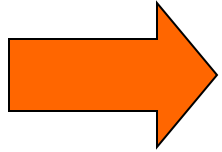




RI Residential Rain Garden Training Program

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.*

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



THE
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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



Rhode Island Stormwater Solutions

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

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

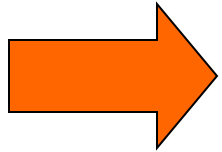


Fertilize sparingly



Topics

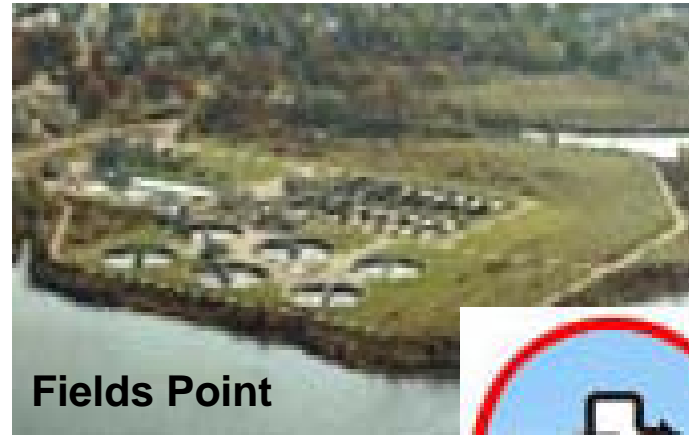
- **About RI NEMO**



- **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.*



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



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**

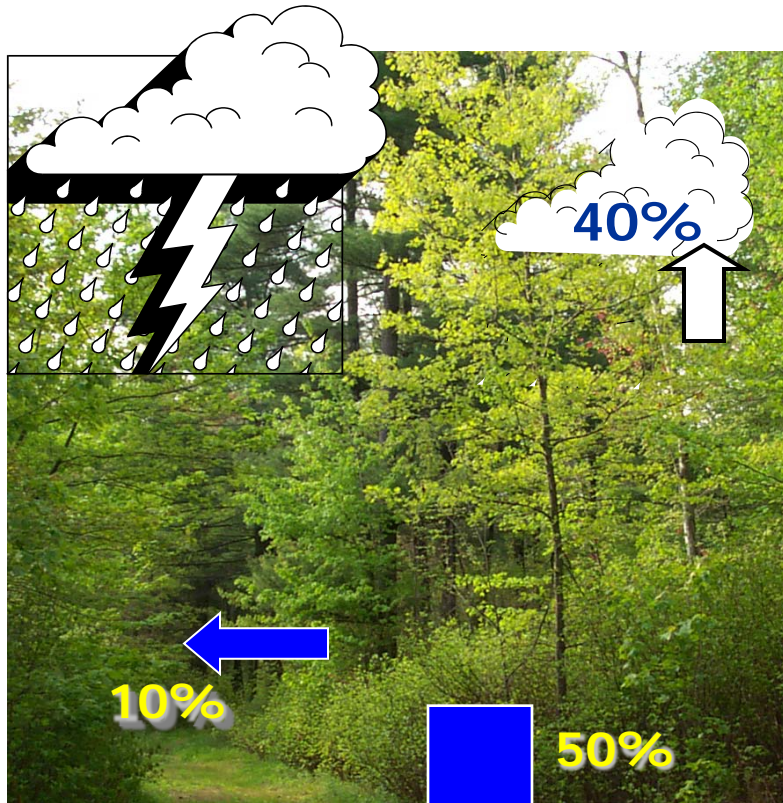


What is Stormwater Pollution?

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.

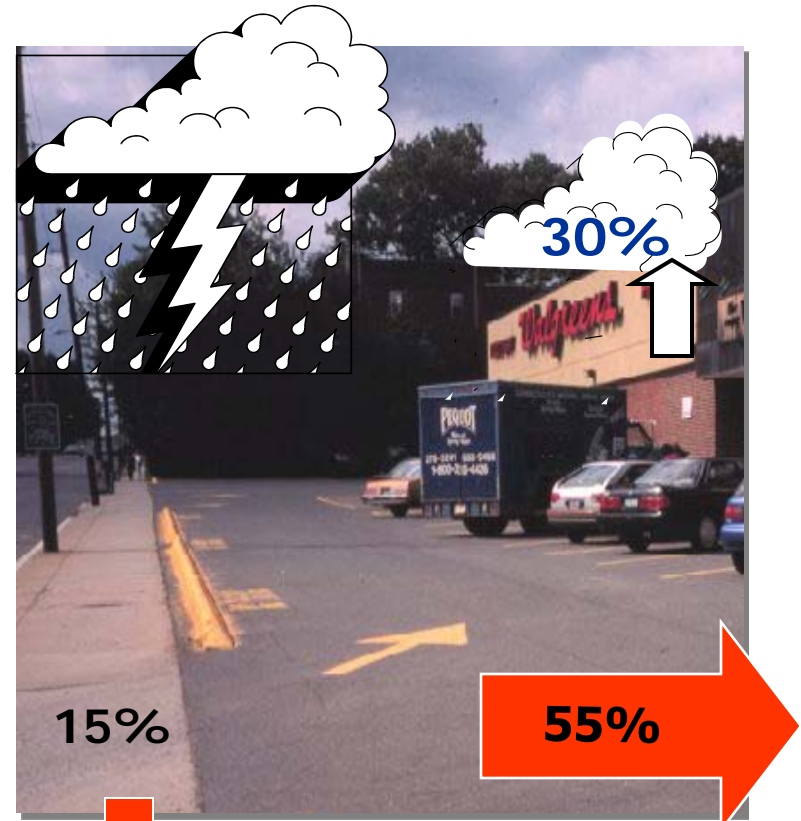


Impacts of land use on water flow



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

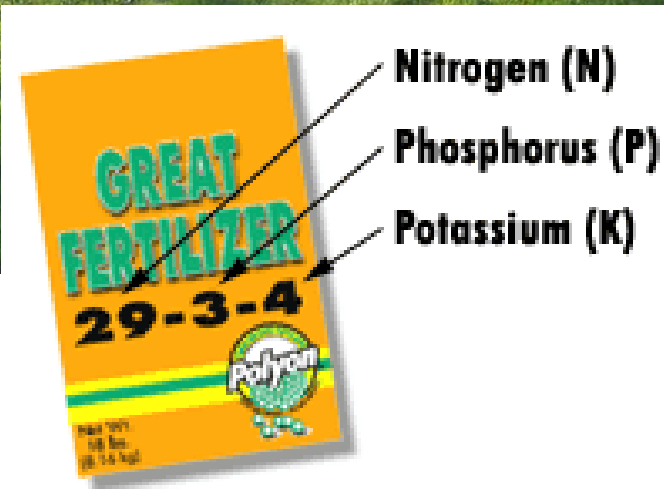
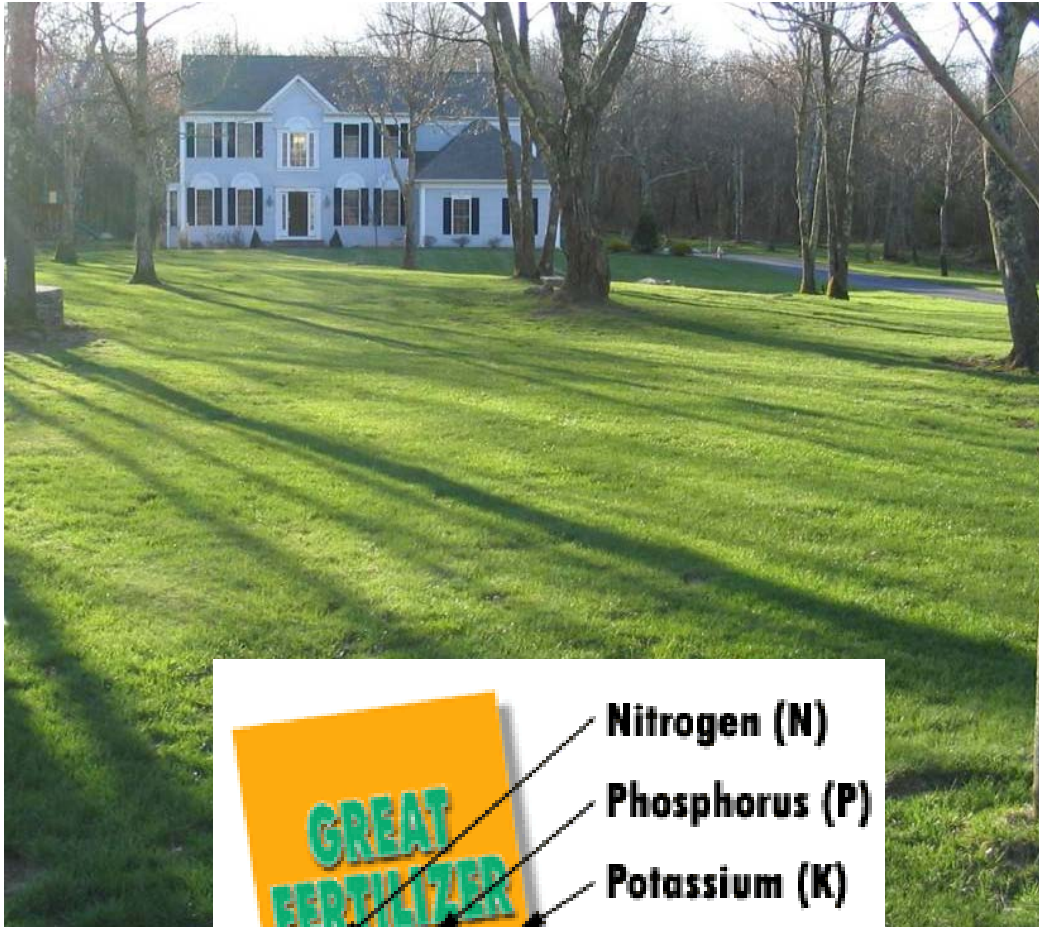


INTENSITY OF LAND USE

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.

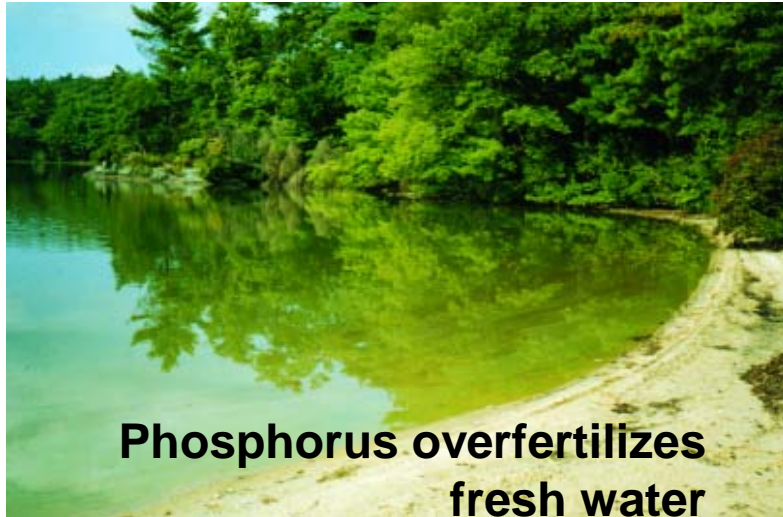
Stormwater Impacts on Water Quantity



Increased runoff quantity



Stormwater Impacts on Water Quality



Organic matter
impairs taste & odor



Toxics

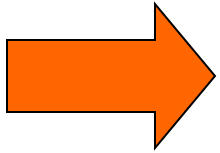


Nitrogen overfertilizes coastal waters, leads to low dissolved oxygen and fish kills.



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



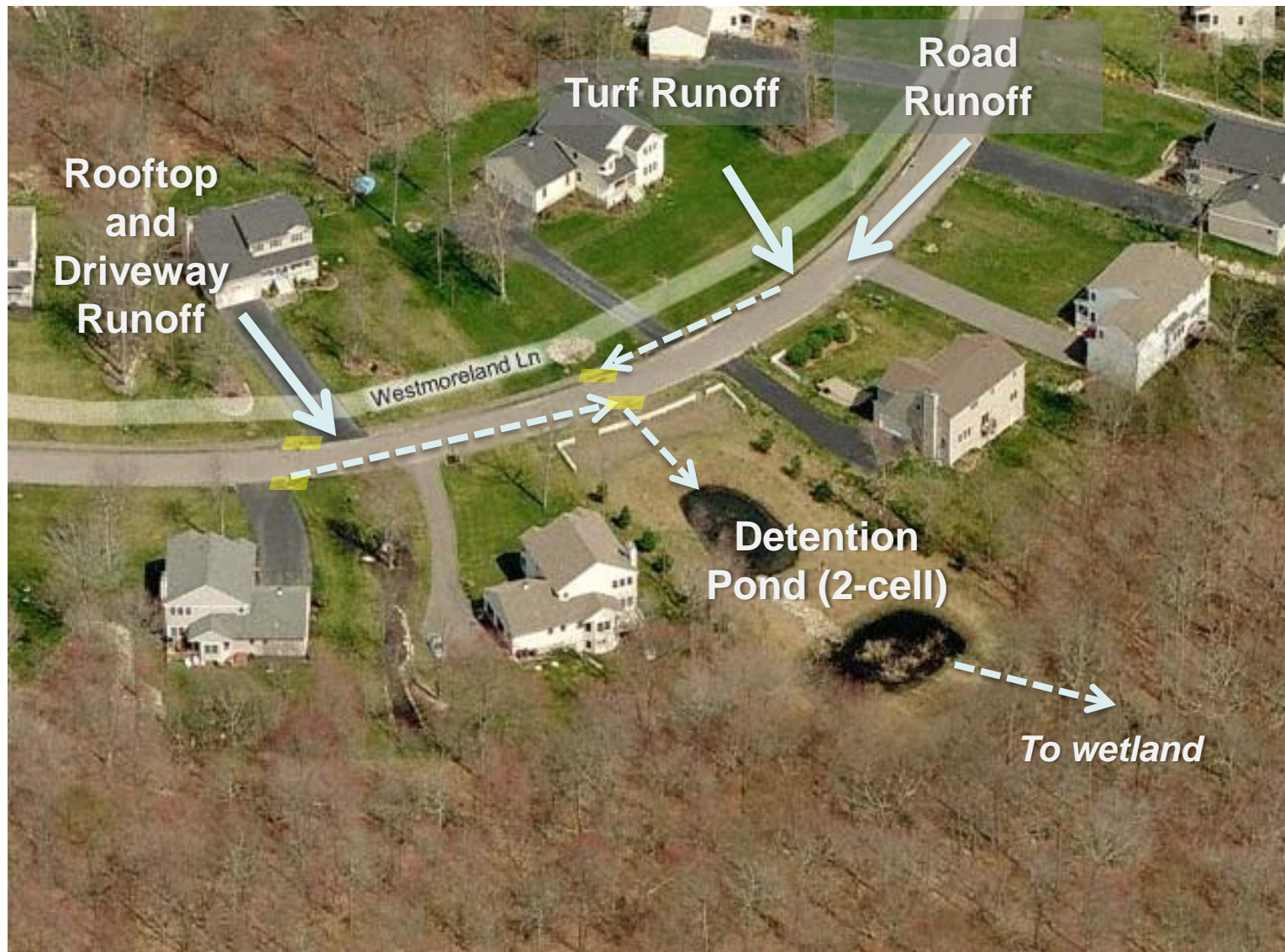
**Detention
Pond** ↓

**Rooftop
and
Driveway
Runoff**

Turf Runoff

**Road
Runoff**





RHODE ISLAND STORMWATER DESIGN AND INSTALLATION STANDARDS MANUAL

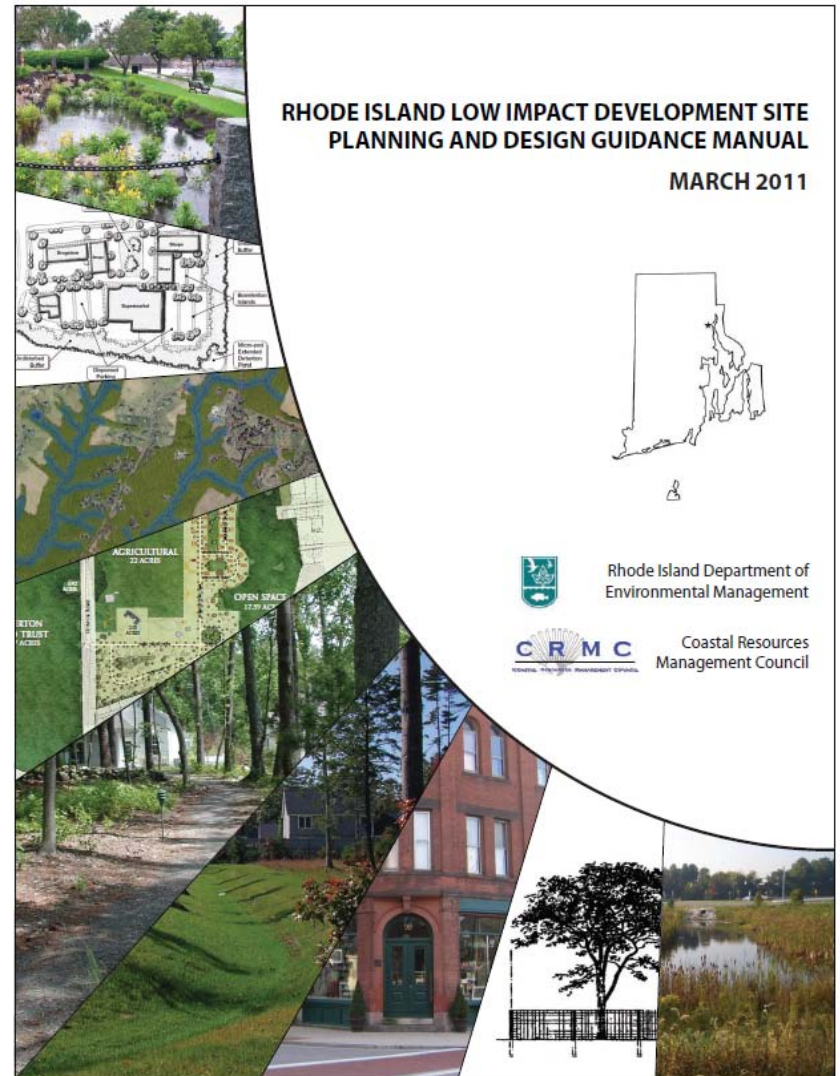
DECEMBER 2010



**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



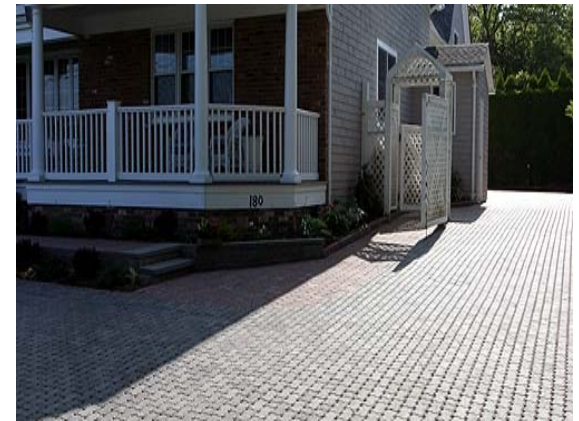
Aquaterra by Unilock



Local Example: Jordan Cove,
Connecticut



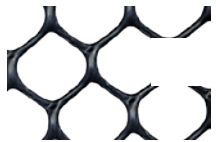
Light duty paver designed for overflow
parking, vehicle emergency access



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/ft²

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/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



Other RI Examples – go to RI LID Inventory

know where
it goes

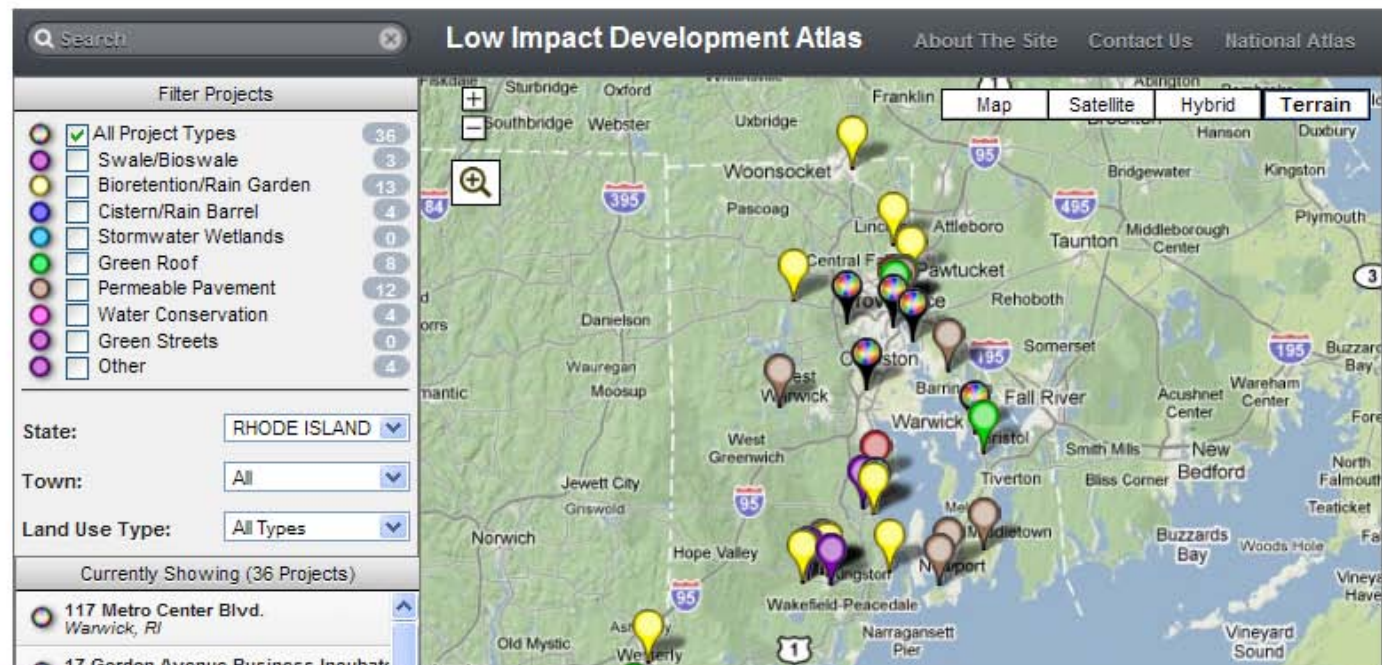
Take simple
steps to reduce
STORMWATER POLLUTION

Rhode Island Stormwater Solutions

[Stormwater Basics](#)[Take Action](#)[Workshops & Events](#)[Resources](#)[About the Project](#)[Statewide Campaign](#)[Basic Materials](#)[Strategies](#)[Examples From RI Towns](#)[RI LID Inventory](#)[LID Atlas](#)[Full LID Description List](#)

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



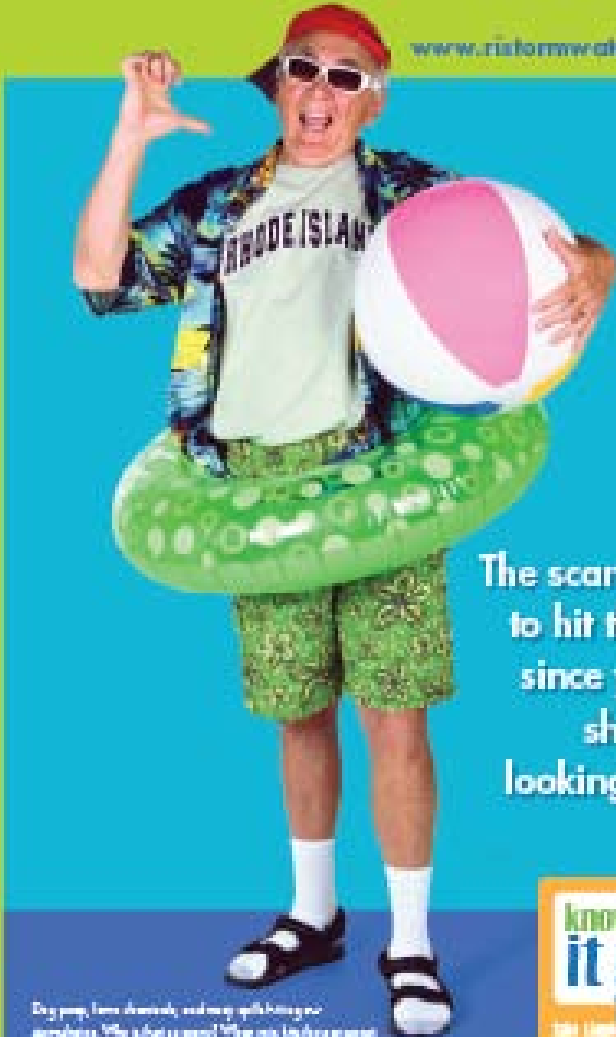
Resources: www.uri.edu/ce/wq
www.ristormwatersolutions.org

NEMO Contacts:

Lorraine Joubert **Tel: 401-874-2138** ljoubert@uri.edu

Lisa D. Philo **Tel: 401- 874-5687** lphilo@mail.uri.edu

Statewide Stormwater Education



www.ristormwatersolutions.org

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

Do it right, have fun, and keep your family safe. Why is that so scary? When you hit the beach, you're not just relaxing; you're also taking a risk. You're taking a risk that you'll get hit by a wave, that you'll get stung by a jellyfish, that you'll get lost, that you'll get hurt. Before you know it, you're all swimming in the water. Fortunately, there's a lot you can do to keep your family safe.

For a few simple steps, visit www.ristormwatersolutions.org. You'll find out how you can help protect the water.

know where it goes

Take 10 minutes
to learn 10 ways
to keep your family safe

Learn more about stormwater solutions at www.ristormwatersolutions.org



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.





Rhode Island Stormwater Solutions

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Simple Steps



Don't dump into
stormdrains



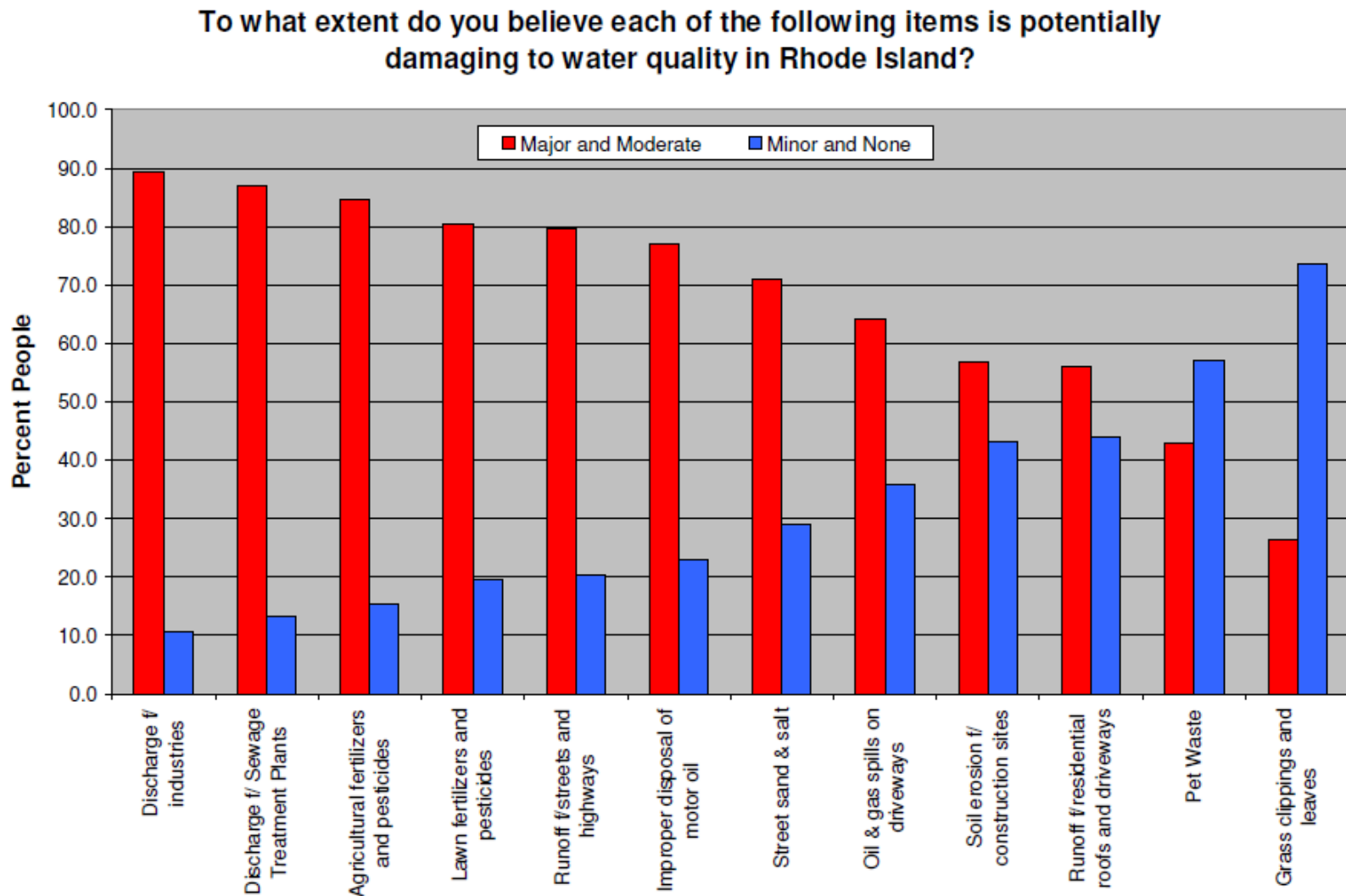
Water wisely



Fertilize sparingly



Figure 14: Water Quality Impacts (Grouped statistics) [N varies]



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 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.**

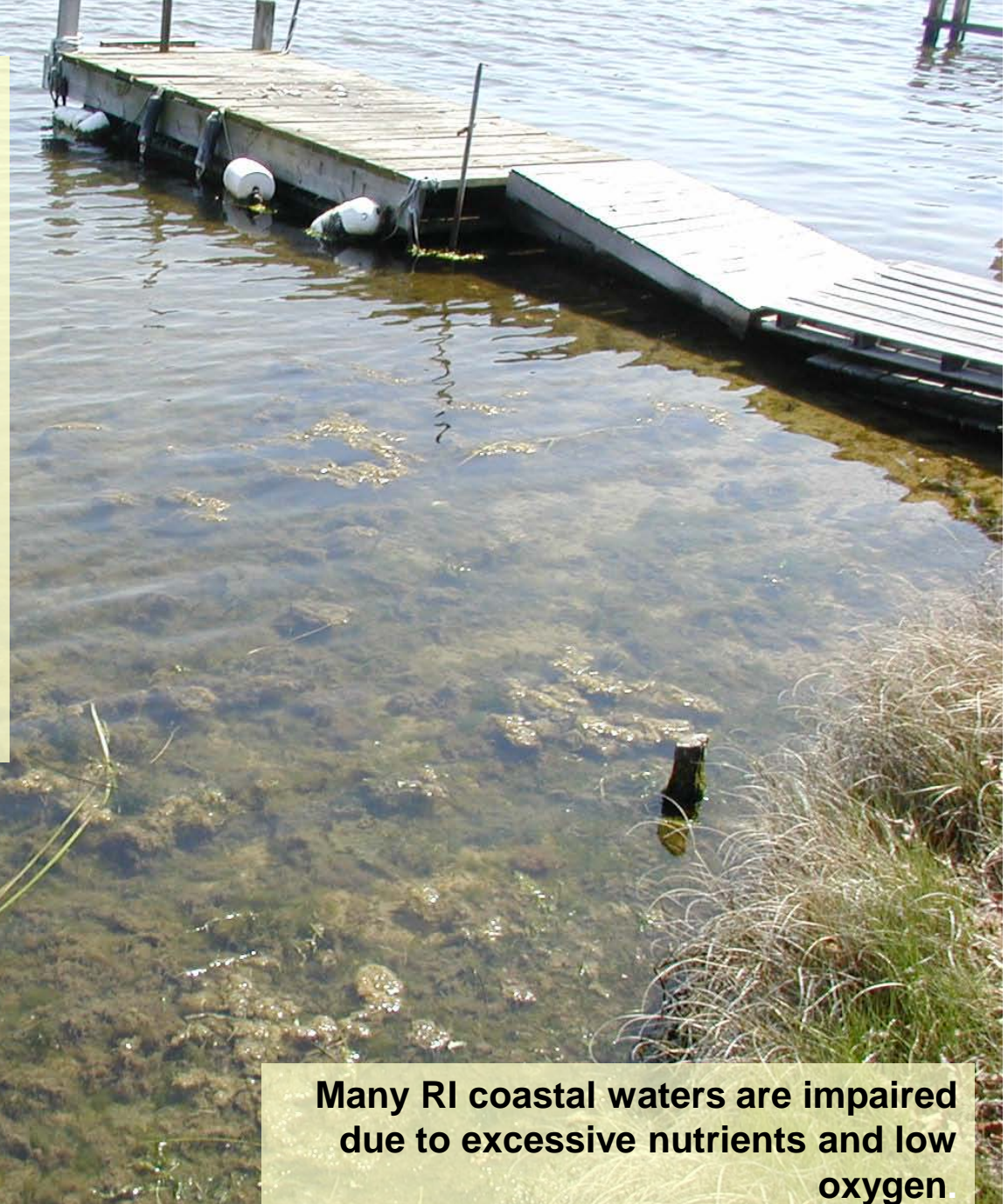
Greenwich Bay fish kill



Nitrogen

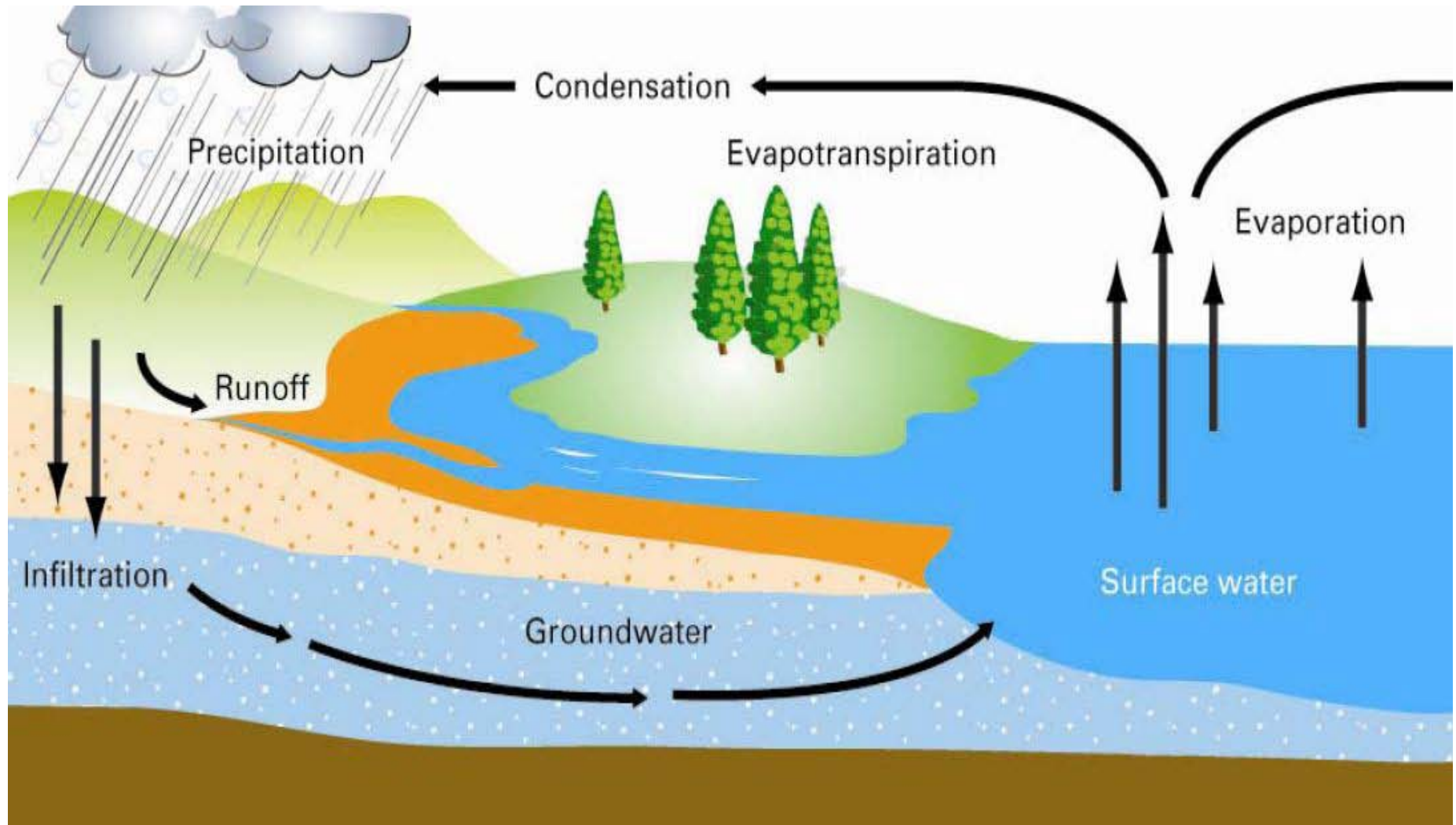
Overfertilizes coastal waters

- 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

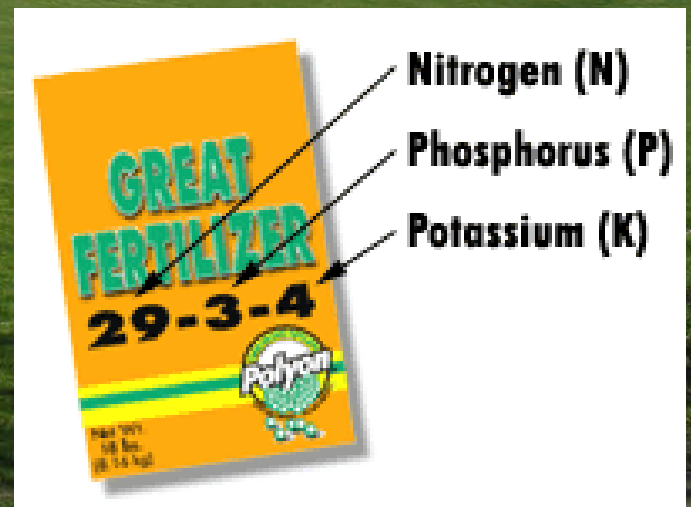
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Water Quality

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- ✓ **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.**



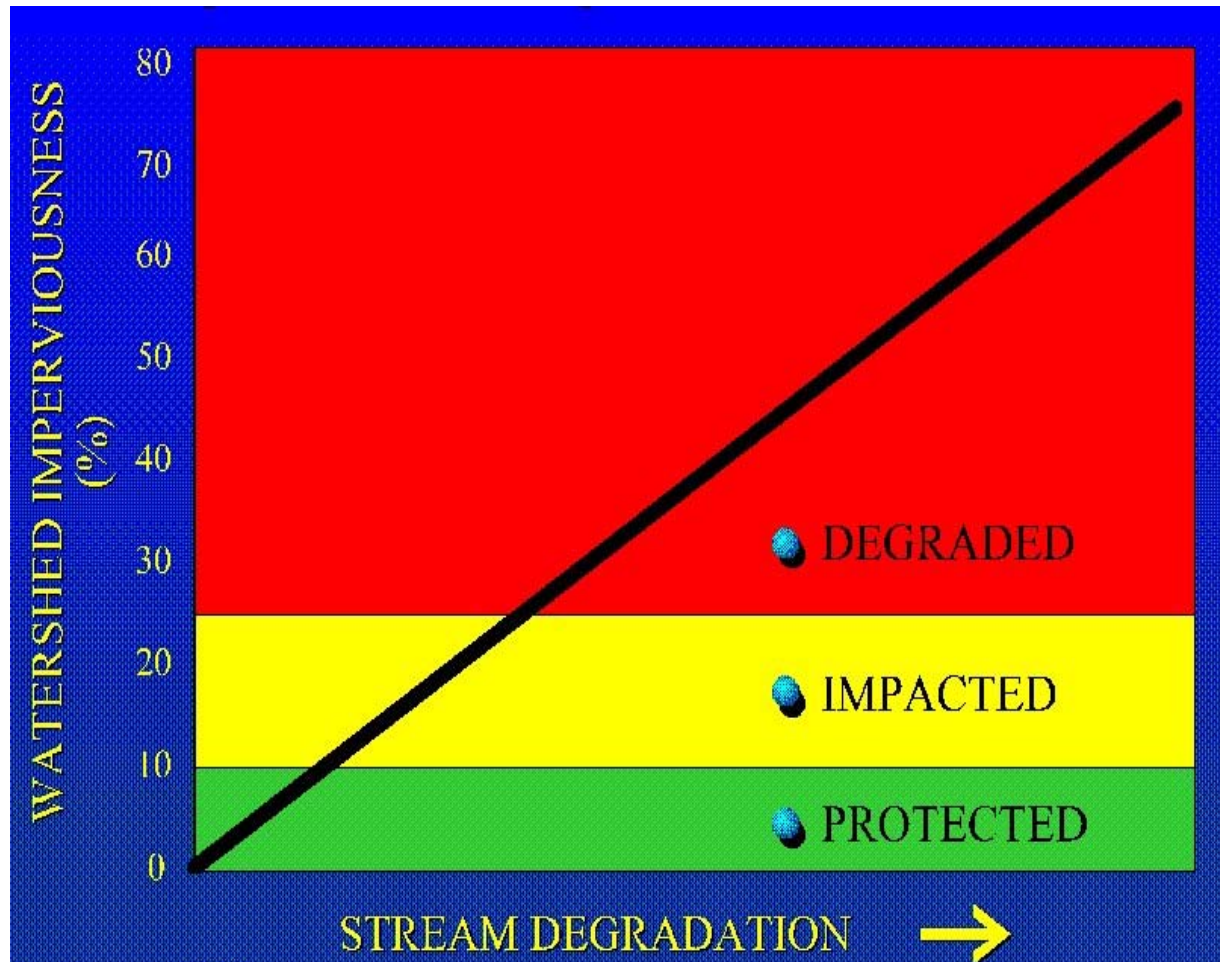
Development Impacts on Water Quality



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)

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

Stream Restoration



