2011

Abbott Run Annual Study 2011

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The purpose of our study is to test whether or not the water in “Abbott Run” is suitable to be Pawtucket, Rhode Island’s drinking water. We checked for dissolved oxygen, the river flow, precipitation levels, pH, the benthic macro-invertebrate diversity, depth of the river sites, salinity, and temperature to see if the river would meet the standards set by MassDEP. To be a source of drinking water, in Massachusetts, the body of water must be Class A.
Abbott Run Watershed
Abbott Run has been the water source for Pawtucket, RI and Cumberland, RI for centuries.
There was a furnace called Iron Rust built on the West side of the River. Cannons were made here during the Revolution.
Robin Hollow, one of the first manufacturing sites in Cumberland, was located on Abbott Run.
The first manufacturing done at Abbott Run was during the time of Charles II when a royal license was obtained to manufacture tar.
There has been a Girl Scout camp on the river called Camp Shady Pines for 40 years.
There was construction of Hunts Bridge near Abbott Run, Site B, during 2006 which has disturbed the pH of the water.
Site A, Cushman Road
Looking downstream
Site B, Shady Pines
Looking Upstream
We have looked at the precipitation data for the area, and we did not have any precipitation seven days prior to our field study.
SITE SKETCH: Draw an overhead view of the complete stream study reach (6 X the bankfull width and > = 20 m) that includes the benthic invertebrate sampling area. Try to note the site kick net collection spots or timed zigzag kick net locations and where you measured your cross sections and current velocity. Note any riffles, pools, dams, incoming streams, roads, large boulders, or drainage pipes that could help someone else locate your study site in the field. Show the direction of flow from the upstream area to the down stream area with an arrow (U → D).

Site Code #: A  River: Abbotts Run  Date: 11/3/10
Observations: Whipper, bugs, leaves, pebbles, logs
Stream Profile, Cushman Road, Site A

Depth (Feet)

Width (in three foot segments)
SITE SKETCH: Draw an overhead view of the complete stream study reach (6 x the bankfull width and >= 20 m) that includes the benthic invertebrate sampling area. Try to note the site kick net collection spots or timed zigzag kick net locations and where you measured your cross sections and current velocity. Note any riffles, pools, dams, incoming streams, roads, large boulders, or drainage pipes that could help someone else locate your study site in the field. Show the direction of flow from the upstream area to the downstream area with an arrow (U → D).

Site Code #: B    River: Shady Pines    Date: 11/3
Observations: calmer, abbott Run
Class A Standards for Our Study

- The percent dissolved oxygen cannot be less than 75%.
- Dissolved Oxygen shall not be less than 6 mg/L.
- The temperature cannot exceed 68° F (20° C) in cold water fisheries unless naturally occurring. It cannot exceed 83°F (28.3°C) in warm water fisheries.
- The pH must be in the range of 6.5 through 8.3 standard units but not more than 0.5 units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.
- Fecal coliform must not exceed 20 fecal coliform organisms per 100 ml in all samples taken in any six month period, or total coliform shall not exceed 100 organisms per 100 ml in 90% of the samples taken in any six month period.
### Average Stream Width, Average Depth, Bottom Composition

#### Site A, Cushman Road

<table>
<thead>
<tr>
<th>Average Width</th>
<th>42 Ft Wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Depth</td>
<td>1.40 Ft</td>
</tr>
<tr>
<td>Bottom Composition</td>
<td>The Bottom Is Solid And Rocky</td>
</tr>
</tbody>
</table>

#### Site B, Shady Pines

<table>
<thead>
<tr>
<th>Average Width</th>
<th>17 Ft Wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Depth</td>
<td>1.3 Ft</td>
</tr>
<tr>
<td>Bottom Composition</td>
<td>The Bottom Is Sandy</td>
</tr>
</tbody>
</table>

*The stream order of the sites was a 2*
<table>
<thead>
<tr>
<th>Site A, Cushman Road</th>
<th>Site B, Shady Pines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Flow</strong></td>
<td><strong>Average Flow</strong></td>
</tr>
<tr>
<td>.50 Ft/Sec</td>
<td>1.23 Ft/Sec</td>
</tr>
<tr>
<td><strong>Total Discharge</strong></td>
<td><strong>Total Discharge</strong></td>
</tr>
<tr>
<td>24.57 CFS 695.93 L/S</td>
<td>23.23 CFS 657.92 L/S</td>
</tr>
</tbody>
</table>
pH Comparison of Site A, Cushman Road and Site B, Shady Pines, November 3-4, 2010

Class A Water Standard: pH between 6.5 – 8.3
Class A Water Standard: pH between 6.5 – 8.3
pH Comparison, Site B, 2005-2010

Class A Water Standard: pH between 6.5 – 8.3
DO Comparison, Abbott Run, Site A and Site B, 11/3/10-11/4/10

Class A: no less than 6.0 mg/l
DO Comparison, Abbott Run, Site A, 2005-2010

Dissolved Oxygen water standard for class A cold waters: no less than 6.0 mg/l - unless background conditions are lower.
DO Comparison, Abbott Run, Site B, 2005-2010

Dissolved Oxygen water standard for class A cold waters: no less than 6.0 mg/l - unless background conditions are lower.
Massachusetts Class A Warm Water Standard is 28.3°C
Temperature Comparison, Abbott Run, Site A, Cushman Road 2005-2010

Class A Warm Water Standards Do Not Exceed 28.3°C
%DO Comparison, Abbott Run, Site A & B, 11/3/10 – 11/4/10

Class A Standard: %DO not less than 75%
% DO Comparison, Site A, Shady Pines 2005-2010

Class A Standard: %DO not less than 75%
% DO Comparison, Site B, Shady Pines 2005-2010

Class A Standard: %DO not less than 75%
Comparison of Temperature & % DO, Site A, Cushman Rd., 11/3-11/4/2010
Comparison of Temperature & % DO, Site B, Shady Pines, 11/3-11/4/2010
<table>
<thead>
<tr>
<th></th>
<th>Range (Highest – Lowest)</th>
<th>Average</th>
<th>Class A Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>1.06</td>
<td>7.20</td>
<td>Not exceed 28.3° warm water fisheries</td>
</tr>
<tr>
<td>pH</td>
<td>.11</td>
<td>9.63</td>
<td>6.5-8.3</td>
</tr>
<tr>
<td>Specific Conductivity mS/cm</td>
<td>.004</td>
<td>.18</td>
<td>0.05mS/cm or less</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>1.13</td>
<td>13.99</td>
<td>6.0</td>
</tr>
<tr>
<td>% Dissolved Oxygen (%Sat)</td>
<td>7.3</td>
<td>114.39</td>
<td>Not less than 75%</td>
</tr>
</tbody>
</table>
# Ranges and Averages, Abbott Run Site B, Shady Pines

<table>
<thead>
<tr>
<th></th>
<th>Range (Highest – Lowest)</th>
<th>Average</th>
<th>Class A Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (C°)</td>
<td>1.76</td>
<td>7.34</td>
<td>Not exceed 28.3° warm water fisheries</td>
</tr>
<tr>
<td>pH</td>
<td>.29</td>
<td>10.61</td>
<td>6.5-8.3</td>
</tr>
<tr>
<td>Specific Conductivity mS/cm</td>
<td>.003</td>
<td>.18</td>
<td>0.05mS/cm or less</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>1.88</td>
<td>12.76</td>
<td>6.0</td>
</tr>
<tr>
<td>% Dissolved Oxygen (%Sat)</td>
<td>15.1</td>
<td>104.69</td>
<td>Not less than 75%</td>
</tr>
</tbody>
</table>
“...natural conductivity level without human influence would be around 0.05mS/cm or less. Levels in the 0.3 – 0.4mS/cm range indicate likely contamination from salt and or wastewater.” –Doug Heath, EPA
Specific Conductivity Comparison Site A, Cushman Road, 2005-2010

“…natural conductivity level without human influence would be around 0.05mS/cm or less. Levels in the 0.3 – 0.4mS/cm range indicate likely contamination from salt and or wastewater.” –Doug Heath, EPA
…natural conductivity level without human influence would be around 0.05mS/cm or less. Levels in the 0.3 – 0.4mS/cm range indicate likely contamination from salt and or wastewater.” –Doug Heath, EPA

Class A Water Standards: N-NO3 less than 1.0 mg/l

Machine Detection Limit for N-NO3: 0.10 mg/l

Machine Detection Limit is 0.008 mg/L

Class A Water Standards: SRP less than .05 mg/L
## Concentration of Nitrogen and Phosphorus

- **Site A Cushman Road**
- **Site B Shady Pines**

<table>
<thead>
<tr>
<th></th>
<th>Concentration of N mg/L</th>
<th>Load g/day</th>
<th>Concentration of N mg/L</th>
<th>Load g/day</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site A Cushman Road</strong></td>
<td><strong>0.37</strong></td>
<td><strong>22247.38</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site B Shady Pines</strong></td>
<td><strong>0.36</strong></td>
<td></td>
<td></td>
<td><strong>20464.04</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Concentration of P mg/L</th>
<th>P load g/day</th>
<th>Concentration of P mg/L</th>
<th>P load g/day</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site A Cushman Road</strong></td>
<td><strong>0.005</strong></td>
<td><strong>324.69</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site B Shady Pines</strong></td>
<td><strong>0.006</strong></td>
<td></td>
<td></td>
<td><strong>346.75</strong></td>
</tr>
</tbody>
</table>
Fecal Coliform Counts, Abbott Run, 11/3/10

**Cushman Rd.**
- 100 ML
  - > 50
  - > 42

**Shady Pines**
- 100 ML
  - > 48
  - > 54

Class A standard: fecal levels should not exceed 200 colonies per 100 ML.
Benthic Macro Invertebrates: Site A

MGBI: 3.5
Excellent

Ephemeroptera: 13%
Plecoptera: 9%
Trichoptera: 54%
Diptera: 9%
Odonata: 3%
Megaloptera: 7%
Coleoptera: 2%
Oligochaeta: 1%
Isopoda: 1%
Oligochaeta: 2%

Benthic Macro Invertebrates: Site A

MGBI: 3.5
Excellent
Benthic Macro Invertebrates: Site B

- Diptera: 27%
- Trichoptera: 19%
- Plecoptera: 19%
- Odonata: 12%
- Coleoptera: 13%
- Ephemeroptera: 9%
- Gastropoda: 1%

MGBI: 4.2

Very Good
Summary of Results

• MGBI (Major Group Biotic Index) of Site A improved from 3.76 (very good) to 3.5 (excellent). Site B’s MGBI improved greatly, going from 5.2 (fair) to 4.2 (very good).
• Site A’s distribution of BMI’s was comparable to last years with a slight increase in Trichoptera. Site B had a large increase in the percentage of Diptera found in the river.
• The pH of Abbott Run are the highest they have been in the last five years at both sites due to instrument error. According to the Pawtucket Water Board, pH is fine for Class A river.
• Phosphorous and Nitrogen levels have decreased and are at low levels compared to the last five years.
• Temperature and Dissolved Oxygen comparisons match similar results over the past five years.
Recommendations

• Monitor pH of stream

• Monitor benthic macro-invertebrates

• Classify organisms by Order and Family

• Conduct study on similar date for following years. This would be to ensure a more accurate comparison of BMIs and other data from year to year.
Presented By:

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