Comparison of latitudinal and elevational range limits of North American plant species: Exploring the role of climate in limiting range boundaries

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Species’ responses to climate change
Climate change impacts species differentially. Some with wide climatic tolerances might experience little impact, while other, more sensitive species will be forced to evolve, shift their geographic distribution, or become extinct. Because species will vary in both their manner and magnitude of response, it is important to determine which are the ones that will be most affected.

Research question
To what extent do climate conditions limit species high-latitude or high-elevation boundaries?

Why compare range limits?
By comparing the extent to which species high-latitude and high-altitude limits correspond with particular climatic features (like cold temperatures) we can begin to differentiate among species that are typically limited by climatic factors versus those that are typically limited by other factors (like competition and dispersal ability); this can help us to understand which species are likely to be most directly impacted by changes in climate.

Methods
• Obtain reliable species occurrence data that is properly sampled. A potential source is the Global Biodiversity Information Facility (GBIF), which provides geographic coordinates for localities where species have been observed.
• Plot coordinates of species occurrences in GIS software along with a digital elevation model.
• Add climate data to compare temperature at each range limit.

Evaluating GBIF Data
A potential problem that can arise from using GBIF data is that species are not being sampled appropriately and thus are not representative of their actual elevational range. To test this, data for a number of species were obtained from GBIF and each coordinate verified to make sure it was valid. ArcGIS was then used to map each occurrence and then extract its elevation. The elevations obtained were then compared to the values reported in the primary literature for well-studied localities. This allows us to contextualize when GBIF data are likely to be suitable for proposed work.

References

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