Biocontrol of Chestnut Blight

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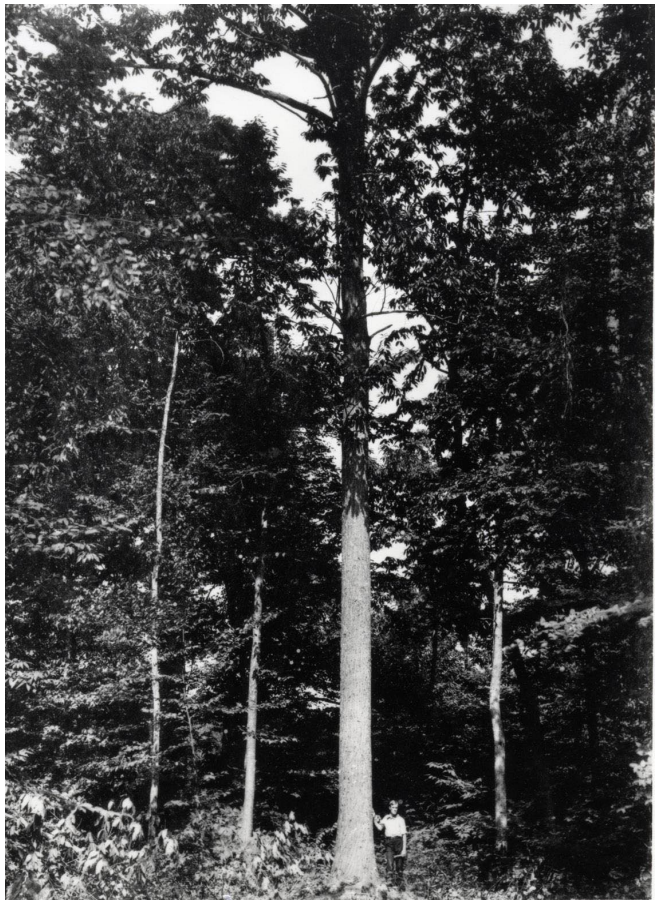
Chestnut blight: Arrived late 1800's, Described 1904 in NY

Scotland CT, 1905
American chestnut
103 years old, 83 ft



Hamden CT, 2015
American chestnut
Connecticut Champion
50 years, 40 ft

Hamden CT, 2025
Hybrid, 25% American
86 years, 72 ft

Chestnut blight signs and impacts

- Canker disease
- Caused by a fungus *Cryphonectria parasitica*
- Spread by spores
- Cankers girdle the tree
- American chestnut highly susceptible

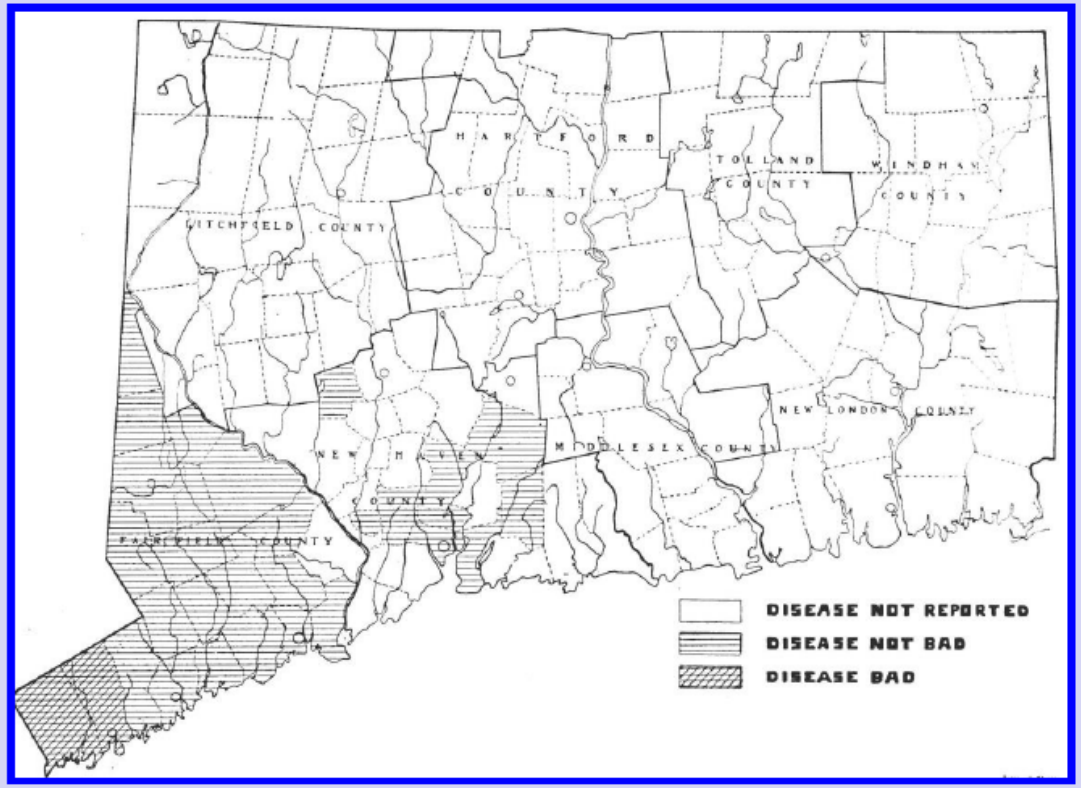
Sporulating canker with orange stromata

American chestnut (1988). Tree has resprouted after leader killed by blight.

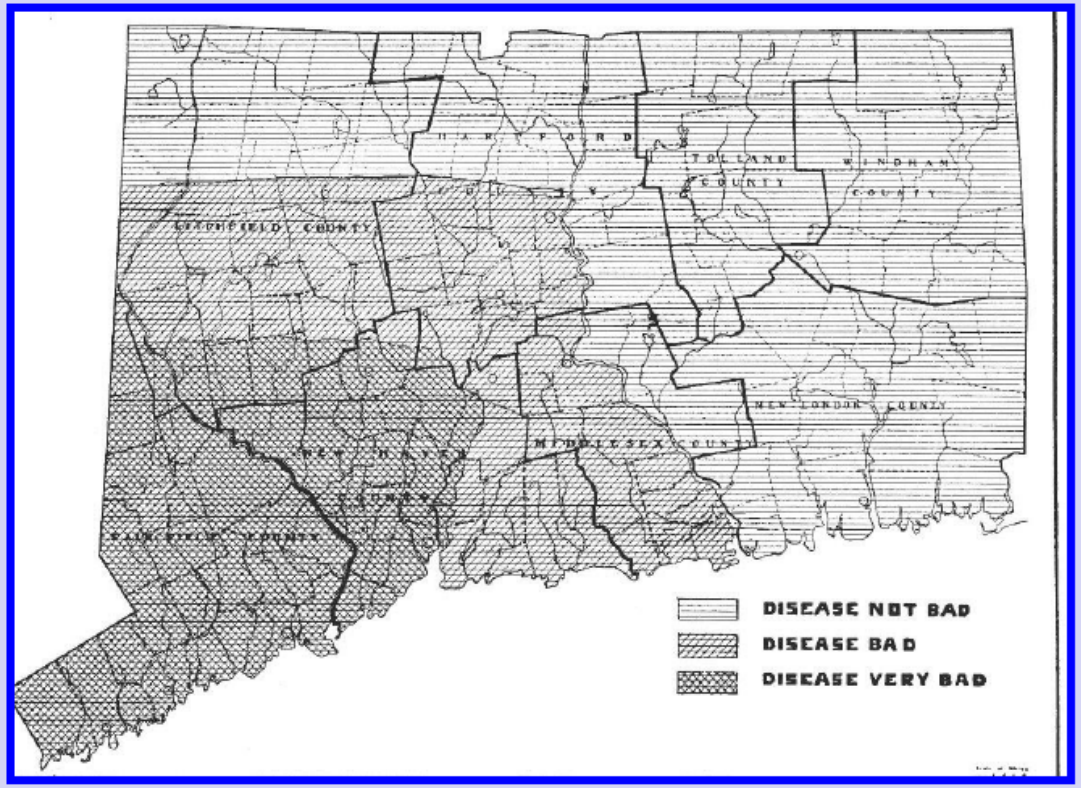
First blight surveys in CT

Anagnostakis
Chestnut Research at CAES.

Blight detected in NYC in 1904
George P. Clinton, Plant Pathologist, At CAES 1902-1937
Conducted blight surveys 1908 and 1912



1908



1912

2026: Known locations of surviving American chestnuts

- Locations provided by Jack Swatt, CT TACF Casey Cordes, RWA
- Some in good shape and flowering
- Trees missing?

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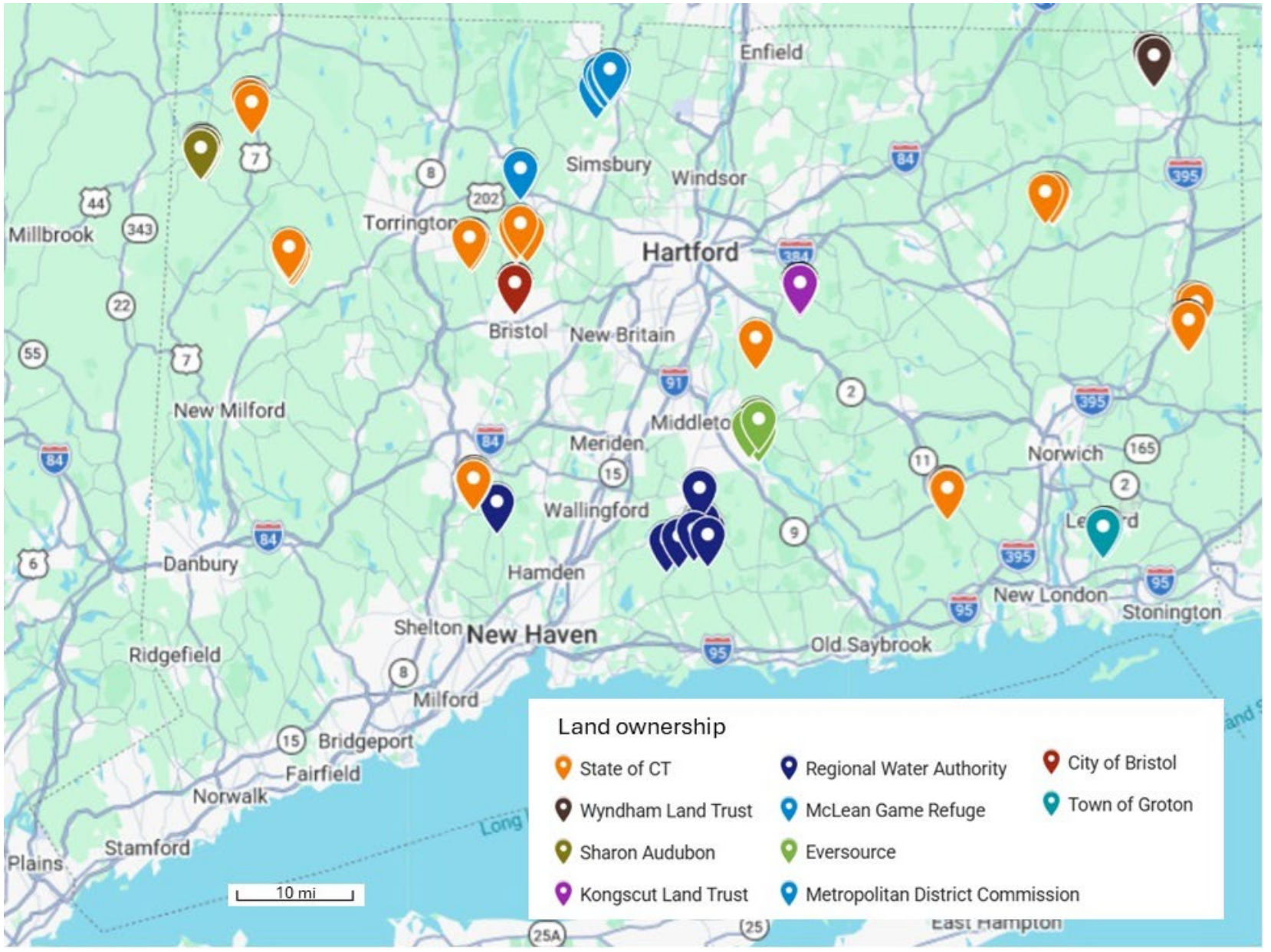


Approaches to chestnut blight management

Hybrid resistance breeding – ~75-90% American heritage	**Transgenic trees –** 99.99% American heritage	**Biocontrol –** hypovirus to reduce disease severity
Slow, Not 100% American	Regulatory restrictions	**Targets pathogen, native trees** ☑

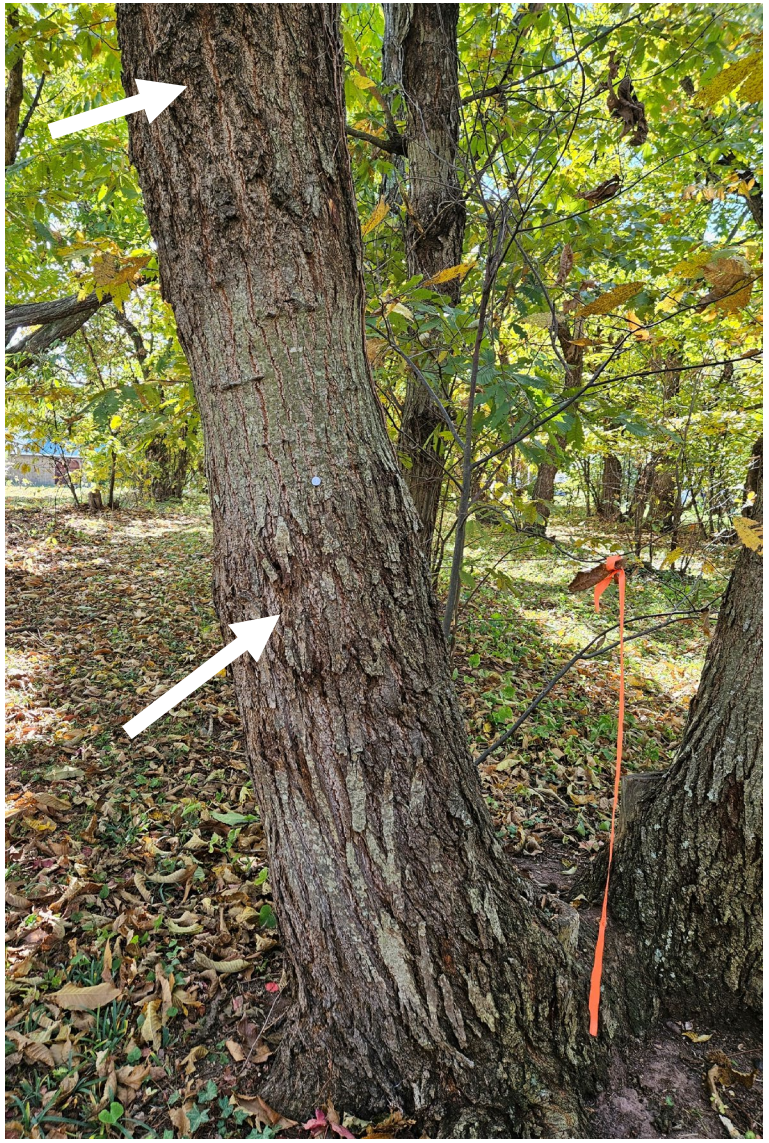
CAES Chestnut Questionnaire 2024

- **Do people in Connecticut want to grow chestnuts, how many, and what kind?**
  - 128 responses from tree wardens, nurseries, land managers, landowners in Connecticut
- Need for 4000-7000 saplings or seeds per year
- **Native heritage is considered the most important trait**
- **Biocontrol can support this**

Hypovirulence in chestnut blight

- **Lowers pathogen virulence**
  - Negative effect on the pathogen
- **Biocontrol agents: Hypoviruses** that infect the pathogen, *C. parasitica*
  - Transmitted by spores and hyphal anastomosis (genetically similar isolates)
- **Gives the tree a chance to heal the cankers by callus production**
  - Tree has a chance to survive

CAES 50-year-old field trial.
American chestnut at CAES (1976).
Treated with hypovirulence 1978-1981.
Arrow = healing canker.



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Biocontrol agents: Hypoviruses

- **Several viruses that infect *C. parasitica***
- ***CHV-1****: Cryphonectria parasitica hypovirus 1*
  - Healing cankers first detected in Italy in 1950s.
  - CAES: Identified dsRNA virus in 1970s
  - Non-native but **reduces virulence**
  - **Most potential for chestnut blight biocontrol**
- *CHV-2*: New Jersey, no impact on pathogen
- *CHV-3*: Michigan, moderate impact on pathogen
- *CHV-4*: Appalachia, no impact on pathogen

White Colony = hypovirus-containing
Orange Colony = hypovirus-free

CAES Research Project on Chestnut Blight Biocontrol

Potential of hypovirulence for chestnut blight management

Project timespan 2025-2030

Why Chestnut Blight Biocontrol?

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1. Outcomes from long-term breeding trials – Trees with hypovirulence perform better
2. Beech Leaf Disease – Thinning canopies may create space for chestnuts
3. Knowledge about virus strain selection –50-year-old field trial at CAES
4. Universal donor strains – Strains capable of transferring hypovirus across VCGs




Meet the Hypovirulence Team

CAES Scientists

Susanna Keriö


Nate Westrick

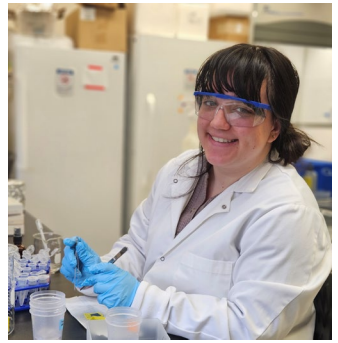

Eli Ward

CAES Technicians


Jack Hatajik


J.P. Barsky

CAES Research Assistants


Julia Celio


Anna Wix

Collaborators


Elena Karlsen-Ayala
USFS Hamden


Mark Double
WVU


Amy Metheny
WVU


Jack Swatt
CT TACF

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- Funding: $5000 from CT Chapter of TACF; $120,000 from USDA FS

50-year-old biocontrol trial at CAES

- Trees planted 1976
- Treated 1978-1981
  - Jaynes, Anagnostakis
  - Mix of viruses (*CHV-1*, *CHV-3*)

- Survival ~50% (2026)
- 2013: dsRNA detected in 14/15 trees (Anagnostakis)

- **2025-2026: Virus identification (Nate)**
  - Potential strains found
  - Mild strains, *CHV-1*

Project Timeline

- **2026:**
  - **Isolate viruses from Lockwood**
  - **Find sites and trees**
  - Collect ¼ inch bark plugs
  - Isolate fungus
  - In lab: Infect with hypovirus
- **2027-2028**: Treat infected trees
  - Hypovirulent strains with virus
  - Transmit virus to support healing
- **2029-2030**: Monitor
  - Repeat sampling

Sampling of chestnuts in Madison (Genesee, RWA)

Sampling the trees in the forest

Collect 4-8 bark plugs of ¼ inch diameter per tree or sprout
Isolate the fungus, infect with virus, treat the tree

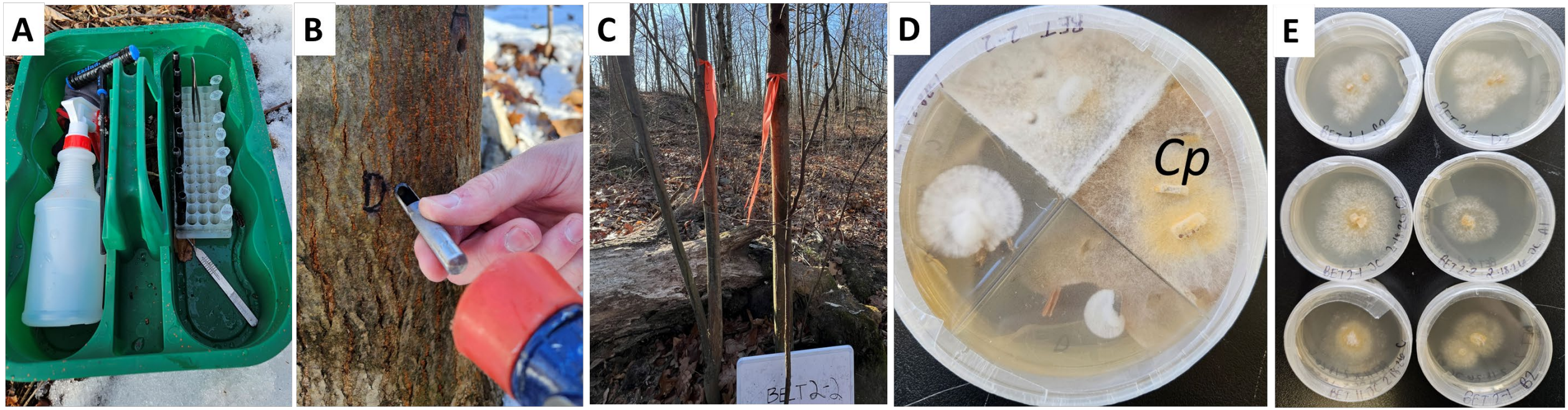

Figure 3. A) Sample collection kit. **B)** Collection of 7 mm bark plugs from a large surviving tree. **C)** American chestnut stump sprouts selected for hypovirulence treatments. **D)** Mixed fungal cultures growing out of the bark plugs, with *C. parasitica* in one sector. **E)** *C. parasitica* cultures isolated from wild surviving American chestnuts.

2026: Known locations of surviving American chestnuts

- **Potential research sites**
  - Clearcuts or open sites with chestnuts
  - Closed canopy sites with chestnuts
- Sites on RWA lands, McLean Refuge
- **Know of a site with chestnuts?**

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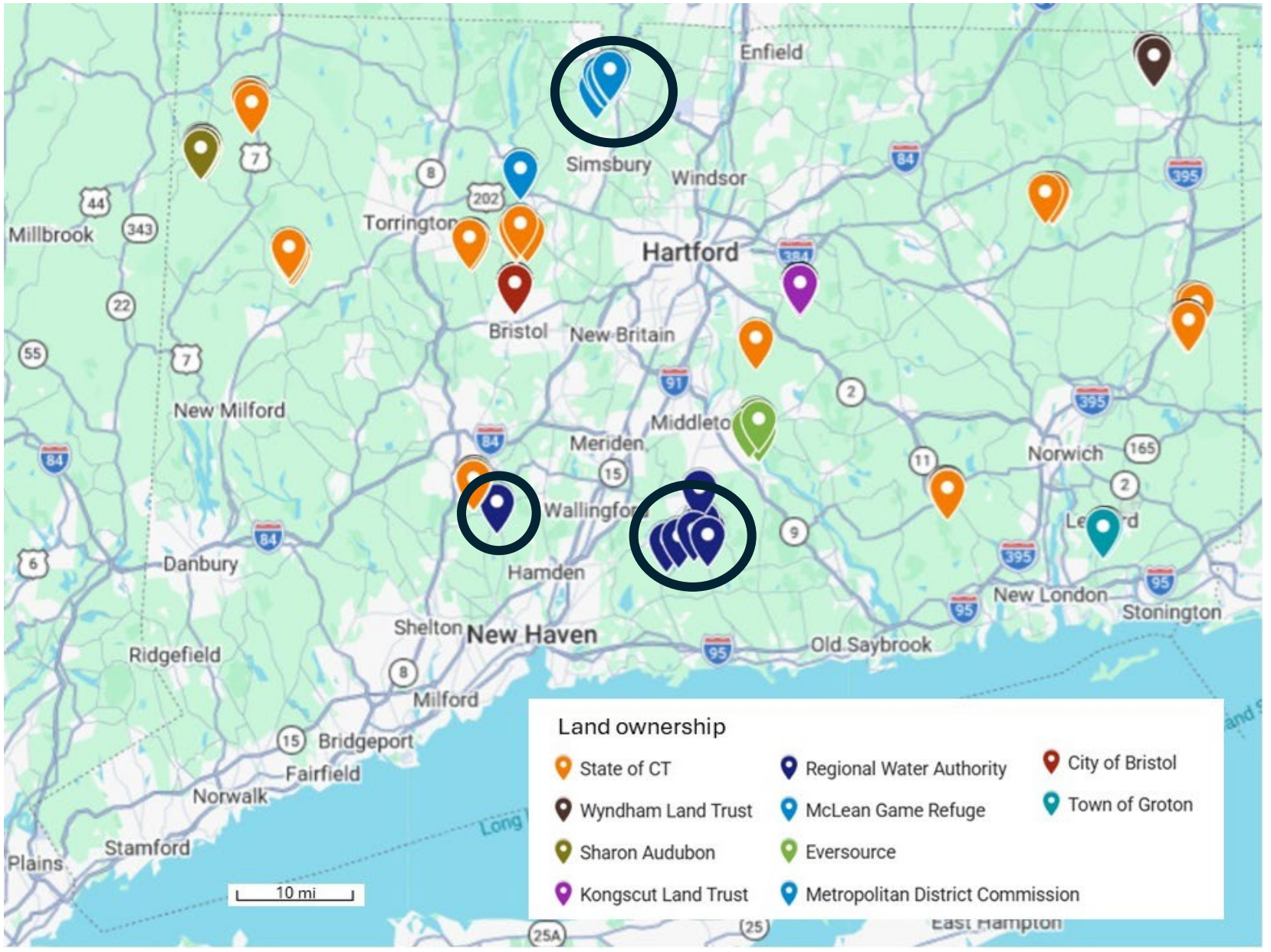

THANK YOU!

Questions?

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Protecting Agriculture, Public Health, and the Environment

CAES Lockwood Farm has chestnut trees

- Lockwood Farm,
  890 Evergreen Avenue
  Hamden CT 06518
  - Mon-Fri 8 AM – 4 PM

Lockwood chestnuts:
Anagnostakis

‘Scientist’s Cliffs’, 1959. American chestnut heritage75%.

Chestnuts in CAES Sleeping Giant Orchards

Trees planted 1930
Trees used in breeding

Sleeping Giant Chestnuts:

Anagnostakis