

Coastal Restoration on Long Island

Assessing the Nitrogen Problem

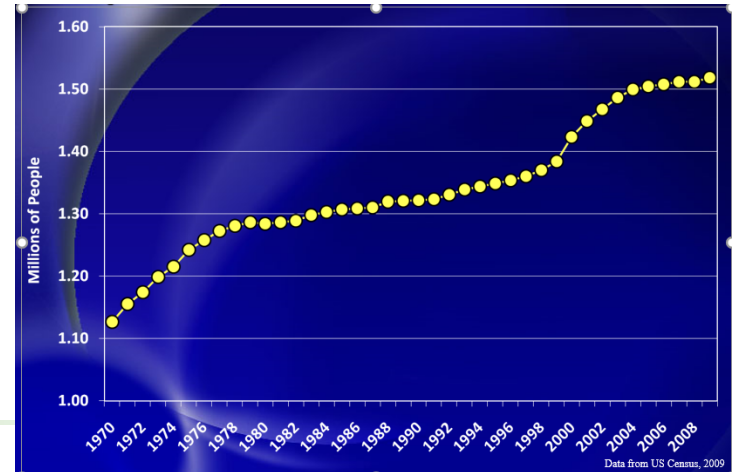
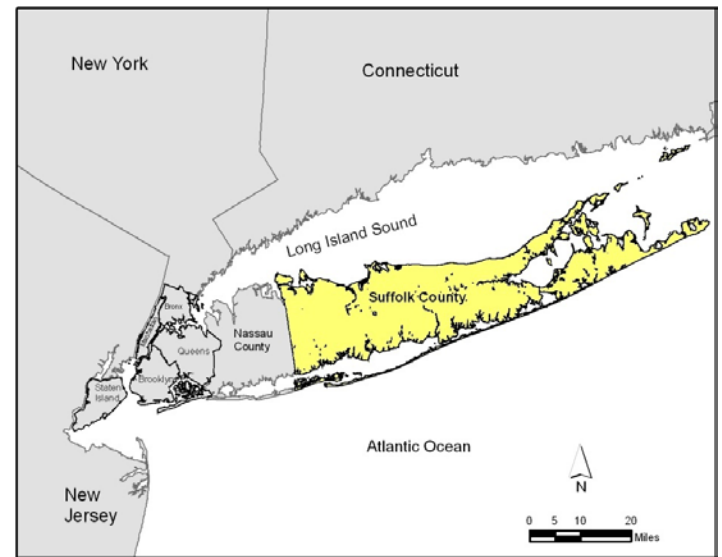
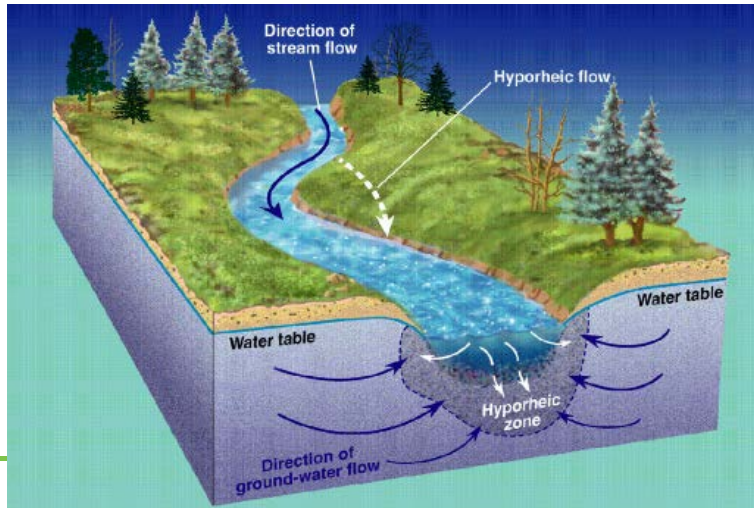
Mary Anne Taylor, P.E.

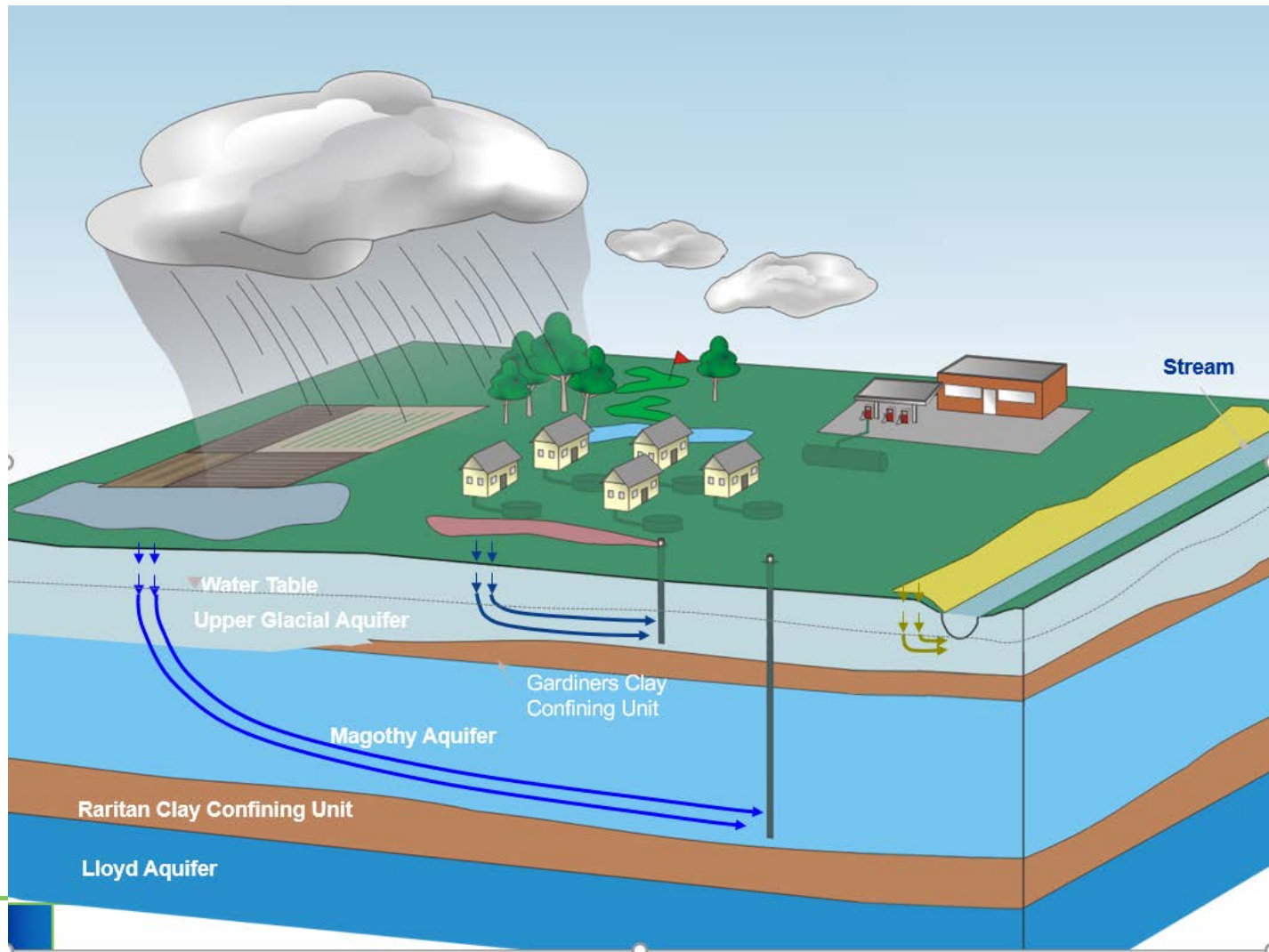
August 28, 2018



Background

- Suffolk County, New York
- Sole Source Aquifer
- Water Quantity & Quality
- Surface Water Impacts

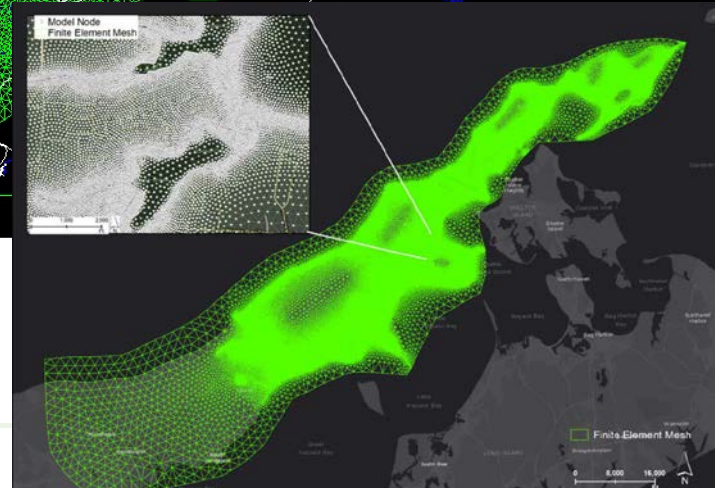
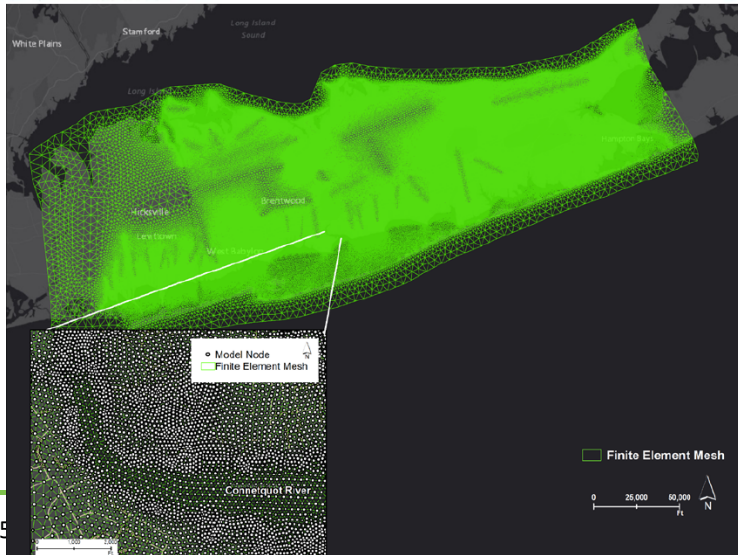
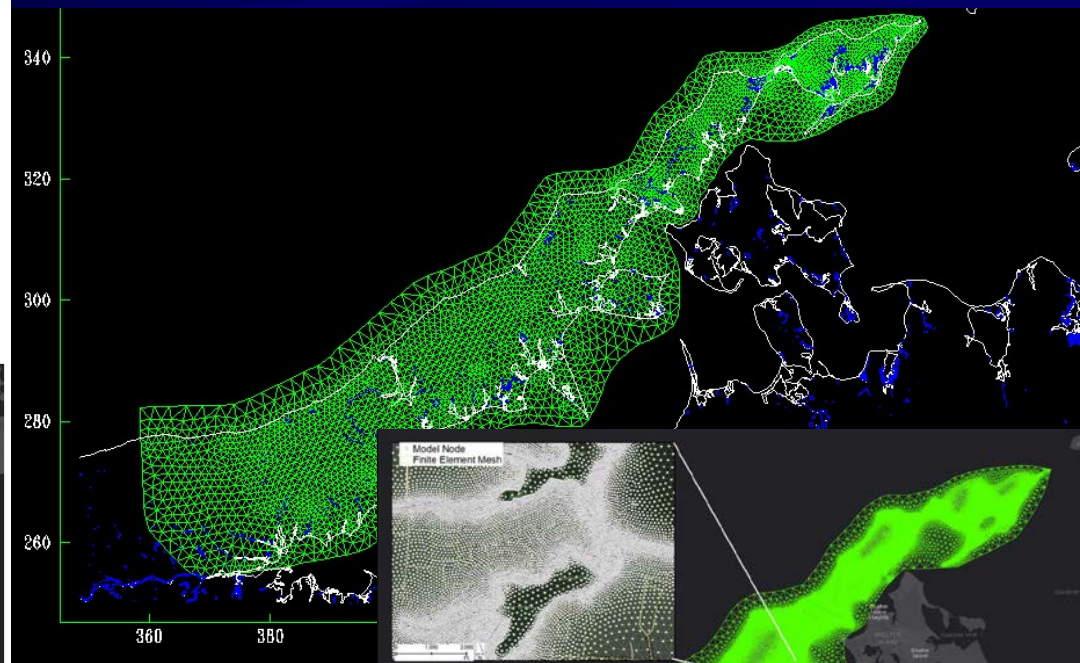
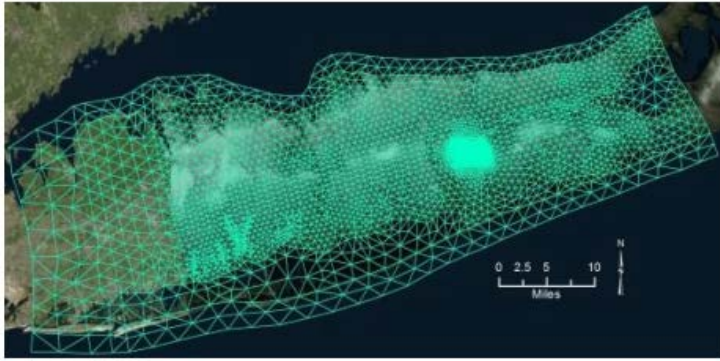




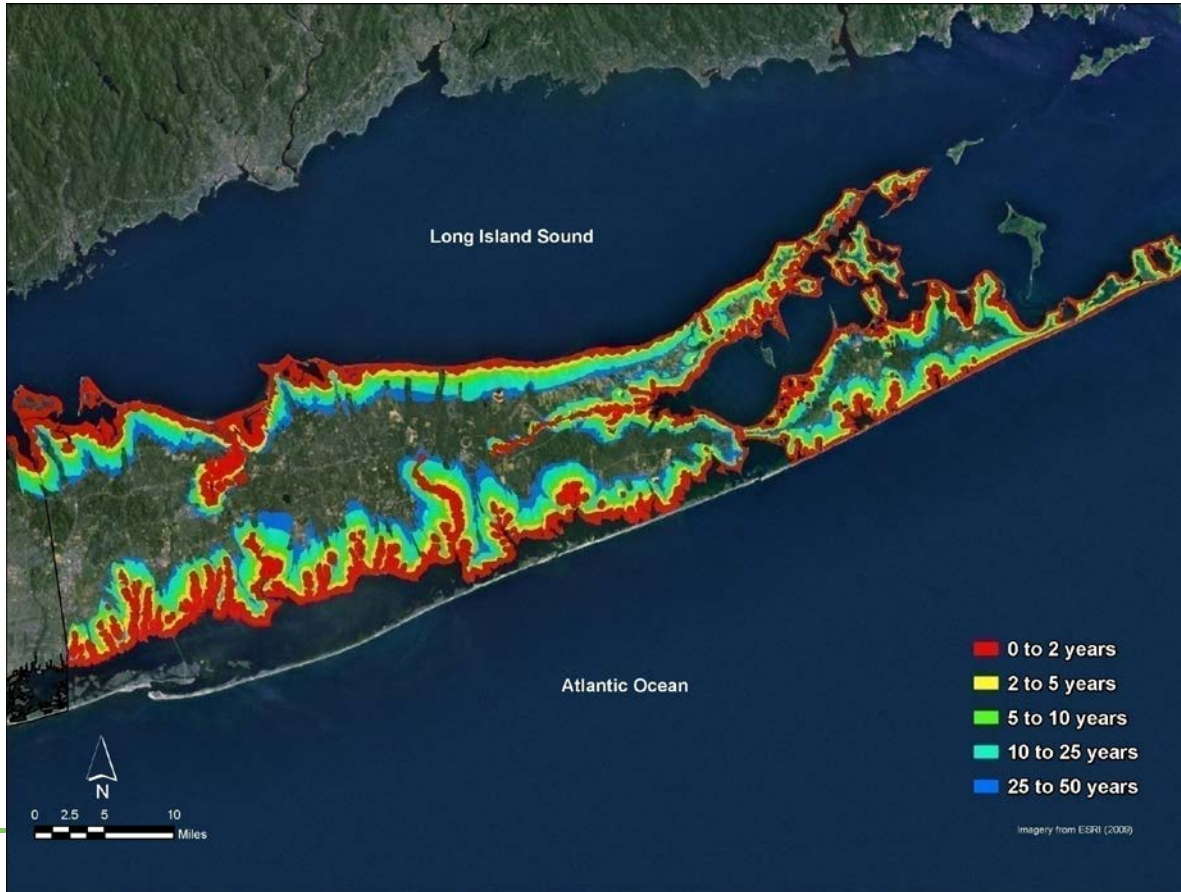
Computational Model Framework



Discretization Added to Finite Element Grids

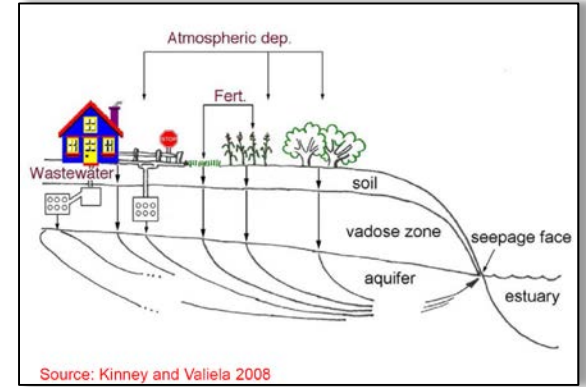


Groundwater Contributing Areas to Surface Waters

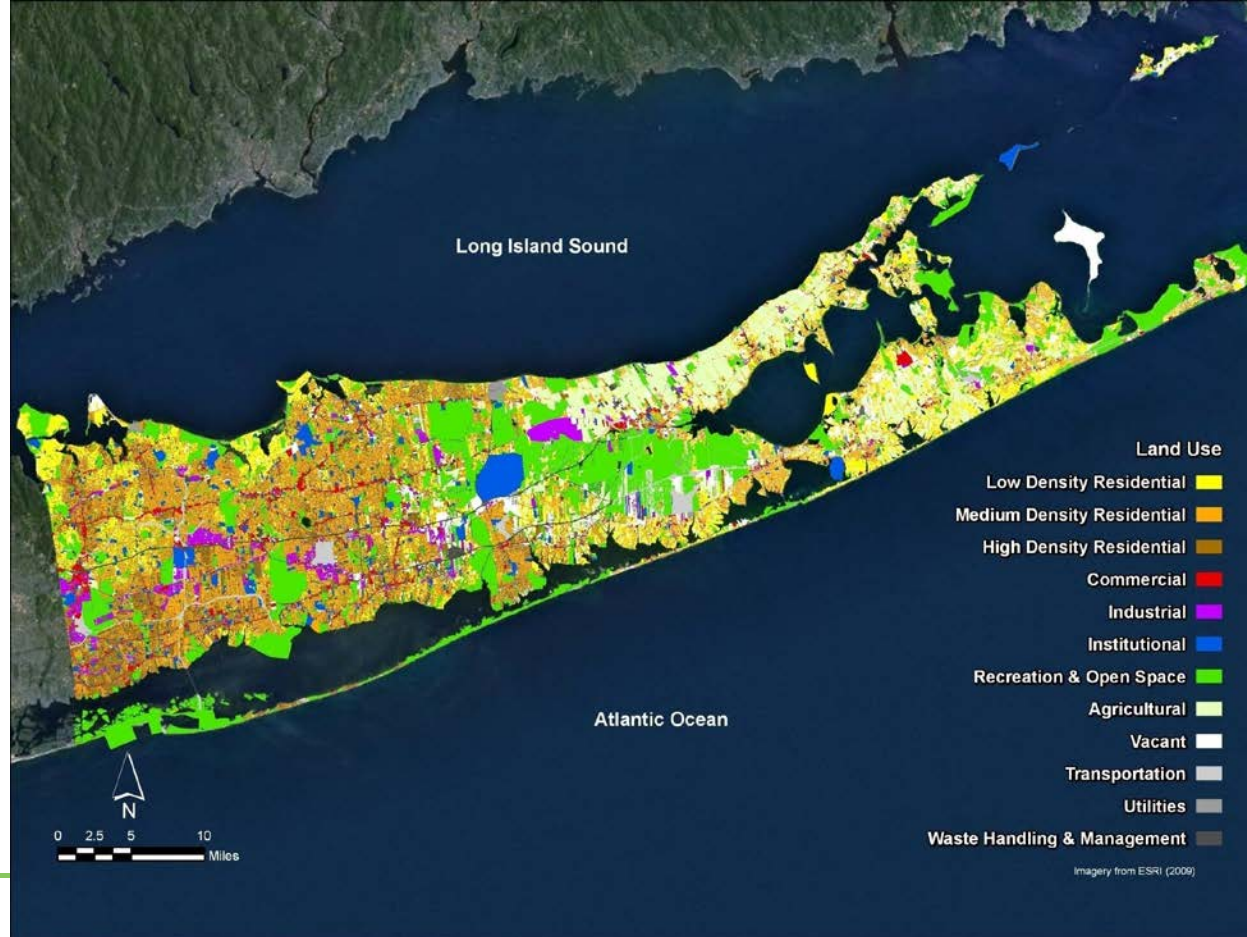


Estimation of Parcel-Specific Nitrogen Loads

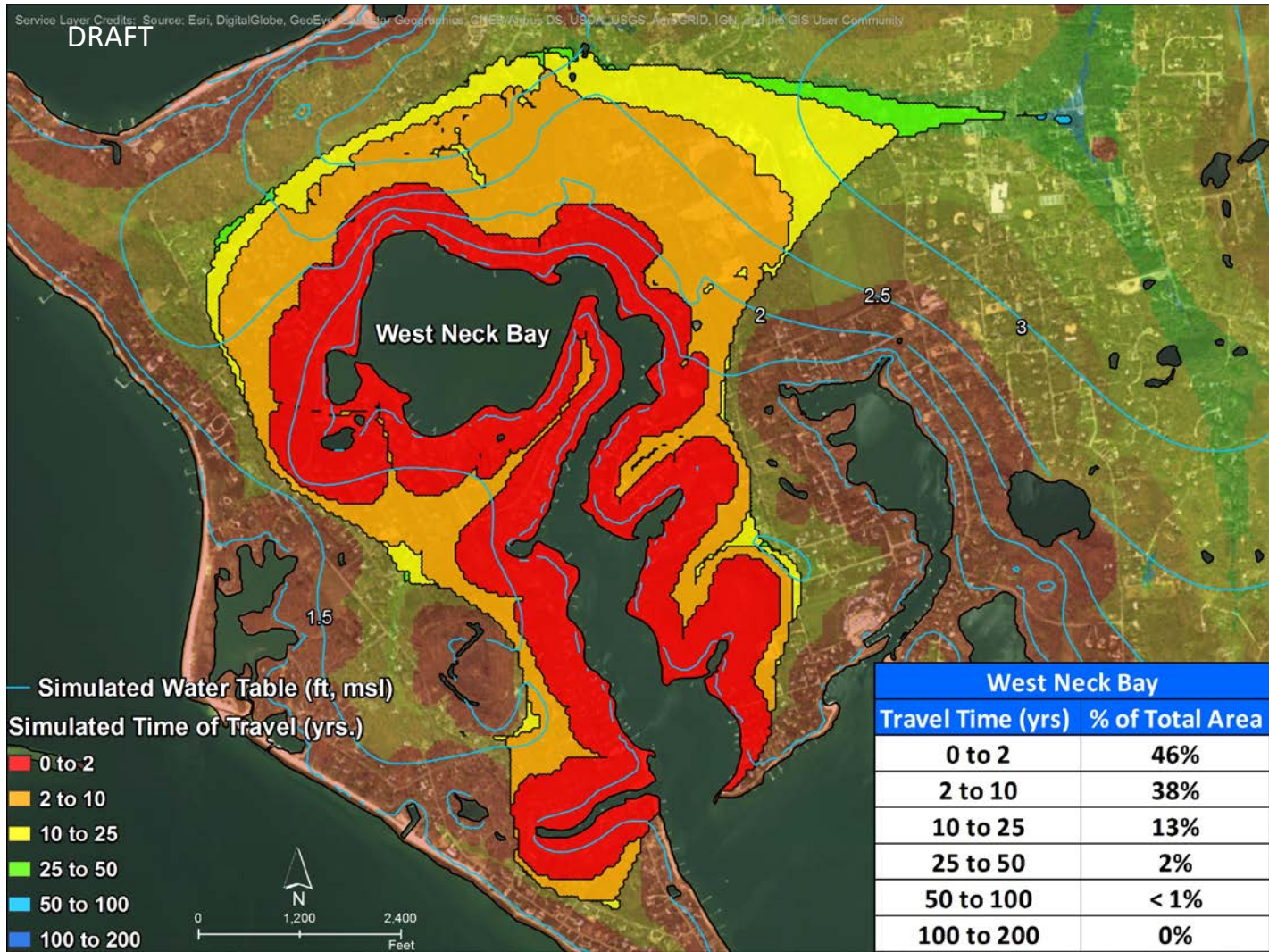
- Sanitary Wastewater
 - On-site Sanitary Wastewater Systems
 - Sewage Treatment Plant Discharges
- Fertilizer
 - Residential Areas
 - Agriculture
 - Golf Courses & Parks
- Atmospheric Deposition
 - To Contributing Area
 - To Surface Water
- Pets

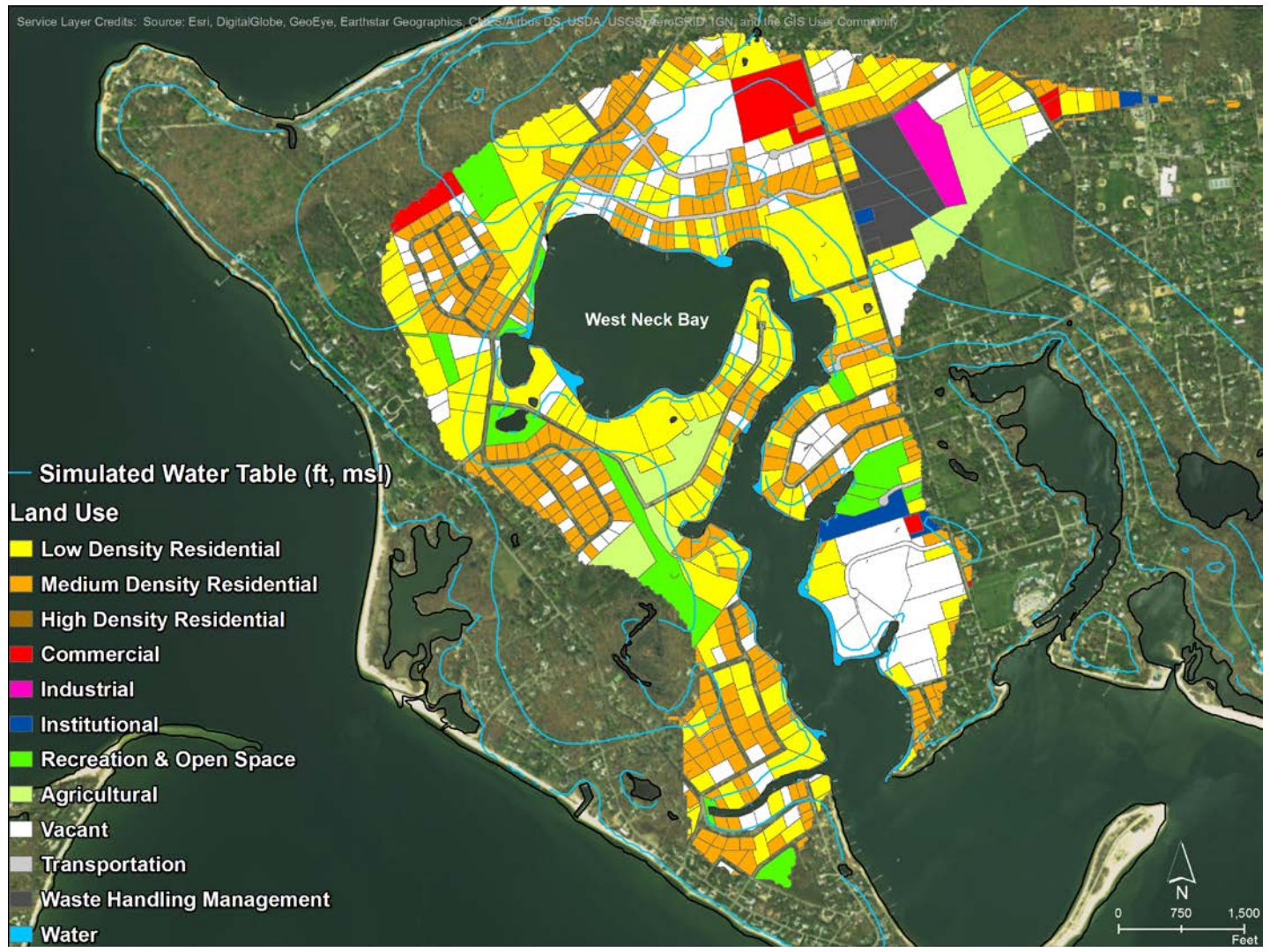


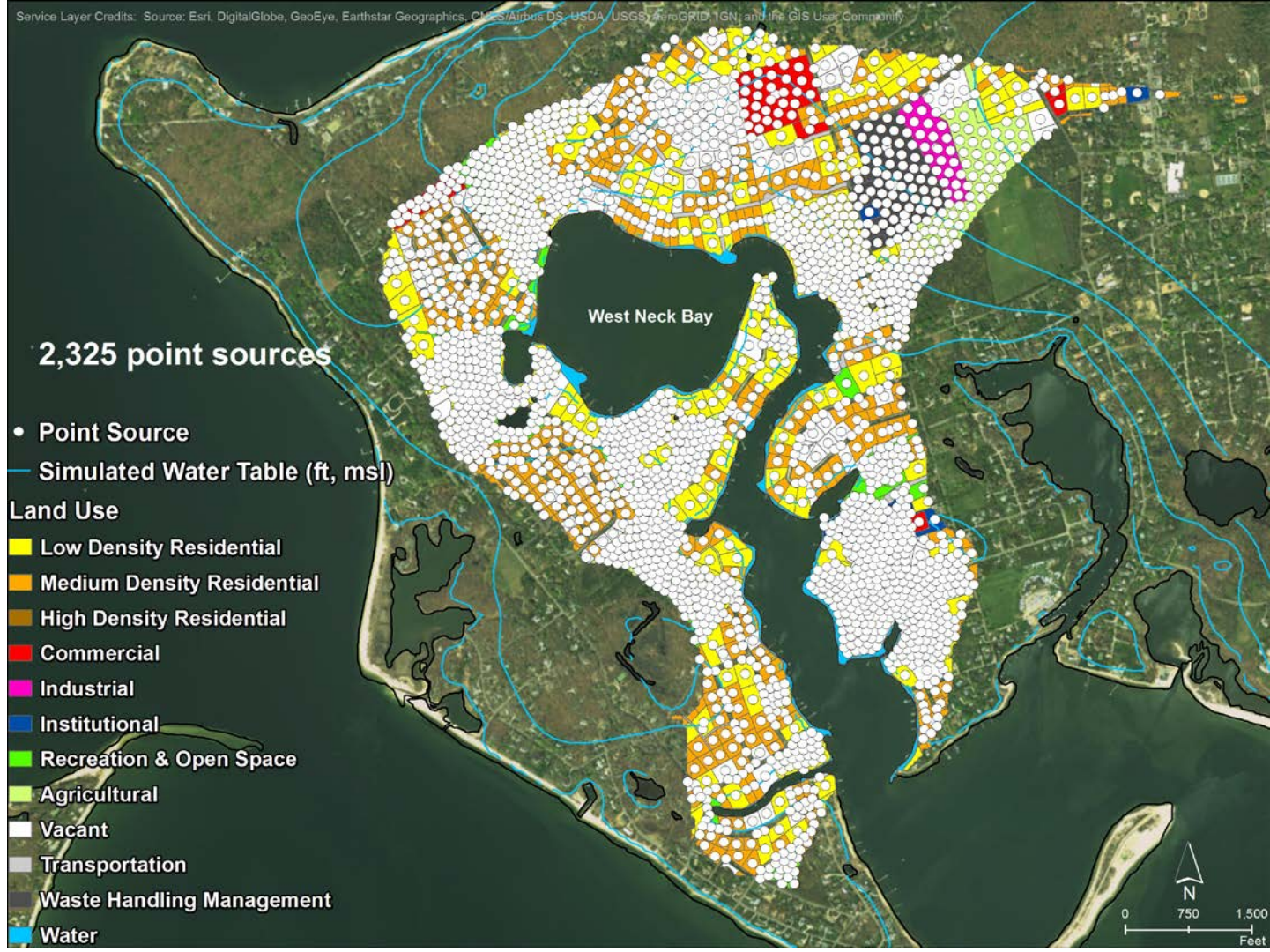
2016 Land Use Data



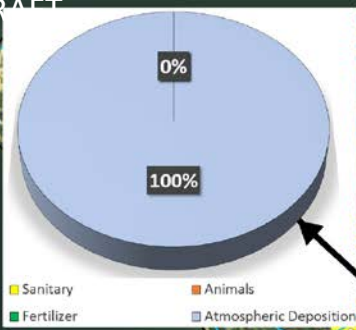
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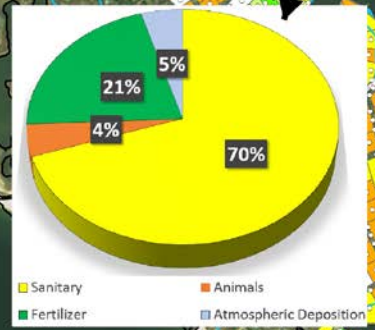
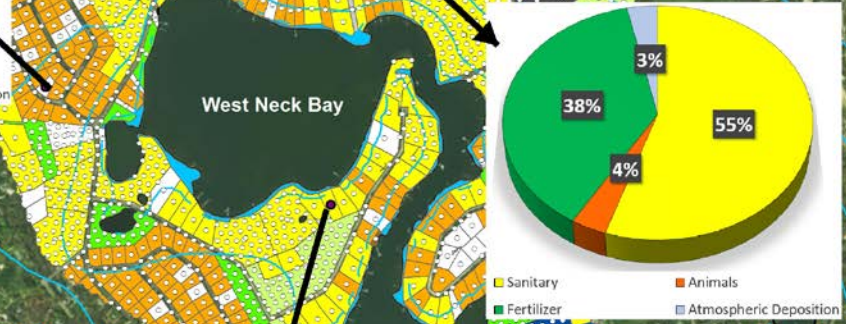
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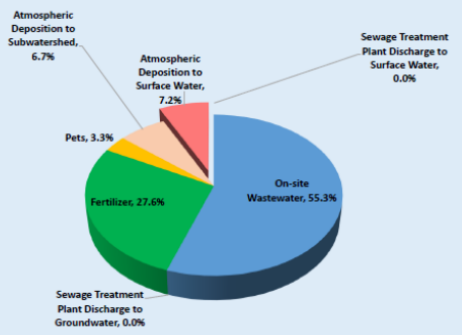
2,325 point sources

- Point Source
- Simulated Water Table (ft, msl)
- Land Use

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Institutional
- Recreation & Open Space
- Agricultural
- Vacant
- Transportation
- Waste Handling Management
- Water



West Neck Bay and Creek Nitrogen Load Sources
 PWL ID: 1701-0242-WB



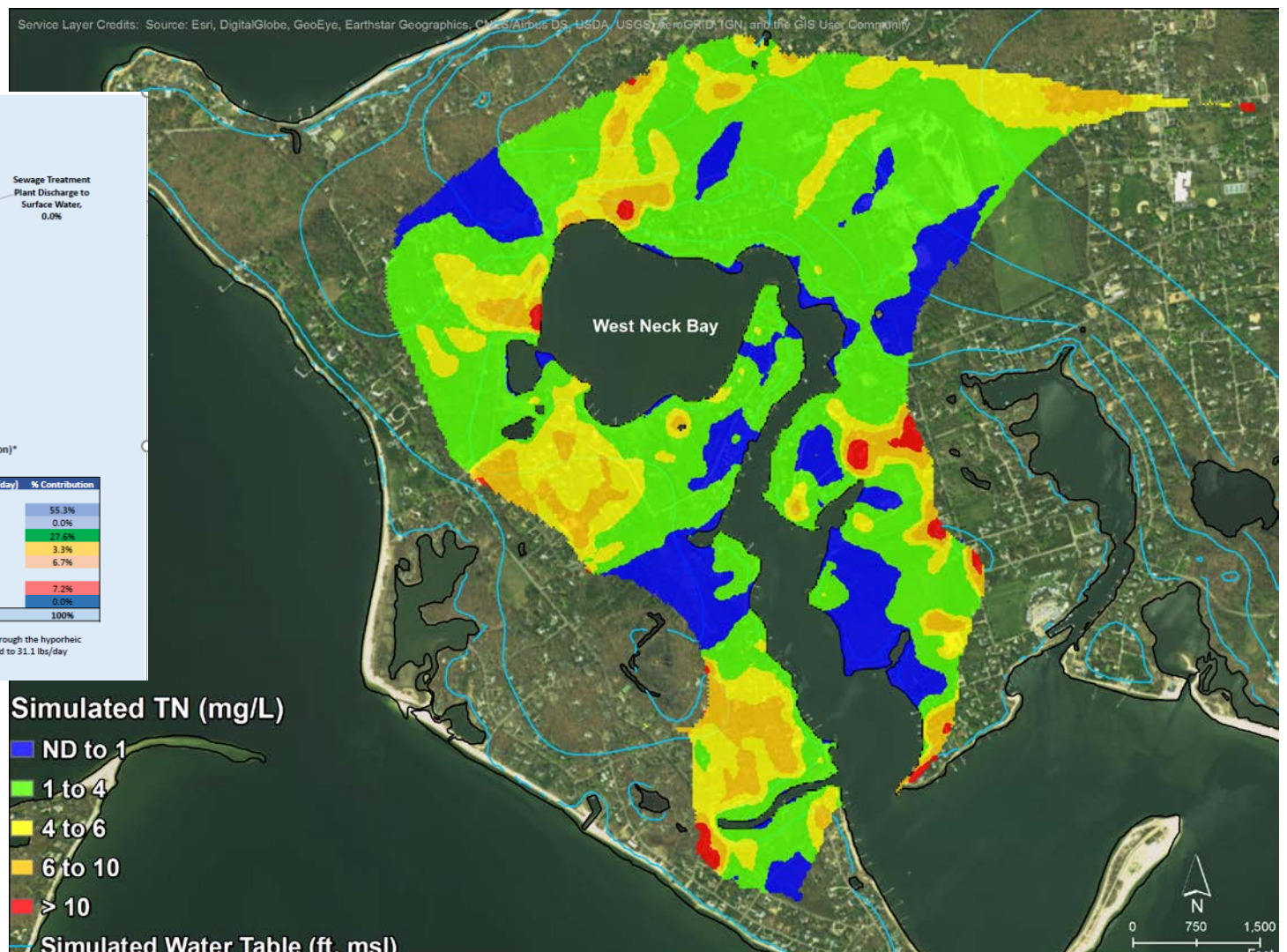
Nitrogen Source	Nitrogen Load (lbs/day)	% Contribution
Groundwater Sources		
On-site Wastewater	20.7	55.3%
Sewage Treatment Plant Discharge to Groundwater	0.0	0.0%
Fertilizer	10.3	27.6%
Pets	1.2	3.3%
Atmospheric Deposition to Subwatershed	2.5	6.7%
Surface Water Sources		
Atmospheric Deposition to Surface Water	2.7	7.2%
Sewage Treatment Plant Discharge to Surface Water	0.0	0.0%
Total N Load (without Hyporheic Zone Attenuation)*	37.5	100%

*Attenuation reduces the nitrogen load from groundwater baseflow as it travels through the hyporheic zone to surface water discharge. The hyporheic zone reduces the total nitrogen load to 31.1 lbs/day

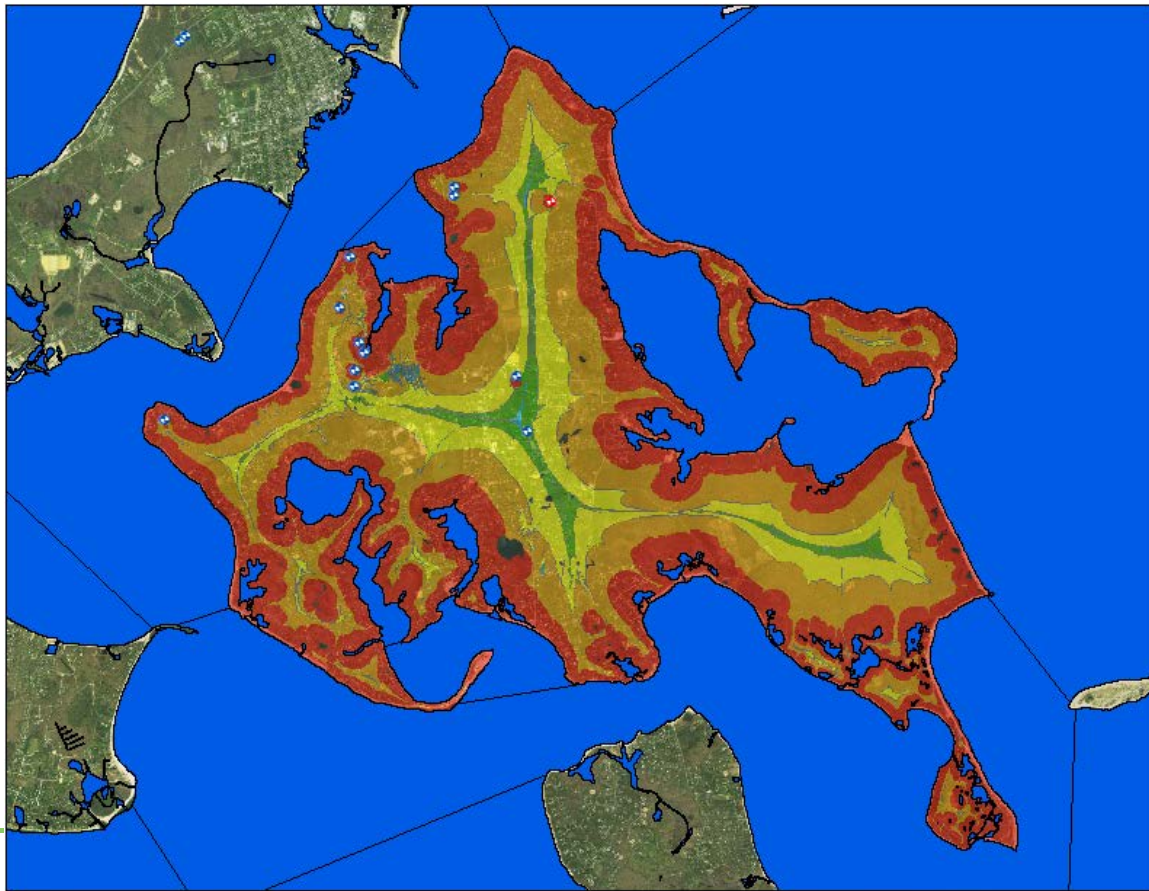
Simulated TN (mg/L)

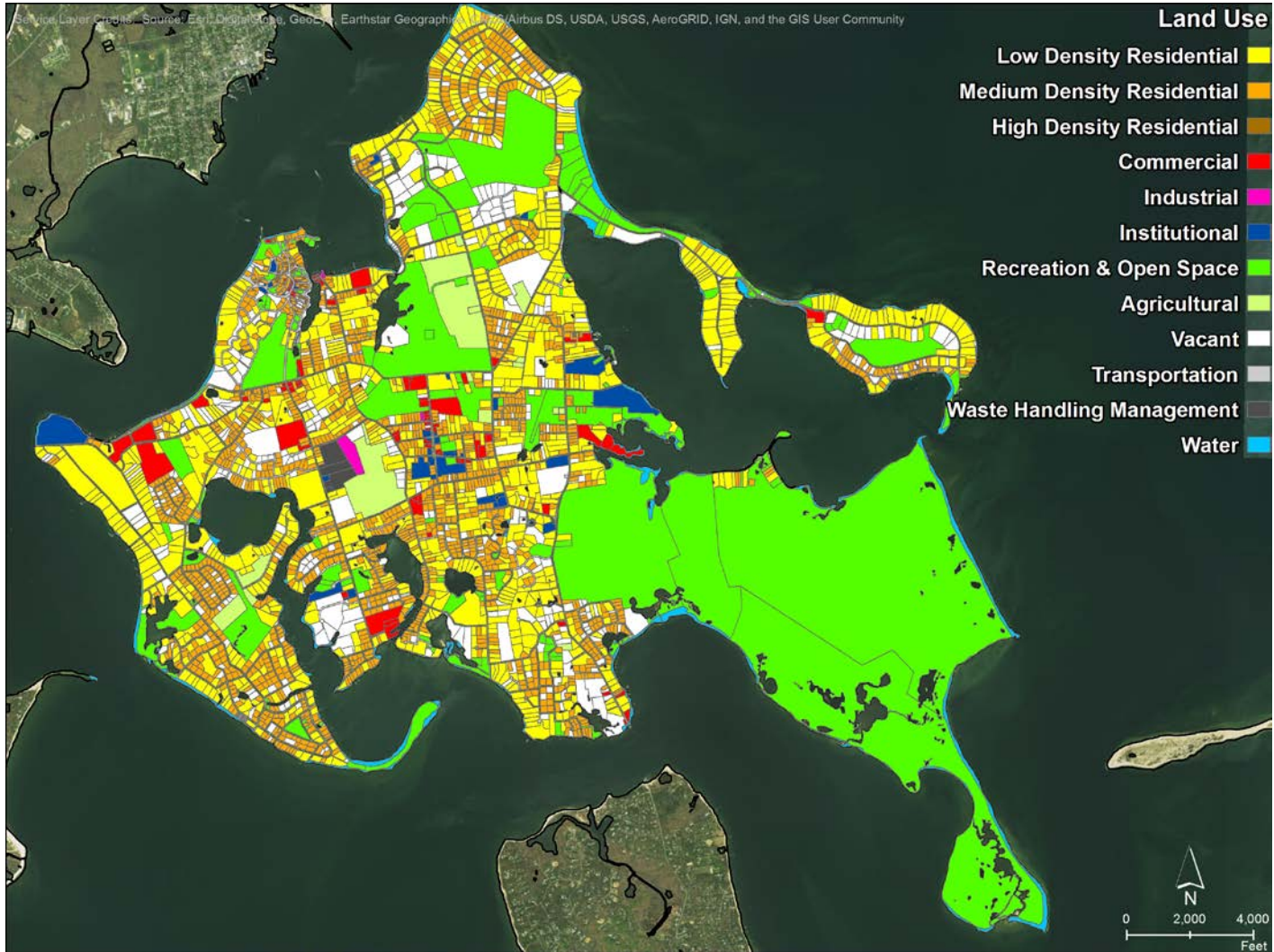
- ND to 1
- 1 to 4
- 4 to 6
- 6 to 10
- ≥ 10

— Simulated Water Table (ft. msl)



Shelter Island – Areas Contributing Groundwater Baseflow to Subwatersheds





22,609 Point Sources

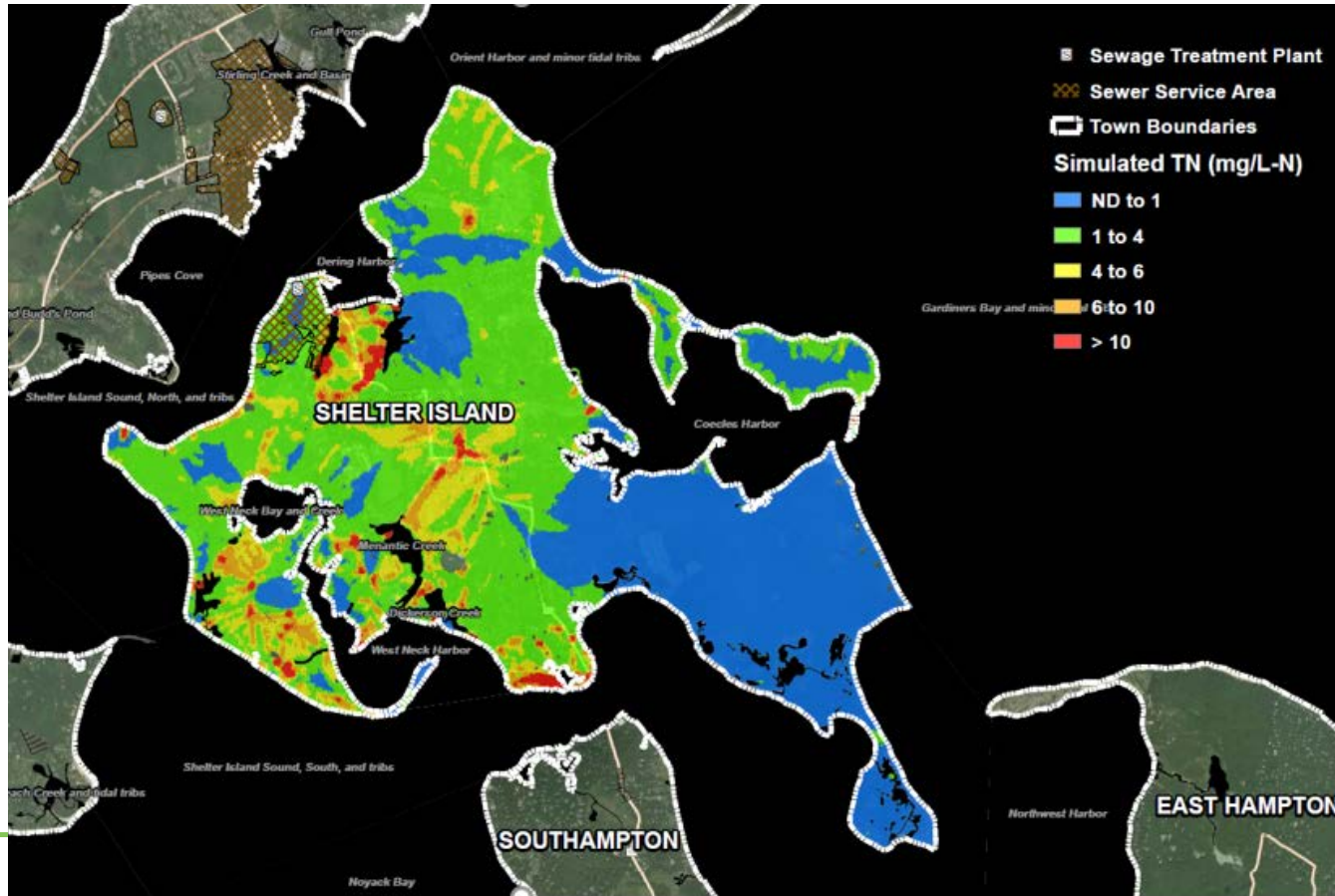
Land Use

- Low Density Residential
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- Transportation
- Waste Handling Management
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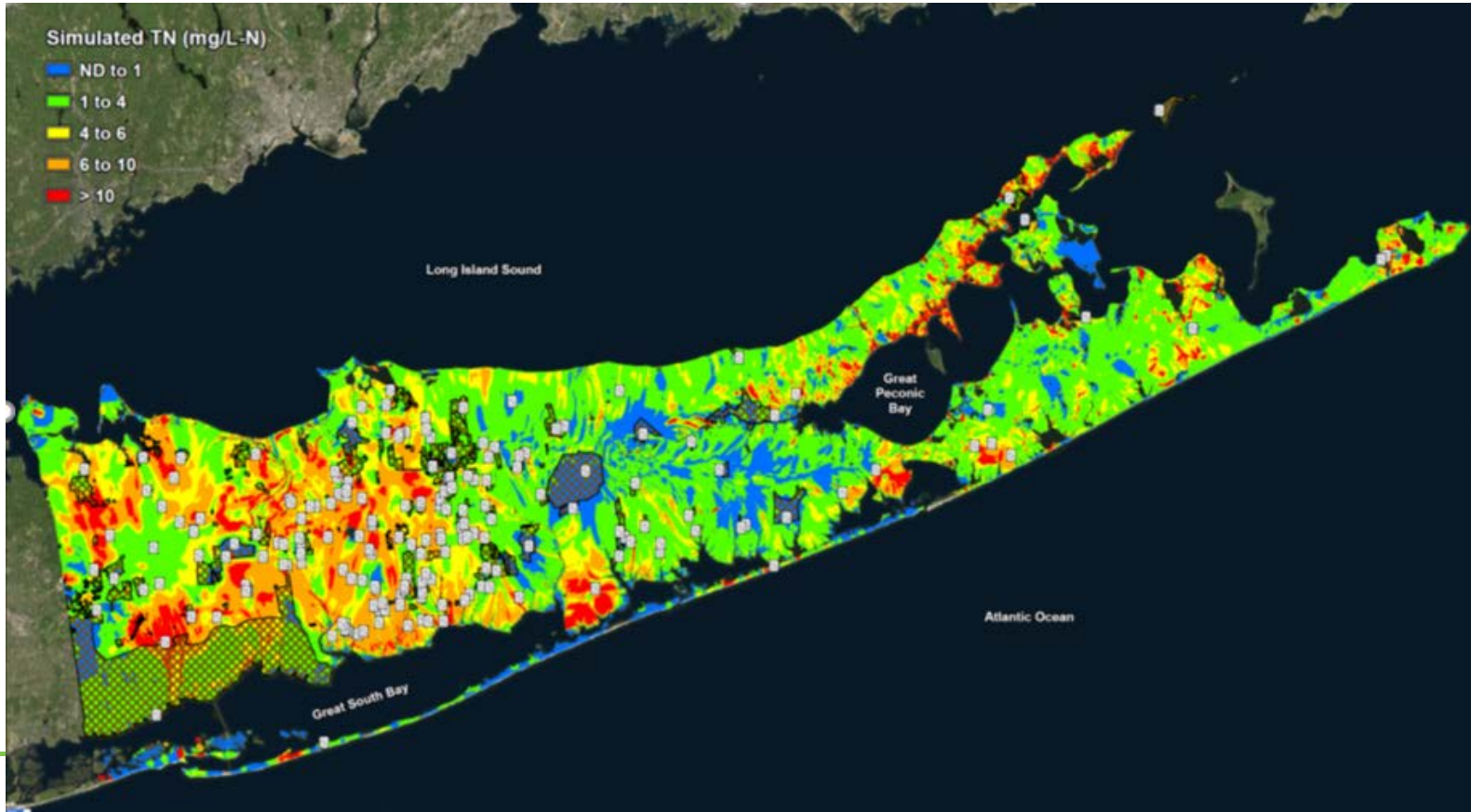
Text



Simulated Nitrogen Concentrations

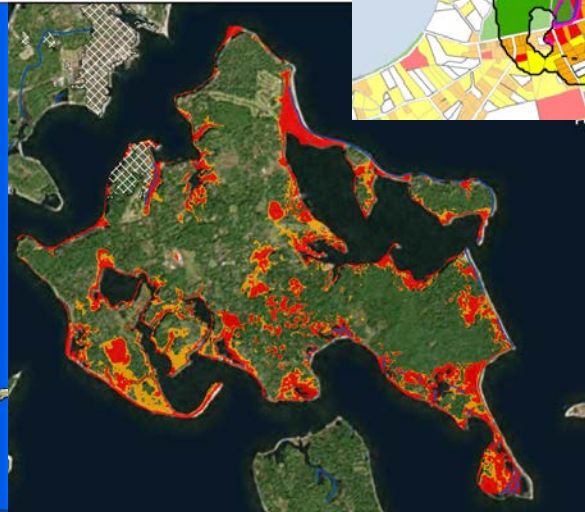
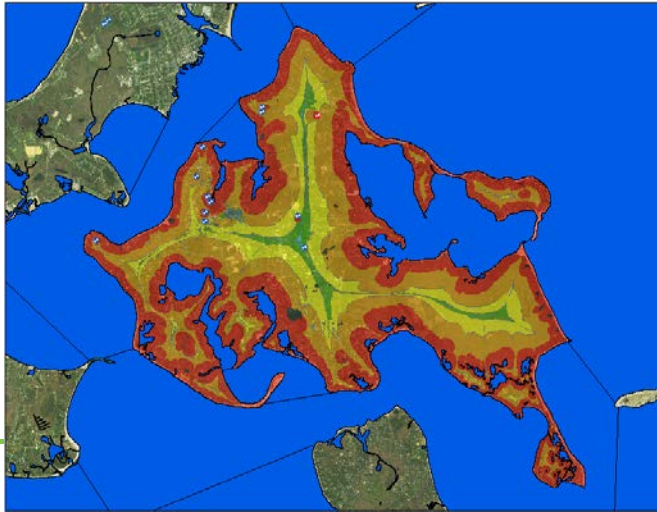
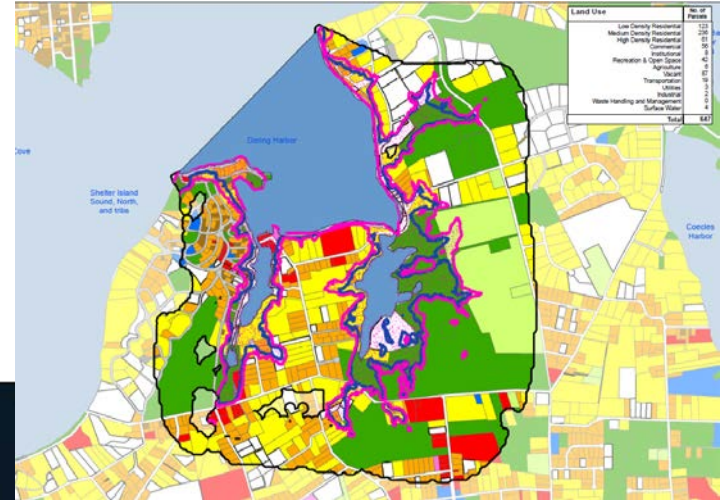


Equilibrium Nitrogen Concentrations after 200 Years



Wastewater Management Planning Criteria

- Travel Time to Discharge
- Land Use
- Nitrogen Load
- Depth to Groundwater
- SLOSH zones

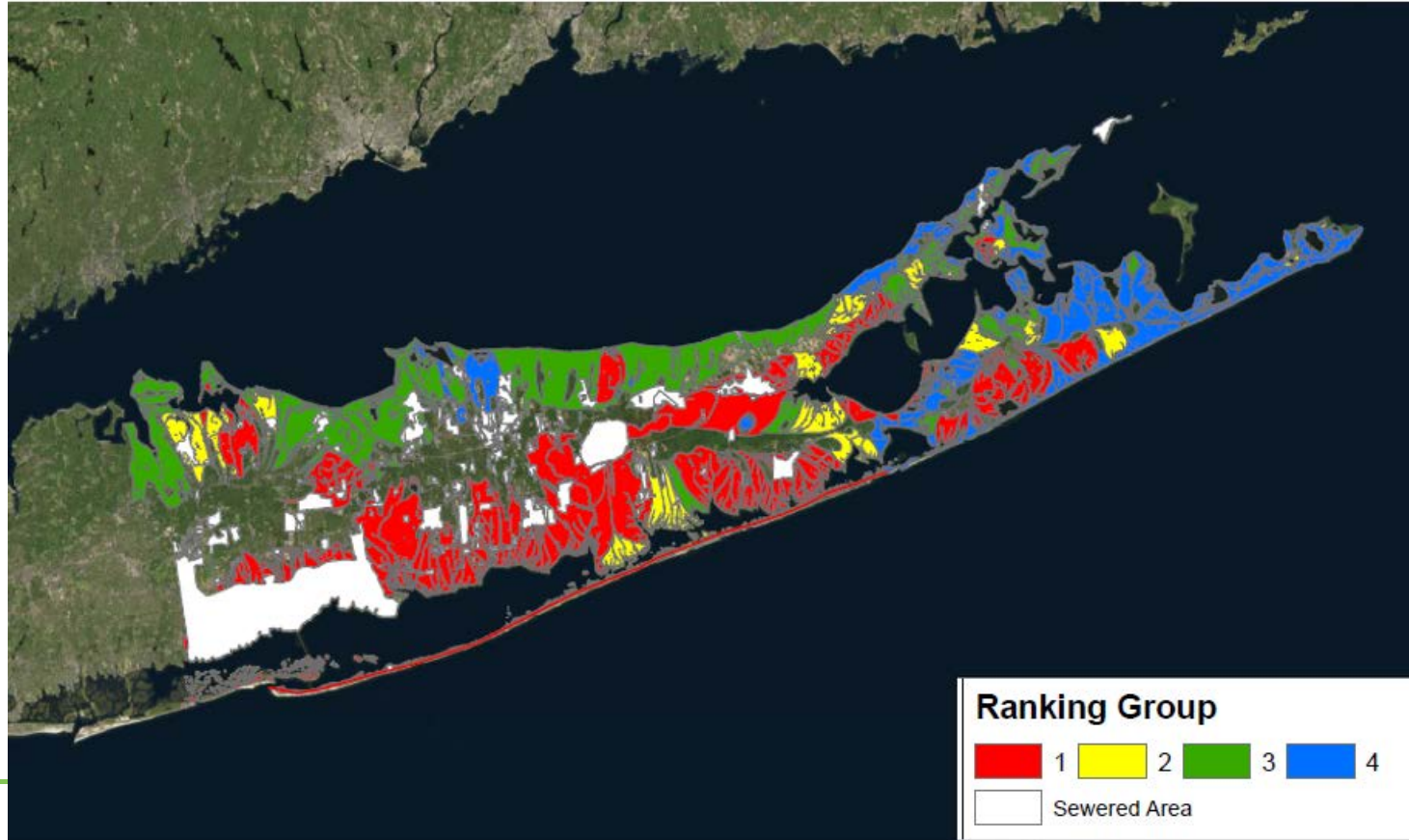


Nitrogen Load Reduction Considerations

- Unit Nitrogen Loads
- Residence Times
- Dissolved Oxygen
- Total Nitrogen
- Total Phosphorus
- Chlorophyll 'a'
- Secchi Depth
- Harmful Algal Blooms
 - Human Health Impacts
 - Environmental Impacts

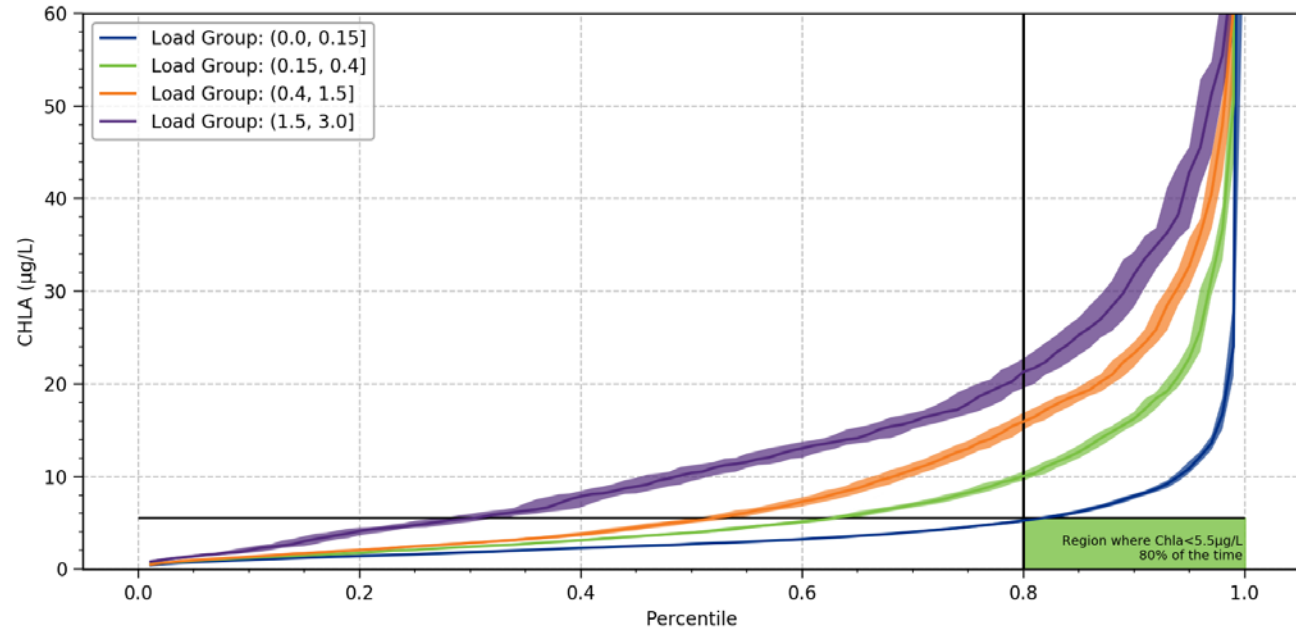


Subwatershed Priorities for Nitrogen Load Reduction

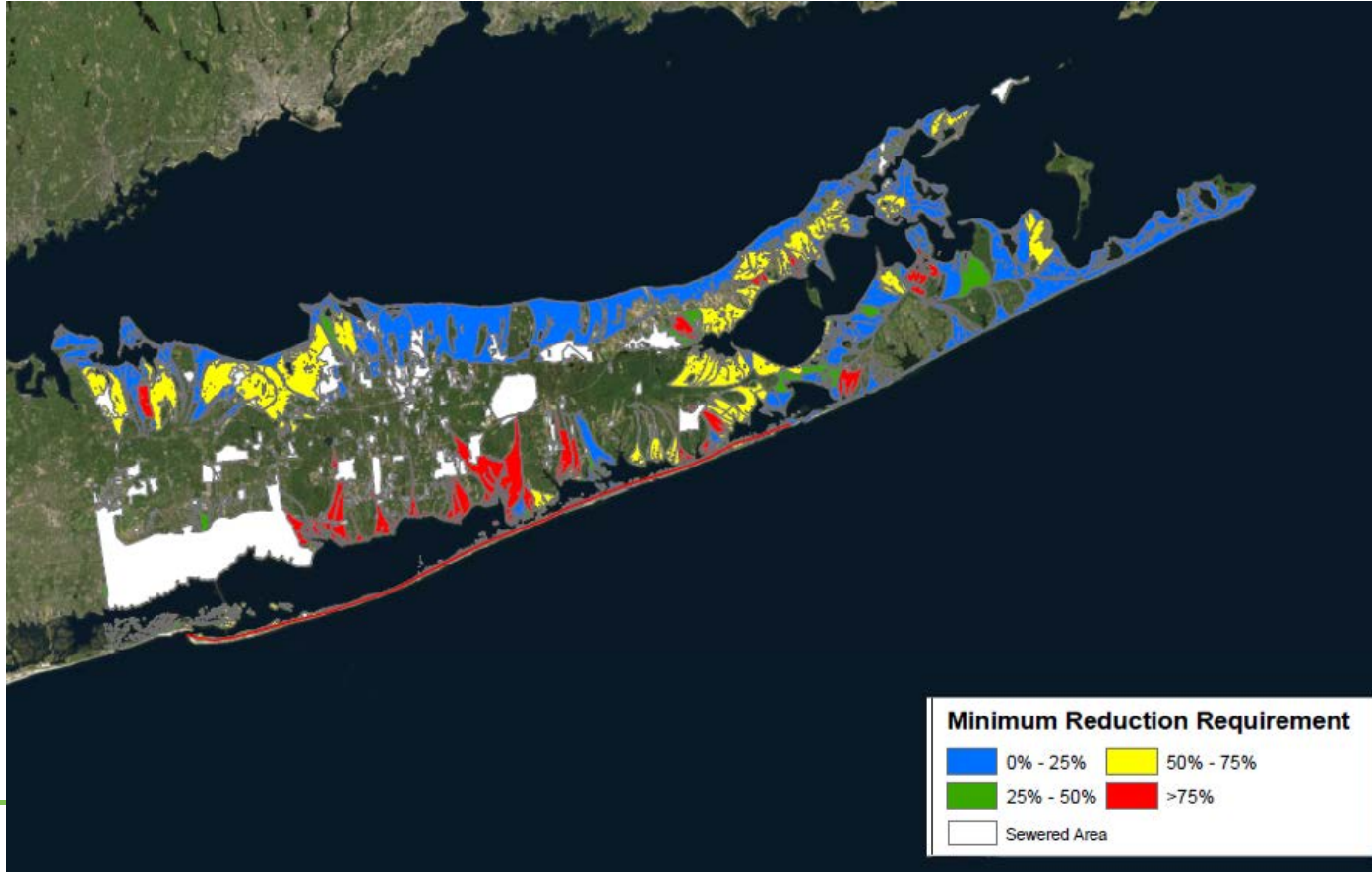


Nitrogen Load Reduction Approach

- Reference Water Body
- Stress-Response
- Published Values



Draft Example Nitrogen Load Reduction Goals for Marine Subwatersheds



Questions?

