Agriculture, Biodiversity & Ecosystem Services

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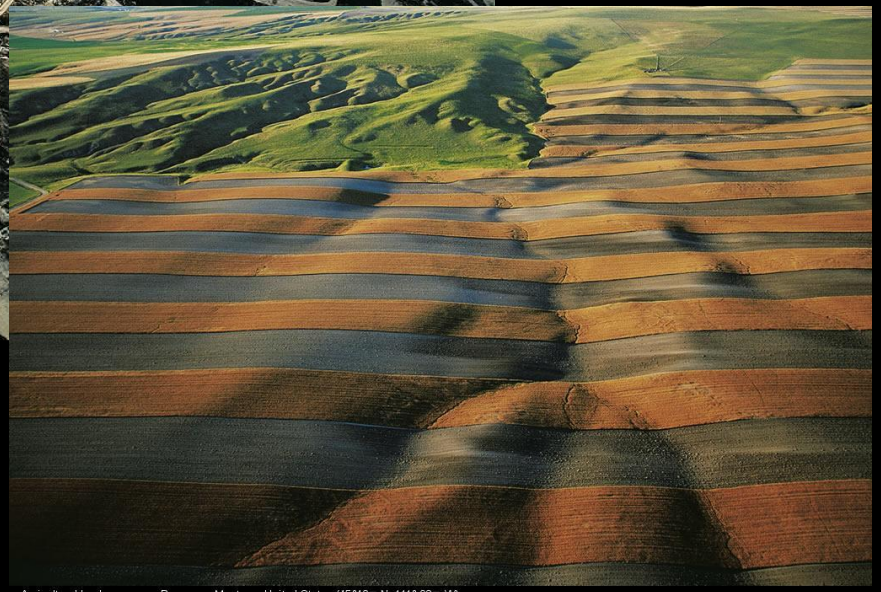
hattan and the One World Trade Center (Freedom Tower), New York, United States (40°43□ N, 74°01□ W).
v.yannarthusbertrand2.org

Oil fields near Bakersfield in California, the United States (35°22□ N, 119°01□ W).
www.yannarthusbertrand2.org



Agricultural landscape near Bozeman, Montana, United States (45°40□ N, 111° 02□ W).
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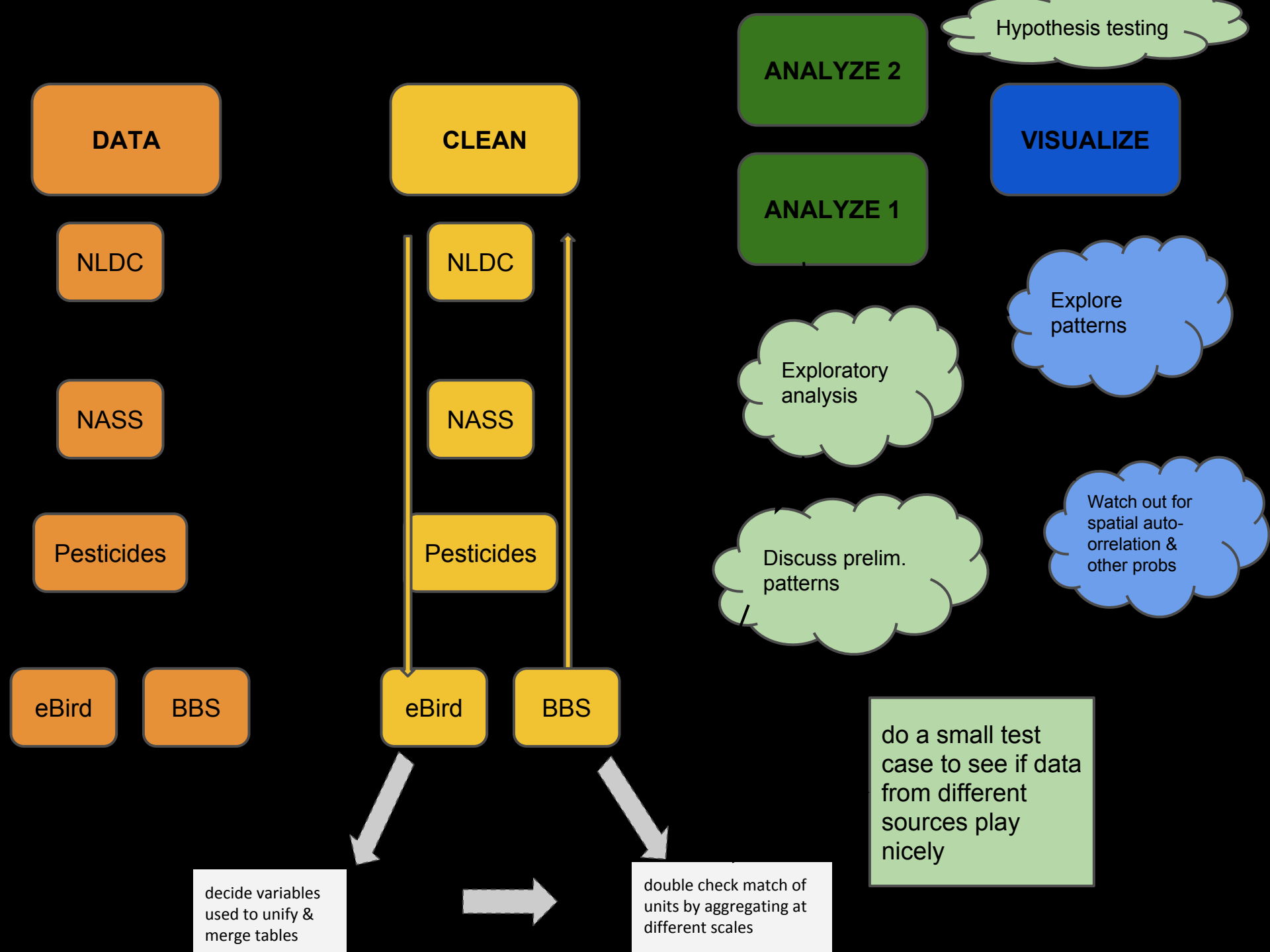
Patterns: We are investigating the influence of land use type, measured across a gradient of increasing intensity, on bird diversity

Process: How does land use intensification, measured as crop yield & pesticide application rates, influence bird species richness and composition in different feeding guilds (functional groups)?

Questions:

1) How does biodiversity vary across a land-use intensification gradient (e.g., natural habitat, agriculture, suburban, urban)?

2) Does variation in biodiversity across land-use intensification influence ecosystem services (and dis-services) to agriculture?


DATA
CLEAN
ANALYZE 2
Hypothesis testing
VISUALIZE
ANALYZE 1
NLDC
NLDC
Explore patterns
Exploratory analysis
NASS
NASS
Pesticides
Pesticides
Watch out for spatial auto-orrelation & other probs
Discuss prelim. patterns
eBird
BBS
eBird
BBS
do a small test case to see if data from different sources play nicely
decide variables used to unify & merge tables
double check match of units by aggregating at different scales

Process: Refining ideas to smaller chunks

Start:

Global/US scale, multiple crops, birds, bees, butterflies, pesticides, land use change, farm labor, commodity prices, organic certification, functional groups, phylogenetics, and why not…climate change.

End:

Ohio. Wah wah.

Rule #1: Care about each other

Group dynamics, assignments, workflow

Tools used

Successes:

Data wrangling (dplyr)

CART (rpart)

Slow GIS in R (raster, rgdal, parallel)

GitHub (eventually)

Failures:

Data wrangling (regular expressions when data have no pattern)

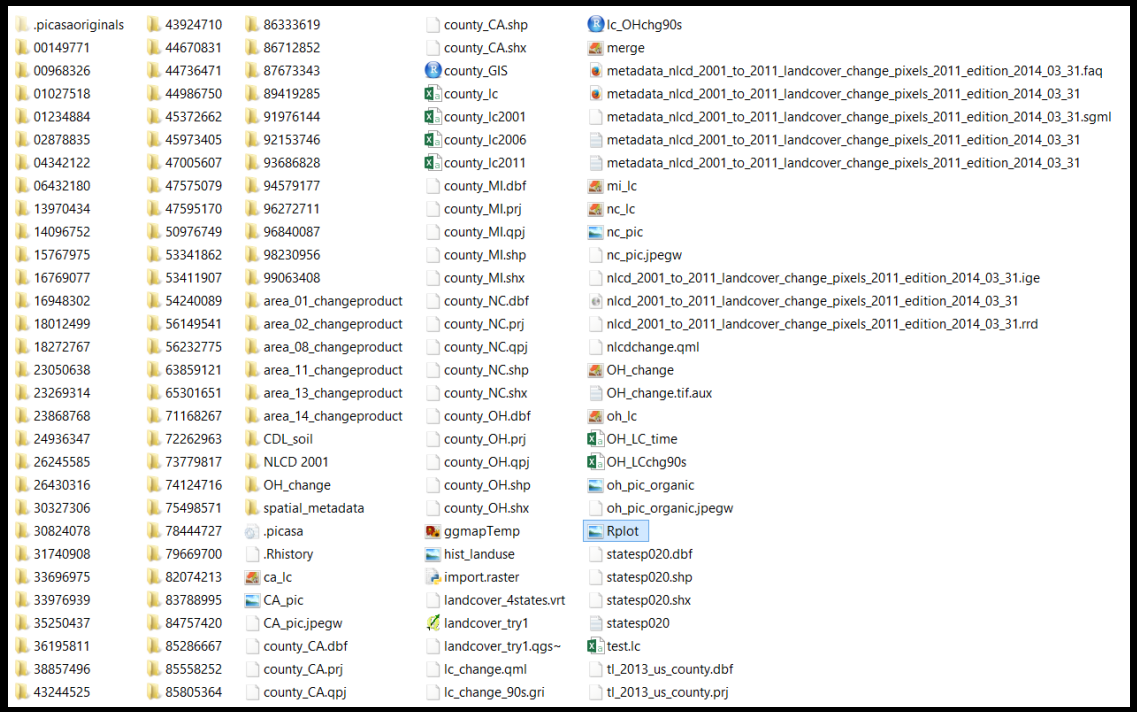
PostgreSQL and PostGIS

Adventures with environmental data

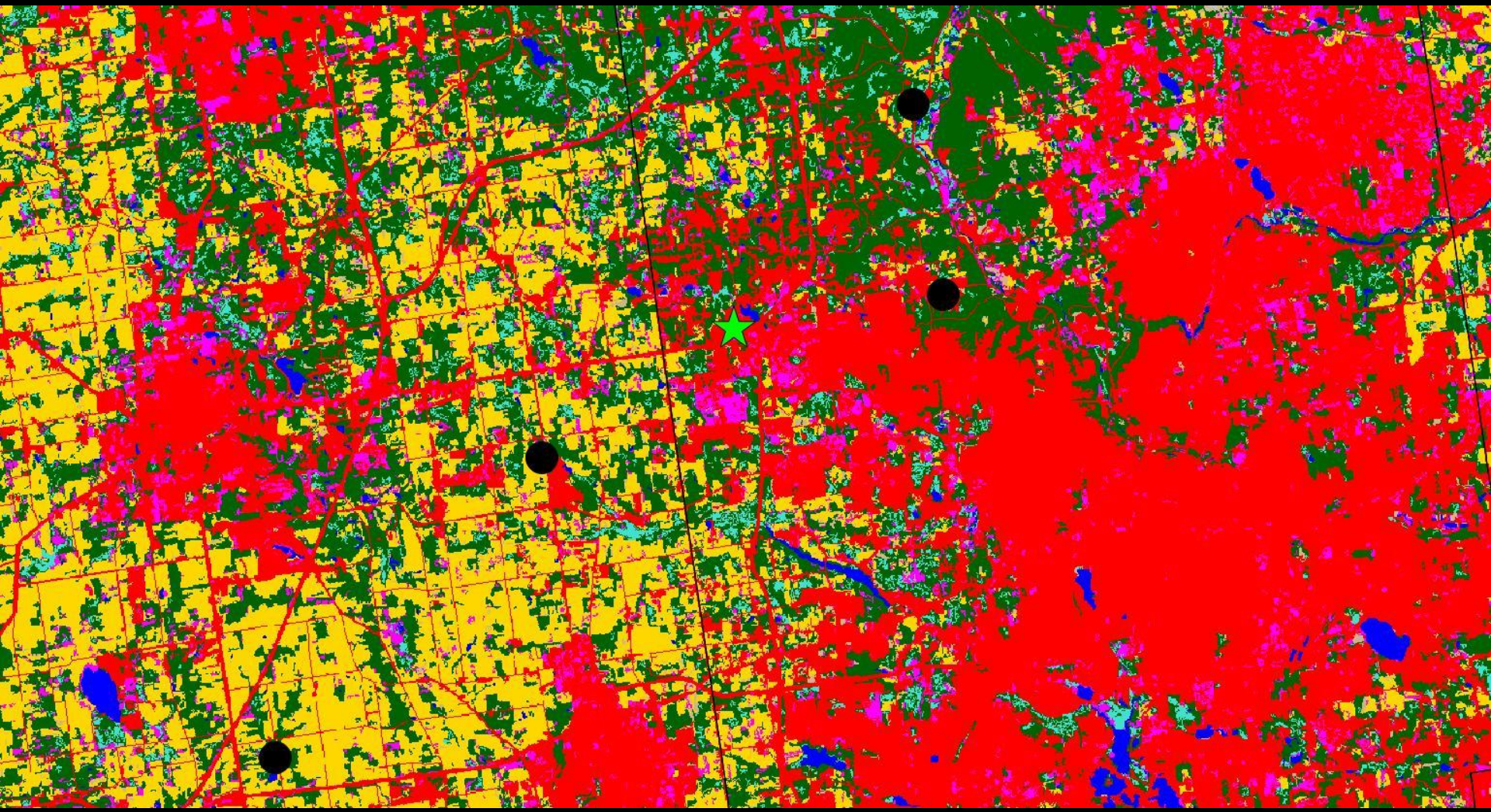
Infinite ways to define predictors

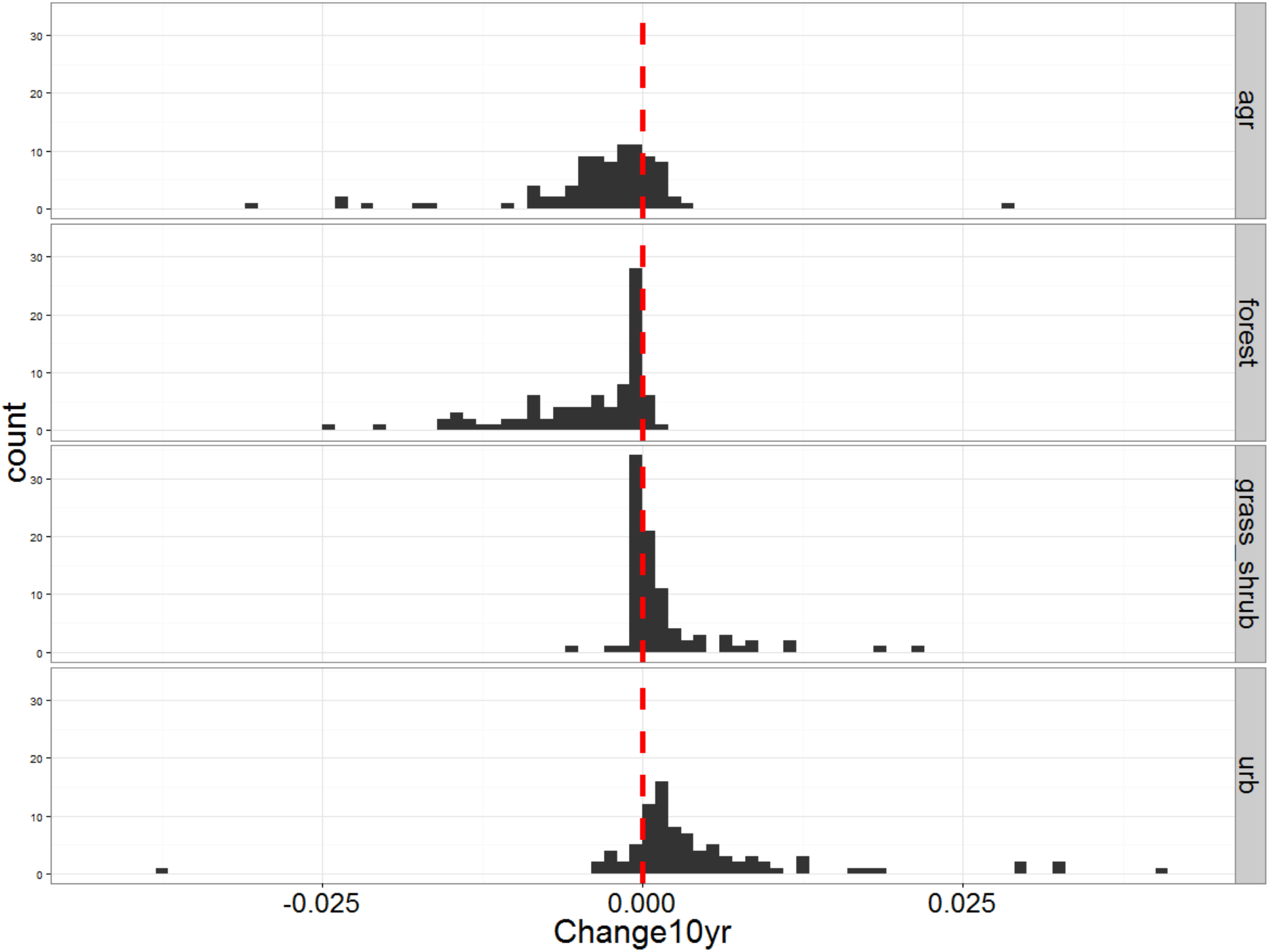
Highly correlated (pesticides + land use)

So many files

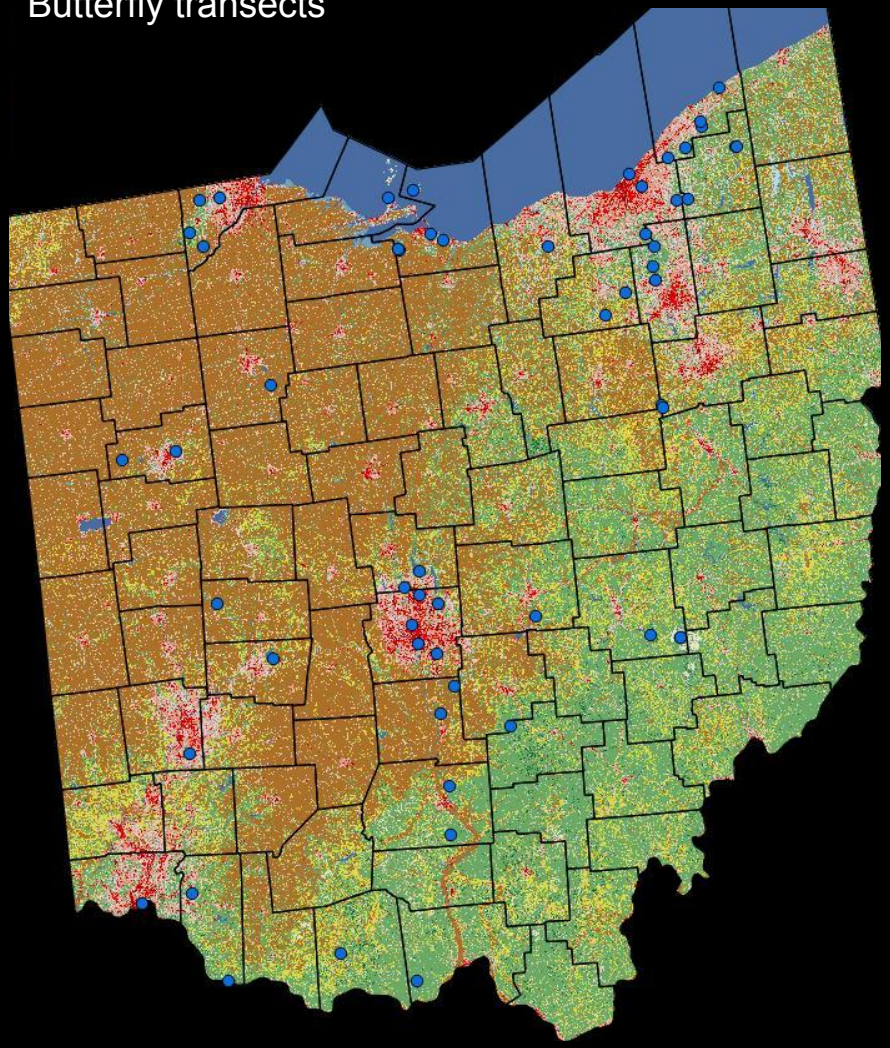


30x30m Land Use Change

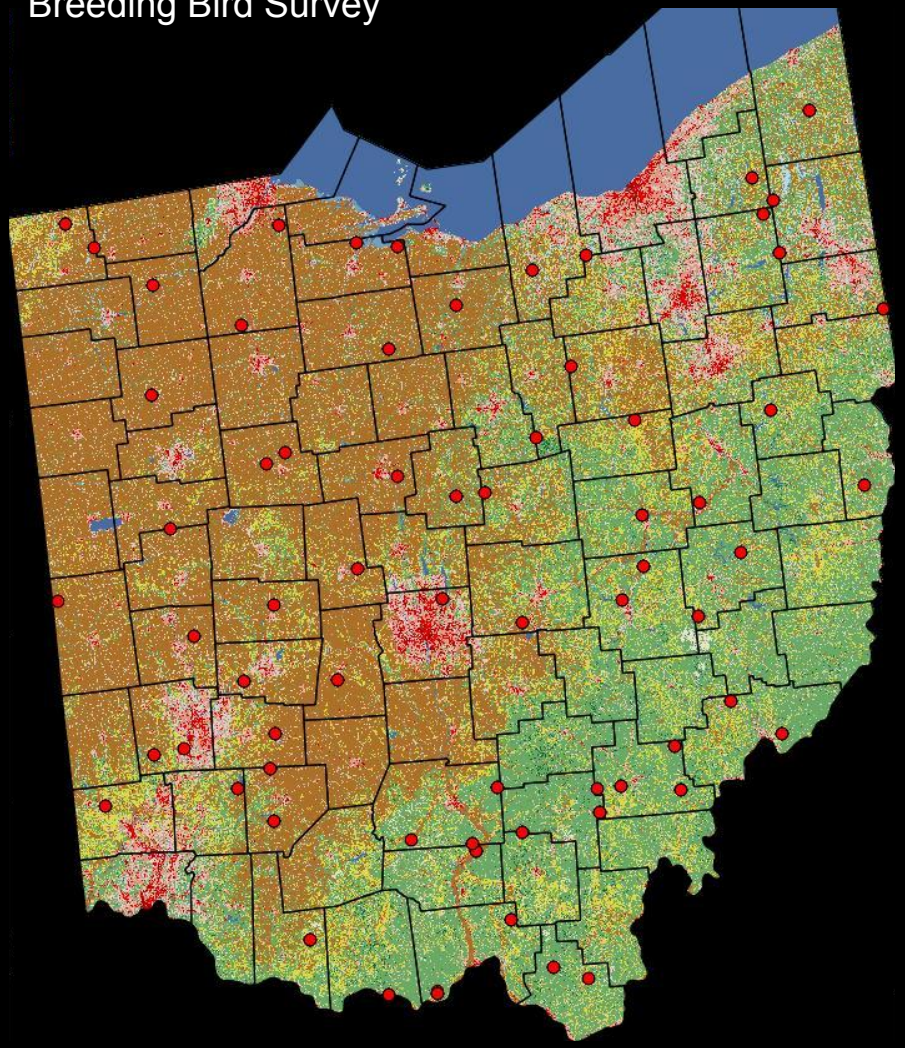



count
agr
forest
grass_shrub
urb
0
10
20
30
-0.025
0.000
0.025
Change10yr

Butterfly transects

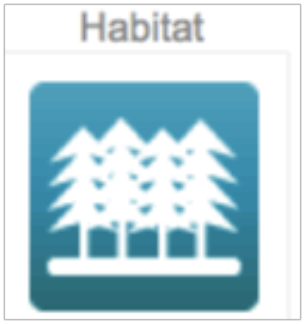


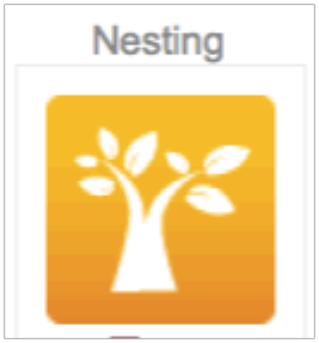
Breeding Bird Survey

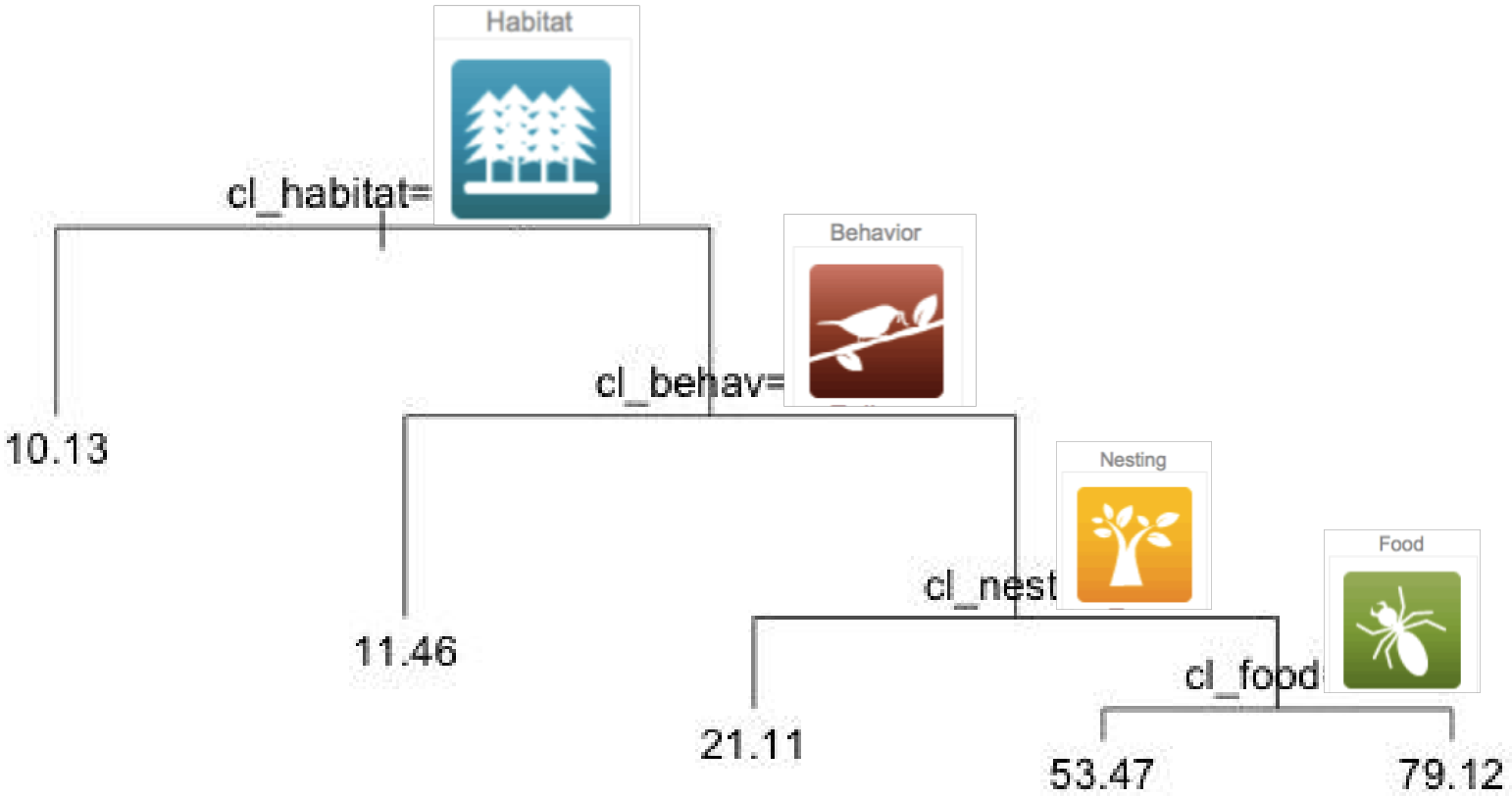


Preliminary results: bird diversity

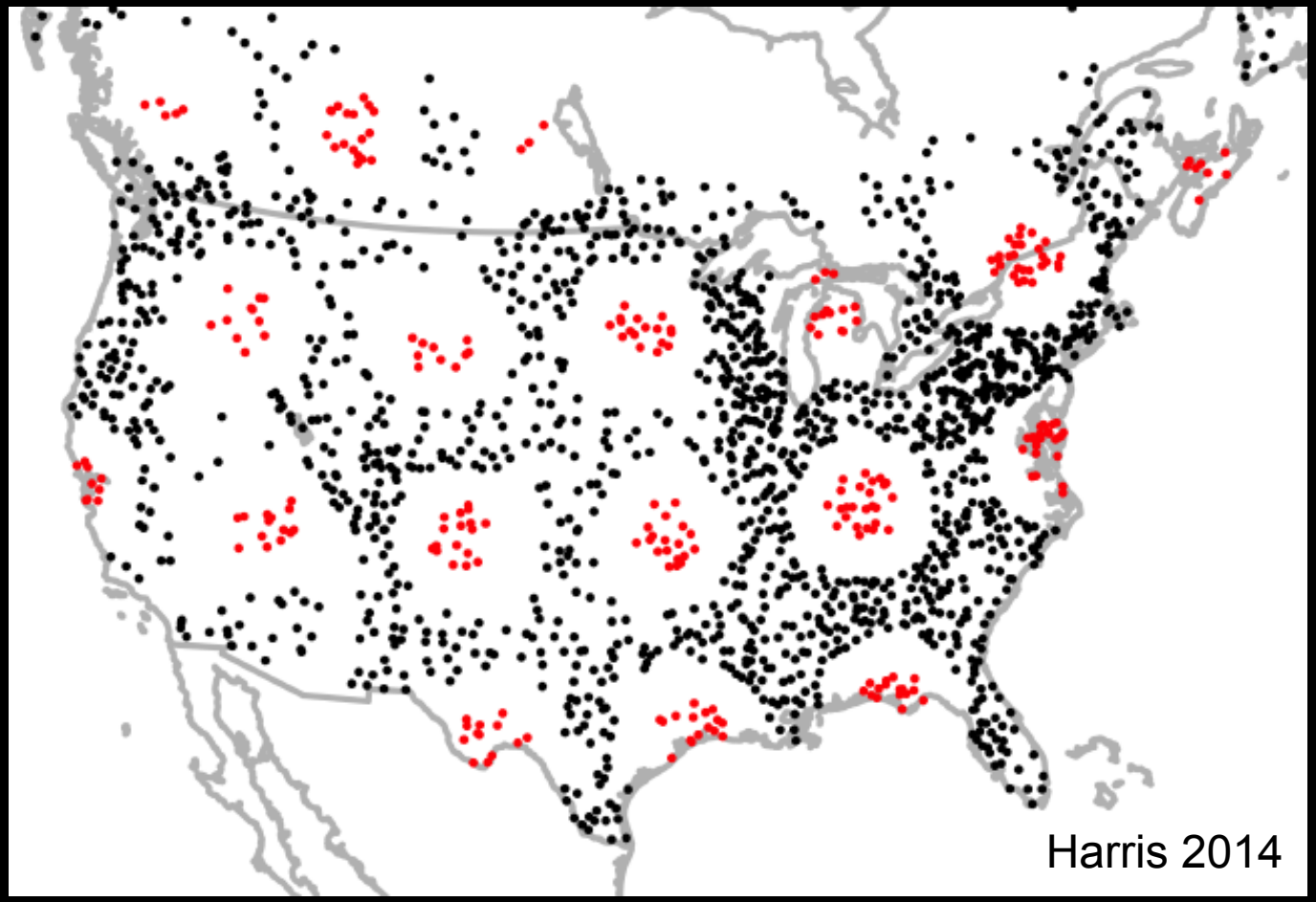
A quick and dirty exploration of functional groups with CART






Habitat
cl_habitat=
Behavior
cl_behav=
10.13
11.46
Nesting
cl_nest
Food
cl_food
21.11
53.47
79.12

Future plans: Ohio, then the world



Questions?