



Foots Pond



Great Swamp Watershed Association

Protecting the waters of the Passaic River region, from source to sea.



Great Swamp Watershed Association 2016 Watershed Report Card

Keeping our waters clean
for everyone

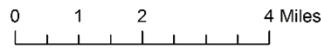
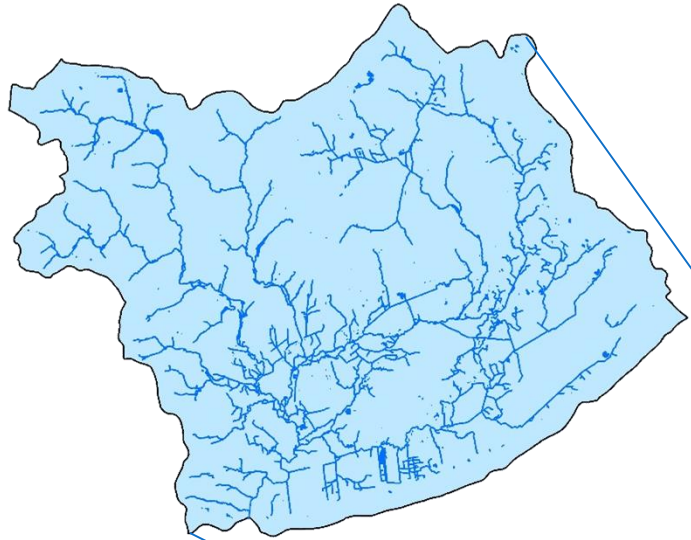
Sandra LaVigne
Director of Water Quality Programs



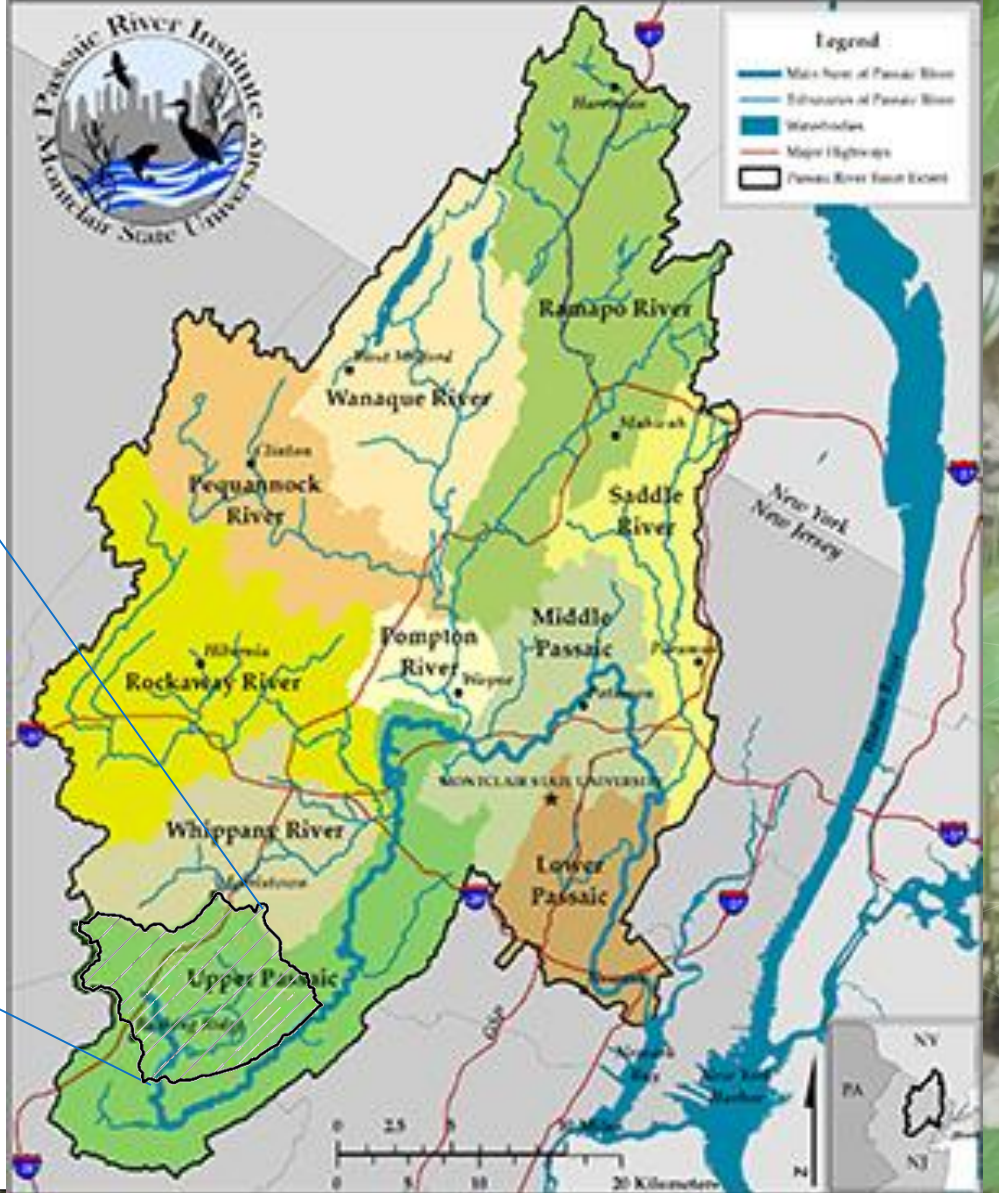
Our Mission – One River, One Community

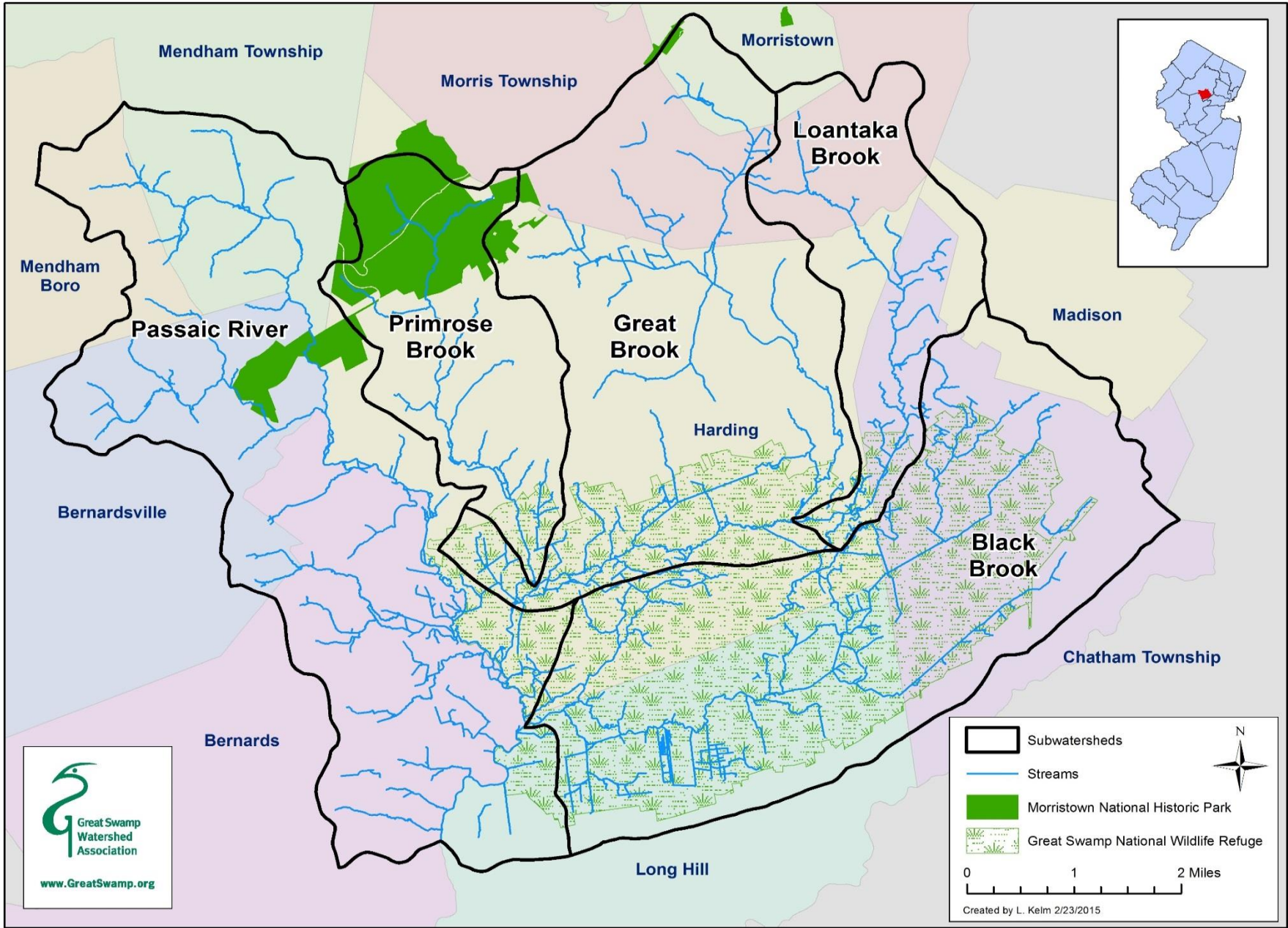
- Great Swamp Watershed Association is dedicated to protecting and improving the water resources of the Passaic River region, from the Great Swamp headwaters to Newark Bay, for present and future generations. Through education, advocacy, science, land preservation, and stewardship, in collaboration with partners, we work to instill our communities with an awareness of water's effect on health and the beauty of the environment, from source to sea.

Great Swamp watershed (headwaters of the Passaic River)



Passaic River Basin and Sub-Watersheds





Subwatersheds
 Streams
 Morristown National Historic Park
 Great Swamp National Wildlife Refuge

0 1 2 Miles

Created by L. Kelm 2/23/2015

Water Quality Monitoring

- Chemical Monitoring
 - 4 times per year
 - Handheld meters
 - Lab analysis
- All five streams
- Watershed outlet
- Macroinvertebrate Sampling
- Bacterial Monitoring
- Visual Stream Assessments
 - NJDEP protocol
 - Fall and Spring
 - 22 sites



Chemical Parameters

- pH
- Temperature
- Dissolved Oxygen
- Flow
- Nitrogen
 - Nitrate
 - Nitrite
 - Total Kjeldahl Nitrogen
 - Ammonia
- Phosphorus
 - Total Phosphorus
 - Soluble Reactive Phosphate

○ Road Salt

- Total Dissolved Solids
- Sodium
- Chloride
- Conductivity

○ Water Clarity

- Turbidity
- Total Suspended Solids



Visual Assessments

- NJDEP protocol; training led by NJDEP Watershed Ambassadors
- Fall/Winter training is just Visual Assessment
- Spring training includes macroinvertebrate sampling





Macroinvertebrate Assessments

- Annual Survey, since 2000
- Macros collected in June/July
- Meter data and visual assessment collected concurrently informs results

E. Coli bacteria

- Indicator of fecal pollution
- Health implications
- Monitor sites watershed wide once yearly in summer over 5 weeks
- Sites selected represent areas where people or pets are likely to be in contact with water



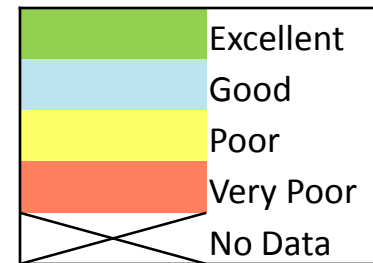


2016 Water Quality Report Card

- Goals:
 - Answer “How’s the water?”
 - Understandable for general audience
 - Include full year WQ data
 - Short length
 - Recommend actions

How the Grades Were Created

- Grades based on water quality standards set by NJDEP or U.S. EPA
- Where no standards exist, grades based on ecological impact
- 2 highest grades pass standard
- 2 lower grades fail standard
- Lots of math!



2016 Results

Stream	Macro-invertebrates	Visual Stream Assessment	Bacteria	Dissolved Oxygen	Water Temperature	pH	Road Salt	Water Clarity	Nitrogen	Phosphorus
Black Brook	Poor ↑	Good	Very Poor ↑	Good ↑	Excellent ↑	Good ↓	Good ↑	Excellent	Poor ↑	Poor ↑
Great Brook (main stem)	Poor ↑	Good ↓	Very Poor ↓	Excellent ↑	Excellent ↓	Excellent	Good ↑	Good ↓	Good	Good
Bayne Brook	 	Good ↑	Poor ↓	 	Excellent	 	 	 	 	
Silver Brook	 	Poor ↑	Very Poor ↓	 	Excellent	 	 	 	 	
Loantaka Brook	Poor ↑	Good ↓	Very Poor ↓	Excellent ↑	Excellent ↓	Excellent	Poor ↑	Good	Very Poor	Poor ↑
Passaic River (main stem)	Good ↑	Good ↑	 	Excellent ↑	Excellent ↑	Excellent	Excellent ↑	Excellent ↑	Excellent	Excellent
Indian Grave Brook	Excellent	 	 	 	 	 	 	 	 	
Branta Pond	 	 	Very Poor ↓	 	 	 	 	 	 	
Primrose Brook (main stem)	Good ↑	Good ↓	Poor ↓	Excellent ↑	Excellent ↑	Excellent	Excellent ↑	Excellent ↑	Excellent	Excellent
Mount Kemble Lake Tributary	 	 	 	Excellent ↑	Excellent ↓	Excellent	Excellent ↑	Excellent	Good	Excellent
Great Swamp Watershed Outlet	 	 	Very Poor ↓	Excellent	Excellent	Excellent	Good	Excellent ↑	Excellent	Good ↓

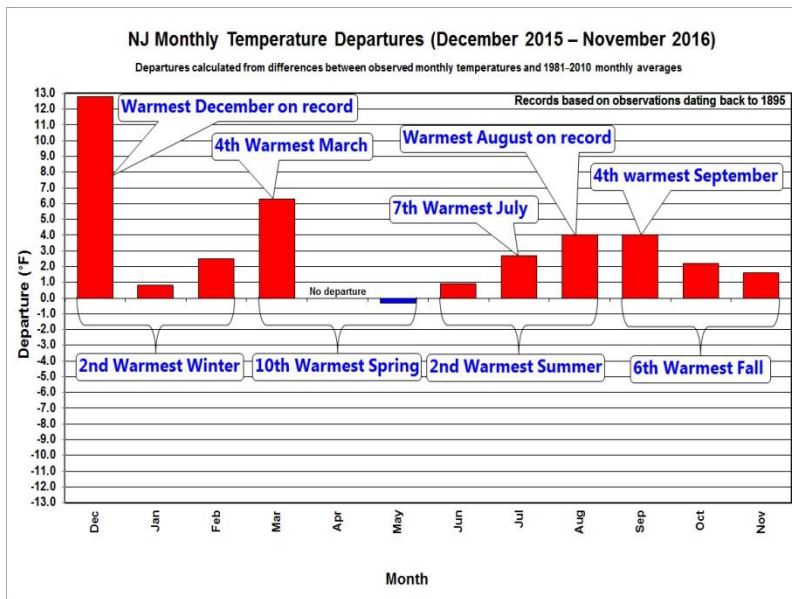
A few changes from 2015

- Multiple year data
 - For better understanding of changes over time two years of data is presented on stream pages
- Road Salt
 - In 2015 road salt was presented as a seasonal result
 - In 2016 not needed due to consistent results across the year

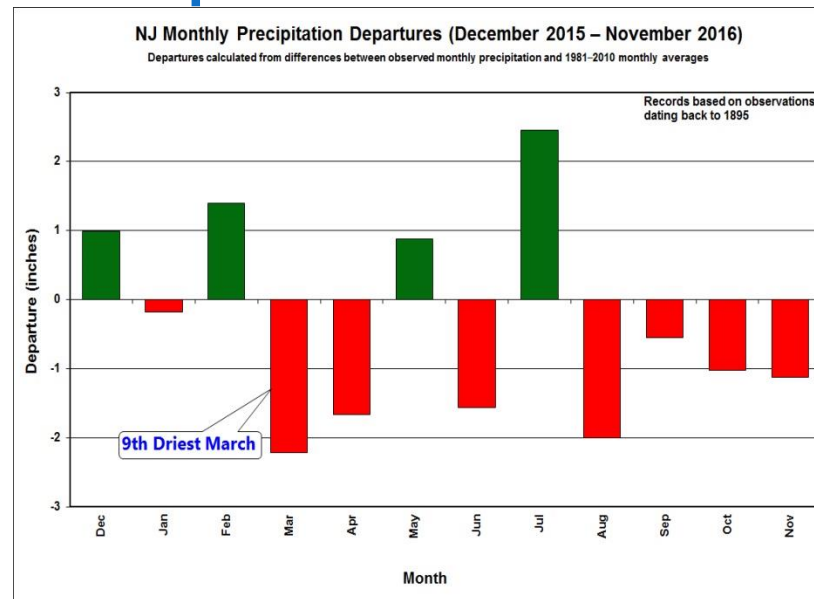
Climate Effects

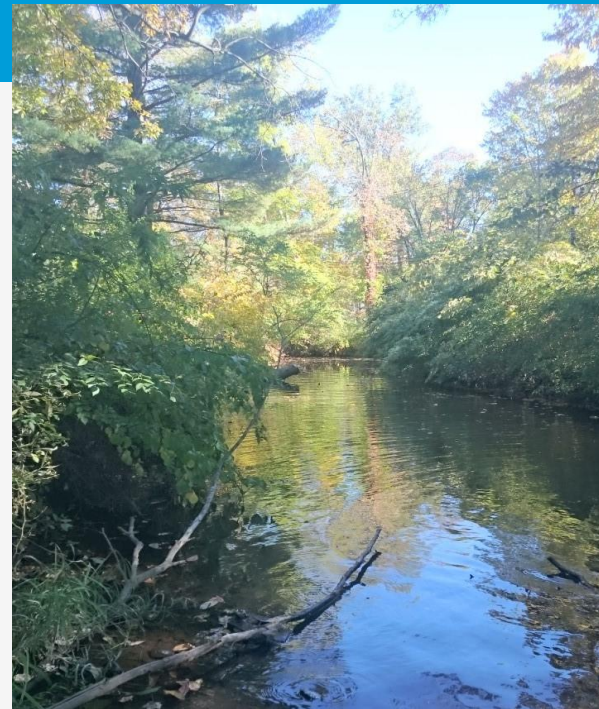
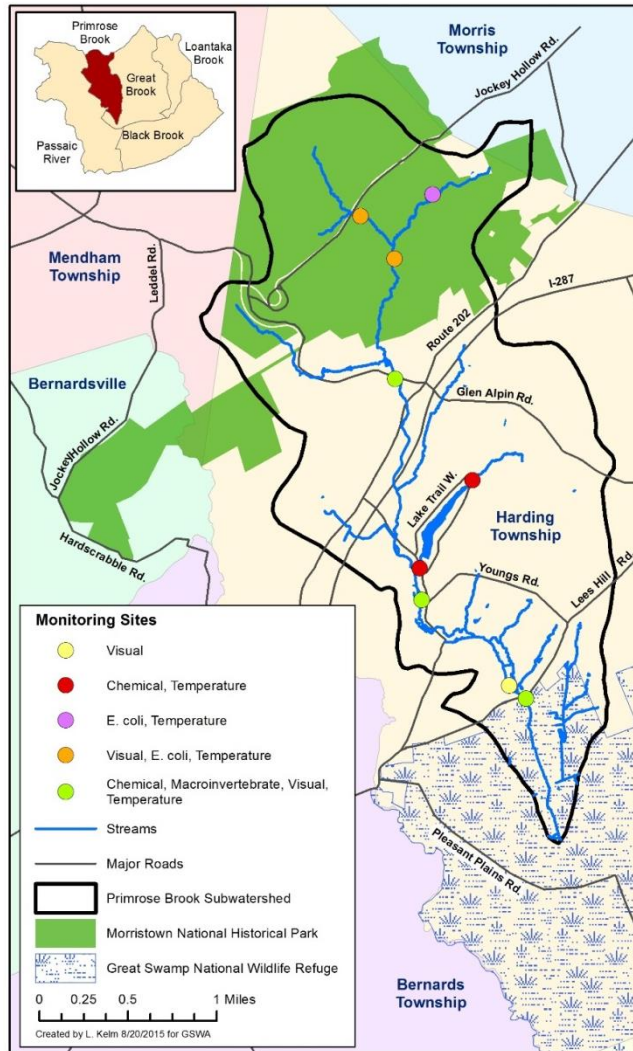
Rutgers State Office of Climatology Monthly Departures

Temperature



Precipitation





Primrose Brook

- Healthiest stream in watershed over three year study
- Headwaters in forested areas
- Mount Kemble Lake tributary

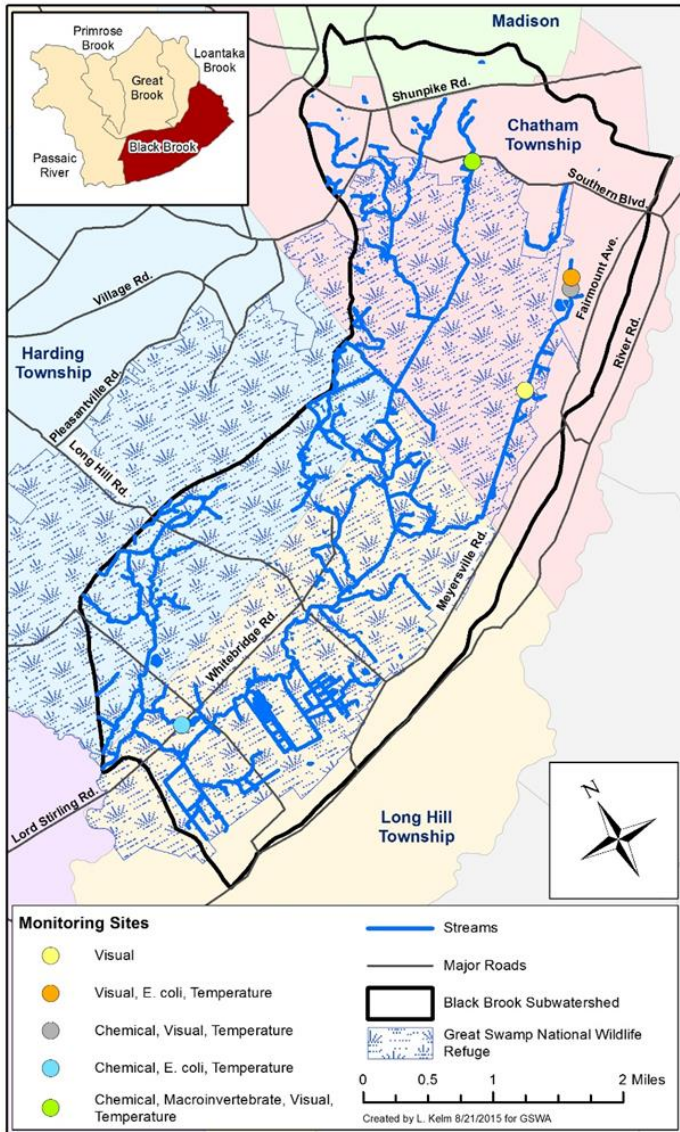
Category	Primrose Brook (Main Stem)		Mt Kemble Lake Tributary	
	2015	2016	2015	2016
Macro-invertebrates	Good ↑	Good ↑		
Visual Stream Assessment	Good	Good ↓		
Bacteria	Good ↓	Poor ↓		
Dissolved Oxygen	Excellent	Excellent ↑	Good	Excellent ↑
Water Temperature	Excellent	Excellent ↑	Excellent	Excellent ↓
pH	Excellent	Excellent	Excellent	Excellent
Road Salt	Excellent	Excellent ↑	Excellent	Excellent ↑
Water Clarity	Excellent	Excellent ↑	Excellent	Excellent
Nitrogen	Excellent ↑	Excellent	Good ↑	Good
Phosphorus	Excellent	Excellent	Excellent	Excellent

Primrose Brook

- Macroinvertebrate population continues to improve
- Decreased road salt
- Significant increase in Bacteria
- Water temperature remains within NJ State standards
- Mt Kemble Lake remains healthy



Interns sampling in Primrose Brook




Black Brook
Whitebridge Rd

Black Brook

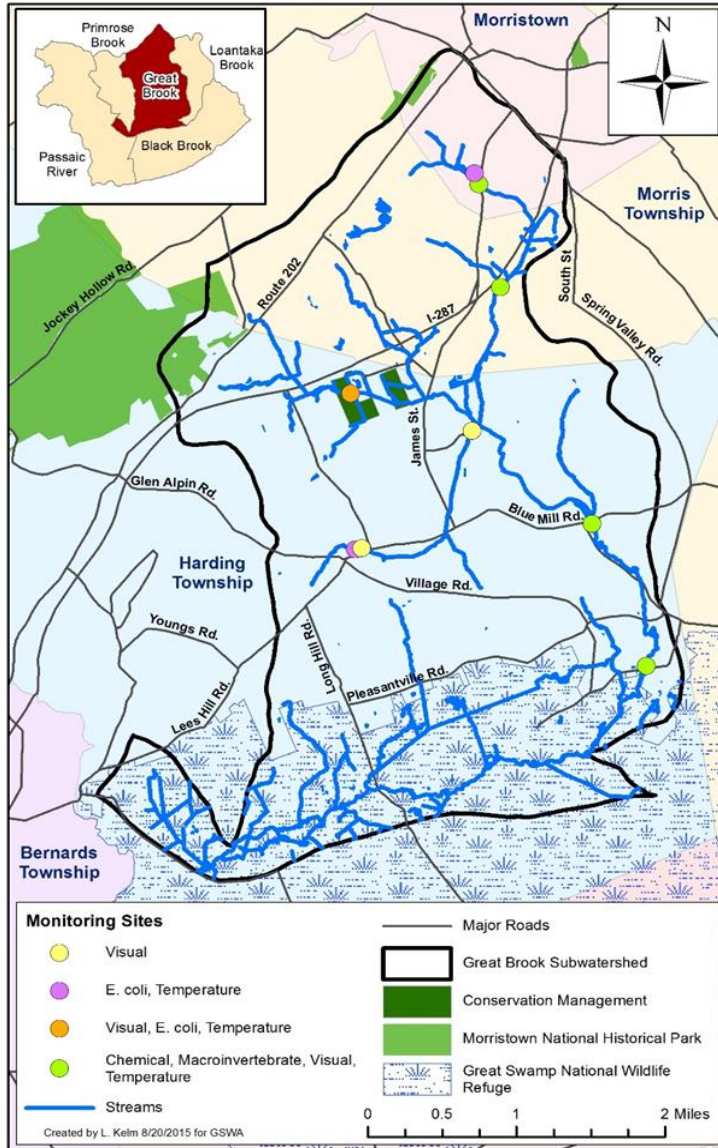
- Starts in developed area – upstream golf course
- Reduction in effluent flow from Chatham WWTP corresponded to nutrient reductions
- Dissolved oxygen lower overall
 - Slower flows, travels through wetland soils of swamp

- Macroinvertebrates
 - Slight decrease in the index
 - Only one sample site
- Bacteria Sampling
 - Elevated at all sites
- Nutrients
 - Improved compared to 2015
 - Decreased flow over all
- Road Salt
 - Similar to other sites in watershed – decreased on all dates

Category	2015	2016
Macro-invertebrates	Very Poor ↓	Poor ↑
Visual Stream Assessment	Good ↑	Good
Bacteria	Very Poor ↓	Very Poor ↑
Dissolved Oxygen	Good	Good ↑
Water Temperature	Excellent	Excellent ↑
pH	Excellent	Good ↓
Road Salt		Good ↑
Water Clarity	Excellent	Excellent
Nitrogen	Very Poor ↑	Poor ↑
Phosphorus	Poor	Poor ↑

Black Brook

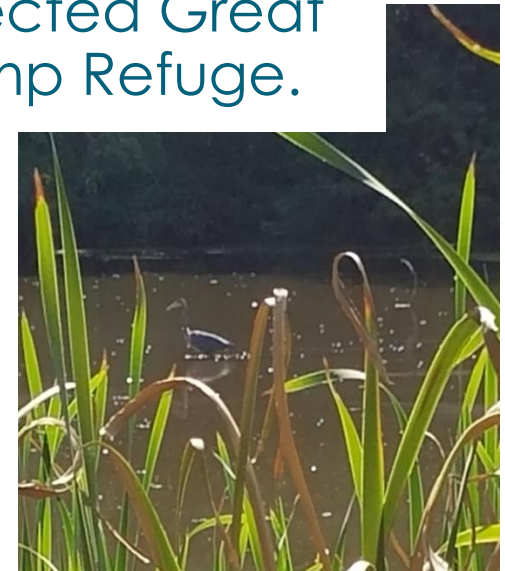




Great Brook

- Headwaters well developed
- High impervious surface cover
- Lower portions flow through protected Great Swamp Refuge.

Foots Pond





Category	Great Brook (Main Stem)		Bayne Brook		Silver Brook	
	2015	2016	2015	2016	2015	2016
Macro-invertebrates	Poor ↑	Poor ↑				
Visual Stream Assessment	Good	Good ↓	Poor	Good ↑	Poor	Poor ↑
Bacteria	Good ↑	Very Poor ↓	Excellent ↓	Poor ↓	Very Poor ↓	Very Poor ↓
Dissolved Oxygen	Excellent	Excellent ↑				
Water Temperature	Excellent	Excellent ↓	Excellent ↑	Excellent	Excellent	
pH	Excellent	Excellent				
Road Salt		Good ↑				
Water Clarity	Good	Good ↓				
Nitrogen	Good ↓	Good				
Phosphorus	Good	Good				

- Great Brook

- Water Quality middle range
- Bacteria significantly higher
- Road salt improved

- Bayne Brook

- Visual Assessments show improvements

- Silver Brook

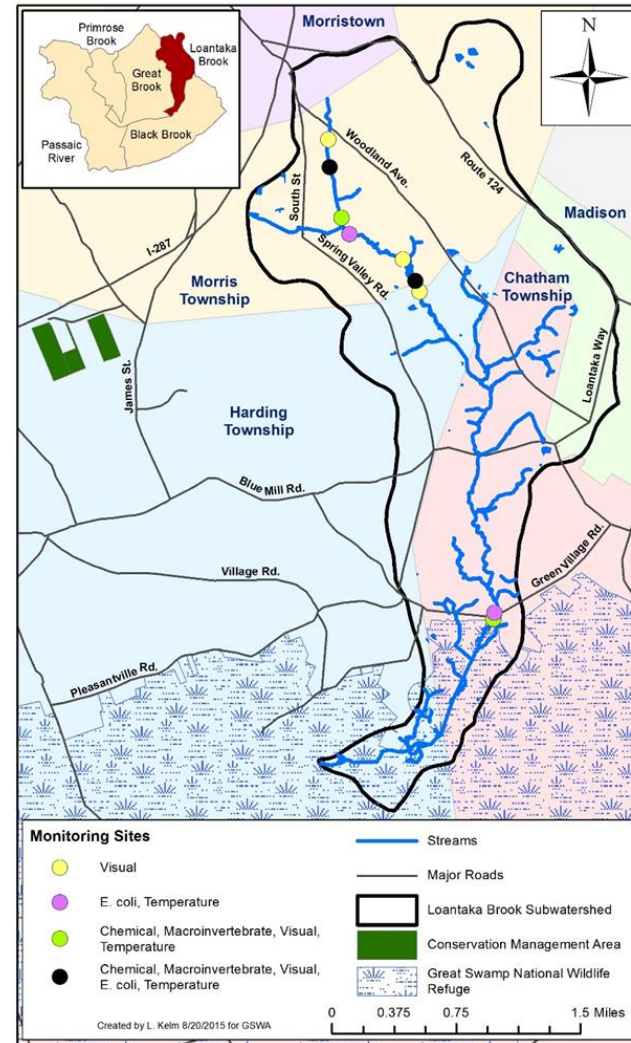
- Elevated bacteria – working on tracking



Stream Team Volunteers sampling Great Brook

Loantaka Brook

Category	2015	2016
Macro-invertebrates	Very Poor ↓	Poor ↑
Visual Stream Assessment	Good	Good ↓
Bacteria	Very Poor ↓	Very Poor ↓
Dissolved Oxygen	Excellent	Excellent ↑
Water Temperature	Excellent	Excellent ↓
pH	Excellent	Excellent
Road Salt	Very Poor ↓	Poor ↑
Water Clarity	Good	Good
Nitrogen	Very Poor ↓	Very Poor
Phosphorus	Very Poor ↓	Poor ↑





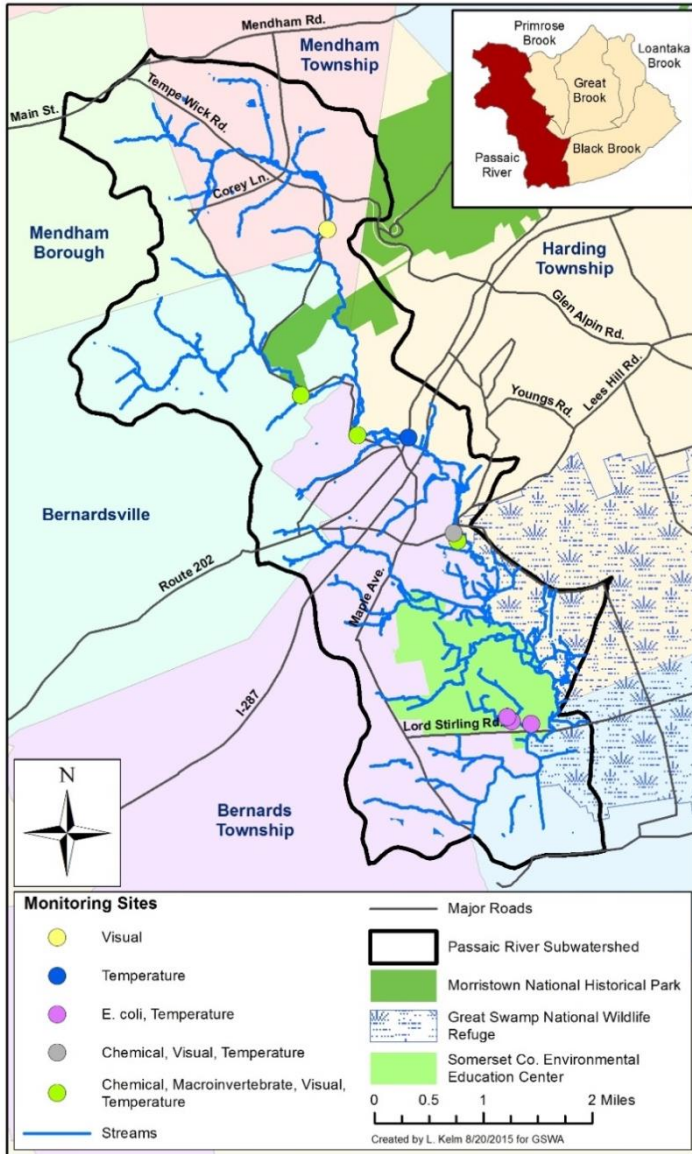
Loantaka Brook

- Highly developed and channelized stream
- Adjacent to sports fields and gravel parking lot, runs through horse farm area
- Elevated levels of algae at Kitchell Pond were treated – could relate to phosphorus reduction

Chatham HS interns during Visual Assessment

Passaic River

- One of the healthiest Watershed streams (with Primrose Brook) north of Rt 202
- Large forested areas in upstream portions of subwatershed
- C1 water upstream of Osborn Pond



Passaic River

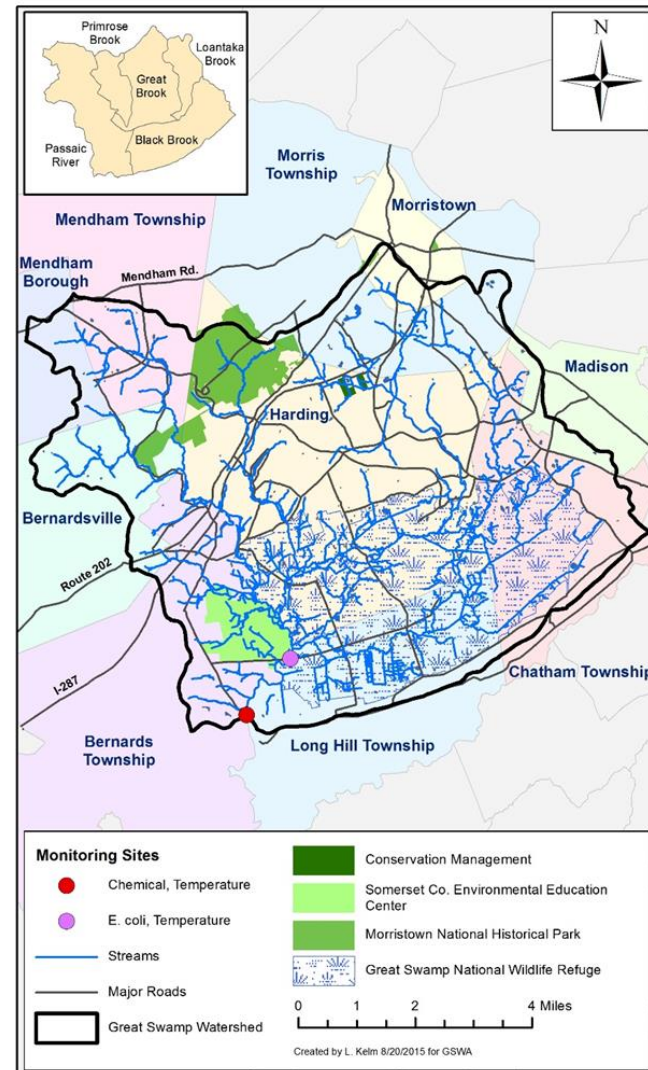


Category	Passaic River	
	2015	2016
Macro-invertebrates	Good ↑	Good ↑
Visual Stream Assessment	Good ↓	Good ↑
Bacteria	Good ↓	Good ↓
Dissolved Oxygen	Excellent ↑	Excellent ↑
Water Temperature	Excellent ↑	Excellent ↑
pH	Excellent	Excellent
Road Salt	Good ↓	Excellent ↑
Water Clarity	Good	Excellent ↑
Nitrogen	Excellent ↑	Excellent
Phosphorus	Excellent	Excellent

- Improvement in most parameters
- Bacteria elevated in Branta Pond
- Indian Grave Brook supported excellent macroinvertebrate population

Great Swamp Watershed Outlet

Category	2015	2016
Macro-invertebrates	X	X
Visual Stream Assessment	X	X
Bacteria	Very Poor ↑	Very Poor ↓
Dissolved Oxygen	Excellent ↓	Excellent
Water Temperature	Excellent ↓	Excellent
pH	Excellent	Excellent
Road Salt	X	Good
Water Clarity	Poor	Excellent ↑
Nitrogen	Excellent	Excellent
Phosphorus	Good	Good ↓



Common Issues

- Elevated temperatures corresponded to elevated bacteria and algae levels
- Buffer zones need improvement
- Impervious surfaces increase storm water runoff
 - Erosion
 - Nutrient inputs
 - Green infrastructure education needed



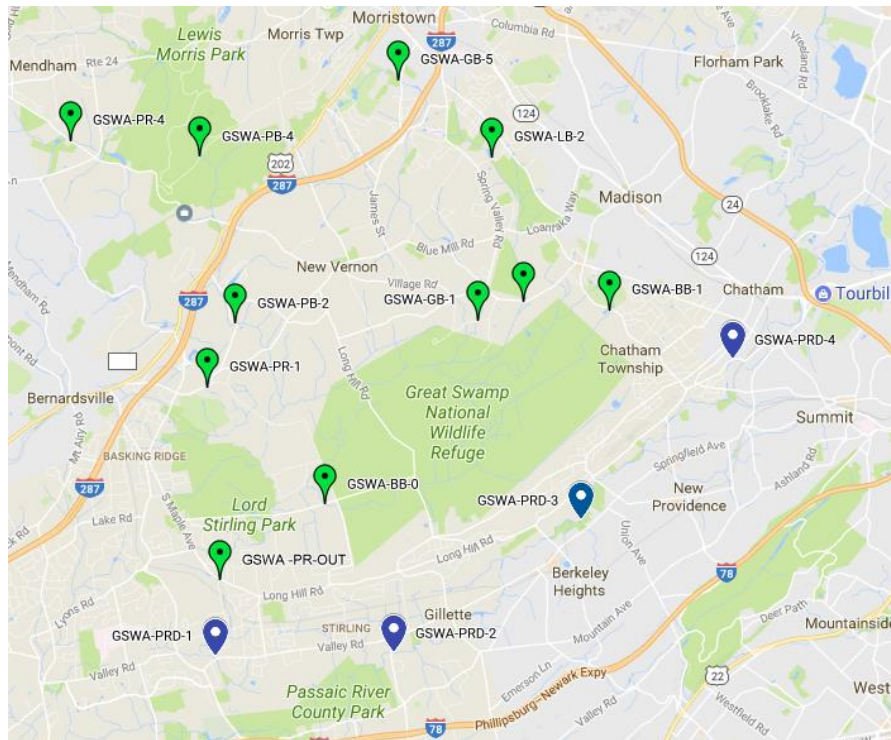
Above: Primrose Brook
Left: Erosion stabilization on the Upper Passaic River

Recommendations

- Increase stream buffers
 - Plant natives and remove invasives
- Reduce road/sidewalk salt usage
- Maintain and regularly check septic and sewers
- Encourage green infrastructure
 - Rain gardens
 - Rain barrels



Downstream Expansion



- 4 new sites below Millington Gorge
- Educational programming throughout the greater Passaic River area
- Spot sampling from Newark bay to headwaters



Preliminary downstream results

- Nutrient loading compounding
- Bacteria levels within state limits
- Flow impacted by effluent
- Access issues
 - Sampling strategies



Water quality effects everyone



Thank you!



- To GSWA staff
- To Stream Team Volunteers
- To generous donors



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Thank You!

Sandra LaVigne

Director of Water Quality Programs
Great Swamp watershed Association

sandral@greatswamp.org