

Long Island Sound Future Funds grant:
Finding the Right Trees for the Right Time

The Fourth Lecture

Brave New Worlds for Trees: Assisted Migration and the Study of Hoffman Preserve

Principal Investigators: Juliana Barrett & Robert Ricard of the University of Connecticut

Avalonia Collaborators: Beth Sullivan & Sharon Lynch

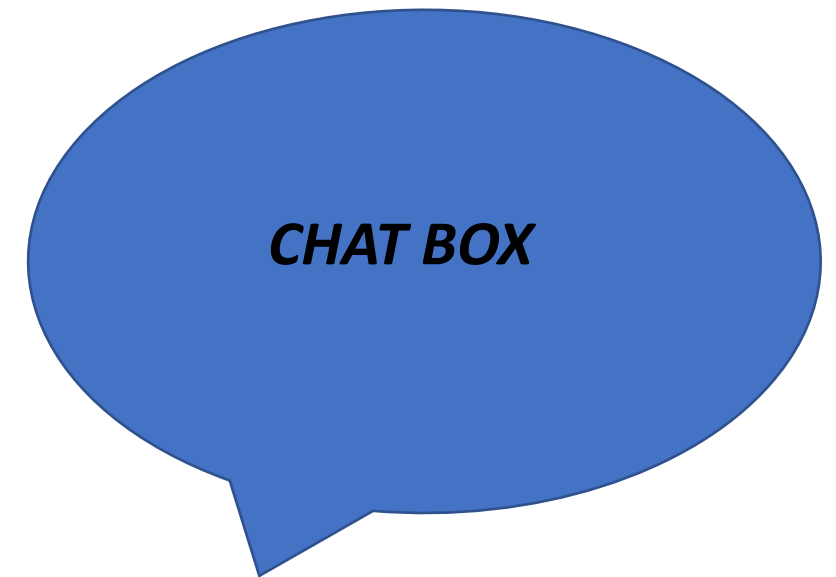
The Way This Webinar Works:

After the talk, 20 minutes for discussion

Place your questions in the chat box

Discussion to be moderated by Dr. Sharon Lynch

Thank you.





HOFFMAN EVERGREEN PRESERVE

AVALONIA LAND CONSERVANCY
NATURE PRESERVE



History of Hoffman Evergreen Preserve



1934

2021

History of Management Concerns at Hoffman Evergreen Preserve



What to do with the Hoffman Evergreen Preserve?

- Avalonia acquisition was a much-loved forest, but a stressed one— insect pests, disease, drought were taking their toll.
- Town Committee approved an ecological cut: 5 small patch cuts + logging skid trails.
- The big question: What to do with the 6 + 50 (somewhat) affected acres?
- Could our grant help us to understand how to plan for a future forest that will be affected by climate change?



Forest Ecosystem Services

Supporting

- Nutrient cycling
- Soil formation
- Primary production

Provisioning

- Food
- Fresh water
- Wood and fiber
- Fuel

Regulating

- Climate regulation
- Flood regulation
- Disease regulation
- Water purification

Cultural

- Aesthetic
- Spiritual
- Educational
- Recreational

WHY IS HOFFMAN EVERGREEN PRESERVE IMPORTANT?

Open space

Carbon sequestration

Water purification: Whitford Brook, local drinking water supply and Long Island Sound

Cultural: early colonial history, hiking

Wildlife – birds, bear, bobcat sightings



(adapted from the Millennium Ecosystem Assessment)

What is a healthy forest?

Forest health has been defined by the production of forest conditions which directly satisfy human needs and by resilience, recurrence, persistence, and biophysical processes which lead to sustainable ecological conditions. Our definitions and understanding of forest health are also dependent on spatial scale. (US Forest Service)

Other thoughts from Drs. Mark Ashton and Joseph Orefice at Yale University:

<https://sustainability.yale.edu/explainers/yale-experts-explain-healthy-forests>

- *A healthy forest is a human construct.*
- *Describing a healthy forest is like describing a healthy human: it's very complex.*
- *A healthy forest is not necessarily one that is completely untouched; Forests regularly face natural or human-made stresses, ...an important assessment to forest health is its ability to resist and/or adapt to them.*
- *When thinking about the health of our forests on any scale, it is important to look at resilience and the ability of our forests to regenerate.*



Management options (look at Todd Ontl's talk in this series – connecting the dots)

Forest carbon: there is no single answer

But we can continue to learn and work towards better solutions.

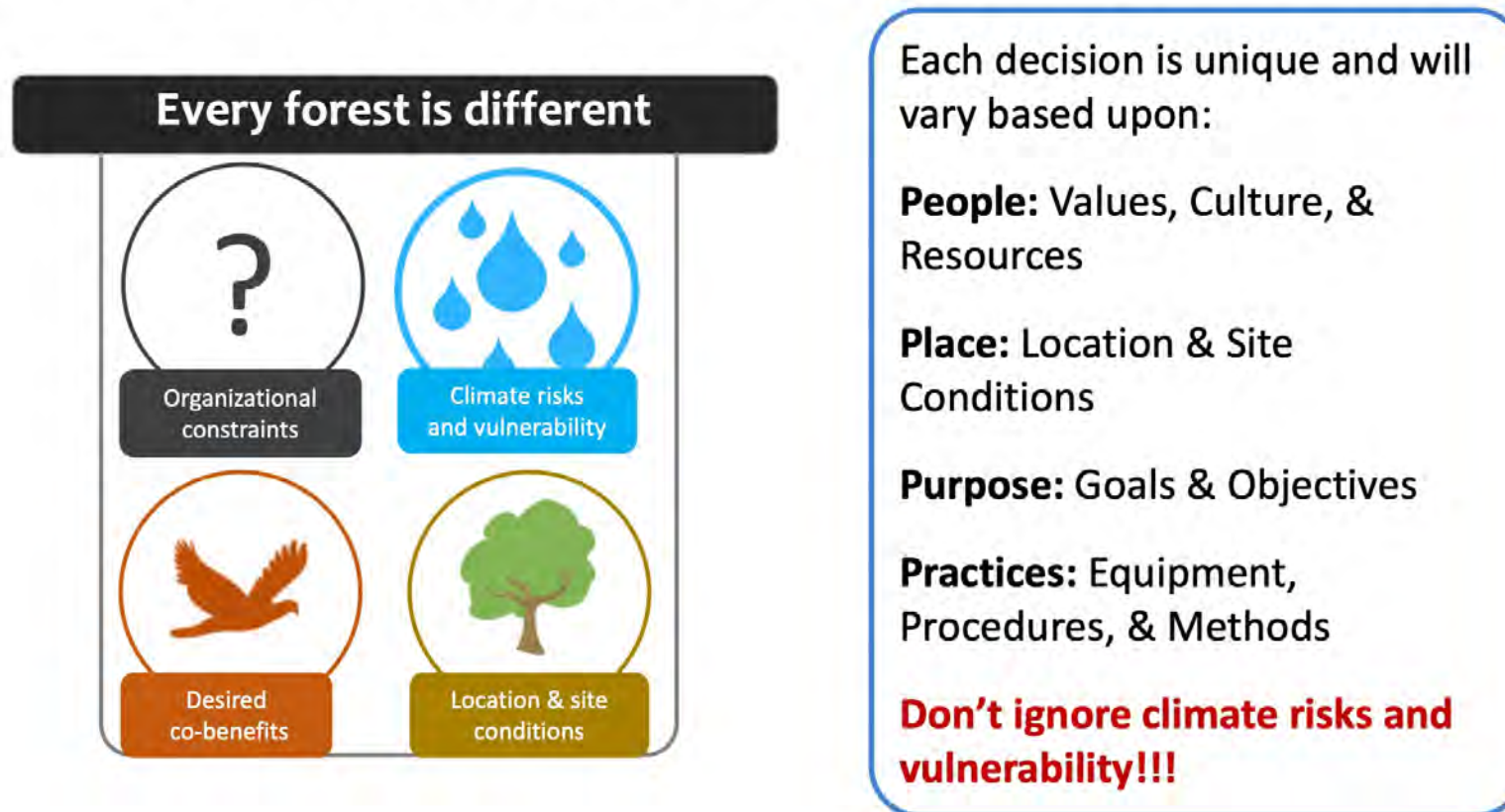


Image from Northern Institute of Applied Climate Science

Improving Habitat and Forest Health

What are we looking for at Hoffman Preserve in terms of forest health in the future?

- Trees of various ages
- Forest layers (tree/shrub/herb)
- Diversity in tree and shrub species
- Habitat value for wildlife
- Safety for Preserve visitors (“safety cuts”)



Now add in climate change to our “healthy forest concept”

- From 1901-2011 mean annual temperature has increased across the region by 2.4 °F, with even greater warming during winter.
- Projected trends indicate a potential increase in mean annual temperature of 3 to 8 °F by 2100.
- A slight trend toward greater annual precipitation and a substantial increase in extreme precipitation events.
- Projections for precipitation indicate an increase in fall and winter precipitation, and spring and summer precipitation projections vary by scenario.
- Potential for more intense (and possible more frequent) coastal storm events

(From US Forest Service Climate Vulnerability assessment for New England)

Model projections suggest that many northern and boreal species, including balsam fir, red spruce, and black spruce, may fare worse under future conditions, but other species may benefit from projected changes in climate. (From US Forest Service Climate Vulnerability assessment for New England)

Eastern Hemlock not expected to fare well.

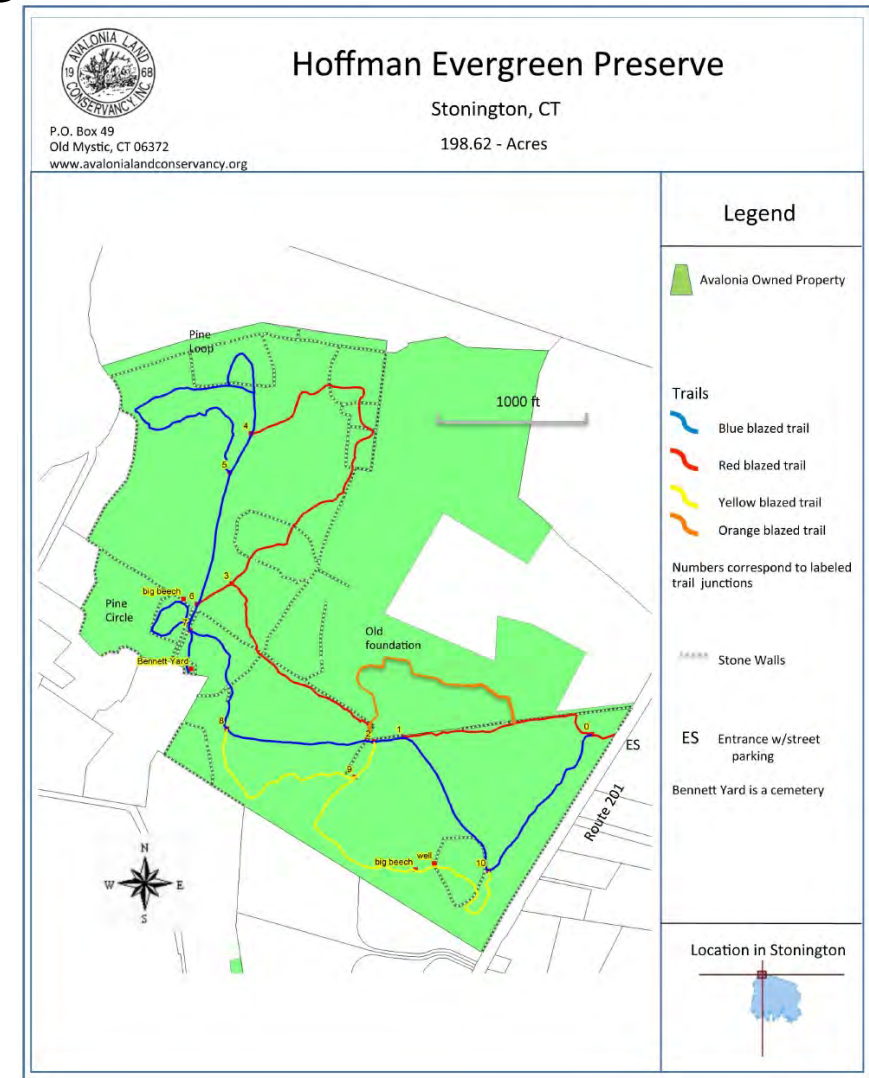
White pine are susceptible to wind damage and salt spray.



Improving Habitat and Forest Health

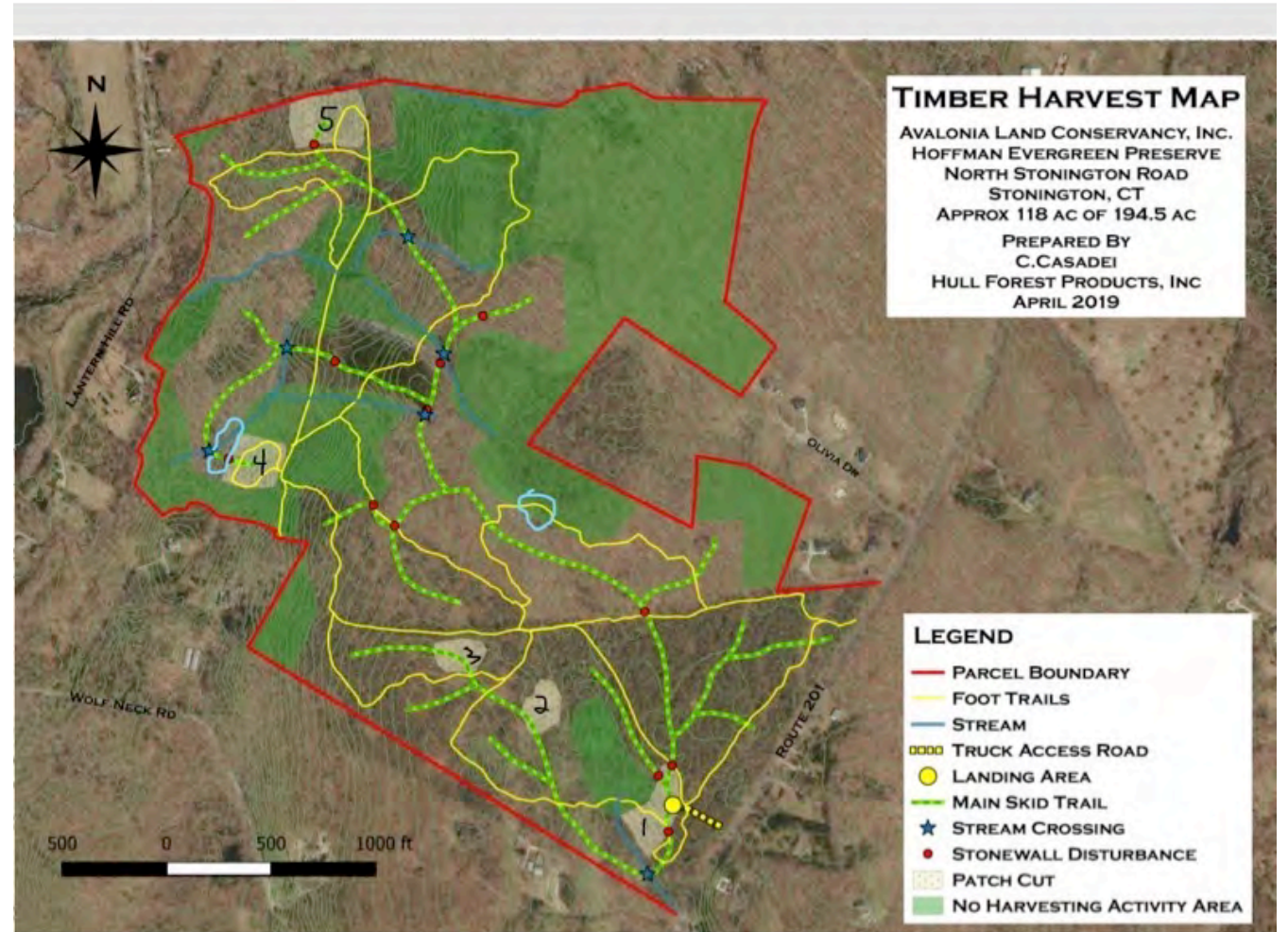
What are we looking for at Hoffman Evergreen Preserve in terms of forest health?

- Trees of various ages
- Forest layers (tree/shrub/herb)
- Diversity in tree and shrub species
- Ability to grow and reproduce successfully in a future climate (2050)
- Add to diversity and resilience with additional species or genotypes
- Safety for Preserve visitors



Patch Cuts/Impacts

Given that we have 5 patch cuts totaling about 6 acres and thinning/skid trails adding about 50 more acres, how can we work with these areas to promote a healthy, resilient **coastal** forest for future climate conditions (2050)?



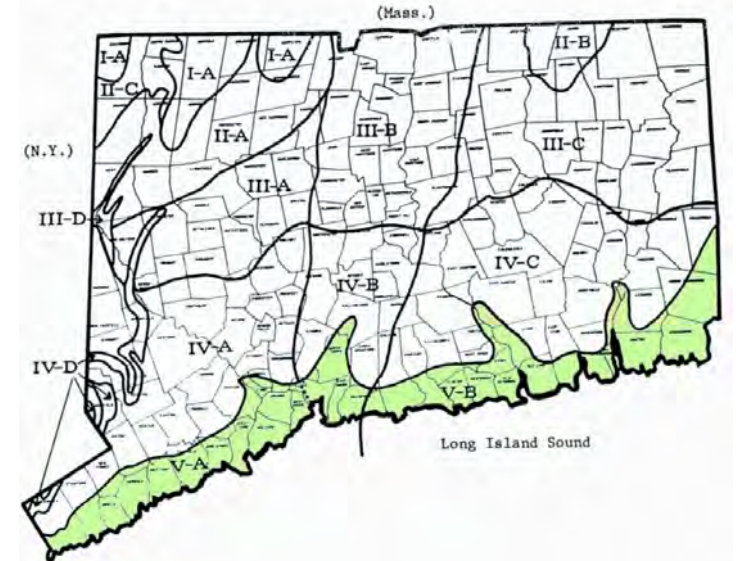
What is a coastal forest?

- Ecoregions of Connecticut (Dowhan and Craig 1976)
- Define coastal forest/ecoregion map
- Few large (100 acre +) tracts of coastal forest left in Connecticut

An example: The Preserve (Old Saybrook, Essex area)



FIGURE 3. Long Island Sound Coastal Boundary Area
(Map Source: LISS)



Ecoregions of Connecticut (from Dowhan, J. and R. Craig. 1976. Rare and endangered species of Connecticut and their habitats. Hartford, CT: Connecticut Geological and Natural History Survey. p. 135.

Where did we start working together on the Hoffman Evergreen Preserve Project?

- Drone flight January 2020
- Climate Corps students (Spring 2020) worked on assessing site conditions such as soils, aspect, slope, moisture regime
- Students worked with the Northern Institute of Applied Climate Science report/Climate Vulnerability Assessment for New England and Tree documents as well as other research to determine climate projections for southeastern CT.
- Barrett and Sullivan worked through potential species based on conditions and species current ranges
- Submitted LISS Futures Fund proposal along with Sullivan, Robert Ricard and Sharon Lynch

LISS Futures Fund grant elements plus additional Avalonia elements/funds

- Plantings
- Seeding (particularly on skid trails)
- Educational Signage
- Resilience management plan
- Lecture series
- Workshop
- Additional work of Conn College students on annotated bibliography and signage

Tree and shrub species: Assisted Migration/ Range Expansion

Assisted Migration: *“Human-assisted movement of species in response to climate change”*

- **Assisted Range expansion:** moving seed sources or populations from their current range to suitable areas just beyond the historical species range, facilitating or mimicking natural dispersal
- Assisted population migration: moving seed sources or populations to new locations within the historical species range
- Assisted species migration: moving seed sources or populations to a location far outside the historical species range , beyond locations accessible by natural dispersal

From Handler et al. USFS: <https://www.fs.usda.gov/ccrc/topics/assisted-migration>

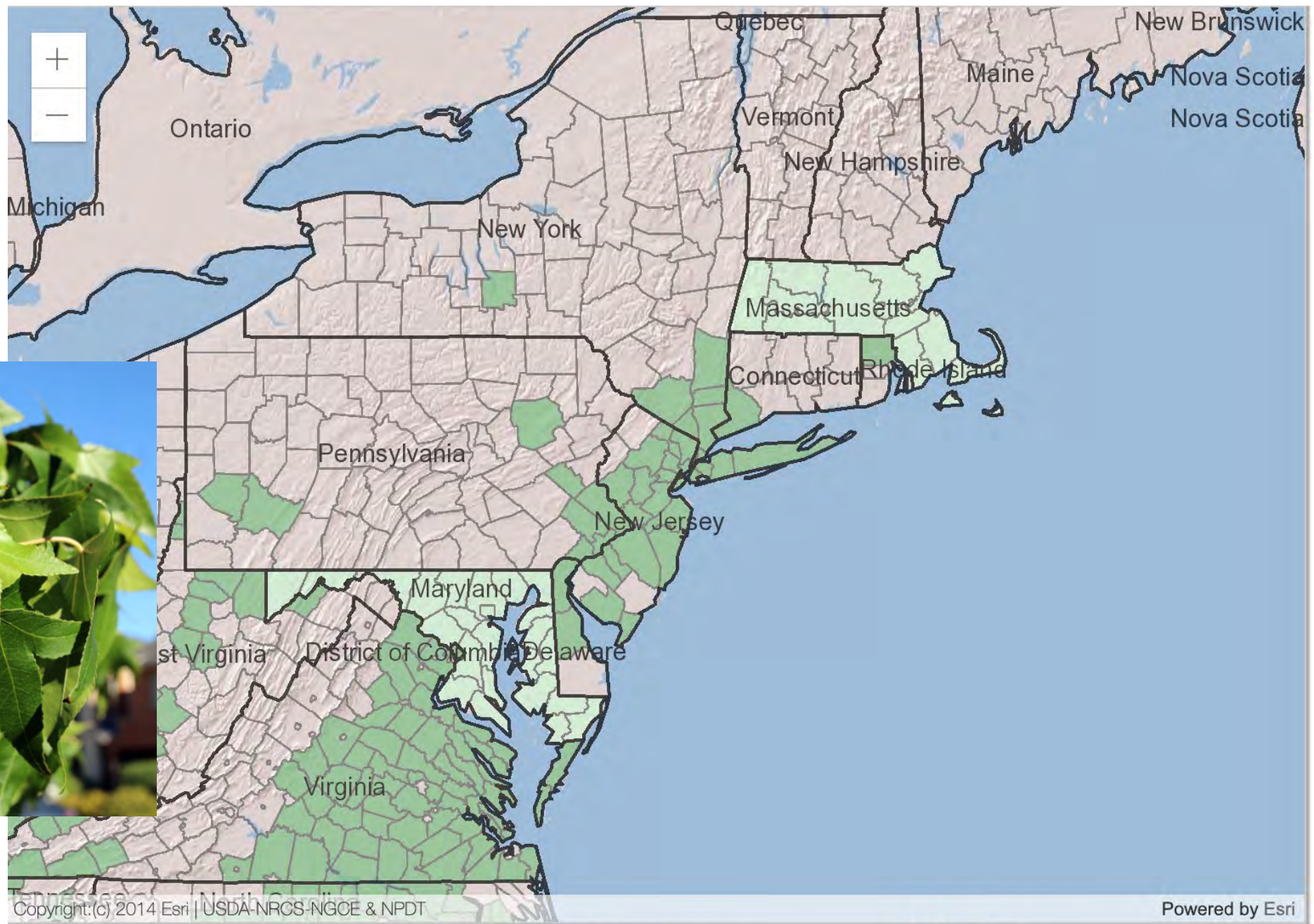
For all species under consideration for planting:

Reviewed by

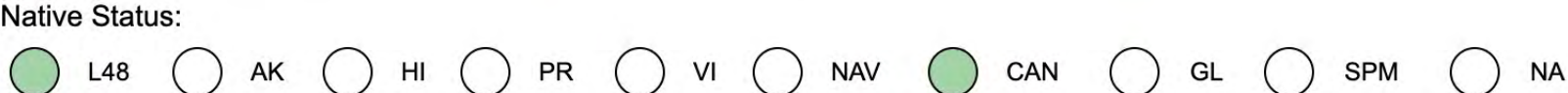
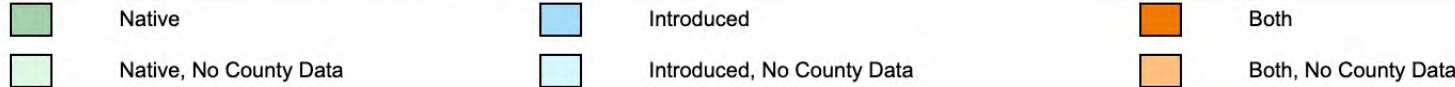
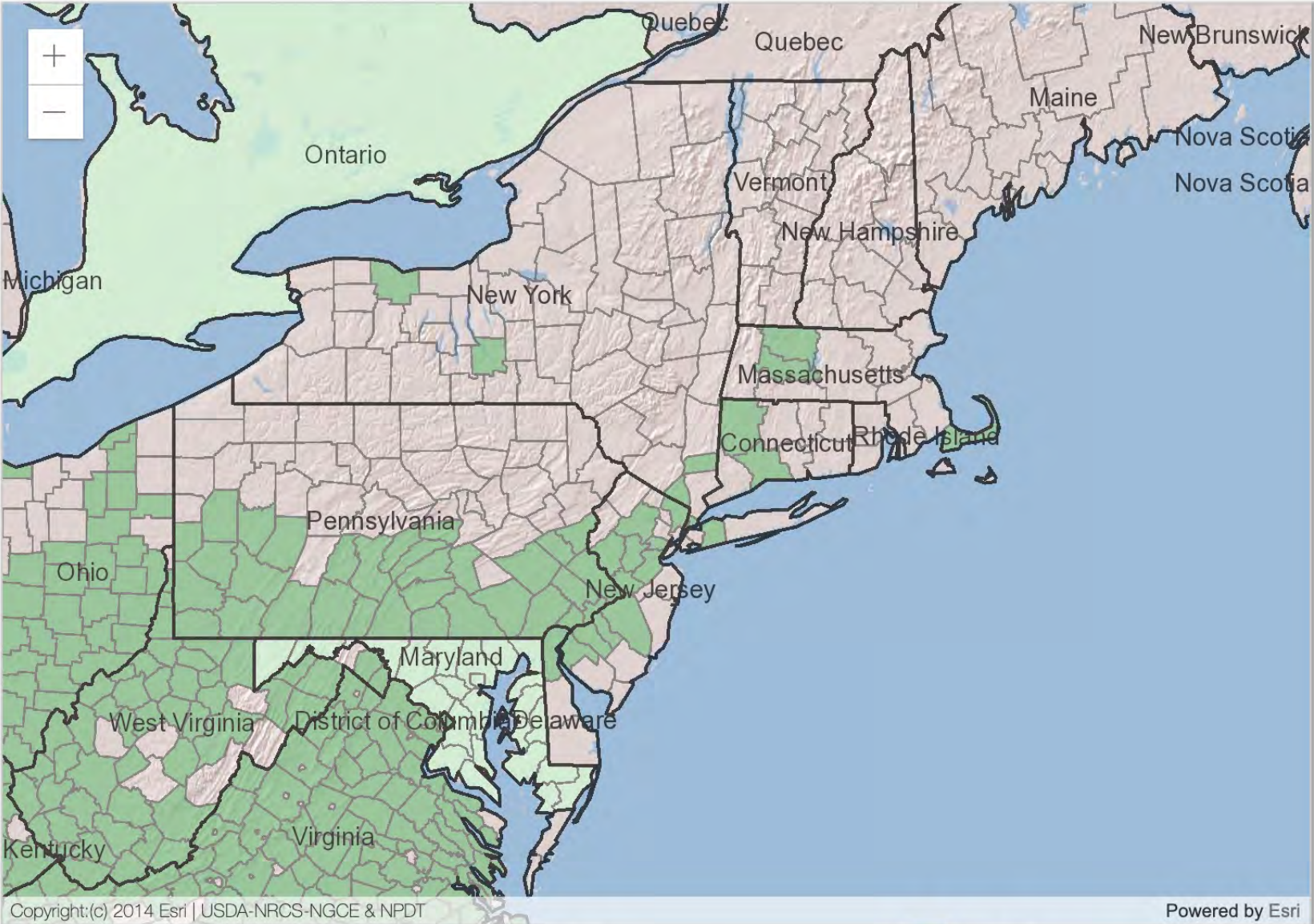
- US Forest Service
- UConn Forester
- CT DEEP NDDDB Ecologist and Foresters

Looked at range of species per USDA PLANTS database and species sold at garden centers (What is already available and planted horticulturally in Connecticut)

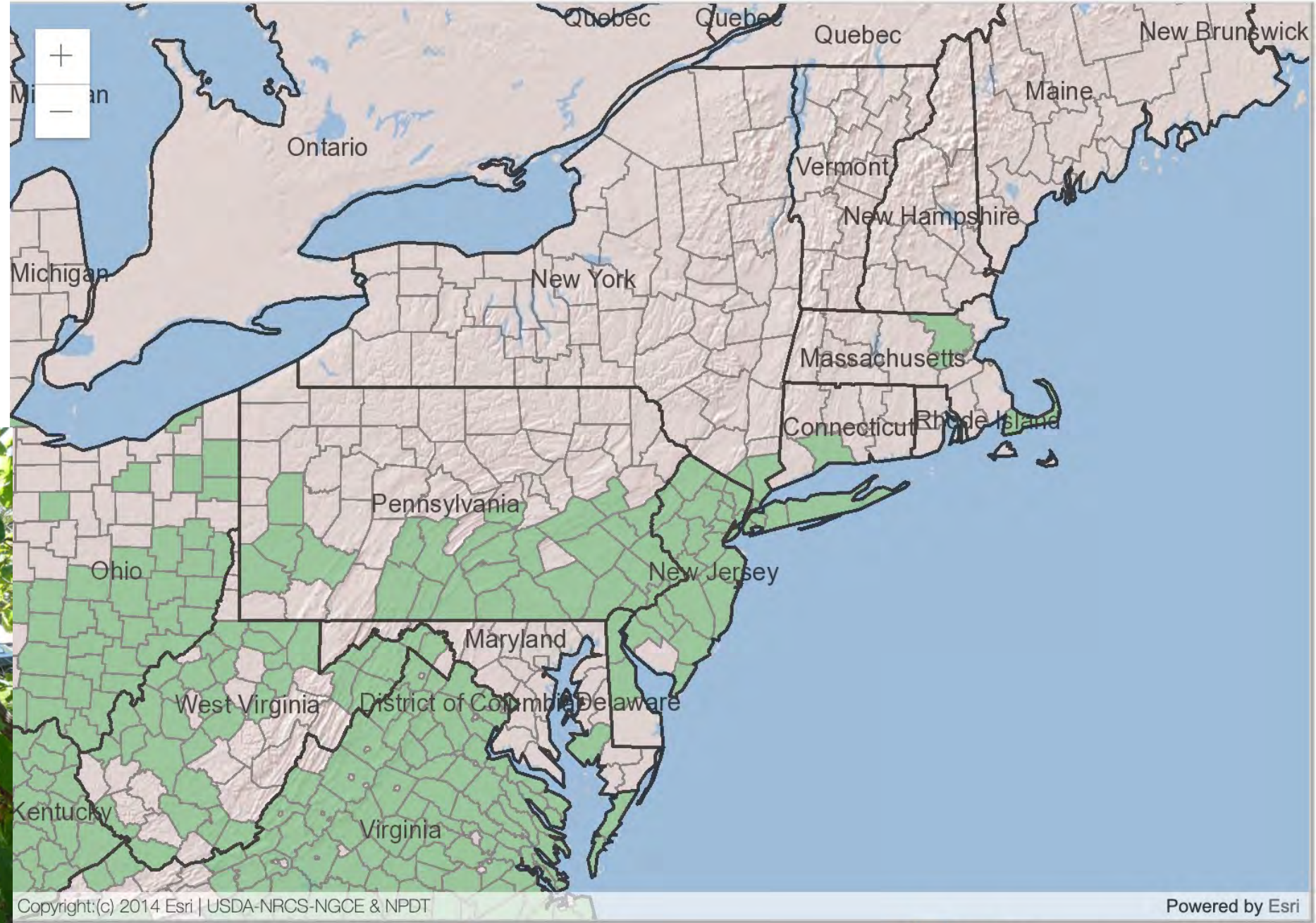
Sweetgum (*Liquidambar styraciflua*)









Eastern Redbud (*Cercis canadensis*)

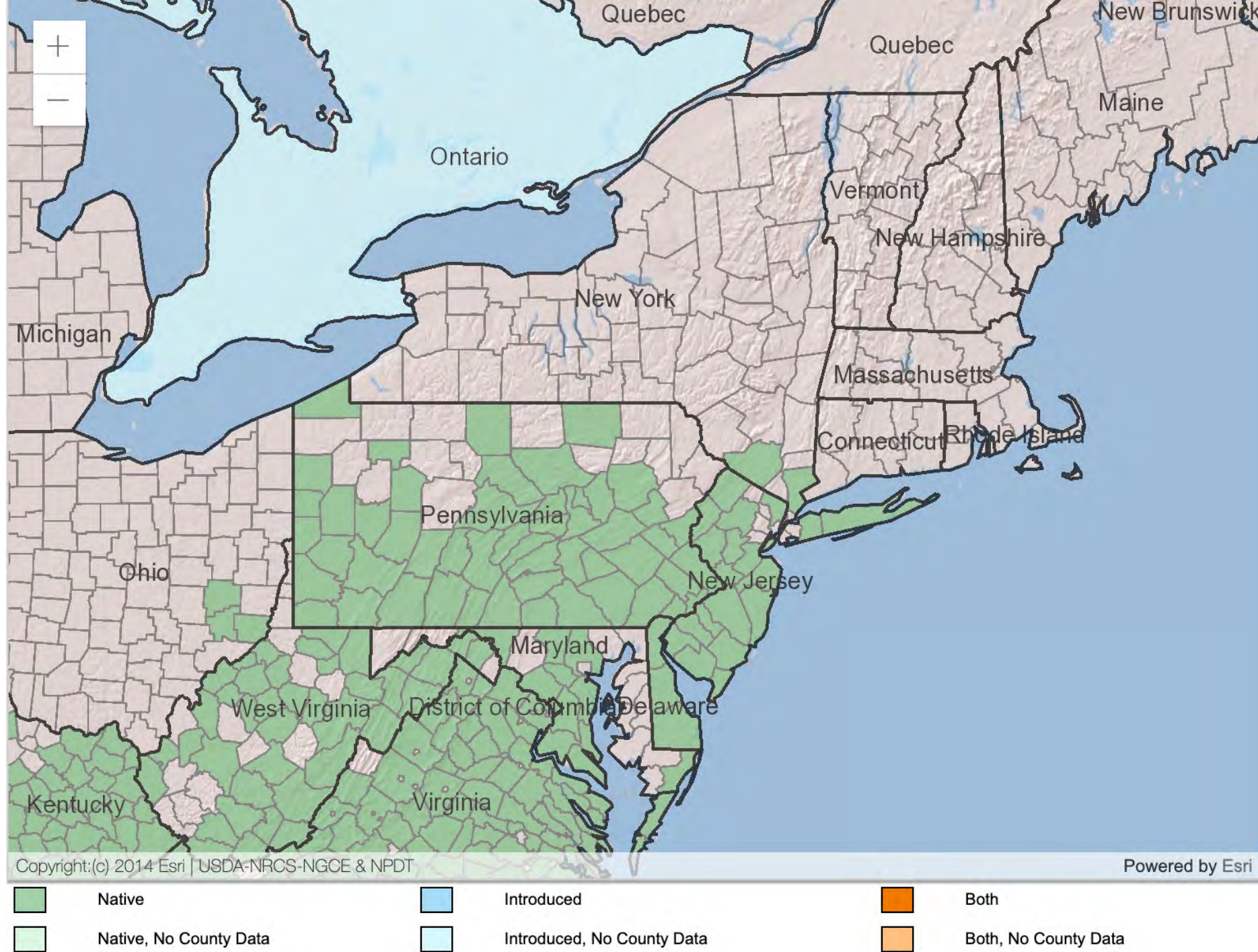


Common Persimmon (*Diospyros virginiana*)



	Native		Introduced		Both
	Native, No County Data		Introduced, No County Data		Both, No County Data

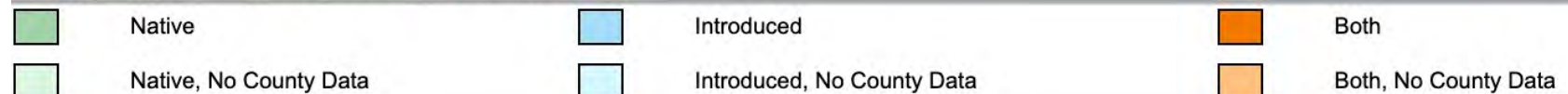
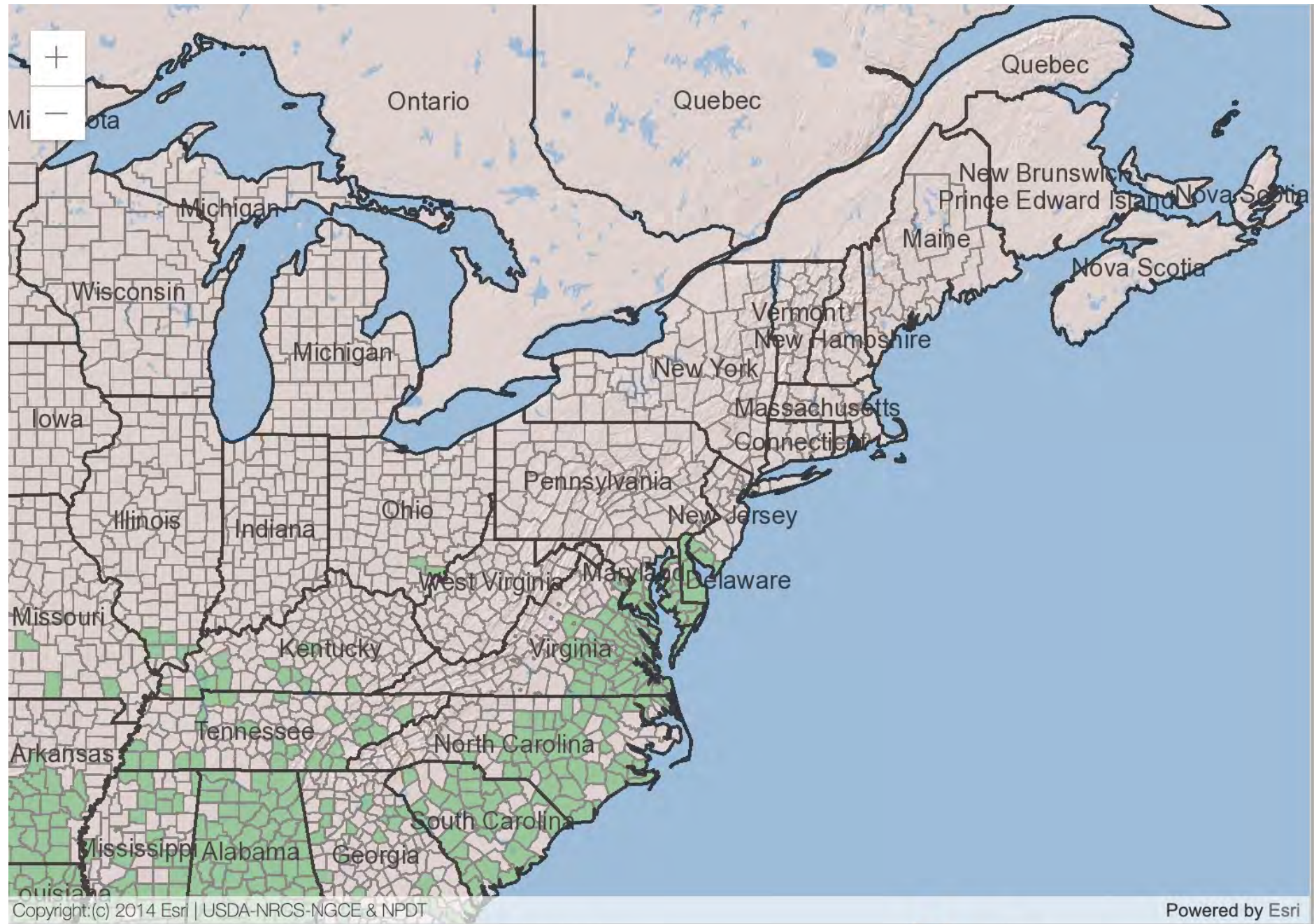
Pinus virginiana (Virginia Pine)



Loblolly Pine (*Pinus taeda*)



Credit: UF/IFAS



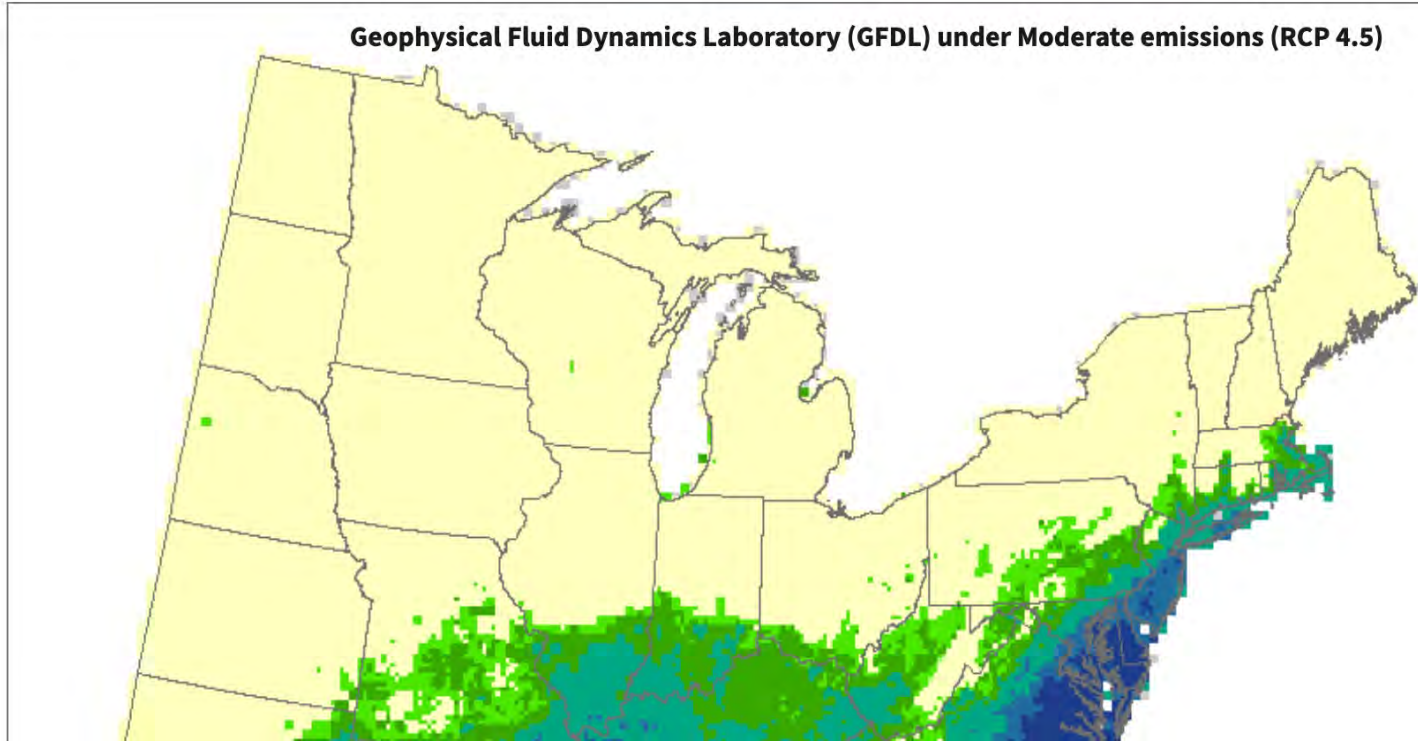


loblolly pine (*Pinus taeda*)

Model Reliability: High

Show me

under

SHIFT ?[⚠ Cautions](#)[ℹ Model Info](#)[? FAQ](#)**Geophysical Fluid Dynamics Laboratory (GFDL) under Moderate emissions (RCP 4.5)**

! Interpretation

Loblolly pine is a widely distributed (19.8% of area), dense, and highly important (higher cumulative importance value, FIAsum, than any other eastern species, and second with respect to average importance where it is found) southern pine with a highly reliable model suggesting expansion northward. It is moderately adapted to a changing climate, but is so abundant that its overall capability rating is good. Furthermore, SHIFT identifies it as a very good infill species, but SHIFT also models a restriction in its northward migration potential over 100 years, especially under RCP 8.5.

[RCP 4.5 SHIFT](#)[RCP 8.5 SHIFT](#)

Plantings

- Spring 2021 – bare root saplings trees and shrubs (1 to 4 ft) (400+ plants/7 species) (Maryland nursery)
- Spring 2021 – potted trees and shrubs (1 to 4 ft) – red, black and white oaks, alternate leaved dogwood and gray dogwood from Maryland State Nursery (130 plants/7 species)
- Fall 2021 – redbud, sweet gum and pines
- Seed mixes scattered into the skid trails



J. Benson, CTSG

Issues and Concerns

Drought



Deer and other herbivores



Rain



Photo by [Sitthan Kutty](#) from [Pexels](#)



Invasive plant species – want to control as a seed source to patch cuts



Emerging infestations of Japanese barberry (*Berberis thunbergii*), Multiflora Rose (*Rosa multiflora*), Autumn Olive (*Eleagnus umbellata*), Oriental Bittersweet (*Celastrus orbiculatus*), Winged Euonymus (*Euonymus alatus*), Mugwort (*Artemisia vulgaris*), Wineberry (*Rubus phoenicolasius*), and Bush Honeysuckles (*Lonicera* spp.).

Concerns continued...

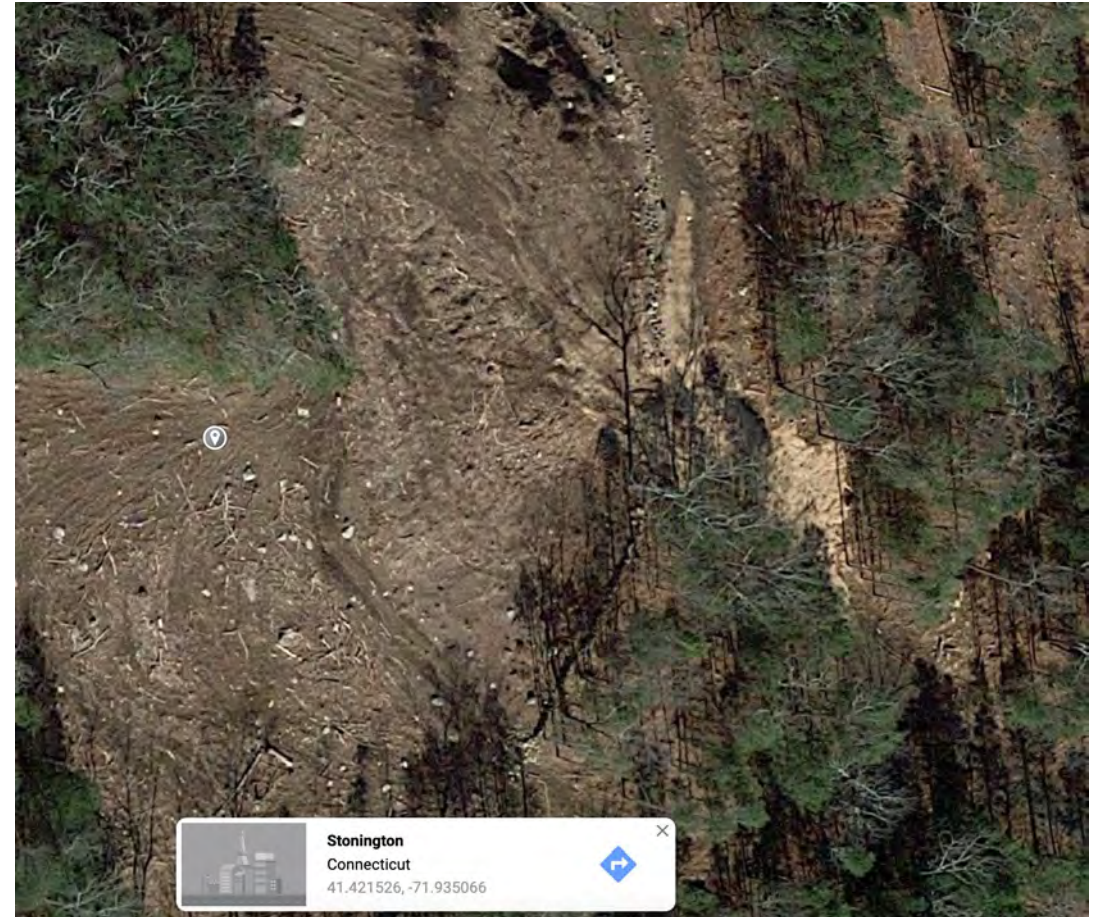
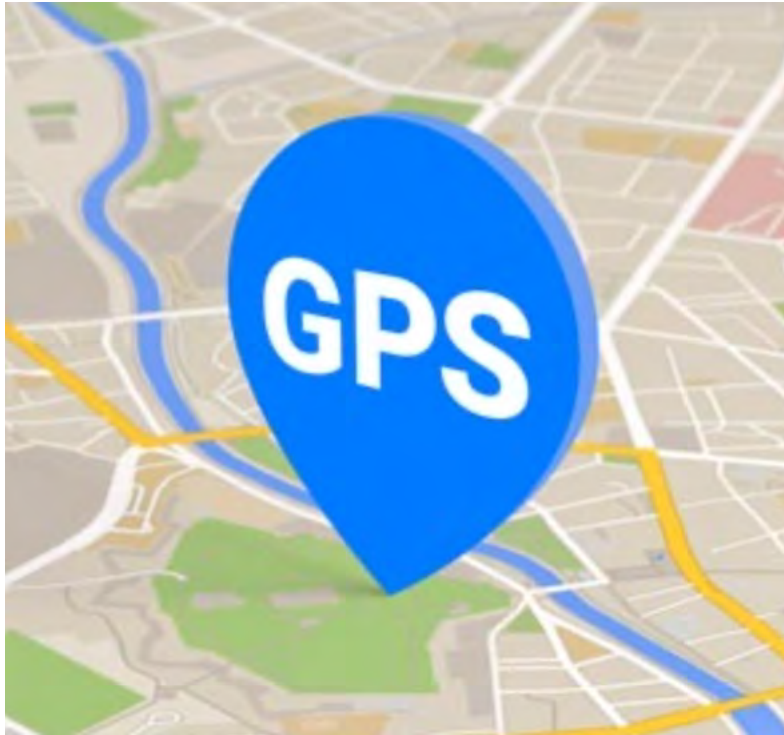
American Beech (*Fagus grandifolia*):
Do we need to be concerned or not?
Sprouts (monoculture) and disease



Beech Bark Disease



Monitoring in the future: GPS locations of plantings/species (latitude/longitude)



Research Opportunities

- Invasive plant research – Chad Jones, Connecticut College
- Whip-poor-will study
- American chestnut genetics
- Bird monitoring with ebird
- Conn College Students
- UConn Students
- Potential for Stonington High School science/ecology programs

Outreach components

- Lecture series
- Workshop with NIACS
- Fact sheet with guiding principles
- Resilience Plan for Hoffman Preserve
- Blogs
- Hikes
- Work parties
- Cub Scouts
- Press coverage
- Educational Signage (supported by Mystic Garden Club)
- Photo points to engage public



Photos: J. Benson, T. Eickel and J. Barrett

Scouts and plantings



A young pine tree sapling with vibrant green needles and a small, developing cone is growing in a forest. The ground is covered with a thick layer of brown, fallen leaves and several large, weathered logs. The scene is captured in a close-up, slightly high-angle shot, emphasizing the sapling's presence in a natural, somewhat rugged environment.

QUESTIONS OR COMMENTS?

"The true meaning of life is to plant trees, under whose shade you do not expect to sit." - Nelson Henderson

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