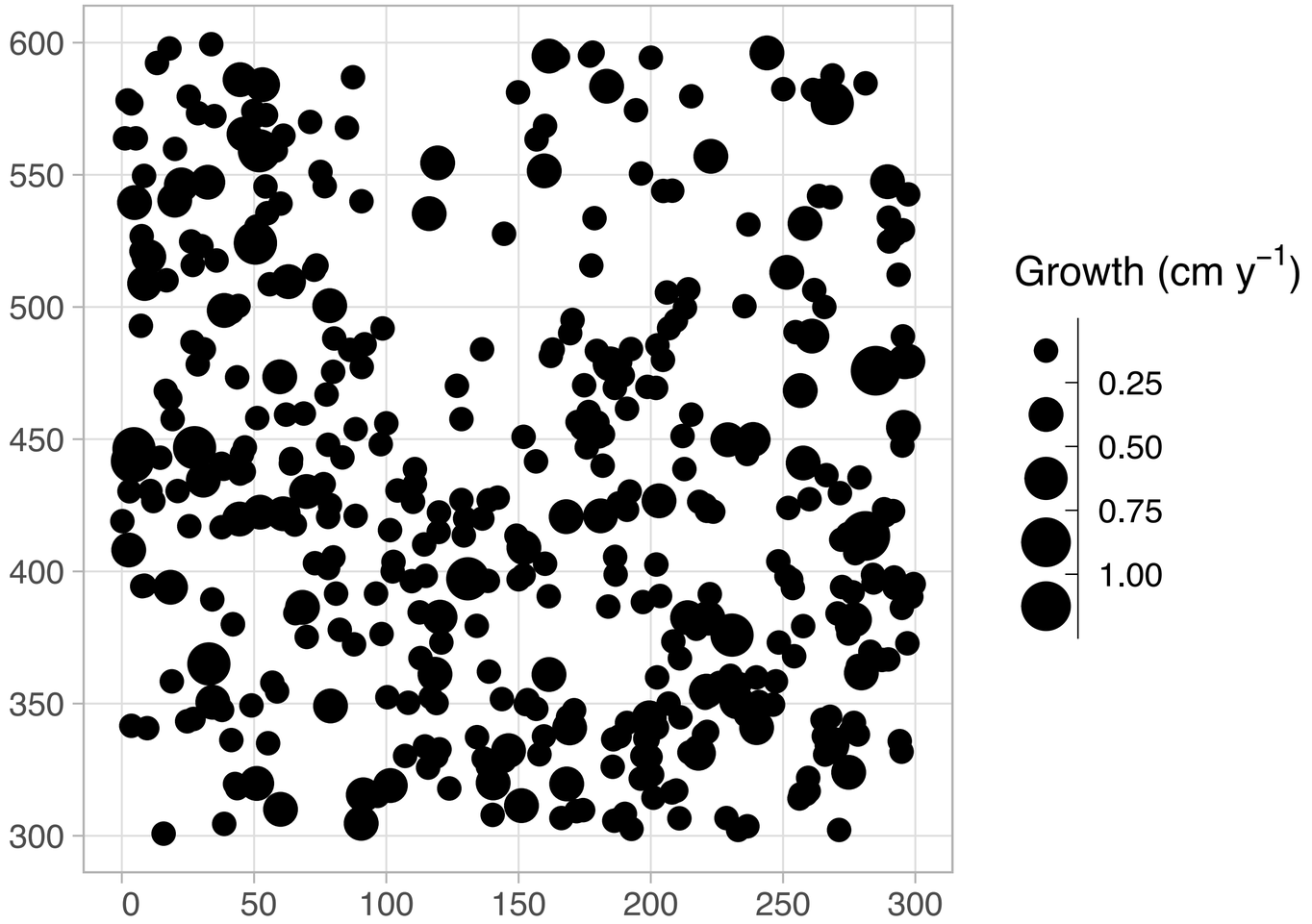
Fitting and assessing models of interspecies competitive effects on the growth of trees with the `forestecology` R package

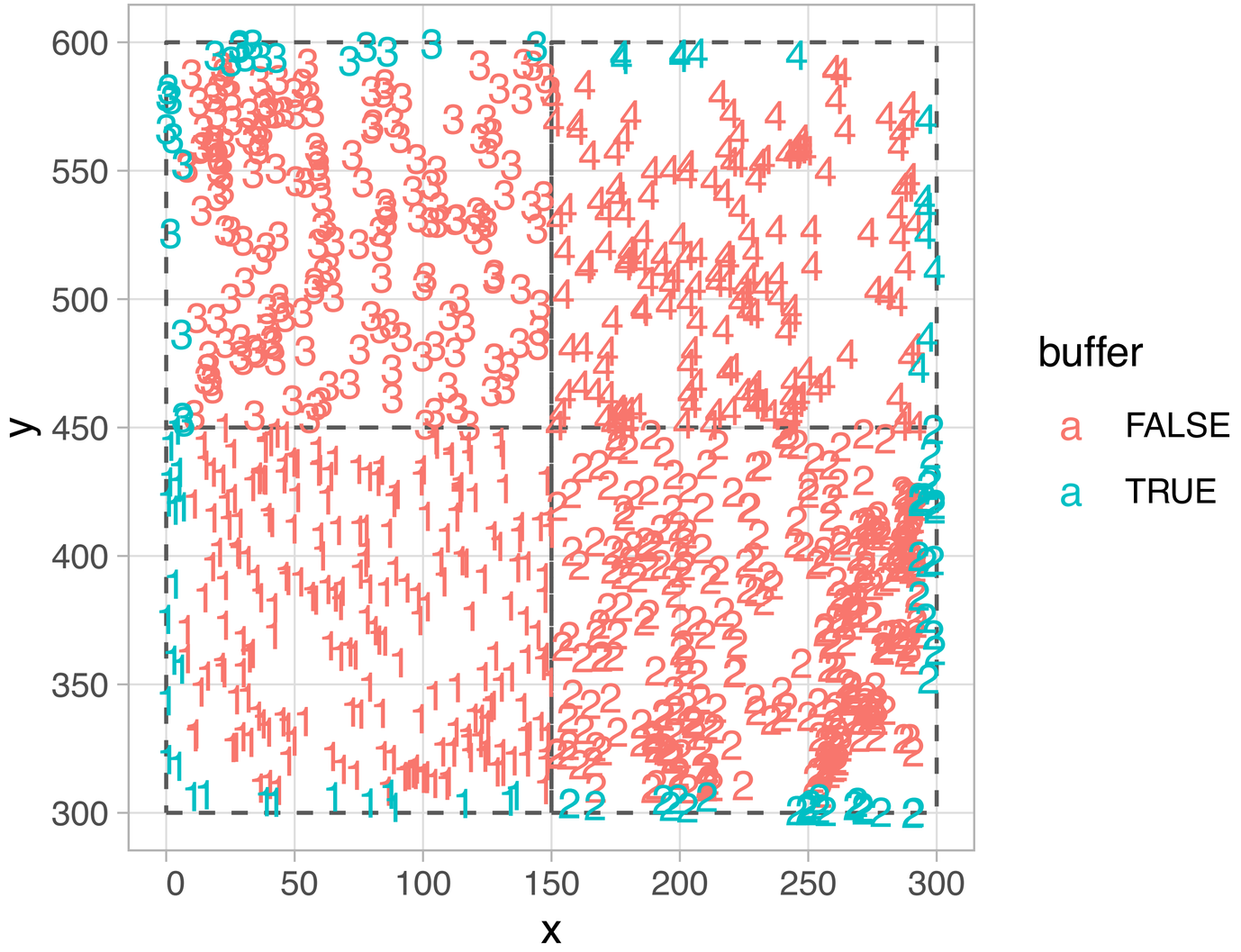
Albert Y. Kim - Smith College
David Allen - Middlebury College
Simon P. Couch - Reed College

Ecological Society of America Annual Meeting 2021
August 4th, 2021

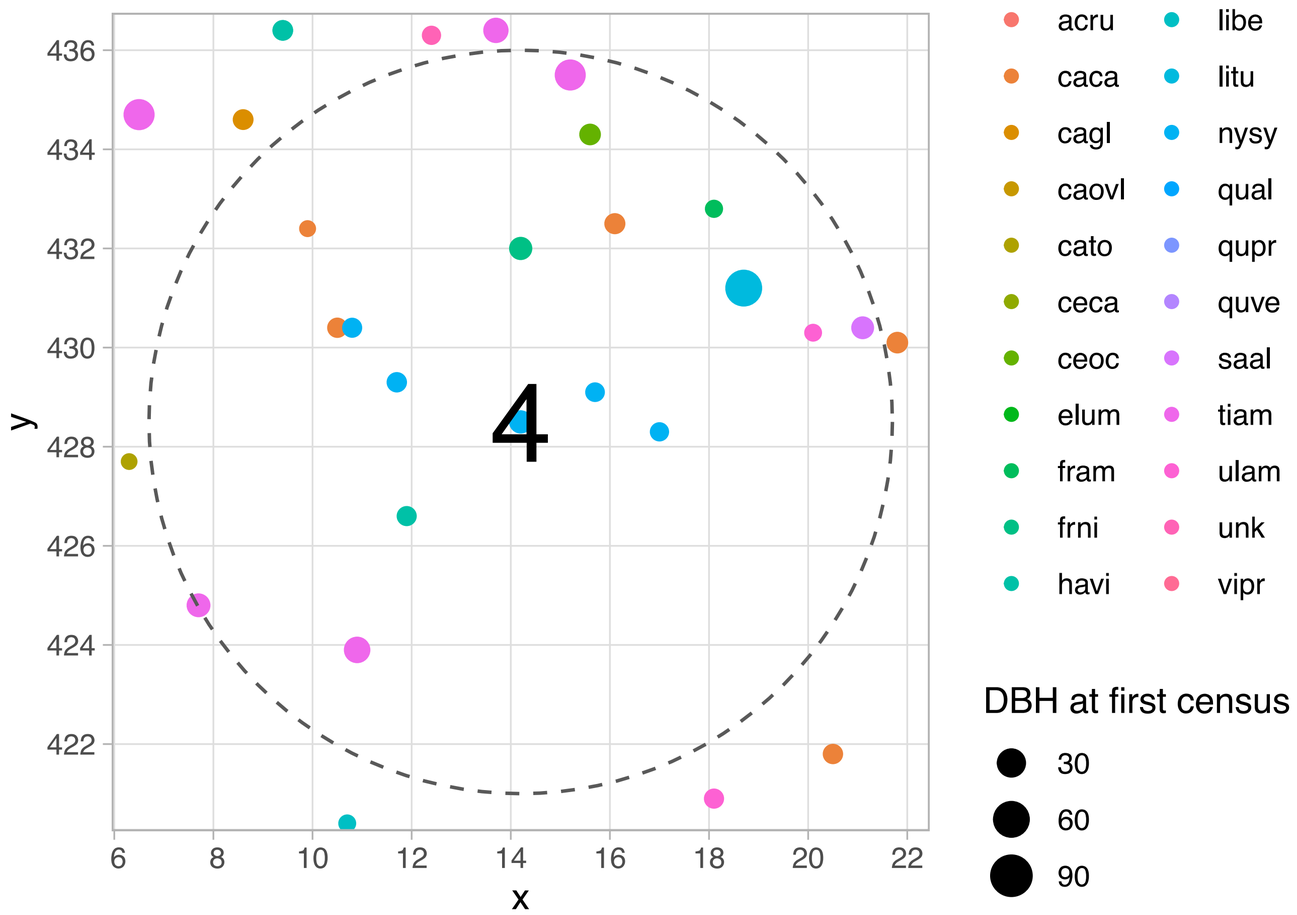
Step 1: Compute tree growth based on census data



Step 2: Add spatial information



Step 3: Identify all focal & competitor trees



Step 4: Fit model

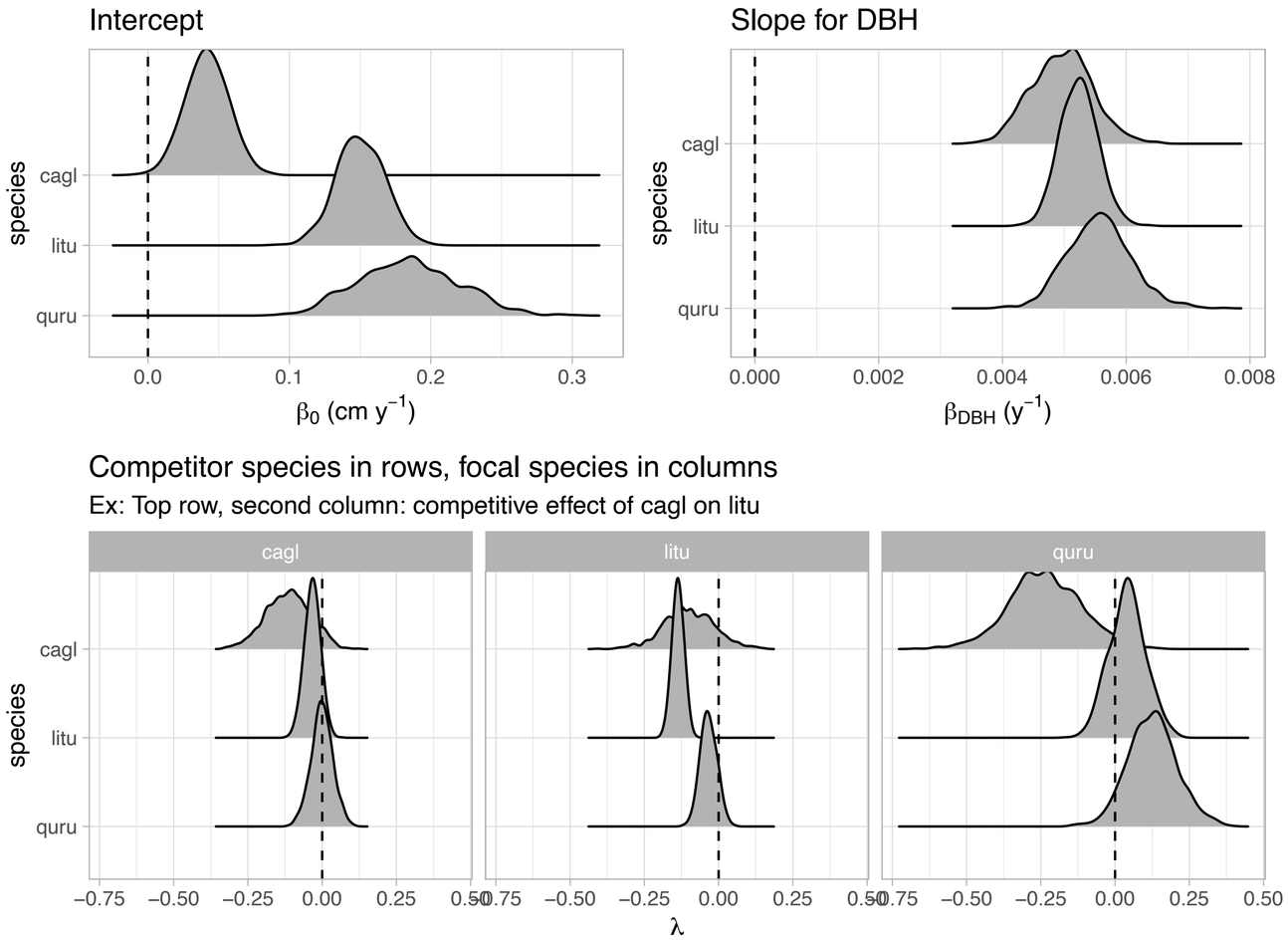
$$y_{ij} = \beta_{0,j} + \beta_{\text{dbh},j} \cdot \text{dbh}_{ij} + \sum_{k=1}^{K} \lambda_{jk} \cdot \text{BA}_{ijk} + \epsilon_{ij}$$

In this case, Bayesian linear regression model where:

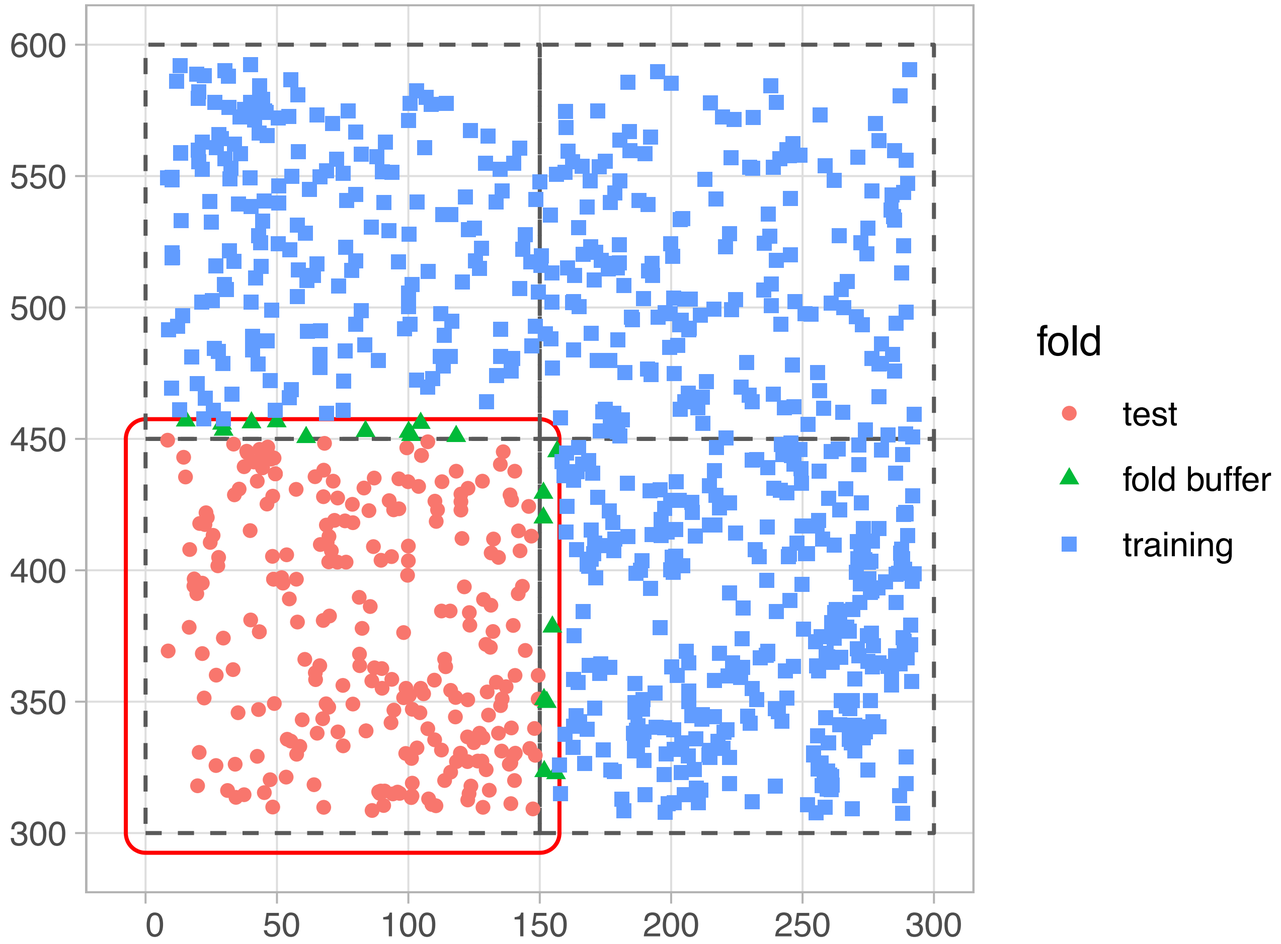
- y_{ij} - growth of tree i of species j
- β_0 - baseline growth
- $\beta_{dbh,j}$ - slope for starting dbh
- λ_{jk} - coefficient of competitive effect of species k on species j
- BA_{ijk} - sum of basal area of all competitor species k
- ϵ_{ij} - error term

More details in Allen (2020) PLOS One
“A permutation test and spatial cross-validation approach to assess models of interspecific competition between trees”
https://doi.org/10.1371/journal.pone.0229930

Step 5: Inspect results



Step 6: Validate model with spatial crossvalidation



More information

- Package source code: github.com/rudeboybert/forestecology
- Preprint: bit.ly/forestecology_preprint