

Assessment of American Chestnut growth (*Castanea dentata*), hybrid stem count, growth, and surrounding vegetation on two reclaimed mines restored using the Forestry Reclamation Approach for soil amendment

ZACHARY GRIFFITH – COLUMBUS STATE COMMUNITY COLLEGE

RYAN HOMSHER – COLUMBUS STATE COMMUNITY COLLEGE

JULIA CHAPMAN-UNIVERSITY OF WISCONSIN-STOUT

KEITH GILLAND-UNIVERSITY OF WISCONSIN-STOUT

JENISE M. BAUMAN - WESTERN WASHINGTON UNIVERSITY

American Chestnut and Mineland Reclamation

- ▶ The American Chestnut Foundation (TACF) is committed to mineland reclamation
 - ▶ Working with other groups, TACF has assisted in the planting of more than 1.8 million seedlings of various high-value hardwood species.
 - ▶ Reforestation of nearly 3,000 acres on both publicly- and privately-owned mined lands in eight states since 2009.
 - ▶ According to Ohio Department of Natural Resources, there are 450,000 acres of abandoned minelands prior to Ohio's 1972 reclamation laws.



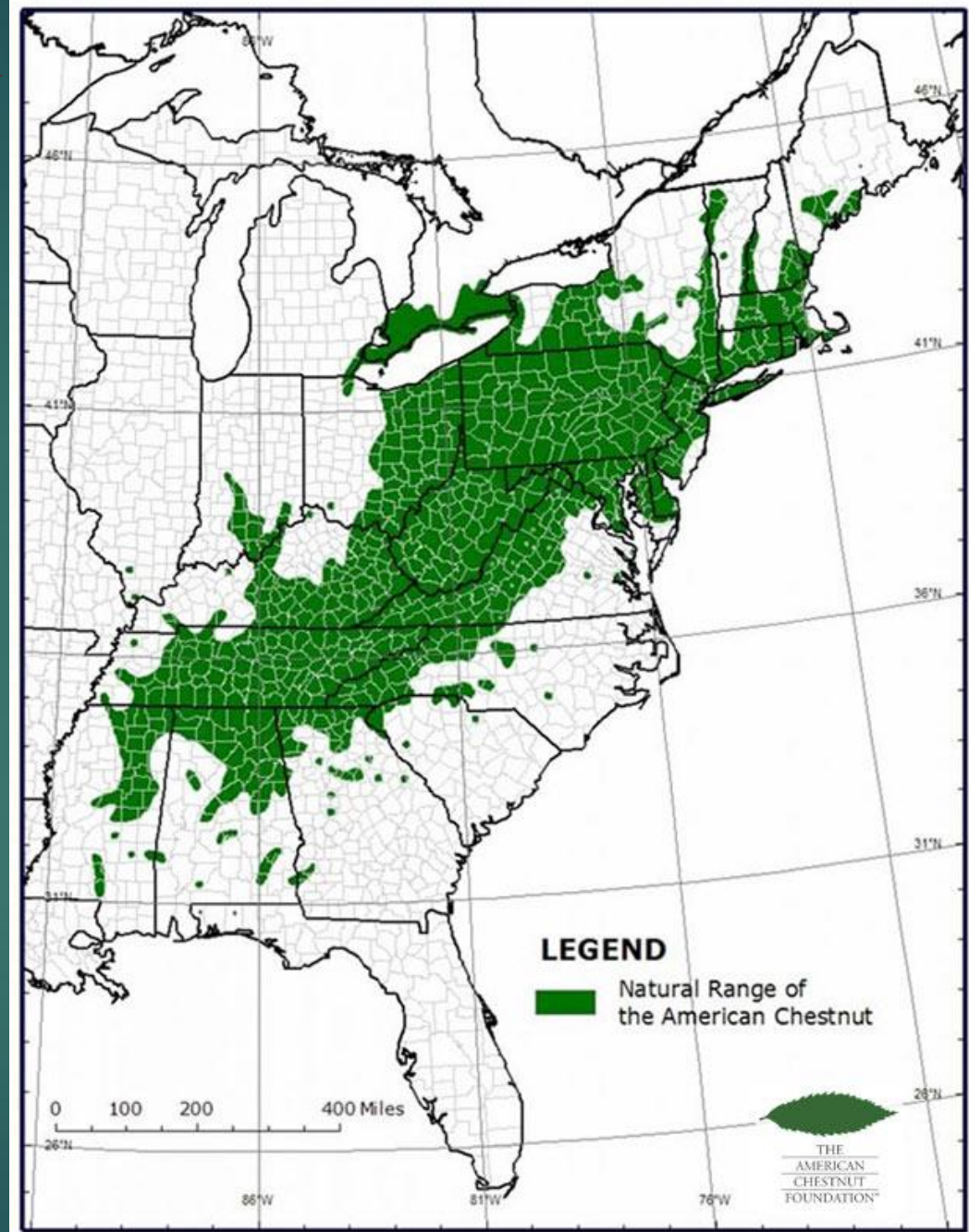
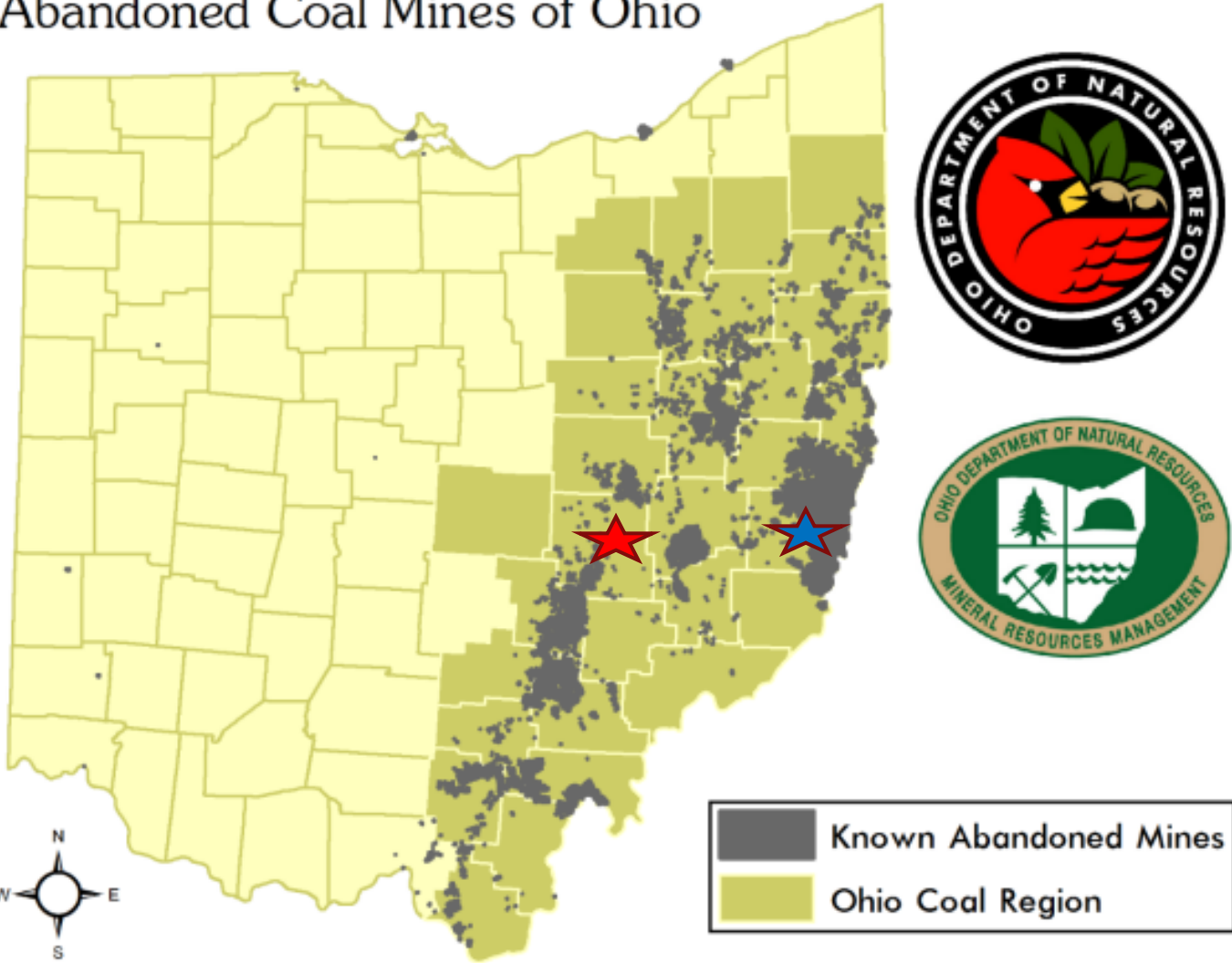
American Chestnut and Mineland Reclamation

- ▶ **Goal:** Revisit two American Chestnut reforestation sites to compare tree growth, vegetative cover, and soil characteristics.
- ▶ (FRA) – Forest Reclamation Approach
 - ▶ Construction of the forest land growth medium.
 - ▶ Placement of the forest land medium.
 - ▶ Loosening of the seed bed on compacted reforestation areas.
 - ▶ Proper ground cover specifications.
 - ▶ Proper tree species for early succession and commercially valued. (Chestnuts fit both)



Tri-Valley Wildlife Area = ★ Jockey Hollow Wildlife Area = ★

Abandoned Coal Mines of Ohio



Ripped Plots: Tri –Valley Wildlife Management Area

- ▶ Muskingum County, Ohio
- ▶ FRA method –Deep (1m) ripping plots (crossed ripped) 18m x 35m, 2.5m x 2.5m in spacing of trees.
- ▶ Planted in March 2007
- ▶ Site managed until 2010



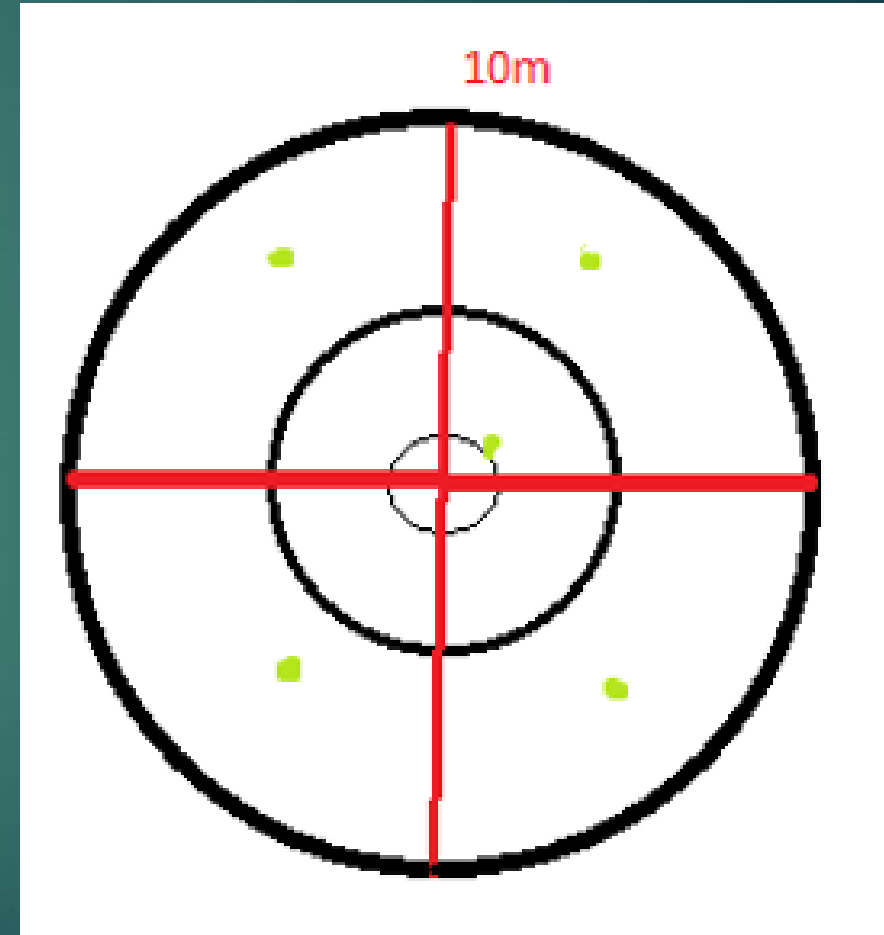
Jockey Hollow Wildlife Management Area

- ▶ Belmont County , Ohio
- ▶ FRA method – “end dump”
first restoring the contour,
then adding loosely
dumped mining overburden
into series of large mounds
approximately 8-10 m in
diameter and 3-5 m high.
- ▶ Planted in March 2009
- ▶ No management after
planting



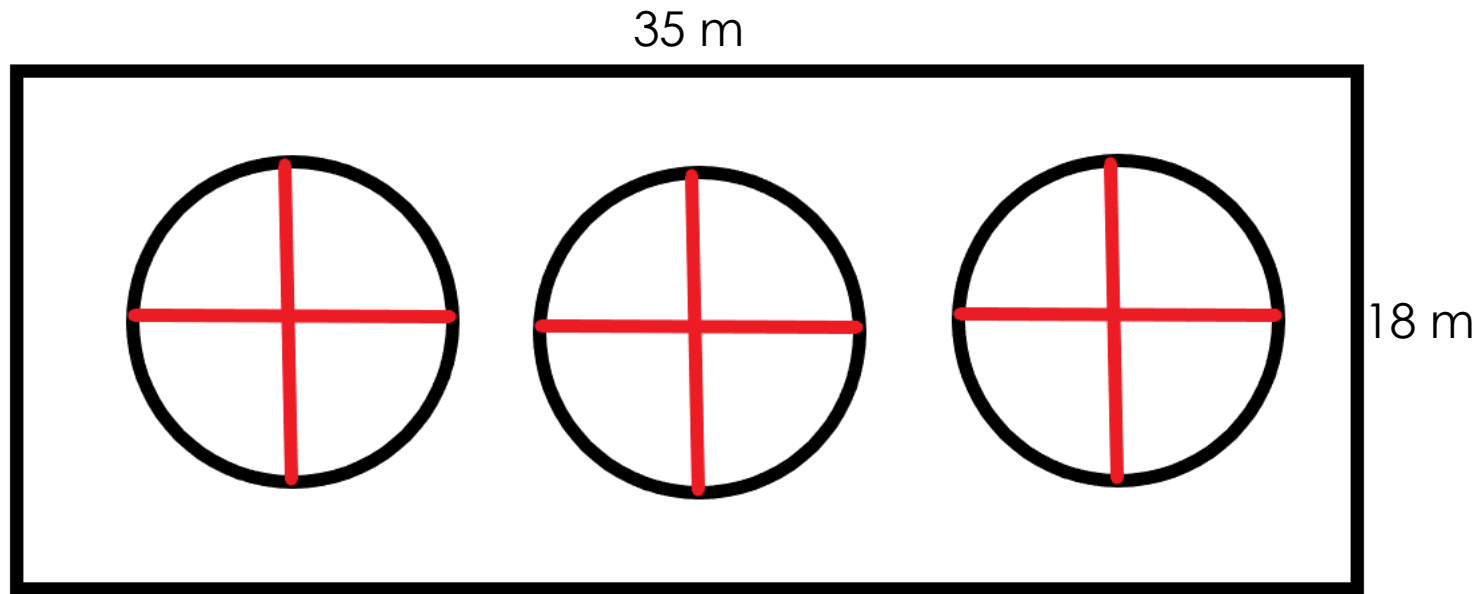
Sampling Method

- ▶ Ten meter diameter circular quadrats
 - ▶ Woody species and DBH were recorded ($>1\text{cm}$)
 - ▶ Shrub species were recorded in a 3.5 meter diameter subplot
 - ▶ Herbaceous species were recorded in a 1 meter diameter subplot
 - ▶ Soil sample from each quadrat was collected from the center and four “corners”



Tri-Valley Field Collection

- ▶ 9 ten-meter diameter circular quadrats
 - ▶ Three plots were selected from each ripping block

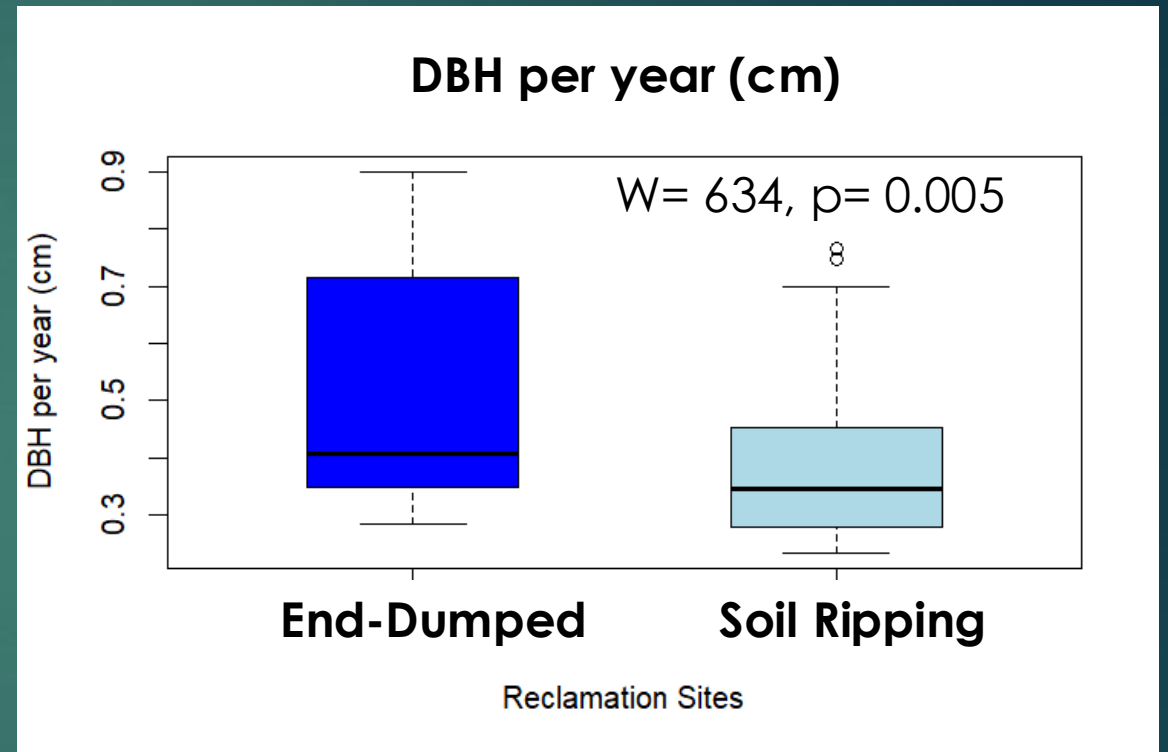
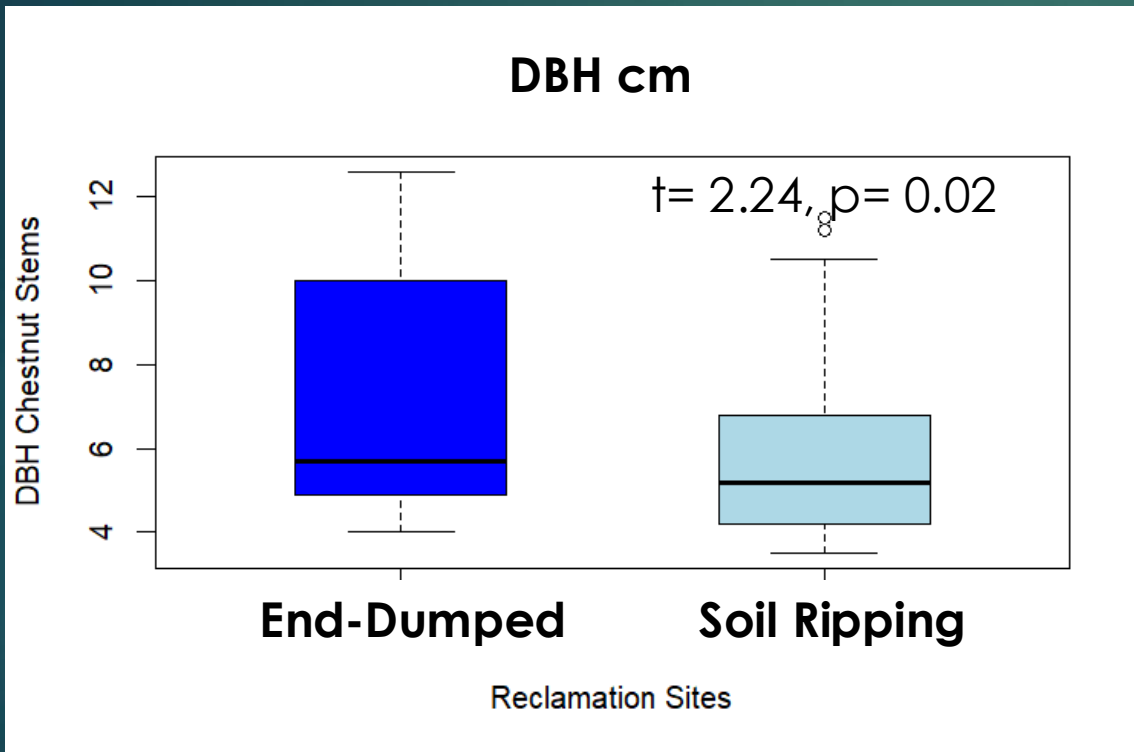


Jockey Hollow Collection

- ▶ 9 ten-meter diameter circular quadrats
 - ▶ Plots were selected on the basis of surviving chestnut locations

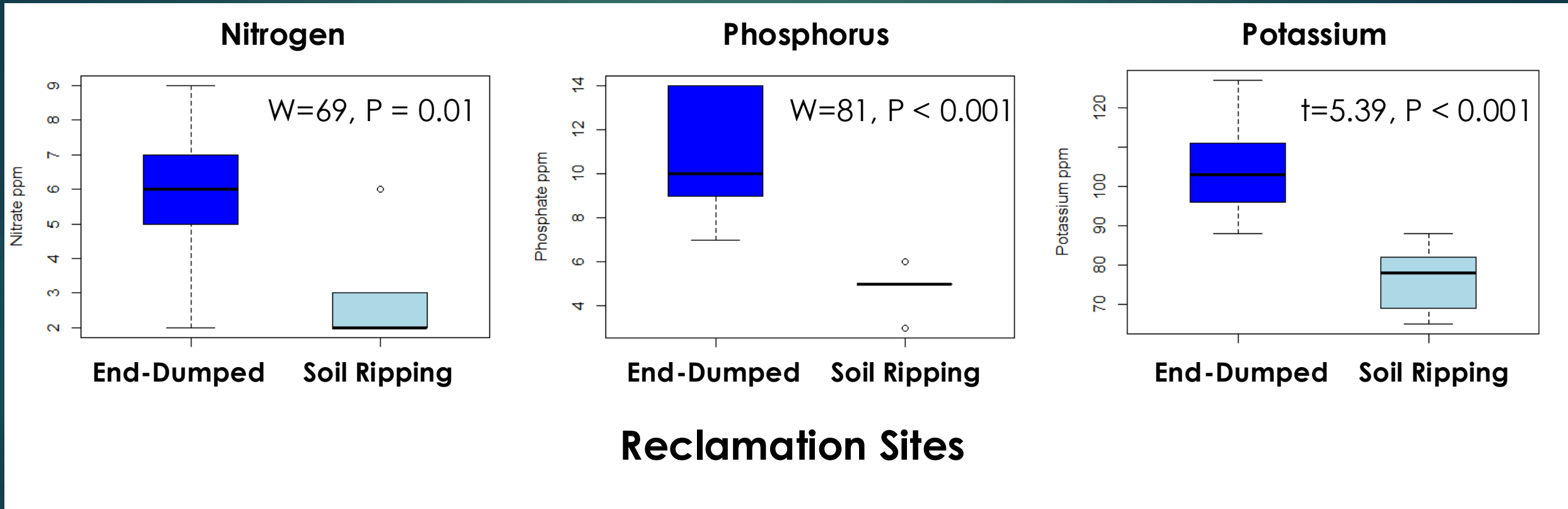


Results - Chestnut DBH per Plot:



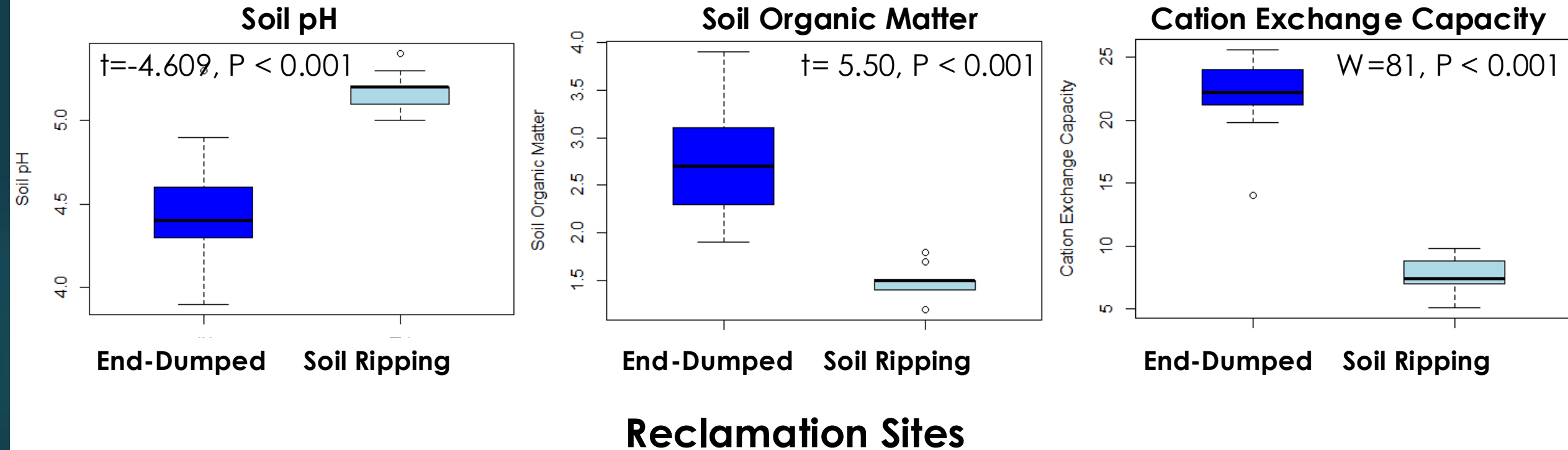
DBH in end-dumped plots were larger (7.8 DBH cm) than trees planted in the ripped plots.

Results - Macronutrients:



Site differences in N-P-K where noted: increased N-P-K in soils within the end-dumped sites may have contributed to increased growth

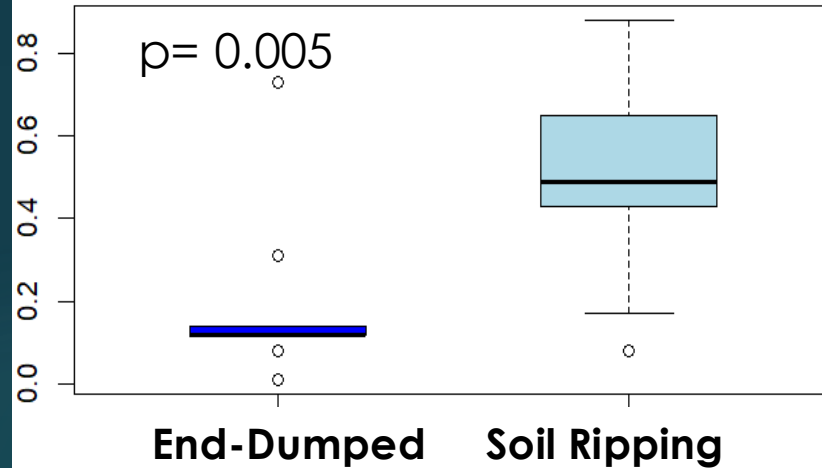
Results - Soil Chemistry:



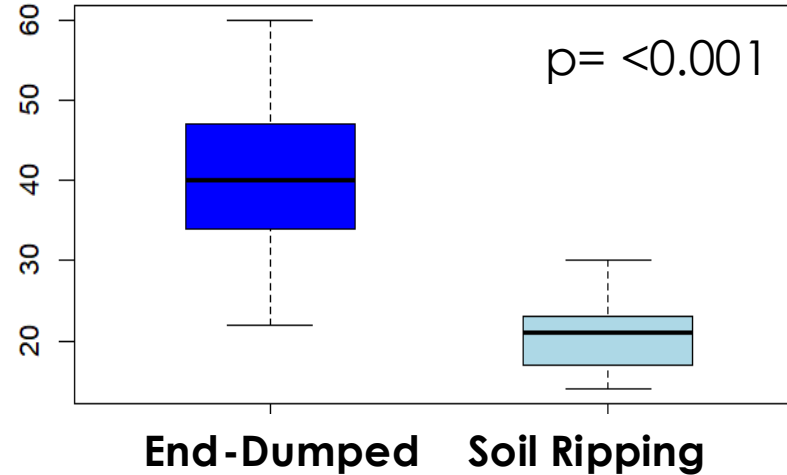
Other site differences in where noted: decreased pH combined with increased OM and CEC within the end-dumped sites may have also contributed to increased growth

Woody Stems and Herbaceous Cover:

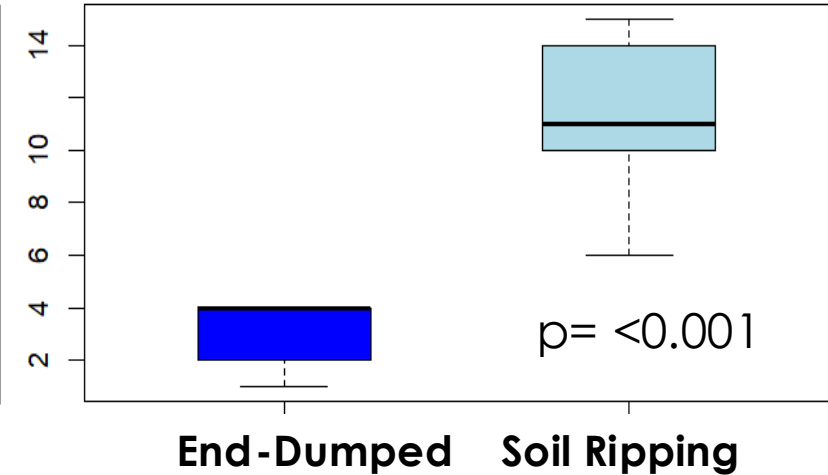
Chestnut Stem Count



Total Stems Count



Vegetation Cover

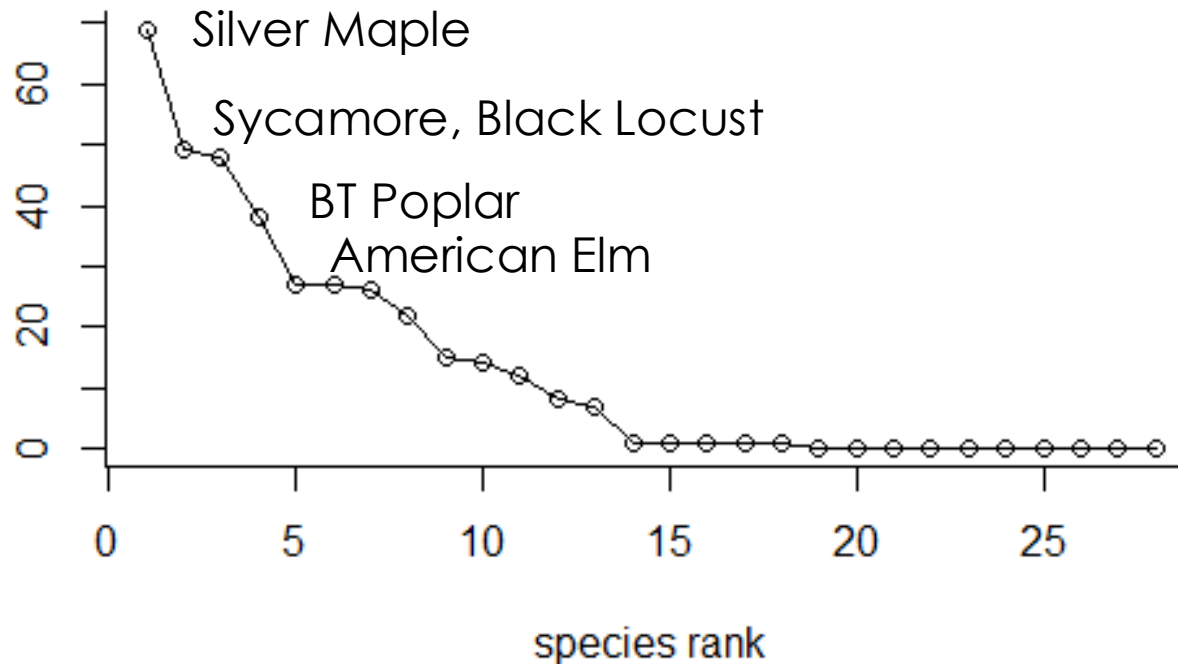


Reclamation Sites

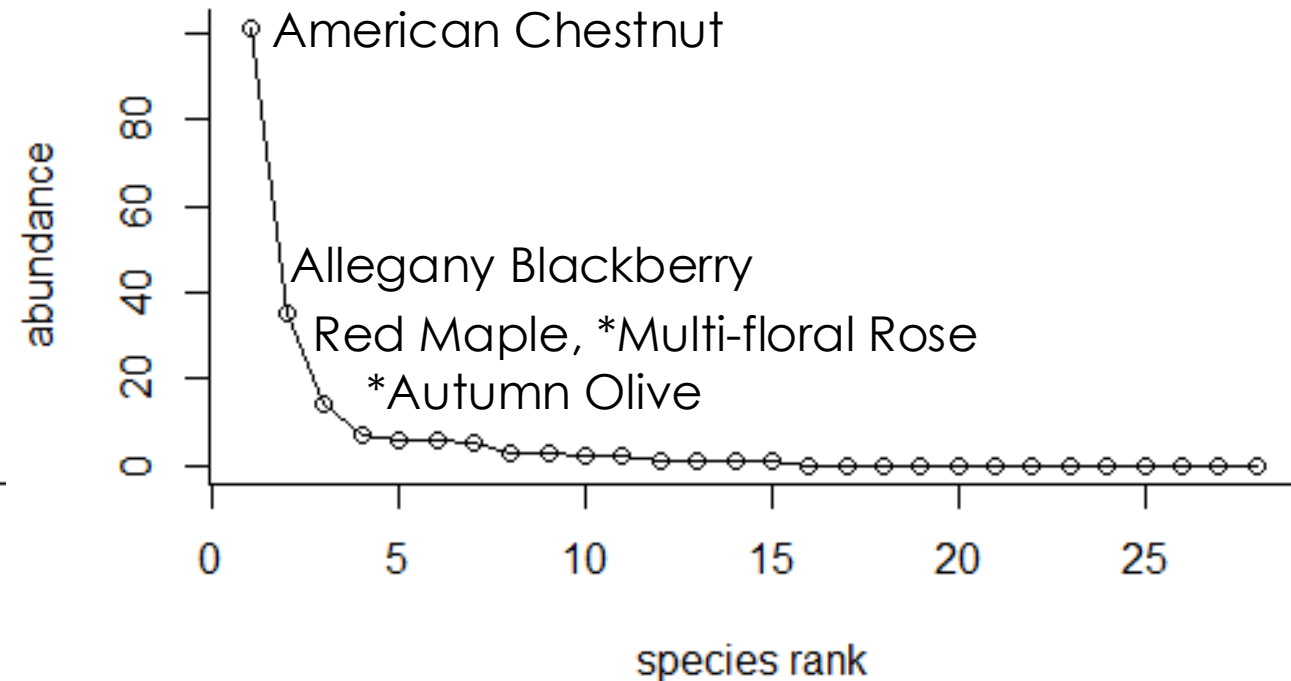
Ripped soils The presence of chestnut stems increased vegetation cover in the ripped soils. More woody stems in end-dumped which is inversely related to vegetation cover.

Woody Species – top five

End-Dumped



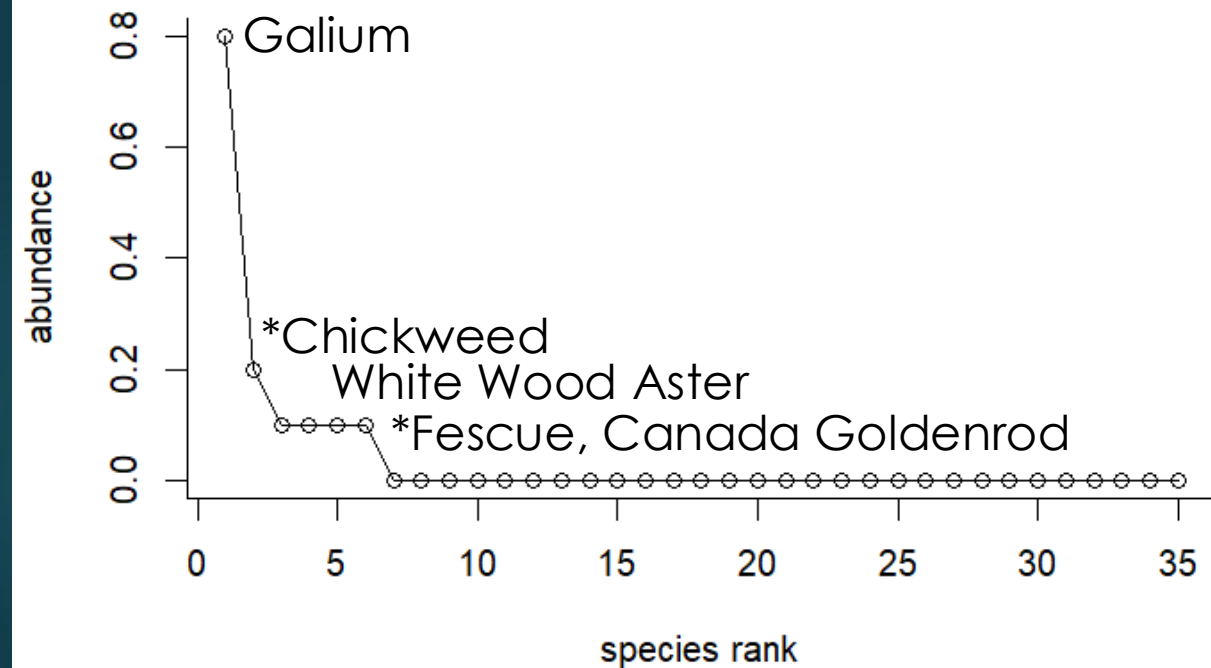
Soil Ripping



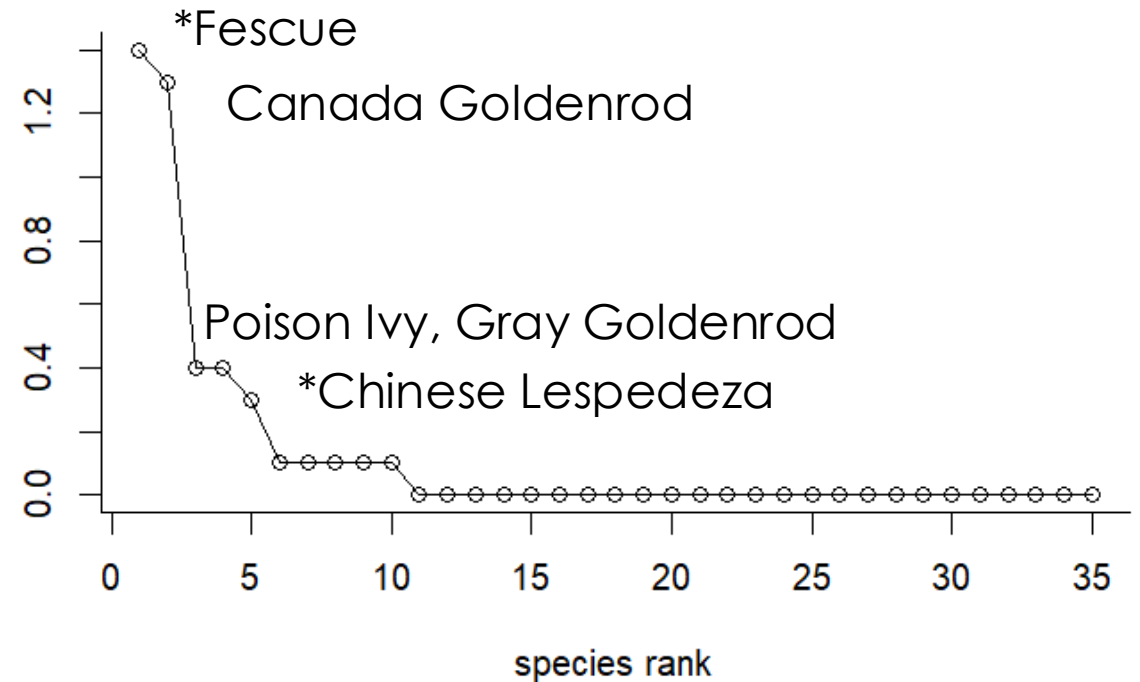
Asterisks (*) indicate non-native species. Greater species richness in end-dumped plots (mean = 9.4 spp.) compared to Soil Ripping (mean = 5 spp.)

Herbaceous Species – top five

End-Dumped



Soil Ripping



Asterisks (*) indicate non-native species. Similar pattern of abundance between the two restoration sites. Similar species richness in end-dumped plots (mean = 6 species) and ripped sites (mean = 5 species)

Interesting Finds: End-dumped Plots

- ▶ DBH – Higher in Ripped plots. Authors note N,P,K, OM, and CEC were higher in these soils
- ▶ Stem Count – Lower chestnut stem count in end-dumped plots
- ▶ Woody Species – Higher abundance of woody species end-dumped

Better trajectory towards forest restoration



Interesting Finds: Ripped Plots

- ▶ DBH – Lower in Ripped plots. Soil conditions conducive for chestnut, interspecific competition may be impacting growth
- ▶ Stem Count: planting methods resulted in a chestnut dominate canopy
- ▶ Woody Species – significantly lower richness and abundance of trees, higher herbaceous

Model for Agroforestry



Mentions

- ▶ Joseph Moosbrugger-Crane Hollow Nature Preserve
- ▶ Ohio – The American Chestnut Foundation
- ▶ Ohio Department of Natural Resources-Division of Forestry
- ▶ Western Washington University

