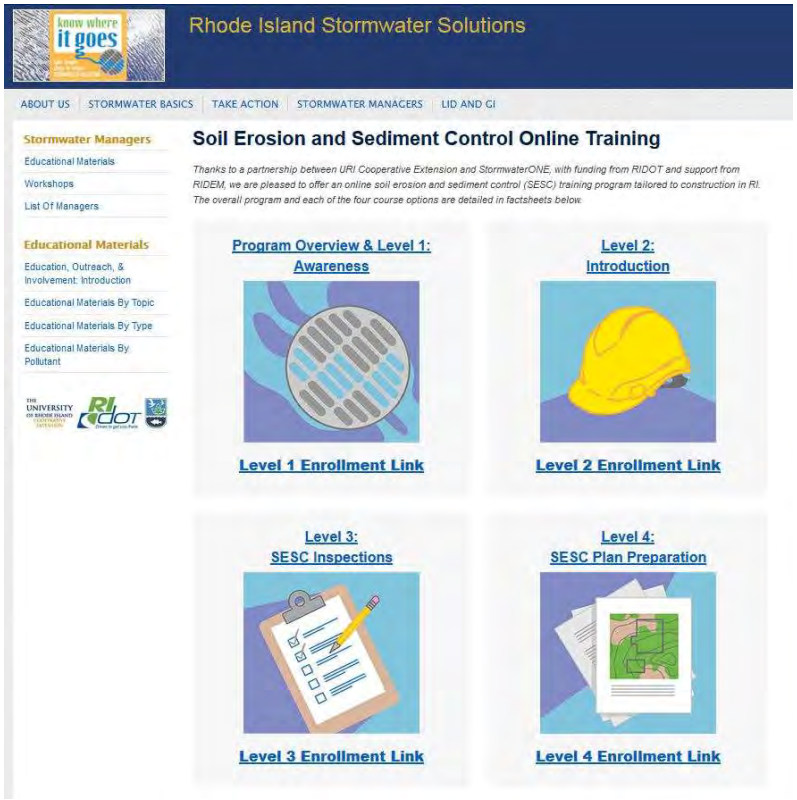
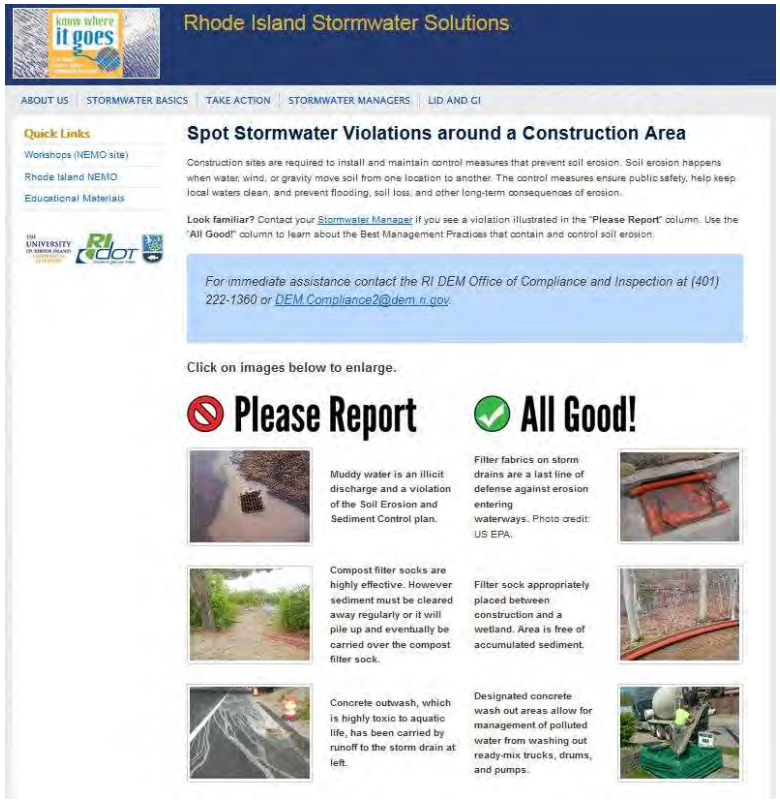
# Practical Tools for Managing Stormwater Runoff

March 9, 2019
Land and Water Summit

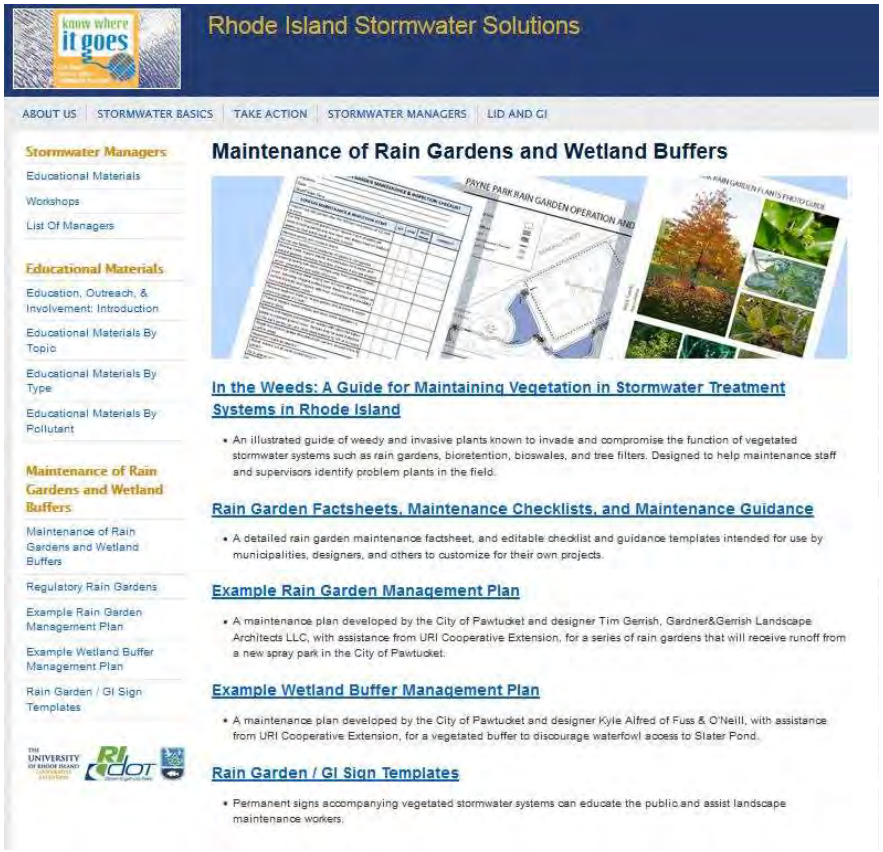
RI DOT Driven to get you there
THE UNIVERSITY OF RHODE ISLAND COOPERATIVE EXTENSION RI NEMO
RIDEM
RHODE ISLAND DEPARTMENT OF HEALTH

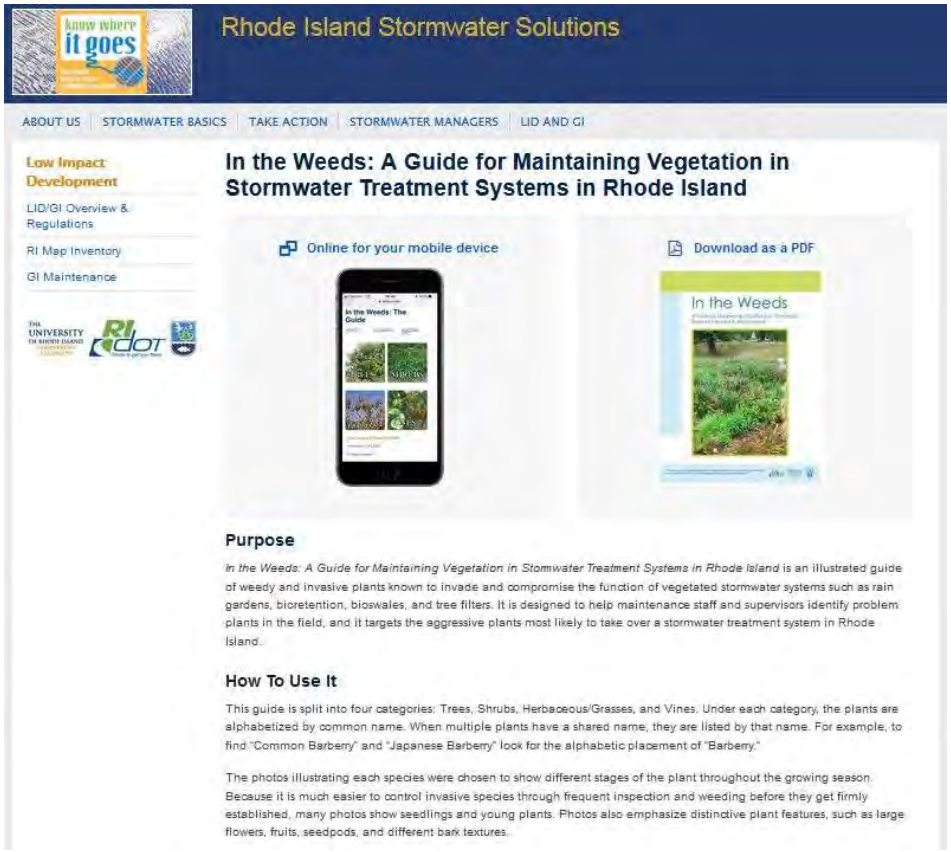
# Today's Highlighted Resources



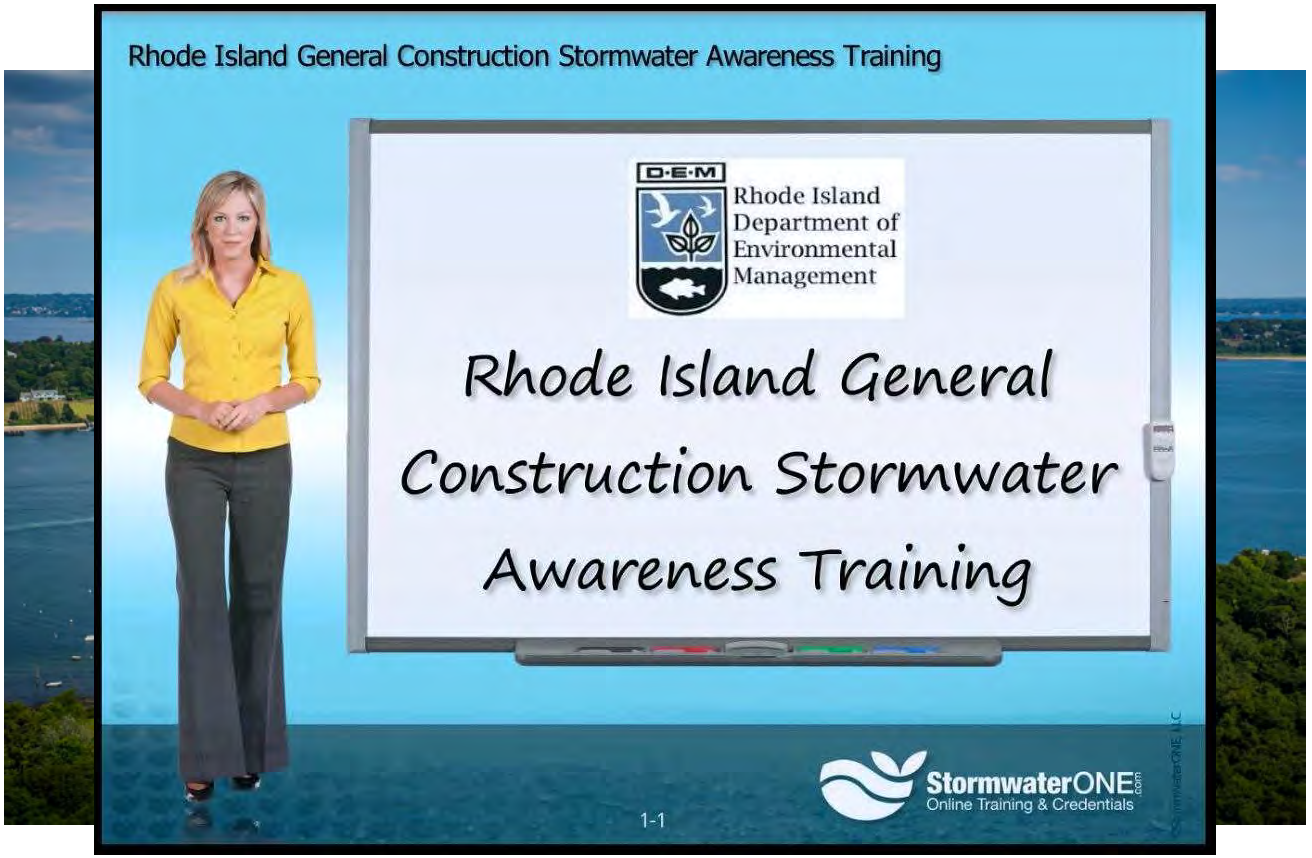



# Highlighted Resources… Continued

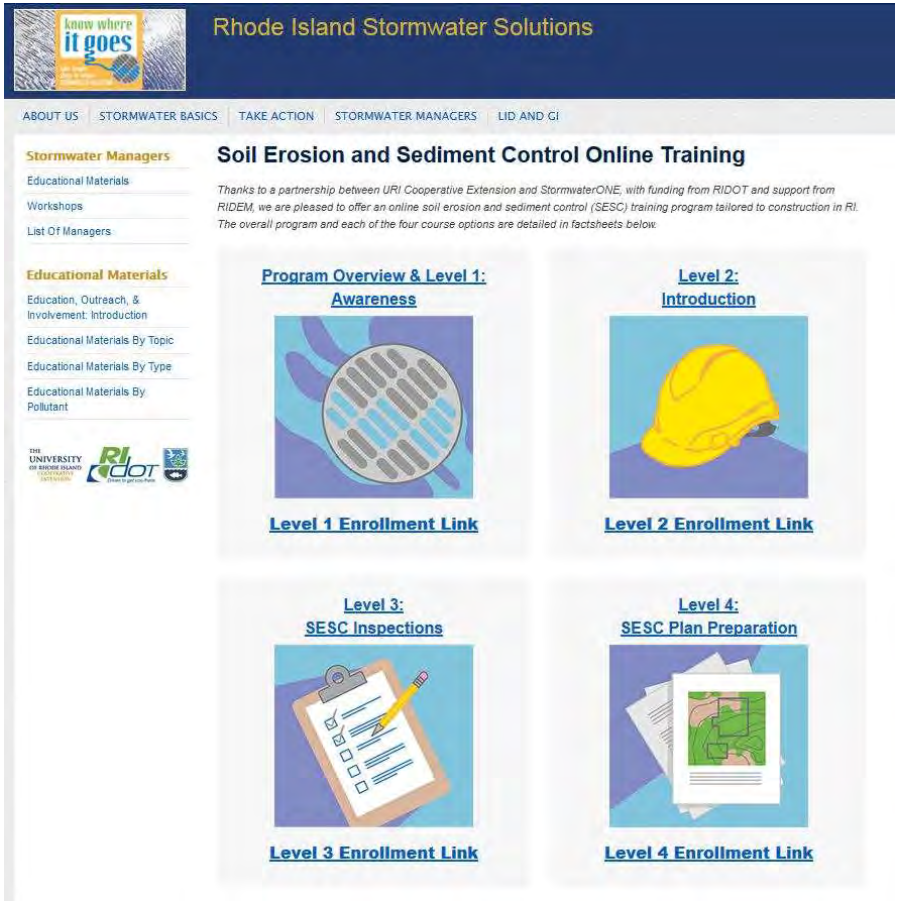


# So Why Are We Here Today?



# Soil Erosion and Sediment Control Training

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# Rhode Island General Construction Stormwater Awareness Training

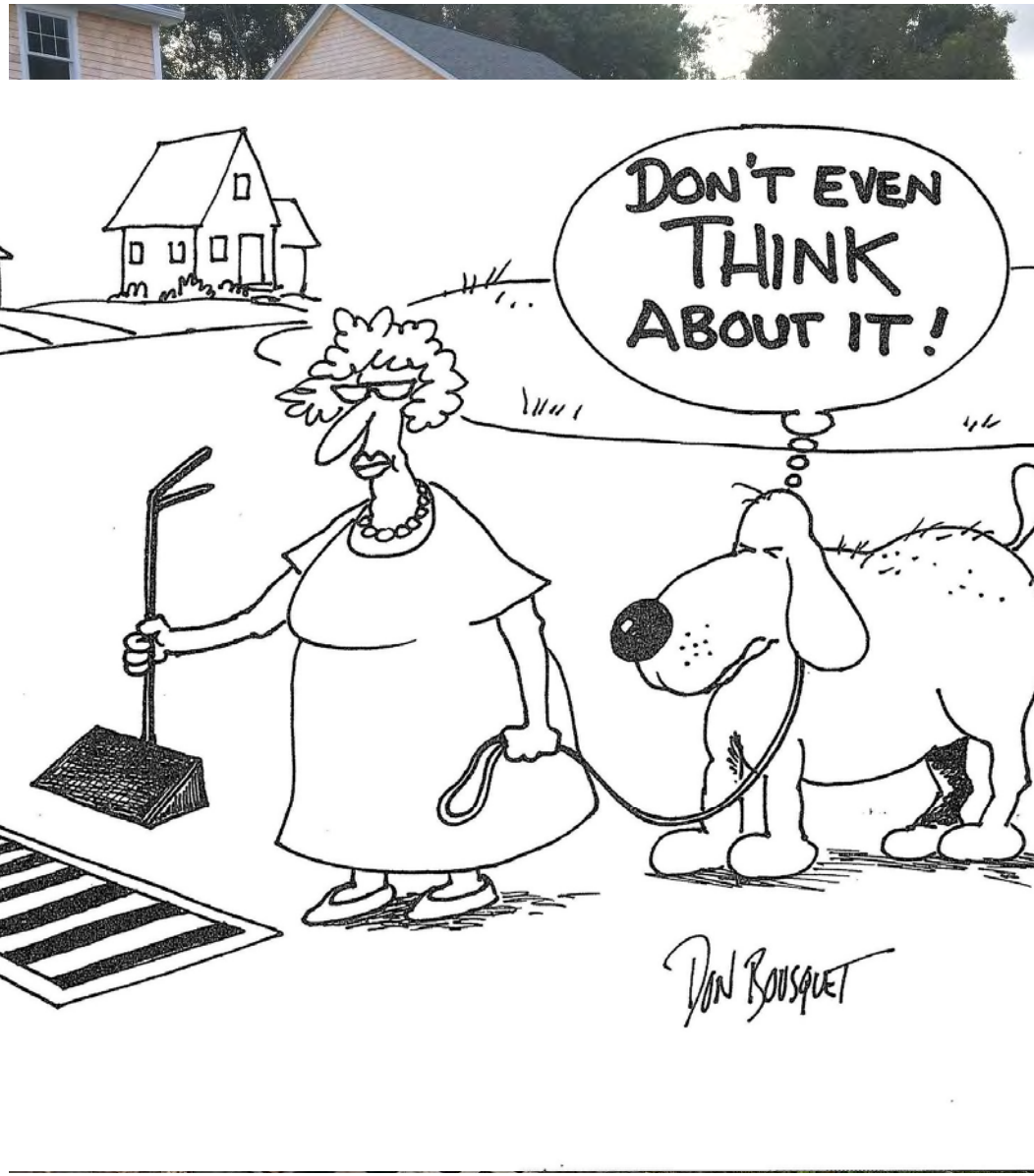
StormwaterONE.com
Online Training & Credentials

# Soil Erosion and Sediment Control Training


*Action Items:*

- ✓ Advocate for this training.
- ✓ Suggest it be required for certain building permit applicants.
- ✓ Share with Land Trust members.
- ✓ Share with construction community.

# Spotting Stormwater Violations



# What's Wrong With This Picture?

www.ristormwatersolutions.org

know where it goes

## Notice: Erosion Control Stormwater Violations

*Construction sites are required to install and maintain control measures that prevent soil erosion (when water, wind, or gravity move soil from one location to another). This ensures public safety, helps keep local waters clean, and prevents flooding, soil loss, and other long-term consequences of erosion.*

***Look familiar?*** *Contact your Stormwater Manager if you see anything from the "Please Report" column, as these are illicit discharges. Use the "All Good!" column to learn about the Best Management Practices that control soil erosion.*

*For immediate assistance with illicit discharging call the RI DEM Office of Compliance and Inspection at (401) 222-1360.*

**Please Report**

Muddy water flowing from construction sites is an illicit discharge.

Concrete outwash, which is highly toxic to aquatic life, was being carried by runoff to a storm drain.

Sediment trapped on the construction side of compost filter socks must be collected and removed regularly.

The sediment in this roadway is a public safety hazard.

A small construction site with no visible erosion control measures. Photo credit: *iowastormwater.org.*

**All Good!**

Filter fabrics on storm drains are a last line of defense against sediment entering waterways. Photo credit: US EPA.

The use of a concrete wash out area allows for containment of water that is generated from washing out ready-mix equipment.

This filter sock is appropriately placed between construction and a wetland. The area is free of accumulated sediment.

Crushed stone has been placed at the construction site access, which reduces sediment being tracked into roadways. Photo credit: *iowastormwater.org.*

Straw mulching is a good way to prevent soil erosion. Photo credit: Barry Tonning at Tetra Tech.

Images not otherwise credited are courtesy of RI DEM.

Produced by URI Cooperative Extension with funding from the RI Department of Transportation and support from the Rhode Island Department of Environmental Management.

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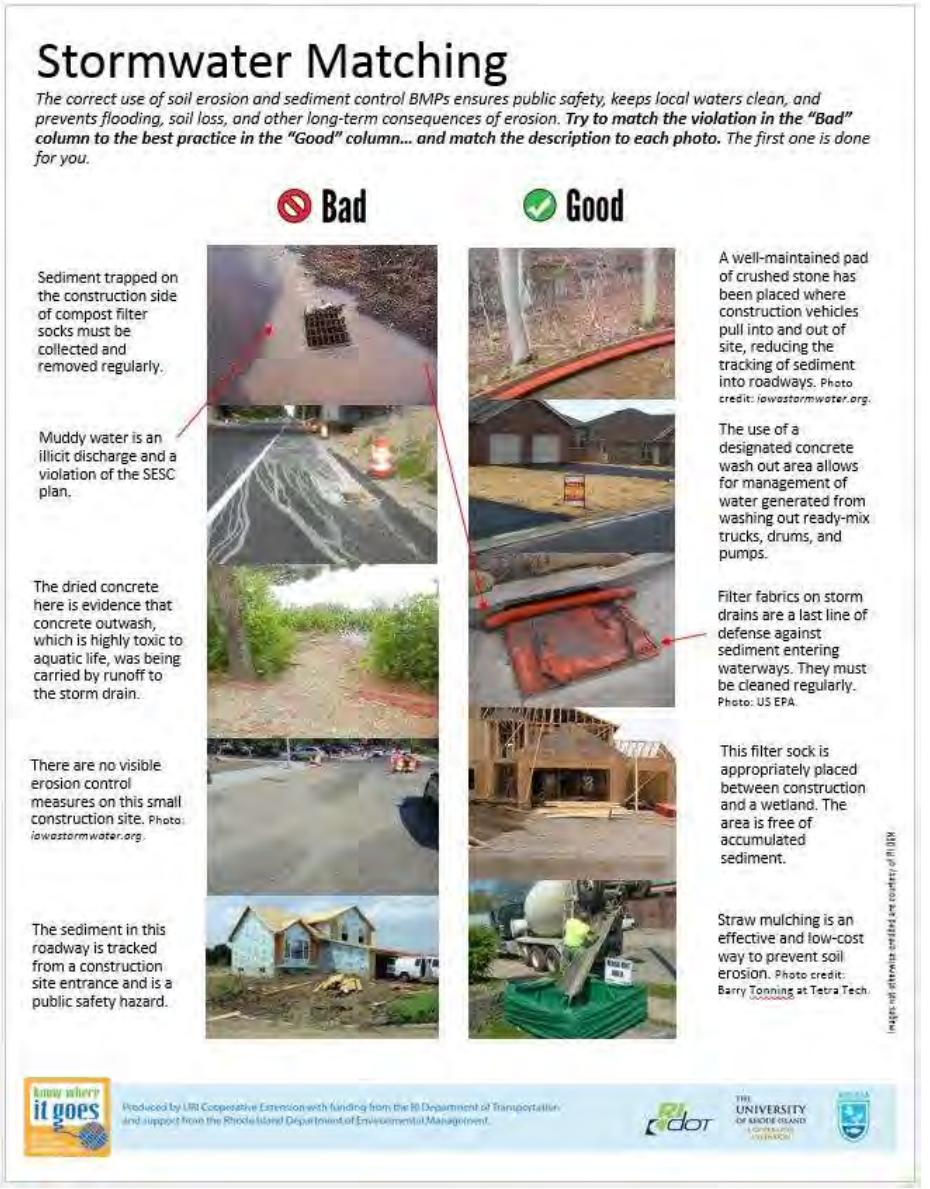

## Stormwater Matching

*The correct use of soil erosion and sediment control BMPs ensures public safety, keeps local waters clean, and prevents flooding, soil loss, and other long-term consequences of erosion.* ***Try to match the violation in the "Bad" column to the best practice in the "Good" column... and match the description to each photo.*** *The first one is done for you.*

**Bad** **Good**

Sediment trapped on the construction side of compost filter socks must be collected and removed regularly.

Muddy water is an illicit discharge and a violation of the SESC plan.

The dried concrete here is evidence that concrete outwash, which is highly toxic to aquatic life, was being carried by runoff to the storm drain.

There are no visible erosion control measures on this small construction site. Photo: *iowastormwater.org.*

The sediment in this roadway is tracked from a construction site entrance and is a public safety hazard.

A well-maintained pad of crushed stone has been placed where construction vehicles pull into and out of site, reducing the tracking of sediment into roadways. Photo credit: *iowastormwater.org.*

The use of a designated concrete wash out area allows for management of water generated from washing out ready-mix trucks, drums, and pumps.

Filter fabrics on storm drains are a last line of defense against sediment entering waterways. They must be cleaned regularly. Photo: US EPA.

This filter sock is appropriately placed between construction and a wetland. The area is free of accumulated sediment.

Straw mulching is an effective and low-cost way to prevent soil erosion. Photo credit: Barry Tonning at Tetra Tech.

Images not otherwise credited are courtesy of RI DEM.

know where it goes

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# Spotting Stormwater Violations


Action Items:

- ✓ Think about sediment. Think about storm drains. Know what to report!
- ✓ Report violations.
- ✓ Share this information!
- ✓ Continue to report!
- ✓ Help organize an event.

# Rain Garden Maintenance

know where it goes

www.stormwatersolutions.org

# Maintenance and Care of a Rain Garden

Updated 2019

## What is a Rain Garden?

Rain gardens are designed to capture stormwater runoff from nearby impervious areas like rooftops and driveways so that rainwater can soak into the ground below, where pollutants are gradually filtered out instead of entering waterways. Simple inlet and outlet structures made from pipe, stone, or both help water enter and leave the garden. Rain gardens can be planted with a variety of native plants and maintained to appear anywhere from manicured to naturalistic.

*Above: image of residential rain garden courtesy of University of New Hampshire*

## Healthy & Functional

Any landscaped area requires maintenance—rain gardens are no different. Along with basic steps for maintaining plant health such as watering and weeding, rain gardens also require some attention to how water moves in and out and keeping edges and berms intact to prevent erosion from taking place. Regular inspections and maintenance will keep your rain garden healthy and allow it to soak up and clean plenty of stormwater.

*Volunteers maintain the rain garden at Southside Cultural Center in Providence by weeding.*

Produced by URI Cooperative Extension with funding from the RI Department of Transportation and support from the Rhode Island Department of Environmental Management.

## Maintenance Checklist

### WEEKLY

- [ ] **Water** 1 inch per week including rainfall for the first 3 years. Water new trees and shrubs weekly until soil at depth of roots is moist. Water established rain gardens during summer droughts and unseasonably hot and dry periods.
- [ ] **Weed** regularly, before seeds can spread.*
- [ ] **Mow** lawn around rain garden and direct clippings away from the rain garden as they can cause clogging. **Do not mow** rain garden plants (unless garden is designed to be mowed).
- [ ] **Clean up** trash, organic debris, and pet waste from within and around garden.
- [ ] **Inspect** the rain garden bed for standing water lasting over 48 hours after a heavy rain. This indicates a clogged surface layer.*

### MONTHLY, *following heavy rain, or as needed.*

- [ ] **Replace plants** that are not thriving with approved native plants to maintain ground cover. Annuals may also be used to maintain ground cover.
- [ ] **Remove sediment buildup** from inflow structure and any flow channels (including gutters if they are directed toward garden) and from bed of rain garden when it accumulates 1 inch of sediment.
- [ ] **Cut back perennials** and mow tall grasses (removing clippings) in the fall, or leave task until early spring for winter interest and to provide habitat for birds and other wildlife.
- [ ] **Prune** trees and shrubs to encourage growth in the spring or fall.
- [ ] **Repair gullies** and any other problems caused by soil erosion in or near the rain garden.*
- [ ] **Stabilize soil** if there is erosion on areas draining to the rain garden. Cover bare soil with mulch or reseed.
- [ ] **Fill animal burrows** and gently pack if there are any in or around rain gardens.
- [ ] **Replenish mulch** once per year to a depth of 2-3", using shredded non-dyed hardwood mulch.
- [ ] **Never fertilize** rain garden, apply pesticides, or add compost. Fertilizer and compost add nutrients that are not needed.

**See the Troubleshooting page for more information and guidance.*

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**Problem** Deep gullies are forming within a rain garden.

Above images courtesy of Rutgers University

**Solution** Add river rock and more plants to better dissipate the flow of water.

**Problem** There is sediment build-up in the inlet, covering the river rock, allowing plants to take root, and blocking flow into the garden.

**Solution** Weed as needed and remove sediment and other debris. Look for bare soil in the area draining to rain garden and correct the problem at the source. Above is a typical rain garden inlet. The stone and pipe will need cleaning out from time to time.

**Problem** The lowest points in the rain garden have begun to gather dark sediment build-up over the brighter mulch layer.

**Solution** Carefully remove top layer of sediment with a flat shovel to prevent or stop clogging. Add fresh mulch if needed.

# Troubleshooting

At some point a rain garden may begin to exhibit signs of trouble. This is normal: in order to function optimally, rain gardens almost always require some adjustment over time, especially when newly installed. Make a habit of inspecting the rain garden regularly, especially during and after heavy rains.

**Plants are not thriving/are dying...** When plants die and leave voids in the garden they must be replaced. The cause of poor plant health should be diagnosed before the plants are replaced. For assistance, contact URI Master Gardeners March – October, Monday – Thursday, 9:00 AM – 2:00 PM by phone **(401) 874 - 4836** or by email **gardener@uri.edu**.

**The original rain garden plants are being joined or outcompeted by invading plants...** For help identifying weeds refer to ***In the Weeds***, a stormwater system weed identification guide available to print or use from your mobile device at web.uri.edu/riss/in-the-weeds-a-guide/.

**It looks like soil is moving within, into, or out of the rain garden...** Erosion within the system signals different problems depending upon location.

- Erosion **throughout the garden** in the form of rills and gullies means energy dissipators like stones must be adjusted or added in order to spread the flow of water more evenly over the garden.
- Erosion **at the edge of the garden** indicates that runoff is entering at other points in addition to the inlet area—check that edges are intact or construct a berm to correct this.
- Erosion **near or past the overflow** means the rain garden is too small to handle the amount of runoff that it is receiving. Enlarge the footprint of the garden.

**Sediment is building up in the rain garden...** When sediment is building up at the inflow structure or on top of the mulch in the bed of the rain garden, then erosion is likely taking place outside of the rain garden. Remove the sediment build-up in the garden and check the contributing area, stabilizing the soil there if needed. If gutters are connected to the rain garden, they should be cleaned out regularly.

**The rain garden has standing water over 48 hours after a rain storm...** Stormwater is meant to pool in the rain garden for some time before infiltrating, but water standing over 48 hours after a rainfall indicates that the rain garden is clogged. Sediment entering the garden can form a visible crust that will prevent drainage. If this happens, remove about 2" of surface crust and mulch with a flat shovel and replace with fresh soil mixture and shredded non-dyed hardwood mulch. If the standing water problem persists, amend the rain garden soil with coarse sand or adjust the overflow structure to let more water out during a rain storm.

**The rain garden looks different than when it was first installed...** Rain gardens will change over time. Plants that are most adapted to the site may multiply while others die out, shrubs and trees may begin to dominate, and new plants may settle in (and attract native pollinators). This naturalized look does not affect the functioning of the rain garden. If a more manicured look is preferred it can be achieved with weeding and pruning.

# SLATER PARK WATERFOWL BUFFER PLANTS PHOTO GUIDE

**BUFFER A**

SWEET FLAG *Acorus americanus*

ARROW ARUM *Peltandra virginica*

**BUFFER B**

TUSSOCK SEDGE *Carex stricta*

FOX SEDGE *Carex vulpinoidea*



SA2P
Prepared by URI Cooperative Extension with funding from Rhode Island Department of Transportation

# SLATER PARK WATERFOWL BUFFER PLANTING PLAN


## KEY

PLANTED BEDS

EXISITING TREE

**BUFFER A**

| *Botanical name* | Common name |
|---|---|
| *Acorus americanus* | Sweet Flag |
| *Peltandra virginica* | Arrow Arum |

**BUFFER B**

| *Botanical name* | Common name |
|---|---|
| *Carex stricta* | Tussock Sedge |
| *Carex vulpinoidea* | Fox Sedge |

**BUFFER C**

| *Botanical name* | Common name |
|---|---|
| *Iris versicolor* | Blue Flag Iris |
| *Lobelia cardinalis* | Cardinal Flower |
| *Lobelia spicata* | Pale-spike Lobelia |

**BUFFER D**

| *Botanical name* | Common name |
|---|---|
| *Schizachyrium scoparium 'The blues'* | The Blues Little Bluestem |

Prepared by City of Pawtucket, designer Kyle Allred of Fuss & O'Neill, and, with funding from Rhode Island Department of Transportation, URI Cooperative Extension

# Rain Garden Maintenance


Action Items:

- ✓ Consider a rain garden… and a sign!
- ✓ Share with friends.
- ✓ Share with town staff and boards.
- ✓ Explore “adopting” a town BMP.

# In The Weeds

Use your phone (or work with your neighbor) to search:

“In the Weeds RI”

Using that mobile guide, try to determine what your picture is.



5455


5453729
Cat. No. 09-016
Fisher Scientific
5539378

# In The Weeds


Action Items:

- ✓ Learn to spot species that can easily overtake vegetated stormwater systems.
- ✓ If you see town BMPs that are being overtaken, bring it to their attention!
- ✓ But share this resource…. so that only the invasives are removed.

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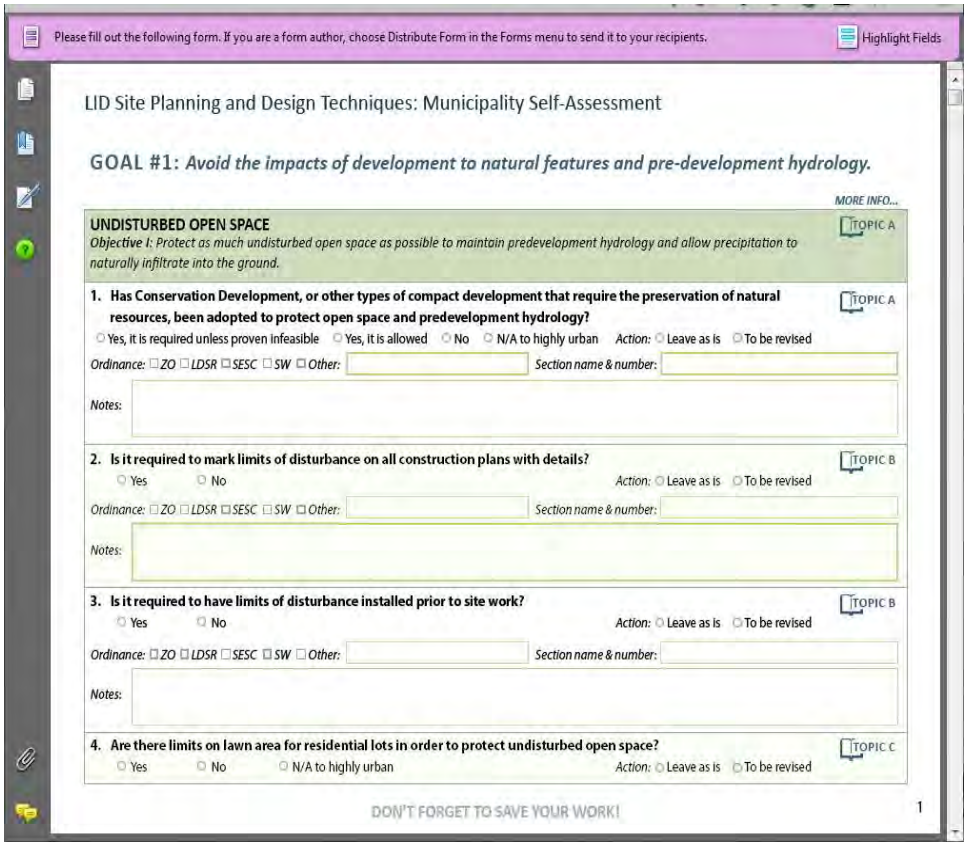
# Rhode Island General Construction Stormwater Awareness Training

StormwaterONE.com
Online Training & Credentials

# Putting It All Together



Please fill out the following form. If you are a form author, choose Distribute Form in the Forms menu to send it to your recipients. Highlight Fields

LID Site Planning and Design Techniques: Municipality Self-Assessment

GOAL #1: *Avoid the impacts of development to natural features and pre-development hydrology.*

MORE INFO...

**UNDISTURBED OPEN SPACE** TOPIC A

*Objective I: Protect as much undisturbed open space as possible to maintain predevelopment hydrology and allow precipitation to naturally infiltrate into the ground.*

**1. Has Conservation Development, or other types of compact development that require the preservation of natural resources, been adopted to protect open space and predevelopment hydrology?** TOPIC A

○ Yes, it is required unless proven infeasible ○ Yes, it is allowed ○ No ○ N/A to highly urban *Action:* ○ Leave as is ○ To be revised

*Ordinance:* ☐ ZO ☐ LDSR ☐ SESC ☐ SW ☐ *Other:* *Section name & number:*

*Notes:*

**2. Is it required to mark limits of disturbance on all construction plans with details?** TOPIC B

○ Yes ○ No *Action:* ○ Leave as is ○ To be revised

*Ordinance:* ☐ ZO ☐ LDSR ☐ SESC ☐ SW ☐ *Other:* *Section name & number:*

*Notes:*

**3. Is it required to have limits of disturbance installed prior to site work?** TOPIC B

○ Yes ○ No *Action:* ○ Leave as is ○ To be revised

*Ordinance:* ☐ ZO ☐ LDSR ☐ SESC ☐ SW ☐ *Other:* *Section name & number:*

*Notes:*

**4. Are there limits on lawn area for residential lots in order to protect undisturbed open space?** TOPIC C

○ Yes ○ No ○ N/A to highly urban *Action:* ○ Leave as is ○ To be revised

DON'T FORGET TO SAVE YOUR WORK!

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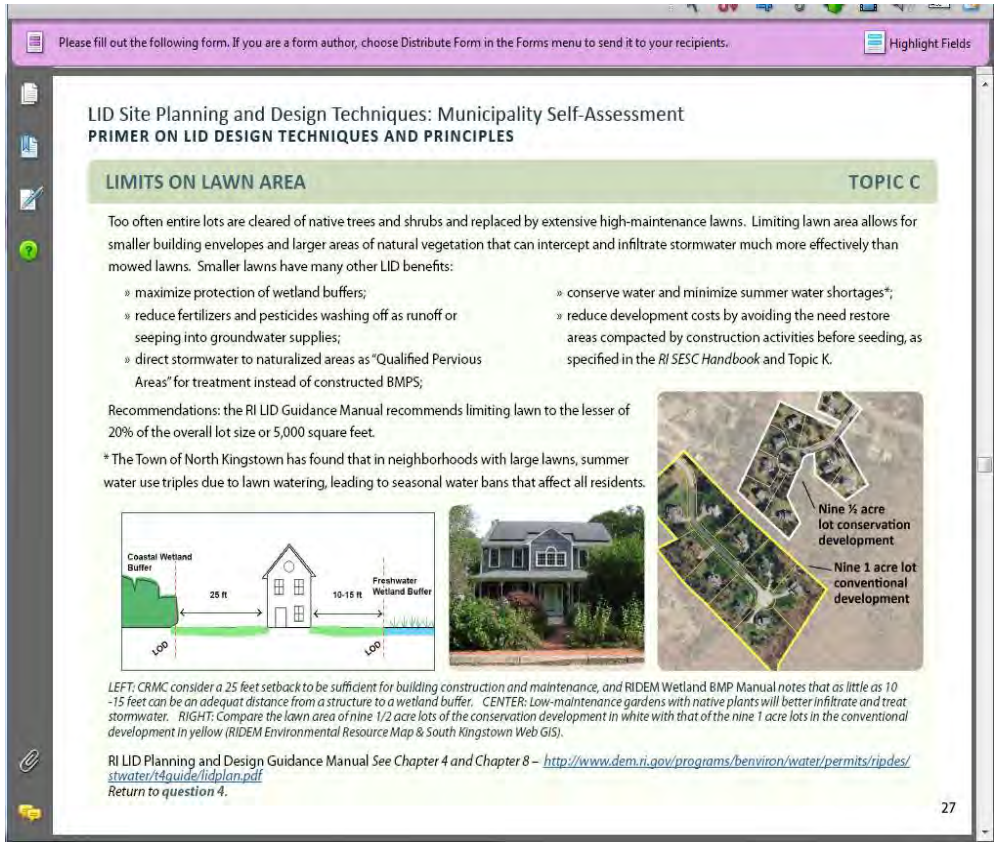

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LID Site Planning and Design Techniques: Municipality Self-Assessment

**PRIMER ON LID DESIGN TECHNIQUES AND PRINCIPLES**

## LIMITS ON LAWN AREA — TOPIC C

Too often entire lots are cleared of native trees and shrubs and replaced by extensive high-maintenance lawns. Limiting lawn area allows for smaller building envelopes and larger areas of natural vegetation that can intercept and infiltrate stormwater much more effectively than mowed lawns. Smaller lawns have many other LID benefits:

- » maximize protection of wetland buffers;
- » reduce fertilizers and pesticides washing off as runoff or seeping into groundwater supplies;
- » direct stormwater to naturalized areas as "Qualified Pervious Areas" for treatment instead of constructed BMPS;
- » conserve water and minimize summer water shortages*;
- » reduce development costs by avoiding the need restore areas compacted by construction activities before seeding, as specified in the *RI SESC Handbook* and Topic K.

Recommendations: the RI LID Guidance Manual recommends limiting lawn to the lesser of 20% of the overall lot size or 5,000 square feet.

* The Town of North Kingstown has found that in neighborhoods with large lawns, summer water use triples due to lawn watering, leading to seasonal water bans that affect all residents.









*LEFT: CRMC consider a 25 feet setback to be sufficient for building construction and maintenance, and* RIDEM Wetland BMP Manual *notes that as little as 10 -15 feet can be an adequat distance from a structure to a wetland buffer. CENTER: Low-maintenance gardens with native plants will better infiltrate and treat stormwater. RIGHT: Compare the lawn area of nine 1/2 acre lots of the conservation development in white with that of the nine 1 acre lots in the conventional development in yellow (RIDEM Environmental Resource Map & South Kingstown Web GIS).*

RI LID Planning and Design Guidance Manual *See Chapter 4 and Chapter 8 –* http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/t4guide/lidplan.pdf

*Return to question 4.*

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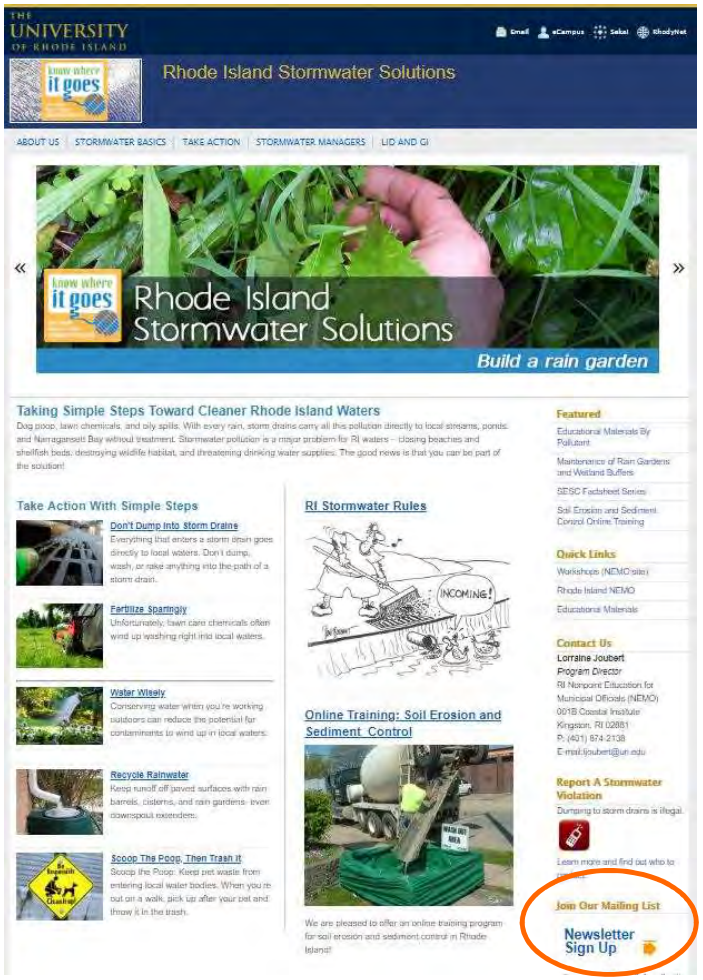
# Where Can I Find All This Information?

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Lorraine Joubert
ljoubert@uri.edu
401.874.2138

Lisa DeProspo Philo
lphilo@uri.edu
401.874.5687