

A Comparison of Carbon Content in Forest Soils in Post-Cultivated Sites and Former Pastures



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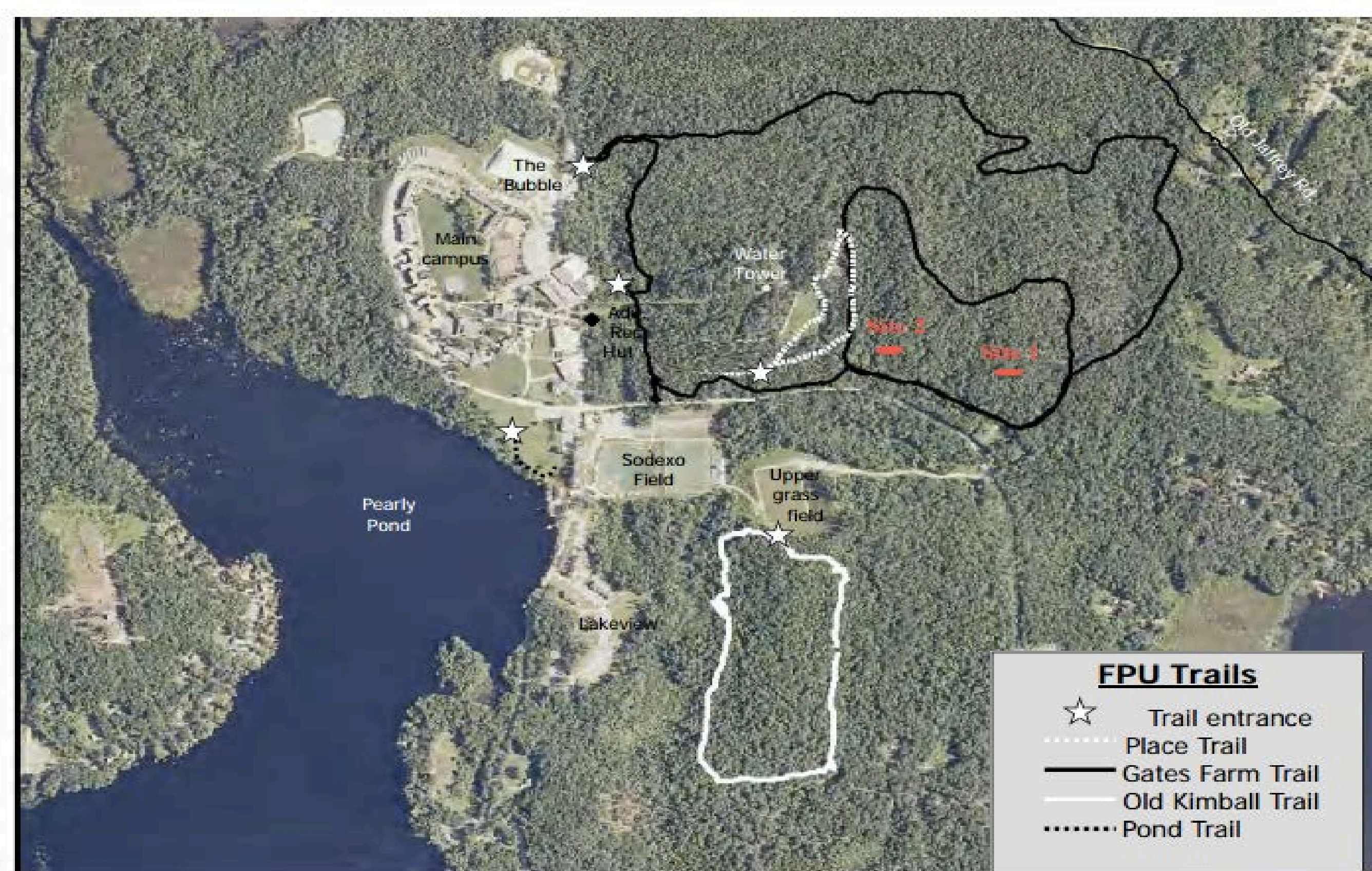
B/ES 430
Forest Ecology

Introduction

Anthropogenic factors have resulted in large changes to the atmosphere and land cover of New England since the colonization of North America by the Europeans. Changes in land cover, due to agriculture in the eighteenth and nineteenth centuries and then reforestation in the late nineteenth and twentieth centuries, have resulted in forest ecosystems in New England taking in much more carbon than in the past; today these forests are a carbon sink (Foster, 2008). Studies have shown that previous land uses affect what grows in the new forests (Foster, 2008). Some of these land uses include pastures for animal grazing, and cultivated fields for growing crops. The purpose of this study is to observe the amount of carbon stored in the soil of two types of new growth forests; those growing on previously cultivated or previously pastured land. This study is a response to climate change because carbon dioxide is a green house gas, and knowing which areas store the most carbon can help us lessen human impacts on the planet.

Methods

- I chose two sites to collect the soil for my data. Both sites had previously pasture and cultivated areas adjacent to each other and separated by a stone wall.
- At each site I set up two fifty meter transects in areas in each site. Along these transects I randomly selected ten points in which I collected a soil core samples. After both sites were finished I ended up with eighty soil samples (forty pasture, and forty cultivated).
- When all the samples were collected I dried them in a oven at 170 degrees Fahrenheit.
- To combust the samples I used a muffle furnace oven at 500 degrees Celsius.
- 0.2 grams of each core was placed in a crucible and weighed before and after combustion.
- Then I found from previous studies that 58% of matter lost in combustion is carbon (Wright et al, 2014).
- After Combustion I took 58% of the weight lost from each sample and recorded my data in a Microsoft Excel data table.
- Lastly I performed an ANOVA test and Constructed a Scatter Plot with error bars using Microsoft Excel.



Map created by Jennifer Bell and Catherine Koning, 2012

Figure 2: Franklin Pierce Campus Trail Map Showing the Location of Sites One and Two

Results

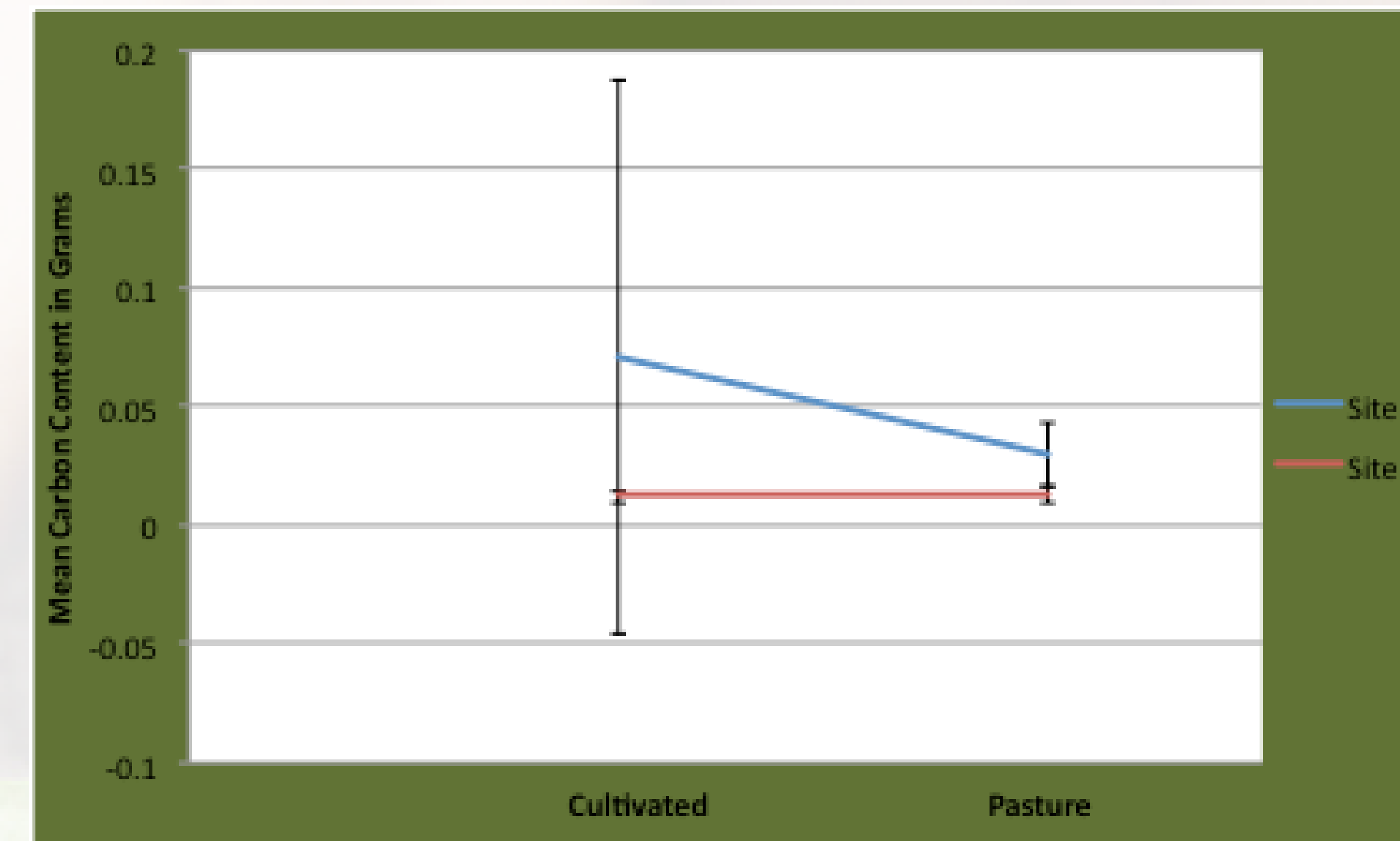


Figure 2: Mean Carbon Content at Site One and Site Two.

At site one there is a large amount of variability in carbon content. There is also a big difference in the over all carbon content of site one when compared to site two.

The ANOVA results concluded that there is no statistical difference between the two sites ($p=0.200890$) or forest types ($p=0.50$)

Discussion

There is no significant difference between the carbon content of previously pastured and previously cultivated forests. There is a noticeable difference between site one and site two. This might possibly be due to the previous land uses of the forest. If site one, the younger forests, had more carbon in the soil it might be the result of differences in land use history between the two sites. If this was a larger study with more samples there could be more support for this possibility.

Works Cited:

Foster, David R., and John D. Aber. *Forests in Time: The Environmental Consequences of 1,000 Years of Change in New England*. New Haven: Yale UP, 2004. Print.

Wright, Alan L., Yu Wang, and K. R. Reddy. "Loss-on-Ignition Method to Assess Soil Organic Carbon in Calcareous Everglades Wetlands." *Communications in Soil Science and Plant Analysis* 39.19-20 (2008): 3074-083. Web. 3 Dec. 2014.

Additional Photos and Results

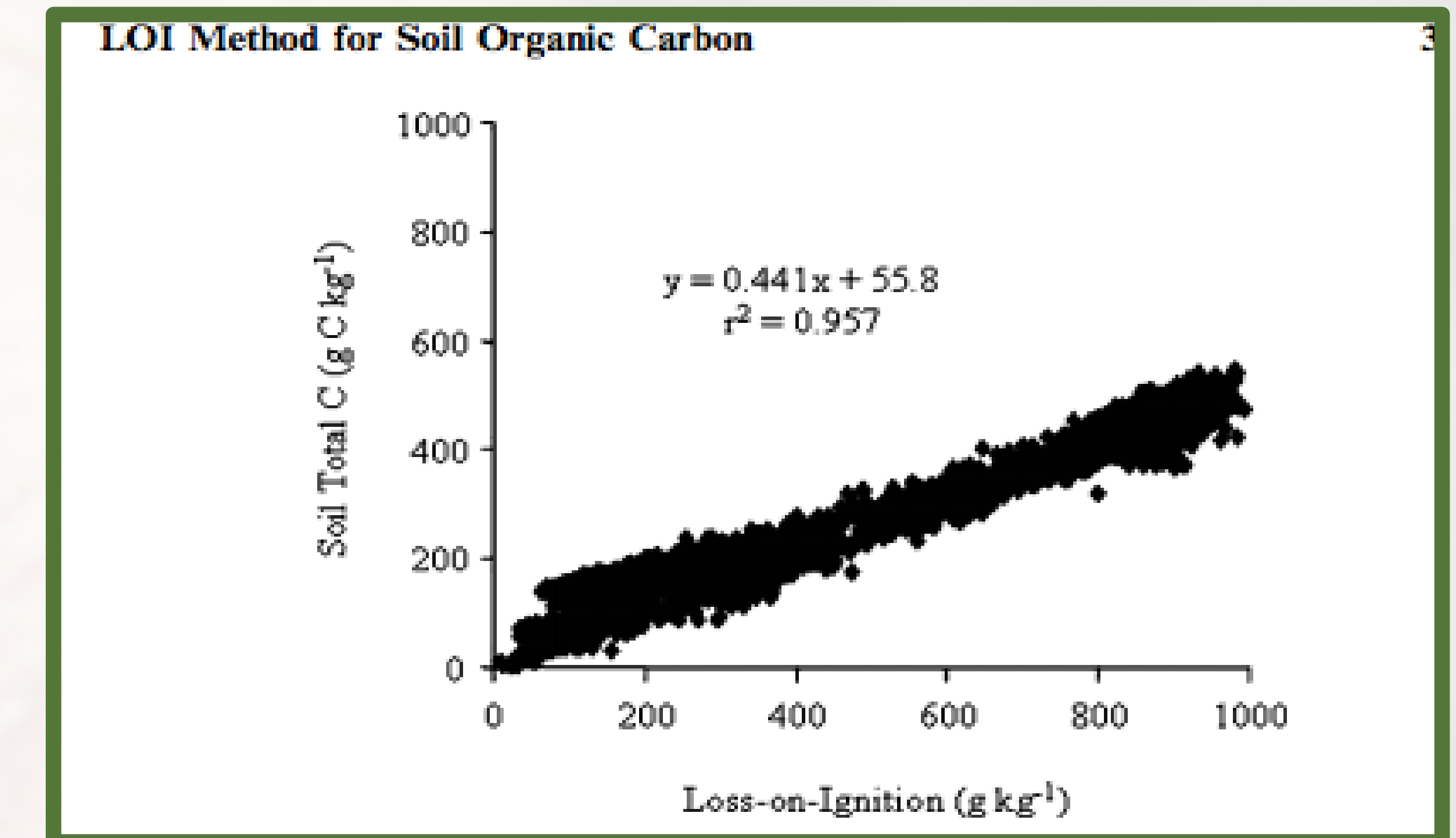


Figure 3: This is a chart from a past study researching soil organic carbon. The scatter plot above shows a positive relationship between the amount of organic matter lost (LOI) during combustion and the soil total carbon (Wright et al. 2008).

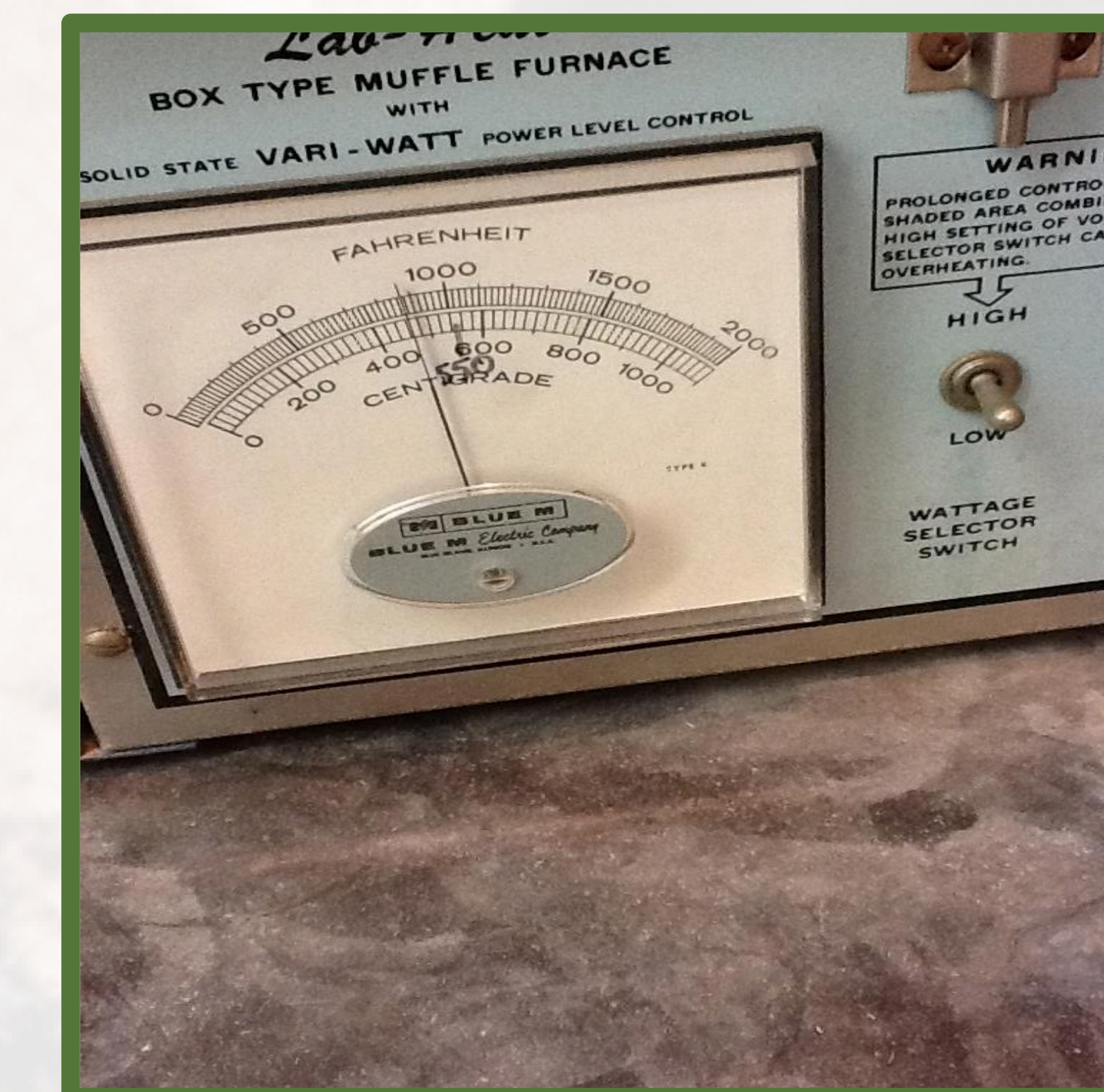


Figure 5: My samples in the muffle furnace oven during combustion.



Figure 4: The oven at 500 degrees Celsius when the samples were put into the muffle furnace oven.