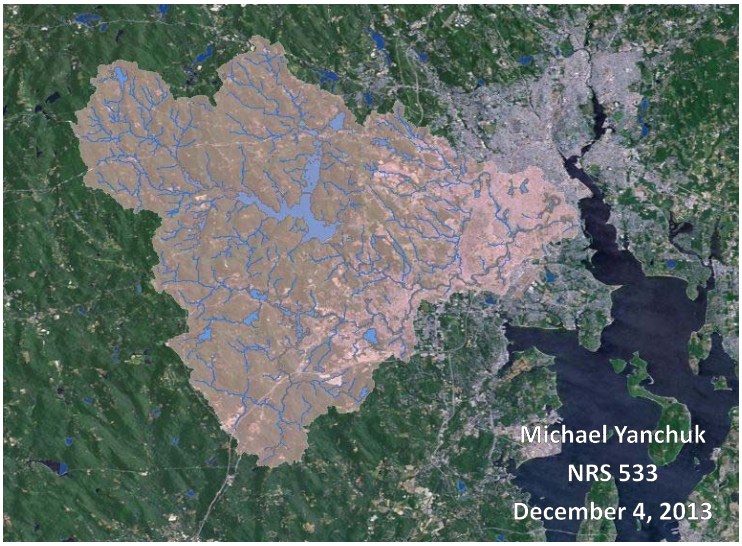
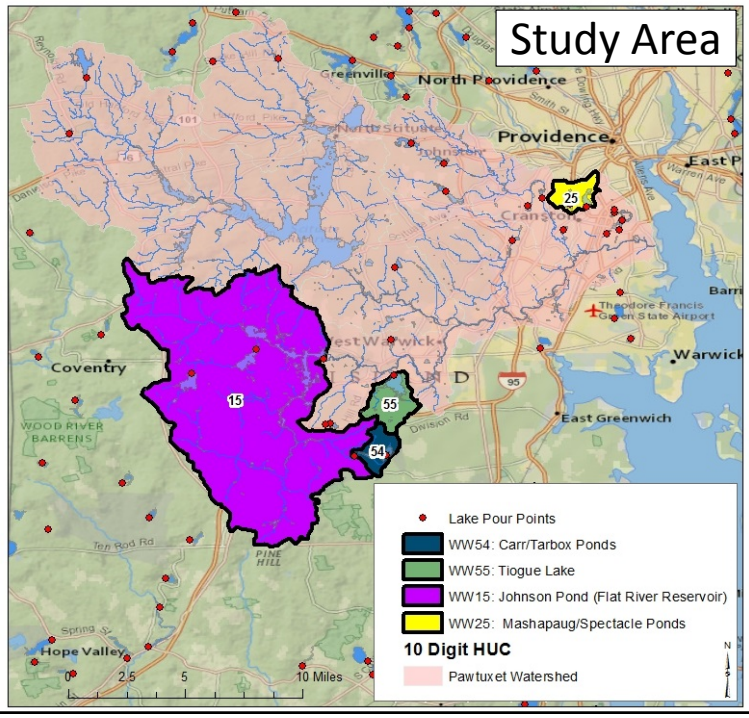
Post classification change detection of four lake drainage basins within the Pawtuxet watershed between 1985 and 2010





Study Area Background

- Pawtuxet watershed totals 60,035 ha
  - Lost 1,279 ha Deciduous Forest (1985-2010)
  - Gained 870 ha Urban Land use (1985-2010)
- Scituate Reservoir located within drainage basin (along with other drinking water reservoirs)

What is the problem?

- Landscape Change (forest to urban)
- NPS pollutants flowing through stream network and settling in lakes

Common Pollution Sources:

- sediment from earth disturbances
  (housing construction projects, tilled crop land)
- fertilizers and pesticides used by homeowners and farming practices
- Pollution sources contribute nitrogen and phosphorus, degrading water quality and clarity

Why should we care?

- Harmful Algal Blooms
  - Cyanobacteria can cause concern for harmful toxins

Effects:
- Water clarity and dissolved oxygen in lakes
- Lake ecosystem and terrestrial wildlife
- Human health
- Drinking water treatment systems
- Recreation
- Tourism/economy

Source: Waterworld.com

Historical Water Quality Monitoring

- Water quality monitoring provides documentation of changes over time

Example:
- Secchi disk depth (m) is the water quality parameter of interest to the study
  - provides a record of water clarity
  - Can be an indicator of chlorophyll

Question:
- How has land use changed within lake drainage basins since monitoring records have been collected (1988-2012)?

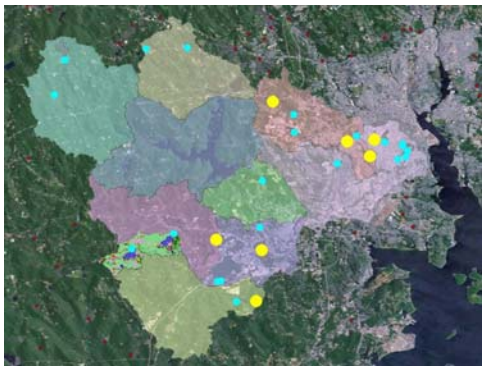
Source: Friends of Gulf of St. Vincent

Data Collection Methods

- Watershed Watch Program directs volunteer based monitoring between April and November each year
  - field recorded parameters such as temp, DO, pH, secchi depth
  - lab processed parameters such as Total N, Total P, bacteria, etc.
- Data entered into Excel workbooks by volunteers, students, and staff
- Recently developed into a database with spatial relationship to monitoring sites locations
  - Efficient selection of records through the years for any site

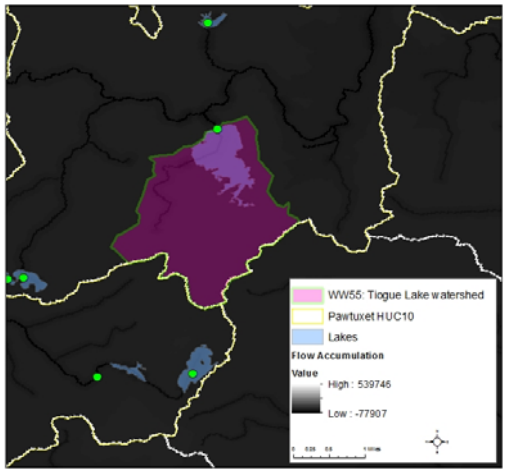
Detecting Change in lake drainage basins: Preparation and Process

- Determined which of the 28 monitoring stations have complete records (1988-2012)
- Many stations were lacking consecutive years of records



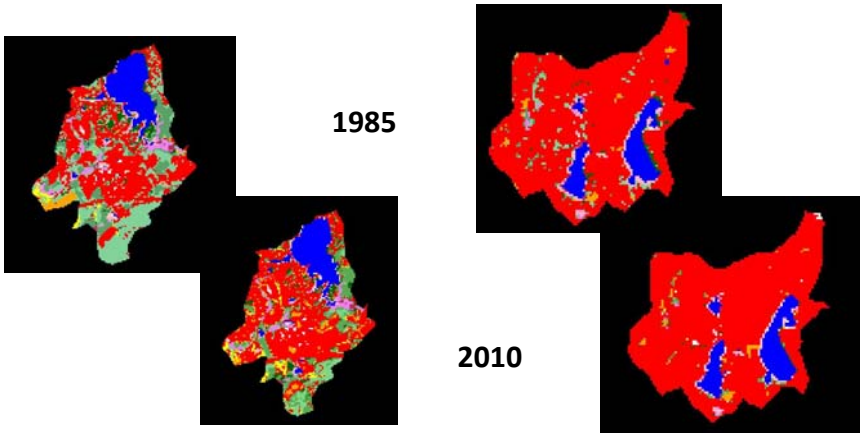
Detecting Change in lake drainage basins: Preparation and Process

- Created lake pour points for sites of interest
- Used spatial analysis toolset (watershed tool) to create flow direction, accumulation lines from pour points and DEM



Detecting Change in lake drainage basins: Preparation and Process

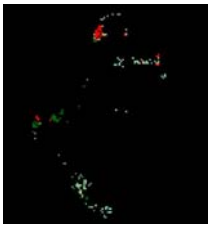
- Clipped Land Use Rasters (1985 and 2010) to lake watershed polygons



Detecting Change in lake drainage basins: Preparation and Process

- Quantified land use change to urban (1985-2010) for study area lake watersheds using ERDAS Imagine mask tool

Tiogue Lake



Carr Pond

Spectacle Pond

Flat River Res

Land Use Change Totals

WW15: Johnson Pond (Flat River Reservoir)

	acres	ha
Total Urban	2995	1212
Change to Urban	1907	771
Total Area	35953	14549
Percent Change	5%	5%

WW25: Mashapaug Pond/Spectacle Pond

	acres	ha
Total Urban	932	377
Change to Urban	51	20
Total Area	1123	454
Percent Change	5%	5%

WW54: Carr Pond/Tarbox Pond

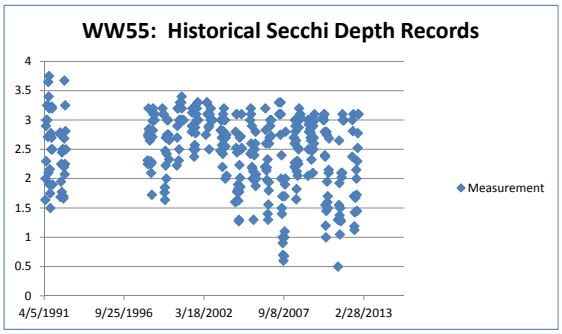
	acres	ha
Total Urban	41	16
Change to Urban	33	13
Total Area	1120	453
Percent Change	3%	3%

WW55: Tiogue Lake

	acres	ha
Total Urban	853	345
Change to Urban	231	93
Total Area	1773	717
Percent change	13%	13%

Further Research Ideas

- Regression Analysis for secchi depth and chlorophyll records spanning 1988-2012
- Relationship between land use change and secchi depth trends
- Additional post classification change from forest to other land uses



Questions?