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Lake Waccabuc

Engineering Study

November 15, 2021

Lake Waccabuc Engineering Study

I. Evaluation of Septic Systems

II. Water Quality Impacts

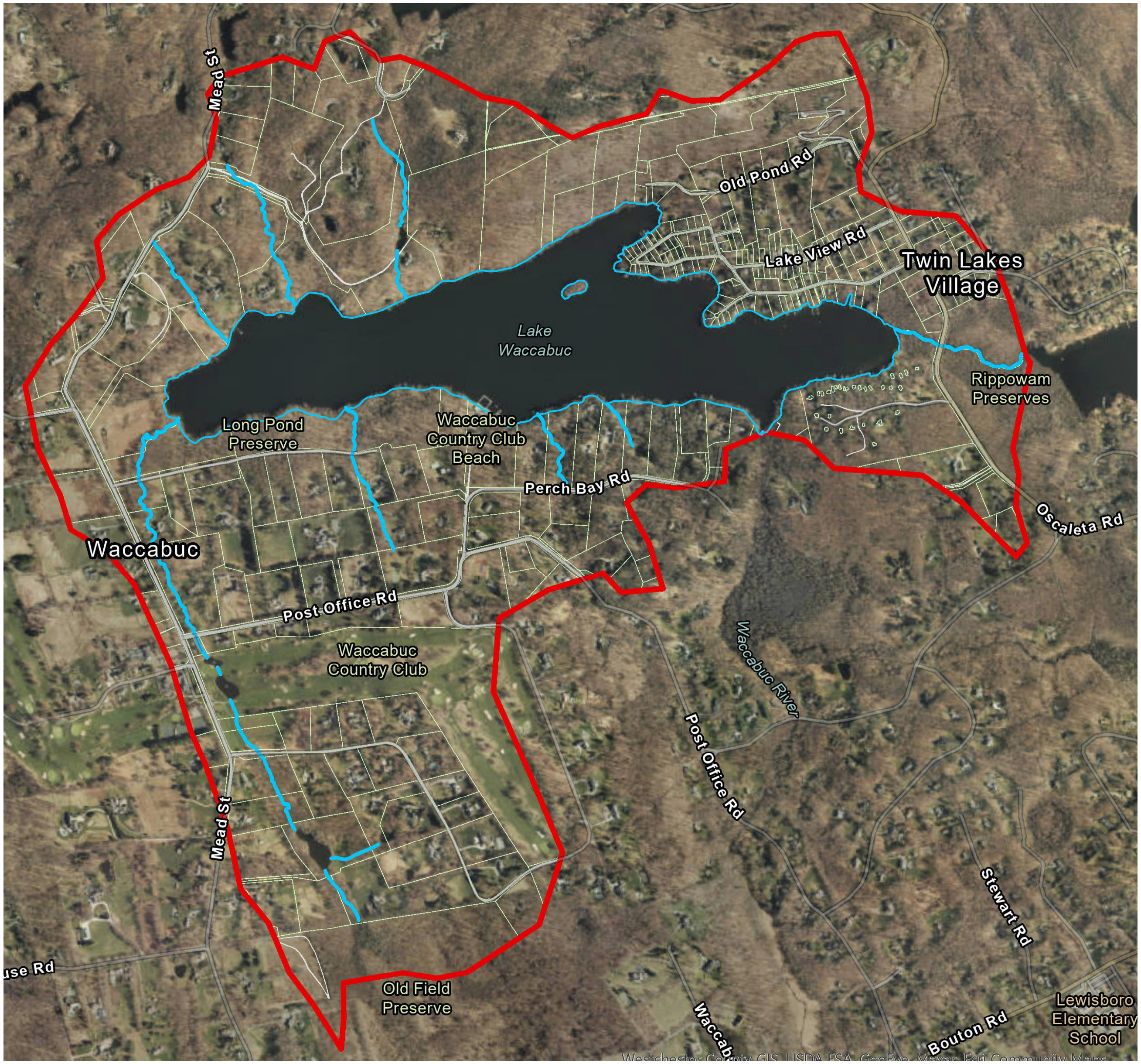
III. Wastewater Management Alternatives

IV. Cost Analysis

V. Next Steps

Evaluation of Septic Systems

Lake Waccabuc Study Area



- The study area is made up of the Lake Waccabuc watershed, excluding Lake Rippowam and Lake Oscaleta
- 285 homes in the study area
- Estimated population of 770 people

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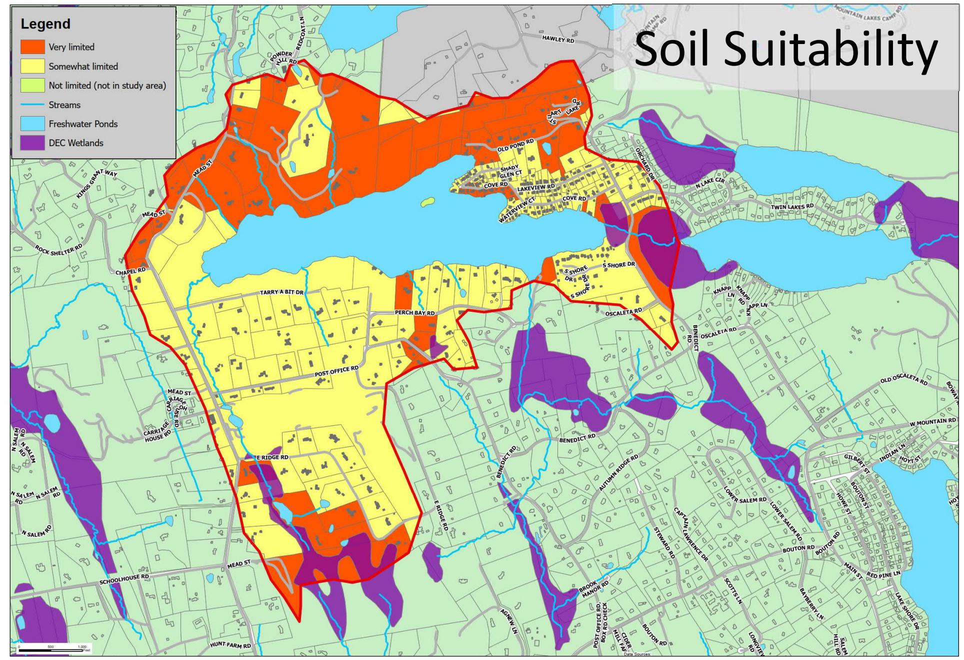
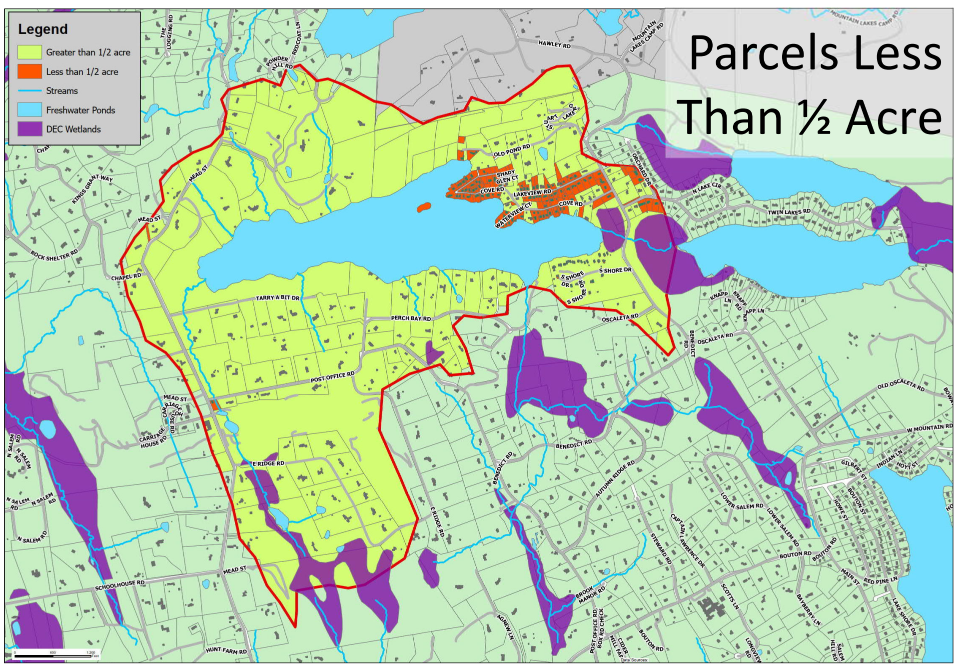
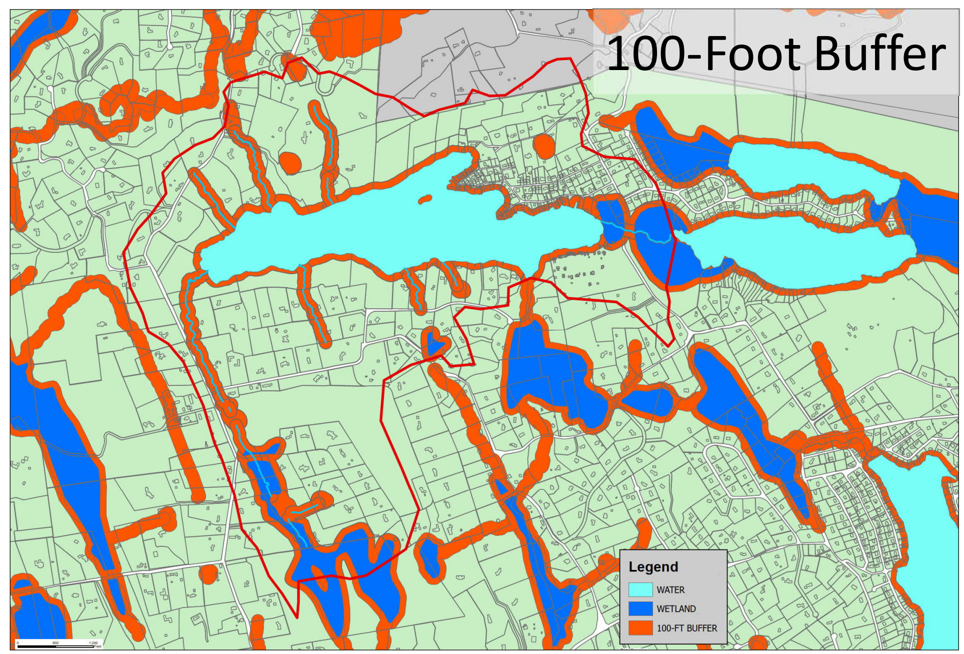
Environmental Constraints

- Infiltration rate of soils
- Depth to seasonal high groundwater table
- Depth to bedrock
- Steepness of slopes
- Proximity to surface water
- Parcel size

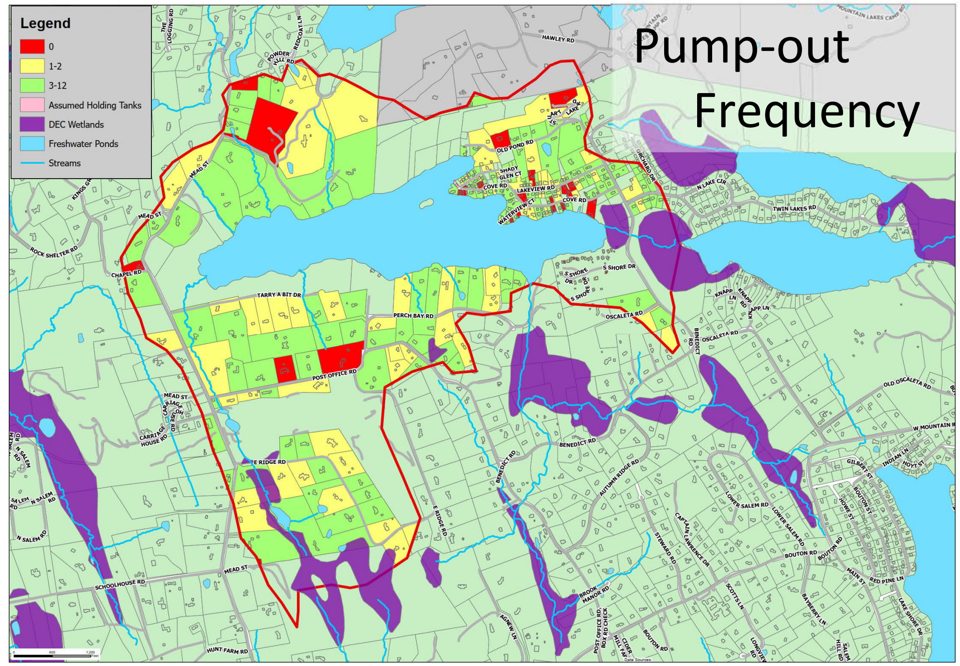


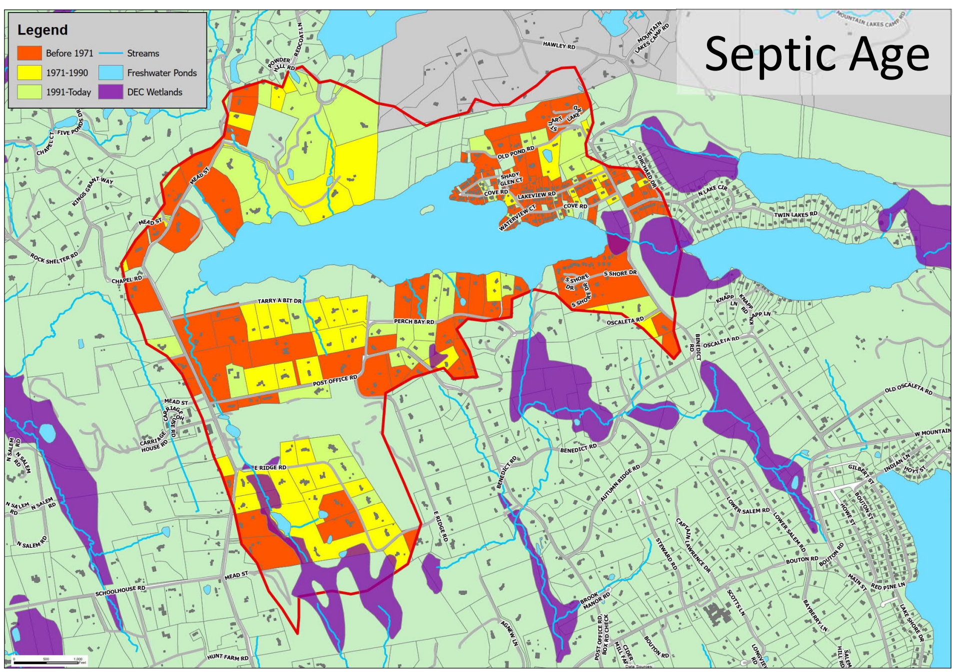


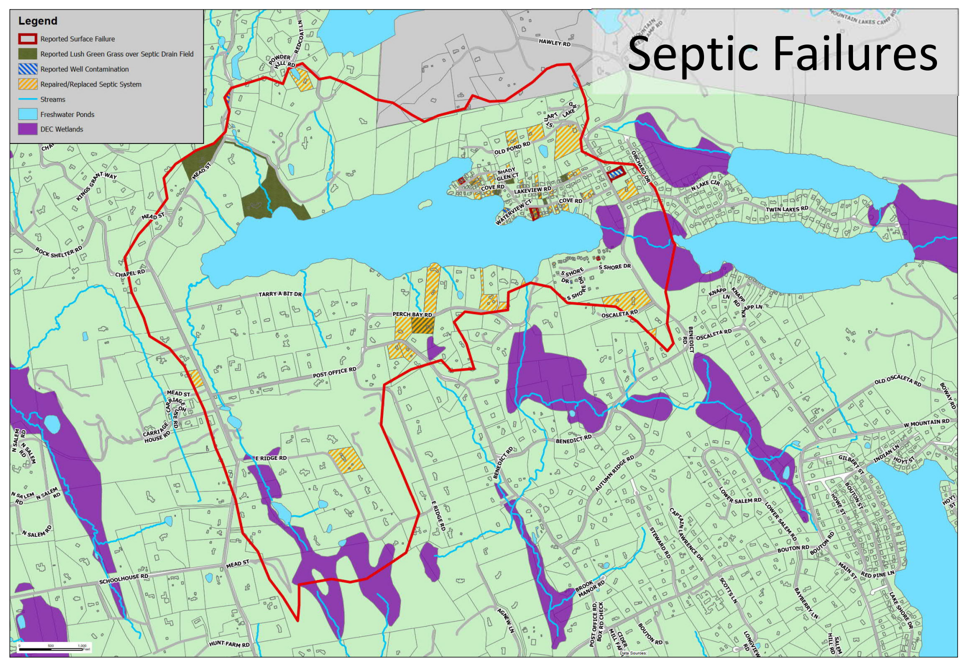


Site Septic Age and Maintenance

- Septic pump-outs required at least once every 5 years
- Average of 2 septic failures reported per year in study area
- Average septic system lifespan is 15 to 40 years (EPA)







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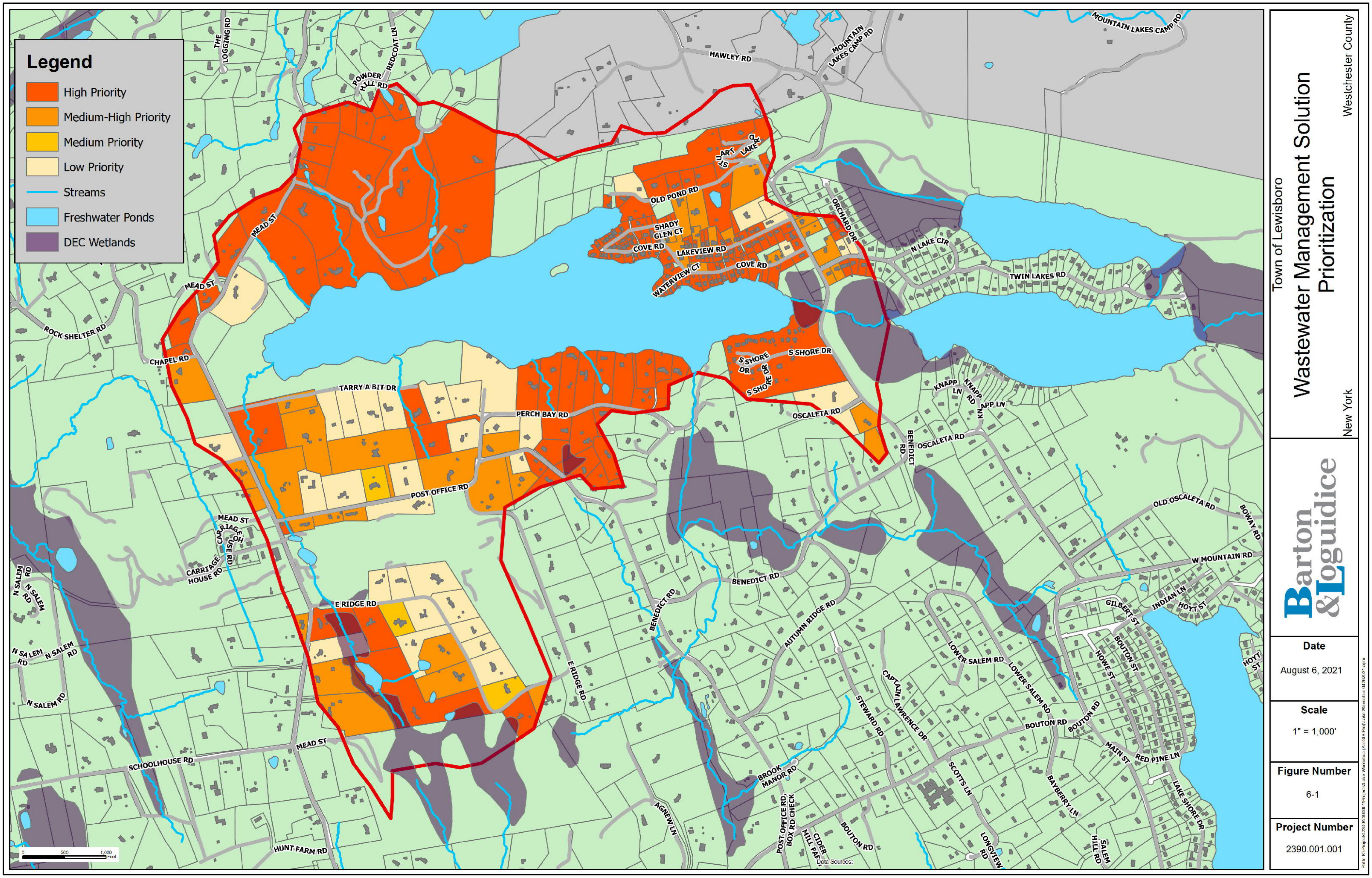
Prioritization of Sites



Water Quality Impacts

Effects of High Nutrient Concentrations

Effects of high nutrient concentrations in Lake Waccabuc include:

- Depletion of dissolved oxygen concentrations
  - Can result in fish kills
- Frequent harmful algal blooms (HABs)
  - HABs produce algal toxins harmful to human health and aquatic life
- Impairment of drinking water supply
- Vulnerability for invasive species
  - Increased growth of lake weed
- Limits on recreational opportunities

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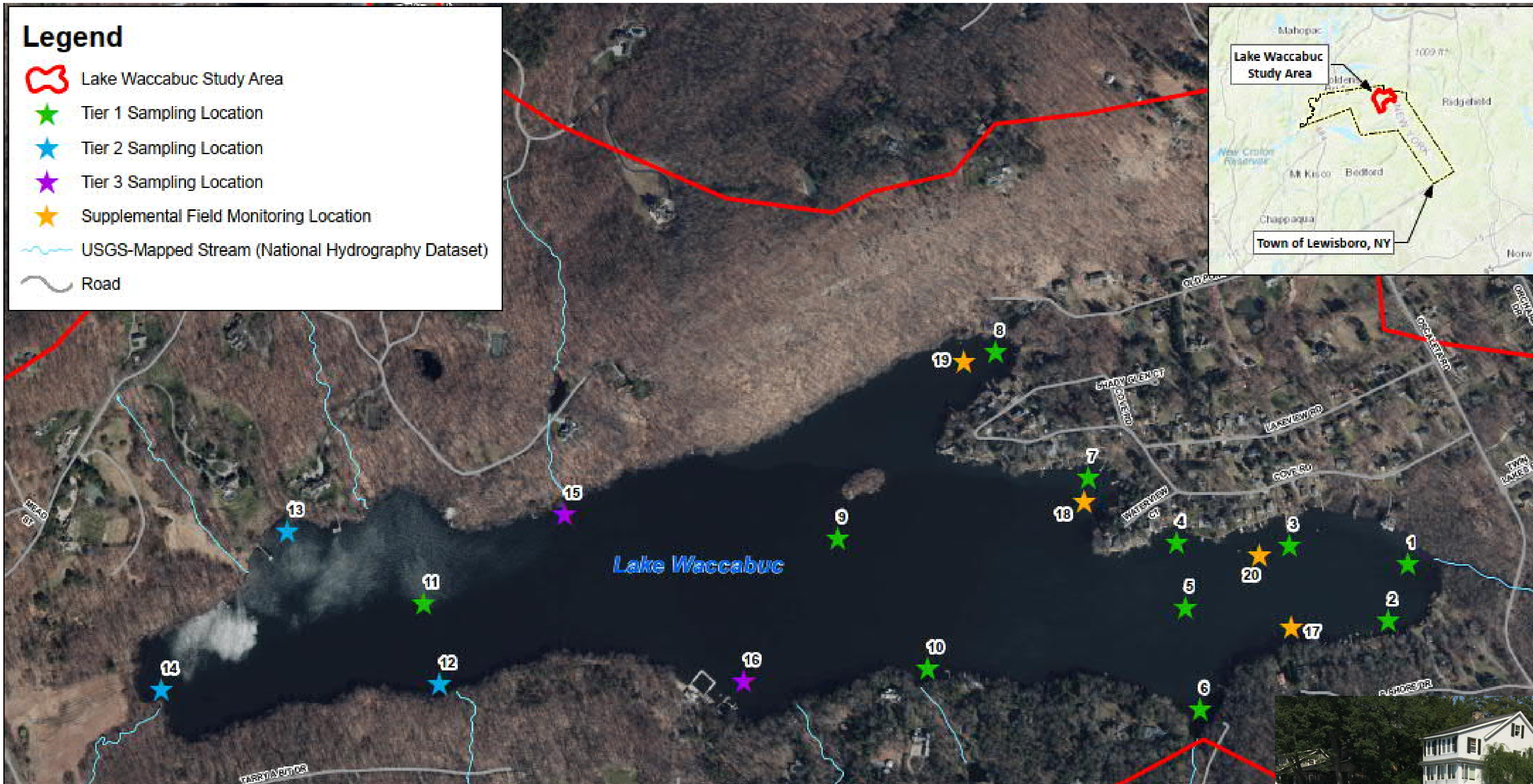
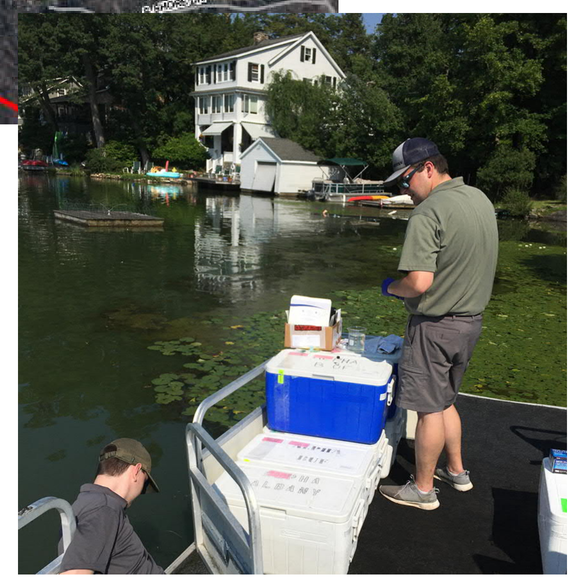
Field Sampling & Monitoring - Locations





July 2021 field monitoring/sampling

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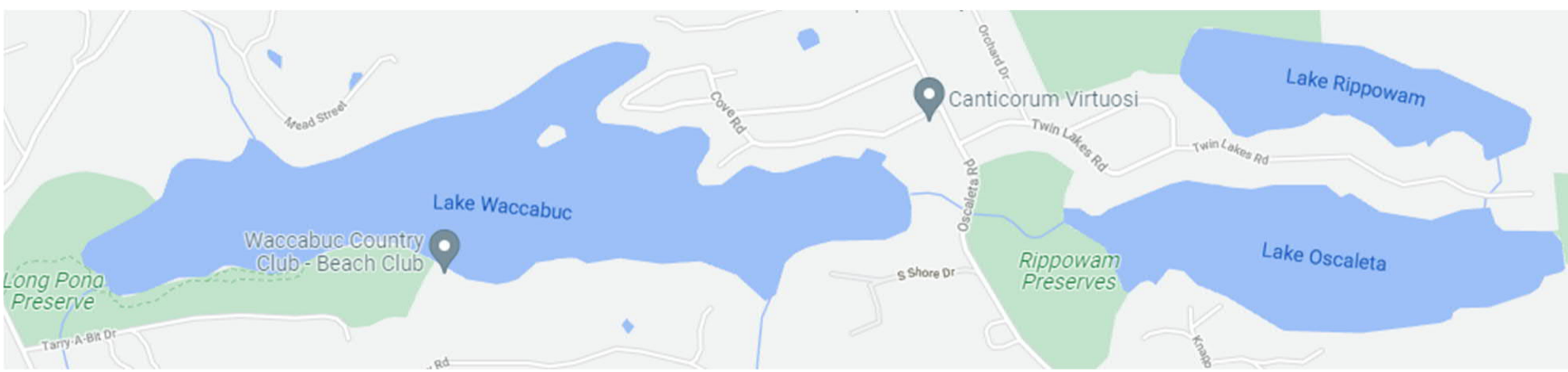
Water Quality Monitoring Results

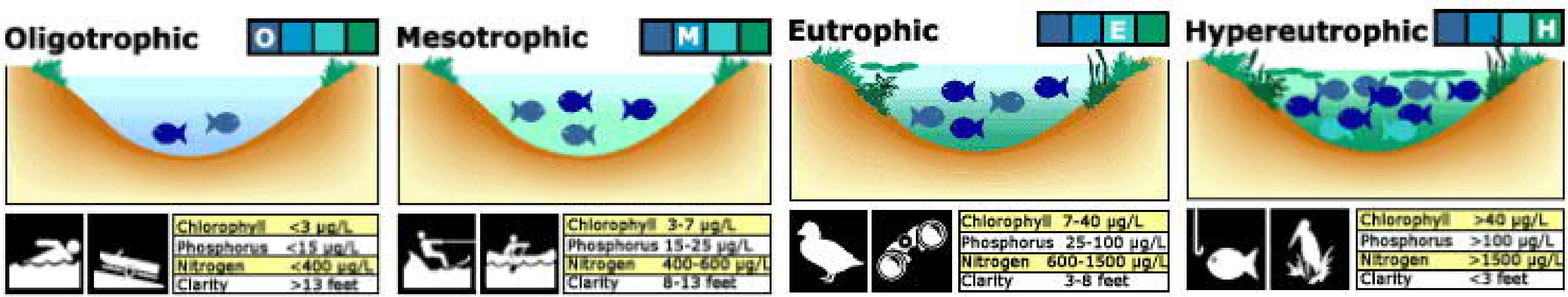
- Data was consistent with the Citizen Statewide Lake Assessment Program (CSLAP) results
- **Phosphorus** is the primary pollutant of concern
- CSLAP - significant increase in phosphorus levels since 1986
- 2020 CSLAP - peak phosphorus concentration of 0.053 mg/L
  - Over 2.5x greater than the NYS recommended limit (0.020 mg/L)
- July 2021 Phosphorus concentrations ranged from 0.025-0.043
- In general, highest phosphorus concentrations were observed at the Lake Waccabuc inlet.



Nutrient Concentrations & Trophic States

- Lake Waccabuc is approaching a **Eutrophic** state
- Cyanobacteria or “blue-green algae” present lake-wide
- Green non-toxic algae also present

Classification	Definition	Water Quality
Oligotrophic	Low level of biological productivity	Good
Mesotrophic	Moderate level of biological productivity	Fair
Eutrophic	High level of biological productivity	Poor
Hypereutrophic	Highest level of biological productivity	Very Poor



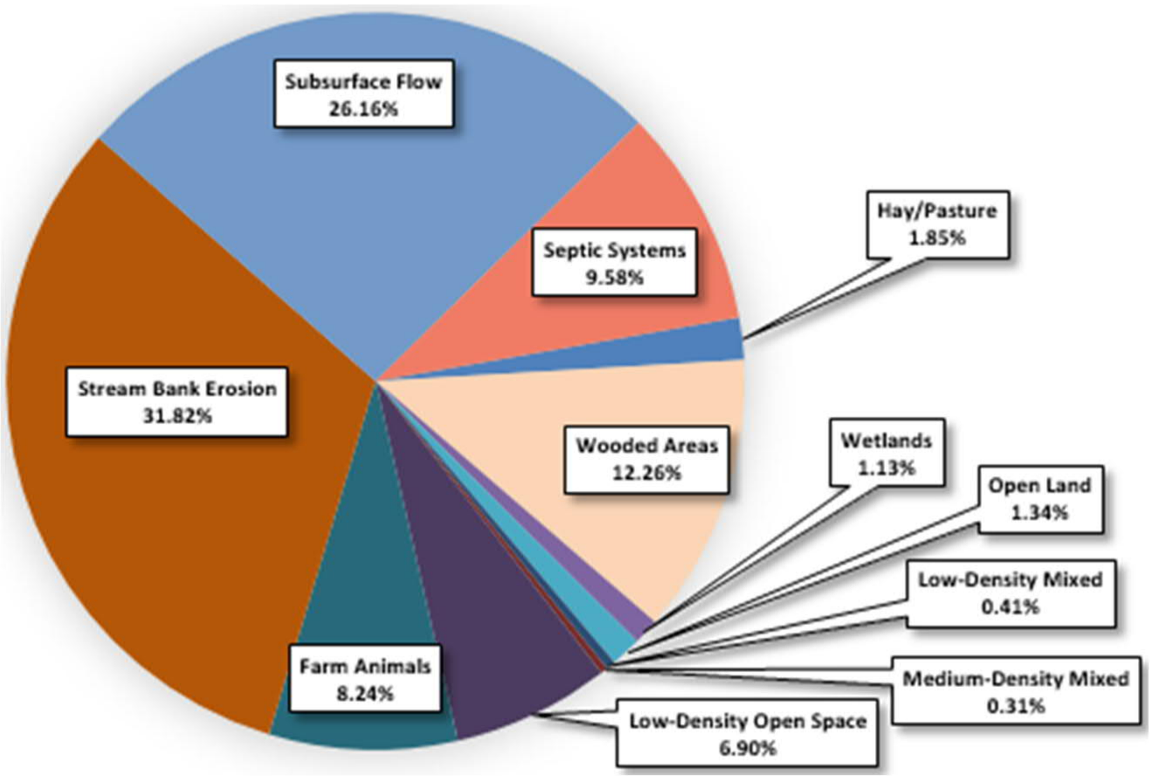
Source: University of Florida, Water Institute

Pollutant Load Modeling

- The Study Area is estimated to contribute between 9 to 1,074 lbs./year of phosphorus to the Lake from failing septic systems.
- The range is due to the number of failing septic systems incorporated into the model.

Minimum Phosphorus Septic Contribution

(Based on 2 failing septic systems/year)



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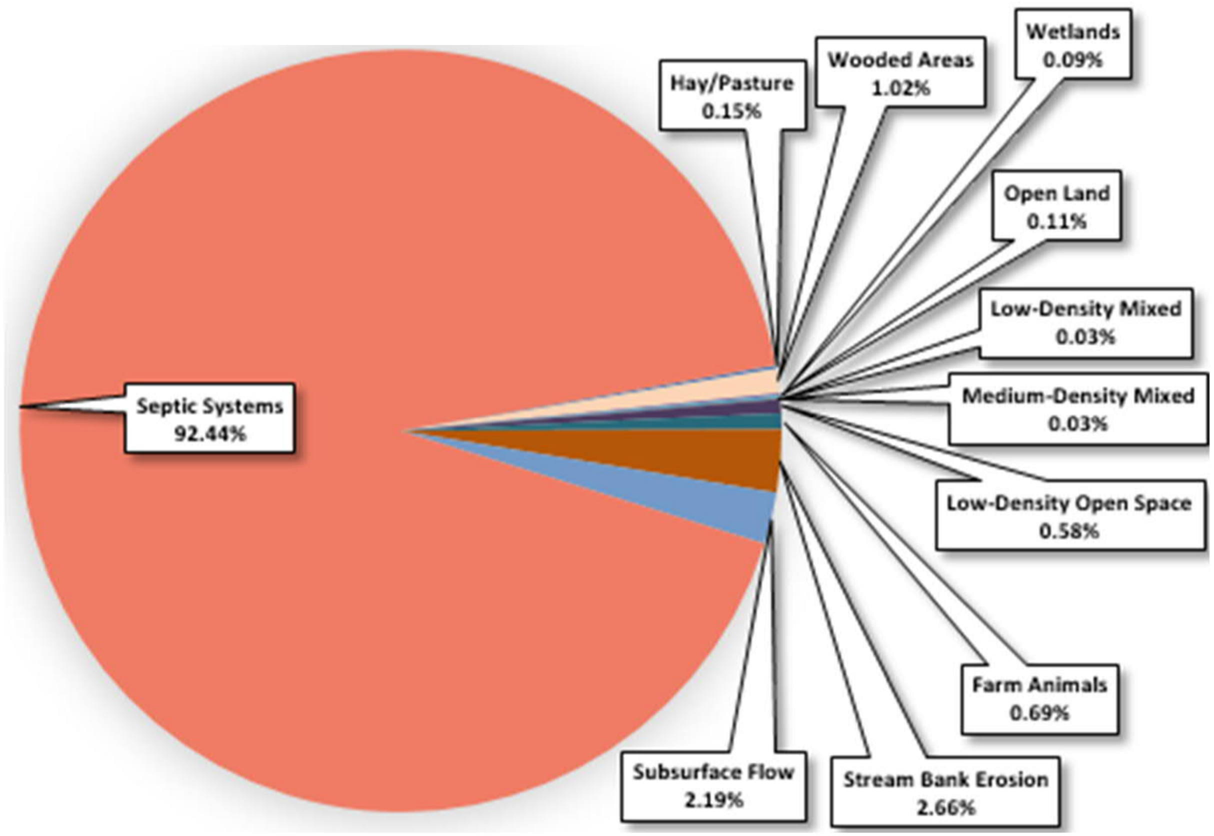
Pollutant Load Modeling

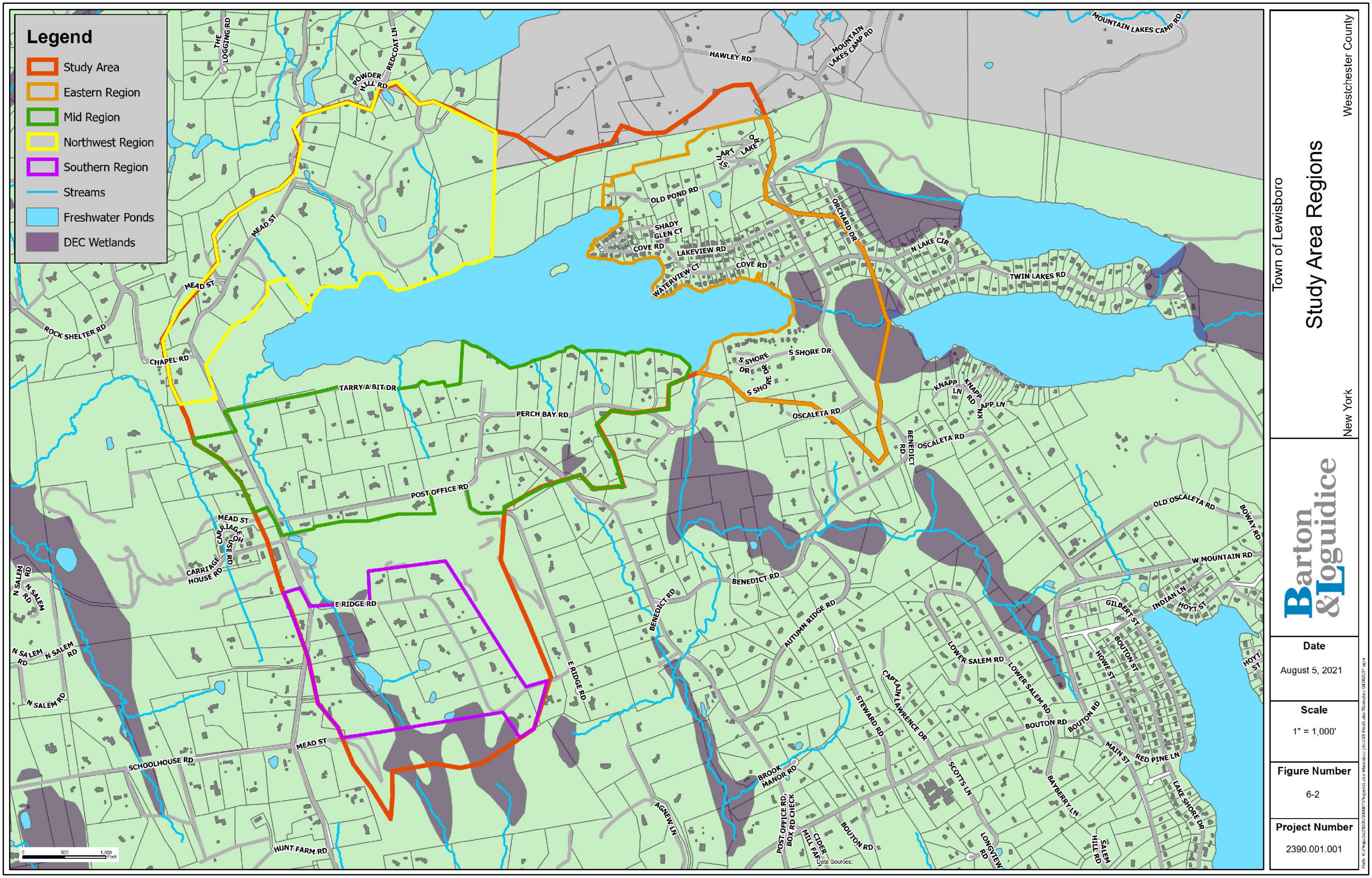
Maximum Phosphorus Septic Contribution



Maximum Scenario assumed 213 Failing Septic Discharges/year, including systems that were:

1) 50 years or older;
2) 30-49 years old without records of regular pump-outs;
3) Within 100-feet of a waterbody;
4) On slopes > 15%;
5) Cesspools and seepage pits;
6) Bedrock < 4 ft.
7) On properties < 0.5-acre

Study Area Regions



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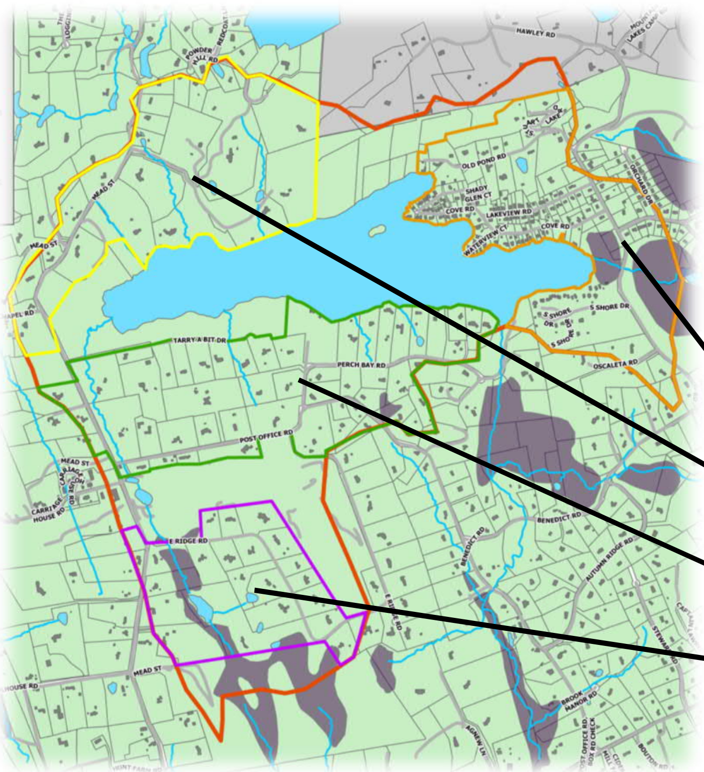
Cost-Benefit to Sewer Each Region

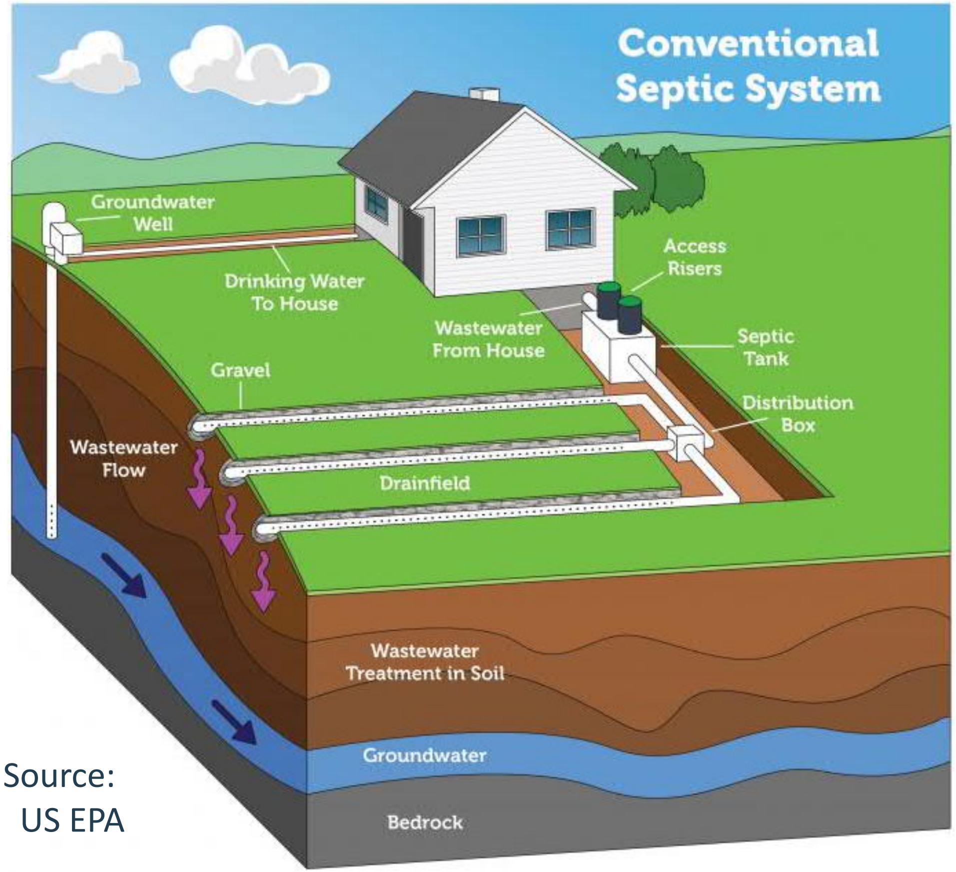


Study Area Region	Capital Cost of Sanitary Sewer System	Maximum Percent Phosphorus Reduction	Sewer Cost Per % Phosphorus Removed
Eastern	**$6,900,000**	**62%**	**$111,000**
Northwest	$3,100,000	10%	$310,000
Mid	$5,300,000	16%	$331,000
Southern	$2,200,000	4%	$550,000

Wastewater Management Alternatives

Wastewater Management Alternatives

1. Upgrades/Replacements of Individual Septic Systems
2. Connection to Community / Cluster Septic Systems
3. Sewer to an Existing Wastewater Treatment Plant (WWTP)
4. Sewer to a New Wastewater Treatment Plant



Source: US EPA

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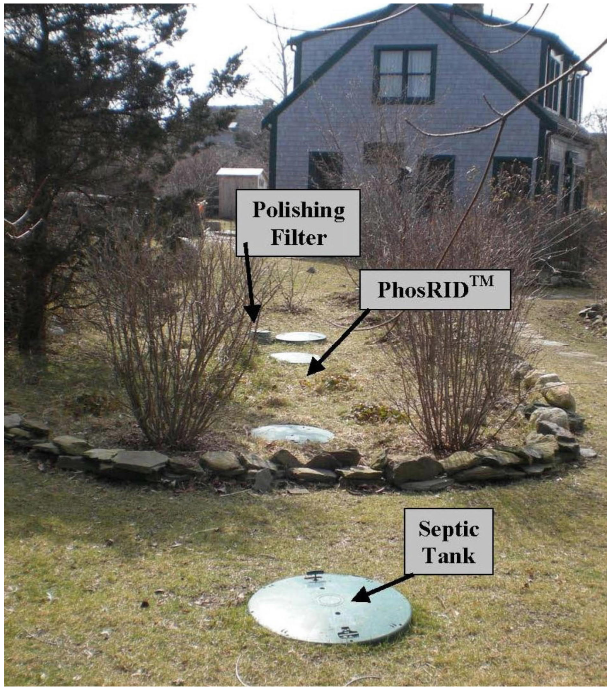
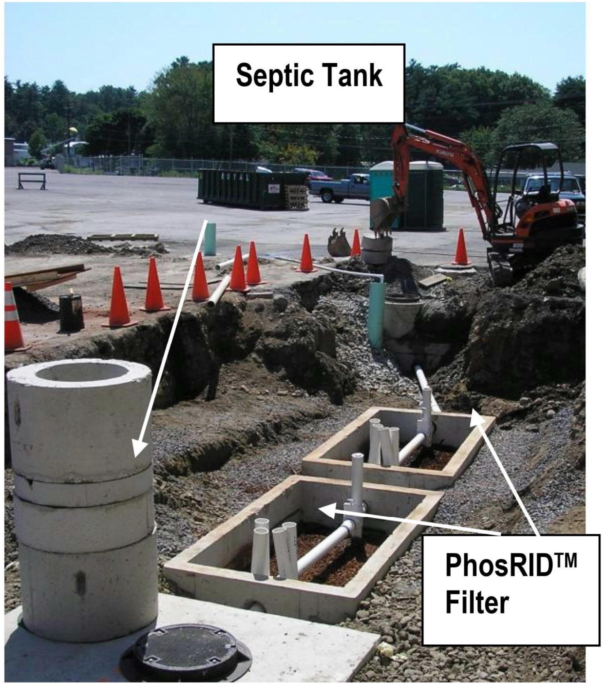
Upgrades/Replacements of Septic Systems

- Replacing old septic systems may reduce nutrient pollution to Lake Waccabuc, **IF** there are no environmental constraints
- For sites with environmental constraints, we recommend the implementation of a phosphorus treatment system





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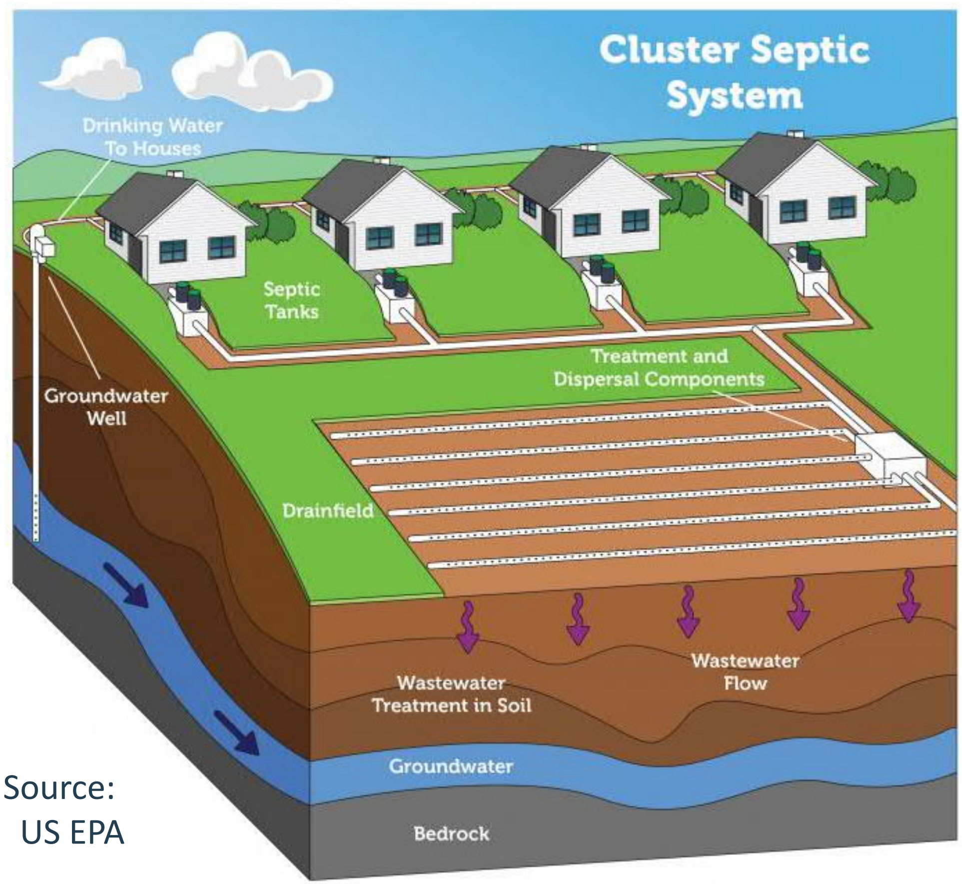

Source: US EPA

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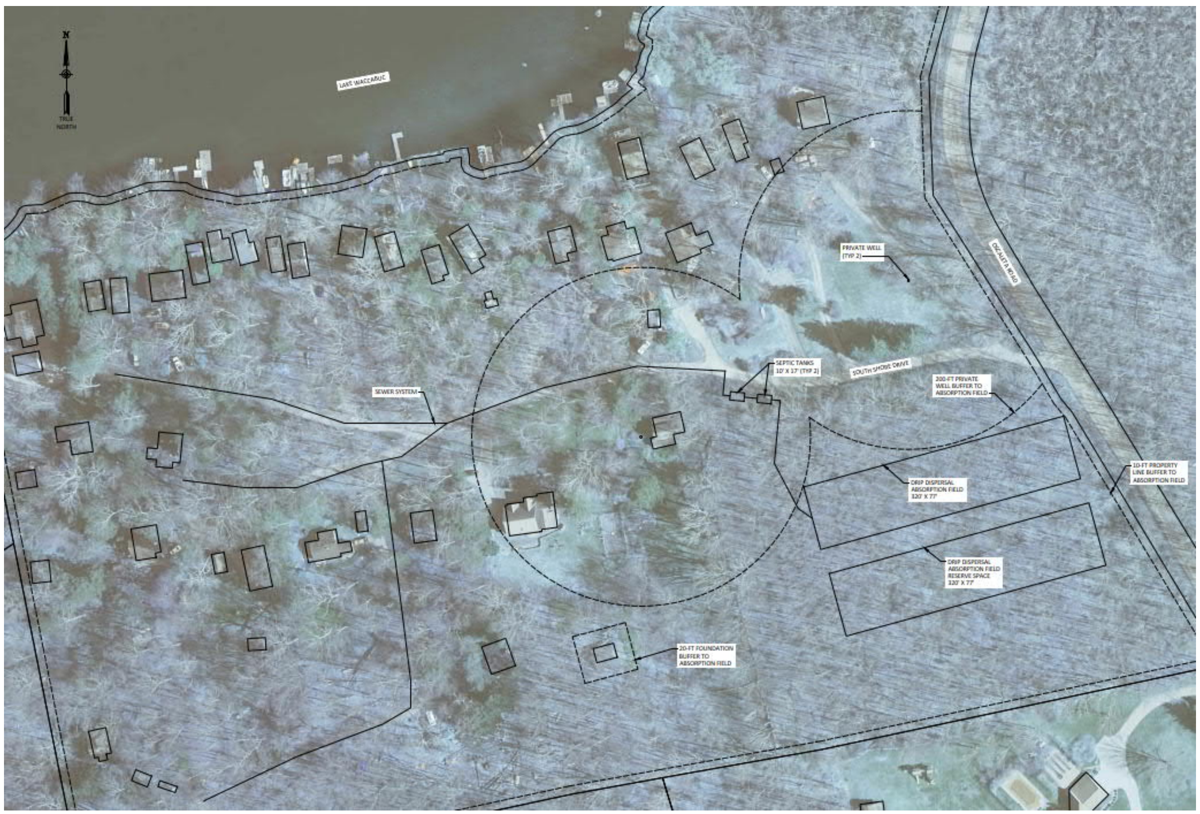
Connection to Community Septic Systems

- Limited land available to build a community septic system
- The land requirement is estimated at ~8 acres to support the entire study area
- South Shore Waccabuc Association can support its residents



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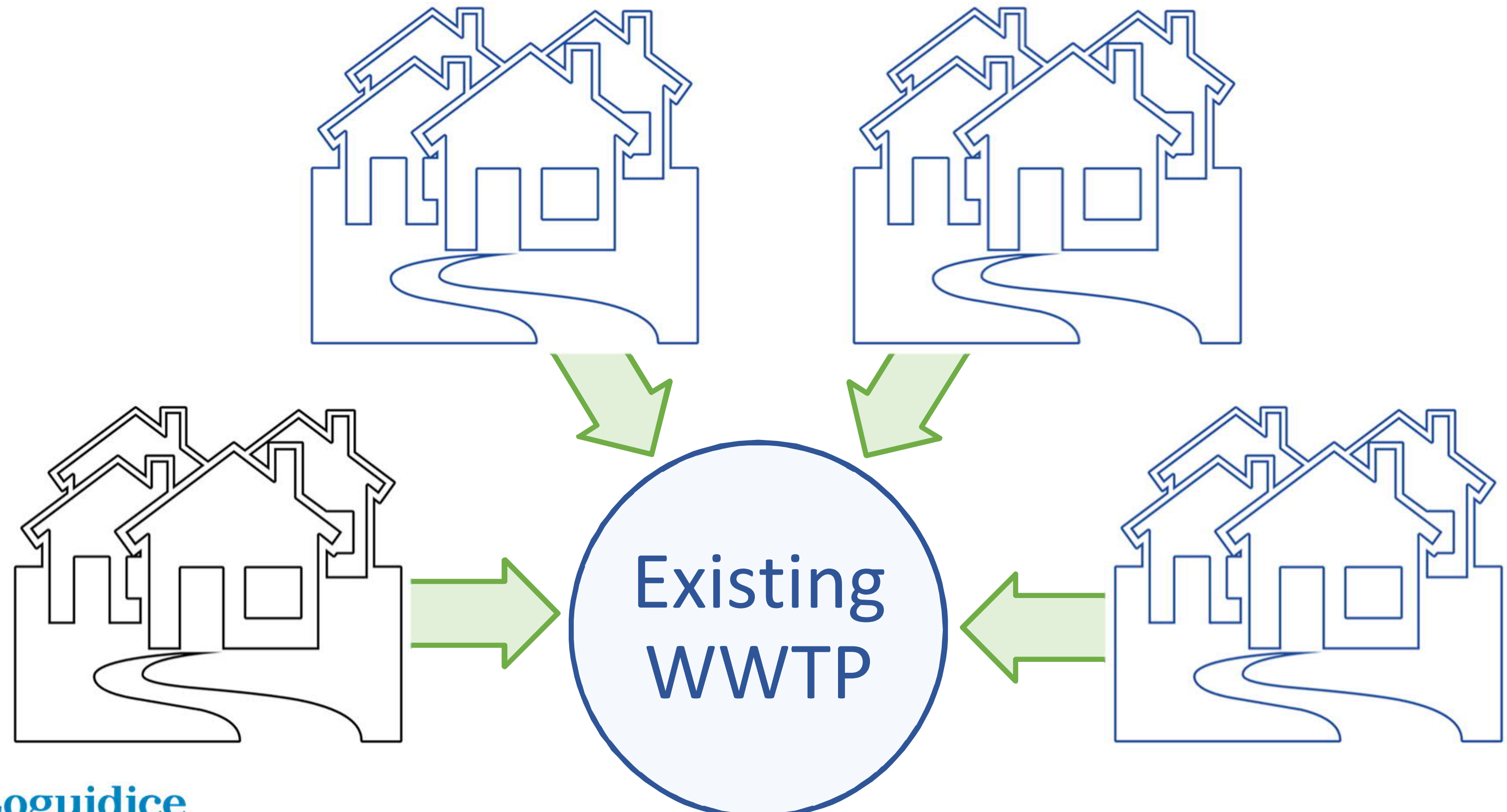

Sewer Extension to an Existing WWTP

- Ridgefield, Connecticut has the nearest municipal WWTP
  - They recently upgraded their plant and are already at capacity
  - They do not have the space to further increase their capacity
- Evaluated other nearby municipal WWTPs within a 10-miles radius
  - Considered sending sewer to Heritage Hills WWTP

Wastewater Management Alternatives

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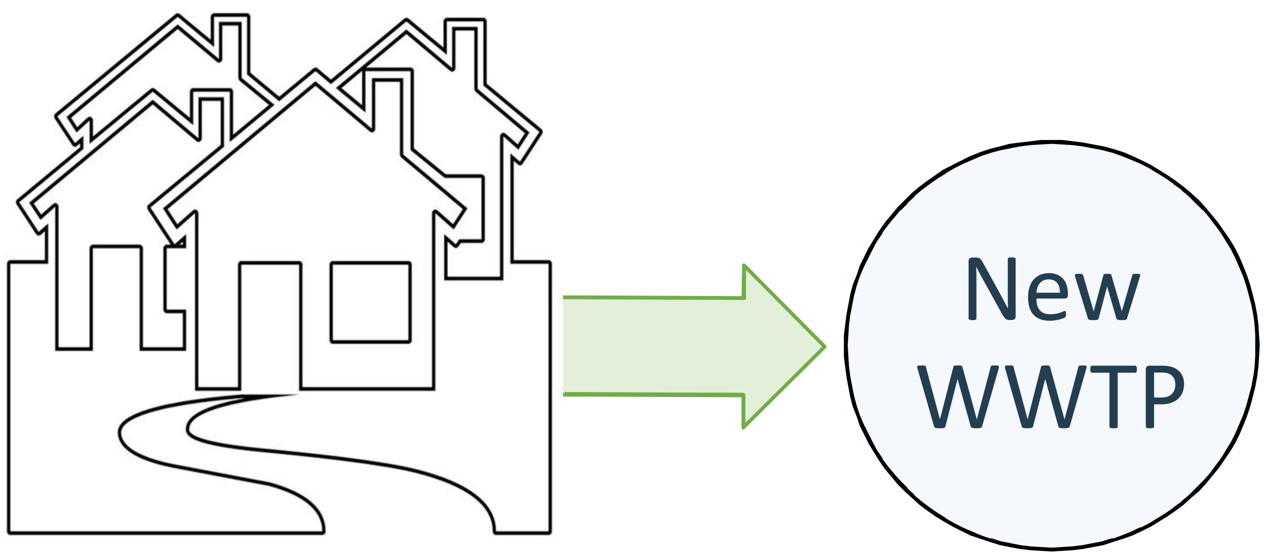
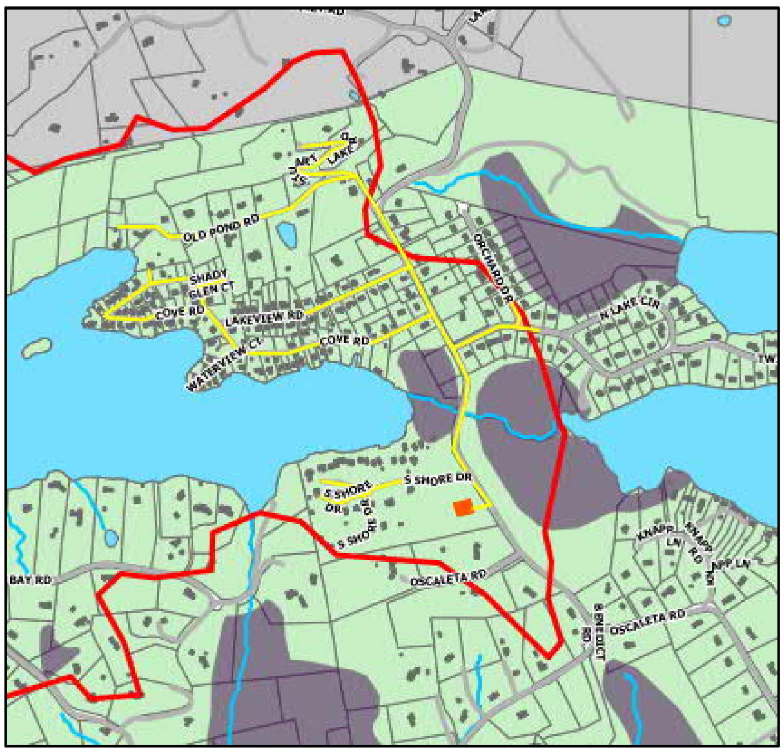
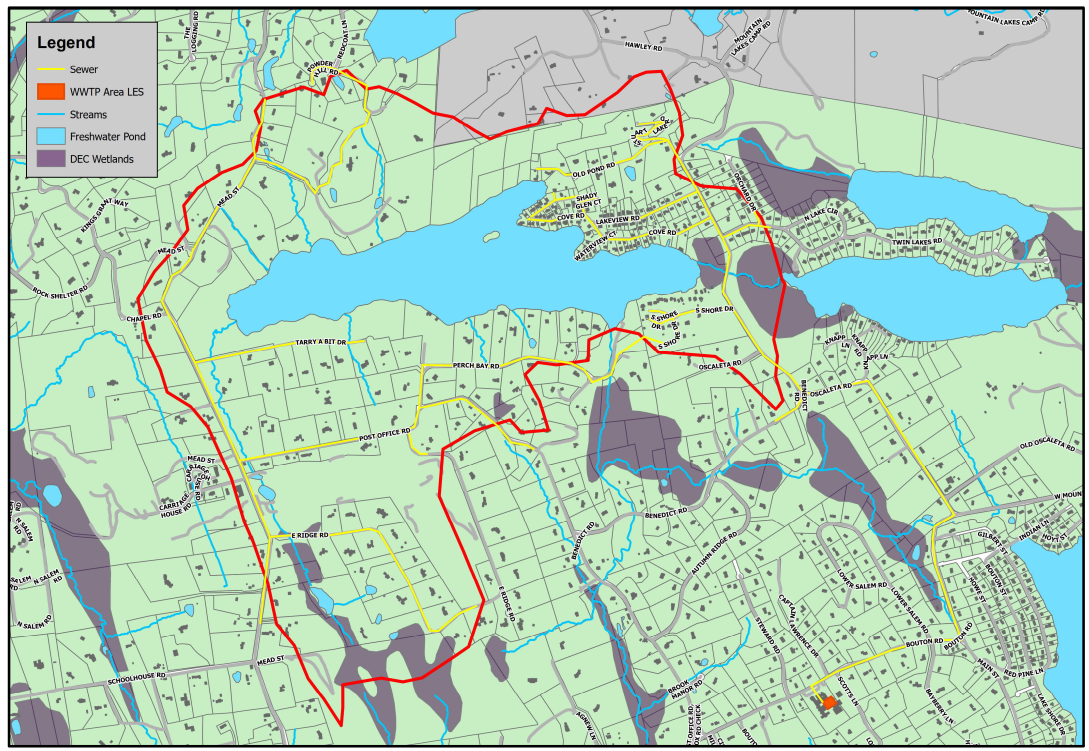


Sewer to a New WWTP

- There is limited land available to build a WWTP
  - It would take ~ 0.5 acres to treat the entire study area
- 2 sites were chosen for evaluation:
  - South Shore Drive – Treat Eastern Region
  - Lewisboro Elementary School – Treat the Entire Study Area





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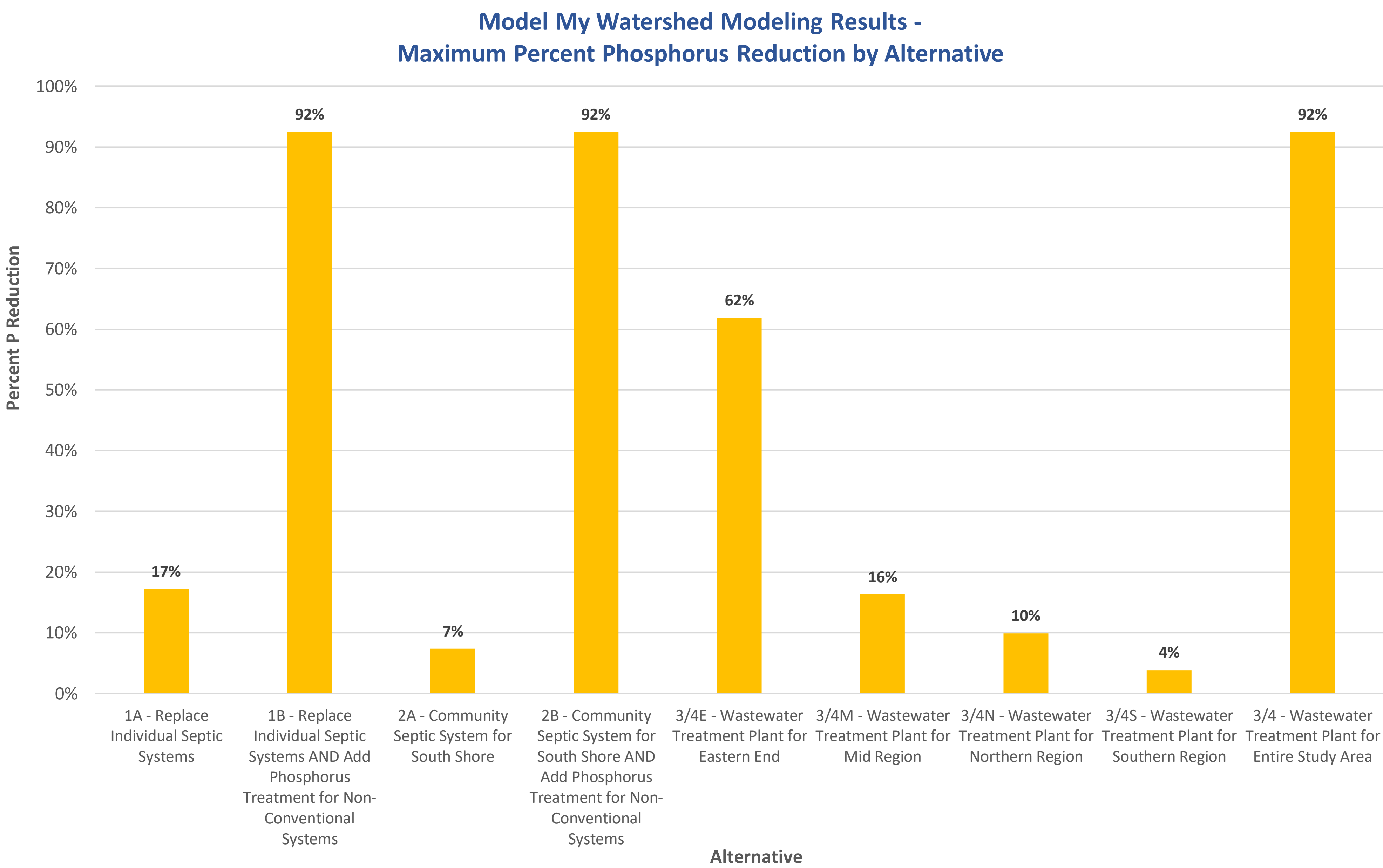
Modeling Alternatives – Phosphorus



Cost Analysis

Capital Cost

Alternative	Area to be Treated	Capital Cost
Alternative 1A – Replacement of Septic Systems	Entire Study Area	$5,100,000
Alternative 1B – Replacement of Septic Systems with Phosphorous Treatment	Entire Study Area	$7,700,000
Alternative 2A – Community Septic System	Only South Shore	$1,400,000
Alternative 2B – Community Septic System for South Shore & Replacement of Septic Systems w/ Phosphorous Treatment for Remaining Study Area	Entire Study Area	$9,000,000
Alternative 3 – Connection to Heritage Hills WWTP	Entire Study Area	$43,200,000
Alternative 4A – SBR WTP at South Shore	Only East Region	$16,600,000
Alternative 4B – SBR WTP at Lewisboro School	Entire Study Area	$34,100,000

Life Cycle Cost Analysis

Alternative	Area to be Treated	Annual Cost
Alternative 1A – Replacement of Septic Systems	Entire Study Area	$320,000
Alternative 1B – Replacement of Septic Systems with Phosphorous Treatment	Entire Study Area	$510,000
Alternative 2A – Community Septic System	Only South Shore	$90,000
Alternative 2B – Community Septic System for South Shore & Replacement of Septic Systems w/ Phosphorous Treatment for Remaining Study Area	Entire Study Area	$590,000
Alternative 3 – Connection to Heritage Hills WWTP	Entire Study Area	$2,470,000*
Alternative 4A – SBR WTP at South Shore	Only East Region	$1,190,000
Alternative 4B – SBR WTP at Lewisboro School	Entire Study Area	$2,190,000

**Does not include cost of user fee*.

Cost-Benefit Analysis by Alternative

Alternative	Area to be Treated	Percent Phosphorous Reduction from Septic Systems	Total Annual Cost
Alternative 1A	Entire Study Area	19%	$320,000
Alternative 1B	Entire Study Area	100%	$510,000
Alternative 2A	Only South Shore	8%	$90,000
Alternative 2B	Entire Study Area	100%	$590,000
Alternative 3	Entire Study Area	100%	$2,470,000*
Alternative 4A	Only East Region	67%	$1,190,000
Alternative 4B	Entire Study Area	100%	$2,190,000

**Does not include cost of user fee*.

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Cost-Benefit Analysis by Alternative

Alternative	Area to be Treated	Percent Phosphorous Reduction from Septic Systems	Total Annual Cost
Alternative 1A	Entire Study Area	19%	$320,000
Alternative 1B	Entire Study Area	100%	$510,000
Alternative 2A	Only South Shore	8%	$90,000
Alternative 2B	Entire Study Area	100%	$590,000
Alternative 3	Entire Study Area	100%	$2,470,000*
Alternative 4A	**Only East Region**	**67%**	**$1,190,000**
Alternative 4B	Entire Study Area	100%	$2,190,000

**Does not include cost of user fee*.

Next Steps

Project Schedule

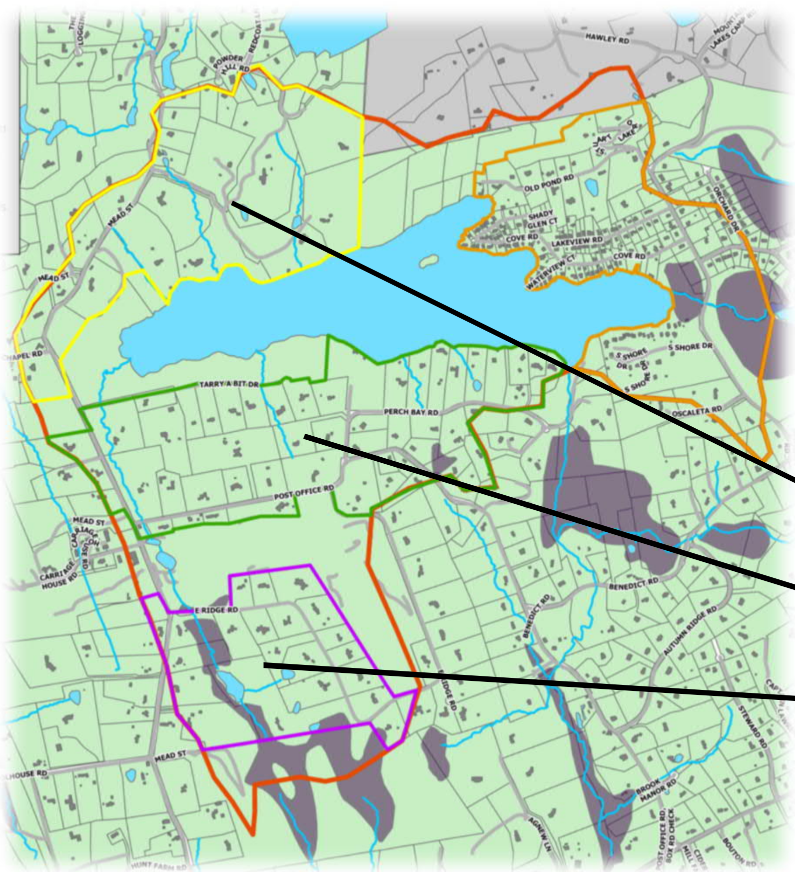
Project Schedule Milestone Item	Schedule Date
Submit Final Engineering Report	December 2021
Complete SEQR & Environmental Review	Spring /Summer 2022
District Formation	Summer 2022
Bond Resolution	Summer 2022
Funding Applications	Summer 2022
Establish Agreement with SSWA	Summer/Fall 2022
Preliminary Design Phase	Fall 2022/Spring 2023

Annual User Fee

- Estimated annual cost to cover Operations & Maintenance (O&M) and Short-Lived Assets (SLA) is **$263,000**
- Proposed average annual user fee to cover O&M and SLA is **$1,600**
- Funding is needed for project capital cost, estimated at **$16,600,000**
- The Engineering Report prepared through this study will be used to apply for grant funding

Cost to Include Remaining Study Area

- Estimated cost to replace/repair septic systems and install phosphorus treatment units for the remaining properties in the study area is **$2,700,000**



- Estimated cost to extend the sewer collection system to the other regions as future phases:

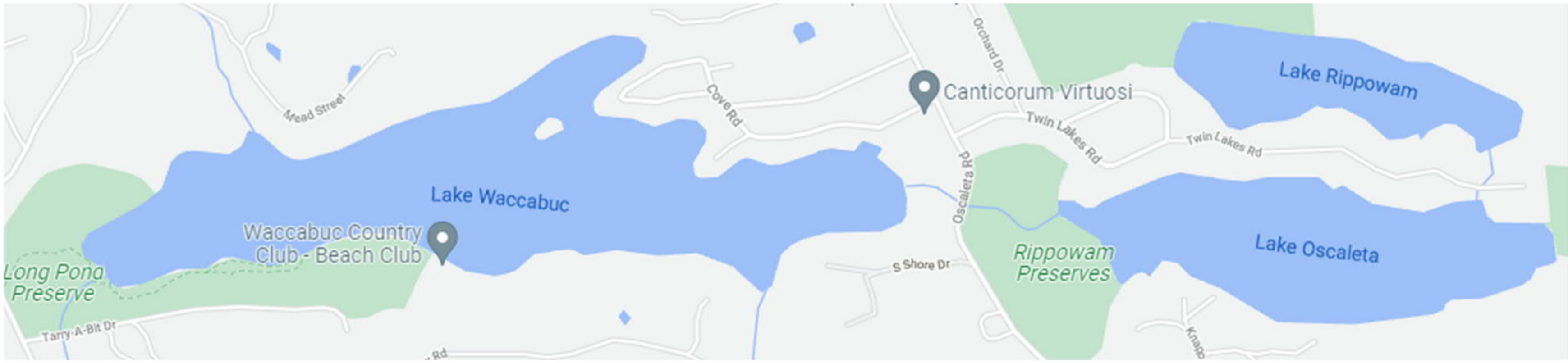
Study Area Region	Capital Cost of Sanitary Sewer Extension
Northwest	$3,100,000
Mid	$5,300,000
Southern	$2,200,000
Total	**$10,600,000**

Funding Opportunities

Program Name	Sponsoring Agency(ies)	Funding Type
Water Infrastructure Improvement Act (WIIA)	New York State Environmental Facilities Corporation (NYSEFC)	Grant for the lesser of 25% net eligible project cost or $5M for projects less than $5M
Small Cities Community Development Block Grant Program (CDBG)	Housing and Community Renewal (HCR)	Grants to $1,000,000 for public health projects; grants from $100,000 to $750,000 for projects creating jobs
Government Efficiency-Planning/Implementation	Department of State	Grant with local match
Water Quality Improvement Grant Program	New York State Department of Conservation (NYSDEC)	Up to $10M grant/max 40% of construction costs, local match of 25% for municipal systems to serve multiple properties with inadequate on-site septic systems Up to $3M grant for decentralized municipal wastewater treatment facilities for failing on-site treatment systems
Economic Development Waterfront Revitalization	Empire State Development; Appalachian Regional Commission	Grant program with local match
Climate Smart Communities Grant Program	NYSDEC	Grants up to $2M with 50% local match

Lakes Oscaleta & Rippowam

- It is recommended that a study of Lake Oscaleta and Lake Rippowam be completed
- It is apparent that these lakes play a role in phosphorus contributions to Lake Waccabuc
- If the sewer district were expanded to include homes from these two lakes communities, it could decrease the annual user fee



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https://LakeWaccabucStudy.com

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The power to
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