

Going Green - Using Bio-retention to Improve Water Quality in Two Coastal Watersheds

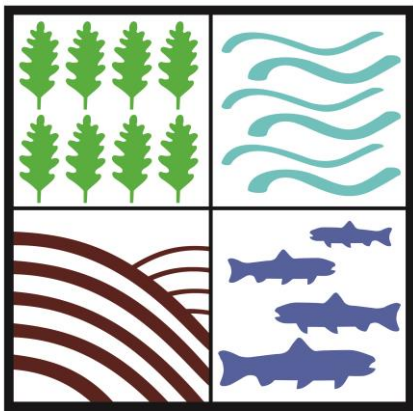


Judy Rondeau
Eastern Connecticut
Conservation District
May 18, 2015



What is the Eastern Connecticut Conservation District?





The Eastern Connecticut Conservation District, Inc.



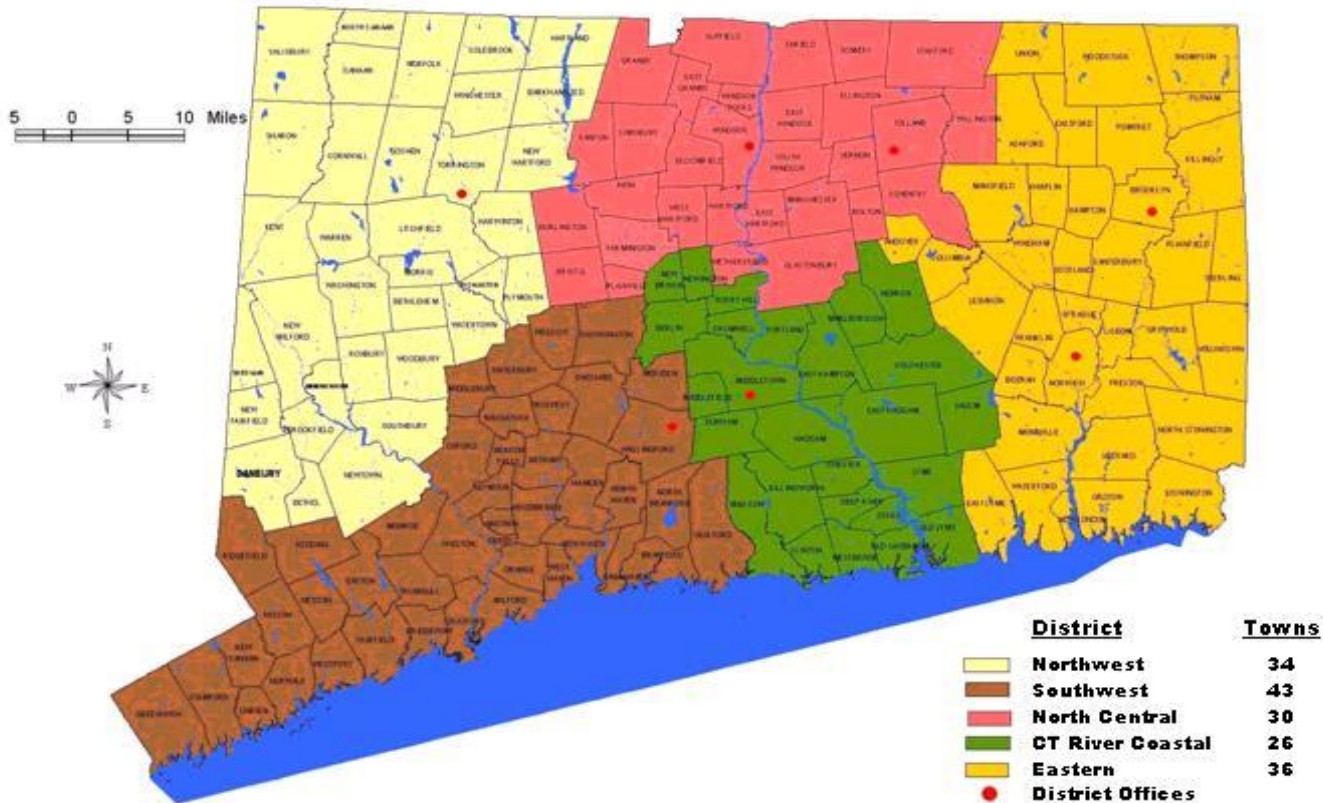
A Not-For-Profit
Natural Resource Conservation
Organization



Connecticut's Five Conservation Districts



Connecticut Conservation Districts



ECCD Board of Directors



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ECCD Staff

Dan Mullins, Executive Director

Kate Johnson, Office Manager

Judy Rondeau, Natural Resource Specialist

Jean Pillo, Watershed Conservation Project Manager

Matt Snurkowski, Conservation Technician





ECCD Intern

Environmental
Earth Science
Student at
ECSU



Primary Activities



1. **Conduct projects, watershed management investigations and test new conservation methods**
2. **Present workshops on natural resource topics**
3. **Assist Town "Land Use" Commissions with environmental reviews of development plans**
4. **Work with local citizens and towns to raise awareness of natural resource concerns**

Projects



- **Agriculture BMPs**
- **Urban Stormwater BMPs**
- **Water Quality Investigations**
- **Habitat Restoration**
- **Education and Outreach**
- **Contract Services**
- **Site Plan Reviews**
- **Technical Assistance**



We Even Own a Fishway!



Hallville Fishway, Preston

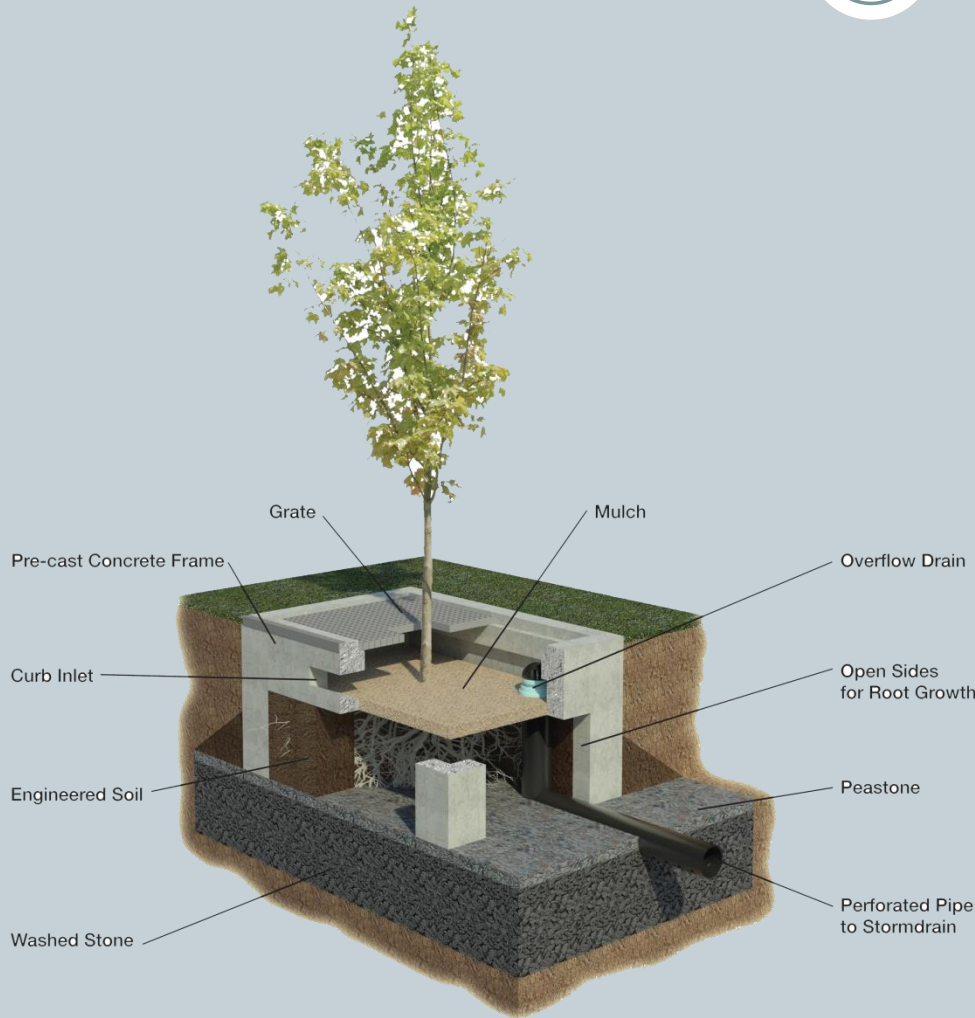
Three alewife passing through in April 2014.



On To the Tree Filters!



Tree Filters are...



A Low Impact Development practice that uses Bio-retention to treat stormwater through the process of Bio-remediation...

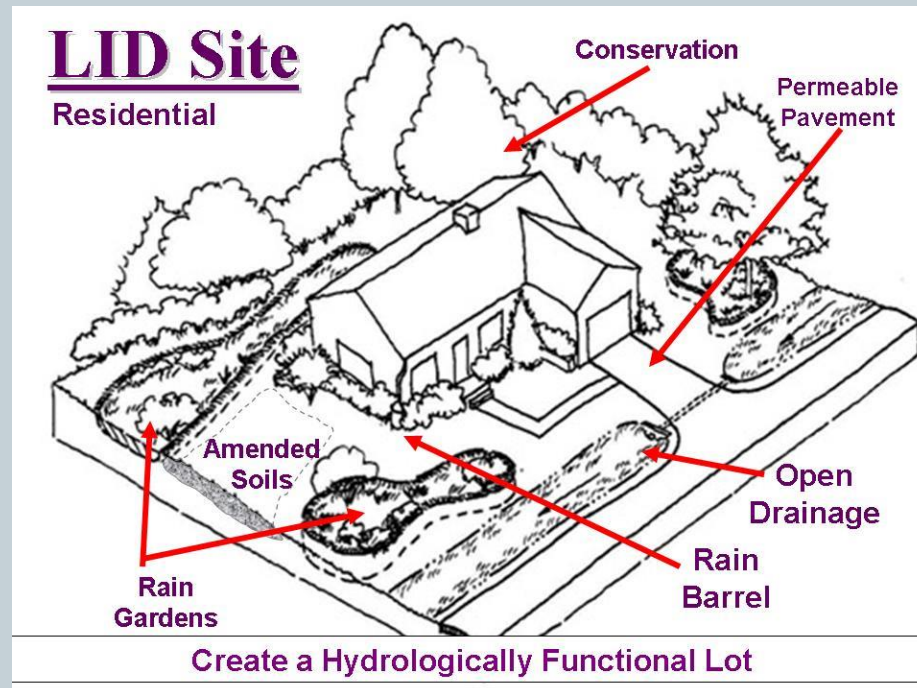
Bio-retention is...



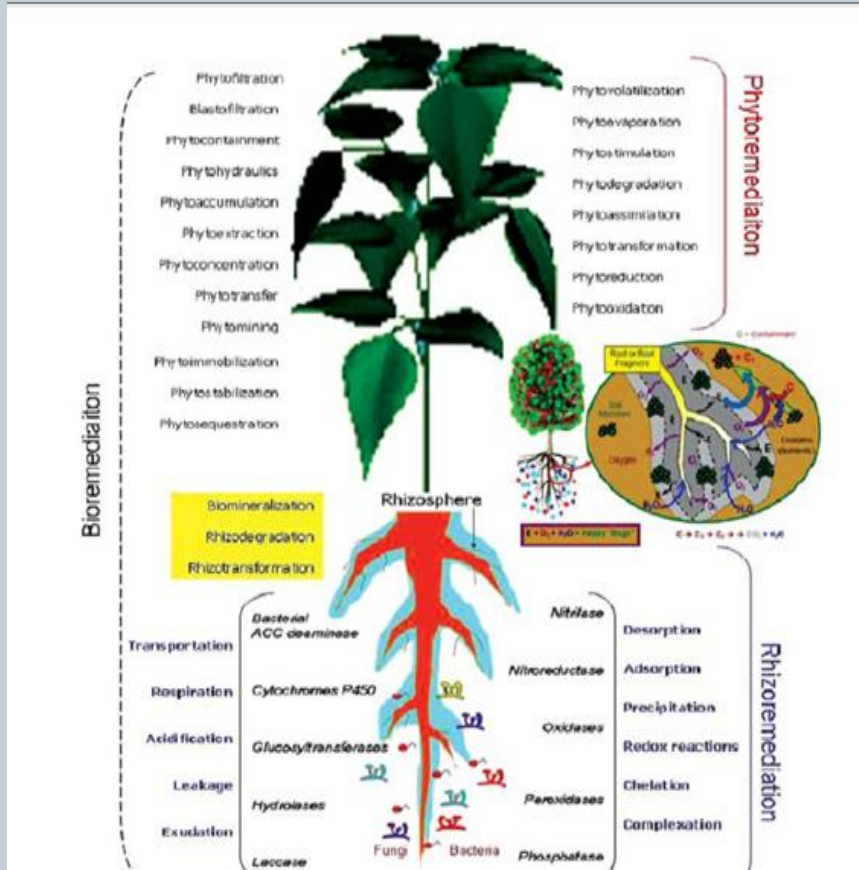
...the use of plants and soils in the removal of pollutants from stormwater runoff.

Low Impact Development (LID) is...

...both a development strategy and a series of stormwater management practices that are designed to mimic the pre-development site hydrology.

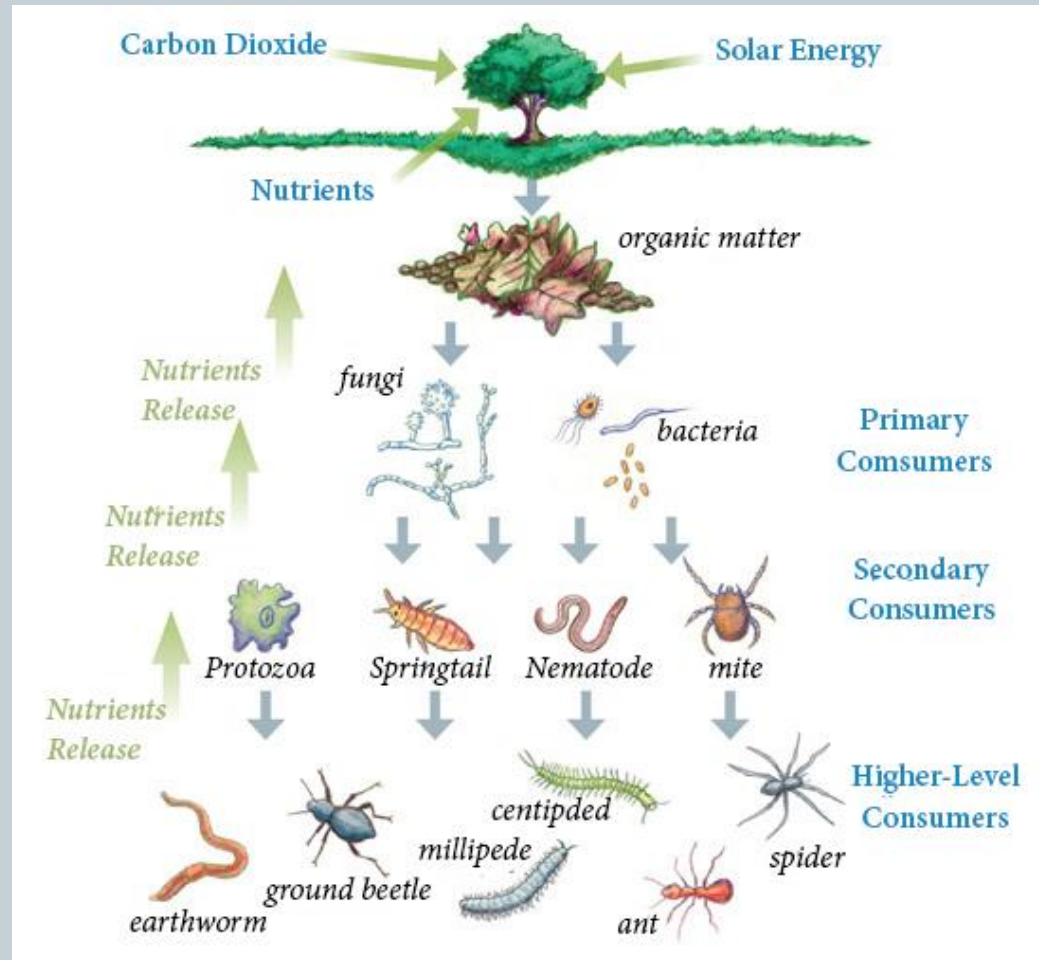


Bio-remediation is...



...the use of plants and soil micro-organisms to remove, neutralize or transform contaminants in water, soil, or the air.

Bugs and Grubs and Worms and Microbes

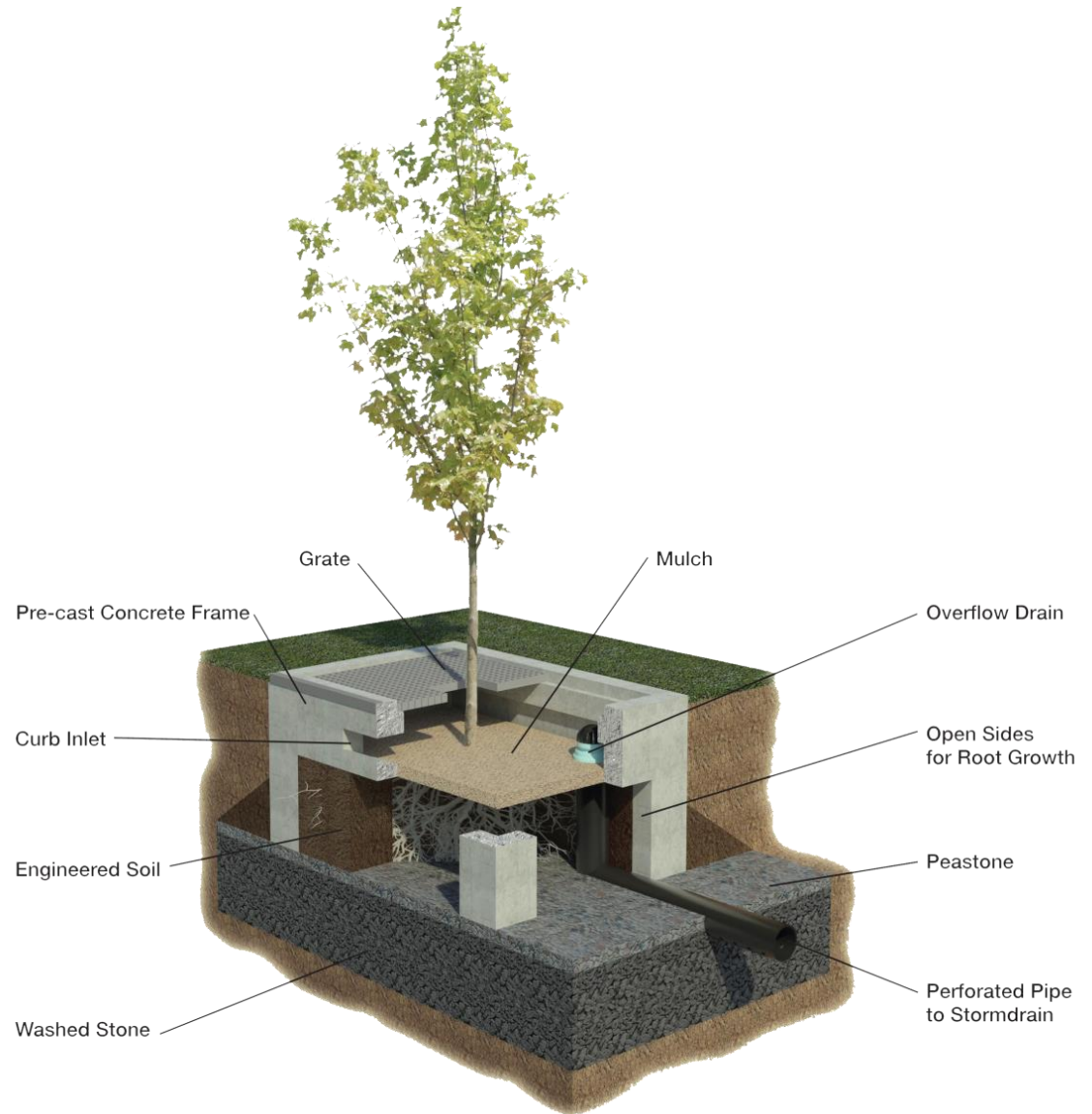


How do Tree Filters Work?



Image - ECCD 2012

How Do Tree Filters Work?



Colony Road Tree Filters, East Lyme

ECCD, in partnership with the Town of East Lyme and CT DEEP, installed five tree filter units in the Colony Road neighborhood in East Lyme to treat storm water prior to its discharge to Latimer Brook, a tributary to the Niantic River.



Colony Road Tree Filters



Image - www.republikaioar.org

Latimer Brook is listed as impaired for recreation by CT DEEP due to periodic high levels of bacteria.



Colony Road Tree Filters

Colony Road Neighborhood



Colony Road Tree Filters

Tree Filter Locations



Colony Road Tree Filters



First, Call Before You Dig!

Colony Road Tree Filters



The Contractor

Colony Road Tree Filters



Construction permits
obtained, Erosion & Sediment
Controls in place

Colony Road Tree Filters



Excavation

Colony Road Tree Filters



Install overflow pipe.

Colony Road Tree Filters



Connecting overflow pipe to
catch basin.

Colony Road Tree Filters



Drainage gravel installed.



Colony Road Tree Filters



Tree Filter Frame

Colony Road Tree Filters



Off-loading the frames.

Colony Road Tree Filters



Setting frame in place.



Colony Road Tree Filters



Tree filter frame leveled and
ready for soil and tree.



Colony Road Tree Filters



Tree set in place and special
soil mix added.



Colony Road Tree Filters



Open frame design allows for greater filtering, infiltration, and tree root growth.

Colony Road Tree Filters



Tree planting completed.



Colony Road Tree Filters



Overflow intake shows the potential depth of standing water the unit can hold.

Colony Road Tree Filters



**Tree and plastic grate
installed.**

Colony Road Tree Filters



*Grate comes in two sections
for easy access and cleaning.*

Colony Road Tree Filters



Curb cut and inlet to tree filter.

Colony Road Tree Filters



Close-up of curb opening.

Colony Road Tree Filters



Seeding and mulching.

Colony Road Tree Filters



Barbara and Bob Merrill
Green Street Systems, LLC.
of Hanover, MA.

Image - ECCD 2012



Colony Road Tree Filters



Colony Road Tree Filters



What is a Tree Filter?

A Tree Filter unit is a mini-water treatment system that helps clean stormwater by filtering the water through a special soil mix which removes pollutants. The Tree Filter is designed to capture at least the first inch of rainfall, or "first flush," which is known to contain the highest amount of nonpoint source pollution. Each Tree Filter unit in this neighborhood is designed to treat stormwater from an area approximately 1/4 to 1/2 acre.

What is Nonpoint Source Pollution?

Nonpoint source pollution (NPS) is pollution that cannot be traced back to a discernible "point" such as a factory or sewer pipe. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, depositing them into lakes, rivers, wetlands, coastal waters and ground waters. These pollutants can harm fish and wildlife populations, kill native vegetation, foul drinking water, and make recreational waters unsafe and unpleasant.

Pollutants from runoff can include:

- Sediment
- Oil, grease and toxic chemicals from motor vehicles
- Pesticides and fertilizers from lawns and gardens
- Viruses, bacteria and nutrients from pet waste and failing septic systems
- Road salts
- Heavy metals from roof shingles, motor vehicles and other sources
- Thermal pollution from dark impervious surfaces such as streets and rooftops

How Do Tree Filters Work?

Tree Filters work in tandem with existing storm drain systems. Stormwater flows down the gutter into the Tree Filter, where the water percolates through a special, engineered soil that removes many of the pollutants. This treated water then either infiltrates into the surrounding "native" soil, or collects in a perforated pipe at the bottom of the unit that is connected to the nearby storm drain. Tree Filters harness the power of nature to do their work. Microbes in the soil capture and break down pollutants, even oil and gasoline. The tree also works, absorbing nutrients to help it grow, and neutralizing some pollutants by absorbing them into its tissue. Additionally, because the engineered soil does not freeze, Tree Filters work year 'round, cleaning stormwater even in the winter.

Why Have Tree Filters Been Installed In This Neighborhood?

The Colony Road Tree Filters are designed and situated to treat stormwater runoff before it enters Latimer Brook, the stream near where you are standing. Latimer Brook is the primary tributary to the Niantic River, and research has shown that pollution entering the Niantic River has degraded habitat for shellfish and other aquatic organisms. By improving water quality in Latimer Brook, Tree Filters also improve water quality in the Niantic River.

Expected Pollutant Removal Rates for Bioretention and Tree Filter Systems*

Total Suspended Solids	>83%
Total Nitrogen	>80%
Total Phosphorus	>80%
Total Select Metals	35% to 95%
Total Zinc	>85%
Oil and Grease	>80%
Bacteria	>80%

*Based upon published data published by University of New Hampshire (Bioscience Center), University of Massachusetts (Department of Technology), and University of Virginia (Research Center).



For more information about Tree Filters, please visit:

- www.ConserveCT.org/Eastern
- www.ct.gov/deep
- www.epa.gov/ointrm/stormwater/best_practices.htm
- www.eltownhall.com/hole-in-the-wall
- www.greentrestsystems.com/



This project was funded in part by the Connecticut Department of Energy and Environmental Protection through a US Environmental Protection Agency Clean Water Act Section 319 Non-point Source Pollution Program Grant, and conforms with stormwater management recommendations in the Niantic River Watershed Protection Plan (2006).

Questions or Problems? Please contact ECCD at 860-887-4163 x401 or the Town of East Lyme DPW at 860-739-6931 x141



Interpretive sign installed at tree filter by Latimer Brook.



Colony Road Tree Filters

Tree Filter Pollutant Removal Rates

Expected Pollutant Removal Rates for Bioretention and Tree Filter Systems*

Total Suspended Solids >83%

Total Nitrogen >50%

Total Phosphorous >60%

Total Select Metals 35% to 95%

Total Zinc >85%

Oil and Grease >80%

Bacteria >85%

** Based upon published 3rd party testing by University of New Hampshire Stormwater Center; University of Massachusetts Stormwater Technologies Clearinghouse; University of Virginia Stormwater Center.*



Colony Road Tree Filters

Bacteria data from Colony Rd municipal stormwater sampling.

Date	Bacteria concentration
5/12/10	11,000 cfu/100ml
9/2010	22,750 cfu/100ml
10/2011	2420 cfu/100ml
10/19/12	>2419.6 cfu/100 ml
<hr/>	
6/5/14	320 cfu/100 ml
11/6/14	190 cfu/100 ml

Before Tree Filters

After Tree Filters

Niantic River Tree Filters

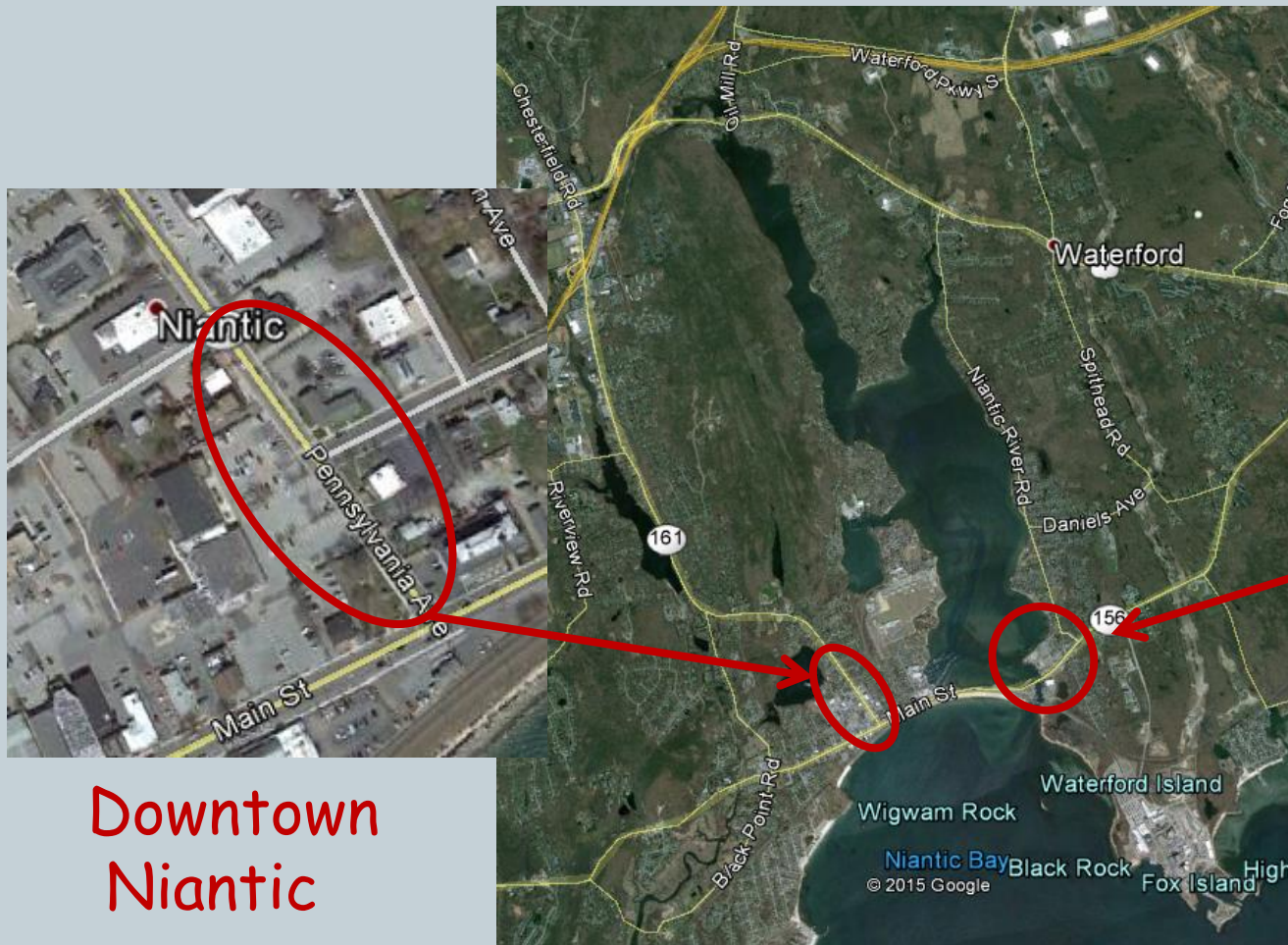
Downtown Niantic



Mago Point, Waterford



The Two Tree Filter Sites



Mago Point



Downtown
Niantic



Niantic Tree Filters



The Niantic River is listed by CT DEEP as impaired for recreation and shellfish consumption due to periodic high levels of bacteria, and for aquatic habitat due to urban stormwater runoff.

Niantic Tree Filters



Niantic tree filter units are closed on the front to provide additional support for heavy roadway traffic.

Niantic Tree Filters



Hole is excavated and underlying processed stone is installed and leveled.

Niantic Tree Filters



Tree filter is set in place...



Niantic Tree Filters



...and leveled up.

Niantic Tree Filters



New curb is installed...



Niantic Tree Filters



...and concreted into place.



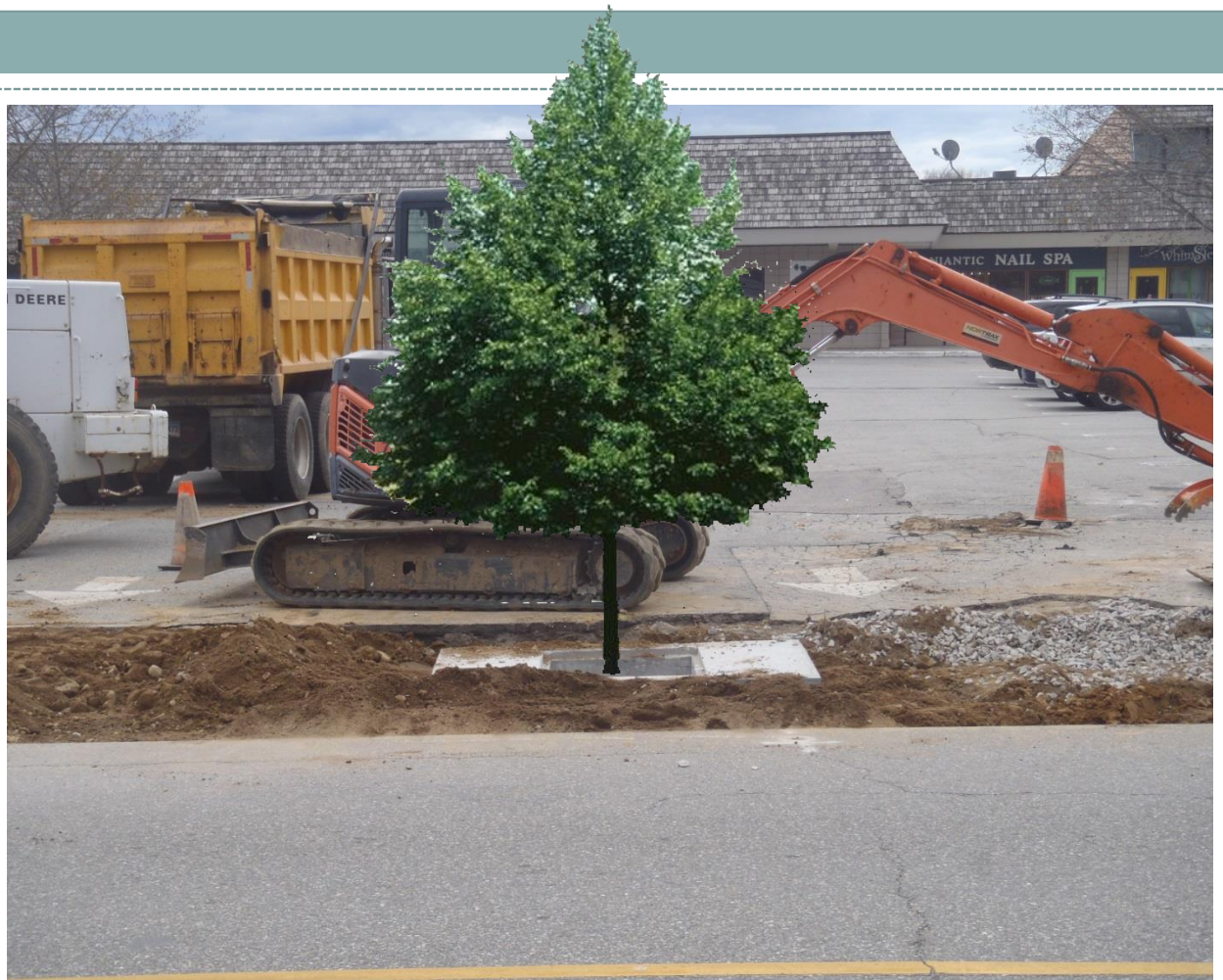
Niantic Tree Filters



Installed tree filter ready
for engineered soil and a tree.



Niantic Tree Filters



Little Leaf Linden will be
installed this week.

Niantic Tree Filters

Niantic River Tree filters



What is a Tree Filter?

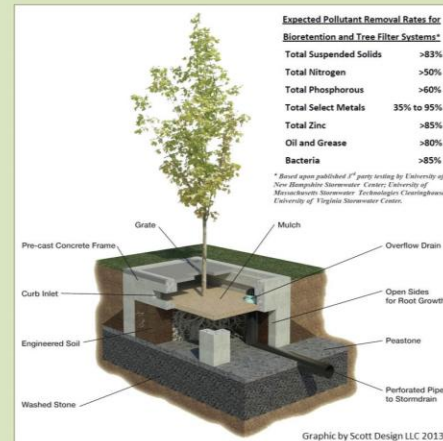
A Tree Filter is a self-contained water treatment system that uses natural processes to help clean stormwater by filtering the water through a specially designed soil mix to remove pollutants. The tree filter is designed to capture at least the first inch, or "first flush," of rainfall, which contains the highest amount of nonpoint source pollution, from the surrounding area. Each Tree Filter unit in this installation is designed to treat stormwater from an area approximately ¼ to ½ acre in size.

What is Nonpoint Source Pollution?

Nonpoint source pollution (NPS) is pollution that cannot be traced back to a discernible "point" such as a factory or sewer pipe. NPS pollution occurs when rainfall or snowmelt moves over and through the ground. As the runoff flows, it picks up and carries away natural and human-made pollutants, depositing them into lakes, rivers, wetlands, coastal and ground waters. These pollutants can harm fish and wildlife populations, kill native vegetation, foul drinking water, and make recreational areas unsafe and unpleasant.

Pollutants contained in runoff can include:

- Sediment
- Oil, grease and toxic chemicals from motor vehicles
- Pesticides and fertilizers from lawns and gardens
- Viruses, bacteria and nutrients from pet waste and failing septic systems
- Road salts
- Heavy metals from roof shingles, motor vehicles and other sources
- Heated water from dark impervious surfaces such as parking lots, streets and rooftops
- Trash



Graphic by Scott Design LLC 2013

Expected Pollutant Removal Rates for Bioretention and Tree Filter Systems*	
Total Suspended Solids	>83%
Total Nitrogen	>50%
Total Phosphorous	>60%
Total Select Metals	35% to 95%
Total Zinc	>85%
Oil and Grease	>80%
Bacteria	>85%

* Based upon published 17 years testing by University of New Hampshire Stormwater Center; University of Massachusetts Stormwater Technology Center; University of Virginia Stormwater Center.

How Do Tree Filters Work?

Tree filters harness the power of nature to do their work. Tree filters are based on the natural process of bio-remediation. The soil in this tree filter is a specially engineered mix of sand, loam and compost. As stormwater from Pennsylvania Avenue flows through this soil mix, micro-organisms in the soil capture and break down pollutants, even oils and gasoline. The tree in this unit also plays a role, absorbing nutrients to help it grow, and neutralizing some pollutants by absorbing them into its tissue. Additionally, the engineered soil does not freeze, so the tree filters work year 'round, cleaning stormwater even in the winter.

Typically, once the treated water has percolated through the engineered soil mix, it flows through a perforated pipe at the bottom of the unit to a nearby storm drain (see sketch at left). However, the soils underlying downtown Niantic are fine-grained stratified drift deposits that range from 50 to 100 feet in depth. Stratified drift deposits are very permeable layers of sand and gravel that were deposited by melting ice at the end of the last glacial period, approximately 12,000 years ago. Stormwater that flows into the tree filter units will be absorbed directly into these sandy, gravelly soils, which act as a natural sand filter, purifying the water further.

For more information about tree filters, please visit:

- www.ConserveCT.org/Eastern
- www.ct.gov/deep
- www.epa.gov/ointrnt/stormwater/best_practices.htm
- www.eltownhall.com/hole-in-the-wall
- www.greenstreetsystems.com
- www.nianticriverwatershedcommittee.org

Why Have Tree Filters Been Installed Here?

The storm drain system along Pennsylvania Avenue drains into the Niantic River via pipes located under Grand Street. Water quality studies conducted in the Niantic River in recent years have demonstrated that polluted stormwater that flows into the Niantic River has degraded habitat for shellfish and other aquatic organisms. By intercepting and treating stormwater before it is discharged to the Niantic River, tree filters reduce water pollution, improving habitat quality for the plants and animals that live in the Niantic River, and making it cleaner and safer for recreation.



This project was funded in part by the Connecticut Department of Energy and Environmental Protection through the US EPA Clean Water Act Section 319 Non-point Source Pollution Program Grant and the CT Office of Policy and Management Small Town Economic Assistance Program (STEAP), and conforms with stormwater management recommendations in the Niantic River Watershed Protection Plan (2006).



Informational sign is designed.



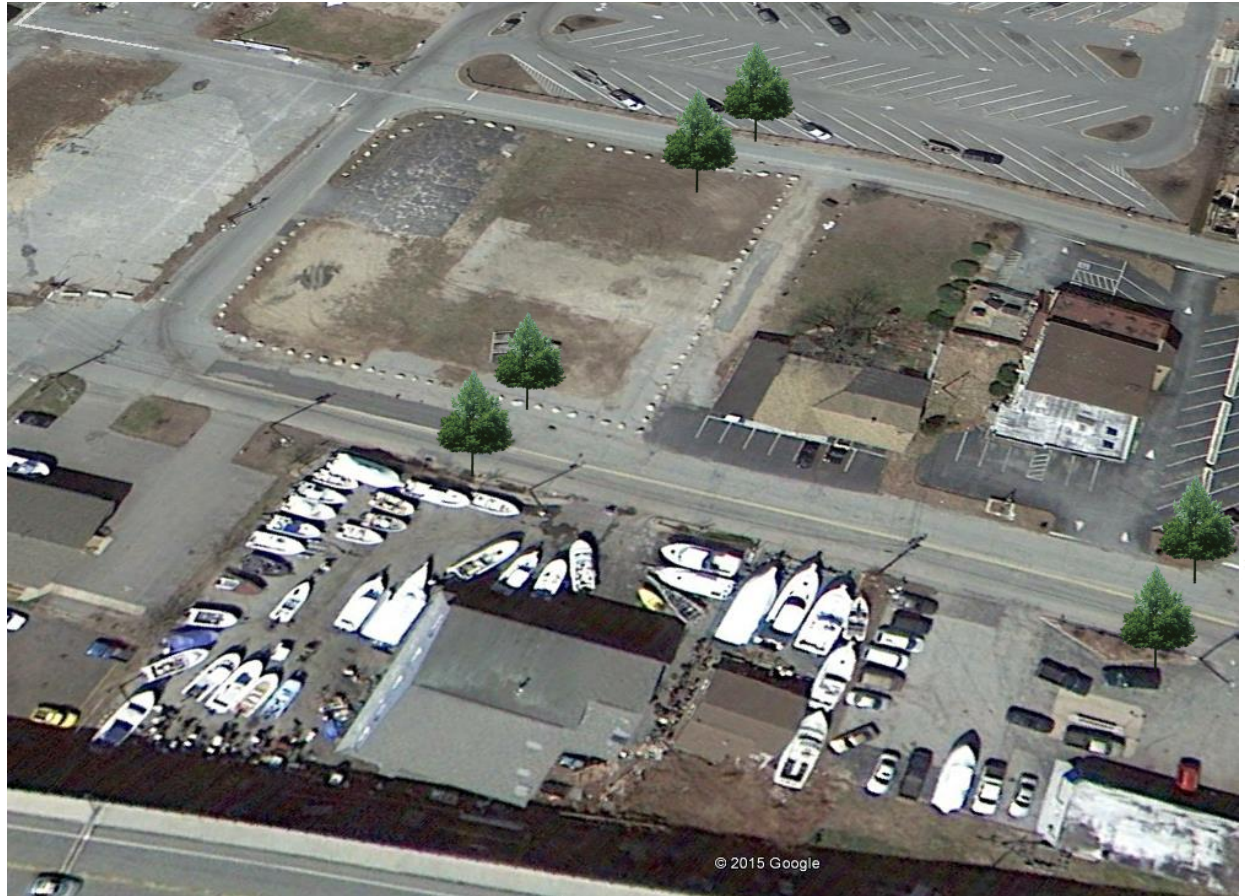
Mago Point Tree Filters



Mago Point features a state-owned boat launch, numerous marine businesses, and restaurants on almost 13 impervious acres, but no stormwater management!!



Mago Point Tree Filters



ECCD plans to install up to six tree filters as part of a Mago Point redevelopment project to treat stormwater runoff to the Niantic River.

Baker Cove Tree Filters, Groton



© 2014 Google

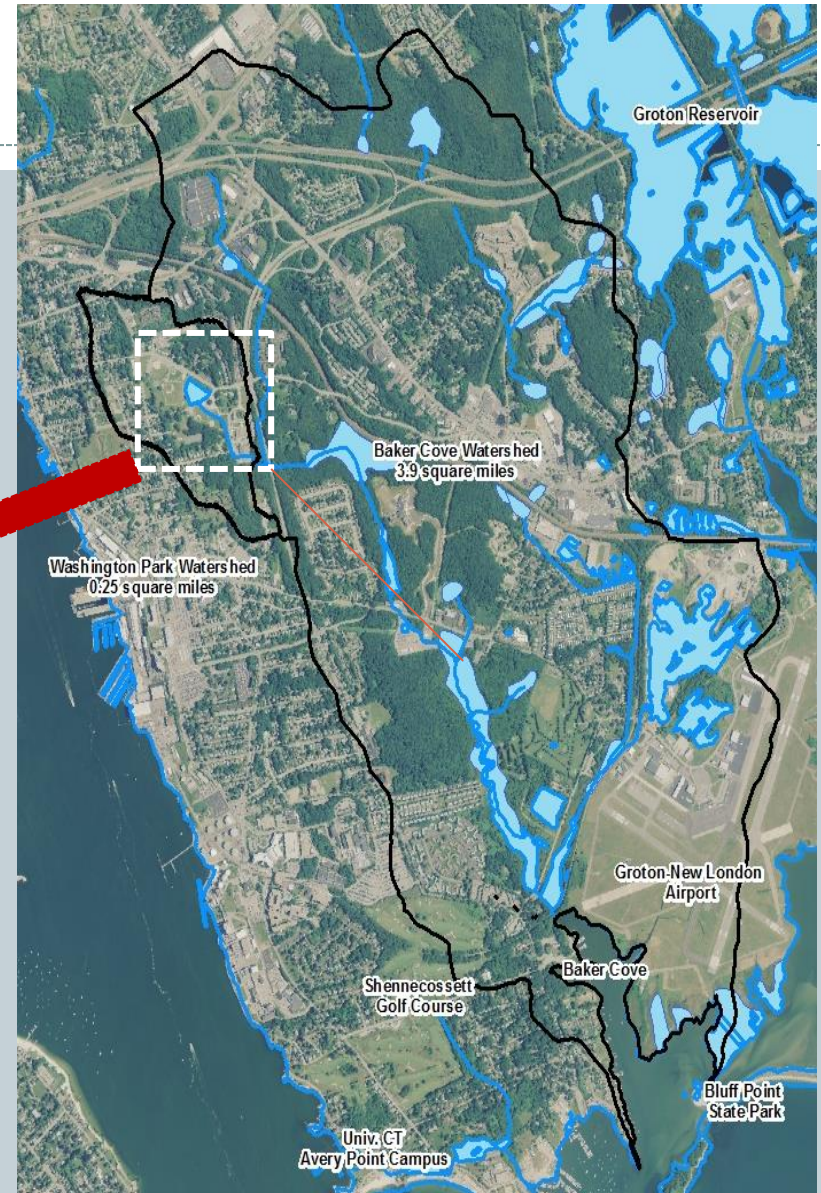
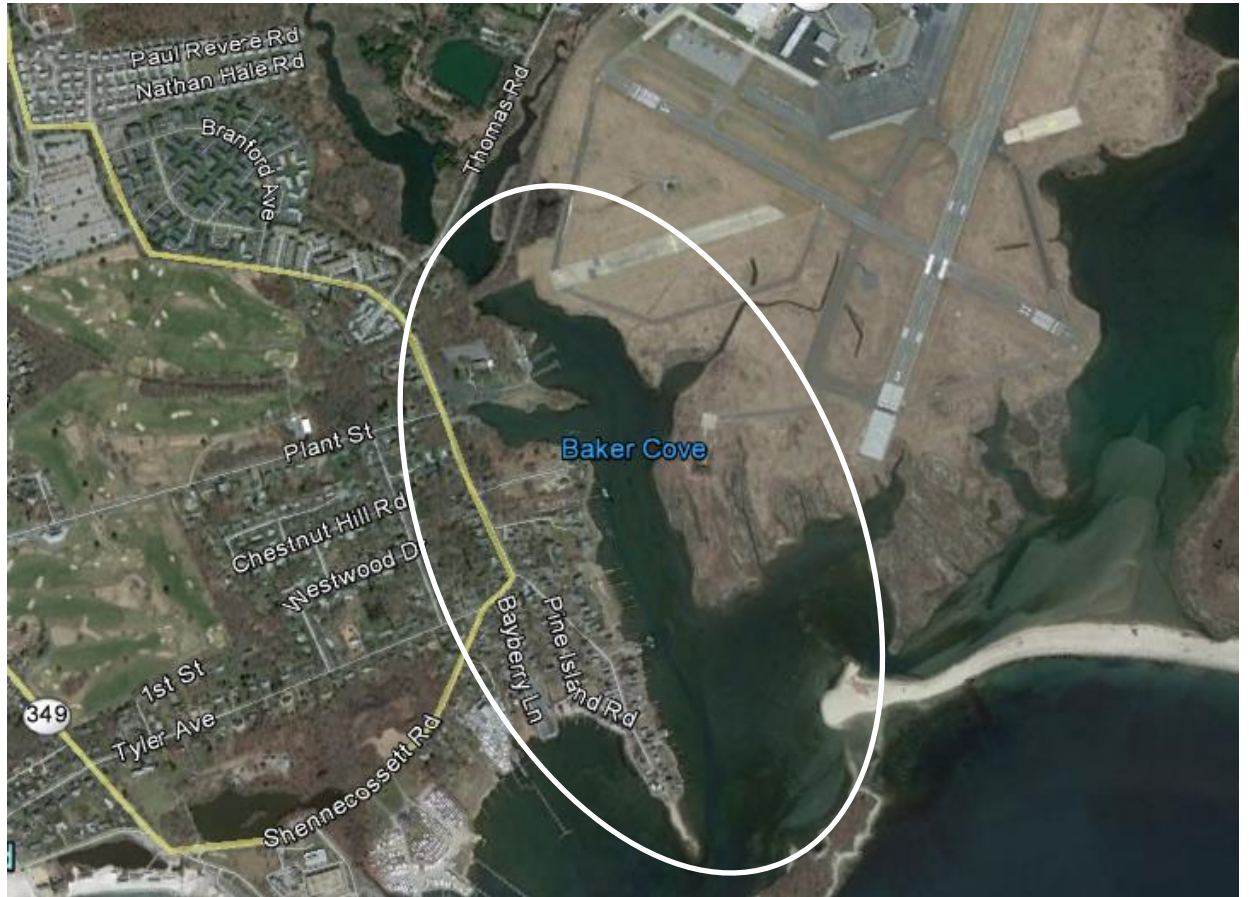


Image - Google Earth 2014

Image - USDA 2008

Baker Cove Tree Filters



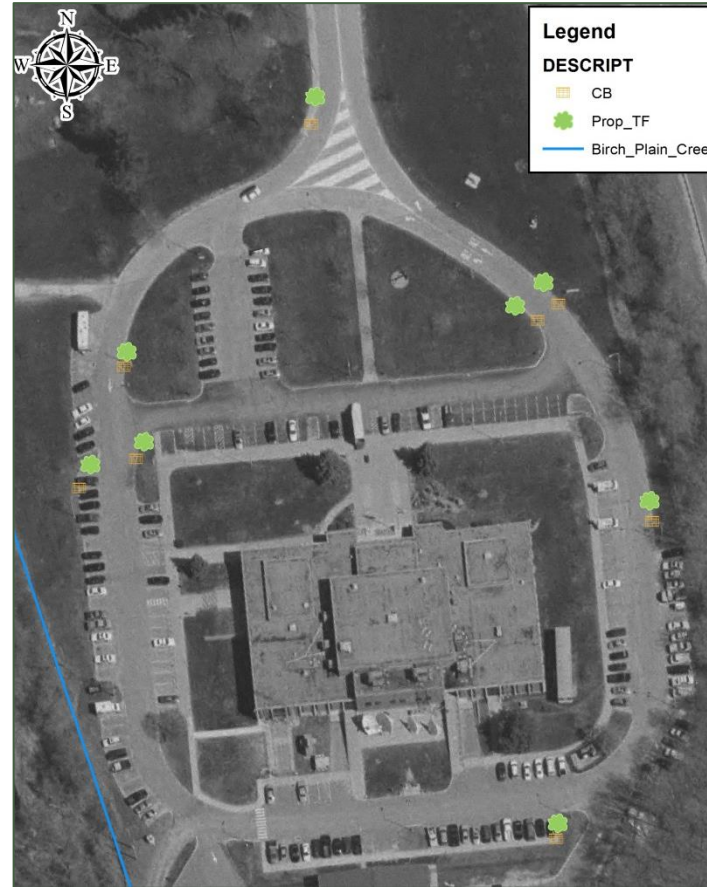
Baker Cove is impaired for the harvesting of shellfish due to periodic high levels of bacteria from stormwater runoff.

Baker Cove Tree Filters



Birch Plain Creek, which flows through Washington Park and alongside the City Hall Complex, is the primary tributary to Baker Cove.

Baker Cove Tree Filters



ECCD plans to install six tree filters at the City Hall Complex to treat storm-water before it is discharged to Birch Plain Creek.



Baker Cove Tree Filters



Future location of a tree filter at
the City Hall (summer 2015).



Going Green

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Using Bio-
Retention to
Improve
Water Quality
in Two Coastal
Watersheds

Questions??

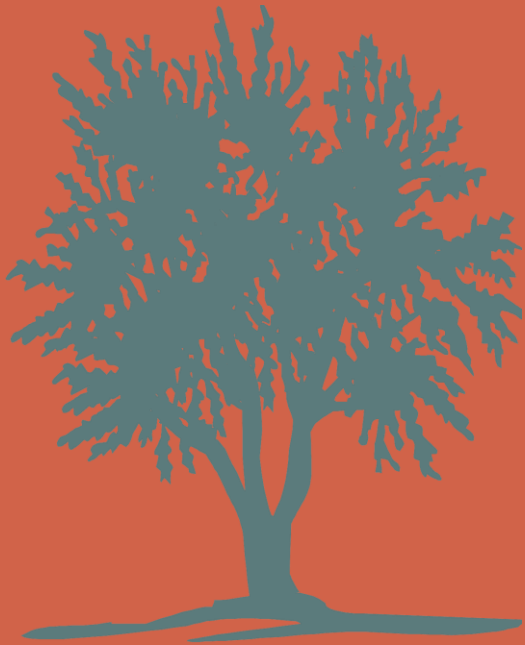


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On-line at: www.ConserveCT.org/eastern
or visit us on FaceBook



The End