Wilson Lake Septic Survey Report

September 2016

Funding for this project, in part, was provided by the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act. The funding is administered by the Maine Department of Environmental Protection in partnership with EPA. EPA does not endorse any commercial products or services mentioned.

Prepared For:
The Wilson Lake Association

Prepared By:
The Acton Wakefield Watersheds Alliance

Support By:
The Maine Department of Environmental Protection

September 2016

Acton Wakefield Watersheds Alliance
254 Main St
PO Box 235
Union, NH 03872
(603)473-2500
www.awwatersheds.org

Principal Authors:

Amy Arsenault, AWWA Program Assistant

Sam Wilson, AWWA Program Manager

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Introduction

This report serves to compile, summarize, and analyze data collected during the Wilson Lake Septic Survey conducted in April 2016 and is intended for residents, landowners and local decision makers within the Wilson Lake watershed. The survey is part of a larger project to implement phosphorus reductions on Wilson Lake and the other Salmon Falls headwater lakes.

The Wilson Lake watershed spans an area of 3.86 square miles. The lake itself covers 308 acres while spanning 3.7 miles of shoreline. Located in Acton, ME, Wilson Lake has an average depth of 17 feet, and its water quality is considered average among Maine lakes. Water quality is defined based on measures of Secchi disk transparency, total phosphorus, and chlorophyll-*a* levels. The average Secchi disk depth of lakes similar to Wilson ranges from 6.1 to 9.1 meters (m). Lakes with average water quality also have low cholorphyll-*a* levels ranging from 2 to 4 parts per billion (ppb), and total phosphorus concentrations ranging from 5 to 10 ppb. In 2015, Wilson Lake had an average Secchi disk depth of 6.7 m, an average phosphorus concentration of 6.8 ppb, and an average of 2.2 ppb of cholorphyll-*a.*

In late summer, Wilson Lake experiences oxygen depletion in the bottom waters. Oxygen depletion signals that the lake is under stress, and as a result, phosphorus is released from the sediment into the water column. The internal loading of nutrients, along with the other water quality parameters mentioned above, puts Wilson Lake at a low to moderate risk of nuisance algal blooms.

The key to maintaining Wilson Lake's water quality is managing and reducing the amount of pollutants entering the lake. One potential source of pollution is wastewater systems. Septic systems, holding tanks, outhouses, compost, cesspools, and even portable toilets help us to manage our wastewater to prevent undue harm to human health, aquatic life, or water resources. However, outdated or improperly maintained systems can release disease-causing bacteria into water bodies, causing gastrointestinal illness and ecosystem damage. Soils can act as an efficient filter of phosphorus in subsurface wastewater systems; however failing systems have the potential to contribute excessive phosphorus into lakes and stream through groundwater. With septic effluent containing about one thousand times the concentration of phosphorus in lake waters (Gilliom and Patmont, 1983) a small amount of effluent can have a major impact. In natural conditions, the scarcity of phosphorus in a lake limits algae growth. However, when a lake receives extra phosphorus, algae growth increases

dramatically. Sometimes this growth causes choking blooms, but more often it results in small changes in water quality that, over time, damage the ecology, aesthetics and economy of lakes.

Septic Survey Methods

A septic survey for Wilson Lake was designed based on a survey previously conducted by FB Environmental for use on Province Lake. Local tax maps were used to determine all landowners within 250 feet of the lake, in the shoreland zone, which had a dwelling on the property. Surveys were sent to the mailing addresses these landowners had registered with the town of Acton, ME. A link to an online version of the survey was also provided. Each mailing contained a brochure on septic systems and their maintenance. A chance to win a $100 gift certificate to a local restaurant was offered to all who participated in the survey.

The survey (Appendix A) included questions relating to the owner's current wastewater system use, along with several other questions to gauge their perception of the lake and knowledge of conservation practices. Questions included the respondent's perception of the Wilson Lake's water quality, the age of the system, age of the house, occupancy, how often the system is pumped, the last time it was pumped, and about other types of water using machines.

To determine high priority septic systems, landowners were ranked based on three risk factors. Risk was calculated by first identifying systems older than 25 years, within 75 feet of the water and pumped less frequently than once every five years. For each, if someone fell into a high risk category, didn't know or didn't respond, they received a '1'. If they had all three factors, they received a '3', which is highest risk. Those who had none of these factors, received a risk rating of '0'.

Septic Survey Results

The survey questions were designed to work in conjunction with a land-use loading model which can estimate the amount of phosphorus septic systems are contributing to the lake. Questions like "How often do you have your wastewater system pumped?" factored in with "How close is your system to the lake?" can provide information about the potential for phosphorus in the system to reach the lake.

In reference to the following figures: "No response" indicates that the question was left unanswered by the respondent. "I don't know" indicates that the question was asked but the respondent did not know the answer.

In total, 138 surveys were sent out, and 50 residents completed the survey, for a response rate of 36%; 37 respondents sent their survey in via mail and 13 responses were completed online. None of the returned surveys were anonymous; however, some homeowners chose not to answer every question.

Septic Survey Results by Question

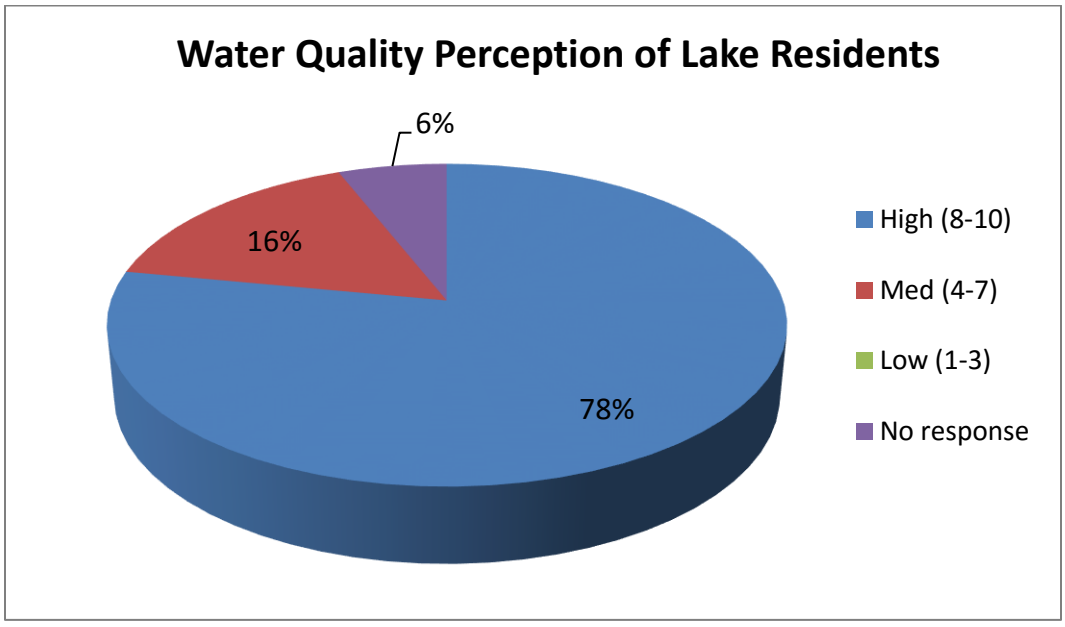

Figure 1 - Most respondents (78%), perceived the water quality in Wilson Lake to be high. Another 16% of residents felt the lake's water quality was medium, and none of the residents reported a low quality perception. Of the residents who turned in the survey, 6% did not respond to this question.

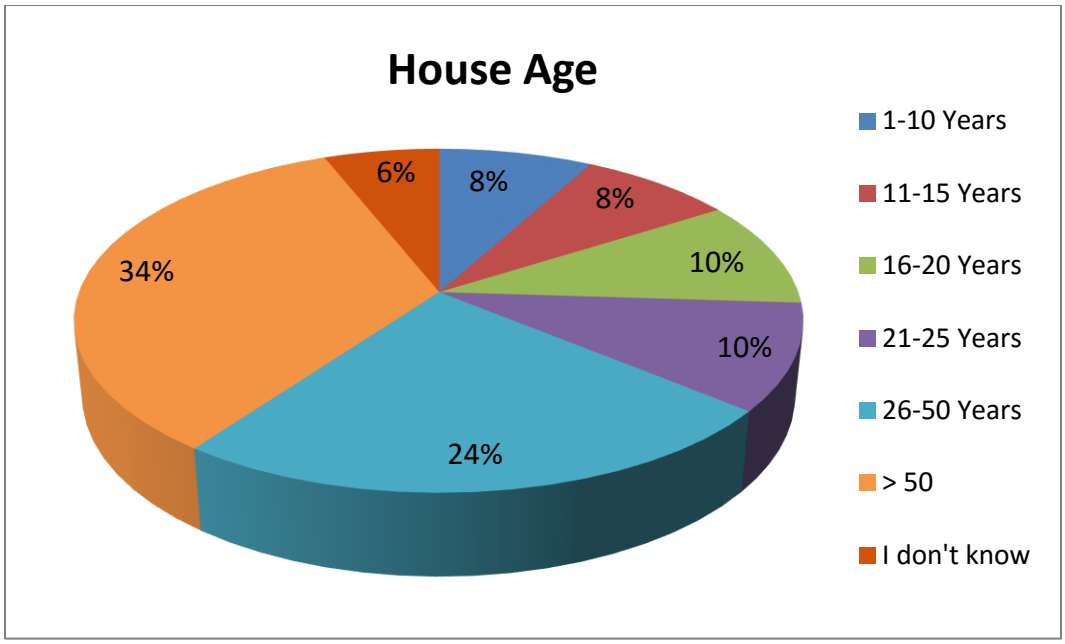

Figure 2 – More than half of the houses (58%) on Wilson Lake were older than 25 years; houses that were 26 - 50 years old accounted for 24%, and houses older than 50 years old accounted for 34%. Properties that were newly built (within the past 10 years), accounted for 8%, and houses 11 - 15 years old also accounted for 8%. In total, 36% of the houses on Wilson Lake were 25 years old or less.

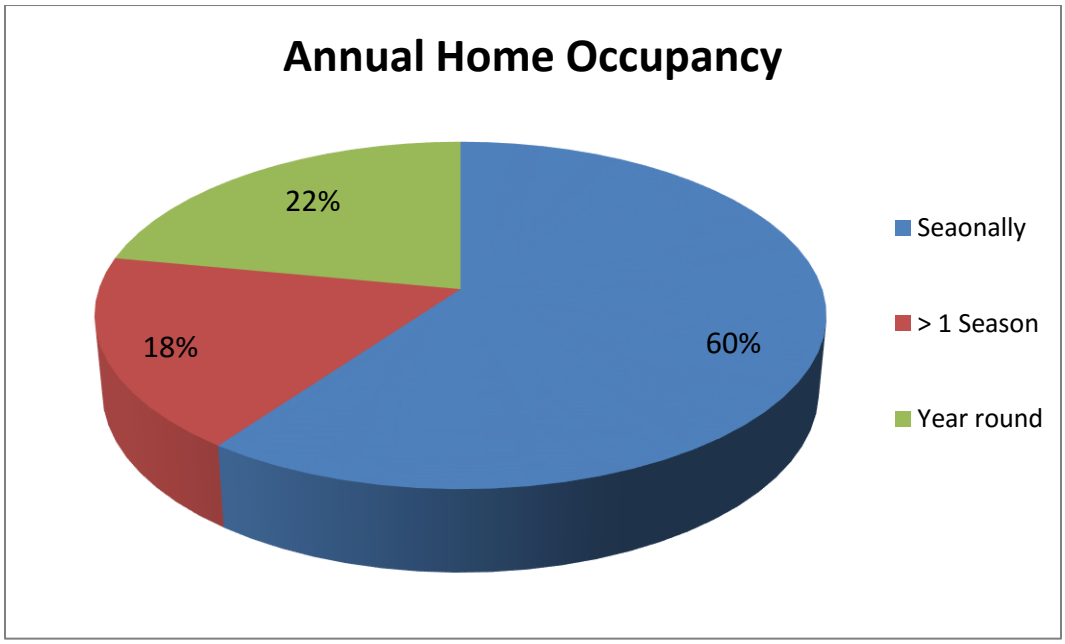

Figure 3 – More than half (60%) of respondents claimed to be seasonal residents, whereas 18% stay for more than one season. On Wilson Lake, year round residents account for 22%. This information will assist in determining the usage of wastewater treatment systems throughout the year.

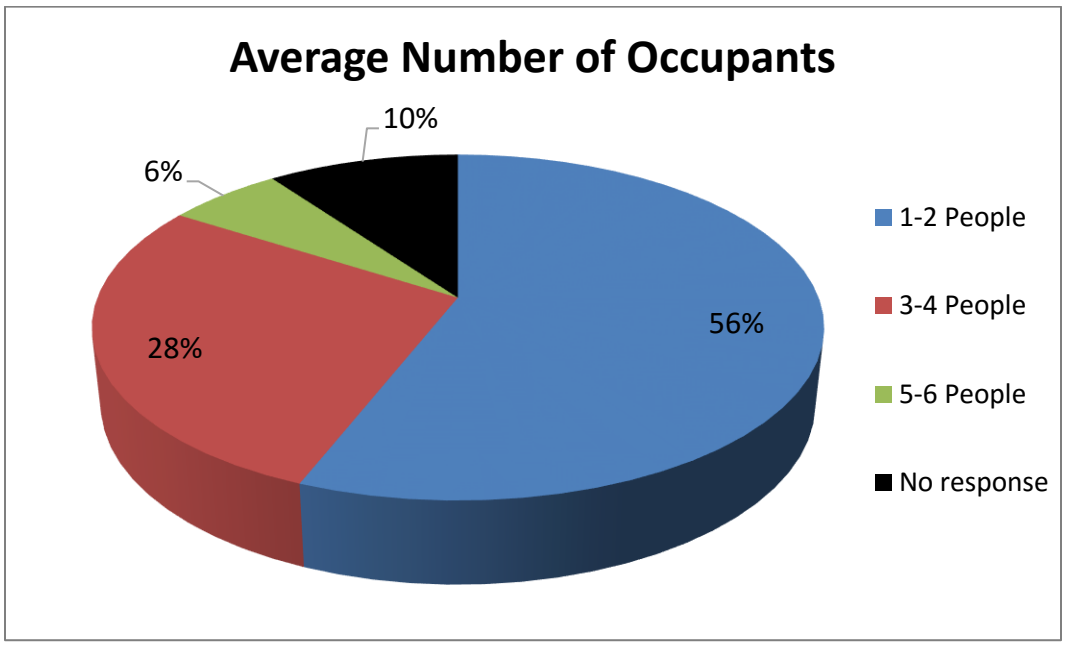

Figure 4 - About half of respondents (56%) had an average of 1-2 people occupying their residence during their stay, while 28% had an average of 3-4 people. In addition, 6% had an average of 5-6 people, and 10% did not respond to this question.

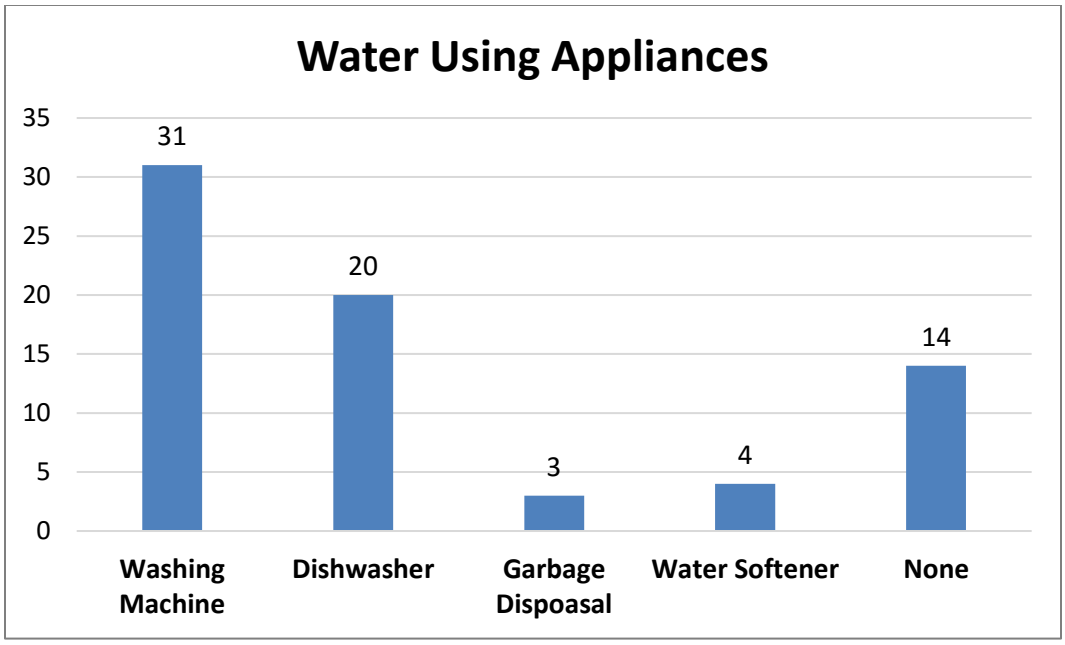

Figure 5 – 31 residencies had washing machines, and 20 had dishwashers. 3 residences had garbage disposals, and 4 used a water softener. 14 residencies claimed to have no water-using machines on their property, and 13 of these are seasonal occupants (less than 50 days/year).

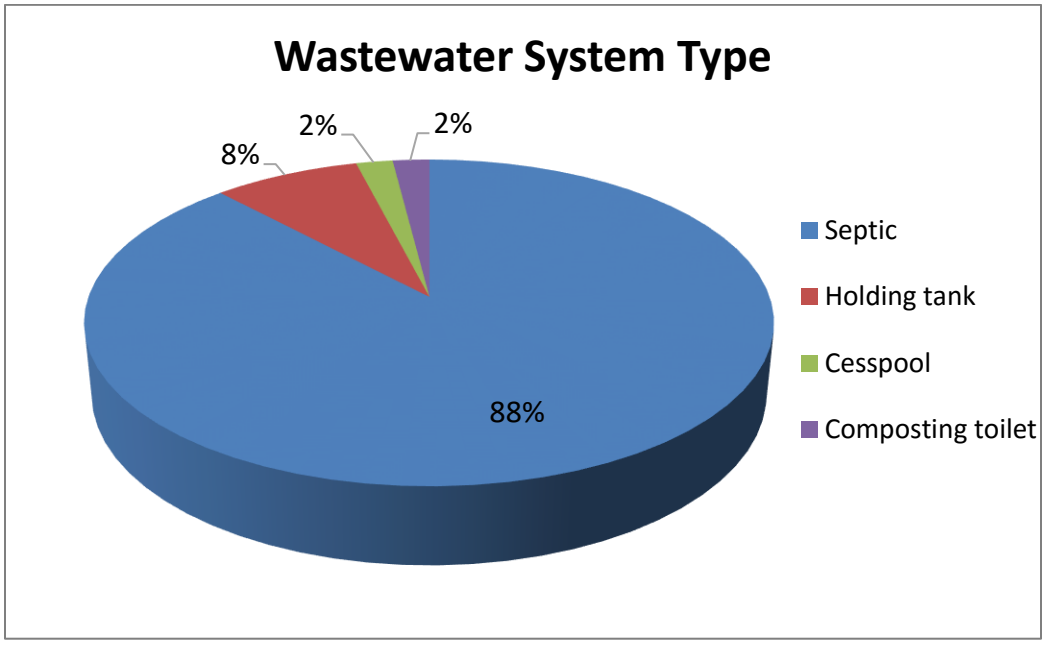

Figure 6 - The majority of respondents (88%) answered that they had septic systems. Another 8% reported having a holding tank, 2% had a cesspool, and the remaining 2% had a composting toilet.

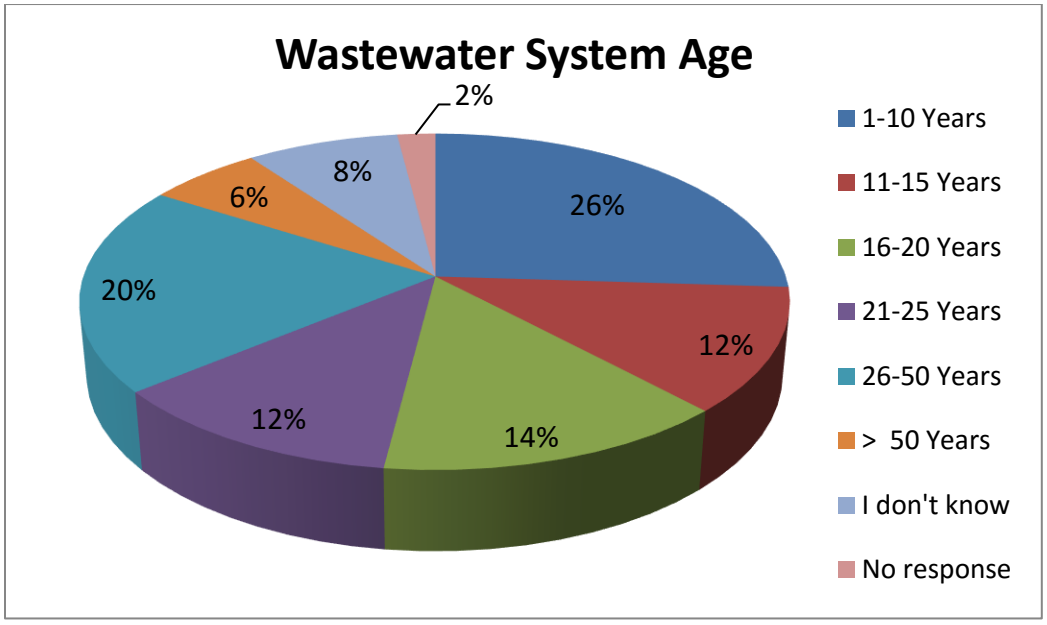

Figure 7 - The age of the wastewater systems was well distributed. The largest percentage of systems (26%) was the newest, and ranged between 1-10 years old. However, the second largest percentage of systems (20%) was over 25 years old. In total, 26% of the wastewater systems were at least 25 years old. Of the residents who turned in the survey, 8% did not know the age of their system, and 2% did not respond to this question.

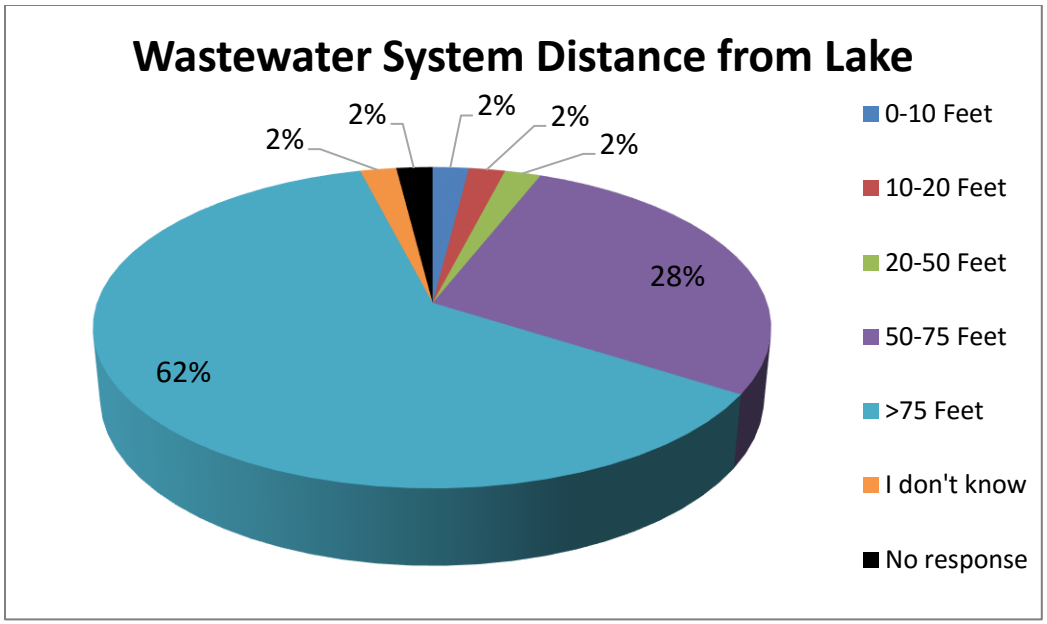

Figure 8 - Most wastewater systems (62%) were greater than 75ft away from Wilson Lake, and 28% of systems were 50-75ft away. In total, 6% of systems were 50ft or less from the lake; 2% were 20-50ft away, 2% were 10-20ft away, and 2% were 0-10ft away. If these systems at the water's edge fail, there is much less ability for the soil to filter out phosphorus and bacteria before they enter the lake. Of the respondents, 2% did not know the distance of their system, and 2% did not respond to the question.

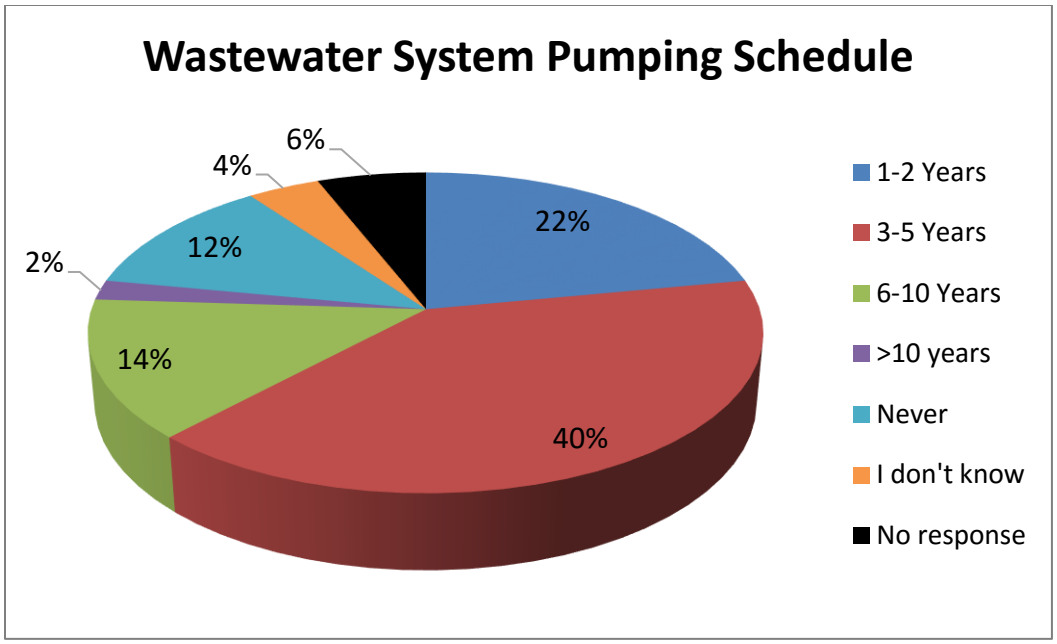

Figure 9 - Approximately 22% of residents had their wastewater systems pumped every 1-2 years, and 40% had their systems pumped every 3-5 years. Of the respondents, 14% had their systems pumped every 6-10 years, and 2% had their systems pumped every 10 years or more. 12% of respondents reported that they've never had their systems pumped; however, some of these can be accounted for as newly installed systems. Of the respondents, 4% did not know when their system was last pumped, and 6% did not answer this question**;** this may be because they felt they'd face repercussions if identified as not pumping enough. As a follow up to this question, 40 residents filled in the year that their systems were last pumped. Of these responses, 28 claimed to have had their systems pumped between 2012 and 2015.

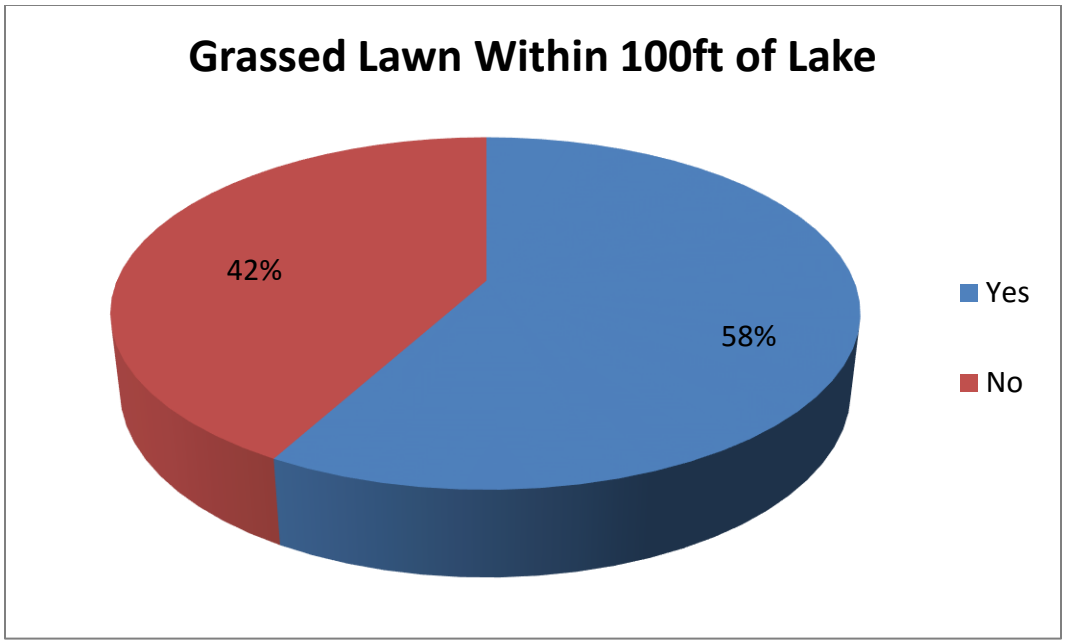

Figure 10 – More than half (58%) of respondents had a grassed lawn within 100ft of the lake, while 42% reportedly did not. Grassed lawns tend to have a greater impact on lakes than forested land due to their inability to filter nutrients and infiltrate runoff as effectively.

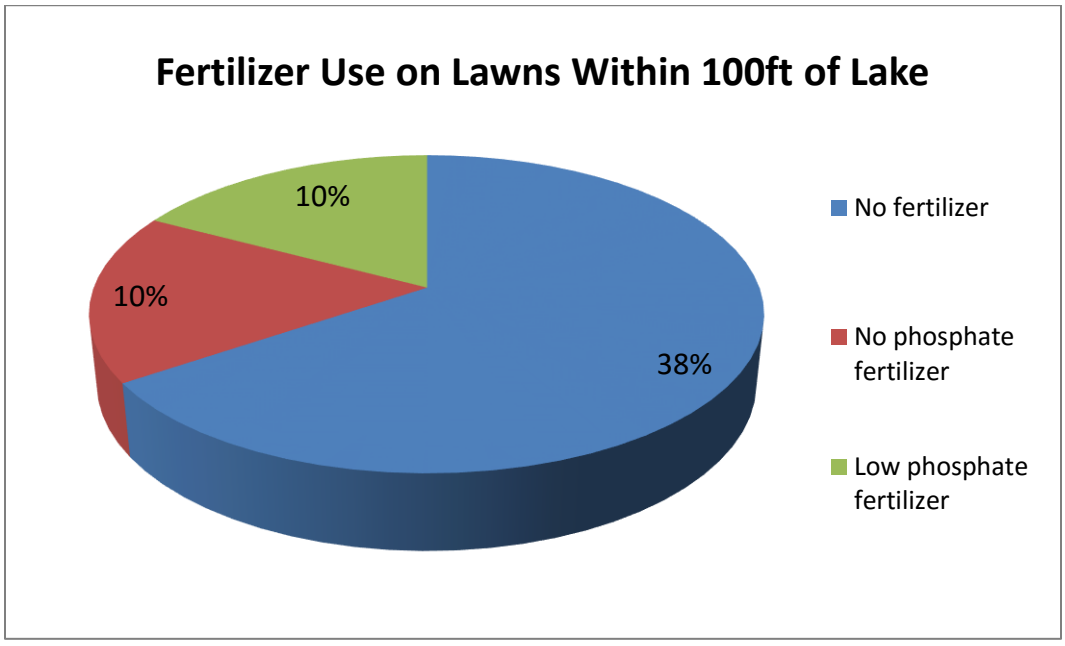

Figure 11 - Of the homes with grassed lawns within 100ft of the lake, 38% do not use fertilizer, while 10% use low phosphate fertilizer, and 10% use no phosphate fertilizer.

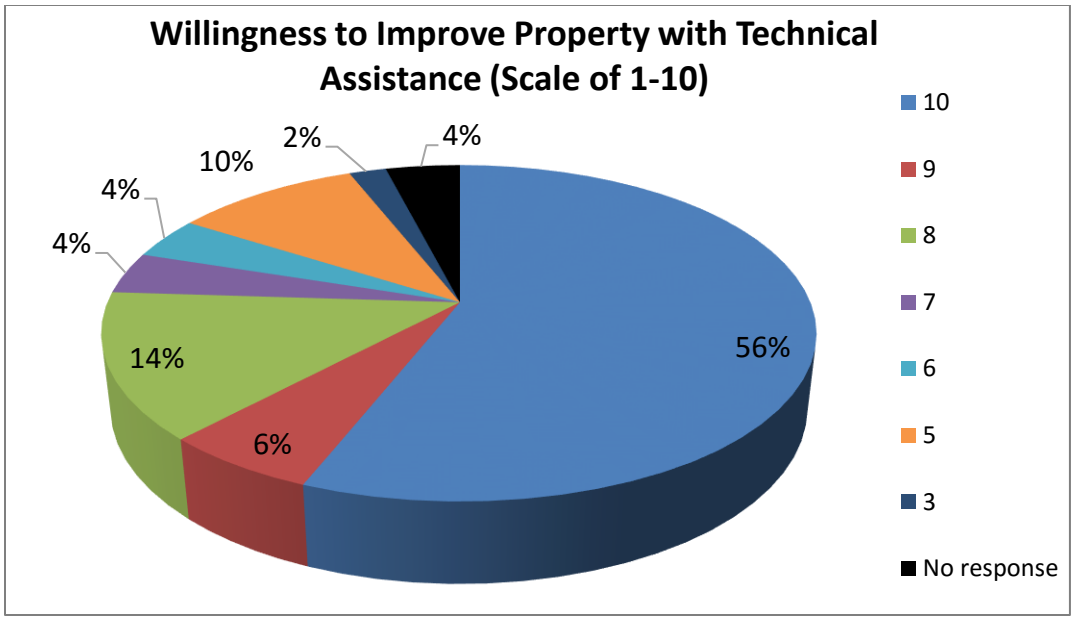

Figure 12 - 76% of respondents are very willing (rated 8-10 on a scale of 1-10) to correct problems identified on their property to improve water quality. 18% had a medium willingness to fix their properties (ranked 4-7). Of the respondents, 2% were less willing (ranked 1-3), and 4% did not respond. This is very encouraging for continuing efforts to manage Wilson Lake's water quality.

Septic System Priority Ranking

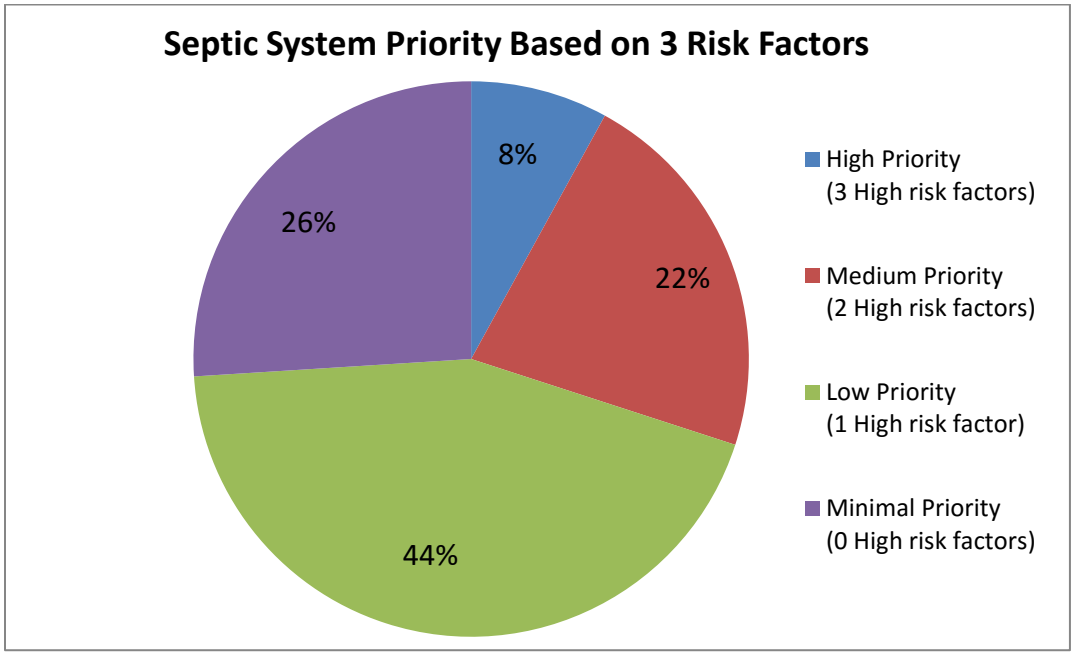

Figure 13 – Of the 50 survey respondents, 4 were classified as high priority systems, 11 were medium priority, 22 were low priority, and 13 were minimal priority. High risk factors include properties which had a septic system older than 25 years, within 75 feet of the water, and systems pumped less frequently than once every five years.

Recommendations

Wilson Lake Association (WLA)

- Prioritize outreach to target landowners with older systems (>25 years), landowners with systems that are within seventy-five feet of a stream or the lake, and residents who rarely or have never had their systems pumped.
- Distribute copies of the septic survey report to residential property owners within the target groups and encourage property owners to make improvements to their properties.
- Apply for funding to fix potential septic system problems identified in the survey; especially at heavy usage sites.
- Educate municipal officials about lake water quality issues and work cooperatively to find solutions.
- Continue to educate landowners on the importance of maintaining septic systems and the effects of the phosphorus-based products on the lake quality.
- Follow up with landowners who did not respond to the survey, and gather more information to determine their system's risk.
- Further analysis could determine if there were any trends in respondent's addresses. For example, maybe certain streets or neighborhoods were more likely to respond to the survey.

Individual Landowners

- Properly maintain wastewater treatment systems. Pump tanks regularly (every 2 to 3 years for a year round residence; 4-5 years for seasonal occupancy) and upgrade marginal systems.
- Call or email the Wilson Lake Association for advice on how to fix septic issues. You can also call the Maine Department of Environmental Protection for free advice on how to get started.
- Join the Wilson Lake Association to get involved with their activities to improve water quality. You can reach them through the WLA website at http://wilsonlake.net/

Town of Acton, ME

- Enforce septic system ordinances to continue to support management efforts at Wilson Lake.
- Participate and support the long-term watershed management plan.

Summary & Next Steps

Information gathered from the Wilson Lake Septic Survey provides a snapshot of the state of wastewater systems in the Wilson Lake watershed. Next steps should include funding for modeling in order to estimate the total phosphorus load contribution to Wilson Lake from wastewater systems, and the highest priority systems in the watershed. From there, targeted grant funds can be used to upgrade outdated and/or malfunctioning systems.

References

Gilliom, R.J., and Patmont, C. (1983). Lake phosphorus loading from septic systems by seasonally perched groundwater. *Water Pollution Control Federation*: *55*(10), 1297-1305

Appendix A: Wilson Lake 2016 Septic Survey

2016 WILSON LAKE SEPTIC SURVEY

Thank you for participating in the Wilson Lake Septic Survey! **When you return this survey or complete it online you will be entered in a drawing for a $100 gift certificate to Willy's Ale Room.** You are being asked for this information because your property is within 250 feet of Wilson Lake. **Please return this survey by April 15, 2016**. The drawing for the gift certificate will be held on Tuesday, April 19, 2016.

The Wilson Lake Septic Survey is a part of the Salmon Falls Headwater Lakes Watershed Management Plan currently being implemented by the Acton Wakefield Watersheds Alliance, the Wilson Lake Association, and the Maine Dept. of Environmental Protection. In order to evaluate the potential cumulative impacts that septic systems around the lake may have on lake water quality, we are surveying properties within 250 ft of the lake and its tributaries. The information will provide a better understanding not only of the state of the septic systems in the area, but will also help us to identify opportunities for future outreach activities and where resources may be needed.

To complete the survey online go to: **http://goo.gl/forms/xbRGuo1cjW**

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1. **On a scale of 1 to 10, where ten is the best, what is your perception of the water quality on your lake?** *(circle one)*
   1 2 3 4 5 6 7 8 9 10
2. **Which of the following describes your wastewater system?** *(circle one)*
   Septic Holding Tank Cesspool Outhouse Portable Toilets Other_____
3. **Do you know where your wastewater system(s) are located?** (*circle one*)
   Yes No Not Sure
4. **How old is the wastewater system?** *(circle one)*
   1-10 years 11-15 years 16-20 years 21-25 years 26-50 years Older than 50 Years I don't know
5. **How old is the house?** *(circle one)*
   1-10 years 11-15 years 16-20 years 21-25 years 26-50 years Older than 50 Years I don't know
6. **Is this home used year-round or seasonally?** *(circle one)*
   Year Round More than one season Seasonal
7. **What's the average occupancy?** *(circle one)*
   1-2 people 3-4 people 5-6 people More than 6 people
8. **What is the approximate distance of your wastewater system from the lake or stream?** *(circle one) Lake or Stream?*
   0-10 feet 10-20 feet 20-50 feet 50-75 feet Greater than 75 feet I don't know
9. **How often do you have your wastewater system pumped?** *(circle one)*
   Every 1-2 years Every 3-5 years Every 6-10 years More than 10 years Never pumped I don't know
10. **When was the last time it was pumped (Year)?_____**

11. Which of the following water-using machines do you have in your house/camp? *(circle all that apply)*

Washing Machine Garbage Disposal Dishwasher Water Softener Other_____

11A. If you have a garbage dispoal, how often do you use it when you are at the house? *(circle one)*

Always Frequently Seldom Never

12. Do you have a grassed lawn area within 100 feet of the water? *(circle one)*

Yes No

12A. If Yes, do you use: *(circle one)*

No Fertilizer No-Phosphate Fertilizer Low Phosphate Fertilizer I don't know

13. How willing (where 10 is most willing) would you be to make improvements to your property to help protect the lake's water quality if technical assistance were provided? *(circle one)*

1 2 3 4 5 6 7 8 9 10

Last Name: _____ **Property Address:** _____

(required) (required)

Map/Lot # (if known):_____

☐ **Yes enter me in the raffle for the $100 gift certificate to Willy's Ale Room**

My email address is: _____ OR

My mailing address is: _____

Please list any other relevant comments/questions that you may have:

THANK YOU!

The results of this survey will be available on the AWWA & WLA websites

www.AWwatersheds.org

www.wilsonlake.net

Funding for this project was provided in part by the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act. The funding is administered by the Maine DEP in partnership with EPA.

Septic Systems and Lakes

Failed or improperly functioning private residential septic systems threaten nearby waterbodies.

When a septic system is not working properly, untreated wastewater can enter the lake, directly or almost directly. Though a septic system is designed to eventually return "clean" wastewater to the groundwater, the waste must first go through the whole process of bacterial action and passage through appropriate materials that filter it.

Untreated Waste Can Be Harmful to Health

Waste from a home that has not passed through a functioning septic system can carry bacteria and viruses into the water body.

Nutrients Harmful to Lakes

Untreated residential wastewater is also heavy with nutrients that feed unwanted plant and algae growth in lakes and ponds. Algae blooms and thriving invasive plants can be supported by nutrients from septic systems that are not working well.

Untreated septic waste can also contain chemicals that are harmful to plants, aquatic life and humans, such as chlorines and various chemicals and hormones used in pharmaceutical and personal care products. Some of these are altered or removed as the waste passes through the microbial and filtration action of a septic system, but reach the lake water when the system is not working properly.

Record of Pumping Service/ Maintenance

Date	Service & Provider

Acknowledgements: The Wilson Lake Association and AWWA are grateful for the use of materials from the Lake Sunapee Protective Association and the NH Dept of Environmental Services.

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Septic Systems

How do they work?

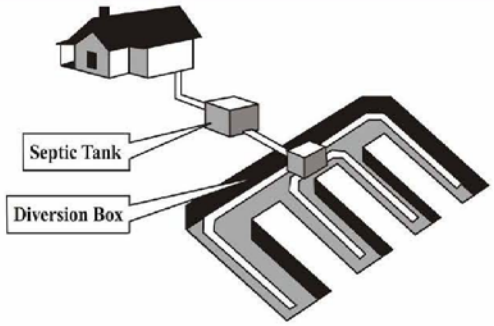
How do you maintain them?

Wilson Lake Association
PO Box 162
Acton, ME 04001
www.wilsonlake.net

In partnership with
Acton Wakefield Watersheds Alliance

PO Box 235, 254 Main Street
Union, NH 03887

Anatomy of a Septic System



Septic Tank

All wastewater leaving your house goes out an underground pipe and dumps into your septic tank, a large cement or plastic chamber. Here, the solids settle to the bottom, and a layer of scum made up of soaps, grease and other lighter-than-water elements floats on the top.

All effluent contains bacteria, and there are anaerobic bacteria (that do not need oxygen) in the bottom sludge layer in the tank. These bacteria go to work decomposing the solid materials and reducing them to sludge which remains in the septic tank.

The layer above the sludge and beneath the scum is a liquid layer with dissolved or suspended waste.

Diversion Box

When wastewater enters the tank, it pushes the liquids already in the septic tank to the other end, past a baffle which holds back solids, into a pipe that empties into a distribution or diversion box (D box).

The liquid then passes out multiple exits in the D box into a number of perforated pipes. From these pipes, it disperses into the surrounding material of the leach field or bed. Wastewater can flow by gravity or be pumped between the different parts of the system.

Leach Field

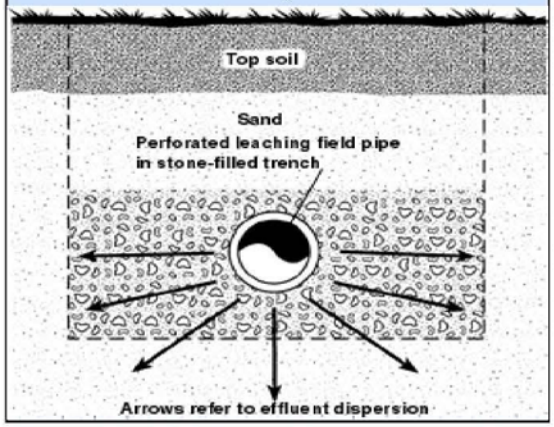
A typical leach field is made up of layers of sand and/or gravel that allow the wastewater to pass through at an appropriate rate into the soil below.

Septic system design relies on permeable soils which will filter the wastewater or effluent as it passes through. So when a leach field is constructed, stone, permeable gravel and other suitable materials are brought in to construct the bed, and regulations require adequate depth of good permeable soil where the leach field is made.

Back into the Groundwater

The process of filtering or percolating through the soil cleanses the wastewater. Dissolved waste and bacteria cling to soil particles or are eaten by microorganisms when oxygen is present. Eventually the resulting "clean" water becomes part of the underground water systems, or groundwater.

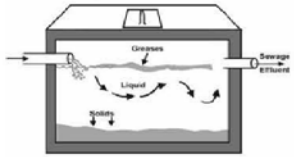
Cross Section of a Leach Field



For More Information

For more information, please contact the Maine Department of Environmental Protection Subsurface Wastewater Team at (207) 287-2070.

Septic System Maintenance



Cross Section of a septic tank with grease, liquid, and solid layers

Pump Out Regularly

The most important thing is to have your septic tank pumped regularly, to remove accumulated sludge and scum before it begins to clog your leach field. The usual recommended interval is every two to three years. The company that pumps your tank can keep you posted on the condition of the tank and whether you are pumping frequently enough. If you use a garbage disposal you must pump much more frequently.

Other Things To Do To Extend the Life of Your System

- Conserve water – so the soil around the leach field does not become too saturated. Use low flow fixtures, and fix leaks.
- Do not flush bulky items like disposable diapers, sanitary pads or paper towels.
- Do not put chemicals down the drain or toilet – they can kill the bacteria needed to break down solid waste. They can also pass through and into the soil, then the groundwater, with the water leaving the leach field – and end up in well or lake waters.
- Do not use a garbage disposal, particularly if it was not included in the original design of your system. (They require significantly larger tanks and leach fields.)

For Your Leach Field

- Do not drive or take heavy machinery across it. The weight can compact the soil, inhibiting filtration, as well as break the pipes.
- Keep trees from growing on or near it. Their roots can clog or break up the pipes.