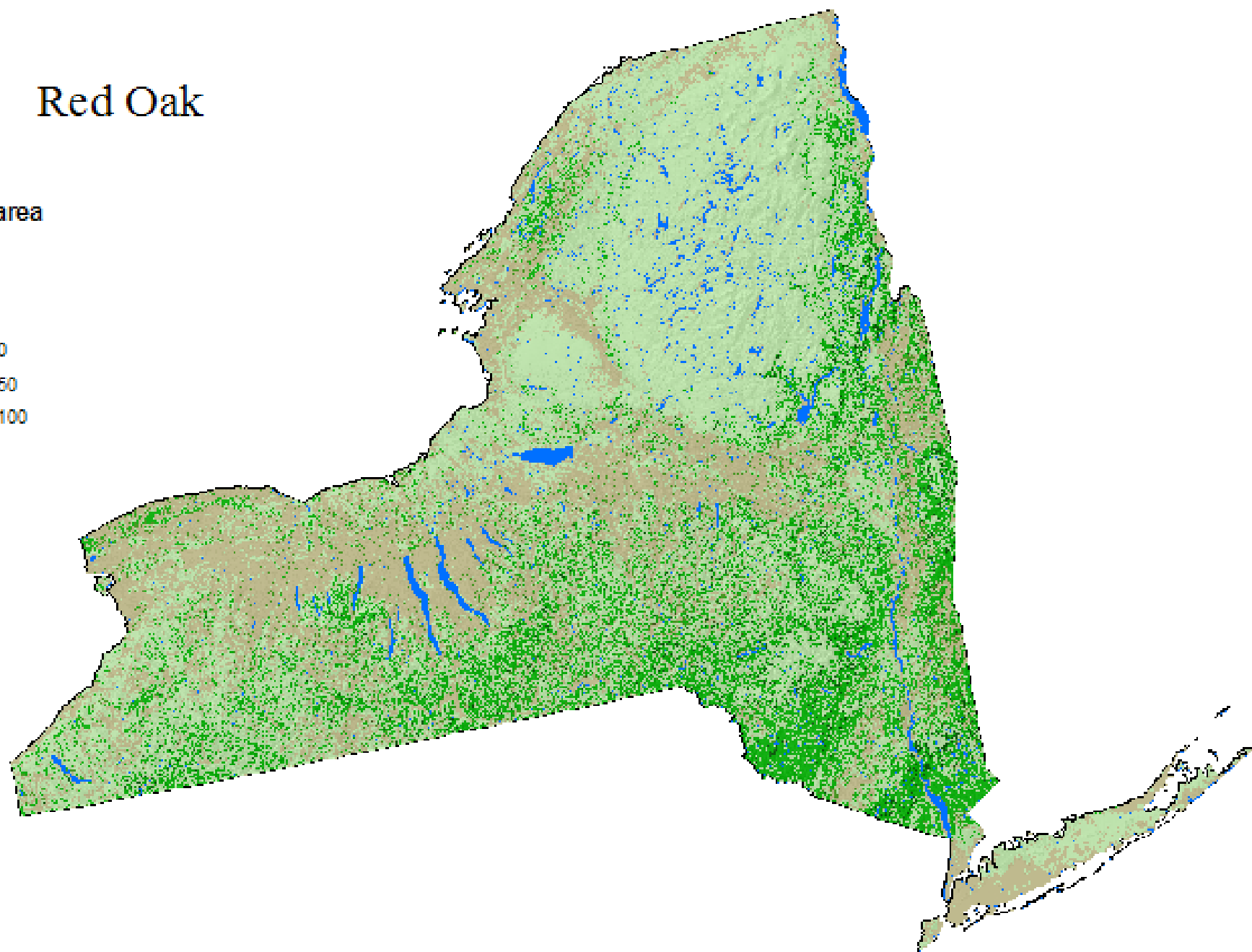
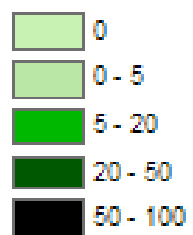
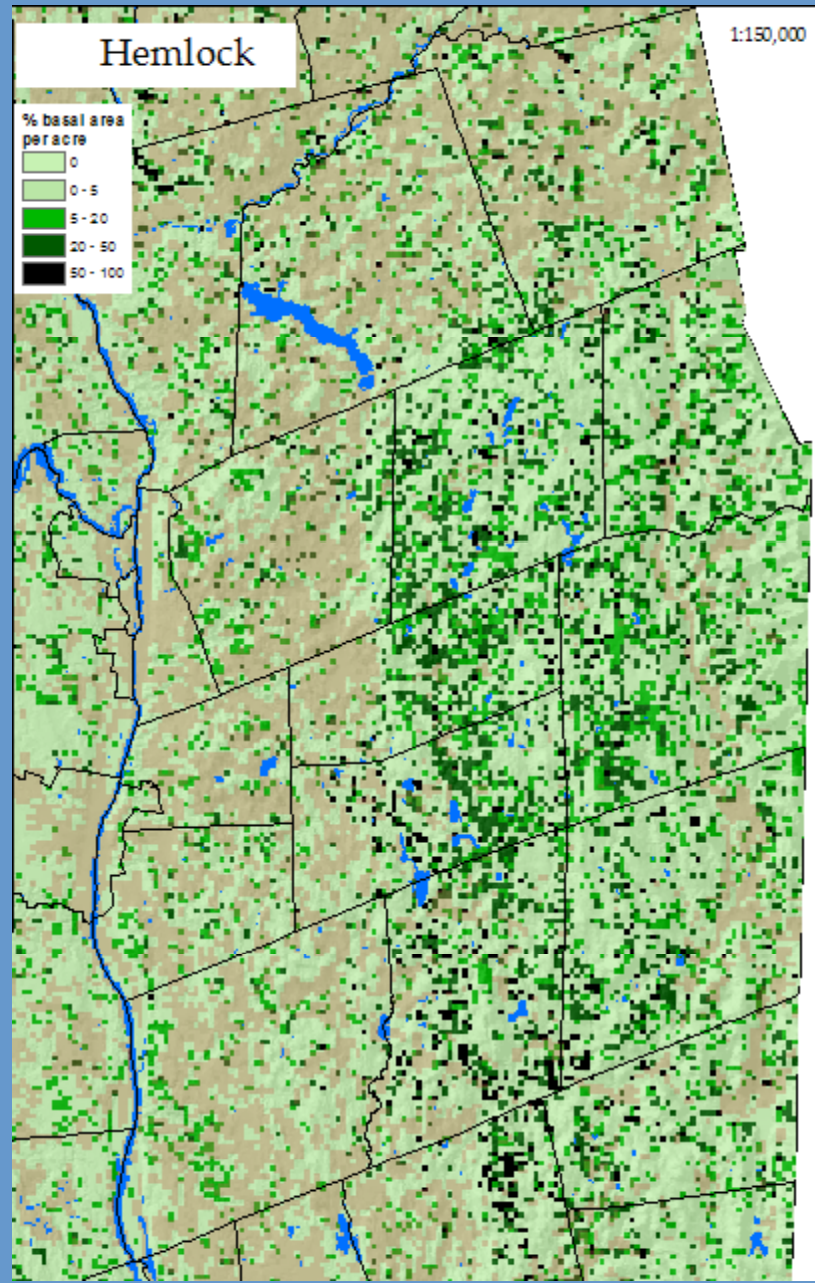
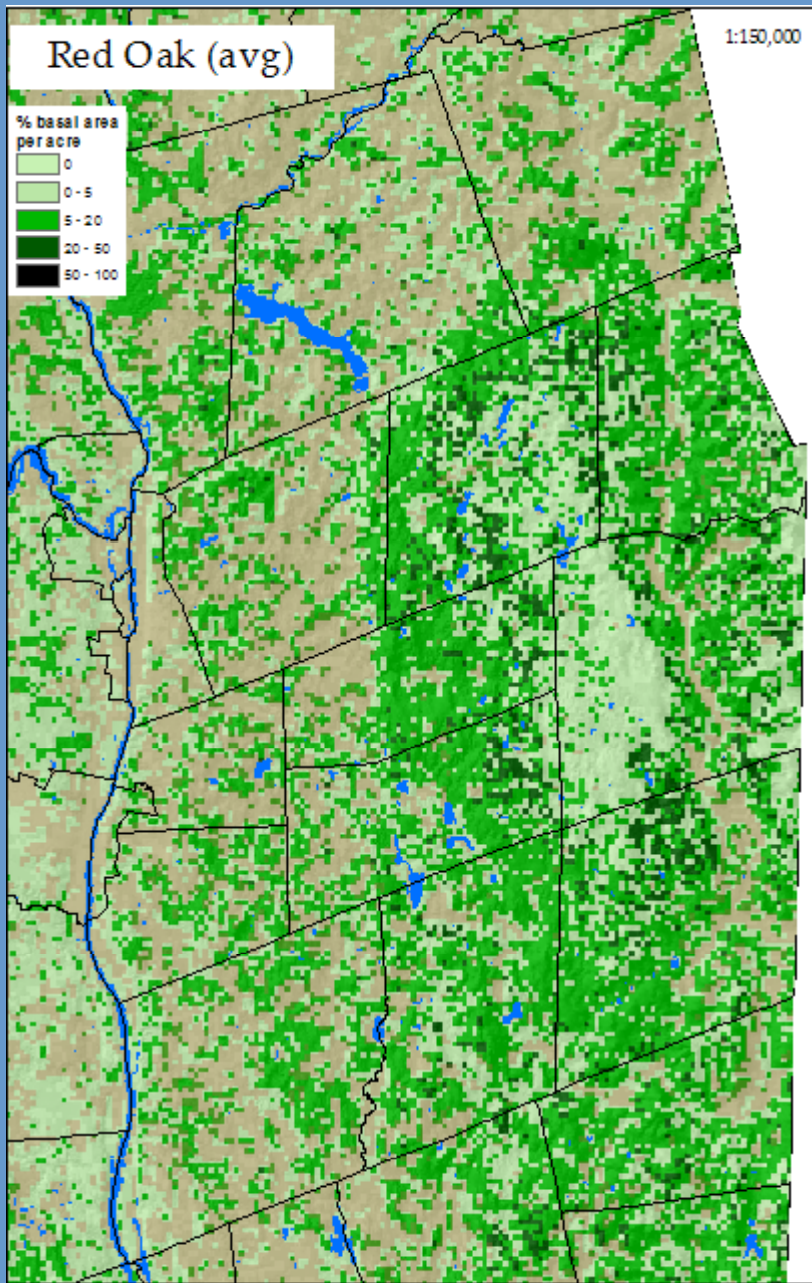
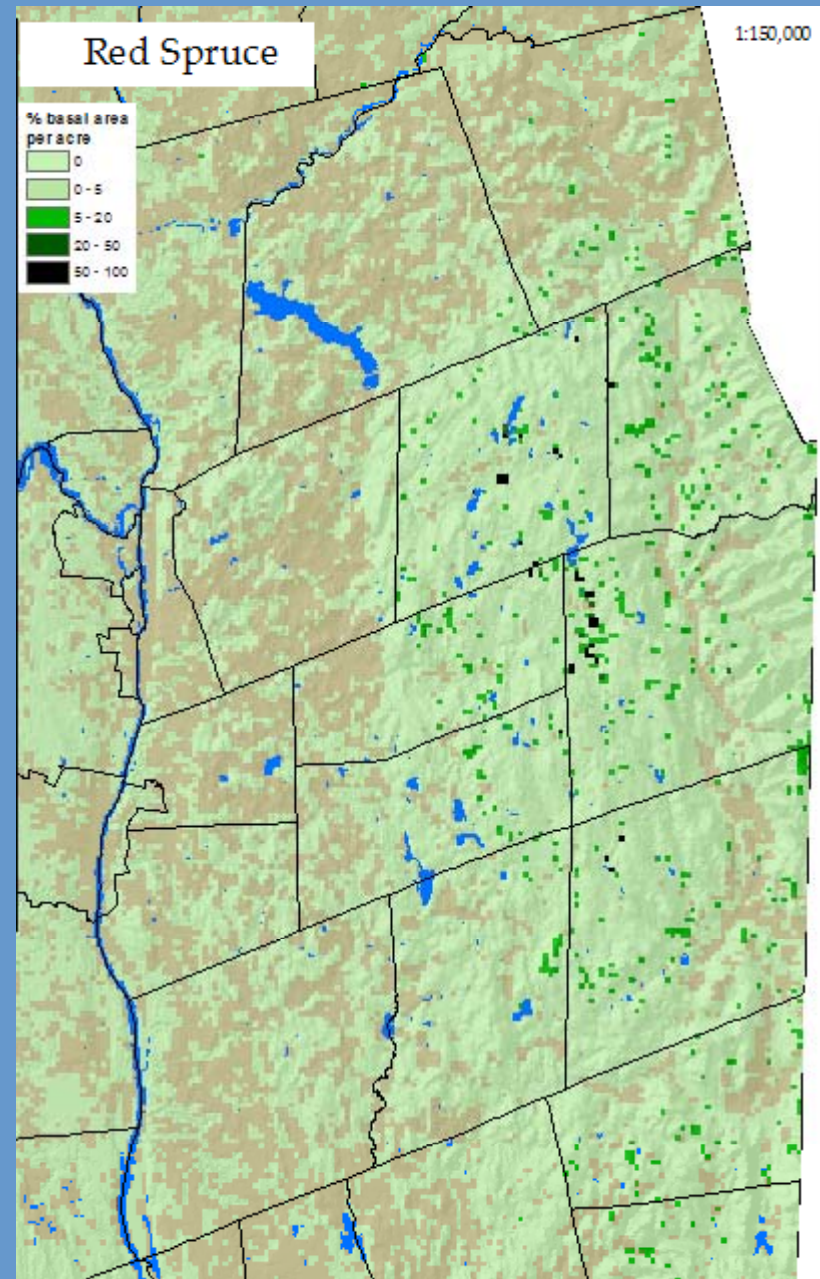
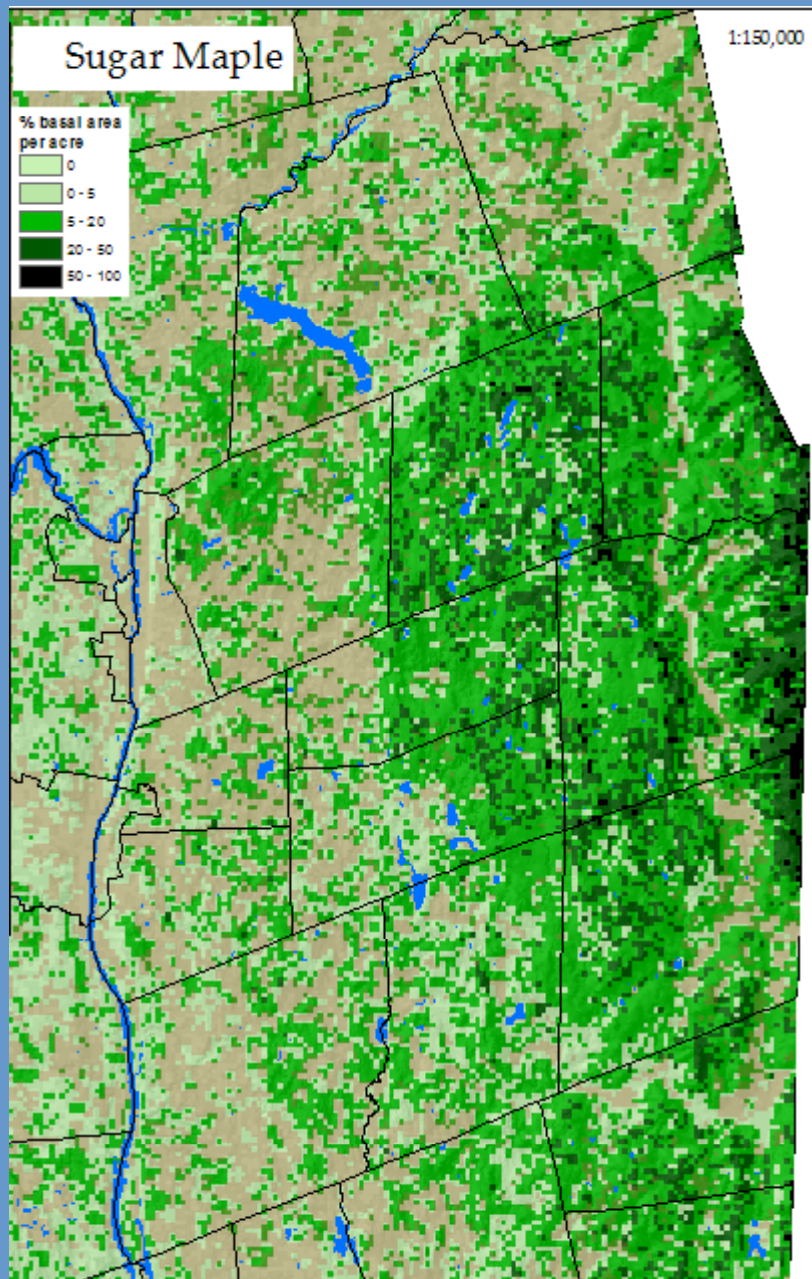


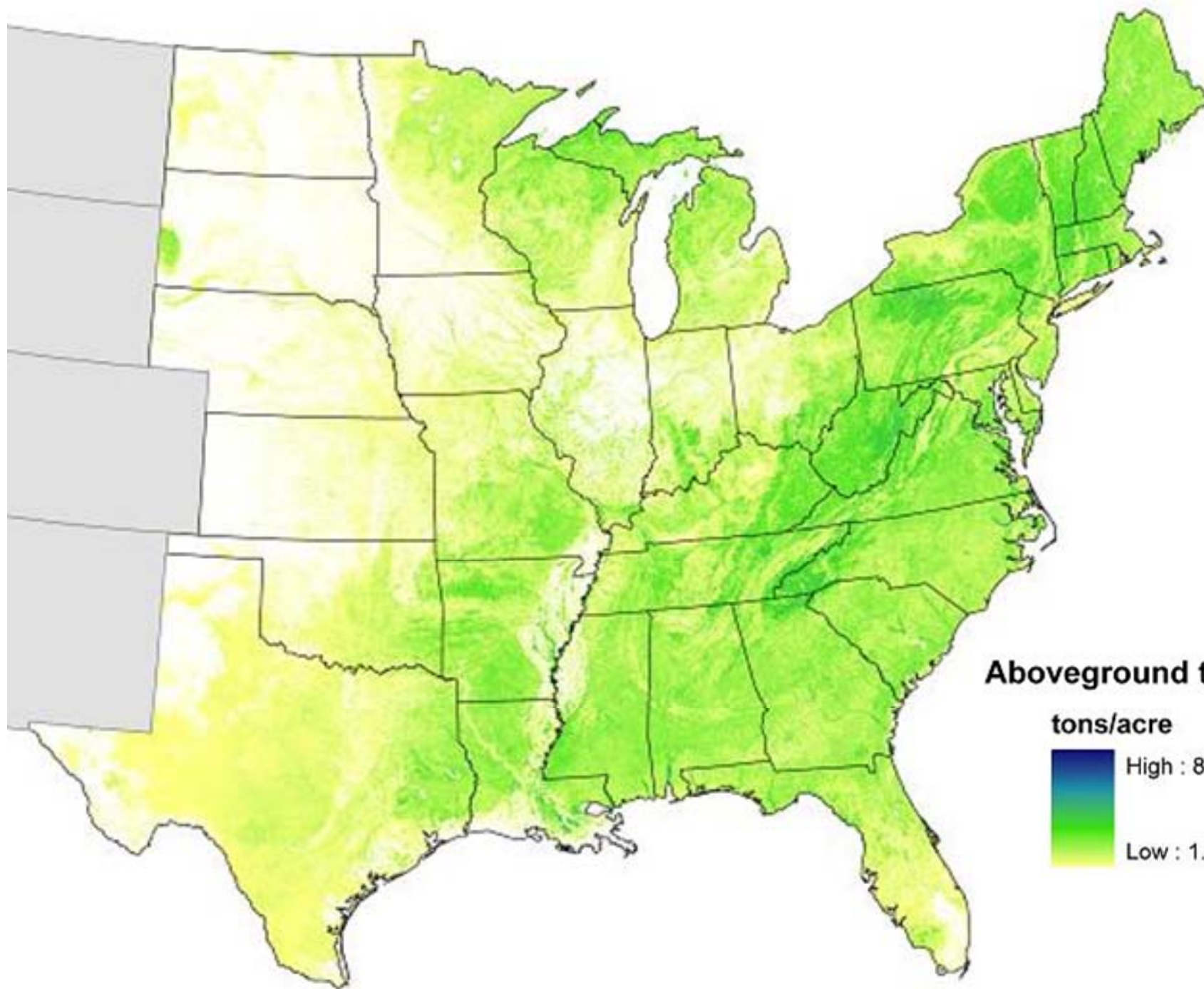
# Red Oak

% basal area  
per acre





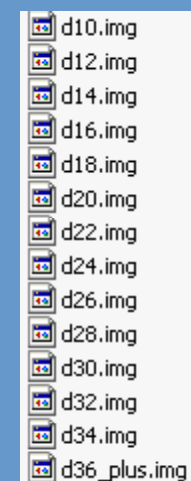
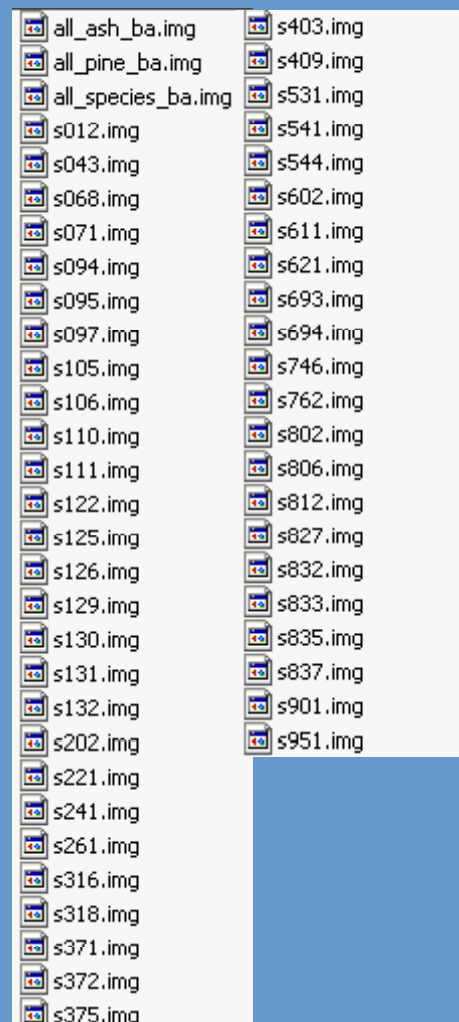
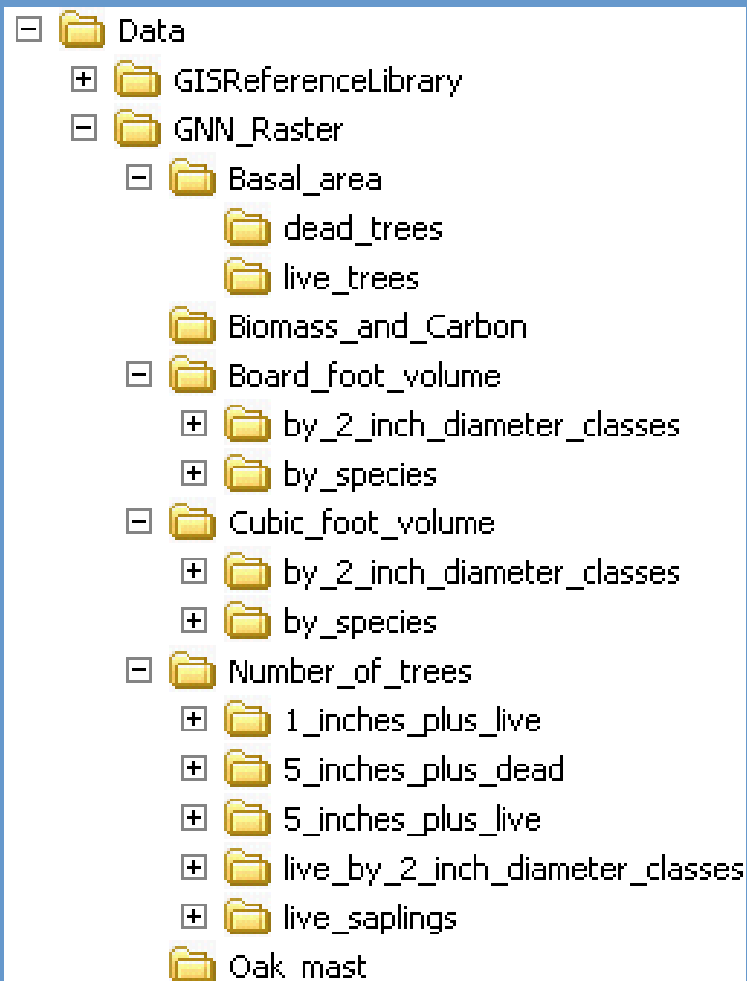




**Aboveground tree carbon**

tons/acre



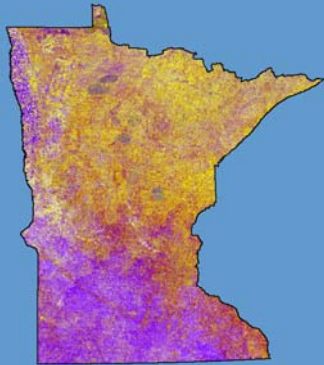


File sizes range from 1 Mb in size for spp 106 to 153Mb for red maple, or 243 Mb for all spp. All generated between July 2009 and Jan 2010.

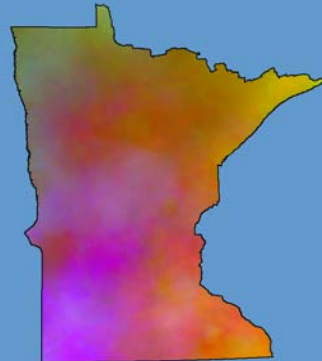
# Gradient Nearest Neighbor (GNN)

- Ohmann & Gregory (2002) CJFR 32:725-741
- Nearest neighbor imputation method
- Similar to kNN and MSN
- Nearness metrics are based on Canonical Correspondence Analysis (CCA) outputs
- Accommodates a multivariate response

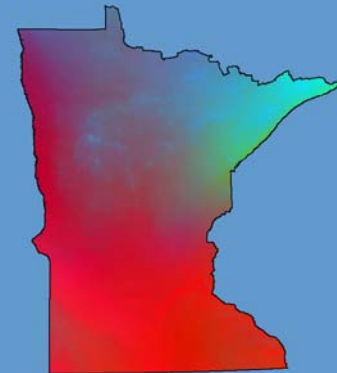
# CCA model predictors



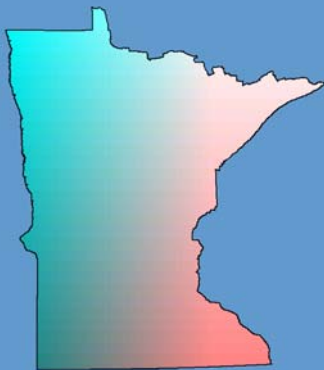
Phenology



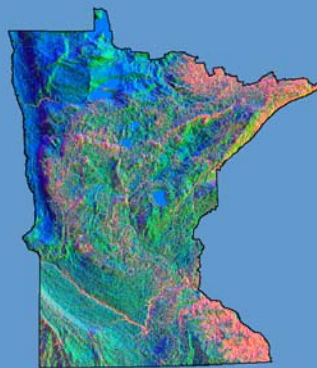
Precipitation



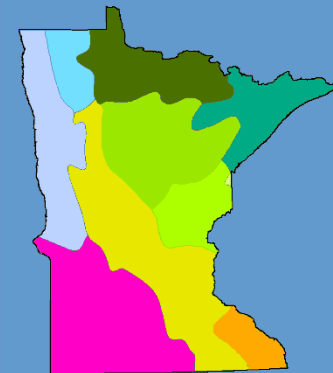
Growing Degree Days



Latitude & Longitude

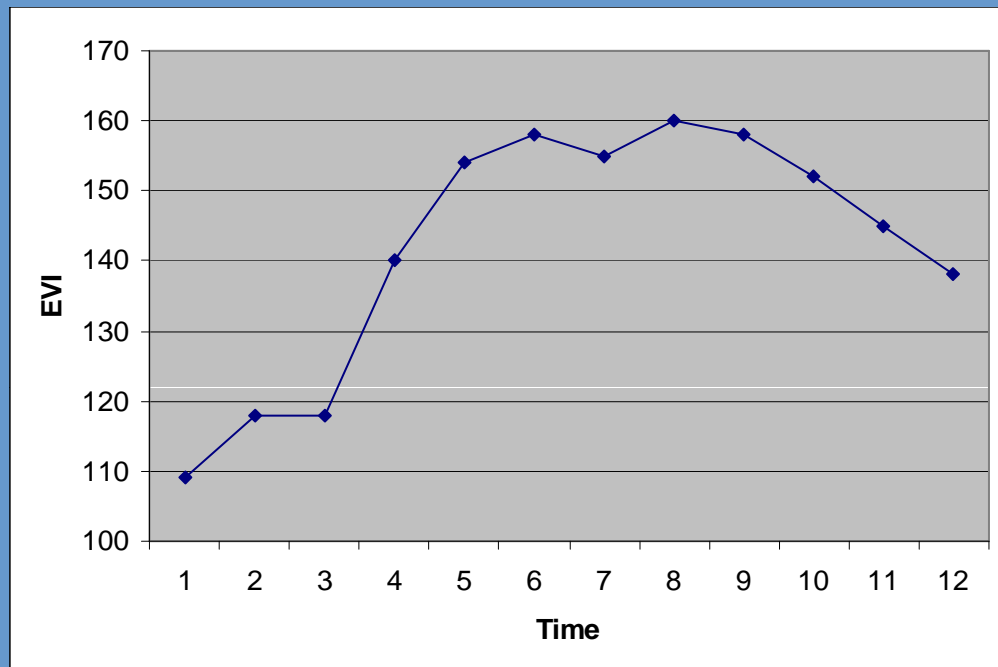


Topography

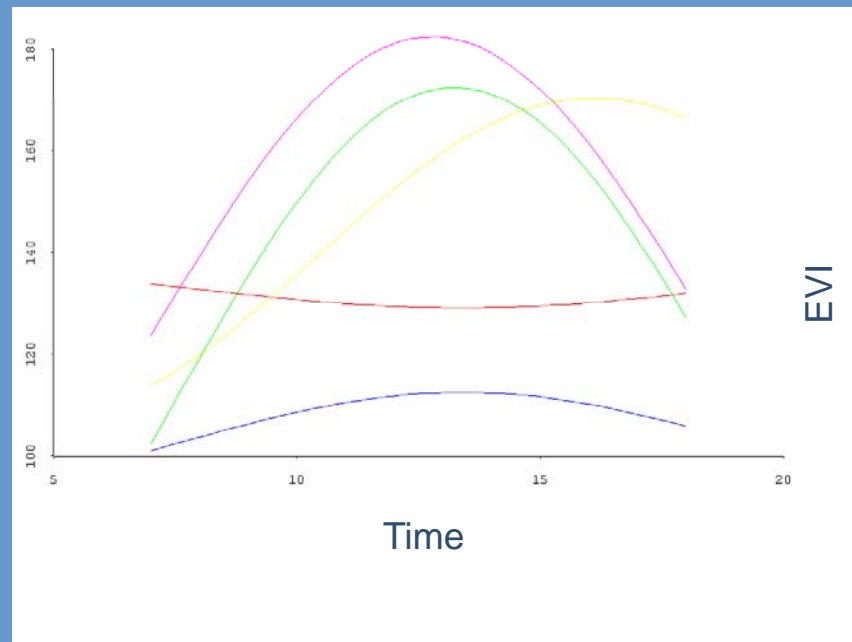


Ecoregion

## Typical Temporal Profile



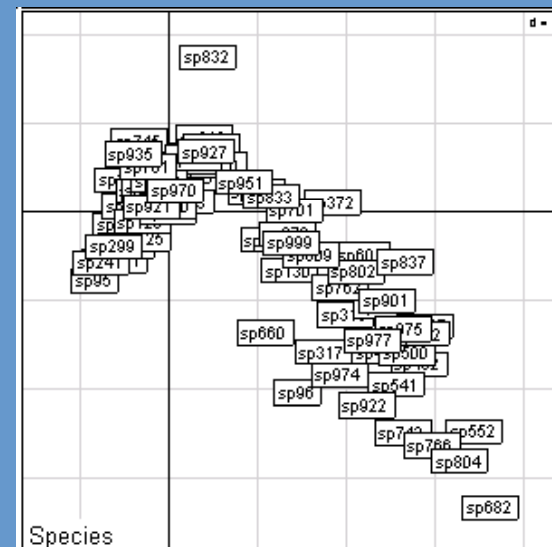
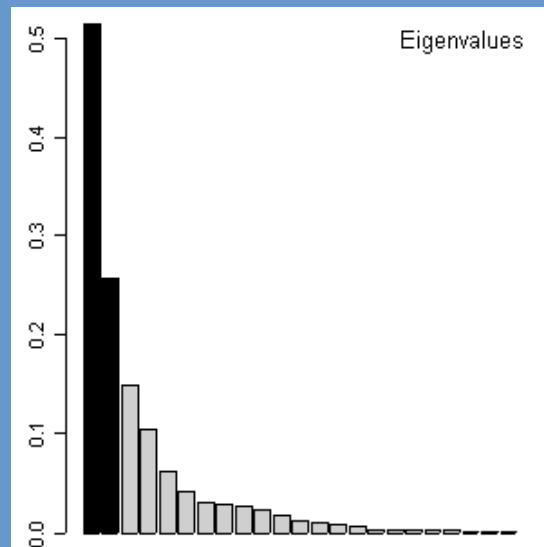
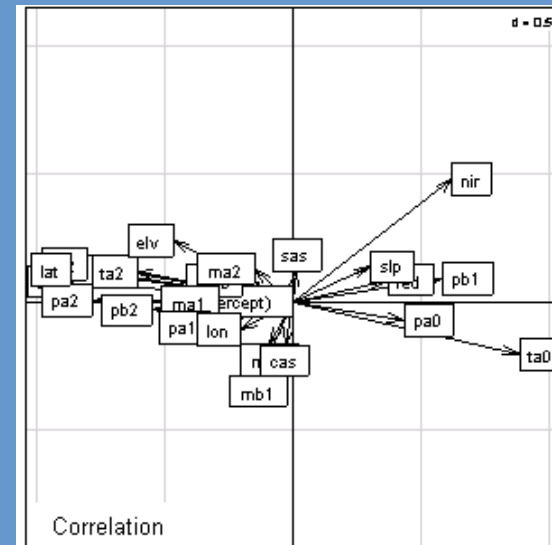
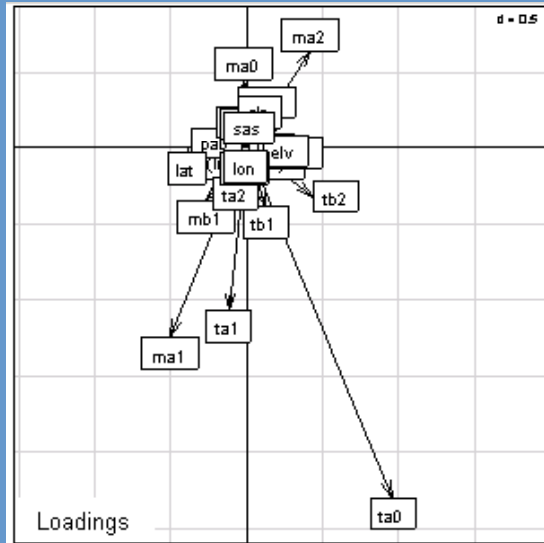
## Fourier series approximations



- Non-forest, early peak
- Non-forest, late peak
- Water
- Softwoods
- Hardwoods



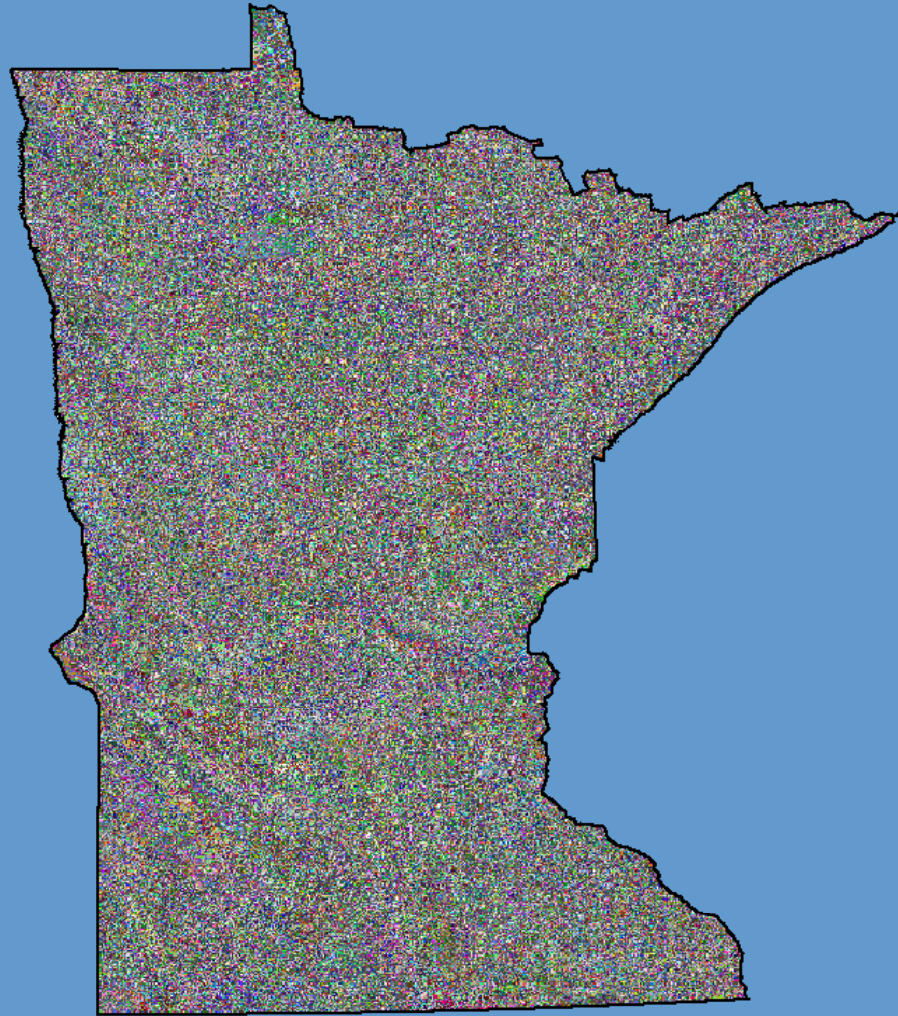
# CCA modeling in R



# Stratification for imputation

- Use 2001 NLCD to identify the proportion of forestland in each 250m pixel
- Two strata: forest and non-forest
- Impute plots to pixels within strata

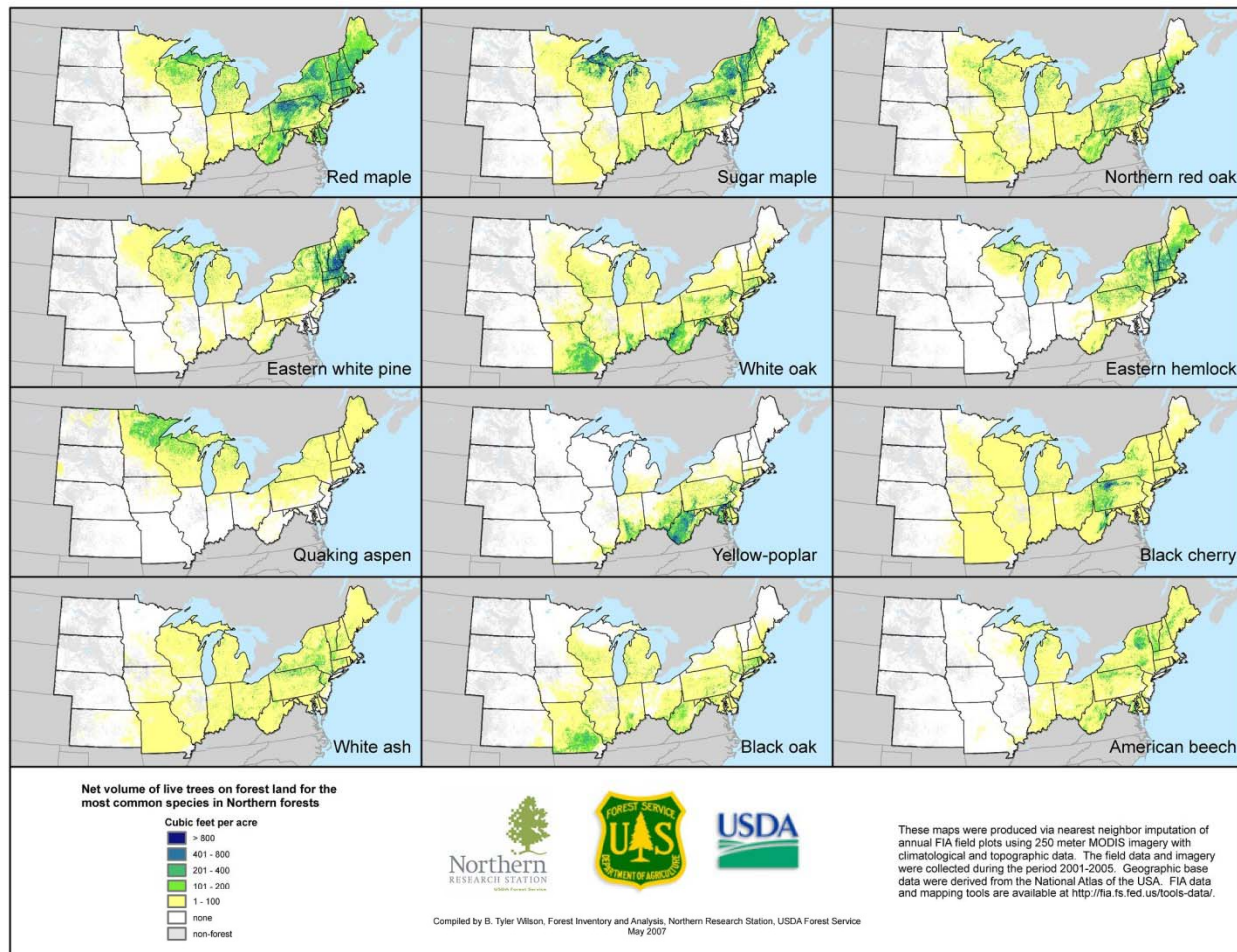
# GNN output – imputed plot ID



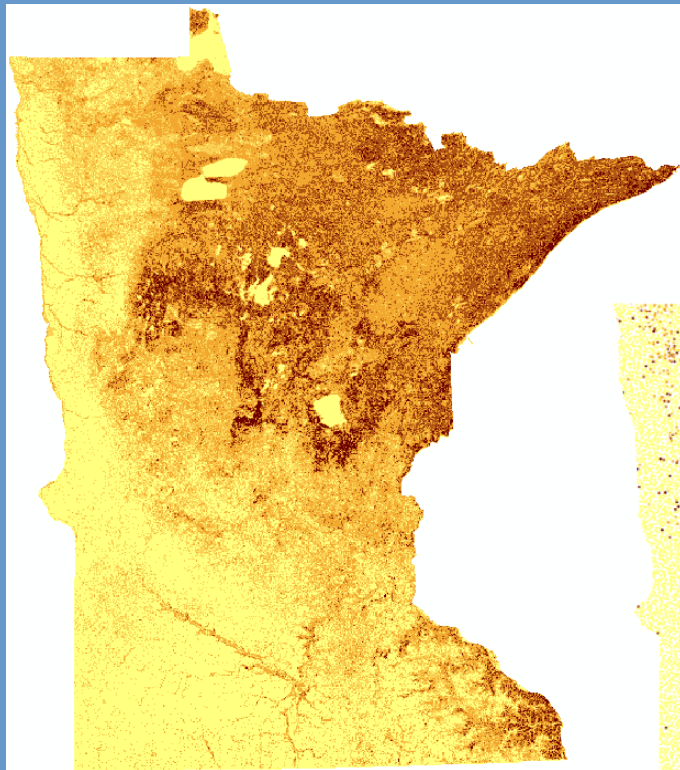
# Stratification for imputation

- For individual variables, the resulting modeled value (e.g. of ba/acre) = a weighted average of the 7 nearest neighbor plots for the forested and nonforested portions of that pixel, with the final value being a weighted average of those two averages based on the proportion of forestland within that pixel

# Species distribution maps

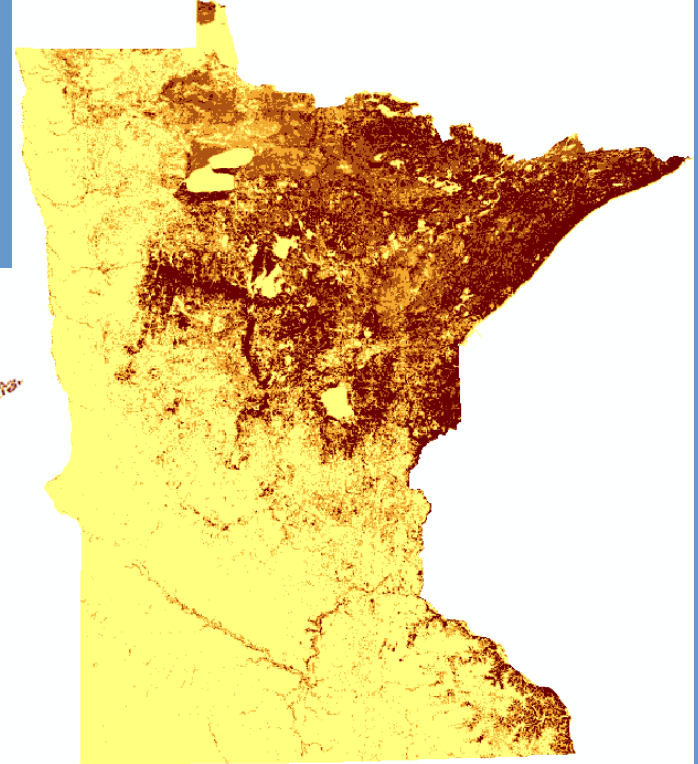
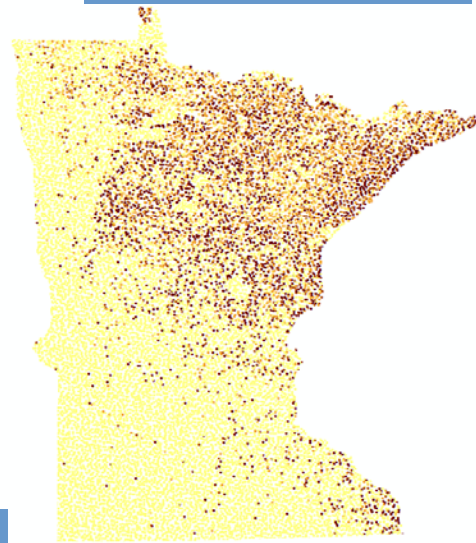


# Assessment



pGNN

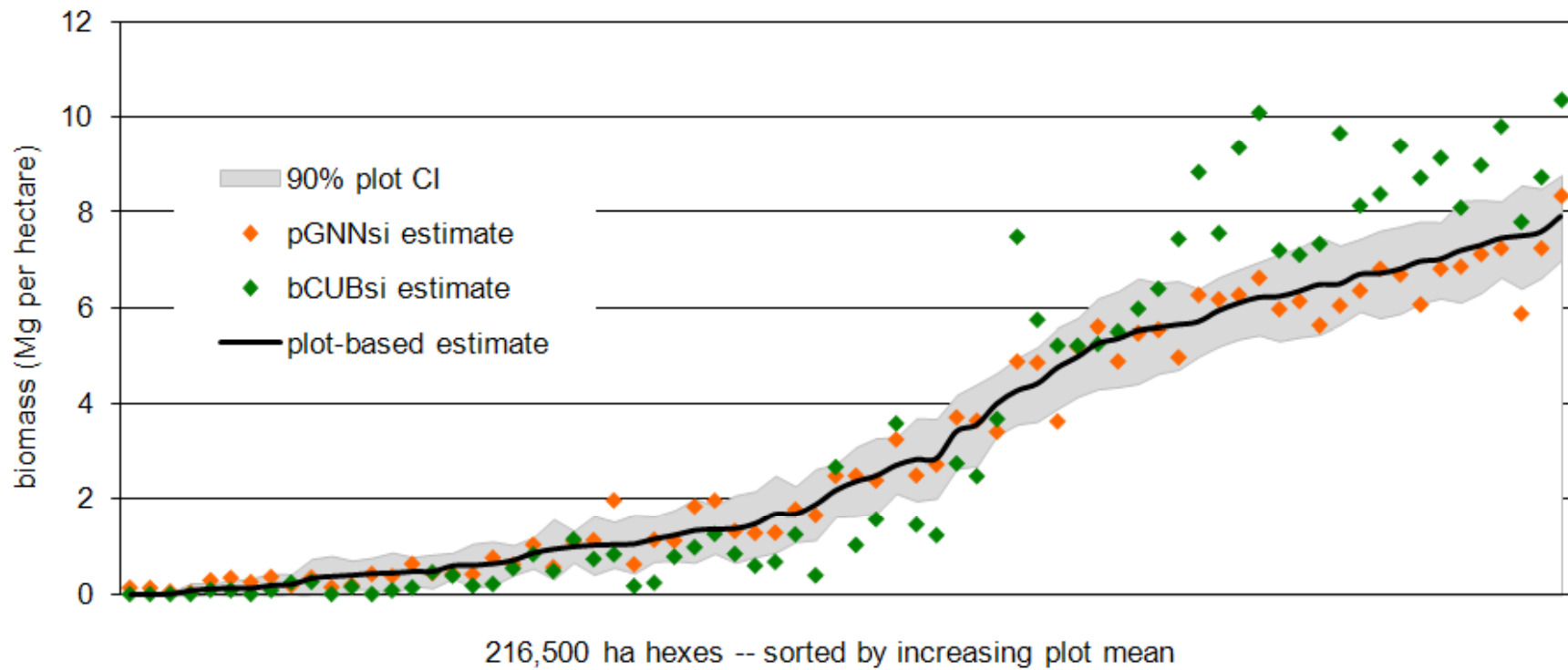
FIA plots



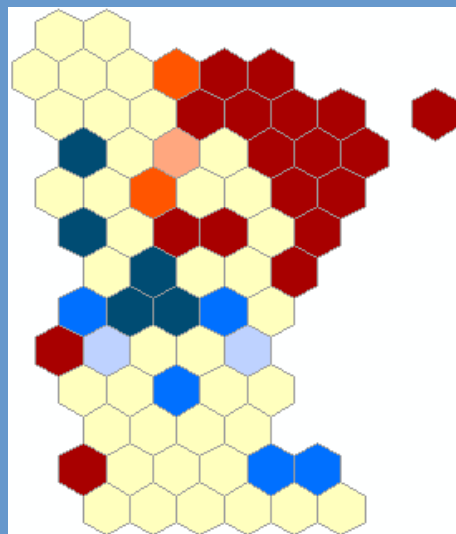
bCUB

Mean biomass (Mg/ha)

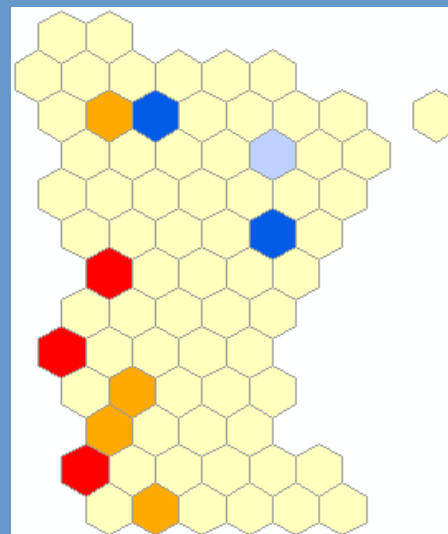


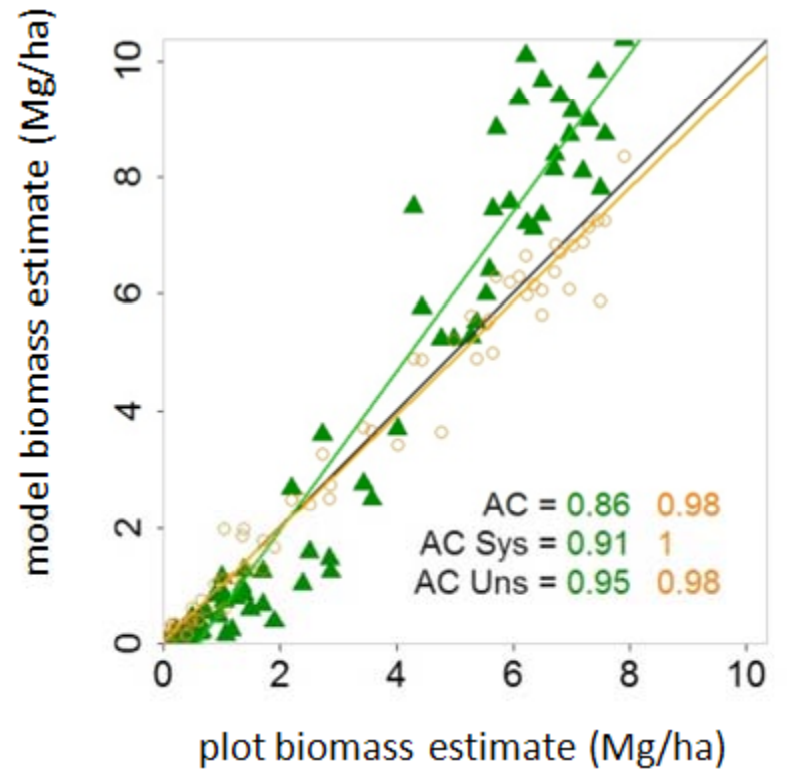
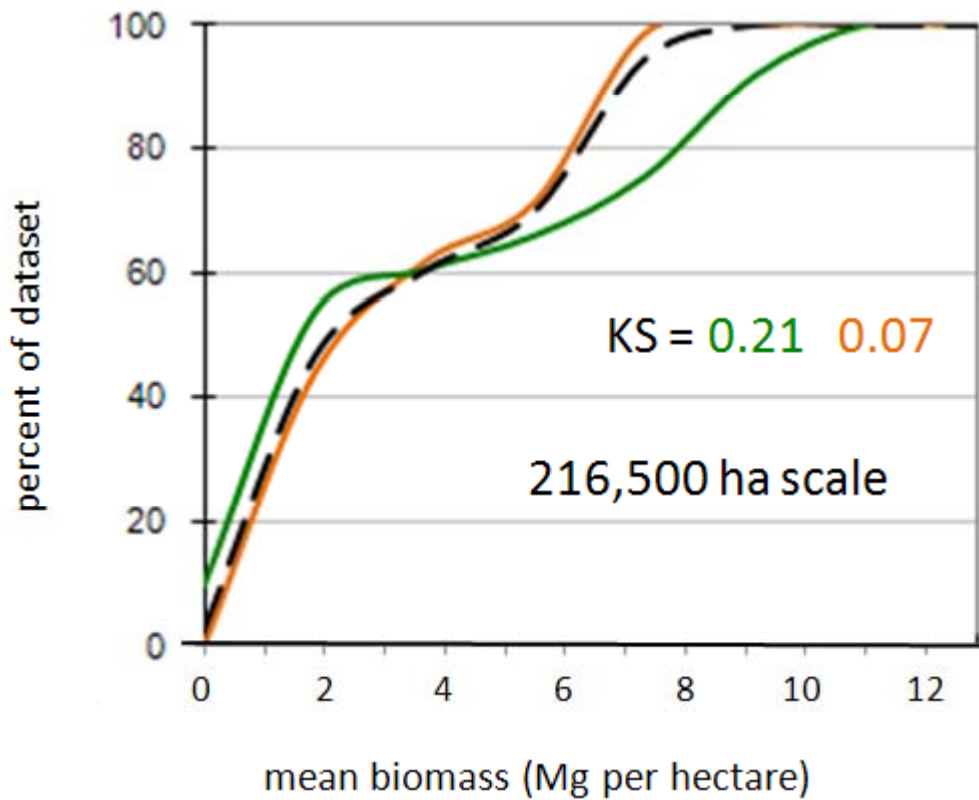


bCUBsi



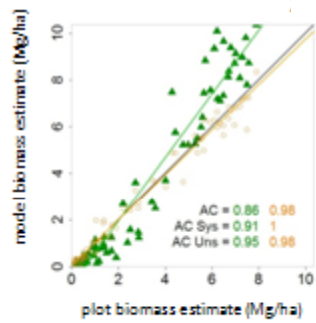
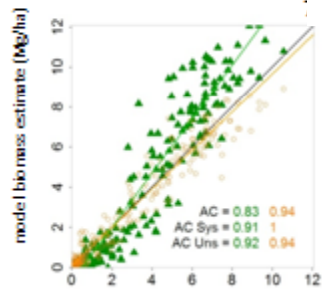
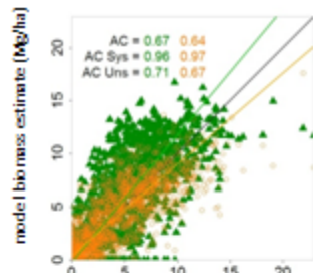
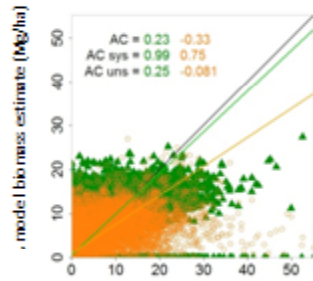
pGNNsi



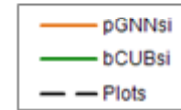
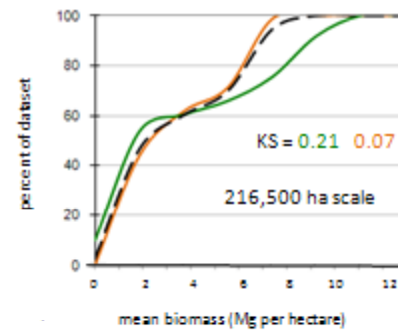
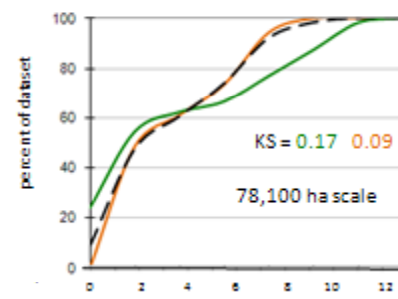
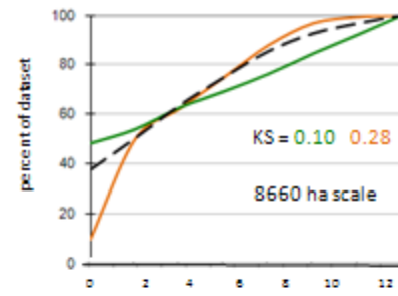
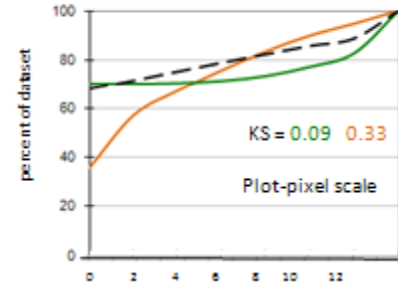




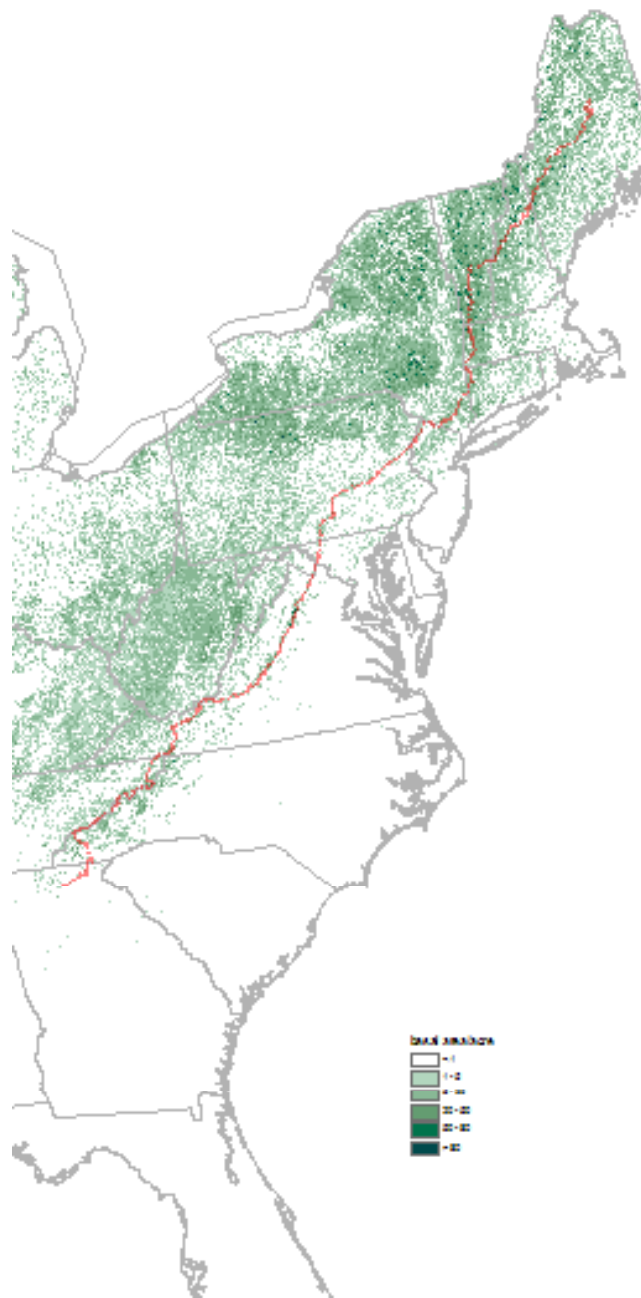
## Minnesota



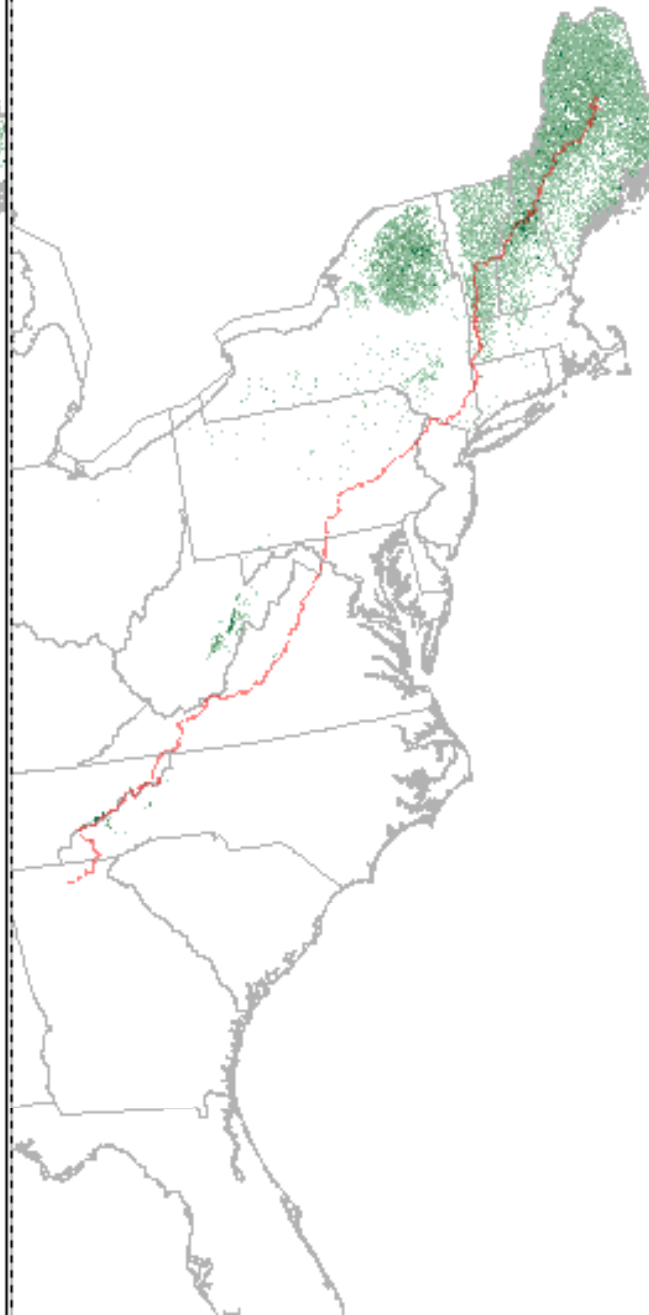
## Minnesota



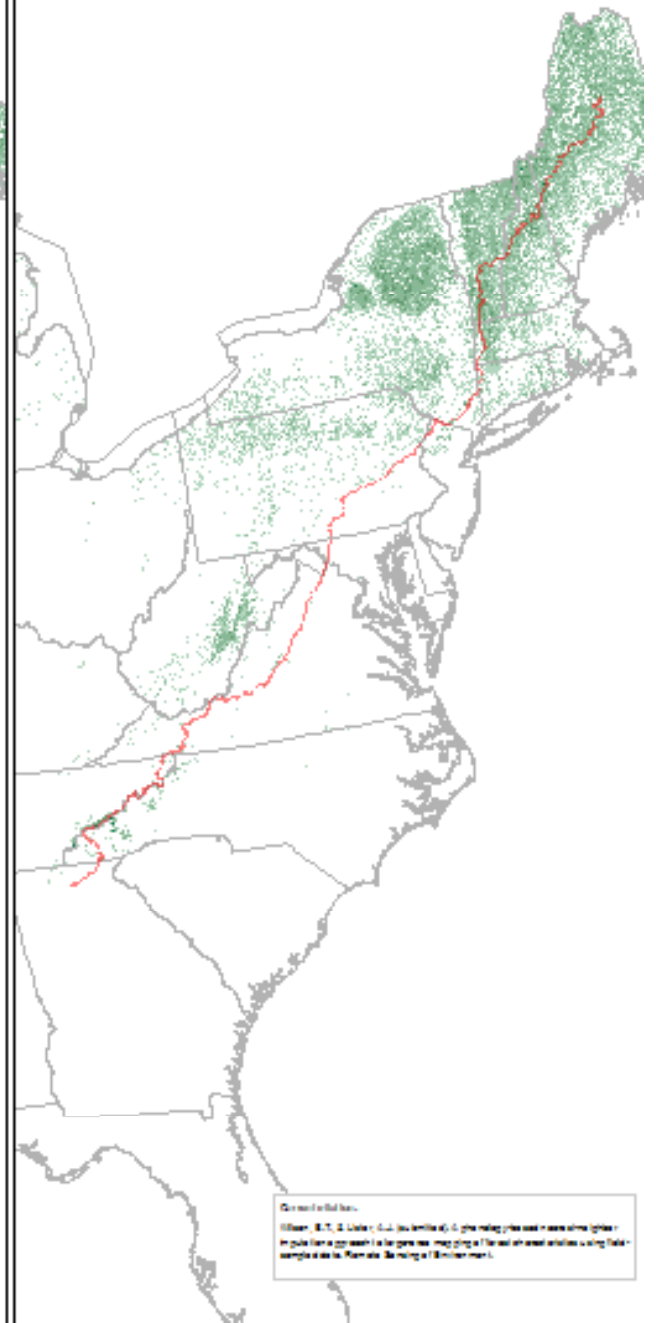
Sugar Maple



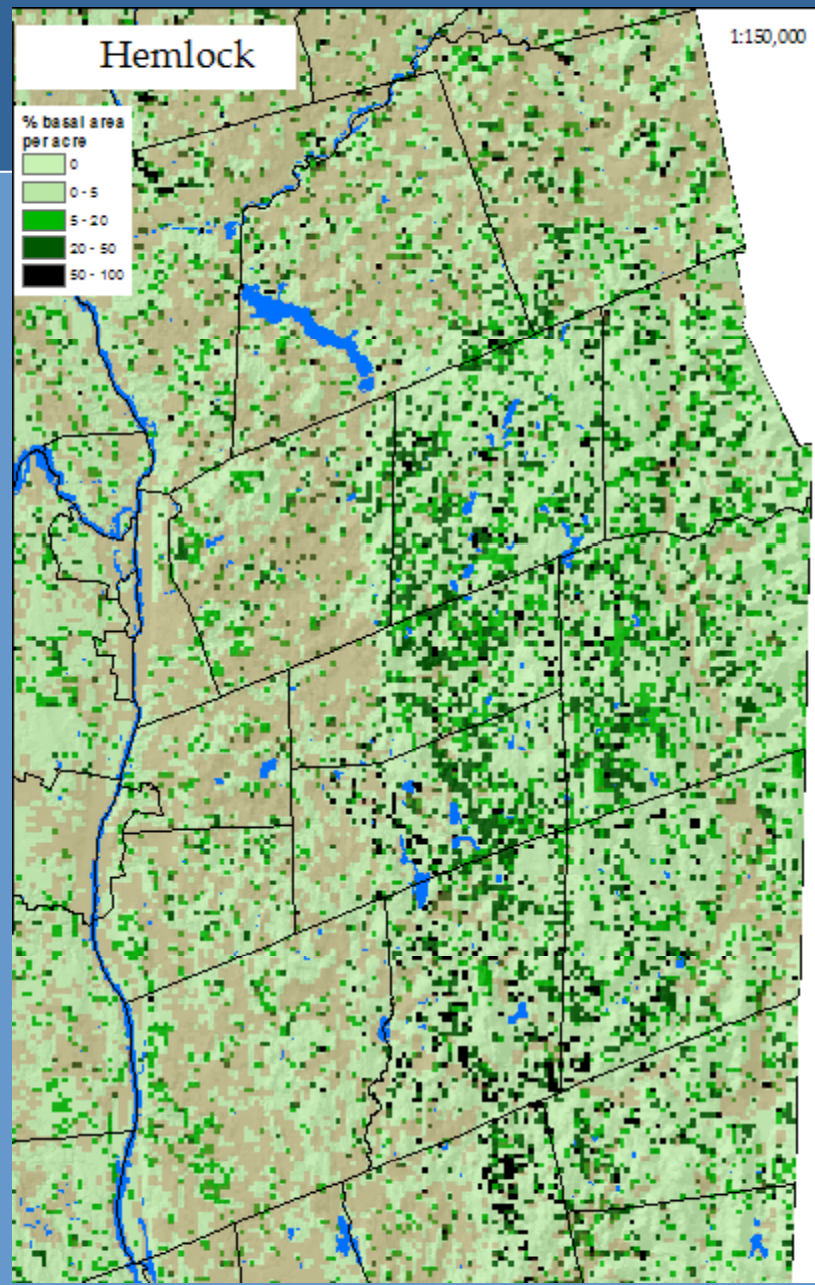
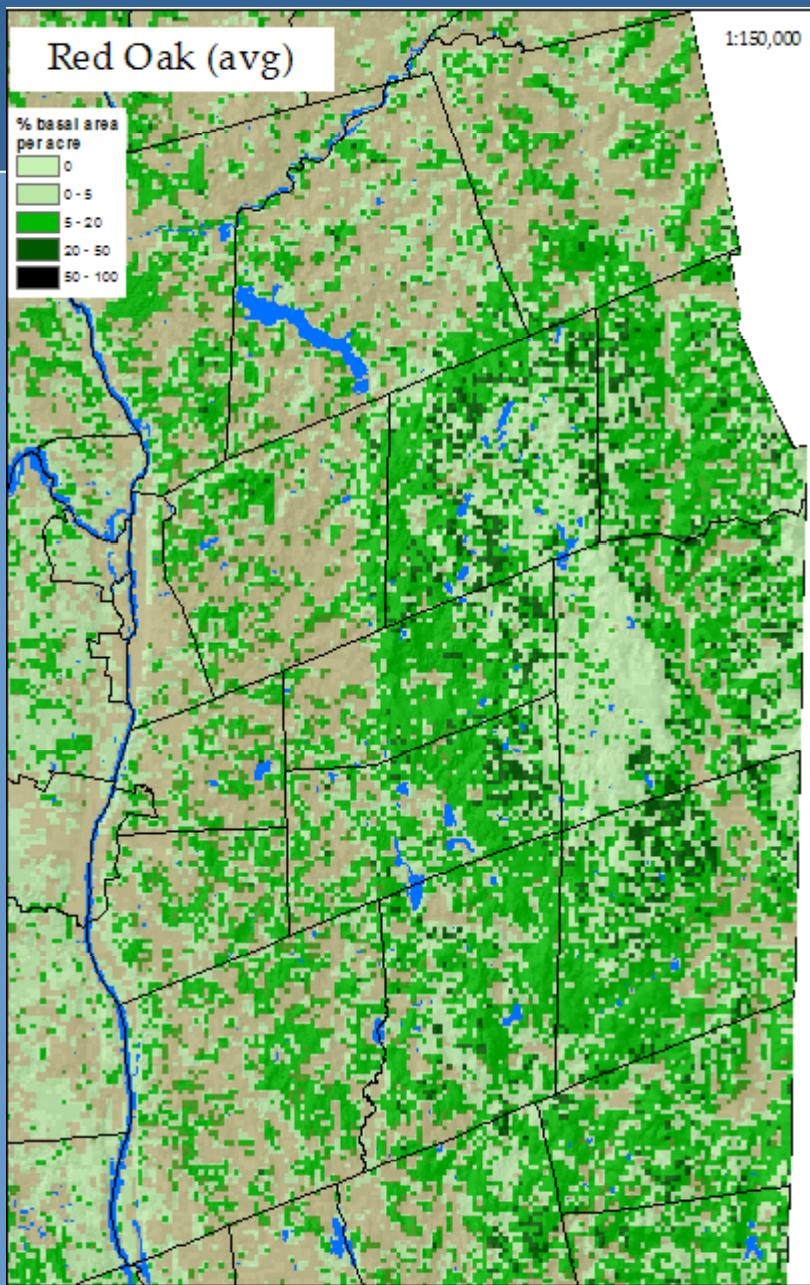
Red Spruce



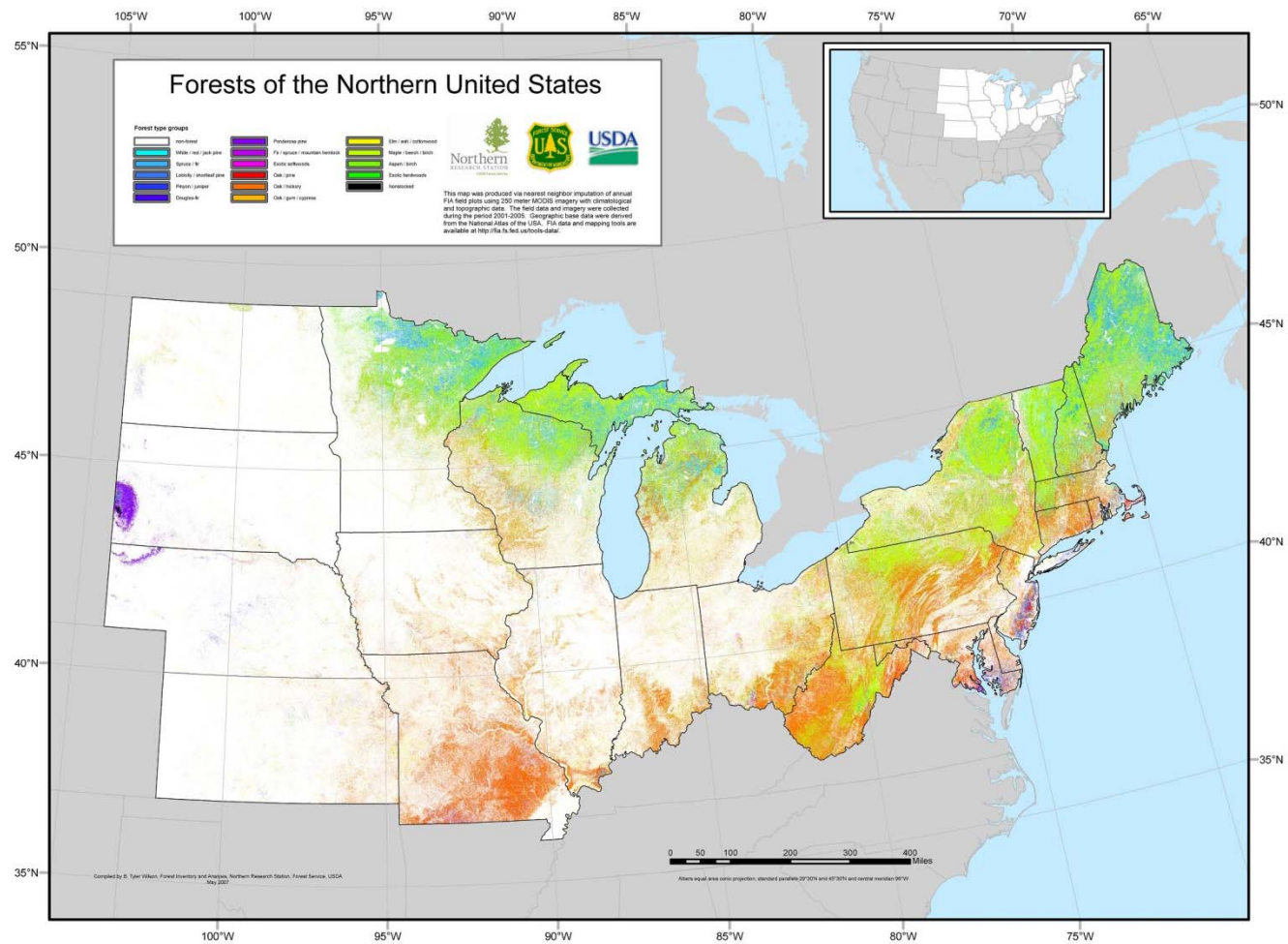
Yellow Birch



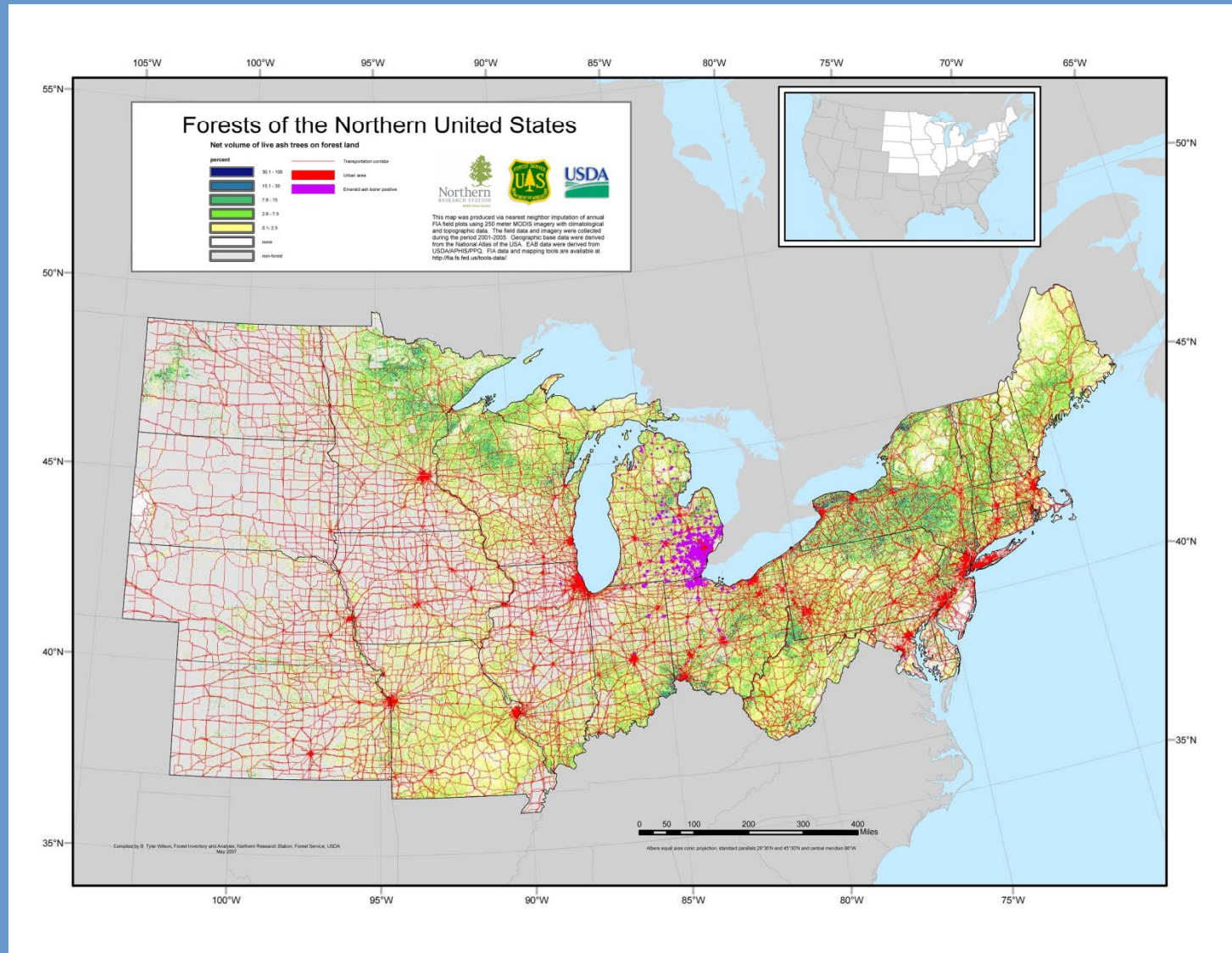
Copyright © 2010  
© 2010, U.S. Forest Service, in partnership with the National Science Foundation, for the development of the National Forest Inventory (NFI) using satellite remote sensing data.



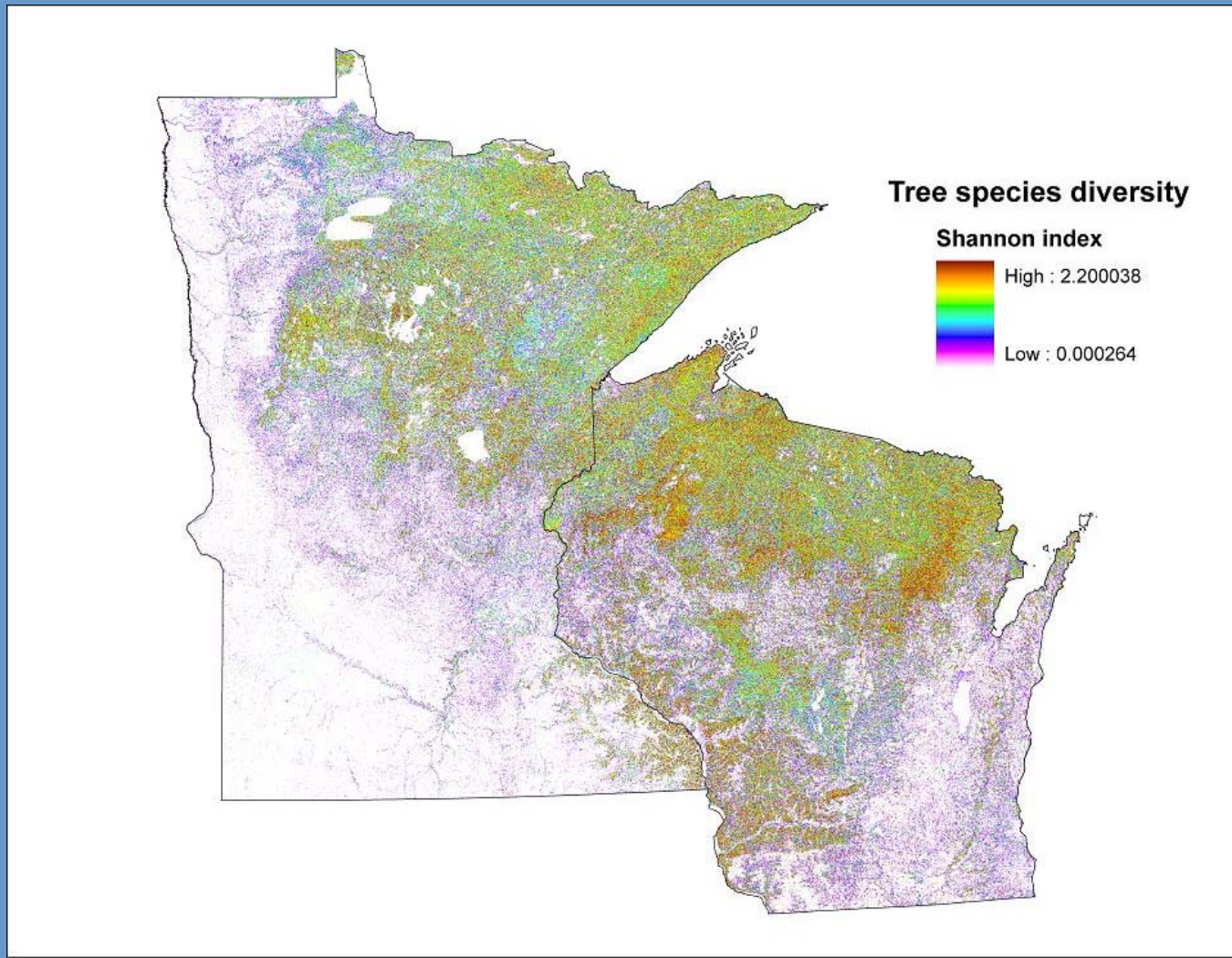
# Forest type groups map



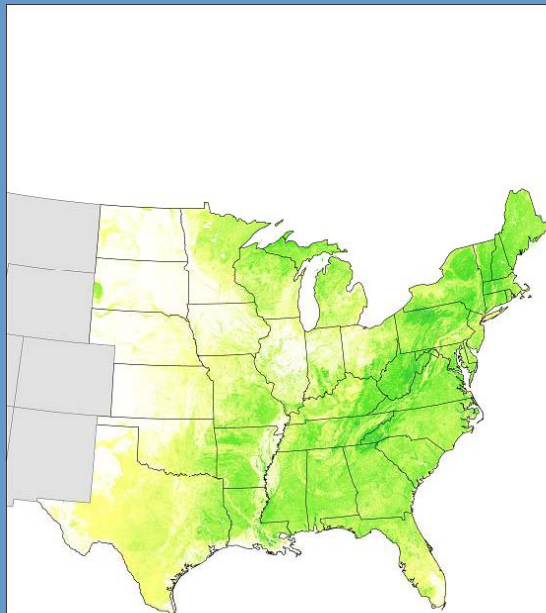
# EAB host map



# Shannon species diversity

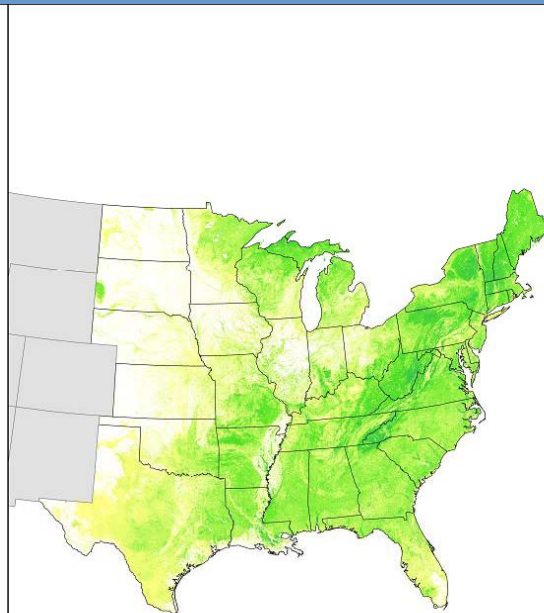


# Maps of forest carbon pools



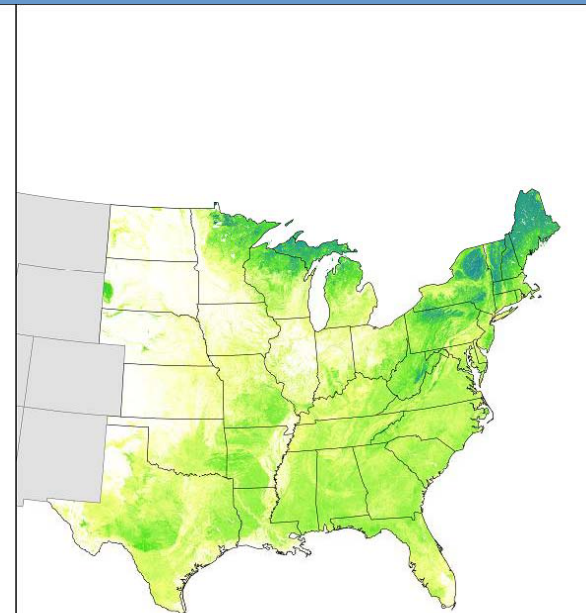
**Aboveground tree carbon**

tons/acre  
High : 88.431  
Low : 1.086e-004



**Belowground tree carbon**

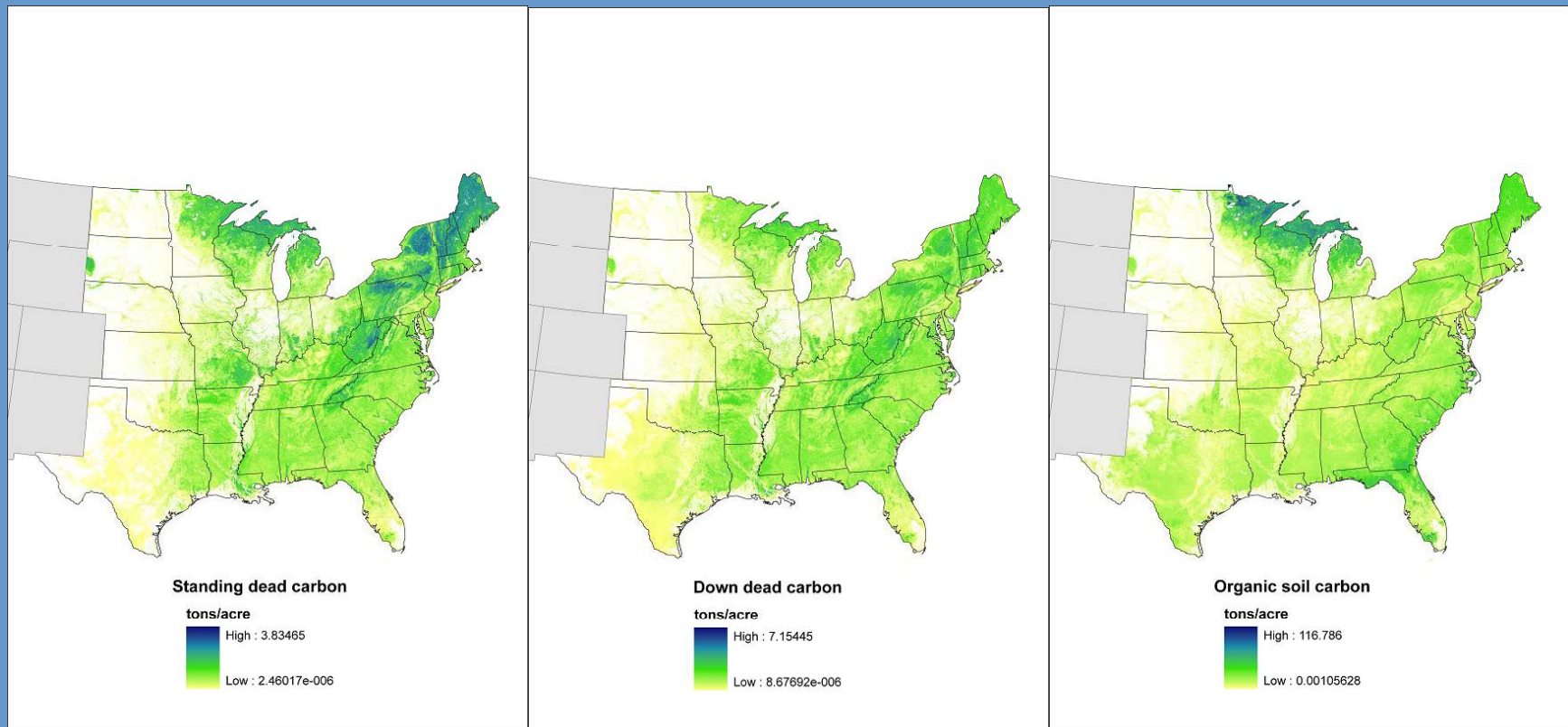
tons/acre  
High : 18.00425  
Low : 5.3272e-005



**Litter carbon**

tons/acre  
High : 18.5452  
Low : 9.56796e-005

# Maps of forest carbon pools (cont)





# Future directions

- Complete western US
- Linkage to FIDO ([fiatools.fs.fed.us](http://fiatools.fs.fed.us))
- Map fluxes
- Replace calculated w/ field data
- LULUC