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News from Hudsonia

Environmental Research and Education · Science for Conservation

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Carbon Cycling in the Hudson River

by Erik Kiviat*

The estuary is a mirror to an observer's mind. Poet Sidney Lanier wrote, "The tide's at full: the marsh with flooded streams / Glimmers, a limpid labyrinth of dreams." A boater looking at the Hudson may see the sun glinting on sails, a businessperson may see a water supply or transportation route, a fisher may see largemouth bass or American shad, and a scientist may see all of these - or carbon. Why carbon?!

Carbon is one of the major constituents of plants, animals, and their remains, and accounts for about one-half of the dry weight of all organic matter. Ultimately, most of the carbon in the Hudson comes from the atmosphere, and most ends up back in the atmosphere, the ocean, or in bottom sediments. What does the carbon do in between? *(Continued on page 6.)*

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*Hudsonia

Where are the Reptiles and Amphibians of the Hudson River? Part 1

by Erik Kiviat*

Bullfrog

Reptile and amphibian (herpetofauna or "herp") use of tidal habitats in the northeastern U.S. may be limited by salinity, tidal fluctuation, water depth, ice scouring, currents, waves, storms, high or low temperatures, vegetation, predation, pollution, and harvest. Estuaries (including freshwater tidal areas) have been altered and degraded as a result of urbanization, industrialization, transportation, and recreation.

Because there have been few herpetofaunal surveys in tidal habitat complexes, there is little knowledge of the faunas and the impacts of limiting factors on different species. Many amphibians and reptiles are believed to be sensitive indicators of general environmental quality, so differences in the faunas of tidal and nontidal habitats could provide insight into the sufficiency of estuarine ecosystems to support use by other animals and people.

Part 1 of this article includes a draft checklist of Hudson River reptiles and amphibians and a discussion of the background issues of habitat ecology and human impacts. One purpose of this article is to solicit data from other naturalists. Part 2 will contain a revised checklist, a discussion of selected species, references, and acknowledgments.

Table 1 suggests that the amphibian and reptile community of the tidal Hudson River has lower abundances for most species than would be expected in large, nontidal, wetland-shoreline-water com- *Continued on page 3)*

Table 1. Amphibians and reptiles of the tidal Hudson River. Introduced species not known to reproduce in the region are excluded, and the New York City - New Jersey shores are not considered due to lack of data.

Species	Distribution	Habitat[1]	Abundance[2]
Snapping turtle, *Chelydra serpentina*	Troy to Piermont Marsh	P Sw M Sh	Common
Musk turtle (stinkpot), *Sternotherus odoratus*	Germantown to Piermont	D Sh M?	Rare
Spotted turtle, *Clemmys guttata*	Tivoli Bays	U	1 record
Wood turtle, *Clemmys insculpta*	Stockport to Constitution Marsh	D Sw	Rare
Painted turtle, *Chrysemys picta*	S. to Iona Island	P Sw M Sh	Uncommon to rare
Map turtle, *Graptemys geographica*	Papscanee Marsh to Hyde Park (Cornwall Bay?)	Sh	Uncommon to rare
Diamondback terrapin, *Malaclemys terrapin*	Bear Mountain to Piermont	M? Sh?	Uncommon to rare
Atlantic Ridley, *Lepidochelys kempii*	Spuyten Duyvil	Sh	1 record
Garter snake, *Thamnophis sirtalis*	Tivoli Bays	E? Sw? M	Rare
Water snake, *Nerodia sipedon*	Tivoli Bays to Manitou Marsh	E Sw M?	Uncommon to rare
Brown snake, *Storeria dekayi*	Tivoli Bays	E?	Local?
Copperhead, *Agkistrodon mokasen*	Cornwall?	E?	1 record
Spotted salamander, *Ambystoma maculatum*	Stockport, Tivoli Bays	P	Very local
Northern dusky salamander, *Desmognathus fuscus*	Tivoli Bays	D	Rare?
Four-toed salamander, *Hemidactylium scutatum*	Tivoli Bays?	Sw?	1 possible record
Mudpuppy, *Necturus maculatus*	(Troy?) Germantown to Kingston?	Sh?	Extirpated[3]
American toad, *Bufo americanus*	Papscanee? to Iona Island	E? P Sw? M	Uncommon
Spring peeper, *Pseudacris (Hyla) crucifer*	Nutten Hook to Barrytown	P Sw M?	Locally common in supratidal pools
Gray treefrog, *Hyla versicolor*	Tivoli Bays to Barrytown	P Sw	Rare
Green frog, *Rana clamitans*	Papscanee? to Iona	D P Sw M	Uncommon to rare
Bullfrog, *Rana catesbeiana*	Papscanee to Tivoli Bays	P M	Rare
Northern leopard frog, *Rana pipiens*	Nutten Hook to Barrytown	P Sw M	Rare
Pickerel frog, *Rana palustris*	Staatsburg	D	1 record
Wood frog, *Rana sylvatica*	Nutten Hook to Barrytown	P Sw M?	Rare, loc. common

[1]Tide-affected habitats in the Hudson River: E = Shoreline near Mean High Water; D = Tidal deltas or tidal channels of small tributaries; P = Supratidal pools; Sw = Inter- or supratidal swamp (woody vegetation) including creeks; M = Tidal marsh including creeks; Sh = Subtidal shallows; U = unknown.
[2]Relative to other species in the tidal Hudson River.
[3]The mudpuppy was apparently an inhabitant of the tidal Hudson in the first half of the 1900s. This salamander may have arrived via the Erie Canal, and may have disappeared from the Hudson due to chemical pollution.

American toad, *Bufo americanus*

plexes of nearby areas. Only 24 species of the approximately 41 potentially aquatic or amphibious reptiles and amphibians found in areas near the Hudson are known to enter tide-affected habitats. Most of the "available" salamanders and snakes are apparently absent, and the frogs and most turtles are uncommon to rare. Only one species is common in the Hudson - the snapping turtle. Spring peeper, American toad, and perhaps wood frog are locally common in breeding choruses at a few supratidal pools. The only population studies that have been conducted on the Hudson suggest a normal density for the snapping turtle but abnormally low density for the painted turtle in Tivoli North Bay.

Estuaries are particularly subject to human impacts. Estuaries are often the locations of intensive and longstanding urban and industrial activities, as well as two-way funnels of pollution between watersheds and "seasheds." I expect the combination of anthropogenic and natural stresses to be acute in estuaries, and the natural constraints to make herpetological communities particularly sensitive to the effects of human activities. Therefore, estuarine herpetofaunas should be useful indicators of the degree of anthropogenic stress and the quality of the environment.

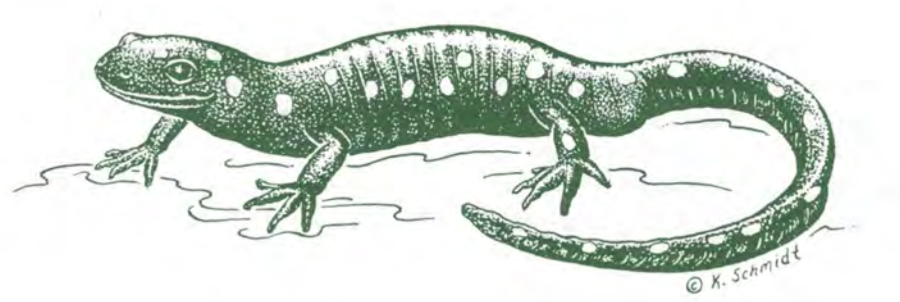
When an estuarine fish species shows signs of decline, justifiable alarms may go off in the popular and scientific press and in natural resource circles. Witness the Atlantic sturgeon decline, tomcod tumors, and striped bass fishery closure. Yet the decline or absence of a common herp rarely strikes sympathetic chords with anyone other than a few herpetologists. We should have learned enough about environmental contaminants, habitat alteration, and overharvest to wonder why the Hudson River herpetofauna is impoverished and what this means for other organisms including us. It is not just the herps, but many of the larger, more sensitive, or more carnivorous birds and mammals that seem to be missing from the Hudson.

The marine and aquatic mammals, birds of prey, and herons of the Hudson all appear to be under stress. Many of these animals are more abundant or reproduce more successfully at other northeastern estuaries, or they were formerly more abundant or more successful breeders on the Hudson. Among these "missing" herps, birds, and mammals are small and large species, eaters of fish, insects, and even plants (the muskrat), species that humans kill or collect, and non-harvested species. Studies of these faunal declines should help us understand the Hudson, other estuaries, urban-industrial regions in general, and declines of non-estuarine fauna. Such studies should also help us manage and restore the Hudson.

The tidal Hudson River has been heavily contaminated with PCBs for at least 25 years. PCBs are well known endocrine disruptors capable of adversely affecting many animals including turtles and frogs. Lead, cadmium, chromium, dioxin, petroleum hydrocarbons and other persistent contaminants could also be toxic to herps alone or in combination. The supratidal (i.e. flooded only by the higher high tides) swamps and pools that comprise the principal Hudson River habitats for spotted salamander, spring peeper, wood frog, and northern leopard frog might have lower contaminant levels because they are reached by less suspended fine sediment carrying PCBs and other contaminants.

Turtles and snakes along the Hudson are attracted to the railroads. Snapping, painted, spotted, wood, and map turtles all lay their eggs in the soils adjoining the tracks. These soils are composed largely of coal cinder and diesel soot. They are also exposed to herbicides used for right-of-way vegetation management and "creosote" (petroleum hydrocarbons) used to pest-proof ties and utility poles. A preliminary study suggested the hatching rates of snapping turtle eggs from the railroad at Tivoli were lower than rates reported in the literature. If this effect is real, it could be due to contaminants in the soils or in the river.

Turtles on the railroad are often

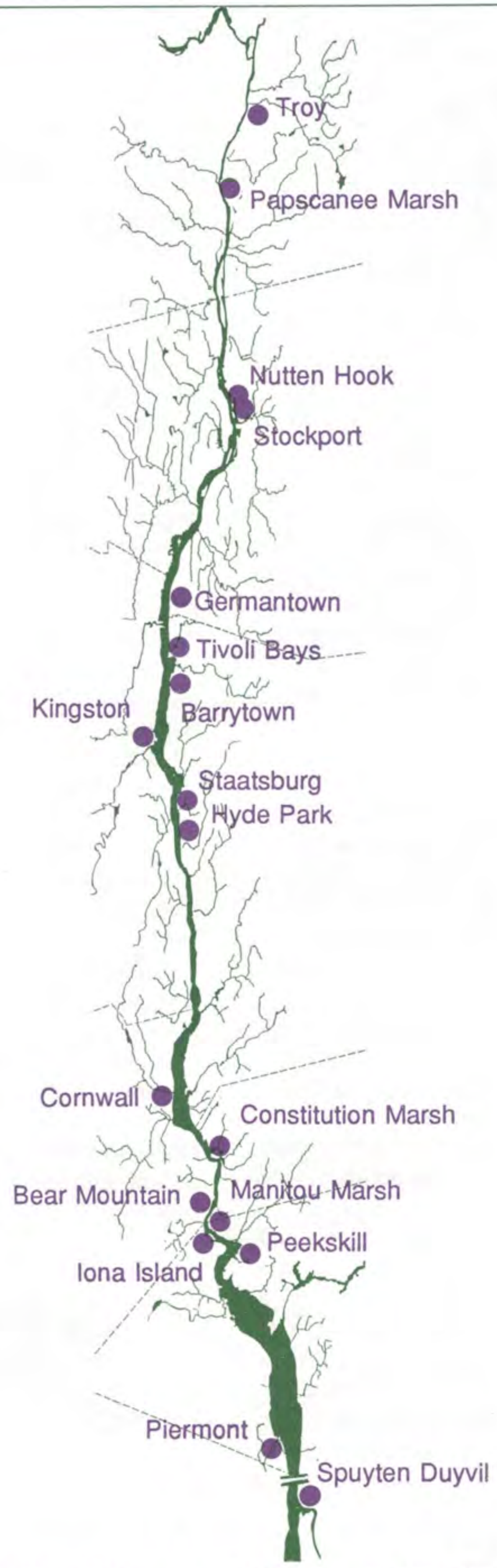


Spotted salamander, *Ambystoma maculatum*

collected by humans or killed by trains and vandals. In the 1960s-70s, large numbers of snapping turtles were harvested from the Hudson for food; these included nesting females on the railroads and adults of both sexes in the marshes where they are easily found at low tide in the spring. Painted turtles were also collected for the pet trade. Snapping turtle harvest rates have fallen due to the discovery that Hudson River snappers are highly contaminated and a subsequent State Department of Health Advisory. I have found remains of snapping turtles that were shot, and I received a report of the shooting of map turtles. Hudson River map turtle populations appear to be small and their distribution determined by suitable, often conspicuous, basking sites, thus this species could be highly vulnerable to armed vandals.

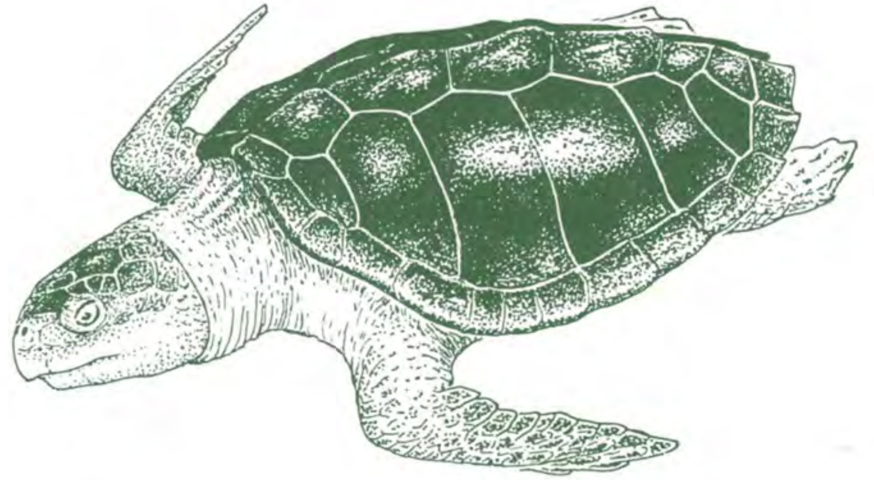
Raccoons have been abundant along the river throughout the 1970s-1990s. Turtle eggs and hatchlings on land, and turtles and frogs in the wetlands at low tide, are vulnerable to predation by raccoons. More than one third of the painted turtles studied at Tivoli North Bay in 1995 had mammal teethmarks on their shells. Raccoon populations are favored by human activities (removal of large predators, inadvertent provisioning with food wastes, agriculture). Snapping turtles, water birds, and fishes such as largemouth bass could also be important predators on small herps in the Hudson. Small fishes could eat amphibian eggs.

In addition to the evident anthropogenic stressors just mentioned, several aspects of tidal habitats may be harsh for herps. Salinities exceeding 1 or 2 parts-per-thousand (ppt) may be stressful for amphibians. These salinity levels affect the river below Beacon or Cold Spring. At Iona Island Marsh, salinity reaches 6+ ppt in summer and fall.



Hudson River Localities (see Table 1).

Interestingly, herp activity there may be concentrated in channels near the road causeway that apparently are influenced by fresh runoff or groundwater discharge. These channels also hold shallow, quiet water at low tide. Most herps are not tolerant of rapidly fluctuating water levels which are especially troublesome for amphibian eggs and larvae. On the Hudson, green frog, bullfrog, and painted turtle seem most abundant where there are quiet ponded waters at low tide (either in or just above the intertidal zone). Not only are these habitats sheltered from waves and currents, but submergent and floating-leaved plants are more abundant and provide cover for herps and their food. Shallow marsh pools and mudflats, however, are subject to high and potentially fatal summer temperatures.



Atlantic Ridley turtle found dead at Spuyten Duyvil in August, 1995.

Perhaps the supratidal swamps and pools are the most interesting and least-studied herp habitats on the Hudson. These areas are reached only by the higher high tides; some supratidal pools and swamps are flooded by spring (i.e. full and new moon) high tides and higher high tides after heavy rains, whereas other pools are so high they are reached only by the storm tides that occur as rarely as once per decade. Although the tidal Hudson lacks the broad floodplain characteristic of many tidal rivers farther south, the diversity of shoreline geology (natural and artificial) has created ecological variety from the elevations of the most extreme high tides down to the shallow continuously-flooded levels.

Water snake, *Nerodia sipedon*

The more extensive, varied, shrub and tree-dominated tidal swamps, with their elevational diversity, small intertidal and supratidal creeks and pools, tree root hummocks and tip-up pools, allow the more terrestrial herp species to enter tide-affected areas with minimal exposure to the stress factors discussed above. Extensive tide-affected swamps at Mill Creek, Nutten Hook, Stockport Flats, Rams Horn Creek, and other locations may support many of the amphibians and reptiles that are rare elsewhere along the estuary.

An analysis of the Hudson River herpetofauna should be applicable (with consideration of geology and other regional factors) to estuaries from at least southern New England to the Middle Atlantic states, including Long Island and the District of Columbia. For this reason, Hudsonia is examining the prospects for comparative studies. I am collaborating with Chris Swarth at the Jug Bay Wetlands Sanctuary on a population study of the painted turtle in a freshwater tidal marsh of the Patuxent River, Maryland, and I have visited potential study areas on the Connecticut and Housatonic rivers with Juliana and Nels Barrett (Nature Conservancy) and Hank Gruner (Science Center of Connecticut).

Some of the apparent impoverishment of the Hudson's herpetofauna may be due to lack of study. Observation and sampling in tidal habitats is often difficult because of tidal fluctuation, soft sediments, and dense vegetation. If estuarine birds did not fly and sing, we would probably know much less about them.

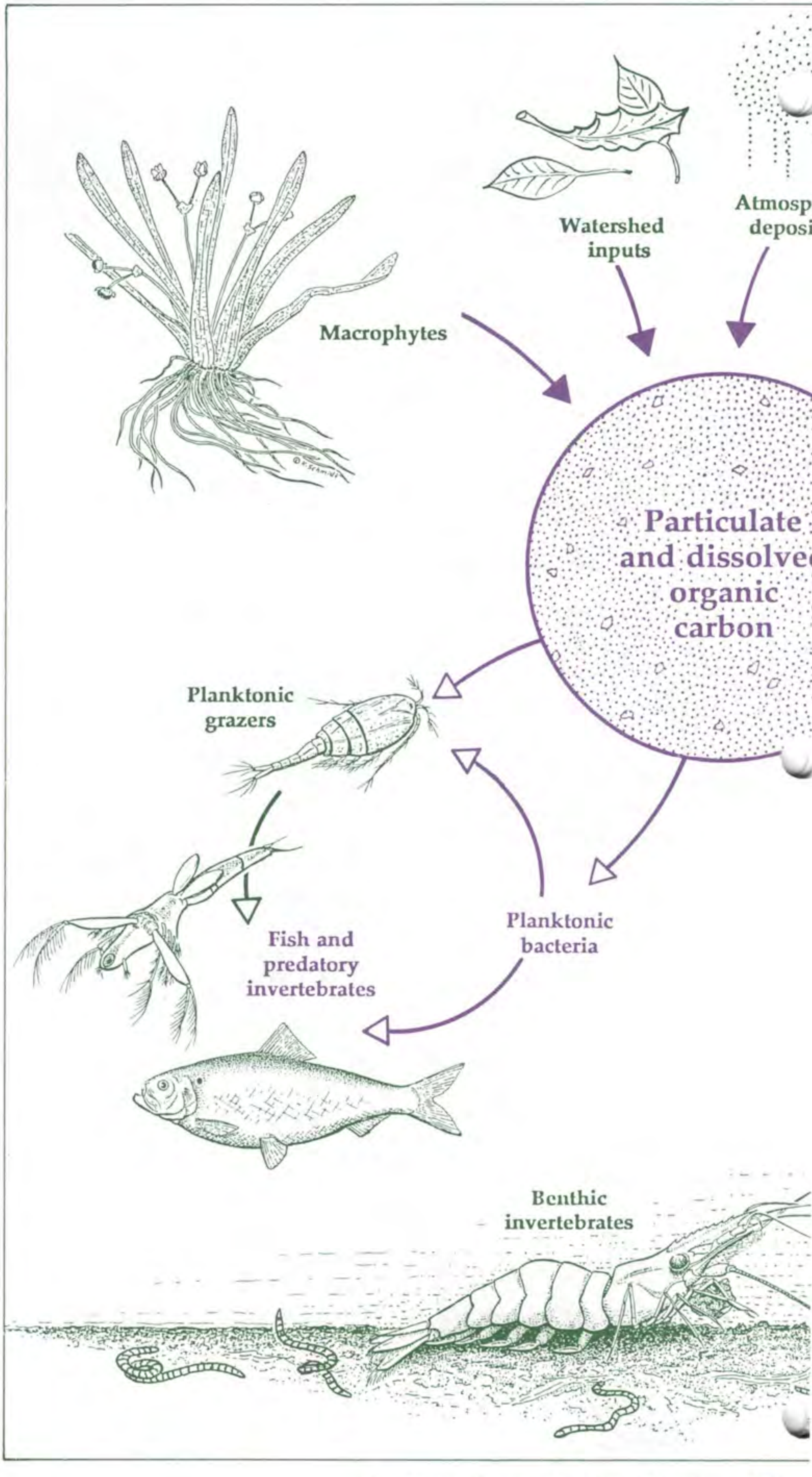
I am interested in readers' observations of herps in tide-affected habitats of the Hudson and other estuaries. (Also, you may know of preserved specimens not in museum collections.) Please provide, if possible, details of identification, habitat, behavior, year, and season. Your data will be reviewed for inclusion in Part 2 of this article. Readers of ***NFH*** have submitted important data on marine mammals, prickly-pear, and other organisms. You can help Hudsonia discover if (and why) estuarine herpetofaunas are a gaping hole in northeastern biological diversity. ●

Carbon Cycling *(Cont from page 1)*

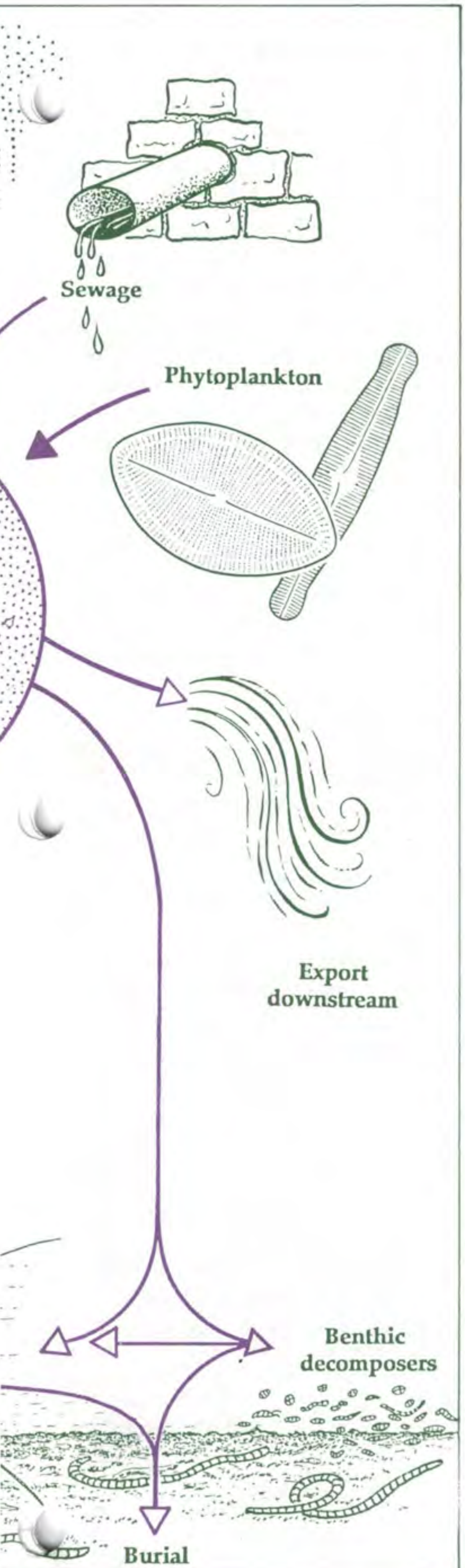
Ecosystem-level researchers strive to describe the estuary in terms of some ecological property such as nitrogen, energy, or carbon. This has the advantage of a "common denominator" that provides equivalencies among many of the living and nonliving components of an estuary, as well as between the estuary and another ecosystem such as a forest. This approach allows identification of the commonalities and peculiarities of the system, and the ability to predict what might happen should components change: for example, an increase in treatment of sewage, or the invasion of the zebra mussel. Carbon is approximately equivalent to organic matter or energy in analyzing an ecosystem, and it is a convenient measure of the quantity of nourishment available to virtually the entire food web.

The diagram shows major pathways of carbon entering, cycling within, and leaving the Hudson River estuary (i.e. the tidal river from Troy to Manhattan). Most of the carbon enters the ecosystem as already-created organic matter. The production of new organic matter by photosynthesis of algae or vascular plants within the open river is less important than "old" (i.e. dead) organic matter entering from the watershed. In this respect, the Hudson is more like a small headwater stream receiving leaf litter than like many estuaries.

Most of the carbon in the Hudson estuary comes over the Troy Dam from the watershed of the nontidal Hudson. This material is about half particles and half dissolved organic matter, and originates principally from tree leaves and from organic soil particles eroded from agricultural areas. Although large quantities of organic matter enter the estuary from tributaries below the dam, this material (from leaves, agriculture, sewage, and other



Carbon Cycle in the Hudson Rive



uary

sources) is dwarfed by the carbon spilling over the dam. New York Harbor receives a major carbon input from sewage, but this source is believed to be minor above the Tappan Zee. In many other estuaries, marsh vegetation, "submerged aquatic vegetation" (SAV), and phytoplankton are major sources of carbon. Salt marshes on the Atlantic Seaboard are a relatively important source of carbon in coastal waters because the marshes are providing carbon to a low-carbon system, unlike the Hudson which has much higher carbon levels.

The Hudson's vegetated shallows and tidal wetlands produce large amounts of organic matter by photosynthesis of marsh and aquatic vascular plants, and to a lesser extent algae that live on the intertidal mud and other surfaces. Vegetated areas comprise more than a quarter of the estuary. The intertidal marshes have a peak aboveground biomass (i.e. the maximum amount of live plant material standing in the marsh in mid-summer) averaging about 400 grams dry weight per square meter, half of which is carbon. Yet because of the relatively small areas of marsh, and the fact that only about half of this carbon reaches the open river, the marshes contribute much less than the watershed. The picture is less well understood in the shallows, where SAV has a peak aboveground biomass averaging about 50 grams dry weight per square meter. Researchers at the Institute of Ecosystem Studies in Millbrook, N.Y. are mapping and measuring SAV in the Hudson.

Free-drifting microscopic algae or "phytoplankton" are not a major source of organic matter in the Hudson, because filtering by zebra mussels keeps their biomass small. Even before zebra mussels were in the Hudson, the high turbidity (due mostly to suspended sediment) prevented development of a large biomass of phytoplankton.

Once organic carbon is in the estuary, it is used by microbes, invertebrates, and fishes as an energy source. About half of the carbon in the Hudson is metabolized by bacteria before reaching New York Harbor. Bacteria nourished by this carbon link dead plant matter to the rest of the food web - the zooplankton (tiny drifting animals), benthos (bottom animals), fishes, and most other animals right up to the herring gulls, harbor seals, and humans that eat live fish and the blue crabs, bald eagles, and other animals that scavenge dead fish. The Hudson's abundant supply of carbon from trees and soils in the watershed may be related to the large production of fish in the estuary - and to the historic and prehistoric role of the estuary in attracting and nourishing human populations.

What kinds of questions might scientists ask about the food web of the Hudson estuary and its carbon source in the forests and soils of the watershed? Because freshwater flow over the Troy Dam controls most of the input of carbon into the estuary, does the magnitude of the spring flood (a large part of the Hudson's freshwater input) vary the amount of "food" in the Hudson from year to year? Will land use change and forest change in the Adirondacks and Mohawk drainage affect the Hudson's carbon cycle? Because there are large external sources of carbon, is the food web of the Hudson buffered against the loss of phytoplankton due to zebra mussel filtration? ⊙

Stuart Findlay (Institute of Ecosystem Studies) provided information and assisted with this article. Research on carbon and the Hudson's food web has been conducted by IES scientists and by Robert Howarth and colleagues at Cornell University. Much of their work was funded by the Hudson River Foundation.

Science, Anyone? Volunteer Programs in Field Biology and Archaeology

by Erik Kiviat

To conserve and better understand the remnants of natural and cultural diversity, and to reduce human impacts on the environment, we need lots of accurate, site-specific, up-to-date information. Collecting good data is expensive, and more than ever there is insufficient funding for all the field and laboratory work needed. Therefore, many scientists and managers are turning to volunteers for help.

Volunteers are trained to collect data for two projects in which Hudsonia is involved: the biological monitoring of a nature reserve in Salisbury, Connecticut, and an archaeological study in Saugerties, New York. Volunteering on a scientific project is not for everyone, but the right persons can derive great enjoyment and satisfaction while providing valuable assistance.

More than 1100 land trusts in the United States are preserving open space lands and natural areas. Land trusts have limited funds to study and monitor the biological diversity and enviromental conditions of their preserves, and the services of volunteers are crucial to these efforts. Good volunteer monitoring projects can also make substantial contributions to science.

Moore Brook is a headwater stream and wetland complex surrounded by forests in a marble valley of Salisbury in northwestern Connecticut. Many rare plants and animals have been found in these limy wetlands and forest edges. In the 1980s, several land owners gave conservation easements totalling 275 acres to The Nature Conservancy. Beginning in 1993, the **Volunteer Monitoring Demonstration Project (VMDP)** of the Salisbury Association retained Hudsonia to design biological monitoring projects and train volunteers to collect data. The **VMDP** is currently conducting several projects:

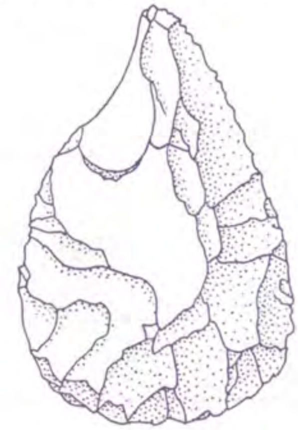
- A survey of the flora of the preserve, documented by herbarium specimens
- A census of the population of a rare plant
- Monitoring the increase of an invasive plant, common reed (*Phragmites*), in sedge meadows
- Breeding bird surveys on a route through the preserve

A water quality monitoring project was suspended due to difficulties with test kits and time requirements, but will be reactivated by a local high school teacher. Butterfly surveys were conducted in 1995, and we are looking for a butterfly expert to lead surveys in the future. An amphibian monitoring project is also under consideration.

Biological surveys, such as the flora study, provide information for the identification and design of monitoring projects. The goal of monitoring is to track populations and environmental features over many years. Monitoring, in turn, provides ideas and data that can be used to make management decisions as well as for scientific research. Moore Brook is a good site for field work because it represents ecosystem types and species that are rare and vulnerable in the tristate region, it is protected from development, and it is visited by few people other than **VMDP** personnel.

From efforts to date, we are learning the essential ingredients of a successful monitoring project. These include diverse, dedicated, well-trained volunteers, lots of time, supervision by experienced field scientists, and a long-lived organizational framework. The Moore Brook projects are overseen by a Scientific Advisory Committee. It is hoped committee members will assume responsibility for the long term continuity of the work.

The **Saugerties Archaeological Research and Education Project (SAREP)** is a community-based study sponsored by Hudsonia. The goal is to bring knowledge of archaeology, local history and prehistory to the public, and to promote the conservation of cultural resources. The Lighthouse Cove archaeological site is on a bluff near the confluence of Esopus Creek and the Hudson River. Much of the surrounding area is being developed for housing, and the site itself is scheduled for eventual construction. During the first two years, more than 35 local volunteers, several classes from Bard College, and Ulster County high school students have conducted excavations. Sixty-three shovel tests were used to select areas for excavation, and more than 15 square meters of excavation units were dug. Results thus far show that the site was used by Native Americans between 2500 BC and 500 AD. In the 1997 field season volunteers and high school students will continue excavation and start cataloguing artifacts from the dig. It is hoped that charcoal will be found for carbon-14 dating. More than 600 students and teachers from Ulster, Greene, and Dutchess counties have been given tours of the site.



Scraper

Hudson River Heritage and **SAREP** sponsored a series of public lectures on Hudson Valley archaeology. The Bard Center sponsored a travelling exhibit which **SAREP** has taken to Mid-Hudson schools, libraries, town halls, museums, and festivals. Visiting hours for the site are announced in the local media.

Readers are well aware that the culture and lifeways of former inhabitants can be determined through archaeological research. Archaeology can also provide information for environmental planning, management, and restoration by establishing the environmental conditions at various historic and prehistoric periods, and by probing how humans altered the environment and how the environment helped shape human cultures.

Inquiries about **SAREP** may be directed to Jeanne Goldberg, 66 Churchland Lane, Saugerties NY 12477 (914-246-5466), and inquiries about Moore Brook **(VMDP)** may be directed to Mary-Alice White, P.O. Box 588, Salisbury CT 06068. Mary-Alice, Jeanne, and Bill Reinhart **(SAREP)** assisted with this article. Support for the Moore Brook **VMDP** has come from the Sweet Water Trust, the Salisbury Association, and individual donors. Support for **SAREP** has come from the Hudson River Valley Greenway Hoffman Community Awards, NY State Natural Heritage Trust, Saugerties Concerned Citizens, and individual donors. Both projects thank the land owners for their cooperation.

Moore Brook Volunteers, 1996

Phyllis Busch
Elaine Hecht
Lou Hecht
Joyce Hemingson
Margaret Hoag
Betty Leech
Robin Magowan
George Massey
Jim Morrill & students
Ingrid Schaefer
Tom Schaefer
Jill Stainkamp
Doris Walker
Mary-Alice White

A Challenge to the Conservation and Development Communities

by Erik Kiviat

Many groups and agencies are promoting outdoor tourism in the Hudson Valley - hiking, cycling, boating, visits to historic sites, outdoor arts events, pick-your-own produce, guided natural history field trips, and the like. Tourism is economically important and is generally thought to be environmentally benign. Tourism may be *relatively* benign, but it is not impact-free! If we could understand the interaction of tourism and environment better, we might be able to educate visitors (and resident recreationists) to reduce their own impacts.

There is a multitude of beautiful foot trails in the Valley. Many of these are in mountainous regions including the Shawangunks, Catskills, Taconics, and Hudson Highlands, and others follow former railroads in the lowlands. Trails are being developed or re-cut along the Hudson River as part of a Hudson River Valley Greenway trail system. Because hikers enjoy the spectacular scenery, many trails follow rock ledges in the mountains and water edges in the lowlands. Unfortunately the greatest effect of soil compaction and erosion, noise, litter, and bushwhacking occur in these environments where many rare or vulnerable plants and animals live. A venerable trail on Breakneck Ridge has lost more than a vertical meter of soil in places. Some trail segments have been devastated by motorcycles, e.g. on Fishkill Ridge and Bull Hill. Off-road bicycles have become an environmental concern in the past several years. Cyclists have bypassed steps and bridges, and are causing unacceptable erosion of the Tivoli South Bay trail at Bard College. Wherever you can see the imprint of bicycle or motorcycle tires, or, indeed, lug soles, soil damage is occurring.

Anyone who sails, kayaks, or canoes on the Hudson is aware of the intensive use of the river by powered pleasure craft. Apart from the hazards to nonmotorized craft posed by careless powerboaters, boat motors pollute the water and air, wakes alter vegetation and animal habitats, boats collide with marine mammals and turtles, and the beds of submerged and emergent vegetation are scarred where boaters enter the shallows or beach. Some boaters even establish illegal campsites and clear vegetation on state lands. "Jet skis" are able to enter marsh creeks too shallow for larger powerboats, there disturbing plants, wildlife, and people alike.

We must all accept the challenge to assess, locally and cumulatively, the many impacts of recreation in the Hudson Valley. Every staff person of a government agency or NGO that promotes outdoor tourism should spend a day canoeing on the Hudson and another day hiking in the mountains to see these impacts. In the meantime, consider leaving your motorcycle, bicycle, or powerboat at home and using your feet or a nonmotorized boat. Hikers, try to stay on the trails (there may be fewer ticks) and boaters stay out of the vegetation. Organizations that promote and maintain trails, find ways to repair damage and make trails less susceptible to erosion.

Soils, plants, and animals are precious. In 20 years we will be pleased that every dollar or hour spent on prevention reduced the need for costly restoration, and helped preserve ecological assets and environmental amenities for many years to come.

Hudsonia Board of Directors:
Vernon Benjamin has resigned from Hudsonia's Board to finish his book on Hudson Valley history. Carla Cooke has resigned from the Board due to her move to Massachusetts. Hudsonia thanks Vernon and Carla for their service. We are seeking additional Board members who are able to help with fundraising, publicity, and other work. Current Board members are: Lawrence H. Weintraub (Acting Chair), Karen L. Jacobs, Michael W. Klemens, Thomas R. Lake, William T. Maple, C. Lavett Smith. We welcome new member Deborah Meyer DeWan.

Awards:
Hudsonia received the Garden Club of America (Marion Thompson Fuller) Award for a conservation exhibit at the Millbrook Garden Club Flower Show in July.

Wish List:
NISC database searches (especially Wildlife Review); Florida natural history literature; letter size steel file cabinets; 486 or 586 laptop computer (IBM-compatible); *Coastal Zone* Symposia & other natural history books, magazines; kayak paddle; Nikkormat camera body; used file folders.

Offered to nonprofits:
Northgate 386 IBM-compatible computer, needs diskette drive repairs. Duplicate books and journals (ask for lists).

Book Review:
Tanacredi, John T. with Curtis J. Badger. 1995. Gateway; A visitor's companion. Stackpole Books, Mechanicsburg, PA. 166p.

This natural history guide covers Gateway National Recreation Area sites at Jamaica Bay - Rockaway Peninsula, Staten Island, and Sandy Hook (New York - New Jersey). It's a good introduction, though fairly brief.

ANYONE FOR T? (Shirts)

Child (short sleeve; S, M, L).........$13.00
Adult (short sleeve; M, L, XL)......$16.50
Adult (long sleeve; M, L, XL).......$21.00

These shirts are 100% cotton, pre-shrunk, and available in white or buff. They have a small Hudsonia logo on the front left and our "signature" Blanding's turtle on the back in dark green and yellow. Sales tax included; please add $2 for shipping.

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The 1997 catalog is available by calling 914-758-7483.

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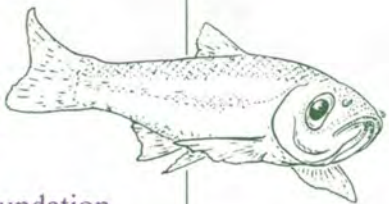

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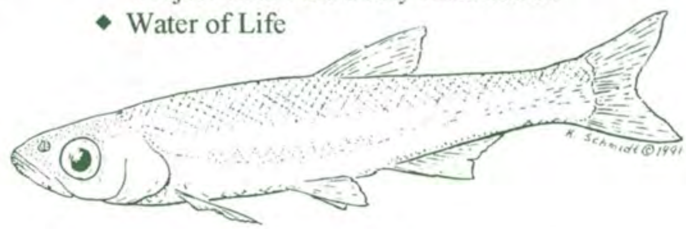

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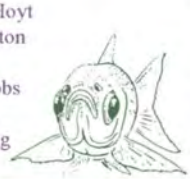

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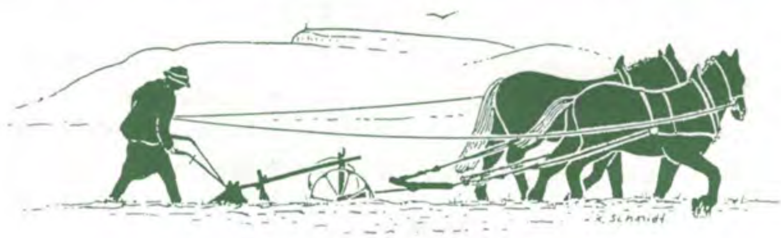

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