**A comparative assessment of Mahalanobis typically and ecological niche factor analysis**

**Methods: work-flow diagram**

- **Species presence**
- **Environmental variables**
- **Potential distribution Mahalanobis**
- **Validation ROC**
- **Comparative results**

**Models inputs**

- Norway maple – field records
- Elevation
- Slope
- Average annual precipitation
- Maximum January temperatures
- Minimum July temperatures
- Distance to hydrological features
- Frequency of forest
- Frequency of residential development

**Models outputs**

- Mahalanobis typically
- ENFA ecological niche factor analysis

**Data and software**

Data on Acer platanoides presence (194 points) were downloaded from the Invasive Plant Atlas of New England (http://www.invasiveplantatlas.org/index.html). Environmental variables of elevation and slope were derived from DEM obtained from the Clark University MR2C database. The data used in the analysis were downscaled from the Worldclim database (http://www.worldclim.org). The precipitation maps represent the annual average precipitation for the period 1950-2000. The temperature data include average maximum July and minimum January temperatures for the same period. The source of hydrology and land cover data is MassGIS (http://www.massgeo.org/mgis). The distance to water bodies was derived from the frequency of forest and residential land cover categories were considered in the analysis. All the data were formatted to the resolution of 10x10 meters.

**Results**

Both models produced suitability maps for Acer platanoides. The presence data were randomly split; 50% was used to calibrate the models, the other 50% to validate them. The Area Under the Curve (AUC) of the Relative Operating Characteristic (ROC) was calculated and the shape of the curve interpreted to compare both models. The Mahalanobis results provided ROC = 0.709, ENFA results ROC = 0.749. The first and last 30% of the curve suggest that ENFA performs better in predicting the presence of A. platanoides as well as its absence within the study area. Mahalanobis provides better results in the mid-range of the predicted suitability.

**Discussion and conclusions**

ROC is a statistics frequently used for evaluation of species distribution models (Fielding and Bell 1997). It compares a rank map (e.g., predicted suitability map) against a Boolean map (e.g., species presence/absence). ROC indicates how well the events of the Boolean map fall within the high suitability values in the rank map. Mahalanobis and ENFA. It penalizes models for predicting presences in locations where no data have been collected, assuming species absence to indicate unsuitable habitats. Therefore, the validation should not be based solely on the absolute value of AUC. The shape of the curve needs to be taken into consideration, as it provides valuable information about models behavior (Parmentier, submitted).

**Acknowledgements**

Our thanks to Florencia Sangermano and Benoit Parmentier from Clark Labs, Ylenia Ogorecko-Hermelisberger, Gil Pontius and John Ragan from Clark University and Ross Meentemeyer from UNC Charlotte.

**References**


Mahalanobis typically

ENFA ecological niche factor analysis

**For AAG conference in Boston, April 2008**