



**Arlington Stormwater:**

**How is it Polluted?**

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**Watershed Scientist**

# Outline

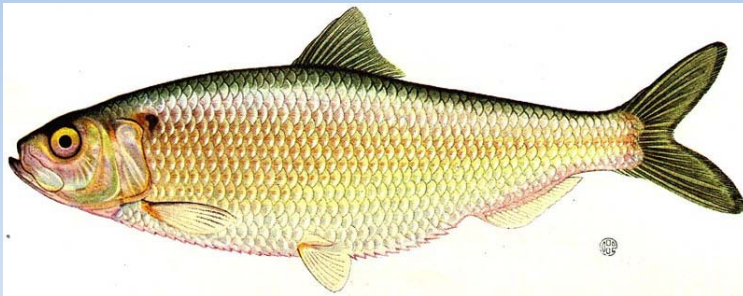
- History of local water bodies
- Stormwater in urban environments
- Current conditions and impairments
- The MS4 permit
- Arlington as a model for a green community
- Opportunities to improve conditions



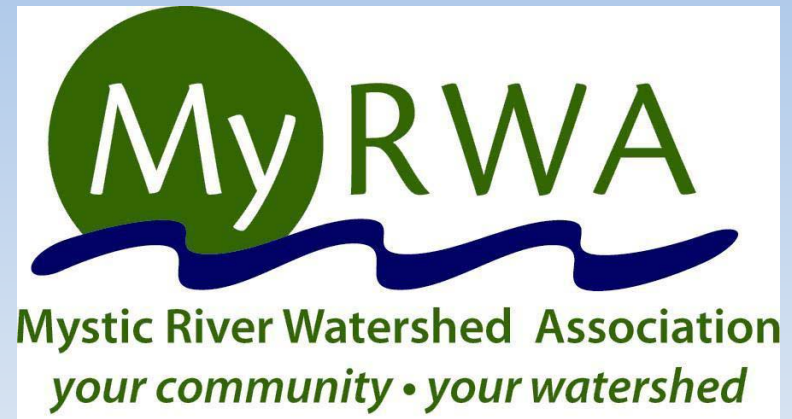


# Who We Are and What We Do

- **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



# Mystic River Watershed

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

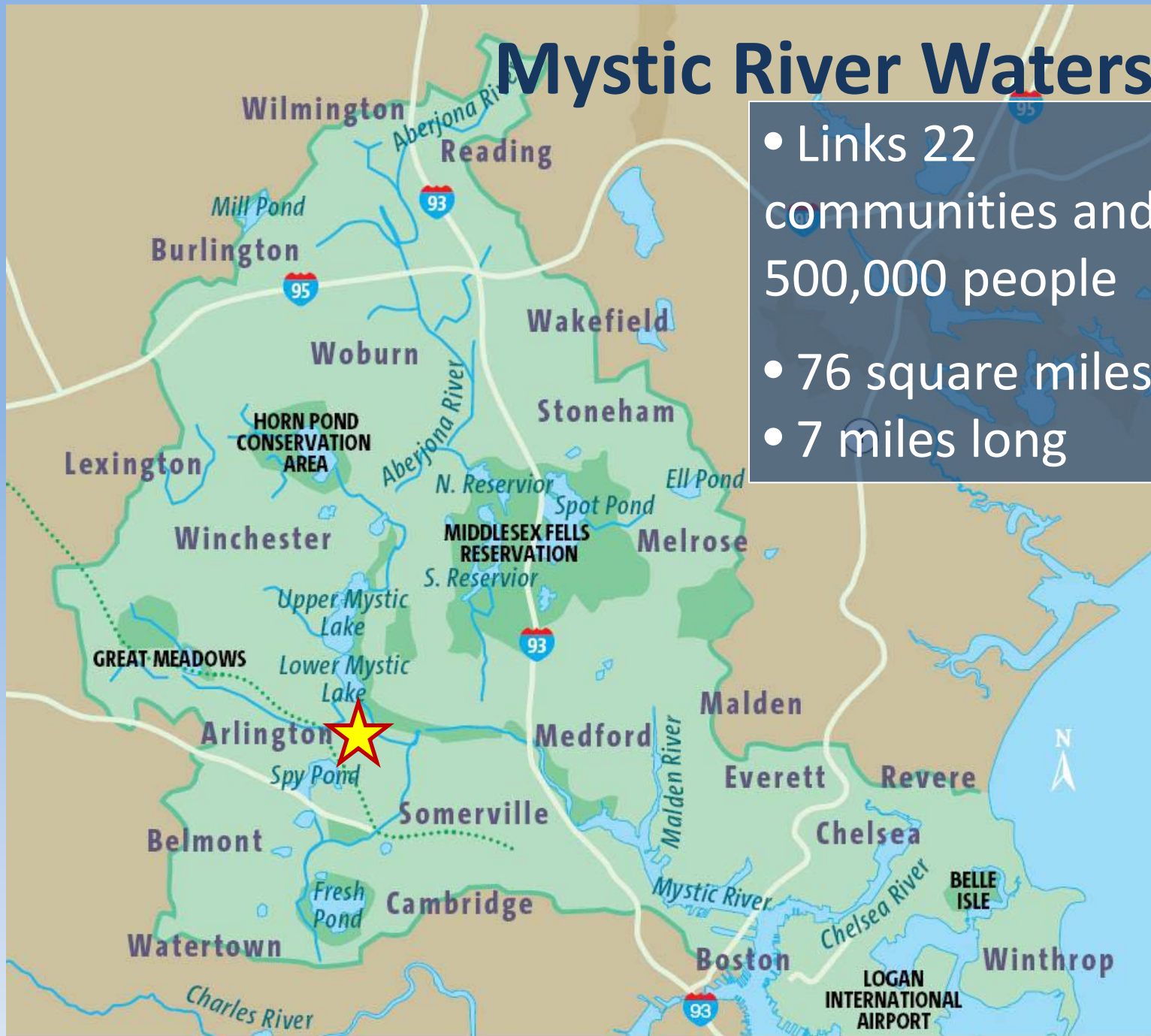






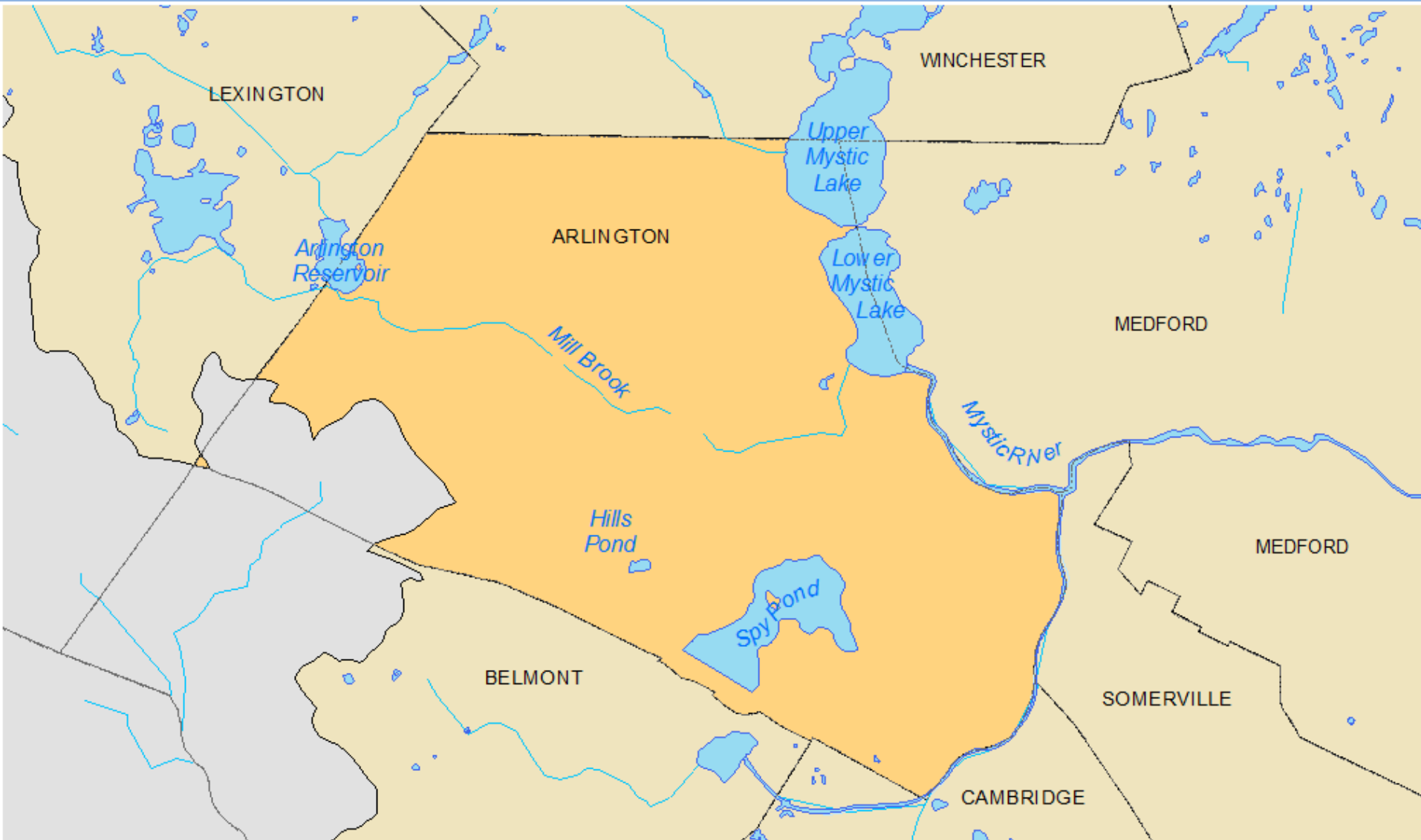




Image from online CS International brochure



# Arlington's Local Water Bodies



# Mill Brook

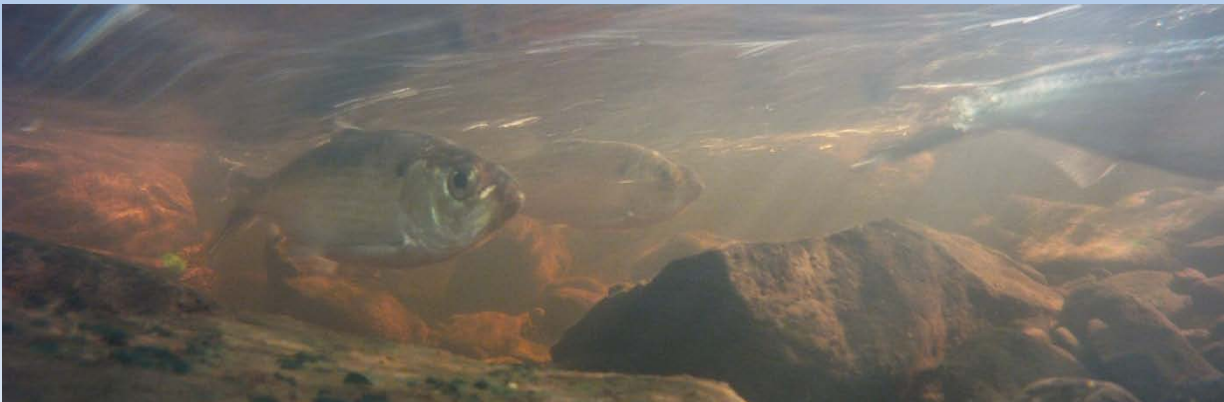
- Originally settled in 1635
  - Menotomy, an Algonquian word meaning "swift running water."
- The main reason for its location was the Mill Brook
  - Seen as a source of power
- 1637: Dam built, mill erected
- Other mills built along 2 miles with dams, mill ponds, and sluices
- Ponds on Mill brook filled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





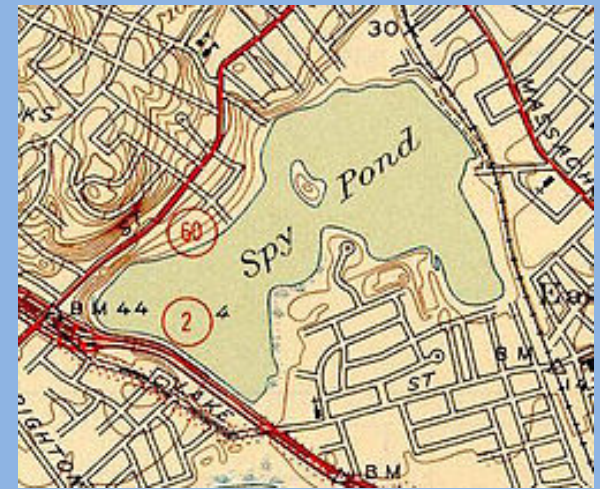
# Mill Brook Today

- 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



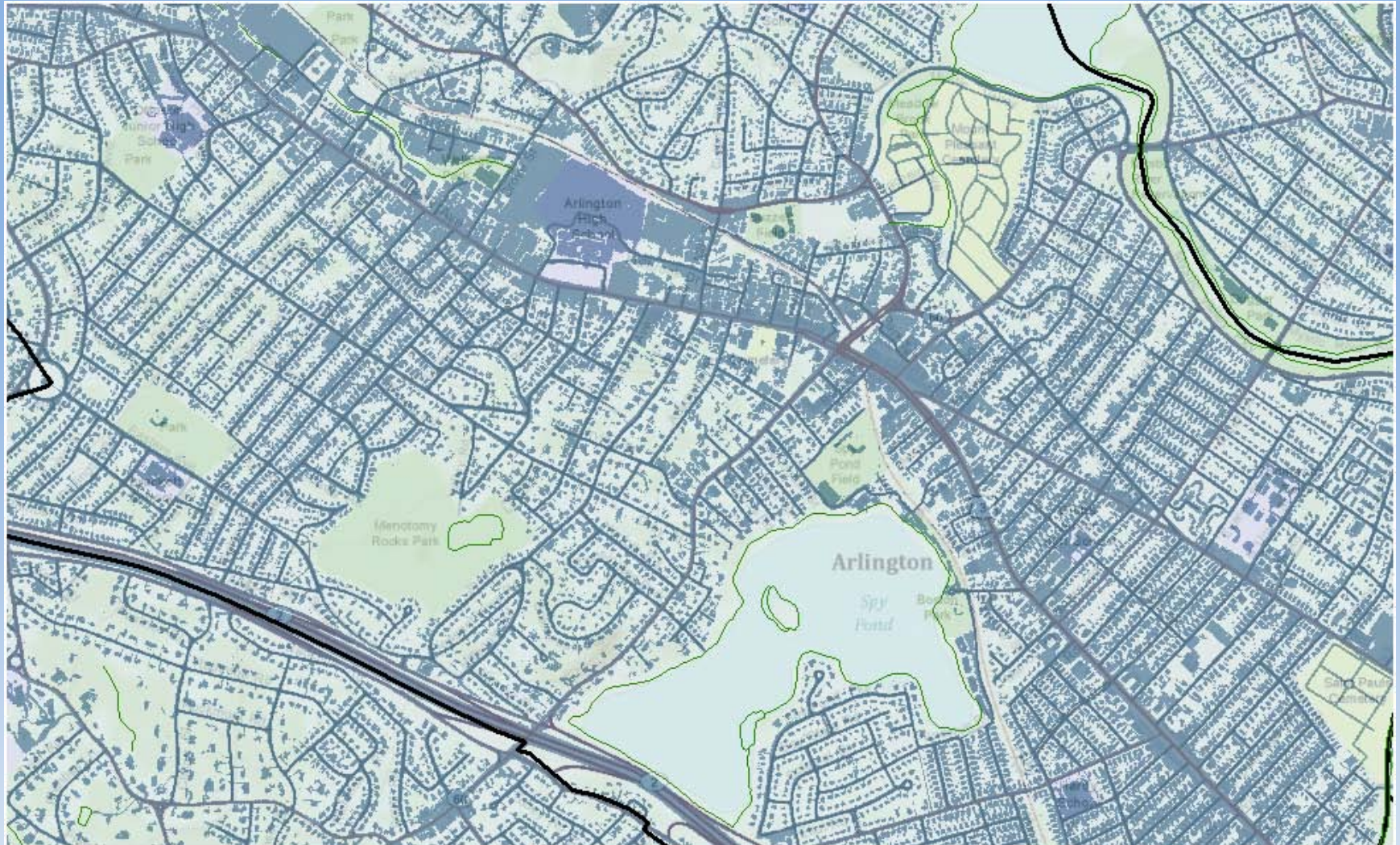
# Arlington Reservoir

- 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?



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

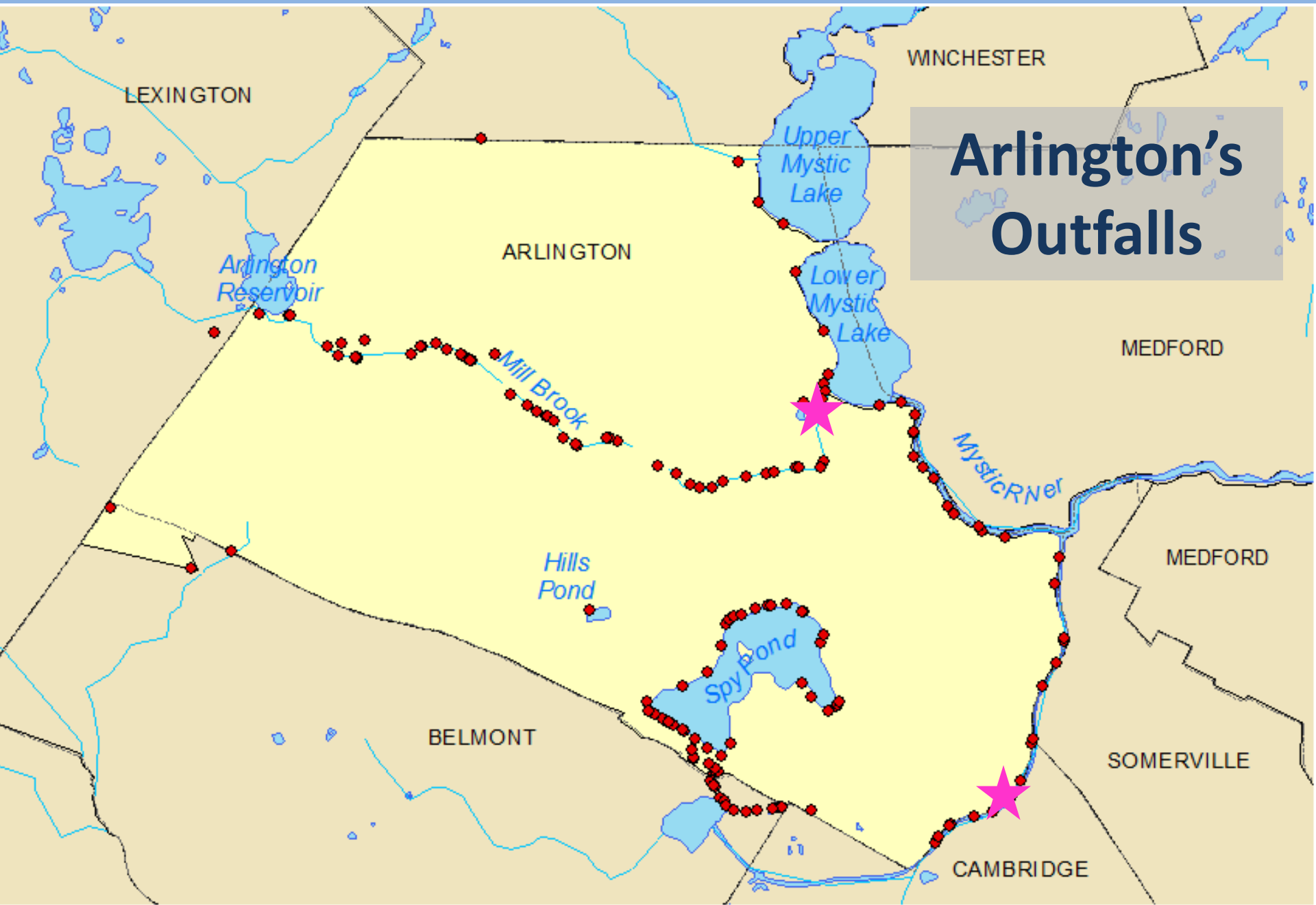




# Urban Stormwater



- 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

LEXINGTON

WINCHESTER

ARLINGTON

Arlington Reservoir

Upper Mystic Lake

Lower Mystic Lake

MEDFORD

Mill Brook

Mystic River

MEDFORD

Hills Pond

Spy Pond

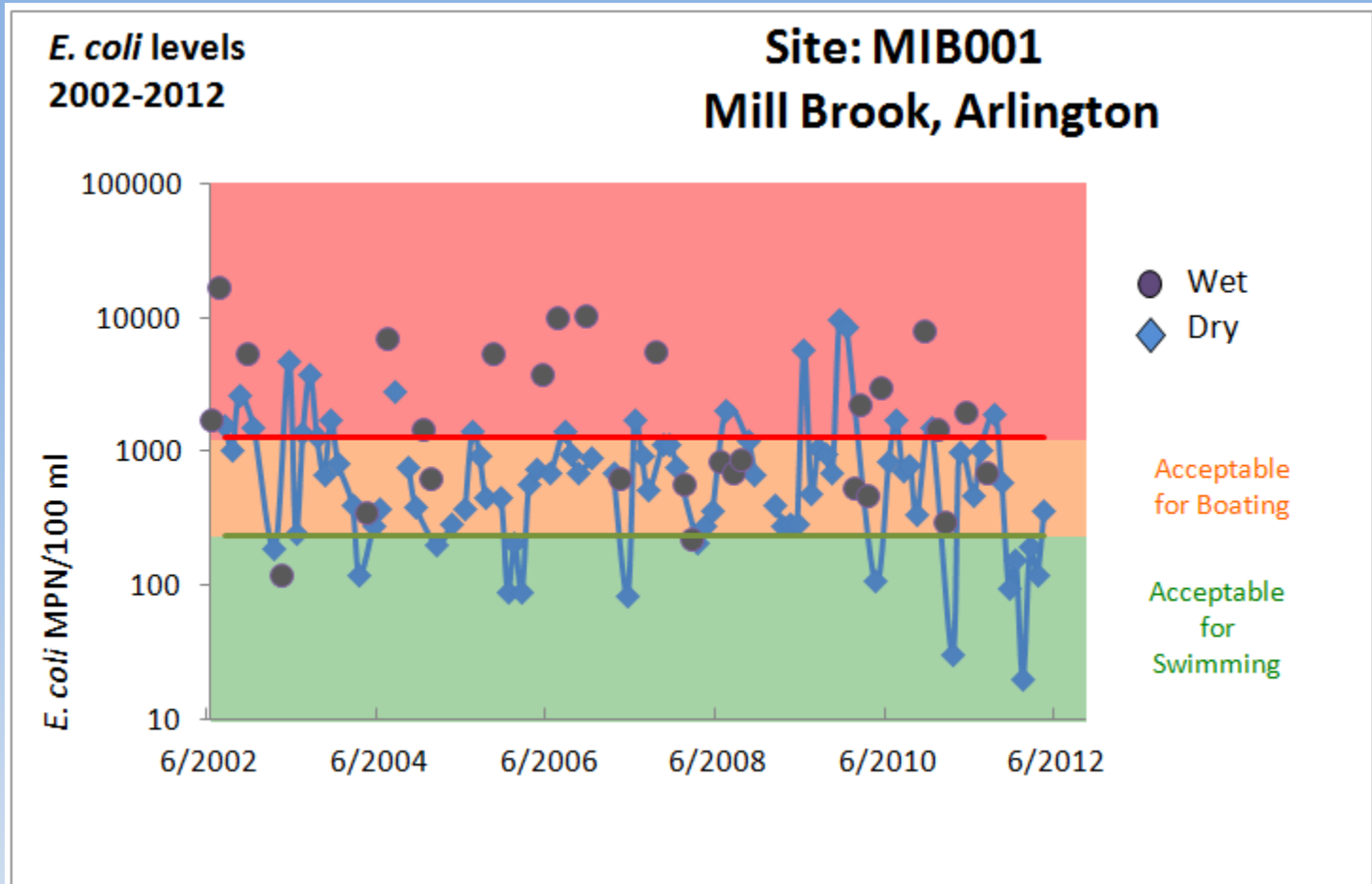
SOMERVILLE

BELMONT

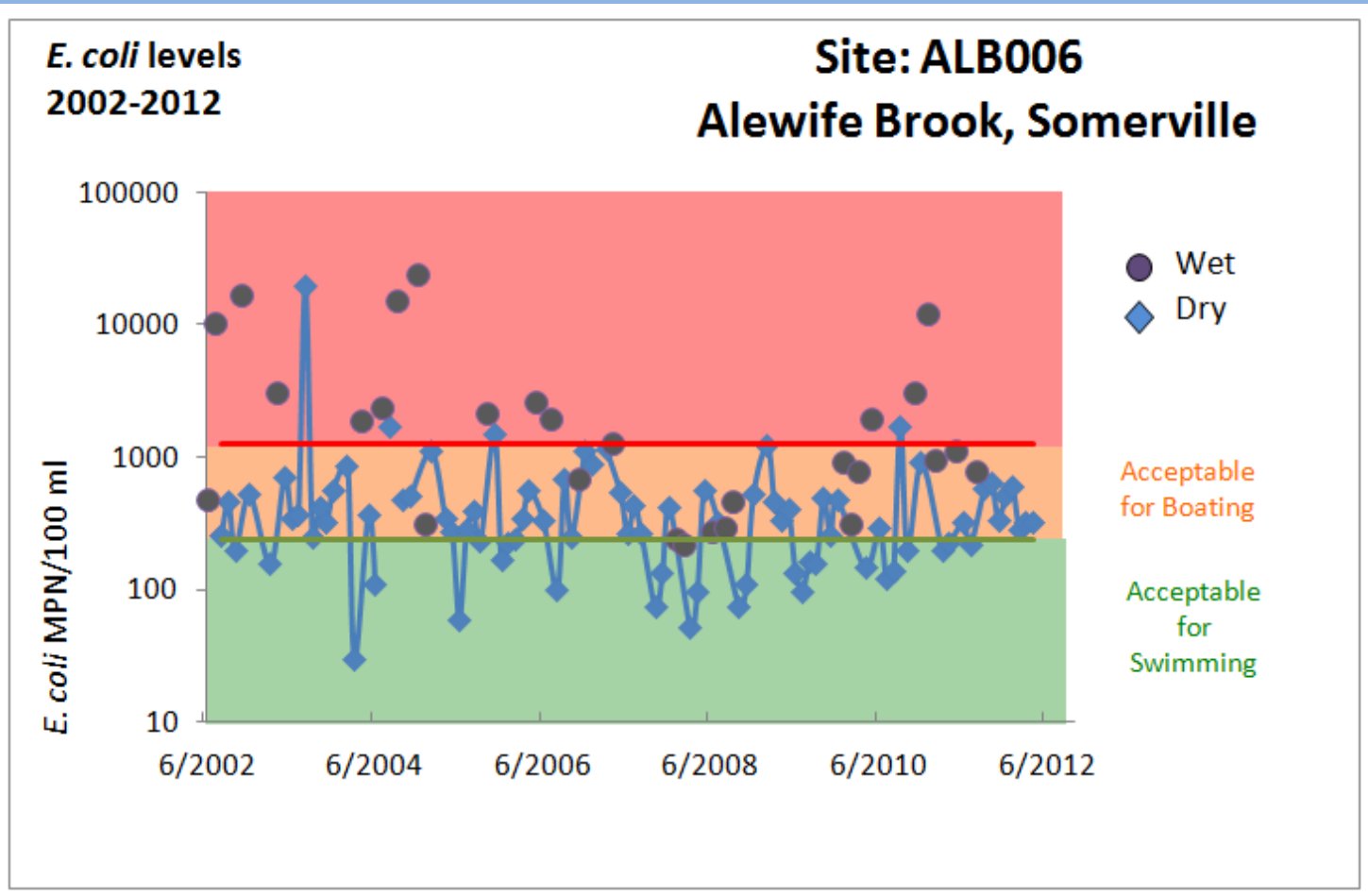
CAMBRIDGE



# Arlington's Stormwater: Mill Brook



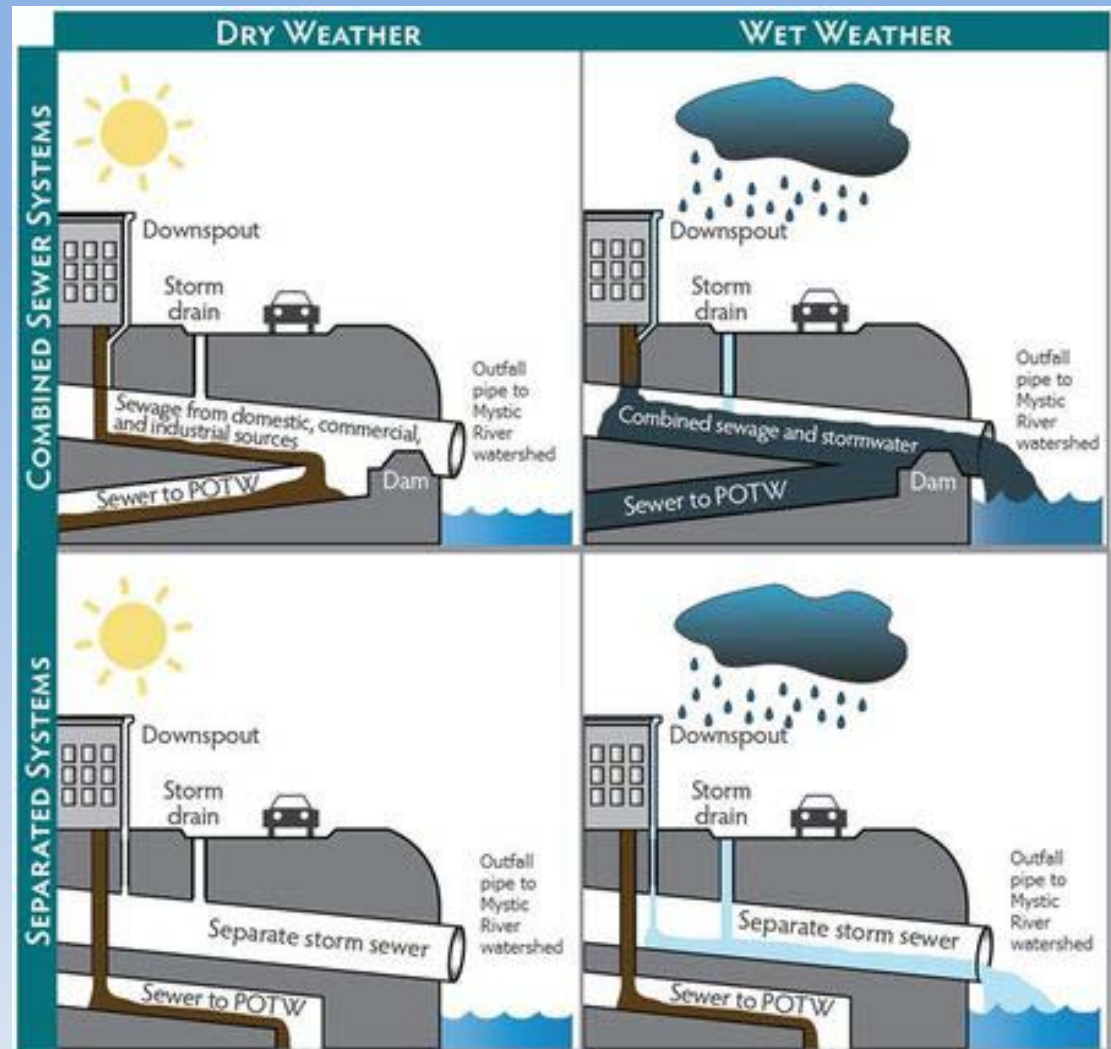
# Arlington's Stormwater: Alewife Brook





# CSO's vs. SSO's

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

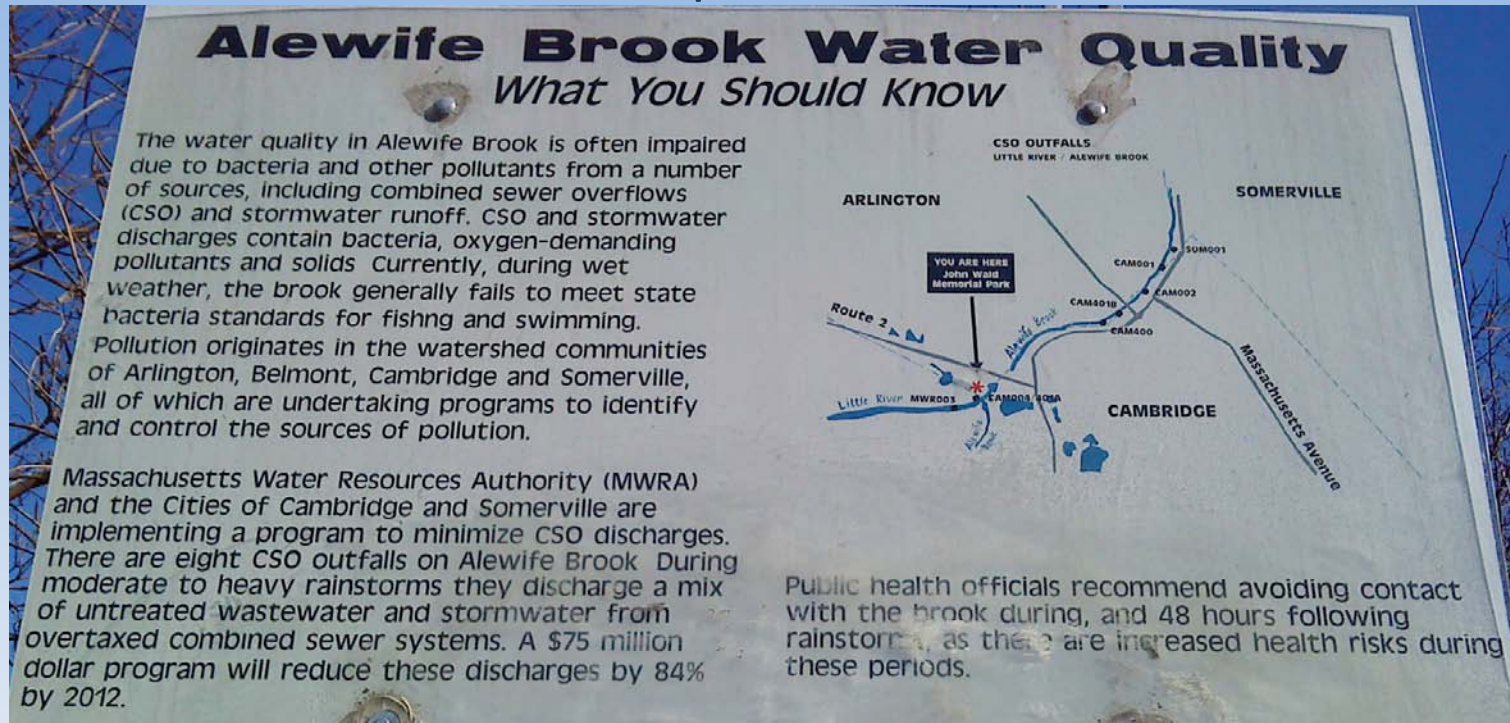


# Alewife Brook

- 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

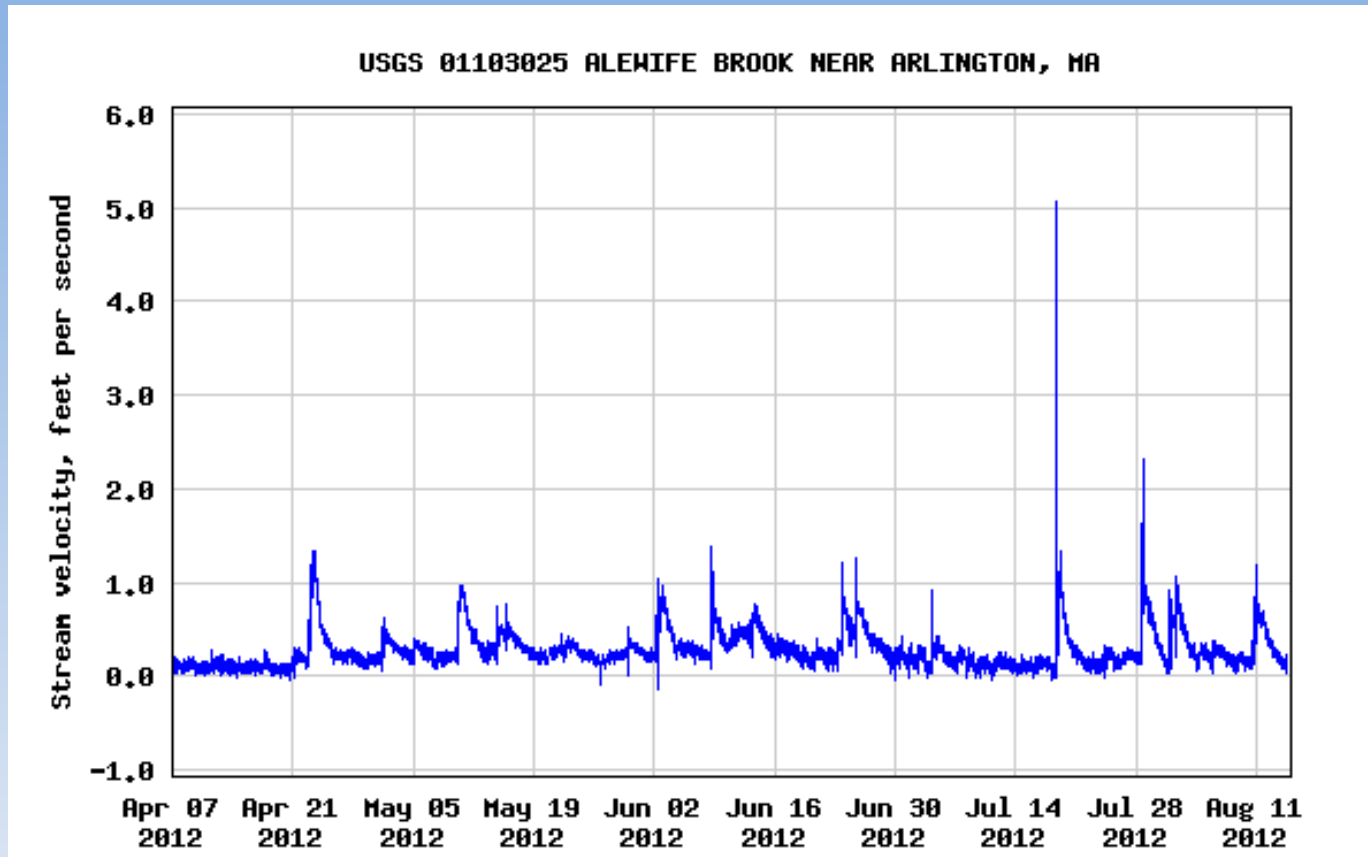
- Arlington, Belmont and Cambridge - MWRA sewage system
  - Arlington and Belmont: Separate sewer/ Stormwater
  - Cambridge: Combined sewer system
- Upstream inputs
- Cutting down vegetation putting in gardens/fertilizers
- Restoration of wetland and paths





# 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

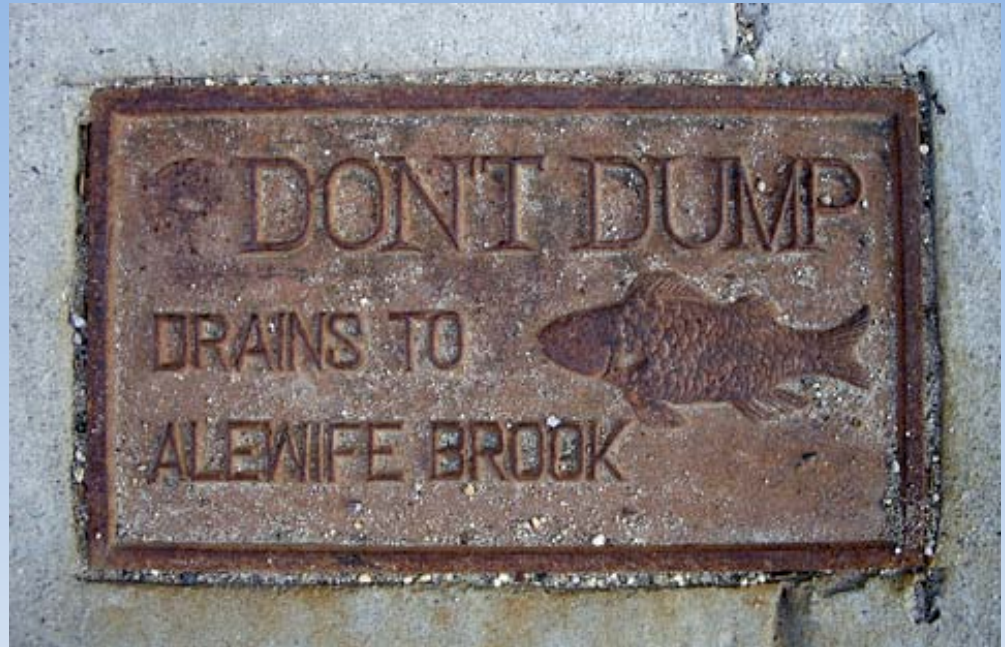
- Before the first MS4 permit
  - Leaching catch basins
  - Takes a fraction of stormwater, takes nutrients out of storm water
- 1<sup>st</sup> permit
  - minimum efforts
  - Arlington ahead, had maps





# 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



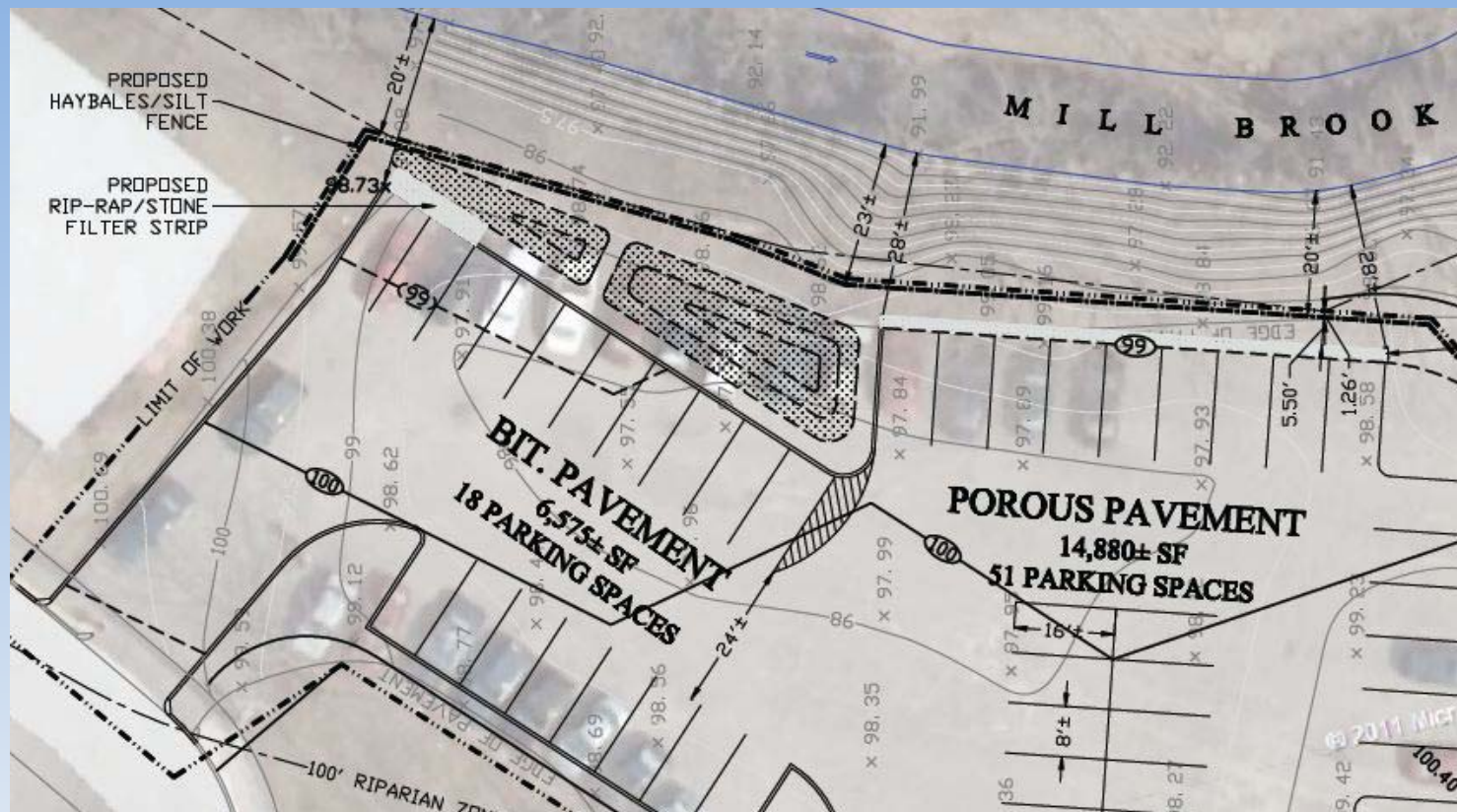
# Current Stormwater Trends

- 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

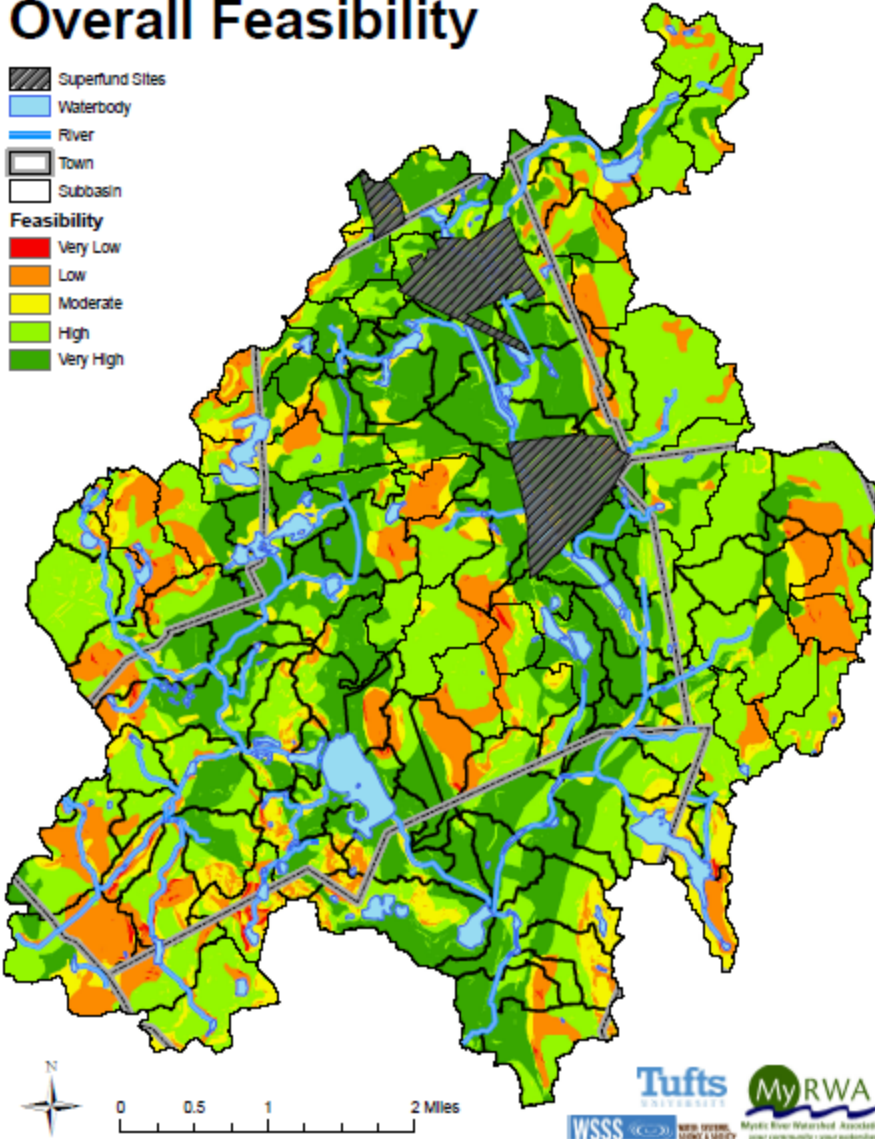
- Arlington Community Rain Gardens
  - Hurd Field
  - Hardy School





# Opportunities to Improve Conditions

## Overall Feasibility



- 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



# Commercial/ Industrial Street Retrofit





# Thank you!

## Questions?



Mystic River Watershed Association  
*your community • your watershed*  
[www.MysticRiver.org](http://www.MysticRiver.org)