

## Storm water Survey Report

**To:** Lorraine Joubert, Lisa Philo, Arianne Corrente, Marc Mainville  
**From:** Kate Venturini, Rob Swanson, Marion Gold  
**Date:** April 4, 2008  
**Re:** Storm Water Survey

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### Section 1 – Background / Introduction

The URI Outreach Center conducted a baseline awareness survey beginning in January and continuing through March of 2008 for the purposes of determining existing knowledge and attitudes related to stormwater among 18-65 year olds in Rhode Island. Using U.S. Census data, it was determined that there are 682, 719 males and females between the ages of 18 and 65 years in Rhode Island (total population of 18-65 year olds = (18 and over) – (65 and over)). The sample size chosen for the baseline statewide stormwater campaign survey was 384 people, which has a 95% confidence level and a confidence interval of 5. This was obtained from the formula:

$$\text{Sample size} = 0.25 (Z (\alpha/2) / E)^2$$

where Z is the value for a 95% confidence level, .25 is a conservative estimate for population proportion ( $p(1-p)$ ) and E is the margin of error. This formula is the most conservative approach for finding sample size when a sample proportion is unknown (Weiss 2005).

Four URI Outreach Center employees administered surveys in teams of two at four of the five Department of Motor Vehicle (DMV) offices (Middletown, Wakefield, Pawtucket, and West Warwick) around the state. Based on the sample size of 384 respondents, each surveyor was responsible for conducting approx. 38 surveys at each location.

Surveyors conducted intercept interviews, which are a convenience or non-random method of sampling. Surveyors randomly approached people at the DMV and handed out the surveys on the spot. Although this was a non-random method of sampling, we believe that the surveys adequately reflect the general statewide population in that the DMV is visited by all demographics. To avoid personal bias in selecting people to be surveyed, the surveyor stood in the same spot in line at the DMV and approached the next person in line once each survey was complete.

Four of the five counties in Rhode Island are represented within the survey data collected at the Pawtucket (Providence County), West Warwick (Kent County), Wakefield (Washington County), and Middletown (Newport County) DMV offices.

### Section 2 – Survey Objectives

- Establish a baseline understanding of RI residents' awareness of storm water issues to allow for evaluation of the effectiveness of the storm water communications campaign

- Assess existing attitudes and behaviors related to storm water runoff pollution and its affects on water quality in Rhode Island.
- Explore what preconceived notions there are, if any, around storm water runoff and Rhode Island water resources

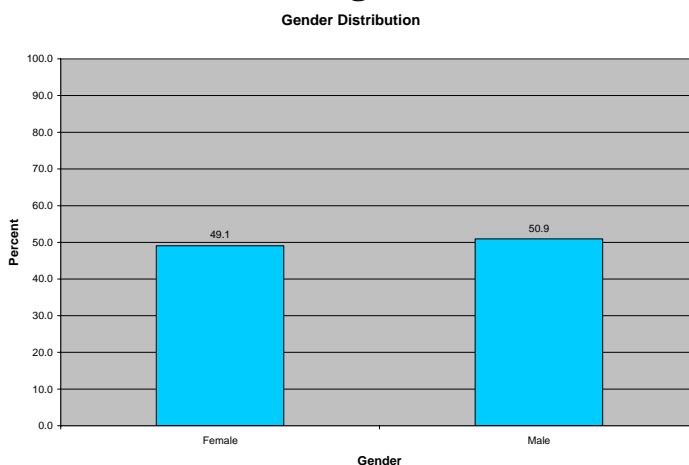
**Section 3 – Demographic Information**

**Table 1 – City and Town Distribution\***

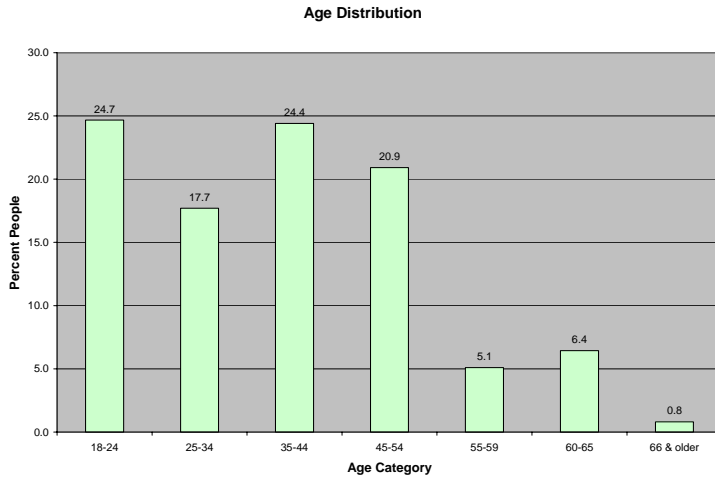
Town	Survey Representation	Town	Survey Representation
Providence	45	Foster	5
North Kingstown	32	North Scituate	5
Warwick	31	Barrington	4
Pawtucket	30	Central Falls	4
South Kingstown	24	Johnston	4
Cranston	17	Richmond	4
West Warwick	17	Tiverton	4
Middletown	14	Bristol	3
Newport	14	Glocester	3
East Providence	13	Situate	3
Portsmouth	12	Smithfield	3
East Greenwich	10	Warren	3
Narragansett	9	Burrillville	2
North Providence	9	Hopkinton	2
Little Compton	7	Lincoln	2
West Greenwich	7	Woonsocket	2
Exeter	6	Jamestown	1
Charlestown	5	North Smithfield	1
Cumberland	5	Westerly	1

Data collected is representative of all (5) Rhode Island counties and all (39) cities / towns with the exception of New Shoreham.

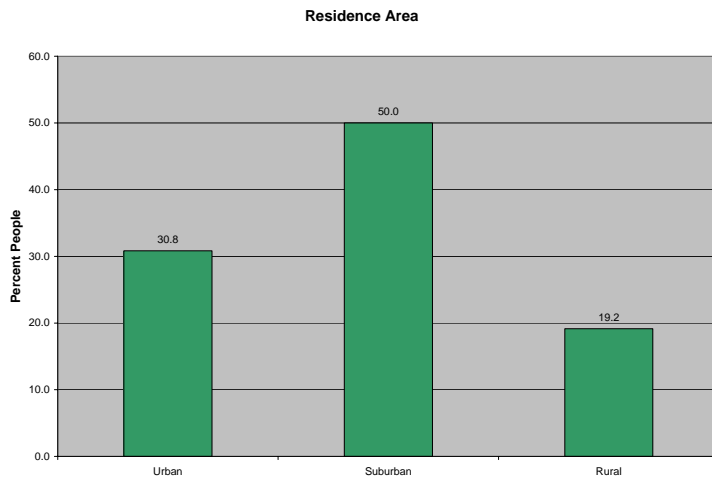
**Figure 1: Gender Distribution [N=373]**



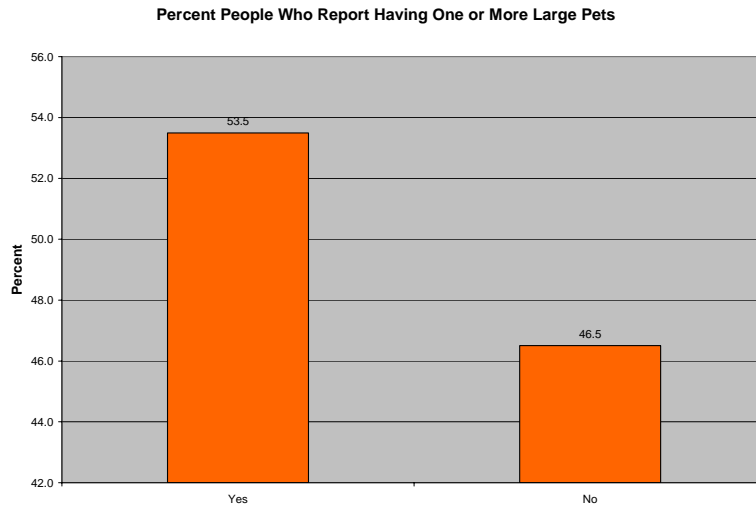
**Figure 2: Age Distribution [N=373]**



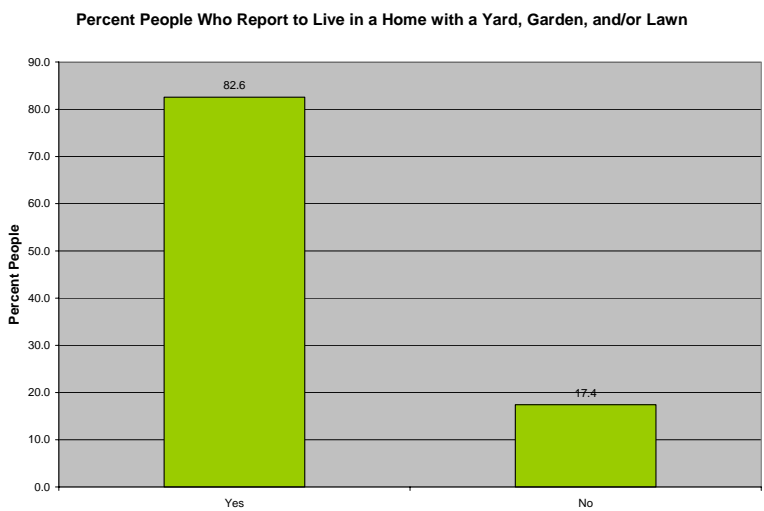
**Figure 3: Residence Area [N=360]**



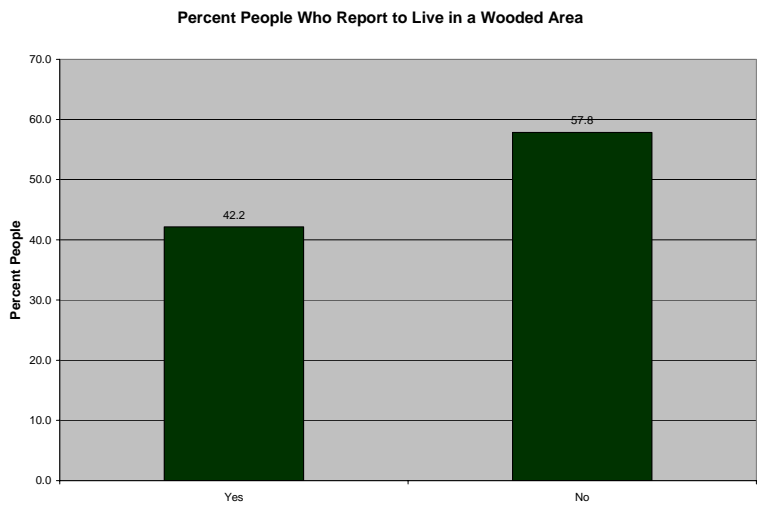
**Figure 4: Pet Ownership [N=372]**



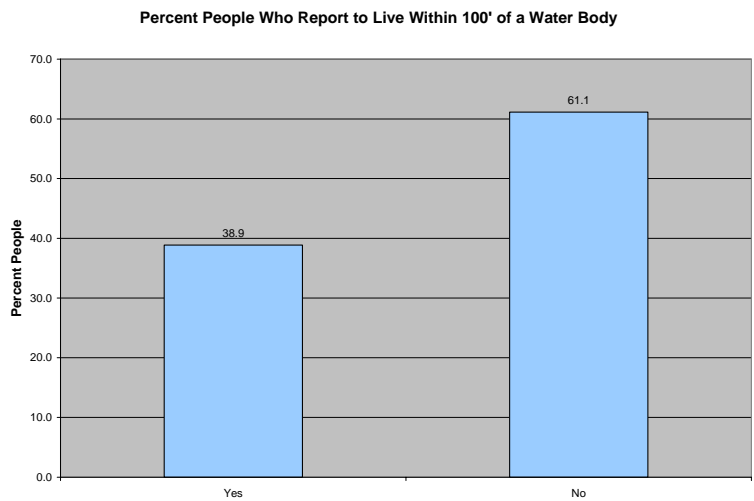
**Figure 5: Home Landscape I [N=373]**



**Figure 6: Home Landscape II [N=370]**



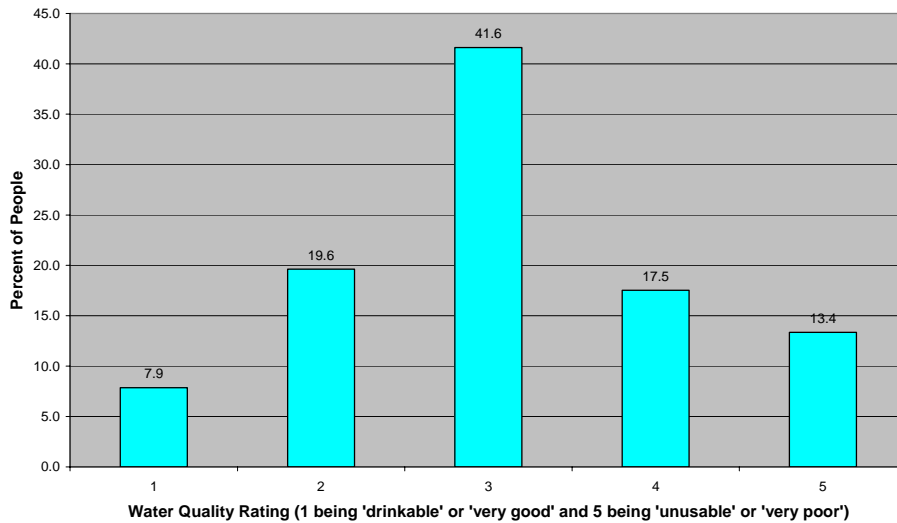
**Figure 7: Proximity to Water Body [N=373]**



**Survey Results**

**Figure 8: Freshwater Quality [N=382]**

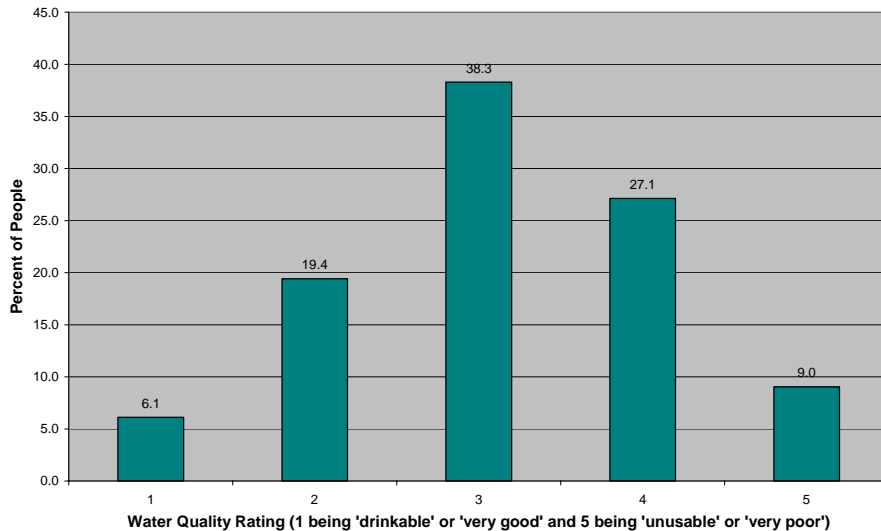
In general, how would you rate the overall water quality of rivers, streams and ponds in your city or town?



Approximately 42% of respondents report that fresh water body quality in their town is average (value of 3) on a nominal scale of 1-5. Over 30% report overall water quality being unusable or very poor [Figure 8].

**Figure 9: Narragansett Bay Water Quality [N=376]**

How would you rate the overall water quality of Narragansett Bay?



Approximately 38% of respondents feel that Narragansett Bay water body quality is average (value of 3) on a nominal scale of 1-5. Over 36% report Narragansett Bay water quality to be unusable or very poor [Figure 9].

**Figure 10: Perception of Fresh vs. Salt Water Quality**  
**[N(fresh)=382; N(salt)=376]**

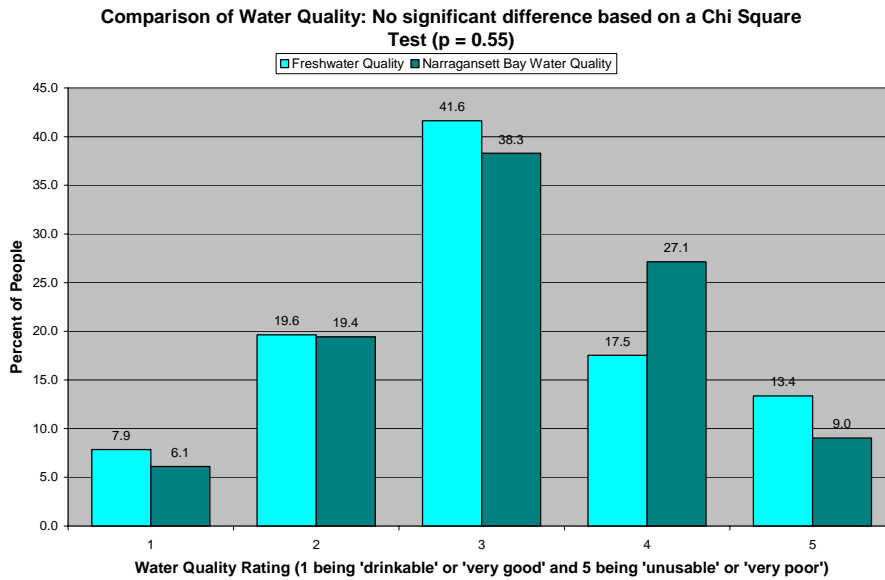
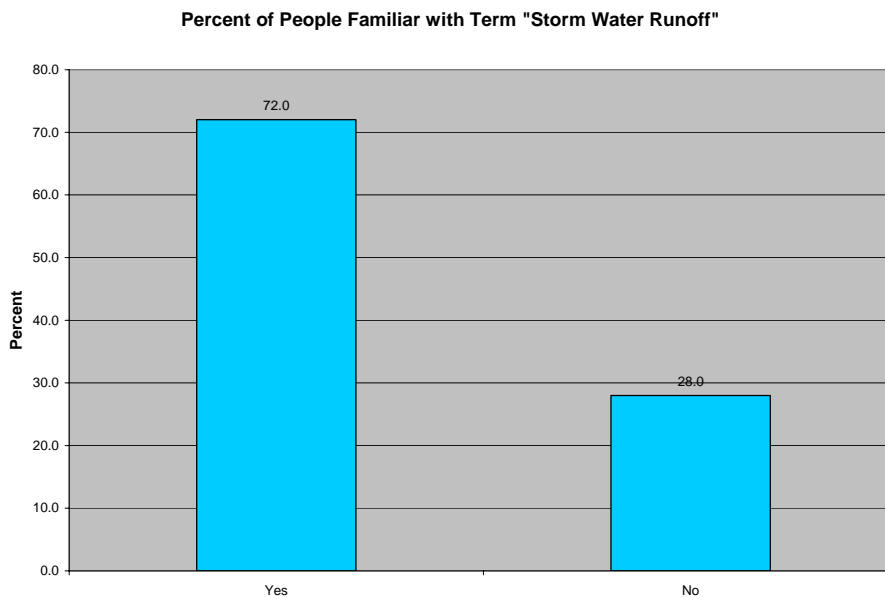


Figure 10 illustrates a comparison between people’s perceived notion of the water quality in the freshwater bodies in their town compared with the water quality of Narragansett Bay. The graph shows us that although people

felt that both their town’s freshwater bodies and the Bay both had average water quality, Bay water quality was perceived to be somewhat worse. However, differences between fresh and salt water quality were not found to be statistically significant.

**Figure 11: Terminology Knowledge [N=386]**

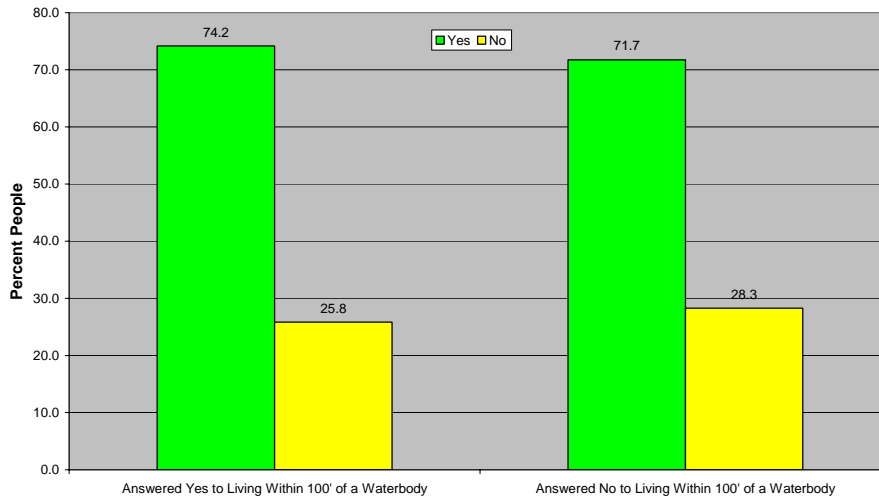


Nearly 75% of survey respondents are familiar with the term “Storm water runoff” [Figure 11].

**Figure 12: Terminology Knowledge vs. Proximity to Water Body**

[N=381; p=0.6]

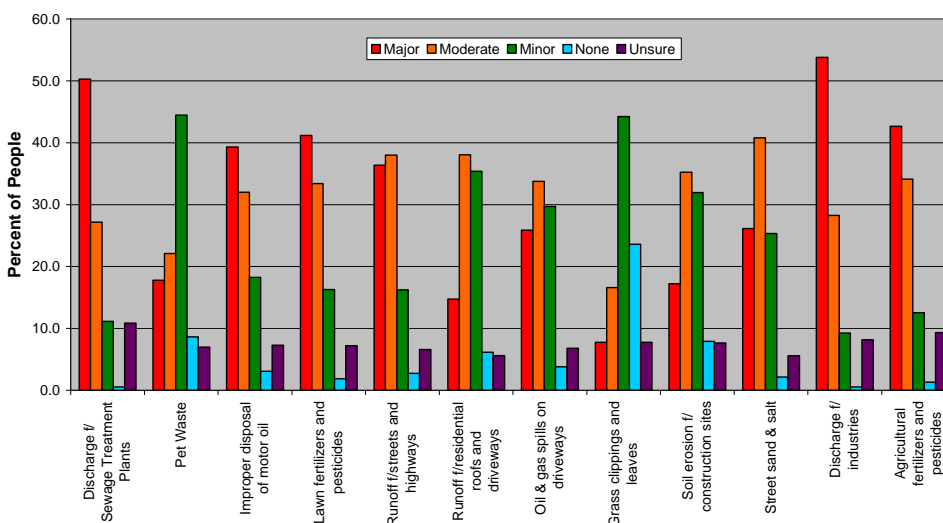
People Who Reported Being Familiar with the Term "Storm Water Runoff" with Respect to Whether They Reported Living Within 100' of a Water Body  
No significant difference based on a chi sq test. (N: 381; p = 0.6)



70% of survey respondents both living within 100' of a waterbody and those not living within 100' of a waterbody were familiar with the term stormwater runoff [Figure 12]. (NB: almost 40% report living within a 100' of waterbody – seems high.)

**Figure 13: Water Quality Impacts (Detailed statistics) [N varies]**

To what extent do you believe each of the following items is potentially damaging to water quality in Rhode Island?

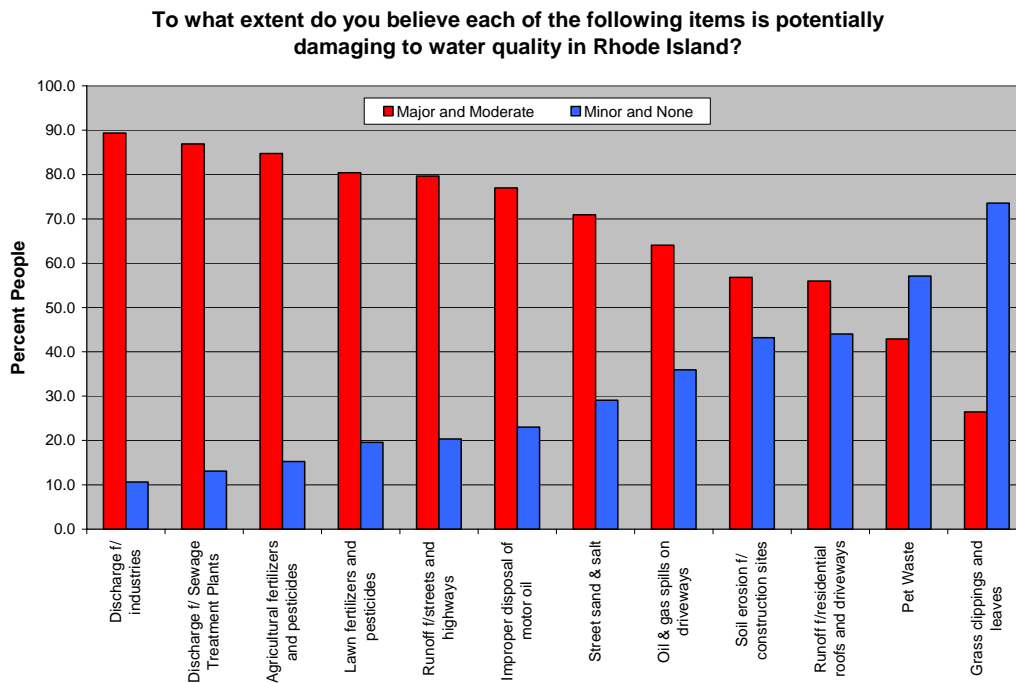


As shown in Figures 13 and 14, survey respondents believe that industrial discharge, sewage treatment discharge and agricultural fertilizers and pesticides have the highest potential to damage water quality in Rhode Island, followed

by lawn fertilizers, improper disposal of motor oil and runoff from highways. Grass clippings and leaves, pet waste and soil erosion from construction sites are thought to have a lower potential to damage water quality in Rhode Island.

Respondents' beliefs regarding the relative impact of various pollution sources are shown more clearly when 'major and minor' impact responses and 'minor and no impact' responses are grouped [Figure 14]. Industrial and wastewater discharge and agricultural runoff are perceived as the biggest potential threats to water quality but pesticides and fertilizers from lawns, run-off from highways, improper disposal of motor oil are also perceived to be potentially damaging by almost 80% of respondents. Street salt, oil and gas spills on driveways, soil from construction sites and runoff from roofs and driveways similarly were felt to be a major or moderate source of damage to water quality by over 50% of people. Only pet waste and grass clippings were perceived by more people to be a minor or not a threat (almost 70% and over 70% respectively than a major or moderate threat (over 40% and over 25% respectively).

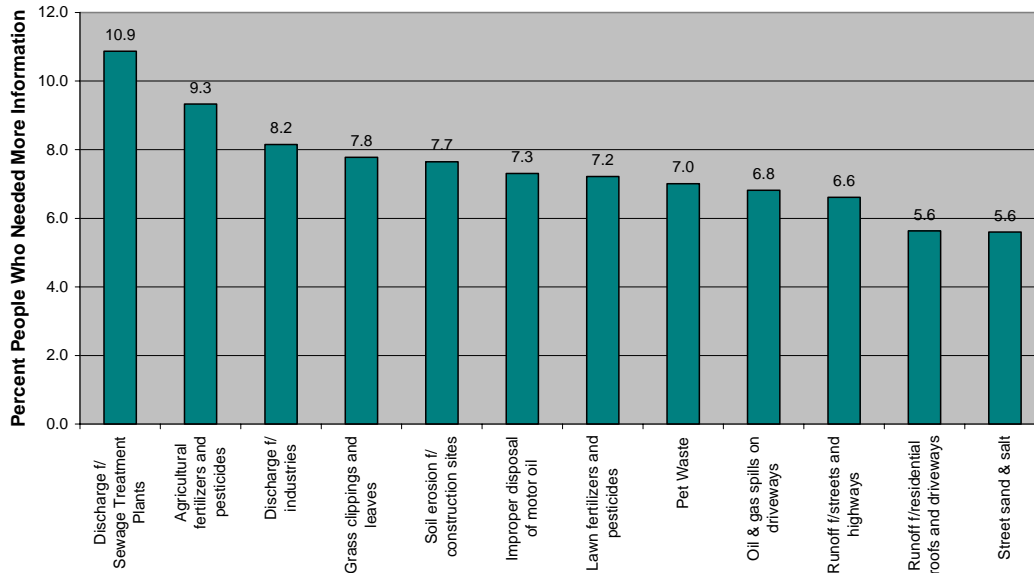
**Figure 14: Water Quality Impacts (Grouped statistics) [N varies]**





**Figure 15: Water Quality Impacts (Grouped statistics – Needing More Info)**

To what extent do you believe each of the following items is potentially damaging to water quality in Rhode Island?  
 People Who Needed More Information

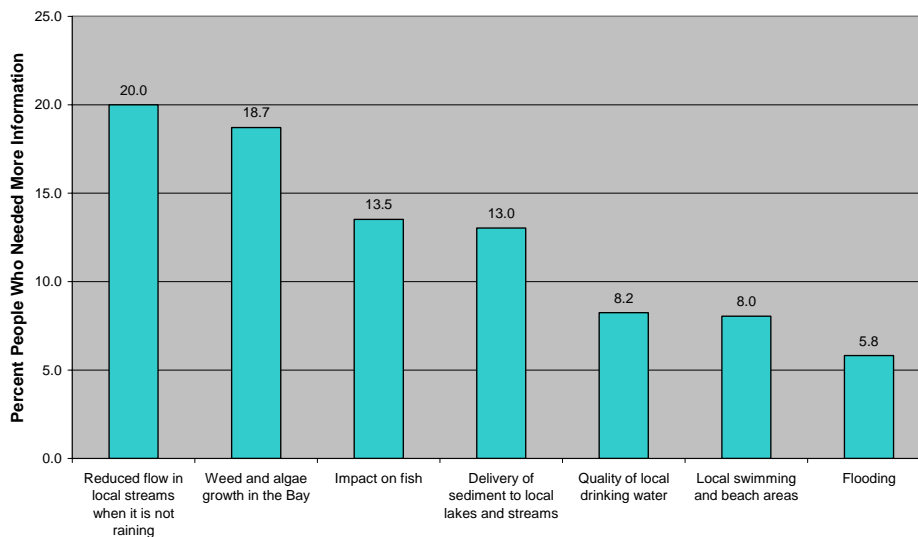


Some respondents indicated a need for more information. Specifically, they would like information on the impacts of sewage treatment plant discharges,

agricultural fertilizers and pesticides, and industrial discharges on Rhode Island water bodies [Figure 15].

**Figure 16: Water Quality Impacts (Grouped statistics - Needing More Info)**

To What Extent Does Storm Water Runoff Have on the Following?  
 People Who Needed More Information

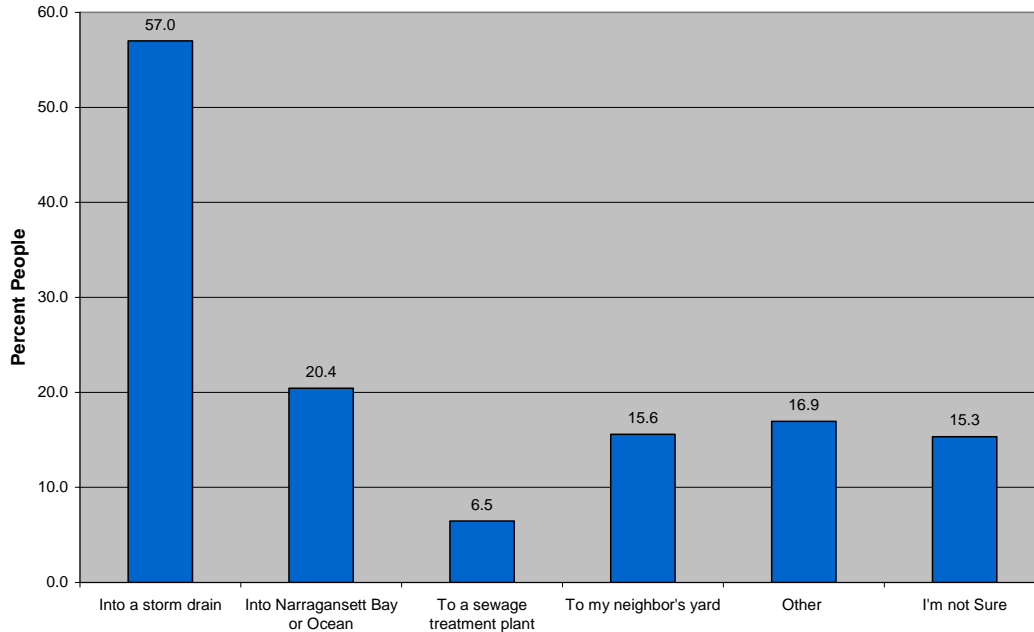


Also, approximately 20% of respondents felt that they were not informed regarding the impacts of reduced flow of water in local streams when it is not raining, ~18% of respondents felt that they were not informed regarding the impacts of weed

and algae growth in Narragansett Bay, and 13.5% of respondents felt uninformed regarding the impacts of stormwater runoff on fish populations [Figure 16].

**Figure 17: Stormwater\* [N=373]**

After it rains or when snow melts, where does water go as it leaves your property?

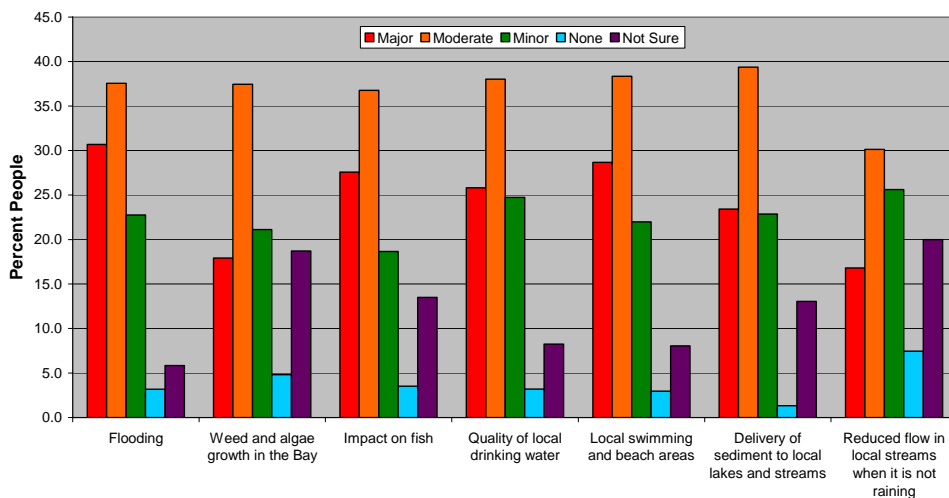


Over 77% of respondents report awareness that rain or snow melt goes into storm drains (57%) or into Narragansett Bay or Rhode Island Sound (20.4%). Only a small percentage mistakenly

believes that storm water is treated (6.5%). Over 15% are unsure what happens to storm water or suggest “other” as where the water goes.

**Figure 18: Water Flow Impacts on Water Quality (Detailed statistics)\* [N varies]**

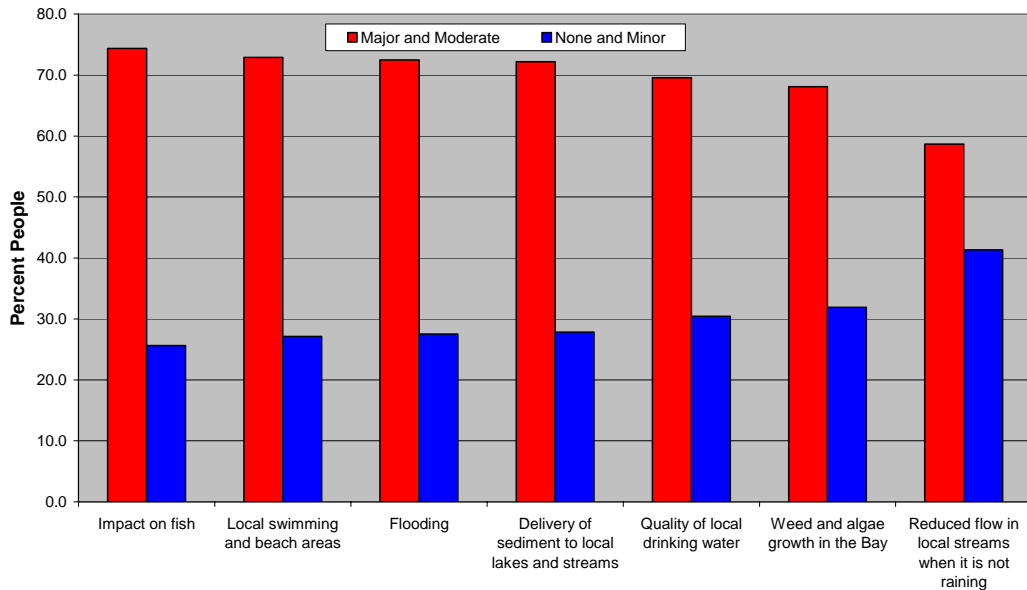
To the best of your knowledge, after it rains or when snow melts, to what extent does the resulting runoff contribute to the following potential problems in Rhode Island?



As shown in Figure 18, survey respondents believe that storm water runoff contributes to all of the listed potential water-related problems in RI.

**Figure 19: Water Flow Impacts on Water Quality (Grouped statistics)\* [N varies]**

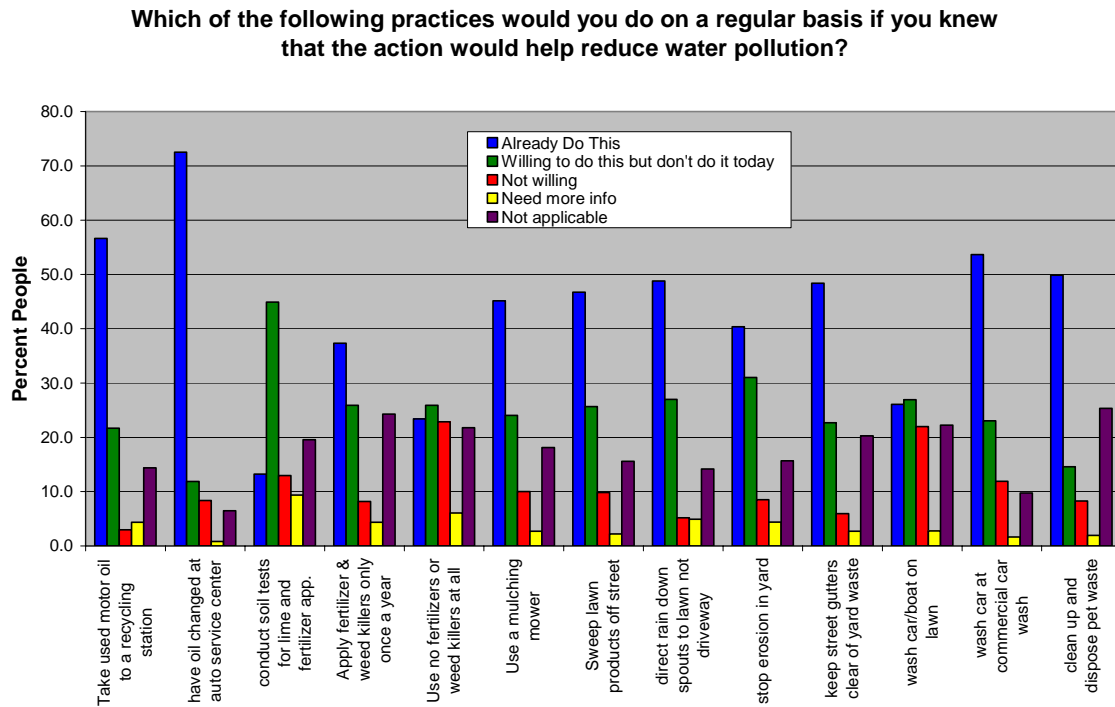
To the best of your knowledge, after it rains or when snow melts, to what extent does the resulting runoff water contribute to the following potential problems in Rhode Island?



When the data are grouped (e.g. ‘major’ and ‘moderate’ impact responses and ‘minor’ and ‘no’ impact responses), the results indicate even more clearly that respondents professed an

awareness that all water quality elements are impacted by rain or snow melt events generating stormwater runoff flow. Over 70% of respondents perceive a major or moderate impact of runoff on fish populations, local swimming and beach area water quality, flooding, delivery of sediment and quality of local drinking water and almost 70% perceive storm water to impact weed and algal growth in the Bay. [Figure 19]. Of note is the fact that over 40% of the respondents believe that storm water runoff has a minor or no impact on reduced flow in local streams. This indicates that many respondents don’t understand the connection between storm water runoff, groundwater recharge and stream levels.

**Figure 20: Stormwater Runoff Impact Awareness (Detailed statistics) [N varies]**



A large percentage of respondents reported that they already practice actions that reduce water pollution. Over 70% report having their oil changed at an auto service center although over 50% of respondents also claim to recycle their motor oil. Additionally, over 40% of respondents claim to use a mulching lawn mower, sweep lawn products off the street, direct rain down spouts to the lawn instead of the driveway, stop erosion in their yards, keep street gutters clear of yard waste, and clean up and dispose of pet waste [Figure 20].

Note that a large percentage of respondents (over 40%) claim to be willing to conduct soil tests for lime and fertilizer application, however only slightly more than 10% of respondents report already having their soil tested [Figure 20].

Also, between 20 – 30% claim willingness to stop erosion on their property, wash their car or boat on the lawn, direct rain spouts to their lawns rather than the driveway, and sweep lawn products off the street [Figure 20].

**Figure 21: Stormwater Runoff Impact Awareness (Grouped statistics) [N varies]**

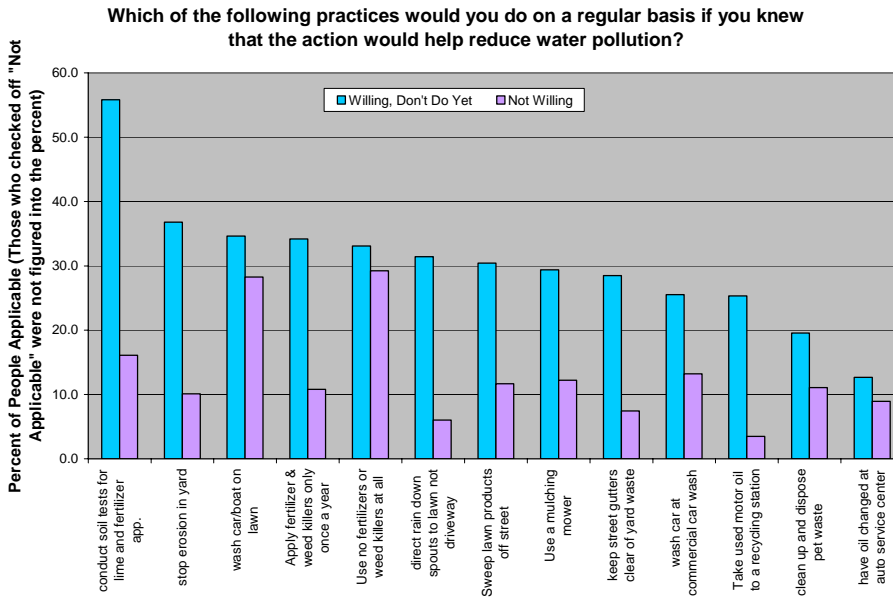
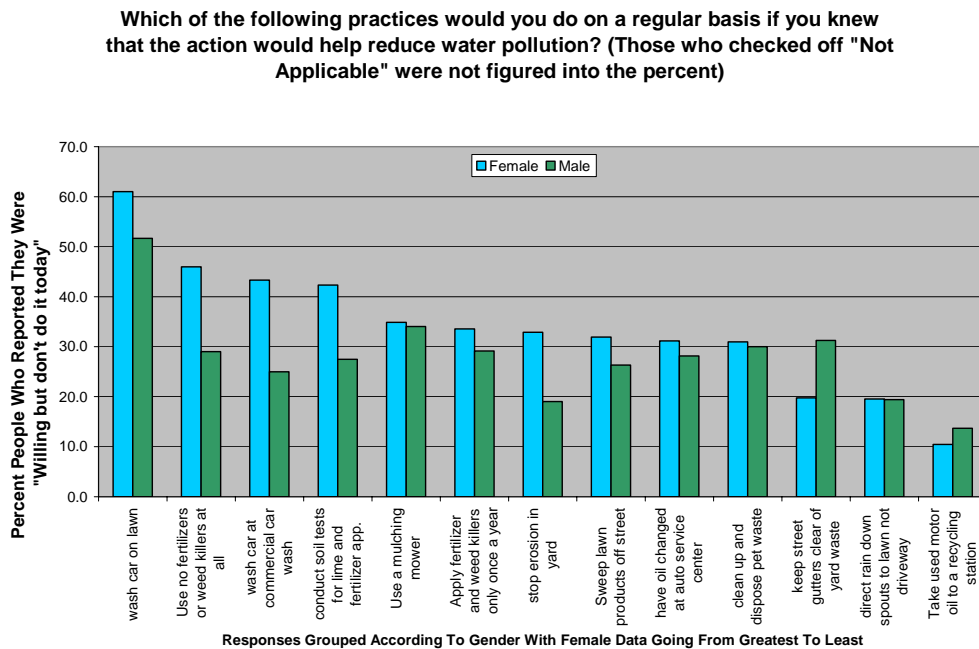


Figure 21 shows the data in terms of willingness to consider a practice versus outright unwillingness. Noteworthy are the almost equal levels of willingness versus non willingness for “washing the car on the

lawn” and “use no fertilizers or weed killers at all.” People’s unwillingness to wash the car on the lawn may be because they think that it will be detrimental to the health of their lawn. Similarly, fertilization may be regarded as an important practice for a healthy lawn. In any case, examination of Figure 21 may be useful when considering an educational message for a particular stormwater management practice.

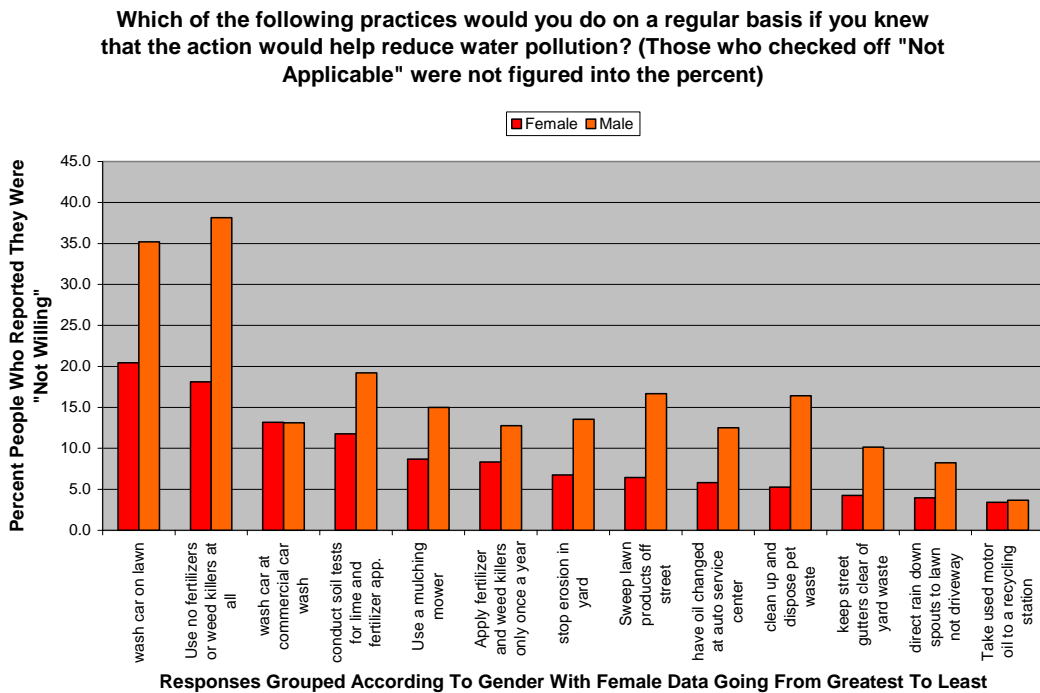
**Figure 22: Stormwater Runoff Impact Awareness (Grouped statistics) [N varies]**



To gain insights for the communication campaign, the data were analyzed based on gender. While not statistically significant based on a chi square test, it is worth noting that female respondents appear to be more

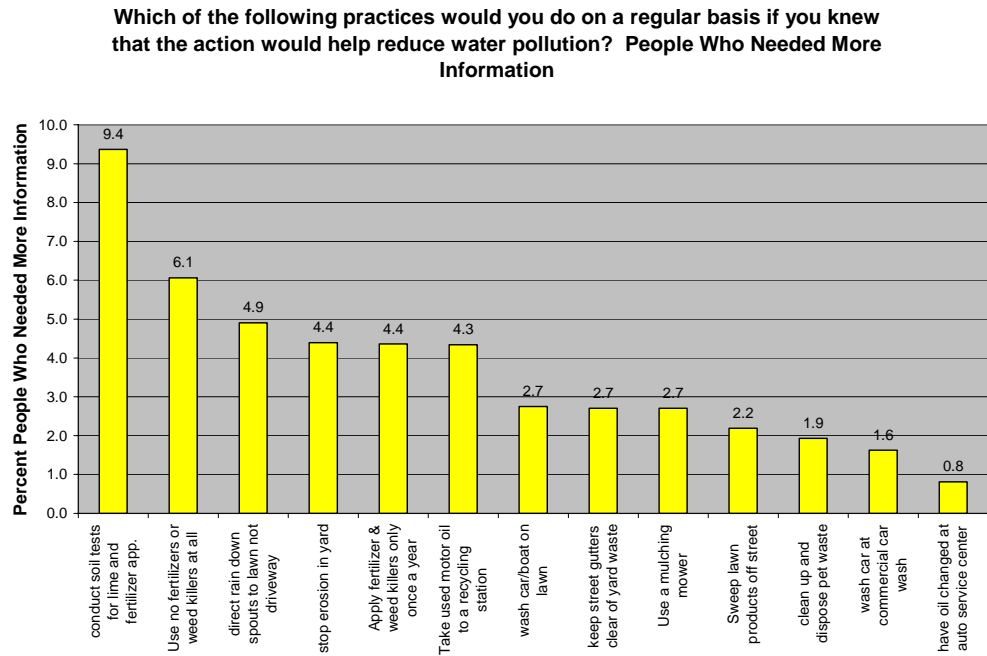
willing to change their behavior to prevent contributing to water pollution. Over 60% of female respondents (compared to ~51% of male respondents) were willing to wash their car on the lawn, while over 40% of female respondents (compared to just over 25% of male respondents) were willing to use no fertilizers or weed killers at all, wash their car a commercial car wash, and conduct soil tests for lime and fertilizer application [Figure 22].

**Figure 23: Stormwater Runoff Impact Awareness (Grouped statistics) [N varies]**



Approximately 38% of male respondents (compared to less than 20% of female respondents) are not willing to cease the use of fertilizers and weed killers on their property, while over 35% of male respondents (compared to ~20% of female respondents) are not willing to wash their car on the lawn as opposed to the driveway [Figure 23].

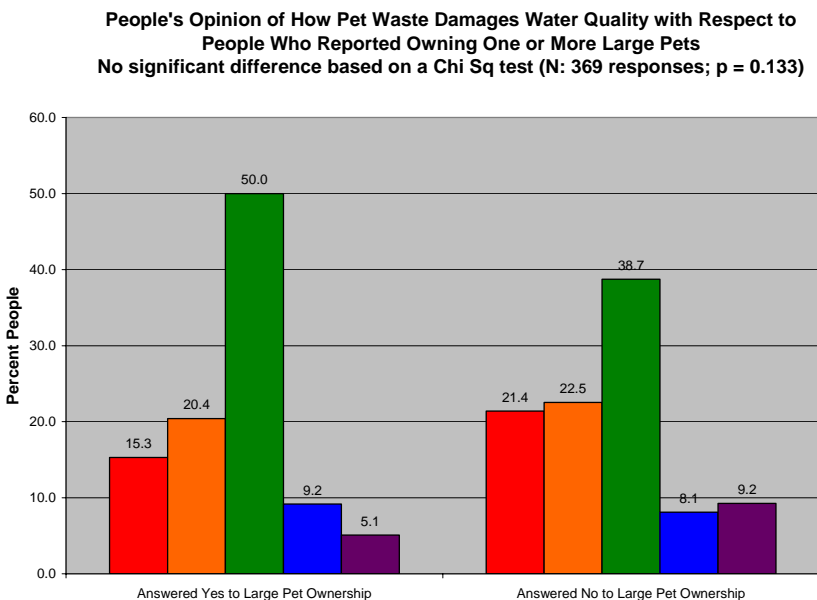
**Figure 24: Stormwater Runoff Impact Awareness (Grouped statistics–need more info) [N varies]**



This graph shows the percentage of respondents who indicated they needed more information to answer the question. Slightly less than 10% of survey respondents indicated, as their

response, that they would like to receive more information about behaviors that contribute to water pollution. Specific areas of interest included: directing rain down spouts to lawn areas instead of driveways (4.9%), stopping erosion in their yard (4.4%), applying fertilizer and weed killers only once a year (4.4%), taking used motor oil to a recycling station (4.3%), washing their car or boat on the lawn instead of the driveway (2.7%), keeping street gutters clear of yard waste (2.7%), using a mulching mower (2.7%), sweeping lawn products off the street (2.2%), cleaning up and disposing of pet waste (1.9%), washing their car at a commercial car wash (1.6%), or having their oil changed at an auto service center (0.8%) [Figure 24].

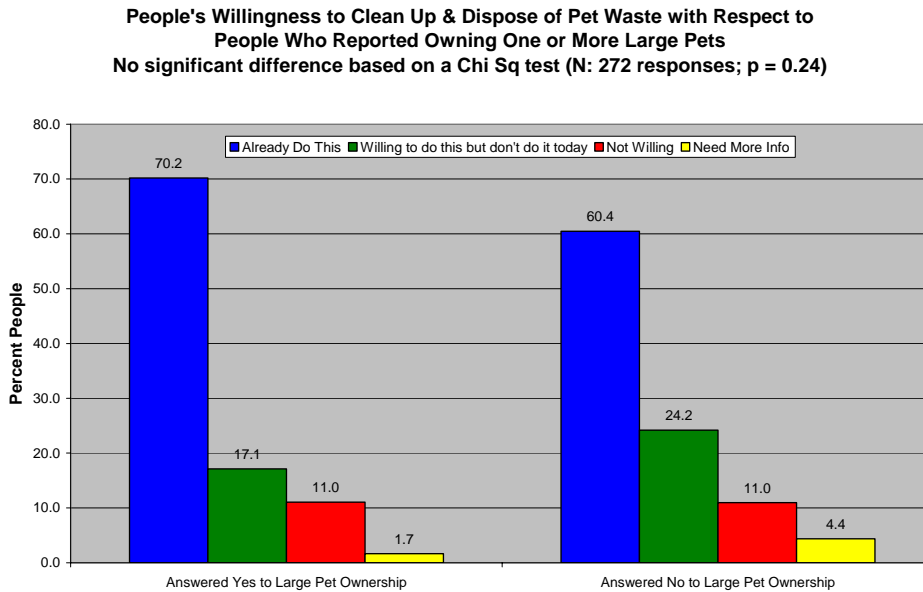
**Figure 25: Awareness of Pet Waste Disposal and Impacts on Water Quality [N=369]**



This graph shows the distribution of responses of large pet owners compared to the responses of non pet owners with regard to how

pest waste impact water quality. Approximately 15% of large pet owners are aware that pet waste damages water quality, compared to 21.4% of non-pet owners [Figure 25].

**Figure 26: Willingness to Change Behavior Related to Pet Waste Disposal [N=272]**



A high percentage (70%) of large pet owners express willing to clean up and dispose of pet waste, compared to ~60% of non-pet owners [Figure 26].

**Figure 27: Freshwater Quality and Proximity to a Water Body [N=376]**

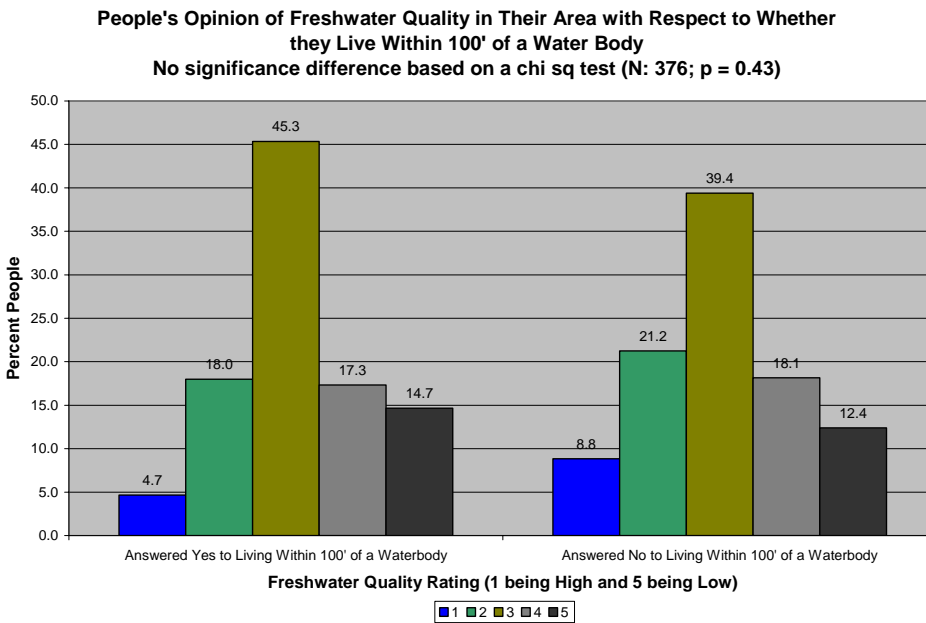
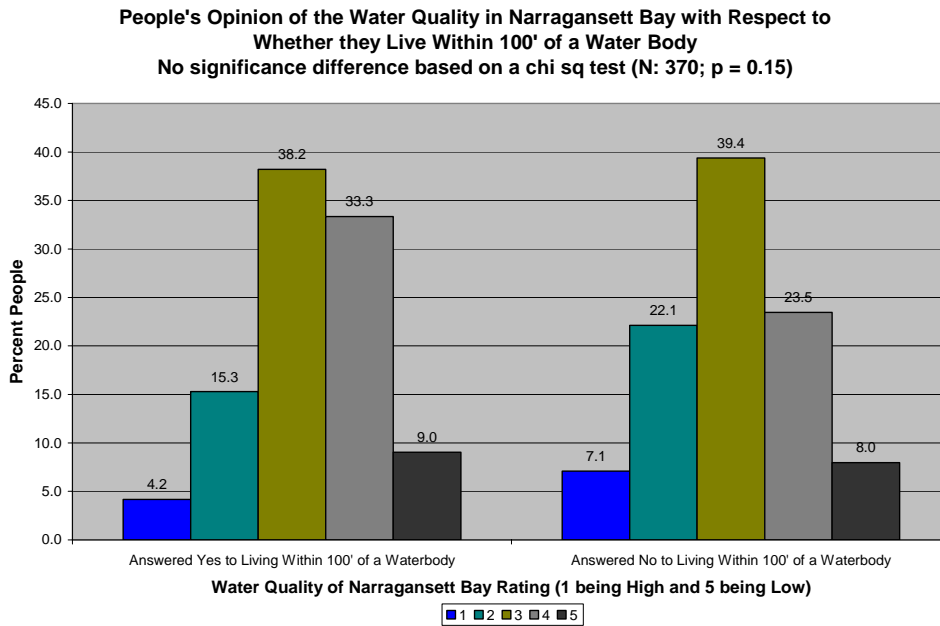


Figure 27 compares the responses of people who live within 100 feet of a water body compared to those who do not with respect to opinion of water quality. The analysis did not reveals statistically significant differences. (Also, note that the percentage of people reporting to live

within 100 feet of a water body seems high (38%).



**Figure 28: Saltwater Quality and Proximity to a Water Body [N=370]**



Approximately 33% of survey respondents living within 100' of a water body gave Narragansett Bay a water quality rating of 4 (a lower rating on the ordinal scale), while only 23% of those not living

within 100' of a water body gave Narragansett Bay the same rating [Figure 28].

### Key Findings (a starting point for further evaluation and discussion)

1. Awareness of the term “storm water” is high.
2. While the majority of respondents consider RI water quality to be “average” (42% for freshwater and 36% for the Bay), over 30% report fresh water quality to be ‘unusable or very poor and over 36% perceive the quality of the Bay to be ‘unusable or very poor.’ Note that a recent (not yet public) survey of ‘do it yourself’ homeowners throughout New England revealed that Rhode Islander’s have a high level of concern about drinking water – over 64% of those surveyed indicated a moderate or severe problem with drinking water in RI.
3. Respondent awareness of potential water pollution sources is generally high. However, pet waste and grass clippings were considered to have ‘minor’ or ‘no impact’ on water quality indicating an opportunity for education.
4. Point sources of pollution and agricultural runoff were considered threats to water quality by the most people (over 80%) followed by lawn fertilizers and pesticides (80%), runoff from streets and highways (80%), improper disposal of motor oil (over 75%), street salt and sand (over 70%), oil and gas spills on driveways (over 60%), soil erosion from construction sites (over 55%), and runoff from residential roofs and driveways (over 50%). (Note - % approximate).

5. Respondent awareness of the water quality damage from storm water runoff was also high. Over 70% of respondents perceive a major or moderate impact from runoff on fish populations, local swimming and beach area water quality, flooding, delivery of sediment and quality of local drinking water and almost 70% perceive storm water to impact weed and algal growth in the Bay. However, the impact of storm water runoff on low stream flow is not widely understood (40% report minor or no impact). This indicates that many respondents don't understand the connection between storm water runoff, groundwater recharge and stream levels and offers an opportunity for education.
6. A large percentage of respondents report already taking actions to reduce water pollution or being willing to do so though not doing it today. The communication campaign may take advantage of this apparent receptivity by focusing on how easy and rewarding it is to take simple steps to protect water quality – to nudge people from inaction to action and provide social reinforcement for the behavior.