A GIS and object oriented classification application to the problem of scaling ecological patterns and processes

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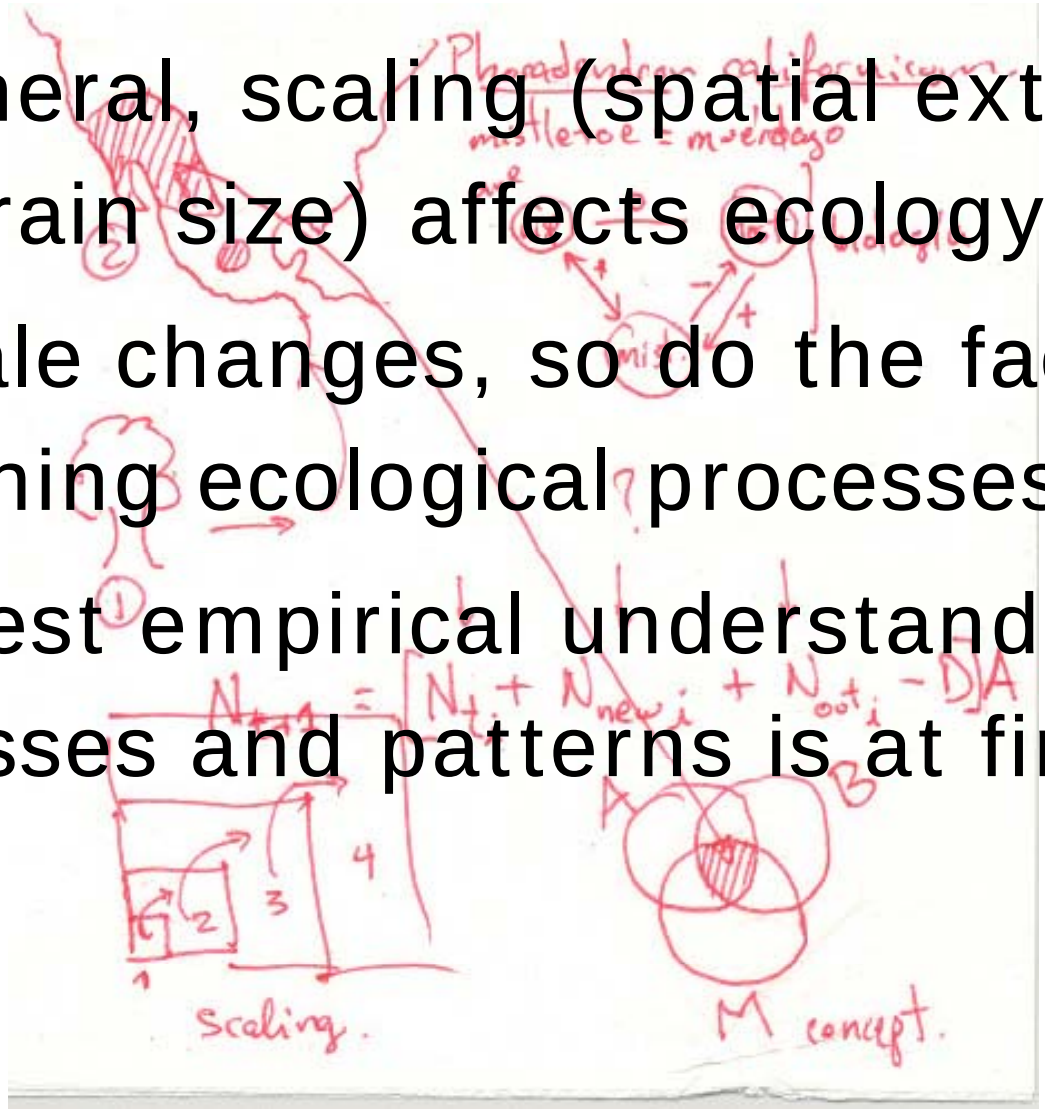
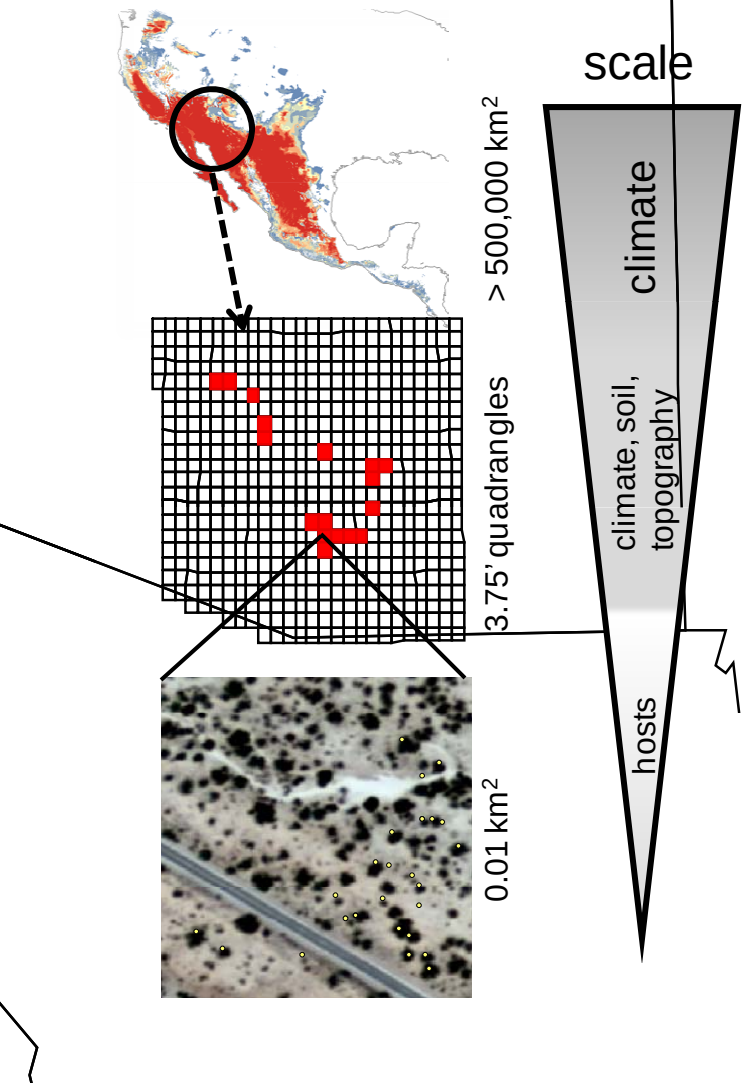
Today's tour

- In general, scaling (spatial extent and grain size) affects ecology
- As scale changes, so do the factors governing ecological processes
- Our best empirical understanding of processes and patterns is at fine scales



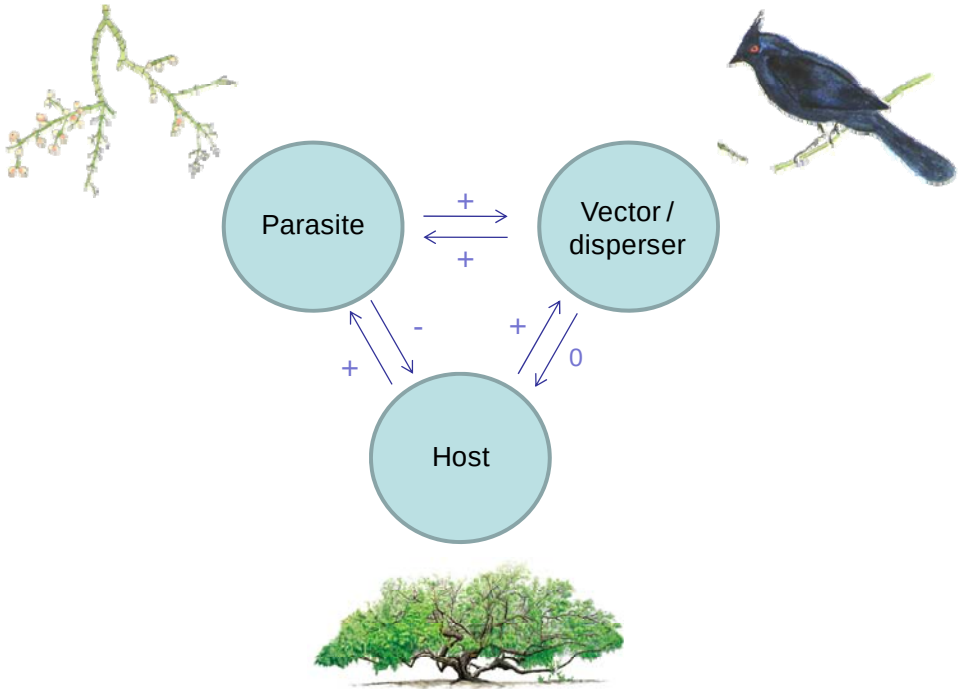
Problem



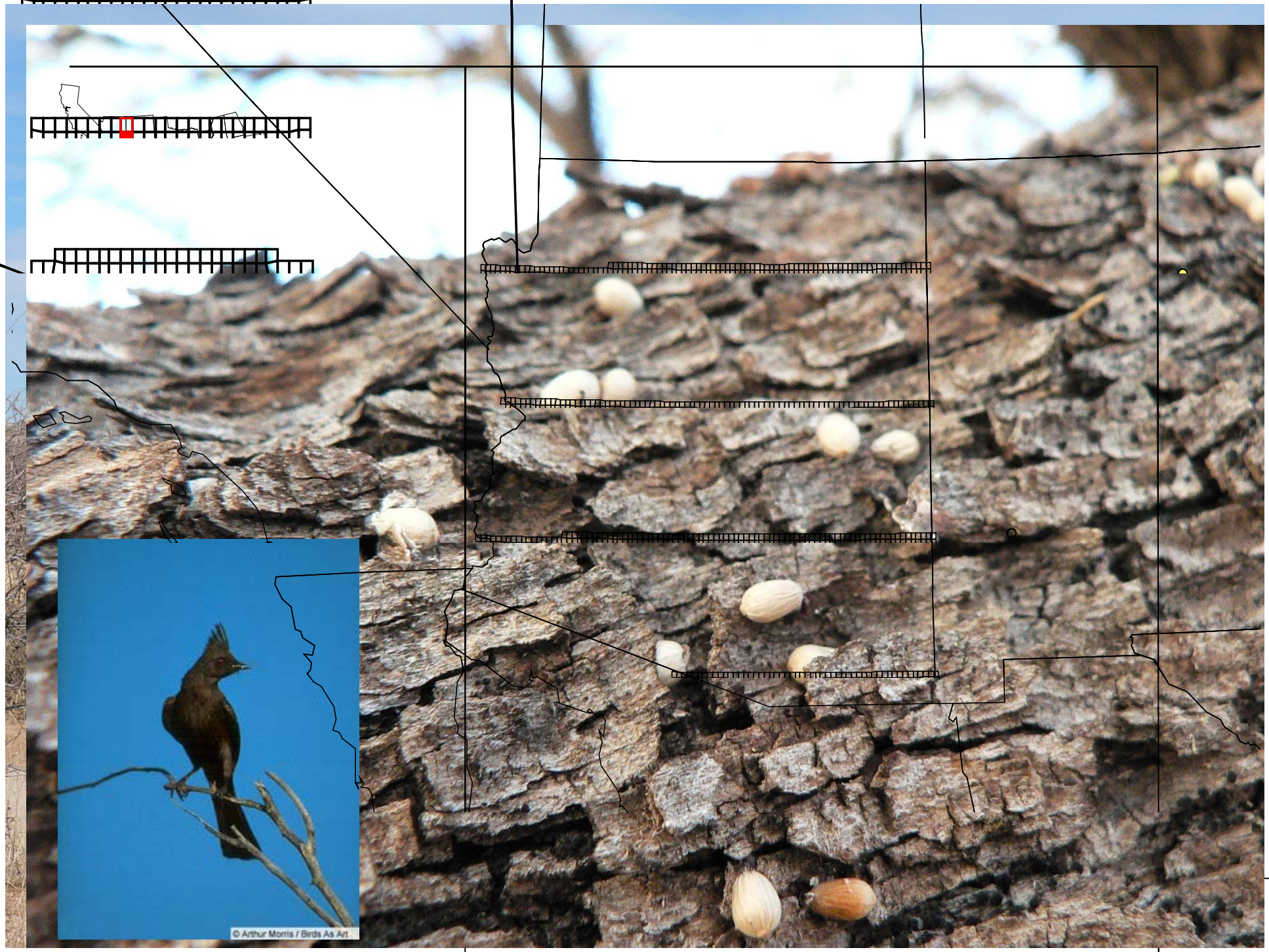
1. How does scaling affect the factors that determine the **area of distribution** of a species?
2. What are the ecological implications of those changes?
3. Moving from a correlative (ENM) approach to a mechanistic (processes-based) approach.

Approach – Mistletoe system

- Field work / GIS and remote sensing
- Statistical (spatially explicit) modeling
- Population ecology modeling
- Experiments



- Natural history
- Manipulable
- “Easy” to observe
- Modelable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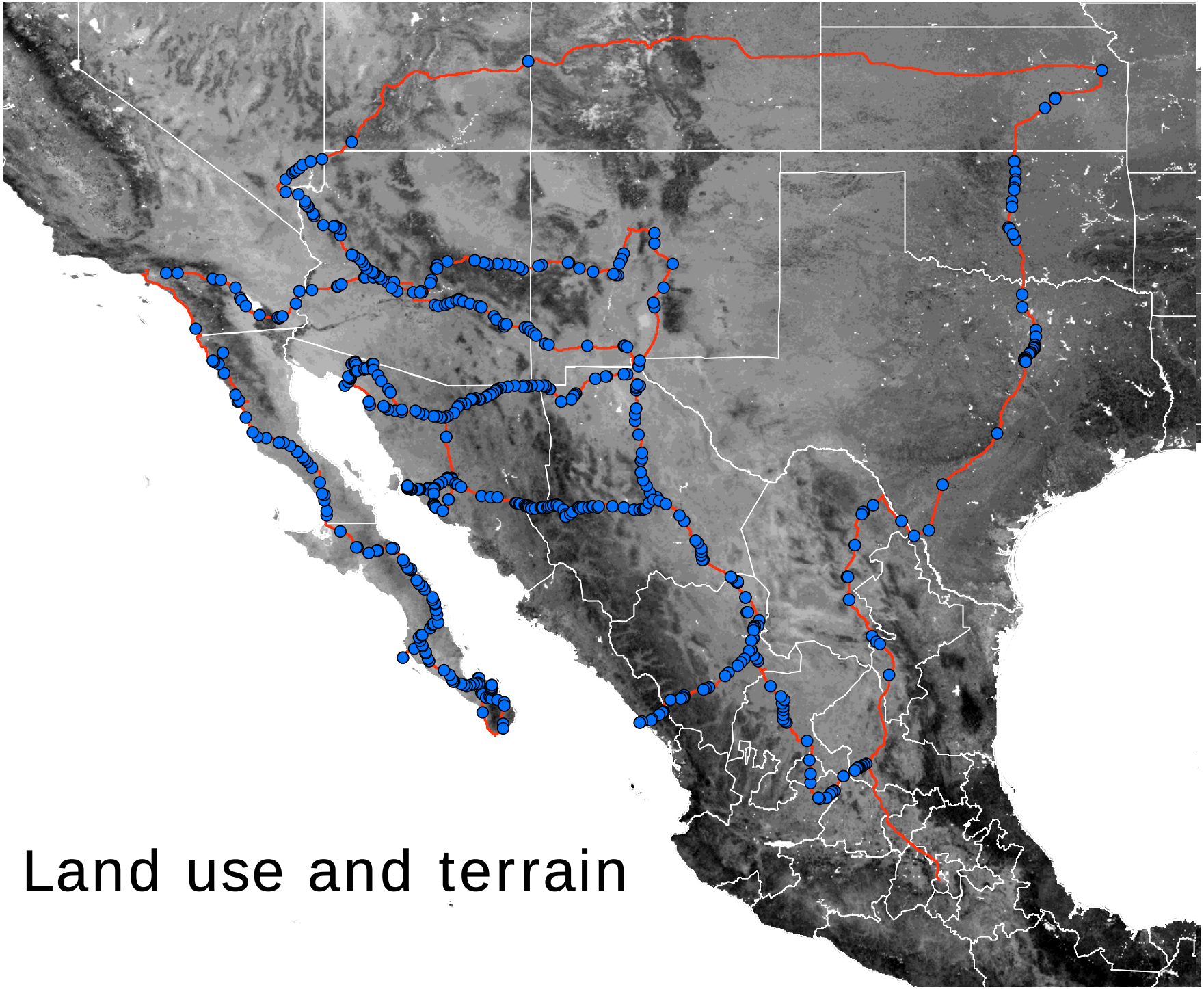
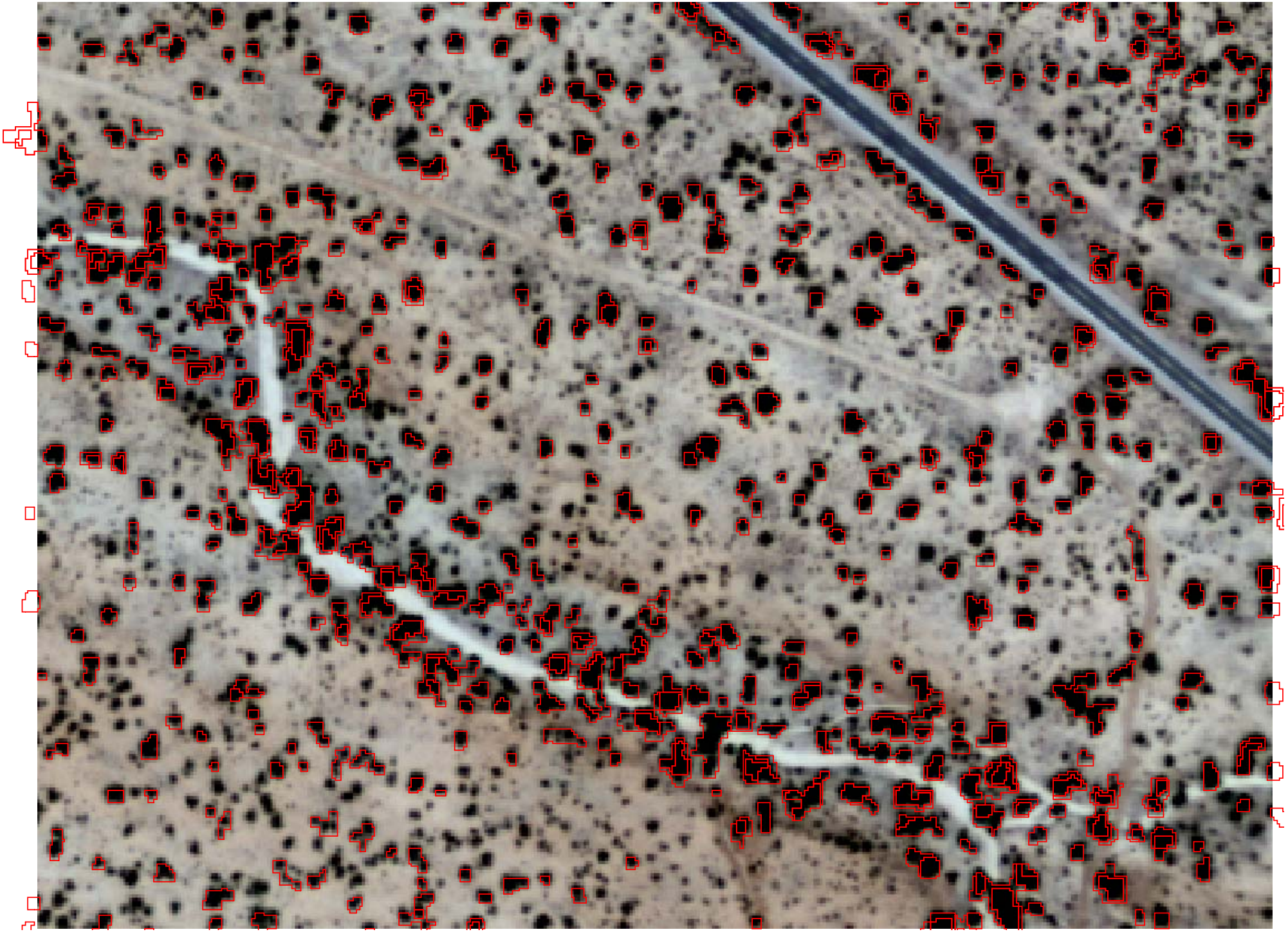
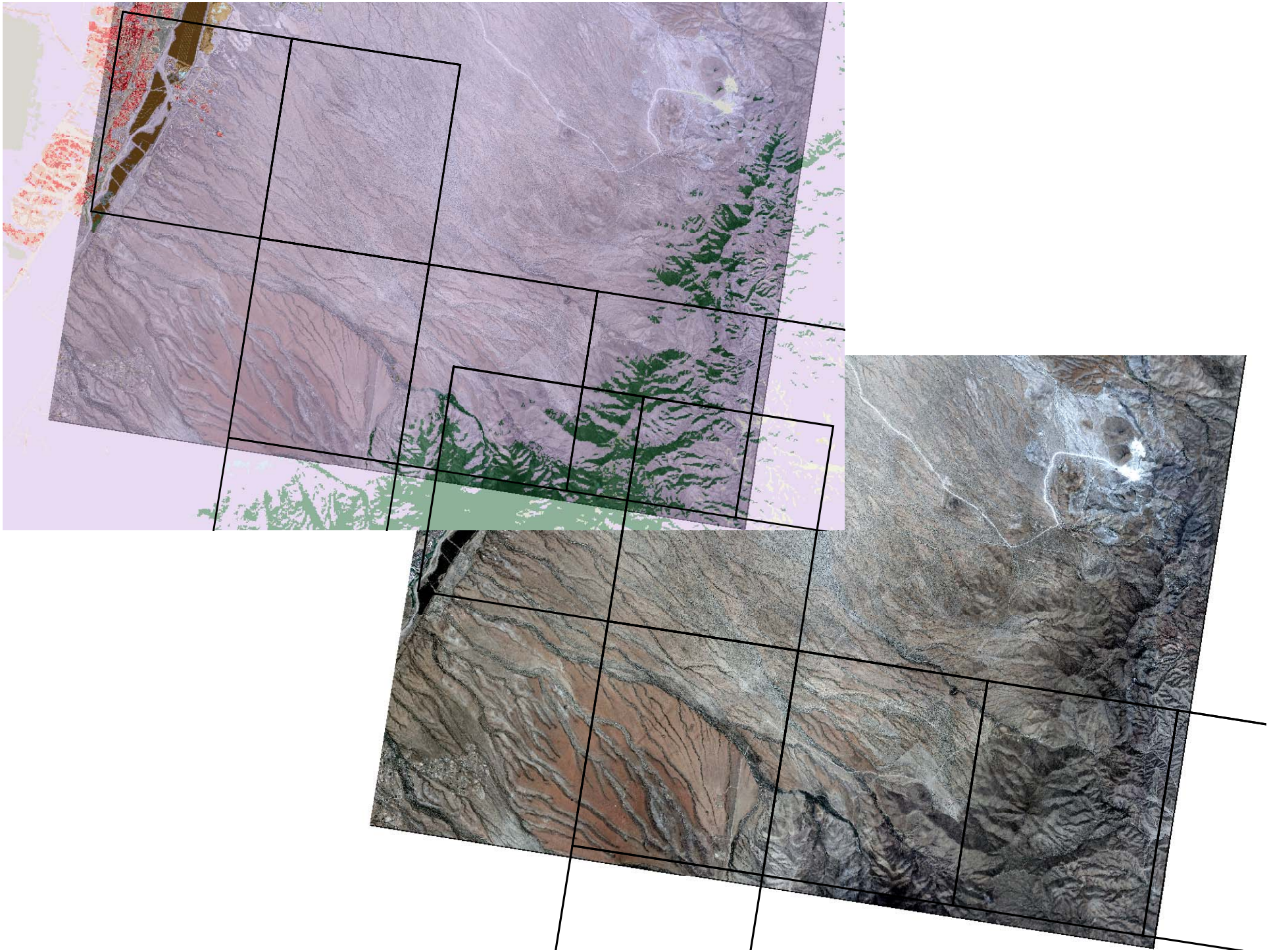
Methods

- Details on field work / remote sensing / modeling
  - trip to southeast United States and Northwest Mexico
  - > 22,200 GPS coordinates on mistletoes, > 6 host species
  - 653 land marks
  - > 20 species collected at 129 localities
  - > 60 aerial photographs NAIP (within the US only), agricultural growing season (~11 km^2 each; RGB and NIR at 1 m ground pixel resolution)
  - NDVI and SAVI in ERDAS Imagine 9.2
  - Object oriented classification (eCognition 3) to extract exact location of host trees
  - Model the probability of presence using a metapopulation framework

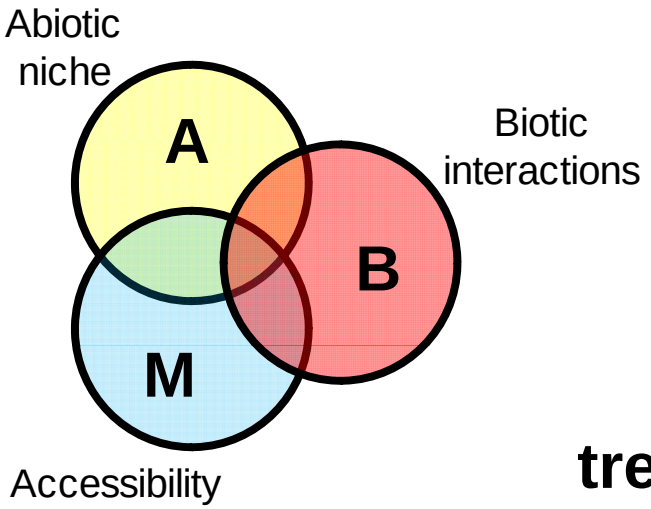


Land use and terrain





Process based modeling

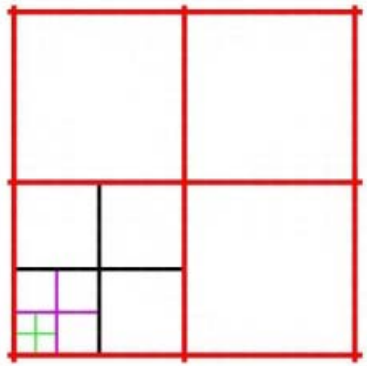


$$p_j = \frac{c_j}{c_j + e_j}$$

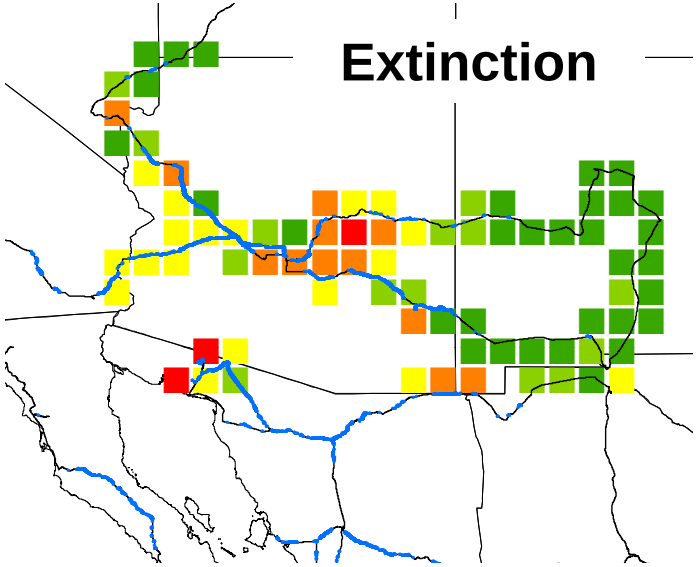
tree

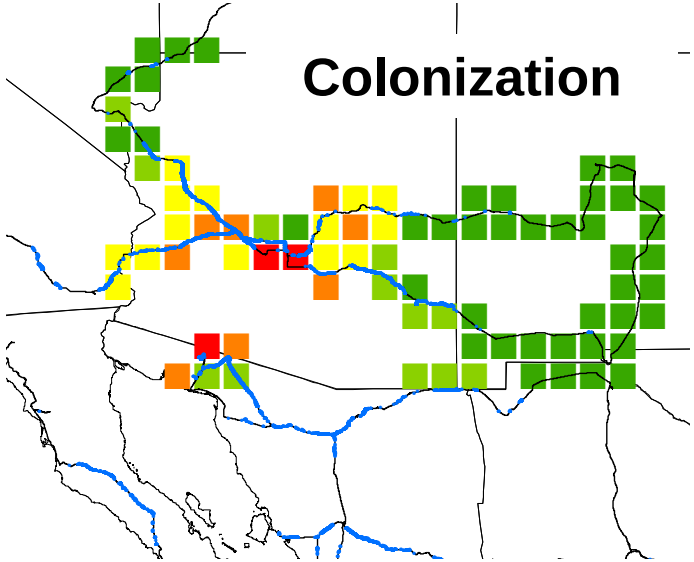
$$p_j = \frac{c_j}{c_j + e_j}$$

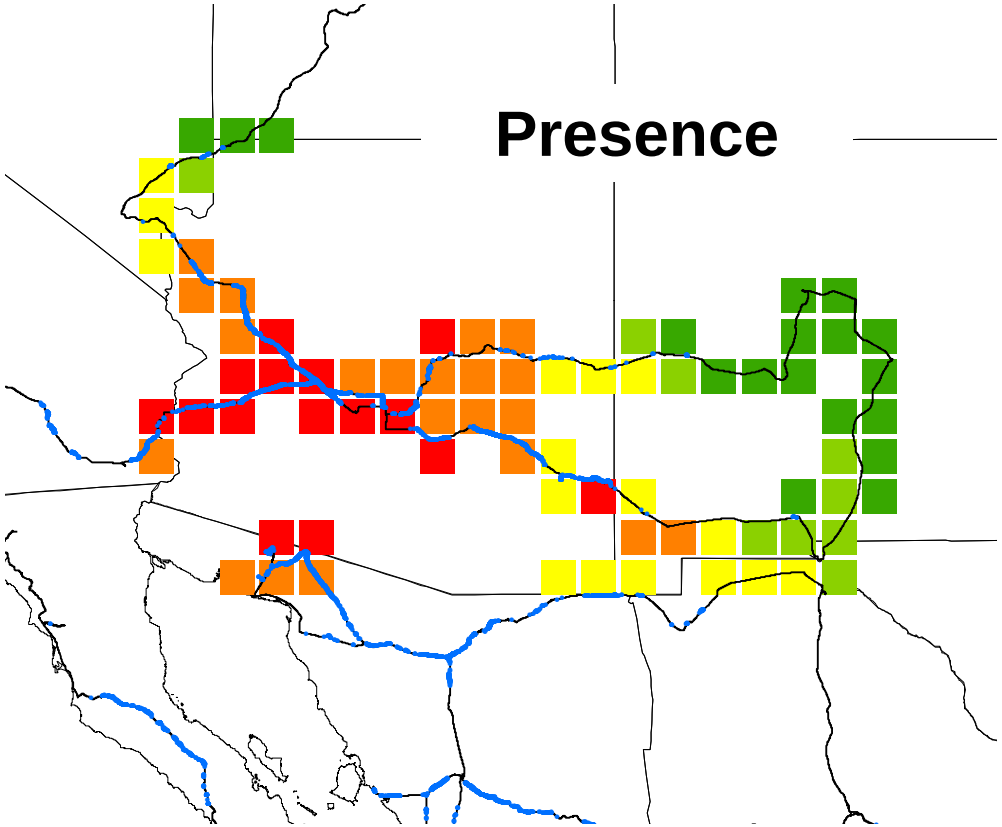
sampling plot



Preliminary results







$$p_j = \frac{c_j}{c_j + e_j}$$

Next steps

- Extend image classification to different parts of the extent
- Conclude first process-based modeling and compare with correlative methods
- Test predictions in the field


Thank you!
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