

A Proposal for
"Northeast Temperate Network Vital Signs Monitoring Program"

Submitted to

US Department of Interior-National Park Service

Submitted by

The Research Foundation of
State University of New York
PO Box 9
Albany, New York 12201

for and in conjunction with

State University of New York
College of Environmental Science and Forestry
Syracuse, New York 13210

SPONSOR DUE DATE:

Proposed Start Date: 6/1/2003

Proposed End Date: 9/30/2004

Proposed Costs: \$93,408.00

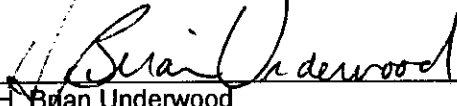
Principal Investigator(s): Dr. James Gibbs, Assistant Professor, Faculty of Environmental and Forest Biology
Dr. H. Brian Underwood, Adjunct Professor, Faculty of Environmental and Forest Biology

Endorsements:

College Administrative Official

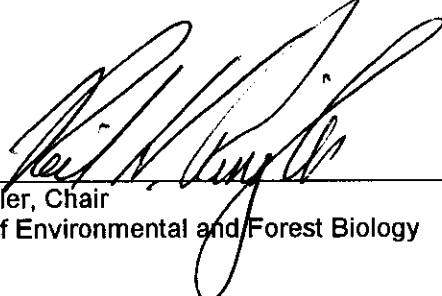

James Gibbs
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Preauthorization for IFR Recharge and CS/Effort Reporting

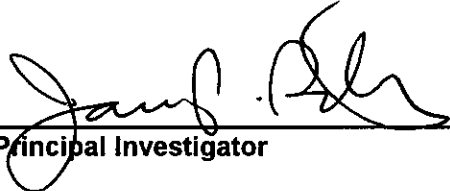
Application #: PL-3390/2272

Proposal Date: 5/2/03

Title: "Northeast Temperate Network Vital Signs Monitoring Program"

Principal Investigator: James Gibbs

The budget corresponding to the above-referenced proposal shows the percentage of effort and dollar value of both Income Fund Reimbursable (IFR) and Cost-Sharing (CS) for all participants. The following signatures provide approval for IFR and CS recharges to this grant should it be funded.

 5/2/03
Principal Investigator Date

 5/2/03
William J. Nicholson Date
Coordinator of Sponsored Programs



United States Department of the Interior

USGS Patuxent Wildlife Research Center
350 Illick Hall
State University of New York
College of Environmental Science and Forestry
1 Forestry Drive
Syracuse, New York 13210

May 2, 2003

Dr. Greg Shriver
Northeast Temperate Network Coordinator
Marsh-Billings-Rockefeller NHP
54 Elm Street
Woodstock, VT 05091

Dear Greg,

Please find enclosed our proposal to the Vital Signs Monitoring of the Northeast Temperate Parks program. We apologize for the tardy response, but it couldn't be helped despite our best efforts. As you can see, we have gone to great lengths to expand the scope of the proposed project to include additional significant natural resource units of each State in the Network. By linking into the Natural Heritage programs of each state, the proposed work will have a much larger impact, which will enhance the value of Vital Signs monitoring in the 10 National Park units. We are very excited about the scope of collaboration that we've managed to leverage in this proposal. What you do not see, however, is the possible future inclusion of additional collaborators in the Faculty of Forestry and Resource Management, who have indicated a strong interest in this endeavor. Specifically, they include a couple of statisticians, a silviculturist and a social scientist.

We stayed very faithful to Items 3-5 in the RFP and have made provisions for dealing with Item 6 in the future should we be successful here. We believe that the conceptualization of the monitoring process is critical at this stage, and we are excited to engage NatureServe to that end. They have already made significant progress in establishing map-based guidelines based on the concept of Element Occurrence Ranks and indicators of ecological integrity. Our goal is to elaborate those concepts in the framework of the kinds of data already available in the National Park system. Much of the initial work proposed is qualitative, and rightly so. Be assured, however, that our approach sets the foundation for much future work of a more quantitative nature for establishing baseline "natural" variability in the selected indicators, understanding the effect of temporal and spatial correlation on monitoring methodology and interpretation and evaluating specific indicator monitoring protocols based on a thorough analysis of statistical power.

We have involved in this proposal a cadre of ecologists and scientists whose breadth of experience in the ecological monitoring arena is unmatched in the northeastern United States. Many are on the forefront of the issues of identifying what constitutes ecological integrity and how to measure it. We are most excited about the prospect of collaboration with the National Park Service now and in the future. If you should have any questions regarding the proposal, please do not hesitate to contact us (Brian: 315-470-6820 or Don: 315-673-0921).

Sincerely,

Brian

H. Brian Underwood, Ph.D.

Don

Don Faber-Langendoen, Ph.D.

Proposal for
NORTHEAST TEMPERATE NETWORK VITAL SIGNS
MONITORING PROGRAM
Northeast Temperate Network Office, Marsh-Billings-Rockefeller NHP
54 Elm Street, Woodstock, Vermont 05091

1. GENERAL INFORMATION:

RESPONDERS

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LIST OF PERSONNEL

Brief CVs are provided in the Attachment section.

1. **Don Faber-Langendoen**, Senior Ecologist, NatureServe & Adjunct Assistant Professor, SUNY College of Environmental Science and Forestry, Syracuse, NY
2. **Lesley Sneddon**, Senior Regional Ecologist, NatureServe, Boston, MA
3. **H. Brian Underwood**, Research Biologist, USGS Patuxent Wildlife Research Center, SUNY College of Environmental Science & Forestry, Syracuse, NY

4. **James Gibbs**, Associate Professor of Conservation Biology, SUNY College of Environmental Science & Forestry, Syracuse, NY
5. **Don Leopold**, Distinguished Teaching Professor, SUNY College of Environmental Science & Forestry, Syracuse, NY
6. **William F. Porter**, Professor and Director, Adirondack Ecological Center, SUNY College of Environmental Science & Forestry, Syracuse, NY
7. **Andy Cutko**, Chief Ecologist, Maine Department of Conservation, Natural Areas Program, Augusta, ME
8. **Gregory J. Edinger**, Program Ecologist, New York Natural Heritage Program, Albany, NY
9. **Patricia C. Swain**, Plant Community Ecologist, Massachusetts Natural Heritage & Endangered Species Program, Division of Fisheries & Wildlife, Westborough, MA
10. **Dan Sperduto**, Ecologist, New Hampshire Natural Heritage Inventory, Department of Resources & Economic Development, Concord, NH
11. **Stephanie Neid**, Plant Community Ecologist, Ecologist, New Hampshire Natural Heritage Inventory, Department of Resources & Economic Development, Concord, NH
12. **Eric Sorenson**, Community Ecologist, Vermont Nongame & Natural Heritage Program Vermont Fish & Wildlife Department, Waterbury, VT
13. **Mark V. Lomolino**, Assistant Professor, Faculty of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY
14. **Gregory McGee**, Adjunct Assistant Professor, Faculty of Environmental and Forest Biology, SUNY-College of Environmental Science and Forestry, Syracuse, NY
15. **Benjamin Rubin**, Post Doctoral Associate, Faculty of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY
16. **Shawn L. Carter**, Post Doctoral Associate, Faculty of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY

2. PROJECT WORK PLAN

This project workplan addresses monitoring needs for the Northeast Temperate Inventory and Monitoring Network including 11 parks (including the Appalachian National Scenic Trail) in the northeastern United States (Figure 1). Parks include:

- Acadia National Park (ACAD)
- Appalachian National Scenic Trail (APPA)
- Boston Harbor Islands National Park Area (BOHA)
- Marsh-Billings-Rockefeller National Historical Park (MABI)

- Minute Man National Historical Park (MIMA)
- Morristown National Historical Park (MORR)
- Roosevelt-Vanderbilt National Historical Sites (ROVA)
- Saint-Gaudens National Historic Site (SAGA)
- Saratoga National Historical Park (SARA)
- Saugus Iron Works National Historic Site (SAIR)
- Weir Farm National Historic Site (WEFA)

2.1 DESCRIPTION OF PROPOSED APPROACH TO THE PROJECT

Our goal is to develop a monitoring program that measures the ecological condition or integrity of communities and ecosystems in the northeast temperate network vital signs monitoring program of the National Park Service. We develop a sequence of steps, including a) classification and mapping of community and ecosystem types, b) development of criteria for measuring ecological integrity using key factors and indicators (vital signs), c) piloting the approach in a specific park showing how to rank the integrity of specific occurrences of communities and ecological systems, and d) providing methodological guidelines for the development of indicators and their sampling needs (Figure 2). Our deliverables would provide a detailed conceptual framework as to how a monitoring program can be established in the network of parks, with a pilot demonstration from at least one park.

A. CLASSIFICATION & MAPPING OF COMMUNITY AND ECOSYSTEM TYPES

A first step in any monitoring program is to establish the ecological types or landscapes that are to be monitored. We develop an approach that focuses on ecological types, though these can be integrated into site or landscape evaluations. We propose to use the classification and mapping tools that are based on existing park inventory and monitoring program guidelines. Specifically, we will use the U.S. Geological Survey - National Park Service (USGS - NPS) Vegetation Mapping Program classification and maps (<http://biology.usgs.gov/npsveg/>). That program, which is mapping a large percentage of the NPS land base, relies on the U.S. National Vegetation Classification (USNVC), a federal standard for classification of terrestrial ecological communities. The program has also begun to use NatureServe's Ecological Systems classification (NatureServe 2003a) as an additional classification and mapping tool (see Acadia National Park map Figure 3). These classifications and maps are tailored to address park-specific needs.

Ecological Systems are defined as a group of plant community types that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients (NatureServe 2003). These systems have been defined across the coterminous United States, and are linked to the USNVC.

Communities are defined using the USNVC, which is in use by many federal and state agencies (FGDC 1997, Grossman et al. 1998, Jennings et al. 2002, NatureServe 2003b). State Natural Heritage Programs in the northeast have all helped to develop this classification, and state community classifications are explicitly linked to the USNVC (e.g. in Vermont, see Thompson and Sorenson 2000, Appendix C), allowing information to be easily shared between jurisdictions.

Global and state conservation status (relative rarity) of each USNVC or state community type are available using this system, allowing parks to prioritize inventory and monitoring needs. In addition, because states track these community types across the state, parks are able to compare status of occurrences (stands) on their lands with those of other lands in the state and region. These ranks are

now also in use by the forest industry for purposes of forest certification (2002 Sustainable Forestry Initiative).

The maps for each park also provide polygon information on the occurrences of all types across the park. Not every polygon may define a meaningful stand – perhaps clusters of polygons are the more meaningful unit, depending on how far apart they are and what separates them. We propose to convert these polygons to “element occurrences,” that is, locations that have practical conservation value for the community or ecosystem type (see also Appendix A).

B. IDENTIFICATION OF KEY FACTORS OF ECOLOGICAL INTEGRITY

Ecological integrity is the “maintenance of...structure, species composition, and the rate of ecological processes and functions within the bounds of normal disturbance regimes (Lindenmayer and Franklin 2002). Ecological integrity is not an either/or measure. Rather it exhibits a range of variability (Table 1).

Table 1 – Assessing the Range of Variability of Ecological Integrity

Rank	Description of Ecological Integrity
A	excellent
B	good
C	fair
D	poor
E	verified extant (viability or integrity not assessed)
H	Historical
X	extirpated

To assign a meaningful rank of ecological integrity, the various components that comprise ecological integrity need to be specified – that is, the ranks need to be measurable in some way. Our focus is on key factors that measure the current ecological state or condition of the system (Young and Sanzone 2002). It is beyond the scope of this proposal to provide measures of the integrity of ecological services provided by ecosystems, or to propose measures of ecosystem stressors (Young and Sanzone 2002), though, depending on current park monitoring efforts, we can show how these additional monitoring needs can fit into the approach developed here.

For each community and ecosystem type found in the park network, we propose to measure ecological integrity using the “element occurrence ranking procedure” developed by NatureServe and the Network of Natural Heritage Programs (Appendix A; see also Stein and Davis 2000, NatureServe 2002). That methodology uses three main categories (condition, size, landscape context) and a set of key factors to assess ecological integrity (Table 2). Each of the categories is assessed in a fairly qualitative or semi-quantitative manner; that is, the key factors are used as guides for assessing the status of a category, but each factor itself may not be explicitly measured. The three categories are then integrated into an overall measure of ecological integrity (Table 1). The methodology is still under development, but resembles other biodiversity assessment approaches, such as the key factors approach of Larsson (2001). Similar methodologies have been developed by EPA using “essential

ecological attribute categories and subcategories" (Harwell et al. 1999, Young and Sanzone 2002), though the EPA approach extends the NatureServe methodology by identifying measurable indicators for each category and subcategory (key factors). The Nature Conservancy has also proposed an "ecological attributes" approach for use in site conservation planning based on the NatureServe methodology, but more fully extended along the lines of the EPA approach (TNC 2000, Parrish et al. 2003). These more rigorous approaches allow these assessments to be more explicit and measurable, facilitating monitoring designs. They also draw on the growing expertise within the conservation biology and wildlife biology community on how best to monitor biodiversity. Thus, we will outline a methodology for assessing ecological integrity that advances the methodology used by NatureServe, the Network of Natural Heritage Programs, federal agencies such as EPA, and others (e.g., Woodley 1993). We will complete a pilot test of the methodology using a specific park, and demonstrate how this methodology can integrate existing park-specific protocols into a consistent framework that is applicable within and beyond the park boundaries.

Table 2 - Rank Factor Categories and Key Factors used to assess Ecological Integrity.

CATEGORY	GENERALIZED KEY FACTORS	species	Communities and Systems
Condition	reproduction and health (evidence of regular, successful reproduction; age distribution for long-lived species; persistence of clones; vigor, evidence of disease affecting reproduction/survival)	√	
	development/maturity (stability, old-growth)		√
	species composition and biological structure (richness, evenness of species distribution, presence of exotics)	√	√
	ecological processes (degree of disturbance by logging, grazing; changes in hydrology or natural fire regime)	√	√
	abiotic physical/chemical factors (stability of substrate, physical structure, water quality) [excluding processes]	√	√
Size	area of occupancy	√	√
	population abundance	√	
	population density	√	
	population fluctuation (average population and minimum population in worst foreseeable year)	√	
Landscape Context	landscape structure and extent (pattern, connectivity, e.g., measure of fragmentation/patchiness, measure of genetic connectivity)	√	√
	condition of the surrounding landscape (i.e., development/maturity, species composition and biological structure, ecological processes, abiotic physical/chemical factors)	√	√

C. DEVELOPMENT OF INDICATORS (VITAL SIGNS) FOR EACH KEY FACTOR

A key component of the overall methodology for assessing ecological integrity is to develop indicators that measure the key factors of interest. Indicators (vital signs) for each key factor will be proposed that contain measurable parameters in the field. A review of the key factors in Table 2 makes clear that key factors per se may be difficult to measure directly. Where this is the case, an indicator of the key factor that may be reasonably and effectively measured will be identified. For example, stand development/maturity is often a key factor in forest types, but it may not be reasonable to expect that all aspects of stand development can be measured. A few size-class or age requirements may be specified that will give us an overall indication (indicator) of how the status of our key factor (Stand Development/Maturity) is changing. So the indicator may be a subset of the variables defining the key factors, or a more measurable substitute for the key factors (see Appendix B column 3) (see also Parrish et al. 2003).

Any community or ecological system's key factors (and therefore its indicators) will vary over time in a relatively undisturbed setting. This variation is not random, but limited to a particular range that can be recognized as either a) natural and consistent with the long-term persistence of each type, or b) outside the natural range because of human influences (e.g., fire suppression in fire maintained systems). Managing for an acceptable range of variation for each type's key factors can be a sound strategy for biodiversity management and conservation at any scale (Parrish et al. 2003).

We propose to specify thresholds of integrity for each key factor based on the indicators. In particular we will establish the thresholds for the A-ranked occurrence (best achievable level of ecological integrity) and the C ranked occurrences (the C/D threshold which, if crossed, may lead to an unrestorable condition, at least without great expense). Establishing both the indicators themselves and the thresholds requires a range-wide knowledge of the systems found in the park. Thus, a key part of our proposal is that we have the expertise across the northeast to establish not just the ecological condition of occurrences of types in the park, but more widely. Thus, e.g., when establishing criteria for A or C/D thresholds for a Red Spruce-Northern Hardwood system, we will draw on the range-wide ecological characteristics of the type, whether in the parks or not. In this way, the network of parks will have a consistent standard by which to evaluate ecological integrity, whether within the NPS network or with partners.

Key factors and indicators for each community and system type can be summarized using a spreadsheet format (see Appendix B). These spreadsheets will be automated so that the user will only need to fill out the key factors and indicators and assign the rating for each indicator. Overall ranks for each category (condition, size, and landscape context) can then be automated using a specific set of rules for how to weight the criteria and key factors. These rules can be tailored to specific community or system types. An overall rank of ecological integrity (as in Table 1) can then be assigned to each occurrence in a park by prioritizing and weighting the 3 categories. We propose to demonstrate the approach using a pilot study from one of the parks.

D APPLICATION OF KEY FACTOR ASSESSMENT TO EACH PARK

The overall assessment of ecological integrity using key factors and indicators will, in principle, be applicable to all occurrences of each community and ecosystem type in each of the parks. The map generated in Step A already identifies where the occurrences are across each park. Each occurrence will need to be evaluated separately. For example, a hemlock-hardwood stand near a road and logged within the last 70 years may be assigned a different measure of ecological integrity than one in the interior of a park, away from roads. Where such maps do not yet exist, personnel will discuss with

each park the best approach to take to develop such maps. In turn, even where maps do exist, reliable information from each park may not exist for each occurrence of a type in the park, making it difficult to assign values to the key factors and indicators. This information will help to guide an inventory program that can be used to gather this information.

The outcome of these assessments is that for each park, it will be possible to generate a map showing not only the occurrences (polygons) of each type across the park, but an evaluation of the ecological integrity of each occurrence. These maps, then, form an essential baseline for monitoring programs, and they can be used to guide the monitoring sampling design. They also highlight where restoration activities may be most critical. For example, if a park contains a highly-ranked community type with occurrences having at best an "ecological integrity rank of "C," then the park will know that these occurrences should be evaluated first to see if they are the top priority for monitoring and restoration.

Stressors to the occurrences could also be developed as a second step, though we do not intend here to develop stressor indicators very fully. Stressors, in essence, become those activities that tend to degrade the key factors. Thus a careful selection of key factors greatly facilitates the evaluation of stressors. In turn the indicators help monitor the progress of alleviating the effects of stressors on the community or system occurrences. An assessment made as to how park management may address these stressors. Suggestions will also be made as to how to monitor the indicators to assess the effectiveness of any management activities.

E. INDICATOR METHODOLOGY AND SAMPLING DESIGN

All indicators should be *measurable, precise, consistent, and sensitive* (see Parrish et al. 2003). To ensure that indicators are also meaningful and effective, they need to be:

1. *Biologically relevant* (i.e., represent an accurate assessment of biodiversity health)
2. *Socially relevant* (i.e., value is recognized by stakeholders)
3. *Sensitive to anthropogenic stress* and reflective of changes in stress without extreme variability
4. *Anticipatory*, providing early warning (i.e., indicate degradation before serious harm has occurred)
5. *Measurable* (i.e., capable of being operationally defined and measured using a standard procedure with documented performance and low error)
6. *Cost-effective* (i.e., inexpensive to measure, providing the maximum amount of information per unit effort)

Recommendations will be provided as to what some effective sampling methods might be for the various key factors and indicators. For example, to assess the key factor of "stand development/maturity," there are a number of commonly used ways of assessing stand structure. Similarly to assess overall park landscape structure, there are a number of ways to measure landscape connectivity or forest landscape structure.

Under the premise of adaptive management, the list of indicators can be refined as more is learned about the ecological system or community.

2.2 IDENTIFICATION OF MILESTONES AND DATES MILESTONES WILL BE REACHED

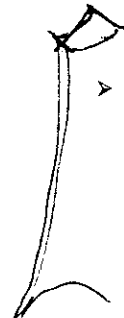
The six milestones and bullets listed below are a required part of the proposal. Approaches to meeting the milestones and their dates of completion are shown in italics.

1. An assessment of the forest resources and threats to forest ecosystems for each of the 10 parks and the Appalachian Trail in the Northeast Temperate Network:



A summary of the existing information regarding forest resources within each park unit (i.e. forest acreage by type, stand size summary statistics).

- *NPS Community and Ecosystem Maps have been or will be created for each of the 10 parks (see example for Acadia NP, Figure 2). We will obtain GIS layers for all parks as they become available through the NPS VMP or, depending on park size, make use of available park maps to complete the work. These maps will provide:*
 - *Acreage by types*
 - *Polygons (stands) and average size of polygons by type*
- *Park completion to date:*
 - *Acadia NP is completed.*
 - *Other park completion dates will be assessed as part of this proposal – all parks are scheduled to use the NPS Vegetation Mapping program*
- The extent and location of forest types within each park unit based on existing and most recent information from the parks and other sources.
 - *NPS Community and Ecosystem Maps provide:*
 - *Polygons (stands) and average size of polygons by type*
 - *Conversion of polygon layer to "element occurrences" based on NatureServe methodologies (see Appendix A).*
 - *Comprehensive GIS layers containing mapped locations of all stands in the park.*
- Identification of park management issues and forest ecosystem threats and stressors for each park.
 - *Parks will be contacted and visited to assemble information. All information will be compiled by June 30.*
- Recommendations for prioritizing sampling effort based on the distribution and abundance of forest types within each park unit.
 - *Community (vegetation) classifications will be used to assess the relative rarity of forest types using state and global conservation status ranks available from NatureServe and the Natural Heritage Program.*
 - *Further prioritization will wait until Ecological Integrity Assessment has been completed for all stands in the parks.*



2. A review of the existing Northeast forest monitoring programs including:



A summary of existing Northeast forest monitoring programs including a comparison of sampling protocols, definition of objectives used, and overview of questions being addressed by each program.

Location and forest type descriptions of permanent forest monitoring plots in relation to Park Service units!

- An assessment of the indicators selected with a review of linkages to ecosystem stressors and the utility of the indicator in detecting trends.
- Recommendations for how the Network should incorporate the protocols of other forest monitoring programs into the Vital Signs Monitoring Program.
 - *All aspects of the current Northeast forest monitoring program will be reviewed and assessed for their role in the monitoring program to be designed based on Steps 3 and 4. Recommendations for how the Network should incorporate the protocols of other forest monitoring programs into this one will be preliminary until Steps 3 and 4 are completed (July 31, 2003)*
 - *A review of the Element Occurrence Ranking methodology used by NatureServe and the Network of Natural Heritage Programs will also be completed, with a recommendation for how best to incorporate the use of indicators (vital signs) as part of the methodology.*

③ 3. Development of conceptual models of forest ecosystem functions including:

- Identification of key forest processes that best indicate forest ecosystem health.
- Identification of stressors to forest ecosystems in the Northeast.
- Identification of key forest resources for ecosystem models and a list of potential indicators for each ecosystem stressor.
 - *Conceptual models that describe the functions and key factors for each Ecological System and Community Type will be developed for a pilot project in one of the parks. These models help to define what is meant by ecological integrity (also referred to as the "Element Occurrence Rank" in NatureServe methodology (see Appendix A) (August 10, 2003).*
 - *For each key factor, one or more series of indicators will be developed (August 20, 2003).*
 - *The indicators used to measure each key factor will serve as the basis for identifying the stresses for each system or community.*
 - *Degree of stress will depend on the level of ecological integrity desired for a given ecological system or community type within a given park.*
 - *Key factors and indicators for the pilot types will be summarized in spreadsheets (August 30)*
 - *All personnel will review the approach.*
 - ***Completion of Step 3 will serve as the INTERIM PROGRESS REPORT.***

↙ 4. Development of indicator selection criteria:

- Making recommendations to define spatial and temporal scales for forest monitoring.
- Work towards estimating the range of "normal" variation in ecosystem indicators.
- Identify thresholds and associated response triggers.
- Establish documented linkages between indicators and ecological stressor.
 - *Spatial and temporal scales will be assessed in two ways:*
 - *Ecosystem level scale (10s to 10,000s of hectares, 50-100 yr timeframe)*
 - *Community level scale (1s to 1,000s of hectares, 5-50 yr timeframe)*
 - *Range of variation will be assessed for a set of pilot ecosystem and community types*
 - *Key factor and indicator approach developed above will describe the range of variation and critical thresholds ("A Threshold," "C/D Threshold") for a set of pilot types.*

- *Where possible, consideration will be given to how indicators of stressors can be used in conjunction with indicators of ecological integrity (October 30, 2003)*

5. Defining forest monitoring objectives for the Northeast Temperate Network forest monitoring plan.

- Including identification of indicators, temporal and spatial scales, and attributes to be monitored with stated degrees of change.
The key factors and indicators of ecological integrity will be assessed based on the ecological systems and communities found in each park. Using the standard classifications and ecological integrity tools, each park can be integrated into an overall forest monitoring plan (November 30, 2003?)

6. Assistance in planning, developing, and facilitating a scoping workshop where experts in forest ecology and monitoring meet to develop a forest monitoring program for the Northeast Temperate Network. Specific objectives of a scoping workshop would include:

- Solicitation of ideas on park specific management issues, focal species, and components to monitor.
- Summarizing existing forest monitoring programs in the Northeast.
- Discussing monitoring objectives, sampling scheme, and data collection/management.
 - *This assistance will be provided in collaboration with park staff and Northeast Temperate Network staff. (Date to be determined)*

2.3 DESCRIPTION OF FINAL DELIVERABLES

A. Community and Ecosystem Inventory Report:

- 1) A list of community and ecosystem types for each park. In at least one pilot park, a map will be produced showing the occurrences of all stands of each community type in the park (as made available by the NPS Vegetation Mapping Program).
- 2) A pilot demonstration of how of each park map can be converted to an "element occurrence" map, based on NatureServe criteria for element occurrences.
- 3) A pilot demonstration of how an Ecological Integrity rank can be assigned to each occurrence.

B. Review of Existing Northeast Forest Monitoring Program.

- 1) Summary of monitoring programs across all of the parks, highlighting similarities and differences.
- 2) Suggestions for how these current programs can contribute to an ecological integrity assessment using key factors and indicators.
- 3) Summary of how NatureServe methodology can be improved based on an approach using key factors and indicators (vital signs) that are applicable to the parks needs.

C. Ecological Integrity and Key factors Assessment

A pilot study of how to assess ecological integrity for a set of community and ecosystem types:

- 1) Conceptual model of community and ecosystem function for a select set of types.
- 2) Key factors for each type grouped by categories of condition, size, and landscape.
- 3) Specific indicators for each key factor, and their range of variation, ranked from A (very good) to D (poor), with the rationale for the A and the C/D threshold clearly specified.

- 4) Documentation and review of the range-wide applicability of these measures of ecological integrity.

D. Indicator Sampling Design.

- 1) A summary of various sampling designs that can effectively monitor the indicators chosen to assess ecological integrity.

E. Summary of forest monitoring objectives for the Northeast Temperate Network.

3. BUDGET [SEE ATTACHED SPREADSHEET]

- Including amounts itemized in expense categories (salary, benefits, workshop expenses, materials, etc.).
- The amount of overhead charged.

4. LITERATURE CITED

- FGDC. 1997. Vegetation classification standard. FGDC-STD-005. Vegetation Subcommittee, Federal Geographic Data Committee. FGDC Secretariat, U.S. Geological Survey, Reston, Virginia, USA. [Web resource: <http://www.fgdc.gov/standards>]
- Grossman, D.H., D. Faber-Langendoen, A.S. Weakley, M. Anderson, P.S. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International Classification of Ecological Communities: terrestrial Vegetation of the United States. Volume I. The national vegetation classification system: development, status, and applications. The Nature Conservancy, Arlington, Virginia, USA.
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Proposed Budget
National Park Service - Marsh-Billings- Rockefeller NHP

Northeast Temperate Network Vital Signs Monitoring Program

June 1, 2003 - September 30, 2004

NPS-Gibbs-Underwood-Faber-Langendoen:03q2.v 5/2/03

CATEGORY	Summer
Senior Personnel:	
PI: James Gibbs, 3% AY	604
2 Weeks Summer Salary	3,096
Co PI: B. Underwood, 5% AY	0
Co PI: D. Faber-langendoen, TNC	0
2- Postdoctoral Associates, 14 and 5 weeks respectively	14,971
1-GIS Tech, - 2 weeks	1,900
Total Personnel	20,571
Benefits, @ 34.37% Excl. Students	208
RF - non Std. 30.5% inc. .5% thereafter	0
Summer Salary @ 17%	3,497
Grad. Students -8.0%	0
Undergrad Students - 3%	0
Total Benefits	3,705
Total S, W and B	24,276
Travel	4,000
Supplies	5,000
Subcontract - NatureServe	25,512
Senior Ecologist (7 weeks)	10,067
Senior Regional Ecologist (1 week)	1,035
Data Manager (2 weeks)	2,070
Benefits	5,532
Indirect costs	6,808
Subcontracts to Heritage Programs	22,436
Maine NHP Ecologist (3 weeks)	6180
Maine NHP Information Manager (1 week)	1465
Maine NHP GIS Manager (1 week)	1620
Massachusetts NHP (2 weeks)	3100
New Hampshire NHP Ecologists (3 weeks)	4221
New York NHP Ecologist (2 weeks)	3550
Vermont NHP Ecologist (2 weeks)	2300
Total Direct Costs	81,224
Indirect Costs - 15% MTDC (Per CESU rate)	12,184
Amount of Request	93,408

APPENDIX A.

SUMMARY OF ELEMENT OCCURRENCE METHODOLOGY USED BY NATURESERVE AND THE NATURAL HERITAGE PROGRAM NETWORK

ELEMENT OCCURRENCES (STANDS, POLYGONS)

An **Element Occurrence** (EO) is an area of land and/or water in which a species, natural community, or ecological system is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location. For species¹ Elements, the EO often corresponds with the local population, but when appropriate may be a portion of a population (e.g., long distance dispersers) or a group of nearby populations (e.g., metapopulation). For community Elements, the EO may represent a stand or patch of a natural community, or a cluster of stands or patches of a natural community. For system Elements, the EO may represent a cluster of stands from different communities that are part of the System. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries.

Element occurrences can be derived from maps of communities and Systems. Element Occurrence Standards contain "Element Occurrence Specifications" that help define occurrences based on polygons. These specifications determine whether two polygons of a type are one or more separate occurrences. The specifications define barriers (such as four-lane highways) or separation distances that are needed, depending on whether there is non-natural vegetation (e.g., agricultural croplands), or other natural vegetation between the two polygons.

ELEMENT OCCURRENCE RANKS

Basic EO ranks used in prioritizing EOs for conservation planning purposes are shown in Table A.1.

Table A.1 - Basic EO Ranks

EO Rank	Description of Ecological Integrity
A	excellent
B	good
C	fair
D	poor
E	verified extant (integrity not assessed)
H	historical
X	extirpated

The basic "A" through "D" ranks are based on currently known factors that are used to estimate the viability or integrity of an EO. The more viable or greater integrity that an EO has, the higher will be its EO rank and the higher its conservation value.

¹ In this Standard, the term "species" includes all entities at the taxonomic level of species (including interspecific hybrids), as well as all subspecies and plant varieties. Subspecies and varieties are collectively termed "infraspecific taxa". Other subsets of species (e.g., geographically distinct population segments not recognized as infraspecific taxa) are sometimes designated as species Elements, and recurrent, transient, mixed-species animal assemblages (e.g., shorebird concentration areas) may also be considered Elements.

The “E” = EXTANT EO rank should be used for an EO that has been recently verified as still existing, but sufficient information on the factors used to estimate viability or integrity of the EO has not yet been obtained. Use of the “E” rank should be reserved for those situations where the occurrence is thought to be extant, but an “A”, “B”, “C”, “D”, or range rank cannot be assigned.

The “H” = HISTORICAL EO rank should be used when there is a lack of recent field information verifying the continued existence of an EO.

The “X” = EXTIRPATED EO rank should be assigned to an EO for which there is documented destruction of its habitat or environment, or persuasive evidence of its eradication based on adequate survey (*i.e.*, thorough or repeated survey efforts by one or more experienced observers at times and under conditions appropriate for the Element at that location).

ECOLOGICAL INTEGRITY AND ELEMENT OCCURRENCE RANKS

Because EO ranks are used to represent the relative conservation value of an EO as it currently exists, EO ranks are based solely on factors that reflect the present status, or quality, of that EO. There are three EO rank factors, each reflecting what is currently known (in an ideal situation) about an EO: size, condition, and landscape context. These factors are used as the basis for estimating the viability or integrity of an EO, *i.e.*, its EO rank. Thus:

$$\text{Size} + \text{Condition} + \text{Landscape Context} \Rightarrow \text{Estimated Viability or Integrity} \approx \text{EO Rank}$$

For community and system Elements, the term “ecological integrity” is preferable to that of viability, since communities and systems are comprised of many separate species, each with their own viability. Ecological integrity is the “maintenance of...structure, species composition, and the rate of ecological processes and functions within the bounds of normal disturbance regimes². More directly, EO ranks reflect the degree of negative anthropogenic impact to a community or system (*i.e.*, the degree to which people have directly or indirectly adversely or favorably impacted community composition, structure, and/or function, including alteration of natural disturbance processes). Occurrences with relatively less impacts would generally be ranked “A”, “B”, or “C” (at least “fair” integrity), and those with significant degradation would be ranked “D” (“poor” integrity).

It is not necessary to have knowledge of each of the three rank factors to develop EO rank specifications (especially for species). The three EO rank factor categories and generalized key factors are summarized in Table A.2 below.

²From Lindenmayer and Recher (in Lindenmayer and Franklin 2002). Similarly, Karr and Chu (1995) define ecological (or biological) integrity as “the capacity to support and maintain a balanced, integrated, adaptive biological system having the full range of elements (genes, species, and assemblages) and processes (mutations, demography, biotic interactions, nutrient and energy dynamics, and metapopulation processes) expected in the natural habitat of a region.

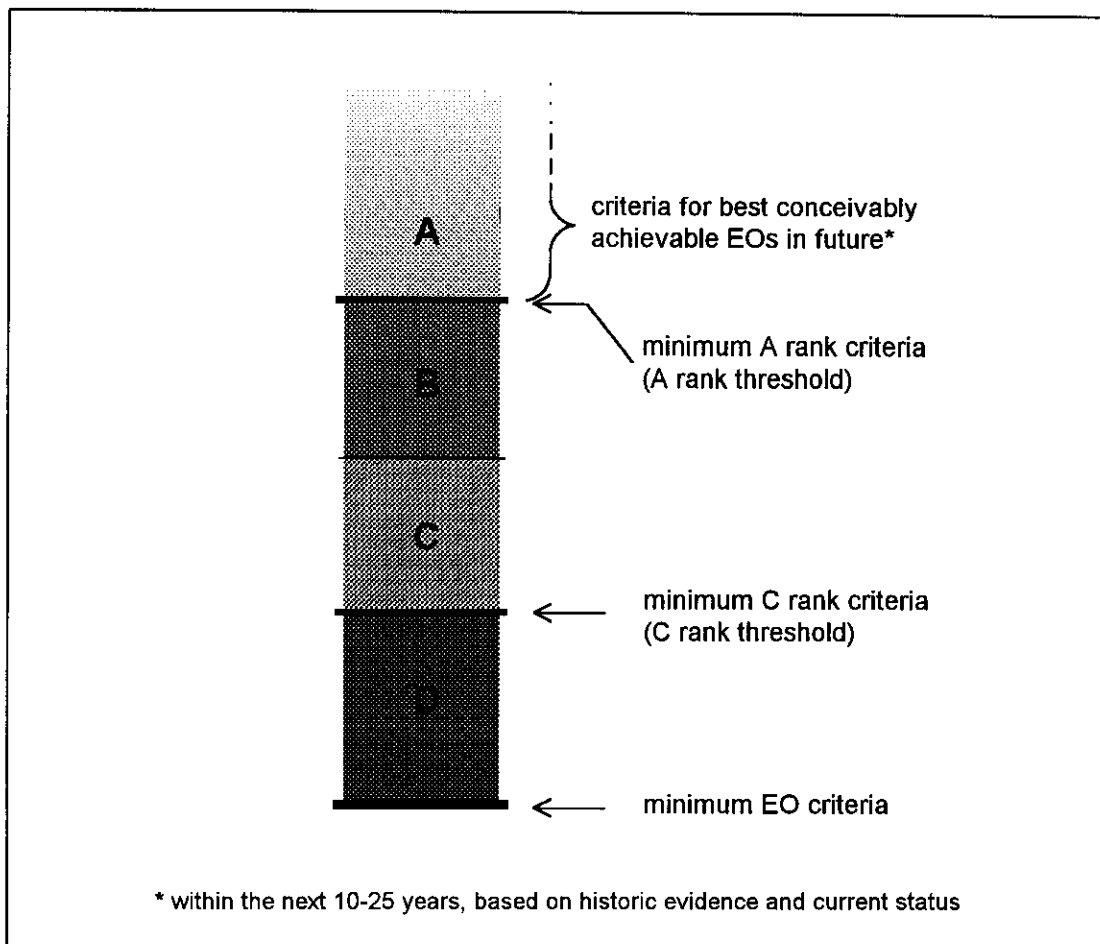
Table A.2 - Rank Factor Categories and Key Factors

CATEGORY	GENERALIZED KEY FACTORS	species	Communities and Systems
Condition	reproduction and health (evidence of regular, successful reproduction; age distribution for long-lived species; persistence of clones; vigor, evidence of disease affecting reproduction/survival)	√	
	development/maturity (stability, old-growth)		√
	species composition and biological structure (richness, evenness of species distribution, presence of exotics)	√	√
	ecological processes (degree of disturbance by logging, grazing; changes in hydrology or natural fire regime)	√	√
	abiotic physical/chemical factors (stability of substrate, physical structure, water quality) [excluding processes]	√	√
Size	area of occupancy	√	√
	population abundance	√	
	population density	√	
	population fluctuation (average population and minimum population in worst foreseeable year)	√	
Landscape Context	landscape structure and extent (pattern, connectivity, e.g., measure of fragmentation/patchiness, measure of genetic connectivity)	√	√
	condition of the surrounding landscape (i.e., development/maturity, species composition and biological structure, ecological processes, abiotic physical/chemical factors)	√	√

ESTABLISHING THRESHOLDS

In order to effectively prioritize occurrences for resource management and monitoring, overall ecological integrity ranks should establish a scale for distinguishing between "A", "B", "C", and "D" occurrences. This scale should usually spread from a lowermost limit (the "D" rank or minimum EO threshold) up through the threshold for an "A" rank. In addition, the threshold delineating EOs with "fair" vs. "poor" viability or integrity must be identified. Figure A.1 illustrates the rank scale for "A", "B", "C", and "D"-ranked EOs.

Figure A.1 - Model of the A, B, C, and D Rank Scale



Once the minimum criteria for determining what constitutes a valid EO has been developed, a potentially useful approach to developing EO rank specifications is to then establish the threshold between EOs with “fair” and “poor” viability or integrity (the minimum “C” rank criteria). Next establish the criteria for the best EOs that are reasonably and conceivably achievable; generally, these will be the minimum “A” rank criteria unless the best reasonably achievable EOs have only “fair” or “poor” viability or integrity. Then, assuming the best EOs that are reasonably and conceivably achievable are at or above the “A” rank threshold, identify minimum “B” rank criteria that, in the absence of a population viability analysis (for species), achieve a spread between “A” and “C”-ranked EOs. Finally, set “D” rank criteria that distinguish between extant occurrences with “poor” viability or integrity (*i.e.*, “D”-ranked EOs) and those for which there is simply not enough information to assign an “A” through “D” rank or range rank (*i.e.*, “E”-ranked EOs).

An “A” rank need not be comparable to historical conditions. For example, bison will not conceivably exist again in their historical condition with herds numbering in the millions, but nevertheless a range of viable populations (*e.g.*, herds of differing sizes and conditions) might still be reasonably achievable. In other words, it is still necessary to conceive of a range of viable populations, although the range is truncated when compared to EO rank specifications that would have been written 150 years ago.

Establishing the "C" Rank Threshold

The distinction between EOs with "fair" viability or integrity (*i.e.*, "C"-ranked) and EOs with "poor" viability or integrity ("D"-ranked) is especially important for helping to prioritize occurrences for conservation planning. The context for developing minimum specifications for "C"-ranked EOs (*i.e.*, the "C" rank threshold) is described below for species and communities.

For communities or systems, criteria for distinguishing occurrences with "fair" ecological integrity ("C"-ranked) from EOs with "poor" ecological integrity ("D"-ranked) should be based on the degree of negative or positive anthropogenic impact rather than a specified probability of persistence over a given time period. In most cases, occurrences with severely altered composition, structure, and/or ecological processes should be ranked "D"; that is, few native species that comprise the community or system type are found on the site, and the ones present are some combination of resilient, common, species and less resilient species that appear unlikely to persist under current conditions. For these EOs, there may be little long-term conservation value without restoration, and such restoration may be difficult or uncertain.

Establishing the "A" Rank Threshold

The "A" rank threshold represents the cut-off for the best EOs that are reasonably and conceivably achievable for a particular Element within a foreseeable time frame (*e.g.*, 10 to 25 years). In setting the minimum criteria for "A"-ranked occurrences, all available knowledge, both historical and current, should be utilized in order to make the most accurate estimation for restorability of EOs for a given Element.³ In addition, any current constraints on restoration should be taken into account.⁴ As restoration techniques improve, the "A" rank threshold could be placed at higher levels, reflecting greater estimated restorability.

³ The "A" rank threshold should not be based solely on historical information because: a) historical status often cannot be achieved; b) use of historical information could drastically truncate the rank scale for current EOs; and c) historical information is often not known.

⁴ Note that, although "restorability" is not a factor in ranking a particular Element Occurrence, it is a factor in setting the "A" rank threshold. In order to set a threshold that is reasonably and conceivably achievable for "A"-ranked occurrences, it is necessary to consider restorability so that the threshold is not limited to EOs that are extant.

Component key factors can be used as a basis for developing indicators to assess the ecological integrity of natural signs that can be measured in the field. The example is based on a specific forest type in the White Pine-ly the indicators for the Condition key factors are provided as working examples.

INDICATOR RANK →

	C	D	REFERENCE	RATING	OVERALL CATEGORY RANK	A-RANKED THRESHOLDS	C/D THRESHOLDS
ing of r s d, little e of on of bry on; ht by k may t;	disturbance to understory vegetation due to logging activities or grazing;	ground very disturbed with major disruptions to vegetation;	Mladenoff and Stearns (1993)			Hemlock forest systems begin to take on old-growth characteristics only after 150 years, and may even go through a series of old-growth changes between 180 and 400 years (Tyrrell and Crow 1994). Forest stands of this type experience relatively low disturbance rates, so under natural disturbance regimes most of the stands should be in old-growth.	Native ground layer composition is severely altered and unlikely to replace exotics. Recovery of hemlock old- growth structure would take greater than 100 years. Overgrazing by deer could prevent hemlock regeneration (Mladenoff and Stearns 1993).
may ant at ilities.	some exotic species present.	large proportion of exotic species.					

osal for Northeast Temperate Inventory and Monitoring Network

[illegible]

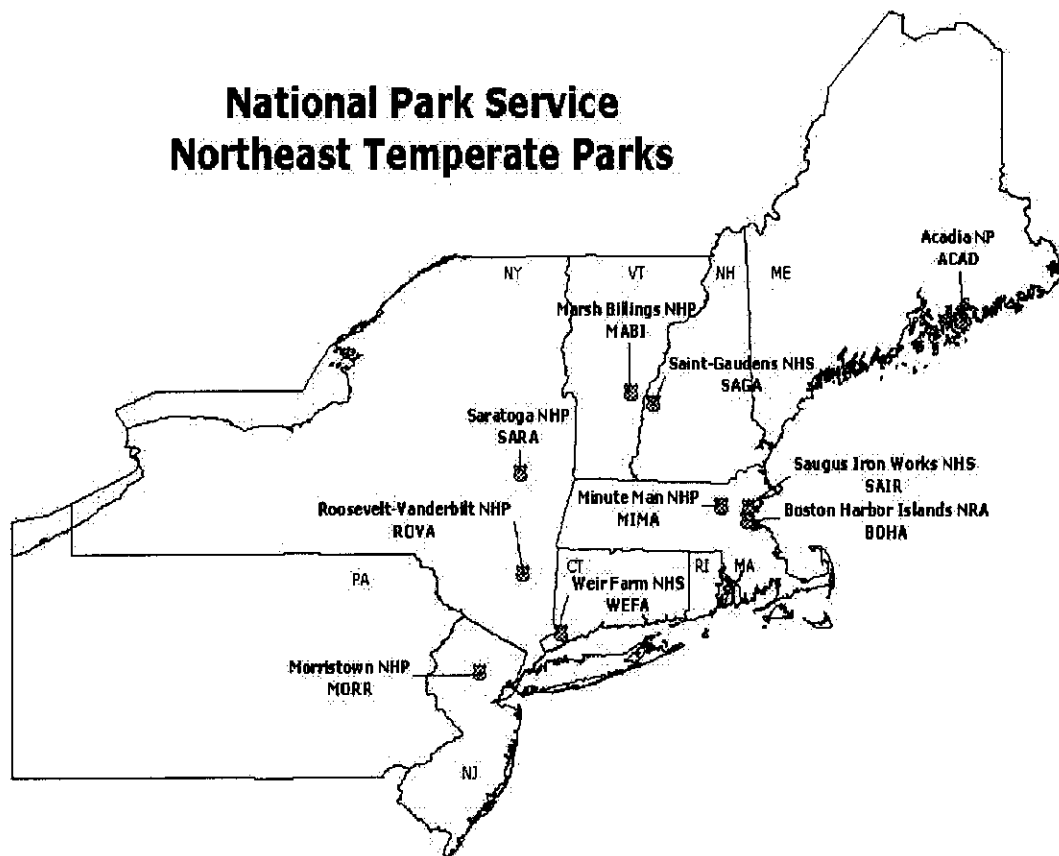


Figure 1. Location of the 11 parks in the Northeast Temperate Network. Not shown is the Appalachian National Scenic Trail, which extends from Maine to Pennsylvania in this region (and down to Georgia).

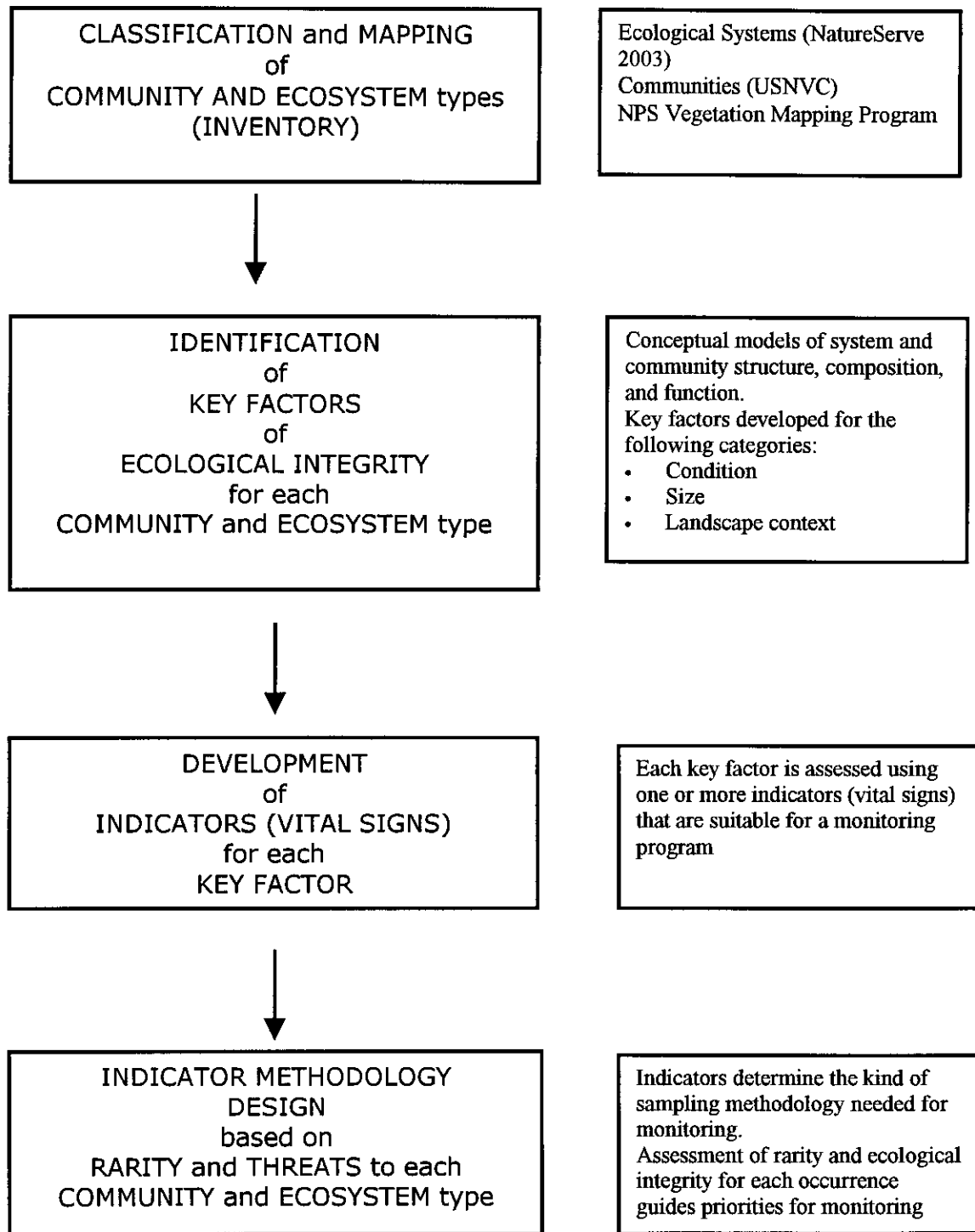


Figure 2. Summary of the overall design for inventory and monitoring of parks in the Northeast Temperate Network. In this design, ecosystems are defined as coarser spatial scale units within which various community types are found. Thus indicators are developed at multiple scales.

5

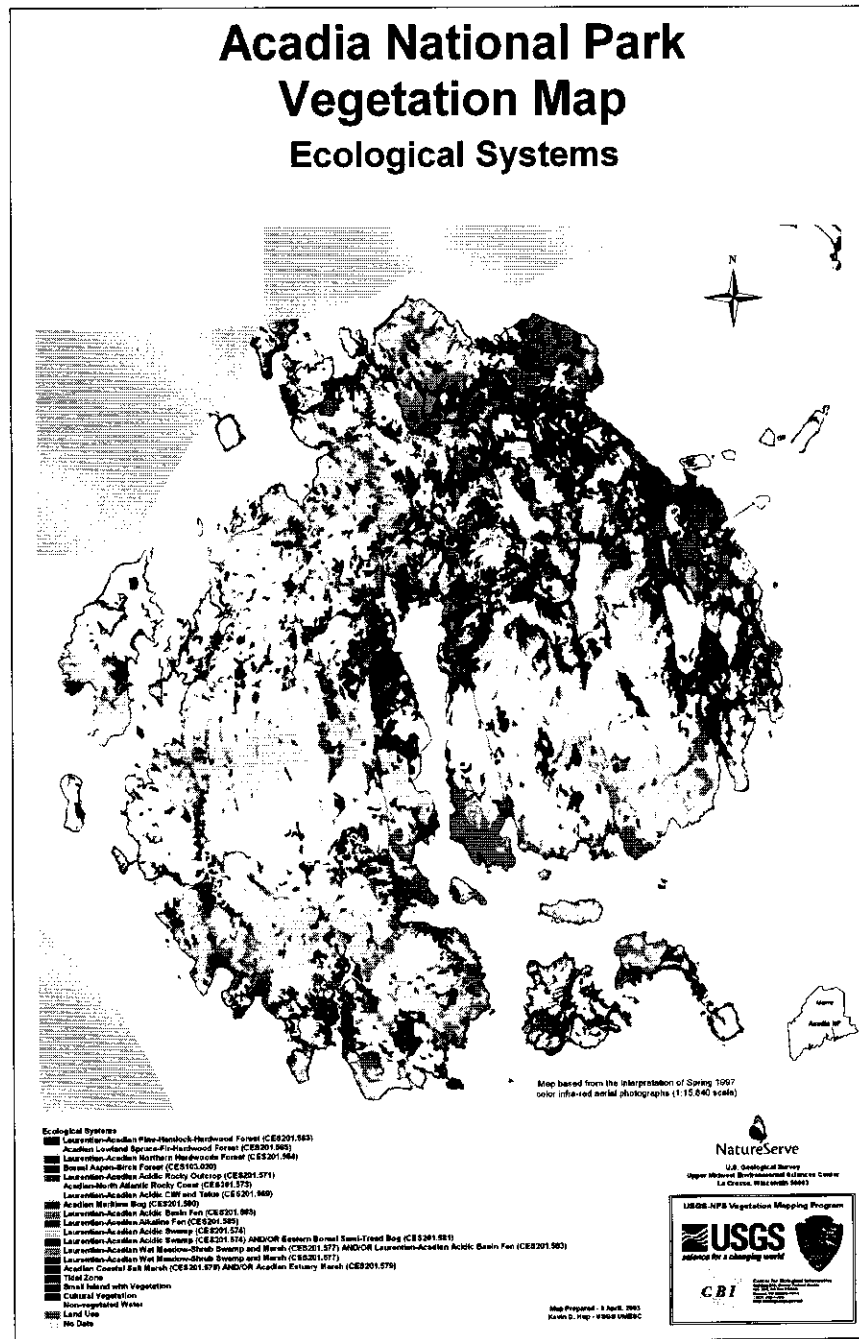


Figure 3. Draft map of ecological systems for Acadia National Park (provided by Kevin Hop, USGS Upper Mississippi Environmental Sciences Center). A similar map at the community level (based on the USNVC) is also available.

ATTACHMENTS

Curriculum Vitae of Personnel

Curriculum Vitae -- Don Faber-Langendoen

3467 Amber Road, Syracuse, NY 13215; (315) 673-0921; don_faber-langendoen@natureserve.org

EDUCATION:

B.S., Biology, Calvin College, Grand Rapids, Michigan, 1981
M.S., Botany, University of Toronto, Toronto, Canada, 1984
Ph.D., Biology, St. Louis University, St. Louis, Missouri 1989
Dissertation: *Combining conservation and forestry in a Colombian rain forest: an ecological assessment*

PROFESSIONAL EXPERIENCE:

Senior Ecologist. NatureServe, Syracuse Office, Syracuse, NY (2000-present).
Adjunct Assistant Professor. College of Environmental Science and Forestry, State University of New York, Syracuse, NY. (1998-present).
Regional Ecologist. The Nature Conservancy, Midwest Conservation Science Department. Minneapolis, MN (1992-2000).
Research Associate. Cedar Creek Natural History Area - Long Term Ecological Research Area, University of Minnesota (1992-1998).

SELECTED JOURNAL PUBLICATIONS

Faber-Langendoen, D. 2003. Ranking forest rarity: no need to reinvent that wheel! *BioScience* 53: 200 (Letters)
Lauver, C.L., K. Kindscher, D. Faber-Langendoen, and R. Schneider. 1999. A classification of the natural vegetation of Kansas. *Southwestern Naturalist* 44: 421-443.
Faber-Langendoen, D., and M. Davis. 1995. Effects of fire frequency on tree canopy cover at Allison Savanna, East-central Minnesota, USA. *Natural Areas Journal* 15: 319-328.
Faber-Langendoen, D., and J. Tester. 1993. Oak mortality in sand savannas following drought in east-central Minnesota. *Bulletin of the Torrey Botanical Club* 120: 248-256.
Faber-Langendoen, D. 1992. Ecological constraints on rain forest management at Bajo Calima, western Colombia. *Forest Ecology and Management* 53: 213-244.

MAJOR TECHNICAL REPORT PUBLICATIONS:

Faber-Langendoen, D., B. Rubin, P. Manion, and A. Leimanis. 2003. Forest Health Monitoring Project for Northern New York: Forest Classification. Report to the New York State Department of Environmental Conservation. 45 p. + appendices, tables, figures.
Jennings, M., O. Loucks, D. Glenn-Lewin, R. Peet, **D. Faber-Langendoen**, D. Grossman, A. Damman, M. Barbour, R. Pfister, M. Walker, S. Talbot, J. Walker, G. Hartshorn, G. Waggoner, M. Abrams, A. Hill, D. Roberts, and D. Tart. 2002. Standards for the associations and alliances of the U.S. National Vegetation Classification. The Ecological Society of America, Vegetation Classification Panel, Version 1.0 May 2002.
Hop, K., **D. Faber-Langendoen**, M. Lew-Smith, N. Aaseng, and S. Lubinski. 2001. Voyageurs National Park, Minnesota: USGS-NPS Vegetation Mapping Program. U.S. Department of Interior, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI. 189 p. (+ Appendices).
Grossman, D., K.L. Goodin, Xiaojun Li, **D. Faber-Langendoen**, and M. Anderson, Patrick Bourgeron, and Randy Vaughan. 1994. Standardized National Vegetation Classification System and Field Methods for Vegetation Mapping. National Biological Service/National Park Service Vegetation Mapping Program. November, December 1994. The Nature Conservancy, Arlington, Virginia; Environmental Systems Research Institute, Redlands, California.

Curriculum Vitae -- James P. Gibbs

Professional Preparation

University of Maine -- Orono; Wildlife Management, B.S., 1986

University of Missouri -- Columbia; Ecology, M.S., 1988

Yale University: Forestry and Environmental Studies, Ph.D., 1995

Yale University: Biology, Research Associate (post-doc), 1995-1996

Appointments.

1997-current *Associate Professor*, College of Environmental Science and Forestry, State University of New York, Syracuse, New York.

1996-1997 *Assistant Professor*, Department of Earth and Environmental Science, Columbia University, New York City, New York (currently Adjunct Assistant Professor).

Some Relevant Publications.

C. L. Elzinga, D. W. Salzer, J. W. Willoughby, and J. P. Gibbs. 2001. Monitoring plant and animal populations. Blackwell Science, Inc. 360 pp

Gibbs, J. P., M. L. Hunter, Jr., and E. J. Sterling. 1998. Problem-solving in conservation biology and wildlife management. Blackwell Science, Inc. 215 pp

Gibbs, J. P., S. Droege, and P. Eagle. 1998. Monitoring populations of plants and animals. *BioScience* 48:935-940.

Other Relevant Activities.

Principal developer of widely used software (MONITOR) used for estimating the statistical power of monitoring programs to detect trends (<http://www.mp2-pwrc.usgs.gov/powcase/monitor.html>)

Some Recent Grants

National Science Foundation, "Land-Use Practices and Persistence of Amphibian Populations" R. D. Semlitsch, M. L. Hunter, J. W. Gibbons, and J. P. Gibbs. \$1,200,000 3/03-3-08.

National Science Foundation, "Inquiry-Based-Learning Modules for Conservation Biology Education" Eleanor J. Sterling, James P. Gibbs, Malcolm L. Hunter. \$499,217, 2/02-2/05.

Tinker Foundation, "Structuring land use to preserve habitat during development: social drivers of Brazilian Amazon forest fragmentation and loss of habitat." A. S. P. Pfaff, E. J. Reis, C. B. de A. Bohrer, J. P. Gibbs, R. Sethi. \$110,000, 2/02-2/04.

US Army Corps of Engineers/International Joint Commission, "Reptile and amphibian diversity relative to water level regulation in the Lake Ontario/St. Lawrence region," \$70,000, J. P. Gibbs. 5/02-5/03.

US Army Corps of Engineers/International Joint Commission, "Avian diversity relative to water level regulation in the Lake Ontario/St. Lawrence region," \$15,000, J. P. Gibbs. 5/02-5/03.

Curriculum Vitae -- Andrew R. Cutko

Education

Master of Forestry

Duke University, Durham NC. May 1988

Concentration: Forest Ecology

Bachelor of Arts

Williams College, Williamstown MA. June 1986

Majors: Biology and Environmental Studies

Honors: Dean's List, Graduated *cum laude*

Professional Experience

Maine Department of Conservation, Natural Areas Program

Augusta ME. 7/96 to Present. Chief Ecologist

- Created and implemented long term monitoring plans for the state's 80,000 acres of Ecological Reserves.
- Planned and conducted statewide inventories of natural communities and rare plants.
- Designed and provided ecological training to foresters and other natural resource professionals.
- Provided conservation recommendations to major forest landowners for ecologically important sites.
- Identified "focus areas" of statewide importance and presented information to land trusts and municipalities.
- Completed study on the vegetation and soils of Maine vernal pools.

The Nature Conservancy Connecticut Chapter

Middletown CT. 3/94 to 7/96. Ecologist

- Prepared Site Conservation and Management Plans for Nature Conservancy preserves.
- Prepared and implemented biological monitoring plans for rare and invasive species.
- Directed the Chapter's Scientific Research and Internship programs. Supervised 10 interns annually.
- Conducted inventory and monitoring studies on plants, animals, and natural communities.

State of New Hampshire, Natural Heritage Inventory

Concord NH. 12/90 to 3/94. Data Manager/Biologist

- Conducted field studies on rare plants, animals, and natural communities, and prepared final reports.
- Co-directed state endangered species program for one year during absence of Coordinator. Garnered funds and administered contracts. Represented program to a variety of public and private organizations.
- Served on a technical advisory committee overseeing management of 40,000 acre public parcel.

Metcalf & Eddy, Inc.

Wakefield MA. 12/88 to 12/90. Environmental Planner

- Prepared environmental impact statements for the US EPA, US DOD, and several private clients.
- Supervised comprehensive field studies of bird migration in the South Dakota.

David R. Noyes & Associates

Epsom NH. 7/88 to 12/88. Forester

- Developed timber and wildlife management plans for private landowners.

USDA Forest Service

Beckley WV. 5/87 to 12/87. Forester

- Conducted surveys on land use, wildlife habitat, and timber for the Inventory and Analysis Project.

Licenses/Affiliations

Maine Licensed Professional Forester #3290; Maine Forest Biodiversity Project (Participant); Friends of Merrymeeting Bay (Vice Chair); Maine Association of Wetland Scientists (Associate Member); Josselyn Botanical Society (Member)

Curriculum Vitae -- Gregory J. Edinger, Program Ecologist
New York Natural Heritage Program
625 Broadway, Albany, 12233-4757
518-402-8947 gjedinge@gw.dec.state.ny.us

EDUCATION

Rutgers University, New Brunswick, New Jersey *11 credits toward Masters of Science in Ecology*, 1987-1995
University of Colorado, Boulder, Colorado. *Bachelor of Arts in Environmental Biology*, December 1984
Bucks County Community College, Newtown, Pennsylvania. *Associate of Arts in Biology*, January 1982

EMPLOYER

New York Natural Heritage Program, Albany, NY. *Program Ecologist* (February 1997 to present)

DUTIES

Leadership: Responsible for the overall administration, coordination, and development of the ecology component of the NY Natural Heritage Program. **Classification:** Develop the New York Ecological Community Classification through field surveys, data analyses, consultations with experts, and literature reviews. **Database Management:** Ensure that the natural community element files are maintained. Transcribe, update, map, and quality control significant natural community occurrence records on a prioritized statewide or project basis. **Innovation:** Participate in the ongoing development of new tools, methods, processes, and techniques that improve the collection, storage, interpretation, dissemination, and application of NY Natural Heritage information. **Field Work:** Oversee field surveys for significant natural communities throughout New York State using methods and techniques developed by the Natural Heritage Network and other experts. Conduct field surveys for significant natural communities on a prioritized statewide or project basis. **Communications:** Communicate the role of the NY Natural Heritage Program in the conservation of New York's biodiversity, and explain the utility of inventories and landscape analyses to partners and potential clients. **Fund Raising:** Prepare and review funding proposals for ecology projects and the ecology component of multi-disciplinary projects that involve natural community inventories and/or the analysis and interpretation of ecological information. **Information Requests:** Respond to requests for ecological information from the NY Natural Heritage database and provide interpretation, as needed. **Staff Management:** Oversee ecology staff to ensure they meet their annual performance objectives, to foster innovation, and to further their continued training.

5.1.1 PUBLICATIONS

- Edinger, G.J. 1995. Native Eupatoriums for the butterfly garden. *American Butterflies*. Vol. 3(4): 24-29.
- Edinger, G.J. 1998. Big Bay Swamp and Camp Zerbe biodiversity inventory summary report. Final report prepared for the Oswego County Environmental Management Council. New York Natural Heritage Program, New York State Department of Environmental Conservation, Latham, NY.
- Edinger, G.J. 2003. Nellie Hill: a calcareous red cedar barrens. Final report prepared for the Eastern New York Chapter of The Nature Conservancy. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.
- Edinger, G., D.J. Evans, A. Finton, D. Hunt, L. Lyons-Swift, and Adele Olivero. 2000. Community field form instructions: community forms 1, 2, & 3. New York Natural Heritage Program, New York State Department of Environmental Conservation, Latham, NY.
- Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2002. *Ecological Communities of New York State*. Second Edition. A revised and expanded edition of Carol Reschke's *Ecological Communities of New York State*. (Draft for review). New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.
- Gebauer, S., G. Edinger, T. Howard, J. Jaycox, and T. Weldy. 2002. Oswego County coastal wetlands. Final report prepared for the Oswego County Department of Planning and Community Development. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.
- Hunt, D.M., G.J. Edinger, J.J. Schmid, D.J. Evans, P.N. Novak, A.M. Olivero, and S.M. Young. 2002. Lake Erie Gorges biodiversity inventory & landscape integrity analysis. Final report prepared for the Central and Western New York Chapter of The Nature Conservancy. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.
- MacDonald, D. and G. Edinger. 2000. Identification of reference wetlands on Long Island, New York. Final report prepared for the Environmental Protection Agency. New York Natural Heritage Program, New York State Department of Environmental Conservation, Latham, NY.

Curriculum Vitae -- Patricia C. Swain

Plant Community Ecologist
Natural Heritage & Endangered Species Program
Division of Fisheries & Wildlife
Westborough, MA 01581

Education:

- Ph.D. Ecology, 1979, University of Minnesota. The development of some bogs in eastern Minnesota. A palynological analysis of community development.
- M.S. Ecology, Botany minor, 1972, University of Minnesota. An analysis of morphological differences among oaks in selected stands of the *Quercus borealis*/*Q. ellipsoidalis* complex.
- B.S. Biology, 1970, Tufts University, Medford, Massachusetts

Positions:

- 1987-current, Plant Community Ecologist, Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife.
- 1990-2003. New England Wild Flower Society, annually (except 2001) teaching course "Plant Communities of New England". Also lead occasional field trips for NEWFS.
- 1998, 1999. New England Wild Flower Society, Workshop on vegetation monitoring.
- 1997. (with 5 others) SAF credit workshop on Exotic species, funded by MA Forest Stewardship Program.
- 1979-1986 College instructor teaching ecology and general biology, usually part time.
University of Minnesota, Clemson University and Tri-County Technical College in South Carolina
- 1976-1978 Instructor and author, Department of Independent Study, University of Minnesota. Writing a study guide for and teaching *An Introduction to Ecology*, chosen a "Meritorious Independent Study Course" by the National University Extension Association, 1977.
- 1976 Field survey crew member for peat survey of northern Minnesota, Minnesota Dept. Natural Resources
- 1973 Mapping aquatic vegetation for US Environmental Protection Agency, Ely, MN.

Technical Publications:

- Swain, Patricia C. 2002. Book Review: Wetland Plants. Ecology 83:2355-2356.
- Swain, Patricia C. and J.B. Kearsley. 2000. Draft. Classification of Natural Communities of Massachusetts. Natural Heritage & Endangered Species Program, Division of Fisheries & Wildlife. Westborough, MA.
- Brugam, Richard B. and Patricia Swain. 2000. Diatom indicators of peatland development at Pogonia Bog Pond, Minnesota, USA. The Holocene 10:43-64.

Articles for general public

- Swain, Patricia C. 1999. Understanding biodiversity. Massachusetts Wildlife XLIX (2):2-5.
- Swain, Patricia C. 1999. Wetlands. essay. p 148-151 in Student Resource (study guide), for Biology, a community concept (high school biology text). Ed: Speziale, Barbara, William Leonard, & John Penick. South-Western Educational Publishing, Cincinnati.
- Swain, Patricia C. 1997. Book review of *Wetlands the Web of Life*, in Massachusetts Wildlife XLVII(2):26.
- Swain, Patricia C. 1996. Coastal plain pondshore communities. Massachusetts Wildlife XLVI(3):2-8.
- Swain, Patricia C. 1991. Prescribed burning in Massachusetts. Massachusetts Wildlife XLI(2):10-21.
- Barbour, H.A., T. Simmons, P. Swain, & H. Woolsey. 1998. Our irreplaceable heritage: protecting biodiversity in Massachusetts. MA Division of Fisheries & Wildlife and The Nature Conservancy. Boston, MA.

Continuing Education:

- Fire Ecology: Workshops on Ecological Burning, The Nature Conservancy, 1992 and 1995 (as resource person) Audited Forest Fire Ecology, UMass. 1988. Passed USFS Fire Courses S-130,190 & S 390 Fire Behavior.
- Carex Identification, New England Wild Flower Society. 1995.
- Wetland Delineation: NEWFS Class (2000), MACC hydric soils workshop (2000), DEP hydric soils workshop(1996).
- Workshops: Wetlands regulations – Riverfront workshop DEP (2000), Soils (NRCS) (1995,97), Hydrology (TNC) (1993), and Vegetation Monitoring (TNC) (1992).

Curriculum Vitae -- Eric R. Sorenson

Nongame and Natural Heritage Program, Vermont Fish and Wildlife Department,
103 South Main Street, 10 South, Waterbury, Vermont 05671-0501, (802) 241-3714

EDUCATION

- 1983-1986 Master of Science in Botany, Wetland Ecology
University of Maine, Orono, Maine
- 1977-1981 Bachelor of Science in Natural Resources, Wildlife Ecology
University of Michigan, Ann Arbor, Michigan

PROFESSIONAL EXPERIENCE

- 1996-present Natural Community Ecologist, Nongame and Natural Heritage Program, Fish and Wildlife Department, Vermont Agency of Natural Resources, Waterbury, Vermont.
Coordinate and conduct statewide inventories of natural communities and update and revise the Vermont natural community classification system based on analysis of study results; coordinate community classification work with other state and regional ecologists; develop applications and administer federal grants; provide education and outreach materials and opportunities on natural communities; maintain quality control for the ecology portion of the Program database; supervise contractors working on community inventories; conduct environmental review of development projects as necessary; develop plans to conserve the biological diversity of the state and the region in cooperation with other state ecologists and biologists and The Nature Conservancy.
- 1989-1996 State Wetlands Assistant Coordinator, Department of Environmental Conservation, Vermont Agency of Natural Resources, Waterbury, Vermont.
Implement the Vermont Wetland Rules in the five counties of eastern Vermont; represent the Agency through written comments and expert testimony at public hearings and court cases; administer federal grants.
- 1989 Consulting Ecologist, The Nature Conservancy, Natural Heritage Program, Waterbury, Vermont.
Conduct Natural Areas Inventory of Essex County, Vermont, including final report preparation.
- 1986-1988 Wetlands Specialist/Senior Biologist, IEP, Inc., Northborough, Massachusetts.
Delineated wetland boundaries; assessed wetland functions; designed and oversaw construction of wetland compensation and restoration projects; managed environmental consulting teams for wetland related projects.
- 1986 Herbarium Curator, University of Maine, Orono, Maine.
Organized herbarium bryophyte collections after recent relocation; catalogued and filed the bryophyte collection.
- 1985 Consulting Ecologist, State of Maine, Executive Planning Office, Critical Areas Program, Augusta, Maine.
Conducted a statewide study on the distribution, vegetation and water chemistry of patterned fens in Maine.
- 1983-1985 Graduate Teaching Assistant, University of Maine, Orono, Maine.
Instructed laboratory classes in plant taxonomy, dendrology, and introductory biology, and field botany.

PUBLICATIONS

- Thompson, E.H. and E.R. Sorenson. 2000. Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont. Vermont Fish and Wildlife Department and The Nature Conservancy. Distributed by University Press of New England.
- Vermont Nongame and Natural Heritage Program publications on statewide community inventories (with co-authors): northern white cedar swamps (1998) and floodplain forests (1998).
- Sorenson, E.R. 1994. Vermont Wetlands Conservation Strategy. Vermont Agency of Natural Resources. 121 pp.
- Sorenson, E.R. 1986. The Ecology and Distribution of Ribbed Fens in Northern Maine. Maine Executive Planning Office, Critical Areas Program, Augusta, Maine. Planning Report No. 81, 171 pp.
- Sorenson, E.R. 1986. The Vegetation and Water Chemistry of Two Patterned Fens in Northern Maine. Department of Botany, University of Maine, Orono, Maine. Unpublished Master's Thesis.

Curriculum Vitae – William F. Porter

Professional Responsibilities

Professor, Faculty of Environmental and Forest Biology, 1988 - present.
Director of the Adirondack Ecological Center, 1981 - present.
Director of the Roosevelt Wild Life Station, 1999- present.
Executive Chairman of Faculty Governance, 1994 - 1998.
Ecologist (GS-14 Schedule A) National Park Service, 1990 - 1994.

Education

Leadership Development Program, 1991-92, State Agricultural Experiment Station System, Indianapolis, Indiana and Washington, D.C.
Ph.D. 1979, Ecology and Behavioral Biology, University of Minnesota, Minneapolis.

Honors and Awards

Henry S. Mosby Award for Outstanding Contributions to Research, 1998, National Wild Turkey Federation

Relevant Refereed and Invited Publications

Didier, K. A. and W. F. Porter. 2003. Evaluating regional patterns in sugar maple regeneration and white-tailed deer densities in northern New York. *Forest Ecology and Management*. In Press.

Sage, R. W. Jr., W. F. Porter and H. B. Underwood. 2003. Windows of opportunity: white-tailed deer and the dynamics of northern forests in the northeastern U.S. *Journal of Nature Conservation*. In Press.

Glennon, M. J., W. F. Porter, and C. L. Demers. 2002. An alternative field technique for estimating diversity of small-mammal populations. *Journal of Mammalogy* 83:734-742.

McClain, B. J. and W. F. Porter. 2000. Using satellite imagery to assess large-scale habitat characteristics of the Adirondack Park. *Environmental Management* 26:553-561.

Glennon, M. J. and W. F. Porter. 1999. Use of satellite imagery in landscape-scale habitat assessment for wild turkeys. *Wildlife Society Bulletin* 27:646-653.

Didier, K. A. and W. F. Porter. 1999. Large-scale assessment of potential habitat to restore elk to New York State. *Wildlife Society Bulletin* 27:409-418.

Porter, W. F. and J. A. Hill. 1999. Biotic resources of the northeastern United States. Pages 181-218 in Mac, M. J., P. A. Opler, C. E. Puckett Haeker and P. D. Doran, editors. Status and trends of the nation's biological resources. U. S. Department of the Interior, U. S. Geological Survey, Reston, Virginia.

Porter, W. F. and H. B. Underwood. 1999. Of elephants and blind men: deer management in the U.S. National Parks. Ecological Applications 9:3-9.

Professional Society Membership

American Association for the Advancement of Science
American Institute of Biological Sciences
American Society of Mammalogists
Ecological Society of America
National Wild Turkey Federation
Organization of Biological Field Stations
Rocky Mountain Elk Foundation
Society for Conservation Biology
The Wildlife Society

Curriculum Vitae --- Donald J. Leopold

Distinguished Teaching Professor, Faculty of Environmental and Forest Biology
State University of New York
College of Environmental Science and Forestry
Syracuse, New York
ph: (315) 470-6784/6760; email: dendro@mailbox.syr.edu

Education

December 1984, Ph.D., Purdue University, Department of Forestry and Natural Resources (Forest Ecology).
December 1981, M.S.F., University of Kentucky, Department of Forestry (Forest Ecology).
May 1978, B.S., University of Kentucky, Department of Horticulture and Landscape Architecture (Nursery Management/Ornamental Horticulture).

Employment

June 1998 to present, Distinguished Teaching Professor, Faculty of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry (SUNY-ESF), Syracuse, NY.
August 1995 to June 1998, Professor, Faculty of Environmental and Forest Biology, SUNY-ESF.
August 1989 to July 1995, Associate Professor (with Continuing Appointment), Faculty of Environmental and Forest Biology, SUNY-ESF.
August 1985 to August 1989, Assistant Professor, Faculty of Environmental and Forest Biology, SUNY-ESF.

March to August 1985, Research Associate, Institute of Ecology, University of Georgia, Athens, GA.
August 1980 to December 1984, Graduate Instructor, Department of Forestry and Natural Resources, Purdue University, West Lafayette, IN.
August 1978 to August 1980, Research Assistant, Department of Forestry, University of Kentucky, Lexington, KY.

Professional Affiliations

Ecological Society of America, Natural Areas Association, Society for Conservation Biology, Society of American Foresters, Society of Wetland Scientists, Torrey Botanical Society

Published Manuscripts (refereed, past 4 years; out of 50 total)

Godwin, K.S., J.P. Shallenberger, D.J. Leopold, and B.L. Bedford. 2002. Linking landscape properties to local hydrogeologic gradients and plant species occurrence in minerotrophic fens of New York: A hydrogeologic setting (HGS) framework. *Wetlands* 22:722-737.
Anderson, K.L. and D.J. Leopold. 2002. The role of canopy gaps in maintaining vascular plant diversity at a forested wetland in New York State. *Journal of the Torrey Botanical Society* 129:238-250.
Hall, B.R., D.J. Raynal, and D.J. Leopold. 2001. Environmental influences on plant species composition in ground-water seeps in the Catskill Mountains of New York. *Wetlands* 21:125-134.
Yorks, T.E., D.J. Leopold, and D.J. Raynal. 2000. Vascular plant propagule banks of six eastern hemlock stands in the Catskill Mountains of New York. *Journal of the Torrey Botanical Society* 127:87-93.
McGee, G.G., D.J. Leopold, and R.D. Nyland. 1999. Structural characteristics of old-growth, maturing, and managed northern hardwood stands: implications for forest ecosystem management. *Ecological Applications* 9:1316-1329.
Bonanno, S.E., D.J. Leopold and L. St. Hilaire. 1998. Vegetation of a freshwater dune barrier under high and low recreation uses. *Journal of the Torrey Botanical Society* 125:39-49.
Johnson, G. and D.J. Leopold. 1998. Habitat management for the eastern massasauga in a central New York weakly-minerotrophic peatland: The effects of cutting, burning and herbicides on vegetation and small mammal abundance. *Journal of Wildlife Management* 62:84-97.
Podniesinski, G.S. and D.J. Leopold. 1998. Plant community development and peat stratigraphy in forested fens in response to groundwater flow systems. *Wetlands* 18:409-430.

Book Chapters (past 4 years; out of 6 total)

Bedford, B.L., D.J. Leopold, and J.P. Gibbs. 2000. Wetland biodiversity, pp. 781-804, In: *Encyclopedia of Biodiversity*, Vol. 5, Academic Press, San Diego, CA.

Raynal, D.J., J.P. Gibbs, N.H. Ringler, and D.J. Leopold. 1998. Ecological surveys: The basis for natural area management (Exercise 21), pp. 125-144, In: J.P. Gibbs, M.L. Hunter, Jr., and E.J. Sterling, *Problem-Solving in Conservation Biology and Wildlife Management*, Blackwell Science, Inc., Cambridge, MA.

Books

- Leopold, D.J. 2003. *Trees of New York. Native and Naturalized*. Syracuse University Press, Syracuse, NY, xxx p. (in press).
- Hardin, J.W., D.J. Leopold, and F.M. White. 2000. *Harlow and Harrar's Textbook of Dendrology*, 9th ed., WCB/ McGraw-Hill, New York, NY, 544 p.
- Raynal, D.J. and D.J. Leopold. 1999. *Landowner Guide to State-protected Plants of Forests in New York State*. State University of New York, College of Environmental Science and Forestry, Syracuse, NY, 96 p.
- Leopold, D.J., W.C. McComb, and R.N. Muller. 1998. *Trees of the Central Hardwood Forests - An Identification and Cultivation Guide*, Timber Press, Inc., Portland, OR, 512 p.

Proceedings (relevant to proposal)

- McDonnell, J.J., S. Stribling, R. Neville, and D.J. Leopold (eds.). 1996. *Watershed Restoration Management: Physical, Chemical and Biological Considerations*. American Water Resources Assoc., Herndon, VA. 514 p.
- McDonnell, J.J., D.J. Leopold, R. Neville, and S. Stribling (eds.). 1996. *New York City Water Supply Studies*. American Water Resources, Herndon, VA. 174 p.

Book Reviews (all invited, past 4 years)

- Leopold, D.J. Guide to Urban Riparian Renaissance. Review of *Restoring Streams in Cities. A Guide for Planners, Policymakers, and Citizens*. Hydrological Processes HP Today (in press).
- Leopold, D.J. 2002. *Wetland Ecology Principles and Conservation*. *Natural Areas Journal* 22:166-167.
- Leopold, D.J. 2002. *Responses of Northern U.S. Forests to Environmental Change*. *The Quarterly Review of Biology* 77: 84-85.
- Leopold, D.J. 2000. *Discovering the Unknown Landscape: A History of America's Wetlands*. *The Quarterly Review of Biology* 75:340-341.

Active Research Grants (as of 1/1/03, out of over \$8 million funding received as PI or coPI since 1986)

- Utility right-of-way management in Karner blue butterfly habitat areas; Niagara Mohawk Power Corporation; \$425,000 (June 1995 to December 2003); D.J. Leopold, P.J. Smallidge and L.P. Abrahamson.
- Restoration of coastal wetlands in the St. Lawrence River through re-establishment of natural hydrologic regimes; Great Lakes Protection Fund; \$222,000 (October 1999 to December 2002); J.M. Farrell and D.J. Leopold.
- A random sample system for accessing forest health on New York State Forest Lands; New York State Department of Environmental Conservation; \$182,000 (May 2000 to April 2003); P.D. Manion and D.J. Leopold.
- Biocomplexity: Physical, biological, and human interactions shaping the ecosystems of freshwater bays and lagoons; National Science Foundation; \$3,000,000 (October 2000 to September 2005); M. Bain, E.A. Cowen, D.P. Loucks, N. Hairston, Jr., R.J. Pendall, D.J. Leopold, C. Driscoll, and S. Ellner.
- The role of disturbance in the long-term viability of a coastal maritime forest fragment; USGS, National Park Service; \$134,065 (October 2000 to September 2004); D.J. Leopold and H.B. Underwood.
- A random sample system for accessing forest health on New York State Forest Lands. Addendum – Ecological community classification component; New York State Department of Environmental Conservation; \$24,800 (May 2001 to April 2002); P.D. Manion and D.J. Leopold.
- Development and application of models to predict occurrence of plant heritage elements on New York State Forest Lands; New York State Department of Environmental Conservation; \$148,428 (May 2001 to April 2003); D.J. Leopold.
- Nelson Swamp Unique Area research; New York State Department of Environmental Conservation; \$9,000 (May 2001 to January 2005); D.J. Leopold.
- Onondaga Creek restoration feasibility study: controlling for flooding and water quality, and enhancing natural processes; US Housing and Urban Development Economic Development Initiative; \$200,000 (January 2002 to December 2004); T.A. Endreny and D.J. Leopold.
- A landscape approach to predicting and evaluating vulnerable wetland ecosystems; US EPA; \$118,135 (October 2002 to December 2005); D.J. Leopold.

SUNY ESF Proposal for Northeast Temperate Inventory and Monitoring Network

Lake Ontario's dynamic coast: Analyzing ecosystem history for sustaining environmental health; New York State Great Lakes Protection Fund; \$200,000 (January 2003 – December 2004); N.G. Hairston, Jr., L. Wagenet, D.J. Leopold, D.M. Peteet, and C.T. Driscoll, Jr.

An assessment of forest health and soil nutrient status to determine the effects of logging practices on water quality in watersheds in the Catskill Mountains, NY; USDI-Geological Survey; \$113,912 (October 2002 to September 2004); D.J. Leopold and D.J. Raynal.

Teaching Experience (past 4 years)

Offer courses at SUNY-CESF each year in Dendrology (3 different courses) and Freshwater Wetland Ecosystems; also classes in Forest Communities of the Adirondacks, and Functional Diversity of the Adirondacks; and, seminars and short courses on Restoration Ecology, Wetland Ecology, and Community Organization.

Teaching Awards

SUNY-CESF Student Association Distinguished Teaching Award, March 1987; SUNY-CESF College Foundation Board Award for Exceptional Achievement in Teaching (first recipient), May 1999.

Professional Service (past 4 years)

Editor, *Natural Areas Journal*, 1992-1998.

Member, Editorial Board (Forest Ecology), *Journal of Forestry*, April 1999 to present.

Member, Fulbright Senior Specialists Program Discipline Peer Review Committee, April 2002 to present.

Member, Forestry/Wildlife Project Technical Working Group, Audubon New York, May 2002 to present

Reviewer, proposals for USDA Competitive Grants Program, National Science Foundation, and McIntire-Stennis Forestry Grants (through SUNY-CESF).

Reviewer, manuscripts for *American Journal of Botany*, *American Midland Naturalist*, *BioScience*, *Bulletin of the Torrey Botanical Club*, *Canadian Journal of Forest Research*, *Castanea*, *Conservation Biology*, *Ecology*, *Journal of Forestry*, *Journal of Soil and Water Conservation*, *Journal of Vegetation Science*, *Natural Areas Journal*, *Northern Journal of Applied Forestry*, *Plant Ecology*, *Wetlands*

Curriculum Vitae --- Mark V. Lomolino

Career Interests: My research focuses on large-scale ecology, biogeography and conservation of vertebrates inhabiting insular, montane and fragmented ecosystems. I am especially interested in processes influencing the diversity of isolated ecosystems including true islands, lacustrine and marine ecosystems, and habitat islands such as fragmented, old-growth forests and nature reserves. My research combines empirical and theoretical approaches across a broad range of scales to explore patterns in the geography of nature and to develop effective strategies for conserving biological diversity. I thoroughly enjoy teaching a variety of courses, and advising and interacting with students interested in biology, ecology and conservation biology.

Professional Experience:

2001 to present – Assistant Professor, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY
2003 to present – President, International Biogeography Society.
2001 – Professor, Department of Zoology and Oklahoma Natural Heritage Inventory, Oklahoma Biological Survey, University Of Oklahoma, Norman, OK
1997 to 2000 – Associate Professor, Department of Zoology and Oklahoma Natural Heritage Inventory, Oklahoma Biological Survey, University Of Oklahoma, Norman, OK
1992 to 1997 – Assistant Professor, Department of Zoology and Oklahoma Natural Heritage Inventory, Oklahoma Biological Survey, University Of Oklahoma, Norman, OK
1990 to 1992 – Assistant Professor, Department of Biology, Penn State University – Altoona Campus, Altoona, PA
1986 to 1990 – Adjunct Assistant Professor, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ
1979 to 1980 – Wildlife Biologist, U.S. Fish and Wildlife Service, Cortland, NY
1976 to 1977 – Biological Assistant, U.S. Fish and Wildlife Service, National Fish and Wildlife Laboratory, Gainesville, FL.

Personal Information

Office Phone: (315) 470-6805 Email: island@esf.edu

Education:

Ph.D., Department of Biology, State University of New York at Binghamton, 1983. "Island biogeography, immigrant selection, and mammalian body size on islands." (Dissertation Advisor - John Jaenike)
M.S., Department of Wildlife Biology, School of Forestry, University of Florida, 1977. "Ecological role of manatee herbivory in waterhyacinth-dominated communities." (Thesis Advisor - Katherine C. Ewel)
B.S., Department of Biology, State University of New York at Cortland, 1975.

External Research Support:

PI - M. V. Lomolino, Co-investigator, G. A. Smith. Ecological Survey of Birds at the Washita Battlefield National Site, Oklahoma. National Park Service, \$20,000, June, 2001 to December, 2002.
PI - M. V. Lomolino, Co-investigator, G. A. Smith. Ecological Survey of Mammals and Reptiles at the Washita Battlefield National Site, Oklahoma. National Park Service, \$15,000, June, 2000 to December, 2001.
PIs - M. V. Lomolino, D. F. Sax and J. H. Brown. Foundations and Future of Biogeography: Funding to compile seminal papers on biogeography into a book, *Foundations of Biogeography*, to be published by University of Chicago Press; to organize an *International Biogeography Society*; and to plan several working groups on biogeography and large-scale ecology. National Center for Ecological Analysis and Synthesis, National Science Foundation. \$27,000, 2000 and 2001.
PIs - J. Gittleman and M. L. McKinney. Working Group Member - MVL: "Phylogeny and Conservation: Problems in the Quantification of Biodiversity." National Center for Ecological Analysis and Synthesis (NSF, UC Santa Barbara, and the State of California). 1999 to 2001. Total Funding \$118,180 (\$7,380 for MVL).
PI - M. V. Lomolino, REU Supplements: "Biogeography and Biodiversity of Prairie Dog Towns." National Science Foundation, DEB - Ecological Studies Cluster, 1998 to 1999. \$6,000; 1999 to 2000, \$5,000.

- PI – M. V. Lomolino, Corridors and Connectivity of a Fragmented Landscape, Olympic National Forest. National Science Foundation, DEB – Ecological Studies Cluster, 1997 to 1998. \$26,460.
- PI – M. V. Lomolino, "Biogeography and Biodiversity of Prairie Dog Towns." National Science Foundation, DEB – Ecological Studies Cluster, 1996 to 2000. \$211,564.
- PI – M. V. Lomolino, "Conservation of Mammals Inhabiting Fragmented Old-growth Forests of the Olympic Peninsula." National Science Foundation, DEB – Ecological Studies Cluster. 1994 to 1996. \$65,000.
- PI – M. V. Lomolino, "Ecology and Status of the Swift Fox (*Vulpes velox*) in Oklahoma." USFWS and Oklahoma Department of Wildlife Conservation, 1994 to 1997. \$52,000.
- PI – M. V. Lomolino, "Ecology of the Swift Fox in Oklahoma." National Biological Service, 1996. \$6,000.
- PI – M. V. Lomolino, "Development of Animal Distribution Layer for Oklahoma GAP Analysis." National Geological Survey – Biotic Resources, 1994 to 1997. \$55,000.
- Supplement to GAP Analysis: 1998 to 1999. \$7,000
 - Supplement to GAP Analysis: 1997 - 1998. \$17,424.
 - Supplement to GAP Analysis: 1995. \$2,600.
- PI – M. V. Lomolino, "Ecology and Conservation of Mammal Communities in Fragmented, Tropical Rainforests of Brazil." Smithsonian Institution BDFPP (1994; \$3,600).
- PI – M. V. Lomolino, "Surveys for the Endangered American Burying Beetle and Mammals in the Tiak District of Ouachita National Forest." U.S. Fish and Wildlife Service, 1994. \$5,600.
- PI – M. V. Lomolino, Initial Survey for Rare Species of Amphibians and Reptiles of the TIAK District of Ouachita National Forest. U.S. Forest Service. 1993. \$4,550.
- PI – M. V. Lomolino, Habitat Use and Genetic Characterization of the American Burying Beetle. Oklahoma Department Of Wildlife Conservation. 1992 to 1994. With Co-PI, J. Curtis Creighton. \$38,000.
- PI – M. V. Lomolino, Biological Survey of Vance AFB and Kegelman Auxiliary Air Field. The Nature Conservancy. 1993-1995. \$32,667. G. D. Schnell, PI.
- PI – M. V. Lomolino, Survey of Threatened or Endangered Species for the Oklahoma Department of Transportation. Oklahoma Department of Transportation. 1993. \$30,000. G. D. Schnell, PI.
- PI – G. D. Schnell, Co PI - M. V. Lomolino, "Intensive Survey for American Burying Beetles at Fort Chaffee, Arkansas." U. S. Army. \$22,612 (with Schnell and Creighton). 1992.
- PI – M. V. Lomolino, "Survey for Rare and Endangered Species at McAlester Army Ammunition Depot. U. S. Army. \$14,000. 1993.
- PI – M. V. Lomolino, "Ecology of insular mammals of Lake Huron." Naturalist - Ecologist Fellowships, University of Michigan - Mellon Foundation. 1986 (\$4,800), 1987 (\$5,100), and 1988 (\$5,100)

Awards and Honors:

- Glaser Distinguished Visiting Professor, Florida International University. Island Biology. Spring, 2001.
- The American Society of Mammalogists Award, 1983 (\$500). Immigrant selection, predation and the distributions of *Microtus pennsylvanicus* and *Blarina brevicauda* on islands.
- University of Arizona Five Star Teaching Award Nominee. Spring, 1989.
- Distinguished Dissertation Award, Division of Science and Mathematics, State University of New York at Binghamton, 1983.
- University of Arizona, TAPP Faculty Teaching Recognition, 1987.

Publications:

- Lomolino, M. V. 1977. The Florida manatee. Wildlife Rept. 77:1-2. Florida Coop. Ext. Serv.
- Lomolino, M. V. 1980. Impact of additional locks operations on mammals along the St. Lawrence River. U.S. Fish and Wildlife Report:D, 1-23, Cortland, New York.
- Lomolino, M. V. 1982. Species-area and species-distance relationships of terrestrial mammals in the Thousand Island Region. Oecologia 54: 72-75.
- Lomolino, M. V., and K. C. Ewel. 1984. Digestive efficiencies and consumption rates of the Florida manatee (*Trichechus manatus*). Florida Scientist 47:176-179.
- Lomolino, M. V. 1984. Mammalian island biogeography: Effects of area, isolation and vagility. Oecologia 61:376-382.
- Lomolino, M. V. 1984. Immigrant selection, predatory exclusion and the distributions of *Microtus pennsylvanicus* and *Blarina brevicauda* on islands. Amer. Natur. 123:468-483.

- Lomolino, M. V. 1985. Body size of mammals on islands: the island rule re-examined. *Amer. Natur.* 125:310-316.
- Lomolino, M. V. 1986. Mammalian community structure on islands: Immigration, extinction and interactive effects. *Biol. J. Linn. Soc.* 28:1-21, and Chapter I in, "Island Biogeography of Mammals", Academic Press, New York.
- Lomolino, M. V. 1988. Winter immigration abilities and insular community structure of mammals in temperate archipelagoes. In *Biogeography of the Island Region of Western Lake Erie*. Ohio University Press.
- Davis, R., C. Dunford and M. V. Lomolino. 1988. Montane mammals of the American southwest: the possible influence of post-Pleistocene colonization. *J. Biogeog.* 15:841-848.
- Lomolino, M. V., J. H. Brown and R. Davis. 1989. Island biogeography of montane forest mammals in the American Southwest. *Ecology* 70:180-194.
- Brown, J. H. and M. V. Lomolino. 1989. On the nature of scientific revolutions: independent discovery of the equilibrium theory of island biogeography. *Ecology* 70:1954-1957.
- Lomolino, M. V. 1989. Interpretation and comparisons of constants in the species-area relationship: an additional caution. *Amer. Nat.* 133:71-75.
- Lomolino, M. V. 1989. Bioenergetics of cross-ice movements of *Microtus pennsylvanicus*, *Peromyscus leucopus* and *Blarina brevicauda*. *Holarctic Ecology* 12:213-218.
- Lomolino, M. V. 1990. A test of the "target area effect": the influence of island area on immigration rates of non-volant mammals. *Oikos* 77:297-300.
- Lomolino, M. V. 1993. Winter filtering, immigrant selection and species composition of insular mammals of Lake Huron. *Ecography* 16:24-30.
- Lomolino, M. V. 1993. Matching among granivorous mammals of the Great Basin and Sonoran Deserts: a question of scale. *J. Mammal.* 74:863-867.
- Lomolino, M. V. 1993. Immigrations and distribution patterns of insular mammals: studying fundamental processes island biogeography. *Ecography* 16:376-379.
- Lomolino, M. V. 1994. Species richness patterns of mammals inhabiting nearshore archipelagoes: area, isolation, and immigration filters. *J. Mammal.* 75:39-49.
- Lomolino, M. V. 1994. An evaluation of alternative strategies for building networks of nature reserves. *Biological Conservation* 69:243-249.
- Lomolino, M. V., J. H. Brown and R. Davis. 1994. Analyzing insular distribution patterns: statistical approaches and biological inferences. (in press, *Ann. Zool. Fenn.*)
- Lomolino, M. V., J. C. Creighton, G. D. Schnell and D. L. Certain. 1995. Ecology and conservation of the endangered American burying beetle (*Nicrophorus americanus*). *Conservation Biology* 9:605-614.
- Lomolino, M. V., and R. Channell. 1995. Splendid isolation: patterns of range collapse in endangered mammals. *Journal of Mammalogy* 76:335-347.
- Lomolino, M. V. 1996. Investigating causality of nestedness of animal communities: selective immigrations or extinctions? *Journal of biogeography* 23:699-713.
- Lomolino, M. V., and J. C. Creighton. 1996. Habitat selection and breeding success of the endangered American burying beetle (*Nicrophorus americanus*). *Biological Conservation* 77:235-241.
- Rosenzweig, M. L., and M. V. Lomolino. 1997. Rarity and community ecology: who gets the tiny bits of the broken stick. Pp. 63-90 in, *The Biology of Rarity: Causes and Consequences of rare-common differences* (W. E. Kunin and K. J. Gaston, eds).
- Lomolino, M. V. 1997. Review of "Species Diversity in Space and Time" by M. L. Rosenzweig. *Journal of Wildlife Management*.
- Lomolino, M. V. 1997. Range collapse in endangered mammals. *Environmental Review* 4(1):1-4.
- Songer, M., Lomolino, M. V., and D. Perault. 1997. Habitat selection and niche dynamics of deer mice (*Peromyscus oreas* and *P. maniculatus*) in a fragmented, old-growth forest landscape. *Journal of Mammalogy* (Special Feature) 78:1027-1039.
- Lomolino, M. V., and R. Davis. 1997. Biogeographic scale and biodiversity of mountain forest mammals of western North America. *Global Ecology and Biogeography Letters* 6:57-76.
- Lomolino, M. V., and R. Channell. 1998. Range collapse, reintroductions and biogeographic guidelines for conservation: a cautionary note. *Conservation Biology* 12:481-484.
- Brown, J. H., and M. V. Lomolino. 1998. *Biogeography*. Sinauer Associates.
- Lomolino, M. V. 1999. Review of *Evolution on Islands*, by Peter R. Grant (Oxford University Press. *American Zoologist* 39:184.

- Lomolino, M. V. 1999. A species-based, hierarchical model of island biogeography. Chapter in, *The Search for Assembly Rules in Ecological Communities* (E. A. Weiher and P. A. Keddy, eds.) Cambridge University Press, New York.
- Channell, R., and M. V. Lomolino. 2000. Dynamic biogeography and conservation of endangered species. *Nature* 403:84-86.
- Perault, D., and M. V. Lomolino. 2000. Corridors and Mammal Community Structure across a Fragmented, Old-growth Forest Landscape. *Ecological Monographs* 70:401-422.
- Lomolino, M. V. 2000. Contributions on Island Biogeography, In *Encyclopaedic Dictionary of Environmental Change*. Arnold University Press, London.
- Lomolino, M. V., and D. R. Perault. 2000. Assembly and dis-assembly of mammal communities in a fragmented temperate rainforest. *Ecology* 81:1517-1532.
- Lomolino, M. V. 2000. A Beacon for Ecology, Evolution and Conservation of Isolated Biotas. A review of "Island Biogeography: ecology, evolution, and conservation," by R. J. Whittaker. 1998. Oxford University Press, Oxford, UK. *Journal of Biogeography* 26:1129-1131.
- Lomolino, M. V. 2000. Ecology's most general, yet protean pattern: the species-area relationship. Millennium Issue, *Journal of Biogeography* (invited paper) 27:17-26.
- Lomolino, M. V. 2000. A call for a new paradigm of island biogeography. (introduction to a special feature, edited by M. V. L. for) *Global Ecology and Biogeography* 9:1-6.
- Lomolino, M. V. 2000. A species-based theory of insular zoogeography. *Global Ecology and Biogeography* 9:39-58.
- Lomolino, M. V., and G. A. Smith. 2000. Islands in a sea of grass. *Newsletter of the Oklahoma Biological Survey*. 1:4-5.
- Lomolino, M. V. 2000. An Overview of Biogeography, In *Encyclopedia of Biodiversity* (S. Levin, editor). Academic Press, California.
- Brown, J. H., and M. V. Lomolino. 2000. Concluding remarks: historical perspective and the future of island biogeography theory. *Global Ecology and Biogeography* 9:87-92.
- Channell, R., and M. V. Lomolino. 2000. Trajectories toward extinction: dynamics of geographic range collapse. *Journal of Biogeography* 27:169-179.
- Lomolino, M. V. 2001. The species-area relationship: new challenges for an old pattern. Invited paper, *Progress in Physical Geography*, 25:1-21.
- Lomolino, M. V., R. Channell, D. R. Perault, and G. A. Smith. 2001. Downsizing nature: anthropogenic dwarfing of species and ecosystems. Invited Chapter in, *Biotic Homogenization: the loss of diversity through invasion and extinction*, edited by Michael McKinney and Julie Lockwood.
- Lomolino, M. V., and D. R. Perault. 2001. Island biogeography and landscape ecology of mammals inhabiting fragmented, temperate rainforests. *Global Ecology and Biogeography*, in press.
- Lomolino, M. V. 2001. Elevational gradients of species-density: historical and prospective views. *Global Ecology and Biogeography*, in press.
- Lomolino, M. V., and G. A. Smith. 2001. Dynamic biogeography of prairie dog (*Cynomys ludovicianus*) towns near the edge of their range. Invited paper for a special feature, *Journal of Mammalogy* 82:937-945.
- Lomolino, M. V., and M. D. Weiser. 2001. Towards a more general species-area relationship: diversity on all islands, great and small. *Journal of Biogeography*, 28:431-445.
- Lomolino, M. V. 2002. "There are areas too small, and areas too large to show clear diversity patterns ..." R. H. MacArthur (1972:191). *Journal of Biogeography* 29:555-557.
- Lomolino, M. V., and G. A. Smith. (in press) Terrestrial vertebrate communities at black-tailed prairie dog (*Cynomys ludovicianus*) towns. *Biological Conservation*.
- Lomolino, M. V., and G. A. Smith. (in press) Long-term persistence of prairie dog towns: insights for designing networks of prairie reserves. Submitted to *Biological Conservation*.
- Smith, G.A., Lomolino, M.V., (in review) Black-tailed prairie dogs and the structure of avian communities on the shortgrass plains. *Oecologia*.
- Lomolino, M. V., and G. A. Smith. (in review) Prairie dog towns as islands: applications of island biogeography and landscape ecology for conserving non-volant terrestrial vertebrates. *Global Ecology and Biogeography* (tentatively accepted)
- Lomolino, M. V., Sax, D. F., and Brown, J. H. (editors) 2003. *Foundations of Biogeography*. University of Chicago Press, IL.

Lomolino, M. V., and G. A. Smith. 2003. Prairie dog towns as islands: applications of island biogeography and landscape ecology for conserving non-volant terrestrial vertebrates. *Global Ecology and Biogeography* (in press).

Service and Related Activities:

President, *INTERNATIONAL SOCIETY OF BIOGEOGRAPHY*, 2002 to present.

Scientific Working Group, New York State Biodiversity Research Institute, 2002 to present.

Membership in Professional Societies:

Ecological Society of America, 1978 to present

Society for Conservation Biology, 1990 to present

American Society of Mammalogists, 1977 to present

International Biogeography Society, 2001 to present.

Curriculum Vitae ---Gregory G. McGee

Adjunct Assistant Professor
Faculty of Environmental and Forest Biology
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EDUCATION:

Ph.D., State University of New York, College of Environmental Science and Forestry (Environmental and Forest Biology), Syracuse, NY, December, 1998. Dissertation Topic: Influences of structural heterogeneity in northern hardwoods on herbaceous and bryophytic diversity.

M.S., State University of New York, College of Environmental Science and Forestry (Environmental and Forest Biology), Syracuse, NY, September, 1993. Thesis Topic: Impacts of prescribed fire on transition oak forest understories.

B.S., cum laude, Allegheny College (Aquatic Environments), Meadville, PA, June, 1987.
Undergraduate Research Topic: The spatial variation of phosphorus fractions in surficial lake sediments.

RESEARCH and PROFESSIONAL EXPERIENCE:

Adjunct Assistant Professor, Environmental and Forest Biology, State University of New York – College of Environmental Science and Forestry, May 2002 – present.

Post-Doctoral Research Associate, SUNY-CESF, October 1998-August 2000; May 2001-August 2001.

Consulting Reclamation Ecologist: General Electric, Schenectady, NY; City of Carlisle, PA, 1999.

Consultant to Niagara Mohawk Power Corporation, Syracuse, New York, summer, 1994.

Intern, New York Dept. of Environmental Conservation, Bureau of Forest Resource Management, Long Pond Management Unit, Smithville Flats, New York, summer, 1993.

Graduate Research Assistant, Research Foundation of New York, 1991-1993, 1996-1998.

Wetland Ecologist, Environmental Science & Engineering, Inc., Plymouth Meeting, PA, 1990-1991.

Director, Research and Education, Pennsylvania Environmental Council, Philadelphia, PA, 1990.

Research Associate, Pennsylvania Environmental Council, Philadelphia, PA, 1987-1990.

GRANTS RECEIVED:

Triftshauser, H., A. Weir and G.G. McGee. Consideration of epiphytic lichens in the evaluation of adaptive management for Adirondack Park (AMAP). Roosevelt Wild Life Station. 2000. \$3200.

Forrester, J., D.J. Leopold and G.G. McGee. Influence of beech bark disease on nitrogen retention in a mature forest of the Adirondacks. Roosevelt Wild Life Station. 2000. \$3500.

McGee, G.G., D.J. Leopold, R.D. Nyland, R.W. Kimmerer and J.J. Worrall. The influence of structural heterogeneity on biodiversity within managed, maturing and old-growth northern hardwood stands: implications for ecosystem management. McIntire-Stennis Cooperative Forestry Research Program. 1996-1999. \$72,671.

McGee, G.G. Analysis of forest composition and structure on portions of the Long Pond Management Unit (including a proposed old-growth reserve), Chenango County, New York; Edna Bailey Sussman Fund; May-August 1993; \$3100.

McGee, G.G. A comparison of structural features and associated biodiversity in managed and old-growth hardwood forests of the Adirondacks; Edna Bailey Sussman Fund; May-August 1995; \$3400.

PUBLICATIONS:

Peer Reviewed:

- McGee, G.G. and R.W. Kimmerer (in review). Dispersal and establishment regulate epiphytic bryophyte communities in Adirondack northern hardwood forests: evidence from transplants. *Biological Conservation*.
- Mitchell, M.J., C.T. Driscoll, S. Inamdar, G.G. McGee, M.O. Mbila and D.J. Raynal. (in press) Nitrogen biogeochemistry in the Adirondack Mountains of New York: hardwood ecosystems and associated surface waters. *Environmental Pollution*.
- Forrester, J.A., G.G. McGee and M.J. Mitchell. (in press). Effects of beech bark disease on aboveground biomass and species composition in a mature northern hardwood forest, 1985 to 2000. *Journal of the Torrey Botanical Society*.
- McGee, G.G. and R.W. Kimmerer. 2002. Forest age and management effects on epiphytic bryophyte communities in Adirondack northern hardwood forests, New York, USA. *Canadian Journal of Forest Research* 32:1562-1576.
- McGee, G.G. 2001. The influence of decaying logs on understory vascular plant communities in Adirondack northern hardwood forests. *Journal of the Torrey Botanical Society*. 128:370-380.
- McGee, G.G. 2000. The contribution of beech bark disease-induced mortality to coarse woody debris loads in northern hardwood stands of Adirondack Park, New York, USA. *Canadian Journal of Forest Research* 30:1453-1462.
- McGee, G.G., D.J. Leopold, and R.D. Nyland. 1999. Structural characteristics of old-growth, maturing, and partially-cut northern hardwood stands. *Ecological Applications* 9:1316-1329.
- McGee, G.G. and J.P. Birmingham. 1997. Decaying logs as germination sites in northern hardwood forests. *Northern Journal of Applied Forestry* 14:178-192.
- McGee, G.G., D.J. Leopold and R.D. Nyland. 1995. Understory response to springtime prescribed fire in two New York transition oak forests. *Forest Ecology and Management* 76: 149-168.
- Ostrofsky, M.L. and G.G. McGee. 1991. Spatial variation in the distribution of phosphorus species in the surficial sediments of Canadohta Lake, Pennsylvania: implications for internal phosphorus loading estimates. *Canadian Journal of Fisheries and Aquatic Science* 48:233-237.

Misc. Publications and Reports:

- McGee, G.G. 2000. Concepts and methods in forest biogeochemistry - a science education module. State University of New York, College of Environmental Science and Forestry, Syracuse, NY.
- McGee, G.G. and D.A. Saunders. 1998. The ecological roles of decadent and dead trees: lessons for forest management – a science education module. State University of New York, College of Environmental Science and Forestry, Syracuse, NY.
- McGee, G.G. 1993. Analysis of forest composition and structure on portions of the Long Pond Management Unit (including a proposed old-growth reserve), Chenango County, New York. Report to the NY Department of Environmental Conservation, Sherburne, NY.
- McGee, G.G. 1986. Vegetation survey of the Erie National Wildlife Refuge. Report to the US Fish & Wildlife Service, Guys Mills, PA.

HONORS and AWARDS:

SUNY-CESF Graduate Student Association Research Award, 1997.

New York Society of American Foresters Annual Meeting Award for Outstanding Contributed Paper, 1996.

Allegheny College, Environmental Science Department award for outstanding undergraduate research, 1987.

SERVICE:

St. Lawrence University Integrated Science Education Initiative (ISEI), Watershed Subcommittee.

St. Lawrence University Integrated Science Education Initiative (ISEI), Biodiversity Subcommittee.

SUNY-CESF Student Representative to Search Committee for Plant Physiology Faculty, 1996.

SUNY-CESF Graduate Teaching Fellow; 1994-1995, 1995-1996.

Peer reviews for: Journal of Forestry; Canadian Journal of Forest Research; Natural Areas Journal; Northeastern Naturalist; Journal of the Torrey Botanical Society; Urban Ecosystems; USDA Agricultural Research Service; Kluwer Academic Publishers, Plant Pathology and Entomology Program.

PROFESSIONAL AFFILIATIONS:

Ecological Society of America, Society of American Foresters, Society for Ecological Restoration, Natural Areas Association, Torrey Botanical Society

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Professional Experience

- Research Biologist, USGS Patuxent Wildlife Research Center, College of Environmental Science and Forestry, Syracuse, New York

Education

- Ph.D. (1990); Wildlife Ecology, State University of New York College of Environmental Science and Forestry, Syracuse, NY. *Dissertation Title: Population dynamics of white-tailed deer in the central Adirondack mountains of New York: influences of winter, harvest, and population abundance. Typed and bound thesis. 125 pages, 3 tables, 23 figures, 6 appendices.*

Current Research Emphasis

- applied population biology and demography
- natural resource conservation and management
- systems modeling and simulation
- trophic dynamics of grazing systems

Selected Publications

Sage, R. W. Jr., W. F. Porter and H. B. Underwood. 2003. Windows of opportunity: white-tailed deer and the dynamics of northern forests in the northeastern U.S. *Journal of Nature Conservation*. In Press.

Naugle, R. E., A. T. Rutberg, H. B. Underwood, J. W. Turner, Jr., and I. K. M. Liu. 2002. Field testing immunocontraception on white-tailed deer (*Odocoileus virginianus*) on Fire Island National Seashore, New York, USA. *Reproduction*. Supplement 60: 145-153.

Porter, William F. and H. B. Underwood. 2001. Contraception in deer: the Irondequoit Study. State University of New York, College of Environmental Science & Forestry. 92pp.

Underwood, H. B. 2000. Viability of feral horse populations on Atlantic coastal barrier islands: implications for management. Bureau of Land Management. Resource Note #33, (<http://www.blm.gov/narsc/resnotes.html>).

Rudolph, B. A., W. F. Porter, and H. B. Underwood. 2000. Evaluating immunocontraception for managing suburban white-tailed deer in Irondequoit, New York. *J. Wildl. Manage.* 64(2):463-473.

Underwood, H. B. 2000. Review of *Deer of the world: their evolution, behaviour, and ecology* by Valerius Geist. *The Quarterly Review of Biology* 75:196.

Porter, W. F. and H. B. Underwood. 1999. Of elephants and blind men: deer management in the Eastern United States. *J. Applied Ecology*. 9(1):3-9.

Curriculum Vitae --- Benjamin Rubin

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Education

Ph.D. April 2003. State University of New York College of Environmental Science and Forestry (SUNY ESF), Faculty of Environmental and Forest Biology.
Dissertation title: Assessment of the health and sustainability of New York Forests based on forest structure, mortality, and disease.

Research Experience

Post-doctoral Fellow. Starting May 2003. SUNY ESF. Will analyze forest health and forest classification data for New York State, and produce scientific publications and reports on the sustainability of New York's Forests. Supervisor: Don Leopold, Distinguished Teaching Professor.

Publications

- Rubin, B. D. and P. D. Manion. Characterizing regional forest health and sustainability from diameter distributions, baseline mortality and cumulative liabilities. In J. E. Lundquist, R. Hamelin and C. Aguirre-Bravo (eds.). *Integrating Scales of Forest Pathology*. American Phytopathological Society Press. In Review.
- Rubin, B. D. and P. D. Manion. 2001. Impacts of the 1998 ice storm on forest structure and potential consequences for forest health and succession in northern New York. *For. Chron.* 77(4): 613-619.
- Manion, P. D., D. H. Griffin and B. D. Rubin. 2001. Ice damage impacts on the health of the forests in northern New York. *For. Chron.* 77(4): 619-625.
- Manion, P. D., B. D. Rubin and D. H. Griffin. 2000. A healthy amount of disease. *Proceedings of the Society of American Foresters Annual Convention*. Pp. 122-127. Washington, DC. November 16-20.
- Rubin, B. D. and G. G. Hyman. 1999. The extent and economic impacts of soil erosion in Costa Rica. In C. A. S. Hall, ed. *Quantifying Sustainable Development*. Academic Press. New York. pp. 449-471.

Forest Health Monitoring Reports

Faber-Langendoen, D., B. D. Rubin, P. D. Manion, and A. Leimanis. 2002. Forest health monitoring project for southeastern New York: Forest classification report to the New York State Department of Environmental Conservation. January 15.

Manion, P. D., B. D. Rubin, D. Faber-Langendoen, and D. J. Leopold. 2002. Forest health monitoring project for southeastern New York State. Final Report to the New York State Department of Environmental Conservation. February 19.

Faber-Langendoen, D. Rubin, B. D., Manion, P. D., Griffin, D. H., and A. Leimanis. 2001. Forest health monitoring report for central-western New York: Forest classification. Final Report to the New York State Department of Environmental Conservation. December 31.

Manion, P. D., B. D. Rubin, and D. J. Leopold. 2001. Forest health monitoring project for western New York. Final Report to the New York State Department of Environmental Conservation. January 31.

Professional Societies

American Phytopathological Society
Ecological Society of America
Society of American Foresters

Curriculum Vitae --- Stephanie L. Neid

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Education

PhD. Plant Biology 2000 University of Minnesota St. Paul, MN

- *Dissertation topic:* Physiological and Ecological Aspects of Salt Tolerance in Native Grasses
- Outstanding Performance Award for Teaching Assistants, 1998
- Carolyn Crosby Fellowship, 1997
- Dayton-Wilkie Grant, 1997
- Doctoral Dissertation Special Grant, 1996
- Plant Biological Sciences Program Research Assistantship, 1993-1994 B.A. Botany and Biology 1992 University of Iowa Iowa City, IA
- Undergraduate Scholar Assistantship
- Dean's Scholarship

Professional experience

Ecologist 2002- New Hampshire Natural Heritage Bureau Concord, NH

- Performed statewide natural community surveys, assessments and mapping, database development for regional and state vegetation classification.
- Wrote user-friendly guide to New Hampshire's open peatland ecosystems. Eastern Regional Vegetation Ecologist 2001 2002- NatureServe Boston, MA
- Revised plant community classification descriptions in the National Vegetation Classification Ecologist 2000 - 2001 Massachusetts Natural Heritage & Endangered Species Program Westborough, MA
- Performed statewide natural community surveys, assessments and mapping and database development for a comprehensive biodiversity conservation project (<http://www.state.ma.us/dfwele/dfw/nhesp/nhbiomap.htm>)

Botany Consultant 1998 - 2000 self-employed St. Paul, MN

- Minnesota Department of Natural Resources, Trails and Waterways Unit
- Department of the Army
- The Nature Conservancy National Park Service Regional Botany Specialist 1996-1998
TheNature Conservancy Minneapolis, MN
- Wrote Element Global Ranking forms for 50+ plant species occurring in the eastern United States.
- Performed accuracy assessments of the vegetation map of Voyageurs National Park.

Presentations and Publications

S.L.Neid, ed.2002. Terrestrial vegetation of the United States. Chesapeake Bay Lowlands. NatureServe, 11 Avenue de Lafayette, Boston, MA 02111

S.L.Neid, ed.2002. Terrestrial vegetation of the United States. North Atlantic Coast. NatureServe, 11 Avenue de Lafayette, Boston, MA 02111

Biesboer, D.D., S.L. Neid, and B. Darveaux. 1998. Salt tolerance in short-stature native grasses. Minnesota Department of Transportation MN-RC-1998-16.

Neid, S.L. and D.D. Biesboer. 1998. Presentation: The efficacy of soil amendments to alleviate NaCl-induced stress on seed germination.

Neid, S.L., D.D. Biesboer, and J. Doyle. 1998. Presentation: Evaluation of a wetland restoration in a transportation corridor.

Curriculum Vitae --- Shawn L. Carter

Professional Preparation

Ph.D. – Conservation Biology, SUNY College of Environmental Science and Forestry,
Syracuse, NY, 2003

M.S. – Wildlife, Virginia Tech, Blacksburg, VA, 1996

B.S. – Natural Resources, Cornell University, Ithaca, NY, 1994

Appointments

2002-current *Adjunct Instructor*, Hudson Valley Community College, Troy, NY.

2001-current *Adjunct Instructor*, New School University, New York, NY.

1998-2001 *Graduate Research Assistant*, SUNY College of Environmental Science and
Forestry, Syracuse, NY.

Publications

Carter, S.L. 2003. An assessment of the contribution of forest structure and spatial scale to
faunal diversity patterns in the Adirondack Mountain region. Dissertation. State
University of New York, College of Environmental Science and Forestry, Syracuse,
New York.

Carter, S.L., C.A. Haas, J.C. Mitchell. 2000. Movements and activity of bog turtles
(*Clemmys muhlenbergii*) in southwestern Virginia. *Journal of Herpetology* 34(1):75-
80.

Carter, S.L., C.A. Haas, J.C. Mitchell. 1999. Home range and habitat selection of bog
turtles in southwestern Virginia. *Journal of Wildlife Management* 63(3):853-860.

Awards and Fellowships

Roosevelt Wild Life Station Graduate Fellowship (\$8,200), SUNY-ESF, Syracuse, NY,
2001.

Proposal: "Forest structure as a determinant of biological diversity in Adirondack
forests."

Cornell University Tradition Fellowship (\$8,750), Cornell University, Ithaca, NY, 1990-
1993.

Sea Education Association Scholarship (\$2,000), Cornell University, Ithaca, NY, 1992.