



The "Lake Effect" on Wastewater Management

Outline







Project Introduction







NYC DEP Announces \$3 Million in Wastewater Planning Grants for Communities Near Two Reservoirs in Putnam, Westchester

February 20, 2020

Article Link: <u>https://www1.nyc.gov/site/dep/news/20-005/nyc-dep-3-</u> million-wastewater-planning-grants-communities-near-two-reservoirs-in#/0 Lake Engineering Studies

- The Town of Lewisboro obtained grant money to conduct engineering studies on three lakes:
 - Lake Waccabuc
 - Lake Truesdale
 - Lake Kitchawan
- The goals of the studies were twofold:
 - Identify the contribution of phosphorus from septic systems to the lakes
 - Determine a wastewater management solution for failing and poorly functioning septic systems





Nutrients in Lake Waccabuc

- Phosphorus is the primary pollutant of concern in Lake Waccabuc
- Water quality data is collected annually through the Citizen Statewide Lake Assessment Program (CSLAP)
- CSLAP data shows a significant increase in phosphorus levels since 1986
- NYS Limit of Phosphorus is 0.020 mg/L
- 2020 CSLAP data shows a peak phosphorus concentration of 0.053 mg/L



Effects of High Nutrient Concentrations

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- Nutrients are essential to lake health
- Nutrients can also be a source of pollution
- Effects of high nutrient concentrations in Lake Waccabuc include:
 - Vulnerability for invasive species
 - Frequent harmful algal blooms (HABs)
 - Depletion of dissolved oxygen concentrations
 - Impairment of drinking water supply
 - Limits on recreational opportunities

PROJECT INTRODUCTION





PROJECT INTRODUCTION



Septic Systems How They Work & How They Fail

Residential Septic Systems





- Septic tanks separate out the scum and sludge before discharging to the drainfield
- Having your septic tank pumped out regularly is important!
 - EPA recommends pump out and inspection every 3 to 5 years
 - Your Town Code / County Health Department may have more stringent standards/guidelines

Animated Interactive Model



https://www.gbra.org/presentations/septic/index.html

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Seepage Pits and Cesspools





Cesspools are similar to seepage pits, but do not have septic tanks

No septic tank means no pretreatment

Source: US EPA

- Cesspools no longer meet state health code, therefore new cesspools cannot be constructed
- State health code only allows seepage pits to be installed when conventional drainfields are not possible

Seepage Pits and Cesspools



SEPA United States Environmental Protection Age

In 1999, EPA promulgated regulations prohibiting the use of cesspools for the disposal of sewage from multi-family dwellings, and any other buildings where cesspool capacity was for 20 or more persons per day, such as schools, hospitals, and manufacturing facilities. In that rule, a cesspool was defined as "a "driwell" that receives untreated sanitary waste containing human excreta, and which sometimes has an open bottom and/or perforated sides. "Drywell" means a well, other than an improved sinkhole or subsurface fluid distribution system, completed above the water table so that its bottom and sides are typically dry except when receiving fluids. These regulations also contain a prohibition against the use of any seepage pit, drywell, septic system, or other subsurface disposal system for the disposal of hazardous or toxic substances (40 CFR part 144.)



Region 9 Ground Water Office (WTR-9)

EPA 909-F-01-001

APRIL 2001

Seepage Pits May Endanger Ground Water Quality

While the use of cesspools for sewage disposal has been prohibited in most states for a number of years, some local ordinances still allow for the construction of drywells as a means of dispersing effluent from septic tanks. When used in this fashion, they are more commonly called "seepage pits." This method of effluent dispersal is deficient for a number of reasons:

Seepage pits disperse effluent in anoxic, or oxygen-poor, environments, where
pathogens (especially viruses) may not be treated before they reach the water table.
They place fluids below the root zone, where there is no immediate uptake by plants of
the water and nutrients, nor is there the potential for treatment by evaporation or
evapotranspiration.

 If septic tanks and other treatment components are not properly sized, constructed and maintained, seepage pits may receive sewage solids (essentially functioning like cesspools.)

 Water tables are not static, and may rise above the bottom of the seepage pit, flooding it and allowing direct contact of pathogens and nitrogen species with ground water.

 Seepage pit construction and use may open up pathways to cracks and fissures in rock, sending effluent directly to waterways.

Depending on their depth, seepage pits may allow contaminated ground water to pollute pristine aquifers.

6. Seepage pits used for the disposal of untreated or partially treated industrial or compercial waste may pose additional hazards to ground water quality, if the effluent contains soluble toxics.

Seepage his may cause other hazards not directly related to water quality. They are a hazard for people, animals and property that may fall into them. They may also affect slope stability and promote landsides. For all of these reasons, the Ground Water Office at EPA, Region 9 discourages the use of seepage pits for onsite sewage (or septic) system effluent, particularly on steep slopes, irratured rock areas, areas with shallow ground water, and/or areas where ground water provides

the sole source of drinking water.

Exceptions should only be allowed where the seepage pit is backfilled with cobblec or other weight-bearing material, where the sanitary waste stream has been treated (e.g., disinfection, nitrogen removal), and no other effluent dispersal mechanism is feasible. Regulators should assess cumulative impacts based on the number and types of other nearby subsurface discharges.

References are listed on the reverse of this sheet. For more information, please call Elizabeth Janes at (415) 972-3537, or e-mail janes.elizabeth@epa.gov.

https://www.epa.gov/sites/production/files/2015-06/documents/seepagepits.pdf







Poorly Functioning Septic Systems

- A septic system is considered poorly functioning when the wastewater is not fully treated before it reaches the groundwater.
- Potential Causes:
 - Site Environmental Constraints
 - Aging System Components





Failing Septic Systems

A septic system is considered failing when one of two things happen:

- Wastewater reaches the surface above the septic system
- Wastewater backs into the home





SEPTIC SYSTEMS: HOW THEY WORK & HOW THEY FAIL





SEPTIC SYSTEMS: HOW THEY WORK & HOW THEY FAIL





SEPTIC SYSTEMS: HOW THEY WORK & HOW THEY FAIL



Phosphorus Model



Model Inputs from Septic Systems

- Used Model My Watershed to run a nutrient analysis on Lake Waccabuc.
- Needed to determine the following inputs:
 - Number of failing septic systems
 - Number of poorly functioning septic systems

hodel My Watershed 🐂

Lake Waccabuc Study A... Details

Current Conditions - + New scenario 🕹 Export GMS 🗰 Compare

Hydrology Water Quality

Average annual loads from 30-years of daily fluxes Related Layer: Weather Stations used in this model. ✓ Turn on Weather Source: USEPA National Climate Data ⊕ Simulated by the GWLF-E (MapShed) model ⊕

Sources	Sediment	Total Nitrogen	Total Phosphorus
Total Loads (lb)	102,498.5	1,277.7	85.6
Loading Rates (Ib/ac)	198.09	2.47	0.17
Mean Annual Concentration (mg/L)	42.57	0.53	0.04
Mean Low-Flow Concentration (mg/L)	73.65	0.84	0.11



🛓 Download this data

Sources \$	Sediment (Ib)	Total Nitrogen (Ib)	Total Phosphorus (Ib)
Hay/Pasture	562.3	5.4	1.8
Cropland	0.0	0.0	0.0
Wooded Areas	6,387.3	103.7	11.9
Wetlands	75.4	19.4	1.1
Open Land	871.1	13.3	1.3
Barren Areas	0.0	0.0	0.0
Low-Density Mixed	175.9	3.6	0.4
Medium-Density	151.1	2.8	0.3



Monitor

Analyze

Model





Failing Septic Systems

- There are ~2 septic systems failures per year within the study area
- This value is based on data from the Westchester County Department of Health and a public survey
- There may be additional septic system failures that have not been reported

Environmental Constraints





- Steepness of slopes
- Depth to bedrock

 Depth to seasonal high groundwater table

Environmental Constraints





Infiltration rate of soils

Parcel size

Proximity to water



Aging Septic Systems

- The limiting components of a septic system have a life expectancy of **50 years**.
- The USEPA states that "the average lifespan of a septic system is 15 to 40 years, but it can last longer if properly maintained."
- The Cornell Cooperative Extension states that "[septic] systems are designed to have a useful life of 20 to 30 years under the best conditions."





Septic Age and Maintenance



 Any septic system estimated to be 50 years or older was assumed to be poorly functioning



 Any septic system estimated to be 30 to 49 years old, without record of regular septic pump-outs was assumed to be poorly functioning

Prioritization for a Wastewater Management Solution





PHOSPHORUS MODEL

Model Results for Phosphorus







Wastewater Management Solutions





- Upgrades / Replacements of Individual Septic Systems
- Connection to Community / Cluster Septic Systems
- Sewer to an Existing Water Resource Recovery Facility (WRRF)
- Sewer to a New Water Resource Recovery Facility (WRRF)





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Recommended Alternative

- Sewer to a New Water Resource Recovery Facility (WRRF)
- Would be fully enclosed
- Building air would be treated
- Noise mitigation measures would be implemented
- Building would be designed to blend in with the neighborhood

WASTEWATER MANAGEMENT SOLUTIONS



The "Lake Effect"

- It is common for lake communities to have parcels that...
 - Are small and close together
 - Are near surface water (including streams)

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- Have shallow groundwater
- Have outdated/aging septic systems
- These factors can cause septic systems to be poorly functioning or even fail
- Failing/poorly functioning septic systems can cause nutrient pollution to the lake

Want more tips on how to maintain your septic system?

SAVE THE DATE! SepticSmart Week 2022 September 19-23, 2022

Get ready for the 10th anniversary of SepticSmart Week!

This year SepticSmart Week celebrates 10 years of outreach and education activities that encourage homeowners and communities to care for and maintain their septic systems.

For more information, visit www.epa.gov/septic

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Questions

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