Challenges and Choices

The History and Future of New England's Forests
Canopy Nitrogen

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
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
Research Infrastructure

- Meteorological Station
- Field-based Wireless Network
- Diverse Permanent Plots & Large Long-term Experiments
- Fleet of Vintage Field Vehicles
- Greenhouses, Shade Houses, and Exp. Garden
- Electronic Data Archive & Real-time Data
- Microbial and Molecular Biology, Biogeochemistry, Plant Physiology, Soils, and Paleoecology Labs
- Herbarium of Local Flora
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
Massachusetts Long-term Forest Dynamics

Years Before Present

- Ragweed
- Chestnut
- Hickory
- Maple
- Beech
- Hemlock
- Oak
- Pine
- Spruce
Mid-Holocene Hemlock Decline

5000 Years BP

M. B. Davis – Biological Explanation

“Pathogen”

Single species, simultaneous across entire range

% hemlock pollen 6000 years ago

% hemlock pollen 4500 years ago

Hemlock decline
Abrupt Forest Dynamics With Climate Change & Disturbance

Regional Records
- West Mass
- Coastal Mass

Indicator of Drop in Water Table

Warm + Droughts (+Insects?)
Great Hurricanes

Hurricane Intensity

Fujita Scale

1620 1700 1800 1900
Hurricanes 1620 - 2010

Number of Storms

- 1
- 23

Maximum Damage

- No Damage
- Severe Damage
- Damage

Boose et al. 1994, 2001
Late Woodland Indian Population (ca. 1000 – 1600 A.D.)

Major groups, population centers, and trails

Population per square mile (Highly debated estimates)
At European Settlement New England was a Forested Land

Harvard Pisgah Tract 1910s

Dominated by Old Forests
Asian Long-horned Beetle Infestations in North America

Map Key:
- Orange: Maple Forest
- Green: Other Eastern Forests
- Red: Infestations

New England

Forest Cover and Population

1860s – Agriculture dominated

2010s – Forest dominated

2060 – ???

Thoreau
Wildlife Dynamics in the New England Landscape

Abundance Relative to Presettlement Level

Year

1600 1700 1800 1900 2000

1800

Black Bear

1600 1700 1800 1900 2000

Eastern Coyote

1990-2003

1850 - 1900

Gray Wolf
Bounties & Reports
1630-1860

1990 - 2003

Moose & Beaver

1990 - 2003

Forest

Bobolink Meadowlark

Deer

Wolf

Coyote

Grassland Birds

1850 - 1900

1990 - 2003

Eastern Coyote

1990-2003

1600 1700 1800 1900 2000

Year

Grassland Birds

1990-2003

1600 1700 1800 1900 2000

Year

Black Bear

1600 1700 1800 1900 2000

Year

Western Coyote

1990-2003

1600 1700 1800 1900 2000

Year

Black Bear
New Habitat for Moose in Oak Forest
Forests = Direct Economic Benefits
Forests = Critical Infrastructure

e.g., Quabbin Reservoir = Unfiltered water source for 40% of Massachusetts Population
Canopy Nitrogen Low
Canopy Nitrogen High
New England Forests

Globally important carbon storage and climate mitigation

New England Forests

Continental Connections

Globally important carbon storage and climate mitigation

Cumulative Carbon Storage (metric tons/hectare)

Carbon Uptake and Storage in a New England Forest

Record from Bill Munger & Steve Wofsy
Threats

Deforestation
Perforation
Degradation

Recent Population Change and Future Development of Forest Land


Projected Development of Forests (2000–2030)

- >5% loss
- 0–5% loss
- 0–5% gain
- 5–10% gain
- >10% gain
- Not shown: 2008 population less than 50 people

Percentage of private forest developed by 2030
- 40–63%
- 30–40%
- 21–30%
- < 21
Changes in Forest Ownership – Northern Maine

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

Copyright 2010 - James W. Sewall Co., Old Town, Maine
Two Remarkable Products of History

**Land Cover**

**Conserved Open Space**

Legend:
- Farmland
- Development
- Forest
- Water
- Land Protected from Development

Scale: 50 Miles
What can we do?
New England’s Conservation Capacity

Regional Landtrusts in Southern New England

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 came from the individual groups’ websites.
Petersham, Massachusetts

>60% Conservation Land

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

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

Well-managed forests permanently conserved

Changes in New England Timber Volume

<table>
<thead>
<tr>
<th>Year</th>
<th>Softwood</th>
<th>Hardwood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Available Timber (millions of cubic feet)
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

Forbes

Report: Forest cover declining across New England

The New York Times

New England Groups Plot to Save Their Dwindling Woodlands

By DINA FINE MARON at ClimateWise

New England Losing Forest Cover - Scholars Call for Accelerated Conservation

KENNEBEC JOURNAL

OUR OPINION: Developmental threat to forest can be mitigated

May 23

Study: Forests Declining Throughout New England

PPA Opinion

Our View: Shrinking forest should be cause for concern

May 21

Northwoods Sporting Journal

Memphis Business Journal

New England Losing Forest Cover - Scholars Call for Accelerated Conservation

The Sacramento Bee

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

National Science Foundation
WHERE DISCOVERIES BEGIN

Burlington FreePress.com

NEW ENGLAND SCIENTISTS CALL FOR FOREST CONSERVATION

May 7, 2010

By CANDACE PAGE, FREE PRESS STAFF WRITER - Thursday, May 20, 2010

The Boston Globe

Sunday October 10, 2010
THE GREEN ISSUE

Speaking for the trees
By Tom Horton

ctpost.com

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

Thursday, May 20, 2010

Report: Forest cover declining across New England

U.S. Politics Today

Northwoods Sporting Journal

Forests of Tomorrow

abc40

MEMPHIS BUSINESS JOURNAL

People You Know, News You Can Trust

nashuaTelegraph.com

Rolling back the forest canopy
After expanding for 150 years, New England woods are declining

Thursday, May 20, 2010

Report: Forest cover declining across New England
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 100th 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.
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

* indicates part-time position

Highstead Foundation is the regional conservation nonprofit advancing Wildlands & Woodlands Conservation in New England and Beyond.
Blue Hills Foundation
Strafford, NH

• ~ 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
Program on Conservation Innovation
Harvard Forest, Harvard University
Jim Levitt, Director

Conservation Finance Initiatives
Collaborations with Highstead and The Lincoln Institute of Land Policy

From WALDEN to WALL STREET
Frontiers of Conservation Finance
Edited by James N. Levitt
Foreword by James D. Range, Chairman, Theodore Roosevelt Conservation Partnership

CONSERVATION CAPITAL IN THE AMERICAS
Exemplary Conservation Finance Initiatives
James N. Levitt, Editor

FINANCING FOREST CONSERVATION ACROSS THE COMMONWEALTH
Using Aggregation and Mitigation to Conserve the Forests of Massachusetts
By James N. Levitt, Jason Sohigian, and Kate Isenberg
June 2010
This is a research publication of the program on Conservation Innovation at the Harvard Forest, Harvard University
Prepared with support from The Massachusetts Environmental Trust
Large Landscape-scale Conservation Initiatives
Collaborations with Highstead and The Lincoln Institute of Land Policy

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

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

Air Pollution

Great Lakes Mercury Connections

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

Climate Change

NE Forests 2100

Understanding the impacts of Climate Change on Northeastern Forests

PARTNERS: NE Forests 2100 – coalition of 50+ U.S. and Canadian scientists, U.S. Forest Service

Science Communications

A Policy Agenda for Conserving New England’s Forests

Priorities for 2012

Science & Policy Collaborations

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

Science Communications

National Science Foundation Long-Term Ecological Research Network Communications Strategy

2010
Harvard Forest & Wildlands & Woodlands