



Stormwater Pollution: A City Problem with Backyard Solutions

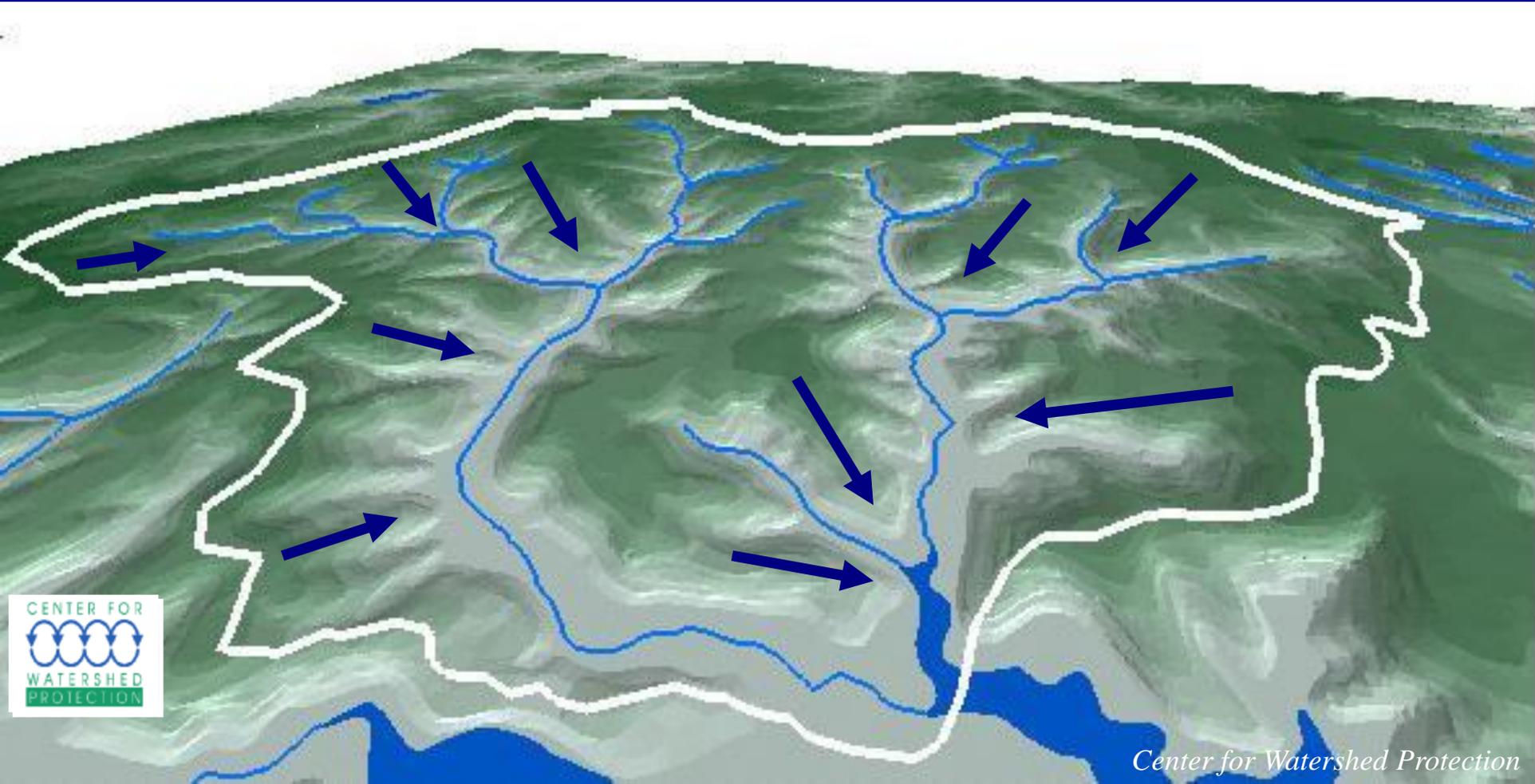
Worcester Residential Rain Garden Training Workshop

June 23 and 24, 2011
Worcester Youth Center
Worcester, MA

Donna Williams
Blackstone Headwaters Coalition

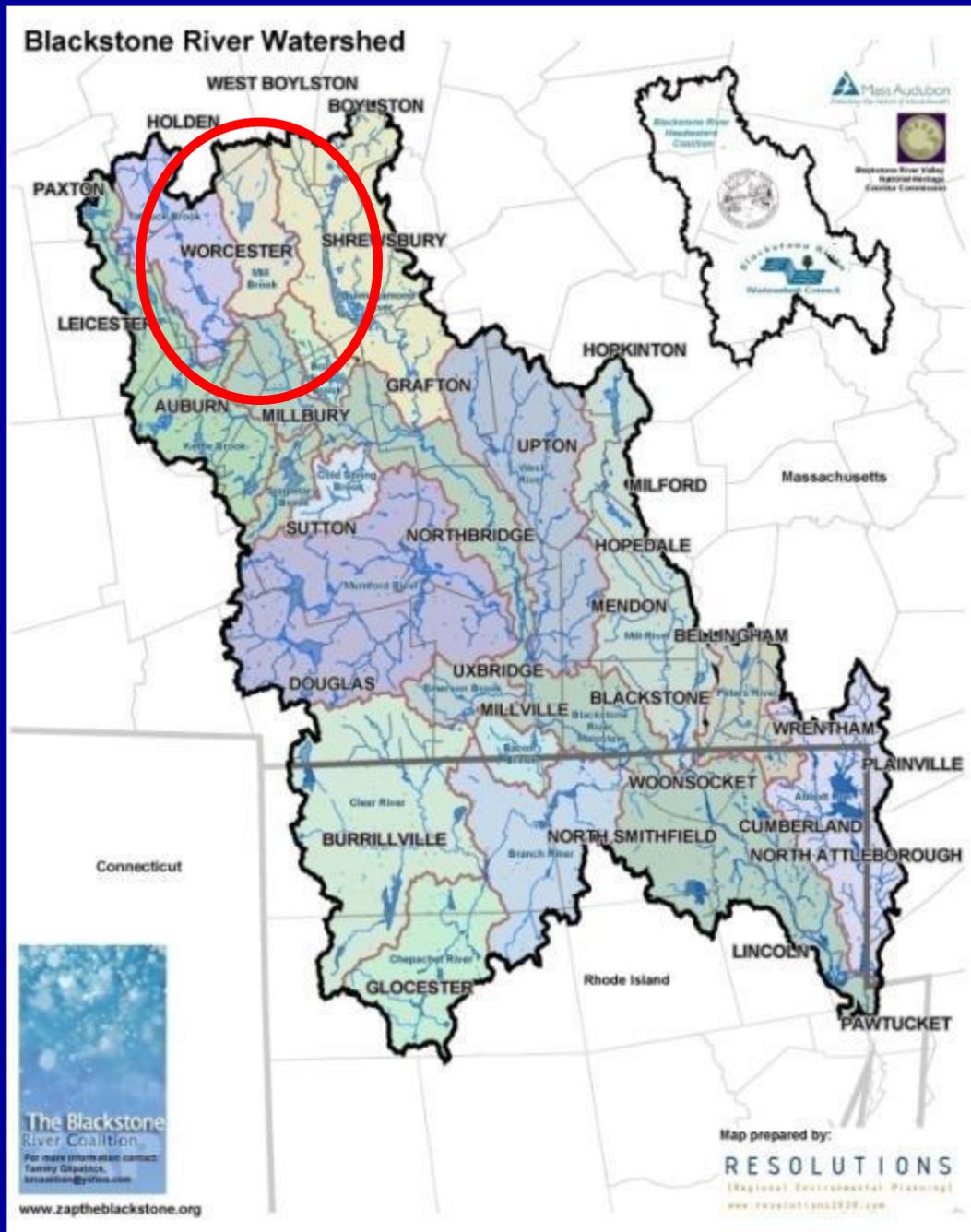
What Is a Watershed?

A watershed is the area of land that drains to a particular point along a stream



Blackstone River Watershed:

Worcester to Pawtucket, RI
↓
Narragansett Bay
↓
Atlantic Ocean



The Blackstone River Coalition
For more information contact:
Tawny Gispatrik,
tawny@blackstone.org
www.zaptheblackstone.org

Map prepared by:
RESOLUTIONS
Regional Environmental Planning
www.resolutions2000.com

The Blackstone River Coalition
ZAP

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

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

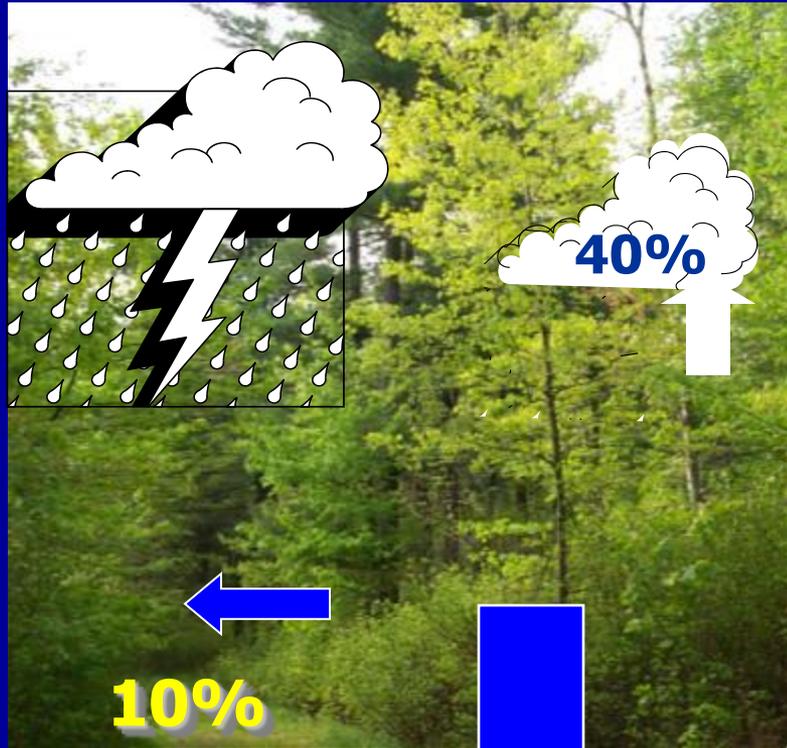


What is Stormwater Pollution?

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, lawn chemicals, road sand, sediment, trash, and dirty water from washing your car directly to local waters that we drink, fish, or swim in.

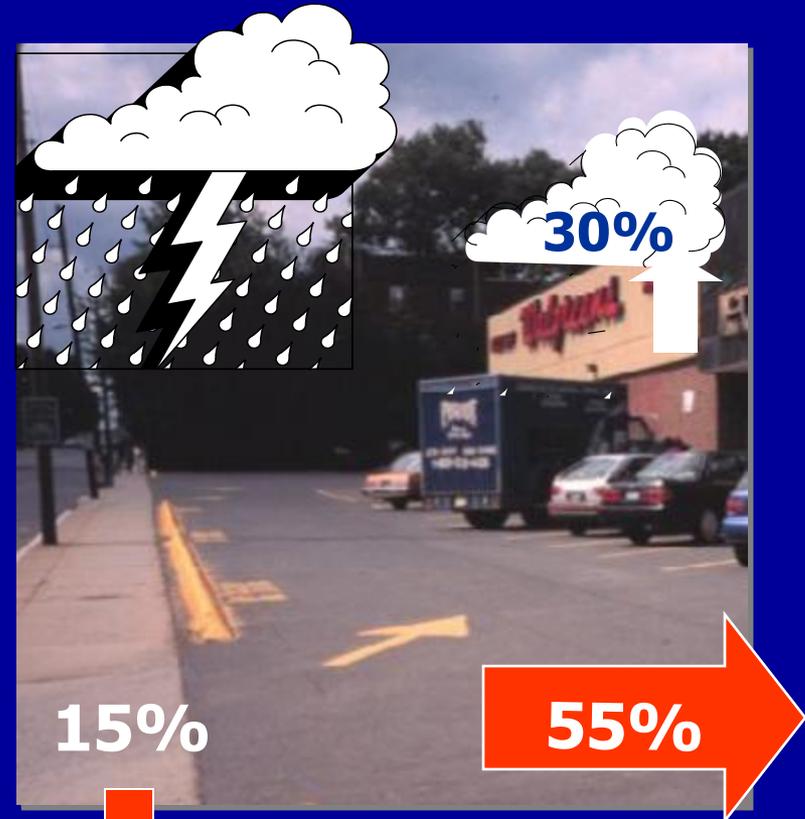


Impacts of land use on water flow



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

Many Forms of Impervious Cover in the Urban Landscape



Sidewalks

Roads

Driveways

Parking

Buildings

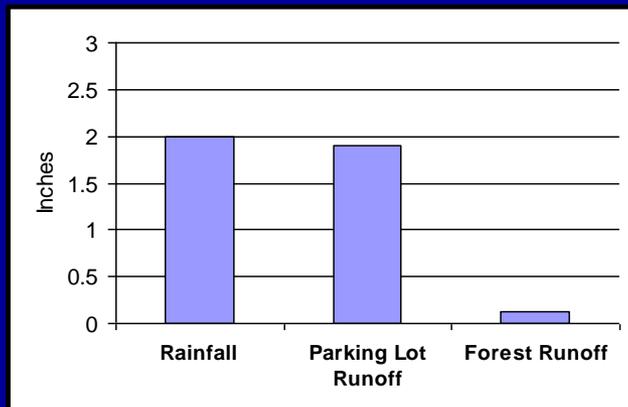
Stream Quality Is Related to Impervious Cover



- In a forest, rain soaks into the ground and is either taken up by tree roots or continues to move down through the soil and into the groundwater.



- When rain falls on impervious cover, it cannot soak into the ground and instead becomes stormwater runoff.



- Impervious cover produces 16 times more stormwater runoff than forest.

Impervious Cover Influences Dry Weather Stream Flow



Quinsigamond River at Wheeler Rd.,
isolated pool, no flow, September, 2007

- Impervious surfaces can block water from contributing to groundwater supply
- Many streams draw from groundwater
- This can result in lower stream flows during dry weather

Impervious Cover Influences Wet Weather Stream Flow

When it rains, a large amount of water . . .



Runs off of
impervious
surfaces



Enters the
stormdrain
system



Is directed straight to
the stream

Impervious Cover Influences Wet Weather Stream Flow

The large amount of stormwater runoff in the stream system can cause:



More Frequent Flooding



Higher Flood Levels

Impervious Cover Influences Water Quality

Pollutants build up on impervious surfaces and wash off into the stream system when it rains.



Harmful Pollutants in Runoff



Bacteria

Nutrients

Pet Waste

**Fertilizers and
Pesticides**



Oil & Grease

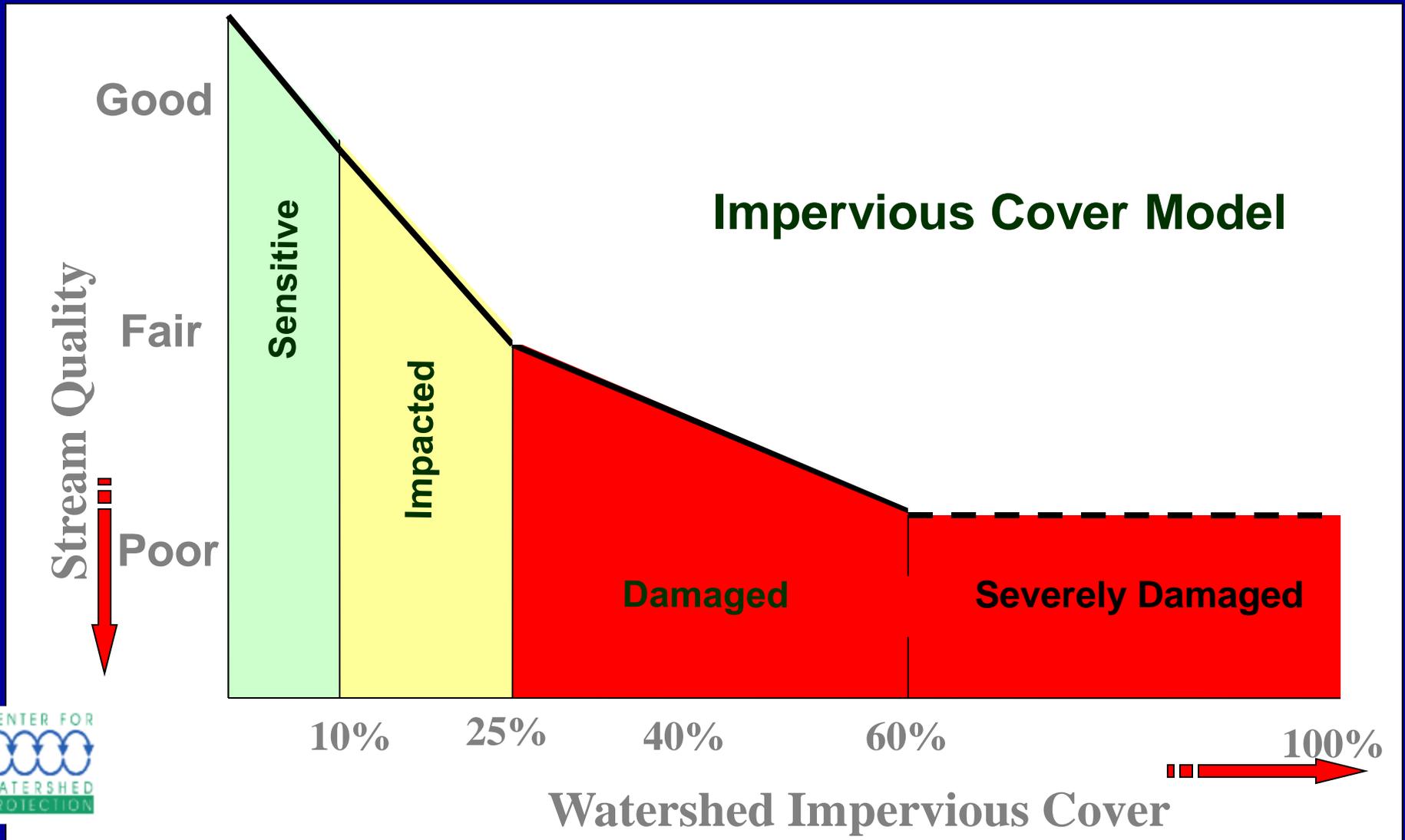
Muddy Water

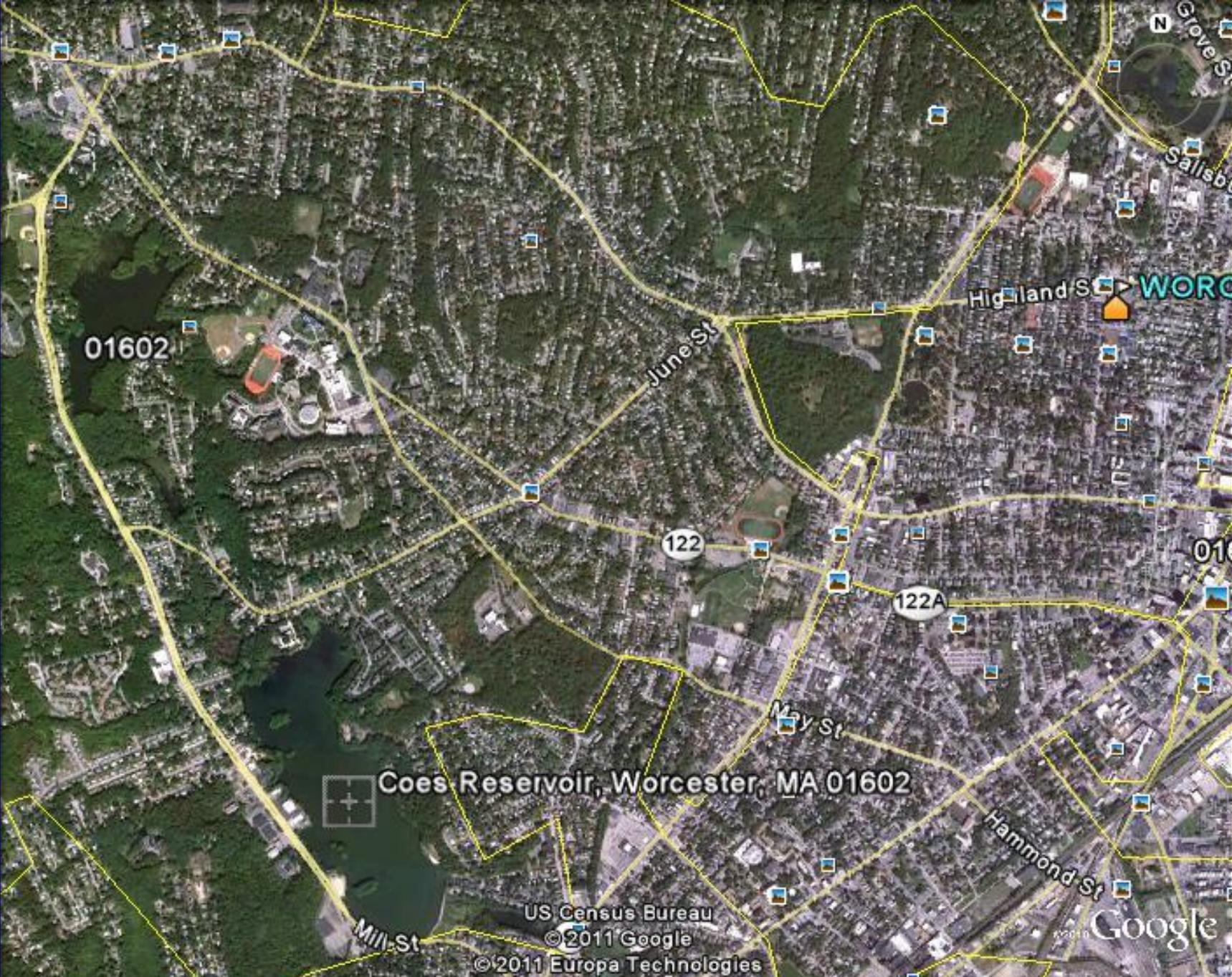
Heavy Metals

(e.g. Zinc, Copper, Lead)



Relationship Between Impervious Cover and Stream Quality





01602

June St

Highland St

WORC

122

122A

016

May St

Coes Reservoir, Worcester, MA 01602

Hammond St

Mill St

US Census Bureau

©2011 Google

©2011 Europa Technologies

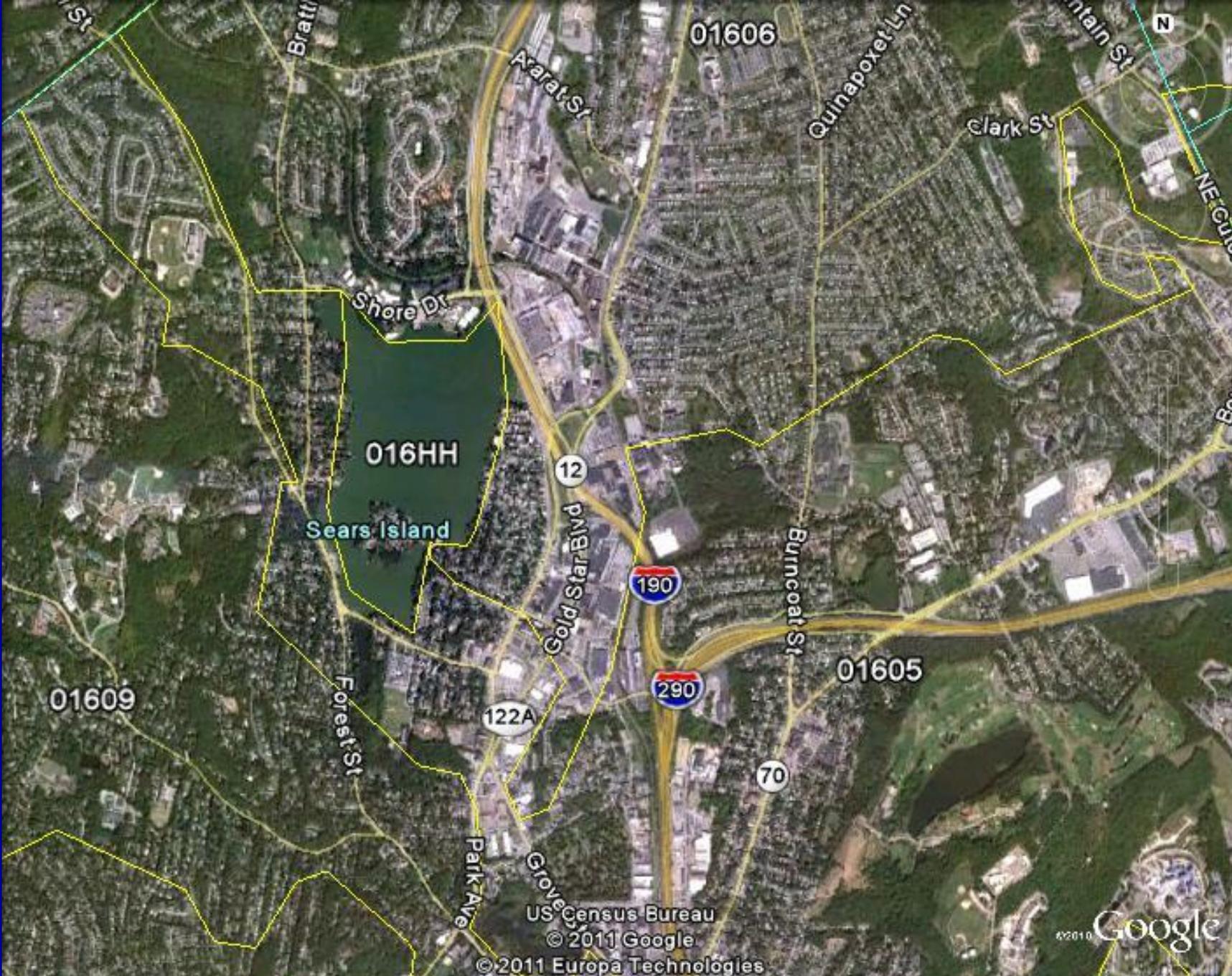
Google

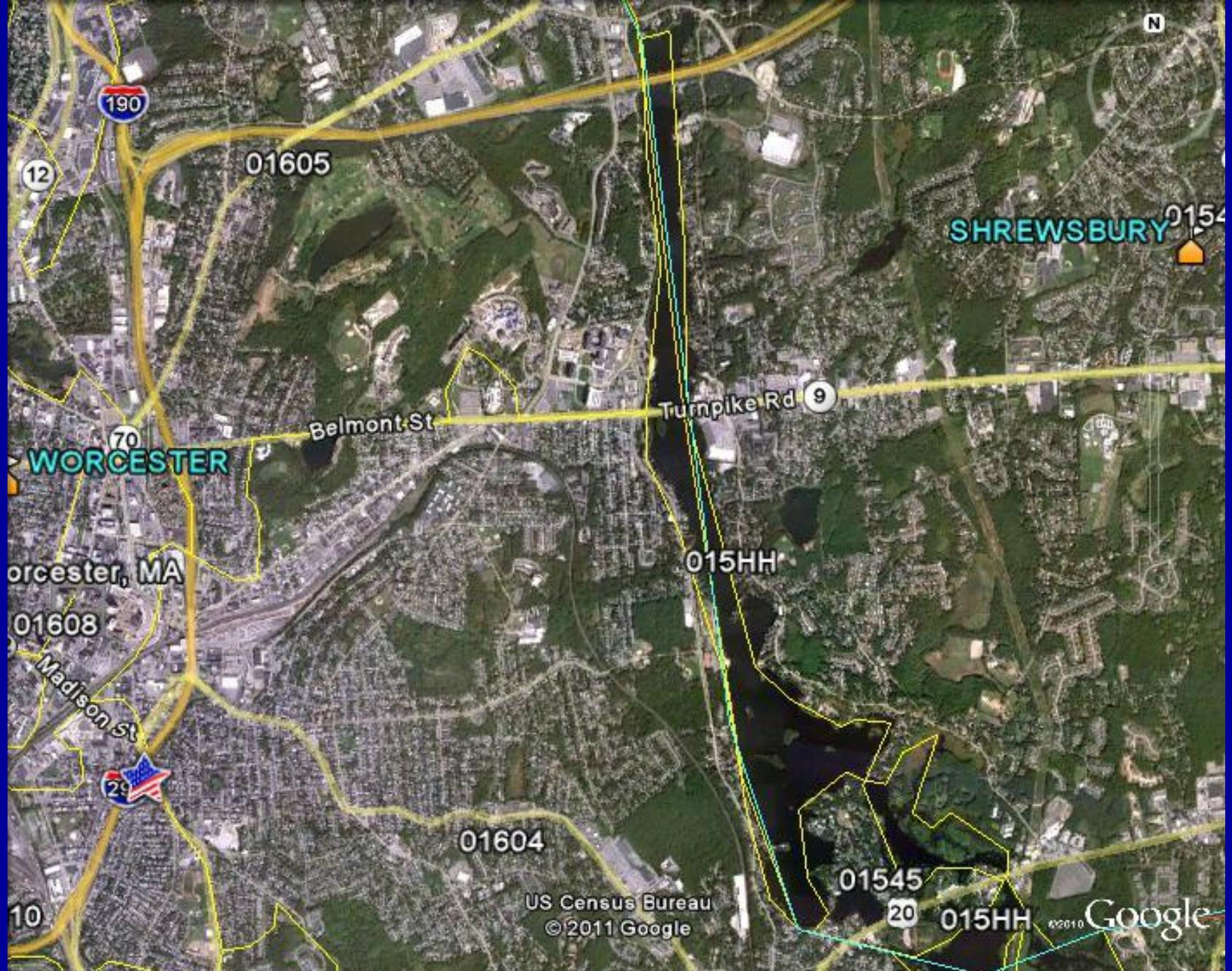
Imagery Date: 9/20/2010

1995

42°15'48.64" N 71°49'47.08" W elev 155 m

Eye alt 4.02 km





190

12

01605

SHREWSBURY 0154

WORCESTER

70

Belmont St

Turnpike Rd 9

orcester, MA

015HH

01608

Madison St



01604

01545

015HH

US Census Bureau
© 2011 Google

Google

10

Imagery Date: 9/20/2010 1995 42°16'07.20" N 71°45'36.76" W elev 133 m

Eye alt 6.94 km

Volunteer Water Quality Monitoring



Blackstone River Coalition Watershed-wide Volunteer Water Quality Monitoring Program

map #	WaterBody	Site Location	Town	Aesthetics	Chemical	Nutrients	Flow	
HEADWATERS TRIBUTARIES								
1	Kettle Brook	James St	Worcester					KEY TO COLOR CODES
2	Dark Brook	Auburn High	Auburn					
3	Leesville Pond	Leesville inflow	Auburn					
4	Leesville Pond	Leesville outflow	Worcester					
5	Tatnuck Brook ^{*cwf}	VFW-south	Worcester					
6	Tatnuck Brook ^{*cwf}	Park Ave. Carwash	Worcester					Fair
7	Beaver Brook	Jewish Community Center	Worcester					Not enough data points
8	Beaver Brook	Park Ave. Carwash	Worcester					Not Sampled
9	Middle River	St. John's Cemetery	Worcester					
10	Ararat Brook ^{*cwf}	Ford Brook	Worcester					
11	Ararat Brook ^{*cwf}	Shore Drive	Worcester					
12	Kendrick Brook	Ararat Street	Worcester					Categories (Each category is derived from the combination of the following factors)
13	Salisbury Pond	Salisbury Pond East	Worcester					
14	Salisbury Pond	Salisbury Pond West	Worcester					
15	Broad Meadow Brook	Dunkirk	Worcester					
16	Broad Meadow Brook	Dupuis	Worcester					
17	Broad Meadow Brook	Sprague Lane	Worcester					Aesthetics - turbidity, water appearance, water odor & visual assessments
18	Broad Meadow Brook	Dosco	Millbury					
19	Cold Spring Brook ^{*cwf}	Hatchery Rd	Sutton					Chemical - dissolved oxygen & water temperature
20	Casey Brook	Putnam Hill Road**	Sutton					
21	Quinsigamond River	rte 140	Grafton					Nutrients - nitrate & orthophosphate
22	Quinsigamond River	Wheeler Rd.	Grafton					
23	Quinsigamond River	Pleasant St	Grafton					
24	Coal Mine Brook	Plantation St	Shrewsbury					
25	Poor Farm Brook ^{*cwf}	Roberto Clemente	Worcester					
26	Sewall Brook ^{*cwf}	School St.	Boylston					
27	Sewall Brook ^{*cwf}	Holden St	Shrewsbury					
28	Tilly Brook	Vinny Testa's	Shrewsbury					
29	Bummitt Brook	Pratts Pond	Grafton					
30	Singletery Brook	Sycamore Circle	Millbury					

BLACKSTONE RIVER								
31	Blackstone River	outlet of Fisherville Pond @ Rt. 122A	Grafton					KEY TO COLOR CODES Excellent Good Fair Not enough data points Poor Not Sampled
32	Blackstone River	Sutton St. USGS flow station	Northbridge					
33	Blackstone River	Plummer's Landing	Northbridge					
34	Blackstone River	Tow path north of Stanley Woolen	Uxbridge					
35	Blackstone River	Upstream at Gorge off Staples Lane	Blackstone					
36	Blackstone River	Main St. Blackstone/TKO	Blackstone					
37	Blackstone River	Albion Dam	Lincoln, RI					
TRIBUTARIES								Categories <i>(Each category is derived from the combination of the following factors)</i> Aesthetics - turbidity, water appearance, water odor & visual assesments Chemical - dissolved oxygen & water temperature Nutrients - nitrate & orthophospate
38	Mumford River	inlet of L. Manchaug	Sutton					
39	Mumford River	outlet of L. Manchaug near Parker Road	Sutton					
40	Mumford River	Gilboa Street/above WWTP	Douglas					
41	Mumford River	Rt. 122, N. Uxbridge	Uxbridge					
42	Mumford River	downstream @ Depot St.	Uxbridge					
43	Dark Brook	Putnam Hill Road**	Sutton					
44	unnamed tributary	outlet of Whitin Reservoir	Douglas					
45	Centerville Brook *cwf	West Street	Douglas					
46	Cook Allen Brook *cwf	upstr of bridge on Johnson Road	Sutton					
47	Purgatory Brook	upstr of bridge on Johnson Road**	Sutton					
48	West River *cwf	Glen Ave. Wells	Upton					
49	West River *cwf	Hartford Avenue	Upton					
50	West River *cwf	Pleasant and Glen	Upton					
51	West River *cwf	Mendon Road	Northbridge					
52	West River *cwf	upstream @ Harrington pool	Northbridge					
53	West River *cwf	under Rte. 16 bridge	Uxbridge					
54	Warren Brook *cwf	Fowler Road Bridge	Upton					
55	Center Brook *cwf	Station Street	Upton					
56	Center Brook *cwf	at Mendon Road	Upton					
57	Meadow Brook	upstream at Blackstone St. bridge	Uxbridge					
58	Emerson Brook *cwf	bridge @ Mill Street - before pond St.	Uxbridge					
59	Emerson Brook *cwf	Above Quaker Highway	Uxbridge					
60	Bacon Brook *cwf	East of Bridge, South Street	Uxbridge					

Low Impact Development (LID):

- A more sustainable land development approach –
- Based on an environmentally sensitive site planning process; and
- A stormwater management strategy designed to mimic natural hydrology.



Encourage Low Impact Development Practices to Increase Infiltration and Reduce Stormwater Volume

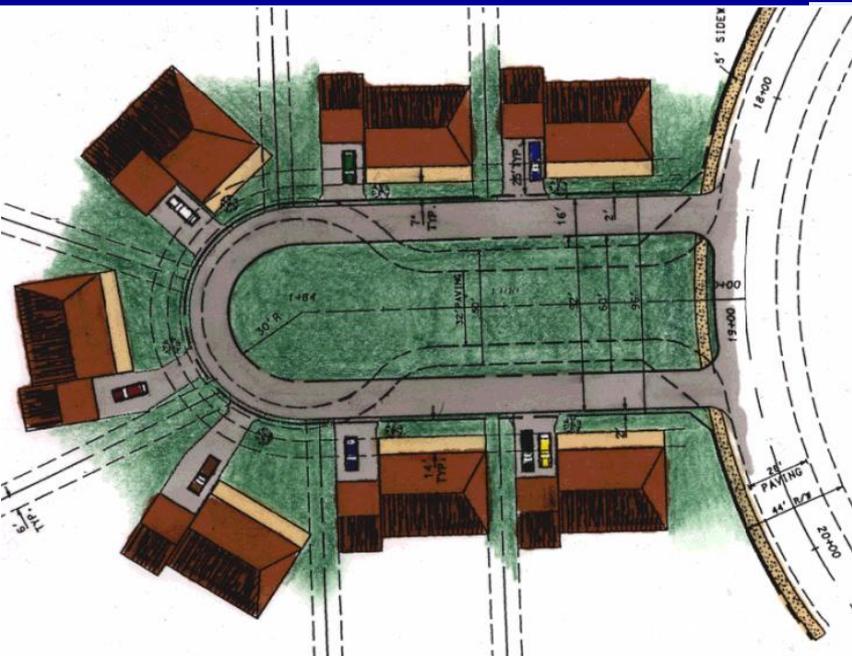
- Site planning techniques
- Impervious surface reduction
- Rain gardens and bioretention
- Rooftop gardens
- Vegetated swales, buffers and strips
- Roof leader disconnection
- Rain barrels and cisterns
- Permeable pavers



WPI Green Roof

Better Site Design of Roadways & Driveways

- Narrower streets
- Alternative cul-de sacs
- Shared driveways



Source: City of Portland, OR



Source: R. Claytor

Vegetated Swales

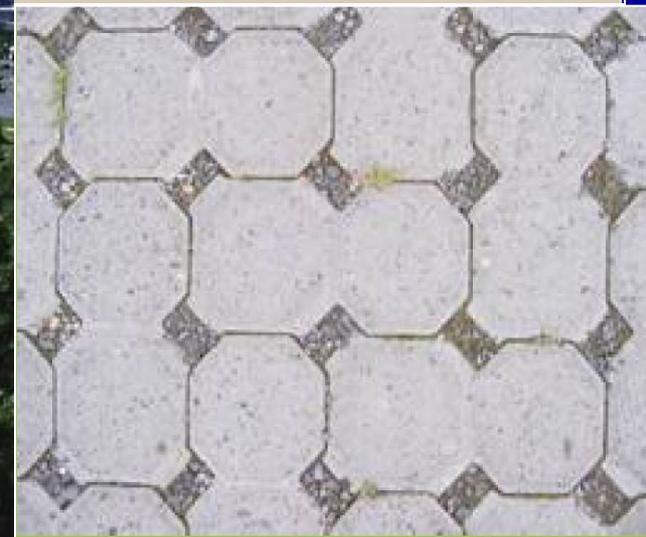
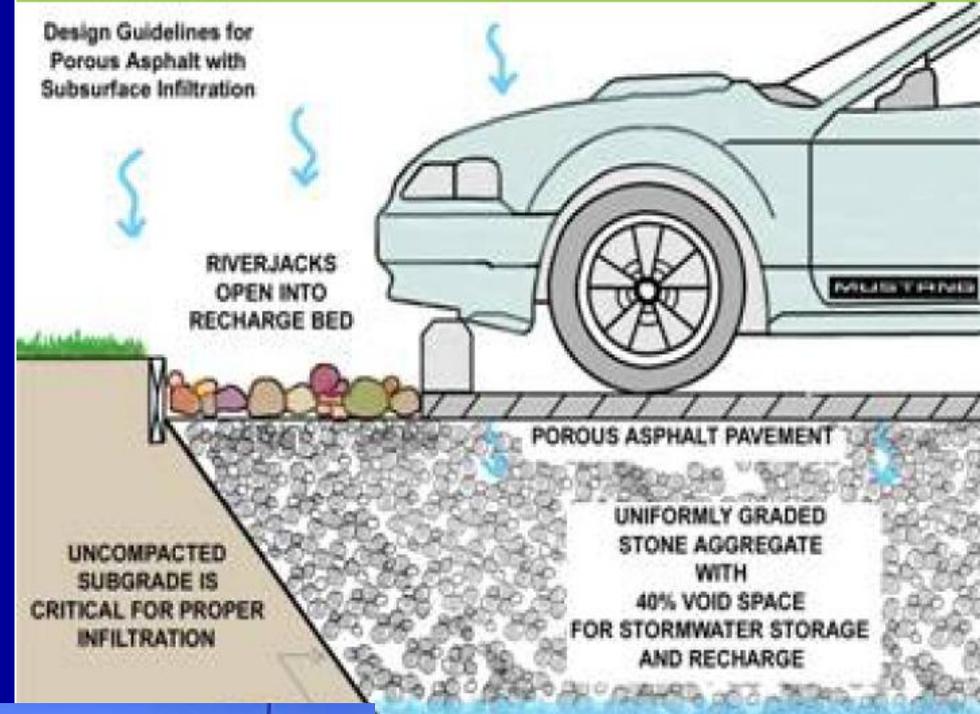
Conveyance, Treatment, Infiltration

- Roadside swales (country drainage) for lower density and small-scale projects;
- For small parking lots;
- Mild side slopes and flat longitudinal slopes;
- Provides area for snow storage & snowmelt treatment



Permeable Paving Runoff Reduction

- Grass pavers
- Paving stones
- Porous asphalt
- Pervious concrete
- Reinforced turf



Rain Barrels and Cisterns

Runoff Reduction and Water Conservation

- Downspouts directed to tanks or barrels;
- 50 –10,000 gallons;
- Excess diverted to drywell or rain garden;
- Landscaping, car washing, other non-potable uses.



Rain Gardens, Bioretention and Street Tree Filters

- Parking lot islands
- Median strips
- Residential lots
- Office parks



Source: City of Portland, OR



Source: LID Center

LID Cost Savings

- Constructing and maintaining LID saves money
 - for the developer
 - for municipal maintenance.
- Less land needs to be cleared
- Less pavement to build and maintain (plowing, sweeping, repaving)
- No piping to install or maintain
- No catch basin or detention basin cleaning, etc.



Homeowners:

Campaign for a Fishable/Swimmable Blackstone River by 2015

A Homeowner's Guide to Protecting Water Quality in the Blackstone River Watershed



If you live in the shaded area of the map, then you live in the Blackstone River watershed. You can help restore and protect its water quality. Look inside to learn how. A cleaner Blackstone River begins in your own backyard!

- Lawns/Gardens
- Car Care
- Pet Waste
- Clean Dishes/Clean Streams
- Rooftop Runoff
- Household Hazardous Waste
- Pervious Surfaces
- Stream Buffers

Remember This:

Roof runoff
connected to *driveways*,
draining to *streets*,
draining to *pipe systems*,
draining into streams =
dead fish, erosion of the
riverbank, and
thirsty people.

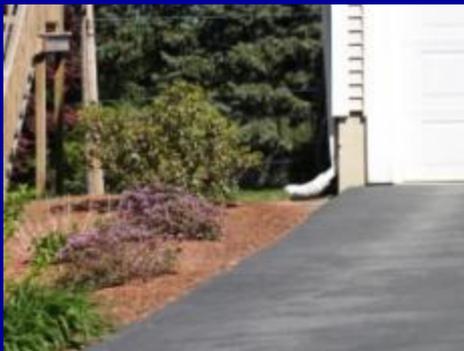
Divert Your Downspouts!





Diversion Tactics

Angle downspout away from pavement to vegetated area.



Install a rain barrel.



Create a rain garden.





The Blackstone River Coalition

Campaign for a Fishable/Swimmable Blackstone River by 2015

www.zaptheblackstone.org

