

Project 2 (35 pts)

A county-based impact assessment of near-future climate change on two threatened or endangered woody plant species from the flora of Pennsylvania.

Write a 6 page (double spaced, 12 pt font, 1 inch margins; page length NOT inclusive of figures and tables) report on the topic described above. The format of your report and literature citations should follow precisely the format used in the journal *Systematic Biology* (some copies can be found in the herbarium, but they should not be removed from the herbarium).

Each of you will be assigned two woody plant species that are listed as either threatened or endangered by the Pennsylvania Natural Heritage Program and the Pennsylvania Flora Project.

Working alone, you are tasked with:

1. Evaluating the current health (conservation status) of each species in Pennsylvania, complete with an explanation as to the factors you or the literature thinks determine why this species is threatened or endangered in the state. This should be accompanied by a figure showing the plot of specimens in the country and the state (use both GBIF specimens and those from the PA Flora Project (see <http://herbarium.millersville.edu/471.php> for the latter).
2. Making projections of climatic suitability for the species in this state for the year 2050 and evaluate whether or not the species is likely to become more or less threatened or endangered than it currently is. Use two sets of variables as follows: the first includes 1, 5, 6, 12, 18 and 19, the second set includes all variables. Be sure to use this table in your report.

Table 1. Pool of climatic variables utilized for climatic niche modeling under the current, Worldclim 1.4 (Hijmans et al. 2005), and future, CCM3 (Govindasamy et al. 2003), climate models.

Number	Climatic Variable
01	Annual Mean Temperature
02	Mean Monthly Temperature Range
03	Isothermality
04	Temperature Seasonality
05	Maximum Temperature of Warmest Month
06	Minimum Temperature of Coldest Month
07	Temperature Annual Range
08	Mean Temperature of Wettest Quarter
09	Mean Temperature of Driest Quarter
10	Mean Temperature of Warmest Quarter
11	Mean Temperature of Coldest Quarter
12	Average Annual Precipitation
13	Average Precipitation of Wettest Month
14	Average Precipitation of Driest Month
15	Precipitation Seasonality
16	Average Precipitation of Wettest Quarter
17	Average Precipitation of Driest Quarter
18	Average Precipitation of Warmest Quarter
19	Average Precipitation of Coldest Quarter

Each species should primarily be discussed separately from the other, although if you deem comparisons between the two species and your predictions for them are interesting, then please do pursue this.

3. More general points to consider in your discussion are

- Is it possible to prioritize plant conservation efforts in Pennsylvania?
- Is it possible to be more proactive in targeting plant species for conservation efforts in Pennsylvania?
- Do endangered or threatened species lists in the state generally consider the impending near-future climate change in their assessments? How might doing so impact such lists?
- It is a difficult task of calibrating a “probability of occurrence” or “climatic suitability” map and its associated probability values in order to produce some tangible and meaningful predictions about the future fate of a species in Pennsylvania. How might you do this?

4. Be sure to cite and include proper references for all computer programs you use.

5. Be sure to consult the primary literature for background and to support your conclusions.

6. Be sure to proofread.

7. Be sure to cite the GBIF providers of the data you utilized (the citation.txt that comes with your data) in the Acknowledgments section.

The following are due by Friday, Apr 3 at 5 pm (-10% for every working day late):

1. A printed hardcopy of the report.

2. As one zip file:

An electronic copy of your report and figures via email .

Your actual specimen occurrence spreadsheet files via email.

Your MaxEnt output files including the bioclimatic model .grd files.

SOME POSSIBLE REFERENCES (BUT YOU MUST READ AND USE THESE TO CITE THESE)

Govindasamy B, PB Duffy, J Coquard. 2003. High-resolution simulations of global climate, part 2: effects of increased greenhouse cases. *Climate Dynamics* 21: 391–404.

Hijmans RJ, CH Graham. 2006. The ability of climate envelope models to predict the effect of climate change on species distributions. *Global Change Biology* 12: 2272-2281.

Hijmans RJ, SE Cameron, JL Parra, PG Jones, A Jarvis. 2005. Very high resolution interpolated climate surfaces for global land areas. *International Journal of Climatology* 25: 1965-1978.

Hijmans RJ, L Guarino, A Jarvis, R O'Brien, P Mathur, C Bussink, M Cruz, I Barrantes, E Rojas. 2005. DIVA-GIS version 5.2. Available from the authors at <http://www.diva-gis.org>.

McNeely JA, HA Mooney, LE Neville, PJ Schei, JK Waage. 2001. Global strategy on invasive alien species. Cambridge: IUCN Global Invasive Species Programme.

Phillips SJ, RP Anderson, RE Schapire. 2006. Maximum entropy modeling of species geographic distributions. *Ecological Modelling* 190: 231-259.