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How does Land Use Affect the Chemistry of the Water of Fall Brook

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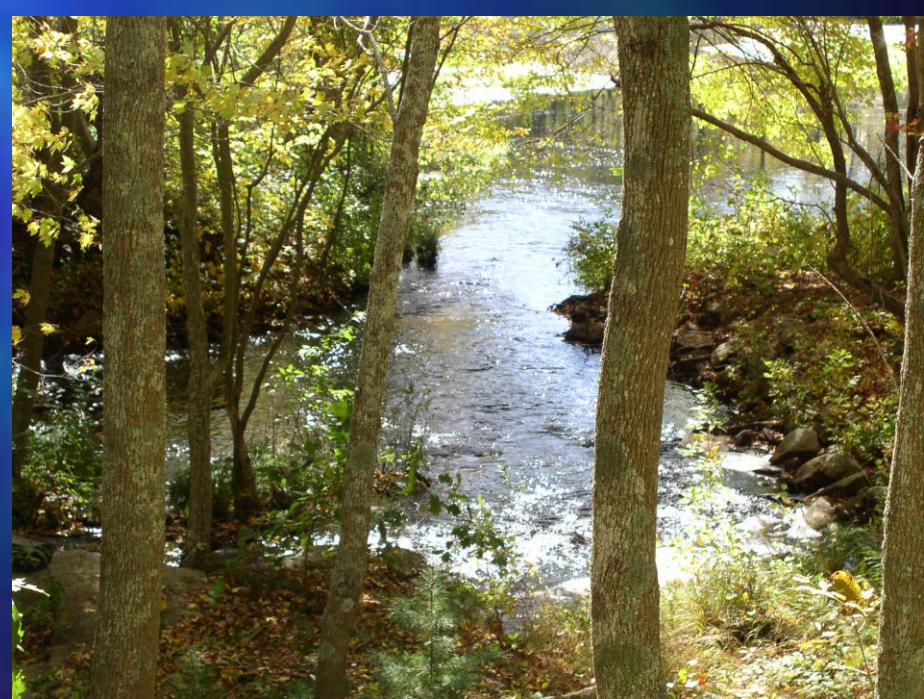
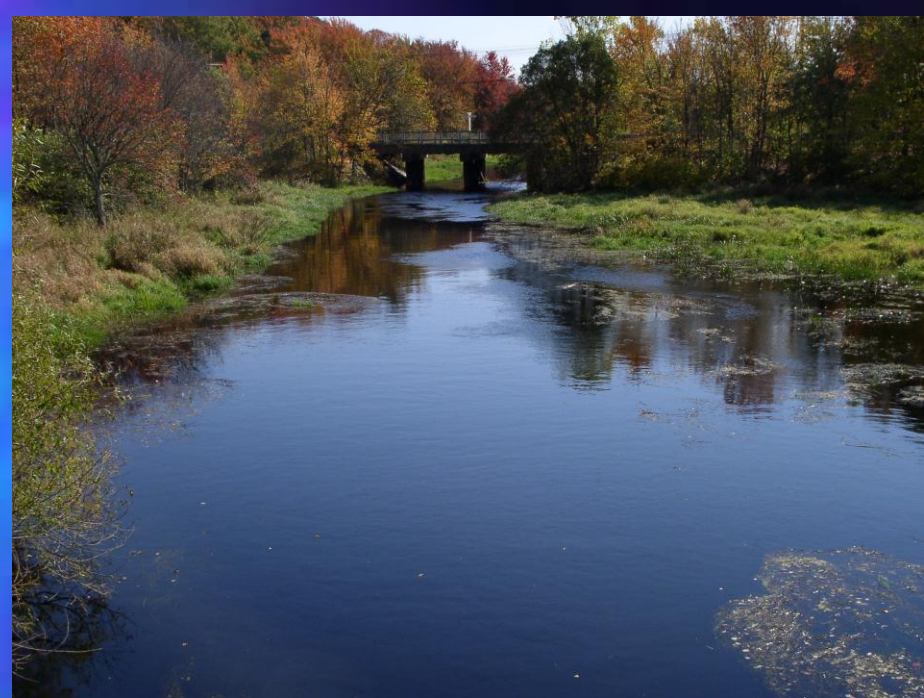
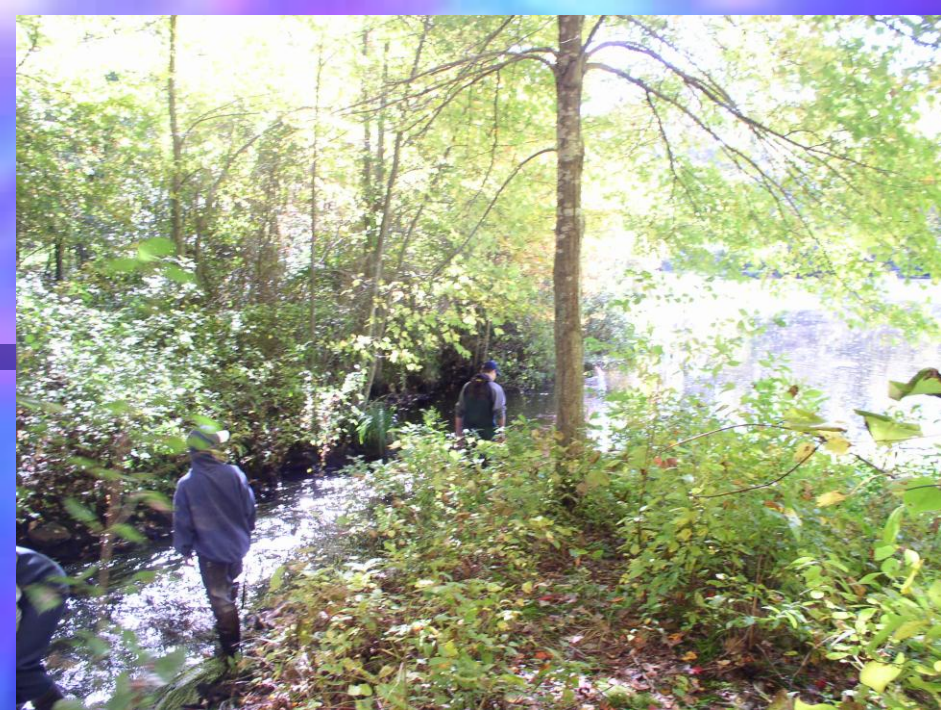
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How does Land Use Affect the Chemistry of the Water of Fall Brook

Drew Greene, Eric Salvador

Introduction

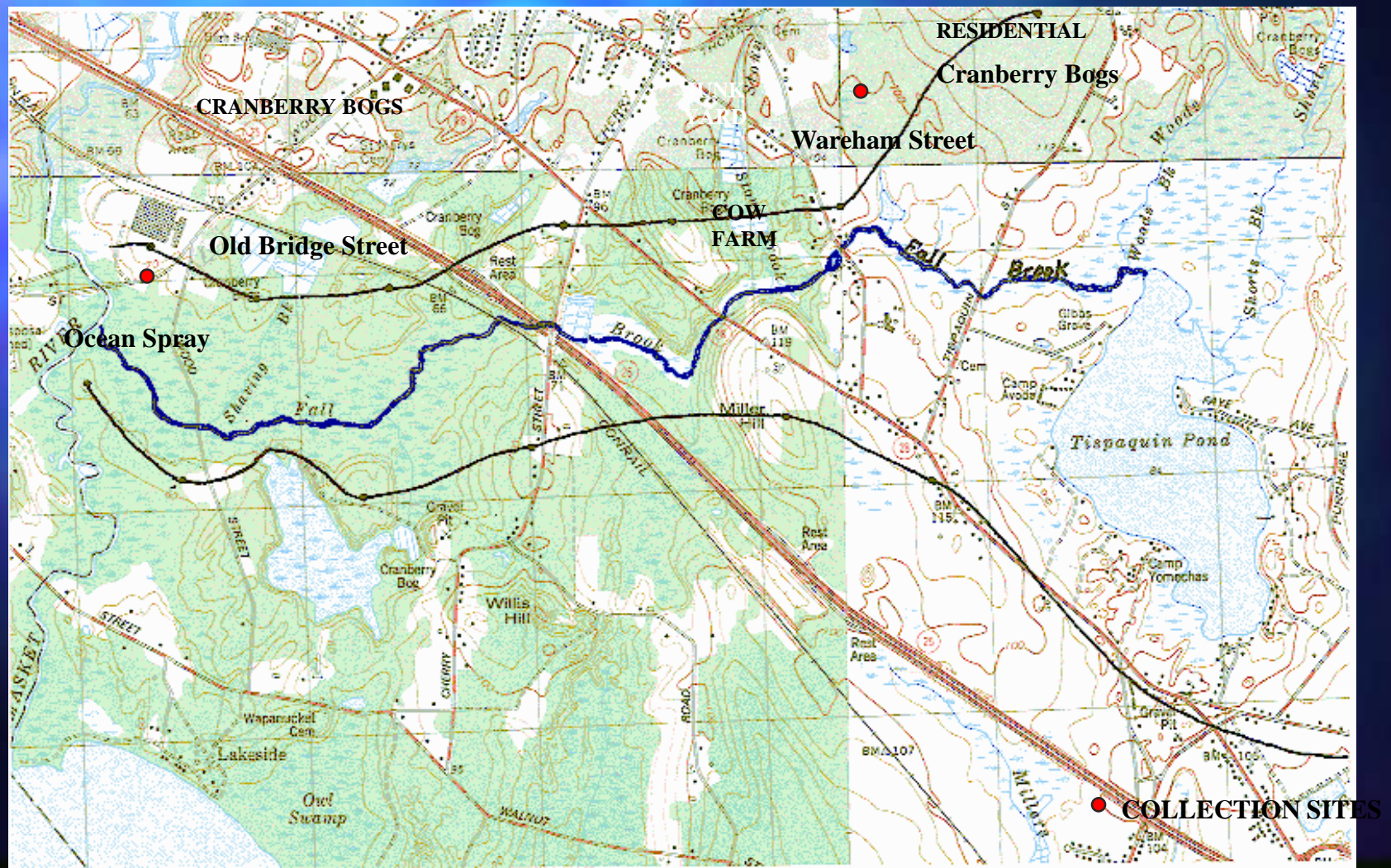
- Fall Brook begins from Gibbs Pond and runs through Middleboro, intersecting at Wareham Street and Old Bridge St.
- We suspect that different types of land uses such as a nearby farm, runoff from the street, and an Ocean Spray Plant are affecting the water of Fall Brook in a negative way by an increased amount of phosphorus and nitrogen.



Hypothesis

- Different types of land uses are resulting in a lesser quality in the water of Fall Brook due to variations in reactive phosphorus and nitrate-nitrogen.

Land Use



Flow and Dissolved Oxygen

- Dissolved oxygen is needed for organisms to live.
- The more flow there is, the more dissolved oxygen there is that enters the waterway through the atmosphere.

Nitrate : Where does it come from?

- Major routes of entry into bodies of water are municipal and industrial waste water, septic tanks, feed lot discharges, animal wastes, and discharges from car exhausts (Cooke, 2003)
- Fertilizers are a source of nitrate needed for plant growth (Weston, April 1994)



Nitrate : What does it cause?

- Nitrate is an inorganic compound that occurs under a variety of conditions in the environment, both naturally and synthetically,(McCasland, 98)
- Short term exposure at or above the federal standard (.1 mg/L) can cause health problems, especially in infants (Kaplan, 2004)
- Can cause oxygen depletion, causing aquatic organisms depending on the oxygen to die (Cooke, 2003)

Phosphorus : Where does it come from?

- Phosphorus is used in farm soils as a fertilizer
- Rainfall can cause varying amounts of phosphorus to wash from farm soils (fertilizer) into nearby waterways (Cooke, 2003)



Phosphorus : What does it cause?

- Key element necessary for growth of plants, and animals (DNR Ag. Runoff Management Program Staff, 2003)
- Stimulates growth of plankton and aquatic plants which provide food for fish (since there's an excess in dissolved oxygen, an increase of fish population will benefit the overall quality of water) (Dohner, 1994)
- Phosphorus not toxic to humans unless in very high levels (digestive problems) (Cooke, 2003)
- Federal Standard is .01 mg/L (Allan, 2001)

Nitrate and Phosphorus: Effect on Animals

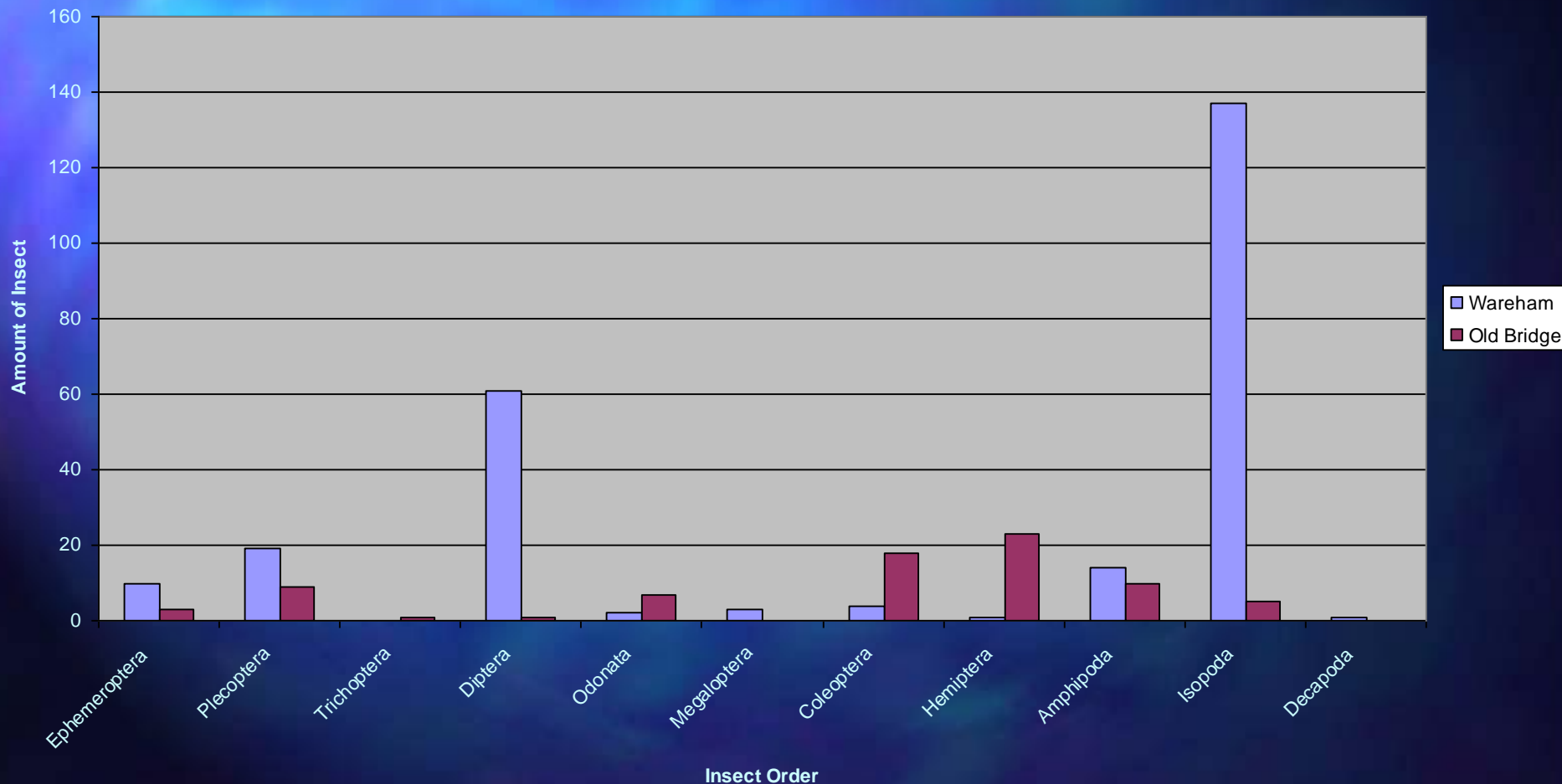
- In streams with high amounts of phosphorus and nitrate, there are high amounts of only a few species. (Wells, 2004)
- If there are more species, the water is cleaner while the less means an overflow of phosphorus and nitrate (Meck, 2000).
- Tolerant insects dominate to eliminate species (Bragg, 2000)

Wareham Street contained 76.6% of all the organisms collected

The more flow (Wareham has a higher flow) the more dissolved oxygen, which increases bug population (this also increases the overall quality of the water)

Organisms

Amount of Insects 10-13-03 Eric Salvador, Drew Greene



Data Explanation

- Isopodas are very tolerant of phosphorus and nitrates. They dominate with high amounts.(Bragg, 2000)
- Hemipteras live in slow moving water hence there are more in Old Bridge St (Carpenter, 1992)
- Coleopteras are tolerant of low DO levels and Old Bridge St has a lower DO level (Kaplan, 2004)

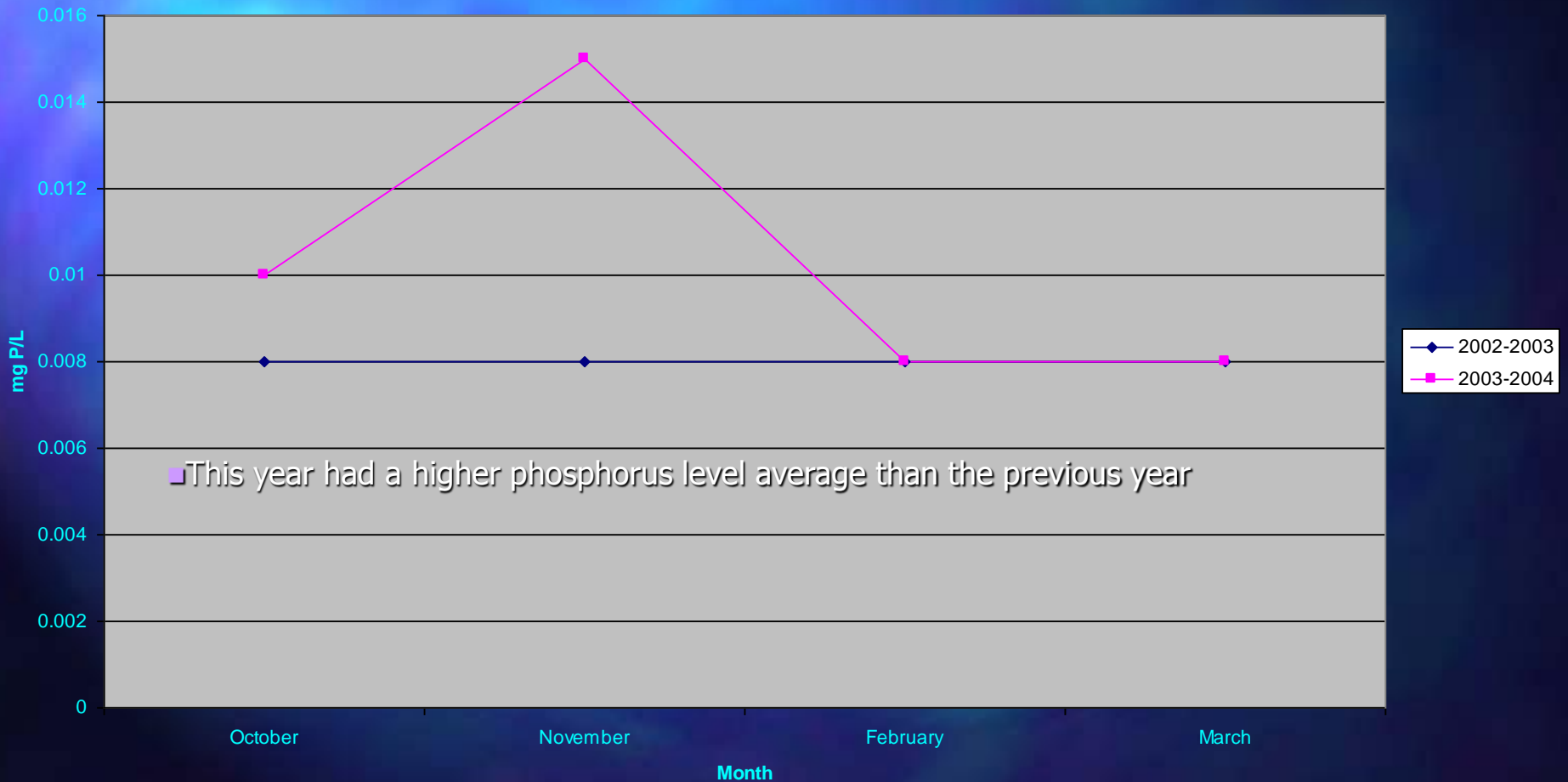
Wareham 2002-2003 & 2003-2004 Phosphorus Comparisons

Phosphate Comparisons Wareham



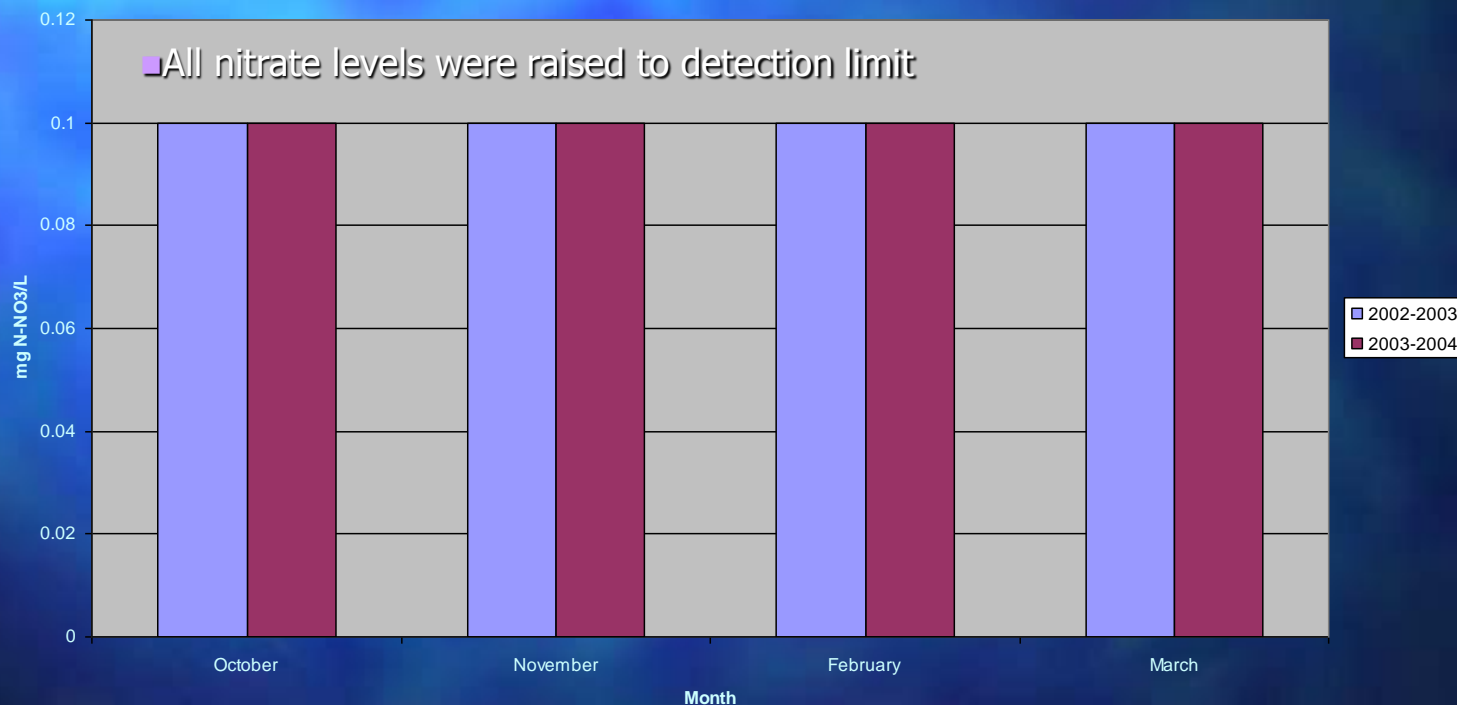
Old Bridge St 2002-2003 & 2003-2004 Phosphorus Comparisons

Phosphate Comparisons Old Bridge



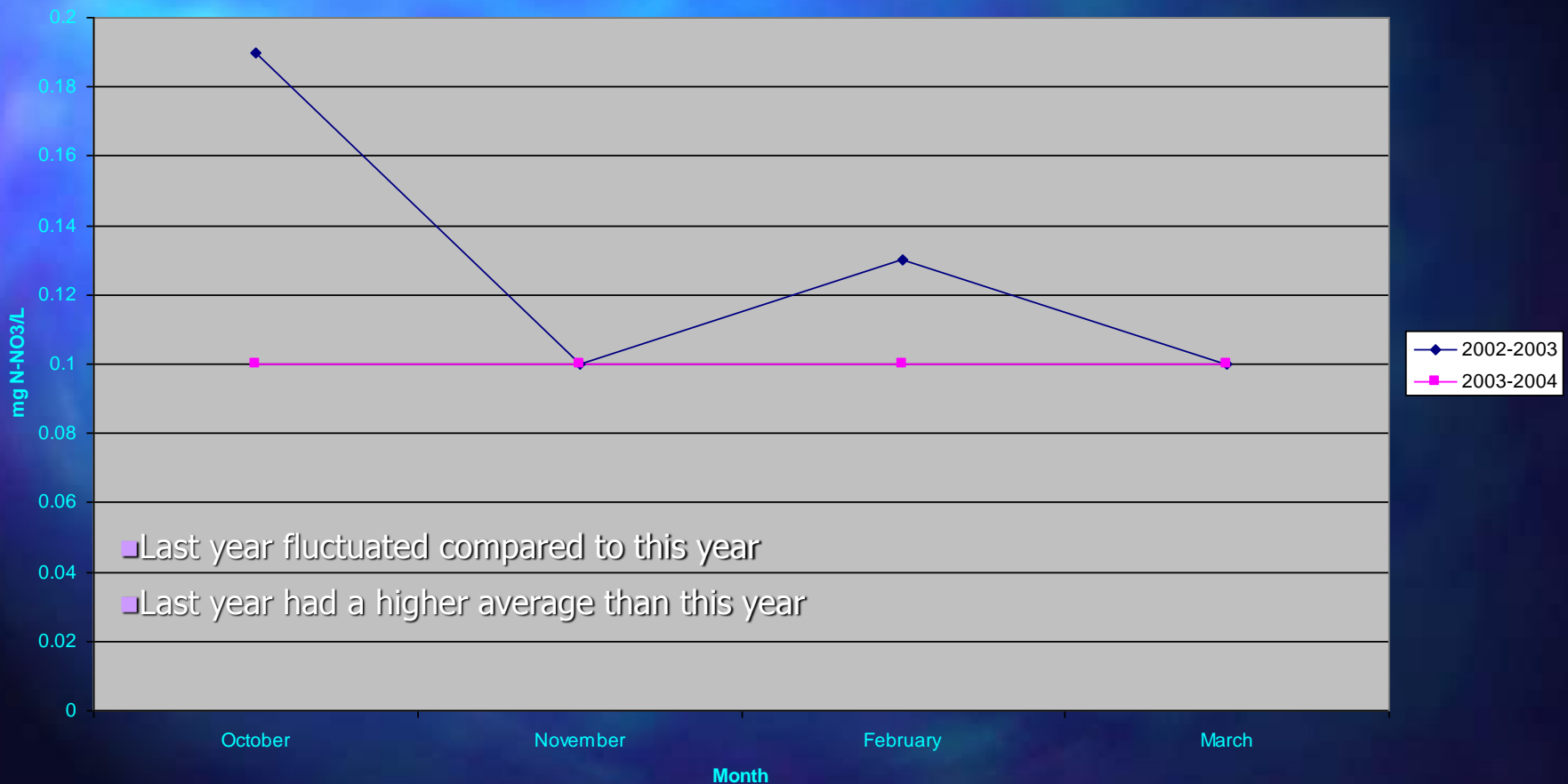
Wareham 2002-2003 & 2003-2004 Nitrate Comparisons

Nitrate Comparisons for Wareham St.
by Eric Salvador and Drew Greene



Old Bridge St 2002-2003 & 2003-2004 Nitrate Comparisons

Nitrate Comparisons Old Bridge



Old Bridge St. Analysis

- The nitrate levels were low, being under detection level 100% of the time. The level decreased from a year ago and did not cause harm to the water.
- The phosphorus levels were low and did not support any growth in the water. The average level was slightly higher than the natural level of .01. (Allan, 2001) The insect count was low. Although the phosphorus level was higher than the 2002-2003 reading.

Wareham St. Analysis

- Nitrate levels were low, 100% of the time it was below detection level.
- The Nitrate levels of 2002-2003 and 2003-2004 were the same.
- The phosphorus levels were higher than they were at Old Bridge St. and higher than the natural level of .01.(Allan, 2001) This higher level helped with the higher organism count. The phosphorus level average is the same as a year ago.
- The higher level of phosphorus is due to the nearby farm. (Behar,1997)

Old Bridge Street Conclusion

- The stream was not affected by Ocean Spray or any other surrounding source. Although the levels of Phosphorus were slightly above normal, it was not enough of an increase to affect the health of the water.
- Nitrate was at or below detection level 100% of the time. It did not cause any changes in the water.

Wareham Street Conclusion

- The farm caused a higher phosphorus level, but not significantly enough to change the well being of the stream.
- Nitrate was at or below detection level 100% of the time. It did not cause any changes in the water.

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