

Published and Reported Woody Crop Biomass Yield Data



Presented by:
Lynn Wright,
Laurance Eaton,
and Bob Perlack

October 19, 2010
SRWCOWG Meeting

Why gather and summarize woody crop yields?

- **Biomass yield information is desired by many groups for planning purposes**
 - Analyst and Policy makers
 - Bioenergy investors
 - Bioenergy project developers
 - Potential growers
 - Potential users/wood suppliers
 - Companies supplying cuttings & seedlings
 - Researchers
- **Effort was needed to support modeling efforts used in “billion ton” update**

Terminology explanation

- **“Verified” biomass yields are values derived from publications with growth curves allowing identification of maximum MAI or CAI values or normal harvest age and with good descriptions of experimental trial conditions.**
- **“Reported but unverified” biomass yields are values derived from published overview papers, presentations, personal communications or grey literature reports with insufficient information on trial conditions and no growth curves.**

Attributes and limitations of the database

- **Limited to peer-reviewed journal publications to provide “verified” data sets**
- **Limited to reports of biomass yield estimates**
 - No effort made to convert volume to biomass
 - Expansion from stem or merchantable biomass to total aboveground biomass was done
- **Largely limited to reports including growth curves in order to determine if biomass yields represented maximum MAI or CAI**
 - Made exception for very high density plantings
- **Data inclusion was selective and subjective**
 - Good and optimal production conditions
 - Treatment & controls from well documented data

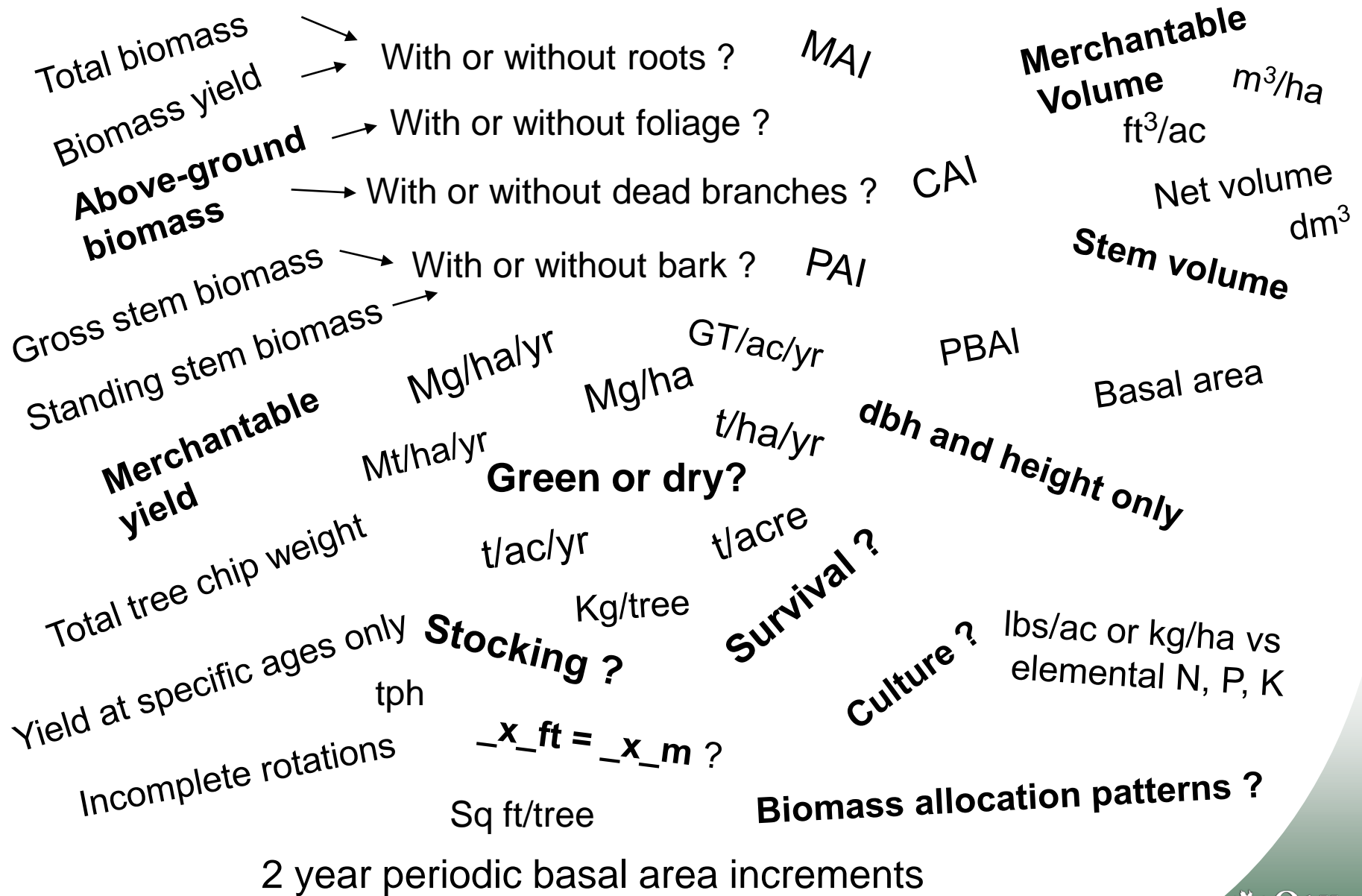
Database attributes and limitations cont.

- **Poor growth conditions and low yield genotypes were excluded when evaluating yield potential**
- **Yield reports without associated stocking density and management input information were excluded from “verified” data sets.**
- **Site descriptions were included in database when available**
- **Fertilization information was normalized to “total rotation input” rather than average annual input**

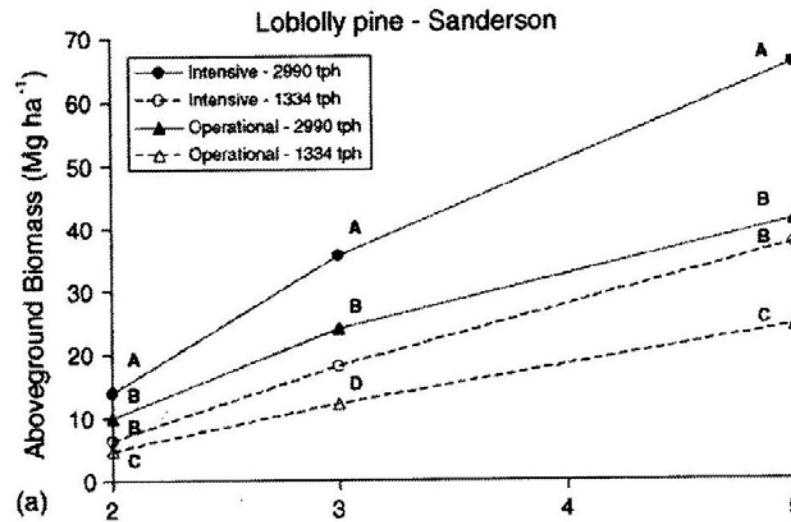
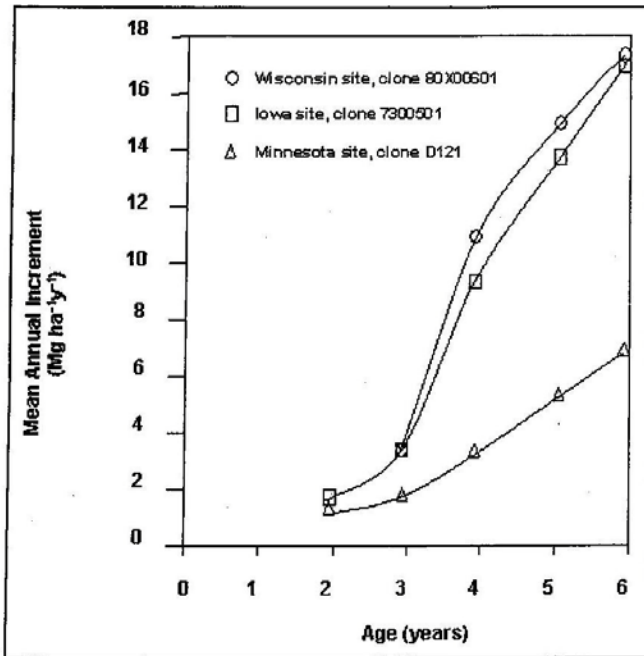
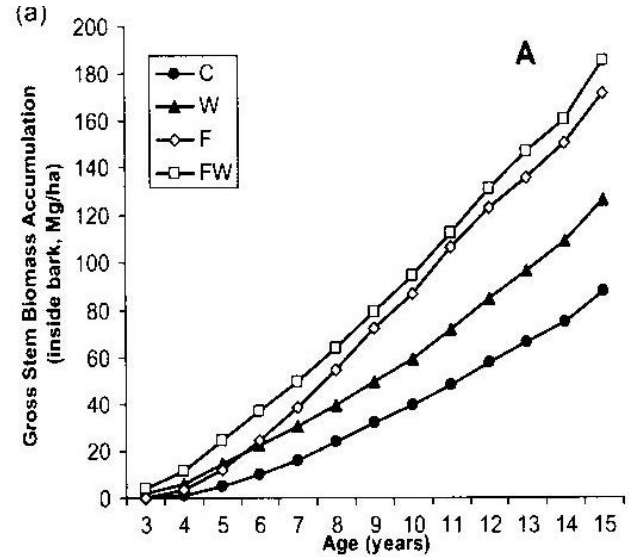
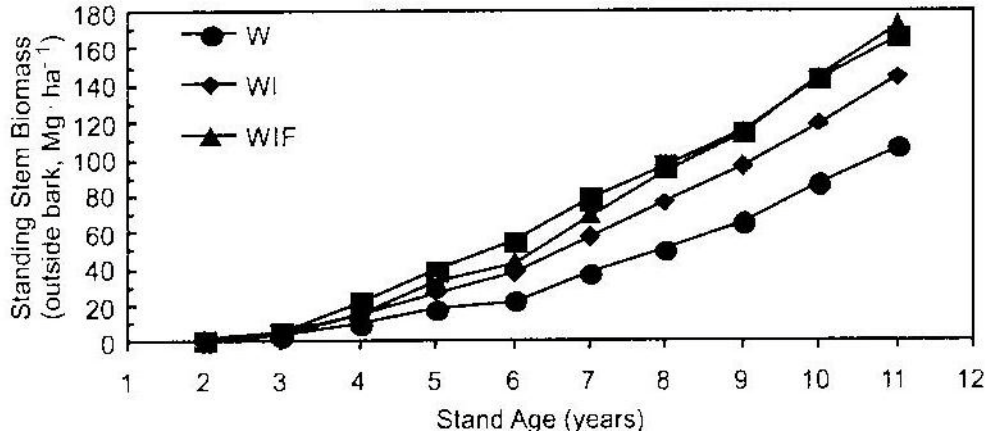
Information resources used for database

- **~ 200 published papers with growth data examined as of Oct. 14, 2010.**
- **67 useful field trials identified from 32 papers**
- **357 useful genotype x treatment x locations**
- **163 treatment combinations with growth data at or near MAI_{max} , though not all used.**
- **111 “verified” MAI_{max} data points deemed useful for potential yield estimation.**
- **Additional “reported” but “unverified” and model projections of biomass yields will be put into separate worksheets**

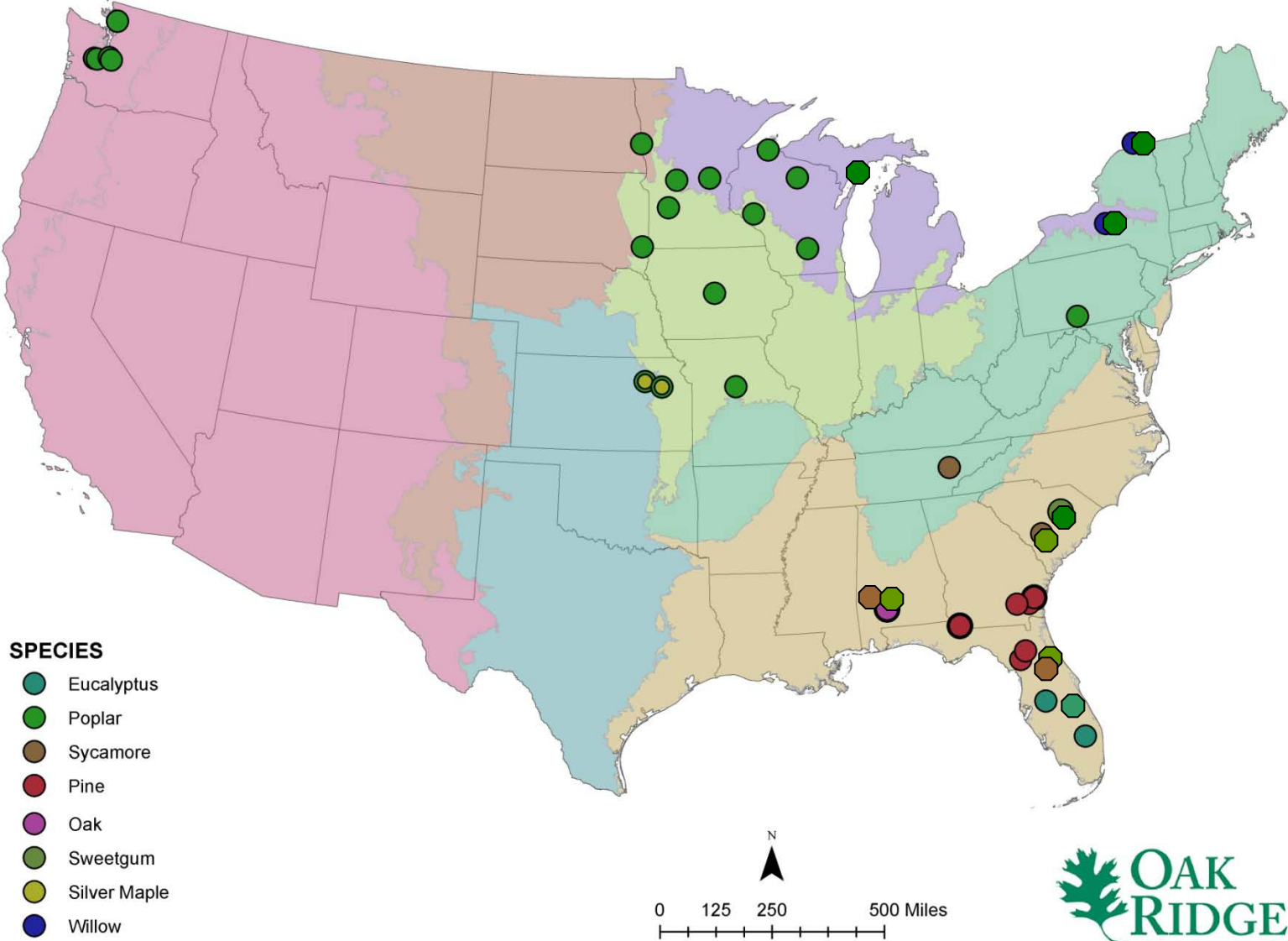
Challenges to assembling comparable data



Many data points derived from graphs

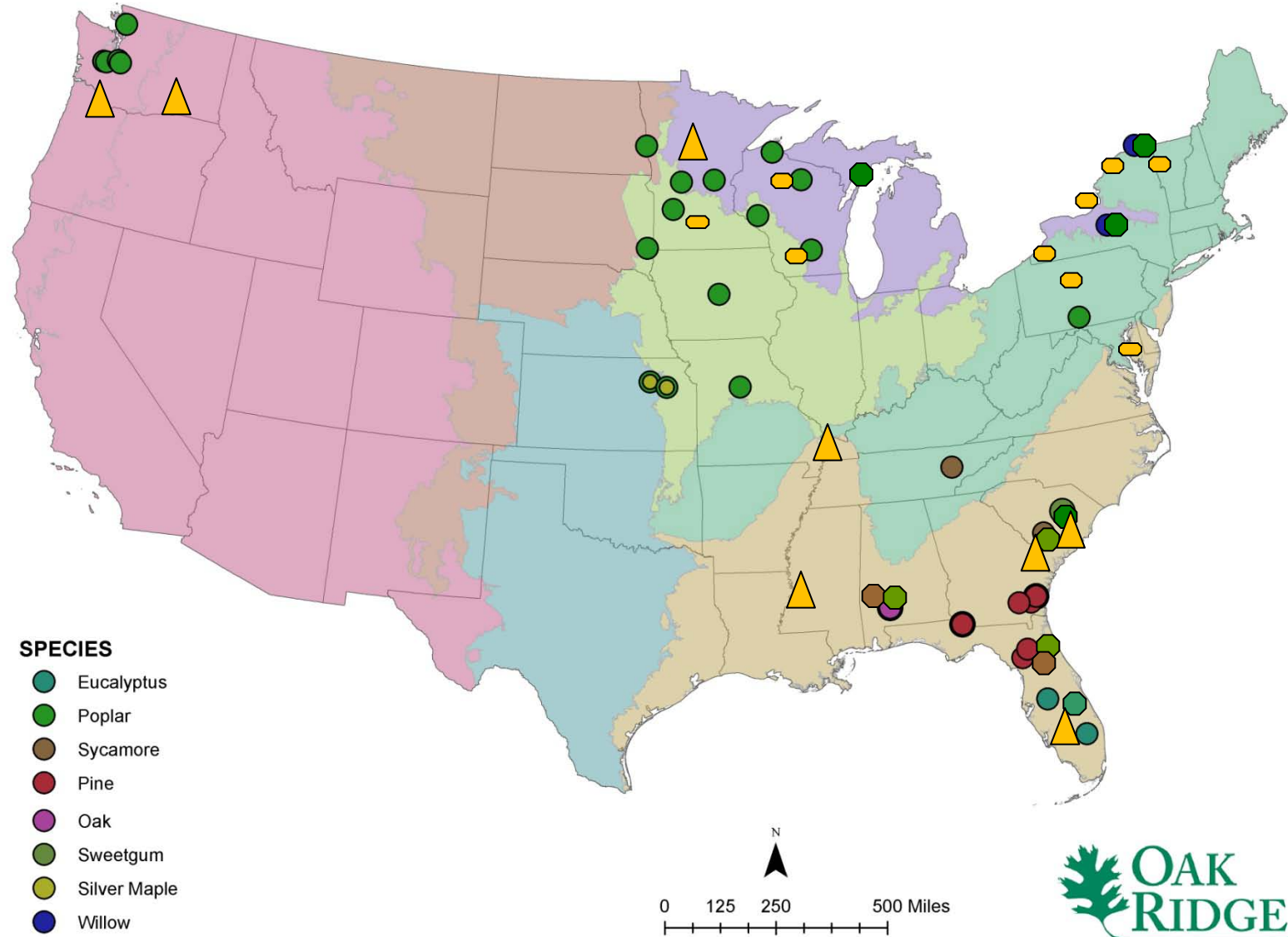


Research locations in woody crop database



Research locations in woody crop database

with hardwood commercial▲ or scale-up locations●



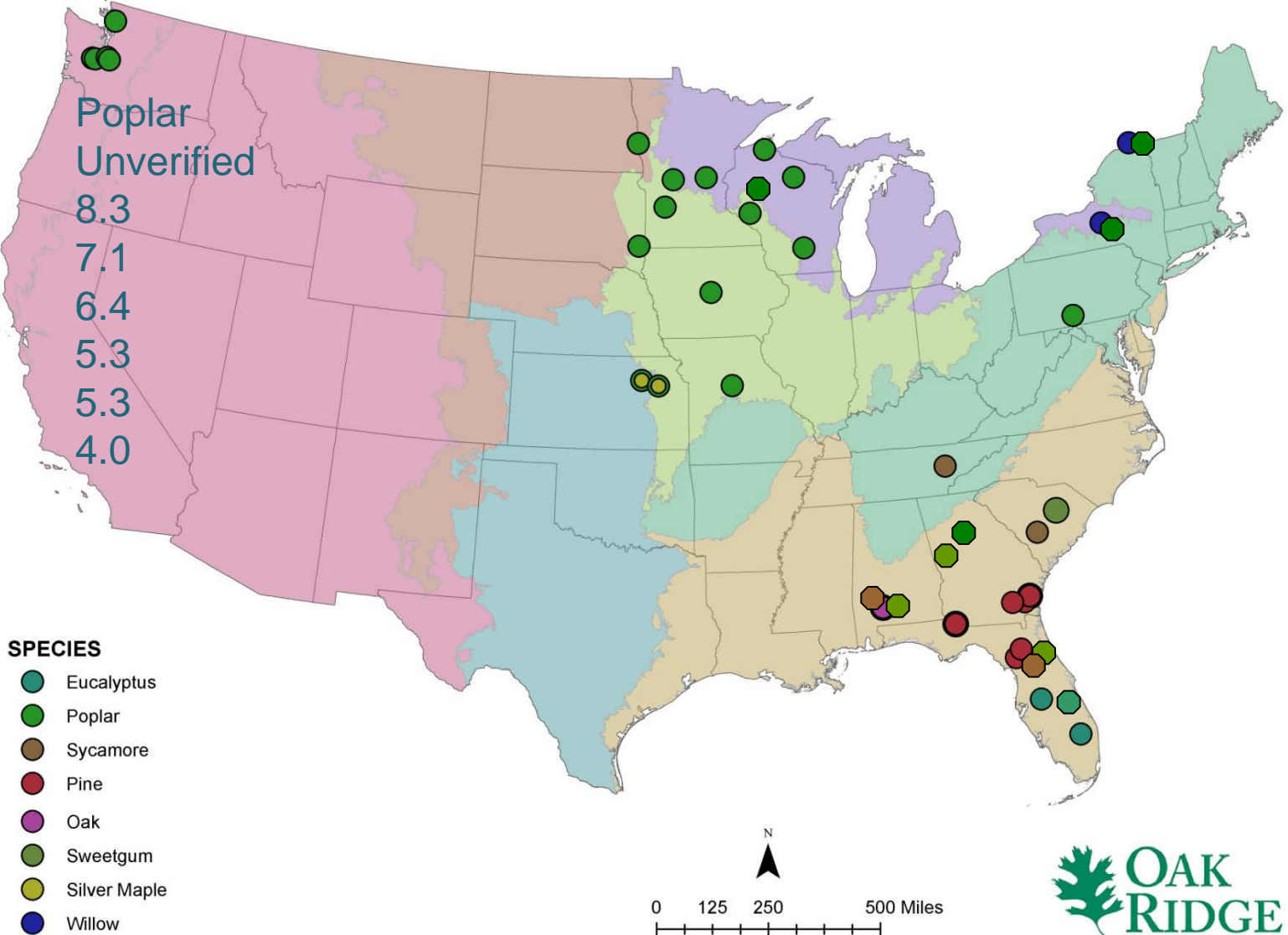
Pacific Northwest biomass yield range dt/ac/yr

Poplar
verified

19.4
14.6
13.9
8.3
7.1
6.4
13.0
12.4
12.3
10.8
10.3
8.2
7.9
7.6
6.6

Poplar
Unverified

Pre 1979
2.5 – 4.6



North Central/Midwest biomass yield range dt/ac/yr

Poplar

Unverified Verified

10.9 7.7

9.4 7.5

7.3 6.8

7.2 6.7

6.9 6.1

6.0 6.0

6.0 5.7

5.0 5.2

4.6 5.1

4.0 4.8

3.8 4.7

3.5 4.1

3.0 4.1

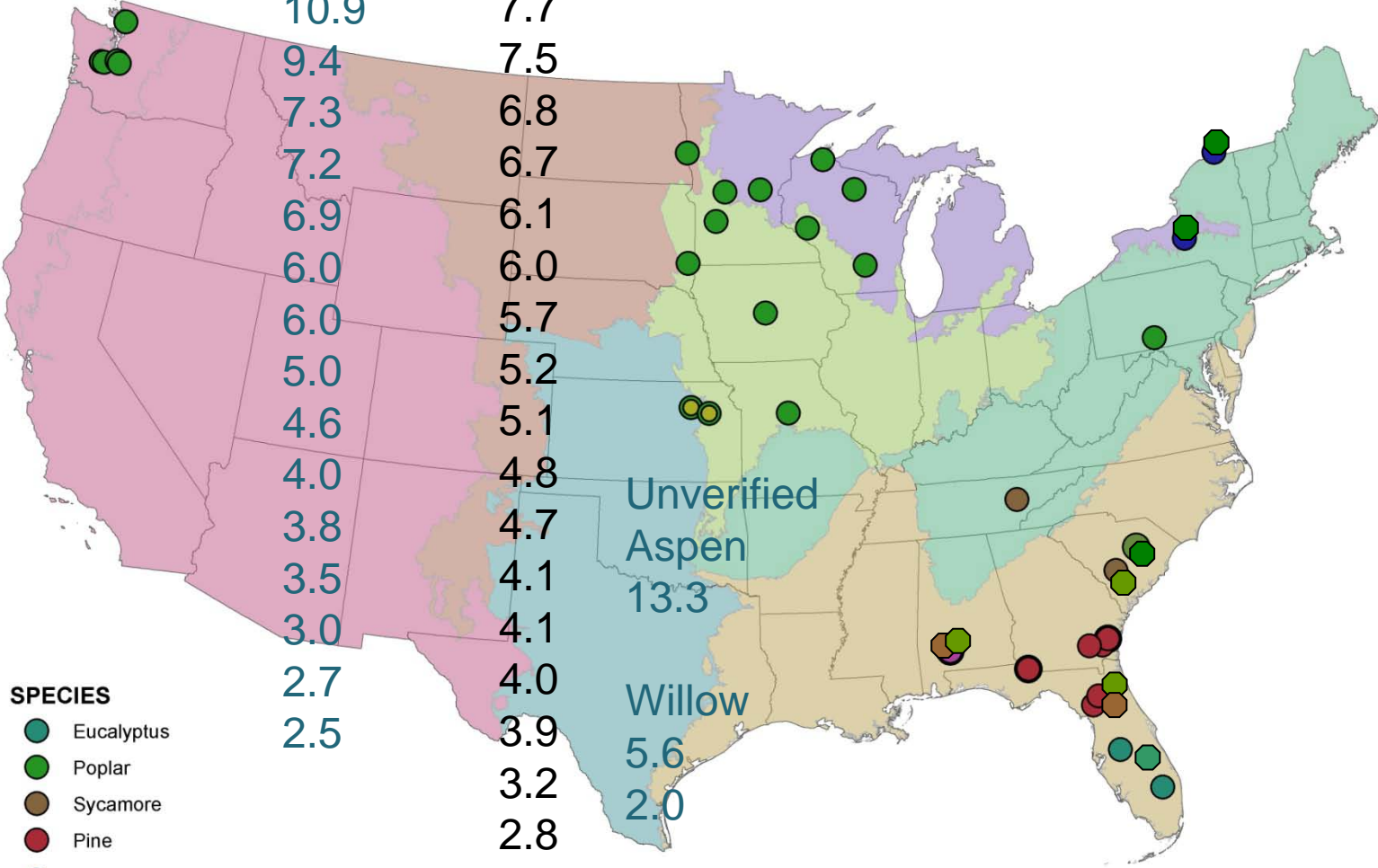
2.7 4.0

2.5 3.9

3.2

2.8

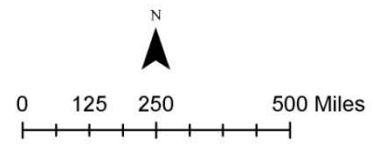
2.4



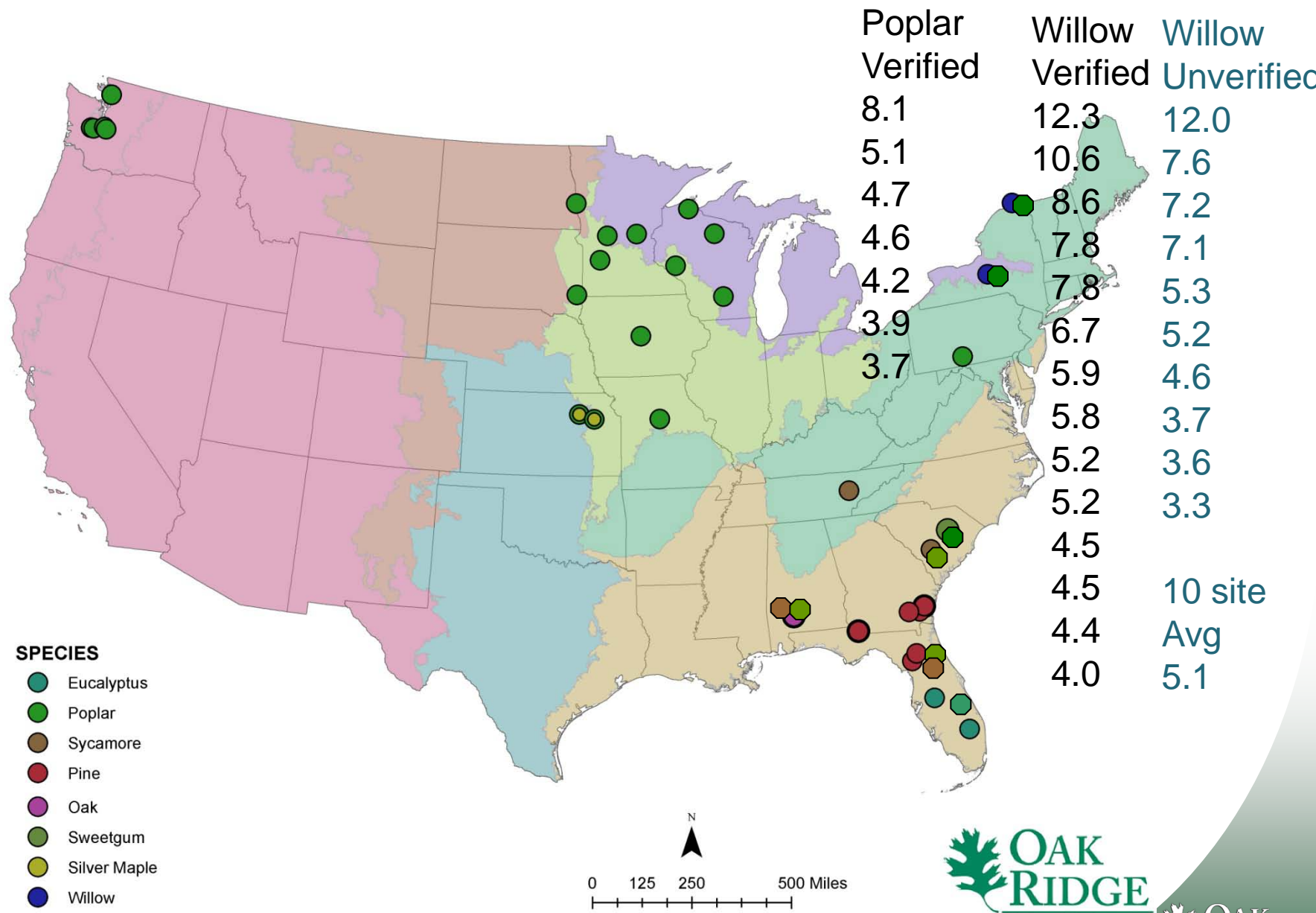
Unverified
Aspen
13.3

Willow
5.6
2.0

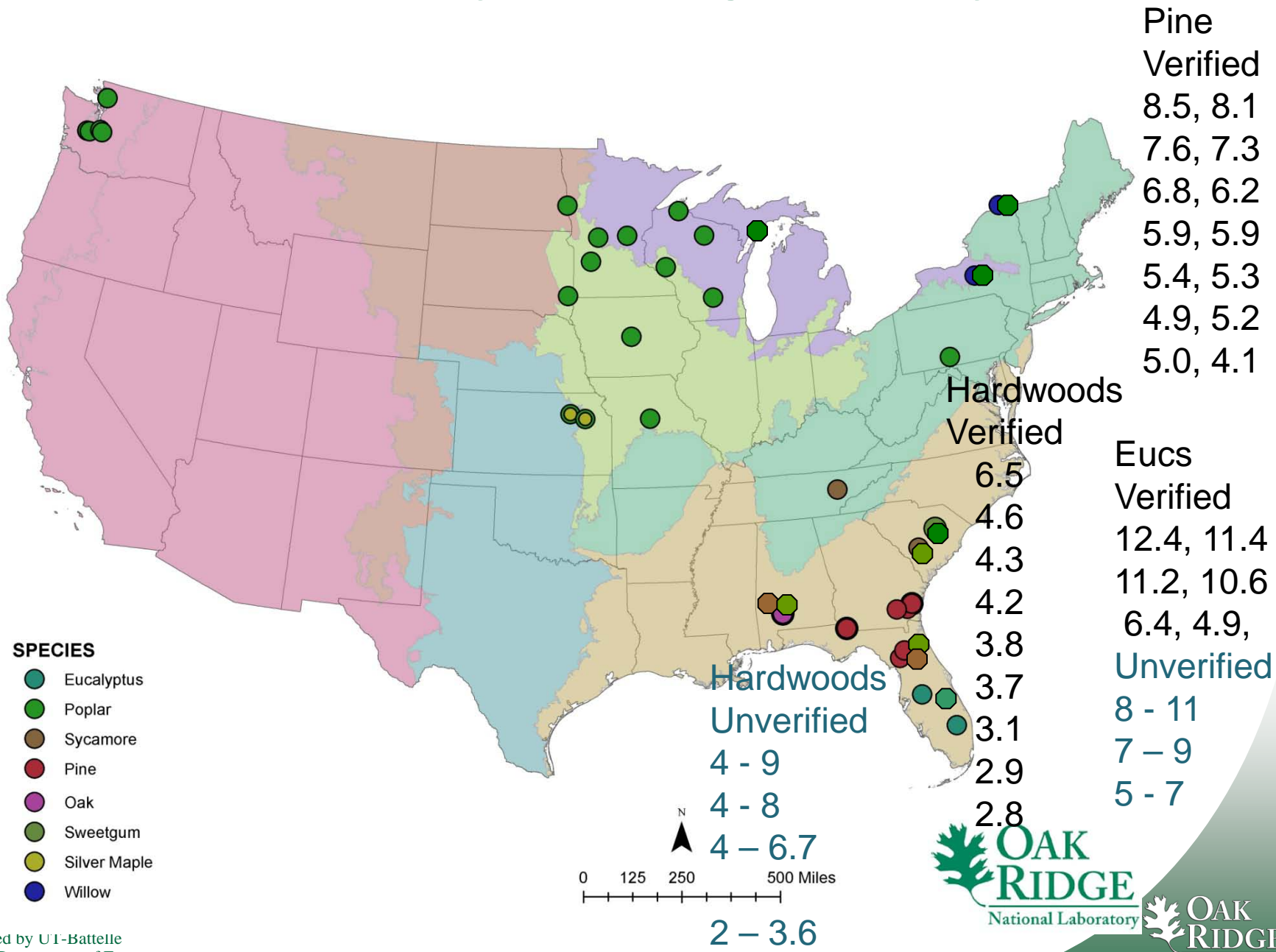
- SPECIES**
- Eucalyptus
 - Poplar
 - Sycamore
 - Pine
 - Oak
 - Sweetgum
 - Silver Maple
 - Willow



Northeast biomass yield range dt/ac/yr

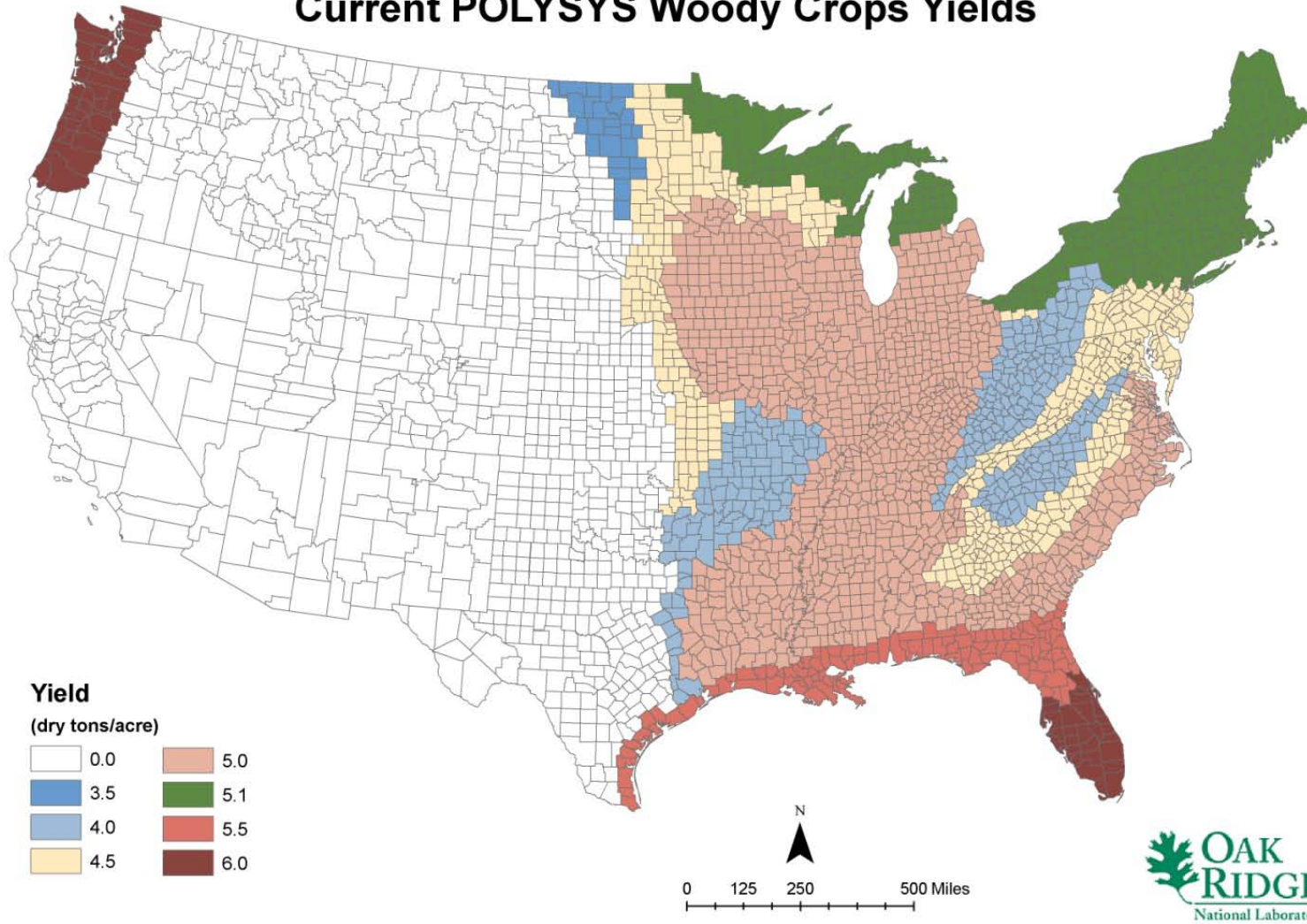


Southeast biomass yield range dt/ac/yr



Assumed average yields of woody crops planted in 2012 for bioenergy feedstocks

Current POLYSYS Woody Crops Yields



Concluding comments about yields

- **Continuation of yield measurements through point of maximum mean annual increment (MAI_{max}) is very important to obtaining reliable yield potential information.**
- **Research suggests that woody crop yields > 7 dt/ac/yr can be frequently reached in PNW and coastal SE and occasionally reached in NE and NC/Midwest with selected varieties of best species on good to marginal sites.**
- **Currently only perennial or annual grass crops show potential for > 7 dt/ac/yr in central-eastern US. Insufficient research exists for woody crops in that region.**

Available and expected products from review of woody crop yields

- **Summary tables of woody crop yields – available at this meeting**
- **Woody crop database with ~ 70 data columns for info input (in Excel spreadsheet)**
 - About 1500 lines of US research data input
 - Data addition still in progress
 - Drafts available upon request
- **Technical Manuscript with summary tables & discussion of woody crop data – in progress**
- **Book chapter or paper including European, Canadian and US data on woody crops – in progress**

Your additions and corrections
would be welcomed greatly

Contact

Lynn Wright

wrightld@gmail.com

wrightl@ornl.gov

Ph 865-288-9463