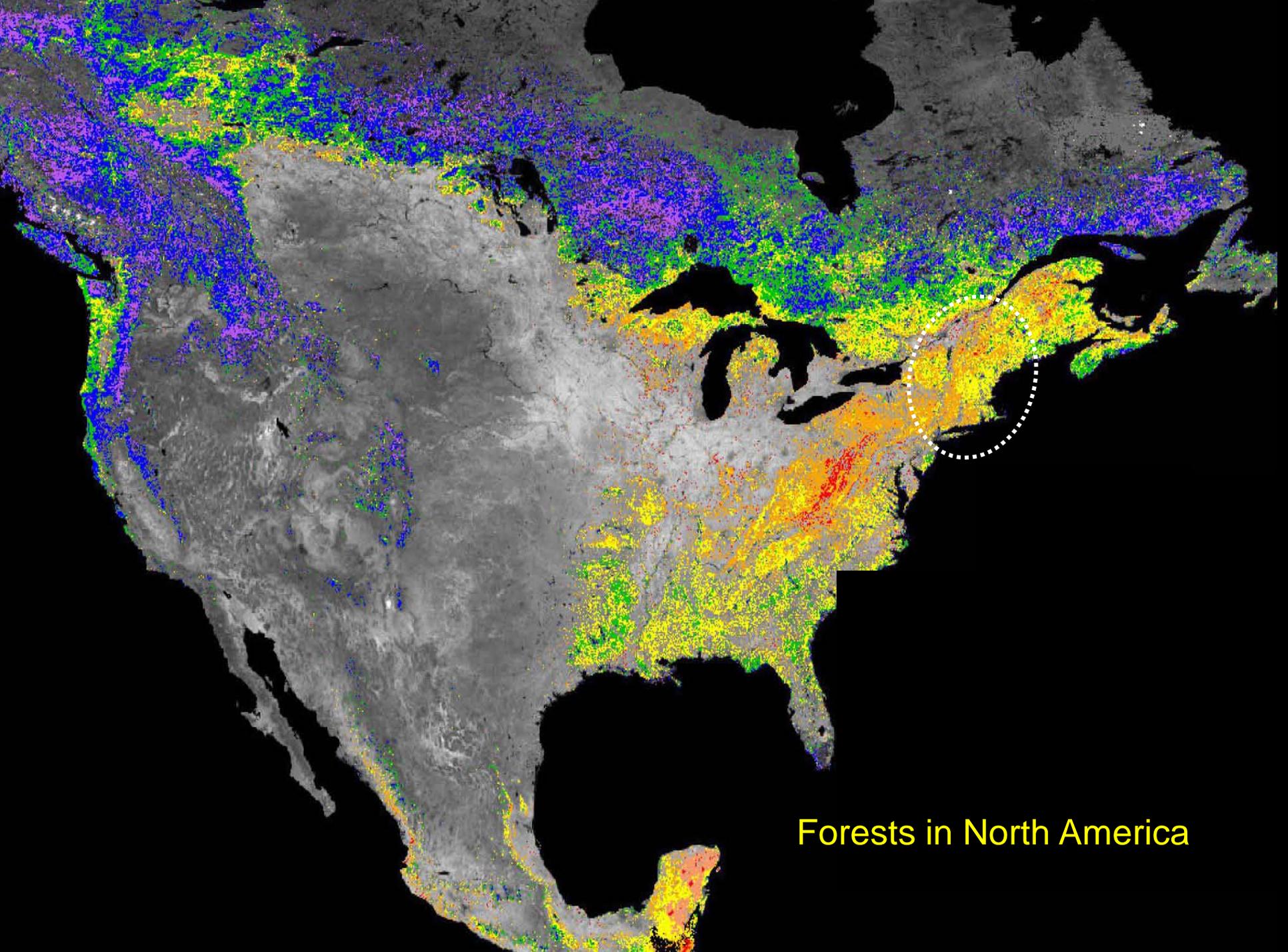


Challenges and Choices

# **The History and Future of New England's Forests**





Forests in North America

# Harvard Forest

Harvard University's 3500-acre Laboratory and Classroom

NSF - Long-Term Ecological Research site since 1988

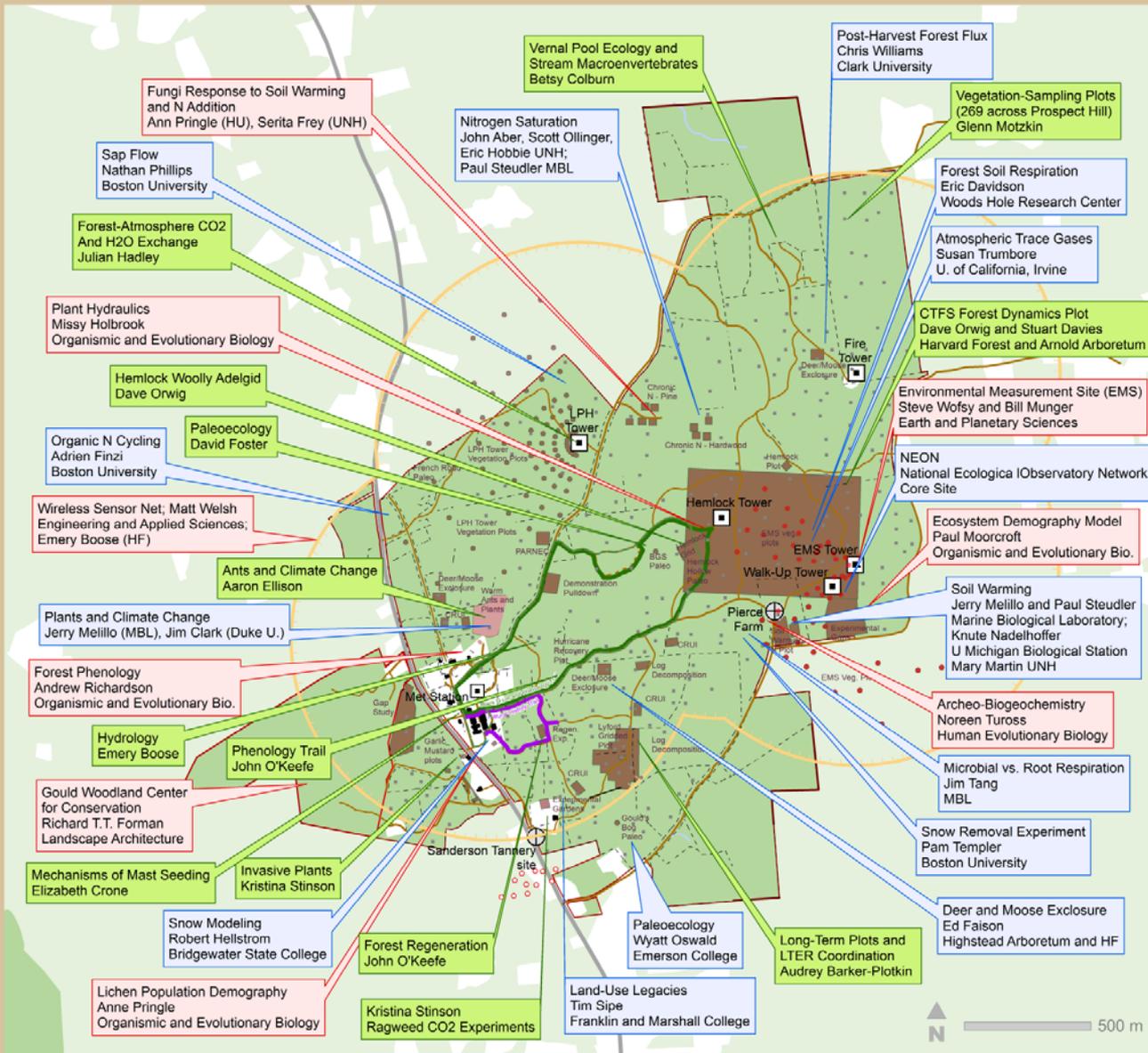
NSF - NEON Core Site since 2010



Est. 1907



# Harvard Forest - Major Research Activities on Prospect Hill



**Harvard Forest Scientists**

- Aaron Ellison
- Dave Orwig
- Kristina Stinson
- Audrey Barker Plotkin
- Betsy Colburn
- Elizabeth Crone
- Emery Boose
- Brian Hall
- Wyatt Oswald
- Clarisse Hart

**Other Harvard Scientists**

- Missy Holbrook
- Anne Pringle
- Steve Wofsy
- Bill Munger
- Andrew Richardson
- Paul Moorcroft
- Noreen Tuross
- Richard Forman
- Matt Welsh
- Stuart Davies
- Peter Del Tredici

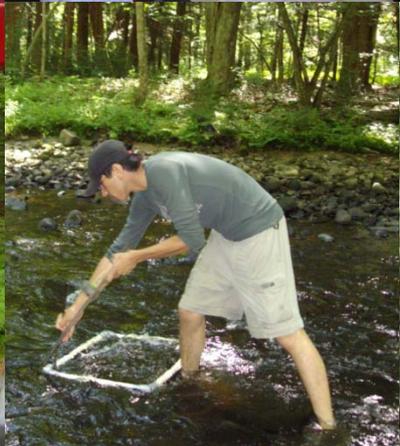
Some of >100 Institutions

- MBL – Ecosystems Center
- Boston University
- U California – Irvine
- Smithsonian Institute
- Emerson College
- Notre Dame
- Duke University
- Yale University
- University Vermont
- University of Connecticut
- University of New Hampshire
- University of Wyoming
- Oregon State University
- Cornell University
- Syracuse University
- Princeton University



## Summer Undergraduate Research Program - 35+ students

- Forest-Atmosphere Exchange
- Microbial Ecology
- Forest Conservation and Management
- Invasive Species & Public Health
- Biodiversity Studies & Population Dynamics
- Population & Evolutionary Ecology
- Paleoecology
- Informatics & Modeling
- Plant Physiology
- Environmental History

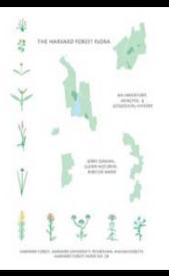
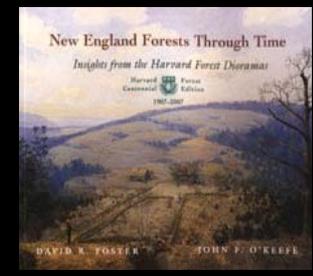
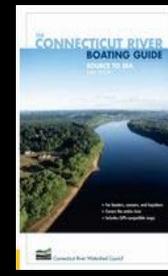
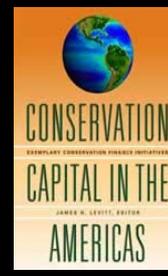
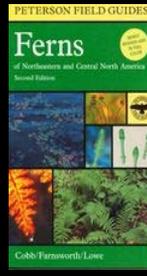
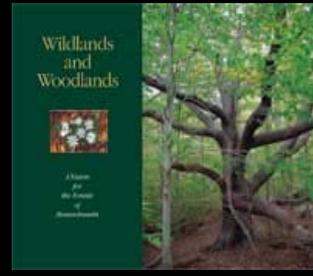
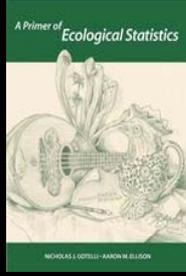




# Archives

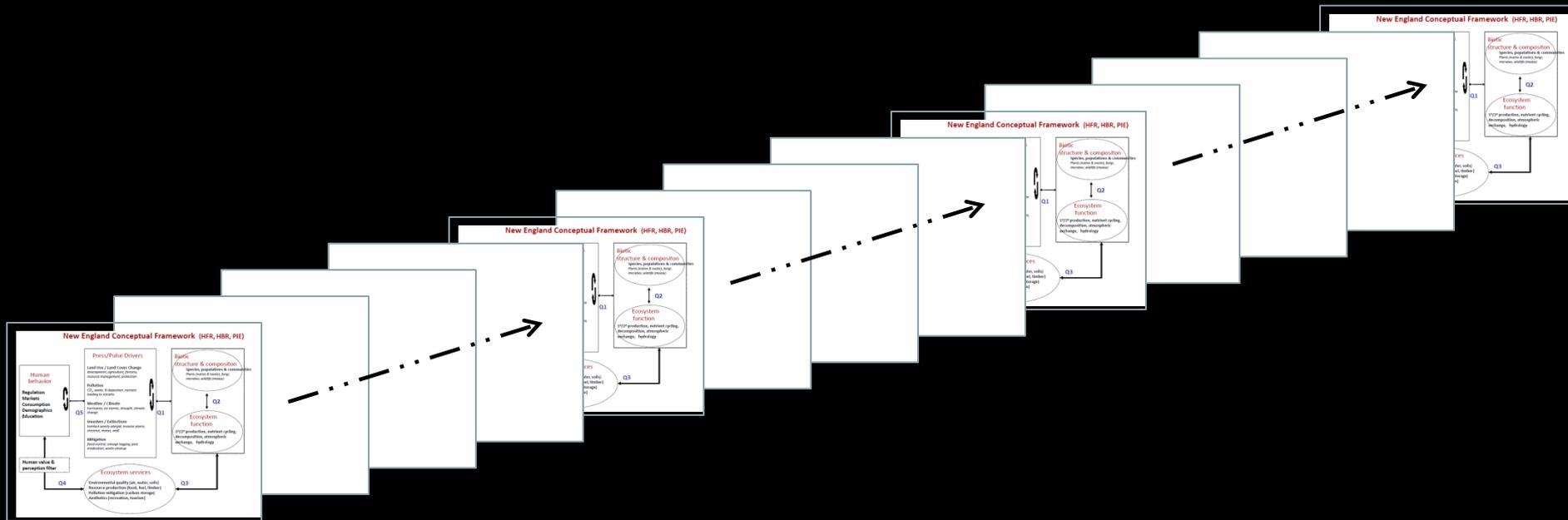


100 years of maps, photos, original research notes, records and samples  
and our books and other publications



# Harvard Forest Studies Through Time

## Application of Ecology and History to Conservation



**Pre-History**  
6000 – 500 Yrs BP

**History**  
AD 1500 - 1988

**Modern**  
AD 1988 - 2018

**Future**  
AD 2012 - 2062

*Time* →



# Future Scenarios of Landscape Change in the United States



>30 Universities  
U.S. Forest Service  
Smithsonian Institute



Ragweed

Chestnut

Hickory

Maple

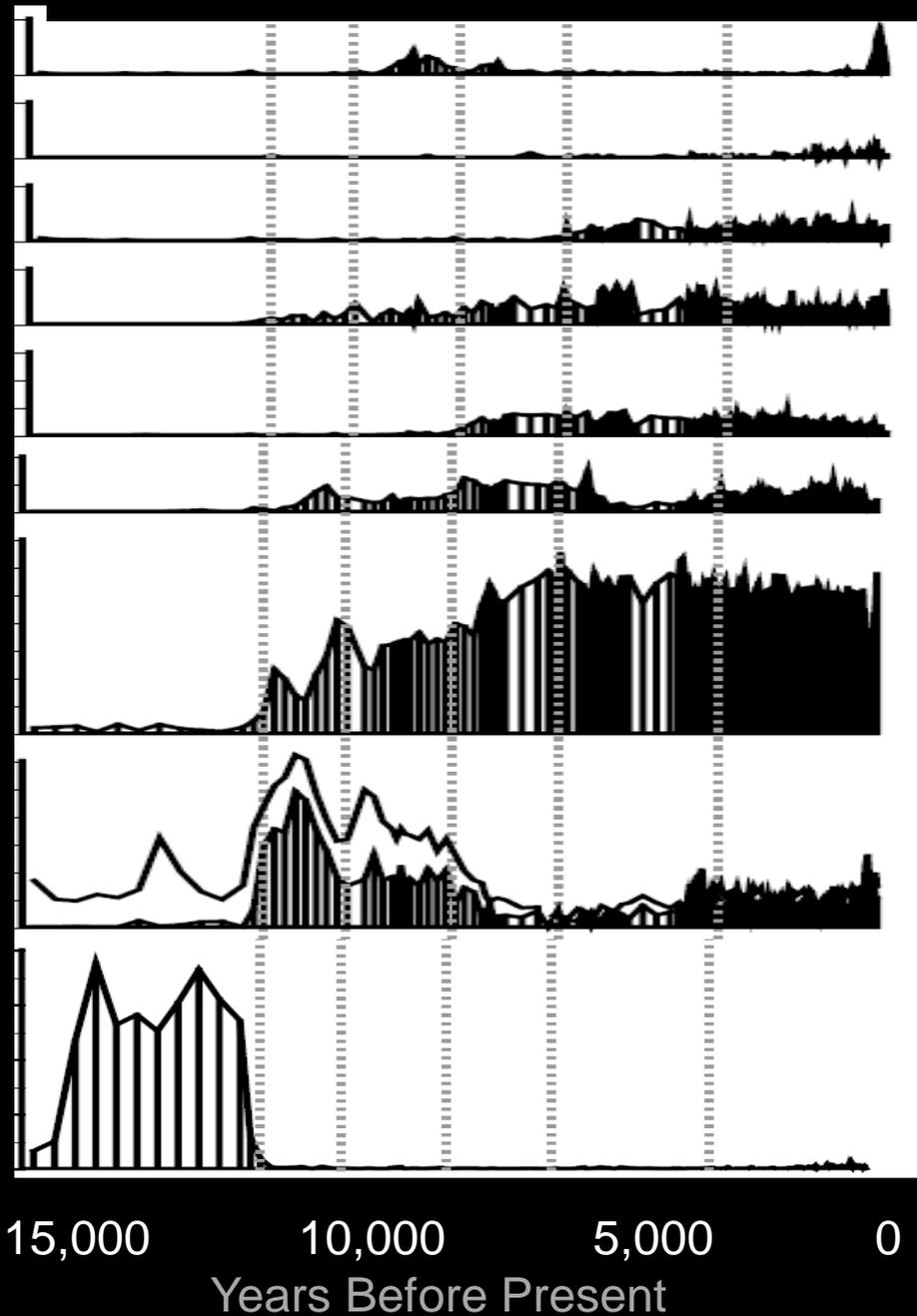
Beech

Hemlock

Oak

Pine

Spruce



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Massachusetts

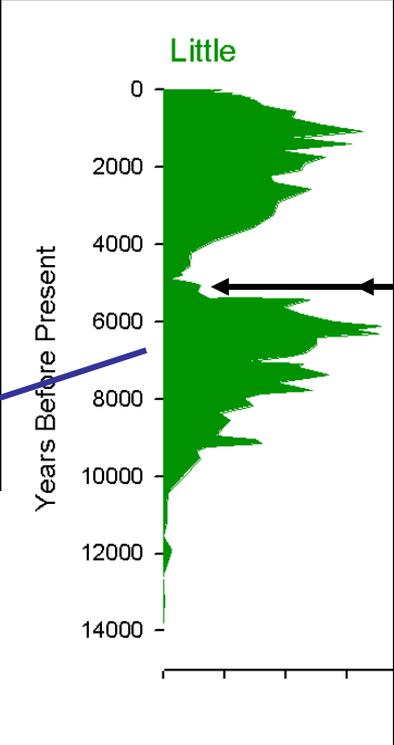
Long-term

Forest

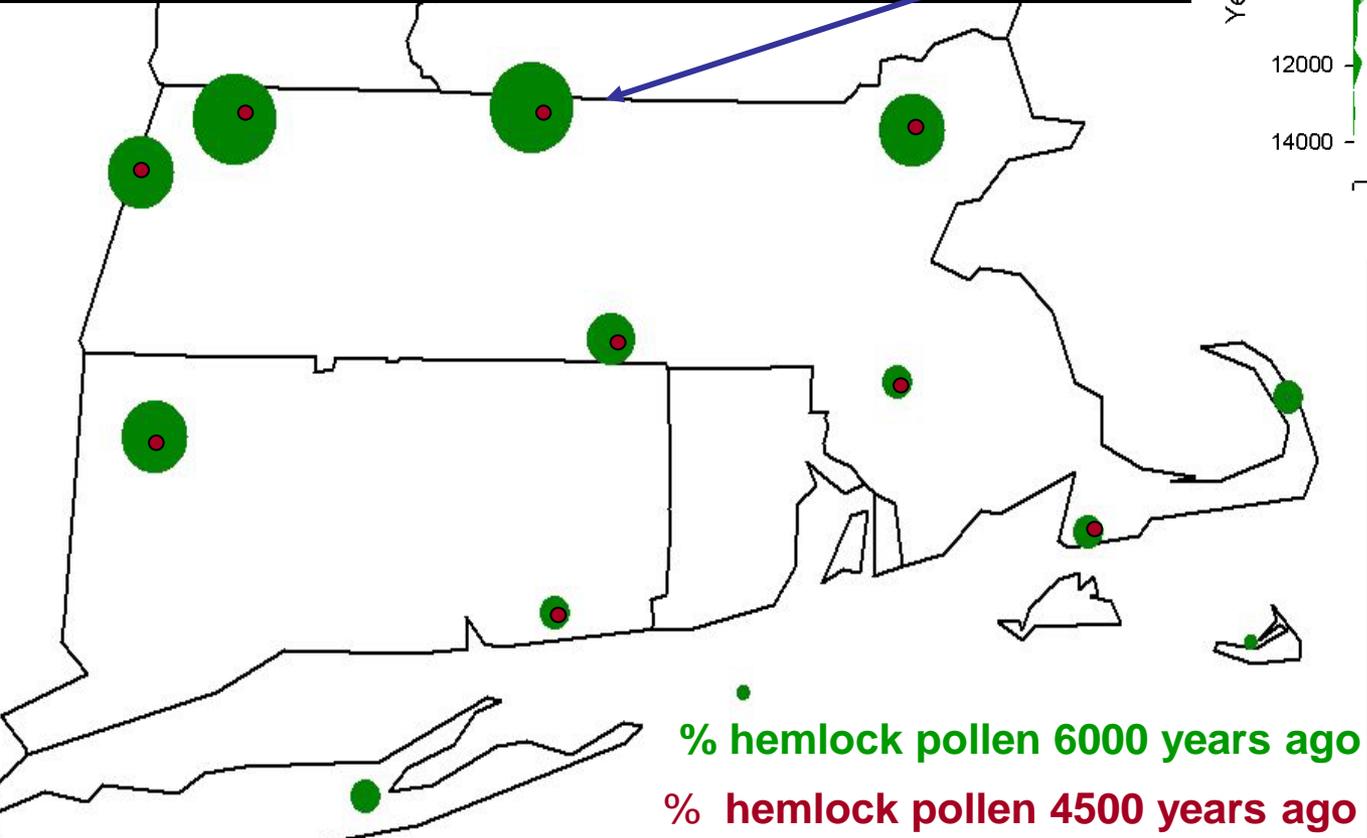
Dynamics

# Mid-Holocene Hemlock Decline

5000 Years BP



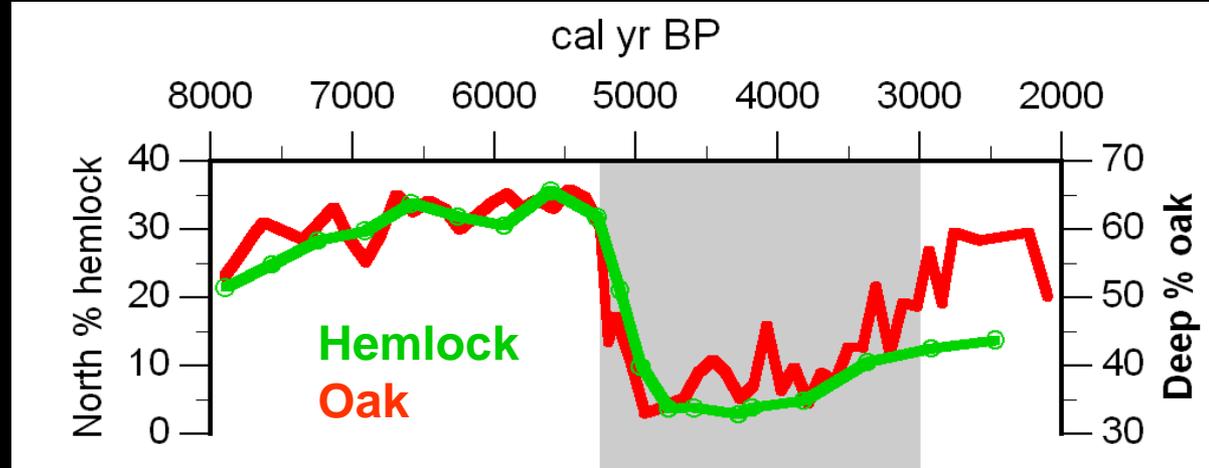
Hemlock decline



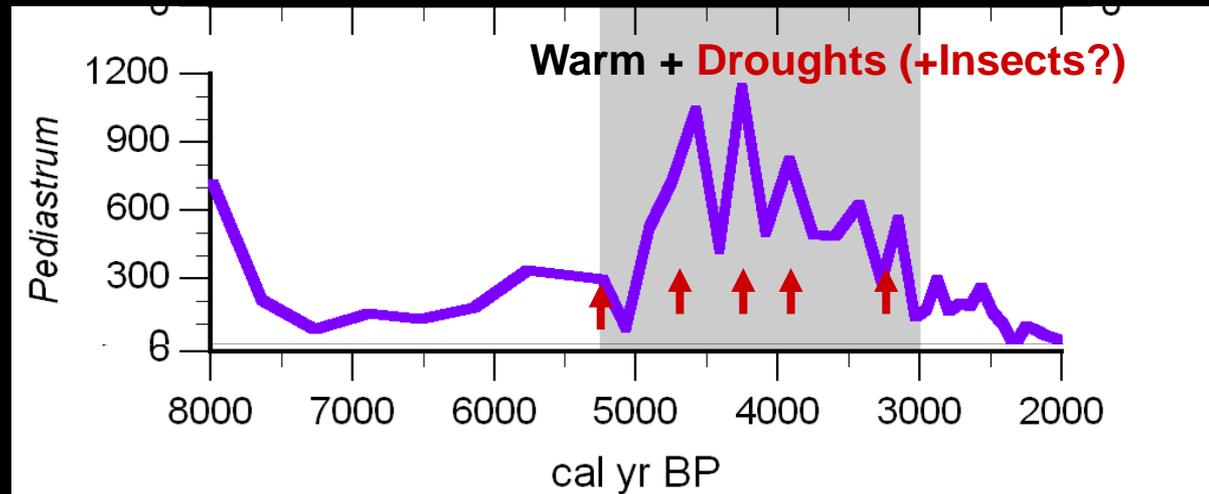
# Abrupt Forest Dynamics With Climate Change & Disturbance

## Regional Records

- West Mass
- Coastal Mass

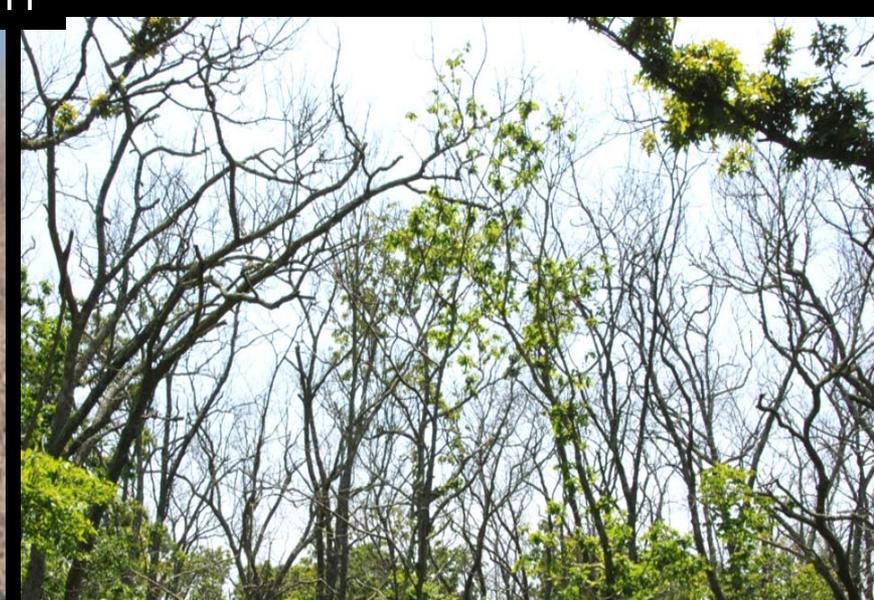
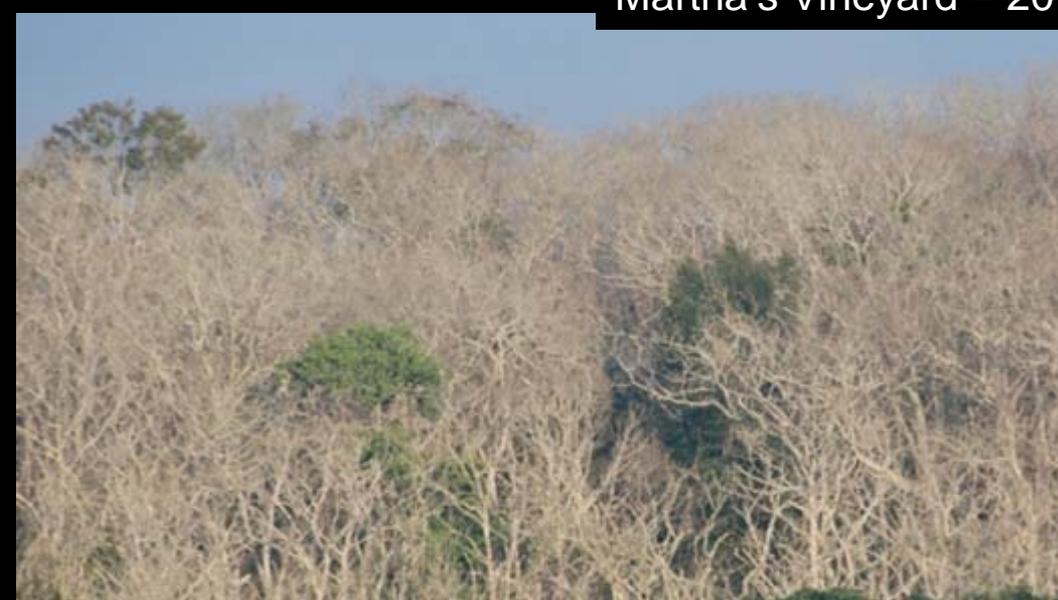


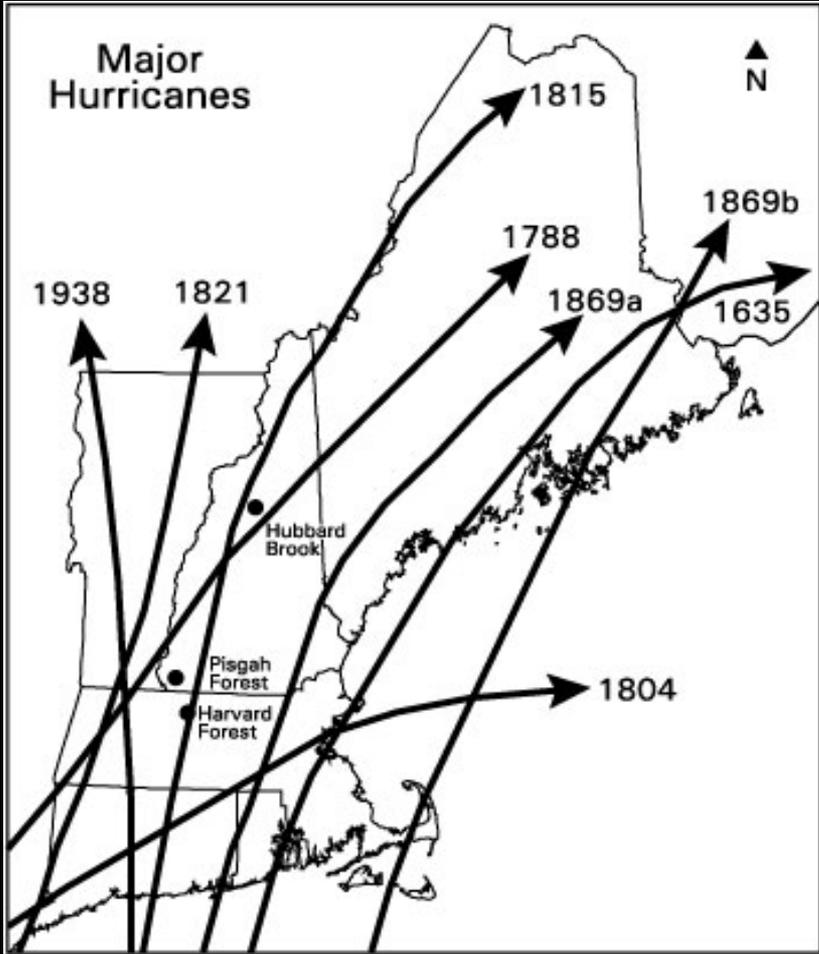
## Indicator of Drop in Water Table



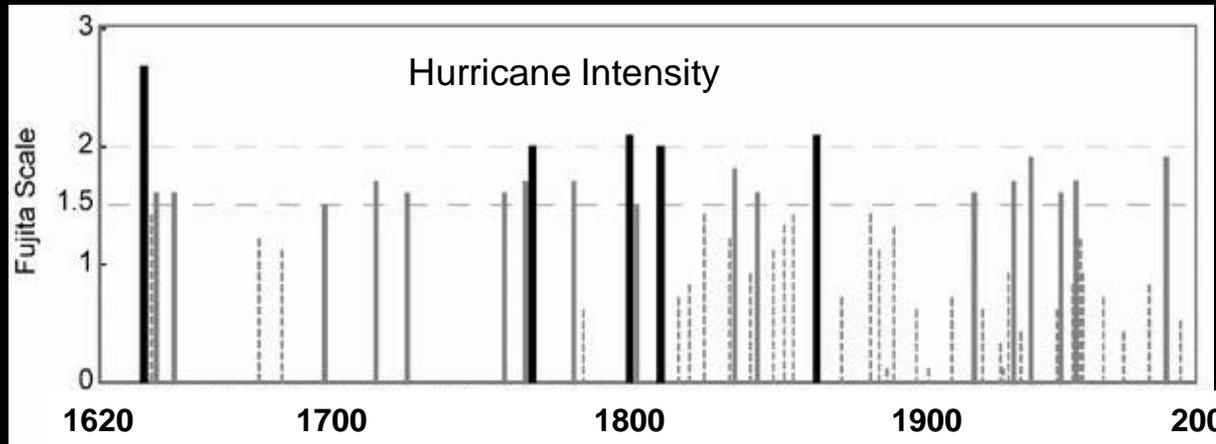


Martha's Vineyard – 2011

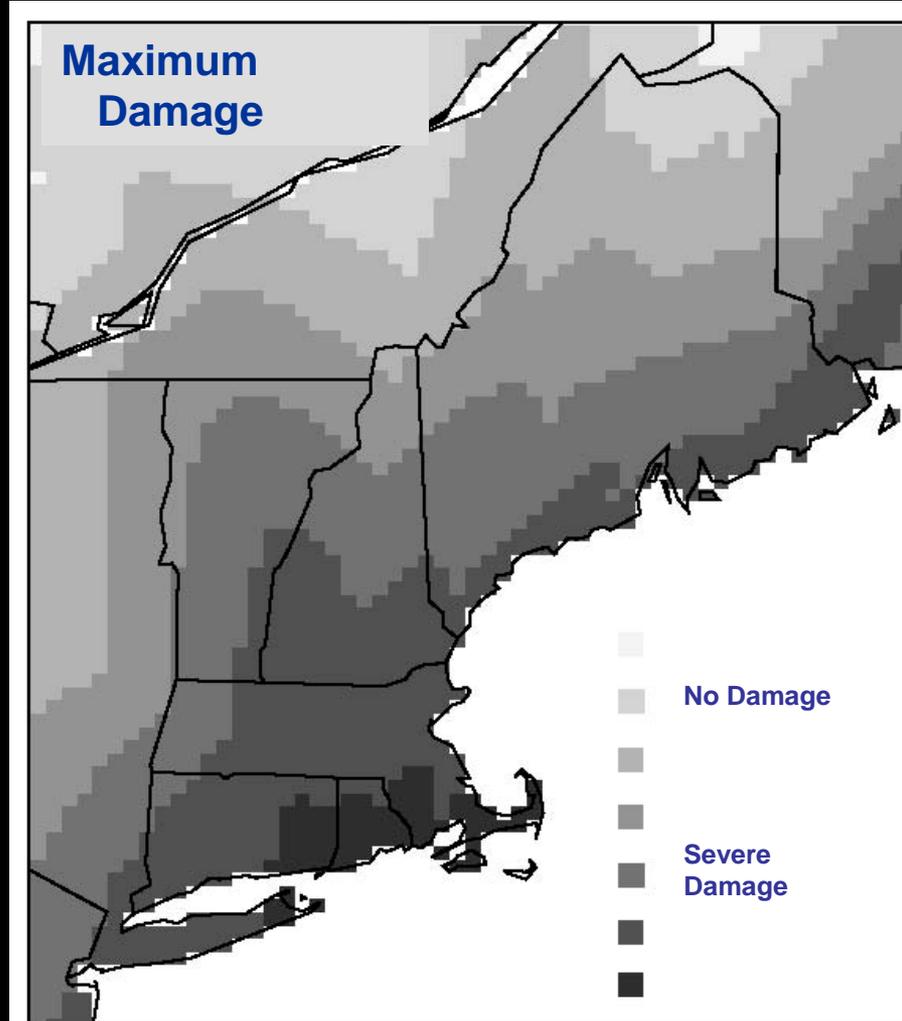
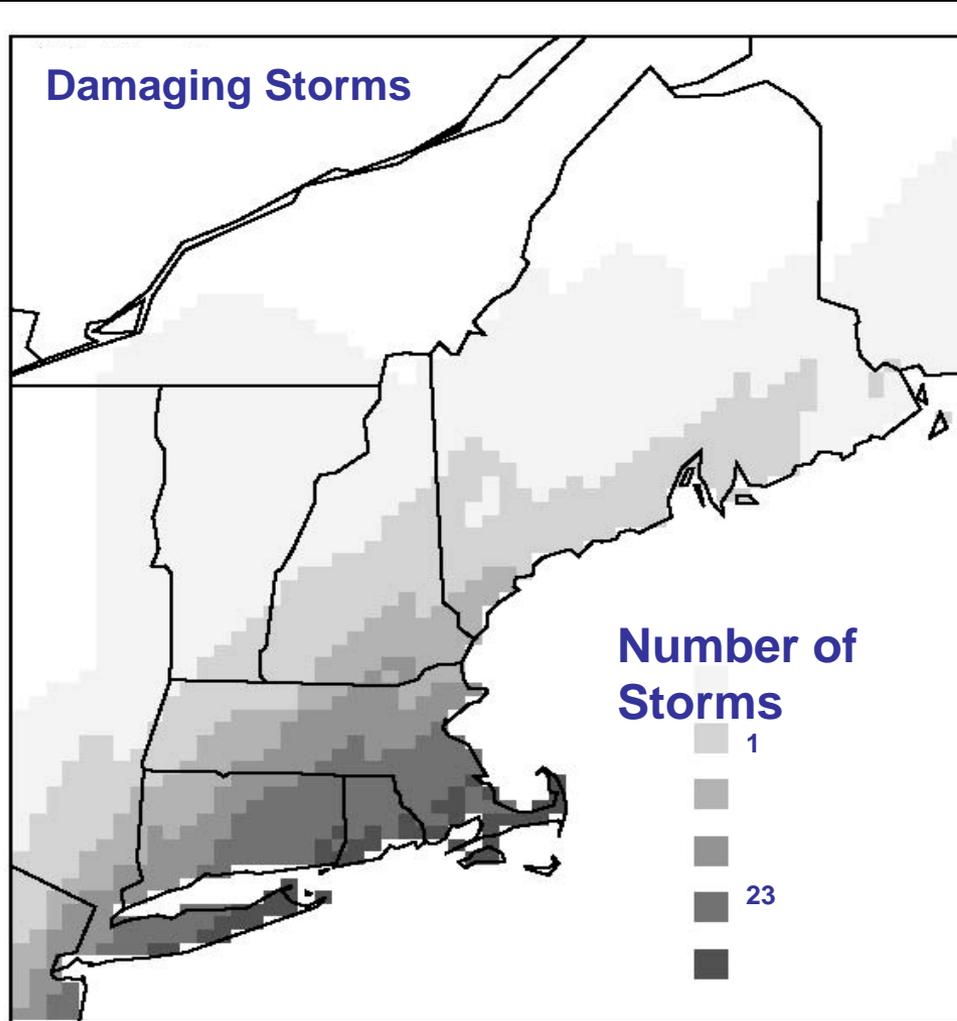




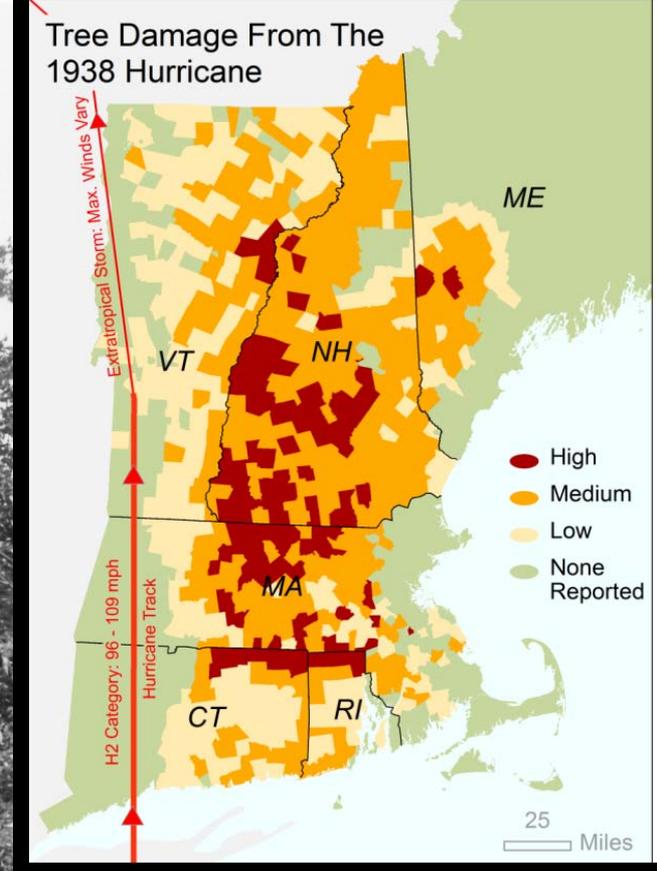
# Great Hurricanes



# Hurricanes 1620 - 2010



# Harvard Forest Pisgah Tract Winchester, NH 1938 Hurricane



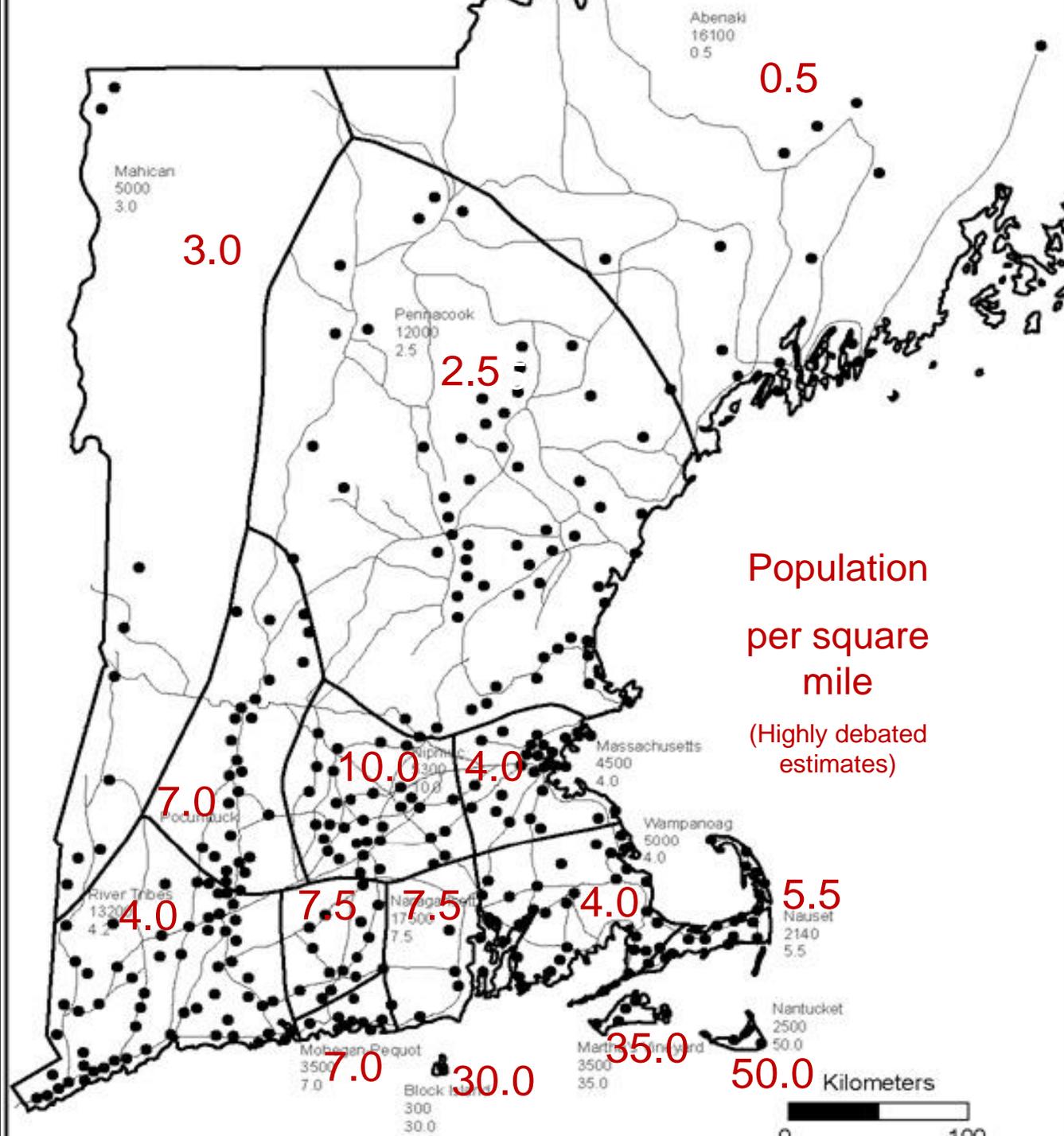


Pisgah Tract 2011



Late Woodland  
Indian Population  
(ca. 1000 – 1600 A.D.)

Major groups,  
population centers,  
and trails



Population  
per square  
mile  
(Highly debated  
estimates)

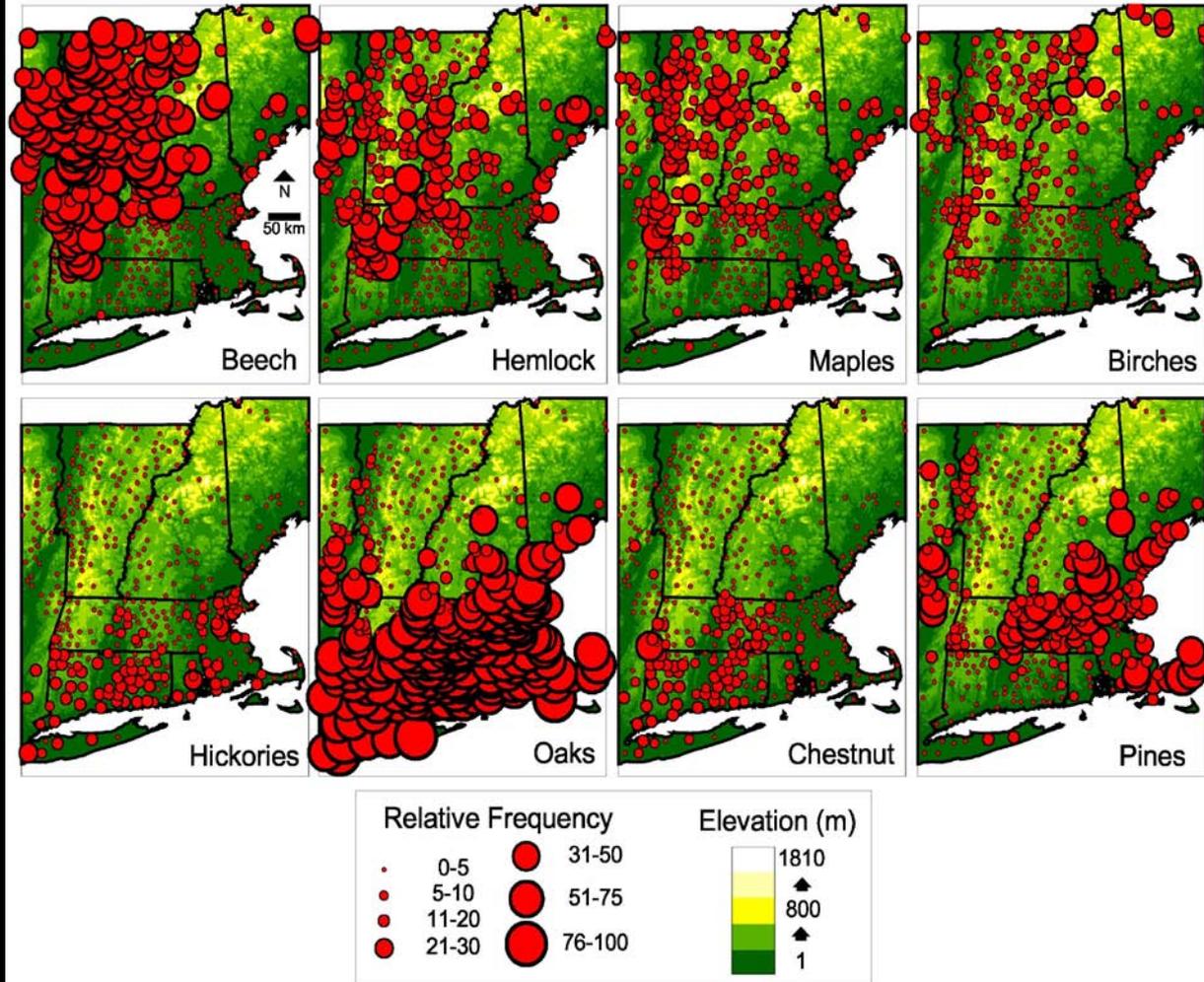
Kilometers

# At European Settlement New England was a Forested Land

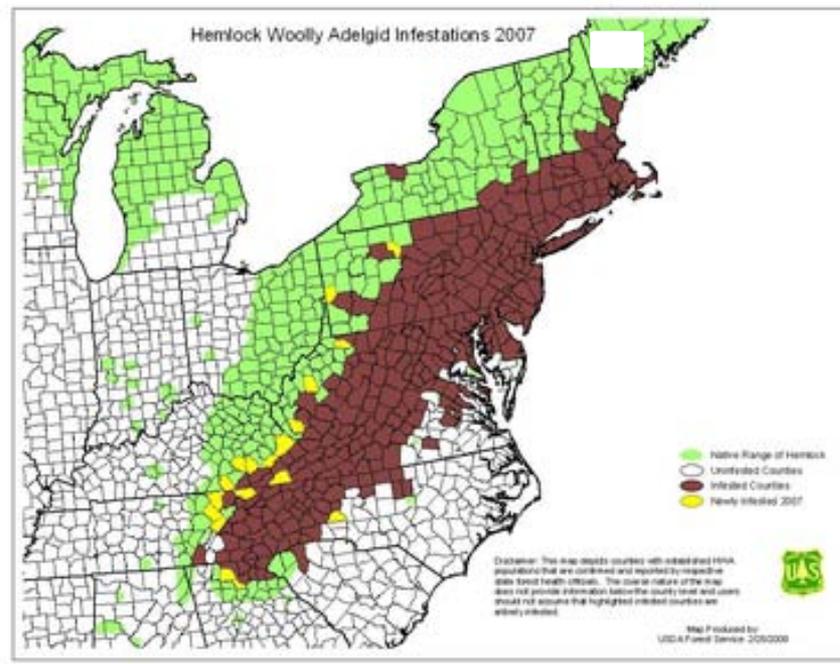


Harvard Pisgah Tract 1910s

## New England Witness Tree Distribution



Dominated by Old Forests



Hemlock  
 Woolly  
 Adelgid



# Asian Long-horned Beetle Infestations in North America



# New England

## Forest Cover and Population

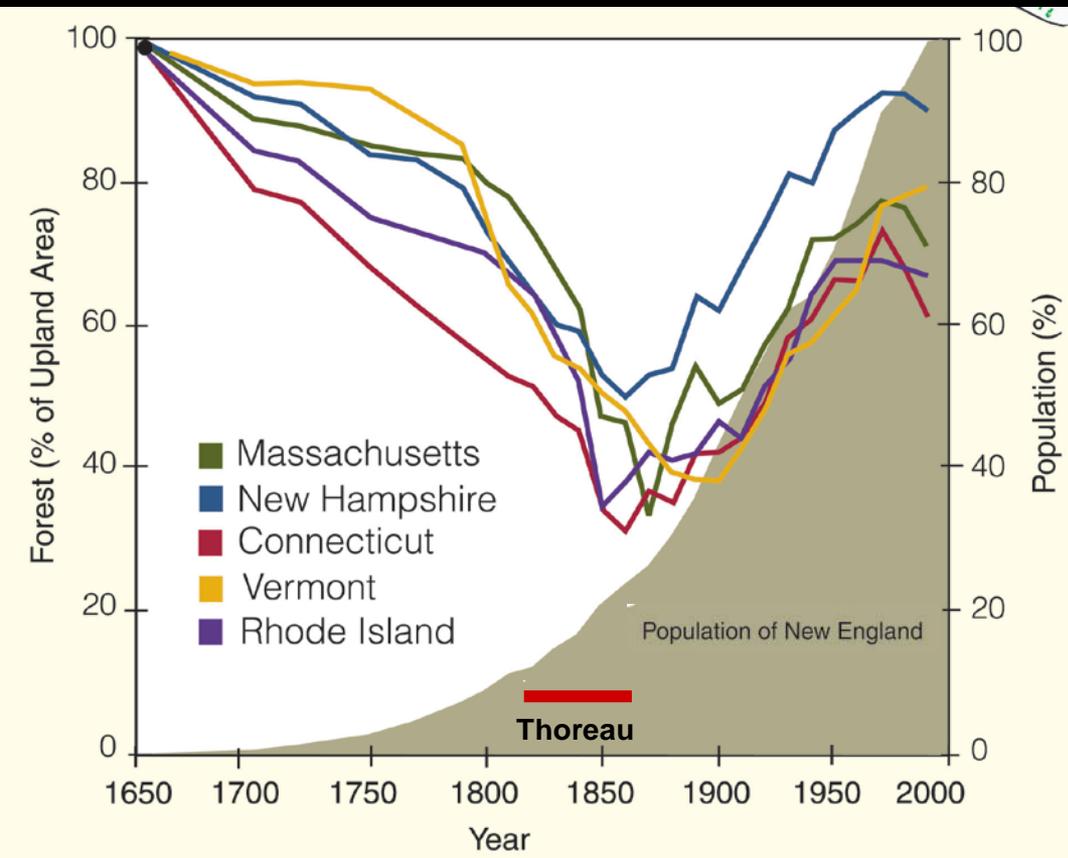
1860s – Agriculture dominated

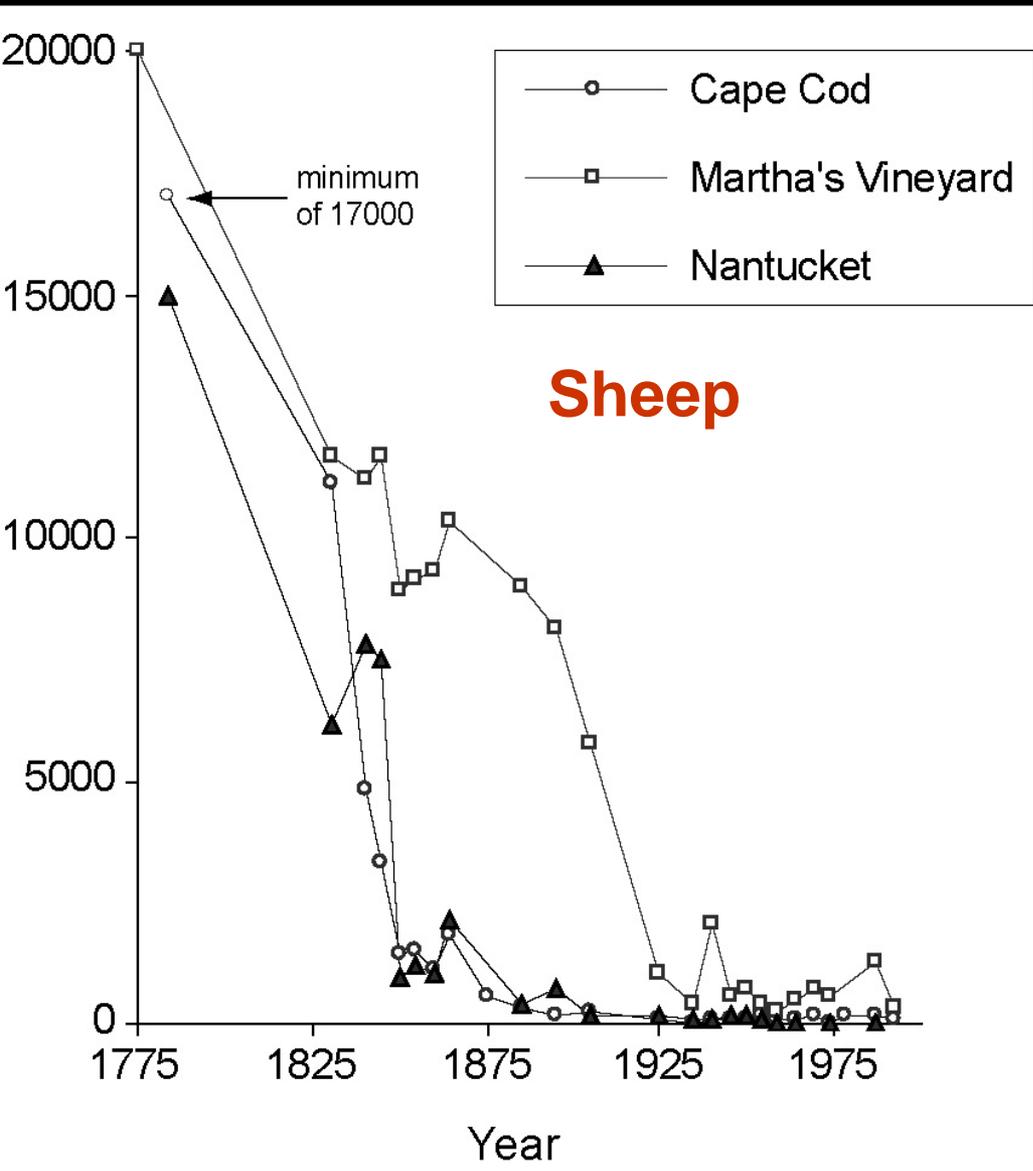


2010s – Forest dominated



2060 – ???



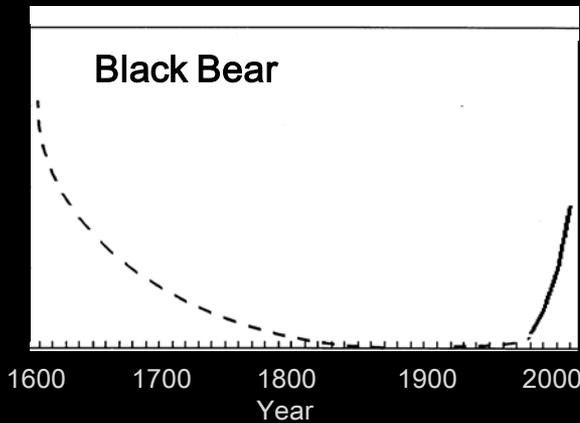
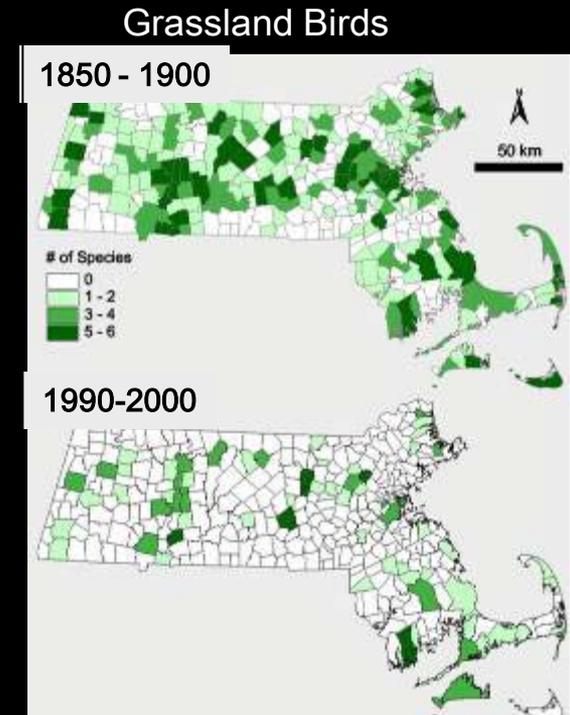
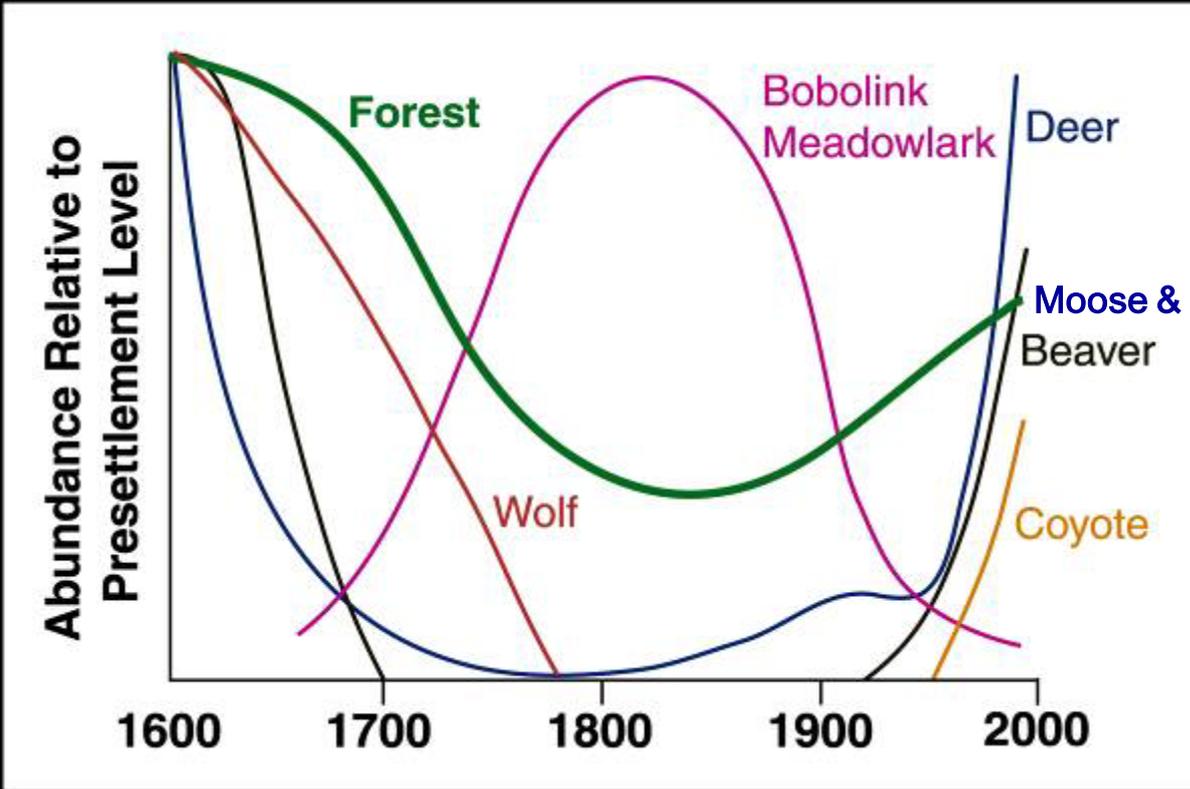


**1890s**



**1990s**

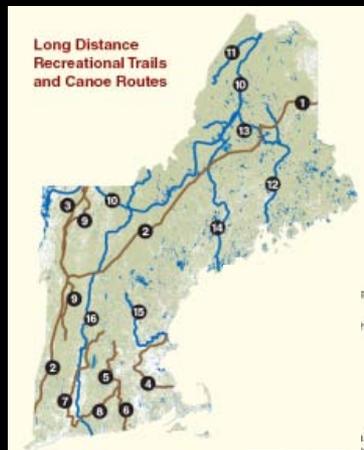
# Wildlife Dynamics in the New England Landscape



**New Habitat  
for  
Moose  
Oak Forest**



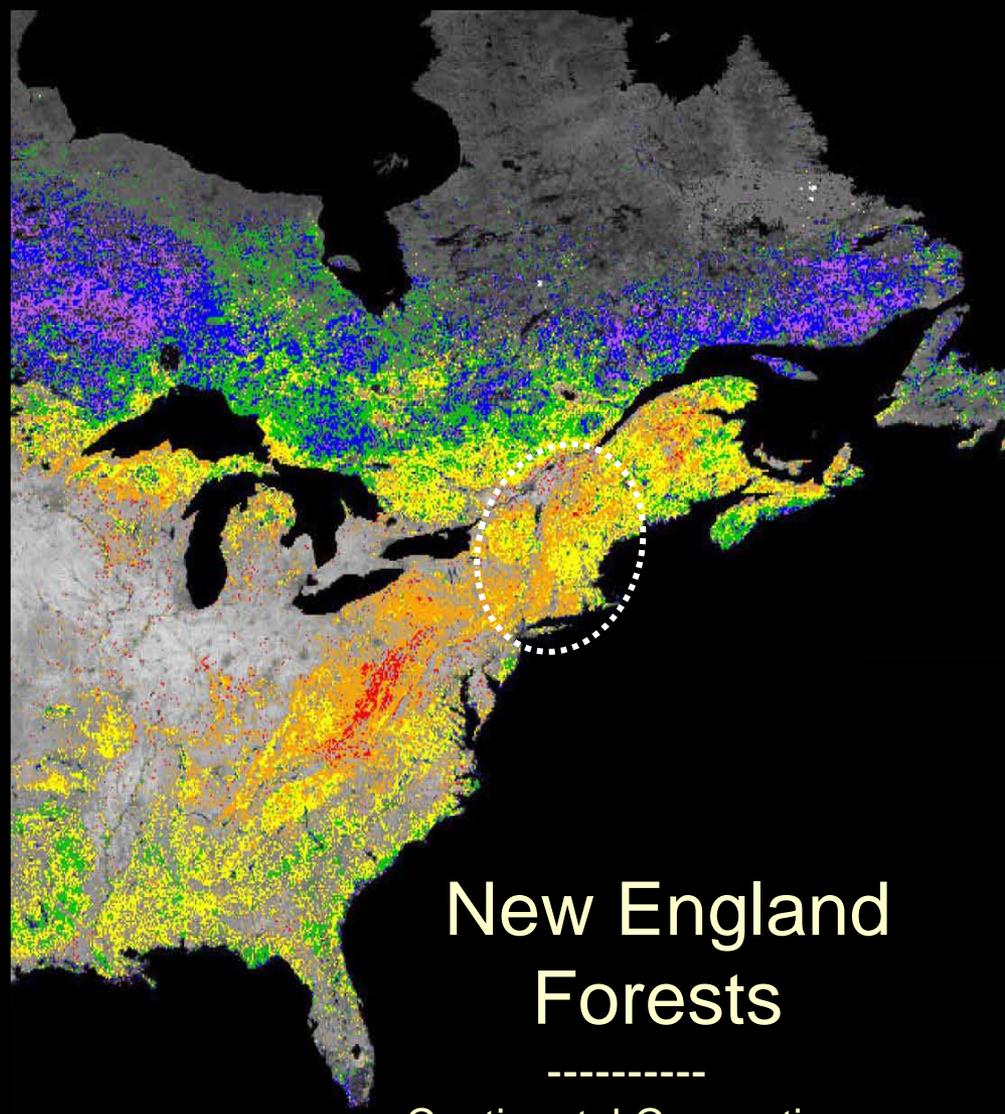
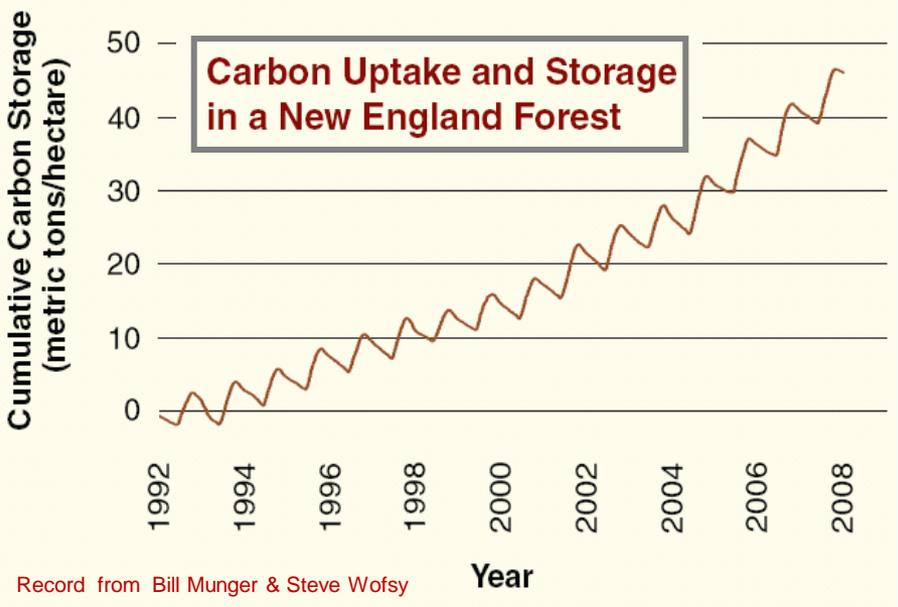
# Forests = Direct Economic Benefits



# Forests = Critical Infrastructure

e.g., Quabbin Reservoir = Unfiltered water source for 40% of Massachusetts Population





# New England Forests

-----  
Continental Connections

Globally important carbon storage and climate mitigation

# Threats

Deforestation

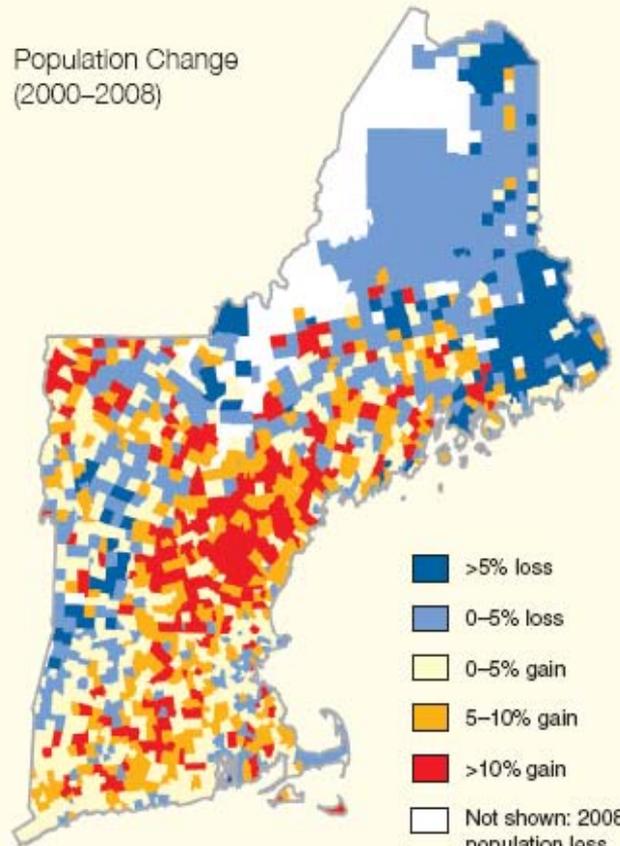
Perforation

Degradation

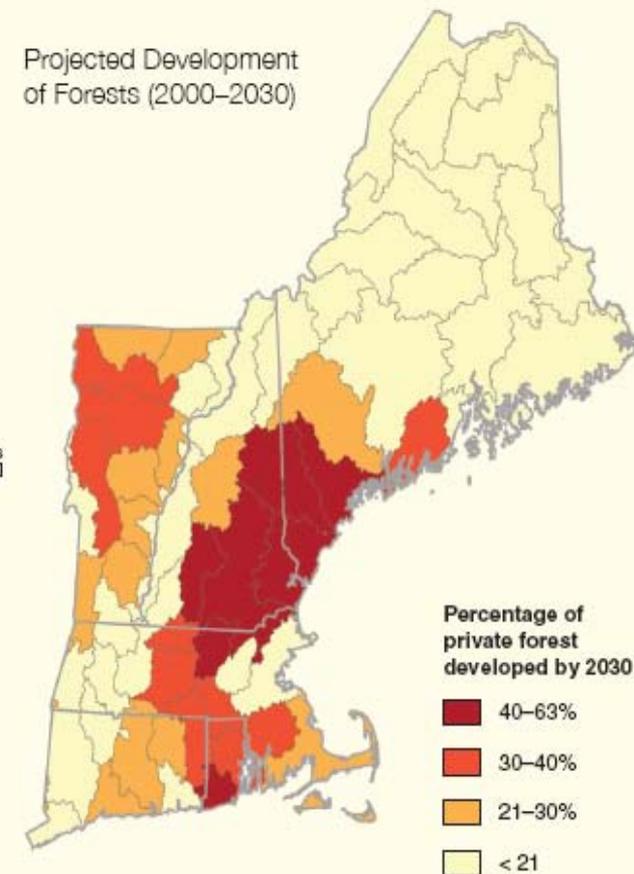


## Recent Population Change and Future Development of Forest Land

Population Change  
(2000–2008)



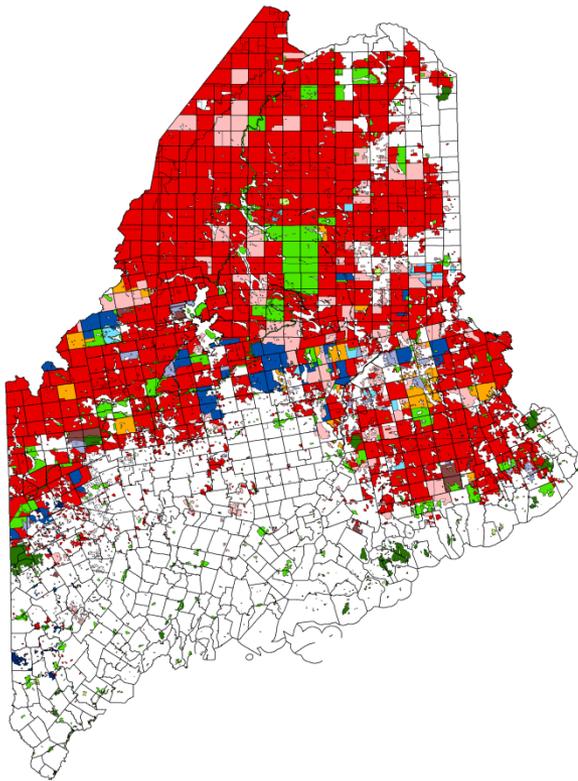
Projected Development  
of Forests (2000–2030)



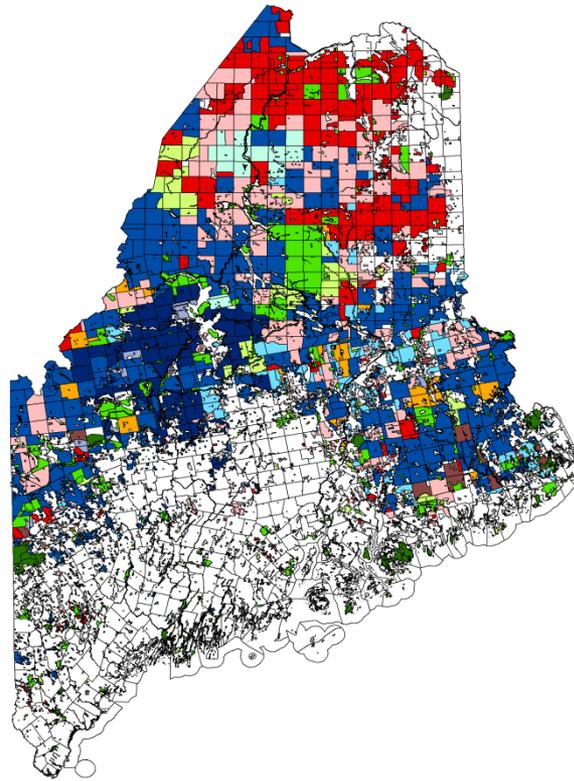
# Threats

## Change in Ownership & Management

### Changes in Forest Ownership – Northern Maine



1994



2009

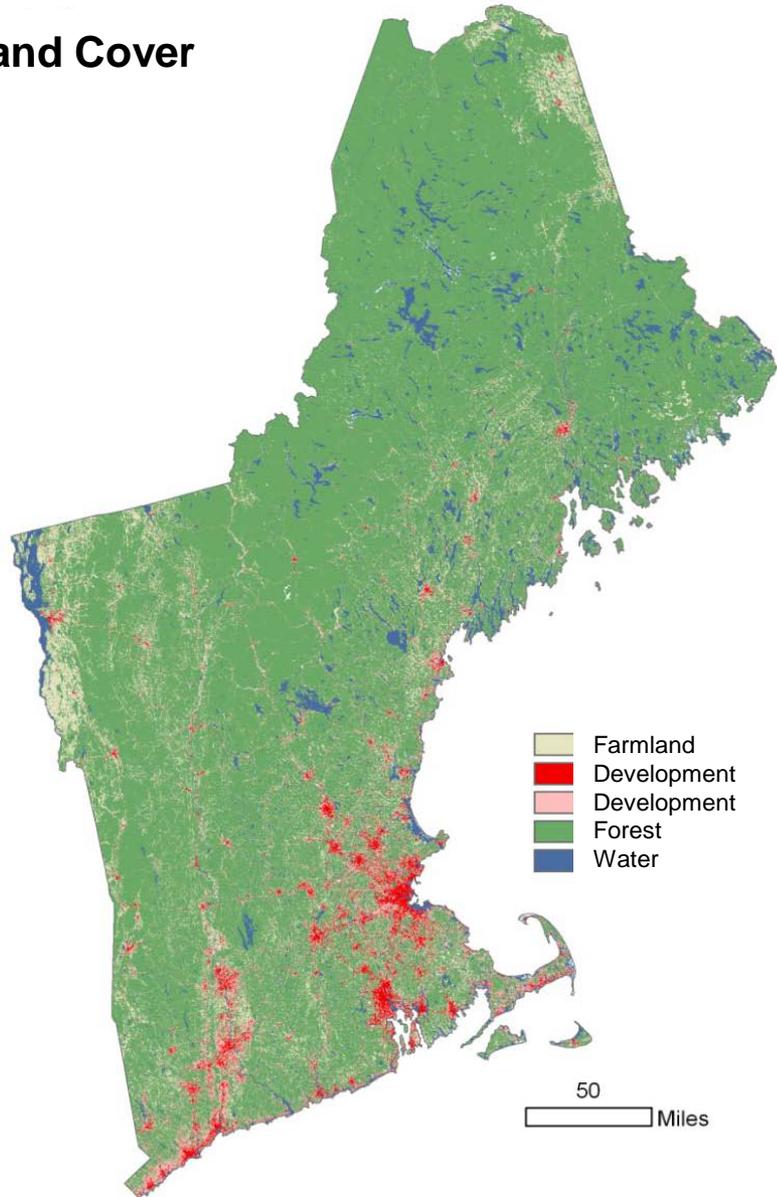
Copyright 2010 - James W. Sewall Co., Old Town, Maine

#### Legend

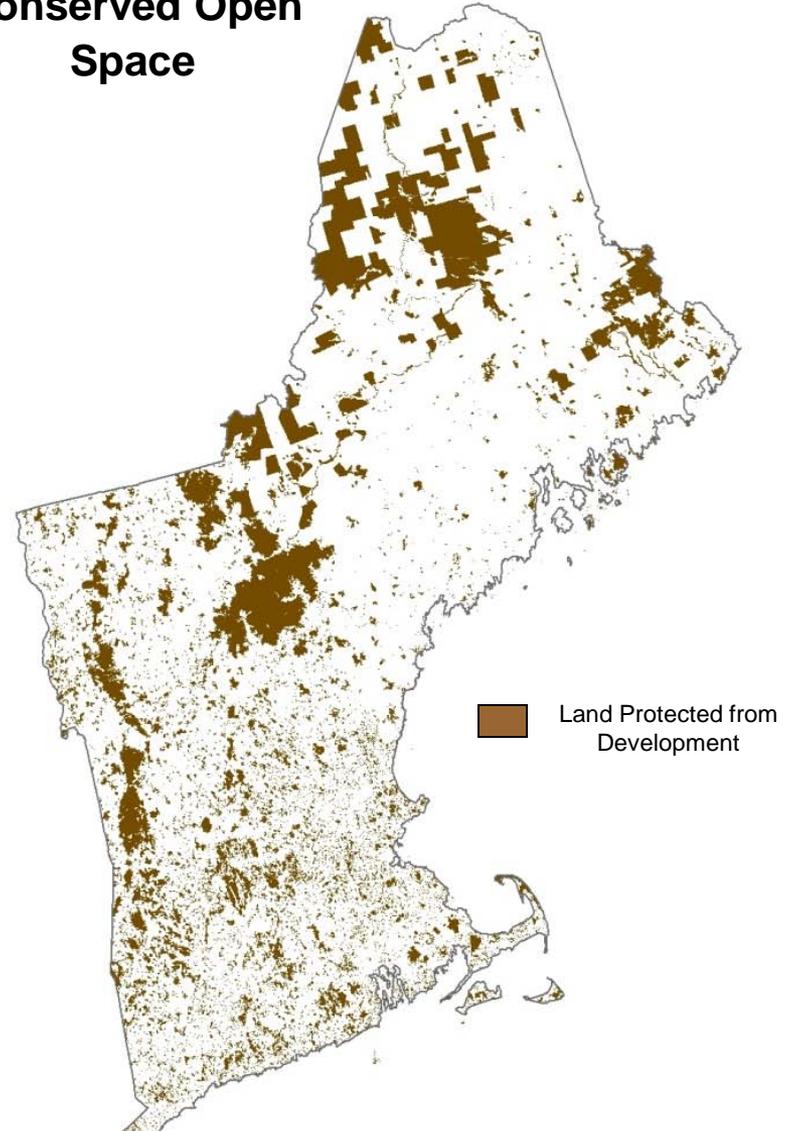
- Industry
- Old-line Family
- REIT
- Financial Investor
- Developer
- Contractor/New Timber Baron
- Individual/Family
- Tribal
- Federal
- Public (state)
- Non-profit
- Other

# Two Remarkable Products of History

Land Cover



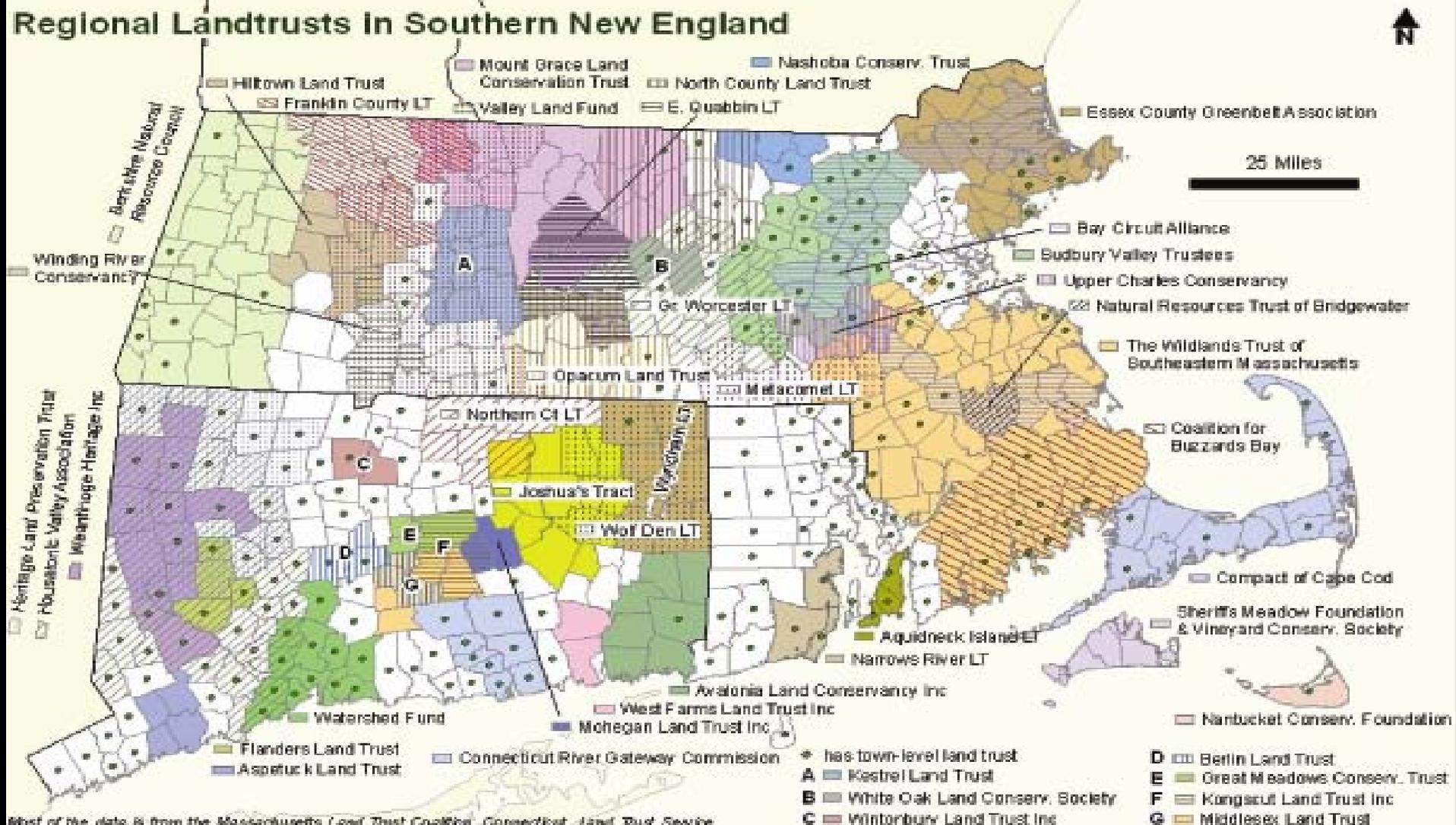
Conserved Open Space



# What can we do?

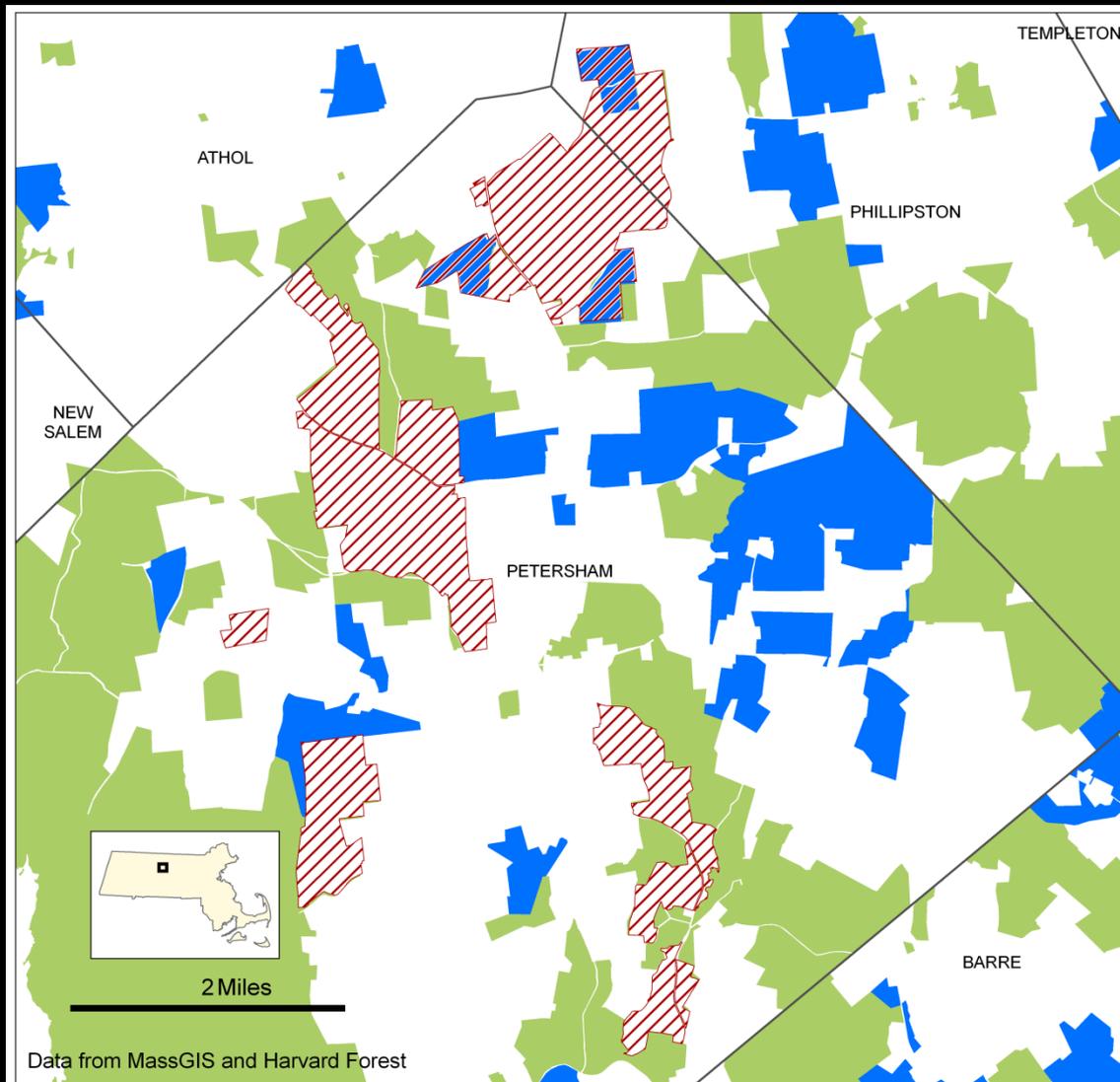


# New England's Conservation Capacity



Most of the data is from the Massachusetts Land Trust Coalition, Connecticut Land Trust Service Bureau, and Rhode Island Land Trust Council. Data on some smaller land trusts come from the individual groups' websites.

compiled by Brian Hall, at The Harvard Forest (978 724-3302), April 2006.



## Petersham, Massachusetts

>60% Conservation Land

- Individual Land Owners
- Individual Conservation Leaders
- State Conservation Priorities



**Harvard Forest**

**Protected Open Space - Period Protected**

 ~1900 - 1990

 1990 - 2010



# Wildlands and Woodlands

*A Vision for the New England Landscape*

**John D. Aber** *University of New Hampshire*  
**Charles V. Cogbill** *Sterling College, Vermont*  
**Elizabeth A. Colburn** *Harvard Forest, Harvard University*  
**Anthony W. D'Amato** *University of Minnesota*  
**Brian M. Donahue** *Brandeis University*  
**Charles T. Driscoll** *Syracuse University*  
**Aaron M. Ellison** *Harvard Forest, Harvard University*  
**Timothy J. Fahey** *Cornell University*  
**David R. Foster** *Harvard Forest, Harvard University*  
**Brian R. Hall** *Harvard Forest, Harvard University*  
**Clarisse M. Hart** *Harvard Forest, Harvard University*  
**Malcolm L. Hunter** *University of Maine, Orono*  
**Lloyd C. Irland** *Yale University*  
**William S. Keeton** *University of Vermont*  
**David B. Kittredge** *University of Massachusetts*  
**Kathleen F. Lambert** *Harvard Forest, Harvard University*  
**James N. Levitt** *Harvard Forest, Harvard University*  
**Robert J. Lillieholm** *University of Maine*  
**David A. Orwig** *Harvard Forest, Harvard University*  
**Jonathan R. Thompson** *Smithsonian Institution*

# W&W Authors



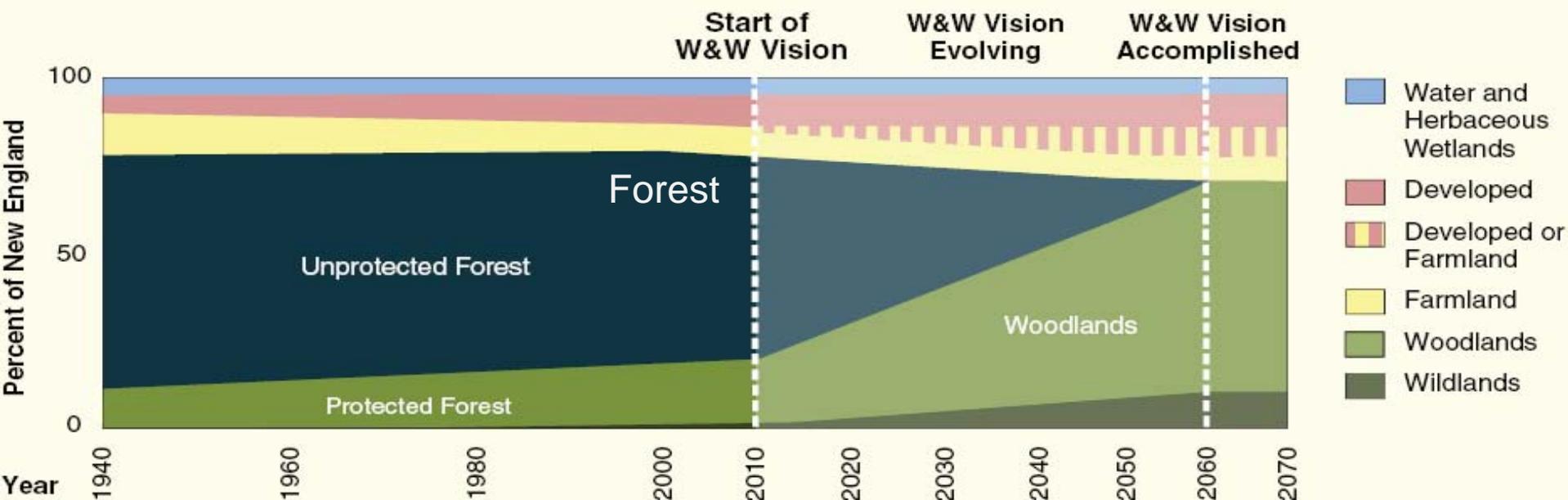
# The *Wildlands and Woodlands* Vision

**Conserve at Least 70% of New England in Forest  
(Double the pace of land conservation)**

Protect 30 million acres of New England's existing 33 million acres of forest

Retain or increase farmland (>7% of land)

Concentrate future development for energy and economic efficiency

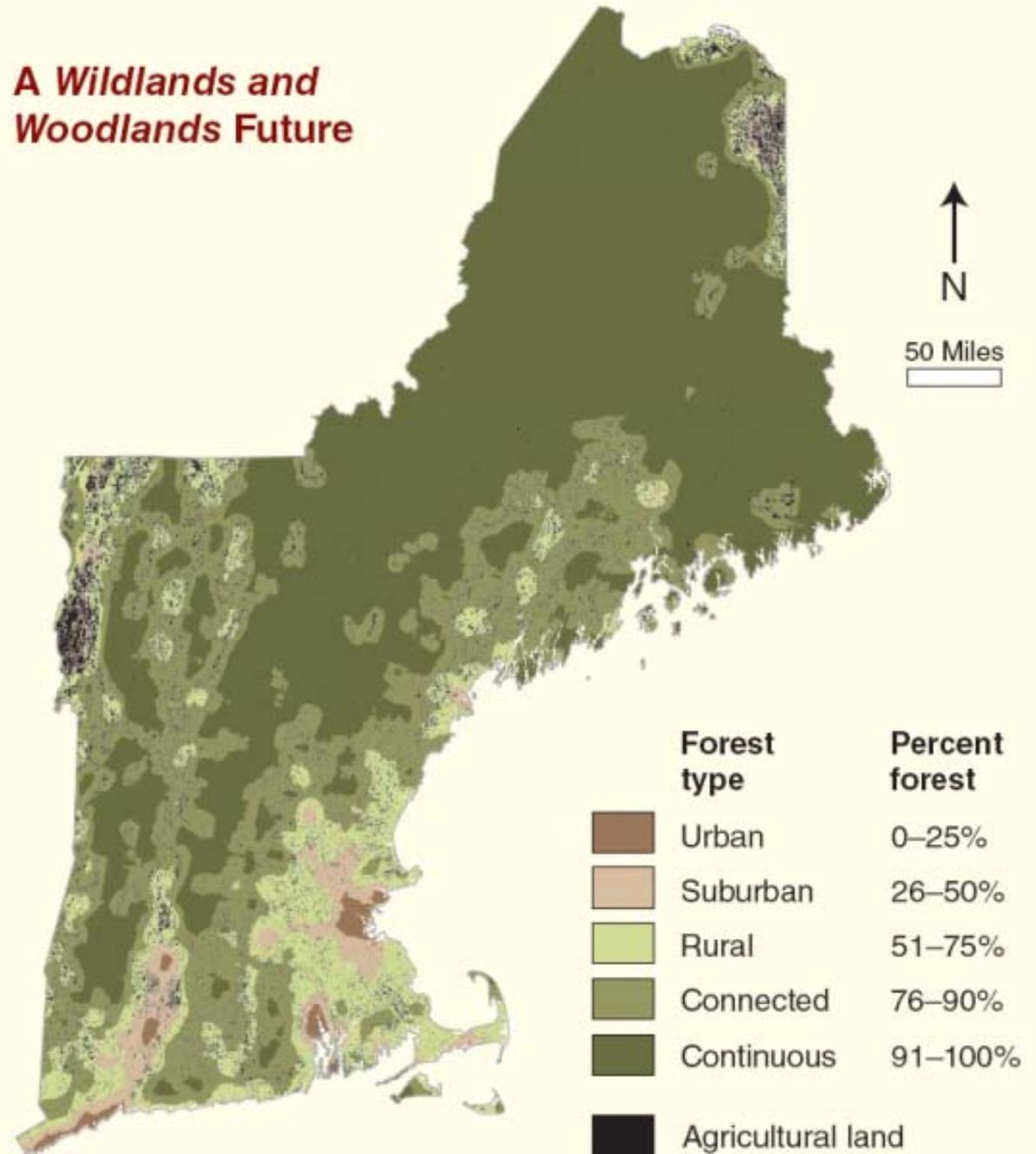


## Conservation

On private land  
through conservation  
easements

Shaped by local  
conditions and  
interest

### *A Wildlands and Woodlands Future*



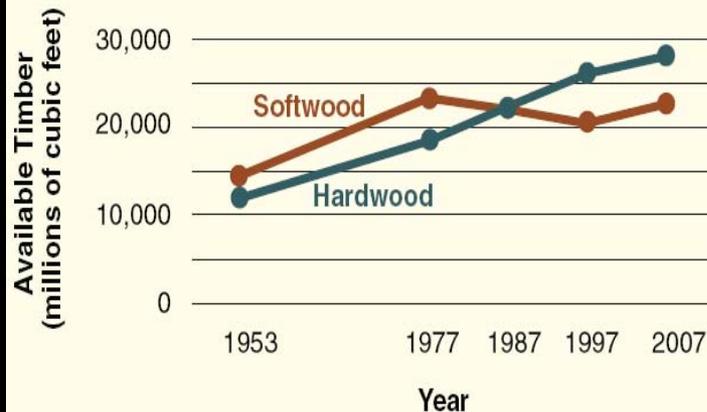
# Managed Woodlands

**90% of forest land  
63% of New England  
~27 million acres**

**Well-managed forests  
permanently conserved**



**Changes in New England Timber Volume**



# Wildland Reserves

**10% of forest land  
7% of New England  
~3 million acres**

---

Large forest landscapes shaped by  
natural processes



# And a place for agriculture and its landscapes





# Report: New England's Forests Declining

# The Boston Globe

Sunday October 10, 2010  
THE GREEN ISSUE

# ctpost.com

## The forests of New England are disappearing too quickly, experts say

### Speaking for the trees By Tom Horton

### Forbes.com

## Report: Forest cover declining across New England

The New York Times  
June 7, 2010

## New England Groups Plot to Save Their Dwindling Woodlands

By DINA FINE MARON of [ClimateWire](#)

THE SACRAMENTO BEE [sacbee.com](#)

## New England Losing Forest Cover - Scholars Call for Accelerated Conservation



Press Release 10-087  
New England Losing Significant Forest Cover, According to New Report

### Burlington FreePress.com

## NEW ENGLAND SCIENTISTS CALL FOR FOREST CONSERVATION

BY CANDACE PAGE, FREE PRESS STAFF WRITER • THURSDAY, MAY 20, 2010

### 90.9 fm wbur.org npr BOSTON'S NEWS SOURCE

### KENNEBEC JOURNAL

May 23

## OUR OPINION: Developmental threat to forest can be mitigated

## Study: Forests Declining Throughout New England

### ppa Opinion

May 21

## Our View: Shrinking forest should be cause for concern



### HARVARD gazette

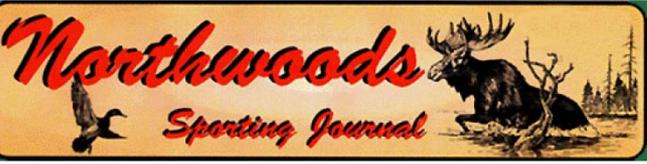
## Rolling back the forest canopy

After expanding for 150 years, New England woods are declining

### nashua telegraph

Thursday, May 20, 2010

## Report: Forest cover declining across New England



July 2010

### Memphis Business Journal

## New England Losing Forest Cover - Scholars Call for Accelerated Conservation



## New England Losing Forest Cover - Scholars Call for Accelerated Conservation

# New England Natural Resource Center

ADOPTION CERTIFIED BY THE NEW ENGLAND GOVERNORS' CONFERENCE  
February 27, 2011.

## *A RESOLUTION HONORING CHARLES H.W. FOSTER*

**WHEREAS**, Charles H.W. 'Hank' Foster has dedicated his professional career to academic and public service, particularly in the areas of environmental policy, conservation and forestry; and

**WHEREAS**, Dr. Foster served seven Massachusetts governors and was the first cabinet-level secretary of environmental affairs in the state, as well as holding numerous other public service positions; and

**WHEREAS**, Dr. Foster's contributions to professional and non-governmental organizations are too numerous to detail but include work with the Woods Hole Oceanographic Institution, the New England Aquarium, the Conservation Foundation, the Appalachian National Scenic Trail Advisory Board, the Cape Cod National Seashore Advisory Commission and a host of others; and

**WHEREAS**, Dr. Foster was the editor of the book 'Twentieth Century New England Land Conservation', which commemorated the 100<sup>th</sup> anniversary of the first meeting of the New England governors (in 1908), and led to the formation of the NEGC Commission on Land Conservation.

**NOW, THEREFORE, BE IT RESOLVED**, that the New England Governors salute the lifetime of achievements and public service of Charles 'Hank' Foster, and recognize him for the many contributions he has made to protecting the New England environment and preserving our natural places.

Deval L. Patrick  
Governor of Massachusetts  
Chairman

Dannel P. Malloy  
Governor of Connecticut

Paul R. LePage  
Governor of Maine

Lincoln D. Chafee  
Governor of Rhode Island

Peter Shumlin  
Governor of Vermont

John Lynch  
Governor of New Hampshire

# Highstead Foundation



*Advancing Wildlands & Woodlands Conservation in New England and Beyond*

## ***Conservation Director***

***Regional Conservationist***

***Ecologist***

***Senior Fellow***

***Senior Fellow***

***Outreach & Communications***

***Staff & Administration***

***Communications Director***

***Operations Manager***

***Undergraduate Interns***

## ***Job Search Underway***

Bill Labich

Ed Faison

Jim Levitt\*

Kathy Lambert\*

Clarisse Hart\*

Jody Cologgi

Future Hire

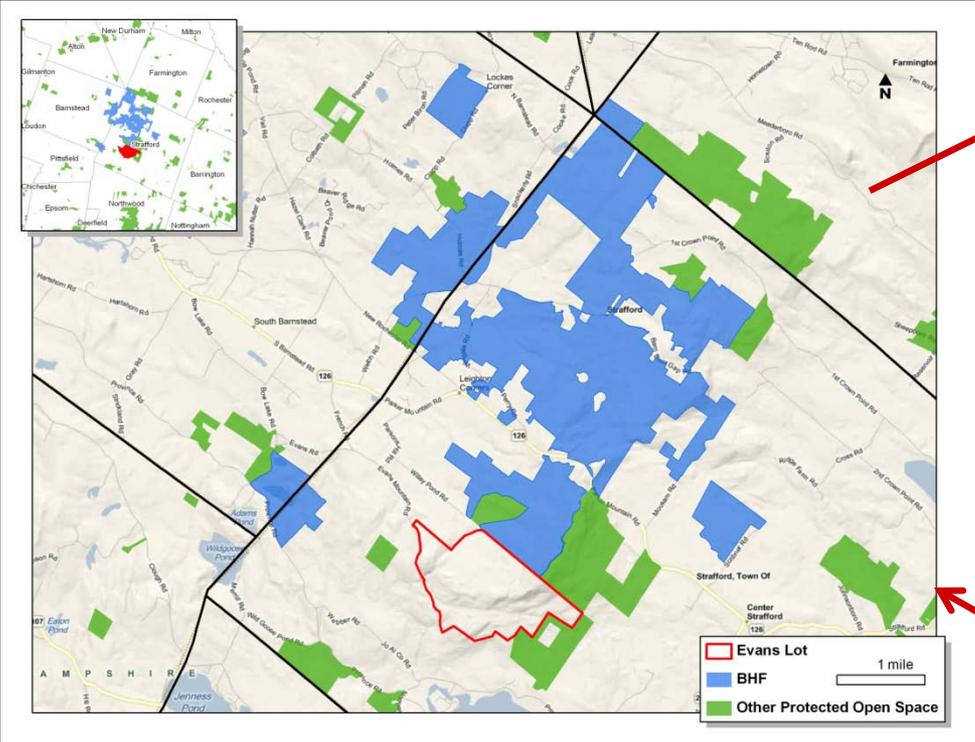
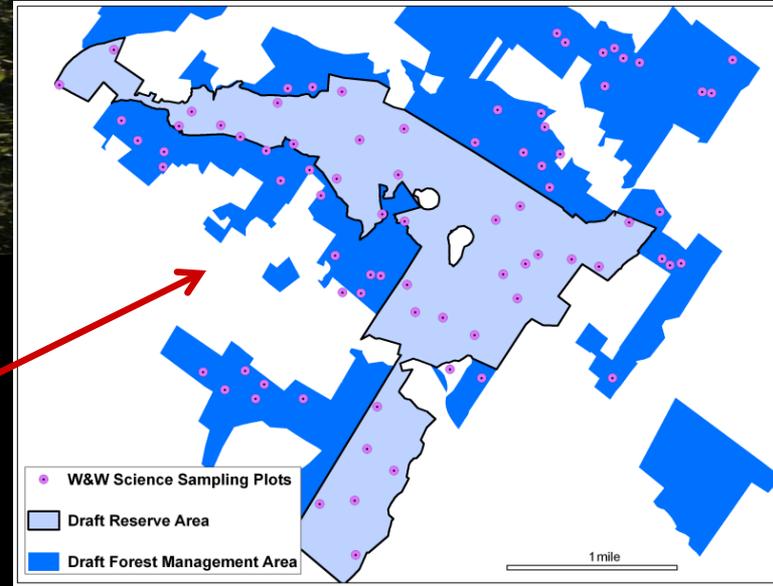
Future Hire

6-8 annually

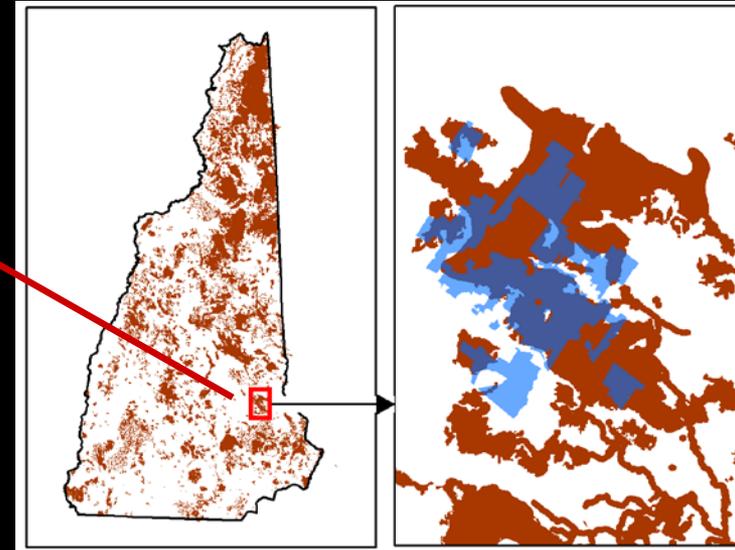
# Blue Hills Foundation Strafford, NH



### Draft Reserve Area and Science Plots



### Highly-Ranked Wildlife Habitat



- ~ 7,000 acres Private non-profit foundation
- >120 land transactions; Conservation Restrictions with NEFF SPNHF
- Reserve and science infrastructure based on W&W principles
- Advancing research and education with UNH and Harvard University

# Regional Conservation Partnerships

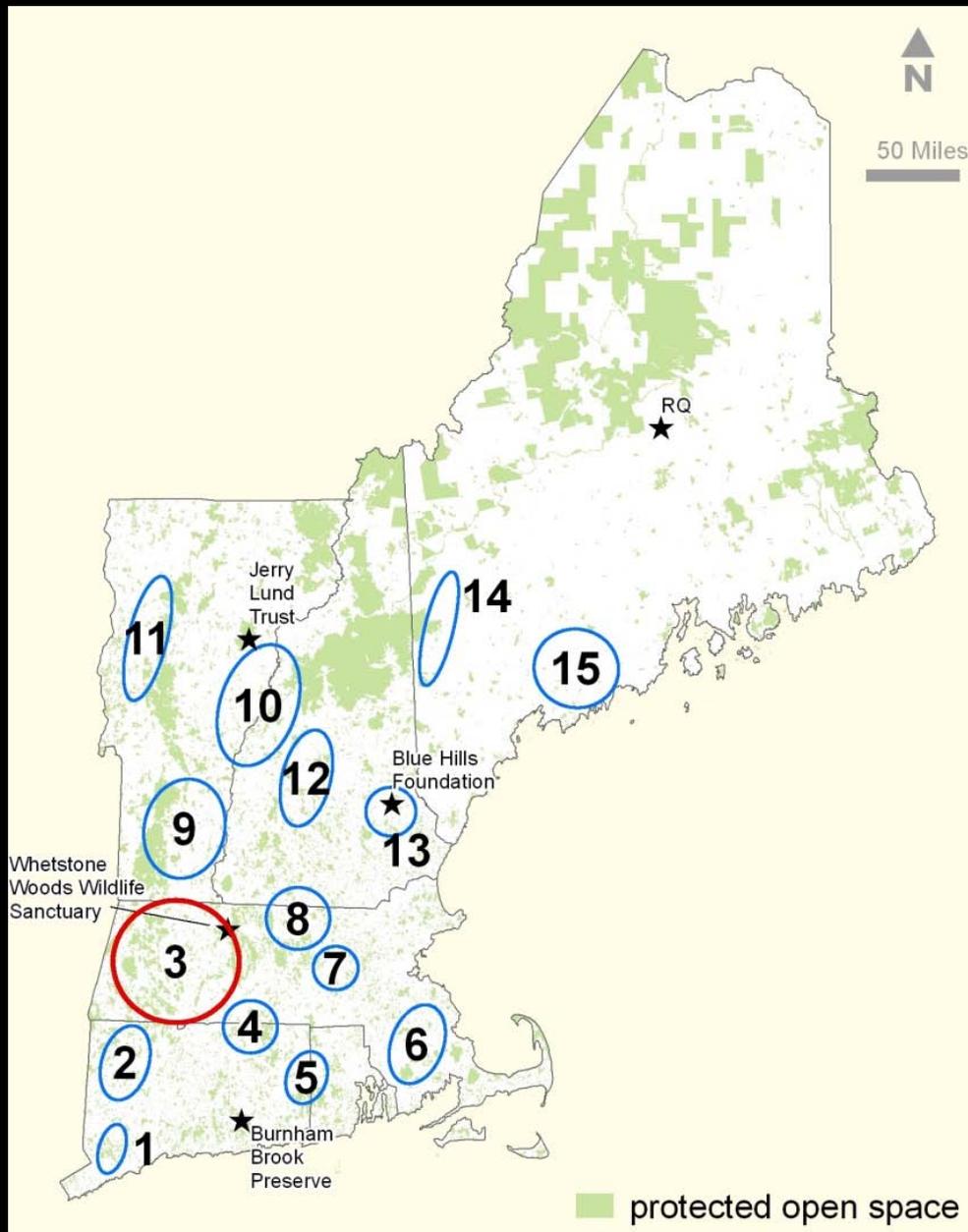


*W&W Partnership - more than 60 local and regional organizations and agencies*



# New England – Wide Conservation Aggregation

Bundling parcels for land protection to  
increase efficiency and attract funding



**NEW ENGLAND FORESTRY FOUNDATION**  
CONSERVING FORESTS *for* FUTURE GENERATIONS

**LandVest**<sup>®</sup>

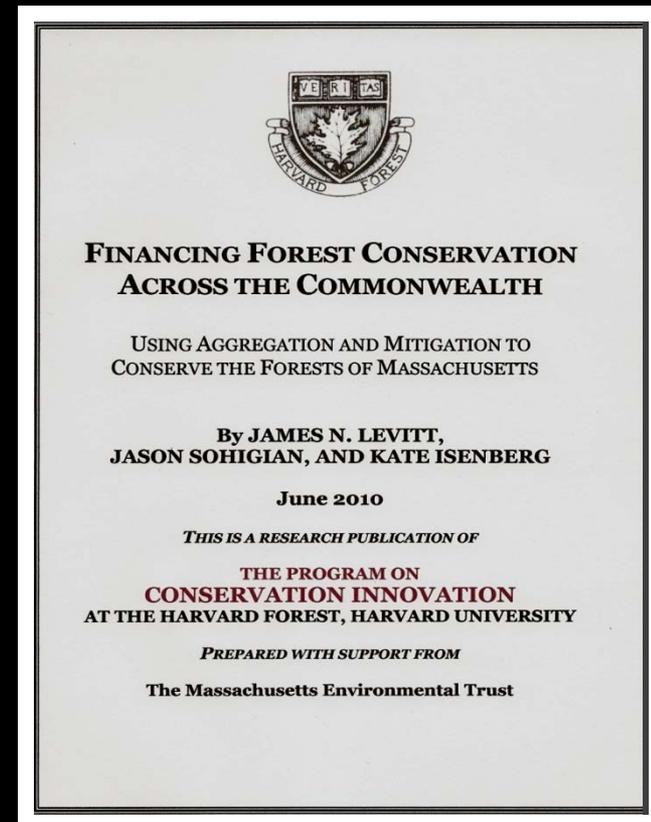
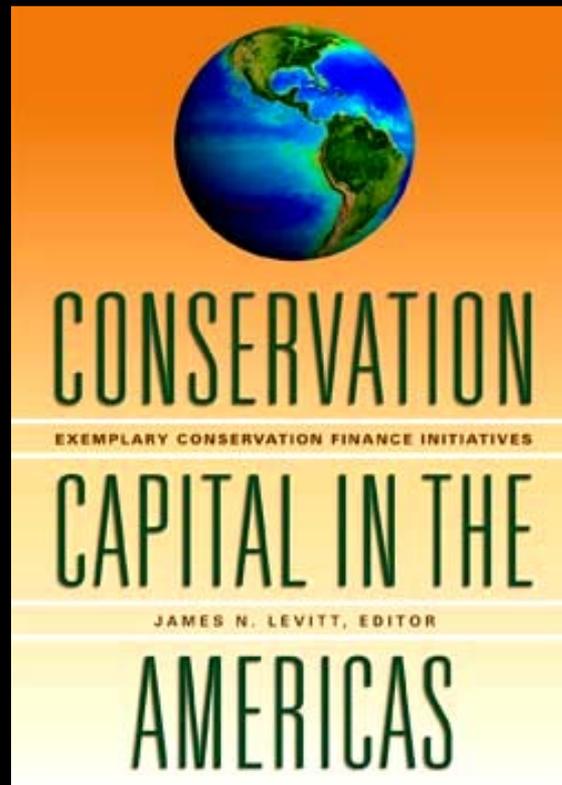
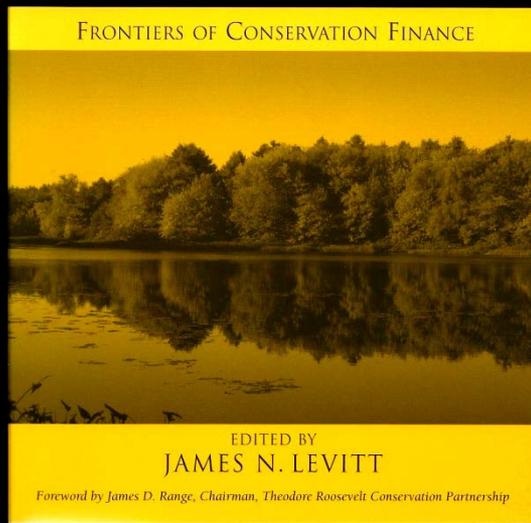
# Program on Conservation Innovation

Harvard Forest, Harvard University

Jim Levitt, Director

## Conservation Finance Initiatives

Collaborations with Highstead and The Lincoln Institute of Land Policy



# Program on Conservation Innovation

## Large Landscape-scale Conservation Initiatives

Collaborations with Highstead and The Lincoln Institute of Land Policy



**2011 Lincoln Institute Conservation Leadership Dialogue on  
The Future of Large Landscape Conservation in America  
Library of Congress, Washington, DC, March 2011**

Forthcoming at the  
Harvard Forest in late  
September 2011, the  
organizational meeting of:

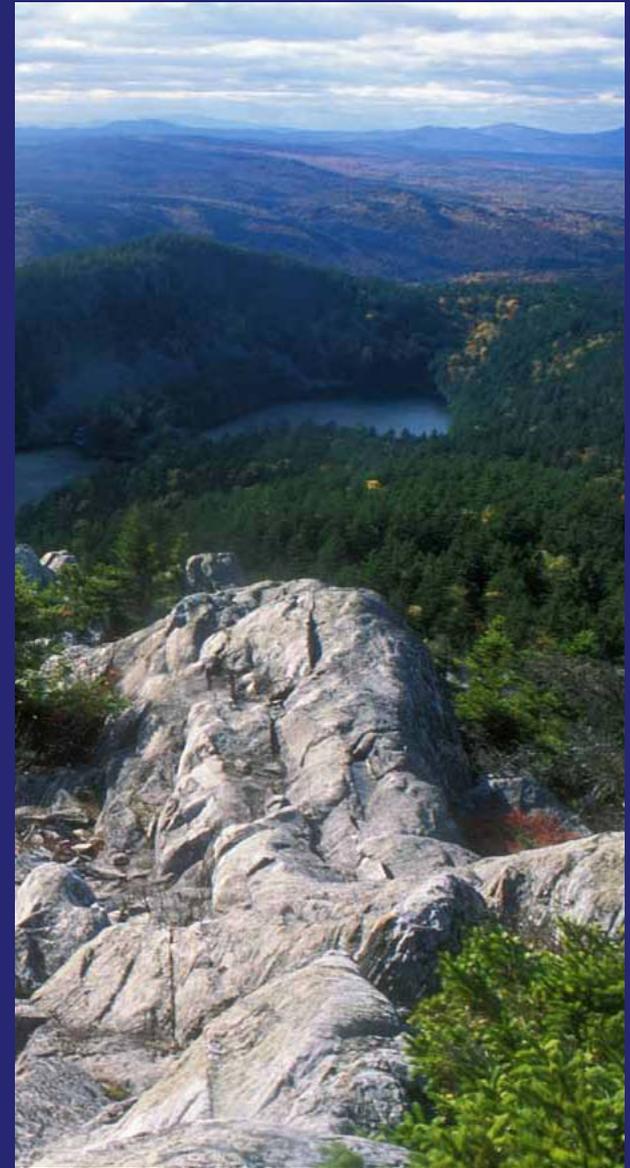
**PARCC**

(Program on Academic and  
Research Institutions as  
Conservation Catalysts )

# *Knowledge to Action*



The Science & Policy Integration Project at the  
Harvard Forest, Harvard University  
Project Director: Kathy Fallon Lambert



If science is to aid in the advance toward a resilient and sustainable society, we must experiment with more effective means of integrating ecological research and decision making.

(Driscoll, Lambert & Weathers 2011 *BioScience*)



## Land Use

Future Scenarios of Landscape Change  
in the United States

2011



Long-Term Ecological Research and Future Scenarios of Climate and Land-use Change



A Policy Agenda for Conserving  
New England's Forests  
Priorities for 2012

**PARTNERS:** 20 scholars, 60  
NGOs, Highstead,  
Smithsonian Conservation  
Biology Institute, LTER sites

## Air Pollution



Great Lakes Mercury Connections

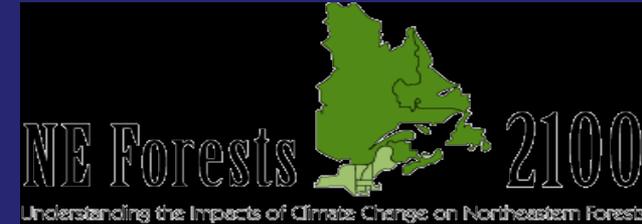
The Extent and Effects  
of Mercury Pollution  
in the Great Lakes Region

A publication of the Biodiversity Research Institute  
in partnership with the Great Lakes Commission  
and the University of Wisconsin-La Crosse



**PARTNERS:** Great Lakes  
Commission, Biodiversity  
Research Institute, Ecological  
Society of America

## Climate Change



## Science Communications

2010

National Science Foundation  
Long-Term Ecological Research Network  
Communications Strategy



LTER Ad Hoc Communications Committee  
Project Consultant – Kathy Fallon Lambert

7/16/2010

# Harvard Forest & Wildlands & Woodlands



