Introduction

A majority of land in Maine is forested. Currently, we have an estimated 96% of forests that there were at time time of first settlement (Forest Trees of Maine, 2008). While there is a large area of forest, there are not as many species present as other states (Forest Trees of Maine, 2008). The amount of ecosystem functions that a single species can provide for an ecosystem is limited and the more species present in an area is generally thought to increase ecological stability (Peterson et al. 1998). In this study we ask what parts of Maine have the highest number of different native tree species. Additionally, we investigate whether development is increasing in the areas with highest species richness. Shifts in population location can lead to more development, patch creation, and put strain on an ecosystem (Grimm et al. 2008).

Methods

Species Richness

Native tree species were identified using the the 14th edition of the Forest Trees of Maine guide book (Forest Trees of Maine). Tree ranges were obtained from the United States Geological Survey (https://esp.cr.usgs.gov/data/little/). They are digital representations of tree species range maps from “Atlas of United States Trees” by Elbert Little of the Department of Agriculture. We used ArcGIS to convert to raster, and combine these data to a new layer. Zonal statistics was used to analyze at the county level. County boundary data was collected from the Maine Office of GIS data catalog.

Development

We used the population shifts in Maine towns from 2000 to 2010 as a proxy for development. The data and map were collected and generated by Dawon Lee. Data for town populations at the town level were collected from the 2000 and 2010 US Census. Zonal statistics was used to get number of species data at the town level. The correlation between population change and number of tree species was analysed with a simple linear regression test in the software R.

Results

Species Richness

Our analysis showed that the number of tree species in any part of the state varies from 30, the lowest species richness, to 55 at the highest species richness (Table 1). This area of high species numbers appears to be clustered in the south and along the coast (Fig. 2). The county with the highest species number is Cumberland county, the second most southern coastal county, with a mean number of 55 tree species. The county with the lowest mean tree species is the most northern inland county, Aroostook, with a mean of only 33 native tree species.

Development

The map of shifts in population (Fig. 3) shows a slight increase (1-250 people) in population for the majority of the towns in the state. The areas with the highest population increases (500-2240 people) are in southern coastal towns, and towns in the midcoast region.

Discussion

The distribution of native tree species appears to follow a pattern. The areas of highest species richness appear to be clustered in the south and along the coast. The northern inland areas have the least number of species. This is most likely driven by climate. Southern regions have milder temperatures and the maritime climate along the coast minimizing extreme hot and cold temperatures. A continuing step with this project would be to compare the species map to climate data.

The observed relationship between area with high population change and high species richness could carry larger implications about future conservatism efforts. The amount of species that would be affected and the level of threat are important factors to consider when conserving land. Our work shows that over a 10 year period there was a slight, but significant correlation between shifts in population and number of species in an area. While we acknowledge that population change does not represent a complete data set on human development and linear regression was not the best statistical test to use, it may represent a potential for future investigation.

Conclusion

Tree species in Maine are most commonly found in the southern counties of the state as well as along the coastline. Maine’s lowest tree species richness is in the northern counties. Population change over a 10 year period, while relatively low in quantity and not a true measure of development is still weakly correlated with areas which have high species values indicating that more development could be happening in area of higher ecological importance.

Citations