Restoring Old-Growth Characteristics

MLCC Conference

Photo: Tony D'Amato

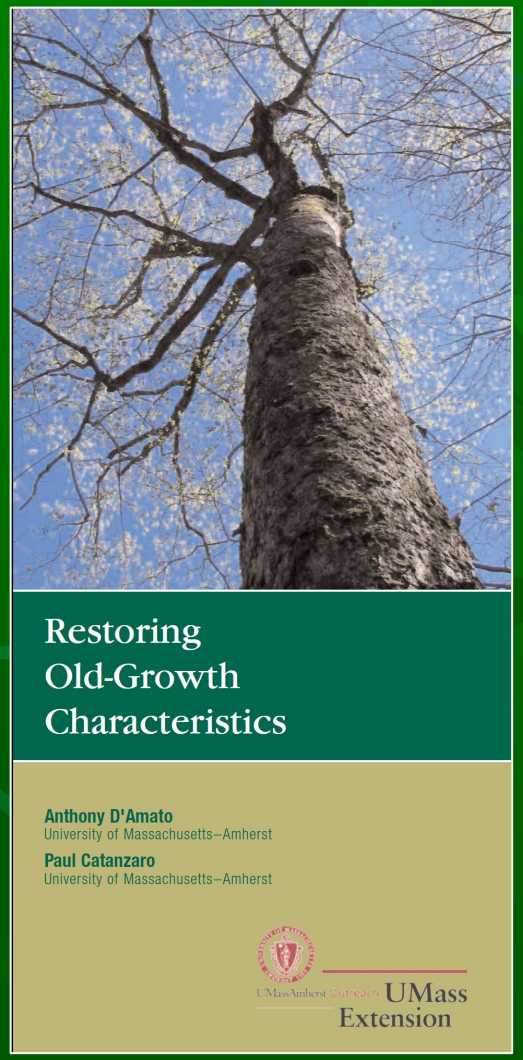
Paul Catanzaro

University of Massachusetts Amherst

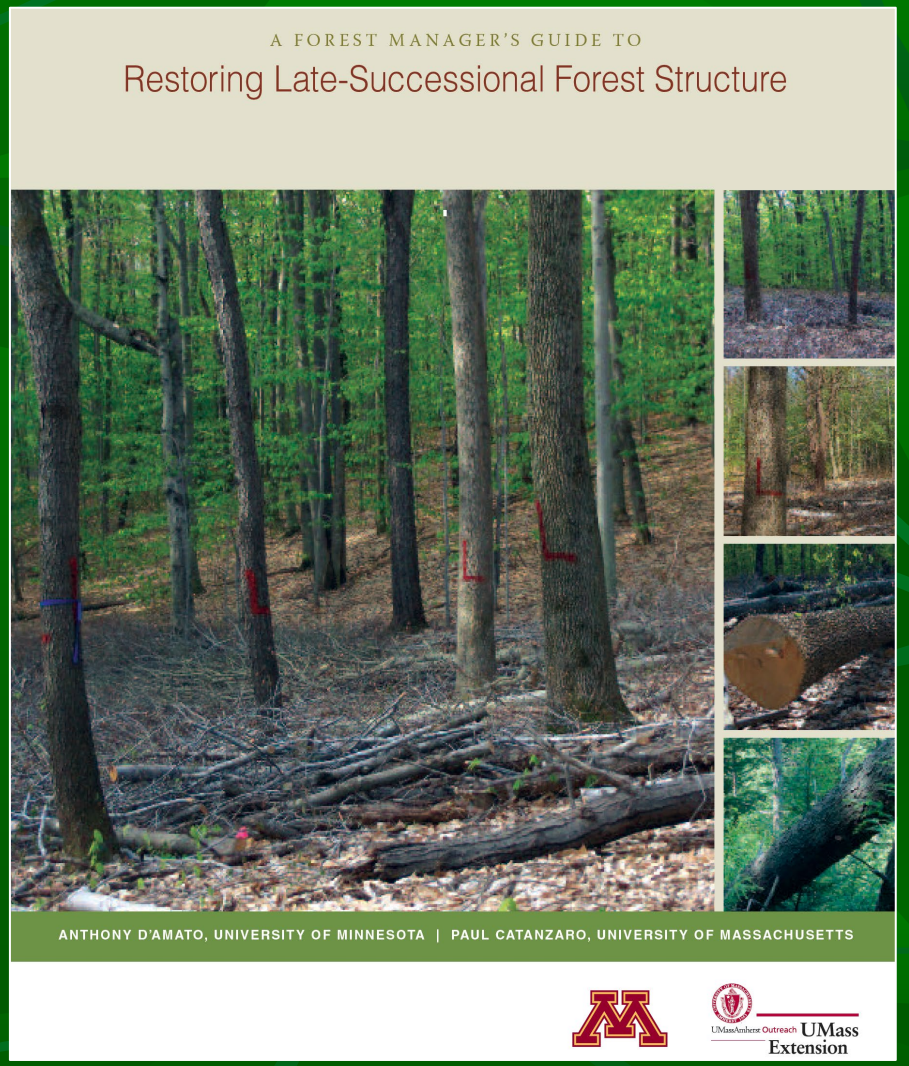
Anthony D'Amato

The University of Vermont

Why now?



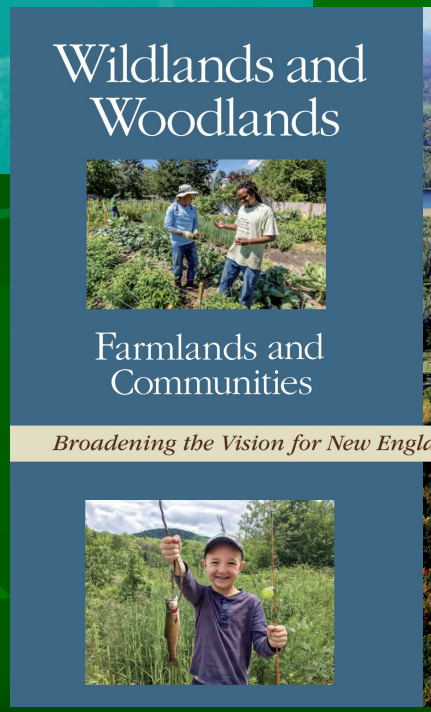
2007

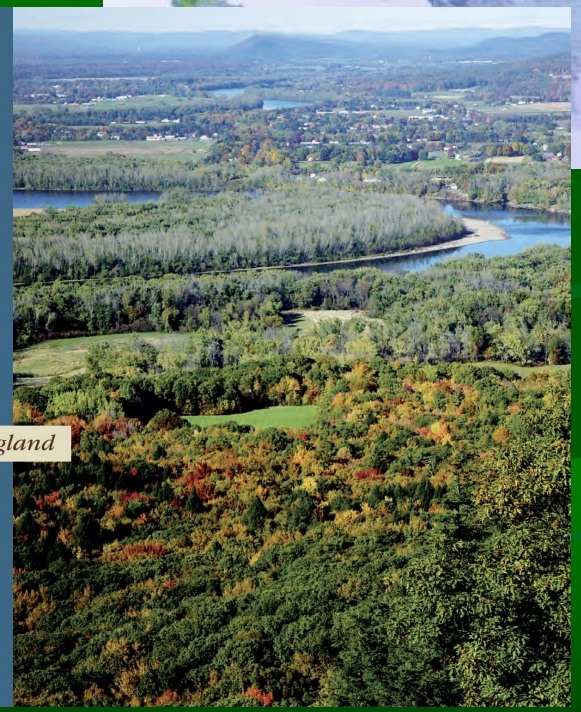


2009

Calls for Large-scale Forest Conservation

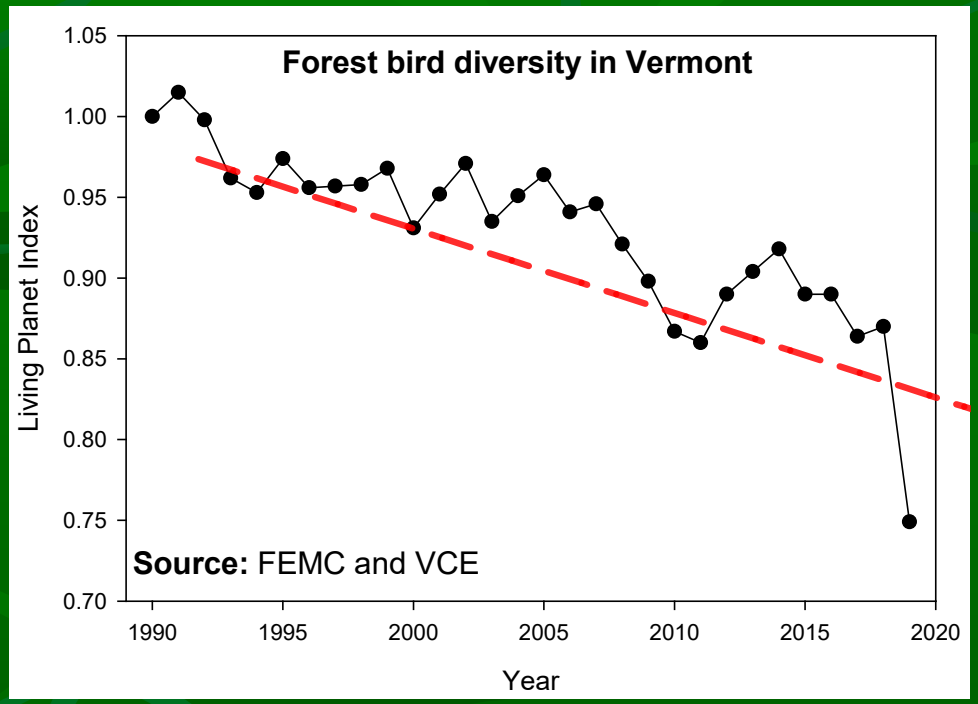
2020 UN Biodiversity Conference [new dates and place] | Climate Chance (climate-chance.org)

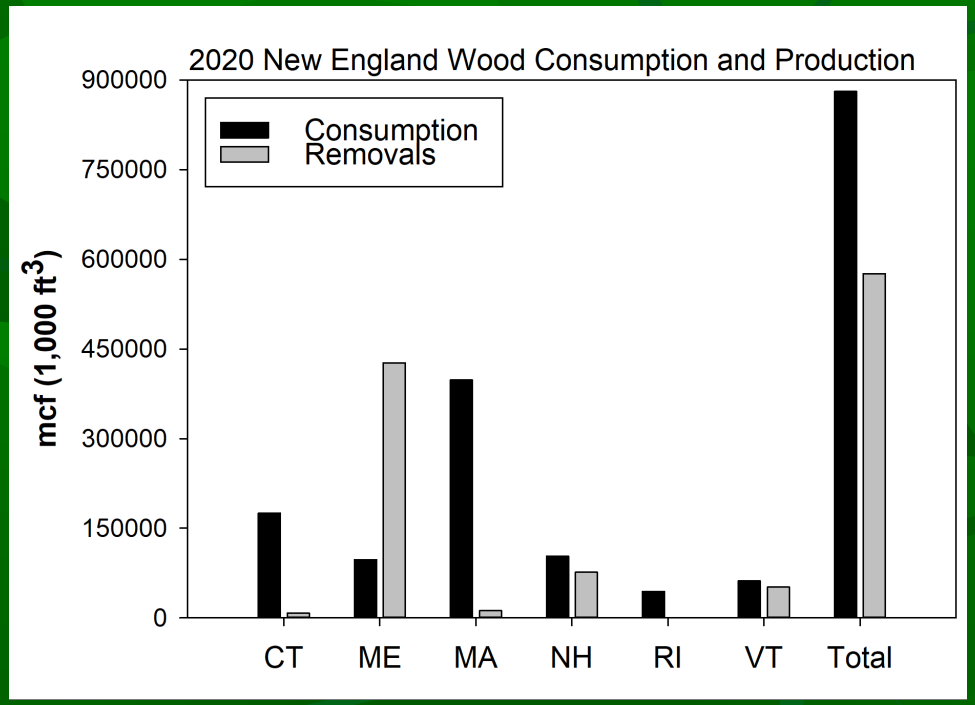




Wildlands and Woodlands 2017

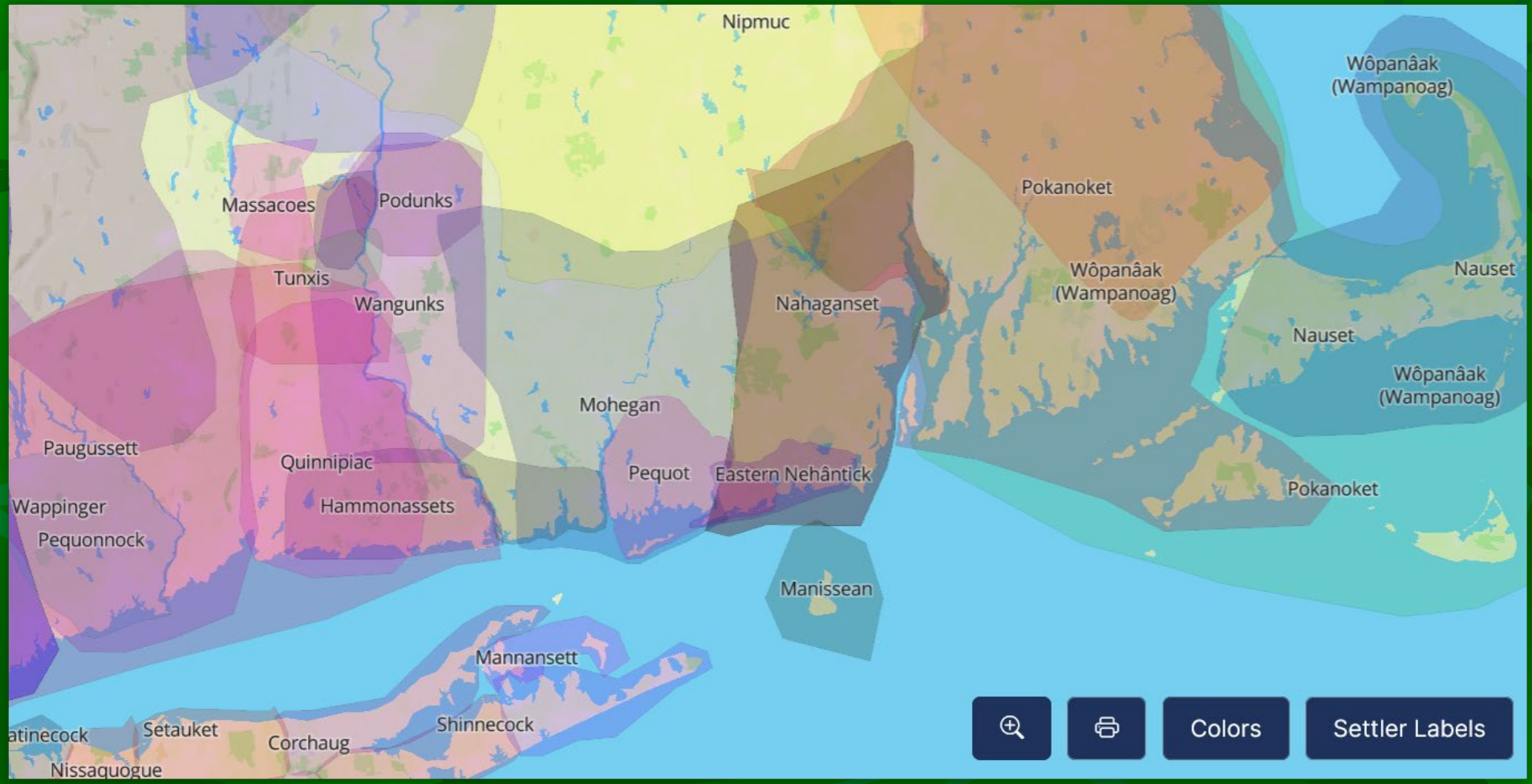
Diversity of Benefits. Diversity of Approaches.





Littlefield et al. (in prep)

Pre-Colonial Land Use History



https://native-land.ca/

Colonial Land Use History

1700

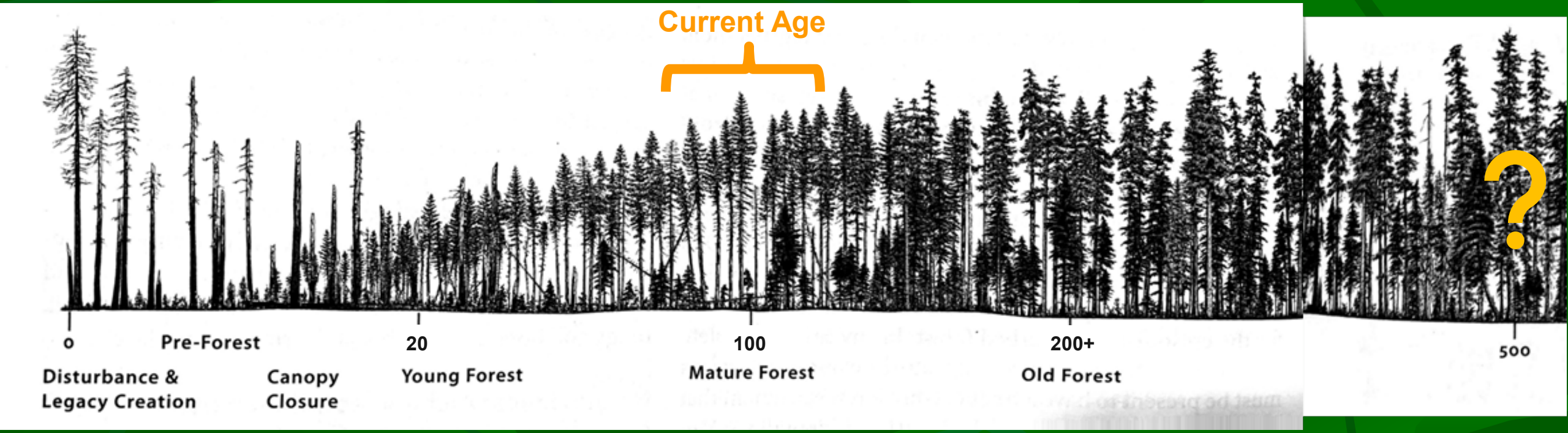
1740

1830

1910

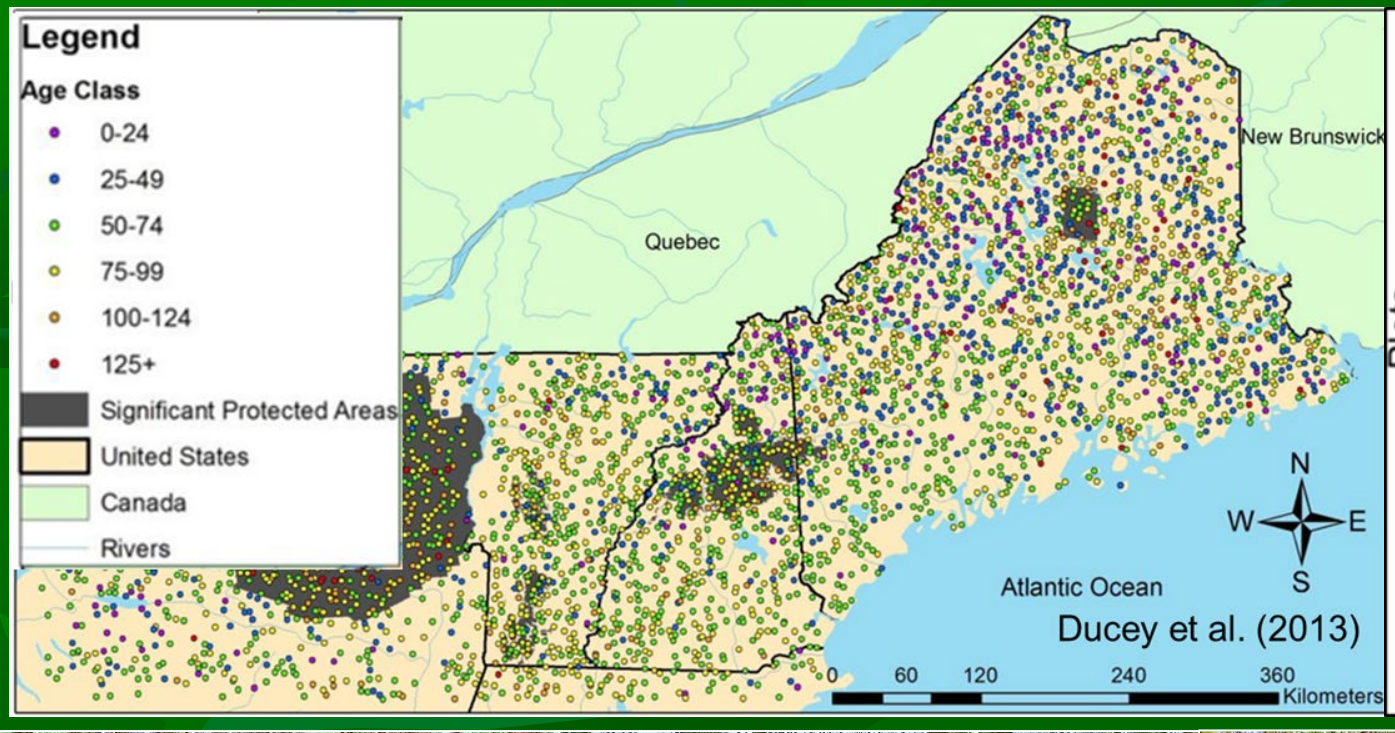
Harvard Forest Fisher Museum - Petersham, MA

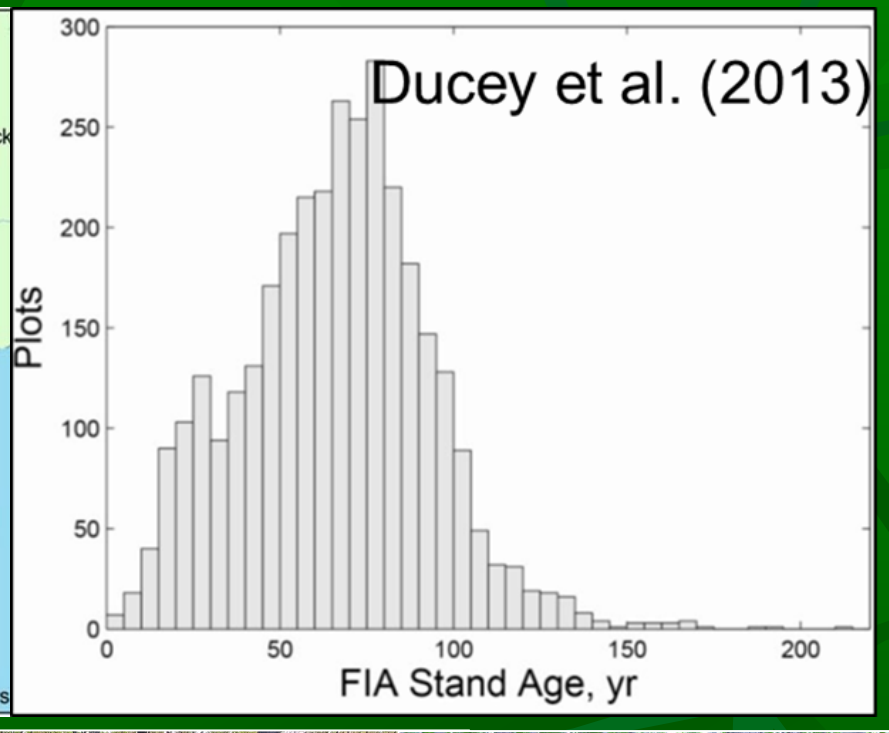
Forest Succession



Adapted from: Franklin, J. F., Johnson, K. N., & Johnson, D. L. (2018). Ecological Forest Management. Waveland Press, Inc.

Current Forest Age





Most of our forests are **ecologically-young**, second growth

Terminology

- **Old growth:** forests that were never directly impacted by intensive human land uses, such as those brought on by European settlement.

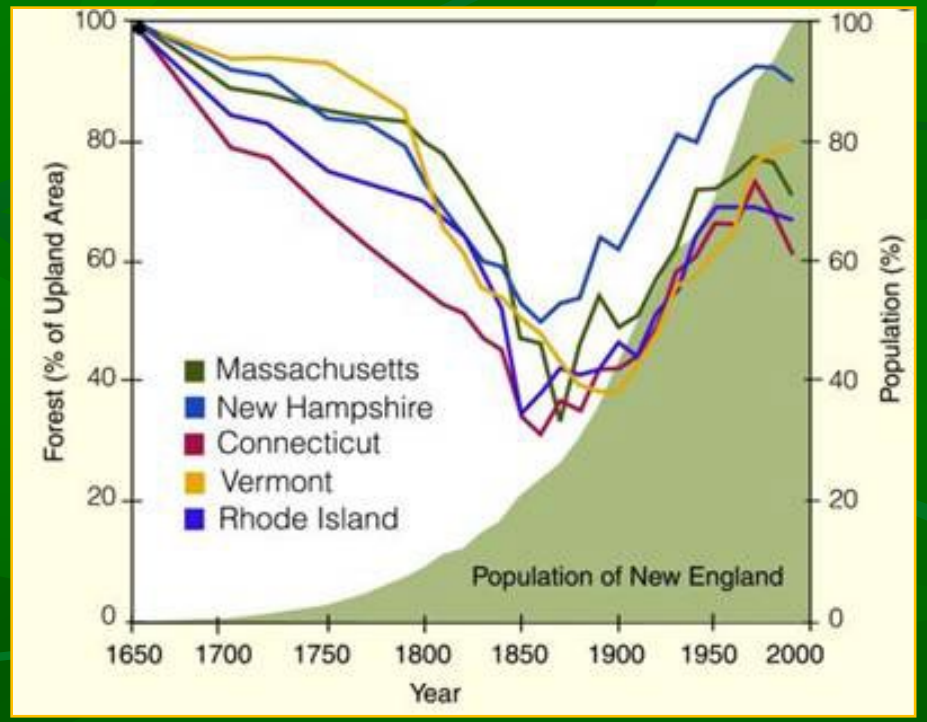
- **Second growth:** forests that established and grew following intensive human land use, such as agriculture or logging.

- **Old forests**: forests that contains a critical mass of characteristics associated with old growth.
  - Age at which these characteristics develop varies by forest type, disturbance history, and site quality. Focus on restoring tractable characteristics **versus relying on stand age**.

Photo: Tony D'Amato

Past Extent of Old-Growth

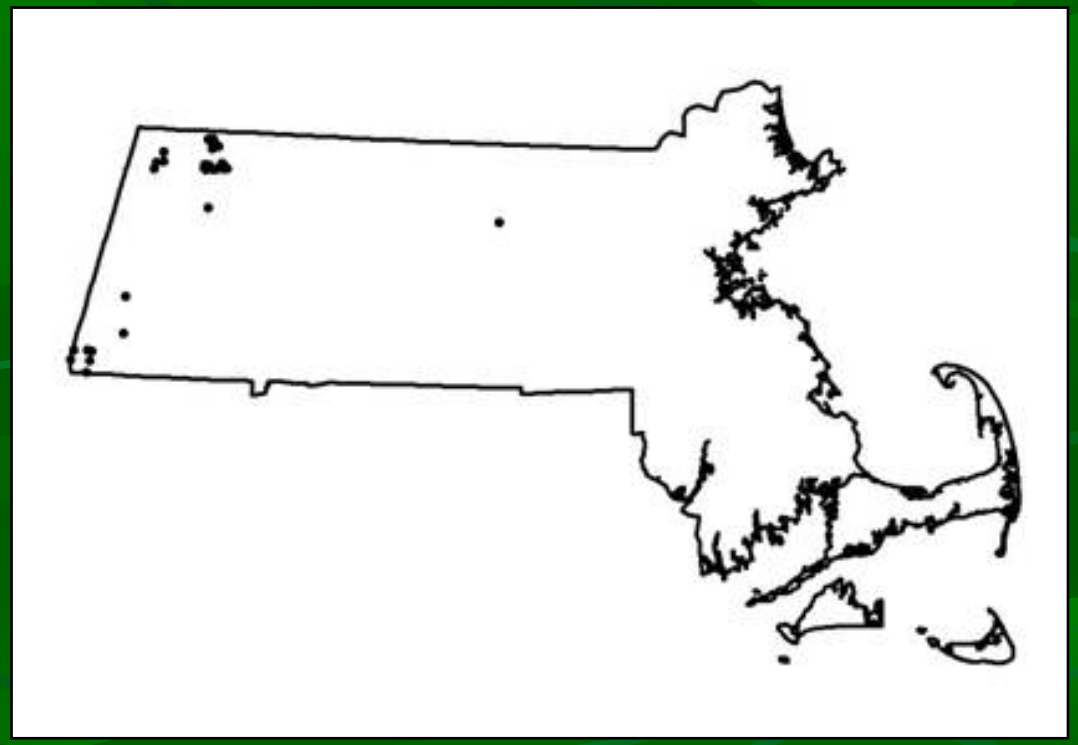
- **Old-growth forests covered ~ 90% of the landscape prior to European settlement**



Harvard Forest, Fisher Museum

Current Extent of Old-Growth in MA

- ~ 1,119 acres* (<0.1% of forest)



* D'Amato, Anthony W., David A. Orwig, and David R. Foster. 2006. New Estimates of Massachusetts Old-growth Forests: Useful Data for Regional Conservation and Forest Reserve Planning. Northeastern Naturalist. 13(4):495–506.



Big trees can bias our view of old-growth forests




General Old Growth Characteristics

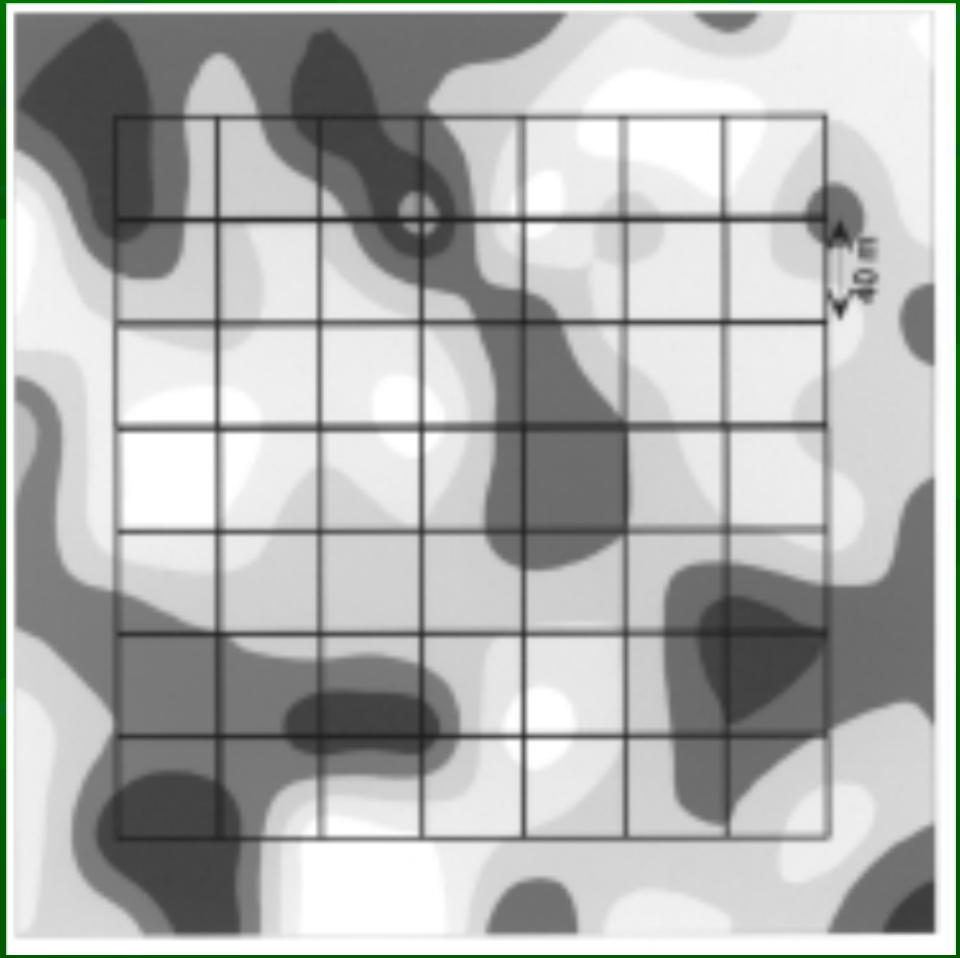
- Diversity of tree sizes and ages
  (including large trees 20+ and old 400+)
- Spatial variability
  (crowded small trees, well-spaced big trees, & in-between)
- Dead standing trees (snag)
- Downed logs
- Late seral plan communities

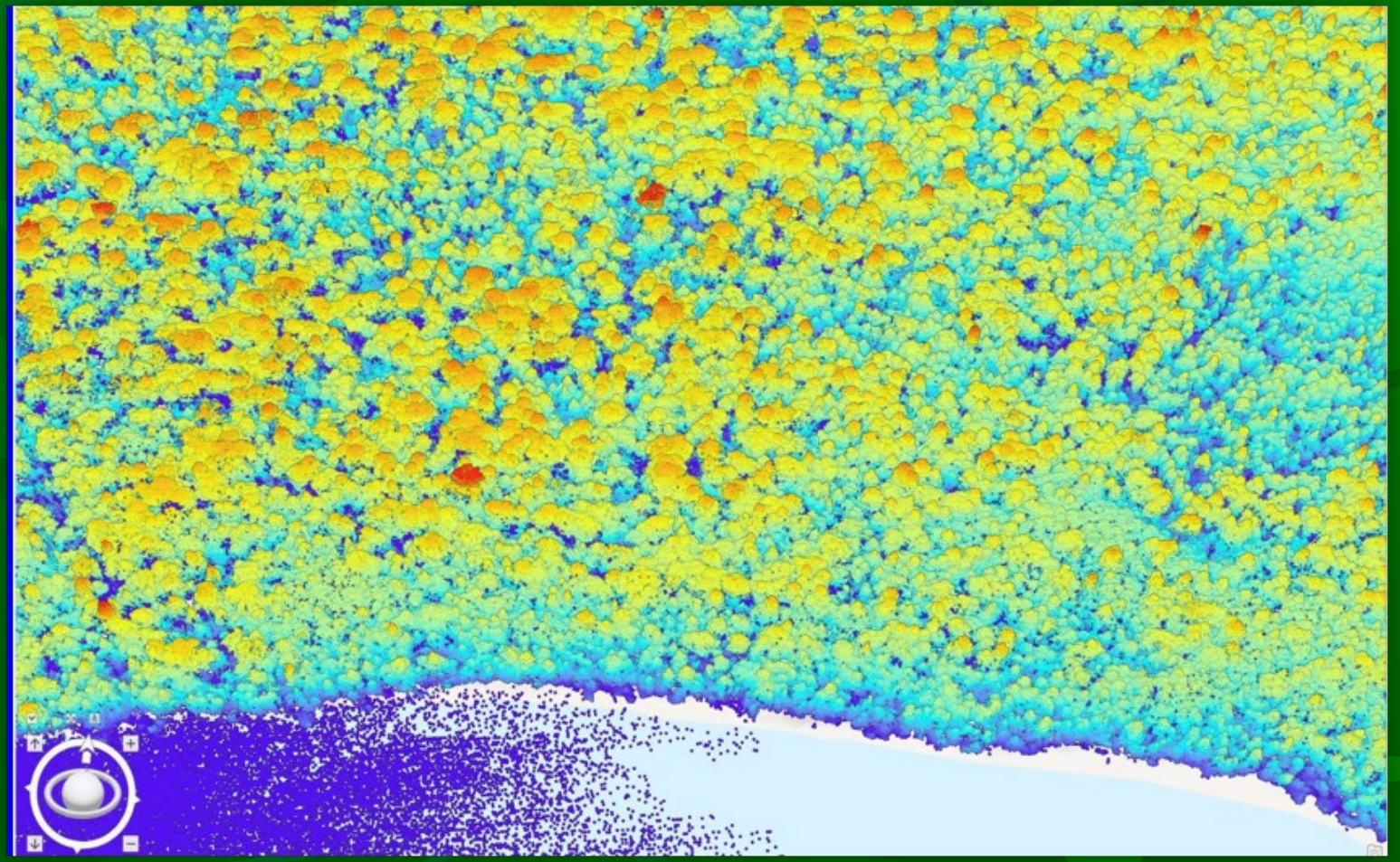
Squirrel Corn

Diversity of Tree Sizes and Ages

Spatial Variability

Old Growth Forests are 'Gappy'





Courtesy of John Hagan: jhagan@ourclimatecommon.org

Old Trees

~20 yrs. old – primary bark

~80 yrs. old – secondary bark

300 yrs. old –tertiary bark

red oak

Old Trees

Downed Logs

- Old Growth Forests have **2 – 4 times more** dead wood on the forest floor than second growth forests in MA*
- Likely on the lower end of the range in oak forests

Cords of wood on forest floor per acre	
Old-Growth	Second-Growth
15	3.7

* D'Amato, Anthony W., David A. Orwig, and David R. Foster. 2006. New Estimates of Massachusetts Old-growth Forests: Useful Data for Regional Conservation and Forest Reserve Planning. Northeastern Naturalist. 13(4):495–506.

Standing Dead Wood (snags)

- Old Growth Forests have **2 - 3 times more** snags per acre than second growth forests in MA (hemlock)
- Likely on the lower end of the range in oak systems



* D'Amato, Anthony W., David A. Orwig, and David R. Foster. 2006. New Estimates of Massachusetts Old-growth Forests: Useful Data for Regional Conservation and Forest Reserve Planning. Northeastern Naturalist. 13(4):495–506.

Late Successional Plant Communities

Why is Old Growth Important?

Wildlife

- Diverse habitats (big/small trees, layers)
- Source Population
- Certain species of fungi and lichens need old growth or old-growth structure
- Provide “stepping stones” for species adaptation

Climate change

- Carbon storage
- Forest Resilience

Scientific

- Baseline condition
- Being humble

Lobaria

Wood Thrush

Tree Hugger


“To Keep Every Cog
and Wheel is the
First Precaution
of Intelligent
Tinkering”
- Aldo Leopold

Strategies for Restoring Old-Growth Characteristics

- We can't re-create old-growth forests, so how do we close the gap (~90% > .1%)?
  - Passive Management
  - Active Management

Passive Management

- Let nature take its course
- Characteristics developed through forest growth and natural disturbances (*e.g.*, windstorms, ice storms, insects, and disease)
- Most natural appearance (*i.e.*, no stumps or skid trails)

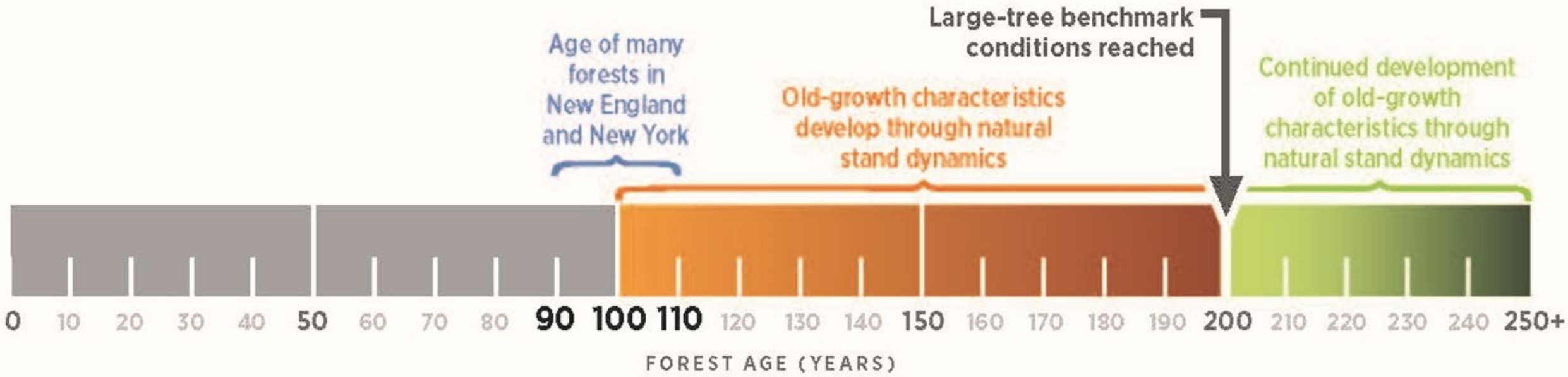
Should I Salvage?

- Developing OG structure means leaving dead and dying trees in the woods. While looking “messy”, it is what creates the structure we are missing

- If you do salvage, keep some patches un-salvaged and limit the removal of live trees.

Photos: John Burke

Passive Pathway to Old Forests



Adapted from Hagan and Whitman (2004)

Siting Passive Management

- Not all forests will develop old-growth characteristics over the next decades.
- Will they develop old-growth characteristics over centuries?

Mt. Laurel & Hay-scented Fern

Japanese Barbery

Active Management

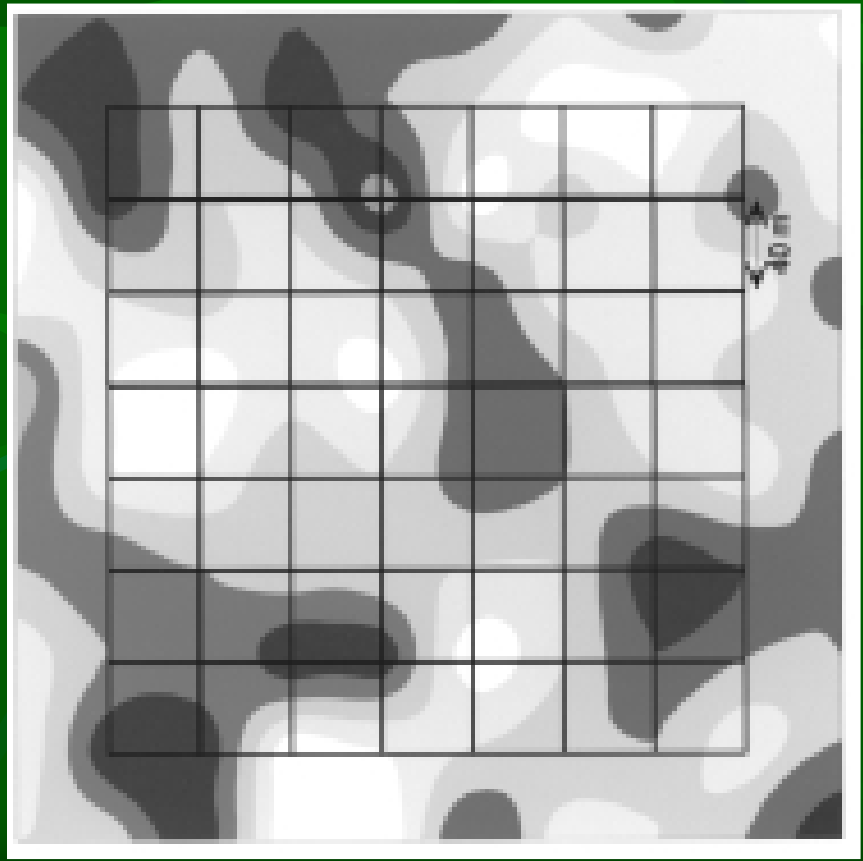
- Diversify tree size and spatial variation: combine removals of individual trees and groups of canopy trees, while also retaining a high proportion of mature trees (single-tree/group selection; irregular shelterwoods; variable density thinning)

- Increase tree size: thin between patches
- Increase stand variation and dead standing trees: designate legacy trees and patch reserves

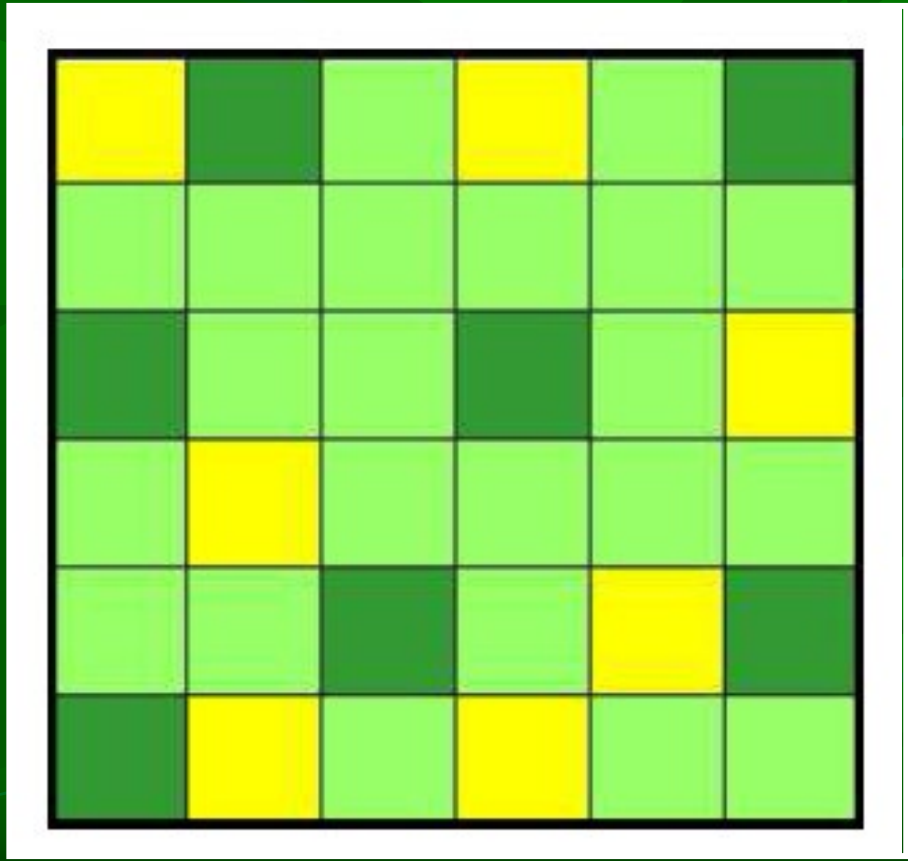
- Increase downed dead logs:
  designate legacy trees and fell & leave trees (UGS)
- Late seral plant communities: patch reserves

Variable Density Thinning

Density of trees > 8” dbh
in an old-growth forest

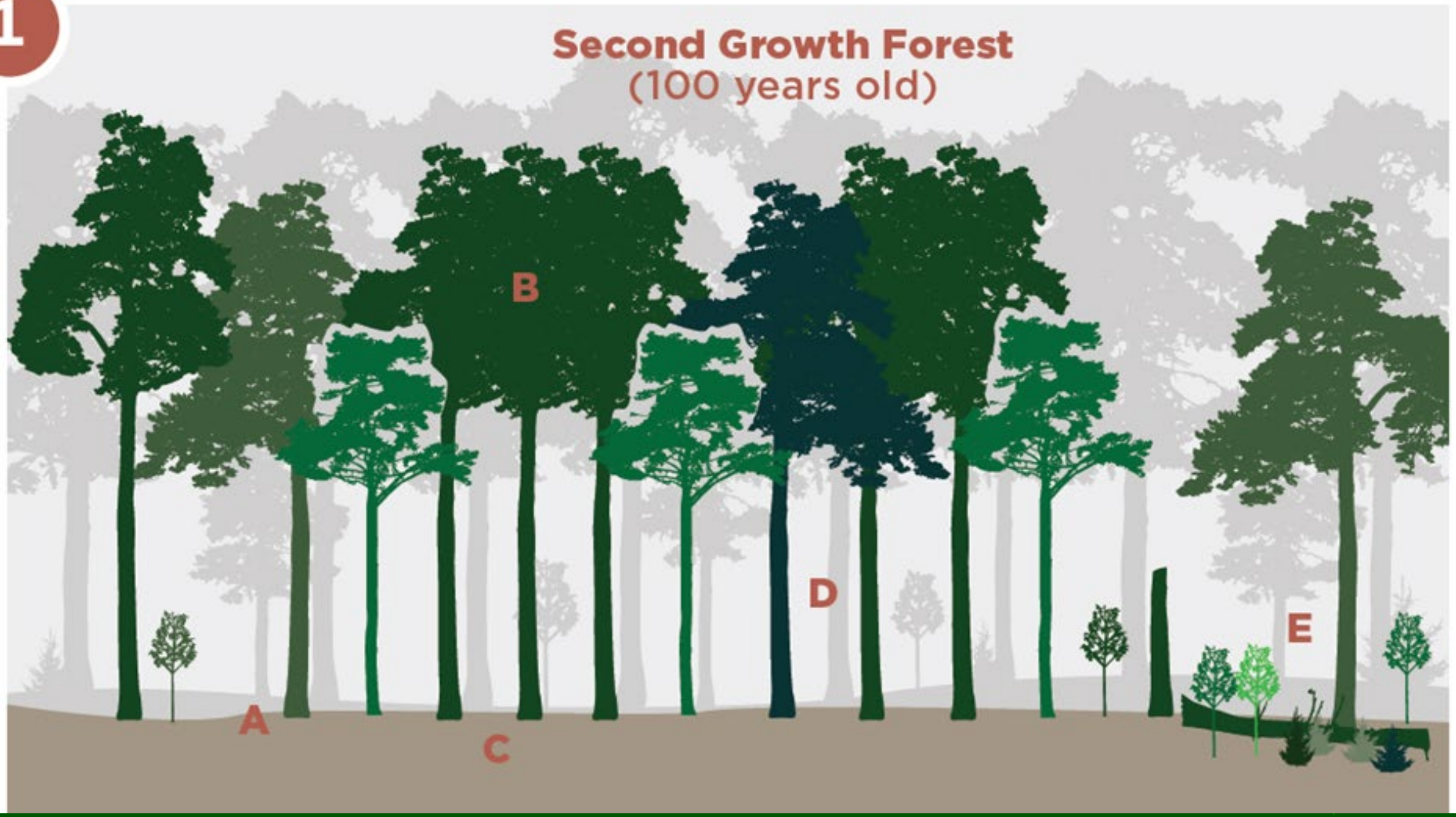


Variable Density Thinning



20% Skips
20% Gaps
60% Thinning

1



2

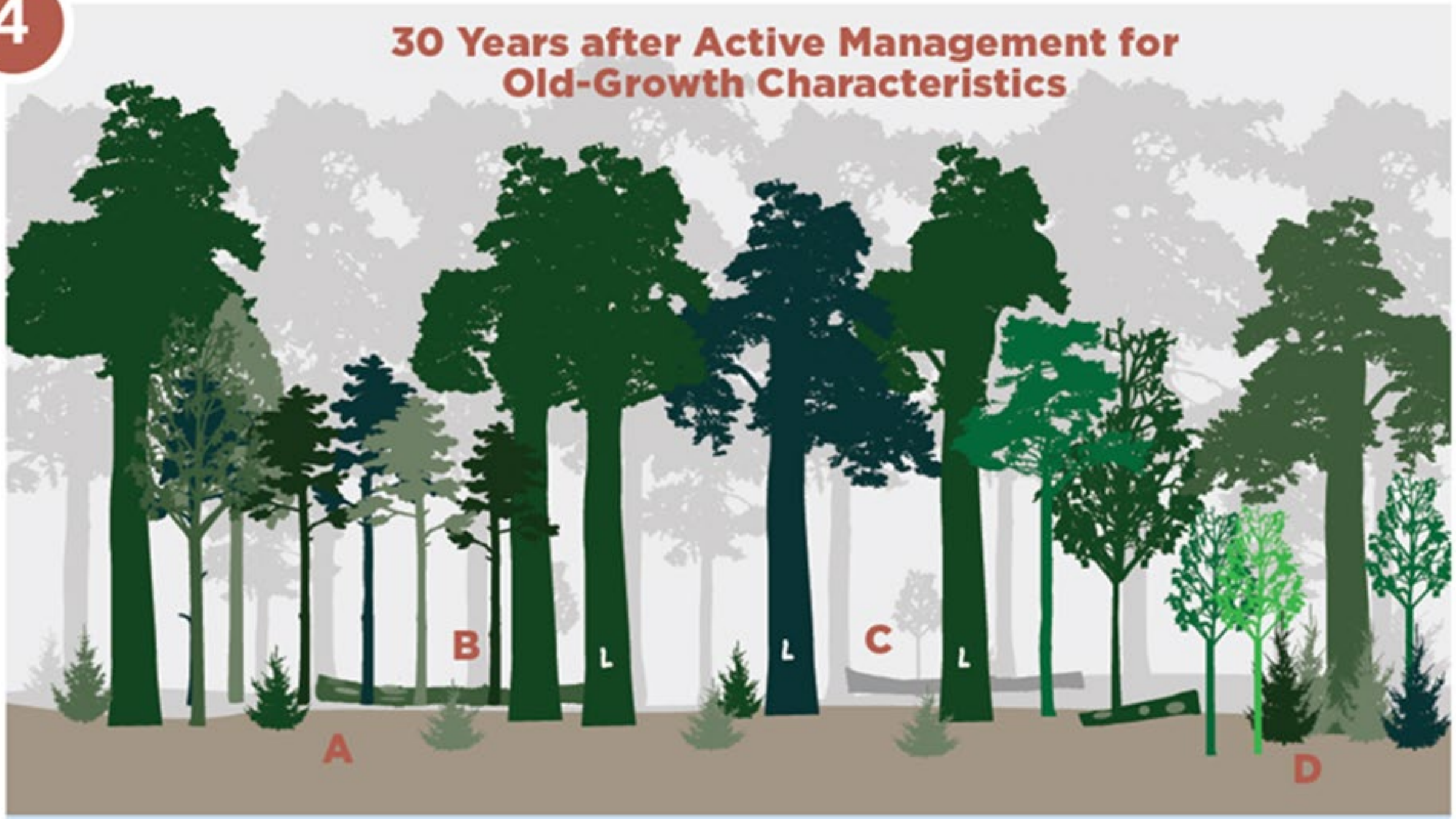
Second Growth Forest with Active Management for Old-Growth Characteristics

3

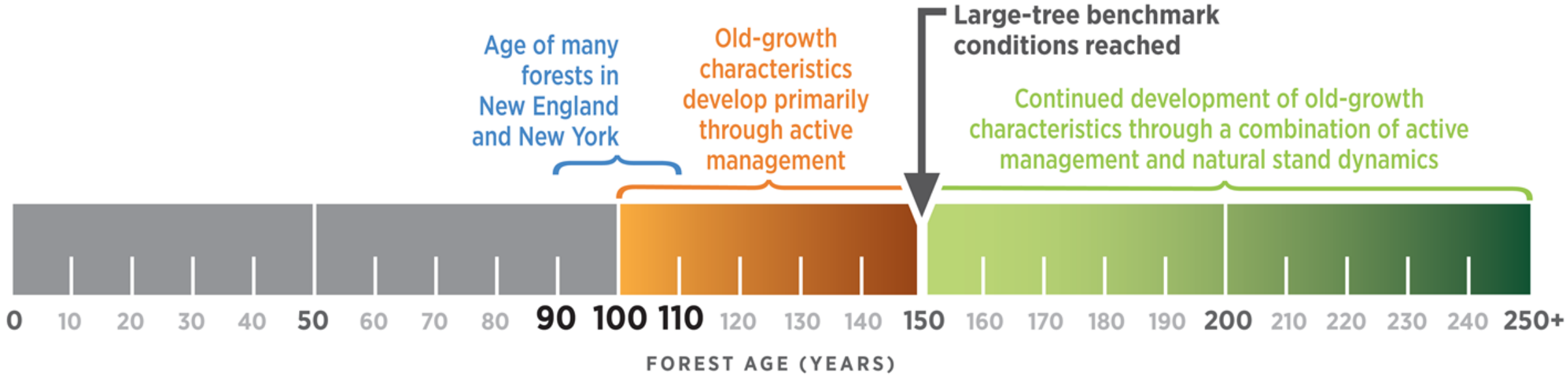
15 Years after Active Management for Old-Growth Characteristics

4

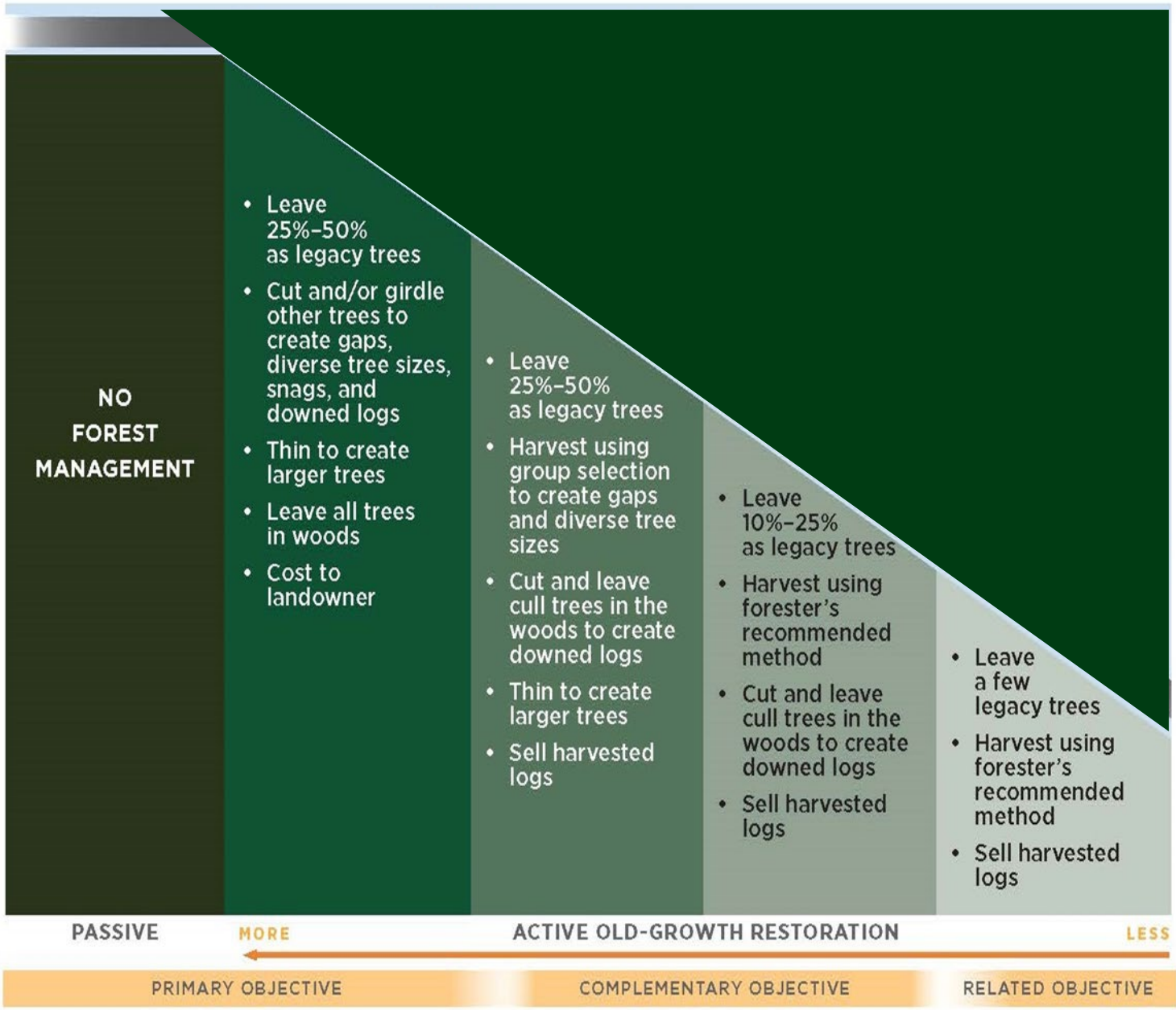
30 Years after Active Management for Old-Growth Characteristics



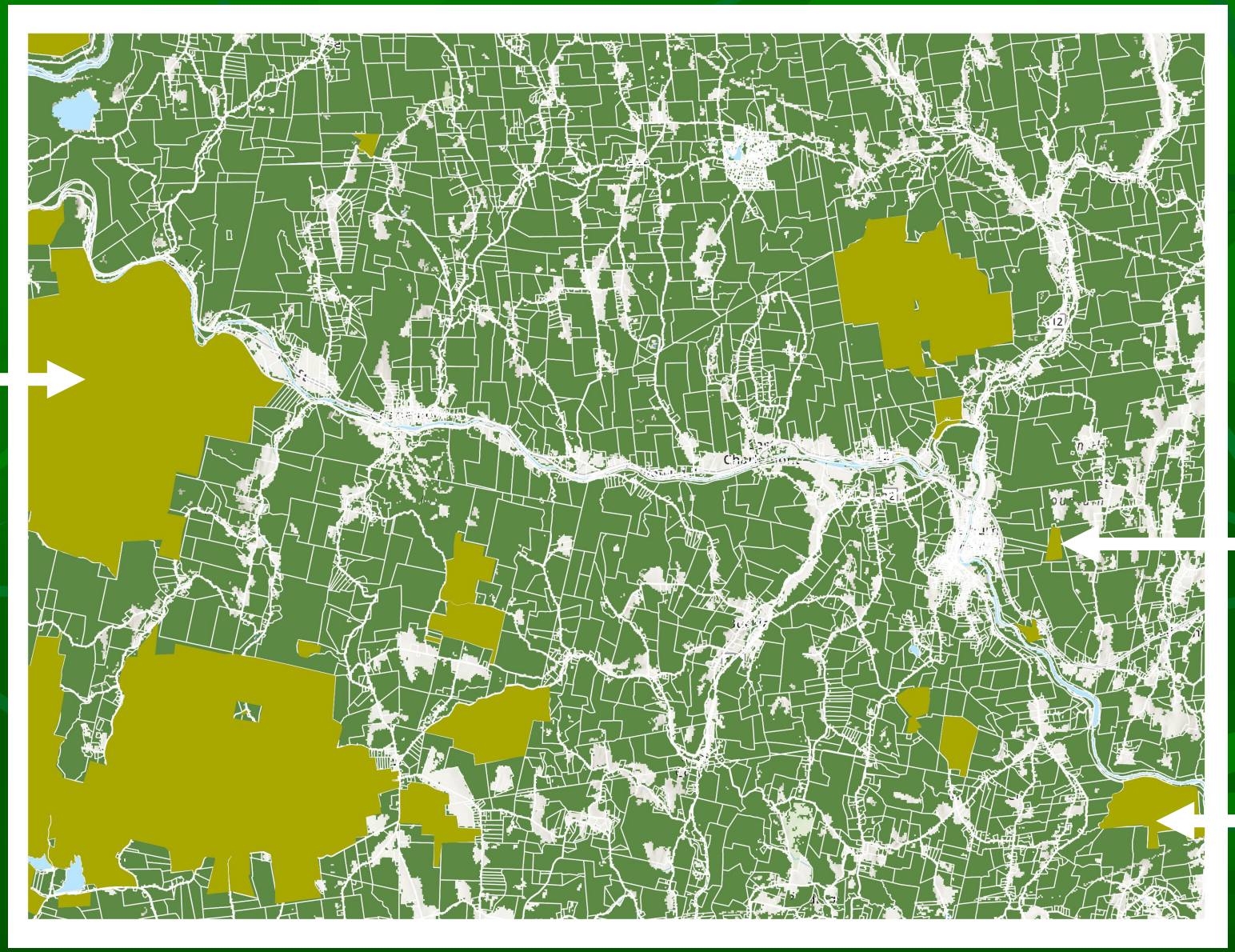
Active Pathway to Old Forests



Gradient of old-growth restoration strategies



Our New England Landscape

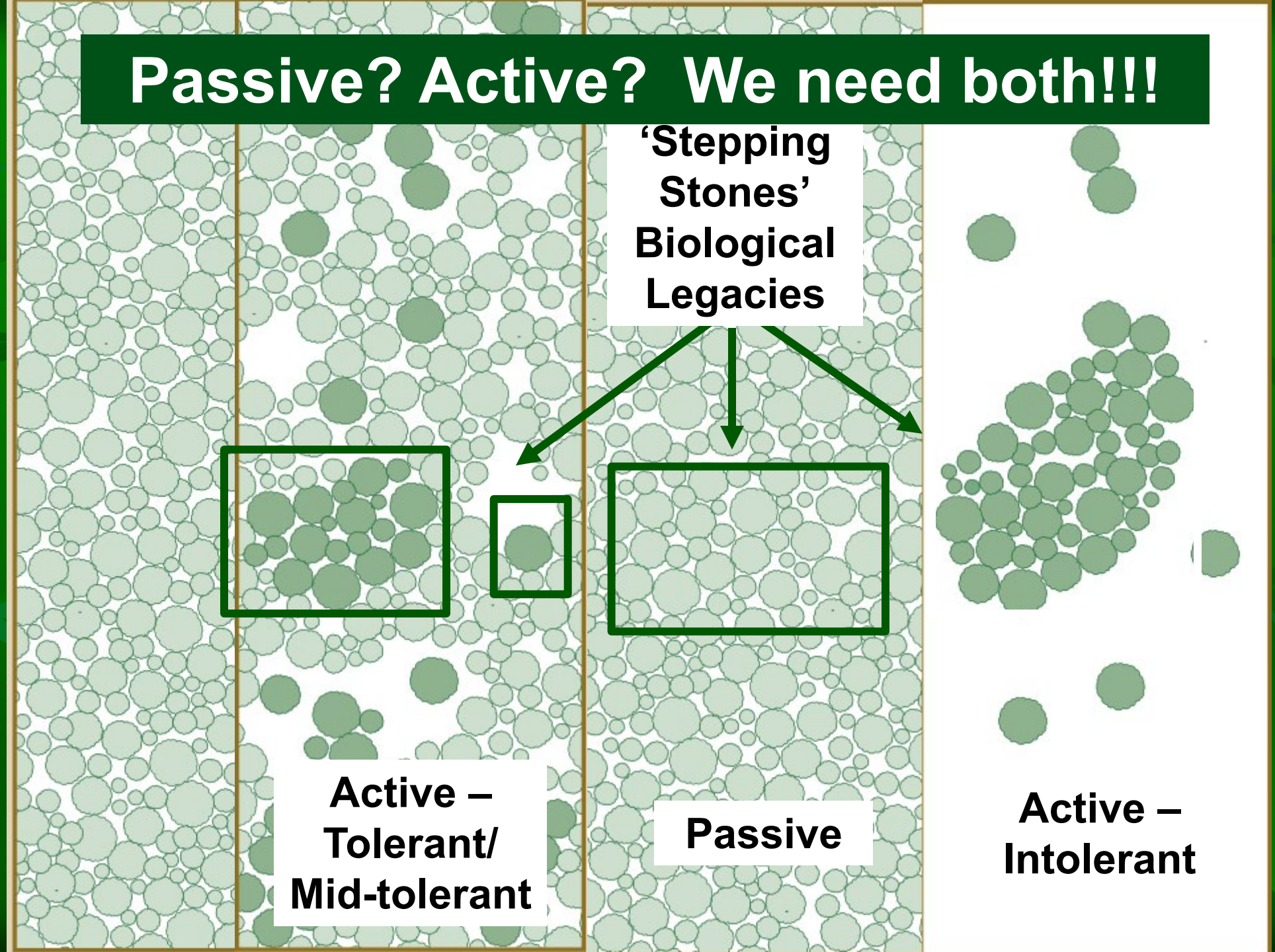


Credit: Lina Clifford

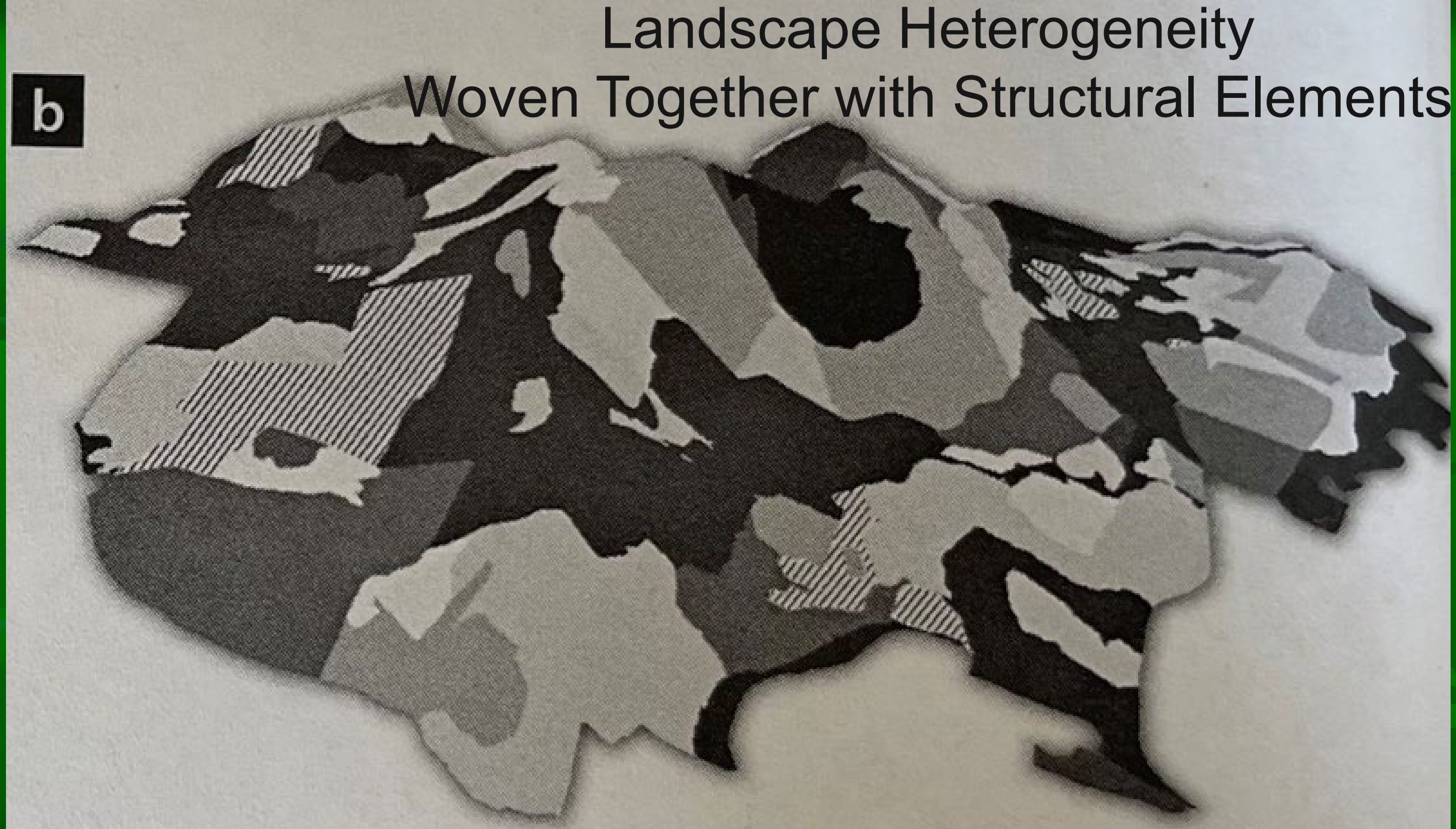
Restoring Old-Growth Characteristics to our Landscapes

- Because of our ownership pattern, we must take a landscape scale perspective.

Passive? Active? We need both!!!



Landscape Heterogeneity Woven Together with Structural Elements



Franklin, J. F., Johnson, K. N., & Johnson, D. L. (2018). Ecological Forest Management. Waveland Press, Inc.

Land Protection is Essential

- It will take decades/centuries to restore characteristics.
- Average age of family forest owners is ~ 65 years old
- Largest inter-generational transfer we have ever experienced.

Take-homes

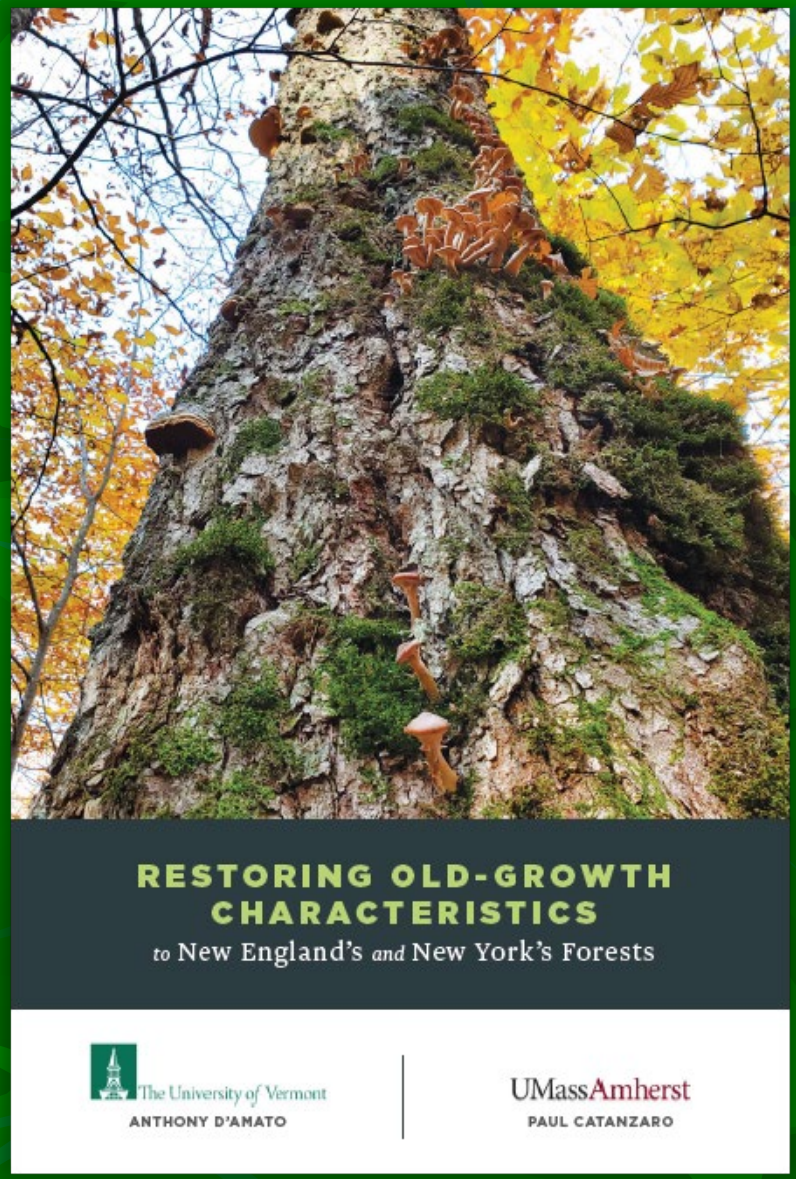
- Old-growth forests are a rare, but historically important forest type.
- Passive and active management strategies exists for restoring old-growth characteristics and the many benefits we depend on. We need both!
- Old-growth restoration can be implemented in a gradient of intensities to meet landowner goals. Different benefits necessitate different strategies!
- A landscape scale perspective is essential in our region
- We must permanently protect enough forests to ensure essential public benefits.

Paul Catanzaro

Professor & State Extension Forester

UMass Amherst

paulcat@umass.edu



Impatience as a Virtue?

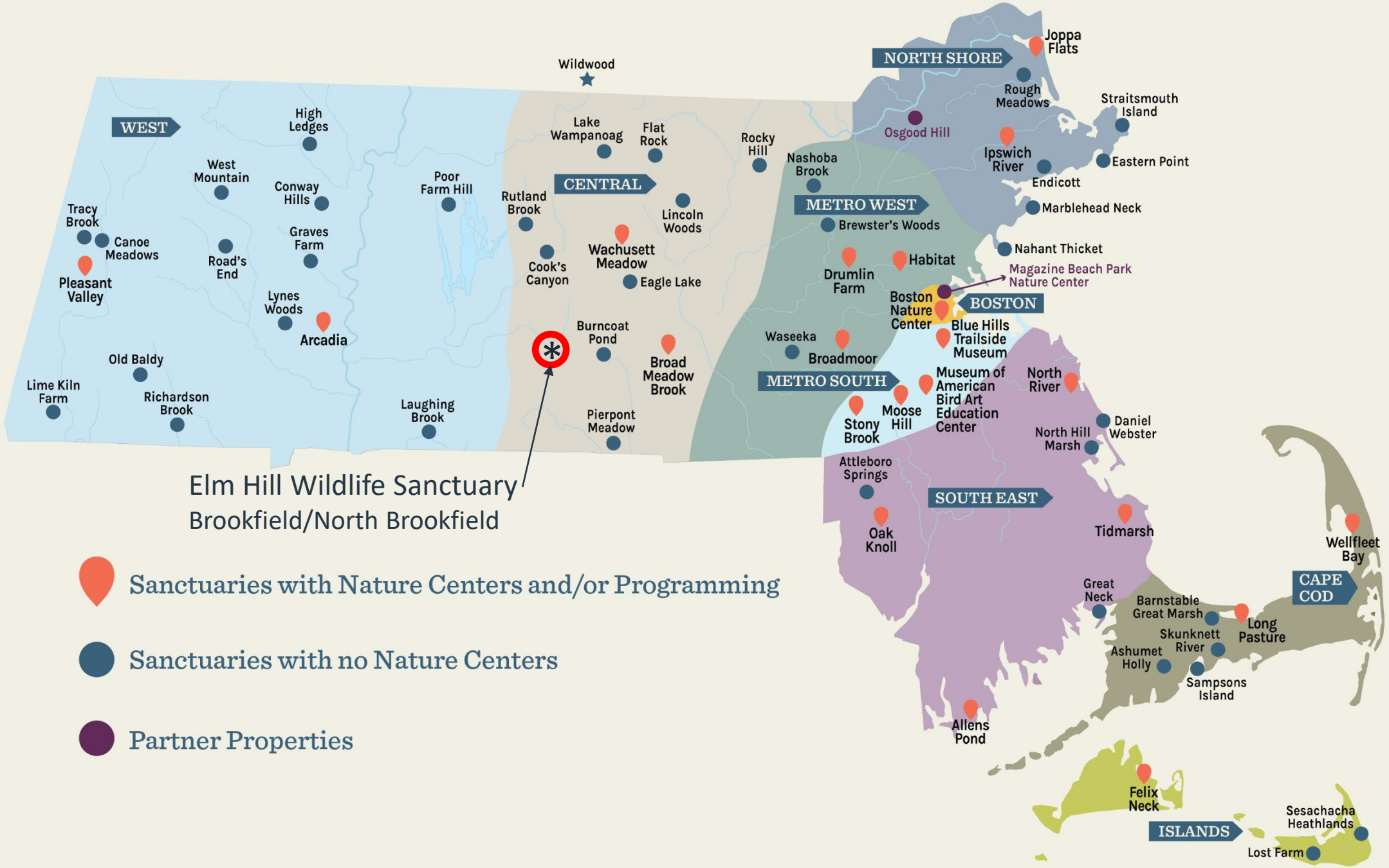
Restoring Old-Growth Forest Characteristics –

A Case Study from Elm Hill Wildlife Sanctuary

Tom Lautzenheiser
03/25/23

Mass Audubon

Mike Barry & Paul C. at Elm Hill, October 2019



Elm Hill Wildlife Sanctuary
Brookfield/North Brookfield

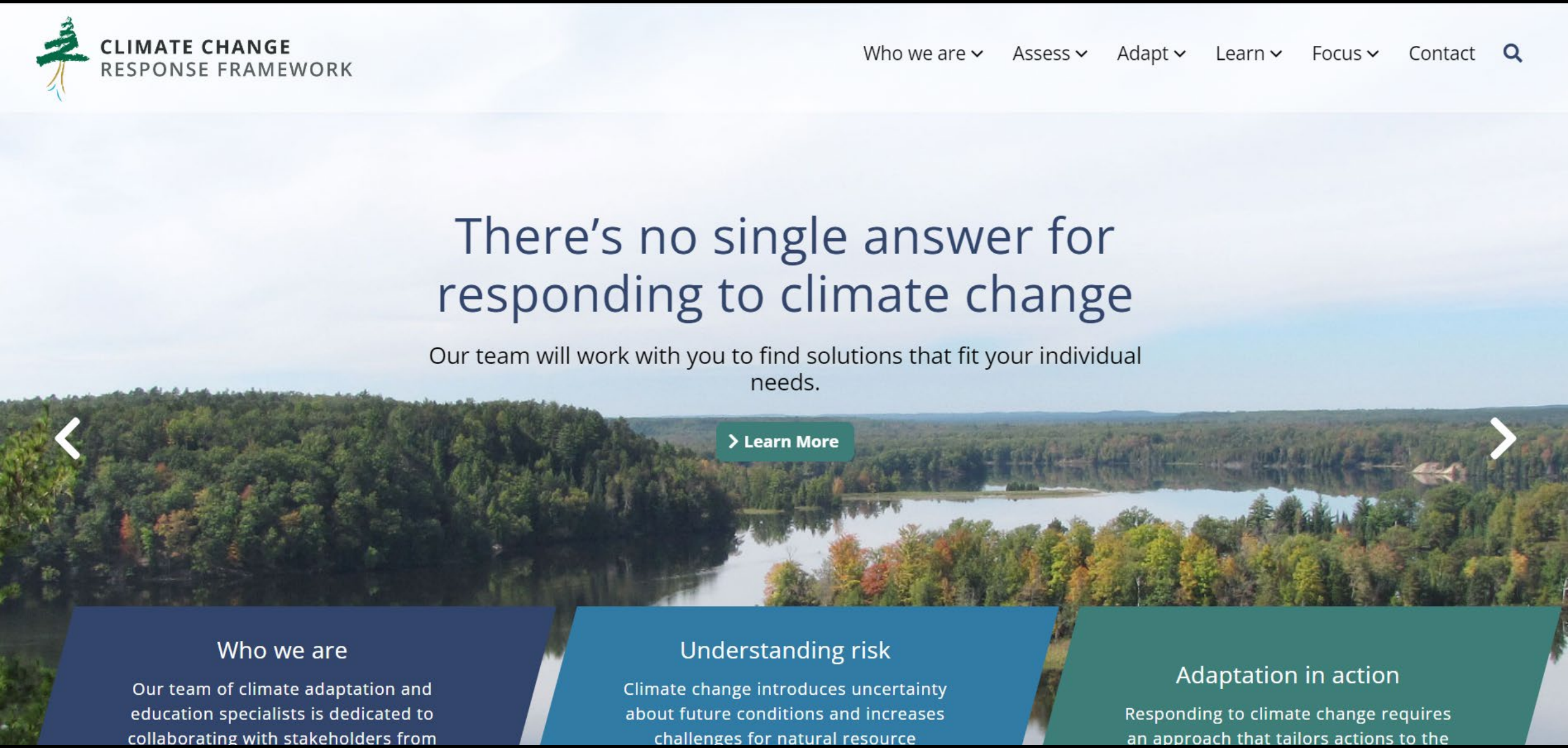
Sanctuaries with Nature Centers and/or Programming

Sanctuaries with no Nature Centers

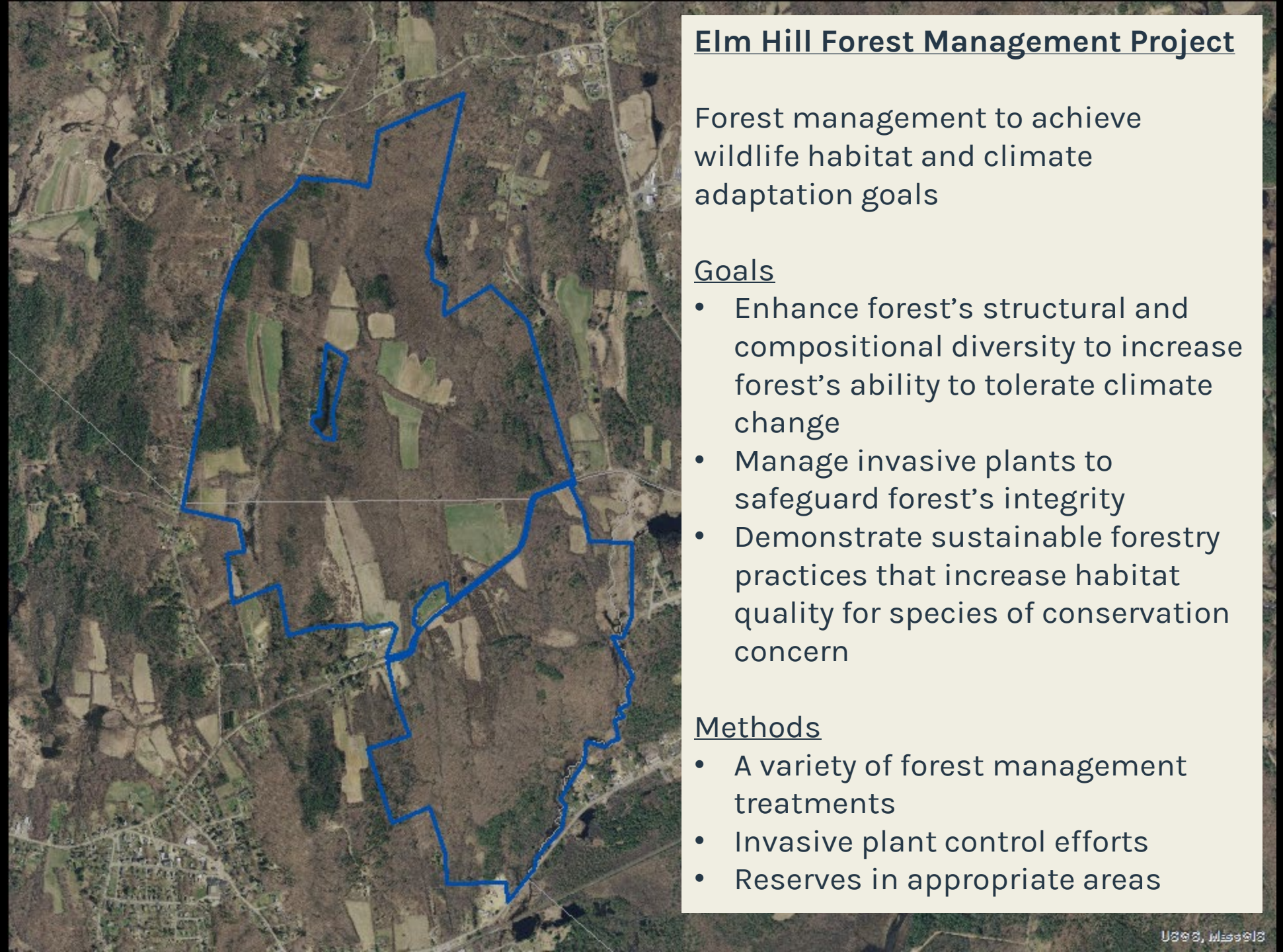
Partner Properties

Elm Hill Wildlife Sanctuary

- ~1,100 acres, acquired by Mass Audubon in 1995
- Subject to APR, including forest products
- Demonstration site for *Foresters for the Birds* Program & Climate-smart forestry
- Project support from DCR, NRCS, NFWF, NIACS, others



Northern Institute of Applied Climate Science (NIACS)
forestadaptation.org



Elm Hill Forest Management Project

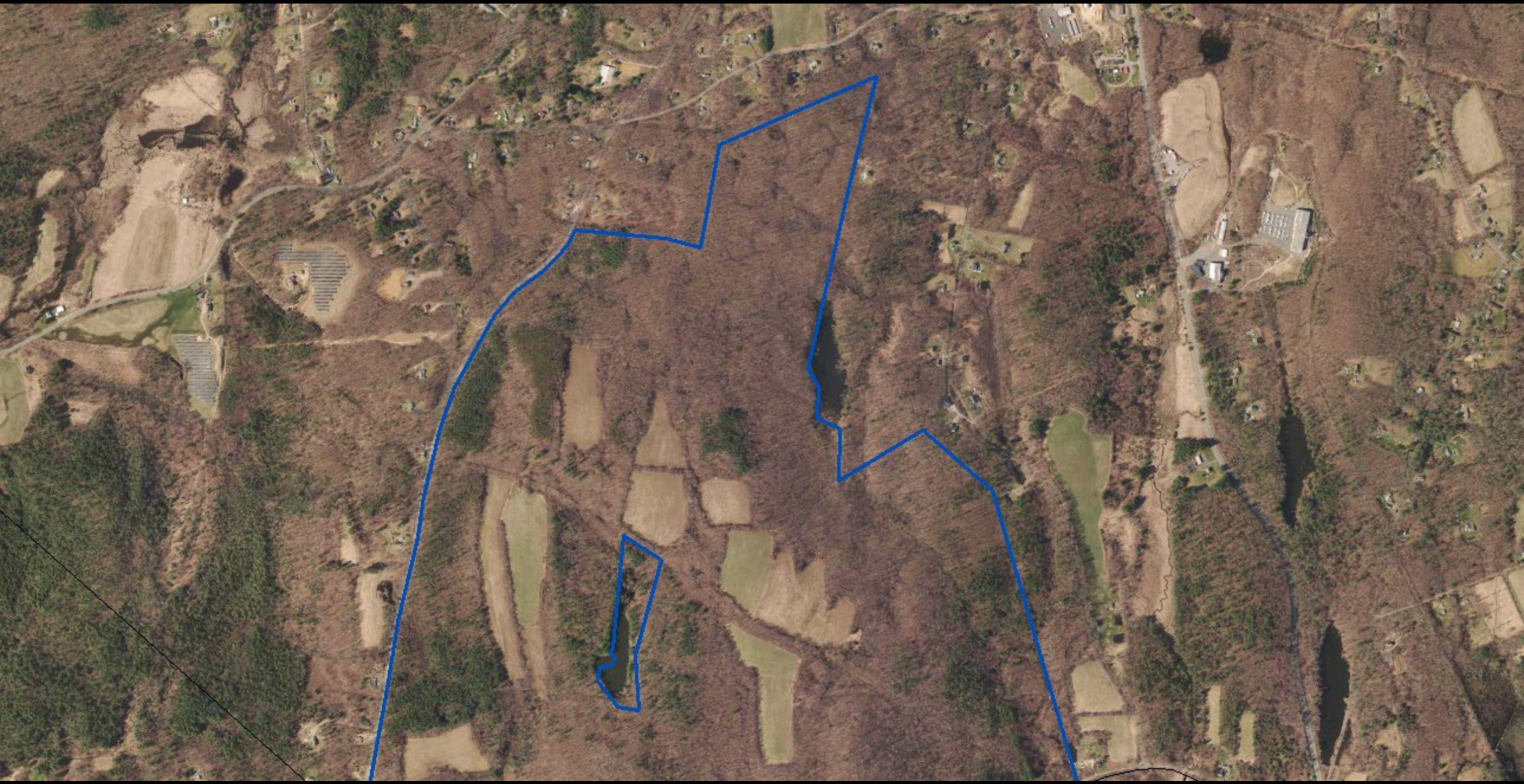
Forest management to achieve wildlife habitat and climate adaptation goals

Goals

- Enhance forest's structural and compositional diversity to increase forest's ability to tolerate climate change
- Manage invasive plants to safeguard forest's integrity
- Demonstrate sustainable forestry practices that increase habitat quality for species of conservation concern

Methods

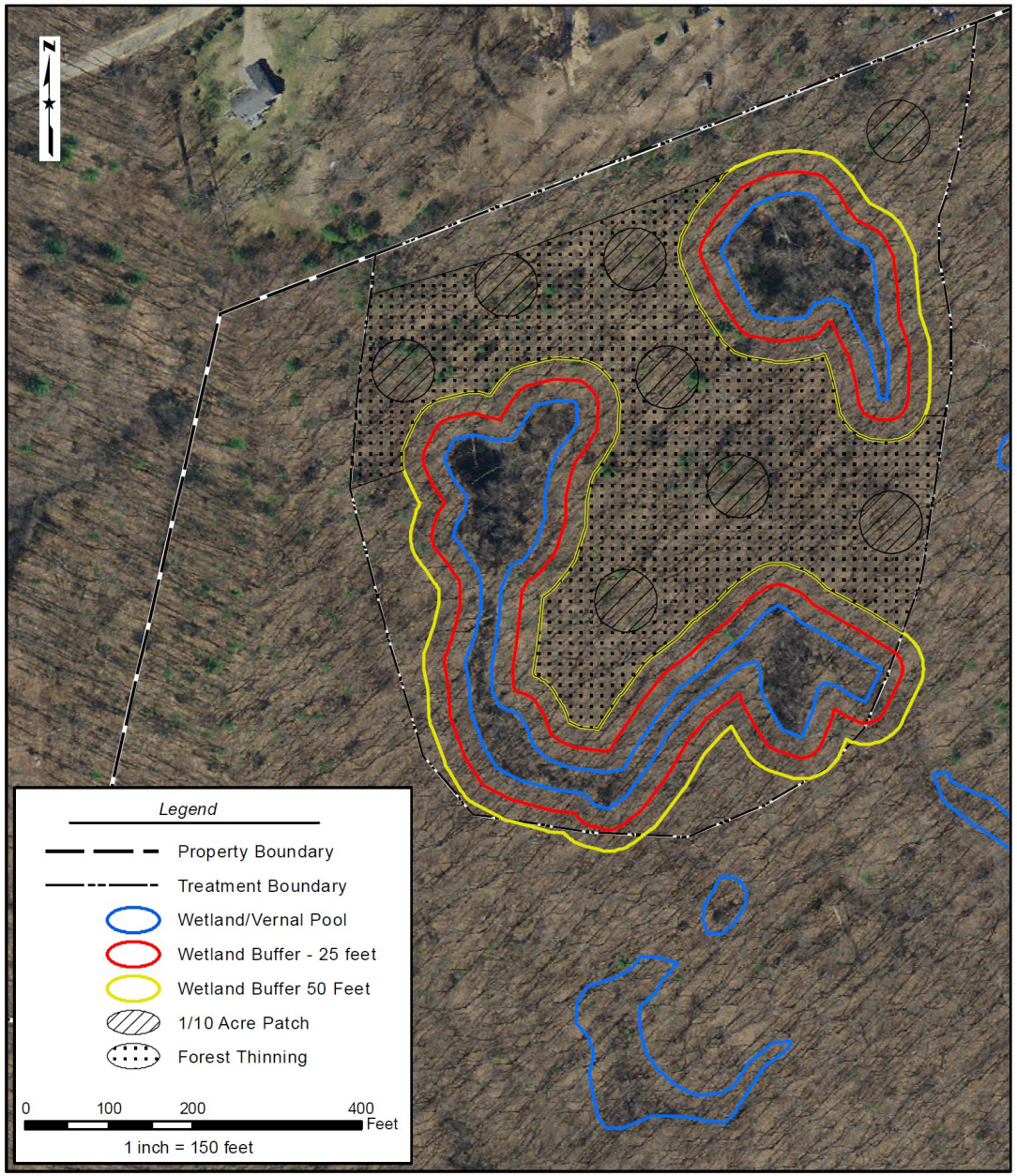
- A variety of forest management treatments
- Invasive plant control efforts
- Reserves in appropriate areas



2019

2021


Bonnie View Hill



Treatment Plan

- Approximately 10 acres, extending from complex of vernal pools
- Light canopy thinning outside of 50’ wetland buffer
- Eight 1/10-acre patch cuts with a reserved tree or two within area