

Abstract:

- The purpose of our study was to investigate the growth of northern red oak in response to climate change.
- We used dendrochronology (Cook, 1990) to measure growth
- We found that climate does effect the growth of northern red oak and that southernmost seed sources grew the best and therefor had adapted best to climate warming.

INTRODUCTION

The purpose of our research was to investigate how the stem growth of 32 families of northern red oak (*Quercus rubra*) from different regions of North America respond to climate change. We also compared the results of factors such as competition, genetics and stand age between the families. Data was collected from Martell Forest, West Lafayette, IN, where approximately 1500 trees were planted in the early 1960s; but due to climate change and competition, there is approximately 35% of trees left today available for the project. We originally had 3 groupings (A, B, and C) of 32 blocks (families) of 16 trees, surrounded by 160 border trees in our plantation. Trees were numbered 1 through 32, starting from the lowest longitude as 1 and moving north. Our working hypothesis was that Northern red oak trees from the southernmost seed sources will grow larger and faster in Indiana climate, therefor out competing surrounding trees due to the results of previous studies

METHODS

Field Work: Martell Forest Plantation

Data collected:

- Diameter at breast height (dbh at 1.3 m) with logger's measuring tape
- Height measurements with a Forestry Pro tree height measuring device
- 2 breast height core samples on opposite sides of each tree using a Moar increment borer

METHODS (cont.)

Lab Work: Pfendler G041 and Purdue wood shop

Core samples:

- Dried in open air on a plastic tray for 24 hours
- Glued with Elmer's wood glue to wooden plywood mounts and taped down to dry flat.
- Sanded each dry sample by hand using 4 stages of 3M Ultra Fine Grit Sandpaper
- Used a dendrochronology approach (Cook, 1990) to cross-date under a microscope using the Velmex measuring system connected to a lap top computer

Border trees:

- collected core samples, height, and dbh measurements to assess how competition from border trees affected growth rates of different populations of red oak over time.
- We used climate data from Canada and the US that had been collected every year since 1950 to compare growth over time.

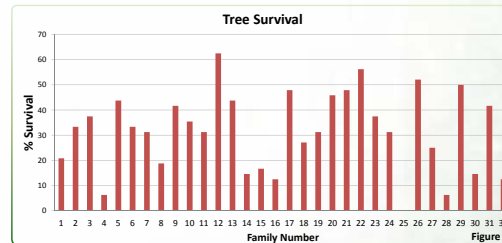


Figure 1

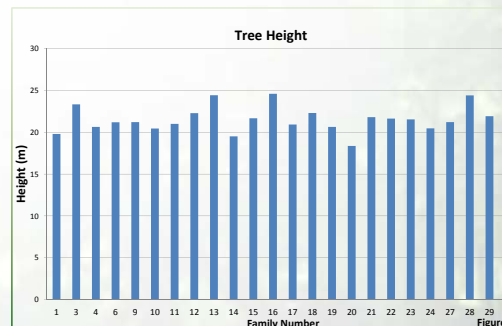


Figure 2

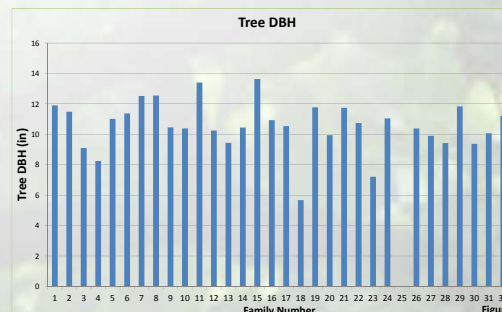


Figure 3

RESULTS

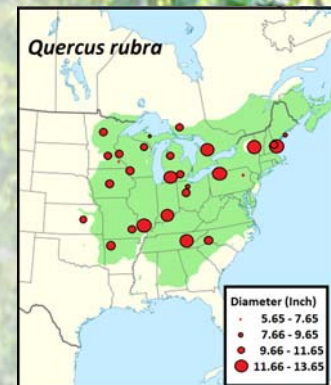
Currently data collection and analysis is in process. We speculate that the death of many of the trees was due to genetic male adaptation and intraspecific competition from neighboring trees.

DISCUSSION

- The southernmost seed sources had a higher rate of survival in comparison to the northernmost seed sources (Fig 1).
- There was not much of a significant difference in tree height between the families. However, families 14 and 20 were slightly lower than the average tree height; and families 13, 16, and 28 were all slightly taller than average (Fig 2).
- We found that the trees from southern most seed sources did in fact have larger average dbh measurements (Fig 3).

Future directions:

By the end of this study will measure all of the heights of the trees in the plot at Martell Forest. We will also finish analyzing the rest of the tree core samples from our study. Eventually we will have detailed results as to which seed sources grew the best. Eventually, we will determine which seed source would be most suitable for silviculture. Certain seed sources will be better adapted to climate change and therefor will be better at maintaining healthy and quality forest ecosystems.



LITERATURE CITED:

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- COOK, E. R. 1990. A conceptual linear aggregate model for tree rings. In: Methods of dendrochronology: applications in the environmental sciences. Kluwer Academic Publishers, Dordrecht, the Netherlands. 5: 98-104.

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