Predicting the potential spatial distribution of invasive alien plants with niche modeling

Concepts and Applications

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Overview

• What is species distribution modeling?

• Challenges

• Applications
Step 1: Species distribution data

- Presence-absence
- Presence-only

[Link to GBIF website: www.gbif.org]
Step 2: Predictors

Temperature

Rainfall
Step 3: Modeling

*Rumex acetosella*
Step 4: Prediction

Rumex acetosella

Holcus lanatus
Black Box

http://www2.unil.ch/biomapper/
Look into the Black Box
Challenge 1: Transferability

- **IN SPACE:**
  from native range to areas of introduction

- **IN TIME:**
  climate change
Typically 80%-90% of presences and absences correctly predicted
75% of the presences and absences correct for some species. For other species the predictions are no better than random.
Main issues with transferability

1. Biased and incomplete data
2. Ecology implicit in model
3. Equilibrium assumption
4. Shift of (realized) niches
   - Biotic interactions
   - Rapid evolution
Challenge 2: predict impacts

Holcus lanatus

Anthoxanthum odoratum
Habitat effect

Holcus lanatus
Prevention

• Climate matching

• Soil matching?

• Awareness building and social marketing
Early Detection & Eradication

- Predict high probability of occurrence
- Estimate search effectiveness and costs

However, this needs transferable and reliable models

- Tracking occurrences in environmental space
Verbascum thapsus
Containment

- Plan target areas and boundary zones
- Estimate management costs
- Document management efforts in environmental space
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Species x Habitat

Species

Genotypes

Prevention → Early Detection → Containment