**Title:**

Impacts on Tree Species Diversity between Eastern United States & the Appalachia Province

**Research Question:**

The proposed goal of this project is to more directly compare the difference in unique tree species density between the Appalachia Province and the rest of the eastern United States. I am particularly interested in comparing the density of unique tree species on a state-to-state basis, in the hopes that the states which the Appalachia Province passes through have the potential of being preferentially diverse compared to non-Appalachia Province states.

**Background & Rationale:**

The eastern United States hosts a broad variety of microclimate environments and niche’s that have been filled by a vast diversity of tree species. The heterogeneous distribution of these species poses a multitude of questions concerning their biogeographic abundance and placement. Of particular note, within the region of the eastern United States is the province of Appalachia, a known region of heightened biological diversity compared to surrounding areas. The rich biodiversity of the Appalachia Province is well reflected in the density of unique tree species found within this area. The difference is so stark that the province can be seen geographically just by graphing the heightened species diversity compared to the surrounding areas/states.

The Appalachia Province stretches from northern Alabama all the way to Vermont, spanning a broad latitudinal range. Literature read in class recently has highlighted the potential importance of this latitudinal range in species range size within the United States. The Rapoport effect is something supported by strong empirical testing and is in fact present across the eastern United States FIA database. Tree species within the Appalachia Province include isolated species found almost nowhere else, as well as species that cover a quarter of the North American continent. This makes the Appalachia Province an excellent study area for the criteria used within Morin & Lechowicz’ 2011 study of patterns in range size of tree species. Additionally, if only the difference in latitudinal gradient is considered across the Appalachia Province the methods of Pintor et al. in their 2015 study of Rapoport’s Rule become applicable.

**Hypothesis:**

I believe that a definitive trend in species diversity will be found within the states of the Appalachia Province. I also believe that this trend in heightened diversity will be significant when compared to states outside of the Appalachia Province. Following the same logic, there is a distinct possibility larger states with more square area found within the Appalachia Province could explain this starkly heightened species diversity.

**Methodology:**

The principal data that will be used in this study include counts of unique species within each GRIDID that fall within the study area. Importance Value for those species will also be useful to determine the relevance of the present species that are being isolated within this region. Shape files of the 31 states will be necessary for clarifying and grouping species diversity by state.

This project will be conducted firstly by creating a GGPLOT map of species diversity across the entire eastern United States and overlaying that map with the shapes of the 31 states of this region. Then, I will group the FIA database by state ID to isolate and compare species diversity of all states, and then further isolate the states within the Appalachia Province. Importance value is an additional important metric to be considered, but its most practical application is not yet determined. Broadly generalizing the quantified value of specie diversity per state and displaying that in a color gradient across the eastern United States will produce an efficient, simple visual of the relevance of the Appalachia Province in entire state species density. Time providing, using the Appalachia Province to investigate Rapoport Effect across the present species would also be very beneficial.

**Expected Results:**

I expect to find that the Appalachia Province will have a pronounced impact on tree species density for the states within the region and mapped correctly that impact will be easily apparent to see. The strength of this trend can be plotted empirically by comparing Appalachia Province species density to non-Appalachia Province species density.

The goal of this project is not to break new ground or pose a particularly insightful question upon biogeography. My goal explicitly is to use the skills I have learned within this course to produce a easily understood map of the role the Appalachia Province plays in tree species density across the eastern United States.

**References:**

**Morin & Lechowicz 2011**

<file:///D:/Biogeography/Paper%20Review/Paper%20Review2/Morin%20and%20Lechowicz.%202011.%20Geographical%20and%20ecological%20patterns%20of%20range%20size%20in%20North%20American%20trees.%20Ecography%20(1).pdf>

**Pintor et al. 2015**

<file:///C:/Users/devin/Downloads/Pintor%20et%20al.%202015.%20Rapoport_s%20rule%20-%20do%20climate%20variability%20gradients%20shape%20range%20extent.%20Ecol%20Mon%20(1).pdf>

**Murphy et al. 2010**

<file:///C:/Users/devin/Downloads/Ecol%20Lett%202010%20Murphy%20HT%20(1).pdf>