Soil Chemistry: Change Through Cells

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Abstract: Wetlands are known to be natural filters for wastewaters. The Lake Waco Wetlands is an artificially constructed landscape to assist in the water treatment process. The question this research project poses is whether all that filtration can be attributed to consumption of the pollutants by living matter. By testing the sediment concentration the results should show whether the pollutants are being dumped or consumed. The study consists of five comparative tests: Cell 1, Cell 2, Cell 3, Cell 4, and a Control. If the filtration has some correlation to the sediments then Cell 1 should have the highest amount of pollutants because that is the water that has highest concentration descending all the way to the control. The data was not sufficient to support or reject the hypothesis and further investigation is needed.

Introduction: The best indicator of pollutants in soil is Phosphorus (Childers and Noe 2007). Phosphorus is a sink of nutrients for wetlands, meaning the main rotations are six-month cycles. Potassium, Calcium, and Magnesium tend to be heavy and drop out of water regardless of plants surrounding (Cao, Ellis, Fisher, Harris and Osborne 2007). All three elements would be good indicators for pollutants in the sediment testing; however for theses elements to accumulate takes a long period of time. Little research has been done as to what causes the presence of sulfur; however sulfur is known to have negative side effects to marine life (Chen, Moussavi, and Sycip 1973). Hydrogen sulfide is known for its toxicity, but sulfur in its raw state has been linked to killing many ocean fish. If this holds true it could potentially have grave effects if the levels build up within the artificial wetlands. Sodium is most likely of all solutes to stay in the water, therefore probably not the best indicator for soil samples (Dordipour, Ghadiri, Hussein, and Rose 2004). Sodium should be a constant that should hold throughout the wetland but provide interesting contrast to the control. In addition sodium will provide a good comparison to the other testing variables.

Discussion: The nitrate results demonstrated by the graph have little effect or indication of how effective the Lake Waco Wetlands are. The same applies to the other elements, like Ca, Mg, P, K, S, and Na, where no clear representation of evaluation can take place. Other studies have shown that high levels Na and K concentrations possibly were the cause for malformations in frogs, fortunately those levels are not concurrent with those in the Lake Waco Wetlands (Erb, Garber, Larsen, and Magner 2002). All in all, the lab tests conducted at the Lake Waco Wetlands did not support the hypothesis, yielding skewed results with no pattern, but factors such as age and human contact may have interfered in those results. Still, the tests were conducted so to gather information on the efficiency of the Lake Waco Wetlands working as a filtration system, and achieved in providing interesting data.

Literature Cited:
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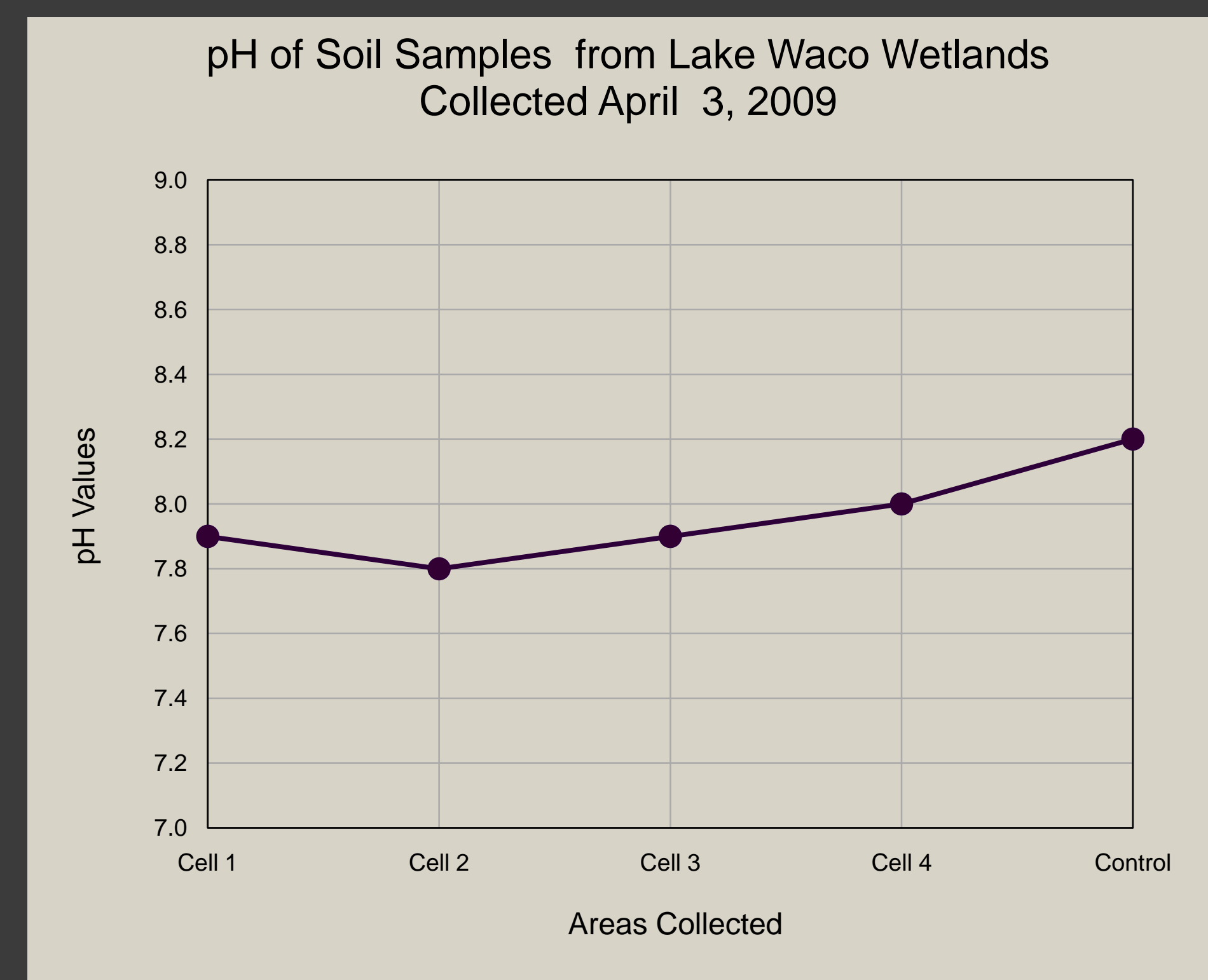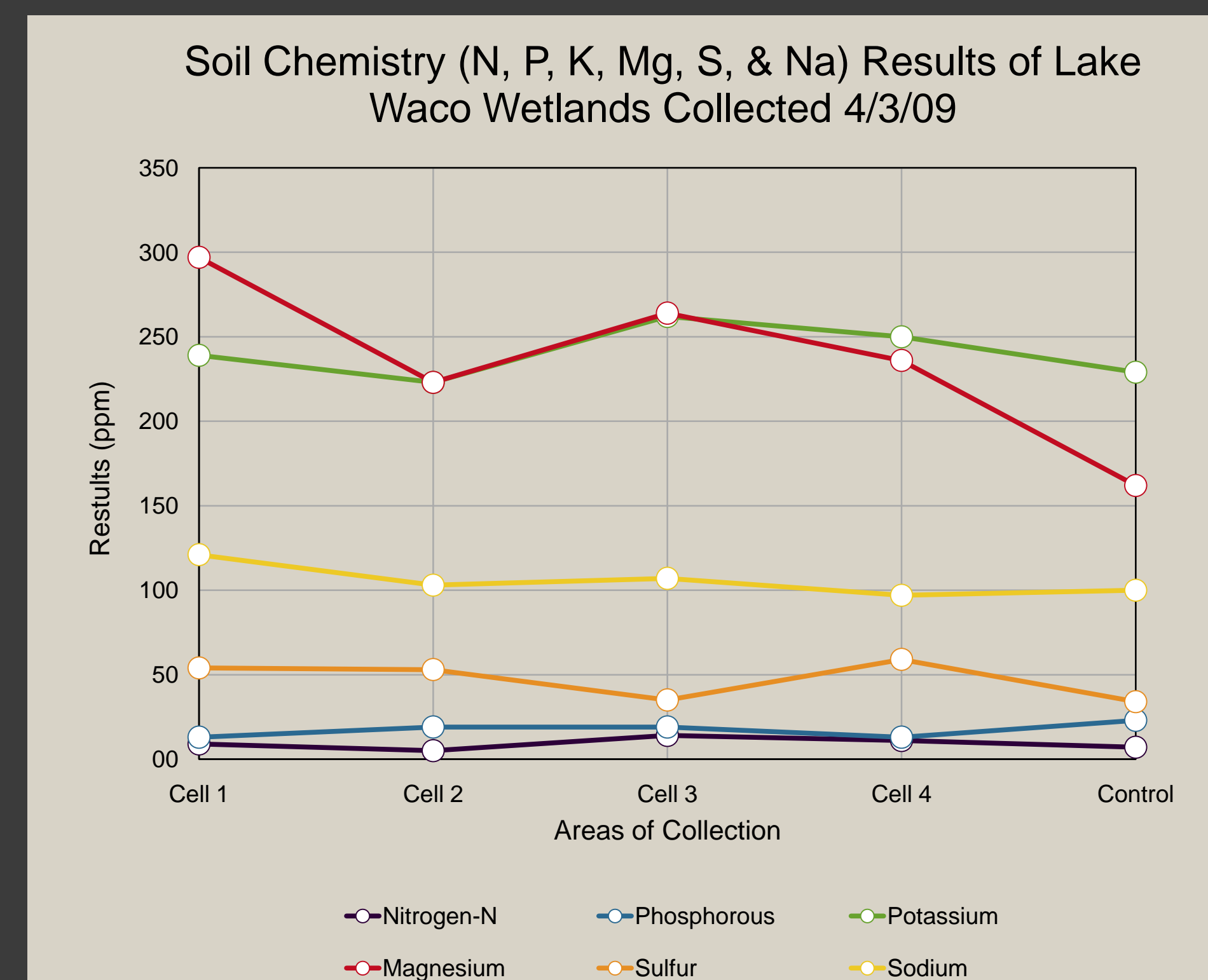
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Soil Chemistry (N, P, K, Mg, S, & Na) Results of Lake Waco Wetlands Collected 4/3/09

pH of Soil Samples from Lake Waco Wetlands Collected April 3, 2009

Methods and Materials: Seventy five sub-sample sites were located throughout each of four cell as well as our control site (15 samples per collecting site). All 15 samples from each site were compiled together into their own individual container to dry. Upon drying completely ½ liter worth of each cell's dirt was sent to Texas A&M's soil testing facility to be analyzed.

Conclusion: The results did not support hypothesis. The inconclusive nature of results calls for further research. Many factors could have caused the inconsistency of the data.
1. The dig-outs of some of the soil and sediment in Cell 1 of Lake Waco's Wetlands could have easily contributed to some of unexpected results related to that particular cell.
2. The fact that Lake Waco Wetlands are newly made may have played a role in unexpected data. It usually takes around one hundred years to form topsoil, so Lake Waco Wetlands (2-4 years old) may not have had enough soil to accurately test. To emphasize this claim, the pH results from Lake Waco Wetlands seem slightly high. Other studies have shown that wetland soil tends to have a pH near neutrality (Bird and Carrillo 2003). Once again, the correlation between calculated results and young age could contribute to skewed soil sample test results.