Stormwater Pollution: A City Problem with Backyard Solutions

RI Residential Rain Garden Training Program
March 31 and April 1, 2011
Roger Williams Park Botanical Center
Providence RI

Lorraine Joubert
URI Cooperative Extension – RI NEMO
Topics

• About RI NEMO

• Why stormwater matters

• New management approaches
RI NEMO Provides training and technical tools to help local officials manage impacts of changing land use on local water resources.
Acknowledgments

RI NEMO is funded by the RI Department of Transportation as part of RIDOT’s Storm Water Management Program under the RI Stormwater Solutions project, in partnership with the RI Department of Environmental Management.

For more information go to: www.RIStormwaterSolutions.org
What's So Scary About Stormwater?

Dog poop, lawn chemicals, and nasty spills. These are only a few of the things that stormwater picks up and mixes with as it rushes off the pavement in our driveways, sidewalks, and streets. Storm drains rush all this polluted water directly to the nearest stream, pond, or ocean. No filters. No treatment. So the pollutants that stormwater carries wind up in the water we drink, fish, and swim. And that's pretty scary.

The good news is, there's a lot we can do to keep that water clean.

Simple Steps

- Don't dump into stormdrains
- Water wisely
- Fertilize sparingly
Topics

- About RI NEMO
- Why stormwater matters
- New management approaches
Progress in Cleaning Up RI’s Urban Waters

Fields Point

Narragansett Bay Commission
Wet Weather Sewage Discharge
Outfall #042

Pumpouts
Stormwater Pollution is now the #1 water quality problem in the U.S.*

...And the major source of pollution to RI waters statewide.

* USEPA
In R.I. 22% of surface waters are not meeting fishable swimmable standards due to stormwater pollution. - RIDEM

In recent years, up to 75% of annual beach closures were traced to stormwater, with the remainder due to CSOs - RI Health
What is Stormwater Pollution?

Stormdrains and roadside ditches lead directly to local waters without any treatment. So when rain hits the pavement, it carries any oil, spills, pet waste, leaves, road sand, sediment, trash, and dirty water from washing your car directly to local waters that we drink, fish, or swim in.
Impacts of land use on water flow

Natural Landscape
- Low runoff
- High recharge
- Healthy summer stream flow
- Natural pollutant treatment

Developed
- High runoff, high pollutants
- Flooding
- Low stream flow
- Bypass natural treatment
INTENSITY OF LAND USE

Amount of IMPERVIOUS SURFACE

Water Quantity & Quality Impacts
Why focus on landscape care?

**Water Quality**
Materials used or stored can pollute stormwater

Nutrients – nitrogen and phosphorus essential for plant growth but are pollutants in local water resources.

**Water Quantity**

- Lawn watering can triple summer water use.
- Overwatering lawns leaches nitrogen into groundwater.
- Compacted lawns increase runoff.
Stormwater Impacts on Water Quantity

Increased runoff quantity

Erosion

Flooding
Stormwater Impacts on Water Quality

Phosphorus overfertilizes fresh water

Organic matter impairs taste & odor

Toxics

Nitrogen overfertilizes coastal waters, leads to low dissolved oxygen and fish kills.
Topics

• About RI NEMO

• Why stormwater matters

• New management approaches
Conventional Stormwater Management

channels water away from buildings and roads as quickly and efficiently as possible, often using pipes
RHODE ISLAND STORMWATER DESIGN AND INSTALLATION STANDARDS MANUAL

DECEMBER 2010

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT AND
COASTAL RESOURCES MANAGEMENT COUNCIL
Low Impact Development (LID)
Low Impact Development (LID)

Community Planning

LID Site Design

LID BMPs

Receiving Waters

Larger Conventional BMPs
LID Site Planning and Design Strategies
Minimum Standard No. 1 (out of 11)

- Must be used to the maximum extent practicable.
- Avoid, reduce, manage runoff impacts
- Thorough site assessment in early review
- Protect water quality function of soils, wetlands
- Limit area of disturbance, restore veg and soils
- Greater design flexibility, compact design
- Reduce impervious cover
- Use nonstructural stormwater controls.
Example LID project...

Cottages on Green, East Greenwich RI
Example LID practices…

Bioretention

Bioretention in parking lot islands, North Kingstown commercial development
Infiltration trenches at roadsides intercept roadway runoff. North Kingstown, RI
Permeable Pavements

There are three major categories:

- **Block Pavers**
- **Porous Pavement**
- **Plastic Grid Pavers**
Block Pavers

• Most paver blocks are impermeable; about 15 - 30% void space allows infiltration.

• Some pavers blocks are permeable, using porous concrete.

• Recommended for use in driveways, parking areas, emergency access roads, fire lanes, sidewalks, and shoulders along airstrips and highways.

• Installation requires a sub-base and the depth is dependent on soil type.

Eco-Stone by Unilock

Local Example: Jordan Cove, Connecticut

Turfstone by Unilock

Light duty paver designed for overflow parking, vehicle emergency access

Aquaterra by Unilock

Local Examples: Boston Neck Road, Narragansett
Grid Pavers

- Constructed mainly from recycled plastic materials
- Their flexibility allows for use on uneven terrains
- They do not require curbs, certain drains, detention or retention ponds

**Turfguard**
- Application: driveways, parking lots, access roads for light vehicles
- No groundbreaking necessary
- It is simply unrolled
- Product life is 120 years
- Grid Technologies 849-7920

**Geoblock**
- Application: driveways, auxiliary parking areas, emergency access roads
- Installed over a rock and sand subbase
- Total load capacity 130,000 lbs/ft²
- Jennian Enterprises (781) 665-7915

**Netpave 50**
- Application: permanent/overspill parking lots, driveways, bike paths, emergency access roads
- Installation requires a sub-base between 4-19” – site dependent
- Load bearing capacity 200 T/m²
- Grid Technologies 849-7920
Porous Asphalt

University of Rhode Island – Built 2003

2 lots serve 1000 vehicles for student and event parking
Green Roofs
Rain Barrels and Cisterns
Rain Gardens
RI Stormwater Low Impact Development (LID) Inventory

Due to compatibility issues, the map below might not display properly using the browser Internet Explorer. Please try Mozilla Firefox or Safari.
Summary

• Stormwater pollution comes from many sources, not 1 fix.
• Rain gardens are a simple and effective LID practice.
• New RI storm water standards require use of LID.
• Expect to see more interest in rain garden construction and maintenance services!

Simple steps
- Sweeping fertilizer off pavement

New practices
- Rain gardens

Updated methods
- Low-input grass varieties
Resources:  www.uri.edu/ce/wq

www.ristormwatersolutions.org

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Statewide Stormwater Education

Government, Business and Non-profit partners.
Ad Campaign

The scariest thing to hit the water since Uncle Jack showed up wearing one of these.

Dog poop, lawn chemicals, and nasty spills hitting our storm drains.

To know where it goes, visit www.risternwatersolutions.org.
What's So Scary About Stormwater?

Dog poop, lawn chemicals, and nasty spills. These are only a few of the things that stormwater picks up and mixes with as it rushes over the pavement in our driveways, sidewalks, and streets. Storm drains rush all this polluted water directly to the nearest stream, pond, or ocean. No filters. No treatment. So the pollutants that stormwater carries wind up in the water we drink, fish, and swim. And that's pretty scary. The good news is, there's a lot we can do to keep that water clean.

Simple Steps

- Don't dump into stormdrains
- Water wisely
- Fertilize sparingly
Figure 14: Water Quality Impacts (Grouped statistics)  [N varies]

To what extent do you believe each of the following items is potentially damaging to water quality in Rhode Island?

- Discharge from industries
- Discharge from sewage treatment plants
- Agricultural fertilizers and pesticides
- Lawn fertilizers and pesticides
- Runoff from streets and highways
- Improper disposal of motor oil
- Street sand and salt
- Oil and gas spills on driveways
- Soil erosion from construction sites
- Runoff from residential roofs and driveways
- Pet waste
- Grass clippings and leaves

Results, 2008 URI Cooperative Extension Public Awareness Survey conducted at RI Division of Motor Vehicle Branch Offices.
The Top 10 Solutions

Yard Care
1. Never dump anything into the path of a stormdrain.
2. Sweep everything back onto the lawn.
3. Water wisely.
4. Divert rooftop runoff.
5. Reduce fertilizer and pesticide use.

Home Care
6. Never put hazardous household wastes down stormdrains, indoor drains, or the trash.
7. Have your septic system inspected regularly (every 3-5 years) and pumped as needed.

Auto Care
8. If you change your own motor oil, recycle the used oil.
9. Wash your vehicle at a designated car wash or on grass.

Pet Care
10. Scoop your dog’s poop. Then throw it in the trash.

www.RIStormwatersolutions.org
The Two to Live By

- Keep as much water as possible off of paved surfaces.

- Keep the water that does run off as clean as possible.
Why focus on landscape care?

**Water Quality**
Materials used or stored can pollute stormwater

- **Nutrients**
- **Oil, toxics**
- **Sediment**
- **Thermal Stress**

**Water Quantity**
Lawn watering can *triple* summer water use.
Providence St., West Warwick, RI, 1030 am 3/31/10. David R. Vallee, NWS/ Northeast River Forecast Center
Direct effect of coastal nitrogen contamination

- Low dissolved oxygen leads to summer fish kills.

- Sediments may continue to store and recycle nutrients.
Nitrogen

Overfertilizes coastal waters
- Nuisance seaweed replaces eelgrass,
- Smothers habitat,
- Algae decays and consumes oxygen.

Many RI coastal waters are impaired due to excessive nutrients and low oxygen.
Waterflow in undeveloped areas
Why focus on landscape care?

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- Nutrients
- Oil, toxics
- Sediment
- Thermal Stress

**Water Quantity**
Lawn watering can **triple** summer water use.
Nutrients- Nitrogen and phosphorus are essential for plant growth but are pollutants in local water resources.
Phosphorus overfertilizes fresh water

Organic matter from aquatic plants affects taste & odor of drinking water

Algae and aquatic plants limit recreational use & aquatic habitat.
Development Impacts on Water Quality

- Sediment
- Nutrients
- Bacteria & viruses
- Oil, toxics
- Debris
- Road salt
- Thermal Stress

More Runoff = More Pollutants
Green/blue Roofs
To what extent do you believe each of the following items is potentially damaging to water quality in Rhode Island? (Major contributor, Moderate contributor, Minor contributor, None, Does not contribute, Don’t Know/Not Sure)

<table>
<thead>
<tr>
<th>Item</th>
<th>Major</th>
<th>Moderate</th>
<th>Minor</th>
<th>None</th>
<th>Not Sure</th>
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<td>1. Discharges from sewage treatment plants</td>
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<td>2. Pet waste (dog and cat droppings)</td>
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<td>3. Improper disposal of used motor oil</td>
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<td>4. Lawn fertilizers and pesticides</td>
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<td>5. Water runoff from streets and highways</td>
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<td>6. Water runoff from residential roofs and driveways</td>
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<td>7. Oil and gasoline spills on driveways</td>
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<td>8. Grass clippings and leaves</td>
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<td>9. Soil erosion from construction sites</td>
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<td>10. Street sand and salt (during snow storms)</td>
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<td>11. Discharges from industries</td>
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<td>12. Agricultural fertilizers and pesticides</td>
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2008 URI Cooperative Extension Public Awareness Survey conducted at
Stream Restoration
Road Runoff
Parking Lot Runoff
Rooftop Runoff
Wet Basin
WQ Structure