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Mapping Mayapple Growth in Restored Forest

Jonathan Walt
Calvin University

Stephanie Praamsma
Calvin University

Tanner Vincent
Calvin University

David P. Warners
Calvin University

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Jonathan Walt, Stephanie Praamsma, Tanner Vincent, Dr. Dave Warners
Calvin College, Grand Rapids, Michigan

Introduction

Podophyllum peltatum (American Mayapple) is a commonly found forb in eastern North America, residing in forested areas. Due to relatively low germination rates, mayapples propagate through the use of rhizomes. This results in colonies of mayapple clones covering the forest floor as a single, multi-stemmed organism. This study is based on information from a previous study done by Calvin Researchers in the forested area by the south entrance on Burton Street. An area of 2250 ft² was restored from lawn to forest in 2008, with mayapples planted as part of the restoration process.

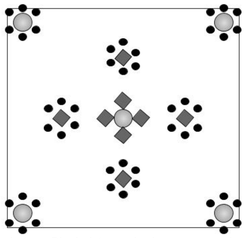


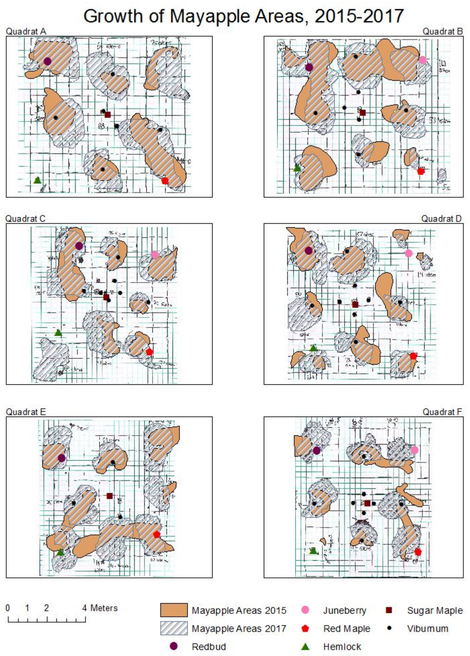
Figure 1: Quadrat ex: Black dots are herbaceous species, grey diamonds are Viburnums, grey circles are trees.

Objectives

- **To map the extent of the mayapples up-to-date in 2017**
- **To input the maps into GIS in order to have an accurate base for future reference**
- **To further understand what impacts the growth of mayapples**
  - **Interpolate a possible curve by which the mayapples grow**
  - **Understand the relationship between density increase and stem count increase**
  - **Formulate an equation to allow researches to understand age of mayapple clone areas**

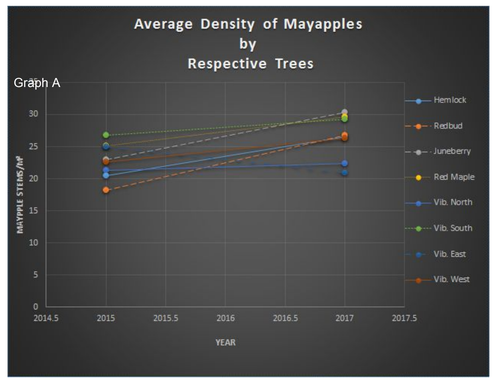
Methods

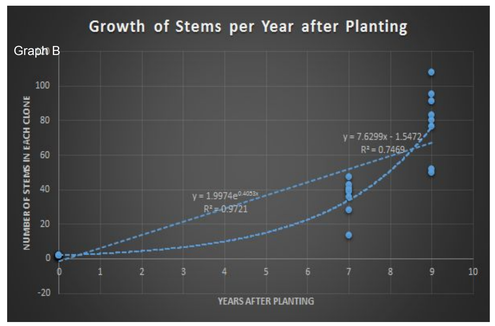
In De Jong et al. study, there were six quadrats that were planted identically measuring 5 meters by 5 meters. We expanded this to 8 meters by 8 meters to fit the expanded mayapple clones. Each quadrat was gridded and mapped. In addition, every stem was counted for each clone. The maps from the 2015 and 2017 study were then scanned and imported into ArcGIS. The coordinates of the center of the quadrats were matched with the maps. Each mayapple clone was mapped on ArcMap to determine area and density of stems per square meter. The density was averaged for each tree so that there was one density per year per tree. This allowed a correlation line to be drawn for the three data points that we have from the three years of the study.

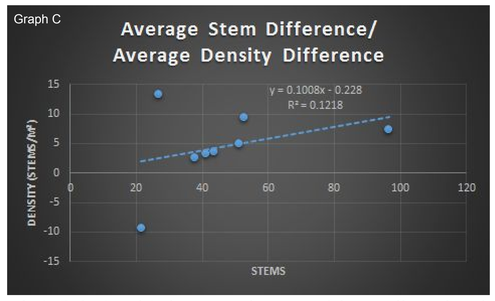


Results

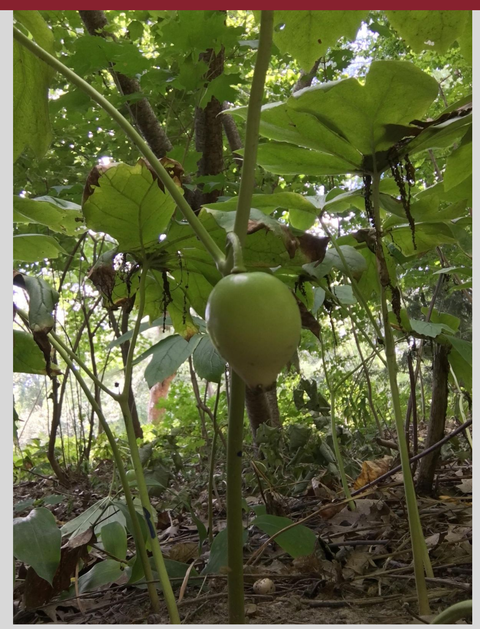
- **Mayapple clones added an average of 47 stems, and became denser by 4.4 stems/sq. m**
- **Stems increase at an average rate of y=7.63x-1.55, but there is possible exponential growth**
- **Density has no significant correlation with increase in stem numbers**







Graph A: Relationship between the year of data collected and the averaged density of mayapples at each tree. Graph B: Equations based on stem count after each year data was collected. Graph C: Relationship between the differenc in stems per year and the change in density per year. R^2 value displayed to show little correlation.



Conclusions

- **In conclusion, we found that density does not increase in relationship with stem increase or area increase.**
- **Mayapple clonal areas add stems in a linear relationship, and future data will validate this relationship**
- **Following this experiment into the future will allow for more data points and a more accurate equation for the growth of mayapple clones.**
- **More research can be conducted into variables impacting growth, including light, soil moisture, and competition.**

References

DeJong, L.N., M.G. Warners and D.P. Warners. 2017 Converting Lawn to Restored Forest on a Midwest College Campus: A Seven Year Assessment of Herbaceous Plant Establishment. *Restoration Ecology* 35: 167-174.