



# The Effect of Soil Conditions on Plant Health at UCF main campus

Diana Bateman, Jacqueline Gibson, PJ Ruben, Phillip Zen Eyck  
Alaina Bernard, Jennifer Elliott  
Department of Biology, University of Central Florida, Orlando, FL 32816



## Introduction

Soil is predisposed to rapid urbanization and is a good indicator of ecosystem health.<sup>5</sup> Myakka, the native soil type of Central Florida's flatwoods, is comprised of sandy topsoil and partially organic subsoil.<sup>4</sup> Soil compaction is the compression of particles that reduces pore size. Urban ecosystems are frequent to vehicle and foot passage and increase the possibility of water runoff causing unintentional chemical and excess nutrient dispersal. Compaction negatively influences water drainage, which diminishes the capacity for roots to receive proper water uptake.<sup>3</sup> Fertilizer efficiency is reduced in sandy soil types due to leaching and inability to retain moisture.<sup>2</sup> In addition to the acidic nature of sandy soil; pH gradually decreases in an urban setting.<sup>5</sup> Irresponsible irrigation regimens raise conservation concerns on a global scale. As the 2<sup>nd</sup> largest campus in the U.S.,<sup>1</sup> it is imperative that irrigation and nutrients are retained in the soil and do not runoff into local ecosystems. We define plant health as the ability to maintain minimal biological functions, which is observable in plant color, rigidity, and the absence of disease. Plant health is diminished when facing frequent and severe compaction, unstable infiltration, and low in essential nutrients. In order to sustain optimal plant bed conditions a broad study is needed to better understand the effect of soil conditions and plant health at the University of Central Florida.



## Methods

- Eleven randomly selected plots were chosen in each of the four irrigation zones at the UCF main campus (44 total).
- Data was collected of a 6 week period and analyzed using Excel.
- ArcGIS was used to effectively locate each plot.
- Equipment included a double-ringed infiltrometer, core sampler, compaction tester, moisture and pH device, and nutrient kit.
- Plots were categorized as sandy, mixed, organic, and construction rubble.
- Plants studied included: groundcover, shrubs, vines, grasses, and subcanopy.
- A local expert determined plant health based on a scale of 1 to 5 (1= clear signs of disease, parasitism, little growth, discoloration, and weak structure ;5= absence of disease, parasitism and factors that may inhibit growth).



ArcGIS Plant bed map



## Objective

The aim of this study was to evaluate randomly selected plant beds for a variety of abiotic conditions that potentially influence plant health. Direct measurement of soil health included soil type, pH value, infiltration, compaction, moisture, and macronutrients present (nitrogen, phosphorous, and potassium). Factors such as sunlight and weather were also taken into consideration. We expect soil compaction and infiltration to affect plant health. We also predict that soil type, classified by particle size, will influence the content of macronutrients (N-P-K) and plant health. Our goal was to collect data necessary for the prospective increase in plant fitness and appearance at the University of Central Florida.

## Results

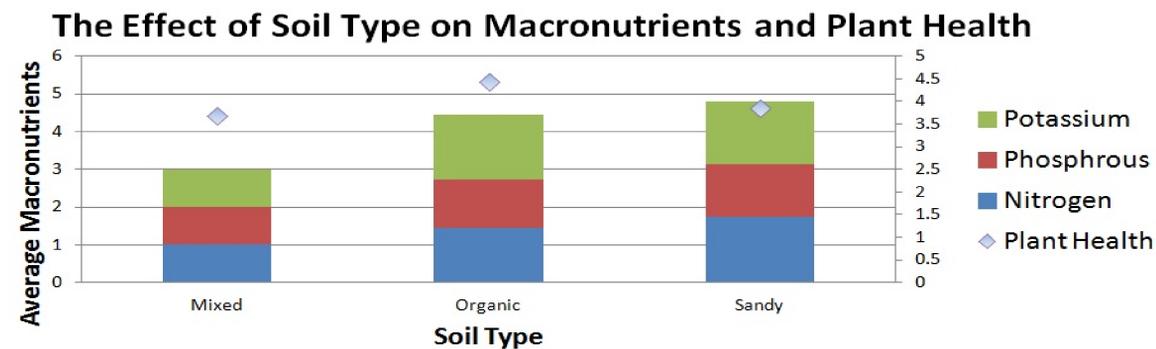


Figure 1.

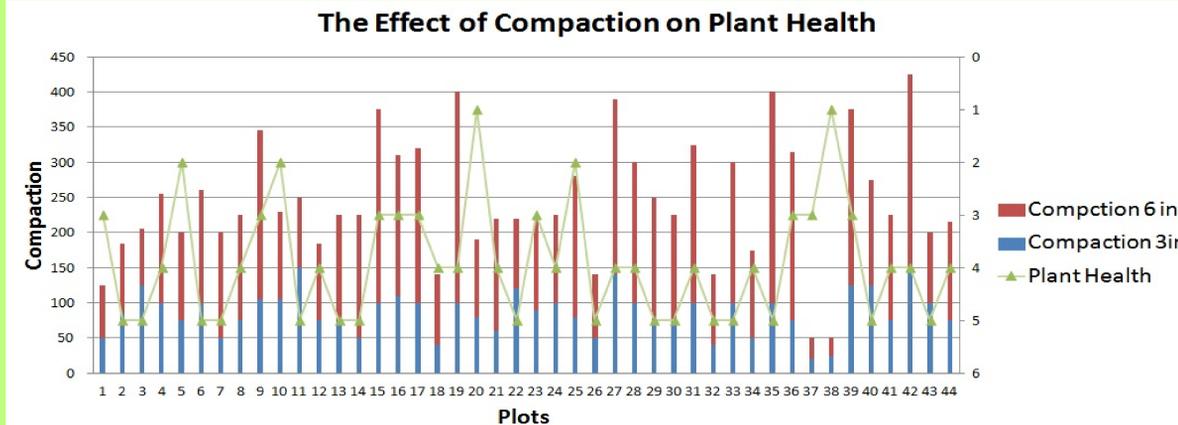


Figure 2.

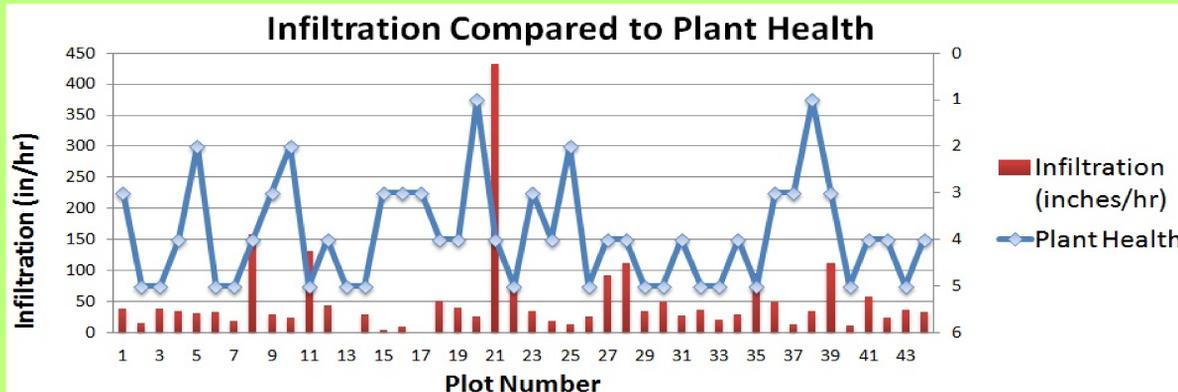


Figure 3.

## Discussion

- This study demonstrated that soil conditions such as compaction and soil type were indicators of plant health in an urban environment.
- Organic soil types had the highest average plant health illustrated in Figure 1.
- Sandy soil types had the highest average macronutrient content (Figure 1). This may be due to the higher abundance of sandy soil types found in plots or recent fertilization prior to the study.
- All plots were in the green compaction zone (0-200) at 3 inches shown in Figure 2. Indicating that immediate topsoil was not highly compressed.
- Plots with a maximum plant health of five had the most plant beds in the green compaction zone (31%), with only one highly compacted plot at 6 inches. Plants with a health of four had the second most in the green compaction zone (23%) (Figure 2).
- There was no correlation between infiltration and plant health found in the study (Figure 3).
- A total of thirty-nine ornamental plants were analyzed in the study. Five plants occurred more than twice and one species, Indian Hawthorn (*Rhaphiolepis indica*), appeared in ten plant beds.
- Invasive species and mature canopies were present but not included in plant health analysis.
- Only one plot (15) was found to have a partial construction rubble soil type. This plot had the slowest rate of infiltration (4 inches/hour) and a higher than average compaction (100 and 375 inches).
- Plants were shown to suffer from a various amount of sun damage, fungus, herbivory, and excessive moisture. All these factors were taken into consideration for our plant health scale.
- The moisture readings were inconsistent with observable soil conditions. A different device would be encouraged if replicated.
- Future studies could be focused on individual plant species to determine which do better in the above soil conditions.



## Literature Cited

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