Effect of silvicultural treatment and forest type on chestnut emergence

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Acknowledgements

TACF: Kendra Collins, Will Abbott, Eric Evans, and Mark McCollough

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Foresters: Elizabeth Farrell, Roger Greene, Charli Moreno, Malcolm Richardson, Brian Roth

Introduction

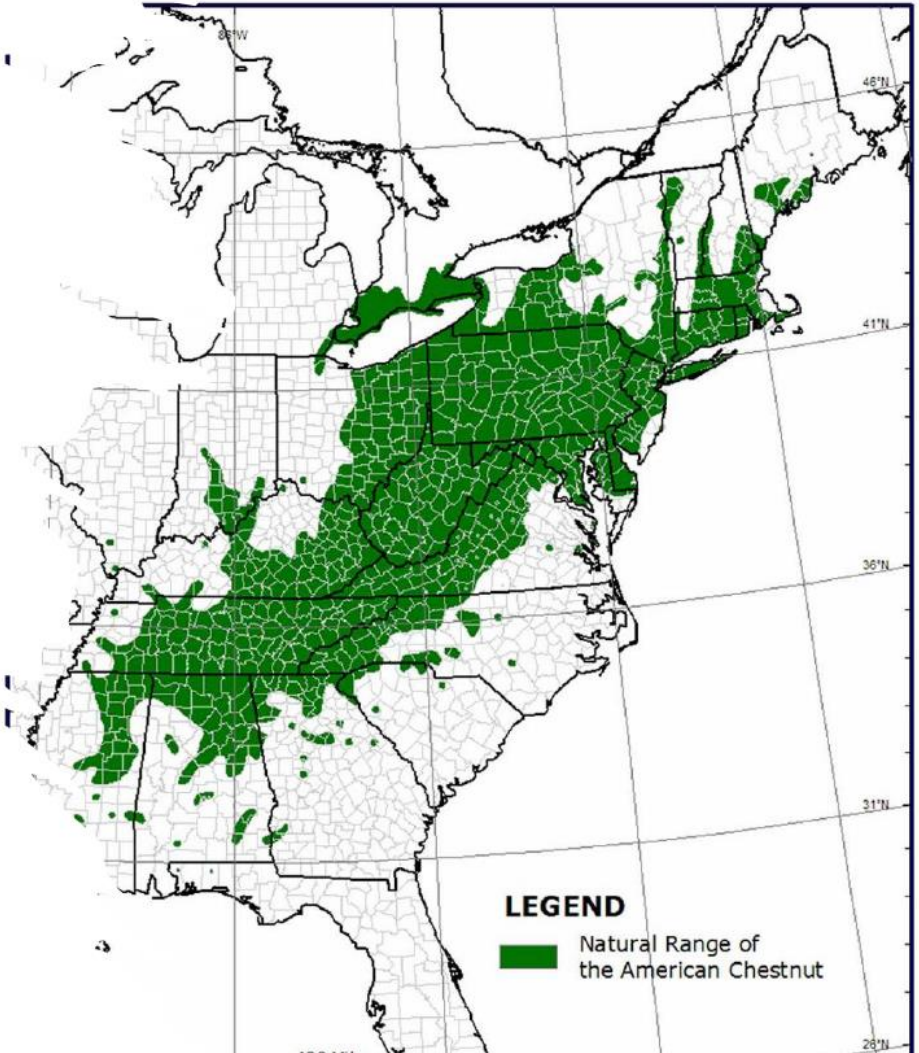
- Nonnative, invasive forest diseases and insect pests are negatively impacting in biodiversity, wildlife habitat, and other ecological services.
- Partially resistant/improved seed and seedlings from the American Chestnut Foundation (TACF) are now available.
- Not much is known about silviculture of chestnut in New England.
- **Objective**: To partner with the TACF, universities (such as UNH), and land conservation and management agencies (White Mountain National Forest, WMNF) to restore American chestnuts to forested sites.

Hypotheses & Variables

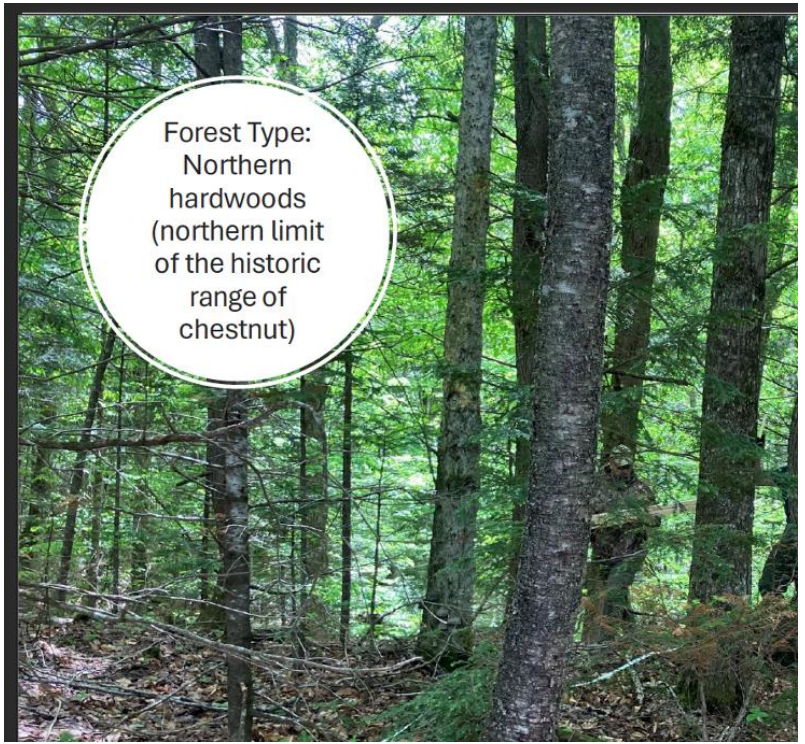
1. Chestnut performance is affected by silvicultural treatment.

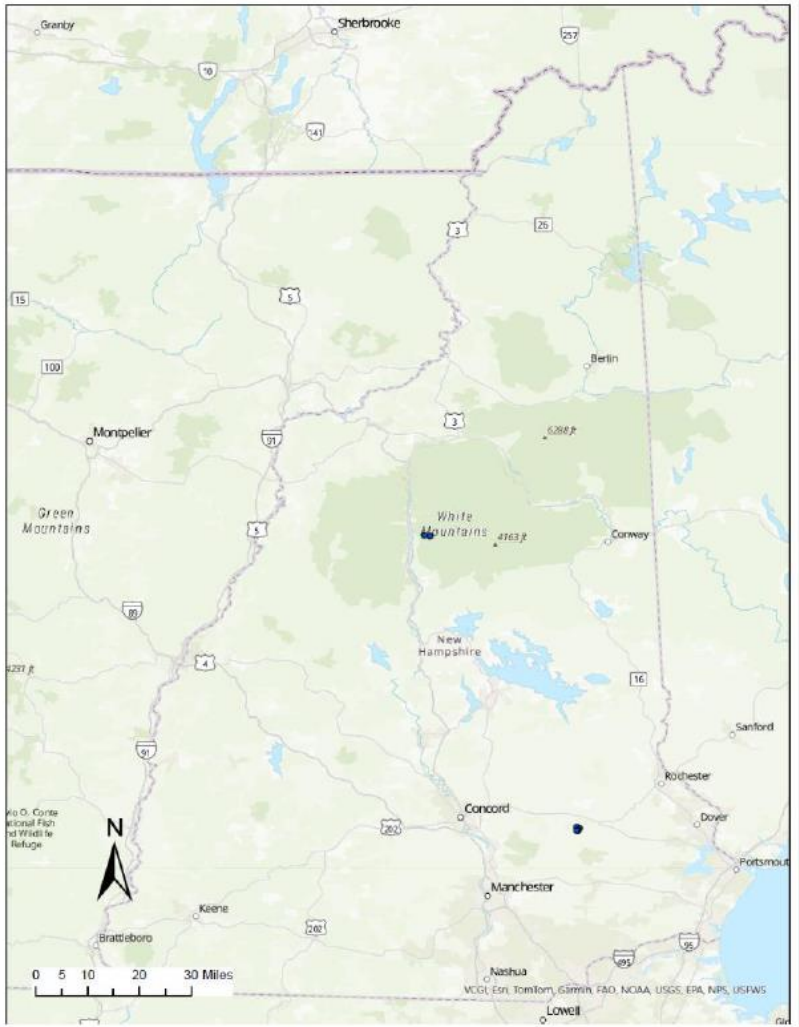
2. Chestnut performance is affected by forest type.

American Chestnut Native Range TACF




Forest Type:
Oak-Pine
(historic
range of
chestnut)


Forest Type:
Northern
hardwoods
(northern limit
of the historic
range of
chestnut)


Granby
Sherbrooke
257
10
91
3
25
15
5
100
Berlin
Montpelier
6288 ft
Green Mountains
White Mountains
4163 ft
Conway
89
New Hampshire
4291 ft
16
Sanford
91
Rochester
Concord
Dover
N
262
Portsmouth
Manchester
Keene
Brattleboro
95
0 5 10 20 30 Miles
Nashua
VCGI, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS
Lowell

Silvicultural Treatments

Group selection (0.25-1 acre)

Patch cut (>2 acres ~1 ha)

Shelterwood

No treatment-Control

Dependent variables-chestnut performance

- **emergence**
- survivability
- size (height and dbh)
- susceptibility to blight
- nut production
- wildlife use?

Methods

- Planted chestnuts in 3 sites within each forest type in each silvicultural treatment (harvested in 2024-2025)
- At each site, planted 30 chestnuts with 8’ (2.5 m) spacing between nuts, protecting them with tagged tree shelters staked to the ground
- Of the 30 nuts planted at each site, 15 were hybrids (Chinese x American) and 15 were American chestnuts

Total chestnuts to be planted: 30 nuts/site x 3 sites x 2 forest types x 4 silvicultural treatments= **720**

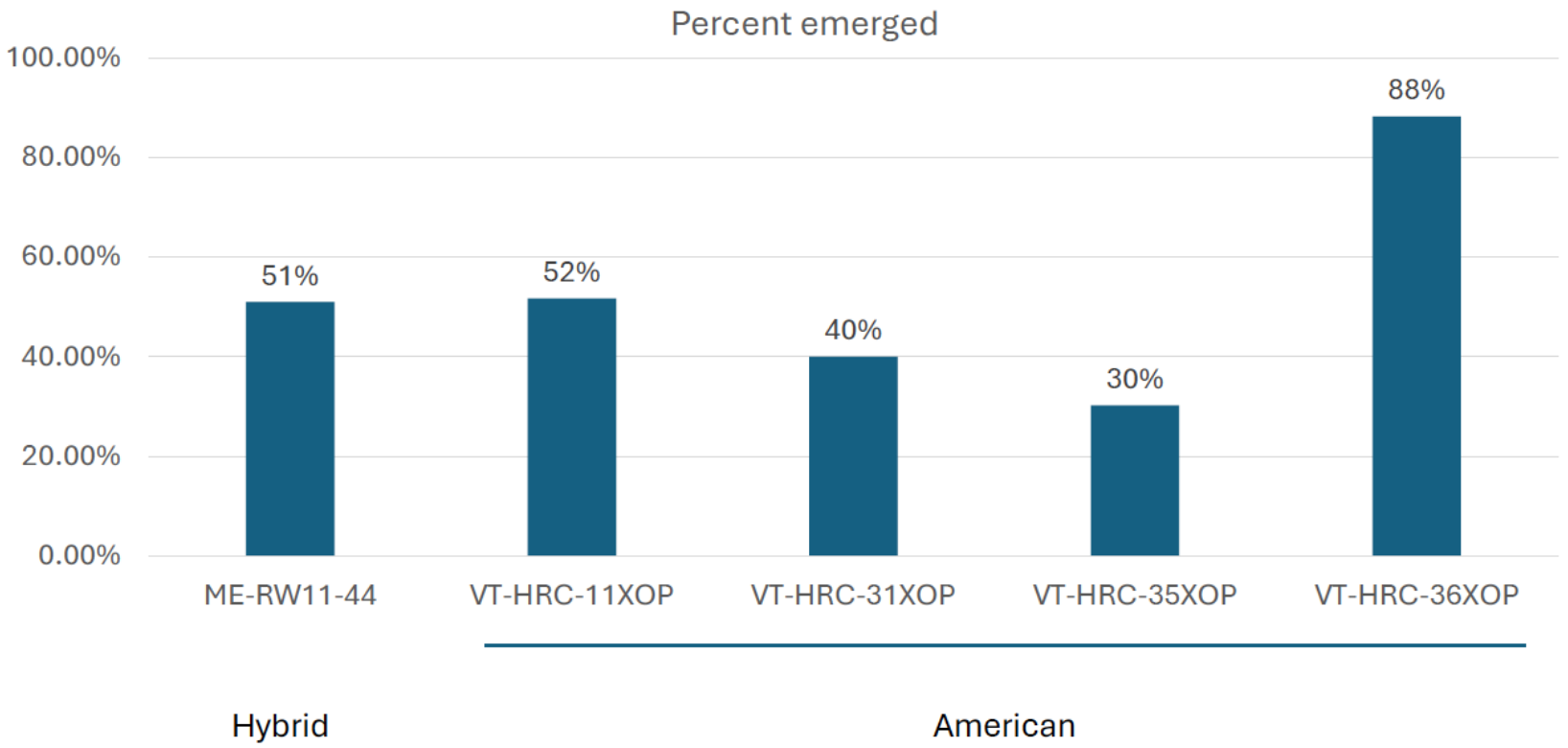
Planted seed

Tree shelters were staked and tagged

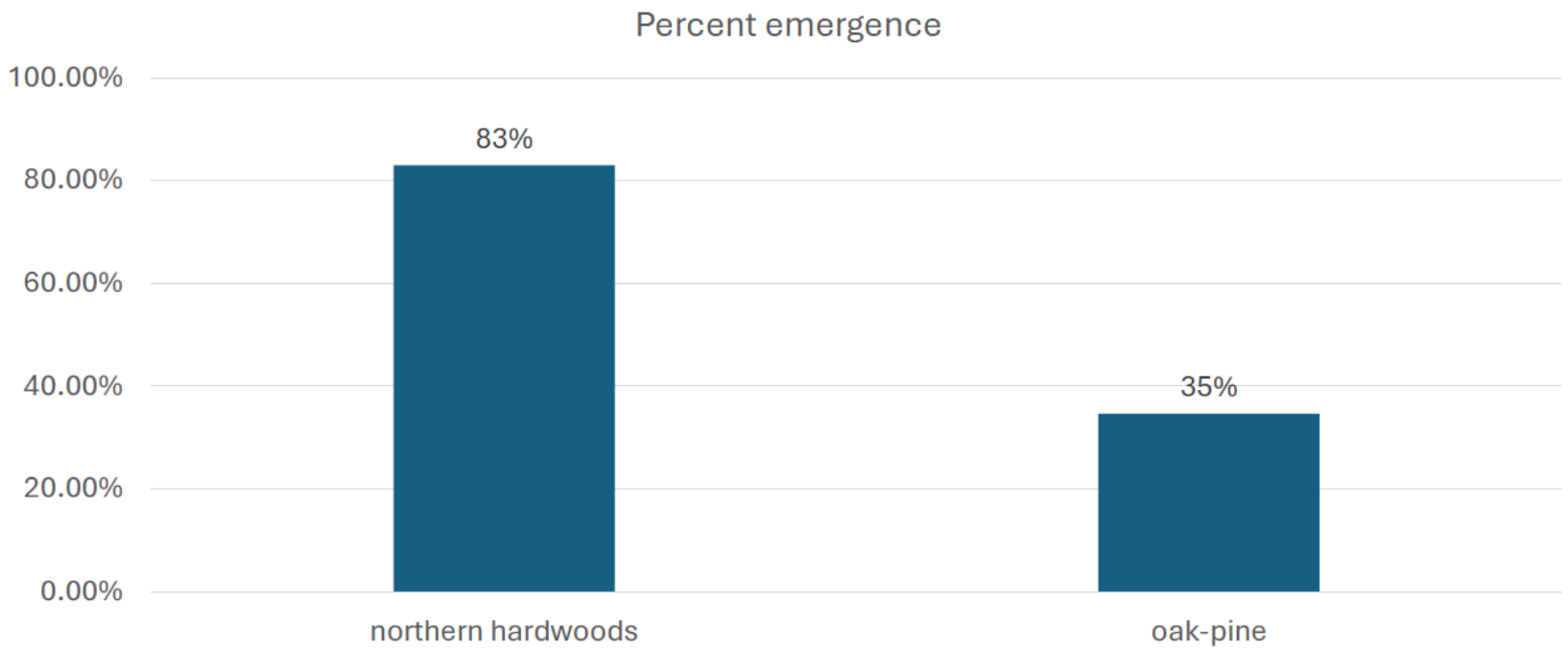
Results

- Could not find accessible patch cuts in the northern hardwood forest type
- Planted 635 chestnuts in mid-May to first week of June 2025
- Emergence was measured at the beginning of September 2025

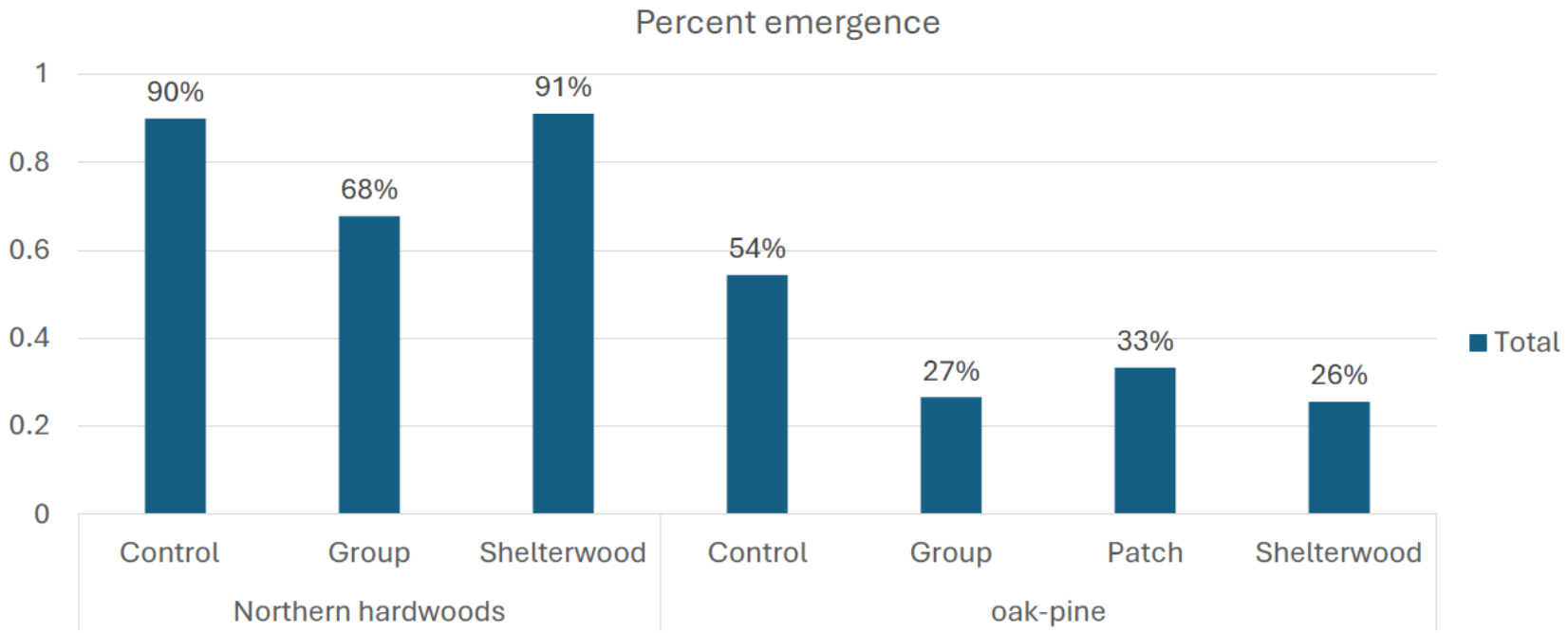
Results-type of nut



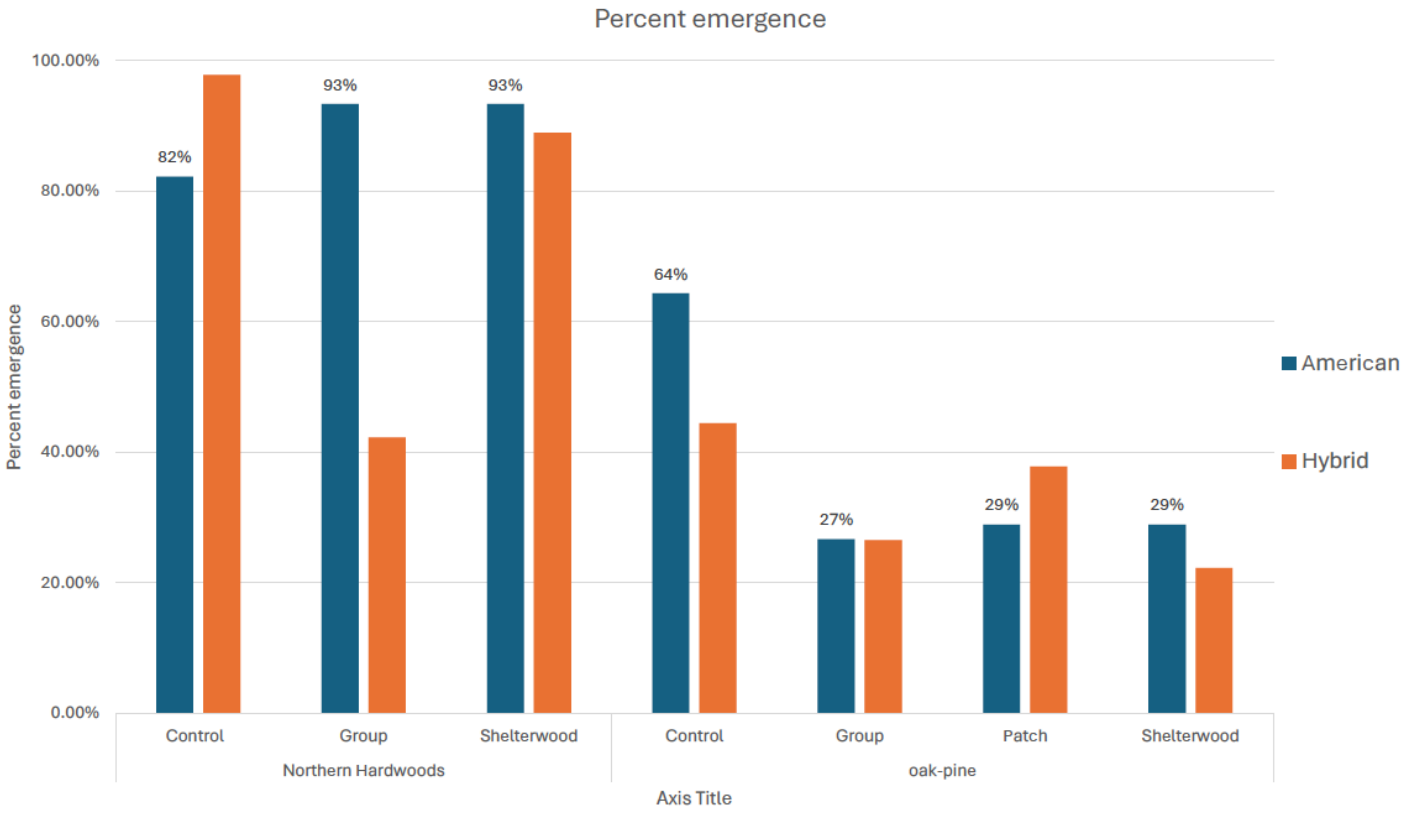
Results-forest type



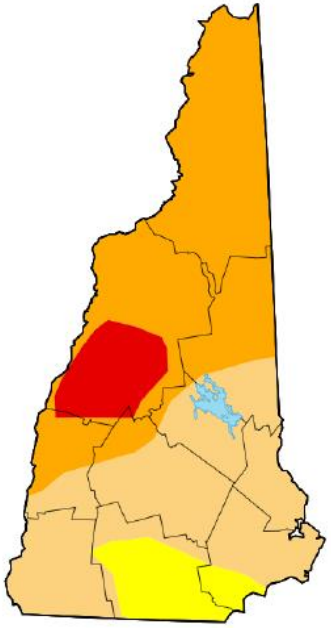
Results-silvicultural treatment



Results-silvicultural treatment



What is happening?



Drought Severity Index

Map released: Thurs. September 11, 2025

Data valid: September 9, 2025 at 8 a.m. EDT

Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

Authors

United States and Puerto Rico Author(s):

Brad Pugh, NOAA/CPC

Pacific Islands and Virgin Islands Author(s):

Brad Rippey, U.S. Department of Agriculture

Conclusions

We expected:

- >chestnut emergence in silvicultural treatment sites because of greater light availability and less competition from surrounding vegetation
- >chestnut emergence in oak-pine sites (historically forested with chestnut) versus northern hardwood sites (edge historic chestnut range)

Instead:

- > chestnut emergence in untreated controls and northern hardwood sites

Drought conditions in the summer favored chestnut emergence in shadier, cooler and wetter sites

Using silvicultural management and genetic selection to assist in the restoration of American chestnut to the northeastern U.S.

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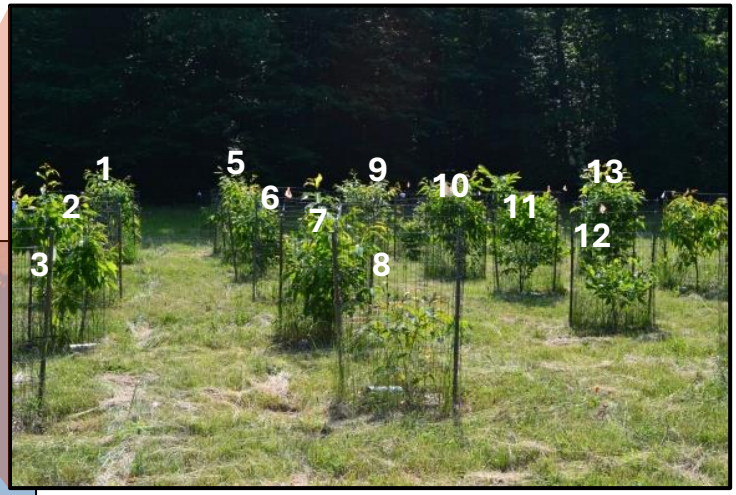
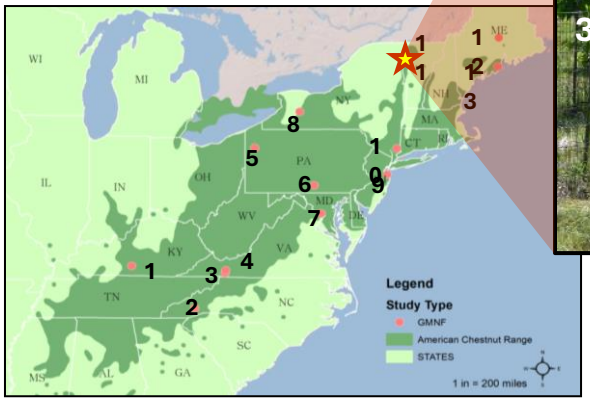
Green Mountain National Forest study design
Provenance test

Established in 2009

Common garden



Source sites throughout native range

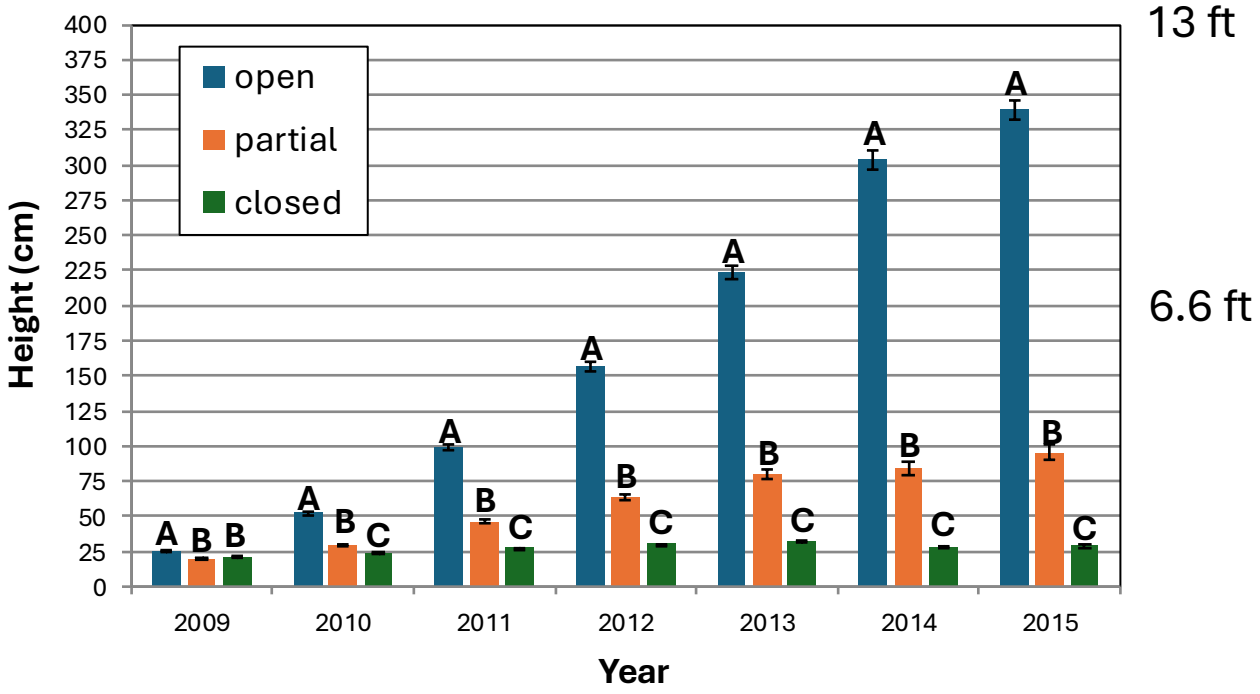


GMNF study design

- 13 pure American sources, 2 Chinese sources, 2 red oak sources
- 3 silvicultural treatments – closed canopy, partially closed and open canopy
- 3 treatment replicates
- About 880 saplings planted overall

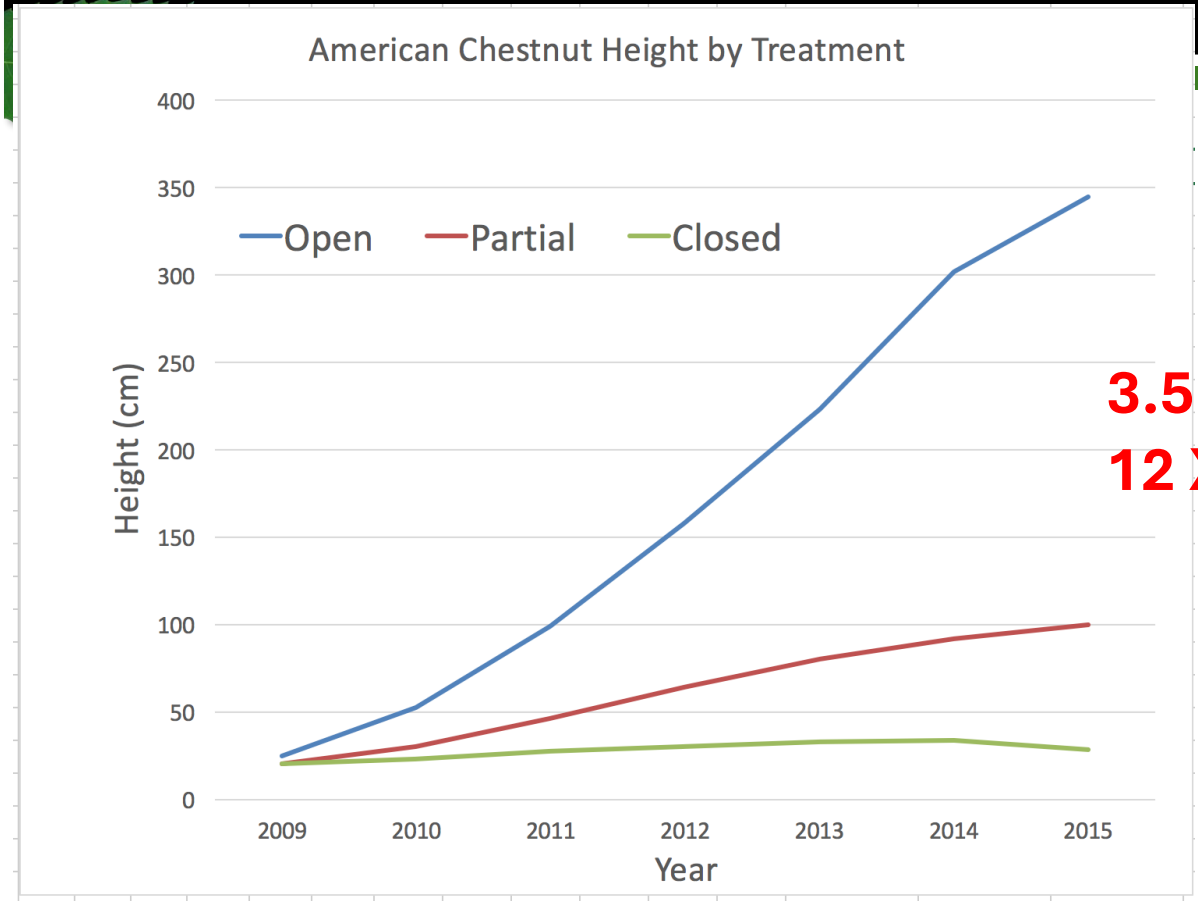
Treatment heights 2009-15

American chestnut



Treatment heights 2009-15

American chestnut

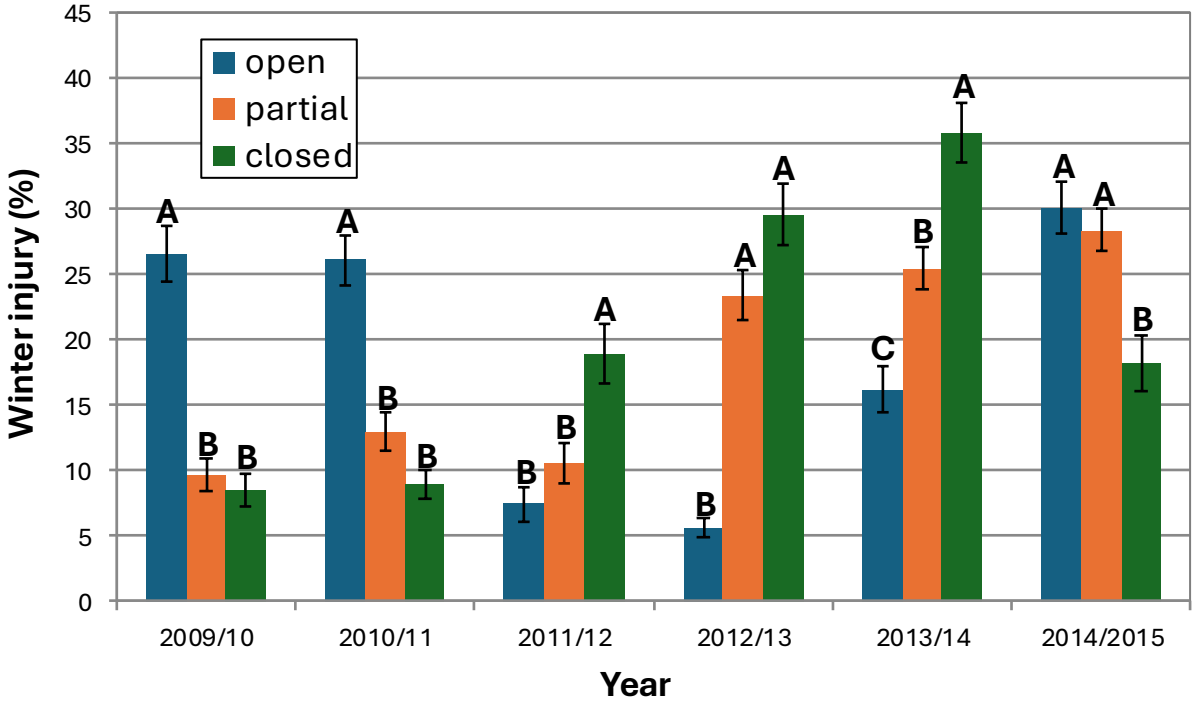


3.5 X Partial

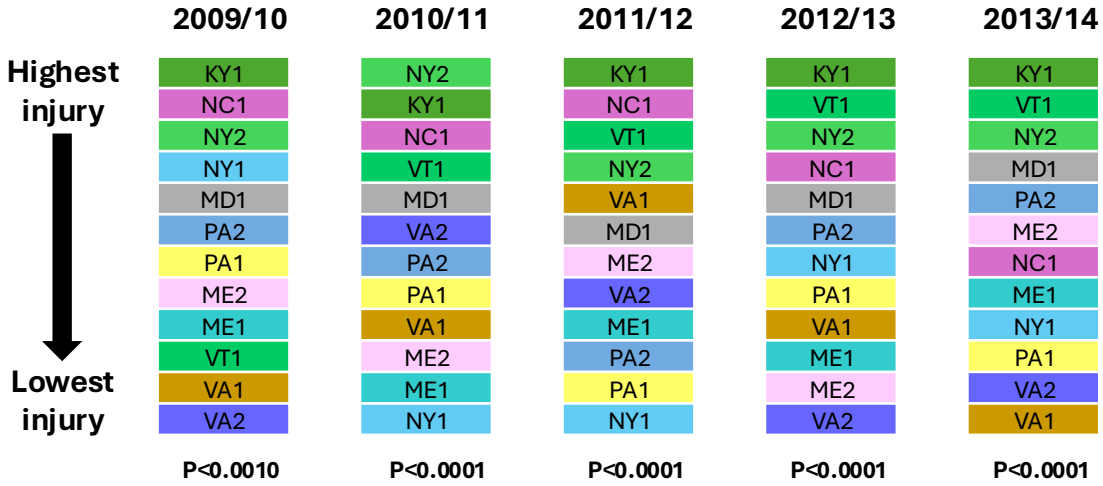
12 X Closed

Treatment winter injury 2009-15

American chestnut

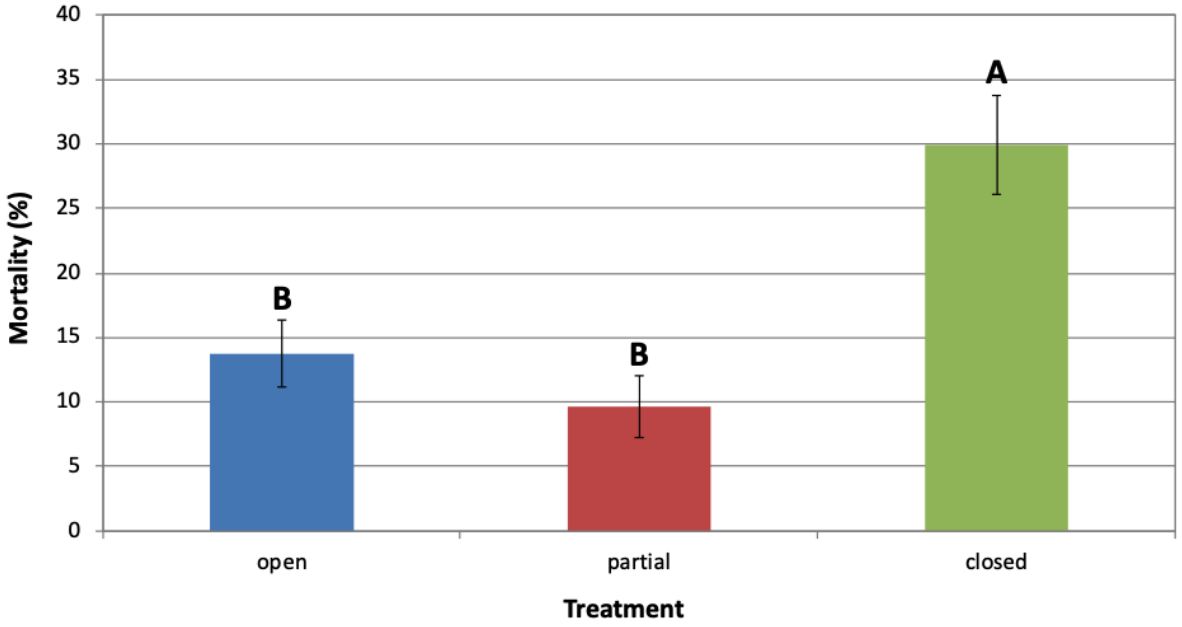


Seed source winter injury trends



Treatment 2015 Mortality

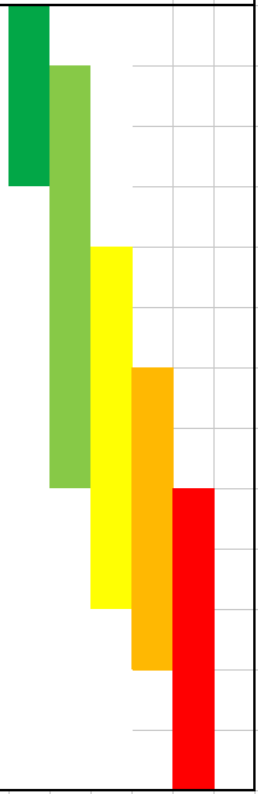
American chestnut



Source heights 2015

Open treatment

Code	County, State		2015 Height (cm)
NJ1	Monmouth County,	NJ	422.6
VA1	Smyth County,	VA	387.4
VT1	Chittenden County,	VT	379.7
VA2	Smyth County,	VA	374.2
PA2	Mercer County,	PA	373.4
NY1	Westchester County,	NY	364.6
ME2	Knox County,	ME	360.7
NY2	Wyoming County,	NY	339.5
MD1	Montgomery County,	MD	320.3
PA1	Franklin County,	PA	315.5
NC1	Jackson County,	NC	304.2
KY1	Metcalfe County,	KY	283
ME1	Piscataquis County,	ME	274.4



13.8 ft

9.0 ft

Findings

- Silvicultural treatment differences
- Provenance (seed source) differences in growth and WI
- Year to year differences in leaf-out phenology and spring frost injury
- **Incorporate natural variability in winter injury into current and future breeding programs in the north**

Questions?