Cultivating a Conservation Collection on the Island of Martha's Vineyard: Challenges and Opportunities

THE POLLY HILL ARBORETUM

Tim Boland, Executive Director
Emily Ellingson, Curator & Assistant Director
Ian Jochems, Director of Grounds & Facilities
May 2, 2026
Arboretum Wespelaar

Tim Boland, Executive Director

- BS in Landscape Horticulture (1985) Michigan State University
- One Year fellowship (1986) RHS, Wisley
- Plant Propagator, Michigan State University (1988-1998)
- MS Degree Plant Taxonomy (1995) Michigan State University
- Curator, the Morton Arboretum (1998-2002)
- Curator, the Polly Hill Arboretum (2002 – 2004) Executive Director (2002-2026)
- Board member, The International Oak Society (2018-present)
  - Chair of the Oak Conservation and Research Committee

Tim retires September 1 of the year!

Ian Jochems, Director of Grounds & Facilities

- Started at age 15 in the landscaping industry
- BS in Environmental Horticulture with a concentration in Greenhouse/Nursery Production and Management (2012) from Colorado State University
- Horticulturist, the Gardens on Spring Creek (2010-2012)
- Horticulturist, the Polly Hill Arboretum (2012-2019) Grounds Manager (2019-2025) Director of Grounds and Facilities (2025-present)
- International Society of Arboriculture, Certified arborist and Tree Risk Assessment Qualified (TRAQ)

Emily Ellingson, Curator & Assistant Director

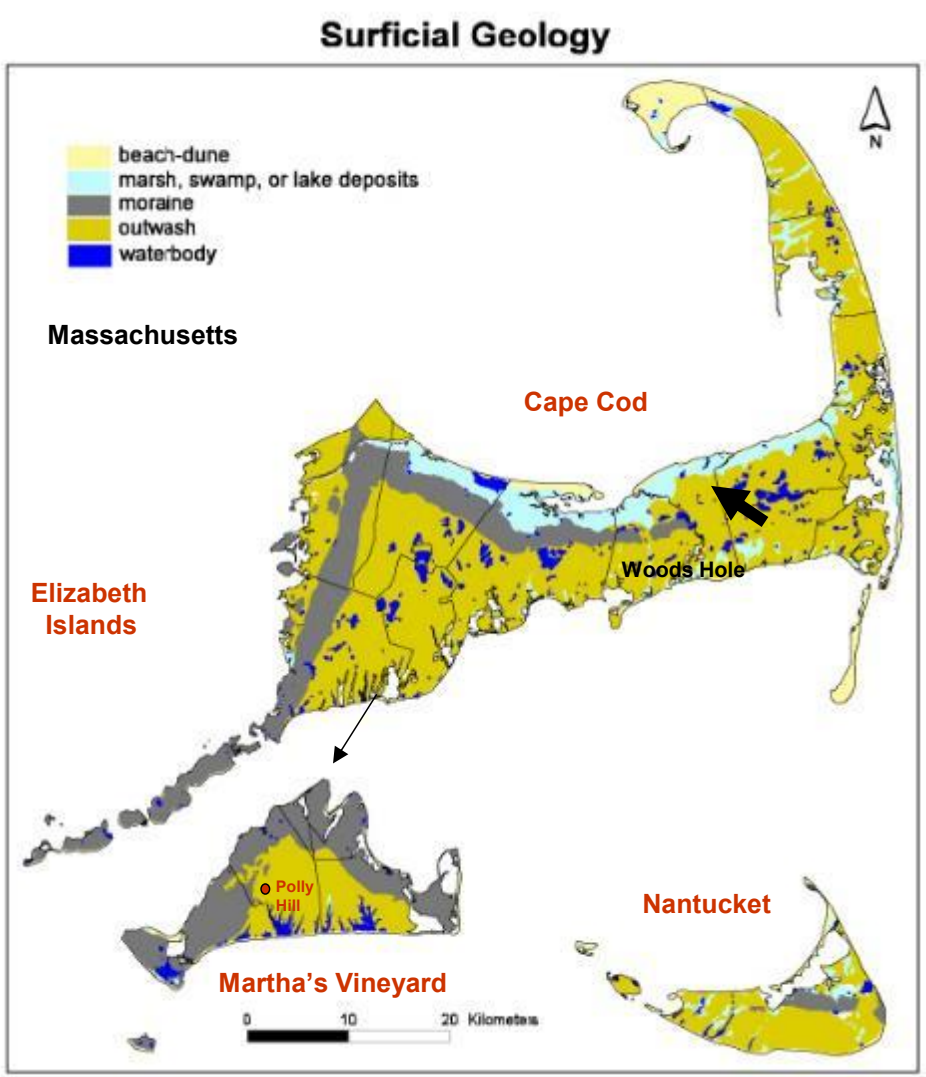
- BA in Biology and Environmental Studies; St. Olaf College, Northfield, MN (2009)
- Internships at Coastal Maine Botanical Gardens, the Arnold Arboretum, Filoli, Polly Hill Arboretum
- MS in Applied Plant Science, minor in Museum Studies; University of MN (2017)
- Curator and Collections Manager, Arboretum State Botanical Garden of Kentucky (2017-2021)
- PHA Curator & Assistant Director (2021-)
- APGA Plant Collections Community Leadership Team

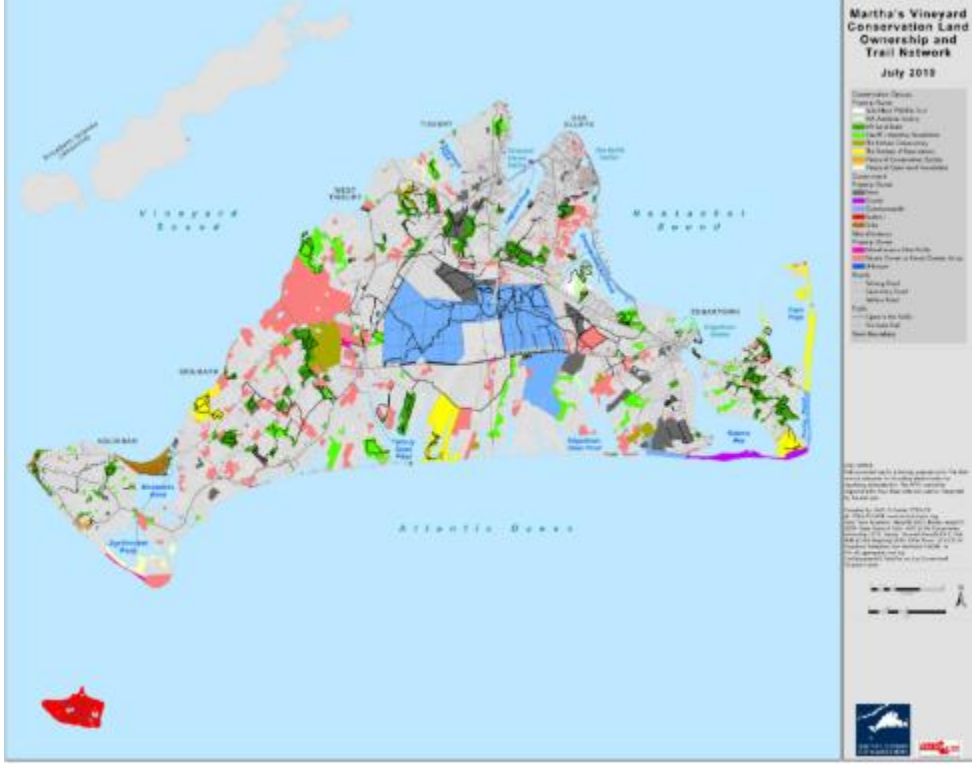
INTRODUCTION

Island Fast Facts

- 5 Miles (8km) from Woods Hole, Massachusetts
- Wampanoag Tribe Original Inhabitants
- First European Settlement in 1602
- 22,000 YR Population
- 130,000 Summer Population
- Land area of approx. 96 square miles (250 $km^{2)}$

- Six Towns
- Highest Point 311 feet (95m)
- Average Precipitation 40 inches (100cm)
- Seasonal Drought in July and August
- USDA Plant Hardiness Zone 7a
- Tourism Economy





40% of the Island is permanently protected open space

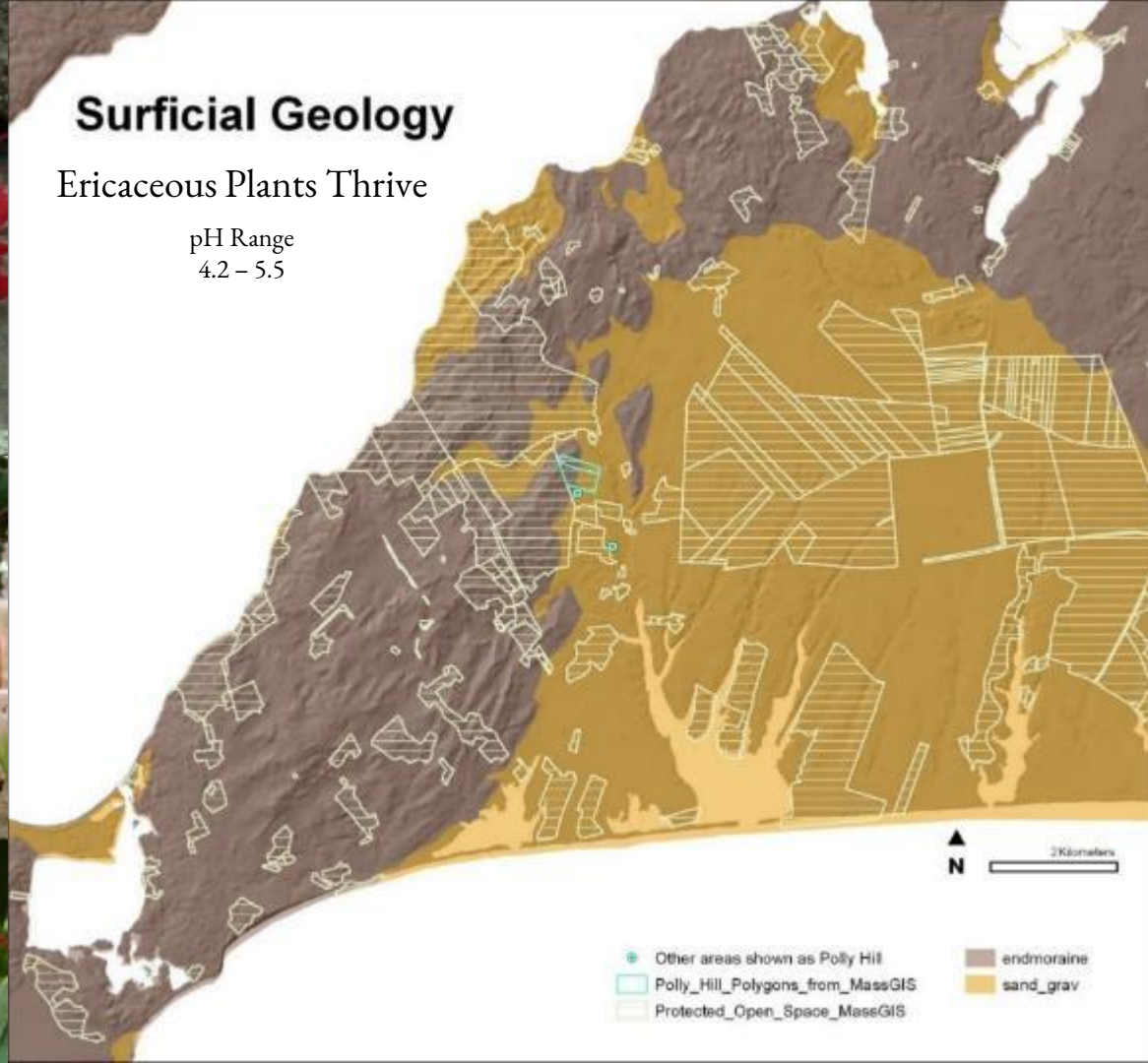
Rhododendron cumberlandense

Rhododendron 'Hal Bruce'

Surficial Geology

Ericaceous Plants Thrive

pH Range
4.2 – 5.5



Captain Bartholomew Gosnold

Sassafras albidum

Photo: Rick Darke

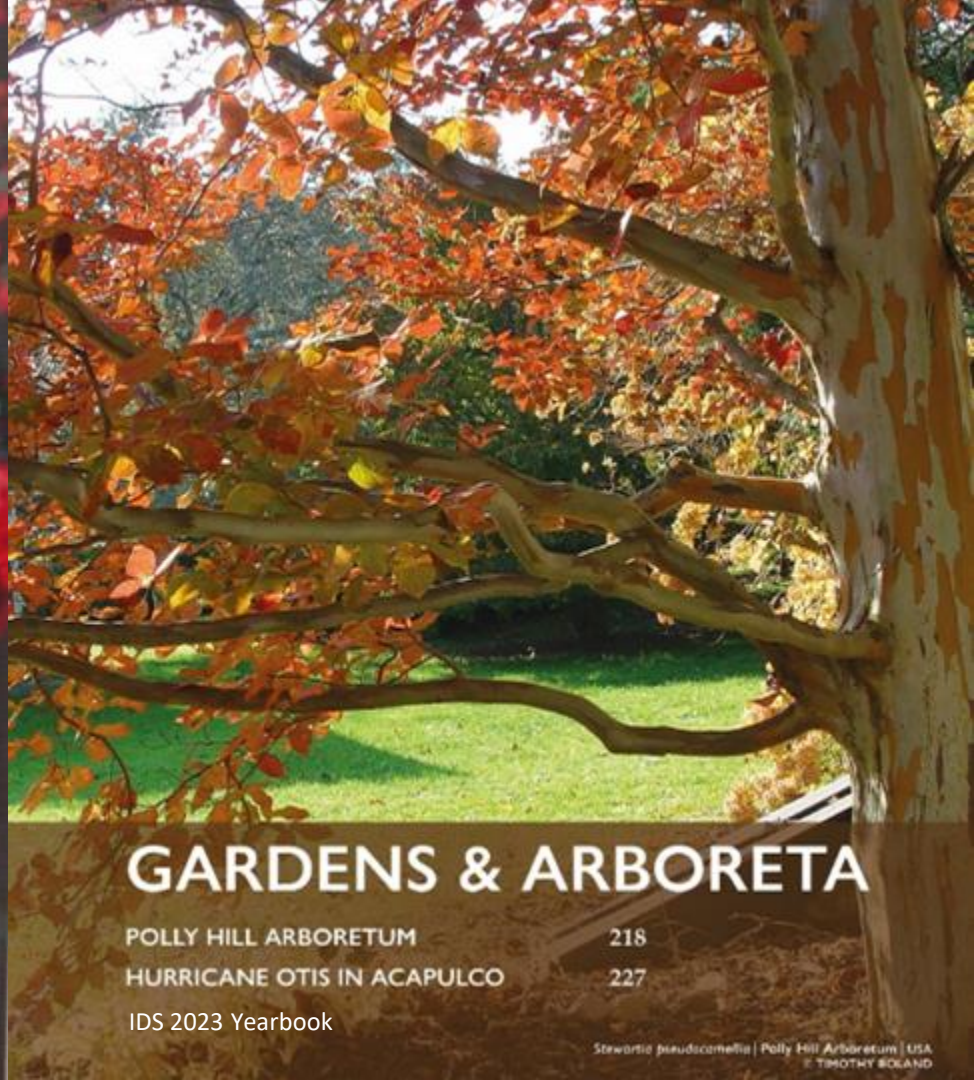
Polly Hill (1907-2007)

Experimental Horticulturist

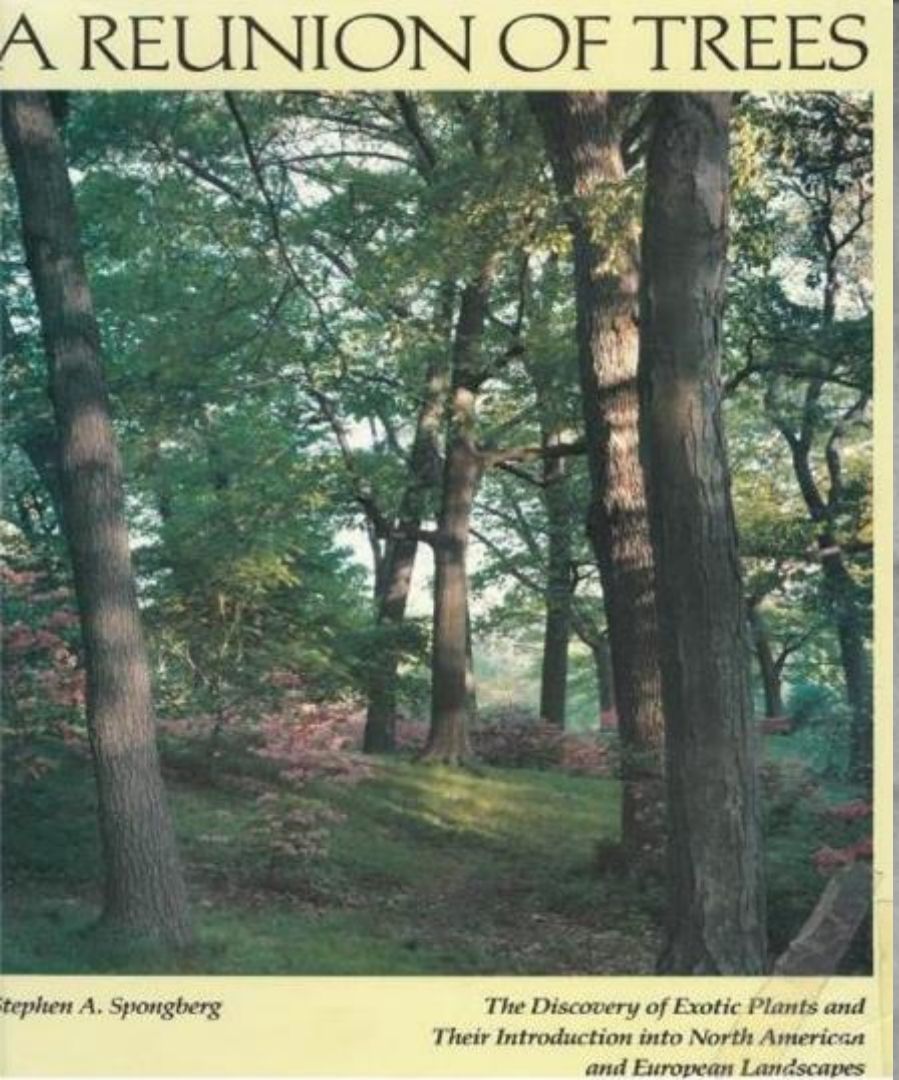
Devoted to planting seeds

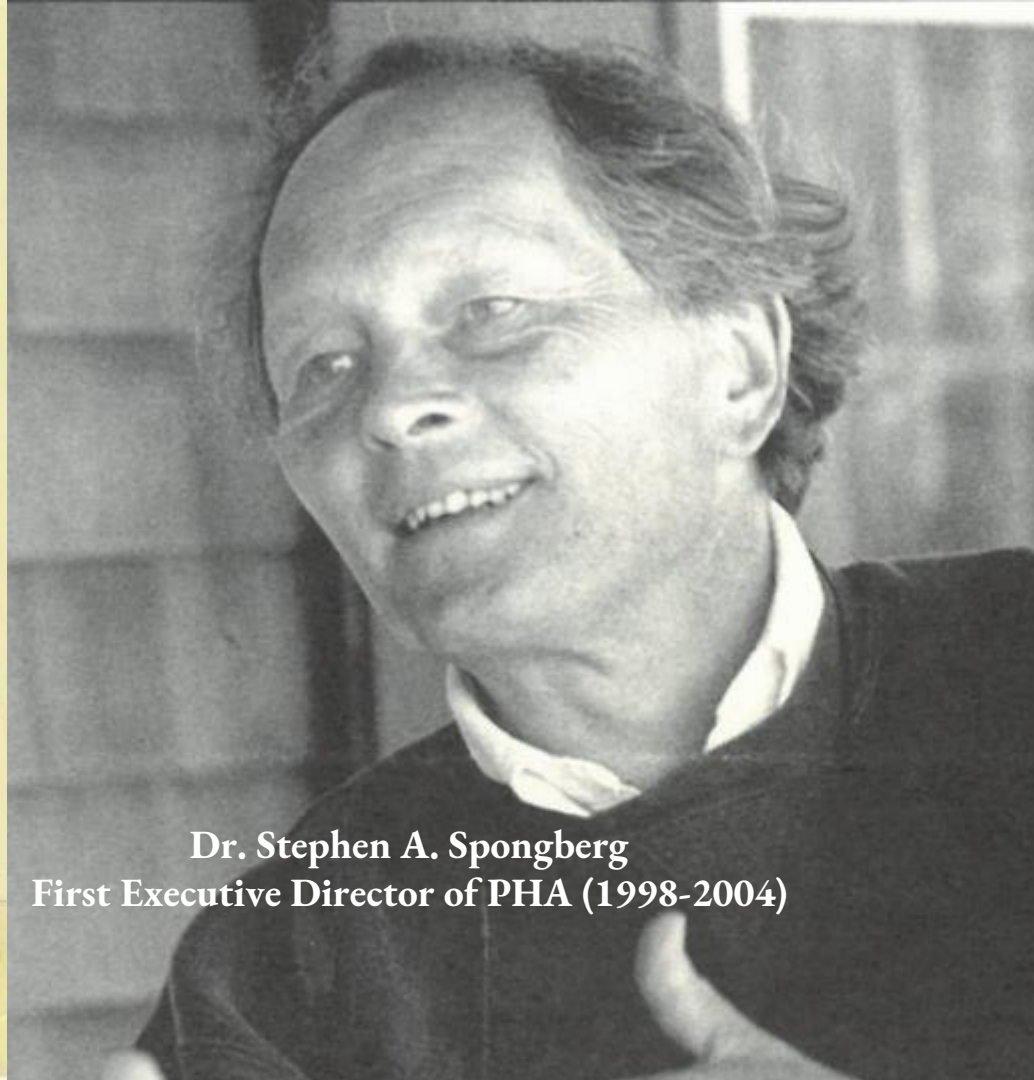
Named over 60 cultivated varieties

Extensive plant records led to the establishment of the PHA in 1998



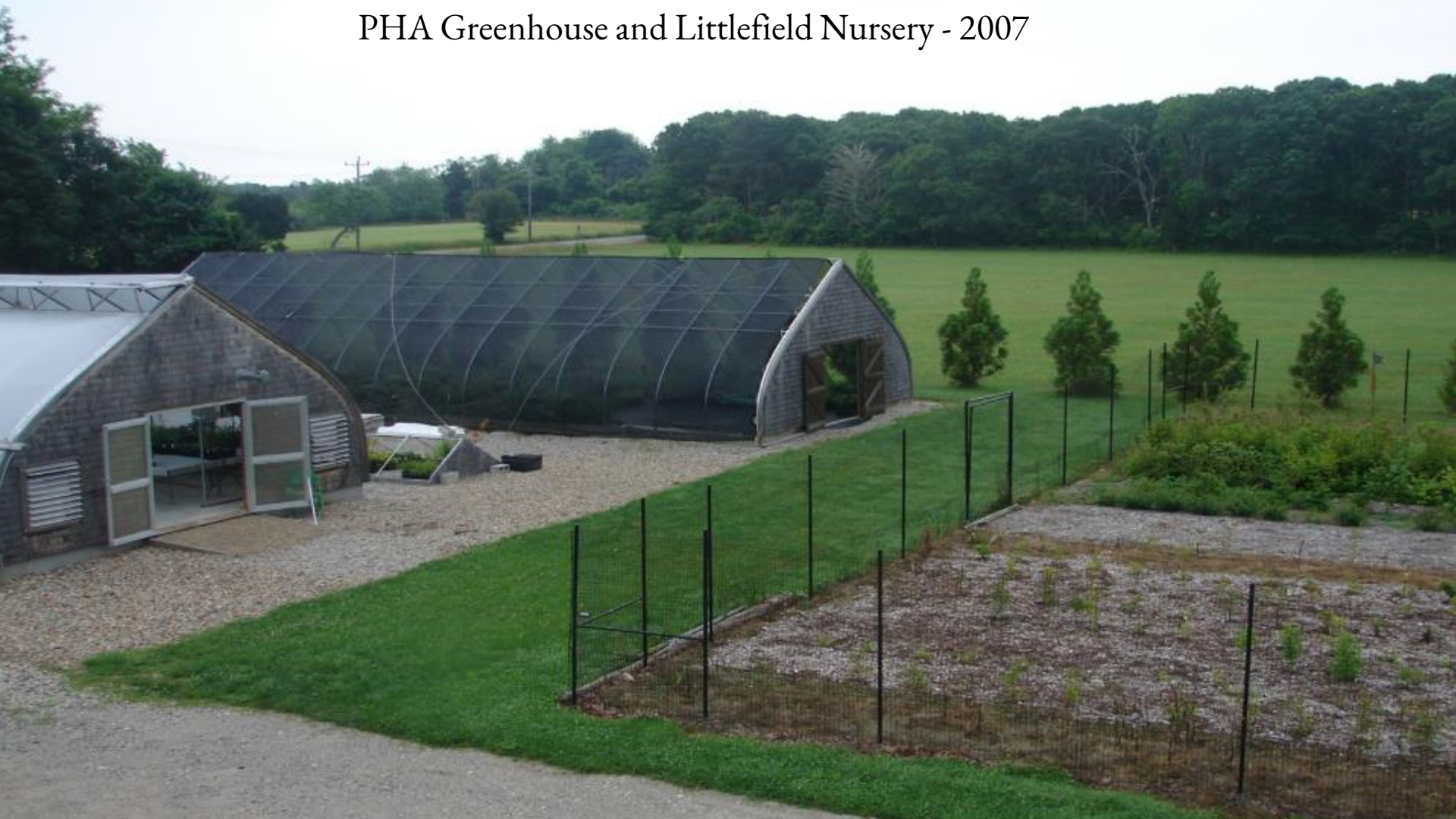

Total Land - 30 Hectares





Dr. Stephen A. Spongberg
First Executive Director of PHA (1998-2004)

PHA Greenhouse and Littlefield Nursery - 2007




2022


2006 Peter Raven – “How Many Plants will Survive the 21st Century”

Spongberg -
Correction Copy

A Review of Deciduous-Leaved Species of Stewartia (Theaceae)

Stephen A. Spongberg

Reprinted from
Journal of the Arnold Arboretum
Volume 55, Number 2
April, 1974

Stewartia pseudocamellia 'Mint Frills' has been selected for its ruffled petals and green tinged flowers

Stewartia in cultivation

ERIC HSU, TIMOTHY BOLAND and KOEN CAMELBEKE provide an overview of the cultivated species and highlight some new cultivars

IF THERE IS A TREE that embodies the Japanese principle of wabi-sabi, the intuitive appreciation of understated beauty, it is the genus *Stewartia*. This is evident from its graceful form, irregularly mottled bark and demure white flowers. When the zenith of spring-flowering trees has passed, stewartias fill that quiet moment in early summer with their camellia-like flowers. Their preference for acidic soils notwithstanding, they are suitable subjects for small gardens since their growth, at best, is modest.

Genus characteristics

The solitary white flowers of *Stewartia* convince any botanically inclined or knowledgeable gardener that the genus is in the *Theaceae*, along with other ornamental genera such as *Camellia*, *Franklinia* and *Schima*. Depending on taxonomic point of view, *Stewartia* encompasses approximately 20 species. However, the genus has a surprisingly wide geographical distribution, from the moist montane forests of China into the Japanese archipelago, and to the

The Red List of
Theaceae

Emily Beech, Megan Barstow & Malin Rivers

BGCI GTA IUCN SSC

Publications

Polly Hill Arboretum Collection Development Plan: Nationally Accredited Stewartia Collection™ Version 2019

Plant Collections Network

AMERICAN PUBLIC GARDENS ASSOCIATION

The Nationally Accredited Stewartia Collection at Polly Hill Arboretum (hereafter, the Arboretum) advances the organization's mission by advancing botanical research, plant conservation, curatorial excellence, and collaborative partnerships. Temperate Stewartia thrive at the Arboretum, and were a horticulturally important group to our founder, Polly Hill, who selected and named nine cultivars.

This document serves to (1) provide a global summary and definition of the genus Stewartia, including taxonomic treatment and cultivated resources. (2) document the historical development

Nationally Accredited Plant Collection

Polly's initial fascination with stewartias—the handsome bark, the pristine flowers, stunning fall color—led her to seek out and grow as many species as possible. She planted seeds and patiently waited decades to see the first breathtaking flowers. Today the PHA's *Stewartia* collection numbers over 70 trees representing 21 taxa including nine unique cultivars selected and named by Polly.

As a result of Polly's initial efforts and our ongoing efforts to grow, study, conserve, understand and promote these remarkable trees the Arboretum's Stewartia collection is a nationally recognized collection. PHA earned accreditation for its Stewartia collection in 2005 through the Plant Collections Network (at that time known as the North American Plant Collections Consortium), a long-term collaboration between the American Public Gardens Association and the USDA–Agricultural Research Service.

NATIONALLY ACCREDITED
American Public Gardens Association
PLANT COLLECTION
™

Stewartia ovata – Mountain Camellia

FLOGEO
2021

Stewartia malacodendron - silky camellia

Collections summary

Coll. #	Taxon	State, County
FLOGEO-01	*Tilia americana*	FL, Wakulla
FLOGEO-02	*Tilia americana* var. *caroliniana*	FL, Wakulla
FLOGEO-03	*Quercus austrina*	FL, Wakulla
FLOGEO-04	*Carya glabra* var. *megacarpa*	FL, Wakulla
FLOGEO-05	*Stewartia malacodendron*	FL, Gadsden
FLOGEO-06	*Stewartia malacodendron*	FL, Gadsden
FLOGEO-07	*Stewartia malacodendron*	FL, Gadsden
FLOGEO-08	*Stewartia malacodendron*	FL, Gadsden
FLOGEO-09	*Stewartia malacodendron*	FL, Gadsden
FLOGEO-10	*Stewartia malacodendron*	FL, Gadsden
FLOGEO-11	*Stewartia malacodendron*	FL, Gadsden
FLOGEO-12	*Stewartia malacodendron*	FL, Washington
FLOGEO-13	*Stewartia malacodendron*	FL, Washington
FLOGEO-14	*Stewartia malacodendron*	FL, Washington
FLOGEO-15	*Stewartia malacodendron*	FL, Washington
FLOGEO-16	*Stewartia malacodendron*	FL, Washington
FLOGEO-17	*Stewartia malacodendron*	FL, Santa Rosa
FLOGEO-18	*Hibiscus aculeatus*	FL, Santa Rosa
FLOGEO-19	*Vernonia angustifolia*	FL, Santa Rosa
FLOGEO-20	*Stewartia malacodendron*	FL, Santa Rosa
FLOGEO-21	*Baptisia lanceolata*	FL, Santa Rosa
FLOGEO-22	*Rhododendron viscosum*	FL, Santa Rosa
FLOGEO-23	*Kalmia hirsuta*	FL, Santa Rosa




Great Age of Plant Exploration

- 2005 - Japan
- 2007 - Japan, Alabama, Georgia (Mt Cuba – BBG)**
- 2008 - Georgia, South Carolina**
- 2010 - Alabama (Mt. Cuba – BBG)**
- 2014 - ZARKS – Ozarks
- 2014 - SEUS** – North, South Carolina
- 2015 - GEONC** – Georgia and North Carolina
- 2016 - TUCK** – Kentucky
- 2017 - TNKY** –Tennessee & Kentucky; COSE
- 2018 - TNKY2** and Japan (PCC2018-HON)
- 2019 - (PCC2019-HON) Japan
- 2021- FLOGEO** –Florida, Georgia, and Alabama
- 2022- FLO2022** –Florida; ORCA22 –Oregon &California
- 2023 - GEOSC** –Georgia, South Carolina, Louisiana and Alabama; LIMB23 – Oregon & California; ALMS23 –Mississippi & Alabama

**US Native Stewartia collections

Asclepias purpurascens

Stewartia malacodendron

Asimina mansota

Conservation Gap Analysis of Native

U.S. Oaks

Species profile: ***Quercus similis***

Emily Beckman, Tim Boland, Abby Meyer, Murphy Westwood

SPECIES OF CONSERVATION CONCERN

CHALLENGES

Fagus sylvatica 'Zlatia'

Challenges of a Small Island and the Impact on our Trees

- Roughly 3 miles from the mainland
- Approximately 96 sq/miles
- Coastal maritime climate that always seems to have a breeze
- Isolated (pests and beneficials)

Climate and Conditions

- Avg rainfall
  - 45” or .75L per year
- Avg wind- 12mph from the W/SW
- Avg gusts- 40-50mph regularly with average storms
  - Hurricane Bob 1991- 115mph
  - Nor’Easter 2026- 71+mph
- Soil conditions (formed by a glacier)
  - Reminisce of a glacial push moraine and we are the terminal part of that
  - Mainly sandy to sandy loam with rocks and pockets of clay to loam clay

Effects of the wind

Beech Leaf Disease (BLD)

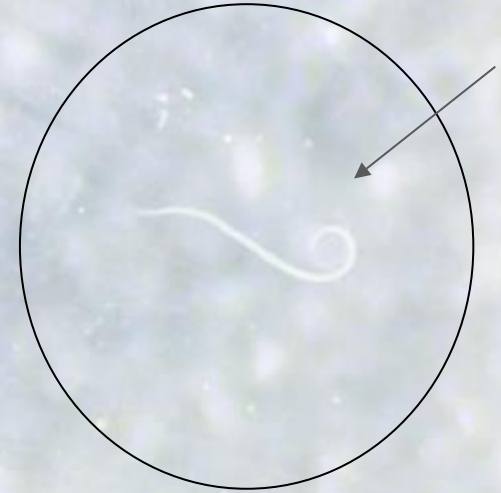
PHA Beech Collection

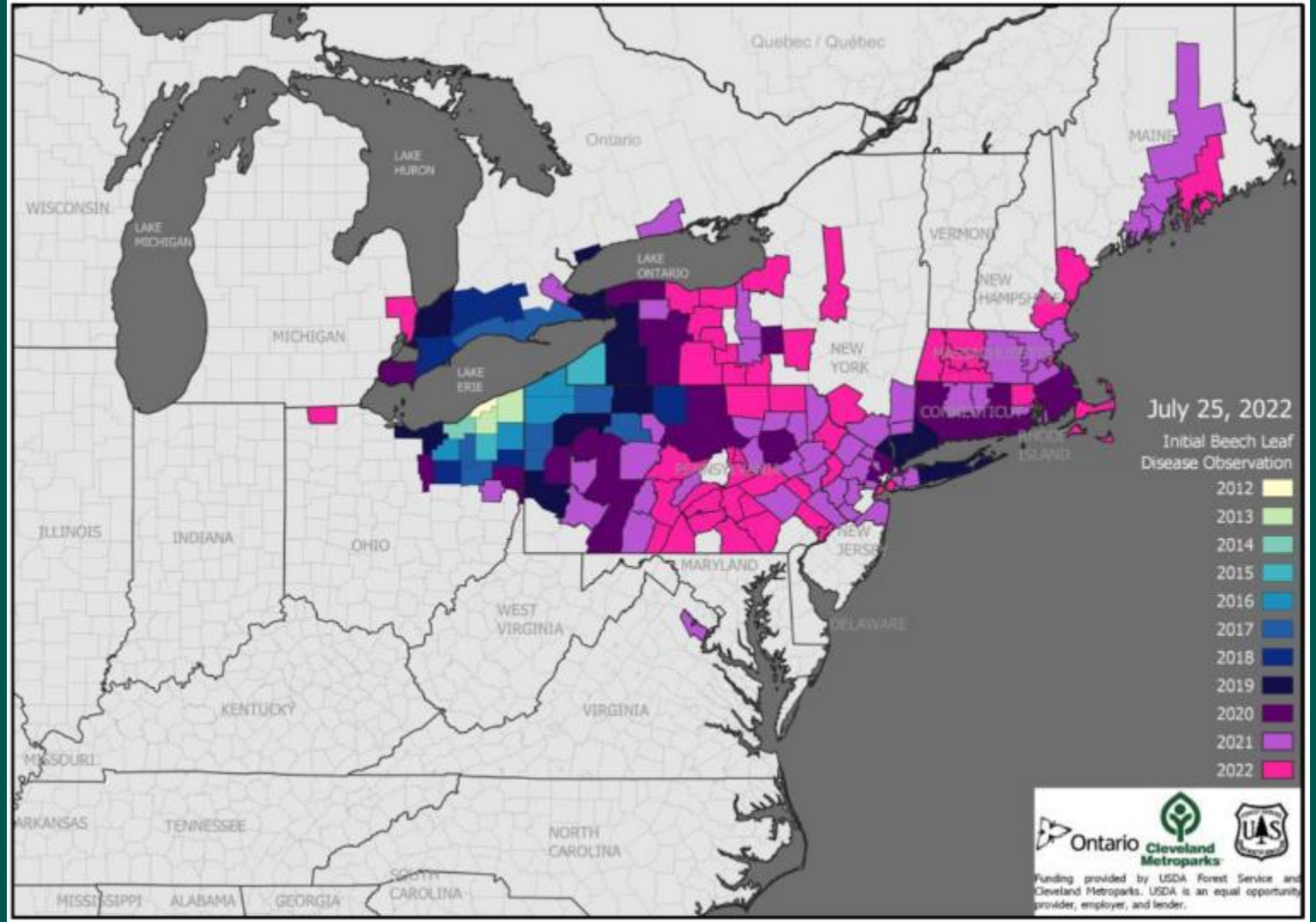
- First tree in Polly's accessions
  - *Fagus sylvatica* 'Fastigiata' - acc.# 1958-001A
- We have 13 non-native Beech species or cultivars and about a dozen American Beech accessioned into our collection


Picnic Grove

Litylenchus crenatae mccannii

- Beech Leaf Nematode
  - Foliar feeding nematode
  - Believed to originate from Japan
- First recognized in the US in 2012 in Lake County, Ohio
- MV in 2022
- Effects all Beech Species
- No currently known parasite or beneficial actors at this point




Quebec / Québec
Ontario
LAKE HURON
LAKE MICHIGAN
LAKE ONTARIO
LAKE ERIE
WISCONSIN
MICHIGAN
MAINE
VERMONT
NEW HAMPSHIRE
NEW YORK
ILLINOIS
INDIANA
OHIO
MARYLAND
NEW JERSEY
DELAWARE
WEST VIRGINIA
KENTUCKY
VIRGINIA
MISSOURI
ARKANSAS
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
MISSISSIPPI
ALABAMA
GEORGIA
July 25, 2022
Initial Beech Leaf Disease Observation
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Ontario
Cleveland Metroparks
Funding provided by USDA Forest Service and Cleveland Metroparks. USDA is an equal opportunity provider, employer, and lender.

Signs and Symptoms of BLD

- Cupping of interveinal tissue
- Dark interveinal banding when looking at a leaf from below
- New foliage dried up and/or severely damaged as it emerges from the bud
- Thin canopy

BLD Treatments- Foliar Spray

- Broadform by Bayer

  Fluopyram (F/N) and Trifloxystrobin (F)
  4 foliar applications spread out starting in early July and going until September/ October
  - 4-8fl/oz per 100g water
  - Timing is crucial and complete coverage can be difficult
  - Highest potential for environmental impact
  - ~$200 for 12fl/oz

BLD Treatment- Basal Injection

- Arbotect 20S by Syngenta and Rainbow Tree Care
  - Thiabendazole (Fungicide/ Nematicide)
  - 1 part product to 16-32 parts water
  - For each 5” of dbh use 2-8fl oz of product and up to 12fl oz of product on larger trees
  - Injection done at 20psi or less
  - 1 application should have a 2 year control effect
    - Environmentally the safer option and has the best canopy coverage
    - Cannot be used on trees under 5”dbh
    - Try to make injections along the side of a root flare not on top (prevents bark cracking)
  - ~$500/ gallon

Our Results

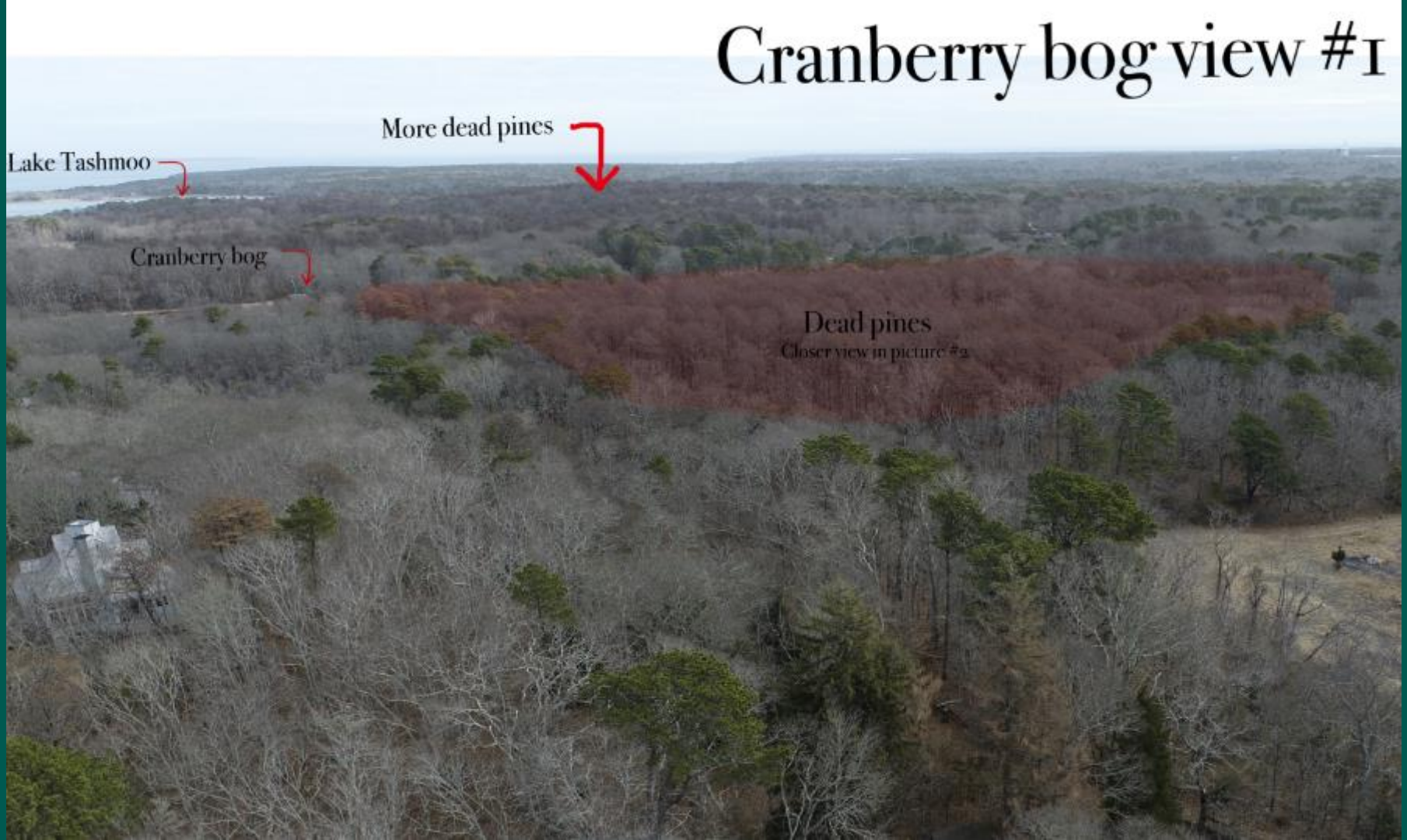
- Both are effective
- We have zero losses for anything treated
- Injection has the best control and is the easiest for timing and dealing with any environmental concerns

Southern Pine Beetle

Dendroctonus frontalis

- Prefers Southern Pine tree species but can also go to Pitch Pine, Norway Spruce, White Pine
- Sprays can be effective but timing is critical and spray has to be complete coverage ⅔ of the way up into the canopy
  - Not as environmentally friendly
- Causes tree mortality in two ways
  - Beetle adults and larvae girdling the tree from under the bark
  - Blue stain fungal infection they carry with then

Cranberry bog view #1



Monitoring for Southern Pine Beetle

Lindgren Funnel traps

- Can be passive or attractive
  - We only use passive catch
- Monitored weekly to see who is in the area
- Helps us formulate a IPM program and plan

Deterrents “No Vacancy”

Verbenone pouches or splat

- Synthetic pheromone
- Signal to other adult beetles that are flying that the tree is full.
- Hang them 6-12’ up the trunk
- Environment and human/pet safe

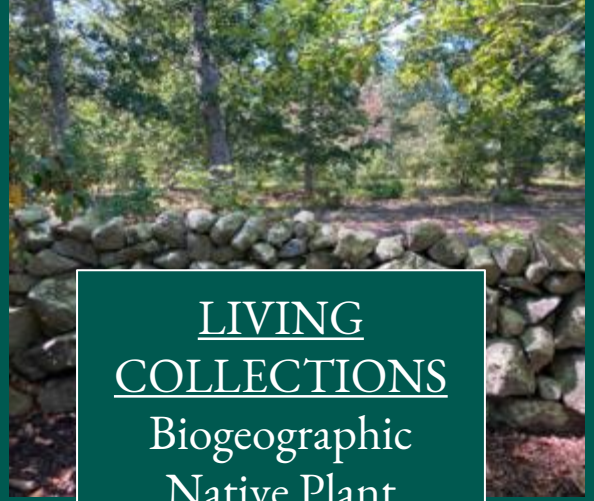
Basal Injection Trials

Basal root flare injections of Tree-age G4 (emamectin benzoate, Insecticide) with Propiconazole 14.3 (fungicide)

- Small amounts of water with high concentrations of product
- Higher PSI ~40-60psi
- Preventative treatments for now

OPPORTUNITIES

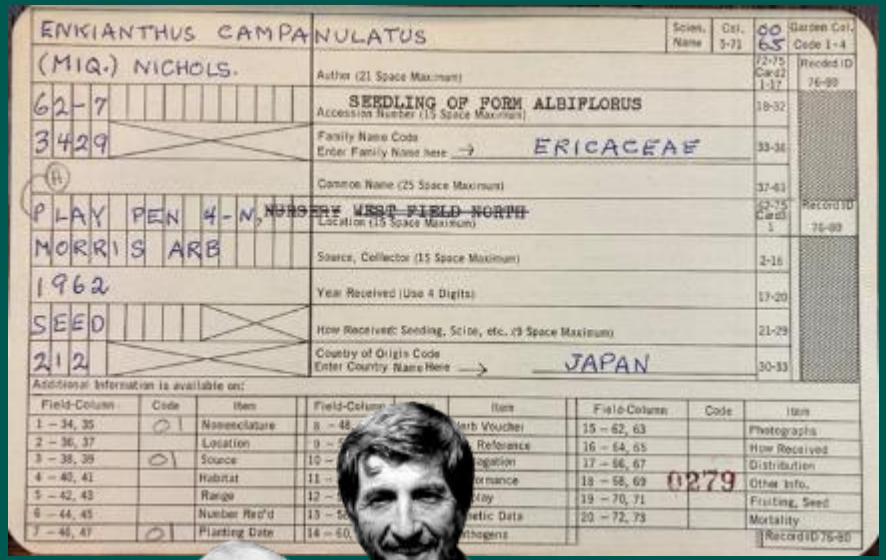
Franklinia alatamaha



LIVING COLLECTIONS

Biogeographic
Native Plant
Conservation
PCN Stewartia
Historic
Horticultural

Plant Records: A Way of Life


ENKIANTHUS CAMPANULATUS (MIQ.) NICHOLS.

SEEDLING OF FORM ALBIFLORUS

Family Name Code — ERICACEAE

PLAY PEN 4-N, ~~NURSERY WEST FIELD NORTH~~

MORRIS ARB

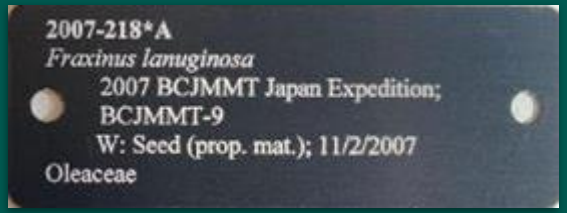
1962

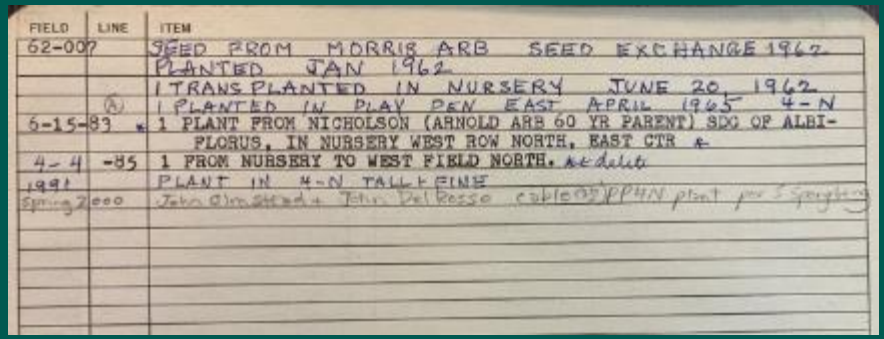
SEED

212

Country of Origin Code — JAPAN

0279




FIELD	LINE	ITEM
62-007		SEED FROM MORRIS ARB SEED EXCHANGE 1962
		PLANTED JAN 1962
		1 TRANS PLANTED IN NURSERY JUNE 20, 1962
	(A)	1 PLANTED IN PLAY PEN EAST APRIL 1965 4-N
6-15-83	*	1 PLANT FROM NICHOLSON (ARNOLD ARB 60 YR PARENT) SDG OF ALBI-FLORUS, IN NURSERY WEST ROW NORTH, EAST CTR *
4-4	-85	1 FROM NURSERY TO WEST FIELD NORTH. * delete
1991		PLANT IN 4-N TALL FINE
Spring 2000		John Olmstead + John DelBosso cable 00 JPPHN plant per J Spaulding

Living Collections Statistics

Total # Unique Taxa: 1,631

Total # Accessions: 2,254

Total # Plants: 3,080

37% of accessions wild-collected

Top 5 Families: Ericaceae, Hydrangeaceae, Cupressaceae, Fagaceae, Hamamelidaceae

Top 5 Genera: Rhododendron, Hydrangea, Quercus, Ilex, Stewartia

Significant Taxonomic Collections

Enkianthus


Enkianthus cernuus var. *rubens*


Enkianthus perulatus


Enkianthus campanulatus


Stewartia malacodendron


Stewartia ovata


Stewartia monadelpha


Stewartia pseudocamellia


Stewartia rostrata

Stewartia

Significant Taxonomic Collections


Rhododendron cumberlandense 'Sizzler'


Rhododendron 'Joseph Hill'


Rhododendron 'Hal Bruce'


Rhododendron mucronulatum 'Cornell Pink'


Rhododendron polystichum


Rhododendron vaseyi


Rhododendron pilosum


Rhododendron tschonoskii

Rhododendron

Significant Taxonomic Collections

Magnoli
a


Magnolia 'Butterflies'


Magnolia obovata 'Lydia'


Magnolia macrophylla 'Julian Hill'


Magnolia salicifolia


Magnolia x *soulangeana*


Magnolia stellata


Magnolia x *loebneri* 'Leonard Messel'

Significant Taxonomic Collections

Ilex

Ex situ Conservation

67 Species on IUCN Red List

13 Near Threatened (NT)

25 Vulnerable (VU)

23 Endangered (EN)

5 Critically Imperiled (CR)

1 Extinct in the Wild (EW)

Larix gmelinii var. *olgensis* (NT)

Rhododendron eastmannii (VU)

Magnolia stellata (EN)

Quercus boyntonii (CR)

Franklinia alatamaha (EW)

Conservation Horticulture

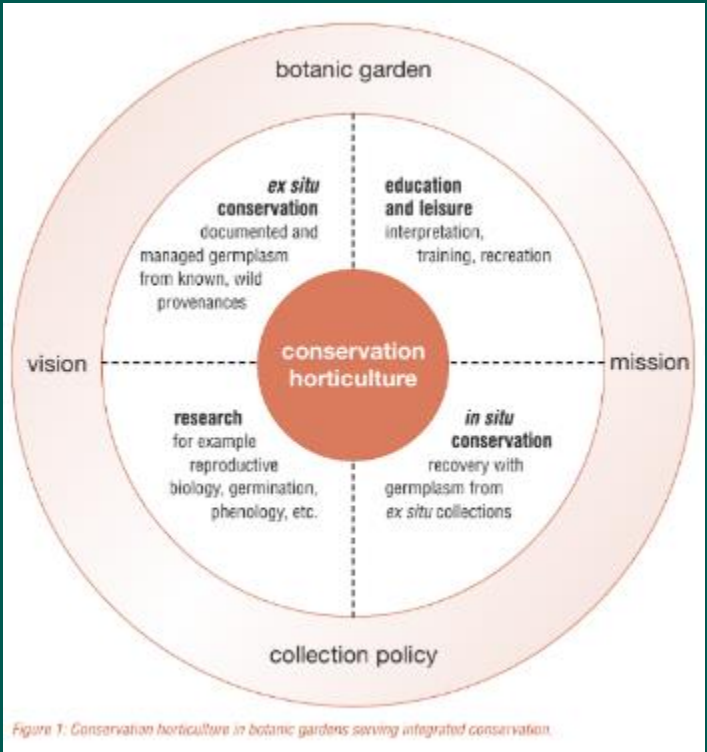


Figure 1: Conservation horticulture in botanic gardens serving integrated conservation.

BGCI • 2017 • BGjournal • Vol 14 (2) • What is Conservation Horticulture? By Joachim Gratzfeld

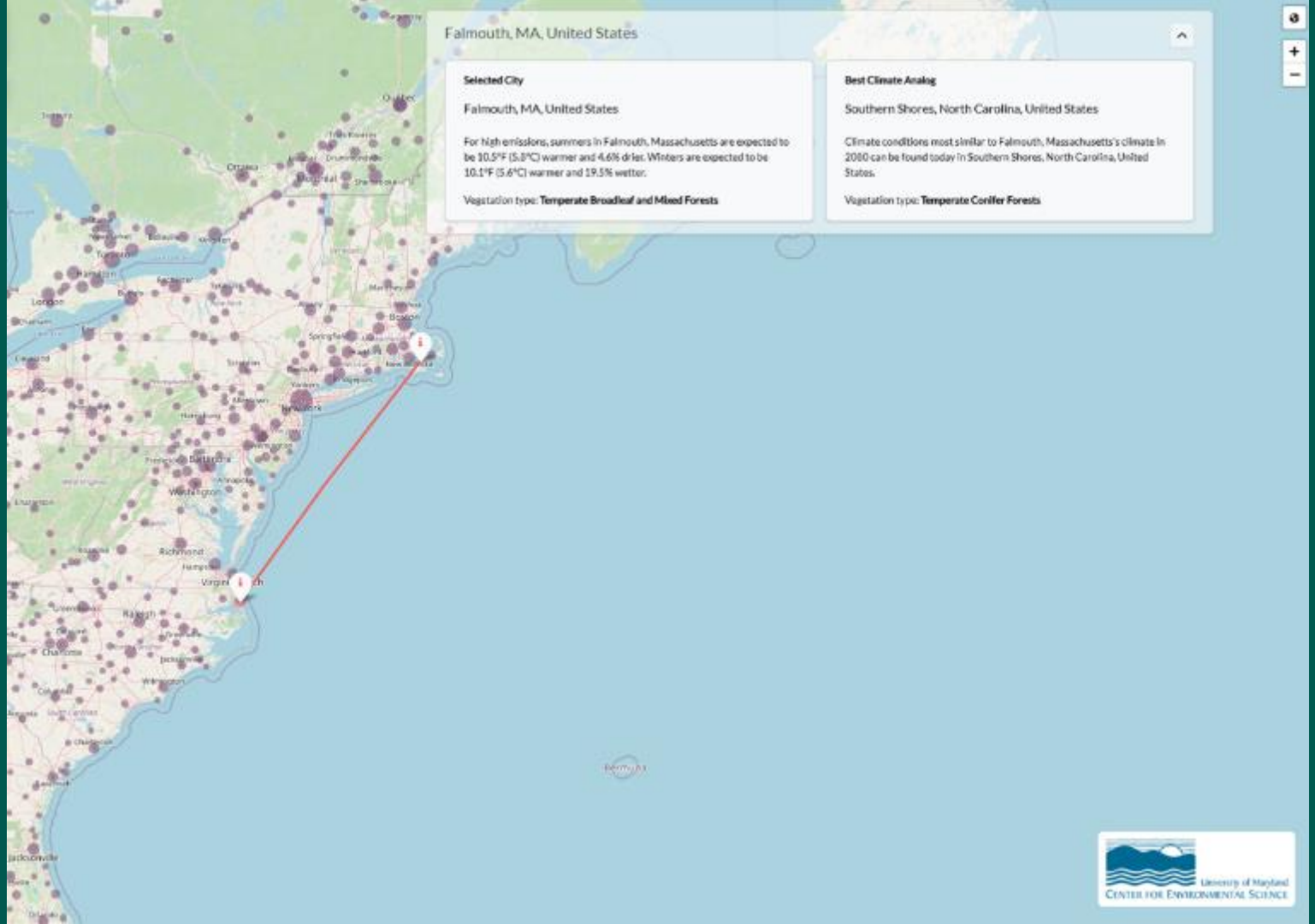
Cleft-leaved Hawthorn; *Crataegus schizophylla*

Bluff Oak; *Quercus austrina*

Purple Milkweed, *Asclepias purpurascens*

New England Blazing Star; *Liatris novae-angliae*

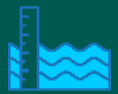
Martha's Vineyard Wildtype Program


Falmouth, MA, United States
Selected City
Falmouth, MA, United States
For high emissions, summers in Falmouth, Massachusetts are expected to be 10.5°F (5.8°C) warmer and 4.6% drier. Winters are expected to be 10.1°F (5.6°C) warmer and 19.5% wetter.
Vegetation type: Temperate Broadleaf and Mixed Forests
Best Climate Analog
Southern Shores, North Carolina, United States
Climate conditions most similar to Falmouth, Massachusetts's climate in 2080 can be found today in Southern Shores, North Carolina, United States.
Vegetation type: Temperate Conifer Forests
Boston
New York
Washington
Richmond
Raleigh
Charlotte
Jacksonville
Bermuda
University of Maryland
Center for Environmental Science

Climate Change Impacts in New England

-Temperatures projected to increase 5.3 - 9.1 F by late century, greatest warming in winter

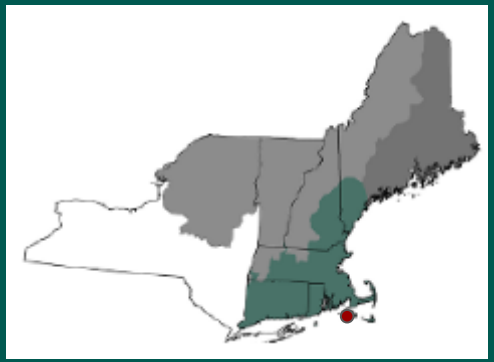
-Precipitation patterns will be altered



-Sea levels along NE Atlantic Coast projected to rise between. 2 - 4.5 ft.

-Extreme weather events more frequent or severe

-Increase in certain pests, pathogens, and invasive species

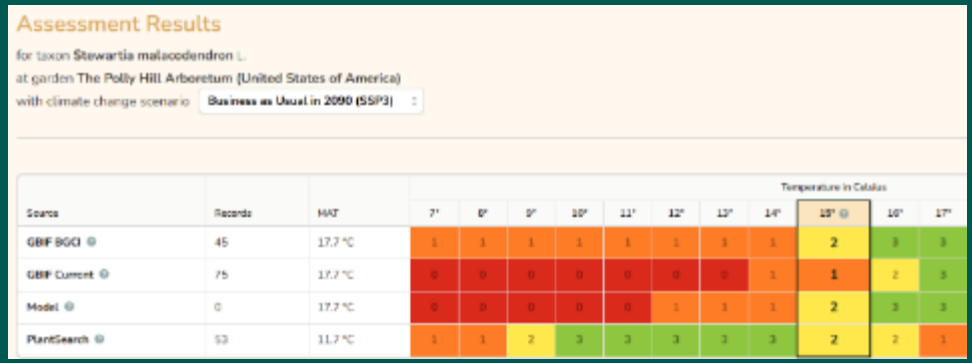


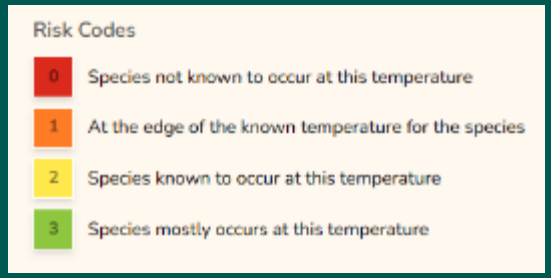
CLIMATE CHANGE RESPONSE FRAMEWORK

NIACS
Northern Institute of Applied Climate Science

Tree Species Selection Tools

BGCI Climate Assessment Tool





USDA Forest and Tree Atlas

CLIMATE CHANGE CAPABILITY	
POOR CAPABILITY	
American basswood	Paper birch
Balsam fir	Pitch pine
Balsam poplar	Red pine
Black ash	Red spruce
Black spruce	Slippery elm
Black walnut	Striped maple
Bur oak	Swamp white oak
Eastern white pine	Sweet birch
Hackberry	Tamarack (native)
Northern pin oak	White spruce
Northern white-cedar	
FAIR CAPABILITY	
Black locust	White ash
Quaking aspen	
GOOD CAPABILITY	
American beech	Post oak
American holly	Red maple
Black cherry	Sassafras
Black oak	Scarlet oak
Blackgum	Shagbark hickory
Chestnut oak	Sugar maple
Eastern redcedar	Sweetgum
Mockernut hickory	White oak
Northern red oak	Yellow-poplar
Pignut hickory	
MIXED RESULTS	
American elm	Gray birch
American hornbeam	Green ash
Bigtooth aspen	Ironwood
Eastern hemlock	Silver maple
Flowering dogwood	Yellow birch
NEW HABITAT WITH MIGRATION POTENTIAL	
Chinkapin oak	Sweetbay
Loblolly pine	Virginia pine
Shortleaf pine	Water hickory
Southern red oak	

Woodland Garden Expansion

What's been planted in the Woodland Garden?

53 woody plants; 34 species; 26 genera

71% Wild-collected

Ostrya virginiana

Magnolia x 'Lois'

Hamamelis virginiana

Carpinus caroliniana

Acer stachyophyllum subsp. *betulifolium*

Corylopsis glabrescens

Acer rubrum

Alnus maritima

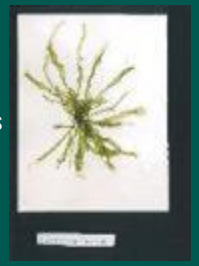
Stachyurus praecox

NON-LIVING

Library
Herbarium
Archives
Art

PHARB - the Polly Hill Arboretum Herbarium

2001 - Rose Treat's algal specimens donated



2015 - Collecting! Mounting!

2009 - Comprehensive review of existing Martha's Vineyard Specimens by Tim Boland and Melissa Cullina

2016 - Education and Botany Lab Built

2019 - PHARB into Index Herbariorum at NYBG

The Polly Hill Arboretum:PHARB

2021 - Data live-managed in Symbiota Portal and specimens digitized; Flora of Dukes County Checklist published to PHA's website

PHARB - the Polly Hill Arboretum Herbarium

Flora of Dukes County

PHA collections

Seed collection expeditions

Trips without seed collection

The Flora of Dukes County

A comprehensive list of the vascular plants (and some bryophytes!) known to occur on Martha's Vineyard and the Elizabeth Islands.

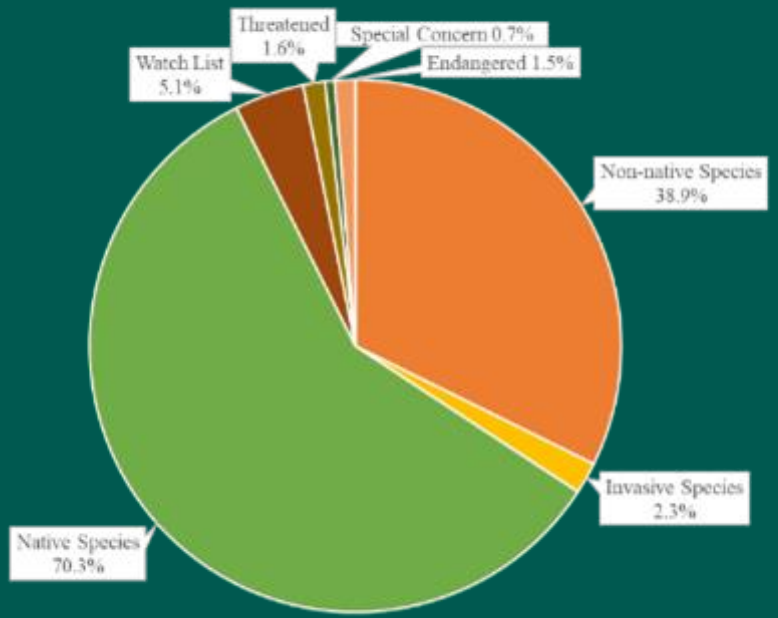
Massachusetts State Flower: *Epigea repens* - mayflower

Bryophytes


Fontinalaceae
Fissidentaceae
Entodontaceae
Ditrichaceae
Leskeaceae
Lepidoziaceae
Jungermanniaceae
Jubulaceae

The Flora of Dukes County: by the numbers

Dukes County	Number	% total taxa
Total taxa	1235	
Total species	1030	83.4
Introduced taxa	480	38.9
Invasive taxa	28	2.3
Total native taxa	868	70.3
Watch List	63	5.1
Threatened	20	1.6
Special Concern	9	0.7
Endangered	19	1.5
Historic, native	145	11.7
Only found on Elizabeth Islands	32	2.6
Total re-established from historic status	35	2.8
Total County Records	167	13.5
Of county records, introduced	116	9.4
Of county records, native	42	3.4



Gregory Palermo and Margaret Curtin (Photo by Mark Lovewell)

Melissa Cullina

Tim Boland

Representatives from PHA, NatureServe and Massachusetts Dept. of Conservation surveying for the endangered orchid, *Malaxis bayardii*

Sowing the Seeds of the Future

Matt Lobdell – Director, Landscape and Living Collections, Missouri Botanical Garden, St. Louis

Cat Meholic – Director of Gardens and Horticulture at Hagley Museum and Library, Delaware

Emily Ellingson - Curator/Assistant Director, Polly Hill Arboretum

Kady Wilson – Collections Manager, Smith College, Northampton, Massachusetts

Thomas Murphy – Austin Peay University, TN. Masters Degree.; PhD candidate, University of Florida

Elizabeth Thomas – University of Georgia MS Plant Ecology 2025; Conservation Scientist at Bartlett Arboretum and Research Laboratory, North Carolina

Dylan Dubay - Science & Collections Information Specialist, Coastal Maine Botanical Gardens, Boothbay, Maine

Isabella Colucci, Plant Collections Apprentice, Mount Auburn Cemetery, Boston, Massachusetts

THANK YOU

Magnolia 'David'