

How does higher elevation affect the amount of invasive plant species in an ecosystem?

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Background

- An invasive species is a species that is non-native to an ecosystem under consideration, whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Many invasives produce large quantities of seed and thrive on disturbed soil, and some have aggressive root systems that spread rapidly and for long distances. Too many invasive species in an area can result in degraded water erosion, increased soil erosion, and an overall lack in biodiversity.
- Invasives can overtake endangered species in their natural habitats by out-competing them for their resources. Most studies done on invasive plant species have focused on their impact at lower elevations, while fewer studies have focused on less disturbed, higher elevations. (Pauchard et al., 2009)

Hypothesis

- We hypothesize that at higher elevations, the ecosystem will be less disturbed, and will therefore have fewer invasive plant species than at a lower elevation.

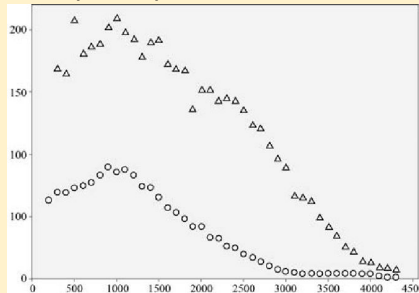


Figure 1. Invasive plant (O) and Native tree (Δ) species richness over elevation.

Literature Cited: Blaise, P., Keith, M., Tim, S., & Olivier, B. (2016). Will climate change increase the risk of plant invasions into mountains? [Abstract]. *Ecological Applications*, 26(2), 530-544. doi:10.1890/14-1871Dark, S. J. (2004). The biogeography of invasive alien plants in California: An application of GIS and spatial regression analysis. *Diversity and Distributions*, 10(1), 1-9. Invasive Species: What are they? (2020, March 27). Retrieved November 28, 2020, from <https://oaklandinvasivespecies.org/invasive-species/> Jules, E. S., Kauffman, M. J., Ritts, W. D., & Carroll, A. L. (2002). Spread of an invasive pathogen over a variable landscape: A nonnative root rot on Port Orford cedar. *Ecology*, 83(11), 3167-3181. Pauchard, A., & Alaback, P. B. (2004). Influence of elevation, land use, and landscape context on patterns of alien plant invasions along roadsides in protected areas of south-central Chile. *Conservation Biology*, 18(1), 238-248. Pauchard, A., Kueffer, C., & Dietz, H. (2009). Ain't no mountain high enough: Plant invasions reaching new elevations. *Frontiers in Ecology and the Environment*, 7(9), 479-486. Sarah Farmer, S. (2018, October 04). Elevation and Invasion. Retrieved November 28, 2020, from <https://www.srs.fs.usda.gov/compass/2018/10/04/elevation-and-invasion/> U.S. Forest Service. (n.d.). Retrieved November 28, 2020, from <https://www.fs.fed.us/wildflowers/invasives/index.shtml>

Study Design

- We will conduct a field experiment on Mt. Mansfield located in Stowe, Vermont to determine the effect that elevation has on invasive species growth and spread.
- The study will consist of an invasive plant survey on three 100 meter plots at low elevation (~800'), mid elevation (~2,500'), and at the mountain's highest elevation (~4,400').



Figure 2. Common types of invasive plant species.

Intended Analysis

- The response variable is the number of invasive plant species counted which is continuous, while the independent variable is the height of elevation, which is categorical.
- We can conduct a regression analysis to evaluate the relationship between the number of invasives and the elevation.
- The data used in this analysis is limited to our study plots, therefore the scope of inference is limited.

Expected Benefits and Greater Impact

- There are fewer invasives at higher elevations as of now, but there is a gap in knowledge about the negative ecosystemic effects that invasive species can cause as global warming increases the temperature. It is critical that we understand this so we can halt the further spread of invasive species before it is too late to control them (Pauchard and Alaback, 2004).



Figure 3. Example of invasive plant survey and removal, the species pictured is Oriental Bittersweet. Photo by Bethany Smith.