Arlington Stormwater:

How is it Polluted?

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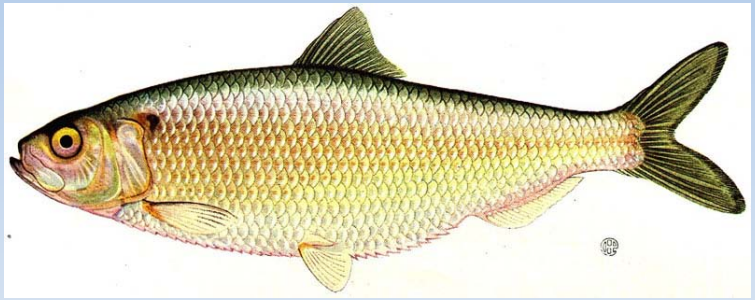
Outline

- History of local water bodies
- Stormwater in urban environments
- Current conditions and impairments
- The MS4 permit
- Arlington as a model for a green community
- Opportunities to improve conditions

Who We Are and What We Do

- **Education/Outreach** - Educate the public and municipal leaders about contamination issues in the watershed
- **Policy/Advocacy** - Submit comments on important policy issues
- **Monitoring/Science** - Monitor the health of the watershed



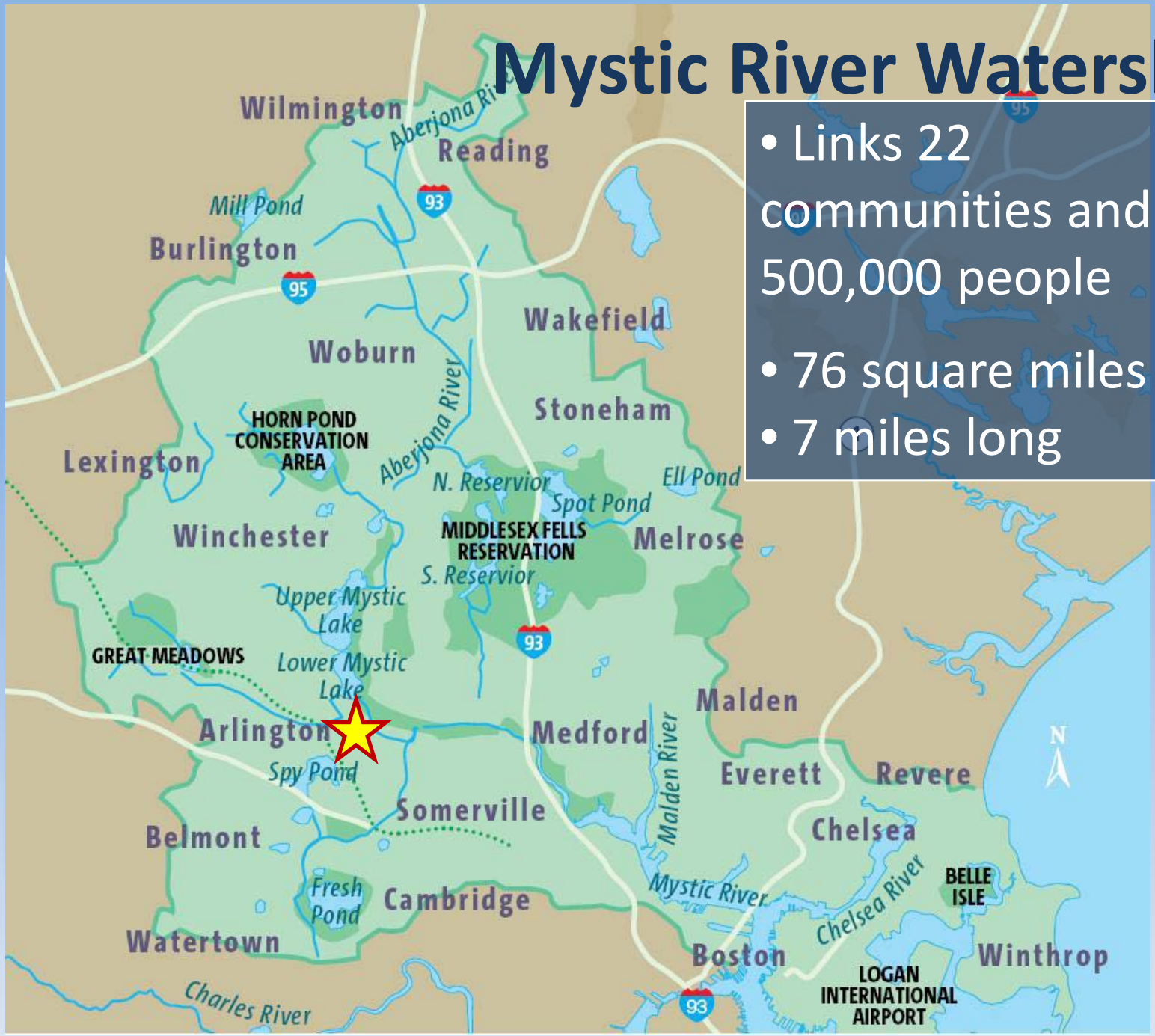
Blueback Herring

My RWA

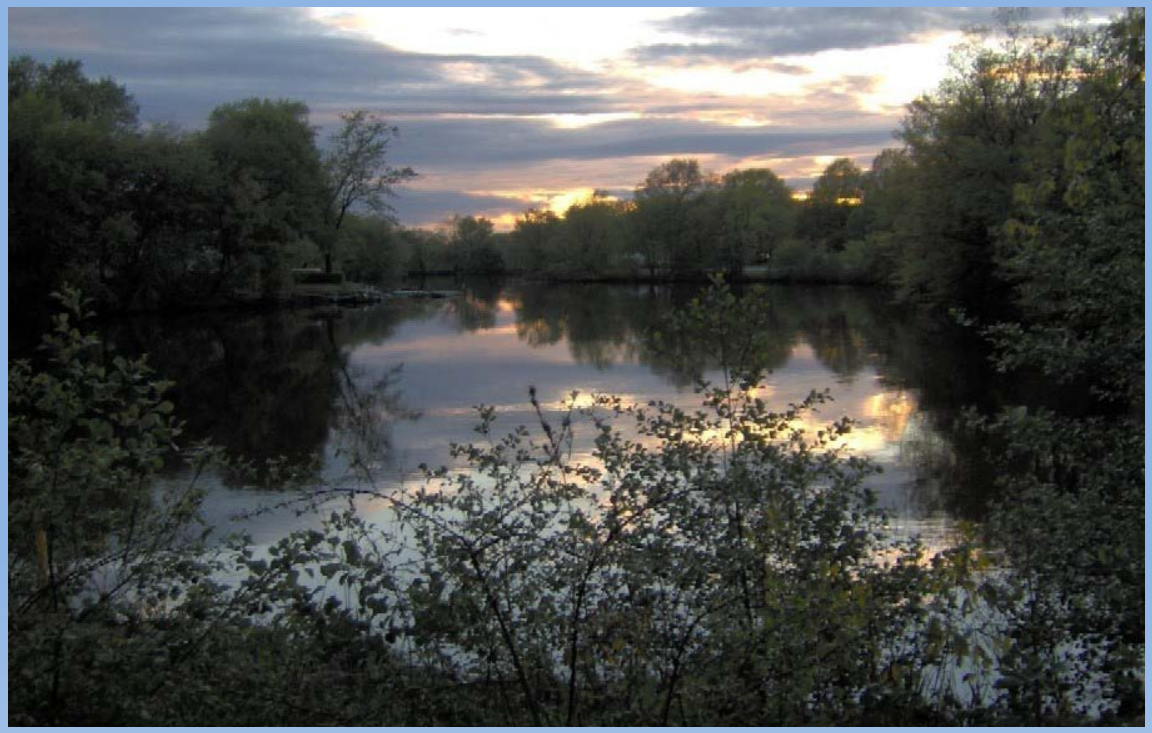
Mystic River Watershed Association

your community • your watershed

Mystic River Watershed



- Links 22 communities and 500,000 people
- 76 square miles
- 7 miles long



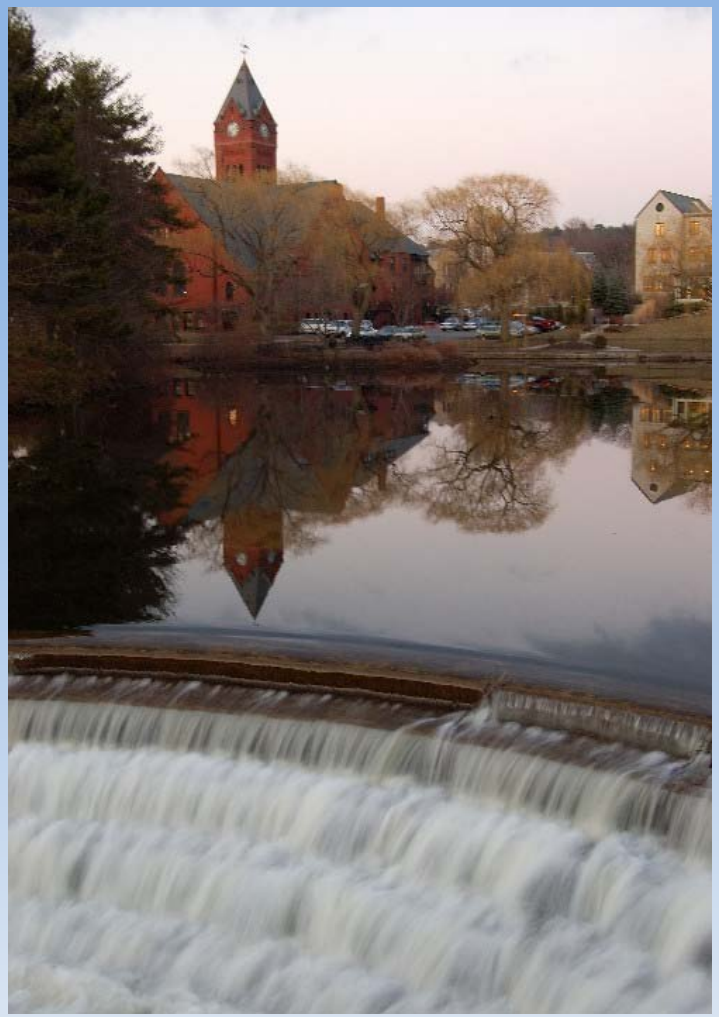
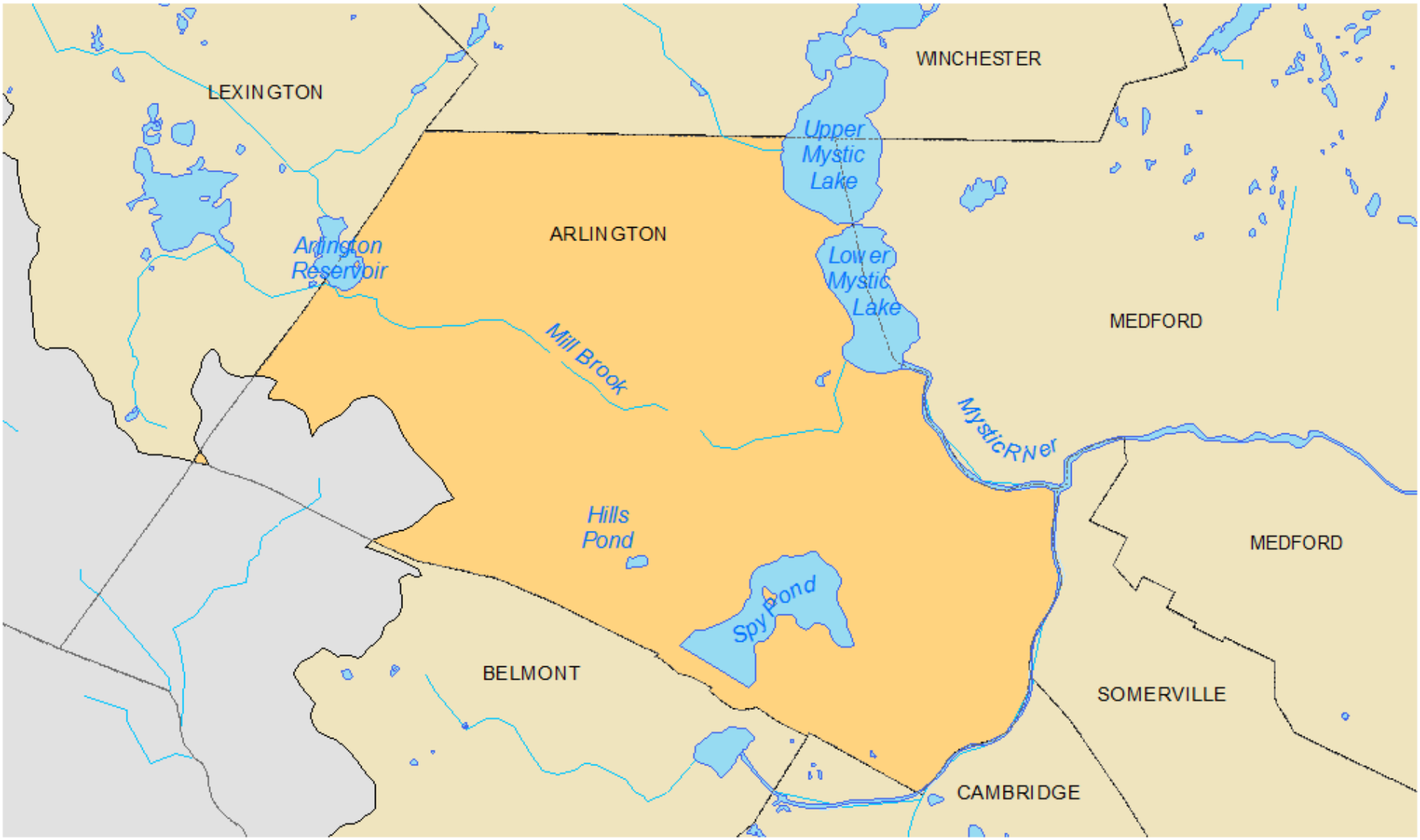


Image from online CSL International brochure

Arlington's Local Water Bodies



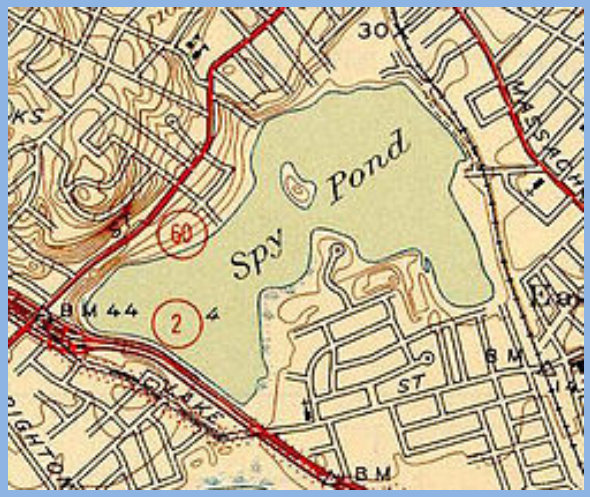
Mill Brook

- Originally settled in 1635
  - Menotomy, an Algonquian word meaning "swift running water.“
- The main reason for its location was the Mill Brook
  - Seen as a source of power
- 1637: Dam built, mill erected
- Other mills built along 2 miles with dams, mill ponds, and sluices
- Ponds on Mill brook filled in, large sections culverted or underground

Mill Brook Today

- Headwaters at the confluence of Munroe and Sickle Brooks, which meet next to the Arlington Reservoir
- >40% of the brook is culverted
- 30% percent is channelized but exposed
- very few short sections are in its natural stage
- Needs substantial restoration and remediation to improve biodiversity, water quality, drainage and flood control
- Plans are proposed for the Mill Brook Linear Park

Spy Pond



- Fed by groundwater and surface runoff
- 1850: the Spy Pond Water Company began piping water to West Cambridge
- 19th century: Spy Pond became an industrial center
  - Became a source for ice and pure water
  - Installed infrastructure and equipment, leading to development of the local railroad
- 1970s: the Wetland Protection Act was passed classifying Spy Pond as a Great Pond under Massachusetts law
  - Despite this classification, Spy Pond used for drainage from Route 2

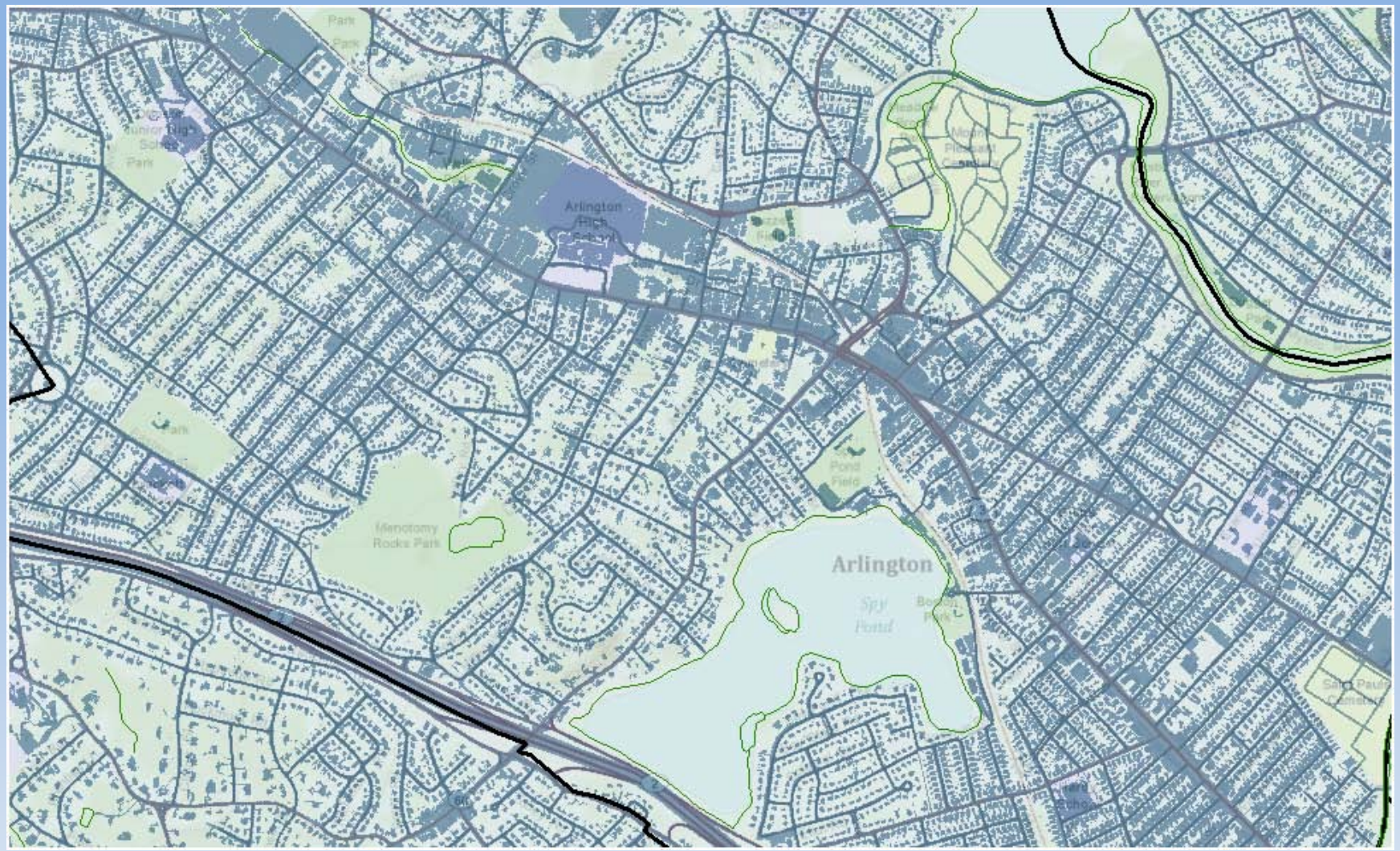
Spy Pond

- Elevated levels of arsenic (As) in the sediments
- Study identified the source and extent of contamination
- No known history of As use by industry or agriculture
- Sediment cores dated to 1962 (North) and 1956 (South)
- Record of arsenical herbicide use from 1960-1968, applied to pond to control aquatic macrophytes
- Arsenic levels from 1 - 2600 ppm (Background levels 10-40 ppm)
- The highest concentrations comparable to levels in lakes contaminated with chemical manufacturing and mining wastes

Arlington Reservoir

- Water supply a major issue during 1800s
  - Most individuals take water from wells and springs
- 1872: Arlington Reservoir constructed from Great Meadows
  - piped into the lower sections of Arlington
- Poor water quality
  - had too much soil and iron
  - Reservoir diverted water from mills
- Original Park Circle standpipe constructed in 1895
- Water troubles continued until Arlington joined the Metropolitan District system in 1898

Arlington’s Impervious Surfaces



What is a Storm Water?

- Stormwater runoff is unfiltered water that reaches streams, lakes and oceans by flowing across impervious surfaces.
- Surfaces include roads, parking lots, driveways, and roofs.

What sources of pollution do we suspect are present?

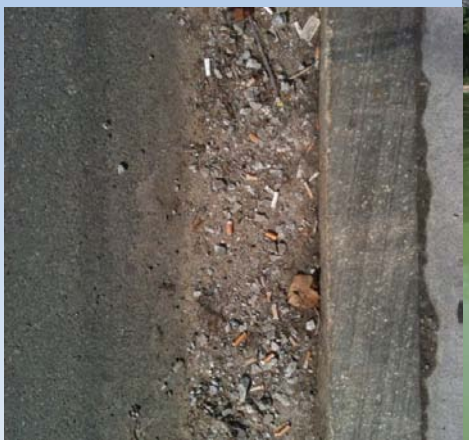
Human sewage | Road Runoff | Industrial Pollution

How do we measure this?

Human sewage	Road Runoff	Industrial Pollution
Bacteria (*Enterococcus, E.coli*) Surfactants Dissolved oxygen	Nitrogen Phosphorus Total Suspended Solids Specific conductivity Salinity	Petroleum products Specific conductivity pH Temperature Total Suspended Solids

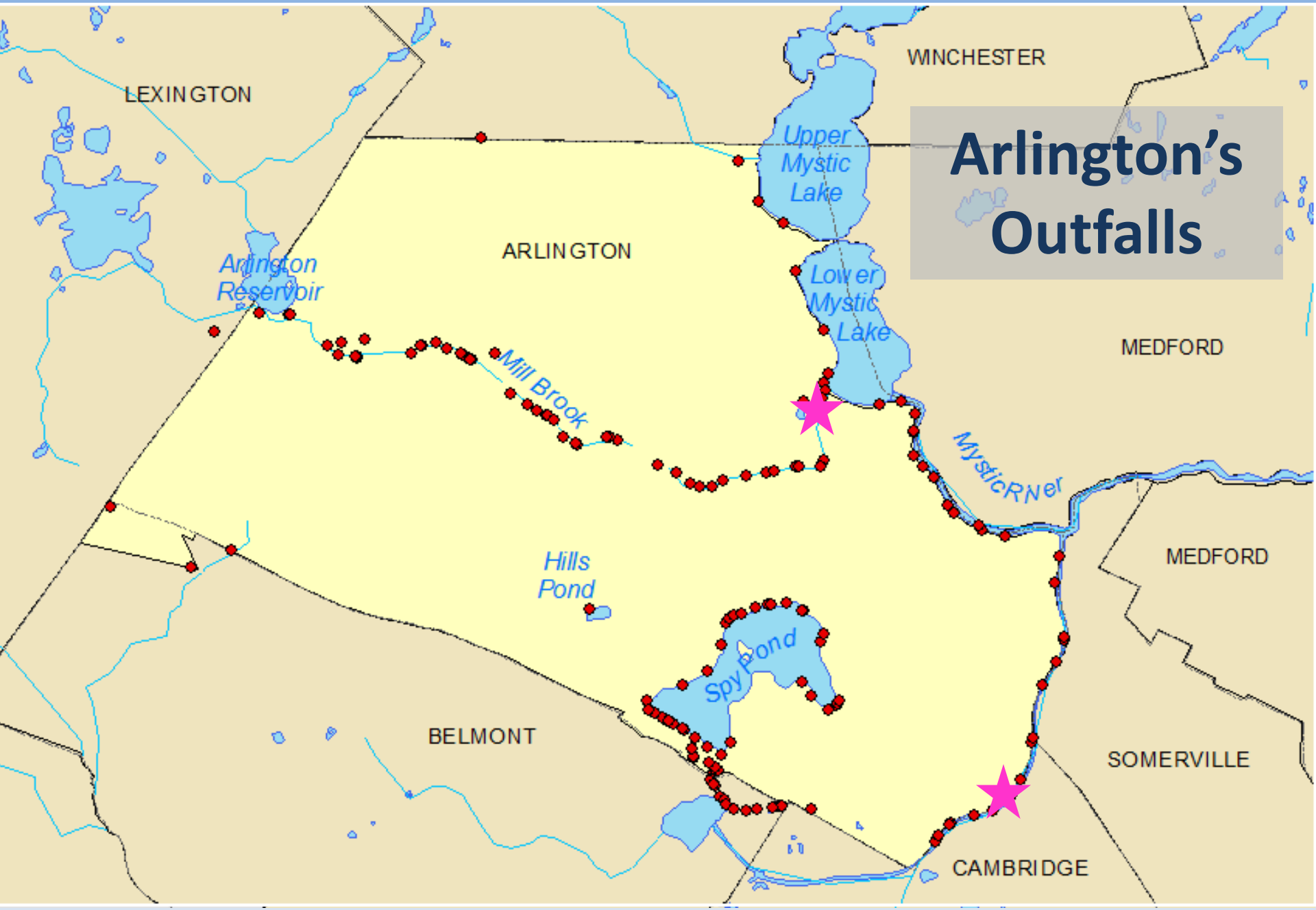
Stormwater in Urban Environments

- Water Quality Issues
  - Sewage contamination (CSO's, SSO's)
  - Eutrophication/Nutrient loading
- Results in
  - Flooding
  - Erosion
  - Pollution
  - Beach Closures

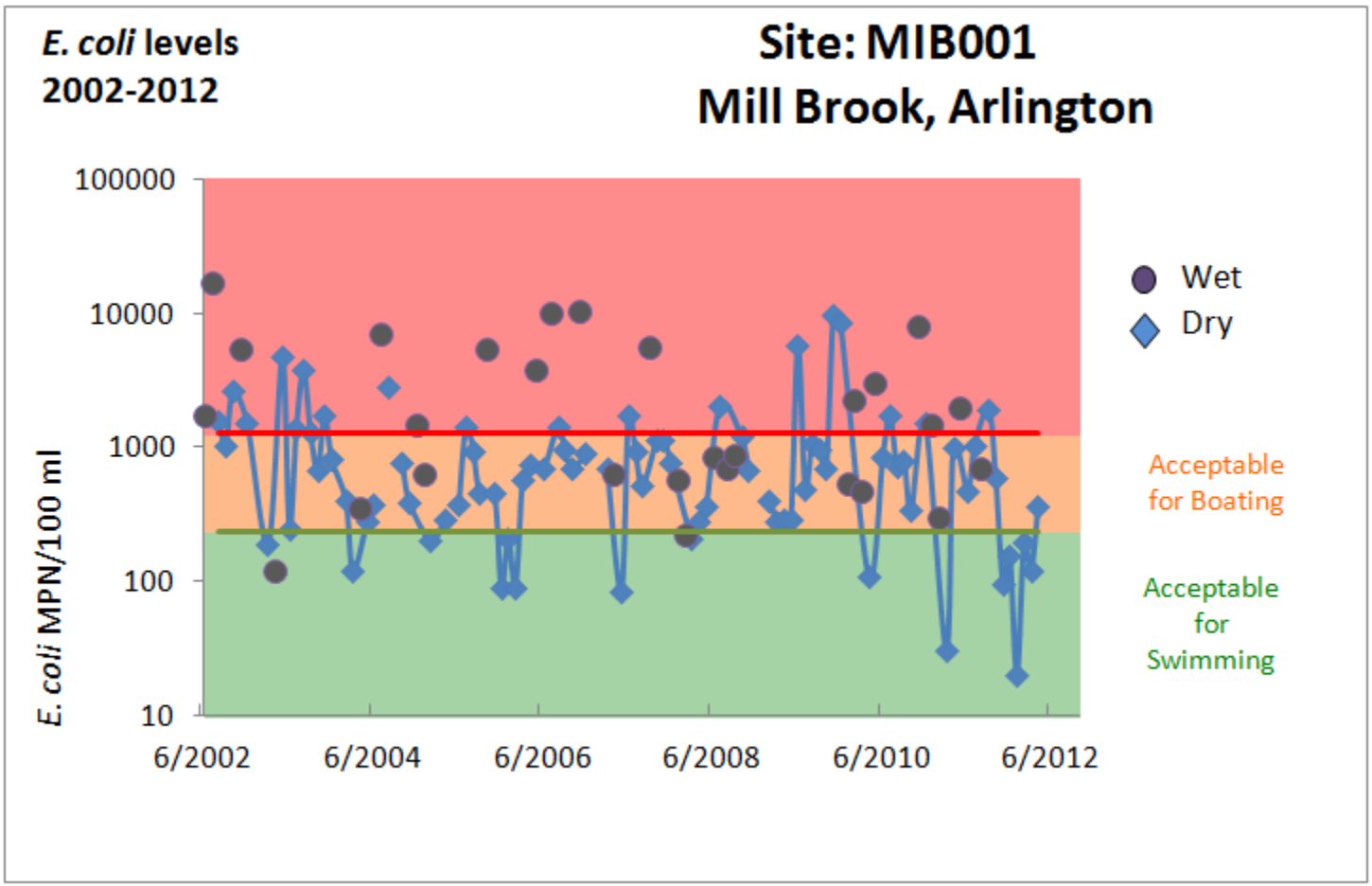


Urban Stormwater

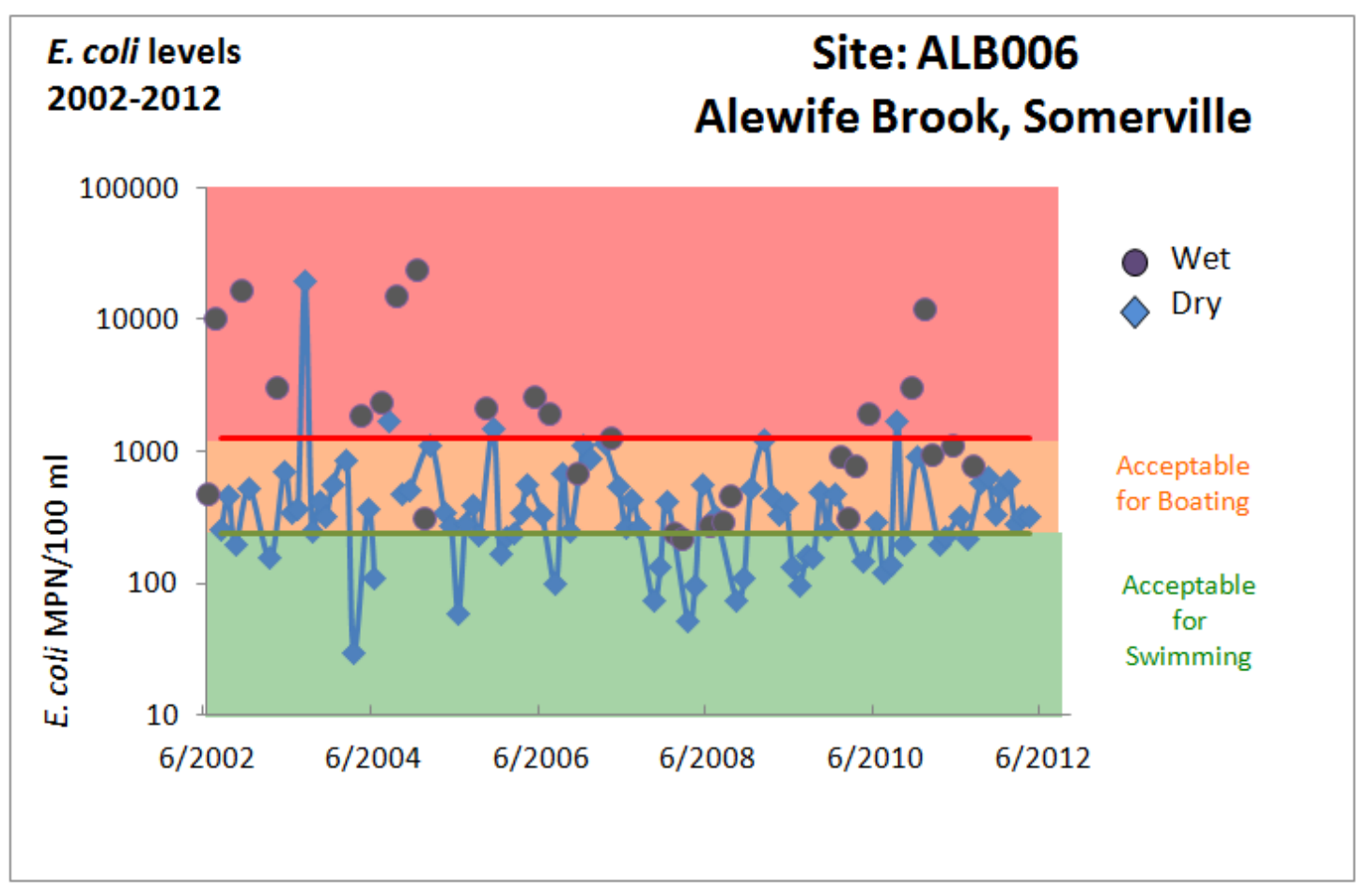
- Pollutants from urban runoff include:
  - Sediment
  - Oil, grease and toxic chemicals
  - Pesticides and nutrients
  - Viruses, bacteria and nutrients
  - Road salts
  - Heavy metals from roof shingles, motor vehicles and other sources
  - Thermal pollution from dark impervious surfaces
- habitat-destroying impacts
  - harm fish and wildlife populations
  - kill native vegetation
  - foul drinking water
  - make recreational areas unsafe and unpleasant


Arlington's Outfalls
WINCHESTER
LEXINGTON
ARLINGTON
Upper Mystic Lake
Lower Mystic Lake
Arlington Reservoir
Mill Brook
MEDFORD
Mystic River
Hills Pond
Spy Pond
MEDFORD
BELMONT
SOMERVILLE
CAMBRIDGE

Arlington's Stormwater: Mill Brook

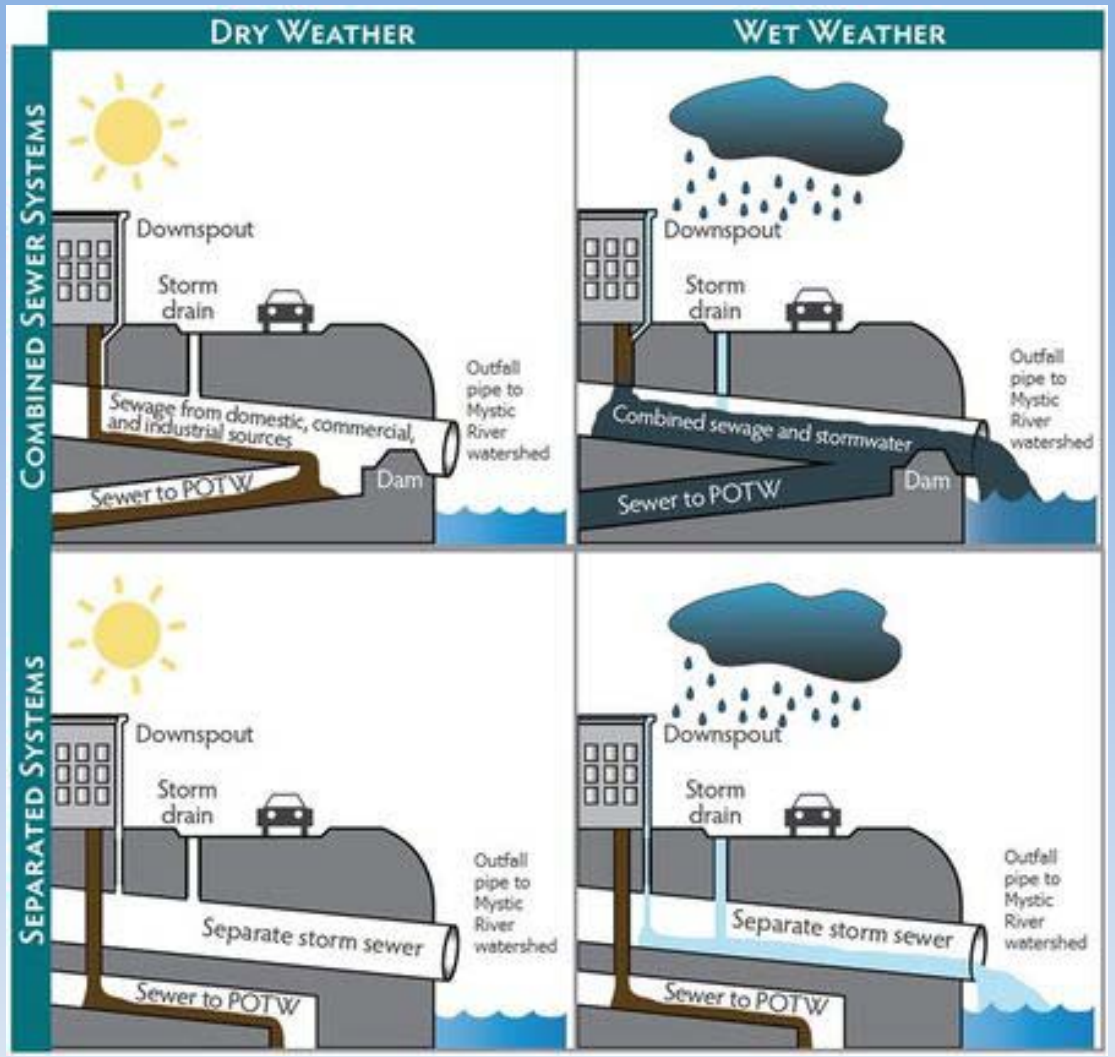


Arlington's Stormwater: Alewife Brook



CSO's vs. SSO's

- Interaction between stormwater and sanitary sewer system
  - CSO's
  - SSO's

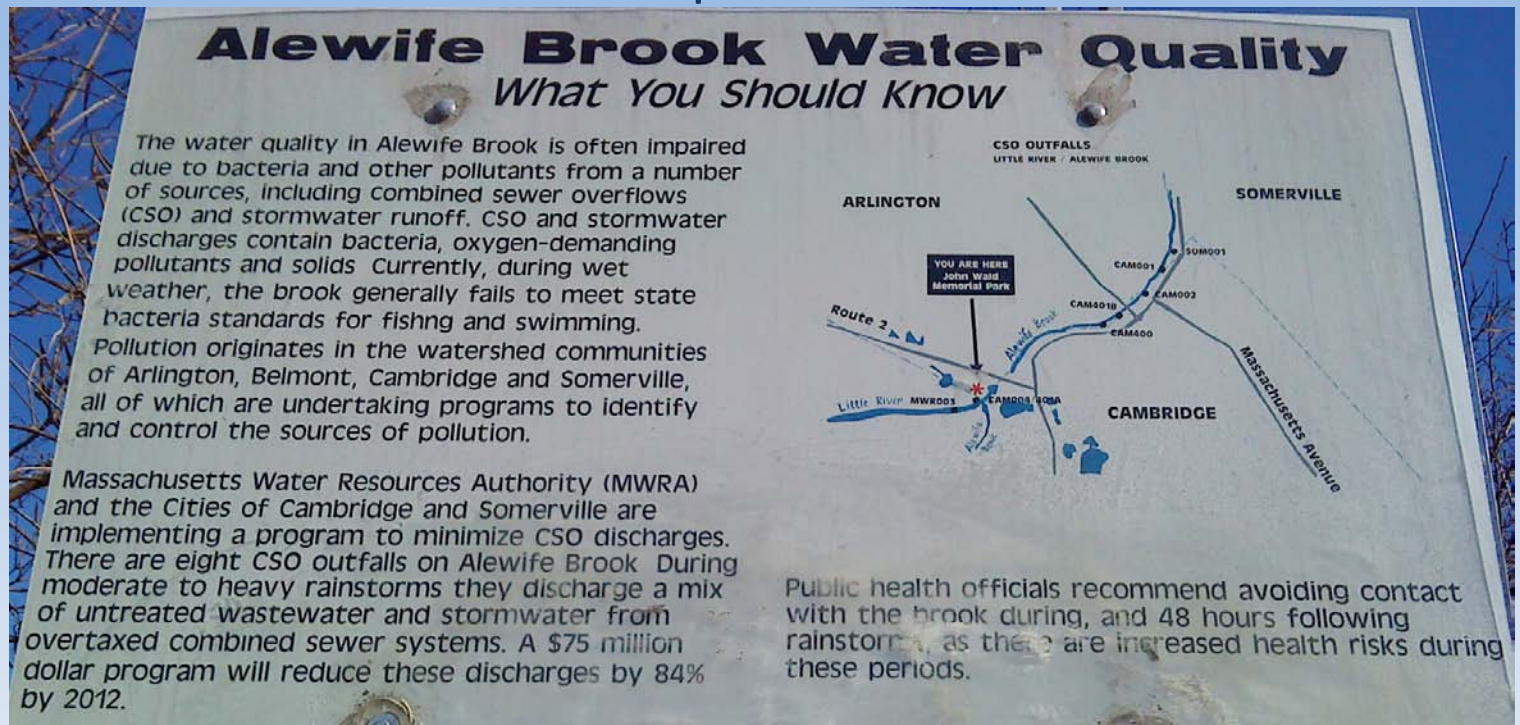


Alewife Brook

- Previously: Sewage directly into brook
- MWRA put in interceptors on Alewife Brook, connecting Arlington sewer pipes
- Contamination from stormwater drainage and sanitary sewers
  - Significant problem during floods
- Adequate capacity to convey sewage, but stormwater combined with sewage may exceed system capacity
  - Backups and overflows
- Pipes in poor condition result in I/I
  - Infiltration: Groundwater seeping into sewer pipes
  - Inflow: Stormwater runoff pouring into sewer pipes

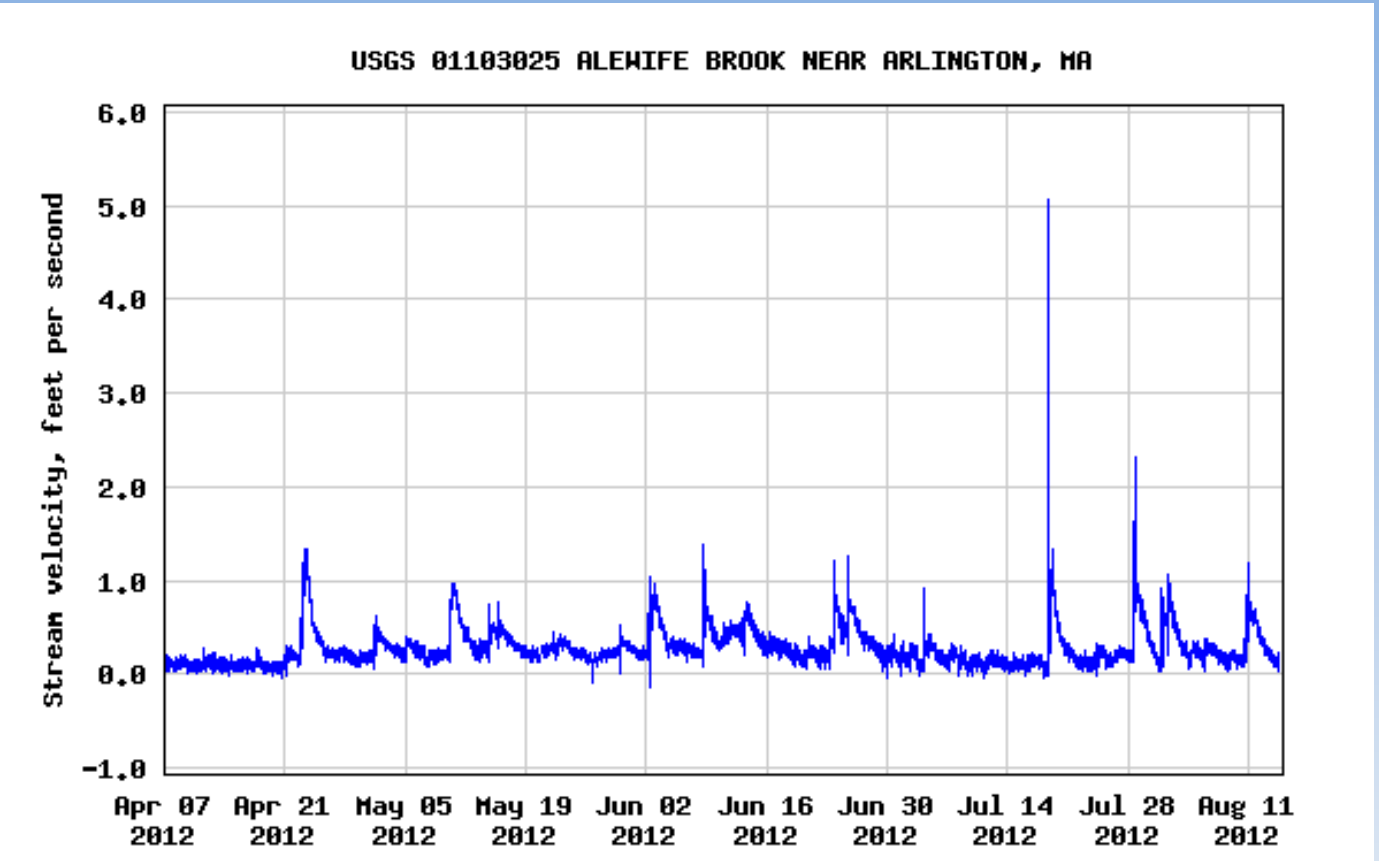
Alewife Brook's Challenges

- Arlington, Belmont and Cambridge - MWRA sewage system
  - Arlington and Belmont: Separate sewer/ Stormwater
  - Cambridge: Combined sewer system
- Upstream inputs
- Cutting down vegetation putting in gardens/fertilizers
- Restoration of wetland and paths



Alewife Brook Today

- Drought Conditions
  - Low flow
  - Infiltration of groundwater into sewer pipes



Stormwater Discharges From MS4s

- Municipal Separate Storm Sewer Systems (MS4s)
- Polluted stormwater runoff is transported through MS4s
- To prevent harmful pollutants from being dumped, must obtain a NPDES permit and develop a *stormwater management program*
- Renewal permit

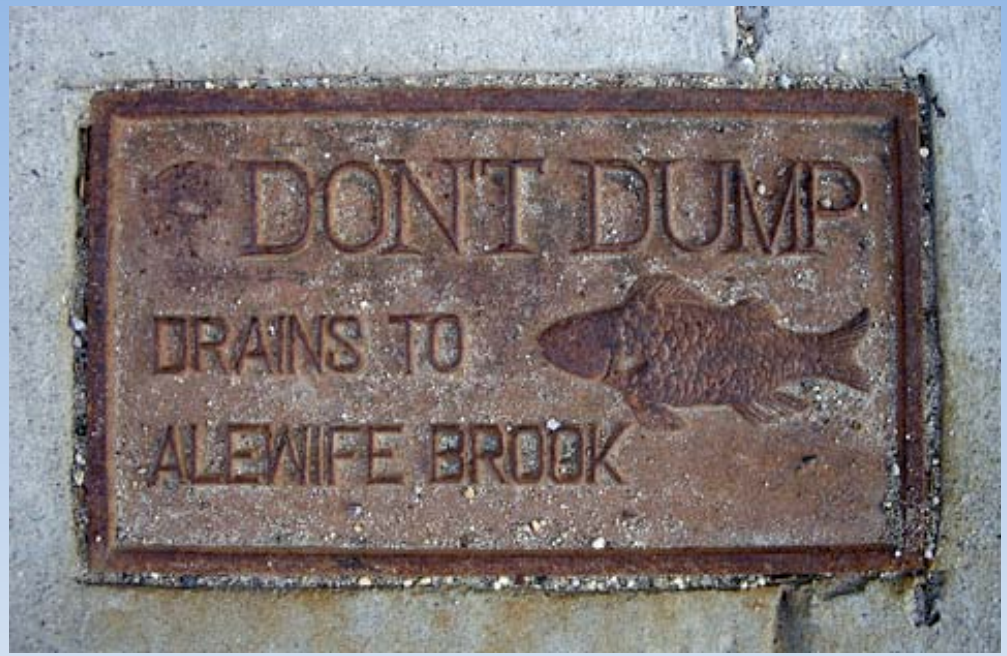
MS4 permit and Arlington

- Before the first MS4 permit
  - Leaching catch basins
  - Takes a fraction of stormwater, takes nutrients out of storm water
- 1st permit
  - minimum efforts
  - Arlington ahead, had maps

MS4 permit and Arlington

- Arlington has been proactive
- DOT investigated stormwater outfalls at Spy Pond
  - 2 problem areas from Belmont (connection from Rt 2)
- Removal of illicit connections - DEP authority

- Curb side plaques around spy pond, and continued signage in other areas of the city
- DEP started a watershed wide SSO investigation
  - not covered on MS4

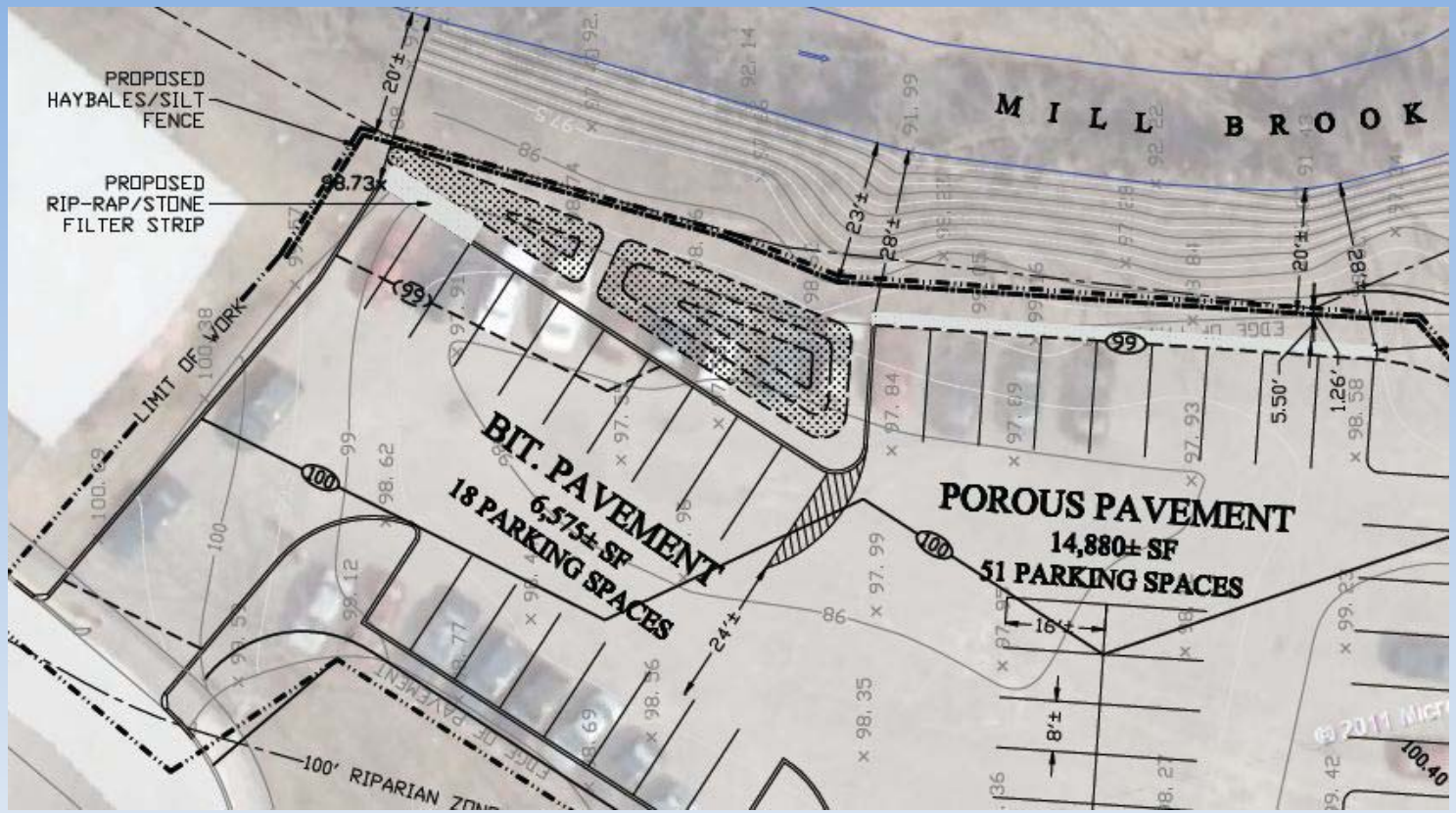


Current Stormwater Trends

- Redevelopment of site includes a vegetative bioswale as part of the landscape design to improve stormwater quality
- Reduction of the impervious areas on the property by 0.75 acres or a 24% reduction
- Compensatory flood storage for Mill Brook
- Increased flood storage capacity > 2:1 by adding 26,062 additional cubic feet of storage

Opportunities to Improve Conditions

- Arlington Community Rain Gardens
  - Hurd Field
  - Hardy School



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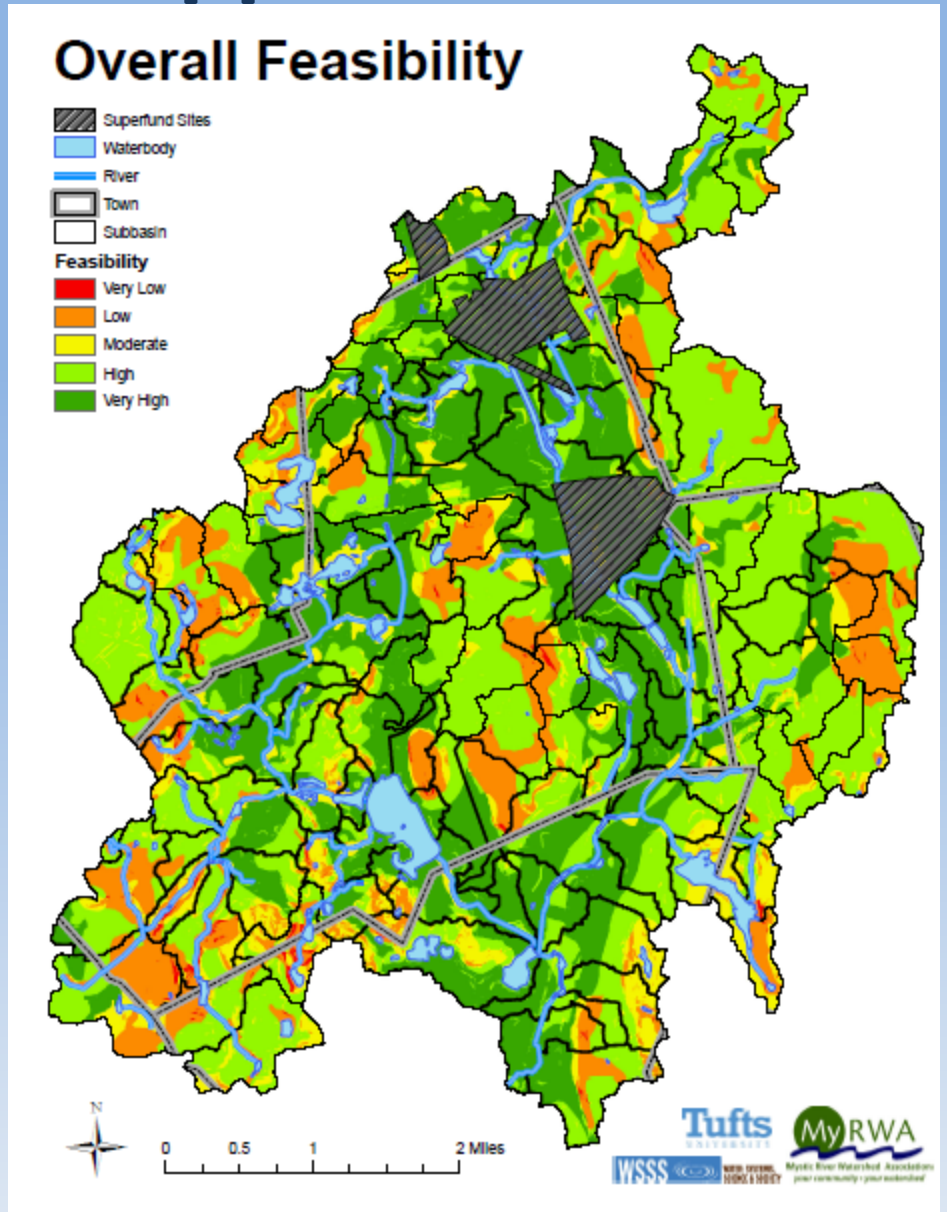


- Mapping of ideal BMP locations
  - Increase infiltration to reduce runoff
  - Remove pollutants to improve quality
- Infiltration is key

Neighborhood Scale Approaches

- Green streets and Greenways
- Integrate stormwater management with existing open space
- Stream daylighting
- Regional retention and detention systems

Large site scale approaches

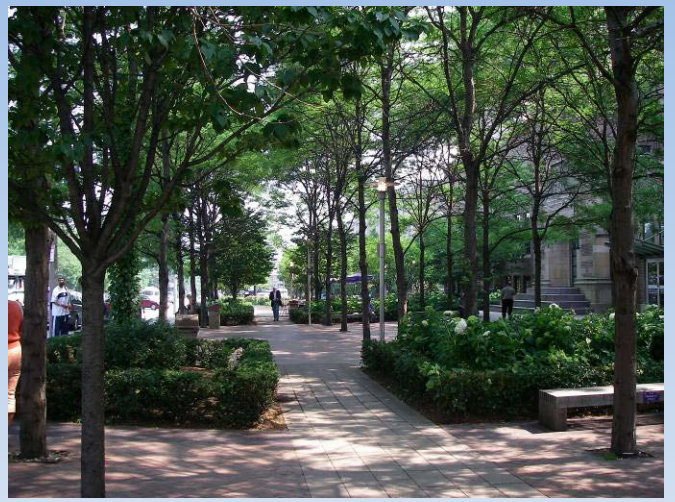
- Parking lot and courtyard retrofits
- Permeable pavement
- Constructed wetlands and other retention and detention systems

Residential/Small Scale Approaches

- Cisterns/ rainbarrels
- Rain gardens
- Stormwater planters

Benefits of Green Infrastructure

- Reduced flooding
- Increased recharge
- Reduced ‘heat island’ effect
- Aesthetic, pedestrian and public safety improvements
- Improved conditions in the River
- Public support for sustainable communities



Residential Street Retrofit

Residential Street Retrofit

Commercial/ Industrial Street Retrofit

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Thank you!

Questions?