Great Swamp Watershed Association 2016 Watershed Report Card

Keeping our waters clean for everyone

Sandra LaVigne
Director of Water Quality Programs

Foots Pond
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)
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

<table>
<thead>
<tr>
<th>Stream</th>
<th>Macro-invertebrates</th>
<th>Visual Stream Assessment</th>
<th>Bacteria</th>
<th>Dissolved Oxygen</th>
<th>Water Temperatures</th>
<th>pH</th>
<th>Road Salt</th>
<th>Water Clarity</th>
<th>Nitrogen</th>
<th>Phosphorus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Brook</td>
<td>Poor ↑</td>
<td>Good</td>
<td>Very Poor ↑</td>
<td>Good ↑</td>
<td>Excellent ↑</td>
<td>Good ↓</td>
<td>Good ↑</td>
<td>Excellent</td>
<td>Poor ↑</td>
<td>Poor ↑</td>
</tr>
<tr>
<td>Great Brook (main stem)</td>
<td>Poor ↑</td>
<td>Good ↓</td>
<td>Very Poor ↓</td>
<td>Excellent ↑</td>
<td>Excellent ↓</td>
<td>Excellent</td>
<td>Good ↑</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Bayne Brook</td>
<td>Good ↑</td>
<td>Poor ↓</td>
<td></td>
<td>Excellent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver Brook</td>
<td>Poor ↑</td>
<td>Very Poor ↓</td>
<td></td>
<td>Excellent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loantaka Brook</td>
<td>Poor ↑</td>
<td>Good ↓</td>
<td>Very Poor ↓</td>
<td>Excellent ↑</td>
<td>Excellent ↓</td>
<td>Excellent</td>
<td>Poor ↑</td>
<td>Good</td>
<td>Very Poor</td>
<td>Poor ↑</td>
</tr>
<tr>
<td>Passaic River (main stem)</td>
<td>Good ↑</td>
<td>Good ↑</td>
<td></td>
<td>Excellent ↑</td>
<td>Excellent ↑</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Indian Grave Brook</td>
<td>Excellent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branta Pond</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primrose Brook (main stem)</td>
<td>Good ↑</td>
<td>Good ↓</td>
<td>Poor ↓</td>
<td>Excellent ↑</td>
<td>Excellent ↑</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Mount Kemble Lake Tributary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Swamp Watershed Outlet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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**

---

**NJ Monthly Temperature Departures (December 2015 – November 2016)**

Departures calculated from differences between observed monthly temperatures and 1981-2010 monthly averages.

- Warmest December on record
- 4th Warmest March
- Warmest August on record
- 4th warmest September
- 2nd Warmest Winter
- 10th Warmest Spring
- 2nd Warmest Summer
- 6th Warmest Fall

---

**NJ Monthly Precipitation Departures (December 2015 – November 2016)**

Departures calculated from differences between observed monthly precipitation and 1981-2010 monthly averages.

- Records based on observations dating back to 1895.

---

**Month**

- Dec
- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
Primrose Brook

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Primrose Brook (Main Stem)</th>
<th>Mt Kemble Lake Tributary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro-invertebrates</td>
<td>Good ↑</td>
<td>Good ↑</td>
</tr>
<tr>
<td>Visual Stream Assessment</td>
<td>Good</td>
<td>Good ↓</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Good ↓</td>
<td>Poor ↓</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Excellent</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>Water Temperature</td>
<td>Excellent</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>pH</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Road Salt</td>
<td>Excellent</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>Water Clarity</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Excellent ↑</td>
<td>Excellent</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

Interns sampling in Primrose Brook
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

<table>
<thead>
<tr>
<th>Category</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro-invertebrates</td>
<td>Very Poor ↘</td>
<td>Poor ↑</td>
</tr>
<tr>
<td>Visual Stream Assessment</td>
<td>Good ↑</td>
<td>Good</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Very Poor ↘</td>
<td>Very Poor ↑</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Good</td>
<td>Good ↑</td>
</tr>
<tr>
<td>Water Temperature</td>
<td>Excellent</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>pH</td>
<td>Excellent</td>
<td>Good ↓</td>
</tr>
<tr>
<td>Road Salt</td>
<td></td>
<td>Good ↑</td>
</tr>
<tr>
<td>Water Clarity</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Very Poor ↑</td>
<td>Poor ↑</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Poor</td>
<td>Poor ↑</td>
</tr>
</tbody>
</table>
Great Brook

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

<table>
<thead>
<tr>
<th>Category</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro-invertebrates</td>
<td>Very Poor ↓</td>
<td>Poor ↑</td>
</tr>
<tr>
<td>Visual Stream Assessment</td>
<td>Good</td>
<td>Good ↓</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Very Poor ↓</td>
<td>Very Poor ↓</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Excellent</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>Water Temperature</td>
<td>Excellent</td>
<td>Excellent ↓</td>
</tr>
<tr>
<td>pH</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Road Salt</td>
<td>Very Poor ↓</td>
<td>Poor ↑</td>
</tr>
<tr>
<td>Water Clarity</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Very Poor ↓</td>
<td>Very Poor</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Very Poor ↓</td>
<td>Poor ↑</td>
</tr>
</tbody>
</table>
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

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Passaic River</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2015</td>
</tr>
<tr>
<td>Macro-invertebrates</td>
<td>Good ↑</td>
</tr>
<tr>
<td>Visual Stream Assessment</td>
<td>Good ↓</td>
</tr>
<tr>
<td>Bacteria</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>Water Temperature</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>pH</td>
<td>Excellent</td>
</tr>
<tr>
<td>Road Salt</td>
<td></td>
</tr>
<tr>
<td>Water Clarity</td>
<td>Good</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
## Great Swamp Watershed Outlet

<table>
<thead>
<tr>
<th>Category</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro-invertebrates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Stream Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td>Very Poor ↑</td>
<td>Very Poor ↓</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Excellent ↓</td>
<td>Excellent</td>
</tr>
<tr>
<td>Water Temperature</td>
<td>Excellent ↓</td>
<td>Excellent</td>
</tr>
<tr>
<td>pH</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Road Salt</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Water Clarity</td>
<td>Poor</td>
<td>Excellent ↑</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Good</td>
<td>Good ↓</td>
</tr>
</tbody>
</table>
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
Thank You!

Sandra LaVigne
Director of Water Quality Programs
Great Swamp watershed Association
sandral@greatswamp.org