“Despite abundant evidence of historical human impacts across Puerto Rico and New England, the 1987 LTER proposals exclusively focused on natural ecological processes. Avoidance of history and humans was an act of deliberate grantsmanship.

Both groups concluded that research on humans would review poorly in the ecological community and would not be funded by NSF.”

*Conservation Lessons and Challenges from Ecological History*  
Forest History 2000
Foster LTER Mini-symposium
3/8/07
LTER Network - 2007
Integrated Science for Society and the Environment
ISSE

Flexible and Comprehensive Framework

Research
Synthetic and interdisciplinary; site, regional and interregional; historical

Education
Undergraduate, graduate and informal

Applications
Conservation, planning, natural resource management
Harvard Forest-Hubbard Brook-Plum Island
New England Regional Framework

Press & Pulse Drivers
- Land Use/Cover Change
  development, protection, harvesting
- Pollution
  CO₂, ozone, N dep.
- Climate variability
- Pests/pathogens
  hemlock woolly adelgid, invasive plants
- Natural disturbance
  hurricanes, ice storms

Ecosystem services
- Air quality, Water quality, Carbon storage, Timber, Food, Fuel, Recreation, Aesthetics

Biotic structure & composition
- Species, populations & communities
  Plants (native & exotic), fungi, microbes, wildlife (moose)

Ecosystem function
- 1°/2° production, nutrient cycling, decomposition, atmospheric exchange, hydrology

History

Human behavior
- Regulatory
- Market
- Institutional
- Individual

Human value & perception filter

Q1 Q2 Q3 Q4 Q5
“Historical Slinky”
ISSE with History

Holocene Dynamics

Deforestation

Agriculture

Reforestation

Sprawl

History/Legacies Affect Subsequent Iterations of the Loop

Foster LTER Mini-symposium
3/8/07
Reconciling Abrupt Vegetation Response with the Long-term Press of Climatic Drivers
Foster LTER Mini-symposium
3/8/07

Middle Archaic (7-5000 Yrs B.P.)
86 Sites

Late Archaic (5-3000 Yrs B.P.)
536 Sites

Early Woodland (3-1000 Yrs B.P.)
130 Sites
Hemlock Woolly Adelgid

Harvard Forest regional program initiated 1995

Hubbard Brook
Harvard Forest
IES
Delaware Water Gap
Shenandoah
Coweeta
Great Smokies

Range of Eastern Hemlock

Hemlock Woolly Adelgid Infestation

Foster LTER Mini-symposium
3/8/07
Hemlock Forest Dynamics

Critical Need for Integrated Studies:

- Coupled Human and Natural Systems
- Historical, and Modern
- Inter-site and Regional
- Terrestrial, Aquatic and Atmospheric
- Input to Management, Policy & Outreach
Carbon Uptake by New England Forests
Measured by Eddy Covariance at the Harvard Forest

Carbon Storage In Forests
Wildlife Dynamics in the New England Landscape

Foster et al. 2002
Bernardos et al. 2003

Moose
Beaver
Deer
Bear
Moose
Beaver
Coyote

Abundance Relative to Presettlement Level

1600 1700 1800 1900 2000
Historical ISSE as Context for Conservation

Forest Cover and Population Trends in New England

- Maine
- Vermont
- Massachusetts
- New Hampshire
- Rhode Island
- Connecticut
- New England population, % of 1990 pop

A Second “Hard” Deforestation

1880s – Agriculture dominated

1990s – Forest dominated

2050 – Both in Houses???
Wildlands and Woodlands

A Vision for the Forests of Massachusetts

2006

David Foster, David Kittredge, Brian Donahue, Glenn Motzkin, David Orwig, Aaron Ellison, Brian Hall, Betsy Colburn and Anthony D’Amato
Forests Provide Critical Infrastructure
For Us and Natural Processes
One Argument for Conservation Investment

Green Infrastructure - The Quabbin Reservoir Example

- Quabbin -- unfiltered drinking water for 40% of the Massachusetts
- 85% of the watershed is protected managed forest
- Filtration plant = $750 million, plus operation
- EPA – The forest filtration plant makes this unnecessary
Historical ISSE as Context for Education

• Lecture Series
• General Readership Volume
• Children’s Book
• Alumni Trips
• Field Exploration

• Landscapes and people through time
• Forest biology, diversity and function
• Nature as infrastructure
• Conservation history and future

“Reading and Conserving New England”

New Permanent and Traveling Exhibit -- 2009
New England Center for Ecological Synthesis

- Resources for scientists, students, and professionals in ecology & conservation
- Melding digital, document, and physical collections with long-term data
- Securing and distributing data & facilitating collaborative research & education

Harvard Management Group
David Foster, Emery Boose, Aaron Ellison, Julie Pallant

Advisory Committee

Ecology: Jerry Melillo, John Aber, Kathleen Donohue, Paul Moorcroft, Jim Hanken

Social Science: Billie Turner, Brian Donahue, Elizabeth Chilton, Dave Kittredge

Computer and Physical Science: Alyce Goodman, Lee Osterweil, Steve Wofsy

Library and Archival Science: Judy Warnement, Sheila Connor, Martha Mahard

Historical ISSE is all about Synthesis