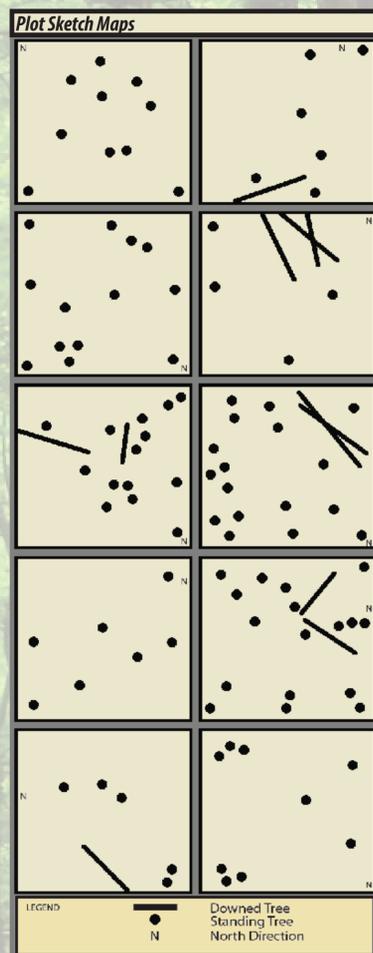
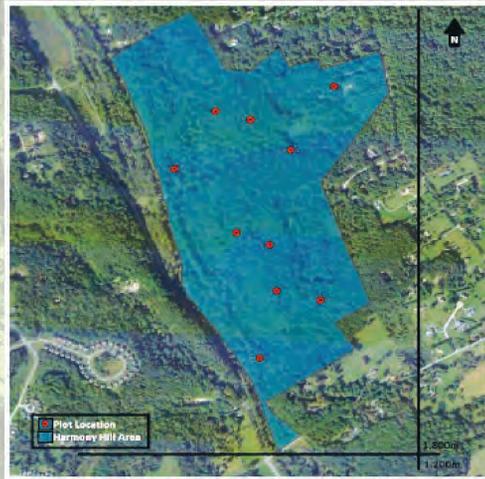


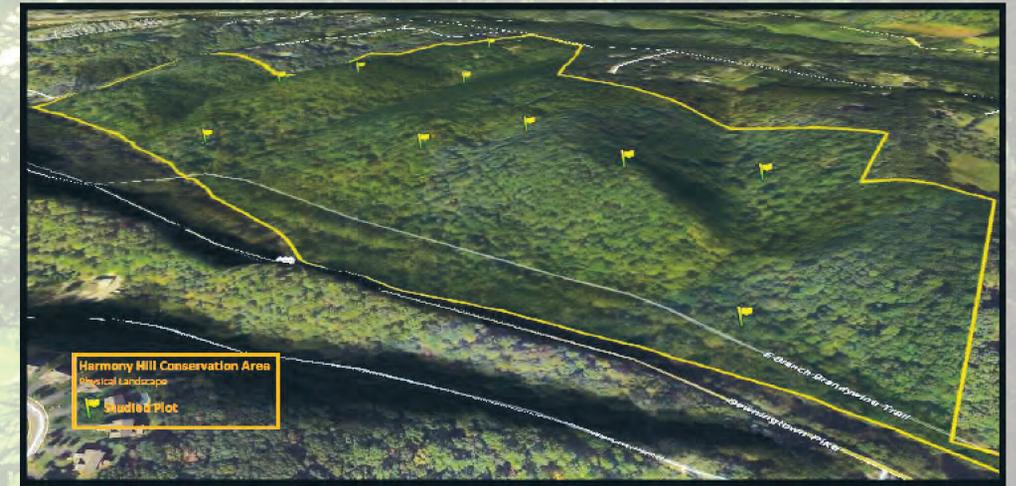


# Harmony Hill Conservation Area: Exploring the Influence of Topography on Tree Composition and Structure



### Abstract:

The carbon pool of a forest can vary significantly depending upon the topographic position, for example the severity of the slope they are growing on and the direction their slope faces. To better understand the significance of this influence, we surveyed trees in the Harmony Hill Conservation Area in order to explore topographic variations in total carbon stock (TCS). We also calculated importance values (IV) in an attempt to predict the future regeneration of tree species within the forest. Ten 10x10 m plots were located at different topographic positions using stratified random sampling and all trees > 5cm diameter at breast height were measured. The results showed a young, changing forest that varied in carbon storage, composition, and structure but not according to topographic position. Using ordination analysis to assess ecological similarities between the factors examined (slope, elevation, aspect, and canopy cover) the result proved that slope and aspect were not the main contributing factors in determining the overall tree species composition, structure, and TCS. Furthermore, we found that the Harmony Hill Conservation Area is an unstable forest as invasive red maple and tree-of-heaven species are likely increasing in the understory. With these results, further research should be conducted in order to better understand variations in tree carbon storage, composition, and structure in the Harmony Hill Conservation Area.

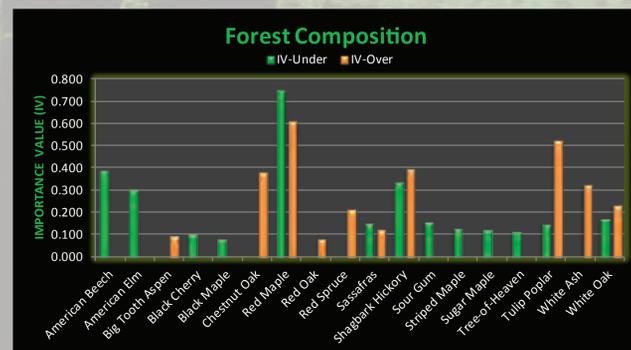


### Methods:

- Ten 10x10 meter plots chosen through stratified random sampling method
- Slope steepness, slope aspect, DBH, canopy cover, GPS coordinates, and tree species were the recorded variables
- Understory 5-10 DBH overstory >10 DBH
- Pearson (2007) method of data analysis used to determine forest composition and structure
- PC-ORD NMS 2-D for multivariate analysis of vegetation

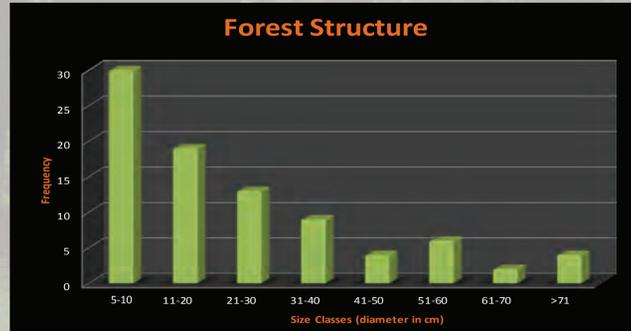
### Study Location:

Harmony Hill Conservation Area is located in East Bradford Township, Chester County, Pennsylvania. In June 2010, Harmony Hill Conservation Easement was donated by East Bradford Township to the North American Land Trust (NALT). This conservation easement is approximately 241.018 acres. East Bradford Township partnered with the North American Land Trust to protect this area from future development and allow it to become a public park.



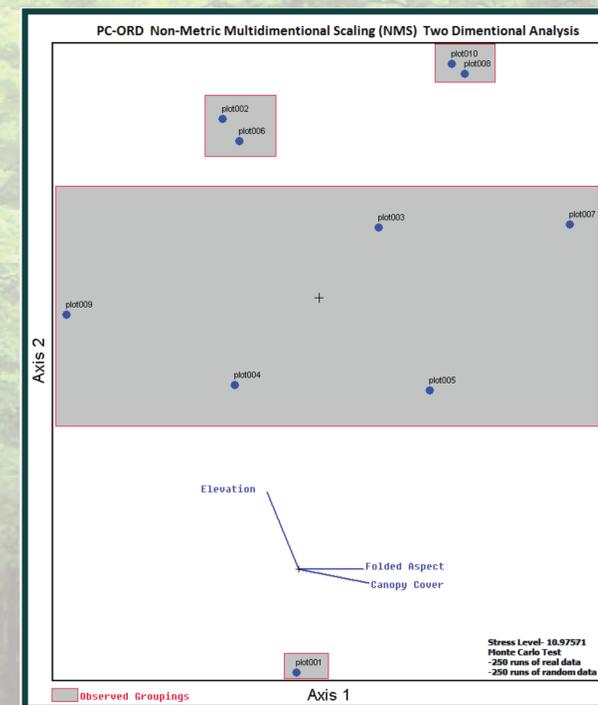
### Forest Composition:

- Red maple was the most abundant species making up 24% of trees studied
- Chestnut oak is following a similar declining pattern observed all across the mid-Atlantic region of the United States
- White ash is dying out, which could be related to the impact of the emerald ash borer
- Big tooth aspen, chestnut oak, red oak, red spruce & white ash had no observed regeneration



### Forest Structure:

- Harmony Hill is a young forest that has experienced significant disturbance of some kind in the past
- A steady increase in trees under 40cm DBH was observed showing a growing young forest
- A combination of forest composition and structure imply a changing forest as young trees in the understory replace the older species of the overstory



### PC-ORD Analysis:

- No correlation with elevation, slope, or aspect with regards to the clustering of the analysis output data
- Plot 1 was found to be an outlier away from all clustered plots
- Clusters found at mid-range (Plots 3,4,5,7, and 9) and paired plots 2 and 6, as well as at plots 8 and 10
- None of the factors studied could be identified as the most influential variable in determining the tree composition
- A non-researched factor is theorized to be the significant variable clustering the plots together
- Folded aspect and canopy cover were important factors on axis 1. Elevation was a significant factor on axis 2 although none were very influential on the final results

### Conclusions:

Although, the original hypothesis was not proven, a PC-ORD test showed that there was a significant factor influencing the growth and species in the Harmony Hill Conservation Area. This factor could possibly be previous land-use, soil type, and adjacent physical features etc. that were not included in this study. Forest composition and structure showed a young forest that experienced significant disturbance and does not appear to be stable in that there were understory species that were absent in the overstory and some overstory trees that were not present in the understory.

Future research would incorporate multiple other features (roads, floodplain, soils etc.) into the PC-ORD test to help target the factors that are contributing to the tree composition and structure of Harmony Hill.