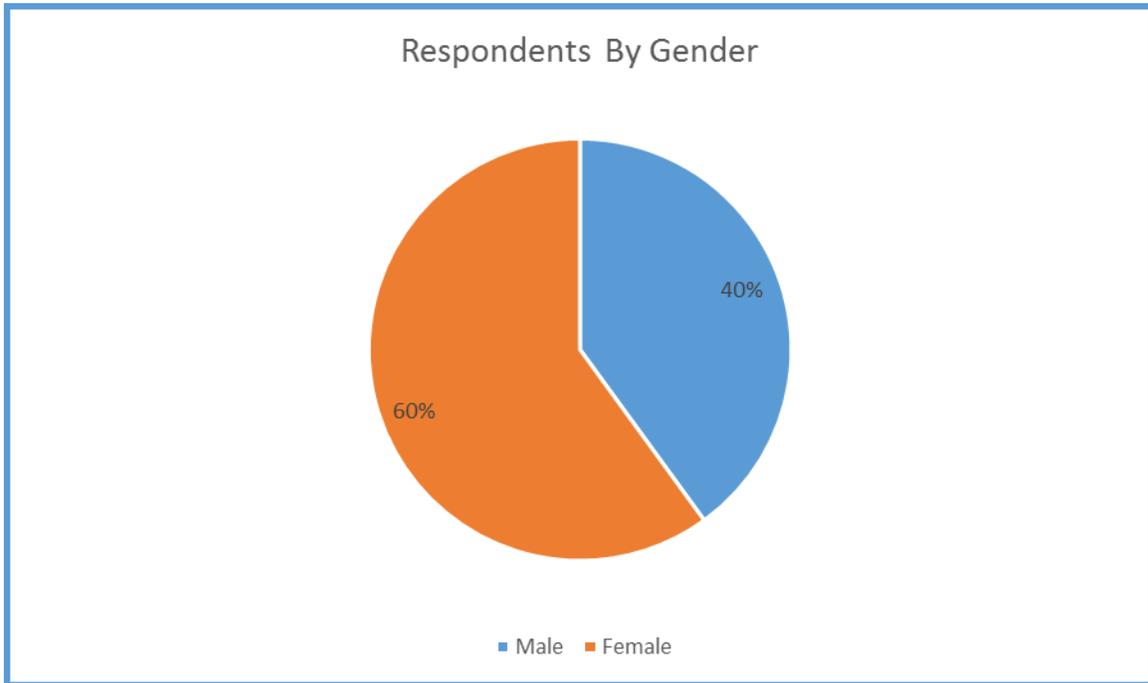
Hypotheses were tested using the 0.05 level of significance as the criterion value for the chi-square analysis. When differences between groups reached this value, the finding is reported along with its level of significance which is stated as a p-value (e.g., $p = 0.04$). Chi-square test results that reach the 0.05 level of significance indicate there is at least a 19-out-of-20 likelihood that the finding is true. This is a generally accepted level of reliability for public surveys. Findings of no significance are also reported to provide the basis for conclusions regarding the uniformity of opinion across the sample.

Cramér’s V is a statistical test that measures the degree of association between two categorical variables. For statistical tests that reach significance using chi-square, Cramér’s V values are provided to describe the strength of the association between the variables. This measurement ranges between 0.0 and 1.0. The higher the level of association, the greater is the probability that the independent variable is causing an effect on the dependent variable. A measurement of 0 indicates there is no association between the two, meaning it is likely the independent variable has no systematic effect on the dependent variable. A measurement of 1.0 indicates that variations in the independent variable completely match variations in the dependent variable.

Multivariate analyses were performed only between 2015 and 2012 data. Multivariate analysis consisted of Analysis of Variance (ANOVA) and Chi-Square Analysis. The 2010 data was included to provide a benchmark for the subsequent years; Priority classifications were based off the 2010 results for comparison (i.e. the questions involved in each Priority issue were kept the same each year, regardless if the questions may have shifted to another Priority classification).

Respondent Profile

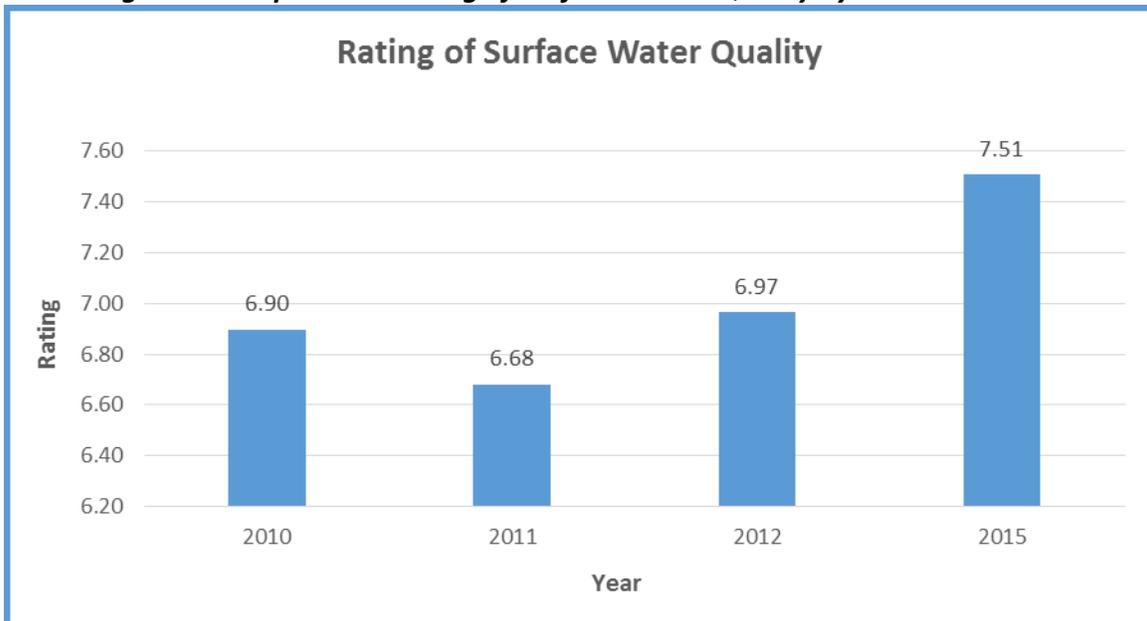
The following chart describes the demographic profile of the sample for Maple Valley by gender. As indicated in the methodology section, there is no significant difference between weighted and un-weighted sample by gender at the 95% confidence level. The percentages listed below are the un-weighted sample frequencies for gender.



Assessment of Water Quality in the Environment

Respondents rated the quality of water in Maple valley’s rivers, wetlands, and lakes on a 0-10 numeric scale where 0 meant “extremely polluted” and 10 meant “extremely clean.” The average rating for surface water quality was significantly higher in 2015 than in the previous three years. The rating increased from 6.97 in 2012 to 7.51 in 2015. This increase was statistically significant ($p = .001$).

Figure 1. Respondent Rating of Surface Water Quality by Year

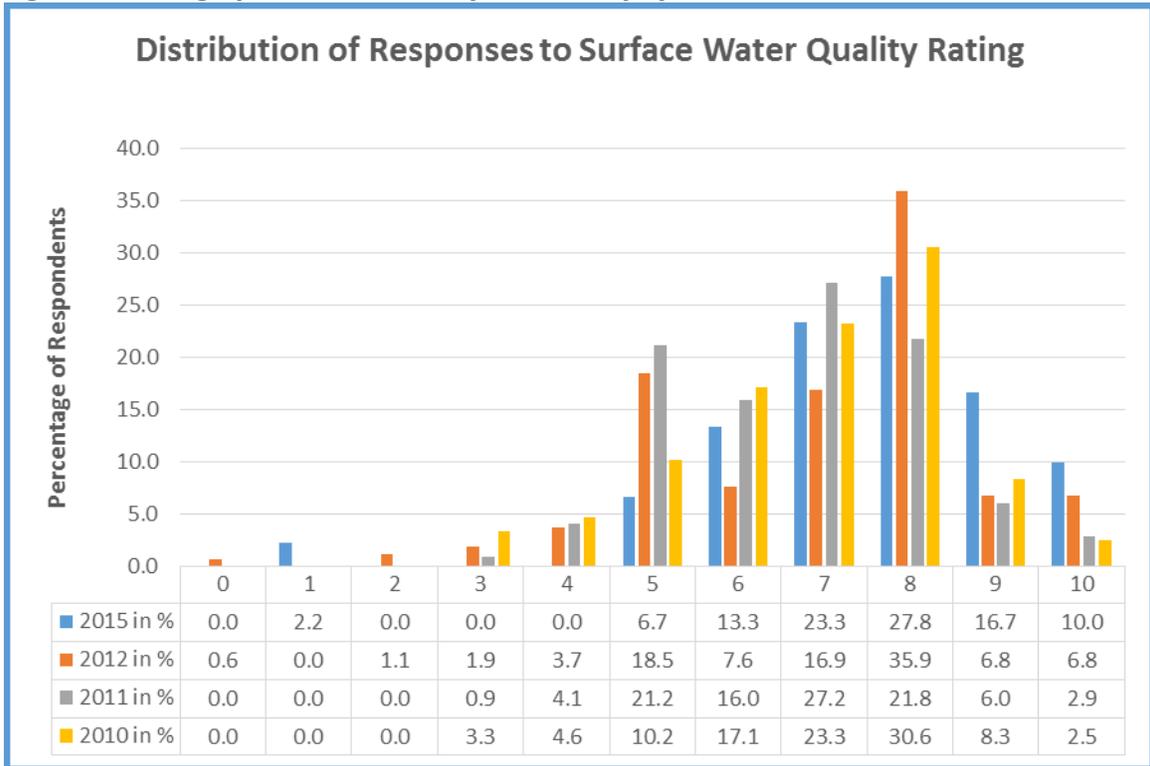


Sample Standard Deviation (S) = 1.552 in 2010; S = 1.469 in 2011; S = 1.882 in 2012; S = 1.678 in 2015

Figure 2 shows the distribution of respondent ratings for 2015, 2012, 2011, and for the 2010 benchmark at each point along the rating scale.

Over three-quarters of the respondents (77.8%) reported a surface water quality level of 7 or higher. This is an 11.35% increase in number of respondents responding with 7 or greater from 2012. The number of respondents giving a low surface water quality ratings (ratings 0-3) decreased from 3.6% in 2012 to 2.2% in 2015.

Figure 2: Rating by General Public of the Quality of Water in the Environment



Opportunities for Expansion and Focus of Education Programs

The two main purposes of this survey were to assess changes in the public’s stormwater knowledge and related behavior from 2010, 2011 and 2012 to 2015. These comparisons are needed because of the city’s educational program and to develop priorities for future stormwater public education and outreach.

As in the baseline study, the results are organized by the percent of the respondents who provided a correct answer for the current survey—the lower the percent of correct answers given by the sample, the higher the priority for education:

- Priority 1 Issues: Less than 50% correct answers
- Priority 2 Issues: From 50 to 80% correct answers
- Priority 3 Issues: Over 80% correct answers

In administering the questionnaire, respondents were presented with statements that were either true or false and were asked if they agreed or disagreed with the statement. Each of the statements in the tables appearing below include a letter indicating the correct answer for that statement, an A for “Agree” and a D for “Disagree.” When the word “Adopt” appears, it means the statement deals with whether respondents have “adopted” the desirable behavior mentioned in the statement. The combination of “A Adopt,” then, means the question deals with behavior and the desired response is A for “Agree.” This response equates to the respondent saying that he or she engages in the desired behavior mentioned in the statement.

Priority 1 Issues

Priority 1 issues represent areas of knowledge and behavior where less than half of the respondents provided the correct or desired response. Table 1 shows the percent of correct answers for Priority 1 issues in 2010, 2011, 2012 and 2015.

Table 1: Priority 1 Issues

Priority 1 Issues (based on 2010 results)				
Questions	% Correct			
	2015	2012	2011	2010
Drains on city streets for stormwater are connected to the same sanitary or sewage system for waste. D	36.89%	37.00%	51.00%	48.10%
Pollution in our rivers, wetlands and lakes is more the result of industrial dumping practices than individual human activity. D	31.07%	33.00%	53.00%	44.30%
The runoff from washing a car with biodegradable soap is safe in stormwater drains. D	32.35%	22.00%	28.00%	22.60%
When I wash a motor vehicle at home, the soapy water ends up in a ditch or on the street. D Adopt	33.33%	47.70%	34.90%	19.40%
Grass clippings and leaves are not regarded as harmful in stormwater. D	50.98%	46.00%	50.00%	46.20%
Sediment or dirt in stormwater is natural and not regarded as pollution. D	36.27%	39.00%	44.00%	32.10%
Bricks or pavers offer no advantage for reducing runoff over concrete or asphalt pavement. D	40.20%	45.00%	40.00%	38.70%
Green rooftops reduce the amount of stormwater runoff. A	46.08%	N/A	N/A	N/A
Impervious surfaces and streets are better for managing runoff than porous ones. D	46.53%	N/A	N/A	N/A

**Yellow Highlights indicate a question dealing with behavior; how the respondent acts in that situation. Percents apply only to respondents who said the question applied to them. All "Does not apply" responses were combined with the "Don't Know" response category for the knowledge questions since all of the knowledge questions apply to everyone.*

The question where the public showed a statistically significant difference between the benchmark year 2012 and 2015 was:

- When I wash a motor vehicle at home, the soapy water ends up in a ditch or on the street. The percent of correct responses decreased from 47.70% in 2012 to 33.33% in 2015. (p-value = 0.04, Cramers'v = 0.157)

Related Multivariate Analysis Findings

Differences by Gender

There were statistically significant differences in responses to one Priority I issue when analyzed by Gender:

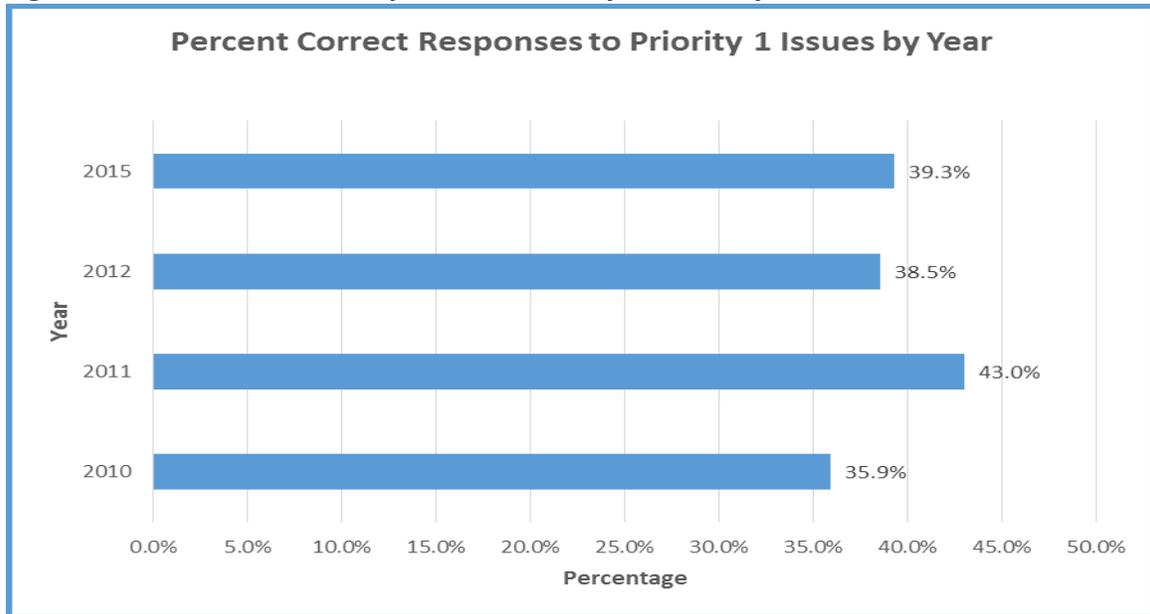
Males were more likely to disagree with the statement “Bricks or pavers offer no advantage for reducing runoff over concrete or asphalt pavement.”(p-value = 0.045, Cramer's V = .283)

Bricks or pavers offer no advantage for reducing runoff over concrete or asphalt pavement						
Gender	Agree	Disagree	Need more information	Uncertain, Don't Know	Refused	Doesn't Apply
Male	35.0%	45.0%	12.5%	7.5%	0.0%	0.0%
Female	38.3%	38.3%	1.7%	21.7%	0.0%	0.0%

Topics for Public Education: Priority 1

The overall percentage of respondents who answered correctly for the 2010 Priority I issues was calculated for the 2010, 2011, 2012 and 2015 surveys. The overall percent in 2010 of 35.9% increased to 43% in 2011, decreased down to 38.5% in 2012 and slightly increased to 39.3%. The overall percentage of correct responses in 2012 was not significantly different from the overall percentage for the same issues in 2015.

Figure 3: Percent Correct Responses to Priority 1 Issues by Year



Knowledge of how rivers, wetlands, lakes and the marine waters of Puget Sound become polluted by stormwater is an essential precursor to improving understanding, raising the desire to act responsibly, and bringing about behavioral change. Priority 1 educational programming and marketing campaigns should convey the following messages:

- *The water in stormwater drains is not connected to the sanitary sewer system nor is all stormwater treated to remove pollutants before being released into the environment. Therefore, the quality of stormwater going into the drainage system is what determines the level of pollution in surface water.*
- *The primary cause of pollution in stormwater runoff is individual human activity, not industrial dumping. Success in reducing environmental pollution depends upon everyone's participation in helping to make a difference.*
- *Biodegradable soap is not a safe addition to stormwater drains and should be kept from entering the stormwater drainage system.*
- *To best protect the environment, soapy water from washing a motor vehicle is best handled by allowing it to be absorbed by a lawn or the ground. It should not be allowed to flow into the street or into a drainage ditch.*
- *Sediment and dirt are pollution and should be prevented from entering the stormwater drainage system.*

- *Bricks or pavers help to reduce the volume of stormwater runoff and, therefore, help to reduce stormwater pollution in the environment.*
- *Green rooftops help to reduce the volume of stormwater runoff and, therefore help to reduce stormwater pollution in the environment.*
- *Impervious surfaces and streets are better for managing runoff than porous ones. Impervious surfaces are significant contributors to pollution in stormwater runoff. Hence, it is important to keep impervious surfaces clean using acceptable cleaning techniques and, where possible, use pervious surfaces.*

Priority 2 Issues

Priority 2 issues represent areas of knowledge and behavior where 50% to 80% of the respondents provided the correct response. Table 2 shows the percent of correct answers for Priority 2 issues in 2010, 2011, 2012 and 2015.

Table 2: Priority 2 Issues

Priority 2 Issues (based on 2010 results)				
Questions	% Correct			
	2015	2012	2011	2010
Non-Point stormwater runoff is the leading cause of pollution in rivers, wetlands and lakes. A	51.46%	56.00%	66.00%	56.60%
All water going into stormwater drains on the street is treated before being discharged into the surface and ground water. D	51.96%	60.00%	64.00%	59.40%
Impervious surfaces such as roads and driveways are not significant sources of pollution to stormwater. D	71.29%	71.00%	81.00%	67.00%
Scrubbing oil and grease spots on outdoor concrete or asphalt with soap and hosing it off is a good way to prevent polluting stormwater runoff. D	63.73%	59.00%	69.00%	78.30%
Washing a vehicle at a commercial car wash causes less pollution than washing a vehicle on the street using a biodegradable soap. A	60.78%	54.00%	60.00%	54.70%
The best place to dispose of water from cleaning a Latex paint brush is in a sink inside, not outdoors. A	57.84%	62.00%	65.00%	68.90%
Chemical treatments to kill moss on roofs pose little risk for polluting stormwater. D	70.59%	61.00%	74.00%	63.20%
The downspouts at my house convey the water to an area where it is absorbed by the ground. A Adopt	74.49%	83.00%	85.70%	77.40%
Using a mulching lawnmower reduces the need to fertilize a lawn. A	77.45%	73.00%	81.00%	73.60%
Carpet shampoo wastewater can be safely added to a stormwater drain. D	66.34%	56.00%	68.00%	76.40%
An <i>illicit or unlawful stormwater discharge</i> is primarily defined as anything that enters a storm drain system that is not made up entirely of stormwater. A	66.34%	54.00%	68.00%	62.30%
All automotive chemicals and cleaning supplies, can be stored and disposed of in the same manner	76.47%	N/A	N/A	N/A

*Yellow Highlights indicate a question dealing with behavior; how the respondent acts in that situation. Percents apply only to respondents who said the question applied to them. All "Does not apply" responses were combined with the "Don't Know" response category for the knowledge questions since all of the knowledge questions apply to everyone.

The questions where the public showed a statistically significant difference in knowledge between the benchmark year 2012 and 2015 were:

- Scrubbing oil and grease spots on outdoor concrete or asphalt with soap and hosing it off is a good way to prevent polluting stormwater runoff. The percent of correct responses increased from 59% in 2012 to 63.73% in 2015. (p-value < 0.0001, Cramer’s V = 0.58)
- Carpet shampoo wastewater can be safely added to a stormwater drain. The percent of correct responses increased from 56% in 2012 to 66.34% in 2015. (p-value = 0.009, Cramer’s V = 0.185)

Related Multivariate Analysis Findings

Differences by Gender

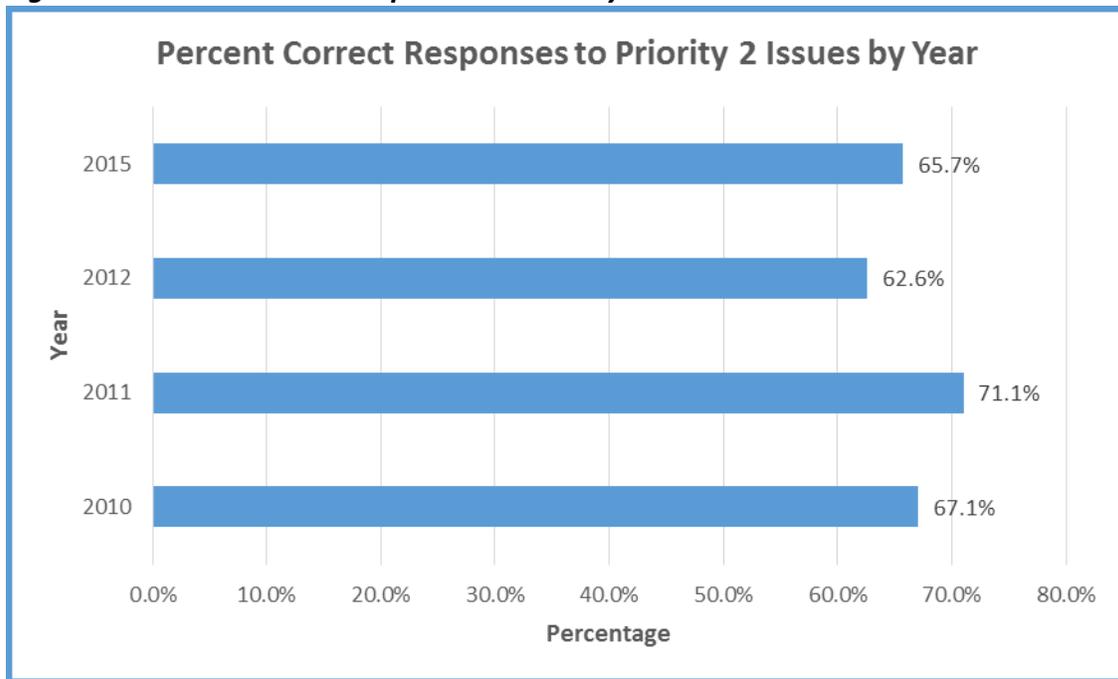
Males were more likely to agree with the statement “Using a mulching lawnmower reduces the need to fertilize a lawn.” (p-value = 0.04, Cramer’s V = 0.317)

Using a mulching lawnmower reduces the need to fertilize a lawn						
Gender	Agree	Disagree	Need more information	Uncertain, Don’t Know	Refused	Doesn’t Apply
Male	85.0%	10.0%	0.0%	0.0%	0.0%	5.0%
Female	75.0%	8.3%	5.0%	11.7%	0.0%	0.0%

Topics for Public Education: Priority 2

The average percentage of respondents who answered correctly for the 2010 Priority 2 issues was calculated for the 2011, 2012 and 2015 surveys. The overall percent in 2010 of 67.1% increased to 71.1% in 2011, decreased to 62.6% in 2012 and increased to 65.7% in 2015. The increase in overall correct responses from 2012 to 2015 was statistically significant (p-value = 0.003).

Figure 4: Percent Correct Responses to Priority 2 Issues



While more than half of the public responded correctly to these issues represents a desirable level of public knowledge, the goal remains to achieve a fully informed public. Consequently, Priority 2 issues continue to represent real opportunities for further public education and social marketing. Future educational and marketing campaigns addressing Priority 2 issues should contain the following messages:

- *Stormwater runoff is the leading cause of pollution in rivers, wetlands and lakes.*
- *All water going into stormwater drains is not treated before being discharged into the environment.*
- *Impervious surfaces, such as roads and driveways, are a significant source of stormwater pollution.*
- *Proper methods for cleaning up oil and grease spills, such as using kitty litter and paper towels.*
- *Grass clippings and leaves in stormwater are regarded as pollution and should be kept out of the stormwater drainage system.*
- *Vehicles should be washed at commercial facilities, not at homes where runoff is allowed to drain into the streets.*

- *The best place to clean paint brushes is in a sink that drains into the sanitary sewer system, not outdoors.*
- *The residue from chemical treatments that kill moss is a source of pollution.*
- *Fix house downspouts to dispense the water to an area where it can be absorbed by the ground.*
- *A mulching lawnmower reduces the need for using fertilizer and, hence, represents a valuable method for eliminating fertilizer pollution in stormwater.*
- *Proper disposal of used cleaning supplies, including carpet shampoo.*
- *An illicit or illegal discharge is anything that enters a storm drain system that is not made up entirely of stormwater.*
- *All automotive chemicals and cleaning supplies, should be stored and disposed of in the different manner*

Priority 3 Issues

Priority 3 issues represent areas of knowledge or behavior where more than 80% of the respondents provided the correct response. Table 3 shows the percentage of correct answers for Priority 3 issues in 2010, 2011, 2012 and 2015.

Table 3: Priority 3 Issues

Priority 3 Issues (based on 2010 results)				
Questions	% Correct			
	2015	2012	2011	2010
All of my family's vehicle parts with oil or grease on them are kept away from the weather. A Adopt	82.28%	83.70%	87.90%	81.70%
The best way to clean up spilled oil on the driveway is to fully absorb it using kitty litter or paper towels and deposit this waste in a garbage can. A	77.23%	86.00%	79.00%	83.00%
My household recycles all used motor oil. A Adopt	92.00%	87.00%	90.90%	84.80%
My family stores all containers holding oil or antifreeze under a roof or cover. A Adopt	94.44%	97.80%	93.50%	95.50%
My household stores all yard fertilizers and pesticides inside a building or in a covered area out of the rain. A Adopt	94.57%	97.90%	100.00%	99.00%
I'm careful not to exceed the recommended amount of insecticide or weed killer than the directions say to use. A Adopt	91.95%	91.40%	93.40%	90.30%
I'm careful not to exceed the recommended amount of fertilizer than the directions say to use. A Adopt	89.16%	93.70%	88.60%	89.10%

**Yellow Highlights indicate a question dealing with behavior; how the respondent acts in that situation. Percents apply only to respondents who said the question applied to them. All "Does not apply" responses were combined with the "Don't Know" response category for the knowledge questions since all of the knowledge questions apply to everyone.*

The questions where the public showed a statistically significant difference in knowledge between the benchmark year 2012 and 2015 were:

- All of my family's vehicle parts with oil or grease on them are kept away from the weather. The percent of correct responses slightly decreased from 83.7% in 2012 to 82.28% in 2015 (p-value < 0.0001, Cramer's V = 0.667).
- The best way to clean up spilled oil on the driveway is to fully absorb it using kitty litter or paper towels and deposit this waste in a garbage can. The percent

of correct responses decreased from 86% in 2012 to 77.23% in 2015 (p-value = 0.002, Cramer's V = 0.215)

Related Multivariate Analysis Findings

Differences by Gender

Males were more likely to agree with the statement “I’m careful not to exceed the recommended amount of insecticide or weed killer than the directions say to use.” Which is the correct answer (p-value = 0.001, Cramer’s V = 0.395)

I’m careful not to exceed the recommended amount of insecticide or weed killer than the directions say to use						
Gender	Agree	Disagree	Need more information	Uncertain, Don’t Know	Refused	Doesn’t Apply
Male	97.5%	0.0%	2.5%	0.0%	0.0%	0.0%
Female	66.7%	6.7%	1.7%	0.0%	0.0%	25.0%

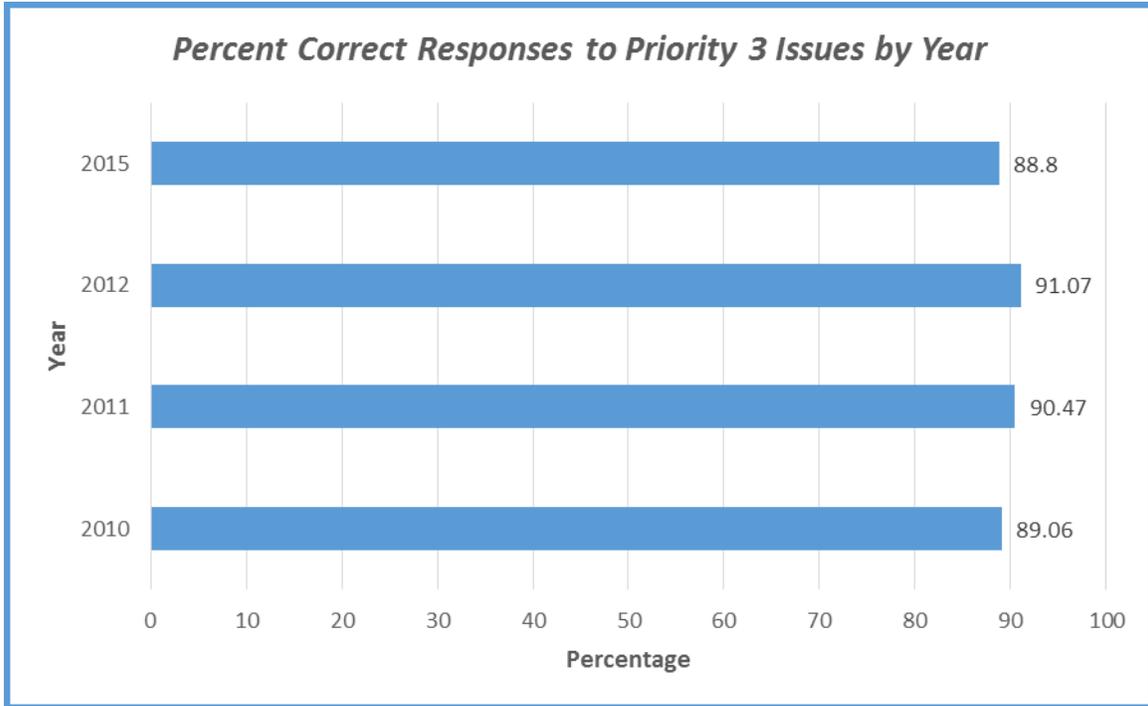
Males were more likely to agree with the statement “I’m careful not to exceed the recommended amount of fertilizer than the directions say to use.” Which is the correct answer (p-value = 0.001, Cramer’s V = 0.368)

I’m careful not to exceed the recommended amount of fertilizer than the directions say to use.						
Gender	Agree	Disagree	Need more information	Uncertain, Don’t Know	Refused	Doesn’t Apply
Male	85.0%	12.5%	0.0%	0.0%	0.0%	2.5%
Female	66.7%	3.3%	0.0%	0.0%	0.0%	30.0%

Topics for Public Education: Priority 3

The average percentage of respondents who answered correctly for the 2010 Priority 3 issues was calculated for the 2011, 2012 and 2015 surveys. The overall percent in 2010 of 89.06% increased to 90.47% in 2011, increased to 91.07% in 2012 and decreased to 88.8% in 2015. The overall percentage of correct responses in 2012 was statistically significant from the overall percentage for the same issues in 2015.

Figure 5: Percent Correct Responses to Priority 3 Issues



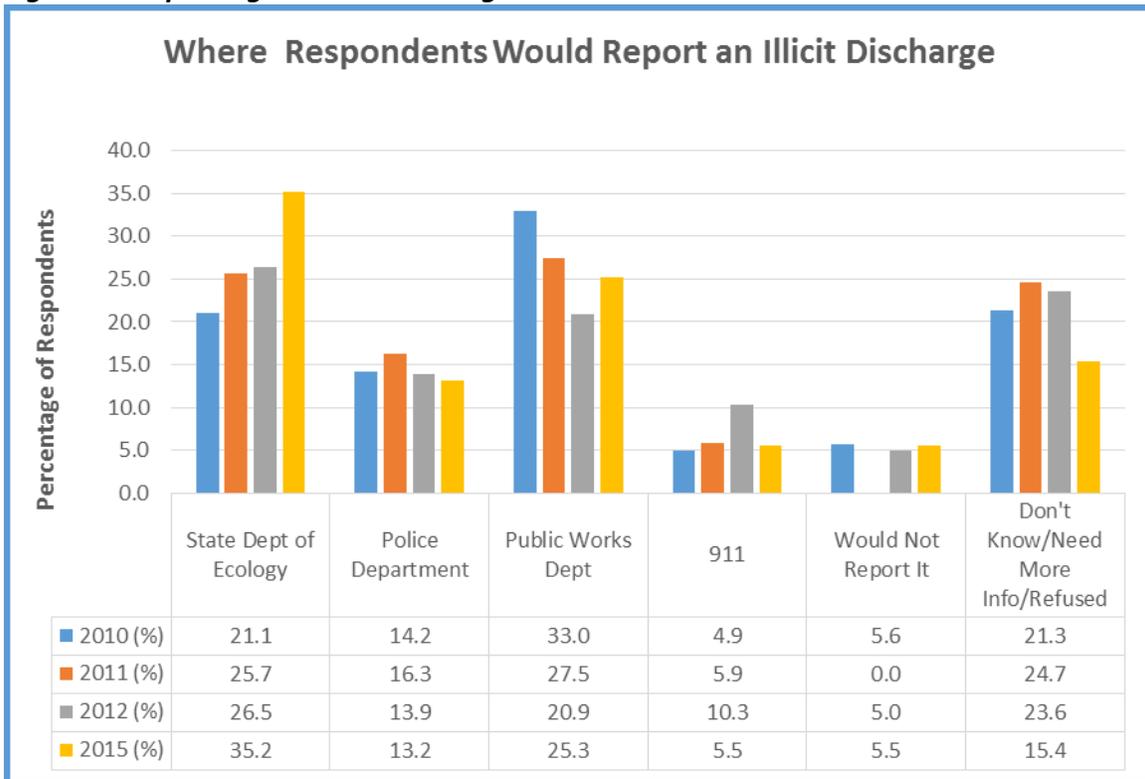
The relatively high percent of respondents who gave the correct responses in this category suggests that high behavioral compliance continues to take place. At minimum, it can be said that respondents knew the right thing to do and answered accordingly. To maintain and increase positive behaviors, it remains advisable to continue educating the public on these issues. Because of the already high level of knowledge/compliance for Priority 3 issues, the degree of emphasis on these issues may be lower compared to Priority 1 and Priority 2 issues. If Priority 3 issues are addressed during educational and marketing campaigns, the following messages should be included:

- *Store auto or truck parts with oil or grease on them under a roof or cover, store containers holding oil or antifreeze under a roof or cover.*
- *Apply fertilizer, insecticides or weed killer at recommended rates*
- *Recycle all used motor oil.*
- *Store all yard fertilizers and pesticides inside a building or in a covered area out of the rain.*

Reporting an Illicit Discharge

Respondents were asked the following question: “If you witnessed someone pouring a gallon of used paint thinner into a stormwater drain, which agency would you call first to report it?” A variety of options were given as choices. Only 25.3% of residents chose the correct choice, calling their City Public Works Department. This finding represents a 4.4% increase from the 20.9% of Maple Valley respondents who said they would contact the Public Works Department in 2012, and a 7.7 decrease from the 33.0% correct responses in 2010. Furthermore, 5.5% of respondents in 2015 would incorrectly report to 911 if they witnessed an illicit discharge. That is a 4.8% decrease from the 10.3% of incorrect responses in 2012 and a .6% increase from the 4.9% in 2010. About 15.4% of the public remains unaware of the proper agency to call to report an illicit discharge. That is a 8.2% decrease from the 23.6% in 2012.

Figure 6: Reporting an Illicit Discharge



There was no statistically significant differences in the responses between 2012 and 2015

Related Multivariate Analysis Findings

Differences by Gender

Females were more likely to report to the right department which is City Public Works Department when asking “If you witnessed someone pouring a gallon of used paint thinner into a stormwater drain, which agency would you call first to report it.” (p-value = 0.022, Cramer’s V = 0.383)

If you witnessed someone pouring a gallon of used paint thinner into a stormwater drain, which agency would you call first to report it						
Gender	WA Department of Ecology	Police Department	Public Works Department	911	Need More Information	I would not report it
Male	44.1%	23.5%	14.7%	0.0%	8.8%	8.8%
Female	30.4%	7.1%	30.4%	8.9%	19.6%	3.6%

Stewardship Activities

Respondents were asked the following question: “Which of the following stewardship activities have you heard of within the last year?” the result is summarized in the following table below. About half (48.04%) of respondents reported that they have not heard of or participated in any stewardship activities. Of those who reported “heard of or participated in stewardship activities of the city within the last year,” 37.25 % of respondents reported they have heard of or participated in “Scoop the Poop” while 26.47% reported they have heard of or participated in “Puget Sound Starts Here”. Only 18.63% of those reported that they have heard of or participated in “Don’t Drip and Drive: Fix that Leak!”

“Which of the following stewardship activities have you heard of within the last year?”	
Haven't Heard of Any	48.04%
Scoop the Poop	37.25%
Don't Drip and Drive: Fix that leak!	18.63%
Puget Sound Starts Here	26.47%

Research Findings

- 1) The public perception in Maple Valley is that the surface water is relatively clean and absent from pollutants. Although the lowest rating was given in 2011 at 6.68, the ratings have been generally high. With the highest average rating thus far of 7.51 in 2015, respondents are indicating that the perception of surface water quality will continue to increase, or at the least above average.

- 2) As compared to 2012, the 2015 data revealed changes in Priority classifications. In 2015, one statement changed from Priority I issues to Priority II issues. That is, responses to the statement in 2012 that were considered Priority I crossed the 50% correct threshold to settle among the Priority II issues. The following is the statement described above:
 - *Grass clippings and leaves are not regarded as harmful in stormwater.*

In regard to Priority trends, the 2015 results showed the overall average proportions in both Priority I and Priority II issues indicate increasing public knowledge on stormwater education as compared to that of 2012. This indicated that the city's current educational program, marketing campaigns and stewardship activities (as reported in the annual Stormwater Management Plan) have effectively addressed Priority I and Priority II issues by improving the public's knowledge and concern about their potential behavior for stormwater pollution, raising the desire to act responsibly and bringing about improper behavioral change.

For priority I issues, less than half of public responded correctly to these issues and only one out of nine issues changed from Priority I to Priority II as described above. There are still advanced rooms for the city to improve the public stormwater knowledge issues. In order to do so, the future educational program and marketing campaigns should increase the degree of emphasis on these issues to target audience by increasing both level of frequency and media coverage.

For the Priority II issues, while more than half of public responded correctly to these issues and no changes from Priority II to III issues occurred in 2015 research, with the goal remains to achieve a fully informed public and bring a behavioral change. Consequently, Priority II issues continue to represent real opportunities for further public education and social marketing.

Furthermore, the results showed two statements changed from Priority III issues in 2012 to Priority II issues in 2015. The two statements are given as below:

- *The downspouts at my house convey the water to an area where it is absorbed by the ground.*
- *The best way to clean up spilled oil on the driveway is to fully absorb it using kitty litter or paper towels and deposit this waste in a garbage can.*

In regard to Priority trends, the overall proportion in Priority III issues was a decrease from 91.07% in 2012 to 88.8% in 2015. This indicated that the current educational program and marketing campaigns are not effective enough to address the Priority III issues. The relatively high percent of respondents who gave the correct responses in this category suggests that high behavioral compliance continues to take place. In order to maintain and increase positive behaviors, it remains advisable to continue educating the public on these issues and maintain the properly degree of emphasis on these issues to make sure no changes from the Priority III issues to Priority I or II happen.

Lastly, of the three new questions added into the 2015 survey, two were classified into Priority I issues. The statements are given below:

- *Green rooftops reduce the amount of stormwater runoff*
- *Impervious surfaces and streets are better for managing runoff than porous ones*

While the remaining was classified into the Priority II issue as below:

- *All automotive chemicals and cleaning supplies, can be stored and disposed of in the same manner*

- 3) The public's knowledge in Maple Valley regarding which agency to report an illicit discharge may need more attention. In all four years, less than a third of respondents answered correctly. Although, the proportion that have answered correctly has declined in each subsequent year during 2010 – 2012 period. This year, the proportion that have answered correctly has increased. That indicated educational program, marketing campaigns and stewardship activities have proved their effectiveness in improving the public's knowledge regarding which agency to report an illicit discharge. However, as mentioned above the correct percentage is less than one third (25.3%) so there still is more room for the City of Maple Valley to improve the level of residents' knowledge regarding which agency to report an illicit discharge.
- 4) When asking "*If you witnessed someone pouring a gallon of used paint thinner into a stormwater drain, which agency would you call first to report it*", females (30.4%) were more likely to report to the right department which is City Public Works Department as compared to males (14.7%). Hence, the future educational program and marketing campaigns should focus more on male audience regarding to the issues.

5) When read the following statements, males were more likely to provide the correct answer as compared to female. In order to improve the overall knowledge regarding to these issues, the future educational program and marketing campaigns should target on female audiences.

- a) *“Bricks or pavers offer no advantage for reducing runoff over concrete or asphalt pavement.”*
- b) *“Using a mulching lawnmower reduces the need to fertilize a lawn.”*
- c) *“I’m careful not to exceed the recommended amount of insecticide or weed killer than the directions say to use.”*
- d) *“I’m careful not to exceed the recommended amount of fertilizer than the directions say to use.”*

Stormwater Community Survey Questionnaire

Hello, this is _____ from Hebert Research, on behalf of the City of Maple Valley. We are asking residents about important storm water issues and we would like to include your opinions. All your answers are strictly confidential and will not be connected to your name.

1. My first question is about the water in Maple Valley. I'd like you to rate your perception of the overall quality of the water in our rivers, wetlands and lakes. By "quality of water" I mean how absent it is from pollution. Rate it on a 0 to 10 scale where "0" means the water is "extremely polluted" and 10 means the water is "extremely clean." **[RECORD NUMBER]**

[READ]

I will be reading a number of statements regarding stormwater. The responses for each question are as follows:

1. Agree
2. Disagree
3. Need more information
4. Uncertain, Don't Know
5. Refused
6. Doesn't Apply

2. Drains on city streets for stormwater are connected to the same sanitary or sewage system for waste.

3. Non-Point stormwater runoff is the leading cause of pollution in rivers, wetlands and lakes.

4. Pollution in our rivers, wetlands and lakes is more the result of commercial discharge practices than individual human activity.

5. All water going into stormwater drains on the street is treated before being discharged into the surface and ground water.

[ROTATE Q6-Q33] [NOTE: These questions will be asked in a random order to prevent sequencing bias.]

6. Impervious surfaces such as roads and driveways are not significant sources of pollution to stormwater. .

7. The best way to clean up spilled oil on the driveway is to fully absorb it using kitty litter or paper towels and deposit this waste in a garbage can.

8. Scrubbing oil and grease spots on outdoor concrete or asphalt with soap and hosing it off is a good way to prevent polluting stormwater runoff.
9. All of my family's vehicle parts with oil or grease on them are kept away from the weather.
10. My household recycles all used motor oil.
11. My family stores all containers holding oil or antifreeze under a roof or cover.
12. The runoff from washing a car with biodegradable soap is safe in stormwater drains.
13. When I wash a motor vehicle at home, the soapy water ends up in a ditch or on the street.
14. Washing a vehicle at a commercial car wash causes less pollution than washing a vehicle on the street using a biodegradable soap.
15. The best place to dispose of water from cleaning a Latex paint brush is in a sink inside, not outdoors.
16. Grass clippings and leaves are not regarded as harmful in stormwater.
17. Chemical treatments to kill moss on roofs pose little risk for polluting stormwater.
18. Sediment or dirt in stormwater is natural and not regarded as pollution.
19. The downspouts at my home convey the water to an area where it is absorbed by the ground.
20. Using a mulching lawnmower reduces the need to fertilize a lawn.
21. My household stores all yard fertilizers and pesticides inside a building or in a covered area out of the rain.
22. I'm careful not to exceed the recommended amount of insecticide or weed killer than the directions say to use.
23. I'm careful not to exceed the recommended amount of fertilizer than the directions say to use.
24. Carpet shampoo wastewater can be safely added to a stormwater drain.

25. Bricks or pavers offer no advantage for reducing runoff over concrete or asphalt pavement.

26. An *illicit or unlawful stormwater discharge* is primarily defined as anything that enters a storm drain system that is not made up entirely of stormwater.

27. If you witnessed someone pouring a gallon of used paint thinner into a stormwater drain, which agency would you call first to report it: **[READ 1-5]**

1. The Washington Department of Ecology
2. The police department
3. The city Public Works Department
4. 911
5. Need more information
6. I would not report it
7. Don't Know
8. Refused

28. Which of the following stewardship activities have you heard of or participated in within the last year? **[Select all that apply]**

- Scoop the Poop
- Don't Drip and Drive: Fix that Leak!
- "Puget Sound Starts Here"

29. Green rooftops reduce the amount of stormwater runoff

30. Impervious surfaces and streets are better for managing runoff than porous ones

31. All automotive chemicals and cleaning supplies, can be stored and disposed of in the same manner

That concludes our survey. I want to thank you very much for your time and cooperation. You have been very helpful. Have a good day!

Thank them and ask if they would like to be included in the panel in the future

POSTCODE GENDER:

1. MALE
2. FEMALE

DATE: _____ Research

Assistant:
