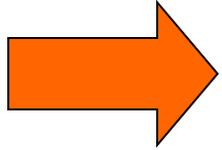




# RI Residential Rain Garden Training Program

## Stormwater Pollution: A BIG Problem with Backyard Solutions

# Topics



- **About RI NEMO**
- **Why stormwater matters**
- **New management approaches**



# ***RI Nonpoint Education for Municipal Officials (NEMO)***

*is part of the URI Cooperative  
Extension Water Quality Program  
and member of the National  
NEMO network.*

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***RI NEMO Provides training and technical tools  
to help local officials manage impacts of  
changing land use on local water resources.***



THE  
UNIVERSITY  
OF RHODE ISLAND  
COOPERATIVE  
EXTENSION

# 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](http://www.RIStormwaterSolutions.org)



## Rhode Island Stormwater Solutions

[Stormwater Basics](#) | [Take Action](#) | [Newsroom](#) | [Workshops & Events](#) | [Resources](#) | [About the Project](#)

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## 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

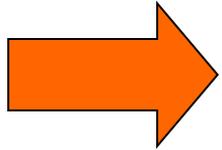


Fertilize sparingly



# Topics

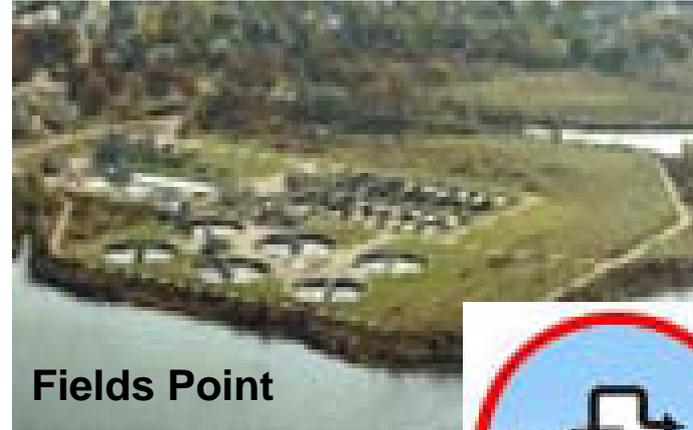
- **About RI NEMO**



- **Why stormwater matters**

- **New management approaches**

# Progress in Cleaning Up RI's Urban Waters



Fields Point



*Pumpouts*



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





**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**

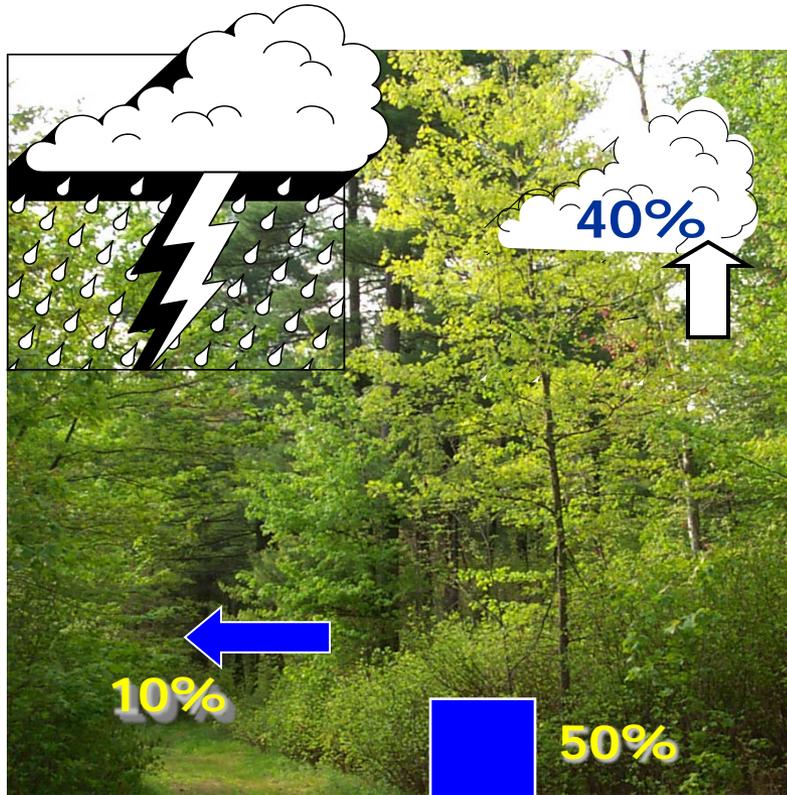


# What is Stormwater Pollution?

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.

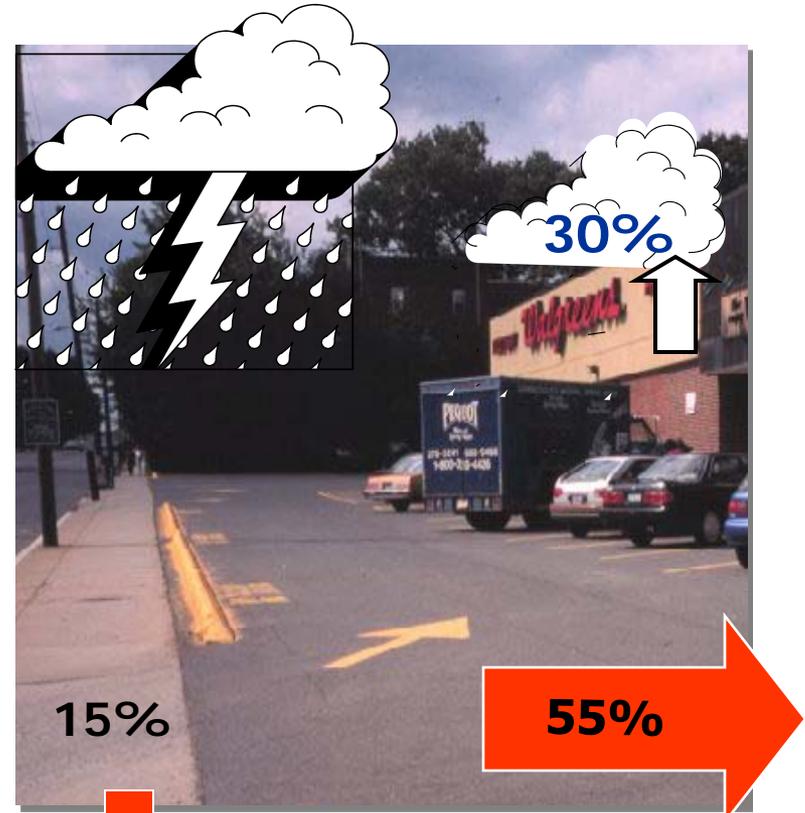


# Impacts of land use on water flow



## 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

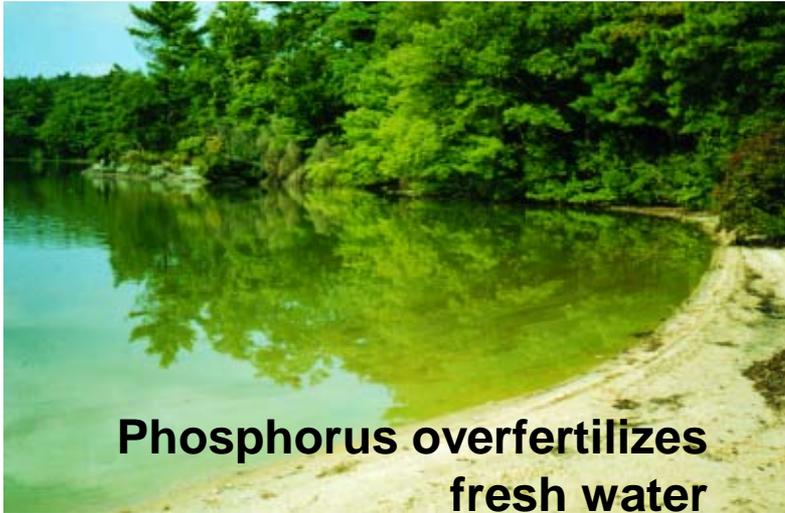
- Lawn watering can **triple** summer water use.
- Overwatering lawns leaches nitrogen into groundwater.
- Compacted lawns increase runoff.

# Stormwater Impacts on Water Quantity



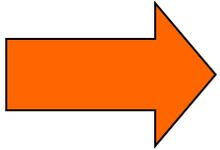
Increased runoff quantity

# Stormwater Impacts on Water Quality



# 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





Detention  
Pond ↓

Road  
Runoff

Rooftop  
and  
Driveway  
Runoff

Turf Runoff



Rooftop  
and  
Driveway  
Runoff

Turf Runoff

Road  
Runoff

Westmoreland Ln

Detention  
Pond (2-cell)

To wetland

# RHODE ISLAND STORMWATER DESIGN AND INSTALLATION STANDARDS MANUAL

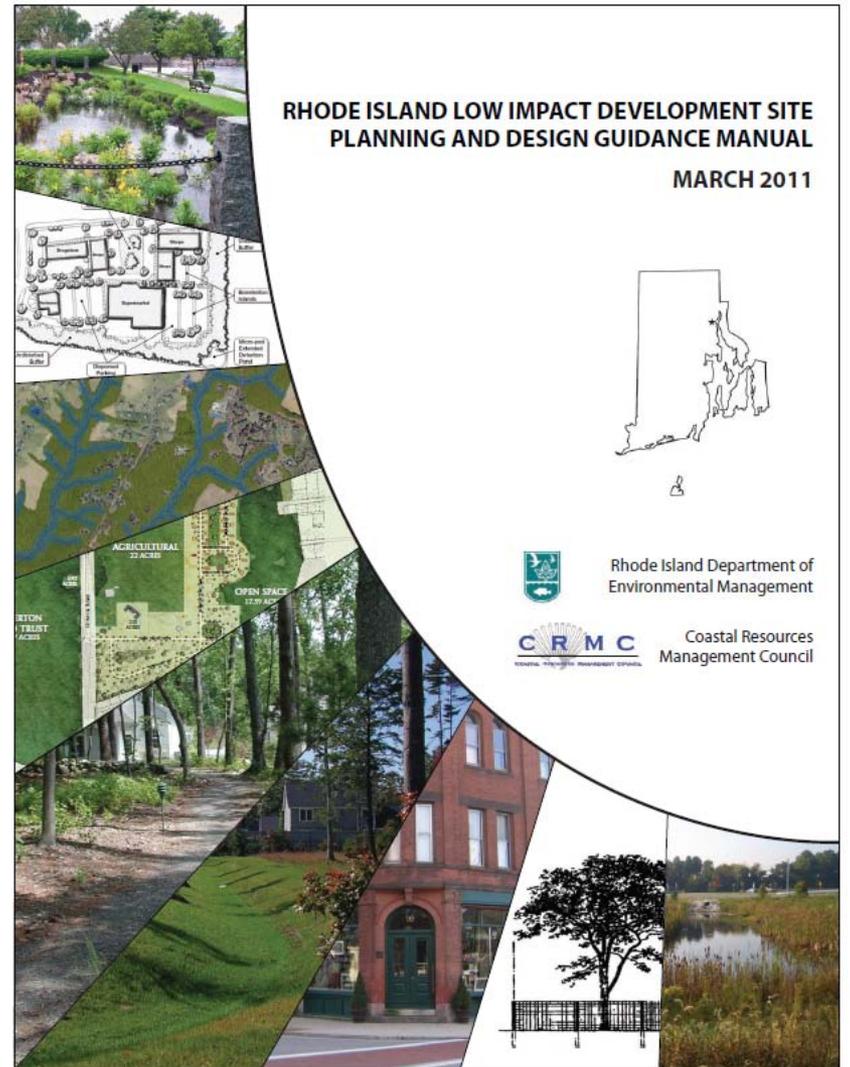
DECEMBER 2010



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL  
MANAGEMENT AND**



**COASTAL RESOURCES MANAGEMENT COUNCIL**



# Low Impact Development (LID)

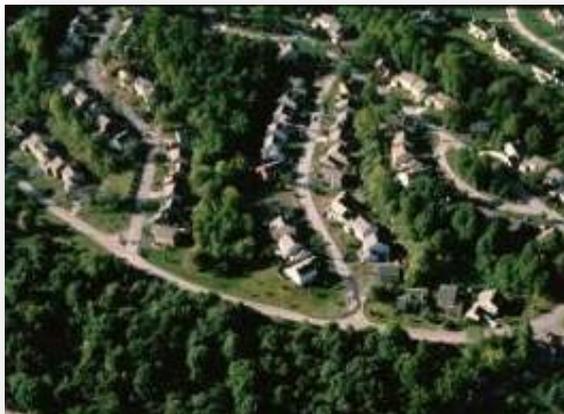


# Low Impact Development (LID)

Community Planning



LID Site Design



LID BMPs



Larger Conventional BMPs



Receiving Waters



# 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





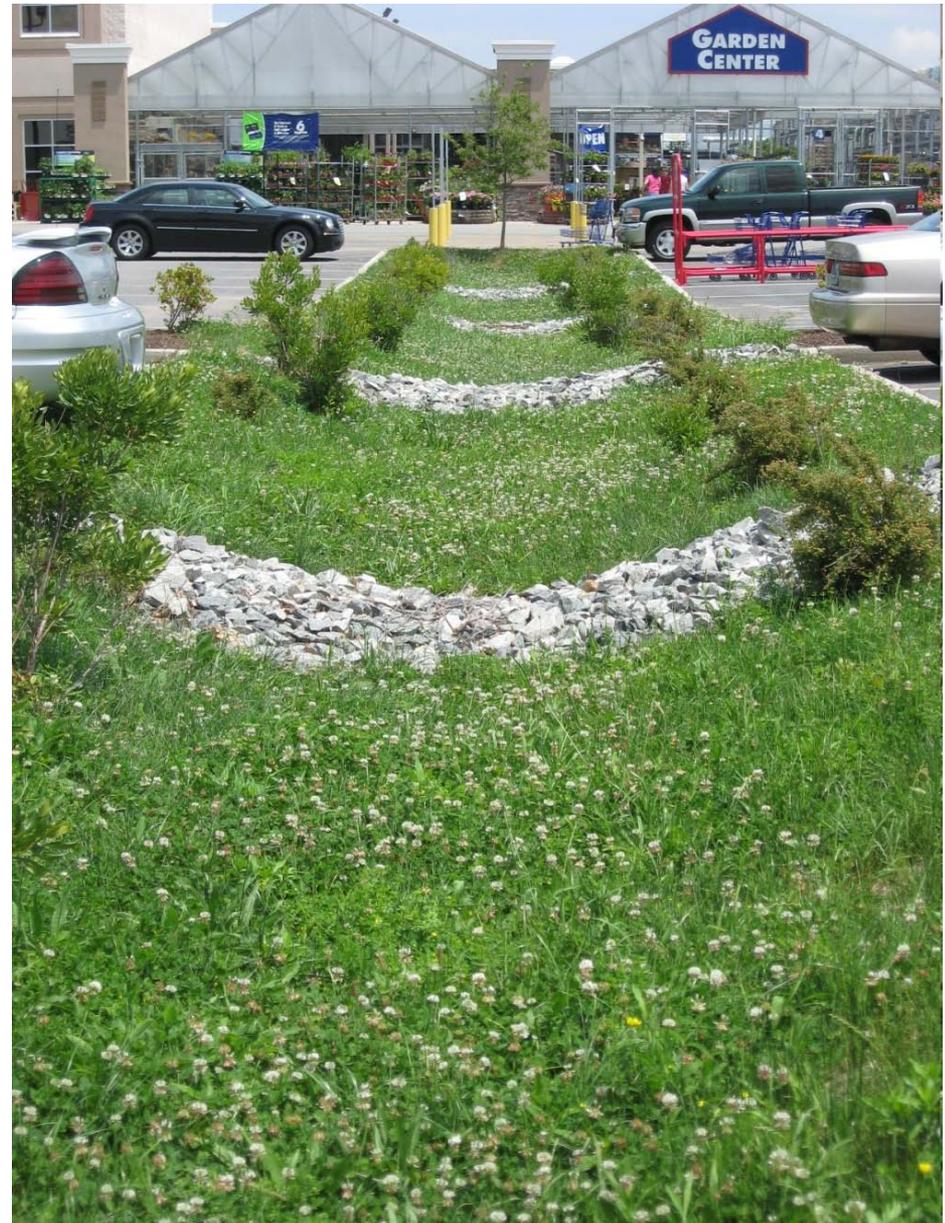




# *Example LID practices...*

## ***Bioretention***

Bioretention in parking lot islands, North Kingstown commercial development





## ***Infiltration Trenches***

***Infiltration trenches at roadsides intercept roadway runoff. North Kingstown, RI***

# Permeable Pavements

There are three major categories:

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



**Heavy duty**

**Moderate**

**Light duty**

# 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



**Turfstone** by Unilock



**Aquaterra** by Unilock



Local Example: Jordan Cove, Connecticut



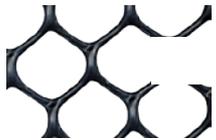
Light duty paver designed for overflow parking, vehicle emergency access



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**  
Grid Tech



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**  
Geosystems



Application: driveways, auxiliary parking areas, emergency access roads

Installed over a rock and sand subbase

Total load capacity 130,000 lbs/ft<sup>2</sup>

**Jennian Enterprises (781) 665-7915**



**Netpave 50**  
Grid Tech



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/m<sup>2</sup>

**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*



# Other RI Examples – go to RI LID Inventory

know where  
it goes

Take simple  
steps to reduce  
STORMWATER POLLUTION

## Rhode Island Stormwater Solutions

[Stormwater Basics](#) | [Take Action](#) | [Workshops & Events](#) | [Resources](#) | [About the Project](#) | [Statewide Campaign](#)

### 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](#).

[Basic Materials](#)

[Strategies](#)

[Examples From RI Towns](#)

[RI LID Inventory](#)

[LID Atlas](#)

[Full LID Description List](#)

**Low Impact Development Atlas**

Search: [ ]

Filter Projects

- All Project Types (36)
- Swale/Bioswale (3)
- Bioretention/Rain Garden (13)
- Cistern/Rain Barrel (4)
- Stormwater Wetlands (0)
- Green Roof (8)
- Permeable Pavement (12)
- Water Conservation (4)
- Green Streets (0)
- Other (4)

State: **RHODE ISLAND**

Town: **All**

Land Use Type: **All Types**

Currently Showing (36 Projects)

- 117 Metro Center Blvd. Warwick, RI
- 17 Gordon Avenue Business Incubator

Map | Satellite | Hybrid | Terrain

# 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](http://www.uri.edu/ce/wq)

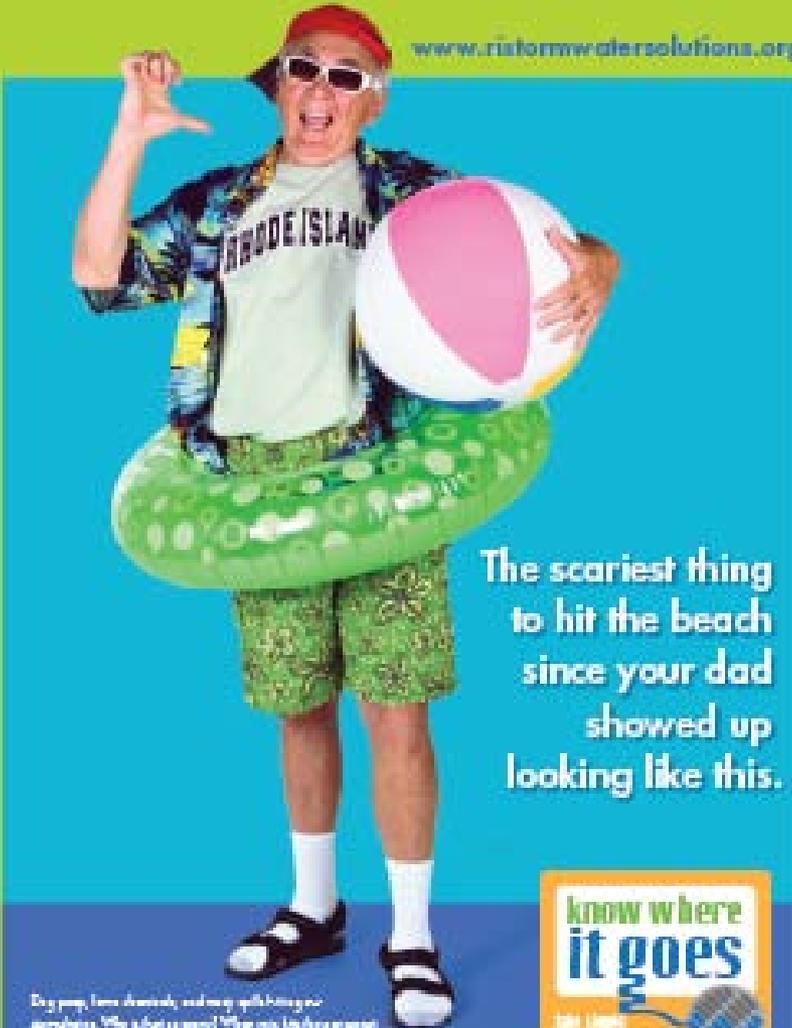
[www.ristormwatersolutions.org](http://www.ristormwatersolutions.org)

***NEMO Contacts:***

**Lorraine Joubert**      **Tel: 401-874-2138**      [ljoubert@uri.edu](mailto:ljoubert@uri.edu)

**Lisa D. Philo**      **Tel: 401- 874-5687**      [lphilo@mail.uri.edu](mailto:lphilo@mail.uri.edu)

# Statewide Stormwater Education



[www.ristormwatersolutions.org](http://www.ristormwatersolutions.org)

The scariest thing to hit the beach since your dad showed up looking like this.

**know where it goes**

Take 10 minutes. Learn 10 minutes. Save 100 million gallons of water.

Do you pump, pour, spray, and pour pollutants into your stormwater? Why is that so scary? When you hit the beach, you're not just relaxing, you're also relaxing on a beach that's been polluted by your stormwater. Before you know it, you're all swimming in pollution. Fortunately, Parents Action can do a lot to help that water clean.

For a few simple steps, visit [www.ristormwatersolutions.org](http://www.ristormwatersolutions.org). You don't need a lot of money to help.

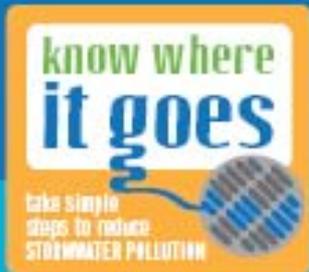
Support from the Rhode Island Department of Transportation, the University of Rhode Island, and the Rhode Island Stormwater Solutions Center.



THE  
UNIVERSITY  
OF RHODE ISLAND

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.ristormwatersolutions.org](http://www.ristormwatersolutions.org).



Produced by Ristormwater Solutions with support from the State of Oregon Department of Transportation and the Portland Regional Council of Environmental Management.





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## Simple Steps



Don't dump into stormdrains



Water wisely



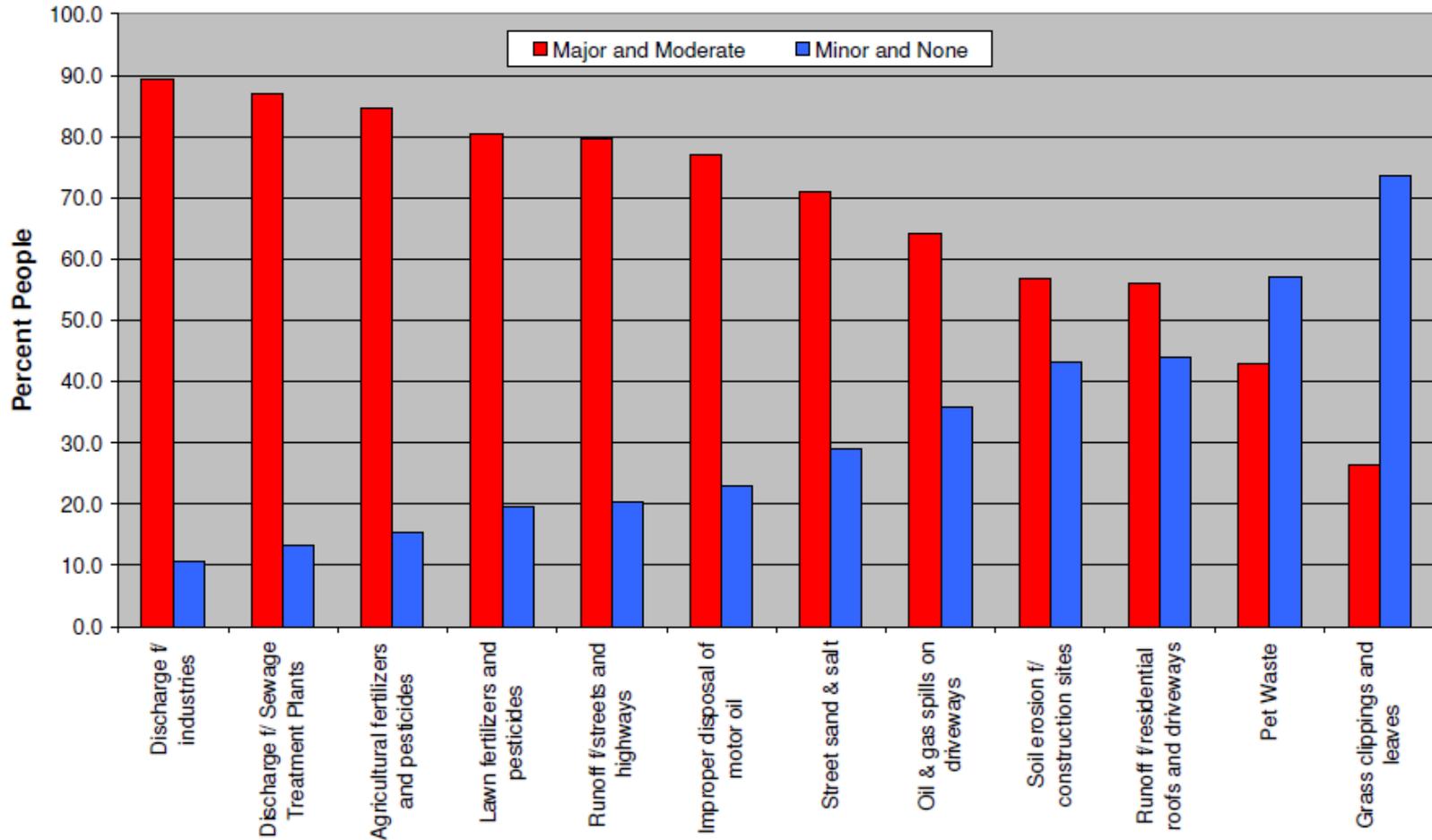
Fertilize sparingly





**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?



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](http://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 Quantity

Lawn watering can **triple** summer water use.

## Water Quality

Materials used or stored can pollute stormwater

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



Providence St., West Warwick, RI, 1030 am 3/31/10. David R. Vallee, NWS/ Northeast River Forcast Center

# Direct effect of coastal nitrogen contamination

- Low dissolved oxygen leads to summer fish kills.
- Sediments may continue to store and recycle nutrients.

Greenwich Bay fish kill



# ***Nitrogen***

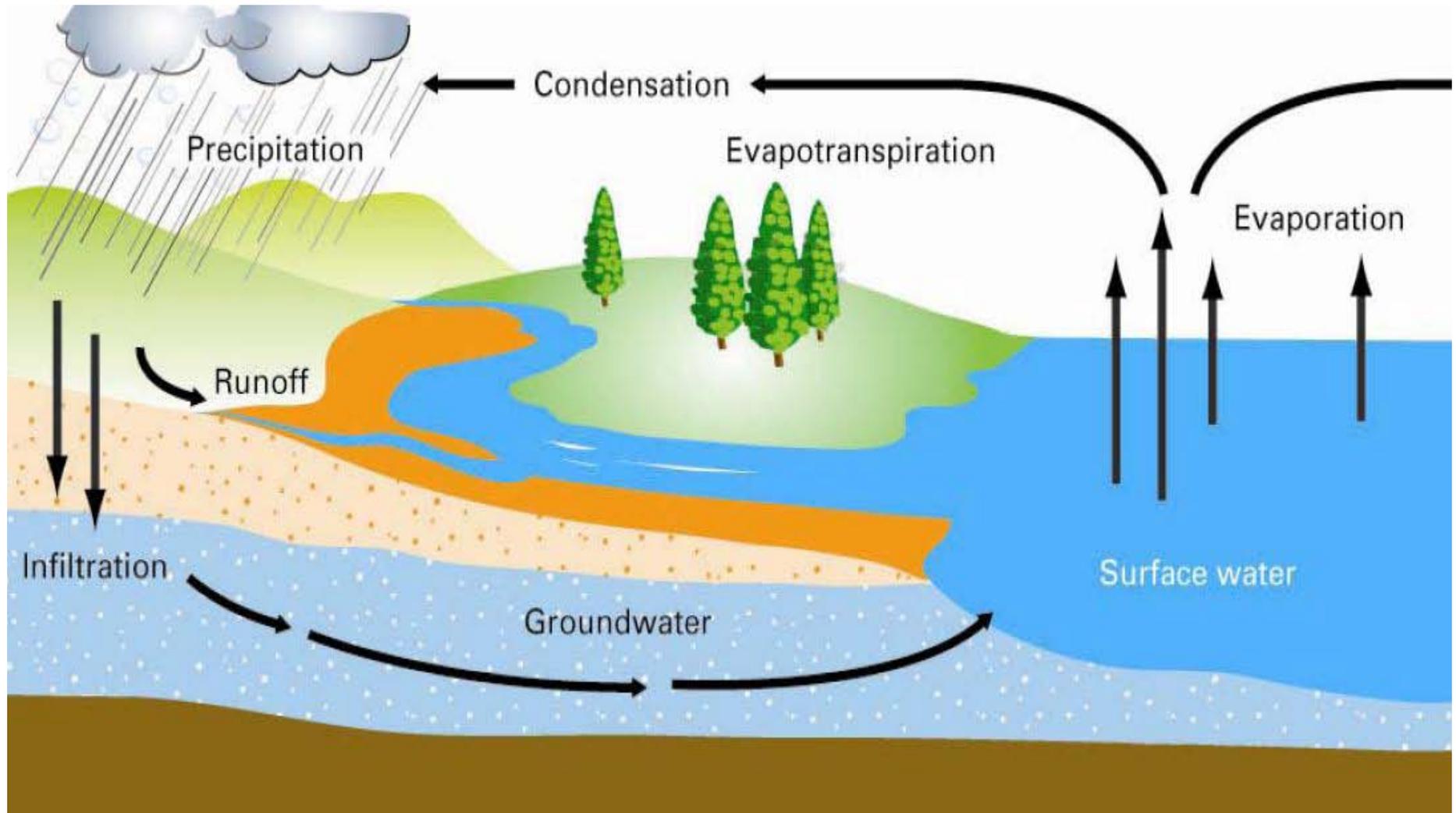
## ***Overfertilizes coastal waters***

- 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?



## Water Quantity

Lawn watering can **triple** summer water use.

## Water Quality

Materials used or stored can pollute stormwater

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

**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

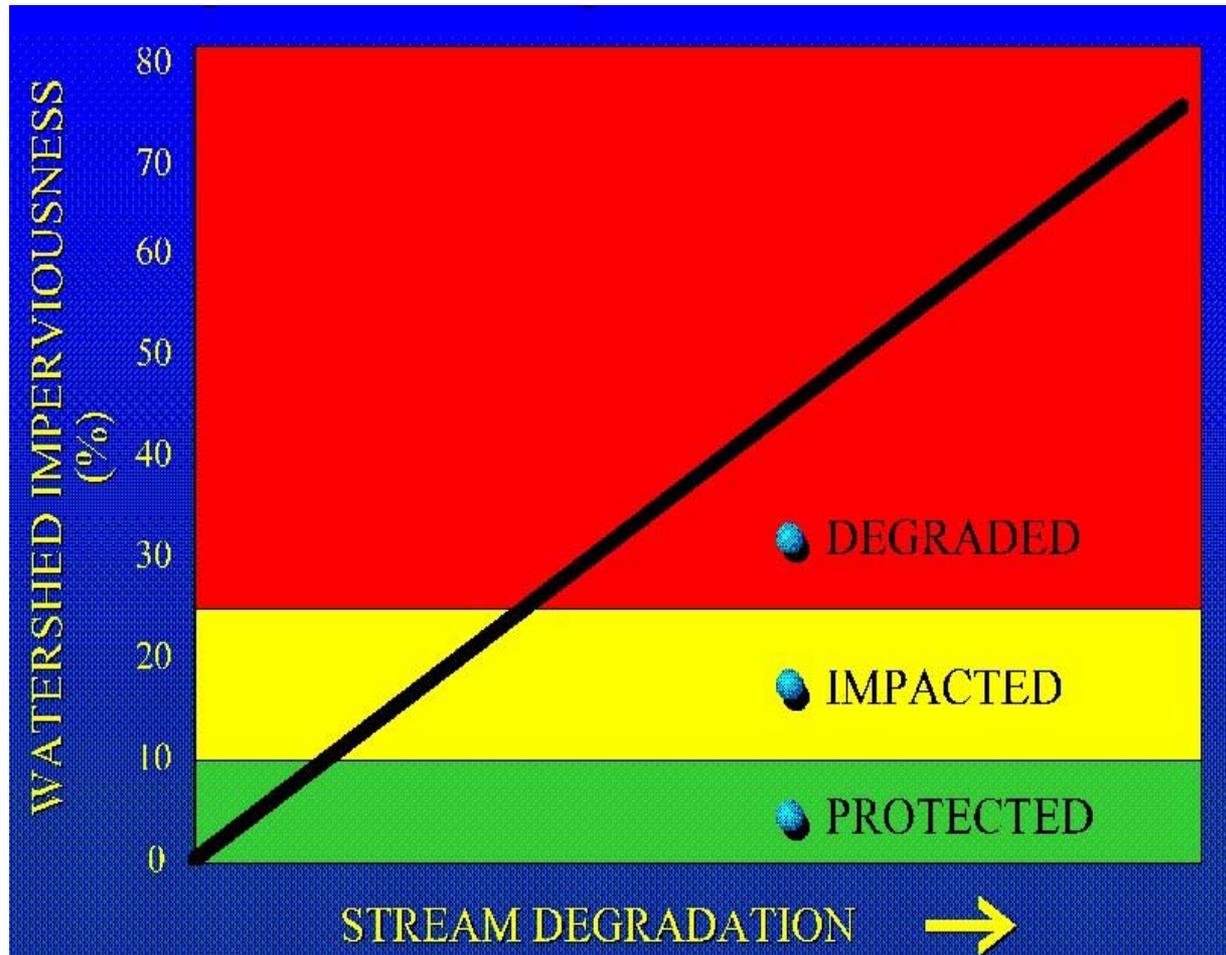


Sediment  
Nutrients  
Bacteria & viruses  
Oil, toxics  
Debris  
Road salt  
Thermal Stress

**More Runoff =  
More Pollutants**

# Increasing Imperviousness, Declining Stream Health

---



# *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, Does not contribute, Don't Know/Not Sure)

	<i>Major</i>	<i>Moderate</i>	<i>Minor</i>	<i>None</i>	<i>Not Sure</i>
1. Discharges from sewage treatment plants	<input type="radio"/>				
2. Pet waste (dog and cat droppings)	<input type="radio"/>				
3. Improper disposal of used motor oil	<input type="radio"/>				
4. Lawn fertilizers and pesticides	<input type="radio"/>				
5. Water runoff from streets and highways	<input type="radio"/>				
6. Water runoff from residential roofs and driveways	<input type="radio"/>				
7. Oil and gasoline spills on driveways	<input type="radio"/>				
8. Grass clippings and leaves	<input type="radio"/>				
9. Soil erosion from construction sites	<input type="radio"/>				
10. Street sand and salt (during snow storms)	<input type="radio"/>				
11. Discharges from industries	<input type="radio"/>				
12. Agricultural fertilizers and pesticides	<input type="radio"/>				

# *Stream Restoration*



