

# *Septic System Inspections and Biomat Evaluations in the Georges Pond Watershed*

Maine Lakes & Lake Stewards of Maine  
Joint Conference  
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## Presenters:

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## Contributor:

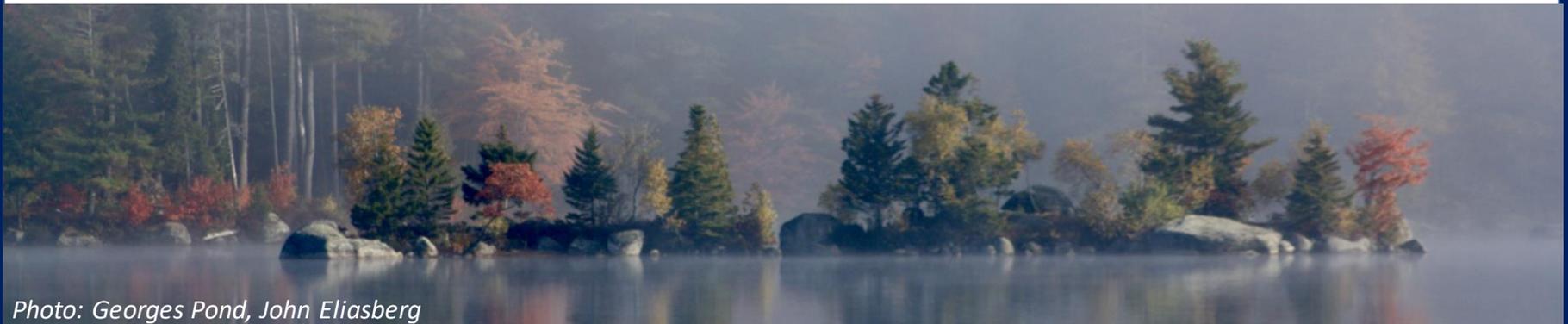
John Eliasberg, Georges Pond Association



**ecological  
instincts**  
Environmental Consulting & Ecodesign

**Georges Pond**  
Association

*Preserve • Protect • Promote*



*Photo: Georges Pond, John Eliasberg*

# Overview

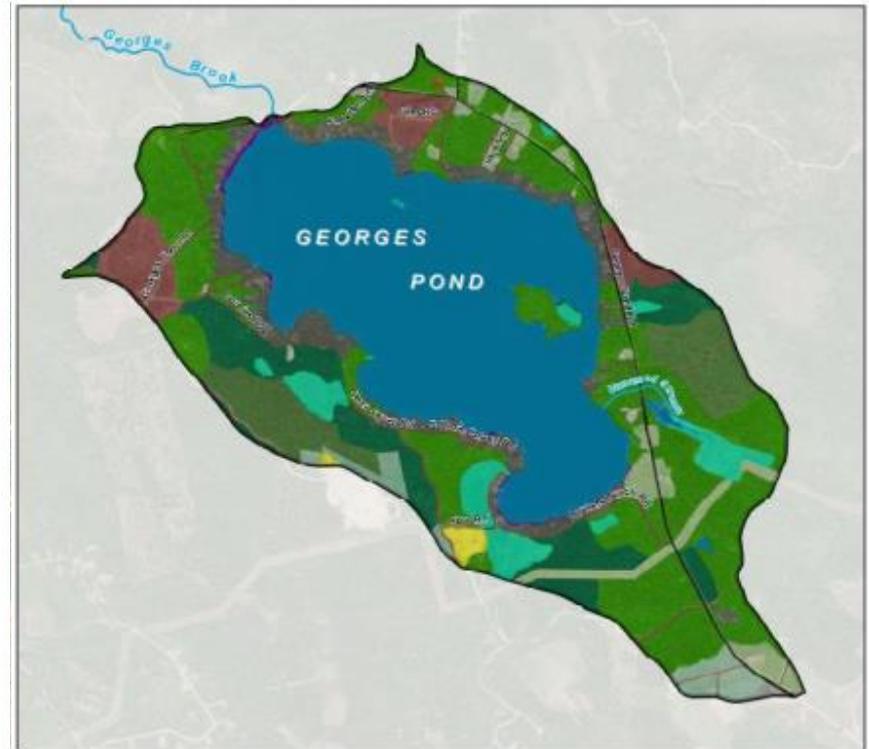
- Background & Project History
- Septic Vulnerability Analysis
- Septic Database & Septic Socials
- Septic Biomat Evaluation Selection
- 2022 Septic Inspections & Biomat Evaluations
- Summary of Findings
- Lessons Learned
- Next Steps



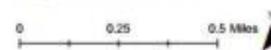
*Photo: Septic Evaluation, John Eliasberg*

# Background- Georges Pond

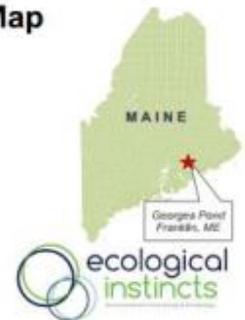
- 358-acre Great Pond
- Town of Franklin, ME
- Max Depth- 45 ft (14 m)
- Average Depth- 14 ft (4.3 m)
- Low flushing rate (0.45/yr)
- 1-square mile watershed
- Fed by Intermittent Drainages
- Single outlet- Georges Brook



Georges Pond Watershed - Land Cover Map



Source: Maine Geospatial, 2008 & 2011  
Projection: NAD 1983 UTM Zone 18N  
Map Created by: W. Baker, Ecological Instincts - 2019  
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar  
Geographic, CNES/Airbus DS, USDA, USGS, Aero, GeoMapping,  
Jeppia, IGN, IGC, swisstopo, and the GIS User Community



# Background

- NPS Priority Watersheds List “Threatened”
- Monitored since 1977
- **First Significant Algal Bloom in 2012**
  - Pre-2012 Average Total Phosphorus= 12 ppb
  - Pre-2012 Water Clarity= 4.6 m
- **Starting in 2012....**
  - Reoccurring algal blooms
  - Significant decrease in water clarity (< 2m)
  - Significant increase in Chl-a (10x historic)
  - Increase in area of anoxia (from 8m to 4m)

Photos: John Eliasberg



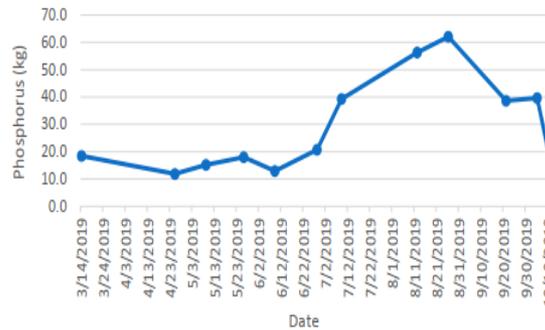
# The Culprits



**NPS Pollution**



Gravel Roads  
Shoreline Dev.  
Agriculture



**Internal P Loading**



Build up of P  
High % of Fe-P  
Low levels of DO



**Sandy Soils**



Concern about  
Septic Systems

# Project History

- 2013 Watershed Survey
- 2018 Watershed Protection Plan
- 2018 Septic Survey & Database
- 2018-2019 Culvert & Roads Survey
- 2018 LakeSmart Program
- 2018 - 2019 Watershed Plan Development
  - Bathymetric mapping & sediment mapping
  - Sediment sampling & analysis
  - Intensive water sampling program
  - Watershed modeling
  - Septic vulnerability analysis
  - Water quality goal setting



# Vulnerability Analysis

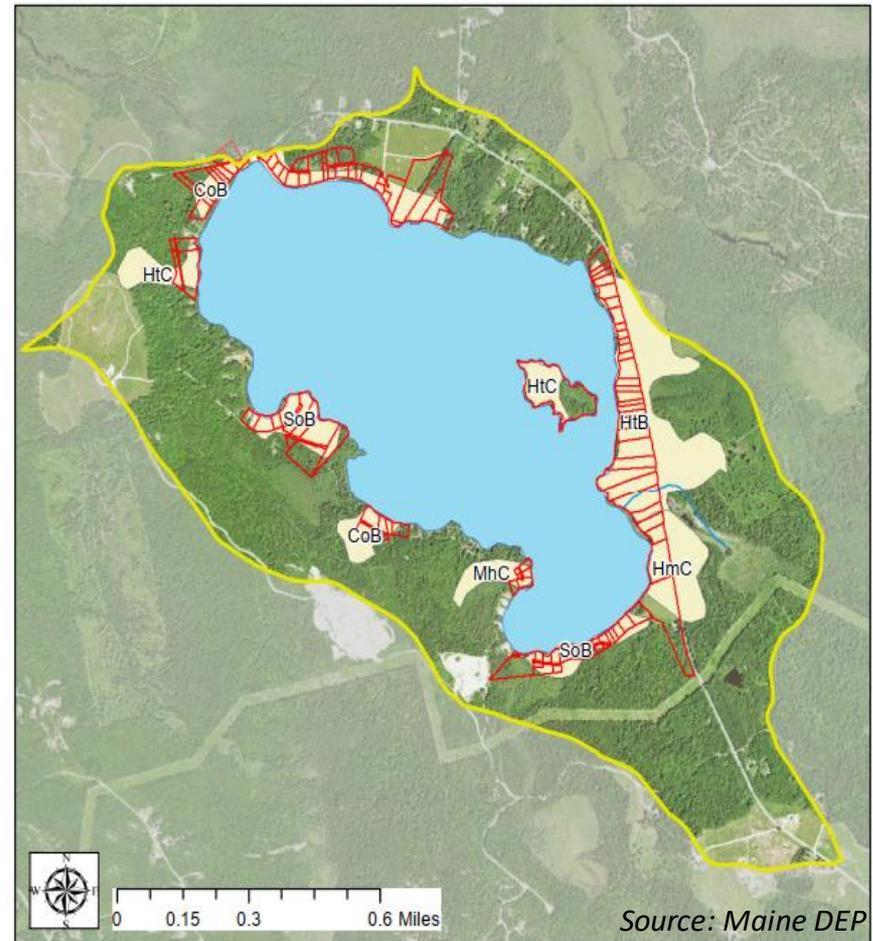
- **Soils most susceptible to septic short-circuiting**

- Deep, well-drained gravelly sandy loams (Colton & Hermon soils)
- Course or gravelly soils adjacent to hydric soils w/shallow water tables
- Rapid permeability

- **Sensitive Parcels w/in 150' of Georges Pond**

- High Risk = 102 properties
- Added to GPA Septic Database
- Prioritized based on age (Pre-1974 & Pre-1995)

Georges Pond Sensitive Shoreline Soils Map



Source: Maine DEP

## Legend

- Georges Pond Watershed
- Sensitive Shoreline Soils
- Sensitive Shoreline Tax Parcels

This map shows soils within 150 feet of the pond that are most susceptible to short-circuiting of subsurface wastewater disposal system effluent. Short-circuiting is a phenomenon whereby septic tank effluent is not properly treated in the leach field because the soils are coarse and porous, which allows the effluent to move through them too quickly. Shoreline tax parcels that contain these soils are also highlighted.

# GPA Septic Database

- HHE-200 Online Search
- GPA Septic Survey
- LakeSmart Evaluations
- Town Record Search

**SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION** Maine Dept. Health & Human Services  
Div of Environmental Health, 11 SHS  
(207) 287-5672 Fax: (207) 287-4172

**>> CAUTION: LPI APPROVAL REQUIRED <<**

<b>PROPERTY LOCATION</b>		<b>Town/City</b> <u>                    </u> <b>Permit #</b> <u>1907</u>	
<b>City, Town, or Plantation</b>		<b>Date Permit Issued</b> <u>03/18/14</u> <b>Fee</b> \$ <u>115.00</u> <b>Double Fee Charged</b> <input type="checkbox"/>	
<b>Street or Road</b>		<b>Local Plumbing Inspector Signature</b> <u>                    </u> <b>L.P.I. #</b> <u>0900</u>	
<b>Subdivision, Lot #</b>		<b>Municipal Tax Map #</b> <u>R-12</u> <b>Lot #</b> <u>4675</u>	
<b>OWNER/APPLICANT INFORMATION</b>			
<b>Name (last, first, middle)</b>		<b>The Subsurface Wastewater Disposal System shall not be installed until a Permit is issued by the Local Plumbing Inspector. The Permit shall authorize the owner or installer to install the disposal system in accordance with this application and the Maine Subsurface Wastewater Disposal Rules.</b>	
<b>Mailing Address of Owner/Applicant</b>		<b>CAUTION: INSPECTION REQUIRED</b>	
<b>Daytime Tel. #</b>		I have inspected the installation authorized above and found it to be in compliance with the Subsurface Wastewater Disposal Rules Application. (1st) date approved <u>11/27/14</u> (2nd) date approved <u>                    </u>	
<b>OWNER/APPLICANT STATEMENT</b>			
I state and acknowledge that the information submitted is correct to the best of my knowledge and understanding and that any falsification is reason for the Department and/or Local Plumbing Inspector to deny a Permit.			
<input checked="" type="checkbox"/> Signature of Owner or Applicant <u>                    </u> <b>Date</b> <u>10/8/14</u>		<input type="checkbox"/> Signature of Local Plumbing Inspector <u>                    </u> <b>Date</b> <u>                    </u>	
<b>PERMIT INFORMATION</b>			
<b>TYPE OF APPLICATION</b>		<b>THIS APPLICATION REQUIRES</b>	
<input type="checkbox"/> 1. First Time System		<input checked="" type="checkbox"/> 1. No Rule Variance	
<input checked="" type="checkbox"/> 2. Replacement System		<input type="checkbox"/> 2. First Time System Variance	
<b>Type replaced:</b>		<input type="checkbox"/> a. Local Plumbing Inspector Approval	
<input type="checkbox"/> 3. Expanded System		<input type="checkbox"/> b. State & Local Plumbing Inspector Approval	
<input type="checkbox"/> a. 25% Expansion		<input type="checkbox"/> 3. Replacement System Variance	
<input type="checkbox"/> b. 225% Expansion		<input type="checkbox"/> a. Local Plumbing Inspector Approval	
<input type="checkbox"/> 4. Experimental System		<input type="checkbox"/> b. State & Local Plumbing Inspector Approval	
<input type="checkbox"/> 5. Seasonal Conversion		<input type="checkbox"/> 4. Minimum Lot Size Variance	
<b>SIZE OF PROPERTY</b>		<input type="checkbox"/> 5. Seasonal Conversion Permit	
<b>3</b> <input type="checkbox"/> SQ. FT. <input checked="" type="checkbox"/> ACRES		<b>DISPOSAL SYSTEM TO SERVE</b>	
<b>SHORELAND ZONING</b>		<input type="checkbox"/> 1. Single Family Dwelling Unit, No. of Bedrooms: <u>3</u>	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> 2. Multiple Family Dwelling, No. of Units: <u>                    </u>	
		<input type="checkbox"/> 3. Other: <u>                    </u>	
		(specify)	
		Current Use <input type="checkbox"/> Seasonal <input type="checkbox"/> Year Round <input type="checkbox"/> Undeveloped	
<b>DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)</b>			
<b>TREATMENT TANK</b>		<b>DISPOSAL FIELD TYPE &amp; SIZE</b>	
<input checked="" type="checkbox"/> 1. Concrete		<input type="checkbox"/> 1. Stone Bed <input type="checkbox"/> 2. Stone Trench	
<input type="checkbox"/> a. Regular		<input type="checkbox"/> 3. Proprietary Device	
<input type="checkbox"/> b. Low Profile		<input type="checkbox"/> a. cluster array <input type="checkbox"/> c. Linear	
<input type="checkbox"/> 2. Plastic		<input type="checkbox"/> b. regular load <input type="checkbox"/> d. H-20 load	
<input type="checkbox"/> 3. Other: <u>                    </u>		<input type="checkbox"/> 4. Other: <u>                    </u>	
CAPACITY: <u>1600</u> GAL.		<b>GARBAGE DISPOSAL UNIT</b>	
		<input checked="" type="checkbox"/> 1. No <input type="checkbox"/> 2. Yes <input type="checkbox"/> 3. Maybe	
		If Yes or Maybe, specify one below:	
		<input type="checkbox"/> a. multi-compartment tank	
		<input type="checkbox"/> b. <u>                    </u> tanks in series	
		<input type="checkbox"/> c. increase in tank capacity	
		<input type="checkbox"/> d. increase in tank capacity	
		<input type="checkbox"/> e. increase in tank capacity	
		<input type="checkbox"/> f. increase in tank capacity	
		<input type="checkbox"/> g. increase in tank capacity	
		<input type="checkbox"/> h. increase in tank capacity	
		<input type="checkbox"/> i. increase in tank capacity	
		<input type="checkbox"/> j. increase in tank capacity	
		<input type="checkbox"/> k. increase in tank capacity	
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		<input type="checkbox"/> r. increase in tank capacity	
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# Implementation

- **10% Reduction in Watershed P Load**
  - Phase I 319 Grant (2020-2021)
  - Phase II 319 Grant (2022-2023)
  - LakeSmart (86 of 144 properties surveyed, 28 LakeSmart Awards)
- **90% Reduction in Internal P Load**
  - Aluminum Treatment 1 (2020)
  - Aluminum Treatment 2 (2021)



- ❖ *GPA Memberships (increased from 35 to 219)*
- ❖ *Clearest water on record in 2020-2022*
- ❖ *Watershed Plan goal of 10 ppb met in 2021*

## GEORGES POND WATERSHED-BASED MANAGEMENT PLAN (2020-2029)



**Georges Pond**  
Association  
*Preserve • Protect • Promote*

JANUARY 2020

### GOAL

**Georges Pond is free of  
Nuisance Algal Blooms**

*In-Lake P = 10 ppb  
Annual P Load ~ 90 kg/yr*

# Septic Outreach

- **Septic Socials**

- July 15, 2022 (16 attendees)
- August 12, 2022 (15 attendees)

- **Septic System “Pilot” Project (2022)**

- RFQ for Septic Contractors
- Free Septic System & Biomat Evaluations
- 5 Seasonal, 1 Year-Round



**Georges Pond**  
Association  
*Preserve • Protect • Promote*

Thanks for joining us!!

• ***Your Number 2 is Our Number 1!***

- ***Try to remember: the greener grass across the fence may be due to a septic tank issue.***

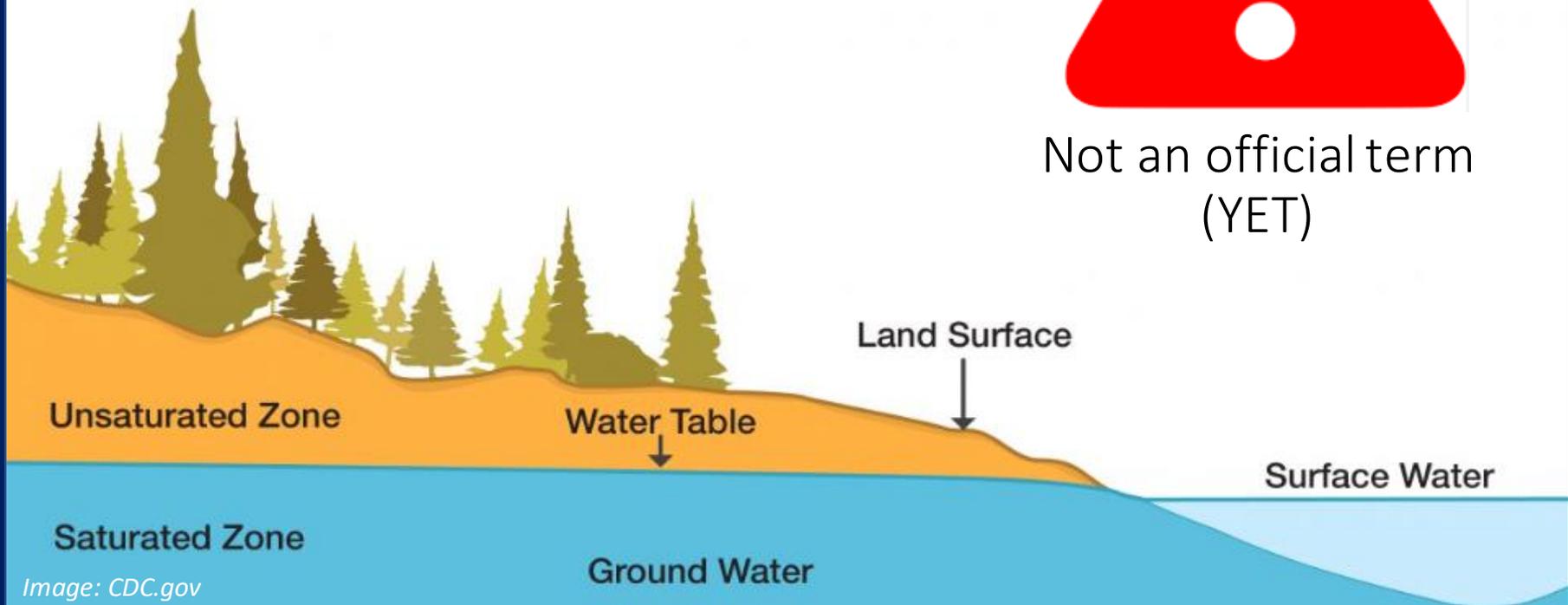
**Do your part – be Septic Smart.**

# What is a “Short-Circuit”?

- Wastewater Effluent Passes Quickly through Soil or Bedrock
- Reaches the Groundwater Table
- Relatively Untreated/Little Nutrient Retention
- Can Move to a Waterbody



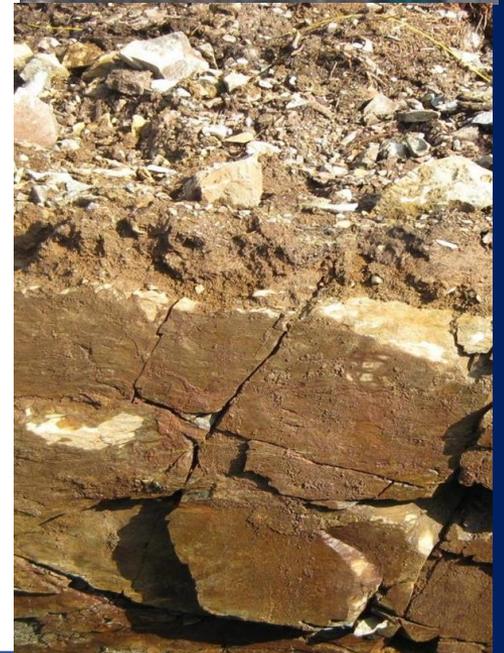
Not an official term  
(YET)



# Mostly Likely to Occur

- Very Course Textured Sand & Gravelly Soils
- Course Textured Fill
- Fractured Bedrock
- Course Textured Soil Over Fractured Bedrock or Extends to a Drainage Way

\* Began as biomat evaluation but ended up as determining site specific threats to surface water quality

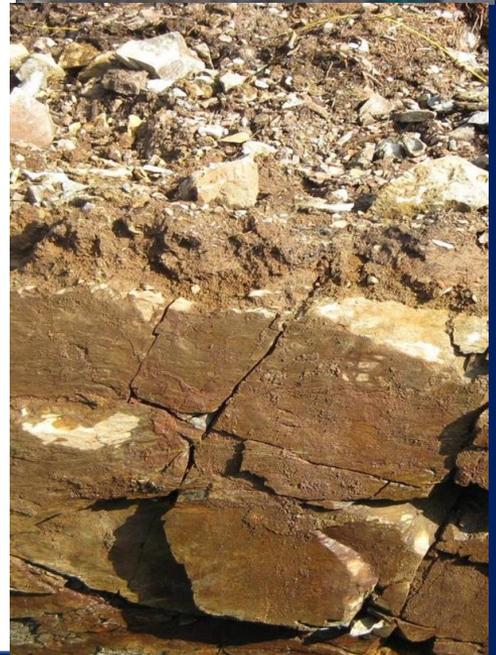


# Concern Rating Scale

- Pre-1974 Systems
- Pre-1995 Systems in Sandy or Shallow Soils
- ATU systems in Sandy or Shallow Soils

\* If a pre-1974 system is used to any extent, it should have failed by now- most are in sandy or shallow soils

\* Subsurface Wastewater Rules adopted in 1995 required a liner in systems installed in Sandy soils in the Shoreland Zone



*Top photo: Colton Soil (C.C., Doiron); Bottom Photo: Fractured Bedrock (Dave Rocque)*

# What is a “Biomat”?

- Black “slime” layer formed at the soil interface in the leach field
- Comprised of particles escaping the septic tank & the bodies of dead and living microbes
- Provides significant pathogen reduction
- Indication there is NO Short Circuit
- Does not significantly reduce nutrient levels



Disposal  
Field  
Biomat

# Development Dependent On:

- Soil Type
- Wastewater Strength & Daily Wastewater Load
- How often the System is Used
- Age of the System
- **NOT ALL DISPOSAL FIELDS WILL DEVELOP A Biomat**



**Determine the  
Soil Type for  
Likelihood of a  
Short-Circuit**

# NOT all Disposal Fields will Develop a Biomat

- Short-circuits
- Seasonal Use/Lightly Used
- Advance Treatment Systems
- Some Proprietary Disposal Systems

**\* Though these systems may not have a biomat, it is not necessarily an indication they are short-circuiting**

# Georges Pond Sites

## #1- Seasonal Cottage & Shower House

- Two pre-1974 Systems
- Metal Tanks & Unknown Leachfields

## Site Conditions

- Sandy Loam Soils
- Main house tank ~ 25 ft from the lake on a side slope toward the lake
- Shower house tank >100 ft from the lake on level ground separated by a berm



*Camera Inspection*

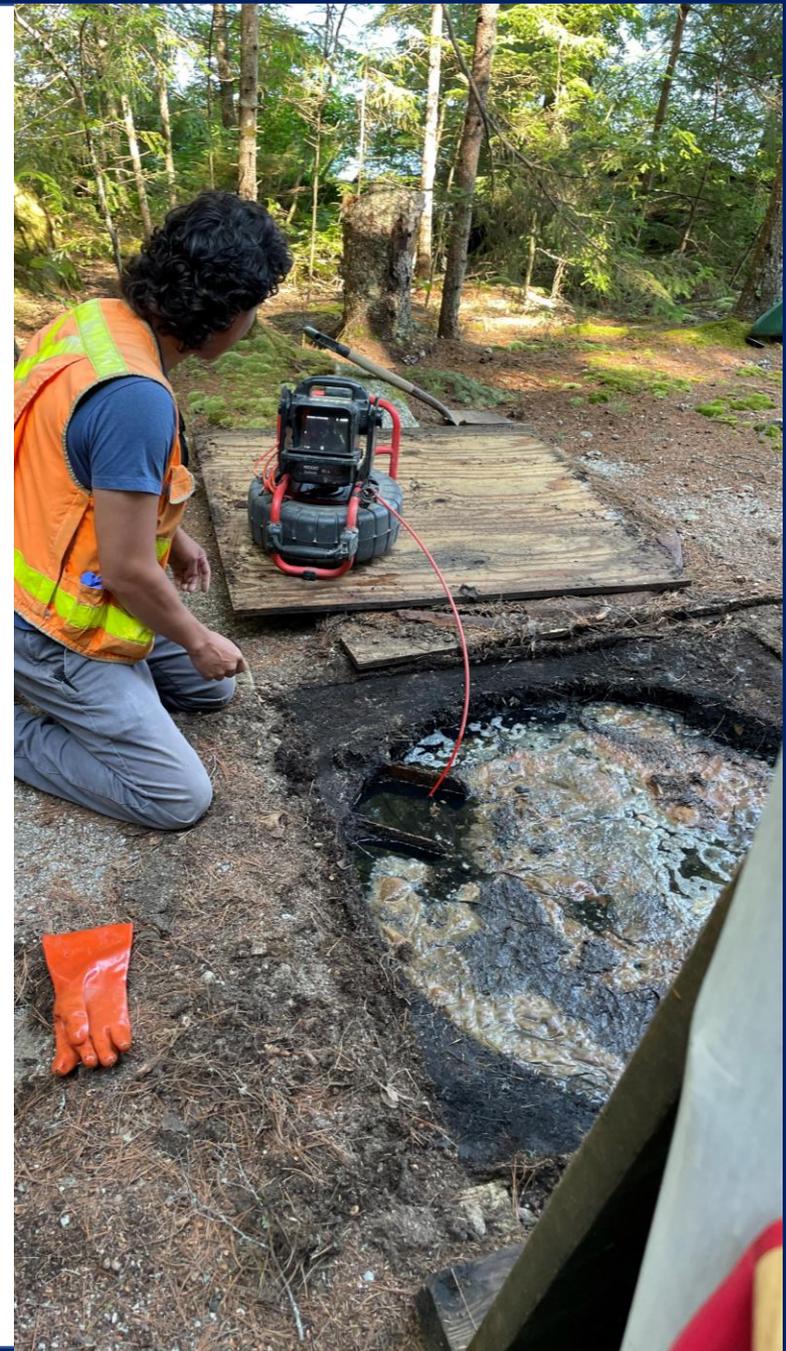
# Site #1

## Main House

- Septic tank had holes in it
- Outlet baffles were missing
- Outlets plugged with roots
- Overflowing with effluent

## Shower House

- Septic tank had holes in it
- Outlets plugged with roots
- Not Overflowing with effluent



# Site #1

## Main House

- Significant Current Threat
- Location & Condition of Tank

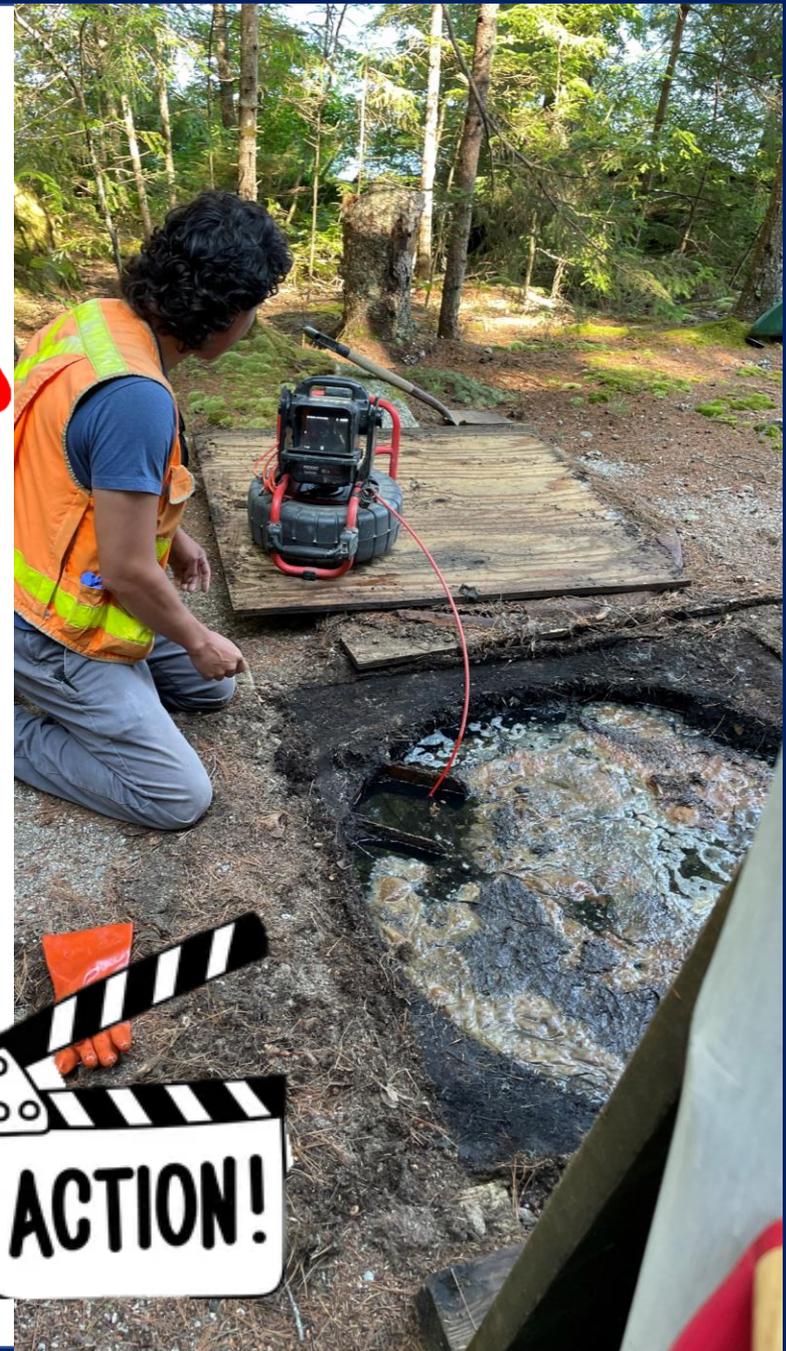


## Shower House

- Not a Significant Current Threat
- Outlets plugged with roots
- Tank Undersized-Not Overflowing

## Actions Taken

- Septic Tank Pumped the Same Day
- Replacement System Designed for 2023 Install



# System # 2

- Seasonal Cottage
- 1993 Septic System
- HHE-200 Form on file
- Concrete tank w/proprietary disposal device

## Site Conditions

- Fine Sandy Loam w/Pan
- Site sloping away from the lake



## Survey Results

- Ponded effluent in the disposal field (evidence of Biomat)
- System functioning properly
- No short-circuit

# System # 3

- Seasonal Cottage
- 1992 Septic System
- HHE-200 Form on file
- Concrete tank w/stone bed disposal field
- Design by same site evaluator and soil type as System # 2

## Site Conditions

- Sandy Outwash Soils
- Disposal field across the road from the lake



# System # 3

- Seasonal Cottage
- 1992 Septic System
- HHE-200 Form on file
- Concrete tank w/stone bed disposal field
- Design by same site evaluator and soil type as System # 2

## Site Conditions

- Sandy Outwash Soils
- Disposal field across the road from the lake



*Clean stone- no evidence of Biomat*

## Survey Results

- No evidence of Biomat
- Tree roots present in sand below disposal field stone (nutrient uptake)
- **Short-Circuit**



# System # 3

## Outcome

- Moderate threat to lake, replacement NOT immediate



- 1) Limited Seasonal Use
- 2) Distance to the Lake (several hundred feet)
- 3) Higher priority if usage increases significantly and/or used year round



*Clean stone- no evidence of Biomat*

## Survey Results

- No evidence of Biomat
- Tree roots present in sand below disposal field stone (nutrient uptake)
- Short-Circuit



# System # 4

- Seasonal Cottage
- Pre-1974 Septic System
- 300-gallon metal tank w/unknown disposal area

## Site Conditions

- Fine sandy loam w/ a hardpan)
- Not near the lake
- Slopes down to a seasonal drainage way 55 ft away



# System # 4

- Seasonal Cottage
- Pre-1974 Septic System
- 300-gallon metal tank w/unknown disposal area

## Site Conditions

- Fine sandy loam w/ a hardpan)
- Not near the lake
- Slopes down to a seasonal drainage way 55 ft away



## Survey Results

- Outlet of septic tank plugged w/roots
- Holes in septic tank
- Tank undersized
- Low levels of effluent

# System # 4

## Outcome

- System needs replacing but not deemed a significant threat as currently used



- 1) Fine sandy loam soils not likely to short-circuit
- 2) Septic tank holes acting as cesspool
- 3) Elevate to moderate priority if usage increases significantly due to threat of seep into drainageway



## Actions

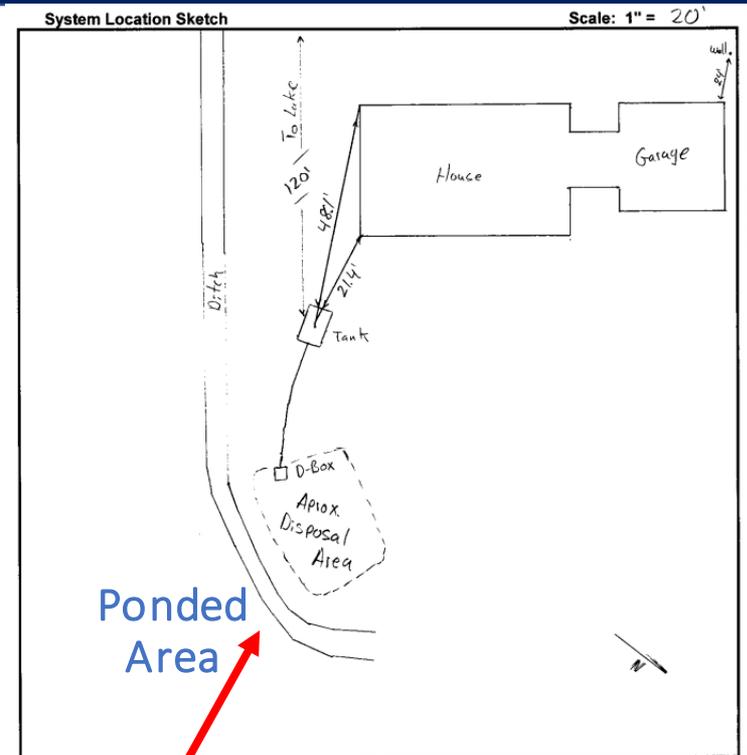
- Replace with modern system
- Owner has replacement system designed
- Costly due to slopes & set-backs

# System # 5

- Year-round home on the lake
- Post-1974 Septic System
- No HHE-200 record on file
- Concrete tank in good working order

## Site Conditions

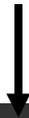
- Installed in a natural drainageway
- Ponded area upslope of disposal field
- Excavated drainage swale adjacent to disposal field to drain to ponded area (evidence of ponded water)
- Natural drainage swale in woods connects excavated drainage swale to lake



# System # 5

## Survey Results

- One of the disposal field pipes located in gravel a couple of feet from excavated ditch
- Bottom of stone in disposal field lower in elevation than bottom of excavated drainage ditch



- ✓ **Direct connection to the lake**
- ✓ **Would likely have surfacing effluent if not for the connection to the ditch**



## Actions

- Disposal field is a significant threat to the lake- Highest Priority
- Replace as soon as possible

# Summary

- 5 septic inspections & 6 Biomat evaluations (3 pre-1974, 3 between 1974-1995)
- No significant concerns for only **1 out of 6 systems**
- Two systems were immediately pumped
- All three pre-1974 systems should be completely replaced
- Two 1974-1995 systems pose substantial immediate risk to water quality (1 direct connection & 1 short-circuit)



# Lessons Learned

- Determining a septic system's threat to water quality requires looking at multiple variables:

- ✓ Age/Condition
- ✓ Use Pattern (Seasonal vs. Yr-Round)
- ✓ Distance from Waterbody
- ✓ Construction Details
- ✓ Slope & Soil Type



- Prioritizing which systems to replace or repair requires:

- ✓ Consideration of their current threat to water quality
- ✓ Willingness of landowners to participate
- ✓ Available resources

# Lessons Learned

- Not meeting today's standards does not mean there is an impact on water quality & vice versa (e.g., System #3: Short Circuit)
- Site evaluators are not soil scientists or engineers & early years of site evaluations were less reliable than today
- No certification required for installers (e.g., System #5)



# Recommendations

- Prevent Short-Circuits on sandy or shallow soils by installing the drain field on or in the topsoil layer
- Avoid removing natural soil down to sand or bedrock and replacing it with sandy fill material
- Consider local ordinances requiring systems in the SLZ be built to avoid Short-Circuits
- Avoid placing gravelly fill right up to the edge of drainage ditches



*Photo: Georges Pond, John Eliasberg*

# Project Outcomes

- Achieved the desired goal of providing a “snapshot” of the possibility of septic systems affecting lake water quality
- Need for more comprehensive study of septic systems in the Georges Pond Watershed



# Next Steps

## Launch of the GPA 2023 Septic System Inspection Program

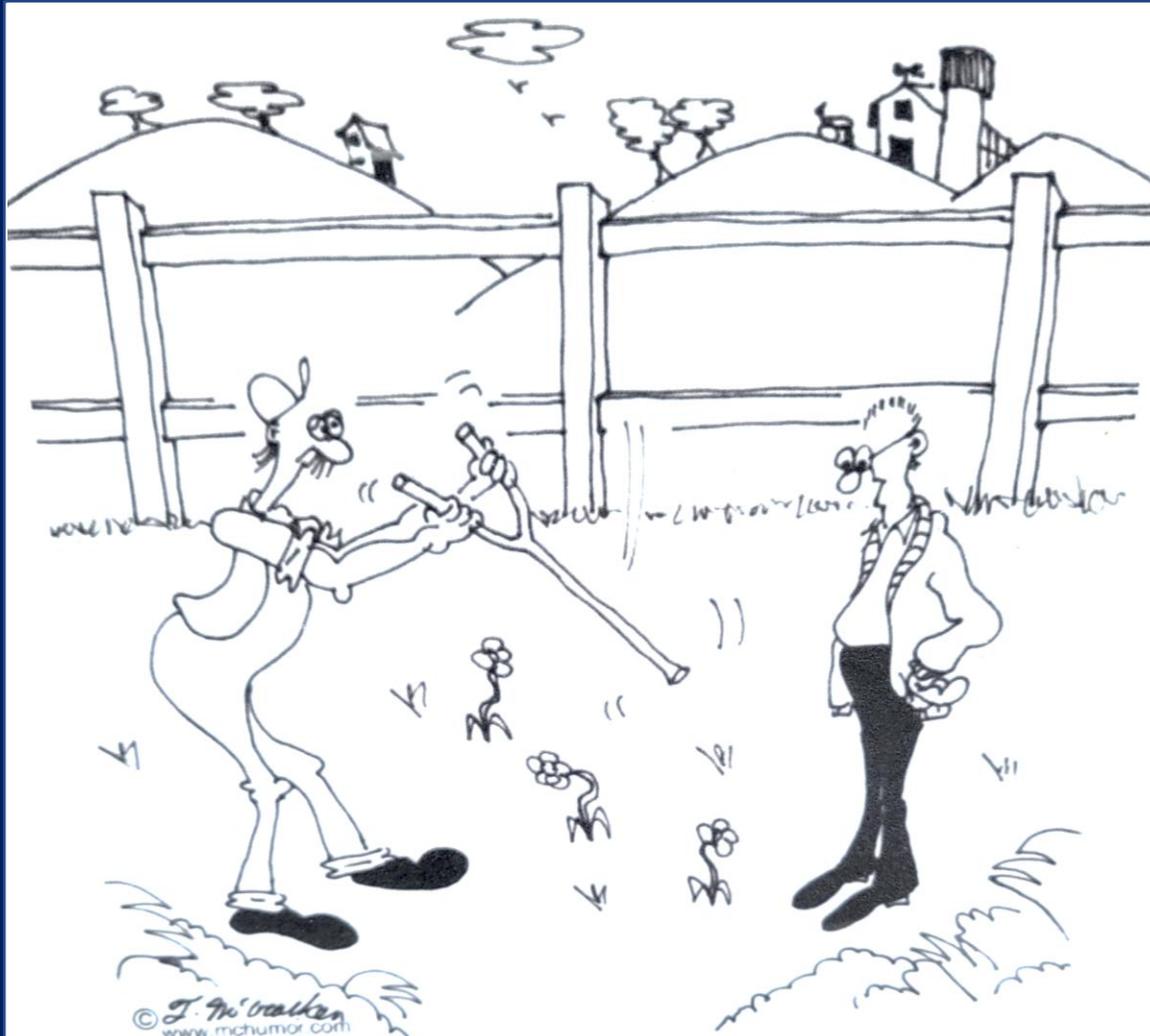
*“Proper maintenance is one of the most important steps every homeowner can take to protect the value of their camp and keep Georges Pond clean.”*

- GPA will schedule & coordinate septic inspections with the landowner and a licensed professional inspector
- Free inspections for pre-1974 and year-round systems
- 50% discount for 1974-1995 systems or rentals
- Post-1995, GPA will help schedule and coordinate inspections



Photo: Georges Pond, John Eliasberg

Septic Inspection Program Application: [georgespondassociation.org](http://georgespondassociation.org)



"Great. You found my septic tank."

**Georges Pond**  
Association

Preserve • Protect • Promote



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