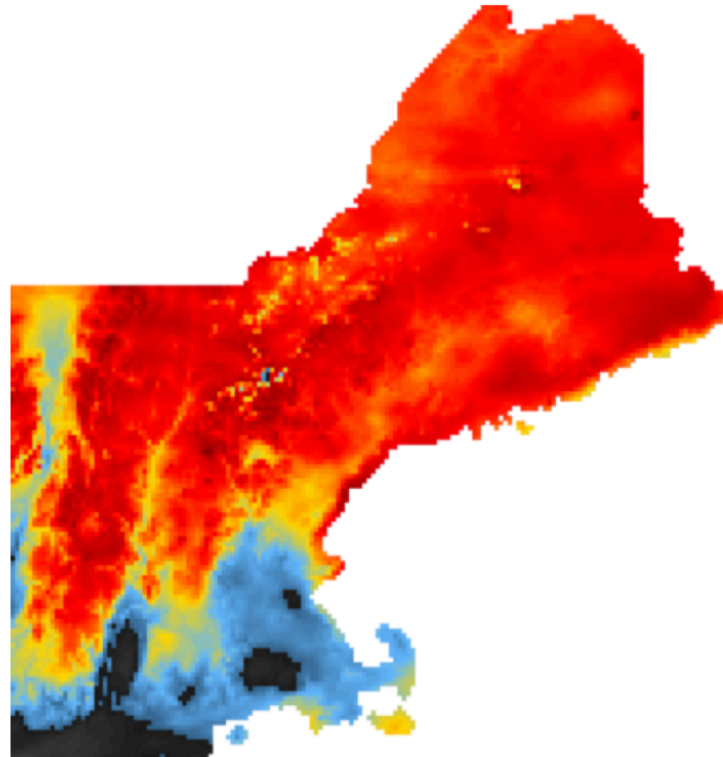


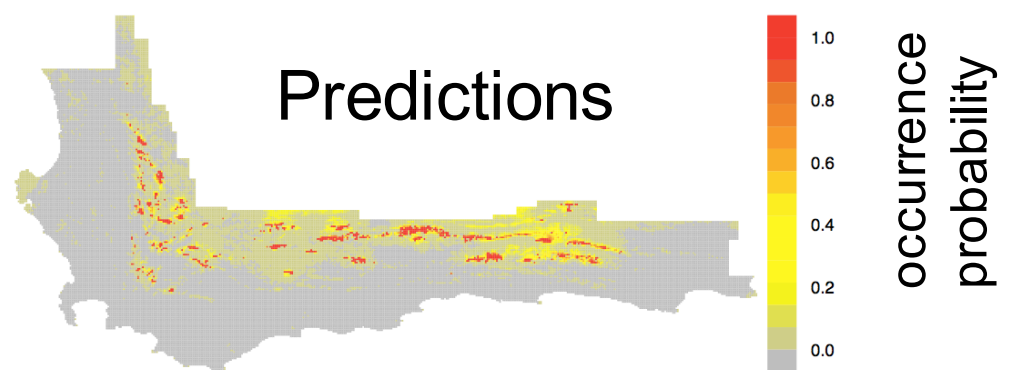
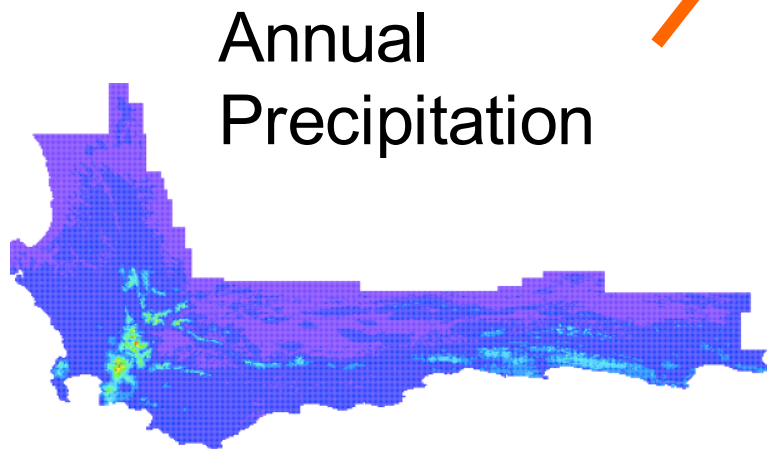
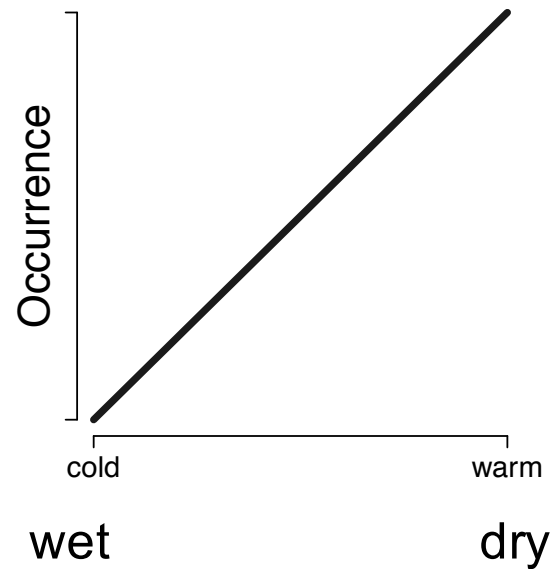
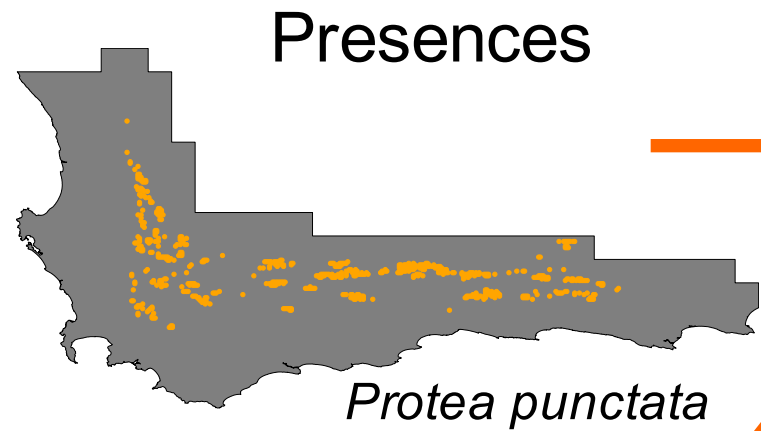
Modeling Presence Only Data

Cory Merow

Yale University

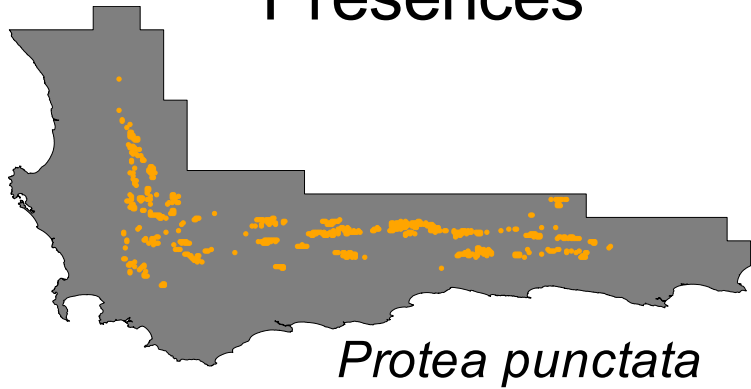


Occurrence Models

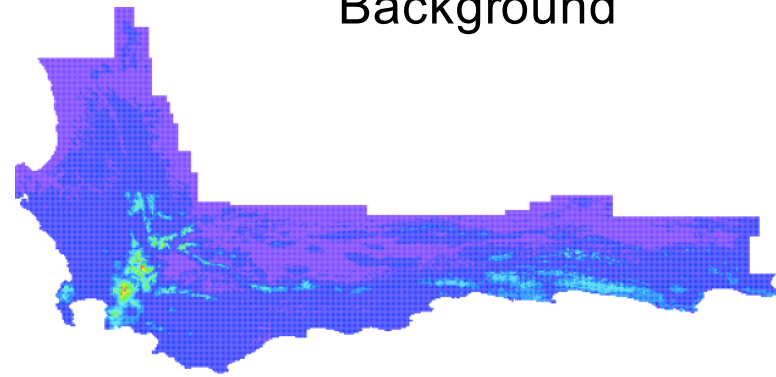


Presence vs Background

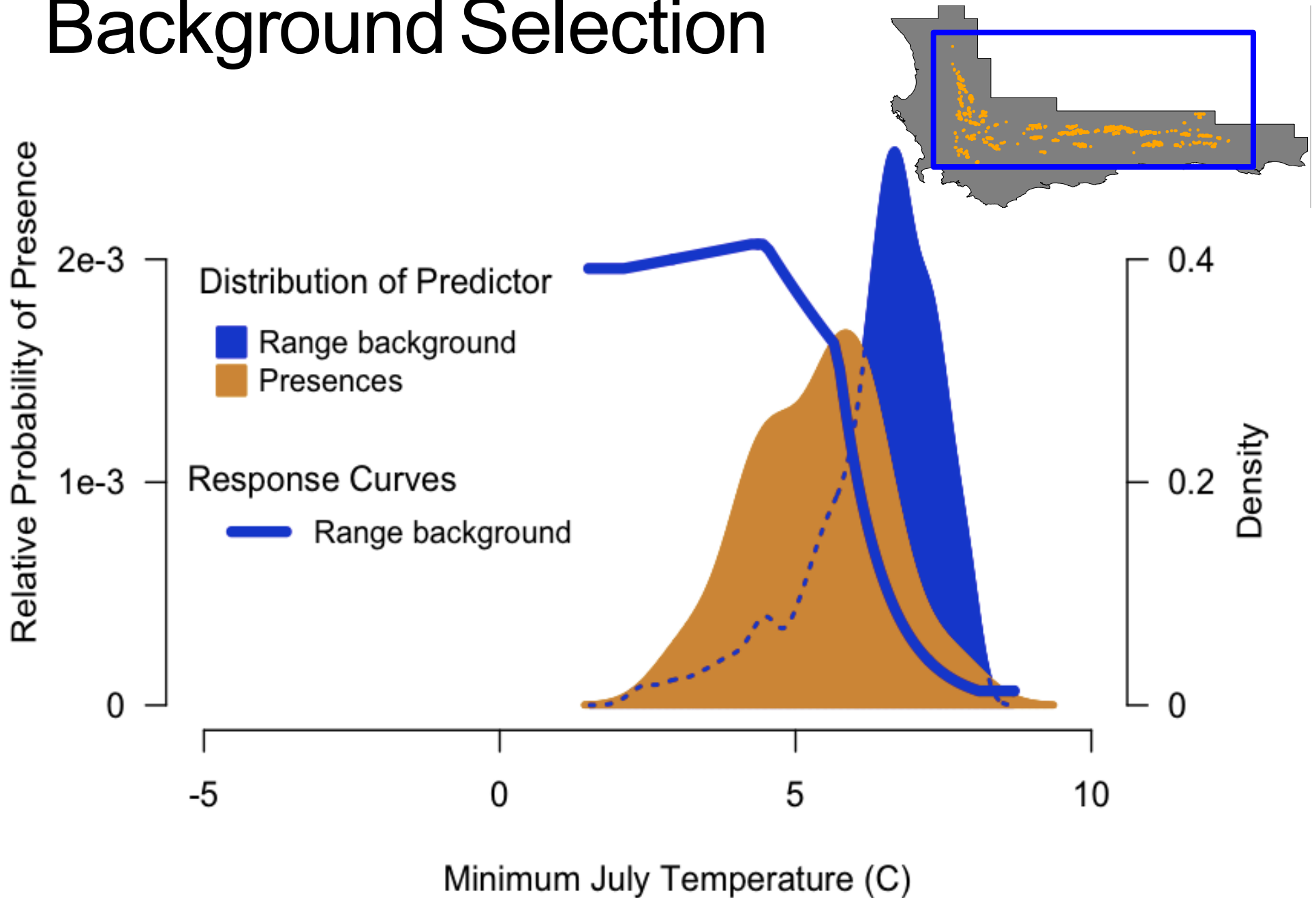
Presences



Background



Background Selection



Maxent's prediction

$$P^*(\mathbf{z}(x_i)) = \exp(\mathbf{z}(x_i)\boldsymbol{\lambda}) / \sum_i \exp(\mathbf{z}(x_i)\boldsymbol{\lambda})$$


Likelihood,
in case
anyone
asks...

$gain = \frac{1}{m} \sum_{i=1}^M \mathbf{z}(x_i) \lambda$
sum of predicted values at presence locations

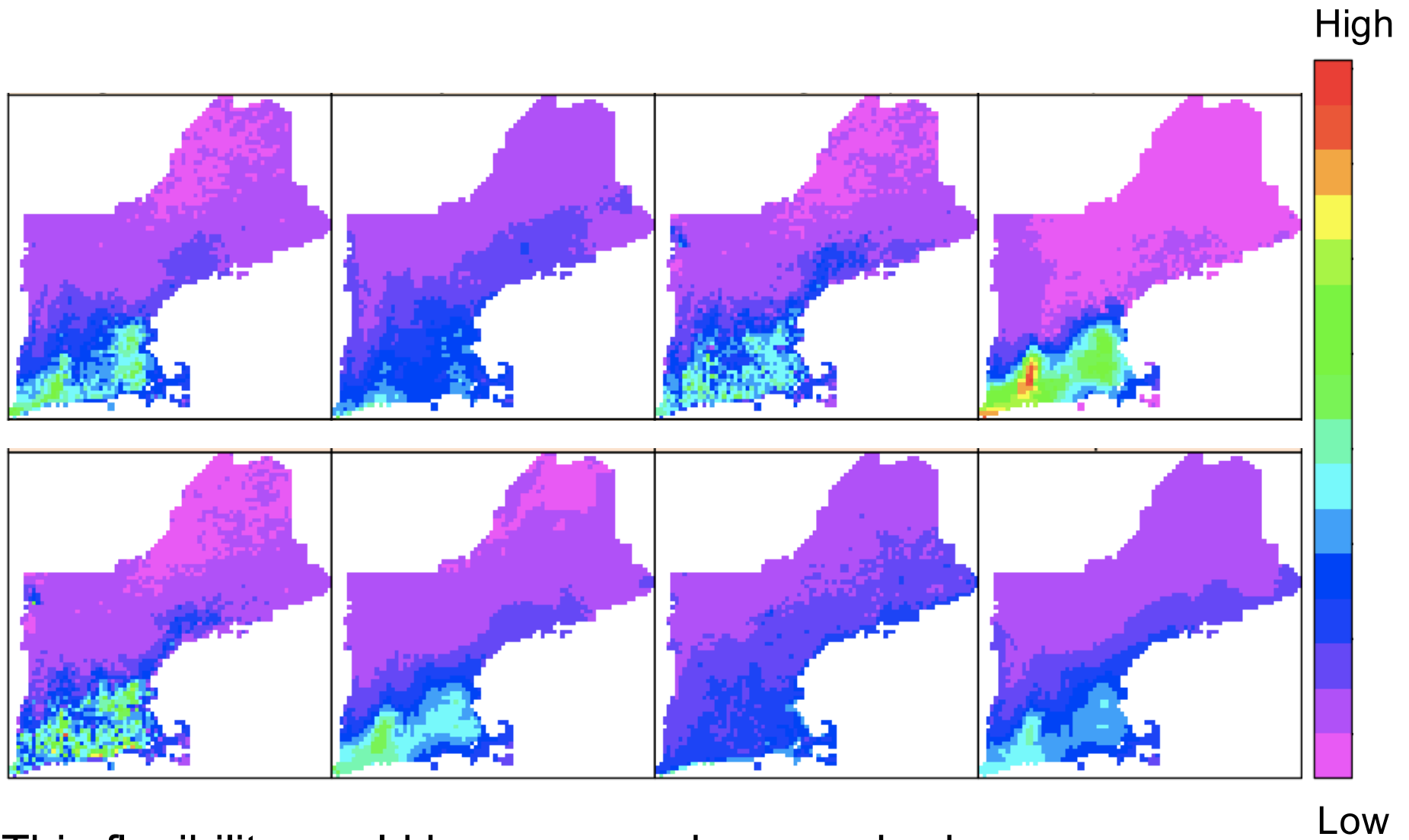
$-\log \sum_{i=1}^N Q(x_i) e^{\mathbf{z}(x_i) \lambda}$
sum of predicted values at background locations

$-\sum_{j=1}^J |\lambda_j| * \beta * \sqrt{s^2 [\mathbf{z}_j] / M}$
overfitting penalty

m should be M

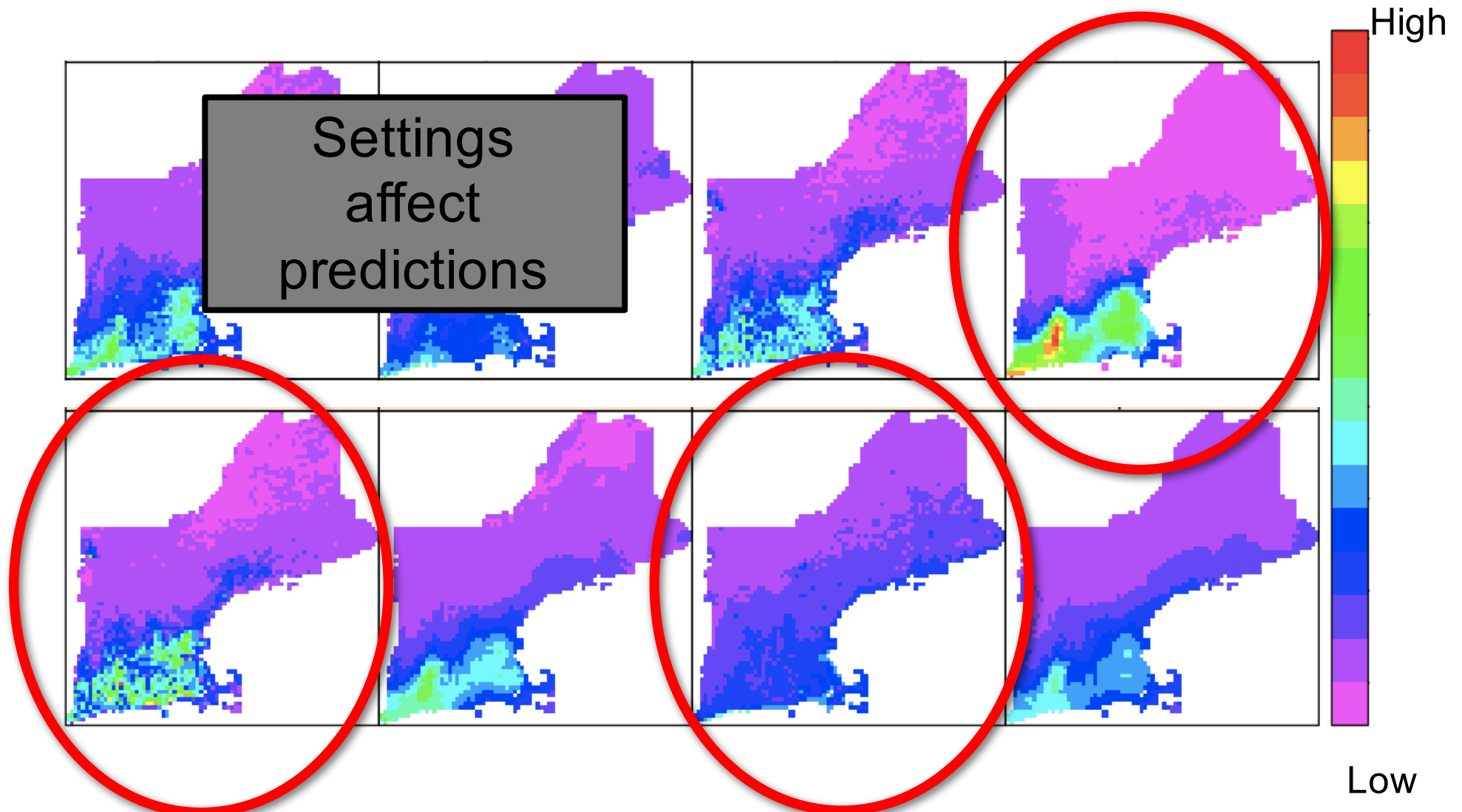


Variation in Predictions for Different Settings



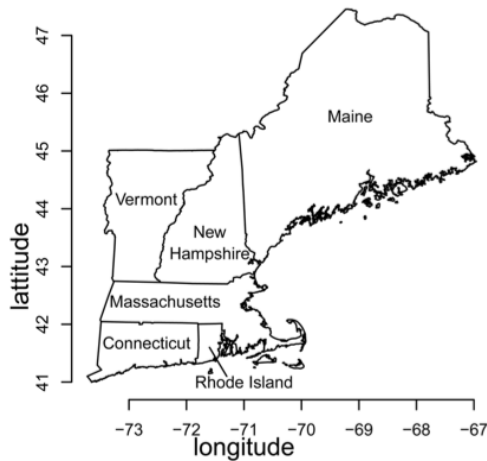
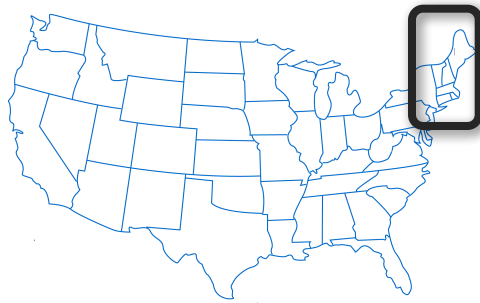
This flexibility could be very good or very bad....

Variation in Predictions for Different Settings



This flexibility could be very good or very bad....

Case Study – *Mustards*



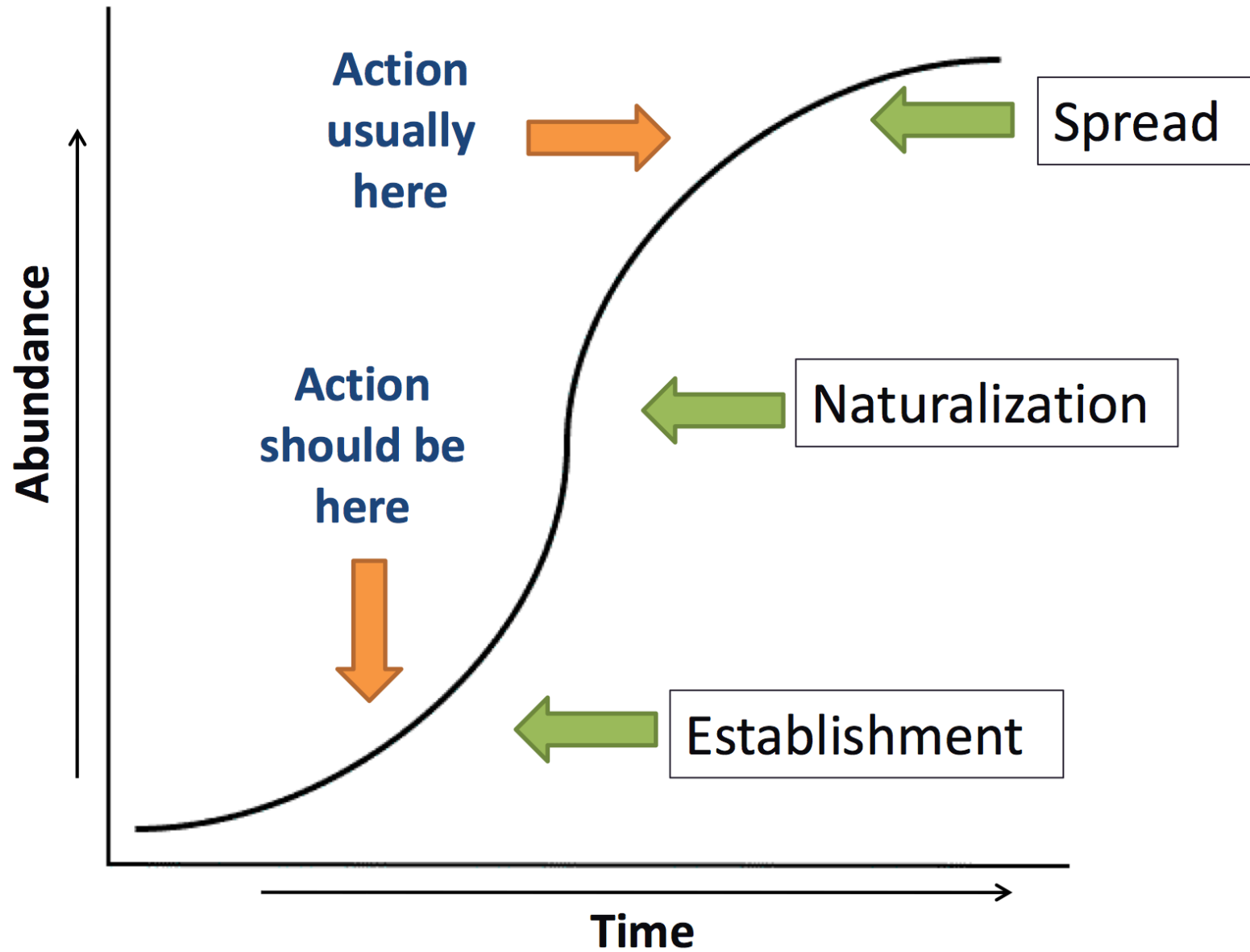
Invasive
Garlic Mustard
Alliaria petiolata



Native
Tower Mustard
Arabis glabra



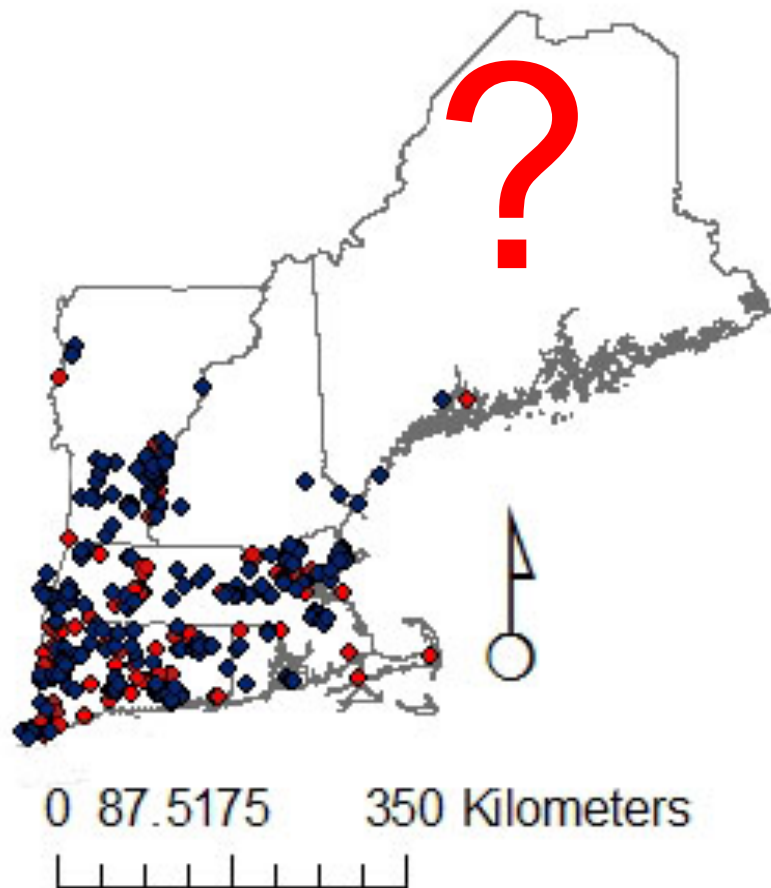
Invasion process



Invasions require extrapolation

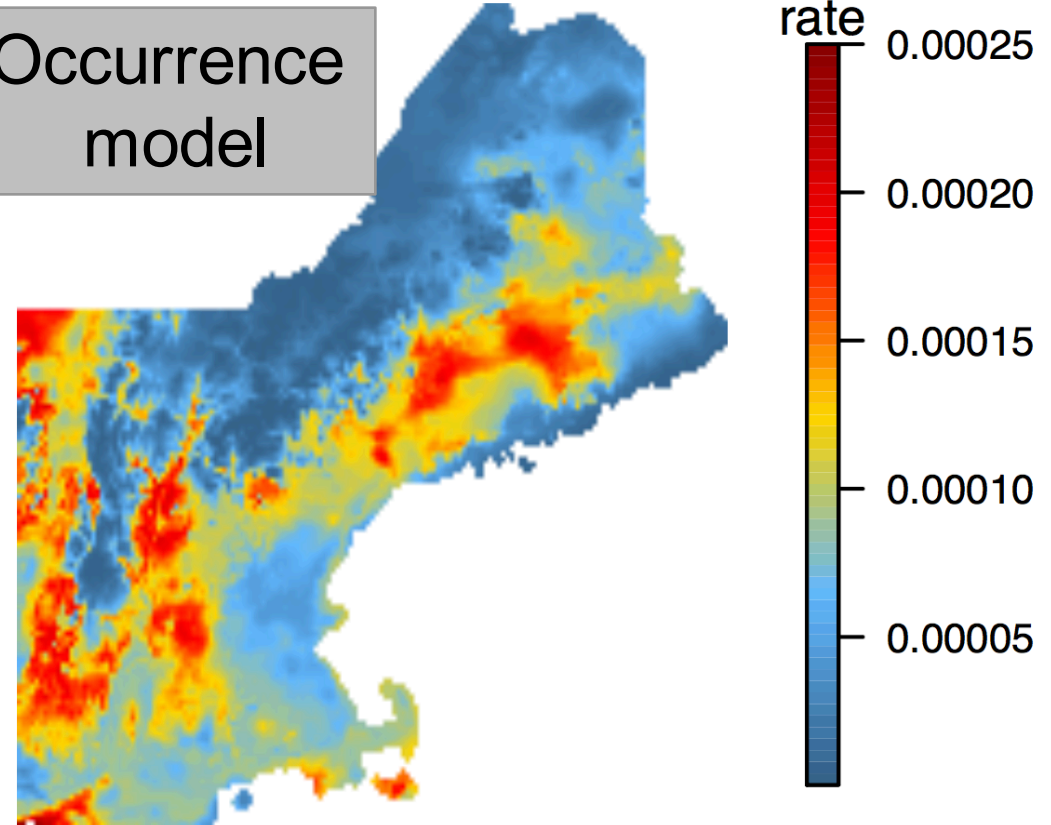


What we 'know' already...



A. petiolata

Occurrence
model



Merow, et al. PNAS, 2017

Objectives

Are uninvaded regions suitable?

How will climate change affect invasion?



Merow, et al. PNAS, 2017