

Fire Ants: Enhance Soil Nitrate Levels?

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Bio 1406, Spring 2010, Baylor University, Waco, TX

ABSTRACT

Fire ants have invaded ecosystems and may have a profound impact on soil nutrients and plant growth. (Lafleur, 2005). This preliminary experiment was designed to test whether the fire ants have beneficial effect on soil nitrate level in Lake Waco Wetlands. The hypothesis that the fire ant population increases the soil nitrate level was accepted. The results demonstrated that the soil taken from ant piles has a higher level of nitrate ions than the control soil samples (taken 1 meter away from ant piles).

INTRODUCTION

Ants are an integral part of food chains because of their ability to “affect the flow of energy, nutrients and water through many terrestrial ecosystems” (Jurgensen, 2008). Fire ants are also one of the most important groups primarily because they aerate the soil and expose it to the atmosphere. This allows for many important nutrients to penetrate the soil and can potentially “enhance soil quality for plant growth” (Lafleur, 2005). The objective of the experiment was to test whether fire ants (Figure 1) have a beneficial effect on the soil for plants by increasing the soil nitrate levels. The prediction was nitrate levels would be higher in ant pile soils.



Our Research Group

MATERIALS AND METHODS

In this study:

- Collect ten soil samples from the ant piles and ten soil samples 1m away from each ant pile (which are control soils). As shown in Figure 1 below.
- Place the soil samples in the freezer for period of 7 days to kill the ants in the sample.
- After the period of 7 days, separate the rocks and debris from the soil samples to make it ‘fine’ soil.
- Send soil samples to the laboratory for processing.



Figure 1: Fire Ant (*Solenopsis invicta*)

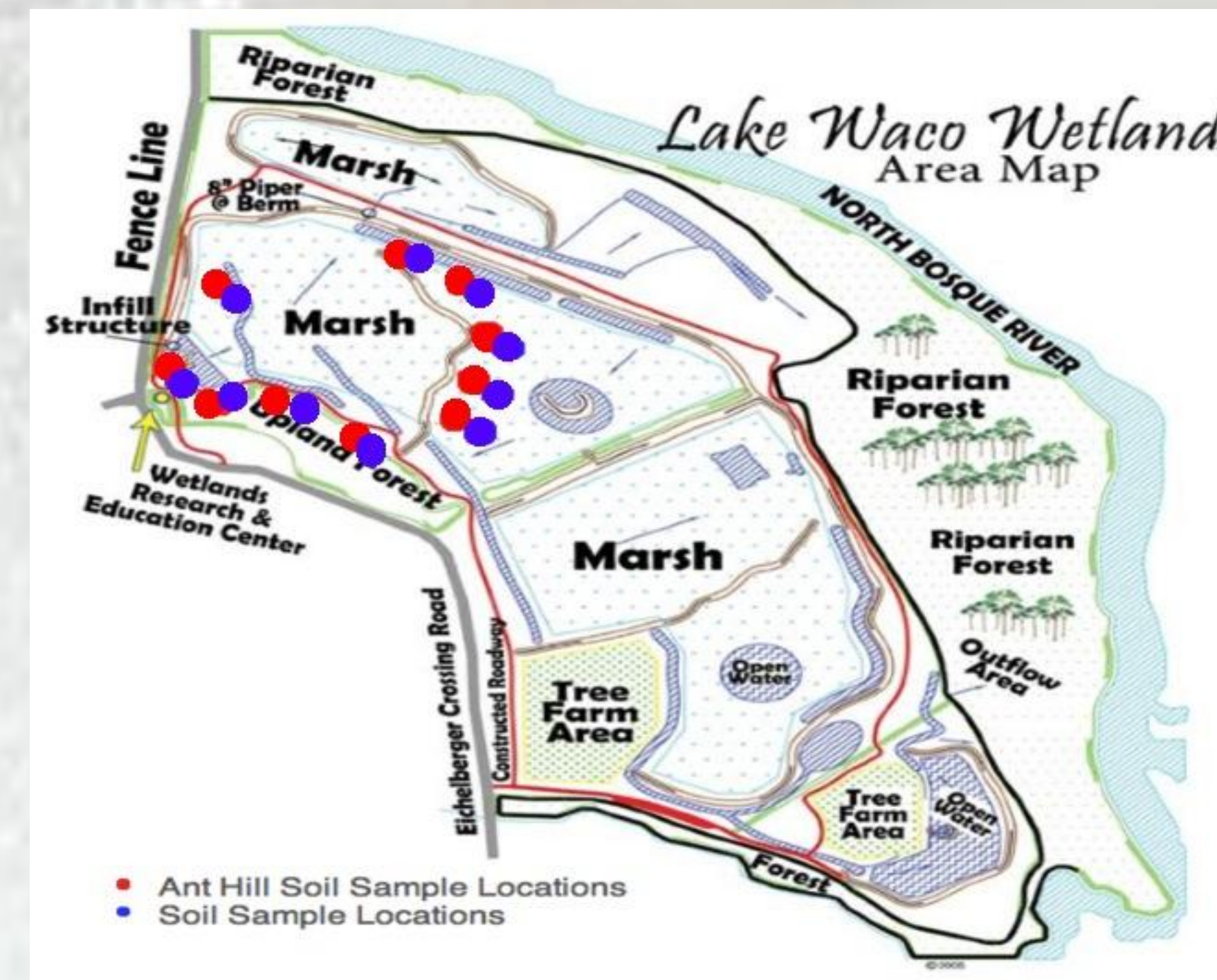
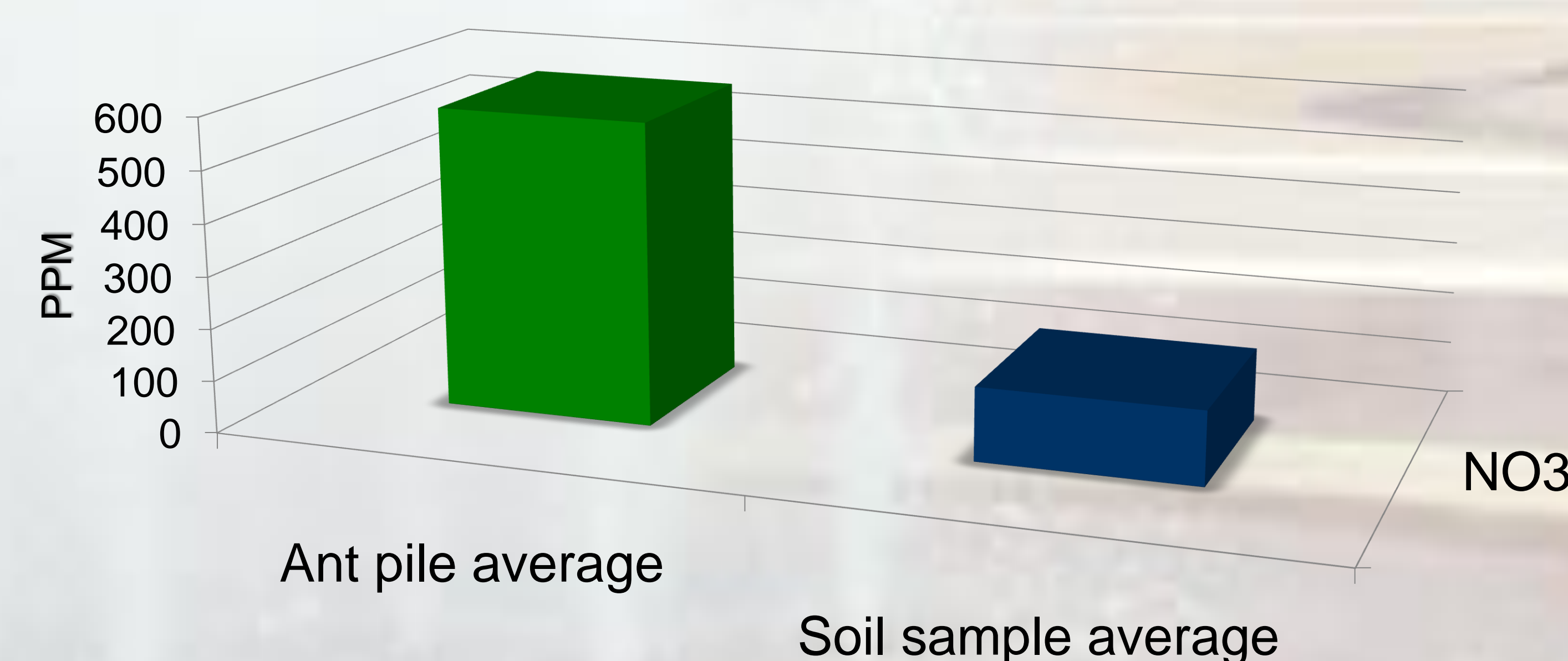


Figure 2: Location of soil samples

RESULTS

The concentration of nitrate ion is significantly higher in ant pile soils.



t-Test- This is testing to see if there is a difference in mean NO₃-N levels between Ant pile sample and soil sample. Prob < t = 0.0006* This number is statistically small. In this context, it gives us sufficient statistical evidence that the mean NO₃-N level is higher in the ant samples than in the control.

CONCLUSIONS AND DISCUSSION

The preliminary research suggests a scenario in which ant pile soils have high levels of nitrate ion. This may be explained by the fact that the ant pile is formed by nitrogenous waste excreted by fire ants. Nitrogen is vital for growth and reproduction of all plant and animal life. It is a crucial constituent of proteins RNA and DNA. The form of nitrogen within plants when consumed by animals has important effects on growth and reproduction.

Nitrogen in form of Nitrate is a natural compound in soil. An adequate supply of nitrate is required for good plant growth. Approximately, more than 90 percent of the nitrogen absorbed by plants is in the nitrate ion form. (Marshall Christy and George S. Smith, 1993).

Today we are facing the problem with high usage of artificial fertilizers for nitrogen and by using these fertilizers we are interfering with the balance of ecosystem. By finding out a way to use fire ant piles for fixing the nitrogen of the soil, we can limit the use of artificial chemicals on the soil.



LITERATURE CITED

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ACKNOWLEDGEMENTS

A special thanks to: Dr. Marty Harvill, Dr. Shannon Hill, Jacques Mayeux, Catherine Sims, Kristen Rose, The Texas A&M Soil, Water and Forage Testing Laboratory, The College of Arts and Sciences of Baylor University, Department of Biology, Lake Waco Wetlands