INSIDE
Hudsonia's Fortieth Year

Chris Graham

News from Hudsonia

Volume 34, Number 2

Fall 2020

Cover photo: Oldfield vegetation at the Greenport Public Conservation Area (Columbia Land Conservancy). Teasels (*Dipsacus*) are nonnative forbs that colonize fallow fields along with diverse other nonnative and native plants. Meadows like this one that are left unmowed into late fall support rich communities of insects, small mammals, and a host of other animals that reside in or use these habitats intermittently. Photo © Chris Graham 2020.

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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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Annandale, NY 12504-5000

Volume 34, Number 2 Fall 2020

Dear Friends of Hudsonia,

We hope this letter finds you well.

The Covid pandemic and national politics have made this a year of great turmoil, but you have probably discovered by now the soothing benefits of a vigorous hike or bike ride, a paddle on a lake or river, or a quiet walk in field, forest, or urban park.

Whatever happens in Washington, at Hudsonia we believe that local action is always essential for the protection of our environment.

Hudsonia's scientific research tackles environmental problems that have real-world consequences for habitats, rare species, and ecological services to the human community, and our education programs bring useful science to the people best-positioned to put it to work for conservation. This issue of News from Hudsonia *describes some examples.*

Our donors have not failed us in these times, despite all the unknowns about the pandemic's trajectory and everyone's future social and economic lives. We count on your continuing support to keep our programs running at full capacity.

We recognize that there are many unexpected demands on people's wallets, and many worthy beneficiaries for charitable contributions, but we hope you will keep Hudsonia near the top of your list.

Your generous donation is greatly appreciated.

Ann Gabler
Interim Chair, Board of Directors

Erik Kiviat
Executive Director

* 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.

HUDSONIA'S FORTIETH YEAR

by Hudsonia Staff

In 1981, when Bob Schmidt, Jim Stapleton, and Erik Kiviat founded Hudsonia, we wanted to escape the politics of the organizations and agencies where most field biologists work. We wanted to do research and educate environmental decision-makers about fish, wetlands, and renewable energy. Hudsonia's first major project was the design of the Hudson River National Estuarine Research Reserve (HRNERR) in 1982. HRNERR has since conducted and sponsored wide-ranging research on the aquatic, wetland, and adjacent habitats of the estuary, developed information for better management and protection, and led popular education programs that bring children and adults into intimate contact with the estuary environments. Soon after, we reviewed proposals for a resort and a wind farm in the sensitive areas of the Northern Shawangunks, and created a book that synthesized the biodiversity of the whole ridge. Also in the 1980s, we surveyed uses for apple pomace (the solid waste from cider mills) and successfully tested anaerobic digestion for biogas production, and sampled fish, aquatic insects, diatoms and water quality in key Hudson River tributaries to establish reference conditions.

Throughout Hudsonia's history, a central part of our mission has been to put important scientific information into the hands of those who can put it to the best uses. These early studies and hundreds of our other projects in ensuing decades have given the Hudson Valley and neighboring regions better knowledge of wildlife, plants, and habitats, and taught hundreds of conservation and planning professionals how to use that knowledge. As Hudsonia approaches 40, we are assessing our programs and future directions, and evaluating our niche in conservation research and education. Here is a summary of what we do and why.

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CONSERVATION ECOLOGY OF RARE WILDLIFE AND PLANTS

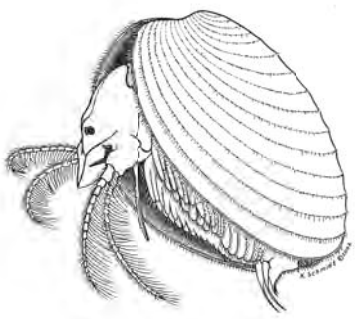
Our aim is to understand the ecology and conservation needs of rare and vulnerable northeastern fauna and flora. We study species for which we can make a difference. For example, turtles worldwide are under pressure from habi-

Wood turtle (NY Special Concern) and Blanding's turtle (NY Threatened) are vulnerable to injury from motor vehicles and farm equipment as they move between habitats for foraging, resting, nesting, and overwintering. Photos © 2020 Larry Federman (top) and Kristen Bell Travis (bottom).

tat loss, pollution, road mortality, and overharvest for food and the pet trade, and have always been prominent in Hudsonia research. Currently, we are analyzing the hazards posed by farm operations, especially to wood turtles, by means of radio-tracking at two organic farms. This species, designated Special Concern in New York, lives in and near streams and rivers, and forages in riparian thickets and fields. Wood turtles are frequently killed or injured by farm equipment and vehicles where fields are cultivated or hayed near the river. We are learning that non-farmed buffers with a certain vegetational structure allow wood turtles to bask and feed with fewer forays into farm fields, and we will translate this knowledge into recommendations for protection and management of stream buffers. We are also using data from a dozen-year study of Blanding's turtle, soil, and vegetation response to a habitat creation project to formulate conservation recommendations for the genetically unique Dutchess County population of this Threatened species.

Clam shrimps are 5-10 mm (0.2-0.4 inches) long crustaceans with clam-like shells that live in temporary rain pools, often on trails and dirt roads. These "charismatic microfauna" develop quickly when rain floods the pools, survive as dormant eggs in the sediment when pools dry, and probably are carried from pool to pool in mud stuck to tires or animals. Some biologists and managers dismiss the clam shrimp as unimportant invertebrates inhabiting artificial mudpuddles, but we presume these enigmatic creatures to be as important as any other species group albeit culturally unrecognized. Our current research focuses on finding the animals, because the adult stages are short-lived and clam shrimps seem to be absent from many potential habitats. We are documenting geographic distributions and describing habitats, and will be sampling other organisms that co-occur. So far we have found five species at widely scattered localities in New York and New Jersey; one or more of these are believed to be globally rare. We are also working to persuade property managers of clam shrimp significance, and state officials to add them to the Species of Greatest Conservation Need lists.

For 15 years as part of a river-wide monitoring network, Hudsonia, Bard College, and the New York State Department of Environmental Conservation have operated a fyke net for sampling in-



Clam shrimp are tiny crustaceans whose habitats—temporary rain pools—have long been overlooked by biologists. Drawing © Kathleen A Schmidt 2002.

coming juvenile eels, and an experimental eel ladder in the Saw Kill, just outside the Hudsonia office at the Bard College Field Station. The average number of eels passed over the dam was 109 per year for a total of 1,638 eels thus far. Most of

American eels arrive at Hudson River tributaries in the "glass eel" stage—tiny and transparent—after journeying a thousand miles from their ocean birthplace. In ensuing years the eels turn opaque and dark, and grow to over one meter (three feet) long, and ultimately migrate back to the ocean where they spawn. Photo © Lea Stickle 2020.

these eels are quite small—i.e., less than 20 cm (8 inches), and many are less than 7.6 cm (3 inches) long. This study has been carried out in cooperation with Dan Miller and others at the Hudson River National Estuarine Research Reserve.

An unusual-looking wetland plant, goldenclub, grows in acidic streams and bogs, as well as in freshwater tidal wetlands, three very different environments. Locally common in states southward, goldenclub is ranked as Threatened in New York. A Hudsonia Intern, Julia Les, surveyed goldenclub in the Hudson River in 2014. Although she found previously-unknown stands, several major populations had disappeared or declined since the 1970s. Sea level rise, herbivory, and competition from larger plants such as cattails and sweetflag may be the causes of decline. Many freshwater tidal wetlands are accessible only by paddlecraft, and most goldenclub stands must be surveyed at low tide, complicating the logistics of monitoring this species.

Additional rare or declining biota we have studied include dodders (*Cuscuta* spp.), strange-looking herbaceous vines that parasitize other plants, and native species of prickly-pear cactus (*Opuntia* spp.), as well as muskrat, northern har-

rier, common gallinule, Pine Barrens treefrog, Atlantic Coast leopard frog, Cecropia moth, and "anise" millipedes (Xystodesmidae).

ECOLOGY AND MANAGEMENT OF NONNATIVE AND OVERABUNDANT SPECIES

Most researchers and land managers agree that invasive, nonnative species are adversely affecting native biological diversity. The exact nature of this problem and how to ameliorate it are less clear. We approach overabundant species issues by asking three questions: What are the goals of management? What is the local situation in a park, preserve, estate, or development site?

Goldenclub populations in freshwater tidal wetlands are threatened by herbivory and sea level rise. Drawing © Kathleen A Schmidt 2001; photo © Kristen Bell Travis 2020.

What do we know about the ecology of the species involved? There is no magic wand for eliminating unwanted weeds and pests, so strategy is important. A species can be perceived as harmful in one place and beneficial in another, and most management techniques have their own negative impacts. Here are three examples: a plant, an animal, and a preserve.

Our eight native species of dodders in the Hudson Valley look superficially alike—delicate orange vines with small cream-colored flowers. The six rare dodder species in the region can be identified only by close examination of minute flower parts. Photo © Erik Kiviat 2020.

Two species of prickly-pear—*Opuntia cespitosa* and *Opuntia humifusa*—are native to the Hudson Valley, and are found on unshaded, dry, rocky outcrops. Photo © Erik Kiviat 2020.

Common reed (*Phragmites australis*) occurs here in both native and nonnative forms, although the nonnative is abundant in the Northeast and the native is rare. Reed occurs in many marshes, ditches, ponds, and even on well-drained ground, and the stands sometimes expand to dominate large areas, especially where soil and water have been inadvertently salinized or fertilized. Extensive, dense stands of robust reeds can compete adversely with many plants, including uncommon and rare species. These large reedbeds, depending on their physical characteristics, can also be unfavorable habitat for certain marsh and water birds. Yet reedbeds help to build and stabilize

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soils against rising sea level, and improve water quality by taking up nutrients and metals. Reedbeds can also be important to roosting and breeding bird species, and can be managed to make better habitat for particular organisms. Common reed provides analogous habitat functions wherever it occurs, and these are shaped by a number of biological and physical-chemical habitat features. For 35 years we have been studying reedbeds to elucidate these phenomena and devise practical, site-specific, management approaches. We are also beginning research on a native reed population discovered by Ed McGowan a

Common reed is often reviled as a nonnative invasive plant, but can serve valuable roles in stabilizing soils, taking up excess nutrients and other contaminants from soils and water, and providing nesting and roosting habitat for birds. Photo © Erik Kiviat 2020.

few years ago in a Hudson River marsh, and are prospecting for native reed elsewhere.

The mute swan is a stunningly elegant, large, nonnative, waterfowl species that was introduced to northeastern estates for ornament in the 1800s. During the past three decades, mute swans have proliferated and now nest on many Hudson Valley water bodies. Mute swans uproot and consume large amounts of submergent aquatic plants, and are often blamed for competition with native submergent-foraging swans and ducks such as the canvasback. We examined the research literature about American mute swans, and concluded that the methodology of most studies was insufficient to support conclusions about impacts on plants and competition with other birds. For example, several papers reported using exclosures to compare swan-grazed and non-grazed plots, but potential grazing by other herbivores, and physical effects of the exclosures, were typically not well-controlled for. The conclusions of competition may be correct but need to be confirmed by better-designed studies inasmuch as state wildlife agencies are practicing expensive and controversial management methods.

The best test of an approach is the management of a whole landscape. This fall we are collaborating with the Clarkson University Beacon Institute for Rivers and Estuaries to plan management of nonnative weeds on Denning's Point (Beacon, New York). This state park covers approximately 24 hectares (60 acres) of a highly disturbed, former brick-making site, now mostly woods and thickets, and rife with nonnative woody plants. We are focusing on species that 1) have invasive potential and are localized enough to allow effective control; 2) are intruding on a small supratidal swamp and pool, an unusual habitat; and 3) border a woodland pool and potentially release a chemical known to be toxic to amphibian larvae. Tentatively, bottlebrush buckeye (*Aesculus parviflora*), a nonnative viburnum (*Viburnum plicatum*), and knotweed (*Reynoutria japonica s.l.*) are among the species to be managed. Highly successful weeds such as these require long-term efforts, and it will take several to many years to gauge success. Several widespread and common nonnative plants, including Norway maple and Bell's honeysuckle (*Lonicera* × *bella*), will be left alone because they are too abundant to manage successfully.

We are also analyzing forest sampling data from 1976 and 2011 to discover if the space opened by hemlock death (due to an infestation of the non-native hemlock woolly adelgid) in the old forest of Montgomery Place South Woods (Annandale, New York) will be colonized by native or nonnative trees, shrubs, and vines. This information will help guide conservation of an unusual forest stand and may be applicable to other old forests facing new stresses.

WETLANDS AND WATERWAYS

Surface waters (perennial or intermittent streams, lakes, ponds, vernal pools, etc.) support the life cycles of many organisms, but also accumulate physical and chemical stresses from the surrounding landscapes. Thompson Pond is a 55-hectare (136-acre) circumneutral bog lake on a Nature Conservancy preserve in Pine Plains, New York. We recently repeated a 1973-74 survey of the wetland flora. Two findings are of special interest. Pipewort (*Eriocaulon aquaticum*), common in the first survey, was not found at all in the second survey. Pipewort is associated with low-nutrient waters, and water quality data at Thompson Pond indicated a sharp increase in phosphorus (an important nutrient) between surveys. Typical sources of phosphorus pollution are fertilizers and septic leachate, but we have not pinpointed the sources at this site. We found 1.6 hectares (4 acres) of nonnative common reed in the second survey although the species was absent in the first survey; reed may also be responding to the elevated phosphorus. Nutrient enrichment of aquatic habitats is a pervasive problem, and studies such as this help us understand changes in wetlands and lakes, and their ability to support native biodiversity.

Tivoli North Bay, a freshwater tidal wetland on the Hudson River and a part of HRNERR, has been a site of ecological research since 1971. We have studied the vascular flora and vegetation, bryophytes, nonnative weeds, benthos, fish, snapping and painted turtles, birds, muskrat, and human activities at North Bay. In 1984, we analyzed veg-

Northern pipewort is an uncommon plant of uncommon habitats in this region—usually circumneutral or acidic, nutrient-poor, sandy-bottomed or peaty ponds. Photo © Erik Kiviat 2020.

Thompson Pond is a fine example of a circumneutral bog lake, an unusual kind of wetland with aspects of acidic bog, calcareous marsh, and open-water lake habitats. These places are known for rare ecological phenomena and rare and uncommon species of plants and animals. Photo © Lea Stickle 2020.

etation biomass by species on transects along the intertidal elevation gradient, and found that aboveground biomass, plant height, plant species richness, plant litter mass, and soil organic matter content were all correlated with elevation. Data such as these are useful in understanding the effects of sea level rise on tidal marshes.

Other wetland research has included analyses of the fen soils and vegetation supporting the Endangered bog turtle; sampling of fish, benthos, vegetation, and soils in fifteen Hudson River marshes to inform restoration planning; relationships between people and wetlands worldwide; and how wetland imagery in fiction reflects wetland ecology.

URBAN BIODIVERSITY STUDIES

In 1999 we were asked to review a development proposal that would have built on 80 hectares (200 acres) of marsh in the New Jersey Meadowlands. We subsequently synthesized much of the existing information about Meadowlands biodiversity to provide a starting point for future research and land use reviews. This effort became a book manuscript about urban biodiversity using the Meadowlands as a case study, to be published by Lexington Books in 2021. Biota data for this highly altered urban-industrial region are among the most detailed from U.S. cities, and offer a unique opportunity to test ideas about the urban-tolerance and urban-sensitivity of different species and groups by comparing the Meadowlands to other much-disturbed places that we have studied, such as Denning's Point, Quarry Waters Park in East Kingston (New York), the Marcellus shale gas landscapes of Pennsylvania and West Virginia, and Jekyll Island (Georgia).

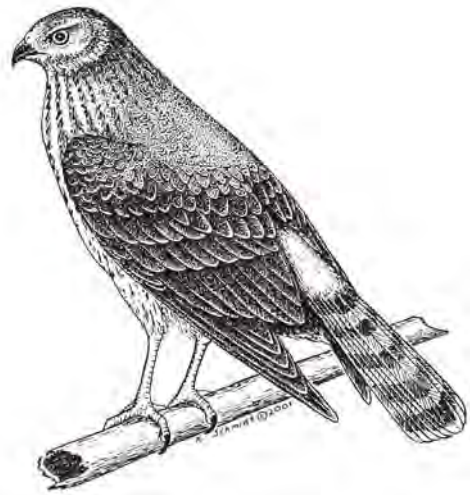
ENERGY INFRASTRUCTURE

Many solar, wind, biomass, and hydropower installations are now being built in the northeastern states. It is not news that energy generation and transmission facilities, including those for renewable energy, have a variety of environmental impacts. Renewable energy generation, in general, does much less harm to biodiversity than does fossil fuel energy, but solar photovoltaic (PV) generating plants, for example, use large land areas, and little is known about how they affect vegetation, birds, and other organisms. A year of studying the 600-hectare (1480-acre) site proposed for a major solar PV facility allowed us to explore how the impacts of solar development can be reduced and mitigated. As with any major land use project, this requires knowledge of the plants and wildlife of the site. The fallow farmland in question supports many rare plants and is well-used by both rare and common wintering raptors. The rare plants of woodlands are sensitive to disturbance, and the habitat is best left intact. Rare plants of meadows may be more robust to panel installation and occasional mowing, but most raptors will probably not hunt between solar arrays. The loss of habitat may be mitigated by preservation and management of suitable foraging areas nearby, but a net loss of habitat is inevitable.

We have also studied the ecological impacts of hydraulic fracturing (fracking), gas pipelines, electric transmission rights-of-way, and small hydropower projects. An interesting potential is the use of unwanted plant biomass (e.g., from thinning or fragmenting stands of nonnative common reed) as a feedstock for biomass energy. There are several possible ways of converting plant material to fuel, and many questions about which techniques generate the least air, water, and soil pollution.

BIODIVERSITY RESOURCES CENTER

Hudsonia's Biodiversity Resources Center (BRC) consolidates our work on biodiversity research, mapping, and education. We conduct habitat assessments and biodiversity surveys of sites throughout the Hudson Valley and neighboring regions, and make recommendations for reducing the impacts of human activities on sensitive



Northern harrier, ranked as Threatened in New York, is one of the raptor species that loses hunting habitat and potential nesting habitat to utility-scale solar arrays sited in large meadows. Drawing © Kathleen A Schmidt.

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species and habitats. These projects are undertaken at the requests of public agencies, land trusts and other conservation organizations, developers, citizens' groups, and individual landowners. In the BRC's habitat mapping program we identify and map ecologically significant habitats in large areas—such as whole towns—based on remote analysis and field observations, explain the implications for land uses, and offer recommendations for effective conservation.

Another significant program of the BRC is the preparation of Natural Resource Inventories and similar documents for municipalities and counties. The NRIs that we have prepared for two counties (Columbia and Greene) and for three towns (Ancram, Dover, and New Lebanon) are designed as practical references about the physical landscape and biological and water resources, threats to important resources, and ideas for best uses, stewardship, and conservation.

The BRC's education program instructs community leaders in science-based principles and techniques for conservation and protection of biodiversity and water resources, and provides technical assistance to support local efforts. Through indoor and outdoor workshops, training programs, seminars, and webinars, we especially work with members of planning boards, town boards, environmental commissions, the staffs of land trusts, and other public agencies and NGOs who establish local policy, conduct environmental reviews of land development projects, help landowners design conservation easements, manage conservation lands, and regularly engage in other actions related to land use and conservation. Since 2001 the program has been carried out in partnership with the NYSDEC Hudson River Estuary Program with funding from the NYS Environmental Protection Fund.

The BRC programs inform local policy-making, open space planning, siting and design of land development projects, environmental reviews of those projects, and land management of publicly- and privately-held properties. All are designed to advance local knowledge of biological resources, and help participants stem the loss of native biodiversity in the region.

Chris Graham (foreground) led a survey of non-woody plants at a bioblitz of the Thorn Preserve, sponsored by the Woodstock Land Conservancy and the Catskill Center. Photo © Maxanne Resnick 2020.

* * * * *

All of our studies and programs result in reports, publications, seminars, or other dissemination for the benefit of ecologists, planners, policy-makers, regulatory officials, landowners, developers, environmentalists, and others. We believe that bringing up-to-date science to local policy and land management decisions is essential for effective conservation of biodiversity in the Hudson Valley and the northeastern states.

Hudsonia is grateful to the funders who make our programs possible. Many are listed in the acknowledgments at the end of this journal.

Education programs of Hudsonia's Biodiversity Resource Center include hands-on exercises in identifying and assessing significant habitats remotely (using maps and aerial photos) and in the field. Photo © Elise Heffernan 2020.

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For all items, please inquire first.)

Welcome to Philippa


Kristen Bell Travis

Former board chair Philippa Dunne has joined Hudsonia as director of Community Outreach and Development, in part to free up Erik's time so that he can finish his manuscripts. Philippa has had wide work experience including research and writing for the American Museum of Natural History and for designers Ray and Charles Eames. A performing musician, she has taught at the college level, and is looking forward to playing at one of our events when we can meet again.

Philippa spent some of her California childhood monitoring tadpoles in roadside ditches and moving them to deeper waters if they were developing more slowly than the water was evaporating. So she fits right in.


Erik Kiviat

Purple pitcher-plant is one of several species of insectivorous plants that occur in peatlands of the Hudson Valley. Insectivory provides a supplemental source of nutrients where the acidic or alkaline environments make nutrients from water and soils less accessible.

SPECIAL THANKS

Julianna Zdunich, for designing our fundraising appeals.

Northern pearly eye (*Enodia anthedon*)

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Hudsonia gratefully acknowledges the individuals, businesses, organizations, and foundations that have, through their gifts, expressed a commitment to the advancement of environmental science, education, and conservation.

(Listed here are donations received between 17 December 2019 and 18 November 2020.)

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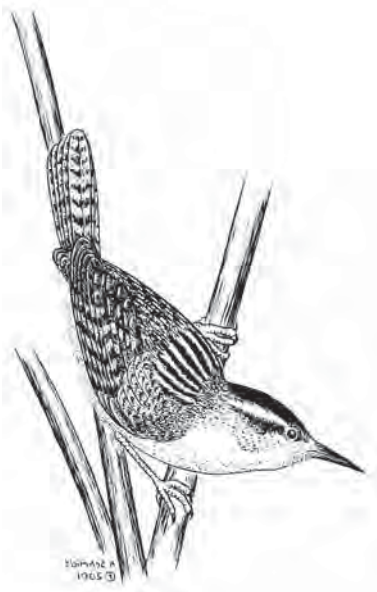

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