# North Central Wisconsin Stormwater Survey:
## A Follow-Up Report on Residents' Stormwater Knowledge and Practices

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**Survey Research Center Report 2010/2**
**January 2010**

The SRC would like to thank Diane Wessel from the Department of Conservation, Planning and Zoning of Marathon County and members of the North Central Wisconsin Storm Water Coalition for their input throughout the survey process. We would like to thank SRC staff and students, Denise Parks, James Janke, Mandy Speerstra, Megan Keune, Hannah Stuttgen, Grady Stehr, Aaron Peterson, Ted Cannady, and Ashley Julka. Their hard work and dedication are gratefully acknowledged. Finally, we would like to thank residents of north central Wisconsin who took the time to complete their questionnaires.

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## Executive Summary

The Survey Research Center (SRC) at the University of Wisconsin – River Falls, working with the North Central Wisconsin Storm Water Coalition, surveyed a random set of residents from the cities of Merrill, Mosinee, Schofield, Stevens Point, Wausau, and Wisconsin Rapids, the villages of Kronenwetter, Rothschild and Weston, and the town of Rib Mountain. The survey was conducted during the fall of 2009 and was a follow-up to a similar survey completed in the spring of 2008. The goals of the 2009 survey included:

- determining citizens' understanding of stormwater issues and whether they have improved since the 2008 survey
- understanding residents' current behaviors that can affect stormwater quality and quantity and, again, see if they have changed since the 2008 survey
- determining what percentage of residents are aware of the North Central Wisconsin Storm Water Coalition and if they have participated in/are aware of Coalition programs

The SRC received 370 of the 1,155 surveys sent to a randomly selected set of households in north central Wisconsin. Based on the estimated population in the participating jurisdictions, this 32 percent response rate should provide estimates that are accurate to within plus or minus 5.1 percent with 95 percent confidence. There is some concern that the sample overstates the level of knowledge that people in north central Wisconsin have about stormwater issues.

The following are key survey results:

- Two-thirds or more of the respondents correctly said that pesticides and other pollutants are not removed from stormwater before it reaches local surface waters, that drain spouts from roofs should flow onto green spaces rather than hard surfaces, that stormwater can add significantly to sedimentation of local surface waters, and that stormwater carries plant nutrients that reduce dissolved oxygen levels in water.
- Relatively few respondents knew that stormwater run-off is relatively greater in urban than rural areas, that stormwater in their community drains to local surface waters or that stormwater run-off on a hot summer day can degrade local water quality.
- There were no significant differences in the percentage of correct answers to these factual questions in 2009 and 2008, despite the Coalition's educational efforts.
- For the most part, respondents' yard care practices align with recommendations in terms of minimizing stormwater run-off impacts.
- Respondents also, for the most part, have vehicle maintenance practices that would be classified as environmentally sensitive. One exception is that the vast majority who reported washing cars on their own property said that waste water drains to gutters rather than green spaces.
- Again, there were no significant changes in yard care or vehicle maintenance practices between 2008 and 2009.
- Fewer than one in ten respondents said they were familiar with the North Central Wisconsin Stormwater Coalition. Coalition name recognition was particularly low among women and those under 35 or older than 55 years of age.
- There was a relatively high level of awareness of/participation in the Wisconsin River cleanup project, but other Coalition-led efforts (e.g. an Earth Week commercial about washing cars at home) had relatively low recognition by respondents.

## Survey Purpose

This study sought to:

- Measure current public understanding of stormwater issues
- Describe current practices with respect to factors that affect stormwater quality
- Determine public awareness of the North Central Wisconsin Stormwater Coalition and its programs
- Compare responses to this survey to a similar survey done in the spring of 2008 to determine if the Coalition's educational efforts have affected citizen's understanding of and practices relevant to proper management of stormwater.

The following jurisdictions were involved in this survey:

- Cities of Merrill, Mosinee, Schofield, Stevens Point, Wausau, and Wisconsin Rapids
- Villages of Kronenwetter, Rothschild and Weston
- Town of Rib Mountain

## Survey Methods

In mid-September 2009, the Survey Research Center (SRC) at the University of Wisconsin – River Falls mailed surveys to 1,155 randomly selected households in the participating jurisdictions. After two weeks, the SRC mailed postcards to those from whom a completed questionnaire had not been received and two weeks after that a second questionnaire was sent to non-respondents.

The SRC received a total of 370 completed questionnaires from residents for a 32 percent response rate. In the 2000 Census, there were 50,811 occupied housing units in these 10 jurisdictions. Based on that number of households and the number of returned surveys, the estimates provided in this report are expected to be accurate to within plus or minus 5.1 percent with 95 percent confidence.

Any survey has to be concerned with "non-response bias". Non-response bias refers to a situation in which people who don't return a questionnaire have opinions that are systematically different from the opinions of those who return their surveys. **Based upon a standard statistical analysis described in Appendix A, the Survey Research Center (SRC) concludes that non-response bias is a concern for one part of this survey.** The first eight questions in the survey were knowledge-based (e.g. Does more stormwater run off an acre of rural land than an acre of urban land? (false), Can stormwater run off on a hot summer day impair surface water quality? (true), etc.). For five of these eight questions, a significantly higher proportion of respondents to the second mailing said that they didn't know the answer than was the case for the respondents to the first mailing. **The results summarized in this report may slightly overstate the level of knowledge that the average person in the participating jurisdictions has about stormwater.**

In addition to the numeric responses, respondents provided additional written comments, which were compiled by the SRC. **Appendix B to this report contains the complete compilation of comments.**

**Appendix C contains a copy of the survey questionnaire with a quantitative summary of responses by question.**

## Profile of Respondents

Table 1 summarizes the demographic profile of respondents to the 2009 and 2008 surveys. Where comparable data were available from the 2000 Census, they were included to indicate the degree to which the sample represents the adult population in north central Wisconsin.

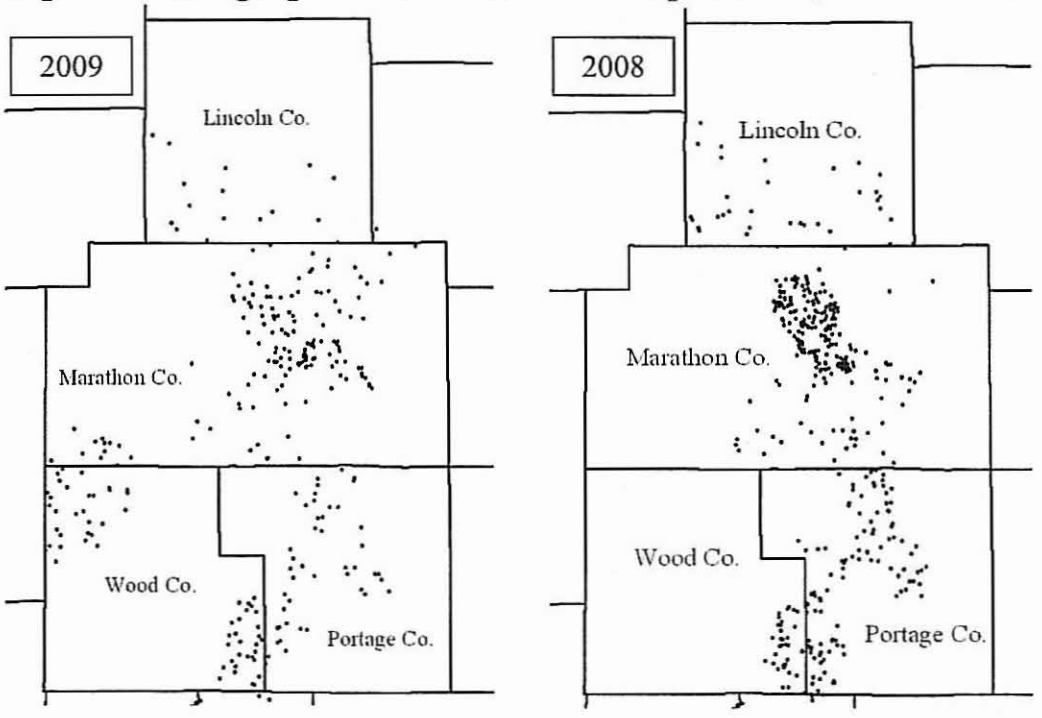
| Table 1: Demographic Profile of Respondents | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Gender** | **Count** | **Male** | **Female** | | | | |
| **Sample, 2009** | **334** | **68%** | **32%** | | | | |
| Sample, 2008 | 448 | 66% | 34% | | | | |
| 2000 Census | 127,712 | 48% | 52% | | | | |
| | | | | | | | |
| **Age 18+** | **Count** | **18-24** | **25-34** | **35-44** | **45-54** | **55-64** | **65+** |
| **Sample, 2009** | **340** | **1%** | **7%** | **13%** | **20%** | **24%** | **35%** |
| Sample, 2008 | 450 | 2% | 6% | 16% | 27% | 22% | 28% |
| 2000 Census | 96,990 | 18% | 17% | 19% | 16% | 10% | 19% |
| | | | | | | | |
| **Children in household** | **Count** | **0** | **1** | **2** | **3+** | | |
| **Sample, 2009** | **334** | **76%** | **9%** | **10%** | **5%** | | |
| Sample, 2008 | 442 | 69% | 12% | 13% | 6% | | |
| 2000 Census | 15,870 | 69% | 31% | | | | |
| | | | | | | | |
| **Housing** | **Count** | **Own** | **Rent** | **Other** | | | |
| **Sample, 2009** | **351** | **85%** | **14%** | **1%** | | | |
| Sample, 2008 | 453 | 98% | 2% | | | | |
| 2000 Census | 50,811 | 65% | 35% | | | | |
| | | | | | | | |
| **Educational Level** | **Count** | **High School or Less** | **Some College/ Tech** | **2-Year Degree** | **4-Year Degree** | **Grad/ Professional Degree** | |
| **Sample, 2009** | **339** | **27%** | **29%** | **12%** | **16%** | **13%** | |
| Sample, 2008 | 442 | 26% | 29% | 12% | 19% | 14% | |
| 2000 Census | 80,260 | 51% | 19% | 9% | 14% | 7% | |
| | | | | | | | |
| **Household income range** | **Count** | **<$25,000** | **$25-$49,999** | **$50-$74,999** | **$75-$99,999** | **$100,000+** | |
| **Sample, 2009** | **303** | **20%** | **28%** | **26%** | **15%** | **11%** | |
| Sample, 2008 | 382 | 12% | 29% | 27% | 16% | 16% | |
| 2000 Census | 50,895 | 31% | 33% | 21% | 9% | 7% | |

As indicated in Table 1, the demographic profile of respondents to the 2009 survey was, in most respects, very similar to the respondents in the 2008 survey. Like the 2008 sample, the 2009 sample is disproportionately male. The bad news is that there are also a fairly large number of significant differences in the responses of men and women (14 of 36 variables tested). This is bad because the sample is not as representative of the overall population as we would like (too many males) and gender seems to matter in stormwater issues. Further, we noted that respondents to the second mailing were less likely to get the correct answer to the knowledge-based questions (questions 1 – 8) and because of this, the responses reported might slightly overstate citizen understanding of stormwater issues. It turns out that men were significantly more likely to get the "correct" answer to these knowledge-based questions. Thus, the gender breakdown of the sample, with too many males, amplifies our concern that the results may **overstate** residents' understanding of stormwater issues.

The 2009 sample is significantly older, less likely to have children living in the home, more likely to rent, and slightly less well-off than the 2008 sample. The educational levels of the 2008 and 2009 samples are nearly identical and both have higher attainment levels than was reported in the 2000 Census. As we go through the report, statistically significant differences across the demographic groups included in Table 1 will be noted and discussed.

Figure 1 shows the general geographic distribution of respondents to both the 2009 and 2008 surveys. The dots are randomly placed within the respondents' zip codes and do not represent specific locations. The only substantial difference between the two maps is a concentration of participants in northeastern Wood County in 2009 that was not there in 2008.

**Figure 1: Geographic Distribution of Respondents, 2009 and 2008**



## Factual Knowledge of Stormwater Issues

The first set of questions in the survey was designed to gauge respondents' factual understanding of stormwater issues. These questions, with the correct answers in parentheses, are included in Table 2. This Table also shows the percentage of respondents in the 2009 and 2008 surveys who answered the question correctly. There are no differences between 2009 and 2008 in the level of understanding of these stormwater issues – all differences are within the confidence intervals.

**Table 2: Percent Residents with Correct Answer to Stormwater Questions**

| | Count 2009 | 2009 | Count 2008 | 2008 |
|---|---|---|---|---|
| Stormwater in my local community drains to lake/stream (true) | 323 | **50%** | 444 | **52%** |
| The amount of stormwater run-off per acre is much greater in a rural area than in a city or village (false) | 355 | **59%** | 458 | **60%** |
| Drain spouts from roofs should flow onto hard surfaces rather than green spaces such as lawn, garden, undeveloped areas (false) | 359 | **73%** | 461 | **71%** |
| Stormwater run-off on a hot summer day negatively impacts local water quality (true) | 355 | **24%** | 460 | **24%** |
| The impact of stormwater run-off on the amount of sediment in local rivers, streams and lakes is unimportant/minimal (false) | 355 | **74%** | 463 | **76%** |
| Stormwater carries plant nutrients (e.g. fertilizers) into local rivers, streams and lakes, which reduces dissolved oxygen level in the water (true) | 358 | **80%** | 462 | **80%** |
| Pesticides and other pollutants are removed from stormwater before it is released into rivers, streams or lakes (false) | 356 | **69%** | 462 | **71%** |

Table 2 indicates that there is a high level understanding (80% correct answers) that stormwater can carry plant nutrients into local waterways causing reductions in dissolved oxygen. In contrast, only about one in four respondents understand that thermal shock from stormwater run-off on a hot summer day can impair local water quality. Approximately one-half to two-thirds of respondents knew that stormwater drains directly to local waterways, that urban areas create more stormwater run-off per acre than do rural ones, and that pesticides and other pollutants are not removed from stormwater prior to reaching local waterways. Approximately three out of four respondents know that roof down spouts should flow onto green spaces rather than hard surfaces and that stormwater contributes to sedimentation of local rivers and lakes.

There are quite a few differences across demographic groups in terms of their understanding of stormwater issues. Specifically:

- As noted above, men were much more likely than women to know that stormwater drains directly to local surface waters, that urban areas produce more stormwater per acre than do rural ones, that downspouts should drain to green areas rather than hard surfaces, that stormwater run-off on a hot day can degrade local surface waters, that stormwater carries nutrients to local waterways, and that pollutants are not removed from stormwater prior to discharge. For all these questions, substantial percentages of women reported that they were unsure of the correct answers.

- Older respondents, compared to younger ones, were more likely to say they didn't know whether roof down spouts should flow onto hard surfaces or green spaces. Older respondents were also less likely to correctly say that stormwater adds to sedimentation problems in local surface waters.
- Compared to renters, homeowners were more likely to correctly say that stormwater drains to local surface water areas (50% of renters said they didn't know where stormwater went) and that urban areas produce more stormwater than rural ones (45% of renters said they didn't know the answer to this question).
- The percentage of respondents saying they didn't know to where stormwater drains tends to decline, and the percentage who believe (correctly) that urban areas produce more run-off per square mile than rural areas, increases as the level of formal education increases.
- With respect to income levels, understanding that stormwater drains to local surface waters peaks among households with incomes of between $50,000 and $74,999 per year. Understanding that urban areas produce relatively more run-off than a rural area of comparable size increases with income. Households with incomes of less than $25,000 were significantly less likely to agree that stormwater can carry nutrients into local waterways.

Respondents were asked if their community currently has stormwater quality requirements. Compared to 2008, significantly more respondents in 2009 said that their community did have such standards (26% in 2009 vs. 19% in 2008) and fewer said they didn't know (64% in 2009 vs. 69% in 2008).

Respondents were asked if there is a stormwater drain on their street. The responses in 2008 and 2009 were virtually identical. In both years, 48% said there was a drain on their street, about 40% said there was not and about 10% said they didn't know.

The final "factual question" was an open-ended question that asked respondents "what sorts of things are acceptable to allow to run down a storm drain?" A total of 258 responses were recorded (see Question 24 in Appendix B) and only 12 percent listed things that should probably not be allowed to run down a storm drain (grass clippings, dirt, whatever happens to be on the street, etc.

There appears to be an on-going need for educational efforts on stormwater topics in north central Wisconsin. The negative impacts of thermal shocks is the issue with the highest level of misunderstanding. A key target audience for educational efforts should be women. Substantial percentages of women reported that they didn't know the correct answer to most of the factual questions included in the survey.

## Residents' Activities Affecting Stormwater

### Yard Care

One major way in which households can affect the quantity and quality of stormwater run-off is through their yard care practices. For example, the more permeable surfaces (more green space), on a lot, the less stormwater is likely to run off. Respondents were asked to where drain spouts from their roofs mostly drain. In both 2008 and 2009, nearly 90 percent said they mostly either drain directly to green spaces (about 60% in both years) or onto hard surfaces and subsequently onto green spaces (a bit more than one-quarter of respondents).

In both 2009 and 2008, approximately 90% of respondents said they are responsible for maintaining their yard; fewer than 10% reported hiring an individual or company for this task. Women, compared to men, were significantly less likely to report that they maintained their yard and more likely to report hiring a person or firm to do so. Somewhat surprisingly, the probability that individuals maintained their own yard increased as household income rose.

As expected, renters' responses were consistently different than owners for almost all of the yard care questions we asked. In many instances, renters have less control over yard care practices than owners (e.g. if they live in an apartment complex). So, we will not dwell on differences between homeowners and renters in this section of the report.

In Table 3, we summarize north central Wisconsin landscaping practices in terms of how much of respondents' house lots are in "green space" (lawn, garden, undeveloped) and how much of that green space is made up of lawn. There are no significant differences in the percentage of green space or lawn between 2008 and 2009. In both years, about two thirds of the respondents said that more than half of their lot was green space. In both years, there are similar proportions of respondents who said that their lawn made up half or less of their green space and who said that their lawn made up more than half of their green space.

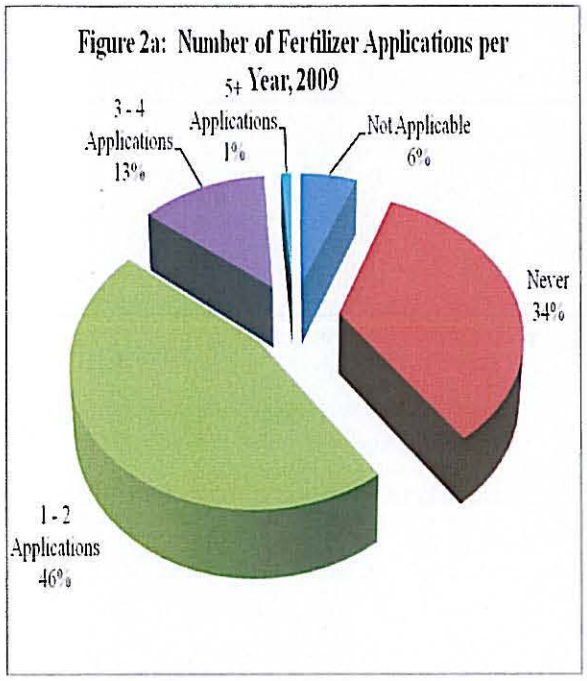
In terms of demographic differences, those with more education or income were more likely to say that the green space and lawn issues asked about in Table 3 were applicable to them, probably reflecting a higher likelihood that higher income groups are homeowners. However, there were no clear trends in terms of these demographic features and the percentage of their property that was in green space or lawn.

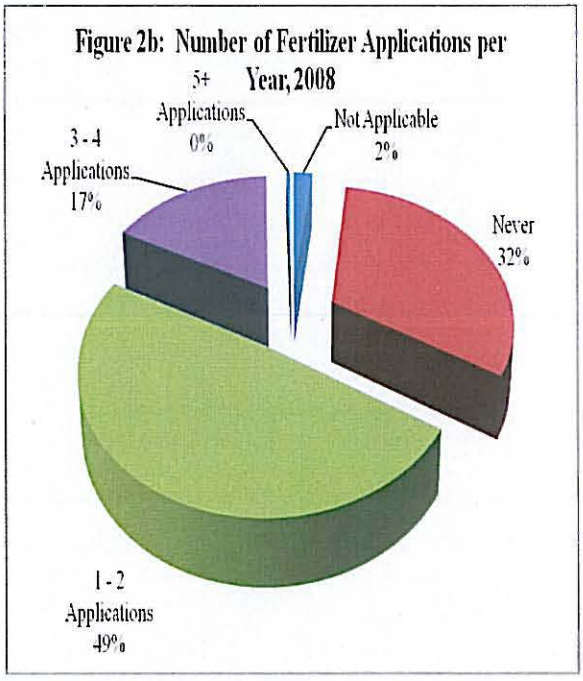
**Table 3: Percent Green space and Lawn, North Central Wisconsin, 2009 and 2008**

| | Percent Green space | | | Percent Lawn | |
|---|---|---|---|---|---|
| | 2009 | 2008 | | 2009 | 2008 |
| NA | 5% | 1% | | 5% | 1% |
| 0 - 25% | 10% | 6% | | 20% | 19% |
| 26 - 50% | 21% | 29% | | 29% | 37% |
| 51 - 75% | 41% | 39% | | 28% | 27% |
| 75%+ | 24% | 25% | | 18% | 16% |

Respondents' practices with respect to fertilizer and herbicide use can also affect stormwater quality. Respondents were asked if they use a soil test to determine fertilizer needs for their lawn. In both 2008 and 2009, about 10% of respondents said they use a soil test for this purpose and 80% said they did not. Men, compared to women, were both more likely to say they used a soil test (10% for men vs. 6% for women) and to say they did not (81% men vs. 73% women); women were more likely to say they didn't know (15% for women vs. 8% for men). In addition, the higher the reported household income, the more likely it was that the respondent said they used a soil test to determine fertilizer needs.

As Figures 2a and 2b indicate, nearly half the respondents in both years said they apply fertilizer once or twice per year; approximately one-third say they never apply fertilizer. Similarly, about 15% say they apply fertilizer 3 or more times per year. Women were significantly more likely to say they never apply fertilizer and those with higher education or higher incomes were more likely to apply fertilizers more frequently.

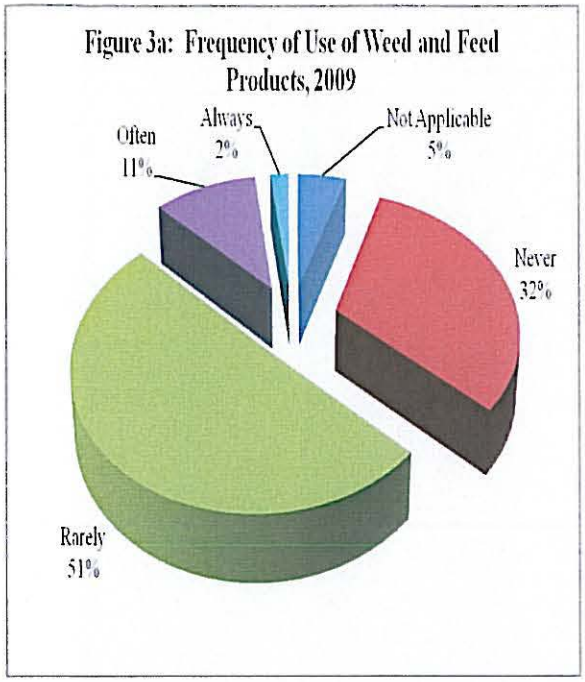


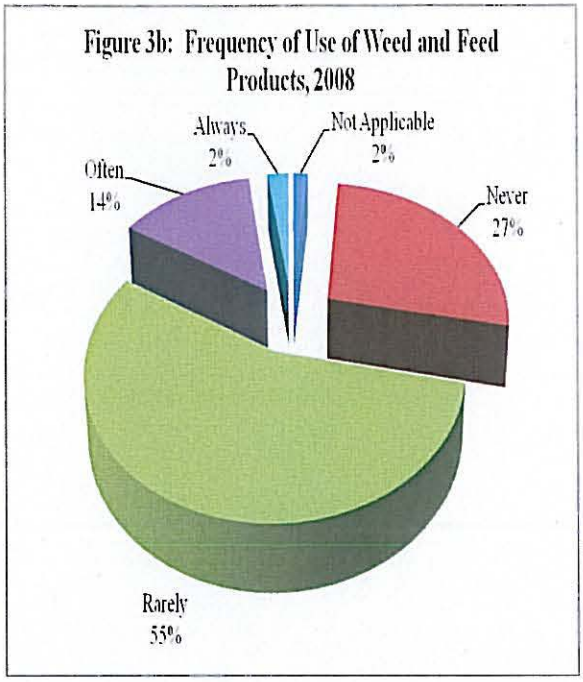




Figures 3a and 3b indicate that the proportion of north central Wisconsin residents who use weed and feed products (containing both fertilizers and herbicides) did not change significantly between 2008 and 2009. In both cases, about half the respondents said they rarely use these products and between one-quarter and one-third said they never use them. In both years, roughly 15% said they often or always use weed and feed products. In 2009, younger respondents (those under 45) were significantly less likely to use weed and feed products than were their older counterparts. Frequency of use also tended to increase as household income increased in 2009.

Table 4 summarizes four other landscaping practices about which respondents were asked in the 2008 and 2009 surveys. There were statistically significant differences in the pattern of responses with respect to how residents reported dealing with lawn clippings and leaves. In 2009, significantly more respondents than in 2008 said that dealing with lawn clippings was not applicable to their situation but fewer said they collect and compost them. Again, compared to

2008, more 2009 respondents said that leaf disposal was not applicable to them but fewer said they collect and take leaves off their own property.




| Table 4: Additional Landscaping Practices, North Central Wisconsin, 2009 and 2008 | | | | | | |
|---|---|---|---|---|---|---|
| Use Mulching Mower | Count | NA | Yes | No | Don't Know | |
| 2009 | 360 | 4% | 60% | 35% | 1% | |
| 2008 | 450 | 0% | 64% | 34% | 1% | |
| | | | | | | |
| Lawn Clippings | Count | NA | Compost | Leave on Lawn | Garbage | Other |
| 2009 | 343 | 6% | 18% | 71% | 2% | 2% |
| 2008 | 442 | 0% | 23% | 71% | 3% | 3% |
| | | | | | | |
| Leaf Disposal | Count | NA | Compost @ Home | Compost Off-Site | Take Off Property | Other |
| 2009 | 344 | 10% | 34% | 33% | 14% | 9% |
| 2008 | 441 | 4% | 37% | 34% | 19% | 6% |
| | | | | | | |
| Pet Wastes | Count | NA | Compost | Leave on Ground | Flush/Trash | Other |
| 2009 | 348 | 48% | 9% | 10% | 30% | 3% |
| 2008 | 443 | 49% | 8% | 9% | 32% | 2% |

Of the half of the sample who had pets, about 60% dispose of pet waste by putting it in the garbage or by flushing it down the toilet. Nearly one-in-five leave their pet waste on the ground.

There were relatively **few differences in the landscape management practices of residents in north central Wisconsin between 2008 and 2009**.

Our summary from 2008 remains true: "Residents of Central Wisconsin generally live on lots that contain 50 percent or more green space, about half of which is in lawn. **They rarely use a soil test to determine fertilizer needs** but appear to apply fertilizer relatively infrequently and rarely use weed and feed products. **Most residents appear to handle grass clippings, leaves, and pet waste in environmentally sensitive ways."**

## Vehicle Maintenance

A second set of residents' practices that might affect the quantity and quality of water entering the stormwater system are associated with vehicle maintenance. Table 5 summarizes the results for the 2008 and 2009 surveys with respect to three vehicle maintenance practices. There were no significant changes in where north central Wisconsin residents tend to wash their vehicles, where they reported car-wash water went, or where they dispose of their used motor oil. In both years, about two-thirds of the respondents said they took their vehicles off-site to a car wash, about half said that water used to wash cars at home flowed to the gutter, and two-thirds had their oil changes done at an auto center.

**Table 5: Vehicle Maintenance Practices**

| Where do you usually wash your vehicle? | Count | NA | On Own Property | Car Wash | |
|---|---|---|---|---|---|
| 2009 | 341 | 6% | 29% | 63% | |
| 2008 | 441 | 3% | 30% | 67% | |
| | | | | | |
| Where does water used to wash cars on property go? | Count | NA | To Gutter | Green Space | Other |
| 2009 | 346 | 40% | 47% | 10% | 3% |
| 2008 | 431 | 35% | 49% | 15% | 2% |
| | | | | | |
| Where do you usually dispose of used motor oil? | Count | NA | Own Property | Recycle | Have Done at Auto Center |
| 2009 | 339 | 6% | 1% | 21% | 69% |
| 2008 | 448 | 6% | 0% | 25% | 68% |

Women and men have distinctly different response patterns with respect to the questions posed in Table 5. Men are significantly more likely to report washing their vehicle on their own property (36% of men compared to 19% of women), report that wash water drains to the gutter (54% for men vs. 33% for women), and to say they take used motor oil to a recycling center (30% for men vs. 8% for women). Women were more likely to say they take their car to an auto service center to have their oil changed (82% for women vs. 61% for men).

Renters and owners also have different patterns of responses with respect to vehicle maintenance. Owners are more likely to wash their vehicle on their property (33% for owners vs. 15% for renters), to say wash water flows to a gutter (50% for owners vs. 33% for renters), and to report taking used motor oil to a recycling center (23% for owners vs. 15% for renters).

**Residents of north central Wisconsin report vehicle maintenance practices that are, largely, environmentally sensitive.** Most wash their cars at a car wash and take their car to an auto center for oil changes or recycle used oil.

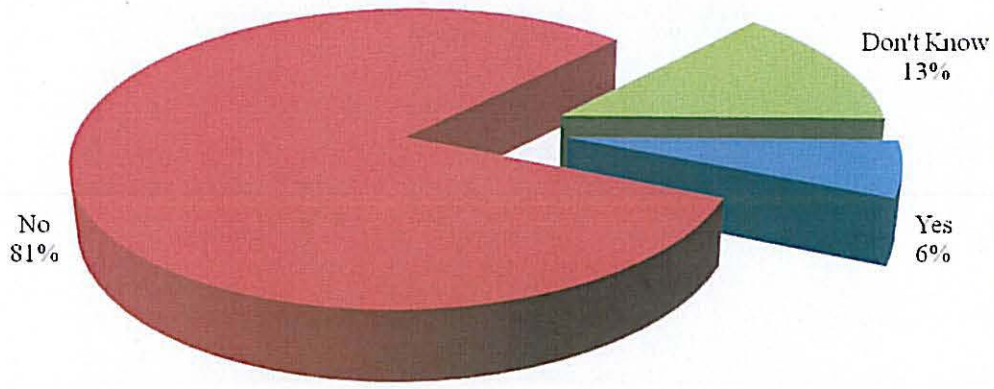
**Men and home-owners** are more likely to report washing cars on their property, allowing wash water to drain to gutters and recycling their oil. These groups **might be targets for an educational campaign to encourage them, when they wash their cars on their own property, to have their wash water drain to green space.**

## Familiarity with North Central Wisconsin Stormwater Coalition

In the 2009 survey only, respondents were asked if they were familiar with the work of the North Central Wisconsin Stormwater Coalition. Figure 4 indicates that relatively few (6%) of the respondents were familiar with the Coalition.

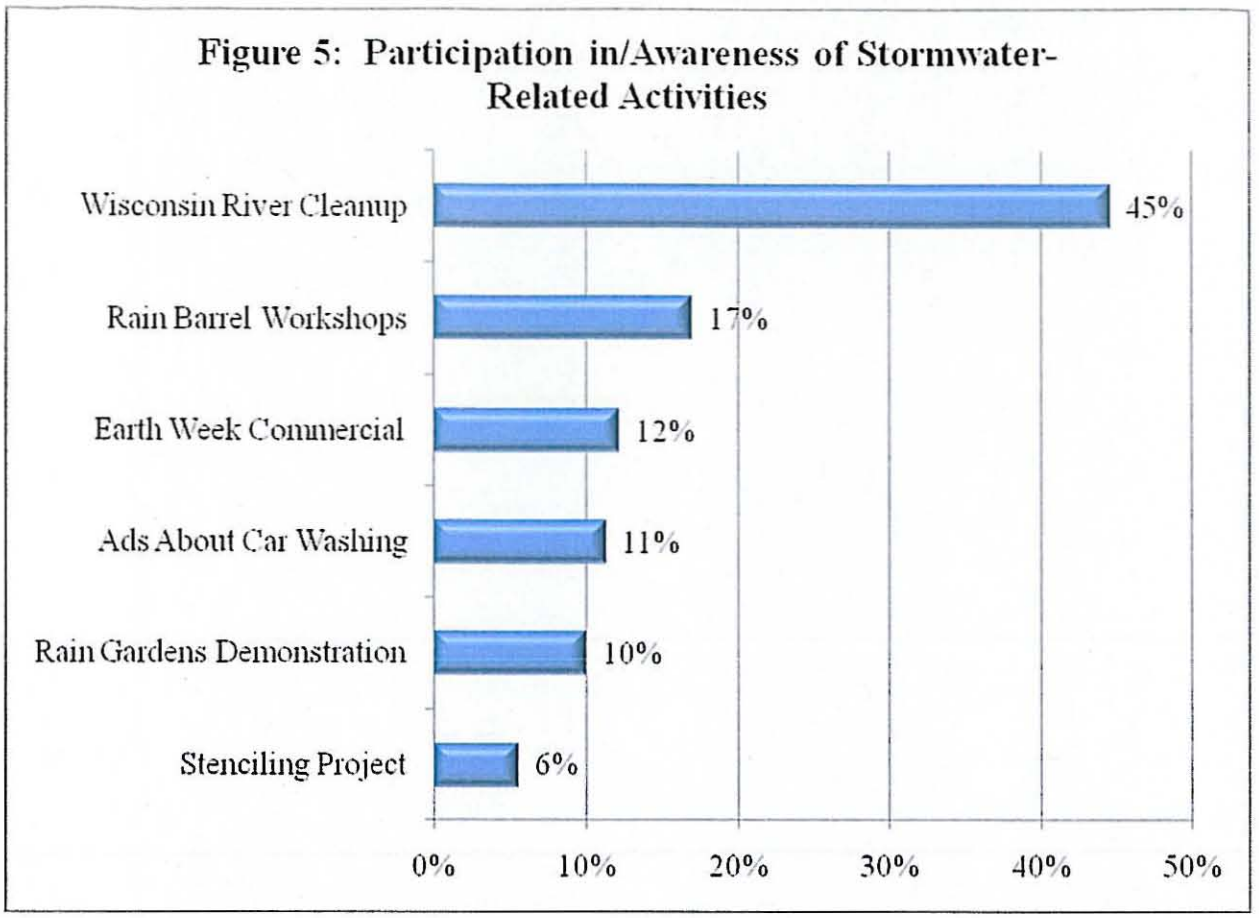
- Women are significantly more likely to say they aren't sure if they know about the Coalition (22% of women vs. 9% of men).
- Familiarity is higher among those in the 35 to 54 age groups than in younger or older groups.
- Familiarity with the Coalition peaks at 13% in households with incomes of between $50,000 and $74,999.

**Figure 4: I Am Familiar with North Central Wisconsin Stormwater Coalition**




Clearly, the North Central Wisconsin Stormwater Coalition has a ways to go in terms of name recognition.

Participants were also asked if they had participated in or were aware of a number of stormwater-related activities. The percentages who said they had participated in or were aware of these activities are summarized in Figure 5. Nearly half the respondents were aware of the Wisconsin River Cleanup activity but fewer than one in five were aware of any of the other activities about which we asked.




There are relatively few differences in participation in/awareness of the stormwater-related activities listed in Figure 5 across demographic groups. Those with more formal education tended to be more aware of the rain barrel workshops, the rain garden demonstration, the storm drain stenciling project, and the Wisconsin River Cleanup initiative. Compared to renters, homeowners were more aware of the rain barrel demonstration program and the Wisconsin River cleanup.

The North Central Wisconsin Stormwater Coalition has not achieved widespread name recognition in the region surveyed. Other than the Wisconsin River cleanup initiative, fewer than one in five residents were aware of/participated in stormwater-related programs offered by the Coalition.

## Conclusions

The results of the 2009 North Central Wisconsin Stormwater Coalition Survey aligned very closely with those of the 2008 survey. This can be viewed as a "good news/bad news story."

The "good news" part of these results are:

- The consistency across these two years provides additional confidence that we have accurately captured the knowledge level and practices of people in north central Wisconsin relative to stormwater issues.
- The level of factual knowledge about stormwater issues in north central Wisconsin is fairly high but there is room for additional educational efforts with respect to the negative impacts of stormwater run-off on hot summer days, where stormwater run-off drains, and the impact of impermeable surfaces in urban areas on the volume of stormwater run-off.
- Most respondents appear to use lawn fertilizers and herbicides in moderation and dispose of leaves, grass clippings, and pet waste in environmentally sensitive ways.
- Most residents also appear to behave in ways that are likely to minimize their environmental impact with respect to washing their cars and disposing of waste motor oil.

The "bad news" portion of the results include:

- The probability that the results reported somewhat overstate the level of knowledge of north central Wisconsin residents because of concerns about non-response bias and the fact that men (who were more likely to correctly answer the factual questions) are over-represented in both the 2009 and 2008 samples. Educational efforts aimed at women are called for.
- Educational efforts have not changed behavior with respect to where respondents allow water that is used to wash cars at home to drain. Ignoring the percentage of respondents who said that washing cars on their property was not applicable to them, the vast majority said they allow water to drain to the gutter rather than onto green space.
- Relatively few respondents said they were aware of the North Central Wisconsin Stormwater Coalition. Women and those under 35 years of age or older than 55 were particularly unaware of Coalition.
- With the exception of the Wisconsin River cleanup effort, few respondents were aware of/participants in any of the Coalition's educational programs.

## Appendix A – Non-Response Bias Test

Any survey has to be concerned with "non-response bias." Non-response bias refers to a situation in which people who don't return a questionnaire have opinions that are systematically different from the opinions of those who return their surveys. For example, Question 1 of the survey asked the respondent where stormwater in their community drains with possible answers of "a lake or stream," "a waste water treatment plant," or "don't know." Suppose, a majority of non-respondents don't know the answer to this question whereas most of those who returned their questionnaire correctly said it drains to a lake or stream. In this case, non-response bias would exist and the raw results would overstate the amount of knowledge residents of north central Wisconsin have about the ultimate destination of their stormwater.

The standard way to test for non-response bias is to compare the responses of those who return the first mailing of a questionnaire to those who return the second mailing. Those who return the second questionnaire are, in effect, a sample of non-respondents (to the first mailing), and we assume that they are representative of that group. In this survey, 225 people responded to the first mailing and 145 responded to the second mailing.

**Table A1 – Statistically Significant Differences Between Responses of First and Second Mailings**

| Variable | Mean First Mailing | Mean Second Mailing | Statistical Significance |
|---|---|---|---|
| Q2 The amount of stormwater run-off per acre is much greater in a rural area than in a city or village. | 2.07 | 2.34 | .000 |
| Q4 Stormwater run-off on a hot summer day negatively impacts local water quality. | 2.11 | 2.29 | .036 |
| Q5 The impact of stormwater run-off on the amount of sediment in local rivers, streams and lakes is unimportant/minimal. | 1.98 | 2.16 | .002 |
| Q6 Stormwater carries plant nutrients (e.g. fertilizers) into local rivers, streams and lakes, which reduces dissolved oxygen level in the water. | 1.24 | 1.53 | .001 |
| Q7 Pesticides and other pollutants are removed from stormwater before it is released into rivers, streams or lakes. | 2.08 | 2.20 | .042 |
| Q26f. Have you participated in or are you aware of the Wisconsin River cleanup | 1.55 | 1.72 | .010 |
| Q33 Highest level of education | 2.81 | 2.29 | .000 |
| Q34 Household income level | 2.80 | 2.44 | .014 |

Of the 36 variables tested, 8 were statistically significant at the 5 percent level and these are shown in Table A1. Five of the eight differences were in the portion of the survey testing respondents' factual understanding of stormwater (questions 1 – 8). In all of the questions showing a statistically significant difference, respondents to the second mailing were more likely to say they don't know the answer (Table A2). Comparing the responses of those who answered something other than "don't know" to questions 2, 4, 5, 6, and 7, the pattern for mail 1 and mail 2 are quite similar. For example, 84% of the mail 1 respondents who answered something other than "don't know" correctly said that it is not true that there is more stormwater run-off per acre

in rural areas than in a city or village (question 2). Eight-one percent of the mail 2 respondents who answered something other than "don't know" also got question 2 correct.

| Table A2 – Percent Respondents Who Said They "Don't Know" | | |
|---|---|---|
| **Variable** | **First Mailing % Don't Know** | **Second Mailing % Don't Know** |
| Q2 The amount of stormwater run-off per acre is much greater in a rural area than in a city or village. | 20% | 44% |
| Q4 Stormwater run-off on a hot summer day negatively impacts local water quality. | 37% | 50% |
| Q5 The impact of stormwater run-off on the amount of sediment in local rivers, streams and lakes is unimportant/minimal. | 10% | 25% |
| Q6 Stormwater carries plant nutrients (e.g. fertilizers) into local rivers, streams and lakes, which reduces dissolved oxygen level in the water. | 10% | 24% |
| Q7 Pesticides and other pollutants are removed from stormwater before it is released into rivers, streams or lakes. | 18% | 29% |

With respect to question 26f, the major difference is in the percentages who said they had participated or were aware of the Wisconsin River clean-up project (49% for mail 1 vs. 38% for mail 2), but there was also a substantial difference in the "didn't know" percentages (3% of mail 1 vs. 10% of mail 2).

Finally, respondents in mail 1 were somewhat more highly educated and earned somewhat higher incomes than mail 2 respondents.

- only 22 percent of mail 1 respondents said they had a high school diploma or less compared to 35 percent for mail 2
- 45 percent of mail 1 respondents earned less than $50,000 per year compared to 55 percent for mail 2.

The SRC is concerned that there is evidence of non-response bias in the battery of knowledge-based questions shown in Table A2. As noted, the second set of respondents were much more likely to say they didn't know the correct answer to these questions. This suggests that for this set of questions, the results of this survey may slightly overstate the true level of understanding of the stormwater issues covered in questions 2, 4, 5, 6, and 7.

## Appendix B – North Central Stormwater Survey Written Comments

**Question 13 When I cut the lawn, the clippings are usually (other):**

- Bagged and taken to yard waste site
- Land site
- Yard waste site

**Question 14 What do you currently do with your leaves (other)?:**

- Cut up with lawn mower go back in soil
- Leave on ground
- Leave on ground
- Let them lie where they are
- No trees no leaves
- Run over with mower

**Question 15 What do you usually do with pet waste (other)?**

- Dispose in woodlot
- Farm field
- No pets

**Question 16 My yard/lawn is mostly maintained by (other)?**

None

**Question 19 When you wash your vehicles, do you usually (other)?**

- Don't wash

**Question 20 If you wash vehicles on your property, does the water (other)?**

- Drain to road
- Dries on drive
- On driveway

**Question 21 When you change the oil in your car, do you (other)?**

- Garbage pick up and recycle
- Oil furnace
- Recycle pick-up

**Question 22 Drain spouts from your roofs mostly drain onto (other)?**

- Rain barrels

**Question 29 Housing (other)?**

- Live with family

**Question 24 What sorts of things are acceptable to allow to run down a storm drain?**

**Stormwater (97 responses)**

- Rain/Stormwater **(78x)**
- Rain/Stormwater Only**(16x)**
- Clean Rain/Stormwater **(2x)**
- Hail
- Sleet

- **Water (78 responses)**
- Water (45x)
- Water Only (13x)
- Clean Water (7x)
- Sprinkler Water (6x)
- Water Run-off (2x)
- All natural things like water
- City water
- Runoff from surface water on streets and sidewalks
- Water filtered by a rain garden or green space
- Well water

**Snowmelt (25 responses)**

- Snowmelt (17x)
- Snow (4x)
- Ice/Snow Melt (3x)
- Ice melting

**Leaves, Grass, etc. (23 responses)**

- Leaves **(10x)**
- Grass **(5x)**
- Biodegradable leaves
- Biodegradables
- Keep all to minimum-Leaves only
- Natural vegetation
- Organic material
- Pine needles from wild trees
- Possibly a mixture of leaves and twigs
- Small sticks

**Don't Know (9 responses)**

- Don't Know **(7x)**
- Not sure
- Unknown

**Not Applicable (8 responses)**

- Do not have storm drains **(4x)**
- Not Applicable **(4x)**

**Miscellaneous (7 responses)**

- Debris from roadway--town of Rib Mt. does not currently sweep our streets
- Gutter drains
- I am not sure, I new to this area so I do not know much about it."
- Just what is on the street
- Most city sorts a storm drain
- Only rain and products of creatures in the wild
- Rodents that are alive

**Nothing (5 responses)**

- Nothing **(4x)**
- None

**Things NOT to allow (4 responses)**

- No soaps, fertilizers, etc
- Not wash water from washing clothes, cars, or dishes
- Nothing toxic like car washing water, etc.
- As little as possible, leaves and grass clippings clog sewers. Anything else drains to the Wisconsin River.

**Sand and Dirt (2 responses)**

- Dirt
- Sand

## Appendix C: Quantitative Summary of Responses by Question

NORTH CENTRAL WISCONSIN STORMWATER COALITION SURVEY

**The following questions ask about stormwater in your local community.**

| | A lake or stream | The waste water treatment plant | I don't know |
|---|---|---|---|
| 1. Stormwater in my local community drains to: | 50% | 16% | 34% |

**For each of the following statements, please indicate if you agree, disagree or don't know.**

| | Yes, I agree | No, I disagree | I don't know |
|---|---|---|---|
| 2. The amount of stormwater run-off per acre is much greater in a rural area than in a city or village. | 12% | 59% | 29% |
| 3. Drain spouts from roofs should flow onto hard surfaces rather than green spaces (lawn, garden, undeveloped). | 14% | 73% | 13% |
| 4. Stormwater run-off on a hot summer day negatively impacts local water quality. | 24% | 34% | 42% |
| 5. The impact of stormwater run-off on the amount of sediment in local rivers, streams and lakes is unimportant/minimal. | 11% | 74% | 16% |
| 6. Stormwater carries plant nutrients (e.g. fertilizers) into local rivers, streams and lakes, which reduces dissolved oxygen level in the water. | 80% | 4% | 16% |
| 7. Pesticides and other pollutants are removed from stormwater before it is released into rivers, streams or lakes. | 9% | 69% | 22% |
| 8. My local community currently has stormwater quality requirements. | 26% | 10% | 64% |

**Questions 9 – 22 ask about activities around your residence. NA = Not Applicable**

| | NA | Yes | No | Don't know |
|---|---|---|---|---|
| 9. Do you use a soil test to determine fertilizer needs for your lawn? | 10% | 9% | 79% | 3% |
| 10. Do you use a mulching lawn mower to cut your lawn? | 4% | 60% | 35% | 1% |

| | NA | Never | 1 – 2 | 3 – 4 | 5+ |
|---|---|---|---|---|---|
| 11. How often do you apply fertilizer to your lawn each growing season? | 6% | 34% | 46% | 13% | 1% |

| | NA | Never | Rarely | Often | Always |
|---|---|---|---|---|---|
| 12. How often do you use "weed and feed" products (contain herbicide & fertilizer)? | 5% | 32% | 51% | 11% | 2% |

| | NA | Collect & Compost | Left on Lawn | Bagged - Garbage/ Swept to Gutter | Other _____ |
|---|---|---|---|---|---|
| 13. When I cut the lawn, the clippings are usually: | 6% | 18% | 71% | 2% | 2% |

| | NA | Collect & compost on own property | Collect for pick-up & compost off site | Collect and take off own property | Other _____ |
|---|---|---|---|---|---|
| 14. What do you currently do with your leaves | 10% | 34% | 33% | 14% | 9% |

| | NA | Collect & Compost | Leave on Ground | Put in Garbage or Toilet | Other _____ |
|---|---|---|---|---|---|
| 15. What do you usually do with pet waste? | 48% | 9% | 10% | 30% | 3% |

| | NA | Myself | A hired person | A company | Other _____ |
|---|---|---|---|---|---|
| 16. My yard/lawn is mostly maintained by: | 3% | 88% | 4% | 3% | 2% |

| | NA | 0 – 25% | 26-50% | 51-75% | 76+% |
|---|---|---|---|---|---|
| 17. Approximately what percentage of your house lot is green space (lawn, garden, undeveloped)? | 5% | 10% | 21% | 41% | 24% |
| 18. Of the green space (lawn, garden, undeveloped), approximately what percentage of your lot is lawn? | 5% | 20% | 29% | 29% | 18% |

| | NA | Wash on own property | Take to car wash | Other _____ |
|---|---|---|---|---|
| 19. When you wash your vehicles, do you usually: | 6% | 29% | 63% | 1% |

| | NA | Drain to lawn/ green space | Drain to gutter | Other _____ |
|---|---|---|---|---|
| 20. If you wash vehicles on your own property, does the water: | 40% | 47% | 10% | 3% |

| | NA | Dispose oil on own prop. | Take oil to recycling center | Have it done at auto service center | Other _____ |
|---|---|---|---|---|---|
| 21. When you change the oil in your car, do you: | 6% | 1% | 21% | 69% | 3% |

| | NA | Hard surface & street gutter | Hard surface & green space | Green space | Other _____ |
|---|---|---|---|---|---|
| 22. Drain spouts from your roofs mostly drain onto: | 7% | 4% | 26% | 62% | 1% |

| | Yes | No | Don't Know |
|---|---|---|---|
| 23. Is there a stormwater drain on your street? | 48% | 41% | 12% |

24. What sorts of things are acceptable to allow to run down a storm drain?

**See appendix B**

| | Yes | No | Don't Know |
|---|---|---|---|
| 25. I am familiar with the work of the North Central Wisconsin Stormwater Coalition. | 6% | 81% | 13% |

26. Have you participated in or are you aware of the following activities?

| | Yes | No | Don't Know |
|---|---|---|---|
| a. Earth Week commercial about car washing and storm drains | 12% | 78% | 9% |
| b. Advertisement about car washing (movie theater and billboards) | 11% | 79% | 9% |
| c. Demonstration rain gardens in area communities | 10% | 81% | 9% |
| d. Build a rain barrel workshops | 17% | 76% | 7% |
| e. Storm drain stenciling projects | 6% | 84% | 11% |
| f. Wisconsin River Cleanup | 45% | 49% | 6% |

Finally, we'd like you to tell us a bit about yourself. Your answers are voluntary and will be confidential. Your name will never be linked to your responses

| 27. **Gender** | Male | Female |
|---|---|---|
| | 68% | 32% |

| 28. **Age** | 18-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65+ |
|---|---|---|---|---|---|---|
| | 1% | 7% | 13% | 20% | 24% | 35% |

| 29. **Housing** | Own | Rent | Other |
|---|---|---|---|
| | 85% | 14% | 1% |

**See Appendix B**

30. **Your zip code?** **See Appendix B**

| 31. **Children under 18 in home** | 0 | 1 | 2 | 3+ |
|---|---|---|---|---|
| | 76% | 9% | 10% | 5% |

32. **The name of your community** **See Appendix B**

| 33. **Highest Level of Education** | High school or less | Some college/tech | 2-year degree | 4-year degree | Grad or professional degree |
|---|---|---|---|---|---|
| | 27% | 29% | 12% | 18% | 13% |

| 34. **Household Income Range** | Under $25,000 | $25 - $49,999 | $50 - $74,999 | $75 - $99,999 | $100,000+ |
|---|---|---|---|---|---|
| | 20% | 28% | 26% | 15% | 11% |