

Possible Effects of Rock Type and Size on Forest Understory Plants and Lichen

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Introduction

For my research project, I was interested to see whether there is a correlation between certain plant and lichen communities and certain types of rocks. It was interesting to see if certain plant and lichen species use certain rock types as their preferred habitat. I also looked at overall rock size and wet and dry areas to help further understand factors affecting these species. For example, When lichens are dry, they 'turn off' and become brittle and go dormant (Lichen Habitat, n.d.).

Research Questions:

Is there an effect of rock type on the number and types of plant and lichen found growing on that rock? Do bigger rocks have more species of plants and lichen growing on them? How do plant communities in wet vs. dry forest plots compare? Is there a relationship seen between rock type and the vegetation present upon the rock?

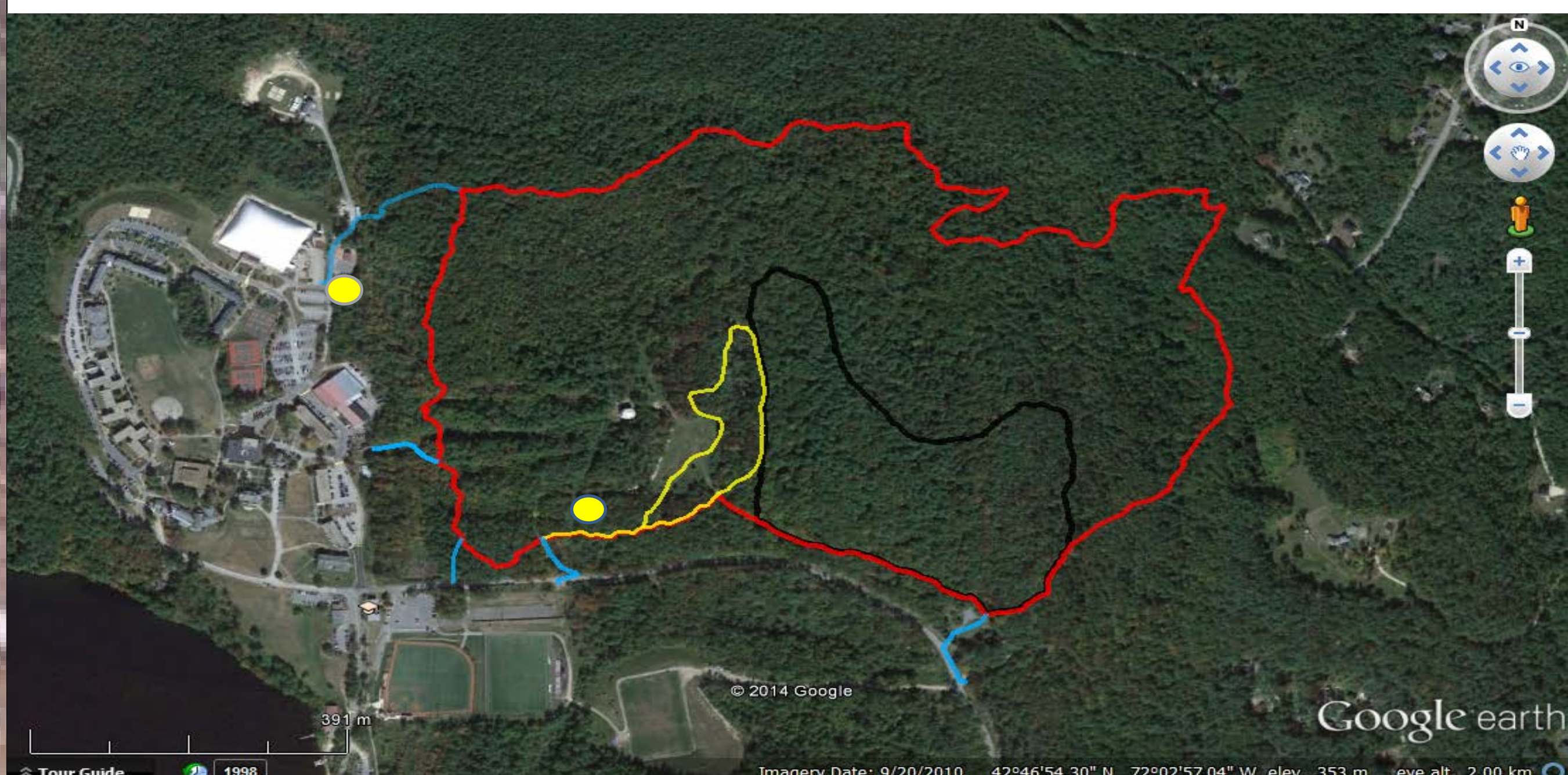


Figure 1 – Trail map of the forests of Franklin Pierce in which my study was conducted. The upper left yellow dot represents the damp lowland transect behind the bubble. The middle yellow dot represents the buckthorn b-plots in which my 2 uphill, dry transects occurred and my last lowland, damp transect.

Methods

The sites I visited included both lowland damp areas and uphill dry areas. The sites were filled with tree fall pits and mounds, suggesting that they were once pasture sites. This was helpful because there were many more vegetated rocks than other areas in the forest. I used a 50m meter tape, meter stick, compass, 1m x 1m plot box, and a field guide to help me collect my data. I used the 50m transect laid out facing south in each of my 4 plots. I then used a 1m x 1m plot every 5m along the transect to collect my samples. I sampled any rocks larger than 15.2cm x 15.2cm. The data I collected included rock size (length x width), type of rock, # of plant and lichen species, and plant and lichen species identification. I included two 50m transects in both the wet, lowland plots and the uphill, dry plots. To analyze my data I used Microsoft Excel to perform regression analyses, Anova analyses, scatterplots, and a relative abundance graph.

Results

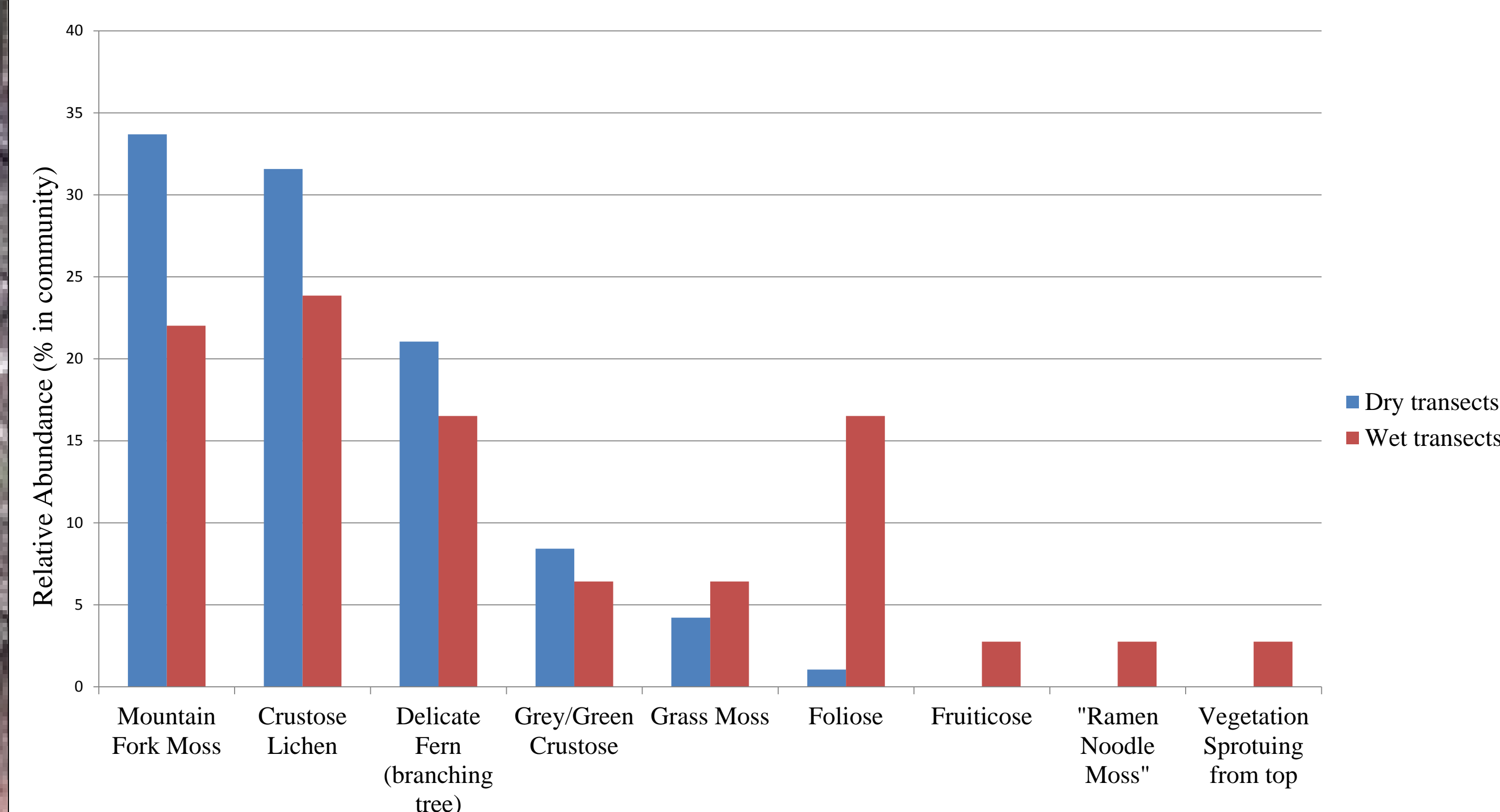
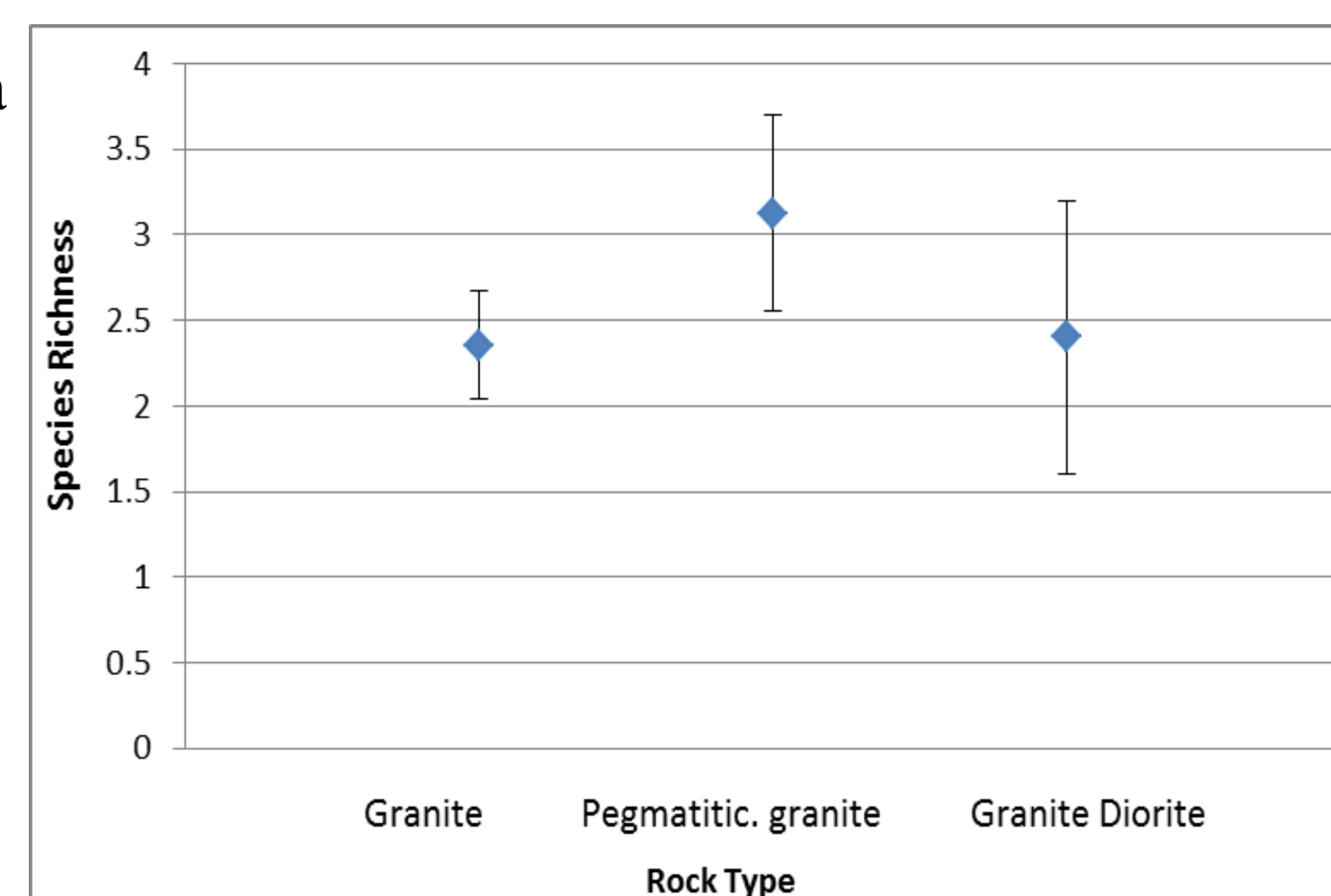


Figure 2 – This figure compares the relative abundance of the communities of plant and lichen found in wet versus dry transects. The blue bars represent my dry transects and the red bars represent my wet transects. The wet transects had more species overall. A chi-square analysis was performed with the results, (Chi Square = 256.85, df = 8, p-value = 6.087×10^{-51}). This shows a statistically significant difference in species composition between the wet and dry areas.

Figure 3 – This figure shows a Scatterplot with error bars comparing the mean number of species on each of the 3 most common rock types found in the field. The error Bars represent two standard errors. There is not a Significant difference found among the means (Anova, $p = 0.062$).



Discussion

This research project shows that there is more plant and lichen species found in the lowland wet land plots compared to the uphill dry plots (Figure 2). The p-value of 6.087×10^{-51} confirms that the difference in species composition between the wet and dry transects is statistically significant and not due to random chance. When lichens are wet, they "turn on" and start photosynthesizing and growing. When lichens are dry, they "turn off", become brittle and go dormant (Lichen Habitat, n.d.). The three rocks that had the most number of species present on them were Granite, Pegmatitic Granite, and Granite Diorite. Pegmatitic Granite overall had the greatest species richness, though overall the three rock types showed similar results in the total number of plant and lichen species upon them (Figure 3). The p-value from my Anova analysis ($p = 0.062$) confirms that there was not a significant difference among the three rocks. If I was to repeat this study I would collect data from an area with more rock types present for more varied results on which rocks correlate with vegetation.

References:

"Lichen Habitat." *Lichen Habitat*. U.S. Forest Service Rangeland Management Botany Program, n.d. Web. 04 Dec. 2014. <<http://www.fs.fed.us/wildflowers/beauty/lichens/habitat.shtml>>.

Additional Photos and Results

I also did analyses on the species area relationships between the size of the rocks and the number of species of plants and lichen growing upon them. I wanted to determine if larger rocks have more species of plants and lichen growing on them. To do this I calculated the area in square cm of each rock in each of my four transects separately. This was done by taking the short rock diameter and long rock diameter for each rock and inputting them into a formula for an ellipse to calculate an estimate of the area in square cm. I then used regression analyses to compare the estimated area of the rock to the number of plant and lichen species. Scatterplots were then created to aid in understanding the relationship seen between the size of the rock and the number of species upon it.

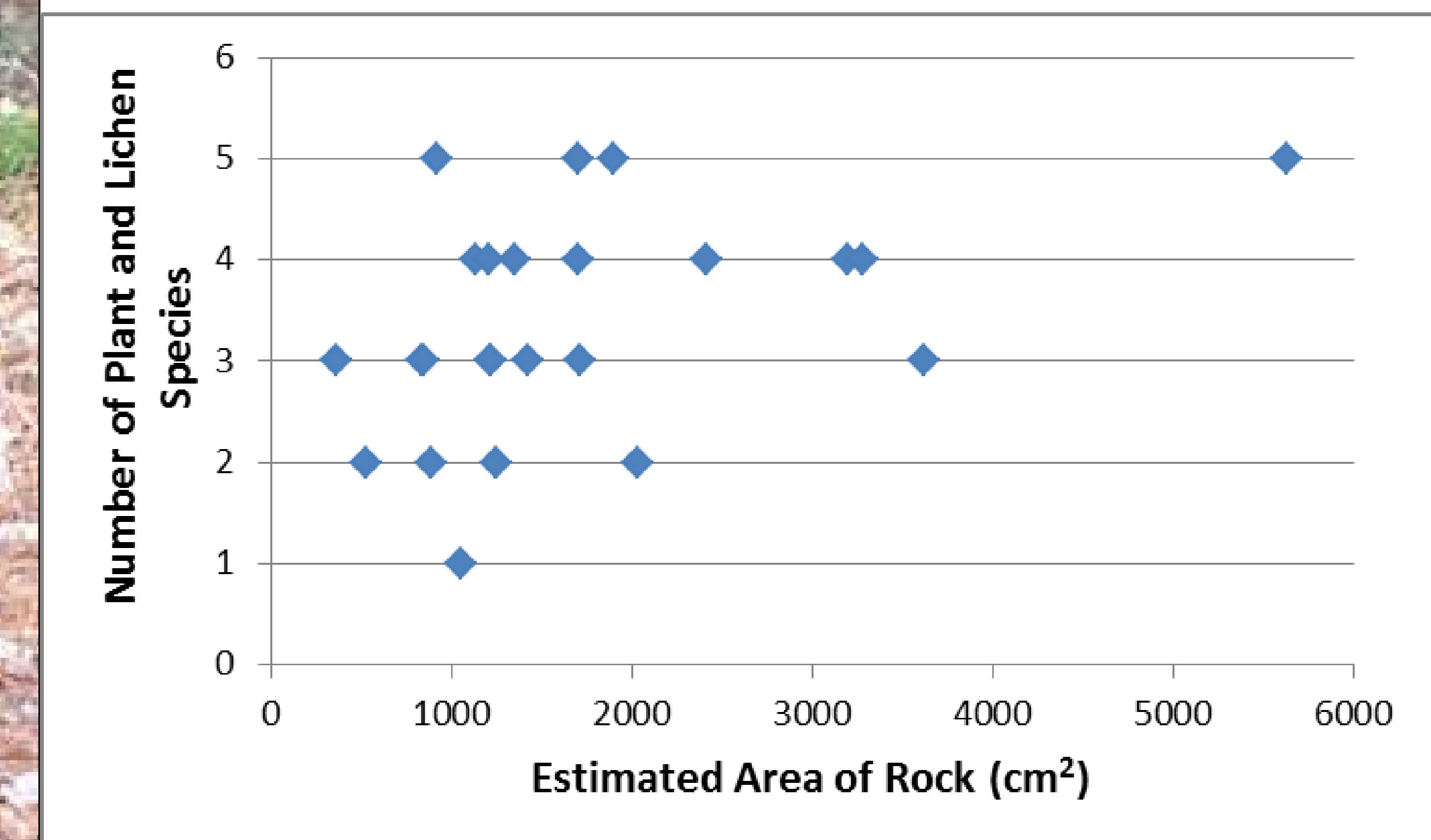


Figure 4 – Shows the species area relationship between the estimated size of rock (cm^2) and the number of plant and lichen species in my 3rd transect (the first lowland wet transect). The p-value here is 0.046, showing a statistically significant increase in the number of plant and lichen species with rock size. The r-squared is 0.17 which means that 17% of the number of plant and lichen species is explained by the estimated size of rock ($p = 0.046$, $r^2 = 0.17$).



Figure 5 - A classic example of Granite rock found at my uphill field site with crustose lichen and delicate fern moss covering a good portion of the rock.

Figure 6 - A photo I took of the Buckthorn B-plot where I collected data for my dry, uphill transects. You can see the downward facing slope clearly.

