
**NATIONAL COMMISSION ON SCIENCE FOR SUSTAINABLE FORESTRY (NCSSF)
2003 SCIENCE PROGRAM**
Application Form

A. Cover Page

Proposal Number and Title: **7 B1.1, Land use history impact on biodiversity – implications for management strategies in the northeastern United States**

Investigator name (Last, First, MI, Degree):
Litvaitis, John, A., PhD

Title: **Professor of Wildlife Ecology**

Applicant Institution and Department:
**University of New Hampshire
Department of Natural Resources**

Address:
**215 James Hall - UNH
Durham, NH 03824**

Telephone: **603-862-2094**
Fax: **-4976**
E-mail: **john@christa.unh.edu**

Signature:

Institutional Official to notify if awarded:
Andrew W. Shepard

Title: **Grant Administrator**

Institution:
University of New Hampshire

Address:
**Office of Sponsored Research
Room 111, Service Building - UNH
Durham, NH 03824**

Telephone: **603-862-2436**
Fax: **-3564**
E-mail: **andy.shepard@unh.edu**

Signature:

Other major investigators and key staff

Thomas D. Lee, Associate Professor of Plant Ecology, Department of Natural Resources, University of New Hampshire, Voice: 603.862.3791, Fax: -4976, e-mail: tom.lee@unh.edu

Mark J. Ducey, Assistant Professor of Forest Biometrics and Management, Department of Natural Resources, University of New Hampshire, Voice: 603.862.4429, Fax: -4976, e-mail: mjducey@cisunix.unh.edu

Lauren Howard, PhD Candidate, Department of Plant Biology, University of New Hampshire, Voice: 603.862.4523, e-mail: lhoward@unh.edu

NCSSF 2003 SCIENCE PROGRAM

Table of Contents

A. Cover Page	1
B. Abstract	2
C. Project Plan	3
D. Literature	10
E. Past Performance	11
F. Budget Table	12
G. Other Sources of Support	14
H. Biographical Sketches	19
I. Full Curriculum Vitae for Principle Investigator	24

B. Abstract

We propose to conduct a review of original vegetation and historic land uses, and current land-use trends in the northeastern United States, and identify how each major land use has affected the structure and composition of present-day forests. To establish the distribution and structure of natural communities in the Northeast around the time of European colonization, we will collate information from several sources, including reconstructions of natural vegetation based on early survey records, verbal descriptions of natural forest types made by travelers and residents of the colonial Northeast, and recent studies of sites that have not been substantially modified by human activities. Next, we will review how land-use patterns during the past 400 years have shaped the structure and composition of present-day forests. We will pay particular attention to modifications (e.g., urban developments and road networks) that may limit the restoration of baseline conditions. Finally, we will evaluate recent advances in silviculture that may be useful in restoring specific habitat elements and thus, provide a range of habitat conditions that is essential for maintaining regional biodiversity. We anticipate that our final report will include summaries and recommendations that consider at least three major features of forests in the Northeast: forest type, historic land use, and extent of habitat fragmentation. We will demonstrate that these features have an obvious influence on baseline conditions, current status of biodiversity, and our ability to support native communities with sustainable forestry. To achieve this, we have organized an interdisciplinary research team with expertise in forest management, plant community ecology, and wildlife ecology. This collaboration will provide an opportunity to include representation of our respective disciplines while focusing on a central theme. We believe that our unique combination of knowledge and experience with the topic should enable us to go well beyond a simple summary of existing information and result in a substantial contribution.

C. Project Plan

1. Introduction

Much of the work on landscape ecology and forest management to date has focused on a simplified model, representing the landscape as a dichotomous patchwork of “pristine” forests and managed areas. In such an approach, the “pristine” is viewed as normative, and a major goal of (or constraint to) forest management is the maintenance and restoration of pristine elements within the landscape matrix. Whether or not such an approach has merit, for example, in western National Forests, it may be of questionable value in eastern landscapes that already bear the imprint of centuries of settlement and culture. A more subtle view, recognizing the influence of history on forest management objectives, opportunities, and constraints, is needed.

Unlike other portions of the United States, forests have substantially increased in the Northeast during the last century. Historically, the majority of this region was cleared to accommodate colonial agriculture and the timber needs of a rapidly expanding population. Subsequent abandonment of many of these lands in the mid 1800s has resulted in extensive stands of second-growth forest, and the region now includes the most extensively forested states in the nation. For example, >80% of the land area of Maine and New Hampshire is covered by forests. However, recent FIA data suggest this trend is reversing, especially in southern and central New England, as suburban sprawl competes with traditional land uses.

Because the majority of plants and animals native to the Northeast are affiliated with forests, one might conclude that the abundant forests in this region provide adequate habitat for most taxa. However, the majority of the mid-successional stands that dominate the region lack important habitat features (e.g., large diameter trees, canopy gaps, and coarse woody debris). Additionally, species that require regenerating or mature stands may be experiencing habitat shortages. Left idle, it may take a century or more for the forests in this region to mature and develop the structural complexity and diverse age distributions they currently lack. Management of these forests is further complicated by a range of landscape modifications and ownership patterns that cannot easily be reconciled. Extensive suburban/urban developments with associated road networks have substantially fragmented the landscape and continuity. These modifications have altered community interactions, such as predation and competition, provided avenues for the invasion of aggressive alien species, and affected demographic processes (especially dispersal) among a variety of organisms.

It is clear that historic land-uses are having a wide range of influences on contemporary forest communities. A comprehensive understanding of these impacts is an essential first step in assuring that current levels of biological diversity will be maintained. This information should then be placed in the context of current land uses to develop realistic approaches for using silviculture to provide a range of habitats within forest ecosystems.

2. Approach and Methods

We propose to conduct a review of original vegetation and historic land uses, and current land-use trends in the northeastern United States and identify how each major land use has affected the structure and composition of present-day forests. We will focus on Ecoregions 221 (Eastern Broadleaf Forest Province) and M212 (Adirondack – New England Mixed Forest – Coniferous Forest – Meadow Province). Forests within these two ecoregions include an assortment of historic and present-day management activities. We will use this information to identify how sustainable methods of timber management may be implemented to rehabilitate present-day forests. To accomplish this goal, we propose the following:

Compare baseline to current forest conditions

a. Establishment of baseline conditions – Two aspects of pre-settlement conditions must be established: i) the distribution and abundance of natural forest types and ii) the natural disturbance regime for each major type. To establish the distribution and structure of natural communities in the Northeast around the time of European colonization, we will collate information from several sources. First, there are a number of reconstructions of natural vegetation based on early survey records (e.g., Cogbill et al. 2002), though these are focused on the northern part of the region. Although such studies might not provide precise species identification and a true random sample of vegetation, they can coarsely characterize forest structure and distribution. These surveys also provide information about disturbance regimes, as particular tree species (and assemblages of them) often serve as indicators of fire, windstorms, or even lack of disturbance. Next, there also are verbal descriptions of natural forest types made by travelers and residents of the colonial Northeast. Some of these descriptions have already been collated (e.g., Cronan 1983) and these will be reviewed. Finally, some parts of the region, especially in the mountains of northern New York and New England, contain landscapes relatively undisturbed by humans, and these have been studied quantitatively by foresters and

ecologists (e.g., Foster and Reiners 1983). These studies provide detailed information, not only on the structure and composition of primary communities, but also on the physical disturbance regimes and biotic interactions that maintain them (e.g., Foster 1988). Disturbances within the region range from extensive but low-frequency wildfires and hurricanes, to high-frequency but low-intensity losses of individual canopy trees (or small groups of them) due to wind or disease (Lorimer and White 2003). The synthesis of these information sets will yield an approximation of major forest age classes (regenerating, mid-successional, and mature/old growth) as well as age structure (even- versus multi-age) prior to human modifications.

b. Human impacts since 1600 – It is widely accepted that forests covered the majority of the northeastern United States at the time of European colonization. With settlement and population expansion, transformation of these forests began. Human impacts on forest vegetation are well-known for most forest types. Most areas in the Northeast were initially deforested, but land uses diverged thereafter. Different areas were subjected to agriculture (including either cropping or grazing), continued forest harvest, urbanization or suburbanization. In some areas the frequency and intensity of natural disturbances, especially fire and flooding, were altered by human activities and policy. Fire frequency has increased sharply in some areas whereas it has decreased in others.

Since about 1870, many agricultural lands have been abandoned and left to revert to natural, usually forest communities. Resulting from this dramatic change in land use, was an obvious “successional wave” that is still apparent in much of the region (Fig. 1). Many of these second-

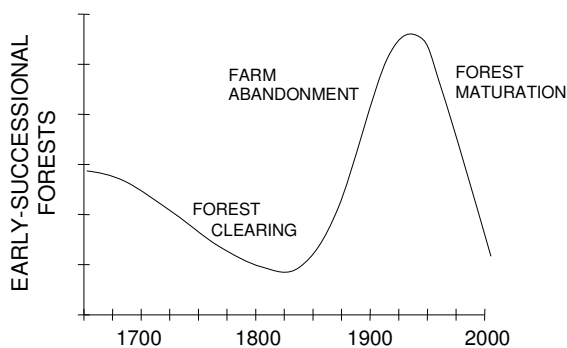


Figure 1. Temporal variation in the abundance of early-successional habitats in the northeastern United States (modified from Litvaitis 1993).

growth forests have matured into mid-successional stands. As a result, regional forests are

characterized by a distorted age distribution where important habitat elements are in short supply, including:

- Large diameter trees that function as dens, roosts, and nest sites.
- Course woody debris that functions as a habitat component or creates a microclimate used by a variety of vertebrates and invertebrates.
- Canopy gaps that enhance local structure and species diversity.

The majority of terrestrial vertebrates in the Northeast rely on a combination of early-, mid-, and late-successional stands. Yet there are some species that clearly depend more on specific seral stages. In recent decades, species dependent on young stands have become increasingly scarce. At the same time, species dependent on mature and old-growth stands are essentially represented by relics that escaped human alteration or clearing. As a result, restoration of a more balanced age distribution has become of increasing importance.

In addition to the obvious influence on forest age distributions, historic land uses have also contributed to a modification in local plant species composition. This modification seems to be related to changes that occur in forest soils that occur when vegetation is removed and soils are plowed for row crops. Accumulating evidence suggests that these changes in soils can persist for centuries and have direct implications on the restoration of native communities and encroachment by exotic species (e.g., Foster et al. 2003). We propose to assemble information on current community composition and structure from published forest inventories and ecological studies. These results will be sorted by forest type and land use history, so that the relationship between present-day and original forests can be clearly established (e.g., Bellemare et al. 2002).

c. Consequences of human impacts on forest ecosystems and their management — Forests in the Northeast are embedded in a variety of landscapes, ranging from rural to intensely-developed urban centers. Additionally, the ownership patterns among non-industrial forests also varies tremendously. These parameters will have a definite influence on the local biota and our ability to sustain it. Therefore, we envision a need to provide foresters with guidelines and recommendations for incorporating the characteristics of the physical and cultural landscape into their forest management plans. Such an approach will acknowledge that the natural range of variability in forest composition and structure may be an appropriate goal, but this goal can be

modified in response to present-day landscape configurations and ownership patterns while still addressing issues of sustainability.

Our attempts to make objective “current versus historic comparisons” cannot overlook the dramatic changes that have occurred in portions of the Northeast that cannot be easily reversed or reconciled. These include the elimination of prominent plants [e.g., chestnut (*Castanea dentata*)] and animals (especially large predators), and the fragmentation of natural habitats by urban/suburban developments, dense road networks, and agricultural fields. As a result of these changes, restoration to baseline conditions may not be achievable or even an appropriate goal for some regions (Litvaitis 2003).

We propose to stratify major forest regions using some index of habitat integrity or continuity. Although there are a number of parameters that could be considered (e.g., average stand size), we plan to use road densities to partition major forest types into categories of fragmentation (e.g., nearly continuous to severely fragmented) because this feature is correlated with a number of human-land uses that affect community processes and functions (Forman et al. 2003).

Information on road densities has become readily available (e.g., U.S. Census Bureau TIGER data sets – Heilman et al. 2002). In addition to affecting such processes as dispersal of plants and animals and vulnerability to invasive organisms, we suspect that road densities will also be highly correlated with ownership fragmentation (parcelization). This feature has obvious ramifications on the involvement of private land owners in forest management and should be considered when evaluating programs designed to provide a range of forest habitats.

Identify silvicultural techniques that may be able to restore a range of forest habitats

There is increasing movement toward using natural disturbance regimes as a guide for silvicultural treatments in managed forests (Attiwill 1994, Lindenmayer and Franklin 2002, Seymour et al. 2002). Natural disturbances may be an appropriate reference because these are the conditions that forest-dwelling plants and animals evolved with. Within the Northeast, available information indicates that pre-Columbian disturbance regimes varied substantially among major forest types. For example, the dry, sandy soils of coastal areas were characterized by regular and often large-scale disturbances, including fires and hurricanes (Lorimer and White, 2003). In contrast, the most prevalent natural disturbances among inland oak-pine, northern hardwood forests were frequent, but very restricted. Disturbance events (including windthrows and insect or pathogen outbreaks) killed individual trees or a small group of trees, and resulted in

small canopy gaps. From this overview, it is obvious that efforts to modify silvicultural methods should differ among forest types.

The literature on the ability or inability of silvicultural techniques to maintain, enhance, or restore forest structural and compositional features is conflicting and often contentious (*e.g.*, Franklin *et al.* 2002). Much is also conceptual, and better tied to ideas about stand development than to concrete, management-oriented studies. We will review published studies for forests in the Northeast and other regions as appropriate. These will be identified through exhaustive database and bibliographic searches. To assist in reconciling conflicting reports, we will examine the following issues:

- What structural and compositional features does the study address, and how have these been defined?
- What silvicultural or management techniques are being assessed (*e.g.* slash disposal, levels of utilization, green-tree retention) and how were they implemented?
- If the study presents original field work, is the study design and data analysis sound (adequate true replication, appropriate statistical analysis)?
- Is the study observational, or experimental?
- Does the study address economic issues associated with the management techniques?
- Does the study take a static view of stand structure, or does it address stand dynamics through time?
- Is the study strictly empirical, or does it address a generalizable question?

We expect some patterns to emerge from this review. We also expect to identify strong assertions and significant knowledge gaps. Where a consensus can be identified, we will do so. Where considerable disagreement remains, and where this cannot be resolved by examining well-designed and analyzed field trials, we will clearly identify the research questions most relevant for management.

We anticipate that our final report will include summaries and recommendations that consider at least three major parameters that will influence management activities: forest type, historic land use, and extent of habitat fragmentation. As we have indicated, these features have an obvious influence on baseline conditions, current status, and our ability support native communities with sustainable forestry.

3. Deliverables

In addition to a final report and Power Point presentation summarizing our investigation, we will produce at least one summary manuscript that will target a broad audience and be submitted to the *Journal of Forestry*. Additionally, we will participate in several regional conferences, including the annual meetings of the *New England Chapter of SAF* and *Northeast Section of The Wildlife Society*. The total audience that we will reach will likely exceed 1,000. We will also develop a web site that will summarize major findings and provide additional reference materials for practicing foresters. This approach is proving to be an extremely effective approach for contacting foresters and motivated landowners.

4. Timeline

2003-2004

Activity	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NCSSF meeting	xxx												xxx
Literature review	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx					
Progress report						xxx							
Web site established									xxx				
SAF presentation										xxx			
TWS presentation											xxx		
J. Forestry paper											xxx		
Final report												xxx	
Power Point slide show												xxx	

5. Resources

Each of the investigators has been involved with a number of outreach programs. We regularly assist with workshops and conferences, including those hosted by Cooperative Extension. Additionally, Dr. Litvaitis is currently involved with a group of ecologists and natural resource specialists that are developing a set of guidelines for managing native shrublands and early-successional habitats in the Northeast. This affiliation will provide an obvious conduit for disseminating information.

D. Literature

Attiwill, P.M. 1994. The disturbance of forest ecosystems: the ecological basis for conservation management. *Forest Ecology and Management* 63:247-300.

Bellemare, J., G. Motzkin, and D. R. Foster 2002. Legacies of the agricultural past in the forested present: An assessment of historical land use effects on mesic rich forests. *Journal of Biogeography* 29:1401-1420.

Cogbill, C. V., J. Burk, and G. Motzkin. 2002. The forests of presettlement New England USA: Spatial and compositional patterns based on town proprietor surveys. *Journal of Biogeography* 29: 1279-1304.

Cronon, W. 1983. Changes in the land. Indians, colonists, and the ecology of New England. Hill and Wang, New York, New York.

Forman, R.T.T. et al. 2003. Road ecology. Island Press, Washington,DC.

Foster, D. R. 1988. Disturbance history, community organization and vegetation dynamics of the old-growth Pisgah Forest, south-western New Hampshire, U.S.A. *Journal of Ecology* 76:105-134.

Foster, D.R., F. Swanson, J. Aber, I. Burke, N. Brokaw, D. Tilman, and A. Knapp. 2003. The importance of land-use legacies to ecology and conservation. *BioScience* 53:77-88.

Foster, J. and W. Reiners. 1983. Vegetation patterns in a virgin subalpine forest at Crawford Notch, White Mountains, New Hampshire. *Bulletin of the Torrey Botanical Club* 110:141-153.

Franklin, J.F., T.A. Spies, R. Van Pelt, A.B. Carey, D.A. Thornburgh, D.R. Berg, D.B. Lindenmayer, M.E. Harmon, W.S. Keeton, D.C. Shaw, K. Bible and J. Chen. 2002. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. *Forest Ecology and Management* 155: 399-423.

Heilman, Jr., G.E., J.R. Strittholt, N.C. Slosser, and D.A. Dellasala. 2002. Forest fragmentation of the conterminous United States: assessing forest intactness through road density and spatial characteristics. *BioScience* 52:411-422.

Lindenmayer, D.B., and J.F. Franklin. 2002. Conserving forest biodiversity – a comprehensive multiscaled approach. Island Press, Washington, DC.

Litvaitis, J.A. 1993. Response of early successional vertebrates to historic changes in land use. *Conservation Biology* 7:866-873.

Litvaitis, J.A. 2003. Are pre-Columbian conditions relevant baselines in managed forests of the

northeastern United States? *Forest Ecology and Management*: In revision.

Lorimer, C.G., and A.S. White. 2003 Scale and frequency of natural disturbances in the northeastern United States: implications for early-successional forest habitat and regional age distributions. *Forest Ecology and Management* : In revision.

Seymour, R.S., A.S. White, and P.G. deMaynadier. 2002. Natural disturbance regimes in northeastern North America – evaluating silviculture systems using natural scales and frequencies. *Forest Ecology and Management* 155:357-367.

E. Past Performance

Mr. Michael Amaral
New England Field Office
U.S. Fish and Wildlife Service
70 Commercial St., Ste 300
Concord, NH 03301
Tel. 603.223.2541 Fax 603.223.0104, E-mail: Michael_Amaral@fws.gov

Dr. Litvaitis is involved with a regional survey of the conservation status, population centers, and potential restoration sites of New England cottontails. This project requires periodic progress reports, workshop organization, and frequent consultation with cooperators.

Dr. Walter Jakubas
Maine Department of Inland Fisheries and Wildlife
Bangor, ME 04401, USA
Tel. 207.941.4440, E-mail: Walter.Jakubas@state.me.us

Dr. Litvaitis recently completed a contracted study with the Maine Department of Inland Fisheries and Wildlife. This project required periodic progress reports, final report, and manuscript submissions.

F. Budget

Project Timeframe: 12 months

A. Personnel	%Effort/year	Salary/yr	Fringe/yr	Subtotal/yr	Subtotal/project life
1. J. A. Litvaitis	10%	\$6,121	\$502	\$6,623	\$6,623
2. T. Lee	10%	\$6,347	\$520	\$6,867	\$6,867
3. M. J. Ducey	7%	\$3,317	\$272	\$3,589	\$3,589
4. L. Howard	100%	\$17,000	\$1,394	\$18,394	\$18,394

Personnel Total: \$35,473

B. Consultants (By individual with fully loaded rates x days of work)

Consultants Total: \$0.00

C. Services and Supplies (No office equipment or computers)

1. Web site development	\$2,000
2. Miscellaneous supplies	\$500

Services and Supplies Total: \$2,500

D. Travel (By trips)

1. Visit university archives and special collections (up to 5 trips)	\$1,000
2. Presentation at annual meeting of New England SAF	\$200
3. Presentation at annual meeting of Northeast Section of the Wildlife Society	\$200
4. Attend June 2004 meeting of NCSSF	\$1,100

Travel Total: \$2,500

E. Other Expenses (Be specific – no general equipment)

Other Expenses Total: \$0.00

TOTAL DIRECT COSTS/project life: \$40,473

F. Indirect Charges - Not to exceed 10% of direct costs

(@10%)

TOTAL INDIRECT COSTS/project life: \$4,047

TOTAL: \$44,520

Budget Explanation

Project personnel -- In addition to the three primary investigators, we believe that a post-doctoral associate is essential given the large amount of literature that will be reviewed. We anticipate that this person also will visit several universities in the Northeast to review material in archives and special collections.

Services and supplies -- We plan to provide a detailed summary of our report and associated links to other sources of information on a web site to assist forest managers and landowners as they consider and development management plans. This web site will be affiliated with an existing site that will soon contain the papers associated with a recent conference on early-successional forests and native shrublands, and a guide for land managers on the same topic.

Travel -- In addition to traveling to special library collections, we have budgeted travel funds to support presentation of our results at regional conferences of the *Society of American Forests* and *The Northeast Section of the Wildlife Society*. This will assure that our results will be available to a large proportion of the land managers and decision makers within the region.

G. Other Sources of Personnel Support:

John A. Litvaitis (50% of time directed toward research, 10% of time directed toward NCSSE project)

1. U.S. Fish and Wildlife Service
 2. Status, Population Centers, and Restoration Sites of New England Cottontails
 3. 12/15/01-12/31/04
 4. Principal Investigator
 5. \$66,000 (total project)
 6. Fully funded
 7. Survey includes inventory of early-successional forests
-
1. Fish and Wildlife Agencies of Vermont, New Hampshire, and Massachusetts
 2. Regional Status of New England Cottontails
 3. 1/1/02 – 12/21/03
 4. Principal Investigator
 5. \$20,000 (total project)
 6. Fully funded
 7. Not related
-
1. New Hampshire Agricultural Experiment Station, MS-26
 2. Landscape Features Affecting Dispersal Among Remnant Populations of New England Cottontails
 3. 10/1/01 – 9/30/04
 4. Principal Investigator
 5. \$30,000 (total project)
 6. Fully funded
 7. Investigating ability forest wildlife to persist where current landscape composition may hinder gene flow.
-
1. VHB Associates
 2. Status of New England Cottontails Along the Planned Expansion of Interstate 93
 3. 1/15/03 – 6/15/03
 4. Principal Investigator
 5. \$13,000 (total project)
 6. Fully funded
 7. Not related
-
1. USDA National Research Initiative
 2. Understanding and Limiting the Effects of Invasive Shrubs in Early-Successional Habitats
 3. 9/1/03 – 8/31/05
 4. Principal Investigator
 5. \$75,000 (total project)

6. Pending
7. Original research to identify factors that may influence vulnerability of managed forests to colonization by invasive plants.

Thomas D. Lee (30% of time directed toward research, 10% of time directed toward NCSSF project)

1. New Hampshire Agricultural Experiment Station, MS-40
2. Disturbance regimes and succession in pine barrens and transition hardwoods.
3. 10/2001-9/2004
4. Co-Principal Investigator
5. \$6,500 plus investigator and graduate student support.
6. Fully funded.
7. Original field research on disturbance and succession and their relation to plant diversity.

1. McCabe Fund of the New Hampshire Charitable Foundation.
2. Effects of sheep grazing on vegetation under power lines.
3. 11/11/02-11/10/03
4. Principal Investigator
5. \$10,000 (total project)
6. Fully funded.
7. Original field research on the use of sheep to maintain early successional vegetation.

1. John Merck Fund
2. Effects of sheep grazing on vegetation under power lines.
3. 6/1/02 to 5/31/03
4. Principal Investigator
5. \$30,000 (total project)
6. Fully funded
7. Original field research on the use of sheep to maintain early successional vegetation.

1. Prospect Hill Fund
2. Effects of sheep grazing on vegetation under power lines.
3. 5/1/02 to 4/30/03
4. Principal Investigator
5. \$50,000 (total project)
6. Fully funded
7. Original field research on the use of sheep to maintain early successional vegetation.

1. Public Service Company of New Hampshire, Hooksett, N.H
2. Effects of mowing on vegetation under power lines.
3. 6/1999 to 5/2004
4. Co-Principal Investigator
5. \$39,000 (total project)
6. Fully funded

7. Original field research on the use of mechanical mowing to maintain early successional vegetation.

1. Carroll Brown
2. Atlantic white-cedar dynamics at Brown Mill Pond, Rye, NH
3. 10/1998-10/2003
4. Principal Investigator
5. \$15,000 (total project)
6. Fully funded
7. Original field research on structure, dynamics, and regeneration of Atlantic white-cedar populations.

1. Public Service Company of New Hampshire, Hooksett, N.H (pending)
2. Effects of sheep grazing on vegetation under power lines.
3. 4/2003 to 3/2004
4. Co-Principal Investigator
5. \$7,338 (total project)
6. Pending
7. Original field research on the use of sheep to maintain early successional vegetation.

Mark J. Ducey (50% of time directed toward research, 7% of time directed toward NCSSF project)

1. NASA LBA-Ecology, CD-17
2. Calibration, Validation and Parameterization of a Forest Regrowth Model for the Eastern Amazon
3. 8/31/01-8/31/04
4. Principal Investigator
5. \$266,000
6. Fully funded.
7. Not related.

1. USDA National Research Initiative
2. Efficient Methods of Sampling Coarse Woody Material
3. 8/31/00-8/31/03
4. Principal Investigator
5. \$61,000
6. Fully funded.
7. Original field research on silviculture and measurement of structural legacies in New England forests.

1. Interagency Fire Panel
2. Fire Management Options for Controlling Invasive Woody Species
3. 9/1/00 to 9/30/03
4. Collaborator

5. \$138,000 (total project)
 6. Fully funded
 7. Field research on impacts of management and land use history on composition and invasion of New England forests; restoration silviculture
-
1. New Hampshire Agricultural Experiment Station, MS-44
 2. Structure and Dynamics of New Hampshire Forests
 3. Continuing
 4. Principal Investigator
 5. \$9,000 plus investigator and graduate student support
 6. Fully funded
 7. Original field research on stand dynamics of New England forests
-
1. USDA National Research Initiative, pending
 2. Efficient Methods of Sampling Coarse Woody Material – Renewal
 3. 9/1/03-8/31/06
 4. Principal Investigator
 5. \$114,000
 6. Pending
 7. Original field research addressing silviculture and measurement of structural legacies in Northeastern forests.
-
1. Interagency Fire Program, pending
 2. Comparison of Combustion Characteristics in Wildland-Urban Interface Vegetation
 3. 10/1/03-9/30/06
 4. Co-Investigator
 5. \$292,500 (total project)
 6. Pending
 7. Original field research addressing invasion of forested habitats and consequences for fire as a silvicultural tool.
-
1. Environmental Protection Agency, pending
 2. Integrated Multifactor Classification of Northeastern Watersheds
 3. 7/01/03-6/30/06
 4. Co-Investigator
 5. \$284,000 (total project)
 6. Pending
 7. Impacts of forests, forest management, and other land uses on water quality, quantity, and biological integrity
-
1. National Science Foundation, Ecosystems, pending
 2. Collaborative Research: The Northeastern Carbon Sink: Enhanced Growth, Regrowth, or Both?
 3. 7/01/03-6/30/06
 4. Investigator

5. \$61,000
6. Pending
7. Analysis and modeling of historical data on growth and compositional changes in Northeastern forests.

Lauren Howard (100% for 6 months directed toward this project)

H. Biographical Sketch:

Dr. John A. Litvaitis

Professor

Department of Natural Resources

University of New Hampshire

Durham, NH 03824

Education

University of New Hampshire, 1972-1975. B.S. in Wildlife Management.

Oklahoma State University, 1976-1978. M.S. in Wildlife Ecology. Thesis: Movements and habitat use of coyotes on the Wichita Mountains National Wildlife Refuge.

University of Maine, 1980-1984. PhD in Wildlife Management. Dissertation: Bobcat movements in relation to prey density.

Recent Research and Professional Experience

Professor of Wildlife Ecology, University of New Hampshire, 1998 to present.

Guest Editor for Forest Ecology and Management. 2002-2003.

Organizer and Host of a Regional Conference (Shrublands and early-successional forests of the northeastern United States: critical habitats dependent on disturbance). Spring 2002.

Visiting Scientist: While on sabbatical leave visited researchers involved with habitat-based research in Aiken, SC; Ashford, England; Corvallis, OR; Bialowieza, Poland; and Kaunas, Lithuania to develop case studies in managing wildlife habitats for undergraduate text on wildlife habitats. Spring 2001.

Coordinator and Host of the 80th Annual Meeting of the American Society of Mammalogists. Spring 2000.

Associate Editor of the Journal of Mammalogy. 1997-2000.

Editor of Northeast Wildlife. 1995-2000.

Visiting Scientist: Visited researchers involved with landscape-based investigations on populations of wild vertebrates at Doñana Biological Station, Seville, Spain; Institute of Ecosystem Studies, Millbrook, NY; Grimsö Wildlife Research Station, Riddarhyttan, Sweden; and Institute of Ecology, Vilnius, Lithuania. Spring 1994.

Associate Professor of Wildlife Ecology, University of New Hampshire, 1990-1998.

Assistant Professor of Wildlife Ecology, University of New Hampshire, 1985-1990.

Research and Outreach Accomplishments

Dr. Litvaitis has over 50 peer-reviewed publications on a wide-range of wildlife species and their habitats. For more than a decade, he has been investigating the implications of historic and current land uses on forest wildlife. His current efforts are directed toward understanding the role of disturbance-dependent habitats and how human activities (especially timber harvests) can be used to sustain these habitats. He has participated in a number of professional and lay meetings on forest wildlife, and recently organized a conference to discuss the importance of early-successional habitats and native shrublands to regional biological diversity (web site = <http://www.unh.edu/thicket/>). Papers from this conference have been prepared for a special issue of *Forest Ecology and Management*.

Relevant publications

- Litvaitis, J.A. 1993. Response of early successional vertebrates to historic changes in land use. *Conservation Biology* 7:866-873.
- Litvaitis, J.A., D.L. Wagner, J.L. Confer, M.D. Tarr, and E.J. Snyder. 1999. Early successional forests and shrub-dominated habitats: land-use artifact or critical community in the northeastern United States. *Northeast Wildlife* 54:101-118.
- Litvaitis, J.A. 2001. Importance of early-successional habitats to mammals in eastern forests. *Wildlife Society Bulletin* 29:466-473.
- Litvaitis, J.A. 2003. Are pre-Columbian conditions relevant baselines in managed forests of the northeastern United States? *Forest Ecology and Management*: In revision.
- Litvaitis, J.A. 2003. Shrublands and early-successional forests of the northeastern United States: critical habitats dependent on disturbance. Preface to special issue of *Forest Ecology and Management*. In revision.

Recent collaborators

Joseph Chapman, John Confer, Richard DeGraaf, Serita Frey, Thomas Maier, David Wagner, Mariko Yamasaki

Dr. Thomas D. Lee

Associate Professor
Department of Natural Resources
University of New Hampshire
Durham, NH 03824

Education

State University of New York, College of Environmental Science and Forestry, 1969-1973. B.S. in Forest Biology.

University of Alberta, 1973-1976. M.Sc. in Botany. Thesis: Gradient analysis of bryophytes in Jasper National Park, Alberta.

University of Illinois, 1976-1980. Ph.D. in Plant Biology awarded May, 1980. Dissertation: Extrinsic and intrinsic factors controlling reproduction in an annual plant.

Recent Research and Professional Experience

Associate Professor of Forest Ecology, University of New Hampshire, 2001- present.

Associate Professor of Plant Biology, University of New Hampshire, 1986 - 2001.

Visiting Scientist, Institute of Ecosystem Studies, Millbrook, NY, Spring, 1989.

Assistant Professor, University of New Hampshire, 1980 - 1986.

Research and Outreach Accomplishments

Dr. Lee has 23 peer-reviewed research papers published or accepted in ecological, botanical, or forestry journals; has authored or co-authored 11 research reports and book chapters; and has edited a book on New Hampshire's biodiversity. He currently serves as Co-Principal Investigator of two research programs, both of which are related to the proposed work. One project investigates the relationship of natural and human disturbance and succession to plant diversity, the other examines the use of herbivores (sheep) to maintain early successional vegetation. Dr. Lee serves on the Core Team of the New Hampshire Living Legacy Project, a collaborative state-private effort seeking to maintain the native biodiversity of that state.

Mark J. Ducey

Assistant Professor and Forestry Program Coordinator
Department of Natural Resources
University of New Hampshire
Durham, NH 03824

Education

Yale College, 1986 to 1990. B.A. summa cum laude with distinction in Classical Civilization. Senior thesis: The Development of the Concept of Progress in Ancient Greece.

Yale School of Forestry and Environmental Studies, 1990 to 1992. M.F.S. in Forest Hydrology and Watershed Management (non thesis). Major research in climate change, forest decline, and application of GIS technology to hydrology and land use planning.

Yale University, 1992 to 1996. Ph.D. in Forestry awarded December, 1996. Dissertation: Scale and Structure in Forest Response to Climatic Change.

Recent Research and Professional Experience

Assistant Professor, Forest Biometrics and Management, University of New Hampshire, 1998-present; Forestry Program Coordinator, 2001-present.

Visiting Research Assistant Professor, Forest Biometrics, North Carolina State Forest Nutrition Cooperative, North Carolina State University, 1997.

Visiting Assistant Professor, Nicholas School of the Environment, Duke University, Fall 1997.

Lecturer, Forest Biometrics, Yale School of Forestry and Environmental Studies, Fall 1996.

Forest Manager, Yale Forests, 1993 to 1994.

Research and Outreach Accomplishments

Dr. Ducey has 26 peer-reviewed research papers published or accepted in forestry and ecology journals, and has authored 22 extension reports, book chapters, and conference papers. He currently serves as Principal Investigator of two major field research programs directly related to the proposed work: one focusing on the silviculture and biometrics of structural legacies in Northeastern forests, and the other on stand dynamics of New England forests. He has a strong track record of outreach to large industrial forestland owners and managers, dating from his time with the North Carolina State Forest Nutrition Cooperative. In his current position, he regularly organizes and participates in extension and training programs for consulting foresters, state and federal land managers, and private landowners.

Lauren F. Howard

Department of Plant Biology
University of New Hampshire
Durham, NH 03824

Education

Norwich University, Northfield, VT. 1997. B.S in Biology.

University of New Hampshire, Durham, NH, 1997-2000. M.S. in Plant Biology. Thesis: Old-field succession in southeastern New Hampshire.

University of New Hampshire, Durham, NH, 2000-2003. Ph.D. in Plant Biology expected in August, 2003. Dissertation: Effects of disturbance history, soils, and seed source on the structure of pine barrens vegetation in New Hampshire.

Recent Research and Professional Experience

Research Assistant in Plant Biology, University of New Hampshire, Durham, with Dr. Thomas D. Lee, 1997-2002.

Teaching Assistant in Plant Biology, University of New Hampshire, Durham, 1997-2002.

Research and Outreach Accomplishments

Lauren Howard is in the final semester of his doctoral program. He has published one paper on old-field succession and has 'in press' another paper on plant diversity patterns through succession. His current research on the plant community ecology of pine barrens vegetation connects land use, edaphic factors, and seed dispersal to current vegetation structure. His results will be used to make management recommendations for pine barrens vegetation in New Hampshire.