New Hampshire’s Impaired Waterbodies and BMP’s for Treating Nitrogen and Phosphorus

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Deb Loiselle
Watershed Assistance Section
Let's start from the beginning
The Water Cycle

- Transportation
  - Condensation
  - Precipitation
  - Snowmelt Runoff
- Evaporation
  - Transpiration
- Infiltration into Groundwater
- Plant Uptake
- Groundwater Flow
Undeveloped Area

40% runs off

50% soaks in

10% runs off
Developed Area

30% of the water runs off,
15% soaks in,
and 55% runs off.
Runoff Carries Pollution
## NPS sources and pollutants

<table>
<thead>
<tr>
<th>Source</th>
<th>Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural runoff</td>
<td>Nutrients, sediment, bacteria</td>
</tr>
<tr>
<td>Animal waste – pets, waterfowl, livestock...</td>
<td>Bacteria, nutrients</td>
</tr>
<tr>
<td>Atmospheric deposition</td>
<td>Nutrients</td>
</tr>
<tr>
<td>Erosion</td>
<td>Phosphorus and sediment</td>
</tr>
<tr>
<td>Hydromodification – dams, culverts, channelization…</td>
<td>Flooding, low DO, poor habitat</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>Nutrients</td>
</tr>
<tr>
<td>Impervious cover (IC) – roads, parking lots, roofs, driveways…</td>
<td>Everything: bacteria, fertilizer, oil, gas, sand, salt, nutrients, hot water, high flows ……</td>
</tr>
<tr>
<td>Septic systems</td>
<td>Bacteria and nutrients</td>
</tr>
<tr>
<td>Stormwater runoff</td>
<td>Everything!</td>
</tr>
</tbody>
</table>
Why should you care about NPS?

NPS pollution can have serious impacts on economics, quality of life, and public health and safety.
Sediment
Bacteria
Bacteria

POO-LUTION
threatens our health and waters

there is no poop fairy

pick it up
Nutrients
Table 12. Summary of pollutant loading estimates for new development projects.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>ESTIMATED % INCREASE IN POLLUTANT LOAD</th>
<th>HIGHEST ESTIMATED INCREASE IN LOADING AT SINGLE SITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Suspended Solids (TSS)</td>
<td>26% - 70%</td>
<td>9,400 lbs/year</td>
</tr>
<tr>
<td>Total Phosphorus (TP)</td>
<td>22% - 440%</td>
<td>108 lbs/year</td>
</tr>
<tr>
<td>Total Nitrogen (TN)</td>
<td>22% - 115%</td>
<td>416 lbs/year</td>
</tr>
</tbody>
</table>
Non-Point Source Nitrogen Loads

From PREP (2013)

Total Load 1,225 Tons/yr

DES Great Bay Nitrogen Non-Point Source Study

Non-Point Source Load 900 ±100 tons/yr

Delivered by Stormwater = 26%

Non-Point Source Nitrogen Loads

Wastewater Treatment Facilities 390 tons/yr 32%
Non-Point Sources 835 tons/yr 68%
Total Load 1,225 Tons/yr

Human Waste 240±30 tons/yr 27%
Atmospheric Deposition 280±40 tons/yr 33%
Animal Waste 110±10 tons/yr 13%
Chemical Fertilizer 230±30 tons/yr 27%
In State Sources 110±10 tons/yr
Out of State Sources 170±20 tons/yr
Surface Water Quality Assessment Program

The Surface Water Quality Assessment Program produces two surface water quality documents every two years, the "305(b) Report" and the "303(d) List". As the two documents use the same data, the 305(b) Report and 303(d) List were combined into one Integrated Report starting in 2002. The Integrated Report describes the quality of New Hampshire's surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water.

Hot Topics
- Removal of Water Quality Impairments: Data and Documentation Considerations
- 2018, Guidance for Submittal of Surface Water Data
- 2016, 203(d) List
- 2014, 303(d) List

Publications (Complete List)
- 2012, 305(b)/303(d)
- Level 1: Landscape Level Wetlands Assessment Scores for the 2012 305(b)
- Consolidated Assessment and Listing Methodology
- Surface Water Quality Watershed Report Cards
- Evaluation of Sediment Quality

Rules/Regulatory
- Water Quality Standards

Related Programs
- Water Quality Standards Program
- Stormwater
- Total Maximum Daily Load (TMDL) Program

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Where Do We Stand Today

2012 – Full EPA Approval – September 24, 2015

2014 – Partial EPA Approval – March 16, 2018

2016 – Partial EPA Approval – June 22, 2018

2018 – Under Development
305(b) / 303(d) - Categories

- **Category 2** – Parameter meets water quality standards
- **Category 3** – Insufficient data to assess the parameter per the CALM
- **Category 5** – Parameter is a pollutant that requires a TMDL
- **Category 4** – Impairment per the CALM
  - **4A** = An EPA-approved TMDL has been completed
  - **4B** = A TMDL is not necessary since other enforceable controls are expected to attain water quality standards
  - **4C** = Not a pollutant but is causing impairment
Draft 303(d) Document Availability

2016, 303(d) List

- EPA Partial Approval of New Hampshire's 2016, 303(d) List (June 22, 2018)
  - Map of 303(d) List Applicability
- Consolidated Assessment and Listing Methodology (CALM)
- 2016, 303(d) List Content Introduction
  - Appendix A.1 - 2016, 303(d) List
  - Appendix A.2 - 2016, 303(d)
  - Appendix A.3 - Map of 303(d) Impaired Waters
  - Waters Removed from the 303(d) List
  - Waters Added to the 303(d) List Since 2014
  - Appendix B – New Hampshire’s Long-term 303(d) Vision
- Response to Comments on the Draft 303(d) and CALM

Other related materials

- Technical Support Document for the Great Bay Estuary Aquatic Life Use Support Assessments, 2016 305(b) Report/303(d) List
- GIS Layers for the 2016 Assessment
- Impairments Removed Since the 2014 305(b)
- Impairments Added to the 2016 305(b)
- Surface Water Quality Mapper and Watershed Report Cards
- 2016 Status of Each Assessment Unit

Okay to use but will miss category 4s

This is what you want

Assessment Overview

• Biennial report fulfills Federal & State requirements to assess water quality

• Completed biannually on even years
  0 ..., 2014, 2016, 2018, etc.

• 305(b) = All assessments
  Reminder: 303(d) = Impairments that need a TMDL

• Public review process
How WAS Addresses NPS

New Hampshire Nonpoint Source Management Program Plan
September 26, 2014

Funding for this project was provided in part by a Watershed Assistance Grant from the NH Department of Environmental Services with Clean Water Act Section 319 funds from the U.S. Environmental Protection Agency.

NH-MS4 Municipalities
New Hampshire Municipal Stormwater Coalition

Overview
The 2013 NH Nonpoint Source MS4 General Permit was issued on January 28, 2013. The Final permit reflects modifications to the 2013 Draft Storm MS4 General Permit and the 2013 Final permit sections. This permit replaces the 2002 stormwater permit for MS4 operations within the State of New Hampshire. For more information on communities within New Hampshire that are automatically designated as MS4 communities and the regulatory permit coverage see: NH Environmental Services.

Please see the EPA 2017 Municipal Separate Storm Sewer System General Permit (SMERG) for the latest on the 2017 NH MS4 permit.

Soak up the Rain
New Hampshire

Green SnowPro
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Treating for Removal of Phosphorus and Nitrogen

Northeast Annual Conference
Northeast Chapter
International Erosion Control Association

October 1, 2018

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The Purpose of Alteration of Terrain

To protect

Surface Water, Groundwater & Drinking Water Supplies

from degradation due to

construction activities and development

Erosion and Sediment Control + Flood Mitigation

+ Treatment of Contaminants + Groundwater Recharge

Photo credit: NH Loon Preservation Committee

Photo by: Jay Aube
AoT permit needed for projects that will disturb...

✓ **100,000 sf** (2.3 ac)

✓ **50,000 sf** – Protected Shoreland

✓ **2,500 sf** – within 50’ of surface water & on steep slope (≥25%)
AoT Focus

1. Erosion & Sediment Control
   Good Construction Practices

There IS a silt fence there somewhere
2. Channel Protection & Flood Protection

- 2-year
- 10-year
- 50-year

Channel Forming Flow

Floods
3. Recharge

RETURN WATER BACK INTO THE GROUND

- Supply streams and wetlands during low flows
- Well recharge

www.constructionspecifier.com
AoT Focus

4. Treatment

REMOVE POLLUTANTS!
New Rules (eff. August 2017) re:

Treatment for Nitrogen and Phosphorus

Env-Wq 1503.11

Treat for **Nitrogen and Phosphorus** removal if discharges to:
• Class A surface Water
• Outstanding Resource Water

Treat for **Nitrogen** if discharges to:
• Nitrogen Impaired Surface Water

Treat for **Phosphorus** if discharges to:
• Phosphorous Impaired Surface Water
• Lake or Pond
CLASS A SURFACE WATERS

Treat for N and P

Highest quality and considered optimal for use as water supplies after adequate treatment.

By statute, some of the Class A waters include their watersheds

When only the surface water-¼ mile buffer for AoT requirements
OUTSTANDING RESOURCES WATER

Treat for N and P

White Mountain National Forest Waters

Surface waters designated as “Natural” under the Designated Rivers Program
NITROGEN IMPAIRED WATERS

2016 list of impaired waters

¼ mile buffer on 5 tributaries rivers to Great Bay
PHOSPHORUS IMPAIRED WATERS

watershed clipped to $\frac{1}{4}$ mile buffer
Lakes and Ponds

watershed clipped to 1/4 mile buffer

Treat for P
AoT Screen Layer available on OneStop GIS Datamapper
TREATMENT for N and P
Infiltration versus Filtration

Infiltration - existing soils

Filtration - filtering media (sands with organic material)
-- sometimes with underdrain
PHOSPHORUS
Infiltration most effective BMP (also NON underdrained filtration)

Source:
2017 NH Small MS4 General Permit, Appendix F
Infiltration practices

Treatment

Groundwater recharge

Sedimentation
Filtration
Adsorption

Biological and chemical conversion in the soil
Underdrained Filtering Practices

Examples:
Surface sand filters, Pervious pavement, Bioretention areas, Tree box filters
NITROGEN

Gravel Wetland most effective BMP

Source: 2017 NH Small MS4 General Permit, Appendix F
GRAVEL WETLAND

UNH Stormwater Center, 2016 specification

Sedimentation
Filtration
Adsorption
Anaerobic transformation
BMP Performance Curve: Enhanced Bio-filtration w/ ISR
Long-Term Cumulative Load Reduction based on BMP Design Storage Capacity

Cumulative Nutrient Load Reduction

Physical Storage Capacity, Depth of Runoff from Impervious Area (inches)

- Blue line: Cumulative Phosphorus Load Reduction
- Red line: Cumulative Nitrogen Load Reduction
Questions?

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NH Stormwater Manual -
http://des.nh.gov/organization/divisions/water/stormwater