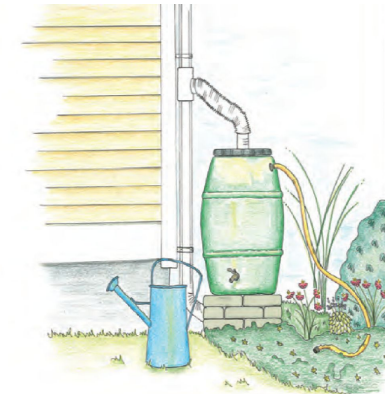
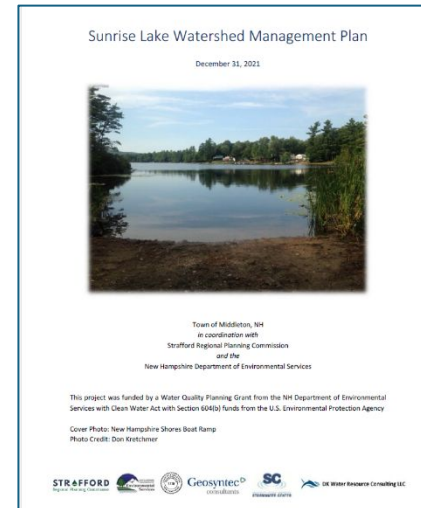
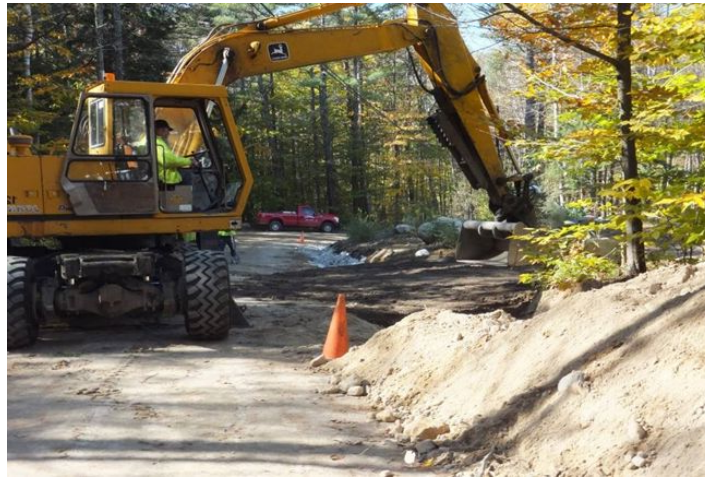


# Managing Polluted Runoff

*It's an adventure!*



Sally Soule, Coastal Watershed Supervisor  
NHDES Watershed Assistance Section

# Managing polluted runoff

**Real examples from New Hampshire!  
Accomplished by real lake people!**

- **Structural**
  - Roads
  - Boat launches & beaches
  - Shoreline stabilization
  - Residential runoff
- **Non-structural**
  - Municipal operations
  - Waterfowl
  - Regulations
  - Outreach: fertilizer, pet waste, general
- **Septic systems**
- **In-lake treatment**
- **Prevention**
- **Funding**





# Polluted Runoff

- Polluted runoff contributes to over 90% of the water quality problems in NH!
- Diffuse sources – nonpoint source pollution
- Rainfall or snowmelt moving over the ground carries pollutants
- Pollutants travel with runoff into lakes

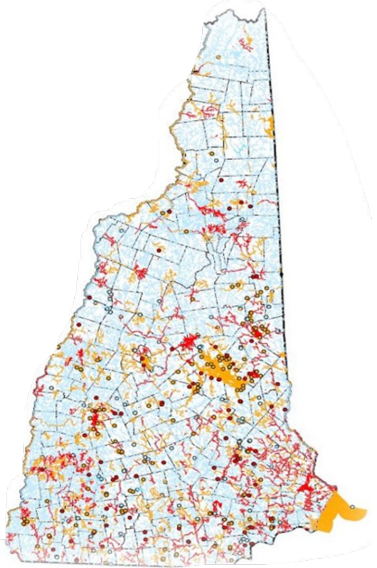
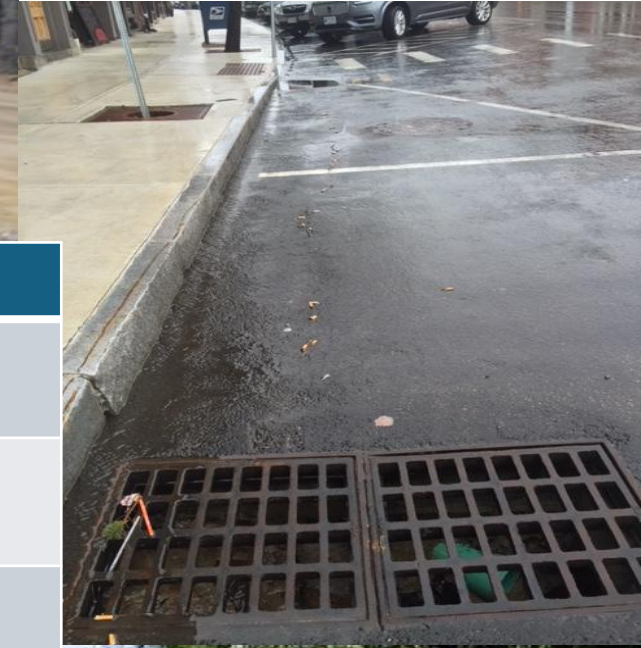


Photo by Jon McKeon



# WHERE DOES THIS STUFF COME FROM?!

Source	Pollutants
Agricultural runoff	Nutrients , sediment, bacteria
Animal waste – pets, waterfowl, livestock ...	Bacteria, nutrients
Atmospheric deposition	Nutrients
Erosion	Phosphorus and sediment
Hydromodification – dams, culverts, channelization	Flooding, low DO, poor habitat
Fertilizers	Nutrients
Impervious cover (IC) – roads, parking lots, roofs, driveways...	Everything: bacteria, fertilizer, oil, gas, sand, salt, nutrients, hot water, high flows .....
Septic systems	Bacteria and nutrients
Stormwater runoff – from IC, gravel roads, lawns	Everything!

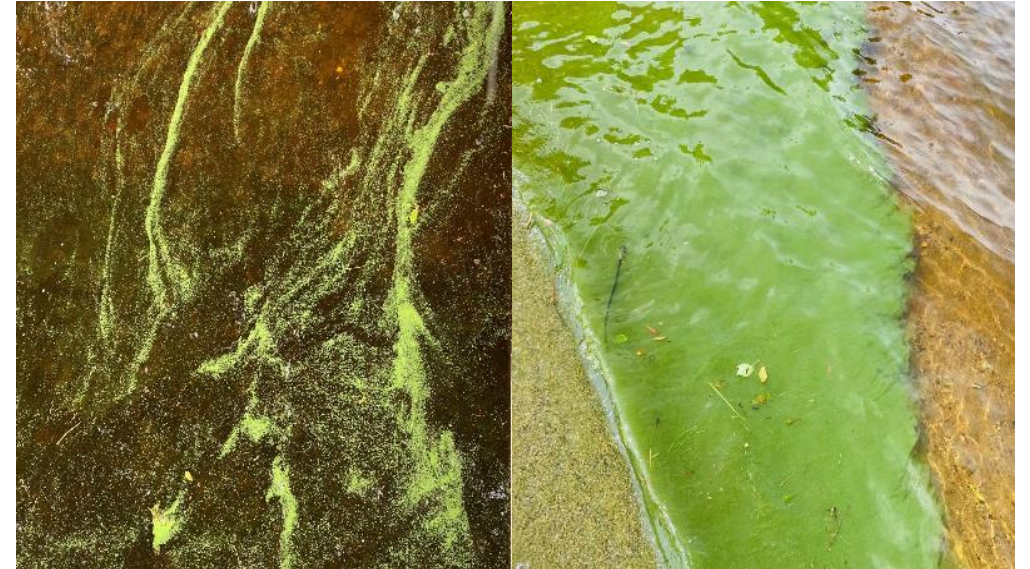
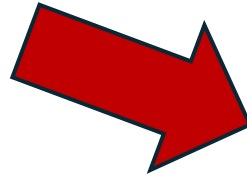


# Phosphorus feeds cyanobacteria

Too much phosphorus



Cyanobacteria blooms



DIRECT LOADS TO POND	TP (KG/YR)
INTERNAL	3.6
WATERFOWL	5.4
ATMOSPHERIC	13.6
SEPTIC SYSTEM	74.4
WATERSHED LOAD	431.0
<b>TOTAL LOAD TO POND (Watershed + direct loads)</b>	<b>527.9</b>

# ***A reminder, good water quality...***

- Supports recreation
- Provides habitat for fish and wildlife
- Protects public health
- Supports local businesses
- Protects property values



# What should we do about polluted runoff ?!

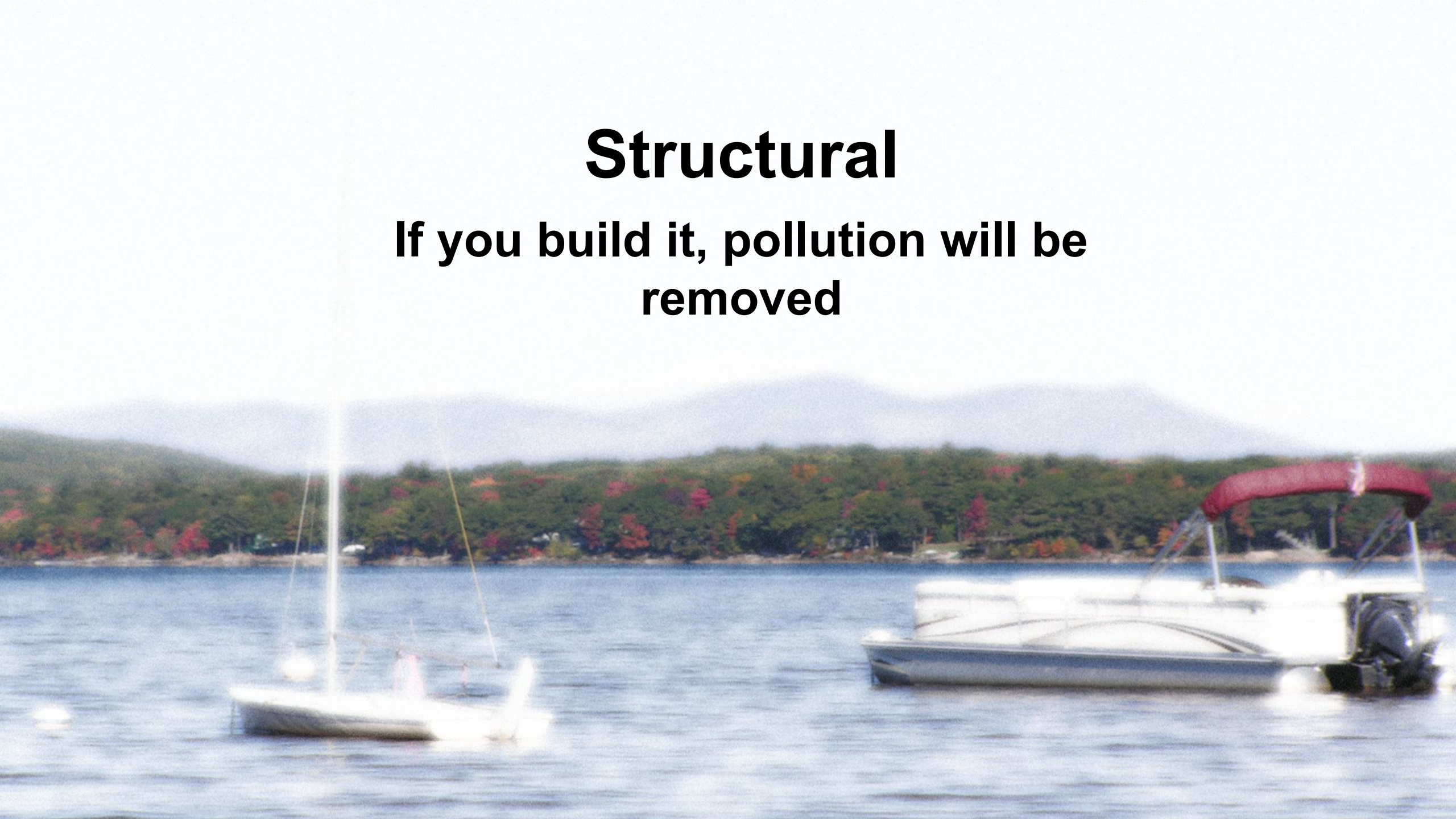
***Develop*** a watershed plan to identify and quantify sources; create a road map for effective management.

***Implement*** your watershed management plan – take action to reduce pollution!



# **Structural**

**If you build it, pollution will be  
removed**





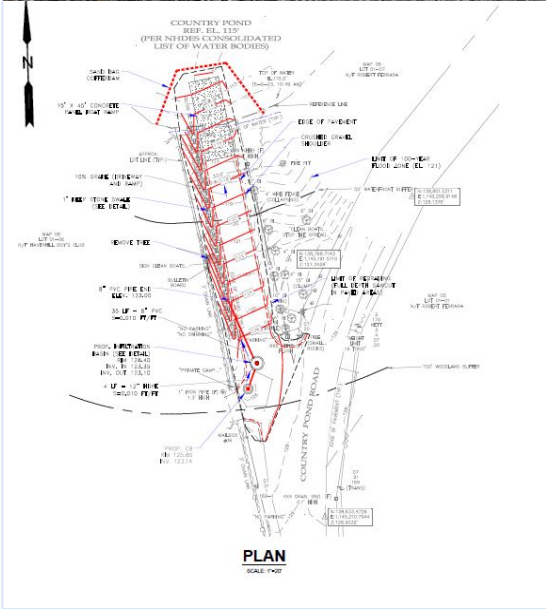
# Roads

- Gravel
- Paved
- Parking lots
- Public
- Private





# Boat launches



# Beaches



# Shorelines



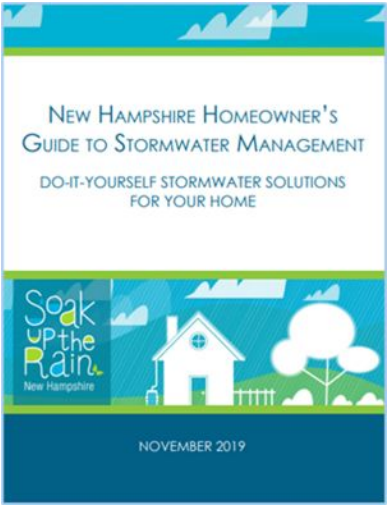
Before



After



Residential



# Show me the numbers

## !!!

### STEP 1: Calculate Annual Runoff

Eqn 1:  $R = P * P_j * R_v$

Where: R = Annual runoff (inches)

P = Annual rainfall (inches) 48

$P_j$  = Fraction of annual rainfall events that produce runoff 0.9

$R_v$  = Runoff coefficient Eqn 2:  $R_v = 0.05 + 0.9I_a$

$I_a$  = % Impervious area

### STEP 2: Determine the load into BMP

Eqn 3:  $L_i = 0.226 * R * C * A$

Where:  $L_i$  = Annual load (lbs) to brook

R = Annual runoff (inches)

C = Pollutant concentration (mg/l)

A = Area (acres)

0.226 = Unit conversion factor

### STEP 3: Calculate the load out of BMP after treatment

Eqn 4:  $L_e = L_i * R_e * V_r$

Where:  $L_e$  = Total Annual Effluent Load (lbs)

$L_i$  = Total Annual Influent Load (lbs)

$R_e$  = 1 - BMP pollutant removal efficiency<sup>1</sup>

$V_r$  = BMP volume reduction<sup>2</sup>

#### Gully Stabilization

These may include:

- Grade Stabilization Structure
- Grassed Waterway
- Critical Area Planting in areas with gullies
- Water and Sediment Control Basins

Please select a soil textural class:

- ☒ Sands, loamy sands
- ☐ Silty clay loam, silty clay
- ☐ Sandy loam
- ☐ Clay loam
- ☐ Fine sandy loam
- ☐ Clay
- ☐ Loams, sandy clay loams, sandy clay
- ☐ Organic
- ☐ Silt loam

Please fill in the gray areas below:

Parameter	Gully	Example
Top Width (ft)		15
Bottom Width (ft)		4
Depth (ft)		5
Length (ft)		20
Number of Years		5
Soil Weight (tons/ft <sup>3</sup> )	0.055	0.05
Soil P Conc (lb/lb soil)	0.0005	0.0005
Soil N Conc (lb/lb soil)	0.001	0.001

\* If not using the default values, users must provide input (in red) for Total P and Total N soil concentration

#### Estimated Load Reductions

	BMP Efficiency*	Gully	Example
Sediment Load Reduction (ton/year)	0.4	#DIV/0!	4
Phosphorus Load Reduction (lb/year)		#DIV/0!	3
Nitrogen Load Reduction (lb/yr)		#DIV/0!	6

\* BMP efficiency values should be between 0 and 1, and 1 means 100% pollutant removal efficiency.

United States Environmental Protection Agency

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Home / Polluted Runoff: Nonpoint Source (NPS) Pollution

#### Polluted Runoff: Nonpoint Source (NPS) Pollution

- Basic Information
- Types of NPS Pollution ▾
- Success Stories
- Using a Watershed Approach
- Webinars
- Technical Guidance and Tools
- Nonpoint Source News Notes
- NPSINFO Discussion Forum
- National NPS Monitoring Program
- Coastal Zone Act Reauthorization Amendments (CZARA)

#### Pollutant Load Estimation Tool (PLET)

The [Pollutant Load Estimation Tool \(PLET\)](#) is a planning level web-based model used to estimate long-term nutrient and sediment loads from different land uses and the load reductions resulting from the implementation of best management practices.

On this page:

- [What is PLET?](#)
- [Model Documentation](#)
- [Training Materials](#)
- [Questions and Answers about the PLET model](#)

#### What is PLET?

PLET provides a user-friendly web interface to create a customized model at the watershed, field, or site scale. For the HUC 12 watershed scale data inputs are auto-populated by the input data source.

PTAPP

My Account Log Out

Home Add Submission My Submissions Instructions Reports Import

Welcome to PTAPP

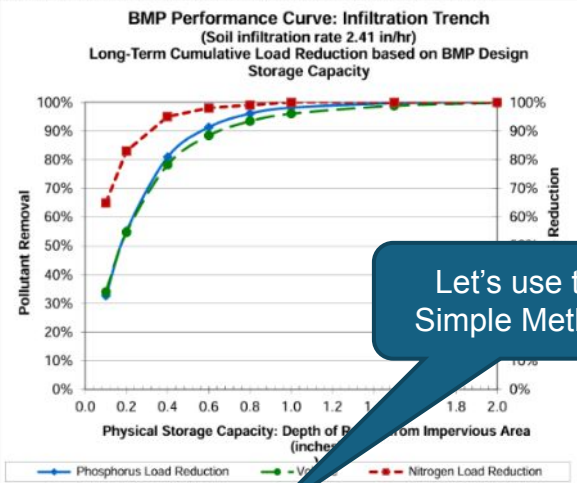
View Edit Revisions

Welcome to the PTAPP NPS tracking database. If you already have an account, please log in to add your tracking submissions. If you do not yet have an account, [please click here](#) and follow the instructions for setting up an account. You will receive an e-mail confirming your registration shortly after you create your account.

Table 3- 10: Infiltration Trench (IR = 2.41 in/hr) BMP Performance Table

Infiltration Trench (IR = 2.41 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	34%	55%	78%	88%	93%	96%	99%	100%
Cumulative Phosphorus Load Reduction	33%	55%	81%	91%	96%	98%	100%	100%
Cumulative Nitrogen Load Reduction	65%	83%	95%	98%	99%	100%	100%	100%

Figure 3- 5: BMP Performance Curve: Infiltration Trench (infiltration rate = 2.41 in/hr)



Let's use the Simple Method!



## NPS Projects - Pollutants Controlled Report

New Hampshire Department of Environmental Services, Watershed Assistance Section

DES Project Number: RI-21-S-07      Date of Report: 10/30/2023

**Table 3. List of BMP Sites and Methods Used**      Lake: Province Lake

Site ID (Name or # from site list )	Site Location Description	Latitude and Longitude (decimal degrees)	Brief BMP Description	Estimation Method / Sub- Method Used	Implementation Date	Pounds of Nitrogen Per Year	Pounds of Phosphorus Per Year	Tons of Sediment Per Year
Province Line Associates (Pine Grove Campground)	Bonnyman Road Wakefield, NH	43.67899, -70.98954	Shoreline Stabilization & Restoration	ME DEP LAP & Province LLRM	11/17/22	N/A	8.80	10.5
Fertilizer Pledge	Various Locations on Province Lake	43.68994, -70.99476	Homeowner pledge not to use Phosphorus fertilizer	MS4 General Permit Turf Grass Fertilizer Load Calculation	6/15/2023	N/A	6	0
P. Sullivan	<u>Bonnyman Road</u> Effingham, NH 03882	43.683304, -71.004625	Erosion Control Mulch and <u>Waterbars</u>	ME DEP LAP & Province LLRM	8/17/2023	N/A	4.0	4.9
Totals:						N/A	18.80	15.4

# **Non-structural**

## **Get pumped!**



# Municipal operations



## *Clean Sweep*

Recommendations for New and Updated  
Credits for Street Cleaning in New Hampshire



Technical Memorandum

September 1, 2022

# Waterfowl – the nuisance type, not loons ;-)

## Got honkers?

- Green lasers
- Inflatable people
- Live dogs
- Banners, flags, pinwheels
- Decoys : swans, coyotes, dogs
- Birds of prey
- Eradication (unpopular!)
- Feeding bans
- Vegetated buffers

## Example:

Table 19: Waterfowl Management Actions

Management Action	TP Load Reduction*	Cost
Shoreline modifications such as buffers, no mow zones, etc.	1 – 4 lbs/project	\$0 - \$5,000
Education programs to discourage waterfowl feeding	1-2 lbs/project	\$500 - \$1,000
Waterfowl assessment	None	\$500 - \$1,000
*Load reductions and cost estimates based on outcomes from similar New Hampshire projects		



# Regulations


Table 22: Municipal Land Use Regulations, Policies, and Land Conservation

Action Item	Description	Responsible Party	Funding	Schedule
Develop a regulation pertaining to inspection and replacement of failing septic systems in the Sunrise Lake watershed	This regulation, which would be adopted by the Town's Health Officer, would help determine if there are failed septic systems in proximity (~250ft) to the lake, conduct inspections, and enforce any necessary replacements and/or upgrades	SLLA, HS, SLE, SLVD, Health Officer, Board of Selectmen, SRPC	NHDES grants	Propose within the next 3-5 years
Develop a pump out regulation in the Sunrise Lake watershed	This regulation, which would be adopted by the Town's Health Officer, would require lakefront property owners to pump their septic tanks at least once every three years	SLLA, HS, SLE, SLVD, Health Officer, Board of Selectmen, SRPC	NHDES grants	Propose within the next 3-5 years
Review the Town's environmental regulations, such as the Wetland Conservation District and Open Space Conservation/ Cluster Development	Conduct an audit on existing regulations using the latest guidance to make recommended amendments that may include ways to provide additional protections to the lake, such as a 50ft no-disturb vegetative buffer and impervious coverage limitations.	SLLA, HS, SLE, SLVD, Planning Board, SRPC	NHDES grants	Propose within the next 2-3 years
Review Town's base zoning, specifically the Sunrise Lake District, and performance standards for areas with the Shoreland District	Conduct an audit on existing regulations using the latest guidance to make recommended amendments that may include additional dimensional requirements for the Sunrise Lake District and restrictions that go beyond the state's shoreland protection act	SLLA, HS, SLE, SLVD, Planning Board, SRPC	NHDES grants	Propose within the next 2-3 years
Review Town's site plan and subdivision regulations	Conduct an audit on existing land use regulations to make recommended revisions that may include improvements to development standards, landscaping, and stormwater management	SLLA, HS, SLE, SLVD, Planning Board, SRPC	NHDES grants	Propose within the next 2-3 years
Explore partnerships at the regional and statewide level to obtain funding for additional land conservation efforts around the lake	Regional and statewide land conservation organizations, such as SELT, MMRG, the Forest Society, TNC and the Lakes Region Conservation Trust, can help provide funding and stewardship for land protection activities.	SLLA, HS, SLE, SLVD, Conservation Commission, SRPC	NHDES, LCHIP, and other grants	Propose within the next 2-3 years

# Outreach


Don't feed the





**Acton Wakefield Watersheds Alliance**

PO Box 235, 254 Main St., Union, NH 03887  
info@AWwatersheds.org / www.AWwatersheds.org  
603.473.2500



**TAKE THE PLEDGE**

**PROTECT PROVINCE LAKE**

**The Fertilizer Pledge**



## Province Lake Fertilizer Pledge

Take the Pledge! By completing this form, you commit to a small effort that will make a big difference on Province Lake. You agree never to use fertilizer containing the nutrient Phosphorus on your lakefront property. Excess Phosphorus is the primary cause of cyanobacteria blooms, and this simple step will bring us one step closer to keeping Province Lake blue!

First Name

Last Name

Lake Address (ex. 123 Lake Street)

Town

I will take the pledge! I agree to never use phosphorus based fertilizer on my property. This includes the use of any fertilizer products that contain Phosphorus, and also includes animal manure which also contains high levels of Phosphorus. Using no fertilizer is the best choice for the lake, however, "Zero Phosphorus" fertilizer products are acceptable. Checking the box below signifies my commitment to honoring this pledge

\*This is a pledge and NOT a legally binding commitment.

☐


**Submit**


Do not submit passwords through this form. Report malicious form


# Outreach


## Pet waste



 MENU



 SUBSCRIBE

Manchester, NH 03101 60° Cloudy 2% [Change](#) 

MORE >

## Town of Rye cracking down on dog waste disposal, enforcing \$1,000 fines

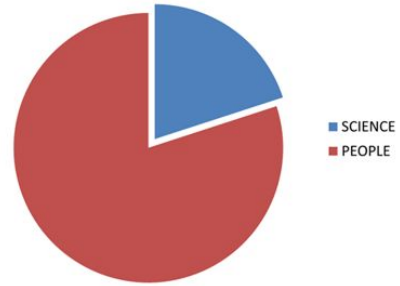
High levels of bacteria found in Parson's Creek

Share



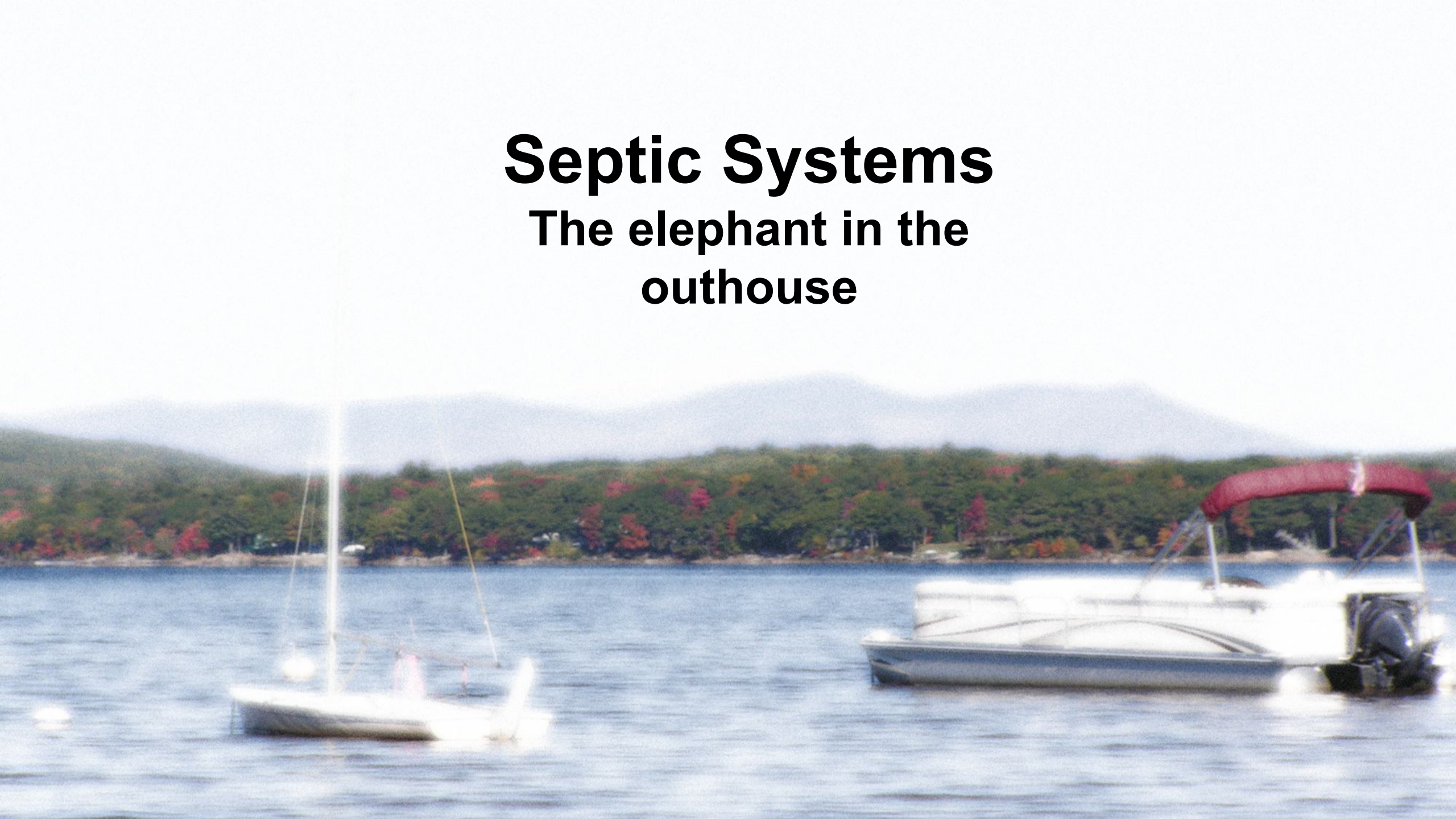
Updated: 6:28 PM EDT Sep 4, 2017

# Outreach



# **Septic Systems**

## **The elephant in the outhouse**



# Septic system surveys

Sector-Site

Surveyors

2013 PROVINCE LAKE SEPTIC SURVEY

Thank you for participating in the Province Lake Septic Survey! If you are receiving this questionnaire that means you missed our visit. Please help us complete this survey by filling out the questionnaire by mail, or online at [www.thenvironmental.com/province.html](http://www.thenvironmental.com/province.html).

The Province Lake Septic Survey is a part of the Province Lake Watershed Plan currently being developed by the Province Lake Association. In order to develop an accurate lake response model and to evaluate the potential cumulative impacts that septic systems around the lake may have on lake water quality, we are visiting properties within 250 feet 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.

1. On a scale of 1 to 10, where ten is the best, what is your perception of the water quality in Lake Wentworth and Crescent Lake? (circle one)

12345678910

2. Do you have a septic system, or other wastewater system? (circle one)

Septic

Overboard Discharge

Holding Tank

Cesspool/Outhouse

Town/Other

3. Do you know where your septic tank and leach field are located? (circle one)

Yes

No

Not Sure

4. How old is the septic system? (circle one)

1-10 years

10-15 years

15-20 years

20-25 years

I don't know

5. How old is the house? (circle one)

1-10 years

10-15 years

15-20 years

20-25 years

I don't know

6. Is this home used year-round or seasonally? (circle one)

Year Round

More than one season (50-150 days/year)

Seasonal (less than 50 days/year)

7. What's the average occupancy? (circle one)

1-2 people

2-4 people

4-6 people

More than 6 people

8. What is the approximate distance of your septic system from the lake or stream? (circle one)

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 septic tank pumped? (circle one)

Every 1-2 years

Every 3-5 years

Every 6-10 years

More than 10 years

I don't know

10. When was the last time it was pumped?

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

IMPORTANT: PLEASE FILL OUT THE BACK OF THIS SURVEY!

Date

Time

Visit #

Septic System Survey Results							
SUMMARY							
Respondent	Age of house	Type of system	Age of system	Distance to lake	Occupancy	Usage	Pump out frequency
1	31-40 years	Septic system with leach field	21 to 30 years	125-250 feet	Year round	1-2 people	We have never pumped out our system.
2	21-30 years	Septic system with leach field	21 to 30 years	N/A	Year round	1-2 people	Every 1-2 years
3	11-20 years	Septic system with leach field	11-20 years	125-250 feet	Year round	1-2 people	Every 3-5 years
4	Older than 40 years	Septic system with leach field	21 to 30 years	75 - 125 feet	More than one season: 50 to 150 days per year	1-2 people	pumped out our
5	Older than 40 years	Leaching Cesspool	more than 50 years	75 - 125 feet	Limited year round: 150 -250 days per year	1-2 people	Every 1-2 years
6	Older than 40 years	Septic system with leach field	1-10 years	75 - 125 feet	Seasonal: less than 50 days per year	3-4 people	Every 3-5 years
7	Older than 40 years	Holding tank	11-20 years	75 - 125 feet	More than one season: 50 to 150 days per year	1-2 people	Every 1-2 years
8	Older than 40 years	Septic system with leach field	21 to 30 years	75 feet or less	Limited year round: 150 -250 days per year	1-2 people	Every 1-2 years
9	Older than 40 years	Septic system with leach field	31-40 years	75 feet or less	Seasonal: less than 50 days per year	1-2 people	Every 3-5 years
10	Older than 40 years	Septic system with leach field	21 to 30 years	75 feet or less	More than one season: 50 to 150 days per year	1-2 people	Every 6-10 years
11	Older than 40 years	Septic system with leach field	31-40 years	75 feet or less	10-15 times a year	3-4 people	Every 6-10 years
12	11-20 years	Septic system with leach field	11-20 years	75 - 125 feet	Seasonal: less than 50 days per year	3-4 people	I don't know.
13	Older than 40 years	Septic system with leach field	1-10 years	125-250 feet	Year round	1-2 people	Every 1-2 years
14	Older than 40 years	Outhouse	more than 50 years	75 - 125 feet	One or two days per year	1-2 people	pumped out our
15	21-30 years	Septic system with leach field	1-10 years	125-250 feet	Year round	3-4 people	Every 1-2 years
16	Older than 40 years	Septic system with leach field	more than 50 years	75 - 125 feet	Seasonal: less than 50 days per year	3-4 people	Every 6-10 years
17	Older than 40 years	Septic system with leach field	21 to 30 years	75 - 125 feet	Seasonal: less than 50 days per year	1-2 people	Every 3-5 years
18	1-10 years	Septic system with leach field	1-10 years	125-250 feet	Year round	1-2 people	Every 3-5 years
19	31-40 years	Septic system with leach field	1-10 years	75 - 125 feet	More than one season: 50 to 150 days per year	1-2 people	I don't know.
20	Older than 40 years	Septic system with leach field	1-10 years	75 - 125 feet	Limited year round: 150 -250 days per year	3-4 people	Every 6-10 years

Pumping Schedule

Pumping Schedule	Percentage
Every 1-2 years	29.1%
Every 3-5 Years	27.3%
Every 6-10 years	20.0%
More than 10 years	9.5%
Never pumped	6.4%
I don't know	4.5%
No Response	3.2%

Average Occupancy

Average Occupancy	Percentage
1-2 People	57.3%
3-4 People	28.6%
5-6 People	5.9%
More than 6 People	5.9%
More than 10 People	2.3%
More than 50 People	0.5%
More than 75 People	0.5%
Didn't Respond	4.5%

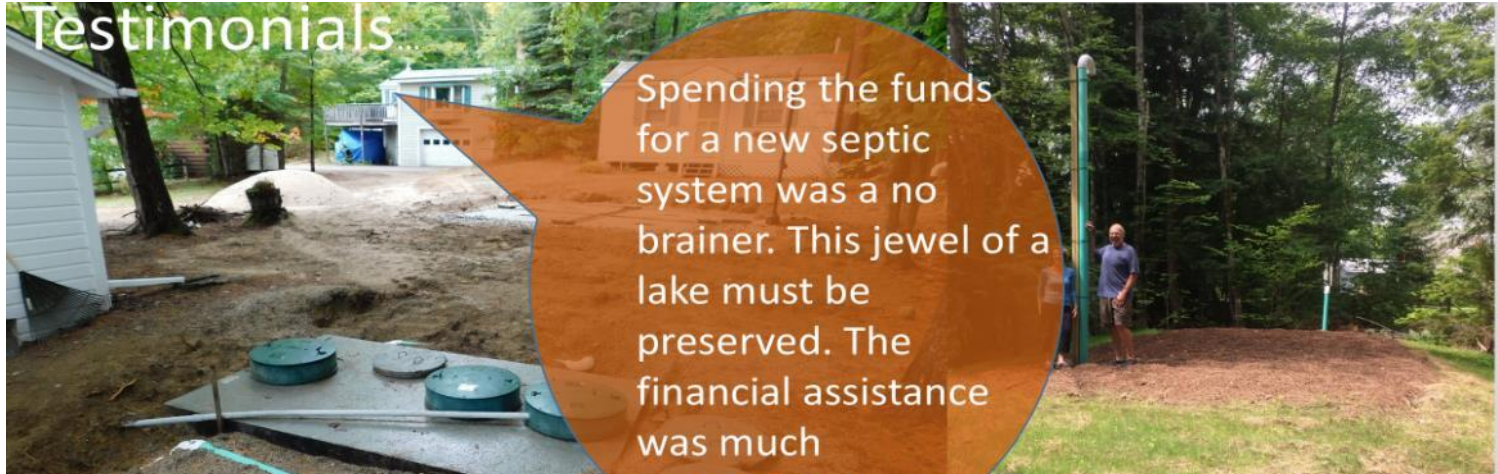
## Pump out programs



# Septic system replacements




## Testimonials



Spending the funds for a new septic system was a no brainer. This jewel of a lake must be preserved. The financial assistance was much appreciated.



When I first heard about the funding available for upgrading septic I thought it was too good to be true. I was delighted to find the process simple and well defined.



We had intended to upgrade eventually but your program was the catalyst that moved us forward sooner than later.

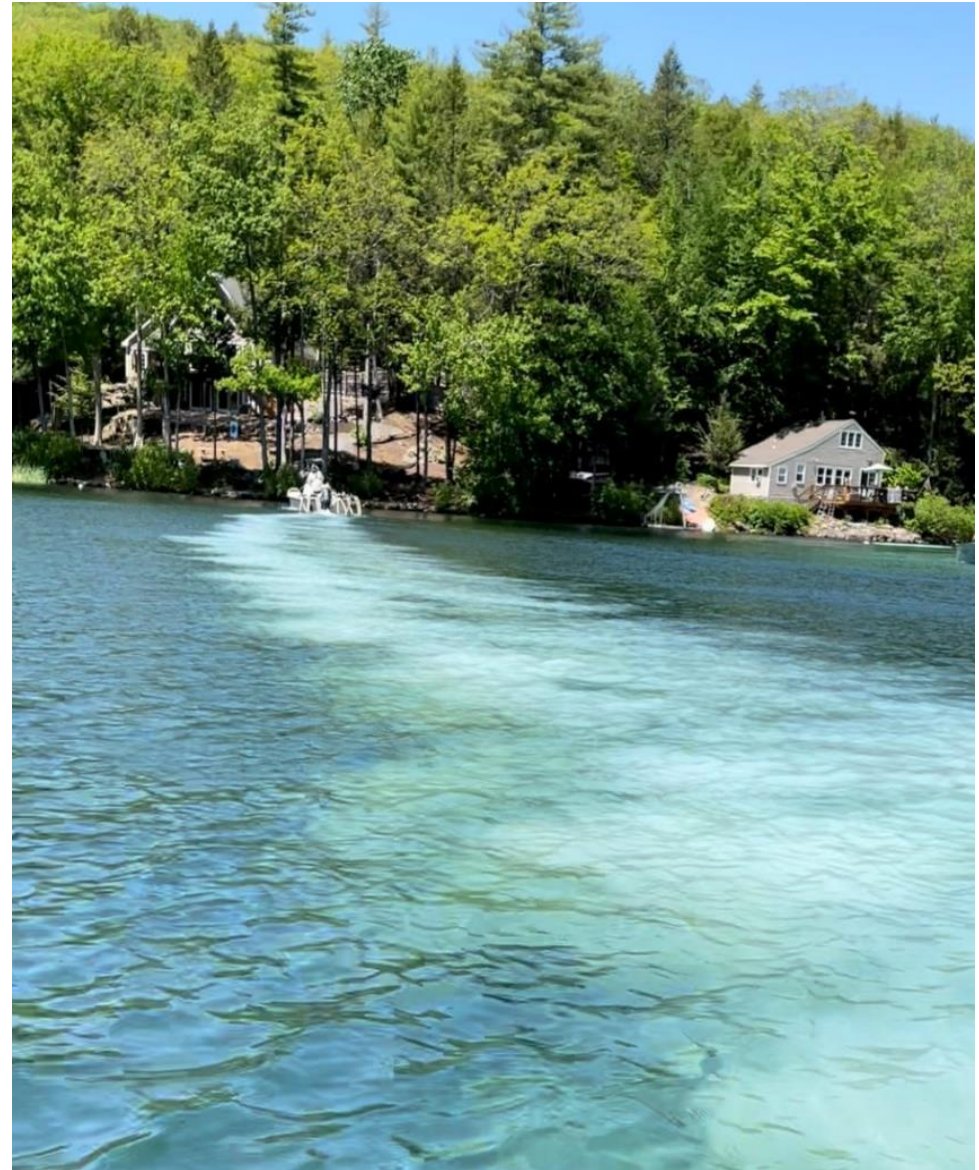
# Septic system regulations

Municipality	Description of Regulation	NPS Pollutant of Concern	Link
Meredith	A health ordinance requires evaluation of all septic systems within 250 feet of Lake <u>Waukewan</u> ; replacement is required under certain circumstances.	Nutrients	<a href="#">Town of Meredith septic system regulations</a>
Rye	Septic systems in the Parsons Creek watershed must be pumped every three years.	Pathogens	<a href="#">Town of Rye Health Regulation Septic Systems</a>
Sunapee	All developed properties with septic systems in the Shoreline Overlay District shall be pumped a minimum of once every three years. When a developed waterfront property is sold or transferred, a copy of the Waterfront Property Site Assessment Study required by NHDES Env- <u>Wq</u> 1025 regulations must be submitted to the Town within 10 days of the sale.	Nutrients & Pathogens	<a href="#">Town of Sunapee Shoreland Overlay District Septic System Regulations</a>
Windham	Cobbetts Pond Village District Ordinance requires septic tank pump out and inspection at least once every three years; promotes education in the characteristics of systems and proper procedures for altering, operating, and maintaining them; establishes and maintains records of septic systems.	Nutrients	<a href="#">Town of Windham Onsite Wastewater Treatment for Cobbetts Village District</a>

# **In-lake treatment**

## **The ghost of loadings past**





# **Preventing future runoff**

**An ounce of prevention is worth a  
pound of phosphorus**



# Land protection



# **Funding**

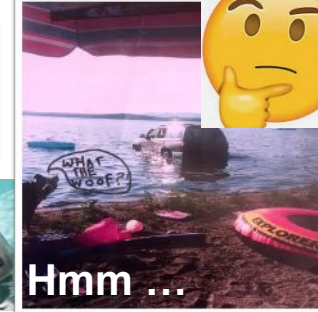
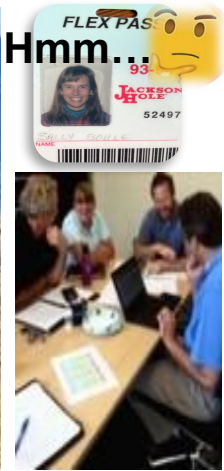
## **Show me the money!**



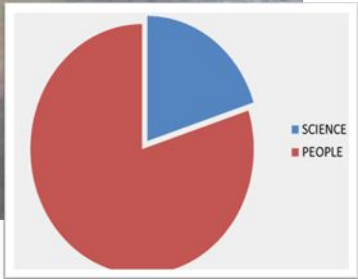
Funding Opportunity	Description	For more information
Aquatic Resource Mitigation Fund (ARM) - NHDES	Annual funding for conservation and water resources projects	<a href="#">Aquatic Resource Mitigation Fund   NH Department of Environmental Services</a>
Clean Water State Revolving Fund - NHDES	Loans and funding for water quality projects (planning and implementation)	<a href="#">Clean Water State Revolving Fund   NH Department of Environmental Services</a>
Land Transaction Grant Program - Great Bay Resource Protection Partnership	Funding for land conservation transaction costs	<a href="#">Great Bay Resource Protection Partnership (greatbaypartnership.org)</a>
Milfoil and Other Exotic Plant Prevention Grants - NHDES	Annual funding for projects that prevent infestations of exotic plants	<a href="#">Rivers and Lakes   NH Department of Environmental Services</a>
Moose Plate Grants - New Hampshire State Conservation Committee Grant Program	Annual funding for water quality, conservation, and habitat projects	<a href="#">Conservation Grant Program   State Conservation Committee   NH Department of Agriculture, Markets and Food</a>
New England Grassroots Environmental Fund	Grants for sustaining environmentally sustainable communities	<a href="#">New England Grassroots Environment Fund (grassrootsfund.org)</a>
New Hampshire Charitable Foundation	Multiple grant categories awarded annually including funding for environmental projects	<a href="#">Home - NH Charitable Foundation (nhcf.org)</a>
Land & Community Heritage Investment Program	Grants for land and cultural protection activities	<a href="#">LCHIP - Protecting New Hampshire's Natural, Historic, and Cultural Resources</a>
Water Quality Planning Grants - NHDES	Annual funding to assist regional planning commissions and their partners – for water quality projects	<a href="#">Watershed Assistance Grants   NH Department of Environmental Services</a>
Watershed Assistance Grants - NHDES	Annual grant program with funding to implement projects described in watershed plans	<a href="#">Watershed Assistance Grants   NH Department of Environmental Services</a>



So much dog poop



So many watershed surveys ... Lovell Lake (2x), Great East Lake (2x), Pine River Pond, Horn Pond, Country Pond, Nippo Lake, Province Lake, Milton 3 Ponds, Willand Pond, Sunrise Lake, Parsons Creek, Little River ... TNTC!



***Credit where credit is due!***

***To these water quality warriors whose amazing projects were showcased today:***

Acton Wakefield Watersheds Alliance

Camp Jephnewa

Country Pond Lake Association

City of Dover

Hodgdon Brook Restoration Project

Messer Pond Protective Association

Nippo Lake Association

Pine River Pond Association

Province Lake Association

Strafford Regional Planning Commission

Sunrise Lake Watershed Advisory Committee

Town of Farmington

Town of Rye

UNH Stormwater Center

***Invitation at Dawn***

*As darkness slips  
from the trees  
small bass jostle for flies  
just past where our casts fall  
beyond the dock  
where we sit*

*From across the water  
comes a sound  
softly at first then  
growing louder  
the lake calls to us  
arise  
now is your moment  
this is your time*

*~ PAH*

# Questions?

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