

Species Distribution Models (in R)

Lab2

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Movement and Global Change

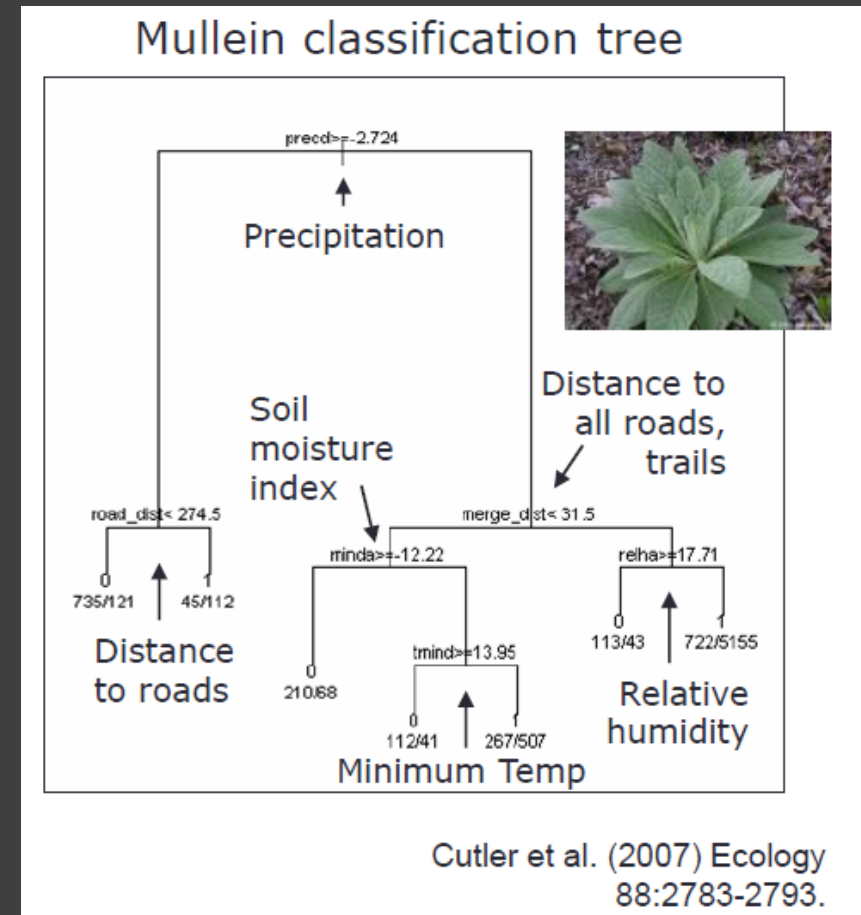
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Why do we model distributions...

- Portray underlying relationships between species and ecological factors/processes
- Explanation
- Prediction

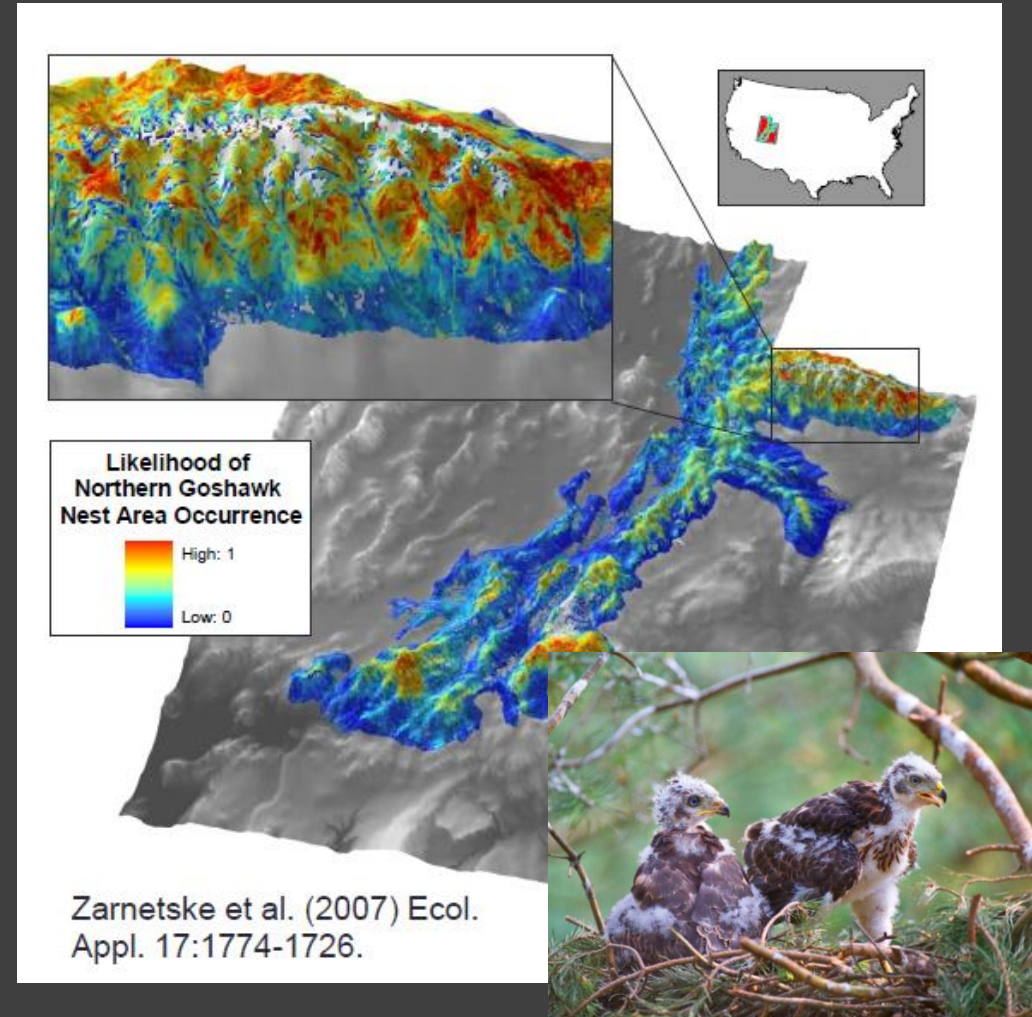
Some applications of SDMs

- Predict locations of plant invasion (Lava Beds Ntnl. Park, USA)



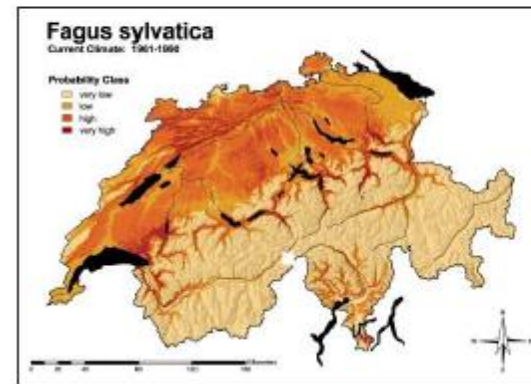
Some applications of SDMs

- Expected nesting habitat for northern goshawk



Some applications of SDMs

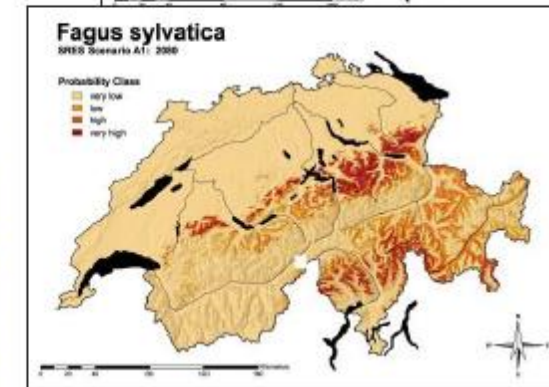
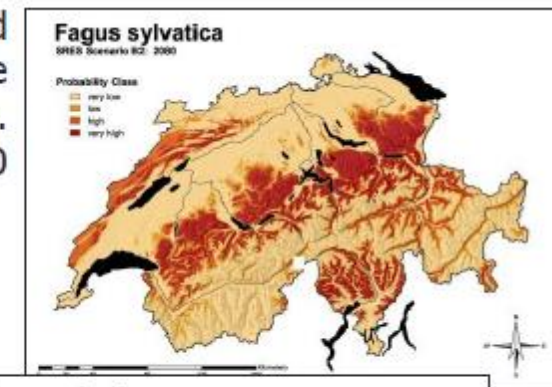
- Project to future distribution associated with climate change



Current distribution
of European beech
ca.2000



Best and
worse case
distributions.
2080



Courtesy: N. Zimmermann,
WSL & Zurich ETH, Switzerland

SDMs: comparisons with similar ideas...

- Resource selection models/functions (RSM/RSF)
 - Defined by characteristics measured on 'resource units'
 - Values of 'resource units' are proportional to probability of being used
 - Focus on 'habitat use'
 - Typically repeat sampling of individuals

Resources:

Manly et al. 'Resource selection by animals'

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 - Relationship with biotic/abiotic predictors
 - Predictors for detection process
 - Hierarchical modeling based on particular sampling design
 - Not always spatial depiction

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'Estimating site occupancy rates when detection probabilities are less than one'

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- *Blended* SDMs?

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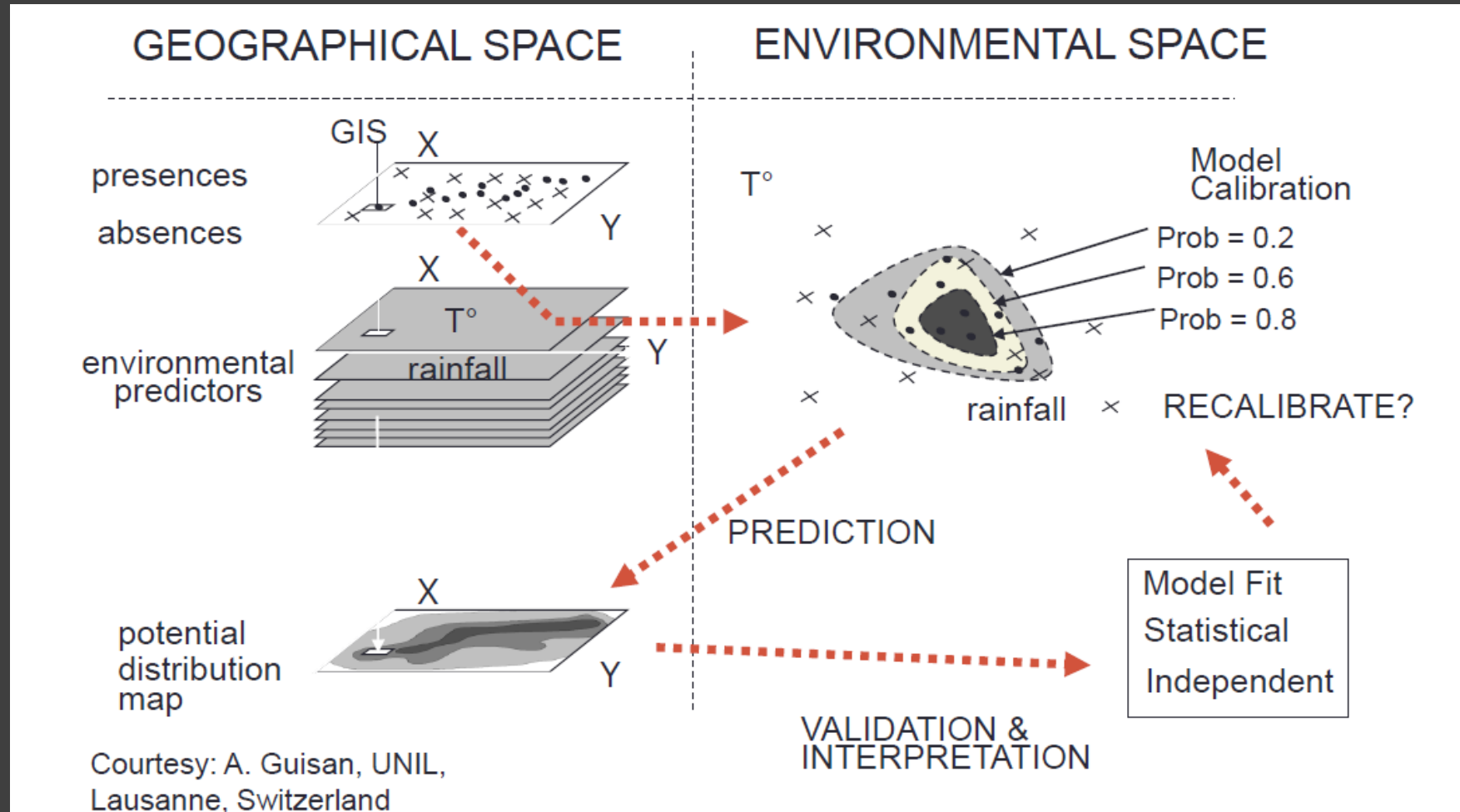
'Estimating site occupancy rates when detection probabilities are less than one'

Kery et al. 'Predicting species distributions from checklist data using site-occupancy models'

Typical SDM construction

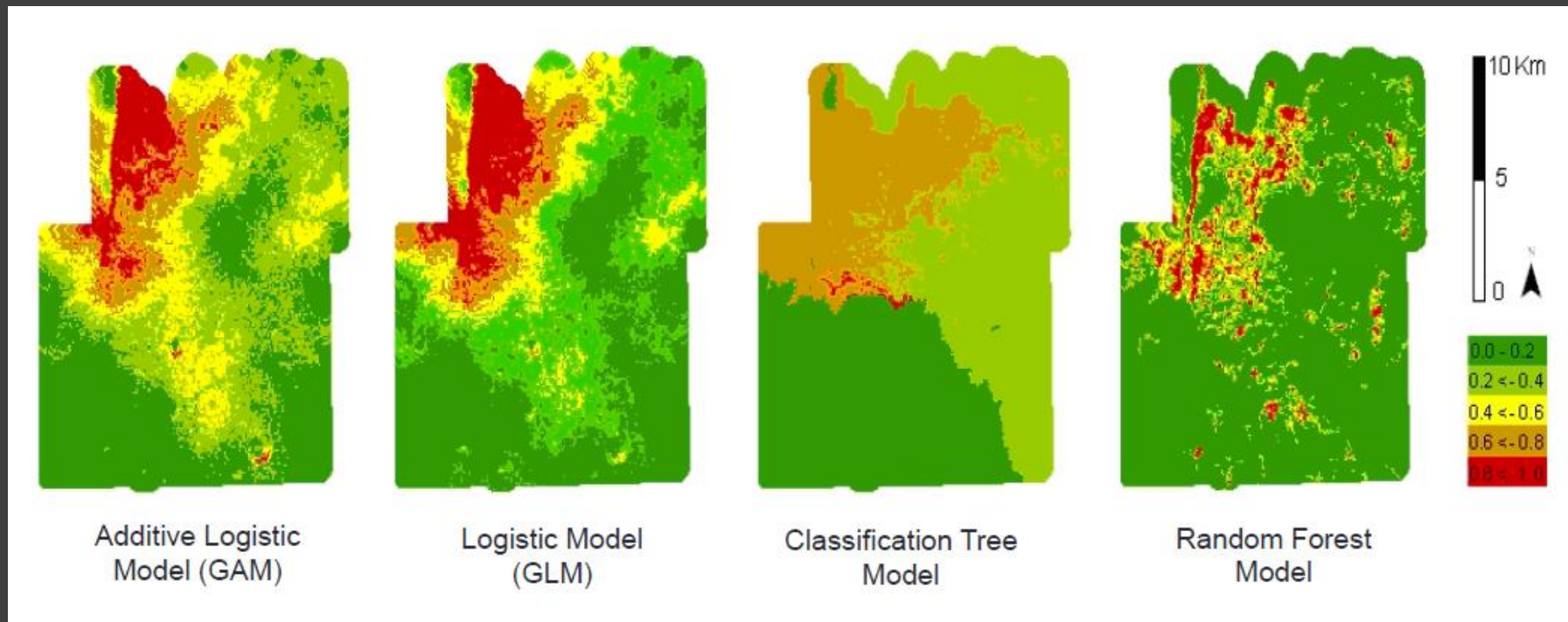
1. Agree on question to be addressed
2. Survey species
3. Link species with predictors
4. Encode relationships as statistical model
5. Validate model
6. Make inference!

Typical SDM construction- link species with predictors

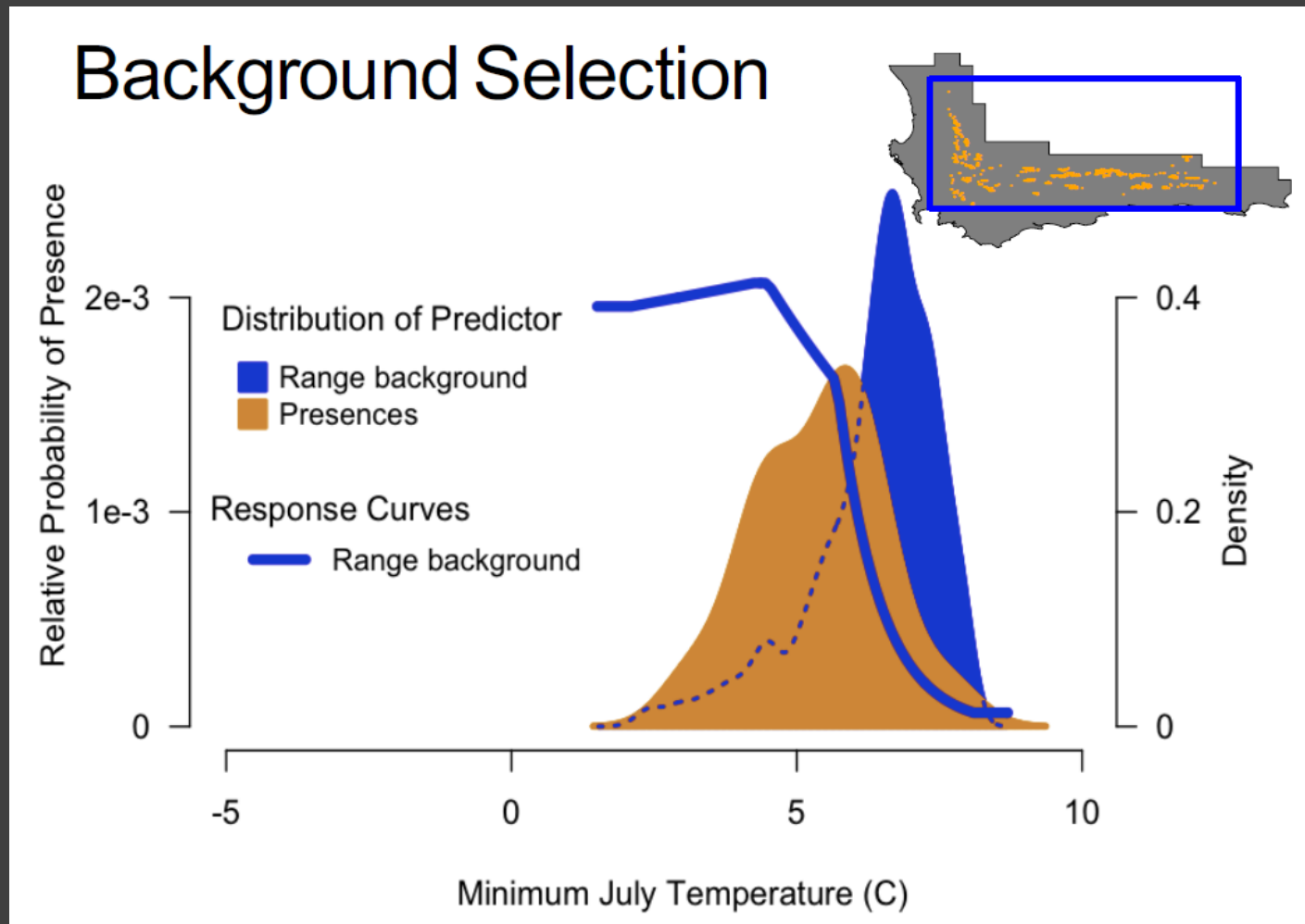


Typical SDM construction- encode as statistical model

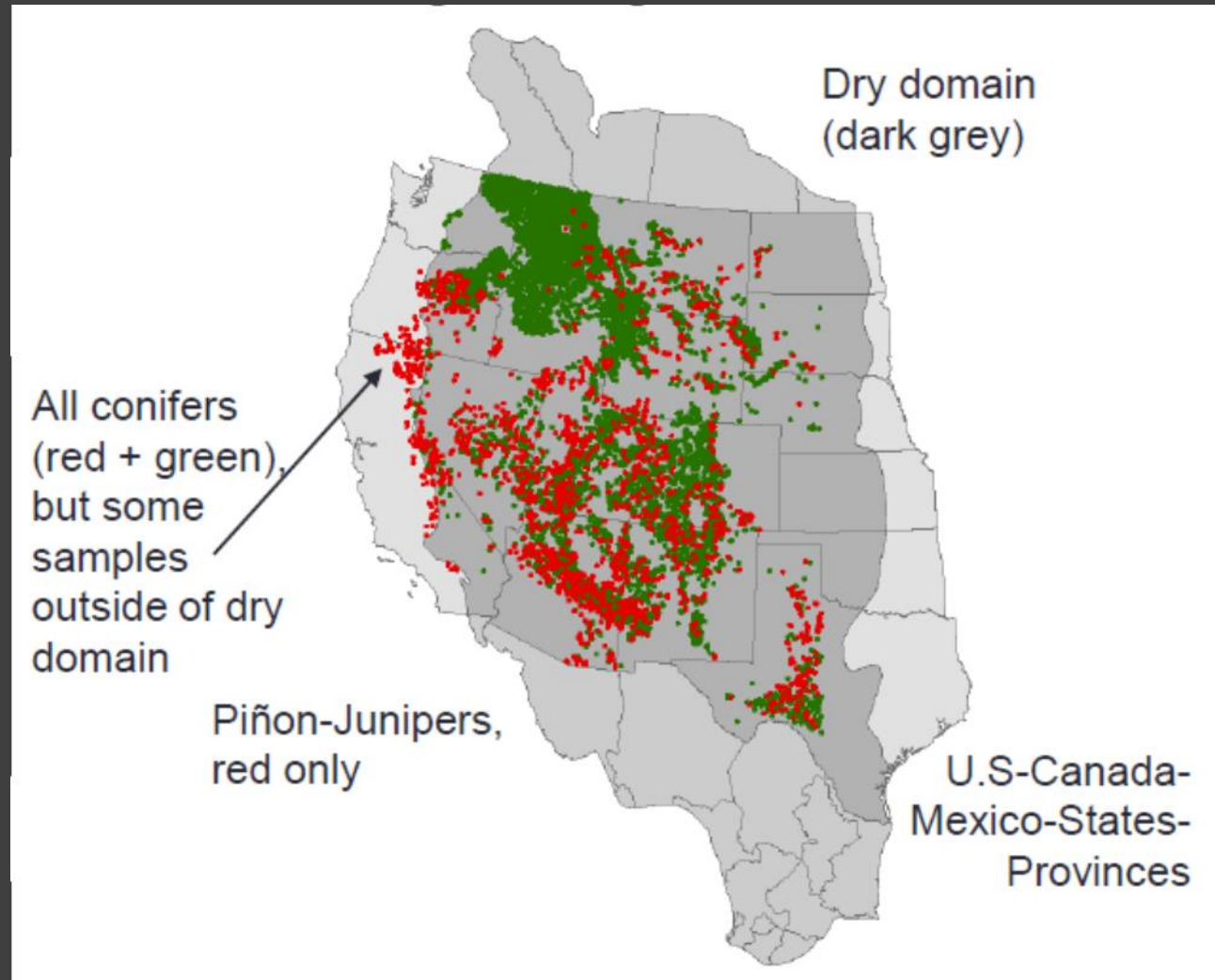
- Presence only data
- Presence/Background data
- Presence/Absence data



Typical SDM construction- presence-background digression



Typical SDM construction- presence-background digression



Typical SDM construction- validation

- (at least) 3 'kinds' of model validation

Typical SDM construction- validation

- (at least) 3 'kinds' of model validation
 - Internal, in-sample
 - Internal, cross-validation
 - External

Start distribution modeling!