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Elise Heffernan © 2019

News from Hudsonia

Volume 33, Number 1

Spring 2019

Cover photo: The full-grown caterpillar of the cecropia moth can be 4-5 inches (10-12 cm) long. It feeds on the leaves of woody plants through the summer, and then spins a cocoon for pupating and overwintering. Elise Heffernan © 2019

The adult moth emerges from the cocoon the following spring. With a wing span of 5-7 inches (12-18 cm), it is the largest native moth in North America. Larry Federman © 2019

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We are grateful to Qualprint for printing *News From Hudsonia* each year.

ISSN 1072-8244

Environmental Research and Education
Science for Conservation

News from Hudsonia

A journal of natural history and environmental issues

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Volume 33, Number 1 Spring 2019

Dear Friends of Hudsonia,

Rapid development of renewable energy systems throughout the world is essential for slowing the pace of climate change. We are learning that utility-scale solar energy development is not without environmental impacts, but that these can be reduced and mitigated with careful study and planning. Although solar development is certainly "softer" on the earth, by far, than fossil fuel development, there are better and worse sites, designs, and management regimes for solar facilities. Research on the biology of solar installations is just beginning, and we are looking forward to putting our experience to work at other sites.

In the back of this issue we summarize our major ongoing activities, including Natural Resource Inventories for towns and counties, and research on rare species, invasive plants, and biodiversity in both urban and rural environments. We continue to learn about the wildlife and plants of the northeastern states, devise ways to conserve and manage their habitats, and educate environmental professionals, students, and the general public about incorporating more and better science into land use planning and conservation.

Please let us know where Hudsonia's skills and experience are needed. And please donate generously to help our work continue. The increasing abandonment of federal oversight and regulation, and reduction of federal funding for local environmental protection makes your support more important than ever!

Erik Kiviat PhD
Executive Director

Philippa Dunne MA
Chair, Board of Directors

* Nothing is provided in exchange for your donation except the knowledge that you are helping biodiversity survive. Hudsonia only uses funds for the organization's nonprofit purposes. Our most recent nonprofit tax return (Form 990) is available from the Hudsonia office or the NYS Office of Charities Registration.

RENEWABLE ENERGY AND THE BIOLOGICAL LANDSCAPE

By Elise Heffernan and Gretchen Stevens*

When a green energy project is proposed, community responses often range from positive, seeing the project as a cleaner alternative to fossil-fuel-derived energy, to negative, seeing it as an unwanted change to the scenic landscape or a loss of agricultural potential, for example. Rarely discussed, however, are the project's short- and long-term effects on the local ecological environment. Wind farms, solar farms, and hydropower generation all alter the local landscape, albeit far less than the average coal mine, oil well, or natural gas well and associated infrastructure.

"Renewable energy" uses natural resources that are replenished on a human timescale. In New York, the main renewable energy sources are hydroelectric, wind, solar, biomass, and geothermal.[14] The resources are either persistent (such as wind, solar, water, and geothermal) or replenished quickly enough that they can be used again (such as biomass).

The New York State 2016 Clean Energy Standard set a goal to have 50% of the state's electricity produced by renewables by 2030.[18] Achieving that goal will require rapid development of renewable energy systems.

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* Elise Heffernan is a Hudsonia biologist; Gretchen Stevens is director of Hudsonia's Biodiversity Resources Center.

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Solar farm in western Massachusetts. Erik Kiviat © 2019

Reasons for switching from fossil fuels to renewables are many—reducing emissions of greenhouse gases (a primary cause of global warming) and other pollutants; reducing dependence on foreign energy sources; reducing harm to habitats and ecosystems; and reducing energy expense for the user. Still, harnessing renewable energy is not without environmental impacts.

Some direct impacts of renewable energy development are relatively well known, including those for wind[1,21] and hydroelectric power.[4] Less well known are the local environmental costs of land-use change, such as converting meadows to solar arrays.

THE MAIN RENEWABLES

Hydroelectric power generation needs a location with continuous running water and a drop in elevation. Operation of hydropower facilities creates little pollution of air or water but can be problematic for many aquatic species. Dams are physical barriers for aquatic organisms that move up and down streams to meet their life history needs and respond to seasonal changes and environmental conditions such as droughts, heat waves, and floods.[11,23] In the Hudson Valley, the American eel and alewife depend on upstream habitats for critical periods of their life cycles, and dams associated with active or former hydropower impede their migrations.[14] The turbines that produce the power are also a source of fish mortality.[23]

According to the New York State Department of Environmental Conservation,[15] wind energy is the least expensive of the renewables to capture for our use, and has high growth potential in the state. While small wind turbines (e.g., for backyard use) can be effective in many areas, large turbines for utility-scale use are practical only in the windiest locations which, in eastern New York, are mostly at high elevations. One often-cited criticism of utility-scale wind turbines is that the rotating blades cause harm to birds and bats.[7] We know very little about other effects of

"Wind farms" and "solar farms" are sites with multiple large turbines or acres of solar panels that connect to the grid via high-voltage transmission lines. These are also referred to as "utility-scale" or "industrial-scale" installations.

"Distributed wind" and "distributed solar" refer to single turbines or a few solar panels for residential, farm, institutional, or community use that offset some or all grid power usage near the point of end use.

"Community solar" facilities are small or large solar arrays that serve offsite energy consumers who purchase shares of or subscriptions to the electricity produced from the solar panels.

wind farms on wildlife, but expect that the habitat fragmentation caused by access roads and clearings around the turbines themselves would degrade the environment for area-sensitive wildlife. One advantage of wind power is that turbines of any size can be easily paired with other land uses, including agriculture, given the relatively small footprint and height of the turbines.

Photovoltaic-based solar energy production is increasing in popularity and has a wider breadth of application than wind or hydro in New York. "Distributed solar" (see sidebar) is possible at developed and undeveloped sites in urban and suburban as well as rural settings.[5,22] But individual solar arrays can be expensive, and the initial burden of cost falls on the property owner who may not have the capital to make that investment. Costs may continue to decline, but in 2019, a 5 kW installation in Dutchess County would cost approximately $12,000 after tax credits.[27] For that reason, development of community and industrial-scale solar power facilities will be important to achieve the state's renewable energy goals.

Monarch larva on common milkweed at a proposed solar farm site, Greene County, NY. Elise Heffernan © 2019

Biomass energy and biomass fuel production are growing areas of renewable energy. These systems use materials that are grown rapidly (e.g., soy and corn for ethanol) or waste products (e.g., wood, manure, used cooking oil, or weeds).[14,29] However, growing soy and corn for ethanol competes with food production, and may be energetically negative,[20] and burning biomass for energy generates air pollutants, including carbon dioxide, one of the primary greenhouse gases contributing to global warming. Non-combustion methods such as anaerobic digestion of biomass (to produce methane for fuel) is a cleaner process.

Geothermal energy refers to the Earth's internal heat. The most common technology for tapping this source for residential and commercial heating and cooling is by ground-source heat pumps (GSHPs) that use the constant temperature underground (about 60 °F) and a heat exchanger. Carbon emissions, other pollutants, and land requirements for this technology are minimal. Installation costs, ranging from $10,000 to over $40,000, are the largest barrier to widespread GSHP adoption, but new technologies continue to bring costs down.[9,16] A 2017 analysis found that residential GSHP systems in New York State resulted in heating cost savings of $680 (± $119) per year compared to fuel oil furnaces.[17]

SITE SELECTION AND DESIGN

Site selection is the most important step in limiting the local impacts of a land-intensive renewable energy project such as wind or solar. Using brownfields, capped landfills, abandoned mines, and former industrial sites will reduce conflicts with intact habitats and farmland. Smaller solar facilities can be installed over parking lots or on roofs of industrial, commercial, institutional, or residential buildings.

Avoiding disturbance of wetlands and forests and minimizing soil disturbance are important strategies to reduce the initial carbon footprint of a renewable energy project.[12] Wetlands and forests hold large amounts of carbon in their soils and biomass, and converting

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these habitats to alternate uses can release large amounts of carbon into the atmosphere, contributing to a higher initial carbon cost. Clearing forests also removes the large carbon sequestration potential of the living biomass and forest soils, cancelling out some of the carbon advantage of the solar or wind project.

Solar panels are necessarily located in open (unforested) areas, and trees and shrubs must be kept at bay. Thus existing meadows are obvious sites for solar farms, but clearing a forest to make room for a solar array increases the carbon footprint of the project. Unlike wind turbines, solar arrays are not very amenable to co-location with crop agriculture and sometimes compete with other agriculture for land. In some cases, solar arrays can be co-located with grazing, however, and hay and biomass production can occur in adjacent and nearby areas.[8]

Consulting with environmental experts during the site selection process will help to avoid or minimize many environmental problems, such as impacts on rare species, sensitive habitats, important farmland, or historic resources. Scenic Hudson is developing a mapping tool that will provide decision support for siting Hudson Valley solar projects where they will avoid many of those features

LOCAL IMPACTS OF SOLAR FARMS

Over the past year, Hudsonia has investigated the effects of solar installations on local environments, but has found little research relevant to this region; the few studies in the northeastern states are still in process. It is well known that solar arrays alter the microclimate of the landscape, creating a mosaic of shaded and unshaded meadows. Their presence alters hydrology (by diverting snow and rain that falls on the panels), solar radiation (shading beneath arrays),[2] heat island effect (in desert conditions,), soil chemistry, and vegetation distribution.[26] Solar panels also create polarized light pollution which many birds and insects perceive as water; this can lead to birds colliding with the panels and insects laying eggs in unsuitable environments.[6]

In addition to those general effects of solar panels are important site-specific impacts on sensitive habitats and rare species of plants or animals. For example, solar farms in large meadows may conflict with nesting habitat for grassland breeding birds such as eastern meadowlark and grasshopper sparrow, and foraging habitat for raptors such as northern harrier and short-eared owl (all four are NYS Species of Greatest Conservation Need). The effects of a solar farm may also extend well beyond the footprint of the arrays and alter the habitat use and behavior of wildlife in neighboring areas

Oldfield at a proposed solar farm site, Greene County, NY. Elise Heffernan © 2019

Hudsonia spent 2018 surveying the landscape of a proposed utility-scale facility to document the biological resources of the site and provide advice for site design and vegetation management. Our recommendations were based on our field surveys of plants, animals, and habitats, and on literature surveys on oldfield management and best land management practices.[10,19,24,25,28] We found that most studies of solar panel impacts have investigated the effects of construction but few have looked at how different post-construction land management techniques could benefit various species or habitats. Aided by pre-construction biological surveys, Hudsonia developed a list of curated management techniques that would improve the conservation functions of a solar facility for wildlife and plants of conservation concern.

In many cases, a "light touch" approach to land management is best for both wind and solar developments. Maintaining shrubland and meadow vegetation beneath, between, and around solar arrays and wind turbines could provide important habitat for butterflies, moths, bees, other insects, small mammals, and their predators such as foxes and eastern coyote. Required setback areas from property lines and treelines can also help to preserve large areas of habitat within the project parcel.

OUTLOOK FOR RENEWABLES

Development of clean, carbon-neutral, renewable energy resources is a crucial step on the way to sustainable energy systems, but carbon neutrality is not the same as being "environmentally benign."[3] While the environmental impacts of wind and solar are much lower than those of fossil-fueled power systems, they are still not well understood and should be investigated before large scale landscape conversions are undertaken.

Multi-use landscapes are probably the best future of renewable energy in the US. Utility-scale wind and solar power require disturbance of large tracts of land, and the site selection, construction, and operation of those facilities should all be designed to minimize harm to local ecosystems, and the land around the installations can be managed to enhance its value for habitats or agriculture. The ambitious goals set by New York State require rapid development, but speed should not outrank considerations for biodiversity conservation and carbon sequestration.

Hudsonia is glad to be involved in biological surveys, site design, and management planning for renewable energy projects. We hope to help other energy project developers, regulators such as planning boards, and environmental organizations bring conservation biology into the siting, design, and land management associated with these projects in New York and the Northeast. ■

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LOGGING AND THE ENVIRONMENT, PART 2

By Erik Kiviat*

REGULATION OF LOGGING IN NEW YORK

Many aspects of logging are unregulated by the State of New York, but a permit may be required for a stream crossing (if it is a "classified" stream), logging in a state-regulated wetland (but activities in most wetlands are unregulated), or in the Adirondacks for a clearcut greater than 25 acres.[9] Some New York municipalities regulate tree cutting—for example, in ridgeline zones, on steep slopes, or in urban or suburban districts, and the curb cut on a public road for log trucks might require municipal, county, or state approval.

A logging operation in New York is not required to use a professional forester to plan the harvest and select trees to be cut or left uncut. Slash and stumps may be burned at the logging site as long as the fire is attended and completely extinguished,[10] and does not violate local outdoor burning restrictions. Logging *per se* does not trigger the requirement for a New York State stormwater management plan despite the potential for soil erosion, increased surface runoff, and siltation into streams and wetlands, but stump removal on one or more acres does require a stormwater permit.

Non-native plants like knotweed often thrive in logged woods. Erik Kiviat © 2019

REDUCING THE NEED FOR LOGGING

We all use forest products directly and indirectly in buildings, furniture, paper, packaging, pencils, and many other essential items. Finding ways to reduce our consumption of wood products will help to reduce the need and demand for logging. But one danger is that reductions in uses of wood might be counterbalanced by an undesirable increase in use of non-renewable resources, for example, plastics and other synthetics manufactured from fossil fuels. Other materials can be substituted for some uses of wood; for example, cattail and common reed are used to produce high quality, modern building materials from reflooded post-agricultural wetlands in Europe,[13] and farmed bamboo is a strong and durable material for construction, furniture, flooring, and many other uses.

Wood wasted in construction projects contributes to the pressure for logging; overall, this can account for a quarter by weight of materials used in a project, and its generation is due to a variety of factors (not all wasted material is wood[3]). Combined construction and demolition (C&D) debris may constitute 13-29% of all landfilled solid waste.[3] Many unused construction materials can be reused or recycled, but the diversity of materials and their widely dispersed generation makes this difficult. Depots that sell or give away surplus materials are an important first step.[8] Salvage and restoration of existing structures, such as old houses and barns, in place of new construction with new materials can also help. There are many attractive and functional dwellings in re-purposed barns and industrial buildings in the Hudson Valley and elsewhere.

Minimizing our uses of paper, reusing scrap paper, and recycling paper reduces the need for new pulpwood. New York State has greatly increased recycling efforts and the use of paper made from recycled fiber, yet could do much more in this respect, and all of us can improve our habits of wood and paper consumption and waste. Better regulation and enforcement of logging practices would help to internalize (to the logging industry) the costs of environmental damage. Any resulting increased costs for consumers might help to rein in our profligate uses and waste of wood products, although given the international trade in forest products the effect would be hard to predict.

* Erik Kiviat is Hudsonia's executive director.

Pink lady's-slipper, a forest orchid, is vulnerable to logging. Erik Kiviat © 2019

CLIMATE CHANGE AND OTHER STRESSORS

The last several decades have seen historically unprecedented changes that include a warmer and wetter northeastern climate with more violent storms, the proliferation of pathogens and insect pests of forest trees with many resulting tree species declines, arrival and spread of invasive plants, and explosion of white-tailed deer populations. These phenomena are in some cases mutually reinforcing, and are affecting the physical structure and species composition of forests.[5,12] It is impossible to predict the future of northeastern forests because of so many strong effects with new ones appearing each year. For example, when I first studied the forest of old trees in the Montgomery Place South Woods (in Annandale, New York) in 1976, I could not know that by 2018 almost all the hemlocks, which constituted two-thirds of the tree stems, would be dead from insect attack.

One noteworthy large scale change occurring in the Northeast is the increase in abundance of red maple, a previously secondary forest species.[1,7] Future forests will be different, their economic value and hence their attraction for harvest may be less or greater, and the ecosystem services they provide (such as water quantity and quality, and biodiversity support) will be different and unpredictable. We should therefore be conservative about forest policy and management.

REDUCING THE EFFECTS OF LOGGING

Best management practices for timber harvest have been formulated and validated based on research.[2] For example, forested buffer zones between logging areas and streams substantially reduce nutrient and sediment pollution[4] but buffer zones are not always maintained in logging operations. Leaving cull trees, snags, and wolf trees standing maintains important habitat functions for many organisms. Building brushpiles or leaving slash and stumps in place is often the best use of logging residues. Ultimately, less logging is usually best for the environment.

Some municipalities in the more-developed parts of the Hudson Valley have local laws regulating tree cutting. Given the reversal of the trend in forest cover increase, due to land development, the NYS Young Forest Initiative, and clearcutting and heavy selective cutting for forest products, it would make sense to regulate logging more closely. In my opinion, a state or local permit should be required for all logging projects exceeding one acre, and the Best Management Practices[11] should be improved and codified into regulations. Use of a Certified Forester to mark trees for harvest should be required for operations above a certain size threshold; this helps ensure the best operation for the goals of the landowner and allows confirmation that only trees intended to be cut are actually cut. Such a program could be supported by permit fees inasmuch as many logging operations appear to be quite profitable. If such regulation cannot be instituted at the state level, municipalities should consider local regulation.

Reforestation in the Northeast has a high potential for storing carbon and thus mitigating global climate change.[6] Given the importance of forests in carbon accumulation, it would seem efficient to log and clear forest only when really necessary, instead of clearing and then reforesting somewhere else where reforestation might conflict with the habitat needs of meadow and shrubland biodiversity.

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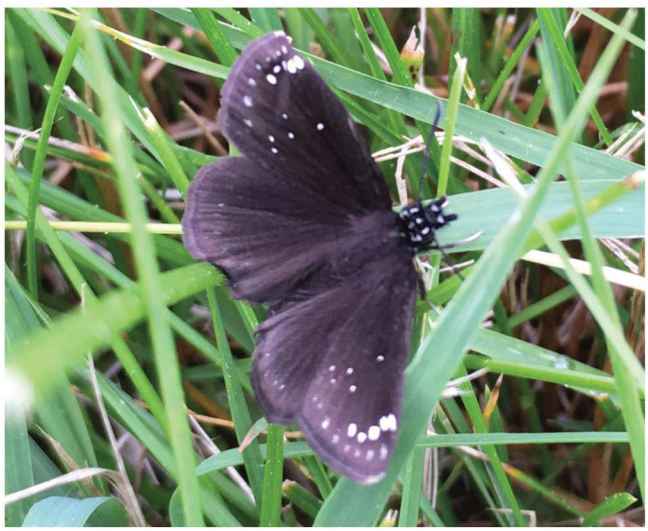
A log landing in Dutchess County, NY. Erik Kiviat © 2019

HUDSONIA PROJECT UPDATES, WINTER-SPRING 2018-2019

Biological Assessments

Newtown Creek. We are puzzling out the last of the plant identifications and preparing a report on the flora of the industrial Newtown Creek estuary in **Brooklyn** and **Queens, New York**. An accompanying butterfly survey will continue this summer. (Conducted in collaboration with the Newtown Creek Alliance and funded by the Hudson River Foundation Newtown Creek Fund.)



Common sootywing at Newtown Creek. Elise Heffernan © 2019

Turtles and Agriculture. Our wood turtle study continues with radio-tracking at the Farm Hub in **Ulster County** and Roxbury Farm in **Columbia County**, in collaboration with Jason Tesauro. Results of a wide-ranging review of positive and negative farm impacts on turtles were presented at the Northeast Natural History Conference in April, and a review paper will soon be submitted for journal publication. (Funded by Hawthorne Valley Farmscape Ecology Program.)

Wood turtle. Kristen Travis © 2019

Solar Facilities. Our biological work continues on two proposed solar projects, the community solar project in Rhinebeck, New York (SunCommon), and the utility-scale project in Coxsackie and Athens, NY (Flint Mine Solar). As these projects wend their way through the regulatory process, we are advising the developers on mitigation measures and vegetation management, including management for raptor foraging habitat, conservation of rare plants, and floral resources for pollinators. Other solar projects are being conceived, planned, and built all over the northeastern states, and Hudsonia's field science expertise is being honed for this relatively new type of development. We welcome readers to share their questions and concerns about solar projects in their neighborhoods, and help us connect with other developers, municipalities, and NGOs that need biological surveys, rare species assessments, and planning assistance.

American Eel. Hudsonia continues its collaboration with the New York State Department of Environmental Conservation (NYSDEC) and Bard College to monitor an eel fyke net at the mouth of the Saw Kill in Tivoli South Bay. Each year the net is checked daily from mid-March to mid-May for glass eels, the young, translucent American eels (*Anguilla rostrata*) that migrate each year from the Sargasso Sea into streams along the US East Coast. The Saw Kill is one of 15 citizen science sites keeping track of the Hudson River eels. The program relies on volunteers from Bard College and the larger community to operate; over 50 volunteers participated in 2019. (Funded by Bard College and NYSDEC.)

Other Biological Assessments and Surveys. We reported on a preliminary biodiversity assessment of the Hempstead Harbor Nature Sanctuary which comprises a portion of the extensive, long-abandoned sand mines in Port Washington (Nassau County, Long Island; funded by Organizing Force, a conservation NGO). This area contains an interesting mixture of woods, shrub thickets, seasonal ponds, and wetlands, including open sandy areas that do, or could, support rare species. During the winter we assessed the site of a proposed recreation facility adjoining a large wetland complex that is potential bog turtle habitat (Dutchess County). Studies of flora and wildlife habitats of Sepasco Lake (Rhinebeck) and the flora, fauna, and water quality of South Twin Lake (Elizaville, Columbia County, NY) continue this spring (funded by the Town of Rhinebeck and the Twin Lakes Association). We also assessed the potential for impacts on Blanding's turtle of the proposed rezoning of a series of parcels in the Town of LaGrange. Biological studies of the Saw Kill and bordering lands in the Town of Red Hook continue in connection with land preservation, hydropower development, and dam removal (funded by the Winnakee Land Trust and Bard College.)

New Jersey Meadowlands

Following a hiatus, we are revising the manuscript about our case study of urban biodiversity conservation in the Meadowlands region, with two books under a new publisher contract (supported by the Geoffrey C. Hughes Foundation and the Emma Barnsley Foundation). We are also assessing a proposed energy facility in the Meadowlands (for Bergen County Audubon Society). And we are expecting to work with a team of scientists developing restoration plans for wetlands in the Berry's Creek Superfund study area that will be dredged to remediate industrial contamination (for Geosyntec and ELM).

Invasive Plant Research

Our studies of selected abundant and widespread, long-present, non-native weeds continue. The emphasis is on the ecological relationships between these weeds and other native and non-native wildlife, plants, and fungi. Two new papers about common reed are close to publication, analyzing a proposed reed biocontrol program, and comparing organisms associated with reed in three world regions. We are compiling observations about songbird nests in knotweed stands in the Northeast and elsewhere in North America and Europe. If you have found a nest in the past, or find one this year, please contact us – nests are easiest to see before full development of the current year's shoots. We are translating our research results and those of other scientists into management recommendations for nature preserves, parks, and private landowners; inquiries for assistance are welcome.

Natural Resource Inventories & Conservation Priorities

The ***Natural Resources Inventory for Columbia County*** was published in December 2018 and adopted by the county Board of Supervisors in April 2019. The document was created by Hudsonia in partnership with the Columbia County Environmental Management Council and the Columbia Land Conservancy, and funded by the Hudson River Estuary Program and Furthermore. The *NRI* illustrates and describes many of the natural resources of the county (e.g., minerals, water, plants, animals, habitats, farmland, scenic areas, recreation resources), explains their importance to local ecosystems and the human community, describes some of the threats to those resources, and offers ideas for identifying priorities for conservation. It is intended to be used by municipal agencies engaged in comprehensive planning, local policy-making, and environmental reviews; by land trusts who are assessing land for potential acquisition or for conservation easements; and by landowners, developers, and anyone else wanting to learn more about the land and natural resources of the county.

Nest in knotweed. Erik Kiviat © 2019

In spring and summer of 2019 we will complete an NRI for **Greene County** (in partnership with the Greene Land Trust) and for the **Town of Dover** in Dutchess County (in partnership with the Dover Conservation Advisory Council and the Climate Smart Dover Task Force). An add-on to the Greene County project is a landscape analysis to identify the conservation priorities throughout the county, which

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Dover oak-heath barren. Chris Graham © 2019

Hudsonia Project Updates continued from page 9

A 2018 field workshop. Elise Heffernan © 2019

will help the Greene Land Trust focus their efforts where they will have the greatest positive impact for the land and resources. The Dover NRI is part of the town's larger effort to mitigate and respond to climate change. Funding for these projects has been from the NYS Environmental Protection Fund, through the Land Trust Alliance and the Hudson River Estuary Program (for Greene County) and through the Climate Smart Communities program of NYSDEC (for Dover).

Conservation Education

In 2019, in partnership with the Hudson River Estuary Program of NYSDEC, we are offering several courses and workshops on various aspects of natural resource assessment and conservation. These include two half-day field workshops on **Recognizing Habitats**, to be held in Greene and Putnam counties; a two-part course on **Small Streams: Values, Threats, and Protection**, to be held in New Paltz; a two-day course on **Habitat and Water Resource Assessment for Land Use Planning** to be held in Voorheesville (Albany County), and a one-day workshop called **Inventories to Action** (location to be decided) on how to make practical use of Natural Resource Inventories and Open Space Plans in local planning, policy-making, and land use decision-making. All programs are funded by the New York State Environmental Protection Fund through the Hudson River Estuary Program. See page 11 for more information about these events. ■

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Logging continued from page 7

Although there is still a lot of forest in the Northeast, we are probably approaching or have passed the peak of mature forest cover in the Hudson Valley. Logging and clearing should be a general as well as a local environmental concern because of the potential loss of ecological integrity and ecosystem services that it represents. Improved regulation of logging, improved enforcement, more conservative logging techniques, and reduction of our consumption and waste of wood products would help to preserve the services provided by forests, including moderation of local air temperatures, carbon sequestration, support of water resources, and maintenance of forest biodiversity. And some areas should not be cut at all, especially those on steep slopes, on soils that are vulnerable to erosion or compaction, near streams, lakes, and wetlands, and where there are rare wildlife or plants. ■

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UPCOMING EDUCATIONAL EVENTS

Small Streams: Values, Threats, and Protection
NYSDEC Region 3 office, New Paltz
28-29 May 2019
In this two-part evening workshop, we will discuss the ecological values of small streams; how to identify them remotely and in the field; threats to stream habitats and water quality; the status of state and federal regulatory programs for small streams; and how to extend local protections to these important resources.

Recognizing Habitats Two workshops:

Putnam County	**Greene County**
Fahnestock State Park	[location to be decided]
14 June 2019, 1:00-4:00pm	21 June 2019, 1:00-4:00pm

These are outdoor workshops for municipal officials and land trust staff to increase their ability to recognize and evaluate major habitat types. We will discuss ecological values, habitat quality, and issues related to land development and conservation.

Habitat and Water Resource Assessment for Land Use Planning
Cornell Cooperative Extension office, 24 Martin Road, Voorheesville, NY
13-14 September 2019, approx. 9:00-5:00pm
In indoor and outdoor sessions we will address finding existing information on significant habitats and water resources, identifying important areas, reviewing site plans and subdivision plats, and applying conservation principles to land use planning and policy, environmental reviews, and design of conservation easements.

Inventories to Action
[location to be decided]
9 November 2019
This is a one-day workshop for representatives of communities that have completed (or are preparing) Natural Resource Inventories or Open Space Plans. We will discuss how to use those documents for comprehensive planning, revising a zoning ordinance or other local legislation, conducting reviews of site plans or subdivision plats, and designing conservation easements.

These courses and workshops are especially for members of municipal planning boards, conservation advisory councils, zoning boards of appeal, staff of land trusts, and other agencies that are developing local land use policy, reviewing land development proposals, advising landowners and developers, and making land management or regulatory decisions.

All programs are conducted in partnership with Cornell University and the NYSDEC Hudson River Estuary Program, and funded by the NYS Environmental Protection Fund. To register, contact Lea Stickle at lstickle@bard.edu or 845-758-7053.

To be notified about other Hudsonia education events, join the email list at https://hudsonia.org/mailinglist/ or check back at https://hudsonia.org/events/.

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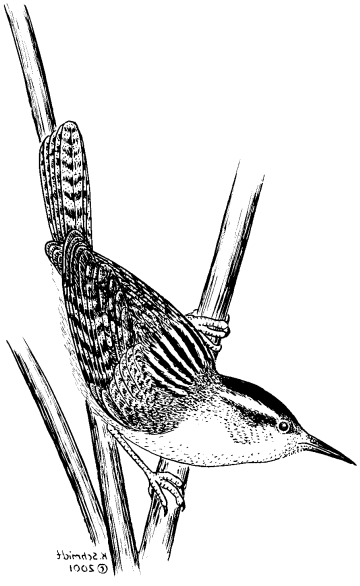

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