* How does the dynamic probability of occupancy () of county *j* change over space and time?
* Does the probability of detection change over time?
* What is the appropriate data source to use for “absences”?
* What is the appropriate temporal scale?

“Absence” source: All Tracheophytes (leave off collector-specific models), Tracheophytes collected by known collectors of Anacardiaceae, Anacardiaceae

“Presence” source: Only records with coordinates (to be able to compare “improvement” of model fit by adding in “messy” records), all records scaled up to county-level identification, hybrid data: some records kept at coordinate level, others at county-level

Test multiple models:

|  |  |
| --- | --- |
| **Covariates:** | **Covariates:** |
| County area: larger area = more area to occupy, increased probability of occupancy | County area: spatial variation in abundance induces variability in detection probability |
| Occupancy status of neighbors: more occupied neighbors means higher probability of being occupied | Collector covariates: (number of previous collections), random effect,  Probability of multiple collections declines with time? |
| Year (random effect)? Time since introduction?:  Due to allee effects, populations may struggle when rare. Time since introduction is a proxy for having enough time to build-up sufficient population size to expand? | Year (random effect, time since “invasive”)  Are collectors more likely to be looking out for invasives later on in the invasion process? |
| Environmental covariates: min temperature in county, # days below freezing, precipitation (which metric to use though)  Negative relationship between freezing and occupancy | Collector type: (Botanist, citizen-scientist)  Type of collector (professional botanist vs citizen scientist) might influence how |
|  | Spatial resolution: county level, or coordinates |
|  | Spatially structured random effects (from Bled et al. 2014): variability in detection probability induced by spatial variation in abundance |

Validating models:

Blocking factors: county, year, collector type,