Shifting Sources
Long Island Sound Nitrogen Loading
NPS Conference – April 20-21, 2016

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Discussion Outline

• Background on LIS and Hypoxia
• LIS TMDL and Implementation Efforts
• Progress and LIS Hypoxia Trend
• In-stream Nitrogen Trends
• Current Loading and Dominant Sources
• NPS & Stormwater Evaluation
LIS TMDL Background

- 1985 Congress Creates the LIS NEP
- CT, NY & EPA investigates WQ
- Hypoxia problem identified (Nitrogen)
- 1998 Plan to reduce N by 58.5%
- Impaired condition req. a TMDL*
- 2001 EPA approves LIS TMDL for DO*
  - Nitrogen the limiting nutrient
  - Establishes nitrogen reductions & allocations to sources
LIS TMDL Process

• Assessed & Modeled Sources of Nitrogen to LIS
• TMDL = WLA + LA + MOS
  – Wasteload Allocation (WLA) for Point Sources
  – Load Allocation (LA) for Nonpoint Sources & Stormwater*
• Reductions to Atmospheric Deposition (CAA)
• Provided Reduction Plan with Targets
• Phased Implementation Schedule/Adaptive Mgt.
58.5% Reduction in Total Nitrogen Loading for CT & NY:
• The reduction applied to WWTPs in CT & NY is 63.5% and 58.5%

Reductions for Upstream States (MA, NH, VT):
• Aggregate WWTP reductions of 25%
• 10% reduction in NPS (watershed)

Atmospheric Reductions:
• 18% reduction expected (CAA)
Baseline Total Nitrogen Loading to LIS

<table>
<thead>
<tr>
<th>Region</th>
<th>WWTP</th>
<th>NPS &amp; Storm water</th>
<th>Total</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>9,875</td>
<td>7,996</td>
<td>17,871</td>
<td>27</td>
</tr>
<tr>
<td>NY</td>
<td>29,024</td>
<td>891</td>
<td>29,915</td>
<td>45</td>
</tr>
<tr>
<td>Upper states</td>
<td>2,991</td>
<td>10,574</td>
<td>13,565</td>
<td>20</td>
</tr>
<tr>
<td>LIS surface</td>
<td></td>
<td>5,485</td>
<td>5,485</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>41,890</td>
<td>24,946</td>
<td>66,836</td>
<td></td>
</tr>
</tbody>
</table>
TMDL Implementation Actions

- Nitrogen trading program for WWTPs
- Stormwater permits (with runoff retention reqs and LID guidance)
- CSO control plans, implementation & right-to-know website
- Draft CAFO permit (Ag)
- Agriculture nutrient mgt. plans & implementation in partnership with NRCS
- Sewer projects and improved wastewater mgt.
TMDL Implementation Actions

• 2014 update of the NPS management plan
• Section 6217 coastal NPS management
• Grant programs (319, license plate, future’s fund)
• Continued watershed mgt., stormwater mgt. & incorporated LID/GI technical assistance
• Development of Watershed Based Plans (approx. 80% of the state is covered)
Atmospheric Deposition of Nitrogen

Precipitation-weighted mean concentrations for nitrate 1990-2012
(NADP NTN)

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Maximum Area of Hypoxia
1987-2015 (June-September)

Five-year rolling average
Second smallest area in 28 years
Tributary Trends in Nitrogen Loading


CT & Upper States Nitrogen Loading to Long Island Sound

Tons/Year

Date

Runoff, 1980-2011

courtesy of USGS
Weighted Regressions Analysis

Estimated Annual Mean and Flow-Normalized Total Nitrogen Load to LIS.
The Nitrogen Load

• WWTP Loads based on actual monitoring data
• NPS and Stormwater Loads based on land cover & literature nitrogen export values
  – Urban
  – Agriculture
  – Forest
Nitrogen Loading Baseline & Current

Connecticut Nitrogen Load

<table>
<thead>
<tr>
<th></th>
<th>Baseline WWTP</th>
<th>Current WWTP</th>
<th>Baseline Urban</th>
<th>Current Urban</th>
<th>Baseline Agriculture</th>
<th>Current Agriculture</th>
<th>Baseline Forest</th>
<th>Current Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons/year</td>
<td>10000</td>
<td></td>
<td>4000</td>
<td></td>
<td>2000</td>
<td></td>
<td>4000</td>
<td></td>
</tr>
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</table>

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### CT Baseline Nitrogen Percentages

<table>
<thead>
<tr>
<th>Category</th>
<th>Baseline</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWTP</td>
<td>55</td>
<td>30</td>
</tr>
<tr>
<td>Urban</td>
<td>17</td>
<td>33</td>
</tr>
<tr>
<td>Agriculture</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Forest</td>
<td>23</td>
<td>30</td>
</tr>
</tbody>
</table>

### CT Current Nitrogen Percentages

- WWTP: 30%
- Urban: 33%
- Agriculture: 7%
- Forest: 30%
Evaluation of Stormwater & NPS Efforts

• Examined watershed wide drivers of nitrogen change (population, land use changes, atm. etc.)
http://www.neiwpcc.org/longislandsoundtmdl.asp

• Individual states prepared inventory of programs/efforts with N reductions
  – Regulated and non-regulated stormwater (MS4, GPs)
  – Agricultural BMPs, CAFOs GPs
  – Fertilizer control and land cover (application)
  – Watershed management and NPS Programs
  – Septic system management
  – Marine no discharge zone
# Trends in Nitrogen Loading Sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Trend</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWTPs (CT/NY)</td>
<td>↓</td>
<td>88% of WLA target</td>
</tr>
<tr>
<td>Atm Deposition</td>
<td>↓</td>
<td>26% ↓ in TN, 50% ↓ in NO$_3$</td>
</tr>
<tr>
<td>Agricultural</td>
<td>↓</td>
<td>25-40% ↓ in fertilizer and livestock</td>
</tr>
<tr>
<td>Urban Stormwater</td>
<td>↑</td>
<td>2-3% ↑ in impervious areas</td>
</tr>
<tr>
<td>Septic</td>
<td>↑</td>
<td>8% ↑ in basin population (1990-2010)</td>
</tr>
<tr>
<td>Turf Fertilizer</td>
<td>↑</td>
<td>1-2% ↑ in turf/grass areas</td>
</tr>
</tbody>
</table>

Source: Long island Sound Study
About Fertilizers

Fertilizer Application Rates To:

- Lawns = 196 lbs-N/ha
- Agriculture = 198 lbs-N/ha
- Golf Courses = 419 lbs-N/ha
Continued Implementation Actions

- Enhance N requirements in Stormwater permit revisions
- Development of an MS4 permit for CTDOT
- Finalize and issue the CAFO permit (2017)
- Continue sewer extensions and other wastewater mgt. improvement projects
- Assess septic system management options and denitrification technology
Continued Implementation Actions

• Continue Green Infrastructure Tech Assistance
• Two RCPP (NRCS) projects for agricultural nutrient mgt.
• Incorporate the regional nitrogen fertilizer guidelines as regulation
• Continue watershed based planning and NPS project implementation
• Further N reduction projects at WWTPs