

The Effect of Leaf Species on Insect Oviposition Preference and Colonization

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Introduction

- The input of plant material to aquatic ecosystems can alter ecosystem processes, water chemistry, and a variety of aquatic organisms. These are affected by both plant quantity and species (Cuthbert et.al, 2019).
- However, little is known about how leaf species alters the colonization and oviposition preferences of aquatic insects, which include some important disease vectors (e.g., mosquitoes).



- The goal of this study is to examine the effects of leaf species on aquatic insect oviposition and colonization by focusing on non-biting midges and Asian tiger mosquitoes.

Methods and Materials

Experimental Design:

18 buckets filled with 15L tap water were placed in 2 blocks located in a suburban front and backyard in spring 2020. Each block of buckets had three replicates of the treatments. Treatments consisted of leaves (15g per bucket) of southern magnolia, loblolly pine, and post oak, which were randomly assigned to buckets in each block. Insect samples were collected twice per week through the duration of the study.

Statistical Analysis:

We analyzed effect of treatment on total insect abundance per bucket from four collection dates, using Poisson regression.

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Figure 1: Mean Asian tiger mosquito abundance per bucket by leaf species treatment. Error bars represent standard error.

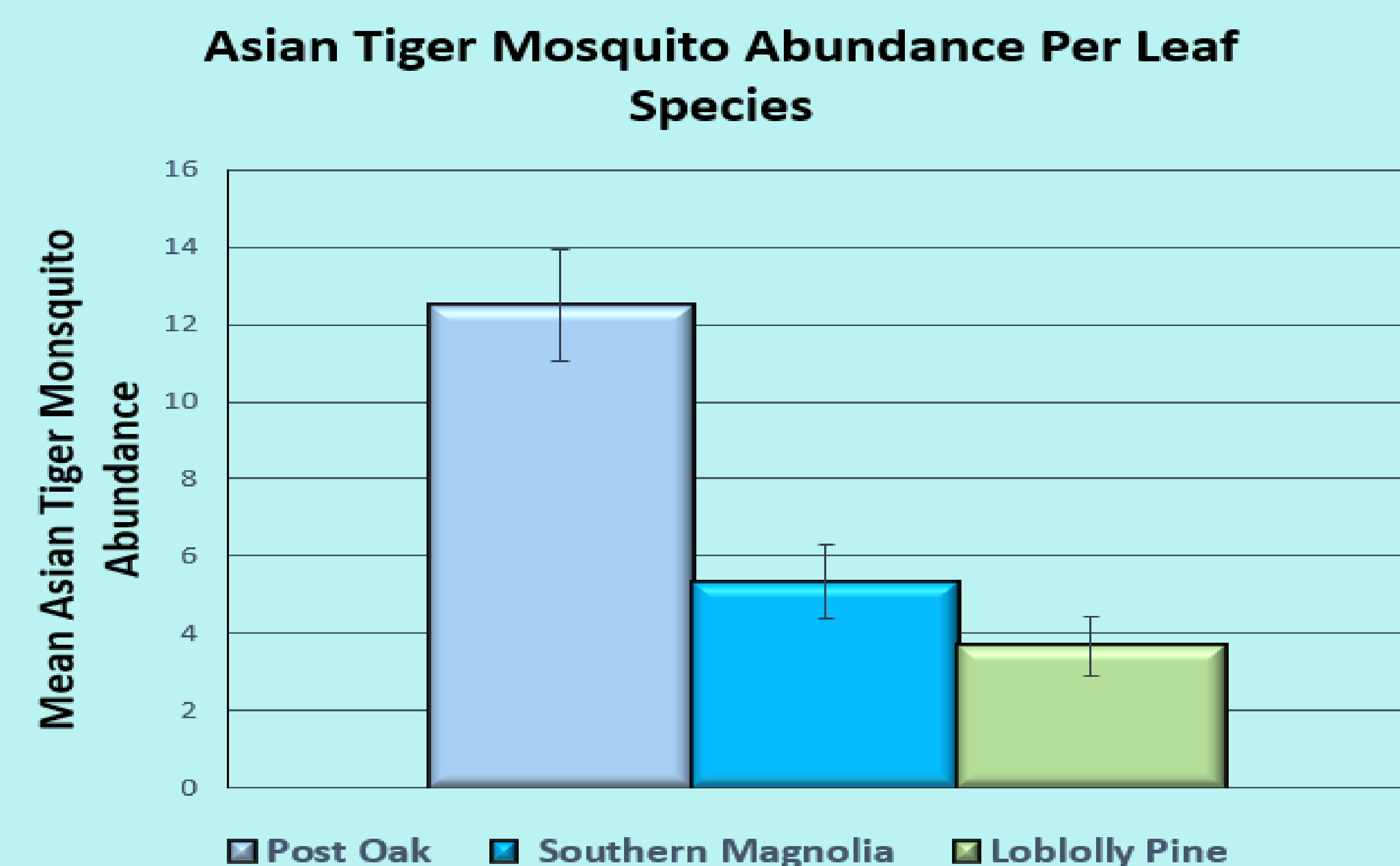
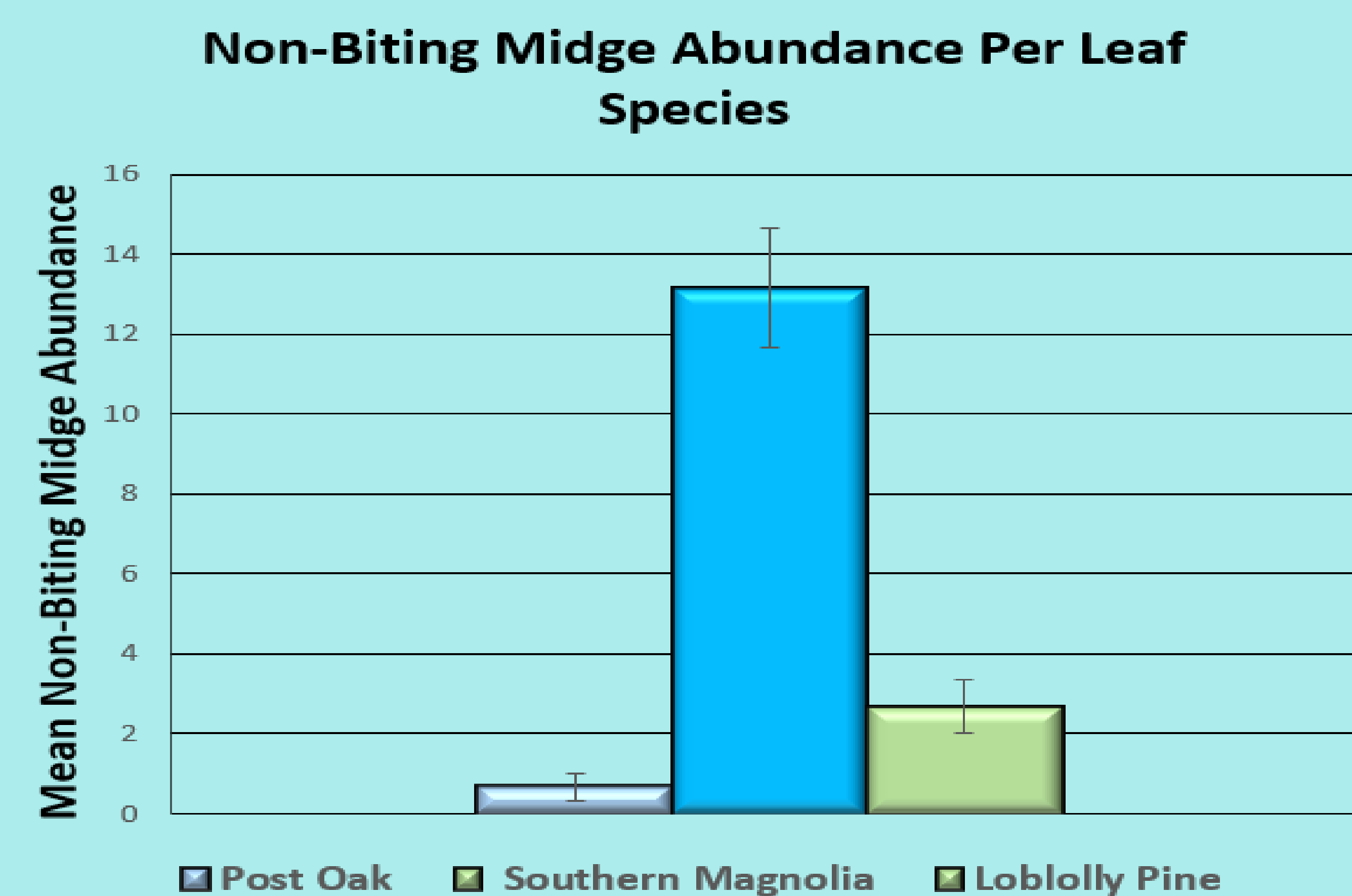


Figure 2: Mean non-biting midge abundance per bucket by leaf species treatment. Error bars represent standard error.



References

- Cuthbert, R. N., Dalu, T., Mutshekwa, T., & Wasserman, R. J. (2019). Leaf inputs from invasive and native plants drive differential mosquito abundances. *Science of the Total Environment* 698: 652-654.
- Ephantus J. M., Brian F. A., James R. (2012). Influence of Leaf Detritus Type on Production and Longevity of Container-Breeding Mosquitoes. *Environmental Entomology* 41: 1062-1068.

Results

- Mean Asian tiger mosquito abundance significantly differed among leaf treatments ($P < 0.001$; Figure 1).
- Buckets with post oak leaves (12.50 ± 1.44 , mean \pm SE) had higher numbers of Asian tiger mosquitoes than buckets with southern magnolia (5.33 ± 0.94) or loblolly pine (3.66 ± 0.78).



- Mean non-biting midge abundance significantly differed among leaf treatments ($P < 0.001$; Figure 2).
- Buckets with southern magnolia leaves (13.17 ± 1.48) contained significantly higher abundances of midges than buckets with post oak (0.67 ± 0.33) or loblolly pine (2.67 ± 0.67).

Discussion

- Our preliminary results suggest that leaf species content can affect an insect's oviposition site preference, though it depends on the insect species. Further research could assess whether planting loblolly pine could lower mosquito abundance and mosquito-transmitted pathogen prevalence in suburban areas.
- It is unclear what leaf or water quality variables the insects use as a cue during habitat selection. In a related study, leaf treatments were found to affect water quality (Ephantus et.al, 2012). We measured a variety of water quality parameters. The abundance of non-biting midges matched the differences among treatments in conductivity, but there was no variable that matched the mosquitoes' preference.
- Future analyses will involve additional dates when insects were collected during the study and the analysis of water tannin concentrations.