Watershed Tools for Local Leaders Seminar

Climate Resilient Municipalities: Controlling Stormwater, Protecting Streams & Maintaining Water Quality

Bill Kibler & Kristi MacDonald, Ph.D., Raritan Headwaters
Chris Obropta, Ph.D., Rutgers Coop Extension Water Resources Program

May 16, 2019

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New Jersey Agricultural Experiment Station

Raritan Headwaters
Your water is our mission.

Raritan Headwaters
WATERSHED WATCHDOG SINCE 1959

Our Mission

Protecting the water in our rivers, our streams, and our homes through science, education, advocacy, stewardship, and preservation.

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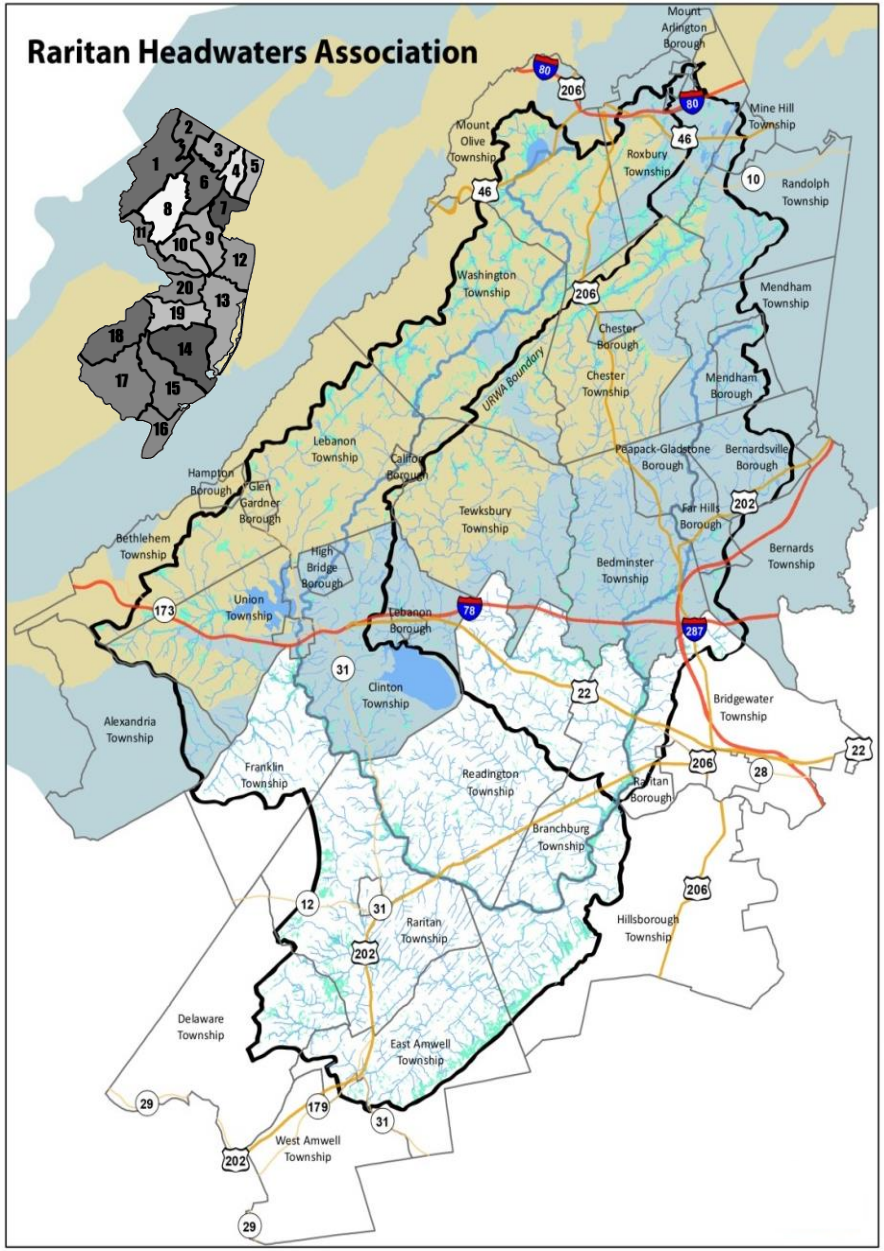
Raritan Headwaters Region

- 470 square miles
- located in 3 Counties: Hunterdon, Somerset & Morris
- includes all or parts of 38 municipalities
- home to nearly 250,000 people
- 32% Ag, 22% Urban, 45% Forest & Wetland
- headwaters region so water starting out very clean
- provides drinking water to more than 1.5 million citizens beyond the region into NJ's urban areas



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Seminar Series: Watershed Tools for Local Leaders

- Share and apply key science, planning, and regulatory tools
- Partner on projects to identify, protect, and restore water resources
- For upcoming seminar topics & dates visit

  https://www.raritanheadwaters.org/municipal-tools/

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Agenda: Climate Resilient Municipalities

- Intro, Climate + Land Use Change Impacts on Water Resources in NJ – K. MacDonald
- Overview of Stormwater Regulations and Green Infrastructure – C. Obropta
- Stormwater Utilities – B. Kibler
- Additional Resources provided at https://www.raritanheadwaters.org/municipal-tools/

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Climate Change + Land Use Change Impacts on Stormwater, Stream Health, and Water Quality

Kristi MacDonald, Ph.D., Director of Science, RHA

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Land Use Change 1986-2012

Land Use-Land Cover	% Change NJ	% Change Upper Raritan
Urban	+29%	+37.6
Agriculture	-26.7%	-25.6
Upland Forest	-6.9%	-2.4
Wetlands	-5.4%	-5.6

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Urban **Impervious Cover**	+29%	+37.6
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Impaired Water Quality at 10% impervious cover
Degraded Water Quality at 25% impervious cover

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Climate Change in NJ

- Warmer temperatures (↑ 3°F over last century)
- Hotter summers, more heat waves
- More precipitation (8% above avg. over past 10 years)
- Increased frequency of extreme weather events – storms and droughts
- Spring arriving earlier
- Coastal communities: 16 in. rise in sea level since 1911 and 1 to 4 ft. rise by 2100
- Fourth National Climate Assessment (Nov 2018) warns of severe ecological, economic and social consequences for the Northeast

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Impacts of Climate + Land Use Change on Streams

- Erosion of topsoil
- Scouring of streams: Damage to streambanks
- Increased sedimentation
- Flooding
- Decreased Water Quality (high bacteria; nutrients; algal blooms)

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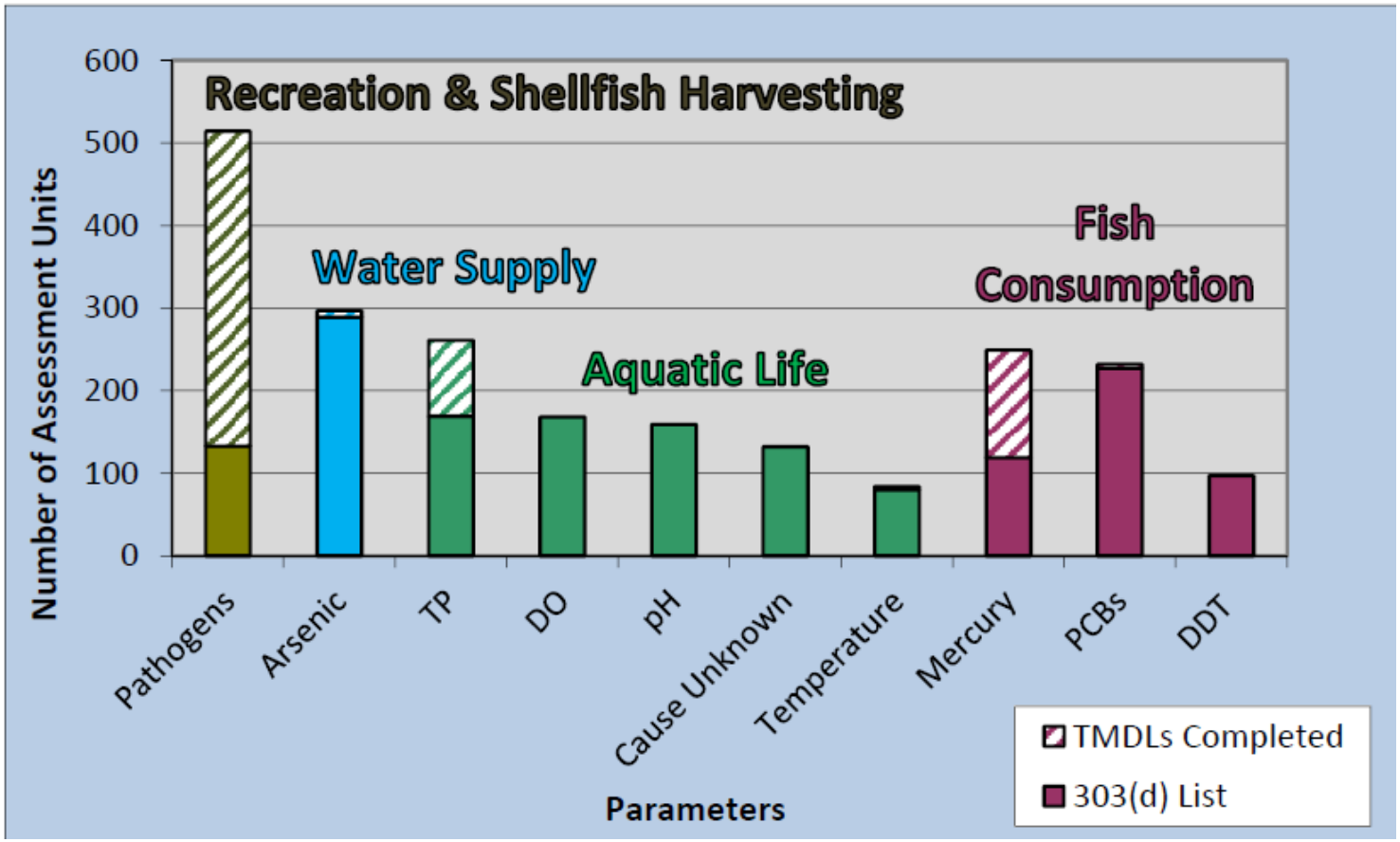
Top Ten Causes of Use Impairment



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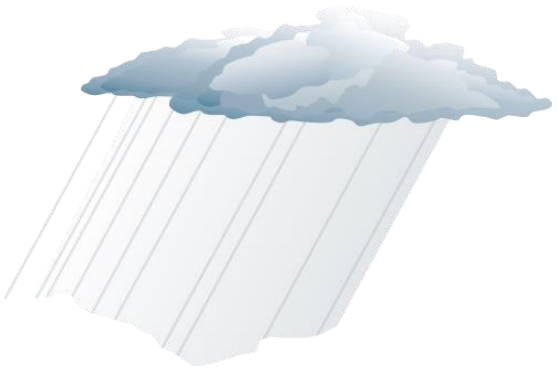
Week 1



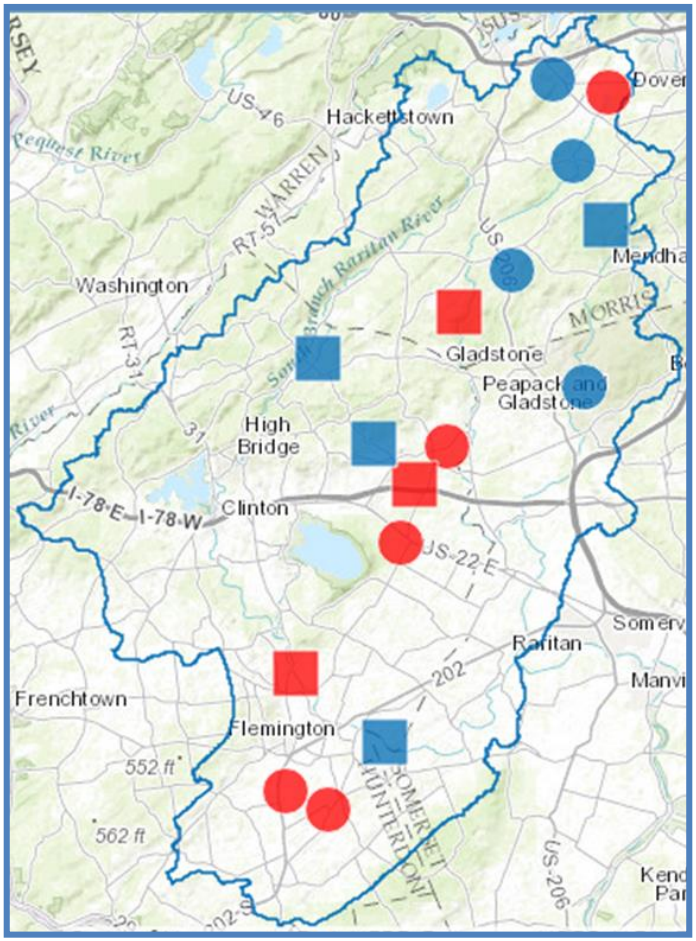
Swimming Holes

- Acceptable
- Unacceptable

Stream Sites

- Acceptable
- Unacceptable

Raritan Headwaters Region



Raritan Headwaters

Week 2

Swimming Holes

Acceptable

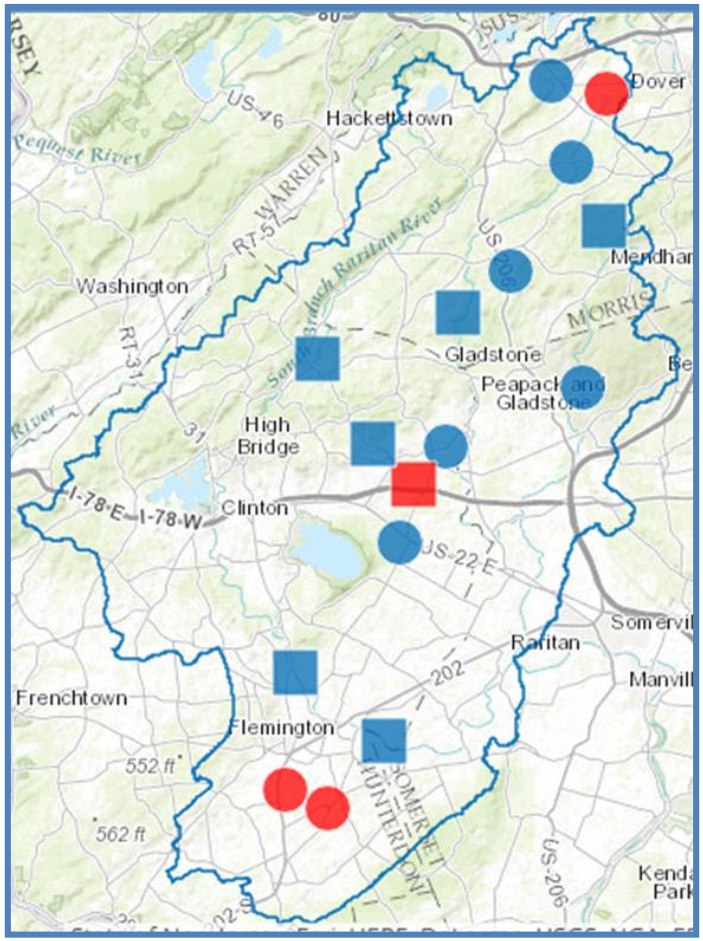
Unacceptable

Stream Sites

Acceptable

Unacceptable

Raritan Headwaters Region



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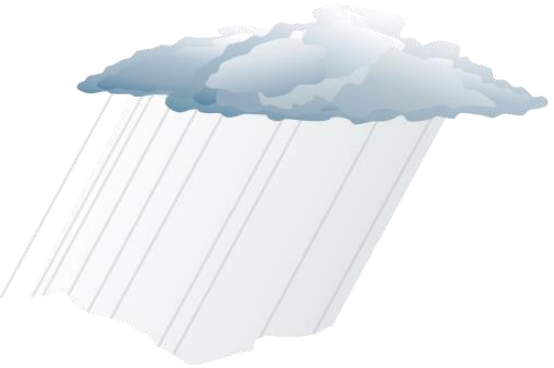
Week 3



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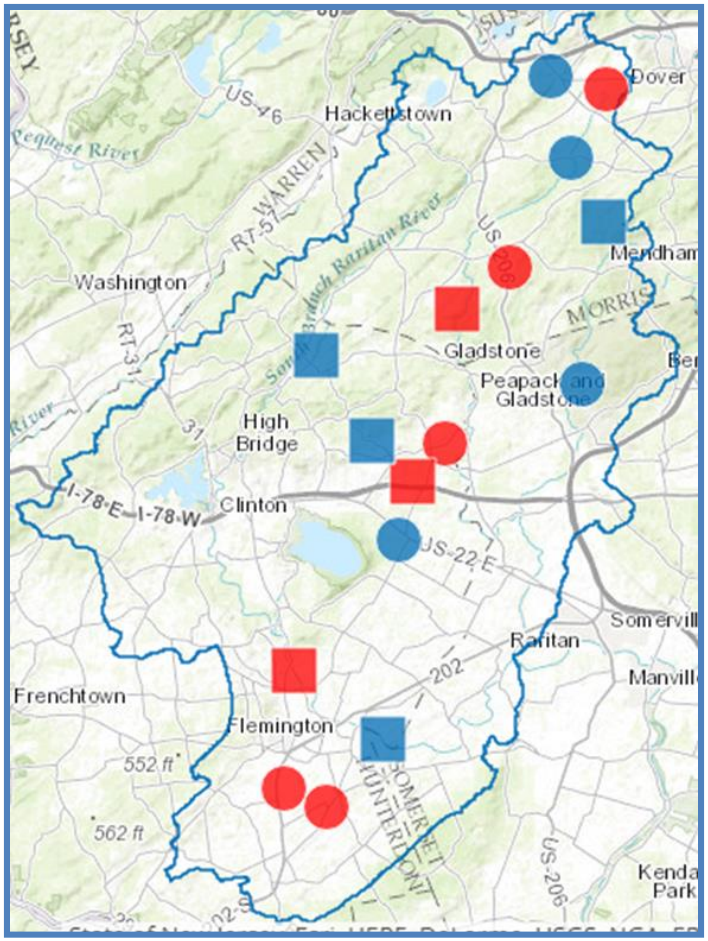
Raritan Headwaters Region



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What defines a healthy stream?

- Cool temperatures, High Oxygen, Neutral pH
- Low nutrients (nitrates and phosphates) and low bacteria levels
- Larger cobbles, less fine sediments
- Diverse benthic macroinvertebrates – especially mayflies, stoneflies and caddisflies
- Diversity of breeding native fish
- Intact, rooted streambanks
- Stream buffers of native trees and shrubs in a wide riparian buffer
- Forest and wetland in the catchement

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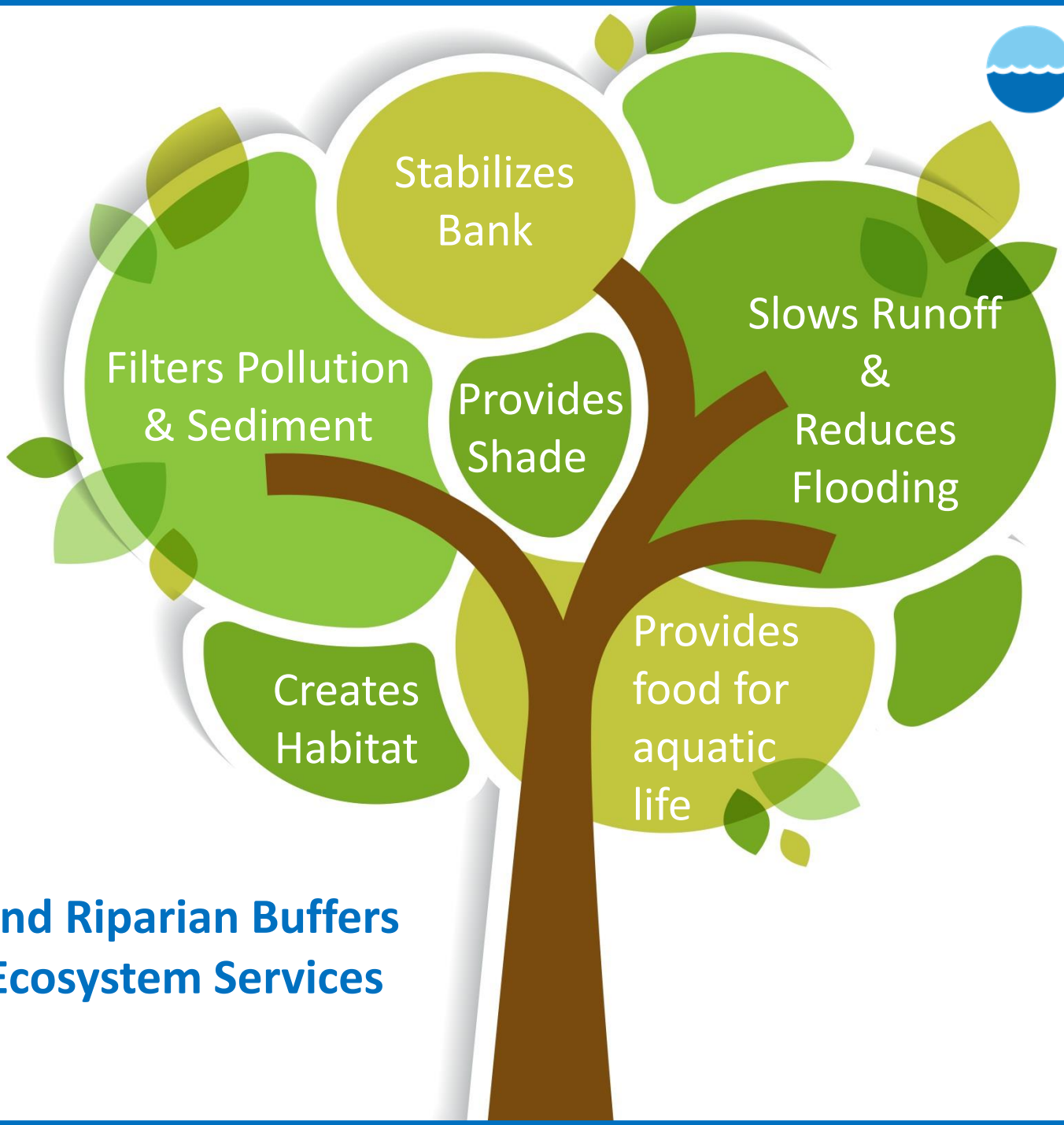

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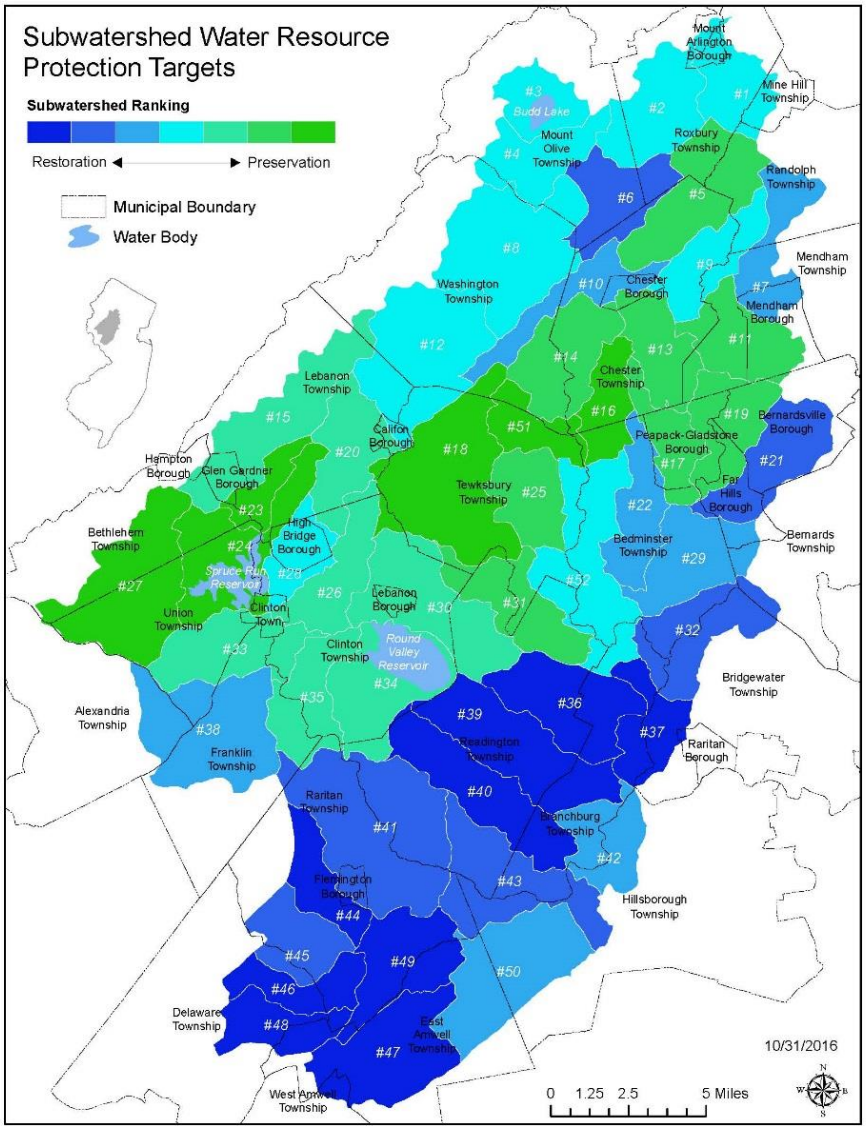
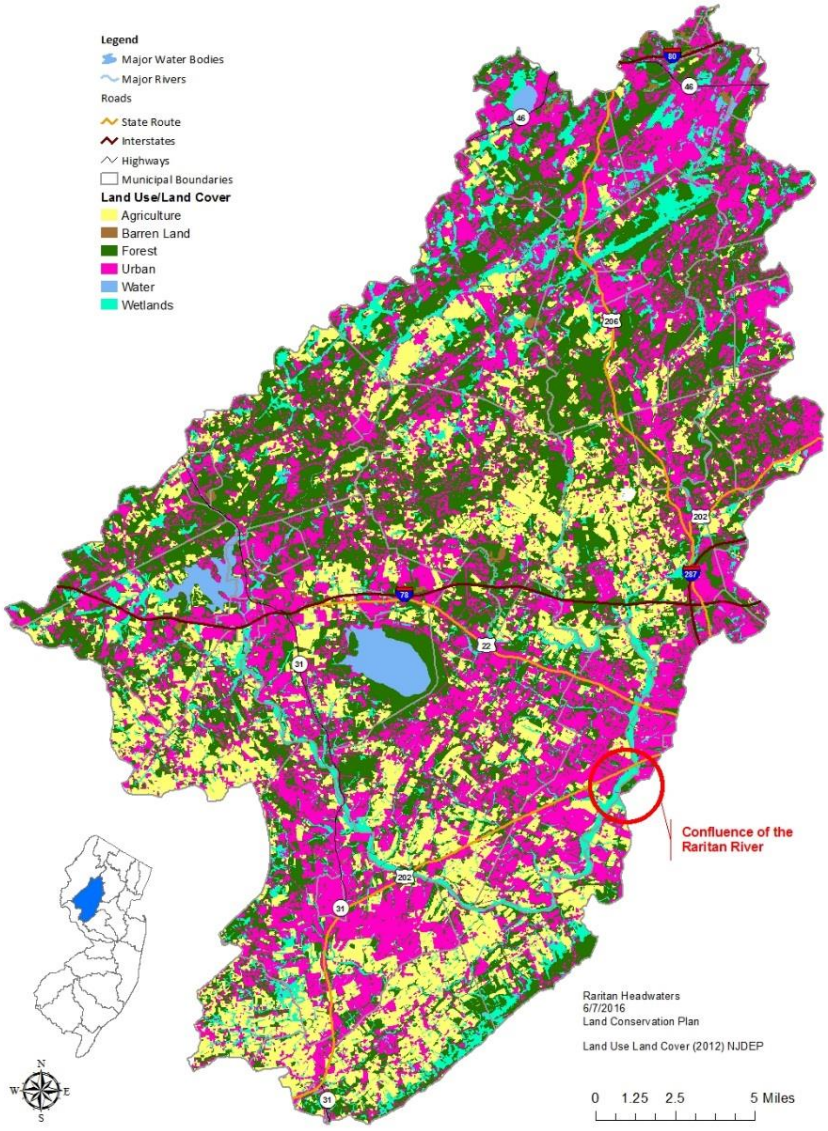
Forests and Riparian Buffers Provide Ecosystem Services


Subwatershed Water Resource Protection Targets
Subwatershed Ranking
Restoration
Preservation
Municipal Boundary
Water Body
Mount Arlington Borough
Mine Hill Township
Budd Lake
Mount Olive Township
Roxbury Township
Randolph Township
Washington Township
Chester Borough
Mendham Township
Mendham Borough
Lebanon Township
Chester Township
Califon Borough
Bernardsville Borough
Peapack-Gladstone Borough
Hampton Borough
Glen Gardner Borough
Tewksbury Township
Far Hills Borough
Bethlehem Township
High Bridge Borough
Bedminster Township
Bernards Township
Spruce Run Reservoir
Union Township
Clinton Town
Lebanon Borough
Clinton Township
Round Valley Reservoir
Bridgewater Township
Alexandria Township
Franklin Township
Readington Township
Raritan Borough
Raritan Township
Branchburg Township
Flemington Borough
Hillsborough Township
Delaware Township
East Amwell Township
West Amwell Township
10/31/2016
0 1.25 2.5 5 Miles


Legend
Major Water Bodies
Major Rivers
Roads
State Route
Interstates
Highways
Municipal Boundaries
Land Use/Land Cover
Agriculture
Barren Land
Forest
Urban
Water
Wetlands
Confluence of the Raritan River
Raritan Headwaters
6/7/2016
Land Conservation Plan
Land Use Land Cover (2012) NJDEP
0 1.25 2.5 5 Miles

Columbia University and RHA Report, 2015 Strategies for Climate Adaptation and Resiliency

Climate change will impact the region mainly through flooding, drought and water pollution. The 3 main strategies to adapt are:

- Stormwater Management
- Wetland Restoration
- Riparian Buffer Zone Remediation

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