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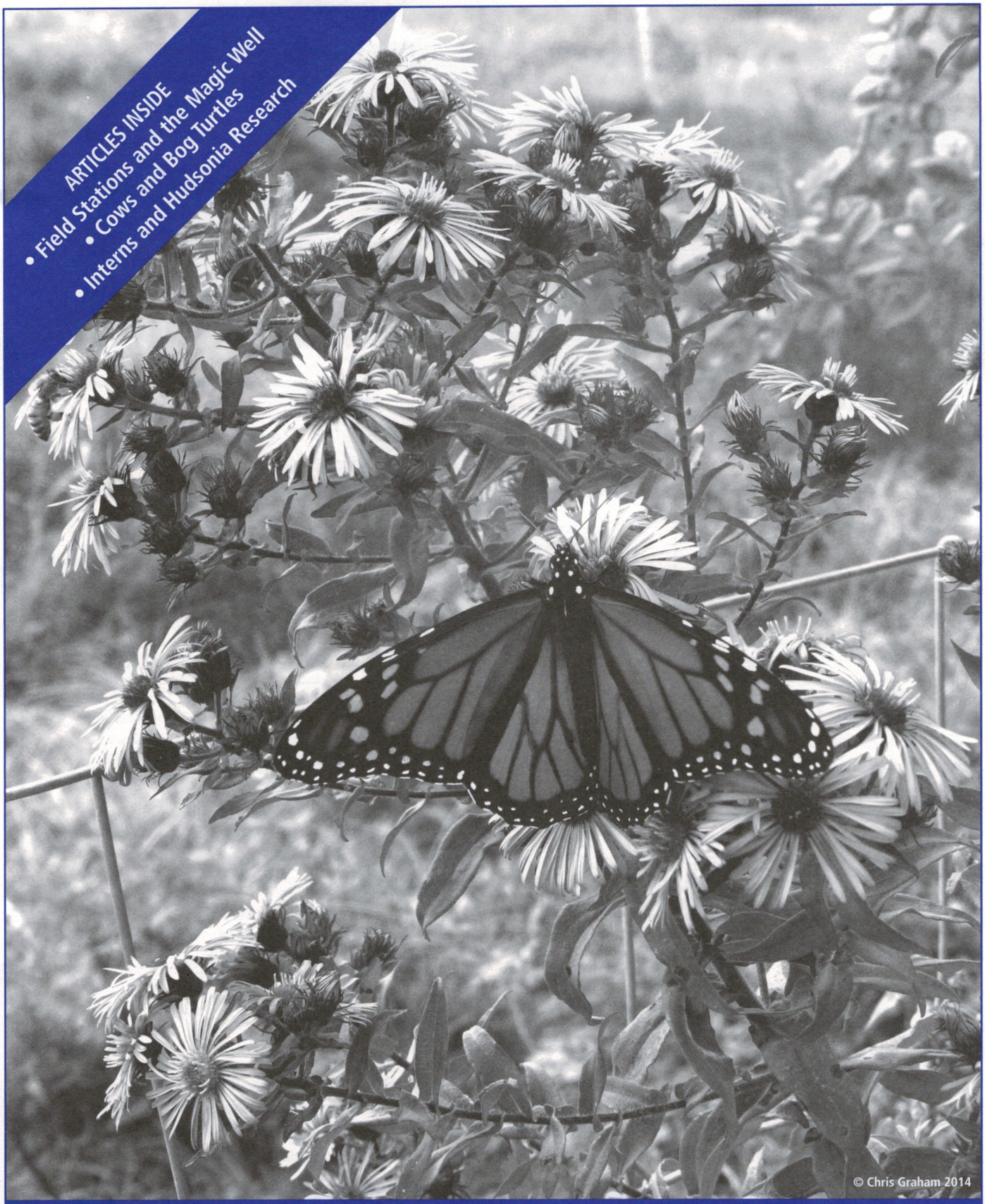

Environmental Research and Education
Science for Conservation

News from Hudsonia

Volume 28, Number 2

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Cover photo: Monarch visiting New England aster (*Symphyotrichum novae-angliae*) flowers at the Mohonk Foothills site near New Paltz, NY. Asters and many other native and non-native wildflowers provide nectar to locally-hatched as well as migrant adults of this iconic butterfly. In recent years, monarch populations have declined and the World Wildlife Fund considers the species "Near Threatened" due to loss of winter habitat in Mexico, agricultural herbicides in the US, and climate change.

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News from Hudsonia

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Dear friends of Hudsonia,


K. Schmidt ©2001

By the time you read this, the Solstice will be past and we will have entered a new biological year.

Hudsonia does not "hibernate" in the winter, however. We identify specimens and pore over data and field notes to understand why goldenclub grows where it does and bog turtles forage where they do, why Atlantic Coast leopard frogs chorus in one reed-rimmed pool rather than another, and when and why Blanding's turtles use "natural" vs. constructed wetlands.

Then we translate our and others' research results into information and training for environmental decision-makers, so that they are better equipped to reduce human impacts on biodiversity and other natural resources.

This is the season when we ask for your support. Donations allow us to continue the work that translates directly into conservation support for your community.

Right now, an anonymous donor will match 1:1 any amount that you donate above your usual giving, so please give generously.

Wishing you a wonderful winter,

Philippa Dunne
Chair

Erik Kiviat
Executive Director

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CONTENTS

FIELD STATIONS, RESEARCH, AND THE MAGIC WELL OF NATURE

By Erik Kiviat*

Biologists have lamented the decline of the formal study of natural history—the basic observations of organisms in the field—that have made much of ecological research and conservation possible and effective. Good science requires intellectual humility and an open mind, often lacking in structured institutions where scientists and scholars compete for funding and prestige. Moreover, the study of natural history often involves the blending of disciplines (Bury 2006), including geology, biology, anthropology, and the arts, and combines with other approaches, such as quantitative ecology and molecular biology, to facilitate scientific discovery (Schubel et al. 2014).

Many conservation scientists and other ecologists have also expressed concerns about the shortage of taxonomic capacity—the people, collections, training and experience needed to classify and identify organisms, especially those in less well-known groups such as spiders, water mites, or lichens (Burton 2003, Mace 2004, Ward 2012). Both research and conservation are facilitated in proportion to that available capacity; inexperienced taxonomists produce data that can address some questions but not others (Nielsen et al. 1998). My colleagues and I have discovered that surveying disparate groups of organisms, for example in the urban New Jersey Meadowlands or representative habitats of Columbia County, yields a broader and stronger understanding of biodiversity, human impacts on the environment, and potential for conservation and restoration. We also have found that identification of organisms to the species level rather than just to family or genus yields more useful information for environmental assessment and biodiversity conservation. In addition to our experienced field biologists, it takes tens of taxonomic specialists to assist with such surveys.

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* Erik Kiviat is Hudsonia's executive director.

Field Stations continued from page 1

Scientific field stations support field research in natural history, taxonomy, and ecology (as well as geology, cultural studies, and other disciplines) with their associated laboratory work, data analysis, writing, and teaching. Field stations allow professionals and students access to field research and education sites with the facilities and equipment they need for their studies (Schubel et al. 2014). These facilities also help connect scientists to educational institutions, conservation decision-makers, and the public, and students to each other. In these and other ways, field stations play a unique role in ecological science, natural history, and environmental planning.

Besides being essential for conservation and management of rare species, basic descriptive field work at the level of whole organisms and their interactions with the environment often interests beginning students in more complex biological questions (Bury 2006). Beneficially, as described by Eisner (1982), "Students who learn to discover in nature develop a fondness for nature, and almost inevitably in due course, a strong personal commitment to the preservation of nature."

Perhaps the best way to illustrate the importance of these institutions is via a personal example. When I was seventeen I spent three summer months as a high school volunteer in Huntington, Long Island, at the Kalbfleisch Field Research Station of the American Museum of Natural History. For three mornings each week, I removed woody plants from vegetation study plots, maintained trails, and cleaned cages in exchange for fulltime room and board, and the privilege of helping with population studies of turtles, snakes, and frogs. That was my first experience of professional field science. I learned that box turtles moved from one habitat to another as different foods became available, and that milk snakes could be found beneath intentionally placed "cover boards" at certain times of day, and many less tangible lessons in field biology and field research. The experience launched my lifelong career in conservation biology.

I have since visited, and sometimes worked at, scientific field stations in Maine, New Jersey, Florida, Georgia, Oregon, Maryland, Manitoba, Botswana, and the Czech Republic. And for forty-two years I have worked at the Bard College Field Station on the Hudson River. In the year prior to the construction of the Bard station, I began studying the plants and animals of the Tivoli Bays, a freshwater tidal wetland complex adjoining the college. I explored the marshes in a rubber raft and kept pressed plant specimens in an old refrigerator to protect them from pests. These primitive beginnings led to my career interest (with canoes and herbarium cabinets!) in fresh-tidal wetlands about the same time that researchers began studying similar systems on the Delaware River and Chesapeake Bay. With my Hudsonia and Bard colleagues, and collaborators from other institutions, I have also conducted research on other types of wetlands, forests, rocky hill crests, rights-of-way of railroads, pipelines, and electric lines, nonnative weeds, rare native organisms, and the ecology of human settlements. Under the direction of Gretchen Stevens, we developed methods for educating and training environmental professionals, and mapping, assessing, restoring, and conserving habitats that support native biodiversity.

My teenage experience at a Long Island field station launched my lifelong career in conservation biology.

Brussard (1982) stated that field stations were paramount in locating and identifying rare species, and conducting research on their ecology and evolutionary biology, hence contributing to the conservation of genetic diversity. The Bard Field Station has supported this endeavor via field work on goldenclub, other rare plants on and off the Hudson River, the bog turtle and Blanding's turtle, and a tiny, globally rare clam shrimp. Students and faculty from Bard and other institutions have worked together on these projects, learning in ways that do not occur in the classroom or within the structure of a single institution.

During those four decades, many interesting phenomena have come to light. For example, that Hudson River snapping turtles carried large body burdens of PCBs (Stone et al. 1980), that muskrats helped maintain marsh diversity by creating raised and lowered microhabitats for many kinds of plants and animals (Kiviat 1978, Connors et al. 2000); and that American goldfinches and other birds nested in large clumps of purple loosestrife in marsh habitats where there were fewer predators and nest parasites (Kiviat 1996).

Urban tidal wetland in winter, Haverstraw, Rockland County, NY. Photo © Erik Kiviat 2014

Hudsonia scientists collaborated on studies of American eels, a declining species (Schmidt et al. 2006, 2009a), and the recently noticed mitten crab, an exotic species with invasive potential (Schmidt et al. 2009b), in Hudson River tributaries. We designed, and conducted eighteen years of research on, a complex of constructed habitats and the responses of the Threatened Blanding's turtle to restoration (Kiviat et al. 2000, Hartwig & Kiviat 2007, Dowling et al. 2010). By means of habitat mapping and analysis, reports, and workshops we assisted hundreds of NGOs, public agencies, landowners, businesses, and individuals with assessment and conservation of habitats in their communities (e.g., Kiviat and Stevens 2001, Bell et al. 2008, Graham et al. 2012, Stevens 2012, Woodstock Land Conservancy 2013, Stevens et al. 2014). We analyzed biodiversity in the Northern Shawangunk Mountains and prepared a guide to basic information for research and conservation in that region (Kiviat 1988). Fourteen years of biological surveys and analysis (Kiviat and MacDonald 2004), reviews of development proposals, assessment of wetland management projects, participation in public planning meetings in the New Jersey Meadowlands, and the preparation of a Biodiversity Assessment Handbook for New York City (Kiviat and Johnson 2013) gave us a keen appreciation of the importance of urban and industrial environments for wild plants and animals and their human observers. Our experience with urban-industrial areas, ecological restoration, mined lands, and the northeastern flora and fauna provided insight that we are applying to the analysis of shale gas development impacts on biodiversity (Gillen & Kiviat 2012, Kiviat 2013a), invasive species effects on wetlands, and assessment of what works and doesn't work in wetland management. All of these projects were made possible by the laboratories, equipment, biological collections, library, or other resources at the Bard College Field Station.

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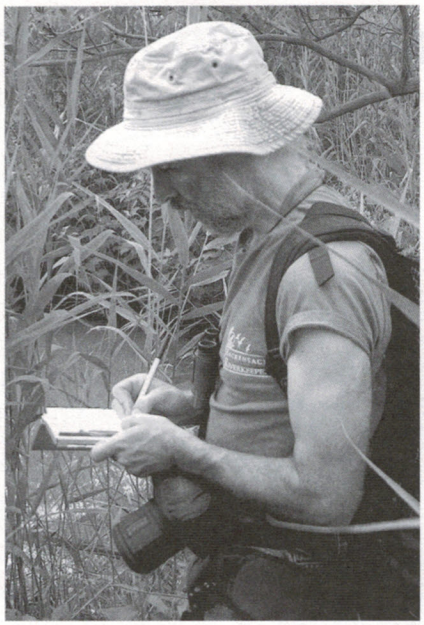


Erik Kiviat studying a common reed (*Phragmites*), stand in the New Jersey Meadowlands. Photo © Laura Heady

I have instructed or collaborated with more than 500 undergraduate and graduate students, sharing knowledge of and passion for natural history and ecology with many who were, or subsequently became, environmental professionals or researchers. Graduate students from other institutions have used the Bard College Field Station to study the songs of swamp sparrows, larval settlement of zebra mussels, submergent plant effects on water quality, and transfer of dioxins from river water to air.

While preparing this article, I asked one of the first, and one of the most recent, Bard students with whom I have worked to comment on their experiences at the Bard Field Station. Stewart Fefer (Bard '73), who just retired from a long career with the U.S. Fish and Wildlife Service, said:

> *The Bard Field Station was the location where I was able to find science through natural history. I learned about biology, water quality, ecology, chemistry and . . . was introduced to human ecology and understanding the role of humans in resource issues and solutions. . . . The inspiration and education provided by the Field Station led me to a successful career as a conservation leader.*

Continued on page 8

THREE YEARS, TWO COWS, AND TWENTY-FIVE BOG TURTLES

By Erik Kiviat

The bog turtle is a secretive animal of fen habitats in southeastern New York.
Photo © Jason Tesauro 2014

The bog turtle (*Glyptemys muhlenbergii*) is a tiny turtle of conservation concern that is rare throughout its range from Georgia to Massachusetts. It is federally listed as Threatened and New York State-listed as Endangered. Bog turtles occur in small populations that rarely leave groundwater-fed, herbaceous wetlands with soft, wet soils. Rich fens are the typical core habitat for the bog turtle in southeastern New York. These are unusual habitats in the region, characterized by calcium-rich groundwater seepage, low and (often) sparse vegetation, and a distinctive plant community. Destruction of habitat, illegal collecting, and development of tall dense vegetation in the core wetlands have caused the endangerment of this species.

Several bog turtle wetlands in New York have been protected by acquisition or easement, but most are yet unprotected. The wetlands must be managed to keep the vegetation low and open such that sunlight can warm the ground, the turtles, and their eggs. Evidently, bog turtle wetlands have been kept open historically by local conditions that inhibited taller plants, as well as fire, beaver activity, and large grazing animals. During the past couple of centuries, domestic livestock seem to have substituted for large native herbivores in maintaining some of the bog turtle wetlands in New York and elsewhere.

Biologist Jason Tesauro has developed methods for using cows, sheep, and goats, as well as hand-cutting, to reduce the height and density of vegetation in degraded bog turtle wetlands in New Jersey and New York. Hudsonia has had the privilege of collaborating with Jason, a dairy farmer, the New York State Department of Environmental Conservation (DEC), and the US Fish and Wildlife Service for the past three years on a project to improve habitat for bog turtles at a Hudson Valley site. This wetland retained sedge and low shrub-dominated fen-like areas but had a large dense stand of cattails as well as many tall shrubs that reduced the habitat suitability for bog turtles. Jason erected fences and manually removed about 100 shrub stems in the first year prior to spring emergence of the turtles, and then introduced two young dairy cows to graze in the wetlands. The cows had access to upland grazing and supplemental food to ensure their health, and were kept on the site for six months beginning in May each year with different heifers.

Each year, with the assistance of Hudsonia research interns, we radio-tracked several adult bog turtles through their active season, located bog turtle nests, measured vegetation on permanent plots, and surveyed the entire flora of the core habitat. We have mapped turtle location data, and statistically analyzed the species cover data in the vegetation plots for years 1 and 2, and are now analyzing the year 3 (2014) data and preparing a report on all three years.

The cows have done a superb job of opening up the cattail stand and even reducing the volume of tall shrubs, and the bog turtles demonstrated an affinity for the mucky wet cowpaths. Cover of cattail and a nonnative weed—great hairy willow herb (*Epilobium hirsutum*)—has decreased, and smaller plants have filled in some of the space thus created. The turtles have extended their home ranges a little, continuing to favor the margins of the cattail stand.

Next year, if funding is renewed, we plan to discontinue grazing and see if vegetation height and density increase rapidly. We hope to continue the vegetation sampling and flora survey, and study the wetland

Jason Tesauro examines a bog turtle at the habitat restoration site.
Photo © Erik Kiviat 2014

GREAT WORK AWARD

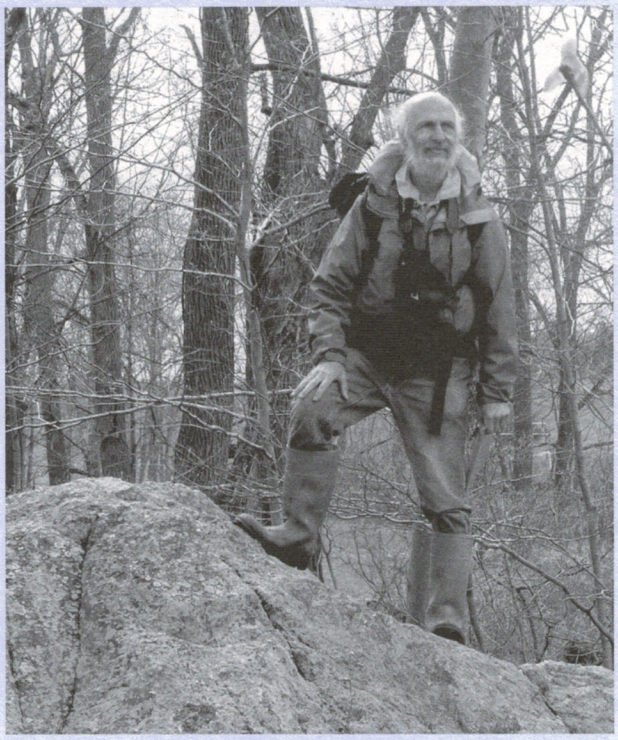
This fall **Erik Kiviat**, Hudsonia's executive director, received the **Great Work Award in Honor of Thomas Berry** from the Environmental Consortium of Colleges and Universities.

The award is bestowed annually on individuals in higher education whose work exemplifies Thomas Berry's counsel that colleges and universities should "reorient the human community toward a greater awareness that the human exists, survives, and becomes whole only within the single great community of the planet Earth." Thomas Berry, 1914–2009, was a cultural historian, religious thinker, environmental philosopher, lecturer, and writer who taught at Seton Hall, Fordham, and Columbia.

Erik was recognized for his forty-five years of research in the field of conservation biology.

In a press release about the award, Consortium director Michelle Land (Pace University) said "Dr. Kiviat is legendary amongst Hudson Valley scientists and environmentalists as the gold standard for ethical research and the pursuit of environmental truth. This year's award not only recognizes his life's work, it echoes his call that knowledge must be the basis for environmental decision-making."

In 1981 Erik (along with Bob Schmidt and Jim Stapleton) co-founded Hudsonia as a home base for conducting independent environmental research. Throughout his career Erik has studied natural history; the ecology of wetlands, rare species, and invasive plants; interactions of humans with the natural environment; and other aspects of conservation science in projects that span North America, Europe, and Africa. He has taught professionals and students, authored or coauthored hundreds of technical reports and peer-reviewed papers, and for 33 years has shepherded a small non-profit research organization that has had a large impact, regionally and nationally, on the thought and practice of conservation science.



Erik Kiviat on a glacial erratic at the Mohonk Foothills site.
Photo © Chris Graham 2014

In 2002, understanding the importance of conveying scientific knowledge to influential non-scientists, Erik and biologist Gretchen Stevens established Hudsonia's Biodiversity Resources Center which gathers and disseminates information on biodiversity resources and conservation to land trusts, municipal agencies, and others involved in land use planning, environmental reviews, design of conservation reserves and easements, and land use regulatory decisions.

Hudsonia staff congratulate Erik on this well-deserved honor!

Bog Turtles continued from page 4

soils to better understand why the turtles use certain areas and not others. We expect this study to yield information that will confirm and refine prescribed grazing as an innovative method for managing herbaceous wetland vegetation. Vegetation management is being conducted for the bog turtle (and for other rare species such as New England cottontail and certain marsh birds) in many areas, but without detailed study of the effects on the animals and plants we typically do not know how well management is working or how to improve an unsuccessful management protocol.

The study has been supported by federal Landowner Incentive Program funds through the DEC. We are grateful to the landowners for their collaboration on this project; their names are confidential to protect the turtles from collectors. Kristen Bell Travis, Suzanne Macey, Laura Lukas, Othoniel Vázquez Domínguez, Robert Naczi, Tierney Rosenstock, and Dave Fischer helped with the study, and the indispensable research interns were Nicole Lopane, Angela Cross, Veronica Steckler, Jillian Bonitatibus, Lea Stickle, and Melissa Fadden. ■

Readers may be interested in Jason's earlier prescribed grazing research in New Jersey:

Tesauro, J. 2001. Restoring wetland habitats with cows and other livestock. Conservation in Practice 2(2):26-31.

Tesauro, J. and D. Ehrenfeld. 2007. The effects of livestock grazing on the bog turtle [*Glyptemys* (= *Clemmys*) *muhlenbergii*]. Herpetologica 63(3):293-300.

GOLDENCLUB, MOSSES, AND BIOFUELS: INTERNS AND HUDSONIA RESEARCH

In spring 2013, **Lea Stickle** was graduating with a bachelor's degree in biology from the State University at New Paltz. She asked her professor Eric Keeling (formerly on Bard College faculty) about interesting summer positions, and Eric referred her to Hudsonia. That summer Lea began a research collaboration with Hudsonia, sampling the bryophytes (mosses and liverworts) that grow on the moist exposed roots of purple loosestrife (*Lythrum salicaria*, a nonnative wetland plant) and the similar and related swamp loosestrife (*Decodon verticillatus*, a native) where the two host plants occurred together. She also began helping with a variety of office and laboratory tasks, including curating and cataloguing herbarium specimens. In 2013 and 2014 she completed the herculean task of digitizing two years of extensive plant data for our Columbia County Living Land project. In 2014, while continuing to work on the bryophytes and Herbarium tasks, Lea joined Hudsonia's bog turtle study (see article this issue), live-trapping and radiotracking turtles, sampling vegetation, and surveying flora of the fen habitat. Lea's quick mind, efficient habits, and meticulousness in all aspects of her work have made her especially valuable to Hudsonia as a technician and research collaborator.

At New Paltz Lea had taken a field natural history course which provided her first exposure to mosses, and she enjoyed courses in entomology and freshwater science. At Hudsonia, Lea liked field work, especially kayaking to some of her moss study sites. This first independent project expanded her concept of research, and gave her a different perspective on invasive plants. She enjoyed interacting with students, interns, and professionals from other institutions at the Bard Field Station. While she experienced a wide range of subjects and groups of organisms, she developed her observation skills, learned radiotracking techniques, was exposed to new software and data analyses, and drafted a paper on the bryophyte study for submission to a scientific journal. Her internship has been a great match for both Lea and Hudsonia!

Our research and curatorial interns have diverse backgrounds and interests, but are united by a common interest in natural history and ecology, and a desire to build their knowledge, skills, and résumés. Our interns have been students from Bard and from other institutions near and far. Some are still in school or are in between bouts of education, and others have finished school and want to acquire new skills or respite from other activities. Some interns receive independent study credits or

Lea Stickle, Melissa Fadden, and Jason Tesauro at the bog turtle habitat restoration site. Photo © Erik Kiviat 2014

base a thesis on their collaborative research. Most use the Bard College Field Station as their research home base. In addition to a primary research project, they all pitch in on day-to-day tasks such as managing data, cataloguing photographs, curating specimens, repairing field equipment, ordering and cataloguing literature, and carrying out a variety of clerical tasks.

While an undergraduate at Bard, **Jennifer Gillen** first collaborated with Hudsonia on an analysis of the vulnerability to shale gas development of species with restricted geographic ranges (Gillen & Kiviat 2012). Subsequently she spent a summer with us managing and analyzing radiotracking data from our long term research on Blanding's turtle response to wetland habitat creation.

Regina Vaičekonytė also began working with Hudsonia while a Bard undergrad. She took the lead in a study of the feasibility of making fuel pellets from common reed (*Phragmites*). This project resulted in a conference presentation and scientific publication (Vaičekonytė et al. 2014). Regina also helped design and build a floating turtle trap for a Hudsonia biological survey.

Melissa Fadden spent two summers with Hudsonia while finishing her bachelor's degree at SUNY Environmental Science and Forestry. In 2013 she worked with Jen Gillen on the Blanding's turtle data analyses, and in 2014 she was a member of the bog turtle team. Now that three years of field work on that project are complete, Melissa and Lea are helping with the data analyses and report preparation.

Veronica Steckler, a recent Bard graduate, worked on the bog turtle team for two years, radiotracking turtles and assisting with vegetation sampling.

Julia Les graduated from Bard a year ago. With the help of a Polgar Fellowship from the Hudson River Foundation, she spent spring and summer 2014 studying goldenclub, a rare plant in the freshwater tidal Hudson River. Her work capped two years of volunteer surveys and allowed comparison with goldenclub populations in the 1930s, 1970s, and 2010s. Julia has documented overall decline despite some newly discovered stands, and has observations of extensive herbivory and a possible role of sea level rise.

For **Zara Dowling**'s Senior Project at Bard, she experimented with different management techniques for maintaining Blanding's turtle nesting habitat. As part of her study she followed the fine-scale movements of female turtles selecting their nest sites (Dowling et al. 2010).

This past summer, three Bard undergrads worked with Hudsonia. **Rebecca Lansbury** pressed, mounted, and catalogued plant specimens from a variety of our field studies. **Isabel Keddy-Hector** and **Olivia Raine** conducted literature searches and organized information for a Hudsonia analysis of invasive plant and animal impacts on the Species of Greatest Conservation Need (rare or declining wildlife species).

Horticulturist **Laura Wyeth** began a project compiling observational and specimen data on organisms found in stands of Japanese knotweed, a large nonnative weed that is spreading in the Hudson Valley. She expects to continue this study in January.

Hudsonia interns acquire knowledge, skills, and new perspectives working with professionals experienced in natural history, conservation science, and habitat management. They also bring fresh eyes and minds to Hudsonia's work, and greatly extend our capacity for research by providing capable assistance with laboratory and field work, conducting new projects, or carrying out additional aspects of ongoing projects. ■

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Vaičekonytė, R., E. Kiviat, F. Nsenga and A. Ostfeld. 2014. An exploration of common reed *(Phragmites australis)* bioenergy potential in North America. Mires & Peat 13(Article 12):1-9.

Farewell to Bill!

Bill Maple has retired after so many years on Hudsonia's Board of Directors that his actual election to the board is lost in the proverbial mists of time. During and before his tenure on the board, in addition to participating in governance, as Director of the Field Station Bill interacted closely with Hudsonia in managing libraries, biological collections, and equipment, commenting on scientific manuscripts, recommending student assistants and interns, answering technical questions, reporting natural history observations, donating books and equipment, and (with his family) making cash donations. It is impossible to remember everything Bill has done for Hudsonia. We look forward to further collaboration during Bill's retirement. As we have said so many times in the past, "Thanks so much, Bill!"

Field Stations continued from page 3

Regina Vaičekonytė (Bard '11) said:

> *The Bard Field Station was much more than just a place to work during my four years at Bard. It was a place to learn . . . about everything from plants, insects and amphibians, to turtle population surveys, to curating biological specimens and conducting scientific literature reviews. I also had an amazing opportunity to lead a study and explore the biofuel potential of* Phragmites australis *[common reed], the results of which have recently been published in* Mires and Peat.

Field stations, here at Bard College and in other places, create such opportunities. Field stations house the workspaces, microscopes, laboratory instruments, field gear, boats, libraries, offices, herbaria and other collections of biological specimens that support research by field scientists. Prior to the establishment of the Bard College Field Station in 1972, and its expansion in 1984 to house the Hudson River Natural Estuarine Research Reserve, there was no field station situated next to a Hudson River wetland.

Field stations are not nature centers *per se*, although many field stations welcome visitors for tours, seminars, and field trips that allow the public to see how scientists develop information as well as to appreciate the diversity of nature (Schubel et al. 2014). The isolation of field stations from busy campuses or cities allows scientists to focus on their work (Schubel et al. 2014); field stations are often associated with parks or reserves where experiments and measuring equipment, and the objects of study, are somewhat protected from human disturbance. Study of the persistence and change of habitats and species through time is crucial to biological understanding, and field stations, if they are fostered and supported in the long term, allow the accumulation of natural history and ecological data, experience, and knowledge for making discoveries and solving scientific and environmental problems (Wilson 1982, Schubel et al. 2014).

Field stations offer professional, amateur, and future scientists a panoply of species, habitats, and phenomena for research. Field stations and the people who staff them are important repositories for crucial data and knowledge. These facilities are where students and researchers learn how to find the species and phenomena they wish to study, and access data on important physical, chemical, and biological conditions. Wilson

Field stations accumulate natural history and ecological data, experience, and knowledge for solving environmental problems.

Urban nontidal marsh soon after an accidental fire, early spring, Kane Natural Area, New Jersey Meadowlands. Photo © Erik Kiviat 2014

Lady's tresses orchid (*Spiranthes*) in a ditch at a powerline right-of-way, Bluestone State Forest, Ulster County, New York. Photo © Erik Kiviat 2014

(1982), paraphrasing von Frisch's comment on the honey bee, observed that "every species is a magic well," and "The more you draw from it, the more there is to draw." Wilson believed that field stations would be increasingly important in drawing information from the magic well of biodiversity. ■

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UPDATES ON 2014 PROJECTS

Biological Assessments

In 2014 we surveyed the biodiversity resources in the **Binnewater Lakes region** (Ulster County) to help the Open Space Institute and local land trusts assess the conservation potential of this area that is rich in limestone ledges, wetlands, and forests. We also conducted a biological assessment of the **Mohonk Foothills** site in New Paltz (Ulster County), where the Glynwood Center is launching an agricultural incubator program on property owned by the Open Space Institute. Based on surveys of birds, reptiles, amphibians, bees, butterflies, dragonflies, damselflies, and plants, our report included recommendations for land management and farm practices to support important natural resources as well as profitable agriculture. We also conducted biodiversity assessments and reviewed land use proposals on two **gas pipelines** (one proposed to be built, the other proposed for increased capacity), a proposed **casino resort**, a proposed **contamination cleanup site**, a proposed **cell tower site,** and a **shooting preserve**.

Biodiversity Education

We held many educational programs on topics related to biodiversity conservation throughout the Hudson Valley. For example, a workshop for **Town of Clinton** (**Dutchess County**) landowners on unusual wetlands in their town, two workshops in **Rensselaer County** on using the Rensselaer Plateau Regional Conservation Plan for land use planning and decision-making, three in **Schoharie and Greene** counties on the importance of intact stream corridor habitats for stream stability and resiliency to flood events, and one in **Greene County** on using the Greene County Grassland Habitat Management Plan in environmental reviews and local land use policy. In addition, community groups from the towns of **Philipstown, Putnam Valley** (**Putnam County**), and the **City of Newburgh** (**Orange County**) took part in a six-month Biodiversity Assessment Training program led by Hudsonia, in which participants learned conservation principles and techniques for identifying and protecting biodiversity resources in their own communities. All of those programs were conducted in partnership with the Hudson River Estuary Program of the NYS Department of Environmental Conservation, with funds from the NYS Environmental Protection Fund.

We held workshops for environmental professionals on the ecology and management of *Phragmites* at Lamont Doherty Earth Observatory (**Rockland County**), reptiles and amphibians of the Hudson River at Norrie Point (**Dutchess County**), and conservation of urban biodiversity at Rutgers Newark (**New Jersey**) (funded by Hudson River Improvement Fund).

Bog Turtle Habitat Management

We are analyzing three years of vegetation, flora, and turtle radio-tracking data from our project (described in this issue) to improve and monitor a degraded fen habitat for the **bog turtle** (NYS Endangered), using grazing dairy cows to remove some of the taller vegetation.

Bog Turtle Habitat Connectivity

Continuing our interests in the ecology and management of the endangered **bog turtle**, we are modeling the connectivity of bog turtle habitats (i.e., the ability of the turtles to move from one core habitat to another) using our detailed townwide habitat maps of five contiguous Dutchess County towns. We are also assisting in the completion of regional action plans for bog turtle conservation. (Funded by the Geoffrey C. Hughes Foundation, Andrew Sabin Family Foundation, and US Fish and Wildlife Service.)

Biofuels

This fall we harvested *Phragmites* reeds at a Hudson River marsh for a second experiment with fuel pellet production (in progress; collaboration with Hudson Valley Grass Energy and the Palisades Interstate Park Commission).

Columbia County Living Land

We completed the third year of field observations in the Columbia County Living Land project in which we are collaborating with the **Farmscape Ecology Program** and the **Columbia Land Conservancy** to survey and describe **ecological communities throughout Columbia County**, study the interactions of people with the land, and convey our findings to the public. Using the mountains of data collected from hundreds of sites throughout the county, we will be working with FEP and the CLC to create a natural history guide to the county, help landowners, residents, and municipal agencies recognize some of the special places and understand how to protect the most important areas.

Hydraulic Fracturing

We are seeking funding to expand our studies of **biodiversity impacts of fracking** for natural gas from the Marcellus shale. In spring 2014 Erik Kiviat moderated the third symposium on this topic at the Northeast Natural History Conference in Springfield, MA. We are also collaborating on analyses of the biological impacts of the many **gas transmission pipelines** proposed or under construction in the northeastern states.

Leopard Frog

Hudsonia continues to study the newly-recognized **Atlantic Coast leopard frog**. In the **New Jersey Meadowlands** and on **Staten Island**, these leopard frogs breed in a few urban coastal ponds, most of which are surrounded by common reed (*Phragmites*) marsh. In 2012, these areas were flooded with brackish water by Hurricane Sandy. The adult frogs seemed to tolerate the urban, slightly brackish, and reed-dominated conditions in the 2013 and 2014 breeding seasons. (Collaboration with Jeremy Feinberg and the New York Natural Heritage Program.)

Ancram Natural Resource Conservation Plan

We worked with the **Town of Ancram** (**Columbia County**) Conservation Advisory Council to create a draft Natural Resource Conservation Plan, describing Ancram's natural assets, prioritizing areas for conservation, and recommending measures for protecting water resources, wildlife habitats, farmland, scenic areas, and recreational resources long into the future. After incorporating feedback from Ancram citizens, we expect to publish the final document by the end of the year.

Invasive Species

We are analyzing the **invasive species** threats to New York State Species of Greatest Conservation Need (SGCN) in the lower Hudson Valley in collaboration with Lower Hudson Partnership in Regional Invasive Species Management.

Non-native Weeds

Hudsonia Research Interns are studying the non-native **purple loosestrife** and the native swamp loosestrife as microhabitats for mosses and liverworts (*Lea Stickle*), and the animals associated with stands of **Japanese knotweed** (*Laura Wyeth*). These studies continue Hudsonia's interests in the ecological integration of abundant, long-present, non-native plants with native organisms. The information will help improve the ability to selectively manage weeds for biodiversity support.

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SPECIAL THANKS

Norene Coller, the Town of Clinton CAC, and the Omega Institute for sponsoring a landowner workshop on unusual wetlands.

Steve Hakim for touring Hudsonia staff around his property in the Binnewater Lakes area.

Landowners in Columbia County and in the Binnewater Lakes area who granted us permission to visit their land.

Julianna Zdunich, for designing the spring and fall fundraising appeals and managing the Hudsonia website.

WISH LIST

Canoe repairs and other minor carpentry

Office copier

HP plotter, 42-inch

GPS units

Binoculars (lightweight, good quality)

Natural history and conservation science books, periodicals, maps

Lightweight pruning pole

(For technical equipment, we are interested only in items less than 5 years old and in good working condition. For all items, please inquire first)

FOR SALE TO BENEFIT HUDSONIA

Hasselblad 500CM camera body, film backs, Zeiss lenses, and small accessories. Inquire for price list: kiviat@bard.edu.

Esther Kiviat photography of Tivoli Bays, other nature subjects, and the Southwest

Artwork by Kathleen Schmidt, Jean Tate, Ralph della Volpe, Victor Demanet

UPCOMING EDUCATIONAL EVENTS

We hope to offer professional workshops and biodiversity assessment training in 2015. Please visit hudsonia.org\events and see the spring 2015 issue of *News from Hudsonia* for future announcements.

HUDSONIA MEMBERS, 2014

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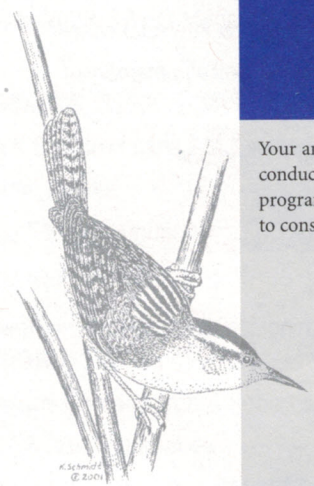

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