Purdue University
Department of Entomology
Undergraduate Capstone
Project Summary

Name of Student:

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Project Title:

Influence of forest configuration on occurrence of *Typocerus v. velutinus*

Project Summary:

   Typocerus v. velutinus is a beneficial longhorn beetle that inhabits two different types of environments. The immature larvae are found in forests where they develop in rotting wood on the forest floor and are beneficial because they decompose this wood. The adults are found in open fields where they are beneficial in the way they pollinate local flower varieties. They are frequently found on wild hydrangea flowers. It has also been suggested that the adults are pollinators of the American Chestnut tree which has been almost completely destroyed by American Chestnut Blight. Learning more about these beetles and their movement within and between their environments could possibly help with future efforts to bring back the American Chestnut.

   From June to August 2010 the project was focused on a mark-release-recapture study on *Typocerus v. velutinus* in northwestern Indiana. Twenty-six different individuals were marked and released but unfortunately for the rest of the test period, no further beetles were found. No marked beetles were recaptured and the project was unsuccessful. It was decided to take a different approach to analyze the effect of forest configuration on the occurrence of this beetle.

Materials and Methods:

   Data on occurrence of *Typocerus v. velutinus* was gathered from three different ongoing research projects including the Hardwood Ecosystems Experiment (HEE), the Upper Wabash Ecosystems Experiment (UWEP), and the Indiana Survey (landowners). The sites visited during the mark-release-recapture portion of this project are included with those in the Indiana Survey. The forest configuration measures of greatest interest were forest density and forest fragmentation. Two variables were measured at fifteen different spatial scales ranging from 0.09-22 km. Forest density was calculated using a moving window analysis which counted the number of forest pixels within each of the fifteen spatial scales across the entire state of Indiana. Forest density measures were extracted for each of our specific points of interest. Forest fragmentation was calculated using Jochen Jeagers Splitting Index equation (Jeager, 2000). This

equation allowed the calculation of the splitting index (a measure of forest fragmentation) at each of our points of interest using buffers sized specifically to each of our fifteen spatial scales.

The measurements of forest density and forest fragmentation were then regressed against the "presence or absence" of *Typocerus v. velutinus* for each point of interest. An individual logistic regression analysis was done at each of the fifteen different spatial scales.

Results:

The significant z-values resulting from the multiple logistic regressions for forest density ranged from 2.99-3.285 (figure1), with the most significant having a z-value of 3.285 measured at a spatial scale of 1.35 km (figure 2). The z-values resulting from the multiple logistic regressions for forest fragmentation were not significant (figure 3).

Conclusions:

From these results it can be concluded that the occurrence of *Typocerus v. velutinus* is limited by forest density and the beetle responds most strongly to forest density measured at a spatial scale of 1.35 km. This could be a contributing factor to why the mark-release-recapture project was not successful. The beetles are less likely to be found in areas that are less densely forested and the northern half of Indiana is less densely forested than the southern half of Indiana. We can also conclude from the results that forest fragmentation measured by splitting index does not limit the occurrence of this beetle.
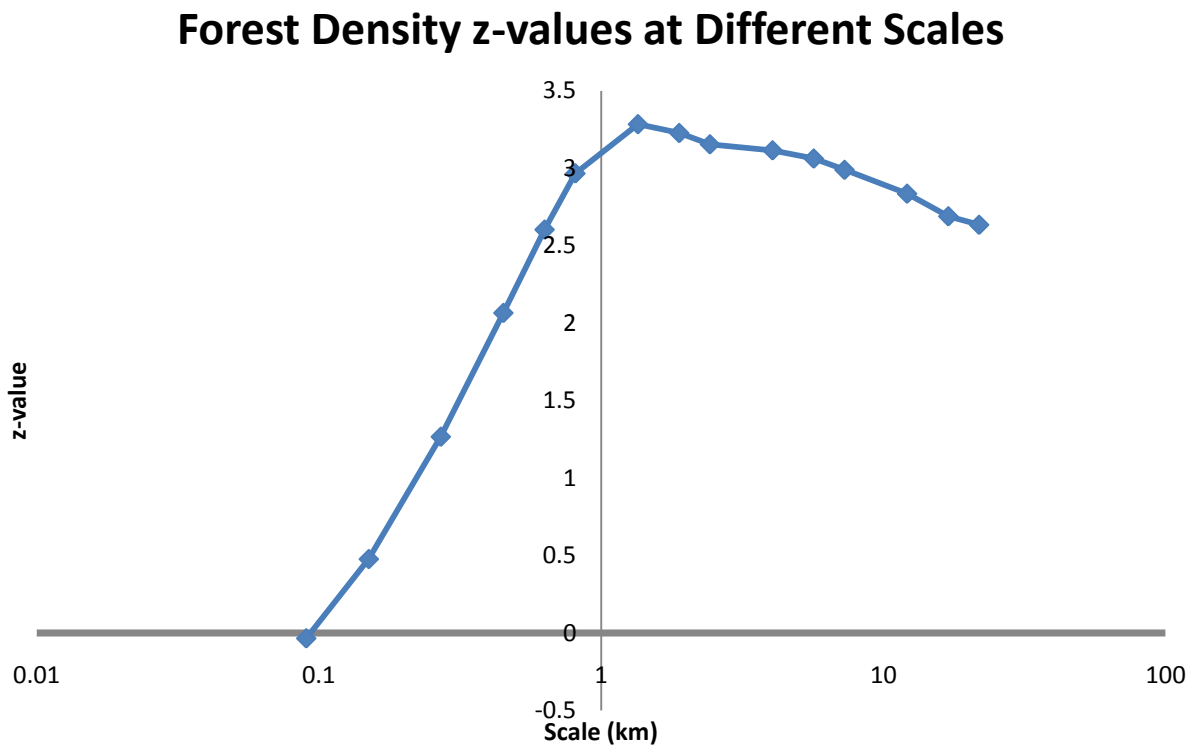
Graphs:

Forest Density z-values at Different Scales

Figure 1. Range of z-values resulting from multiple logistic regressions for forest density

Occurrence of *Typocerus v. velutinus* at Forest Density
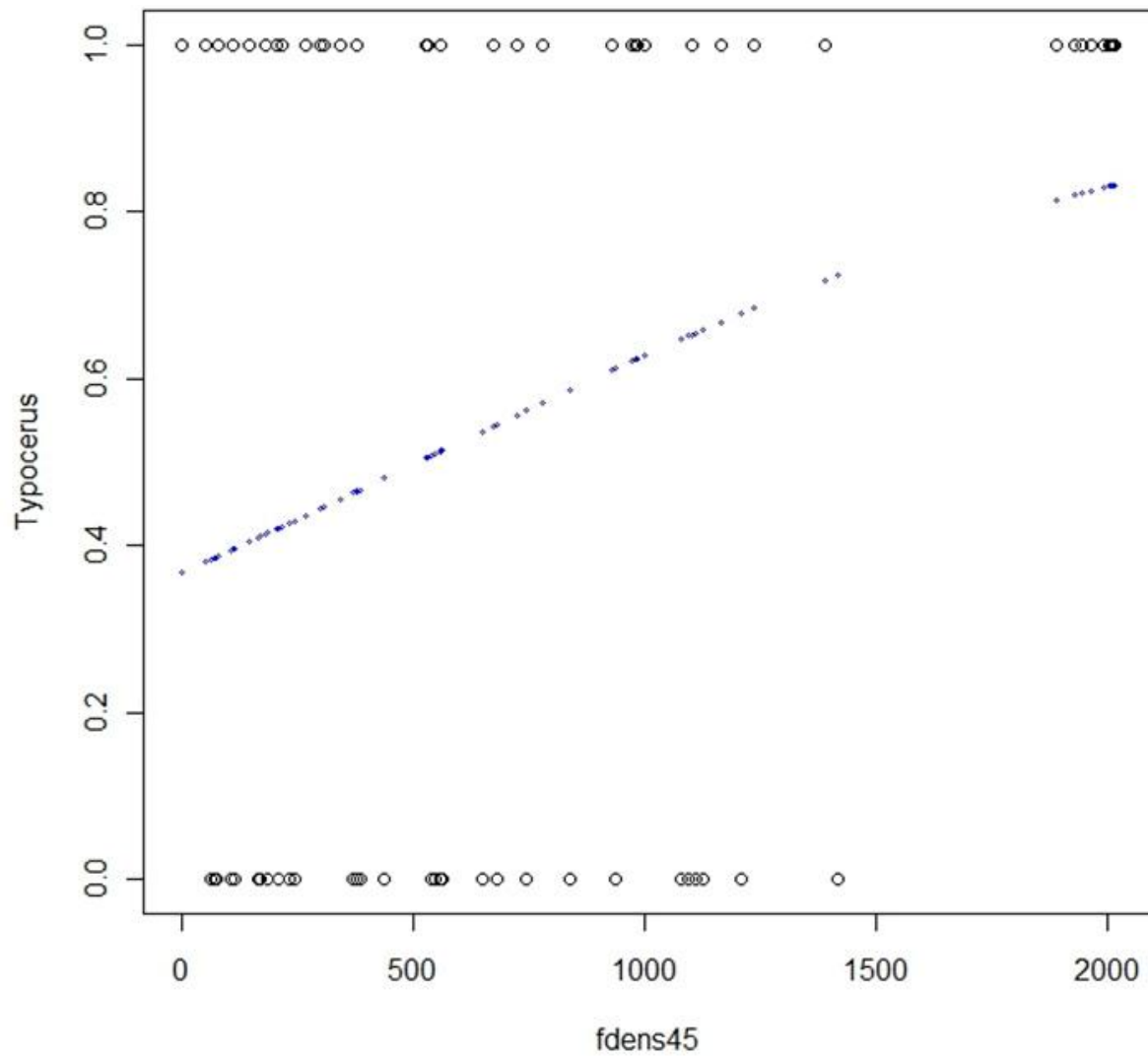## Spatial Scale 1.35km

Figure 2. The occurrence of *Typocerus v. velutinus* measured at the most significant spatial scale for forest density. As the forest density increases, the number of *Typocerus v. velutinus* also increases.
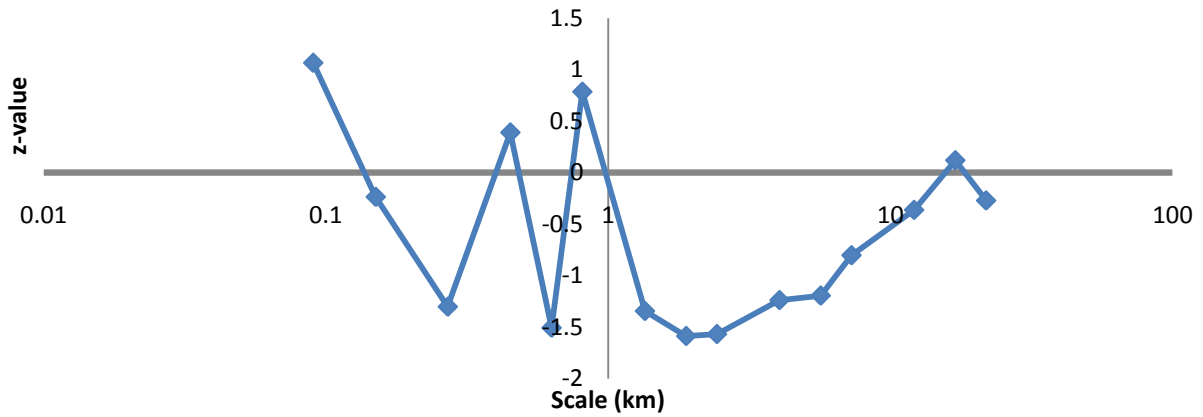
Figure 3. Range of z-values resulting from multiple logistic regressions for forest fragmentation measured by splitting index.

References:

Jeager, Jochen A.G. "Landscape Division, Splitting Index, and Effective Mesh Size: New Measures of Landscape Fragmentation." *Landscape Ecology* 15 (2000): 115-30.