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### How Polluted is West Meadow Brook?

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# *How Polluted Is West Meadow Brook?*



Students Involved:

- Ryan Lake
- Roosevelt Lewis
- Robert Corr
- Elizabeth Caledonia
- Caitlin Wagner

# Introduction

The word 'Introduction' is rendered in a large, bold, sans-serif font. The letters are white with a black outline and are filled with a photograph of a winter scene. The scene shows a frozen body of water in the foreground, with snow-covered ground and trees in the middle ground. In the background, there is a large, multi-story building with many windows. The entire image is set against a light blue gradient background.

# *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 brooks 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.

## Collection



# *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





West  
Meadow Brook  
Watershed Area

55 mi<sup>2</sup>

42.074° N Flagg  
71.038° W Pond and  
West  
Meadow  
Brook

1 mile

A horizontal scale bar with vertical end caps, indicating a distance of 1 mile.





West  
Meadow  
Brook  
Watershed  
Area

220 squares  
0.25 mile  
sq

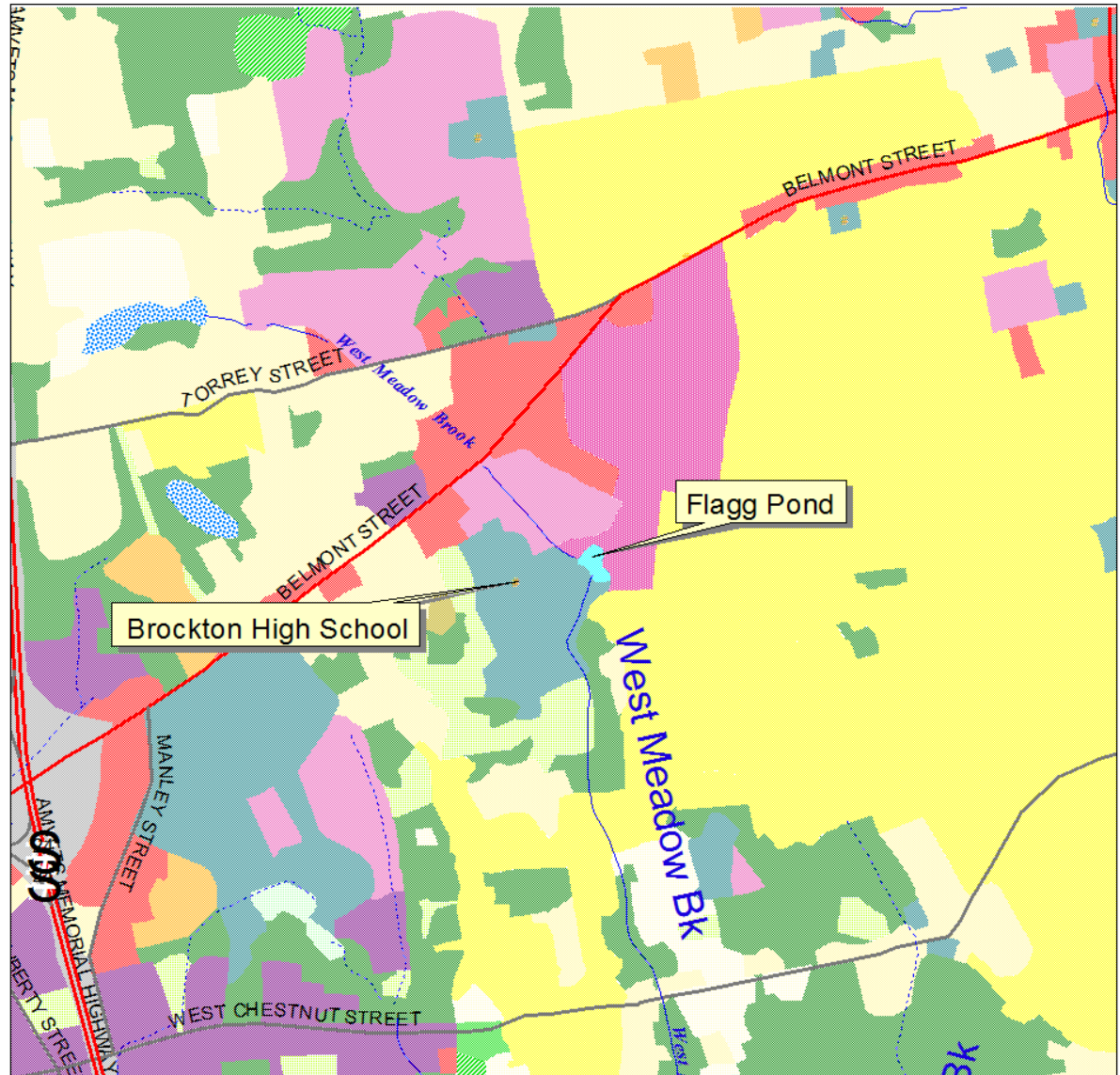
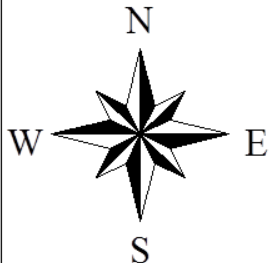
55 sq. miles

1 mile

42  
71

# Land Usage Map Brockton, MA

- Text Maj Pond Labels  
 Text Maj Stream Labels  
 Rivers & Streams  
 Stream  
 Intermittent Stream  
 Text Geographic Names - Water Features  
 Maj MHD Rds by Admin lg scale  
 Interstate  
 U. S. Federal  
 State  
 Major Road - Collector  
 Street Names sm scale  
 Maj. Roads Labels and Shields  
 School1.shp  
 Land Use  
 Crop Land  
 Pasture  
 Forest  
 Non-Forested Wetland  
 Mining  
 Open Land  
 Participation Rec.  
 Spectator Rec.  
 Water-based Rec.  
 Multi-Fam. Res.  
 High Density Res.  
 Medium Dens. Res.  
 Low Dens. Res.  
 Salt Water Wetland  
 Commercial  
 Industrial  
 Urban Open  
 Transportation  
 Waste Disposal  
 Water  
 Woody Perennial

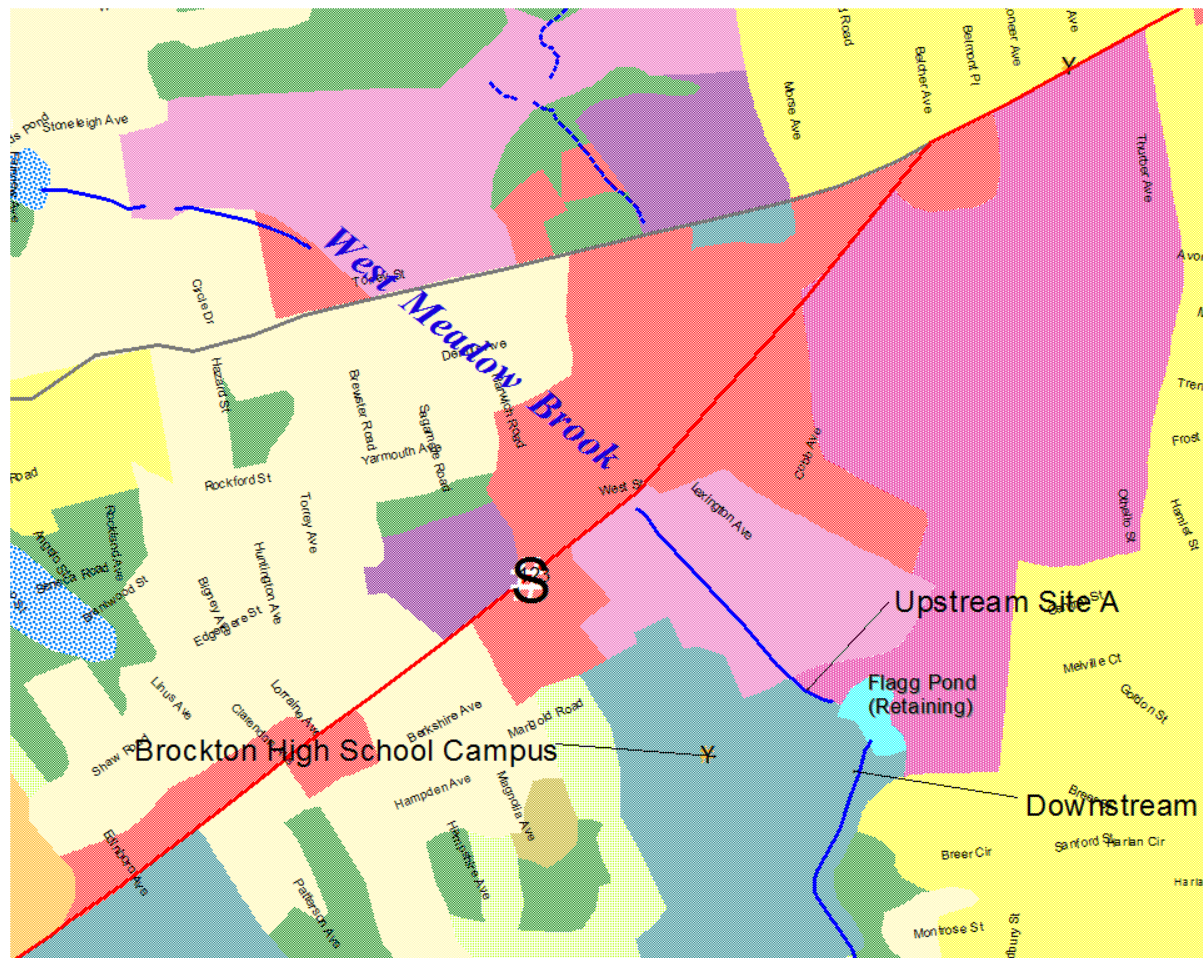


0.5 0 0.5 1 Miles

# State Land Use Classifications

## West Meadow Brook Area

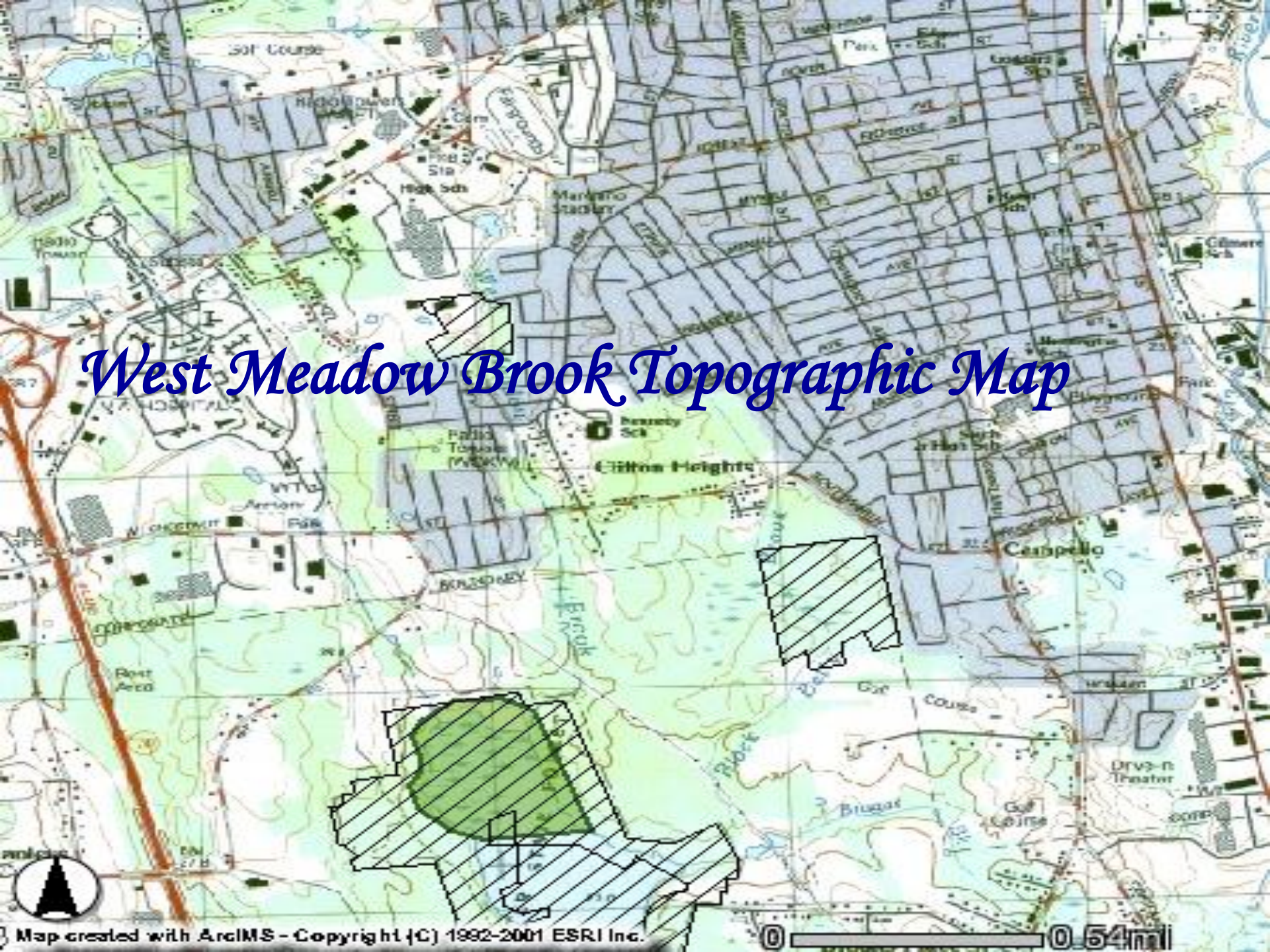
### Brockton, MA 02301



- Text** Maj Pond Labels
- Rivers & Streams**
- Stream
  - Intermittent Stream
- Text** Geographic Names - Water Features
- Maj MHD Rds by Admin lg scale**
- Interstate
  - U. S. Federal
  - State
  - Major Road - Collector
- Maj. Roads Labels and Shields**
- Schoolx1.shp**
- Land Use**
- Crop Land
  - Pasture
  - Forest
  - Non-Forested Wetland
  - Mining
  - Open Land
  - Participation Rec.
  - Spectator Rec.
  - Water-based Rec.
  - Multi-Fam. Res.
  - High Density Res.
  - Medium Dens. Res
  - Low Dens. Res
  - Salt Water Wetland
  - Commercial
  - Industrial
  - Urban Open
  - Transportation
  - Waste Disposal
  - Water
  - Woody Perennial



# *West Meadow Brook Topographic Map*





# Orthographic Photo

Upstream  
Site



High  
Density  
Residential  
Area

Brockton High  
School Campus



Downstream  
Site



Test Sites 1&2



# *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



Hydrology

## Gradient Calculation

Elevation at source (Source ponds) 118 Feet

Elevation at confluence (Town River) 15 Feet

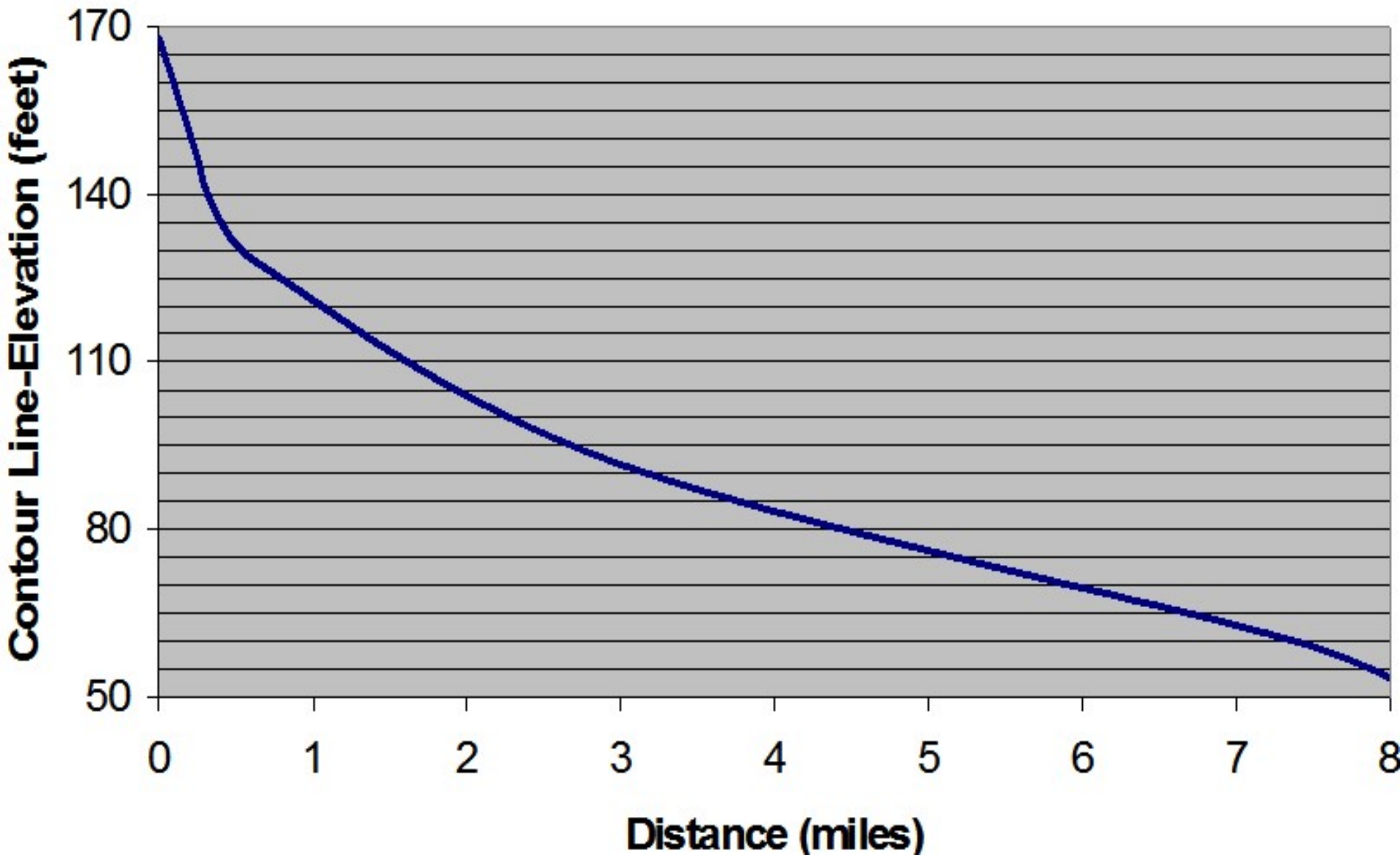
Total Distance of River in Miles from Upstream to Downstream locations = 8.27 miles

$$51 \text{ feet} - 15 \text{ feet} = 36 \text{ feet}$$

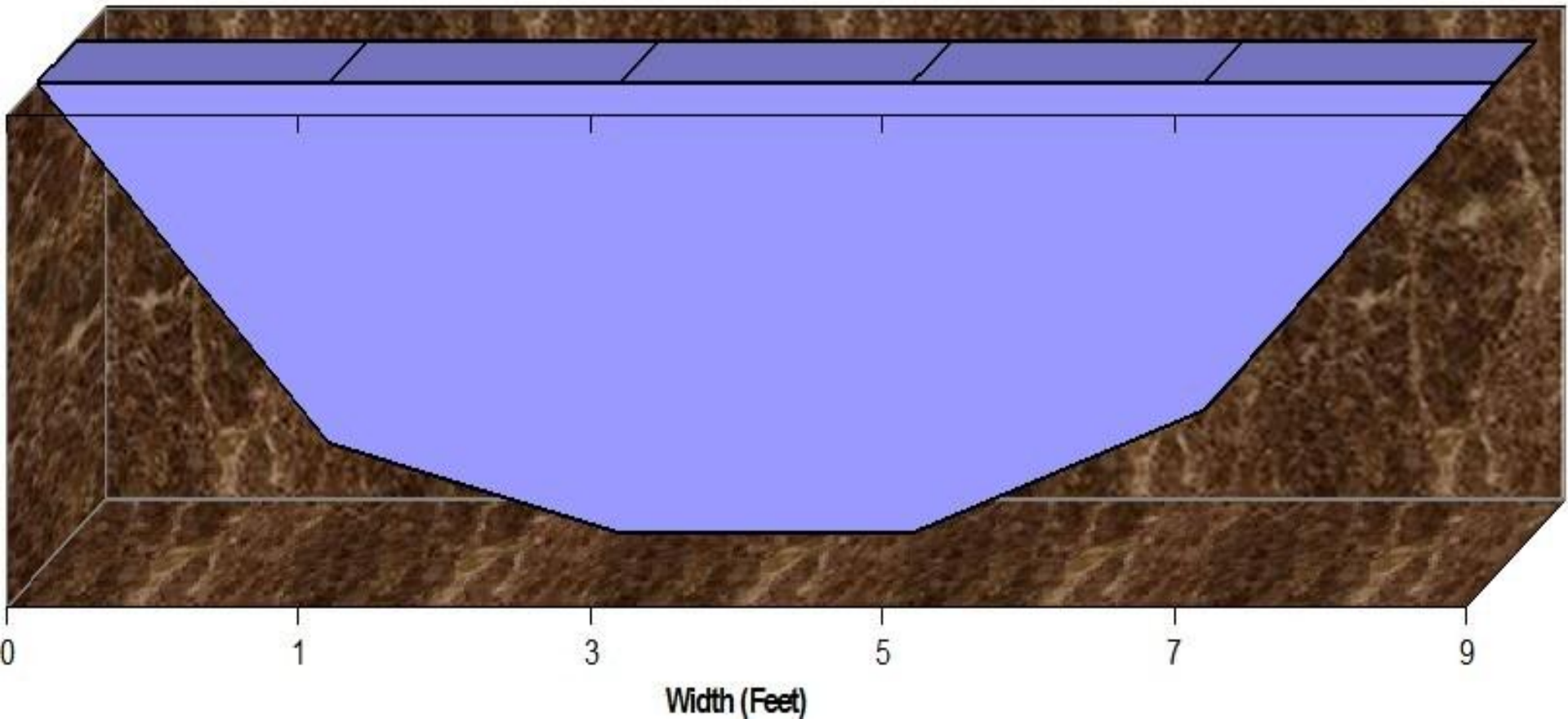
$$\frac{(118 \text{ feet})}{(8.27 \text{ miles})} = 14.28 \text{ feet/mile}$$

# Longitudinal Profile

## West Meadow Brook, Brockton , MA

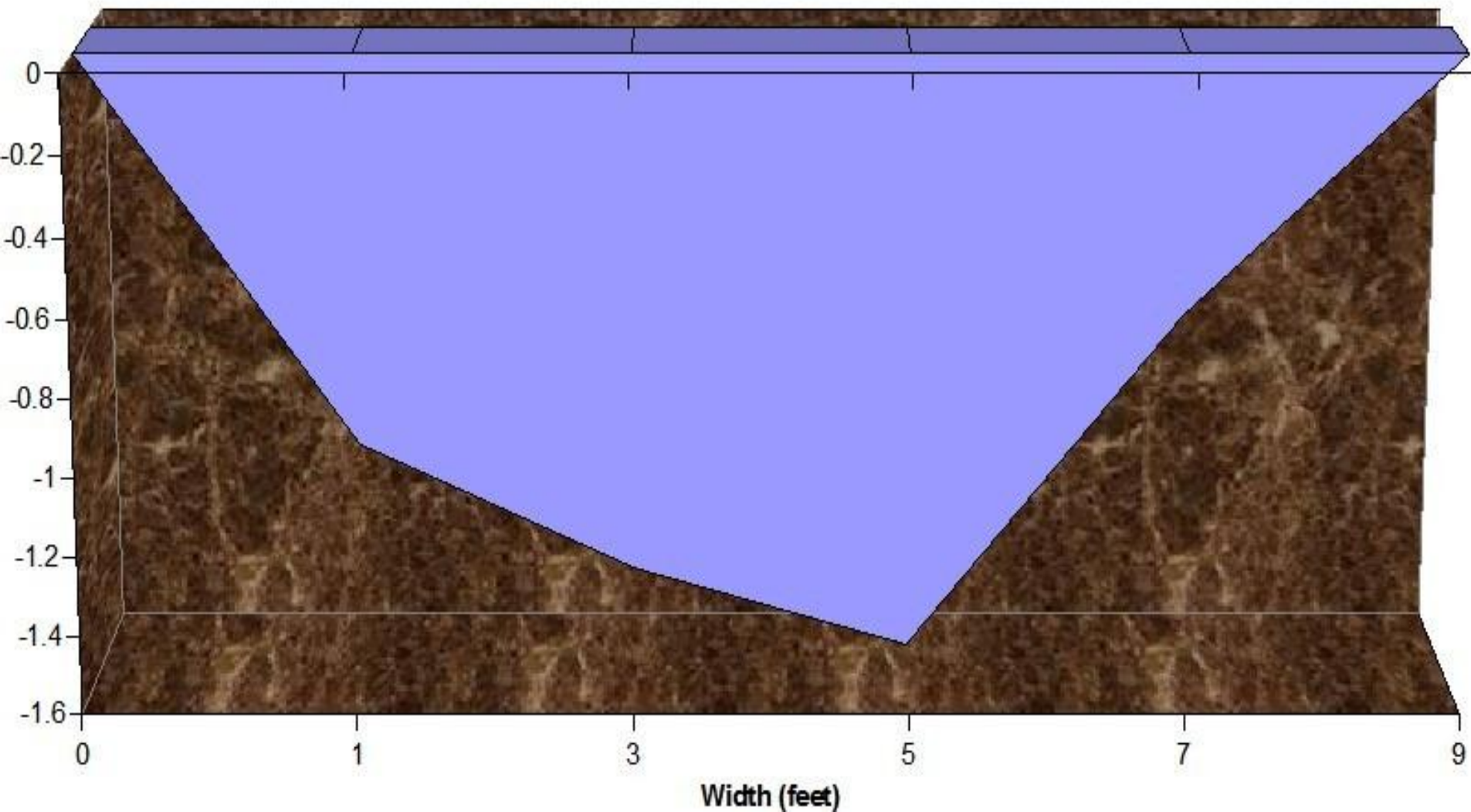


# West Meadow Brook Upstream Cross Section (site A)





# 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.



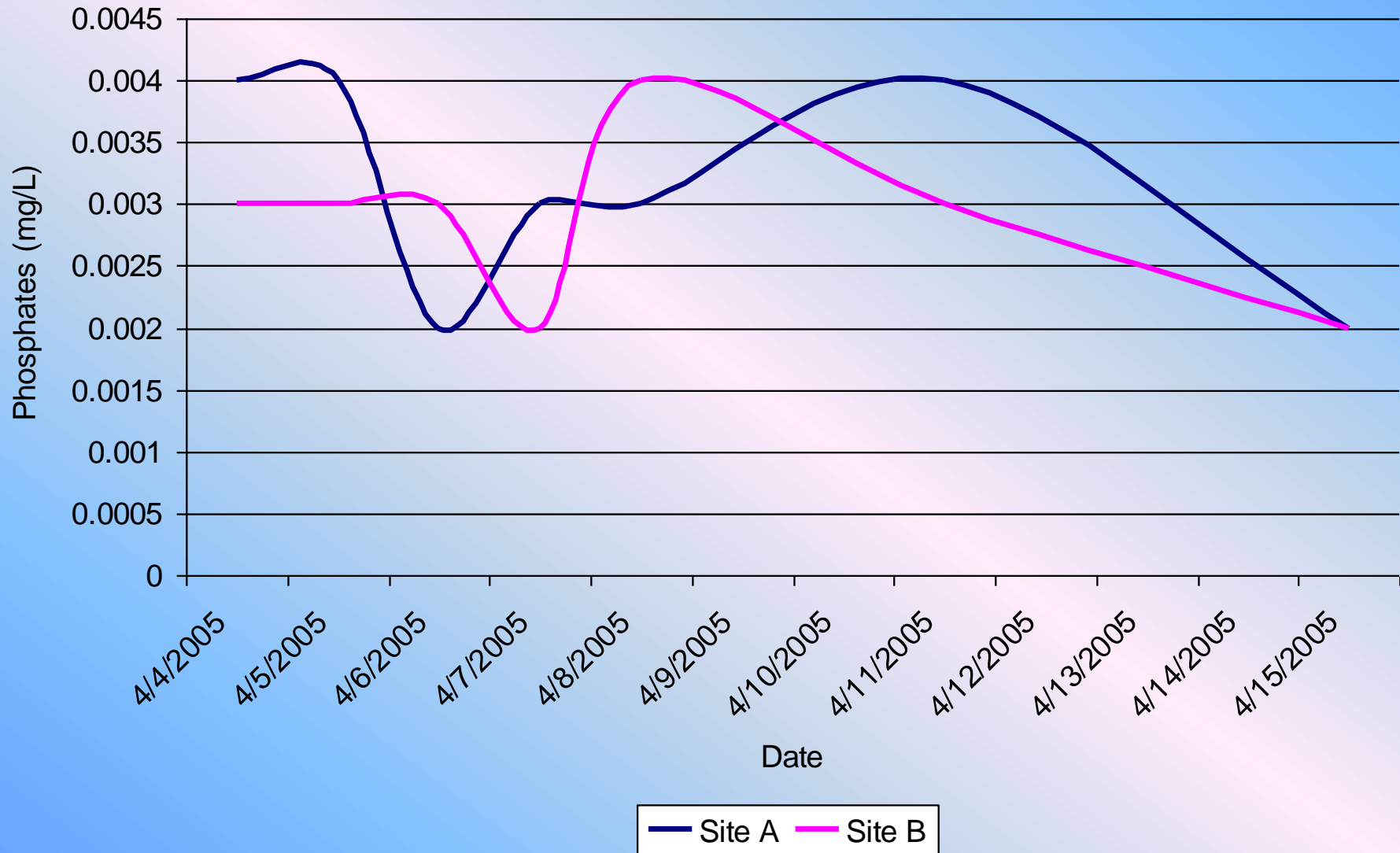
regeneration

Sediments

# *Phosphates Data*

Phosphates- West Meadow Brook

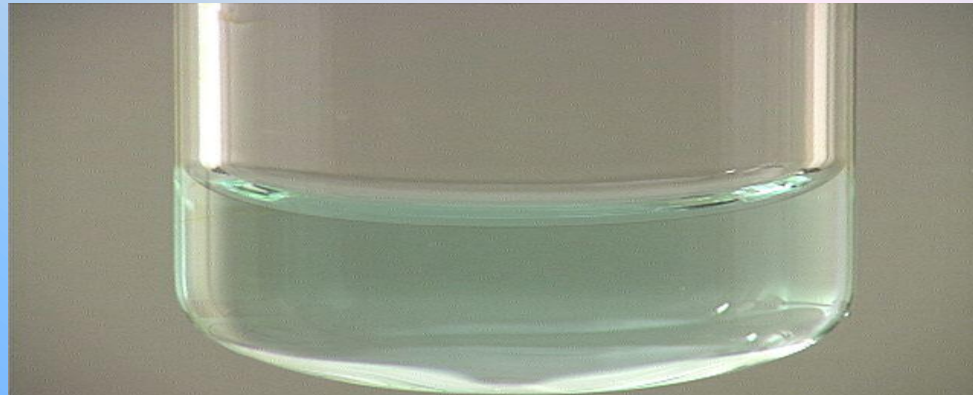
Month of April 2005





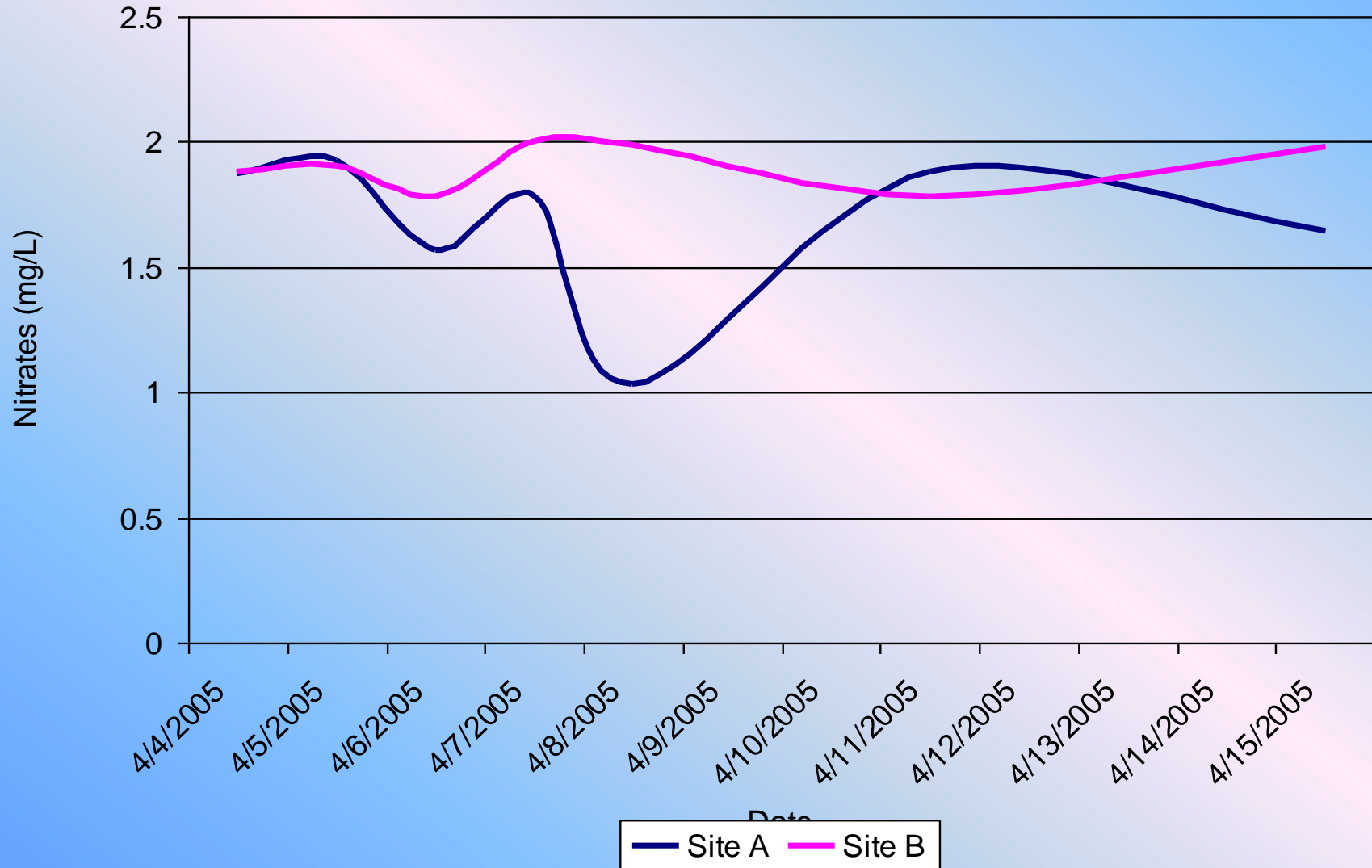
# *Nitrate Levels*

- 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.



# *Nitrates Data*

Nitrates- West Meadow Brook  
Month of April 2005



# pH Level

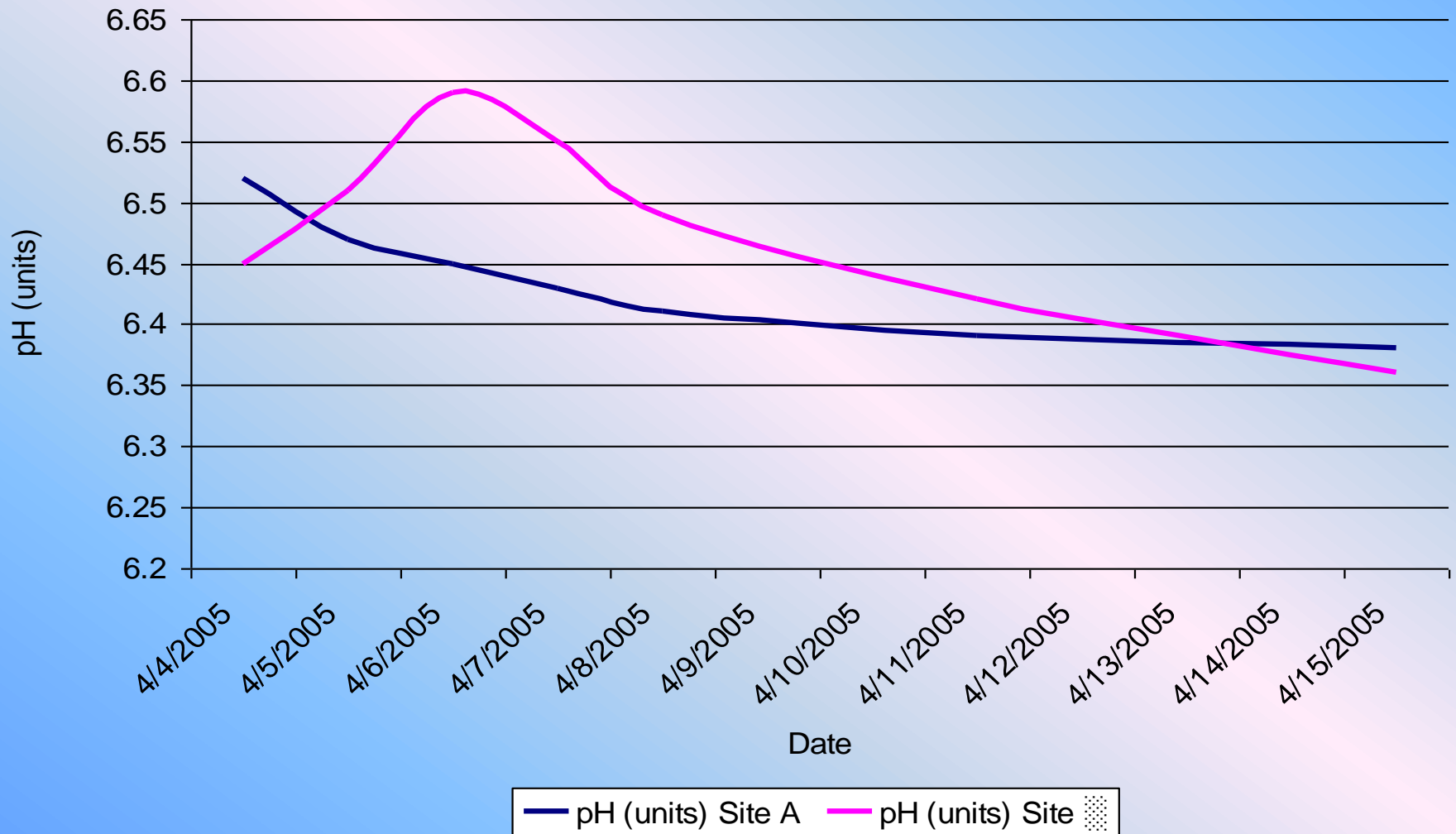
- Brief Overview

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



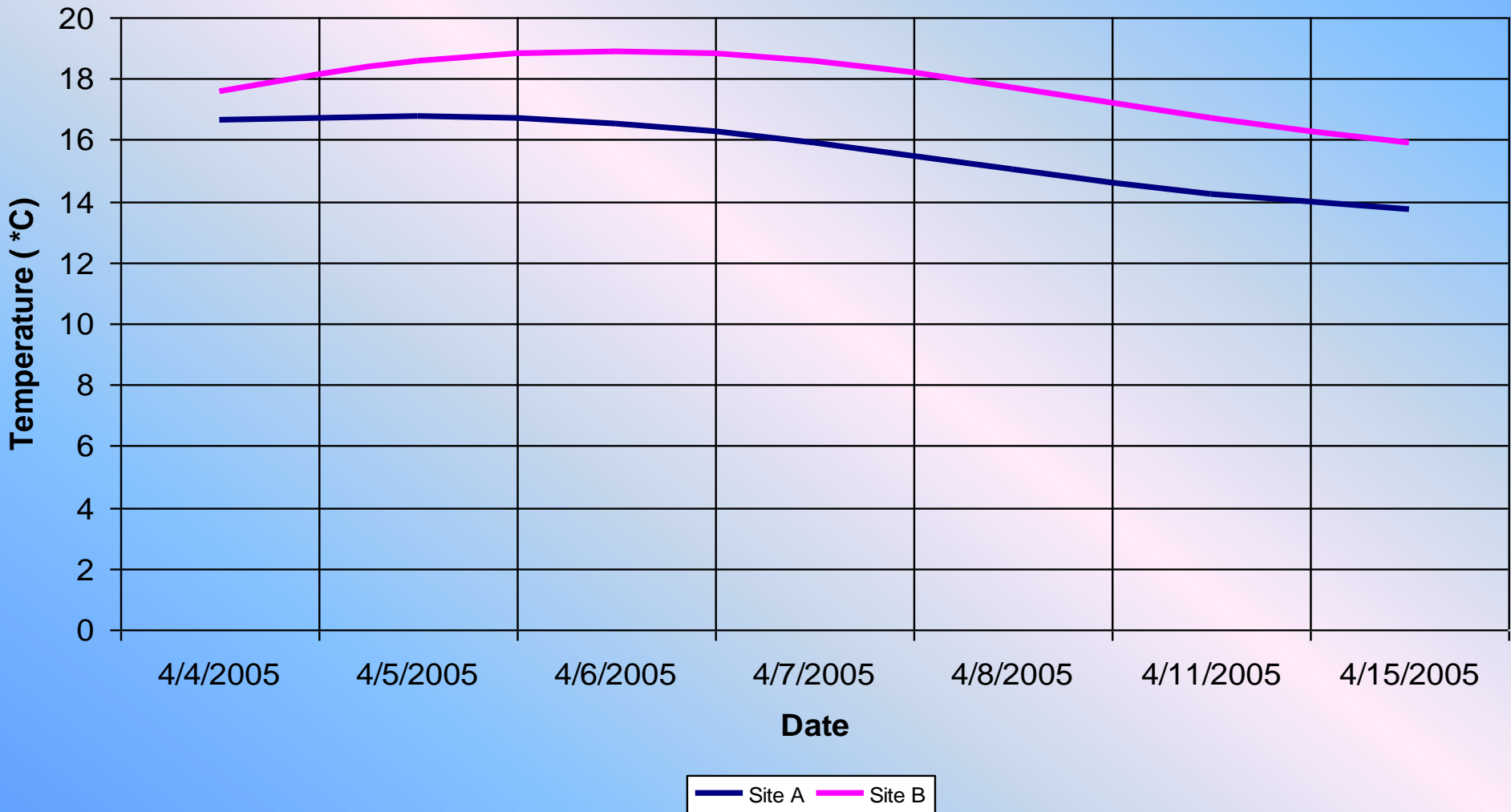
# *Temperature*

- 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





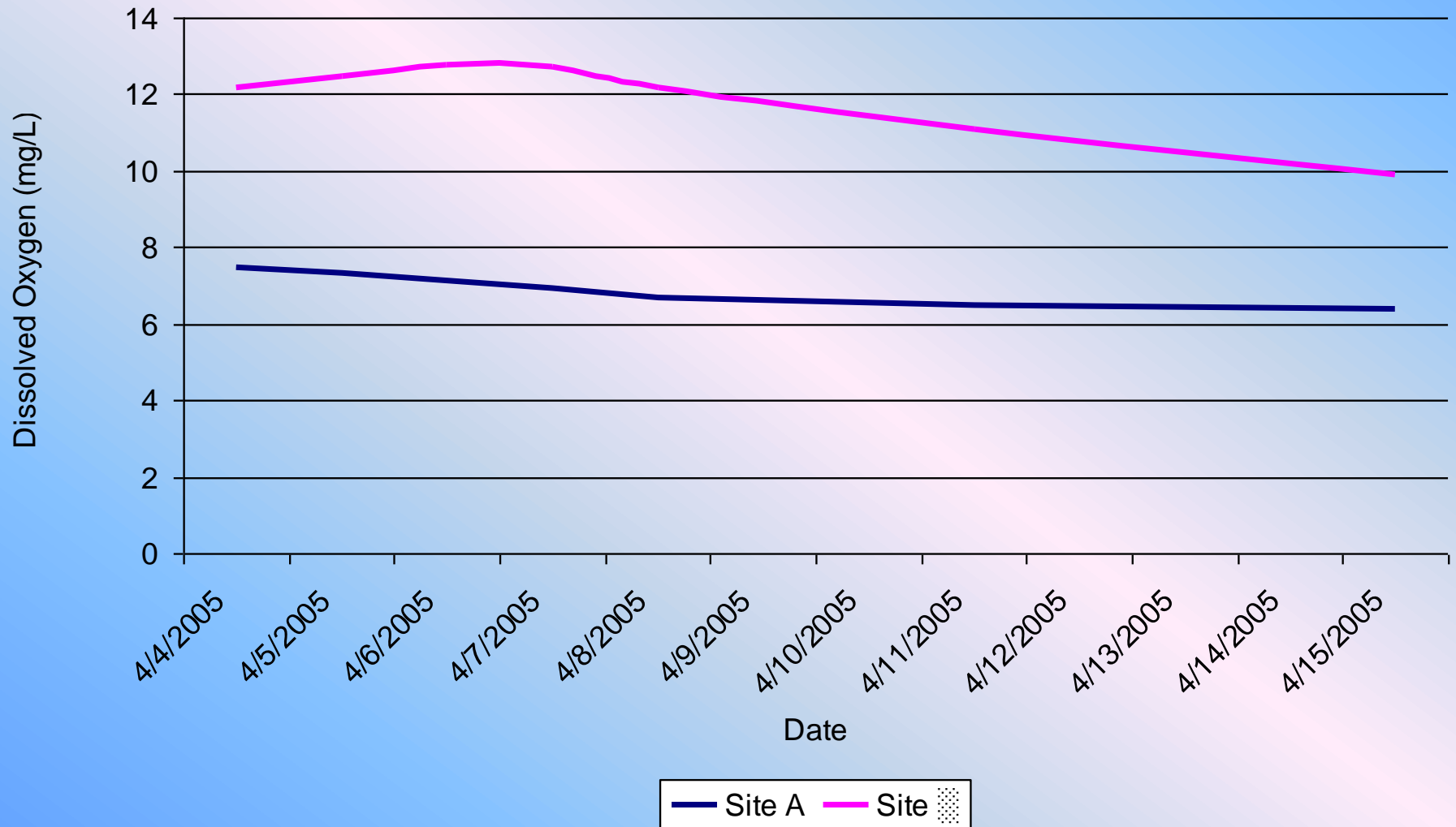
# *Dissolved Oxygen*



- Brief Overview
- Dissolved oxygen analysis measures the amount of gaseous oxygen ( $O_2$ ) 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 Data*

Dissolved Oxygen - West Meadow Brook  
Month of April 2005



# *Dissolved Oxygen Percent*



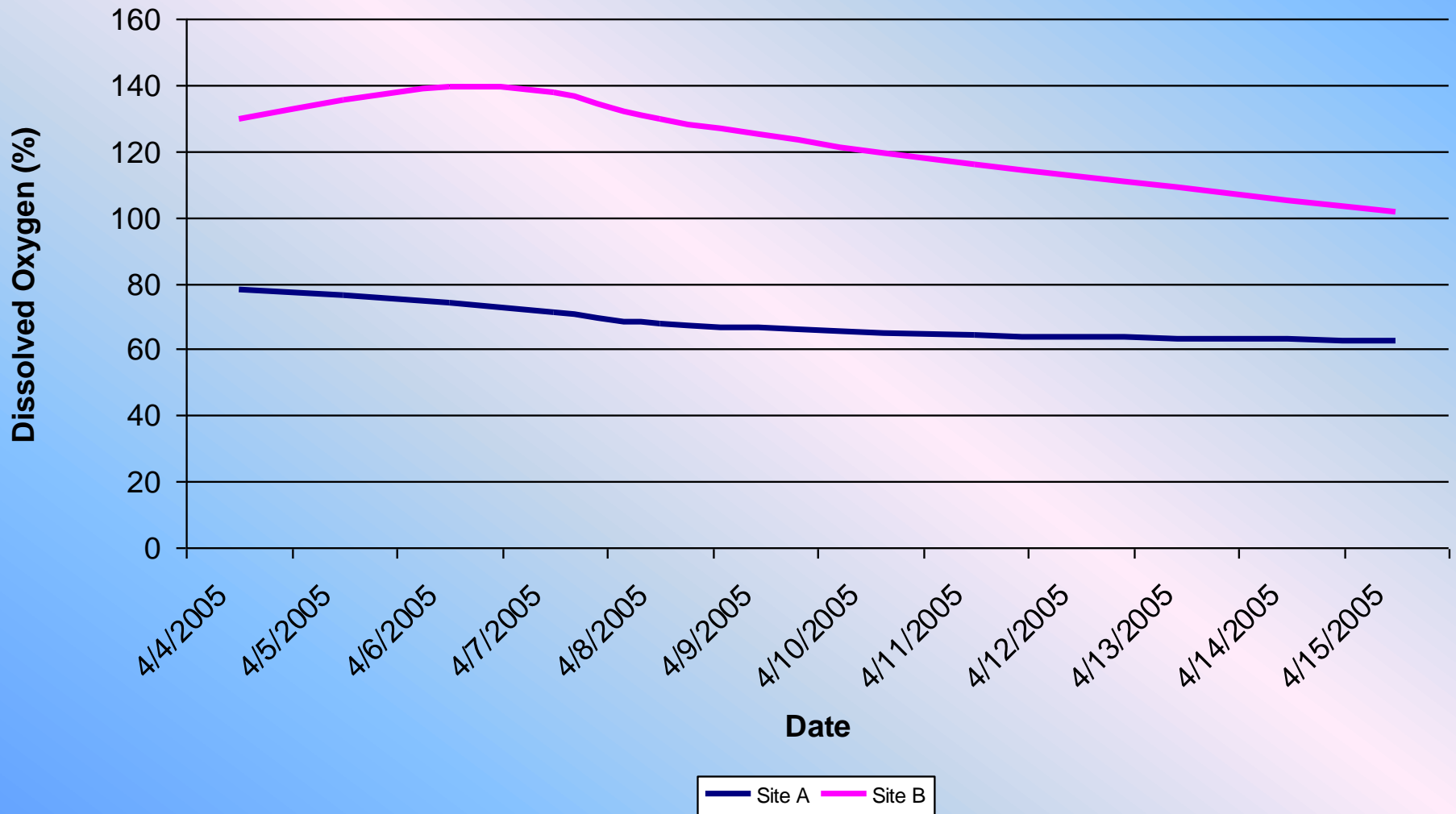
## **Brief Overview**

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*

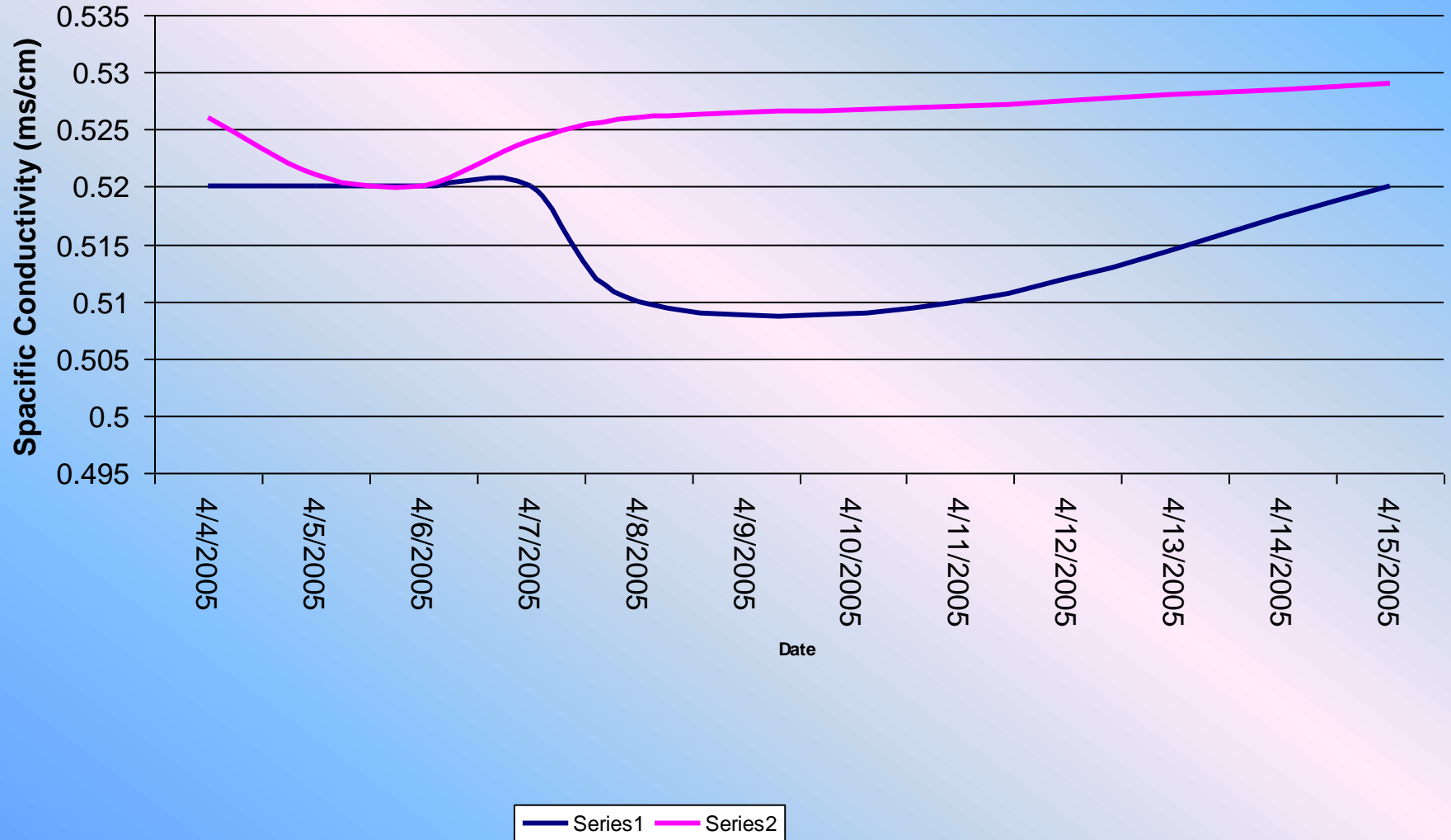
- **Brief Overview**

- **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 cm<sup>2</sup> in area and 1 cm apart.**



# Specific Conductivity Data

Specific Conductivity - Month of April 2005





# 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 where 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

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MS AMY GAUTHIER, Science Instructional  
Resource Specialist

DR. KEVIN CURRY, BSC PROFESSOR  
BIOLOGICAL SCIENCES

KIM MCCOY, BSC WATERSHED LAB  
MANAGER



**The End**  
**Any Questions?**

