Green Infrastructure at NYC Parks: What decisions are we making and what research is needed?

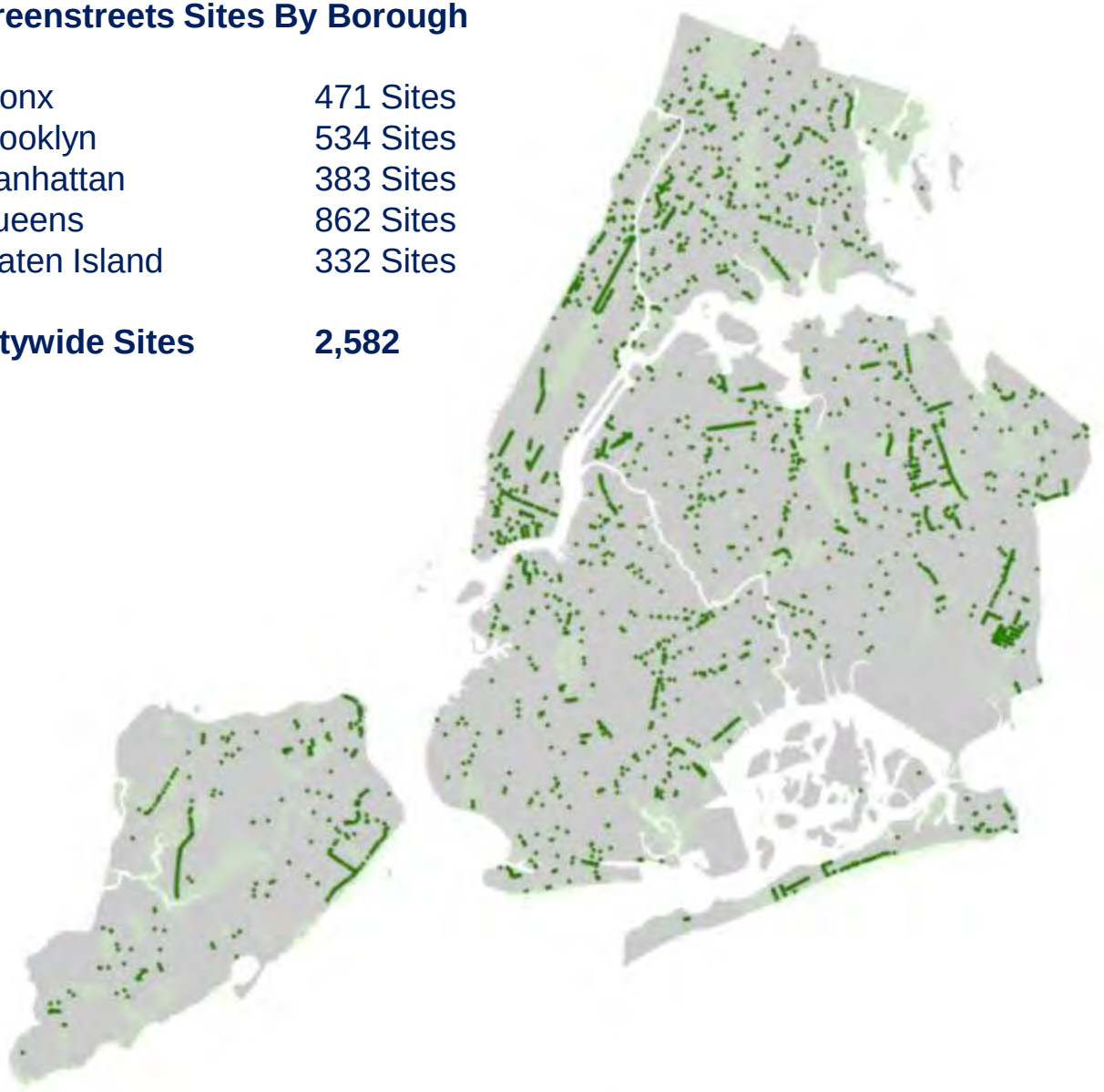
Nette Compton
New York City Department of Parks & Recreation

Urban Eco-hydrology Science and Practice
July 24th 2012

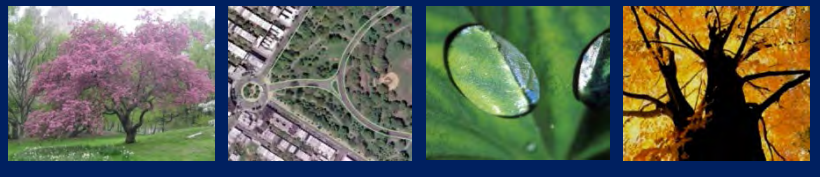
Greenstreets

Greenstreets Sites By Borough

Bronx	471 Sites
Brooklyn	534 Sites
Manhattan	383 Sites
Queens	862 Sites
Staten Island	332 Sites
Citywide Sites	**2,582**

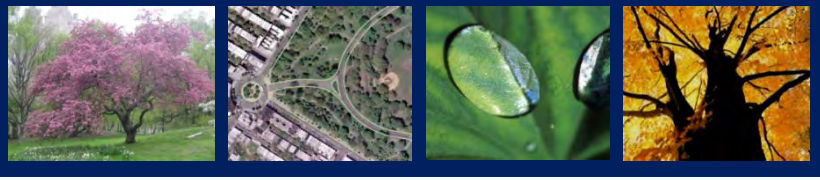


Research Goals



1. Optimize Green Infrastructure (GI) Design
2. Predict GI Performance and quantify value of the entire system
3. Reduce or Eliminate Maintenance from Watering Trucks

NYC Green Infrastructure Plan



Goals

- Reduce CSO outflows
- Manage run-off from 10% of the impervious surfaces in sewer-sheds through retention and infiltration over the next two decades

Green Infrastructure Fund

- $1.5 billion over 20 years
- Funded by water rates
- $187 million for construction in the next 4 years plus $56 million for maintenance

Interagency Partnerships and Coordination

- Green Infrastructure Task Force
- Best Management Practices

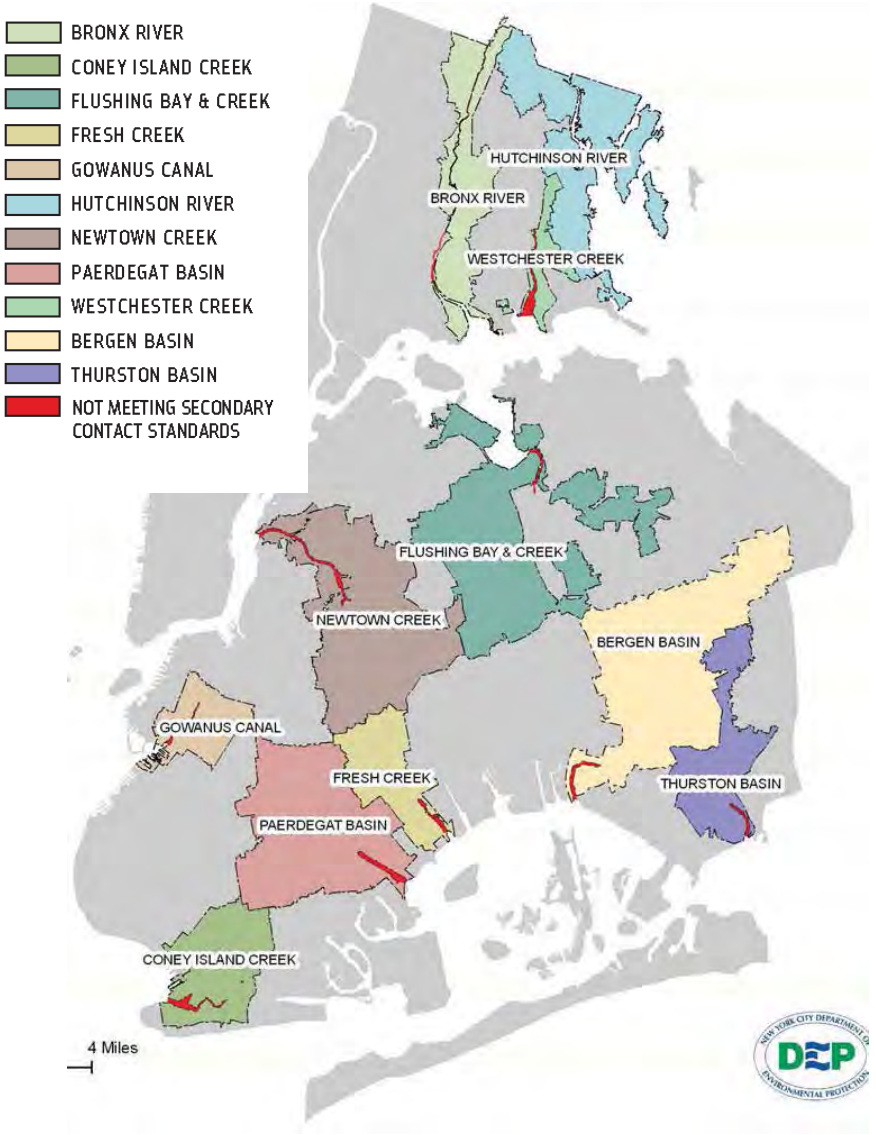
Combined Sewer Overflows

Waterbodies exceeding Federal Standards

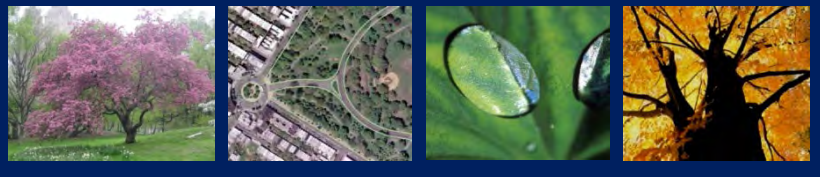
NYC CSO discharge: 30 billion gal/yr

Leading cause of water pollution in NYC's harbor

CSO discharging into Harlem River

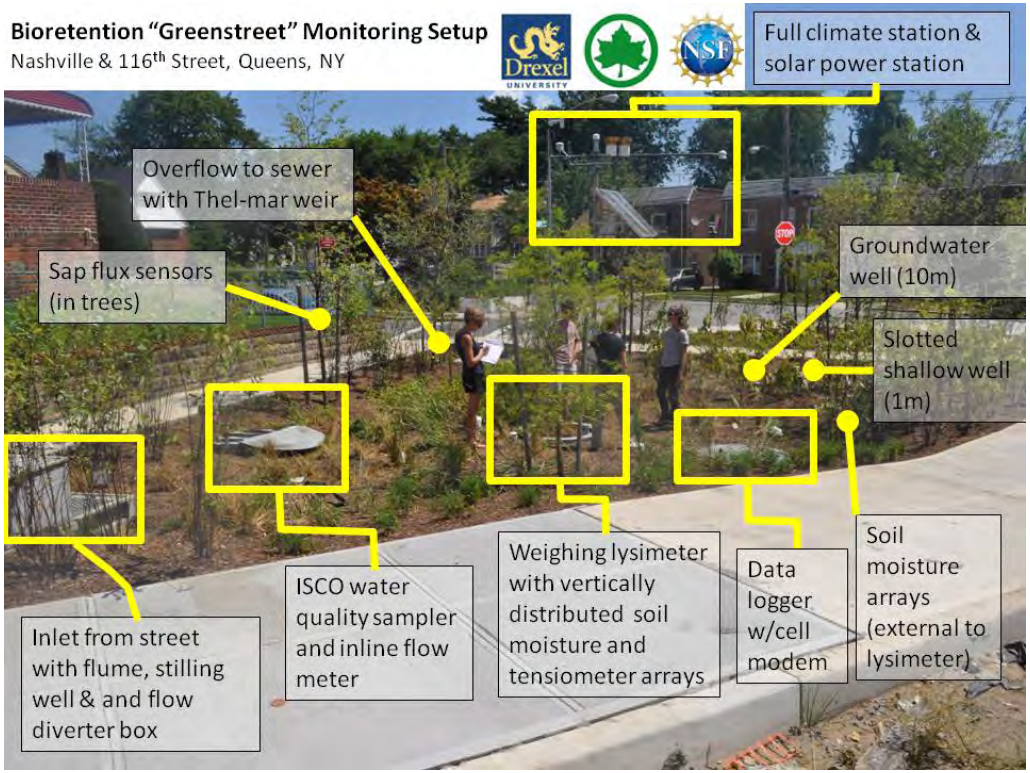


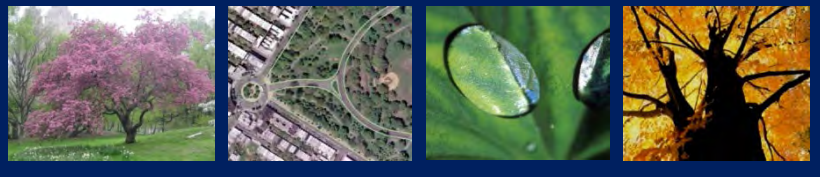
Upcoming Research Topics



Research and Development Agenda

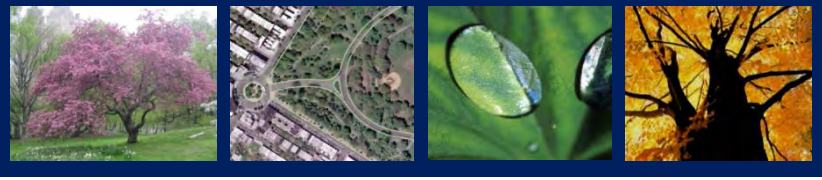
- **Small chunks of research studies via Request for Proposals (Like NYC DDC's "town and gown")**
- **Highest Priority Topics First**
- **Don't want to duplicate research – make use of data collected across nation (Onondaga County, International BMP database)**
- **Interagency Peer Review Panel to review and analyze data**





Green Infrastructure at Parks: Plant Selection & Maintenance

“The Four Experiments” – Study 1

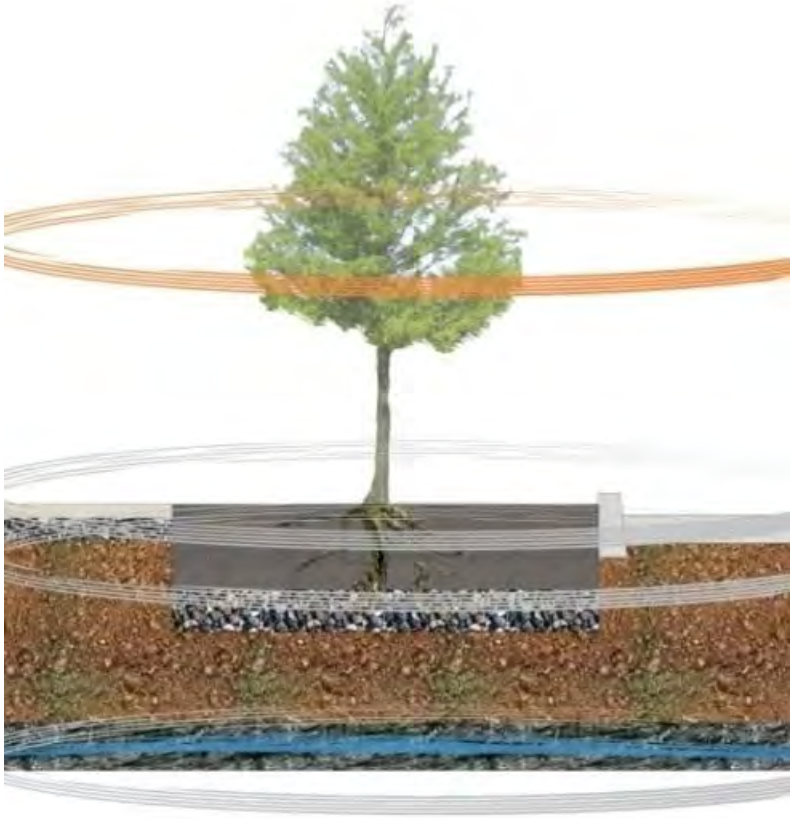


canopy

soil surface

root zone

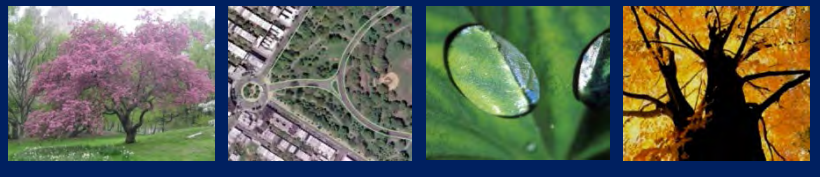
groundwater



4 Experiments

1. Rainfall, evaporation, & quantity of water intercepted by plants
2. Surface storage & infiltration; inflow from subwatershed
3. Soil moisture, percolation & overflow
4. Water table levels in response to rain events

Ongoing Monitoring – Site Assessment Study



Summer 2011

6 Interns

130 Greenstreets

Plant Mortality

GS Site Assessment Data Collection

Names _____ Date _____

_____ Weather _____

Location

Borough: _____ Property No.: _____

A) Intersection of: OR B)

Street 1 _____ On Street: _____

Street 2 _____ Cross Street 1 _____

Street 3 _____ Cross Street 2 _____

Installation (circle all that apply)

Season: Spring Fall

Planting Date: _____ Contract No.: _____

Existing Conditions (circle all that apply)

TYPOLOGY:	•Median	•Triangle/ Island
	•Sidewalk Planting	•Bumpout/ Neckdown

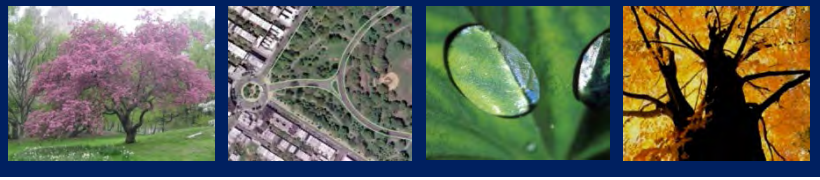
HARDSCAPE:	•Sidewalk (4'+)	•Concrete Curb
	•Steel Faced Curb	•Belgium Blocks
		•Fencing

ROW Bioswales

Upcoming Research Topics

Self Sufficiency – design to reduce maintenance from watering trucks

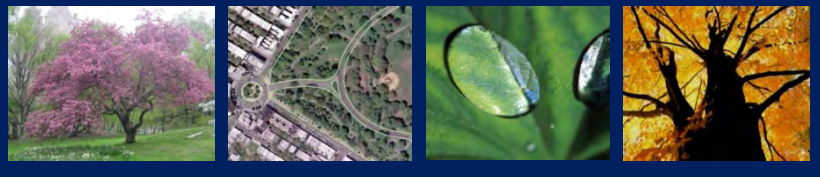
Upcoming Research Topics



Vegetative Selection and Health

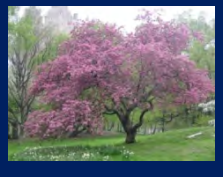
Upcoming Research Topics

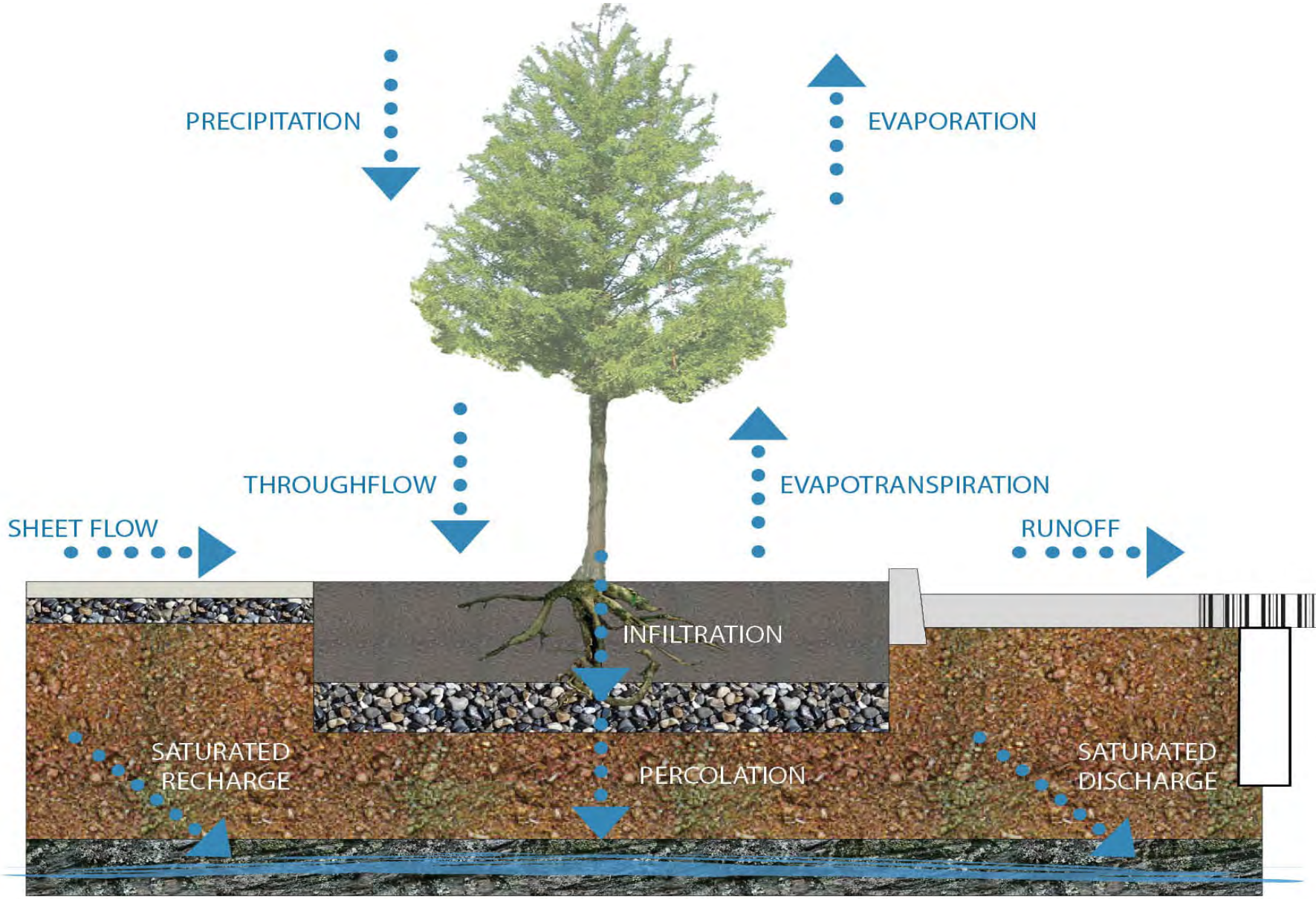
Pollinator Use



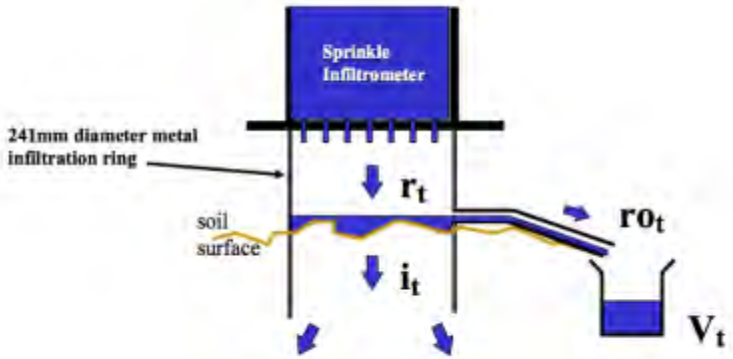
Green Infrastructure at Parks: Soil Management

Greenstreets Hydrological Processes



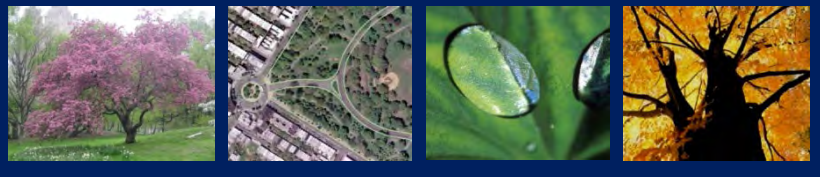



Ongoing Monitoring – Infiltration Rates



Cornell sprinkle infiltrometer

Ongoing Monitoring – Infiltration Rates



Location	Infiltration Rate (in/hr)
Orient, Metropolitan & Bushwick Aves, Brooklyn	5.55
Riverside Dr & W 104th St, Manhattan	5.32
Furmanville Ave, 80th St & Dry Harbor Rd, Queens	4.81
Nashville Blvd, 116 Av, & 209 St, Queens	4.72
Carmansville PG: Amsterdam Ave bet W 151st & W 152nd Sts, Manhattan	4.32
Lafayette Ave & Edgewater Rd, Bronx	4.27
Pelham Pkwy & Stillwell Ave, Bronx	3.71
Church Ave, 14th Ave & 35th St, Brooklyn	3.06
Bay St & Swan St, Staten Island	2.92
Gregory Saucedo Triangle: Ave T, Fillmore Ave, & E 57th St, Brooklyn	2.87
Seagirt Blvd between Beach 20th & Beach 19th, Queens	2.76
Targee Ave & Van Duzer St, Staten Island	2.02
Westbourne Ave & Bay 25th St, Queens	1.15
Colfax St & Murdock Ave, Queens	0.95

Finding #1

No statistical difference between greenstreets (they all drain rapidly!)

N = 50 tests

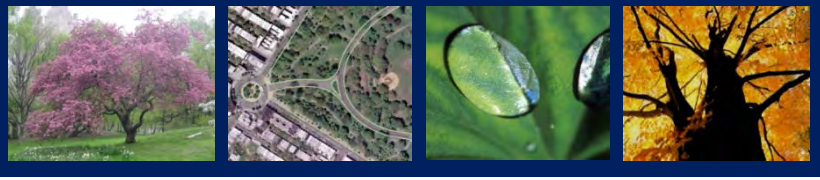
Average Ksat: 4.5 in/hr

95% confidence that the median is between 3.2 in/hr and 5.8 in/hr

Maximum: 0.3 in/hr

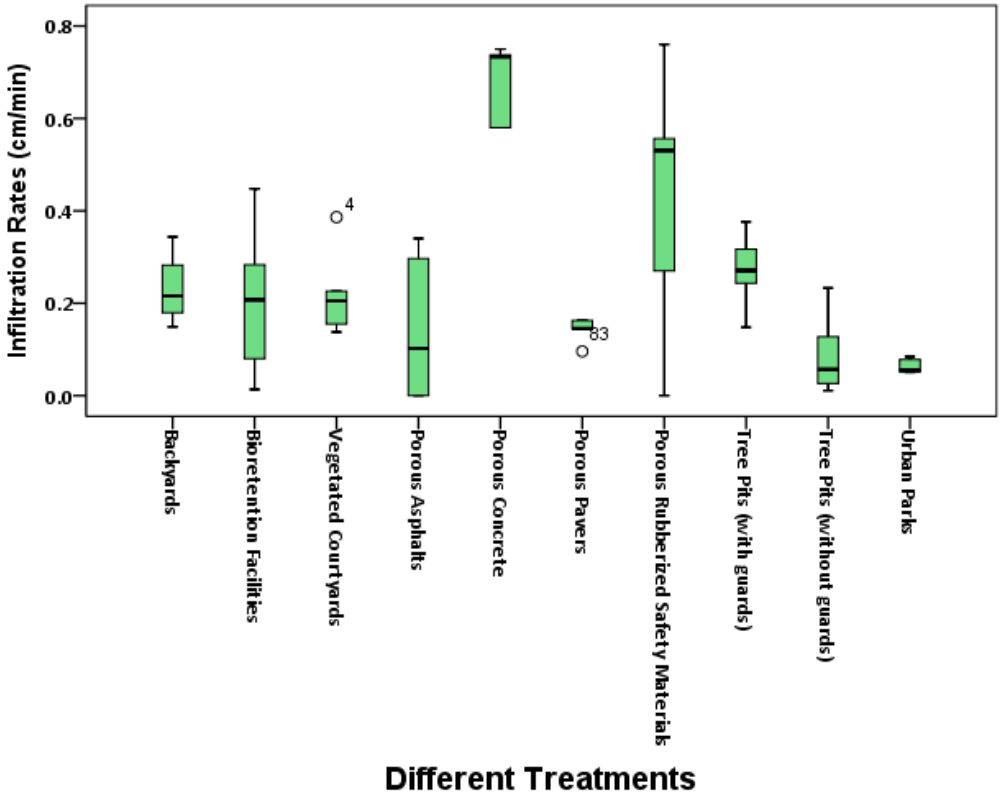
Maximum: 10.6 in/hr

Ongoing Monitoring – Infiltration Rates

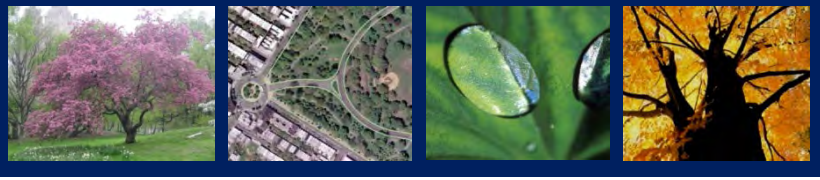


Finding #2

Clear statistical difference between tree pits with and without guards



Upcoming Research Topics

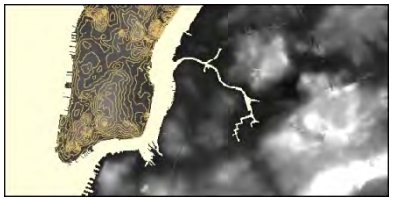


Site Selection based on environmental factors

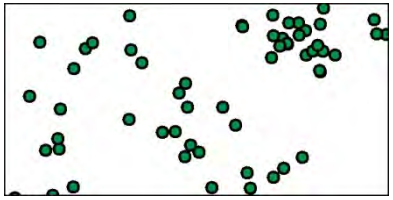
- bedrock

- soils

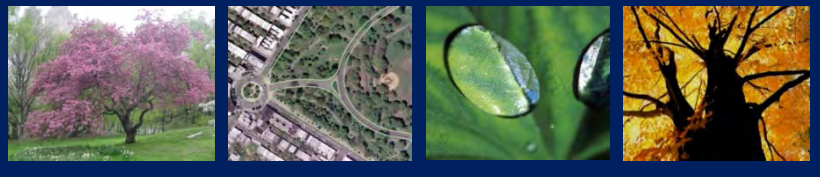
- water table



- 311 flooding

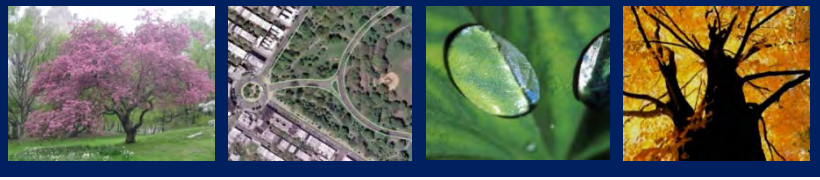


Upcoming Research Topics



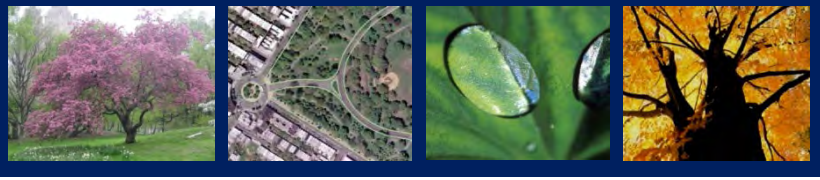
Clogging Rates of Various Media

Sizing Calculator / Maximum Hydraulic Loading Rates

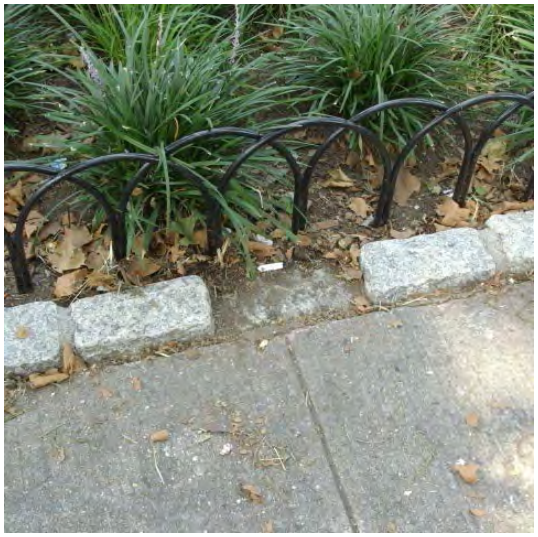


Green Infrastructure at Parks: Stormwater Management

Stormwater Capture – Techniques



Pipe Inlets



Surface Edging

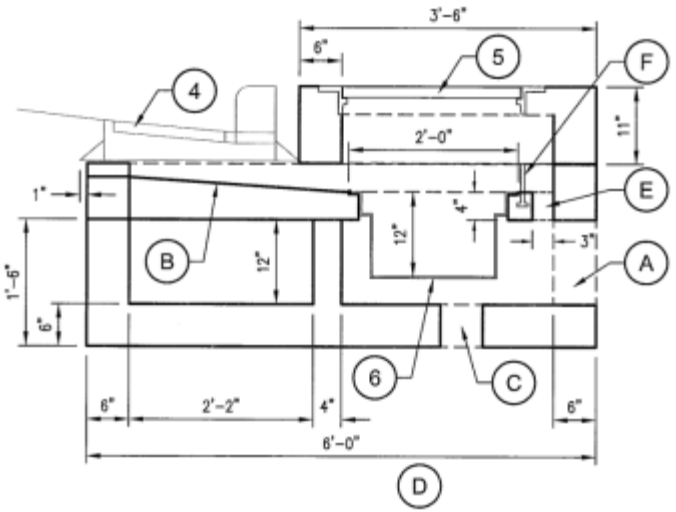
Trench Drains

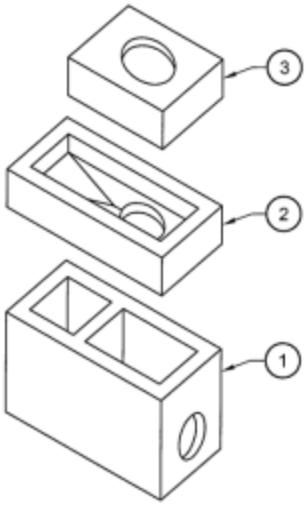
Curb Inlets

Deep Excavation

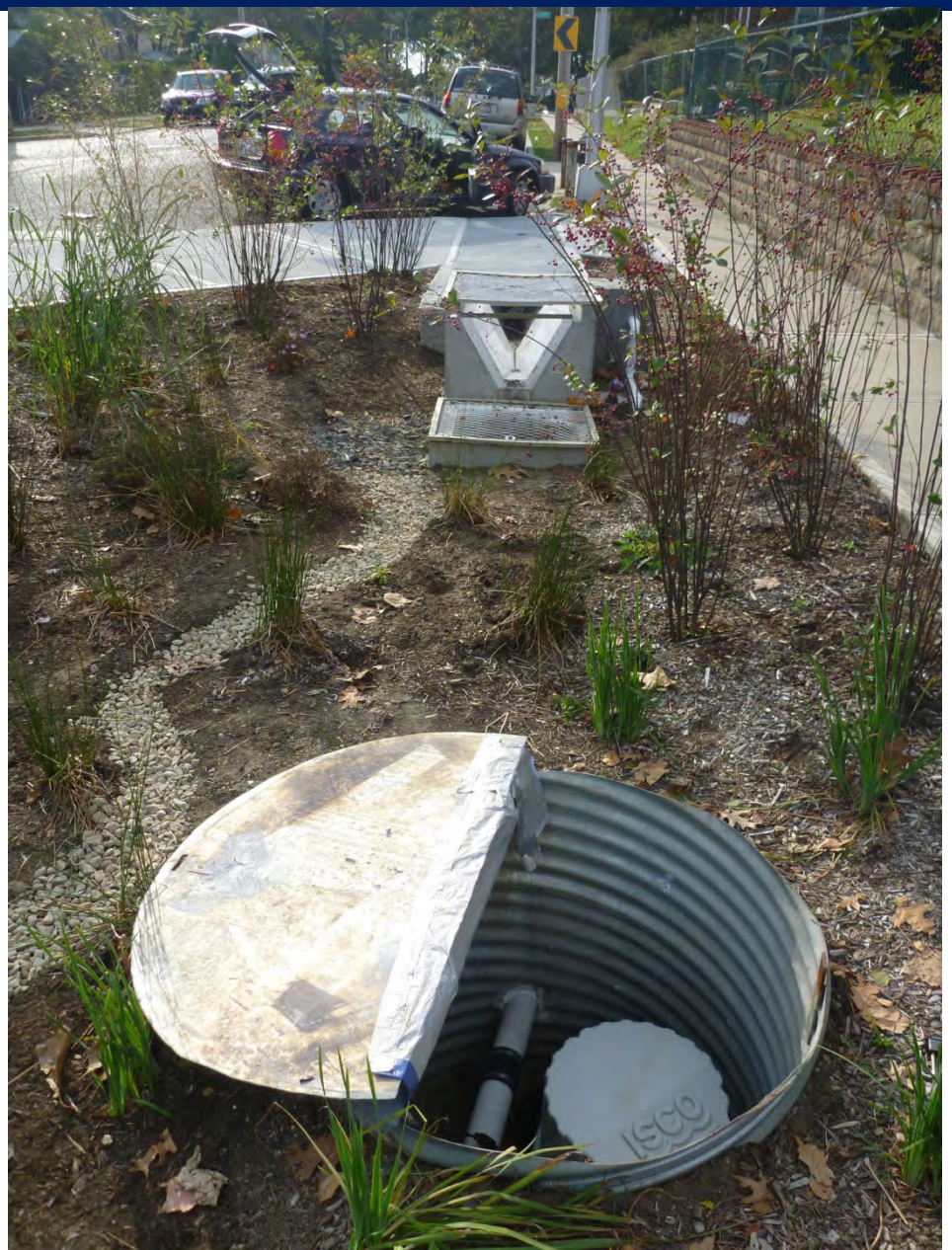
Bioswale Grading

Better Inlets

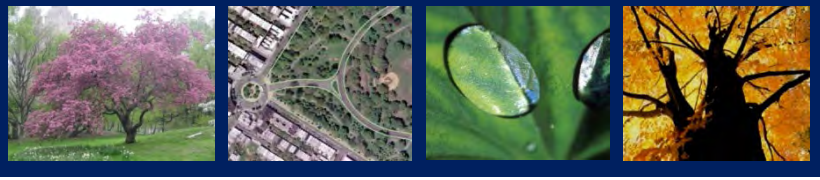




Monitoring Study 2



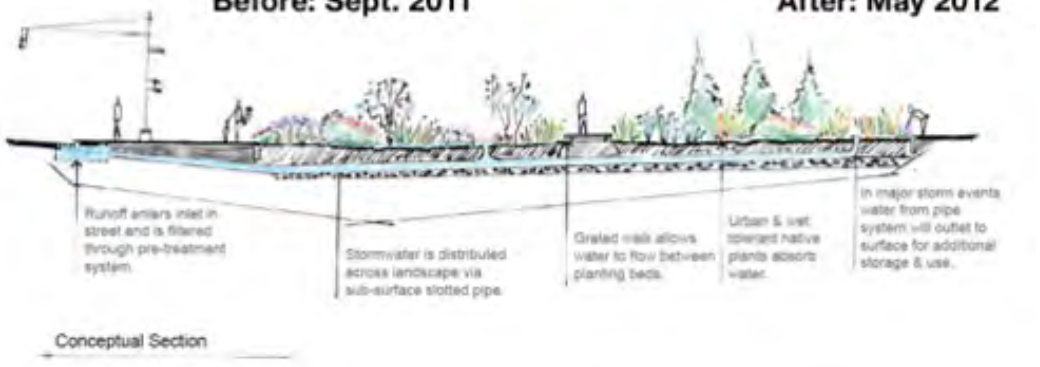
Green Innovation Grant – Upcoming



Upcoming Research Topics

Inlets to Maximize Inflow and Minimize Clogging

Before: Sept. 2011 After: May 2012



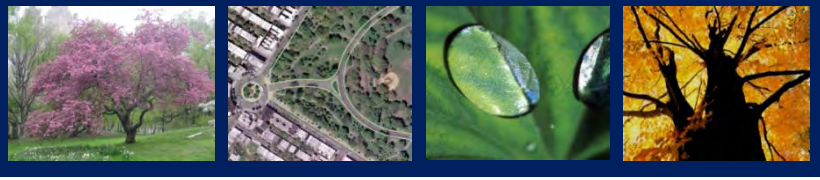
Conceptual Section

Upcoming Research Topics

Runoff Reduction Calculator

Easy to use, but scientifically underpinned spreadsheet model

Upcoming Research Topics

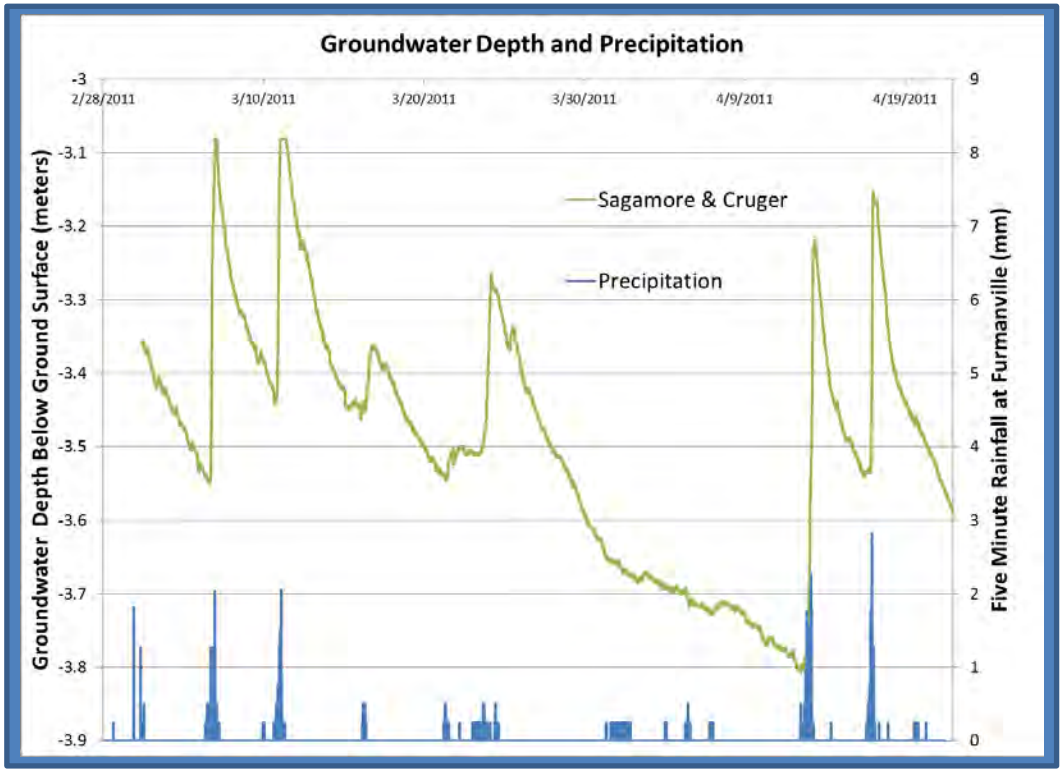


Water Quality and Pollutant Removal Efficiency

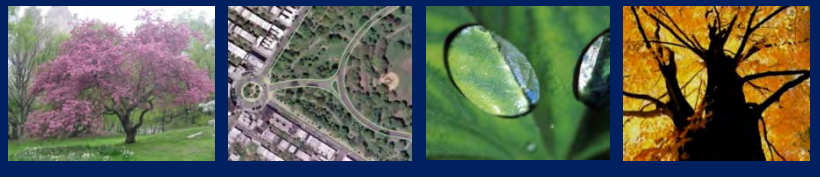
Non-CSO areas

Upcoming Research Topics

Groundwater Mounding Issues

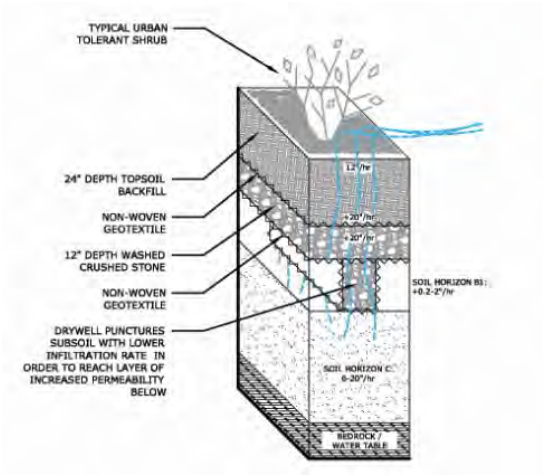


Upcoming Research Topics



In areas where infiltration won't work…

Sand Column Connections to higher infiltrating soils



Detention Based Controls

slow release back to sewers