UNH STORMWATER CENTER
EFFECTIVE STORMWATER MANAGEMENT
Lamprey River Symposium
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Mill Pond Rd after dam failure at Nottingham Lake, 4/18/2007
Dedicated to the protection of water resources through effective stormwater management

- Research and development of stormwater treatment systems
- To provide resources to stormwater communities currently involved in design and implementation of Phase II requirements
Outreach Materials

Annual Reports

Fact Sheets

Web Resources

Journal Articles

Design Drawings

Design Specifications

http://www.unh.edu/erg/cstev

or just google UNHSC
Impacts of Imperviousness

A.

WATER-QUALITY AND HABITAT CONDITIONS SCORE

Watershed Impervious Cover

Smooth line
Sediment Data (TS, TSS, VSS)

Influent Concentration vs. Effluent Concentration

- Wet
- Dry
- Swale
- No Treatment
Hydrodynamic Separator
Isolator Row
Subsurface Infiltration
Filter Unit
Porous Asphalt
Pervious Concrete
Retention Pond
Stone Swale
Veg Swale
Gravel Wetland
Sand Filter
Bioretention Unit
Tree Filter
The Anatomy of a Box and Whisker

Median Annual Influent

80% Annual Removal

TSS Event Mean Concentrations (mg/L)

TPH-D Event Mean Concentrations (ug/L)

Conventional Systems

Manufactured Systems

LID Systems

Median Annual Influent

80% Annual Removal
Influent Retention Pond Vegetated Swale Berm Swale HDS Average (3) Aqua Filter Isolator Chamber Sub Storage/Filt Gravel Wetland Porous Asphalt Bio II Tree Filter Sand Filter

TP Event Mean Concentrations (mg/L)

INF Conventional Systems Manufactured Systems LID Systems

Median Annual Influent 60% Annual Removal
Bacterial Colonies

So What Really Bugs You?
Bacterial Concentrations

Enterococci (cfu/100mL)

Minimum: 20
Median: 44
Maximum: 6653

Regulatory limit = 103 cfu/100ml
The effect of T and [Cl\(^-\)] is to nearly double the settling time from 1.6 to 3.4 cm/sec.
Chloride

- There are now multiple chloride TMDLs in the country
- There are 4 proposed chloride TMDLs in NH
- Chloride is toxic to aquatic life
- No BMP targets removal
Chloride Levels in First Order Receiving Stream (Durham, NH)
Where should reductions occur?

Sources of Salt Loading
From Vehicular Surface Deicing
(Rockingham County, NH)
(NHDES 2007)

- Parking Lots: 50%
- Municipal Roads: 27%
- State Roads: 11%
- Private Roads: 3%
- Parking Lots: 9%
- Other: 11%
Salt Reduction and Porous Asphalt

% Ice Cover

% Salt Application

- Dense Mix Asphalt
- Porous Asphalt
100% Removal???

There are no silver bullets

➤ Designs should be based on regional watershed and water quality objectives. (think locally act locally!)

➤ We are moving beyond 80% TSS removal:
  ● Nutrients, PSD, effluent concentrations
Samples from 1st storm after sealcoat was applied.

EPA Surface Water Quality Criteria for total PAHs = 300μg/l

- Coal Tar: 5,890 μg/L
- Asphalt: 642 μg/L
- Control: 4.39 μg/L
Total PAH (mg/kg) in surface sediments

Pre sealant - Oct 2007
9 months after sealant - June 2008

Oct 2007
1.58
3.08
1.3
Aquatic Effects Range Low = 4 mg/kg
Aquatic Effects Range Median = 44.7 mg/kg
4% of watershed sealcoated

June 2008
95.7
51.2
10.9
Other Issues

Clogging of filter media?

Tremendous implications for subsurface infiltration!
While concerns exist for LID in cold climates, seasonal variations are observed for conventional BMPs and Manufactured systems.

Infiltration and filtration systems have the highest removal efficiency.

The standard of practice is moderate at best, and low especially for stone lined swales.

Systems dependent on particle settling show the greatest affect by season and temperature variability.

Bacterial concentrations are only reduced significantly by LID systems and subsurface infiltration.
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Questions?