Your Water - Your Future

A Residential Household Survey to Assess Our Water Future

A Report on the Community Survey

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Source: http://geebart.com/art/photography/images-of-lake-bloomington

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Introduction: Planning for the Future of the Lake Bloomington and Evergreen Lake Watersheds

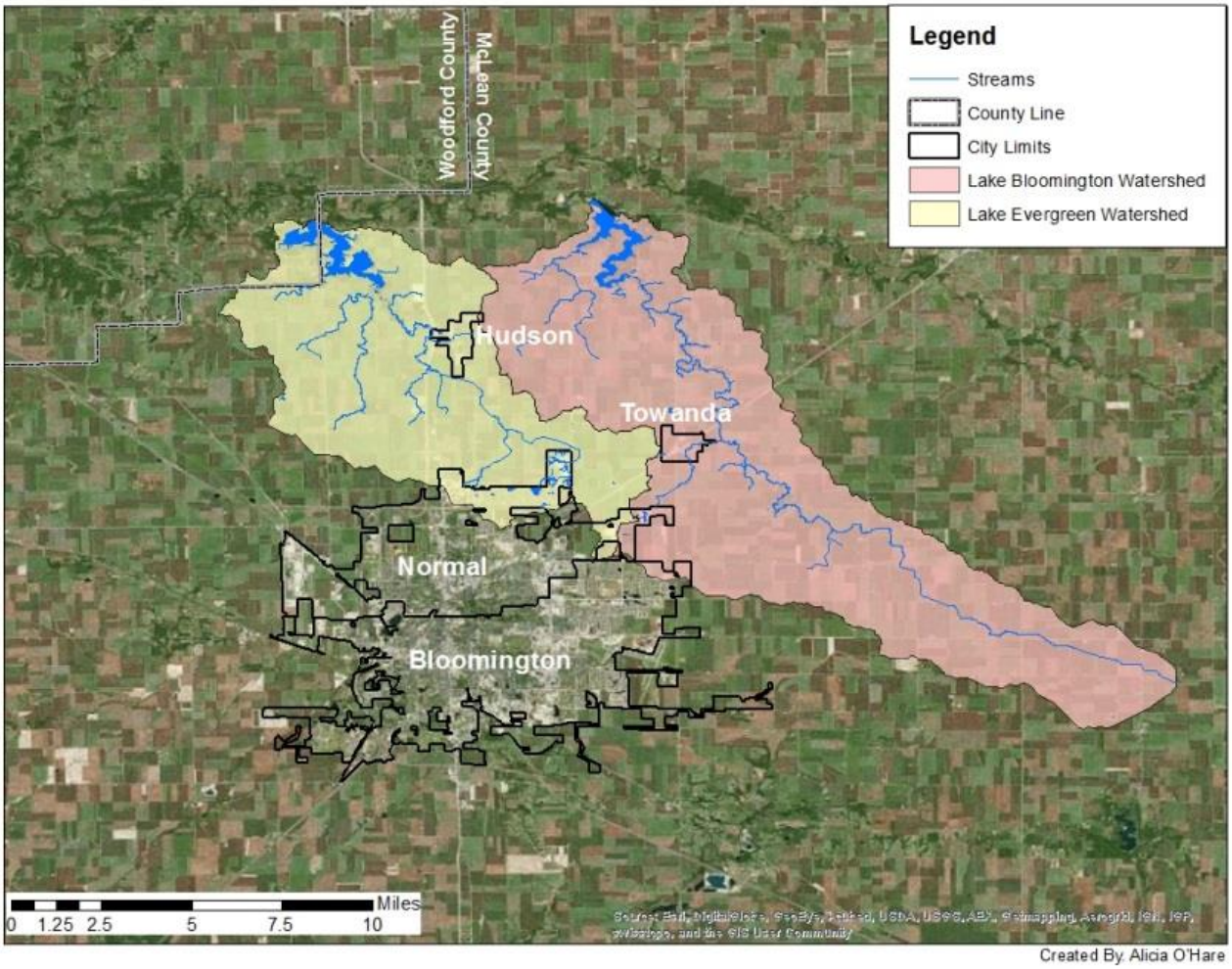
Since the initial development of water resources in the Bloomington-Normal area, urbanization has continued to expand into the predominantly agricultural landscape within the watershed. For example, between 1989 and 2005, development within the Town of Normal has changed almost 1000 acres from agricultural to urban residential land use in the upper reaches of Six Mile Creek. The Town of Normal's comprehensive plan estimates that another 1,400 acres of the Evergreen Lake watershed could be urbanized in the next 20 years (Evergreen Lake Watershed Management Plan 2008). Similarly, the population of McLean County is estimated to have increased by 2.6% between 2010 and 2014. The City of Bloomington population has grown by 2.8% and the Town of Normal population has grown by 3.9% during that same time period (United States Census). The Town of Normal has doubled the amount of residential acreage between 1970 and 2015, from 3 to 6 square miles (Town of Normal 2015). This trend is mirrored in similar changes at the state scale. For example, the amount of farmland in Illinois has declined by 10% since 1950. The Northeastern Illinois Planning Commission estimates that between 1970 and 1990 the amount of urbanized land in the Chicago area expanded by 51%--a net land consumption over the two decades of more than 360,000 acres (Illinois Department of Natural Resources, https://dnr.state.il.us/orep/ctap/sumrepo/chap8/chap8t.htm). This continued expansion of residential development impacts water quality and quantity in many ways, including raising concerns about the availability of water for the future. Yet, much of the current research on non-point source pollution continues to focus on agricultural producers as the primary source, with very little emphasis on the impacts from the growing residential populations.

To address these issues the Mclean County Soil and Water Conservation District, in collaboration with Illinois State University, has submitted and received a Section 319(h) of the Clean Water Act funding from the Illinois Environmental Protection Agency (Illinois EPA) to conduct a watershed social assessment, with an emphasis on the Lake Bloomington and Evergreen Lake Watersheds. Water supply and water quality are critically important issues for both human health and the health of the natural environment we depend on to meet our basic needs. Despite the importance of water to our society, pollution and poor planning for how we use our water resources are growing problems. To address these issues the United States EPA and the Illinois EPA provide funding for plans to protect these resources at the watershed scale. Efforts to plan for water use and protect water quality in watershed plans must incorporate social science to be successful, as it is people's understandings and behaviors that must change to protect our water resources.

The water resources that are the focus of this project are found in the Lake Bloomington and the Evergreen Lake Watersheds, which are located in the central part of McLean County, Illinois. The Lake Bloomington watershed consists of 43,100 acres, and its central water feature is the 572-acre Lake Bloomington. Lake Bloomington was constructed in 1929 by the impoundment of Money Creek, and it serves as the primary drinking water supply reservoir for 80,000 residents within the City of Bloomington and several surrounding townships. In an effort to fully utilize the lake's potential for public benefits, recreation and residential development were established as well on the lake, and today the lake has approximately 190 residential structures on or adjacent to its shoreline (Lake Bloomington Management Plan 2008). Immediately adjacent to the Lake Bloomington watershed is the Evergreen Lake watershed. The central feature in this watershed is Evergreen Lake, which was constructed in 1971 as a supplemental water reservoir for the City of Bloomington through the impoundment of Six Mile Creek. The Evergreen Lake watershed encompasses 25,730 acres within McLean and Woodford Counties. Evergreen Lake was also constructed as a water source for the City of Bloomington, but has been maintained as a purely recreational body of water with no housing development directly adjacent to the lake managed by McLean County Parks and Recreation (MCPR).

The first step in the current research process was a qualitative assessment of current perceptions, concerns, and desires for water resources in and around the watersheds by interviewing key stakeholders that provided the foundation for other data collection. This assessment was conducted by Graduate Students at the Stevenson Center for Community and Economic Development between August and December, 2014. The attached report documents the initial findings from this process. These data were used to develop a residential household survey administered to a random selection of households in Bloomington, Normal, Hudson, and Towanda during May and June, 2015.

Figure 1 Lake Bloomington and Evergreen Lake Watersheds



Through consultation with the McLean County Soil and Water Conservation District and the City of Bloomington, and a review of relevant social science research, goals for the research were created, and further discussions with members of the project team identified specific uses for the information collected. The social science research was conducted to examine social factors relevant to efforts to maintain water quality, and the findings provide information for use in the update of the watershed plan and the design and delivery of education and outreach programs.

The survey project was designed to:

1) *Evaluate urban resident's general level of knowledge and concerns of water quality*
2) *Identify the effects residents' activities have on water quality and the practices they currently use that effect water quality (BMPs)*
3) *Evaluate onsite waste system knowledge and practice*
4) *Evaluate knowledge of and opinions of water conservation activities on water quality and quantity*
5) *Provide critical data to direct future outreach and education efforts*

Research Methods

A self-administered questionnaire survey was administered to residential homeowners in the City of Bloomington, North Normal (the geographic area identified as being in the Evergreen Lake watershed), the Village of Hudson, the Village of Towanda, and residents on Lake Bloomington. A scientifically random sample was drawn for each study site from a listing of all residential water utility records. A total sample of 1,000 residential households was drawn, with stratification based on overall population size of each study site. To best address the objectives of the research, the sample was drawn with the following parameters:

1. Oversampling of the residential populations that are within the watershed boundaries. This includes the Village of Hudson, Village of Towanda, households on Lake Bloomington, and the northern edge of the Town of Normal and the City of Bloomington.
2. An additional small sample from the rest of the City of Bloomington residents, which are the end users of the water supply from Lake Bloomington and Lake Evergreen.
3. No sampling from the broader population within the Town of Normal was drawn, as they are outside the watershed boundary and they get their residential water supply from a separate well. However, the survey was made available via a web-based interface for anyone who learned of the project and wished to participate. We were able to keep the data from the scientifically drawn sample separate from those who self-selected to participate in the web-based survey through the use of a distinct access code for those who self-selected to participate on-line.
4. Sample size was based on the total population of residential households that received a water utility billing.

Due to bad addresses or undeliverable surveys (vacant homes, construction, etc.), the final sample size was reduced to 939 households.

The survey was administered using a drop-off pick up methodology. This methodology involves delivering each questionnaire in person to the household address that was selected for the sample. Personal contact is made with an adult age 18 or over in the household and the project is presented to them, and they are asked to participate by completing the questionnaire. Respondents who agree to participate are instructed to complete the survey within 24 hours, place it in the envelope provided, and then hang it on their front door using the plastic bag that is also provided. Survey administrators return in 24 hours to retrieve the completed survey. If the survey is not hanging on the door, a reminder postcard is left asking them to complete the survey so it can be picked up the next day at that same time. The personal contact with each household resident and the ability to personally explain the study increases participation, as compared to the more traditional mail surveys. In addition, the specific time frame, along with the ease of placing the survey on the front door for pick-up (and not having to interrupt the resident a second time) has been shown to increase overall response rates, as compared to more traditional self-administered survey methodologies (Steele, Bourke, Luloff, Liao, Theodori, and Krannich 2001).

A small proportion of the residential addresses of potential respondents from the original sample frame were determined to be "undeliverable" due to inaccuracies in town records, vacant lots/homes, or houses still under construction. In order to maintain our original sample size, the undeliverable surveys were replaced and the same drop-off/pick-up methodology was implemented to deliver these surveys. After the survey administration time frame was complete, there were still a small percentage of residential addresses that were undeliverable. Rather than repeating the process and holding up data collection, the original sample went from 1,000 to 939. Of the 939 questionnaires delivered to valid addresses, 550 were completed and returned for an overall response rate of 58.57%. Please see table 1 for data describing the sample and the response rates in each community.

Table 1 Sampled Communities, Size of Population, And Samples Drawn From Each

Community	Water Utility Customers	Sampled Population	Response Rate
Towanda	243	81	66.67%
Hudson	677	135	74.81%
Lake Bloomington	368	105	79.05%
Normal (watershed)*	2329	211	49.76%
Bloomington (watershed)*	229	98	57.14%
Bloomington (all)	30626	309	48.87%
TOTAL	**34472**	**939**	**58.57%**

*Source: City of Bloomington Water Utility. *Only a portion of the Town of Normal and City of Bloomington households lie within the watershed.*

Overall, respondents are reasonably representative of the general population on basic demographic characteristics, as indicated in Table 2. However, a few differences are visible. For example, respondents in our project are a bit more affluent with a higher median income and a higher education level (BS or more, age 25+). Our respondents also had a slightly higher rate of home ownership and were a bit skewed towards male and retirement age, compared to the general county population.

Table 2 McLean County American Community Survey Demographics vs. Survey Demographics.

	McLean Co - ACS	Survey Respondents
Male	48.6%	52.7%
Female	51.4%	43.3%
Education: High School Diploma or more (Age 25+)	94.4%	93.9%
Education: BS or more (Age 25+)	42.8%	57%
Median Income	$62,089	$75,000-$99,999
Homeownership Rate	67.3%	89.2%
Age: 18 and up	77.3%	100%
Age: 65 and up	10.2%	21.9%

Source: http://factfinder.census.gov/servlet

Analyses of the questionnaire data collected were conducted using Statistical Package for the Social Sciences (SPSS). Descriptive statistics, bivariate analyses, and multivariate procedures were used to examine the results and to identify important findings that can be applied to achieve the goals of the project to inform watershed planning and the design of effective outreach and education.

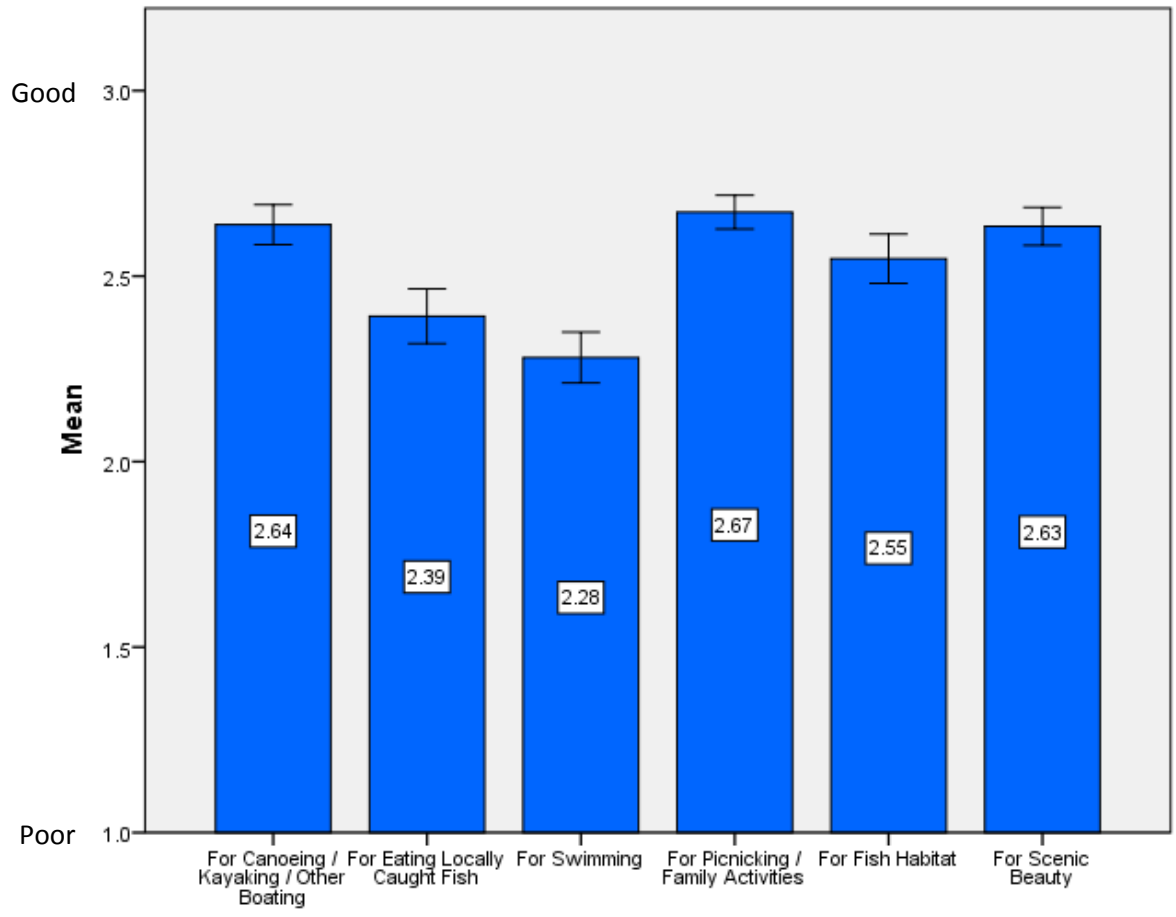
This report presents key findings from the survey of particular importance for the implementation of future outreach and education activities and updates to the Lake Bloomington and Evergreen Lake Watershed Management Plans through the use of tables, charts, and by highlighting the most important findings. Complete information about the responses to all questions in the survey is provided in the appendix to this document, which presents tables and charts giving the complete responses to each question in the questionnaire. A copy of the questionnaire used in the survey appears at the end of this report and as the last section of the appendix.

Findings

Perceptions of Water Quality Relative to Activities

In addition to meeting basic human needs for health and well-being, water is central to the community because it provides recreational opportunities for families, friends, and neighbors. Understanding how residents believe water quality impacts these activities provides a basic measure for water quality, because it demonstrates whether residents see the water as impaired to the point of affecting their leisure activities and overall quality of life. Respondents were asked to assess water quality in response to the most common recreational activities that occur within each watershed, and in particular on each body of water. Figure 2 show respondents' mean values for opinions on how water quality affects specific activities in the watershed.

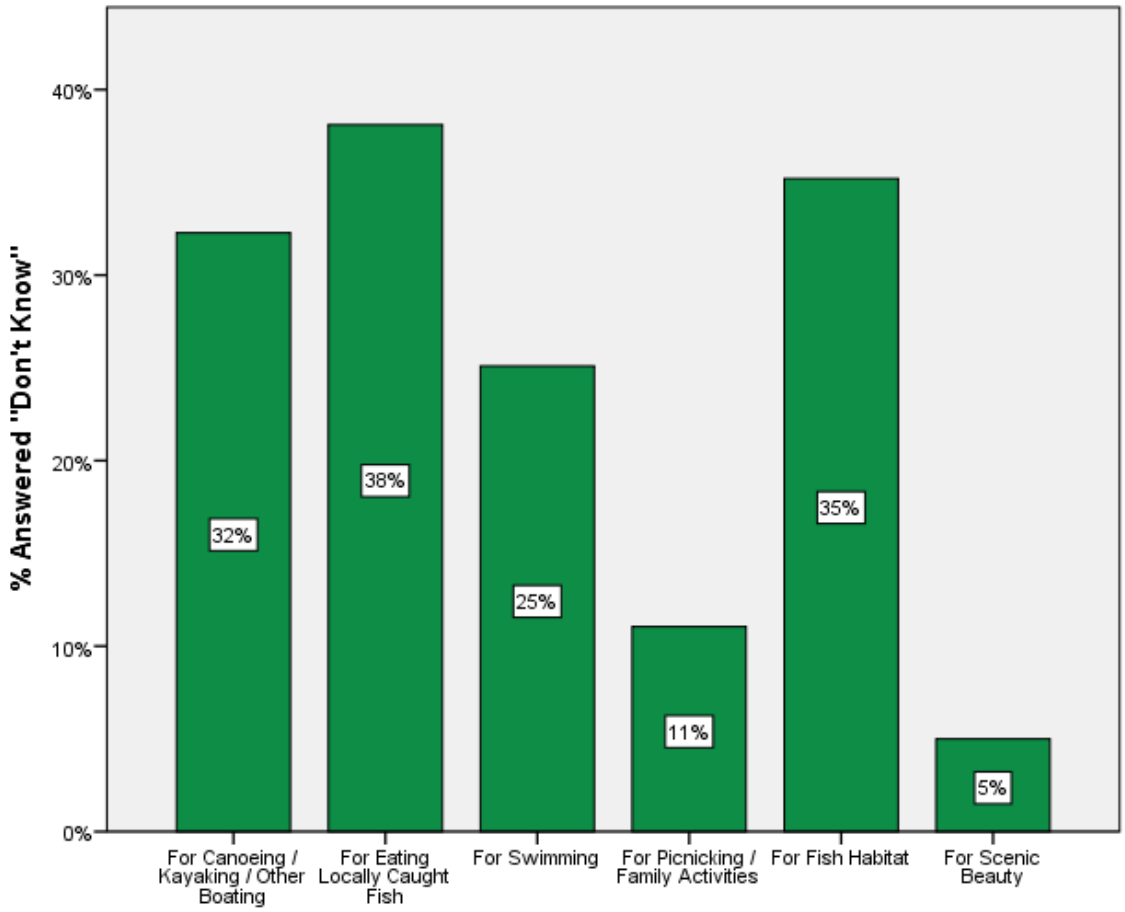
Figure 2: Respondents' Views on Water Quality for Particular Activities (1=Poor, 3=Good)



**Error Bars at 95% Confidence Interval*

Figure 3 shows the number of respondents who responded to a given item with "Don't Know," revealing the overall salience of these activities.

Figure 3: Respondents' Who Answered "Don't Know" for Water Quality for Particular Activities (1=Poor, 3=Good)



- Overall, water quality was rated lowest in relationship to swimming (see Figure 2). This could be reflective of the dearth of opportunities to do so at Lakes Bloomington and Evergreen, a claim supported by remarks some respondents made in the comments section of the survey. Lake Bloomington does not have any public beach, and Evergreen Lake has only one public beach, although it does not seem to be widely known or commonly used.
    - This lack of swimming opportunities could also contribute to the 25% of respondents that couldn't answer the question (see Figure 3). If there aren't many opportunities to swim, then respondents understandably cannot comment on the quality of it.
    - With a mean score of 2.28, though, it can still be said that the local waters are reasonably favorable for swimming.
- Figure 1 demonstrates that the highest water quality rating was for picnicking / family activities. However, it was not rated much higher than scenic beauty or boating, which had identical means.
    - What these three activities have in common is that they center on the aesthetic beauty of the lakes. All three having a mean over 2.5, indicating that opinions about water quality are positive.

- Water quality ratings for fish habitat and for eating locally caught fish were very similar, with mean scores at 2.55 or below. These two activities are directly related. They often promote more direct interaction with the lakes, which requires patrons to be actively engaged in a more consumptive recreation activity.

- In Figure 3, picnicking/family activities and scenic beauty were also the lowest in terms of "Don't Know" responses, which is likely due to their ease of accessibility and higher levels of use. Evergreen Lake, as part of Comlara County Park, has an abundance of camping and picnicking opportunities and these areas seem to be utilized on a consistent basis by local residents.
- Eating locally caught fish and fish habitat both scored the highest "Don't Know" responses. Nevertheless, data indicates that 62% of respondents do have sufficient knowledge to rate water quality relative to this activity. This may in part reflect the focus on fishing and fish habitat on the lakes, especially Lake Evergreen.

In general, residents perceive local water quality to be quite favorable for their favorite activities. Although swimming opportunities may be in more limited supply, the aesthetic beauty of the lakes is something that is widely valued.

Perceptions About Water Impairments

As part of the objective to improve non-point source (NPS) pollution management through the use of social indicators by clarifying the views held by members of the public, respondents were asked to rate how much of a problem common water pollutants and conditions were in their area. Using personal interviews with key stakeholders and the Social Indicators Planning and Evaluations System (SIPES) variable database, a list of the 10 most common pollutants or problematic conditions within the watershed was developed. The measurement of these variables provides valuable insights into local residents' awareness and perceptions about common pollutants that are related to water quality improvement and protection at a watershed scale.

Figure 4: Respondents' Views on Sources of Water Quality Impairments (1=Not a Problem, 4=Severe Problem)

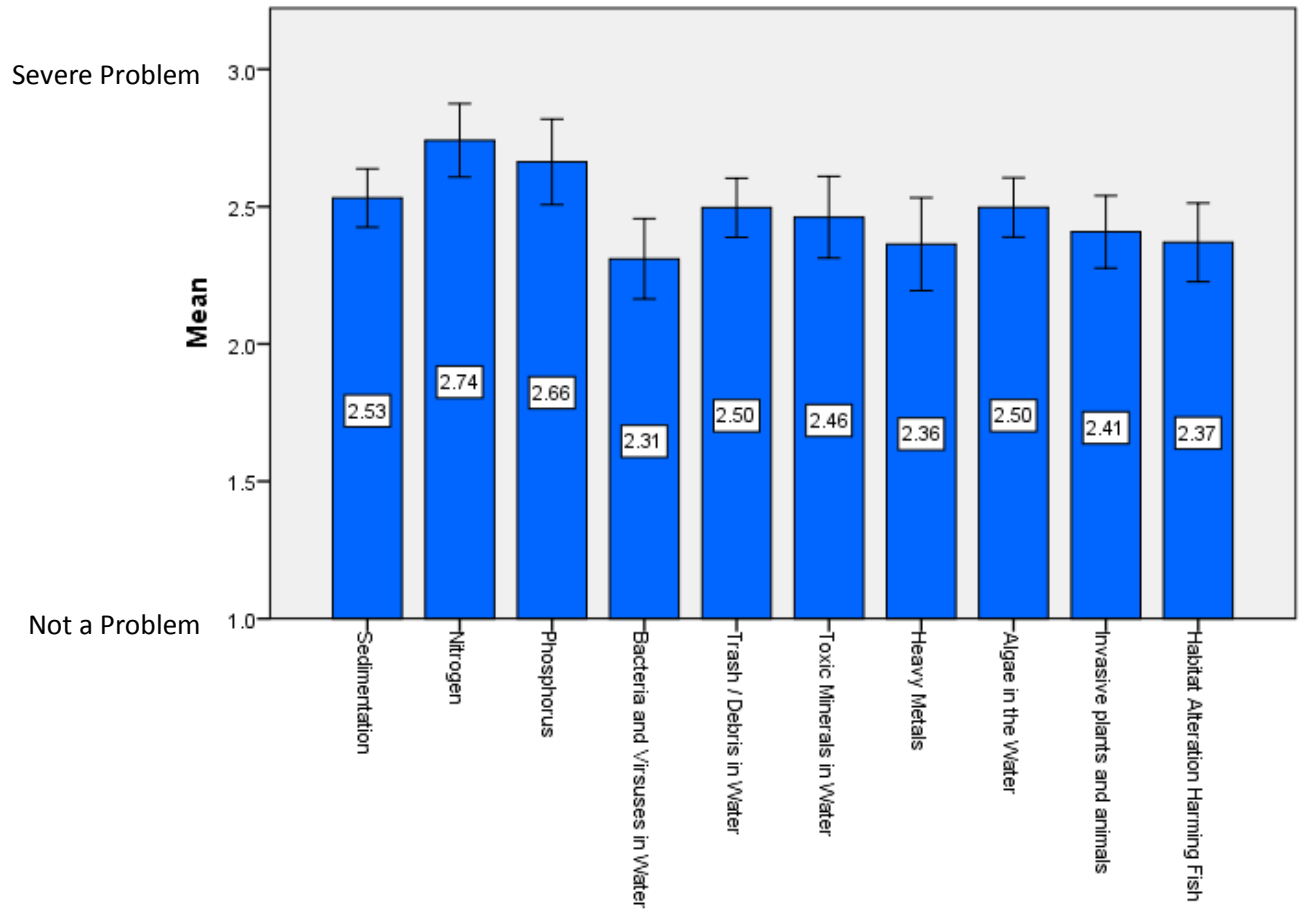


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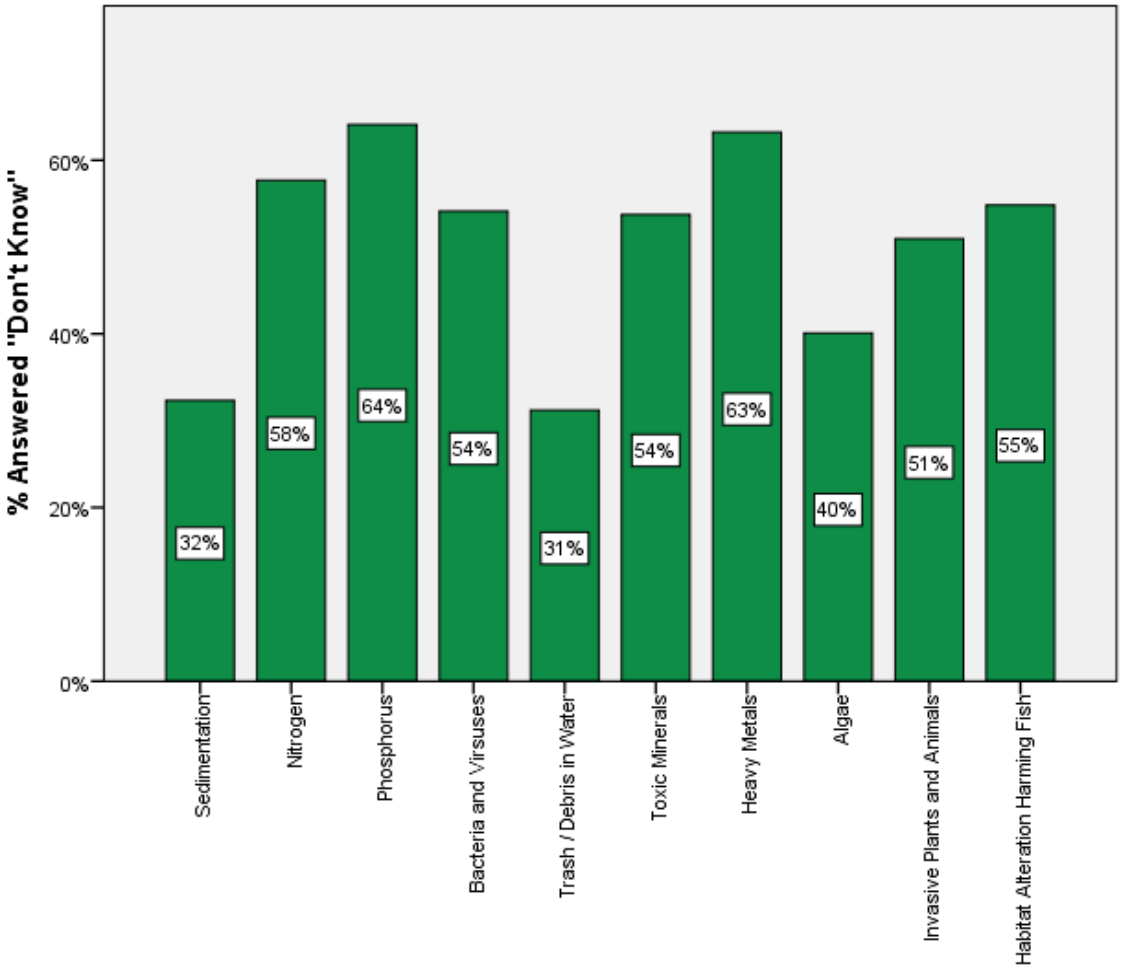
Figure 5: Respondents Who Indicated "Don't Know" On Particular Water Impairment Issues



- Figure 4 demonstrates that none of the 10 impairments had a mean score higher than 3.0 on a 1-4 point scale, indicating that none of these were seen as reaching a "Moderate Problem." In addition, it should be noted that there was relatively little variance in respondents' views on the different water quality impairments.
- The highest scoring impairments were nitrogen (2.74) and phosphorus (2.66).
    - Coincidentally, these were also two of the categories with the most "Don't Know" responses, in addition to heavy metals and habitat alteration (see Figure 5). This potentially throws some of the findings into question because they do not properly reflect the opinions of even a majority of the sample. For example, 58% of respondents indicated that they "don't know" if nitrogen was a problem, and 64% indicated that they 'don't know' if phosphorous was a problem.
        - Higher rates of 'don't know' for both nitrogen and phosphorous presents an opportunity to help residents more clearly connect their own lawn care practices to these specific pollutants, most notably phosphorous in lawn fertilizer products.
- The higher mean value for Nitrogen impairments may reflect a perception that 'farmers' are the problem. Excess nitrogen is often associated with agriculture, and this was reflected in the qualitative

data from the first phase of the project (ie: focus groups, key informant interviews). However, it is important to note that the qualitative interviews are not representative of the larger watershed population and therefore it is not possible to make any broader assumptions with this data.

- Bacteria and viruses, heavy metals, and habitat alteration involving fish scored on average lower than the rest in terms of being a problem. These mean values were closer to 2, indicating perceptions of these impairments being only a "slight problem."
- In addition, non-visible impairments, namely nitrogen and phosphorus, ranked higher than readily visible ones, like trash and algae.
    - The latter can be observed with the naked eye while the former requires the use of science or media reporting to form an opinion, which may help to explain the differences is concern.
- In total, 7 out of 10 impairments were recorded as "don't know" by more than 50% of respondents.

Respondents were less knowledgeable about non-visible water quality impairments than visible ones, in particular phosphorous and nitrogen. This indicates the need for continued education on water quality issues. However, these issues still have resonance with residents as indicated by the fact that nitrogen and phosphorus are the impairments of most concern to respondents.

Perceptions of the Sources of Water Pollution

Directly related to residents' awareness and perceptions of common pollutants and conditions that degrade water quality is their opinion on the *sources* of those pollutants. Respondents were asked to rate how much of a problem they perceive for the thirteen most common sources of water quality pollution within the Lake Bloomington and Evergreen Lake Watersheds.

Figure 6: Respondents' Perceptions of the Severity of Sources of Water Pollution
(1 = Not a Problem, 4 = Severe Problem)

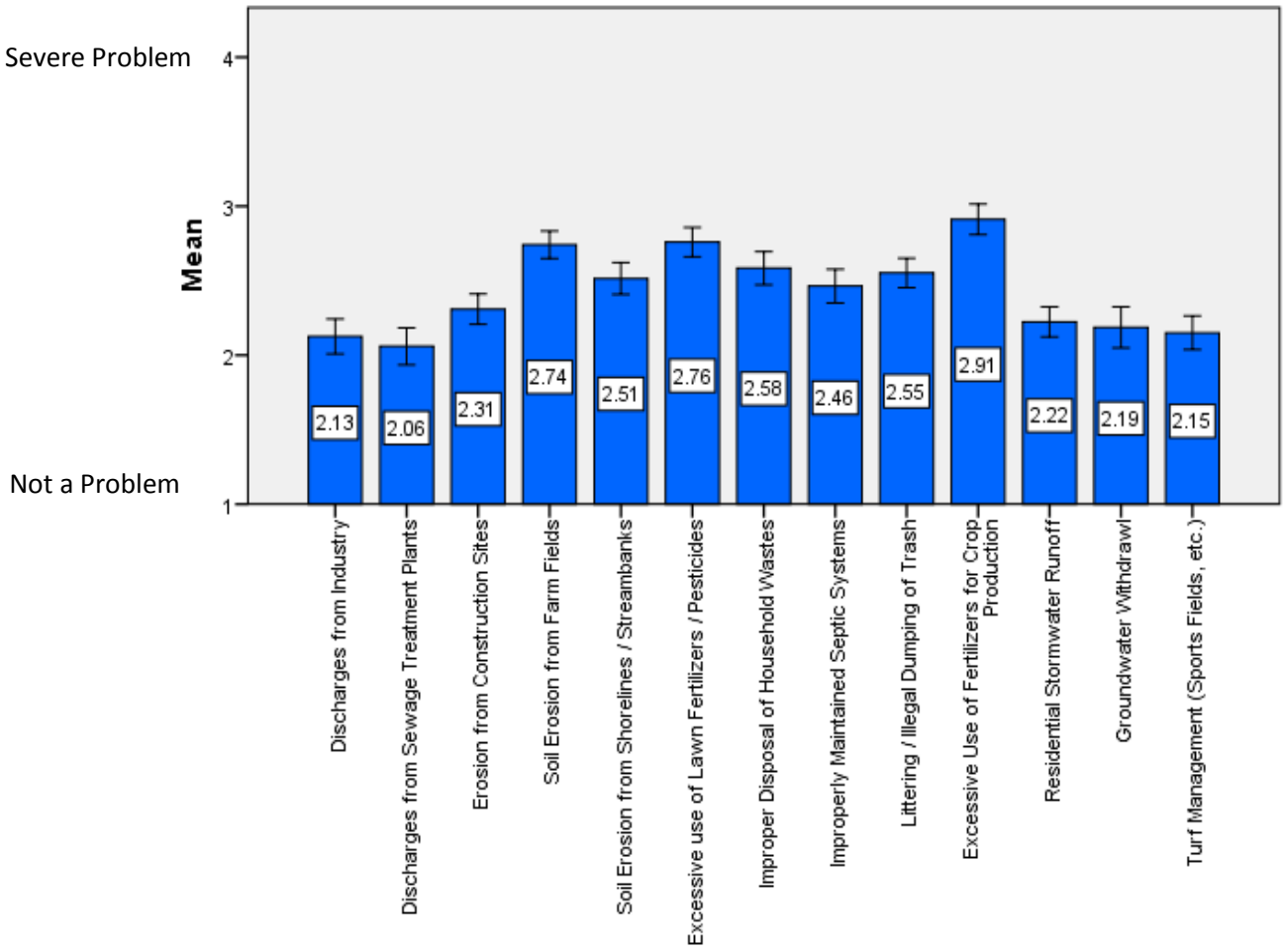


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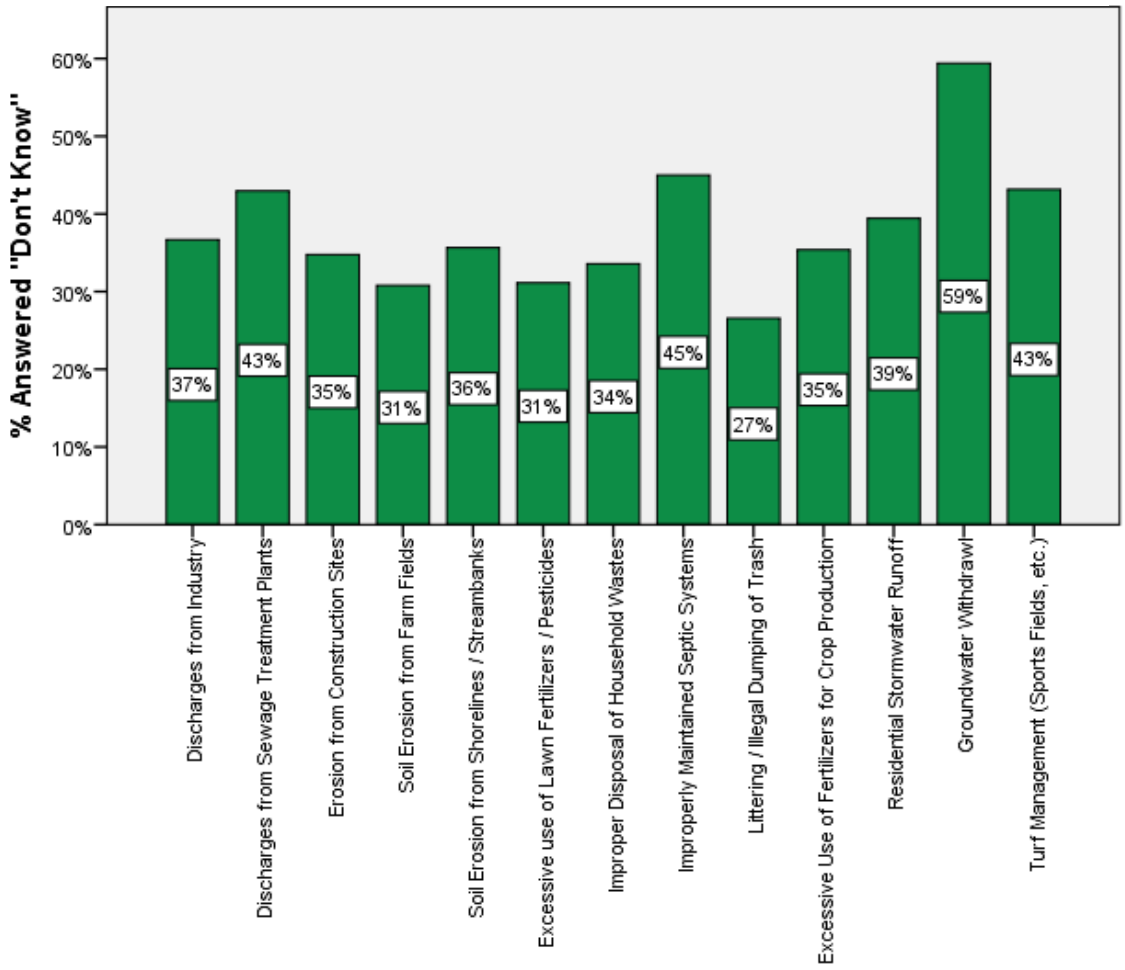
Figure 7: Respondents Who Indicated "Don't Know" for Sources of Water Pollution



- Figure 6 shows that in general, respondents expressed the greatest amount of concern about farm-related and chemical sources of pollution. Fertilizers used in crop production was the source respondents indicated the most concern about,
    - This supports the previous data that found Nitrogen to have the highest mean score as a problem impairment, as it is commonly associated with agriculture.
- However, household sources were of concern, as excessive lawn fertilizers/pesticides and improperly disposed of household waste also were identified as relatively serious problems by respondents.
- As with perceptions of impairments, there were high rates of "Don't Know" responses concerning the sources of water impairment (see figure 7).
- The cause of pollution that people were least knowledgeable about was groundwater withdrawal (59% indicated "don't know")

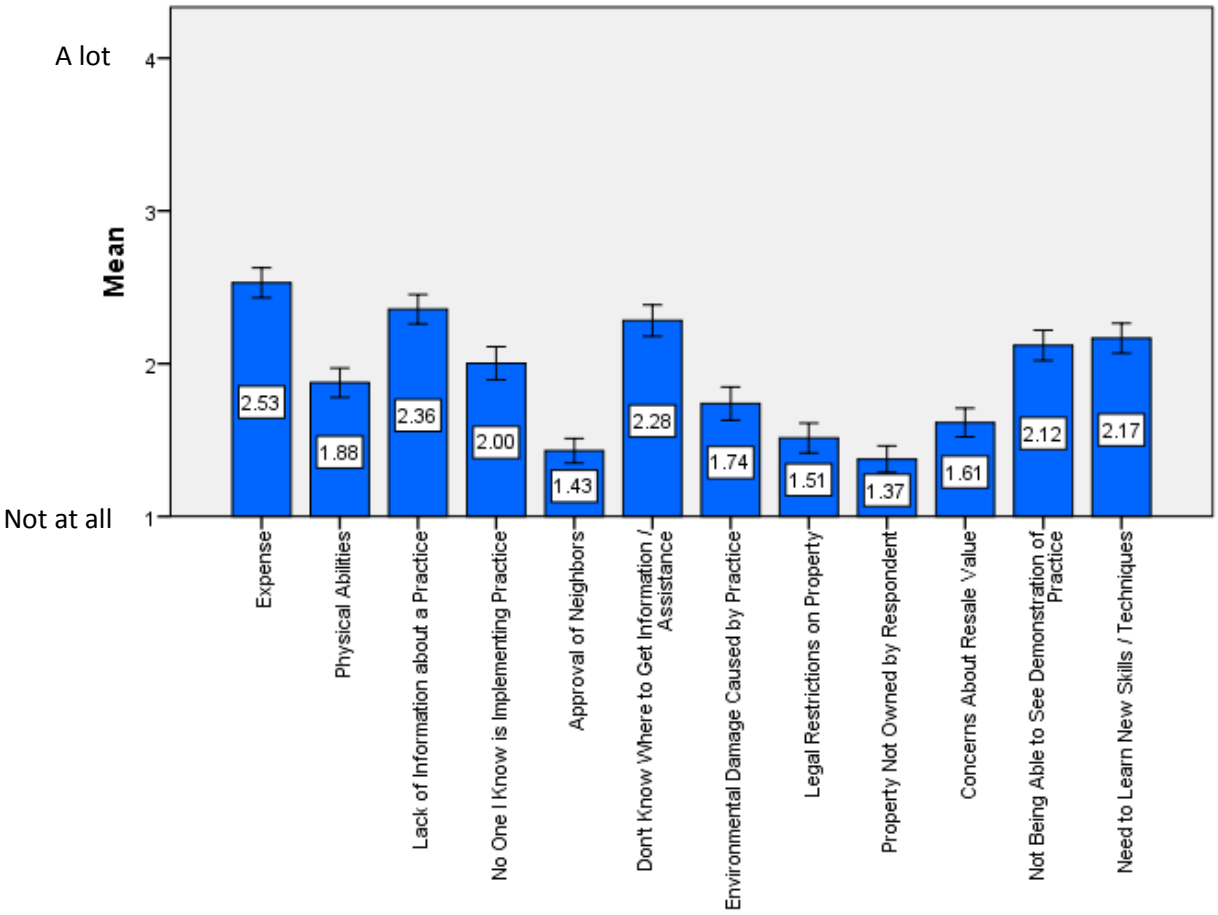
Overall, respondents were most concerned about farm-related sources of pollution, followed by lawn-care sources. This is consistent with the fact that respondents rated nitrogen and then phosphorous as the most problematic for local water quality.

Although agricultural practices still contribute to the problem on non-point source pollution, particularly through excess nitrogen, more recent research has acknowledged the growing contributions of residential lawn care practices. The United States Environmental Protection Agency has acknowledged that NPS pollution is the leading source of water quality degradation (Environmental Protection Agency 2009). One significant source of NPS pollution in urban and suburban areas is fertilizer and pesticide runoff from turf grass lawns, which has been associated with a variety of water quality concerns such as algal blooms, eutrophication, and contaminated groundwater (Law et al. 2004). Other practices such as the use of water-intensive and fertilizer-hungry non-native landscaping, removal of buffer strips around waterways, excessive use of impermeable pavements, and failing septic systems can increase pollutants that enter the groundwater and contribute to NPS pollution (Bannerman et al. 1993; Environmental Protection Agency 2009; Morton et al. 1988). In particular, Bannerman et. al. (1993) identified urban areas as "hot spots" of NPS pollution, identifying lawns and driveways as a primary source of fecal coliform bacteria in storm water runoff. Respondents still view farm-related sources of pollution as the greatest concern, which presents an important opportunity to begin to increasing public awareness of the role that homeowners also play in water quality stewardship practices that address non-point source pollution.

Influences on Residents' Decisions to Change Lawn Care Management Practices

To achieve the goals in a watershed plan it is helpful to analyze the influences on residents' decisions about the lawn care practices they use at home. Residential lawn care practices are significant factors in NPS pollution, particularly in more urbanizing areas. Influences on lawn care choices may include social, economic, political, and environmental factors. The chart below presents respondents' mean rating of the strength of various influences on changing lawn care practices for their property.

Figure 8: Influences on Residents' Decisions to Change Lawn Care Practices for Their Property (1="Not at All"; 4="A Lot").



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- The strongest influence on changing practices identified by respondents dealt was expenses. This supports the finding that people were least likely to accept increasing costs to help protect water quality (see Figure 12, pg. 25).
- The next strongest limitations included lack of information about a practice and not knowing where to get information or assistance. These findings point to the fact that any future outreach for education or

best management practices should consider the need to increase visibility in the broader community, concentrating on successful marketing strategies that identify specific sources of information and resources.

- The least limiting factors were neighbor approval and property ownership.
    - The latter point makes sense when considering that nearly 90% of watershed residents own their home.
    - This also demonstrates that residents are not necessarily limited by neighborhood social norms when it comes to making decisions for their own property, opening the door to introduce new approaches or innovative best management practices.
- In general, respondents expressed a moderate level of perceived limitations when making decisions about their lawns, primarily in response to economics and information.
    - Many of the most limiting factors can be addressed through education and raising awareness, with specific attention given to directing residents to local experts and sources of this information. The most significant limiting factor, cost, could be addressed through local subsidies for residential BMPs, a practice suggested by many in the comments section of the survey.

Expense, not knowing how to implement new practices, and not knowing where to get information on new practices are the factors most limiting respondents' ability to change their lawn care management practices.

Knowledge and Use of Best Management Practices for Improving Water Quality

Protecting water quality is an important objective for future outreach and education plans. Since the majority of water quality impairments are often the result of NPS pollution, it is critical to understand how familiar residents are with specific best management practices that can both maintain and improve overall water quality within the watershed. The following question asked respondents to indicate their level of familiarity with several best management practices that have been identified by the USEPA to reduce NPS pollution and improve water quality.

Figure 9 depicts the mean level of knowledge respondents reported having of any given best management practice. However, it is important to note that these means to do not include respondents who reported actually using these practices; familiarity indicates knowledge of the practice without actually putting it into use.

Figure 9: Familiarity with Practices to Improve Water Quality (1="Never Heard of It"; 3="Know How to Use It").

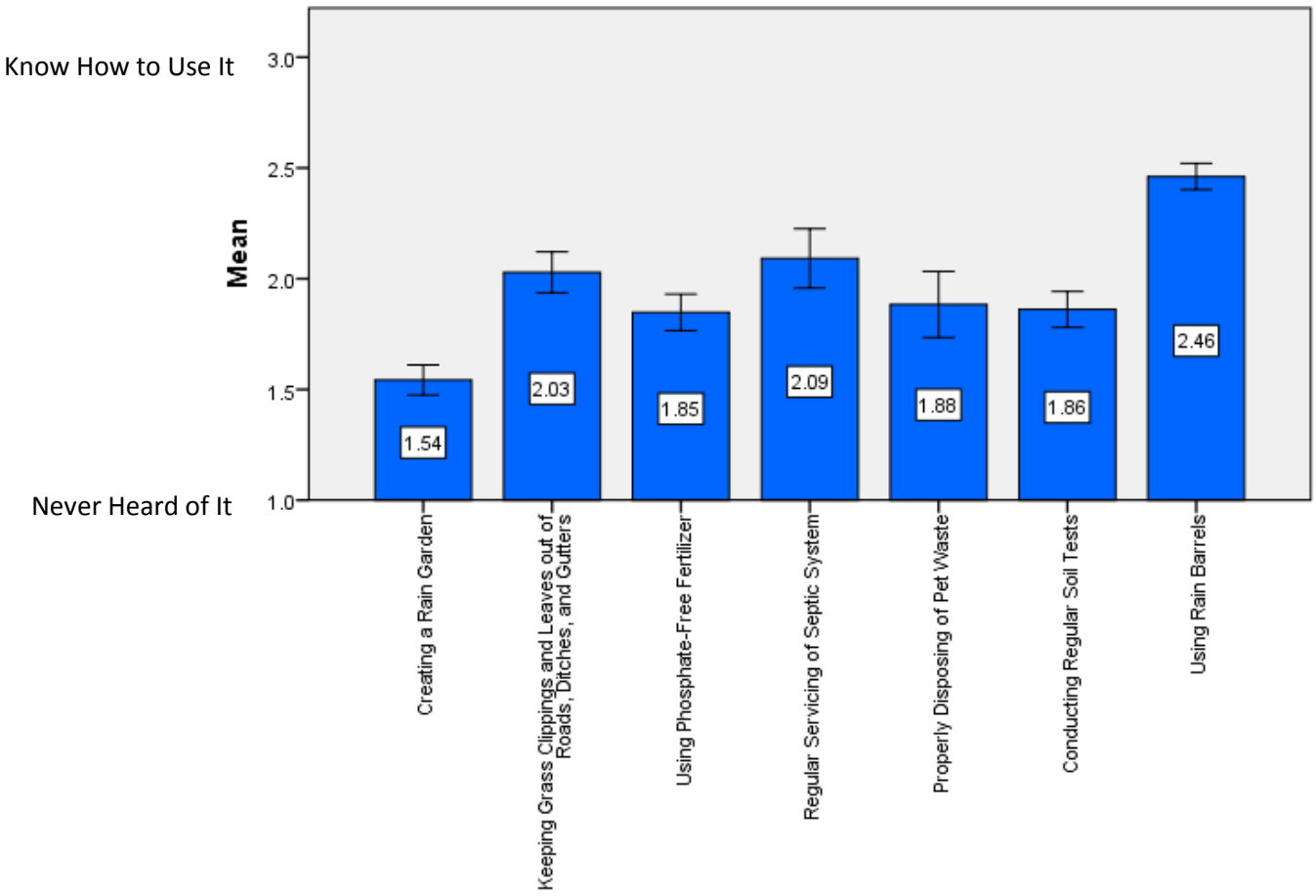

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Figure 10 depicts the number of respondents who reported actively using the practice, and is therefore understood not in terms of mean scores, but with percentage of participation.

Figure 10: Percentage of Respondents Currently Using a Given Best Management Practice

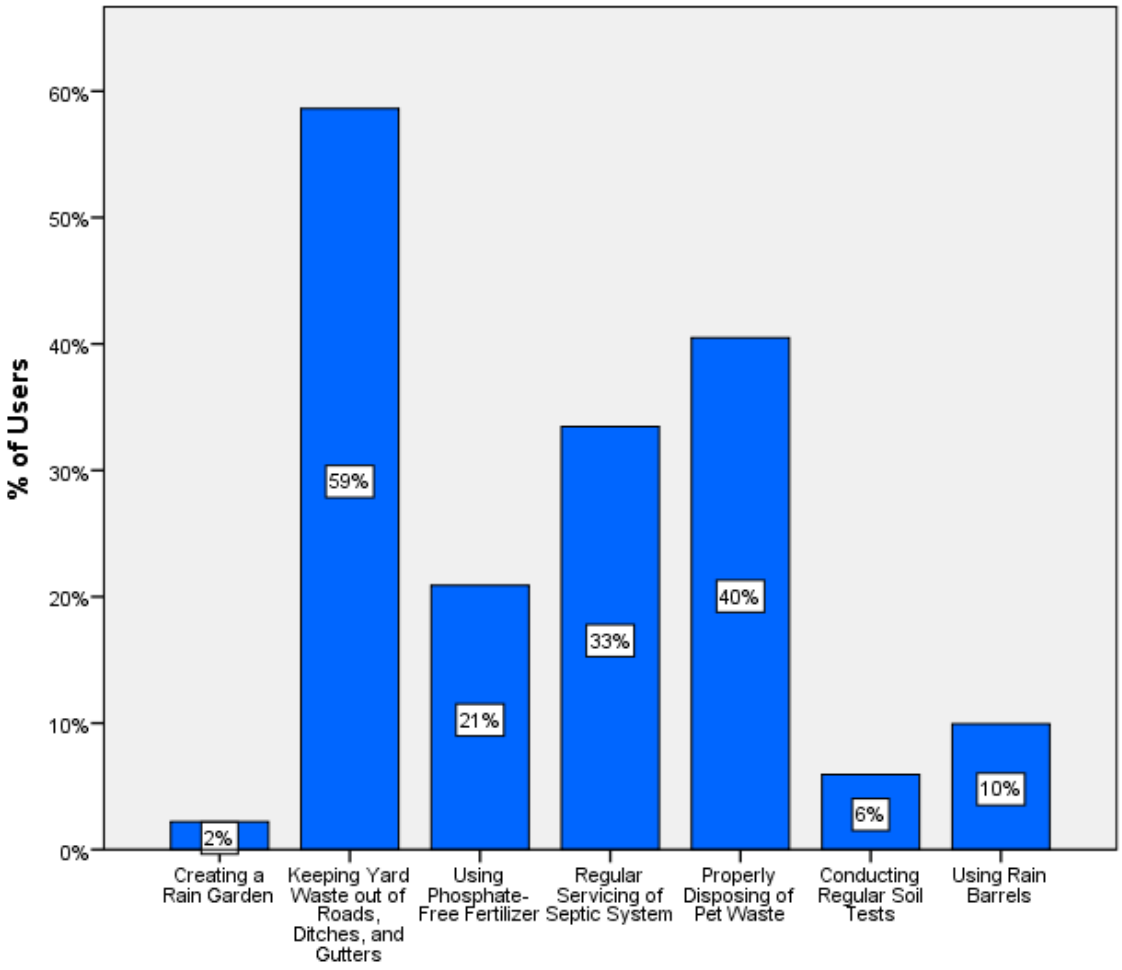
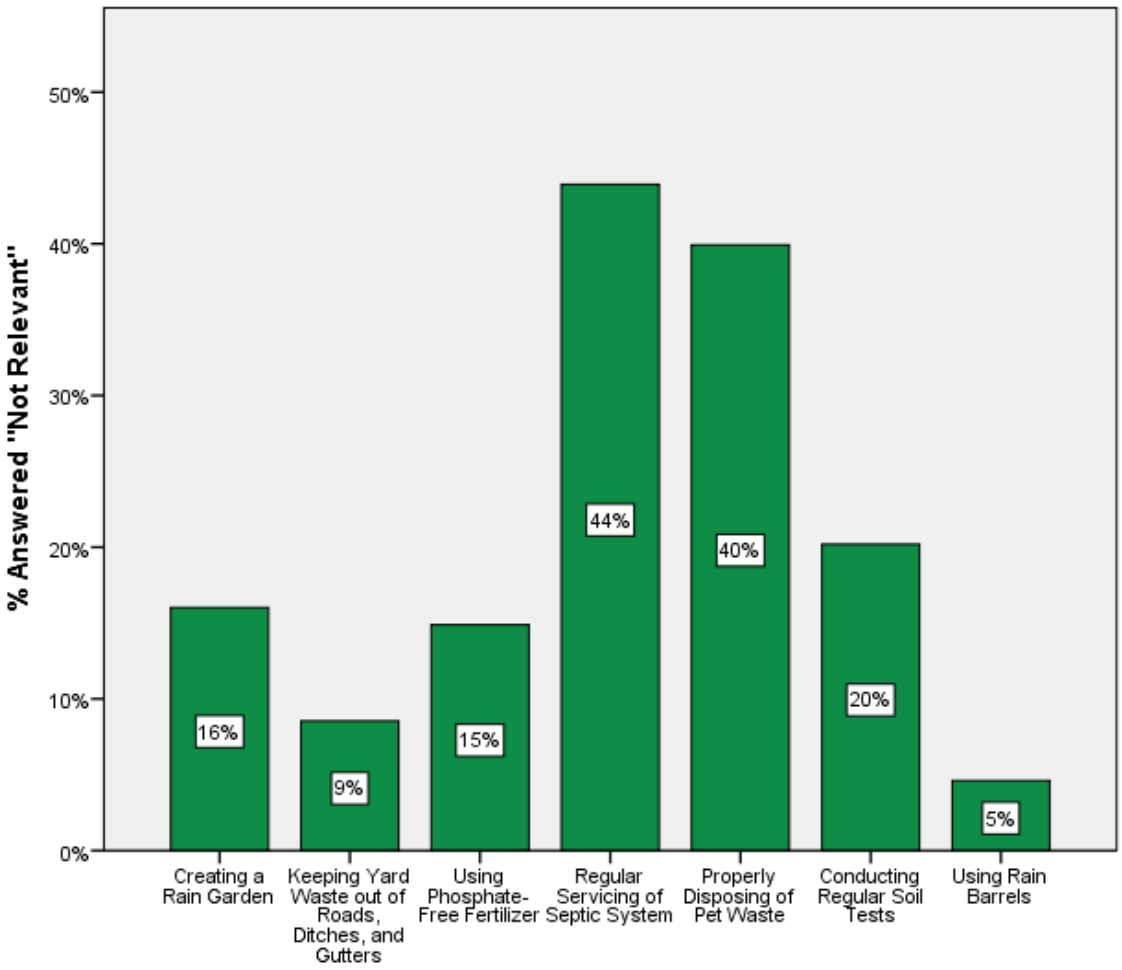


Figure 11 depicts the number of respondents who reported neither familiarity with nor current use of a given practice.

Figure 11: Respondents Who Indicated a Particular Practice is Not Relevant to Them



- The three practices that respondents reported using the least included creating a rain garden, conducting regular soil tests, and using rain barrels, listed from least to most frequently in use. These practices tend to be more obscure and require particular knowledge/labor. Supporting this are the low scores on familiarity reported on creating a rain garden and conducting regular soil tests
- However, despite their low use, rain barrels had the highest level of knowledge. This is significant as it indicates that knowledge is not a barrier to use. Therefore, there must be other reasons that people are not using rain barrels, such as expense or attitudes/beliefs. Only 5% of respondents indicated that rain barrels were 'not relevant'.
- Together, this presents an opportunity to address barriers to use – people have knowledge, think they are relevant, but still don't use them. Qualitative comments indicate concern for mosquitoes as one

possibility. Others might be don't know where to get them. This provides a good direction for future outreach, which could focus on making rain barrels more accessible to residents and dispelling any myths or misinformation about their use and maintenance.

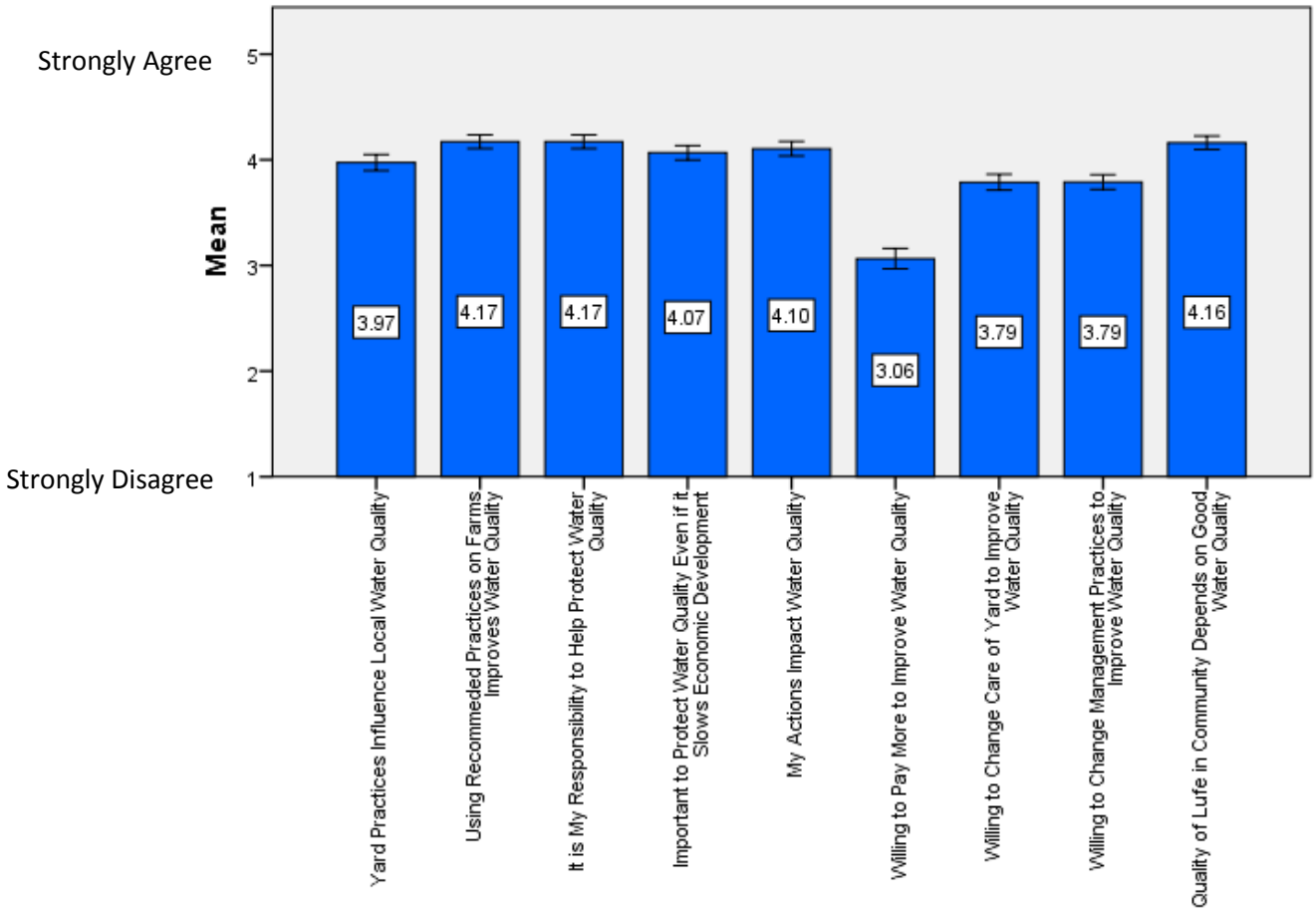
- Conversely, creating a rain garden has both low knowledge and low use (2%). This provides another opportunity for outreach; however, in this case, outreach may need to focus more on basic knowledge about this best management practice.
- Many respondents saw regular septic system servicing and properly disposed of pet waste the least relevant practices of the six presented.
    - This is to be expected, considering not everyone has a septic tank and not everyone has a pet.
- Cleaning up yard waste and creating a rain garden were the two practices that people shared the most in terms of qualitative comments.
    - These were the practices that were rated the most and least utilized, respectively.

While rain barrels have a low level of use among respondents, they are nonetheless considered the most relevant practice with the most familiarity, making it a good focus for future BMP outreach efforts.

Attitudes and Beliefs Regarding Water Quality

Respondents' values and opinions regarding water quality are an important consideration when trying to determine what factors may most stronly influence their adoption of best management practices and their support for local education and outreach. The choices people make that impact the overall quality and health of their watershed are driven in large part by their value systems and beliefs. In order to influence people's awareness, attitudes, skills and capacity to act, a firm understanding of the values and beliefs that form the basis of those actions is necessary. The following questions ask respondents to indicate their level of agreement or disagreement with a series of statements that measure their values and opinions related to water quality and its relationship to their own actions and behaviors.

Figure 12: Respondents' Attitudes and Beliefs on Water Quality (1="Strongly Disagree"; 5="Strongly Agree")



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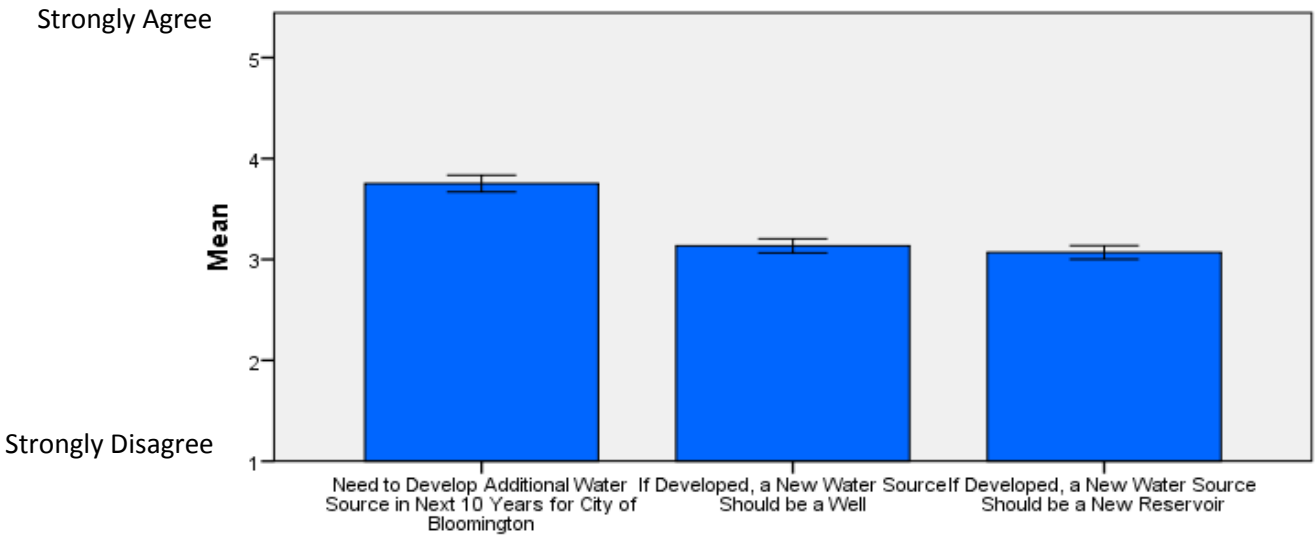
- In general, citizens tend to agree that they and others have an impact on and a responsibility to protect water quality. Most items have a mean score of 4 or higher, indicating a level of agreement. This information can be incorporated in normatively framed messaging.
- While most of the indicators have mean scores clustered around 4.0, it is clear that the least popular opinion has to do with spending more money to protect water quality.

Overall, respondents felt that they and others have an impact on and a responsibility to protect water quality, though willingness to pay more to protect water quality had more modest support.

Opinions on the Future of Local Water Resources

One of the critical questions on the survey was designed to measure residents' perceptions about the current state of water resources and the need to develop new sources of water for the future.

Figure 13: Respondents' Opinions the Future of Local Water Resources (1="Strongly Agree"; 5="Strongly Disagree")



**Error Bars at 95% Confidence Interval*

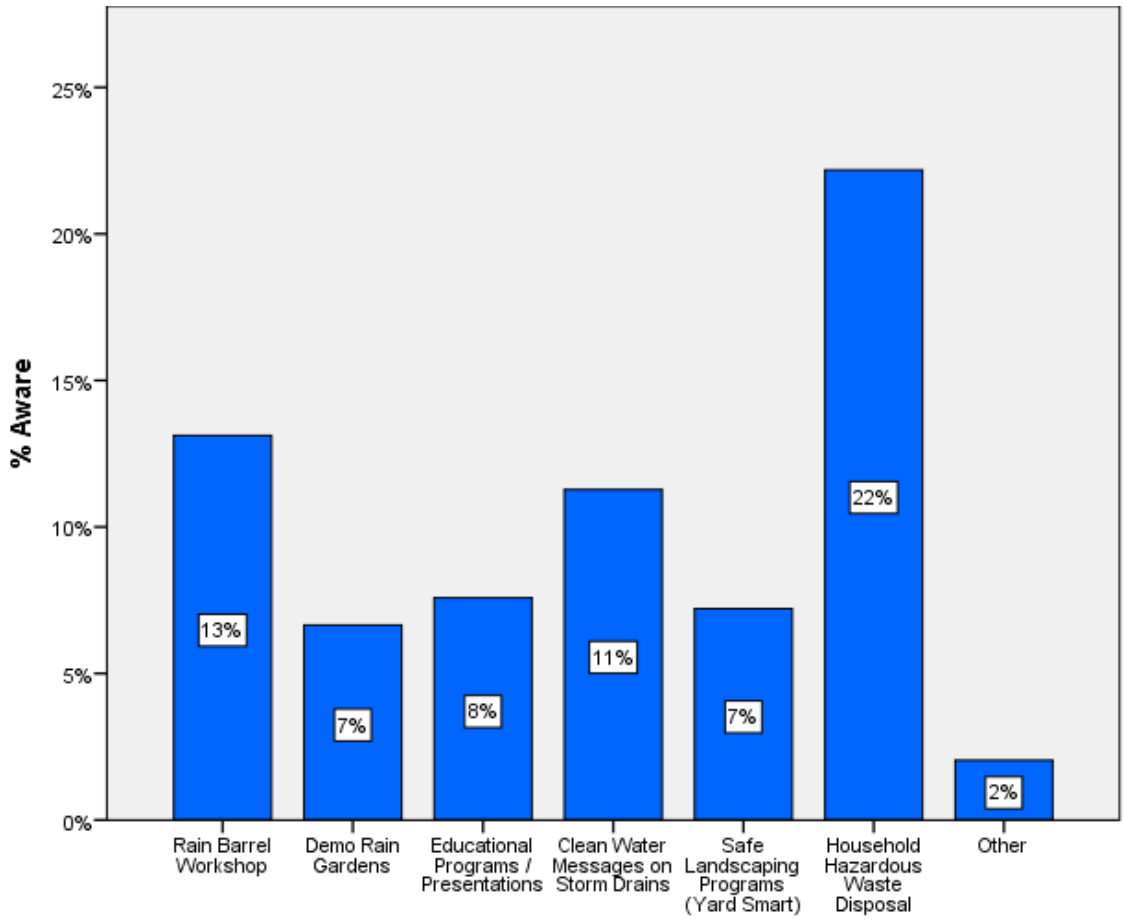
- Results indicate that aggregated responses indicate agreement that Bloomington needs a new water source in the next 10 years.
    - What this source should look like does not reveal a consistent or shared desire for the future. A new well is only slightly preferred to an additional reservoir.
    - Additional ANOVA analyses did not reveal any statistically significant differences in level of agreement by community of residence, indicating that there is no real preference among respondents.

Overall, respondents showed a modest level of agreement with a statement expressing the need to develop an additional water source for the City of Bloomington in the next ten years. However, opinions about what form that development should take are evenly split between a well or a new reservoir.

Knowledge and Awareness of Current Water Outreach and Education Programs

Several programs designed to promote best management practices and raise awareness about environmental issues exist within the watershed. The Ecology Action Center (EAC) is a local organization that sponsors and provides most of the programs that are available locally, and can be a partner to many organizations in the region in continued outreach and education efforts. As such, a question was constructed assessing the number of people who are aware of EAC outreach efforts. The results are displayed in Figure 14.

Figure 14: Awareness of Current Water Outreach and Education Programs



- Less than a quarter of respondents have knowledge of any single EAC program.
- Although it was expected that these findings may be reflective of a difference in visibility among urban and rural respondents, t-test and ANOVA analyses did not show any statistically significant differences between the five communities or between urban and rural respondents.
- The least recognized (excluding 'other') was a tie between Yard Smart and the demo rain gardens.

- The latter is consistent with the previous finding that rain gardens are the BMP people knew the least about (see figure 11).

- The 'Other' category has seven different responses, and included the following: composting, free mulch, radon testing, IEPA programs, city-provided rain barrels, "extension programs," and mail information.

Programs and education offered by the Ecology Action Center (EAC) are not widely known among respondents. Future outreach could both promote as well as benefit from greater visibility of EAC programs, especially those that focus on issues related to water quality.

Septic System Issues and Water Quality

During the key informant interview phase of this project, a common theme of concern that emerged was residential septic systems as a source of water contamination. For example, the majority of the homes directly on Lake Bloomington (a source of drinking water for the watershed) are on septic waste systems. Therefore, a series of questions that focuses specifically on issues related to septic systems was an important part of the survey.

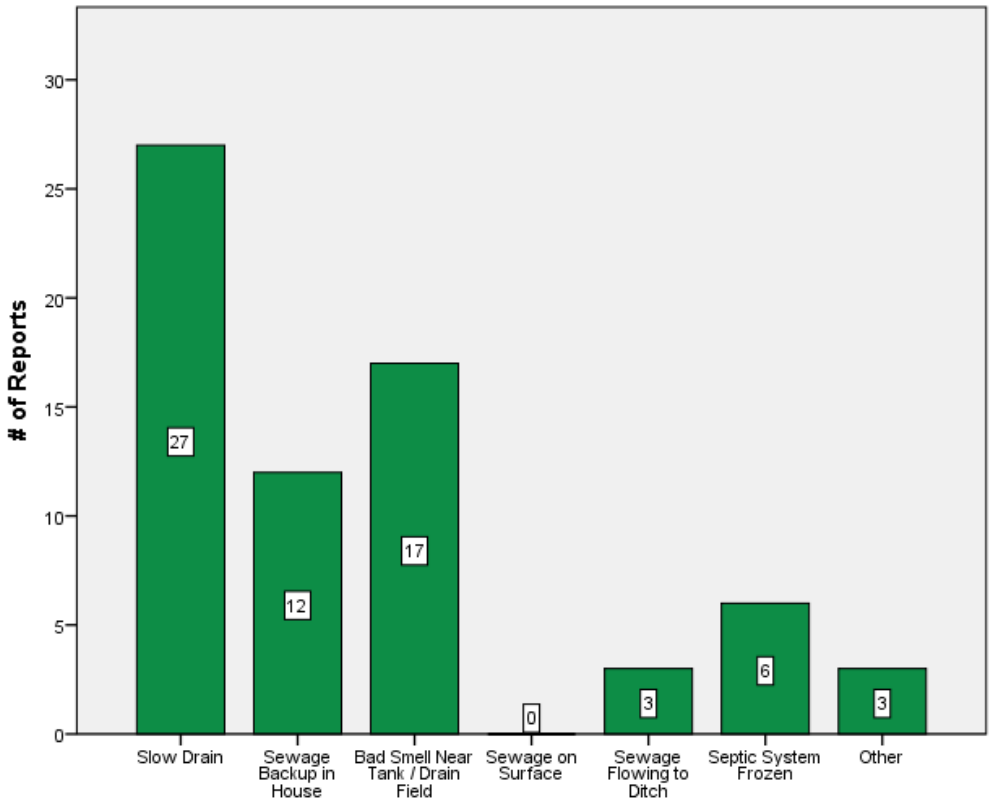
The first question asked residents, "**Does your household have a septic system?"**

- 45.5% of respondents answered yes, while 46.3% of respondents indicated that their household did not have a septic system. Additionally, 4.8% indicated that they didn't know whether they had a septic system or not.

Residents were asked about specific types of problems that they may have encountered with their septic system over the last five years. Responses included the most commonly reported problems and respondents were allowed to choose more than one issue.

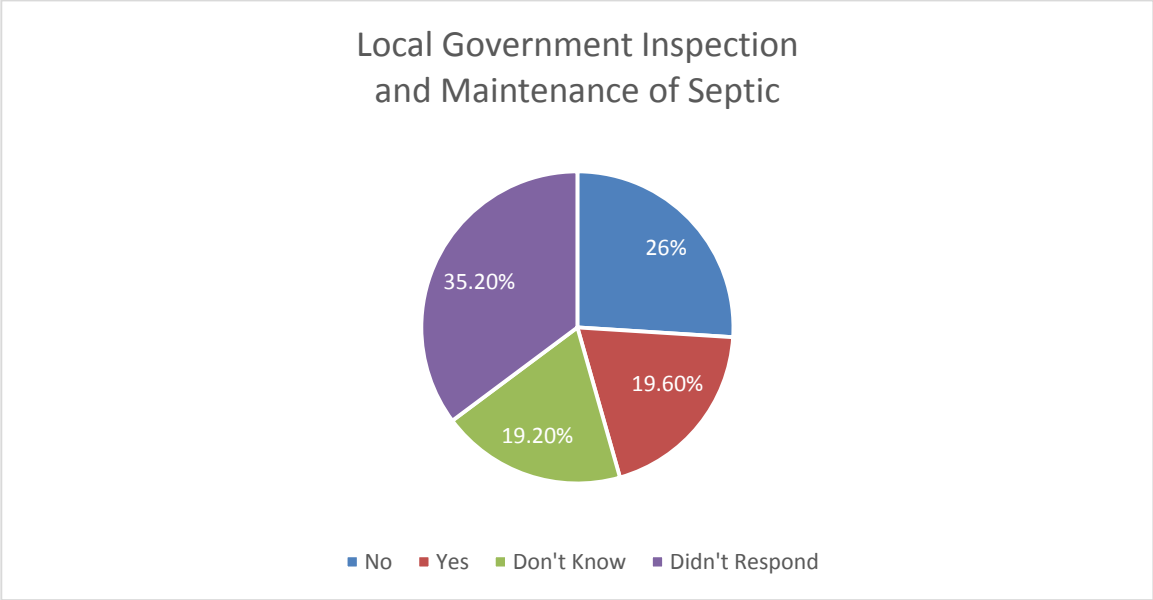
- Of the respondents who indicated their household has a septic system, 217 (or about 87% of the total) respondents indicated they had **never** experienced problems with their septic system. The following graph represents the most common septic system problems.
- The most commonly reported problem was slow drainage followed by bad smells.

Figure 15: Common Septic System Problems



Respondents were then asked if they thought a local government agency should handle inspection and maintenance of septic systems. While this question was intended specifically for those who own a septic system, many participants who did not own one answered it as well. Those responses were kept in the analysis for their use as an indicator of the level of government intervention participants are comfortable with.

Figure 16: Do you think a local government agency should handle inspection and maintenance of septic systems?



Who Responded to The Survey?

Table 3 below highlights some of the basic demographics of survey respondents. Complete tables and charts representing responses to all questions in the survey including responses to open-ended questions are in the appendix to this document.

Table 3: Respondent Demographics

Gender	
Male	52.7%
Female	43.3%
Age (Years)	
Mean	52.5
Median	52
Mode	40
Ethnicity	
African American	1.3%
American Indian	0.2%
Asian / Asian American / Pacific Islander	3.3%
Hispanic / Latino	1.8%
White / Caucasian	85.2%
Multi-Racial	0.9%
Other	0.7%
Education	
Some Formal Schooling	0.9%
High School Diploma / GED	14.6%
Some College	13.0%
2 Year College Degree	9.3%
4 Year College Degree	34.9%
Post-Graduate Degree	22.1%
Household Income	
< $24,999	3.5%
$25,000 - $49,000	12.6%
$50,000 - $74,999	12.8%
$75,000 - $99,999	16.8%
> $100,000	37.5%

Residential Area	
Towanda	9.30%
Hudson	17.20%
Lake Bloomington	15.20%
Normal	18.50%
Bloomington Watershed	10.20%
City of Bloomington	27.80%
Type of Community	
Town, Village, or City	74.4%
Isolated, Rural, Non-Farm Residence	4.0%
Rural Subdivision or Development	16.6%
Farm	0.9%
Length of Residence on Property (Years)	
Mean	13.7
Median	10
Mode	1
Own or Rent Property	
Own	89.2%
Rent	7.5%
Size of Lot	
1/4 Acre or Less	54.7%
More than 1/4 Acre, Less than 1 Acre	32.9%
1 Acre to Less Than 5 Acres	5%
5 or More Acres	0.5%

Results of Bivariate and Correlation Analyses: Understanding Urban/Rural Differences

The basic demographic data also allows for analysis using multivariate statistical analyses to identify how respondents' characteristics are related to patterns of responses. Sociodemographic variables (age, gender, education, income, length of residence) are frequently found to be the source of variations in belief systems and behaviors. In an effort to better understand the applications and limitations of the survey data, analyses were run to better understand differences between urban and rural respondents. Historically, residents of small towns or rural communities may hold values/beliefs or engage in practices that are different from residents in a larger, urban center. Since the Lake Bloomington and Evergreen Lake watersheds are largely rural and agricultural in their land use, yet the water supply serves a very urban city center, comparing and contrasting these two populations on a variety of key variables will be beneficial for analyses and the development of outreach activities that may need to be tailored to a specific type of population, rather than a single, uniform message for the entire watershed.

Conducting these analyses is a technical process and to present useful information for plan implementation in a succinct form the section below highlights only the important relationships between respondent characteristics and responses to specific questions in the survey.

The analyses conducted focus on the following variables:

Age	Gender
Level of Education	Household Income
Length of Residence	Community of Residence
And their influence on……	
Knowledge and Use of Best Management Practices	Attitudes/Beliefs
Perceptions of Water Impairments	Perceptions of Sources of Water Pollution
Limits and Influences to Changing Lawn Care Practices	Opinions on the Future of Water Resources
Knowledge and Awareness of Local Outreach Programs	

Understanding the Data

Many variables were subjected to recoding in order to better facilitate analysis.

- Community was recoded dichotomously, based on whether the respondent lived in a more rural or urban community.
    - 0 = Rural Communities (Towanda, Hudson, and Lake Bloomington)
    - 1 = Urban communities (Bloomington and Normal)
- Gender was coded dichotomously
    - 0 = Male
    - 1 = Female

- Education was coded on a scale of 1-6
    - 1 = Some Formal Schooling
    - 2 = High School Diploma/GED
    - 3 = Some College
    - 4 = 2 Year Degree
    - 5 = 4 Year Degree
    - 6 = Post-Grad Degree
- Income was coded on a scale of 1-5
    - 1 = Less Than $24,999
    - 2 = 25,000 to $49,999
    - 3 = $50,000 to $74,999
    - 4 = $75,000 to $99,999
    - 5 = $100,000 or more
- BMP Use and Knowledge was recoded dichotomously, based on whether or not the respondent used or didn't use a particular practice.
    - 0 = Doesn't Use the Practice
    - 1 = Uses the Practice
- Attitudes and beliefs were combined to create an index, which produces an overall measure based on the composite totals of all items combined. This way, a global measure of respondents' perception of water quality could be developed and understood in terms of its relationship with other variables.

The earlier sections of this report discussed the univariate analyses and demonstrated how the primary variables were measured. However, this information is re-stated below to serve as a reference guide for the bivariate analyses.

- Sources of Pollution and Water Impairments are coded on a scale of 1-4
    - 1 = Not a Problem
    - 4 = Severe Problem
- Attitudes/Beliefs and Future of Local Water Resources are coded on a scale of 1-5
    - 1 = Strongly Disagree
    - 5 = Strongly Agree
- Barriers to Lawn Care Change is coded on a scale of 1-4
    - 1 = Not at All [Restricted By]
    - 4 = [Restricted by this] A Lot
- Awareness of Outreach is coded on a scale of 0-1
    - 0 = Not Aware
    - 1 = Aware
- BMP Knowledge and Use is on a scale of 1-4. In the analysis of BMPs, though, the dichotomous recode is used to judge mean differences appropriately.
    - 1 = Never Heard of It
    - 2 = Somewhat Familiar with It
    - 3 = Know How to Use It; Not Using it
    - 4 = Currently Use it

Findings from Bivariate Analyses

The following discussion focuses on those variables that were found to be statistically significant. For a full listing of all analyses conducted over the course of the study, please refer to the appendix. These statistically significant relationships can inform the design and implementation of research goals and future activities.

Rural vs. Urban Communities

The various communities in the watershed, while just a short distance from each other, are nevertheless different in respect to their social dynamics and local institutions. As a part of the survey's goals to evaluate knowledge, practices, and opinions, understanding the fundamental differences between perceptions and value/belief systems among residents of these communities is vital to directing future outreach and education efforts and revisions to the watershed management plan. In particular, the study focused on understanding any key differences between the residential populations that were in the urban core (City of Bloomington, Town of Normal watershed), as compared to those that were in the outlying rural communities (Hudson, Towanda, Lake Bloomington).

Table 4: Community Distribution

Communities	Frequency	Percent	Communities	Frequency	Percent
Towanda	51	9.3%	Normal	101	18.5%
Hudson	94	17.2%	Bloomington Watershed	56	10.2%
Lake Bloomington	83	15.2%	City of Bloomington	152	27.8%
Rural	***228***	***41.7%***	***Urban***	***309***	***56.5%***

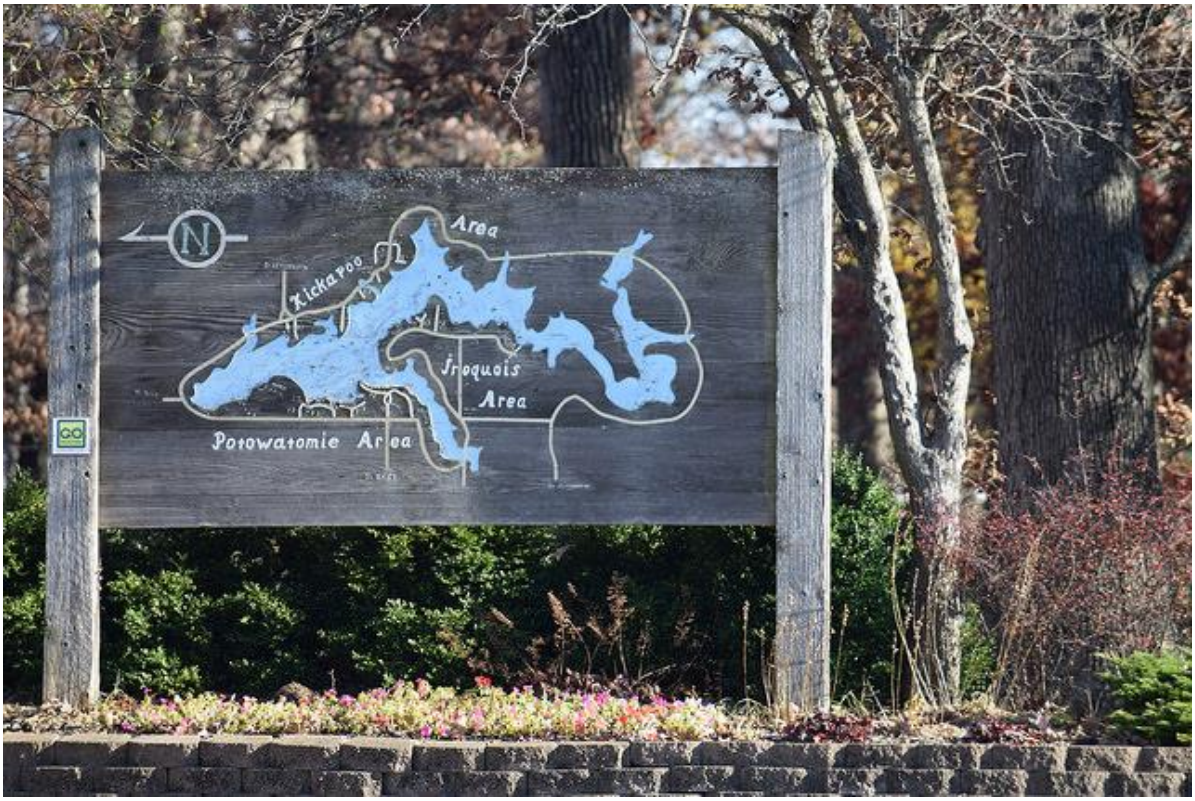
The results of the analyses have been presented in Table 5. Of the variables used, six were found to have significant relationships with the classification of a respondents' community as rural or urban: Important Activities, Knowledge and Use of Best Practices; Sources of Water Pollution; Barriers to Lawn Care Change; and some demographic variables. As discussed earlier, Community as a variable was recoded into Rural vs. Urban: The former represents Towanda, Hudson, and Lake Bloomington; the latter represents Normal and Bloomington townships.

Table 5: Results of Bivariate T-Tests for Rural vs. Urban Respondents

Variables	Mean Scores: Rural	Mean Scores: Urban	Mean Differences	Significance
Important Activities				
Boating	.23	.09	0.14	P<.001
Picnicking / Family Activities	.28	.38	-0.1	P<.05
BMP Knowledge and Use				
Regular Servicing of Septic	3.59	2.24	1.35	P<.001
Proper Disposal of Pet Waste	3.49	3.13	0.36	P<.01
Water Impairments				
Sedimentation	2.65	2.41	0.24	P<.05
Toxic Minerals in the Water	2.25	2.57	-0.32	P<.05
Heavy Metals	2.04	2.58	-0.54	P<.01
Invasive Plants and Animals	2.26	2.53	-0.27	P<.05
Habitat Alteration Harming Fish	2.11	2.59	-0.48	P<.001
Sources of Pollution				
Industry Discharge	1.82	2.38	-0.56	P<.001
Sewage Plant Discharge	1.78	2.30	-0.52	P<.001
Construction Erosion	2.04	2.51	-0.47	P<.001
Excessive Use of Lawn Chemicals	2.58	2.87	-0.29	P<.01
Improper Disposal of Household Waste	2.26	2.79	-0.53	P<.001
Improperly Maintained Septic	2.30	2.60	-0.3	P<.01
Littering / Illegal Trash Dumping	2.37	2.68	-0.31	P<.01
Groundwater Withdrawal	1.93	2.38	-0.45	P<.01
Turf Management	1.93	2.38	-0.45	P<.001
Barriers to Lawn Care Change				
Lack of Information	2.22	2.46	-0.24	P<.05
No One I Know is Implementing It	1.87	2.10	-0.23	P<.05
Approval of Neighbors	1.33	1.50	-0.17	P<.05
Don't Know Where to Get Info/Assistance	2.15	2.38	-0.23	P<.05
Legal Restrictions	1.39	1.62	-0.23	P<.05
Concerns over Resale Value	1.50	1.70	-0.2	P<.05
Unable to See a Demonstration	1.98	2.22	-0.24	P<.05
Need to Learn New Skills/Techniques	1.95	2.32	-0.37	P<.001
Demographics				
Education	3.90	4.73	-0.83	P<.001
Income	3.60	4.06	-0.46	P<.001
Length of Residence (in years)	17.44	10.61	6.83	P<.001

- The variables measuring 'Sources of Pollution' held the most significant differences between urban and rural residents. Nine out of the thirteen items that comprised this indicator were significant, and five of those were significant at the .001 level.
    - These results indicate that rural respondents reported less concern about most sources of pollution compared to urban residents.
- Another important finding from table 5 is that rural respondents tend to perceive fewer limitations on their ability to make decisions concerning their lawn care practices. Rural areas may operate under

slightly different social structures, necessitating outreach that is tailored to their specific needs and perspectives on changing lawn care practices.
    - This is supported by the fact that rural residents also overwhelmingly own septic systems, a fundamental structural difference that also needs to be addressed in outreach efforts.
- Demographic differences between urban and rural respondents include lower educational attainment and income levels in rural areas.
- Rural respondents were more likely to cite boating as their favorite activity, while urban respondents were more likely to cite picnicking / family activities.
- Rural respondents report a slightly higher frequency of picking up after their pets.
- Rural residents see sedimentation as more of an issue than their urban counterparts, which may be attributable to the fact that Lake Bloomington residents (classified as rural) live directly on the lake and have direct contact with this issue.



Knowledge and Use of Practices to Improve Water Quality

The previous analyses indicate that, among the common residential practices used to protect water quality, respondents were most familiar with keeping rain barrels, keeping grass clippings and leaves out of roads, ditches and gutters, and regularly servicing their septic systems. Bivariate analyses were conducted to understand key differences between users and non-users of rain barrels.

Table 6: Results of Bivariate T-tests for Rain Barrel Users vs. Non-Users

Variables	Mean Scores: Users	Mean Scores: Non-Users	Mean Differences	Significance
BMP Knowledge and Use				
Create a Rain Garden	2.04	1.55	0.49	P<.01
Keep Yard Waste Out of Roads, Ditches, and Gutters	3.56	3.27	0.29	P<.05
Use Phosphate-Free Fertilizer	2.83	2.32	0.51	P<.01
Regular Servicing of Septic Systems	3.63	3.21	0.42	P<.05
Conduct Regular Soil Tests	2.43	1.99	0.44	P<.01
Awareness of Outreach				
Rain Barrel Workshop	0.44	0.10	0.34	P<.001
Demo Rain Gardens	0.21	0.05	0.16	P<.01
Messages on Storm Drains	0.31	0.09	0.22	P<.001
Safe Landscaping Programs (e.g., YardSmart)	0.25	0.04	0.06	P<.001
Household Waste Disposal	0.40	0.19	0.21	P<.01
Attitudes/Beliefs				
Willing to Pay More to Improve Water	4.42	4.14	0.28	P<.01
Barriers to Lawn Care Change				
Don't Know Where to Get Info	1.94	2.32	-0.38	P<.05
Need to Learn New Skills	2.22	1.82	0.40	P<.05
Demographics				
Length of Residence (in Years)	17.52	12.89	4.63	P<.05

- Respondents who use rain barrels have greater awareness of Ecology Action Center programs than non-users.
    - This may be reflective of the fact that the Ecology Action Center sponsors several programs each year where community members can build their own rain barrel and learn about their uses for a minimal cost.
    - Another way to understand this is that users likely have greater knowledge of environmental issues and best management practices, creating fewer barriers to changing their lawn care habits.

After examining some of the indicators that influence residents in their decision to implement a rain barrel, we can logically ask the next question: how can we increase the prevalence of rain barrels? One final key observation for this BMP is that users of rain barrels tend to make greater use of most of the other BMPs than non-users, excluding properly disposing of pet waste and regularly servicing septic systems (practices which are not relevant to the entire population). The BMP with the strongest relationship, though, is the use of phosphate-free fertilizers, due to a higher mean difference and significance at the P<.01 level. Table 7 presents the

bivariate analyses comparing those who use phosphorous-free fertilizers and those who do not on a variety of indicators.

Table 7: Phosphorus-Free Fertilizer Users vs. Non-Users

Variables	Mean Scores: Users	Mean Scores: Non-Users	Mean Differences	Significance
BMP Knowledge and Use				
Create a Rain Garden	1.86	1.55	0.31	P<.01*
Keep Yard Waste Out of Roads, Ditches, and Gutters	3.68	3.14	0.54	P<.001*
Regular Servicing of Septic System	3.72	3.08	0.64	P<.001*
Properly Dispose of Pet Waste	3.74	3.11	0.63	P<.001*
Conduct Regular Soil Tests	2.40	1.92	0.48	P<.001*
Keep a Rain Barrel	2.85	2.56	0.29	P<.001
Attitudes/Beliefs				
Yard Practices Influence Local Water	4.15	3.94	0.21	P<.05
Using Recommended Practices on Farms Improves Water	4.31	4.14	0.17	P<.05
It is My Responsibility to Help Protect Water	4.38	4.11	0.27	P<.001
My Actions Impact Water	4.30	4.09	0.21	P<.05*
Quality of Life in Community Depends on Good Water	4.35	4.12	0.23	P<.01
Awareness of Outreach				
Clean Water Messages on Storm Drains	0.21	0.10	0.11	P<.05*
Household Hazardous Waste Disposal	0.32	0.19	0.13	P<.05*
Other	0.00	0.03	-0.03	P<.01*

**Equality of Variances Not Assumed*

- The data demonstrates that the use of phosphorus-free fertilizer is significantly related to *all* other BMPs, including regularly servicing septic systems and properly disposing of pet waste.
    - This suggests that phosphorus-free fertilizers may act as a "gateway BMP," a practice that is easy to adopt and that has the potential to lead to the practice of others.
    - This is supported by the lack of statistical significance for the variable "Limits to Lawn Care Decisions."
- Additionally, the use of phosphorus-free fertilizer is associated with greater awareness of outreach and higher levels of environmental consciousness.
    - In particular, significance and mean scores surrounding the indicator "It is My Responsibility to Help Protect Water" held the most significance in the beliefs/attitudes variable.
    - While it is true that there is no causal direction in this relationship, instead indicating that those who have a greater degree of environmental concern are perhaps just more likely to use this practice, we can nevertheless see relevance for this practice to a large number of people in the watersheds as a whole.

Further analyses are facilitated by examining the number of people participating in its use, compared to the level of use seen in other practices. NOTE: the following numbers do not include those who found the practice not relevant, because those people likely do not meet the conditions for use of the BMP (they don't own pets or a septic system, they rent their property, etc.).

- Keeping yard waste out of roads, ditches, and gutters, regularly servicing septic systems, and properly disposing of pet waste constitute the most common and basic BMPs, as well as the easiest and most socially acceptable ones.
    - Keeping Yard Waste out of Roads, Ditches, and Gutters: 308 users, 175 non-users (64% use-rate)
    - Regular Servicing of Septic System: 178 users, 120 non-users (60% use-rate)
    - Properly Disposing of Pet Waste: 212 users, 103 non-users (67% use-rate)
- Rain Gardens, regular soil tests, and rain barrels are the practices at the lower end of the BMP spectrum, constituting the least accessible and most advanced practices, and which also see the least current use.
    - Creating a Rain Garden: 12 users, 435 non-users (3% use-rate)
    - Conducting Regular Soil Tests: 32 users, 390 non-users (8% use-rate)
    - Keeping a Rain Barrel: 52 users, 455 non-users (10% use-rate)
- Phosphorus-free fertilizers constitute a middle ground with a decent number of users and a simple method of implementation.
    - Using Phosphorus-Free Fertilizer: 108 users, 336 non-users (24% use-rate)

Widely used/basic practices see use by over half of the respondents that consider the practice relevant; middle-range practices see use by around one quarter of respondents that consider the practice relevant; and low-use/advanced practices see the very lowest use-rates, closer to the single digit percentages of use among respondents that find the practice relevant. The lower-use practices also tend to be the ones that often require a greater level of knowledge or physical manipulation of one's property.

Outreach and education activities may be most successful in terms of increasing overall BMP use among residential homeowners by focusing on promoting the use of phosphorus-free fertilizers and rain barrels, based on the previous analyses. The most apparent way to achieve this would be through increased awareness of practices and local programs/organizations that can assist with these practices. Incentive structures may also provide a way of increasing use, in addition to lowering barriers to entry, like more opportunities to implement and cheaper costs.

- Many respondents agree, as these solutions can be seen reflected in the comments section of the survey.
- Many respondents expressed a desire to learn more about environmentally-friendly practices, and to learn more about the issues affecting our community.
    - "I really don't know anything this subject - even though I use water all day everyday! I should know more."
    - "Would like to know more info about 'green' lawn care & benefits to lawn & environment. Demo Lawns, real working weed control, would be helpful."
    - "Better education for the public on conserving water, as well as how to help keep our water clean and safe is needed."
- Respondents also suggested some ways that rain barrels could be encouraged in the community.

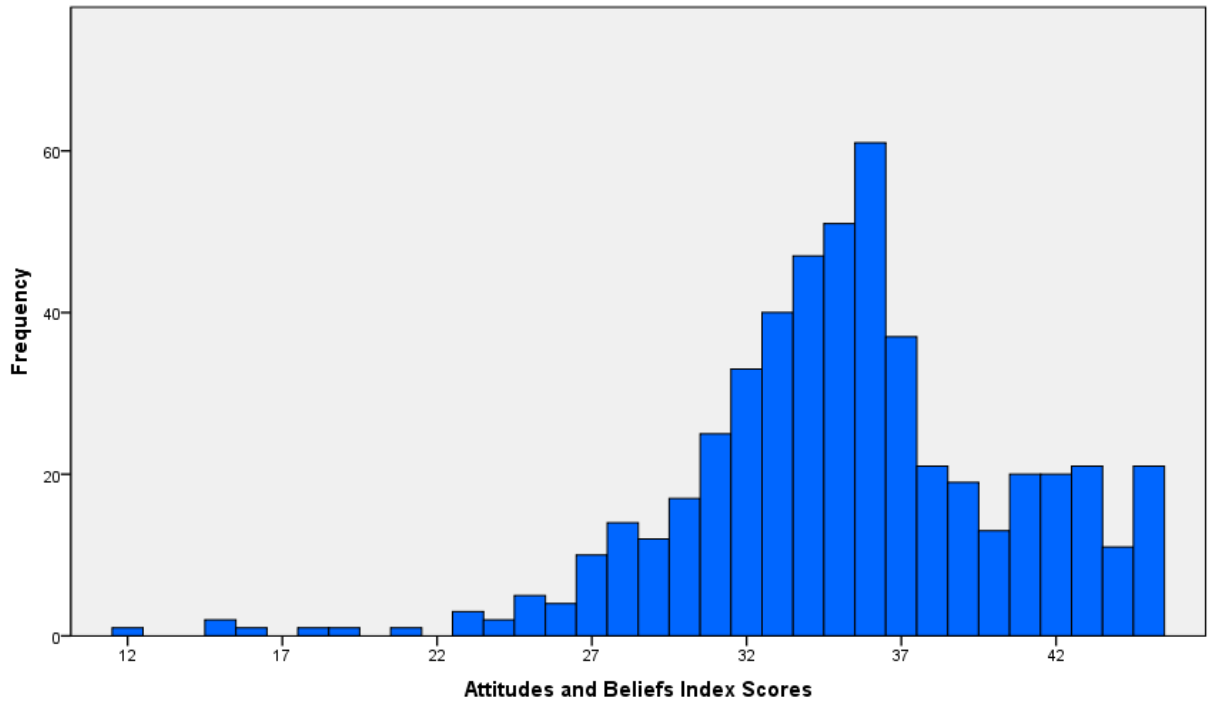
- "Tax rebates/subsidies for installing rain water storage tanks would go a long way in preserving water quality and quick adoption by the community."
- "If the city provided rain barrels, like it does recycling cans, I'd use them!"

The willingness to learn, and the desire to change practices, has been expressed in the community. While perhaps not agreed upon by all, the demand is there, so the supply should be provided.

Global Measures of Environmental Concern

Responses to questions concerning respondents' values and beliefs were fairly similar, with the exception of willingness to pay more to improve water quality (see pg. 18). Again, we saw a pretty high degree of agreement with the importance of environmental issues, but with a slightly lower degree of agreement to change habits and practices. In this section, we now seek to understand respondents' composite scores for environmental consciousness. This is accomplished by examining the Attitudes/Beliefs Index in relation to the other variables of the survey. The following pages present the results of this analysis. To begin, Figure 17 shows the distribution of scores in the index.

Figure 17: Distribution of Attitudes/Beliefs Composite Scores



- The minimum possible score is 9, while the maximum is 45. However, the minimum *reported* score is 12, while the greatest reported score is 45.
- Composed of 9 items total, the Cronbach's alpha of the index is .857, making it very reliable for analysis.
- The mean of all scores is 35.38; the standard deviation is 5.23; and the total number of possible scores is 514 excluding those that didn't answer all of the items (33 respondents).
- The most frequent score (mode) is 36, with 61 respondents holding this score. The median score is 35.

- The graph also demonstrates what the curve of the scores looks like. It is skewed left, revealing a tendency towards higher environmental consciousness in the sample.

Table 8 shows the strength of the significant relationships between the attitudes/beliefs index and other variables.

Table 8: Attitudes/Beliefs Correlations

Variables	Pearson Correlation (r)
Sources of Water Pollution	
Discharges from Industry	.178**
Erosion from Construction	.143**
Soil Erosion from Farms	.205**
Excessive Use of Lawn Chemicals	.342**
Improper Disposal of Household Wastes	.227**
Improperly Maintained Septic Systems	.235**
Littering / Illegal Trash Dumping	.172**
Excessive Use of Fertilizers on Farms	.325**
Residential Stormwater Runoff	.267**
Groundwater Withdrawal	.292**
Turf Management	.318**
Water Impairments	
Sedimentation	.186**
Nitrogen	.327**
Phosphorus	.368**
Bacteria and Viruses	.235**
Trash / Debris	.196**
Toxic Materials	.334**
Heavy Metals	.273**
Algae	.163**
Invasive Plants and Animal	.187**
Habitat Alteration Harming Fish	.187**
Awareness of Outreach	
Rain Barrel Workshop	.094*
Demo Rain Gardens	.089*
Safe Landscaping Programs (e.g., YardSmart)	.126**
Household Hazardous Waste Disposal	.10*
Other	.098*
Barriers to Lawn Care Change	
Expense	-.114*
Concerns About Resale Value	-.101*
Other	
Need to Develop Additional Water Source in Next 10 Years	.248**
Gender	.107*
Education	.112*

=P<.05; **=P<.01

- The most significant relationship that comes out of this data is the heightened awareness of sources of water pollution and specific impairments for those with greater environmental awareness. Eleven out of thirteen sources of water pollution were statistically significant in relation to attitudes/beliefs, as well as all of the specific impairments.

    - Both farming and residential chemicals and toxic materials are cited as the most important by those with a stronger level of environmental concern.
    - Littering, construction sources, and habitat alteration all held the weakest relationships, but were nevertheless statistically significant.
- Those with greater environmental concern tend to more strongly agree with the idea that Bloomington needs an alternative water resource in the next 10 years. What that source should be, however, is not quite agreed upon.
- Respondents with a greater level of environmental concern tend to be a bit less concerned with costs associated with improving water quality.
    - This relationship is very weak, though, and so should not be overstated.
- Finally, gender and education had weak relationships with environmental concern, demonstrating that women with more education had higher levels of environmental concern.

Qualitative Comment Analysis

Throughout the survey, there were numerous places where respondents could fill in their own responses and they were also encouraged to add any additional comments at the conclusion of the survey. Overall, 145 respondents volunteered qualitative comments at some point in the survey questionnaire. Although these comments are not representative or generalizable, they do offer some useful insight into a few common themes related to the use of BMPs.

Best Management Practices (BMPs)

- Some of the qualitative comments at the end of the survey indicated issues or concerns about how to use and maintain rain barrels. With greater awareness of the Ecology Action Center (EAC) and its programs, it is possible that these concerns could be more directly addressed and adoption of this specific BMP could be increased. The connection between clean/plentiful water and how rain barrels can help in this larger issue may not be fully understood by respondents:
        - "Better education for the public on conserving water, as well as how to help keep our water clean and safe is needed. […] Rain barrels are not the answer! They have their own problems."
        - "It's quite apparent that the big problem staring us directly in the face is the quantity of H2O to meet the needs of the region. Rain barrels don't address this!"
    - Others expressed interest in rain barrels, but were unaware of the opportunities the EAC provides for learning about them. The connection between EAC awareness and rain barrel usage shows that mere exposure would solve this issue:
        - "I would like to learn about rain barrels. We have a neighbor that does that and seems so practical for watering plants and the lawn."
        - "My neighbor collects rain water and I would like to but haven't even thought about how to switch out our gutters or where to get a rain barrel."

Conclusions

The social science research data that has been presented was gathered to examine social factors relevant to efforts to maintain water quality. In addition, these findings provide information that can be beneficial for future updates of the watershed plans for Lake Evergreen and Lake Bloomington Watersheds. Finally, the data can help to direct the design and delivery of future education and outreach programs so they are optimized to be as effective as possible. To re-cap, the specific goals of the project were as follows:

1) Evaluate urban resident's general level of knowledge and concerns of water quality
2) Identify the effects residents' activities have on water quality and the practices they currently use that effect water quality (BMPs)
3) Evaluate onsite waste system knowledge and practice
4) Evaluate knowledge of and opinions of water conservation activities on water quality and quantity
5) Provide critical data to direct future outreach and education efforts

The survey results overall were very encouraging, demonstrating a reasonable level of knowledge about water quality issues and an understanding that personal behaviors impact water quality. Respondents demonstrated that they saw a connection between their actions, water quality, and quality of life in their community. Older respondents were more likely to see the connection between personal action and water quality and indicated that they were more willing to make changes in their own lawn care practices to protect water quality.

In regards to the first goal, which focused on assessing general knowledge and concerns for water quality, the data illustrated some important findings. Overall, respondents rated the water quality in both watersheds as fairly good, with an overall mean score of 2.53 on a scale of 1 (poor) to 3 (good). More specifically, water quality for picnicking/family activities (2.67), for scenic beauty (2.63) and for canoeing/kayaking/other boating (2.64) were rated the highest. Water quality for swimming was rated the lowest (2.28). In general, these findings indicate that respondents have a generally favorable view of the current state of water quality. When asked to rate various sources of pollutants, Nitrogen and Phosphorous were viewed as the most problematic sources of water quality impairments. This is consistent with water quality monitoring data that has historically found these to be the most common non-point source pollutants (Evergreen Lake Watershed Management Plan 2008; Lake Bloomington Watershed Management Plan 2008).

In response to the second and third goals, there is greater variation in knowledge and use of specific BMPs, and onsite waste systems more specifically. In general, respondents were somewhat familiar with each of the seven BMPs. Respondents were most familiar with using rain barrels, followed by regularly servicing septic systems and then keeping grass clippings and leaves out of roads, ditches, and gutters. However, only 10% of respondents indicated that they actually use rain barrels. The most commonly used BMPs were keeping grass clippings and leaves out of roads, ditches, and gutters, followed by properly disposing of pet waste and then regular servicing of septic systems. When looking at the data for those who indicated that their household had a septic system, the majority of respondents indicated that they have never experienced any problems with their septic system.

When examining data that addresses the fourth goal, the findings are less conclusive. Respondents did agree that there is a need to develop an additional water source for the City of Bloomington in the next ten years. However, when asked if that source should be a well or a new reservoir, respondents were almost equally split between favoring one option over the other, with a well having only a slight preference over a reservoir.

The data on respondents' values and opinions regarding water quality and conservation efforts demonstrates that respondents generally agree that they have a personal responsibility to protect water quality. However, when those action involve spending their own money or making specific personal changes to protect water resources, the level of support tends to decrease. Not surprisingly, those most willing to spend more money to improve water quality include women, older respondents, those with higher incomes and education, and those who own their own property. The most significant barrier to changing lawn care and/or storm water practices for an individual's property was expense, followed by lack of information about a practice.

Although not a specific goal of the project, one of the intended uses of the data collected is to inform future updates of both the Lake Evergreen and Lake Bloomington Watershed Management Plans. The current plans date back to 2008 and as such, are becoming due for an update. The watershed plans acknowledged that "an informed and knowledgeable community is crucial to the success of the storm water management program." (44) However, the plans lacked any specific focus on the role of the growing residential population in water quality stewardship. As such, the plans do not address specific goals or plans for outreach activities that focus on the residential populations, instead focusing more strongly on outreach activities that are targeted to agricultural producers within the watershed. The higher percentages of respondents who did not know about various water impairments and specific sources of water pollution indicate that there is room to improve this knowledge as a vector to also improve water stewardship. For example, respondents with higher concern for algae in the water were more likely to use phosphate free fertilizer. The current watershed management plans also do not directly discuss future alternative water sources. Data demonstrated that respondents do share a belief that a new water source needs to be pursued for the City of Bloomington, however responses were more split on whether that should take the direction of a well or a new reservoir. Incorporating planning efforts and strategies to more fully pursue alternatives for an additional water supply in an updated watershed management plan would be very beneficial.

Finally, when considering how to utilize this baseline data to inform future outreach activities, there are some useful outcomes to consider. Overall, the survey results informing the first four objectives are encouraging and provide some clear guidance in terms of directing future outreach and education efforts. Based on the data, the most effective areas to target for outreach would be:

- Use of Phosphorous-Free Fertilizers
  - The data demonstrates that the use of phosphorus-free fertilizer is significantly related to *all* other BMPs, including regularly servicing septic systems and properly disposing of pet waste.
  - This suggests that phosphorus-free fertilizers may act as a "gateway BMP," a practice that is easy to adopt and that has the potential to lead to the practice of others.
  - Furthermore, knowledge is still somewhat low, indicating that an outreach campaign would benefit from sharing some basic knowledge about the value of this product and how it can have a positive impact on water quality. Actual use of this practice is higher than rain barrels, but it is still only at 21%, indicating significant room for improvement.
- Use of Rain Barrels
  - Knowledge of this practice is fairly high, but adoption is very low (10%). This indicates that outreach efforts need to focus more on actual adoption, and less on just sharing information about the practice.
- Dispelling myths about sources of pollutants
  - Overall, respondents seemed to reflect some inaccurate or outdated perceptions, especially as it relates to sources of water pollutants.

- Although agricultural production remains a source of water contaminants, the impacts continue to decrease. It appears that this is not recognized by a majority of urban respondents.
- Urban residents could benefit from a greater awareness of how urban environments and their own personal lawn care practices contribute to degraded water quality.
- Inaccurate perceptions about 'problems' with rain barrels (breeding ground for mosquitoes, hard to maintain, etc…) seem to have a negative influence on the percentage of respondents using this tool.
- Qualitative comments indicated a level of pessimism concerning how "one person can't make an impact".

When looking at the difference between rural and urban respondents, the data shows that there are some differences of opinion, which implies that outreach may need to be structured differently in urban vs. rural settings. For example, rural respondents expressed less concern for impairments and indicated fewer barriers to adoption. Rural respondents also tended to have lower incomes and levels of educational attainment. Based on these differences, outreach in the rural communities may be more effective if an emphasis was placed on ***value-driven*** messages, while urban outreach may be more effective using ***science-driven*** messages.

- Examples of value-messages might include:
  - An emphasis on family and natural beauty, since these were rated highly in terms of activities enjoyed by respondents
  - Focus on community health and personal agency
    - Aspects relating to community health and personal agency were rated very high in the attitudes/beliefs analysis.
    - Agency is an important vector of delivery for any message since the majority of respondents agreed that it is their responsibility to protect water quality.
    - Outreach messages would benefit from a focus on making a difference through small changes that do not pose a significant economic burden.
  - Finally, for rural respondents, boating was rate as much more important to them, compared to urban respondents. This presents an important contextual frame for outreach messages in rural areas.
- Examples of science-driven messages might include:
  - More clearly framing the linkages between specific household/lawn chemicals and degraded water quality. The chemicals relevant to regular household practices and how they can be reduced
    - Particularly P and N (P especially), as per Impairments graphs, with possible inclusion of heavy metals and other toxic materials
  - Help in assuaging the impact of population growth and development
    - This was observed in the comments
  - Environmental degradation
  - Ecosystem health

Overall, any future outreach and education activities would benefit from addressing some of the common barriers to making changes to personal lawn care practices that emerged in the data.

- Cost
  - Respondents were commonly concerned with how changing specific behaviors or practices would cost them more money.

- Ease and convenience
    - Another common barrier to changing lawn care practices was the perception that learning new skills/techniques might be difficult nor not convenient.

Community based social marketing techniques are a valuable tool that can be utilized to address many of the issues previously identified. These techniques may help to facilitate both awareness and, more importantly, behavior change, to further protect water quality and watershed health in the Lake Bloomington and Lake Evergreen watersheds. Research has shown that education alone often has little or no effect on changing people's behaviors, in particular as it relates to sustainability issues such as water quality or watershed health (Geller 1981; Geller, Erickson, and Buttram 1983; Jordan, Hungerford, and Tomera 1986). Community-based social marketing addresses this shortcoming by first identifying barriers to a sustainable behavior and then designing a strategy that utilizes behavior change tools (McKenzie-Mohr 2010).

This study has provided critical baseline information on barriers to specific actions such as making changes to lawn care and/or storm water practices and adoption of various BMPs such as using phosphate free fertilizer or using rain barrels. With this information, it is now possible to develop and employ specific tools that are effective in changing behavior. Examples of the most proven tools include gaining a commitment from an individual to try a new activity or developing community norms that encourage people to behave in a way that is more supportive of sustainability objectives (McKenzie-Mohr). To be most effective, it is important that these tools be carried out at the local and community level and work to incorporate direct personal contact. Partnering with local organizations that have a history working with issues of water quality and quantity will be vital to the future success of any outreach campaign and will also ensure that direct, personal contact. The two most obvious organizations would be the McLean County Soil and Water Conservation District (MCSWCD) and the Ecology Action Center (EAC). Both organizations have a strong history of outreach and education related to water resources, however MCSWCD has historically focused more directly on agricultural producers. The EAC, in contrast, focuses directly on residential populations, with a mission "to inspire and assist residents of McLean County in creating, strengthening and preserving a healthy environment. The EAC acts as a central resource for environmental education, information, outreach, and technical assistance in McLean County". Collaborating with these two organizations in the development of future outreach and education activities will help to ensure that messages can be tailored to the diversity of residents throughout the watershed. For example, the findings indicate that some objectives could be carried out watershed-wide while others may be more effective if targeted to rural or urban residents, such as focusing on septic system maintenance in the rural areas where these are most prevalent.

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