2005

How Polluted is West Meadow Brook?

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How Polluted Is West Meadow Brook?

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- Roosevelt Lewis
- Robert Corr
- Elizabeth Caledonia
- Caitlin Wagner
Introduction
Objective

Our objective in this experiment was to continue with the water quality study of West Meadow Brook, which has been ongoing for 5 years. We tested the water for pH, Nitrate, Phosphate, Dissolved Oxygen, and Specific Conductivity levels to determine the brook's water quality.
Procedure

- First we collected water samples from both an Upstream and downstream site. (we took the temp at same time.)
- Next we filtered samples to remove any suspended solids..
- We then sent samples to Bridgewater State College Lab so they could be tested for their various chemical levels.
- We then collected Macroinvertebrates
- Lastly we formed a conclusion based on indicated levels, as to the water quality of West Meadow Brook.
West Meadow Brook

As shown in picture 1 in comparison with picture 2 West Meadow Brook has evolved over time. One major change that has taken place over time is the increased vegetation surrounding the banks.
West Meadow Brook
Watershed Area

55 mi²
42.074° N, 71.038° W
Flagg Pond and West Meadow Brook
West Meadow Brook Topographic Map
Orthographic Photo

Upstream Site

Brockton High School Campus

Downstream Site

High Density Residential Area

Map created with ArcIMS - Copyright (C) 1992-2001 ESRI Inc.

0 0.23mi
Test Site 1 (Upstream Site)

Site 1 Panoramic View

- Width Across- 135 inches
- Depth (middle)- 15 inches
- Depth (right)- 11.5 inches
- Depth (left)- 9.7 inches
Test Site 2 (Downstream Site)

Site 2 Panoramic View

- Width Across - 132 inches
- Depth (middle) - 13.6 inches
- Depth (right) - 11.2 inches
- Depth (left) - 8.9 inches
Gradient Calculation

Elevation at source (Source ponds) 118 Feet
Elevation at confluence (Town River) 15 Feet
Total Distance of River in Miles from Upstream to Downstream locations = 8.27 miles

\[
\frac{51 \text{ feet} - 15 \text{ feet}}{8.27 \text{ miles}} = 14.28 \text{ feet/mile}
\]
West Meadow Brook Upstream Cross Section (site A)
West Meadow Brook Downstream Cross Section (Site B)
chemistry
Phosphates

**Brief Overview**

Phosphates are a salt or ester of phosphoric acid; fertilizer containing phosphorus compounds. Humans add phosphates to water through industrial and agricultural wastes. Fertilizers contain high levels of phosphates and will enter the water by means of runoff and soil erosion. Phosphorus can be a pollutant if it is found in the river in excess amounts.
Phosphates Data

Phosphates- West Meadow Brook
Month of April 2005

Date

0
0.0005
0.001
0.0015
0.002
0.0025
0.003
0.0035
0.004
0.0045
4/4/2005
4/5/2005
4/6/2005
4/7/2005
4/8/2005
4/9/2005
4/10/2005
4/11/2005
4/12/2005
4/13/2005
4/14/2005
4/15/2005

Phosphates (mg/L)

Site A

Site B

Phosphates- West Meadow Brook
Month of April 2005
Nitrate Levels

• Brief Overview
  - Fertilizer consisting of sodium nitrate or potassium nitrate. Nitrates are naturally occurring chemicals that come from fertilizer, sewage, manure and decayed vegetable matter. In agricultural areas nitrate levels often test higher when more fertilizer is applied than plants will absorb. Because nitrates are water-soluble, the excess can then end up in ground water.
pH Level

• **Brief Overview**

A measure of the degree of the acidity or the alkalinity of a solution as measured on a scale (pH scale) of 0 to 14. The midpoint of 7.0 on the pH scale represents neutrality, i.e., a "neutral" solution is neither acid nor alkaline. Numbers below 7.0 indicate acidity; numbers greater than 7.0 indicate alkalinity.
pH Data

pH - West Meadow Brook
Month of April 2005
Temperature

• Brief Overview

• A measure of the average kinetic energy of the particles in a sample of matter, expressed in terms of units or degrees designated on a standard scale.
### Temperature Data

**Water Temperature - West Meadow Brook**  
Month of April 2005

<table>
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<th>Date</th>
<th>Temperature (°C) Site A</th>
<th>Temperature (°C) Site B</th>
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<td>14.5</td>
<td>14.0</td>
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</tbody>
</table>
Dissolved Oxygen

• **Brief Overview**

• Dissolved oxygen analysis measures the amount of gaseous oxygen (O2) dissolved in an aqueous solution. Oxygen gets into water by diffusion from the surrounding air, by aeration (rapid movement), and as a waste product of photosynthesis.
Dissolved Oxygen Percent

Brief Overview

Oxygen easily dissolves from the atmosphere to water until it reaches a point of saturation and cannot hold anymore of the gas. The oxygen begins to diffuse slowly once it is in the water by currents that are created by wind. Oxygen also can enter the water after it is produced by photosynthesis from aquatic plants and algae. The amount of oxygen that can be held in the water is determined by factors such as temperature, salinity levels, and atmospheric pressure.
Dissolved Oxygen Percent Data

West Meadow Brook - Dissolved Oxygen (%)
Month of April 2005
Specific Conductivity

• **Brief Overview**

• Electrical conductivity is a measure of a water’s ability to conduct electricity, and therefore a measure of the water’s ionic activity and content. Specific conductivity is the reciprocal of the specific resistance of a solution measured between two electrodes 1 cm² in area and 1 cm apart.
Specific Conductivity Data

Specific Conductivity - Month of April 2005

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<th>Date</th>
<th>Specific Conductivity (ms/cm)</th>
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</table>

Graph showing specific conductivity data for the month of April 2005, with two series labeled Series1 and Series2.
Ecology
Common Benthic Macro Invertebrates

Hirudinea

Amphipoda

Trichoptera

Chironomidae
Benthic Macro invertebrates Data Summary

**Upstream**

- **MGBI**: 5.00
- **Top Five Groups**
  1. Diptera
  2. Tricoptera
  3. Hirundea
  4. Amphipoda
  5. Plecoptera

**Stream Health** - Moderate Impairment

**Downstream**

- **MGBI**: 6.42
- **Top Five Groups**
  1. Tricoptera
  2. Hirundea
  3. Diptera
  4. Amphipoda
  5. Megaloptera

**Stream Health** - Moderate Impairment
Conclusion (based on indicated levels)

• Nitrates- Nitrate levels were especially high.
• Phosphates- BDL (below detection limit)
• pH- normal
• Dissolved Oxygen % - Normal in Site A samples. Site B samples had a high saturation of Oxygen.
**Conclusion (cont.)**

- **Macroinvertebrates** - In both sites high abundance of trichoptera and Hirundea. These high quantities indicate poor water quality.
- With all data deeply considered we concluded that West Meadow Brooks water quality should be considered moderately to severely impaired.
Possible Causes of high Chemical Values.

Thorny Lea Golf Club

Brockton High Parking Lot

Campanelli Stadium

Marciano Stadium
Special Thanks To:

MS. SUZANNE YOEST, BHS SCIENCE TEACHER
MS. ELERI MERRIKIN, BHS SCIENCE TEACHER
MR WILLIAM FINN, BHS Science Dept Chair
MS AMY GAUTHIER, Science Instructional Resource Specialist
DR. KEVIN CURRY, BSC PROFESSOR BIOLOGICAL SCIENCES
KIM MCCOY, BSC WATERSHED LAB MANAGER
The End
Any Questions?